

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 22

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte EIJI HASUNUMA, HIDEKI GENJO, SHIGERU SHIRATAKE,  
ATSUSHI HACHISUKA and KOJI TANIGUCHI

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Appeal No. 2001-0646  
Application No. 09/227,935

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ON BRIEF

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Before HAIRSTON, BARRETT, and RUGGIERO, Administrative Patent Judges.

RUGGIERO, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134 from the Examiner's final rejection of claims 1, 2 and 4. Claim 3 has been canceled and claims 5, 6 and 7 are withdrawn from consideration as non-elected claims. An amendment filed April 7, 2000 after final rejection was approved for entry by the Examiner.

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The disclosed invention relates to an integrated semiconductor device structure. The inventive structure is an improvement upon the prior art device depicted in Fig. 15 of Appellants' disclosure. According to Appellants (Brief at page 3), the impurity region 12 in Fig. 15 of the disclosure is modified to have two impurity regions (50 and 52 in Fig 1 of Appellants' disclosure) and the connection hole 10a in Fig. 1 is coated with an anti-HF (hydrofluoric acid) to make it resistant to the hydrofluoric acid which is used as etch during the formation of the impurity regions 50 and 52.

Claim 1 is illustrative of the invention and reads as follows:

1. A semiconductor device, comprising:

a semiconductor substrate having a main surface;

an element isolating region for defining an element forming region on the main surface of said semiconductor substrate;

an isolation region provided in a strip-shape and having a peak impurity concentration at a prescribed depth position from the main surface of said semiconductor substrate;

a connection hole provided piercing through said element isolating region;

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an anti-HF (hydrofluoric acid) side wall film not etched by hydrofluoric acid, provided to cover a side wall of said connection hole at least near a lower end of said connection hole;

an interconnection layer provided to fill an inner portion of said connection hole; and

an impurity region provided in said semiconductor substrate extending from the lower end of said connection hole to said isolation region, wherein said impurity region comprises a first impurity region portion provided to connect said interconnection layer to said isolation region, and a second impurity region portion provided near the lower end of said connection hole and connected to said interconnection layer.

The Examiner relies on the following prior art reference:<sup>1</sup>

Kuroda	5,825,059	Oct. 20, 1998 (filed Jan. 30, 1997)
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Claims 1, 2 and 4 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the admitted prior art in view of Kuroda.

Rather than repeating the arguments of Appellants and the Examiner, we make reference to the Briefs (Paper Nos. 15 and 17) and the Examiner's Answer (Paper No. 16) for the respective details thereof.

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<sup>1</sup> In addition, the Examiner relies on the admitted prior art illustrated at Figure 15 and described beginning at pages 1 and 2 of Appellants' specification.

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OPINION

We have carefully considered the subject matter on appeal, the rejection advanced by the Examiner, the arguments in support of the rejection, and the evidence of obviousness relied upon by the Examiner as support for the rejection. We have, likewise, reviewed and taken into consideration, in reaching our decision, Appellants' arguments set forth in the Briefs along with the Examiner's rationale in support of the rejection and arguments in rebuttal set forth in the Examiner's Answer.

It is our view, after consideration of the record before us, that the evidence relied upon and the level of skill in the particular art would have suggested to one of ordinary skill in the art the obviousness of the invention as set forth in claims 1, 2, and 4. Accordingly, we affirm.

As a general proposition, in an appeal involving a rejection under 35 U.S.C. § 103, an Examiner is under a burden to make out a prima facie case of obviousness. If that burden is met, the burden of going forward then shifts to Appellants to overcome the prima facie case with argument and/or evidence. Obviousness, is then determined on the basis of the evidence as a whole and the relative persuasiveness of the arguments. See In re Oetiker, 977

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F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992); In re Hedges, 783 F.2d 1038, 1039, 228 USPQ 685, 686 (Fed. Cir. 1986); In re Piasecki, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984); and In re Rinehart, 531 F.2d 1048, 1051-52, 189 USPQ 143, 147 (CCPA 1976).

Following the guidelines above, the Examiner sets forth in detail the rejection of claims 1, 2 and 4 under 35 U.S.C. § 103(a) at pages 4 and 5 of the Examiner's Answer. Appellants argue (Brief, page 6) that "the Examiner has not established that a person of ordinary skill in the art would have been led by a reading of Kuroda to consider this reference in the context of the structure of prior art Fig. 15 nor, even if so considered, would have been motivated to modify the prior art Fig. 15 embodiment to result in the specifically claimed invention."

In response, the Examiner discusses in detail (Answer, pages 6 and 7) why a person of ordinary skill in the art would have been motivated to modify Fig. 15 of Appellants' disclosure (prior art) with the teachings of Kuroda. The Examiner makes a reference to Appellants' discussion of the admitted prior art at page 3, line 27 through page 4, line 1 of the specification to show that there was recognition of the problem of the connection

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hole wall being etched away by the hydrofluoric acid and that the use of anti-HF material coating the connection hole would have corrected this problem. This recognition is also disclosed by the Kuroda reference at Figure 5 and the accompanying description at column 8, line 58 through column 9, line 23. We agree with the Examiner's position because we, like the Examiner, find that the stated citation in Kuroda teaches the use of an anti-HF layer 20 which protects the connection hole from being degraded by the etching process which employs an HF solution.

Appellants further argue (Brief at page 7) that "[t]he Office Action does not specify the manner in which the side wall structure of prior art Fig. 15 is to be modified, nor identify what disclosure in Kuroda would have impelled modification." The Examiner responds (Answer pages 6 and 7) that the insulating film (20) made of silicon dioxide and covered with the inside layer (21A) made of polycrystalline silicon prevents the wall of the connection hole from being damaged by the hydrofluoric acid. Kuroda further discloses that in the absence of the silicon dioxide film (20) the diameter of the opening portion of the capacitor would be enlarged during the etching step using the hydrofluoric acid. Therefore, the Examiner concludes (id. at

pages 6 & 7) "[f]rom the above explanation, the Office Action does specify the manner in which the side wall structure of the prior art Fig. 15 is to be modified . . . ." We agree with the Examiner's reasoning because the problem of the wall of the connection hole being etched away by the hydrofluoric acid was recognized in the prior art and the teaching of Kuroda to coat the wall with an anti-hydrofluoric layer to protect it from being etched away would have been a desirable feature that an artisan would have executed.

Appellants further argue (Brief, page 8) that "[t]he purpose for forming these two distinct impurity portions, described above, is to overcome a significant problem with the prior art Fig. 15 embodiment, *i.e.*, the likelihood that the single impurity region of Fig. 15 can extend to a width sufficient to short circuit adjacent capacitor storage nodes." Appellants further assert (id. at page 8) that "the single impurity region of prior art Fig. 15 is not equivalent to the two impurity region portions recited in claim 1." The Examiner responds (Answer at page 7) that "it is important to note that claim 1 only discloses an impurity connection means formed between the lower end of the contact hole and the isolation region. The claim never discloses

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the specified shape and the impurity concentration of an impurity connection means formed by the manufacturing method according to applicant's [sic, applicants'] written description."

We agree with the Examiner's position. We, like the Examiner, see no reason why the impurity region (12) in Fig. 15 of the disclosure (prior art) cannot be considered as having two regions, one closer to the lower end of the connection hole and the other away from the lower end of the connection hole and proximate to the strip-shape region (3). We are also of the opinion that Appellants' arguments are not commensurate with the recited structure in claim 1.

Appellants further argue (Reply Brief at page 2) that "[t]here has been no allegation by the Examiner that Kuroda teaches or suggests piercing the element isolation region 11 to form an interconnection with an underlying impurity region as recited in claim 1." However, we are of the view that the Examiner uses the prior art Fig. 15 of the disclosure to show the connection hole as piercing the isolation region recited in claim 1.

Therefore, we sustain the obviousness rejection of claim 1 over the admitted prior art in view of Kuroda.

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With respect to claims 2 and 4, Appellants argue (Brief at page 9) that "[c]laims 2 and 4 are dependent from claim 1 and further require that the side wall film is a nitride film (claim 2) or either a polysilicon film or amorphous silicon film (claim 4). None of the Office Actions has addressed these claim requirements." However, we find that the Examiner has given an explanation at pages 5 and 8 of the Examiner's Answer where the Examiner has shown in Kuroda the recited silicon nitride film (20) and the polycrystalline silicon side wall (21A), as recited in these claims.

Therefore, we also sustain the obviousness rejection of claims 2 and 4 over the admitted prior art in view of Kuroda.

The decision of the Examiner rejecting claims 1, 2 and 4 under 35 U.S.C. § 103 is affirmed.

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No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED

KENNETH W. HAIRSTON	)	
Administrative Patent Judge	)	
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	)	
	)	BOARD OF PATENT
LEE E. BARRETT	)	APPEALS AND
Administrative Patent Judge	)	INTERFERENCES
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JOSEPH F. RUGGIERO	)	
Administrative Patent Judge	)	

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