

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

Case No. IPR2024-00094

Patent No. 7,812,409

PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE

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I. INTRODUCTION

Petitioner presented six grounds of unpatentability based on three prior art references and the knowledge of a POSITA. Patent Owner's challenges to these grounds fail because Patent Owner misreads the prior art disclosures and overlooks strong motivation to combine the relevant prior art teachings. Under any of the proposed claim constructions, including the Board's preliminary determination to interpret the claims according to their plain and ordinary meaning, the Petition has demonstrated by a preponderance of the evidence that claims 1-6 of U.S. Patent No. 7,812,409 are unpatentable.

II. CONSTRUCTION OF THE CLAIMS

Petitioner proposed construing the term "rounded corners" to mean "corners that are truncated by design layout and then rounded." Paper 1 at 15-18. Petitioner further proposed construing the term "truncated corners" to mean "corners that are truncated by design layout." Paper 1 at 18-19. Patent Owner advanced its own constructions for each term. *See* Paper 6 at 4-11. The Board preliminarily declined to adopt any of the proposed constructions, instead holding that there is "no reason to determine that [the terms] deviate[] from [their] ordinary and customary meaning." Paper 9 at 11-12.

In effect, the Board's preliminary decision held that both Petitioner and Patent Owner advanced constructions that were unduly narrow in scope. In

rejecting both Petitioners and Patent Owners proposed constructions, the Board noted in each case that it is improper to import limitations from the specification into the claim terms. *See* Paper 9 at 10 (“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.”); Paper 9 at 11 (“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.”).

Petitioner agrees with the Board’s preliminary conclusion that there is no need to interpret “rounded corners” or “truncated corners.” Petitioner’s patentability grounds stand under all of the proposed constructions, as well as the plain and ordinary meaning of these terms.

III. CLAIMS 1-6 ARE UNPATENTABLE

A. Ground 1: Kobayashi Anticipated Claims 1 and 3–5

1. Claim 1

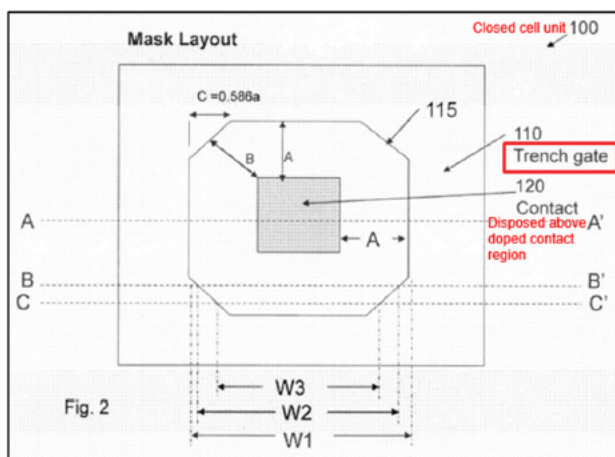
Patent Owner does not dispute that Kobayashi taught the preamble and elements 1[b], 1[c], 1[d], 1[e], and 1[f] of claim 1. Paper 24 at 22-27. Patent Owner disputes only element 1[a], which requires “said trenched gates surrounding said transistor cells as closed cells constituting substantially square-shaped cells

with rounded corners.” Paper 24 at 22. In particular, Patent Owner disputes Kobayashi’s teaching of (a) substantially square-shaped cells, and (b) rounded corners. *Id.* at 22-27. Patent Owner’s arguments fail because Patent Owner ignores the totality of Kobayashi’s teachings.

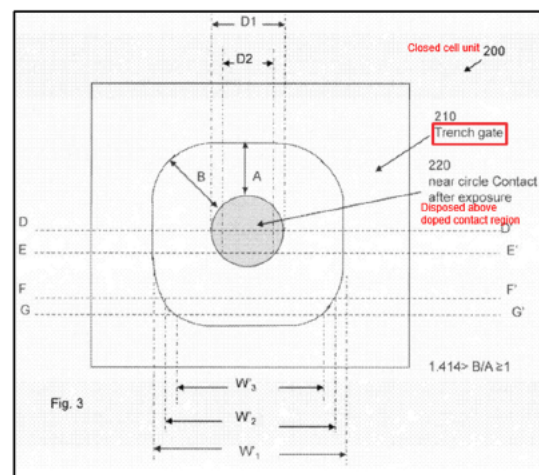
a) Kobayashi mirrored the disclosure of the ’409 Patent

For context, it is helpful to review the exemplary embodiment disclosed in the ’409 Patent. Claim 1 may not be limited to this embodiment, but there is no dispute that claim 1 *covers* the exemplary embodiment, and Kobayashi’s disclosure is essentially the same with respect to substantially square-shaped cells and rounded corners.

The ’409 Patent describes an embodiment in which the corners of a square transistor cell are truncated in the design phase (Figure 2) and then rounded in the fabrication phase (Figure 3). Ex. 1001 at 4:53-62; *see also* Paper 1 at 5-6.



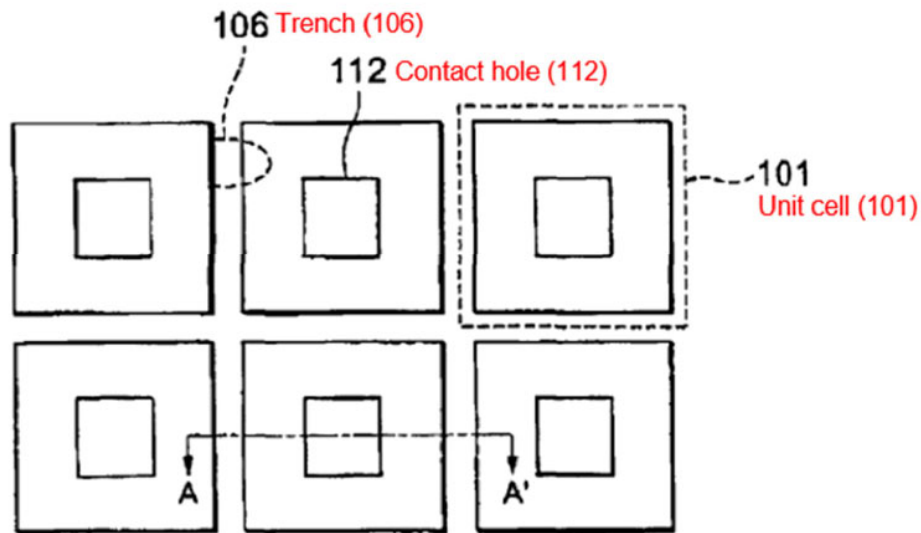
’409 Patent, Figure 2 (annotated)



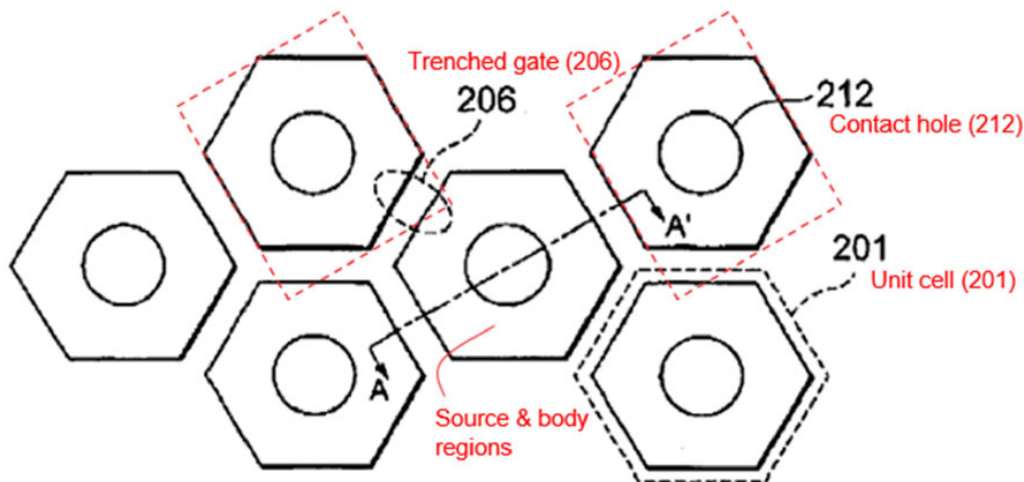
’409 Patent, Figure 3 (annotated)

In particular, the '409 Patent explains that due to the natural effects of photolithography, “[i]t is by nature that truncated corners in layout as shown in FIG. 2 and becomes [sic] rounded as shown in FIG. 3.” Ex. 1001 at 4:58-60; *see also* Paper 1 at 4-5.

Likewise, Kobayashi taught truncating the corners of square transistor cells in the design phase and then rounding the corners in the fabrication phase. In particular, Kobayashi disclosed layouts with trench gates surrounding both square and hexagonal transistor cells. Paper 1 at 25-27; Ex. 1003, ¶¶ 68-70.



Kobayashi, Figure 3A (annotated)



Kobayashi, Figure 4A (annotated)

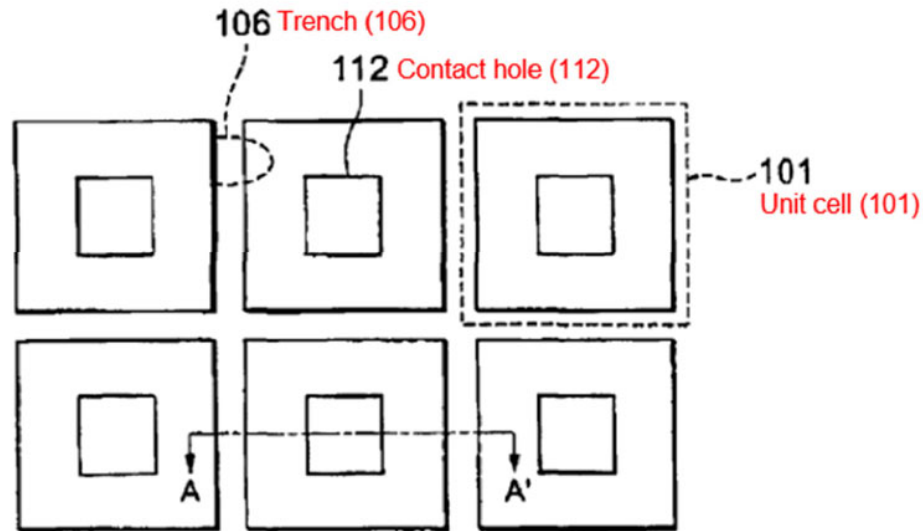
Ex. 1005 at 6:26-27, 6:30, Fig. 3A, Fig. 4A; *see also* Paper 1 at 25-26; Ex. 1003, ¶¶ 67-68. The hexagonal cells that Kobayashi shows in the design layout of Figure 4A are substantially square shaped with corners truncated to form hexagons.

Like the '409 Patent, Kobayashi further taught that the transistor cells are surrounded by trench gates (6, 106, 206), and that the corners of the trench gate openings may be rounded in the fabrication process (“corners of each trench 6 at an opening portion may also be rounded”). Ex. 1005 at 7:57-8:4; *see also* Paper 1 at 27; Ex. 1003, ¶¶ 69-70.

b) Kobayashi teaches “substantially square-shaped cells”

Turning to the parties’ substantive disagreements, Patent Owner first disputes Kobayashi’s disclosure of “substantially square-shaped cells.” Paper 24 at

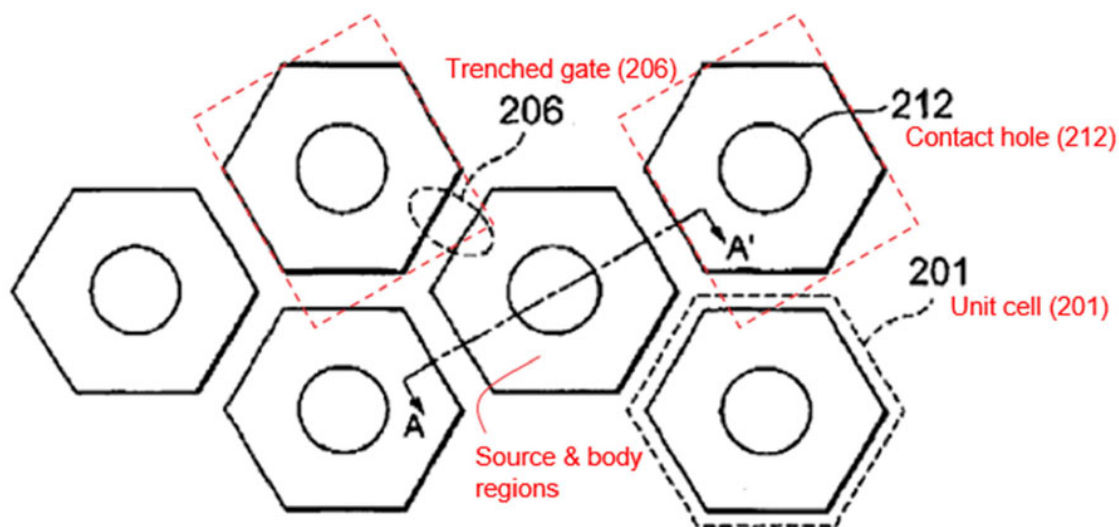
22-23. At the outset, Patent Owner ignores the square-shaped cells that Kobayashi taught in Figure 3A.



Kobayashi, Figure 3A (annotated)

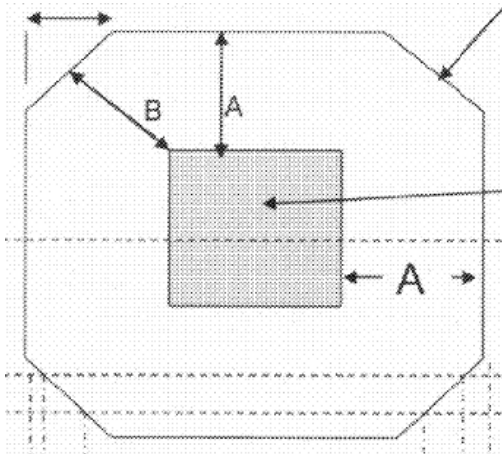
Ex. 1005 at 6:26-27 (“a plurality of *square cells* arranged in a matrix”) (emphasis added), Fig. 3A; *see also* Paper 1 at 25-26; Ex. 1003, ¶ 67.

Looking past Figure 3A, Patent Owner focuses its critique on the hexagonal cells shown in Kobayashi Figure 4A. Paper 24 at 22-23. Contrary to Patent Owner’s assertion, Kobayashi’s hexagonal cells are substantially square-shaped with truncated corners, just as the ’409 Patent describes and claims. Ex. 1005 at 6:30, Fig. 4A; *see also* Paper 1 at 26; Ex. 1003, ¶ 68.

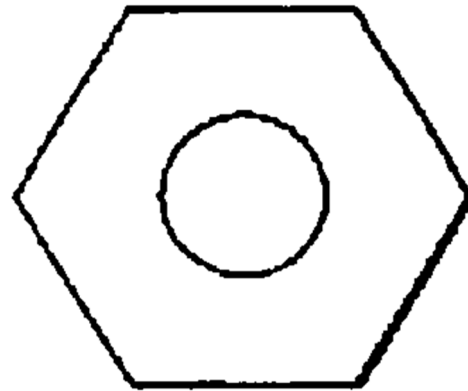


Kobayashi, Figure 4A (annotated)

In essence, Patent Owner asserts that a hexagon is not a square. Paper 24 at 22-23. Likewise, an octagon is not a square. Yet the '409 Patent shows an octagon in Figure 2, and that octagon is the only example that the '409 Patent provides of a substantially square-shaped cell with truncated corners, as shown below. Ex. 1001 at 4:53-63, Fig. 2, Fig. 3A; *see also* Paper 1 at 5-6. Thus, there can be no dispute that, consistent with the '409 Patent, truncating the corners of a square cell will change its shape. The same is true with Kobayashi's hexagonal cells, which also constitute substantially square-shaped cells with truncated corners. A comparison of Figure 2 from the '409 Patent and Figure 4A from Kobayashi illustrates the point.



'409 Patent, Figure 2 (excerpt)



Kobayashi, Figure 4A (excerpt)

Figure 2 of the '409 Patent and Figure 4A of Kobayashi both show substantially square-shaped transistor cells with truncated corners. In Figure 2 of the '409 Patent, the corners are truncated to form an octagon. In Kobayashi Figure 4A, the corners are truncated more to form a hexagon. Patent Owner cites nothing in the '409 Patent that limits *how* or *how much* the corners should be truncated. Further, Kobayashi's hexagonal cells are consistent with the objective of the '409 Patent, providing a more uniform space between the contact region and the surrounding trench gate. *See* Ex. 1001 at 2:65-3:3, Fig. 1A, Fig. 2; *see also* Paper 1 at 6-7.

Patent Owner further argues that “truncated corners are not rounded corners.” Paper 24 at 23. This is true, but nothing in claim 1 *excludes* truncating the corners. Indeed, the exemplary embodiment of the '409 Patent describes truncating the corners (Figure 2) as the first step toward rounding them (Figure

3A). Ex. 1001 at 4:53-62; *see also* Paper 1 at 5-6. Petitioner further addresses the “rounded corners” requirement of claim 1 in the following section.

As for square-shaped cells, Kobayashi’s teaching is clear. Just like the ’409 Patent, Kobayashi taught both square-shaped cells (Figure 3A) ***and*** substantially square-shaped cells with truncated corners (Figure 4A). *See* Paper 1 at 5-6, 25-26. Accordingly, Kobayashi satisfies the “substantially square-shaped cells” requirement of claim 1.

c) Kobayashi teaches “rounded corners”

Patent Owner next disputes the “rounded corners” teaching in Kobayashi. Paper 24 at 23-27. Patent Owner does ***not*** dispute that Kobayashi taught rounding corners. Instead, Patent Owner asserts that Kobayashi taught rounding the wrong corners. The disclosure in Kobayashi shows that Patent Owner is mistaken.

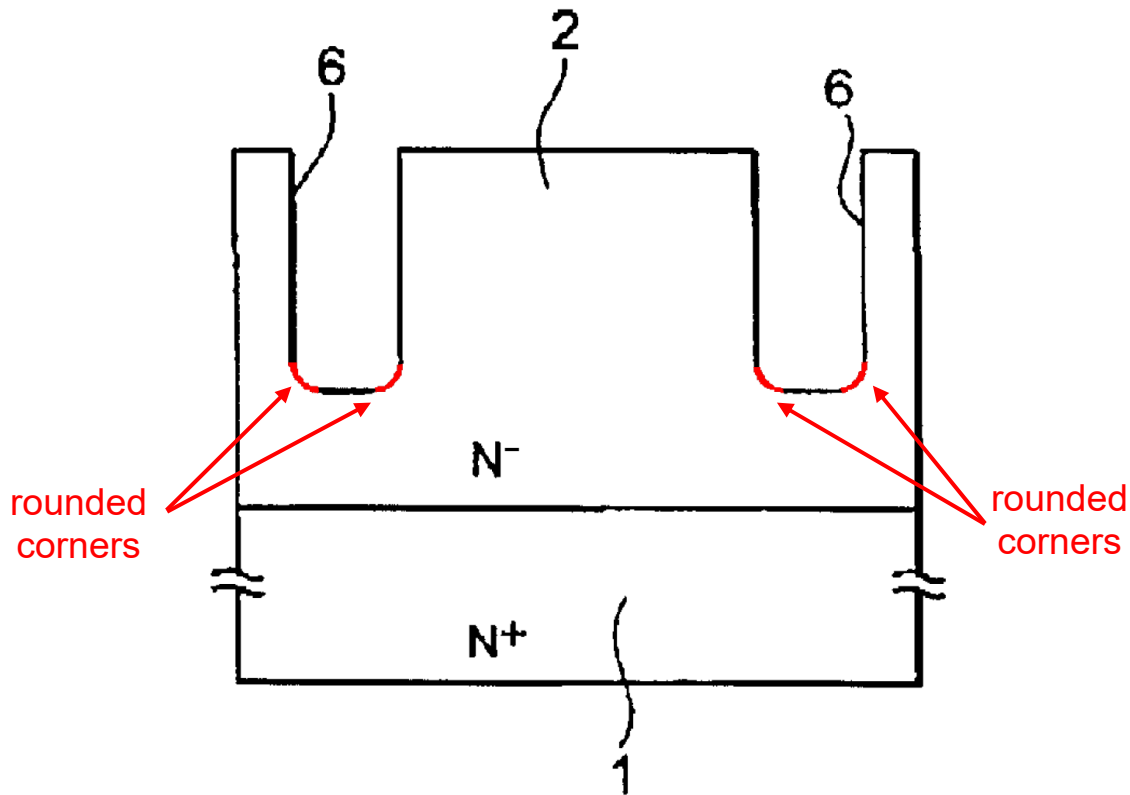
Patent Owner would treat the side views and top views illustrated in Kobayashi as if they are totally independent of one another. *See* Paper 24 at 24-25. They are not. Kobayashi taught that Figures 6A to 6D describe “a first part of a method of producing the vertical MOSFET according to the ***first embodiment.***” Ex. 1005 at 6:3-5 (emphasis added). Figure 5A likewise shows “a vertical MOSFET according to a ***first embodiment.***” Ex. 1005 at 5:65-67 (emphasis added). Further, Figure 5A shows the sectional view “taken along a line A-A’ ***in FIGS. 3A, 3B, 4A, and 4B.***” *Id.* (emphasis added). Thus, Figures 3A (top view),

4A (top view), 5A (side view), and 6C (side view) all relate to one another and illustrate Kobayashi's first embodiment.

As shown in those figures—and like the '409 Patent—Kobayashi taught that the cells are defined by the surrounding trench gates. For example, the '409 Patent describes Figure 2 as showing that the “closed cell is *surrounded by trenched gate 110* that has truncated corners.” Ex. 1001 at 3:34-35 (emphasis added), Fig. 2.

Kobayashi also taught trenched gates (“trench gates (8) formed in the pair of trenches”) surrounding the transistor cells formed in a semiconductor substrate (“a unit cell formed in a region of the semiconductor layer *surrounded by the pair of trench gates*”). Ex. 1005 at 4:12-19 (emphasis added); *see also* Paper 1 at 22-23. In relevant part, Kobayashi illustrated the trench gates as elements 6, 106, and 206 in Figures 3A, 4A, 5A, and 6C. *See, e.g.*, Ex. 1005 at 4:14-15, 6:32-34, 6:53-54. Accordingly, in both Kobayashi and the '409 Patent, the shape of the trench gates defines the shape of the unit cells, including their corners.

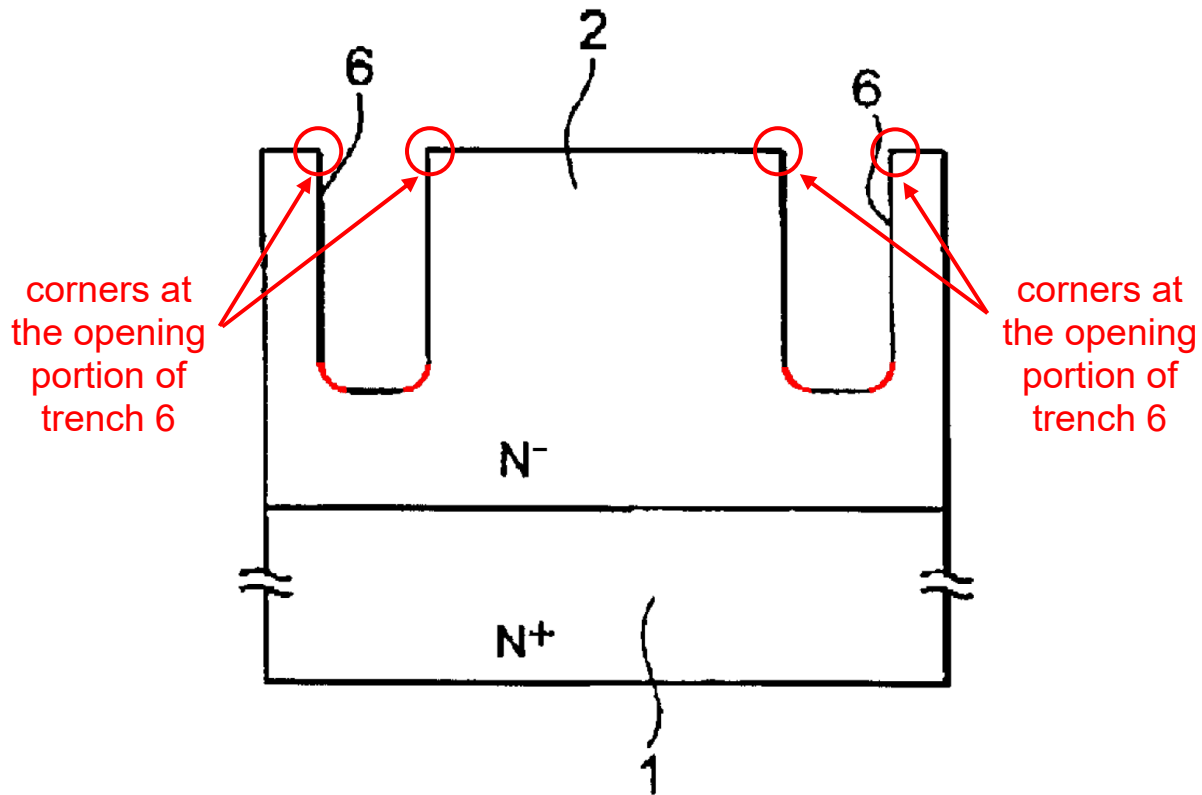
Kobayashi taught rounding the corners at both the bottom and the openings of the trenches. In particular, Kobayashi taught that the “corners of each trench 6 at the bottom are rounded.” Ex. 1005 at 7:57-59; *see also* Paper 1 at 27; Ex. 1003, ¶ 69. Kobayashi illustrated the rounding of these corners in Figure 6C.



Kobayashi, Figure 6C (annotated)

Ex. 1005 at 7:57-59, Fig. 6C; *see also* Paper 1 at 27; Ex. 1003, ¶ 69.

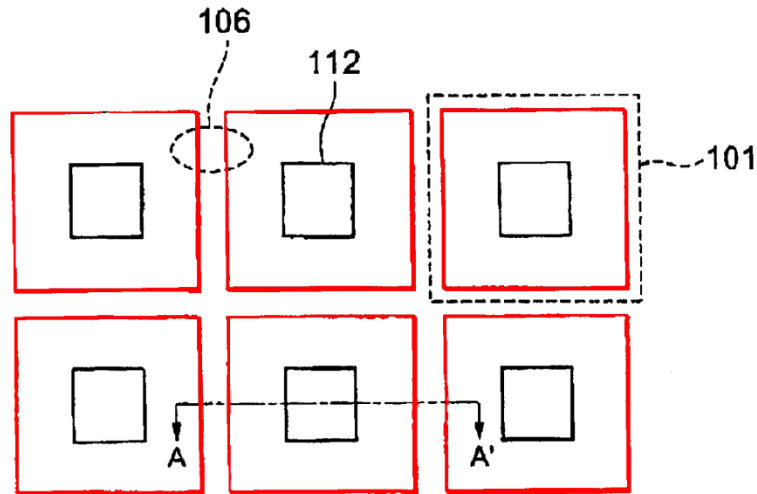
Kobayashi further taught that the “*corners of each trench 6 at an opening portion may also be rounded.*” Ex. 1005 at 7:59-60; *see also* Paper 1 at 27, Ex. 1003, ¶ 69. The figures of Kobayashi do not illustrate this optional rounding of the corners at the openings of the trenches. However, the figures do show where these corners at the openings are located. For example, Figure 6C shows a side view of the corners at the openings of the trenches 6.



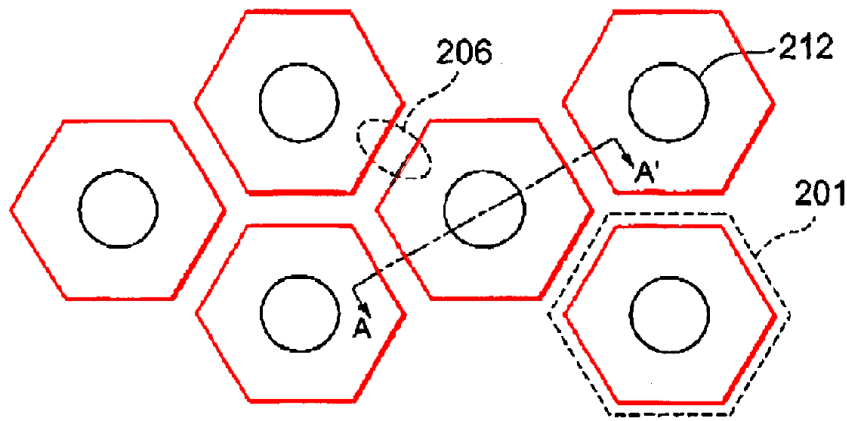
Kobayashi, Figure 6C (annotated)

Ex. 1005 at 7:59-60; *see also* Paper 1 at 27, Ex. 1003, ¶ 69. Because the trench gates define the cells, rounding the trench gate corners also rounds the cell corners.

As Kobayashi explains, “unit cells 101, 201, and 301 in each figure can be defined as structural units separated by trenches 106, 206, and 306 where gate electrodes are to be formed.” Ex. 1005 at 6:32-35. This relationship between the trenches and cells is the same as in the ’409 Patent, for which Patent Owner’s expert admitted that the trenches surrounding a unit cell define the shape of the cell. Ex. 1020 (Neikirk Tr.) at 18:16-19:2. Thus, the corners at the openings of Kobayashi’s trenches can also be seen in top view in Figures 3A and 4A. These corners at the opening of the trenches 106 and 206 are highlighted in red below.



Kobayashi, Figure 3A (annotated)



Kobayashi, Figure 4A (annotated)

Rounding the corners at the trench openings requires removing semiconductor material from the walls of the trenches 106 and 206 by etching or similar fabrication process, which results in rounding every corner of the cell defined by the surrounding trench, exactly as Kobayashi described. Ex. 1005 at 7:57-8:4; *see also* Paper 1 at 27. The fact that Kobayashi did not show the rounded corners in the top views of Figures 3A and 4A is immaterial. As Kobayashi

explained, rounding of the corners at the opening is optional (*i.e.*, “corners of each trench 6 at an opening portion *may* also be rounded”). Ex. 1005 at 7:59-60 (emphasis added); *see also* Paper 1 at 26-27. Indeed, the side views in Figures 5A and 6C likewise do not illustrate this optional rounding at the trench openings. That does not matter because Kobayashi expressly disclosed in text the optional rounding of the corners at the trench openings.

Under any of the proposed constructions, Kobayashi taught the rounded corners of claim 1. In accordance with Petitioner’s proposed construction, Kobayashi taught truncating the corners of the cells in the design phase (Figure 4A) and then rounding them in the fabrication phase. Ex. 1005 at 7:59-60; *see also* Paper 1 at 26-27. For the same reason, Kobayashi taught the “rounded corners” under the broader plain and ordinary meaning of that phrase that the Board preliminarily adopted. Finally, even if the Board changes course and adopts Patent Owner’s proposal that *all* corners must be rounded, Kobayashi taught that too. Kobayashi taught “corners *of each trench 6* at an opening portion may also be rounded, and nothing in Kobayashi suggests that this meant less than all corners. Ex. 1005 at 7:59-60. Accordingly, Kobayashi satisfies the “substantially square-shaped cells” requirement of claim 1.

2. Claim 3-4

Patent Owner does not challenge Petitioner's arguments specific to the additional requirements of dependent claims 3 and 4. Instead, Patent Owner rests on the same arguments it presented for claim 1. Paper 24 at 27. Petitioner addressed each of those arguments above with respect to claim 1.

3. Claim 5

Patent Owner argues that Petitioner cannot use the "apparent relative proportions of the MOSFET of Figure 5A" to determine the diameter of the Kobayashi's circular trench contact, citing *Nystrom v. TREX Co.*, 424 F.3d 1136, 1149 (Fed. Cir. 2005). Paper 24 at 28. But Patent Owner omits the exception to this rule, which is that reliance on the figures to show a particular size is improper only "*if the specification is completely silent on the issue.*" *Nystrom*, 424 F.3d at 1149 (emphasis added). Kobayashi's specification is not silent. Kobayashi disclosed specific sizes for several features shown in Figure 5A, and each of those sizes is consistent with one another, establishing that the figure has a consistent relative scale. Paper 1 at 35-36. Thus, Figure 5A and Kobayashi's supporting disclosure demonstrate that the diameter of the top surface of the circular trench contact is less than 1.0 micrometer, as claim 5 requires. *Id.*

B. Ground 2: Kobayashi in View of Kikkawa Renders Obvious Claims 2 and 6

Patent Owner challenges Ground 2 on four bases. First, Patent Owner challenges the public availability of Kikkawa before the priority date. Paper 24 at 39-41. Second, Patent Owner asserts that there was no motivation to combine the relevant teachings of Kobayashi and Kikkawa. *Id.* at 29-33. Third, with respect to dependent claim 2, Patent Owner makes the same arguments it made concerning independent claim 1. *Id.* at 33-34. Fourth, with respect to independent claim 6, Patent Owner argues that Kobayashi failed to disclose the “truncated corners.” *Id.* at 35-39. Each of Patent Owner’s arguments fails for the reasons explained below.

1. Kikkawa qualifies as a prior art printed publication

In support of its contention that Kikkawa is a prior art printed publication, Petitioner presented an expert declaration from Dr. Hall-Ellis, who is an expert in the field of library science. Dr. Hall-Ellis’s 52-page *curriculum vitae* catalogs her 50+ years of experience in the field. Ex. 1013. She has authored more than 100 publications and presented at a similar number of conferences and other events in the relevant field. *Id.* at 5-15. The Board has previously credited Dr. Hall-Ellis’s expert testimony on similar topics in other investigations. *See, e.g., Unified Patents, LLC v. 2BCom, LLC*, IPR2020-00996, Paper 65, at 18-21, 25-29 (finding that petitioner had proven by a preponderance of the evidence that a prior art

reference was publicly available based on the testimony of Dr. Hall-Ellis and the evidence she cited).

By contrast, Patent Owner has presented no expert of its own to dispute Dr. Hall-Ellis's opinions or the evidence she cites. Instead, Patent Owner argues Dr. Hall-Ellis lacks personal knowledge regarding the public availability of Kikkawa before the priority date. Paper 24 at 39-41. Petitioner offers Dr. Hall-Ellis as an expert witness, not a fact witness. As such, personal knowledge is not required, and Patent Owner does not challenge Dr. Hall-Ellis's qualifications as an expert.

In her 26-page declaration, Dr. Hall-Ellis analyzes the relevant evidence and offers her expert opinion that Kikkawa was publicly available on or shortly after January 26, 1993. Ex. 1008, ¶¶ 46, 51. Among the evidence Dr. Hall-Ellis considered is a stamp on the cover of Kikkawa. *Id.*, ¶¶ 44-46. The stamp indicates that a physical copy of Kikkawa was received at the Linda Hall Library of Science, Engineering & Technology in Kansas City, Missouri, on January 26, 1993. *Id.* Dr. Hall-Ellis testified that she obtained the copy of Kikkawa submitted as Exhibit 1007 directly from the Linda Hall Library. Ex. 2023 at 38:22–39:5. Dr. Hall-Ellis further testified that she is very familiar with the Linda Hall Library because she requests materials from the library “almost every week.” *Id.* at 35:20–36:1, 39:6-20. Kikkawa has been publicly available since the date on the stamp because the

Linda Hall Library “is a privately endowed library that is open to the public.” *Id.* at 39:6-11.

Patent Owner describes the stamp as “faint and illegible.” Paper 24 at 40. The stamp is faint, but it is not illegible, and the stamp date of January 26, 1993, is consistent with the publication date of February 1993, which also appears on the cover of Kikkawa. Ex. 1007. Dr. Hall-Ellis testified that she has worked with stamps like these “for a long, long time, and you learn to read them.” *Id.* at 38:4-15. Admitting that the stamp is “a little bit smudgy,” Dr. Hall-Ellis testified that “you have to enlarge these” to read them based on her extensive experience. *Id.*

Patent Owner’s reliance on *ServiceNow Inc., v. Hewlett-Packard Co.*, IPR2015-00716, Paper No. 13, 8, 15-17 (P.T.A.B. Aug. 26, 2015) is misplaced. In that case, the petitioner relied solely on dates printed on the faces of the documents at issue, including copyright dates, and the fact that the documents are currently downloadable from an online service. *Id.* at 15-16. By contrast, Petitioner and Dr. Hall-Ellis do not rely solely on the “February 1993” date printed on the cover of Kikkawa. Petitioner and Dr. Hall-Ellis rely on a hand stamp showing that Kikkawa was received at the Linda Hall Library on January 26, 1993, as well as Dr. Hall-Ellis’s expert testimony that such stamps are routinely applied in libraries such as the Linda Hall Library to indicate a date of receipt. Ex. 1008, ¶ 46; Ex. 2023 at 34:25–35:6.

For all of these reasons, the record demonstrates that Kikkawa was publicly available at the Linda Hall Library since January 26, 1993, or shortly thereafter—well before the priority date of the '409 Patent. Accordingly, Kikkawa qualifies as prior art to the '409 Patent.

2. A POSITA would have been motivated to combine Kobayashi and Kikkawa

Patent Owner argues a lack of motivation to combine Kobayashi in view of Kikkawa. Paper 24 at 34. Petitioner fully addressed the motivation to combine these references in the Petition. Paper 1 at 41-49. Here, Petitioner addresses a few specific points that Patent Owner raised in its response.

First, Patent Owner incorrectly contends that Kikkawa is not analogous prior art. Paper 24 at 29-32. As the Petition explains, the '409 Patent, Kobayashi, and Kikkawa are all directed to problems with semiconductor devices such as electro- and stress-migration. Paper 1 at 42. The '409 Patent claims a titanium metal layer “for reducing a contact resistance between said contact metal plug and said source metal.” Similarly, Kobayashi discloses a Ti and TiN barrier metal layer below the source metal, which serves the purpose of electro-migration resistance. Ex. 1003, ¶ 99. Kikkawa similarly discloses that problems with electro-migration and contact resistance are improved by using Ti and TiN barrier layers on an AlSiCu metal layer in a semiconductor structure. Ex. 1007 at 4. As the petition explains, it would have been obvious to a POSITA that Kobayashi would benefit from a

bottom titanium layer in addition to its existing aluminum layer for exactly the reasons Kikkawa taught. Paper 1 at 43-49.

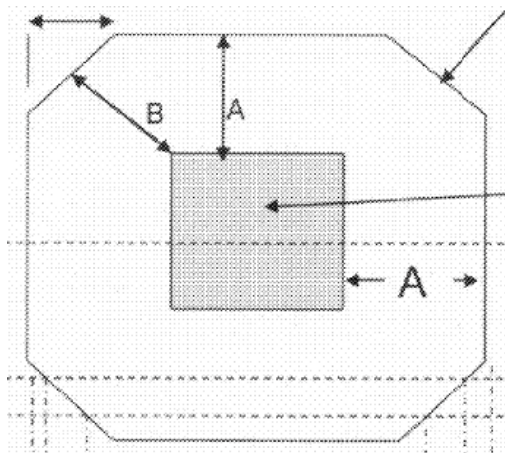
3. Claim 2 would have been obvious in view of Kobayashi and Kikkawa

Patent Owner does not dispute that Kikkawa taught the additional feature recited in dependent claim 2, which is “a contact resistance reduction metal layer composed of a titanium (Ti) layer disposed above a top surface said contact metal plug and below a bottom surface of said source metal for reducing a contact resistance between said contact metal plug and said source metal.” Instead, Patent Owner challenges the combined disclosures of Kobayashi and Kikkawa solely on the basis that Kobayashi allegedly fails to disclose each limitation of claim 1. Paper 24 at 33-34. This argument fails for the same reasons discussed above with respect to claim 1 in Ground 1.

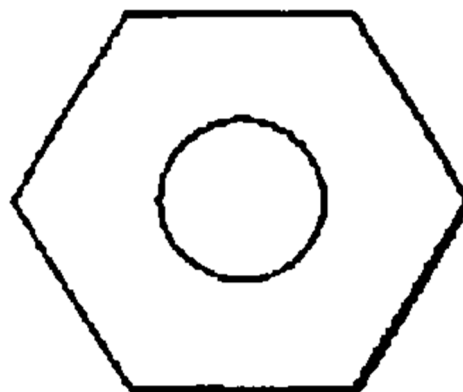
4. Claim 6 would have been obvious in view of Kobayashi and Kikkawa

With respect to claim 6, Patent Owner challenges the combined teachings of Kobayashi and Kikkawa on two bases. First, Patent Owner challenges the teaching of square-shaped cells with truncated corners.” Paper 24 at 35-38. As explained above in connection with Ground 1, claim 1, Kobayashi taught hexagonal cells, which are “substantially square-shaped with truncated corners,” just like the octagonal cells described in the ’409 Patent. The comparison of Figure 2 from the

'409 Patent and Figure 4A from Kobayashi is repeated here for convenience, and it demonstrates how Kobayashi taught substantially square-shaped cells with truncated corners.



'409 Patent, Figure 2 (excerpt)



Kobayashi, Figure 4A (excerpt)

Second, Patent Owner challenges the combined teaching of Kobayashi and Kikkawa as to the source metal layer composed of Ti/AlCu or Ti/AlSiCu alloys. Paper 24 at 38-39. This argument fails for the same reasons discussed above with respect to claim 2 in Ground 2.

C. Ground 3: Kobayashi in View of the Knowledge of a POSITA Renders Obvious Claims 5

Patent Owner challenges the combination of Kobayashi and the knowledge of a POSITA as to the disclosure and knowledge of using a source contact with a diameter less than 1.0 micrometer. As explained above in Ground 1, Kobayashi itself discloses, or at least strongly suggests, that the source contact has a diameter less than 1.0 micrometer. Independently, Dr. Liu provided additional reasons why

this would have been known to a POSITA, and none of Patent Owner’s arguments undermine Dr. Liu’s reasoning. Paper 1 at 49-51; Ex. 1003, ¶¶ 110-111.

D. Ground 4: Kobayashi in View of Hshieh Renders Obvious Claims 1 and 3-5

1. Claim 1

Patent Owner does not dispute that the combination of Kobayashi in view of Hshieh discloses all the limitations of claim 1. Patent Owner challenges only the motivation to combine Kobayashi and Hshieh to achieve “substantially square shaped cells with rounded corners” as required by element 1[a]. Paper 24 at 61-62. Patent Owner’s argument misses the mark because it misinterprets Kobayashi’s teachings, as explained above in Ground 1.

First, Patent Owner contends that “Petitioner repeatedly conflates the side view rounding of trench gate bottoms and openings (such as in Kobayashi and Kim) with the top-view rounding of cell corners (such as in Hshieh).” Paper 24 at 45-48. This argument fails because, as discussed above, Kobayashi taught rounding the corners at the opening of the gate trenches, which also define the corners of the cell that the gate trenches surround.

Patent Owner also seems to suggest that there can be no motivation to modify Kobayashi with Hshieh’s rounded corners because Kobayashi allegedly does not disclose this feature in the first place. That clearly is not the test for obviousness.

Second, Patent Owner contends that “Hshieh teaches away from ‘substantially square-shaped cells with rounded corners’ because Hshieh is directed to increasing the packing density of the cell topology of power transistors by using ‘non-orthogonal parallelograms.’” Paper 24 at 48-52. Patent Owner misses the point. The paragraph of Hshieh that Petitioner cited expressly taught the benefit of blunting or rounding sharp corners “to prevent the corner vulnerability where punch through where punch through weak points may be formed at the sharp corners.” Ex. 1006 at 5:3-28; *see also* Paper 1 at 54; Ex. 1003, ¶ 121. On its face, this teaching applies to sharp corners generally, not just to the specific shapes shown in the figures of Hshieh.

Nor is there any merit to Patent Owner’s argument that the combination of Kobayashi and Hshieh would render Hshieh inoperable. Petitioner has not argued that Hshieh’s non-orthogonal parallelogram cells should be modified. Instead, as discussed above, Petitioner relies on the teachings of Hshieh regarding the benefits of rounding sharp cell corners to modify Kobayashi’s square cells. Paper 1 at 54.

Third, Patent Owner contends that Petitioner ignores differences between Hshieh and the claimed invention. Paper 24 at 52-54. None of the purported differences Patent Owner highlights are relevant here. Petitioner relies on Hshieh solely for its teaching that rounding sharp corners helps prevent corner vulnerability due to punch through. To the extent Kobayashi did not already teach

rounding corners (and it did), the benefits of adding Hshieh's rounded corners to the Kobayashi's transistor cells would have been obvious to a POSITA for the reasons expressly discussed in Hshieh. For the same reason, Petitioner is not engaging in improper hindsight because the motivation to combine was express.

Fourth, Patent Owner contends that Hshieh's teachings regarding the "three dimensional diffusion" phenomenon are inapplicable to Kobayashi. Paper 24 at 54-60. Patent Owner's argument, which the Board preliminarily rejected, again fails for the simple reason that both Kobayashi and Hshieh faced the problem of "punch-through" at sharp cell corners. Patent Owner admits as much. Paper 24 at 55. Whether different effects contribute to the "punch-through" problem in Kobayashi and Hshieh is immaterial. Hshieh's solution of rounding the corners to avoid "punch through" was equally applicable in Kobayashi, and it would have been obvious to combine it with the teachings in Kobayashi.

2. Claim 3-5

Patent Owner does not challenge Petitioner's arguments specific to the additional requirements of dependent claims 3-4. Instead, Patent Owner rests on the same arguments it presented for claim 1. Paper 24 at 62. Petitioner addressed each of those arguments above with respect to claim 1.

E. Ground 5: Kobayashi in View of Hsieh and Kikkawa Renders Obvious Claims 2 and 6

Patent Owner argues that Petitioner “fails to provide any reasoning for a motivation to combine Kobayashi, Hsieh and Kikkawa together.” Paper 24 at 63. With respect to both claims 2 and 6, however, Patent Owner only argues that Petitioner allegedly failed to demonstrate that the combination of Kobayashi and Hsieh renders obvious claim 1. Paper 24 at 63-65. These argument fails for the same reasons discussed above with respect to claim 1 in Ground 4. Patent Owner’s challenge to the public availability of Kikkawa likewise fails for the reasons addressed above in Ground 2.

F. Ground 6: Kobayashi in View of Hsieh and the Knowledge of a POSITA Renders Obvious Claim 5

Patent Owner argues that Petitioner “fails to provide any reasoning for a motivation to combine in this ground.” Paper 24 at 66. Patent Owner, however, only argues that Petitioner allegedly failed to demonstrate that the combination of Kobayashi and Hsieh renders obvious claim 1 and that Kobayashi in view of the knowledge of a POSITA renders obvious claim 5. Paper 24 at 63-65. Patent Owner’s argument fails for the same reasons discussed above with respect to claim 1 in Ground 4 and claim 5 in Ground 3.

Dated: November 11, 2024

Respectfully submitted,

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CERTIFICATION UNDER 37 C.F.R. § 42.24

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petitioner's Reply to Patent Owner's Response totals 4,626 words, which is less than the 5,600 allowed under 37 CFR § 42.24.

Dated: November 11, 2024

/Charles M. McMahon/

Charles M. McMahon

CERTIFICATE OF SERVICE

I hereby certify that on November 11, 2024, I caused a true and correct copy of Petitioner's Reply to Patent Owner's Response to be served on Patent Owner via email at the following addresses:

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Dated: November 11, 2024

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