

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.

IPR2024-00094
Patent 7,812,409 B2

Before GRACE KARAFFA OBERMANN, CHRISTOPHER L. OGDEN,
and MARY C. HOFFMAN, *Administrative Patent Judges*.

HOFFMAN, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Inergy Technology, Inc. (“Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting *inter partes* review of claims 1–6 of U.S. Patent No. 7,812,409 B2 (Ex. 1001, “the ’409 patent”). Force MOS Technology Co., Ltd. (“Patent Owner”) filed a Preliminary Response (Paper 6, “Prelim. Resp.”).

We have authority to determine whether to institute an *inter partes* review. 35 U.S.C. § 314; 37 C.F.R. § 42.4(a). Under 35 U.S.C. § 314(a), an *inter partes* review may not be instituted “unless . . . the information presented in the petition . . . and any response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” Based on the current record and for the reasons explained below, Petitioner has demonstrated a reasonable likelihood of prevailing with respect to at least one of the challenged claims of the ’409 patent. Thus, we institute this *inter partes* review.

We provide the following preliminary findings of fact and conclusions of law for the sole purpose of explaining our reasons for instituting this *inter partes* review. Any final determinations shall be based on the full trial record.

A. REAL PARTIES IN INTEREST

Petitioner identifies itself, Inergy Technology, Inc., as well as ASUSTek Computer, Inc. (“ASUS”) and Panjit International Inc. as real parties in interest. Pet. 1. Patent Owner identifies itself, Force MOS Technology Co., Ltd., as a real party in interest. Paper 5, 2.

B. RELATED PROCEEDINGS

Inter partes review IPR2024-00093 challenges U.S. Patent No. 7,629,634 B2 and involves the same parties. The parties also identify *Force MOS Technology Co. Ltd. v. ASUSTek Computer, Inc.*, No. 2:22-cv-00460 (E.D. Tex.) (“parallel proceeding”) as challenging the ’409 patent in federal district court. Pet. 1; Paper 5, 2.

II. BACKGROUND

A. THE ’409 PATENT (EX. 1001)

The ’409 patent describes a “semiconductor power device that includes a trenched gate disposed in an extended continuous trench surrounding a plurality of transistor cells,” wherein the trenched gate surrounds the transistor cells “as closed cells having truncated corners or rounded corners.” Ex. 1001, code (57). “[T]he semiconductor power device further includes a contact dopant region . . . having [a] substantially circular shape to achieve a uniform space between the contact dopant region and the trenched gate surrounding the closed cells.” *Id.*

According to the ’409 patent, conventional semiconductor power devices included a “non-uniform” space between the trenched gate and the contact, as seen in Figure 1A below. Ex. 1001, 1:49–50.

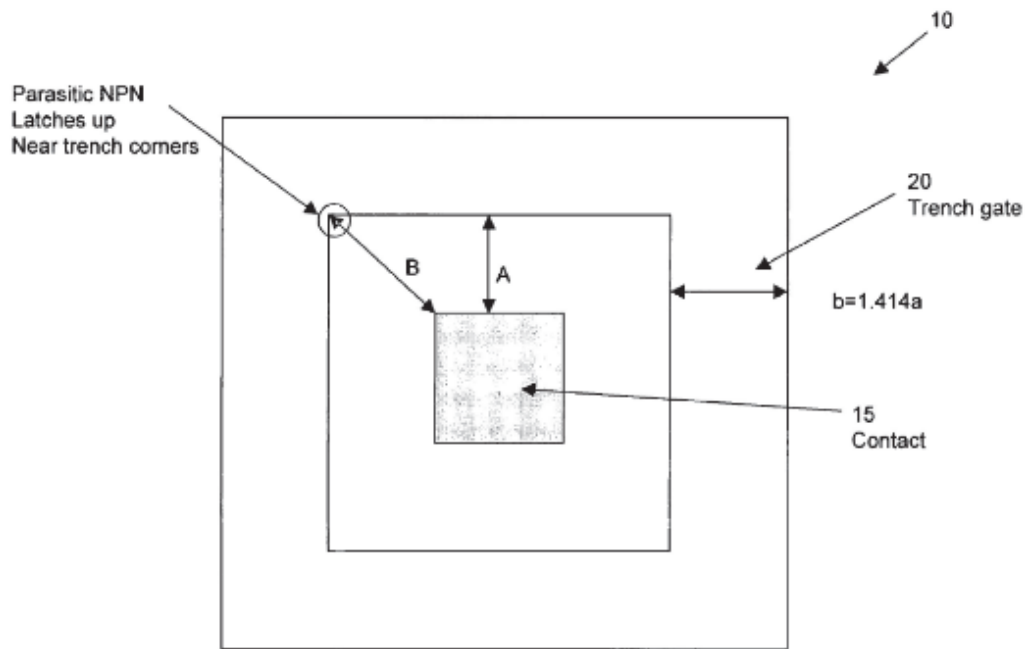


Fig. 1A (Prior Art)

Figure 1A above illustrates closed cell unit 10 of a prior art semiconductor power device, including trenched gate 20 forming a square surrounding square-shaped metal contact 15. Ex. 1001, 1:20–30. As seen in the figure, Distance B, from a corner of contact 15 to the nearest interior corner of trenched gate 20, is 1.414 times greater than Distance A between contact 15 and the interior of trenched gate 20 at their peripheral sides. *Id.* at 1:28–38. Due to the non-uniform space between trenched gate 20 and metal contact 15, weak points occur at the four trenched gate corners. *Id.* at 1:48–53. This results in low avalanche current and reduced device ruggedness due to parasitic NPN latch up near the corners. *Id.*; *id.* at 1:18–19.

To remedy this, the '409 patent describes a semiconductor power device having a “more uniform” space in the closed cell between the trenched gate and contact, as seen in Figure 3 below. Ex. 1001, 2:3–7.

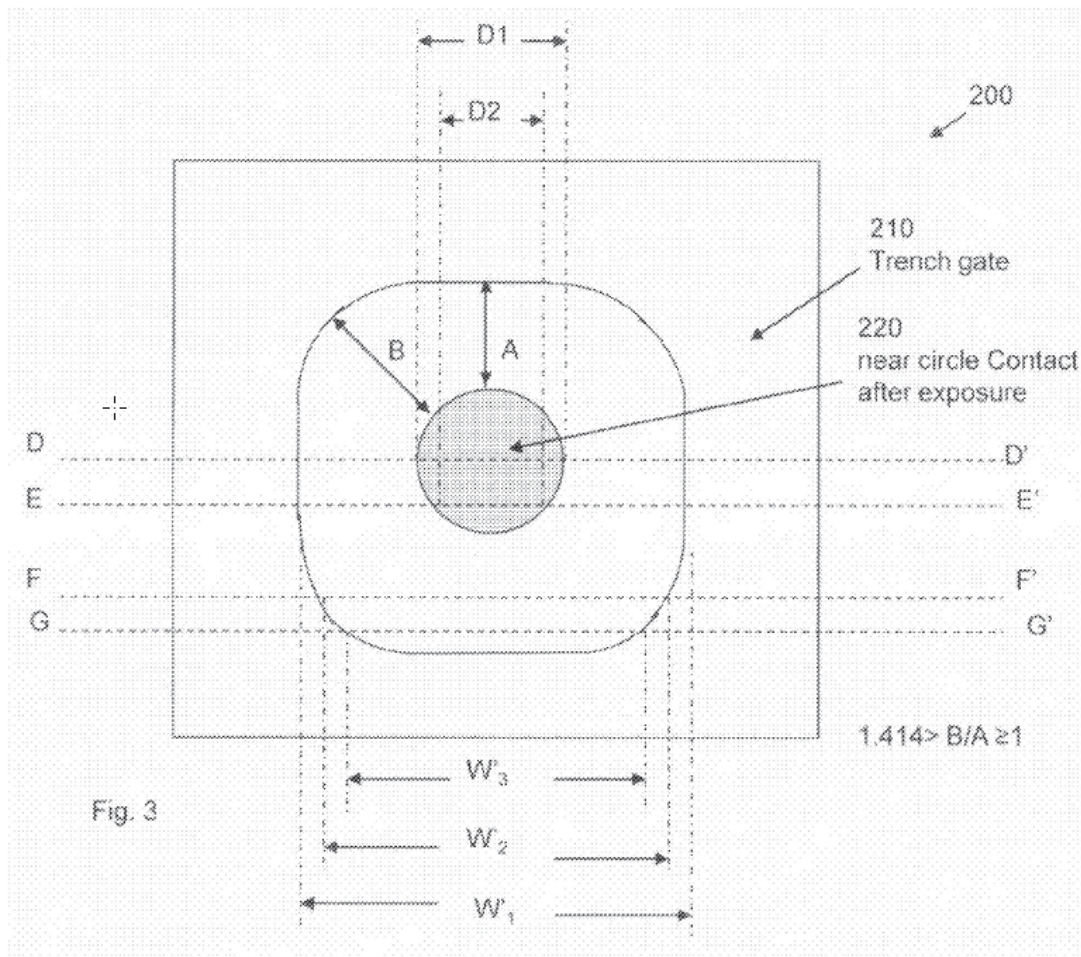


Figure 3 above illustrates closed cell unit 200 of a MOSFET¹ device, including trenched gate 210 surrounding doped contact region 220 and a metal contact being disposed above doped contact region 220. Ex. 1001, 4:4–7. Trenched gate 210 includes rounded or truncated corners forming a substantially square-shaped cell, and region 220 is substantially circular shaped. *Id.* at 4:7–9, 4:37–39. Due to the geometries of trench gate 210 and doped contact region 220, the distance from trenched gate 200 to doped contact region 220, including Distances A and B, is more uniform, i.e., “the ratio of B/A is substantially kept near 1.0 and certainly smaller than 1.414.”

¹ “MOSFET” refers to “Metal Oxide Semiconductor Field Effect Transistor.” See, e.g., Ex. 1005, 1:7–8.

Id. at 4:9–15. This improved uniformity eliminates the weak spots at the trenched gate corners to enhance device ruggedness. *Id.* at 4:15–17, 3:24–27.

B. CHALLENGED CLAIMS

The Petition challenges all claims, claims 1–6, of the '409 patent. Pet. 3–4.

Claim 1, one of the two independent claims of the '409 patent, reads as follows:

1. A trenched semiconductor power device comprising a plurality of trenched gates surrounding a plurality of transistor cells formed in a semiconductor substrate, wherein:
 - said trenched gates surrounding said transistor cells as closed cells constituting substantially square-shaped cells with rounded corners;
 - each of said closed cells further includes a circular trench contact disposed substantially in a central portion of said closed cells, penetrating through a source region surrounding said trenched gates and extending into a body region encompassing said source region;
 - said circular trench contact comprises a hole opened from a top surface of said semiconductor substrate and is filled with a contact metal plug wherein sidewalls of said hole are surrounded by and in contact said source and body regions and said circular trench contact is separate from said trenched gates with said source region and body region disposed between a gate oxide lining of said trenched gates and all circumferential points of the circular trench contact; and
 - said contact metal plug connected to a source metal disposed on top of said circular trench contact.

Ex. 1001, 5:7–28.

Claims 2–5 depend directly from claim 1. Ex. 1001, 5:29–6:11.

Claim 2 further recites a titanium layer. *Id.* Claim 3 further limits the

material used for the contact metal plug. *Id.* Claim 4 further recites an aluminum alloy layer. *Id.* Claim 5 further limits the circular trench contact to have a top surface diameter smaller than 1.0 micrometer. *Id.* Independent claim 6 recites similar subject matter as claims 1–5 but recites “truncated” corners instead of rounded corners. *Id.* at 6:12–6:38.

C. ASSERTED GROUNDS OF UNPATENTABILITY

The Petition advances six grounds, as summarized in the table below:

Ground	Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1	1, 3–5	102(b) ²	Kobayashi ^{3,4}
2	2, 6	103(a)	Kobayashi, Kikkawa ⁵
3	5	103(a)	Kobayashi

² 35 U.S.C. §§ 102, 103 (2006), *amended by* Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29 §§ 102, 103, sec. (n)(1), 125 Stat. 284, 287, 293 (2011) (effective Mar. 16, 2013). The pre-AIA versions of §§ 102, 103 apply because the ’409 patent issued from a U.S. application filed on December 4, 2006, which is before the effective date of the AIA amendments. *See* Ex. 1001, code (22).

³ Kobayashi, US 6,888,196 B2, issued May 3, 2005. Ex. 1005.

⁴ Grounds 1, 3, 4, and 6 each challenge claim 5. Grounds 1 and 3 rely on Kobayashi, and Grounds 4 and 6 rely on Kobayashi and Hshieh. In Grounds 1 and 4, Petitioner contends that the subject matter of claim 5 is disclosed in Kobayashi. In Grounds 3 and 6, Petitioner alternatively contends that the subject matter of claim 5 would have been obvious over the applied prior art and the knowledge of a person of ordinary skill in the art.

⁵ Kikkawa et al., *A Quarter-Micrometer Interconnection Technology Using a TiN/Al–Si–Cu/TiN/Al–Si–Cu/TiN/Ti Multilayer Structure*, IEEE Transactions on Electron Devices, Vol. 40, No. 2, February 1993. Ex. 1007. Petitioner avers, and Patent Owner does not currently contest, that this reference qualifies as prior art because it “was published and made publicly available in or around January-February 1993.” Pet. 12; Ex. 1008.

Ground	Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
4	1, 3–5	103(a)	Kobayashi, Hshieh ⁶
5	2, 6	103(a)	Kobayashi, Hshieh, Kikkawa
6	5	103(a)	Kobayashi, Hshieh

Pet. 3–4.

In support of its arguments, Petitioner relies on a declaration of Dr. David Kuan-Yu Liu. Ex. 1003.

III. ANALYSIS

A. LEVEL OF ORDINARY SKILL IN THE ART

The level of ordinary skill in the art at the time of the invention is a factual determination that provides a primary guarantee of objectivity in an obviousness analysis. *Al-Site Corp. v. VSI Int’l Inc.*, 174 F.3d 1308, 1324 (Fed. Cir. 1999) (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966); *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991)).

Petitioner asserts that a person of ordinary skill in the art (“POSITA”), “at the filing date of the ’409 [p]atent[,] would have a master’s degree in electrical engineering, and at least two years of relevant work experience in the field of integrated circuit design and manufacturing.” Pet. 13 (citing Ex. 1003 ¶ 52). Patent Owner does not dispute Petitioner’s proffered level of ordinary skill in the art. *See generally* Prelim. Resp.

⁶ Hshieh et al., US 5,763,914, issued June 9, 1998. Ex. 1006 (“Hshieh”).

We adopt Petitioner’s proffered level of ordinary skill in the art, which is supported by declaration testimony and consistent with the ’409 patent and prior art of record. *See* Ex. 1001, 1:6–3:8 (describing the invention and related art in terms of integrated circuit design and fabrication).

B. CLAIM CONSTRUCTION

In an *inter partes* review, the Board construes the terms of a patent claim “in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” 37 C.F.R. § 42.100(b). Under that standard, claim terms generally are given their plain and ordinary meaning as would have been understood by the ordinarily skilled artisan at the time of the invention and within the context of the entire patent disclosure. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc).

1. “*substantially square-shaped cells with rounded corners*”

Claim 1 recites “said trenched gates surrounding said transistor cells as closed cells constituting substantially square-shaped cells with rounded corners.” Ex. 1001, 5:10–12.

Petitioner does not provide an express claim construction for “substantially square-shaped cells.” *See* Pet. 14–19. Petitioner argues that the term “rounded corners” is properly construed as “corners that are truncated by design layout and then rounded.” *Id.* at 15 (citing Ex. 1003 ¶ 55; Ex. 1001, 2:10–20, 4:53–64). Petitioner argues that the claim language cannot include a cell designed to be square but having rounded corners as a natural or incidental result of photolithography. *Id.* at 16–18. According to Petitioner, this is because (1) “[i]t is well known in the art” that corners, such as those illustrated in Figure 1A (Prior Art) of the ’409 patent, become

rounded as an incidental result of lithography (*id.* at 16 (citing Ex. 1003 ¶ 56)), and because (2) the claims were amended during prosecution to distinguish over prior art reference Pfirsch⁷, which allegedly shows square corners incidentally rounded by lithography (*id.* at 17–19 (citing Ex. 1002, 302)).

Patent Owner disputes Petitioner’s proposed construction as improperly limiting apparatus claims to products made by a particular process of manufacture (i.e., truncated by design layout and then rounded). Prelim. Resp. 8–11. Patent Owner also disputes Petitioner’s characterization of the prosecution history. *Id.* at 9 (citing Ex. 1002, 302). Specifically, Patent Owner argues that the claims were amended to add a feature (i.e., a circular trench contact hole) missing from Pfirsch, not to distinguish the claimed rounded corners over Pfirsch’s rounded corners. *Id.* (citing Ex. 1002, 302, 295).

Based on the preliminary arguments and evidence, we disagree with Petitioner’s proposed construction requiring the corners to be rounded via a particular process because it improperly imports a process of manufacture from the Specification into apparatus claims. *See Cont’l Circuits LLC v. Intel Corp.*, 915 F.3d 788, 799 (Fed. Cir. 2019) (citing *Vanguard Prods. Corp. v. Parker Hannifin Corp.*, 234 F.3d 1370, 1372–73 (Fed. Cir. 2000) (“Generally, ‘[a] novel product that meets the criteria of patentability is not limited to the process by which it was made.’”)). We also preliminarily disagree with Petitioner’s assessment of the prosecution history, i.e., that the claims were amended to distinguish the claimed rounded corners from

⁷ Pfirsch et al., US 6,541,818, issued April 1, 2003. Ex. 1011.

Pfirsch's rounded corners. Indeed, both the Examiner found and Patent Owner admitted that Pfirsch has the recited "rounded corner[s]." *See* Ex. 1002, 237, 302. Patent Owner appears, at this stage, to be correct that the claims were amended to include a "circular" contact to distinguish over Pfirsch's square contact. *See id.* at 295, 302.

Patent Owner also proposes a claim construction, arguing that the term "substantially square-shaped cells with rounded corners" means "the cells have, from the top view perspective, largely or essentially the shape of a square (a shape that has four equal sides and four right angles) with all corners rounded (i.e.,] having a curved shape like a portion of a circle or oval)." Prelim. Resp. 4; *see also id.* at 4–7 (citing Ex. 1001, Figs. 2, 3, 1:20–1:33, 3:32–34, 1:18–57, 1:66–2:7, 3:34–45, 3:55–4:3, 4:9–20, 4:33–51; Ex. 1002, 302; Ex. 2007, 5–7).

At this stage, we do not adopt Patent Owner's proposed construction, which requires "all" corners being rounded from a "top view perspective." The claims do not recite language directed to all corners, and we decline to import this particular embodiment into the claims based on the current record. At this stage, we need not resolve whether the corners need be rounded solely from a top view perspective because, as we discuss below, we preliminarily determine that the combination of Kobayashi and Hshieh teaches rounding from a top view perspective. *See infra* Section III.D.3.

Rather, at this stage of the proceeding and on this record, we see no reason to determine that "substantially square-shaped cells with rounded corners" deviates from its ordinary and customary meaning, and we determine that, apart from our discussion above, no other claim construction analysis is necessary for our decision to institute an *inter partes* review. *See*

Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co., 868 F.3d 1013, 1017 (Fed. Cir. 2017) (holding that only terms in controversy must be construed “and only to the extent necessary to resolve the controversy”) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)). Thus, we preliminarily determine that the term does not include any process limitations and does not necessarily require all four corners to be rounded.

2. “*substantially square-shaped cells with truncated corners*”

Claim 6 recites “said trenched gates surrounding said transistor cells as closed cells constituting substantially square-shaped cells with truncated corners.” Ex. 1001, 6:14–16.

Petitioner and Patent Owner make similar claim construction arguments as those discussed above. Pet. 18–19; Prelim. Resp. 9–11.

Petitioner argues that “truncated corners” is properly construed as “corners that are truncated by design layout.” Pet. 18–19. Patent Owner argues that “substantially square-shaped cells with truncated corners” is properly construed as “the cells have, from the top view perspective, largely or essentially the shape of a square (a shape that has four equal sides and four right angles) with all corners truncated (i.e., being cut off).” Prelim. Resp. 9.

For reasons similar to those discussed above, we decline to adopt either of the parties’ proposed claim constructions. Rather, at this stage and on this record, we see no reason to determine that the term deviates from its ordinary and customary meaning, which does not include any process limitations and does not necessarily require all four corners to be truncated.

C. OVERVIEW OF ASSERTED PRIOR ART

1. *Kobayashi (Ex. 1005)*

Kobayashi describes a MOSFET, and more specifically, a UMOSFET. Ex. 1005, 1:7–10. The UMOSFET includes a unit cell formed in a region of semiconductor layer surrounded by U-shaped trenches, the unit cell having a central contact hole. *Id.* at 6:25–37. According to the Kobayashi, the MOSFET can have several layouts, including having square-shaped unit cells with square-shaped contact holes, as seen in Figure 3A below. *Id.*

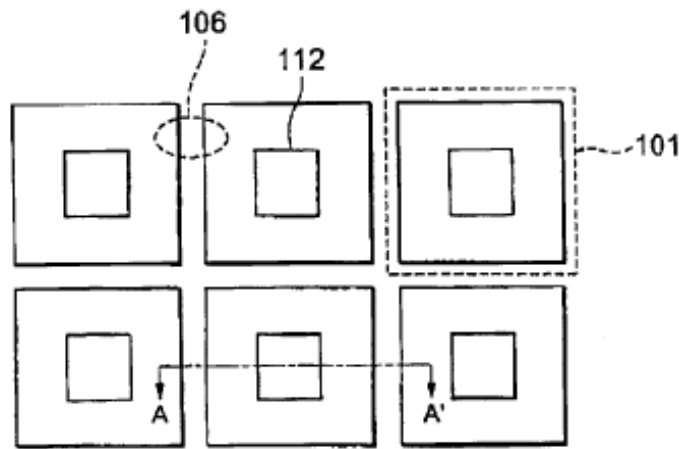


FIG. 3A

Kobayashi Figure 3A depicts trench 106 surrounding a square-shaped unit cell 101. Ex. 1005, 6:25–37. Figure 3A also depicts square contact hole 112, however, Kobayashi states that “contact holes may have any desired shape,” including “a circular shape.” *Id.* at 6:37–39. Figure 4A, below, shows an alternative layout with hexagonal-shaped unit cells with circular contact holes.

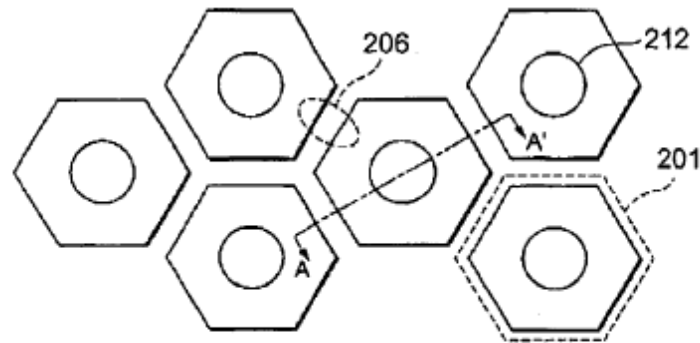


FIG. 4A

Kobayashi Figure 4A depicts trench 206 surrounding a hexagonal-shaped unit cell 201. Ex. 1005, 6:32–34. Figure 3A also depicts circular contact hole 212. *Id.* at 6:37–39.

Kobayashi further describes rounded trench corners, as seen from the side view perspective in Figure 6C below.

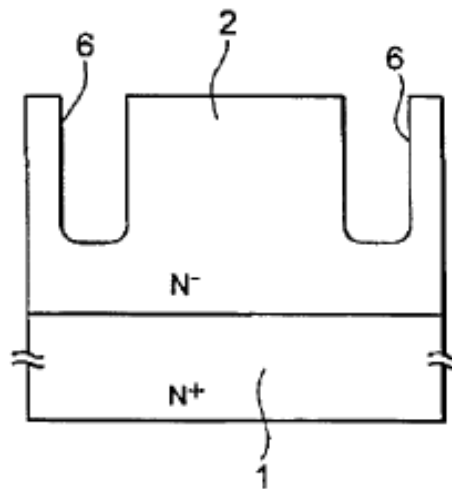


FIG. 6C

Above Figure 6C depicts N⁺-type silicon substrate layer 1 beneath N⁻-type epitaxial layer 2. Within layer 2, trench 6 is formed with rounded bottom corners. Ex. 1005, 7:57–59. Kobayashi further describes a non-illustrated embodiment in which the “corners of each trench 6 at an opening

portion may also be rounded.” *Id.* at 7:59–60. Kobayashi explains that the bottom and opening portion corners can be rounded via etching or hydrogen annealing. *Id.* at 7:60–8:4.

Figure 5A, reproduced below, illustrates several other features described in Kobayashi.

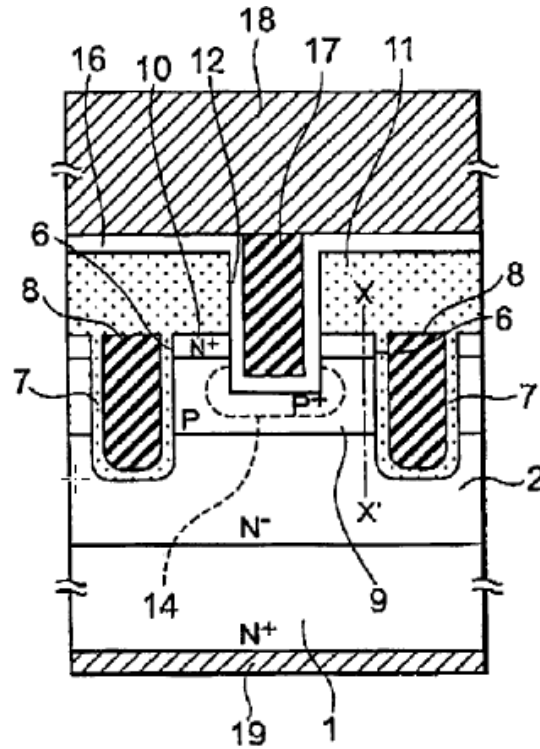
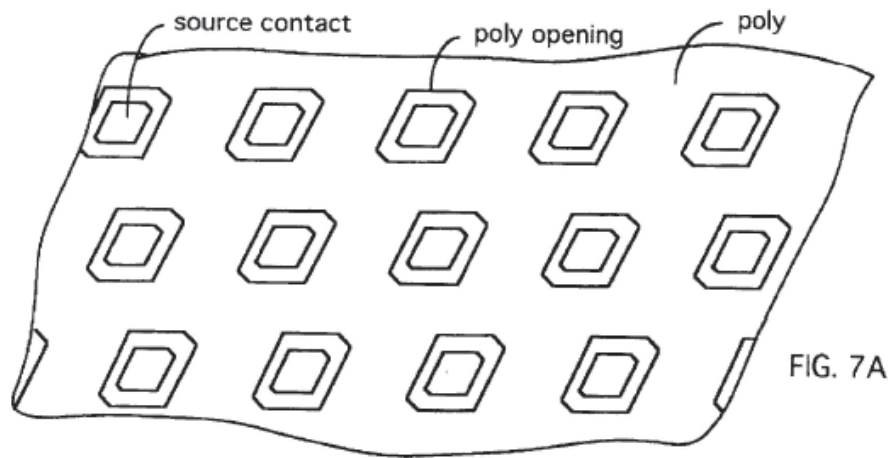


FIG.5A

In Figure 5A, trench 6, located above layer 1 and within layer 2, is filled with gate oxide film 7 and polysilicon trench gate 8. Ex. 1005, 6:53–57. Interlayer oxide film 11 is formed on trench gate 8. *Id.* Barrier metal 16 extends over interlayer oxide film 11 and into contact hole 12. *Id.* at 6:58–66. Contact hole 12 extends to P-type base layer 9 through N⁺-type source layer 10 and is filled with tungsten metal plug 17. *Id.* Barrier metal 16 and plug 17 are in contact with source electrode 18. *Id.* Drain electrode 19 is formed below layer 1.

2. *Hshieh (Ex. 1006)*

Hshieh describes a power transistor cell supported on a semiconductor substrate with improved MOSFET cell topography. Ex. 1006, code (57), 2:60. Specifically, the power transistor cell implements a non-orthogonal parallelogram cell topography, which increases cell packing density because a non-orthogonal parallelogram cell occupies less total area than a square cell. *Id.* at 5:10–17. Figure 7A below illustrates an embodiment with non-orthogonal parallelogram transistor cells.



Hshieh Figure 7A depicts cells, each cell constituting a polysilicon opening of non-orthogonal parallelogram shape and a central source contact, wherein the cells are separated by a polysilicon gate layer. Ex. 1006, 3:30–38. The two sharper corners of the parallelogram-shaped cells are blunted “to prevent corner vulnerability where punch through weak points may be formed . . . due to a three-dimension diffusion effect.” *Id.* at 5:3–8. In a similar embodiment, all corners may be blunted or rounded, as in Figure 8A, reproduced below. *Id.* at 5:23–25.

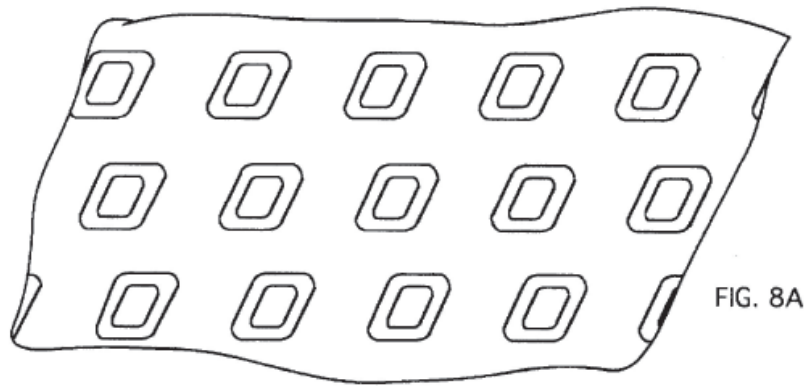


FIG. 8A

Hshieh Figure 8A, above, depicts all corners of the non-orthogonal parallelogram-shaped cells and the source contacts being blunted or rounded. Ex. 1006, 5:23–25. Hshieh further describes a similar embodiment, as seen in Figures 10A and 10B below, having trenches and trenched gates.

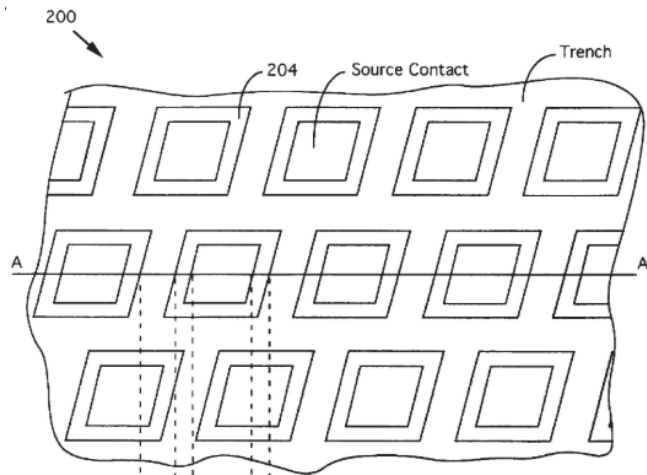


FIG. 10A

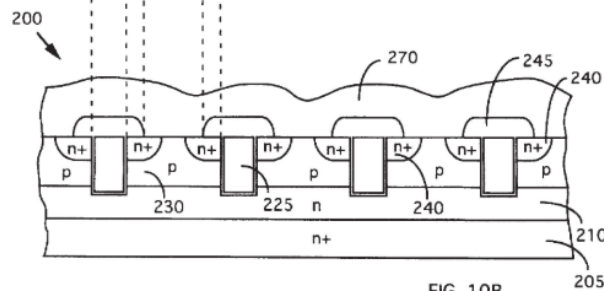


FIG. 10B

Hshieh Figure 10A, above, depicts MOSFET device 200 with an array of non-orthogonal parallelogram-shaped cells 204 surrounded by a trench. Ex. 1006, 7:26–8:5. Cells 204 may have rounded corners. *Id.* at 12:32–36. Figure 10B, above, shows a cross-sectional view of device 200, illustrating N⁺ substrate layer 205, N⁻ epitaxial layer 210, doped body region 230, doped source region 240, source contact 270 (which extends to regions 230 and 240 except at layer 245), and trenched gate 225. *Id.* at 7:26–8:5.

3. *Kikkawa (Ex. 1007)*

Kikkawa describes a semiconductor device using a multilayer structure including a barrier bilayer of titanium nitride (“TiN”) and titanium (“Ti”) to improve electromigration resistance. Ex. 1007, Abstr., Fig. 1.

D. GROUND 4: OBVIOUS OVER KOBAYASHI AND HSHIEH

We focus our analysis on Ground 4 and address the remaining grounds in Section § V below. Under Ground 4, Petitioner contends that claims 1 and 3–5 are unpatentable under § 103(a) as obvious over Kobayashi in view of Hshieh. Pet. 51–63.

1. *Legal Principles*

A claim is unpatentable under § 103(a) if the differences between the claimed subject matter and the prior art are “such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). When a ground in a petition is based on a combination of references, we consider “whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *Id.* at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). We base our obviousness inquiry on factual

considerations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) any objective indicia of obviousness or non-obviousness that may be in evidence. *See Graham*, 383 U.S. at 17–18.

We now turn to our analysis of independent claim 1. Considering these factors,⁸ we determine that Petitioner has shown a reasonable likelihood that claim 1 is unpatentable as obvious over Kobayashi and Hsieh, for the reasons explained below.

2. *Claim 1 Preamble*

The preamble of claim 1 recites “[a] trenched semiconductor power device comprising a plurality of trenched gates surrounding a plurality of transistor cells formed in a semiconductor substrate, wherein” the device comprises certain features. Ex. 1001, 5:7–9.

Petitioner argues that Kobayashi discloses the preamble because it describes a trenched semiconductor power device comprising a plurality of trenched gates surrounding a plurality of transistor cells formed in a semiconductor substrate. Pet. 22–25, 51 (citing Ex. 1005, 4:12–19, 6:29–37, 6:51–56, Figs. 4A, 5A). Patent Owner does not specifically contest this. *See Prelim. Resp.*

At this stage, we need not decide whether the preamble is limiting because we are persuaded that Kobayashi discloses the preamble of claim 1, for the reasons given by Petitioner.

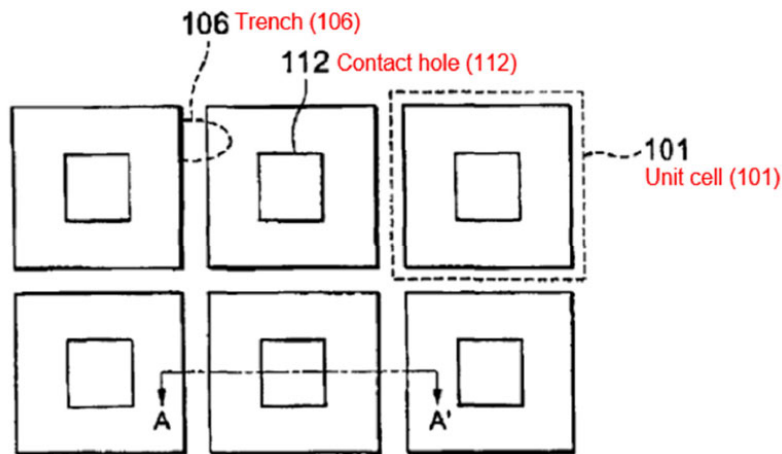
⁸ At this stage, neither party argues that there are objective indicia of obviousness or non-obviousness, so this factor is not part of our analysis. *See generally* Pet.; Prelim. Resp.

3. *Limitation 1[a]*

(a) Petitioner's Contentions

Limitation 1[a] recites “said trenched gates surrounding said transistor cells as closed cells constituting substantially square-shaped cells with rounded corners.” Petitioner argues that limitation 1[a] is taught by the combination of Kobayashi and Hsieh. Pet. 52.

In Kobayashi, Petitioner identifies trench gates surrounding transistor cells as closed cells constituting substantially square-shaped cells. Pet. 52 (citing Ex. 1005, 6:26–27, Fig. 3A). Petitioner's annotated version of Kobayashi's Figure 3A is provided below.

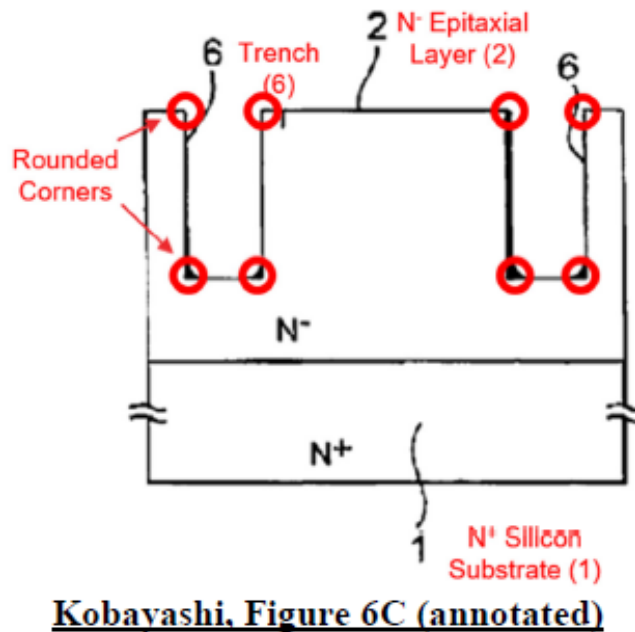


Kobayashi, Figure 3A (annotated)

Petitioner's annotated Figure 3A of Kobayashi identifies, from a top view perspective, square-shaped unit cell 101, trench 106 (which surrounds unit cell 101), and contact hole 112.⁹

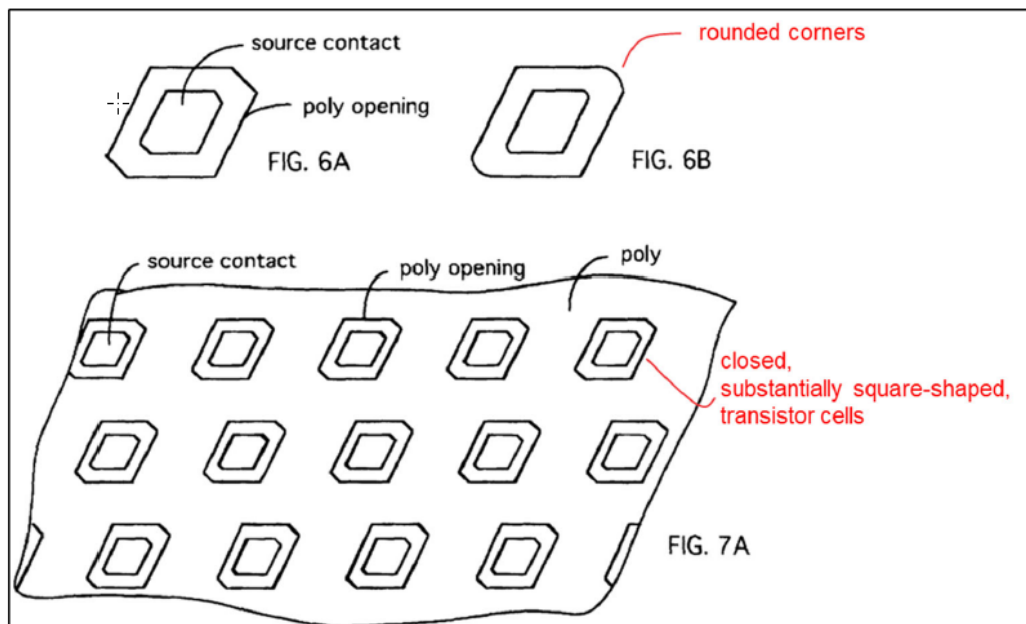
⁹ Under Ground 4, Petitioner alternatively contends that Kobayashi's hexagonal cells, illustrated in Figure 4A, are “substantially square cells with truncated corners.” Pet. 52 (citing Ex. 1005, 6:30; Ex. 1003 ¶ 119). In this Decision, we focus our discussion on Petitioner's reliance on Kobayashi's square cells, illustrated in Figure 3A.

Petitioner further identifies rounded corners at trench opening portions forming the closed cell. Pet. 53 (citing Ex. 1005, 7:57–8:4, Fig. 6C; Ex. 1003 ¶ 120). Petitioner’s annotated version of Kobayashi Figure 6C, pointing out the location of the rounded corners, is reproduced below. Pet. 53.



Petitioner’s above annotated version of Kobayashi Figure 6C shows a side view of trench 6 formed with rounded bottom and opening corners at the positions indicted by the circle annotations. Pet. 53. According to Petitioner’s declarant, Dr. Liu, Kobayashi’s rounding leads to “higher breakdown voltage and lower leakage current—the same benefits discussed in the ’409 Patent.” Ex. 1003 ¶ 133.

Alternatively, Petitioner also identifies rounded corners in Hshieh, as seen below in Petitioner’s annotated versions of Figures 6A–7A. Pet. 54 (citing Ex. 1006, 5:3–28; Ex. 1003 ¶ 121); *id.* at 59 (citing Figs. 6A–8B).



Petitioner annotates Hshieh’s Figures 6A–7A with the descriptions “closed, substantially square-shaped, transistor cells” and “rounded corners.” As seen above, Figures 6A–7A illustrate, from a top view perspective, non-orthogonal parallelogram-shaped cells, each cell having its two opposing sharper corners being rounded. Of note, Petitioner also cites to Figures 8A and 8B, which illustrate similar cells having all four corners rounded. Pet. 59; Ex. 1003 ¶ 137.

Petitioner points to Hshieh’s express teaching that rounding cell corners “discloses the problems of vulnerable punch-through weak points in the corners of square cells, [which is] due to undesirable higher peak electric field being reached at the corners.” Pet. 57–58; *see* Ex. 1003 ¶ 133 (citing Ex. 1006, 2:19–39); *see also* Pet. 59 (citing Ex. 1006, 5:3–17, Figs. 6A–8B; Ex. 1003 ¶ 137). For example, Hshieh states, “[i]n order to prevent the corner vulnerability where punch through weak points may be formed at the sharp corners due to a three-dimension diffusion effect . . . , the sharp corners [of the cells] can be either be blunted or rounded.” Ex. 1006, 5:3–8.

Based on the teachings in Kobayashi and Hshieh on the benefits of rounding, Petitioner contends it would have been obvious to combine Kobayashi's square-shaped cells with Hshieh's rounded corners. Pet. 54, 59 (citing Ex. 1003 ¶¶ 122, 137).

In support of its contention that it would have been obvious to combine Kobayashi and Hshieh, Petitioner explains that Kobayashi and Hshieh, like the '409 patent, relate to the field of semiconductor devices and address the vulnerabilities at the corners of closed cells in semiconductor devices. Pet. 59–60 (citing Ex. 1003 ¶ 138); *see also* Ex. 1003 ¶¶ 133–134.

In addition, according to Petitioner, Kobayashi and Hshieh both demonstrate that “square-shaped cells, their corners, and methods of truncating, blunting, and rounding the corners, are all known, conventional, familiar elements to a POSITA.” Pet. 59 (citing Ex. 1003 ¶ 137); *see also id.* at 61 (citing Ex. 1003 ¶ 140). As such, Petitioner contends that “combining Kobayashi and Hshieh requires nothing more than the use of known techniques to improve similar devices in the same way.” *Id.* at 59.

Petitioner further contends that “[a]dding Hshieh's rounding of corners to Kobayashi's truncated corners of a closed cell layout applies a known technique to realize a minor and commonplace modification.” Pet. 60. Petitioner also contends adding Hshieh's rounding to Kobayashi's corners applies a known technique to a known device ready for improvement (as expressly taught by Hshieh) to yield a predictable result, i.e., “to improve electro-migration and contact resistance.” *Id.* at 61 (citing Ex. 1003 ¶ 139). Petitioner similarly contends that combining Kobayashi and Hshieh requires nothing more than combining familiar elements according to known methods to yield a predictable result. *Id.* at 61–62 (citing Ex. 1003 ¶ 140).

Lastly, Petitioner contends that design incentives exist for modifying Kobayashi with Hshieh and that “a POSITA designing a semiconductor structure would naturally seek to eliminate known problems at the corners of closed cells, where possible.” Pet. 62 (citing Ex. 1003 ¶ 141); *see also* Ex. 1003 ¶¶ 133, 137–140.

(b) Patent Owner Arguments; Analysis

Patent Owner makes several arguments in response to Petitioner’s contentions under Ground 4 with respect to claim 1, which we address in turn, along with our preliminary analysis of the parties’ arguments.

First, Patent Owner argues that Petitioner fails to articulate a sufficient motivation to combine Kobayashi and Hshieh in the manner claimed by limitation 1[a]. Patent Owner states that each of Petitioner’s rationales are “based on the notion that ‘rounding’ was well-known and conventional” and “nowhere does Petitioner or its expert articulate any motivation to combine the alleged *top view* rounding of Hshieh with Kobayashi.” Prelim. Resp. 21–23.

We disagree at this stage. Petitioner’s rationale for combining Kobayashi with Hshieh is not solely based on Hshieh’s top view rounding being well known. Rather, Petitioner’s rationale is clearly based on express teachings in Hshieh about the benefits of top view rounding. *See* Pet. 54, 59 (citing Ex. 1006, 5:3–17, Figs. 6A–8B; Ex. 1003 ¶ 137); Ex. 1003 ¶¶ 122, 133. For example, Petitioner and its declarant refer to Hshieh’s teaching at column 5, lines 3–17, which states, “[i]n order to prevent the corner vulnerability where punch through weak points may be formed at the sharp corners due to a three-dimension diffusion effect . . . , the sharp corners of the polysilicon openings can be either blunted or rounded.” *See* Pet. 59; *see*

Ex. 1003 ¶ 137. Accordingly, at this stage, we find that Petitioner has sufficiently articulated a motivation to combine the top view rounding of Hshieh with Kobayashi.

Next, Patent Owner argues that Hshieh teaches non-orthogonal parallelogram-shaped cells to increase cell packing density and “specifically identifies square cell configurations as having disadvantageous packing densities.” Prelim. Resp. 23. Patent Owner argues that Hshieh therefore “plainly teach[es] away from combining Hshieh with Kobayashi in the manner claimed.” *Id.*

We do not agree at this stage. Although Hshieh teaches that non-orthogonal cells are preferable over square cells, Patent Owner has not pointed out anything in Hshieh that would “criticize, discredit, or otherwise discourage” modifying Kobayashi’s square cells to have rounded corners. *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004); *see also DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009) (“A reference does not teach away . . . if it merely expresses a general preference for an alternative invention . . .”). Thus, we find nothing in the preliminary record to suggest that Hshieh teaches away from the combination.

Next, Patent Owner argues that Petitioner fails to articulate why a POSITA would have been motivated to combine Kobayashi and Hshieh to arrive at a square-shaped cell with all four corners rounded. Prelim. Resp. 24–25. According to Patent Owner, “the cited portions of Hshieh only involve rounding the *two* sharper corners of each non-orthogonal parallelogram, leaving two corners unrounded.” *Id.* at 25.

We do not agree with Patent Owner because the Petition cites Hshieh Figures 8A–8B, which clearly illustrate non-orthogonal parallelograms

having all four corners rounded. Pet. 54 (citing Ex. 1006, 5:3–28); *id.* at 59 (citing Ex. 1006, Figs. 6A–8B). At this stage, the evidence suggests that it was within the ordinary skill in the art to modify Kobayashi’s device with all four rounded corners as described in Hshieh Figures 8A and 8B. Moreover, we do not construe claim 1, at this stage, to necessarily require that all four corners are rounded. *See supra* Section III.B.1.

Next, Patent Owner argues against Petitioner’s combination because Hshieh’s rounding addresses a different problem than the problem addressed in the ’409 patent. Prelim. Resp. 25. Patent Owner explains that the ’409 patent addresses the problem of parasitic bipolar latch up due to the non-uniform distance between trench gates and the trenched source contact. *Id.* Patent Owner also explains that Hshieh lacks trenched source contacts and therefore “Hshieh’s discussion of ‘rounding’ is not concerned with problems relating to trenched source contacts.” *Id.* at 26. “Rather, Hshieh is concerned with the effect of the ‘three dimension diffusion effect’ at the two sharper corners of Hshieh’s non-orthogonal parallelograms.” *Id.*

On this record, contrary to Patent Owner’s assertion, Hshieh’s rounding is not limited to the two sharper corners. As seen in Hshieh Figures 8A and 8B, Hshieh teaches rounding at all four corners to reduce three-dimension diffusion. Ex. 1006, 2:19–39, 5:3–28. Further, as the Supreme Court made clear in *KSR*, “[i]n determining whether the subject matter of a patent claim is obvious, neither the particular motivation nor the avowed purpose of the patentee controls.” 550 U.S. at 419–420. At this stage, we do not agree that the Kobayashi-Hshieh combination fails because Hshieh’s rounding addresses a different problem (the three-dimension diffusion effect) than that of the ’409 patent (parasitic bipolar latch up).

Patent Owner also alleges improper cherry-picking and hindsight analysis. Prelim. Resp. 27. However, the evidence does not suggest that the Petitioner engaged in improper cherry-picking or hindsight reasoning to arrive at the claimed configuration. The evidence suggests that Kobayashi describes all the features of claim 1 except, perhaps, rounded corners, and Hshieh describes a similar device with rounded corners. Ex. 1005, 6:25–39; Ex. 1006, Figs. 8A–8B. Petitioner also provides a sufficiently persuasive rationale, expressly taught by Hshieh, to modify Kobayashi with Hshieh’s rounding: to prevent corner vulnerability. *See* Pet. 54, 59 (citing Ex. 1006, 5:3–17). At this juncture, Patent Owner does not contend that this was outside of the knowledge within the level of ordinary skill in the art at the time the claimed invention was made nor that it was gleaned only from the ’409 patent. *In re McLaughlin*, 443 F.2d 1392, 1395 (CCPA 1971) (“Any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning, but so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made and does not include knowledge gleaned only from applicant’s disclosure, such a reconstruction is proper.”). On this record, therefore, the proposed combination of features is suggested by the intrinsic disclosures of Kobayashi and Hshieh.

4. *Undisputed Limitations 1[b]–1[f]*

At this stage, Patent Owner does not dispute Petitioner’s contentions regarding limitations 1[b]–1[f], which are discussed briefly below.

Limitation 1[b] recites “each of said closed cells further includes a circular trench contact disposed substantially in a central portion of said closed cells, penetrating through a source region surrounding said trenched

gates and extending into a body region encompassing said source region,” which Petitioner identifies in Kobayashi as centrally disposed circular contact hole 12 extending through source layer 10 to base layer 9. Ex. 1001, 5:13–17; Pet. 27–29, 55 (citing Ex. 1005, 6:29–39, 6:46–67, Figs. 4A, 5A).

Limitation 1[c] recites “said circular trench contact comprises a hole opened from a top surface of said semiconductor substrate and is filled with a contact metal plug.” Ex. 1001, 5:18–20. Petitioner identifies Kobayashi’s contact hole 12 filled with tungsten metal plug 17. Pet. 29–30, 55 (citing Ex. 1005, 6:58–67, Figs. 4A, 5A).

Limitation 1[d] recites “wherein sidewalls of said hole are surrounded by and in contact said source and body regions.” Ex. 1001, 5:20–22. Petitioner identifies Kobayashi’s contact hole 12 sidewalls in contact with the source and base layers. Pet. 30–31, 55 (citing Ex. 1005, Figs 4A, 5A).

Limitation 1[e] recites “and said circular trench contact is separate from said trenched gates with said source region and body region disposed between a gate oxide lining of said trenched gates and all circumferential points of the circular trench contact.” Ex. 1001, 5:22–26. Petitioner identifies Kobayashi’s source and base layers 10, 9 disposed between trench gate oxide film 7 and all circumferential points of contact hole 12. Pet. 31–32, 55 (citing Ex. 1005, Figs 4A, 5A).

Limitation 1[f] recites “and said contact metal plug connected to a source metal disposed on top of said circular trench contact.” Ex. 1001, 5:27–28. Petitioner identifies Kobayashi’s tungsten metal plug 17 connected to source electrode 18. Pet. 32–33, 55 (citing Ex. 1005, 6:64–68, Fig. 5A).

At this stage, Patent Owner does not specifically contest Petitioner’s contentions with respect to limitations 1[b]–1[g], and we are persuaded that

Kobayashi teaches each of these limitations, for the reasons given by Petitioner. *See* Prelim. Resp.

5. *Conclusion as to Claim 1*

For the above reasons, we determine that Petitioner has shown, sufficiently persuasively at this stage, that Kobayashi in combination with Hshieh teaches all the limitations of claim 1, and that a person of ordinary skill in the art would have had reason to combine the features of each reference as Petitioner argues in the Petition. We therefore determine that Petitioner is reasonably likely to prevail in showing that claim 1 is unpatentable under § 103(a) as obvious over Kobayashi and Hshieh.

6. *Claims 3–5*

For claims 3–5, which depend from claim 1, Petitioner advances arguments that map with particularity every claim limitation to disclosures in Kobayashi. Pet. 51–56. At this stage in the proceeding, Patent Owner does not contest those arguments except to contend that the combination of Kobayashi and Hshieh does not suggest substantially square-shaped cells with rounded corners, which we addressed above in Section § III.D.3.b. Prelim. Resp. 28.

IV. DISCRETION TO DENY INSTITUTION UNDER § 314(a)

A. BACKGROUND: § 314(a) AND *FINTIV*

Institution of an *inter partes* review is discretionary. *See* 35 U.S.C. § 314(a) (authorizing institution of an *inter partes* review under particular circumstances, but not requiring institution under any circumstances); *Cuozzo Speed Techs., LLC v. Lee*, 579 U.S. 261, 273 (2016) (“[T]he

agency’s decision to deny a petition is a matter committed to the Patent Office’s discretion.”); *SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1356 (2018) (“[Section] 314(a) invests the Director with discretion on the question whether to institute review” (emphasis omitted)).

In light of the parallel district court proceeding challenging the ’409 patent, Patent Owner urges the Board to exercise our discretion to deny institution of this *inter partes* review based on the factors established in *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential) (“*Fintiv*”). Prelim. Resp. 31–35. Petitioner argues that the Board should decline to exercise our discretion. Pet. 71–74. For the reasons below, we decline to exercise our discretion to deny institution in this case.

An advanced state of a parallel district court proceeding is a “factor that weighs in favor of denying the Petition under § 314(a).” *NHK Spring Co. v. Intri-Plex Techs., Inc.*, IPR2018-00752, Paper 8 at 20 (PTAB Sept. 12, 2018) (precedential) (“*NHK*”). Specifically, an early trial date is part of a “balanced assessment of all relevant circumstances in the case, including the merits.” Consolidated Trial Practice Guide (November 2019) 58.¹⁰

In *Fintiv*, the Board explained that “cases addressing earlier trial dates as a basis for denial under *NHK* have sought to balance considerations such as system efficiency, fairness, and patent quality.” *Fintiv*, Paper 11 at 5 (footnote omitted). *Fintiv* sets forth six nonexclusive factors for determining “whether efficiency, fairness, and the merits support the exercise of authority to deny institution in view of an earlier trial date in the parallel proceeding.” *Id.* at 6. These factors consider the following:

¹⁰ Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

1. whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted;
2. proximity of the court's trial date to the Board's projected statutory deadline for a final written decision;
3. investment in the parallel proceeding by the court and the parties;
4. overlap between issues raised in the petition and in the parallel proceeding;
5. whether the petitioner and the defendant in the parallel proceeding are the same party; and
6. other circumstances that impact the Board's exercise of discretion, including the merits.

Id. at 5–6. In evaluating these factors, we “take[] a holistic view of whether efficiency and integrity of the system are best served by denying or instituting review.” *Id.* at 6.

The Director of the U.S. Patent and Trademark Office has issued additional guidance on the application of the *Fintiv* factors. See Katherine K. Vidal, Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation (June 21, 2022) (“*Fintiv* Memo”).¹¹ The *Fintiv* Memo states that “to benefit the patent system and the public good, the PTAB will not rely on the *Fintiv* factors to discretionarily deny institution in view of parallel district court litigation where a petition presents compelling evidence of unpatentability.” *Id.* at 2.

¹¹ Available at https://www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621_.pdf.

We now address the parties’ arguments with respect to the *Fintiv* factors. In the analysis that follows, we first consider whether *Fintiv* factors 1–5 weigh in favor of exercising our discretion to deny institution. For the reasons discussed below, we conclude that *Fintiv* factors 1–5 weigh in favor of denying institution. Nevertheless, we decline to deny institution because the Petition presents compelling evidence of unpatentability under factor 6. *See CommScope Techs. LLC v. Dali Wireless, Inc.*, IPR2022-01242, Paper 23 at 4–5 (PTAB Feb. 27, 2023) (precedential) (“In circumstances where . . . the Board’s analysis of *Fintiv* factors 1–5 favors denial of institution, the Board shall then assess compelling merits.”).

B. *FINTIV* FACTOR 1: WHETHER THE COURT GRANTED A STAY OR EVIDENCE EXISTS THAT ONE MAY BE GRANTED IF A PROCEEDING IS INSTITUTED

A district court stay of parallel litigation pending resolution of an *inter partes* review allays concerns about inefficiency and duplication of efforts, and strongly weighs against exercising our authority to deny institution. *Fintiv*, Paper 11 at 6. Petitioner asserts that “[n]o party has requested a stay of litigation, and so this factor is neutral.” Pet. 72. In response, Patent Owner notes that ASUS, a real party in interest in the instant proceeding, filed a motion to stay the parallel district court proceeding. Prelim. Resp. 31 (citing Ex. 2003); Pet. 1. ASUS’s motion to stay was denied with prejudice. *See* Paper 7; Ex. 2008. Accordingly, we weigh the first *Fintiv* factor as favoring discretionary denial.

C. *FINTIV* FACTOR 2: PROXIMITY OF THE COURT’S TRIAL DATE TO THE BOARD’S PROJECTED STATUTORY DEADLINE FOR A FINAL WRITTEN DECISION

The *Fintiv* Memo directs the Board to “consider the median time from filing to disposition of the civil trial for the district in which the parallel

litigation resides.” *Fintiv* Memo, 3 (footnote omitted). Based on a median time to trial of 19 months for the U.S. District Court for the Eastern District of Texas as of March 2023, Petitioner estimates that the parallel proceeding would result in a trial occurring in October 2024, which is six months earlier than the Board’s expected final written decision, which Petitioner estimates would issue around April 2025. Pet. 72 (citing Ex. 1010). Patent Owner does not dispute this estimate. Prelim. Resp. 32.

As of December 2023, the median time to trial for the Eastern District of Texas is 21.4 months¹², which projects a district court trial date of December 2024, five months prior to the expected May 2025 due date for our final written decision if we were to institute an *inter partes* review on this Petition. Because the district court would address issues relating to the validity of the ’409 patent several months before we would issue a final written decision, we weigh the second *Fintiv* factor as favoring discretionary denial.

D. *FINTIV* FACTOR 3: INVESTMENT IN THE PARALLEL PROCEEDING BY THE COURT AND THE PARTIES

The third *Fintiv* factor concerns the amount of investment in the parallel proceeding by the district court and the parties. Petitioner argues that the parallel proceeding “is still in the early stages,” and that substantial work remains before trial. Pet. 73 (citing Ex. 1018). Patent Owner argues that the parallel proceeding is no longer in its early stages. Prelim. Resp. 32. According to Patent Owner, (1) the parties in the parallel proceeding have already exchanged infringement and invalidity contentions, (2) claim

¹² The most recent statistics are available at <https://www.uscourts.gov/statistics/table/na/federal-court-management-statistics/2023/12/31-1>.

construction discovery is complete, and (3) prior to an expected Board institution decision, the opening claim construction brief will have been submitted, the *Markman* hearing will have been held, and fact discovery will be complete. *Id.* at 32–33; Ex. 1018, 4–5; Ex. 2004, 4.

Because there has been significant investment by the parties and the district court in the parallel proceeding, including the completion of preliminary disclosures and claim construction, and the near-completion of fact discovery, we weigh the third *Fintiv* factor as favoring discretionary denial.

E. *FINTIV* FACTOR 4: OVERLAP BETWEEN ISSUES RAISED IN THE PETITION AND IN THE PARALLEL PROCEEDING

In the *Fintiv* Memo, the Director stated that, “[c]onsistent with *Sotera Wireless, Inc.*, the PTAB will not discretionarily deny institution in view of parallel district court litigation where a petitioner presents a stipulation not to pursue in a parallel proceeding the same grounds or any grounds that could have reasonably been raised before the PTAB.” *Fintiv* Memo, 3 (footnote omitted) (citing *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 (PTAB Dec. 1, 2020) (precedential) (“*Sotera*”)).

Petitioner stipulates “not to pursue invalidity challenges in any district court case based on the same or substantially the same grounds relied upon in this Petition.” Pet. 73.

Patent Owner argues that Petitioner’s stipulation is too narrow, that Petitioner is not a party in the parallel proceeding, and that the record reflects no *Sotera*-type stipulation from the actual defendant in that proceeding: Petitioner’s real party in interest ASUS. Prelim. Resp. 33. Patent Owner further argues that ASUS’s invalidity contentions in the

parallel proceeding include the same Kobayashi and Hshieh grounds as in this Petition. *Id.*; Ex. 2005, 7–8.

Patent Owner has the better position. The instant proceeding and the parallel litigation involve the same or substantially the same claims and grounds. *See* Ex. 2005. We are directed to no argument or evidence sufficient to show that Petitioner’s stipulation binds ASUS and, therefore, prevents overlap between this proceeding and the parallel proceeding. Thus, we weigh the fourth *Fintiv* factor as favoring discretionary denial.

F. *FINTIV* FACTOR 5: WHETHER THE PETITIONER AND THE DEFENDANT IN THE PARALLEL PROCEEDING ARE THE SAME PARTY

“If a petitioner is unrelated to a defendant in an earlier court proceeding, the Board has weighed this fact against exercising discretion to deny institution under *NHK*.” *Fintiv*, Paper 11 at 13–14 (footnote omitted).

Petitioner contends it is not a defendant in the parallel proceeding nor is it an affiliate or subsidiary thereof. Pet. 74. In response, Patent Owner notes that the defendant in the parallel proceeding, ASUS, is identified as a real party in interest in the Petition. Prelim. Resp. 34; Ex. 1010; Pet. 1.

Given Petitioner’s statement that ASUS is a real party in interest, we find that the defendant in the parallel proceeding is not “unrelated” to Petitioner. Accordingly, we weigh the fifth *Fintiv* factor as favoring discretionary denial.

G. *FINTIV* FACTOR 6: OTHER CIRCUMSTANCES THAT IMPACT THE BOARD’S EXERCISE OF DISCRETION, INCLUDING COMPELLING MERITS

We consider whether Petitioner has presented compelling evidence of unpatentability when, as here, our analysis of the first five *Fintiv* factors favors denial of institution. *CommScope Techs.*, Paper 23 at 5.

“Compelling, meritorious challenges are those in which the evidence, if

unrebutted in trial, would plainly lead to a conclusion that one or more claims are unpatentable by a preponderance of the evidence.” *Fintiv* Memo, 4. As further explained in *OpenSky Industries, LLC v. VLSI Technology LLC*, “a compelling-merits challenge is a higher standard than the reasonable likelihood required for the institution of an IPR,” and is met when “it is highly likely that the petitioner would prevail with respect to at least one challenged claim.” IPR2021-01064, Paper 102 at 49 (PTAB Oct. 4, 2022) (decision on Director review) (precedential).

Petitioner argues that we should not deny institution under *Fintiv* “because the merits are strong.” Pet. 74. Conversely, Patent Owner argues that “the merits of the petition are extraordinarily weak.” Prelim. Resp. 34.

Here, we find that the evidence, if unrebutted in trial, demonstrates that it is highly likely that Petitioner would prevail under at least Ground 4 with respect to claim 1. At this stage, Patent Owner has not submitted any declaratory evidence or evidence of objective indicia of non-obviousness to rebut Petitioner’s seemingly straightforward case for claim 1 being obvious over the combined teachings of Kobayashi and Hshieh. As discussed above, Petitioner identifies most and/or all limitations in Kobayashi, and relies on Hshieh only for what appears to be a minor modification, i.e., rounding of corners. *See supra* Section § III.D. Petitioner’s motivation for this modification comes from an express teaching in Hshieh. *See, e.g.*, Ex. 1003 ¶ 137. At this stage of the proceeding, Patent Owner’s arguments do not undercut the sufficiency of Petitioner’s citations to Hshieh’s express teaching and to certain relied-upon embodiments of Hshieh, specifically Figures 8A and 8B, which illustrate all corners being rounded from a top view perspective. *See* Prelim. Resp. 20–28. Even if we were to adopt Patent

Owner's narrow claim construction (which we decline to do on this preliminary record) requiring all four corners being rounded from a top view perspective, it still appears Petitioner is highly likely to prevail with respect to at least claim 1 under Ground 4. *See supra* Section §§ III.B, III.D.3.b. As such, we determine, based on the evidence of record, that Petitioner presents a compelling, meritorious challenge with respect to at least one claim.

Having identified compelling merits, we decline to exercise discretion to deny institution under § 314(a). *Fintiv* Memo, 5 (“[T]he PTAB will not deny institution based on *Fintiv* if there is compelling evidence of unpatentability.”). However, “a determination of ‘compelling’ merits should not be taken as a signal to the ultimate conclusion after trial” because “all relevant evidence likely will not have been adduced at the point of institution [and] trial should produce additional evidence that may support a determination in the Final Written Decision that unpatentability has not been adequately proven.” *OpenSky*, Paper 102 at 49–50.

V. OTHER GROUNDS

Because Petitioner has shown a likelihood of prevailing, and has identified a compelling, meritorious challenge with respect to claim 1 on Ground 4 based on Kobayashi and Hsieh, we will institute on all claims and all grounds raised in the Petition. 37 C.F.R. § 42.108(a) (“When instituting . . . review, the Board will authorize the review to proceed on all of the challenged claims and on all grounds of unpatentability asserted for each claim.”); *see SAS*, 138 S. Ct. at 1359–60; *AC Techs. S.A. v. Amazon.com, Inc.*, 912 F.3d 1358, 1364 (Fed. Cir. 2019) (“[I]f the Board

institutes an IPR, it must . . . address all grounds of unpatentability raised by the petitioner.”).

At this stage, we decline to provide detailed preliminary findings as to the remaining grounds of unpatentability (i.e., Grounds 1–3 and 5–6). We determine that, under the facts presented on this record, the dispute surrounding these grounds is best suited for resolution on a full trial record and in view of any final determination on claim construction. Refraining from supplying preliminary findings may be the prudent course, moreover, where the District Court in the parallel proceeding (1) denied with prejudice a stay, (2) is poised to presently issue an order on claim construction, and (3) is scheduled to hold a trial about five months before the Board is scheduled to enter its final written decision in the instant proceeding.¹³

However, we provide the following remarks as guidance to the parties in an effort to promote a streamlined trial.

For each additional ground, Petitioner advances arguments that map with particularity every claim limitation to disclosures in the asserted prior art. Pet. 22–67.¹⁴

¹³ These remarks are based on information presented by the parties in connection with Patent Owner’s request for a discretionary denial, which we addressed above in Section § IV. See Pet. 71–74; Prelim. Resp. 31–34; Paper 7 (citing Ex. 2008).

¹⁴ Under Grounds 1, 2, 4, and 5, Petitioner provides alternate mappings with respect to Kobayashi and the claimed substantially square-shaped cells. Compare Pet. 26 (annotating Kobayashi, Figure 4A) with *id.* at 27 (annotating Kobayashi, Figure 6C); *id.* at 39, 51–53, 66. We have concerns regarding the reasonableness of Petitioner’s mapping of Kobayashi’s hexagonal cells, seen in Figure 4A, to the claimed substantially square-shaped cells, for similar reasons as argued by Patent Owner. See Prelim. Resp. 13–14 (“a hexagon is not essentially square shaped”).

Regarding Grounds 1–3, Patent Owner’s main contention, at this stage of the proceeding, is that Kobayashi does not disclose substantially square-shaped cells with “top view” rounded or truncated corners. Prelim.

Resp. 12–20. The parties may wish to explore whether the construction of the claim term “substantially square-shaped cells with rounded corners” properly includes the “top view” requirement proposed by Patent Owner in its Preliminary Response. Prelim. Resp. 4, 9. The parties may also wish to explore whether Kobayashi discloses corner rounding from a top view perspective, i.e., whether Kobayashi’s trench corner rounding, seen from a side view perspective in Petitioner’s annotated Figure 6C (*see* Pet. 27), inherently meets Patent Owner’s proposed claim construction requiring a top view requirement.

Regarding Grounds 5–6, at this stage of the proceeding, Patent Owner does not contest Petitioner’s mapping and arguments except to contend that the references do not suggest substantially square-shaped cells with rounded or truncated corners, which was addressed in our above analysis. Prelim. Resp. 28–31.

VI. CONCLUSION

Having identified at least one compelling, meritorious challenge based on alleged obviousness of claim 1 over the combined teachings of Kobayashi and Hsieh, we decline to deny the Petition on a discretionary basis. We determine that there is a reasonable likelihood that Petitioner would prevail with respect to at least one of the claims challenged in the Petition, and therefore, we institute *inter partes* review.

Any argument not raised in a Patent Owner Response to the Petition, or as permitted in another manner during trial, shall be deemed waived even if asserted in the Preliminary Response. In addition, nothing in this Decision authorizes Petitioner to supplement information advanced in the Petition in a manner not permitted by the Board's Rules.

VII. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), *inter partes* review of all challenged claims of the '409 patent is instituted on all grounds of unpatentability set forth in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(a) and 37 C.F.R. § 42.4, notice is given of institution of trial commencing on the entry date of this Decision.

IPR2024-00094
Patent 7,812,409 B2

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