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**Datasheet for the decision
of 9 July 2019**

Case Number: T 2679/16 - 3.4.03

Application Number: 13161683.1

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Language of the proceedings: EN

Title of invention:

Trench-gate MOSFET

Applicant:

Cree, Inc.

Headword:

Relevant legal provisions:

EPC Art. 76(1), 84, 123(2)
EPC R. 115(2)
RPBA Art. 13(1), 15(3), 15(6)

Keyword:

Late-filed request - admitted (no)

Decisions cited:

T 1587/07

Catchword:



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Case Number: T 2679/16 - 3.4.03

D E C I S I O N
of Technical Board of Appeal 3.4.03
of 9 July 2019

Appellant: Cree, Inc.
(Applicant) 4600 Silicon Drive
Durham, NC 27703 (US)

Representative: FRKelly
27 Clyde Road
Dublin D04 F838 (IE)

Decision under appeal: Decision of the Examining Division of the
European Patent Office posted on 14 July 2016
refusing European patent application No.
13161683.1 pursuant to Article 97(2) EPC.

Composition of the Board:

Chairman G. Eliasson
Members: T. M. Häusser
C. Heath

Summary of Facts and Submissions

- I. The appeal concerns the decision of the examining division refusing the European patent application No. 13 161 683 for
- added subject-matter extending beyond the application as filed and the parent application (Articles 76(1) and 123(2) EPC) and lack of clarity (Article 84 EPC) in relation to the main request, and
 - added subject-matter in relation to the auxiliary request (Articles 76(1) and 123(2) EPC).
- II. In a telephone conversation with the chairman of the board dated 8 July 2019, the appellant's (applicant's) representative had enquired about the board's preliminary opinion, whereupon the chairman had replied that the preliminary opinion of the board tended to be negative, yet that all relevant issues could be discussed during the oral hearing.

Oral proceedings took place on 9 July 2019 before the board in the absence of the appellant, of which the board had been informed beforehand.

In writing the appellant had requested that the decision under appeal be set aside and a patent be granted based on the set of claims filed with letter dated 7 June 2019.

- III. The wording of independent claim 1 is as follows (board's labelling "(a)" and "(b)"): :

"1. A transistor (50) formed of silicon carbide and having an insulated control contact (61) within a trench (56), the transistor comprising:

a pair of semiconductor mesas (65) defining the trench, each semiconductor mesa of the pair of semiconductor mesas comprising at least one p-n junction;

(a) a buried channel layer (72) extending across portions of top surfaces of the pair of semiconductor mesas and covering walls and a bottom of the trench, the transistor including a N+ type drift layer (55) where the N+ type drift layer (55) and the pair of semiconductor mesas are formed of silicon carbide;

the N+ type drift layer (55) extending beneath the trench;

(b) a P+ type well (77) having a doping concentration in a range between $1 \times 10^{18} \text{ cm}^{-3}$ and $1 \times 10^{19} \text{ cm}^{-3}$ extending from a first semiconductor mesa (60) of the pair of semiconductor mesas to a depth within the drift layer that is greater than a depth of the trench where the buried channel layer extends to the drift layer, the P+ type well being laterally separated from the trench, wherein for the first semiconductor mesa of the pair of semiconductor mesas, a p-n junction of the at least one p-n junction in the first semiconductor mesa comprises:

a P+ type semiconductor region (68) positioned above at least a portion of the P+ type well (77) and between the P+ type well (77) and the trench;

and

a N+ type source region (69) positioned on the first semiconductor region;

a source contact (60) in direct contact with both the P+ type well (77) and the source region;

an N+ type epitaxial buffer layer (73) on the drift layer (55) and extending between the P+ type well (77) and the trench to the drift layer;

an oxide layer (64) within the trench; and

a gate contact (61) on the oxide layer.

- IV. The appellant argued that the claims as amended did not contain subject-matter extending beyond the application as filed and that the application was in order for grant.

Reasons for the Decision

1. Procedural matters
- 1.1 As announced in advance, the duly summoned appellant did not attend the oral proceedings. In accordance with Rule 115(2) EPC the proceedings were continued without the appellant.
- 1.2 According to Article 15(3) and (6) RPBA, the board shall "not be obliged to delay any step in the proceedings, including its decision, by reason only of the absence at the oral proceedings of any party duly summoned who may then be treated as relying only on its written case" and "ensure that each case is ready for decision at the conclusion of the oral proceedings, unless there are special reasons to the contrary".
- Indeed, the purpose of oral proceedings is to give the party the opportunity to present its case and to be heard. However, a party gives up that opportunity if it does not attend the oral proceedings.
- 1.3 In the present case, the current request was filed with the letter dated 7 June 2019, i. e. after the oral proceedings before the board had been arranged. Under such circumstances the appellant had to expect a discussion on the admission of this newly filed request during the oral proceedings, in particular because explicit reference had been made to Article 13 RPBA in the board's

communication pursuant to Article 15(1) RPBA annexed to the summons to oral proceedings.

By not attending the oral proceedings the appellant forwent the opportunity to present its case as to why the new request should be admitted into the appeal proceedings and could thus be treated as relying only on its written submissions in this respect (see T 1587/07, points 2.1 and 2.2 of the Reasons).

The board's decision in relation to the admission of the newly filed request (see point 2 below) is therefore in conformity with the requirements of Article 113(1) EPC that the decisions of the EPO may only be based on grounds or evidence on which the parties concerned have had an opportunity to present their comments.

Consequently, the case was ready for decision at the conclusion of the oral proceedings.

2. Admission of the new request

2.1 The new request was filed about one month before the date of the oral proceedings before the board. It constitutes therefore an amendment to the appellant's case after it filed its grounds of appeal and may be admitted into the proceedings and considered at the board's discretion (Article 13(1) RPBA).

2.2 The discretion is exercised in view of, *inter alia*, the current state of the proceedings (Article 13(1) RPBA, second sentence). Moreover, in accordance with established case law, late-filed requests are held inadmissible if - *prima facie* - they do not overcome the outstanding objections under the EPC or give rise to new

objections (*Case Law of the Boards of Appeal of the EPO*, 8th edition 2016, sections IV.E.4.4.1 and 4.4.2).

2.3 In the present case claim 1 was amended to specify that the P+ type well has a doping concentration in a range between $1 \times 10^{18} \text{ cm}^{-3}$ and $1 \times 10^{19} \text{ cm}^{-3}$ (see feature (b) of claim 1).

Neither in the application as filed nor in the parent application there appears to be any explicit basis for the claimed range of the doping concentration of the P+ type well.

The appellant argued that a basis for the amendment could be found in Figure 5 of the application as filed, which is identical to Figure 5 of the parent application.

In this Figure the P+ type well is shown to have various shadings in different locations indicating the corresponding doping concentrations. However, in accordance with the relevant shading key provided in relation to the Figure these doping concentrations of the P+ type well appear to cover a range of between $1 \times 10^{15.5} \text{ cm}^{-3}$ and $1 \times 10^{19} \text{ cm}^{-3}$, which is significantly wider than the claimed range. Moreover, the value of $1 \times 10^{18} \text{ cm}^{-3}$, i. e. the lower end point of the claimed range, is not mentioned in the shading key at all.

It would thus appear that the claimed range of the doping concentration of the P+ type well is not directly and unambiguously derivable from the application as filed or from the parent application. Therefore, the board is of the opinion that - *prima facie* - the amendments effected in relation to present claim 1 give rise to new objections under Articles 76(1) and 123(2) EPC.

2.4 Furthermore, the following feature (a)' was deleted in current claim 1 at the end of feature (a) in relation to claim 1 of the previous main request on file (submitted with the grounds of appeal):

(a)' ", and a portion of the buried channel layer is formed on an $11\bar{2}0$ plane of the silicon carbide along a sidewall of the trench".

The examining division had objected to the absence of feature (a)' from the independent claim then on file as early as in the European search opinion drawn up under Rule 62 EPC and transmitted to the appellant with the communication dated 13 June 2013. In particular, the examining division was of the opinion that feature (a)' was presented as an essential feature in the parent application and was indispensable for the function of the invention so that its omission from the independent claim then on file constituted subject-matter extending beyond the content of the parent application as filed contrary to the provisions of Article 76(1) EPC (see point 1.1 of the search opinion).

The appellant did not present any reasons why it considered the omission of feature (a)' to be in conformity with Article 76(1) EPC.

Based on a first appraisal the board agrees with the examining division in its assessment that feature (a)' was presented as essential in the parent application and was indispensable for the function of the invention. Indeed, the channel conductivity appears to be enhanced by using the $11\bar{2}0$ plane along a sidewall of the trench and this appears to be presented accordingly in the description. Moreover, a feature corresponding

essentially to feature (a)' was comprised in the independent claims of the parent application as originally filed. Hence, in accordance with the essentiality test the omission of this feature appears to constitute an amendment which introduces subject-matter extending beyond the parent application (*Case Law of the Boards of Appeal of the EPO*, 8th edition 2016, sections II.E.1.2.4).

Therefore, the board is of the opinion that - *prima facie* - the amendments effected in relation to present claim 1 give rise to a further new objection under Article 76(1) EPC.

2.5 In addition - as pointed out above - the objection mentioned under point 2.4 above had already been raised by the examining division at the earliest possible stage of the proceedings, namely in the European search opinion.

In the requests underlying the decision under appeal the appellant had addressed this issue by incorporating feature (a)' in claim 1 of the then auxiliary request and a somewhat broader version of that feature (omitting the expression "along a sidewall of the trench") in claim 1 of the then main request. With the grounds of appeal the appellant then filed a new main request and a new auxiliary request which both contained an independent claim 1 comprising feature (a)'.

Hence, the objection had not been an issue during the appeal proceedings before. Only at a very late stage of these proceedings, namely about one month prior to the oral proceedings before the board, the appellant replaced the requests on file and submitted a new claim

request which contained an independent claim 1 wherein feature (a)' was omitted.

Moreover, the appellant did not provide any justification why feature (a)' was omitted in the independent claim of the new request. The board does not see any reason for such an amendment, either. In particular, it does not appear to be a response to comments or objections raised by the board in its communication under Rule 15(1) RPBA.

In view of the state of the proceedings the omission of feature (a)' in the independent claim of the present sole request is thus considered an unsuitable attempt to overcome issues of patentability.

2.6 In view of the above, the new request is not admitted into the appeal proceedings (Article 13(1) RPBA).

3. Conclusion

Since the board does not admit the new request into the proceedings, there is no admissible request on file on the basis of which a patent could be granted. Consequently, the appeal has to be dismissed (Articles 97(2) and 111(1) EPC).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



S. Sánchez Chiquero

G. Eliasson

Decision electronically authenticated