

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

STMICROELECTRONICS, INC.,
Petitioner,

v.

THE TRUSTEES OF PURDUE UNIVERSITY,
Patent Owner.

IPR2022-00252
Patent 7,498,633 B2

Before GRACE KARAFFA OBERMANN, JO-ANNE M. KOKOSKI, and
JEFFREY W. ABRAHAM, *Administrative Patent Judges*.

OBERMANN, *Administrative Patent Judge*.

DECISION

Denying Petitioner's Request for Rehearing of
Decision Denying Institution of *Inter Partes* Review
37 C.F.R. § 42.71(d)

I. INTRODUCTION

Petitioner filed a Request for Rehearing (Paper 14, “Rehearing Request” or “Req. Reh’g”) of the Decision Denying Institution of *Inter Partes* Review (Paper 13, “Institution Decision” or “Dec.”) of claims 9–11 of U.S. Patent No. 7,498,633 B2 (“the ’633 patent” or “Ex. 1001”).

Upon request, we review a decision “for an abuse of discretion” (37 C.F.R. § 42.71(c) (2020)), which occurs when the decision is “based on an erroneous conclusion of law,” “clearly erroneous factual findings,” or “a clear error of judgment.” *PPG Indus. Inc. v. Celanese Polymer Specialties Co.*, 840 F.2d 1565, 1567 (Fed. Cir. 1988). Applying that standard, we *deny* the Rehearing Request.

II. BACKGROUND

The sole ground of unpatentability advanced in the Petition (Paper 2, “Pet.”) challenges independent claim 9—as well as claims 10 and 11, which depend from claim 9—as obvious in view of Ryu¹ and Williams². Pet. 4. Claim 9 relates to a double-implanted metal-oxide semiconductor field effect transistor (“DIMOSFET”). Ex. 1001, 2:29–30. The ’633 patent describes and claims a DIMOSFET that includes a plurality of base contact regions, which are “spaced apart from each other in a direction parallel to the longitudinal axis.” *Id.* at Fig. 3; *see id.* at 9:49–53; 10:1–5.

In other words, the sole challenge asserted in the Petition is based on obviousness over Ryu and Williams, and a dispositive question presented is whether Petitioner, in the Petition, shows adequately that the subject matter of claim 9, from which the other challenged claims depend, would have been

¹ US 2004/0119076 A1, published June 24, 2004 (Ex. 1003).

² US 6,413,822 B2, issued July 2, 2002 (Ex. 1004).

obvious in view of that combination. Petitioner's arguments, in that regard, are keyed to the numbered components in Ryu's device as illustrated, for example, in Ryu's Figure 2A, reproduced below:

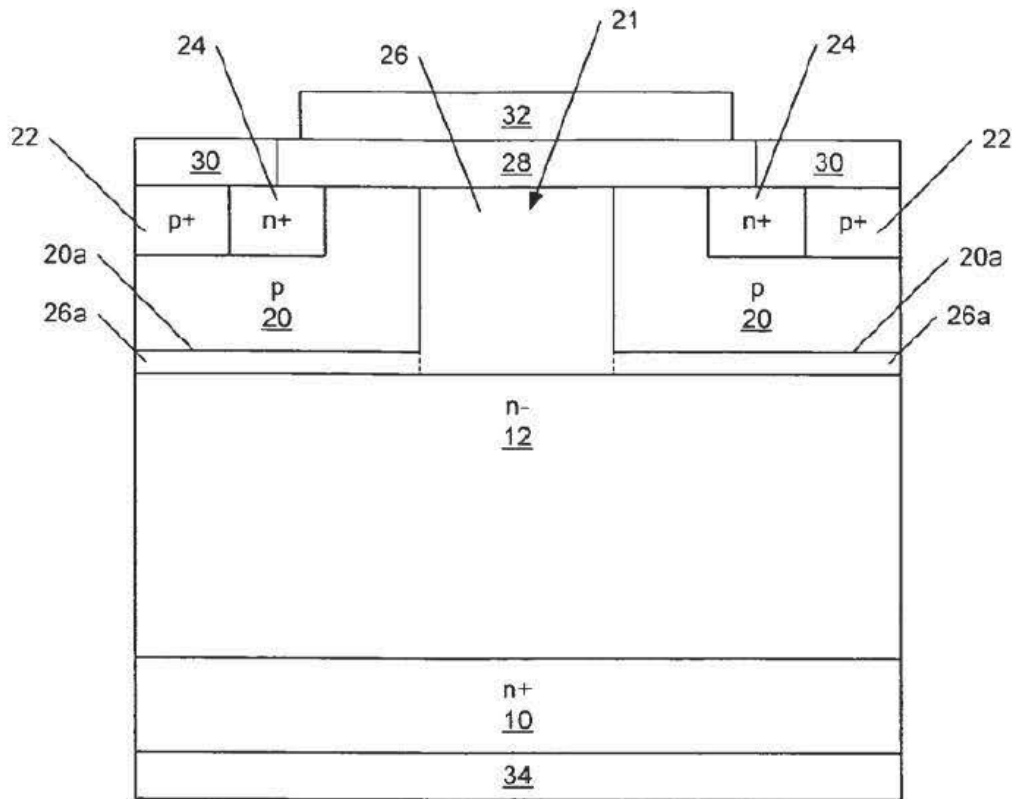
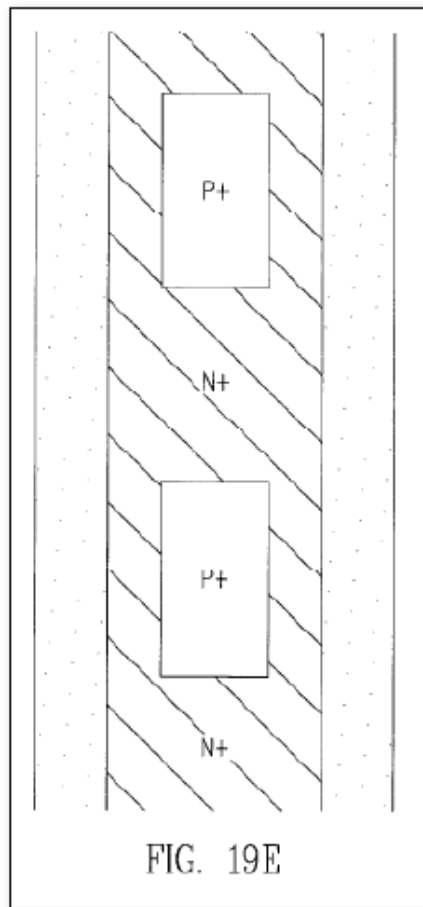


Figure 2A

Ex. 1003, Fig. 2A. Figure 2A from Ryu illustrates a cross-sectional view of a MOSFET. *Id.* ¶ 28. In the Petition, Petitioner acknowledges that “Ryu does not explicitly disclose a plurality of left p+ regions 22 defined in the left n+ region 24 and spaced apart from each other in a direction parallel to the longitudinal axis defined by the left source contact 30. However,” according to Petitioner, “Williams does.” Pet. 63.

Figure 2A, reproduced above, confirms that Ryu's MOSFET lacks the limitation of claim 9 that requires “a plurality of first base contact regions defined in the first source region,” wherein each of that plurality of contact

regions (identified in Figure 2A as element 22) is “spaced apart from each other in a direction parallel to the longitudinal axis defined by” a first source electrode (identified in Figure 2A as element 30). For that limitation, Petitioner turns to Williams’ Figure 19E, reproduced below, which purportedly “shows a linear cellular structure extending top-to-bottom”:

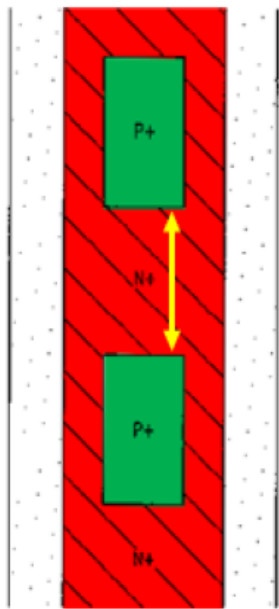


EX1004, FIG. 19E

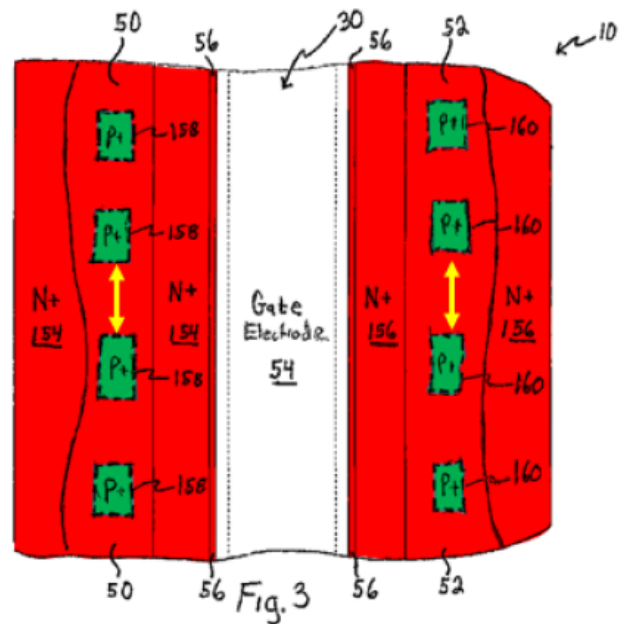
Pet. 22 (citing Ex. 1002 ¶ 46), 47–48 (citing Ex. 1002 ¶ 88; reproducing Figure 19E from Williams). Figure 19E from Williams illustrates a plan view of a source-body design that “shows a continuous N⁺ source region with P⁺ body contact ‘windows.’” Ex. 1004, 10:22–24. In the Petition,

Petitioner argues that the ordinarily skilled artisan would have been led to modify Ryu's MOSFET to include "a continuous N+ source region with P+ body contact 'windows'" as shown in Williams' Figure 19E. Pet. 63 (emphasis omitted).

To be clear, Petitioner, in the Petition, directs the Board to "Williams' Figure 19E" as showing "P+ body contact windows" that "are 'defined in' the N+ source region and are 'spaced apart from each other in the direction of a longitudinal axis' (i.e., up-down with respect to the page), as annotated using yellow arrows," in the comparison figure reproduced below, "just the same way as shown in the '633 patent." *Id.*



EX1004, FIG. 19E (annotated)



EX1001, FIG. 3 (annotated)

Id. at 64. (Petitioner's comparison illustration). The above comparison illustration shows Williams' Figure 19E on the left and Figure 3 from the '633 patent on the right. Petitioner annotates the both figures in the comparison illustration to highlight N+ source regions in red, P+ body

contact windows in green, and the longitudinal axis “using yellow arrows.” *Id.* at 63–64.

The Institution Decision resolved, in Patent Owner’s favor, a dispositive dispute surrounding whether the Petition articulates reasons for the proposed combination with sufficient clarity and persuasiveness to support institution of review. Dec. 16–20; *compare* Pet. 65, with Paper 8 (“Prelim. Resp.”), 40. At bottom, based on the information presented, the Board agreed with Patent Owner that “Petitioner’s ‘rationale for combining the teachings of Ryu and Williams’ in the manner claimed is ‘flawed.’” Dec. 20 (citing Prelim. Resp. 43). Accordingly, we denied the Petition and declined to institute review, because Petitioner failed to demonstrate a reasonable likelihood of prevailing at trial with respect to the sole ground of unpatentability asserted in the Petition, based on obviousness over Ryu in view of Williams. *Id.*; *see* Pet. 4 (identification of the sole ground).

In the Rehearing Request, Petitioner argues that the Institution Decision misapprehends Petitioner’s reasons to combine Ryu and Williams and, further, misunderstands the disclosure of Williams. Req. Reh’g 1–2. We address each of those asserted errors in our analysis below.

III. ANALYSIS

A. Reasons to Combine Ryu and Williams

The Petition identifies MOSFETs that “reduce on-state resistance” in conjunction with the field of endeavor, to establish that Ryu and Williams are within the same field of endeavor. Pet. 51–52, 65–66 (arguing that “Ryu and Williams are from the same field of endeavor” and, concluding, that “both references are directed to vertical MOSFETs and aim at reducing on-resistance.”). *Id.* Petitioner further argues, repeatedly, that, despite

differences in gate structure, the ordinarily skilled artisan “would nonetheless have been motivated to use Williams’s teachings in Ryu” to “ruggedize Ryu’s MOSFET.” *Id.* at 52–56, 65–71.

In the Rehearing Request, Petitioner now attempts to step back from its repeated assertions in the Petition that a desire to improve ruggedness would have prompted the proposed modification. Req. Reh’g 4 (miscasting this repeated and consistent argument in the Petition as “guided by Patent Owner’s arguments”); *but see* Pet. 52–56, 65–71 (repeatedly and consistently relying on a desire to improve ruggedness in Ryu’s device).

Petitioner, not Patent Owner, emphasized in the Petition that the reason to combine is based on solving in Ryu the same “problem [of preventing the parasitic bipolar junction transistor (BJT) from activating] in the same way” as does Williams. Pet. 52–56, 65–69. In that regard, when proposing a reason to combine, the Petition states clearly and unambiguously that the ordinarily skilled artisan would have been prompted to modify Ryu in view of Williams because both references “include a parasitic BJT” and in “both Williams and Ryu, the solution to the potential problem caused by this parasitic transistor is the same.” *Id.* at 52, 65–66.

Against that backdrop, the Petition does not identify reduction of on-resistance as a reason *independent* from increasing ruggedness that would have prompted the proposed modification of Ryu in view of Williams. *See generally* Pet. The Petition provides examples of parasitic BJT in each reference and asserts that, because Ryu and Williams prevent parasitic BJT in the same way, “Williams’s well-known linear geometry” would have been recognized as “applicable in Ryu.” *Id.* at 52–56, 66–69. The Petition discusses Figures 19A–19F of Williams and concludes that the ordinarily

skilled artisan would have been led “to use Williams’s teachings of multiple and periodic P+ body contact regions in Ryu to maximize the contact of the p+ regions *and ruggedize* Ryu’s MOSFET.” *Id.* at 69 (Board’s emphasis; Petitioner’s emphasis omitted).

In the Rehearing Request, Petitioner argues, “[T]he Petition clearly describes (1) reducing on-resistance and (2) maintaining ruggedness as the two **distinct** design considerations motivating the combination of Ryu and Williams.” Req. Reh’g 4 (Petitioner’s emphasis). For support, Petitioner asserts that these design considerations were separately discussed in the “Technology Background” section of the Petition. *Id.* at 4–5 (citing Pet. 10, 12). Petitioner also directs us to page 71 of the Petition for information regarding benefits of lower on-resistance. *Id.* at 3. In addition, Petitioner directs us to the following argument, presented on page 70 of the Petition, which states that the ordinarily skilled artisan:

would have been motivated to combine elements taught by Ryu and Williams ... because, as Williams teaches, such a configuration would help reduce on-resistance [**i.e., design consideration (1)**], while continuing to provide the needed connection between the n+ regions 24 and the p-wells via the p+ regions 22 to ruggedize Ryu’s MOSFET against unwanted activation of the parasitic BJT [**i.e., design consideration (2)**].
Id. at 5–6 (alterations in original).

Petitioner’s view that the Petition sets forth “two distinct design considerations motivating the combination of Ryu and Williams” is not supported adequately by the cited material. That material, in fact, makes plain the interconnectedness of the two design considerations that Petitioner attempts to isolate as independent considerations in the Rehearing Request. Req. Reh’g 4; Pet. 5–6. In particular, the quoted material reaffirms that

lower on-resistance and improved ruggedness are intertwined design considerations, by arguing that the combination would have been understood to “help reduce on-resistance, *while continuing* to provide the needed connection . . . *to ruggedize* [the] MOSFET *against unwanted activation of the parasitic BJT.*” Pet. 70 (Board’s emphasis).

To be clear, Petitioner, in the Petition, advances a rationale for the proposed combination that intertwines on-resistance and ruggedization. On page 71 of the Petition, Petitioner similarly links the desire to “lower on-resistance” with a desire for a configuration that “ruggedizes the MOSFET against unwanted turn on of the parasitic BJT.” Pet. 71.

We acknowledge that in a background section of the Petition, Petitioner discusses on-resistance and ruggedness as two of six design considerations. Pet. 4–23. But nowhere in the Petition does Petitioner, with sufficient clarity or persuasive force, advance lower on-resistance as a separate or distinct reason to combine Ryu and Williams.

To the contrary, the Petition asserts a motivation to “ruggedize” the MOSFET of Ryu in a manner consistent with the disclosure of Williams, which explains ruggedization in terms of the desire “to maximize the P+ contact to the body region (to suppress parasitic bipolar turn-on, prevent snapback and ruggedize the device).” Ex. 1004, 16:32–34; Pet. 55–56, 69. For example, in the Petition, Petitioner argues that an ordinarily skilled artisan “would have been motivated to use Williams’s teachings of multiple and periodic P+ body contact regions in Rye to maximize the contact of the p+ regions and *ruggedize* Rye’s MOSFET.” Pet. 69 (Board’s emphasis; Petitioner’s emphasis omitted).

Significantly, on that point, Petitioner, in the Petition, selects Figure 19E of Williams to modify Ryu. Pet. 22–23, 47–51, 63–64. As noted in the Institution Decision, however, the MOSFET illustrated in Figure 19E of Williams is designed to supply “better N+ contact resistance and less P+ contact area (less rugged).” Ex. 1004, 17:18–19; Dec. 17–18. We, therefore, determined that Petitioner’s “assertions are ‘expressly refuted by’ disclosures in ‘Williams itself,’ regarding the embodiment shown in Figure 19E, which Petitioner relies upon for its proposed combination.” Dec. 18.

In the Rehearing Request, Petitioner pivots to Figure 19C of Williams, asserting that “neither option [Figure 19C or Figure 19E] stands apart as the best,” and that “Williams’s options of Figures 19C and 19E are alternatives in achieving that same end.” Req. Reh’g 9–10 (emphasis omitted). According to Petitioner, the embodiment of Figure 19E of Williams need not be the “most desirable” or “best” option, and only needs to be “a suitable option.” *Id.* at 11–12. A similar line of reasoning in the Petition, that it “would have been obvious to try” any of the configurations depicted in Figures 19A–19F of Williams, was discounted in the Decision for failing to explain “adequately why one would have done so.” Dec. 19–20 (emphasis omitted). Petitioner’s attempt to fill that gap in the Rehearing Request is neither persuasive nor timely, where no explanation is articulated clearly, if at all, in the Petition. *See* Pet. 22–23, 47–51, 63–64.

Simply stated, the Petition does **not** present reduction of on-resistance as a distinct reason supporting the modification of Ryu’s device in view of Williams. *Id.* Petitioner’s rehearing arguments fall short, on this record, of establishing reversible error in the Decision on that point. We find no merit

in Petitioner's new argument that the Petition presents "two distinct design considerations motivating the combination of Ryu and Williams." Req. Reh'g 4. That argument contradicts information asserted in the Petition. *See, e.g.*, Pet. 69 ("Therefore, a POSITA would have been motivated to use Williams's teachings of multiple and periodic P+ body contact regions in Ryu to maximize the contact of the p+ regions and ruggedize [(improve ruggedness of)] Ryu's MOSFET." (emphasis omitted)).

A request for rehearing is not an opportunity to present new arguments or evidence that could have been presented in a petition. We could not have misapprehended or overlooked matters or arguments that were not asserted in the Petition, and which Patent Owner had no opportunity to oppose. We deny the Rehearing Request because it is based on new arguments that Petitioner did not present in the Petition, and to which Patent Owner had no meaningful opportunity to respond.

B. The Board's Understanding of the Disclosure of Williams

We are not persuaded that our focus on ruggedness led us to misapprehend the plain teachings of Williams in a manner that constitutes reversible error. Req. Reh'g 1–2. In the Rehearing Request, Petitioner for the first time argues that Williams is directed to achieving a compromise between on-resistance and ruggedness, not sacrificing one for the other. *Id.* at 8–10. On that basis, Petitioner argues, the Board improperly emphasized, in the Institution Decision, a "sacrifice" that misapprehends the teachings of Williams and led to an erroneous denial of the Petition. *Id.* at 8, 10.

Petitioner does not demonstrate adequately that this purported distinction between compromise and sacrifice is articulated in the Petition. *Id.* at 8–10. To the contrary, in the Petition, Petitioner simply asserts that the

ordinarily skilled artisan “would have been motivated to use Williams’s teachings of multiple and periodic P+ body contact regions in Ryu to maximize the contact of the p+ regions *and* ruggedize Ryu’s MOSFET.” Pet. 69 (Board’s emphasis; Petitioner’s emphasis omitted). The Petition does not address a purported compromise or trade-off between reducing on-resistance and maintaining ruggedness, or explain adequately, if at all, an asserted difference between what Petitioner now characterizes as a “compromise” and the term “sacrifice” used in the Institution Decision. Nor does Petitioner explain adequately how any purported difference would have supported trial institution. *Id.*

In any event, the plain teaching of Williams is that the embodiment illustrated in Figure 19E, upon which Petitioner relies in the Petition, has “better N+ contact resistance and *less* P+ contact area (*less rugged*).” Ex. 1004, 17:15–19 (Board’s emphasis); Dec. 18. Based on these particular facts and circumstances, we discern no reversible error in our determination that Petitioner, in the Petition, “proposes reasons for the combination of Ryu and Williams that run counter to clear disclosures within the four corners of the asserted prior art” (Dec. 18), namely, that this embodiment sacrifices (or compromises) ruggedness (Ex. 1004, 17:15–19).

As we explained in the Institution Decision, the reason for the proposed combination, as presented in the Petition, is based not on any path illuminated by the prior art, but rather, suggests “the taint of impermissible ‘hindsight’ reconstruction.” Dec. 18–19 (citing Prelim. Resp. 41; *comparing* Pet. 70 (arguing that Williams’ Figure 19E would have prompted the proposed modification “to ruggedize Ryu’s MOSFET against unwanted activation of parasitic BJT”), *with* Ex. 1004, 16:28–36, 17:15–19 (Williams’

device, as illustrated in Figure 19E, produces a “less rugged” device that sacrifices “parasitic bipolar turn-on”). Petitioner does not persuade us of reversible error on that point or any other issue. *See generally* Req. Reh’g.

IV. CONCLUSION

For the above reasons, we find that Petitioner does not show “an abuse of discretion” in the Decision. *See* 37 C.F.R. § 42.71(c). Accordingly, we *deny* the Rehearing Request.

V. ORDER

It is

ORDERED that the Petitioner’s Rehearing Request for Rehearing of the Decision Denying Institution of *Inter Partes* Review is *denied*.

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