

CPC COOPERATIVE PATENT CLASSIFICATION

H ELECTRICITY

(NOTE omitted)

H01 BASIC ELECTRIC ELEMENTS

(NOTE omitted)

H01L SEMICONDUCTOR DEVICES; ELECTRIC SOLID STATE DEVICES NOT OTHERWISE PROVIDED FOR (use of semiconductor devices for measuring [G01](#); resistors in general [H01C](#); magnets, inductors, transformers [H01F](#); capacitors in general [H01G](#); electrolytic devices [H01G 9/00](#); batteries, accumulators [H01M](#); waveguides, resonators, or lines of the waveguide type [H01P](#); line connectors, current collectors [H01R](#); stimulated-emission devices [H01S](#); electromechanical resonators [H03H](#); loudspeakers, microphones, gramophone pick-ups or like acoustic electromechanical transducers [H04R](#); electric light sources in general [H05B](#); printed circuits, hybrid circuits, casings or constructional details of electrical apparatus, manufacture of assemblages of electrical components [H05K](#); use of semiconductor devices in circuits having a particular application, see the subclass for the application)

NOTES

1. This subclass covers:
 - electric solid state devices which are not covered by any other subclass and details thereof, and includes: semiconductor devices adapted for rectifying, amplifying, oscillating or switching; semiconductor devices sensitive to radiation; electric solid state devices using thermoelectric, superconductive, piezo-electric, electrostrictive, magnetostrictive, galvanomagnetic or bulk negative resistance effects and integrated circuit devices;
 - photoresistors, magnetic field dependent resistors, field effect resistors, capacitors with potential-jump barrier, resistors with potential-jump barrier or surface barrier, incoherent light emitting diodes and thin-film or thick-film circuits;
 - processes and apparatus adapted for the manufacture or treatment of such devices, except where such processes relate to single-step processes for which provision exists elsewhere.
2. In this subclass, the following terms or expressions are used with the meaning indicated:
 - "wafer" means a slice of semiconductor or crystalline substrate material, which can be modified by impurity diffusion (doping), ion implantation or epitaxy, and whose active surface can be processed into arrays of discrete components or integrated circuits;
 - "solid state body" means the body of material within which, or at the surface of which, the physical effects characteristic of the device occur. In thermoelectric devices, it includes all materials in the current path.
Regions in or on the body of the device (other than the solid state body itself), which exert an influence on the solid state body electrically, are considered to be "electrodes" whether or not an external electrical connection is made thereto. An electrode may include several portions and the term includes metallic regions which exert influence on the solid state body through an insulating region (e.g. capacitive coupling) and inductive coupling arrangements to the body. The dielectric region in a capacitive arrangement is regarded as part of the electrode. In arrangements including several portions, only those portions which exert an influence on the solid state body by virtue of their shape, size, or disposition or the material of which they are formed are considered to be part of the electrode. The other portions are considered to be "arrangements for conducting electric current to or from the solid state body" or "interconnections between solid state components formed in or on a common substrate", i.e. leads;
 - "device" means an electric circuit element; where an electric circuit element is one of a plurality of elements formed in or on a common substrate it is referred to as a "component";
 - "complete device" is a device in its fully assembled state which may or may not require further treatment, e.g. electroforming, before it is ready for use but which does not require the addition of further structural units;
 - "parts" includes all structural units which are included in a complete device;
 - "container" is an enclosure forming part of the complete device and is essentially a solid construction in which the body of the device is placed, or which is formed around the body without forming an intimate layer thereon. An enclosure which consists of one or more layers formed on the body and in intimate contact therewith is referred to as an "encapsulation";
 - "integrated circuit" is a device where all components, e.g. diodes, resistors, are built up on a common substrate and form the device including interconnections between the components;
 - "assembly" of a device is the building up of the device from its component constructional units and includes the provision of fillings in containers.
3. In this subclass, both the process or apparatus for the manufacture or treatment of a device and the device itself are classified, whenever both of these are described sufficiently to be of interest.

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(continued)

4. Attention is drawn to Note (3) after the title of section [C](#), which Note indicates to which version of the periodic table of chemical elements the IPC refers. In this subclass, the Periodic System used is the 8 group system indicated by Roman numerals in the Periodic Table thereunder.

WARNINGS

1. The following IPC groups are not in the CPC scheme. The subject matter for these IPC groups is classified in the following CPC groups:

H01L 21/301	covered by	H01L 21/30
H01L 21/328	covered by	H01L 29/66075
H01L 21/329	covered by	H01L 29/66083
H01L 21/33	covered by	H01L 29/66227
H01L 21/331	covered by	H01L 29/66234
H01L 21/332	covered by	H01L 29/66363
H01L 21/334	covered by	H01L 29/66075
H01L 21/335	covered by	H01L 29/66409
H01L 21/336	covered by	H01L 29/66477
H01L 21/337	covered by	H01L 29/66893
H01L 21/338	covered by	H01L 29/66848
H01L 21/339	covered by	H01L 29/66946
H01L 21/36-H01L 21/368	covered by	
H01L 21/58	covered by	H01L 24/80
H01L 21/60	covered by	H01L 24/80
H01L 21/66	covered by	H01L 22/00
H01L 21/603	covered by	H01L 24/80
H01L 21/607	covered by	H01L 24/80
H01L 21/8242	covered by	H01L 27/10844
H01L 21/8244	covered by	H01L 27/11
H01L 21/8246	covered by	H01L 27/112
H01L 21/98	covered by	H01L 25/50
H01L 29/38	covered by	H01L 29/04-H01L 29/365
H01L 29/96	covered by	H01L 29/68-H01L 29/945
H01L 51/30	covered by	H01L 51/0032
H01L 51/40	covered by	H01L 51/0001
H01L 51/46	covered by	H01L 51/0032
H01L 51/48	covered by	H01L 51/0001
H01L 51/54	covered by	H01L 51/0032

2. In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

21/00

Processes or apparatus adapted for the manufacture or treatment of semiconductor or solid state devices or of parts thereof (testing or measuring during manufacture or treatment, or reliability measurements [H01L 22/00](#); multistep manufacturing processes for passive two-terminal components without a potential-jump or surface barrier for integrated circuits [H01L 28/00](#);) processes or apparatus peculiar to the manufacture or treatment of devices provided for in groups [H01L 31/00 - H01L 51/00](#) or of parts thereof, see these groups; single-step processes covered by other subclasses, see the relevant subclasses, e.g. [C23C](#), [C30B](#); photomechanical production of textured or patterned surfaces, materials or originals therefor, apparatus specially adapted therefor, in general [G03F](#))

21/02 . Manufacture or treatment of semiconductor devices or of parts thereof

21/02002 . . {Preparing wafers}

NOTES

1. This group covers processes for manufacturing wafers prior to the fabrication of any device, i.e. between the sawing of ingots (covered by [B28D](#)) and the cleaning of substrates (covered by [H01L 21/02041](#)).

2. This group does not cover:

- simple use of grinding or polishing machines [B24B](#)
- thermal smoothening [H01L 21/324](#)

21/02005 . . . {Preparing bulk and homogeneous wafers}

21/02008 {Multistep processes}

21/0201 {Specific process step}

21/02013 {Grinding, lapping}

21/02016 {Backside treatment}

21/02019 {Chemical etching}

21/02021 {Edge treatment, chamfering}

21/02024 {Mirror polishing}

21/02027 {Setting crystal orientation}

21/0203 {Making porous regions on the surface}

21/02032 {by reclaiming or re-processing}

21/02035 {Shaping}

21/02041 . . {Cleaning}

21/02043 . . . {Cleaning before device manufacture, i.e. Begin-Of-Line process}

21/02046 {Dry cleaning only ([H01L 21/02085](#) takes precedence)}

21/02049 {with gaseous HF}

21/02052 {Wet cleaning only ([H01L 21/02085](#) takes precedence)}

- 21/02054 {combining dry and wet cleaning steps
([H01L 21/02085](#) takes precedence)}
- 21/02057 . . . {Cleaning during device manufacture}
- 21/0206 {during, before or after processing of
insulating layers}
- 21/02063 {the processing being the formation of vias
or contact holes}
- 21/02065 {the processing being a planarization of
insulating layers}
- 21/02068 {during, before or after processing of
conductive layers, e.g. polysilicon or
amorphous silicon layers}
- 21/02071 {the processing being a delineation, e.g.
RIE, of conductive layers}
- 21/02074 {the processing being a planarization of
conductive layers}
- 21/02076 . . . {Cleaning after the substrates have been
singulated}
- 21/02079 . . . {Cleaning for reclaiming}
- 21/02082 . . . {product to be cleaned}
- 21/02085 {Cleaning of diamond}
- 21/02087 {Cleaning of wafer edges}
- 21/0209 {Cleaning of wafer backside}
- 21/02093 {Cleaning of porous materials}
- 21/02096 . . . {only mechanical cleaning}
- 21/02098 . . . {only involving lasers, e.g. laser ablation}
- 21/02101 . . . {only involving supercritical fluids}
- 21/02104 . . {Forming layers ([deposition in general C23C](#);
[crystal growth in general C30B](#))}
- WARNING**
- Groups [H01L 21/02104](#) – [H01L 21/02694](#)
are incomplete pending reclassification
of documents from groups [H01L 21/06](#),
[H01L 21/16](#), and [H01L 21/20](#).
- Groups [H01L 21/02104](#) – [H01L 21/02694](#),
[H01L 21/06](#), [H01L 21/20](#), and [H01L 21/16](#)
should be considered in order to perform a
complete search.
- 21/02107 . . . {Forming insulating materials on a substrate}
- WARNING**
- Groups [H01L 21/02107](#) – [H01L 21/02326](#)
are incomplete pending reclassification
of documents from groups [H01L 21/312](#),
[H01L 21/314](#), [H01L 21/316](#), and
[H01L 21/318](#).
- Groups [H01L 21/02107](#) – [H01L 21/02326](#),
[H01L 21/312](#), [H01L 21/314](#), [H01L 21/316](#),
and [H01L 21/318](#) should be considered in
order to perform a complete search.
- 21/02109 {characterised by the type of layer, e.g. type
of material, porous/non-porous, pre-cursors,
mixtures or laminates}
- 21/02112 {characterised by the material of the layer}
- NOTE**
- Layers comprising sublayers,
i.e. multi-layers, are additionally
classified in [H01L 21/022](#); porous
layers are additionally classified in
[H01L 21/02203](#)
- 21/02115 {the material being carbon, e.g. alpha-C,
diamond or hydrogen doped carbon}
- 21/02118 {carbon based polymeric organic or
inorganic material, e.g. polyimides, poly
cyclobutene or PVC (polymers [per se](#)
[C08G](#), photoresist [per se](#) [G03F](#))}
- 21/0212 {the material being fluoro carbon
compounds, e.g.(CF_x)_n, (CH_xF_y)_n
or polytetrafluoroethylene}
- 21/02123 {the material containing silicon}
- 21/02126 {the material containing Si, O, and at
least one of H, N, C, F, or other non-
metal elements, e.g. SiOC, SiOC:H or
SiONC}
- 21/02129 {the material being boron or
phosphorus doped silicon oxides,
e.g. BPSG, BSG or PSG}
- NOTE**
- Halogen, e.g. fluorine,
containing BPSG, PSG, BSG,
and the like, are additionally
classified in [H01L 21/02131](#)
- 21/02131 {the material being halogen doped
silicon oxides, e.g. FSG}
- 21/02134 {the material comprising hydrogen
silsesquioxane, e.g. HSQ}
- 21/02137 {the material comprising alkyl
silsesquioxane, e.g. MSQ}
- 21/0214 {the material being a silicon
oxynitride, e.g. SiON or SiON:H}
- 21/02142 {the material containing silicon and
at least one metal element, e.g. metal
silicate based insulators or metal
silicon oxynitrides}
- 21/02145 {the material containing
aluminium, e.g. AlSiO_x}
- 21/02148 {the material containing hafnium,
e.g. HfSiO_x or HfSiON}
- 21/0215 {the material containing tantalum,
e.g. TaSiO_x}
- 21/02153 {the material containing titanium,
e.g. TiSiO_x}
- 21/02156 {the material containing at least one
rare earth element, e.g. silicate of
lanthanides, scandium or yttrium}
- 21/02159 {the material containing zirconium,
e.g. ZrSiO_x}
- 21/02161 {the material containing more than
one metal element}
- 21/02164 {the material being a silicon oxide,
e.g. SiO₂}
- NOTE**
- The formation of silicon oxide
layers is classified in this group
regardless of the precursor or
of the process of formation;
in case of explicit statements
on doping, on rest-groups, or
on material components [see](#)
[H01L 21/02126](#) and subgroups;
deposition of silicon oxide from
organic precursors without
further statements on film

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H01L 21/02164

(continued)

composition is classified here and in [H01L 21/02205](#) and subgroups

- 21/02167 {the material being a silicon carbide not containing oxygen, e.g. SiC, SiC:H or silicon carbonitrides ([H01L 21/02126](#) and [H01L 21/0214](#) take precedence)}
- 21/0217 {the material being a silicon nitride not containing oxygen, e.g. SixNy or SixByNz ([H01L 21/02126](#) and [H01L 21/0214](#) take precedence)}
- 21/02172 {the material containing at least one metal element, e.g. metal oxides, metal nitrides, metal oxynitrides or metal carbides (materials containing silicon [H01L 21/02123](#); metal silicates [H01L 21/02142](#))}
- 21/02175 {characterised by the metal ([H01L 21/02197](#) takes precedence)}
- 21/02178 {the material containing aluminium, e.g. Al₂O₃}
- 21/02181 {the material containing hafnium, e.g. HfO₂}
- 21/02183 {the material containing tantalum, e.g. Ta₂O₅}
- 21/02186 {the material containing titanium, e.g. TiO₂}
- 21/02189 {the material containing zirconium, e.g. ZrO₂}
- 21/02192 {the material containing at least one rare earth metal element, e.g. oxides of lanthanides, scandium or yttrium}
- 21/02194 {the material containing more than one metal element}
- 21/02197 {the material having a perovskite structure, e.g. BaTiO₃}
- 21/022 {the layer being a laminate, i.e. composed of sublayers, e.g. stacks of alternating high-k metal oxides (adhesion layers or buffer layers [H01L 21/02304](#), [H01L 21/02362](#))}
- 21/02203 {the layer being porous}
- 21/02205 {the layer being characterised by the precursor material for deposition}
- 21/02208 {the precursor containing a compound comprising Si}
- 21/02211 {the compound being a silane, e.g. disilane, methylsilane or chlorosilane}
- 21/02214 {the compound comprising silicon and oxygen}
- NOTE**
- This group does not cover mixtures of a silane and oxygen
- 21/02216 {the compound being a molecule comprising at least one silicon-oxygen bond and the compound having hydrogen or an organic group attached to the silicon or oxygen, e.g. a siloxane}

- 21/02219 {the compound comprising silicon and nitrogen}

NOTE

This group does not cover mixtures of silane and nitrogen

- 21/02222 {the compound being a silazane}
- 21/02225 {characterised by the process for the formation of the insulating layer}
- 21/02227 {formation by a process other than a deposition process}

NOTE

Subject matter classified in the range of [H01L 21/0223](#) - [H01L 21/02249](#) is additionally classified in [H01L 21/02249](#), [H01L 21/02255](#) and [H01L 21/02252](#), depending on the type of reaction

- 21/0223 {formation by oxidation, e.g. oxidation of the substrate}
- 21/02233 {of the semiconductor substrate or a semiconductor layer}
- 21/02236 {group IV semiconductor}
- 21/02238 {silicon in uncombined form, i.e. pure silicon}
- 21/02241 {III-V semiconductor}
- 21/02244 {of a metallic layer}
- 21/02247 {formation by nitridation, e.g. nitridation of the substrate}
- 21/02249 {formation by combined oxidation and nitridation performed simultaneously}
- 21/02252 {formation by plasma treatment, e.g. plasma oxidation of the substrate (after treatment of an insulating film by plasma [H01L 21/3105](#) and subgroups)}
- 21/02255 {formation by thermal treatment ([H01L 21/02252](#) takes precedence; after treatment of an insulating film [H01L 21/3105](#) and subgroups)}
- 21/02258 {formation by anodic treatment, e.g. anodic oxidation}
- 21/0226 {formation by a deposition process ([per se C23C](#))}
- 21/02263 {deposition from the gas or vapour phase}

NOTE

This group and subgroups also cover deposition methods in which the gas or vapour is produced by physical means, e.g. ablation from targets or heating of source material

- 21/02266 {deposition by physical ablation of a target, e.g. sputtering, reactive sputtering, physical vapour deposition or pulsed laser deposition}

- 21/02269 {deposition by thermal evaporation
([H01L 21/02293](#) takes precedence)}
- NOTE**
- Subject matter relating to molecular beam epitaxy is classified in this group
- 21/02271 {deposition by decomposition or reaction of gaseous or vapour phase compounds, i.e. chemical vapour deposition ([H01L 21/02266](#) takes precedence)}
- 21/02274 {in the presence of a plasma [PECVD]}
- 21/02277 {the reactions being activated by other means than plasma or thermal, e.g. photo-CVD}
- 21/0228 {deposition by cyclic CVD, e.g. ALD, ALE, pulsed CVD}
- NOTE**
- Subject matter relating to cyclic plasma CVD is additionally classified in [H01L 21/02274](#)
- 21/02282 {liquid deposition, e.g. spin-coating, sol-gel techniques, spray coating}
- 21/02285 {Langmuir-Blodgett techniques}
- 21/02288 {printing, e.g. ink-jet printing ([per se B41J](#))}
- 21/0229 {liquid atomic layer deposition}
- 21/02293 {formation of epitaxial layers by a deposition process ([epitaxial growth per se C30B](#))}
- NOTE**
- Formation of non-epitaxial layers by MBE, ALE, etc. is not covered by this group; for MBE [see H01L 21/02269](#); for ALE [see H01L 21/0228](#)
- 21/02296 {characterised by the treatment performed before or after the formation of the layer ([H01L 21/02227](#) and subgroups take precedence)}
- NOTE**
- This group and subgroups only cover processes which are directly linked to the layer formation; routine anneals, i.e. thermal treatment without further features like a special atmosphere, presence of a plasma, thermally induced chemical reactions, change of phase (crystal structure) etc. are not classified here; for cleaning [see H01L 21/02041](#) and subgroups; for etching processes [see H01L 21/311](#) and subgroups; for planarization processes [see H01L 21/31051](#) and subgroups; for processes to repair etch damage [see H01L 21/3105](#) and subgroups
- 21/02299 {pre-treatment}
- NOTE**
- This group and subgroups cover treatments to improve adhesion or change the surface termination; for etching [see H01L 21/306](#) and subgroups and [H01L 21/311](#) and subgroups
- 21/02301 {in-situ cleaning}
- NOTE**
- Subject matter relating to the cleaning processes for semiconductor devices in general is covered by [H01L 21/02041](#) and subgroups
- 21/02304 {formation of intermediate layers, e.g. buffer layers, layers to improve adhesion, lattice match or diffusion barriers}
- 21/02307 {treatment by exposure to a liquid}
- 21/0231 {treatment by exposure to electromagnetic radiation, e.g. UV light}
- 21/02312 {treatment by exposure to a gas or vapour}
- 21/02315 {treatment by exposure to a plasma}
- 21/02318 {post-treatment}
- NOTE**
- This group only covers processes that are part of the layer formation; treatments which are performed after completion of the insulating layer are covered by [H01L 21/3105](#) and subgroups
- 21/02321 {introduction of substances into an already existing insulating layer ([H01L 21/02227](#) and subgroups take precedence)}
- NOTE**
- processes like the introduction of phosphorus into silicon oxide by diffusion, or doping of an already existing insulating layer are covered by this group and subgroups; for the method of introduction, [see H01L 21/02337](#), [H01L 21/02343](#), [H01L 21/02345](#) and subgroups
- 21/02323 {introduction of oxygen}
- 21/02326 {into a nitride layer, e.g. changing SiN to SiON}
- 21/02329 {introduction of nitrogen}
- 21/02332 {into an oxide layer, e.g. changing SiO to SiON}
- 21/02334 {in-situ cleaning after layer formation, e.g. removing process residues}
- NOTE**
- Subject matter relating to the cleaning processes for semiconductor

H01L

H01L 21/02334

(continued)

devices in general is covered by [H01L 21/02041](#) and subgroups

- 21/02337 {treatment by exposure to a gas or vapour}
- 21/0234 {treatment by exposure to a plasma}
- 21/02343 {treatment by exposure to a liquid}
- 21/02345 {treatment by exposure to radiation, e.g. visible light}
- 21/02348 {treatment by exposure to UV light}
- 21/02351 {treatment by exposure to corpuscular radiation, e.g. exposure to electrons, alpha-particles, protons or ions}
- 21/02354 {using a coherent radiation, e.g. a laser}
- 21/02356 {treatment to change the morphology of the insulating layer, e.g. transformation of an amorphous layer into a crystalline layer}
- 21/02359 {treatment to change the surface groups of the insulating layer}
- 21/02362 {formation of intermediate layers, e.g. capping layers or diffusion barriers}
- 21/02365 {Forming inorganic semiconducting materials on a substrate (for light-sensitive devices [H01L 31/00](#))}

WARNING

Group [H01L 21/02365](#) is incomplete pending reclassification of documents from groups [H01L 21/06](#), [H01L 21/16](#), and [H01L 21/20](#)

Groups [H01L 21/06](#), [H01L 21/16](#), and [H01L 21/20](#) should be considered in order to perform a complete search.

- 21/02367 {Substrates}
- 21/0237 {Materials}
- 21/02373 {Group 14 semiconducting materials}
- 21/02376 {Carbon, e.g. diamond-like carbon}
- 21/02378 {Silicon carbide}
- 21/02381 {Silicon, silicon germanium, germanium}
- 21/02384 {including tin}
- 21/02387 {Group 13/15 materials}
- 21/02389 {Nitrides}
- 21/02392 {Phosphides}
- 21/02395 {Arsenides}
- 21/02398 {Antimonides}
- 21/024 {Group 12/16 materials}
- 21/02403 {Oxides}
- 21/02406 {Sulfides}
- 21/02409 {Selenides}
- 21/02411 {Tellurides}
- 21/02414 {Oxide semiconducting materials not being Group 12/16 materials, e.g. ternary compounds}
- 21/02417 {Chalcogenide semiconducting materials not being oxides, e.g. ternary compounds}
- 21/0242 {Crystalline insulating materials}
- 21/02422 {Non-crystalline insulating materials, e.g. glass, polymers}

- 21/02425 {Conductive materials, e.g. metallic silicides}
- 21/02428 {Structure}
- 21/0243 {Surface structure}
- 21/02433 {Crystal orientation}
- 21/02436 {Intermediate layers between substrates and deposited layers}
- 21/02439 {Materials}
- 21/02441 {Group 14 semiconducting materials}
- 21/02444 {Carbon, e.g. diamond-like carbon}
- 21/02447 {Silicon carbide}
- 21/0245 {Silicon, silicon germanium, germanium}
- 21/02452 {including tin}
- 21/02455 {Group 13/15 materials}
- 21/02458 {Nitrides}
- 21/02461 {Phosphides}
- 21/02463 {Arsenides}
- 21/02466 {Antimonides}
- 21/02469 {Group 12/16 materials}
- 21/02472 {Oxides}
- 21/02474 {Sulfides}
- 21/02477 {Selenides}
- 21/0248 {Tellurides}
- 21/02483 {Oxide semiconducting materials not being Group 12/16 materials, e.g. ternary compounds}
- 21/02485 {Other chalcogenide semiconducting materials not being oxides, e.g. ternary compounds}
- 21/02488 {Insulating materials}
- 21/02491 {Conductive materials}
- 21/02494 {Structure}
- 21/02496 {Layer structure}
- 21/02499 {Monolayers}
- 21/02502 {consisting of two layers}
- 21/02505 {consisting of more than two layers}
- 21/02507 {Alternating layers, e.g. superlattice}
- 21/0251 {Graded layers}
- 21/02513 {Microstructure}
- 21/02516 {Crystal orientation}
- 21/02518 {Deposited layers}
- 21/02521 {Materials}
- 21/02524 {Group 14 semiconducting materials}
- 21/02527 {Carbon, e.g. diamond-like carbon}
- 21/02529 {Silicon carbide}
- 21/02532 {Silicon, silicon germanium, germanium}
- 21/02535 {including tin}
- 21/02538 {Group 13/15 materials}
- 21/0254 {Nitrides}
- 21/02543 {Phosphides}
- 21/02546 {Arsenides}
- 21/02549 {Antimonides}
- 21/02551 {Group 12/16 materials}
- 21/02554 {Oxides}
- 21/02557 {Sulfides}
- 21/0256 {Selenides}
- 21/02562 {Tellurides}

- 21/02565 {Oxide semiconducting materials not being Group 12/16 materials, e.g. ternary compounds}
- 21/02568 {Chalcogenide semiconducting materials not being oxides, e.g. ternary compounds}
- 21/0257 {Doping during depositing}
- 21/02573 {Conductivity type}
- 21/02576 {N-type}
- 21/02579 {P-type}
- 21/02581 {Transition metal or rare earth elements}
- 21/02584 {Delta-doping}
- 21/02587 {Structure}
- 21/0259 {Microstructure}
- 21/02592 {amorphous}
- 21/02595 {polycrystalline}
- 21/02598 {monocrystalline}
- 21/02601 {Nanoparticles (fullerenes [H01L 51/0046](#))}
- 21/02603 {Nanowires}
- 21/02606 {Nanotubes (carbon nanotubes [H01L 51/0048](#))}
- 21/02609 {Crystal orientation}
- 21/02612 {Formation types}
- 21/02614 {Transformation of metal, e.g. oxidation, nitridation}
- 21/02617 {Deposition types}
- 21/0262 {Reduction or decomposition of gaseous compounds, e.g. CVD}
- 21/02623 {Liquid deposition}
- 21/02625 {using melted materials}
- 21/02628 {using solutions}
- 21/02631 {Physical deposition at reduced pressure, e.g. MBE, sputtering, evaporation}
- 21/02634 {Homoepitaxy}
- 21/02636 {Selective deposition, e.g. simultaneous growth of mono- and non-monocrystalline semiconductor materials}
- 21/02639 {Preparation of substrate for selective deposition}
- 21/02642 {Mask materials other than SiO₂ or SiN}
- 21/02645 {Seed materials}
- 21/02647 {Lateral overgrowth}
- 21/0265 {Pendeoepitaxy}
- 21/02653 {Vapour-liquid-solid growth}
- 21/02656 {Special treatments}
- 21/02658 {Pretreatments (cleaning in general [H01L 21/02041](#))}
- 21/02661 {In-situ cleaning}
- 21/02664 {Aftertreatments (planarisation in general [H01L 21/304](#))}
- 21/02667 {Crystallisation or recrystallisation of non-monocrystalline semiconductor materials, e.g. regrowth}
- 21/02669 {using crystallisation inhibiting elements}
- 21/02672 {using crystallisation enhancing elements}
- 21/02675 {using laser beams}
- 21/02678 {Beam shaping, e.g. using a mask}
- 21/0268 {Shape of mask}
- 21/02683 {Continuous wave laser beam}
- 21/02686 {Pulsed laser beam}
- 21/02689 {using particle beams}
- 21/02691 {Scanning of a beam}
- 21/02694 {Controlling the interface between substrate and epitaxial layer, e.g. by ion implantation followed by annealing}
- 21/02697 {Forming conducting materials on a substrate}
- 21/027 Making masks on semiconductor bodies for further photolithographic processing not provided for in group [H01L 21/18](#) or [H01L 21/34](#) { (photographic masks or originals [per se G03F 1/00](#); registration or positioning of photographic masks or originals [G03F 9/00](#); photographic cameras [G03B](#); control of position [G05D 3/00](#))}
- 21/0271 {comprising organic layers}
- 21/0272 {for lift-off processes}
- 21/0273 {characterised by the treatment of photoresist layers}
- 21/0274 {Photolithographic processes}
- 21/0275 {using lasers}
- 21/0276 {using an anti-reflective coating (anti-reflective coating for lithography in general [G03F 7/09](#))}
- 21/0277 {Electrolithographic processes}
- 21/0278 {Röntgenlithographic or X-ray lithographic processes}
- 21/0279 {Ionlithographic processes}
- 21/033 comprising inorganic layers
- 21/0331 {for lift-off processes}
- 21/0332 {characterised by their composition, e.g. multilayer masks, materials}
- 21/0334 {characterised by their size, orientation, disposition, behaviour, shape, in horizontal or vertical plane}
- 21/0335 {characterised by their behaviour during the process, e.g. soluble masks, redeposited masks}
- 21/0337 {characterised by the process involved to create the mask, e.g. lift-off masks, sidewalls, or to modify the mask, e.g. pre-treatment, post-treatment}
- 21/0338 {Process specially adapted to improve the resolution of the mask}
- 21/04 the devices having at least one potential-jump barrier or surface barrier, e.g. PN junction, depletion layer, carrier concentration layer {(multistep processes specially adapted for the manufacture of said devices [H01L 29/66007](#), [H01L 29/401](#); details of semiconductor bodies [H01L 29/02](#))}
- 21/0405 {the devices having semiconductor bodies comprising semiconducting carbon, e.g. diamond, diamond-like carbon (multistep processes for the manufacture of said devices [H01L 29/66015](#))}
- NOTE**
This group covers passivation
- 21/041 {Making n- or p-doped regions}
- 21/0415 {using ion implantation}

- 21/042 {Changing their shape, e.g. forming recesses (etching of the semiconductor body [H01L 21/302](#))}
- 21/0425 {Making electrodes}
- 21/043 {Ohmic electrodes}
- 21/0435 {Schottky electrodes}
- 21/044 {Conductor-insulator-semiconductor electrodes}
- 21/0445 . . . {the devices having semiconductor bodies comprising crystalline silicon carbide (multistep processes for the manufacture of said devices [H01L 29/66053](#))}
- 21/045 {passivating silicon carbide surfaces}
- 21/0455 {Making n or p doped regions or layers, e.g. using diffusion}
- 21/046 {using ion implantation}
- NOTE**
- Processes where ion implantation of boron and subsequent annealing does not produce a p-doped region are classified elsewhere, e.g. [H01L 21/0445](#)
- 21/0465 {using masks}
- 21/047 {characterised by the angle between the ion beam and the crystal planes or the main crystal surface}
- 21/0475 {Changing the shape of the semiconductor body, e.g. forming recesses, (etching of the semiconductor body [H01L 21/302](#))}
- 21/048 {Making electrodes}
- 21/0485 {Ohmic electrodes}
- 21/049 {Conductor-insulator-semiconductor electrodes, e.g. MIS contacts}
- 21/0495 {Schottky electrodes}
- 21/06 . . . the devices having semiconductor bodies comprising selenium or tellurium in uncombined form other than as impurities in semiconductor bodies of other materials
- WARNING**
- Group [H01L 21/06](#) is impacted by reclassification into groups [H01L 21/02365](#) – [H01L 21/02694](#).
- Groups [H01L 21/06](#) and [H01L 21/02365](#) – [H01L 21/02694](#) should be considered in order to perform a complete search.
- 21/08 Preparation of the foundation plate
- 21/10 Preliminary treatment of the selenium or tellurium, its application to the foundation plate, or the subsequent treatment of the combination
- 21/101 {Application of the selenium or tellurium to the foundation plate}
- 21/103 Conversion of the selenium or tellurium to the conductive state
- 21/105 Treatment of the surface of the selenium or tellurium layer after having been made conductive
- 21/108 Provision of discrete insulating layers, i.e. non-genetic barrier layers
- 21/12 Application of an electrode to the exposed surface of the selenium or tellurium after the selenium or tellurium has been applied to the foundation plate
- 21/14 Treatment of the complete device, e.g. by electroforming to form a barrier
- 21/145 Ageing
- 21/16 . . . the devices having semiconductor bodies comprising cuprous oxide or cuprous iodide
- WARNING**
- Group [H01L 21/16](#) is impacted by reclassification into groups [H01L 21/02365](#) – [H01L 21/02694](#).
- Groups [H01L 21/16](#) and [H01L 21/02365](#) – [H01L 21/02694](#) should be considered in order to perform a complete search.
- 21/161 {Preparation of the foundation plate, preliminary treatment oxidation of the foundation plate, reduction treatment}
- 21/162 {Preliminary treatment of the foundation plate}
- 21/164 {Oxidation and subsequent heat treatment of the foundation plate ([H01L 21/165](#) takes precedence)}
- 21/165 {Reduction of the copper oxide, treatment of the oxide layer}
- 21/167 {Application of a non-genetic conductive layer}
- 21/168 {Treatment of the complete device, e.g. electroforming, ageing}
- 21/18 . . . the devices having semiconductor bodies comprising elements of Group IV of the Periodic System or $A_{III}B_V$ compounds with or without impurities, e.g. doping materials {([H01L 21/041](#) - [H01L 21/0425](#), [H01L 21/045](#) - [H01L 21/048](#) take precedence)}
- NOTE**
- This group covers also processes and apparatus which, by using the appropriate technology, are clearly suitable for manufacture or treatment of devices whose bodies comprise elements of Group IV of the Periodic System or $A_{III}B_V$ compounds, even if the material used is not explicitly specified.
- 21/182 {Intermixing or interdiffusion or disordering of III-V heterostructures, e.g. IILD}
- 21/185 {Joining of semiconductor bodies for junction formation}
- 21/187 {by direct bonding}
- 21/20 Deposition of semiconductor materials on a substrate, e.g. epitaxial growth {solid phase epitaxy}
- WARNING**
- Group [H01L 21/20](#) is impacted by reclassification into groups [H01L 21/02365](#) – [H01L 21/02694](#).
- Groups [H01L 21/20](#) and [H01L 21/02365](#) – [H01L 21/02694](#) should be considered in order to perform a complete search.

- 21/2003 {Characterised by the substrate
([H01L 21/203](#), [H01L 21/205](#),
[H01L 21/208](#) take precedence)}
- 21/2007 {Bonding of semiconductor wafers
to insulating substrates or to
semiconducting substrates using
an intermediate insulating layer
([H01L 21/2011](#) takes precedence;
bonding of semiconductor wafers to
semiconductor wafers for junction
formation [H01L 21/187](#))}
- 21/2011 {the substrate being of crystalline
insulating material, e.g. sapphire}
- 21/2015 {the substrate being of crystalline
semiconductor material, e.g. lattice
adaptation, heteroepitaxy}
- 21/2018 {Selective epilaxial growth, e.g.
simultaneous deposition of mono - and
non-mono semiconductor materials}
- 21/2022 {Epitaxial regrowth of non-
monocrystalline semiconductor
materials, e.g. lateral epitaxy by seeded
solidification, solid-state crystallization,
solid-state graphoepitaxy, explosive
crystallization, grain growth in
polycrystalline materials}
- 21/2026 {using a coherent energy beam, e.g.
laser or electron beam}
- 21/203 using physical deposition, e.g. vacuum
deposition, sputtering
- 21/2033 {Epitaxial deposition of elements of
Group IV of the Periodic System, e.g.
Si, Ge}
- 21/2036 {Epitaxial deposition of A_{III}B_V
compounds}
- 21/205 using reduction or decomposition of
a gaseous compound yielding a solid
condensate, i.e. chemical deposition
- 21/2053 {Epitaxial deposition of elements of
Group IV of the Periodic System, e.g.
Si, Ge}
- 21/2056 {Epitaxial deposition of A_{III}B_V
compounds}
- 21/208 using liquid deposition
- 21/2085 {Epitaxial deposition of A_{III}B_V
compounds}
- 21/22 Diffusion of impurity materials, e.g.
doping materials, electrode materials,
into or out of a semiconductor body,
or between semiconductor regions;
{Interactions between two or more
impurities; Redistribution of impurities}
- 21/2205 {from the substrate during epitaxy,
e.g. autodoping; Preventing or using
autodoping}
- 21/221 {of killers}
- 21/2215 {in A_{III}B_V compounds}
- 21/222 {Lithium-drift}
- 21/2225 {Diffusion sources}
- 21/223 using diffusion into or out of a
solid from or into a gaseous phase
{([H01L 21/221](#) - [H01L 21/222](#) take
precedence; diffusion through an applied
layer [H01L 21/225](#))}
- 21/2233 {Diffusion into or out of A_{III}B_V
compounds}
- 21/2236 {from or into a plasma phase}
- 21/225 using diffusion into or out of a solid from
or into a solid phase, e.g. a doped oxide
layer {([H01L 21/221](#) - [H01L 21/222](#) take
precedence)}
- 21/2251 {Diffusion into or out of group IV
semiconductors}
- 21/2252 {using predeposition of impurities
into the semiconductor surface, e.g.
from a gaseous phase}
- 21/2253 {by ion implantation}
- NOTE**
- In groups
[H01L 21/2254](#) - [H01L 21/2257](#)
one should consider the main
compositional parts of the
applied layer just before the
diffusion step
- 21/2254 {from or through or into an applied
layer, e.g. photoresist, nitrides}
- 21/2255 {the applied layer comprising
oxides only, e.g. P₂O₅, PSG,
H₃BO₃, doped oxides}
- 21/2256 {through the applied layer}
- 21/2257 {the applied layer being silicon or
silicide or SIPOS, e.g. polysilicon,
porous silicon}
- 21/2258 {Diffusion into or out of A_{III}B_V
compounds}
- 21/228 using diffusion into or out of a solid from
or into a liquid phase, e.g. alloy diffusion
processes {([H01L 21/221](#) - [H01L 21/222](#)
take precedence)}
- 21/24 Alloying of impurity materials, e.g. doping
materials, electrode materials, with a
semiconductor body {([H01L 21/182](#) takes
precedence)}
- 21/242 {Alloying of doping materials with A_{III}B_V
compounds}
- 21/244 {Alloying of electrode materials}
- 21/246 {with A_{III}B_V compounds}
- 21/248 {Apparatus specially adapted for the
alloying}
- 21/26 Bombardment with radiation
{([H01L 21/3105](#) takes precedence)}
- 21/2605 {using natural radiation, e.g. alpha, beta or
gamma radiation}
- 21/261 to produce a nuclear reaction transmuted
chemical elements
- 21/263 with high-energy radiation ([H01L 21/261](#)
takes precedence)
- 21/2633 {for etching, e.g. sputteretching}
- 21/2636 {for heating, e.g. electron beam heating}

21/265	. . . . . producing ion implantation (ion beam tubes for localised treatment H01J 37/30)	21/28026	. . . . . {characterised by the conductor (H01L 21/28176 takes precedence)}
	WARNING		NOTE
	Groups H01L 21/26566 , H01L 21/2658 and H01L 21/26593 are incomplete pending reclassification of documents from groups H01L 21/26506 and H01L 21/2654 .		When the final conductor comprises a superconductor, subject matter is not classified according to the subgroups H01L 21/28035 - H01L 21/28097 . Instead, it is classified in H01L 21/28026
	Groups H01L 21/26566 , H01L 21/2658 , H01L 21/26593 , H01L 21/26506 and H01L 21/2654 should be considered in order to perform a complete search.	21/28035	. . . . . {the final conductor layer next to the insulator being silicon, e.g. polysilicon, with or without impurities (H01L 21/28105 takes precedence)}
21/26506	. . . . . {in group IV semiconductors}		NOTE
21/26513	. . . . . {of electrically active species}		A very thin, e.g. silicon, adhesion or seed layer is not considered as the one next to the insulator
21/2652	. . . . . {Through-implantation}	21/28044	. . . . . {the conductor comprising at least another non-silicon conductive layer}
21/26526	. . . . . {Recoil-implantation}	21/28052	. . . . . {the conductor comprising a silicide layer formed by the silicidation reaction of silicon with a metal layer (formed by metal ion implantation H01L 21/28044)}
21/26533	. . . . . {of electrically inactive species in silicon to make buried insulating layers}	21/28061	. . . . . {the conductor comprising a metal or metallic silicide formed by deposition, e.g. sputter deposition, i.e. without a silicidation reaction (H01L 21/28052 takes precedence)}
21/2654	. . . . . {in A _{III} B _V compounds}		NOTE
21/26546	. . . . . {of electrically active species}		To assess the coverage of groups H01L 21/28052 and H01L 21/28061 , barrier layers, e.g. TaSiN, are not considered
21/26553	. . . . . {Through-implantation}	21/2807	. . . . . {the final conductor layer next to the insulator being Si or Ge or C and their alloys except Si}
21/2656	. . . . . {characterised by the implantation of both electrically active and inactive species in the same semiconductor region to be doped}	21/28079	. . . . . {the final conductor layer next to the insulator being a single metal, e.g. Ta, W, Mo, Al}
21/26566	. . . . . {of a cluster, e.g. using a gas cluster ion beam}	21/28088	. . . . . {the final conductor layer next to the insulator being a composite, e.g. TiN}
2021/26573	. . . . . {in diamond}	21/28097	. . . . . {the final conductor layer next to the insulator being a metallic silicide}
21/2658	. . . . . {of a molecular ion, e.g. decaborane}	21/28105	. . . . . {the final conductor next to the insulator having a lateral composition or doping variation, or being formed laterally by more than one deposition step}
21/26586	. . . . . {characterised by the angle between the ion beam and the crystal planes or the main crystal surface}		
21/26593	. . . . . {at a temperature lower than room temperature}		
21/266	. . . . . using masks {(H01L 21/26586 takes precedence)}		
21/268	. . . . . using electromagnetic radiation, e.g. laser radiation		
21/2683	. . . . . {using X-ray lasers}		
21/2686	. . . . . {using incoherent radiation}		
21/28	. . . . . Manufacture of electrodes on semiconductor bodies using processes or apparatus not provided for in H01L 21/20 - H01L 21/268 ; {(etching for patterning the electrodes H01L 21/311 and H01L 21/3213)}		
21/28008	. . . . . {Making conductor-insulator-semiconductor electrodes}		
21/28017	. . . . . {the insulator being formed after the semiconductor body, the semiconductor being silicon}		
	NOTE		
	This group covers deposition of the insulators, including epitaxial insulators, and the conductors within the same process or chamber		

- 21/28114 {characterised by the sectional shape, e.g. T, inverted-T}
- NOTE**
- Documents are also classified in groups [H01L 21/28035](#) - [H01L 21/2810](#); when the composition is also relevant
- 21/28123 {Lithography-related aspects, e.g. sub-lithography lengths; Isolation-related aspects, e.g. to solve problems arising at the crossing with the side of the device isolation; Planarisation aspects}
- 21/28132 {conducting part of electrode is defined by a sidewall spacer or a similar technique, e.g. oxidation under mask, plating}
- 21/28141 {insulating part of the electrode is defined by a sidewall spacer, e.g. dummy spacer, or a similar technique, e.g. oxidation under mask, plating}
- 21/2815 {part or whole of the electrode is a sidewall spacer or made by a similar technique, e.g. transformation under mask, plating}
- 21/28158 {Making the insulator}
- 21/28167 {on single crystalline silicon, e.g. using a liquid, i.e. chemical oxidation}
- 21/28176 {with a treatment, e.g. annealing, after the formation of the definitive gate conductor}
- 21/28185 {with a treatment, e.g. annealing, after the formation of the gate insulator and before the formation of the definitive gate conductor}
- 21/28194 {by deposition, e.g. evaporation, ALD, CVD, sputtering, laser deposition ([H01L 21/28202](#) takes precedence)}
- 21/28202 {in a nitrogen-containing ambient, e.g. nitride deposition, growth, oxynitridation, NH₃ nitridation, N₂O oxidation, thermal nitridation, RTN, plasma nitridation, RPN}
- 21/28211 {in a gaseous ambient using an oxygen or a water vapour, e.g. RTO, possibly through a layer ([H01L 21/28194](#) and [H01L 21/28202](#) take precedence)}
- NOTE**
- thin oxidation layers used as a barrier layer or as a buffer layer, e.g. before the formation of a high-k insulator, are classified here only if important per se
- 21/2822 {with substrate doping, e.g. N, Ge, C implantation, before formation of the insulator}
- 21/28229 {by deposition of a layer, e.g. metal, metal compound or polysilicon, followed by transformation thereof into an insulating layer}
- 21/28238 {with sacrificial oxide}
- 21/28247 {passivation or protection of the electrode, e.g. using re-oxidation}
- 21/28255 {the insulator being formed after the semiconductor body, the semiconductor belonging to Group IV and not being elemental silicon, e.g. Ge, SiGe, SiGeC}
- 21/28264 {the insulator being formed after the semiconductor body, the semiconductor being a III-V compound}
- 21/28273 {Making conductor-insulator-conductor-insulator-semiconductor electrodes ([H01L 21/28291](#) takes precedence)}
- 21/28282 {comprising a charge trapping insulator}
- 21/28291 {comprising a layer which is used for its ferroelectric properties}
- 21/283 Deposition of conductive or insulating materials for electrodes {conducting electric current}
- 21/285 from a gas or vapour, e.g. condensation
- 21/28506 {of conductive layers}
- 21/28512 {on semiconductor bodies comprising elements of Group IV of the Periodic System}
- 21/28518 {the conductive layers comprising silicides ([H01L 21/28537](#) takes precedence)}
- 21/28525 {the conductive layers comprising semiconducting material ([H01L 21/28518](#), [H01L 21/28537](#) take precedence)}
- 21/28531 {Making of side-wall contacts}
- 21/28537 {Deposition of Schottky electrodes}
- 2021/28543 {on semiconductor bodies comprising diamond}
- 21/2855 {by physical means, e.g. sputtering, evaporation ([H01L 21/28518](#) - [H01L 21/28537](#) and [H01L 21/28568](#) take precedence)}
- 21/28556 {by chemical means, e.g. CVD, LPCVD, PECVD, laser CVD ([H01L 21/28518](#) - [H01L 21/28537](#) and [H01L 21/28568](#) take precedence)}
- 21/28562 {Selective deposition}
- 21/28568 {the conductive layers comprising transition metals ([H01L 21/28518](#) takes precedence)}
- 21/28575 {on semiconductor bodies comprising A_{III}B_V compounds}
- 21/28581 {Deposition of Schottky electrodes}

- 21/28587 {characterised by the sectional shape, e.g. T, inverted T}
- 21/28593 {asymmetrical sectional shape}
- 21/288 from a liquid, e.g. electrolytic deposition
- 21/2885 {using an external electrical current, i.e. electro-deposition}
- 21/30 Treatment of semiconductor bodies using processes or apparatus not provided for in groups [H01L 21/20](#) - [H01L 21/26](#) (manufacture of electrodes thereon [H01L 21/28](#))
- 21/3003 {Hydrogenation or deuterisation, e.g. using atomic hydrogen from a plasma}
- 21/3006 {of A_{III}B_V compounds}
- 21/302 to change their surface-physical characteristics or shape, e.g. etching, polishing, cutting
- 21/304 Mechanical treatment, e.g. grinding, polishing, cutting ([H01L 21/30625](#) takes precedence)
- 21/3043 {Making grooves, e.g. cutting}
- 21/3046 {using blasting, e.g. sand-blasting ([H01L 21/2633](#) takes precedence)}
- 21/306 Chemical or electrical treatment, e.g. electrolytic etching (to form insulating layers [H01L 21/31](#))
- 21/30604 {Chemical etching}
- 21/30608 {Anisotropic liquid etching ([H01L 21/3063](#) takes precedence)}
- 21/30612 {Etching of A_{III}B_V compounds}
- 21/30617 {Anisotropic liquid etching}
- 21/30621 {Vapour phase etching}
- 21/30625 {With simultaneous mechanical treatment, e.g. mechano-chemical polishing}
- 21/3063 Electrolytic etching
- 21/30635 {of A_{III}B_V compounds}
- 21/3065 Plasma etching; Reactive-ion etching
- 21/30655 {comprising alternated and repeated etching and passivation steps, e.g. Bosch process}
- 21/308 using masks ([H01L 21/3063](#), [H01L 21/3065](#) take precedence)
- 21/3081 {characterised by their composition, e.g. multilayer masks, materials}
- 21/3083 {characterised by their size, orientation, disposition, behaviour, shape, in horizontal or vertical plane}
- 21/3085 {characterised by their behaviour during the process, e.g. soluble masks, redeposited masks}
- 21/3086 {characterised by the process involved to create the mask, e.g. lift-off masks, sidewalls, or to modify the mask, e.g. pre-treatment, post-treatment}
- 21/3088 {Process specially adapted to improve the resolution of the mask}
- 21/31 to form insulating layers thereon, e.g. for masking or by using photolithographic techniques (layers forming electrodes [H01L 21/28](#); encapsulating layers [H01L 21/56](#)); After treatment of these layers
- 21/3105 After-treatment
- 21/31051 {Planarisation of the insulating layers ([H01L 21/31058](#) takes precedence)}
- 21/31053 {involving a dielectric removal step}
- 21/31055 {the removal being a chemical etching step, e.g. dry etching (etching *per se* [H01L 21/311](#))}
- 21/31056 {the removal being a selective chemical etching step, e.g. selective dry etching through a mask}
- 21/31058 {of organic layers}
- 21/311 Etching the insulating layers {by chemical or physical means ([H01L 21/31058](#) takes precedence)}
- 21/31105 {Etching inorganic layers}
- 21/31111 {by chemical means}
- 21/31116 {by dry-etching}
- 21/31122 {of layers not containing Si, e.g. PZT, Al₂O₃}
- 21/31127 {Etching organic layers}
- 21/31133 {by chemical means}
- 21/31138 {by dry-etching}
- 21/31144 {using masks}
- 21/3115 Doping the insulating layers
- 21/31155 {by ion implantation}
- 21/312 Organic layers, e.g. photoresist ([H01L 21/3105](#), [H01L 21/32](#) take precedence; {photoresists *per se* [G03C](#)})

WARNING

Groups [H01L 21/312](#) – [H01L 21/3128](#) are no longer used for the classification of documents as of May 1, 2011. The content of these groups is being reclassified into groups [H01L 21/02107](#) – [H01L 21/02326](#).

Groups [H01L 21/02107](#) – [H01L 21/02326](#) should be considered in order to perform a complete search.

- 21/3121 {Layers comprising organo-silicon compounds} (*Frozen*)
- 21/3122 {layers comprising polysiloxane compounds} (*Frozen*)
- 21/3124 {layers comprising hydrogen silsesquioxane} (*Frozen*)
- 21/3125 {layers comprising silazane compounds} (*Frozen*)
- 21/3127 {Layers comprising fluoro (hydro)carbon compounds, e.g. polytetrafluoroethylene} (*Frozen*)
- 21/3128 {by Langmuir-Blodgett techniques} (*Frozen*)

21/314 (Frozen)	Inorganic layers (H01L 21/3105 , H01L 21/32 take precedence)	21/31625 (Frozen)	{Deposition of boron or phosphorus doped silicon oxide, e.g. BSG, PSG, BPSG}
	WARNING	21/31629 (Frozen)	{Deposition of halogen doped silicon oxide, e.g. fluorine doped silicon oxide}
	Groups H01L 21/314 – H01L 21/3185 are no longer used for the classification of documents as of May 1, 2011. The content of these group is being reclassified into group H01L 21/02107 – H01L 21/02326 .	21/31633 (Frozen)	{Deposition of carbon doped silicon oxide, e.g. SiOC}
	Groups H01L 21/02107 – H01L 21/02326 should be considered in order to perform a complete search.	21/31637 (Frozen)	{Deposition of Tantalum oxides, e.g. Ta ₂ O ₅ }
21/3141 (Frozen)	{Deposition using atomic layer deposition techniques [ALD]}	21/31641 (Frozen)	{Deposition of Zirconium oxides, e.g. ZrO ₂ }
21/3142 (Frozen)	{of nano-laminates, e.g. alternating layers of Al ₂ O ₃ -HfO ₂ }	21/31645 (Frozen)	{Deposition of Hafnium oxides, e.g. HfO ₂ }
21/3143 (Frozen)	{composed of alternated layers or of mixtures of nitrides and oxides or of oxinitrides, e.g. formation of oxinitride by oxidation of nitride layers}	21/3165 (Frozen)	{formed by oxidation (H01L 21/31691 , H01L 21/31695 take precedence)}
21/3144 (Frozen)	{on silicon}	21/31654 (Frozen)	{of semiconductor materials, e.g. the body itself}
21/3145 (Frozen)	{formed by deposition from a gas or vapour}	21/31658 (Frozen)	{by thermal oxidation, e.g. of SiGe}
21/3146 (Frozen)	{Carbon layers, e.g. diamond-like layers}	21/31662 (Frozen)	{of silicon in uncombined form}
21/3147 (Frozen)	{Epitaxial deposition of insulating materials}	21/31666 (Frozen)	{of AIII BV compounds}
21/3148 (Frozen)	{Silicon Carbide layers}	21/3167 (Frozen)	{of anodic oxidation}
2021/3149 (Frozen)	{Langmuir-Blodgett techniques}	21/31675 (Frozen)	{of silicon}
21/316 (Frozen)	composed of oxides or glassy oxides or oxide based glass	21/31679 (Frozen)	{of AIII BV compounds}
	WARNING	21/31683 (Frozen)	{of metallic layers, e.g. Al deposited on the body, e.g. formation of multi-layer insulating structures}
	Group H01L 21/316 is no longer used for the classification of documents as of May 1, 2011. The content of this group is being reclassified into groups H01L 21/02107 – H01L 21/02326 .	21/31687 (Frozen)	{by anodic oxidation}
	Groups H01L 21/02107 – H01L 21/02326 should be considered in order to perform a complete search.	21/31691 (Frozen)	{with perovskite structure}
21/31604 (Frozen)	{Deposition from a gas or vapour (H01L 21/31691 , H01L 21/31695 take precedence)}	21/31695 (Frozen)	{Deposition of porous oxides or porous glassy oxides or oxide based porous glass}
21/31608 (Frozen)	{Deposition of SiO ₂ (H01L 21/31625 , H01L 21/31629 and H01L 21/31633 take precedence)}	21/318 (Frozen)	composed of nitrides WARNING
21/31612 (Frozen)	{on a silicon body}		Group H01L 21/318 is no longer used for the classification of documents as of May 1, 2011. The content of this group is being reclassified into groups H01L 21/02107 – H01L 21/02326 .
21/31616 (Frozen)	{Deposition of Al ₂ O ₃ }		Groups H01L 21/02107 – H01L 21/02326 should be considered in order to perform a complete search.
21/3162 (Frozen)	{on a silicon body}	21/3185 (Frozen)	{of siliconnitrides}
		21/32	using masks
		21/3205	Deposition of non-insulating-, e.g. conductive- or resistive-, layers on insulating layers; After-treatment of these layers (manufacture of electrodes H01L 21/28)

- 21/32051 {Deposition of metallic or metal-silicide layers}
- 21/32053 {of metal-silicide layers}
- 21/32055 {Deposition of semiconductive layers, e.g. poly - or amorphous silicon layers}
- 21/32056 {Deposition of conductive or semi-conductive organic layers
([H01L 21/32058](#) takes precedence)}
- 21/32058 {Deposition of superconductive layers}
- 21/321 After treatment
- 21/32105 {Oxidation of silicon-containing layers}
- 21/3211 {Nitridation of silicon-containing layers}
- 21/32115 {Planarisation}
- 21/3212 {by chemical mechanical polishing [CMP]}
- 21/32125 {by simultaneously passing an electrical current, i.e. electrochemical mechanical polishing, e.g. ECMP}
- 21/3213 Physical or chemical etching of the layers, e.g. to produce a patterned layer from a pre-deposited extensive layer
- 21/32131 {by physical means only}
- 21/32132 {of silicon-containing layers}
- 21/32133 {by chemical means only}
- 21/32134 {by liquid etching only}
- 21/32135 {by vapour etching only}
- 21/32136 {using plasmas}
- 21/32137 {of silicon-containing layers}
- 21/32138 {pre- or post-treatments, e.g. anti-corrosion processes}
- 21/32139 {using masks}
- 21/3215 Doping the layers
- 21/32155 {Doping polycrystalline - or amorphous silicon layers}
- 21/322 to modify their internal properties, e.g. to produce internal imperfections
- 21/3221 {of silicon bodies, e.g. for gettering}
- 21/3223 {using cavities formed by hydrogen or noble gas ion implantation}
- 21/3225 {Thermally inducing defects using oxygen present in the silicon body for intrinsic gettering ([H01L 21/3226](#) takes precedence)}
- NOTE**
- Gettering using both extrinsic and intrinsic gettering techniques is classified in both [H01L 21/3221](#) and [H01L 21/3225](#)
- 21/3226 {of silicon on insulator}
- 21/3228 {of $A_{III}B_V$ compounds, e.g. to make them semi-insulating}
- 21/324 Thermal treatment for modifying the properties of semiconductor bodies, e.g. annealing, sintering ([H01L 21/20](#) - [H01L 21/288](#) and [H01L 21/302](#) - [H01L 21/322](#) take precedence)
- 21/3242 {for the formation of PN junctions without addition of impurities
([H01L 21/22](#) takes precedence)}
- 21/3245 {of $A_{III}B_V$ compounds}
- 21/3247 {for altering the shape, e.g. smoothing the surface}
- WARNING**
- Group [H01L 21/3247](#) is incomplete pending reclassification of documents from group [H01L 21/324](#).
- Groups [H01L 21/324](#) and [H01L 21/3247](#) should be considered in order to perform a complete search.
- 21/326 Application of electric currents or fields, e.g. for electroforming ([H01L 21/20](#) - [H01L 21/288](#) and [H01L 21/302](#) - [H01L 21/324](#) take precedence)
- 21/34 the devices having semiconductor bodies not provided for in groups {[H01L 21/0405](#), [H01L 21/0445](#)}, [H01L 21/06](#), [H01L 21/16](#) and [H01L 21/18](#) with or without impurities, e.g. doping materials
- 21/38 Diffusion of impurity materials, e.g. doping materials, electrode materials, into or out of a semiconductor body, or between semiconductor regions
- 21/383 using diffusion into or out of a solid from or into a gaseous phase
- 21/385 using diffusion into or out of a solid from or into a solid phase, e.g. a doped oxide layer
- 21/388 using diffusion into or out of a solid from or into a liquid phase, e.g. alloy diffusion processes
- 21/40 Alloying of impurity materials, e.g. doping materials, electrode materials, with a semiconductor body
- 21/42 Bombardment with radiation
- 21/423 with high-energy radiation
- 21/425 producing ion implantation (ion beam tubes for localized treatment [H01J 37/30](#))
- 21/426 using masks
- 21/428 using electromagnetic radiation, e.g. laser radiation
- 21/44 Manufacture of electrodes on semiconductor bodies using processes or apparatus not provided for in groups [H01L 21/38](#) - [H01L 21/428](#)
- 21/441 Deposition of conductive or insulating materials for electrodes
- 21/443 from a gas or vapour, e.g. condensation
- 21/445 from a liquid, e.g. electrolytic deposition
- 21/447 involving the application of pressure, e.g. thermo-compression bonding

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- 21/449 involving the application of mechanical vibrations, e.g. ultrasonic vibrations
- 21/46 Treatment of semiconductor bodies using processes or apparatus not provided for in groups [H01L 21/428](#) (manufacture of electrodes thereon [H01L 21/44](#))
- 21/461 to change their surface-physical characteristics or shape, e.g. etching, polishing, cutting
- 21/463 Mechanical treatment, e.g. grinding, ultrasonic treatment
- 21/465 Chemical or electrical treatment, e.g. electrolytic etching (to form insulating layers [H01L 21/469](#))
- 21/467 using masks
- 21/469 to form insulating layers thereon, e.g. for masking or by using photolithographic techniques (layers forming electrodes [H01L 21/44](#); encapsulating layers [H01L 21/56](#)); After-treatment of these layers
- 21/47 Organic layers, e.g. photoresist ([H01L 21/475](#), [H01L 21/4757](#) take precedence)
- 21/471 Inorganic layers ([H01L 21/475](#), [H01L 21/4757](#) take precedence)
- 21/473 composed of oxides or glassy oxides or oxide based glass
- 21/475 using masks
- 21/4757 After-treatment
- 21/47573 {Etching the layer}
- 21/47576 {Doping the layer}
- 21/4763 Deposition of non-insulating, e.g. conductive -, resistive -, layers on insulating layers; After-treatment of these layers (manufacture of electrodes [H01L 21/28](#), {[H01L 21/44](#)})
- 21/47635 {After-treatment of these layers}
- 21/477 Thermal treatment for modifying the properties of semiconductor bodies, e.g. annealing, sintering ([H01L 21/38](#) - [H01L 21/449](#) and [H01L 21/461](#) - [H01L 21/475](#) take precedence)
- 21/479 Application of electric currents or fields, e.g. for electroforming ([H01L 21/38](#) - [H01L 21/449](#) and [H01L 21/461](#) - [H01L 21/475](#) take precedence)
- 21/48 Manufacture or treatment of parts, e.g. containers, prior to assembly of the devices, using processes not provided for in a single one of the subgroups [H01L 21/06](#) - [H01L 21/326](#) ({apparatus therefor [H01L 21/67005](#); insulative sealing of leads in bases [H01L 21/50](#) } ; containers, encapsulations, fillings, mountings per se [H01L 23/00](#); {marking of parts [H01L 23/544](#)})
- 21/4803 {Insulating or insulated parts, e.g. mountings, containers, diamond heatsinks ([H01L 21/4846](#) takes precedence; printed circuit boards [H05K 1/00](#))}
- 21/4807 {Ceramic parts}
- 21/481 {Insulating layers on insulating parts, with or without metallisation}
- 21/4814 {Conductive parts}
- 21/4817 {for containers, e.g. caps ([H01L 21/4871](#) takes precedence)}
- 21/4821 {Flat leads, e.g. lead frames with or without insulating supports}
- 21/4825 {Connection or disconnection of other leads to or from flat leads, e.g. wires, bumps, other flat leads}
- 21/4828 {Etching (etching for cleaning without patterning [H01L 21/4835](#))}
- 21/4832 {Etching a temporary substrate after encapsulation process to form leads}
- 21/4835 {Cleaning, e.g. removing of solder}
- 21/4839 {Assembly of a flat lead with an insulating support, e.g. for TAB}
- 21/4842 {Mechanical treatment, e.g. punching, cutting, deforming, cold welding}
- 21/4846 {Leads on or in insulating or insulated substrates, e.g. metallisation ([H01L 21/4821](#) takes precedence; metallisation of ceramics in general [C04B 41/51](#); printed circuits [H05K 3/00](#))}
- 21/485 {Adaptation of interconnections, e.g. engineering charges, repair techniques}
- 21/4853 {Connection or disconnection of other leads to or from a metallisation, e.g. pins, wires, bumps}
- 21/4857 {Multilayer substrates (multilayer metallisation on monolayer substrate [H01L 21/4846](#))}
- 21/486 {Via connections through the substrate with or without pins}
- 21/4864 {Cleaning, e.g. removing of solder}
- 21/4867 {Applying pastes or inks, e.g. screen printing ([H01L 21/486](#) takes precedence)}
- 21/4871 {Bases, plates or heatsinks}
- 21/4875 {Connection or disconnection of other leads to or from bases or plates}
- 21/4878 {Mechanical treatment, e.g. deforming}
- 21/4882 {Assembly of heatsink parts}
- 21/4885 {Wire-like parts or pins (wire ball formation [B23K 20/00](#); methods related to connecting semiconductor or other solid state bodies [H01L 24/00](#))}
- 21/4889 {Connection or disconnection of other leads to or from wire-like parts, e.g. wires}
- 21/4892 {Cleaning}
- 21/4896 {Mechanical treatment, e.g. cutting, bending}

NOTE

In this group, the expression "treatment" covers also the removal of leads from parts

- 21/50 . . . Assembly of semiconductor devices using processes or apparatus not provided for in a single one of the subgroups [H01L 21/06](#) - [H01L 21/326](#), {e.g. sealing of a cap to a base of a container}
- NOTE**
Arrangements for connecting or disconnecting semiconductor or other solid state bodies, or methods related thereto, other than those arrangements or methods covered by the following subgroups, are covered by [H01L 24/00](#)
- 21/52 Mounting semiconductor bodies in containers
- 21/54 Providing fillings in containers, e.g. gas fillings
- 21/56 Encapsulations, e.g. encapsulation layers, coatings
- 21/561 {Batch processing}
- 21/563 {Encapsulation of active face of flip-chip device, e.g. underfilling or underencapsulation of flip-chip, encapsulation preform on chip or mounting substrate}
- 21/565 {Moulds}
- 21/566 {Release layers for moulds, e.g. release layers, layers against residue during moulding}
- 21/568 {Temporary substrate used as encapsulation process aid ([H01L 21/4832](#) and [H01L 21/566](#) take precedence)}
- 2021/60 {Attaching or detaching leads or other conductive members, to be used for carrying current to or from the device in operation}
- 2021/60007 {involving a soldering or an alloying process}
- 2021/60015 {using plate connectors, e.g. layer, film}
- 2021/60022 {using bump connectors, e.g. for flip chip mounting}
- 2021/6003 {Apparatus therefor}
- 2021/60037 {Right-up bonding}
- 2021/60045 {Pre-treatment step of the bump connectors prior to bonding}
- 2021/60052 {Oxide removing step, e.g. flux, rosin}
- 2021/6006 {with temporary supporting member not part of an apparatus, e.g. removable coating, film or substrate}
- 2021/60067 {Aligning the bump connectors with the mounting substrate}
- 2021/60075 {involving active alignment, i.e. by apparatus steering, e.g. using alignment marks, sensors}
- 2021/60082 {involving passive alignment, e.g. using surface energy, chemical reactions, thermal equilibrium}
- 2021/6009 {involving guiding structures, e.g. structures that are left at least partly in the bonded product, spacers}
- 2021/60097 {Applying energy, e.g. for the soldering or alloying process}
- 2021/60105 {using electromagnetic radiation}
- 2021/60112 {Coherent radiation, i.e. laser beam}
- 2021/6012 {Incoherent radiation, e.g. polychromatic heating lamp}
- 2021/60127 {Induction heating, i.e. eddy currents}
- 2021/60135 {using convection, e.g. reflow oven}
- 2021/60142 {with a graded temperature profile}
- 2021/6015 {using conduction, e.g. chuck heater, thermocompression}
- 2021/60157 {with a graded temperature profile}
- 2021/60165 {using an electron beam}
- 2021/60172 {using static pressure}
- 2021/6018 {Unidirectional static pressure}
- 2021/60187 {Isostatic pressure, e.g. degassing using vacuum or pressurised liquid}
- 2021/60195 {using dynamic pressure, e.g. ultrasonic or thermosonic bonding}
- 2021/60202 {using a protective atmosphere, e.g. with forming or shielding gas}
- 2021/6021 {using an autocatalytic reaction}
- 2021/60217 {Detaching bump connectors, e.g. after testing}
- 2021/60225 {Arrangement of bump connectors prior to mounting}
- 2021/60232 {wherein the bump connectors are disposed only on the semiconductor chip}
- 2021/6024 {wherein the bump connectors are disposed only on the mounting substrate}
- 2021/60247 {wherein the bump connectors are disposed on both the semiconductor chip and the mounting substrate, e.g. bump to bump}
- 2021/60255 {wherein the bump connectors are provided as prepeg, e.g. are provided in an insulating plate member}
- 2021/60262 {Lateral distribution of bump connectors prior to mounting}
- 2021/6027 {Mounting on semiconductor conductive members}
- 2021/60277 {involving the use of conductive adhesives}
- 2021/60285 {involving the use of mechanical auxiliary parts without the use of an alloying or soldering process, e.g. pressure contacts}
- 2021/60292 {involving the use of an electron or laser beam}
- 2021/603 {involving the application of pressure, e.g. thermo-compression bonding}
- 2021/607 {involving the application of mechanical vibrations, e.g. ultrasonic vibrations}
- 21/62 . . . the devices having no potential-jump barriers or surface barriers
- 21/64 . . . Manufacture or treatment of solid state devices other than semiconductor devices, or of parts thereof, not peculiar to a single device provided for in groups [H01L 31/00](#) - [H01L 51/00](#)

- 21/67 Apparatus specially adapted for handling semiconductor or electric solid state devices during manufacture or treatment thereof; Apparatus specially adapted for handling wafers during manufacture or treatment of semiconductor or electric solid state devices or components {; Apparatus not specifically provided for elsewhere (processes [per se H01L 21/30](#), [H01L 21/46](#), [H01L 23/00](#); simple temporary support means, e.g. using adhesives, electric or magnetic means [H01L 21/68](#), [H01L 21/302](#); apparatus for manufacturing arrangements for connecting or disconnecting semiconductor or solid-state bodies and for methods related thereto [H01L 24/74](#);)}
- NOTE**
- In this subgroup the term substrate designates a semiconductor or electric solid state device or component, or a wafer
- 21/67005 {Apparatus not specifically provided for elsewhere (processes [per se H01L 21/30](#), [H01L 21/46](#), [H01L 23/00](#); simple temporary support means, e.g. using adhesives, electric or magnetic means [H01L 21/68](#), [H01L 21/302](#))}
- 21/67011 {Apparatus for manufacture or treatment (processes [H01L 21/30](#), [H01L 21/46](#); for production or after-treatment of single crystals or homogeneous polycrystalline material [C30B 35/00](#))}
- 21/67017 {Apparatus for fluid treatment ([H01L 21/67126](#), [H01L 21/6715](#) take precedence)}
- 21/67023 {for general liquid treatment, e.g. etching followed by cleaning}
- 21/67028 {for cleaning followed by drying, rinsing, stripping, blasting or the like}
- 21/67034 {for drying}
- 21/6704 {for wet cleaning or washing}
- 21/67046 {using mainly scrubbing means, e.g. brushes}
- 21/67051 {using mainly spraying means, e.g. nozzles}
- 21/67057 {with the semiconductor substrates being dipped in baths or vessels}
- 21/67063 {for etching}
- 21/67069 {for drying etching}
- 21/67075 {for wet etching}
- 21/6708 {using mainly spraying means, e.g. nozzles}
- 21/67086 {with the semiconductor substrates being dipped in baths or vessels}
- 21/67092 {Apparatus for mechanical treatment (or grinding or cutting, [see the relevant groups in subclasses B24B or B28D](#))}
- 21/67098 {Apparatus for thermal treatment}
- 21/67103 {mainly by conduction}
- 21/67109 {mainly by convection}
- 21/67115 {mainly by radiation}
- 21/67121 {Apparatus for making assemblies not otherwise provided for, e.g. package constructions}
- 21/67126 {Apparatus for sealing, encapsulating, glassing, decapsulating or the like (processes [H01L 23/02](#), [H01L 23/28](#))}
- 21/67132 {Apparatus for placing on an insulating substrate, e.g. tape}
- 21/67138 {Apparatus for wiring semiconductor or solid state device}
- 21/67144 {Apparatus for mounting on conductive members, e.g. leadframes or conductors on insulating substrates}
- 21/6715 {Apparatus for applying a liquid, a resin, an ink or the like ([H01L 21/67126](#) takes precedence)}
- 21/67155 {Apparatus for manufacturing or treating in a plurality of work-stations}
- 21/67161 {characterized by the layout of the process chambers}
- 21/67167 {surrounding a central transfer chamber}
- 21/67173 {in-line arrangement}
- 21/67178 {vertical arrangement}
- 21/67184 {characterized by the presence of more than one transfer chamber}
- 21/6719 {characterized by the construction of the processing chambers, e.g. modular processing chambers}
- 21/67196 {characterized by the construction of the transfer chamber}
- 21/67201 {characterized by the construction of the load-lock chamber}
- 21/67207 {comprising a chamber adapted to a particular process}
- 21/67213 {comprising at least one ion or electron beam chamber (coating by ion implantation [C23C](#); ion or electron beam tubes [H01J 37/00](#))}
- 21/67219 {comprising at least one polishing chamber (polishing apparatuses [B24B](#))}
- 21/67225 {comprising at least one lithography chamber (lithographic apparatuses [G03F 7/00](#))}
- 21/6723 {comprising at least one plating chamber (electroless plating apparatuses [C23C](#), electroplating apparatuses [C25D](#))}
- 21/67236 {the substrates being processed being not semiconductor wafers, e.g. leadframes or chips}
- 21/67242 {Apparatus for monitoring, sorting or marking (testing or measuring during manufacture [H01L 22/00](#), marks [per se H01L 23/544](#); testing individual semiconductor devices [G01R 31/26](#))}
- 21/67248 {Temperature monitoring}
- 21/67253 {Process monitoring, e.g. flow or thickness monitoring}
- 21/67259 {Position monitoring, e.g. misposition detection or presence detection}
- 21/67265 {of substrates stored in a container, a magazine, a carrier, a boat or the like}
- 21/67271 {Sorting devices}
- 21/67276 {Production flow monitoring, e.g. for increasing throughput (program-control systems [per se G05B 19/00](#), e.g. total factory control [G05B 19/418](#))}
- 21/67282 {Marking devices}

- 21/67288 {Monitoring of warpage, curvature, damage, defects or the like}
- 21/67294 {using identification means, e.g. labels on substrates or labels on containers}
- 21/673 . . using specially adapted carriers {or holders; Fixing the workpieces on such carriers or holders (holders for supporting a complete device in operation [H01L 23/32](#))}
- 21/67303 {Vertical boat type carrier whereby the substrates are horizontally supported, e.g. comprising rod-shaped elements}
- 21/67306 {characterized by a material, a roughness, a coating or the like}
- 21/67309 {characterized by the substrate support}
- 21/67313 {Horizontal boat type carrier whereby the substrates are vertically supported, e.g. comprising rod-shaped elements}
- 21/67316 {characterized by a material, a roughness, a coating or the like}
- 21/6732 {Vertical carrier comprising wall type elements whereby the substrates are horizontally supported, e.g. comprising sidewalls}
- 21/67323 {characterized by a material, a roughness, a coating or the like}
- 21/67326 {Horizontal carrier comprising wall type elements whereby the substrates are vertically supported, e.g. comprising sidewalls}
- 21/6733 {characterized by a material, a roughness, a coating or the like}
- 21/67333 {Trays for chips ([magazine for components H05K 13/0084](#))}
- 21/67336 {characterized by a material, a roughness, a coating or the like}
- 21/6734 {specially adapted for supporting large square shaped substrates ([containers and packaging elements for glass sheets B65D 85/48, transporting of glass products during their manufacture C03B 35/00](#))}
- 21/67343 {characterized by a material, a roughness, a coating or the like}
- 21/67346 {characterized by being specially adapted for supporting a single substrate or by comprising a stack of such individual supports}
- 21/6735 {Closed carriers}
- 21/67353 {specially adapted for a single substrate}
- 21/67356 {specially adapted for containing chips, dies or ICs}
- 21/67359 {specially adapted for containing masks, reticles or pellicles}
- 21/67363 {specially adapted for containing substrates other than wafers ([H01L 21/67356, H01L 21/67359 take precedence](#))}
- 21/67366 {characterised by materials, roughness, coatings or the like ([materials relating to an injection moulding process B29C 45/00; chemical composition of materials C08L 51/00](#))}
- 21/67369 {characterised by shock absorbing elements, e.g. retainers or cushions}
- 21/67373 {characterised by locking systems}
- 21/67376 {characterised by sealing arrangements}
- 21/67379 {characterised by coupling elements, kinematic members, handles or elements to be externally gripped}
- 21/67383 {characterised by substrate supports}
- 21/67386 {characterised by the construction of the closed carrier}
- 21/67389 {characterised by atmosphere control}
- 21/67393 {characterised by the presence of atmosphere modifying elements inside or attached to the closed carrier!}
- 21/67396 {characterised by the presence of antistatic elements}
- 21/677 . . . for conveying, e.g. between different workstations
- 21/67703 {between different workstations}
- 21/67706 {Mechanical details, e.g. roller, belt ([H01L 21/67709 takes precedence](#))}
- 21/67709 {using magnetic elements}
- 21/67712 {the substrate being handled substantially vertically}
- 21/67715 {Changing the direction of the conveying path}
- 21/67718 {Changing orientation of the substrate, e.g. from a horizontal position to a vertical position}
- 21/67721 {the substrates to be conveyed not being semiconductor wafers or large planar substrates, e.g. chips, lead frames ([H01L 21/6773 takes precedence](#))}
- 21/67724 {by means of a cart or a vehicle}
- 21/67727 {using a general scheme of a conveying path within a factory}
- 21/6773 {Conveying cassettes, containers or carriers}
- 21/67733 {Overhead conveying}
- 21/67736 {Loading to or unloading from a conveyor}
- 21/67739 {into and out of processing chamber}
- 21/67742 {Mechanical parts of transfer devices ([robots in general in B25J](#))}
- 21/67745 {characterized by movements or sequence of movements of transfer devices}
- 21/67748 {horizontal transfer of a single workpiece}
- 21/67751 {vertical transfer of a single workpiece}
- 21/67754 {horizontal transfer of a batch of workpieces}
- 21/67757 {vertical transfer of a batch of workpieces}
- 21/6776 {Continuous loading and unloading into and out of a processing chamber, e.g. transporting belts within processing chambers}
- 21/67763 {the wafers being stored in a carrier, involving loading and unloading ([H01L 21/6779 takes precedence](#))}
- 21/67766 {Mechanical parts of transfer devices ([robots in general in B25J](#))}
- 21/67769 {Storage means}
- 21/67772 {involving removal of lid, door, cover}
- 21/67775 {Docking arrangements}
- 21/67778 {involving loading and unloading of wafers}
- 21/67781 {Batch transfer of wafers}
- 21/67784 {using air tracks}
- 21/67787 {with angular orientation of the workpieces}
- 21/6779 {the workpieces being stored in a carrier, involving loading and unloading}
- 21/67793 {with orientating and positioning by means of a vibratory bowl or track}

- 21/67796 . . . {with angular orientation of workpieces ([H01L 21/67787](#) and [H01L 21/67793](#) take precedence)}
- 21/68 . . . for positioning, orientation or alignment (for conveying [H01L 21/677](#))
- 21/681 . . . {using optical controlling means}
- 21/682 . . . {Mask-wafer alignment (in general [G03F 7/70](#), [G03F 9/70](#))}
- 21/683 . . . for supporting or gripping (for conveying [H01L 21/677](#), for positioning, orientation or alignment [H01L 21/68](#))
- 21/6831 . . . {using electrostatic chucks}
- 21/6833 {Details of electrostatic chucks}
- 21/6835 . . . {using temporarily an auxiliary support}
- NOTE**
- [H01L 21/6835](#), details of the apparatus are to be further indexed using the indexing codes chosen from [H01L 2221/68304](#) and subgroups
- 21/6836 {Wafer tapes, e.g. grinding or dicing support tapes (adhesive tapes in general [C09J 7/20](#))}
- 21/6838 . . . {with gripping and holding devices using a vacuum; Bernoulli devices}
- 21/687 . . . using mechanical means, e.g. chucks, clamps or pinches {(using electrostatic chucks [H01L 21/6831](#))}
- 21/68707 {the wafers being placed on a robot blade, or gripped by a gripper for conveyance}
- 21/68714 {the wafers being placed on a susceptor, stage or support}
- 21/68721 {characterised by edge clamping, e.g. clamping ring}
- 21/68728 {characterised by a plurality of separate clamping members, e.g. clamping fingers}
- 21/68735 {characterised by edge profile or support profile}
- 21/68742 {characterised by a lifting arrangement, e.g. lift pins}
- 21/6875 {characterised by a plurality of individual support members, e.g. support posts or protrusions}
- 21/68757 {characterised by a coating or a hardness or a material}
- 21/68764 {characterised by a movable susceptor, stage or support, others than those only rotating on their own vertical axis, e.g. susceptors on a rotating carousel}
- 21/68771 {characterised by supporting more than one semiconductor substrate}
- 21/68778 {characterised by supporting substrates others than wafers, e.g. chips}
- 21/68785 {characterised by the mechanical construction of the susceptor, stage or support}
- 21/68792 {characterised by the construction of the shaft}
- 21/70 . . . Manufacture or treatment of devices consisting of a plurality of solid state components formed in or on a common substrate or of parts thereof; Manufacture of integrated circuit devices or of parts thereof ({multistep manufacturing processes of assemblies consisting of a plurality of individual semiconductor or other solid state devices [H01L 25/00](#); } manufacture of assemblies consisting of preformed electrical components [H05K 3/00](#), [H05K 13/00](#))
- 21/702 . . . {of thick-or thin-film circuits or parts thereof}
- 21/705 {of thick-film circuits or parts thereof}
- 21/707 {of thin-film circuits or parts thereof}
- 21/71 . . . Manufacture of specific parts of devices defined in group [H01L 21/70](#) ({[H01L 21/0405](#), [H01L 21/0445](#)}, [H01L 21/28](#), [H01L 21/44](#), [H01L 21/48](#) take precedence)
- 21/74 . . . Making of {localized} buried regions, e.g. buried collector layers, internal connections {substrate contacts}
- 21/743 {Making of internal connections, substrate contacts}
- 21/746 {for AIII-BV integrated circuits}
- 21/76 . . . Making of isolation regions between components
- 21/7602 {between components manufactured in an active substrate comprising SiC compounds}
- 21/7605 {between components manufactured in an active substrate comprising AIII BV compounds}
- 21/7607 {between components manufactured in an active substrate comprising $A_{II}B_{VI}$ compounds}
- 21/761 PN junctions
- 21/762 Dielectric regions {, e.g. EPIC dielectric isolation, LOCOS; Trench refilling techniques, SOI technology, use of channel stoppers}
- 21/76202 {using a local oxidation of silicon, e.g. LOCOS, SWAMI, SILO ([H01L 21/76235](#) takes precedence; together with vertical isolation, e.g. LOCOS in a SOI substrate, [H01L 21/76264](#))}
- 21/76205 {in a region being recessed from the surface, e.g. in a recess, groove, tub or trench region}
- 21/76208 {using auxiliary pillars in the recessed region, e.g. to form LOCOS over extended areas}
- 21/7621 {the recessed region having a shape other than rectangular, e.g. rounded or oblique shape ([H01L 21/76208](#) takes precedence)}
- 21/76213 {introducing electrical inactive or active impurities in the local oxidation region, e.g. to alter LOCOS oxide growth characteristics or for additional isolation purpose}
- 21/76216 {introducing electrical active impurities in the local oxidation region for the sole purpose of creating channel stoppers}

- 21/76218 {introducing both types of electrical active impurities in the local oxidation region for the sole purpose of creating channel stoppers, e.g. for isolation of complementary doped regions}
- 21/76221 {with a plurality of successive local oxidation steps}
- 21/76224 {using trench refilling with dielectric materials ([trench filling with polycrystalline silicon H01L 21/763](#); together with vertical isolation, e.g. trench refilling in a SOI substrate [H01L 21/76264](#))}
- 21/76227 {the dielectric materials being obtained by full chemical transformation of non-dielectric materials, such as polycrystalline silicon, metals}
- 21/76229 {Concurrent filling of a plurality of trenches having a different trench shape or dimension, e.g. rectangular and V-shaped trenches, wide and narrow trenches, shallow and deep trenches}
- 21/76232 {of trenches having a shape other than rectangular or V-shape, e.g. rounded corners, oblique or rounded trench walls ([H01L 21/76229 takes precedence](#))}
- 21/76235 {trench shape altered by a local oxidation of silicon process step, e.g. trench corner rounding by LOCOS}
- 21/76237 {introducing impurities in trench side or bottom walls, e.g. for forming channel stoppers or alter isolation behavior}
- 21/7624 {using semiconductor on insulator [SOI] technology ([H01L 21/76297 takes precedence](#); manufacture of integrated circuits on insulating substrates [H01L 21/84](#); silicon on sapphire [SOS] technology [H01L 21/86](#))}
- 21/76243 {using silicon implanted buried insulating layers, e.g. oxide layers, i.e. SIMOX techniques}
- 21/76245 {using full isolation by porous oxide silicon, i.e. FIPOS techniques}
- 21/76248 {using lateral overgrowth techniques, i.e. ELO techniques}
- 21/76251 {using bonding techniques}
- 21/76254 {with separation/delamination along an ion implanted layer, e.g. Smart-cut, Unibond}
- 21/76256 {using silicon etch back techniques, e.g. BESOI, ELTRAN}
- 21/76259 {with separation/delamination along a porous layer}
- 21/76262 {using selective deposition of single crystal silicon, i.e. SEG techniques}
- 21/76264 {SOI together with lateral isolation, e.g. using local oxidation of silicon, or dielectric or polycrystalline material refilled trench or air gap isolation regions, e.g. completely isolated semiconductor islands}
- 21/76267 {Vertical isolation by silicon implanted buried insulating layers, e.g. oxide layers, i.e. SIMOX techniques}
- 21/7627 {Vertical isolation by full isolation by porous oxide silicon, i.e. FIPOS techniques}
- 21/76272 {Vertical isolation by lateral overgrowth techniques, i.e. ELO techniques}
- 21/76275 {Vertical isolation by bonding techniques}
- 21/76278 {Vertical isolation by selective deposition of single crystal silicon, i.e. SEG techniques}
- 21/76281 {Lateral isolation by selective oxidation of silicon}
- 21/76283 {Lateral isolation by refilling of trenches with dielectric material}
- 21/76286 {Lateral isolation by refilling of trenches with polycrystalline material}
- 21/76289 {Lateral isolation by air gap}
- 21/76291 {Lateral isolation by field effect}
- 21/76294 {using selective deposition of single crystal silicon, i.e. SEG techniques}
- 21/76297 {Dielectric isolation using EPIC techniques, i.e. epitaxial passivated integrated circuit}
- 21/763 Polycrystalline semiconductor regions ([H01L 21/76264 takes precedence](#))
- 21/764 Air gaps ([H01L 21/76264 takes precedence](#))
- 21/765 by field effect ([H01L 21/76264 takes precedence](#))
- 21/768 Applying interconnections to be used for carrying current between separate components within a device {comprising conductors and dielectrics}
- NOTE**
- Groups [H01L 21/768](#) - [H01L 21/76898](#) cover multi-step processes for manufacturing interconnections. Information peculiar to single-step processes should also be classified in the corresponding group, e.g.
- cleaning [H01L 21/02041](#)
 - etching [H01L 21/311](#), [H01L 21/3213](#)
 - masking [H01L 21/027](#), [H01L 21/033](#), [H01L 21/31144](#), [H01L 21/32139](#)
 - planarizing [H01L 21/3105](#), [H01L 21/321](#)
- 21/76801 {characterised by the formation and the after-treatment of the dielectrics, e.g. smoothing}
- 21/76802 {by forming openings in dielectrics}
- 21/76804 {by forming tapered via holes}
- 21/76805 {the opening being a via or contact hole penetrating the underlying conductor}
- 21/76807 {for dual damascene structures}
- 21/76808 {involving intermediate temporary filling with material}
- 21/7681 {involving one or more buried masks}
- 21/76811 {involving multiple stacked pre-patterned masks}
- 21/76813 {involving a partial via etch}

- 21/76814 {post-treatment or after-treatment, e.g. cleaning or removal of oxides on underlying conductors}
- 21/76816 {Aspects relating to the layout of the pattern or to the size of vias or trenches ([layout of the interconnections per se H01L 23/528](#); [CAD of ICs G06F 17/50](#))}
- 21/76817 {using printing or stamping techniques}
- 21/76819 {Smoothing of the dielectric ([planarisation of insulating materials per se H01L 21/31051](#))}
- 21/7682 {the dielectric comprising air gaps}
- 21/76822 {Modification of the material of dielectric layers, e.g. grading, after-treatment to improve the stability of the layers, to increase their density etc.}
- 21/76823 {transforming an insulating layer into a conductive layer}
- 21/76825 {by exposing the layer to particle radiation, e.g. ion implantation, irradiation with UV light or electrons etc. ([plasma treatment H01L 21/76826](#))}
- 21/76826 {by contacting the layer with gases, liquids or plasmas}
- 21/76828 {thermal treatment}
- 21/76829 {characterised by the formation of thin functional dielectric layers, e.g. dielectric etch-stop, barrier, capping or liner layers}
- 21/76831 {in via holes or trenches, e.g. non-conductive sidewall liners}
- 21/76832 {Multiple layers}
- 21/76834 {formation of thin insulating films on the sidewalls or on top of conductors ([H01L 21/76831 takes precedence](#))}
- 21/76835 {Combinations of two or more different dielectric layers having a low dielectric constant ([H01L 21/76832 takes precedence](#))}
- 21/76837 {Filling up the space between adjacent conductive structures; Gap-filling properties of dielectrics}
- 21/76838 {characterised by the formation and the after-treatment of the conductors ([etching for patterning the conductors H01L 21/3213](#))}
- NOTE**
- When the interconnect is also used as the conductor part of a conductor insulator semiconductor electrode (gate level interconnections), documents are classified in the relevant electrode manufacture groups, e.g. [H01L 21/28026](#)
- 21/7684 {Smoothing; Planarisation}
- 21/76841 {Barrier, adhesion or liner layers}
- 21/76843 {formed in openings in a dielectric}
- 21/76844 {Bottomless liners}
- 21/76846 {Layer combinations}
- 21/76847 {the layer being positioned within the main fill metal}
- 21/76849 {the layer being positioned on top of the main fill metal}
- 21/7685 {the layer covering a conductive structure ([H01L 21/76849 takes precedence](#))}
- 21/76852 {the layer also covering the sidewalls of the conductive structure}
- 21/76853 {characterized by particular after-treatment steps}
- 21/76855 {After-treatment introducing at least one additional element into the layer}
- 21/76856 {by treatment in plasmas or gaseous environments, e.g. nitriding a refractory metal liner}
- 21/76858 {by diffusing alloying elements}
- 21/76859 {by ion implantation}
- 21/76861 {Post-treatment or after-treatment not introducing additional chemical elements into the layer}
- 21/76862 {Bombardment with particles, e.g. treatment in noble gas plasmas; UV irradiation}
- 21/76864 {Thermal treatment}
- 21/76865 {Selective removal of parts of the layer ([H01L 21/76844 takes precedence](#))}
- 21/76867 {characterized by methods of formation other than PVD, CVD or deposition from a liquids ([PVD H01L 21/2855](#); [CVD H01L 21/28556](#); [deposition from liquids H01L 21/288](#))}
- 21/76868 {Forming or treating discontinuous thin films, e.g. repair, enhancement or reinforcement of discontinuous thin films}
- 21/7687 {Thin films associated with contacts of capacitors}
- 21/76871 {Layers specifically deposited to enhance or enable the nucleation of further layers, i.e. seed layers}
- 21/76873 {for electroplating}
- 21/76874 {for electroless plating}
- 21/76876 {for deposition from the gas phase, e.g. CVD}
- 21/76877 {Filling of holes, grooves or trenches, e.g. vias, with conductive material}
- 21/76879 {by selective deposition of conductive material in the vias, e.g. selective C.V.D. on semiconductor material, plating ([plating on semiconductors in general H01L 21/288](#))}
- 21/7688 {by deposition over sacrificial masking layer, e.g. lift-off ([lift-off per se H01L 21/0272](#))}
- 21/76882 {Reflowing or applying of pressure to better fill the contact hole}
- 21/76883 {Post-treatment or after-treatment of the conductive material}
- 21/76885 {By forming conductive members before deposition of protective insulating material, e.g. pillars, studs}
- 21/76886 {Modifying permanently or temporarily the pattern or the conductivity of conductive members, e.g. formation of alloys, reduction of contact resistances}

- 21/76888 {By rendering at least a portion of the conductor non conductive, e.g. oxidation}
- 21/76889 {by forming silicides of refractory metals}
- 21/76891 {by using superconducting materials}
- 21/76892 {modifying the pattern}
- 21/76894 {using a laser, e.g. laser cutting, laser direct writing, laser repair}
- 21/76895 {Local interconnects; Local pads, as exemplified by patent document EP0896365}
- 21/76897 {Formation of self-aligned vias or contact plugs, i.e. involving a lithographically uncritical step (self-aligned silicidation on field effect transistors [H01L 29/665](#))}
- 21/76898 {formed through a semiconductor substrate}
- 21/77 Manufacture or treatment of devices consisting of a plurality of solid state components or integrated circuits formed in, or on, a common substrate (electrically programmable read-only memories or multistep manufacturing processes therefor [H01L 27/115](#))
- NOTE**
- Integration processes for the manufacture of devices of the type classified in [H01L 27/14](#) - [H01L 27/32](#) are not classified in this group and its sub-groups. Instead, as they are peculiar to said devices, they are classified together with the devices Multistep processes for manufacturing memory structures in general using field effect technology are covered by [H01L 27/1052](#); Multistep processes for manufacturing dynamic random access memory structures are covered by [H01L 27/10844](#); Multistep processes for manufacturing static random access memory structures are covered by [H01L 27/11](#); Multistep processes for manufacturing read-only memory structures are covered by [H01L 27/112](#); Multistep processes for manufacturing electrically programmable read-only memory structures are covered by [H01L 27/115](#)
- 2021/775 {comprising a plurality of TFTs on a non-semiconducting substrate, e.g. driving circuits for AMLCDs}
- 21/78 with subsequent division of the substrate into plural individual devices (cutting to change the surface-physical characteristics or shape of semiconductor bodies [H01L 21/304](#))
- 21/7806 {involving the separation of the active layers from a substrate}
- 21/7813 {leaving a reusable substrate, e.g. epitaxial lift off}
- 21/782 to produce devices, each consisting of a single circuit element ([H01L 21/82](#) takes precedence)
- 21/784 the substrate being a semiconductor body
- 21/786 the substrate being other than a semiconductor body, e.g. insulating body
- 21/82 to produce devices, e.g. integrated circuits, each consisting of a plurality of components
- 21/8206 {the substrate being a semiconductor, using diamond technology ([H01L 21/8258](#) takes precedence)}
- 21/8213 {the substrate being a semiconductor, using SiC technology ([H01L 21/8258](#) takes precedence)}
- 21/822 the substrate being a semiconductor, using silicon technology ([H01L 21/8258](#) takes precedence)
- 21/8221 {Three dimensional integrated circuits stacked in different levels}
- 21/8222 Bipolar technology
- 21/8224 comprising a combination of vertical and lateral transistors
- 21/8226 comprising merged transistor logic or integrated injection logic
- 21/8228 Complementary devices, e.g. complementary transistors
- 21/82285 {Complementary vertical transistors}
- 21/8229 Memory structures
- 21/8232 Field-effect technology
- 21/8234 MIS technology {, i.e. integration processes of field effect transistors of the conductor-insulator-semiconductor type}
- 21/823406 {Combination of charge coupled devices, i.e. CCD, or BBD}
- 21/823412 {with a particular manufacturing method of the channel structures, e.g. channel implants, halo or pocket implants, or channel materials}
- 21/823418 {with a particular manufacturing method of the source or drain structures, e.g. specific source or drain implants or silicided source or drain structures or raised source or drain structures}
- 21/823425 {manufacturing common source or drain regions between a plurality of conductor-insulator-semiconductor structures}
- 21/823431 {with a particular manufacturing method of transistors with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET}
- 21/823437 {with a particular manufacturing method of the gate conductors, e.g. particular materials, shapes}
- 21/823443 {silicided or salicided gate conductors}
- 21/82345 {gate conductors with different gate conductor materials or different gate conductor implants, e.g. dual gate structures}
- 21/823456 {gate conductors with different shapes, lengths or dimensions}

- 21/823462 {with a particular manufacturing method of the gate insulating layers, e.g. different gate insulating layer thicknesses, particular gate insulator materials or particular gate insulator implants}
- 21/823468 {with a particular manufacturing method of the gate sidewall spacers, e.g. double spacers, particular spacer material or shape}
- 21/823475 {interconnection or wiring or contact manufacturing related aspects}
- 21/823481 {isolation region manufacturing related aspects, e.g. to avoid interaction of isolation region with adjacent structure}
- 21/823487 {with a particular manufacturing method of vertical transistor structures, i.e. with channel vertical to the substrate surface (with a current flow parallel to the substrate surface [H01L 21/823431](#))}
- 21/823493 {with a particular manufacturing method of the wells or tubs, e.g. twin tubs, high energy well implants, buried implanted layers for lateral isolation [BILLI]}
- 21/8236 Combination of enhancement and depletion transistors
- 21/8238 Complementary field-effect transistors, e.g. CMOS
- 21/823807 {with a particular manufacturing method of the channel structures, e.g. channel implants, halo or pocket implants, or channel materials}
- 21/823814 {with a particular manufacturing method of the source or drain structures, e.g. specific source or drain implants or silicided source or drain structures or raised source or drain structures}
- 21/823821 {with a particular manufacturing method of transistors with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET}
- 21/823828 {with a particular manufacturing method of the gate conductors, e.g. particular materials, shapes}
- 21/823835 {silicided or salicided gate conductors}
- 21/823842 {gate conductors with different gate conductor materials or different gate conductor implants, e.g. dual gate structures}
- 21/82385 {gate conductors with different shapes, lengths or dimensions}
- 21/823857 {with a particular manufacturing method of the gate insulating layers, e.g. different gate insulating layer thicknesses, particular gate insulator materials or particular gate insulator implants}
- 21/823864 {with a particular manufacturing method of the gate sidewall spacers, e.g. double spacers, particular spacer material or shape}
- 21/823871 {interconnection or wiring or contact manufacturing related aspects}
- 21/823878 {isolation region manufacturing related aspects, e.g. to avoid interaction of isolation region with adjacent structure}
- 21/823885 {with a particular manufacturing method of vertical transistor structures, i.e. with channel vertical to the substrate surface (with a current flow parallel to the substrate surface [H01L 21/823821](#))}
- 21/823892 {with a particular manufacturing method of the wells or tubs, e.g. twin tubs, high energy well implants, buried implanted layers for lateral isolation [BILLI]}
- 21/8239 Memory structures
- 21/8248 Combination of bipolar and field-effect technology
- 21/8249 Bipolar and MOS technology
- 21/8252 the substrate being a semiconductor, using III-V technology ([H01L 21/8258](#) takes precedence)
- 21/8254 the substrate being a semiconductor, using II-VI technology ([H01L 21/8258](#) takes precedence)
- 21/8256 the substrate being a semiconductor, using technologies not covered by one of groups ([H01L 21/8206](#), [H01L 21/8213](#)), [H01L 21/822](#), [H01L 21/8252](#) and [H01L 21/8254](#) ([H01L 21/8258](#) takes precedence)
- 21/8258 the substrate being a semiconductor, using a combination of technologies covered by ([H01L 21/8206](#), [H01L 21/8213](#)), [H01L 21/822](#), [H01L 21/8252](#), [H01L 21/8254](#) or [H01L 21/8256](#)
- 21/84 the substrate being other than a semiconductor body, e.g. being an insulating body
- 21/845 {including field-effect transistors with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET}
- 21/86 the insulating body being sapphire, e.g. silicon on sapphire structure, i.e. SOS
- 22/00** **{Testing or measuring during manufacture or treatment; Reliability measurements, i.e. testing of parts without further processing to modify the parts as such; Structural arrangements therefor}**

- 22/10 . {Measuring as part of the manufacturing process (burn-in [G01R 31/2855](#))}
- 22/12 . . {for structural parameters, e.g. thickness, line width, refractive index, temperature, warp, bond strength, defects, optical inspection, electrical measurement of structural dimensions, metallurgic measurement of diffusions (electrical measurement of diffusions [H01L 22/14](#))}
- 22/14 . . {for electrical parameters, e.g. resistance, deep-levels, CV, diffusions by electrical means}
- 22/20 . {Sequence of activities consisting of a plurality of measurements, corrections, marking or sorting steps}
- 22/22 . . {Connection or disconnection of sub-entities or redundant parts of a device in response to a measurement (testing and repair of stores after manufacture including at wafer scale [G11C 29/00](#); fuses per se [H01L 23/525](#))}
- 22/24 . . {Optical enhancement of defects or not directly visible states, e.g. selective electrolytic deposition, bubbles in liquids, light emission, colour change (voltage contrast [G01R 31/311](#))}
- 22/26 . . {Acting in response to an ongoing measurement without interruption of processing, e.g. endpoint detection, in-situ thickness measurement (endpoint detection arrangements in CMP apparatus [B24B 37/013](#), in discharge apparatus [H01J 37/32](#))}
- 22/30 . {Structural arrangements specially adapted for testing or measuring during manufacture or treatment, or specially adapted for reliability measurements}
- 22/32 . . {Additional lead-in metallisation on a device or substrate, e.g. additional pads or pad portions, lines in the scribe line, sacrificed conductors (arrangements for conducting electric current to or from the solid state body in operation [H01L 23/48](#))}
- 22/34 . . {Circuits for electrically characterising or monitoring manufacturing processes, e.g. whole test die, wafers filled with test structures, on-board-devices incorporated on each die, process control monitors or pad structures thereof, devices in scribe line (switching, multiplexing, gating devices [G01R 19/25](#); process control with lithography, e.g. dose control, [G03F 7/20](#); structures for alignment control by optical means [G03F 7/70633](#))}
- 23/00 Details of semiconductor or other solid state devices** ([H01L 25/00](#) takes precedence {; structural arrangements for testing or measuring during manufacture or treatment, or for reliability measurements [H01L 22/00](#); arrangements for connecting or disconnecting semiconductor or solid-state bodies, or methods related thereto [H01L 24/00](#); finger print sensors [G06K 9/00006](#)})
- NOTE**
- This group **does not cover**:
- details of semiconductor bodies or of electrodes of devices provided for in group [H01L 29/00](#), which details are covered by that group;
 - details peculiar to devices provided for in a single main group of groups
- [H01L 31/00](#) - [H01L 51/00](#), which details are covered by those groups.
- 23/02 . Containers; Seals ([H01L 23/12](#), [H01L 23/34](#), [H01L 23/48](#), [H01L 23/552](#), {[H01L 23/66](#)} take precedence; {for memories [G11C](#)})
- 23/04 . . characterised by the shape {of the container or parts, e.g. caps, walls}
- 23/041 . . . {the container being a hollow construction having no base used as a mounting for the semiconductor body}
- 23/043 . . . the container being a hollow construction and having a conductive base as a mounting as well as a lead for the semiconductor body
- 23/045 the other leads having an insulating passage through the base
- 23/047 the other leads being parallel to the base
- 23/049 the other leads being perpendicular to the base
- 23/051 another lead being formed by a cover plate parallel to the base plate, e.g. sandwich type
- 23/053 . . . the container being a hollow construction and having an insulating {or insulated} base as a mounting for the semiconductor body
- 23/055 the leads having a passage through the base {([H01L 23/057](#) takes precedence)}
- 23/057 the leads being parallel to the base
- 23/06 . . characterised by the material of the container or its electrical properties
- 23/08 . . . the material being an electrical insulator, e.g. glass
- 23/10 . . characterised by the material or arrangement of seals between parts, e.g. between cap and base of the container or between leads and walls of the container
- 23/12 . Mountings, e.g. non-detachable insulating substrates
- 23/13 . . characterised by the shape
- 23/14 . . characterised by the material or its electrical properties {(printed circuit boards [H05K 1/00](#))}
- 23/142 . . . {Metallic substrates having insulating layers}
- 23/145 . . . {Organic substrates, e.g. plastic}
- 23/147 . . . {Semiconductor insulating substrates (semiconductor conductive substrates [H01L 23/4926](#))}
- 23/15 . . . Ceramic or glass substrates {([H01L 23/142](#), [H01L 23/145](#), [H01L 23/147](#) take precedence)}
- 23/16 . Fillings or auxiliary members in containers {or encapsulations}, e.g. centering rings ([H01L 23/42](#), [H01L 23/552](#) take precedence)
- 23/18 . . Fillings characterised by the material, its physical or chemical properties, or its arrangement within the complete device
- NOTE**
- Group [H01L 23/26](#) takes precedence over groups [H01L 23/20](#) - [H01L 23/24](#)
- 23/20 . . . gaseous at the normal operating temperature of the device
- 23/22 . . . liquid at the normal operating temperature of the device
- 23/24 . . . solid or gel at the normal operating temperature of the device {([H01L 23/3135](#) takes precedence)}

- 23/26 . . . including materials for absorbing or reacting with moisture or other undesired substances {, e.g. getters}
- 23/28 . Encapsulations, e.g. encapsulating layers, coatings, {e.g. for protection} ([H01L 23/552](#) takes precedence; {insulating layers for contacts or interconnections [H01L 23/5329](#)})
- 23/29 . . characterised by the material {, e.g. carbon (interlayer dielectrics [H01L 23/5329](#))}
- 23/291 . . . {Oxides or nitrides or carbides, e.g. ceramics, glass}
- 23/293 . . . {Organic, e.g. plastic}
- 23/295 {containing a filler ([H01L 23/296](#) takes precedence)}
- 23/296 {Organo-silicon compounds}
- 23/298 . . . {Semiconductor material, e.g. amorphous silicon}
- 23/31 . . characterised by the arrangement {or shape}
- 23/3107 . . . {the device being completely enclosed}
- 23/3114 {the device being a chip scale package, e.g. CSP}
- 23/3121 {a substrate forming part of the encapsulation}
- 23/3128 {the substrate having spherical bumps for external connection}
- 23/3135 {Double encapsulation or coating and encapsulation}
- 23/3142 {Sealing arrangements between parts, e.g. adhesion promoters}
- 23/315 {the encapsulation having a cavity}
- 23/3157 . . . {Partial encapsulation or coating (mask layer used as insulation layer [H01L 21/31](#))}
- 23/3164 {the coating being a foil}
- 23/3171 {the coating being directly applied to the semiconductor body, e.g. passivation layer ([H01L 23/3178](#) takes precedence)}
- 23/3178 {Coating or filling in grooves made in the semiconductor body}
- 23/3185 {the coating covering also the sidewalls of the semiconductor body}
- 23/3192 {Multilayer coating}
- 23/32 . Holders for supporting the complete device in operation, i.e. detachable fixtures ([H01L 23/40](#) takes precedence; connectors, {e.g. sockets} , in general [H01R](#); for printed circuits [H05K](#))
- 23/34 . Arrangements for cooling, heating, ventilating or temperature compensation {; Temperature sensing arrangements (thermal treatment apparatus [H01L 21/00](#))}
- 23/345 . . {Arrangements for heating (thermal treatment apparatus [H01L 21/00](#))}
- 23/36 . . Selection of materials, or shaping, to facilitate cooling or heating, e.g. heatsinks {([H01L 23/28](#), [H01L 23/40](#), [H01L 23/42](#), [H01L 23/44](#), [H01L 23/46](#) take precedence; heating [H01L 23/345](#))}
- 23/367 . . . Cooling facilitated by shape of device {([H01L 23/38](#), [H01L 23/40](#), [H01L 23/42](#), [H01L 23/44](#), [H01L 23/46](#) take precedence)}
- 23/3672 {Foil-like cooling fins or heat sinks (being part of lead-frames [H01L 23/49568](#))}
- 23/3675 {characterised by the shape of the housing}
- 23/3677 {Wire-like or pin-like cooling fins or heat sinks}
- 23/373 Cooling facilitated by selection of materials for the device {or materials for thermal expansion adaptation, e.g. carbon}
- 23/3731 {Ceramic materials or glass ([H01L 23/3732](#), [H01L 23/3733](#), [H01L 23/3735](#), [H01L 23/3737](#), [H01L 23/3738](#) take precedence)}
- 23/3732 {Diamonds}
- 23/3733 {having a heterogeneous or anisotropic structure, e.g. powder or fibres in a matrix, wire mesh, porous structures ([H01L 23/3732](#), [H01L 23/3737](#) take precedence)}
- 23/3735 {Laminates or multilayers, e.g. direct bond copper ceramic substrates}
- 23/3736 {Metallic materials ([H01L 23/3732](#), [H01L 23/3733](#), [H01L 23/3735](#), [H01L 23/3737](#), [H01L 23/3738](#) take precedence)}
- 23/3737 {Organic materials with or without a thermoconductive filler}
- 23/3738 {Semiconductor materials}
- 23/38 . . Cooling arrangements using the Peltier effect
- 23/40 . . Mountings or securing means for detachable cooling or heating arrangements {(heating [H01L 23/345](#)); fixed by friction, plugs or springs}
- 23/4006 . . . {with bolts or screws}
- 23/4012 {for stacked arrangements of a plurality of semiconductor devices (assemblies [per se](#) [H01L 25/00](#))}
- 2023/4018 {characterised by the type of device to be heated or cooled}
- 2023/4025 {Base discrete devices, e.g. presspack, disc-type transistors}
- 2023/4031 {Packaged discrete devices, e.g. to-3 housings, diodes}
- 2023/4037 {characterised by thermal path or place of attachment of heatsink}
- 2023/4043 {heatsink to have chip}
- 2023/405 {heatsink to package}
- 2023/4056 {heatsink to additional heatsink}
- 2023/4062 {heatsink to or through board or cabinet}
- 2023/4068 {Heatconductors between device and heatsink, e.g. compliant heat-spreaders, heat-conducting bands}
- 2023/4075 {Mechanical elements}
- 2023/4081 {Compliant clamping elements not primarily serving heat-conduction}
- 2023/4087 {Mounting accessories, interposers, clamping or screwing parts}
- 23/4093 . . . {Snap-on arrangements, e.g. clips}
- 23/42 . . Fillings or auxiliary members in containers {or encapsulations} selected or arranged to facilitate heating or cooling ({heating [H01L 23/345](#)}; characterised by selection of materials for the device [H01L 23/373](#))}
- 23/427 . . . Cooling by change of state, e.g. use of heat pipes {(by liquefied gas [H01L 23/445](#))}
- 23/4275 {by melting or evaporation of solids}
- 23/433 . . . Auxiliary members {in containers} characterised by their shape, e.g. pistons
- 23/4332 {Bellows}
- 23/4334 {Auxiliary members in encapsulations ([H01L 23/49568](#) takes precedence)}
- 23/4336 {in combination with jet impingement}

- 23/4338 {Pistons, e.g. spring-loaded members}
- 23/44 . . the complete device being wholly immersed in a fluid other than air {(H01L 23/427 takes precedence)}
- 23/445 . . . {the fluid being a liquefied gas, e.g. in a cryogenic vessel}
- 23/46 . . involving the transfer of heat by flowing fluids (H01L 23/42, H01L 23/44 take precedence)
- 23/467 . . . by flowing gases, e.g. air {(H01L 23/473 takes precedence)}
- 23/473 . . . by flowing liquids {(H01L 23/4332, H01L 23/4338 take precedence)}
- 23/4735 {Jet impingement (H01L 23/4336 takes precedence)}
- 23/48 . . Arrangements for conducting electric current to or from the solid state body in operation, e.g. leads, terminal arrangements (in general H01R); {Selection of materials therefor}
- NOTE**
- Arrangements for connecting or disconnecting semiconductor or other solid state bodies, or methods related thereto, other than those arrangements or methods covered by the following subgroups, are covered by H01L 24/00
- 23/481 . . {Internal lead connections, e.g. via connections, feedthrough structures}
- 23/482 . . consisting of lead-in layers inseparably applied to the semiconductor body {(electrodes H01L 29/40)}
- 23/4821 . . . {Bridge structure with air gap}
- 23/4822 . . . {Beam leads}
- 23/4824 . . . {Pads with extended contours, e.g. grid structure, branch structure, finger structure}
- 23/4825 . . . {for devices consisting of semiconductor layers on insulating or semi-insulating substrates, e.g. silicon on sapphire devices, i.e. SOS}
- 23/4827 . . . {Materials}
- 23/4828 {Conductive organic material or pastes, e.g. conductive adhesives, inks}
- 23/485 . . . consisting of layered constructions comprising conductive layers and insulating layers, e.g. planar contacts {(H01L 23/4821, H01L 23/4822, H01L 23/4824, H01L 23/4825 take precedence; materials H01L 23/532, bond pads H01L 24/02, bump connectors H01L 24/10)}
- 23/4855 {Overhang structure}
- 23/488 . . consisting of soldered {or bonded} constructions {(bump connectors H01L 24/01)}
- 23/49 . . . wire-like {arrangements or pins or rods (using optical fibres H01L 23/48; pins attached to insulating substrates H01L 23/49811)}
- 23/492 . . . Bases or plates {or solder therefor}
- 23/4922 {having a heterogeneous or anisotropic structure}
- 23/4924 {characterised by the materials}
- 23/4926 {the materials containing semiconductor material}
- 23/4928 {the materials containing carbon}
- 23/495 . . . Lead-frames {or other flat leads (H01L 23/498 takes precedence; lead frame interconnections between components H01L 23/52)}
- 23/49503 {characterised by the die pad}
- 23/49506 {an insulative substrate being used as a diepad, e.g. ceramic, plastic (H01L 23/49531 takes precedence)}
- 23/4951 {Chip-on-leads or leads-on-chip techniques, i.e. inner lead fingers being used as die pad}
- 23/49513 {having bonding material between chip and die pad}
- 23/49517 {Additional leads}
- 23/4952 {the additional leads being a bump or a wire}
- 23/49524 {the additional leads being a tape carrier or flat leads}
- 23/49527 {the additional leads being a multilayer}
- 23/49531 {the additional leads being a wiring board}
- 23/49534 {Multi-layer}
- 23/49537 {Plurality of lead frames mounted in one device}
- 23/49541 {Geometry of the lead-frame}
- 23/49544 {Deformation absorbing parts in the lead frame plane, e.g. meanderline shape (H01L 23/49562 takes precedence)}
- 23/49548 {Cross section geometry (H01L 23/49562 takes precedence)}
- 23/49551 {characterised by bent parts}
- 23/49555 {the bent parts being the outer leads}
- 23/49558 {Insulating layers on lead frames, e.g. bridging members}
- 23/49562 {for devices being provided for in H01L 29/00}
- 23/49565 {Side rails of the lead frame, e.g. with perforations, sprocket holes}
- 23/49568 {specifically adapted to facilitate heat dissipation}
- 23/49572 {consisting of thin flexible metallic tape with or without a film carrier (H01L 23/49503 - H01L 23/49568 and H01L 23/49575 - H01L 23/49579 take precedence)}
- 23/49575 {Assemblies of semiconductor devices on lead frames}
- 23/49579 {characterised by the materials of the lead frames or layers thereon}
- 23/49582 {Metallic layers on lead frames}
- 23/49586 {Insulating layers on lead frames}
- 23/49589 {Capacitor integral with or on the leadframe}
- 23/49593 {Battery in combination with a leadframe}
- 23/49596 {Oscillators in combination with lead-frames}
- 23/498 Leads, {i.e. metallisations or lead-frames} on insulating substrates, {e.g. chip carriers (shape of the substrate H01L 23/13)}
- 23/49805 {the leads being also applied on the sidewalls or the bottom of the substrate, e.g. leadless packages for surface mounting}
- 23/49811 {Additional leads joined to the metallisation on the insulating substrate, e.g. pins, bumps, wires, flat leads (H01L 23/49827 takes precedence)}
- 23/49816 {Spherical bumps on the substrate for external connection, e.g. ball grid arrays [BGA]}

- 23/49822 {Multilayer substrates (multilayer metallisation on monolayer substrate [H01L 23/498](#))}
- 23/49827 {Via connections through the substrates, e.g. pins going through the substrate, coaxial cables ([H01L 23/49822](#), [H01L 23/49833](#), [H01L 23/4985](#), [H01L 23/49861](#) take precedence)}
- 23/49833 {the chip support structure consisting of a plurality of insulating substrates}
- 23/49838 {Geometry or layout}
- 23/49844 {for devices being provided for in [H01L 29/00](#)}
- 23/4985 {Flexible insulating substrates ([H01L 23/49572](#) and [H01L 23/49855](#) take precedence)}
- 23/49855 {for flat-cards, e.g. credit cards ([cards per se G06K 19/00](#))}
- 23/49861 {Lead-frames fixed on or encapsulated in insulating substrates ([H01L 23/4985](#), [H01L 23/49805](#) take precedence)}
- 23/49866 {characterised by the materials (materials of the substrates [H01L 23/14](#), of the lead-frames [H01L 23/49579](#))}
- 23/49872 {the conductive materials containing semiconductor material}
- 23/49877 {Carbon, e.g. fullerenes (superconducting fullerenes [H01L 39/123](#))}
- 23/49883 {the conductive materials containing organic materials or pastes, e.g. for thick films (for printed circuits [H05K 1/092](#))}
- 23/49888 {the conductive materials containing superconducting material}
- 23/49894 {Materials of the insulating layers or coatings}
- 23/50 . . for integrated circuit devices, {e.g. power bus, number of leads} ([H01L 23/482](#) - [H01L 23/498](#) take precedence)
- 23/52 . . Arrangements for conducting electric current within the device in operation from one component to another {, i.e. interconnections, e.g. wires, lead frames (optical interconnections [G02B 6/00](#))}
- 23/522 . . including external interconnections consisting of a multilayer structure of conductive and insulating layers inseparably formed on the semiconductor body
- 23/5221 . . . {Crossover interconnections}
- 23/5222 . . . {Capacitive arrangements or effects of, or between wiring layers (other capacitive arrangements [H01L 23/642](#))}
- 23/5223 . . . {Capacitor integral with wiring layers}
- 23/5225 . . . {Shielding layers formed together with wiring layers}
- 23/5226 . . . {Via connections in a multilevel interconnection structure}
- 23/5227 . . . {Inductive arrangements or effects of, or between, wiring layers (other inductive arrangements [H01L 23/645](#))}
- 23/5228 . . . {Resistive arrangements or effects of, or between, wiring layers (other resistive arrangements [H01L 23/647](#))}
- 23/525 . . . with adaptable interconnections
- 23/5252 {comprising anti-fuses, i.e. connections having their state changed from non-conductive to conductive}
- 23/5254 {the change of state resulting from the use of an external beam, e.g. laser beam or ion beam}
- 23/5256 {comprising fuses, i.e. connections having their state changed from conductive to non-conductive}
- 23/5258 {the change of state resulting from the use of an external beam, e.g. laser beam or ion beam}
- 23/528 . . . {Geometry or} layout of the interconnection structure {([H01L 27/0207](#) takes precedence; algorithms [G06F 17/50](#))}
- 23/5283 {Cross-sectional geometry}
- 23/5286 {Arrangements of power or ground buses}
- 23/532 . . . characterised by the materials
- 23/53204 {Conductive materials}
- 23/53209 {based on metals, e.g. alloys, metal silicides ([H01L 23/53285](#) takes precedence)}
- 23/53214 {the principal metal being aluminium}
- 23/53219 {Aluminium alloys}
- 23/53223 {Additional layers associated with aluminium layers, e.g. adhesion, barrier, cladding layers}
- 23/53228 {the principal metal being copper}
- 23/53233 {Copper alloys}
- 23/53238 {Additional layers associated with copper layers, e.g. adhesion, barrier, cladding layers}
- 23/53242 {the principal metal being a noble metal, e.g. gold}
- 23/53247 {Noble-metal alloys}
- 23/53252 {Additional layers associated with noble-metal layers, e.g. adhesion, barrier, cladding layers}
- 23/53257 {the principal metal being a refractory metal}
- 23/53261 {Refractory-metal alloys}
- 23/53266 {Additional layers associated with refractory-metal layers, e.g. adhesion, barrier, cladding layers}
- 23/53271 {containing semiconductor material, e.g. polysilicon}
- 23/53276 {containing carbon, e.g. fullerenes (superconducting fullerenes [H01L 39/123](#))}
- 23/5328 {containing conductive organic materials or pastes, e.g. conductive adhesives, inks}
- 23/53285 {containing superconducting materials}
- 23/5329 {Insulating materials}
- 23/53295 {Stacked insulating layers}
- 23/535 . . including internal interconnections, e.g. cross-under constructions {(internal lead connections [H01L 23/481](#))}
- 23/538 . . the interconnection structure between a plurality of semiconductor chips being formed on, or in, insulating substrates {([H05K](#) takes precedence; manufacture or treatment [H01L 21/4846](#) ; mountings per se [H01L 23/12](#); {materials [H01L 23/49866](#))}
- 23/5381 . . . {Crossover interconnections, e.g. bridge stepovers}
- 23/5382 . . . {Adaptable interconnections, e.g. for engineering changes}

- 23/5383 . . . {Multilayer substrates ([H01L 23/5385](#) takes precedence; multilayer metallisation on monolayer substrates [H01L 23/538](#))}
- 23/5384 . . . {Conductive vias through the substrate with or without pins, e.g. buried coaxial conductors ([H01L 23/5383](#), [H01L 23/5385](#) take precedence; pins attached to insulating substrates [H01L 23/49811](#))}
- 23/5385 . . . {Assembly of a plurality of insulating substrates}
- 23/5386 . . . {Geometry or layout of the interconnection structure}
- 23/5387 . . . {Flexible insulating substrates ([H01L 23/5388](#) takes precedence)}
- 23/5388 . . . {for flat cards, e.g. credit cards ([cards per se G06K 19/00](#))}
- 23/5389 . . . {the chips being integrally enclosed by the interconnect and support structures}
- 23/544 . Marks applied to semiconductor devices {or parts}, e.g. registration marks, {alignment structures, wafer maps ([test patterns for characterising or monitoring manufacturing processes H01L 22/00](#))}
- NOTE**
- When classifying in group [H01L 23/544](#), details are to be further indexed by using the indexing codes chosen from [H01L 2223/544](#) and subgroups
- 23/552 . Protection against radiation, e.g. light {or electromagnetic waves}
- 23/556 . . against alpha rays
- 23/562 . {Protection against mechanical damage ([H01L 23/02](#), [H01L 23/28](#) take precedence)}
- 23/564 . {Details not otherwise provided for, e.g. protection against moisture ([getters H01L 23/26](#))}
- 23/57 . {Protection from inspection, reverse engineering or tampering}
- 23/573 . . {using passive means}
- 23/576 . . {using active circuits}
- 23/58 . Structural electrical arrangements for semiconductor devices not otherwise provided for {, e.g. in combination with batteries ([H01L 23/49593](#), [H01L 23/49596](#) take precedence)}
- 23/585 . . {comprising conductive layers or plates or strips or rods or rings ([H01L 23/60](#), [H01L 23/62](#), [H01L 23/64](#), [H01L 23/66](#) take precedence)}
- 23/60 . . Protection against electrostatic charges or discharges, e.g. Faraday shields ([in general H05F](#))
- 23/62 . . Protection against overvoltage, e.g. fuses, shunts
- 23/64 . . Impedance arrangements
- 23/642 . . . {Capacitive arrangements ([H01L 23/49589](#), [H01L 23/645](#), [H01L 23/647](#), [H01L 23/66](#) take precedence; capacitive effects between wiring layers on the semiconductor body [H01L 23/5222](#))}
- 23/645 . . . {Inductive arrangements ([H01L 23/647](#), [H01L 23/66](#) take precedence)}
- 23/647 . . . {Resistive arrangements ([H01L 23/66](#), [H01L 23/62](#) take precedence)}
- 23/66 . . . High-frequency adaptations
- NOTE**
- When classifying in group [H01L 23/66](#), details are to be further indexed by using the
- indexing codes chosen from [H01L 2223/66](#) and subgroups
- 24/00 **{Arrangements for connecting or disconnecting semiconductor or solid-state bodies; Methods or apparatus related thereto}**
- NOTES**
1. This group does not cover:
- details of semiconductor bodies or of electrodes of devices provided for in group [H01L 29/00](#), which details are covered by that group;
 - details peculiar to devices provided for in a single main group of groups [H01L 31/00](#) - [H01L 51/00](#), which details are covered by those groups.
 - printed circuits, which are covered by groups [H05K 1/00](#) - [H05K 1/189](#);
 - apparatus or manufacturing processes for printed circuits, which are covered by groups [H05K 3/00](#) - [H05K 3/4685](#);
 - manufacture or treatment of parts, which are covered by group [H01L 21/48](#) and subgroups except [H01L 21/4885](#) - [H01L 21/4896](#);
 - assemblies of semiconductor devices, which are covered by groups [H01L 21/50](#) - [H01L 21/568](#);
 - applying interconnections to be used for carrying current between separate components within a device, which is covered by group [H01L 21/768](#) and subgroups;
 - containers or seals, which are covered by groups [H01L 23/02](#) - [H01L 23/10](#);
 - mountings, which are covered by groups [H01L 23/12](#) - [H01L 23/15](#) and subgroups;
 - arrangements for cooling, heating, ventilating or temperature compensation, which are covered by groups [H01L 23/34](#) - [H01L 23/4735](#);
 - arrangements for conducting electric current, which are covered by groups [H01L 23/48](#) - [H01L 23/50](#), and by groups [H01L 23/52](#) - [H01L 23/5389](#);
 - structural electrical arrangements, which are covered by groups [H01L 24/80](#) - [H01L 23/66](#);
 - assemblies of semiconductor or other solid state devices, which are covered by groups [H01L 25/00](#) - [H01L 25/18](#).
2. In this group the following indexing codes are used : [H01L 24/00](#), [H01L 2224/00](#), [H01L 2924/00](#), and subgroups thereof
- 24/01 . {Means for bonding being attached to, or being formed on, the surface to be connected, e.g. chip-to-package, die-attach, "first-level" interconnects; Manufacturing methods related thereto}

<p>24/02 . . {Bonding areas (on insulating substrates, e.g. chip carriers, H01L 23/49816, H01L 23/49838, H01L 23/5389); Manufacturing methods related thereto}</p> <p>WARNING</p> <p>Groups H01L 24/02 – H01L 24/09 are incomplete pending reclassification of documents from groups H01L 24/02 and H01L 24/10.</p> <p>Groups H01L 24/02 – H01L 24/09 and H01L 24/10 should be considered in order to perform a complete search.</p>	<p>24/27 . . . {Manufacturing methods}</p> <p>24/28 . . . {Structure, shape, material or disposition of the layer connectors prior to the connecting process}</p> <p>24/29 {of an individual layer connector}</p> <p>24/30 {of a plurality of layer connectors}</p> <p>24/31 . . . {Structure, shape, material or disposition of the layer connectors after the connecting process}</p> <p>24/32 {of an individual layer connector}</p> <p>24/33 {of a plurality of layer connectors}</p> <p>24/34 . . {Strap connectors, e.g. copper straps for grounding power devices; Manufacturing methods related thereto}</p> <p>WARNING</p> <p>Groups H01L 24/34 – H01L 24/41 are incomplete pending reclassification of documents from groups H01L 24/34, H01L 24/01, H01L 24/42, and H01L 24/85.</p> <p>Groups H01L 24/34 – H01L 24/41 and H01L 24/01, H01L 24/42, H01L 24/85 should be considered in order to perform a complete search.</p>
<p>24/03 . . . {Manufacturing methods}</p> <p>24/04 . . . {Structure, shape, material or disposition of the bonding areas prior to the connecting process}</p> <p>24/05 {of an individual bonding area}</p> <p>24/06 {of a plurality of bonding areas}</p> <p>24/07 . . . {Structure, shape, material or disposition of the bonding areas after the connecting process}</p> <p>24/08 {of an individual bonding area}</p> <p>24/09 {of a plurality of bonding areas}</p> <p>24/10 . . {Bump connectors (bumps on insulating substrates, e.g. chip carriers, H01L 23/49816); Manufacturing methods related thereto}</p>	<p>24/35 . . . {Manufacturing methods}</p> <p>24/36 . . . {Structure, shape, material or disposition of the strap connectors prior to the connecting process}</p> <p>24/37 {of an individual strap connector}</p> <p>24/38 {of a plurality of strap connectors}</p> <p>24/39 . . . {Structure, shape, material or disposition of the strap connectors after the connecting process}</p> <p>24/40 {of an individual strap connector}</p> <p>24/41 {of a plurality of strap connectors}</p> <p>24/42 . . {Wire connectors; Manufacturing methods related thereto}</p> <p>24/43 . . . {Manufacturing methods}</p> <p>WARNING</p> <p>Group H01L 24/43 is incomplete pending reclassification of documents from groups H01L 24/42 and H01L 24/85.</p> <p>Groups H01L 24/43, H01L 24/42, and H01L 24/85 should be considered in order to perform a complete search.</p>
<p>24/11 . . . {Manufacturing methods (for bumps on insulating substrates H01L 21/4853)}</p> <p>24/12 . . . {Structure, shape, material or disposition of the bump connectors prior to the connecting process}</p> <p>24/13 {of an individual bump connector}</p> <p>24/14 {of a plurality of bump connectors}</p> <p>24/15 . . . {Structure, shape, material or disposition of the bump connectors after the connecting process}</p> <p>24/16 {of an individual bump connector}</p> <p>24/17 {of a plurality of bump connectors}</p> <p>24/18 . . {High density interconnect [HDI] connectors; Manufacturing methods related thereto (interconnection structure between a plurality of semiconductor chips H01L 23/5389)}</p> <p>WARNING</p> <p>Groups H01L 24/18 – H01L 24/25 are incomplete pending reclassification of documents from groups H01L 24/18 and H01L 24/82.</p> <p>Groups H01L 24/18 – H01L 24/25 and H01L 24/82 should be considered in order to perform a complete search.</p>	<p>24/44 . . . {Structure, shape, material or disposition of the wire connectors prior to the connecting process}</p> <p>WARNING</p> <p>Group H01L 24/44 is incomplete pending reclassification of documents from groups H01L 24/42 and H01L 24/85.</p> <p>Groups H01L 24/44 and H01L 24/42, H01L 24/85 should be considered in order to perform a complete search.</p>
<p>24/19 . . . {Manufacturing methods of high density interconnect preforms}</p> <p>24/20 . . . {Structure, shape, material or disposition of high density interconnect preforms}</p> <p>24/23 . . . {Structure, shape, material or disposition of the high density interconnect connectors after the connecting process}</p> <p>24/24 {of an individual high density interconnect connector}</p> <p>24/25 {of a plurality of high density interconnect connectors}</p> <p>24/26 . . {Layer connectors, e.g. plate connectors, solder or adhesive layers; Manufacturing methods related thereto}</p>	<p>24/45 {of an individual wire connector}</p> <p>24/46 {of a plurality of wire connectors}</p>

- 24/47 . . . {Structure, shape, material or disposition of the wire connectors after the connecting process}
- WARNING**
- Group [H01L 24/47](#) is incomplete pending reclassification of documents from groups [H01L 24/42](#) and [H01L 24/85](#).
- Groups [H01L 24/47](#) and [H01L 24/42](#), [H01L 24/85](#) should be considered in order to perform a complete search.
- 24/48 {of an individual wire connector}
- 24/49 {of a plurality of wire connectors}
- 24/50 . . {Tape automated bonding [TAB] connectors, i.e. film carriers; Manufacturing methods related thereto (thin flexible metallic tape with or without a film carrier [H01L 23/49572](#), flexible insulating substrates [H01L 23/4985](#), [H01L 23/5387](#))}
- WARNING**
- Group [H01L 24/50](#) is incomplete pending reclassification of documents from group [H01L 24/86](#).
- Groups [H01L 24/50](#) and [H01L 24/86](#) should be considered in order to perform a complete search.
- 24/63 . . {Connectors not provided for in any of the groups [H01L 24/10](#) - [H01L 24/50](#) and subgroups; Manufacturing methods related thereto}
- 24/64 . . . {Manufacturing methods}
- 24/65 . . . {Structure, shape, material or disposition of the connectors prior to the connecting process}
- 24/66 {of an individual connector}
- 24/67 {of a plurality of connectors}
- 24/68 . . . {Structure, shape, material or disposition of the connectors after the connecting process}
- 24/69 {of an individual connector}
- 24/70 {of a plurality of connectors}
- 24/71 . {Means for bonding not being attached to, or not being formed on, the surface to be connected (holders for supporting the complete device in operation [H01L 23/32](#))}
- 24/72 . . {Detachable connecting means consisting of mechanical auxiliary parts connecting the device, e.g. pressure contacts using springs or clips}
- 24/73 . {Means for bonding being of different types provided for in two or more of groups [H01L 24/10](#), [H01L 24/18](#), [H01L 24/26](#), [H01L 24/34](#), [H01L 24/42](#), [H01L 24/50](#), [H01L 24/63](#), [H01L 24/71](#)}
- 24/74 . {Apparatus for manufacturing arrangements for connecting or disconnecting semiconductor or solid-state bodies}
- 24/741 . . {Apparatus for manufacturing means for bonding, e.g. connectors}
- 24/742 . . . {Apparatus for manufacturing bump connectors}
- 24/743 . . . {Apparatus for manufacturing layer connectors}
- 24/744 . . . {Apparatus for manufacturing strap connectors}
- 24/745 . . . {Apparatus for manufacturing wire connectors}
- 24/75 . . {Apparatus for connecting with bump connectors or layer connectors}
- 24/76 . . {Apparatus for connecting with build-up interconnects}
- 24/77 . . {Apparatus for connecting with strap connectors}
- 24/78 . . {Apparatus for connecting with wire connectors}
- 24/79 . . {Apparatus for Tape Automated Bonding [TAB]}
- 24/799 . . {Apparatus for disconnecting}
- 24/80 . {Methods for connecting semiconductor or other solid state bodies using means for bonding being attached to, or being formed on, the surface to be connected}
- 24/81 . . {using a bump connector}
- 24/82 . . {by forming build-up interconnects at chip-level, e.g. for high density interconnects [HDI] (interconnection structure between a plurality of semiconductor chips [H01L 23/5389](#))}
- 24/83 . . {using a layer connector}
- 24/84 . . {using a strap connector}
- WARNING**
- Group [H01L 24/84](#) is incomplete pending reclassification of documents from group [H01L 24/85](#).
- Group [H01L 24/84](#) and [H01L 24/85](#) should be considered in order to perform a complete search.
- 24/85 . . {using a wire connector (wire bonding in general [B23K 20/004](#))}
- 24/86 . . {using tape automated bonding [TAB]}
- 24/89 . . {using at least one connector not provided for in any of the groups [H01L 24/81](#) - [H01L 24/86](#)}
- 24/90 . {Methods for connecting semiconductor or solid state bodies using means for bonding not being attached to, or not being formed on, the body surface to be connected, e.g. pressure contacts using springs or clips}
- 24/91 . {Methods for connecting semiconductor or solid state bodies including different methods provided for in two or more of groups [H01L 24/80](#) - [H01L 24/90](#)}
- 24/92 . . {Specific sequence of method steps}
- 24/93 . {Batch processes}
- WARNING**
- Group [H01L 24/93](#) is incomplete pending reclassification of documents from groups [H01L 24/80](#) - [H01L 24/90](#).
- Groups [H01L 24/93](#) and [H01L 24/80](#) - [H01L 24/90](#) should be considered in order to perform a complete search.
- 24/94 . . {at wafer-level, i.e. with connecting carried out on a wafer comprising a plurality of undiced individual devices}
- 24/95 . . {at chip-level, i.e. with connecting carried out on a plurality of singulated devices, i.e. on diced chips}
- 24/96 . . . {the devices being encapsulated in a common layer, e.g. neo-wafer or pseudo-wafer, said common layer being separable into individual assemblies after connecting}
- 24/97 . . . {the devices being connected to a common substrate, e.g. interposer, said common substrate being separable into individual assemblies after connecting}

- 25/98 . {Methods for disconnecting semiconductor or solid-state bodies}
- 25/00 Assemblies consisting of a plurality of individual semiconductor or other solid state devices {; Multistep manufacturing processes thereof}** (devices consisting of a plurality of solid state components formed in or on a common substrate [H01L 27/00](#); photovoltaic modules or arrays of photovoltaic cells [H01L 31/042](#) {; panels or arrays of photo electrochemical cells [H01G 9/2068](#)})
- 25/03 . all the devices being of a type provided for in the same subgroup of groups [H01L 27/00](#) - [H01L 51/00](#), e.g. assemblies of rectifier diodes
- 25/04 . . the devices not having separate containers
- 25/041 . . . {the devices being of a type provided for in group [H01L 31/00](#)}
- 25/042 {the devices being arranged next to each other (solar cells [H01L 31/042](#))}
- 25/043 {Stacked arrangements of devices}
- 25/046 . . . {the devices being of a type provided for in group [H01L 51/00](#)}
- 25/047 {the devices being of a type provided for in group [H01L 51/42](#), e.g. photovoltaic modules based on organic solar cells}
- 25/048 {the devices being of a type provided for in group [H01L 51/50](#), e.g. assembly of organic light emitting devices}
- 25/065 . . . the devices being of a type provided for in group [H01L 27/00](#)
- NOTE**
Group [H01L 25/0652](#) takes precedence over groups [H01L 25/0655](#) and [H01L 25/0657](#)
- 25/0652 {the devices being arranged next and on each other, i.e. mixed assemblies}
- 25/0655 {the devices being arranged next to each other}
- 25/0657 {Stacked arrangements of devices}
- 25/07 . . . the devices being of a type provided for in group [H01L 29/00](#)
- NOTE**
Group [H01L 25/071](#) takes precedence over groups [H01L 25/072](#) - [H01L 25/074](#)
- 25/071 {the devices being arranged next and on each other, i.e. mixed assemblies}
- 25/072 {the devices being arranged next to each other}
- 25/073 {Apertured devices mounted on one or more rods passed through the apertures}
- 25/074 {Stacked arrangements of non-apertured devices}
- 25/075 . . . the devices being of a type provided for in group [H01L 33/00](#)
- 25/0753 {the devices being arranged next to each other}
- 25/0756 {Stacked arrangements of devices}
- 25/10 . . the devices having separate containers
- 25/105 . . . {the devices being of a type provided for in group [H01L 27/00](#)}
- NOTE**
When classifying in group [H01L 25/105](#), details of the assemblies are to be further indexed by using the indexing codes chosen from [H01L 2225/1005](#) and subgroups
- 25/11 . . . the devices being of a type provided for in group [H01L 29/00](#)
- NOTE**
Group [H01L 25/112](#) takes precedence over groups [H01L 25/115](#) and [H01L 25/117](#)
- 25/112 {Mixed assemblies}
- 25/115 {the devices being arranged next to each other}
- 25/117 {Stacked arrangements of devices}
- 25/13 . . . the devices being of a type provided for in group [H01L 33/00](#)
- 25/16 . the devices being of types provided for in two or more different main groups of [H01L 27/00](#) - [H01L 49/00](#) {and [H01L 51/00](#)}, e.g. forming hybrid circuits {(interconnections for hybrid circuits [H01L 23/5389](#))}
- 25/162 . . {the devices being mounted on two or more different substrates}
- 25/165 . . {Containers}
- 25/167 . . {comprising optoelectronic devices, e.g. LED, photodiodes}
- 25/18 . the devices being of types provided for in two or more different subgroups of the same main group of groups [H01L 27/00](#) - [H01L 51/00](#) {(comprising devices provided for in [H01L 27/144](#) and subgroups, see [H01L 27/144](#) and subgroups)}
- 25/50 . {Multistep manufacturing processes of assemblies consisting of devices, each device being of a type provided for in group [H01L 27/00](#) or [H01L 29/00](#) ([H01L 21/50](#) takes precedence)}
- 27/00 Devices consisting of a plurality of semiconductor or other solid-state components formed in or on a common substrate** (details thereof [H01L 23/00](#), [H01L 29/00](#) - [H01L 51/00](#); assemblies consisting of a plurality of individual solid state devices [H01L 25/00](#))
- NOTES**
1. In this group, with the exception of groups [H01L 27/115](#) - [H01L 27/11597](#), the last place priority rule is applied, i.e. at each hierarchical level, in the absence of an indication to the contrary, classification is made in the last appropriate place.
 2. When classifying in this group, subject matter relating to electrically programmable read-only memories is classified in group [H01L 27/115](#), irrespective of the last place priority rule.

- 27/01 comprising only passive thin-film or thick-film elements formed on a common insulating substrate {passive two-terminal components without a potential-jump or surface barrier for integrated circuits, details thereof and multistep manufacturing processes therefor [H01L 28/00](#)}
- NOTE**
In groups [H01L 27/01](#) - [H01L 27/26](#), in the absence of an indication to the contrary, classification is made in the last appropriate place.
- 27/013 {Thick-film circuits}
- 27/016 {Thin-film circuits}
- 27/02 including semiconductor components specially adapted for rectifying, oscillating, amplifying or switching and having at least one potential-jump barrier or surface barrier; including integrated passive circuit elements with at least one potential-jump barrier or surface barrier
- 27/0203 {Particular design considerations for integrated circuits}
- 27/0207 {Geometrical layout of the components, e.g. computer aided design; custom LSI, semi-custom LSI, standard cell technique}
- 27/0211 {adapted for requirements of temperature}
- 27/0214 {for internal polarisation, e.g. I2L}
- 27/0218 {of field effect structures}
- 27/0222 {Charge pumping, substrate bias generation structures}
- 27/0225 {Charge injection in static induction transistor logic structures [SITL]}
- 27/0229 {of bipolar structures}
- 27/0233 {Integrated injection logic structures [I2L]}
- 27/0237 {using vertical injector structures}
- 27/024 {using field effect injector structures}
- 27/0244 {I2L structures integrated in combination with analog structures}
- 27/0248 {for electrical or thermal protection, e.g. electrostatic discharge [ESD] protection}
- 27/0251 {for MOS devices}
- 27/0255 {using diodes as protective elements}
- 27/0259 {using bipolar transistors as protective elements}
- 27/0262 {including a PNP transistor and a NPN transistor, wherein each of said transistors has its base coupled to the collector of the other transistor, e.g. silicon controlled rectifier [SCR] devices}
- 27/0266 {using field effect transistors as protective elements}
- 27/027 {specially adapted to provide an electrical current path other than the field effect induced current path}
- 27/0274 {involving a parasitic bipolar transistor triggered by the electrical biasing of the gate electrode of the field effect transistor, e.g. gate coupled transistors}
- 27/0277 {involving a parasitic bipolar transistor triggered by the local electrical biasing of the layer acting as base of said parasitic bipolar transistor}
- 27/0281 {field effect transistors in a "Darlington-like" configuration}
- 27/0285 {bias arrangements for gate electrode of field effect transistors, e.g. RC networks, voltage partitioning circuits [\(H01L 27/0281 takes precedence\)](#)}
- 27/0288 {using passive elements as protective elements, e.g. resistors, capacitors, inductors, spark-gaps}
- 27/0292 {using a specific configuration of the conducting means connecting the protective devices, e.g. ESD buses}
- 27/0296 {involving a specific disposition of the protective devices}
- 27/04 the substrate being a semiconductor body
- 27/06 including a plurality of individual components in a non-repetitive configuration
- 27/0605 {integrated circuits made of compound material, e.g. A_{III}B_V}
- 27/0611 {integrated circuits having a two-dimensional layout of components without a common active region}
- 27/0617 {comprising components of the field-effect type [\(H01L 27/0251 takes precedence\)](#)}
- 27/0623 {in combination with bipolar transistors}
- 27/0629 {in combination with diodes, or resistors, or capacitors}
- 27/0635 {in combination with bipolar transistors and diodes, or resistors, or capacitors}
- 27/0641 {without components of the field effect type}
- 27/0647 {Bipolar transistors in combination with diodes, or capacitors, or resistors, e.g. vertical bipolar transistor and bipolar lateral transistor and resistor}
- 27/0652 {Vertical bipolar transistor in combination with diodes, or capacitors, or resistors}
- 27/0658 {Vertical bipolar transistor in combination with resistors or capacitors}
- 27/0664 {Vertical bipolar transistor in combination with diodes}
- 27/067 {Lateral bipolar transistor in combination with diodes, or capacitors, or resistors}
- 27/0676 {comprising combinations of diodes, or capacitors or resistors}
- 27/0682 {comprising combinations of capacitors and resistors}
- 27/0688 {Integrated circuits having a three-dimensional layout}
- 27/0694 {comprising components formed on opposite sides of a semiconductor substrate}
- 27/07 the components having an active region in common

27/0705	. . . . . {comprising components of the field effect type}	27/0886	. . . . . {including transistors with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET}
27/0711	. . . . . {in combination with bipolar transistors and diodes, or capacitors, or resistors}	27/092	. . . . . complementary MIS field-effect transistors
27/0716	. . . . . {in combination with vertical bipolar transistors and diodes, or capacitors, or resistors}	27/0921	. . . . . {Means for preventing a bipolar, e.g. thyristor, action between the different transistor regions, e.g. Latchup prevention}
27/0722	. . . . . {in combination with lateral bipolar transistors and diodes, or capacitors, or resistors}	27/0922	. . . . . {Combination of complementary transistors having a different structure, e.g. stacked CMOS, high-voltage and low-voltage CMOS}
27/0727	. . . . . {in combination with diodes, or capacitors or resistors}	27/0924	. . . . . {including transistors with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET}
27/0733	. . . . . {in combination with capacitors only}	27/0925	. . . . . {comprising an N-well only in the substrate}
27/0738	. . . . . {in combination with resistors only}	27/0927	. . . . . {comprising a P-well only in the substrate}
27/0744	. . . . . {without components of the field effect type}	27/0928	. . . . . {comprising both N- and P- wells in the substrate, e.g. twin-tub}
27/075	. . . . . {Bipolar transistors in combination with diodes, or capacitors, or resistors, e.g. lateral bipolar transistor, and vertical bipolar transistor and resistor}	27/095	. . . . . the components being Schottky barrier gate field-effect transistors
27/0755	. . . . . {Vertical bipolar transistor in combination with diodes, or capacitors, or resistors}	27/098	. . . . . the components being PN junction gate field-effect transistors
27/0761	. . . . . {Vertical bipolar transistor in combination with diodes only}	27/10	. . . including a plurality of individual components in a repetitive configuration
27/0766	. . . . . {with Schottky diodes only}	27/101	. . . . {including resistors or capacitors only}
27/0772	. . . . . {Vertical bipolar transistor in combination with resistors only}	27/102	. . . . including bipolar components
27/0777	. . . . . {Vertical bipolar transistor in combination with capacitors only}	27/1021	. . . . . {including diodes only}
27/0783	. . . . . {Lateral bipolar transistors in combination with diodes, or capacitors, or resistors}	27/1022	. . . . . {including bipolar transistors}
27/0788	. . . . . {comprising combinations of diodes or capacitors or resistors}	27/1023	. . . . . {Bipolar dynamic random access memory structures}
27/0794	. . . . . {Combinations of capacitors and resistors}	27/1024	. . . . . {Arrays of single bipolar transistors only, e.g. read only memory structures}
27/08	. . . including only semiconductor components of a single kind	27/1025	. . . . . {Static bipolar memory cell structures}
27/0802	. . . . {Resistors only}	27/1026	. . . . . {Bipolar electrically programmable memory structures (using fuses H01L 23/525)}
27/0805	. . . . {Capacitors only}	27/1027	. . . . . {Thyristors}
27/0808	. . . . {Varactor diodes}	27/1028	. . . . . {Double base diodes}
27/0811	. . . . {MIS diodes}	27/105	. . . . including field-effect components
27/0814	. . . . {Diodes only}		NOTE
27/0817	. . . . {Thyristors only}		In this group and its subgroups classification is made in any appropriate place
27/082	. . . . including bipolar components only		
27/0821	. . . . {Combination of lateral and vertical transistors only}	27/1052	. . . . . {Memory structures and multistep manufacturing processes therefor not provided for in groups H01L 27/1055 - H01L 27/112 }
27/0823	. . . . . {including vertical bipolar transistors only}	27/1055	. . . . . {comprising charge coupled devices of the so-called bucket brigade type}
27/0825	. . . . . {Combination of vertical direct transistors of the same conductivity type having different characteristics,(e.g. Darlington transistors)}	27/1057	. . . . . {comprising charge coupled devices [CCD] or charge injection devices [CID]}
27/0826	. . . . . {Combination of vertical complementary transistors}		
27/0828	. . . . . {Combination of direct and inverse vertical transistors}		
27/085	. . . . including field-effect components only		
27/088	. . . . . the components being field-effect transistors with insulated gate		
27/0883	. . . . . {Combination of depletion and enhancement field effect transistors}		

27/108	. . . . . Dynamic random access memory structures	27/10876	. . . . . {the transistor having a trench structure in the substrate (vertical transistor in combination with a capacitor formed in a substrate trench H01L 27/10864)}
	NOTE		
	In this group and its subgroups classification is made in any appropriate place	27/10879	. . . . . {the transistor being of the FinFET type}
27/10802	. . . . . {comprising floating-body transistors, e.g. floating-body cells}	27/10882	. . . . . {with at least one step of making a data line}
27/10805	. . . . . {with one-transistor one-capacitor memory cells}	27/10885	. . . . . {with at least one step of making a bit line}
27/10808	. . . . . {the storage electrode stacked over transistor}	27/10888	. . . . . {with at least one step of making a bit line contact}
27/10811	. . . . . {with bit line higher than capacitor}	27/10891	. . . . . {with at least one step of making a word line}
27/10814	. . . . . {with capacitor higher than bit line level}	27/10894	. . . . . {with simultaneous manufacture of periphery and memory cells}
27/10817	. . . . . {the storage electrode having multiple wings}	27/10897	. . . . . {Peripheral structures}
27/1082	. . . . . {the capacitor extending under transfer transistor area}	27/11	. . . . . Static random access memory structures
27/10823	. . . . . {the transistor having a trench structure in the substrate}	27/1104	. . . . . {the load element being a MOSFET transistor}
27/10826	. . . . . {the transistor being of the FinFET type}	27/1108	. . . . . {the load element being a thin film transistor}
27/10829	. . . . . {the capacitor being in a substrate trench}	27/1112	. . . . . {the load element being a resistor (resistors for integrated circuits H01L 28/20, H01L 29/8605)}
27/10832	. . . . . {the capacitor extending under or around transfer transistor area}	27/1116	. . . . . {Peripheral circuit region}
27/10835	. . . . . {having storage electrode extension stacked over transistor}	27/112	. . . . . Read-only memory structures {[ROM] and multistep manufacturing processes therefor}
27/10838	. . . . . {the capacitor and the transistor being in one trench}	27/11206	. . . . . {Programmable ROM [PROM], e.g. memory cells comprising a transistor and a fuse or an antifuse}
27/10841	. . . . . {the transistor being vertical}	27/11213	. . . . . {ROM only}
27/10844	. . . . . {Multistep manufacturing methods}	27/1122	. . . . . {with source and drain on the same level, e.g. lateral transistors}
27/10847	. . . . . {for structures comprising one transistor one-capacitor memory cells}	27/11226	. . . . . {Source or drain contact programmed}
27/1085	. . . . . {with at least one step of making the capacitor or connections thereto}	27/11233	. . . . . {Gate programmed, e.g. different gate material or no gate}
27/10852	. . . . . {the capacitor extending over the access transistor}	27/1124	. . . . . {Gate contact programmed}
27/10855	. . . . . {with at least one step of making a connection between transistor and capacitor, e.g. plug}	27/11246	. . . . . {Gate dielectric programmed, e.g. different thickness}
27/10858	. . . . . {the capacitor extending under the access transistor area}	27/11253	. . . . . {Doping programmed, e.g. mask ROM}
27/10861	. . . . . {the capacitor being in a substrate trench}	27/1126	. . . . . {Entire channel doping programmed}
27/10864	. . . . . {in combination with a vertical transistor}	27/11266	. . . . . {Source or drain doping programmed}
27/10867	. . . . . {with at least one step of making a connection between transistor and capacitor, e.g. buried strap}	27/11273	. . . . . {with source and drain on different levels, e.g. vertical channel}
27/1087	. . . . . {with at least one step of making the trench}	27/1128	. . . . . {with transistors on different levels, e.g. 3D ROM}
27/10873	. . . . . {with at least one step of making the transistor}	27/11286	. . . . . {Peripheral circuit regions}
		27/11293	. . . . . {of memory structures of the ROM-only type}
		27/115	. . . . . Electrically programmable read-only memories; Multistep manufacturing processes therefor
		27/11502	. . . . . with ferroelectric memory capacitors
		27/11504	. . . . . characterised by the top-view layout
		27/11507	. . . . . characterised by the memory core region

27/11509	characterised by the peripheral circuit region	27/11573	characterised by the peripheral circuit region
27/11512	characterised by the boundary region between the core and peripheral circuit regions	27/11575	characterised by the boundary region between the core and peripheral circuit regions
27/11514	characterised by the three-dimensional arrangements, e.g. with cells on different height levels	27/11578	characterised by three-dimensional arrangements, e.g. with cells on different height levels
27/11517	with floating gate	27/1158	with source and drain on different levels, e.g. with sloping channels
27/11519	characterised by the top-view layout	27/11582	the channels comprising vertical portions, e.g. U-shaped channels
27/11521	characterised by the memory core region (three-dimensional arrangements H01L 27/11551)	27/11585	with the gate electrodes comprising a layer used for its ferroelectric memory properties, e.g. metal-ferroelectric-semiconductor [MFS] or metal-ferroelectric-metal-insulator-semiconductor [MFMIS]
27/11524	with cell select transistors, e.g. NAND	27/11587	characterised by the top-view layout
27/11526	characterised by the peripheral circuit region	27/1159	characterised by the memory core region
27/11529	of memory regions comprising cell select transistors, e.g. NAND	27/11592	characterised by the peripheral circuit region
27/11531	Simultaneous manufacturing of periphery and memory cells	27/11595	characterised by the boundary region between core and peripheral circuit regions
27/11534	including only one type of peripheral transistor	27/11597	characterised by three-dimensional arrangements, e.g. cells on different height levels
27/11536	with a control gate layer also being used as part of the peripheral transistor	27/118	Masterslice integrated circuits
27/11539	with an inter-gate dielectric layer also being used as part of the peripheral transistor	27/11801	{using bipolar technology}
27/11541	with a floating-gate layer also being used as part of the peripheral transistor	27/11803	{using field effect technology}
27/11543	with a tunnel dielectric layer also being used as part of the peripheral transistor	2027/11805	{A3B5 or A3B6 gate arrays}
27/11546	including different types of peripheral transistor	27/11807	{CMOS gate arrays}
27/11548	characterised by the boundary region between the core and peripheral circuit regions	2027/11809	{Microarchitecture}
27/11551	characterised by three-dimensional arrangements, e.g. with cells on different height levels	2027/11811	{Basic cell P to N transistor count}
27/11553	with source and drain on different levels, e.g. with sloping channels	2027/11812	{4-T CMOS basic cell}
27/11556	the channels comprising vertical portions, e.g. U-shaped channels	2027/11814	{5-T CMOS basic cell}
27/11558	the control gate being a doped region, e.g. single-poly memory cells	2027/11816	{6-T CMOS basic cell}
27/1156	the floating gate being an electrode shared by two or more components	2027/11818	{7-T CMOS basic cell}
27/11563	with charge-trapping gate insulators, e.g. MNOS or NROM	2027/1182	{8-T CMOS basic cell}
27/11565	characterised by the top-view layout	2027/11822	{relative P to N transistor sizes}
27/11568	characterised by the memory core region (three-dimensional arrangements H01L 27/11578)	2027/11824	{for current drive capability}
27/1157	with cell select transistors, e.g. NAND	2027/11825	{for delay time adaptation}
		2027/11827	{for capacitive loading}
		2027/11829	{Isolation techniques}
		2027/11831	{FET isolation}
		2027/11833	{LOCOS}
		2027/11835	{Degree of specialisation for implementing specific functions}
		2027/11837	{Implementation of digital circuits}
		2027/11838	{Implementation of memory functions}
		2027/1184	{Implementation of analog circuits}
		2027/11842	{Resistors and capacitors}
		2027/11844	{Hybrid analog or digital}
		2027/11846	{Embedded IO cells}
		2027/11848	{Transmission gate}

2027/1185	. . . . .	{Porous cells, i.e. pass-through elements}	27/1222	. . . . .	{with a particular composition, shape or crystalline structure of the active layer}
2027/11851	. . . . .	{Technology used, i.e. design rules}	27/1225	. . . . .	{with semiconductor materials not belonging to the group IV of the periodic table, e.g. InGaZnO}
2027/11853	. . . . .	{Sub-micron technology}	27/1229	. . . . .	{with different crystal properties within a device or between different devices}
2027/11855	. . . . .	{Twin-tub technology}	27/1233	. . . . .	{with different thicknesses of the active layer in different devices}
2027/11857	. . . . .	{SOS, SOI technology}	27/1237	. . . . .	{with a different composition, shape, layout or thickness of the gate insulator in different devices}
2027/11859	. . . . .	{Connectivity characteristics, i.e. diffusion and polysilicon geometries}	27/124	. . . . .	{with a particular composition, shape or layout of the wiring layers specially adapted to the circuit arrangement, e.g. scanning lines in LCD pixel circuits (wiring structures per se H01L 23/52)}
2027/11861	. . . . .	{Substrate and well contacts}	27/1244	. . . . .	{for preventing breakage, peeling or short circuiting}
2027/11862	. . . . .	{Horizontal or vertical grid line density}	27/1248	. . . . .	{with a particular composition or shape of the interlayer dielectric specially adapted to the circuit arrangement}
2027/11864	. . . . .	{Yield or reliability}	27/1251	. . . . .	{comprising TFTs having a different architecture, e.g. top- and bottom gate TFTs}
2027/11866	. . . . .	{Gate electrode terminals or contacts}	27/1255	. . . . .	{integrated with passive devices, e.g. auxiliary capacitors}
2027/11868	. . . . .	{Macro-architecture}	27/1259	. . . . .	{Multistep manufacturing methods}
2027/1187	. . . . .	{Number of core or basic cells in the macro (RAM, ROM)}	27/1262	. . . . .	{with a particular formation, treatment or coating of the substrate}
2027/11872	. . . . .	{Distribution function, e.g. Sea of Gates}	27/1266	. . . . .	{the substrate on which the devices are formed not being the final device substrate, e.g. using a temporary substrate}
2027/11874	. . . . .	{Layout specification, i.e. inner core region}	27/127	. . . . .	{with a particular formation, treatment or patterning of the active layer specially adapted to the circuit arrangement}
2027/11875	. . . . .	{Wiring region, routing}	27/1274	. . . . .	{using crystallisation of amorphous semiconductor or recrystallisation of crystalline semiconductor}
2027/11877	. . . . .	{Avoiding clock-skew or clock-delay}	27/1277	. . . . .	{using a crystallisation promoting species, e.g. local introduction of Ni catalyst}
2027/11879	. . . . .	{Data lines (buses)}	27/1281	. . . . .	{by using structural features to control crystal growth, e.g. placement of grain filters}
2027/11881	. . . . .	{Power supply lines}	27/1285	. . . . .	{using control of the annealing or irradiation parameters, e.g. using different scanning direction or intensity for different transistors}
2027/11883	. . . . .	{Levels of metallisation}	27/1288	. . . . .	{employing particular masking sequences or specially adapted masks, e.g. half-tone mask}
2027/11885	. . . . .	{Two levels of metal}	27/1292	. . . . .	{using liquid deposition, e.g. printing}
2027/11887	. . . . .	{Three levels of metal}	27/1296	. . . . .	{adapted to increase the uniformity of device parameters}
2027/11888	. . . . .	{More than 3 levels of metal}	27/13	. . . . .	combined with thin-film or thick-film passive components
2027/1189	. . . . .	{Latch-up prevention}			
2027/11892	. . . . .	{Noise prevention (crosstalk)}			
2027/11894	. . . . .	{Radiation hardened circuits}			
27/11896	. . . . .	{using combined field effect/bipolar technology}			
27/11898	. . . . .	{Input and output buffer/driver structures}			
27/12	. .	the substrate being other than a semiconductor body, e.g. an insulating body			
27/1203	. . .	{the substrate comprising an insulating body on a semiconductor body, e.g. SOI (three-dimensional layout H01L 27/0688)}			
27/1207	. . . .	{combined with devices in contact with the semiconductor body, i.e. bulk/SOI hybrid circuits}			
27/1211	. . . .	{combined with field-effect transistors with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET}			
27/1214	. . .	{comprising a plurality of TFTs formed on a non-semiconducting substrate, e.g. driving circuits for AMLCDs}			
<u>WARNING</u>					
Group H01L 27/1218 – H01L 27/1296 are incomplete pending reclassification of documents from group H01L 27/1214 .					
Groups H01L 27/1218 – H01L 27/1296 and H01L 27/1214 should be considered in order to perform a complete search.					
27/1218	. . . .	{with a particular composition or structure of the substrate}			

- 27/14 . . . including semiconductor components sensitive to infra-red radiation, light, electromagnetic radiation of shorter wavelength or corpuscular radiation and specially adapted either for the conversion of the energy of such radiation into electrical energy or for the control of electrical energy by such radiation ([radiation-sensitive components structurally associated with one or more electric light sources only H01L 31/14](#); [couplings of light guides with optoelectronic elements G02B 6/42](#))
- 27/142 . . . Energy conversion devices ([photovoltaic modules or arrays of single photovoltaic cells comprising bypass diodes integrated or directly associated with the devices H01L 31/0443](#); [photovoltaic modules composed of a plurality of thin film solar cells deposited on the same substrate H01L 31/046](#))
- 27/1421 . . . {comprising bypass diodes integrated or directly associated with the device, e.g. bypass diode integrated or formed in or on the same substrate as the solar cell}
- 27/144 . . . Devices controlled by radiation
- 27/1443 . . . {with at least one potential jump or surface barrier}
- 27/1446 . . . {in a repetitive configuration}
- 27/146 . . . Imager structures
- WARNING**
- Groups [H01L 27/146](#) – [H01L 27/14893](#) are incomplete pending reclassification of documents from groups [H04N 5/3696](#) and [H04N 9/045](#).
- Groups [H04N 5/3696](#), [H04N 9/045](#), and [H01L 27/146](#) – [H01L 27/14893](#) should be considered in order to perform a complete search.
- 27/14601 {Structural or functional details thereof}
- 27/14603 {Special geometry or disposition of pixel-elements, address-lines or gate-electrodes}
- 27/14605 {Structural or functional details relating to the position of the pixel elements, e.g. smaller pixel elements in the center of the imager compared to pixel elements at the periphery}
- 27/14607 {Geometry of the photosensitive area}
- 27/14609 {Pixel-elements with integrated switching, control, storage or amplification elements ([scanning details of imagers H04N 3/15](#); [circuitry of imagers H04N 5/369](#))}
- 27/1461 {characterised by the photosensitive area}
- 27/14612 {involving a transistor}
- 27/14614 {having a special gate structure}
- 27/14616 {characterised by the channel of the transistor, e.g. channel having a doping gradient}
- 27/14618 {Containers}
- 27/1462 {Coatings}
- 27/14621 {Colour filter arrangements}
- 27/14623 {Optical shielding}
- 27/14625 {Optical elements or arrangements associated with the device}
- 27/14627 {Microlenses}
- 27/14629 {Reflectors}
- 27/1463 {Pixel isolation structures}
- 27/14632 {Wafer-level processed structures}
- 27/14634 {Assemblies, i.e. Hybrid structures}
- 27/14636 {Interconnect structures}
- 27/14638 {Structures specially adapted for transferring the charges across the imager perpendicular to the imaging plane}
- 27/1464 {Back illuminated imager structures}
- 27/14641 {Electronic components shared by two or more pixel-elements, e.g. one amplifier shared by two pixel elements}
- 27/14643 {Photodiode arrays; MOS imagers}
- 27/14645 {Colour imagers}
- 27/14647 {Multicolour imagers having a stacked pixel-element structure, e.g. npn, npnpn or MQW elements}
- 27/14649 {Infra-red imagers}
- 27/1465 {of the hybrid type}
- 27/14652 {Multispectral infra-red imagers, having a stacked pixel-element structure, e.g. npn, npnpn or MQW structures}
- 27/14654 {Blooming suppression}
- 27/14656 {Overflow drain structures}
- 27/14658 {X-ray, gamma-ray or corpuscular radiation imagers ([measuring X-, gamma- or corpuscular radiation G01T 1/00](#))}
- 27/14659 {Direct radiation imagers structures}
- 27/14661 {of the hybrid type}
- 27/14663 {Indirect radiation imagers, e.g. using luminescent members}
- 27/14665 {Imagers using a photoconductor layer}
- 27/14667 {Colour imagers}
- 27/14669 {Infra-red imagers}
- 27/1467 {of the hybrid type}
- 27/14672 {Blooming suppression}
- 27/14674 {Overflow drain structures}
- 27/14676 {X-ray, gamma-ray or corpuscular radiation imagers ([measuring X-, gamma- or corpuscular radiation G01T 1/00](#))}
- 27/14678 {Contact-type imagers}
- 27/14679 {Junction field effect transistor [JFET] imagers; static induction transistor [SIT] imagers}
- 27/14681 {Bipolar transistor imagers}
- 27/14683 {Processes or apparatus peculiar to the manufacture or treatment of these devices or parts thereof ([not peculiar thereto H01L 21/00](#))}
- 27/14685 {Process for coatings or optical elements}
- 27/14687 {Wafer level processing}
- 27/14689 {MOS based technologies}
- 27/1469 {Assemblies, i.e. hybrid integration}
- 27/14692 {Thin film technologies, e.g. amorphous, poly, micro- or nanocrystalline silicon}
- 27/14694 {The active layers comprising only $A_{III}B_V$ compounds, e.g. GaAs, InP}
- 27/14696 {The active layers comprising only $A_{II}B_{VI}$ compounds, e.g. CdS, ZnS, CdTe}
- 27/14698 {Post-treatment for the devices, e.g. annealing, impurity-gettering, short-circuit elimination, recrystallisation}
- 27/148 Charge coupled imagers ([individual charge coupled devices H01L 29/765](#))

- 27/14806 {Structural or functional details thereof}
- 27/14812 {Special geometry or disposition of pixel-elements, address lines or gate-electrodes}
- 27/14818 {Optical shielding}
- 27/14825 {Linear CCD imagers}
- 27/14831 {Area CCD imagers}
- 27/14837 {Frame-interline transfer}
- 27/14843 {Interline transfer}
- 27/1485 {Frame transfer}
- 27/14856 {Time-delay and integration}
- 27/14862 {CID imagers}
- 27/14868 {CCD or CID colour imagers}
- 27/14875 {Infra-red CCD or CID imagers}
- 27/14881 {of the hybrid type}
- 27/14887 {Blooming suppression}
- 27/14893 {comprising a photoconductive layer deposited on the CCD structure}
- 27/15 including semiconductor components with at least one potential-jump barrier or surface barrier specially adapted for light emission
{(monolithically integrated components including semiconductor laser components [H01S 5/026](#))}
- 27/153 {in a repetitive configuration, e.g. LED bars}
- 27/156 {two-dimensional arrays}
- 27/16 including thermoelectric components with or without a junction of dissimilar materials; including thermomagnetic components (using the Peltier effect only for cooling of semiconductor or other solid state devices [H01L 23/38](#))
- 27/18 including components exhibiting superconductivity
- 27/20 including piezo-electric components; including electrostrictive components; including magnetostrictive components
- 27/22 including components using galvano-magnetic effects, e.g. Hall effects; using similar magnetic field effects
- 27/222 {Magnetic non-volatile memory structures, e.g. MRAM}
- 27/224 {comprising two-terminal components, e.g. diodes, MIM elements}
- 27/226 {comprising multi-terminal components, e.g. transistors}
- 27/228 {of the field-effect transistor type}
- 27/24 including solid state components for rectifying, amplifying or switching without a potential-jump barrier or surface barrier, {e.g. resistance switching non-volatile memory structures}
- 27/2409 {comprising two-terminal selection components, e.g. diodes}
- 27/2418 {of the metal-insulator-metal type}
- 27/2427 {of the Ovonic threshold switching type}
- 27/2436 {comprising multi-terminal selection components, e.g. transistors}
- 27/2445 {of the bipolar type}
- 27/2454 {of the vertical channel field-effect transistor type}
- 27/2463 {Arrangements comprising multiple bistable or multistable switching components of the same type on a plane parallel to the substrate, e.g. cross-point arrays, details of the horizontal layout}
- 27/2472 {the switching components having a common active material layer}
- 27/2481 {arranged in a direction perpendicular to the substrate, e.g. 3D cell arrays, details of the vertical layout}
- 27/249 {the switching components being connected to a common vertical conductor}
- 27/26 including bulk negative resistance effect components
- 27/265 {Gunn effect devices}
- 27/28 including components using organic materials as the active part, or using a combination of organic materials with other materials as the active part
- 27/281 {Integrated circuits having a three-dimensional layout}
- 27/283 {comprising components of the field-effect type}
- 27/285 {Integrated circuits with a common active layer, e.g. cross point devices}
- 27/286 {with an active region comprising an inorganic semiconductor}
- 27/288 {Combination of organic light sensitive components with organic light emitting components, e.g. optocoupler}
- 27/30 with components specially adapted for sensing infra-red radiation, light, electromagnetic radiation of shorter wavelength, or corpuscular radiation; with components specially adapted for either the conversion of the energy of such radiation into electrical energy or for the control of electrical energy by such radiation
{(combination of organic light sensitive components with organic light emitting components, e.g. optocoupler [H01L 27/288](#))}
- 27/301 {Energy conversion devices}
- 27/302 {comprising multiple junctions, e.g. tandem cells}
- 27/304 {in form of a fiber or a tube, e.g. photovoltaic fibers}
- 27/305 {Devices controlled by radiation}
- 27/307 {Imager structures}
- WARNING**
- Group [H01L 27/307](#) is incomplete pending reclassification of documents from groups [H04N 5/3696](#) and [H04N 9/045](#).
- Groups [H04N 5/3696](#), [H04N 9/045](#), and [H01L 27/307](#) should be considered in order to perform a complete search.
- 27/308 {Devices specially adapted for detecting X-ray radiation (measuring X-radiation [G01T 1/00](#))}
- 27/32 with components specially adapted for light emission, e.g. flat-panel displays using organic light-emitting diodes [OLED] {(combination of organic light sensitive components with organic light emitting components, e.g. optocoupler [H01L 27/288](#))}
- 27/3202 {OLEDs electrically connected in parallel}
- 27/3204 {OLEDs electrically connected in series}
- 27/3206 {Multi-colour light emission}
- 27/3209 {using stacked OLED}

- 27/3211 {using RGB sub-pixels}
- WARNING**
- Groups [H01L 27/3213](#) – [H01L 27/3218](#) are incomplete pending reclassification of documents from group [H01L 27/3211](#).
Groups [H01L 27/3213](#) – [H01L 27/3218](#) and [H01L 27/3211](#) should be considered in order to perform a complete search.
- 27/3213 {using more than three sub-pixels, e.g. RGBW}
- 27/3216 {the areas of RGB sub-pixels being different}
- 27/3218 {characterised by the geometrical arrangement of the RGB sub-pixels}
- 27/322 {using colour filters or colour changing media [CCM]}
- 27/3223 {combined with dummy elements, i.e. non-functional features}
- 27/3225 {OLED integrated with another component ([H01L 27/3223](#) takes precedence)}
- 27/3227 {the other component being a light sensitive element, e.g. inorganic solar cell, inorganic photodiode ([H01L 27/288](#) takes precedence)}
- 27/323 {the other component being a touch screen}
- 27/3232 {the other component being a light modulating element, e.g. electrochromic element, photochromic element, liquid crystal element}
- 27/3234 {the other component being an imager structure ([H01L 27/146](#) takes precedence)}
- 27/3237 {Displays not provided for in group [H01L 27/3241](#) and subgroups, e.g. segment-type displays}
- 27/3239 {Light emitting logos}
- 27/3241 {Matrix-type displays}
- WARNING**
- From 1.2.2012 onwards, groups [H01L 27/3295](#) and [H01L 27/3297](#) are no longer used for classification of new documents. The backfile is being reclassified to [H01L 27/3244](#) and [H01L 27/3281](#) and subgroups thereof
- 27/3244 {Active matrix displays}
- 27/3246 {Banks, i.e. pixel defining layers}
- 27/3248 {Connection of the pixel electrode to the TFT}
- 27/3251 {Double substrate, i.e. with OLED and TFT on different substrates}
- 27/3253 {Electrical connection of the two substrates}
- 27/3255 {Chiplets}
- 27/3258 {Insulating layers formed between TFT elements and OLED elements}
- 27/326 {special geometry or disposition of pixel-elements}
- 27/3262 {of TFT}
- 27/3265 {of capacitor}
- 27/3267 {Dual display, i.e. having two independent displays}
- 27/3269 {Including photosensors to control luminance}
- 27/3272 {Shielding, e.g. of TFT}
- 27/3274 {including organic thin film transistors [OTFT]}
- 27/3276 {Wiring lines}
- 27/3279 {comprising structures specially adapted for lowering the resistance}
- 27/3281 {Passive matrix displays}
- 27/3283 {Including banks or shadow masks}
- 27/3286 {Dual display, i.e. having two independent displays}
- 27/3288 {Wiring lines}
- 27/329 {comprising structures specially adapted for lowering the resistance}
- 27/3293 {Tiled displays}
- 27/3295 {including banks or shadow masks}
- 27/3297 {Wiring lines, e.g. power supply lines}
- 28/00** **{Passive two-terminal components without a potential-jump or surface barrier for integrated circuits; Details thereof; Multistep manufacturing processes therefor (testing or measuring during manufacture [H01L 22/00](#); integration methods [H01L 21/70](#); integrated circuits [H01L 27/00](#); two-terminal components with a potential-jump or surface barrier [H01L 29/00](#); resistors in general [H01C](#); inductors in general [H01F](#); capacitors in general [H01G](#))}**
- 28/10 {Inductors}
- 28/20 {Resistors}
- 28/22 {with an active material comprising carbon, e.g. diamond or diamond-like carbon [DLC]}
- 28/24 {with an active material comprising a refractory, transition or noble metal, metal compound or metal alloy, e.g. silicides, oxides, nitrides}
- 28/26 {with an active material comprising an organic conducting material, e.g. conducting polymers}
- 28/40 {Capacitors}
- 28/55 {with a dielectric comprising a perovskite structure material}
- 28/56 {the dielectric comprising two or more layers, e.g. comprising buffer layers, seed layers, gradient layers}
- 28/57 {comprising a barrier layer to prevent diffusion of hydrogen or oxygen}
- 28/60 {Electrodes}
- 28/65 {comprising a noble metal or a noble metal oxide, e.g. platinum (Pt), ruthenium (Ru), ruthenium dioxide (RuO₂), iridium (Ir), iridium dioxide (IrO₂)}
- 28/75 {comprising two or more layers, e.g. comprising a barrier layer and a metal layer}
- 28/82 {with an enlarged surface, e.g. formed by texturisation}
- 28/84 {being a rough surface, e.g. using hemispherical grains}
- 28/86 {having horizontal extensions}
- 28/87 {made by depositing layers, e.g. by depositing alternating conductive and insulating layers}
- 28/88 {made by patterning layers, e.g. by etching conductive layers}
- 28/90 {having vertical extensions}

- 28/91 {made by depositing layers, e.g. by depositing alternating conductive and insulating layers}
- 28/92 {made by patterning layers, e.g. by etching conductive layers}
- 29/00 Semiconductor devices adapted for rectifying, amplifying, oscillating or switching, or capacitors or resistors with at least one potential-jump barrier or surface barrier, e.g. PN junction depletion layer or carrier concentration layer; Details of semiconductor bodies or of electrodes thereof; {Multistep manufacturing processes therefor} (H01L 31/00 - H01L 47/00, H01L 51/05 take precedence; processes or apparatus adapted for the manufacture or treatment thereof or of parts thereof H01L 21/00; details other than of semiconductor bodies or of electrodes thereof H01L 23/00; devices consisting of a plurality of solid state components formed in or on a common substrate H01L 27/00; {passive two-terminal components without a potential-jump or surface barrier for integrated circuits, details thereof and multistep manufacturing processes therefor H01L 28/00; } resistors in general H01C; capacitors in general H01G, {e.g. ceramic barrier-layer capacitors H01G 4/1272})**
- NOTE**
- In this main group, classification is made both in groups [H01L 29/02](#) - [H01L 29/51](#) and in groups [H01L 29/66](#) - [H01L 29/94](#) if both of these sets of groups are relevant.
- 29/02 . Semiconductor bodies {; Multistep manufacturing processes therefor}
- 29/04 . . characterised by their crystalline structure, e.g. polycrystalline, cubic or particular orientation of crystalline planes (characterised by physical imperfections [H01L 29/30](#))
- 29/045 . . . {by their particular orientation of crystalline planes}
- 29/06 . . characterised by their shape; characterised by the shapes, relative sizes, or dispositions of the semiconductor regions {; characterised by the concentration or distribution of impurities within semiconductor regions}
- 29/0603 . . . {characterised by particular constructional design considerations, e.g. for preventing surface leakage, for controlling electric field concentration or for internal isolations regions (isolation regions between components [H01L 21/76](#); design considerations for integrated circuits [H01L 27/00](#); geometrical design considerations for devices [H01L 29/0657](#))}
- 29/0607 {for preventing surface leakage or controlling electric field concentration}
- 29/0611 {for increasing or controlling the breakdown voltage of reverse biased devices ([H01L 29/0661](#) takes precedence)}
- 29/0615 {by the doping profile or the shape or the arrangement of the PN junction, or with supplementary regions, e.g. junction termination extension [JTE] (LDD or drain offset regions [H01L 29/7833](#))}
- 29/0619 {with a supplementary region doped oppositely to or in rectifying contact with the semiconductor containing or contacting region, e.g. guard rings with PN or Schottky junction}
- 29/0623 {Buried supplementary region, e.g. buried guard ring ([multi-RESURF H01L 29/0634](#))}
- 29/0626 {with a localised breakdown region, e.g. built-in avalanching region (in self-protected thyristors [H01L 29/7424](#))}
- 29/063 {Reduced surface field [RESURF] pn-junction structures}
- 29/0634 {Multiple reduced surface field (multi-RESURF) structures, e.g. double RESURF, charge compensation, cool, superjunction (SJ), 3D-RESURF, composite buffer (CB) structures}
- 29/0638 {for preventing surface leakage due to surface inversion layer, e.g. with channel stopper (channel stoppers in combination with isolation region for integrated circuits [H01L 21/762](#))}
- 29/0642 {Isolation within the component, i.e. internal isolation}
- 29/0646 {PN junctions}
- 29/0649 {Dielectric regions, e.g. SiO₂ regions, air gaps}
- 29/0653 {adjoining the input or output region of a field-effect device, e.g. the source or drain region}
- 29/0657 . . . {characterised by the shape of the body}
- 29/0661 {specially adapted for altering the breakdown voltage by removing semiconductor material at, or in the neighbourhood of, a reverse biased junction, e.g. by bevelling, moat etching, depletion etching}
- 29/0665 {the shape of the body defining a nanostructure ([nanotechnology per se B82B](#))}
- 29/0669 {Nanowires or nanotubes (carbon nanotubes as material of solid-state device active part [H01L 51/0048](#))}
- 29/0673 {oriented parallel to a substrate}
- 29/0676 {oriented perpendicular or at an angle to a substrate}
- 29/068 {comprising a junction}
- 29/0684 . . . {characterised by the shape, relative sizes or dispositions of the semiconductor regions or junctions between the regions}
- 29/0688 {characterised by the particular shape of a junction between semiconductor regions}
- 29/0692 {Surface layout}
- 29/0696 {of cellular field-effect devices, e.g. multicellular DMOS transistors or IGBTs}
- 29/08 . . . with semiconductor regions connected to an electrode carrying current to be rectified, amplified or switched and such electrode being part of a semiconductor device which comprises three or more electrodes
- 29/0804 {Emitter regions of bipolar transistors}
- 29/0808 {of lateral transistors}

- 29/0813 {Non-interconnected multi-emitter structures}
- 29/0817 {of heterojunction bipolar transistors ([H01L 29/7375](#) takes precedence)}
- 29/0821 {Collector regions of bipolar transistors}
- 29/0826 {Pedestal collectors}
- 29/083 {Anode or cathode regions of thyristors or gated bipolar-mode devices}
- 29/0834 {Anode regions of thyristors or gated bipolar-mode devices, e.g. supplementary regions surrounding anode regions}
- 29/0839 {Cathode regions of thyristors}
- 29/0843 {Source or drain regions of field-effect devices}
- 29/0847 {of field-effect transistors with insulated gate ([H01L 29/0653](#) takes precedence; with a passive supplementary region related to punch-through, capacity or isolation phenomena [H01L 29/1079](#); with LDD or DDD structure [H01L 29/7833](#); for thin film transistors [H01L 29/78618](#))}
- 29/0852 {of DMOS transistors}
- WARNING**
- Groups [H01L 29/0852](#) – [H01L 29/0886](#) are incomplete pending reclassification of documents from group [H01L 29/0847](#) and [H01L 29/7801](#).
Groups [H01L 29/0852](#) – [H01L 29/0886](#) and [H01L 29/0847](#), [H01L 29/7801](#) should be considered in order to perform a complete search.
- 29/0856 {Source regions}
- 29/086 {Impurity concentration or distribution}
- 29/0865 {Disposition}
- 29/0869 {Shape ([cell layout H01L 29/0696](#))}
- 29/0873 {Drain regions}
- 29/0878 {Impurity concentration or distribution}
- 29/0882 {Disposition}
- 29/0886 {Shape}
- 29/0891 {of field-effect transistors with Schottky gate}
- 29/0895 {Tunnel injectors}
- 29/10 with semiconductor regions connected to an electrode not carrying current to be rectified, amplified or switched and such electrode being part of a semiconductor device which comprises three or more electrodes
- 29/1004 {Base region of bipolar transistors}
- 29/1008 {of lateral transistors}
- 29/1012 {Base regions of thyristors ([H01L 29/083](#) takes precedence)}
- 29/1016 {Anode base regions of thyristors}
- 29/102 {Cathode base regions of thyristors}
- 29/1025 {Channel region of field-effect devices}
- 29/1029 {of field-effect transistors}
- 29/1033 {with insulated gate, e.g. characterised by the length, the width, the geometric contour or the doping structure ([with channel and gate aligned in the lengthwise direction H01L 29/42376](#); [with buried channel H01L 29/7838](#))}
- 29/1037 {and non-planar channel ([resulting from the gate electrode disposition, e.g. within a trench, H01L 29/42356](#))}
- 29/1041 {with a non-uniform doping structure in the channel region surface}
- 29/1045 {the doping structure being parallel to the channel length, e.g. DMOS like}
- 29/105 {with vertical doping variation ([H01L 29/7827](#) takes precedence)}
- 29/1054 {with a variation of the composition, e.g. channel with strained layer for increasing the mobility}
- 29/1058 {with PN junction gate}
- 29/1062 {of charge coupled devices}
- 29/1066 {Gate region of field-effect devices with PN junction gate}
- 29/107 {Substrate region of field-effect devices}
- 29/1075 {of field-effect transistors}
- 29/1079 {with insulated gate}
- 29/1083 {with an inactive supplementary region, e.g. for preventing punch-through, improving capacity effect or leakage current}
- 29/1087 {characterised by the contact structure of the substrate region, e.g. for controlling or preventing bipolar effect}
- 29/1091 {of charge coupled devices}
- 29/1095 {Body region, i.e. base region, of DMOS transistors or IGBTs ([cell layout H01L 29/0696](#))}
- 29/12 characterised by the materials of which they are formed
- 29/122 {Single quantum well structures ([single heterojunctions, couples of materials H01L 29/165, H01L 29/205, H01L 29/225, H01L 29/267](#))}
- 29/125 {Quantum wire structures}
- 29/127 {Quantum box structures}
- 29/15 Structures with periodic or quasi periodic potential variation, e.g. multiple quantum wells, superlattices ([such structures applied for the control of light G02F 1/017](#), applied in semiconductor lasers [H01S 5/34](#))
- NOTE**
- Group [H01L 29/15](#) takes precedence over groups [H01L 29/16](#) - [H01L 29/26](#).
- 29/151 {Compositional structures ([H01L 29/157](#) and [H01L 29/158](#) take precedence)}
- 29/152 {with quantum effects only in vertical direction, i.e. layered structures with quantum effects solely resulting from vertical potential variation}

- 29/154 {comprising at least one long range structurally disordered material, e.g. one-dimensional vertical amorphous superlattices}
- 29/155 {Comprising only semiconductor materials ([H01L 29/154](#) takes precedence)}
- 29/157 {Doping structures, e.g. doping superlattices, nipi superlattices ([delta doping in general H01L 29/365](#))}
- 29/158 {Structures without potential periodicity in a direction perpendicular to a major surface of the substrate, i.e. vertical direction, e.g. lateral superlattices, lateral surface superlattices [LSS]}
- 29/16 . . . including, apart from doping materials or other impurities, only elements of Group IV of the Periodic System
- 29/1602 {Diamond}
- 29/1604 {Amorphous materials}
- 29/1606 {Graphene}
- 29/1608 {Silicon carbide}
- 29/161 including two or more of the elements provided for in group [H01L 29/16](#) {, e.g. alloys ([H01L 29/1604](#) takes precedence)}
- 29/165 in different semiconductor regions {, e.g. heterojunctions}
- 29/167 further characterised by the doping material {([H01L 29/1604](#) takes precedence)}
- 29/18 . . . Selenium or tellurium only, apart from doping materials or other impurities
- 29/185 {Amorphous materials}
- 29/20 . . . including, apart from doping materials or other impurities, only $A_{III}B_V$ compounds
- 29/2003 {Nitride compounds}
- 29/2006 {Amorphous materials}
- 29/201 including two or more compounds {, e.g. alloys ([H01L 29/2006](#) takes precedence)}
- 29/205 in different semiconductor regions {, e.g. heterojunctions}
- 29/207 further characterised by the doping material {([H01L 29/2006](#) takes precedence)}
- 29/22 . . . including, apart from doping materials or other impurities, only $A_{III}B_{VI}$ compounds
- 29/2203 {Cd X compounds being one element of the 6th group of the Periodic System ([H01L 29/2206](#) takes precedence)}
- 29/2206 {Amorphous materials}
- 29/221 including two or more compounds {, e.g. alloys ([H01L 29/2206](#) takes precedence)}
- 29/225 in different semiconductor regions {, e.g. heterojunctions}
- 29/227 further characterised by the doping material {([H01L 29/2206](#) takes precedence)}
- 29/24 . . . including, apart from doping materials or other impurities, only semiconductor materials not provided for in groups [H01L 29/16](#), [H01L 29/18](#), [H01L 29/20](#), [H01L 29/22](#) (including organic materials [H01L 51/00](#))
- 29/242 { $A_{II}B_{VI}$ or $A_{II}B_{VII}$ compounds, e.g. Cu_2O , CuI ([H01L 29/247](#) takes precedence)}
- 29/245 {Pb compounds, e.g. PbO ([H01L 29/247](#) takes precedence)}
- 29/247 {Amorphous materials}
- 29/26 . . . including, apart from doping materials or other impurities, elements provided for in two or more of the groups [H01L 29/16](#), [H01L 29/18](#), [H01L 29/20](#), [H01L 29/22](#), [H01L 29/24](#) {, e.g. alloys}
- 29/263 {Amorphous materials}
- 29/267 in different semiconductor regions {, e.g. heterojunctions ([H01L 29/263](#) takes precedence)}
- 29/30 . . characterised by physical imperfections; having polished or roughened surface
- 29/32 . . . the imperfections being within the semiconductor body
- 29/34 . . . the imperfections being on the surface
- 29/36 . . characterised by the concentration or distribution of impurities {in the bulk material ([within semiconductor regions H01L 29/06](#))}
- 29/365 . . . {Planar doping, e.g. atomic-plane doping, delta-doping}
- 29/40 . Electrodes {; Multistep manufacturing processes therefor}
- 29/401 . . {Multistep manufacturing processes}
- 29/402 . . {Field plates}
- 29/404 . . . {Multiple field plate structures}
- 29/405 . . . {Resistive arrangements, e.g. resistive or semi-insulating field plates}
- 29/407 . . . {Recessed field plates, e.g. trench field plates, buried field plates}
- 29/408 . . {with an insulating layer with a particular dielectric or electrostatic property, e.g. with static charges or for controlling trapped charges or moving ions, or with a plate acting on the insulator potential or the insulator charges, e.g. for controlling charges effect or potential distribution in the insulating layer, or with a semi-insulating layer contacting directly the semiconductor surface}
- 29/41 . . characterised by their shape, relative sizes or dispositions
- 29/413 . . . {Nanosized electrodes, e.g. nanowire electrodes comprising one or a plurality of nanowires ([transparent electrodes comprising carbon nano-tubes H01L 51/444, nanotechnology per se B82B](#); nanosized carbon materials, e.g. carbon nanotubes, [per se C01B 32/15](#))}
- 29/417 . . . carrying the current to be rectified, amplified or switched
- 29/41708 {Emitter or collector electrodes for bipolar transistors}
- 29/41716 {Cathode or anode electrodes for thyristors}
- 29/41725 {Source or drain electrodes for field effect devices ([with monocrystalline semiconductor on source/drain region H01L 29/0843](#))}
- 29/41733 {for thin film transistors with insulated gate}
- 29/41741 {for vertical or pseudo-vertical devices}

NOTE

A pseudo-vertical device is a device with the drain and source electrodes on the same main surface and where the main current is vertical at least in a part of its path

- 29/4175 {for lateral devices where the connection to the source or drain region is done through at least one part of the semiconductor substrate thickness, e.g. with connecting sink or with via-hole}
- NOTE**
The sink or via-hole leading to the source or drain region is considered to form part of the source or drain electrode
- 29/41758 {for lateral devices with structured layout for source or drain region, i.e. the source or drain region having cellular, interdigitated or ring structure or being curved or angular ([H01L 29/41733](#) - [H01L 29/4175](#) take precedence)}
- NOTE**
Interdigitated structure means that at least one of the source or drain region has two or more fingers
- 29/41766 {with at least part of the source or drain electrode having contact below the semiconductor surface, e.g. the source or drain electrode formed at least partially in a groove or with inclusions of conductor inside the semiconductor ([H01L 29/41733](#) - [H01L 29/41758](#) take precedence)}
- 29/41775 {characterised by the proximity or the relative position of the source or drain electrode and the gate electrode, e.g. the source or drain electrode separated from the gate electrode by side-walls or spreading around or above the gate electrode}
- 29/41783 {Raised source or drain electrodes self aligned with the gate}
- 29/41791 {for transistors with a horizontal current flow in a vertical sidewall, e.g. FinFET, MuGFET}
- 29/423 not carrying the current to be rectified, amplified or switched
- 29/42304 {Base electrodes for bipolar transistors}
- 29/42308 {Gate electrodes for thyristors}
- 29/42312 {Gate electrodes for field effect devices}
- 29/42316 {for field-effect transistors}
- 29/4232 {with insulated gate}
- 29/42324 {Gate electrodes for transistors with a floating gate}
- 29/42328 {with at least one additional gate other than the floating gate and the control gate, e.g. program gate, erase gate or select gate}
- 29/42332 {with the floating gate formed by two or more non connected parts, e.g. multi-particles flating gate}
- 29/42336 {with one gate at least partly formed in a trench}
- 29/4234 {Gate electrodes for transistors with charge trapping gate insulator}
- 29/42344 {with at least one additional gate, e.g. program gate, erase gate or select gate}
- 29/42348 {with trapping site formed by at least two separated sites, e.g. multi-particles trapping site}
- 29/42352 {with the gate at least partly formed in a trench}
- 29/42356 {Disposition, e.g. buried gate electrode ([H01L 29/42324](#) and [H01L 29/4234](#) take precedence)}
- 29/4236 {within a trench, e.g. trench gate electrode, groove gate electrode}
- 29/42364 {characterised by the insulating layer, e.g. thickness or uniformity ([H01L 29/42324](#) and [H01L 29/4234](#) take precedence)}
- 29/42368 {the thickness being non-uniform}
- 29/42372 {characterised by the conducting layer, e.g. the length, the sectional shape or the lay-out ([H01L 29/42324](#) takes precedence)}
- 29/42376 {characterised by the length or the sectional shape}
- 29/4238 {characterised by the surface layout}
- 29/42384 {for thin film field effect transistors, e.g. characterised by the thickness or the shape of the insulator or the dimensions, the shape or the lay-out of the conductor}
- 2029/42388 {characterised by the shape of the insulating material}
- 29/42392 {fully surrounding the channel, e.g. gate-all-around}
- 29/42396 {for charge coupled devices}
- 29/43 characterised by the materials of which they are formed
- 29/432 {Heterojunction gate for field effect devices}
- 29/435 {Resistive materials for field effect devices, e.g. resistive gate for MOSFET or MESFET}
- 29/437 {Superconductor materials}
- 29/45 Ohmic electrodes
- 29/452 {on AIII-BV compounds}
- 29/454 {on thin film AIII-BV compounds}
- 29/456 {on silicon}
- 29/458 {for thin film silicon, e.g. source or drain electrode}
- 29/47 Schottky barrier electrodes ([H01L 29/435](#) takes precedence)}
- 29/475 {on AIII-BV compounds}
- 29/49 Metal-insulator-semiconductor electrodes, {e.g. gates of MOSFET ([H01L 29/435](#) takes precedence)}
- NOTE**
This group covers also devices using any other conductor material in place of metal
- 29/4908 {for thin film semiconductor, e.g. gate of TFT}

- 29/4916 {the conductor material next to the insulator being a silicon layer, e.g. polysilicon doped with boron, phosphorus or nitrogen ([H01L 29/4908](#), [H01L 29/4983](#) take precedence)}
- 29/4925 {with a multiple layer structure, e.g. several silicon layers with different crystal structure or grain arrangement (with only a vertical doping structure or vertical doping variation [H01L 29/4916](#))}
- 29/4933 {with a silicide layer contacting the silicon layer, e.g. Polycide gate (with a barrier layer between the silicide and silicon layers [H01L 29/4941](#))}
- 29/4941 {with a barrier layer between the silicon and the metal or metal silicide upper layer, e.g. Silicide/TiN/Polysilicon}
- 29/495 {the conductor material next to the insulator being a simple metal, e.g. W, Mo ([H01L 29/4908](#), [H01L 29/4983](#) take precedence)}
- 29/4958 {with a multiple layer structure}
- 29/4966 {the conductor material next to the insulator being a composite material, e.g. organic material, TiN, MoSi₂ ([H01L 29/4908](#), [H01L 29/4983](#) take precedence)}
- 29/4975 {being a silicide layer, e.g. TiSi₂}
- 29/4983 {with a lateral structure, e.g. a Polysilicon gate with a lateral doping variation or with a lateral composition variation or characterised by the sidewalls being composed of conductive, resistive or dielectric material}
- 29/4991 {comprising an air gap}
- WARNING**
- Group [H01L 29/4991](#) is incomplete pending reclassification of documents from group [H01L 29/4983](#).
- Groups [H01L 29/4991](#) and [H01L 29/4983](#) should be considered in order to perform a complete search.
- 29/51 Insulating materials associated therewith {(for MIS structures on thin film semiconductor [H01L 29/4908](#))}
- 29/511 {with a compositional variation, e.g. multilayer structures ([H01L 29/516](#) takes precedence)}
- 29/512 {the variation being parallel to the channel plane}
- 29/513 {the variation being perpendicular to the channel plane}
- 29/515 {with cavities, e.g. containing a gas}
- 29/516 {with at least one ferroelectric layer}
- 29/517 {the insulating material comprising a metallic compound, e.g. metal oxide, metal silicate ([H01L 29/518](#) takes precedence)}
- 29/518 {the insulating material containing nitrogen, e.g. nitride, oxynitride, nitrogen-doped material}
- 29/66 Types of semiconductor device {; Multistep manufacturing processes therefor}
- 29/66007 {Multistep manufacturing processes}
- 29/66015 {of devices having a semiconductor body comprising semiconducting carbon, e.g. diamond, diamond-like carbon, graphene}
- 29/66022 {the devices being controllable only by variation of the electric current supplied or the electric potential applied, to one or more of the electrodes carrying the current to be rectified, amplified, oscillated or switched, e.g. two-terminal devices}
- 29/6603 {Diodes}
- 29/66037 {the devices being controllable only by the electric current supplied or the electric potential applied, to an electrode which does not carry the current to be rectified, amplified or switched, e.g. three-terminal devices}
- 29/66045 {Field-effect transistors}
- 29/66053 {of devices having a semiconductor body comprising crystalline silicon carbide}
- 29/6606 {the devices being controllable only by variation of the electric current supplied or the electric potential applied, to one or more of the electrodes carrying the current to be rectified, amplified, oscillated or switched, e.g. two-terminal devices}
- 29/66068 {the devices being controllable only by the electric current supplied or the electric potential applied, to an electrode which does not carry the current to be rectified, amplified or switched, e.g. three-terminal devices}
- 29/66075 {of devices having semiconductor bodies comprising group 14 or group 13/15 materials (comprising semiconducting carbon [H01L 29/66015](#); comprising crystalline silicon carbide [H01L 29/66053](#))}
- 29/66083 {the devices being controllable only by variation of the electric current supplied or the electric potential applied, to one or more of the electrodes carrying the current to be rectified, amplified, oscillated or switched, e.g. two-terminal devices}
- 29/6609 {Diodes}
- 29/66098 {Breakdown diodes}
- 29/66106 {Zener diodes}
- 29/66113 {Avalanche diodes}
- 29/66121 {Multilayer diodes, e.g. PNP diodes}
- 29/66128 {Planar diodes}
- 29/66136 {PN junction diodes}
- 29/66143 {Schottky diodes}
- 29/66151 {Tunnel diodes (group 13/15 resonant tunneling diodes [H01L 29/66219](#))}
- 29/66159 {Transit time diodes, e.g. IMPATT, TRAPATT diodes}
- 29/66166 {Resistors with PN junction}
- 29/66174 {Capacitors with PN or Schottky junction, e.g. varactors (capacitors with PN junction combined with MOS control [H01L 29/66189](#))}
- 29/66181 {Conductor-insulator-semiconductor capacitors, e.g. trench capacitors}
- 29/66189 {with PN junction, e.g. hybrid capacitors}
- 29/66196 {with an active layer made of a group 13/15 material}

- 29/66204 {Diodes}
- 29/66212 {Schottky diodes}
- 29/66219 {with a heterojunction, e.g. resonant tunneling diodes [RTD]}
- 29/66227 {the devices being controllable only by the electric current supplied or the electric potential applied, to an electrode which does not carry the current to be rectified, amplified or switched, e.g. three-terminal devices}
- 29/66234 {Bipolar junction transistors [BJT]}
- 29/66242 {Heterojunction transistors [HBT] (with an active layer made of a group 13/15 material [H01L 29/66318](#))}
- 29/6625 {Lateral transistors ([H01L 29/66242](#) and [H01L 29/66265](#) take precedence)}
- 29/66257 {Schottky transistors}
- 29/66265 {Thin film bipolar transistors ([H01L 29/66242](#) takes precedence)}
- 29/66272 {Silicon vertical transistors ([H01L 29/66242](#), [H01L 29/66257](#) and [H01L 29/66265](#) take precedence)}
- 29/6628 {Inverse transistors}
- 29/66287 {with a single crystalline emitter, collector or base including extrinsic, link or graft base formed on the silicon substrate, e.g. by epitaxy, recrystallisation, after insulating device isolation ([H01L 29/6628](#) takes precedence)}
- 29/66295 {with main current going through the whole silicon substrate, e.g. power bipolar transistor}
- 29/66303 {with multi-emitter, e.g. interdigitated, multi-cellular or distributed emitter}
- 29/6631 {with an active layer made of a group 13/15 material}
- 29/66318 {Heterojunction transistors}
- 29/66325 {controlled by field-effect, e.g. insulated gate bipolar transistors [IGBT]}
- 29/66333 {Vertical insulated gate bipolar transistors}
- 29/6634 {with a recess formed by etching in the source/emitter contact region ([H01L 29/66348](#) takes precedence; etching of semiconductor bodies [H01L 21/302](#))}
- 29/66348 {with a recessed gate}
- 29/66356 {Gated diodes, e.g. field controlled diodes [FCD], static induction thyristors [SITh], field controlled thyristors [FCTh]}
- 29/66363 {Thyristors}
- 29/66371 {structurally associated with another device, e.g. built-in diode (making integrated circuits [H01L 21/82](#))}
- 29/66378 {the other device being a controlling field-effect device}
- 29/66386 {Bidirectional thyristors}
- 29/66393 {Lateral or planar thyristors}
- 29/66401 {with an active layer made of a group 13/15 material}
- 29/66409 {Unipolar field-effect transistors}
- 29/66416 {Static induction transistors [SIT] (with an active layer made of a group 13/15 material [H01L 29/66454](#))}
- 29/66424 {Permeable base transistors [PBT]}
- 29/66431 {with a heterojunction interface channel or gate, e.g. HFET, HIGFET, SISFET, HJFET, HEMT (with an active layer made of a group 13/15 material [H01L 29/66462](#))}
- 29/66439 {with a one- or zero-dimensional channel, e.g. quantum wire FET, in-plane gate transistor [IPG], single electron transistor [SET], striped channel transistor, Coulomb blockade transistor (with an active layer made of a group 13/15 material [H01L 29/66469](#))}
- 29/66446 {with an active layer made of a group 13/15 material, e.g. group 13/15 velocity modulation transistor [VMT], group 13/15 negative resistance FET [NERFET]}
- 29/66454 {Static induction transistors [SIT], e.g. permeable base transistors [PBT]}
- 29/66462 {with a heterojunction interface channel or gate, e.g. HFET, HIGFET, SISFET, HJFET, HEMT}
- 29/66469 {with one- or zero-dimensional channel, e.g. quantum wire field-effect transistors, in-plane gate transistors [IPG], single electron transistors [SET], Coulomb blockade transistors, striped channel transistors}
- 29/66477 {with an insulated gate, i.e. MISFET}
- 29/66484 {with multiple gate, at least one gate being an insulated gate ([H01L 29/66742](#) takes precedence)}
- 29/66492 {with a pocket or a lightly doped drain selectively formed at the side of the gate}
- 29/665 {using self aligned silicidation, i.e. silicide (formation of conductive layers comprising silicides [H01L 21/28518](#))}
- 29/66507 {providing different silicide thicknesses on the gate and on source or drain}
- 29/66515 {using self aligned selective metal deposition simultaneously on the gate and on source or drain}
- 29/66522 {with an active layer made of a group 13/15 material ([H01L 29/66446](#) takes precedence)}
- 29/6653 {using the removal of at least part of spacer, e.g. disposable spacer}
- 29/66537 {using a self aligned punch through stopper or threshold implant under the gate region ([H01L 29/66606](#) takes precedence)}
- 29/66545 {using a dummy, i.e. replacement gate in a process wherein at least a part of the final gate is self aligned to the dummy gate}

- 29/66553 {using inside spacers, permanent or not}
- 29/6656 {using multiple spacer layers, e.g. multiple sidewall spacers}
- 29/66568 {Lateral single gate silicon transistors}
- 29/66575 {where the source and drain or source and drain extensions are self-aligned to the sides of the gate ([H01L 29/66606 takes precedence](#))}
- 29/66583 {with initial gate mask or masking layer complementary to the prospective gate location, e.g. with dummy source and drain contacts}
- 29/6659 {with both lightly doped source and drain extensions and source and drain self-aligned to the sides of the gate, e.g. lightly doped drain [LDD] MOSFET, double diffused drain [DDD] MOSFET}
- 29/66598 {forming drain [D] and lightly doped drain [LDD] simultaneously, e.g. using implantation through the wings a T-shaped layer, or through a specially shaped layer}
- 29/66606 {with final source and drain contacts formation strictly before final or dummy gate formation, e.g. contact first technology ([H01L 29/66621 takes precedence](#))}
- 29/66613 {with a gate recessing step, e.g. using local oxidation ([making recessed gate LDMOS transistors H01L 29/66704](#))}
- 29/66621 {using etching to form a recess at the gate location ([etching of semiconductor bodies H01L 21/302](#))}
- 29/66628 {recessing the gate by forming single crystalline semiconductor material at the source or drain location}
- 29/66636 {with source or drain recessed by etching or first recessed by etching and then refilled}
- 29/66643 {with source or drain regions formed by a Schottky barrier or a conductor-insulator-semiconductor structure}
- 29/66651 {with a single crystalline channel formed on the silicon substrate after insulating device isolation}
- 29/66659 {with asymmetry in the channel direction, e.g. lateral high-voltage MISFETs with drain offset region, extended drain MISFETs}
- 29/66666 {Vertical transistors ([H01L 29/66712](#), [H01L 29/66742 take precedence](#))}
- 29/66674 {DMOS transistors, i.e. MISFETs with a channel accommodating body or base region adjoining a drain drift region ([making lateral high-voltage MISFETs with channel well and drain offset region H01L 29/66659](#))}
- 29/66681 {Lateral DMOS transistors, i.e. LDMOS transistors}
- 29/66689 {with a step of forming an insulating sidewall spacer ([forming insulating material on a substrate H01L 21/02107](#))}
- 29/66696 {with a step of recessing the source electrode}
- 29/66704 {with a step of recessing the gate electrode, e.g. to form a trench gate electrode}
- 29/66712 {Vertical DMOS transistors, i.e. VDMOS transistors}
- 29/66719 {With a step of forming an insulating sidewall spacer}
- 29/66727 {with a step of recessing the source electrode}
- 29/66734 {with a step of recessing the gate electrode, e.g. to form a trench gate electrode}
- 29/66742 {Thin film unipolar transistors}
- 29/6675 {Amorphous silicon or polysilicon transistors}
- 29/66757 {Lateral single gate single channel transistors with non-inverted structure, i.e. the channel layer is formed before the gate}
- 29/66765 {Lateral single gate single channel transistors with inverted structure, i.e. the channel layer is formed after the gate}
- 29/66772 {Monocrystalline silicon transistors on insulating substrates, e.g. quartz substrates ([H01L 29/66666 takes precedence](#); thin film FinFETs [H01L 29/66795](#))}
- 29/6678 {on sapphire substrates, e.g. SOS transistors}
- 29/66787 {with a gate at the side of the channel}
- 29/66795 {with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET}
- 29/66803 {with a step of doping the vertical sidewall, e.g. using tilted or multi-angled implants}
- 29/6681 {using dummy structures having essentially the same shape as the semiconductor body, e.g. to provide stability}
- 29/66818 {the channel being thinned after patterning, e.g. sacrificial oxidation on fin}
- 29/66825 {with a floating gate ([H01L 29/6684 takes precedence](#))}
- 29/66833 {with a charge trapping gate insulator, e.g. MNOS transistors}

- 29/6684 {with a ferroelectric gate insulator}
- 29/66848 {with a Schottky gate, i.e. MESFET}
- 29/66856 {with an active layer made of a group 13/15 material ([H01L 29/66446](#) takes precedence)}
- 29/66863 {Lateral single gate transistors}
- 29/66871 {Processes wherein the final gate is made after the formation of the source and drain regions in the active layer, e.g. dummy-gate processes}
- 29/66878 {Processes wherein the final gate is made before the formation, e.g. activation anneal, of the source and drain regions in the active layer}
- 29/66886 {Lateral transistors with two or more independent gates}
- 29/66893 {with a PN junction gate, i.e. JFET}
- 29/66901 {with a PN homojunction gate}
- 29/66909 {Vertical transistors, e.g. tecnetrans}
- 29/66916 {with a PN heterojunction gate}
- 29/66924 {with an active layer made of a group 13/15 material ([H01L 29/66446](#) takes precedence)}
- 29/66931 {BJT-like unipolar transistors, e.g. hot electron transistors [HET], metal base transistors [MBT], resonant tunneling transistor [RTT], bulk barrier transistor [BBT], planar doped barrier transistor [PDBT], charge injection transistor [CHINT]}
- 29/66939 {with an active layer made of a group 13/15 material}
- 29/66946 {Charge transfer devices}
- 29/66954 {with an insulated gate}
- 29/66962 {with a Schottky gate}
- 29/66969 {of devices having semiconductor bodies not comprising group 14 or group 13/15 materials ([comprising selenium or tellurium in uncombined form other than as impurities in semiconductor bodies of other materials, comprising cuprous oxide or cuprous iodide \[H01L 21/02365\]\(#\)](#))}
- 29/66977 {Quantum effect devices, e.g. using quantum reflection, diffraction or interference effects, i.e. Bragg- or Aharonov-Bohm effects}
- 29/66984 {Devices using spin polarized carriers}
- 29/66992 {controllable only by the variation of applied heat ([controllable by IR radiation \[H01L 31/00\]\(#\); measuring quantity of heat \[G01K 17/00\]\(#\)](#))}
- 29/68 controllable by only the electric current supplied, or only the electric potential applied, to an electrode which does not carry the current to be rectified, amplified or switched
- 29/685 {Hi-Lo semiconductor devices, e.g. memory devices}
- 29/70 Bipolar devices
- 29/705 {Double base diodes}
- 29/72 Transistor-type devices, i.e. able to continuously respond to applied control signals
- 29/73 Bipolar junction transistors
- 29/7302 {structurally associated with other devices ([assemblies of devices \[H01L 25/00\]\(#\); integrated circuits \[H01L 27/00\]\(#\); IGBT \[H01L 29/7393\]\(#\)](#))}
- 29/7304 {the device being a resistive element, e.g. ballasting resistor ([transistors integrated with resistors \[H01L 27/075\]\(#\)](#))}
- 29/7306 {Point contact transistors}
- 29/7308 {Schottky transistors}
- 29/7311 {Tunnel transistors}
- 29/7313 {Avalanche transistors}
- 29/7315 {Transistors with hook collector}
- 29/7317 {Bipolar thin film transistors}
- 29/732 Vertical transistors
- 29/7322 {having emitter-base and base-collector junctions leaving at the same surface of the body, e.g. planar transistor}
- 29/7325 {having an emitter-base junction leaving at a main surface and a base-collector junction leaving at a peripheral surface of the body, e.g. mesa planar transistor}
- 29/7327 {Inverse vertical transistors}
- 29/735 Lateral transistors
- 29/737 Hetero-junction transistors
- 29/7371 {Vertical transistors}
- 29/7373 {having a two-dimensional base, e.g. modulation-doped base, inversion layer base, delta-doped base}
- 29/7375 {having an emitter comprising one or more non-monocrystalline elements of group IV, e.g. amorphous silicon, alloys comprising group IV elements}
- 29/7376 {Resonant tunnelling transistors}
- 29/7378 {comprising lattice mismatched active layers, e.g. SiGe strained layer transistors}
- 29/739 controlled by field-effect, {e.g. bipolar static induction transistors [BSIT] ([unijunction transistors \[H01L 29/705\]\(#\)](#))}
- 29/7391 {Gated diode structures}
- 29/7392 {with PN junction gate, e.g. field controlled thyristors (FCTh), static induction thyristors (SITh)}
- 29/7393 {Insulated gate bipolar mode transistors, i.e. IGBT; IGT; COMFET}
- 29/7394 {on an insulating layer or substrate, e.g. thin film device or device isolated from the bulk substrate ([H01L 29/7398](#) takes precedence)}
- 29/7395 {Vertical transistors, e.g. vertical IGBT}

NOTE

The transistor is called vertical if the emitter and the collector are not on the same main surface or, if they are on the same main surface, at least a part of the main current

H01L

H01L 29/7395

(continued)

- has a component substantially not parallel to the main surface 29/76825 {Structures for regeneration, refreshing, leakage compensation or the like}
- 29/7396 {with a non planar surface, e.g. with a non planar gate or with a trench or recess or pillar in the surface of the emitter, base or collector region for improving current density or short circuiting the emitter and base regions (H01L 29/7398 takes precedence)}
- 29/7397 {and a gate structure lying on a slanted or vertical surface or formed in a groove, e.g. trench gate IGBT}
- 29/7398 {with both emitter and collector contacts in the same substrate side}
- 29/74 Thyristor-type devices, e.g. having four-zone regenerative action {(two-terminal thyristors H01L 29/87)}
- 29/7404 {structurally associated with at least one other device (assemblies H01L 25/00; integrated circuits H01L 27/00)}
- 29/7408 {the device being a capacitor or a resistor}
- 29/7412 {the device being a diode}
- 29/7416 {the device being an antiparallel diode, e.g. RCT (shorted anode structures enabling reverse conduction H01L 29/0834)}
- 29/742 {the device being a field effect transistor (for turn-on or turn-off by field effect H01L 29/745, H01L 29/749)}
- 29/7424 {having a built-in localised breakdown/breakover region, e.g. self-protected against destructive spontaneous, e.g. voltage breakover, firing}
- 29/7428 {having an amplifying gate structure, e.g. cascade (Darlington) configuration}
- 29/7432 {Asymmetrical thyristors (with a particular shorted anode structure H01L 29/0834)}
- 29/7436 {Lateral thyristors}
- 29/744 Gate-turn-off devices
- 29/745 with turn-off by field effect
- 29/7455 {produced by an insulated gate structure}
- 29/747 Bidirectional devices, e.g. triacs
- 29/749 with turn-on by field effect
- 29/76 Unipolar devices {, e.g. field effect transistors}
- 29/7606 {Transistor-like structures, e.g. hot electron transistor [HET]; metal base transistor [MBT]}
- 29/7613 {Single electron transistors; Coulomb blockade devices (H01L 29/7888 takes precedence)}
- 29/762 Charge transfer devices
- 29/765 Charge-coupled devices {(peripheral circuits for CCD storage devices G11C 19/285)}
- 29/768 with field effect produced by an insulated gate
- 29/76808 {Input structures}
- 29/76816 {Output structures}
- 29/76833 {Buried channel CCD}
- 29/76841 {Two-Phase CCD}
- 29/7685 {Three-Phase CCD}
- 29/76858 {Four-Phase CCD}
- 29/76866 {Surface Channel CCD}
- 29/76875 {Two-Phase CCD}
- 29/76883 {Three-Phase CCD}
- 29/76891 {Four-Phase CCD}
- 29/772 Field effect transistors
- 29/7722 {using static field induced regions, e.g. SIT, PBT}
- 29/7725 {with delta-doped channel (H01L 29/778 takes precedence)}
- 29/7727 {Velocity modulation transistors, i.e. VMT}
- 29/775 with one dimensional charge carrier gas channel, e.g. quantum wire FET
- 29/778 with two-dimensional charge carrier gas channel, e.g. HEMT {; with two-dimensional charge-carrier layer formed at a heterojunction interface (H01L 29/803 takes precedence)}
- 29/7781 {with inverted single heterostructure, i.e. with active layer formed on top of wide bandgap layer, e.g. IHEMT}
- 29/7782 {with confinement of carriers by at least two heterojunctions, e.g. DHHEMT, quantum well HEMT, DHMODFET}
- 29/7783 {using III-V semiconductor material}
- 29/7784 {with delta or planar doped donor layer (H01L 29/7785 takes precedence)}
- 29/7785 {with more than one donor layer}
- 29/7786 {with direct single heterostructure, i.e. with wide bandgap layer formed on top of active layer, e.g. direct single heterostructure MIS-like HEMT}
- 29/7787 {with wide bandgap charge-carrier supplying layer, e.g. direct single heterostructure MODFET}
- 29/7788 {Vertical transistors}
- 29/7789 {the two-dimensional charge carrier gas being at least partially not parallel to a main surface of the semiconductor body}
- 29/78 with field effect produced by an insulated gate {(H01L 29/7725, H01L 29/775, H01L 29/778 take precedence)}
- 29/7801 {DMOS transistors, i.e. MISFETs with a channel accommodating body or base region adjoining a drain drift region (lateral high-voltage MISFETs with channel well and drain offset region H01L 29/7835)}
- 29/7802 {Vertical DMOS transistors, i.e. VDMOS transistors}

<p>29/7803 {structurally associated with at least one other device (assemblies H01L 25/00; integrated circuits H01L 27/00)}</p> <p>WARNING</p> <p>Groups H01L 29/7803 – H01L 29/7808 are incomplete pending reclassification of documents from group H01L 29/7802.</p> <p>Groups H01L 29/7803 – H01L 29/7808 and H01L 29/7802 should be considered in order to perform a complete search.</p> <p>29/7804 {the other device being a pn-junction diode}</p> <p>29/7805 {in antiparallel, e.g. freewheel diode}</p> <p>29/7806 {the other device being a Schottky barrier diode}</p> <p>29/7808 {the other device being a breakdown diode, e.g. Zener diode}</p> <p>29/7809 {having both source and drain contacts on the same surface, i.e. Up-Drain VDMOS transistors}</p> <p>29/781 {Inverted VDMOS transistors, i.e. Source-Down VDMOS transistors}</p> <p>29/7811 {with an edge termination structure (guard regions per se H01L 29/0619; field plates per se H01L 29/402)}</p> <p>WARNING</p> <p>Group H01L 29/7811 is incomplete pending reclassification of documents from group H01L 29/7802.</p> <p>Groups H01L 29/7811 and H01L 29/7802 should be considered in order to perform a complete search.</p> <p>29/7812 {with a substrate comprising an insulating layer, e.g. SOI-VDMOS transistors}</p> <p>29/7813 {with trench gate electrode, e.g. UMOS transistors (trench gate electrodes per se H01L 29/4236)}</p> <p>29/7815 {with voltage or current sensing structure, e.g. emulator section, overcurrent sensing cell}</p> <p>WARNING</p> <p>Group H01L 29/7815 is incomplete pending reclassification of documents from group H01L 29/7802.</p> <p>Groups H01L 29/7815 and H01L 29/7802 should be considered in order to perform a complete search.</p>	<p>29/7816 {Lateral DMOS transistors, i.e. LDMOS transistors}</p> <p>29/7817 {structurally associated with at least one other device (assemblies H01L 25/00; integrated circuits H01L 27/00)}</p> <p>29/7818 {the other device being a pn-junction diode}</p> <p>29/7819 {in antiparallel, e.g. freewheel diode}</p> <p>29/782 {the other device being a Schottky barrier diode}</p> <p>29/7821 {the other device being a breakdown diode, e.g. Zener diode}</p> <p>29/7823 {with an edge termination structure (guard regions per se H01L 29/0619; field plates per se H01L 29/402)}</p> <p>29/7824 {with a substrate comprising an insulating layer, e.g. SOI-LDMOS transistors}</p> <p>29/7825 {with trench gate electrode (trench gate electrodes per se H01L 29/4236)}</p> <p>29/7826 {with voltage or current sensing structure, e.g. emulator section, overcurrent sensing cell}</p> <p>29/7827 {Vertical transistors (H01L 29/7802, H01L 29/78642 take precedence)}</p> <p>29/7828 {without inversion channel, e.g. vertical ACCUFETs, normally-on vertical MISFETs}</p> <p>29/783 {comprising a gate to body connection, i.e. bulk dynamic threshold voltage MOSFET (for thin film transistors H01L 29/78612, H01L 29/78696)}</p> <p>29/7831 {with multiple gate structure (FinFETs or MuGFETs H01L 29/7855, thin film transistors H01L 29/78645)}</p> <p>29/7832 {the structure comprising a MOS gate and at least one non-MOS gate, e.g. JFET or MESFET gate}</p> <p>29/7833 {with lightly doped drain or source extension, e.g. LDD MOSFET's; DDD MOSFET's (for thin film transistors H01L 29/78618)}</p> <p>29/7834 {with a non-planar structure, e.g. the gate or the source or the drain being non-planar}</p> <p>NOTE</p> <p>Field oxide sunken in the substrate and not filling a groove is not an element characterising a non-planar structure</p> <p>29/7835 {with asymmetrical source and drain regions, e.g. lateral high-voltage MISFETs with drain offset region, extended drain MISFETs}</p> <p>29/7836 {with a significant overlap between the lightly doped extension and the gate electrode (H01L 29/7834, H01L 29/7835 take precedence)}</p>
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29/7838	{without inversion channel, e.g. buried channel lateral MISFETs, normally-on lateral MISFETs, depletion-mode lateral MISFETs}	29/78609	{for preventing leakage current (H01L 29/78618 takes precedence)}
29/7839	. . . . .	{with Schottky drain or source contact}	29/78612	. . . . .	{for preventing the kink- or the snapback effect, e.g. discharging the minority carriers of the channel region for preventing bipolar effect}
29/78391	. . . . .	{the gate comprising a layer which is used for its ferroelectric properties}	29/78615	. . . . .	{with a body contact}
29/7841	. . . . .	{with floating body, e.g. programmable transistors}	29/78618	. . . . .	{characterised by the drain or the source properties, e.g. the doping structure, the composition, the sectional shape or the contact structure (silicide contacts, electrodes in general H01L 29/458)}
29/7842	. . . . .	{means for exerting mechanical stress on the crystal lattice of the channel region, e.g. using a flexible substrate (variation of the composition of the channel H01L 29/1054)}	29/78621	. . . . .	{with LDD structure or an extension or an offset region or characterised by the doping profile}
29/7843	. . . . .	{the means being an applied insulating layer}	29/78624	. . . . .	{the source and the drain regions being asymmetrical}
29/7845	. . . . .	{the means being a conductive material, e.g. silicided S/D or Gate}	29/78627	. . . . .	{with a significant overlap between the lightly doped drain and the gate electrode, e.g. GOLDD}
29/7846	. . . . .	{the means being located in the lateral device isolation region, e.g. STI}	2029/7863	. . . . .	{with an LDD consisting of more than one lightly doped zone or having a non-homogeneous dopant distribution, e.g. graded LDD}
29/7847	. . . . .	{using a memorization technique, e.g. re-crystallization under strain, bonding on a substrate having a thermal expansion coefficient different from the one of the region}	29/78633	. . . . .	{with a light shield}
29/7848	. . . . .	{the means being located in the source/drain region, e.g. SiGe source and drain}	29/78636	. . . . .	{with supplementary region or layer for improving the flatness of the device}
29/7849	. . . . .	{the means being provided under the channel}	29/78639	. . . . .	{with a drain or source connected to a bulk conducting substrate}
29/785	. . . . .	{having a channel with a horizontal current flow in a vertical sidewall of a semiconductor body, e.g. FinFET, MuGFET}	29/78642	. . . . .	{Vertical transistors}
29/7851	. . . . .	{with the body tied to the substrate}	29/78645	. . . . .	{with multiple gate}
29/7853	. . . . .	{the body having a non-rectangular crosssection}			NOTE
29/7854	. . . . .	{with rounded corners}			In groups
29/7855	. . . . .	{with at least two independent gates}			H01L 29/78651 - H01L 29/78696 ,
29/7856	. . . . .	{with an non-uniform gate, e.g. varying doping structure, shape or composition on different sides of the fin, or different gate insulator thickness or composition on opposing fin sides (H01L 29/7855 takes precedence)}			the materials specified for the transistors are the material of the channel region
2029/7857	. . . . .	{of the accumulation type}	29/78648	. . . . .	{arranged on opposing sides of the channel}
2029/7858	. . . . .	{having contacts specially adapted to the FinFET geometry, e.g. wrap-around contacts}	29/78651	. . . . .	{Silicon transistors (H01L 29/78606 - H01L 29/78645 take precedence)}
29/786	. . . . .	Thin film transistors, {i.e. transistors with a channel being at least partly a thin film (transistors having only the source or the drain region on an insulator layer H01L 29/0653 ; thin film FinFETs H01L 29/785)}	29/78654	. . . . .	{Monocrystalline silicon transistors}
29/78603	. . . . .	{characterised by the insulating substrate or support (H01L 29/78657 takes precedence)}	29/78657	. . . . .	{SOS transistors}
29/78606	. . . . .	{with supplementary region or layer in the thin film or in the insulated bulk substrate supporting it for controlling or increasing the safety of the device (H01L 29/78642 , H01L 29/78645 take precedence)}	29/7866	. . . . .	{Non-monocrystalline silicon transistors}
			29/78663	. . . . .	{Amorphous silicon transistors}
			29/78666	. . . . .	{with normal-type structure, e.g. with top gate}
			29/78669	. . . . .	{with inverted-type structure, e.g. with bottom gate}
			29/78672	. . . . .	{Polycrystalline or microcrystalline silicon transistor}

- 29/78675 {with normal-type structure, e.g. with top gate}
- 29/78678 {with inverted-type structure, e.g. with bottom gate}
- 29/78681 {having a semiconductor body comprising $A_{III}B_V$ or $A_{II}B_{VI}$ or $A_{IV}B_{VI}$ semiconductor materials, or Se or Te}
- 29/78684 {having a semiconductor body comprising semiconductor materials of Group IV not being silicon, or alloys including an element of the group IV, e.g. Ge, SiN alloys, SiC alloys (H01L 29/7869 takes precedence)}
- 29/78687 {with a multilayer structure or superlattice structure}
- 29/7869 {having a semiconductor body comprising an oxide semiconductor material, e.g. zinc oxide, copper aluminium oxide, cadmium stannate}
- 29/78693 {the semiconducting oxide being amorphous}
- 29/78696 {characterised by the structure of the channel, e.g. multichannel, transverse or longitudinal shape, length or width, doping structure, or the overlap or alignment between the channel and the gate, the source or the drain, or the contacting structure of the channel (H01L 29/78612 takes precedence; transistors having a drain offset region or a lightly doped drain [LDD] H01L 29/78621)}
- 29/788 with floating gate {(H01L 29/78391 takes precedence)}
- 29/7881 {Programmable transistors with only two possible levels of programming (H01L 29/7888 takes precedence)}
- 29/7882 {charging by injection of carriers through a conductive insulator, e.g. Poole-Frankel conduction}
- 29/7883 {charging by tunnelling of carriers, e.g. Fowler-Nordheim tunnelling}
- 29/7884 {charging by hot carrier injection}
- 29/7885 {Hot carrier injection from the channel}
- 29/7886 {Hot carrier produced by avalanche breakdown of a PN junction, e.g. FAMOS}
- 29/7887 {Programmable transistors with more than two possible different levels of programming}
- 29/7888 {Transistors programmable by two single electrons}
- 29/7889 {Vertical transistors, i.e. transistors having source and drain not in the same horizontal plane}
- 29/792 with charge trapping gate insulator, e.g. MNOS-memory transistors
- 29/7923 {Programmable transistors with more than two possible different levels of programming}
- 29/7926 {Vertical transistors, i.e. transistors having source and drain not in the same horizontal plane}
- 29/80 with field effect produced by a PN or other rectifying junction gate {, i.e. potential-jump barrier}
- 29/802 {with heterojunction gate, e.g. transistors with semiconductor layer acting as gate insulating layer, MIS-like transistors (H01L 29/806 takes precedence; with one dimensional electron gas H01L 29/775; with dimensional electron gas H01L 29/778)}
- 29/803 {Programmable transistors, e.g. with charge-trapping quantum well}
- 29/806 {with Schottky drain or source contact}
- 29/808 with a PN junction gate {, e.g. PN homojunction gate (H01L 29/7725, H01L 29/775, H01L 29/778, H01L 29/806 take precedence)}
- 29/8083 {Vertical transistors (SIT H01L 29/7722)}
- 29/8086 {Thin film JFET's}
- 29/812 with a Schottky gate {(H01L 29/7725, H01L 29/775, H01L 29/778, H01L 29/806 take precedence; with Schottky contact on top of heterojunction gate H01L 29/802)}
- 29/8122 {Vertical transistors (SIT, PBT H01L 29/7722)}
- 29/8124 {with multiple gate}
- 29/8126 {Thin film MESFET's}
- 29/8128 {with recessed gate}
- 29/82 controllable by variation of the magnetic field applied to the device
- 29/84 controllable by variation of applied mechanical force, e.g. of pressure
- 29/86 controllable only by variation of the electric current supplied, or only the electric potential applied, to one or more of the electrodes carrying the current to be rectified, amplified, oscillated or switched
- 29/8605 Resistors with PN junctions
- 29/861 Diodes
- 29/8611 {Planar PN junction diodes}
- 29/8613 {Mesa PN junction diodes}
- 29/8615 {Hi-lo semiconductor devices, e.g. memory devices}
- 29/8616 {Charge trapping diodes}
- 29/8618 {Diodes with bulk potential barrier, e.g. Camel diodes, Planar Doped Barrier diodes, Graded bandgap diodes}
- 29/862 Point contact diodes
- 29/864 Transit-time diodes, e.g. IMPATT, TRAPATT diodes
- 29/866 Zener diodes
- 29/868 PIN diodes
- 29/87 Thyristor diodes, e.g. Shockley diodes, break-over diodes
- 29/872 Schottky diodes
- 29/8725 {of the trench MOS barrier type [TMBS]}
- 29/88 Tunnel-effect diodes
- 29/882 {Resonant tunneling diodes, i.e. RTD, RTBD}
- 29/885 Esaki diodes
- 29/92 Capacitors with potential-jump barrier or surface barrier

- 29/93 Variable capacitance diodes, e.g. varactors
- 29/94 Metal-insulator-semiconductors, e.g. MOS
- 29/945 {Trench capacitors}
- 31/00** **Semiconductor devices sensitive to infra-red radiation, light, electromagnetic radiation of shorter wavelength or corpuscular radiation and adapted either for the conversion of the energy of such radiation into electrical energy or for the control of electrical energy by such radiation; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof; Details thereof** ([H01L 51/42](#) takes precedence; devices consisting of a plurality of solid state components formed in, or on, a common substrate, other than combinations of radiation-sensitive components with one or more electric light sources, [H01L 27/00](#); measurement of X-radiation, gamma radiation, corpuscular radiation or cosmic radiation with semiconductor detectors [G01T 1/24](#), with resistance detectors [G01T 1/26](#); measurement of neutron radiation with semiconductor detectors [G01T 3/08](#); couplings of light guides with optoelectronic elements [G02B 6/42](#); obtaining energy from radioactive sources [G21H](#))
- 31/02 . . Details
- 31/02002 . . {Arrangements for conducting electric current to or from the device in operations}
- 31/02005 . . . {for device characterised by at least one potential jump barrier or surface barrier}
- 31/02008 {for solar cells or solar cell modules}
- 31/0201 {comprising specially adapted module bus-bar structures}
- 31/02013 {comprising output lead wires elements}
- 31/02016 . . {Circuit arrangements of general character for the devices}
- 31/02019 . . . {for devices characterised by at least one potential jump barrier or surface barrier}
- 31/02021 {for solar cells (electrical connection means, e.g. junction boxes, specially adapted for structural association with photovoltaic modules [H02S 40/34](#))}
- 31/02024 {Position sensitive and lateral effect photodetectors; Quadrant photodiodes}
- 31/02027 {for devices working in avalanche mode}
- 31/0203 . . Containers; Encapsulations {, e.g. encapsulation of photodiodes} (for photovoltaic devices [H01L 31/048](#); for organic photosensitive devices [H01L 51/44](#))
- 31/0216 . . Coatings ([H01L 31/041](#) takes precedence)
- 31/02161 . . . {for devices characterised by at least one potential jump barrier or surface barrier}
- 31/02162 {for filtering or shielding light, e.g. multicolour filters for photodetectors}
- 31/02164 {for shielding light, e.g. light blocking layers, cold shields for infra-red detectors}
- 31/02165 {using interference filters, e.g. multilayer dielectric filters (interference filters [G02B 5/28](#))}
- 31/02167 {for solar cells}
- 31/02168 {the coatings being antireflective or having enhancing optical properties for the solar cells}
- 31/0224 . . Electrodes
- 31/022408 . . . {for devices characterised by at least one potential jump barrier or surface barrier}
- 31/022416 {comprising ring electrodes}
- 31/022425 {for solar cells}
- 31/022433 {Particular geometry of the grid contacts}
- 31/022441 {Electrode arrangements specially adapted for back-contact solar cells}
- 31/02245 {for metallisation wrap-through [MWT] type solar cells}
- 31/022458 {for emitter wrap-through [EWT] type solar cells, e.g. interdigitated emitter-base back-contacts}
- 31/022466 . . . {made of transparent conductive layers, e.g. TCO, ITO layers}
- 31/022475 {composed of indium tin oxide [ITO]}
- 31/022483 {composed of zinc oxide [ZnO]}
- 31/022491 {composed of a thin transparent metal layer, e.g. gold}
- 31/0232 . . Optical elements or arrangements associated with the device ([H01L 31/0236](#) takes precedence; for photovoltaic cells [H01L 31/054](#); for photovoltaic modules [H02S 40/20](#))
- 31/02322 . . . {comprising luminescent members, e.g. fluorescent sheets upon the device}
- 31/02325 . . . {the optical elements not being integrated nor being directly associated with the device}
- 31/02327 . . . {the optical elements being integrated or being directly associated to the device, e.g. back reflectors (optical coatings [H01L 31/0216](#))}
- 31/0236 . . Special surface textures
- 31/02363 . . . {of the semiconductor body itself, e.g. textured active layers}
- 31/02366 . . . {of the substrate or of a layer on the substrate, e.g. textured ITO/glass substrate or superstrate, textured polymer layer on glass substrate}
- 31/024 . . Arrangements for cooling, heating, ventilating or temperature compensation (for photovoltaic devices [H01L 31/052](#))
- 31/0248 . . characterised by their semiconductor bodies
- 31/0256 . . characterised by the material
- 31/0264 . . . Inorganic materials
- 31/0272 Selenium or tellurium
- 31/02725 {characterised by the doping material}
- 31/028 including, apart from doping material or other impurities, only elements of Group IV of the Periodic System
- 31/0284 {comprising porous silicon as part of the active layer(s) (porous silicon as antireflective layer for photodiodes [H01L 31/0216](#); for solar cells [H01L 31/02168](#))}
- 31/0288 characterised by the doping material
- 31/0296 including, apart from doping material or other impurities, only $A_{II}B_{VI}$ compounds, e.g. CdS, ZnS, HgCdTe
- 31/02963 {characterised by the doping material}
- 31/02966 {including ternary compounds, e.g. HgCdTe}
- 31/0304 including, apart from doping materials or other impurities, only $A_{III}B_V$ compounds
- 31/03042 {characterised by the doping material}
- 31/03044 {comprising a nitride compounds, e.g. GaN}

- 31/03046 {including ternary or quaternary compounds, e.g. GaAlAs, InGaAs, InGaAsP}
- 31/03048 {comprising a nitride compounds, e.g. InGaN}
- 31/0312 including, apart from doping materials or other impurities, only $A_{IV}B_{IV}$ compounds, e.g. SiC
- 31/03125 {characterised by the doping material}
- 31/032 including, apart from doping materials or other impurities, only compounds not provided for in groups [H01L 31/0272](#) - [H01L 31/0312](#)
- 31/0321 {characterised by the doping material ([H01L 31/0323](#), [H01L 31/0325](#) take precedence)}
- 31/0322 {comprising only $A_{I}B_{III}C_{VI}$ chalcopyrite compounds, e.g. Cu In Se₂, Cu Ga Se₂, Cu In Ga Se₂}
- 31/0323 {characterised by the doping material}
- 31/0324 {comprising only $A_{IV}B_{VI}$ or $A_{II}B_{IV}C_{VI}$ chalcogenide compounds, e.g. Pb Sn Te}
- 31/0325 {characterised by the doping material}
- 31/0326 {comprising $A_{I}B_{II}C_{IV}D_{VI}$ kesterite compounds, e.g. Cu₂ZnSnSe₄, Cu₂ZnSnS₄}
- 31/0327 {characterised by the doping material}
- 31/0328 including, apart from doping materials or other impurities, semiconductor materials provided for in two or more of groups [H01L 31/0272](#) - [H01L 31/032](#)
- 31/0336 in different semiconductor regions, e.g. Cu₂X/CdX hetero-junctions, X being an element of Group VI of the Periodic System
- 31/03365 {comprising only Cu₂X / CdX heterojunctions, X being an element of Group VI of the Periodic System}
- 2031/0344 {Organic materials}
- 31/0352 characterised by their shape or by the shapes, relative sizes or disposition of the semiconductor regions
- 31/035209 {comprising a quantum structures}
- 31/035218 {the quantum structure being quantum dots}
- 31/035227 {the quantum structure being quantum wires, or nanorods ([carbon nanotubes H01L 51/0048](#))}
- 31/035236 {Superlattices; Multiple quantum well structures}
- 31/035245 {characterised by amorphous semiconductor layers}
- 31/035254 {including, apart from doping materials or other impurities, only elements of Group IV of the Periodic System, e.g. Si-SiGe superlattices}
- 31/035263 {Doping superlattices, e.g. nipi superlattices}
- 31/035272 {characterised by at least one potential jump barrier or surface barrier}
- 31/035281 {Shape of the body}
- 31/03529 {Shape of the potential jump barrier or surface barrier}
- 31/036 characterised by their crystalline structure or particular orientation of the crystalline planes
- 31/0368 including polycrystalline semiconductors ([H01L 31/0392](#) takes precedence)
- 31/03682 {including only elements of Group IV of the Periodic System}
- 31/03685 {including microcrystalline silicon, uc-Si}
- 31/03687 {including microcrystalline $A_{IV}B_{IV}$ alloys, e.g. uc-SiGe, uc-SiC}
- 31/0376 including amorphous semiconductors ([H01L 31/0392](#) takes precedence)
- 31/03762 {including only elements of Group IV of the Periodic System}
- 31/03765 {including $A_{IV}B_{IV}$ compounds or alloys, e.g. SiGe, SiC}
- 31/03767 {presenting light-induced characteristic variations, e.g. Staebler-Wronski effect}
- 31/0384 including other non-monocrystalline materials, e.g. semiconductor particles embedded in an insulating material ([H01L 31/0392](#) takes precedence)
- 31/03845 {comprising semiconductor nanoparticles embedded in a semiconductor matrix ([in insulating matrix H01L 31/0384](#))}
- 31/0392 including thin films deposited on metallic or insulating substrates {; characterised by specific substrate materials or substrate features or by the presence of intermediate layers, e.g. barrier layers, on the substrate ([textured substrates H01L 31/02366](#))}
- 31/03921 {including only elements of Group IV of the Periodic System}
- 31/03923 {including $A_{I}B_{III}C_{VI}$ compound materials, e.g. CIS, CIGS}
- 31/03925 {including $A_{II}B_{VI}$ compound materials, e.g. CdTe, CdS}
- 31/03926 {comprising a flexible substrate}
- 31/03928 {including $A_{I}B_{III}C_{VI}$ compound, e.g. CIS, CIGS deposited on metal or polymer foils}
- 31/04 adapted as photovoltaic [PV] conversion devices ([testing thereof during manufacture {H01L 22/00}](#); [testing thereof after manufacture H02S 50/10](#))
- 31/041 Provisions for preventing damage caused by corpuscular radiation, e.g. for space applications
- 31/042 PV modules or arrays of single PV cells ([supporting structures for PV modules H02S 20/00](#))
- 31/043 Mechanically stacked PV cells
- 31/044 including bypass diodes ([bypass diodes in the junction box H02S 40/34](#))
- 31/0443 comprising bypass diodes integrated or directly associated with the devices, e.g. bypass diodes integrated or formed in or on the same substrate as the photovoltaic cells
- 31/0445 including thin film solar cells, e.g. single thin film a-Si, CIS or CdTe solar cells
- 31/046 PV modules composed of a plurality of thin film solar cells deposited on the same substrate
- 31/0463 characterised by special patterning methods to connect the PV cells in a module, e.g. laser cutting of the conductive or active layers
- 31/0465 comprising particular structures for the electrical interconnection of adjacent PV cells in the module ([H01L 31/0463](#) takes precedence)

- 31/0468 comprising specific means for obtaining partial light transmission through the module, e.g. partially transparent thin film solar modules for windows
- 31/047 . . . PV cell arrays including PV cells having multiple vertical junctions or multiple V-groove junctions formed in a semiconductor substrate
- 31/0475 . . . PV cell arrays made by cells in a planar, e.g. repetitive, configuration on a single semiconductor substrate; PV cell microarrays (PV modules composed of a plurality of thin film solar cells deposited on the same substrate [H01L 31/046](#))
- 31/048 . . . Encapsulation of modules
- 31/0481 {characterised by the composition of the encapsulation material}
- 31/0488 {Double glass encapsulation, e.g. photovoltaic cells arranged between front and rear glass sheets}
- 31/049 Protective back sheets
- 31/05 . . . Electrical interconnection means between PV cells inside the PV module, e.g. series connection of PV cells (electrodes [H01L 31/0224](#); electrical interconnection of thin film solar cells formed on a common substrate [H01L 31/046](#); particular structures for electrical interconnecting of adjacent thin film solar cells in the module [H01L 31/0465](#); electrical interconnection means specially adapted for electrically connecting two or more PV modules [H02S 40/36](#))
- 31/0504 {specially adapted for series or parallel connection of solar cells in a module}
- 31/0508 {the interconnection means having a particular shape}
- 31/0512 {made of a particular material or composition of materials}
- 31/0516 {specially adapted for interconnection of back-contact solar cells}
- 31/052 . . Cooling means directly associated or integrated with the PV cell, e.g. integrated Peltier elements for active cooling or heat sinks directly associated with the PV cells (cooling means in combination with the PV module [H02S 40/42](#))
- 31/0521 . . . {using a gaseous or a liquid coolant, e.g. air flow ventilation, water circulation}
- 31/0525 . . . including means to utilise heat energy directly associated with the PV cell, e.g. integrated Seebeck elements
- 31/053 . . Energy storage means directly associated or integrated with the PV cell, e.g. a capacitor integrated with a PV cell (energy storage means associated with the PV module [H02S 40/38](#))
- 31/054 . . Optical elements directly associated or integrated with the PV cell, e.g. light-reflecting means or light-concentrating means
- 31/0543 . . . {comprising light concentrating means of the refractive type, e.g. lenses}
- 31/0547 . . . {comprising light concentrating means of the reflecting type, e.g. parabolic mirrors, concentrators using total internal reflection}
- 31/0549 . . . {comprising spectrum splitting means, e.g. dichroic mirrors}
- 31/055 . . . where light is absorbed and re-emitted at a different wavelength by the optical element directly associated or integrated with the PV cell, e.g. by using luminescent material, fluorescent concentrators or up-conversion arrangements
- 31/056 . . . the light-reflecting means being of the back surface reflector [BSR] type
- 31/06 . . characterised by at least one potential-jump barrier or surface barrier
- 31/061 . . . the potential barriers being of the point-contact type ([H01L 31/07](#) takes precedence)
- 31/062 . . . the potential barriers being only of the metal-insulator-semiconductor type
- 31/065 . . . the potential barriers being only of the graded gap type
- 31/068 . . . the potential barriers being only of the PN homojunction type, e.g. bulk silicon PN homojunction solar cells or thin film polycrystalline silicon PN homojunction solar cells
- 31/0682 {back-junction, i.e. rearside emitter, solar cells, e.g. interdigitated base-emitter regions back-junction cells}
- 31/0684 {double emitter cells, e.g. bifacial solar cells}
- 31/0687 Multiple junction or tandem solar cells
- 31/06875 {inverted grown metamorphic [IMM] multiple junction solar cells, e.g. III-V compounds inverted metamorphic multi-junction cells}
- 31/0693 the devices including, apart from doping material or other impurities, only $A_{III}B_V$ compounds, e.g. GaAs or InP solar cells
- 31/07 . . . the potential barriers being only of the Schottky type
- 31/072 . . . the potential barriers being only of the PN heterojunction type
- 31/0725 Multiple junction or tandem solar cells
- 31/073 comprising only $A_{II}B_{VI}$ compound semiconductors, e.g. CdS/CdTe solar cells
- 31/0735 comprising only $A_{III}B_V$ compound semiconductors, e.g. GaAs/AlGaAs or InP/GaNAs solar cells
- 31/074 comprising a heterojunction with an element of Group IV of the Periodic System, e.g. ITO/Si, GaAs/Si or CdTe/Si solar cells
- 31/0745 comprising a $A_{IV}B_{IV}$ heterojunction, e.g. Si/Ge, SiGe/Si or Si/SiC solar cells
- 31/0747 comprising a heterojunction of crystalline and amorphous materials, e.g. heterojunction with intrinsic thin layer or HIT® solar cells; solar cells
- 31/0749 including a $A_{I}B_{III}C_{VI}$ compound, e.g. CdS/CuInSe₂ [CIS] heterojunction solar cells
- 31/075 . . . the potential barriers being only of the PIN type
- 31/076 Multiple junction or tandem solar cells
- 31/077 the devices comprising monocrystalline or polycrystalline materials
- 31/078 . . . including different types of potential barriers provided for in two or more of groups [H01L 31/062](#) - [H01L 31/075](#)
- 31/08 . . in which radiation controls flow of current through the device, e.g. photoresistors

- 31/085 . . . {the device being sensitive to very short wavelength, e.g. X-ray, Gamma-rays}
- 31/09 . . . Devices sensitive to infra-red, visible or ultraviolet radiation ([H01L 31/101 takes precedence](#))
- 31/095 . . . {comprising amorphous semiconductors}
- 31/10 . . . characterised by at least one potential-jump barrier or surface barrier, e.g. phototransistors
- 31/101 . . . Devices sensitive to infra-red, visible or ultraviolet radiation
- 31/1013 {devices sensitive to two or more wavelengths, e.g. multi-spectrum radiation detection devices}
- 31/1016 {comprising transparent or semitransparent devices}
- 31/102 characterised by only one potential barrier or surface barrier
- 31/1025 {the potential barrier being of the point contact type}
- 31/103 the potential barrier being of the PN homojunction type
- 31/1032 {the devices comprising active layers formed only by $A_{II}B_{VI}$ compounds, e.g. HgCdTe IR photodiodes}
- 31/1035 {the devices comprising active layers formed only by $A_{III}B_V$ compounds}
- 31/1037 {the devices comprising active layers formed only by $A_{IV}B_{VI}$ compounds}
- 31/105 the potential barrier being of the PIN type
- 31/1055 {the devices comprising amorphous materials of Group IV of the Periodic System}
- 31/107 the potential barrier working in avalanche mode, e.g. avalanche photodiode
- 31/1075 {in which the active layers, e.g. absorption or multiplication layers, form an heterostructure, e.g. SAM structure}
- 31/108 the potential barrier being of the Schottky type
- 31/1085 {the devices being of the Metal-Semiconductor-Metal [MSM] Schottky barrier type}
- 31/109 the potential barrier being of the PN heterojunction type
- 31/11 characterised by two potential barriers or surface barriers, e.g. bipolar phototransistor
- 31/1105 {the device being a bipolar phototransistor}
- 31/111 characterised by at least three potential barriers, e.g. photothyristor
- 31/1113 {the device being a photothyristor}
- 31/1116 {of the static induction type}
- 31/112 characterised by field-effect operation, e.g. junction field-effect phototransistor
- 31/1121 {Devices with Schottky gate}
- 31/1122 {the device being a CCD device}
- 31/1123 {the device being a photo MESFET}
- 31/1124 {Devices with PN homojunction gate}
- 31/1125 {the device being a CCD device}
- 31/1126 {the device being a field-effect phototransistor}
- 31/1127 {Devices with PN heterojunction gate}
- 31/1128 {the device being a CCD device}
- 31/1129 {the device being a field-effect phototransistor}
- 31/113 being of the conductor-insulator-semiconductor type, e.g. metal-insulator-semiconductor field-effect transistor
- 31/1133 {the device being a conductor-insulator-semiconductor diode or a CCD device}
- 31/1136 {the device being a metal-insulator-semiconductor field-effect transistor}
- 31/115 Devices sensitive to very short wavelength, e.g. X-rays, gamma-rays or corpuscular radiation
- 31/117 of the bulk effect radiation detector type, e.g. Ge-Li compensated PIN gamma-ray detectors
- 31/1175 {Li compensated PIN gamma-ray detectors}
- 31/118 of the surface barrier or shallow PN junction detector type, e.g. surface barrier alpha-particle detectors
- 31/1185 {of the shallow PN junction detector type}
- 31/119 characterised by field-effect operation, e.g. MIS type detectors
- 31/12 structurally associated with, e.g. formed in or on a common substrate with, one or more electric light sources, e.g. electroluminescent light sources, and electrically or optically coupled thereto ([semiconductor devices with at least one potential barrier or surface barrier adapted for light emission H01L 33/00; amplifiers using electroluminescent element and photocell H03F 17/00; electroluminescent light sources per se H05B 33/00](#))
- 31/125 {Composite devices with photosensitive elements and electroluminescent elements within one single body}
- 31/14 the light source or sources being controlled by the semiconductor device sensitive to radiation, e.g. image converters, image amplifiers or image storage devices
- 31/141 {the semiconductor device sensitive to radiation being without a potential-jump barrier or surface barrier}
- 31/143 {the light source being a semiconductor device with at least one potential-jump barrier or surface barrier, e.g. light emitting diode}
- 31/145 {the semiconductor device sensitive to radiation being characterised by at least one potential-jump barrier or surface barrier}
- 31/147 the light sources and the devices sensitive to radiation all being semiconductor devices characterised by at least one potential or surface barrier
- 31/153 formed in, or on, a common substrate
- 31/16 the semiconductor device sensitive to radiation being controlled by the light source or sources
- 31/161 {Semiconductor device sensitive to radiation without a potential-jump or surface barrier, e.g. photoresistors}
- 31/162 {the light source being a semiconductor device with at least one potential-jump barrier or surface barrier, e.g. a light emitting diode}
- 31/164 {Optical potentiometers}

- 31/165 . . . {the semiconductor sensitive to radiation being characterised by at least one potential-jump or surface barrier}
- 31/167 . . . the light sources and the devices sensitive to radiation all being semiconductor devices characterised by at least one potential or surface barrier
- 31/173 formed in, or on, a common substrate
- 31/18 . . Processes or apparatus peculiar to the manufacture or treatment of these devices or of parts thereof (not peculiar thereto [H01L 21/00](#))
- 31/1804 . . {comprising only elements of Group IV of the Periodic System}
- 31/1808 . . . {including only Ge}
- 31/1812 . . . {including only $A_{IV}B_{IV}$ alloys, e.g. SiGe}
- 31/1816 {Special manufacturing methods for microcrystalline layers, e.g. uc-SiGe, uc-SiC}
- 31/182 . . . {Special manufacturing methods for polycrystalline Si, e.g. Si ribbon, poly Si ingots, thin films of polycrystalline Si}
- 31/1824 {Special manufacturing methods for microcrystalline Si, uc-Si}
- 31/1828 . . {the active layers comprising only $A_{II}B_{VI}$ compounds, e.g. CdS, ZnS, CdTe}
- 31/1832 . . . {comprising ternary compounds, e.g. Hg Cd Te}
- 31/1836 . . . {comprising a growth substrate not being an $A_{II}B_{VI}$ compound}
- 31/184 . . {the active layers comprising only $A_{III}B_V$ compounds, e.g. GaAs, InP}
- 31/1844 . . . {comprising ternary or quaternary compounds, e.g. Ga Al As, In Ga As P}
- 31/1848 {comprising nitride compounds, e.g. InGaN, InGaAlN}
- 31/1852 . . . {comprising a growth substrate not being an $A_{III}B_V$ compound}
- 31/1856 . . . {comprising nitride compounds, e.g. GaN}
- 31/186 . . {Particular post-treatment for the devices, e.g. annealing, impurity gettering, short-circuit elimination, recrystallisation}
- 31/1864 . . . {Annealing}
- 31/1868 . . . {Passivation}
- 31/1872 . . . {Recrystallisation}
- 31/1876 . . {Particular processes or apparatus for batch treatment of the devices}
- 31/188 . . . {Apparatus specially adapted for automatic interconnection of solar cells in a module}
- 31/1884 . . {Manufacture of transparent electrodes, e.g. TCO, ITO}
- 31/1888 . . . {methods for etching transparent electrodes}
- 31/1892 . . {methods involving the use of temporary, removable substrates}
- 31/1896 . . . {for thin-film semiconductors}
- 31/20 . . such devices or parts thereof comprising amorphous semiconductor materials
- 31/202 . . . {including only elements of Group IV of the Periodic System}
- 31/204 {including $A_{IV}B_{IV}$ alloys, e.g. SiGe, SiC}
- 31/206 . . . {Particular processes or apparatus for continuous treatment of the devices, e.g. roll-to roll processes, multi-chamber deposition}
- 31/208 . . . {Particular post-treatment of the devices, e.g. annealing, short-circuit elimination}
- 33/00** **Semiconductor devices with at least one potential-jump barrier or surface barrier specially adapted for light emission; Processes or apparatus specially adapted for the manufacture or treatment thereof or of parts thereof; Details thereof** ([H01L 51/50](#) takes precedence; devices consisting of a plurality of semiconductor components formed in or on a common substrate and including semiconductor components with at least one potential-jump barrier or surface barrier, specially adapted for light emission [H01L 27/15](#); semiconductor lasers [H01S 5/00](#))
- NOTES**
1. This group covers light emitting diodes [LEDs] or superluminescent diodes [SLDs], including LEDs or SLDs emitting infra-red [IR] light or ultra-violet [UV] light.
 2. In this group, the first place priority rule is applied, i.e. at each hierarchical level, in the absence of an indication to the contrary, classification is made in the first appropriate place.
- 33/0004 . . {Devices characterised by their operation}
- 33/0008 . . . {having p-n or hi-lo junctions}
- 33/0012 {p-i-n devices}
- 33/0016 {having at least two p-n junctions}
- 33/002 . . . {having heterojunctions or graded gap}
- 33/0025 {comprising only $A_{III}B_V$ compounds}
- 33/0029 {comprising only $A_{II}B_{VI}$ compounds}
- 33/0033 . . . {having Schottky barriers}
- 33/0037 . . . {having a MIS barrier layer}
- 33/0041 . . . {characterised by field-effect operation}
- 33/0045 . . . {the devices being superluminescent diodes}
- 33/005 . . {Processes}
- 33/0054 . . . {for devices with an active region comprising only group IV elements}
- 33/0058 {comprising amorphous semiconductors}
- 33/0062 . . . {for devices with an active region comprising only III-V compounds}
- 33/0066 {with a substrate not being a III-V compound}
- 33/007 {comprising nitride compounds}
- 33/0075 {comprising nitride compounds}
- 33/0079 {wafer bonding or at least partial removal of the growth substrate}
- 33/0083 . . . {for devices with an active region comprising only II-VI compounds}
- 33/0087 {with a substrate not being a II-VI compound}
- 33/0091 . . . {for devices with an active region comprising only IV-VI compounds}
- 33/0095 . . . {Post-treatments of the devices, e.g. annealing, recrystallisation, short-circuit elimination}
- 33/02 . . characterised by the semiconductor bodies
- 33/025 . . . {Physical imperfections, e.g. particular concentration or distribution of impurities}
- 33/04 . . . with a quantum effect structure or superlattice, e.g. tunnel junction
- 33/06 within the light emitting region, e.g. quantum confinement structure or tunnel barrier

- 33/08 . . with a plurality of light emitting regions, e.g. laterally discontinuous light emitting layer or photoluminescent region integrated within the semiconductor body ([H01L 27/15](#) takes precedence)
- 33/10 . . with a light reflecting structure, e.g. semiconductor Bragg reflector
- 33/105 . . . {with a resonant cavity structure}
- 33/12 . . with a stress relaxation structure, e.g. buffer layer
- 33/14 . . with a carrier transport control structure, e.g. highly-doped semiconductor layer or current-blocking structure
- 33/145 . . . {with a current-blocking structure}
- 33/16 . . with a particular crystal structure or orientation, e.g. polycrystalline, amorphous or porous
- 33/18 . . . within the light emitting region
- NOTE**
- When classifying in this group, classification is also made in group [H01L 33/26](#) or one of its subgroups in order to identify the chemical composition of the light emitting region
- 33/20 . . with a particular shape, e.g. curved or truncated substrate
- 33/22 . . . Roughened surfaces, e.g. at the interface between epitaxial layers
- 33/24 . . . of the light emitting region, e.g. non-planar junction
- 33/26 . . Materials of the light emitting region
- 33/28 . . . containing only elements of group II and group VI of the periodic system
- 33/285 {characterised by the doping materials}
- 33/30 . . . containing only elements of group III and group V of the periodic system
- 33/305 {characterised by the doping materials}
- 33/32 containing nitrogen
- 33/325 {characterised by the doping materials}
- 33/34 . . . containing only elements of group IV of the periodic system
- 33/343 {characterised by the doping materials}
- 33/346 {containing porous silicon}
- 33/36 . characterised by the electrodes
- 33/38 . . with a particular shape
- 33/382 . . . {the electrode extending partially in or entirely through the semiconductor body}
- 33/385 . . . {the electrode extending at least partially onto a side surface of the semiconductor body}
- 33/387 . . . {with a plurality of electrode regions in direct contact with the semiconductor body and being electrically interconnected by another electrode layer}
- 33/40 . . Materials therefor
- 33/405 . . . {Reflective materials}
- 33/42 . . . Transparent materials
- 33/44 . characterised by the coatings, e.g. passivation layer or anti-reflective coating
- 33/46 . . Reflective coating, e.g. dielectric Bragg reflector
- 33/465 . . . {with a resonant cavity structure}
- 33/48 . . characterised by the semiconductor body packages
- NOTE**
- This group covers elements in intimate contact with the semiconductor body or integrated with the package
- 33/483 . . {Containers}
- 33/486 . . . {adapted for surface mounting}
- 33/50 . . Wavelength conversion elements
- 33/501 . . . {characterised by the materials, e.g. binder}
- 33/502 {Wavelength conversion materials}
- 33/504 {Elements with two or more wavelength conversion materials}
- 33/505 . . . {characterised by the shape, e.g. plate or foil}
- 33/507 . . . {the elements being in intimate contact with parts other than the semiconductor body or integrated with parts other than the semiconductor body}
- 33/508 . . . {having a non-uniform spatial arrangement or non-uniform concentration, e.g. patterned wavelength conversion layer, wavelength conversion layer with a concentration gradient of the wavelength conversion material}
- 33/52 . . Encapsulations
- 33/54 . . . having a particular shape
- 33/56 . . . Materials, e.g. epoxy or silicone resin
- 33/58 . . Optical field-shaping elements
- 33/60 . . . Reflective elements
- 33/62 . . Arrangements for conducting electric current to or from the semiconductor body, e.g. lead-frames, wire-bonds or solder balls
- 33/64 . . Heat extraction or cooling elements
- 33/641 . . . {characterized by the materials}
- 33/642 . . . {characterized by the shape}
- 33/644 . . . {in intimate contact or integrated with parts of the device other than the semiconductor body}
- 33/645 . . . {the elements being electrically controlled, e.g. Peltier elements}
- 33/647 . . . {the elements conducting electric current to or from the semiconductor body}
- 33/648 . . . {the elements comprising fluids, e.g. heat-pipes}
- 35/00 Thermoelectric devices comprising a junction of dissimilar materials, i.e. exhibiting Seebeck or Peltier effect with or without other thermoelectric effects or thermomagnetic effects; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof; Details thereof (devices consisting of a plurality of solid state components formed in or on a common substrate [H01L 27/00](#); refrigerating machines using electric or magnetic effects [F25B 21/00](#); thermometers using thermoelectric or thermomagnetic elements [G01K 7/00](#); obtaining energy from radioactive sources [G21H](#))**
- 35/02 . Details
- 35/04 . . Structural details of the junction; Connections of leads
- 35/06 . . . detachable, e.g. using a spring
- 35/08 . . . non-detachable, e.g. cemented, sintered, soldered {, e.g. thin films}
- 35/10 . . . Connections of leads
- 35/12 . Selection of the material for the legs of the junction

- 35/14 . . using inorganic compositions
- 35/16 . . . comprising tellurium or selenium or sulfur
- 35/18 . . . comprising arsenic or antimony or bismuth ([H01L 35/16](#) takes precedence), {e.g. $A_{III}B_V$ compounds}
- 35/20 . . . comprising metals only ([H01L 35/16](#), [H01L 35/18](#) take precedence)
- 35/22 . . . comprising compounds containing boron, carbon, oxygen or nitrogen {or germanium or silicon, e.g. superconductors}
- 35/225 {Superconducting materials}
- 35/24 . . using organic compositions
- 35/26 . . using compositions changing continuously or discontinuously inside the material
- 35/28 . operating with Peltier or Seebeck effect only
- 35/30 . . characterised by the heat-exchanging means at the junction
- 35/32 . . characterised by the structure or configuration of the cell or thermo-couple forming the device {including details about, e.g., housing, insulation, geometry, module}
- 35/325 . . . {Cascades of thermo-couples}
- 35/34 . Processes or apparatus peculiar to the manufacture or treatment of these devices or of parts thereof (not peculiar thereto [H01L 21/00](#))
- 37/00 Thermoelectric devices without a junction of dissimilar materials; Thermomagnetic devices, e.g. using Nernst-Ettinghausen effect; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof (devices consisting of a plurality of solid state components formed in or on a common substrate [H01L 27/00](#); {radiation pyrometers using pyroelectric detectors [G01J 5/34](#)} thermometers using thermo-electric or thermomagnetic elements [G01K 7/00](#); selection of materials for magnetography, e.g. for Curie-point writing [G03G 5/00](#))**
- 37/02 . using thermal change of dielectric constant, e.g. working above and below Curie point {, e.g. pyroelectric devices}
- 37/025 . . {Selection of materials}
- 37/04 . using thermal change of magnetic permeability, e.g. working above and below the Curie point {, e.g. pyromagnetic devices}
- 39/00 Devices using superconductivity; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof (devices consisting of a plurality of solid state components formed in or on a common substrate [H01L 27/00](#); {light detection [G01J](#), [G02F 2/00](#); application to memories [G11C 11/44](#), [G11C 15/00](#), [G11C 19/32](#)} ; superconducting conductors cables or transmission lines [H01B 12/00](#); {microwaves [H01P 7/00](#), [H01P 11/00](#)} ; superconductive coils or windings [H01F](#); amplifiers using superconductivity [H03F 19/00](#); {impulse generators and logic circuits [H03K 3/38](#), [H03K 17/92](#), [H03K 19/195](#); lasers [H01S 3/00](#), [H01S 5/00](#))}**
- NOTE**
- In this group, in the absence of an indication to the contrary, an invention is classified in the last appropriate place
- 39/005 . {Alleged superconductivity}
- 39/02 . Details
- 39/025 . . {for Josephson devices}
- 39/04 . . Containers; Mountings
- 39/045 . . . {for Josephson devices}
- 39/06 . . characterised by the current path
- 39/08 . . characterised by the shape of the element
- 39/10 . . characterised by the means for switching {between superconductive and normal states}
- 39/12 . . characterised by the material
- 39/121 . . . {Organic materials}
- 39/123 {Fullerene superconductors, e.g. soccerball-shaped allotrope of carbon, e.g. C_{60} , C_{94} (fullerenes in general [C07C 13/00](#))}
- 39/125 . . . {Ceramic materials}
- 39/126 {comprising copper oxide}
- 39/128 {Multi-layered structures, e.g. super lattices}
- 39/14 . Permanent superconductor devices
- 39/141 . . {comprising metal borides, e.g. MgB_2 }
- 39/143 . . {comprising high T_c ceramic materials}
- 39/145 . . {Three or more electrode devices ([H01L 39/228](#) takes precedence)}
- 39/146 . . . {Field effect devices}
- 39/148 . . {Abrikosov vortex devices}
- 39/16 . Devices switchable between superconductive and normal states {, e.g. switches, current limiters (circuits for current limitation using superconductor elements [H02H 9/023](#))}
- 39/18 . . Cryotrons
- 39/20 . . . Power cryotrons
- 39/22 . Devices comprising a junction of dissimilar materials, e.g. Josephson-effect devices
- 39/221 . . {Single electron tunnelling devices}
- 39/223 . . {Josephson-effect devices}
- 39/225 . . . {comprising high T_c ceramic materials}
- 39/226 . . . {comprising metal borides, e.g. MgB_2 }
- 39/228 . . {three or more electrode devices, e.g. transistor-like structures}
- 39/24 . Processes or apparatus peculiar to the manufacture or treatment of devices provided for in [H01L 39/00](#) or of parts thereof
- 39/2403 . . {Processes peculiar to the manufacture or treatment of composite superconductor filaments (comprising copper oxide [H01L 39/2419](#))}
- 39/2406 . . {of devices comprising Nb or an alloy of Nb with one or more of the elements of group 4, e.g. Ti, Zr, Hf}
- 39/2409 . . {of devices comprising an intermetallic compound of type A-15, e.g. Nb_3Sn }
- 39/2412 . . {of devices comprising molybdenum chalcogenides}
- 39/2416 . . {of devices comprising nitrides or carbonitrides}
- 39/2419 . . {the superconducting material comprising copper oxide}
- 39/2422 . . . {Processes for depositing or forming superconductor layers}
- 39/2425 {from a solution}
- 39/2429 {from a suspension or slurry, e.g. screen printing; doctor blade casting}
- 39/2432 {by evaporation independent of heat source, e.g. MBE}
- 39/2435 {by sputtering}

- 39/2438 {by chemical vapour deposition [CVD]}
- 39/2441 {by metalloorganic chemical vapour deposition [MOCVD]}
- 39/2445 {by thermal spraying, e.g. plasma deposition}
- 39/2448 {Pulsed laser deposition, e.g. laser sputtering; laser ablation}
- 39/2451 {Precursor deposition followed by after-treatment, e.g. oxidation}
- 39/2454 {characterised by the substrate}
- 39/2458 {Monocrystalline substrates, e.g. epitaxial growth}
- 39/2461 {Intermediate layers, e.g. for growth control}
- 39/2464 . . . {After-treatment, e.g. patterning}
- 39/2467 {Etching}
- 39/247 {Passivation}
- 39/2474 . . . {Manufacture or deposition of contacts or electrodes}
- 39/2477 . . . {Processes including the use of precursors}
- 39/248 . . . {Processes peculiar to the manufacture or treatment of filaments or composite wires}
- 39/2483 . . . {Introducing flux pinning centres}
- 39/2487 . . {of devices comprising metal borides, e.g. MgB₂}
- 39/249 . . {Treatment of superconductive layers by irradiation, e.g. ion-beam, electron-beam, laser beam, X-rays (irradiation devices [G21K](#), [H01J](#))}
- 39/2493 . . {for Josephson devices}
- 39/2496 . . . {comprising high T_c ceramic materials}
- 41/00 Piezo-electric devices in general; Electrostrictive devices in general; Magnetostrictive devices in general; Processes or apparatus specially adapted for the manufacture or treatment thereof or of parts thereof; Details thereof (devices consisting of a plurality of solid-state components formed in or on a common substrate [H01L 27/00](#))**
- WARNING**
- Groups [H01L 41/23-H01L 41/47](#) are incomplete pending reclassification of documents from group [H01L 41/22](#).
- Groups [H01L 41/23-H01L 41/47](#) and [H01L 41/22](#) should be considered in order to perform a complete search.
- 41/02 . Details
- 41/04 . . of piezo-electric or electrostrictive devices
- 41/042 . . . {Drive or control circuitry or methods for piezo-electric or electrostrictive devices not otherwise provided for}
- 41/044 {for piezoelectric transformers (conversion of DC or AC power [H02M](#); for operating discharge lamps [H05B 41/282](#))}
- 41/047 . . . Electrodes {or electrical connection arrangements}
- 41/0471 {Individual layer electrodes of multilayer piezo-electric or electrostrictive devices, e.g. internal electrodes}
- 41/0472 {Connection electrodes of multilayer piezo-electric or electrostrictive devices, e.g. external electrodes}
- 41/0474 {embedded within piezo-electric or electrostrictive material, e.g. via connections}
- 41/0475 {Further connection or lead arrangements, e.g. flexible wiring boards, terminal pins}
- 41/0477 {Conductive materials (in general [H01B 1/00](#))}
- 41/0478 {the principal material being non-metallic, e.g. oxide or carbon based}
- 41/053 . . . Mounts, supports, enclosures or casings
- 41/0533 {Further insulation means against electrical, physical or chemical damage, e.g. protective coatings}
- 41/0536 {Mechanical prestressing means, e.g. springs (in general [F16F 1/00](#))}
- 41/06 . . of magnetostrictive devices
- 41/08 . Piezo-electric or electrostrictive devices
- 41/0805 . . {based on piezo-electric or electrostrictive films or coatings}
- 41/081 . . . {characterised by the underlying base, e.g. substrates}
- 41/0815 {Intermediate layers, e.g. barrier, adhesion or growth control buffer layers}
- 41/082 . . {based on piezo-electric or electrostrictive fibres}
- 41/0825 . . {with electrical and mechanical input and output, e.g. having combined actuator and sensor parts}
- 41/083 . . having a stacked or multilayer structure
- 41/0831 . . . {with non-rectangular cross-section in stacking direction, e.g. polygonal, trapezoidal}
- 41/0833 . . . {with non-rectangular cross-section orthogonal to the stacking direction, e.g. polygonal, circular}
- 41/0835 {Annular cross-section}
- 41/0836 . . . {of cylindrical shape with stacking in radial direction, e.g. coaxial or spiral type rolls}
- 41/0838 . . . {adapted for alleviating internal stress, e.g. cracking control layers ("Sollbruchstellen")}
- 41/087 . . formed as coaxial cables
- 41/09 . . with electrical input and mechanical output {, e.g. actuators, vibrators (in frequency selective networks [H03H 9/00](#))}
- 41/0906 . . . {using longitudinal or thickness displacement combined with bending, shear or torsion displacement}
- 41/0913 {with polygonal or rectangular shape}
- 41/092 {with cylindrical or annular shape}
- 41/0926 . . . {using bending displacement, e.g. unimorph, bimorph or multimorph cantilever or membrane benders}
- 41/0933 {Beam type}
- 41/094 {Cantilevers, i.e. having one fixed end}
- 41/0946 {connected at their free ends, e.g. parallelogram type}
- 41/0953 {with multiple segments mechanically connected in series, e.g. zig-zag type}
- 41/096 {adapted for in-plane bending displacement}
- 41/0966 {adapted for multi-directional bending displacement}
- 41/0973 {Membrane type}
- 41/098 {with non-planar shape}
- 41/0986 . . . {using longitudinal or thickness displacement only, e.g. d33 or d31 type devices}
- 41/0993 . . . {using shear or torsion displacement, e.g. d15 type devices}
- 41/107 . . with electrical input and electrical output {, e.g. transformers}

- 41/113 . . with mechanical input and electrical output {, e.g. generators, sensors}
- 41/1132 . . . {Sensors}
- 41/1134 . . . {Beam type}
- 41/1136 {Cantilevers}
- 41/1138 . . . {Membrane type}
- 41/12 . Magnetostrictive devices
- 41/125 . . {with mechanical input and electrical output, e.g. generators, sensors}
- 41/16 . Selection of materials
- 41/18 . . for piezo-electric or electrostrictive devices {, e.g. bulk piezo-electric crystals}
- 41/183 . . . {Composite materials, e.g. having 1-3 or 2-2 type connectivity}
- 41/187 . . . Ceramic compositions {, i.e. synthetic inorganic polycrystalline compounds incl. epitaxial, quasi-crystalline materials}
- 41/1871 {Alkaline earth metal based oxides, e.g. barium titanates}
- 41/1873 {Alkali metal based oxides, e.g. lithium, sodium or potassium niobates}
- 41/1875 {Lead based oxides}
- 41/1876 {Lead zirconate titanate based}
- 41/1878 {Bismuth based oxides}
- 41/193 . . . Macromolecular compositions {, e.g. piezo-electric polymers}
- 41/20 . . for magnetostrictive devices
- 41/22 . Processes or apparatus specially adapted for the assembly, manufacture or treatment of piezo-electric or electrostrictive devices or of parts thereof
- 41/23 . . Forming enclosures or casings
- 41/25 . . Assembling devices that include piezo-electric or electrostrictive parts
- 41/253 . . Treating devices or parts thereof to modify a piezo-electric or electrostrictive property, e.g. polarisation characteristics, vibration characteristics or mode tuning
- 41/257 . . . by polarising
- 41/27 . . Manufacturing multilayered piezo-electric or electrostrictive devices or parts thereof, e.g. by stacking piezo-electric bodies and electrodes
- 41/273 . . . by integrally sintering piezo-electric or electrostrictive bodies and electrodes
- 41/277 . . . by stacking bulk piezo-electric or electrostrictive bodies and electrodes
- 41/29 . . Forming electrodes, leads or terminal arrangements
- 41/293 . . . Connection electrodes of multilayered piezo-electric or electrostrictive parts
- NOTE**
- Integral individual layer electrode and connection electrode are classified in both [H01L 41/293](#) and [H01L 41/297](#)
- 41/297 . . . Individual layer electrodes of multilayered piezo-electric or electrostrictive parts
- NOTE**
- Integral individual layer electrode and connection electrode are classified in both [H01L 41/293](#) and [H01L 41/297](#)
- 41/31 . . Applying piezo-electric or electrostrictive parts or bodies onto an electrical element or another base
- 41/311 . . . Mounting of piezo-electric or electrostrictive parts together with semiconductor elements, or other circuit elements, on a common substrate
- 41/312 . . . by laminating or bonding of piezo-electric or electrostrictive bodies
- 41/313 by metal fusing or with adhesives
- 41/314 . . . by depositing piezo-electric or electrostrictive layers, e.g. aerosol or screen printing
- 41/316 by vapour phase deposition
- 41/317 by liquid phase deposition
- 41/318 by sol-gel deposition
- 41/319 using intermediate layers, e.g. for growth control
- 41/33 . . Shaping or machining of piezo-electric or electrostrictive bodies
- 41/331 . . . by coating or depositing using masks, e.g. lift-off
- 41/332 . . . by etching, e.g. lithography
- 41/333 . . . by moulding or extrusion
- 41/335 . . . by machining
- 41/337 by polishing or grinding
- 41/338 by cutting or dicing
- 41/339 by punching
- 41/35 . . Forming piezo-electric or electrostrictive materials
- 41/37 . . . Composite materials
- 41/39 . . . Inorganic materials
- 41/41 by melting
- 41/43 by sintering
- 41/45 . . . Organic materials
- 41/47 . Processes or apparatus specially adapted for the assembly, manufacture or treatment of magnetostrictive devices or of parts thereof
- 43/00** **Devices using galvano-magnetic or similar magnetic effects; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof (devices consisting of a plurality of solid state components formed in or on a common substrate [H01L 27/00](#); devices with potential-jump barrier, or surface barrier controllable by variation of a magnetic field [H01L 29/82](#))**
- 43/02 . Details
- 43/04 . . of Hall-effect devices
- 43/06 . Hall-effect devices
- 43/065 . . {Semiconductor Hall-effect devices}
- 43/08 . Magnetic-field-controlled resistors
- 43/10 . Selection of materials
- 43/12 . Processes or apparatus peculiar to the manufacture or treatment of these devices or of parts thereof ([not peculiar thereto \[H01L 21/00\]\(#\)](#))
- 43/14 . . for Hall-effect devices

- 45/00 Solid state devices adapted for rectifying, amplifying, oscillating or switching without a potential-jump barrier or surface barrier, e.g. dielectric triodes; Ovshinsky-effect devices; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof (devices consisting of a plurality of solid state components formed in or on a common substrate [H01L 27/00](#); devices using superconductivity [H01L 39/00](#); piezo-electric devices [H01L 41/00](#); bulk negative resistance effect devices [H01L 47/00](#); {memories [G11C 11/34](#); [G11C 13/0002](#); amplifying circuits [H03F 11/00](#); pulse generation [H03K 3/02](#); electronic switching circuits [H03K 17/00](#); logic circuits [H03K 19/00](#)})**
- 45/005 . {Charge density wave transport devices}
 - 45/02 . Solid state travelling-wave devices
 - 45/04 . {Bistable or multistable switching devices, e.g. for resistance switching non-volatile memory}
 - 45/06 . . {based on solid-state phase change, e.g. between amorphous and crystalline phases, Ovshinsky effect}
 - 45/065 . . . {between different crystalline phases, e.g. cubic and hexagonal}
 - 45/08 . . {based on migration or redistribution of ionic species, e.g. anions, vacancies}
 - 45/085 . . . {the species being metal cations, e.g. programmable metallization cells}
 - 45/10 . . {based on bulk electronic defects, e.g. trapping of electrons}
 - 45/12 . . {Details}
 - 45/1206 . . . {Three or more terminal devices, e.g. transistor like devices}
 - 45/1213 . . . {Radiation or particle beam assisted switching devices, e.g. optically controlled devices}
 - 45/122 . . . {Device geometry}
 - 45/1226 {adapted for essentially horizontal current flow, e.g. bridge type devices}
 - 45/1233 {adapted for essentially vertical current flow, e.g. sandwich or pillar type devices}
 - 45/124 {on sidewalls of dielectric structures, e.g. mesa or cup type devices}
 - 45/1246 {Further means within the switching material region to limit current flow, e.g. constrictions}
 - 45/1253 . . . {Electrodes}
 - 45/126 {adapted for resistive heating}
 - 45/1266 {adapted for supplying ionic species}
 - 45/1273 {adapted for electric field or current focusing, e.g. tip shaped}
 - 45/128 . . . {Thermal details}
 - 45/1286 {Heating or cooling means other than resistive heating electrodes, e.g. heater in parallel}
 - 45/1293 {Thermal insulation means}
 - 45/14 . . {Selection of switching materials}
 - 45/141 . . . {Compounds of sulfur, selenium or tellurium, e.g. chalcogenides}
 - 45/142 {Sulfides, e.g. CuS}
 - 45/143 {Selenides, e.g. GeSe}
 - 45/144 {Tellurides, e.g. GeSbTe}
 - 45/145 . . . {Oxides or nitrides}
 - 45/146 {Binary metal oxides, e.g. TaOx}
 - 45/147 {Complex metal oxides, e.g. perovskites, spinels}
 - 45/148 . . . {Other compounds of groups 13-15, e.g. elemental or compound semiconductors}
 - 45/149 {Carbon or carbides}
 - 45/16 . . {Manufacturing}
 - 45/1608 . . . {Formation of the switching material, e.g. layer deposition}
 - 45/1616 {by chemical vapor deposition, e.g. MOCVD, ALD}
 - 45/1625 {by physical vapor deposition, e.g. sputtering}
 - 45/1633 {by conversion of electrode material, e.g. oxidation}
 - 45/1641 . . . {Modification of the switching material, e.g. post-treatment, doping}
 - 45/165 {by implantation}
 - 45/1658 {by diffusion, e.g. photo-dissolution}
 - 45/1666 . . . {Patterning of the switching material}
 - 45/1675 {by etching of pre-deposited switching material layers, e.g. lithography}
 - 45/1683 {by filling of openings, e.g. damascene method}
 - 45/1691 {Patterning process specially adapted for achieving sub-lithographic dimensions, e.g. using spacers}
- 47/00 Bulk negative resistance effect devices, e.g. Gunn-effect devices; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof (devices consisting of a plurality of solid state components formed in or on a common substrate [H01L 27/00](#))**
- 47/005 . {Processes or apparatus peculiar to the manufacture or treatment of these devices or of parts thereof (not peculiar thereto [H01L 21/00](#))}
 - 47/02 . Gunn-effect devices {or transferred electron devices}
 - 47/023 . . {controlled by electromagnetic radiation}
 - 47/026 . . {Gunn diodes ([H01L 47/02](#) takes precedence)}
- 49/00 Solid state devices not provided for in groups [H01L 27/00](#) - [H01L 47/00](#) and [H01L 51/00](#) and not provided for in any other subclass; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof**
- 49/003 . {Devices using Mott metal-insulator transition, e.g. field effect transistors}
 - 49/006 . {Quantum devices, e.g. Quantum Interference Devices, Metal Single Electron Transistor (using semiconductors in the active part [H01L 29/00](#))}
 - 49/02 . Thin-film or thick-film devices
- 51/00 Solid state devices using organic materials as the active part, or using a combination of organic materials with other materials as the active part; Processes or apparatus specially adapted for the manufacture or treatment of such devices, or of parts thereof (devices consisting of a plurality of components formed in or on a common substrate [H01L 27/28](#); thermoelectric devices using organic material [H01L 35/00](#), [H01L 37/00](#); piezoelectric, electrostrictive or magnetostrictive elements using organic material [H01L 41/00](#))**

- 51/0001 . {Processes specially adapted for the manufacture or treatment of devices or of parts thereof ([multistep processes H01L 51/0098](#), [H01L 51/05](#), [H01L 51/42](#), [H01L 51/50](#))}
- 51/0002 . . {Deposition of organic semiconductor materials on a substrate}
- 51/0003 . . . {using liquid deposition, e.g. spin coating}
- 51/0004 {using printing techniques, e.g. ink-jet printing, screen printing}
- 51/0005 {ink-jet printing}
- 51/0006 {Electrolytic deposition using an external electrical current, e.g. in-situ electropolymerisation}
- 51/0007 {characterised by the solvent}
- 51/0008 . . . {using physical deposition, e.g. sublimation, sputtering}
- 51/0009 {using laser ablation}
- 51/001 {Vacuum deposition}
- 51/0011 {selective deposition, e.g. using a mask}
- 51/0012 . . . {special provisions for the orientation or alignment of the layer to be deposited}
- 51/0013 . . . {using non liquid printing techniques, e.g. thermal transfer printing from a donor sheet}
- 51/0014 . . {for changing the shape of the device layer, e.g. patterning}
- 51/0015 . . . {by selective transformation of an existing layer}
- 51/0016 . . . {lift off techniques}
- 51/0017 . . . {etching of an existing layer}
- 51/0018 {using photolithographic techniques}
- 51/0019 {using printing techniques, e.g. applying the etch liquid using an ink jet printer}
- 51/002 . . {Making n- or p-doped regions}
- 51/0021 . . {Formation of conductors}
- 51/0022 . . . {using printing techniques, e.g. ink jet printing}
- 51/0023 . . . {Patterning of conductive layers}
- 51/0024 . . {for forming devices by joining two substrates together, e.g. lamination technique}
- 51/0025 . . {Purification process of the organic semiconductor material}
- 51/0026 . . {Thermal treatment of the active layer, e.g. annealing}
- 51/0027 . . . {using coherent electromagnetic radiation, e.g. laser annealing}
- 51/0028 . . . {Thermal treatment in the presence of solvent vapors, e.g. solvent annealing}
- 51/0029 . . {Special provisions for controlling the atmosphere during processing ([H01L 51/0026 takes precedence](#))}
- 51/003 . . {using a temporary substrate}
- 51/0031 . . {Testing, e.g. accelerated lifetime tests of photoelectric devices}
- 51/0032 . {Selection of organic semiconducting materials, e.g. organic light sensitive or organic light emitting materials}
- NOTE**
- This group only covers the selection of organic materials for their electrical or other properties insofar as they are specific for their use in devices covered by the group [H01L 51/00](#). For the materials [per se](#), [see](#) the relevant subclasses.
- Attention is drawn to the following places:
- organic materials in general [C07C](#), [C07D](#), [C07E](#), [C08L](#);
 - organic materials as electrical conductors [H01B 1/12](#);
 - organic materials as electrical insulators [H01B 3/18](#)
- 51/0034 . . {Organic polymers or oligomers ([organic macromolecular compounds or compositions per se C08](#))}
- 51/0035 . . . {comprising aromatic, heteroaromatic, or aryl chains, e.g. polyaniline ([per se C08G 73/026](#)), polyphenylene ([per se C08G 61/10](#)), polyphenylene vinylene ([per se C08G 61/02](#))}
- 51/0036 {Heteroaromatic compounds comprising sulfur or selenium, e.g. polythiophene ([per se C08G 61/126](#))}
- 51/0037 {Polyethylene dioxythiophene [PEDOT] and derivatives}
- 51/0038 {Poly-phenylenevinylene and derivatives ([per se C08G 61/10](#))}
- 51/0039 {Polyfluorene and derivatives}
- 51/004 . . . {comprising aliphatic or olefinic chains, e.g. poly N-vinylcarbazol, PVC, PTFE}
- 51/0041 {Poly acetylene ([per se C08G 61/04](#), [C08F 38/02](#), [C08F 138/02](#), [C08F 238/02](#)) or derivatives}
- 51/0042 {poly N-vinylcarbazol and derivatives}
- 51/0043 . . . {Copolymers}
- 51/0044 . . . {Ladder-type polymers}
- 51/0045 . . {Carbon containing materials, e.g. carbon nanotubes, fullerenes ([per se C01B 32/15](#))}
- 51/0046 . . . {Fullerenes, e.g. C₆₀, C₇₀}
- 51/0047 {comprising substituents, e.g. PCBM}
- 51/0048 . . . {Carbon nanotubes}
- 51/0049 {comprising substituents}
- 51/005 . . {Macromolecular systems with low molecular weight, e.g. cyanine dyes, coumarine dyes, tetrathiafulvalene ([H01L 51/0045](#), [H01L 51/0077](#), [H01L 51/0093](#), [H01L 51/0094 take precedence](#))}
- 51/0051 . . . {Charge transfer complexes}
- 51/0052 . . . {Polycyclic condensed aromatic hydrocarbons, e.g. anthracene}
- 51/0053 {Aromatic anhydride or imide compounds, e.g. perylene tetra-carboxylic dianhydride, perylene tetracarboxylic diimide}
- 51/0054 {containing four rings, e.g. pyrene}
- 51/0055 {containing five rings, e.g. pentacene}
- 51/0056 {containing six or more rings}
- 51/0057 {containing at least one aromatic ring having 7 or more carbon atoms, e.g. azulene}
- 51/0058 {containing more than one polycyclic condensed aromatic rings, e.g. bis-anthracene}
- 51/0059 . . . {Amine compounds having at least two aryl rest on at least one amine-nitrogen atom, e.g. triphenylamine ([per se C07C 211/00](#))}
- 51/006 {comprising polycyclic condensed aromatic hydrocarbons as substituents on the nitrogen atom}
- 51/0061 {comprising heteroaromatic hydrocarbons as substituents on the nitrogen atom}

- 51/0062 . . . {aromatic compounds comprising a heteroatom, e.g.: N,P,S}
- 2051/0063 {Oxadiazole Compounds}
- 51/0064 {Cyanine Dyes}
- 51/0065 {comprising only oxygen as heteroatom}
- 51/0067 {comprising only nitrogen as heteroatom (H01L 51/0064 takes precedence)}
- 51/0068 {comprising only sulfur as heteroatom}
- 51/0069 {comprising two or more different heteroatoms per ring, e.g. S and N (H01L 51/0064 takes precedence)}
- 51/007 {oxadiazole compounds}
- 51/0071 {Polycyclic condensed heteroaromatic hydrocarbons}
- 51/0072 {comprising only nitrogen in the heteroaromatic polycondensed ringsystem, e.g. phenanthroline, carbazole}
- 51/0073 {comprising only oxygen in the heteroaromatic polycondensed ringsystem, e.g. cumarine dyes}
- 51/0074 {comprising only sulfur in the heteroaromatic polycondensed ringsystem, e.g. benzothiophene}
- 51/0075 . . {Langmuir Blodgett films (per se B05D 1/202)}
- 51/0076 . . {Liquid crystalline materials (per se C09K 19/00)}
- 51/0077 . . {Coordination compounds, e.g. porphyrin}
- 51/0078 . . . {Phthalocyanine (per se C09B 47/04)}
- 51/0079 . . . {Metal complexes comprising a IIIB-metal (B, Al, Ga, In or Tl), e.g. Tris (8-hydroxyquinoline) gallium (Gaq₃)}
- 51/008 {comprising boron}
- 51/0081 {comprising aluminium, e.g. Alq₃}
- 51/0082 {comprising gallium}
- 51/0083 . . . {Metal complexes comprising an iron-series metal, e.g. Fe, Co, Ni}
- 51/0084 . . . {Transition metal complexes, e.g. Ru(II)polypyridine complexes}
- 51/0085 {comprising Iridium}
- 51/0086 {comprising Ruthenium}
- 51/0087 {comprising platinum}
- 51/0088 {comprising osmium}
- 51/0089 . . . {Metal complexes comprising Lanthanides or Actinides, e.g. Eu}
- 51/009 . . . {Polynuclear complexes, i.e. complexes having two or more metal centers}
- 51/0091 . . . {Metal complexes comprising a IB-metal (Cu, Ag, Au)}
- 51/0092 . . . {Metal complexes comprising a IIB-metal (Zn, Cd, Hg)}
- 51/0093 . . . {Biomolecules or bio-macromolecules, e.g. proteins, ATP, chlorophyl, beta-carotene, lipids, enzymes}
- 51/0094 . . {Silicon-containing organic semiconductors}
- 51/0095 . . {Starburst compounds}
- 51/0096 . {Substrates}
- 51/0097 . . {flexible substrates}
- 51/0098 . {Molecular electronic devices (molecular computers G06F 15/80; molecular memories G11C 11/00, G11C 13/02)}
- 51/05 . . specially adapted for rectifying, amplifying, oscillating or switching, or capacitors or resistors with at least one potential- jump barrier or surface barrier {multistep processes for their manufacture}
- 51/0504 . . {the devices being controllable only by the electric current supplied or the electric potential applied, to an electrode which does not carry the current to be rectified, amplified or switched, e.g. three-terminal devices}
- 51/0508 . . . {Field-effect devices, e.g. TFTs}
- 51/0512 {insulated gate field effect transistors}
- 51/0516 {characterised by the gate dielectric}
- 51/052 {the gate dielectric comprising only organic materials}
- 51/0525 {the gate dielectric comprising only inorganic materials}
- 51/0529 {the gate dielectric having a multilayered structure}
- 51/0533 {Combinations of organic and inorganic layers}
- 51/0537 {the gate dielectric comprising composite materials, e.g. TiO₂ particles in a polymer matrix}
- 51/0541 {Lateral single gate single channel transistors with non inverted structure, i.e. the organic semiconductor layer is formed before the gate electrode}
- 51/0545 {Lateral single gate single channel transistors with inverted structure, i.e. the organic semiconductor layer is formed after the gate electrode}
- 51/055 {characterised by the gate conductor}
- 51/0554 {the transistor having two or more gate electrodes}
- 51/0558 {characterised by the channel of the transistor}
- 51/0562 {the channel comprising two or more active layers, e.g. forming pn - hetero junction}
- 51/0566 {the channel comprising a composite layer, e.g. a mixture of donor and acceptor moieties, forming pn - bulk hetero junction}
- 51/057 {having a vertical structure, e.g. vertical carbon nanotube field effect transistors [CNT-FETs]}
- 51/0575 . . . {the devices being controllable only by variation of the electric current supplied or the electric potential applied, to one or more of the electrodes carrying the current to be rectified, amplified, oscillated or switched, e.g. two-terminal devices}
- 51/0579 . . . {Schottky diodes}
- 51/0583 . . . {comprising an organic/organic junction, e.g. hetero-junction}
- 51/0587 . . . {comprising an organic/inorganic hetero-junction, e.g. hetero-junction}
- 51/0591 . . . {Bi-stable switching devices}
- 51/0595 . . . {molecular electronic devices (molecular computers G06F 15/80; molecular memories G11C 11/00, G11C 13/02)}
- 51/10 . . Details of devices
- 51/102 . . . {Electrodes}
- 51/105 {Ohmic contacts, e.g. source and drain electrodes}
- 51/107 . . . {Passivation, containers, encapsulations}

- 51/42 . . . specially adapted for sensing infra-red radiation, light, electro-magnetic radiation of shorter wavelength or corpuscular radiation and adapted for the conversion of the energy of such radiation into electrical energy or for the control of electrical energy by such radiation {using organic materials as the active part, or using a combination of organic materials with other material as the active part; Multistep processes for their manufacture}
- 51/4206 . . {Metal-organic semiconductor-metal devices}
- 51/4213 . . {Comprising organic semiconductor-inorganic semiconductor hetero-junctions ([H01L 51/4253 takes precedence](#))}
- 51/422 . . . {Majority carrier devices using sensitisation of widebandgap semiconductors, e.g. TiO₂ (photoelectrochemical devices with a liquid or solid electrolyte [H01G 9/20](#))}
- 51/4226 {the wideband gap semiconductor comprising titanium oxide, e.g. TiO₂}
- 51/4233 {the wideband gap semiconductor comprising zinc oxide, e.g. ZnO}
- 51/424 . . {comprising organic semiconductor-organic semiconductor hetero-junctions ([H01L 51/4253 takes precedence](#))}
- 51/4246 . . . {comprising multi-junctions, e.g. double hetero-junctions}
- 51/4253 . . {comprising bulk hetero-junctions, e.g. interpenetrating networks}
- 51/426 . . . {comprising inorganic nanostructures, e.g. CdSe nanoparticles}
- 51/4266 {the inorganic nanostructures being nanotubes or nanowires, e.g. CdTe nanotubes in P3HT}
- 51/4273 . . . {comprising blocking layers, e.g. exciton blocking layers}
- 51/428 . . {light sensitive field effect devices}
- 51/4286 . . {Devices having a m-i-s structure}
- 51/4293 . . {Devices having a p-i-n structure}
- 51/44 . . Details of devices
- 51/441 . . . {Electrodes}
- 51/442 {transparent electrodes, e.g. ITO, TCO}
- 51/444 {comprising carbon nanotubes}
- 51/445 {comprising arrangements for extracting the current from the cell, e.g. metal finger grid systems to reduce the serial resistance of transparent electrodes}
- 51/447 . . . {Light trapping means}
- 51/448 . . . {Passivation, containers, encapsulations}
- 51/50 . . specially adapted for light emission, e.g. organic light emitting diodes [OLED] or polymer light emitting devices [PLED]; ([organic semiconductor lasers H01S 5/36](#); [circuit arrangements for OLED or PLED H05B 33/0896](#); [control arrangements for organic electroluminescent displays G09G 3/3208](#))
- 51/5004 . . {characterised by the interrelation between parameters of constituting active layers, e.g. HOMO-LUMO relation}
- 51/5008 . . {Intermediate layers comprising a mixture of materials of the adjoining active layers}
- 51/5012 . . {Electroluminescent [EL] layer}
- 51/5016 . . . {Triplet emission}
- 51/502 . . . {comprising active inorganic nanostructures, e.g. luminescent quantum dots}
- 51/5024 {having a host comprising an emissive dopant and further additive materials, e.g. for improving the dispersability, for improving the stabilisation, for assisting energy transfer}
- 51/5028 {for assisting energy transfer, e.g. sensitization}
- 51/5032 {Light emitting electrochemical cells [LEC], i.e. with mobile ions in the active layer}
- 51/5036 {Multi-colour light emission, e.g. colour tuning, polymer blend, stack of electroluminescent layers}
- 51/504 {Stack of electroluminescent layers}
- 51/5044 {with spacer layers between the emissive layers}
- 51/5048 . . . {Carrier transporting layer}
- 51/5052 {Doped transporting layer}
- 51/5056 {Hole transporting layer}
- 51/506 {comprising a dopant}
- 51/5064 {having a multilayered structure}
- 51/5068 {arranged between the light emitting layer and the cathode}
- 51/5072 {Electron transporting layer}
- 51/5076 {comprising a dopant}
- 51/508 {having a multilayered structure}
- 51/5084 {arranged between the light emitting layer and the anode}
- 51/5088 . . . {Carrier injection layer}
- 51/5092 {Electron injection layer}
- 51/5096 . . . {Carrier blocking layer}
- 51/52 . . Details of devices
- 51/5203 . . . {Electrodes}
- 51/5206 {Anodes, i.e. with high work-function material}
- 51/5209 {characterised by the shape}
- 51/5212 {combined with auxiliary electrode, e.g. ITO layer combined with metal lines}
- 51/5215 {composed of transparent multilayers}
- 51/5218 {Reflective anodes, e.g. ITO combined with thick metallic layer}
- 51/5221 {Cathodes, i.e. with low work-function material}
- 51/5225 {characterised by the shape}
- 51/5228 {combined with auxiliary electrodes}
- 51/5231 {composed of opaque multilayers}
- 51/5234 {Transparent, e.g. including thin metal film}
- 51/5237 {Passivation; Containers; Encapsulation, e.g. against humidity}
- 51/524 {Sealing arrangements having a self-supporting structure, e.g. containers}
- 51/5243 {the sealing arrangements being made of metallic material}
- 51/5246 {characterised by the peripheral sealing arrangements, e.g. adhesives, sealants}
- 51/525 {Vertical spacers, e.g. arranged between the sealing arrangement and the OLED}
- 51/5253 {Protective coatings}
- 51/5256 {having repetitive multilayer structures}
- 51/5259 {including getter material or desiccant}
- 51/5262 {Arrangements for extracting light from the device}
- 51/5265 {comprising a resonant cavity structure, e.g. Bragg reflector pair}

- 51/5268 {Scattering means}
- 51/5271 {Reflective means}
- 51/5275 {Refractive means, e.g. lens}
- 51/5278 {comprising a repetitive electroluminescent unit between one set of electrodes}
- 51/5281 . . . {Arrangements for contrast improvement, e.g. preventing reflection of ambient light}
- 51/5284 {comprising a light absorbing layer, e.g. black layer}
- 51/5287 . . . {OLED having a fiber structure}
- 51/529 . . . {Arrangements for heating or cooling}
- 51/5293 . . . {Arrangements for polarized light emission (H01L 51/5281 takes precedence)}
- 51/5296 . . . {Light emitting organic transistors}
- 51/56 . . Processes or apparatus specially adapted for the manufacture or treatment of such devices or of parts thereof
- 2221/00** **Processes or apparatus adapted for the manufacture or treatment of semiconductor or solid state devices or of parts thereof covered by H01L 21/00**
- 2221/10 . . Applying interconnections to be used for carrying current between separate components within a device
- 2221/1005 . . Formation and after-treatment of dielectrics
- 2221/101 . . . Forming openings in dielectrics
- 2221/1015 for dual damascene structures
- 2221/1021 Pre-forming the dual damascene structure in a resist layer
- 2221/1026 the via being formed by burying a sacrificial pillar in the dielectric and removing the pillar
- 2221/1031 Dual damascene by forming vias in the via-level dielectric prior to deposition of the trench-level dielectric
- 2221/1036 Dual damascene with different via-level and trench-level dielectrics
- 2221/1042 . . . the dielectric comprising air gaps
- 2221/1047 the air gaps being formed by pores in the dielectric
- 2221/1052 . . . Formation of thin functional dielectric layers
- 2221/1057 in via holes or trenches
- 2221/1063 Sacrificial or temporary thin dielectric films in openings in a dielectric
- 2221/1068 . . Formation and after-treatment of conductors
- 2221/1073 . . . Barrier, adhesion or liner layers
- 2221/1078 Multiple stacked thin films not being formed in openings in dielectrics
- 2221/1084 Layers specifically deposited to enhance or enable the nucleation of further layers, i.e. seed layers
- 2221/1089 Stacks of seed layers
- 2221/1094 . . . Conducting structures comprising nanotubes or nanowires
- 2221/67 . . Apparatus for handling semiconductor or electric solid state devices during manufacture or treatment thereof; Apparatus for handling wafers during manufacture or treatment of semiconductor or electric solid state devices or components; Apparatus not specifically provided for elsewhere
- 2221/683 . . for supporting or gripping
- 2221/68304 . . . using temporarily an auxiliary support
- 2221/68309 Auxiliary support including alignment aids
- 2221/68313 Auxiliary support including a cavity for storing a finished device, e.g. IC package, or a partly finished device, e.g. die, during manufacturing or mounting
- 2221/68318 Auxiliary support including means facilitating the separation of a device or wafer from the auxiliary support
- 2221/68322 Auxiliary support including means facilitating the selective separation of some of a plurality of devices from the auxiliary support
- 2221/68327 used during dicing or grinding
- 2221/68331 of passive members, e.g. die mounting substrate
- 2221/68336 involving stretching of the auxiliary support post dicing
- 2221/6834 used to protect an active side of a device or wafer
- 2221/68345 used as a support during the manufacture of self supporting substrates
- 2221/6835 used as a support during build up manufacturing of active devices
- 2221/68354 used to support diced chips prior to mounting
- 2221/68359 used as a support during manufacture of interconnect decals or build up layers
- 2221/68363 used in a transfer process involving transfer directly from an origin substrate to a target substrate without use of an intermediate handle substrate
- 2221/68368 used in a transfer process involving at least two transfer steps, i.e. including an intermediate handle substrate
- 2221/68372 used to support a device or wafer when forming electrical connections thereto (when forming bonding pads H01L 24/03; when forming bump connectors H01L 24/11; when forming layer connectors H01L 24/27)
- 2221/68377 with parts of the auxiliary support remaining in the finished device
- 2221/68381 Details of chemical or physical process used for separating the auxiliary support from a device or wafer
- 2221/68386 Separation by peeling
- 2221/6839 using peeling wedge or knife or bar
- 2221/68395 using peeling wheel
- 2223/00** **Details relating to semiconductor or other solid state devices covered by the group H01L 23/00**
- 2223/544 . . Marks applied to semiconductor devices or parts
- 2223/54406 . . comprising alphanumeric information
- 2223/54413 . . comprising digital information, e.g. bar codes, data matrix
- 2223/5442 . . comprising non digital, non alphanumeric information, e.g. symbols
- 2223/54426 . . for alignment
- 2223/54433 . . containing identification or tracking information
- 2223/5444 . . . for electrical read out
- 2223/54446 Wireless electrical read out
- 2223/54453 . . for use prior to dicing
- 2223/5446 . . . Located in scribe lines
- 2223/54466 . . . Located in a dummy or reference die
- 2223/54473 . . for use after dicing
- 2223/5448 . . . Located on chip prior to dicing and remaining on chip after dicing

- 2223/54486 . . . Located on package parts, e.g. encapsulation, leads, package substrate
- 2223/54493 . . Peripheral marks on wafers, e.g. orientation flats, notches, lot number
- 2223/58 . Structural electrical arrangements for semiconductor devices not otherwise provided for
- 2223/64 . . Impedance arrangements
- 2223/66 . . . High-frequency adaptations
- 2223/6605 High-frequency electrical connections
- 2223/6611 Wire connections
- 2223/6616 Vertical connections, e.g. vias
- 2223/6622 Coaxial feed-throughs in active or passive substrates
- 2223/6627 Waveguides, e.g. microstrip line, strip line, coplanar line
- 2223/6633 Transition between different waveguide types
- 2223/6638 Differential pair signal lines
- 2223/6644 Packaging aspects of high-frequency amplifiers ([amplifiers per se H03F](#))
- 2223/665 Bias feed arrangements
- 2223/6655 Matching arrangements, e.g. arrangement of inductive and capacitive components
- 2223/6661 for passive devices ([passive components per se H01L 28/00](#))
- 2223/6666 for decoupling, e.g. bypass capacitors
- 2223/6672 for integrated passive components, e.g. semiconductor device with passive components only ([integrated circuits with passive components only per se H01L 27/01](#))
- 2223/6677 for antenna, e.g. antenna included within housing of semiconductor device ([antennas per se H01Q](#))
- 2223/6683 for monolithic microwave integrated circuit [MMIC]
- 2223/6688 Mixed frequency adaptations, i.e. for operation at different frequencies
- 2223/6694 Optical signal interface included within high-frequency semiconductor device housing
- 2224/00 Indexing scheme for arrangements for connecting or disconnecting semiconductor or solid-state bodies and methods related thereto as covered by [H01L 24/00](#)**
- 2224/01 . Means for bonding being attached to, or being formed on, the surface to be connected, e.g. chip-to-package, die-attach, "first-level" interconnects; Manufacturing methods related thereto
- 2224/02 . . Bonding areas; Manufacturing methods related thereto
- 2224/0212 . . . Auxiliary members for bonding areas, e.g. spacers
- 2224/02122 being formed on the semiconductor or solid-state body
- 2224/02123 inside the bonding area
- 2224/02125 Reinforcing structures
- 2224/02126 Collar structures
- 2224/0213 Alignment aids
- 2224/02135 Flow barrier
- 2224/0214 Structure of the auxiliary member
- 2224/02141 Multilayer auxiliary member
- 2224/02145 Shape of the auxiliary member
- 2224/0215 Material of the auxiliary member
- 2224/02163 on the bonding area
- 2224/02165 Reinforcing structures
- 2224/02166 Collar structures
- 2224/0217 Alignment aids
- 2224/02175 Flow barrier
- 2224/0218 Structure of the auxiliary member
- 2224/02181 Multilayer auxiliary member
- 2224/02185 Shape of the auxiliary member
- 2224/0219 Material of the auxiliary member
- 2224/022 Protective coating, i.e. protective bond-through coating
- 2224/02205 Structure of the protective coating
- 2224/02206 Multilayer protective coating
- 2224/0221 Shape of the protective coating
- 2224/02215 Material of the protective coating
- 2224/02233 not in direct contact with the bonding area
- 2224/02235 Reinforcing structures
- 2224/0224 Alignment aids
- 2224/02245 Flow barrier
- 2224/0225 Structure of the auxiliary member
- 2224/02251 Multilayer auxiliary member
- 2224/02255 Shape of the auxiliary member
- 2224/0226 Material of the auxiliary member
- 2224/023 Redistribution layers [RDL] for bonding areas
- 2224/0231 Manufacturing methods of the redistribution layers
- 2224/02311 Additive methods
- 2224/02313 Subtractive methods
- 2224/02315 Self-assembly processes
- 2224/02317 by local deposition
- 2224/02319 by using a preform
- 2224/02321 Reworking
- 2224/0233 Structure of the redistribution layers
- 2224/02331 Multilayer structure
- 2224/02333 being a bump
- 2224/02335 Free-standing redistribution layers
- 2224/0235 Shape of the redistribution layers
- 2224/02351 comprising interlocking features
- 2224/0236 Shape of the insulating layers therebetween
- 2224/0237 Disposition of the redistribution layers
- 2224/02371 connecting the bonding area on a surface of the semiconductor or solid-state body with another surface of the semiconductor or solid-state body
- 2224/02372 connecting to a via connection in the semiconductor or solid-state body
- 2224/02373 Layout of the redistribution layers
- 2224/02375 Top view
- 2224/02377 Fan-in arrangement
- 2224/02379 Fan-out arrangement
- 2224/02381 Side view
- 2224/0239 Material of the redistribution layers
- 2224/024 Material of the insulating layers therebetween
- 2224/03 Manufacturing methods
- 2224/03001 Involving a temporary auxiliary member not forming part of the manufacturing apparatus, e.g. removable or sacrificial coating, film or substrate
- 2224/03002 for supporting the semiconductor or solid-state body
- 2224/03003 for holding or transferring a preform

- 2224/03005 for aligning the bonding area, e.g. marks, spacers
- 2224/03009 for protecting parts during manufacture
- 2224/03011 Involving a permanent auxiliary member, i.e. a member which is left at least partly in the finished device, e.g. coating, dummy feature
- 2224/03013 for holding or confining the bonding area, e.g. solder flow barrier
- 2224/03015 for aligning the bonding area, e.g. marks, spacers
- 2224/03019 for protecting parts during the process
- 2224/031 Manufacture and pre-treatment of the bonding area preform
- 2224/0311 Shaping
- 2224/0312 Applying permanent coating
- 2224/033 by local deposition of the material of the bonding area
- 2224/0331 in liquid form
- 2224/03312 Continuous flow, e.g. using a microsyringe, a pump, a nozzle or extrusion
- 2224/03318 by dispensing droplets
- 2224/0332 Screen printing, i.e. using a stencil
- 2224/0333 in solid form
- 2224/03332 using a powder
- 2224/03334 using a preform
- 2224/034 by blanket deposition of the material of the bonding area
- 2224/0341 in liquid form
- 2224/03416 Spin coating
- 2224/03418 Spray coating
- 2224/0342 Curtain coating
- 2224/03422 by dipping, e.g. in a solder bath ([hot-dipping C23C 2/00](#))
- 2224/03424 Immersion coating, e.g. in a solder bath ([immersion processes C23C 2/00](#))
- 2224/03426 Chemical solution deposition [CSD], i.e. using a liquid precursor
- 2224/03428 Wave coating
- 2224/0343 in solid form
- 2224/03436 Lamination of a preform, e.g. foil, sheet or layer
- 2224/03438 the preform being at least partly pre-patterned
- 2224/0344 by transfer printing
- 2224/03442 using a powder
- 2224/03444 in gaseous form
- 2224/0345 Physical vapour deposition [PVD], e.g. evaporation, or sputtering
- 2224/03452 Chemical vapour deposition [CVD], e.g. laser CVD
- 2224/0346 Plating
- 2224/03462 Electroplating
- 2224/03464 Electroless plating
- 2224/03466 Conformal deposition, i.e. blanket deposition of a conformal layer on a patterned surface
- 2224/0347 using a lift-off mask
- 2224/03472 Profile of the lift-off mask
- 2224/03474 Multilayer masks
- 2224/0348 Permanent masks, i.e. masks left in the finished device, e.g. passivation layers
- 2224/035 by chemical or physical modification of a pre-existing or pre-deposited material
- 2224/03502 Pre-existing or pre-deposited material
- 2224/03505 Sintering
- 2224/0351 Anodisation
- 2224/03515 Curing and solidification, e.g. of a photosensitive material
- 2224/0352 Self-assembly, e.g. self-agglomeration of the material in a fluid
- 2224/03522 Auxiliary means therefor, e.g. for self-assembly activation
- 2224/03524 with special adaptation of the surface of the body to be connected or of an auxiliary substrate, e.g. surface shape specially adapted for the self-assembly process
- 2224/0355 Selective modification
- 2224/03552 using a laser or a focussed ion beam [FIB]
- 2224/03554 Stereolithography, i.e. solidification of a pattern defined by a laser trace in a photosensitive resin
- 2224/036 by patterning a pre-deposited material ([treatment of parts prior to assembly of the devices H01L 21/48](#))
- 2224/03602 Mechanical treatment, e.g. polishing, grinding
- 2224/0361 Physical or chemical etching
- 2224/03612 by physical means only
- 2224/03614 by chemical means only
- 2224/03616 Chemical mechanical polishing [CMP]
- 2224/03618 with selective exposure, development and removal of a photosensitive material, e.g. of a photosensitive conductive resin
- 2224/0362 Photolithography
- 2224/03622 using masks
- 2224/0363 using a laser or a focused ion beam [FIB]
- 2224/03632 Ablation by means of a laser or focused ion beam [FIB]
- 2224/037 involving monitoring, e.g. feedback loop
- 2224/038 Post-treatment of the bonding area
- 2224/0381 Cleaning, e.g. oxide removal step, desmearing
- 2224/0382 Applying permanent coating, e.g. in-situ coating
- 2224/03821 Spray coating
- 2224/03822 by dipping, e.g. in a solder bath
- 2224/03823 Immersion coating, e.g. in a solder bath
- 2224/03824 Chemical solution deposition [CSD], i.e. using a liquid precursor
- 2224/03825 Plating, e.g. electroplating, electroless plating
- 2224/03826 Physical vapour deposition [PVD], e.g. evaporation, or sputtering
- 2224/03827 Chemical vapour deposition [CVD], e.g. laser CVD
- 2224/03828 Applying flux
- 2224/03829 Applying a precursor material
- 2224/0383 Reworking, e.g. shaping ([reflowing H01L 2224/03849](#))
- 2224/03831 involving a chemical process, e.g. etching the bonding area

2224/0384	. . . . .	involving a mechanical process, e.g. planarising the bonding area	2224/05017	. . . . .	comprising protrusions or indentations
2224/03845	. . . . .	Chemical mechanical polishing [CMP]	2224/05018	. . . . .	being a conformal layer on a patterned surface
2224/03848	. . . . .	Thermal treatments, e.g. annealing, controlled cooling	2224/05019	. . . . .	being a non conformal layer on a patterned surface
2224/03849	. . . . .	Reflowing	2224/0502	. . . . .	Disposition
2224/039	. . . . .	Methods of manufacturing bonding areas involving a specific sequence of method steps	2224/05022	. . . . .	the internal layer being at least partially embedded in the surface
2224/03901	. . . . .	with repetition of the same manufacturing step	2224/05023	. . . . .	the whole internal layer protruding from the surface
2224/03902	. . . . .	Multiple masking steps	2224/05024	. . . . .	the internal layer being disposed on a redistribution layer on the semiconductor or solid-state body
2224/03903	. . . . .	using different masks	2224/05025	. . . . .	the internal layer being disposed on a via connection of the semiconductor or solid-state body
2224/03906	. . . . .	with modification of the same mask	2224/05026	. . . . .	the internal layer being disposed in a recess of the surface
2224/0391	. . . . .	Forming a passivation layer after forming the bonding area	2224/05027	. . . . .	the internal layer extending out of an opening
2224/03912	. . . . .	the bump being used as a mask for patterning the bonding area	2224/05073	. . . . .	Single internal layer
2224/03914	. . . . .	the bonding area, e.g. under bump metallisation [UBM], being used as a mask for patterning other parts	2224/05075	. . . . .	Plural internal layers
2224/03916	. . . . .	a passivation layer being used as a mask for patterning the bonding area	2224/05076	. . . . .	being mutually engaged together, e.g. through inserts
2224/0392	. . . . .	specifically adapted to include a probing step	2224/05078	. . . . .	being disposed next to each other, e.g. side-to-side arrangements
2224/03921	. . . . .	by repairing the bonding area damaged by the probing step	2224/0508	. . . . .	being stacked
2224/04	. . . . .	Structure, shape, material or disposition of the bonding areas prior to the connecting process	2224/05082	. . . . .	Two-layer arrangements
2224/0401	. . . . .	Bonding areas specifically adapted for bump connectors, e.g. under bump metallisation [UBM]	2224/05083	. . . . .	Three-layer arrangements
2224/04026	. . . . .	Bonding areas specifically adapted for layer connectors	2224/05084	. . . . .	Four-layer arrangements
2224/04034	. . . . .	Bonding areas specifically adapted for strap connectors	2224/05085	. . . . .	with additional elements, e.g. vias arrays, interposed between the stacked layers
2224/04042	. . . . .	Bonding areas specifically adapted for wire connectors, e.g. wirebond pads	2224/05086	. . . . .	Structure of the additional element
2224/0405	. . . . .	Bonding areas specifically adapted for tape automated bonding [TAB] connectors	2224/05087	. . . . .	being a via with at least a lining layer
2224/04073	. . . . .	Bonding areas specifically adapted for connectors of different types	2224/05088	. . . . .	Shape of the additional element
2224/04105	. . . . .	Bonding areas formed on an encapsulation of the semiconductor or solid-state body, e.g. bonding areas on chip-scale packages	2224/05089	. . . . .	Disposition of the additional element
2224/05	. . . . .	of an individual bonding area	2224/0509	. . . . .	of a single via
2224/05001	. . . . .	Internal layers	2224/05091	. . . . .	at the center of the internal layers
2224/05005	. . . . .	Structure	2224/05092	. . . . .	at the periphery of the internal layers
2224/05006	. . . . .	Dual damascene structure	2224/05093	. . . . .	of a plurality of vias
2224/05007	. . . . .	comprising a core and a coating	2224/05094	. . . . .	at the center of the internal layers
2224/05008	. . . . .	Bonding area integrally formed with a redistribution layer on the semiconductor or solid-state body, e.g.	2224/05095	. . . . .	at the periphery of the internal layers
2224/05009	. . . . .	Bonding area integrally formed with a via connection of the semiconductor or solid-state body	2224/05096	. . . . .	Uniform arrangement, i.e. array
2224/0501	. . . . .	Shape	2224/05097	. . . . .	Random arrangement
2224/05011	. . . . .	comprising apertures or cavities	2224/05098	. . . . .	Material of the additional element
2224/05012	. . . . .	in top view	2224/05099	. . . . .	Material
2224/05013	. . . . .	being rectangular	2224/051	. . . . .	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/05014	being square			
2224/05015	being circular or elliptical			
2224/05016	in side view			

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2224/05101	the principal constituent melting at a temperature of less than 400°C	2224/05181	Tantalum [Ta] as principal constituent
2224/05105	Gallium [Ga] as principal constituent	2224/05183	Rhenium [Re] as principal constituent
2224/05109	Indium [In] as principal constituent	2224/05184	Tungsten [W] as principal constituent
2224/05111	Tin [Sn] as principal constituent	2224/05186	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/05113	Bismuth [Bi] as principal constituent	2224/05187	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/05188)
2224/05114	Thallium [Tl] as principal constituent	2224/05188	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/05116	Lead [Pb] as principal constituent	2224/0519	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/05117	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/05191	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/05118	Zinc [Zn] as principal constituent	2224/05193	with a principal constituent of the material being a solid not provided for in groups H01L 2224/051 - H01L 2224/05191 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/0512	Antimony [Sb] as principal constituent	2224/05194	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/051 - H01L 2224/05191
2224/05123	Magnesium [Mg] as principal constituent	2224/05195	with a principal constituent of the material being a gas not provided for in groups H01L 2224/051 - H01L 2224/05191
2224/05124	Aluminium [Al] as principal constituent	2224/05198	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/05138	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/05199	Material of the matrix
2224/05139	Silver [Ag] as principal constituent	2224/052	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/05144	Gold [Au] as principal constituent	2224/05201	the principal constituent melting at a temperature of less than 400°C
2224/05147	Copper [Cu] as principal constituent	2224/05205	Gallium [Ga] as principal constituent
2224/05149	Manganese [Mn] as principal constituent	2224/05209	Indium [In] as principal constituent
2224/05155	Nickel [Ni] as principal constituent	2224/05211	Tin [Sn] as principal constituent
2224/05157	Cobalt [Co] as principal constituent	2224/05213	Bismuth [Bi] as principal constituent
2224/0516	Iron [Fe] as principal constituent	2224/05214	Thallium [Tl] as principal constituent
2224/05163	the principal constituent melting at a temperature of greater than 1550°C	2224/05216	Lead [Pb] as principal constituent
2224/05164	Palladium [Pd] as principal constituent		
2224/05166	Titanium [Ti] as principal constituent		
2224/05169	Platinum [Pt] as principal constituent		
2224/0517	Zirconium [Zr] as principal constituent		
2224/05171	Chromium [Cr] as principal constituent		
2224/05172	Vanadium [V] as principal constituent		
2224/05173	Rhodium [Rh] as principal constituent		
2224/05176	Ruthenium [Ru] as principal constituent		
2224/05178	Iridium [Ir] as principal constituent		
2224/05179	Niobium [Nb] as principal constituent		
2224/0518	Molybdenum [Mo] as principal constituent		

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2224/05217	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/05287	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/05288)
2224/05218	Zinc [Zn] as principal constituent	2224/05288	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/05222	Antimony [Sb] as principal constituent	2224/0529	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/05223	Magnesium [Mg] as principal constituent	2224/05291	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/05224	Aluminium [Al] as principal constituent	2224/05293	with a principal constituent of the material being a solid not provided for in groups H01L 2224/052 - H01L 2224/05291 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/05238	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/05294	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/052 - H01L 2224/05291
2224/05239	Silver [Ag] as principal constituent	2224/05295	with a principal constituent of the material being a gas not provided for in groups H01L 2224/052 - H01L 2224/05291
2224/05244	Gold [Au] as principal constituent	2224/05298	Fillers
2224/05247	Copper [Cu] as principal constituent	2224/05299	Base material
2224/05249	Manganese [Mn] as principal constituent	2224/053	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/05255	Nickel [Ni] as principal constituent	2224/05301	the principal constituent melting at a temperature of less than 400°C
2224/05257	Cobalt [Co] as principal constituent	2224/05305	Gallium [Ga] as principal constituent
2224/0526	Iron [Fe] as principal constituent	2224/05309	Indium [In] as principal constituent
2224/05263	the principal constituent melting at a temperature of greater than 1550°C	2224/05311	Tin [Sn] as principal constituent
2224/05264	Palladium [Pd] as principal constituent	2224/05313	Bismuth [Bi] as principal constituent
2224/05266	Titanium [Ti] as principal constituent	2224/05314	Thallium [Tl] as principal constituent
2224/05269	Platinum [Pt] as principal constituent	2224/05316	Lead [Pb] as principal constituent
2224/0527	Zirconium [Zr] as principal constituent	2224/05317	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/05271	Chromium [Cr] as principal constituent	2224/05318	Zinc [Zn] as principal constituent
2224/05272	Vanadium [V] as principal constituent	2224/0532	Antimony [Sb] as principal constituent
2224/05273	Rhodium [Rh] as principal constituent	2224/05323	Magnesium [Mg] as principal constituent
2224/05276	Ruthenium [Ru] as principal constituent	2224/05324	Aluminium [Al] as principal constituent
2224/05278	Iridium [Ir] as principal constituent		
2224/05279	Niobium [Nb] as principal constituent		
2224/0528	Molybdenum [Mo] as principal constituent		
2224/05281	Tantalum [Ta] as principal constituent		
2224/05283	Rhenium [Re] as principal constituent		
2224/05284	Tungsten [W] as principal constituent		
2224/05286	with a principal constituent of the material being a non metallic, non metalloid inorganic material		

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2224/05338	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/05391	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/05339	Silver [Ag] as principal constituent	2224/05393	with a principal constituent of the material being a solid not provided for in groups H01L 2224/053 - H01L 2224/05391 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/05344	Gold [Au] as principal constituent	2224/05394	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/053 - H01L 2224/05391
2224/05347	Copper [Cu] as principal constituent	2224/05395	with a principal constituent of the material being a gas not provided for in groups H01L 2224/053 - H01L 2224/05391
2224/05349	Manganese [Mn] as principal constituent	2224/05398	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/05355	Nickel [Ni] as principal constituent	2224/05399	Coating material
2224/05357	Cobalt [Co] as principal constituent	2224/054	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/0536	Iron [Fe] as principal constituent	2224/05401	the principal constituent melting at a temperature of less than 400°C
2224/05363	the principal constituent melting at a temperature of greater than 1550°C	2224/05405	Gallium [Ga] as principal constituent
2224/05364	Palladium [Pd] as principal constituent	2224/05409	Indium [In] as principal constituent
2224/05366	Titanium [Ti] as principal constituent	2224/05411	Tin [Sn] as principal constituent
2224/05369	Platinum [Pt] as principal constituent	2224/05413	Bismuth [Bi] as principal constituent
2224/0537	Zirconium [Zr] as principal constituent	2224/05414	Thallium [Tl] as principal constituent
2224/05371	Chromium [Cr] as principal constituent	2224/05416	Lead [Pb] as principal constituent
2224/05372	Vanadium [V] as principal constituent	2224/05417	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/05373	Rhodium [Rh] as principal constituent	2224/05418	Zinc [Zn] as principal constituent
2224/05376	Ruthenium [Ru] as principal constituent	2224/0542	Antimony [Sb] as principal constituent
2224/05378	Iridium [Ir] as principal constituent	2224/05423	Magnesium [Mg] as principal constituent
2224/05379	Niobium [Nb] as principal constituent	2224/05424	Aluminium [Al] as principal constituent
2224/0538	Molybdenum [Mo] as principal constituent	2224/05438	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/05381	Tantalum [Ta] as principal constituent		
2224/05383	Rhenium [Re] as principal constituent		
2224/05384	Tungsten [W] as principal constituent		
2224/05386	with a principal constituent of the material being a non metallic, non metalloid inorganic material		
2224/05387	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/05388)		
2224/05388	Glasses, e.g. amorphous oxides, nitrides or fluorides		
2224/0539	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy		

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2224/05439	...	Silver [Ag] as principal constituent	2224/05493	...	with a principal constituent of the material being a solid not provided for in groups H01L 2224/054 - H01L 2224/05491 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/05444	...	Gold [Au] as principal constituent	2224/05494	...	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/054 - H01L 2224/05491
2224/05447	...	Copper [Cu] as principal constituent	2224/05495	...	with a principal constituent of the material being a gas not provided for in groups H01L 2224/054 - H01L 2224/05491
2224/05449	...	Manganese [Mn] as principal constituent	2224/05498	...	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/05455	...	Nickel [Ni] as principal constituent	2224/05499	...	Shape or distribution of the fillers
2224/05457	...	Cobalt [Co] as principal constituent	2224/0554	...	External layer
2224/0546	...	Iron [Fe] as principal constituent	2224/05541	...	Structure
2224/05463	...	the principal constituent melting at a temperature of greater than 1550°C	2224/05546	...	Dual damascene structure
2224/05464	...	Palladium [Pd] as principal constituent	2224/05547	...	comprising a core and a coating
2224/05466	...	Titanium [Ti] as principal constituent	2224/05548	...	Bonding area integrally formed with a redistribution layer on the semiconductor or solid-state body
2224/05469	...	Platinum [Pt] as principal constituent	2224/0555	...	Shape
2224/0547	...	Zirconium [Zr] as principal constituent	2224/05551	...	comprising apertures or cavities
2224/05471	...	Chromium [Cr] as principal constituent	2224/05552	...	in top view
2224/05472	...	Vanadium [V] as principal constituent	2224/05553	...	being rectangular
2224/05473	...	Rhodium [Rh] as principal constituent	2224/05554	...	being square
2224/05476	...	Ruthenium [Ru] as principal constituent	2224/05555	...	being circular or elliptic
2224/05478	...	Iridium [Ir] as principal constituent	2224/05556	...	in side view
2224/05479	...	Niobium [Nb] as principal constituent	2224/05557	...	comprising protrusions or indentations
2224/0548	...	Molybdenum [Mo] as principal constituent	2224/05558	...	conformal layer on a patterned surface
2224/05481	...	Tantalum [Ta] as principal constituent	2224/05559	...	non conformal layer on a patterned surface
2224/05483	...	Rhenium [Re] as principal constituent	2224/0556	...	Disposition
2224/05484	...	Tungsten [W] as principal constituent	2224/05561	...	On the entire surface of the internal layer
2224/05486	...	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/05562	...	On the entire exposed surface of the internal layer
2224/05487	...	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/05488)	2224/05563	...	Only on parts of the surface of the internal layer
2224/05488	...	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/05564	...	Only on the bonding interface of the bonding area
2224/0549	...	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/05565	...	Only outside the bonding interface of the bonding area
2224/05491	...	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene	2224/05566	...	Both on and outside the bonding interface of the bonding area
			2224/05567	...	the external layer being at least partially embedded in the surface
			2224/05568	...	the whole external layer protruding from the surface
			2224/05569	...	the external layer being disposed on a redistribution layer on the semiconductor or solid-state body

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2224/0557	the external layer being disposed on a via connection of the semiconductor or solid-state body	2224/05663	the principal constituent melting at a temperature of greater than 1550°C
2224/05571	. . . . .	the external layer being disposed in a recess of the surface	2224/05664	. . . . .	Palladium [Pd] as principal constituent
2224/05572	. . . . .	the external layer extending out of an opening	2224/05666	. . . . .	Titanium [Ti] as principal constituent
2224/05573	. . . . .	Single external layer	2224/05669	. . . . .	Platinum [Pt] as principal constituent
2224/05575	. . . . .	Plural external layers	2224/0567	. . . . .	Zirconium [Zr] as principal constituent
2224/05576	. . . . .	being mutually engaged together, e.g. through inserts	2224/05671	. . . . .	Chromium [Cr] as principal constituent
2224/05578	. . . . .	being disposed next to each other, e.g. side-to-side arrangements	2224/05672	. . . . .	Vanadium [V] as principal constituent
2224/0558	. . . . .	being stacked	2224/05673	. . . . .	Rhodium [Rh] as principal constituent
2224/05582	. . . . .	Two-layer coating	2224/05676	. . . . .	Ruthenium [Ru] as principal constituent
2224/05583	. . . . .	Three-layer coating	2224/05678	. . . . .	Iridium [Ir] as principal constituent
2224/05584	. . . . .	Four-layer coating	2224/05679	. . . . .	Niobium [Nb] as principal constituent
2224/05599	. . . . .	Material	2224/0568	. . . . .	Molybdenum [Mo] as principal constituent
2224/056	. . . . .	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/05681	. . . . .	Tantalum [Ta] as principal constituent
2224/05601	. . . . .	the principal constituent melting at a temperature of less than 400°C	2224/05683	. . . . .	Rhenium [Re] as principal constituent
2224/05605	. . . . .	Gallium [Ga] as principal constituent	2224/05684	. . . . .	Tungsten [W] as principal constituent
2224/05609	. . . . .	Indium [In] as principal constituent	2224/05686	. . . . .	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/05611	. . . . .	Tin [Sn] as principal constituent	2224/05687	. . . . .	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/05688)
2224/05613	. . . . .	Bismuth [Bi] as principal constituent	2224/05688	. . . . .	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/05614	. . . . .	Thallium [Tl] as principal constituent	2224/0569	. . . . .	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/05616	. . . . .	Lead [Pb] as principal constituent	2224/05691	. . . . .	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/05617	. . . . .	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/05693	. . . . .	with a principal constituent of the material being a solid not provided for in groups H01L 2224/056 - H01L 2224/05691 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/05618	. . . . .	Zinc [Zn] as principal constituent	2224/05694	. . . . .	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/056 - H01L 2224/05691
2224/0562	. . . . .	Antimony [Sb] as principal constituent	2224/05695	. . . . .	with a principal constituent of the material being a gas not provided for in groups H01L 2224/056 - H01L 2224/05691
2224/05623	. . . . .	Magnesium [Mg] as principal constituent			
2224/05624	. . . . .	Aluminium [Al] as principal constituent			
2224/05638	. . . . .	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C			
2224/05639	. . . . .	Silver [Ag] as principal constituent			
2224/05644	. . . . .	Gold [Au] as principal constituent			
2224/05647	. . . . .	Copper [Cu] as principal constituent			
2224/05649	. . . . .	Manganese [Mn] as principal constituent			
2224/05655	. . . . .	Nickel [Ni] as principal constituent			
2224/05657	. . . . .	Cobalt [Co] as principal constituent			
2224/0566	. . . . .	Iron [Fe] as principal constituent			

2224/05698	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams	2224/05766	Titanium [Ti] as principal constituent
2224/05699	Material of the matrix	2224/05769	Platinum [Pt] as principal constituent
2224/057	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/05777	Zirconium [Zr] as principal constituent
2224/05701	the principal constituent melting at a temperature of less than 400°C	2224/05771	Chromium [Cr] as principal constituent
2224/05705	Gallium [Ga] as principal constituent	2224/05772	Vanadium [V] as principal constituent
2224/05709	Indium [In] as principal constituent	2224/05773	Rhodium [Rh] as principal constituent
2224/05711	Tin [Sn] as principal constituent	2224/05776	Ruthenium [Ru] as principal constituent
2224/05713	Bismuth [Bi] as principal constituent	2224/05778	Iridium [Ir] as principal constituent
2224/05714	Thallium [Tl] as principal constituent	2224/05779	Niobium [Nb] as principal constituent
2224/05716	Lead [Pb] as principal constituent	2224/0578	Molybdenum [Mo] as principal constituent
2224/05717	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/05781	Tantalum [Ta] as principal constituent
2224/05718	Zinc [Zn] as principal constituent	2224/05783	Rhenium [Re] as principal constituent
2224/0572	Antimony [Sb] as principal constituent	2224/05784	Tungsten [W] as principal constituent
2224/05723	Magnesium [Mg] as principal constituent	2224/05786	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/05724	Aluminium [Al] as principal constituent	2224/05787	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/05788)
2224/05738	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/05788	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/05739	Silver [Ag] as principal constituent	2224/0579	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/05744	Gold [Au] as principal constituent	2224/05791	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/05747	Copper [Cu] as principal constituent	2224/05793	with a principal constituent of the material being a solid not provided for in groups H01L 2224/057 - H01L 2224/05791 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/05749	Manganese [Mn] as principal constituent	2224/05794	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/057 - H01L 2224/05791
2224/05755	Nickel [Ni] as principal constituent	2224/05795	with a principal constituent of the material being a gas not provided for in groups H01L 2224/057 - H01L 2224/05791
2224/05757	Cobalt [Co] as principal constituent	2224/05798	Fillers
2224/0576	Iron [Fe] as principal constituent	2224/05799	Base material
2224/05763	the principal constituent melting at a temperature of greater than 1550°C		
2224/05764	Palladium [Pd] as principal constituent		

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2224/058	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/05871	Chromium [Cr] as principal constituent
2224/05801	the principal constituent melting at a temperature of less than 400°C	2224/05872	Vanadium [V] as principal constituent
2224/05805	Gallium [Ga] as principal constituent	2224/05873	Rhodium [Rh] as principal constituent
2224/05809	Indium [In] as principal constituent	2224/05876	Ruthenium [Ru] as principal constituent
2224/05811	Tin [Sn] as principal constituent	2224/05878	Iridium [Ir] as principal constituent
2224/05813	Bismuth [Bi] as principal constituent	2224/05879	Niobium [Nb] as principal constituent
2224/05814	Thallium [Tl] as principal constituent	2224/0588	Molybdenum [Mo] as principal constituent
2224/05816	Lead [Pb] as principal constituent	2224/05881	Tantalum [Ta] as principal constituent
2224/05817	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/05883	Rhenium [Re] as principal constituent
2224/05818	Zinc [Zn] as principal constituent	2224/05884	Tungsten [W] as principal constituent
2224/0582	Antimony [Sb] as principal constituent	2224/05886	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/05823	Magnesium [Mg] as principal constituent	2224/05887	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/05888)
2224/05824	Aluminium [Al] as principal constituent	2224/05888	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/05838	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/0589	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/05839	Silver [Ag] as principal constituent	2224/05891	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/05844	Gold [Au] as principal constituent	2224/05893	with a principal constituent of the material being a solid not provided for in groups H01L 2224/058 - H01L 2224/05891 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/05847	Copper [Cu] as principal constituent	2224/05894	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/058 - H01L 2224/05891
2224/05849	Manganese [Mn] as principal constituent	2224/05895	with a principal constituent of the material being a gas not provided for in groups H01L 2224/058 - H01L 2224/05891
2224/05855	Nickel [Ni] as principal constituent	2224/05898	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/05857	Cobalt [Co] as principal constituent	2224/05899	Coating material
2224/0586	Iron [Fe] as principal constituent		
2224/05863	the principal constituent melting at a temperature of greater than 1550°C		
2224/05864	Palladium [Pd] as principal constituent		
2224/05866	Titanium [Ti] as principal constituent		
2224/05869	Platinum [Pt] as principal constituent		
2224/0587	Zirconium [Zr] as principal constituent		

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2224/059	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/05971	Chromium [Cr] as principal constituent
2224/05901	the principal constituent melting at a temperature of less than 400°C	2224/05972	Vanadium [V] as principal constituent
2224/05905	Gallium [Ga] as principal constituent	2224/05973	Rhodium [Rh] as principal constituent
2224/05909	Indium [In] as principal constituent	2224/05976	Ruthenium [Ru] as principal constituent
2224/05911	Tin [Sn] as principal constituent	2224/05978	Iridium [Ir] as principal constituent
2224/05913	Bismuth [Bi] as principal constituent	2224/05979	Niobium [Nb] as principal constituent
2224/05914	Thallium [Tl] as principal constituent	2224/0598	Molybdenum [Mo] as principal constituent
2224/05916	Lead [Pb] as principal constituent	2224/05981	Tantalum [Ta] as principal constituent
2224/05917	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/05983	Rhenium [Re] as principal constituent
2224/05918	Zinc [Zn] as principal constituent	2224/05984	Tungsten [W] as principal constituent
2224/0592	Antimony [Sb] as principal constituent	2224/05986	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/05923	Magnesium [Mg] as principal constituent	2224/05987	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/05988)
2224/05924	Aluminium [Al] as principal constituent	2224/05988	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/05938	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/0599	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/05939	Silver [Ag] as principal constituent	2224/05991	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/05944	Gold [Au] as principal constituent	2224/05993	with a principal constituent of the material being a solid not provided for in groups H01L 2224/059 - H01L 2224/05991 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/05947	Copper [Cu] as principal constituent	2224/05994	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/059 - H01L 2224/05991
2224/05949	Manganese [Mn] as principal constituent	2224/05995	with a principal constituent of the material being a gas not provided for in groups H01L 2224/059 - H01L 2224/05991
2224/05955	Nickel [Ni] as principal constituent	2224/05998	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/05957	Cobalt [Co] as principal constituent	2224/05999	Shape or distribution of the fillers
2224/0596	Iron [Fe] as principal constituent	2224/06	of a plurality of bonding areas
2224/05963	the principal constituent melting at a temperature of greater than 1550°C	2224/0601	Structure
2224/05964	Palladium [Pd] as principal constituent	2224/0603	Bonding areas having different sizes, e.g. different heights or widths
2224/05966	Titanium [Ti] as principal constituent	2224/0605	Shape
2224/05969	Platinum [Pt] as principal constituent		
2224/0597	Zirconium [Zr] as principal constituent		

2224/06051	Bonding areas having different shapes	2224/06156	Covering only the central area of the surface to be connected, i.e. central arrangements
2224/061	Disposition	2224/06157	with specially adapted redistribution layers [RDL]
2224/06102	the bonding areas being at different heights	2224/06158	being disposed in a single wiring level, i.e. planar layout
2224/0612	Layout	2224/06159	being disposed in different wiring levels, i.e. resurf layout
2224/0613	Square or rectangular array	2224/0616	Random array, i.e. array with no symmetry
2224/06131	being uniform, i.e. having a uniform pitch across the array	2224/06163	with a staggered arrangement
2224/06132	being non uniform, i.e. having a non uniform pitch across the array	2224/06164	covering only portions of the surface to be connected
2224/06133	with a staggered arrangement, e.g. depopulated array	2224/06165	Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
2224/06134	covering only portions of the surface to be connected	2224/06166	Covering only the central area of the surface to be connected, i.e. central arrangements
2224/06135	Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements	2224/06167	with specially adapted redistribution layers [RDL]
2224/06136	Covering only the central area of the surface to be connected, i.e. central arrangements	2224/06168	being disposed in a single wiring level, i.e. planar layout
2224/06137	with specially adapted redistribution layers [RDL]	2224/06169	being disposed in different wiring levels, i.e. resurf layout
2224/06138	being disposed in a single wiring level, i.e. planar layout	2224/06177	Combinations of arrays with different layouts
2224/06139	being disposed in different wiring levels, i.e. resurf layout	2224/06179	Corner adaptations, i.e. disposition of the bonding areas at the corners of the semiconductor or solid-state body
2224/0614	Circular array, i.e. array with radial symmetry	2224/0618	being disposed on at least two different sides of the body, e.g. dual array
2224/06141	being uniform, i.e. having a uniform pitch across the array	2224/06181	On opposite sides of the body
2224/06142	being non uniform, i.e. having a non uniform pitch across the array	2224/06182	with specially adapted redistribution layers [RDL]
2224/06143	with a staggered arrangement, e.g. depopulated array	2224/06183	On contiguous sides of the body
2224/06144	covering only portions of the surface to be connected	2224/06187	with specially adapted redistribution layers [RDL]
2224/06145	Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements	2224/06188	being disposed in a single wiring level, i.e. planar layout
2224/06146	Covering only the central area of the surface to be connected, i.e. central arrangements	2224/06189	being disposed in different wiring levels, i.e. resurf layout
2224/06147	with specially adapted redistribution layers [RDL]	2224/065	Material
2224/06148	being disposed in a single wiring level, i.e. planar layout	2224/06505	Bonding areas having different materials
2224/06149	being disposed in different wiring levels, i.e. resurf layout	2224/0651	Function
2224/0615	Mirror array, i.e. array having only a reflection symmetry, i.e. bilateral symmetry	2224/06515	Bonding areas having different functions
2224/06151	being uniform, i.e. having a uniform pitch across the array	2224/06517	including bonding areas providing primarily mechanical bonding
2224/06152	being non uniform, i.e. having a non uniform pitch across the array	2224/06519	including bonding areas providing primarily thermal dissipation
2224/06153	with a staggered arrangement, e.g. depopulated array	2224/07	Structure, shape, material or disposition of the bonding areas after the connecting process
2224/06154	covering only portions of the surface to be connected	2224/08	of an individual bonding area
2224/06155	Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements	2224/0801	Structure
		2224/0805	Shape
		2224/08052	in top view
		2224/08053	being non uniform along the bonding area
		2224/08054	being rectangular
		2224/08055	being square
		2224/08056	being circular or elliptic
		2224/08057	in side view

- 2224/08058 being non uniform along the bonding area
- 2224/08059 comprising protrusions or indentations
- 2224/0807 of bonding interfaces, e.g. interlocking features
- 2224/081 Disposition
- 2224/08111 the bonding area being disposed in a recess of the surface of the body
- 2224/08112 the bonding area being at least partially embedded in the surface of the body
- 2224/08113 the whole bonding area protruding from the surface of the body
- 2224/0812 the bonding area connecting directly to another bonding area, i.e. connectorless bonding, e.g. bumpless bonding
- 2224/08121 the connected bonding areas being not aligned with respect to each other
- 2224/08123 the bonding area connecting directly to at least two bonding areas
- 2224/08135 the bonding area connecting between different semiconductor or solid-state bodies, i.e. chip-to-chip
- 2224/08137 the bodies being arranged next to each other, e.g. on a common substrate
- 2224/08145 the bodies being stacked
- 2224/08146 the bonding area connecting to a via connection in the body
- 2224/08147 the bonding area connecting to a bonding area disposed in a recess of the surface of the body
- 2224/08148 the bonding area connecting to a bonding area protruding from the surface of the body
- 2224/08151 the bonding area connecting between a semiconductor or solid-state body and an item not being a semiconductor or solid-state body, e.g. chip-to-substrate, chip-to-passive
- 2224/08153 the body and the item being arranged next to each other, e.g. on a common substrate
- 2224/08155 the item being non-metallic, e.g. being an insulating substrate with or without metallisation
- 2224/0816 the bonding area connecting to a pin of the item
- 2224/08163 the bonding area connecting to a potential ring of the item
- 2224/08165 the bonding area connecting to a via metallisation of the item
- 2224/08167 the bonding area connecting to a bonding area disposed in a recess of the surface of the item
- 2224/08168 the bonding area connecting to a bonding area protruding from the surface of the item
- 2224/08175 the item being metallic
- 2224/08183 the bonding area connecting to a potential ring of the item
- 2224/08187 the bonding area connecting to a bonding area disposed in a recess of the surface of the item
- 2224/08188 the bonding area connecting to a bonding area protruding from the surface of the item
- 2224/08195 the item being a discrete passive component
- 2224/08197 the bonding area connecting to a bonding area disposed in a recess of the surface of the item
- 2224/08198 the bonding area connecting to a bonding area protruding from the surface of the item
- 2224/08221 the body and the item being stacked
- 2224/08225 the item being non-metallic, e.g. insulating substrate with or without metallisation
- 2224/0823 the bonding area connecting to a pin of the item
- 2224/08233 the bonding area connecting to a potential ring of the item
- 2224/08235 the bonding area connecting to a via metallisation of the item
- 2224/08237 the bonding area connecting to a bonding area disposed in a recess of the surface of the item
- 2224/08238 the bonding area connecting to a bonding area protruding from the surface of the item
- 2224/08245 the item being metallic
- 2224/08253 the bonding area connecting to a potential ring of the item
- 2224/08257 the bonding area connecting to a bonding area disposed in a recess of the surface of the item
- 2224/08258 the bonding area connecting to a bonding area protruding from the surface of the item
- 2224/08265 the item being a discrete passive component
- 2224/08267 the bonding area connecting to a bonding area disposed in a recess of the surface of the item
- 2224/08268 the bonding area connecting to a bonding area protruding from the surface of the item
- 2224/085 Material
- 2224/08501 at the bonding interface
- 2224/08502 comprising an eutectic alloy
- 2224/08503 comprising an intermetallic compound
- 2224/08505 outside the bonding interface
- 2224/08506 comprising an eutectic alloy
- 2224/09 of a plurality of bonding areas
- 2224/0901 Structure
- 2224/0903 Bonding areas having different sizes, e.g. different diameters, heights or widths

2224/0905	. . . . .	Shape	2224/0918	. . . . .	being disposed on at least two different sides of the body, e.g. dual array
2224/09051	. . . . .	Bonding areas having different shapes	2224/09181	. . . . .	On opposite sides of the body
2224/09055	. . . . .	of their bonding interfaces	2224/09183	. . . . .	On contiguous sides of the body
2224/091	. . . . .	Disposition	2224/095	. . . . .	Material
2224/09102	. . . . .	the bonding areas being at different heights	2224/09505	. . . . .	Bonding areas having different materials
2224/09103	. . . . .	on the semiconductor or solid-state body	2224/0951	. . . . .	Function
2224/09104	. . . . .	outside the semiconductor or solid-state body	2224/09515	. . . . .	Bonding areas having different functions
2224/0912	. . . . .	Layout (layout of bonding areas prior to the connecting process H01L 2224/0612)	2224/09517	. . . . .	including bonding areas providing primarily mechanical support
2224/0913	. . . . .	Square or rectangular array	2224/09519	. . . . .	including bonding areas providing primarily thermal dissipation
2224/09132	. . . . .	being non uniform, i.e. having a non uniform pitch across the array	2224/10	. . .	Bump connectors; Manufacturing methods related thereto
2224/09133	. . . . .	with a staggered arrangement, e.g. depopulated array	2224/1012	. . . .	Auxiliary members for bump connectors, e.g. spacers
2224/09134	. . . . .	covering only portions of the surface to be connected	2224/10122	. . . .	being formed on the semiconductor or solid-state body to be connected
2224/09135	. . . . .	Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements	2224/10125	. . . . .	Reinforcing structures
2224/0914	. . . . .	Circular array, i.e. array with radial symmetry	2224/10126	. . . . .	Bump collar
2224/09142	. . . . .	being non uniform, i.e. having a non uniform pitch across the array	2224/10135	. . . . .	Alignment aids
2224/09143	. . . . .	with a staggered arrangement	2224/10145	. . . . .	Flow barriers
2224/09144	. . . . .	covering only portions of the surface to be connected	2224/10152	. . . .	being formed on an item to be connected not being a semiconductor or solid-state body
2224/09145	. . . . .	Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements	2224/10155	. . . . .	Reinforcing structures
2224/0915	. . . . .	Mirror array, i.e. array having only a reflection symmetry, i.e. bilateral symmetry	2224/10156	. . . . .	Bump collar
2224/09151	. . . . .	being uniform, i.e. having a uniform pitch across the array	2224/10165	. . . . .	Alignment aids
2224/09152	. . . . .	being non uniform, i.e. having a non uniform pitch across the array	2224/10175	. . . . .	Flow barriers
2224/09153	. . . . .	with a staggered arrangement, e.g. depopulated array	2224/11	. . . .	Manufacturing methods
2224/09154	. . . . .	covering only portions of the surface to be connected	2224/11001	. . . .	Involving a temporary auxiliary member not forming part of the manufacturing apparatus, e.g. removable or sacrificial coating, film or substrate
2224/09155	. . . . .	Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements	2224/11002	. . . . .	for supporting the semiconductor or solid-state body
2224/09156	. . . . .	Covering only the central area of the surface to be connected, i.e. central arrangements	2224/11003	. . . . .	for holding or transferring the bump preform
2224/0916	. . . . .	Random array, i.e. array with no symmetry	2224/11005	. . . . .	for aligning the bump connector, e.g. marks, spacers
2224/09163	. . . . .	with a staggered arrangement	2224/11009	. . . . .	for protecting parts during manufacture
2224/09164	. . . . .	covering only portions of the surface to be connected	2224/11011	. . . .	Involving a permanent auxiliary member, i.e. a member which is left at least partly in the finished device, e.g. coating, dummy feature
2224/09165	. . . . .	Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements	2224/11013	. . . . .	for holding or confining the bump connector, e.g. solder flow barrier
2224/09177	. . . . .	Combinations of arrays with different layouts	2224/11015	. . . . .	for aligning the bump connector, e.g. marks, spacers
2224/09179	. . . . .	Corner adaptations, i.e. disposition of the bonding areas at the corners of the semiconductor or solid-state body	2224/11019	. . . . .	for protecting parts during the process
			2224/111	. . . .	Manufacture and pre-treatment of the bump connector preform
			2224/1111	. . . . .	Shaping
			2224/1112	. . . . .	Applying permanent coating
			2224/113	. . . . .	by local deposition of the material of the bump connector
			2224/1131	. . . . .	in liquid form
			2224/11312	. . . . .	Continuous flow, e.g. using a microsyringe, a pump, a nozzle or extrusion
			2224/11318	. . . . .	by dispensing droplets
			2224/1132	Screen printing, i.e. using a stencil
			2224/1133	in solid form
			2224/11332	using a powder

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- 2224/11334 using preformed bumps
- 2224/1134 Stud bumping, i.e. using a wire-bonding apparatus
- 2224/114 by blanket deposition of the material of the bump connector
- 2224/1141 in liquid form
- 2224/11416 Spin coating
- 2224/11418 Spray coating
- 2224/1142 Curtain coating
- 2224/11422 by dipping, e.g. in a solder bath ([hot-dipping C23C 2/00](#))
- 2224/11424 Immersion coating, e.g. in a solder bath ([immersion processes C23C 2/00](#))
- 2224/11426 Chemical solution deposition [CSD], i.e. using a liquid precursor
- 2224/11428 Wave coating
- 2224/1143 in solid form
- 2224/11436 Lamination of a preform, e.g. foil, sheet or layer
- 2224/11438 the preform being at least partly pre-patterned
- 2224/1144 by transfer printing
- 2224/11442 using a powder
- 2224/11444 in gaseous form
- 2224/1145 Physical vapour deposition [PVD], e.g. evaporation, or sputtering
- 2224/11452 Chemical vapour deposition [CVD], e.g. laser CVD
- 2224/1146 Plating
- 2224/11462 Electroplating
- 2224/11464 Electroless plating
- 2224/11466 Conformal deposition, i.e. blanket deposition of a conformal layer on a patterned surface
- 2224/1147 using a lift-off mask
- 2224/11472 Profile of the lift-off mask
- 2224/11474 Multilayer masks
- 2224/1148 Permanent masks, i.e. masks left in the finished device, e.g. passivation layers
- 2224/115 by chemical or physical modification of a pre-existing or pre-deposited material
- 2224/11502 Pre-existing or pre-deposited material
- 2224/11505 Sintering
- 2224/1151 Anodisation
- 2224/11515 Curing and solidification, e.g. of a photosensitive bump material
- 2224/1152 Self-assembly, e.g. self-agglomeration of the bump material in a fluid
- 2224/11522 Auxiliary means therefor, e.g. for self-assembly activation
- 2224/11524 with special adaptation of the surface or of an auxiliary substrate, e.g. surface shape specially adapted for the self-assembly process
- 2224/11526 involving the material of the bonding area, e.g. bonding pad or under bump metallisation [UBM]
- 2224/1155 Selective modification
- 2224/11552 using a laser or a focussed ion beam [FIB]
- 2224/11554 Stereolithography, i.e. solidification of a pattern defined by a laser trace in a photosensitive resin
- 2224/116 by patterning a pre-deposited material ([treatment of parts prior to assembly of the devices H01L 21/48](#))
- 2224/11602 Mechanical treatment, e.g. polishing, grinding
- 2224/1161 Physical or chemical etching
- 2224/11612 by physical means only
- 2224/11614 by chemical means only
- 2224/11616 Chemical mechanical polishing [CMP]
- 2224/11618 with selective exposure, development and removal of a photosensitive bump material, e.g. of a photosensitive conductive resin
- 2224/1162 using masks
- 2224/11622 Photolithography
- 2224/1163 using a laser or a focused ion beam [FIB]
- 2224/11632 Ablation by means of a laser or focused ion beam [FIB]
- 2224/117 involving monitoring, e.g. feedback loop
- 2224/118 Post-treatment of the bump connector
- 2224/1181 Cleaning, e.g. oxide removal step, desmearing
- 2224/1182 Applying permanent coating, e.g. in-situ coating
- 2224/11821 Spray coating
- 2224/11822 by dipping, e.g. in a solder bath
- 2224/11823 Immersion coating, e.g. in a solder bath
- 2224/11824 Chemical solution deposition [CSD], i.e. using a liquid precursor
- 2224/11825 Plating, e.g. electroplating, electroless plating
- 2224/11826 Physical vapour deposition [PVD], e.g. evaporation, or sputtering
- 2224/11827 Chemical vapour deposition [CVD], e.g. laser CVD
- 2224/1183 Reworking, e.g. shaping ([reflowing H01L 2224/11849](#))
- 2224/11831 involving a chemical process, e.g. etching the bump connector
- 2224/1184 involving a mechanical process, e.g. planarising the bump connector
- 2224/11845 Chemical mechanical polishing [CMP]
- 2224/11848 Thermal treatments, e.g. annealing, controlled cooling
- 2224/11849 Reflowing
- 2224/119 Methods of manufacturing bump connectors involving a specific sequence of method steps
- 2224/11901 with repetition of the same manufacturing step
- 2224/11902 Multiple masking steps
- 2224/11903 using different masks
- 2224/11906 with modification of the same mask
- 2224/1191 Forming a passivation layer after forming the bump connector
- 2224/11912 the bump being used as a mask for patterning other parts
- 2224/11914 the under bump metallisation [UBM] being used as a mask for patterning other parts
- 2224/11916 a passivation layer being used as a mask for patterning other parts

2224/12	. . . Structure, shape, material or disposition of the bump connectors prior to the connecting process	2224/13078	. . . . . being disposed next to each other, e.g. side-to-side arrangements
2224/12105	. . . . . Bump connectors formed on an encapsulation of the semiconductor or solid-state body, e.g. bumps on chip-scale packages	2224/1308	. . . . . being stacked
2224/13	. . . . . of an individual bump connector	2224/13082	. . . . . Two-layer arrangements
2224/13001	. . . . . Core members of the bump connector	2224/13083	. . . . . Three-layer arrangements
2224/13005	. . . . . Structure	2224/13084	. . . . . Four-layer arrangements
2224/13006	. . . . . Bump connector larger than the underlying bonding area, e.g. than the under bump metallisation [UBM]	2224/13099	. . . . . Material
2224/13007	. . . . . Bump connector smaller than the underlying bonding area, e.g. than the under bump metallisation [UBM]	2224/131	. . . . . with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/13008	. . . . . Bump connector integrally formed with a redistribution layer on the semiconductor or solid-state body	2224/13101	. . . . . the principal constituent melting at a temperature of less than 400°C
2224/13009	. . . . . Bump connector integrally formed with a via connection of the semiconductor or solid-state body	2224/13105	. . . . . Gallium [Ga] as principal constituent
2224/1301	. . . . . Shape	2224/13109	. . . . . Indium [In] as principal constituent
2224/13011	. . . . . comprising apertures or cavities, e.g. hollow bump	2224/13111	. . . . . Tin [Sn] as principal constituent
2224/13012	. . . . . in top view	2224/13113	. . . . . Bismuth [Bi] as principal constituent
2224/13013	. . . . . being rectangular or square	2224/13114	. . . . . Thallium [Tl] as principal constituent
2224/13014	. . . . . being circular or elliptic	2224/13116	. . . . . Lead [Pb] as principal constituent
2224/13015	. . . . . comprising protrusions or indentations	2224/13117	. . . . . the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/13016	. . . . . in side view	2224/13118	. . . . . Zinc [Zn] as principal constituent
2224/13017	. . . . . being non uniform along the bump connector	2224/1312	. . . . . Antimony [Sb] as principal constituent
2224/13018	. . . . . comprising protrusions or indentations	2224/13123	. . . . . Magnesium [Mg] as principal constituent
2224/13019	. . . . . at the bonding interface of the bump connector, i.e. on the surface of the bump connector	2224/13124	. . . . . Aluminium [Al] as principal constituent
2224/1302	. . . . . Disposition	2224/13138	. . . . . the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/13021	. . . . . the bump connector being disposed in a recess of the surface	2224/13139	. . . . . Silver [Ag] as principal constituent
2224/13022	. . . . . the bump connector being at least partially embedded in the surface	2224/13144	. . . . . Gold [Au] as principal constituent
2224/13023	. . . . . the whole bump connector protruding from the surface	2224/13147	. . . . . Copper [Cu] as principal constituent
2224/13024	. . . . . the bump connector being disposed on a redistribution layer on the semiconductor or solid-state body	2224/13149	. . . . . Manganese [Mn] as principal constituent
2224/13025	. . . . . the bump connector being disposed on a via connection of the semiconductor or solid-state body	2224/13155	. . . . . Nickel [Ni] as principal constituent
2224/13026	. . . . . relative to the bonding area, e.g. bond pad, of the semiconductor or solid-state body	2224/13157	. . . . . Cobalt [Co] as principal constituent
2224/13027	. . . . . the bump connector being offset with respect to the bonding area, e.g. bond pad	2224/1316	. . . . . Iron [Fe] as principal constituent
2224/13028	. . . . . the bump connector being disposed on at least two separate bonding areas, e.g. bond pads	2224/13163	. . . . . the principal constituent melting at a temperature of greater than 1550°C
2224/13075	. . . . . Plural core members	2224/13164	. . . . . Palladium [Pd] as principal constituent
2224/13076	. . . . . being mutually engaged together, e.g. through inserts	2224/13166	. . . . . Titanium [Ti] as principal constituent
		2224/13169 Platinum [Pt] as principal constituent
		2224/1317 Zirconium [Zr] as principal constituent

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2224/13171	Chromium [Cr] as principal constituent	2224/13201	the principal constituent melting at a temperature of less than 400°C
2224/13172	Vanadium [V] as principal constituent	2224/13205	Gallium [Ga] as principal constituent
2224/13173	Rhodium [Rh] as principal constituent	2224/13209	Indium [In] as principal constituent
2224/13176	Ruthenium [Ru] as principal constituent	2224/13211	Tin [Sn] as principal constituent
2224/13178	Iridium [Ir] as principal constituent	2224/13213	Bismuth [Bi] as principal constituent
2224/13179	Niobium [Nb] as principal constituent	2224/13214	Thallium [Tl] as principal constituent
2224/1318	Molybdenum [Mo] as principal constituent	2224/13216	Lead [Pb] as principal constituent
2224/13181	Tantalum [Ta] as principal constituent	2224/13217	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/13183	Rhenium [Re] as principal constituent	2224/13218	Zinc [Zn] as principal constituent
2224/13184	Tungsten [W] as principal constituent	2224/1322	Antimony [Sb] as principal constituent
2224/13186	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/13223	Magnesium [Mg] as principal constituent
2224/13187	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/13188)	2224/13224	Aluminium [Al] as principal constituent
2224/13188	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/13238	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/1319	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/13239	Silver [Ag] as principal constituent
2224/13191	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene	2224/13244	Gold [Au] as principal constituent
2224/13193	with a principal constituent of the material being a solid not provided for in groups H01L 2224/131 - H01L 2224/13191 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond	2224/13247	Copper [Cu] as principal constituent
2224/13194	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/131 - H01L 2224/13191	2224/13249	Manganese [Mn] as principal constituent
2224/13195	with a principal constituent of the material being a gas not provided for in groups H01L 2224/131 - H01L 2224/13191	2224/13255	Nickel [Ni] as principal constituent
2224/13198	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams	2224/13257	Cobalt [Co] as principal constituent
2224/13199	Material of the matrix	2224/1326	Iron [Fe] as principal constituent
2224/132	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/13263	the principal constituent melting at a temperature of greater than 1550°C
		2224/13264	Palladium [Pd] as principal constituent
		2224/13266	Titanium [Ti] as principal constituent
		2224/13269	Platinum [Pt] as principal constituent
		2224/1327	Zirconium [Zr] as principal constituent
		2224/13271	Chromium [Cr] as principal constituent
		2224/13272	Vanadium [V] as principal constituent
		2224/13273	Rhodium [Rh] as principal constituent
		2224/13276	Ruthenium [Ru] as principal constituent

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2224/13278	Iridium [Ir] as principal constituent	2224/13316	Lead [Pb] as principal constituent
2224/13279	.....	Niobium [Nb] as principal constituent	2224/13317	.....	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/1328	.....	Molybdenum [Mo] as principal constituent	2224/13318	.....	Zinc [Zn] as principal constituent
2224/13281	.....	Tantalum [Ta] as principal constituent	2224/1332	.....	Antimony [Sb] as principal constituent
2224/13283	.....	Rhenium [Re] as principal constituent	2224/13323	.....	Magnesium [Mg] as principal constituent
2224/13284	.....	Tungsten [W] as principal constituent	2224/13324	.....	Aluminium [Al] as principal constituent
2224/13286	.....	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/13338	.....	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/13287	.....	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/13288)	2224/13339	.....	Silver [Ag] as principal constituent
2224/13288	.....	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/13344	.....	Gold [Au] as principal constituent
2224/1329	.....	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/13347	.....	Copper [Cu] as principal constituent
2224/13291	.....	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene	2224/13349	.....	Manganese [Mn] as principal constituent
2224/13293	.....	with a principal constituent of the material being a solid not provided for in groups H01L 2224/132 - H01L 2224/13291 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond	2224/13355	.....	Nickel [Ni] as principal constituent
2224/13294	.....	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/132 - H01L 2224/13291	2224/13357	.....	Cobalt [Co] as principal constituent
2224/13295	.....	with a principal constituent of the material being a gas not provided for in groups H01L 2224/132 - H01L 2224/13291	2224/1336	.....	Iron [Fe] as principal constituent
2224/13298	.....	Fillers	2224/13363	.....	the principal constituent melting at a temperature of greater than 1550°C
2224/13299	.....	Base material	2224/13364	.....	Palladium [Pd] as principal constituent
2224/133	.....	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/13366	.....	Titanium [Ti] as principal constituent
2224/13301	.....	the principal constituent melting at a temperature of less than 400°C	2224/13369	.....	Platinum [Pt] as principal constituent
2224/13305	.....	Gallium [Ga] as principal constituent	2224/1337	.....	Zirconium [Zr] as principal constituent
2224/13309	.....	Indium [In] as principal constituent	2224/13371	.....	Chromium [Cr] as principal constituent
2224/13311	.....	Tin [Sn] as principal constituent	2224/13372	.....	Vanadium [V] as principal constituent
2224/13313	.....	Bismuth [Bi] as principal constituent	2224/13373	.....	Rhodium [Rh] as principal constituent
2224/13314	.....	Thallium [Tl] as principal constituent	2224/13376	.....	Ruthenium [Ru] as principal constituent
			2224/13378	.....	Iridium [Ir] as principal constituent
			2224/13379	.....	Niobium [Nb] as principal constituent
			2224/1338	.....	Molybdenum [Mo] as principal constituent
			2224/13381	.....	Tantalum [Ta] as principal constituent
			2224/13383	Rhenium [Re] as principal constituent
			2224/13384	Tungsten [W] as principal constituent

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2224/13386	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/13417	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/13387	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/13388)	2224/13418	Zinc [Zn] as principal constituent
2224/13388	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/1342	Antimony [Sb] as principal constituent
2224/1339	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/13423	Magnesium [Mg] as principal constituent
2224/13391	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene	2224/13424	Aluminium [Al] as principal constituent
2224/13393	with a principal constituent of the material being a solid not provided for in groups H01L 2224/133 - H01L 2224/13391	2224/13438	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
	e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond	2224/13439	Silver [Ag] as principal constituent
2224/13394	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/133 - H01L 2224/13391	2224/13444	Gold [Au] as principal constituent
2224/13395	with a principal constituent of the material being a gas not provided for in groups H01L 2224/133 - H01L 2224/13391	2224/13447	Copper [Cu] as principal constituent
2224/13398	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams	2224/13449	Manganese [Mn] as principal constituent
2224/13399	Coating material	2224/13455	Nickel [Ni] as principal constituent
2224/134	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/13457	Cobalt [Co] as principal constituent
2224/13401	the principal constituent melting at a temperature of less than 400°C	2224/1346	Iron [Fe] as principal constituent
2224/13405	Gallium [Ga] as principal constituent	2224/13463	the principal constituent melting at a temperature of greater than 1550°C
2224/13409	Indium [In] as principal constituent	2224/13464	Palladium [Pd] as principal constituent
2224/13411	Tin [Sn] as principal constituent	2224/13466	Titanium [Ti] as principal constituent
2224/13413	Bismuth [Bi] as principal constituent	2224/13469	Platinum [Pt] as principal constituent
2224/13414	Thallium [Tl] as principal constituent	2224/1347	Zirconium [Zr] as principal constituent
2224/13416	Lead [Pb] as principal constituent	2224/13471	Chromium [Cr] as principal constituent
		2224/13472	Vanadium [V] as principal constituent
		2224/13473	Rhodium [Rh] as principal constituent
		2224/13476	Ruthenium [Ru] as principal constituent
		2224/13478	Iridium [Ir] as principal constituent
		2224/13479	Niobium [Nb] as principal constituent
		2224/1348	Molybdenum [Mo] as principal constituent
		2224/13481	Tantalum [Ta] as principal constituent
		2224/13483	Rhenium [Re] as principal constituent
		2224/13484	Tungsten [W] as principal constituent

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2224/13486	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/13576	being mutually engaged together, e.g. through inserts
2224/13487	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/13488)	2224/13578	being disposed next to each other, e.g. side-to-side arrangements
2224/13488	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/1358	being stacked
2224/1349	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/13582	Two-layer coating
2224/13491	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene	2224/13583	Three-layer coating
2224/13493	with a principal constituent of the material being a solid not provided for in groups H01L 2224/134 - H01L 2224/13491 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond	2224/13584	Four-layer coating
2224/13494	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/134 - H01L 2224/13491	2224/13599	Material
2224/13495	with a principal constituent of the material being a gas not provided for in groups H01L 2224/134 - H01L 2224/13491	2224/136	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/13498	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams	2224/13601	the principal constituent melting at a temperature of less than 400°C
2224/13499	Shape or distribution of the fillers	2224/13605	Gallium [Ga] as principal constituent
2224/1354	Coating	2224/13609	Indium [In] as principal constituent
2224/13541	Structure	2224/13611	Tin [Sn] as principal constituent
2224/1355	Shape	2224/13613	Bismuth [Bi] as principal constituent
2224/13551	being non uniform	2224/13614	Thallium [Tl] as principal constituent
2224/13552	comprising protrusions or indentations	2224/13616	Lead [Pb] as principal constituent
2224/13553	at the bonding interface of the bump connector, i.e. on the surface of the bump connector	2224/13617	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/1356	Disposition	2224/13618	Zinc [Zn] as principal constituent
2224/13561	On the entire surface of the core, i.e. integral coating	2224/1362	Antimony [Sb] as principal constituent
2224/13562	On the entire exposed surface of the core	2224/13623	Magnesium [Mg] as principal constituent
2224/13563	Only on parts of the surface of the core, i.e. partial coating	2224/13624	Aluminium [Al] as principal constituent
2224/13564	Only on the bonding interface of the bump connector	2224/13638	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/13565	Only outside the bonding interface of the bump connector	2224/13639	Silver [Ag] as principal constituent
2224/13566	Both on and outside the bonding interface of the bump connector	2224/13644	Gold [Au] as principal constituent
2224/1357	Single coating layer	2224/13647	Copper [Cu] as principal constituent
2224/13575	Plural coating layers	2224/13649	Manganese [Mn] as principal constituent
		2224/13655	Nickel [Ni] as principal constituent
		2224/13657	Cobalt [Co] as principal constituent
		2224/1366	Iron [Fe] as principal constituent
		2224/13663	the principal constituent melting at a temperature of greater than 1550°C
		2224/13664	Palladium [Pd] as principal constituent
		2224/13666	Titanium [Ti] as principal constituent
		2224/13669	Platinum [Pt] as principal constituent

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2224/1367	Zirconium [Zr] as principal constituent	2224/13701	the principal constituent melting at a temperature of less than 400°C
2224/13671	. . . . .	Chromium [Cr] as principal constituent	2224/13705	. . . . .	Gallium [Ga] as principal constituent
2224/13672	. . . . .	Vanadium [V] as principal constituent	2224/13709	. . . . .	Indium [In] as principal constituent
2224/13673	. . . . .	Rhodium [Rh] as principal constituent	2224/13711	. . . . .	Tin [Sn] as principal constituent
2224/13676	. . . . .	Ruthenium [Ru] as principal constituent	2224/13713	. . . . .	Bismuth [Bi] as principal constituent
2224/13678	. . . . .	Iridium [Ir] as principal constituent	2224/13714	. . . . .	Thallium [Tl] as principal constituent
2224/13679	. . . . .	Niobium [Nb] as principal constituent	2224/13716	. . . . .	Lead [Pb] as principal constituent
2224/1368	. . . . .	Molybdenum [Mo] as principal constituent	2224/13717	. . . . .	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/13681	. . . . .	Tantalum [Ta] as principal constituent	2224/13718	. . . . .	Zinc [Zn] as principal constituent
2224/13683	. . . . .	Rhenium [Re] as principal constituent	2224/1372	. . . . .	Antimony [Sb] as principal constituent
2224/13684	. . . . .	Tungsten [W] as principal constituent	2224/13723	. . . . .	Magnesium [Mg] as principal constituent
2224/13686	. . . . .	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/13724	. . . . .	Aluminium [Al] as principal constituent
2224/13687	. . . . .	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/13688)	2224/13738	. . . . .	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/13688	. . . . .	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/13739	. . . . .	Silver [Ag] as principal constituent
2224/1369	. . . . .	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/13744	. . . . .	Gold [Au] as principal constituent
2224/13691	. . . . .	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene	2224/13747	. . . . .	Copper [Cu] as principal constituent
2224/13693	. . . . .	with a principal constituent of the material being a solid not provided for in groups H01L 2224/136 - H01L 2224/13691 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond	2224/13749	. . . . .	Manganese [Mn] as principal constituent
2224/13694	. . . . .	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/136 - H01L 2224/13691	2224/13755	. . . . .	Nickel [Ni] as principal constituent
2224/13695	. . . . .	with a principal constituent of the material being a gas not provided for in groups H01L 2224/136 - H01L 2224/13691	2224/13757	. . . . .	Cobalt [Co] as principal constituent
2224/13698	. . . . .	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams	2224/1376	. . . . .	Iron [Fe] as principal constituent
2224/13699	. . . . .	Material of the matrix	2224/13763	. . . . .	the principal constituent melting at a temperature of greater than 1550°C
2224/137	. . . . .	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/13764	. . . . .	Palladium [Pd] as principal constituent
			2224/13766	. . . . .	Titanium [Ti] as principal constituent
			2224/13769	. . . . .	Platinum [Pt] as principal constituent
			2224/1377	. . . . .	Zirconium [Zr] as principal constituent
			2224/13771	. . . . .	Chromium [Cr] as principal constituent
			2224/13772	. . . . .	Vanadium [V] as principal constituent
			2224/13773	Rhodium [Rh] as principal constituent
			2224/13776	Ruthenium [Ru] as principal constituent

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2224/13778	Iridium [Ir] as principal constituent	2224/13816	Lead [Pb] as principal constituent
2224/13779	.....	Niobium [Nb] as principal constituent	2224/13817	.....	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/1378	.....	Molybdenum [Mo] as principal constituent	2224/13818	.....	Zinc [Zn] as principal constituent
2224/13781	.....	Tantalum [Ta] as principal constituent	2224/1382	.....	Antimony [Sb] as principal constituent
2224/13783	.....	Rhenium [Re] as principal constituent	2224/13823	.....	Magnesium [Mg] as principal constituent
2224/13784	.....	Tungsten [W] as principal constituent	2224/13824	.....	Aluminium [Al] as principal constituent
2224/13786	.....	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/13838	.....	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/13787	.....	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/13788)	2224/13839	.....	Silver [Ag] as principal constituent
2224/13788	.....	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/13844	.....	Gold [Au] as principal constituent
2224/1379	.....	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/13847	.....	Copper [Cu] as principal constituent
2224/13791	.....	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene	2224/13849	.....	Manganese [Mn] as principal constituent
2224/13793	.....	with a principal constituent of the material being a solid not provided for in groups H01L 2224/137 - H01L 2224/13791 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond	2224/13855	.....	Nickel [Ni] as principal constituent
2224/13794	.....	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/137 - H01L 2224/13791	2224/13857	.....	Cobalt [Co] as principal constituent
2224/13795	.....	with a principal constituent of the material being a gas not provided for in groups H01L 2224/137 - H01L 2224/13791	2224/1386	.....	Iron [Fe] as principal constituent
2224/13798	.....	Fillers	2224/13863	.....	the principal constituent melting at a temperature of greater than 1550°C
2224/13799	.....	Base material	2224/13864	.....	Palladium [Pd] as principal constituent
2224/138	.....	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/13866	.....	Titanium [Ti] as principal constituent
2224/13801	.....	the principal constituent melting at a temperature of less than 400°C	2224/13869	.....	Platinum [Pt] as principal constituent
2224/13805	.....	Gallium [Ga] as principal constituent	2224/1387	.....	Zirconium [Zr] as principal constituent
2224/13809	.....	Indium [In] as principal constituent	2224/13871	.....	Chromium [Cr] as principal constituent
2224/13811	.....	Tin [Sn] as principal constituent	2224/13872	.....	Vanadium [V] as principal constituent
2224/13813	.....	Bismuth [Bi] as principal constituent	2224/13873	.....	Rhodium [Rh] as principal constituent
2224/13814	.....	Thallium [Tl] as principal constituent	2224/13876	.....	Ruthenium [Ru] as principal constituent
			2224/13878	.....	Iridium [Ir] as principal constituent
			2224/13879	.....	Niobium [Nb] as principal constituent
			2224/1388	.....	Molybdenum [Mo] as principal constituent
			2224/13881	.....	Tantalum [Ta] as principal constituent
			2224/13883	Rhenium [Re] as principal constituent
			2224/13884	Tungsten [W] as principal constituent

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2224/13886	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/13917	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/13887	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/13888)	2224/13918	Zinc [Zn] as principal constituent
2224/13888	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/1392	Antimony [Sb] as principal constituent
2224/1389	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/13923	Magnesium [Mg] as principal constituent
2224/13891	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene	2224/13924	Aluminium [Al] as principal constituent
2224/13893	with a principal constituent of the material being a solid not provided for in groups H01L 2224/138 - H01L 2224/13891 e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond	2224/13938	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/13894	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/138 - H01L 2224/13891	2224/13939	Silver [Ag] as principal constituent
2224/13895	with a principal constituent of the material being a gas not provided for in groups H01L 2224/138 - H01L 2224/13891	2224/13944	Gold [Au] as principal constituent
2224/13898	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams	2224/13947	Copper [Cu] as principal constituent
2224/13899	Coating material	2224/13949	Manganese [Mn] as principal constituent
2224/139	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/13955	Nickel [Ni] as principal constituent
2224/13901	the principal constituent melting at a temperature of less than 400°C	2224/13957	Cobalt [Co] as principal constituent
2224/13905	Gallium [Ga] as principal constituent	2224/1396	Iron [Fe] as principal constituent
2224/13909	Indium [In] as principal constituent	2224/13963	the principal constituent melting at a temperature of greater than 1550°C
2224/13911	Tin [Sn] as principal constituent	2224/13964	Palladium [Pd] as principal constituent
2224/13913	Bismuth [Bi] as principal constituent	2224/13966	Titanium [Ti] as principal constituent
2224/13914	Thallium [Tl] as principal constituent	2224/13969	Platinum [Pt] as principal constituent
2224/13916	Lead [Pb] as principal constituent	2224/1397	Zirconium [Zr] as principal constituent
		2224/13971	Chromium [Cr] as principal constituent
		2224/13972	Vanadium [V] as principal constituent
		2224/13973	Rhodium [Rh] as principal constituent
		2224/13976	Ruthenium [Ru] as principal constituent
		2224/13978	Iridium [Ir] as principal constituent
		2224/13979	Niobium [Nb] as principal constituent
		2224/1398	Molybdenum [Mo] as principal constituent
		2224/13981	Tantalum [Ta] as principal constituent
		2224/13983	Rhenium [Re] as principal constituent
		2224/13984	Tungsten [W] as principal constituent

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2224/13986	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/14135	Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
2224/13987	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/13988)	2224/14136	Covering only the central area of the surface to be connected, i.e. central arrangements
2224/13988	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/1414	Circular array, i.e. array with radial symmetry
2224/1399	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/14141	being uniform, i.e. having a uniform pitch across the array
2224/13991	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene	2224/14142	being non uniform, i.e. having a non uniform pitch across the array
2224/13993	with a principal constituent of the material being a solid not provided for in groups H01L 2224/139 - H01L 2224/13991 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond	2224/14143	with a staggered arrangement, e.g. depopulated array
2224/13994	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/139 - H01L 2224/13991	2224/14144	covering only portions of the surface to be connected
2224/13995	with a principal constituent of the material being a gas not provided for in groups H01L 2224/139 - H01L 2224/13991	2224/14145	Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
2224/13998	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams	2224/14146	Covering only the central area of the surface to be connected, i.e. central arrangements
2224/13999	Shape or distribution of the fillers	2224/1415	Mirror array, i.e. array having only a reflection symmetry, i.e. bilateral symmetry
2224/14	of a plurality of bump connectors	2224/14151	being uniform, i.e. having a uniform pitch across the array
2224/1401	Structure	2224/14152	being non uniform, i.e. having a non uniform pitch across the array
2224/1403	Bump connectors having different sizes, e.g. different diameters, heights or widths	2224/14153	with a staggered arrangement, e.g. depopulated array
2224/1405	Shape	2224/14154	covering only portions of the surface to be connected
2224/14051	Bump connectors having different shapes	2224/14155	Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
2224/141	Disposition	2224/14156	Covering only the central area of the surface to be connected, i.e. central arrangements
2224/14104	relative to the bonding areas, e.g. bond pads, of the semiconductor or solid-state body	2224/1416	Random layout, i.e. layout with no symmetry
2224/1411	the bump connectors being bonded to at least one common bonding area	2224/14163	with a staggered arrangement
2224/1412	Layout	2224/14164	covering only portions of the surface to be connected
2224/1413	Square or rectangular array	2224/14165	Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
2224/14131	being uniform, i.e. having a uniform pitch across the array	2224/14166	Covering only the central area of the surface to be connected, i.e. central arrangements
2224/14132	being non uniform, i.e. having a non uniform pitch across the array	2224/14177	Combinations of arrays with different layouts
2224/14133	with a staggered arrangement, e.g. depopulated array	2224/14179	Corner adaptations, i.e. disposition of the bump connectors at the corners of the semiconductor or solid-state body
2224/14134	covering only portions of the surface to be connected	2224/1418	being disposed on at least two different sides of the body, e.g. dual array
		2224/14181	On opposite sides of the body
		2224/14183	On contiguous sides of the body
		2224/145	Material
		2224/14505	Bump connectors having different materials
		2224/1451	Function

- 2224/14515 Bump connectors having different functions
- 2224/14517 including bump connectors providing primarily mechanical bonding
- 2224/14519 including bump connectors providing primarily thermal dissipation
- 2224/15 Structure, shape, material or disposition of the bump connectors after the connecting process
- 2224/16 of an individual bump connector
- 2224/1601 Structure
- 2224/16012 relative to the bonding area, e.g. bond pad
- 2224/16013 the bump connector being larger than the bonding area, e.g. bond pad
- 2224/16014 the bump connector being smaller than the bonding area, e.g. bond pad
- 2224/1605 Shape
- 2224/16052 in top view
- 2224/16054 being rectangular or square
- 2224/16055 being circular or elliptic
- 2224/16056 comprising protrusions or indentations
- 2224/16057 in side view
- 2224/16058 being non uniform along the bump connector
- 2224/16059 comprising protrusions or indentations
- 2224/1607 of bonding interfaces, e.g. interlocking features
- 2224/161 Disposition
- 2224/16104 relative to the bonding area, e.g. bond pad
- 2224/16105 the bump connector connecting bonding areas being not aligned with respect to each other
- 2224/16106 the bump connector connecting one bonding area to at least two respective bonding areas
- 2224/16108 the bump connector not being orthogonal to the surface
- 2224/16111 the bump connector being disposed in a recess of the surface
- 2224/16112 the bump connector being at least partially embedded in the surface
- 2224/16113 the whole bump connector protruding from the surface
- 2224/1613 the bump connector connecting within a semiconductor or solid-state body, i.e. connecting two bonding areas on the same semiconductor or solid-state body
- 2224/16135 the bump connector connecting between different semiconductor or solid-state bodies, i.e. chip-to-chip
- 2224/16137 the bodies being arranged next to each other, e.g. on a common substrate
- 2224/16141 the bodies being arranged on opposite sides of a substrate, e.g. mirror arrangements
- 2224/16145 the bodies being stacked
- 2224/16146 the bump connector connecting to a via connection in the semiconductor or solid-state body
- 2224/16147 the bump connector connecting to a bonding area disposed in a recess of the surface
- 2224/16148 the bump connector connecting to a bonding area protruding from the surface
- 2224/16151 the bump connector connecting between a semiconductor or solid-state body and an item not being a semiconductor or solid-state body, e.g. chip-to-substrate, chip-to-passive
- 2224/16153 the body and the item being arranged next to each other, e.g. on a common substrate
- 2224/16155 the item being non-metallic, e.g. being an insulating substrate with or without metallisation
- 2224/16157 the bump connector connecting to a bond pad of the item
- 2224/1616 the bump connector connecting to a pin of the item
- 2224/16163 the bump connector connecting to a potential ring of the item
- 2224/16165 the bump connector connecting to a via metallisation of the item
- 2224/16167 the bump connector connecting to a bonding area disposed in a recess of the surface of the item
- 2224/16168 the bump connector connecting to a bonding area protruding from the surface of the item
- 2224/16175 the item being metallic
- 2224/16183 the bump connector connecting to a potential ring of the item
- 2224/16187 the bump connector connecting to a bonding area disposed in a recess of the surface of the item
- 2224/16188 the bump connector connecting to a bonding area protruding from the surface of the item
- 2224/16195 the item being a discrete passive component
- 2224/16197 the bump connector connecting to a bonding area disposed in a recess of the surface of the item
- 2224/16198 the bump connector connecting to a bonding area protruding from the surface of the item
- 2224/16221 the body and the item being stacked
- 2224/16225 the item being non-metallic, e.g. insulating substrate with or without metallisation
- 2224/16227 the bump connector connecting to a bond pad of the item
- 2224/1623 the bump connector connecting to a pin of the item
- 2224/16233 the bump connector connecting to a potential ring of the item
- 2224/16235 the bump connector connecting to a via metallisation of the item
- 2224/16237 the bump connector connecting to a bonding area disposed in a recess of the surface of the item

- 2224/16238 the bump connector connecting to a bonding area protruding from the surface of the item
- 2224/1624 the bump connector connecting between the body and an opposite side of the item with respect to the body
- 2224/16245 the item being metallic
- 2224/16253 the bump connector connecting to a potential ring of the item
- 2224/16257 the bump connector connecting to a bonding area disposed in a recess of the surface of the item
- 2224/16258 the bump connector connecting to a bonding area protruding from the surface of the item
- 2224/1626 the bump connector connecting between the body and an opposite side of the item with respect to the body
- 2224/16265 the item being a discrete passive component
- 2224/16267 the bump connector connecting to a bonding area disposed in a recess of the surface of the item
- 2224/16268 the bump connector connecting to a bonding area protruding from the surface of the item
- 2224/165 Material
- 2224/16501 at the bonding interface
- 2224/16502 comprising an eutectic alloy
- 2224/16503 comprising an intermetallic compound
- 2224/16505 outside the bonding interface, e.g. in the bulk of the bump connector
- 2224/16506 comprising an eutectic alloy
- 2224/16507 comprising an intermetallic compound
- 2224/17 of a plurality of bump connectors
- 2224/1701 Structure
- 2224/1703 Bump connectors having different sizes, e.g. different diameters, heights or widths
- 2224/1705 Shape
- 2224/17051 Bump connectors having different shapes
- 2224/17055 of their bonding interfaces
- 2224/171 Disposition
- 2224/17104 relative to the bonding areas, e.g. bond pads
- 2224/17106 the bump connectors being bonded to at least one common bonding area
- 2224/17107 the bump connectors connecting two common bonding areas
- 2224/1712 Layout ([layout of bump connectors prior to the connecting process H01L 2224/1412](#))
- 2224/1713 Square or rectangular array
- 2224/17132 being non uniform, i.e. having a non uniform pitch across the array
- 2224/17133 with a staggered arrangement, e.g. depopulated array
- 2224/17134 covering only portions of the surface to be connected
- 2224/17135 Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
- 2224/17136 Covering only the central area of the surface to be connected, i.e. central arrangements
- 2224/1714 Circular array, i.e. array with radial symmetry
- 2224/17142 being non uniform, i.e. having a non uniform pitch across the array
- 2224/17143 with a staggered arrangement
- 2224/17144 covering only portions of the surface to be connected
- 2224/17145 Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
- 2224/17146 Covering only the central area of the surface to be connected, i.e. central arrangements
- 2224/1715 Mirror array, i.e. array having only a reflection symmetry, i.e. bilateral symmetry
- 2224/17151 being uniform, i.e. having a uniform pitch across the array
- 2224/17152 being non uniform, i.e. having a non uniform pitch across the array
- 2224/17153 with a staggered arrangement, e.g. depopulated array
- 2224/17154 covering only portions of the surface to be connected
- 2224/17155 Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
- 2224/17156 Covering only the central area of the surface to be connected, i.e. central arrangements
- 2224/1716 Random layout, i.e. layout with no symmetry
- 2224/17163 with a staggered arrangement
- 2224/17164 covering only portions of the surface to be connected
- 2224/17165 Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
- 2224/17166 Covering only the central area of the surface to be connected, i.e. central arrangements
- 2224/17177 Combinations of arrays with different layouts
- 2224/17179 Corner adaptations, i.e. disposition of the bump connectors at the corners of the semiconductor or solid-state body
- 2224/1718 being disposed on at least two different sides of the body, e.g. dual array
- 2224/17181 On opposite sides of the body
- 2224/17183 On contiguous sides of the body
- 2224/175 Material
- 2224/17505 Bump connectors having different materials
- 2224/1751 Function
- 2224/17515 Bump connectors having different functions
- 2224/17517 including bump connectors providing primarily mechanical support

2224/17519	. . . . .	including bump connectors providing primarily thermal dissipation	2224/24151	. . . . .	Connecting between a semiconductor or solid-state body and an item not being a semiconductor or solid-state body, e.g. chip-to-substrate, chip-to-passive
2224/18	. .	High density interconnect [HDI] connectors; Manufacturing methods related thereto	2224/24153	. . . . .	the body and the item being arranged next to each other, e.g. on a common substrate
2224/19	. . .	Manufacturing methods of high density interconnect preforms	2224/24155	. . . . .	the item being non-metallic, e.g. insulating substrate with or without metallisation
2224/20	. . .	Structure, shape, material or disposition of high density interconnect preforms	2224/24175	. . . . .	the item being metallic
2224/21	. . . .	of an individual HDI interconnect	2224/24195	. . . . .	the item being a discrete passive component
2224/2101	. . . . .	Structure	2224/24221	. . . . .	the body and the item being stacked
2224/2105	. . . . .	Shape	2224/24225	. . . . .	the item being non-metallic, e.g. insulating substrate with or without metallisation
2224/211	. . . . .	Disposition	2224/24226	. . . . .	the HDI interconnect connecting to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the item being planar
2224/214	. . . . .	Connecting portions	2224/24227	. . . . .	the HDI interconnect not connecting to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item
2224/215	. . . . .	Material	2224/24245	. . . . .	the item being metallic
2224/22	. . . .	of a plurality of HDI interconnects	2224/24246	. . . . .	the HDI interconnect connecting to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the item being planar
2224/2201	. . . . .	Structure	2224/24247	. . . . .	the HDI interconnect not connecting to the same level of the item at which the semiconductor or solid-state body is mounted, e.g. the semiconductor or solid-state body being mounted in a cavity or on a protrusion of the item
2224/2205	. . . . .	Shape	2224/24265	. . . . .	the item being a discrete passive component
2224/221	. . . . .	Disposition	2224/244	. . . . .	Connecting portions
2224/224	. . . . .	Connecting portions	2224/245	. . . . .	Material
2224/225	. . . . .	Material	2224/2499	. . . . .	Auxiliary members for HDI interconnects, e.g. spacers, alignment aids
2224/22505	. . . . .	HDI interconnects having different materials	2224/24991	. . . . .	being formed on the semiconductor or solid-state body to be connected
2224/23	. . .	Structure, shape, material or disposition of the high density interconnect connectors after the connecting process	2224/24992	. . . . .	Flow barrier
2224/24	. . . .	of an individual high density interconnect connector	2224/24996	. . . . .	being formed on an item to be connected not being a semiconductor or solid-state body
2224/2401	. . . . .	Structure	2224/24997	. . . . .	Flow barrier
2224/24011	. . . . .	Deposited, e.g. MCM-D type	2224/24998	. . . . .	Reinforcing structures, e.g. ramp-like support
2224/2402	. . . . .	Laminated, e.g. MCM-L type	2224/25	. . . . .	of a plurality of high density interconnect connectors
2224/2405	. . . . .	Shape	2224/2501	. . . . .	Structure
2224/24051	. . . . .	Conformal with the semiconductor or solid-state device	2224/2505	. . . . .	Shape
2224/241	. . . . .	Disposition	2224/251	. . . . .	Disposition
2224/24101	. . . . .	Connecting bonding areas at the same height	2224/25105	. . . . .	Connecting at different heights
2224/24105	. . . . .	Connecting bonding areas at different heights			
2224/2413	. . . . .	Connecting within a semiconductor or solid-state body			
2224/24135	. . . . .	Connecting between different semiconductor or solid-state bodies, i.e. chip-to-chip			
2224/24137	. . . . .	the bodies being arranged next to each other, e.g. on a common substrate			
2224/24141	. . . . .	the bodies being arranged on opposite sides of a substrate, e.g. mirror arrangements			
2224/24145	. . . . .	the bodies being stacked			
2224/24146	. . . . .	the HDI interconnect connecting to the same level of the lower semiconductor or solid-state body at which the upper semiconductor or solid-state body is mounted			
2224/24147	. . . . .	the HDI interconnect not connecting to the same level of the lower semiconductor or solid-state body at which the upper semiconductor or solid-state body is mounted, e.g. the upper semiconductor or solid-state body being mounted in a cavity or on a protrusion of the lower semiconductor or solid-state body			

- 2224/2511 the connectors being bonded to at least one common bonding area
- 2224/25111 the connectors connecting two common bonding areas
- 2224/25112 the connectors connecting a common bonding area on the semiconductor or solid-state body to different bonding areas outside the body
- 2224/25113 the connectors connecting different bonding areas on the semiconductor or solid-state body to a common bonding area outside the body
- 2224/2512 Layout
- 2224/25171 Fan-out arrangements
- 2224/25174 Stacked arrangements
- 2224/25175 Parallel arrangements
- 2224/25177 Combinations of a plurality of arrangements
- 2224/2518 being disposed on at least two different sides of the body, e.g. dual array
- 2224/254 Connecting portions
- 2224/2541 the connecting portions being stacked
- 2224/2543 the connecting portions being staggered
- 2224/255 Material
- 2224/26 . . . Layer connectors, e.g. plate connectors, solder or adhesive layers; Manufacturing methods related thereto
- 2224/2612 . . . Auxiliary members for layer connectors, e.g. spacers
- 2224/26122 being formed on the semiconductor or solid-state body to be connected
- 2224/26125 Reinforcing structures
- 2224/26135 Alignment aids
- 2224/26145 Flow barriers
- 2224/26152 being formed on an item to be connected not being a semiconductor or solid-state body
- 2224/26155 Reinforcing structures
- 2224/26165 Alignment aids
- 2224/26175 Flow barriers
- 2224/27 . . . Manufacturing methods
- 2224/27001 Involving a temporary auxiliary member not forming part of the manufacturing apparatus, e.g. removable or sacrificial coating, film or substrate
- 2224/27002 for supporting the semiconductor or solid-state body
- 2224/27003 for holding or transferring the layer preform
- 2224/27005 for aligning the layer connector, e.g. marks, spacers
- 2224/27009 for protecting parts during manufacture
- 2224/27011 Involving a permanent auxiliary member, i.e. a member which is left at least partly in the finished device, e.g. coating, dummy feature
- 2224/27013 for holding or confining the layer connector, e.g. solder flow barrier
- 2224/27015 for aligning the layer connector, e.g. marks, spacers
- 2224/27019 for protecting parts during the process
- 2224/271 Manufacture and pre-treatment of the layer connector preform
- 2224/2711 Shaping
- 2224/2712 Applying permanent coating
- 2224/273 by local deposition of the material of the layer connector
- 2224/2731 in liquid form
- 2224/27312 Continuous flow, e.g. using a microsyringe, a pump, a nozzle or extrusion
- 2224/27318 by dispensing droplets
- 2224/2732 Screen printing, i.e. using a stencil
- 2224/2733 in solid form
- 2224/27332 using a powder
- 2224/27334 using preformed layer
- 2224/274 by blanket deposition of the material of the layer connector
- 2224/2741 in liquid form
- 2224/27416 Spin coating
- 2224/27418 Spray coating
- 2224/2742 Curtain coating
- 2224/27422 by dipping, e.g. in a solder bath ([hot-dipping C23C 2/00](#))
- 2224/27424 Immersion coating, e.g. in a solder bath ([immersion processes C23C 2/00](#))
- 2224/27426 Chemical solution deposition [CSD], i.e. using a liquid precursor
- 2224/27428 Wave coating
- 2224/2743 in solid form
- 2224/27436 Lamination of a preform, e.g. foil, sheet or layer
- 2224/27438 the preform being at least partly pre-patterned
- 2224/2744 by transfer printing
- 2224/27442 using a powder
- 2224/27444 in gaseous form
- 2224/2745 Physical vapour deposition [PVD], e.g. evaporation, or sputtering
- 2224/27452 Chemical vapour deposition [CVD], e.g. laser CVD
- 2224/2746 Plating
- 2224/27462 Electroplating
- 2224/27464 Electroless plating
- 2224/27466 Conformal deposition, i.e. blanket deposition of a conformal layer on a patterned surface
- 2224/2747 using a lift-off mask
- 2224/27472 Profile of the lift-off mask
- 2224/27474 Multilayer masks
- 2224/2748 Permanent masks, i.e. masks left in the finished device, e.g. passivation layers
- 2224/275 by chemical or physical modification of a pre-existing or pre-deposited material
- 2224/27502 Pre-existing or pre-deposited material
- 2224/27505 Sintering
- 2224/2751 Anodisation
- 2224/27515 Curing and solidification, e.g. of a photosensitive layer material
- 2224/2752 Self-assembly, e.g. self-agglomeration of the layer material in a fluid
- 2224/27522 Auxiliary means therefor, e.g. for self-assembly activation
- 2224/27524 with special adaptation of the surface or of an auxiliary substrate, e.g. surface shape specially adapted for the self-assembly process

- 2224/27526 involving the material of the bonding area, e.g. bonding pad
- 2224/2755 Selective modification
- 2224/27552 using a laser or a focussed ion beam [FIB]
- 2224/27554 Stereolithography, i.e. solidification of a pattern defined by a laser trace in a photosensitive resin
- 2224/276 by patterning a pre-deposited material (treatment of parts prior to assembly of the devices [H01L 21/48](#))
- 2224/27602 Mechanical treatment, e.g. polishing, grinding
- 2224/2761 Physical or chemical etching
- 2224/27612 by physical means only
- 2224/27614 by chemical means only
- 2224/27616 Chemical mechanical polishing [CMP]
- 2224/27618 with selective exposure, development and removal of a photosensitive layer material, e.g. of a photosensitive conductive resin
- 2224/2762 using masks
- 2224/27622 Photolithography
- 2224/2763 using a laser or a focused ion beam [FIB]
- 2224/27632 Ablation by means of a laser or focused ion beam [FIB]
- 2224/277 involving monitoring, e.g. feedback loop
- 2224/278 Post-treatment of the layer connector
- 2224/2781 Cleaning, e.g. oxide removal step, desmearing
- 2224/2782 Applying permanent coating, e.g. in-situ coating
- 2224/27821 Spray coating
- 2224/27822 by dipping, e.g. in a solder bath
- 2224/27823 Immersion coating, e.g. in a solder bath
- 2224/27824 Chemical solution deposition [CSD], i.e. using a liquid precursor
- 2224/27825 Plating, e.g. electroplating, electroless plating
- 2224/27826 Physical vapour deposition [PVD], e.g. evaporation, or sputtering
- 2224/27827 Chemical vapour deposition [CVD], e.g. laser CVD
- 2224/2783 Reworking, e.g. shaping ([reflowing H01L 2224/27849](#))
- 2224/27831 involving a chemical process, e.g. etching the layer connector
- 2224/2784 involving a mechanical process, e.g. planarising the layer connector
- 2224/27845 Chemical mechanical polishing [CMP]
- 2224/27848 Thermal treatments, e.g. annealing, controlled cooling
- 2224/27849 Reflowing
- 2224/279 Methods of manufacturing layer connectors involving a specific sequence of method steps
- 2224/27901 with repetition of the same manufacturing step
- 2224/27902 Multiple masking steps
- 2224/27903 using different masks
- 2224/27906 with modification of the same mask
- 2224/2791 Forming a passivation layer after forming the layer connector
- 2224/27912 the layer being used as a mask for patterning other parts
- 2224/27916 a passivation layer being used as a mask for patterning other parts
- 2224/28 Structure, shape, material or disposition of the layer connectors prior to the connecting process
- 2224/28105 Layer connectors formed on an encapsulation of the semiconductor or solid-state body, e.g. layer connectors on chip-scale packages
- 2224/29 of an individual layer connector
- 2224/29001 Core members of the layer connector
- 2224/29005 Structure
- 2224/29006 Layer connector larger than the underlying bonding area
- 2224/29007 Layer connector smaller than the underlying bonding area
- 2224/29008 Layer connector integrally formed with a redistribution layer on the semiconductor or solid-state body
- 2224/29009 Layer connector integrally formed with a via connection of the semiconductor or solid-state body
- 2224/2901 Shape
- 2224/29011 comprising apertures or cavities
- 2224/29012 in top view
- 2224/29013 being rectangular or square
- 2224/29014 being circular or elliptical
- 2224/29015 comprising protrusions or indentations
- 2224/29016 in side view
- 2224/29017 being non uniform along the layer connector
- 2224/29018 comprising protrusions or indentations
- 2224/29019 at the bonding interface of the layer connector, i.e. on the surface of the layer connector
- 2224/2902 Disposition
- 2224/29021 the layer connector being disposed in a recess of the surface ([embedded layer connector H01L 2224/29022](#))
- 2224/29022 the layer connector being at least partially embedded in the surface
- 2224/29023 the whole layer connector protruding from the surface
- 2224/29024 the layer connector being disposed on a redistribution layer on the semiconductor or solid-state body
- 2224/29025 the layer connector being disposed on a via connection of the semiconductor or solid-state body
- 2224/29026 relative to the bonding area, e.g. bond pad, of the semiconductor or solid-state body
- 2224/29027 the layer connector being offset with respect to the bonding area, e.g. bond pad
- 2224/29028 the layer connector being disposed on at least two separate bonding areas, e.g. bond pads
- 2224/29034 the layer connector covering only portions of the surface to be connected

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2224/29035	covering only the peripheral area of the surface to be connected	2224/29166	Titanium [Ti] as principal constituent
2224/29036	covering only the central area of the surface to be connected	2224/29169	Platinum [Pt] as principal constituent
2224/29075	Plural core members	2224/2917	Zirconium [Zr] as principal constituent
2224/29076	being mutually engaged together, e.g. through inserts	2224/29171	Chromium [Cr] as principal constituent
2224/29078	being disposed next to each other, e.g. side-to-side arrangements	2224/29172	Vanadium [V] as principal constituent
2224/2908	being stacked	2224/29173	Rhodium [Rh] as principal constituent
2224/29082	Two-layer arrangements	2224/29176	Ruthenium [Ru] as principal constituent
2224/29083	Three-layer arrangements	2224/29178	Iridium [Ir] as principal constituent
2224/29084	Four-layer arrangements	2224/29179	Niobium [Nb] as principal constituent
2224/29099	Material	2224/2918	Molybdenum [Mo] as principal constituent
2224/291	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/29181	Tantalum [Ta] as principal constituent
2224/29101	the principal constituent melting at a temperature of less than 400°C	2224/29183	Rhenium [Re] as principal constituent
2224/29105	Gallium [Ga] as principal constituent	2224/29184	Tungsten [W] as principal constituent
2224/29109	Indium [In] as principal constituent	2224/29186	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/29111	Tin [Sn] as principal constituent	2224/29187	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/29188)
2224/29113	Bismuth [Bi] as principal constituent	2224/29188	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/29114	Thallium [Tl] as principal constituent	2224/2919	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/29116	Lead [Pb] as principal constituent	2224/29191	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/29117	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/29193	with a principal constituent of the material being a solid not provided for in groups H01L 2224/291 - H01L 2224/29191 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/29118	Zinc [Zn] as principal constituent	2224/29194	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/291 - H01L 2224/29191
2224/2912	Antimony [Sb] as principal constituent	2224/29195	with a principal constituent of the material being a gas not provided for in groups H01L 2224/291 - H01L 2224/29191
2224/29123	Magnesium [Mg] as principal constituent	2224/29198	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/29124	Aluminium [Al] as principal constituent	2224/29199	Material of the matrix
2224/29138	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C		
2224/29139	Silver [Ag] as principal constituent		
2224/29144	Gold [Au] as principal constituent		
2224/29147	Copper [Cu] as principal constituent		
2224/29149	Manganese [Mn] as principal constituent		
2224/29155	Nickel [Ni] as principal constituent		
2224/29157	Cobalt [Co] as principal constituent		
2224/2916	Iron [Fe] as principal constituent		
2224/29163	the principal constituent melting at a temperature of greater than 1550°C		
2224/29164	Palladium [Pd] as principal constituent		

2224/292	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/29271	Chromium [Cr] as principal constituent
2224/29201	the principal constituent melting at a temperature of less than 400°C	2224/29272	Vanadium [V] as principal constituent
2224/29205	Gallium [Ga] as principal constituent	2224/29273	Rhodium [Rh] as principal constituent
2224/29209	Indium [In] as principal constituent	2224/29276	Ruthenium [Ru] as principal constituent
2224/29211	Tin [Sn] as principal constituent	2224/29278	Iridium [Ir] as principal constituent
2224/29213	Bismuth [Bi] as principal constituent	2224/29279	Niobium [Nb] as principal constituent
2224/29214	Thallium [Tl] as principal constituent	2224/2928	Molybdenum [Mo] as principal constituent
2224/29216	Lead [Pb] as principal constituent	2224/29281	Tantalum [Ta] as principal constituent
2224/29217	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/29283	Rhenium [Re] as principal constituent
2224/29218	Zinc [Zn] as principal constituent	2224/29284	Tungsten [W] as principal constituent
2224/2922	Antimony [Sb] as principal constituent	2224/29286	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/29223	Magnesium [Mg] as principal constituent	2224/29287	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/29288)
2224/29224	Aluminium [Al] as principal constituent	2224/29288	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/29238	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/2929	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/29239	Silver [Ag] as principal constituent	2224/29291	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/29244	Gold [Au] as principal constituent	2224/29293	with a principal constituent of the material being a solid not provided for in groups H01L 2224/292 - H01L 2224/29291 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/29247	Copper [Cu] as principal constituent	2224/29294	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/292 - H01L 2224/29291
2224/29249	Manganese [Mn] as principal constituent	2224/29295	with a principal constituent of the material being a gas not provided for in groups H01L 2224/292 - H01L 2224/29291
2224/29255	Nickel [Ni] as principal constituent	2224/29298	Fillers
2224/29257	Cobalt [Co] as principal constituent	2224/29299	Base material
2224/2926	Iron [Fe] as principal constituent	2224/293	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/29263	the principal constituent melting at a temperature of greater than 1550°C	2224/29301	the principal constituent melting at a temperature of less than 400°C
2224/29264	Palladium [Pd] as principal constituent	2224/29305	Gallium [Ga] as principal constituent
2224/29266	Titanium [Ti] as principal constituent		
2224/29269	Platinum [Pt] as principal constituent		
2224/2927	Zirconium [Zr] as principal constituent		

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2224/29309	Indium [In] as principal constituent	2224/2938	Molybdenum [Mo] as principal constituent
2224/29311	Tin [Sn] as principal constituent	2224/29381	Tantalum [Ta] as principal constituent
2224/29313	Bismuth [Bi] as principal constituent	2224/29383	Rhenium [Re] as principal constituent
2224/29314	Thallium [Tl] as principal constituent	2224/29384	Tungsten [W] as principal constituent
2224/29316	Lead [Pb] as principal constituent	2224/29386	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/29317	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/29387	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/29388)
2224/29318	Zinc [Zn] as principal constituent	2224/29388	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/2932	Antimony [Sb] as principal constituent	2224/2939	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/29323	Magnesium [Mg] as principal constituent	2224/29391	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/29324	Aluminium [Al] as principal constituent	2224/29393	with a principal constituent of the material being a solid not provided for in groups H01L 2224/293 - H01L 2224/29391 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/29338	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/29394	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/293 - H01L 2224/29391
2224/29339	Silver [Ag] as principal constituent	2224/29395	with a principal constituent of the material being a gas not provided for in groups H01L 2224/293 - H01L 2224/29391
2224/29344	Gold [Au] as principal constituent	2224/29398	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/29347	Copper [Cu] as principal constituent	2224/29399	Coating material
2224/29349	Manganese [Mn] as principal constituent	2224/294	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/29355	Nickel [Ni] as principal constituent	2224/29401	the principal constituent melting at a temperature of less than 400°C
2224/29357	Cobalt [Co] as principal constituent	2224/29405	Gallium [Ga] as principal constituent
2224/2936	Iron [Fe] as principal constituent	2224/29409	Indium [In] as principal constituent
2224/29363	the principal constituent melting at a temperature of greater than 1550°C	2224/29411	Tin [Sn] as principal constituent
2224/29364	Palladium [Pd] as principal constituent		
2224/29366	Titanium [Ti] as principal constituent		
2224/29369	Platinum [Pt] as principal constituent		
2224/2937	Zirconium [Zr] as principal constituent		
2224/29371	Chromium [Cr] as principal constituent		
2224/29372	Vanadium [V] as principal constituent		
2224/29373	Rhodium [Rh] as principal constituent		
2224/29376	Ruthenium [Ru] as principal constituent		
2224/29378	Iridium [Ir] as principal constituent		
2224/29379	Niobium [Nb] as principal constituent		

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2224/29413	Bismuth [Bi] as principal constituent	2224/29483	Rhenium [Re] as principal constituent
2224/29414	Thallium [Tl] as principal constituent	2224/29484	Tungsten [W] as principal constituent
2224/29416	Lead [Pb] as principal constituent	2224/29486	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/29417	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/29487	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/29488)
2224/29418	Zinc [Zn] as principal constituent	2224/29488	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/2942	Antimony [Sb] as principal constituent	2224/2949	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/29423	Magnesium [Mg] as principal constituent	2224/29491	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/29424	Aluminium [Al] as principal constituent	2224/29493	with a principal constituent of the material being a solid not provided for in groups H01L 2224/294 - H01L 2224/29491 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/29438	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/29494	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/294 - H01L 2224/29491
2224/29439	Silver [Ag] as principal constituent	2224/29495	with a principal constituent of the material being a gas not provided for in groups H01L 2224/294 - H01L 2224/29491
2224/29444	Gold [Au] as principal constituent	2224/29498	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/29447	Copper [Cu] as principal constituent	2224/29499	Shape or distribution of the fillers
2224/29449	Manganese [Mn] as principal constituent	2224/2954	Coating
2224/29455	Nickel [Ni] as principal constituent	2224/29541	Structure
2224/29457	Cobalt [Co] as principal constituent	2224/2955	Shape
2224/2946	Iron [Fe] as principal constituent	2224/29551	being non uniform
2224/29463	the principal constituent melting at a temperature of greater than 1550°C	2224/29552	comprising protrusions or indentations
2224/29464	Palladium [Pd] as principal constituent	2224/29553	at the bonding interface of the layer connector, i.e. on the surface of the layer connector
2224/29466	Titanium [Ti] as principal constituent	2224/2956	Disposition
2224/29469	Platinum [Pt] as principal constituent	2224/29561	On the entire surface of the core, i.e. integral coating
2224/2947	Zirconium [Zr] as principal constituent	2224/29562	On the entire exposed surface of the core
2224/29471	Chromium [Cr] as principal constituent	2224/29563	Only on parts of the surface of the core, i.e. partial coating
2224/29472	Vanadium [V] as principal constituent	2224/29564	Only on the bonding interface of the layer connector
2224/29473	Rhodium [Rh] as principal constituent	2224/29565	Only outside the bonding interface of the layer connector
2224/29476	Ruthenium [Ru] as principal constituent		
2224/29478	Iridium [Ir] as principal constituent		
2224/29479	Niobium [Nb] as principal constituent		
2224/2948	Molybdenum [Mo] as principal constituent		
2224/29481	Tantalum [Ta] as principal constituent		

2224/29566	. . . . .	Both on and outside the bonding interface of the layer connector	2224/29666	. . . . .	Titanium [Ti] as principal constituent
2224/2957	. . . . .	Single coating layer	2224/29669	. . . . .	Platinum [Pt] as principal constituent
2224/29575	. . . . .	Plural coating layers	2224/2967	. . . . .	Zirconium [Zr] as principal constituent
2224/29576	. . . . .	being mutually engaged together, e.g. through inserts	2224/29671	. . . . .	Chromium [Cr] as principal constituent
2224/29578	. . . . .	being disposed next to each other, e.g. side-to-side arrangements	2224/29672	. . . . .	Vanadium [V] as principal constituent
2224/2958	. . . . .	being stacked	2224/29673	. . . . .	Rhodium [Rh] as principal constituent
2224/29582	. . . . .	Two-layer coating	2224/29676	. . . . .	Ruthenium [Ru] as principal constituent
2224/29583	. . . . .	Three-layer coating	2224/29678	. . . . .	Iridium [Ir] as principal constituent
2224/29584	. . . . .	Four-layer coating	2224/29679	. . . . .	Niobium [Nb] as principal constituent
2224/29599	. . . . .	Material	2224/2968	. . . . .	Molybdenum [Mo] as principal constituent
2224/296	. . . . .	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/29681	. . . . .	Tantalum [Ta] as principal constituent
2224/29601	. . . . .	the principal constituent melting at a temperature of less than 400°C	2224/29683	. . . . .	Rhenium [Re] as principal constituent
2224/29605	. . . . .	Gallium [Ga] as principal constituent	2224/29684	. . . . .	Tungsten [W] as principal constituent
2224/29609	. . . . .	Indium [In] as principal constituent	2224/29686	. . . . .	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/29611	. . . . .	Tin [Sn] as principal constituent	2224/29687	. . . . .	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/29688)
2224/29613	. . . . .	Bismuth [Bi] as principal constituent	2224/29688	. . . . .	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/29614	. . . . .	Thallium [Tl] as principal constituent	2224/2969	. . . . .	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/29616	. . . . .	Lead [Pb] as principal constituent	2224/29691	. . . . .	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/29617	. . . . .	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/29693	. . . . .	with a principal constituent of the material being a solid not provided for in groups H01L 2224/296 - H01L 2224/29691 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/29618	. . . . .	Zinc [Zn] as principal constituent	2224/29694	. . . . .	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/296 - H01L 2224/29691
2224/2962	. . . . .	Antimony [Sb] as principal constituent	2224/29695	. . . . .	with a principal constituent of the material being a gas not provided for in groups H01L 2224/296 - H01L 2224/29691
2224/29623	. . . . .	Magnesium [Mg] as principal constituent	2224/29698	. . . . .	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/29624	. . . . .	Aluminium [Al] as principal constituent	2224/29699	. . . . .	Material of the matrix
2224/29638	. . . . .	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C			
2224/29639	. . . . .	Silver [Ag] as principal constituent			
2224/29644	. . . . .	Gold [Au] as principal constituent			
2224/29647	. . . . .	Copper [Cu] as principal constituent			
2224/29649	. . . . .	Manganese [Mn] as principal constituent			
2224/29655	. . . . .	Nickel [Ni] as principal constituent			
2224/29657	. . . . .	Cobalt [Co] as principal constituent			
2224/2966	. . . . .	Iron [Fe] as principal constituent			
2224/29663	. . . . .	the principal constituent melting at a temperature of greater than 1550°C			
2224/29664	. . . . .	Palladium [Pd] as principal constituent			

2224/297	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/29771	Chromium [Cr] as principal constituent
2224/29701	the principal constituent melting at a temperature of less than 400°C	2224/29772	Vanadium [V] as principal constituent
2224/29705	Gallium [Ga] as principal constituent	2224/29773	Rhodium [Rh] as principal constituent
2224/29709	Indium [In] as principal constituent	2224/29776	Ruthenium [Ru] as principal constituent
2224/29711	Tin [Sn] as principal constituent	2224/29778	Iridium [Ir] as principal constituent
2224/29713	Bismuth [Bi] as principal constituent	2224/29779	Niobium [Nb] as principal constituent
2224/29714	Thallium [Tl] as principal constituent	2224/2978	Molybdenum [Mo] as principal constituent
2224/29716	Lead [Pb] as principal constituent	2224/29781	Tantalum [Ta] as principal constituent
2224/29717	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/29783	Rhenium [Re] as principal constituent
2224/29718	Zinc [Zn] as principal constituent	2224/29784	Tungsten [W] as principal constituent
2224/2972	Antimony [Sb] as principal constituent	2224/29786	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/29723	Magnesium [Mg] as principal constituent	2224/29787	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/29788)
2224/29724	Aluminium [Al] as principal constituent	2224/29788	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/29738	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/2979	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/29739	Silver [Ag] as principal constituent	2224/29791	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/29744	Gold [Au] as principal constituent	2224/29793	with a principal constituent of the material being a solid not provided for in groups H01L 2224/297 - H01L 2224/29791 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/29747	Copper [Cu] as principal constituent	2224/29794	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/297 - H01L 2224/29791
2224/29749	Manganese [Mn] as principal constituent	2224/29795	with a principal constituent of the material being a gas not provided for in groups H01L 2224/297 - H01L 2224/29791
2224/29755	Nickel [Ni] as principal constituent	2224/29798	Fillers
2224/29757	Cobalt [Co] as principal constituent	2224/29799	Base material
2224/2976	Iron [Fe] as principal constituent	2224/298	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/29763	the principal constituent melting at a temperature of greater than 1550°C	2224/29801	the principal constituent melting at a temperature of less than 400°C
2224/29764	Palladium [Pd] as principal constituent	2224/29805	Gallium [Ga] as principal constituent
2224/29766	Titanium [Ti] as principal constituent		
2224/29769	Platinum [Pt] as principal constituent		
2224/2977	Zirconium [Zr] as principal constituent		

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2224/29809	Indium [In] as principal constituent	2224/2988	Molybdenum [Mo] as principal constituent
2224/29811	Tin [Sn] as principal constituent	2224/29881	Tantalum [Ta] as principal constituent
2224/29813	Bismuth [Bi] as principal constituent	2224/29883	Rhenium [Re] as principal constituent
2224/29814	Thallium [Tl] as principal constituent	2224/29884	Tungsten [W] as principal constituent
2224/29816	Lead [Pb] as principal constituent	2224/29886	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/29817	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/29887	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/29888)
2224/29818	Zinc [Zn] as principal constituent	2224/29888	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/2982	Antimony [Sb] as principal constituent	2224/2989	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/29823	Magnesium [Mg] as principal constituent	2224/29891	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/29824	Aluminium [Al] as principal constituent	2224/29893	with a principal constituent of the material being a solid not provided for in groups H01L 2224/298 - H01L 2224/29891 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/29838	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/29894	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/298 - H01L 2224/29891
2224/29839	Silver [Ag] as principal constituent	2224/29895	with a principal constituent of the material being a gas not provided for in groups H01L 2224/298 - H01L 2224/29891
2224/29844	Gold [Au] as principal constituent	2224/29898	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/29847	Copper [Cu] as principal constituent	2224/29899	Coating material
2224/29849	Manganese [Mn] as principal constituent	2224/299	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/29855	Nickel [Ni] as principal constituent	2224/29901	the principal constituent melting at a temperature of less than 400°C
2224/29857	Cobalt [Co] as principal constituent	2224/29905	Gallium [Ga] as principal constituent
2224/2986	Iron [Fe] as principal constituent	2224/29909	Indium [In] as principal constituent
2224/29863	the principal constituent melting at a temperature of greater than 1550°C	2224/29911	Tin [Sn] as principal constituent
2224/29864	Palladium [Pd] as principal constituent		
2224/29866	Titanium [Ti] as principal constituent		
2224/29869	Platinum [Pt] as principal constituent		
2224/2987	Zirconium [Zr] as principal constituent		
2224/29871	Chromium [Cr] as principal constituent		
2224/29872	Vanadium [V] as principal constituent		
2224/29873	Rhodium [Rh] as principal constituent		
2224/29876	Ruthenium [Ru] as principal constituent		
2224/29878	Iridium [Ir] as principal constituent		
2224/29879	Niobium [Nb] as principal constituent		

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2224/29913	Bismuth [Bi] as principal constituent	2224/29983	Rhenium [Re] as principal constituent
2224/29914	Thallium [Tl] as principal constituent	2224/29984	Tungsten [W] as principal constituent
2224/29916	Lead [Pb] as principal constituent	2224/29986	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/29917	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/29987	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/29988)
2224/29918	Zinc [Zn] as principal constituent	2224/29988	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/2992	Antimony [Sb] as principal constituent	2224/2999	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/29923	Magnesium [Mg] as principal constituent	2224/29991	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/29924	Aluminium [Al] as principal constituent	2224/29993	with a principal constituent of the material being a solid not provided for in groups H01L 2224/299 - H01L 2224/29991 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/29938	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/29994	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/299 - H01L 2224/29991
2224/29939	Silver [Ag] as principal constituent	2224/29995	with a principal constituent of the material being a gas not provided for in groups H01L 2224/299 - H01L 2224/29991
2224/29944	Gold [Au] as principal constituent	2224/29998	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/29947	Copper [Cu] as principal constituent	2224/29999	Shape or distribution of the fillers
2224/29949	Manganese [Mn] as principal constituent	2224/30	of a plurality of layer connectors
2224/29955	Nickel [Ni] as principal constituent	2224/3001	Structure
2224/29957	Cobalt [Co] as principal constituent	2224/3003	Layer connectors having different sizes, e.g. different heights or widths
2224/2996	Iron [Fe] as principal constituent	2224/3005	Shape
2224/29963	the principal constituent melting at a temperature of greater than 1550°C	2224/30051	Layer connectors having different shapes
2224/29964	Palladium [Pd] as principal constituent	2224/301	Disposition
2224/29966	Titanium [Ti] as principal constituent	2224/30104	relative to the bonding areas, e.g. bond pads, of the semiconductor or solid-state body
2224/29969	Platinum [Pt] as principal constituent	2224/3011	the layer connectors being bonded to at least one common bonding area
2224/2997	Zirconium [Zr] as principal constituent	2224/3012	Layout
2224/29971	Chromium [Cr] as principal constituent	2224/3013	Square or rectangular array
2224/29972	Vanadium [V] as principal constituent	2224/30131	being uniform, i.e. having a uniform pitch across the array
2224/29973	Rhodium [Rh] as principal constituent	2224/30132	being non uniform, i.e. having a non uniform pitch across the array
2224/29976	Ruthenium [Ru] as principal constituent	2224/30133	with a staggered arrangement, e.g. depopulated array
2224/29978	Iridium [Ir] as principal constituent		
2224/29979	Niobium [Nb] as principal constituent		
2224/2998	Molybdenum [Mo] as principal constituent		
2224/29981	Tantalum [Ta] as principal constituent		

2224/30134	covering only portions of the surface to be connected	2224/30515	Layer connectors having different functions
2224/30135	Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements	2224/30517	including layer connectors providing primarily mechanical bonding
2224/30136	Covering only the central area of the surface to be connected, i.e. central arrangements	2224/30519	including layer connectors providing primarily thermal dissipation
2224/3014	Circular array, i.e. array with radial symmetry	2224/31	Structure, shape, material or disposition of the layer connectors after the connecting process
2224/30141	being uniform, i.e. having a uniform pitch across the array	2224/32	of an individual layer connector
2224/30142	being non uniform, i.e. having a non uniform pitch across the array	2224/3201	Structure
2224/30143	covering only portions of the surface to be connected	2224/32012	relative to the bonding area, e.g. bond pad
2224/30145	Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements	2224/32013	the layer connector being larger than the bonding area, e.g. bond pad
2224/30146	Covering only the central area of the surface to be connected, i.e. central arrangements	2224/32014	the layer connector being smaller than the bonding area, e.g. bond pad
2224/3015	Mirror array, i.e. array having only a reflection symmetry, i.e. bilateral symmetry	2224/3205	Shape
2224/30151	being uniform, i.e. having a uniform pitch across the array	2224/32052	in top view
2224/30152	being non uniform, i.e. having a non uniform pitch across the array	2224/32053	being non uniform along the layer connector
2224/30153	with a staggered arrangement, e.g. depopulated array	2224/32054	being rectangular or square
2224/30154	covering only portions of the surface to be connected	2224/32055	being circular or elliptic
2224/30155	Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements	2224/32056	comprising protrusions or indentations
2224/30156	Covering only the central area of the surface to be connected, i.e. central arrangements	2224/32057	in side view
2224/3016	Random layout, i.e. layout with no symmetry	2224/32058	being non uniform along the layer connector
2224/30163	with a staggered arrangement	2224/32059	comprising protrusions or indentations
2224/30164	covering only portions of the surface to be connected	2224/3207	of bonding interfaces, e.g. interlocking features
2224/30165	Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements	2224/321	Disposition
2224/30166	Covering only the central area of the surface to be connected, i.e. central arrangements	2224/32104	relative to the bonding area, e.g. bond pad
2224/30177	Combinations of arrays with different layouts	2224/32105	the layer connector connecting bonding areas being not aligned with respect to each other
2224/30179	Corner adaptations, i.e. disposition of the layer connectors at the corners of the semiconductor or solid-state body	2224/32106	the layer connector connecting one bonding area to at least two respective bonding areas
2224/3018	being disposed on at least two different sides of the body, e.g. dual array	2224/32111	the layer connector being disposed in a recess of the surface
2224/30181	On opposite sides of the body	2224/32112	the layer connector being at least partially embedded in the surface
2224/30183	On contiguous sides of the body	2224/32113	the whole layer connector protruding from the surface
2224/305	Material	2224/3213	the layer connector connecting within a semiconductor or solid-state body, i.e. connecting two bonding areas on the same semiconductor or solid-state body
2224/30505	Layer connectors having different materials	2224/32135	the layer connector connecting between different semiconductor or solid-state bodies, i.e. chip-to-chip
2224/3051	Function	2224/32137	the bodies being arranged next to each other, e.g. on a common substrate
		2224/32141	the bodies being arranged on opposite sides of a substrate, e.g. mirror arrangements
		2224/32145	the bodies being stacked
		2224/32146	the layer connector connecting to a via connection in the semiconductor or solid-state body

- 2224/32147 the layer connector connecting to a bonding area disposed in a recess of the surface
- 2224/32148 the layer connector connecting to a bonding area protruding from the surface
- 2224/32151 the layer connector connecting between a semiconductor or solid-state body and an item not being a semiconductor or solid-state body, e.g. chip-to-substrate, chip-to-passive
- 2224/32153 the body and the item being arranged next to each other, e.g. on a common substrate
- 2224/32155 the item being non-metallic, e.g. being an insulating substrate with or without metallisation
- 2224/32157 the layer connector connecting to a bond pad of the item
- 2224/3216 the layer connector connecting to a pin of the item
- 2224/32163 the layer connector connecting to a potential ring of the item
- 2224/32165 the layer connector connecting to a via metallisation of the item
- 2224/32167 the layer connector connecting to a bonding area disposed in a recess of the surface of the item
- 2224/32168 the layer connector connecting to a bonding area protruding from the surface of the item
- 2224/32175 the item being metallic
- 2224/32183 the layer connector connecting to a potential ring of the item
- 2224/32187 the layer connector connecting to a bonding area disposed in a recess of the surface of the item
- 2224/32188 the layer connector connecting to a bonding area protruding from the surface of the item
- 2224/32195 the item being a discrete passive component
- 2224/32197 the layer connector connecting to a bonding area disposed in a recess of the surface of the item
- 2224/32198 the layer connector connecting to a bonding area protruding from the surface of the item
- 2224/32221 the body and the item being stacked
- 2224/32225 the item being non-metallic, e.g. insulating substrate with or without metallisation
- 2224/32227 the layer connector connecting to a bond pad of the item
- 2224/3223 the layer connector connecting to a pin of the item
- 2224/32233 the layer connector connecting to a potential ring of the item
- 2224/32235 the layer connector connecting to a via metallisation of the item
- 2224/32237 the layer connector connecting to a bonding area disposed in a recess of the surface of the item
- 2224/32238 the layer connector connecting to a bonding area protruding from the surface of the item
- 2224/3224 the layer connector connecting between the body and an opposite side of the item with respect to the body
- 2224/32245 the item being metallic
- 2224/32253 the layer connector connecting to a potential ring of the item
- 2224/32257 the layer connector connecting to a bonding area disposed in a recess of the surface of the item
- 2224/32258 the layer connector connecting to a bonding area protruding from the surface of the item
- 2224/3226 the layer connector connecting between the body and an opposite side of the item with respect to the body
- 2224/32265 the item being a discrete passive component
- 2224/32267 the layer connector connecting to a bonding area disposed in a recess of the surface of the item
- 2224/32268 the layer connector connecting to a bonding area protruding from the surface of the item
- 2224/325 Material
- 2224/32501 at the bonding interface
- 2224/32502 comprising an eutectic alloy
- 2224/32503 comprising an intermetallic compound
- 2224/32505 outside the bonding interface, e.g. in the bulk of the layer connector
- 2224/32506 comprising an eutectic alloy
- 2224/32507 comprising an intermetallic compound
- 2224/33 of a plurality of layer connectors
- 2224/3301 Structure
- 2224/3303 Layer connectors having different sizes, e.g. different heights or widths
- 2224/3305 Shape
- 2224/33051 Layer connectors having different shapes
- 2224/33055 of their bonding interfaces
- 2224/331 Disposition
- 2224/33104 relative to the bonding areas, e.g. bond pads
- 2224/33106 the layer connectors being bonded to at least one common bonding area
- 2224/33107 the layer connectors connecting two common bonding areas
- 2224/3312 Layout ([layout of layer connectors prior to the connecting process H01L 2224/3012](#))
- 2224/3313 Square or rectangular array
- 2224/33132 being non uniform, i.e. having a non uniform pitch across the array
- 2224/33133 with a staggered arrangement, e.g. depopulated array
- 2224/33134 covering only portions of the surface to be connected

- 2224/33135 Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
- 2224/3314 Circular array, i.e. array with radial symmetry
- 2224/33142 being non uniform, i.e. having a non uniform pitch across the array
- 2224/33143 with a staggered arrangement
- 2224/33144 covering only portions of the surface to be connected
- 2224/33145 Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
- 2224/3315 Mirror array, i.e. array having only a reflection symmetry, i.e. bilateral symmetry
- 2224/33151 being uniform, i.e. having a uniform pitch across the array
- 2224/33152 being non uniform, i.e. having a non uniform pitch across the array
- 2224/33153 with a staggered arrangement, e.g. depopulated array
- 2224/33154 covering only portions of the surface to be connected
- 2224/33155 Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
- 2224/33156 Covering only the central area of the surface to be connected, i.e. central arrangements
- 2224/3316 Random layout, i.e. layout with no symmetry
- 2224/33163 with a staggered arrangement
- 2224/33164 covering only portions of the surface to be connected
- 2224/33165 Covering only the peripheral area of the surface to be connected, i.e. peripheral arrangements
- 2224/33177 Combinations of arrays with different layouts
- 2224/33179 Corner adaptations, i.e. disposition of the layer connectors at the corners of the semiconductor or solid-state body
- 2224/3318 being disposed on at least two different sides of the body, e.g. dual array
- 2224/33181 On opposite sides of the body
- 2224/33183 On contiguous sides of the body
- 2224/335 Material
- 2224/33505 Layer connectors having different materials
- 2224/3351 Function
- 2224/33515 Layer connectors having different functions
- 2224/33517 including layer connectors providing primarily mechanical support
- 2224/33519 including layer connectors providing primarily thermal dissipation
- 2224/34 Strap connectors, e.g. copper straps for grounding power devices; Manufacturing methods related thereto
- 2224/35 Manufacturing methods
- 2224/35001 Involving a temporary auxiliary member not forming part of the manufacturing apparatus, e.g. removable or sacrificial coating, film or substrate
- 2224/351 Pre-treatment of the preform connector
- 2224/3512 Applying permanent coating, e.g. in-situ coating
- 2224/35125 Plating, e.g. electroplating, electroless plating
- 2224/352 Mechanical processes
- 2224/3521 Pulling
- 2224/355 Modification of a pre-existing material
- 2224/3551 Sintering
- 2224/3552 Anodisation
- 2224/357 Involving monitoring, e.g. feedback loop
- 2224/358 Post-treatment of the connector
- 2224/3581 Cleaning, e.g. oxide removal step, desmearing
- 2224/3582 Applying permanent coating, e.g. in-situ coating
- 2224/35821 Spray coating
- 2224/35822 Dip coating
- 2224/35823 Immersion coating, e.g. solder bath
- 2224/35824 Chemical solution deposition [CSD], i.e. using a liquid precursor
- 2224/35825 Plating, e.g. electroplating, electroless plating
- 2224/35826 Physical vapour deposition [PVD], e.g. evaporation, sputtering
- 2224/35827 Chemical vapour deposition [CVD], e.g. laser CVD
- 2224/3583 Reworking
- 2224/35831 with a chemical process, e.g. with etching of the connector
- 2224/35847 with a mechanical process, e.g. with flattening of the connector
- 2224/35848 Thermal treatments, e.g. annealing, controlled cooling
- 2224/35985 Methods of manufacturing strap connectors involving a specific sequence of method steps
- 2224/35986 with repetition of the same manufacturing step
- 2224/36 Structure, shape, material or disposition of the strap connectors prior to the connecting process
- 2224/37 of an individual strap connector
- 2224/37001 Core members of the connector
- 2224/37005 Structure
- 2224/3701 Shape
- 2224/37011 comprising apertures or cavities
- 2224/37012 Cross-sectional shape
- 2224/37013 being non uniform along the connector
- 2224/3702 Disposition
- 2224/37025 Plural core members
- 2224/37026 being mutually engaged together, e.g. through inserts
- 2224/37028 Side-to-side arrangements
- 2224/3703 Stacked arrangements
- 2224/37032 Two-layer arrangements
- 2224/37033 Three-layer arrangements
- 2224/37034 Four-layer arrangements
- 2224/37099 Material

2224/371	. . . . .	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/37178	. . . . .	Iridium [Ir] as principal constituent
2224/37101	. . . . .	the principal constituent melting at a temperature of less than 400°C	2224/37179	. . . . .	Niobium [Nb] as principal constituent
2224/37105	. . . . .	Gallium [Ga] as principal constituent	2224/3718	. . . . .	Molybdenum [Mo] as principal constituent
2224/37109	. . . . .	Indium [In] as principal constituent	2224/37181	. . . . .	Tantalum [Ta] as principal constituent
2224/37111	. . . . .	Tin [Sn] as principal constituent	2224/37183	. . . . .	Rhenium [Re] as principal constituent
2224/37113	. . . . .	Bismuth [Bi] as principal constituent	2224/37184	. . . . .	Tungsten [W] as principal constituent
2224/37114	. . . . .	Thallium [Tl] as principal constituent	2224/37186	. . . . .	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/37116	. . . . .	Lead [Pb] as principal constituent	2224/37187	. . . . .	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/37188)
2224/37117	. . . . .	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/37188	. . . . .	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/37118	. . . . .	Zinc [Zn] as principal constituent	2224/3719	. . . . .	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/3712	. . . . .	Antimony [Sb] as principal constituent	2224/37191	. . . . .	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/37123	. . . . .	Magnesium [Mg] as principal constituent	2224/37193	. . . . .	with a principal constituent of the material being a solid not provided for in groups H01L 2224/371 - H01L 2224/37191 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/37124	. . . . .	Aluminium [Al] as principal constituent	2224/37194	. . . . .	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/371 - H01L 2224/37191
2224/37138	. . . . .	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/37195	. . . . .	with a principal constituent of the material being a gas not provided for in groups H01L 2224/371 - H01L 2224/37191
2224/37139	. . . . .	Silver [Ag] as principal constituent	2224/37198	. . . . .	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/37144	. . . . .	Gold [Au] as principal constituent	2224/37199	. . . . .	Material of the matrix
2224/37147	. . . . .	Copper [Cu] as principal constituent	2224/372	. . . . .	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/37149	. . . . .	Manganese [Mn] as principal constituent	2224/37201	. . . . .	the principal constituent melting at a temperature of less than 400°C
2224/37155	. . . . .	Nickel [Ni] as principal constituent	2224/37205	. . . . .	Gallium [Ga] as principal constituent
2224/37157	. . . . .	Cobalt [Co] as principal constituent	2224/37209	. . . . .	Indium [In] as principal constituent
2224/3716	. . . . .	Iron [Fe] as principal constituent	2224/37211	. . . . .	Tin [Sn] as principal constituent
2224/37163	. . . . .	the principal constituent melting at a temperature of greater than 1550°C			
2224/37164	. . . . .	Palladium [Pd] as principal constituent			
2224/37166	. . . . .	Titanium [Ti] as principal constituent			
2224/37169	. . . . .	Platinum [Pt] as principal constituent			
2224/3717	. . . . .	Zirconium [Zr] as principal constituent			
2224/37171	. . . . .	Chromium [Cr] as principal constituent			
2224/37172	. . . . .	Vanadium [V] as principal constituent			
2224/37173	. . . . .	Rhodium [Rh] as principal constituent			
2224/37176	. . . . .	Ruthenium [Ru] as principal constituent			

2224/37213	Bismuth [Bi] as principal constituent	2224/37283	Rhenium [Re] as principal constituent
2224/37214	Thallium [Tl] as principal constituent	2224/37284	Tungsten [W] as principal constituent
2224/37216	Lead [Pb] as principal constituent	2224/37286	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/37217	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/37287	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/37288)
2224/37218	Zinc [Zn] as principal constituent	2224/37288	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/3722	Antimony [Sb] as principal constituent	2224/3729	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/37223	Magnesium [Mg] as principal constituent	2224/37291	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/37224	Aluminium [Al] as principal constituent	2224/37293	with a principal constituent of the material being a solid not provided for in groups H01L 2224/372 - H01L 2224/37291 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/37238	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/37294	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/372 - H01L 2224/37291
2224/37239	Silver [Ag] as principal constituent	2224/37295	with a principal constituent of the material being a gas not provided for in groups H01L 2224/372 - H01L 2224/37291
2224/37244	Gold [Au] as principal constituent	2224/37298	Fillers
2224/37247	Copper [Cu] as principal constituent	2224/37299	Base material
2224/37249	Manganese [Mn] as principal constituent	2224/373	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/37255	Nickel [Ni] as principal constituent	2224/37301	the principal constituent melting at a temperature of less than 400°C
2224/37257	Cobalt [Co] as principal constituent	2224/37305	Gallium [Ga] as principal constituent
2224/3726	Iron [Fe] as principal constituent	2224/37309	Indium [In] as principal constituent
2224/37263	the principal constituent melting at a temperature of greater than 1550°C	2224/37311	Tin [Sn] as principal constituent
2224/37264	Palladium [Pd] as principal constituent	2224/37313	Bismuth [Bi] as principal constituent
2224/37266	Titanium [Ti] as principal constituent	2224/37314	Thallium [Tl] as principal constituent
2224/37269	Platinum [Pt] as principal constituent	2224/37316	Lead [Pb] as principal constituent
2224/3727	Zirconium [Zr] as principal constituent	2224/37317	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/37271	Chromium [Cr] as principal constituent	2224/37318	Zinc [Zn] as principal constituent
2224/37272	Vanadium [V] as principal constituent		
2224/37273	Rhodium [Rh] as principal constituent		
2224/37276	Ruthenium [Ru] as principal constituent		
2224/37278	Iridium [Ir] as principal constituent		
2224/37279	Niobium [Nb] as principal constituent		
2224/3728	Molybdenum [Mo] as principal constituent		
2224/37281	Tantalum [Ta] as principal constituent		

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2224/3732	Antimony [Sb] as principal constituent	2224/37388	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/37323	Magnesium [Mg] as principal constituent	2224/3739	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/37324	Aluminium [Al] as principal constituent	2224/37391	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/37338	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/37393	with a principal constituent of the material being a solid not provided for in groups H01L 2224/373 - H01L 2224/37391 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/37339	Silver [Ag] as principal constituent	2224/37394	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/373 - H01L 2224/37391
2224/37344	Gold [Au] as principal constituent	2224/37395	with a principal constituent of the material being a gas not provided for in groups H01L 2224/373 - H01L 2224/37391
2224/37347	Copper [Cu] as principal constituent	2224/37398	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/37349	Manganese [Mn] as principal constituent	2224/37399	Coating material
2224/37355	Nickel [Ni] as principal constituent	2224/374	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/37357	Cobalt [Co] as principal constituent	2224/37401	the principal constituent melting at a temperature of less than 400°C
2224/3736	Iron [Fe] as principal constituent	2224/37405	Gallium [Ga] as principal constituent
2224/37363	the principal constituent melting at a temperature of greater than 1550°C	2224/37409	Indium [In] as principal constituent
2224/37364	Palladium [Pd] as principal constituent	2224/37411	Tin [Sn] as principal constituent
2224/37366	Titanium [Ti] as principal constituent	2224/37413	Bismuth [Bi] as principal constituent
2224/37369	Platinum [Pt] as principal constituent	2224/37414	Thallium [Tl] as principal constituent
2224/3737	Zirconium [Zr] as principal constituent	2224/37416	Lead [Pb] as principal constituent
2224/37371	Chromium [Cr] as principal constituent	2224/37417	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/37372	Vanadium [V] as principal constituent	2224/37418	Zinc [Zn] as principal constituent
2224/37373	Rhodium [Rh] as principal constituent	2224/3742	Antimony [Sb] as principal constituent
2224/37376	Ruthenium [Ru] as principal constituent	2224/37423	Magnesium [Mg] as principal constituent
2224/37378	Iridium [Ir] as principal constituent		
2224/37379	Niobium [Nb] as principal constituent		
2224/3738	Molybdenum [Mo] as principal constituent		
2224/37381	Tantalum [Ta] as principal constituent		
2224/37383	Rhenium [Re] as principal constituent		
2224/37384	Tungsten [W] as principal constituent		
2224/37386	with a principal constituent of the material being a non metallic, non metalloid inorganic material		
2224/37387	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/37388)		

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2224/37424	Aluminium [Al] as principal constituent	2224/3749	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/37438	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/37491	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/37439	Silver [Ag] as principal constituent	2224/37493	with a principal constituent of the material being a solid not provided for in groups H01L 2224/374 - H01L 2224/37491 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/37444	Gold [Au] as principal constituent	2224/37494	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/374 - H01L 2224/37491
2224/37447	Copper [Cu] as principal constituent	2224/37495	with a principal constituent of the material being a gas not provided for in groups H01L 2224/374 - H01L 2224/37491
2224/37449	Manganese [Mn] as principal constituent	2224/37498	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/37455	Nickel [Ni] as principal constituent	2224/37499	Shape or distribution of the fillers
2224/37457	Cobalt [Co] as principal constituent	2224/3754	Coating
2224/3746	Iron [Fe] as principal constituent	2224/37541	Structure
2224/37463	the principal constituent melting at a temperature of greater than 1550°C	2224/3755	Shape
2224/37464	Palladium [Pd] as principal constituent	2224/3756	Disposition, e.g. coating on a part of the core
2224/37466	Titanium [Ti] as principal constituent	2224/37565	Single coating layer
2224/37469	Platinum [Pt] as principal constituent	2224/3757	Plural coating layers
2224/3747	Zirconium [Zr] as principal constituent	2224/37572	Two-layer stack coating
2224/37471	Chromium [Cr] as principal constituent	2224/37573	Three-layer stack coating
2224/37472	Vanadium [V] as principal constituent	2224/37574	Four-layer stack coating
2224/37473	Rhodium [Rh] as principal constituent	2224/37576	being mutually engaged together, e.g. through inserts
2224/37476	Ruthenium [Ru] as principal constituent	2224/37578	being disposed next to each other, e.g. side-to-side arrangements
2224/37478	Iridium [Ir] as principal constituent	2224/37599	Material
2224/37479	Niobium [Nb] as principal constituent	2224/376	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/3748	Molybdenum [Mo] as principal constituent	2224/37601	the principal constituent melting at a temperature of less than 400°C
2224/37481	Tantalum [Ta] as principal constituent	2224/37605	Gallium [Ga] as principal constituent
2224/37483	Rhenium [Re] as principal constituent	2224/37609	Indium [In] as principal constituent
2224/37484	Tungsten [W] as principal constituent	2224/37611	Tin [Sn] as principal constituent
2224/37486	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/37613	Bismuth [Bi] as principal constituent
2224/37487	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/37488)	2224/37614	Thallium [Tl] as principal constituent
2224/37488	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/37616	Lead [Pb] as principal constituent

2224/37617	. . . . .	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/37688	. . . . .	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/37618	. . . . .	Zinc [Zn] as principal constituent	2224/3769	. . . . .	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/3762	. . . . .	Antimony [Sb] as principal constituent	2224/37691	. . . . .	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/37623	. . . . .	Magnesium [Mg] as principal constituent	2224/37693	. . . . .	with a principal constituent of the material being a solid not provided for in groups H01L 2224/376 - H01L 2224/37691 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/37624	. . . . .	Aluminium [Al] as principal constituent	2224/37694	. . . . .	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/376 - H01L 2224/37691
2224/37638	. . . . .	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/37695	. . . . .	with a principal constituent of the material being a gas not provided for in groups H01L 2224/376 - H01L 2224/37691
2224/37639	. . . . .	Silver [Ag] as principal constituent	2224/37698	. . . . .	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/37644	. . . . .	Gold [Au] as principal constituent	2224/37699	. . . . .	Material of the matrix
2224/37647	. . . . .	Copper [Cu] as principal constituent	2224/377	. . . . .	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/37649	. . . . .	Manganese [Mn] as principal constituent	2224/37701	. . . . .	the principal constituent melting at a temperature of less than 400°C
2224/37655	. . . . .	Nickel [Ni] as principal constituent	2224/37705	. . . . .	Gallium [Ga] as principal constituent
2224/37657	. . . . .	Cobalt [Co] as principal constituent	2224/37709	. . . . .	Indium [In] as principal constituent
2224/3766	. . . . .	Iron [Fe] as principal constituent	2224/37711	. . . . .	Tin [Sn] as principal constituent
2224/37663	. . . . .	the principal constituent melting at a temperature of greater than 1550°C	2224/37713	. . . . .	Bismuth [Bi] as principal constituent
2224/37664	. . . . .	Palladium [Pd] as principal constituent	2224/37714	. . . . .	Thallium [Tl] as principal constituent
2224/37666	. . . . .	Titanium [Ti] as principal constituent	2224/37716	. . . . .	Lead [Pb] as principal constituent
2224/37669	. . . . .	Platinum [Pt] as principal constituent	2224/37717	. . . . .	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/3767	. . . . .	Zirconium [Zr] as principal constituent	2224/37718	. . . . .	Zinc [Zn] as principal constituent
2224/37671	. . . . .	Chromium [Cr] as principal constituent	2224/3772	. . . . .	Antimony [Sb] as principal constituent
2224/37672	. . . . .	Vanadium [V] as principal constituent	2224/37723	. . . . .	Magnesium [Mg] as principal constituent
2224/37673	. . . . .	Rhodium [Rh] as principal constituent	2224/37724	. . . . .	Aluminium [Al] as principal constituent
2224/37676	. . . . .	Ruthenium [Ru] as principal constituent			
2224/37678	. . . . .	Iridium [Ir] as principal constituent			
2224/37679	. . . . .	Niobium [Nb] as principal constituent			
2224/3768	. . . . .	Molybdenum [Mo] as principal constituent			
2224/37681	. . . . .	Tantalum [Ta] as principal constituent			
2224/37683	. . . . .	Rhenium [Re] as principal constituent			
2224/37684	. . . . .	Tungsten [W] as principal constituent			
2224/37686	. . . . .	with a principal constituent of the material being a non metallic, non metalloid inorganic material			
2224/37687	. . . . .	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/37688)			

2224/37738	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/37791	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/37739	Silver [Ag] as principal constituent	2224/37793	with a principal constituent of the material being a solid not provided for in groups H01L 2224/377 - H01L 2224/37791 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/37744	Gold [Au] as principal constituent	2224/37794	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/377 - H01L 2224/37791
2224/37747	Copper [Cu] as principal constituent	2224/37795	with a principal constituent of the material being a gas not provided for in groups H01L 2224/377 - H01L 2224/37791
2224/37749	Manganese [Mn] as principal constituent	2224/37798	Fillers
2224/37755	Nickel [Ni] as principal constituent	2224/37799	Base material
2224/37757	Cobalt [Co] as principal constituent	2224/378	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/3776	Iron [Fe] as principal constituent	2224/37801	the principal constituent melting at a temperature of less than 400°C
2224/37763	the principal constituent melting at a temperature of greater than 1550°C	2224/37805	Gallium [Ga] as principal constituent
2224/37764	Palladium [Pd] as principal constituent	2224/37809	Indium [In] as principal constituent
2224/37766	Titanium [Ti] as principal constituent	2224/37811	Tin [Sn] as principal constituent
2224/37769	Platinum [Pt] as principal constituent	2224/37813	Bismuth [Bi] as principal constituent
2224/3777	Zirconium [Zr] as principal constituent	2224/37814	Thallium [Tl] as principal constituent
2224/37771	Chromium [Cr] as principal constituent	2224/37816	Lead [Pb] as principal constituent
2224/37772	Vanadium [V] as principal constituent	2224/37817	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/37773	Rhodium [Rh] as principal constituent	2224/37818	Zinc [Zn] as principal constituent
2224/37776	Ruthenium [Ru] as principal constituent	2224/3782	Antimony [Sb] as principal constituent
2224/37778	Iridium [Ir] as principal constituent	2224/37823	Magnesium [Mg] as principal constituent
2224/37779	Niobium [Nb] as principal constituent	2224/37824	Aluminium [Al] as principal constituent
2224/3778	Molybdenum [Mo] as principal constituent	2224/37838	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/37781	Tantalum [Ta] as principal constituent	2224/37839	Silver [Ag] as principal constituent
2224/37783	Rhenium [Re] as principal constituent	2224/37844	Gold [Au] as principal constituent
2224/37784	Tungsten [W] as principal constituent	2224/37847	Copper [Cu] as principal constituent
2224/37786	with a principal constituent of the material being a non metallic, non metalloid inorganic material		
2224/37787	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/37788)		
2224/37788	Glasses, e.g. amorphous oxides, nitrides or fluorides		
2224/3779	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy		

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2224/37849	Manganese [Mn] as principal constituent	2224/37894	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/378 - H01L 2224/37891
2224/37855	Nickel [Ni] as principal constituent	2224/37895	with a principal constituent of the material being a gas not provided for in groups H01L 2224/378 - H01L 2224/37891
2224/37857	Cobalt [Co] as principal constituent	2224/37898	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/3786	Iron [Fe] as principal constituent	2224/37899	Coating material
2224/37863	the principal constituent melting at a temperature of greater than 1550°C	2224/379	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/37864	Palladium [Pd] as principal constituent	2224/37901	the principal constituent melting at a temperature of less than 400°C
2224/37866	Titanium [Ti] as principal constituent	2224/37905	Gallium [Ga] as principal constituent
2224/37869	Platinum [Pt] as principal constituent	2224/37909	Indium [In] as principal constituent
2224/3787	Zirconium [Zr] as principal constituent	2224/37911	Tin [Sn] as principal constituent
2224/37871	Chromium [Cr] as principal constituent	2224/37913	Bismuth [Bi] as principal constituent
2224/37872	Vanadium [V] as principal constituent	2224/37914	Thallium [Tl] as principal constituent
2224/37873	Rhodium [Rh] as principal constituent	2224/37916	Lead [Pb] as principal constituent
2224/37876	Ruthenium [Ru] as principal constituent	2224/37917	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/37878	Iridium [Ir] as principal constituent	2224/37918	Zinc [Zn] as principal constituent
2224/37879	Niobium [Nb] as principal constituent	2224/3792	Antimony [Sb] as principal constituent
2224/3788	Molybdenum [Mo] as principal constituent	2224/37923	Magnesium [Mg] as principal constituent
2224/37881	Tantalum [Ta] as principal constituent	2224/37924	Aluminium [Al] as principal constituent
2224/37883	Rhenium [Re] as principal constituent	2224/37938	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/37884	Tungsten [W] as principal constituent	2224/37939	Silver [Ag] as principal constituent
2224/37886	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/37944	Gold [Au] as principal constituent
2224/37887	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/37888)	2224/37947	Copper [Cu] as principal constituent
2224/37888	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/37949	Manganese [Mn] as principal constituent
2224/3789	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/37955	Nickel [Ni] as principal constituent
2224/37891	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene		
2224/37893	with a principal constituent of the material being a solid not provided for in groups H01L 2224/378 - H01L 2224/37891 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond		

2224/37957	...	Cobalt [Co] as principal constituent	2224/37995	...	with a principal constituent of the material being a gas not provided for in groups H01L 2224/379 - H01L 2224/37991
2224/3796	...	Iron [Fe] as principal constituent	2224/37998	...	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/37963	...	the principal constituent melting at a temperature of greater than 1550°C	2224/37999	...	Shape or distribution of the fillers
2224/37964	...	Palladium [Pd] as principal constituent	2224/38	...	of a plurality of strap connectors
2224/37966	...	Titanium [Ti] as principal constituent	2224/39	...	Structure, shape, material or disposition of the strap connectors after the connecting process
2224/37969	...	Platinum [Pt] as principal constituent	2224/40	...	of an individual strap connector
2224/3797	...	Zirconium [Zr] as principal constituent	2224/4001	...	Structure
2224/37971	...	Chromium [Cr] as principal constituent	2224/4005	...	Shape
2224/37972	...	Vanadium [V] as principal constituent	2224/4007	...	of bonding interfaces, e.g. interlocking features
2224/37973	...	Rhodium [Rh] as principal constituent	2224/4009	...	Loop shape
2224/37976	...	Ruthenium [Ru] as principal constituent	2224/40091	...	Arched
2224/37978	...	Iridium [Ir] as principal constituent	2224/40095	...	Kinked
2224/37979	...	Niobium [Nb] as principal constituent	2224/401	...	Disposition
2224/3798	...	Molybdenum [Mo] as principal constituent	2224/40101	...	Connecting bonding areas at the same height, e.g. horizontal bond
2224/37981	...	Tantalum [Ta] as principal constituent	2224/40105	...	Connecting bonding areas at different heights
2224/37983	...	Rhenium [Re] as principal constituent	2224/40106	...	the connector being orthogonal to a side surface of the semiconductor or solid-state body, e.g. parallel layout
2224/37984	...	Tungsten [W] as principal constituent	2224/40108	...	the connector not being orthogonal to a side surface of the semiconductor or solid-state body, e.g. fanned-out connectors, radial layout
2224/37986	...	with a principal constituent of the material being a non metallic, non metalloïd inorganic material	2224/40111	...	the strap connector extending above another semiconductor or solid-state body
2224/37987	...	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/37988)	2224/4013	...	Connecting within a semiconductor or solid-state body, i.e. fly strap, bridge strap
2224/37988	...	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/40132	...	with an intermediate bond, e.g. continuous strap daisy chain
2224/3799	...	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/40135	...	Connecting between different semiconductor or solid-state bodies, i.e. chip-to-chip
2224/37991	...	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene	2224/40137	...	the bodies being arranged next to each other, e.g. on a common substrate
2224/37993	...	with a principal constituent of the material being a solid not provided for in groups H01L 2224/379 - H01L 2224/37991 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond	2224/40139	...	with an intermediate bond, e.g. continuous strap daisy chain
2224/37994	...	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/379 - H01L 2224/37991	2224/40141	...	the bodies being arranged on opposite sides of a substrate, e.g. mirror arrangements
			2224/40145	...	the bodies being stacked
			2224/40147	...	with an intermediate bond, e.g. continuous strap daisy chain
			2224/40151	...	Connecting between a semiconductor or solid-state body and an item not being a semiconductor or solid-state body, e.g. chip-to-substrate, chip-to-passive
			2224/40153	...	the body and the item being arranged next to each other, e.g. on a common substrate

2224/40155	. . . . .	the item being non-metallic, e.g. insulating substrate with or without metallisation	2224/4026	. . . . .	Connecting between the body and an opposite side of the item with respect to the body
2224/40157	. . . . .	Connecting the strap to a bond pad of the item	2224/40265	. . . . .	the item being a discrete passive component
2224/40158	. . . . .	the bond pad being disposed in a recess of the surface of the item	2224/404	. . . . .	Connecting portions
2224/40159	. . . . .	the bond pad protruding from the surface of the item	2224/4046	. . . . .	with multiple bonds on the same bonding area
2224/4016	. . . . .	Connecting the strap to a pin of the item	2224/40475	. . . . .	connected to auxiliary connecting means on the bonding areas
2224/40163	. . . . .	Connecting the strap to a potential ring of the item	2224/40477	. . . . .	being a pre-ball (i.e. a ball formed by capillary bonding)
2224/40165	. . . . .	Connecting the strap to a via metallisation of the item	2224/40479	. . . . .	on the semiconductor or solid-state body
2224/40175	. . . . .	the item being metallic	2224/4048	. . . . .	outside the semiconductor or solid-state body
2224/40177	. . . . .	Connecting the strap to a bond pad of the item	2224/40484	. . . . .	being a plurality of pre-balls disposed side-to-side
2224/40178	. . . . .	the bond pad being disposed in a recess of the surface of the item	2224/40486	. . . . .	on the semiconductor or solid-state body
2224/40179	. . . . .	the bond pad protruding from the surface of the item	2224/40487	. . . . .	outside the semiconductor or solid-state body
2224/40183	. . . . .	Connecting the strap to a potential ring of the item	2224/40491	. . . . .	being an additional member attached to the bonding area through an adhesive or solder, e.g. buffer pad
2224/40195	. . . . .	the item being a discrete passive component	2224/40496	. . . . .	not being interposed between the connector and the bonding area
2224/40221	. . . . .	the body and the item being stacked	2224/40499	. . . . .	Material of the auxiliary connecting means
2224/40225	. . . . .	the item being non-metallic, e.g. insulating substrate with or without metallisation	2224/405	. . . . .	Material
2224/40227	. . . . .	Connecting the strap to a bond pad of the item	2224/40505	. . . . .	at the bonding interface
2224/40228	. . . . .	the bond pad being disposed in a recess of the surface of the item	2224/40506	. . . . .	comprising an eutectic alloy
2224/40229	. . . . .	the bond pad protruding from the surface of the item	2224/40507	. . . . .	comprising an intermetallic compound
2224/4023	. . . . .	Connecting the strap to a pin of the item	2224/4051	. . . . .	Morphology of the connecting portion, e.g. grain size distribution
2224/40233	. . . . .	Connecting the strap to a potential ring of the item	2224/4052	. . . . .	Bonding interface between the connecting portion and the bonding area
2224/40235	. . . . .	Connecting the strap to a via metallisation of the item	2224/4099	. . . . .	Auxiliary members for strap connectors, e.g. flow-barriers, spacers
2224/40237	. . . . .	Connecting the strap to a die pad of the item	2224/40991	. . . . .	being formed on the semiconductor or solid-state body to be connected
2224/4024	. . . . .	Connecting between the body and an opposite side of the item with respect to the body	2224/40992	. . . . .	Reinforcing structures
2224/40245	. . . . .	the item being metallic	2224/40993	. . . . .	Alignment aids
2224/40247	. . . . .	Connecting the strap to a bond pad of the item	2224/40996	. . . . .	being formed on an item to be connected not being a semiconductor or solid-state body
2224/40248	. . . . .	the bond pad being disposed in a recess of the surface of the item	2224/40997	. . . . .	Reinforcing structures
2224/40249	. . . . .	the bond pad protruding from the surface of the item	2224/40998	. . . . .	Alignment aids
2224/40253	. . . . .	Connecting the strap to a potential ring of the item	2224/41	. . . . .	of a plurality of strap connectors
2224/40257	. . . . .	Connecting the strap to a die pad of the item	2224/4101	. . . . .	Structure
			2224/4103	. . . . .	Connectors having different sizes
			2224/4105	. . . . .	Shape
			2224/41051	. . . . .	Connectors having different shapes
			2224/41052	. . . . .	Different loop heights
			2224/411	. . . . .	Disposition
			2224/41105	. . . . .	Connecting at different heights
			2224/41107	. . . . .	on the semiconductor or solid-state body being
			2224/41109	. . . . .	outside the semiconductor or solid-state body

- 2224/4111 the connectors being bonded to at least one common bonding area, e.g. daisy chain
- 2224/41111 the connectors connecting two common bonding areas
- 2224/41112 the connectors connecting a common bonding area on the semiconductor or solid-state body to different bonding areas outside the body, e.g. diverging straps
- 2224/41113 the connectors connecting different bonding areas on the semiconductor or solid-state body to a common bonding area outside the body, e.g. converging straps
- 2224/4112 Layout
- 2224/4117 Crossed straps
- 2224/41171 Fan-out arrangements
- 2224/41173 Radial fan-out arrangements
- 2224/41174 Stacked arrangements
- 2224/41175 Parallel arrangements
- 2224/41176 Strap connectors having the same loop shape and height
- 2224/41177 Combinations of different arrangements
- 2224/41179 Corner adaptations, i.e. disposition of the strap connectors at the corners of the semiconductor or solid-state body
- 2224/4118 being disposed on at least two different sides of the body, e.g. dual array
- 2224/414 Connecting portions
- 2224/4141 the connecting portions being stacked
- 2224/41421 on the semiconductor or solid-state body
- 2224/41422 outside the semiconductor or solid-state body
- 2224/4143 the connecting portions being staggered
- 2224/415 Material
- 2224/41505 Connectors having different materials
- 2224/42 Wire connectors; Manufacturing methods related thereto
- 2224/43 Manufacturing methods
- 2224/43001 Involving a temporary auxiliary member not forming part of the manufacturing apparatus, e.g. removable or sacrificial coating, film or substrate
- 2224/431 Pre-treatment of the preform connector
- 2224/4312 Applying permanent coating, e.g. in-situ coating
- 2224/43125 Plating, e.g. electroplating, electroless plating
- 2224/432 Mechanical processes
- 2224/4321 Pulling
- 2224/435 Modification of a pre-existing material
- 2224/4351 Sintering
- 2224/4352 Anodisation
- 2224/437 Involving monitoring, e.g. feedback loop
- 2224/438 Post-treatment of the connector
- 2224/4381 Cleaning, e.g. oxide removal step, desmearing
- 2224/4382 Applying permanent coating, e.g. in-situ coating
- 2224/43821 Spray coating
- 2224/43822 Dip coating
- 2224/43823 Immersion coating, e.g. solder bath
- 2224/43824 Chemical solution deposition [CSD], i.e. using a liquid precursor
- 2224/43825 Plating, e.g. electroplating, electroless plating
- 2224/43826 Physical vapour deposition [PVD], e.g. evaporation, sputtering
- 2224/43827 Chemical vapour deposition [CVD], e.g. laser CVD
- 2224/4383 Reworking
- 2224/43831 with a chemical process, e.g. with etching of the connector
- 2224/43847 with a mechanical process, e.g. with flattening of the connector
- 2224/43848 Thermal treatments, e.g. annealing, controlled cooling
- 2224/43985 Methods of manufacturing wire connectors involving a specific sequence of method steps
- 2224/43986 with repetition of the same manufacturing step
- 2224/44 Structure, shape, material or disposition of the wire connectors prior to the connecting process
- 2224/45 of an individual wire connector
- 2224/45001 Core members of the connector
- 2224/45005 Structure
- 2224/4501 Shape
- 2224/45012 Cross-sectional shape
- 2224/45013 being non uniform along the connector
- 2224/45014 Ribbon connectors, e.g. rectangular cross-section
- 2224/45015 being circular
- 2224/45016 being elliptic
- 2224/4502 Disposition
- 2224/45025 Plural core members
- 2224/45026 being mutually engaged together, e.g. through inserts
- 2224/45028 Side-to-side arrangements
- 2224/4503 Stacked arrangements
- 2224/45032 Two-layer arrangements
- 2224/45033 Three-layer arrangements
- 2224/45034 Four-layer arrangements
- 2224/45099 Material
- 2224/451 with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
- 2224/45101 the principal constituent melting at a temperature of less than 400°C
- 2224/45105 Gallium (Ga) as principal constituent
- 2224/45109 Indium (In) as principal constituent
- 2224/45111 Tin (Sn) as principal constituent
- 2224/45113 Bismuth (Bi) as principal constituent
- 2224/45114 Thallium (Tl) as principal constituent
- 2224/45116 Lead (Pb) as principal constituent

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2224/45117	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/45188	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/45118	Zinc (Zn) as principal constituent	2224/4519	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/45112	Antimony (Sb) as principal constituent	2224/45191	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/45123	Magnesium (Mg) as principal constituent	2224/45193	with a principal constituent of the material being a solid not provided for in groups H01L 2224/451 - H01L 2224/45191 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/45124	Aluminium (Al) as principal constituent	2224/45194	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/451 - H01L 2224/45191
2224/45138	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/45195	with a principal constituent of the material being a gas not provided for in groups H01L 2224/451 - H01L 2224/45191
2224/45139	Silver (Ag) as principal constituent	2224/45198	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/45144	Gold (Au) as principal constituent	2224/45199	Material of the matrix
2224/45147	Copper (Cu) as principal constituent	2224/452	with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
2224/45149	Manganese (Mn) as principal constituent	2224/45201	the principal constituent melting at a temperature of less than 400°C
2224/45155	Nickel (Ni) as principal constituent	2224/45205	Gallium (Ga) as principal constituent
2224/45157	Cobalt (Co) as principal constituent	2224/45209	Indium (In) as principal constituent
2224/4516	Iron (Fe) as principal constituent	2224/45211	Tin (Sn) as principal constituent
2224/45163	the principal constituent melting at a temperature of greater than 1550°C	2224/45213	Bismuth (Bi) as principal constituent
2224/45164	Palladium (Pd) as principal constituent	2224/45214	Thallium (Tl) as principal constituent
2224/45166	Titanium (Ti) as principal constituent	2224/45216	Lead (Pb) as principal constituent
2224/45169	Platinum (Pt) as principal constituent	2224/45217	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/4517	Zirconium (Zr) as principal constituent	2224/45218	Zinc (Zn) as principal constituent
2224/45171	Chromium (Cr) as principal constituent	2224/4522	Antimony (Sb) as principal constituent
2224/45172	Vanadium (V) as principal constituent	2224/45223	Magnesium (Mg) as principal constituent
2224/45173	Rhodium (Rh) as principal constituent	2224/45224	Aluminium (Al) as principal constituent
2224/45176	Ruthenium (Ru) as principal constituent		
2224/45178	Iridium (Ir) as principal constituent		
2224/45179	Niobium (Nb) as principal constituent		
2224/4518	Molybdenum (Mo) as principal constituent		
2224/45181	Tantalum (Ta) as principal constituent		
2224/45183	Rhenium (Re) as principal constituent		
2224/45184	Tungsten (W) as principal constituent		
2224/45186	with a principal constituent of the material being a non metallic, non metalloid inorganic material		
2224/45187	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/45188)		

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2224/45238	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/45291	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/45239	Silver (Ag) as principal constituent	2224/45293	with a principal constituent of the material being a solid not provided for in groups H01L 2224/452 - H01L 2224/45291 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/45244	Gold (Au) as principal constituent	2224/45294	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/452 - H01L 2224/45291
2224/45247	Copper (Cu) as principal constituent	2224/45295	with a principal constituent of the material being a gas not provided for in groups H01L 2224/452 - H01L 2224/45291
2224/45249	Manganese (Mn) as principal constituent	2224/45298	Fillers
2224/45255	Nickel (Ni) as principal constituent	2224/45299	Base material
2224/45257	Cobalt (Co) as principal constituent	2224/453	with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
2224/4526	Iron (Fe) as principal constituent	2224/45301	the principal constituent melting at a temperature of less than 400°C
2224/45263	the principal constituent melting at a temperature of greater than 1550°C	2224/45305	Gallium (Ga) as principal constituent
2224/45264	Palladium (Pd) as principal constituent	2224/45309	Indium (In) as principal constituent
2224/45266	Titanium (Ti) as principal constituent	2224/45311	Tin (Sn) as principal constituent
2224/45269	Platinum (Pt) as principal constituent	2224/45313	Bismuth (Bi) as principal constituent
2224/4527	Zirconium (Zr) as principal constituent	2224/45314	Thallium (Tl) as principal constituent
2224/45271	Chromium (Cr) as principal constituent	2224/45316	Lead (Pb) as principal constituent
2224/45272	Vanadium (V) as principal constituent	2224/45317	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/45273	Rhodium (Rh) as principal constituent	2224/45318	Zinc (Zn) as principal constituent
2224/45276	Ruthenium (Ru) as principal constituent	2224/4532	Antimony (Sb) as principal constituent
2224/45278	Iridium (Ir) as principal constituent	2224/45323	Magnesium (Mg) as principal constituent
2224/45279	Niobium (Nb) as principal constituent	2224/45324	Aluminium (Al) as principal constituent
2224/4528	Molybdenum (Mo) as principal constituent	2224/45338	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/45281	Tantalum (Ta) as principal constituent	2224/45339	Silver (Ag) as principal constituent
2224/45283	Rhenium (Re) as principal constituent	2224/45344	Gold (Au) as principal constituent
2224/45284	Tungsten (W) as principal constituent	2224/45347	Copper (Cu) as principal constituent
2224/45286	with a principal constituent of the material being a non metallic, non metalloid inorganic material		
2224/45287	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/45288)		
2224/45288	Glasses, e.g. amorphous oxides, nitrides or fluorides		
2224/4529	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy		

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2224/45349	Manganese (Mn) as principal constituent	2224/45394	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/453 - H01L 2224/45391
2224/45355	Nickel (Ni) as principal constituent	2224/45395	with a principal constituent of the material being a gas not provided for in groups H01L 2224/453 - H01L 2224/45391
2224/45357	Cobalt (Co) as principal constituent	2224/45398	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/4536	Iron (Fe) as principal constituent	2224/45399	Coating material
2224/45363	the principal constituent melting at a temperature of greater than 1550°C	2224/454	with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
2224/45364	Palladium (Pd) as principal constituent	2224/45401	the principal constituent melting at a temperature of less than 400°C
2224/45366	Titanium (Ti) as principal constituent	2224/45405	Gallium (Ga) as principal constituent
2224/45369	Platinum (Pt) as principal constituent	2224/45409	Indium (In) as principal constituent
2224/4537	Zirconium (Zr) as principal constituent	2224/45411	Tin (Sn) as principal constituent
2224/45371	Chromium (Cr) as principal constituent	2224/45413	Bismuth (Bi) as principal constituent
2224/45372	Vanadium (V) as principal constituent	2224/45414	Thallium (Tl) as principal constituent
2224/45373	Rhodium (Rh) as principal constituent	2224/45416	Lead (Pb) as principal constituent
2224/45376	Ruthenium (Ru) as principal constituent	2224/45417	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/45378	Iridium (Ir) as principal constituent	2224/45418	Zinc (Zn) as principal constituent
2224/45379	Niobium (Nb) as principal constituent	2224/4542	Antimony (Sb) as principal constituent
2224/4538	Molybdenum (Mo) as principal constituent	2224/45423	Magnesium (Mg) as principal constituent
2224/45381	Tantalum (Ta) as principal constituent	2224/45424	Aluminium (Al) as principal constituent
2224/45383	Rhenium (Re) as principal constituent	2224/45438	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/45384	Tungsten (W) as principal constituent	2224/45439	Silver (Ag) as principal constituent
2224/45386	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/45444	Gold (Au) as principal constituent
2224/45387	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/45388)	2224/45447	Copper (Cu) as principal constituent
2224/45388	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/45449	Manganese (Mn) as principal constituent
2224/4539	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/45455	Nickel (Ni) as principal constituent
2224/45391	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene		
2224/45393	with a principal constituent of the material being a solid not provided for in groups H01L 2224/453 - H01L 2224/45391 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond		

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2224/45457	Cobalt (Co) as principal constituent	2224/45495	with a principal constituent of the material being a gas not provided for in groups H01L 2224/454 - H01L 2224/45491
2224/4546	. . . . .	Iron (Fe) as principal constituent	2224/45498	. . . . .	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/45463	. . . . .	the principal constituent melting at a temperature of greater than 1550°C	2224/45499	. . . . .	Shape or distribution of the fillers
2224/45464	. . . . .	Palladium (Pd) as principal constituent	2224/4554	. . . . .	Coating
2224/45466	. . . . .	Titanium (Ti) as principal constituent	2224/45541	. . . . .	Structure
2224/45469	. . . . .	Platinum (Pt) as principal constituent	2224/4555	. . . . .	Shape
2224/4547	. . . . .	Zirconium (Zr) as principal constituent	2224/4556	. . . . .	Disposition, e.g. coating on a part of the core
2224/45471	. . . . .	Chromium (Cr) as principal constituent	2224/45565	. . . . .	Single coating layer
2224/45472	. . . . .	Vanadium (V) as principal constituent	2224/4557	. . . . .	Plural coating layers
2224/45473	. . . . .	Rhodium (Rh) as principal constituent	2224/45572	. . . . .	Two-layer stack coating
2224/45476	. . . . .	Ruthenium (Ru) as principal constituent	2224/45573	. . . . .	Three-layer stack coating
2224/45478	. . . . .	Iridium (Ir) as principal constituent	2224/45574	. . . . .	Four-layer stack coating
2224/45479	. . . . .	Niobium (Nb) as principal constituent	2224/45576	. . . . .	being mutually engaged together, e.g. through inserts
2224/4548	. . . . .	Molybdenum (Mo) as principal constituent	2224/45578	. . . . .	being disposed next to each other, e.g. side-to-side arrangements
2224/45481	. . . . .	Tantalum (Ta) as principal constituent	2224/45599	. . . . .	Material
2224/45483	. . . . .	Rhenium (Re) as principal constituent	2224/456	. . . . .	with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
2224/45484	. . . . .	Tungsten (W) as principal constituent	2224/45601	. . . . .	the principal constituent melting at a temperature of less than 400°C
2224/45486	. . . . .	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/45605	. . . . .	Gallium (Ga) as principal constituent
2224/45487	. . . . .	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/45488)	2224/45609	. . . . .	Indium (In) as principal constituent
2224/45488	. . . . .	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/45611	. . . . .	Tin (Sn) as principal constituent
2224/4549	. . . . .	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/45613	. . . . .	Bismuth (Bi) as principal constituent
2224/45491	. . . . .	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene	2224/45614	. . . . .	Thallium (Tl) as principal constituent
2224/45493	. . . . .	with a principal constituent of the material being a solid not provided for in groups H01L 2224/454 - H01L 2224/45491 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond	2224/45616	. . . . .	Lead (Pb) as principal constituent
2224/45494	. . . . .	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/454 - H01L 2224/45491	2224/45617	. . . . .	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
			2224/45618	. . . . .	Zinc (Zn) as principal constituent
			2224/4562	. . . . .	Antimony (Sb) as principal constituent
			2224/45623	. . . . .	Magnesium (Mg) as principal constituent
			2224/45624	. . . . .	Aluminium (Al) as principal constituent
			2224/45638	. . . . .	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
			2224/45639	. . . . .	Silver (Ag) as principal constituent
			2224/45644	. . . . .	Gold (Au) as principal constituent

H01L

2224/45647	Copper (Cu) as principal constituent	2224/45694	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/456 - H01L 2224/45691
2224/45649	Manganese (Mn) as principal constituent	2224/45695	with a principal constituent of the material being a gas not provided for in groups H01L 2224/456 - H01L 2224/45691
2224/45655	Nickel (Ni) as principal constituent	2224/45698	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/45657	Cobalt (Co) as principal constituent	2224/45699	Material of the matrix
2224/45666	Iron (Fe) as principal constituent	2224/457	with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
2224/45663	the principal constituent melting at a temperature of greater than 1550°C	2224/45701	the principal constituent melting at a temperature of less than 400°C
2224/45664	Palladium (Pd) as principal constituent	2224/45705	Gallium (Ga) as principal constituent
2224/45666	Titanium (Ti) as principal constituent	2224/45709	Indium (In) as principal constituent
2224/45669	Platinum (Pt) as principal constituent	2224/45711	Tin (Sn) as principal constituent
2224/4567	Zirconium (Zr) as principal constituent	2224/45713	Bismuth (Bi) as principal constituent
2224/45671	Chromium (Cr) as principal constituent	2224/45714	Thallium (Tl) as principal constituent
2224/45672	Vanadium (V) as principal constituent	2224/45716	Lead (Pb) as principal constituent
2224/45673	Rhodium (Rh) as principal constituent	2224/45717	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/45676	Ruthenium (Ru) as principal constituent	2224/45718	Zinc (Zn) as principal constituent
2224/45678	Iridium (Ir) as principal constituent	2224/4572	Antimony (Sb) as principal constituent
2224/45679	Niobium (Nb) as principal constituent	2224/45723	Magnesium (Mg) as principal constituent
2224/4568	Molybdenum (Mo) as principal constituent	2224/45724	Aluminium (Al) as principal constituent
2224/45681	Tantalum (Ta) as principal constituent	2224/45738	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/45683	Rhenium (Re) as principal constituent	2224/45739	Silver (Ag) as principal constituent
2224/45684	Tungsten (W) as principal constituent	2224/45744	Gold (Au) as principal constituent
2224/45686	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/45747	Copper (Cu) as principal constituent
2224/45687	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/45688)	2224/45749	Manganese (Mn) as principal constituent
2224/45688	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/45755	Nickel (Ni) as principal constituent
2224/4569	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/45757	Cobalt (Co) as principal constituent
2224/45691	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene		
2224/45693	with a principal constituent of the material being a solid not provided for in groups H01L 2224/456 - H01L 2224/45691 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond		

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2224/4576	Iron (Fe) as principal constituent	2224/45799	Base material
2224/45763	the principal constituent melting at a temperature of greater than 1550°C	2224/458	with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
2224/45764	Palladium (Pd) as principal constituent	2224/45801	the principal constituent melting at a temperature of less than 400°C
2224/45766	Titanium (Ti) as principal constituent	2224/45805	Gallium (Ga) as principal constituent
2224/45769	Platinum (Pt) as principal constituent	2224/45809	Indium (In) as principal constituent
2224/4577	Zirconium (Zr) as principal constituent	2224/45811	Tin (Sn) as principal constituent
2224/45771	Chromium (Cr) as principal constituent	2224/45813	Bismuth (Bi) as principal constituent
2224/45772	Vanadium (V) as principal constituent	2224/45814	Thallium (Tl) as principal constituent
2224/45773	Rhodium (Rh) as principal constituent	2224/45816	Lead (Pb) as principal constituent
2224/45776	Ruthenium (Ru) as principal constituent	2224/45817	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/45778	Iridium (Ir) as principal constituent	2224/45818	Zinc (Zn) as principal constituent
2224/45779	Niobium (Nb) as principal constituent	2224/4582	Antimony (Sb) as principal constituent
2224/4578	Molybdenum (Mo) as principal constituent	2224/45823	Magnesium (Mg) as principal constituent
2224/45781	Tantalum (Ta) as principal constituent	2224/45824	Aluminium (Al) as principal constituent
2224/45783	Rhenium (Re) as principal constituent	2224/45838	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/45784	Tungsten (W) as principal constituent	2224/45839	Silver (Ag) as principal constituent
2224/45786	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/45844	Gold (Au) as principal constituent
2224/45787	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/45788)	2224/45847	Copper (Cu) as principal constituent
2224/45788	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/45849	Manganese (Mn) as principal constituent
2224/4579	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/45855	Nickel (Ni) as principal constituent
2224/45791	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene	2224/45857	Cobalt (Co) as principal constituent
2224/45793	with a principal constituent of the material being a solid not provided for in groups H01L 2224/457 - H01L 2224/45791 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond	2224/4586	Iron (Fe) as principal constituent
2224/45794	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/457 - H01L 2224/45791	2224/45863	the principal constituent melting at a temperature of greater than 1550°C
2224/45795	with a principal constituent of the material being a gas not provided for in groups H01L 2224/457 - H01L 2224/45791	2224/45864	Palladium (Pd) as principal constituent
2224/45798	Fillers	2224/45866	Titanium (Ti) as principal constituent
		2224/45869	Platinum (Pt) as principal constituent
		2224/4587	Zirconium (Zr) as principal constituent

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2224/45871	Chromium (Cr) as principal constituent	2224/459	with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
2224/45872	Vanadium (V) as principal constituent	2224/45901	the principal constituent melting at a temperature of less than 400°C
2224/45873	Rhodium (Rh) as principal constituent	2224/45905	Gallium (Ga) as principal constituent
2224/45876	Ruthenium (Ru) as principal constituent	2224/45909	Indium (In) as principal constituent
2224/45878	Iridium (Ir) as principal constituent	2224/45911	Tin (Sn) as principal constituent
2224/45879	Niobium (Nb) as principal constituent	2224/45913	Bismuth (Bi) as principal constituent
2224/4588	Molybdenum (Mo) as principal constituent	2224/45914	Thallium (Tl) as principal constituent
2224/45881	Tantalum (Ta) as principal constituent	2224/45916	Lead (Pb) as principal constituent
2224/45883	Rhenium (Re) as principal constituent	2224/45917	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/45884	Tungsten (W) as principal constituent	2224/45918	Zinc (Zn) as principal constituent
2224/45886	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/4592	Antimony (Sb) as principal constituent
2224/45887	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/45888)	2224/45923	Magnesium (Mg) as principal constituent
2224/45888	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/45924	Aluminium (Al) as principal constituent
2224/4589	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/45938	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/45891	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene	2224/45939	Silver (Ag) as principal constituent
2224/45893	with a principal constituent of the material being a solid not provided for in groups H01L 2224/458 - H01L 2224/45891	2224/45944	Gold (Au) as principal constituent
	e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond	2224/45947	Copper (Cu) as principal constituent
2224/45894	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/458 - H01L 2224/45891	2224/45949	Manganese (Mn) as principal constituent
2224/45895	with a principal constituent of the material being a gas not provided for in groups H01L 2224/458 - H01L 2224/45891	2224/45955	Nickel (Ni) as principal constituent
2224/45898	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams	2224/45957	Cobalt (Co) as principal constituent
2224/45899	Coating material	2224/4596	Iron (Fe) as principal constituent
		2224/45963	the principal constituent melting at a temperature of greater than 1550°C
		2224/45964	Palladium (Pd) as principal constituent
		2224/45966	Titanium (Ti) as principal constituent
		2224/45969	Platinum (Pt) as principal constituent
		2224/4597	Zirconium (Zr) as principal constituent

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2224/45971	Chromium (Cr) as principal constituent	2224/48011	Length
2224/45972	Vanadium (V) as principal constituent	2224/4805	Shape
2224/45973	Rhodium (Rh) as principal constituent	2224/4807	of bonding interfaces, e.g. interlocking features
2224/45976	Ruthenium (Ru) as principal constituent	2224/4809	Loop shape
2224/45978	Iridium (Ir) as principal constituent	2224/48091	Arched
2224/45979	Niobium (Nb) as principal constituent	2224/48092	Helix
2224/4598	Molybdenum (Mo) as principal constituent	2224/48095	Kinked
2224/45981	Tantalum (Ta) as principal constituent	2224/48096	the kinked part being in proximity to the bonding area on the semiconductor or solid-state body
2224/45983	Rhenium (Re) as principal constituent	2224/48097	the kinked part being in proximity to the bonding area outside the semiconductor or solid-state body
2224/45984	Tungsten (W) as principal constituent	2224/481	Disposition
2224/45986	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/48101	Connecting bonding areas at the same height, e.g. horizontal bond
2224/45987	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/45988)	2224/48105	Connecting bonding areas at different heights
2224/45988	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/48106	the connector being orthogonal to a side surface of the semiconductor or solid-state body, e.g. parallel layout
2224/4599	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/48108	the connector not being orthogonal to a side surface of the semiconductor or solid-state body, e.g. fanned-out connectors, radial layout
2224/45991	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene	2224/4811	Connecting to a bonding area of the semiconductor or solid-state body located at the far end of the body with respect to the bonding area outside the semiconductor or solid-state body
2224/45993	with a principal constituent of the material being a solid not provided for in groups H01L 2224/459 - H01L 2224/45991 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond	2224/48111	the wire connector extending above another semiconductor or solid-state body
2224/45994	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/459 - H01L 2224/45991	2224/4813	Connecting within a semiconductor or solid-state body, i.e. fly wire, bridge wire
2224/45995	with a principal constituent of the material being a gas not provided for in groups H01L 2224/459 - H01L 2224/45991	2224/48132	with an intermediate bond, e.g. continuous wire daisy chain
2224/45998	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams	2224/48135	Connecting between different semiconductor or solid-state bodies, i.e. chip-to-chip
2224/45999	Shape or distribution of the fillers	2224/48137	the bodies being arranged next to each other, e.g. on a common substrate
2224/46	of a plurality of wire connectors	2224/48138	the wire connector connecting to a bonding area disposed in a recess of the surface
2224/47	Structure, shape, material or disposition of the wire connectors after the connecting process	2224/48139	with an intermediate bond, e.g. continuous wire daisy chain
2224/48	of an individual wire connector	2224/4814	the wire connector connecting to a bonding area protruding from the surface
2224/4801	Structure	2224/48141	the bodies being arranged on opposite sides of a substrate, e.g. mirror arrangements
		2224/48145	the bodies being stacked
		2224/48147	with an intermediate bond, e.g. continuous wire daisy chain
		2224/48148	the wire connector connecting to a bonding area disposed in a recess of the surface
		2224/48149	the wire connector connecting to a bonding area protruding from the surface

- 2224/48151 Connecting between a semiconductor or solid-state body and an item not being a semiconductor or solid-state body, e.g. chip-to-substrate, chip-to-passive
- 2224/48153 the body and the item being arranged next to each other, e.g. on a common substrate
- 2224/48155 the item being non-metallic, e.g. insulating substrate with or without metallisation
- 2224/48157 connecting the wire to a bond pad of the item
- 2224/48158 the bond pad being disposed in a recess of the surface of the item
- 2224/48159 the bond pad protruding from the surface of the item
- 2224/4816 connecting the wire to a pin of the item
- 2224/48163 connecting the wire to a potential ring of the item
- 2224/48165 connecting the wire to a via metallisation of the item
- 2224/48175 the item being metallic
- 2224/48177 connecting the wire to a bond pad of the item
- 2224/48178 the bond pad being disposed in a recess of the surface of the item
- 2224/48179 the bond pad protruding from the surface of the item
- 2224/48183 connecting the wire to a potential ring of the item
- 2224/48195 the item being a discrete passive component
- 2224/48221 the body and the item being stacked
- 2224/48225 the item being non-metallic, e.g. insulating substrate with or without metallisation
- 2224/48227 connecting the wire to a bond pad of the item
- 2224/48228 the bond pad being disposed in a recess of the surface of the item
- 2224/48229 the bond pad protruding from the surface of the item
- 2224/4823 connecting the wire to a pin of the item
- 2224/48233 connecting the wire to a potential ring of the item
- 2224/48235 connecting the wire to a via metallisation of the item
- 2224/48237 connecting the wire to a die pad of the item
- 2224/4824 Connecting between the body and an opposite side of the item with respect to the body
- 2224/48245 the item being metallic
- 2224/48247 connecting the wire to a bond pad of the item
- 2224/48248 the bond pad being disposed in a recess of the surface of the item
- 2224/48249 the bond pad protruding from the surface of the item
- 2224/48253 connecting the wire to a potential ring of the item
- 2224/48257 connecting the wire to a die pad of the item
- 2224/4826 Connecting between the body and an opposite side of the item with respect to the body
- 2224/48265 the item being a discrete passive component
- 2224/484 Connecting portions
- 2224/4845 Details of ball bonds
- 2224/48451 Shape
- 2224/48453 of the interface with the bonding area
- 2224/48455 Details of wedge bonds
- 2224/48456 Shape
- 2224/48458 of the interface with the bonding area
- 2224/4846 with multiple bonds on the same bonding area
- 2224/48463 the connecting portion on the bonding area of the semiconductor or solid-state body being a ball bond
- 2224/48464 the other connecting portion not on the bonding area also being a ball bond, i.e. ball-to-ball
- 2224/48465 the other connecting portion not on the bonding area being a wedge bond, i.e. ball-to-wedge, regular stitch
- 2224/4847 the connecting portion on the bonding area of the semiconductor or solid-state body being a wedge bond
- 2224/48471 the other connecting portion not on the bonding area being a ball bond, i.e. wedge-to-ball, reverse stitch
- 2224/48472 the other connecting portion not on the bonding area also being a wedge bond, i.e. wedge-to-wedge
- 2224/48475 connected to auxiliary connecting means on the bonding areas, e.g. pre-ball, wedge-on-ball, ball-on-ball
- 2224/48476 between the wire connector and the bonding area
- 2224/48477 being a pre-ball (i.e. a ball formed by capillary bonding)
- 2224/48478 the connecting portion being a wedge bond, i.e. wedge on pre-ball
- 2224/48479 on the semiconductor or solid-state body
- 2224/4848 outside the semiconductor or solid-state body
- 2224/48481 the connecting portion being a ball bond, i.e. ball on pre-ball
- 2224/48482 on the semiconductor or solid-state body
- 2224/48483 outside the semiconductor or solid-state body
- 2224/48484 being a plurality of pre-balls disposed side-to-side
- 2224/48485 the connecting portion being a wedge bond, i.e. wedge on pre-ball

2224/48486	on the semiconductor or solid-state body	2224/48624	Aluminium (Al) as principal constituent
2224/48487	outside the semiconductor or solid-state body	2224/48638	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/48488	the connecting portion being a ball bond, i.e. ball on pre-ball	2224/48639	Silver (Ag) as principal constituent
2224/48489	on the semiconductor or solid-state body	2224/48644	Gold (Au) as principal constituent
2224/4849	outside the semiconductor or solid-state body	2224/48647	Copper (Cu) as principal constituent
2224/48491	being an additional member attached to the bonding area through an adhesive or solder, e.g. buffer pad	2224/48649	Manganese (Mn) as principal constituent
2224/48496	not being interposed between the wire connector and the bonding area	2224/48655	Nickel (Ni) as principal constituent
2224/48499	Material of the auxiliary connecting means	2224/48657	Cobalt (Co) as principal constituent
2224/485	Material	2224/4866	Iron (Fe) as principal constituent
2224/48505	at the bonding interface	2224/48663	the principal constituent melting at a temperature of greater than 1550°C
2224/48506	comprising an eutectic alloy	2224/48664	Palladium (Pd) as principal constituent
2224/48507	comprising an intermetallic compound	2224/48666	Titanium (Ti) as principal constituent
2224/4851	Morphology of the connecting portion, e.g. grain size distribution	2224/48669	Platinum (Pt) as principal constituent
2224/48511	Heat affected zone [HAZ]	2224/4867	Zirconium (Zr) as principal constituent
2224/4852	Bonding interface between the connecting portion and the bonding area	2224/48671	Chromium (Cr) as principal constituent
2224/48599	Principal constituent of the connecting portion of the wire connector being Gold (Au)	2224/48672	Vanadium (V) as principal constituent
2224/486	with a principal constituent of the bonding area being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof	2224/48673	Rhodium (Rh) as principal constituent
2224/48601	the principal constituent melting at a temperature of less than 400°C	2224/48678	Iridium (Ir) as principal constituent
2224/48605	Gallium (Ga) as principal constituent	2224/48679	Niobium (Nb) as principal constituent
2224/48609	Indium (In) as principal constituent	2224/4868	Molybdenum (Mo) as principal constituent
2224/48611	Tin (Sn) as principal constituent	2224/48681	Tantalum (Ta) as principal constituent
2224/48613	Bismuth (Bi) as principal constituent	2224/48683	Rhenium (Re) as principal constituent
2224/48614	Thallium (Tl) as principal constituent	2224/48684	Tungsten (W) as principal constituent
2224/48616	Lead (Pb) as principal constituent	2224/48686	with a principal constituent of the bonding area being a non metallic, non metalloid inorganic material
2224/48617	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950 °C	2224/48687	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/48688)
2224/48618	Zinc (Zn) as principal constituent	2224/48688	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/4862	Antimony (Sb) as principal constituent	2224/4869	with a principal constituent of the bonding area being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/48623	Magnesium (Mg) as principal constituent	2224/48691	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

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2224/48693	with a principal constituent of the bonding area being a solid not provided for in groups H01L 2224/486 - H01L 2224/4869 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond	2224/48755	Nickel (Ni) as principal constituent
2224/48694	with a principal constituent of the bonding area being a liquid not provided for in groups H01L 2224/486 - H01L 2224/4869	2224/48757	Cobalt (Co) as principal constituent
2224/48698	with a principal constituent of the bonding area being a combination of two or more material regions, i.e. being a hybrid material, e.g. segmented structures, island patterns	2224/4876	Iron (Fe) as principal constituent
2224/48699	Principal constituent of the connecting portion of the wire connector being Aluminium (Al)	2224/48763	the principal constituent melting at a temperature of greater than 1550°C
2224/487	with a principal constituent of the bonding area being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof	2224/48764	Palladium (Pd) as principal constituent
2224/48701	the principal constituent melting at a temperature of less than 400°C	2224/48766	Titanium (Ti) as principal constituent
2224/48705	Gallium (Ga) as principal constituent	2224/48769	Platinum (Pt) as principal constituent
2224/48709	Indium (In) as principal constituent	2224/4877	Zirconium (Zr) as principal constituent
2224/48711	Tin (Sn) as principal constituent	2224/48771	Chromium (Cr) as principal constituent
2224/48713	Bismuth (Bi) as principal constituent	2224/48772	Vanadium (V) as principal constituent
2224/48714	Thallium (Tl) as principal constituent	2224/48773	Rhodium (Rh) as principal constituent
2224/48716	Lead (Pb) as principal constituent	2224/48778	Iridium (Ir) as principal constituent
2224/48717	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950 °C	2224/48779	Niobium (Nb) as principal constituent
2224/48718	Zinc (Zn) as principal constituent	2224/4878	Molybdenum (Mo) as principal constituent
2224/4872	Antimony (Sb) as principal constituent	2224/48781	Tantalum (Ta) as principal constituent
2224/48723	Magnesium (Mg) as principal constituent	2224/48783	Rhenium (Re) as principal constituent
2224/48724	Aluminium (Al) as principal constituent	2224/48784	Tungsten (W) as principal constituent
2224/48738	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/48786	with a principal constituent of the bonding area being a non metallic, non metalloid inorganic material
2224/48739	Silver (Ag) as principal constituent	2224/48787	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/48788)
2224/48744	Gold (Au) as principal constituent	2224/48788	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/48747	Copper (Cu) as principal constituent	2224/4879	with a principal constituent of the bonding area being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/48749	Manganese (Mn) as principal constituent	2224/48791	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
		2224/48793	with a principal constituent of the bonding area being a solid not provided for in groups H01L 2224/487 - H01L 2224/4879 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
		2224/48794	with a principal constituent of the bonding area being a liquid not provided for in groups H01L 2224/487 - H01L 2224/4879

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2224/48798	with a principal constituent of the bonding area being a combination of two or more material regions, i.e. being a hybrid material, e.g. segmented structures, island patterns	2224/48866	Titanium (Ti) as principal constituent
2224/48799	Principal constituent of the connecting portion of the wire connector being Copper (Cu)	2224/48869	Platinum (Pt) as principal constituent
2224/488	with a principal constituent of the bonding area being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof	2224/4887	Zirconium (Zr) as principal constituent
2224/48801	the principal constituent melting at a temperature of less than 400°C	2224/48871	Chromium (Cr) as principal constituent
2224/48805	Gallium (Ga) as principal constituent	2224/48872	Vanadium (V) as principal constituent
2224/48809	Indium (In) as principal constituent	2224/48873	Rhodium (Rh) as principal constituent
2224/48811	Tin (Sn) as principal constituent	2224/48878	Iridium (Ir) as principal constituent
2224/48813	Bismuth (Bi) as principal constituent	2224/48879	Niobium (Nb) as principal constituent
2224/48814	Thallium (Tl) as principal constituent	2224/4888	Molybdenum (Mo) as principal constituent
2224/48816	Lead (Pb) as principal constituent	2224/48881	Tantalum (Ta) as principal constituent
2224/48817	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950 °C	2224/48883	Rhenium (Re) as principal constituent
2224/48818	Zinc (Zn) as principal constituent	2224/48884	Tungsten (W) as principal constituent
2224/4882	Antimony (Sb) as principal constituent	2224/48886	with a principal constituent of the bonding area being a non metallic, non metalloid inorganic material
2224/48823	Magnesium (Mg) as principal constituent	2224/48887	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/48888)
2224/48824	Aluminium (Al) as principal constituent	2224/48888	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/48838	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/4889	with a principal constituent of the bonding area being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/48839	Silver (Ag) as principal constituent	2224/48891	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/48844	Gold (Au) as principal constituent	2224/48893	with a principal constituent of the bonding area being a solid not provided for in groups H01L 2224/488 - H01L 2224/4889 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/48847	Copper (Cu) as principal constituent	2224/48894	with a principal constituent of the bonding area being a liquid not provided for in groups H01L 2224/488 - H01L 2224/4889
2224/48849	Manganese (Mn) as principal constituent	2224/48898	with a principal constituent of the bonding area being a combination of two or more material regions, i.e. being a hybrid material, e.g. segmented structures, island patterns
2224/48855	Nickel (Ni) as principal constituent	2224/4899	Auxiliary members for wire connectors, e.g. flow-barriers, reinforcing structures, spacers, alignment aids
2224/48857	Cobalt (Co) as principal constituent	2224/48991	being formed on the semiconductor or solid-state body to be connected
2224/4886	Iron (Fe) as principal constituent	2224/48992	Reinforcing structures
2224/48863	the principal constituent melting at a temperature of greater than 1550°C	2224/48993	Alignment aids
2224/48864	Palladium (Pd) as principal constituent		

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- 2224/48996 being formed on an item to be connected not being a semiconductor or solid-state body
- 2224/48997 Reinforcing structures
- 2224/48998 Alignment aids
- 2224/49 of a plurality of wire connectors
- 2224/4901 Structure
- 2224/4903 Connectors having different sizes, e.g. different diameters
- 2224/4905 Shape
- 2224/49051 Connectors having different shapes
- 2224/49052 Different loop heights
- 2224/4909 Loop shape arrangement
- 2224/49095 parallel in plane
- 2224/49096 horizontal
- 2224/49097 vertical
- 2224/491 Disposition
- 2224/49105 Connecting at different heights
- 2224/49107 on the semiconductor or solid-state body
- 2224/49109 outside the semiconductor or solid-state body
- 2224/4911 the connectors being bonded to at least one common bonding area, e.g. daisy chain
- 2224/49111 the connectors connecting two common bonding areas, e.g. Litz or braid wires
- 2224/49112 the connectors connecting a common bonding area on the semiconductor or solid-state body to different bonding areas outside the body, e.g. diverging wires
- 2224/49113 the connectors connecting different bonding areas on the semiconductor or solid-state body to a common bonding area outside the body, e.g. converging wires
- 2224/4912 Layout
- 2224/4917 Crossed wires
- 2224/49171 Fan-out arrangements
- 2224/49173 Radial fan-out arrangements
- 2224/49174 Stacked arrangements
- 2224/49175 Parallel arrangements
- 2224/49176 Wire connectors having the same loop shape and height
- 2224/49177 Combinations of different arrangements
- 2224/49179 Corner adaptations, i.e. disposition of the wire connectors at the corners of the semiconductor or solid-state body
- 2224/4918 being disposed on at least two different sides of the body, e.g. dual array
- 2224/494 Connecting portions
- 2224/4941 the connecting portions being stacked
- 2224/4942 Ball bonds
- 2224/49421 on the semiconductor or solid-state body
- 2224/49422 outside the semiconductor or solid-state body
- 2224/49425 Wedge bonds
- 2224/49426 on the semiconductor or solid-state body
- 2224/49427 outside the semiconductor or solid-state body
- 2224/49429 Wedge and ball bonds
- 2224/4943 the connecting portions being staggered
- 2224/49431 on the semiconductor or solid-state body
- 2224/49433 outside the semiconductor or solid-state body
- 2224/4945 Wire connectors having connecting portions of different types on the semiconductor or solid-state body, e.g. regular and reverse stitches
- 2224/495 Material
- 2224/49505 Connectors having different materials
- 2224/50 Tape automated bonding [TAB] connectors, i.e. film carriers; Manufacturing methods related thereto
- 2224/63 Connectors not provided for in any of the groups [H01L 2224/10](#) - [H01L 2224/50](#) and subgroups; Manufacturing methods related thereto
- 2224/64 Manufacturing methods
- 2224/65 Structure, shape, material or disposition of the connectors prior to the connecting process
- 2224/66 of an individual connector
- 2224/67 of a plurality of connectors
- 2224/68 Structure, shape, material or disposition of the connectors after the connecting process
- 2224/69 of an individual connector
- 2224/70 of a plurality of connectors
- 2224/71 Means for bonding not being attached to, or not being formed on, the surface to be connected
- 2224/72 Detachable connecting means consisting of mechanical auxiliary parts connecting the device, e.g. pressure contacts using springs or clips
- 2224/73 Means for bonding being of different types provided for in two or more of groups [H01L 2224/10](#), [H01L 2224/18](#), [H01L 2224/26](#), [H01L 2224/34](#), [H01L 2224/42](#), [H01L 2224/50](#), [H01L 2224/63](#), [H01L 2224/71](#)
- 2224/731 Location prior to the connecting process
- 2224/73101 on the same surface
- 2224/73103 Bump and layer connectors
- 2224/73104 the bump connector being embedded into the layer connector
- 2224/73151 on different surfaces
- 2224/73153 Bump and layer connectors
- 2224/732 Location after the connecting process
- 2224/73201 on the same surface
- 2224/73203 Bump and layer connectors
- 2224/73204 the bump connector being embedded into the layer connector
- 2224/73205 Bump and strap connectors
- 2224/73207 Bump and wire connectors
- 2224/73209 Bump and HDI connectors
- 2224/73211 Bump and TAB connectors
- 2224/73213 Layer and strap connectors
- 2224/73215 Layer and wire connectors
- 2224/73217 Layer and HDI connectors
- 2224/73219 Layer and TAB connectors
- 2224/73221 Strap and wire connectors
- 2224/73223 Strap and HDI connectors

- 2224/73225 Strap and TAB connectors
- 2224/73227 Wire and HDI connectors
- 2224/73229 Wire and TAB connectors
- 2224/73231 HDI and TAB connectors
- 2224/73251 on different surfaces
- 2224/73253 Bump and layer connectors
- 2224/73255 Bump and strap connectors
- 2224/73257 Bump and wire connectors
- 2224/73259 Bump and HDI connectors
- 2224/73261 Bump and TAB connectors
- 2224/73263 Layer and strap connectors
- 2224/73265 Layer and wire connectors
- 2224/73267 Layer and HDI connectors
- 2224/73269 Layer and TAB connectors
- 2224/73271 Strap and wire connectors
- 2224/73273 Strap and HDI connectors
- 2224/73275 Strap and TAB connectors
- 2224/73277 Wire and HDI connectors
- 2224/73279 Wire and TAB connectors
- 2224/73281 HDI and TAB connectors
- 2224/74 . . . Apparatus for manufacturing arrangements for connecting or disconnecting semiconductor or solid-state bodies and for methods related thereto
- 2224/741 . . . Apparatus for manufacturing means for bonding, e.g. connectors
- 2224/742 . . . Apparatus for manufacturing bump connectors
- 2224/743 . . . Apparatus for manufacturing layer connectors
- 2224/744 . . . Apparatus for manufacturing strap connectors
- 2224/745 . . . Apparatus for manufacturing wire connectors
- 2224/749 . . . Tools for reworking, e.g. for shaping
- 2224/75 . . . Apparatus for connecting with bump connectors or layer connectors
- 2224/75001 . . . Calibration means
- 2224/7501 . . . Means for cleaning, e.g. brushes, for hydro blasting, for ultrasonic cleaning, for dry ice blasting, using gas-flow, by etching, by applying flux or plasma
- 2224/751 . . . Means for controlling the bonding environment, e.g. valves, vacuum pumps
- 2224/75101 Chamber
- 2224/75102 Vacuum chamber
- 2224/7511 High pressure chamber
- 2224/7515 . . . Means for applying permanent coating, e.g. in-situ coating
- 2224/75151 Means for direct writing
- 2224/75152 Syringe
- 2224/75153 integrated into the bonding head
- 2224/75155 Jetting means, e.g. ink jet
- 2224/75158 including a laser
- 2224/75161 Means for screen printing, e.g. roller, squeegee, screen stencil
- 2224/7517 Means for applying a preform, e.g. laminator
- 2224/75171 including a vacuum-bag
- 2224/7518 Means for blanket deposition
- 2224/75181 for spin coating, i.e. spin coater
- 2224/75182 for curtain coating
- 2224/75183 for immersion coating, i.e. bath
- 2224/75184 for spray coating, i.e. nozzle
- 2224/75185 Means for physical vapour deposition [PVD], e.g. evaporation, sputtering
- 2224/75186 Means for sputtering, e.g. target
- 2224/75187 Means for evaporation
- 2224/75188 Means for chemical vapour deposition [CVD], e.g. for laser CVD
- 2224/75189 Means for plating, e.g. for electroplating, electroless plating
- 2224/752 Protection means against electrical discharge
- 2224/7525 Means for applying energy, e.g. heating means
- 2224/75251 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/75252 in the upper part of the bonding apparatus, e.g. in the bonding head
- 2224/75253 adapted for localised heating
- 2224/7526 Polychromatic heating lamp
- 2224/75261 Laser
- 2224/75262 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/75263 in the upper part of the bonding apparatus, e.g. in the bonding head
- 2224/75264 by induction heating, i.e. coils
- 2224/75265 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/75266 in the upper part of the bonding apparatus, e.g. in the bonding head
- 2224/75267 Flame torch, e.g. hydrogen torch
- 2224/75268 Discharge electrode
- 2224/75269 Shape of the discharge electrode
- 2224/7527 Material of the discharge electrode
- 2224/75271 Circuitry of the discharge electrode
- 2224/75272 Oven
- 2224/7528 Resistance welding electrodes, i.e. for ohmic heating
- 2224/75281 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/75282 in the upper part of the bonding apparatus, e.g. in the bonding head
- 2224/75283 by infrared heating, e.g. infrared heating lamp
- 2224/753 by means of pressure
- 2224/75301 Bonding head
- 2224/75302 Shape
- 2224/75303 of the pressing surface
- 2224/75304 being curved
- 2224/75305 comprising protrusions
- 2224/7531 of other parts
- 2224/75312 Material
- 2224/75313 Removable bonding head
- 2224/75314 Auxiliary members on the pressing surface
- 2224/75315 Elastomer inlay
- 2224/75316 with retaining mechanisms
- 2224/75317 Removable auxiliary member
- 2224/75318 Shape of the auxiliary member
- 2224/7532 Material of the auxiliary member
- 2224/75343 by ultrasonic vibrations
- 2224/75344 Eccentric cams
- 2224/75345 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/75346 in the upper part of the bonding apparatus, e.g. in the bonding head
- 2224/75347 Piezoelectric transducers
- 2224/75348 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/75349 in the upper part of the bonding apparatus, e.g. in the bonding head

2224/7535	. . . . .	Stable and mobile yokes	2224/75803	. . . . .	Pivoting mechanism
2224/75351	. . . . .	in the lower part of the bonding apparatus, e.g. in the apparatus chuck	2224/75804	. . . . .	Translational mechanism
2224/75352	. . . . .	in the upper part of the bonding apparatus, e.g. in the bonding head	2224/75821	. . . . .	Upper part of the bonding apparatus, i.e. bonding head
2224/75353	. . . . .	Ultrasonic horns	2224/75822	. . . . .	Rotational mechanism
2224/75354	. . . . .	in the lower part of the bonding apparatus, e.g. in the apparatus chuck	2224/75823	. . . . .	Pivoting mechanism
2224/75355	. . . . .	Design, e.g. of the wave guide	2224/75824	. . . . .	Translational mechanism
2224/755	. . . . .	Cooling means	2224/75841	. . . . .	of the bonding head
2224/75501	. . . . .	in the lower part of the bonding apparatus, e.g. in the apparatus chuck	2224/75842	. . . . .	Rotational mechanism
2224/75502	. . . . .	in the upper part of the bonding apparatus, e.g. in the bonding head	2224/75843	. . . . .	Pivoting mechanism
2224/7555	. . . . .	Mechanical means, e.g. for planarising, pressing, stamping	2224/759	. . . . .	Means for monitoring the connection process
2224/756	. . . . .	Means for supplying the connector to be connected in the bonding apparatus	2224/75901	. . . . .	using a computer, e.g. fully- or semi-automatic bonding
2224/75601	. . . . .	Storing means	2224/7592	. . . . .	Load or pressure adjusting means, e.g. sensors
2224/75611	. . . . .	Feeding means	2224/75925	. . . . .	Vibration adjusting means, e.g. sensors
2224/75621	. . . . .	Holding means	2224/7595	. . . . .	Means for forming additional members
2224/7565	. . . . .	Means for transporting the components to be connected	2224/7598	. . . . .	specially adapted for batch processes
2224/75651	. . . . .	Belt conveyor	2224/75981	. . . . .	Apparatus chuck
2224/75652	. . . . .	Chain conveyor	2224/75982	. . . . .	Shape
2224/75653	. . . . .	Vibrating conveyor	2224/75983	. . . . .	of the mounting surface
2224/75654	. . . . .	Pneumatic conveyor	2224/75984	. . . . .	of other portions
2224/75655	. . . . .	in a fluid	2224/75985	. . . . .	Material
2224/757	. . . . .	Means for aligning	2224/75986	. . . . .	Auxiliary members on the pressing surface
2224/75701	. . . . .	in the lower part of the bonding apparatus, e.g. in the apparatus chuck	2224/75987	. . . . .	Shape of the auxiliary member
2224/75702	. . . . .	in the upper part of the bonding apparatus, e.g. in the bonding head	2224/75988	. . . . .	Material of the auxiliary member
2224/75703	. . . . .	Mechanical holding means	2224/76	. . . . .	Apparatus for connecting with build-up interconnects
2224/75704	. . . . .	in the lower part of the bonding apparatus, e.g. in the apparatus chuck	2224/76001	. . . . .	Calibration means
2224/75705	. . . . .	in the upper part of the bonding apparatus, e.g. in the bonding head	2224/7601	. . . . .	Means for cleaning, e.g. brushes, for hydro blasting, for ultrasonic cleaning, for dry ice blasting, using gas-flow, by etching, by applying flux or plasma
2224/75723	. . . . .	Electrostatic holding means	2224/761	. . . . .	Means for controlling the bonding environment, e.g. valves, vacuum pumps
2224/75724	. . . . .	in the lower part of the bonding apparatus, e.g. in the apparatus chuck	2224/76101	. . . . .	Chamber
2224/75725	. . . . .	in the upper part of the bonding apparatus, e.g. in the bonding head	2224/76102	. . . . .	Vacuum chamber
2224/75733	. . . . .	Magnetic holding means	2224/7611	. . . . .	High pressure chamber
2224/75734	. . . . .	in the lower part of the bonding apparatus, e.g. in the apparatus chuck	2224/7615	. . . . .	Means for depositing
2224/75735	. . . . .	in the upper part of the bonding apparatus, e.g. in the bonding head	2224/76151	. . . . .	Means for direct writing
2224/75743	. . . . .	Suction holding means	2224/76152	. . . . .	Syringe
2224/75744	. . . . .	in the lower part of the bonding apparatus, e.g. in the apparatus chuck	2224/76155	. . . . .	Jetting means, e.g. ink jet
2224/75745	. . . . .	in the upper part of the bonding apparatus, e.g. in the bonding head	2224/76158	. . . . .	including a laser
2224/75753	. . . . .	Means for optical alignment, e.g. sensors	2224/76161	. . . . .	Means for screen printing, e.g. roller, squeegee, screen stencil
2224/75754	. . . . .	Guiding structures	2224/7617	. . . . .	Means for applying a preform, e.g. laminator
2224/75755	. . . . .	in the lower part of the bonding apparatus, e.g. in the apparatus chuck	2224/76171	. . . . .	including a vacuum-bag
2224/75756	. . . . .	in the upper part of the bonding apparatus, e.g. in the bonding head	2224/7618	. . . . .	Means for blanket deposition
2224/758	. . . . .	Means for moving parts	2224/76181	. . . . .	for spin coating, i.e. spin coater
2224/75801	. . . . .	Lower part of the bonding apparatus, e.g. XY table	2224/76182	. . . . .	for curtain coating
2224/75802	. . . . .	Rotational mechanism	2224/76183	. . . . .	for immersion coating, i.e. bath
			2224/76184	. . . . .	for spray coating, i.e. nozzle
			2224/76185	. . . . .	Means for physical vapour deposition [PVD]
			2224/76186	. . . . .	Means for sputtering, e.g. target
			2224/76187	. . . . .	Means for evaporation
			2224/76188	. . . . .	Means for chemical vapour deposition [CVD], e.g. for laser CVD
			2224/76189	. . . . .	Means for plating, e.g. for electroplating, electroless plating
			2224/762	. . . . .	Protection means against electrical discharge
			2224/7625	. . . . .	Means for applying energy, e.g. heating means

- 2224/76251 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/76252 in the upper part of the bonding apparatus
- 2224/76253 adapted for localised heating
- 2224/7626 Polychromatic heating lamp
- 2224/76261 Laser
- 2224/76262 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/76263 in the upper part of the bonding apparatus
- 2224/76264 by induction heating, i.e. coils
- 2224/76265 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/76266 in the upper part of the bonding apparatus
- 2224/76267 Flame torch, e.g. hydrogen torch
- 2224/76268 Discharge electrode
- 2224/76269 Shape of the discharge electrode
- 2224/7627 Material of the discharge electrode
- 2224/76271 Circuitry of the discharge electrode
- 2224/76272 Oven
- 2224/7628 Resistance welding electrodes, i.e. for ohmic heating
- 2224/76281 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/76282 in the upper part of the bonding apparatus
- 2224/76283 by infrared heating, e.g. infrared heating lamp
- 2224/763 by means of pressure
- 2224/76301 Pressing head
- 2224/76302 Shape
- 2224/76303 of the pressing surface
- 2224/76304 being curved
- 2224/76305 comprising protrusions
- 2224/7631 of other parts
- 2224/76312 Material
- 2224/76313 Removable pressing head
- 2224/76314 Auxiliary members on the pressing surface
- 2224/76315 Elastomer inlay
- 2224/76316 with retaining mechanisms
- 2224/76317 Removable auxiliary member
- 2224/76318 Shape of the auxiliary member
- 2224/7632 Material of the auxiliary member
- 2224/76343 by ultrasonic vibrations
- 2224/76344 Eccentric cams
- 2224/76345 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/76346 in the upper part of the bonding apparatus
- 2224/76347 Piezoelectric transducers
- 2224/76348 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/76349 in the upper part of the bonding apparatus
- 2224/7635 Stable and mobile yokes
- 2224/76351 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/76352 in the upper part of the bonding apparatus
- 2224/76353 Ultrasonic horns
- 2224/76354 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/76355 Design, e.g. of the wave guide
- 2224/765 Cooling means
- 2224/76501 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/76502 in the upper part of the bonding apparatus
- 2224/7655 Mechanical means, e.g. for planarising, pressing, stamping
- 2224/76552 for drilling
- 2224/76554 for abrasive blasting, e.g. sand blasting, wet blasting, hydro-blasting, dry ice blasting
- 2224/766 Means for supplying the material of the interconnect
- 2224/76601 Storing means
- 2224/76611 Feeding means
- 2224/76621 Holding means
- 2224/7665 Means for transporting the components to be connected
- 2224/76651 Belt conveyor
- 2224/76652 Chain conveyor
- 2224/76653 Vibrating conveyor
- 2224/76654 Pneumatic conveyor
- 2224/76655 in a fluid
- 2224/767 Means for aligning
- 2224/76701 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/76702 in the upper part of the bonding apparatus
- 2224/76703 Mechanical holding means
- 2224/76704 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/76705 in the upper part of the bonding apparatus
- 2224/76723 Electrostatic holding means
- 2224/76724 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/76725 in the upper part of the bonding apparatus
- 2224/76733 Magnetic holding means
- 2224/76734 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/76735 in the upper part of the bonding apparatus
- 2224/76743 Suction holding means
- 2224/76744 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/76745 in the upper part of the bonding apparatus
- 2224/76753 Means for optical alignment, e.g. sensors
- 2224/76754 Guiding structures
- 2224/76755 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/76756 in the upper part of the bonding apparatus
- 2224/768 Means for moving parts
- 2224/76801 Lower part of the bonding apparatus, e.g. XY table
- 2224/76802 Rotational mechanism
- 2224/76803 Pivoting mechanism
- 2224/76804 Translational mechanism
- 2224/76821 Upper part of the bonding apparatus, i.e. bonding head
- 2224/76822 Rotational mechanism
- 2224/76823 Pivoting mechanism
- 2224/76824 Translational mechanism
- 2224/76841 of the bonding head
- 2224/76842 Rotational mechanism
- 2224/76843 Pivoting mechanism
- 2224/769 Means for monitoring the connection process

- 2224/76901 using a computer, e.g. fully- or semi-automatic bonding
- 2224/7692 Load or pressure adjusting means, e.g. sensors
- 2224/76925 Vibration adjusting means, e.g. sensors
- 2224/7695 Means for forming additional members
- 2224/7698 specially adapted for batch processes
- 2224/76981 Apparatus chuck
- 2224/76982 Shape
- 2224/76983 of the mounting surface
- 2224/76984 of other portions
- 2224/76985 Material
- 2224/76986 Auxiliary members on the pressing surface
- 2224/76987 Shape of the auxiliary member
- 2224/76988 Material of the auxiliary member
- 2224/77 . . . Apparatus for connecting with strap connectors
- 2224/77001 . . . Calibration means
- 2224/7701 . . . Means for cleaning, e.g. brushes, for hydro blasting, for ultrasonic cleaning, for dry ice blasting, using gas-flow, by etching, by applying flux or plasma
- 2224/771 . . . Means for controlling the bonding environment, e.g. valves, vacuum pumps
- 2224/77101 Chamber
- 2224/77102 Vacuum chamber
- 2224/7711 High pressure chamber
- 2224/7715 . . . Means for applying permanent coating, e.g. in-situ coating
- 2224/77151 Means for direct writing
- 2224/77152 Syringe
- 2224/77153 integrated into the capillary or wedge
- 2224/77155 Jetting means, e.g. ink jet
- 2224/77158 including a laser
- 2224/77161 Means for screen printing, e.g. roller, squeegee, screen stencil
- 2224/7717 Means for applying a preform, e.g. laminator
- 2224/77171 including a vacuum-bag
- 2224/7718 Means for blanket deposition
- 2224/77181 for spin coating, i.e. spin coater
- 2224/77182 for curtain coating
- 2224/77183 for immersion coating, i.e. bath
- 2224/77184 for spray coating, i.e. nozzle
- 2224/77185 Means for physical vapour deposition [PVD], e.g. evaporation, sputtering
- 2224/77186 Means for sputtering, e.g. target
- 2224/77187 Means for evaporation
- 2224/77188 Means for chemical vapour deposition [CVD], e.g. for laser CVD
- 2224/77189 Means for plating, e.g. for electroplating, electroless plating
- 2224/772 . . . Protection means against electrical discharge
- 2224/7725 . . . Means for applying energy, e.g. heating means
- 2224/77251 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/77252 in the upper part of the bonding apparatus, e.g. in the wedge
- 2224/77253 adapted for localised heating
- 2224/7726 Polychromatic heating lamp
- 2224/77261 Laser
- 2224/77262 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/77263 in the upper part of the bonding apparatus, e.g. in the wedge
- 2224/77264 by induction heating, i.e. coils
- 2224/77265 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/77266 in the upper part of the bonding apparatus, e.g. in the wedge
- 2224/77267 Flame torch, e.g. hydrogen torch
- 2224/77268 Discharge electrode
- 2224/77269 Shape of the discharge electrode
- 2224/7727 Material of the discharge electrode
- 2224/77271 Circuitry of the discharge electrode
- 2224/77272 Oven
- 2224/7728 Resistance welding electrodes, i.e. for ohmic heating
- 2224/77281 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/77282 in the upper part of the bonding apparatus, e.g. in the wedge
- 2224/77283 by infrared heating, e.g. infrared heating lamp
- 2224/773 by means of pressure
- 2224/77313 Wedge
- 2224/77314 Shape
- 2224/77315 of the pressing surface, e.g. tip or head
- 2224/77316 comprising protrusions
- 2224/77317 of other portions
- 2224/77318 inside the capillary
- 2224/77319 outside the capillary
- 2224/7732 Removable wedge
- 2224/77321 Material
- 2224/77325 Auxiliary members on the pressing surface
- 2224/77326 Removable auxiliary member
- 2224/77327 Shape of the auxiliary member
- 2224/77328 Material of the auxiliary member
- 2224/77343 by ultrasonic vibrations
- 2224/77344 Eccentric cams
- 2224/77345 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/77346 in the upper part of the bonding apparatus, e.g. in the wedge
- 2224/77347 Piezoelectric transducers
- 2224/77348 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/77349 in the upper part of the bonding apparatus, e.g. in the wedge
- 2224/7735 Stable and mobile yokes
- 2224/77351 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/77352 in the upper part of the bonding apparatus, e.g. in the wedge
- 2224/77353 Ultrasonic horns
- 2224/77354 in the lower part of the bonding apparatus, e.g. in the mounting chuck
- 2224/77355 Design, e.g. of the wave guide
- 2224/775 Cooling means
- 2224/77501 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/77502 in the upper part of the bonding apparatus, e.g. in the wedge
- 2224/7755 Mechanical means, e.g. for severing, pressing, stamping

- 2224/776 . . . Means for supplying the connector to be connected in the bonding apparatus
- 2224/77601 Storing means
- 2224/77611 Feeding means
- 2224/77621 Holding means, e.g. wire claspers
- 2224/77631 Means for wire tension adjustments
- 2224/7765 . . . Means for transporting the components to be connected
- 2224/77651 Belt conveyor
- 2224/77652 Chain conveyor
- 2224/77653 Vibrating conveyor
- 2224/77654 Pneumatic conveyor
- 2224/77655 in a fluid
- 2224/777 . . . Means for aligning
- 2224/77701 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/77702 in the upper part of the bonding apparatus, e.g. in the wedge
- 2224/77703 Mechanical holding means
- 2224/77704 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/77705 in the upper part of the bonding apparatus, e.g. in the wedge
- 2224/77723 Electrostatic holding means
- 2224/77724 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/77725 in the upper part of the bonding apparatus, e.g. in the wedge
- 2224/77733 Magnetic holding means
- 2224/77734 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/77735 in the upper part of the bonding apparatus, e.g. in the wedge
- 2224/77743 Suction holding means
- 2224/77744 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/77745 in the upper part of the bonding apparatus, e.g. in the wedge
- 2224/77753 Means for optical alignment, e.g. sensors
- 2224/77754 Guiding structures
- 2224/77755 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/77756 in the upper part of the bonding apparatus, e.g. in the wedge
- 2224/778 . . . Means for moving parts
- 2224/77801 Lower part of the bonding apparatus, e.g. XY table
- 2224/77802 Rotational mechanism
- 2224/77803 Pivoting mechanism
- 2224/77804 Translational mechanism
- 2224/77821 Upper part of the bonding apparatus, i.e. bonding head, e.g. capillary or wedge
- 2224/77822 Rotational mechanism
- 2224/77823 Pivoting mechanism
- 2224/77824 Translational mechanism
- 2224/77841 of the pressing portion, e.g. tip or head
- 2224/77842 Rotational mechanism
- 2224/77843 Pivoting mechanism
- 2224/779 . . . Means for monitoring the connection process
- 2224/77901 using a computer, e.g. fully- or semi-automatic bonding
- 2224/7792 Load or pressure adjusting means, e.g. sensors
- 2224/77925 Vibration adjusting means, e.g. sensors
- 2224/7795 . . . Means for forming additional members
- 2224/7798 . . . specially adapted for batch processes
- 2224/77981 . . . Apparatus chuck
- 2224/77982 Shape
- 2224/77983 of the mounting surface
- 2224/77984 of other portions
- 2224/77985 Material
- 2224/77986 Auxiliary members on the pressing surface
- 2224/77987 Shape of the auxiliary member
- 2224/77988 Material of the auxiliary member
- 2224/78 . . . Apparatus for connecting with wire connectors
- 2224/78001 . . . Calibration means
- 2224/7801 . . . Means for cleaning, e.g. brushes, for hydro blasting, for ultrasonic cleaning, for dry ice blasting, using gas-flow, by etching, by applying flux or plasma
- 2224/781 . . . Means for controlling the bonding environment, e.g. valves, vacuum pumps
- 2224/78101 Chamber
- 2224/78102 Vacuum chamber
- 2224/7811 High pressure chamber
- 2224/7815 . . . Means for applying permanent coating, e.g. in-situ coating
- 2224/782 . . . Protection means against electrical discharge
- 2224/7825 . . . Means for applying energy, e.g. heating means
- 2224/78251 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/78252 in the upper part of the bonding apparatus, e.g. in the capillary or wedge
- 2224/78253 adapted for localised heating
- 2224/7826 Polychromatic heating lamp
- 2224/78261 Laser
- 2224/78262 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/78263 in the upper part of the bonding apparatus, e.g. in the capillary or wedge
- 2224/78264 by induction heating, i.e. coils
- 2224/78265 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/78266 in the upper part of the bonding apparatus, e.g. in the capillary or wedge
- 2224/78267 Flame torch, e.g. hydrogen torch
- 2224/78268 Discharge electrode
- 2224/78269 Shape of the discharge electrode
- 2224/7827 Material of the discharge electrode
- 2224/78271 Circuitry of the discharge electrode
- 2224/78272 Oven
- 2224/7828 Resistance welding electrodes, i.e. for ohmic heating
- 2224/78281 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/78282 in the upper part of the bonding apparatus, e.g. in the capillary or wedge
- 2224/78283 by infrared heating, e.g. infrared heating lamp
- 2224/783 by means of pressure
- 2224/78301 Capillary
- 2224/78302 Shape
- 2224/78303 of the pressing surface, e.g. tip or head
- 2224/78304 comprising protrusions
- 2224/78305 of other portions

- 2224/78306 inside the capillary
 2224/78307 outside the capillary
 2224/78308 Removable capillary
 2224/78309 Material
 2224/7831 Auxiliary members on the pressing surface
 2224/78311 Removable auxiliary member
 2224/78312 Shape of the auxiliary member
 2224/78313 Wedge
 2224/78314 Shape
 2224/78315 of the pressing surface, e.g. tip or head
 2224/78316 comprising protrusions
 2224/78317 of other portions
 2224/78318 inside the capillary
 2224/78319 outside the capillary
 2224/7832 Removable wedge
 2224/78321 Material
 2224/78325 Auxiliary members on the pressing surface
 2224/78326 Removable auxiliary member
 2224/78327 Shape of the auxiliary member
 2224/78328 Material of the auxiliary member
 2224/78343 by ultrasonic vibrations
 2224/78344 Eccentric cams
 2224/78345 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
 2224/78346 in the upper part of the bonding apparatus, e.g. in the capillary or wedge
 2224/78347 Piezoelectric transducers
 2224/78348 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
 2224/78349 in the upper part of the bonding apparatus, e.g. in the capillary or wedge
 2224/7835 Stable and mobile yokes
 2224/78351 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
 2224/78352 in the upper part of the bonding apparatus, e.g. in the capillary or wedge
 2224/78353 Ultrasonic horns
 2224/78354 in the lower part of the bonding apparatus, e.g. in the mounting chuck
 2224/78355 Design, e.g. of the wave guide
 2224/785 Cooling means
 2224/78501 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
 2224/78502 in the upper part of the bonding apparatus, e.g. in the capillary or wedge
 2224/7855 Mechanical means, e.g. for severing, pressing, stamping
 2224/786 Means for supplying the connector to be connected in the bonding apparatus
 2224/78601 Storing means
 2224/78611 Feeding means
 2224/78621 Holding means, e.g. wire clampers
 2224/78631 Means for wire tension adjustments
 2224/7865 Means for transporting the components to be connected
 2224/78651 Belt conveyor
 2224/78652 Chain conveyor
 2224/78653 Vibrating conveyor
 2224/78654 Pneumatic conveyor
 2224/78655 in a fluid
 2224/787 Means for aligning
 2224/78701 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
 2224/78702 in the upper part of the bonding apparatus, e.g. in the capillary or wedge
 2224/78703 Mechanical holding means
 2224/78704 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
 2224/78705 in the upper part of the bonding apparatus, e.g. in the capillary or wedge
 2224/78723 Electrostatic holding means
 2224/78724 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
 2224/78725 in the upper part of the bonding apparatus, e.g. in the capillary or wedge
 2224/78733 Magnetic holding means
 2224/78734 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
 2224/78735 in the upper part of the bonding apparatus, e.g. in the capillary or wedge
 2224/78743 Suction holding means
 2224/78744 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
 2224/78745 in the upper part of the bonding apparatus, e.g. in the capillary or wedge
 2224/78753 Means for optical alignment, e.g. sensors
 2224/78754 Guiding structures
 2224/78755 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
 2224/78756 in the upper part of the bonding apparatus, e.g. in the capillary or wedge
 2224/788 Means for moving parts
 2224/78801 Lower part of the bonding apparatus, e.g. XY table
 2224/78802 Rotational mechanism
 2224/78803 Pivoting mechanism
 2224/78804 Translational mechanism
 2224/78821 Upper part of the bonding apparatus, i.e. bonding head, e.g. capillary or wedge
 2224/78822 Rotational mechanism
 2224/78823 Pivoting mechanism
 2224/78824 Translational mechanism
 2224/78841 of the pressing portion, e.g. tip or head
 2224/78842 Rotational mechanism
 2224/78843 Pivoting mechanism
 2224/789 Means for monitoring the connection process
 2224/78901 using a computer, e.g. fully- or semi-automatic bonding
 2224/7892 Load or pressure adjusting means, e.g. sensors
 2224/78925 Vibration adjusting means, e.g. sensors
 2224/7895 Means for forming additional members
 2224/7898 specially adapted for batch processes
 2224/78981 Apparatus chuck
 2224/78982 Shape
 2224/78983 of the mounting surface
 2224/78984 of other portions
 2224/78985 Material
 2224/78986 Auxiliary members on the pressing surface
 2224/78987 Shape of the auxiliary member

- 2224/78988 Material of the auxiliary member
- 2224/79 . . . Apparatus for Tape Automated Bonding [TAB]
- 2224/79001 . . . Calibration means
- 2224/7901 . . . Means for cleaning, e.g. brushes, for hydro blasting, for ultrasonic cleaning, for dry ice blasting, using gas-flow, by etching, by applying flux or plasma
- 2224/791 . . . Means for controlling the bonding environment, e.g. valves, vacuum pumps
- 2224/79101 Chamber
- 2224/79102 Vacuum chamber
- 2224/7911 High pressure chamber
- 2224/7915 . . . Means for applying permanent coating
- 2224/79151 Means for direct writing
- 2224/79152 Syringe
- 2224/79153 integrated into the pressing head
- 2224/79155 Jetting means, e.g. ink jet
- 2224/79158 including a laser
- 2224/79161 Means for screen printing, e.g. roller, squeegee, screen stencil
- 2224/7917 Means for applying a preform, e.g. laminator
- 2224/79171 including a vacuum-bag
- 2224/7918 Means for blanket deposition
- 2224/79181 for spin coating, i.e. spin coater
- 2224/79182 for curtain coating
- 2224/79183 for immersion coating, i.e. bath
- 2224/79184 for spray coating, i.e. nozzle
- 2224/79185 Means for physical vapour deposition [PVD], e.g. evaporation, sputtering
- 2224/79186 Means for sputtering, e.g. target
- 2224/79187 Means for evaporation
- 2224/79188 Means for chemical vapour deposition [CVD], e.g. for laser CVD
- 2224/79189 Means for plating, e.g. for electroplating, electroless plating
- 2224/792 Protection means against electrical discharge
- 2224/7925 Means for applying energy, e.g. heating means
- 2224/79251 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/79252 in the upper part of the bonding apparatus, e.g. in the pressing head
- 2224/79253 adapted for localised heating
- 2224/7926 Polychromatic heating lamp
- 2224/79261 Laser
- 2224/79262 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/79263 in the upper part of the bonding apparatus, e.g. in the pressing head
- 2224/79264 by induction heating, i.e. coils
- 2224/79265 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/79266 in the upper part of the bonding apparatus, e.g. in the pressing head
- 2224/79267 Flame torch, e.g. hydrogen torch
- 2224/79268 Discharge electrode
- 2224/79269 Shape of the discharge electrode
- 2224/7927 Material of the discharge electrode
- 2224/79271 Circuitry of the discharge electrode
- 2224/79272 Oven
- 2224/7928 Resistance welding electrodes, i.e. for ohmic heating
- 2224/79281 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/79282 in the upper part of the bonding apparatus, e.g. in the pressing head
- 2224/79283 by infrared heating, e.g. infrared heating lamp
- 2224/793 by means of pressure
- 2224/79301 Pressing head
- 2224/79302 Shape
- 2224/79303 of the pressing surface
- 2224/79304 being curved
- 2224/79305 comprising protrusions
- 2224/7931 of other parts
- 2224/79312 Material
- 2224/79313 Removable pressing head
- 2224/79314 Auxiliary members on the pressing surface
- 2224/79315 Elastomer inlay
- 2224/79316 with retaining mechanisms
- 2224/79317 Removable auxiliary member
- 2224/79318 Shape of the auxiliary member
- 2224/7932 Material of the auxiliary member
- 2224/79343 by ultrasonic vibrations
- 2224/79344 Eccentric cams
- 2224/79345 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/79346 in the upper part of the bonding apparatus, e.g. in the pressing head
- 2224/79347 Piezoelectric transducers
- 2224/79348 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/79349 in the upper part of the bonding apparatus, e.g. in the pressing head
- 2224/7935 Stable and mobile yokes
- 2224/79351 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/79352 in the upper part of the bonding apparatus, e.g. in the pressing head
- 2224/79353 Ultrasonic horns
- 2224/79354 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/79355 Design, e.g. of the wave guide
- 2224/795 Cooling means
- 2224/79501 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/79502 in the upper part of the bonding apparatus, e.g. in the pressing head
- 2224/7955 Mechanical means, e.g. for pressing, stamping
- 2224/796 Means for supplying the connector to be connected in the bonding apparatus
- 2224/79601 Storing means
- 2224/79611 Feeding means
- 2224/79621 Holding means
- 2224/7965 Means for transporting the components to be connected
- 2224/79651 Belt conveyor
- 2224/79652 Chain conveyor
- 2224/79653 Vibrating conveyor
- 2224/79654 Pneumatic conveyor
- 2224/79655 in a fluid
- 2224/797 Means for aligning
- 2224/79701 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/79702 in the upper part of the bonding apparatus, e.g. in the pressing head

- 2224/79703 Mechanical holding means
- 2224/79704 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/79705 in the upper part of the bonding apparatus, e.g. in the pressing head
- 2224/79723 Electrostatic holding means
- 2224/79724 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/79725 in the upper part of the bonding apparatus, e.g. in the pressing head
- 2224/79733 Magnetic holding means
- 2224/79734 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/79735 in the upper part of the bonding apparatus, e.g. in the pressing head
- 2224/79743 Suction holding means
- 2224/79744 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/79745 in the upper part of the bonding apparatus, e.g. in the pressing head
- 2224/79753 Means for optical alignment, e.g. sensors
- 2224/79754 Guiding structures
- 2224/79755 in the lower part of the bonding apparatus, e.g. in the apparatus chuck
- 2224/79756 in the upper part of the bonding apparatus, e.g. in the pressing head
- 2224/798 Means for moving parts
- 2224/79801 Lower part of the bonding apparatus, e.g. XY table
- 2224/79802 Rotational mechanism
- 2224/79803 Pivoting mechanism
- 2224/79804 Translational mechanism
- 2224/79821 Upper part of the bonding apparatus, i.e. pressing head
- 2224/79822 Rotational mechanism
- 2224/79823 Pivoting mechanism
- 2224/79824 Translational mechanism
- 2224/79841 of the pressing head
- 2224/79842 Rotational mechanism
- 2224/79843 Pivoting mechanism
- 2224/799 Means for monitoring the connection process
- 2224/79901 using a computer, e.g. fully- or semi-automatic bonding
- 2224/7992 Load or pressure adjusting means, e.g. sensors
- 2224/79925 Vibration adjusting means, e.g. sensors
- 2224/7995 Means for forming additional members
- 2224/7998 specially adapted for batch processes
- 2224/79981 Apparatus chuck
- 2224/79982 Shape
- 2224/79983 of the mounting surface
- 2224/79984 of other portions
- 2224/79985 Material
- 2224/79986 Auxiliary members on the pressing surface
- 2224/79987 Shape of the auxiliary member
- 2224/79988 Material of the auxiliary member
- 2224/7999 for disconnecting
- 2224/80 Methods for connecting semiconductor or other solid state bodies using means for bonding being attached to, or being formed on, the surface to be connected
- 2224/80001 by connecting a bonding area directly to another bonding area, i.e. connectorless bonding, e.g. bumpless bonding
- 2224/80003 involving a temporary auxiliary member not forming part of the bonding apparatus
- 2224/80004 being a removable or sacrificial coating
- 2224/80006 being a temporary or sacrificial substrate
- 2224/80007 involving a permanent auxiliary member being left in the finished device, e.g. aids for protecting the bonding area during or after the bonding process
- 2224/80009 Pre-treatment of the bonding area
- 2224/8001 Cleaning the bonding area, e.g. oxide removal step, desmearing
- 2224/80011 Chemical cleaning, e.g. etching, flux
- 2224/80012 Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
- 2224/80013 Plasma cleaning
- 2224/80014 Thermal cleaning, e.g. decomposition, sublimation
- 2224/80019 Combinations of two or more cleaning methods provided for in at least two different groups from [H01L 2224/8001](#) - [H01L 2224/80014](#)
- 2224/8002 Applying permanent coating to the bonding area in the bonding apparatus, e.g. in-situ coating
- 2224/80024 Applying flux to the bonding area in the bonding apparatus
- 2224/8003 Reshaping the bonding area in the bonding apparatus, e.g. flattening the bonding area
- 2224/80031 by chemical means, e.g. etching, anodisation
- 2224/80035 by heating means
- 2224/80037 using a polychromatic heating lamp
- 2224/80039 using a laser
- 2224/80041 Induction heating, i.e. eddy currents
- 2224/80047 by mechanical means, e.g. severing, pressing, stamping
- 2224/80048 Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling
- 2224/80051 Forming additional members
- 2224/80052 Detaching bonding areas, e.g. after testing ([unsoldering in general B23K 1/018](#))
- 2224/80053 Bonding environment
- 2224/80054 Composition of the atmosphere
- 2224/80055 being oxidating
- 2224/80065 being reducing
- 2224/80075 being inert
- 2224/80085 being a liquid, e.g. for fluidic self-assembly
- 2224/8009 Vacuum
- 2224/80091 Under pressure
- 2224/80092 Atmospheric pressure
- 2224/80093 Transient conditions, e.g. gas-flow
- 2224/80095 Temperature settings
- 2224/80096 Transient conditions
- 2224/80097 Heating
- 2224/80098 Cooling
- 2224/80099 Ambient temperature
- 2224/8011 involving protection against electrical discharge, e.g. removing electrostatic charge
- 2224/8012 Aligning

- 2224/80121 Active alignment, i.e. by apparatus steering, e.g. optical alignment using marks or sensors
- 2224/80122 by detecting inherent features of, or outside, the semiconductor or solid-state body
- 2224/80123 Shape or position of the body
- 2224/80125 Bonding areas on the body
- 2224/80127 Bonding areas outside the body
- 2224/80129 Shape or position of the other item
- 2224/8013 using marks formed on the semiconductor or solid-state body
- 2224/80132 using marks formed outside the semiconductor or solid-state body, i.e. "off-chip"
- 2224/80136 involving guiding structures, e.g. spacers or supporting members
- 2224/80138 the guiding structures being at least partially left in the finished device
- 2224/80139 Guiding structures on the body
- 2224/8014 Guiding structures outside the body
- 2224/80141 Guiding structures both on and outside the body
- 2224/80143 Passive alignment, i.e. self alignment, e.g. using surface energy, chemical reactions, thermal equilibrium
- 2224/80148 involving movement of a part of the bonding apparatus
- 2224/80149 being the lower part of the bonding apparatus, i.e. holding means for the bodies to be connected, e.g. XY table
- 2224/8015 Rotational movements
- 2224/8016 Translational movements
- 2224/80169 being the upper part of the bonding apparatus, i.e. bonding head
- 2224/8017 Rotational movements
- 2224/8018 Translational movements
- 2224/8019 Arrangement of the bonding areas prior to mounting
- 2224/80194 Lateral distribution of the bonding areas
- 2224/802 Applying energy for connecting
- 2224/80201 Compression bonding
- 2224/80203 Thermocompression bonding, e.g. diffusion bonding, pressure joining, thermocompression welding or solid-state welding
- 2224/80204 with a graded temperature profile
- 2224/80205 Ultrasonic bonding
- 2224/80206 Direction of oscillation
- 2224/80207 Thermosonic bonding
- 2224/80209 applying unidirectional static pressure
- 2224/80211 applying isostatic pressure, e.g. degassing using vacuum or a pressurised liquid
- 2224/80213 using a reflow oven
- 2224/80215 with a graded temperature profile
- 2224/8022 with energy being in the form of electromagnetic radiation
- 2224/80222 Induction heating, i.e. eddy currents
- 2224/80224 using a laser
- 2224/8023 Polychromatic or infrared lamp heating
- 2224/80232 using an autocatalytic reaction, e.g. exothermic brazing
- 2224/80234 using means for applying energy being within the device, e.g. integrated heater
- 2224/80236 using electro-static corona discharge
- 2224/80237 using an electron beam ([electron beam welding in general B23K 15/00](#))
- 2224/80238 using electric resistance welding, i.e. ohmic heating
- 2224/8034 Bonding interfaces of the bonding area
- 2224/80345 Shape, e.g. interlocking features
- 2224/80355 having an external coating, e.g. protective bond-through coating
- 2224/80357 being flush with the surface
- 2224/80359 Material
- 2224/8036 Bonding interfaces of the semiconductor or solid state body
- 2224/80365 Shape, e.g. interlocking features
- 2224/80375 having an external coating, e.g. protective bond-through coating
- 2224/80379 Material ([material of the bonding area prior to the connecting process H01L 2224/05099 and H01L 2224/05599](#))
- 2224/8038 Bonding interfaces outside the semiconductor or solid-state body
- 2224/80385 Shape, e.g. interlocking features
- 2224/80395 having an external coating, e.g. protective bond-through coating
- 2224/80399 Material
- 2224/804 with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
- 2224/80401 the principal constituent melting at a temperature of less than 400°C
- 2224/80405 Gallium [Ga] as principal constituent
- 2224/80409 Indium [In] as principal constituent
- 2224/80411 Tin [Sn] as principal constituent
- 2224/80413 Bismuth [Bi] as principal constituent
- 2224/80414 Thallium [Tl] as principal constituent
- 2224/80416 Lead [Pb] as principal constituent
- 2224/80417 the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
- 2224/80418 Zinc [Zn] as principal constituent
- 2224/8042 Antimony [Sb] as principal constituent
- 2224/80423 Magnesium [Mg] as principal constituent
- 2224/80424 Aluminium [Al] as principal constituent
- 2224/80438 the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
- 2224/80439 Silver [Ag] as principal constituent
- 2224/80444 Gold [Au] as principal constituent
- 2224/80447 Copper [Cu] as principal constituent
- 2224/80449 Manganese [Mn] as principal constituent
- 2224/80455 Nickel [Ni] as principal constituent
- 2224/80457 Cobalt [Co] as principal constituent
- 2224/8046 Iron [Fe] as principal constituent
- 2224/80463 the principal constituent melting at a temperature of greater than 1550°C
- 2224/80464 Palladium [Pd] as principal constituent

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2224/80466	Titanium [Ti] as principal constituent	2224/80514	Thallium [Tl] as principal constituent
2224/80469	. . . . .	Platinum [Pt] as principal constituent	2224/80516	. . . . .	Lead [Pb] as principal constituent
2224/8047	. . . . .	Zirconium [Zr] as principal constituent	2224/80517	. . . . .	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/80471	. . . . .	Chromium [Cr] as principal constituent	2224/80518	. . . . .	Zinc [Zn] as principal constituent
2224/80472	. . . . .	Vanadium [V] as principal constituent	2224/8052	. . . . .	Antimony [Sb] as principal constituent
2224/80473	. . . . .	Rhodium [Rh] as principal constituent	2224/80523	. . . . .	Magnesium [Mg] as principal constituent
2224/80476	. . . . .	Ruthenium [Ru] as principal constituent	2224/80524	. . . . .	Aluminium [Al] as principal constituent
2224/80478	. . . . .	Iridium [Ir] as principal constituent	2224/80538	. . . . .	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/80479	. . . . .	Niobium [Nb] as principal constituent	2224/80539	. . . . .	Silver [Ag] as principal constituent
2224/8048	. . . . .	Molybdenum [Mo] as principal constituent	2224/80544	. . . . .	Gold [Au] as principal constituent
2224/80481	. . . . .	Tantalum [Ta] as principal constituent	2224/80547	. . . . .	Copper [Cu] as principal constituent
2224/80483	. . . . .	Rhenium [Re] as principal constituent	2224/80549	. . . . .	Manganese [Mn] as principal constituent
2224/80484	. . . . .	Tungsten [W] as principal constituent	2224/80555	. . . . .	Nickel [Ni] as principal constituent
2224/80486	. . . . .	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/80557	. . . . .	Cobalt [Co] as principal constituent
2224/80487	. . . . .	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/80488)	2224/8056	. . . . .	Iron [Fe] as principal constituent
2224/80488	. . . . .	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/80563	. . . . .	the principal constituent melting at a temperature of greater than 1550°C
2224/8049	. . . . .	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/80564	. . . . .	Palladium [Pd] as principal constituent
2224/80491	. . . . .	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene	2224/80566	. . . . .	Titanium [Ti] as principal constituent
2224/80493	. . . . .	with a principal constituent of the material being a solid not provided for in groups H01L 2224/804 - H01L 2224/80491 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond	2224/80569	. . . . .	Platinum [Pt] as principal constituent
2224/80494	. . . . .	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/804 - H01L 2224/80491	2224/8057	. . . . .	Zirconium [Zr] as principal constituent
2224/80495	. . . . .	with a principal constituent of the material being a gas not provided for in groups H01L 2224/804 - H01L 2224/80491	2224/80571	. . . . .	Chromium [Cr] as principal constituent
2224/80498	. . . . .	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams	2224/80572	. . . . .	Vanadium [V] as principal constituent
2224/80499	. . . . .	Material of the matrix	2224/80573	. . . . .	Rhodium [Rh] as principal constituent
2224/805	. . . . .	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/80576	. . . . .	Ruthenium [Ru] as principal constituent
2224/80501	. . . . .	the principal constituent melting at a temperature of less than 400°C	2224/80578	. . . . .	Iridium [Ir] as principal constituent
2224/80505	. . . . .	Gallium [Ga] as principal constituent	2224/80579	. . . . .	Niobium [Nb] as principal constituent
2224/80509	. . . . .	Indium [In] as principal constituent	2224/8058	. . . . .	Molybdenum [Mo] as principal constituent
2224/80511	. . . . .	Tin [Sn] as principal constituent	2224/80581	. . . . .	Tantalum [Ta] as principal constituent
2224/80513	. . . . .	Bismuth [Bi] as principal constituent	2224/80583	. . . . .	Rhenium [Re] as principal constituent
			2224/80584	. . . . .	Tungsten [W] as principal constituent
			2224/80586	with a principal constituent of the material being a non metallic, non metalloid inorganic material

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2224/80587	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/80588)	2224/80639	Silver [Ag] as principal constituent
2224/80588	. . . . .	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/80644	. . . . .	Gold [Au] as principal constituent
2224/8059	. . . . .	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/80647	. . . . .	Copper [Cu] as principal constituent
2224/80591	. . . . .	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene	2224/80649	. . . . .	Manganese [Mn] as principal constituent
2224/80593	. . . . .	with a principal constituent of the material being a solid not provided for in groups H01L 2224/805 - H01L 2224/80591 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond	2224/80655	. . . . .	Nickel [Ni] as principal constituent
2224/80594	. . . . .	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/805 - H01L 2224/80591	2224/80657	. . . . .	Cobalt [Co] as principal constituent
2224/80595	. . . . .	with a principal constituent of the material being a gas not provided for in groups H01L 2224/805 - H01L 2224/80591	2224/8066	. . . . .	Iron [Fe] as principal constituent
2224/80598	. . . . .	Fillers	2224/80663	. . . . .	the principal constituent melting at a temperature of greater than 1550°C
2224/80599	. . . . .	Base material	2224/80664	. . . . .	Palladium [Pd] as principal constituent
2224/806	. . . . .	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/80666	. . . . .	Titanium [Ti] as principal constituent
2224/80601	. . . . .	the principal constituent melting at a temperature of less than 400°C	2224/80669	. . . . .	Platinum [Pt] as principal constituent
2224/80605	. . . . .	Gallium [Ga] as principal constituent	2224/8067	. . . . .	Zirconium [Zr] as principal constituent
2224/80609	. . . . .	Indium [In] as principal constituent	2224/80671	. . . . .	Chromium [Cr] as principal constituent
2224/80611	. . . . .	Tin [Sn] as principal constituent	2224/80672	. . . . .	Vanadium [V] as principal constituent
2224/80613	. . . . .	Bismuth [Bi] as principal constituent	2224/80673	. . . . .	Rhodium [Rh] as principal constituent
2224/80614	. . . . .	Thallium [Tl] as principal constituent	2224/80676	. . . . .	Ruthenium [Ru] as principal constituent
2224/80616	. . . . .	Lead [Pb] as principal constituent	2224/80678	. . . . .	Iridium [Ir] as principal constituent
2224/80617	. . . . .	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/80679	. . . . .	Niobium [Nb] as principal constituent
2224/80618	. . . . .	Zinc [Zn] as principal constituent	2224/8068	. . . . .	Molybdenum [Mo] as principal constituent
2224/8062	. . . . .	Antimony [Sb] as principal constituent	2224/80681	. . . . .	Tantalum [Ta] as principal constituent
2224/80623	. . . . .	Magnesium [Mg] as principal constituent	2224/80683	. . . . .	Rhenium [Re] as principal constituent
2224/80624	. . . . .	Aluminium [Al] as principal constituent	2224/80684	. . . . .	Tungsten [W] as principal constituent
2224/80638	. . . . .	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/80686	. . . . .	with a principal constituent of the material being a non metallic, non metalloid inorganic material
			2224/80687	. . . . .	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/80688)
			2224/80688	. . . . .	Glasses, e.g. amorphous oxides, nitrides or fluorides
			2224/8069	. . . . .	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
			2224/80691	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene

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2224/80693	with a principal constituent of the material being a solid not provided for in groups H01L 2224/806 - H01L 2224/80691 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond	2224/80749	Manganese [Mn] as principal constituent
2224/80694	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/806 - H01L 2224/80691	2224/80755	Nickel [Ni] as principal constituent
2224/80695	with a principal constituent of the material being a gas not provided for in groups H01L 2224/806 - H01L 2224/80691	2224/80757	Cobalt [Co] as principal constituent
2224/80698	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams	2224/8076	Iron [Fe] as principal constituent
2224/80699	Coating material	2224/80763	the principal constituent melting at a temperature of greater than 1550°C
2224/807	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/80764	Palladium [Pd] as principal constituent
2224/80701	the principal constituent melting at a temperature of less than 400°C	2224/80766	Titanium [Ti] as principal constituent
2224/80705	Gallium [Ga] as principal constituent	2224/80769	Platinum [Pt] as principal constituent
2224/80709	Indium [In] as principal constituent	2224/8077	Zirconium [Zr] as principal constituent
2224/80711	Tin [Sn] as principal constituent	2224/80771	Chromium [Cr] as principal constituent
2224/80713	Bismuth [Bi] as principal constituent	2224/80772	Vanadium [V] as principal constituent
2224/80714	Thallium [Tl] as principal constituent	2224/80773	Rhodium [Rh] as principal constituent
2224/80716	Lead [Pb] as principal constituent	2224/80776	Ruthenium [Ru] as principal constituent
2224/80717	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/80778	Iridium [Ir] as principal constituent
2224/80718	Zinc [Zn] as principal constituent	2224/80779	Niobium [Nb] as principal constituent
2224/8072	Antimony [Sb] as principal constituent	2224/8078	Molybdenum [Mo] as principal constituent
2224/80723	Magnesium [Mg] as principal constituent	2224/80781	Tantalum [Ta] as principal constituent
2224/80724	Aluminium [Al] as principal constituent	2224/80783	Rhenium [Re] as principal constituent
2224/80738	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/80784	Tungsten [W] as principal constituent
2224/80739	Silver [Ag] as principal constituent	2224/80786	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/80744	Gold [Au] as principal constituent	2224/80787	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/80788)
2224/80747	Copper [Cu] as principal constituent	2224/80788	Glasses, e.g. amorphous oxides, nitrides or fluorides
		2224/8079	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
		2224/80791	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
		2224/80793	with a principal constituent of the material being a solid not provided for in groups H01L 2224/807 - H01L 2224/80791 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
		2224/80794	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/807 - H01L 2224/80791

- 2224/80795 with a principal constituent of the material being a gas not provided for in groups [H01L 2224/807](#) - [H01L 2224/80791](#)
- 2224/80798 with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
- 2224/80799 Shape or distribution of the fillers
- 2224/808 . . . Bonding techniques
- 2224/80801 Soldering or alloying
- 2224/80805 involving forming a eutectic alloy at the bonding interface
- 2224/8081 involving forming an intermetallic compound at the bonding interface
- 2224/80815 Reflow soldering
- 2224/8082 Diffusion bonding
- 2224/80825 Solid-liquid interdiffusion
- 2224/8083 Solid-solid interdiffusion
- 2224/8084 Sintering
- 2224/8085 using a polymer adhesive, e.g. an adhesive based on silicone, epoxy, polyimide, polyester
- 2224/80855 Hardening the adhesive by curing, i.e. thermosetting
- 2224/80856 Pre-cured adhesive, i.e. B-stage adhesive
- 2224/80859 Localised curing of parts of the bonding area
- 2224/80862 Heat curing
- 2224/80865 Microwave curing
- 2224/80868 Infrared [IR] curing
- 2224/80871 Visible light curing
- 2224/80874 Ultraviolet [UV] curing
- 2224/80877 Moisture curing, i.e. curing by exposing to humidity, e.g. for silicones and polyurethanes
- 2224/8088 Hardening the adhesive by cooling, e.g. for thermoplastics or hot-melt adhesives
- 2224/80885 Combinations of two or more hardening methods provided for in at least two different groups from [H01L 2224/80855](#) - [H01L 2224/8088](#), e.g. for hybrid thermoplastic-thermosetting adhesives
- 2224/8089 using an inorganic non metallic glass type adhesive, e.g. solder glass
- 2224/80893 Anodic bonding, i.e. bonding by applying a voltage across the interface in order to induce ions migration leading to an irreversible chemical bond
- 2224/80894 Direct bonding, i.e. joining surfaces by means of intermolecular attracting interactions at their interfaces, e.g. covalent bonds, van der Waals forces
- 2224/80895 between electrically conductive surfaces, e.g. copper-copper direct bonding, surface activated bonding
- 2224/80896 between electrically insulating surfaces, e.g. oxide or nitride layers
- 2224/80897 Mechanical interlocking, e.g. anchoring, hook and loop-type fastening or the like
- 2224/80898 Press-fitting, i.e. pushing the parts together and fastening by friction, e.g. by compression of one part against the other
- 2224/80899 using resilient parts in the bonding area
- 2224/809 . . . with the bonding area not providing any mechanical bonding
- 2224/80901 Pressing a bonding area against another bonding area by means of a further bonding area or connector ([detachable pressure contact H01L 2224/72](#))
- 2224/80902 by means of a further bonding area
- 2224/80903 by means of a bump or layer connector
- 2224/80904 by means of an encapsulation layer or foil
- 2224/80905 Combinations of bonding methods provided for in at least two different groups from [H01L 2224/808](#) - [H01L 2224/80904](#)
- 2224/80906 Specific sequence of method steps
- 2224/80907 Intermediate bonding, i.e. intermediate bonding step for temporarily bonding the semiconductor or solid-state body, followed by at least a further bonding step
- 2224/80908 involving monitoring, e.g. feedback loop
- 2224/80909 Post-treatment of the bonding area
- 2224/8091 Cleaning, e.g. oxide removal step, desmearing
- 2224/80911 Chemical cleaning, e.g. etching, flux
- 2224/80912 Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
- 2224/80913 Plasma cleaning
- 2224/80914 Thermal cleaning, e.g. using laser ablation or by electrostatic corona discharge
- 2224/80919 Combinations of two or more cleaning methods provided for in at least two different groups from [H01L 2224/8091](#) - [H01L 2224/80914](#)
- 2224/8092 Applying permanent coating, e.g. protective coating
- 2224/8093 Reshaping
- 2224/80931 by chemical means, e.g. etching
- 2224/80935 by heating means, e.g. reflowing
- 2224/80937 using a polychromatic heating lamp
- 2224/80939 using a laser
- 2224/80941 Induction heating, i.e. eddy currents
- 2224/80943 using a flame torch, e.g. hydrogen torch
- 2224/80945 using a corona discharge, e.g. electronic flame off [EFO]
- 2224/80947 by mechanical means, e.g. ?pull-and-cut?, pressing, stamping
- 2224/80948 Thermal treatments, e.g. annealing, controlled cooling
- 2224/80951 Forming additional members, e.g. for reinforcing
- 2224/80986 Specific sequence of steps, e.g. repetition of manufacturing steps, time sequence
- 2224/81 . . . using a bump connector
- 2224/81001 involving a temporary auxiliary member not forming part of the bonding apparatus
- 2224/81002 being a removable or sacrificial coating
- 2224/81005 being a temporary or sacrificial substrate
- 2224/81007 involving a permanent auxiliary member being left in the finished device, e.g. aids for holding or protecting the bump connector during or after the bonding process

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- 2224/81009 . . . Pre-treatment of the bump connector or the bonding area
- 2224/8101 Cleaning the bump connector, e.g. oxide removal step, desmearing
- 2224/81011 Chemical cleaning, e.g. etching, flux
- 2224/81012 Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
- 2224/81013 Plasma cleaning
- 2224/81014 Thermal cleaning, e.g. decomposition, sublimation
- 2224/81019 Combinations of two or more cleaning methods provided for in at least two different groups from [H01L 2224/8101](#) - [H01L 2224/81014](#)
- 2224/8102 Applying permanent coating to the bump connector in the bonding apparatus, e.g. in-situ coating
- 2224/81022 Cleaning the bonding area, e.g. oxide removal step, desmearing
- 2224/81024 Applying flux to the bonding area
- 2224/81026 Applying a precursor material to the bonding area
- 2224/8103 Reshaping the bump connector in the bonding apparatus, e.g. flattening the bump connector
- 2224/81031 by chemical means, e.g. etching, anodisation
- 2224/81035 by heating means
- 2224/81037 using a polychromatic heating lamp
- 2224/81039 using a laser
- 2224/81041 Induction heating, i.e. eddy currents
- 2224/81047 by mechanical means, e.g. severing, pressing, stamping
- 2224/81048 Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling
- 2224/81051 Forming additional members
- 2224/81052 . . . Detaching bump connectors, e.g. after testing ([unsoldering in general B23K 1/018](#))
- 2224/81053 . . . Bonding environment
- 2224/81054 Composition of the atmosphere
- 2224/81055 being oxidating
- 2224/81065 being reducing
- 2224/81075 being inert
- 2224/81085 being a liquid, e.g. for fluidic self-assembly
- 2224/8109 Vacuum
- 2224/81091 Under pressure
- 2224/81092 Atmospheric pressure
- 2224/81093 Transient conditions, e.g. gas-flow
- 2224/81095 Temperature settings
- 2224/81096 Transient conditions
- 2224/81097 Heating
- 2224/81098 Cooling
- 2224/81099 Ambient temperature
- 2224/811 . . . the bump connector being supplied to the parts to be connected in the bonding apparatus
- 2224/81101 as prepeg comprising a bump connector, e.g. provided in an insulating plate member
- 2224/8111 . . . involving protection against electrical discharge, e.g. removing electrostatic charge
- 2224/8112 . . . Aligning
- 2224/81121 Active alignment, i.e. by apparatus steering, e.g. optical alignment using marks or sensors
- 2224/81122 by detecting inherent features of, or outside, the semiconductor or solid-state body
- 2224/81123 Shape or position of the body
- 2224/81125 Bonding areas on the body
- 2224/81127 Bonding areas outside the body
- 2224/81129 Shape or position of the other item
- 2224/8113 using marks formed on the semiconductor or solid-state body
- 2224/81132 using marks formed outside the semiconductor or solid-state body, i.e. "off-chip"
- 2224/81136 involving guiding structures, e.g. spacers or supporting members
- 2224/81138 the guiding structures being at least partially left in the finished device
- 2224/81139 Guiding structures on the body
- 2224/8114 Guiding structures outside the body
- 2224/81141 Guiding structures both on and outside the body
- 2224/81143 Passive alignment, i.e. self alignment, e.g. using surface energy, chemical reactions, thermal equilibrium
- 2224/81148 involving movement of a part of the bonding apparatus
- 2224/81149 being the lower part of the bonding apparatus, i.e. holding means for the bodies to be connected, e.g. XY table
- 2224/8115 Rotational movements
- 2224/8116 Translational movements
- 2224/81169 being the upper part of the bonding apparatus, i.e. bonding head
- 2224/8117 Rotational movements
- 2224/8118 Translational movements
- 2224/8119 . . . Arrangement of the bump connectors prior to mounting
- 2224/81191 wherein the bump connectors are disposed only on the semiconductor or solid-state body
- 2224/81192 wherein the bump connectors are disposed only on another item or body to be connected to the semiconductor or solid-state body
- 2224/81193 wherein the bump connectors are disposed on both the semiconductor or solid-state body and another item or body to be connected to the semiconductor or solid-state body
- 2224/81194 Lateral distribution of the bump connectors
- 2224/812 . . . Applying energy for connecting
- 2224/81201 Compression bonding
- 2224/81203 Thermocompression bonding, e.g. diffusion bonding, pressure joining, thermocompression welding or solid-state welding
- 2224/81204 with a graded temperature profile
- 2224/81205 Ultrasonic bonding
- 2224/81206 Direction of oscillation
- 2224/81207 Thermosonic bonding
- 2224/81208 applying unidirectional static pressure
- 2224/81209 applying isostatic pressure, e.g. degassing using vacuum or a pressurised liquid
- 2224/8121 using a reflow oven
- 2224/81211 with a graded temperature profile

- 2224/8122 with energy being in the form of electromagnetic radiation
- 2224/81222 Induction heating, i.e. eddy currents
- 2224/81224 using a laser
- 2224/8123 Polychromatic or infrared lamp heating
- 2224/81232 using an autocatalytic reaction, e.g. exothermic brazing
- 2224/81234 using means for applying energy being within the device, e.g. integrated heater
- 2224/81236 using electro-static corona discharge
- 2224/81237 using an electron beam ([electron beam welding in general B23K 15/00](#))
- 2224/81238 using electric resistance welding, i.e. ohmic heating
- 2224/8134 . . . Bonding interfaces of the bump connector
- 2224/81345 . . . Shape, e.g. interlocking features
- 2224/81355 . . . having an external coating, e.g. protective bond-through coating
- 2224/81359 . . . Material
- 2224/8136 . . . Bonding interfaces of the semiconductor or solid state body
- 2224/81365 . . . Shape, e.g. interlocking features
- 2224/81375 . . . having an external coating, e.g. protective bond-through coating
- 2224/81379 . . . Material ([material of the bump connector prior to the connecting process H01L 2224/13099 and H01L 2224/13599, and subgroups](#))
- 2224/8138 . . . Bonding interfaces outside the semiconductor or solid-state body
- 2224/81385 . . . Shape, e.g. interlocking features
- 2224/81395 . . . having an external coating, e.g. protective bond-through coating
- 2224/81399 . . . Material
- 2224/814 with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
- 2224/81401 the principal constituent melting at a temperature of less than 400°C
- 2224/81405 Gallium [Ga] as principal constituent
- 2224/81409 Indium [In] as principal constituent
- 2224/81411 Tin [Sn] as principal constituent
- 2224/81413 Bismuth [Bi] as principal constituent
- 2224/81414 Thallium [Tl] as principal constituent
- 2224/81416 Lead [Pb] as principal constituent
- 2224/81417 the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
- 2224/81418 Zinc [Zn] as principal constituent
- 2224/8142 Antimony [Sb] as principal constituent
- 2224/81423 Magnesium [Mg] as principal constituent
- 2224/81424 Aluminium [Al] as principal constituent
- 2224/81438 the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
- 2224/81439 Silver [Ag] as principal constituent
- 2224/81444 Gold [Au] as principal constituent
- 2224/81447 Copper [Cu] as principal constituent
- 2224/81449 Manganese [Mn] as principal constituent
- 2224/81455 Nickel [Ni] as principal constituent
- 2224/81457 Cobalt [Co] as principal constituent
- 2224/8146 Iron [Fe] as principal constituent
- 2224/81463 the principal constituent melting at a temperature of greater than 1550°C
- 2224/81464 Palladium [Pd] as principal constituent
- 2224/81466 Titanium [Ti] as principal constituent
- 2224/81469 Platinum [Pt] as principal constituent
- 2224/8147 Zirconium [Zr] as principal constituent
- 2224/81471 Chromium [Cr] as principal constituent
- 2224/81472 Vanadium [V] as principal constituent
- 2224/81473 Rhodium [Rh] as principal constituent
- 2224/81476 Ruthenium [Ru] as principal constituent
- 2224/81478 Iridium [Ir] as principal constituent
- 2224/81479 Niobium [Nb] as principal constituent
- 2224/8148 Molybdenum [Mo] as principal constituent
- 2224/81481 Tantalum [Ta] as principal constituent
- 2224/81483 Rhenium [Re] as principal constituent
- 2224/81484 Tungsten [W] as principal constituent
- 2224/81486 with a principal constituent of the material being a non metallic, non metalloid inorganic material
- 2224/81487 Ceramics, e.g. crystalline carbides, nitrides or oxides ([glass ceramics H01L 2224/81488](#))
- 2224/81488 Glasses, e.g. amorphous oxides, nitrides or fluorides
- 2224/8149 with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
- 2224/81491 The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
- 2224/81493 with a principal constituent of the material being a solid not provided for in groups [H01L 2224/814](#) - [H01L 2224/81491](#), e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
- 2224/81494 with a principal constituent of the material being a liquid not provided for in groups [H01L 2224/814](#) - [H01L 2224/81491](#)
- 2224/81495 with a principal constituent of the material being a gas not provided for in groups [H01L 2224/814](#) - [H01L 2224/81491](#)
- 2224/81498 with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
- 2224/81499 Material of the matrix
- 2224/815 with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof

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2224/81501	the principal constituent melting at a temperature of less than 400°C	2224/81581	Tantalum [Ta] as principal constituent
2224/81505	Gallium [Ga] as principal constituent	2224/81583	Rhenium [Re] as principal constituent
2224/81509	Indium [In] as principal constituent	2224/81584	Tungsten [W] as principal constituent
2224/81511	Tin [Sn] as principal constituent	2224/81586	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/81513	Bismuth [Bi] as principal constituent	2224/81587	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/81588)
2224/81514	Thallium [Tl] as principal constituent	2224/81588	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/81516	Lead [Pb] as principal constituent	2224/8159	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/81517	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/81591	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/81518	Zinc [Zn] as principal constituent	2224/81593	with a principal constituent of the material being a solid not provided for in groups H01L 2224/815 - H01L 2224/81591 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/8152	Antimony [Sb] as principal constituent	2224/81594	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/815 - H01L 2224/81591
2224/81523	Magnesium [Mg] as principal constituent	2224/81595	with a principal constituent of the material being a gas not provided for in groups H01L 2224/815 - H01L 2224/81591
2224/81524	Aluminium [Al] as principal constituent	2224/81598	Fillers
2224/81538	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/81599	Base material
2224/81539	Silver [Ag] as principal constituent	2224/816	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/81544	Gold [Au] as principal constituent	2224/81601	the principal constituent melting at a temperature of less than 400°C
2224/81547	Copper [Cu] as principal constituent	2224/81605	Gallium [Ga] as principal constituent
2224/81549	Manganese [Mn] as principal constituent	2224/81609	Indium [In] as principal constituent
2224/81555	Nickel [Ni] as principal constituent	2224/81611	Tin [Sn] as principal constituent
2224/81557	Cobalt [Co] as principal constituent	2224/81613	Bismuth [Bi] as principal constituent
2224/8156	Iron [Fe] as principal constituent	2224/81614	Thallium [Tl] as principal constituent
2224/81563	the principal constituent melting at a temperature of greater than 1550°C	2224/81616	Lead [Pb] as principal constituent
2224/81564	Palladium [Pd] as principal constituent	2224/81617	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/81566	Titanium [Ti] as principal constituent	2224/81618	Zinc [Zn] as principal constituent
2224/81569	Platinum [Pt] as principal constituent		
2224/8157	Zirconium [Zr] as principal constituent		
2224/81571	Chromium [Cr] as principal constituent		
2224/81572	Vanadium [V] as principal constituent		
2224/81573	Rhodium [Rh] as principal constituent		
2224/81576	Ruthenium [Ru] as principal constituent		
2224/81578	Iridium [Ir] as principal constituent		
2224/81579	Niobium [Nb] as principal constituent		
2224/8158	Molybdenum [Mo] as principal constituent		

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2224/8162	Antimony [Sb] as principal constituent	2224/8169	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/81623	Magnesium [Mg] as principal constituent	2224/81691	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/81624	Aluminium [Al] as principal constituent	2224/81693	with a principal constituent of the material being a solid not provided for in groups H01L 2224/816 - H01L 2224/81691 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/81638	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/81694	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/816 - H01L 2224/81691
2224/81639	Silver [Ag] as principal constituent	2224/81695	with a principal constituent of the material being a gas not provided for in groups H01L 2224/816 - H01L 2224/81691
2224/81644	Gold [Au] as principal constituent	2224/81698	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/81647	Copper [Cu] as principal constituent	2224/81699	Coating material
2224/81649	Manganese [Mn] as principal constituent	2224/817	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/81655	Nickel [Ni] as principal constituent	2224/81701	the principal constituent melting at a temperature of less than 400°C
2224/81657	Cobalt [Co] as principal constituent	2224/81705	Gallium [Ga] as principal constituent
2224/8166	Iron [Fe] as principal constituent	2224/81709	Indium [In] as principal constituent
2224/81663	the principal constituent melting at a temperature of greater than 1550°C	2224/81711	Tin [Sn] as principal constituent
2224/81664	Palladium [Pd] as principal constituent	2224/81713	Bismuth [Bi] as principal constituent
2224/81666	Titanium [Ti] as principal constituent	2224/81714	Thallium [Tl] as principal constituent
2224/81669	Platinum [Pt] as principal constituent	2224/81716	Lead [Pb] as principal constituent
2224/8167	Zirconium [Zr] as principal constituent	2224/81717	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/81671	Chromium [Cr] as principal constituent	2224/81718	Zinc [Zn] as principal constituent
2224/81672	Vanadium [V] as principal constituent	2224/8172	Antimony [Sb] as principal constituent
2224/81673	Rhodium [Rh] as principal constituent	2224/81723	Magnesium [Mg] as principal constituent
2224/81676	Ruthenium [Ru] as principal constituent	2224/81724	Aluminium [Al] as principal constituent
2224/81678	Iridium [Ir] as principal constituent		
2224/81679	Niobium [Nb] as principal constituent		
2224/8168	Molybdenum [Mo] as principal constituent		
2224/81681	Tantalum [Ta] as principal constituent		
2224/81683	Rhenium [Re] as principal constituent		
2224/81684	Tungsten [W] as principal constituent		
2224/81686	with a principal constituent of the material being a non metallic, non metalloid inorganic material		
2224/81687	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/81688)		
2224/81688	Glasses, e.g. amorphous oxides, nitrides or fluorides		

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- 2224/81738 the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
- 2224/81739 Silver [Ag] as principal constituent
- 2224/81744 Gold [Au] as principal constituent
- 2224/81747 Copper [Cu] as principal constituent
- 2224/81749 Manganese [Mn] as principal constituent
- 2224/81755 Nickel [Ni] as principal constituent
- 2224/81757 Cobalt [Co] as principal constituent
- 2224/8176 Iron [Fe] as principal constituent
- 2224/81763 the principal constituent melting at a temperature of greater than 1550°C
- 2224/81764 Palladium [Pd] as principal constituent
- 2224/81766 Titanium [Ti] as principal constituent
- 2224/81769 Platinum [Pt] as principal constituent
- 2224/8177 Zirconium [Zr] as principal constituent
- 2224/81771 Chromium [Cr] as principal constituent
- 2224/81772 Vanadium [V] as principal constituent
- 2224/81773 Rhodium [Rh] as principal constituent
- 2224/81776 Ruthenium [Ru] as principal constituent
- 2224/81778 Iridium [Ir] as principal constituent
- 2224/81779 Niobium [Nb] as principal constituent
- 2224/8178 Molybdenum [Mo] as principal constituent
- 2224/81781 Tantalum [Ta] as principal constituent
- 2224/81783 Rhenium [Re] as principal constituent
- 2224/81784 Tungsten [W] as principal constituent
- 2224/81786 with a principal constituent of the material being a non metallic, non metalloid inorganic material
- 2224/81787 Ceramics, e.g. crystalline carbides, nitrides or oxides ([glass ceramics H01L 2224/81788](#))
- 2224/81788 Glasses, e.g. amorphous oxides, nitrides or fluorides
- 2224/8179 with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
- 2224/81791 The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
- 2224/81793 with a principal constituent of the material being a solid not provided for in groups [H01L 2224/817](#) - [H01L 2224/81791](#), e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
- 2224/81794 with a principal constituent of the material being a liquid not provided for in groups [H01L 2224/817](#) - [H01L 2224/81791](#)
- 2224/81795 with a principal constituent of the material being a gas not provided for in groups [H01L 2224/817](#) - [H01L 2224/81791](#)
- 2224/81798 with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
- 2224/81799 Shape or distribution of the fillers
- 2224/818 Bonding techniques
- 2224/81801 Soldering or alloying
- 2224/81805 involving forming a eutectic alloy at the bonding interface
- 2224/8181 involving forming an intermetallic compound at the bonding interface
- 2224/81815 Reflow soldering
- 2224/8182 Diffusion bonding
- 2224/81825 Solid-liquid interdiffusion
- 2224/8183 Solid-solid interdiffusion
- 2224/8184 Sintering
- 2224/8185 using a polymer adhesive, e.g. an adhesive based on silicone, epoxy, polyimide, polyester
- 2224/81855 Hardening the adhesive by curing, i.e. thermosetting
- 2224/81856 Pre-cured adhesive, i.e. B-stage adhesive
- 2224/81859 Localised curing of parts of the bump connector
- 2224/81862 Heat curing
- 2224/81865 Microwave curing
- 2224/81868 Infrared [IR] curing
- 2224/81871 Visible light curing
- 2224/81874 Ultraviolet [UV] curing
- 2224/81877 Moisture curing, i.e. curing by exposing to humidity, e.g. for silicones and polyurethanes
- 2224/8188 Hardening the adhesive by cooling, e.g. for thermoplastics or hot-melt adhesives
- 2224/81885 Combinations of two or more hardening methods provided for in at least two different groups from [H01L 2224/81855](#) - [H01L 2224/8188](#), e.g. for hybrid thermoplastic-thermosetting adhesives
- 2224/8189 using an inorganic non metallic glass type adhesive, e.g. solder glass
- 2224/81893 Anodic bonding, i.e. bonding by applying a voltage across the interface in order to induce ions migration leading to an irreversible chemical bond

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- 2224/81894 Direct bonding, i.e. joining surfaces by means of intermolecular attracting interactions at their interfaces, e.g. covalent bonds, van der Waals forces
- 2224/81895 between electrically conductive surfaces, e.g. copper-copper direct bonding, surface activated bonding
- 2224/81896 between electrically insulating surfaces, e.g. oxide or nitride layers
- 2224/81897 Mechanical interlocking, e.g. anchoring, hook and loop-type fastening or the like
- 2224/81898 Press-fitting, i.e. pushing the parts together and fastening by friction, e.g. by compression of one part against the other
- 2224/81899 using resilient parts in the bump connector or in the bonding area
- 2224/819 . . . with the bump connector not providing any mechanical bonding
- 2224/81901 Pressing the bump connector against the bonding areas by means of another connector ([detachable pressure contact H01L 2224/72](#))
- 2224/81902 by means of another bump connector
- 2224/81903 by means of a layer connector
- 2224/81904 by means of an encapsulation layer or foil
- 2224/81905 . . . Combinations of bonding methods provided for in at least two different groups from [H01L 2224/818](#) - [H01L 2224/81904](#)
- 2224/81906 Specific sequence of method steps
- 2224/81907 Intermediate bonding, i.e. intermediate bonding step for temporarily bonding the semiconductor or solid-state body, followed by at least a further bonding step
- 2224/81908 . . . involving monitoring, e.g. feedback loop
- 2224/81909 . . . Post-treatment of the bump connector or bonding area
- 2224/8191 Cleaning, e.g. oxide removal step, desmearing
- 2224/81911 Chemical cleaning, e.g. etching, flux
- 2224/81912 Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
- 2224/81913 Plasma cleaning
- 2224/81914 Thermal cleaning, e.g. using laser ablation or by electrostatic corona discharge
- 2224/81919 Combinations of two or more cleaning methods provided for in at least two different groups from [H01L 2224/8191](#) - [H01L 2224/81914](#)
- 2224/8192 Applying permanent coating, e.g. protective coating
- 2224/8193 Reshaping
- 2224/81931 by chemical means, e.g. etching
- 2224/81935 by heating means, e.g. reflowing
- 2224/81937 using a polychromatic heating lamp
- 2224/81939 using a laser
- 2224/81941 Induction heating, i.e. eddy currents
- 2224/81943 using a flame torch, e.g. hydrogen torch
- 2224/81945 using a corona discharge, e.g. electronic flame off [EFO]
- 2224/81947 by mechanical means, e.g. "pull-and-cut", pressing, stamping
- 2224/81948 Thermal treatments, e.g. annealing, controlled cooling
- 2224/81951 Forming additional members, e.g. for reinforcing
- 2224/81986 Specific sequence of steps, e.g. repetition of manufacturing steps, time sequence
- 2224/82 . . . by forming build-up interconnects at chip-level, e.g. for high density interconnects [HDI]
- 2224/82001 . . . involving a temporary auxiliary member not forming part of the bonding apparatus
- 2224/82002 being a removable or sacrificial coating
- 2224/82005 being a temporary or sacrificial substrate
- 2224/82007 . . . involving a permanent auxiliary member being left in the finished device, e.g. aids for holding or protecting a build-up interconnect during or after the bonding process
- 2224/82009 . . . Pre-treatment of the connector or the bonding area
- 2224/8201 Cleaning, e.g. oxide removal step, desmearing
- 2224/8203 Reshaping, e.g. forming vias
- 2224/82031 by chemical means, e.g. etching, anodisation
- 2224/82035 by heating means
- 2224/82039 using a laser
- 2224/82045 using a corona discharge, e.g. electronic flame off [EFO]
- 2224/82047 by mechanical means, e.g. severing, pressing, stamping
- 2224/82048 Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling
- 2224/82051 Forming additional members
- 2224/82053 . . . Bonding environment
- 2224/82054 Composition of the atmosphere
- 2224/82085 being a liquid, e.g. for fluidic self-assembly
- 2224/8209 Vacuum
- 2224/82091 Under pressure
- 2224/82095 Temperature settings
- 2224/82096 Transient conditions
- 2224/82097 Heating
- 2224/82098 Cooling
- 2224/82099 Ambient temperature
- 2224/821 . . . Forming a build-up interconnect
- 2224/82101 by additive methods, e.g. direct writing
- 2224/82102 using jetting, e.g. ink jet
- 2224/82103 using laser direct writing
- 2224/82104 using screen printing
- 2224/82105 by using a preform
- 2224/82106 by subtractive methods
- 2224/82108 by self-assembly processes
- 2224/8211 . . . involving protection against electrical discharge, e.g. removing electrostatic charge
- 2224/8212 . . . Aligning
- 2224/82121 Active alignment, i.e. by apparatus steering, e.g. optical alignment using marks or sensors
- 2224/82122 by detecting inherent features of, or outside, the semiconductor or solid-state body
- 2224/8213 using marks formed on the semiconductor or solid-state body
- 2224/82132 using marks formed outside the semiconductor or solid-state body, i.e. "off-chip"
- 2224/82136 involving guiding structures, e.g. spacers or supporting members

- 2224/82138 the guiding structures being at least partially left in the finished device
- 2224/82143 Passive alignment, i.e. self alignment, e.g. using surface energy, chemical reactions, thermal equilibrium
- 2224/82148 involving movement of a part of the bonding apparatus
- 2224/82149 being the lower part of the bonding apparatus, i.e. holding means for the bodies to be connected, e.g. XY table
- 2224/8215 Rotational movements
- 2224/8216 Translational movements
- 2224/82169 being the upper part of the bonding apparatus, e.g. nozzle
- 2224/8217 Rotational movement
- 2224/8218 Translational movements
- 2224/82181 connecting first on the semiconductor or solid-state body, i.e. on-chip,
- 2224/82186 connecting first outside the semiconductor or solid-state body, i.e. off-chip
- 2224/82191 connecting first both on and outside the semiconductor or solid-state body
- 2224/822 Applying energy for connecting
- 2224/82201 Compression bonding
- 2224/82203 Thermocompression bonding
- 2224/82205 Ultrasonic bonding
- 2224/82207 Thermosonic bonding
- 2224/8221 with energy being in the form of electromagnetic radiation
- 2224/82212 Induction heating, i.e. eddy currents
- 2224/82214 using a laser
- 2224/8223 Polychromatic or infrared lamp heating
- 2224/82232 using an autocatalytic reaction, e.g. exothermic brazing
- 2224/82234 using means for applying energy being within the device, e.g. integrated heater
- 2224/82236 using electro-static corona discharge
- 2224/82237 using electron beam, ([electron beam in general B23K 15/00](#))
- 2224/82238 using electric resistance welding, i.e. ohmic heating
- 2224/8234 Bonding interfaces of the connector
- 2224/82345 Shape, e.g. interlocking features
- 2224/82355 having an external coating, e.g. protective bond-through coating
- 2224/82359 Material
- 2224/8236 Bonding interfaces of the semiconductor or solid state body
- 2224/82365 Shape, e.g. interlocking features
- 2224/82375 having an external coating, e.g. protective bond-through coating
- 2224/82379 Material
- 2224/8238 Bonding interfaces outside the semiconductor or solid-state body
- 2224/82385 Shape, e.g. interlocking features
- 2224/82395 having an external coating, e.g. protective bond-through coating
- 2224/82399 Material
- 2224/828 Bonding techniques
- 2224/82801 Soldering or alloying
- 2224/82805 involving forming a eutectic alloy at the bonding interface
- 2224/8281 involving forming an intermetallic compound at the bonding interface
- 2224/82815 Reflow soldering
- 2224/8282 Diffusion bonding
- 2224/82825 Solid-liquid interdiffusion
- 2224/8283 Solid-solid interdiffusion
- 2224/8284 Sintering
- 2224/8285 using a polymer adhesive, e.g. an adhesive based on silicone, epoxy, polyimide, polyester
- 2224/82855 Hardening the adhesive by curing, i.e. thermosetting
- 2224/82856 Pre-cured adhesive, i.e. B-stage adhesive
- 2224/82859 Localised curing of parts of the connector
- 2224/82862 Heat curing
- 2224/82865 Microwave curing
- 2224/82868 Infrared [IR] curing
- 2224/82871 Visible light curing
- 2224/82874 Ultraviolet [UV] curing
- 2224/82877 Moisture curing, i.e. curing by exposing to humidity, e.g. for silicones and polyurethanes
- 2224/8288 Hardening the adhesive by cooling, e.g. for thermoplastics or hot-melt adhesives
- 2224/82885 Combinations of two or more hardening methods provided for in at least two different groups from [H01L 2224/82855](#) - [H01L 2224/82888](#), e.g. for hybrid thermoplastic-thermosetting adhesives
- 2224/8289 using an inorganic non metallic glass type adhesive, e.g. solder glass
- 2224/82893 Anodic bonding, i.e. bonding by applying a voltage across the interface in order to induce ions migration leading to an irreversible chemical bond
- 2224/82895 Direct bonding, i.e. joining surfaces by means of intermolecular attracting interactions at their interfaces, e.g. covalent bonds, van der Waals forces
- 2224/82896 between electrically conductive surfaces, e.g. copper-copper direct bonding, surface activated bonding
- 2224/82897 between electrically insulating surfaces, e.g. oxide or nitride layers
- 2224/82899 Combinations of bonding methods provided for in at least two different groups from [H01L 2224/828](#) - [H01L 2224/82897](#)
- 2224/829 involving monitoring, e.g. feedback loop
- 2224/82909 Post-treatment of the connector or the bonding area
- 2224/8291 Cleaning, e.g. oxide removal step, desmearing
- 2224/8293 Reshaping
- 2224/82931 by chemical means, e.g. etching, anodisation
- 2224/82935 by heating means
- 2224/82939 using a laser
- 2224/82945 using a corona discharge, e.g. electronic flame off [EFO]
- 2224/82947 by mechanical means, e.g. severing, pressing, stamping

- 2224/82948 Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling
- 2224/82951 Forming additional members
- 2224/82986 . . . Specific sequence of steps, e.g. repetition of manufacturing steps, time sequence
- 2224/83 . . . using a layer connector
- 2224/83001 . . . involving a temporary auxiliary member not forming part of the bonding apparatus
- 2224/83002 being a removable or sacrificial coating
- 2224/83005 being a temporary or sacrificial substrate
- 2224/83007 . . . involving a permanent auxiliary member being left in the finished device, e.g. aids for holding or protecting the layer connector during or after the bonding process
- 2224/83009 . . . Pre-treatment of the layer connector or the bonding area
- 2224/8301 Cleaning the layer connector, e.g. oxide removal step, desmearing
- 2224/83011 Chemical cleaning, e.g. etching, flux
- 2224/83012 Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
- 2224/83013 Plasma cleaning
- 2224/83014 Thermal cleaning, e.g. decomposition, sublimation
- 2224/83019 Combinations of two or more cleaning methods provided for in at least two different groups from [H01L 2224/8301](#) - [H01L 2224/83014](#)
- 2224/8302 Applying permanent coating to the layer connector in the bonding apparatus, e.g. in-situ coating
- 2224/83022 Cleaning the bonding area, e.g. oxide removal step, desmearing
- 2224/83024 Applying flux to the bonding area
- 2224/83026 Applying a precursor material to the bonding area
- 2224/8303 Reshaping the layer connector in the bonding apparatus, e.g. flattening the layer connector
- 2224/83031 by chemical means, e.g. etching, anodisation
- 2224/83035 by heating means
- 2224/83037 using a polychromatic heating lamp
- 2224/83039 using a laser
- 2224/83041 Induction heating, i.e. eddy currents
- 2224/83047 by mechanical means, e.g. severing, pressing, stamping
- 2224/83048 Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling
- 2224/83051 Forming additional members, e.g. dam structures
- 2224/83052 . . . Detaching layer connectors, e.g. after testing ([unsoldering in general B23K 1/018](#))
- 2224/83053 . . . Bonding environment
- 2224/83054 Composition of the atmosphere
- 2224/83055 being oxidating
- 2224/83065 being reducing
- 2224/83075 being inert
- 2224/83085 being a liquid, e.g. for fluidic self-assembly
- 2224/8309 Vacuum
- 2224/83091 Under pressure
- 2224/83092 Atmospheric pressure
- 2224/83093 Transient conditions, e.g. gas-flow
- 2224/83095 Temperature settings
- 2224/83096 Transient conditions
- 2224/83097 Heating
- 2224/83098 Cooling
- 2224/83099 Ambient temperature
- 2224/831 . . . the layer connector being supplied to the parts to be connected in the bonding apparatus
- 2224/83101 as prepreg comprising a layer connector, e.g. provided in an insulating plate member
- 2224/83102 using surface energy, e.g. capillary forces
- 2224/83104 by applying pressure, e.g. by injection
- 2224/8311 . . . involving protection against electrical discharge, e.g. removing electrostatic charge
- 2224/8312 Aligning
- 2224/83121 Active alignment, i.e. by apparatus steering, e.g. optical alignment using marks or sensors
- 2224/83122 by detecting inherent features of, or outside, the semiconductor or solid-state body
- 2224/83123 Shape or position of the body
- 2224/83125 Bonding areas on the body
- 2224/83127 Bonding areas outside the body
- 2224/83129 Shape or position of the other item
- 2224/8313 using marks formed on the semiconductor or solid-state body
- 2224/83132 using marks formed outside the semiconductor or solid-state body, i.e. "off-chip"
- 2224/83136 involving guiding structures, e.g. spacers or supporting members
- 2224/83138 the guiding structures being at least partially left in the finished device
- 2224/83139 Guiding structures on the body
- 2224/8314 Guiding structures outside the body
- 2224/83141 Guiding structures both on and outside the body
- 2224/83143 Passive alignment, i.e. self alignment, e.g. using surface energy, chemical reactions, thermal equilibrium
- 2224/83148 involving movement of a part of the bonding apparatus
- 2224/83149 being the lower part of the bonding apparatus, i.e. holding means for the bodies to be connected, e.g. XY table
- 2224/8315 Rotational movements
- 2224/8316 Translational movements
- 2224/83169 being the upper part of the bonding apparatus, i.e. bonding head
- 2224/8317 Rotational movements
- 2224/8318 Translational movements
- 2224/8319 . . . Arrangement of the layer connectors prior to mounting
- 2224/83191 wherein the layer connectors are disposed only on the semiconductor or solid-state body
- 2224/83192 wherein the layer connectors are disposed only on another item or body to be connected to the semiconductor or solid-state body
- 2224/83193 wherein the layer connectors are disposed on both the semiconductor or solid-state body and another item or body to be connected to the semiconductor or solid-state body
- 2224/83194 Lateral distribution of the layer connectors

- 2224/832 . . . Applying energy for connecting
- 2224/83201 Compression bonding
- 2224/83203 Thermocompression bonding, e.g. diffusion bonding, pressure joining, thermocompression welding or solid-state welding
- 2224/83204 with a graded temperature profile
- 2224/83205 Ultrasonic bonding
- 2224/83206 Direction of oscillation
- 2224/83207 Thermosonic bonding
- 2224/83208 applying unidirectional static pressure
- 2224/83209 applying isostatic pressure, e.g. degassing using vacuum or a pressurised liquid
- 2224/8321 using a reflow oven
- 2224/83211 with a graded temperature profile
- 2224/8322 with energy being in the form of electromagnetic radiation
- 2224/83222 Induction heating, i.e. eddy currents
- 2224/83224 using a laser
- 2224/8323 Polychromatic or infrared lamp heating
- 2224/83232 using an autocatalytic reaction, e.g. exothermic brazing
- 2224/83234 using means for applying energy being within the device, e.g. integrated heater
- 2224/83236 using electro-static corona discharge
- 2224/83237 using an electron beam ([electron beam welding in general B23K 15/00](#))
- 2224/83238 using electric resistance welding, i.e. ohmic heating
- 2224/8334 Bonding interfaces of the layer connector
- 2224/83345 Shape, e.g. interlocking features
- 2224/83355 having an external coating, e.g. protective bond-through coating
- 2224/83359 Material
- 2224/8336 Bonding interfaces of the semiconductor or solid state body
- 2224/83365 Shape, e.g. interlocking features
- 2224/83375 having an external coating, e.g. protective bond-through coating
- 2224/83379 Material ([material of the layer connector prior to the connecting process H01L 2224/29099 and H01L 2224/29599, and subgroups](#))
- 2224/8338 Bonding interfaces outside the semiconductor or solid-state body
- 2224/83385 Shape, e.g. interlocking features
- 2224/83395 having an external coating, e.g. protective bond-through coating
- 2224/83399 Material
- 2224/834 with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
- 2224/83401 the principal constituent melting at a temperature of less than 400°C
- 2224/83405 Gallium [Ga] as principal constituent
- 2224/83409 Indium [In] as principal constituent
- 2224/83411 Tin [Sn] as principal constituent
- 2224/83413 Bismuth [Bi] as principal constituent
- 2224/83414 Thallium [Tl] as principal constituent
- 2224/83416 Lead [Pb] as principal constituent
- 2224/83417 the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
- 2224/83418 Zinc [Zn] as principal constituent
- 2224/8342 Antimony [Sb] as principal constituent
- 2224/83423 Magnesium [Mg] as principal constituent
- 2224/83424 Aluminium [Al] as principal constituent
- 2224/83438 the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
- 2224/83439 Silver [Ag] as principal constituent
- 2224/83444 Gold [Au] as principal constituent
- 2224/83447 Copper [Cu] as principal constituent
- 2224/83449 Manganese [Mn] as principal constituent
- 2224/83455 Nickel [Ni] as principal constituent
- 2224/83457 Cobalt [Co] as principal constituent
- 2224/8346 Iron [Fe] as principal constituent
- 2224/83463 the principal constituent melting at a temperature of greater than 1550°C
- 2224/83464 Palladium [Pd] as principal constituent
- 2224/83466 Titanium [Ti] as principal constituent
- 2224/83469 Platinum [Pt] as principal constituent
- 2224/8347 Zirconium [Zr] as principal constituent
- 2224/83471 Chromium [Cr] as principal constituent
- 2224/83472 Vanadium [V] as principal constituent
- 2224/83473 Rhodium [Rh] as principal constituent
- 2224/83476 Ruthenium [Ru] as principal constituent
- 2224/83478 Iridium [Ir] as principal constituent
- 2224/83479 Niobium [Nb] as principal constituent
- 2224/8348 Molybdenum [Mo] as principal constituent
- 2224/83481 Tantalum [Ta] as principal constituent
- 2224/83483 Rhenium [Re] as principal constituent
- 2224/83484 Tungsten [W] as principal constituent
- 2224/83486 with a principal constituent of the material being a non metallic, non metalloid inorganic material
- 2224/83487 Ceramics, e.g. crystalline carbides, nitrides or oxides ([glass ceramics H01L 2224/83488](#))
- 2224/83488 Glasses, e.g. amorphous oxides, nitrides or fluorides
- 2224/8349 with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
- 2224/83491 The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
- 2224/83493 with a principal constituent of the material being a solid not provided for in groups [H01L 2224/834](#) - [H01L 2224/83491](#), e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
- 2224/83494 with a principal constituent of the material being a liquid not provided for in groups [H01L 2224/834](#) - [H01L 2224/83491](#)

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2224/83495	with a principal constituent of the material being a gas not provided for in groups H01L 2224/834 - H01L 2224/83491	2224/8357	Zirconium [Zr] as principal constituent
2224/83498	. . . . .	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams	2224/83571	. . . . .	Chromium [Cr] as principal constituent
2224/83499	. . . . .	Material of the matrix	2224/83572	. . . . .	Vanadium [V] as principal constituent
2224/835	. . . . .	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/83573	. . . . .	Rhodium [Rh] as principal constituent
2224/83501	. . . . .	the principal constituent melting at a temperature of less than 400°C	2224/83576	. . . . .	Ruthenium [Ru] as principal constituent
2224/83505	. . . . .	Gallium [Ga] as principal constituent	2224/83578	. . . . .	Iridium [Ir] as principal constituent
2224/83509	. . . . .	Indium [In] as principal constituent	2224/83579	. . . . .	Niobium [Nb] as principal constituent
2224/83511	. . . . .	Tin [Sn] as principal constituent	2224/8358	. . . . .	Molybdenum [Mo] as principal constituent
2224/83513	. . . . .	Bismuth [Bi] as principal constituent	2224/83581	. . . . .	Tantalum [Ta] as principal constituent
2224/83514	. . . . .	Thallium [Tl] as principal constituent	2224/83583	. . . . .	Rhenium [Re] as principal constituent
2224/83516	. . . . .	Lead [Pb] as principal constituent	2224/83584	. . . . .	Tungsten [W] as principal constituent
2224/83517	. . . . .	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/83586	. . . . .	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/83518	. . . . .	Zinc [Zn] as principal constituent	2224/83587	. . . . .	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/83588)
2224/8352	. . . . .	Antimony [Sb] as principal constituent	2224/83588	. . . . .	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/83523	. . . . .	Magnesium [Mg] as principal constituent	2224/8359	. . . . .	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/83524	. . . . .	Aluminium [Al] as principal constituent	2224/83591	. . . . .	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/83538	. . . . .	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/83593	. . . . .	with a principal constituent of the material being a solid not provided for in groups H01L 2224/835 - H01L 2224/83591 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/83539	. . . . .	Silver [Ag] as principal constituent	2224/83594	. . . . .	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/835 - H01L 2224/83591
2224/83544	. . . . .	Gold [Au] as principal constituent	2224/83595	. . . . .	with a principal constituent of the material being a gas not provided for in groups H01L 2224/835 - H01L 2224/83591
2224/83547	. . . . .	Copper [Cu] as principal constituent	2224/83598	. . . . .	Fillers
2224/83549	. . . . .	Manganese [Mn] as principal constituent	2224/83599	. . . . .	Base material
2224/83555	. . . . .	Nickel [Ni] as principal constituent	2224/836	. . . . .	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/83557	. . . . .	Cobalt [Co] as principal constituent	2224/83601	. . . . .	the principal constituent melting at a temperature of less than 400°C
2224/8356	. . . . .	Iron [Fe] as principal constituent	2224/83605	. . . . .	Gallium [Ga] as principal constituent
2224/83563	. . . . .	the principal constituent melting at a temperature of greater than 1550°C			
2224/83564	. . . . .	Palladium [Pd] as principal constituent			
2224/83566	Titanium [Ti] as principal constituent			
2224/83569	Platinum [Pt] as principal constituent			

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2224/83609	Indium [In] as principal constituent	2224/8368	Molybdenum [Mo] as principal constituent
2224/83611	Tin [Sn] as principal constituent	2224/83681	Tantalum [Ta] as principal constituent
2224/83613	Bismuth [Bi] as principal constituent	2224/83683	Rhenium [Re] as principal constituent
2224/83614	Thallium [Tl] as principal constituent	2224/83684	Tungsten [W] as principal constituent
2224/83616	Lead [Pb] as principal constituent	2224/83686	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/83617	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/83687	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/83688)
2224/83618	Zinc [Zn] as principal constituent	2224/83688	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/8362	Antimony [Sb] as principal constituent	2224/8369	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/83623	Magnesium [Mg] as principal constituent	2224/83691	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/83624	Aluminium [Al] as principal constituent	2224/83693	with a principal constituent of the material being a solid not provided for in groups H01L 2224/836 - H01L 2224/83691 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/83638	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/83694	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/836 - H01L 2224/83691
2224/83639	Silver [Ag] as principal constituent	2224/83695	with a principal constituent of the material being a gas not provided for in groups H01L 2224/836 - H01L 2224/83691
2224/83644	Gold [Au] as principal constituent	2224/83698	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/83647	Copper [Cu] as principal constituent	2224/83699	Coating material
2224/83649	Manganese [Mn] as principal constituent	2224/837	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/83655	Nickel [Ni] as principal constituent	2224/83701	the principal constituent melting at a temperature of less than 400°C
2224/83657	Cobalt [Co] as principal constituent	2224/83705	Gallium [Ga] as principal constituent
2224/8366	Iron [Fe] as principal constituent	2224/83709	Indium [In] as principal constituent
2224/83663	the principal constituent melting at a temperature of greater than 1550°C	2224/83711	Tin [Sn] as principal constituent
2224/83664	Palladium [Pd] as principal constituent	2224/83713	Bismuth [Bi] as principal constituent
2224/83666	Titanium [Ti] as principal constituent	2224/83714	Thallium [Tl] as principal constituent
2224/83669	Platinum [Pt] as principal constituent		
2224/8367	Zirconium [Zr] as principal constituent		
2224/83671	Chromium [Cr] as principal constituent		
2224/83672	Vanadium [V] as principal constituent		
2224/83673	Rhodium [Rh] as principal constituent		
2224/83676	Ruthenium [Ru] as principal constituent		
2224/83678	Iridium [Ir] as principal constituent		
2224/83679	Niobium [Nb] as principal constituent		

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2224/83716	Lead [Pb] as principal constituent	2224/83786	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/83717	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/83787	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/83788)
2224/83718	Zinc [Zn] as principal constituent	2224/83788	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/8372	Antimony [Sb] as principal constituent	2224/8379	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/83723	Magnesium [Mg] as principal constituent	2224/83791	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/83724	Aluminium [Al] as principal constituent	2224/83793	with a principal constituent of the material being a solid not provided for in groups H01L 2224/837 - H01L 2224/83791 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/83738	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/83794	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/837 - H01L 2224/83791
2224/83739	Silver [Ag] as principal constituent	2224/83795	with a principal constituent of the material being a gas not provided for in groups H01L 2224/837 - H01L 2224/83791
2224/83744	Gold [Au] as principal constituent	2224/83798	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/83747	Copper [Cu] as principal constituent	2224/83799	Shape or distribution of the fillers
2224/83749	Manganese [Mn] as principal constituent	2224/838	Bonding techniques
2224/83755	Nickel [Ni] as principal constituent	2224/83801	Soldering or alloying
2224/83757	Cobalt [Co] as principal constituent	2224/83805	involving forming a eutectic alloy at the bonding interface
2224/8376	Iron [Fe] as principal constituent	2224/8381	involving forming an intermetallic compound at the bonding interface
2224/83763	the principal constituent melting at a temperature of greater than 1550°C	2224/83815	Reflow soldering
2224/83764	Palladium [Pd] as principal constituent	2224/8382	Diffusion bonding
2224/83766	Titanium [Ti] as principal constituent	2224/83825	Solid-liquid interdiffusion
2224/83769	Platinum [Pt] as principal constituent	2224/8383	Solid-solid interdiffusion
2224/8377	Zirconium [Zr] as principal constituent	2224/8384	Sintering
2224/83771	Chromium [Cr] as principal constituent	2224/8385	using a polymer adhesive, e.g. an adhesive based on silicone, epoxy, polyimide, polyester
2224/83772	Vanadium [V] as principal constituent	2224/83851	being an anisotropic conductive adhesive
2224/83773	Rhodium [Rh] as principal constituent	2224/83855	Hardening the adhesive by curing, i.e. thermosetting
2224/83776	Ruthenium [Ru] as principal constituent	2224/83856	Pre-cured adhesive, i.e. B-stage adhesive
2224/83778	Iridium [Ir] as principal constituent	2224/83859	Localised curing of parts of the layer connector
2224/83779	Niobium [Nb] as principal constituent	2224/83862	Heat curing
2224/8378	Molybdenum [Mo] as principal constituent	2224/83865	Microwave curing
2224/83781	Tantalum [Ta] as principal constituent	2224/83868	Infrared [IR] curing
2224/83783	Rhenium [Re] as principal constituent	2224/83871	Visible light curing
2224/83784	Tungsten [W] as principal constituent	2224/83874	Ultraviolet [UV] curing

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- 2224/83877 Moisture curing, i.e. curing by exposing to humidity, e.g. for silicones and polyurethanes
- 2224/83888 Hardening the adhesive by cooling, e.g. for thermoplastics or hot-melt adhesives
- 2224/83885 Combinations of two or more hardening methods provided for in at least two different groups from [H01L 2224/83855](#) - [H01L 2224/83888](#), e.g. for hybrid thermoplastic-thermosetting adhesives
- 2224/83886 Involving a self-assembly process, e.g. self-agglomeration of a material dispersed in a fluid
- 2224/83887 Auxiliary means therefor, e.g. for self-assembly activation
- 2224/83888 with special adaptation of the surface of the body to be connected, e.g. surface shape specially adapted for the self-assembly process
- 2224/83889 involving the material of the bonding area, e.g. bonding pad
- 2224/8389 using an inorganic non metallic glass type adhesive, e.g. solder glass
- 2224/83893 Anodic bonding, i.e. bonding by applying a voltage across the interface in order to induce ions migration leading to an irreversible chemical bond
- 2224/83894 Direct bonding, i.e. joining surfaces by means of intermolecular attracting interactions at their interfaces, e.g. covalent bonds, van der Waals forces
- 2224/83895 between electrically conductive surfaces, e.g. copper-copper direct bonding, surface activated bonding
- 2224/83896 between electrically insulating surfaces, e.g. oxide or nitride layers
- 2224/83897 Mechanical interlocking, e.g. anchoring, hook and loop-type fastening or the like
- 2224/83898 Press-fitting, i.e. pushing the parts together and fastening by friction, e.g. by compression of one part against the other
- 2224/83899 using resilient parts in the layer connector or in the bonding area
- 2224/839 with the layer connector not providing any mechanical bonding
- 2224/83901 Pressing the layer connector against the bonding areas by means of another connector
- 2224/83902 by means of another layer connector
- 2224/83903 by means of a bump connector
- 2224/83904 by means of an encapsulation layer or foil
- 2224/83905 Combinations of bonding methods provided for in at least two different groups from [H01L 2224/838](#) - [H01L 2224/83904](#)
- 2224/83906 Specific sequence of method steps
- 2224/83907 Intermediate bonding, i.e. intermediate bonding step for temporarily bonding the semiconductor or solid-state body, followed by at least a further bonding step
- 2224/83908 involving monitoring, e.g. feedback loop
- 2224/83909 Post-treatment of the layer connector or bonding area
- 2224/8391 Cleaning, e.g. oxide removal step, desmearing
- 2224/83911 Chemical cleaning, e.g. etching, flux
- 2224/83912 Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
- 2224/83913 Plasma cleaning
- 2224/83914 Thermal cleaning, e.g. using laser ablation or by electrostatic corona discharge
- 2224/83919 Combinations of two or more cleaning methods provided for in at least two different groups from [H01L 2224/8391](#) - [H01L 2224/83914](#)
- 2224/8392 Applying permanent coating, e.g. protective coating
- 2224/8393 Reshaping
- 2224/83931 by chemical means, e.g. etching
- 2224/83935 by heating means, e.g. reflowing
- 2224/83937 using a polychromatic heating lamp
- 2224/83939 using a laser
- 2224/83941 Induction heating, i.e. eddy currents
- 2224/83943 using a flame torch, e.g. hydrogen torch
- 2224/83945 using a corona discharge, e.g. electronic flame off [EFO]
- 2224/83947 by mechanical means, e.g. "pull-and-cut", pressing, stamping
- 2224/83948 Thermal treatments, e.g. annealing, controlled cooling
- 2224/83951 Forming additional members, e.g. for reinforcing, fillet sealant
- 2224/83986 Specific sequence of steps, e.g. repetition of manufacturing steps, time sequence
- 2224/84 using a strap connector
- 2224/84001 involving a temporary auxiliary member not forming part of the bonding apparatus
- 2224/84002 being a removable or sacrificial coating
- 2224/84005 being a temporary substrate
- 2224/84007 involving a permanent auxiliary member being left in the finished device, e.g. aids for holding or protecting the strap connector during or after the bonding process
- 2224/84009 Pre-treatment of the connector and/or the bonding area
- 2224/8401 Cleaning, e.g. oxide removal step, desmearing
- 2224/84011 Chemical cleaning, e.g. etching, flux
- 2224/84012 Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
- 2224/84013 Plasma cleaning
- 2224/84014 Thermal cleaning, e.g. decomposition, sublimation
- 2224/84019 Combinations of two or more cleaning methods provided for in at least two different groups from [H01L 2224/8401](#) - [H01L 2224/84014](#)
- 2224/8402 Applying permanent coating, e.g. in-situ coating
- 2224/8403 Reshaping
- 2224/84031 by chemical means, e.g. etching, anodisation
- 2224/84035 by heating means, e.g. "free-air-ball"
- 2224/84037 using a polychromatic heating lamp
- 2224/84039 using a laser
- 2224/84041 Induction heating, i.e. eddy currents

- 2224/84043 using a flame torch, e.g. hydrogen torch
- 2224/84045 using a corona discharge, e.g. electronic flame off [EFO]
- 2224/84047 by mechanical means, e.g. severing, pressing, stamping
- 2224/84048 Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling
- 2224/84051 Forming additional members
- 2224/84053 Bonding environment
- 2224/84054 Composition of the atmosphere
- 2224/84055 being oxidating
- 2224/84065 being reducing
- 2224/84075 being inert
- 2224/84085 being a liquid (e.g. for fluidic self-assembly)
- 2224/8409 Vacuum
- 2224/84091 Under pressure
- 2224/84092 Atmospheric pressure
- 2224/84093 Transient conditions, e.g. gas-flow
- 2224/84095 Temperature settings
- 2224/84096 Transient conditions
- 2224/84097 Heating
- 2224/84098 Cooling
- 2224/84099 Ambient temperature
- 2224/841 the connector being supplied to the parts to be connected in the bonding apparatus
- 2224/8411 involving protection against electrical discharge, e.g. removing electrostatic charge
- 2224/8412 Aligning
- 2224/84121 Active alignment, i.e. by apparatus steering, e.g. optical alignment using marks or sensors
- 2224/84122 by detecting inherent features of, or outside, the semiconductor or solid-state body
- 2224/84123 Shape or position of the body
- 2224/84125 Bonding areas on the body
- 2224/84127 Bonding areas outside the body
- 2224/84129 Shape or position of the other item
- 2224/8413 using marks formed on the semiconductor or solid-state body
- 2224/84132 using marks formed outside the semiconductor or solid-state body, i.e. "off-chip"
- 2224/84136 involving guiding structures, e.g. spacers or supporting members
- 2224/84138 the guiding structures being at least partially left in the finished device
- 2224/84143 Passive alignment, i.e. self alignment, e.g. using surface energy, chemical reactions, thermal equilibrium
- 2224/84148 involving movement of a part of the bonding apparatus
- 2224/84149 being the lower part of the bonding apparatus, i.e. holding means for the bodies to be connected, e.g. XY table
- 2224/8415 Rotational movements
- 2224/8416 Translational movements
- 2224/84169 being the upper part of the bonding apparatus, i.e. bonding head,
- 2224/8417 Rotational movements
- 2224/8418 Translational movements
- 2224/84181 connecting first on the semiconductor or solid-state body, i.e. on-chip, regular stitch
- 2224/84186 connecting first outside the semiconductor or solid-state body, i.e. off-chip, reverse stitch
- 2224/84191 connecting first both on and outside the semiconductor or solid-state body, i.e. regular and reverse stitches
- 2224/84196 involving intermediate connecting steps before cutting the strap connector
- 2224/842 Applying energy for connecting
- 2224/84201 Compression bonding
- 2224/84203 Thermocompression bonding
- 2224/84205 Ultrasonic bonding
- 2224/84206 Direction of oscillation
- 2224/84207 Thermosonic bonding
- 2224/8421 with energy being in the form of electromagnetic radiation
- 2224/84212 Induction heating, i.e. eddy currents
- 2224/84214 using a laser
- 2224/8423 Polychromatic or infrared lamp heating
- 2224/84232 using an autocatalytic reaction, e.g. exothermic brazing
- 2224/84234 using means for applying energy being within the device, e.g. integrated heater
- 2224/84236 using electro-static corona discharge
- 2224/84237 using an electron beam ([electron beam welding in general B23K 15/00](#))
- 2224/84238 using electric resistance welding, i.e. ohmic heating
- 2224/8434 Bonding interfaces of the connector
- 2224/84345 Shape, e.g. interlocking features
- 2224/84355 having an external coating, e.g. protective bond-through coating
- 2224/84359 Material
- 2224/8436 Bonding interfaces of the semiconductor or solid state body
- 2224/84365 Shape, e.g. interlocking features
- 2224/84375 having an external coating, e.g. protective bond-through coating
- 2224/84379 Material
- 2224/8438 Bonding interfaces outside the semiconductor or solid-state body
- 2224/84385 Shape, e.g. interlocking features
- 2224/84395 having an external coating, e.g. protective bond-through coating
- 2224/84399 Material
- 2224/844 with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
- 2224/84401 the principal constituent melting at a temperature of less than 400°C
- 2224/84405 Gallium [Ga] as principal constituent
- 2224/84409 Indium [In] as principal constituent
- 2224/84411 Tin [Sn] as principal constituent
- 2224/84413 Bismuth [Bi] as principal constituent
- 2224/84414 Thallium [Tl] as principal constituent
- 2224/84416 Lead [Pb] as principal constituent
- 2224/84417 the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
- 2224/84418 Zinc [Zn] as principal constituent

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2224/8442	Antimony [Sb] as principal constituent	2224/84498	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/84423	. . . . .	Magnesium [Mg] as principal constituent	2224/84499	. . . . .	Material of the matrix
2224/84424	. . . . .	Aluminium [Al] as principal constituent	2224/845	. . . . .	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
2224/84438	. . . . .	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/84501	. . . . .	the principal constituent melting at a temperature of less than 400°C
2224/84439	. . . . .	Silver [Ag] as principal constituent	2224/84505	. . . . .	Gallium [Ga] as principal constituent
2224/84444	. . . . .	Gold [Au] as principal constituent	2224/84509	. . . . .	Indium [In] as principal constituent
2224/84447	. . . . .	Copper [Cu] as principal constituent	2224/84511	. . . . .	Tin [Sn] as principal constituent
2224/84449	. . . . .	Manganese [Mn] as principal constituent	2224/84513	. . . . .	Bismuth [Bi] as principal constituent
2224/84455	. . . . .	Nickel [Ni] as principal constituent	2224/84514	. . . . .	Thallium [Tl] as principal constituent
2224/84457	. . . . .	Cobalt [Co] as principal constituent	2224/84516	. . . . .	Lead [Pb] as principal constituent
2224/8446	. . . . .	Iron [Fe] as principal constituent	2224/84517	. . . . .	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/84463	. . . . .	the principal constituent melting at a temperature of greater than 1550°C	2224/84518	. . . . .	Zinc [Zn] as principal constituent
2224/84464	. . . . .	Palladium [Pd] as principal constituent	2224/8452	. . . . .	Antimony [Sb] as principal constituent
2224/84466	. . . . .	Titanium [Ti] as principal constituent	2224/84523	. . . . .	Magnesium [Mg] as principal constituent
2224/84469	. . . . .	Platinum [Pt] as principal constituent	2224/84524	. . . . .	Aluminium [Al] as principal constituent
2224/8447	. . . . .	Zirconium [Zr] as principal constituent	2224/84538	. . . . .	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/84471	. . . . .	Chromium [Cr] as principal constituent	2224/84539	. . . . .	Silver [Ag] as principal constituent
2224/84472	. . . . .	Vanadium [V] as principal constituent	2224/84544	. . . . .	Gold [Au] as principal constituent
2224/84473	. . . . .	Rhodium [Rh] as principal constituent	2224/84547	. . . . .	Copper [Cu] as principal constituent
2224/84476	. . . . .	Ruthenium [Ru] as principal constituent	2224/84549	. . . . .	Manganese [Mn] as principal constituent
2224/84478	. . . . .	Iridium [Ir] as principal constituent	2224/84555	. . . . .	Nickel [Ni] as principal constituent
2224/84479	. . . . .	Niobium [Nb] as principal constituent	2224/84557	. . . . .	Cobalt [Co] as principal constituent
2224/8448	. . . . .	Molybdenum [Mo] as principal constituent	2224/8456	. . . . .	Iron [Fe] as principal constituent
2224/84481	. . . . .	Tantalum [Ta] as principal constituent	2224/84563	. . . . .	the principal constituent melting at a temperature of greater than 1550°C
2224/84483	. . . . .	Rhenium [Re] as principal constituent	2224/84564	. . . . .	Palladium [Pd] as principal constituent
2224/84484	. . . . .	Tungsten [W] as principal constituent	2224/84566	. . . . .	Titanium [Ti] as principal constituent
2224/84486	. . . . .	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/84569	. . . . .	Platinum [Pt] as principal constituent
2224/84487	. . . . .	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/84488)	2224/8457	. . . . .	Zirconium [Zr] as principal constituent
2224/84488	. . . . .	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/84571	. . . . .	Chromium [Cr] as principal constituent
2224/8449	. . . . .	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy			
2224/84491	. . . . .	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene			
2224/84493	. . . . .	with a principal constituent of the material being a solid not provided for in groups H01L 2224/844 - H01L 2224/84491 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond			
2224/84494	. . . . .	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/844 - H01L 2224/84491			
2224/84495	with a principal constituent of the material being a gas not provided for in groups H01L 2224/844 - H01L 2224/84491			

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2224/84572	Vanadium [V] as principal constituent	2224/84613	Bismuth [Bi] as principal constituent
2224/84573	Rhodium [Rh] as principal constituent	2224/84614	Thallium [Tl] as principal constituent
2224/84576	Ruthenium [Ru] as principal constituent	2224/84616	Lead [Pb] as principal constituent
2224/84578	Iridium [Ir] as principal constituent	2224/84617	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/84579	Niobium [Nb] as principal constituent	2224/84618	Zinc [Zn] as principal constituent
2224/8458	Molybdenum [Mo] as principal constituent	2224/8462	Antimony [Sb] as principal constituent
2224/84581	Tantalum [Ta] as principal constituent	2224/84623	Magnesium [Mg] as principal constituent
2224/84583	Rhenium [Re] as principal constituent	2224/84624	Aluminium [Al] as principal constituent
2224/84584	Tungsten [W] as principal constituent	2224/84638	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/84586	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/84639	Silver [Ag] as principal constituent
2224/84587	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/84588)	2224/84644	Gold [Au] as principal constituent
2224/84588	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/84647	Copper [Cu] as principal constituent
2224/8459	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/84649	Manganese [Mn] as principal constituent
2224/84591	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene	2224/84655	Nickel [Ni] as principal constituent
2224/84593	with a principal constituent of the material being a solid not provided for in groups H01L 2224/845 - H01L 2224/84591 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond	2224/84657	Cobalt [Co] as principal constituent
2224/84594	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/845 - H01L 2224/84591	2224/8466	Iron [Fe] as principal constituent
2224/84595	with a principal constituent of the material being a gas not provided for in groups H01L 2224/845 - H01L 2224/84591	2224/84663	the principal constituent melting at a temperature of greater than 1550°C
2224/84598	Fillers	2224/84664	Palladium [Pd] as principal constituent
2224/84599	Base material	2224/84666	Titanium [Ti] as principal constituent
2224/846	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/84669	Platinum [Pt] as principal constituent
2224/84601	the principal constituent melting at a temperature of less than 400°C	2224/8467	Zirconium [Zr] as principal constituent
2224/84605	Gallium [Ga] as principal constituent	2224/84671	Chromium [Cr] as principal constituent
2224/84609	Indium [In] as principal constituent	2224/84672	Vanadium [V] as principal constituent
2224/84611	Tin [Sn] as principal constituent	2224/84673	Rhodium [Rh] as principal constituent
		2224/84676	Ruthenium [Ru] as principal constituent
		2224/84678	Iridium [Ir] as principal constituent
		2224/84679	Niobium [Nb] as principal constituent
		2224/8468	Molybdenum [Mo] as principal constituent
		2224/84681	Tantalum [Ta] as principal constituent

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2224/84683	Rhenium [Re] as principal constituent	2224/84717	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/84684	Tungsten [W] as principal constituent	2224/84718	Zinc [Zn] as principal constituent
2224/84686	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/8472	Antimony [Sb] as principal constituent
2224/84687	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/84688)	2224/84723	Magnesium [Mg] as principal constituent
2224/84688	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/84724	Aluminium [Al] as principal constituent
2224/8469	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/84738	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/84691	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene	2224/84739	Silver [Ag] as principal constituent
2224/84693	with a principal constituent of the material being a solid not provided for in groups H01L 2224/846 - H01L 2224/84691 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond	2224/84744	Gold [Au] as principal constituent
2224/84694	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/846 - H01L 2224/84691	2224/84747	Copper [Cu] as principal constituent
2224/84695	with a principal constituent of the material being a gas not provided for in groups H01L 2224/846 - H01L 2224/84691	2224/84749	Manganese [Mn] as principal constituent
2224/84698	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams	2224/84755	Nickel [Ni] as principal constituent
2224/84699	Coating material	2224/84757	Cobalt [Co] as principal constituent
2224/847	with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof	2224/8476	Iron [Fe] as principal constituent
2224/84701	the principal constituent melting at a temperature of less than 400°C	2224/84763	the principal constituent melting at a temperature of greater than 1550°C
2224/84705	Gallium [Ga] as principal constituent	2224/84764	Palladium [Pd] as principal constituent
2224/84709	Indium [In] as principal constituent	2224/84766	Titanium [Ti] as principal constituent
2224/84711	Tin [Sn] as principal constituent	2224/84769	Platinum [Pt] as principal constituent
2224/84713	Bismuth [Bi] as principal constituent	2224/8477	Zirconium [Zr] as principal constituent
2224/84714	Thallium [Tl] as principal constituent	2224/84771	Chromium [Cr] as principal constituent
2224/84716	Lead [Pb] as principal constituent	2224/84772	Vanadium [V] as principal constituent
		2224/84773	Rhodium [Rh] as principal constituent
		2224/84776	Ruthenium [Ru] as principal constituent
		2224/84778	Iridium [Ir] as principal constituent
		2224/84779	Niobium [Nb] as principal constituent
		2224/8478	Molybdenum [Mo] as principal constituent
		2224/84781	Tantalum [Ta] as principal constituent
		2224/84783	Rhenium [Re] as principal constituent
		2224/84784	Tungsten [W] as principal constituent
		2224/84786	with a principal constituent of the material being a non metallic, non metalloid inorganic material

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- 2224/84787 Ceramics, e.g. crystalline carbides, nitrides or oxides ([glass ceramics H01L 2224/84788](#))
- 2224/84788 Glasses, e.g. amorphous oxides, nitrides or fluorides
- 2224/8479 with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
- 2224/84791 The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
- 2224/84793 with a principal constituent of the material being a solid not provided for in groups [H01L 2224/847](#) - [H01L 2224/84791](#), e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
- 2224/84794 with a principal constituent of the material being a liquid not provided for in groups [H01L 2224/847](#) - [H01L 2224/84791](#)
- 2224/84795 with a principal constituent of the material being a gas not provided for in groups [H01L 2224/847](#) - [H01L 2224/84791](#)
- 2224/84798 with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
- 2224/84799 Shape or distribution of the fillers
- 2224/848 Bonding techniques
- 2224/84801 Soldering or alloying
- 2224/84805 involving forming a eutectic alloy at the bonding interface
- 2224/8481 involving forming an intermetallic compound at the bonding interface
- 2224/84815 Reflow soldering
- 2224/8482 Diffusion bonding
- 2224/84825 Solid-liquid interdiffusion
- 2224/8483 Solid-solid interdiffusion
- 2224/8484 Sintering
- 2224/8485 using a polymer adhesive, e.g. an adhesive based on silicone, epoxy, polyimide, polyester
- 2224/84855 Hardening the adhesive by curing, i.e. thermosetting
- 2224/84856 Pre-cured adhesive, i.e. B-stage adhesive
- 2224/84859 Localised curing of parts of the connector
- 2224/84862 Heat curing
- 2224/84865 Microwave curing
- 2224/84868 Infrared [IR] curing
- 2224/84871 Visible light curing
- 2224/84874 Ultraviolet [UV] curing
- 2224/84877 Moisture curing, i.e. curing by exposing to humidity, e.g. for silicones and polyurethanes
- 2224/8488 Hardening the adhesive by cooling, e.g. for thermoplastics or hot-melt adhesives
- 2224/84885 Combinations of two or more hardening methods provided for in at least two different groups from [H01L 2224/84855](#) - [H01L 2224/8488](#), e.g. for hybrid thermoplastic-thermosetting adhesives
- 2224/8489 using an inorganic non metallic glass type adhesive, e.g. solder glass
- 2224/84893 Anodic bonding, i.e. bonding by applying a voltage across the interface in order to induce ions migration leading to an irreversible chemical bond
- 2224/84895 Direct bonding, i.e. joining surfaces by means of intermolecular attracting interactions at their interfaces, e.g. covalent bonds, van der Waals forces
- 2224/84897 between electrically conductive surfaces, e.g. copper-copper direct bonding, surface activated bonding
- 2224/84898 between electrically insulating surfaces, e.g. oxide or nitride layersg
- 2224/84899 Combinations of bonding methods provided for in at least two different groups from [H01L 2224/848](#) - [H01L 2224/84898](#)
- 2224/849 involving monitoring, e.g. feedback loop
- 2224/84909 Post-treatment of the connector or bonding area
- 2224/8491 Cleaning, e.g. oxide removal step, desmearing
- 2224/84911 Chemical cleaning, e.g. etching, flux
- 2224/84912 Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
- 2224/84913 Plasma cleaning
- 2224/84914 Thermal cleaning, e.g. using laser ablation or by electrostatic corona discharge
- 2224/84919 Combinations of two or more cleaning methods provided for in at least two different groups from [H01L 2224/8491](#) - [H01L 2224/84914](#)
- 2224/8492 Applying permanent coating, e.g. protective coating
- 2224/8493 Reshaping, e.g. for severing the strap, modifying the loop shape
- 2224/84931 by chemical means, e.g. etching
- 2224/84935 by heating means, e.g. reflowing
- 2224/84937 using a polychromatic heating lamp
- 2224/84939 using a laser
- 2224/84941 Induction heating, i.e. eddy currents
- 2224/84943 using a flame torch, e.g. hydrogen torch
- 2224/84945 using a corona discharge, e.g. electronic flame off [EFO]
- 2224/84947 by mechanical means, e.g. pressing, stamping
- 2224/84948 Thermal treatments, e.g. annealing, controlled cooling
- 2224/84951 Forming additional members, e.g. for reinforcing
- 2224/84986 Specific sequence of steps, e.g. repetition of manufacturing steps, time sequence
- 2224/85 using a wire connector
- 2224/85001 involving a temporary auxiliary member not forming part of the bonding apparatus, e.g. removable or sacrificial coating, film or substrate

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- 2224/85002 being a removable or sacrificial coating
- 2224/85005 being a temporary or sacrificial substrate
- 2224/85007 . . . involving a permanent auxiliary member being left in the finished device, e.g. aids for holding or protecting the wire connector during or after the bonding process
- 2224/85009 . . . Pre-treatment of the connector or the bonding area
- 2224/8501 Cleaning, e.g. oxide removal step, desmearing
- 2224/85011 Chemical cleaning, e.g. etching, flux
- 2224/85012 Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
- 2224/85013 Plasma cleaning
- 2224/85014 Thermal cleaning, e.g. decomposition, sublimation
- 2224/85016 using a laser
- 2224/85017 Electron beam cleaning
- 2224/85019 Combinations of two or more cleaning methods provided for in at least two different groups from [H01L 2224/8501](#) - [H01L 2224/85014](#)
- 2224/8502 Applying permanent coating, e.g. in-situ coating
- 2224/8503 Reshaping, e.g. forming the ball or the wedge of the wire connector
- 2224/85031 by chemical means, e.g. etching, anodisation
- 2224/85035 by heating means, e.g. "free-air-ball"
- 2224/85037 using a polychromatic heating lamp
- 2224/85039 using a laser
- 2224/85041 Induction heating, i.e. eddy currents
- 2224/85043 using a flame torch, e.g. hydrogen torch
- 2224/85045 using a corona discharge, e.g. electronic flame off [EFO]
- 2224/85047 by mechanical means, e.g. severing, pressing, stamping
- 2224/85048 Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling
- 2224/85051 Forming additional members, e.g. for "wedge-on-ball", "ball-on-wedge", "ball-on-ball" connections
- 2224/85053 . . . Bonding environment
- 2224/85054 Composition of the atmosphere
- 2224/85055 being oxidating
- 2224/85065 being reducing
- 2224/85075 being inert
- 2224/85085 being a liquid, e.g. for fluidic self-assembly
- 2224/8509 Vacuum
- 2224/85091 Under pressure
- 2224/85092 Atmospheric pressure
- 2224/85093 Transient conditions, e.g. gas-flow
- 2224/85095 Temperature settings
- 2224/85096 Transient conditions
- 2224/85097 Heating
- 2224/85098 Cooling
- 2224/85099 Ambient temperature
- 2224/851 . . . the connector being supplied to the parts to be connected in the bonding apparatus
- 2224/8511 . . . involving protection against electrical discharge, e.g. removing electrostatic charge
- 2224/8512 . . . Aligning
- 2224/85121 Active alignment, i.e. by apparatus steering, e.g. optical alignment using marks or sensors
- 2224/85122 by detecting inherent features of, or outside, the semiconductor or solid-state body
- 2224/85123 Shape or position of the body
- 2224/85125 Bonding areas on the body
- 2224/85127 Bonding areas outside the body
- 2224/85129 Shape or position of the other item
- 2224/8513 using marks formed on the semiconductor or solid-state body
- 2224/85132 using marks formed outside the semiconductor or solid-state body, i.e. "off-chip"
- 2224/85136 involving guiding structures, e.g. spacers or supporting members
- 2224/85138 the guiding structures being at least partially left in the finished device
- 2224/85143 Passive alignment, i.e. self alignment, e.g. using surface energy, chemical reactions, thermal equilibrium
- 2224/85148 involving movement of a part of the bonding apparatus
- 2224/85149 being the lower part of the bonding apparatus, i.e. holding means for the bodies to be connected, e.g. XY table
- 2224/8515 Rotational movements
- 2224/8516 Translational movements
- 2224/85169 being the upper part of the bonding apparatus, i.e. bonding head, e.g. capillary or wedge
- 2224/8517 Rotational movements
- 2224/8518 Translational movements
- 2224/85181 connecting first on the semiconductor or solid-state body, i.e. on-chip, regular stitch
- 2224/85186 connecting first outside the semiconductor or solid-state body, i.e. off-chip, reverse stitch
- 2224/85191 connecting first both on and outside the semiconductor or solid-state body, i.e. regular and reverse stitches
- 2224/85196 involving intermediate connecting steps before cutting the wire connector
- 2224/852 . . . Applying energy for connecting
- 2224/85201 Compression bonding
- 2224/85203 Thermocompression bonding
- 2224/85205 Ultrasonic bonding
- 2224/85206 Direction of oscillation
- 2224/85207 Thermosonic bonding
- 2224/8521 with energy being in the form of electromagnetic radiation
- 2224/85212 Induction heating, i.e. eddy currents
- 2224/85214 using a laser
- 2224/8523 Polychromatic or infrared lamp heating
- 2224/85232 using an autocatalytic reaction, e.g. exothermic brazing
- 2224/85234 using means for applying energy being within the device, e.g. integrated heater
- 2224/85236 using electro-static corona discharge
- 2224/85237 using electron beam (using [electron beam in general B23K 15/00](#))

2224/85238	. . . . .	using electric resistance welding, i.e. ohmic heating	2224/85472	. . . . .	Vanadium (V) as principal constituent
2224/8534	. . . . .	Bonding interfaces of the connector	2224/85473	. . . . .	Rhodium (Rh) as principal constituent
2224/85345	. . . . .	Shape, e.g. interlocking features	2224/85476	. . . . .	Ruthenium (Ru) as principal constituent
2224/85355	. . . . .	having an external coating, e.g. protective bond-through coating	2224/85478	. . . . .	Iridium (Ir) as principal constituent
2224/85359	. . . . .	Material	2224/85479	. . . . .	Niobium (Nb) as principal constituent
2224/8536	. . . . .	Bonding interfaces of the semiconductor or solid state body	2224/8548	. . . . .	Molybdenum (Mo) as principal constituent
2224/85365	. . . . .	Shape, e.g. interlocking features	2224/85481	. . . . .	Tantalum (Ta) as principal constituent
2224/85375	. . . . .	having an external coating, e.g. protective bond-through coating	2224/85483	. . . . .	Rhenium (Re) as principal constituent
2224/85379	. . . . .	Material	2224/85484	. . . . .	Tungsten (W) as principal constituent
2224/8538	. . . . .	Bonding interfaces outside the semiconductor or solid-state body	2224/85486	. . . . .	with a principal constituent of the material being a non metallic, non metalloid inorganic material
2224/85385	. . . . .	Shape, e.g. interlocking features	2224/85487	. . . . .	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/85488)
2224/85395	. . . . .	having an external coating, e.g. protective bond-through coating	2224/85488	. . . . .	Glasses, e.g. amorphous oxides, nitrides or fluorides
2224/85399	. . . . .	Material	2224/8549	. . . . .	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/854	. . . . .	with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof	2224/85491	. . . . .	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/85401	. . . . .	the principal constituent melting at a temperature of less than 400°C	2224/85493	. . . . .	with a principal constituent of the material being a solid not provided for in groups H01L 2224/854 - H01L 2224/85491 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/85405	. . . . .	Gallium (Ga) as principal constituent	2224/85494	. . . . .	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/854 - H01L 2224/85491
2224/85409	. . . . .	Indium (In) as principal constituent	2224/85495	. . . . .	with a principal constituent of the material being a gas not provided for in groups H01L 2224/854 - H01L 2224/85491
2224/85411	. . . . .	Tin (Sn) as principal constituent	2224/85498	. . . . .	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/85413	. . . . .	Bismuth (Bi) as principal constituent	2224/85499	. . . . .	Material of the matrix
2224/85414	. . . . .	Thallium (Tl) as principal constituent	2224/855	. . . . .	with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
2224/85416	. . . . .	Lead (Pb) as principal constituent	2224/85501	. . . . .	the principal constituent melting at a temperature of less than 400°C
2224/85417	. . . . .	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C	2224/85505	. . . . .	Gallium (Ga) as principal constituent
2224/85418	. . . . .	Zinc (Zn) as principal constituent	2224/85509	. . . . .	Indium (In) as principal constituent
2224/8542	. . . . .	Antimony (Sb) as principal constituent	2224/85511	. . . . .	Tin (Sn) as principal constituent
2224/85423	. . . . .	Magnesium (Mg) as principal constituent	2224/85513	. . . . .	Bismuth (Bi) as principal constituent
2224/85424	. . . . .	Aluminium (Al) as principal constituent	2224/85514	. . . . .	Thallium (Tl) as principal constituent
2224/85438	. . . . .	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/85516	. . . . .	Lead (Pb) as principal constituent
2224/85439	. . . . .	Silver (Ag) as principal constituent	2224/85517	. . . . .	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/85444	. . . . .	Gold (Au) as principal constituent	2224/85518	. . . . .	Zinc (Zn) as principal constituent
2224/85447	. . . . .	Copper (Cu) as principal constituent			
2224/85449	. . . . .	Manganese (Mn) as principal constituent			
2224/85455	. . . . .	Nickel (Ni) as principal constituent			
2224/85457	. . . . .	Cobalt (Co) as principal constituent			
2224/8546	. . . . .	Iron (Fe) as principal constituent			
2224/85463	. . . . .	the principal constituent melting at a temperature of greater than 1550°C			
2224/85464	. . . . .	Palladium (Pd) as principal constituent			
2224/85466	. . . . .	Titanium (Ti) as principal constituent			
2224/85469	. . . . .	Platinum (Pt) as principal constituent			
2224/8547	Zirconium (Zr) as principal constituent			
2224/85471	Chromium (Cr) as principal constituent			

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2224/8552	Antimony (Sb) as principal constituent	2224/8559	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
2224/85523	Magnesium (Mg) as principal constituent	2224/85591	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
2224/85524	Aluminium (Al) as principal constituent	2224/85593	with a principal constituent of the material being a solid not provided for in groups H01L 2224/855 - H01L 2224/85591 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
2224/85538	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C	2224/85594	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/855 - H01L 2224/85591
2224/85539	Silver (Ag) as principal constituent	2224/85595	with a principal constituent of the material being a gas not provided for in groups H01L 2224/855 - H01L 2224/85591
2224/85544	Gold (Au) as principal constituent	2224/85598	Fillers
2224/85547	Copper (Cu) as principal constituent	2224/85599	Base material
2224/85549	Manganese (Mn) as principal constituent	2224/856	with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
2224/85555	Nickel (Ni) as principal constituent	2224/85601	the principal constituent melting at a temperature of less than 400°C
2224/85557	Cobalt (Co) as principal constituent	2224/85605	Gallium (Ga) as principal constituent
2224/85556	Iron (Fe) as principal constituent	2224/85609	Indium (In) as principal constituent
2224/85563	the principal constituent melting at a temperature of greater than 1550°C	2224/85611	Tin (Sn) as principal constituent
2224/85564	Palladium (Pd) as principal constituent	2224/85613	Bismuth (Bi) as principal constituent
2224/85566	Titanium (Ti) as principal constituent	2224/85614	Thallium (Tl) as principal constituent
2224/85569	Platinum (Pt) as principal constituent	2224/85616	Lead (Pb) as principal constituent
2224/8557	Zirconium (Zr) as principal constituent	2224/85617	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/85571	Chromium (Cr) as principal constituent	2224/85618	Zinc (Zn) as principal constituent
2224/85572	Vanadium (V) as principal constituent	2224/8562	Antimony (Sb) as principal constituent
2224/85573	Rhodium (Rh) as principal constituent	2224/85623	Magnesium (Mg) as principal constituent
2224/85576	Ruthenium (Ru) as principal constituent	2224/85624	Aluminium (Al) as principal constituent
2224/85578	Iridium (Ir) as principal constituent	2224/85638	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/85579	Niobium (Nb) as principal constituent	2224/85639	Silver (Ag) as principal constituent
2224/8558	Molybdenum (Mo) as principal constituent	2224/85644	Gold (Au) as principal constituent
2224/85581	Tantalum (Ta) as principal constituent		
2224/85583	Rhenium (Re) as principal constituent		
2224/85584	Tungsten (W) as principal constituent		
2224/85586	with a principal constituent of the material being a non metallic, non metalloid inorganic material		
2224/85587	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/85588)		
2224/85588	Glasses, e.g. amorphous oxides, nitrides or fluorides		

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2224/85647	Copper (Cu) as principal constituent	2224/85694	with a principal constituent of the material being a liquid not provided for in groups H01L 2224/856 - H01L 2224/85691
2224/85649	Manganese (Mn) as principal constituent	2224/85695	with a principal constituent of the material being a gas not provided for in groups H01L 2224/856 - H01L 2224/85691
2224/85655	Nickel (Ni) as principal constituent	2224/85698	with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
2224/85657	Cobalt (Co) as principal constituent	2224/85699	Coating material
2224/85666	Iron (Fe) as principal constituent	2224/857	with a principal constituent of the material being a metal or a metalloid, e.g. boron (B), silicon (Si), germanium (Ge), arsenic (As), antimony (Sb), tellurium (Te) and polonium (Po), and alloys thereof
2224/85663	the principal constituent melting at a temperature of greater than 1550°C	2224/85701	the principal constituent melting at a temperature of less than 400°C
2224/85664	Palladium (Pd) as principal constituent	2224/85705	Gallium (Ga) as principal constituent
2224/85666	Titanium (Ti) as principal constituent	2224/85709	Indium (In) as principal constituent
2224/85669	Platinum (Pt) as principal constituent	2224/85711	Tin (Sn) as principal constituent
2224/8567	Zirconium (Zr) as principal constituent	2224/85713	Bismuth (Bi) as principal constituent
2224/85671	Chromium (Cr) as principal constituent	2224/85714	Thallium (Tl) as principal constituent
2224/85672	Vanadium (V) as principal constituent	2224/85716	Lead (Pb) as principal constituent
2224/85673	Rhodium (Rh) as principal constituent	2224/85717	the principal constituent melting at a temperature of greater than or equal to 400°C and less than 950°C
2224/85676	Ruthenium (Ru) as principal constituent	2224/85718	Zinc (Zn) as principal constituent
2224/85678	Iridium (Ir) as principal constituent	2224/8572	Antimony (Sb) as principal constituent
2224/85679	Niobium (Nb) as principal constituent	2224/85723	Magnesium (Mg) as principal constituent
2224/8568	Molybdenum (Mo) as principal constituent	2224/85724	Aluminium (Al) as principal constituent
2224/85681	Tantalum (Ta) as principal constituent	2224/85738	the principal constituent melting at a temperature of greater than or equal to 950°C and less than 1550°C
2224/85683	Rhenium (Re) as principal constituent	2224/85739	Silver (Ag) as principal constituent
2224/85684	Tungsten (W) as principal constituent	2224/85744	Gold (Au) as principal constituent
2224/85686	with a principal constituent of the material being a non metallic, non metalloid inorganic material	2224/85747	Copper (Cu) as principal constituent
2224/85687	Ceramics, e.g. crystalline carbides, nitrides or oxides (glass ceramics H01L 2224/85688)	2224/85749	Manganese (Mn) as principal constituent
2224/85688	Glasses, e.g. amorphous oxides, nitrides or fluorides	2224/85755	Nickel (Ni) as principal constituent
2224/8569	with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy	2224/85757	Cobalt (Co) as principal constituent
2224/85691	The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene		
2224/85693	with a principal constituent of the material being a solid not provided for in groups H01L 2224/856 - H01L 2224/85691 , e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond		

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- 2224/8576 Iron (Fe) as principal constituent
- 2224/85763 the principal constituent melting at a temperature of greater than 1550°C
- 2224/85764 Palladium (Pd) as principal constituent
- 2224/85766 Titanium (Ti) as principal constituent
- 2224/85769 Platinum (Pt) as principal constituent
- 2224/8577 Zirconium (Zr) as principal constituent
- 2224/85771 Chromium (Cr) as principal constituent
- 2224/85772 Vanadium (V) as principal constituent
- 2224/85773 Rhodium (Rh) as principal constituent
- 2224/85776 Ruthenium (Ru) as principal constituent
- 2224/85778 Iridium (Ir) as principal constituent
- 2224/85779 Niobium (Nb) as principal constituent
- 2224/8578 Molybdenum (Mo) as principal constituent
- 2224/85781 Tantalum (Ta) as principal constituent
- 2224/85783 Rhenium (Re) as principal constituent
- 2224/85784 Tungsten (W) as principal constituent
- 2224/85786 with a principal constituent of the material being a non metallic, non metalloid inorganic material
- 2224/85787 Ceramics, e.g. crystalline carbides, nitrides or oxides ([glass ceramics H01L 2224/85788](#))
- 2224/85788 Glasses, e.g. amorphous oxides, nitrides or fluorides
- 2224/8579 with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
- 2224/85791 The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
- 2224/85793 with a principal constituent of the material being a solid not provided for in groups [H01L 2224/857](#) - [H01L 2224/85791](#), e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
- 2224/85794 with a principal constituent of the material being a liquid not provided for in groups [H01L 2224/857](#) - [H01L 2224/85791](#)
- 2224/85795 with a principal constituent of the material being a gas not provided for in groups [H01L 2224/857](#) - [H01L 2224/85791](#)
- 2224/85798 with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
- 2224/85799 Shape or distribution of the fillers
- 2224/858 Bonding techniques
- 2224/85801 Soldering or alloying
- 2224/85805 involving forming a eutectic alloy at the bonding interface
- 2224/8581 involving forming an intermetallic compound at the bonding interface
- 2224/85815 Reflow soldering
- 2224/8582 Diffusion bonding
- 2224/85825 Solid-liquid interdiffusion
- 2224/8583 Solid-solid interdiffusion, e.g. "direct bonding"
- 2224/8584 Sintering
- 2224/8585 using a polymer adhesive, e.g. an adhesive based on silicone, epoxy, polyimide, polyester
- 2224/85855 Hardening the adhesive by curing, i.e. thermosetting
- 2224/85856 Pre-cured adhesive, i.e. B-stage adhesive
- 2224/85859 Localised curing of parts of the connector
- 2224/85862 Heat curing
- 2224/85865 Microwave curing
- 2224/85868 Infrared [IR] curing
- 2224/85871 Visible light curing
- 2224/85874 Ultraviolet [UV] curing
- 2224/85877 Moisture curing, i.e. curing by exposing to humidity, e.g. for silicones and polyurethanes
- 2224/8588 Hardening the adhesive by cooling, e.g. for thermoplastics or hot-melt adhesives
- 2224/85885 Combinations of two or more hardening methods provided for in at least two different groups from [H01L 2224/85855](#) - [H01L 2224/8588](#), e.g. for hybrid thermoplastic-thermosetting adhesives
- 2224/8589 using an inorganic non metallic glass type adhesive, e.g. solder glass
- 2224/85893 Anodic bonding, i.e. bonding by applying a voltage across the interface in order to induce ions migration leading to an irreversible chemical bond
- 2224/85895 Direct bonding, i.e. joining surfaces by means of intermolecular attracting interactions at their interfaces, e.g. covalent bonds, van der Waals forces
- 2224/85897 between electrically conductive surfaces, e.g. copper-copper direct bonding, surface activated bonding
- 2224/85898 between electrically insulating surfaces, e.g. oxide or nitride layers
- 2224/85899 Combinations of bonding methods provided for in at least two different groups from [H01L 2224/858](#) - [H01L 2224/85898](#)
- 2224/859 involving monitoring, e.g. feedback loop

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- 2224/85909 . . . Post-treatment of the connector or wire bonding area
- 2224/8591 Cleaning, e.g. oxide removal step, desmearing
- 2224/85911 Chemical cleaning, e.g. etching, flux
- 2224/85912 Mechanical cleaning, e.g. abrasion using hydro blasting, brushes, ultrasonic cleaning, dry ice blasting, gas-flow
- 2224/85913 Plasma cleaning
- 2224/85914 Thermal cleaning, e.g. using laser ablation or by electrostatic corona discharge
- 2224/85916 using a laser
- 2224/85917 Electron beam cleaning
- 2224/85919 Combinations of two or more cleaning methods provided for in at least two different groups from [H01L 2224/8591](#) - [H01L 2224/85914](#)
- 2224/8592 Applying permanent coating, e.g. protective coating
- 2224/8593 Reshaping, e.g. for severing the wire, modifying the wedge or ball or the loop shape
- 2224/85931 by chemical means, e.g. etching
- 2224/85935 by heating means, e.g. reflowing
- 2224/85937 using a polychromatic heating lamp
- 2224/85939 using a laser
- 2224/85941 Induction heating, i.e. eddy currents
- 2224/85943 using a flame torch, e.g. hydrogen torch
- 2224/85945 using a corona discharge, e.g. electronic flame off [EFO]
- 2224/85947 by mechanical means, e.g. "pull-and-cut", pressing, stamping
- 2224/85948 Thermal treatments, e.g. annealing, controlled cooling
- 2224/85951 Forming additional members, e.g. for reinforcing
- 2224/85986 . . . Specific sequence of steps, e.g. repetition of manufacturing steps, time sequence
- 2224/86 . . using tape automated bonding [TAB]
- 2224/86001 . . . involving a temporary auxiliary member not forming part of the bonding apparatus
- 2224/86002 being a removable or sacrificial coating
- 2224/86005 being a temporary or sacrificial substrate
- 2224/86007 . . . involving a permanent auxiliary member being left in the finished device, e.g. aids for holding or protecting the TAB connector during or after the bonding process
- 2224/86009 . . . Pre-treatment of the connector or the bonding area
- 2224/8601 Cleaning, e.g. oxide removal step, desmearing
- 2224/8603 Reshaping
- 2224/86031 by chemical means, e.g. etching, anodisation
- 2224/86035 by heating
- 2224/86039 using a laser
- 2224/86045 using a corona discharge, e.g. electronic flame off [EFO]
- 2224/86047 by mechanical means, e.g. severing, pressing, stamping
- 2224/86048 Thermal treatment, e.g. annealing, controlled pre-heating or pre-cooling
- 2224/86051 Forming additional members
- 2224/86053 Bonding environment
- 2224/86054 Composition of the atmosphere
- 2224/86085 being a liquid, e.g. fluidic self-assembly
- 2224/8609 Vacuum
- 2224/86091 Under pressure
- 2224/86095 Temperature settings
- 2224/86096 Transient conditions
- 2224/86097 Heating
- 2224/86098 Cooling
- 2224/86099 Ambient temperature
- 2224/861 . . . the connector being supplied to the parts to be connected in the bonding apparatus
- 2224/8611 . . . involving protection against electrical discharge, e.g. removing electrostatic charge
- 2224/8612 Aligning
- 2224/86121 Active alignment, i.e. by apparatus steering, e.g. optical alignment using marks or sensors
- 2224/86122 by detecting inherent features of, or outside, the semiconductor or solid-state body
- 2224/8613 using marks formed on the semiconductor or solid-state body
- 2224/86132 using marks formed outside the semiconductor or solid-state body, i.e. "off-chip"
- 2224/86136 involving guiding structures, e.g. spacers or supporting members
- 2224/86138 the guiding structures being at least partially left in the finished device
- 2224/86143 Passive alignment, i.e. self alignment, e.g. using surface energy, chemical reactions, thermal equilibrium
- 2224/86148 involving movement of a part of the bonding apparatus
- 2224/86149 being the lower part of the bonding apparatus, i.e. holding means for the bodies to be connected, e.g. XY table
- 2224/8615 Rotational movements
- 2224/8616 Translational movements
- 2224/86169 being the upper part of the bonding apparatus, e.g. nozzle
- 2224/8617 Rotational movement
- 2224/8618 Translational movements
- 2224/86181 connecting first on the semiconductor or solid-state body, i.e. on-chip,
- 2224/86186 connecting first outside the semiconductor or solid-state body, i.e. off-chip
- 2224/86191 connecting first both on and outside the semiconductor or solid-state body
- 2224/862 Applying energy for connecting
- 2224/86201 Compression bonding
- 2224/86203 Thermo-compression bonding
- 2224/86205 Ultrasonic bonding
- 2224/86207 Thermosonic bonding
- 2224/8621 with energy being in the form of electromagnetic radiation
- 2224/86212 Induction heating, i.e. eddy currents
- 2224/86214 using a laser
- 2224/8623 Polychromatic or infrared lamp heating
- 2224/86232 using an autocatalytic reaction, e.g. exothermic brazing

- 2224/86234 using means for applying energy being within the device, e.g. integrated heater
- 2224/86236 using electro-static corona discharge
- 2224/86237 using electron beam ([electron beam in general B23K 15/00](#))
- 2224/86238 using electric resistance welding, i.e. ohmic heating
- 2224/8634 Bonding interfaces of the connector
- 2224/86345 Shape, e.g. interlocking features
- 2224/86355 having an external coating, e.g. protective bond-through coating
- 2224/86359 Material
- 2224/8636 Bonding interfaces of the semiconductor or solid state body
- 2224/86365 Shape, e.g. interlocking features
- 2224/86375 having an external coating, e.g. protective bond-through coating
- 2224/86379 Material
- 2224/8638 Bonding interfaces outside the semiconductor or solid-state body
- 2224/86385 Shape, e.g. interlocking features
- 2224/86395 having an external coating, e.g. protective bond-through coating
- 2224/86399 Material
- 2224/868 Bonding techniques
- 2224/86801 Soldering or alloying
- 2224/86805 involving forming a eutectic alloy at the bonding interface
- 2224/8681 involving forming an intermetallic compound at the bonding interface
- 2224/86815 Reflow soldering
- 2224/8682 Diffusion bonding
- 2224/86825 Solid-liquid interdiffusion
- 2224/8683 Solid-solid interdiffusion
- 2224/8684 Sintering
- 2224/8685 using a polymer adhesive, e.g. an adhesive based on silicone, epoxy, polyimide, polyester
- 2224/86855 Hardening the adhesive by curing, i.e. thermosetting
- 2224/86856 Pre-cured adhesive, i.e. B-stage adhesive
- 2224/86859 Localised curing of parts of the connector
- 2224/86862 Heat curing
- 2224/86865 Microwave curing
- 2224/86868 Infrared [IR] curing
- 2224/86871 Visible light curing
- 2224/86874 Ultraviolet [UV] curing
- 2224/86877 Moisture curing, i.e. curing by exposing to humidity, e.g. for silicones and polyurethanes
- 2224/8688 Hardening the adhesive by cooling, e.g. for thermoplastics or hot-melt adhesives
- 2224/86885 Combinations of two or more hardening methods provided for in at least two different groups selected from [H01L 2224/86855](#) - [H01L 2224/8688](#), e.g. hybrid thermoplastic-thermosetting adhesives
- 2224/8689 using an inorganic non metallic glass type adhesive, e.g. solder glass
- 2224/86893 Anodic bonding, i.e. bonding by applying a voltage across the interface in order to induce ions migration leading to an irreversible chemical bond
- 2224/86895 Direct bonding, i.e. joining surfaces by means of intermolecular attracting interactions at their interfaces, e.g. covalent bonds, van der Waals forces
- 2224/86896 between electrically conductive surfaces, e.g. copper-copper direct bonding, surface activated bonding
- 2224/86897 between electrically insulating surfaces, e.g. oxide or nitride layers
- 2224/86899 Combinations of bonding methods provided for in at least two different groups from [H01L 2224/868](#) - [H01L 2224/86897](#)
- 2224/869 involving monitoring, e.g. feedback loop
- 2224/86909 Post-treatment of the connector or the bonding area
- 2224/8691 Cleaning, e.g. oxide removal step, desmearing
- 2224/8693 Reshaping
- 2224/86931 by chemical means, e.g. etching, anodisation
- 2224/86935 by heating means
- 2224/86939 using a laser
- 2224/86945 using a corona discharge, e.g. electronic flame off [EFO]
- 2224/86947 by mechanical means, e.g. severing, pressing, stamping
- 2224/86948 Thermal treatments, e.g. annealing, controlled pre-heating or pre-cooling
- 2224/86951 Forming additional members
- 2224/86986 Specific sequence of steps, e.g. repetition of manufacturing steps, time sequence
- 2224/89 using at least one connector not provided for in any of the groups [H01L 2224/81](#) - [H01L 2224/86](#)
- 2224/90 Methods for connecting semiconductor or solid state bodies using means for bonding not being attached to, or not being formed on, the body surface to be connected, e.g. pressure contacts using springs or clips
- 2224/91 Methods for connecting semiconductor or solid state bodies including different methods provided for in two or more of groups [H01L 2224/80](#) - [H01L 2224/90](#)
- 2224/92 Specific sequence of method steps
- 2224/9201 Forming connectors during the connecting process, e.g. in-situ formation of bumps
- 2224/9202 Forming additional connectors after the connecting process
- 2224/9205 Intermediate bonding steps, i.e. partial connection of the semiconductor or solid-state body during the connecting process
- 2224/921 Connecting a surface with connectors of different types
- 2224/9211 Parallel connecting processes
- 2224/9212 Sequential connecting processes
- 2224/92122 the first connecting process involving a bump connector
- 2224/92124 the second connecting process involving a build-up interconnect
- 2224/92125 the second connecting process involving a layer connector

- 2224/92127 the second connecting process involving a wire connector
- 2224/92132 the first connecting process involving a build-up interconnect
- 2224/92133 the second connecting process involving a bump connector
- 2224/92135 the second connecting process involving a layer connector
- 2224/92136 the second connecting process involving a strap connector
- 2224/92137 the second connecting process involving a wire connector
- 2224/92138 the second connecting process involving a TAB connector
- 2224/92142 the first connecting process involving a layer connector
- 2224/92143 the second connecting process involving a bump connector
- 2224/92144 the second connecting process involving a build-up interconnect
- 2224/92147 the second connecting process involving a wire connector
- 2224/92148 the second connecting process involving a TAB connector
- 2224/92152 the first connecting process involving a strap connector
- 2224/92153 the second connecting process involving a bump connector
- 2224/92155 the second connecting process involving a layer connector
- 2224/92157 the second connecting process involving a wire connector
- 2224/92158 the second connecting process involving a TAB connector
- 2224/92162 the first connecting process involving a wire connector
- 2224/92163 the second connecting process involving a bump connector
- 2224/92164 the second connecting process involving a build-up interconnect
- 2224/92165 the second connecting process involving a layer connector
- 2224/92166 the second connecting process involving a strap connector
- 2224/92168 the second connecting process involving a TAB connector
- 2224/92172 the first connecting process involving a TAB connector
- 2224/92173 the second connecting process involving a bump connector
- 2224/92174 the second connecting process involving a build-up interconnect
- 2224/92175 the second connecting process involving a layer connector
- 2224/92176 the second connecting process involving a strap connector
- 2224/92177 the second connecting process involving a wire connector
- 2224/922 Connecting different surfaces of the semiconductor or solid-state body with connectors of different types
- 2224/9221 Parallel connecting processes
- 2224/9222 Sequential connecting processes
- 2224/92222 the first connecting process involving a bump connector
- 2224/92224 the second connecting process involving a build-up interconnect
- 2224/92225 the second connecting process involving a layer connector
- 2224/92226 the second connecting process involving a strap connector
- 2224/92227 the second connecting process involving a wire connector
- 2224/92228 the second connecting process involving a TAB connector
- 2224/92242 the first connecting process involving a layer connector
- 2224/92244 the second connecting process involving a build-up interconnect
- 2224/92246 the second connecting process involving a strap connector
- 2224/92247 the second connecting process involving a wire connector
- 2224/92248 the second connecting process involving a TAB connector
- 2224/92252 the first connecting process involving a strap connector
- 2224/92253 the second connecting process involving a bump connector
- 2224/92255 the second connecting process involving a layer connector
- 2224/93 Batch processes
- 2224/94 at wafer-level, i.e. with connecting carried out on a wafer comprising a plurality of undiced individual devices
- 2224/95 at chip-level, i.e. with connecting carried out on a plurality of singulated devices, i.e. on diced chips
- 2224/95001 involving a temporary auxiliary member not forming part of the bonding apparatus, e.g. removable or sacrificial coating, film or substrate
- 2224/95053 Bonding environment
- 2224/95085 being a liquid, e.g. for fluidic self-assembly
- 2224/95091 Under pressure
- 2224/95092 Atmospheric pressure, e.g. dry self-assembly
- 2224/95093 Transient conditions, e.g. assisted by a gas flow or a liquid flow
- 2224/951 Supplying the plurality of semiconductor or solid-state bodies
- 2224/95101 in a liquid medium
- 2224/95102 being a colloidal droplet
- 2224/9511 using a rack or rail
- 2224/95115 using a roll-to-roll transfer technique
- 2224/9512 Aligning the plurality of semiconductor or solid-state bodies
- 2224/95121 Active alignment, i.e. by apparatus steering
- 2224/95122 by applying vibration
- 2224/95123 by applying a pressurised fluid flow, e.g. liquid or gas flow
- 2224/95133 by applying an electromagnetic field
- 2224/95134 Electrowetting, i.e. by changing the surface energy of a droplet
- 2224/95136 involving guiding structures, e.g. shape matching, spacers or supporting members

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- 2224/95143 Passive alignment, i.e. self alignment, e.g. using surface energy, chemical reactions, thermal equilibrium
- 2224/95144 Magnetic alignment, i.e. using permanent magnetic parts in the semiconductor or solid-state body
- 2224/95145 Electrostatic alignment, i.e. polarity alignment with Coulomb charges
- 2224/95146 by surface tension
- 2224/95147 by molecular lock-key, e.g. by DNA
- 2224/95148 involving movement of a part of the bonding apparatus
- 2224/96 . . . the devices being encapsulated in a common layer, e.g. neo-wafer or pseudo-wafer, said common layer being separable into individual assemblies after connecting
- 2224/97 . . . the devices being connected to a common substrate, e.g. interposer, said common substrate being separable into individual assemblies after connecting
- 2224/98 . . . Methods for disconnecting semiconductor or solid-state bodies
- 2225/00** **Details relating to assemblies covered by the group [H01L 25/00](#) but not provided for in its subgroups**
- 2225/03 . . . All the devices being of a type provided for in the same subgroup of groups [H01L 27/00](#) - [H01L 51/00](#)
- 2225/04 . . . the devices not having separate containers
- 2225/065 . . . the devices being of a type provided for in group [H01L 27/00](#)
- 2225/06503 Stacked arrangements of devices
- 2225/06506 Wire or wire-like electrical connections between devices
- 2225/0651 Wire or wire-like electrical connections from device to substrate
- 2225/06513 Bump or bump-like direct electrical connections between devices, e.g. flip-chip connection, solder bumps
- 2225/06517 Bump or bump-like direct electrical connections from device to substrate
- 2225/0652 Bump or bump-like direct electrical connections from substrate to substrate
- 2225/06524 Electrical connections formed on device or on substrate, e.g. a deposited or grown layer
- 2225/06527 Special adaptation of electrical connections, e.g. rewiring, engineering changes, pressure contacts, layout
- 2225/06531 Non-galvanic coupling, e.g. capacitive coupling
- 2225/06534 Optical coupling
- 2225/06537 Electromagnetic shielding
- 2225/06541 Conductive via connections through the device, e.g. vertical interconnects, through silicon via [TSV] ([manufacturing via connections per se H01L 21/76898](#))
- 2225/06544 Design considerations for via connections, e.g. geometry or layout
- 2225/06548 Conductive via connections through the substrate, container, or encapsulation
- 2225/06551 Conductive connections on the side of the device
- 2225/06555 Geometry of the stack, e.g. form of the devices, geometry to facilitate stacking
- 2225/06558 the devices having passive surfaces facing each other, i.e. in a back-to-back arrangement
- 2225/06562 at least one device in the stack being rotated or offset
- 2225/06565 the devices having the same size and there being no auxiliary carrier between the devices
- 2225/06568 the devices decreasing in size, e.g. pyramidal stack
- 2225/06572 Auxiliary carrier between devices, the carrier having an electrical connection structure
- 2225/06575 Auxiliary carrier between devices, the carrier having no electrical connection structure
- 2225/06579 TAB carriers; beam leads
- 2225/06582 Housing for the assembly, e.g. chip scale package [CSP]
- 2225/06586 Housing with external bump or bump-like connectors
- 2225/06589 Thermal management, e.g. cooling
- 2225/06593 Mounting aids permanently on device; arrangements for alignment ([use of temporary supports H01L 21/6835](#))
- 2225/06596 Structural arrangements for testing ([testing or measuring during manufacture or treatment H01L 22/00](#); [testing electrical properties or locating electrical faults G01R 31/00](#))
- 2225/10 . . . the devices having separate containers
- 2225/1005 . . . the devices being of a type provided for in group [H01L 27/00](#)
- 2225/1011 the containers being in a stacked arrangement
- 2225/1017 the lowermost container comprising a device support
- 2225/1023 the support being an insulating substrate
- 2225/1029 the support being a lead frame
- 2225/1035 the device being entirely enclosed by the support, e.g. high-density interconnect [HDI]
- 2225/1041 Special adaptations for top connections of the lowermost container, e.g. redistribution layer, integral interposer
- 2225/1047 Details of electrical connections between containers
- 2225/1052 Wire or wire-like electrical connections
- 2225/1058 Bump or bump-like electrical connections, e.g. balls, pillars, posts
- 2225/1064 Electrical connections provided on a side surface of one or more of the containers
- 2225/107 Indirect electrical connections, e.g. via an interposer, a flexible substrate, using TAB ([printed circuits H05K 1/00](#))
- 2225/1076 Shape of the containers
- 2225/1082 for improving alignment between containers, e.g. interlocking features
- 2225/1088 Arrangements to limit the height of the assembly
- 2225/1094 Thermal management, e.g. cooling

- 2227/00** Indexing scheme for devices consisting of a plurality of semiconductor or other solid state components formed in or on a common substrate covered by group [H01L 27/00](#)
- 2227/32 . Devices including an organic light emitting device [OLED], e.g. OLED display
- 2227/323 . . Multistep processes for AMOLED
- 2227/326 . . Use of temporary substrate, e.g. for manufacturing of OLED displays having an inorganic driving circuit
- 2229/00** Indexing scheme for semiconductor devices adapted for rectifying, amplifying, oscillating or switching, or capacitors or resistors with at least one potential-jump barrier or surface barrier, for details of semiconductor bodies or of electrodes thereof, or for multistep manufacturing processes therefor
- 2251/00** Indexing scheme relating to organic semiconductor devices covered by group [H01L 51/00](#)
- 2251/10 . Processes specially adapted for the manufacture or treatment of organic semiconductor devices
- 2251/105 . . Patterning of a layer by embossing, e.g. to form trenches in an insulating layer
- 2251/30 . Materials
- 2251/301 . . Inorganic materials
- 2251/303 . . . Oxides, e.g. metal oxides
- 2251/305 Transparent conductive oxides [TCO]
- 2251/306 composed of tin oxides, e.g. F doped SnO₂
- 2251/308 composed of indium oxides, e.g. ITO
- 2251/50 . Organic light emitting devices
- 2251/53 . . Structure
- 2251/5307 . . . specially adapted for controlling the direction of light emission
- 2251/5315 Top emission
- 2251/5323 Two-side emission, i.e. TOLED
- 2251/533 End-face emission
- 2251/5338 . . . Flexible OLED
- 2251/5346 . . . Graded composition
- 2251/5353 . . . Inverted OLED
- 2251/5361 . . . OLED lamp
- 2251/5369 . . . Nanoparticles used in whatever layer except emissive layer, e.g. in packaging
- 2251/5376 . . . Combination of fluorescent and phosphorescent emission
- 2251/5384 . . . Multiple hosts in the emissive layer
- 2251/5392 . . . Short-circuit prevention
- 2251/55 . . characterised by parameters
- 2251/552 . . . HOMO-LUMO-EF
- 2251/554 . . . Oxidation-reduction potential
- 2251/556 . . . Temperature
- 2251/558 . . . Thickness
- 2251/56 . . Processes specially adapted for the manufacture or treatment of OLED
- 2251/562 . . . Aging
- 2251/564 . . . Application of alternating current
- 2251/566 . . . Division of substrate, e.g. for manufacturing of OLED displays
- 2251/568 . . . Repairing
- 2924/00** Indexing scheme for arrangements or methods for connecting or disconnecting semiconductor or solid-state bodies as covered by [H01L 24/00](#)
- 2924/0001 . Technical content checked by a classifier
- NOTE**
- Codes [H01L 2924/0001](#) - [H01L 2924/0002](#) are used to describe the status of reclassification; they do not relate to technical features as such
- 2924/00011 . . Not relevant to the scope of the group, the symbol of which is combined with the symbol of this group
- 2924/00012 . . Relevant to the scope of the group, the symbol of which is combined with the symbol of this group
- 2924/00013 . . Fully indexed content
- 2924/00014 . . the subject-matter covered by the group, the symbol of which is combined with the symbol of this group, being disclosed without further technical details
- 2924/00015 . . the subject-matter covered by the group, the symbol of which is combined with the symbol of this group, being disclosed as prior art
- 2924/0002 . . Not covered by any one of groups [H01L 24/00](#), [H01L 24/00](#) and [H01L 2224/00](#)
- 2924/01 . Chemical elements
- 2924/01001 . . Hydrogen [H]
- 2924/01002 . . Helium [He]
- 2924/01003 . . Lithium [Li]
- 2924/01004 . . Beryllium [Be]
- 2924/01005 . . Boron [B]
- 2924/01006 . . Carbon [C]
- 2924/01007 . . Nitrogen [N]
- 2924/01008 . . Oxygen [O]
- 2924/01009 . . Fluorine [F]
- 2924/0101 . . Neon [Ne]
- 2924/01011 . . Sodium [Na]
- 2924/01012 . . Magnesium [Mg]
- 2924/01013 . . Aluminum [Al]
- 2924/01014 . . Silicon [Si]
- 2924/01015 . . Phosphorus [P]
- 2924/01016 . . Sulfur [S]
- 2924/01017 . . Chlorine [Cl]
- 2924/01018 . . Argon [Ar]
- 2924/01019 . . Potassium [K]
- 2924/0102 . . Calcium [Ca]
- 2924/01021 . . Scandium [Sc]
- 2924/01022 . . Titanium [Ti]
- 2924/01023 . . Vanadium [V]
- 2924/01024 . . Chromium [Cr]
- 2924/01025 . . Manganese [Mn]
- 2924/01026 . . Iron [Fe]
- 2924/01027 . . Cobalt [Co]
- 2924/01028 . . Nickel [Ni]
- 2924/01029 . . Copper [Cu]
- 2924/0103 . . Zinc [Zn]
- 2924/01031 . . Gallium [Ga]
- 2924/01032 . . Germanium [Ge]
- 2924/01033 . . Arsenic [As]
- 2924/01034 . . Selenium [Se]
- 2924/01035 . . Bromine [Br]
- 2924/01036 . . Krypton [Kr]
- 2924/01037 . . Rubidium [Rb]
- 2924/01038 . . Strontium [Sr]
- 2924/01039 . . Yttrium [Y]
- 2924/0104 . . Zirconium [Zr]

2924/01041	. . Niobium [Nb]	2924/01106	. . . Lanthanides, i.e. Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu
2924/01042	. . Molybdenum [Mo]	2924/01107	. . . Actinides, i.e. Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md, No, Lr
2924/01043	. . Technetium [Tc]	2924/01108	. . Noble metals
2924/01044	. . Ruthenium [Ru]	2924/01109	. . Metalloids or Semi-metals
2924/01045	. . Rhodium [Rh]	2924/01111	. . Chalcogens
2924/01046	. . Palladium [Pd]	2924/01111	. . Halogens
2924/01047	. . Silver [Ag]	2924/01112	. . Noble gases
2924/01048	. . Cadmium [Cd]	2924/012	. Semiconductor purity grades
2924/01049	. . Indium [In]	2924/01201	. . 1N purity grades, i.e. 90%
2924/0105	. . Tin [Sn]	2924/01202	. . 2N purity grades, i.e. 99%
2924/01051	. . Antimony [Sb]	2924/01203	. . 3N purity grades, i.e. 99.9%
2924/01052	. . Tellurium [Te]	2924/01204	. . 4N purity grades, i.e. 99.99%
2924/01053	. . Iodine [I]	2924/01205	. . 5N purity grades, i.e. 99.999%
2924/01054	. . Xenon [Xe]	2924/01206	. . 6N purity grades, i.e. 99.9999%
2924/01055	. . Cesium [Cs]	2924/01207	. . 7N purity grades, i.e. 99.99999%
2924/01056	. . Barium [Ba]	2924/01208	. . 8N purity grades, i.e. 99.999999%
2924/01057	. . Lanthanum [La]	2924/013	. Alloys
2924/01058	. . Cerium [Ce]	2924/0132	. . Binary Alloys
2924/01059	. . Praseodymium [Pr]	2924/01321	. . . Isomorphous Alloys
2924/0106	. . Neodymium [Nd]	2924/01322	. . . Eutectic Alloys, i.e. obtained by a liquid transforming into two solid phases
2924/01061	. . Promethium [Pm]	2924/01323	. . . . Hypoeutectic alloys i.e. with compositions lying to the left of the eutectic point
2924/01062	. . Samarium [Sm]	2924/01324	. . . . Hypereutectic alloys i.e. with compositions lying to the right of the eutectic point
2924/01063	. . Europium [Eu]	2924/01325	. . . Peritectic Alloys, i.e. obtained by a liquid and a solid transforming into a new and different solid phase
2924/01064	. . Gadolinium [Gd]	2924/01326	. . . Monotectics, i.e. obtained by a liquid transforming into a solid and a new and different liquid phase
2924/01065	. . Terbium [Tb]	2924/01327	. . . Intermediate phases, i.e. intermetallics compounds
2924/01066	. . Dysprosium [Dy]	2924/0133	. . Ternary Alloys
2924/01067	. . Holmium [Ho]	2924/0134	. . Quaternary Alloys
2924/01068	. . Erbium [Er]	2924/0135	. . Quinary Alloys
2924/01069	. . Thulium [Tm]	2924/014	. . Solder alloys
2924/0107	. . Ytterbium [Yb]	2924/01402	. . Invar, i.e. single-phase alloy of around 36% nickel and 64% iron
2924/01071	. . Lutetium [Lu]	2924/01403	. . Kovar, i.e. FeNiCo alloys
2924/01072	. . Hafnium [Hf]	2924/01404	. . Alloy 42, i.e. FeNi42
2924/01073	. . Tantalum [Ta]	2924/01405	. . Inovco, i.e. Fe-33Ni-4.5Co
2924/01074	. . Tungsten [W]	2924/042	. Borides composed of metals from groups of the periodic table
2924/01075	. . Rhenium [Re]	2924/0421	. . 1st Group
2924/01076	. . Osmium [Os]	2924/0422	. . 2nd Group
2924/01077	. . Iridium [Ir]	2924/0423	. . 3rd Group
2924/01078	. . Platinum [Pt]	2924/0424	. . 4th Group
2924/01079	. . Gold [Au]	2924/0425	. . 5th Group
2924/0108	. . Mercury [Hg]	2924/0426	. . 6th Group
2924/01081	. . Thallium [Tl]	2924/0427	. . 7th Group
2924/01082	. . Lead [Pb]	2924/0428	. . 8th Group
2924/01083	. . Bismuth [Bi]	2924/0429	. . 9th Group
2924/01084	. . Polonium [Po]	2924/044	. . 10th Group
2924/01085	. . Astatine [At]	2924/0441	. . 11th Group
2924/01086	. . Radon [Rn]	2924/0442	. . 12th Group
2924/01087	. . Francium [Fr]	2924/0443	. . 13th Group
2924/01088	. . Radium [Ra]	2924/0444	. . 14th Group
2924/01089	. . Actinium [Ac]	2924/0445	. . Lanthanides
2924/0109	. . Thorium [Th]	2924/0446	. . Actinides
2924/01091	. . Protactinium [Pa]		
2924/01092	. . Uranium [U]		
2924/01093	. . Neptunium [Np]		
2924/01094	. . Plutonium [Pu]		
2924/011	. Groups of the periodic table		
2924/01101	. . Alkali metals		
2924/01102	. . Alkali earth metals		
2924/01103	. . Transition metals		
2924/01104	. . Refractory metals		
2924/01105	. . Rare earth metals		

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2924/0449	. . being a combination of two or more materials provided in the groups H01L 2924/0421 - H01L 2924/0446	2924/0494	. . 4th Group
2924/04491	. . having a monocrystalline microstructure	2924/04941	. . . TiN
2924/04492	. . having a polycrystalline microstructure	2924/0495	. . 5th Group
2924/04494	. . having an amorphous microstructure, i.e. glass	2924/04953	. . . TaN
2924/045	. Carbides composed of metals from groups of the periodic table	2924/0496	. . 6th Group
2924/0451	. . 1st Group	2924/0497	. . 7th Group
2924/0452	. . 2nd Group	2924/0498	. . 8th Group
2924/0453	. . 3rd Group	2924/0499	. . 9th Group
2924/0454	. . 4th Group	2924/05	. . 10th Group
2924/04541	. . . TiC	2924/0501	. . 11th Group
2924/0455	. . 5th Group	2924/0502	. . 12th Group
2924/0456	. . 6th Group	2924/0503	. . 13th Group
2924/04563	. . . WC	2924/05032	. . . AlN
2924/0457	. . 7th Group	2924/0504	. . 14th Group
2924/0458	. . 8th Group	2924/05042	. . . Si ₃ N ₄
2924/0459	. . 9th Group	2924/0505	. . Lanthanides
2924/046	. . 10th Group	2924/0506	. . Actinides
2924/0461	. . 11th Group	2924/0509	. . being a combination of two or more materials provided in the groups H01L 2924/0491 - H01L 2924/0506
2924/0462	. . 12th Group	2924/05091	. . having a monocrystalline microstructure
2924/0463	. . 13th Group	2924/05092	. . having a polycrystalline microstructure
2924/0464	. . 14th Group	2924/05094	. . having an amorphous microstructure, i.e. glass
2924/04642	. . . SiC	2924/051	. Phosphides composed of metals from groups of the periodic table
2924/0465	. . Lanthanides	2924/0511	. . 1st Group
2924/0466	. . Actinides	2924/0512	. . 2nd Group
2924/0469	. . being a combination of two or more materials provided in the groups H01L 2924/0451 - H01L 2924/0466	2924/0513	. . 3rd Group
2924/04691	. . having a monocrystalline microstructure	2924/0514	. . 4th Group
2924/04692	. . having a polycrystalline microstructure	2924/0515	. . 5th Group
2924/04694	. . having an amorphous microstructure, i.e. glass	2924/0516	. . 6th Group
2924/047	. Silicides composed of metals from groups of the periodic table	2924/0517	. . 7th Group
2924/0471	. . 1st Group	2924/0518	. . 8th Group
2924/0472	. . 2nd Group	2924/0519	. . 9th Group
2924/0473	. . 3rd Group	2924/052	. . 10th Group
2924/0474	. . 4th Group	2924/0521	. . 11th Group
2924/0475	. . 5th Group	2924/0522	. . 12th Group
2924/0476	. . 6th Group	2924/0523	. . 13th Group
2924/0477	. . 7th Group	2924/0524	. . 14th Group
2924/0478	. . 8th Group	2924/0525	. . Lanthanides
2924/0479	. . 9th Group	2924/0526	. . Actinides
2924/048	. . 10th Group	2924/0529	. . being a combination of two or more materials provided in the groups H01L 2924/0511 - H01L 2924/0526
2924/0481	. . 11th Group	2924/05291	. . having a monocrystalline microstructure
2924/0482	. . 12th Group	2924/05292	. . having a polycrystalline microstructure
2924/0483	. . 13th Group	2924/05294	. . having an amorphous microstructure, i.e. glass
2924/0484	. . 14th Group	2924/053	. Oxides composed of metals from groups of the periodic table
2924/0485	. . Lanthanides	2924/0531	. . 1st Group
2924/0486	. . Actinides	2924/0532	. . 2nd Group
2924/0489	. . being a combination of two or more materials provided in the groups H01L 2924/0471 - H01L 2924/0486	2924/0533	. . 3rd Group
2924/04891	. . having a monocrystalline microstructure	2924/0534	. . 4th Group
2924/04892	. . having a polycrystalline microstructure	2924/05341	. . . TiO ₂
2924/04894	. . having an amorphous microstructure, i.e. glass	2924/05342	. . . ZrO ₂
2924/049	. Nitrides composed of metals from groups of the periodic table	2924/0535	. . 5th Group
2924/0491	. . 1st Group	2924/0536	. . 6th Group
2924/0492	. . 2nd Group	2924/0537	. . 7th Group
2924/0493	. . 3rd Group	2924/0538	. . 8th Group
		2924/05381	. . . FeOx
		2924/0539	. . 9th Group
		2924/054	. . 10th Group

H01L

- 2924/0541 . . . 11th Group
- 2924/0542 . . . 12th Group
- 2924/0543 . . . 13th Group
- 2924/05432 . . . Al₂O₃
- 2924/0544 . . . 14th Group
- 2924/05442 . . . SiO₂
- 2924/0545 . . . Lanthanides
- 2924/0546 . . . Actinides
- 2924/0549 . . . being a combination of two or more materials provided in the groups [H01L 2924/0531](#) - [H01L 2924/0546](#)
- 2924/05491 . . . having a monocrystalline microstructure
- 2924/05492 . . . having a polycrystalline microstructure
- 2924/05494 . . . having an amorphous microstructure, i.e. glass
- 2924/055 . . . Chalcogenides other than oxygen i.e. sulfides, selenides and tellurides composed of metals from groups of the periodic table
- 2924/0551 . . . 1st Group
- 2924/0552 . . . 2nd Group
- 2924/0553 . . . 3rd Group
- 2924/0554 . . . 4th Group
- 2924/0555 . . . 5th Group
- 2924/0556 . . . 6th Group
- 2924/0557 . . . 7th Group
- 2924/0558 . . . 8th Group
- 2924/0559 . . . 9th Group
- 2924/056 . . . 10th Group
- 2924/0561 . . . 11th Group
- 2924/0562 . . . 12th Group
- 2924/0563 . . . 13th Group
- 2924/0564 . . . 14th Group
- 2924/0565 . . . Lanthanides
- 2924/0566 . . . Actinides
- 2924/0569 . . . being a combination of two or more materials provided in the groups [H01L 2924/0551](#) - [H01L 2924/0566](#)
- 2924/05691 . . . having a monocrystalline microstructure
- 2924/05692 . . . having a polycrystalline microstructure
- 2924/05694 . . . having an amorphous microstructure, i.e. glass
- 2924/057 . . . Halides composed of metals from groups of the periodic table
- 2924/0571 . . . 1st Group
- 2924/0572 . . . 2nd Group
- 2924/0573 . . . 3rd Group
- 2924/0574 . . . 4th Group
- 2924/0575 . . . 5th Group
- 2924/0576 . . . 6th Group
- 2924/0577 . . . 7th Group
- 2924/0578 . . . 8th Group
- 2924/0579 . . . 9th Group
- 2924/058 . . . 10th Group
- 2924/0581 . . . 11th Group
- 2924/0582 . . . 12th Group
- 2924/0583 . . . 13th Group
- 2924/0584 . . . 14th Group
- 2924/0585 . . . Lanthanides
- 2924/0586 . . . Actinides
- 2924/0589 . . . being a combination of two or more materials provided in the groups [H01L 2924/0571](#) - [H01L 2924/0586](#)
- 2924/05891 . . . having a monocrystalline microstructure
- 2924/05892 . . . having a polycrystalline microstructure
- 2924/05894 . . . having an amorphous microstructure, i.e. glass
- 2924/059 . . . Being combinations of any of the materials from the groups [H01L 2924/042](#) - [H01L 2924/0584](#), e.g. oxynitrides
- 2924/05991 . . . having a monocrystalline microstructure
- 2924/05992 . . . having a polycrystalline microstructure
- 2924/05994 . . . having an amorphous microstructure, i.e. glass
- 2924/06 . . . Polymers ([polymers per se C08](#); [polymer adhesives C09J](#))
- 2924/061 . . . Polyolefin polymer
- 2924/0615 . . . Styrenic polymer
- 2924/062 . . . Halogenated polymer
- 2924/0625 . . . Polyvinyl alcohol
- 2924/063 . . . Polyvinyl acetate
- 2924/0635 . . . Acrylic polymer
- 2924/064 . . . Graft polymer
- 2924/0645 . . . Block copolymer
- 2924/065 . . . ABS
- 2924/0655 . . . Polyacetal
- 2924/066 . . . Phenolic resin
- 2924/0665 . . . Epoxy resin
- 2924/067 . . . Polyphenylene
- 2924/0675 . . . Polyester
- 2924/068 . . . Polycarbonate
- 2924/0685 . . . Polyether
- 2924/069 . . . Polyurethane
- 2924/0695 . . . Polyamide
- 2924/07 . . . Polyamine or polyimide
- 2924/07001 . . . Polyamine
- 2924/07025 . . . Polyimide
- 2924/0705 . . . Sulfur containing polymer
- 2924/0715 . . . Polysiloxane
- 2924/078 . . . Adhesive characteristics other than chemical
- 2924/07802 . . . not being an ohmic electrical conductor
- 2924/0781 . . . being an ohmic electrical conductor
- 2924/07811 . . . Extrinsic, i.e. with electrical conductive fillers
- 2924/07812 . . . Intrinsic, e.g. polyaniline [PANI]
- 2924/0782 . . . being pressure sensitive
- 2924/095 . . . with a principal constituent of the material being a combination of two or more materials provided in the groups [H01L 2924/013](#) - [H01L 2924/0715](#)
- 2924/0951 . . . Glass epoxy laminates
- 2924/09511 . . . FR-4
- 2924/09512 . . . FR-5
- 2924/09522 . . . G10
- 2924/09523 . . . G11
- 2924/096 . . . Cermets, i.e. composite material composed of ceramic and metallic materials
- 2924/097 . . . Glass-ceramics, e.g. devitrified glass
- 2924/09701 . . . Low temperature co-fired ceramic [LTCC]
- 2924/10 . . . Details of semiconductor or other solid state devices to be connected
- 2924/1011 . . . Structure
- 2924/1015 . . . Shape
- 2924/10155 . . . being other than a cuboid
- 2924/10156 . . . at the periphery
- 2924/10157 . . . at the active surface
- 2924/10158 . . . at the passive surface
- 2924/1016 . . . being a cuboid
- 2924/10161 . . . with a rectangular active surface
- 2924/10162 . . . with a square active surface

2924/1017	. . .	being a sphere	2924/10359	. . . . .	Gallium indium nitride arsenide antimonide [GaInNASb]
2924/102	. .	Material of the semiconductor or solid state bodies	2924/1036	. . . . .	Gallium indium arsenide antimonide phosphide [GaInAsSbP]
2924/1025	. . .	Semiconducting materials	2924/1037	. . . . .	II-VI
2924/10251	. . . .	Elemental semiconductors, i.e. Group IV	2924/10371	. . . . .	Cadmium selenide [CdSe]
2924/10252	. . . . .	Germanium [Ge]	2924/10372	. . . . .	Cadmium sulfide [CdS]
2924/10253	. . . . .	Silicon [Si]	2924/10373	. . . . .	Cadmium telluride [CdTe]
2924/10254	. . . . .	Diamond [C]	2924/10375	. . . . .	Zinc selenide [ZnSe]
2924/1026	. . . . .	Compound semiconductors	2924/10376	. . . . .	Zinc sulfide [ZnS]
2924/1027	. . . . .	IV	2924/10377	. . . . .	Zinc telluride [ZnTe]
2924/10271	. . . . .	Silicon-germanium [SiGe]	2924/10378	. . . . .	Cadmium zinc telluride, i.e. CZT [CdZnTe]
2924/10272	. . . . .	Silicon Carbide [SiC]	2924/10379	. . . . .	Mercury cadmium telluride [HgZnTe]
2924/1032	. . . . .	III-V	2924/1038	. . . . .	Mercury zinc telluride [HgZnSe]
2924/10321	. . . . .	Aluminium antimonide [AlSb]	2924/10381	. . . . .	Mercury zinc selenide [HgZnSe]
2924/10322	. . . . .	Aluminium arsenide [AlAs]	2924/1042	. . . . .	I-VII
2924/10323	. . . . .	Aluminium nitride [AlN]	2924/10421	. . . . .	Cuprous chloride [CuCl]
2924/10324	. . . . .	Aluminium phosphide [AlP]	2924/1047	. . . . .	I-VI
2924/10325	. . . . .	Boron nitride [BN], e.g. cubic, hexagonal, nanotube	2924/10471	. . . . .	Copper sulfide [CuS]
2924/10326	. . . . .	Boron phosphide [BP]	2924/1052	. . . . .	IV-VI
2924/10327	. . . . .	Boron arsenide [BAs, B ₁₂ As ₂]	2924/10521	. . . . .	Lead selenide [PbSe]
2924/10328	. . . . .	Gallium antimonide [GaSb]	2924/10522	. . . . .	Lead(II)sulfide [PbS]
2924/10329	. . . . .	Gallium arsenide [GaAs]	2924/10523	. . . . .	Lead telluride [PbTe]
2924/1033	. . . . .	Gallium nitride [GaN]	2924/10524	. . . . .	Tin sulfide [SnS, SnS ₂]
2924/10331	. . . . .	Gallium phosphide [GaP]	2924/10525	. . . . .	Tin telluride [SnTe]
2924/10332	. . . . .	Indium antimonide [InSb]	2924/10526	. . . . .	Lead tin telluride [PbSnTe]
2924/10333	. . . . .	Indium arsenide [InAs]	2924/10527	. . . . .	Thallium tin telluride [Tl ₂ SnTe ₅]
2924/10334	. . . . .	Indium nitride [InN]	2924/10528	. . . . .	Thallium germanium telluride [Tl ₂ GeTe ₅]
2924/10335	. . . . .	Indium phosphide [InP]	2924/1057	. . . . .	V-VI
2924/10336	. . . . .	Aluminium gallium arsenide [AlGaAs]	2924/10571	. . . . .	Bismuth telluride [Bi ₂ Te ₃]
2924/10337	. . . . .	Indium gallium arsenide [InGaAs]	2924/1062	. . . . .	II-V
2924/10338	. . . . .	Indium gallium phosphide [InGaP]	2924/10621	. . . . .	Cadmium phosphide [Cd ₃ P ₂]
2924/10339	. . . . .	Aluminium indium arsenide [AlInAs]	2924/10622	. . . . .	Cadmium arsenide [Cd ₃ As ₂]
2924/1034	. . . . .	Aluminium indium antimonide [AlInSb]	2924/10623	. . . . .	Cadmium antimonide [Cd ₃ Sb ₂]
2924/10341	. . . . .	Gallium arsenide nitride [GaAsN]	2924/10624	. . . . .	Zinc phosphide [Zn ₃ P ₂]
2924/10342	. . . . .	Gallium arsenide phosphide [GaAsP]	2924/10625	. . . . .	Zinc arsenide [Zn ₃ As ₂]
2924/10343	. . . . .	Gallium arsenide antimonide [GaAsSb]	2924/10626	. . . . .	Zinc antimonide [Zn ₃ Sb ₂]
2924/10344	. . . . .	Aluminium gallium nitride [AlGaN]	2924/1067	. . . . .	Oxide
2924/10345	. . . . .	Aluminium gallium phosphide [AlGaP]	2924/10671	. . . . .	Titanium dioxide, anatase, rutile, brookite [TiO ₂]
2924/10346	. . . . .	Indium gallium nitride [InGaN]	2924/10672	. . . . .	Copper(I)oxide [Cu ₂ O]
2924/10347	. . . . .	Indium arsenide antimonide [InAsSb]	2924/10673	. . . . .	Copper(II)oxide [CuO]
2924/10348	. . . . .	Indium gallium antimonide [InGaSb]	2924/10674	. . . . .	Uranium dioxide [UO ₂]
2924/10349	. . . . .	Aluminium gallium indium phosphide [AlGaInP]	2924/10675	. . . . .	Uranium trioxide [UO ₃]
2924/1035	. . . . .	Aluminium gallium arsenide phosphide [AlGaInP]	2924/10676	. . . . .	Bismuth trioxide [Bi ₂ O ₃]
2924/10351	. . . . .	Indium gallium arsenide phosphide [InGaAsP]	2924/10677	. . . . .	Tin dioxide [SnO ₂]
2924/10352	. . . . .	Indium gallium arsenide antimonide [InGaAsSb]	2924/10678	. . . . .	Barium titanate [BaTiO ₃]
2924/10353	. . . . .	Indium arsenide antimonide phosphide [InAsSbP]	2924/10679	. . . . .	Strontium titanate [SrTiO ₃]
2924/10354	. . . . .	Aluminium indium arsenide phosphide [AlInAsP]	2924/1068	. . . . .	Lithium niobate [LiNbO ₃]
2924/10355	. . . . .	Aluminium gallium arsenide nitride [AlGaAsN]	2924/10681	. . . . .	Lanthanum copper oxide [La ₂ CuO ₄]
2924/10356	. . . . .	Indium gallium arsenide nitride [InGaAsN]	2924/1072	. . . . .	Layered
2924/10357	. . . . .	Indium aluminium arsenide nitride [InAlAsN]	2924/10721	. . . . .	Lead(II)iodide [PbI ₂]
2924/10358	. . . . .	Gallium arsenide antimonide nitride [GaAsSbN]	2924/10722	. . . . .	Molybdenum disulfide [MoS ₂]
			2924/10723	. . . . .	Gallium selenide [GaSe]
			2924/10724	. . . . .	Tin sulfide [SnS]
			2924/10725	. . . . .	Bismuth sulfide [Bi ₂ S ₃]
			2924/1077	. . . . .	Magnetic diluted [DMS]
			2924/10771	. . . . .	Gallium manganese arsenide [GaMnAs]

2924/10772	Indium manganese arsenide [InMnAs]	2924/13022	MA-GTO - Modified Anode Gate Turn-Off thyristor
2924/10773	Cadmium manganese telluride [CdMnTe]	2924/13023	IGCT - Integrated Gate Commutated Thyristor
2924/10774	Lead manganese telluride [PbMnTe]	2924/13024	LASCR - Light Activated SCR, or LTT - Light triggered thyristor
2924/10775	Lanthanum calcium manganate [La _{0.7} Ca _{0.3} MnO ₃]	2924/13025	Light Activated Semiconducting Switch [LASS]
2924/10776	Iron(II)oxide [FeO]	2924/13026	MCT - MOSFET Controlled Thyristor - It contains two additional FET structures for on/off control
2924/10777	Nickel(II)oxide [NiO]	2924/13027	BRT - Base Resistance Controlled Thyristor
2924/10778	Europium(II)oxide [EuO]	2924/13028	RCT - Reverse Conducting Thyristor
2924/10779	Europium(II)sulfide [EuS]	2924/13029	PUT or PUJT - Programmable Unijunction Transistor - A thyristor with gate on n-type layer near to the anode used as a functional replacement for unijunction transistor
2924/1078	Chromium(III)bromide [CrBr ₃]	2924/1303	SCS - Silicon Controlled Switch or Thyristor Tetrode - A thyristor with both cathode and anode gates
2924/1082	Other	2924/13032	SITH - Static Induction Thyristor, or FCTh - Field Controlled Thyristor - containing a gate structure that can shut down anode current flow
2924/10821	Copper indium gallium selenide, CIGS [Cu[In,Ga]Se ₂]	2924/13033	TRIAC - Triode for Alternating Current - A bidirectional switching device containing two thyristor structures with common gate contact
2924/10822	Copper zinc tin sulfide, CZTS [Cu ₂ ZnSnS ₄]	2924/13034	Silicon Controlled Rectifier [SCR]
2924/10823	Copper indium selenide, CIS [CuInSe ₂]	2924/13035	Asymmetrical SCR [ASCR]
2924/10824	Silver gallium sulfide [AgGaS ₂]	2924/1304	Transistor
2924/10825	Zinc silicon phosphide [ZnSiP ₂]	2924/1305	Bipolar Junction Transistor [BJT]
2924/10826	Arsenic selenide [As ₂ S ₃]	2924/13051	Heterojunction bipolar transistor [HBT]
2924/10827	Platinum silicide [PtSi]	2924/13052	Schottky transistor
2924/10828	Bismuth(III)iodide [BiI ₃]	2924/13053	Avalanche transistor
2924/10829	Mercury(II)iodide [HgI ₂]	2924/13054	Darlington transistor
2924/1083	Thallium(I)bromide [TlBr]	2924/13055	Insulated gate bipolar transistor [IGBT]
2924/10831	Selenium [Se]	2924/13056	Photo transistor
2924/10832	Silver sulfide [Ag ₂ S]	2924/1306	Field-effect transistor [FET]
2924/10833	Iron disulfide [FeS ₂]	2924/13061	Carbon nanotube field-effect transistor [CNFET]
2924/11	Device type	2924/13062	Junction field-effect transistor [JFET]
2924/12	Passive devices, e.g. 2 terminal devices	2924/13063	Metal-Semiconductor Field-Effect Transistor [MESFET]
2924/1203	Rectifying Diode	2924/13064	High Electron Mobility Transistor [HEMT, HFET [heterostructure FET], MODFET]
2924/12031	PIN diode	2924/13066	Inverted-T field effect transistor [ITFET]
2924/12032	Schottky diode	2924/13067	FinFET, source/drain region shapes fins on the silicon surface
2924/12033	Gunn diode	2924/13068	Fast-reverse epitaxial diode field-effect transistor [FREDFET]
2924/12034	Varactor	2924/13069	Thin film transistor [TFT]
2924/12035	Zener diode	2924/1307	Organic Field-Effect Transistor [OFET]
2924/12036	PN diode	2924/13071	Ballistic transistor
2924/12037	Cat's whisker diode	2924/13072	Sensor FET
2924/12038	Point contact	2924/13073	ion-sensitive field-effect transistor [ISFET]
2924/1204	Optical Diode	2924/13074	Electrolyte-oxide-semiconductor field effect transistor [EOSFET], e.g. Neurochip
2924/12041	LED		
2924/12042	LASER		
2924/12043	Photo diode		
2924/12044	OLED		
2924/1205	Capacitor		
2924/1206	Inductor		
2924/1207	Resistor		
2924/13	Discrete devices, e.g. 3 terminal devices		
2924/1301	Thyristor		
2924/13011	Anode Gate Thyristor [AGT]		
2924/13013	Bidirectional Control Thyristor [BCT]		
2924/13014	Breakover Diode [BOD]		
2924/13015	DIAC - Bidirectional trigger device		
2924/13016	Dynistor - Unidirectional switching device		
2924/13017	Shockley diode - Unidirectional trigger and switching device		
2924/13018	SIDAC - Bidirectional switching device		
2924/13019	Trisil, SIDACtor - Bidirectional protection devices		
2924/1302	GTO - Gate Turn-Off thyristor		
2924/13021	DB-GTO - Distributed Buffer Gate Turn-Off thyristor		

2924/13075	. . . . .	Deoxyribonucleic acid field-effect transistor [DNAFET]	2924/14368	. . . . .	Extended data out DRAM [EDO DRAM]
2924/13076	. . . . .	DEPFET	2924/14369	. . . . .	Burst EDO DRAM [BEDO DRAM]
2924/13078	. . . . .	Unijunction transistors	2924/1437	. . . . .	Static random-access memory [SRAM]
2924/13079	. . . . .	Single-electron transistors [SET]	2924/1438	. . . . .	Flash memory
2924/1308	. . . . .	Nanofluidic transistor	2924/1441	. . . . .	Ferroelectric RAM [FeRAM or FRAM]
2924/13081	. . . . .	Multigate devices	2924/1442	. . . . .	Synchronous graphics RAM [SGRAM]
2924/13082	. . . . .	Tetrode transistor	2924/1443	. . . . .	Non-volatile random-access memory [NVRAM]
2924/13083	. . . . .	Pentode transistor	2924/1444	. . . . .	PBRAM
2924/13084	. . . . .	Trigate transistor	2924/145	. . . . .	Read-only memory [ROM]
2924/13085	. . . . .	Dual gate FETs	2924/1451	. . . . .	EPROM
2924/13086	. . . . .	Junctionless Nanowire Transistor [JNT]	2924/14511	. . . . .	EEPROM
2924/13087	. . . . .	Vertical-Slit Field-Effect Transistor [VeSFET]	2924/1453	. . . . .	PROM
2924/13088	. . . . .	Graphene Nanoribbon Field-Effect Transistor [GNRFET]	2924/146	. . .	Mixed devices
2924/13089	. . . . .	Nanoparticle Organic Memory Field-Effect Transistor [NOMFET]	2924/1461	. . .	MEMS
2924/1309	. . . . .	Modulation-Doped Field Effect Transistor [MODFET]	2924/15	. . .	Details of package parts other than the semiconductor or other solid state devices to be connected
2924/13091	. . . . .	Metal-Oxide-Semiconductor Field-Effect Transistor [MOSFET]	2924/151	. . .	Die mounting substrate
2924/13092	. . . . .	Dual Gate Metal-Oxide-Semiconductor Field-Effect Transistor [DG MOSFET]	2924/1511	. . .	Structure
2924/14	. . .	Integrated circuits	2924/1515	. . .	Shape
2924/141	. . . . .	Analog devices	2924/15151	. . . . .	the die mounting substrate comprising an aperture, e.g. for underfilling, outgassing, window type wire connections
2924/142	. . . . .	HF devices	2924/15153	. . . . .	the die mounting substrate comprising a recess for hosting the device
2924/1421	. . . . .	RF devices	2924/15155	. . . . .	the shape of the recess being other than a cuboid
2924/14211	. . . . .	Voltage-controlled oscillator [VCO]	2924/15156	. . . . .	Side view
2924/14215	. . . . .	Low-noise amplifier [LNA]	2924/15157	. . . . .	Top view
2924/1422	. . . . .	Mixer	2924/15158	. . . . .	the die mounting substrate being other than a cuboid
2924/14221	. . . . .	Electronic mixer	2924/15159	. . . . .	Side view
2924/14222	. . . . .	Frequency mixer	2924/15162	. . . . .	Top view
2924/1423	. . . . .	Monolithic Microwave Integrated Circuit [MMIC]	2924/15165	. . . . .	Monolayer substrate
2924/1424	. . . . .	Operational amplifier	2924/1517	. . . . .	Multilayer substrate
2924/1425	. . . . .	Converter	2924/15172	. . . . .	Fan-out arrangement of the internal vias
2924/14251	. . . . .	Frequency converter	2924/15173	. . . . .	in a single layer of the multilayer substrate
2924/14252	. . . . .	Voltage converter	2924/15174	. . . . .	in different layers of the multilayer substrate
2924/14253	. . . . .	Digital-to-analog converter [DAC]	2924/15182	. . . . .	Fan-in arrangement of the internal vias
2924/1426	. . . . .	Driver	2924/15183	. . . . .	in a single layer of the multilayer substrate
2924/1427	. . . . .	Voltage regulator [VR]	2924/15184	. . . . .	in different layers of the multilayer substrate
2924/143	. . . . .	Digital devices	2924/15192	. . . . .	Resurf arrangement of the internal vias
2924/1431	. . . . .	Logic devices	2924/152	. . . . .	Disposition
2924/1432	. . . . .	Central processing unit [CPU]	2924/153	. . . . .	Connection portion
2924/1433	. . . . .	Application-specific integrated circuit [ASIC]	2924/1531	. . . . .	the connection portion being formed only on the surface of the substrate opposite to the die mounting surface
2924/14335	. . . . .	Digital signal processor [DSP]	2924/15311	. . . . .	being a ball array, e.g. BGA
2924/1434	. . . . .	Memory	2924/15312	. . . . .	being a pin array, e.g. PGA
2924/1435	. . . . .	Random access memory [RAM]	2924/15313	. . . . .	being a land array, e.g. LGA
2924/1436	. . . . .	Dynamic random-access memory [DRAM]	2924/1532	. . . . .	the connection portion being formed on the die mounting surface of the substrate
2924/14361	. . . . .	Synchronous dynamic random access memory [SDRAM]	2924/15321	. . . . .	being a ball array, e.g. BGA
2924/14362	. . . . .	RAS Only Refresh [ROR]	2924/15322	. . . . .	being a pin array, e.g. PGA
2924/14363	. . . . .	CAS before RAS refresh [CBR]	2924/15323	. . . . .	being a land array, e.g. LGA
2924/14364	. . . . .	Multibank DRAM [MDRAM]			
2924/14365	. . . . .	Video DRAM [VRAM]			
2924/14366	. . . . .	Window DRAM [WRAM]			
2924/14367	. . . . .	Fast page mode DRAM [FPM DRAM]			

- 2924/1533 the connection portion being formed both on the die mounting surface of the substrate and outside the die mounting surface of the substrate
- 2924/15331 being a ball array, e.g. BGA
- 2924/15332 being a pin array, e.g. PGA
- 2924/15333 being a land array, e.g. LGA
- 2924/156 Material
- 2924/157 with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
- 2924/15701 the principal constituent melting at a temperature of less than 400 C
- 2924/15717 the principal constituent melting at a temperature of greater than or equal to 400 C and less than 950 C
- 2924/15724 Aluminium [Al] as principal constituent
- 2924/15738 the principal constituent melting at a temperature of greater than or equal to 950 C and less than 1550 C
- 2924/15747 Copper [Cu] as principal constituent
- 2924/1576 Iron [Fe] as principal constituent
- 2924/15763 the principal constituent melting at a temperature of greater than 1550 C
- 2924/15786 with a principal constituent of the material being a non metallic, non metalloid inorganic material
- 2924/15787 Ceramics, e.g. crystalline carbides, nitrides or oxides
- 2924/15788 Glasses, e.g. amorphous oxides, nitrides or fluorides
- 2924/1579 with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
- 2924/15791 The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
- 2924/15793 with a principal constituent of the material being a solid not provided for in groups [H01L 2924/157](#) - [H01L 2924/15791](#), e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
- 2924/15798 with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
- 2924/161 Cap
- 2924/1611 Structure
- 2924/1615 Shape
- 2924/16151 Cap comprising an aperture, e.g. for pressure control, encapsulation
- 2924/16152 Cap comprising a cavity for hosting the device, e.g. U-shaped cap
- 2924/16153 Cap enclosing a plurality of side-by-side cavities [e.g. E-shaped cap]
- 2924/1616 Cavity shape
- 2924/1617 Cavity coating
- 2924/16171 Material
- 2924/16172 with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
- 2924/16173 with a principal constituent of the material being a non metallic, non metalloid inorganic material
- 2924/16174 Ceramics, e.g. crystalline carbides, nitrides or oxides ([glass ceramics H01L 2224/16175](#))
- 2924/16175 Glasses, e.g. amorphous oxides, nitrides or fluorides
- 2924/16176 with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
- 2924/16177 The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
- 2924/16178 with a principal constituent of the material being a solid not provided for in groups [H01L 2924/157](#) - [H01L 2924/15791](#), e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
- 2924/16179 with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
- 2924/1619 Cavity coating shape
- 2924/16195 Flat cap [not enclosing an internal cavity]
- 2924/16196 Cap forming a cavity, e.g. being a curved metal foil
- 2924/162 Disposition
- 2924/16235 Connecting to a semiconductor or solid-state bodies, i.e. cap-to-chip
- 2924/16251 Connecting to an item not being a semiconductor or solid-state body, e.g. cap-to-substrate
- 2924/1626 Cap-in-cap assemblies
- 2924/1627 stacked type assemblies, e.g. stacked multi-cavities
- 2924/163 Connection portion, e.g. seal
- 2924/1631 Structure
- 2924/16315 Shape
- 2924/1632 Disposition
- 2924/164 Material
- 2924/165 with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
- 2924/16586 with a principal constituent of the material being a non metallic, non metalloid inorganic material
- 2924/16587 Ceramics, e.g. crystalline carbides, nitrides or oxides
- 2924/16588 Glasses, e.g. amorphous oxides, nitrides or fluorides

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- 2924/1659 with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
- 2924/16593 with a principal constituent of the material being a solid not provided for in groups [H01L 2924/157](#) - [H01L 2924/15791](#), e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
- 2924/16598 with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
- 2924/166 . . . Material
- 2924/167 with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
- 2924/16701 the principal constituent melting at a temperature of less than 400 C
- 2924/16717 the principal constituent melting at a temperature of greater than or equal to 400 C and less than 950 C
- 2924/16724 Aluminium [Al] as principal constituent
- 2924/16738 the principal constituent melting at a temperature of greater than or equal to 950 C and less than 1550 C
- 2924/16747 Copper [Cu] as principal constituent
- 2924/1676 Iron [Fe] as principal constituent
- 2924/16763 the principal constituent melting at a temperature of greater than 1550 C
- 2924/16786 with a principal constituent of the material being a non metallic, non metalloid inorganic material
- 2924/16787 Ceramics, e.g. crystalline carbides, nitrides or oxides
- 2924/16788 Glasses, e.g. amorphous oxides, nitrides or fluorides
- 2924/1679 with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
- 2924/16791 The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
- 2924/16793 with a principal constituent of the material being a solid not provided for in groups [H01L 2924/167](#) - [H01L 2924/16791](#), e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
- 2924/16798 with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
- 2924/171 . . . Frame
- 2924/1711 . . . Structure
- 2924/1715 . . . Shape
- 2924/17151 Frame comprising an aperture, e.g. for pressure control, encapsulation
- 2924/172 . . . Disposition
- 2924/173 . . . Connection portion, e.g. seal
- 2924/176 . . . Material
- 2924/177 with a principal constituent of the material being a metal or a metalloid, e.g. boron [B], silicon [Si], germanium [Ge], arsenic [As], antimony [Sb], tellurium [Te] and polonium [Po], and alloys thereof
- 2924/17701 the principal constituent melting at a temperature of less than 400 C
- 2924/17717 the principal constituent melting at a temperature of greater than or equal to 400 C and less than 950 C
- 2924/17724 Aluminium [Al] as principal constituent
- 2924/17738 the principal constituent melting at a temperature of greater than or equal to 950 C and less than 1550 C
- 2924/17747 Copper [Cu] as principal constituent
- 2924/1776 Iron [Fe] as principal constituent
- 2924/17763 the principal constituent melting at a temperature of greater than 1550 C
- 2924/17786 with a principal constituent of the material being a non metallic, non metalloid inorganic material
- 2924/17787 Ceramics, e.g. crystalline carbides, nitrides or oxides
- 2924/17788 Glasses, e.g. amorphous oxides, nitrides or fluorides
- 2924/1779 with a principal constituent of the material being a polymer, e.g. polyester, phenolic based polymer, epoxy
- 2924/17791 The principal constituent being an elastomer, e.g. silicones, isoprene, neoprene
- 2924/17793 with a principal constituent of the material being a solid not provided for in groups [H01L 2924/177](#) - [H01L 2924/17791](#), e.g. allotropes of carbon, fullerene, graphite, carbon-nanotubes, diamond
- 2924/17798 with a principal constituent of the material being a combination of two or more materials in the form of a matrix with a filler, i.e. being a hybrid material, e.g. segmented structures, foams
- 2924/181 . . . Encapsulation
- 2924/1811 . . . Structure
- 2924/1815 . . . Shape
- 2924/1816 Exposing the passive side of the semiconductor or solid-state body
- 2924/18161 of a flip chip
- 2924/18162 of a chip with build-up interconnect
- 2924/18165 of a wire bonded chip
- 2924/182 . . . Disposition
- 2924/183 . . . Connection portion, e.g. seal
- 2924/18301 being an anchoring portion, i.e. mechanical interlocking between the encapsulation resin and another package part
- 2924/186 . . . Material
- 2924/19 . . . Details of hybrid assemblies other than the semiconductor or other solid state devices to be connected
- 2924/1901 . . . Structure
- 2924/19011 . . . including integrated passive components
- 2924/19015 . . . including thin film passive components
- 2924/1902 . . . including thick film passive components
- 2924/1903 . . . including wave guides
- 2924/19031 being a strip line type

2924/19032	. . . .	being a microstrip line type	2924/20263	. . . .	IR-C 3000 nm \leq W<1 mm, i.e. 300 GHz-100THz
2924/19033	. . . .	being a coplanar line type	2924/2027	. . . .	Radio 1 mm - km 300 GHz - 3 Hz
2924/19038	. . . .	being a hybrid line type	2924/20271	. . . .	Microwave radiation 1 mm - 1 meter, i.e. 300 GHz - 300 MHz
2924/19039	. . . .	impedance transition between different types of wave guides	2924/203	. . . .	Ultrasonic frequency ranges, i.e. KHz
2924/1904	. . . .	Component type	2924/20301	. . . .	Ultrasonic frequency [f] $f<25$ kHz
2924/19041	. . . .	being a capacitor	2924/20302	. . . .	Ultrasonic frequency [f] $25 \text{ KHz} \leq f < 50 \text{ KHz}$
2924/19042	. . . .	being an inductor	2924/20303	. . . .	Ultrasonic frequency [f] $50 \text{ KHz} \leq f < 75 \text{ KHz}$
2924/19043	. . . .	being a resistor	2924/20304	. . . .	Ultrasonic frequency [f] $75 \text{ KHz} \leq f < 100 \text{ KHz}$
2924/1905	. . . .	Shape	2924/20305	. . . .	Ultrasonic frequency [f] $100 \text{ KHz} \leq f < 125 \text{ KHz}$
2924/19051	. . . .	Impedance matching structure [e.g. balun]	2924/20306	. . . .	Ultrasonic frequency [f] $125 \text{ KHz} \leq f < 150 \text{ KHz}$
2924/191	. . . .	Disposition	2924/20307	. . . .	Ultrasonic frequency [f] $150 \text{ KHz} \leq f < 175 \text{ KHz}$
2924/19101	. . . .	of discrete passive components	2924/20308	. . . .	Ultrasonic frequency [f] $175 \text{ KHz} \leq f < 200 \text{ KHz}$
2924/19102	. . . .	in a stacked assembly with the semiconductor or solid state device	2924/20309	. . . .	Ultrasonic frequency [f] $f \geq 200 \text{ KHz}$
2924/19103	. . . .	interposed between the semiconductor or sold-state device and the die mounting substrate [i.e. chip-on-passive]	2924/206	. . . .	Length ranges
2924/19104	. . . .	on the semiconductor or sold-state device [i.e. passive-on-chip]	2924/2064	. . . .	larger or equal to 1 micron less than 100 microns
2924/19105	. . . .	in a side-by-side arrangement on a common die mounting substrate	2924/20641	. . . .	larger or equal to 100 microns less than 200 microns
2924/19106	. . . .	in a mirrored arrangement on two different side of a common die mounting substrate	2924/20642	. . . .	larger or equal to 200 microns less than 300 microns
2924/19107	. . . .	off-chip wires	2924/20643	. . . .	larger or equal to 300 microns less than 400 microns
2924/20	. . . .	Parameters	2924/20644	. . . .	larger or equal to 400 microns less than 500 microns
2924/201	. . . .	Temperature ranges	2924/20645	. . . .	larger or equal to 500 microns less than 600 microns
2924/20101	. . . .	Temperature range $T < 0 \text{ C}$, $T < 273.15 \text{ K}$	2924/20646	. . . .	larger or equal to 600 microns less than 700 microns
2924/20102	. . . .	Temperature range $0 \text{ C} \leq T < 60 \text{ C}$, $273.15 \text{ K} \leq T < 333.15 \text{ K}$	2924/20647	. . . .	larger or equal to 700 microns less than 800 microns
2924/20103	. . . .	Temperature range $60 \text{ C} \leq T < 100 \text{ C}$, $333.15 \text{ K} \leq T < 373.15 \text{ K}$	2924/20648	. . . .	larger or equal to 800 microns less than 900 microns
2924/20104	. . . .	Temperature range $100 \text{ C} \leq T < 150 \text{ C}$, $373.15 \text{ K} \leq T < 423.15 \text{ K}$	2924/20649	. . . .	larger or equal to 900 microns less than 1000 microns
2924/20105	. . . .	Temperature range $150 \text{ C} \leq T < 200 \text{ C}$, $423.15 \text{ K} \leq T < 473.15 \text{ K}$	2924/2065	. . . .	larger or equal to 1000 microns less than 1500 microns
2924/20106	. . . .	Temperature range $200 \text{ C} \leq T < 250 \text{ C}$, $473.15 \text{ K} \leq T < 523.15 \text{ K}$	2924/20651	. . . .	larger or equal to 1500 microns less than 2000 microns
2924/20107	. . . .	Temperature range $250 \text{ C} \leq T < 300 \text{ C}$, $523.15 \text{ K} \leq T < 573.15 \text{ K}$	2924/20652	. . . .	larger or equal to 2000 microns less than 2500 microns
2924/20108	. . . .	Temperature range $300 \text{ C} \leq T < 350 \text{ C}$, $573.15 \text{ K} \leq T < 623.15 \text{ K}$	2924/20653	. . . .	larger or equal to 2500 microns less than 3000 microns
2924/20109	. . . .	Temperature range $350 \text{ C} \leq T < 400 \text{ C}$, $623.15 \text{ K} \leq T < 673.15 \text{ K}$	2924/20654	. . . .	larger or equal to 3000 microns less than 4000 microns
2924/2011	. . . .	Temperature range $400 \text{ C} \leq T < 450 \text{ C}$, $673.15 \text{ K} \leq T < 723.15 \text{ K}$	2924/20655	. . . .	larger or equal to 4000 microns less than 5000 microns
2924/20111	. . . .	Temperature range $450 \text{ C} \leq T < 500 \text{ C}$, $723.15 \text{ K} \leq T < 773.15 \text{ K}$	2924/20656	. . . .	larger or equal to 5000 microns less than 6000 microns
2924/202	. . . .	Electromagnetic wavelength ranges [W]	2924/20657	. . . .	larger or equal to 6000 microns less than 7000 microns
2924/20201	. . . .	Gamma radiation, i.e. wavelength less than 0.01 nm	2924/20658	. . . .	larger or equal to 7000 microns less than 8000 microns
2924/20202	. . . .	X-ray radiation, i.e. wavelength 0.01 to 10 nm	2924/207	. . . .	Diameter ranges
2924/2021	. . . .	Ultraviolet radiation	2924/2075	. . . .	larger or equal to 1 micron less than 10 microns
2924/20211	. . . .	UV-C $100 \leq W < 280 \text{ nm}$	2924/20751	. . . .	larger or equal to 10 microns less than 20 microns
2924/20212	. . . .	UV-B $280 \leq W < 315 \text{ nm}$	2924/20752	. . . .	larger or equal to 20 microns less than 30 microns
2924/20213	. . . .	UV-A $315 \leq W < 400 \text{ nm}$			
2924/2024	. . . .	Visible spectrum wavelength $390 \leq W < 700 \text{ nm}$, i.e. 400-790 THz			
2924/2026	. . . .	Infrared radiation $700 \leq W < 3000 \text{ nm}$			
2924/20261	IR-A $700 \leq W < 1400 \text{ nm}$, i.e. 215 THz-430 THz			
2924/20262	IR-B $1400 \leq W < 3000 \text{ nm}$, i.e. 100THz-215 THz			

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- 2924/20753 . . . larger or equal to 30 microns less than 40 microns
- 2924/20754 . . . larger or equal to 40 microns less than 50 microns
- 2924/20755 . . . larger or equal to 50 microns less than 60 microns
- 2924/20756 . . . larger or equal to 60 microns less than 70 microns
- 2924/20757 . . . larger or equal to 70 microns less than 80 microns
- 2924/20758 . . . larger or equal to 80 microns less than 90 microns
- 2924/20759 . . . larger or equal to 90 microns less than 100 microns
- 2924/2076 . . . equal to or larger than 100 microns
- 2924/30 . Technical effects
- 2924/301 . . Electrical effects
- 2924/30101 . . . Resistance
- 2924/30105 . . . Capacitance
- 2924/30107 . . . Inductance
- 2924/3011 . . . Impedance
- 2924/30111 matching
- 2924/302 . . . Electrostatic
- 2924/30201 Charge
- 2924/30205 Discharge
- 2924/3025 . . . Electromagnetic shielding
- 2924/35 . . Mechanical effects
- 2924/351 . . . Thermal stress
- 2924/3511 Warping
- 2924/3512 Cracking
- 2924/35121 Peeling or delaminating
- 2924/36 . . Material effects
- 2924/364 . . . Polymers
- 2924/3641 Outgassing
- 2924/365 . . . Metallurgical effects
- 2924/3651 Formation of intermetallics
- 2924/36511 Purple plague
- 2924/3656 Formation of Kirkendall voids
- 2924/37 . . Effects of the manufacturing process
- 2924/37001 . . . Yield
- 2924/37002 . . . Shelf life
- 2924/3701 . . . increased through put
- 2924/38 . . Effects and problems related to the device integration
- 2924/381 . . . Pitch distance
- 2924/384 . . . Bump effects
- 2924/3841 Solder bridging
- 2924/386 . . . Wire effects
- 2924/3861 Sag
- 2924/3862 Sweep
- 2924/40 . . Details of apparatuses used for either manufacturing connectors or connecting the semiconductor or solid-state body
- 2924/401 . . LASER
- 2924/40101 . . . Mode
- 2924/40102 being pulsed
- 2924/40103 being continuous
- 2924/40105 . . . Beam details
- 2924/4015 Shape
- 2924/402 . . . Type
- 2924/40201 being a chemical
- 2924/40202 Deuterium Flouride [DF] LASER
- 2924/40203 Hydrogen Flouride [HF] LASER
- 2924/40207 Dye laser
- 2924/4025 being a gas
- 2924/40251 argon-ion LASER
- 2924/40252 CO₂ LASER
- 2924/40253 HeAg LASER
- 2924/40254 HeNe LASER
- 2924/40255 NeCu LASER
- 2924/403 being an Excimer
- 2924/40301 ArF LASER
- 2924/40302 F2 LASER
- 2924/40303 KrCl LASER
- 2924/40304 KrF LASER
- 2924/40305 XeCl LASER
- 2924/40306 XeF LASER
- 2924/4035 being a fiber hosted LASER
- 2924/404 being a solid state
- 2924/40401 Free electron LASER
- 2924/40402 Photonic crystal LASER
- 2924/40403 Fiber solid state LASER
- 2924/40404 Yttrium Aluminium Garnet Nd:YAG LASER
- 2924/40405 Yttrium Lithium Flouride Nd:YLF LASER
- 2924/40406 Ruby LASER
- 2924/40407 Yb:YAG LASER
- 2924/405 . . . Wavelength
- 2924/40501 UV spectrum
- 2924/40502 Visible spectrum
- 2924/40503 IR spectrum
- 2933/00** **Details relating to devices covered by the group H01L 33/00 but not provided for in its subgroups**
- 2933/0008 . . Processes
- 2933/0016 . . relating to electrodes
- 2933/0025 . . relating to coatings
- 2933/0033 . . relating to semiconductor body packages
- 2933/0041 . . relating to wavelength conversion elements
- 2933/005 . . relating to encapsulations
- 2933/0058 . . relating to optical field-shaping elements
- 2933/0066 . . relating to arrangements for conducting electric current to or from the semiconductor body
- 2933/0075 . . relating to heat extraction or cooling elements
- 2933/0083 . . Periodic patterns for optical field-shaping in or on the semiconductor body or semiconductor body package, e.g. photonic bandgap structures
- 2933/0091 . . Scattering means in or on the semiconductor body or semiconductor body package ([H01L 33/22](#) takes precedence)