

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INERGY TECHNOLOGY, INC.,
Petitioner

v.

FORCE MOS TECHNOLOGY CO. LTD.,
Patent Owner

Inter Partes Review No. IPR2024-00093
U.S. Patent No. 7,629,634

PATENT OWNER'S PRELIMINARY RESPONSE

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Patent Owner's Exhibit List

Exhibit No.	Description	Identifier
2001	Transcript of Feb. 13, 2024 Deposition of David Kuan-Yu Liu, PhD in <i>Force MOS Technology Co., Ltd. v. ASUSTeK Computer, Inc.</i> , Case No. 2:22-cv-00460-JRG (E.D. Tex.)	n/a
2002	Declaration of David Kuan-Yu Liu, Ph.D., served on Jan. 30, 2024 in <i>Force MOS Technology Co., Ltd. v. ASUSTeK Computer, Inc.</i> , Case No. 2:22-cv-00460-JRG (E.D. Tex.)	n/a
2003	Defendant ASUSTek Computer, Inc.'s Motion to Stay Pending Resolution of Inter Partes Reviews, filed on Nov. 30, 2023 as Dkt. No. 30 in <i>Force MOS Technology Co., Ltd. v. ASUSTeK Computer, Inc.</i> , Case No. 2:22-cv-00460-JRG (E.D. Tex.)	n/a
2004	Amended Docket Control Order, filed on Jan. 18, 2024 as Dkt. No. 35 in <i>Force MOS Technology Co., Ltd. v. ASUSTeK Computer, Inc.</i> , Case No. 2:22-cv-00460-JRG (E.D. Tex.)	n/a
2005	Cover pleading to Defendant ASUSTek Computer, Inc.'s Invalidity Contentions, served on Jul. 18, 2024 in <i>Force MOS Technology Co., Ltd. v. ASUSTeK Computer, Inc.</i> , Case No. 2:22-cv-00460-JRG (E.D. Tex.)	n/a
2006	Excerpts from S. Gibilisco, Illustrated Dictionary of Electronics (2001) for "layer"	n/a
2007	Excerpts from J. Ruzyllo, Semiconductor Glossary (2d Ed. 2017) for "doping by ion implantation," "doping during material growth," "ion implantation"	n/a
2008	U.S. Patent No. 6,888,196 to Kobayashi	Kobayashi 196 Patent

Exhibit No.	Description	Identifier
2009	Claim Construction Declaration of Dean Neikirk, Ph.D (Corrected), as filed as Exhibit D to Dkt. No. 74 in <i>Alpha and Omega Semiconductor Limited, et al. v. Force MOS Technology Co. Ltd.</i> , Civ. No. 5:22-cv-05448 (N.D. Cal.)	n/a

Pursuant to 35 U.S.C. § 313 and 37 C.F.R. § 42.107, Patent Owner Force MOS Technology Co. Ltd. (“Patent Owner” or “Force MOS”) hereby submits its Patent Owner Preliminary Response.

I. INTRODUCTION

The Board should deny the present request for *inter partes* review of U.S. Patent No. 7,629,634 (Ex. 1001, hereinafter “the ’634 patent”). Petitioner presents arguments in three sets of grounds, all of which fail for largely the same reasons. In particular, the ’634 Patent identifies the claimed “lateral contact layer” as its primary improvement over the prior art. As discussed below, the specification demonstrates that the appropriate construction of “lateral contact layer” requires a region of dopant which is implanted into sidewalls of the source contact trenches to have a P* dopant concentration (i.e. between P and P+) for an N-channel MOSFET or N* (i.e. between N and N+) in a P-channel MOSFET.

However, neither Petitioner nor its expert provides any proposed construction or substantive explanation for the scope of that term, or any attempt to show that the prior art has P* or N* doping. This is despite the fact that neither Petitioner nor its expert identifies any established ordinary meaning for “lateral contact layer,” and despite their admission that, in the ’634 Patent, “[t]he lateral contact layer is doped to P*, where P* is more heavily doped than P and less than P+.” Paper 1 (“Pet.”) at 7. Instead, they simply cherry pick those aspects of the ’634 Patent’s specification

that bear some semblance to the cited prior art, while arbitrarily ignoring the differences.

Once the appropriate construction of “lateral contact layer” is adopted, each of the asserted grounds readily fails. In particular, the prior art structures cited against the “lateral contact layer” limitation: (1) fail to disclose or suggest a region with P* or N* doping; and (2) fail to disclose or suggest that the cited region is *implanted into* the sidewalls of the source contact trench. Accordingly, each of Petitioner’s prior art grounds fails.

Finally, Petitioner’s arguments against discretionary denial are also meritless. Petitioner largely attempts to escape discretionary denial by claiming that it is not a party to Patent Owner’s ongoing litigation asserting the ’634 Patent in the Eastern District of Texas. However, Petitioner’s admitted real-party-in-interest is the sole defendant in that action.

For all of these reasons, institution should be denied.

II. OVERVIEW OF THE ’634 PATENT

The ’634 Patent relates to trenched MOSFETs with source contact trenches, where each of the source contact trenches has a lateral contact layer at a sidewall thereof. Ex. 1001 (’634 Patent), Abstract. A trenched MOSFET (metal-oxide-semiconductor field effect transistor) allows high current to pass through and for the channel to turn on or off using a low voltage. *Id.* at 1:11-17. The ’634 Patent

recognizes that, in a traditional trench MOSFET design, the sidewall of the source contact trench has no ohmic contact with the contact metal plug, which results in poor ruggedness performance of an Unclamp Inductive Switching (UIS) test. *Id.* at 1:35-38. In particular, when P base resistance from the channel to the source contact is too high, device destruction can occur. *Id.* at 1:38-42.

The '634 Patent addresses this problem in the prior art by implanting a P*-type lateral contact layer into parts of the sidewall of the source contact trenches, where P* has more doping than the P base layer, but less doping than the P+ base contact layer which is located at the bottom of the source contact trench. *Id.* at 2:1-11. The '634 Patent describes optimizing the P*-type lateral contact layer doping concentration in order to achieve ohmic contact between the P*-type layer and a contact metal plug without significantly increasing threshold voltage of the device. *Id.* at 2:1-11.

III. CLAIM CONSTRUCTION¹

A. “wherein the sidewalls of said trenches in said base layer are covered by the lateral contact layer” (cl. 1)

Despite “lateral contact layer” being the primary improvement over the prior art addressed by the '634 Patent, Petitioner and its expert present little discussion as

¹ Patent Owner only addresses the constructions relevant to this Preliminary Response. In the event that this Petition is instituted, Patent Owner reserves the right

to the meaning of “lateral contact layer.” Rather, Petitioner seeks to construe the term “the sidewalls of said trenches in said base layer” to address an issue that has no apparent relevance to any of the asserted prior art grounds (i.e., whether the lateral contact layer must cover the *entire* sidewalls in the base layer). Pet. at 17-21. As discussed below, the appropriate construction of “lateral contact layer” requires a region of dopant which is implanted into sidewalls of the source contact trenches to have a dopant concentration between P and P+ (“P* doping”) for an N-channel MOSFET or between N and N+ (“N* doping”) in a P-channel MOSFET.

1. “lateral contact layer”

“In construing claims, the analytical focus must begin and remain centered on the language of the claims themselves.” *Braintree Laboratories, Inc. v. Novel Laboratories*, 749 F. 3d 1349, 1354 (Fed. Cir. 2014). However, the words of the claims themselves are not sufficient to understand how “lateral contact layer” should be appropriately understood and applied to the prior art grounds here. In particular, the lateral contact layer’s lateral relationship with the sidewalls of the trenched source contacts is already established elsewhere in the claim. Ex. 1001 (’634 Patent), cl. 1 (“the sidewalls of [the plurality of source contact trenches] in said base

to raise different or additional claim construction issues in its Patent Owner Response.

layer are covered by the lateral contact layer”). And the term “layer” on its own is quite broad, meaning “a region having unique electrical properties (e.g., n layer).” Ex. 2006 (Dict. of Elecs.) at 6. Indeed, during co-pending litigation involving the ’634 Patent, Petitioner’s expert confirmed in deposition testimony that his understanding of the meaning of this claim term was largely based on the disclosures of the specification of the ’634 Patent, as understood from the perspective of a POSA. Ex. 2001 (Liu Depo.) at 21:6-23-22, 48:19-50:21; *see also* Ex. 2002 (Liu CC Decl.) ¶¶ 46-47, 51-52, 56. Because the language of the phrase “lateral contact layer” alone does not adequately indicate a plain meaning of the term in a manner sufficient to address the present grounds, it is appropriate to construe the term in light of the specific meaning provided in the specification. *Indacon, Inc. v. Facebook, Inc.*, 824 F.3d 1352, 1357-58 (Fed. Cir. 2016).

Here, the specification supports Patent Owner’s construction. The ’634 Patent’s “Summary of the Invention” describes a configuration of differently doped zones in a MOSFET of “the present invention” where the lateral contact layer is a doped region having a dopant concentration between P and P+:

[T]he silicon substrate, the epitaxial layer, and the source layer are N-type; the base layer and lateral contact layer P* are P-type; and each of the source contact trenches further has a P+-type base contact layer at a bottom thereof and *the lateral contact layer P* has less doping concentration than the P+ base contact layer at the source contact*

trench but higher doping concentration than P-base layer to achieve ohmic contact between the *P*-type region, which is lower doping concentration than P+-type region*, and the contact metal plug while threshold voltage V_{th} is not significantly affected by P*-type region

Ex. 1001 ('634 Patent) at 2:1-11 (emphasis added); *see also id.* at 4:3-6 (“the P+-type base contact layer (208) has [a] higher doping concentration of BF₂ (boron fluoride) than the P*-type lateral contact layer (209).”). Figure 3B depicts region 209 as a P* doped region, which is distinct from the P-doped region 205 and the P+ doped region 208. *Id.*, Fig. 3B; *see also id.*, Fig. 2G. Moreover, Petitioner and its expert *admit* that “[t]he lateral contact layer is doped to P*, where P* is more heavily doped than P and less than P+.” Pet. at 7; Ex. 1003 ¶ 29 (“The '634 Patent describes the lateral contact layer (209) as being doped to P*-type ... Doping concentration P* is doped more heavily than P but less than P+.”); *see also* Ex. 2001 at 51:23-53:22.

The foregoing described doping configurations are focused on the example of an “N-channel MOSFET structure,” but the specification expressly provides that “by inverting the conductive type”—i.e. switching each P-type doping to N-type doping and vice-versa—“this invention is also applicable to a P-channel MOSFET structure.” *Id.* at 2:16-19, 4:47-50; *see* Ex. 1003 ¶ 85, 94 (discussing inverting conductive types). Thus, in a P-channel MOSFET, the lateral contact layer would

have N* doping, i.e., a level of doping between N⁺ and N doping. *Id.*; see Pet. at 65 (in annotated figure, acknowledging that a lateral contact layer in “p-channel MOSFET” would have “N* type” doping).

Additionally, the specification makes clear that the lateral contact layer is ***implanted*** into the sidewall of the source contact trenches.² As Figures 2D and 2E of the '634 Patent demonstrate, the source contact trench 224 is first etched, and then the lateral contact layer is implanted into the sidewalls. Ex. 1001 ('634 Patent), Figs. 2D, 2E, 3:41-61. Indeed, the '634 Patent explains that “FIGS. 3A and 3B are schematic sectional views for describing ***ion implantation into a source contact trench of the present invention.***” *Id.* at 2:46-48 (emphasis added); see also Ex. 2001 (Liu Depo.) at 44:21-24. Moreover, the detailed description explains that an “***implantation procedure*** ... [is] carried out ***to form a P*-type lateral contact layer***

² An implant is a region of doped semiconductor material that is the result of introducing dopant into an existing piece of semiconductor material via ion implantation. Ex. 2001 (Liu Depo.) at 47:7-48:6; Ex. 2007 (Semi. Gloss.) at 6 (“doping by ion implantation”), 7 (“ion implantation”). Another way of creating a doped region is by introducing dopant into an entire layer of silicon as that layer is grown over the semiconductor, i.e., as part of the epitaxy process for growing an epitaxial layer. Ex. 2001 (Liu Depo.) at 69:6-10, 71:24-25, 194:1-6; Ex. 2007 (Semi. Gloss.) at 6 (“doping during material growth”).

(209).” Ex. 1001 (’634 Patent) at 3:56-60 (emphasis added). Thus, the Board should construe “lateral contact layer” as requiring a region of dopant which is implanted into sidewalls of the source contact trenches to have a dopant concentration between P and P+ (“P* doping”) for an N-channel MOSFET or between N and N+ (“N* doping”) in a P-channel MOSFET.

2. “the sidewalls of said trenches in said base layer are covered”

Petitioner argues that this language requires that the lateral contact layer cover the *entire* sidewalls in the base layer. Pet. at 17-21. As a threshold issue, the Board need not address Petitioner’s arguments at this time because whether or not partial coverage of the sidewalls in the base layer by the lateral contact layer satisfies the claim is not an issue that requires resolution in deciding institution. In particular, although Patent Owner disputes whether the structures identified by Petitioner as the alleged “lateral contact layer” satisfy that limitation as properly construed, in this preliminary response, Patent Owner does not presently dispute the extent of those structures’ coverage of sidewalls in the base layer. And, neither Petitioner nor its expert raises the *extent* of side wall coverage as a substantive issue of validity or otherwise explains why resolution of that claim construction issue is necessary in this proceeding. To the contrary, Petitioner and its expert appear to consistently take the position that the references disclose or suggest entire side wall coverage in the base layer. Pet. at 22, 26, 33, 40, 53, 55-56, 63, Ex. 1003 ¶¶ 63, 73, 95, 107, 145-

148, 167. Indeed, it appears that Petitioner has sought construction of this term solely for the purposes of influencing infringement-related claim construction issues in co-pending district court litigations. Thus, the Board simply need not resolve this dispute in its institution decision. *See, e.g., LG Elecs. Inc. v. Cywee Grp. Ltd.*, IPR2019-00559, Paper 21 at 16 (PTAB July 12, 2019) (“we need not construe claim terms unless they are material to resolving the disputed issues”).

However, if the Board does determine that resolution of this claim construction issue is appropriate in its decision on institution, Petitioner’s construction is incorrect. In particular, Petitioner seeks to improperly rewrite the language of the claim to insert the word “entire,” but it does not identify evidence of manifest disclaimer in the intrinsic record that would justify excluding partial coverage of the sidewalls in the base layer. *See Thorner v. Sony Computer Entertainment America LLC*, 669 F. 3d 1362, 1366-67 (Fed. Cir. 2012). Indeed, Petitioner’s construction essentially repeats the words of the claim *verbatim* and then inserts the word “entire,” a tacit acknowledgement that the plain and ordinary meaning of the claim text itself does not require “entire” sidewall coverage. Pet. at 19. Moreover, the written description describes the degree of coverage of the lateral contact layer with broad language, rather than language of manifest exclusion or restriction. Ex. A (’634 Patent), Abstract, 1:65-67 (“each of the source contact trenches has a lateral contact layer at a sidewall thereof”), 5:9-12.

Thus, the Petitioner's argument largely relies on the prosecution history. But instead of relying on any statement by the *patentee*, Petitioner points to statements by the *examiner* in the notice of allowance and the examiner's summary of an interview. Pet. at 18 (citing Ex. 1002 at 27, 29). Indeed, there was never a rejection or other office action prior to the notice of allowance, and thus the patentee never submitted any office action response that could contain such a disclaimer. Ex. 1002 at 23 (Notice of Allowance), 26 (Notice of Allowability), 50 (Receipt of Application). Rather, the prosecution on the merits closed with the notice of allowance (*id.* at 23), and the examiner's interview summary expressly stated that it was "not necessary" for the patentee to provide its own statement as to the substance of the interview. *Id.* at 27 (checked box in part III). Thus, there can be no disclaimer because an *examiner's* characterization of the claims cannot itself constitute disclaimer by the *patentee*. *Salazar v. Procter & Gamble Co.*, 414 F.3d 1342, 1345 (Fed. Cir. 2005) ("[a]n applicant's silence in response to an examiner's characterization of a claim does not reflect the applicant's clear and unmistakable acquiescence to that characterization if the claim is eventually allowed"). And, although there was an examiner's amendment entered at the same time as the notice of allowance, that also does not raise an inference of disclaimer. Indeed, the specific text of claim 1 differs in many ways from the original claim 1, and thus does not

demonstrate any particular acquiescence of claim scope due to prior art. *Compare* Ex. 1001, cl. 1 *with* Ex. 1002, 66-67.

Moreover, even if a statement by an examiner could constitute a disclaimer—which it cannot—the examiner’s statements were not clear and unambiguous. Indeed, the claim language itself only relates to coverage of the source trench contact sidewalls *in the base layer*, but the examiner’s statements referenced “the entire sidewall are covered with lateral contact layer.” Ex. 1002 at 29, 27. However, that would exclude all embodiments of the ’634 Patent, none of which have the sidewalls covered with the lateral contact layer outside the base layer (e.g. in the source layer or the interlayer oxide film layer). *See, e.g.*, Ex. 1001 (’634 Patent), Fig. 2G; *Accent Packaging, Inc. v. Leggett & Platt, Inc.*, 707 F.3d 1318, 1326 (Fed. Cir. 2013) (construction excluding preferred embodiments is rarely correct). And the examiner’s reference to U.S. Patent No. 6,888,196 (“Kobayashi ’196”) has no clear connection to the original or issued claims—the examiner never identified any structure within Kobayashi ’196 as allegedly satisfying the “lateral contact layer” limitation. Ex. 1002 at 29-30. The apparent theory of Petitioner and its expert—that the examiner was equating Kobayashi ’196’s base contact layer 14 with the “lateral contact layer”—is also untenable. Pet. at 18; Ex. 2001 (Liu Depo.) at 37:11-38:5; Ex. 1003 ¶¶ 50, 61-62. The claims require both a “base contact layer” and “lateral contact layer”—Kobayashi ’196’s base contact layer 14 cannot satisfy them

both. Ex. 2008 (Kobayashi 196 Patent), Fig. 5A; Ex. 2002 ¶ 56. Indeed, Kobayashi '196 itself states that “the base contact layer is not present on the side wall.” Ex. 2008 (Kobayashi 196 Patent) at 12:12; *see also* Ex. F 2001 at 37:20-21 (admitting “[t]here's no intentional [] effort to additionally dope the sidewalls of Kobayashi.”).³ Thus, the examiner’s statements fall far short of the standard for prosecution disclaimer, which requires clear and unmistakable disclaimer *by the patentee*.

IV. PETITIONER HAS FAILED TO DEMONSTRATE A REASONABLE LIKELIHOOD THAT THE CHALLENGED CLAIMS ARE UNPATENTABLE⁴

A. Ground 1: Hirler Fails to Anticipate the Challenged Claims

1. Claim 1

(a) Hirler Fails to Disclose a “lateral contact layer” as Properly Construed

As discussed above, the appropriate construction of the term “lateral contact layer” requires a region of dopant which is implanted into sidewalls of the source contact trenches to have a dopant concentration between P and P+ (“P* doping”) for

³ Ex. 2008 (Kobayashi 196 Patent) is the issued patent of the application that was published as Ex. 1008 (Kobayashi).

⁴ In this preliminary response, Patent Owner only presents arguments against institution of this Petition. In the event that this Petition is instituted, Patent Owner reserves the right to raise additional or different arguments in its Patent Owner Response.

an N-channel MOSFET or between N and N⁺ (“N* doping”) in a P-channel MOSFET. *Supra*, III.A. In Ground 1, Petitioner identifies this limitation as being satisfied by Hirler’s “body amplification zones” (19). Pet. at 22, 26. However, Hirler’s “body amplification zone (19)” cannot satisfy the “lateral contact layer” limitation as properly construed for at least two reasons.

First, Hirler consistently describes its “body amplification zone (19)” as having a “P+” level of doping concentration. Ex. 1006, [0030]; Ex. 1005, Figs. 2C-2D. As discussed above, as properly construed, “lateral contact layer” requires P* doping for N-channel MOSFETs (such as Hirler), which is a doping concentration between conventional P and P⁺ doping. Ex. 1003 ¶ 75 (admitting Hirler’s primary embodiment is an N-channel MOSFET). The P⁺ doping of Hirler’s “body amplification zone” is plainly not between P and P⁺. Petitioner and its expert point out that Hirler “discloses that the doping concentration of the body amplification zone (19) is larger than the doping concentration of the body zone (12) but smaller than the doping concentration of the body contact zone (17).” Ex. 1003 ¶ 41 (citing Ex. 1006, [0009], [0031]); Pet. at 10-11. However, as discussed, and as Petitioner and its expert admit (Pet. at 7; Ex. 1003 ¶ 29), the ’634 Patent makes clear that the lateral contact layer’s P* doping is ***less than P+ doping***, rather than simply requiring less doping than the base contact layer. Ex. 1001, 2:3-10, 3:65-4:6. Indeed, Hirler’s “body amplification zone” only has a doping concentration between Hirler’s “body

zone” and “body contact zone” because “body contact zones (17)” use “p++” doping. Ex. 1006, [0021], [0030]; Ex. 1005, Figs. 2E-2F.

Second, Hirler’s “body amplification zone” is not a region of dopant resulting from *implantation into the sidewalls* of source contact trenches, as required by the proper construction of “lateral contact layer.” Rather, Hirler describes and depicts that its “body amplification zone (19)” is implanted into the semiconductor material *before* the source contact trench or its sidewalls even exist. Ex. 1006, [0012] (“the implantation body amplification zones are implanted through the source zone areas. A contact trench is subsequently etched down to the relevant body amplification zone.”), [0034] (“implanting the body amplification zones 19 prior to etching the contact hole”). This is illustrated in Figures 2C and 2D of Hirler. In Hirler’s Figure 2C, “p+ implantation body amplification zones 19 are now implanted through the source zone areas 13.” Ex. 1006, [0030]; Ex. 1005, Fig. 2C. Next, in Hirler’s Figure 2D, the “[t]he contact trench is etched so deep that it is driven into the body amplification zone 19.” Ex. 1006, [0030]; Ex. 1005, Fig. 2D.

These differences are more than mere variations in manufacturing processes, but instead result in structurally different devices. As illustrated by Hirler’s Figure 2F, implantation through the source layer, prior to etching the sidewalls, results in Hirler’s body amplification zone 19 being a broadly diffused dopant *zone*, approaching the vicinity of the trench gates. Ex. 1005, Fig. 2F; Ex. 1006, [0036]

(“the implantation of the body amplification zones 19 can be adjusted in such a manner that the lateral extensions reach the vicinity of the channel in the area of the trench gates 14, 15 after subsequent annealing/diffusion steps”). Such a wide zone would restrict the ability to shrink cell size and improve density. By contrast, the ’634 Patent’s lateral *contact layer* 209 is depicted as a layer—penetrating only slightly beyond the surface of the source contact’s sidewalls. Ex. 1001 (’634 Patent), Fig. 2G.

Because Hirler does not disclose a “lateral contact layer” as properly construed, it does not anticipate claim 1.

2. Claims 2, 6

Claims 2 and 6 depend from claim 1. Ex. 1001 (’634 Patent), cls. 2, 6. Petitioner’s arguments in Ground 1 for alleged anticipation of claims 2 and 6 are based on Petitioner’s anticipation arguments for Ground 1, claim 1, which fail as discussed above. Pet. at 27, 28; *supra*, IV.A.1. Thus, Petitioner has not demonstrated that claims 2 and 6 are anticipated.

B. Ground 2: Hirler in view of Kobayashi and the Knowledge of a POSITA Fail to Render Obvious the Challenged Claims

1. Claims 3-5, 7-9

Claims 3-5 and 7-9 all depend indirectly from claim 1. Ex. 1001 (’634 Patent), cls. 3-5, 7-9. Petitioner’s obviousness arguments in Ground 2 for alleged obviousness of claims 3-5 and 7-9 are based on Petitioner’s arguments that Hirler

anticipates claim 1, which fail as discussed above. Pet. at 29-32 (citing to Ground 1). Petitioner offers no argument or evidence that Kobayashi cures any of the deficiencies of Hirler identified above with respect to claim 1. That is, because Petitioner has failed to demonstrate that Hirler discloses each limitation of claim 1, Petitioner's obviousness arguments in Ground 2 for claims 3-5 and 7-9 fail for the same reasons discussed above for claim 1 in Ground 1. *See supra*, IV.A.1.

C. Ground 3: Shiraishi fails to Anticipate the Challenged Claims

1. Claim 1

a) Shiraishi Fails to Disclose a “lateral contact layer” as Properly Construed

As discussed above, the appropriate construction of the term “lateral contact layer” requires a region of dopant which is implanted into sidewalls of the source contact trenches to have a dopant concentration between P and P+ (“P* doping”) for an N-channel MOSFET, or between N and N+ (“N* doping”) in a P-channel MOSFET. *Supra*, III.A. In Ground 3, Petitioner identifies this limitation as being satisfied by Shiraishi's “additional semiconductor layer (14).” Pet. at 40, Ex. 1003 ¶¶ 95, 107. However, Shiraishi's “additional semiconductor layer (14)” cannot satisfy the “lateral contact layer” limitation as properly construed for at least two reasons.

First, Petitioner and its expert fail to identify any evidence demonstrating that Shiraishi's additional semiconductor layer (14) has P* doping. As discussed above,

“lateral contact layer,” as properly construed requires a level of doping between conventional P and P+ doping for an N-channel MOSFET (*supra* III.A.1)—and Petitioner’s expert admits that Shiraishi is an N-channel MOSFET. Ex. 1003 ¶¶ 109-110. But Shiraishi does not describe its semiconductor layer 14 as having doping between P and P+. Petitioner and its expert point out that Shiraishi’s semiconductor layer 14 “can be doped such that the impurity concentration is less than that of the p+ base contact layer 20 but higher than the p-type body layer 13.” Pet. at 14-15 (citing Ex. 1009, [0075]); Ex. 1003 ¶ 55. However, Petitioner and its expert fail to address that Shiraishi’s p-type body layer 13 has “p-” (P minus) doping, i.e. light doping which has lower doping concentration than conventional “P” doping. Ex. 1009, [0072]-[0073]; *see* Ex. 2009 at p. 13, ¶ 48, n.6.

Thus, rather than demonstrating Shiraishi’s semiconductor layer 14 has a level of doping between conventional “P” and “P+” doping, the cited disclosures are consistent with semiconductor layer 14 having the concentration of conventional “P” doping (because conventional “P” doping also falls between the “P-” doping of Shiraishi’s layer 13 and the “P+” doping of Shiraishi’s base contact layer 20). Ex. 2009 at p. 13, ¶ 48, n.6. Indeed, Shiraishi discloses an aggregate implantation dose of 8×10^{12} ions / cm^2 for semiconductor layer 14 (5×10^{12} for the first doping step which penetrates into layers 13 and 14, plus 3×10^{12} for the second doping step that increases the dopant concentration of layer 14). Ex. 1009, [0072]-[0073]

(contrasting “p-” doping of layer 13 with doping of layer 14). By contrast, the ’634 Patent describes, in an embodiment, the lateral contact layer having a dopant concentration dose at the sidewall between 1×10^{14} ions / cm^2 and 4×10^{14} ions / cm^2 . Ex. 1001 (’634 Patent) at 3:55-60. Petitioner and its expert wholly fail to address these differences.

Second, Shiraishi’s “semiconductor layer 14” is not a region of dopant resulting from implantation into the sidewalls of source contact trenches, as required by the proper construction of “lateral contact layer.” Rather, Shiraishi describes and depicts that its “semiconductor layer 14” is implanted into the semiconductor material *before* the source contact trench or its sidewalls even exist. Ex. 1009, [0073] (first forming semiconductor layer 14 by doping), [0074] (subsequently forming contact grooves 17 by etching). This is illustrated in Figures 6-7 of Shiraishi. In Shiraishi’s Figure 6, two dopant implantation procedures are performed to create layers 13 and 14. Ex. 1009, [0072]-[0073], Fig. 6. Then, in Shiraishi’s Figure 7, the semiconductor is patterned and etched to create “contact grooves” 17 (the alleged source contact trenches). Ex. 1009, [0074], Fig. 7; *see* Ex. 1003 ¶ 106. As discussed above in connection with Hirler (*supra* IV.A.1), the differences between Shiraishi’s layer 14 and the ’634 Patent’s lateral contact layer are more than mere variations in manufacturing processes, but result in structurally different devices. As illustrated by Shiraishi’s Figure 9, layer 14 extends all the way between

contact groove (17) and the lining (9) of the gate (10). Ex. 1009, Fig. 9. By contrast, the '634 Patent's lateral *contact layer* 209 is depicted as penetrating only slightly beyond the surface of the sidewalls. Ex. 1001 ('634 Patent), Fig. 2G.

Because Shiraishi does not disclose a "lateral contact layer" as properly construed, it does not anticipate claim 1.

2. Claim 2

Claim 2 depends from claim 1. Ex. 1001 ('634 Patent), cl. 2. Petitioner's arguments in Ground 3 for alleged anticipation of claim 2 are based on Petitioner's anticipation arguments for Ground 3, claim 1, which fail as discussed above. Pet. at 41-42; *supra*, IV.C.1. Thus, Petitioner has not demonstrated that claim 2 is anticipated.

D. Ground 4: Shiraishi in view of Kobayashi and the Knowledge of the POSITA Fail to Render Obvious the Challenged Claims

1. Claims 3-9

Claims 3-9 all depend directly or indirectly from claim 1. Ex. 1001 ('634 Patent), cls. 3-9. Petitioner's obviousness arguments in Ground 4 for alleged obviousness of claims 3-9 are based on Petitioner's arguments that Shiraishi anticipates claim 1, which fail as discussed above. Pet. at 42-46 (citing to Ground 3). In Ground 4, Petitioner offers no argument or evidence that Kobayashi or the knowledge of a POSITA cures any of the deficiencies of Shiraishi identified above with respect to claim 1. That is, because Petitioner has failed to demonstrate that

Shiraishi discloses each limitation of claim 1, Petitioner's obviousness arguments in Ground 4 for claims 3-9 fail for the same reasons discussed above for claim 1 in Ground 3. *See supra*, IV.C.1.

E. Ground 5: Kobayashi in view of Shiraishi and the Knowledge of the POSITA Fail to Render Obvious the Challenged Claims

1. Claim 1

a) Petitioner Fails to Show that Kobayashi or Shiraishi Disclose or Suggest a “lateral contact layer” as Properly Construed

As discussed above, the appropriate construction of the term “lateral contact layer” requires a region of dopant which is implanted into sidewalls of the source contact trenches to have a dopant concentration between P and P+ (“P* doping”) for an N-channel MOSFET or between N and N+ (“N* doping”) in a P-channel MOSFET. *Supra*, III.A. In Ground 5, Petitioner argues that it would be obvious to modify Kobayashi based on Shiraishi to add a P* type lateral contact layer, such that, in the active regions of the device, the P* type layer underlies the source layer and overlays the P-type base layer, except for where interrupted by the gate and source trenches. Pet. at 64 (annotated diagram). Petitioner's theory fails for two reasons.

First, neither Shiraishi nor Kobayashi disclose a P* layer (i.e. a layer having a doping concentration between P and P+) at all. As discussed in Ground 3, Shiraishi does not disclose that its semiconductor layer 14 has a doping concentration between

P and P+, but rather Shiraishi's disclosures are entirely consistent with its semiconductor layer 14 having conventional "P" doping. *See supra* IV.C.1. Neither Petitioner nor its expert identifies any disclosure of Kobayashi or the knowledge of a POSITA as curing this deficiency. Rather, in Ground 5, both Petitioner and its expert rely entirely on Shiraishi for the alleged disclosure of a "P* lateral contact layer." Pet. at 63; Ex. 1003 ¶ 167. However, although the figures provided by Petitioner and its expert for Ground 5 both identify the lateral contact layer as being "P* type" (or "N* type" for a p-channel MOSFET), nothing in the *written* analysis of Petitioner or its expert contains any mention of the "P*" or "N*" layers, or why the cited references allegedly disclose or suggest "P*" or "N*" doping. Pet. at 64-65; Ex. 1003 ¶¶ 169-170. Instead, the written analysis provided by Petitioner and its expert merely repeats the argument from Ground 3 that Shiraishi's layer 14 has a concentration between that of Shiraishi's region 20 and layer 13. Pet. at 63; Ex. 1003 ¶ 167. But, as discussed in Ground 3, Shiraishi's disclosures are consistent with layer 14 having conventional "P" doping (as opposed to P* doping), and neither Petitioner nor its expert presents any evidence or argument to the contrary. *See supra* IV.C.1.

Second, Petitioner's obviousness theory for Ground 5 has the same flaw that Shiraishi has in Ground 3 with respect to not having a region of dopant resulting from implantation into the sidewalls of source contact trenches, as required by the

proper construction of “lateral contact layer.” In particular, like their argument as to Shiraishi in Ground 3, Petitioner and its expert argue that it would be obvious to combine Shiraishi and Kobayashi such that, in the active regions of the device, the alleged lateral contact layer underlies the source layer and overlays the P-type base layer, except for where interrupted by the gate and source trenches. Pet. at 63; Ex. 1003 ¶ 167. That is, Petitioner hypothesizes creating and using Shiraishi’s layer 14 in the Shiraishi-Kobayashi combination in effectively the same way as discussed in Ground 3 (*i.e.*, occupying the entire horizontal extent between the source contacts and the gate lining, rather than being *implanted into* the sidewalls). *Id.* Thus, for the same reasons discussed in Ground 3 with respect to Shiraishi, Petitioner’s Ground 5 theory fails to demonstrate the references would be combined to have a “lateral contact layer” resulting from implantation into the sidewalls of source contact trenches, as required by the proper construction of “lateral contact layer.”

Supra IV.C.1

2. Claims 2-9

All of claims 2-9 depend directly or indirectly from claim 1. Ex. 1001 (’634 Patent), cls. 2-9. Petitioner’s arguments in Ground 5 for alleged obviousness of claims 2-9 are based on Petitioner’s obviousness arguments for Ground 5, claim 1, which fail as discussed above. Pet. at 52-66; *supra*, IV.E.1. Thus, Petitioner has not demonstrated that claims 2-9 are obvious.

V. THE BOARD SHOULD EXERCISE ITS SECTION 314(a) DISCRETION TO DENY INSTITUTION

Here, each of the *Fintiv* factors weigh in favor of discretionary denial. As to *Fintiv* factor 1, there is no stay of litigation. Although Petitioner’s real-party-in-interest, ASUSTek Computer Inc. (“ASUS”) (Pet. at 1) has asked for a stay of the pending litigation (Ex. 2003), the district court has not acted on the motion at this time. Such motion is also exceedingly unlikely to be granted, as one of the three patents-in-suit in that case is not subject to any *inter partes* review. Ex. 1010 (Compl.) ¶¶64-86 (asserting, *inter alia*, U.S. Patent No. 7,847,346); Ex. 1011 (Amend. Compl.) ¶¶73-95 (same); Ex. 2003 at 2 (noting that IPR petitions have only been filed as to ’634 and ’409 Patents); *Uniloc 2017 LLC v. Samsung Elecs. Am., Inc.*, No. 2:19-cv-00259-JRG-RSP, 2020 WL 1433960, at *6 (E.D. Tex. Mar. 24, 2020) (in case assigned to same District Judge, denying stay where less than all asserted claims were subject to IPR). Thus, factor 1 weighs in favor of discretionary denial.

Fintiv factors 2 and 3 also weigh in favor of discretionary denial. As Petitioner admits, the ’634 Patent is asserted in Force MOS’s Eastern District of Texas (“EDTX”) action against ASUS. Pet. at 1; Ex. 1011 ¶¶49-72. Although Petitioner *itself* is not a party to that case, Petitioner’s admitted real-party-in-interest ASUS *is* the sole defendant in that case. Ex. 1010 ¶¶7-8, 40-86 (naming and

identifying infringement allegations against ASUS); Ex. 1011 ¶¶7-8, 49-106 (same); Pet. at 1; see *Global Tel*Link Corporation v. Hlfp Hplding, Inc.*, IPR2021-00444, Paper 14 at 27 (PTAB Jul. 22, 2021) (treating co-pending district court case involving real-parties-in-interest as relevant to *Fintiv* factors, even though Petitioner was not a “named defendant”). Moreover, Petitioner admits that the trial in that case is scheduled for *six* months before the expected Final Written Decision date if this IPR is instituted. Pet. at 74. Although Petitioner argues that the EDTX *ASUS* case is in its early stages, that is simply not true. The parties have already exchanged infringement and invalidity contentions. Ex. 1012 (Docket Control Order) at 4-5. The opening claim construction brief is due to be filed in the *ASUS* case on February 27, 2024—the same due date as this preliminary response, and claim construction discovery (including expert depositions as to claim construction) has already been completed. Ex. 2004 (Amended DCO) at 4. And, by the time that a decision on institution is expected in this IPR on approximately May 27, 2024 (Trial Practice Guide at 3), the schedule in the EDTX *ASUS* case provides that the *Markman* hearing will be already held (on April 9, 2024) and fact discovery is scheduled to be complete (on May 20, 2024). Ex. 2004 at 4; see *Zhuhai Cosmx Battery Co., Ltd., v. Ningde Amperex Technology Ltd.*, IPR2023-00585, Paper 12 at 14 (PTAB Oct. 24, 2023) (“the pertinent inquiry concerns the investment in the parallel proceeding by the court and the parties ‘at the time of the institution decision.’”).

Fintiv factor 4 also weighs in favor of discretionary denial. Here, Petitioner does not dispute that the overlap between this IPR and the EDTX *ASUS* case is significant. Pet. at 74. Indeed, real-party-in-interest ASUS's invalidity contentions served in the EDTX case include all of the same references as in this Petition. Ex. 2005 (Invalidity Contentions) at 4-5 (identifying Hirler ("A-5"), Kobayashi ("A-10"), and Shiraishi (one of the "A-17" references) as asserted prior art to the '634 Patent); *id.* at 21 (identifying Hirler anticipation and obviousness grounds, combining with any other reference); *id.* at 23 (identifying Kobayashi anticipation and obviousness grounds, combining with any other reference, including Shiraishi ("A-17")). And, although Petitioner *itself* has agreed "not to pursue invalidity challenges in any district court case based on the same or substantially the same grounds relied upon in this Petition, and so this factor favors institution" (Pet. at 75)—the record reflects no such stipulation from the party that is actually the defendant in the pending EDTX case: real-party-in-interest ASUS. Moreover, Petitioner's preferred stipulation is unduly narrow because it does not include "grounds that could have reasonably been raised." Vidal Memorandum at 3; *see Zhuhai Cosmx Battery Co., Ltd.*, IPR2023-00585, Paper 12 at 16 (refusing to fully credit stipulation that "does not extend to any ground 'that could have been reasonably raised'").

Fintiv factor 5 weighs in favor of discretionary denial. Petitioner argues that it is not a party in any pending litigation involving Patent Owner. However, as noted, Petitioner's real party-in-interest, ASUS, is the sole defendant in the EDTX action brought by Patent Owner. Ex. 1010 ¶ 2; Ex. 1011 ¶ 2; *Global Tel*Link Corporation v. Hlfiip Hplding, Inc.*, IPR2021-00444, Paper 14 at 28 (PTAB Jul. 22, 2021) (holding that “*Fintiv* factor 5 weighs in favor of discretionary denial of the Petition” when “all of the defendants in the [co-pending litigation] are real parties-in-interest in [the IPR] proceeding.”). And, in any event, *Fintiv* provides that “petitioner should [] address any other district court or Federal Circuit proceedings involving the challenged patent to discuss why addressing the same or substantially the same issues would not be duplicative of the prior case even if the petition is brought by a different party.” *Apple v. Fintiv*, IPR2020-00019, Paper 11 at 14 (PTAB Mar. 20, 2020) (precedential). Petitioner fails to do so in its factor 4 or 5 analysis, as plainly the issues in this IPR would be duplicative of the issues that will be addressed in the EDTX *ASUS* case (see discussion of factor 4 above).

Finally, *Fintiv* factor 6 weighs in favor of discretionary denial. As discussed above, the merits of the petition are extraordinarily weak. Despite the lateral contact layer limitation being the '634 Patent's primary recited advancement over prior art, nothing in the petition attempts to construe “lateral contact layer” or explain or address the readily apparent differences between the patented “lateral contact layer”

and the cited prior art. Indeed, Petitioner and its expert admit that the “lateral contact layer” has P* or N* type doping, but make no attempt to explain that any of the references disclose such doping. Nor do they address the fact that none of the alleged “lateral contact layer[s]” in the asserted prior art references are actually implanted *into* sidewalls.

Because all *Fintiv* factors weigh in favor of dismissal, the petition should be discretionarily denied under section 314(a).

VI. CONCLUSION

For the above reasons, Patent Owner requests that institution of this Petition for *inter partes* review be denied.

Date: February 27, 2024

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Certificate of Service 37 C.F.R. § 42.6(e)

The undersigned certifies that on February 27, 2024, I will cause true and correct copies of the foregoing Patent Owner's Preliminary Response, and all associated exhibits or appendices referred to therein, to be served electronically upon the following attorneys who have consented to service via email. Pet. at 2-3.

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