

PUBLIC VERSION

[REDACTED]

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MONOLITHIC POWER SYSTEMS, INC.,
Petitioner,

v.

GREENTHREAD, LLC,
Patent Owner.

IPR2024-00551
Patent 10,734,481 B2

Before GRACE KARAFFA OBERMANN, JON B. TORNQUIST, and
MONICA S. ULLAGADDI, *Administrative Patent Judges*.

ULLAGADDI, *Administrative Patent Judge*.

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

I. INTRODUCTION

Monolithic Power Systems, Inc. (“Petitioner” or “MPS”) filed a Petition (Paper 1, “Pet.”) requesting *inter partes* review of claims 1–9, 13, 15, 17, 20, 22–27, 31, 32, and 34 (“the challenged claims”) of U.S. Patent No. 10,734,481 B2 (Ex. 1001, “the ’481 patent”), accompanied by the supporting Declaration of Dr. Stephen Campbell (Ex. 1003). Greenthread, LLC (“Patent Owner”) filed a Preliminary Response. Paper 12 (“Prelim. Resp.”).

With our authorization, Petitioner filed a Preliminary Reply (Paper 17, “Prelim. Reply”), and Patent Owner filed a Preliminary Sur-reply (Paper 18, “Prelim. Sur-reply”).

We have authority to determine whether to institute an *inter partes* review. *See* 35 U.S.C. § 314 (2018); 37 C.F.R. § 42.4(a) (2023). 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 the Director determines . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” Having considered the parties’ arguments and the evidence of record, we determine that, for the reasons discussed herein, Petitioner demonstrates a reasonable likelihood that it would prevail with respect to at least one of the challenged claims. We thus institute an *inter partes* review on all challenged claims on all asserted grounds. *See SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1354, 1359–60 (2018).

II. BACKGROUND

A. *Real Parties in Interest*

Petitioner identifies Monolithic Power Systems, Inc. as the real party in interest. Pet. 1. Patent Owner identifies Greenthread, LLC as the real party in interest. Paper 3, 1.

B. *Related Matters*

The parties indicate that the '481 patent is involved in the following district court cases: *Greenthread, LLC v. Cirrus Logic, Inc.*, Case No. 1:23-cv-00369 (W.D. Tex.); *Greenthread, LLC v. OmniVision Technologies, Inc.*, Case No. 2:23-cv-00212 (E.D. Tex.); *Greenthread, LLC v. OSRAM GmbH et al.*, Case No. 2:23-cv-00179 (E.D. Tex.); *Greenthread, LLC v Texas Instruments Incorporated*, Case No. 2:23-cv-00157 (E.D. Tex.); and *Greenthread, LLC v. Monolithic Power Systems, Inc.*, Case No. 1:23-cv-00579 (D. Del.). Pet. 1; Paper 3, 1–2.

The parties indicate that the '481 patent is involved in the following, pending proceedings: *Cirrus Logic, Inc. et al v. Greenthread, LLC*, IPR2024-00001 (PTAB Oct. 12, 2023); and *Semiconductor Components Industries, LLC d/b/a ON Semiconductor v. Greenthread, LLC* IPR2023-00264 (PTAB Dec. 11, 2023). Pet. 2; Paper 3, 2.

C. *The '481 Patent*

The '481 patent, titled “Semiconductor Devices with Graded Dopant Regions,” issued on August 4, 2020. Ex. 1001, codes (45), (54).¹ The '481

¹ The '481 patent issued from application No. 16/717,950, filed on Dec. 17, 2019, and is a continuation of application No. 15/590,282, filed on May 9, 2017, now U.S. Patent No. 10,510,842, which is a continuation of application No. 14/931,636, filed on Nov. 3, 2015, now U.S. Patent No. 9,647,070, which is a continuation of application No. 14/515,584, filed on Oct. 16, 2014, now U.S. Patent No. 9,190,502, which is a continuation of

patent “relates to all semiconductor devices and systems.” *Id.* at 1:36–37. According to the ’481 patent, in bipolar junction transistors, “[e]fforts have been made in graded base transistors to create an aiding drift field to enhance the diffusing minority carrier’s speed from emitter to collector.” *Id.* at 1:59–61. This improvement has not been implemented in “most semiconductor devices, including various power MOSFETs . . . [and] IGBT[s],” which “still use a uniformly doped ‘drift epitaxial’ region in the base.” *Id.* at 1:61–66. The invention of the ’481 patent implements graded dopant concentration in these devices, which causes “[t]wo important performance enhancements.” *Id.* at 3:42–43. These include sweeping electrons “from source to drain rapidly” and simultaneously causing holes to “be recombined closer to the n⁺ buffer layer,” which “can improve t_{ON} and t_{OFF} in the same device.” *Id.* at 3:43–47.

D. Illustrative Claim

Of the challenged claims, claims 1 and 20 are independent. Claim 1 is illustrative and reproduced below.

1. [preamble] A semiconductor device, comprising:
 - [1.1] a substrate of a first doping type at a first doping level having first and second surfaces;
 - [1.2] a first active region disposed adjacent the first surface of the substrate with a second doping type opposite in conductivity to the first doping type and within which transistors can be formed;

application No. 13/854,319, filed on Apr. 1, 2013, now abandoned, which is a continuation of application No. 11/622,496, filed on Jan. 12, 2007, now U.S. Patent No. 8,421,195 (“the ’195 patent”), which is a division of application No. 10/934,915, filed on Sep. 3, 2004, now abandoned. Ex. 1001, codes (21), (22), (60).

[1.3] a second active region separate from the first active region disposed adjacent to the first active region and within which transistors can be formed;

[1.4] transistors formed in at least one of the first active region or second active region;

[1.5] at least a portion of at least one of the first and second active regions having at least one graded dopant concentration to aid carrier movement from the first surface to the second surface of the substrate; and

[1.6] at least one well region adjacent to the first or second active region containing at least one graded dopant region, the graded dopant region to aid carrier movement from the first surface to the second surface of the substrate.

Ex. 1001, 4:50–5:3 (bracketed designations added by Petitioner (*see* Pet. 8–24, App. A, 1)).

E. Asserted Grounds

Petitioner presents the following challenges. Pet. 9.

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–9, 13, 15, 17, 20, 22–27, 31, 32, 34	103(a) ²	Kawagoe ³
1–9, 13, 15, 17, 20, 22–27, 31, 32, 34	103(a)	Onoda ⁴

² The Leahy-Smith America Invents Act, Pub. L. No. 112–29, 125 Stat. 284 (2011) (“AIA”), included revisions to 35 U.S.C. §§ 102 and 103 that became effective after the effective filing date of the challenged claims. *See* Ex. 1001, codes (22), (60). Therefore, we apply the pre-AIA versions of 35 U.S.C. §§ 102 and 103(a).

³ U.S. Patent No. 6,043,114, filed September 22, 1997, issued March 28, 2000, to Kawagoe et al. (Ex. 1007, “Kawagoe”).

⁴ Japanese Unexamined Patent Application Publication No. H8-279598, published Oct. 22, 1996 (Ex. 1043, “Onoda”). A certified translation, to which we cite, is provided. Ex. 1042.

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–9, 13, 15, 17, 20, 22–27, 31, 32, 34	103(a)	Onoda, Nishizawa ⁵

Petitioner relies on the declaration of Dr. Stephen Campbell. Ex. 1003.

III. ANALYSIS

A. Legal Standards

A patent claim is unpatentable under 35 U.S.C. § 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). 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 ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness.⁶ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Discretionary Denial Under 35 U.S.C. § 314(a)

Patent Owner argues that the Board should deny institution under 35 U.S.C. § 314(a) based on the factors set forth in *General Plastic Co., Ltd. v. Canon Kabushiki Kaisha*, Case IPR2016-01357, Paper 19 (PTAB Sept. 6, 2017) (precedential as to § II.B.4.i) (“*General Plastic*”). Prelim. Resp. 13–20.

⁵ U.S. Patent No. 5,384,476, filed June 9, 1987 and issued January 24, 1995, to Nishizawa et al. (Ex. 1046, “Nishizawa”).

⁶ Patent Owner presents no objective evidence of nonobviousness at this stage of the proceeding.

Patent Owner argues that Petitioner “MPS may not wait until related entities have initiated IPR proceedings to file its own IPR petition of the same patent claims with the advantage derived from having already seen [Patent Owner] Greenthread’s arguments.” Prelim. Resp. 13 (citing *General Plastic*, Paper 19 at 11). Patent Owner supports its position by asserting that “MPS has filed [a] modified version of the IPRs [of] MPS’s co-defendants” and that Petitioner “MPS . . . is coordinating invalidity positions with these entities, because MPS, [Cirrus Logic Inc.] CL, [Omnivision Technologies Inc.] OV, and another defendant/petitioner, Texas Instruments Inc. (‘TI’) have filed virtually identical invalidity contentions.” *Id.* at 14.

More particularly, Patent Owner contends Petitioner “MPS is a party to a Joint Defense Group (‘JDG’) in the current district court litigations in Delaware and Texas that shared and copied the same invalidity contentions.” *Id.* at 16. Accordingly, Patent Owner contends that Petitioner “MPS is so closely aligned with the other members of the JDG, which previously filed IPR petitions of the [’481] Patent, that the Board should consider them the same entity for the purposes of a *General Plastic* analysis.” *Id.* at 18 (citing *Valve Corp. v. Elec. Scripting Prods., Inc.*, IPR2019-00062, Paper 11 at 2 (PTAB Apr. 2, 2019) (precedential) (“Valve”)). Patent Owner further argues that, “not only are the members of the JDG accused of infringing the same patent in district court cases; they are actively coordinating their defense and sharing purportedly highly confidential information with competitors.” *Id.*

Petitioner responds that it “has not previously filed a petition challenging the ’481 patent,” and that it “does not have a ‘significant relationship’ with any entities that have,” in part because “MPS and the other component manufacturer petitioners are *competitors* with *different accused products* sued in different district court proceedings.” Prelim.

Reply 1 (emphasis added). Petitioner also argues that it “did not contribute to any other petitioner’s IPR filings,” “no other petitioner contributed to MPS on the [present] Petition,” there is “no licensing relationship” with any member of the Joint Defense Group, and that Petitioner “did not copy the prior petitions or coordinate with the other petitioners on the IPRs.” *Id.* at 1–3 (emphasis omitted). Petitioner notes that “the majority of the grounds [it] asserted in its Petition are based on entirely new prior art references not present in any of the other petitions.” *Id.* at 3 (citing Pet. 9, 83 (setting forth challenges based on Onoda and Nishizawa)). Petitioner also notes that Patent Owner “filed all its *preliminary responses under seal* outside of [Petitioner’s] access, so any alleged benefit gained from successive petitions is wholly illusory.” *Id.* at 4 (emphasis added).

The Director’s decisions in *Ford Motor Co. v. Neo Wireless LLC*, IPR2023-00763, Paper 28 (Vidal Mar. 22, 2024) (“*Ford*”) and *Videndum Prod. Sols., Inc v. Rotolight Ltd.*, IPR2023-01218, Paper 12 (Vidal Apr. 19, 2024) (“*Videndum*”) clarified the Board’s application of the frameworks set forth in *General Plastic* and *Valve*. In *Ford*, the Director explained that “[u]nder existing Office policy and precedent, the Board does not recognize a ‘significant relationship’ between parties [i.e., serial petitioners] having *different accused products* that merely engage in court-ordered pretrial coordination.” *Ford*, Paper 28 at 3 (emphasis added). In *Videndum*, the Director further explained that where “the first and second petitioners are neither the same party, nor possess a significant relationship under *Valve*, *General Plastic* factor one necessarily outweighs the other *General Plastic* factors.” *Videndum*, Paper 12 at 6–7. Thus, per *Ford* and *Videndum*, we will not discretionarily deny a later petition in view of an earlier petition where

the earlier and later petitioners are neither the same party nor have a “significant relationship.”

Based on the current record, we find that no significant relationship exists between Petitioner and any other member of the Joint Defense Group to justify application of the *Valve* framework. In *Valve*, both petitioners were accused of infringing the same patent based upon the same product for which they had an ongoing licensing relationship. *Valve*, Paper 11 at 9–10. Notwithstanding Patent Owner’s assertions about the voluntarily “shared and copied . . . invalidity contentions” (*see* Prelim. Resp. 16) among Petitioner and co-defendants in Texas and Delaware district court proceedings, the relevant facts and circumstances here are more akin to those in *Ford*.

In the present proceeding, there is no evidence of any entity in the Joint Defense Group having a licensing relationship with Petitioner. *See, e.g.*, Prelim. Reply 5–7. And any relationship between Petitioner and the other petitioners is premised on the allegation that they each infringe the same patent, but with different allegedly infringing products and in different district court proceedings. *Id.* at 2.⁷ We note that Patent Owner does not dispute Petitioner’s assertion that Petitioner and other members of the Joint

⁷ *See Greenthread, LLC v. Cirrus Logic, Inc.*, No. 1-23-cv-00369 (W.D. Tex. Mar. 31, 2023) (accusing Cirrus Logic CLI1793B1 power management integrated circuit); *Greenthread, LLC v. Texas Instruments, Inc.*, No. 2-23-cv-00157 (E.D. Tex. April 6, 2023) (accusing Texas Instruments BQ25123); *Greenthread, LLC v. ON Semiconductor Corporation et al.*, No. 1-23-cv-00443 (D. Del. Apr. 21, 2023) (accusing ON Semiconductor AR0820AT); *Greenthread, LLC v. OmniVision Technologies, Inc.*, No. 2-23-cv-00212 (E.D. Tex. May 10, 2023) (accusing OmniVision OV24A1Q); *Greenthread, LLC v. Monolithic Power Systems, Inc.*, No. 1-23-cv-00579 (D. Del. May 26, 2023) (accusing MPS MP86905 monolithic half-bridge).

Defense Group are competitors. *See generally* Prelim. Sur-reply. None of the defendants in Patent Owner’s lawsuits were sued on the same accused product. Prelim. Reply 2; *supra* n.7. Moreover, as was the case with the serial petitioners in *Ford*, there is no evidence of record in the present proceeding that Petitioner has “had any interactions or agreements regarding . . . [the] accused products” that might rise to the level of “relevant or extenuating facts or circumstances” indicative of a significant relationship. *Ford*, Paper 28 at 10–11; *cf. Valve*, Paper 11 at 10 (“Valve represented that ‘HTC’s [accused] VIVE devices incorporate certain Valve technologies under a technology license from Valve”).

We do not find the voluntary coordination described above sufficient to find a “significant relationship” between the parties, however, especially where the parties are not co-defendants in the same proceeding, are competitors, and are alleged to infringe different products. *See* Prelim. Reply 3 (citing *Ford*, at 10 (holding that jointly filed invalidity contentions did not create a significant relationship); *Qualcomm Inc. v. Monterey Research*, IPR2020-01493, Paper 11 at 15–16 (PTAB Mar. 8, 2021); *Sony Mobile Commc’ns. AB v. Ancora Tech., Inc.*, IPR2021-00663, Paper 17 at 10 (PTAB June 10, 2021) (“A common desire to challenge the validity of the asserted patent without more is insufficient to establish that Petitioner Sony has a significant relationship with the other prior petitioners.”)). We further agree with Petitioner that Patent Owner does not point us to any authority to the contrary. *See, e.g.*, Prelim. Reply 3. Thus, we disagree with Patent Owner’s argument that “[t]he determining factor is not the accused product, but rather, the same claims of the same patent under challenge.” Prelim. Sur-reply 3.

For the foregoing reasons, we determine that Petitioner has neither previously challenged the '481 patent, nor does the record sufficiently support a finding that Petitioner, under the framework set forth in *Valve*, has or had a significant relationship with any petitioner that has challenged the '481 patent. In view of this determination, *General Plastic* factor one necessarily outweighs the other *General Plastic* factors. Accordingly, we do not discretionarily deny the present Petition.

C. Timeliness of Petition Under 35 U.S.C. § 315(b)

Patent Owner argues that the Petition should be dismissed because it is untimely. Prelim. Resp. 20. Specifically, Patent Owner argues that Petitioner is in privity with Intel Corp. (“Intel”) and [REDACTED] [REDACTED]⁸—Patent Owner refers to Intel and [REDACTED] collectively as “Licensees”—who Patent Owner asserts are time-barred under 35 U.S.C. § 315(b) and licensed under Greenthread patents, including the '481 patent. *Id.* at 22, 24, 28.

1. Legal Standard

Although Petitioner is a party to a lawsuit involving the '481 patent (*supra* § II.B), Patent Owner does not assert the Petition is time-barred based on this lawsuit—presumably because the Petition was filed within a year of service of the complaint involving the '481 patent against Petitioner. *Compare* Pet. 1 (indicating related litigation commenced May 26, 2023) *with*, Paper 5, 1 (according a filing date of March 18, 2024 to the present Petition). Instead, Patent Owner asserts the Petition is time-barred because

⁸ Although the infringement complaint filed by Greenthread against [REDACTED] indicates [REDACTED], it also lists several other [REDACTED]. Patent Owner should clarify exactly which entities it is referring to when it refers to [REDACTED]. *See generally* Prelim. Resp.

Petitioner is allegedly in privity with Intel and [REDACTED] and, thus, is time-barred based on the earlier-served complaints on those entities.

“A person who is not a party to a suit generally has not had a ‘full and fair opportunity to litigate’ the claims and issues settled in that suit.” *Taylor v. Sturgell*, 553 U.S. 880, 892 (2008). Thus, in general, Petitioner should not be precluded from addressing the unpatentability of a patent based on the filing of previous lawsuits involving Intel or [REDACTED]. *See id.* (explaining that, in general, one is not bound by a judgment “in which he is not designated as a party or to which he has not been made a party by service of process”); *WesternGeco LLC v. ION Geophysical Corp.*, 889 F.3d 1308, 1319 (Fed. Cir. 2018) (noting the “general rule against nonparty preclusion”). This rule is deeply rooted in the “historic tradition that everyone should have his own day in court.” *Taylor*, 553 U.S. at 892–93 (quoting *Richards v. Jefferson County*, 517 U.S. 793, 798 (1996)).

An exception to this deeply-rooted rule exists for parties that are in privity with a defendant in an earlier litigation. *See WesternGeco*, 889 F.3d at 1319 (noting that “the standards for the privity inquiry must be grounded in due process”). The Supreme Court in *Taylor* identified considerations where nonparty preclusion would be justified, including:

- (1) an agreement to be bound; (2) pre-existing substantive legal relationships between the person to be bound and a party to the judgment (e.g., “preceding and succeeding owners of property”); (3) adequate representation by someone with the same interests who was a party (e.g., “class actions” and “suits brought by trustees, guardians, and other fiduciaries”); (4) assumption of control over the litigation in which the judgment was rendered; (5) where the nonparty to an earlier litigation acts as a proxy for the named party to relitigate the same issues; and (6) a special statutory scheme expressly foreclosing successive litigation by nonlitigants.

Id. (citing *Taylor*, 553 U.S. at 894–95).

As this list of considerations indicates, “the mere existence of some relationship between a petitioner and another entity is not sufficient” to place that petitioner in privity with that entity. *Google LLC v. DDC Technology, LLC*, IPR2023-00707, Paper 27 at 37 (PTAB Oct. 25, 2023). Instead, “that relationship must be related to [an earlier] lawsuit and be sufficiently close that it can be fairly said the petitioner had a full and fair opportunity to litigate the validity of the patent in that lawsuit,” or the evidence must demonstrate “that petitioner is simply serving as a proxy to allow another party to litigate the patent validity question that the other party raised in an earlier filed litigation.” *Id.*; *WesternGeco*, 889 F.3d at 1319; *see also Ventex Co. v. Columbia Sportswear North America, Inc.*, IPR2017-00651, Paper 148, at 10, 12 (PTAB Jan. 24, 2019) (precedential) (finding privity where the two parties “had a specially structured, preexisting, and well-established business relationship with one another, including indemnification and exclusivity arrangements”).

A petitioner’s “initial identification of the real parties in interest [and privies] should be accepted unless and until disputed by a patent owner.” *Worlds Inc. v. Bungie, Inc.*, 903 F.3d 1237, 1244 (Fed. Cir. 2018). In order to raise such a dispute, “a patent owner must produce *some* evidence that tends to show that a particular [time-barred] third party should be named a [privity].” *Id.* The amount of evidence a patent owner must produce does not rise to the level of that required to overcome a burden of production. *Id.* at 1244 n.8. One potential formulation of the amount of evidence required is “evidence that ‘reasonably brings into question the accuracy of a petitioner’s’” assertion that it is not time-barred. *Id.* (quoting *Atlanta Gas Light v. Bennett Regulator Guards, Inc.*, IPR2013-00453, Paper 88 (PTAB

Jan. 6, 2015) (addressing the amount of evidence required from a patent owner to question a petitioner’s identification of the real parties-in-interest)). Although the “burden remains with the petitioner to establish” the timeliness of its petition, it need not respond until the patent owner reasonably brings into question the accuracy of its assertion that it is not time-barred. *Id.* at 1242.

2. *The Effect of the Earlier Suit Against [REDACTED] on the Timeliness of the Present Petition*

Patent Owner alleges that the non-parties Intel and [REDACTED] are time-barred under § 315(b) and that Petitioner likewise is time-barred based on an alleged privity relationship with one or both entities. Prelim. Resp. 20–39.

Patent Owner argues that because [REDACTED] [REDACTED] were served with an infringement complaint early enough to create a time bar, and because [REDACTED] was a real party-in-interest of [REDACTED] in that infringement case, [REDACTED] is time-barred under § 315(b). Prelim. Resp. 18–19 (arguing that [REDACTED] is time-barred because it was a real party-in-interest to the [REDACTED] litigation). We are presented with no authority, however, for extending Section 315(b)’s time bar alleged to bar [REDACTED] as a real party in interest to [REDACTED] in the [REDACTED] litigation to further bar Petitioner in this proceeding as a conjectured privity of Petitioner.

We note that [REDACTED] was served with a complaint on January 23, 2023, which is more than one year before the filing of the Petition on March 18, 2024. *Compare* Pet. 92, *with* Ex. 2009 (cited at Prelim. Resp. 21). Accordingly, the service of an infringement complaint on [REDACTED] could render [REDACTED] time-barred under § 315(b) if Petitioner and [REDACTED] are in privity. In the next section, we address Patent Owner’s argument that Intel and [REDACTED] are privies of Petitioner.

3. Licensees as Alleged Privies

In the subsections below, we address Patent Owner's arguments that Licensees are privies of Petitioner under § 315(b).

a) Agency

Patent Owner argues that Petitioner acts as the Licensees' "agent" by making accused products on their behalf under the "have made" clause of the license. Prelim. Resp. 35–37. We disagree.

First, Patent Owner's agency argument is not based on the applicable legal standard. For purposes of privity under § 315(b), the relevant question is whether Petitioner is acting as an agent for Intel or [REDACTED] in filing a petition for *inter partes* review. *See Taylor*, 553 U.S. at 895 ("preclusion is appropriate when a nonparty later brings suit as an agent for a party who is bound by a judgment"). As the Federal Circuit explains, the rationale behind § 315(b)'s time bar is "to prevent successive challenges to a patent by those who previously have had the opportunity to make such challenges in prior litigation." *WesternGeco*, 889 F.3d at 1319. Here, Patent Owner does not assert that Petitioner is acting as an agent for Intel or [REDACTED] in this proceeding. Any such assertion would be appropriate only based on evidence that any of these entities is controlling Petitioner's conduct in the proceeding. *See Taylor*, 553 U.S. at 906 (cautioning that "preclusion is appropriate only if the putative agent's conduct of the suit is subject to the control of the party who is bound by the prior adjudication"). No such evidence is in this record.

Patent Owner argues that to be in privity with the Licensees, what matters is whether prior action concerned a matter within the agency. Prelim. Resp. 35 (citing *Herrion v. Children's Hosp. Nat. Med. Ctr.*, 786 F. Supp. 2d 359 (D.D.C.), *aff'd*, 448 F. App'x 71 (D.C. Cir. 2011)); *see id.* at 35–36

(citing *John Street Leasehold, LLC v. Cap. Mgmt. Res., L.P.*, 283 F.3d 73 (2d Cir. 2002); *Fiumara v. Fireman's Fund Ins. Companies*, 746 F.2d 87 (1st Cir. 1984)). This conclusion, however, would significantly expand the analysis set forth in *Taylor*, which noted that preclusion is only appropriate if the putative agent's conduct "is subject to the control of the party who is bound by the prior adjudication." *Taylor*, 553 U.S. at 906 (explaining that "courts should be cautious about finding preclusion" on the basis of agency). Moreover, the privity inquiry must take into account the rationale behind the preclusion provision in § 315(b), which "is to prevent successive challenges to a patent by those who previously have had the opportunity to make such challenges in prior litigation." *WesternGeco*, 889 F.3d at 1319. Patent Owner's broad interpretation would be inconsistent with this purpose.

Even if Patent Owner's argument that a general agency relationship is sufficient to demonstrate privity for purposes of nonparty preclusion were on solid legal footing, it lacks factual support in the record. An "essential element[] of agency" is "the principal's 'right to direct or control the agent's actions.'" *In re Google LLC*, 949 F.3d 1338, 1345 (Fed. Cir. 2020) (quoting *Meyer v. Holley*, 537 U.S. 280, 286 (2003)). Patent Owner does not argue in the Preliminary Response that Intel or [REDACTED] has or had such a right with respect to Petitioner, or vice versa, much less direct us to any evidence that would tend to prove the existence of such a right. *See generally* Prelim. Resp.

b) Preceding and Succeeding Owners of Property

Patent Owner argues that Petitioner and Licensees are "preceding and succeeding owners" of "licensed and/or infringing products that Petitioner makes and supplies to Licensees." Prelim. Resp. 32 (citing *Taylor*, 553 U.S. at 894). It is true that entities who are "preceding and succeeding owners of

property” can be in privity with one another. *Taylor*, 553 U.S. at 894. This rule, however, is based on property law and “is extended or denied in an effort to protect conflicting property interests rather than an effort to implement concepts of participation or representation.” 18A C. Wright, A. Miller, & E. Cooper, *Federal Practice and Procedure* § 4448 (3d. ed. 2023); *see also id.* at § 4462 (“Successive Property Relationships”) (“There is no independent reason to treat the defeated litigant as the representative of his transferee. Preclusion is limited to the property involved in the judgment.”). As noted above, our relevant analysis is based on the relationships between the parties with respect to the prior proceedings or the Petition (e.g., participation or representation), not on property interests. *See WesternGeco*, 889 F.3d at 1319 (noting that the privity requirement is used “to prevent successive challenges to a patent by those who previously have had the opportunity to make such challenges in prior litigation”).

Moreover, the rule related to preceding and succeeding owners of property does not extend to the point where all manufacturers of allegedly infringing goods are in privity with the customers who buy those goods. *See, e.g., id.* at 1319–22 (the parties “had a contractual and fairly standard customer-manufacturer relationship regarding the accused product,” which “does not necessarily suggest that the relationship is sufficiently close that both” parties should be considered to be in privity); *Wi-Fi One, LLC v. Broadcom Corp.*, 887 F.3d 1329, 1340–41 (Fed. Cir. 2018) (same); *Samsung Electronics Co. v. Netlist Inc.*, IPR2022-00615, Paper 64 at 22–26 (PTAB June 30, 2023) (same).

Patent Owner’s evidence that Petitioner’s products are components of Licensees’ products (Prelim. Resp. 24) does not come close to suggesting that “it can be fairly said that the petitioner had a full and fair opportunity to

litigate the validity of the patent” in the prior lawsuit, or that or that petitioner is serving as a proxy to allow any Licensee to again challenge the patent. *WesternGeco*, 889 F.3d at 1319. Thus, Patent Owner does not present evidence that lends support to a finding that Petitioner’s and Licensees’ status as preceding and succeeding owners of allegedly infringing products renders them privies for purposes of § 315(b).

c) Beneficiaries of License Agreement

Patent Owner argues that Petitioner and Licensees are privies because Petitioner is a “beneficiary” of Patent Owner’s licenses to [REDACTED] and Intel, which Patent Owner asserts are “directly related to” the accused products. Prelim. Resp. 33 (citing *Ventex*, IPR2017-00651, Paper 148, 12). We disagree. Unlike the agreements in *Ventex*, Patent Owner’s licenses to Licensees are not evidence of a privity relationship between Petitioner and Licensees because Petitioner is not a party to the license agreements. Nor is there any argument that Petitioner is a third-party beneficiary of the licenses.

d) Patent Exhaustion

Patent Owner argues that the doctrine of patent exhaustion gives rise to privity because “after Petitioner sells products under the license, any downstream user of the article sold would have an exhaustion defense against [Patent Owner].” Prelim. Resp. 34. According to Patent Owner, “Petitioner is effectively providing rights to third-parties under the license and, therefore, is in privity with Licensees.” *Id.* at 35. We disagree. It is true that downstream purchasers and users of Licensees’ products that incorporate products made by Petitioner may have a license (or exhaustion) defense against any claim of infringement by Patent Owner. The relevant question, however, is ultimately whether the relationship between Petitioner and the Licensees is sufficiently close to justify denying Petitioner its day in

court. *See Taylor*, 553 U.S. at 892. Patent Owner does not sufficiently explain why a license defense supports such a privity relationship between Petitioner and Licensees.

e) Conclusion as to Timeliness of the Petition

As noted above, privity concerns “whether the petitioner and the prior litigant’s relationship—as it relates to the [earlier] lawsuit—is sufficiently close that it can be fairly said that the petitioner had a full and fair opportunity to litigate the validity of the patent in that lawsuit,” or “whether the petitioner is simply serving as a proxy to allow another party to litigate the patent validity question that the other party raised in an earlier filed litigation.” *WesternGeco*, 889 F.3d at 1319. A petitioner’s “initial identification of the real parties in interest [and privies] should be accepted unless and until disputed by a patent owner.” *Worlds*, 903 F.3d at 1244. In order to raise such a dispute, “a patent owner must produce *some* evidence that tends to show that a particular [time-barred] third party should be named a [privity].” *Id.* Here, Patent Owner argues that it has produced such evidence in several respects, but, on the present record, none of the evidence in question tends to show that any time-barred Licensee is a privy of Petitioner for purposes of § 315(b). As such, we find the evidence of record does not tend to suggest that Petitioner is time-barred under 35 U.S.C. § 315(b), or call into question Petitioner’s assertion that the Petition is timely-filed.

D. Level of Ordinary Skill in the Art

In determining the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995)

(citing *Custom Accessories, Inc. v. Jeffrey–Allan Indus., Inc.*, 807 F.2d 955, 962 (Fed. Cir. 1986)).

According to Petitioner,

[a] person of ordinary skill in the art (“POSITA”) for the ’481 Patent would have had a Bachelor’s degree in electrical engineering, material science, applied physics, or a related field, and four years of experience in semiconductor design and manufacturing or equivalent work experience. Additional education might compensate for a deficiency in experience, and vice-versa.

Pet. 9 (citing Ex. 1003 ¶ 18).

Patent Owner does not dispute Petition’s definition of level of ordinary skill. *See generally* Prelim. Resp.

For the purposes of this Decision, we adopt Petitioner’s proposal regarding the level of one of ordinary skill in the art. The level of ordinary skill in the art is also reflected by the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

E. Claim Construction

In *inter partes* review proceedings such as this one, we construe claims using the same claim construction standard that would be used in a civil action under 35 U.S.C. § 282(b), as articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc), and its progeny. *See* 37 C.F.R. § 42.100(b). Petitioner states that it “does not propose any claim terms to be construed but reserves the right to respond to any claim constructions that may arise subsequent to the filing of this Petition.” Pet. 10. Patent Owner does not directly address claim construction at this stage of the proceeding. *See generally* Prelim. Resp. At this stage of the proceeding, we determine that we do not need to expressly construe any other terms to resolve the parties’ disputes on the current record. *See Nidec Motor Corp. v.*

Zhongshan Broad Ocean Motor Co., 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“[W]e need only construe 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))).

F. Ground 1—Asserted Obviousness over Kawagoe

Petitioner argues that claims 1–9, 13, 15, 17, 20, 22–27, 31, 32, and 34 would have been obvious in view of Kawagoe. Pet. 15–40. Patent Owner presents arguments for this ground. Prelim. Resp. 9–11. For the reasons that follow, at this stage of the proceeding, we are persuaded that Petitioner sufficiently demonstrates a reasonable likelihood that it would prevail in showing that at least independent claim 1 would have been obvious in view of Kawagoe.

1. Overview of Kawagoe (Ex. 1007)

Kawagoe discloses a process for manufacturing a semiconductor integrated circuit device using an epitaxial wafer, i.e., a semiconductor wafer having a semiconductor single crystal epitaxial layer grown over a polished semiconductor substrate. Ex. 1007, 1:13–27, 2:31–35. According to Kawagoe, “[t]he epitaxial wafer is advantageous in that it is excellent in suppressing the soft errors and resisting to the latchup,” as well as “drastically reduc[ing] the defect density of the gate insulating film” of a semiconductor integrated device. *Id.* at 1:33–40.

Kawagoe discloses various “representative” processes, including processes in which the single crystal (epitaxial) layer contains an impurity of the same type and in the same concentration as the substrate body. Ex. 1007, 2:55–3:9. According to Kawagoe, the impurity concentration of the substrate body can be made higher than that of epitaxial layer “so that the resistance of the semiconductor substrate body can be relatively lowered to improve

the resistance to the latchup.” *Id.* at 4:1–8. Kawagoe discloses a process for manufacturing a semiconductor integrated circuit device including a step of forming a semiconductor region (well) extending below the epitaxial layer and having an impurity concentration that decreases with increasing depth below the epitaxial layer. *Id.* at 3:10–25. According to Kawagoe, the well can be used for forming a complementary Metal-Oxide-Semiconductor Field-Effect Transistor (“MOS.FET”) circuit. *Id.* at 3:32–38.

Kawagoe describes seven embodiments, including Embodiment 1 (Ex. 1007, 6:41–12:40, Figs. 1–8) and Embodiment 4 (*id.* at 14:46–19:64, Figs. 16–25). According to Embodiment 1, a semiconductor integrated circuit device includes semiconductor substrate body 2S, epitaxial layer 2E, and gettering layer 2G. *Id.* at 6:51–56, Fig. 1. Substrate body 2S and epitaxial layer 2E are doped with p-type impurity in equal concentrations. *Id.* at 6:60–7:3, 10:51–55, 11:12–16. Embodiment 1 includes n-channel MOS.FET (“nMOS”) 4N and p-channel MOS.FET (“pMOS”) 4P, the latter being formed in n-well 6, which is doped with n-type impurity and extends below the epitaxial layer. *Id.* at 8:46–52, 9:32–40, 11:18–24, 11:43–50, Figs. 1, 5, 7.

According to Embodiment 4, substrate body 2S and epitaxial layer 2E are doped with p-type impurity, and the impurity concentration of substrate body 2S is higher than that of epitaxial layer 2E “to improve the resistance to the latchup.” Ex. 1007, 14:64–15:6, 15:13–17, 16:16–21, 19:59–63, Fig. 17. Embodiment 4 includes p-well 6_p formed with nMOS 4N and n-well 6_n formed with pMOS 4P. *Id.* at 15:26–40, 17:40–18:35, Figs. 16, 21–23. In Embodiment 4, the impurity concentration in p-well 6_p and n-well 6_n decreases with increasing depth below the epitaxial layer. *Id.* at 15:62–16:15, 17:55–61, Fig. 17. Kawagoe discloses that the concentration gradient

reduces soft errors by attracting carriers (electrons) to the substrate and preventing them from entering the p-well. *Id.* at 16:2–11.

Petitioner relies on Kawagoe Figures 17 and 23, which are reproduced below, and which illustrate Embodiment 4 and its properties.

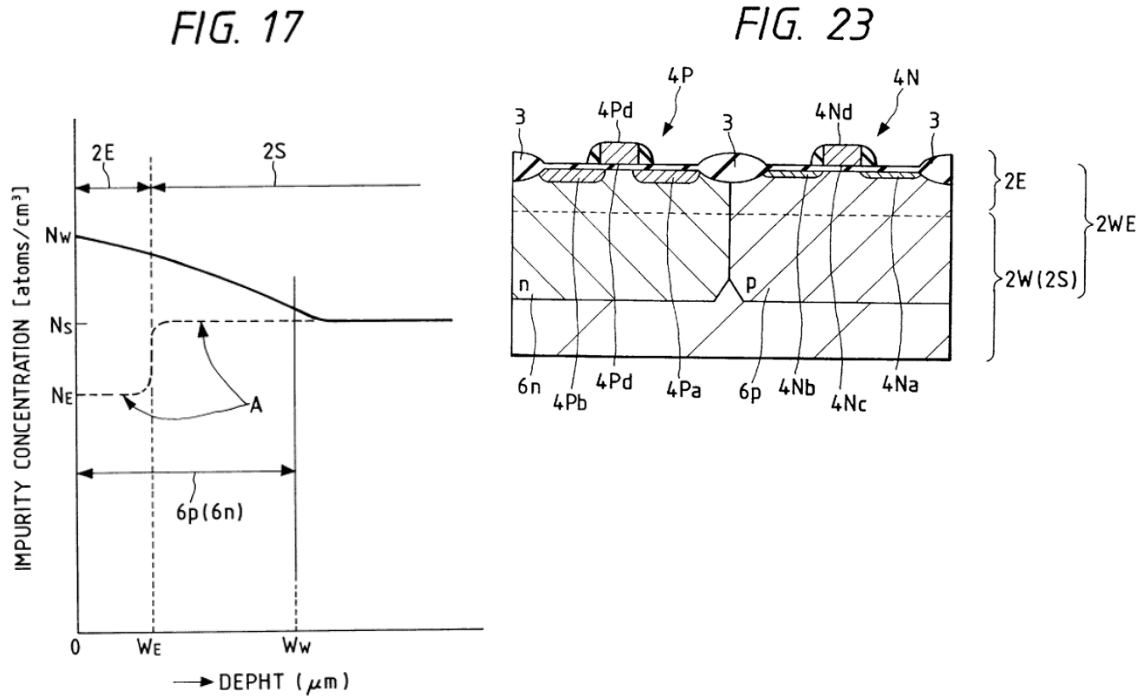


Figure 17 is a plot of impurity concentration as a function of depth in a semiconductor integrated circuit device, which shows “the p-well 6p and n-well 6n have their impurity concentrations gradually lowered in the depthwise direction from the principal surface (having an impurity concentration N_w) of the epitaxial layer 2E.” Ex. 1007, 5:41–45, 15:62–16:40. Figure 23 shows a step in a process for manufacturing a semiconductor integrated circuit device shown in Figure 16 (reproduced below by Petitioner), including p-well 6p formed with nMOS 4N and n-well 6n formed with pMOS 4P. *Id.* at 6:1–4, 15:26–32, 18:3–35.

2. *Petitioner's Initial Contentions for Claim 1*

[preamble] A semiconductor device, comprising:

Without taking a position as to whether the preamble is limiting, Petitioner contends that Kawagoe “teaches that the disclosed semiconductor integrated circuit devices (including MOSFET circuits and various VLSI circuits) can be used in various applications, including memory devices such as DRAM, SRAM, ROM, and semiconductor devices with logic circuits such as the so-called ‘microcomputer.’” Pet. 15–16 (citing Ex. 1007, 24:21–31; Ex. 1003 ¶¶ 240, 151).⁹

[1.1] a substrate of a first doping type at a first doping level having first and second surfaces;

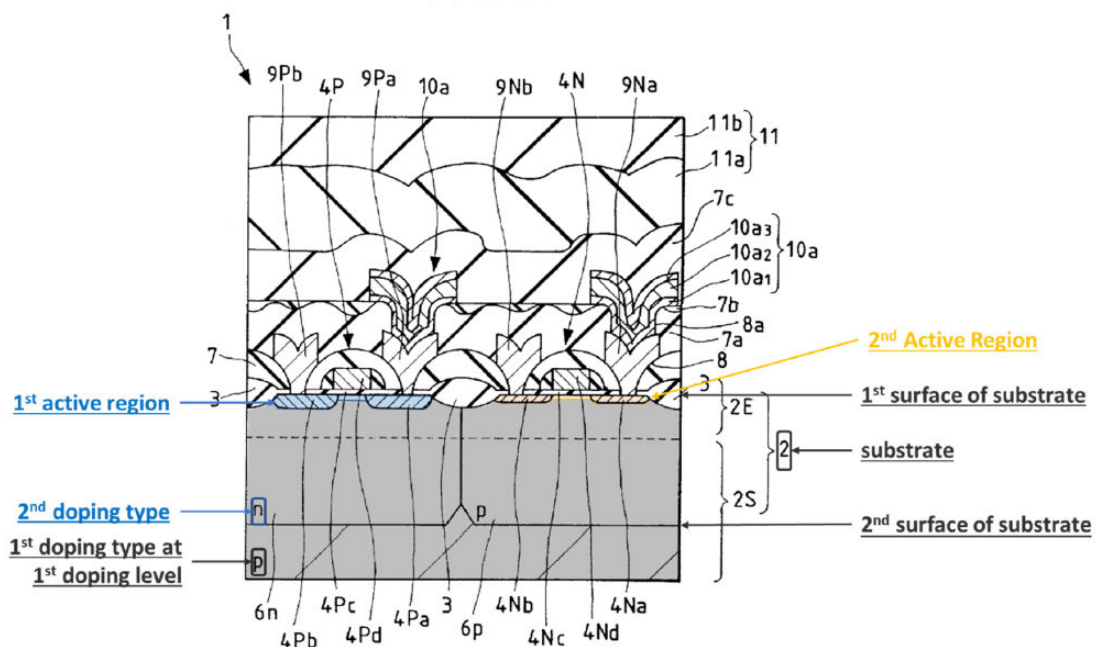
Petitioner contends that “Kawagoe discloses a p-type substrate 2, i.e., the claimed ‘a substrate of a first doping type at a first doping level.’” Pet. 16. Pointing to its annotated version of Kawagoe’s Figure 16¹⁰, Petitioner contends that Kawagoe “depicts . . . the p-type substrate 2 including a p-type Si single crystal substrate body 2S and a p-type Si single crystal epitaxial layer 2E.” *Id.* (citing Ex. 1007, 14:61–15:12, 15:26). According to Petitioner, “[s]ubstrate 2 has various surfaces between different layers or components, and the claimed first and second surface of the substrate 2 are annotated below where the first surface is the top surface of epitaxial layer 2E of the substrate 2 and the second surface is the bottom surface of the N well 6n and the P well 6p.” *Id.* (footnote omitted); *see id.* (citing Ex. 1003 ¶¶ 241, 153); *see id.* at 17–18.

⁹ As neither of the parties take a position as to whether the preamble is limiting and because the reference teaches the subject matter set forth in the claim, we need not and do not determine whether the preamble is limiting.

¹⁰ Petitioner contends that Figure 16 depicts the device that corresponds to the fabrication steps shown in Figures 22 and 23 of Kawagoe. Pet. 20.

[1.2] a first active region disposed adjacent the first surface of the substrate with a second doping type opposite in conductivity to the first doping type and within which transistors can be formed;

Pointing to one of its annotated versions of Kawagoe's Figure 16, reproduced below, Petitioner contends that "Kawagoe provides an n-well 6n that includes an active region (annotated blue, below), forming the source, drain, and channel of PMOS transistor 4P." Pet. 18–19 (citing Ex. 1007, 15:26–36, 9:41–54); *see id.* at 18–21; Ex. 1003 ¶¶ 242, 158–165.



Petitioner's annotated version of Kawagoe's Figure 16 depicts first and second active regions, as well as doping types and doping level. Pet. 19. According to Petitioner, "[t]he claimed 'first active region' is in the n-type region-well 6n that is opposite in conductivity to the first doping type of the substrate 2 (i.e., p-type)." *Id.* (citing Ex. 1007, 14:61–15:12, 15:26–28, 15:30–43). Petitioner contends that "[a] POSITA would have understood that the active region's channel region would remain n-type after forming the source and drain, and the claimed 'a first active region . . . with a second

doping type opposite in conductivity to the first doping type’ is satisfied by the PMOS formed in the n-well.” *Id.* (footnote omitted).

Petitioner further contends that “a POSITA would understand that the above-annotated ‘active region’ comprises a source, channel region, and drain, that provides for conductivity and thusly is an active region. The active region of a MOS transistor is known to be ‘[its] channel and [its] heavily doped source and drain regions.’” Pet. 20 (citing Ex. 1003 ¶ 162; Ex. 1008, 299). Petitioner argues that “[t]his is also confirmed by Patent Owner’s arguments, where when discussing the term ‘active region . . . within which transistors can be formed’ it argued that ‘this term means exactly what it says: an active region (i.e., a doped region at the surface of a semiconductor device) where a transistor can be formed.’” *Id.* at 20–21 (citing Ex. 1030 (Greenthread’s Claim Construction Brief), 31).

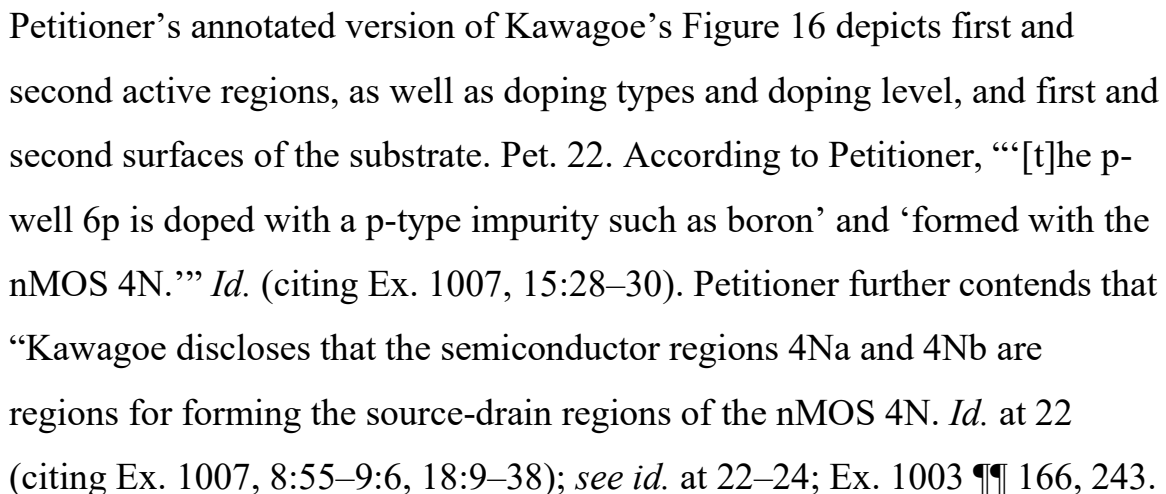
Petitioner further contends

a POSITA would have understood that “a first active region disposed adjacent the first surface of the substrate” means the first active region is disposed vertically adjacent the first surface of the substrate because the first active region in which transistors can be formed is below the top surface of the substrate to include the source, the drain and the channel region of a transistor.

Id. at 21 (citing Ex. 1003 ¶¶ 163–164).

[1.3] a second active region separate from the first active region disposed adjacent to the first active region and within which transistors can be formed;

Pointing to an annotated version of Kawagoe’s Figure 16, reproduced below, Petitioner contends that Kawagoe’s Figure 16 “discloses a second active region (tan, below) separate from, and adjacent to, the first active region (blue).” Pet. 21 (citing Ex. 1007, 15:26–28).



Petitioner contends that “[a]s described in Element [1.2] and [1.3], transistors are formed in the first and second active regions to form a PMOS transistor 4P and an NMOS transistor 4N, respectively.” Pet. 25. Petitioner further contends that, “[t]o the extent this element requires multiple transistors in the first active region or the second active region, it would have been obvious to add multiple transistors into the same active region for

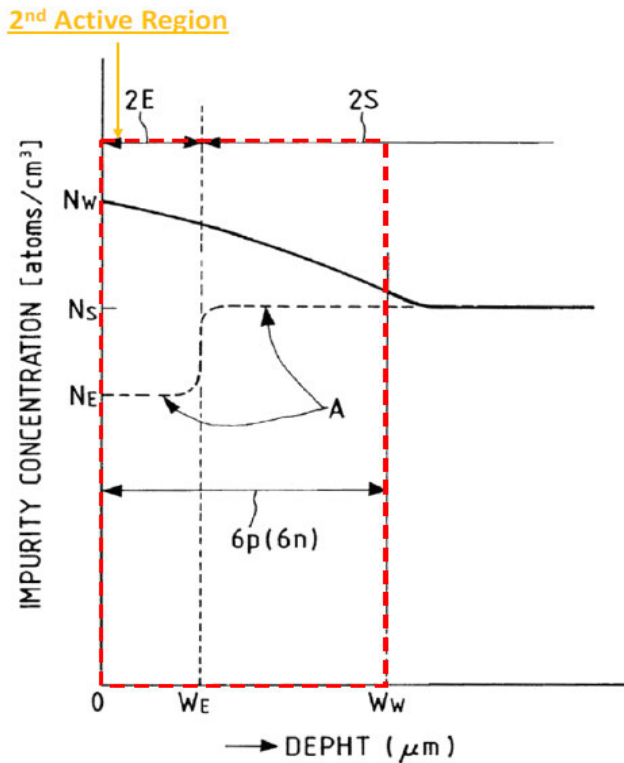
the same reasons as described in [1.3].” *Id.* (citing Ex. 1003 ¶¶ 38–45, 244, 168, 170).

[1.5] at least a portion of at least one of the first and second active regions having at least one graded dopant concentration to aid carrier movement from the first surface to the second surface of the substrate; and

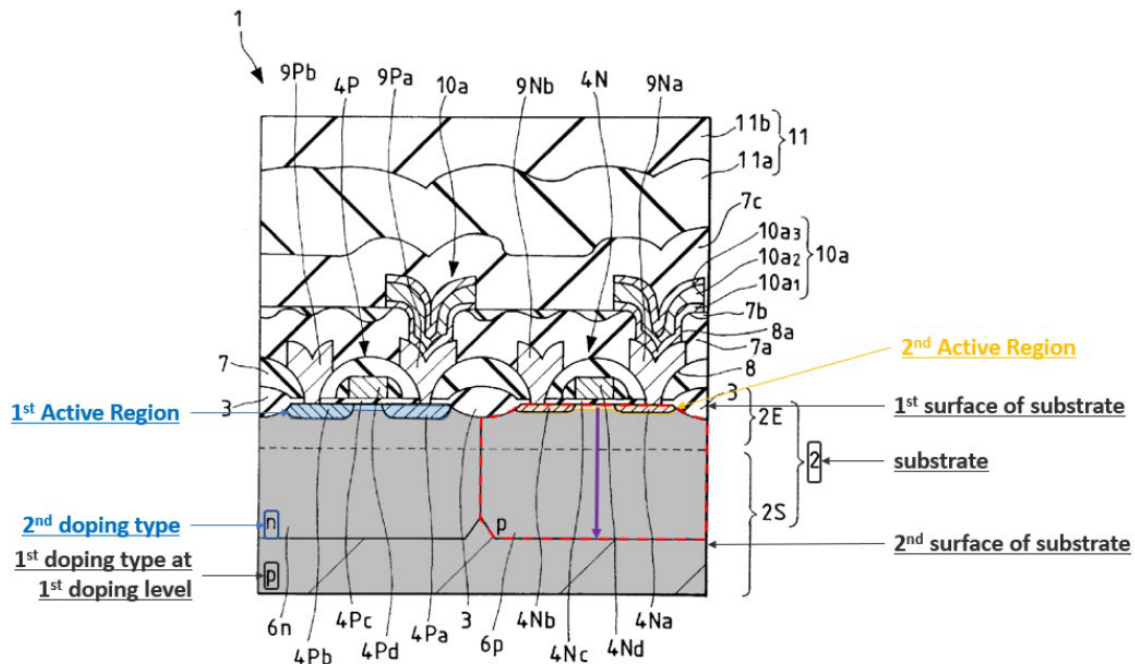
Petitioner contends that Kawagoe’s Figure 17 “illustrates dopant concentration as a function of depth of the physical device depicted in FIG. 16.” Pet. 25 (citing Ex. 1007, 14:46–67, 15:62–16:15). Pointing to an annotated version of Kawagoe’s Figure 17, Petitioner further contends that

[t]he first and second active regions (annotated in blue and tan) are at the first surface of the semiconductor device and have a graded dopant gradient so that carriers (e.g., minority carriers, i.e., electrons in the p-well 6p and holes in the n-well 6n, whose movement is annotated with the purple arrow) are attracted to the substrate to reduce errors.

Id. (citing Ex. 1007, 15:62–16:15). An annotated version of Figure 17 of Kawagoe is reproduced below.



Petitioner's annotated version of Kawagoe's Figure 17 is an impurity distribution diagram for the integrated circuit device of Figure 16. Ex. 1007, 5:41–45; Pet. 27. Petitioner contends that, "[a]s can be seen from FIGS. 16 and 17, the 'second active region' at the top surface of the p-well 6p in the substrate is where the downward dopant gradient begins, and it levels off shortly after the well 6p (red-dashed annotation)." *Id.* at 25–26 (footnote omitted). Petitioner's annotated version of Kawagoe's Figure 16 is reproduced below.



Petitioner's annotated version of Kawagoe's Figure 16 depicts the movement of minority carriers, electrons in the p-well 6p and holes in the n-well 6n. Pet. 25, 27. "Similarly," Petitioner contends, "the 'first active region' at the top surface of the n-well 6n in the substrate also has a downward dopant gradient which levels off when the depth goes beyond the n-well 6n into the lower part of the substrate." *Id.* at 26; *see id.* (citing Ex. 1003 ¶¶ 245, 171–172). Petitioner contends that

[a]s shown in FIG. 17, Kawagoe's downward graded dopant concentration for each of the p-well 6p and n-well 6n is present from the top surface to the bottom surface of each well to generate a drift electric field to move their respective minority carriers downward to the bottom surface of each well, which is the second surface of the substrate 2 in Kawagoe.

Id. at 28 (citing Ex. 1003 ¶¶ 173–178).

Petitioner further contends that

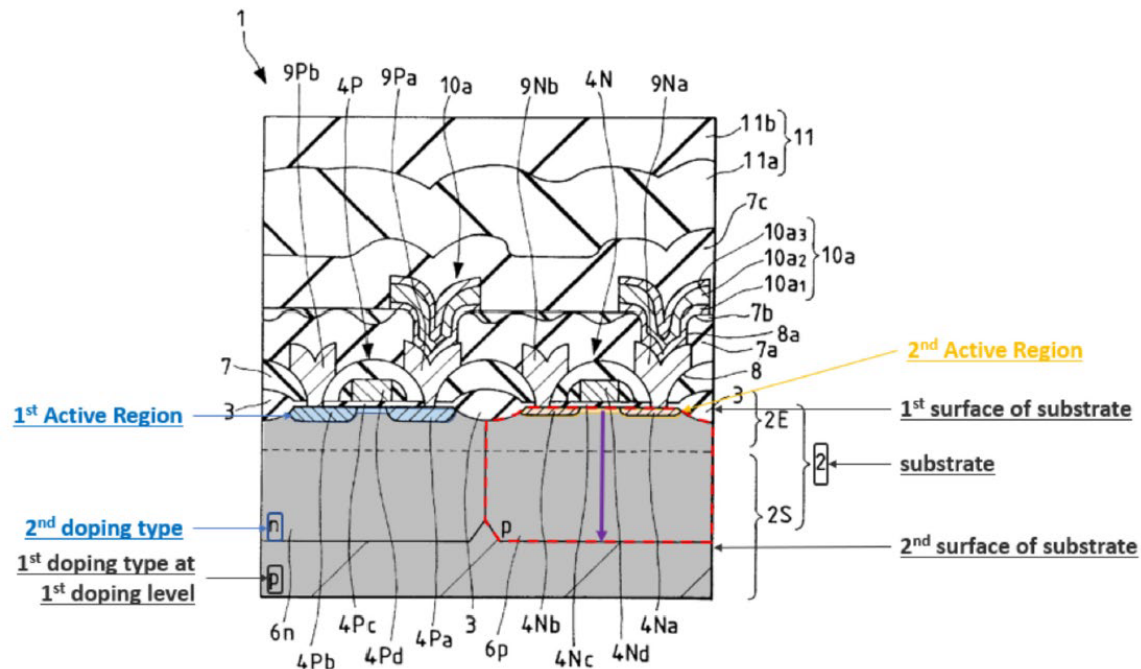
Kawagoe's dopant gradient in the p-well 6p is designed to aid carrier movement of electrons from the top surface of the substrate 2 to attract electrons to the substrate body 2S. Kawagoe states that "the impurity concentration of the p-well 6p is given

such a gradient that it is gradually lowered in the depthwise direction from the surface of the epitaxial layer 2E, so that the influence to be caused by the carriers (or electrons) due to the α -ray is lowered. Specifically, the electrons produced by the α -ray are attracted to the substrate body 2S by that concentration gradient and prevented from entering the p-well 6p so that the soft errors can be reduced in case the MIS memory of the DRAM or the like is formed in the p-well 6p.” Kawagoe’s graded concentration at the active regions (and into the wells) thusly meets the claimed “to aid carrier movement from the first surface to the second surface of the substrate.”

Pet. 28 (citing Ex. 1007, 15:62–16:40; Ex. 1007, 16:2–11); *see id.* at 28–29; Ex. 1003 ¶¶ 173–178.

[1.6] at least one well region adjacent to the first or second active region containing at least one graded dopant region, the graded dopant region to aid carrier movement from the first surface to the second surface of the substrate.

Pointing to an annotated version of Kawagoe’s Figure 16, reproduced below, Petitioner contends that “Kawagoe provides a p-well 6p (the claimed at least one well region) (annotated in red) that is adjacent to the first active region. The p-well has a graded dopant region from its surface (through the second active region) that aids in the movement of carriers from the claimed surface (annotated first surface).” Pet. 29.



Petitioner’s annotated version of Kawagoe’s Figure 16 depicts first and second active regions, the substrate, and the movement of minority carriers. Pet. 30. According to Petitioner, “[a] POSITA would further understand that the n-well 6n (another well region) is similarly adjacent to the second active region.” *Id.* (citing Ex. 1003 ¶¶ 246–251). Petitioner further contends that

Kawagoe in FIG. 17 discloses an example of the graded dopant (impurity) concentration profile at different depths from the top surface of the substrate 2 of FIG. 16. It discloses that the impurity concentration of the p-well 6p (the graded dopant curve with a maximum concentration of N_w at the top surface in FIG. 17) is designed to aid carrier movement of electrons from the top surface of the layer 2E of the substrate 2 by using the graded dope to attract the electrons to the substrate body 2S.”

Id. at 30 (citing Ex. 1007, 15:62–16:40; Ex. 1003 ¶¶ 248). Petitioner further contends that

[t]he first and second active regions (annotated in blue and tan) are within well regions so that carriers (e.g., minority carriers, i.e., electrons in the p-well) are attracted to the bottom part of substrate where there are no active regions. The depthwise

gradient extends from the first surface of the semiconductor device toward the substrate body 2S. As depicted in annotated FIGS. 16 and 17 above, Kawagoe's second active region is disposed on the top portion of the p-well 6p. This portion of the second active region (and at least the channel region) has a graded dopant concentration. The gradient of this graded dopant concentration is represented by a portion of the purple arrow which is also the direction of the electron carrier movement caused by a drift electric field associated with the graded dopant concentration in the second active region which is at the top of the p-well 6p. This portion of the graded dopant profile in the second active region in Kawagoe discloses Element [1.6].

Pet. 31–32 (citing Ex. 1007, 15:26–36, 15:62–16:40, 17:11–21, 1:59–2:5, 2:20–23; Ex. 1003 ¶¶ 249–250).

3. *Patent Owner's Arguments for Claim 1*

Patent Owner argues that the asserted references do not teach limitations 1.5 and 1.6 of claim 1, and in particular, a “graded dopant concentration to aid carrier movement from the first surface to the second surface of the substrate” as recited in claim 1. Prelim. Resp. 2. With respect to the prosecution history statement cited by Petitioner—that “a downward-sloping graded dopant concentration was known in the prior art to create an ‘inherent “built-in” unidirectional electric field’ that sweeps carriers down,”—Patent Owner asserts that Petitioner's quotation of this statement is incomplete. *Id.* at 2–3 (citing Pet. 12; Ex. 1002, 286, 289, 290). Patent Owner takes the position that it also argued “that the movement of carriers ‘[d]epend[s] on the particular slope of the graded concentration of dopant[s]’” and this statement was made in response “to an Office Action regarding a claim that required a ‘single static unidirectional electric drift field to aid the movement of carriers.’” *Id.* at 3 (citing Ex. 1002, 289, 286).

Pointing to the Examiner's findings during prosecution of the '195 patent,¹¹ Patent Owner contends that Dr. Campbell "merely observes that graded dopants would exert some force on carriers, without separately analyzing whether that force would 'aid carrier movement.'" Prelim. Resp. 12. Patent Owner contends that "Dr. Campbell does not offer an opinion regarding the strength of the force created by the dopant grading in Onoda, Nishizawa, or Kawagoe" and merely opines "that a gradient creates an electric field exerting some force, and deems the claim limitation satisfied." *Id.* Accordingly, Patent Owner contends, "Dr. Campbell offers no opinion about the strength of the force created by the dopant gradients," and "necessarily cannot not [sic] compare it to other forces acting on carriers." *Id.* Patent Owner further contends that, "[t]o the extent Dr. Campbell identifies those other forces at all, he likewise does not assess their magnitude." *Id.*

According to Patent Owner, Kawagoe teaches the following:

Specifically, the electrons produced by the α -ray are attracted to the substrate body 2S by that concentration gradient and prevented from entering the p-well 6p so that the soft errors can be reduced in case the MIS memory of the DRAM or the like is formed in the p-well 6p.

Id. at 10 (quoting Ex. 1007, 16:7–11 (emphases omitted)). In view of this disclosure, Patent Owner contends that Kawagoe teaches inhibiting carrier movement, not aiding carrier movement. *Id.* According to Patent Owner,

¹¹ Patent Owner contends that "during prosecution, the examiner said that in 'a complex electronic device, movement of minority carriers is affected by multiple forces and fields' and that a 'drift field may attempt to apply a force on all minority carriers in a specific direction' but that 'without knowing other parameters of the device' one cannot say whether the field would aid the movement of carriers." Prelim. Resp. 4 (citing Ex. 1002, 270).

Kawagoe's 6p extends to the very top of the device. Therefore, carriers travelling vertically could only enter 6p from below. Even if carriers could be located above 6p, those carriers would not satisfy the claim limitation. Those carriers would be in what Petitioner identifies as the active region. Since they are "prevented from entering" 6p, they would remain above 6p and Kawagoe's gradient would not aid their movement downward. Nishizawa also confirms that Kawagoe is discussing carriers outside what Petitioner maps to the active region. Both Nishizawa and Kawagoe adopt dopant gradients as a solution to SEUs caused by α -ray strikes. Nothing in Kawagoe describes α -rays generating electrons in the active region of a device and Nishizawa says that possibility can be "disregarded." Ex. 1046 at 29. The carriers Kawagoe addresses are all below 6p.

Prelim. Resp. 10–11, n.5.

During prosecution of the '195 patent, the Examiner rejected claims under the pre-AIA version of 35 U.S.C. § 112, first paragraph and found that "movement of minority carriers is affected by multiple forces and fields" and that "it does not appear that simply the presence of 'a unidirectional drift field' in itself can achieve 'drawing *all* minority carriers from said surface layer to said substrate.'" Ex. 1002, 289 (emphasis added). Patent Owner responded with following argument:

[A] unidirectional drift (electric) field necessarily affects all the present minority carriers in the same way - moving all minority carriers in the same direction because of the unidirectional drift due to the existence of the electric field. *See* "Physics and Technology of Semiconductor Devices," A.S. Grove, pp. 224–225, John Wiley and Sons, Inc., New York, 1st Edition 1967 ("This same electric field will then be of such direction as to aid the motion of injected holes. Thus the injected minority carriers will now move not only by diffusion but also by drift due to the existence of this electric field."). Depending on the particular slope of the graded concentration of dopant, all minority carriers are either swept "down" (from the surface layer to the substrate)

or “up” (from the substrate to the surface layer). *See* Applicant’s Figs. 5(b) and 5(c).

Id. Patent Owner further argued that the Examiner’s finding

appears to not consider that the graded dopant concentration itself creates a “built-in” electrical field that forces the movement of carriers into a particular direction, whereby the “direction” of the electrical field and the resulting direction of the carrier movement depends *solely* on the slope of the graded concentration of dopant. With regard to the existence of a “built-in” electric field created by a graded dopant density, . . . *this inherent “built-in” unidirectional electric field is the additional parameter for ensuring that all minority carriers are being moved in one direction* and which parameter the Office Action deemed to be missing from the disclosure.

Id. at 289–90 (emphases added). Also, “without conceding its position on this issue,” Patent Owner amended claims to eliminate reference to “*all* carriers” and instead, refer to “carriers.”¹² *Id.* at 290.

4. Analysis of Claim 1

At this stage of the proceeding, we determine that the statements made by Patent Owner during prosecution of the ’195 patent contradict its arguments in the present proceeding. *See generally* Prelim. Resp. Based on the present record, Patent Owner’s statements during prosecution support a preliminary finding that a graded dopant concentration is enough to teach or suggest “at least one graded dopant concentration to aid carrier movement from the first surface to the second surface of the substrate.” Petitioner

¹² The examined claims of the ’195 patent generally recited “a unidirectional drift field drawing all minority carriers from said surface layer to said substrate.” Ex. 1002, 286. Patent Owner amended the claims of the ’195 patent to recite “maintain[ing] a single static unidirectional electric drift field to aid the movement of minority carriers from said surface layer to said substrate.” *Id.*

persuasively contends and Patent Owner does not dispute that the first and second active regions have a graded dopant concentration. Pet. 25 (citing Ex. 1007, 14:46–67, 15:62–16:15); *see generally* Prelim. Resp. Petitioner also persuasively contends and Patent Owner does not dispute that, as specified in claim 1, at least one well region adjacent to the first or second active region contains a graded dopant region. Pet. 29–30 (citing Ex. 1007, 15:62–16:40); Ex. 1003 ¶¶ 246–251. Petitioner presents evidence demonstrating that a graded dopant concentration results in an electric field, which exerts a force on charged particles that will move, or aid movement, of the carriers in a specific direction. *See, e.g.*, Pet. 25–32.

Contrary to Patent Owner’s assertions, Petitioner is not arguing or assuming that “*any* ‘graded dopant concentration’ would *necessarily* ‘aid carrier movement,’” nor is Petitioner attempting to read out the “aid carrier movement” element. Prelim. Resp. 1–2. Additionally, Patent Owner does not direct us to any discussion in the ’481 patent regarding a specific slope value that is necessary to “aid the movement of minority carriers,” either in isolation or in the presence of other forces that may act upon the carriers. Nor does Patent Owner direct us to any authority suggesting that we should demand more from the prior art disclosure in Kawagoe than is provided in the disclosure of the ’481 patent. Although Patent Owner contends, “the specification . . . describes the slope of the dopant concentration, not merely its direction, as a relevant parameter for determining whether a concentration gradient will aid the movement of carriers,” at most, the specification discloses that “[t]he gradient can be linear, quasi linear, exponential or complimentary error function” and that “[t]he relative slope of the donor concentration throughout the base creates a suitable aiding drift electric field, to help the carriers move.” Prelim. Resp. 4 (quoting Ex. 1001, 3:5–9).

As to Patent Owner’s argument that Kawagoe does not disclose aiding the movement of carriers, but rather inhibiting carrier movement (*see* Prelim. Resp. 10, 10–11, n.5; Ex. 1007, 16:7–11), we preliminarily agree with Petitioner’s contention that the electric field in Kawagoe both helps carriers move from the active regions to the substrate (*see* Pet. 28, 30–32) and prevents carriers moving from the substrate to the p-well (*see id.* at 28). Kawagoe expressly teaches that carriers (or electrons) will be created by α -ray strikes. Ex. 1007, 16:2–7. Moreover, there appears to be no real dispute that carriers will naturally be present in the active regions of Kawagoe, regardless of α -ray strikes, and Kawagoe discloses that the downward graded-dopant concentration will direct carriers into the substrate. *Id.* at 16:7–11.

At this stage of the proceeding, Petitioner meets the threshold showing necessary for institution—Kawagoe more closely supports Petitioner’s position because it states that carriers are “attracted to the substrate body . . . by that concentration gradient.” Ex. 1007, 16:7–9. We are persuaded by Petitioner’s evidence and credit Dr. Campbell’s testimony that Kawagoe teaches the preamble and limitations 1.1. through 1.6. Dr. Campbell’s testimony is consistent with, and supported by, other evidence in the record.

At this stage of proceeding, Patent Owner’s arguments are not supported by objective evidence. *See In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984) (lawyer arguments and conclusory statements which are unsupported by factual evidence are entitled to little probative value). There is insufficient evidence on this record that any other additional parameter is necessary, present, or acting upon the carriers in Kawagoe’s system. The

parties, however, are invited to further develop the evidence and arguments relevant to the above-identified issues during the course of this proceeding.

5. *Remaining Claims*

In view of our determination that Petitioner establishes a reasonable likelihood for claim 1, and because Petitioner’s arguments and evidence for remaining claims 2–9, 13, 15, 17, 20, 22–27, 31, 32, 34 (Pet. 32–40) are similar to Petitioner’s arguments and evidence for claim 1 (*id.* at 15–32) and are unopposed at this stage by Patent Owner (except for the issues discussed above with respect to independent claim 1), we determine that it is unnecessary to provide an explicit analysis of Petitioner’s challenges to the remaining claims in order to provide guidance to the parties for the upcoming trial. Consolidated Trial Practice Guide November 2019 (“CTPG”)¹³ at 64; *see* 37 C.F.R. § 42.108(a) (“When instituting *inter partes* 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 (holding that 35 U.S.C. § 314 forbids the Board’s prior “partial institution” practice).

G. Ground 2—Asserted Obviousness over Onoda

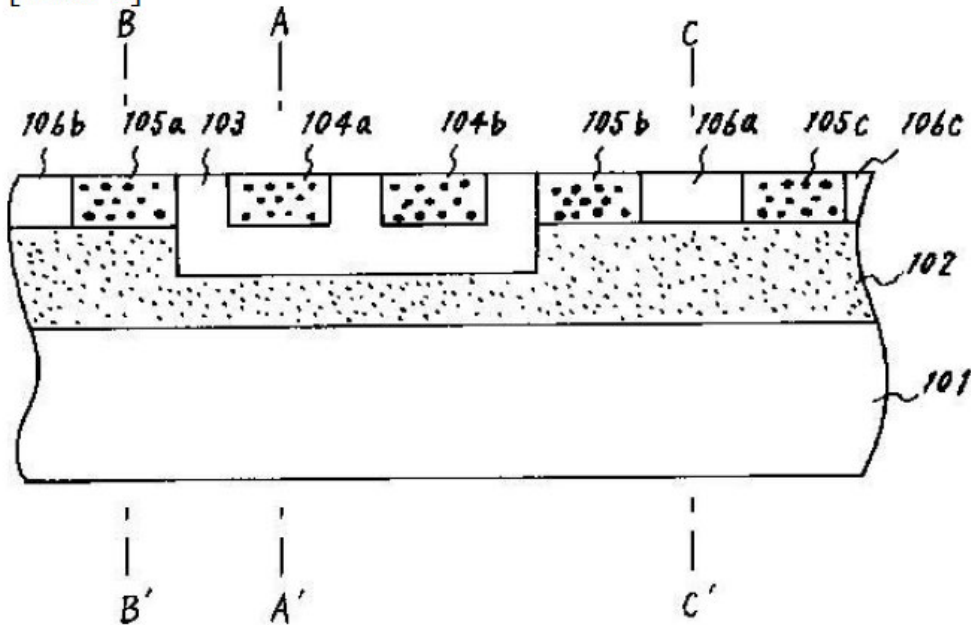
Petitioner argues that claims 1–9, 13, 15, 17, 20, 22–27, 31, 32, and 34 would have been obvious in view of Onoda. Pet. 9, 41–76. Patent Owner presents arguments for this ground. Prelim. Resp. 6–9. For the reasons that follow, at this stage of the proceeding, we are persuaded that Petitioner sufficiently demonstrates that at least independent claim 1 would have been obvious in view of Onoda.

¹³ Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

1. Overview of Onoda (Exs. 1042, 1043)

Onoda is titled “Semiconductor Integrated Circuit Device, Nonvolatile Semiconductor Storage Device, and Manufacturing Method” and describes “a nonvolatile semiconductor storage device with improved latch-up resistance and punch-through breakdown voltage and improved junction breakdown voltage between the well regions and the semiconductor substrate.” Ex. 1042, codes (54), (57). Onoda “relates to a semiconductor integrated circuit device, to a nonvolatile semiconductor storage device, and to methods of manufacturing thereof, and, in particular, relates to a nonvolatile semiconductor storage device wherein a triple-well structure is formed in an epitaxial substrate.” *Id.* ¶ 1. Figure 8 of Onoda, reproduced below, “is a cross-sectional drawing illustrating, in step order [in conjunction with Figures 4–7], manufacturing of a semiconductor substrate 100 to which the first embodiment according to the present invention is applied.” *Id.* at 28.

[FIG. 8]



Onoda's Figure 8, in conjunction with Figures 4–7, depicts a method for manufacturing a flash memory structured as shown. *Id.* ¶ 46. Figure 8 depicts first semiconductor layer 101, which comprises a heavily-doped P-type silicon substrate (silicon wafer) with a dopant concentration of $1 \times 10^{19}/\text{cm}^3$ (*id.*) and lightly-doped P-type second semiconductor layer 102 wherein epitaxial layer 102a, as a whole, is between 1×10^{16} and $1 \times 10^{18}/\text{cm}^3$ (*id.* ¶ 47). Figure 8 also depicts N-type first well region 103 with a depth of about $3 \mu\text{m}$ and a dopant concentration of between 1×10^{15} and $1 \times 10^{18}/\text{cm}^3$. *Id.* ¶ 48. Also shown in Figure 8 are boron implantation layers 104A, 104B, 105A, 105B, and 105C, and phosphorus implantation layers 106A through 106C. *Id.* ¶ 49.

2. *Petitioner's Initial Contentions for Claim 1*

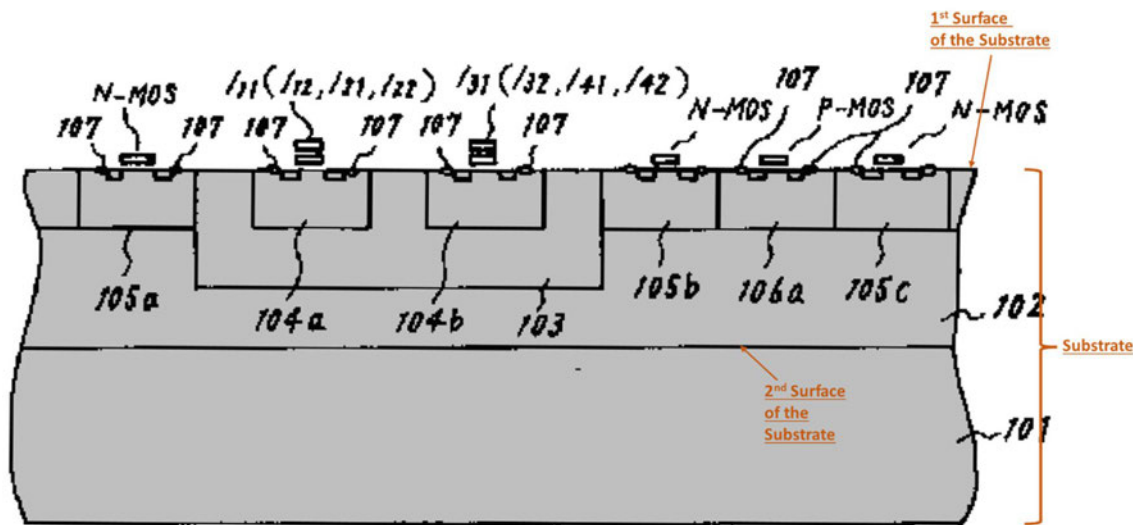
[preamble] A semiconductor device, comprising:

Petitioner contends that “Onoda discloses ‘a nonvolatile semiconductor storage device with improved latch-up resistance and punch-through breakdown voltage.’” Pet. 43 (citing Ex. 1042, Abstract, claims 2–6, ¶¶ 6, 8–11). According to Petitioner, “Onoda’s semiconductor device discloses PMOS and NMOS transistors and fabrication methods.” *Id.* (citing Ex. 1042, Claims 1, 7 and 8–12, ¶¶ 6, 7, 12–17); *supra* n.9.

[1.1] a substrate of a first doping type at a first doping level having first and second surfaces;

Pointing to its annotated Onoda’s Figure 3, reproduced below, Petitioner contends that “Onoda teaches a substrate that has a first and second surface, as annotated on FIG. 3 below” and that “Onoda’s ‘semiconductor substrate 100’ includes a first and second semiconductor layers 101/102.” Pet. 44 (citing Ex. 1042 ¶ 43 (“semiconductor substrate 100

... is depicted in FIG. 3”); Fig. 2 (describing “substrate 100” as encompassing layers 101 and 102)).

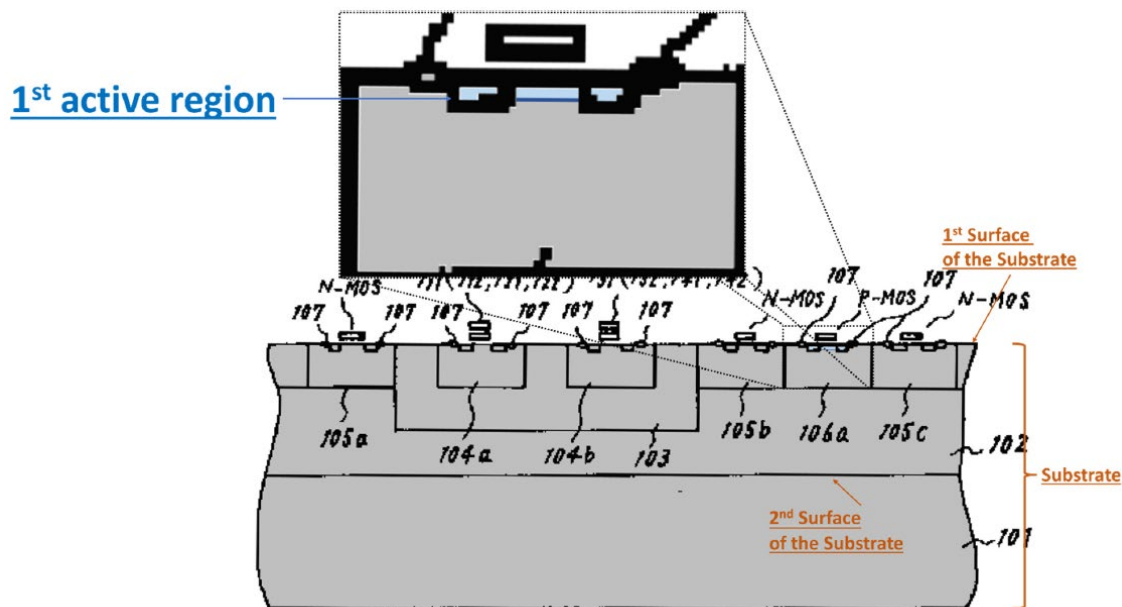


Petitioner’s annotated version in Onoda’s Figure 3 depicts multiple surfaces of a substrate. Pet. 44. Petitioner further contends that “Onoda’s ‘semiconductor substrate 100’ is made of ‘a first semiconductor layer made from a heavily-doped [] P-type silicon substrate’ labeled as 101 and a p-type doped second semiconductor layer 102 on the top of the first semiconductor layer 101.” *Id.* (citing Ex. 1042 ¶ 41).

[1.2] a first active region disposed adjacent the first surface of the substrate with a second doping type opposite in conductivity to the first doping type and within which transistors can be formed;

Petitioner contends that “[t]he top portion of each n-well region 106a, 106b, 106c have PMOS transistors, and each of those transistors have an active region.” Pet. 46 (citing Ex. 1042 ¶¶ 43, 44) (footnote omitted). Petitioner contends that “Onoda’s first active region is also where ‘within which transistors can be formed.’” *Id.* at 47. According to Petitioner, “[t]he top portion of each n-well (i.e., 106a, 106b, or 106c), which has the

claimed ‘first active region,’ also contains a transistor.” *Id.* (citing Ex. 1042 ¶¶ 41–45). Pointing to its excerpted and annotated version of Onoda’s Figure 3, reproduced below, Petitioner contends that “a PMOS transistor (with its gate/source/drain annotated in red and a channel region remains annotated in blue) is formed in the first active region.” *Id.* (citing Ex. 1042 ¶¶ 29 (“a floating electrode formed over a channel region that is positioned between the source region and the drain region”), 41–45); *see id.* at 48–49.

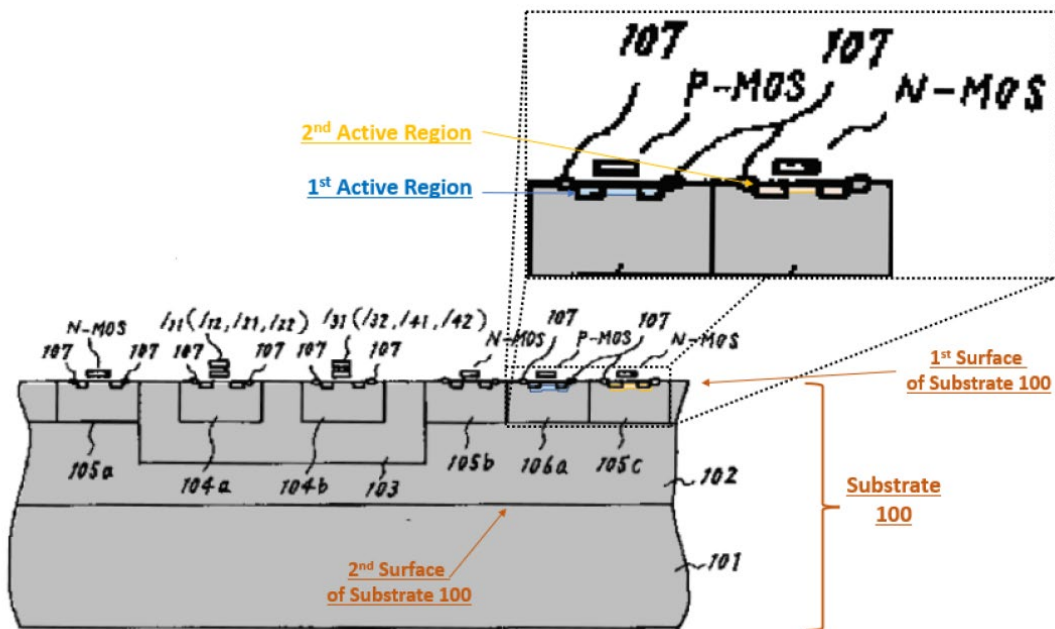


Petitioner’s annotated and excerpted version of Onoda’s Figure 3 depicts a first active region. Pet. 47.

[1.3] a second active region separate from the first active region disposed adjacent to the first active region and within which transistors can be formed;

Pointing to an annotated version of Onoda’s Figure 3, Petitioner contends that “Onoda discloses a second active region formed in p-type wells 105a, 105b, and 105c, one of which is annotated tan below.” Pet. 50 (citing Ex. 1042 ¶¶ 43 (“105a, 105b, and 105c are P-type [] well regions”),

44, Claim 2 (“floating gate electrode formed over the second well region, positioned between the source region and the drain region”).



Petitioner’s annotated version of Onoda’s Figure 3 depicts first and second active regions. Pet. 50. Petitioner further contends that “the second active region (tan) is ‘separate from the first active region’ (blue) and is ‘disposed adjacent to the first active region.’” *Id.* at 51. Pointing to the annotated version of Onoda’s Figure 3, reproduced above, Petitioner contends the “2nd active region is a part of p-type well 105c and forms an NMOS transistor, while the 1st active region is a part of n-type well 106a and forms a PMOS transistor.” *Id.* (citing Ex. 1042 ¶¶ 29, 44); *see id.* at 51–52.

[1.4] transistors formed in at least one of the first active region or second active region;

Petitioner contends that “[a]s demonstrated in Element [1.2] and [1.3], Onoda discloses transistors that are formed in the first active region and the second active region, where the ‘first active region’ contains a P-MOS

and the ‘second active region’ contains an N-MOS.” Pet. 52. According to Petitioner, “[t]o the extent this element is construed to require multiple transistors in the first active region or the second active region, it would have been obvious to include multiple transistors into the same active region for the same reasons as discussed immediately above in [1.3].” *Id.* at 53 (citing Ex. 1003 ¶¶ 199, 35–45, 93).

[1.5] at least a portion of at least one of the first and second active regions having at least one graded dopant concentration to aid carrier movement from the first surface to the second surface of the substrate; and

Petitioner contends that “[a]s described in Element [1.3], a second active region is formed within p-well region 105c.” Pet. 53 “Onoda further discloses (described in more detail below) that the well region has a doping profile that is downward graded and, consequently, the active region would have the same doping profile because it is within the well region.” Pet. 53. Petitioner further contends that

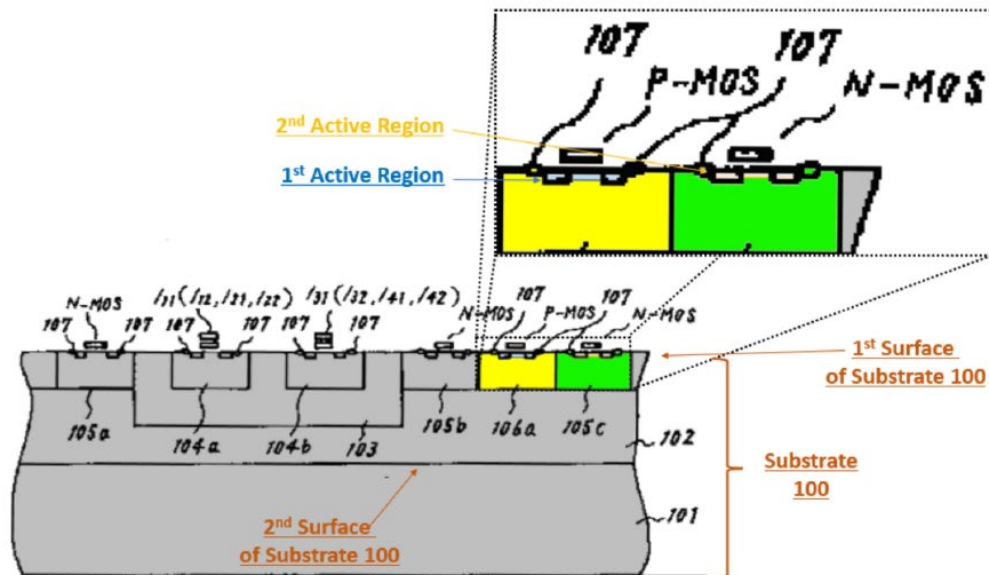
Onoda’s FIG. 11 depicts the graded dopant profile across the p-type well regions 105a, 105b, 105c, which constitutes the “at least one graded dopant concentration” of the “at least a portion of at least one of the first and second active regions.” FIG. 11 is a cross sectional slice (B-B) through the device depicted in FIG. 8, which is the same embodiment as FIG. 3. As can be seen from the below, the dopant concentration decreases as a function of depth through the third well region 105a (p-type) and the second semiconductor layer 102 (p-type). Then, at the point where the slice reaches the semiconductor layer 101, the dopant concentration increases. Moreover, a POSITA would have understood that third well regions 105b and 105c would have the same dopant profile as region 105a, because the composition of all three regions are identical.

Pet. 54 (citing Ex. 1042 ¶¶ 41–45, 52; Ex. 1003 ¶¶ 98–100); *see id.* at 55–61.

[1.6] at least one well region adjacent to the first or second active region containing at least one graded dopant region, the graded dopant region to aid carrier movement from the first surface to the second surface of the substrate.

Petitioner contends that “Onoda discloses semiconductor well regions in the second semiconductor layer 102 within the substrate 100 that are p doped to form p-well regions, e.g., 105a, 105b and 105c (one colored in green) and n doped to form n-well regions, e.g., 106a, 106b and 106c (one colored in yellow).” Pet. 61 (citing Ex. 1042 ¶¶ 41–45). Pointing to its annotated version of Onoda’s Figure 3, reproduced below, Petitioner contends “p-well region 105c is adjacent to the first active region located near the top of the p-well region 105c, and the n-well region 106a is adjacent to the second active region located near the top of the n-well region 106a.”

Id.



Petitioner’s annotated version of Onoda’s Figure 3 depicts first and second active regions, p-well regions, and n-well regions. Pet. 62. Petitioner further contends that “[t]hese active regions within the wells further have a graded

dopant region to aid carrier movement downward.” Pet. 62. Petitioner points to Onoda’s Figure 11 in support of its contention that “Onoda discloses that the p-well region 105a in Onoda at least has a p dopant concentration decreases from the top surface of the p-well region 105a (the first surface of the substrate 100) into the well region 105a.” *Id.* (citing Ex. 1042 ¶ 52). According to Petitioner, “[t]he p-well regions 105b and 105c have the same graded dopant concentration profile.” *Id.* “As discussed above regarding Element [1.5],” Petitioner contends “this graded dopant region in the p-well region 105a, 105b or 105c drives electrons to the bottom of the respective well region towards the bottom of the substrate and, accordingly, has the ‘to aid carrier movement from the surface towards the area of the substrate where there are no active regions.’” *Id.*

3. *Patent Owner’s Arguments*

Patent Owner contends that “Petitioner points to Onoda (primary reference for Grounds II and III) for its disclosure of a graded dopant concentration,” but “does not point to anything in Onoda describing how a graded dopant concentration affects carrier movement at all” or how any disclosure in Onoda would “meet the ‘aid carrier movement’ or ‘from the first surface to the second surface’ limitations.” Prelim. Resp. 6. Patent Owner contends that “[f]or Ground II, to find these claim limitations in Onoda, Petitioner relies entirely on Greenthread’s purported admissions that a downward slope ‘creates an inherent’ electric field ‘to aid the movement of minority carriers.’” *Id.* at 7 (citing Prelim. Resp. § II.A; Pet. 57).

Patent Owner again argues that “during prosecution, the Office agreed that ‘without knowing other parameters of the device’ one cannot say whether the gradient would aid the movement of carriers.” *Id.* at 7 (citing Ex. 1002, 270). According to Patent Owner, “[s]ince neither the Petition nor

Dr. Campbell analyze ‘other parameters’ they cannot show whether Onoda’s concentration gradient would ‘aid carrier movement’ . . . ‘from the first surface to the second surface.’” *Id.* For this reason, Petitioner contends that “Ground II fails to show how Onoda teaches this claim limitation.” *Id.*

4. *Analysis of Claim 1*

After considering the parties’ arguments and evidence, on the present record, we determine that Petitioner has shown sufficiently as supported by Dr. Campbell’s testimony that the cited portions of Onoda teach or suggest the subject matter of the preamble and limitations 1.1 through 1.6 of independent claim 1.

As set forth above, Patent Owner argued during prosecution that a graded dopant concentration creates an electric field that forces the movement of carriers in a particular direction, absent any discussion of the force exerted by the specific dopant gradients, whether any other forces are present, or the comparative magnitude of all forces present. *See* Ex. 1002, 289–290. Furthermore, although Patent Owner now directs us to the Examiner’s findings during prosecution also set forth above (*see* Prelim. Resp. 4 (citing Ex. 1002, 270)), Patent Owner previously represented to the Patent Office that it disagreed with these findings of the Examiner (*see* Ex. 1002, 289) and these comments were made with respect to claims that required *all* carriers be moved to the substrate, as opposed to merely aiding in their movement towards the substrate.

Our analysis of Petitioner’s challenge applying Onoda alone is substantially similar to the analysis set forth above with respect to Kawagoe. *Supra* § III.F.4. We do not repeat it in this section.

5. *Remaining Claims*

In view of our determination that Petitioner establishes a reasonable likelihood for claim 1, and because Petitioner’s arguments and evidence for remaining claims 2–9, 13, 15, 17, 20, 22–27, 31, 32, 34 (Pet. 64–76) are similar to Petitioner’s arguments and evidence for independent claim 1 (*id.* at 43–64) and are essentially unopposed at this stage by Patent Owner (except for the issues discussed above with respect to independent claim 1), we determine that it is not necessary to provide an explicit analysis of Petitioner’s challenges to the remaining claims in order to provide guidance to the parties for the upcoming trial. CTPG at 64; *see* 37 C.F.R. § 42.108(a) (“When instituting *inter partes* 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 (holding that 35 U.S.C. § 314 forbids the Board’s prior “partial institution” practice).

H. Ground 3–Asserted Obviousness over Onoda and Nishizawa

Petitioner argues that claims 1–9, 13, 15, 17, 20, 22–27, 31, 32, and 34 would have been obvious in view of Onoda and Nishizawa. Pet. 9, 76–83. Patent Owner presents arguments for this ground. Prelim. Resp. 6–9.

In view of our determination that Petitioner establishes a reasonable likelihood of prevailing on its challenge to independent claim 1 based on Onoda alone (Petitioner’s Ground II), we institute *inter partes* review. Because we find some grounds sufficient for institution, we institute on all grounds in the Petition. 37 C.F.R. § 42.108(a); *SAS*, 138 S. Ct. at 1353 (“The agency cannot curate the claims at issue but must decide them all.”); *PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018) (interpreting

the statute as requiring “a simple yes-or-no institution choice respecting a petition, embracing all challenges included in the petition”).

IV. CONCLUSION

After considering the evidence and arguments presented in the current record, we determine that Petitioner demonstrates a reasonable likelihood of success in proving that at least one of the challenged claims of the ’481 patent is unpatentable. We therefore institute trial on all challenged claims and grounds raised in the Petition. At this stage of the proceeding, we have not made a final determination as to the patentability of any challenged claims or as to the construction of any claim term. Any final determination will be based on the record developed during trial. We place Patent Owner on express notice that any argument not asserted in a timely-filed Response to the Petition, or in another manner permitted during trial, shall be deemed waived, even if that argument was presented in the Preliminary Response.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–9, 13, 15, 17, 20, 22–27, 31, 32, and 34 of the ’481 patent is instituted with respect to all grounds set forth in the Petition;

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4(b), *inter partes* review of the ’481 patent shall commence on the entry date of this Order, and notice is hereby given of the institution of a trial;

FURTHER ORDERED that, in view of the pending motion to seal, this Decision is being filed “Board and Parties Only”; and

FURTHER ORDERED that after conferring with Petitioner, Patent Owner shall, within one week of this Decision, submit to the Board via

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email to Trials@uspto.gov, a version of this Decision to be filed on the public record, with any redactions proposed by either party.

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For PETITIONER:

Miguel Bombach
Bing Ai
John Esterhay
John Schnurer
Brianna Kadjo
Justin Jiang
PERKINS COIE LLP
bombach-ptab@perkinscoie.com
ai-ptab@perkinscoie.com
esterhay-ptab@perkinscoie.com
schnurer-ptab@perkinscoie.com
kadjo-ptab@perkinscoie.com
jiang-ptab@perkinscoie.com

For PATENT OWNER:

Alan Whitehurst
Nicholas T. Matich
Arvind Jairam
Stuart McCommas
Archis “Neil” Ozarkar
MCKOOL SMITH, P.C.
awhitehurst@mckoolsmith.com
nmatich@mckoolsmith.com
ajairam@mckoolsmith.com
smccommas@mckoolsmith.com
nozarkar@mckoolsmith.com