

**THIS OPINION WAS NOT WRITTEN FOR PUBLICATION**

This opinion (1) was not written for publication and (2) is not binding precedent of the Board.

Paper No. 19

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte HIRONOBU NAKAO

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Appeal No. 95-0634  
Application 07/962,322<sup>1</sup>

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HEARD: 12 January 1998

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Before BARRETT, LEE, and TORCZON, Administrative Patent Judges.  
TORCZON, Administrative Patent Judge.

FINDINGS OF FACT AND CONCLUSIONS OF LAW

FINDINGS OF FACT

We have reviewed the record in its entirety in light of the arguments of Appellant and the examiner. Our decision presumes familiarity with the entire record. A preponderance of the evidence of record supports each of the following fact findings.

A. The nature of the case

1. This is an appeal under 35 U.S.C. § 134 from the final rejection of claim 2. (Paper 13 at 1.) No other claims are

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<sup>1</sup> Attorney docket no. A29171.

pending. (Paper 9 at 1.) We affirm, but we also make a statement pursuant to 37 CFR § 1.196(c) ("Rule 196(c)").

2. The application on appeal was filed on 15 October 1992. Appellant claims the benefit pursuant to 35 U.S.C. § 119 of Japanese patent application no. Hei 3-284551, filed 30 October 1991. (Paper 1, declaration at 1; Paper 6.) Rohm K.K. is the real party in interest. (Paper 6.)

3. The application is entitled "Semiconductor memory device with three-dimensional cluster distribution". (Paper 1 at 1.) The subject matter of the invention "relates to a nonvolatile memory device, for example, a flash EEPROM (flash electrically erasable programmable read-only memory), in which an insulating film containing metal or semiconductor particles is used in a gate of a transistor." (Paper 1 at 1.)

4. The sole claim on appeal defines the subject matter of the invention as follows (Paper 8 at 2, emphasis added):

2. A semiconductor memory device comprising:  
a silicon substrate;  
an insulating layer with a predetermined width, in which clusters of semiconductor material are distributed in three dimensions so as to be overlapped in a direction through the layer;  
a gate region formed on an upper portion of said insulating layer; and  
a source region and a drain region formed in spaced relation in the substrate beneath said insulating layer;  
wherein said drain region is formed by an oblique ion implantation, and is overlapped with said insulating film layer.

5. Figure 1 illustrates the claimed subject matter. The semiconductor memory device has a substrate 1 with a source region 5 and a drain region 6, including a portion of the drain 6a formed beneath an insulating film 2. The insulating film 2 has semiconducting clusters 3. A gate 4 is formed on the insulating film 2. (Paper 1 at 4-5.)

B. The rejection

6. The examiner rejected claim 2 under 35 U.S.C. § 102 as anticipated by the following reference:

Yamazaki et al. (Yamazaki) 3,878,549 15 April 1975

7. Yamazaki teaches a transistor-based semiconductor memory device with semiconductor clusters or thin-films. (1:22-29.) The examiner relies on Yamazaki's Figures 1 and 2G for the anticipatory teachings. (Paper 9

at 2-3.) Figure 1 (right) shows a transistor structure with a substrate 5, a source region 14, a drain region 16, a gate 1, and insulating films 2 & 4 with semiconductor clusters 3.

Yamazaki does not say how the substrate 5, source 14, drain 16, or gate 1 are formed. (3:11-19.)

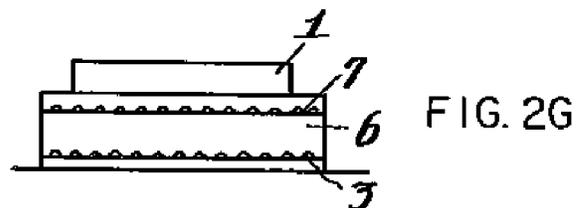
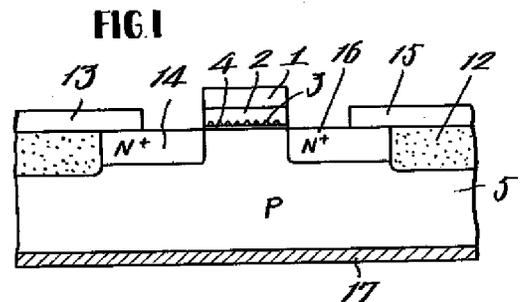


Figure 2G (right) shows the gate **1** and insulating layers of an embodiment in which one layer of semiconductor clusters **7** is disposed over a second layer of semiconductor clusters **3**, separated by an insulating layer **6**. (3:23-26.)

8. Appellant has presented two issues for review: whether Yamazaki teaches "clusters of semiconductor material are distributed in three dimensions so as to be overlapped in a direction through the layer" or the "drain region is formed by an oblique ion implantation, and is overlapped with said insulating film layer". (Paper 14 at 8-12.) Cf. Gechter v. Davidson, 116 F.3d 1454, 1460, 43 USPQ2d 1030, 1035 (Fed. Cir. 1997) (focussing on the contested limitations). At the hearing, counsel confirmed our understanding that "in a direction through the layer" is equivalent to "through the thickness of the layer", i.e., in the vertical direction of Appellant's Figure 1. The examiner contends that Yamazaki's 2G embodiment shows overlapping clusters **3** & **7** and that diffusion from Yamazaki's drain **16** into the substrate below the insulating film layer **2** would create an overlap.

9. We find that Yamazaki teaches clusters of semiconductor material distributed in three dimensions so as to be overlapped through the thickness of the insulating layer. Yamazaki's Fig. 2G embodiment discloses a two-dimensional semiconductor cluster layer disposed over another two-dimensional semiconductor

cluster layer. Two different two-dimensional cluster distributions (not in the same plane) necessarily describe a three-dimensional cluster distribution. The placement of one cluster layer over the other cluster layer necessarily creates an overlap between the two cluster layers in the dimension through the thickness of the insulating layer. Appellant does not argue, and Yamazaki does not teach, that the geometries of the cluster layers are such that no overlap occurs.

10. Yamazaki does not expressly disclose a portion of the drain region beneath the insulating layer. "An anticipatory reference, however, need not duplicate word for word what is in the claims. Anticipation can occur when a claimed limitation is 'inherent' or otherwise implicit in the relevant reference." Standard Havens Prods., Inc. v. Gencor Indus., Inc., 953 F.2d 1360, 1369, 21 USPQ2d 1321, 1328 (Fed. Cir. 1991). The examiner found that "there would be some overlap of the clusters and the drain due to the spreading of the drain caused by migration of N type impurities in the drain during processing." (Paper 9 at 3.) We find this explanation to be credible.

11. Once the examiner establishes a basis for inherency, the burden shifts to appellant to prove that the prior art does not possess that inherent characteristic. In re King, 801 F.2d 1324, 1327, 231 USPQ 136, 138-39 (Fed. Cir. 1986). Appellant has not met this burden. Instead, Appellant notes that Yamazaki does



Consequently, whether or not Yamazaki's transistor inherently has diffusion from the drain into the substrate, Figures 3A and 3B would not be the place to depict that diffusion.

#### CONCLUSIONS OF LAW

1. During prosecution, we must interpret claims as broadly as their terms reasonably allow. In re Zletz, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989). We do so because applicants have the opportunity during prosecution to amend their claims to avoid rejections. We may not interpolate limitations from disclosed embodiments into the claims. In re Paulsen, 30 F.3d 1475, 1480, 31 USPQ2d 1671, 1674 (Fed. Cir. 1994).

2. Appellant argues that the limitation "clusters of semiconductor material are distributed in three dimensions so as to be overlapped in a direction through the layer" can only mean that the clusters must be distributed "throughout" the insulating layer. (Paper 14 at 9.) It is clear to us that Appellant understands his invention to require cluster distribution throughout the insulating layer. (Paper 14 at 3; Paper 1 at 3 (summary) and 4 (description of Fig. 1).) Indeed, he relies on this understanding to distinguish Yamazaki, which he argues teaches that clusters are not distributed through the thickness of the insulating layer. (Paper 14 at 10, alluding to Yamazaki 2:39-42.) Claim 2, however, is not so limited. We cannot

reasonably read "throughout" into the claim because nothing else in the claim requires such a reading. Paulsen, 30 F.3d at 1480, 31 USPQ2d at 1674. As we previously indicated, Yamazaki's two-layer distribution meets the claim's requirement for an overlapping, three-dimensional distribution.

3. Claim 2 contains a process limitation: the drain region is formed by an oblique ion implantation. Process steps in a product claim are limiting to the extent they further define the structure of the claim. In re Thorpe, 777 F.2d 695, 697, 227 USPQ 964, 965-966 (Fed. Cir. 1985). As we indicated earlier, however, the evidence of record does not support a finding that Appellant's claimed structure would differ from Yamazaki's inherent structure.

#### RULE 196(c) STATEMENT

At the hearing, we discussed with counsel the possibility of an amendment under Rule 196(c). The addition of "throughout the layer" after "distributed" would distinguish claim 2 from Yamazaki. We did not identify an amendment that would solve the drain-overlap problem, but one point of distinction would be sufficient to overcome the rejection.

#### DECISION

The examiner's rejection of claim 2 is affirmed. Appellant is entitled, however, to amend the claim as indicated, subject to the provisions of Rule 196(c).

We set a time period to expire two (2) months from the date of this decision during which Appellant may file an amendment under Rule 196(c). No time period for taking subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a). 37 CFR § 1.136(b).

AFFIRMED - RULE 196(c)

LEE E. BARRETT	)	
Administrative Patent Judge	)	
	)	
	)	
	)	
	)	BOARD OF PATENT
JAMESON LEE	)	APPEALS
Administrative Patent Judge	)	AND
	)	INTERFERENCES
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RICHARD TORCZON	)	
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