

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD. and
SAMSUNG ELECTRONICS AMERICA, INC.,
Petitioner,

v.

HARBOR ISLAND DYNAMIC, LLC,
Patent Owner.

IPR2024-01404
Patent 9,147,609 B2

Before WILLIAM V. SAINDON, GREGG I. ANDERSON, and
ARTHUR M. PESLAK, *Administrative Patent Judges*.

SAINDON, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background and Summary

Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (“Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting an *inter partes* review of claims 1–18 (“the challenged claims”) of U.S. Patent No. 9,147,609 B2 (Ex. 1001, “the ’609 patent”). Harbor Island Dynamic, LLC (“Patent Owner”) filed a Preliminary Response (Paper 7, “Prelim. Resp.”).

We have authority to determine whether to institute an *inter partes* review under 35 U.S.C. § 314(b) and 37 C.F.R. § 42.4(a). The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted unless “there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” For the reasons provided below, we determine that Petitioner has demonstrated a reasonable likelihood that at least one claim of the ’609 patent is unpatentable, and we institute an *inter partes* review. 37 C.F.R. § 42.108(a).

Our findings of fact, conclusions of law, and reasoning discussed below are made for the sole purpose of determining whether the Petition meets the threshold for initiating review. This decision to institute review is not a final decision as to the patentability of any challenged claim or the construction of any claim limitation.

B. Real Parties in Interest

The parties assert that they are the sole real parties in interest. Pet. 82; Paper 5, 2 (Patent Owner’s Mandatory Notices).

C. Related Matters

The parties have identified the following pending district court case:
Harbor Island Dynamic, LLC v. Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc., Case No. 2:24-cv-00140-JRG-RSP (E.D. Tex.) (“District Court Litigation”). Pet. 82; Paper 5, 2.

D. Prior Art and Asserted Grounds

Petitioner’s grounds rely on the following prior art references:

Name	Reference	Exhibit No.
Farooq	U.S. Pat. 8,237,288 B1, iss. Aug. 7, 2012	1016
Cooney	U.S. Pat. App. Pub. 2009/027237 A1, pub. Nov. 12, 2009	1004
Chen	U.S. Pat. App. Pub. 2010/0032843 A1, pub. Feb. 11, 2010	1011
Dean	U.S. Pat. App. Pub. 2011/0057319 A1, pub. Mar. 10, 2011	1010

Petitioner asserts that the challenged claims would have been unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–6, 9–14, 17, 18	102	Cooney
1–6, 9–14, 17, 18	103	Cooney
7, 15	103	Cooney, Dean
8, 16	103	Cooney, Farooq
8, 16	103	Che, Cooney

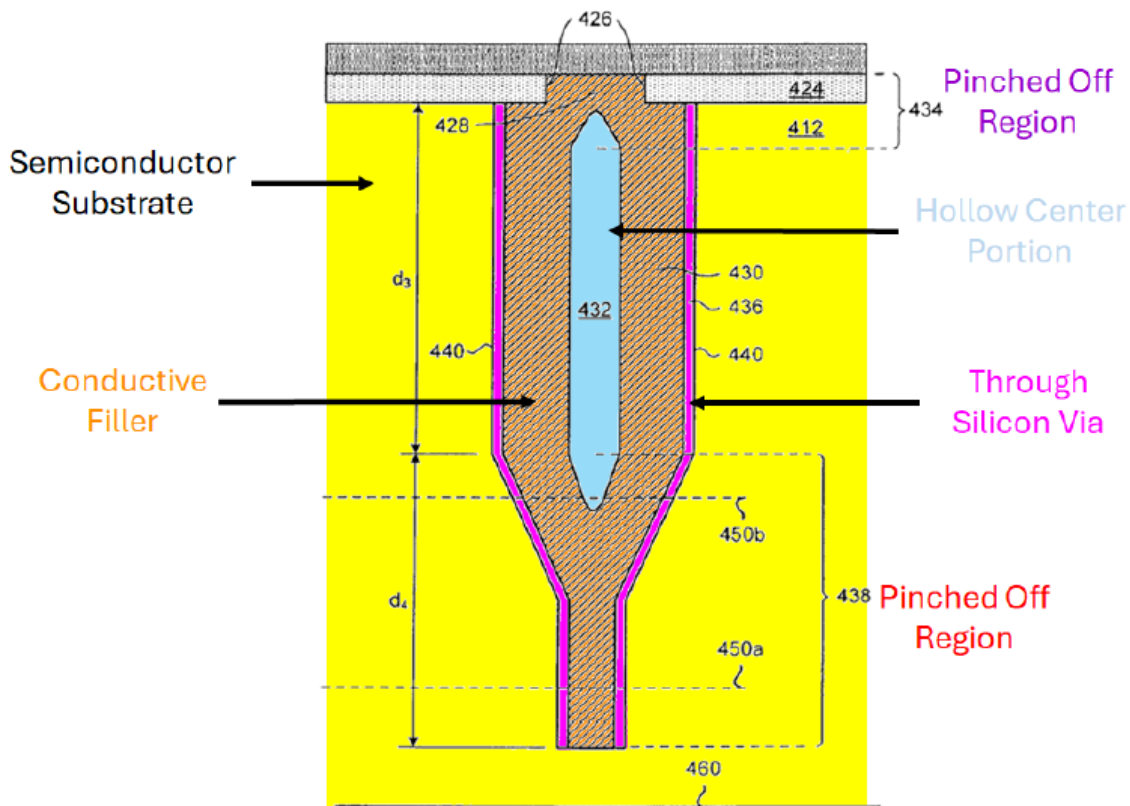
E. Overview of the ’609 Patent

The ’609 patent is directed to a semiconductor substrate that includes:
a plurality of . . . through silicon vias disposed in the substrate and extending from a top surface of the substrate to a bottom surface of the substrate. A conductive filler is disposed within each of the plurality of through silicon vias, each of the plurality of through silicon vias having a hollow center which reduces

thermal stress in the semiconductor substrate. The plurality of through silicon vias also have pinched off regions at the bottom and/or the top portions of the through silicon vias, which prevent contamination during processing of the semiconductor substrate.

Ex. 1001, code (57).

Petitioner's annotated version of Figure 4 of the '609 patent is reproduced below:



'609 patent, Fig. 4 (annotated)

Pet. 3 (annotating a copy of Ex. 1001, Fig. 4). Annotated Figure 4 of the '609 patent shows a cross-sectional view of a through-silicon via (unlabeled, walls 440 in magenta) within a semiconductor substrate (yellow). Ex. 1001, 2:9–11. Inside the via is conductive filler 430 (orange) and hollow center portion 432 (light blue). The via has pinched off region 438 and pinched off

region 434 to ensure the hollow center portion 432 is contained within conductive filler 430. *Id.* at 4:60–5:17. The lower pinched off region, 438, is formed by varying the etchant technique during manufacturing to cause a taper (identified at d_4 in Fig. 4). *Id.* at 4:21–39. In contrast, the upper pinched off region, 434, is formed by an opening formed in oxide layer 424, causing sidewalls 426 of the opening to be smaller in diameter than the width of the via. *Id.* at 5:3–17.

F. Challenged Claims

Claims 1–18 are challenged. Claims 1 and 11 are independent. At a high level, claim 1 is directed to a semiconductor substrate having a via extending from the top surface to the bottom surface of that substrate. The via contains a conductive filler, and inside that conductive filler is a hollow center. Both ends of the via are tapered. The issues raised by the parties at this time are focused on claim 1, reproduced below, and specifically on the element in claim 1 requiring “said hollow center is tapered in said pinched off region” (noted below with added emphasis):

1. A semiconductor substrate having a plurality of devices, said semiconductor substrate comprising:

a plurality of through silicon vias disposed in said substrate extending from a top surface of said substrate to a bottom surface of said substrate;

a conductive filler disposed within each of said plurality of through silicon vias, each of said plurality of through silicon vias having a hollow center to reduce thermal stress in said semiconductor substrate, said hollow center being entirely surrounded by said conductive filler to provide space for said conductive filler to expand inward;

wherein each of said plurality of through silicon vias has a pinched off region at a bottom portion to prevent contamination

during processing of said semiconductor substrate, and *wherein said hollow center is tapered in said pinched off region.*

II. DISCRETIONARY ANALYSIS

Patent Owner argues that, because of co-pending district court litigation between Patent Owner and Petitioner (noted in the Related Matters section above), we should exercise our discretion to deny institution under *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential) (“*Fintiv*”). Prelim. Resp. 21–28.

We consider the advanced state of a parallel district court action as a factor that may weigh in favor of denying a petition under 35 U.S.C. § 314(a). *See NHK Spring Co. v. Intri-Plex Techs., Inc.*, IPR2018-00752, Paper 8 at 20 (PTAB Sept. 12, 2018) (precedential). The following factors inform our assessment of “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”:

- 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 of 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.

Fintiv, IPR2020-00019, Paper 11 at 5–6. Our analysis is also guided by the Chief Administrative Patent Judge’s March 24, 2025 Memorandum, “Guidance on USPTO’s rescission of ‘Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation’” (“CAPJ Memo”).¹

A. Fintiv Factor 1

Fintiv factor 1 asks whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted. Patent Owner contends this factor supports exercising our discretion to deny institution because “[t]here is no stay of the parallel District Court Litigation and, in fact a motion for a stay by Petitioner has already been denied.” Prelim. Resp. 26–27 (citing Ex. 2002, 1). Petitioner argues that this factor is “at worst neutral.” Pet. 81.

Petitioner’s motion for a stay of the District Court Litigation was denied “as premature” because “the Patent Trial and Appeal Board has not yet acted on a petition for *inter partes* review.” Ex. 2002, 1. Although no stay of the District Court Litigation has been issued, it appears that the district court would entertain a renewed request by Petitioner for a stay after this Decision on Institution is entered. Consequently, we find that this factor is neutral.

¹ Available at https://www.uspto.gov/sites/default/files/documents/guidance_memo_on_interim_procedure_rescission_20250324.pdf

B. Fintiv Factor 2

Fintiv factor 2 considers the proximity of the court’s trial date to the Board’s projected statutory deadline for a final written decision. Patent Owner contends that this factor “strongly weighs in favor of discretionary denial.” Prelim. Resp. 24–26. Patent Owner argues that trial in the District Court Litigation “is scheduled for January 5, 2026” which is “three months before the projected statutory deadline” for a Final Written Decision in this proceeding. *Id.* at 25 (citing Ex. 2001). Petitioner argues that this factor is “at worst neutral.” Pet. 86.

The district court’s Docket Control Order, entered by the district court on August 5, 2024, sets January 5, 2026 as the date to commence jury selection in the column labelled “Original Date.” Ex. 2001, 1. The column next to “Original Date” is labelled “Amended Date” and that column is blank. *Id.* The Docket Control Order is prefaced with the statement “it is hereby **ORDERED** that the following schedule of deadlines is in effect until further order of this Court.” *Id.* The Docket Control Order also contemplates that the trial date may be continued under certain circumstances. *See id.* at 6 (“Motions for Continuance”). Based on this, it appears that the Docket Control Order at least contemplates the possibility of a continuance. Nonetheless, there remains the possibility that a trial could be concluded prior to our statutory deadline in this case.

Fintiv instructs us that “the decision to institute will likely implicate other factors” when “the court’s trial date is at or around the same time as the projected statutory deadline.” *Fintiv*, IPR2020-00019, Paper 11 at 9. Given that the originally-scheduled trial date is far away, and the final decision date in this case will be approximately four months after the

originally scheduled trial date, we find that this factor weighs slightly in favor of exercising our discretion to deny institution.

C. Fintiv Factor 3

Fintiv factor 3 asks us to consider investment in the parallel proceeding by the court and the parties. Patent Owner contends that this factor weighs heavily in favor of exercising our discretion because the district court has issued various orders, discovery is under way, and the parties exchanged infringement contentions and invalidity contentions. Prelim. Resp. 26.

Petitioner contends that this factor favors institution because it “acted diligently and almost no parallel investment has occurred.” Pet. 80. According to Petitioner, Patent Owner served infringement contentions on July 18, 2024, fact discovery does not close until August 18, 2025, expert discovery closes on September 22, 2025, claim construction efforts by the parties began on March 4, 2025, and the *Markman* hearing will not take place until July 8, 2025. *Id.* (citing Ex. 1016; Ex. 1017, 3–4).

Although the parties and district court have invested some time in the District Court Litigation, substantial work remains to be done including the completion of fact and expert discovery, claim construction briefing and decision, pretrial motions, and preparation of a joint pretrial order. *See* Ex. 2001, 1–5.

For these reasons, we find that this factor weighs in favor of not exercising our discretion to deny institution.

D. Fintiv Factor 4

Fintiv factor 4 asks us to consider the overlap of issues raised in the petition and in the parallel proceeding. After the Preliminary Response was filed, Petitioner submitted a stipulation stating that it will not pursue, in the District Court Litigation, any ground that was raised or could have reasonably been raised in this proceeding. Paper 8, 1. Petitioner’s stipulation aligns with the stipulation relied on by the Board in *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 at 18–19 (PTAB Dec. 1, 2020) (precedential).

Patent Owner argues that we should reject any “late” *Sotera* stipulation. Prelim. Resp. 28–30. The only authority cited for this argument are Board decisions concerning stipulations filed *after* a Decision on Institution was entered. *Id.* As Petitioner’s stipulation was filed prior to this Decision being entered, it is not “late” under the authority Patent Owner cites, and, thus, on this record, we decline to reject Petitioner’s stipulation. *See NXP USA, Inc. v. Impinj, Inc.*, IPR2021-01556, Paper 13 (Sept. 7, 2022) (precedential) (holding that the only appropriate time for a petitioner to offer a stipulation is prior to the Board’s decision on institution) cited in CAPJ Memo, 2 n.1.

In *Sotera Wireless*, the Board found that a stipulation such as the one proffered here by Petitioner addressed “concerns of duplicative efforts between the district court and the Board, as well as concerns of potentially conflicting decisions” and “ensures that an *inter partes* review is a ‘true alternative’ to the district court proceeding.” *Sotera*, IPR2020-01019, Paper 12 at 19. For these reasons, we find that this factor weighs “strongly in favor of not exercising discretion to deny institution.” *Id.*

E. Fintiv Factor 5

Fintiv factor 5 asks us to consider whether the petitioner and the defendant in the parallel proceeding are the same party. Patent Owner contends this factor weighs in favor of exercising our discretion to deny institution because Petitioner and Patent Owner are parties in the District Court Litigation. Prelim. Resp. 23. Petitioner argues that this factor is “at worst, neutral.” Pet. 80.

Because Petitioner is the defendant in the District Court Litigation, this factor weighs in favor of exercising our discretion to deny institution.

F. Fintiv Factor 6

Fintiv factor 6 asks us to consider other circumstances that impact the Board’s exercise of discretion, including the merits. Patent Owner contends that “Petitioner does not present a strong case on the merits, further supporting denial of institution.” Prelim. Resp. 28. Petitioner contends that the merits support institution. Pet. 80.

As discussed below, the Petition sets forth challenges that meet the reasonable likelihood standard for institution based on the present record. In addition, Petitioner has provided reasonably strong evidence in support of its position, whereas Patent Owner has only offered attorney argument that does not call into doubt any aspect of Petitioner’s case at this time. We find that this factor favors institution.

G. Fintiv Conclusion

When we evaluate the *Fintiv* factors, we take “a holistic view of whether efficiency and integrity of the system are best served by denying or instituting review.” *Fintiv*, IPR2020-00019, Paper 11 at 6. As discussed

above, factor 4 weighs strongly in favor of not exercising our discretion to deny institution and factors 3 and 6 also weigh in favor of not exercising our discretion to deny institution, while factors 2 and 5 weigh slightly in various degrees in favor of exercising our discretion to deny. After consideration of all factors, we determine that efficiency, fairness, and integrity of the system are best served by not exercising our discretion to deny institution.

III. MERITS ANALYSIS

A. Legal Standards Used in the Merits Analysis

“In an IPR, the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)); *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review).

“Under 35 U.S.C. § 102(b), a prior art reference will anticipate if it ‘disclose[s] each and every element of the claimed invention . . . arranged or combined in the same way as in the claim.’” *Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1341 (Fed. Cir. 2016) (citation omitted) (footnote omitted). The Federal Circuit went on to explain that “a reference can anticipate a claim even if it ‘d[oes] not expressly spell out’ all the limitations arranged or combined as in the claim, if a person of skill in the art, reading the reference, would ‘at once envisage’ the claimed arrangement or combination.” *Id.* (quoting *Kennametal, Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376, 1381 (Fed. Cir. 2015)).

A claim is unpatentable under 35 U.S.C. § 103 if “the differences between the subject matter sought to be patented 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.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007) (quoting 35 U.S.C. § 103 (2000)). The question of obviousness is resolved on the basis of underlying factual determinations, 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) when in evidence, objective indicia of non-obviousness. *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

Petitioner asserts:

A person of ordinary skill in the art (POSITA) at the time of the purported invention of the ’609 patent (October 7, 2011) would have had at least a master’s degree in electrical engineering or a similar field and at least two years of experience working with semiconductor systems. Additional work or research experience can substitute for less or different education, and *vice versa*.

Pet. 9–10 (citing Ex. 1003 ¶¶ 72–74). Patent Owner uses Petitioner’s proposed level of skill in the art. Prelim. Resp. 6. We use the parties’ agreed definition for purposes of this Decision because it appears consistent with the level of skill reflected in the prior art and ’609 patent.

C. Claim Construction

Under 37 C.F.R. § 42.100(b), we apply the claim construction standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed.

Cir. 2005) (en banc). That is, “the words of a claim ‘are generally given their ordinary and customary meaning,’” which is “the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention i.e., as of the effective filing date of the patent application.” *Id.* at 1312–13.

Petitioner asserts that no terms require express construction. Pet. 8. Patent Owner does not appear to make an explicit assertion regarding claim construction. We do not construe any terms at this time. *Realtime, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’”) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

*D. Asserted Obviousness over Cooney
(Claims 1–6, 9–14, 17, and 18)*

Petitioner asserts that claims 1–6, 9–14, 17, and 18 would have been obvious in view of Cooney. Pet. 10–57. Petitioner’s position can be seen in its annotated version of Figure 6 of Cooney, reproduced below:

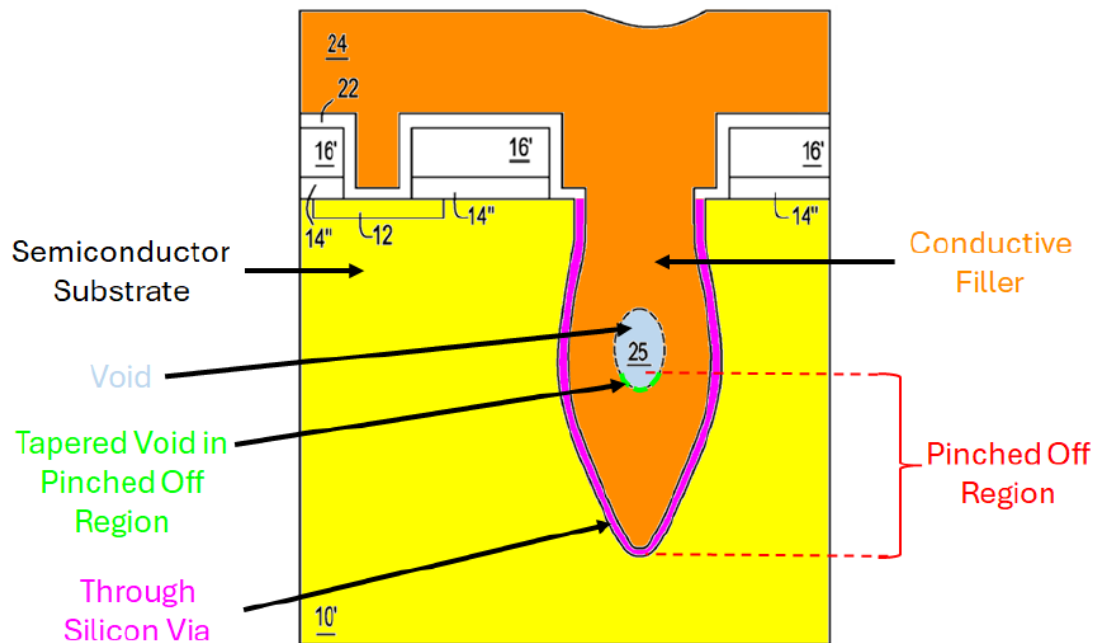


FIG. 6

Cooney, Fig. 6 (annotated).

Pet. 36 (providing an annotated version of Ex. 1004, Fig. 6). Annotated Figure 6 of Cooney depicts a cross-section at one stage in the manufacturing of a microelectronic structure, specifically a through-substrate via. Ex. 1004 ¶¶ 2, 23. Located in a semiconductor substrate (yellow), a via (the boundaries of which can be identified by liner layer 22, marked in magenta) gradually tapers outward and then back inward in a so-called “torpedo” shape. *Id.* ¶ 42; *see also id.* ¶¶ 43–46 (describing the process for creating the torpedo shape). Petitioner has identified the bottom half of the via with red bracketing as the claimed “pinched off region.” Pet. 36. Petitioner has identified conductive filler 24 (orange) as filling the torpedo-shaped via. *Id.* Cooney explains that conductive filler 24 is deposited using a chemical vapor deposition method. Ex. 1004 ¶ 59. Petitioner identifies oval-shaped

void 25 (light blue) within conductive filler 24 as the claimed “hollow center.” Pet. 36. According to Cooney, the void is constrained to the wider region of the via due to its torpedo shape. Ex. 1004 ¶¶ 60, 66. Petitioner has identified in a dashed green line on its annotated Figure 6 the bottom of oval-shaped void 25 as corresponding to the claimed “hollow center taper in said pinched off region.” Pet. 36.

Patent Owner challenges whether Cooney discloses that the void in Cooney “is tapered in said pinched off region.” Prelim. Resp. 7–20. First, Patent Owner argues that Petitioner has not demonstrated that the bottom of the oval in Cooney is in a “pinched off region” as claimed. *Id.* at 8–12. Specifically, Patent Owner argues that Petitioner is impermissibly relying on the precision of drawings. *Id.* at 9–12. Second, Patent Owner argues that, even if the oval is in a pinched-off region, Petitioner has not demonstrated that the bottom of an oval constitutes a “taper” as claimed. *Id.* 12–20. Specifically, Patent Owner characterizes the bottom of the oval as “rounded,” not “tapered.” *Id.* at 15–16. We address these two arguments in turn.

1. Pinched-Off Region

The first issue is whether it would have been obvious that the bottom of oval-shaped void 25 in Cooney is in a “pinched off region” as claimed. Petitioner explains that the void is formed as a consequence of the chemical vapor deposition process of the conductive filler, and specifically, that the shape of the void will reflect the shape of the walls of the via. Pet. 35 (citing Ex. 1005 ¶ 59; Ex. 1002 ¶¶ 167–169). Thus, according to Petitioner, the void’s shape will be similar to the torpedo shape of the via—tapering out on the top half and tapering in on the bottom half. *Id.* In our view, Petitioner

provides a technical reason, supported by testimony, why the bottom of the void will be in the identified pinched-off region of the torpedo-shaped via in Cooney. *See id.* at 35–38. Patent Owner’s arguments do not address Petitioner’s technical analysis and instead focus on the precision of Cooney’s drawings. *See* Prelim. Resp. 8–12. Given Petitioner’s technical analysis, however, the precision of Cooney’s drawings is not determinative. Further, Patent Owner’s argument that “void 25 is localized to [the middle portion of the via] and sealed off from the tapered . . . section” also misses the fact that the middle portion of the via still has the torpedo shape (it is the inflection point of where it goes from wider to smaller). *See id.* at 10–11. With respect to the void in Cooney being in a “pinched off region,” we determine that Petitioner has made a sufficient showing on this preliminary record.

2. *Tapered*

The second issue is whether it would have been obvious that the bottom of oval-shaped void 25 in Cooney is “tapered” as claimed. Petitioner asserts that because conductive layer 24 is formed by conformal deposition, void 25 would have a tapered bottom portion to match the shape of the bottom portion of the tapered via. Pet. 36–36 (citing Ex. 1002 ¶¶ 169–170). Patent Owner argues that an oval shape is not “tapered,” presumably because it is rounded, but does not provide a claim construction that justifies reading the claim this way. *See* Prelim. Resp. 12–16. In contrast, Cooney explains why the via would be formed in a tapered shape (Ex. 1004 ¶¶ 43–48), and Petitioner explains why it would have been obvious that the conformal deposition process of conductive filler 24 will result in a void that matches the shape of the space it is within (Pet. 35–38 (citing Ex. 1004 ¶ 59;

Ex. 1002 ¶¶ 168–172)). With respect to the void in Cooney having a taper, we determine that Petitioner has made a sufficient showing on this preliminary record.

3. *Conclusion for Claim 1*

Reviewing the Petition, the Preliminary Response, and the evidence cited therein, we determine that Petitioner has established a reasonable likelihood of success in showing that the subject matter of claim 1 would have been obvious.

E. Remaining Grounds and Claims

With respect to the remaining grounds and claims, the parties do not raise any materially different issues beyond those we have addressed above. *See* Prelim. Resp. 20–21 (relying on prior arguments).

IV. CONCLUSION

For the reasons given above, we determine that Petitioner has established a reasonable likelihood of success in showing that claim 1 of the '609 patent would have been obvious in view of Cooney. Accordingly, we institute *inter partes* review of all claims and grounds raised in the Petition. 37 C.F.R. § 42.108(a).

V. ORDER

In consideration of the foregoing, it is hereby

ORDERED that the Petition requesting *inter partes* review of claims 1–18 of the '609 patent is *granted*; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(a), the *inter partes* review of the '609 patent commences on the entry date of this

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Decision, and pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial.

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