

PUBLIC VERSION

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SEMICONDUCTOR COMPONENTS INDUSTRIES, LLC D/B/A
ONSEMI and TEXAS INSTRUMENTS INCORPORATED,
Petitioner,

v.

GREENTHREAD, LLC,
Patent Owner.

IPR2023-01243¹
Patent 10,510,842 B2

Before GRACE KARAFFA OBERMANN, DONNA M. PRAISS, and
MONICA S. ULLAGADDI, *Administrative Patent Judges*.

PRAISS, *Administrative Patent Judge*.

JUDGMENT

Final Written Decision on Remand
Determining All Challenged Claims Unpatentable and
Admitting Exhibits 2077 and 2079
35 U.S.C. § 318(a)

¹ Texas Instruments Incorporated, which filed a petition in IPR2024-00672, has been joined as a petitioner in this proceeding. Paper 67.

I. INTRODUCTION

A. Background

Semiconductor Components Industries, LLC (“Petitioner”) filed a Petition (Paper 2, “Pet.”) requesting *inter partes* review of claims 1–18 (“the challenged claims”) of U.S. Patent No. 10,510,842 B2 (Ex. 1001, “the ’842 patent”). Greenthread, LLC (“Patent Owner”) filed a Preliminary Response (Paper 55, “Prelim. Resp.”).¹ With Board authorization, Petitioner filed a Preliminary Reply (Paper 21), and Patent Owner filed a Preliminary Sur-reply (Paper 56).

Upon review of the preliminary record, we instituted *inter partes* review, pursuant to 35 U.S.C. 314, as to the challenged claims based on the challenges set forth in the Petition. (Paper 31, “Institution Decision” or “Inst. Dec.”).

Patent Owner filed a Patent Owner Response (Paper 58, “PO Resp.”); Petitioner filed a Reply to the Patent Owner Response (Paper 69, “Pet. Reply”); and Patent Owner filed a Sur-reply (Paper 65, “PO Sur-reply”). An oral hearing was held on November 13, 2024, and a transcript of the hearing is included in the record. Paper 81 (“Tr.”).

On February 19, 2025, the Board entered a Final Written Decision in this proceeding concluding that challenged claims 1–18 of the ’842 patent were invalid as unpatentable. Paper 84 (“FWD”). On April 24, 2025, the Director granted Patent Owner’s request for review, vacated the Final

¹ Unless noted otherwise, we cite to the public versions of the papers filed by the parties.

Written Decision, and remanded to the Board for further proceedings. Paper 91 (“Director Review Order” or “Dir. Rev. Order”).

B. Director Review Order

1. Additional Discovery Concerning Privity

The Director Review Order remands “to the Board with instructions to allow discovery, narrowly tailored to” a privity issue concerning an alleged relationship between Petitioner and a nonparty, Intel, “such as any indemnification agreements between Petitioner and Intel and the terms and conditions of sale agreements between Petitioner and Intel related to products accused of practicing the challenged claims.” Dir. Rev. Order 3. In particular, the Director Review Order states that

[t]he Board should then determine on the full record whether Petitioner has met its burden of demonstrating it is not time-barred under § 315(b); that is, whether Patent Owner has produced some evidence to support its argument that Intel should be named as a privy so as to have put the issue into dispute.

Id. (citing *Worlds Inc. v. Bungie, Inc.*, 903 F.3d 1237, 1242–44 (Fed. Cir. 2018)).

2. The Location of the “Graded Dopant Concentration”

The Director Review Order found “the Board abused its discretion by not fully addressing the arguments” because

[t]he Board declined to consider Patent Owner’s arguments “concerning the location of the graded dopant concentration,” finding these arguments untimely as first presented in the Sur-Reply. Decision 45 (citing Patent Owner’s Sur-Reply argument that the prior art’s disclosure refers to “gradients and carriers *outside the active region*”). Patent Owner, however, timely

presented these arguments in the Response. *See* Paper 59, 24–25 (arguing that the prior art’s carriers are not in the active regions and, therefore, “the carriers that its graded dopant concentration affects are in the wrong place”).

Dir. Rev. Order 4. The Director Review Order indicates that, on remand, “if the petitions are not time-barred, [the Board] is to consider and address Patent Owner’s arguments concerning the location of the graded concentration.” *Id.*

3. Motion to Strike District Court Orders

The Director Review Order determined that the Board’s “refusal to admit and consider the claim construction orders was legally erroneous because the orders were not ‘evidence.’” Dir. Rev. Order 5. According to the Director Review Order, “[t]he refusal also was an abuse of discretion because the orders were responsive to Petitioner’s arguments and thus timely.” *Id.* at 5–6.

Under the circumstances here, where Patent Owner properly argued that the claim construction dispute between the parties crystallized only in Petitioner’s Reply, the Board should have admitted the district court claim construction rulings and given them “appropriate weight.” Accordingly, on remand, if the petitions are not time-barred, the Board is to admit Exhibits 2077 and 2079 and reconsider the parties’ arguments in view of these two exhibits.

Id. at 6 (footnote omitted) (citing Patent Trial and Appeal Board Consolidated Trial Practice Guide (Nov. 2019) (“CTPG”), 47).

For the reasons that follow, we again conclude that Petitioner has established, by a preponderance of the evidence, that each of the challenged claims of the ’842 patent is unpatentable.

C. Real Parties in Interest

Each party identifies itself as a real party-in-interest. Pet. 1; Paper 4, 2. In addition, Petitioner identifies ON Semiconductor Corporation as a real party-in-interest. Pet. 1. Texas Instruments Incorporated was joined as a petitioner in this proceeding and identifies itself as a real party-in-interest. IPR2024-00672, Paper 3, 1.

D. Related Proceedings

The parties indicate that the '842 patent is at issue in the following district court proceedings:

Greenthread, LLC v. Western Digital Corp., No. 1:23-cv-00326 (D. Del. filed March 24, 2023);

Greenthread, LLC v. Cirrus Logic, Inc., No. 1:23-cv-00369 (W.D. Tex. filed March 31, 2023);

Greenthread, LLC v. Texas Instruments Inc., No. 2:23-cv-00157 (E.D. Tex. filed April 6, 2023);

Greenthread, LLC v. OSRAM GmbH, No. 2:23-cv-00179 (E.D. Tex. filed April 19, 2023);

Greenthread, LLC v. ON Semiconductor Corp., No. 1:23-cv-00443 (D. Del. filed April 21, 2023);

Greenthread, LLC v. OmniVision Technologies, Inc., No. 2:23-cv-00212 (E.D. Tex. filed May 10, 2023); and

Greenthread, LLC v. Monolithic Power Systems, Inc., No. 1:23-cv-00579 (D. Del. filed May 26, 2023).

Pet. 1–2; Paper 5, 1–2.

The parties also note that the '842 patent was at issue in a number of district court and *inter partes* review proceedings that are no longer pending. Pet. 2–3; Paper 5, 3–4.

E. The '842 Patent

The '842 patent issued December 17, 2019, and claims the benefit of a series of continuation applications, the earliest of which was filed September 3, 2004. Ex. 1001, codes (45), (60). The '842 patent is titled “Semiconductor Devices with Graded Dopant Regions” and “relates to all semiconductor devices and systems.” *Id.* at code (54), 1:32–33.

The '842 patent explains that, in bipolar junction transistors, minority carriers are the principal device conduction mechanism, but notes that majority carriers also play a small but finite role in modulating the conductivity in such devices. *Id.* at 1:43–47. The '842 patent further explains that “[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 1:55–57. According to the '842 patent, this improvement has not been implemented in most semiconductor devices, including various power MOSFETs and IGBTs, which “still use a uniformly doped ‘drift epitaxial’ region in the base.” *Id.* at 1:57–62. The invention of the '842 patent implements a graded dopant concentration in these devices, which the '842 patent contends results in two important performance enhancements: “electrons can be swept from source to drain rapidly, while at the same time holes can be recombined closer to the n^+ buffer layer,” thereby improving “ t_{on} and t_{off} in the same device.” *Id.* at 3:38–43.

Figure 1 of the '842 patent is reproduced below.

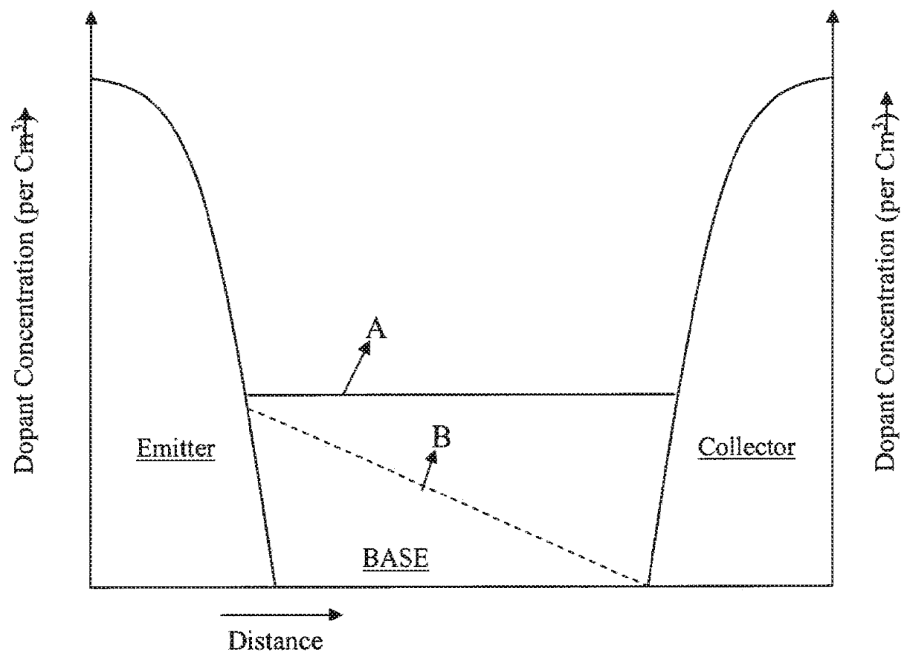


Figure 1 is labeled “Prior Art” and shows a plot of dopant concentration versus distance. Ex. 1001, Fig. 1. According to the ’842 patent, Figure 1 “illustrates the relative doping profiles of emitter, base and collector for the two most popular bipolar junction transistors: namely, uniform base (‘A’) and graded base (‘B’).” *Id.* at 2:35–38.

Figure 3A of the ’842 patent is reproduced below.

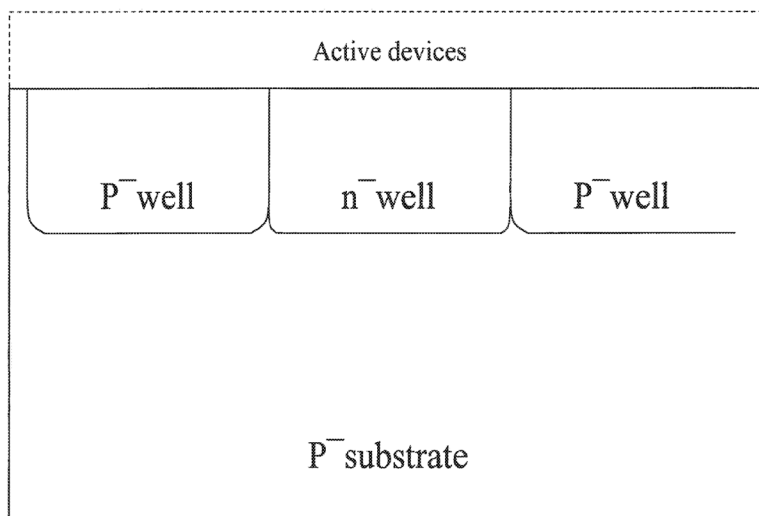


Figure 3A is labeled “Prior art (Twin well CMOS) for a CMOS integrated circuit” (“IC”), and shows a “typical” complementary metal-oxide-semiconductor (“CMOS”) very large-scale integrated circuit (“VLSI”) device that employs “a twin well substrate, on which active devices are subsequently fabricated.” *Id.* at 2:16–18, Fig. 3A; *see also id.* at 2:41–46 (explaining that Figure 3A shows a “commonly used prior art CMOS silicon substrate[]” having “a typical prior art IC with two wells (one n⁻well in which p-channel transistors are subsequently fabricated and one p⁻well in which n-channel transistors are subsequently fabricated)”).

Figure 5A of the '842 patent is reproduced below.

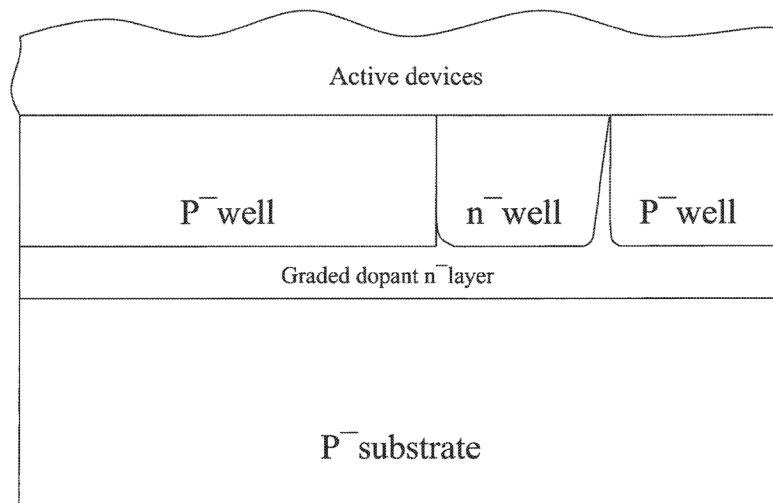


Figure 5A illustrates a cross section of a CMOS silicon substrate with two wells and an underlying layer using embodiments of the invention. *Id.* at 2:54–56. Figure 5A is labeled “[a] CMOS Substrate for digital, mixed[] signal, and sen[s]or[] IC’s.” Ex. 1001, Fig. 5A. The figure illustrates “a CMOS silicon substrate with two wells and an underlying layer,” which is labeled “Graded dopant n⁻ layer.” *Id.* at 2:54–58, Fig. 5A.

According to the '842 patent, “[s]purious minority carriers can be generated by clock switching in digital VSLI logic and memory ICs.” Ex. 1001, 3:47–48. The '842 patent states that these “unwanted carriers” degrade performance of various types of devices, including digital imaging ICs, and describes “a novel technique” in which “a drift field [is used] to sweep these unwanted minority carriers from the active circuitry at the surface into the substrate in a monolithic die as quickly as possible.” *Id.* at 3:49–55, 3:60–64. For example, “[i]n a preferred embodiment, the subterranean n⁻layer has a graded donor concentration to sweep the minority carriers deep into the substrate.” *Id.* at 3:64–66.

F. Illustrative Claim

Petitioner challenges claims 1–18 (all claims) of the '842 patent. Claims 1 and 9 are independent, and claim 1 is illustrative of the claimed subject matter.

1. 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;

[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; and

[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.

Ex. 1001, 4:45–60 (bracketed numbering added by Petitioner).

G. Instituted Challenges to Patentability

We instituted review on the following challenges:

Claims Challenged	35 U.S.C. §²	Reference(s)/Basis
1, 2, 4–10, 12–18	103(a)	Kawagoe ³
1, 2, 4–10, 12–18	103(a)	Kawagoe, Gupta ⁴
1–3, 5–11, 13–18	103(a)	Wieczorek, ⁵ Wolf ⁶
1–3, 5–11, 13–18	103(a)	Wieczorek, Wolf, Gupta

Pet. 5. Petitioner filed the Declaration of Travis Blalock, Ph.D. (Ex. 1003) in support of the Petition. Patent Owner filed the Declarations of Alexander

² The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), included revisions to 35 U.S.C. §§ 102 and 103 that became effective in 2013, 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 US 6,043,114, issued March 28, 2000 (Ex. 1007, “Kawagoe”). Petitioner asserts that Kawagoe is prior art under 35 U.S.C. § 102(b). Pet. 4.

⁴ US 6,163,877, issued December 19, 2000 (Ex. 1014, “Gupta”). Petitioner asserts that Gupta is prior art under 35 U.S.C. § 102(b). Pet. 5.

⁵ US 2003/0183856 A1, published October 2, 2003 (Ex. 1006, “Wieczorek”). Petitioner asserts that Wieczorek is prior art under 35 U.S.C. §§ 102(a) and (e). Pet. 5.

⁶ Stanley Wolf and Richard N. Tauber, *Silicon Processing for the VLSI Era*, Vols. 1–4, Lattice Press (2000) (Ex. 1008, “Wolf”). Petitioner asserts that Wolf was published and publicly available no later than 2002, and is prior art under 35 U.S.C. § 102(b). Pet. 5 (citing Exs. 1012, 1013, 1036). Exhibit 1008 was submitted in four parts (A–D) and includes selected portions of Wolf. We cite to Wolf using its original page numbers and omit the exhibit part designations.

Glew, Ph.D. (Ex. 2057) and Philip John (Ex. 2072) in support of its Response. The parties also filed transcripts of the depositions of Dr. Blalock (Ex. 2058), Dr. Glew (Ex. 1052), and Mr. John (Ex. 1053).

II. TIMELINESS OF PETITION UNDER 35 U.S.C. § 315(B)

Pursuant to 35 U.S.C. § 315(b), “[a]n *inter partes* review may not be instituted if the petition requesting the proceeding is filed more than 1 year after the date on which the petitioner, real party in interest, or privy of the petitioner is served with a complaint alleging infringement of the patent.” Patent Owner argues that the Petition should be dismissed because it is untimely. PO Resp. 39. In particular, Patent Owner argues Petitioner is in privity with Intel Corp. (“Intel”) and [REDACTED] (collectively “Licensees”), who Patent Owner asserts are both time-barred under 35 U.S.C. § 315(b) and licensed under the ’842 patent. *Id.* at 41–47.

The question of whether Petitioner is time-barred under § 315(b) is part of the determination of whether to institute an *inter partes* review. *See Thryv, Inc. v. Click-to-Call Tech., LP*, 140 S. Ct. 1367, 1373 (2020) (“§ 315(b) expressly governs institution and nothing more”). In our Institution Decision, we determined that Patent Owner had not provided a sufficient factual basis upon which to conclude [REDACTED] is a time-barred entity (Dec. Inst. 12), or that Petitioner and Intel or [REDACTED] were privies, based on any of its theories regarding privity. *Id.* at 20. We incorporate that analysis here (*see* Dec. Inst. 10–20), and reconsider Patent Owner’s contention only to the extent it is warranted by subsequent argument and evidence.⁷ *See*

⁷ Patent Owner’s exhibits 2001–2048 were entered prior to Institution. Patent Owner exhibits 2049–2082 were submitted during trial, with certain

Achates Reference Publ'g Inc. v. Apple Inc., 803 F.3d 652, 658 (Fed. Cir. 2015) (“The Board’s reconsideration of the time-bar [in the final determination] is still fair[ly] characterize[ed] as part of the decision to institute.”) (citations omitted).

Following the Director’s Remand Order, the parties filed a Joint Paper Concerning Additional Discovery in which they indicated that the parties “have conferred but were unable to come to agreement on the proper scope of additional discovery” and provided “[t]he respective positions of the [p]arties.” Paper 103 (sealed), 1. In particular, Patent Owner asks for

1. All sales agreements (containing terms and conditions of sale) and/or indemnification agreements related to Petitioner’s products sold to Intel, [REDACTED].
2. All communications between (i) Petitioner and (ii) Intel, [REDACTED], relating to indemnification concerning products that Petitioner makes for, or sells to, Intel, [REDACTED].

Id. at 5.⁸

exceptions for redacted documents. Patent Owner exhibits 2103 and 2104 were submitted after remand to the Board.

⁸ In a set of related cases—IPR2024-00263, IPR2024-00264, IPR2024-00265, and IPR2024-00266—involving the same entities with the exception of Texas Instruments, Inc., Patent Owner stated that it would not seek post-hearing discovery on the same discovery issue that was the subject of the Director’s Decision in the first wave cases. *See e.g.*, IPR2024-00263, Paper 62, 69:10–20 (“JUDGE OBERMANN: Are you or are you not requesting additional discovery in this case? MR. WHITEHURST: I am not requesting additional discovery. I believe we have satisfied *Worlds*, are on the record that is before this Panel there is only one correct outcome, and that is to terminate the IPRs as time barred JUDGE OBERMANN: So you are absolutely stating that you would not request additional discovery in these

On June 27, 2025, we *sua sponte* issued a Discovery Order (“Disc. Order,” Paper 109, 5), “narrowly tailored,” consistent with the Director Review Order, ordering Petitioner to provide the following discovery to Patent Owner in this proceeding

- (a) . . . documents [including]:
 - a. [s]ales agreements between Petitioner and Intel for the Intel Accused Products;⁹ and
 - b. [i]ndemnification agreements between Petitioner and Intel for the Intel Accused Products. *See* [Director Review Order] 3.
- (b) Documents sufficient to show the asserted privity relationship between Petitioner and Intel, including any new declaration(s) that establish that no documents responsive to Subsection (a) above exist... as well as any documents and new declaration(s) that establish (1) the time by which Petitioner became aware of the Intel litigation referenced in the [Director Review Order]; (2) whether Petitioner was the supplier of any product, or component of a product, accused of infringement in the Intel litigation; and (3) whether Petitioner was in a position to control, or actually controlled, Intel’s defense of that litigation.

Disc. Order 10 (internal quotations omitted).

In response to our Discovery Order, Petitioner produced the Declaration of Matthew Murphy. Ex. 2103 (“Murphy Declaration”). Patent Owner cross-examined Mr. Murphy and a deposition transcript was entered

cases? MR. WHITEHURST: We are not requesting additional discovery, Your Honor.”)

⁹ The “products accused” consist of “the ‘Intel Accused Products’” identified on pages 4–8 of Exhibit 2048.

into the record. Ex. 2104.¹⁰ Patent Owner subsequently filed a Patent Owner’s Post-Remand Brief Concerning Board-Ordered Discovery (“PO Remand Br.,” Paper 112, sealed), Petitioner filed a Petitioner’s Responsive Post-Remand Brief (“Pet. Remand Reply,” Paper 115), and Patent Owner filed a Patent Owner’s Reply Post-Remand Brief Concerning Board-Ordered Discovery (“PO Remand Sur-Reply,” Paper 116). We conducted a telephonic hearing on September 18, 2025 (“Remand Tr.,” Exhibit 1059).

The briefs comingle analyses of the issues of real party in interest (RPI) and privity, and often use the terms interchangeably. *See e.g.*, PO Remand Br. 2; PO Reply Remand Sur-reply 2. The two terms, however, describe distinct concepts with differing effects under the statute. *See, e.g.*, 35 U.S.C. § 312(a)(2) (petition must identify all RPIs, but not privies). Prior to analyzing the parties’ arguments, we summarize the concept of privity below.

A. Statutory Bar as Nonparty Preclusion

The one-year statutory bar of § 315(b) “helps to ensure that *inter partes* review provides a quick and cost-effective alternative to litigation, and is not used as a tool for harassment or litigation gamesmanship.” *Johnson Health Tech. Co. v. Icon Health & Fitness, Inc.*, Case IPR2014-01242, slip op. 3 (PTAB Feb. 11, 2015) (Paper 16) (citing H.R. REP. NO. 112-98 at 48, *as reprinted in* 2011 U.S.C.C.A.N. at 78). In this sense, § 315(b) is analogous to the common-law doctrines of claim preclusion and issue preclusion, which “preclude parties from contesting matters that they

¹⁰ The record includes two of Exhibit 2104, a public version and a sealed version. We cite to the *sealed* version of this exhibit unless otherwise noted.

have had a full and fair opportunity to litigate,” thereby “protect[ing] their adversaries from the expense and vexation attending multiple lawsuits, conserv[ing] judicial resources, and foster[ing] reliance on judicial action by minimizing the possibility of inconsistent decisions.” *Montana v. United States*, 440 U.S. 147, 153–54 (1979). Our Practice Guide, therefore, looks to these doctrines of preclusion in interpreting the language of § 315(b). *See* CTPG 12–17.

Like the common-law preclusion doctrines, the preclusive effect of § 315(b) also extends beyond those who were parties to the prior lawsuit. Because nonparty preclusion risks binding those who have not had a full and fair opportunity to litigate, the Supreme Court has cautioned that there is a general rule against nonparty preclusion, subject only to limited exceptions. *See Taylor v. Sturgell*, 553 U.S. 880, 892–93 (2008). In *Taylor*, while noting that it was not a “definitive taxonomy” (*id.* at 893 n.6), the Court set forth a list of six “categories” under which nonparty preclusion may apply.¹¹

(1) “[A] person who *agrees to be bound* by the determination of issues in an action between others is bound in accordance with the terms of his agreement.” *Id.* at 893 (emphasis added).

(2) “[N]onparty preclusion may be justified based on a variety of *pre-existing ‘substantive legal relationship[s]’* between the person to be bound and a party to the judgment,” such as “preceding and succeeding owners of property, bailee and bailor, and assignee and assignor.” *Id.* at 894 (emphasis added).

(3) “[I]n certain limited circumstances,” such as class actions, “a nonparty may be bound by a judgment because she was

¹¹ For clarity, we omit internal quotation marks and citations throughout the list of categories enumerated in *Taylor*, and add emphasis on certain key phrases.

‘adequately represented by someone with the same interests who [wa]s a party to the suit.’” *Id.* The Court later elaborated that this exception applies only if there are “special procedures to protect the nonparties’ interests or an understanding by the concerned parties that the first suit was brought in a representative capacity.” *Id.* at 900 (emphasis added).

(4) “[A] nonparty is bound by a judgment if she ‘*assume[d] control*’ over the litigation,” because that person “has had the opportunity to present proofs and argument . . . even though he was not a formal party to the litigation.” *Id.* at 895 (emphasis added).

(5) “[A] party bound by a judgment may not avoid its preclusive force by *relitigating through a proxy*,” such as “when a nonparty later brings suit as an agent for a party who is bound by a judgment.” *Id.* (emphasis added).

(6) “[A] *special statutory scheme*,” such as bankruptcy or probate, “may ‘expressly foreclose[e] successive litigation by nonlitigants . . . if the scheme is otherwise consistent with due process.’” *Id.* (emphasis added)

Having listed these categories, the Court then held that a broader doctrine of nonparty preclusion, termed “virtual representation,” was inconsistent with Federal common law, and risked violating due process. *Id.* at 898–900. Therefore, nonparty preclusion cannot be based on mere “identity of interests and some kind of relationship between parties and nonparties.” *Id.* at 901.

B. *Caselaw on Privity*

“[T]he 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.” Id. (emphasis added). In other words, 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 LLC v. ION Geophysical Corp.*, 889 F.3d 1308, 1319 (Fed. Cir. 2018).

Though expansive, the concept of privity has boundaries set by due process. As the Court held in *Taylor*, extending the preclusive concept of privity to those in “virtual representation,” through identity of interest and a determination that the relationship of the parties is “‘close enough’ to bring the second litigant within the judgment,” is impermissible. *See Taylor*, 553 U.S. at 898. Only if the nonparty can be said to have had a “full and fair opportunity to litigate” can that nonparty be precluded as a privy. *Id.* at 892–93; *see also Aspex Eyewear, Inc. v. Zenzi Optical, Inc.*, 713 F.3d 1377, 1382 (Fed. Cir. 2013) (“[a] full and fair opportunity to litigate is the touchstone of any preclusion analysis.”).

Courts examine different aspects of the parties’ relationship, depending on the issue for which privity is being asserted. *See Int’l Nutrition Co. v. Horphag Research, Ltd.*, 220 F.3d 1325, 1329 (Fed. Cir. 2000) (“[a] variety of relationships between two parties can give rise to the conclusion that a nonparty to an action is ‘in privity’ with a party to the action”). For example, the parties’ contractual relationship (privity of contract) regarding a product is relevant when determining whether an injunction against the

sale of that product applies. *See In re Cyclobenzaprine Hydrochlorine Extended-Release Capsule Patent Litigation*, 504 F. App'x 900, 906 (Fed. Cir. 2013) (unpublished). In other situations—for example, in the case of a judgment with respect to a particular property interest—the relationship between the parties with respect to the transfer of the property may be the focus. *See Int'l Nutrition*, 220 F.3d at 1329. Therefore, the same two parties may be in privity for certain purposes, but not for others. *Id.*

In the context of § 315(b), the goal of the preclusion is to prevent successive challenges to a patent by those who previously have had the opportunity to make such challenges in prior litigation. As such, the focus of our privity inquiry is on the relationship between the parties *during the prior lawsuit*. In other words, we ask whether the instant petitioner and the prior litigant's relationship—as it relates to the lawsuit—is sufficiently close that it can be fairly said that the petitioner has had a full and fair opportunity to litigate the validity of the patent in the lawsuit. *Aruze Gaming Macau, Ltd. v. MGT Gaming, Inc.*, IPR2014-01288, Paper 13, p. 14 (PTAB Feb. 20, 2015).

In this sense, our privity inquiry will typically fall into *Taylor*'s fourth category of nonparty preclusion, which applies to situations in which the petitioner “has had ‘the opportunity to present proofs and argument’” such that it can be said to have “assumed control” over the action. *Taylor*, 553 U.S. at 895. Our Practice Guide reflects this, noting that control is a “common consideration” in the privity inquiry. CTPG 16.

Furthermore, we note that *actual* assumption of control of the lawsuit is not necessary for a finding of privity; the opportunity, or legal right, to assume control is sufficient. “Substantial control . . . connotes the

availability of a significant degree of effective control in the prosecution or defense of the case—what one might term, in the vernacular, the power—whether exercised or not—to call the shots.” *Gonzalez v. Banco Central Corp.*, 27 F.3d 751, 758 (1st Cir. 1994); *see Arris Group, Inc. v. C-Cation Techs., LLC*, Case IPR2014-00746, slip op. at 10 (PTAB Nov. 24, 2014) (Paper 22) (inquiring into whether party exercised, or could have exercised, control over District Court action); *see also* CTPG 16 (quoting 18A Charles Alan Wright, Arthur R. Miller & Edward H. Cooper, *Federal Practice & Procedure* § 4451 (2d ed. 2011)) (“control generally means that ‘it should be enough that the nonparty has the actual measure of control or *opportunity to control* that might reasonably be expected between two formal coparties’”) (emphasis added).

Finally, privity is based on “flexible and equitable considerations,” and, therefore, neither the Practice Guide nor our decisions set any bright-line test for when privity exists. CTPG 14. Nor should the preceding discussion be understood to mandate that all § 315(b) privity relationships fall within the fourth “assumed control” category set forth in *Taylor*. Common to our cases, however, is a focus on the relationship between the parties in the context of the prior lawsuit, and an inquiry as to whether the petitioner’s relationship with the prior litigant was sufficiently close that it can be said that the petitioner had, or will have, a full and fair opportunity to litigate the validity of the patent in that prior action.

If we are satisfied that petitioner has “enjoyed its day in court” through its relationship with the litigant, it is fair to consider the parties to be privies. In *Taylor*, the Court held that “a party bound by a judgment may not avoid its preclusive force by relitigating through a proxy. Preclusion is thus

in order when a person who did not participate in a litigation later brings suit as the designated representative of a person who was a party to the prior adjudication . . . [I]t also seems clear that preclusion is appropriate when a nonparty later brings suit as an agent for a party who is bound by a judgment.” *Taylor*, 553 U.S. 895.

C. Patent Owner’s Privity Arguments on Remand

Patent Owner argues that it “has presented far more than ‘some evidence’ that time-barred parties, including Intel, should have been named as [an] RPI in the Petition.” PO Remand Br. 2 (footnote omitted). Patent Owner also argues that it “maintains that Petitioner is in privity with . . . two other time-barred parties” and “that discovery should have been granted as to these parties for at least the reasons presented in PO’s portion of the Joint Paper Concerning Additional Discovery.” *Id.* at 2, n.3 (citing Paper 108 [sic Paper 103], 2–5).

Based on those allegations, Patent Owner takes issue with the Murphy Declaration as “merely repeat[ing] its previously-offered attorney argument without providing any additional detail, documentation, or substantiation to those arguments.” PO Remand Br. 4; *see id.* at 5–6. Patent Owner contends that Mr. Murphy “did not contact anyone within the company or at Intel to discuss whether any Intel parts (accused or otherwise) include Petitioner’s components.” *Id.* at 6; *see id.* at 7–11.

Patent Owner contends, *instead*, that “[a]ll Mr. Murphy ‘confirmed’ was that Petitioner does not sell the Intel Accused Products (IAPs) to Intel, something that PO has never alleged.” *Id.* at 6. Patent Owner takes the position that “Petitioner has not established whether or not it was the

‘supplier of any . . . **component** of a product[] accused in the Intel litigation,’ as required by the Board.” *Id.* at 8 (citing Disc. Order 10). Patent Owner further contends that Petitioner’s Declarant, Mr. Murphy, did not consult with the parties or people who would possess relevant information and that Petitioner failed to present any documentary evidence supporting Mr. Murphy’s statements. PO Remand Br. 9–15.

D. Petitioner’s Privity Arguments on Remand

Petitioner contends that “Intel and onsemi are not in privity,” and Patent Owner’s “speculative and disproven arguments are not sufficient under *Worlds* or any other known jurisprudence to indicate that onsemi is time-barred.” Pet. Remand Reply. 1, 11. According to Petitioner, “[t]he evidence is undisputed that ‘onsemi does not currently and has never sold any of the Intel Accused Products’ and ‘onsemi does not currently and has never sold any component of the Intel Accused Products.’” *Id.* at 1 (footnote omitted) (citing Ex. 2103 ¶ 7). Petitioner contends that “discovery has confirmed that Intel *never* sought indemnity from onsemi for the Intel [l]itigation, which makes sense because no onsemi products were at issue in the case.” *Id.* at 11 (internal citation omitted) (citing Ex. 2103 ¶¶ 7, 8), 6.

E. Analysis of the Parties’ Privity Arguments

Our analysis below concerns whether Petitioner is in privity with Intel. *See* Director’s Decision 3; Remand Tr. 14:7–15:2 (Petitioner’s counsel asserting that privity, not RPI, is in dispute in the present proceeding). *Worlds* is a seminal case that addresses burdens on the parties when § 315 is at issue. In *Worlds*, the Court held that “an IPR petitioner’s initial

identification of the real parties in interest should be accepted unless and until disputed by a patent owner.” *Worlds*, 903 F.3d 1242. The Court also “agree[d] that a patent owner must produce *some evidence* to support its argument that a particular third party should be named a real party in interest.” *Id.* “[T]here can be no doubt that the IPR petitioner bears the ultimate burden of persuasion to show that its petitions are not time-barred under § 315(b) based on a complaint served on an alleged real party in interest more than a year earlier.” *Id.* Although *Worlds* addressed RPI, it more broadly discussed § 315 in general, which covers both RPI and privity.

In the present proceeding, Patent Owner did not produce “some evidence” tending to show that Petitioner is in privity with Intel and the burden never shifted to Petitioner. If Patent Owner did produce sufficient evidence to put the relationship between Petitioner and Intel into dispute, the evidence adduced during trial and on remand sufficiently supports Petitioner’s position and, in particular, satisfies Petitioner’s burden to show it is not time barred under § 315(b).

The evidence adduced during trial and on remand does not support a finding that the relationship between Petitioner and Intel is sufficiently close that both should be bound by the trial outcome and related estoppels, nor does it suggest, without more, that the parties were litigating either the district court action or the IPRs as proxies for the other. In a nutshell, the record is devoid of evidence tending to show that Petitioner controlled, or had an opportunity to control, the litigation. To the contrary, as explained below, the only record evidence on point supports Petitioner’s position that it did not control, or have any opportunity to control, the litigation.

Petitioner contends that Patent Owner “does not (and cannot) dispute that onsemi was not aware of the Intel litigation until Friday, April 21, 2023, when Greenthread sued onsemi.” Pet. Remand Reply 1 (citing Ex. 2103 ¶¶ 9, 10). Petitioner further contends that “[b]ecause the Intel litigation was dismissed the very next Monday, April 24, 2023, as a matter of timing, it would have been impossible for onsemi to be involved in the Intel litigation, much less exercise any control over it.” *Id.* Mr. Murphy credibly testifies that onsemi was not “in a position to control,” nor did onsemi “actually control[] Intel’s defense of the Intel [l]itigation.” Ex. 2103 ¶¶ 9, 10.

In light of the assertions of lack of *actual* participation in and control of or opportunity to control the Intel litigation by Petitioner, and the lack of evidence as to whether Intel controlled or had an opportunity to control Petitioner’s decisions in the Petitioner-initiated IPRs,¹² we next consider Petitioner and Intel’s relationship, as it relates to the Intel litigation. We consider whether that relationship is sufficiently close such that the Intel litigation would have given Petitioner a full and fair opportunity to litigate the validity of the challenged claims of the ’842 patent or whether Petitioner “is simply serving as a proxy to allow” Intel “to litigate the patent validity question that” Intel “raised in an earlier-filed litigation.” *See WesternGeco*, 889 F.3d at 1319, 1320 (“[T]he privity analysis is broader than simply inquiring whether PGS controlled or had an opportunity to control ION’s decisions in the ION patent infringement litigation, or whether ION

¹² Patent Owner does not argue that Intel is an RPI to the present proceeding and there is no evidence in the record for this.

controlled or had an opportunity to control PGS's decisions in the PGS-initiated IPRs.").

In response to the Board's Discovery Order, Petitioner produced evidence, none of which supports Patent Owner's argument that Intel should be named as a privy so as to put the issue into dispute. *See* Dir. Rev. Order 3. It is worth emphasizing here that, contrary to Patent Owner's position (*see, e.g., supra* 12 n.8), the Director did not indicate that Patent Owner had met its burden of production under the *Worlds* decision. To the contrary, the Director remanded to the Board to allow discovery to determine, on the full record, "whether Patent Owner has produced some evidence to support its argument that Intel should be named as a privy *so as to have put the issue into dispute.*" *Id.* (Board's emphasis).

Notwithstanding Patent Owner's arguments, addressed below, we find persuasive Petitioner's Declarant's testimony that

[b]ecause onsemi has never sold any of the Intel Accused Products or any component of any of the Intel Accused Products to Intel (*or to anyone else*), I can confirm that onsemi has never signed and does not possess any customer agreements, sales agreements, indemnification agreements, or any other documents concerning the sale of the Intel Accused Products.

Ex. 2103 ¶ 7 (emphasis added). Specifically, Mr. Murphy has been "the Vice President of Sales, Americas, at Semiconductor Components Industries, LLC ('onsemi')" for "approximately the last four years," and has "been employed by onsemi and its predecessor company in various positions for more than twenty-five years." Ex. 2103 ¶ 3. Because of his "current role and . . . long history in sales-related roles at onsemi," Mr. Murphy testifies that he is "familiar with . . . whether any particular onsemi product has been sold

to Intel Corporation (‘Intel’) in particular.” *Id.* ¶ 4. We are persuaded that his experience supports that he had sufficient knowledge to make the attestation set forth above.

Mr. Murphy’s deposition testimony also supports his Declaration testimony. Ex. 2104, 26:9–13 (“ . . . None of the parts we [(onsemi)] sell would be part of a[n] Intel CPU”), 33:20–34:8 (“Q. As you sit here today testifying under penalty of perjury, can you tell me definitively whether any of the products listed on Pages 4 through 8 of Exhibit 2048, include an onsemi part or product? A. I can confirm they do not.”), 35:14–19 (“I can confirm that onsemi does not currently and has never sold any of the Intel accused products. And I can confirm that onsemi does not currently and has never sold any component of the Intel accused products.”), 36:15–17 (“I do not sell any of these accused products or any component of those products to Intel.”), 83:6–12 (“Q. . . . Do you know whether the Intel Atom C2308 in fact included onsemi or Semiconductor Components Industries, LLC parts or elements? . . . [A.] I know that it does not include components of onsemi or Semiconductor Components Industries, LLC.”).

In response to Patent Owner’s allegation that “‘Mr. Murphy clearly admitted that he does not know’ whether the Intel Accused Products include an onsemi part,” Petitioner clarified that “Mr. Murphy misunderstood one line of questions and answered in a way that suggested he did not know whether the Intel Accused Products included onsemi components.” Pet. Remand Reply 12 (citing PO Remand Resp. 8; Ex. 2104, 62:3–17). Petitioner persuasively argues that “Mr. Murphy corrected this misunderstanding both on redirect and in the errata to his deposition.” *Id.* (citing Ex. 2104, 62:3–17, 83:6–84:11, 104:1–22). Petitioner contends, and

we agree, that “[t]he full record thus shows that Mr. Murphy knows that the Intel Accused Products *do not* include onsemi components.” *Id.* (citing Ex. 2014, 33:20–34:8). We are neither apprised of nor can discern evidence of inaccuracies, inconsistencies, or any other impropriety, particularly as Mr. Murphy testified under penalty of perjury.

We agree with Petitioner that “the best source of proof for this *negative* point—*i.e.*, that onsemi *does not supply* the Intel Accused Products or components thereof—is testimony from a person knowledgeable about onsemi’s business” and agree that “Mr. Murphy’s declaration and deposition testimony resolves this question.” Pet. Remand Reply 13; *but see* PO Remand Resp. 14–15.

We did not order a particular style or depth of investigation (*see* Disc. Order 10), nor do we think that Petitioner’s investigations were in any way insufficient. In particular, we disagree with Patent Owner’s position that compliance with our Discovery Order required Petitioner’s Declarant to contact Intel to determine whether IAPs include components sold or manufactured by Petitioners or contact distributors, manufacturing fabs, or corporate affiliates as part of their investigation. *See, e.g.*, PO Remand Resp. 10. The Declaration produced by Petitioner is sufficient to comply with our Discovery Order.

We further agree with Petitioner’s contention that Patent Owner’s teardown analyses of the IAPs do not tend to show that the IAPs contain any components that are supplied by any third party, including Petitioner, otherwise, Patent Owner’s “teardown analysis and robust party discovery in the Intel litigation would have revealed it.” Pet. Remand Reply 6–7 (citing Ex. 2048, 52–56). Thus, the teardown analysis supports Petitioner’s view

that the accused products in the Intel litigation are limited to the enumerated Intel products listed on pages 4–8 of Exhibit 2048. Our analysis, in that regard, satisfies the Director’s mandate that we resolve, on the full record, whether “Petitioner was a supplier of” products that were “accused of practicing the challenged claims” in the Intel litigation. Dir. Rev. Order 3. The resounding answer is no.

1. Indirect Sales and Third-Party Resellers

Patent Owner alleges that “any investigation into Petitioner’s supplier relationship with Intel was cabined solely to whether or not there are direct sales or indemnity agreements for the complete IAPs themselves.” PO Remand Sur-Reply 6 (citing Ex. 2104, 25:12–51). Patent Owner contends that “Petitioner undertook no efforts to learn whether any of its parts are incorporated into Intel processors” and “never investigated whether any of Petitioner’s affiliates, subsidiaries, or third-party resellers provide parts that Intel then incorporates into its products.” PO Remand Br. 9, 12. The Discovery Order did not specifically require Petitioner to produce evidence beyond “agreements between Petitioner and Intel related to products accused of practicing the challenged claims.” Disc. Order 2–3. Here again, we observe, the Discovery Order comports with the Director’s mandate for us to investigate and resolve whether “Petitioner was a supplier of” products that were “accused of practicing the challenged claims” in the Intel litigation. Dir. Rev. Order 3.

Nevertheless, Mr. Murphy repeatedly testified that “onsemi does not in fact sell to Intel (*or any other party*) any components of the Intel Accused Products.” Pet. Remand Reply 7 (emphasis added) (citing Ex. 2103 ¶ 7;

Ex. 2104, 26:9–13 (“None of the parts we [(onsemi)] sell would be part of a[n] Intel CPU.”), 33:20–34:8, 35:14–19, 36:15–17, 83:6–12).

2. *Incorporation of Petitioner’s Products into Non-Accused Intel Products*

To the extent Patent Owner is arguing that Petitioner’s investigation is lacking for failure to determine any potential use of Petitioner’s products in *non-accused*, Intel products, even assuming, *arguendo*, that Patent Owner is correct that “[i]t is undisputed that Intel is one of Petitioner’s customers” and “Intel confirms that Petitioner is one of its suppliers,” this argument is unavailing. A “manufacturer-customer relationship alone does not establish privity” at least because any such relationship does not concern supplying *IAPs or components thereof*. PO Remand Br. 2–3 (citing Ex. 2009, 2 (listing Intel as a “[t]op OEM customer”); Ex. 2104, 63:15–17, 38:1–3; Ex. 2004, 10–13); Pet. Remand Reply 5 (quoting *Samsung Electronics Co. Ltd. v. Netlist Inc.*, IPR2022-00615, Paper 64 at 23 (PTAB, June 30, 2023) (citation omitted), 10); *see WesternGeco*, 889 F.3d at 1321 (“Regarding the pre-suit business alliance, the Board found that ION and PGS had a contractual and fairly standard customer-manufacturer relationship regarding the accused product. This finding does not necessarily suggest that the relationship is sufficiently close”).

According to Patent Owner, “[p]er its ‘Standard Terms and Conditions of Sale’ (T&Cs), Petitioner indemnifies its customers.” PO Remand Br. 3 (citing Ex. 2010). Patent Owner asserts that “[t]hese T&Cs apply to all onsemi sales and every customer, including Intel.” *Id.* (citing Ex. 2104, 43:19–44:6, 45:14–46:5 (“Q. Are you aware as to whether or not there is a different agreement in place for sales made by onsemi to Intel? A.

No.”)). Patent Owner further contends that “Mr. Murphy confirmed that the indemnity provisions of Petitioner’s Standard T&Cs require Petitioner to ‘indemnify a buyer based upon a claim of patent infringement of a product purchased from onsemi.’” *Id.* (citing Ex. 2104, 74:15–22). Those arguments are mooted by Mr. Murphy’s unequivocal testimony on point. We agree with Petitioner that the evidence supports a finding that “discovery has confirmed that Intel *never* sought indemnity from onsemi for the Intel [l]itigation, which makes sense because no onsemi products were at issue in the” Intel litigation. Pet. Remand Reply 11 (internal citation omitted)(citing Ex. 2103 ¶¶ 7, 8).

3. Adjacency to IAPs

To the extent that Patent Owner is arguing that Petitioner’s product was accused because it is capable of being in the same system as an IAP (*see* Ex. 2006, Fig. 2; Tr. 22:1–27:22), we find these arguments unavailing. That is not what Patent Owner specifically identified in its infringement contentions as practicing the challenged claims. The system(s) identified by Patent Owner are accused solely on the basis that the infringement derives from the IAPs specifically identified in the list of infringement contentions. *See* Ex. 2048, 3–8.

4. Providing Custom Products to Customers

To the extent that Patent Owner suggests that, because “Petitioner [] makes custom products for its OEM customers,” such collaboration implies privity, presumably with Intel, we disagree. PO Remand Br. 3. Instead, we agree with Petitioner that “generally collaborating and making custom products” is not dispositive and, instead, “[w]hat matters for privity is that onsemi did *not* make the Intel Accused Products or components thereof.”

Pet. Remand Reply 11 (citing Ex. 2103 ¶ 7). *See, e.g., WesternGeco*, 889 F.3d 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. Ltd. v. Netlist Inc.*, IPR2022-00615, Paper 64 at 22–26 (PTAB June 30, 2023)(same).

5. *Alleged Sub-license to RPX*

Patent Owner contends that “Intel confirms that Petitioner is one of its suppliers” and “[a]s a result, Petitioner received a sublicense as a ‘have made vendor’ to make and sell products to Intel under Intel’s license with PO.” PO Remand Br. 2–3 (citing Ex. 2004, 10–13; Ex. 2022, 3). Petitioner correctly points out that Patent Owner’s argument is unavailing because Patent Owner “has not produced the actual sublicense from RPX to Intel; an agreement between RPX and Greenthread cannot create privity between onsemi and Intel; and this RPX agreement does nothing to show a connection between onsemi and the Intel litigation.” Pet. Remand Reply 10–11.

In view of the above, the evidence adduced during trial and on remand does not support Patent Owner’s argument that Intel should be named as a privy so as to put the issue into dispute. *See Dir. Rev. Order 3* (making plain that the question on remand is whether Patent Owner has met that burden of production). Moreover, even if Patent Owner had met their burden of production, the totality of evidence adduced during trial and on remand does not support a finding that the relationship between Petitioner and Intel is

sufficiently close that both should be bound by the trial outcome and related estoppels, nor does it suggest, without more, that the parties were litigating either the district court action or the IPRs as proxies for the other. Further, the record is devoid of evidence that Petitioner had any opportunity to control the Intel litigation.

As for Patent Owner’s argument that it “maintains that Petitioners [are] in privity with both [REDACTED], two other time-barred parties,” and “that discovery should have been granted as to these parties for at least the reasons presented in PO’s portion of the Joint Paper Concerning Additional Discovery” in the Wave 1 (onsemi) IPRs, we decline to address this argument. PO Remand Br. 2, n.3 (citing Paper 108 [sic 103] at 2–5). The Director Review Order made clear that our earlier FWD was remanded to consider issues of privity with respect to only Intel and we decline to enlarge the scope of the “narrowly tailored” discovery set forth in the Director Review Order. *See* Dir. Rev. Order 3.

Furthermore, [REDACTED] was served an infringement complaint on [REDACTED], and the Petition in the present proceeding was filed on July 27, 2023—[REDACTED] could not possibly be considered a party giving rise to a time bar under § 315(b). [REDACTED] is not alleged to be an RPI or privity of Petitioner. Rather, [REDACTED] is alleged to be an RPI of an alleged RPI—[REDACTED]—a degree of separation that is not contemplated by the clear language of the statute.

III. PATENTABILITY ANALYSIS

A. Legal Standards

“In an [*inter partes* review], 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). The burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

A claim is unpatentable under 35 U.S.C. § 103 if “the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains.” 35 U.S.C. § 103. 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 present, objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

To show obviousness, it is not enough to merely show that the prior art includes separate references covering each separate limitation in a challenged claim. *Unigene Labs., Inc. v. Apotex, Inc.*, 655 F.3d 1352, 1360 (Fed. Cir. 2011). “Rather, obviousness requires the additional showing that a person of ordinary skill at the time of the invention would have selected and combined those prior art elements in the normal course of research and development to yield the claimed invention.” *Id.* (citing *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007)). “This is so because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known.” *KSR*, 550 U.S. at 418–19. On the other hand, an obviousness analysis “need not seek out precise teachings directed to the

specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *Id.* at 418; accord *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1259 (Fed. Cir. 2007). Nevertheless, “[a] factfinder should be aware, of course, of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning.” *KSR*, 550 U.S. at 421.

Notwithstanding what the teachings of the prior art would have suggested to a person of ordinary skill in the art, objective evidence of non-obviousness may lead to a conclusion that the challenged claims would not have been obvious. *In re Piasecki*, 745 F.2d 1468, 1471–72 (Fed. Cir. 1984). Objective evidence of non-obviousness “may often be the most probative and cogent evidence in the record” and “may often establish that an invention appearing to have been obvious in light of the prior art was not.” *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Drilling USA, Inc.*, 699 F.3d 1340, 1349 (Fed. Cir. 2012) (quoting *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983)). Such evidence, however, does not necessarily control the obviousness conclusion. *See, e.g., Pfizer, Inc. v. Apotex, Inc.* 480 F.3d 1348, 1372 (Fed. Cir. 2007) (“Here, the record establishes such a strong case of obviousness that Pfizer’s alleged unexpectedly superior results are ultimately insufficient.”).

B. Level of Ordinary Skill in the Art

Factors pertinent to determining the level of ordinary skill in the art include (1) the educational level of the inventor; (2) the type of problems encountered in the art; (3) prior-art solutions to those problems; (4) the rapidity with which innovations are made; (5) the sophistication of the

technology; and (6) the educational level of workers active in the field. *Envtl. Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 696–97 (Fed. Cir. 1983). Not all factors may exist in every case, and one or more of these or other factors may predominate in a particular case. *Id.* These factors are not exhaustive, but merely a guide to determining the level of ordinary skill in the art. *Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007).

Petitioner argues a person of ordinary skill in the art “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.” Pet. 8 (citing Ex. 1003 ¶ 49). According to Petitioner, “[a]dditional education might compensate for a deficiency in experience, and vice-versa.” *Id.*

Patent Owner argues

[a] person of ordinary skill in the art (POSITA) in the technology field of the Challenged Patent would be a person with at least a Bachelor’s of Science degree in electrical or computer engineering, materials science, chemical engineering, applied physics, or a related field, with emphasis on semiconductor manufacturing, or an equivalent degree, and at least four years of experience in semiconductor design and manufacturing. Additional education in a relevant field or industry experience may compensate for a deficit in one of the other aspects of the requirements stated above.

PO Resp. 12 (citing Ex. 2057 ¶¶ 17–18).

Petitioner and Patent Owner’s definitions for the ordinary level of skill in the art are substantially similar. In light of the record before us, we adopt Petitioner’s proposal regarding the level of ordinary skill in the art. Based on our review of the ’842 patent and the prior art of record, we

determine that Petitioner’s definition comports with the qualifications a person would have needed to understand and implement the teachings of the ’842 patent and the prior art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (explaining that specific findings regarding ordinary skill level are not required “where the prior art itself reflects an appropriate level and a need for testimony is not shown”) (quoting *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 163 (Fed. Cir. 1985)). The outcome of our Decision does not depend on which party’s definition is selected. Patent Owner does not argue the result would change if its definition were adopted.

C. Claim Construction

We construe claim terms “using the same claim construction standard” that district courts use to construe claim terms in civil actions under 35 U.S.C. § 282(b). *See* 37 C.F.R. § 42.100(b) (2023). Under that standard, claim terms “are given their ordinary and customary meaning, which is the meaning the term would have to a person of ordinary skill in the art at the time of the invention.” *Power Integrations, Inc. v. Fairchild Semiconductor Int’l, Inc.*, 904 F.3d 965, 971 (Fed. Cir. 2018) (citing *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc)). The meaning of claim terms may be determined by “look[ing] principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17).

Neither party proposes any claim term for express construction. *See* Pet. 9; *see also* PO Resp. 13 (citing Ex. 2057 ¶¶ 20–25, 45). Patent Owner,

however, implicitly construes “at least one graded dopant concentration to aid carrier movement” to require carrier movement, and Petitioner disagrees. We address the implicit construction in section III.E.2. below.

After considering the arguments and information presented during trial, we agree that we do not need to construe any term in this Decision. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”)).

*D. Objective Indicia of Nonobviousness*¹³

Patent Owner alleges that a license agreement with RPX Corp. (“RPX”) (“the RPX license”) that covers the patent family including the ’842 patent is evidence supporting the objective indicia of nonobviousness. PO Resp. 2, 35–37. Patent Owner further argues that because the licensees, [REDACTED] approached Patent Owner through RPX without threat of litigation against them, the RPX license agreement is especially probative of non-obviousness. *Id.* at 35–36 (citing Ex. 2072). Patent Owner further argues that its invention is “part and parcel” of the RPX license because all of the claims of the licensed patents relate to using graded dopants to move carriers from active circuitry at the surface further down into the device. *Id.* at 37.

¹³ In Section III.D, we refer to the sealed version of the Patent Owner Response (Paper 46).

Patent Owner bears the burden of establishing that a nexus exists between the objective evidence and the claimed invention. *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019). Nexus is a legally and factually sufficient connection between the objective evidence and the claimed invention, such that the objective evidence should be considered in determining non-obviousness. *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988). “A nexus may not exist where, for example, the merits of the claimed invention were ‘readily available in the prior art.’” *ClassCo, Inc. v. Apple, Inc.*, 838 F.3d 1214, 1220 (Fed. Cir. 2016) (quoting *Richdel, Inc. v. Sunspool Corp.*, 714 F.2d 1573, 1580 (Fed. Cir. 1983)). “Unlike products, which may incorporate numerous features beyond those claimed or described in a patent and therefore may require careful parsing to establish a nexus, actual licenses to the subject patent do not demand the same, as they are, by their nature, directly tied to the patented technology.” *Ancora Techs. Inc. v. Roku Inc.*, 140 F.4th 1351, 1362 (Fed. Cir. June 16, 2025) (citing *Institut Pasteur & Universite Pierre Et Marie Curie v. Focarino*, 783 F.3d 1337, 1347 (Fed. Cir. 2013)).

We find that there is nexus between the objective indicia and the challenged claims based on the RPX license that includes the ’842 patent in the listing of the patent family covered by the license. *See* Ex. 2072, 19 (Appendix A, Exhibit B); *Ancora*, 140 F.4th at 1362.

Here, Patent Owner relies on the RPX license and asserts that its technique of “creating ‘a drift field to sweep these unwanted minority carriers from the active circuitry at the surface into the substrate’” (PO Resp. 37, quoting Ex. 1001, 3:52–56) is “part and parcel” with the RPX

license. *Id.* at 37. We have considered the RPX license and Patent Owner’s argument.

Even if the RPX license conveys a right to all the challenged claims sufficient to support a nexus, we decline to give significant weight to the RPX license. We do not agree with Patent Owner that the RPX license is “especially probative” because [REDACTED] were under no apparent threat of litigation. *See* PO Resp. 36. Although Patent Owner argues that the RPX license was not motivated by a threat of litigation, and that the expense for [REDACTED] to litigate the challenged patents “would have been trivial” (*see id.*), the weight of evidence does not support those arguments. RPX markets itself as a cost-saving service that spreads litigation cost across a large network of companies and “remove[s] patents from circulation before they become costly issues.” Ex. 1051, 1. RPX further markets itself as working on behalf of its clients to prevent potential litigation and associated legal defense costs and settlements. *Id.* at 3.

In view of this evidence, Patent Owner’s argument that [REDACTED] entered a license under no apparent threat of litigation is not persuasive because it may reflect the value of RPX as a risk mitigation service and, therefore, on this record, does not reflect the value of the challenged patent specifically. *Cf. Transocean Offshore Deepwater Drilling, Inc. v. Maersk Drilling USA, Inc.*, 699 F.3d 1340, 1353 (Fed. Cir. 2012) (License found to be due to the merits of the claimed invention to support nonobviousness where royalties exceeding the cost of litigation reflected the value of the licensed technology); *Samsung Elec. Co. Ltd. v. Neonode Smartphone LLC*, IPR2021-00144, Paper 59 at 51 (PTAB Dec. 15, 2022) (License found to be due to an interest in “[the patent owner’s] technology

exclusively” and not some “other economic reason that might discount . . . interest in exclusively licensing the technology.”).

Unlike in the *Samsung Electric* case, the record here does not provide sufficient evidence that the amount paid for the RPX license is due exclusively to the licensed technology rather than some other economic reason. In addition, unlike in the *Transocean* case, the record here includes no evidence of the contribution that [REDACTED] made towards the lumpsum licensing fee, relative to the contribution of [REDACTED] and/or any other RPX member. The record is not sufficiently developed to determine whether the contribution amounts of [REDACTED] are significant compared to the potential cost of litigation. Ex. 2072 ¶ 6.

As to Patent Owner’s argument that the license evidences non-obviousness because “moving carriers ‘from the active circuitry at the surface’ is missing from the prior art” (PO Resp. 37), we disagree that claim limitation [1.5 / 9.5] is missing from the prior art for the reasons discussed below in Section III.E.2. *See Tokai Corp. v. Easton Enters., Inc.*, 632 F.3d 1358, 1369 (Fed. Cir. 2011) (“If commercial success is due to an element in the prior art, no nexus exists.”); *Ormco Corp. v. Align Technology, Inc.*, 463 F.3d 1299, 1312 (Fed. Cir. 2006) (“[I]f the feature that creates the commercial success was known in the prior art, the success is not pertinent.”). Accordingly, we find the RPX licenses are not entitled to significant weight.

Having determined the weight to be given to Patent Owner’s licenses, we turn to the evidence and argument regarding the remaining *Graham* factors in evaluating Petitioner’s obviousness contentions as to each of the challenged claims. Even if we were to give the RPX license significant

weight, we determine that Petitioner’s showings of *prima facie* obviousness, particularly in view of the strength of the grounds based on Kawagoe (a single reference obviousness ground) and Wiezorek and Wolf discussed below outweigh Patent Owner’s objective evidence of nonobviousness. *See Tokai Corp. v. Easton Enters., Inc.*, 632 F.3d at 1371 (“A strong case of *prima facie* obviousness . . . cannot be overcome by a far weaker showing of objective indicia of nonobviousness.”).

E. Obviousness over Kawagoe

Petitioner challenges claims 1, 2, 4–10, and 12–18 as obvious based on Kawagoe. Pet. 5, 13–40. Patent Owner disagrees. *See generally* PO Resp. For the reasons discussed below, Petitioner has established by a preponderance of evidence that claims 1, 2, 4–10, and 12–18 are obvious over Kawagoe.

1. 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,”¹⁴ and also has

¹⁴ Petitioner submits Exhibit 1009 (Wang, Single Event Upset: An Embedded Tutorial, 21st Int’l Conf on VLSI Design, 429–434, IEEE 2008) (“Wang”), which explains that “soft errors” are “random and not related to permanent hardware faults” and “[t]heir causes may be internal (e.g.,

“excellent breakdown characteristics” that “drastically reduce 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 the 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 14:46–19:63, Figs. 16–25). Figure 1, reproduced below, depicts the device of Embodiment 1.

interconnect coupling) or external (e.g., cosmic radiation),” including “[a]lpha particles [that] are emitted when the nucleus of an unstable isotope decays to a lower energy state.” Ex. 1009, Abstract, 430. Dr. Blalock characterizes “latchup” as “a ‘short-circuit’ failure condition in poorly designed circuits.” Ex. 1003 ¶ 77.

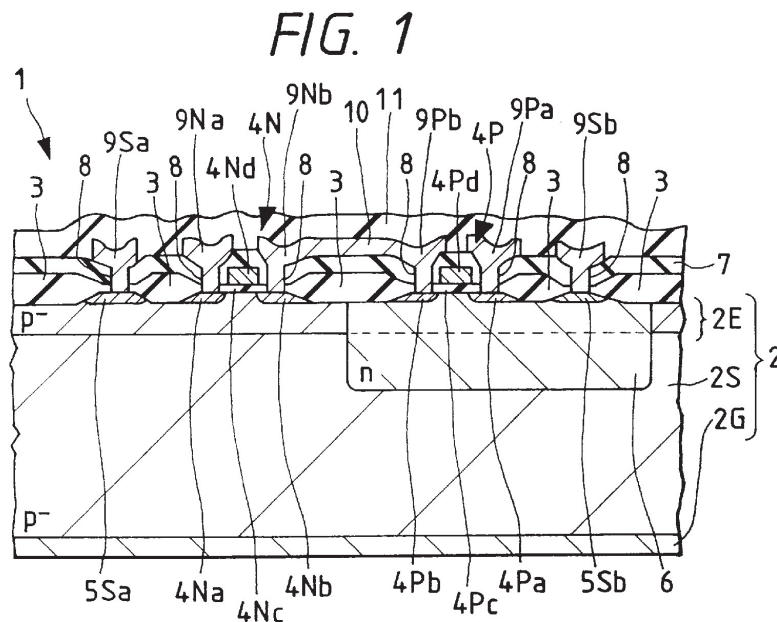


Figure 1 depicts “an essential portion of a semiconductor integrated circuit device” that includes semiconductor substrate body 2S, epitaxial layer 2E, and gettering layer 2G. *Id.* at 4:59–61, 6:42–49, 6:51–56, Fig. 1. Substrate body 2S and epitaxial layer 2E are doped with a p-type impurity in equal 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.

Figure 23, reproduced below, depicts a semiconductor device of Embodiment 4 in the process of manufacture. *Id.* at 17:11–13.

FIG. 23

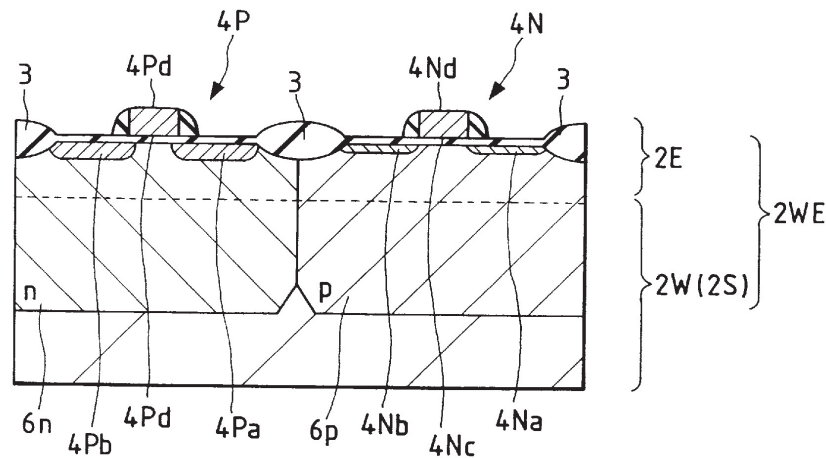


Figure 23 shows a step in a process for manufacturing the semiconductor integrated circuit device of Embodiment 4, including p-well 6p formed with nMOS 4N and n-well 6n formed with pMOS 4P. *Id.* at 6:1–4, 15:26–32, 18:3–35. Substrate body 2S and epitaxial layer 2E are doped with p-type impurity, and the impurity concentration of substrate body 2S is higher than that of epitaxial layer 2E “to improve the resistance to the latchup.” *Id.* at 14:64–15:6, 15:13–17, 16:16–21, 19:59–63, Fig. 17. In Embodiment 4, the impurity concentration in p-well 6p and n-well 6n 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 Figure 17, which is reproduced below and illustrates properties of the semiconductor device of Embodiment 4.

FIG. 17

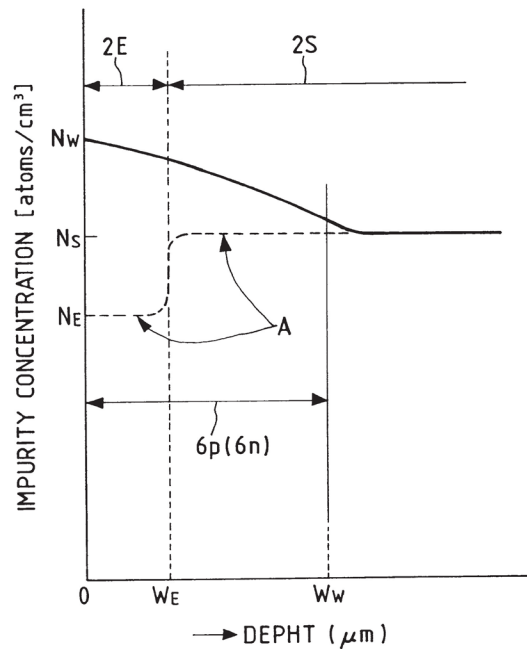


Figure 17 is a plot of impurity concentration as a function of depth in a semiconductor integrated circuit device, which shows “the p-well 6p and n-well 6n have their impurity concentrations gradually lowered in the depthwise direction from the principal surface (having an impurity concentration NW) of the epitaxial layer 2E.” Ex. 1007, 5:41–45, 15:62–16:40.

2. Claim 1

a. [pre] “[a] semiconductor device”

Petitioner contends Kawagoe discloses a semiconductor device as recited in each limitation of claim 1. Pet. 13–14 (citing Ex. 1007, 1:13–23, 14:46–67, Figs. 16, 17, 23; Ex. 1003 ¶ 66). Generally, a preamble does not limit a claim. *Allen Eng’g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1346 (Fed. Cir. 2002). We need not decide whether claim 1’s preamble limits the

claim because we agree with Petitioner that Kawagoe teaches claim 1's preamble.

b. [1.1] “a substrate of a first doping type at a first doping level having first and second surfaces.”

Petitioner relies on Kawagoe's Embodiment 4, depicted in Figure 23, as disclosing limitation [1.1]. Pet. 14–15. Petitioner contends Kawagoe discloses “a substrate of a first doping type” because epitaxial layer 2E and substrate body 2S are doped with p-type impurity, and Kawagoe's epitaxial substrate has a top surface. *Id.* (citing Ex. 1007, 6:50–7:3, 14:61–15:12, 17:10–18:38, Figs. 20, 23).

Petitioner contends Kawagoe discloses “a first doping level” because Embodiment 1 has a uniformly-doped epitaxial substrate, with epitaxial layer 2E and substrate body 2S having the same impurity concentration. Pet. 16 (citing Ex. 1007, code (57), 2:57–3:9, 6:60–7:3). Petitioner contends a person of ordinary skill in the art would have understood that Kawagoe teaches forming a twin-well CMOS device on either a uniformly-doped epitaxial substrate, as described in Embodiment 1, or a non-uniformly doped latchup-resistant epitaxial substrate, as described in Embodiment 4. *Id.* at 16–17 (citing Ex. 1003 ¶ 72). Relying on Dr. Blalock's testimony and prior art disclosures cited in Kawagoe, Petitioner contends that a person of ordinary skill would have been motivated to use a uniformly-doped epitaxial substrate to form a twin-well CMOS device and would have had a reasonable expectation of success. *Id.* at 16–19 (citing Ex. 1003 ¶¶ 72–78; Ex. 1007, 1:33–40, 2:57–65, 8:40–52, 12:8–40, 14:58–60, 15:7–40, 19:49–63, Fig. 23; Ex. 1008, 381, 387–89, 406, 419, 523, 530; Ex. 1026, 1).

Patent Owner does not dispute Petitioner's showing as to limitation [1.1]. Based upon Petitioner's undisputed showing as discussed above, we find that Kawagoe discloses limitations [1.3].

c. [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 Kawagoe discloses "semiconductor regions 4Na and 4Nb . . . for forming the source-drain regions of the nMOS...4N." Pet. 20 (citing Ex. 1007, 8:66–67, Fig. 23) (emphasis omitted). Petitioner contends Kawagoe's semiconductor regions 4Na and 4Nb (corresponding to the "first active region") have a doping type (n-type) opposite to the doping type (p-type) of the substrate. Pet. 20–21 (citing Ex. 1007, 8:67–9:3). Petitioner contends a person of ordinary skill in the art would have considered Kawagoe's source-drain regions 4Na and 4Nb, as well as the channel region between those regions and below insulating film 4Nc, as part of an active region. Pet. 21 (citing Ex. 1003 ¶ 80; Ex. 1014, 1:52–54, 2:17–21; Ex. 1020, 31).

Notwithstanding Patent Owner's arguments to the contrary, which we discuss below, we find that Petitioner demonstrates that Kawagoe teaches limitation [1.2].

Patent Owner contends the Petition fails to establish Kawagoe discloses limitation [1.2]. According to Patent Owner, "the Petition mapped 'a first doping type' to p-type doping" and "Kawagoe's [source-drain] regions 4Na and 4Nb 'have a second doping type (n-type) opposite in conductivity to the first doping type (p-type) of the substrate.'" PO Resp. 32 (citing Pet. 14, 20–21, 36). Patent Owner argues that "the Petition also states

that the *channel* of transistor 4N is [*also*] part of the first active region.” *Id.* (citing Ex. 1007, 8:66–9:3; Pet. 20 (“Source-drain regions 4Na/4Nb (purple) form part of the claimed first active region, which also includes the channel region”)) (alteration added). Patent Owner thus contends, with respect to limitation [1.5] which recites “at least a portion of at least one of the first and second active regions having at least one graded dopant concentration”

the Petition pointed to the concentration profile under the *channel*. But the channel of transistor 4N is doped *p-type*, because it is the top portion of a p-well (as shown in Figure 23 of Kawagoe).

PO Resp. 32 (citing-in-part Pet. 20 (Ex. 1007, Fig. 23, which shows channel of transistor 4N at the top of p-well 6p), *id.* (“the channel region (light purple) between source-drain regions 4Na/4Nb”), 18–20).

Patent Owner points to Dr. Glew’s testimony and contends it “explain[s] that the channel in a CMOS transistor has the same doping type as the well in which the source and drain are formed)” and that “the channel of NMOS 4N made from *the p-well, the p-well, and the p[-]type substrate are all doped p-type.*” *Id.* at 33 (citing Ex. 2057 ¶ 60) (emphasis added); see PO Sur-reply 11–14.

Having considered the evidence and arguments of both parties, we conclude that Petitioner persuasively demonstrates that a person of ordinary skill would have understood that the source-drain regions and channel regions are part of the active regions where transistor activity occurs. Pet. 20 (citing Ex. 1003 ¶ 79; Ex. 1008B, 299–300); PO Resp. 32 (citing Ex. 1007, 8:66–9:3; Pet. 14). The parties’ dispute whether an active region should be characterized by the dopant type of the source-drain regions, or by the dopant type of the channel region between the source and drain. We agree

with Petitioner that there is insufficient support for interpreting the “‘first active region’ as *only* having the ‘doping type’ of the transistor channel.” Pet. Reply 16 (citing PO Resp. 32–33) (emphasis added). Wolf supports Petitioner’s position; it describes how a person of ordinary skill would have understood an *nMOS* as including a source and drain that are doped with an n-type dopant and “[a] *channel* region in the semiconductor under the gate electrode[,] separat[ing] the source and drain” that “is lightly doped with a dopant type *opposite* to that of the source and drain.” Ex. 1008B, Fig. 5-1(a), 298 (emphasis added). Therefore, we agree with Petitioner that “the ‘doping type’ of the ‘first active region’” may be “the doping type of the associated source and drain regions.” See Pet. Reply 18; Sur-reply 12.

Patent Owner’s argument that Kawagoe’s channel region is not opposite in type to Kawagoe’s epitaxial substrate—that is, epitaxial layer 2E and substrate body 2S doped with p-type impurity—is not persuasive because claim 1 is not so limited. See PO Sur-reply 11–14. Claim 1 requires a “first *active region* . . . with a second doping type opposite in conductivity to the first doping type,” and does not specifically require *a channel region* with a doping type opposite in conductivity to the first doping type. As Petitioner has persuasively shown, a person of ordinary skill would have understood that the claimed “active region” of a MOS device may be characterized by the type of the source and drain of the MOS.

Dr. Glew testified that “[t]he claimed invention is clearly disclosed in, e.g., Figs. 5B-5C of the Challenged Patent, and the corresponding parts of the specification.” Ex. 2057 ¶ 34. Like Kawagoe and Wolf, Figure 5B of the ’842 patent depicts n-type source and drain regions, a p^- substrate, and a graded dopant region which “creates a drift field to sweep [] unwanted

minority carriers from the active circuitry at the surface into the substrate in a monolithic die as quickly as possible.” Ex. 1001, 3:61–64. The ’842 patent further discloses that this graded dopant region can be implemented in a deeply-implanted n-layer, an epitaxial layer, an n-well, or a p-well, like Kawagoe, and when implemented in a well region, can be “graded or retrograded.” *Id.* at 4:1–5. Accordingly, the ’842 patent does not redefine, let alone differ from, Wolf concerning the naming convention for a CMOS comprised of NMOS and PMOS components.

Patent Owner argues in its Sur-reply that Petitioner's argument that the doping type of the source and drain doping may represent the doping type of the “active region” was improperly raised for the first time in its Reply. PO Sur-reply 12. We disagree. Petitioner has consistently argued that the source and drain are part of the first active region. Pet. 20. Petitioner also provides express support for this understanding from Wolf. *Id.* (emphasis omitted) (citing Ex. 1008B, 299–300 (“The active regions are those in which transistor action occurs, i.e., the channel and the heavily doped source and drain regions.”)).

Patent Owner also argues in its Sur-reply that the source and drain regions cannot be part of the “active region” because an “active region” can exist without a source and drain, with the claim indicating that the transistors are formed in the active region. PO Sur-reply 13 (citing Ex. 1052, 24:22–25, 27:25–28:2). This argument, in addition to being raised for the first time in Sur-reply, is in direct conflict with both Dr. Glew’s declaration testimony and the disclosures of Wolf. For example, as noted above, Wolf expressly states that “active regions” are those where transistor action occurs, and include both the channel and the source and drain regions. Ex. 1008B, 299–

300. Consistent with this understanding, Dr. Glew testified that the “source and drain” of Kawagoe “are part of the active region.” Ex. 1052, 137:6–14.

In view of the foregoing, we find that Kawagoe discloses limitation [1.2].

- d. [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; and”*

Petitioner contends Kawagoe discloses limitations [1.3] and [1.4]. Patent Owner does not dispute this. *See generally* PO Resp. As we discuss below, Petitioner provides a detailed analysis showing where it contends Kawagoe discloses each of these limitations.

As to limitation [1.3], Petitioner contends Kawagoe discloses “semiconductor regions 4Pa and 4Pb . . . for forming the source-drain regions of the pMOS 4P.” Pet. 23–24. Petitioner contends a person of ordinary skill in the art would have understood that source-drain regions 4Pa and 4Pb, as well as the channel region between those regions and below insulating film 4Pc, were part of an active region. *See id.* at 23; Ex. 1008B, 299–300 (“The active regions are those in which transistor action occurs; i.e., the channel and the heavily doped source and drain regions.”).) Petitioner contends Kawagoe discloses this active region adjacent to the first active region and separated by an isolation region, i.e., insulating film 3. *Id.* (citing Ex. 1007, 14:46–55. Fig. 23; Ex. 1008A, 818–20, Fig. 16-11(f); Ex. 1003 ¶¶ 83–84).

As to limitation [1.4], by reference to the two preceding sections of the Petition (*see* Pet. 25), Petitioner contends Kawagoe discloses forming

transistors 4N and 4P, each in an active region. *See* Pet. 20, 23 (citing Ex. 1007, 8:66–9:3, 9:47–50, Fig. 23). Petitioner contends Kawagoe’s disclosures satisfy claim 1’s recitation of “transistors” either under Patent Owner’s district court construction of “transistors” as requiring one or more transistors, or under an alternative construction requiring multiple transistors in each active region. Pet. 21 (“a POSITA would have understood that Kawagoe teaches forming multiple nMOS transistors in this [first active] region to minimize chip area, as good layout practice dictates”), 24 (“a POSITA would have understood that Kawagoe teaches forming multiple pMOS transistors in this [second active] region”).

Based upon Petitioner’s undisputed showings, we find that Kawagoe discloses limitations [1.3] and [1.4].

- e. [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.”*

Notwithstanding Patent Owner’s arguments to the contrary, which we discuss below, Petitioner demonstrates how Kawagoe teaches a “graded dopant concentration to aid carrier movement from the first surface to the second surface of the substrate,” as recited in limitation [1.5]. Pet. 25–27.

(1) The Parties’ Contentions

Petitioner contends Kawagoe’s Figure 17 illustrates a doping concentration that is “gradually lowered in the depthwise direction ***from the principal surface*** (having an impurity concentration NW) of the epitaxial layer 2E.” Pet. 26 (quoting Ex. 1007, 15:62–16:40). Petitioner further contends Kawagoe’s dopant concentration is “graded in the channel region

of transistor 4N, which is a portion of the first active region formed at” the top surface of epitaxial layer 2E. *Id.* (citing Ex. 1003 ¶ 89). Petitioner contends Kawagoe’s Figure 17 shows a downward-sloping graded concentration from the top surface of the substrate, through the depth of the channel region and underlying well, for both transistor 4N and transistor 4P, and thus discloses “at least a portion of” the first and second active regions have a downward-sloping graded dopant concentration. *Id.* at 26–27 (citing Ex. 1007, 15:32–36, 15:62–16:2, Fig. 23; Ex. 1008B, 298–301, Figs. 5-2, 6-4).

Petitioner further contends the downward-sloping graded dopant concentration in Kawagoe Figure 17 aids the movement of carriers from the top surface of the epitaxial layer (corresponding to the “first surface” in limitation [1.5]) to the bottom surface of the substrate (corresponding to the “second surface” in limitation [1.5]), because Kawagoe discloses “the *electrons produced by the a-ray are attracted to the substrate body 2S by that concentration gradient.*” *Id.* at 28 (quoting Ex. 1007, 16:2–11, Ex. 1003 ¶ 92). Petitioner further contends Kawagoe discloses a downward-sloping graded dopant concentration that aids carrier movement from the first surface to the second surface of the substrate “to the same extent to which Applicant relied on the prior art and admitted to the Patent Office that such carrier movement would occur under the same scenario.” *Id.* at 30 (citing Ex. 1003 ¶ 94). As support for that contention, Petitioner relies on the file history for the parent ’195 patent¹⁵ and references cited during examination. *Id.* at 30–32 (citing Exs. 1010, 1016, 1031).

¹⁵ U.S. Patent No. 8,421,195 (“the parent ’195 patent”).

Patent Owner disputes Petitioner’s showing as to Kawagoe based on five contentions: (1) a mere downward sloping gradient does not necessarily “aid carrier movement” and “Dr. Blalock admitted that, to determine whether a dopant concentration gradient would ‘aid carrier movement,’ he looked *only* at the direction of the slope” and “did not look at the magnitude of the slope or other possible forces acting on a carrier” (PO Resp. 16, 20–21); (2) Kawagoe “teach[es] that the graded concentration actually *inhibits* carrier movement” and Kawagoe’s carriers are not in the active region and “nowhere near what Petitioner identifies as the ‘surface’” (*id.* at 23–25); (3) the Petition improperly relies on Wang, a post-priority date reference, “to fill the gap” with respect to Kawagoe (*id.* at 25–26); (4) a person of ordinary skill in the art would have understood that Kawagoe’s electrons that are prevented from entering the p-well are not created near the surface (*id.* at 27–28); and (5) all of Kawagoe’s teaching about a gradient refers to gradients and carriers outside the active region. PO Resp. 24–25; PO Sur-reply 9 (citing Pet. 28, n.9; PO Resp. 24).

(2) Analysis of Limitation [1.5]

Before turning to discussion of each of Patent Owner’s contentions, we first address the interpretation of “to aid carrier movement” as recited in limitation [1.5].

With its Sur-Reply, Patent Owner introduced claim construction orders from two district courts to support its position that the mere gradient itself does not satisfy the “aid carrier movement” limitation. PO Sur-reply 4–5 (citing Ex. 2077 (“WDTX Markman Order”) and Ex. 2079 (“EDTX Markman Order”)). We granted Petitioner’s motion to strike these exhibits, among others, due to their late submission and their relevance to a

proceeding involving different parties. Paper 78, 7. The Director Review Order determined that the Board’s “refusal to admit and consider the claim construction orders was legally erroneous because the orders were not ‘evidence.’” Dir. Rev. Order 5. According to the Director Review Order, “[t]he refusal also was an abuse of discretion because the orders were responsive to Petitioner’s arguments and thus timely.” *Id.* at 5–6.

Under the circumstances here, where Patent Owner properly argued that the claim construction dispute between the parties crystallized only in Petitioner’s Reply, the Board should have admitted the district court claim construction rulings and given them “appropriate weight.” Accordingly, on remand, if the petitions are not time-barred, the Board is to admit Exhibits 2077 and 2079 and reconsider the parties’ arguments in view of these two exhibits.

Id. at 6 (footnote omitted) (citing CTPG 47).

We now admit the district court claim construction rulings submitted by Patent Owner with its Sur-Reply and “give[] them ‘appropriate weight,’” pursuant to the Director Review Order. Dir. Rev. Order 6 (citing CTPG 47). Patent Owner contends that “two district courts have held that the mere gradient itself does not satisfy the ‘aid carrier movement’ limitation.” PO Sur-Reply 4; *see id.* at 16 (“Two district courts have agreed with Greenthread that magnitude is relevant, without reading a ‘specific slope’ into the claims.”).

(a) The District Court Orders

With regard to the Western District of Texas Markman Order, Patent Owner contends that the Court “said that ‘the graded concentration has to be sufficiently graded’ to create the electric field that will cause movement and that ‘a graded concentration . . . that is [not “sufficiently graded”] will not’

‘aid movement.’” PO Sur-Reply 4 (alterations by Patent Owner) (quoting Ex. 2077, 39–40 (“WDTX Markman Order”)). The Defendant in that case, Cirrus Logic, asserted that the term “graded dopant concentration” was indefinite, as the boundary between “graded” and “uniform” doping concentrations is unclear. Ex. 2077, 32 (citing Ex. 2062 (“the ’195 patent”), 3:45–49; *Berkheimer v. HP, Inc.*, 881 F.3d 1360, 1364 (Fed. Circ. 2018)).

Patent Owner argued in response that the patent provides sufficient guidance as to the meaning of the claim term, with “graded” meaning varying or not “uniform.” Ex. 2077, 37–38 (“Greenthread contends that Figure 1 in the ’195 Patent depicts the difference between uniform and graded concentration, namely, that the concentration in the former is the same across a region while in the latter, the concentration has a slope.”). According to Patent Owner, “[t]he ‘particular slope’ determines the magnitude of the gradient’s force, and this is how the District Court understood the claims.” PO Sur-Reply 17 (citing Ex. 2077, 39–40).

With regard to the EDTX Markman Order, Patent Owner contends that the Court “‘said that ‘the slope [of the gradient] has both a direction and a magnitude and [d]efendant [*incorrectly*] suggests that the direction of the drift electric field depends solely on the direction of the slope of the graded concentration.’” PO Sur-Reply 4–5 (alterations by Patent Owner) (quoting Ex. 2079, 9 (“EDTX Markman Order”)). The parties disputed the proper construction of the term “single drift layer . . . having a graded concentration of dopants . . . said drift layer further having a first static unidirectional electric drift field.” Ex. 2079, 5. Patent Owner asserted that no construction was necessary, whereas Defendant Samsung argued that the term should be construed as a “single layer whose concentration of dopants either increases

across the layer or decreases across the layer.” *Id.* According to Patent Owner, the EDTX Court understood that direction alone does not determine whether a gradient aids carrier movement, as the magnitude of the gradient must also be considered. *Id.* (citing Ex. 2077, 39–40; Ex. 2079, 9).

The EDTX Court explained that the dispute distilled into two issues: (1) “whether ‘graded concentration of dopants’ necessarily means the concentration only decreases or only increases across the layer”; and (2) “whether the ‘single drift layer’ is necessarily a single layer.” *Id.* at 7.

In addressing the first issue, namely, whether the graded concentration of dopants could both increase and decrease in the drift layer, the EDTX Court rejected the suggestion that the prosecution statement concerning the direction of the electrical field and that carrier movement “depends solely on the slope of the graded concentration of dopant” demonstrates that “the slope must be only increasing or only decreasing to maintain a unidirectional drift field.” *Id.* at 8. In rejecting this argument, the EDTX Court found that the patentee affirmatively argued during prosecution “that a graded dopant concentration will provide a unidirectional electric drift field to move the minority carriers in a single direction,” and that “[t]his does not clearly foreclose a situation in which the slope of the concentration may be both increasing and decreasing in the drift layer.” *Id.* Contrary to Patent Owner’s arguments, therefore, the EDTX Court’s conclusion regarding the scope of the claims appears consistent with both the Applicant’s assertion during prosecution and Petitioner’s arguments in this proceeding, i.e., that “a graded dopant concentration will provide a unidirectional electric drift field to move the minority carriers in a single direction.” *Id.* at 9.

The WDTX Court determined that the term was not indefinite for multiple reasons and that “graded” “describes a sloped doping concentration.” Ex. 2077, 39–41. According to the WDTX Court, a graded dopant concentration must be sufficiently graded to result in a “static unidirectional electric drift field to aid the movement of minority carriers,” as recited in claim 1 of U.S. Patent No. 8,421,195. *Id.* at 39–40.

We discern no finding in the WDTX Court’s Order that one must quantify the magnitude of the field in order to know if the electric field will “aid the movement of minority carriers.” First, the WDTX Court was not addressing the same argument raised by Patent Owner in this proceeding. Rather, it was addressing whether the term “graded dopant concentration” is indefinite.

Second, the WDTX Court’s Order can reasonably be interpreted to require only that the graded dopant concentration be sufficiently graded to create a “static unidirectional electric drift field,” as recited in the claims, which, as the Applicant argued during prosecution and in its claim construction brief before the WDTX, would “aid in the movement of minority carriers.” Ex. 2077, 39–40; Ex. 1020¹⁶, 26 (“a [person of ordinary skill in the art] would have readily recognized that when a ‘static unidirectional electric drift field’ is present that it aids the movement of minority carriers. If it isn’t present, then it doesn’t.”), 28 (“[t]he intrinsic record consistently confirms that the electric fields aid the movement of the carriers.”). Against that backdrop, we find unpersuasive Patent Owner’s inconsistent contention here “that ‘the graded concentration has to be

¹⁶ We refer to the native numbering in Exhibit 1020.

sufficiently graded’ to create the electric field that will cause movement and that ‘a graded concentration . . . that is [not “sufficiently graded”] will not’ ‘aid movement.’” PO Sur-Reply 4 (alterations by Patent Owner) (quoting Ex. 2077, 39–40 (“WDTX Markman Order”)).

(b) The Prosecution History

During prosecution of the parent ’195 patent, the Examiner rejected claims under the pre-AIA version of 35 U.S.C. § 112, first paragraph, arguing 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. 1016, 270 (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 the claims to no longer require “drawing all minority carriers,” and instead, requiring that the claimed “unidirectional drift field” created by the “graded concentration of dopants” “aid the movement of minority carriers.”¹⁷ *Id.* at 290.

Here, Patent Owner contends its statement was in response to an Office Action on a claim that required a “single static unidirectional electric drift field to aid the movement of carriers” (PO Resp. 15 (citing Ex. 1016, 286)), and those additional limitations were an additional parameter besides the graded dopants to “ensur[e] that all minority carriers are moved.” *Id.* at 16. Patent Owner also points to the Examiner’s statement during prosecution that in “a complex electronic device, movement of minority carriers is affected by multiple forces and fields” but “without knowing other parameters of the device” one cannot say whether a drift field would aid carrier movement. *Id.* (quoting Ex. 1016, 270). Thus, Patent Owner argues a

¹⁷ The examined claims of the ’195 patent application generally recited “a unidirectional drift field drawing all minority carriers from said surface layer to said substrate.” Ex. 1016, 286. Patent Owner amended the claims of the ’195 patent application 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.*

mere downward sloping gradient, without additional calculation of slope, does not satisfy limitation [1.5]’s purported requirement to “aid carrier movement.”

Petitioner argues the prosecution history above supports its contention that limitation [1.5] does not require that all minority carriers are moved. Pet. Reply 5 (citing Ex. 1016, 250, 269–270, 289–290). In other words, “the Examiner’s focus on ‘all’ confirms that while additional parameters may be required for moving ‘all’ carriers, a graded dopant concentration resulting in a unidirectional drift field ... is sufficient to move ‘some’ carriers,” which is enough to satisfy limitation [1.5]. Pet. Reply 6–7 (citing Ex. 1016, 270; PO Resp. 16).

Petitioner also relies on Patent Owner’s statement during prosecution of descendent U.S. Patent Application No. 17/728,588 (“the ’588 application”), which claims priority to both the ’842 and the ’195 patents. During prosecution of the ’588 application, Patent Owner asserted that “‘relative slope’ ... means nothing more than the fact that one-side is relatively lower than the other.” Pet. Reply 6 (citing Ex. 1054, 12; Ex. 1055, 5); Tr. 24:19–24.

Having considered the parties’ arguments and evidence from the prosecution history together with the district court claim construction orders, we determine that Patent Owner’s statements during prosecution of the ’195 parent patent were clear, unambiguous, and indicate that one of ordinary skill in the art need not know whether there are other “forces and fields” in an electronic device, as the mere presence of a graded dopant concentration creating “a unidirectional drift field,” facing in the appropriate direction, will “aid the movement of minority carriers from” the surface layer to the

substrate. Ex. 1016, 270, 289–290. The public was entitled to rely on these clear and unambiguous statements when considering the scope of the challenged claims. *Hockerson-Halberstadt v. Avia Group Int’l*, 222 F.3d 951, 957 (Fed. Cir. 2000) (“The prosecution history constitutes a public record of the patentee’s representation concerning the scope and meaning of the claims, and competitors are entitled to rely on those representation when ascertaining the degree of lawful conduct, such as designing around the claim invention.”). Patent Owner’s statements during prosecution contradict its arguments in the present proceeding. The conclusions of the district court claim construction orders are consistent with Patent Owner’s statements during prosecution.

We agree with Petitioner that in view of the prosecution history, limitation [1.5] requires only a relative slope determination, and a graded dopant concentration is enough to teach aiding carrier movement in a particular direction. Patent Owner’s statements during prosecution of the parent ’195 patent and ’588 application, along with the specification of the ’842 patent, support a determination that a graded dopant concentration is enough to teach aiding carrier movement in a particular direction. Petitioner’s arguments about the prosecution of the ’588 application are similarly persuasive. After reconsidering the parties’ arguments on remand, our analysis is not altered after giving appropriate weight to the district court claim construction analyses in Exhibits 2027 and 2029.

The language of limitation [1.5] itself also supports our determination that a graded dopant concentration as taught in Kawagoe’s Figure 17 is sufficient to meet limitation [1.5]. In *ParkerVision, Inc. v. Qualcomm Inc.*, 903 F.3d 1354, 1361 (Fed. Cir. 2018), the Federal Circuit held that claims

directed to devices “cover what a device *is*, not what a device does” (quoting *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1468 (Fed. Cir. 1990)). In other words, a claim limitation directed to a device having a recited function requires “an apparatus that is ‘reasonably capable’ of performing the claimed function[.]” *Id.* at 1361–62 (a device may be “reasonably capable of operating so as to meet the claim limitations, even if it does not meet the claim limitations in all modes of operation”).

Challenged claim 1 is not a method claim, and limitation [1.5] recites structure for a semiconductor device, i.e. “at least one graded dopant concentration.” Therefore, to effectively challenge limitation [1.5], Petitioner need only show “a graded dopant concentration” that is *capable* of “aid[ing] carrier movement from the first surface to the second surface of the substrate.”

We turn to Patent Owner’s first contention disputing Petitioner’s showing as to Kawagoe. Patent Owner’s arguments are based on its interpretation of limitation [1.5] as requiring that a graded dopant necessarily aids carrier movement. *See* PO Sur-reply 1–3, 6, 7 (citing *Transclean Corp. v. Bridgewood Servs., Inc.*, 290 F.3d 1364, 1373 (Fed. Cir. 2002)). We do not find this persuasive, for the reasons described above and further below. *Transclean* is distinguishable because it concerned “anticipation by inherent disclosure” which “is appropriate only when the reference discloses prior art that must *necessarily* include the unstated limitation.” *Transclean Corp.*, 290 F.3d 1364, 1373 (citing *Cont’l Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268–69 (Fed. Cir. 1991)). The challenges here are based on obviousness, and are not based on an assertion of inherent disclosure. To the contrary, as

explained above, Petitioner argues Kawagoe's capability to aid carrier movement. *See ParkerVision*, 903 F.3d at 1361–62.

As to Patent Owner's argument that the '842 patent specification requires a specific dopant concentration (PO Resp. 16; PO Sur-reply 20–21), we find that the '842 patent specification does not support that argument. Patent Owner relies on the statement that “the relative slope of the donor concentration throughout the base creates a suitable aiding draft electric field” (Ex. 1001, 3:2–4) and further argues

the donor dopant concentration may be 10 to 100x” at one end of the gradient *compared to the other*. The next sentence recites that “[t]he gradient can be linear, quasi linear, exponential or complimentary error function. *The relative slope* of the donor concentration throughout the base creates a suitable aiding drift electric field....” In the context of a bipolar junction transistor (“BJT”), the specification recites that “the relative doping concentrations of emitter and collector regions varies from 10^{18} to $10^{20}/\text{cm}^3$, whereas the base region is 10^{14} to $10^{16}/\text{cm}^3$.

PO Sur-reply 20–21 (internal citation omitted). We disagree with Patent Owner because the specification excerpts above describe relative slope and gradient. Further, the donor concentration is described in the context of a bipolar junction transistor (BJT) embodiment that is not encompassed by claim 1. *See* Tr. 26:1–8. In the BJT embodiment of the '842 patent, the graded dopant concentration moves carriers from emitter to collector, that is, *within* the active region. *See id.* at 25:9–16, 25:19–23. In contrast, claim 1 requires moving carriers *away* from the active region to the substrate. *See id.* at 25:17–18, 25:23–25; *cf. id.* at 65:14–66:2.

Patent Owner argues that, during prosecution, it “disagreed with the Examiner's conclusion that the claim at issue there (which never issued)

should be rejected, but was not disagreeing with the relevant part of the Examiner's statement" that "[a] gradient is not the only force acting on a carrier." PO Sur-reply 18. As to the hypothetical opposing forces that Patent Owner asserts are missing from Petitioner's analysis, the specification, prosecution history, and prior art references do not mention such forces or a need to compensate for them. We agree with Petitioner that "[t]he challenged claims also do not require the graded dopant concentration be strong enough . . . to overcome a hypothetical resistance." Pet. Reply 16. Citing Kawagoe's disclosure (Ex. 1007, 6:2–11), Petitioner's counsel persuasively explained at oral hearing that "what it's telling us is that they've intentionally picked the gradient in *Kawagoe* so that it will handle whatever other fields and forces may be going on here to the extent you needed something else to make sure these electrons are attracted to the substrate." Tr. 22:20–23.

We disagree with Patent Owner that "Petitioner must show that" these hypothetical opposing forces "would never overwhelm the gradient." PO Sur-reply 8. Patent Owner also argues that "[t]he fact that a reference does not explicitly discuss a force does not mean that the force is absent or that a POSITA would disregard it." *Id.* Even if "it is undisputed that [some] resistance is 'always' present" as Patent Owner argues (*id.* (citing Ex. 1052, 146:16–18 (emphasis by Patent Owner))), we disagree with Patent Owner that "[t]o carry its burden, Petitioner must affirmatively show that other forces are absent or that the gradient is stronger" (*id.*). Here, where the inventor "did not provide the type of detail in his specification that" Patent Owner "now argues is necessary in" Kawagoe, we find "that one skilled in

the art would have known how to implement the features of the reference[.]”
In re Epstein, 32 F.3d 1559, 1568 (Fed. Cir. 1994).

In view of our interpretation of limitation [1.5] as discussed above, Patent Owner’s argument as to the deficiencies of Dr. Blalock’s testimony because he did not consider the magnitude of gradient slope or other possible forces acting on a carrier (*see* PO Resp. 16, 20–21) is not persuasive. On the other hand, based on our determination that a graded dopant concentration need only be capable of aiding carrier movement in order to satisfy limitation [1.5], we find that Dr. Glew’s deposition testimony that “a field will provide a force in a direction aiding [] movement in the direction of the force. That’s just basic physics” (Ex. 1052, 108:20–23) supports Petitioner’s contention. *See* Pet. Reply 2. Demonstrating “a graded dopant concentration” that is capable of “aid[ing] carrier movement from the first surface to the second surface of the substrate” is a sufficient basis for challenging limitation [1.5], and for the reasons discussed above, we are persuaded Petitioner has done so by showing a graded dopant concentration with a slope, in a particular direction, in Figures 17 and 23 of Kawagoe that is not only reasonably capable, but actually does, move carriers in the claimed direction.

We turn to Patent Owner’s second contention, i.e., that Kawagoe only teaches using a graded slope to impede carrier movement. *See* PO Resp. 16. Patent Owner relies on Kawagoe’s disclosure that “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*” (Ex. 1007, 16:7–11) (emphasis by Patent Owner) and argues Dr. Blalock admitted that in

Kawagoe, “SEUs^[18] generate ‘electrons created by an α -ray in the substrate body below the wells’” and “Kawagoe’s electrons are initially *below* p-well 6p, and prevented from moving *upward* into p-well 6p.” PO Resp. 24–25 (citing Ex. 1003 ¶ 91 n.5; Ex. 2057 ¶ 53).

We find that Kawagoe does not support Patent Owner’s contention, and do not agree that Dr. Blalock incorrectly analyzed Kawagoe. Petitioner persuasively argues an “electric field will aid electron movement in one direction and impede electron movement in the opposite direction.” Pet. Reply 7 (citing Ex. 1052, 83:13–89:13, 92:2–97:8, 102:2–109:14, 109:25–116:3, 121:19–123:15); *see also* Pet. Reply 10 (“because of the concentration gradient electrons are **both** ‘attracted to the substrate body 2S’ (i.e., movement aided) **and** ‘prevented from entering the p-well’ (i.e., movement inhibited)”). Dr. Glew’s deposition testimony supports Petitioner. *See id.*, 103:25–104:4, 104:14–16, 105:22–106:6. Thus, we agree with Petitioner that in Kawagoe, “an electric field aids carrier movement ‘to the substrate body 2S’ and impedes carrier movement in the opposite direction [from] ‘entering the p-well.’” Pet. Reply 7 (citing Ex. 1007, 16:2–11, Figs. 17, 23; Pet. 25–32); *see id.* at 10 (citing Ex. 1052, 102:2–109:14; Ex. 1007, 16:2–11).

With respect to Patent Owner’s argument that Petitioner does not dispute Dr. Glew’s . . . testimony that “if two forces are acting on an object in opposite directions, both forces cannot aid its movement,” we determine that this is not the relevant inquiry. PO Resp. 18 (citing Ex. 2057 ¶¶ 50–51);

¹⁸ “SEU” refers to a “single event upset.” PO Resp. 17 (citing Ex. 1007, 16:7–11).

PO Sur-reply 2 (“[A] force also cannot push in one direction and ‘aid movement’ in the opposite direction.”). Patent Owner’s litigation position is more on point: “Electric drift fields are a well-known phenomenon that cause carriers to move, and a POSITA would have readily recognized that when a ‘static unidirectional electric drift field’ is present that it aids the movement of the minority carriers. If it isn’t present, then it doesn’t.” Ex. 1020, 26; *see also id.* at 27 (“The drift field points to one direction and charge carriers, when free to move, respond to the drift field by moving in one direction or the other depending on their charge polarity.”). More particularly, Patent Owner contends in the related litigation:

Defendants argue that the claims do not recite a range of doping, a particular doping profile, or a particular result. But this is not the test for indefiniteness. While the claims require that the graded dopants create an electric field that aids movement of the carriers, *they do not require a specific range of doping, a particular doping field, or a particular result, and this information is not necessary to understand the scope of Dr. Rao’s invention.*

Id. at 28 (emphasis added). We find that Patent Owner’s arguments in this proceeding are inconsistent with its positions in related litigation, and unpersuasive. For similar reasons, we find that Dr. Glew’s testimony concerning Nishizawa’s¹⁹ teaching on the probability of carriers from an alpha ray at the top of a device is not pertinent. *See* PO Resp. 24–25 n.10.

We turn to Patent Owner’s third contention, i.e., that Petitioner improperly relies on Wang. Patent Owner contends Petitioner has not

¹⁹ U.S. Patent No. 5,384,476 issued January 24, 1995 to Nishizawa et al. (Ex. 2060, “Nishizawa”).

established public availability of Wang, “which purports to be from **2008, i.e., four years after the critical date** for the Challenged Patent.” PO Resp. 26 (citing Ex. 1003 ¶ 92; Pet. ix; Ex. 1009, 429 (listing 2008 copyright date)). Petitioner responds that Wang’s subject matter was “known before the priority date” because Nishizawa, which issued in 1995, “confirms that alpha-ray strikes generate electrons in the active region, and PO’s expert confirmed that alpha ray strikes from cosmic rays were well known before” the earliest possible priority date of the ’842 patent. Pet. Reply 14 (citing Ex. 1052, 82:6–83:7, 116:4–123:15; Ex. 2057, 30, n.4; PO Resp. 25–26).

We agree that Patent Owner’s arguments relying on Nishizawa confirm that a person of ordinary skill in the art would have known before the ’842 patent’s priority date that alpha-ray strikes generate electrons in the active region, and therefore its argument as to Wang’s date is not pertinent to our inquiry. Further, Petitioner does not propose modifying Kawagoe in view of Wang, but rather contends a person of ordinary skill would have understood Kawagoe’s electric field would interact with electrons to aid their movement towards the substrate. *See* Pet. Reply 15.

We turn to Patent Owner’s fourth contention, i.e., that Kawagoe’s electrons that are prevented from entering the p-well are not created near the surface. PO Resp. 27–28. Patent Owner relies on Dr. Glew’s testimony that a person of ordinary skill would have understood that Kawagoe’s reference to “electrons produced by the α -ray” is not describing electrons near the surface, because Nishizawa teaches the “probability of creation of electron-hole pairs is extremely low near the surface.” *See id.* at 27 (emphasis omitted) (citing Ex. 2057 ¶ 55; Ex. 2060, 19:21–34, 20:19–22;). Patent Owner asserts Dr. Blalock’s testimony about Kawagoe should be discredited

for similar reasons. *See id.* at 28 (citing Ex. 2058, 147–148). Petitioner responds that Patent Owner’s argument is largely irrelevant, because there are electrons in Kawagoe’s active region regardless of whether an alpha ray strike ever occurs. Pet. Reply 13. Petitioner further argues that Nishizawa undercuts Patent Owner’s argument that alpha ray strikes in Kawagoe would only produce electrons in the substrate below the well. *Id.*

We agree with Petitioner and find that Kawagoe’s disclosure that “electrons [are] produced by the α -ray” is illustrative, and not limiting as to a person of ordinary skill’s understanding of how Kawagoe’s graded dopant concentration functions. Further, we agree with Petitioner that alpha ray strikes are not even required for Kawagoe’s graded dopant concentration to create an electric field that will have an effect on a carrier depending on its charge polarity, notwithstanding Patent Owner’s assertion that “the alpha-particle immediately after irradiation to the surface of a semiconductor body has an energy of several MeV” and “the probability of creation of electron-hole pairs is extremely low near the surface” (PO Resp. 27 (citing Ex. 2057 ¶ 55; Ex. 1007, 16:7–11; Ex. 2060, 19:21–34, 20:19–22)). Under *ParkerVision*, the relevant inquiry is whether the graded dopant concentration is *capable* of performing the claimed limitation, *not* how likely the claimed limitation is to be performed or occur.

Further, we find that Nishizawa does not support Patent Owner’s position. Nishizawa discloses

[t]he number of electron-hole pairs which are created in that portion of semiconductor region up to a depth of about 0.8 μm from the surface of the semiconductor body is about 1/50 or less of the total number (which is of the order of 10^6) of those electron-hole pairs which are created in the semiconductor body

by a single alpha-particle, where alpha-particle is irradiated in a vertical direction. *In other words, several ten thousand electrons will flow into the n^+ type region 13.*

Ex. 2060, 19:34–42 (emphasis added). Nishizawa further discloses

in case [an] alpha-particle is irradiated with an inclination there onto, the situation will become different. For example, in case an alpha-particle having an initial energy of 5 MeV impinges onto the surface of a silicon semiconductor body at an angle of incidence of 30° , this alpha-particle will enter into silicon up to a depth of 25 μm . However, the depth measured from the topmost surface of the device is 12.5 μm . Also, *as the initial energy of alpha-particle attenuates, the site at which electron-hole pairs are created in a large number will shift toward and closer to the surface of the device.*

Id. at 19:56–67 (emphasis added). We find persuasive Petitioner’s argument that even if an alpha ray strike were required, Nishizawa indicates that the alpha ray strike could produce electrons near the surface of the CMOS device. *See* Pet. Reply 13–14.

We turn to Patent Owner’s fifth contention, i.e., that Kawagoe’s teaching about a gradient only refers to gradients and carriers outside the active region. PO Sur-reply 9. According to Patent Owner, “[t]he Petition itself confirms that Kawagoe’s teaching ‘refers to electrons produced in the large substrate body below the wells.’ The carriers Kawagoe discusses are ‘prevented from entering the p-well,’ and are thus below it.” *Id.* (internal citation omitted) (citing Pet. 28, n.9; PO Resp. 24). Patent Owner further contends that “Dr. Glew testified that Kawagoe ‘only describes that this dopant gradient is able to keep SEU electrons out of the well,’ and says nothing about drawing carriers ‘from the . . . active regions.’” *Id.* at 10 (citing Ex. 1052, 121:11–17, 122:6–9). Patent Owner also argues that

“Petitioner offers no analysis of Kawagoe’s electric field to show that it has the same effect in the active region as further down” (*id.*) and that the Petition incorrectly maps the challenged claim to Kawagoe. *Id.* at 11–12. Patent Owner also argues that the active region is the well region. *Id.* at 13 (citing Ex. 1052, 24:1–9) (“as Dr. Glew explained, Petitioner is ignoring Figure 5A. ‘Looking back at 5A, one can see a p-well and an n-well. ... [S]ources and drains are of the opposite type of well or active area they’re formed in. So if I have an n-type source and drain, it will be formed in a p-type [active] region.’” (alterations by Patent Owner)).

For the reasons discussed for limitation [1.2] *supra*, we agree with Petitioner’s position that “the ‘doping type’ of the ‘first active region’” is “the doping type of the associated *source and drain regions*,” which is supported by the underlying evidence in Wolf. Pet. Reply 18 (emphasis added); *see* Ex. 1008B Fig. 5-1(a), 298–99).

In view of the foregoing, we find that Kawagoe discloses limitation [1.5].

f. Conclusion as to Claim 1

For the foregoing reasons, including the evidence of objective indicia of non-obviousness, we determine that Petitioner establishes by a preponderance of the evidence that claim 1 is unpatentable as obvious over Kawagoe.

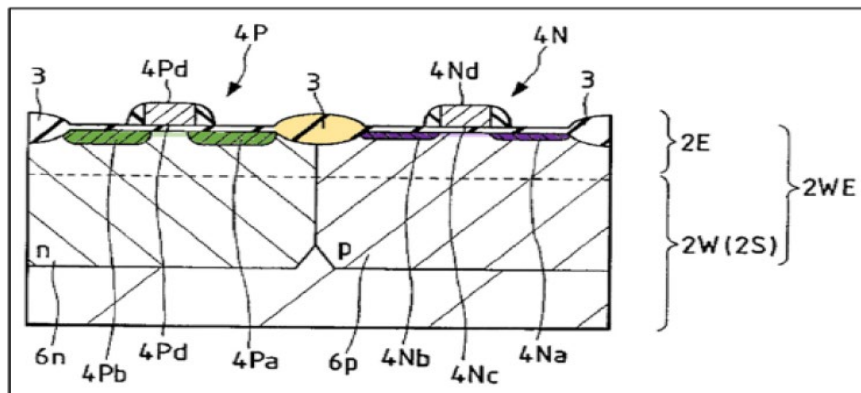
3. Independent Claim 9

Petitioner’s arguments and evidence for claim 9 (Pet. 35–37) are substantially the same as Petitioner’s arguments and evidence for claim 1 (*id.* at 13–30).

Patent Owner does not present argument for independent claim 9, beyond what is presented for independent claim 1. In view of the foregoing discussion, we determine that Petitioner establishes by a preponderance of the evidence that independent claim 9 is unpatentable as obvious over Kawagoe.

4. Dependent Claims 7 and 15

Claims 7 and 15 recite “wherein the first active region and second active region are each separated by at least one isolation region.” Petitioner maps Kawagoe’s field insulating film 3, annotated in yellow in Kawagoe’s Figure 23, as reproduced below, to the claimed isolation region.



The figure reproduced above depicts Petitioner’s annotated version of Kawagoe’s Figure 23 with field insulating film 3 highlighted yellow. Pet. 35.

Patent Owner argues

the Petition fails to appreciate that regions 4Na and 4Nb, which “are regions for forming the source-drain regions of the nMOS 4N” “are made as deep as about 0.5 μm and ***formed in the range of the thickness of the epitaxial layer 2E.***” Kawagoe provides similar disclosure regarding regions 4Pa and 4Pb. Thus, a POSITA would have understood that the first and second active regions extend to about the depth of the epitaxial

layer 2E and abut each other laterally, and therefore they are not separated by Kawagoe's field insulating film 3, as required by claims 7 and 15.

PO Resp. 34–35 (citing Ex. 1007, 8:66–67, 9:3–6, 9:47–53; Ex. 2057 ¶ 64). Accordingly, Patent Owner contends that “[t]he field insulating film 3 is formed ‘[o]ver the principal surface of the epitaxial layer 2E’ and a POSITA would have understood that it does not extend deep enough to separate the two active regions.” *Id.* at 35 (citing Ex. 2057 ¶ 64; Ex. 1007, 8:40–42).

Petitioner replies that Patent Owner's “argument rests on an unsupported assumption that claims 7 and 15 require the isolation region to separate the first and second active regions at *all points along their respective depth*.” Pet. Reply 20 (citing PO Resp. 33–35) (emphasis added). According to Petitioner, “the claims do not specify where and to what extent the isolation region must separate the first and second active regions.” *Id.*

Petitioner also argues Patent Owner misunderstands Kawagoe's geometry. Pet. Reply 20. First, Petitioner argues epitaxial layer 2E can range from 0.3 μm to 5 μm , the top end of the range being significantly larger than the maximum 0.5 μm depth of semiconductor active region 4Na, 4Nb, 4Pa, and 4Pb. *Id.* at 21. Second, Petitioner argues “Kawagoe teaches that insulating film 3 is formed via [local oxidation of silicon, “LOCOS”] which (according to Patent Owner's own expert) ‘consumes a portion of the silicon and works its way downward.’” *Id.* at 21 (citing Ex. 1052, 139:2–142:2).

Finally, Petitioner contends that, even if the “claims require[ed] separation on the full depth of the active regions *and* if PO were right about the active regions protruding deeper into the device than insulating film 3, Kawagoe would *still* teach an ‘isolation region’ that separates the first and

second active regions.” Pet. Reply 21. Petitioner points to Kawagoe’s teaching “a channel stopper region is formed below the field insulating film 3, although not shown.” *Id.* at 22 (citing Ex. 1007, 8:43–45).

We find Petitioner has the better position, for the simple reason that the claims do not require the “isolation region” to completely separate the active regions, that is, that the isolation region extend to a depth that is the same as or deeper than the depth of the active regions. The claimed “isolation region” is not defined or set forth in the specification, only in the claims.

For the foregoing reasons, we determine that Petitioner establishes by a preponderance of the evidence that claims 7 and 15 are unpatentable as obvious over Kawagoe.

5. Remaining Dependent Claims

We have reviewed Petitioner’s arguments and evidence for remaining claims 2, 4–6, 8, 10, 12–14, and 16–18, and we are persuaded that the cited portions of Kawagoe teach what Petitioner asserts they teach and that Dr. Blalock’s testimony sufficiently supports Petitioner’s arguments. *See* Pet. 32–40. Patent Owner does not present arguments for these claims beyond those presented for independent claim 1. In view of the foregoing discussion, we determine that Petitioner establishes by a preponderance of the evidence that these dependent claims are unpatentable as obvious over Kawagoe.

F. Obviousness Based on the Combination of Wieczorek and Wolf

Petitioner challenges claims 1–3, 5–11, and 13–18 as obvious based on the combination of Wieczorek and Wolf. Pet. 5, 40–62. Patent Owner disagrees. *See generally* PO Resp. For the reasons discussed below, Petitioner has established by a preponderance of evidence that claims 1–3,

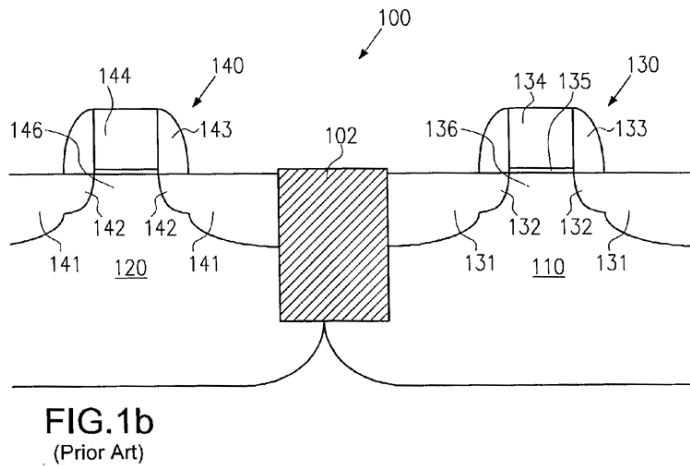
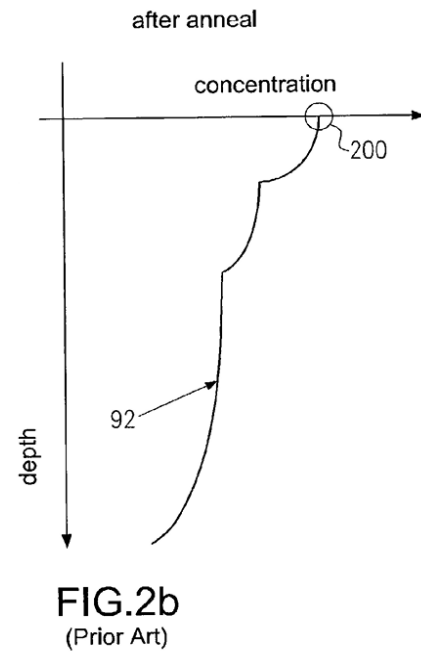
5–11, and 13–18 are obvious based on the combination of Wieczorek and Wolf.

1. Wieczorek (Ex. 1006)

Wieczorek relates “to a semiconductor device, such as a field-effect transistor, having an improved retrograde dopant profile in a channel region of the transistor element.” Ex. 1006 ¶ 2. Petitioner relies on Wieczorek’s description of a conventional prior-art CMOS device, not its disclosed improvement. Pet. 40.

Wieczorek explains that a retrograde channel dopant profile is one where “the concentration of dopants increases from the gate insulation layer to the areas located deeper down the channel region.” Ex. 1006 ¶ 6. According to Wieczorek, a retrograde channel dopant profile is desirable, but “very difficult to obtain.” *Id.* Wieczorek states that “the dopant concentration immediately after the implantation process exhibits a desired retrograde dopant profile” (*id.* ¶ 9), but during heat treatment, “the initially retrograde profile in the vicinity of the surface of the semiconductor device . . . may have become substantially uniformly distributed” due to diffusion of the dopant atoms (*id.* ¶ 11).

Petitioner relies on Figures 1b and 2b (reproduced below), which Wieczorek uses to illustrate the prior art.



Wieczorek Figure 1b shows a conventional semiconductor device at an early manufacturing stage, including shallow trench isolation 102 separating N-well structure 120 from P-well structure 110. Ex. 1006 ¶¶ 7, 20. The device includes P-channel transistor 140 with source and drain regions 141 in N-well structure 120 and N-channel transistor 130 with source and drain regions 131 in P-well structure 110. *Id.* ¶ 12. Wieczorek Figure 2b is a graph of dopant concentration versus depth of N-well structure 120 and P-well structure 110 and shows “a typical dopant profile with respect to the depth of the respective well structure” after ion implantation and heat treatment. *Id.* ¶¶ 9–11, 13, 21.

2. *Wolf (Ex. 1008)*

Wolf is a four-volume textbook titled “Silicon Processing for the VLSI Era.” Ex. 1008.

3. Reason to Combine Wieczorek and Wolf

Petitioner argues a person of ordinary skill in the art would have had a reason to combine the teachings of Wieczorek and Wolf because Wieczorek discloses “a conventional prior-art CMOS device” and “Wolf is a well-known textbook that teaches known fundamental features and concepts related to semiconductor manufacturing, with particular emphasis on CMOS devices.” Pet. 40–41. Petitioner further argues Wieczorek discloses “[a] typical process flow for forming the semiconductor device 100” which is “a complementary MOS transistor pair.” *Id.* at 40 (citing Ex. 1006 ¶ 12, Fig. 1b). Dr. Blalock explains that a person of ordinary skill in the art would have looked to Wolf for details on how to manufacture the conventional CMOS devices of Wieczorek. Ex. 1003 ¶ 138; Ex. 1008A, 807–40. Based on Petitioner’s showing, we find that a person of ordinary skill in the art would have been motivated to combine the teachings of Wieczorek and Wolf with a reasonable expectation of success.

4. Claim 1

Petitioner provides detailed analysis showing where it contends each limitation of claim 1 is taught in the combination of Wieczorek and Wolf. Patent Owner does not dispute Petitioner’s showing, except with regard to limitation [1.5]. *See* PO Resp. 29–31. We focus our discussion on that disputed limitation.

- a. [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.”

Petitioner contends the combination of Wieczorek and Wolf teaches this limitation. Petitioner contends channel region 136 of Wieczorek’s nMOS transistor 130, formed at the top surface of the substrate shown in Figure 1b, is a portion of the first active region. Pet. 50 (citing Ex. 1006 ¶¶ 4, 12–13; Ex. 1008B, 298–301, Fig. 5-2; Ex. 1003 ¶ 140. Petitioner contends Wieczorek discloses a doping profile in Figure 2b which shows the dopant concentration is highest at the surface of the substrate and decreases with depth. *Id.* at 51 (citing Ex. 1003 ¶ 141). Therefore, Petitioner contends, channel region 136 has a graded dopant concentration. *Id.* Petitioner further contends Wieczorek discloses channel region 146 of pMOS transistor 140 also has a graded dopant concentration. *Id.* at 52 (citing Ex. 1006 ¶¶ 4, 9, 11–13, Figs. 2a, 2b; Ex. 1008B, 298–301, Fig. 5-2. Petitioner further contends Wieczorek’s downward-sloping graded dopant concentration aids carrier movement from the first surface to the second surface of the substrate. *Id.* at 52–53.

Patent Owner argues Petitioner’s Wieczorek-based challenge fails for similar reasons to the challenge based on Kawagoe. PO Resp. 29. Patent Owner’s argument is based on its interpretation of limitation [1.5] as requiring that the graded dopant concentration “aid carrier movement” and its contention as to the effect of its statements during prosecution history, as discussed in Section III.E.2.e. *supra*. Patent Owner further asserts “Dr. Blalock admitted that he did not calculate the slope of the graded

concentration curve in Wieczorek” and “it would have been impossible for Dr. Blalock to make such a calculation, because the dopant gradient Petitioner points to in Figure 2B (and Wieczorek generally) does not have any values from which one could calculate a slope.” *Id.* at 30 (citing Ex. 2058, 195; Ex. 2057 ¶ 60).

Having considered the evidence and arguments of both parties, we find that Petitioner demonstrates the combination of Wieczorek and Wolf teaches limitation [1.5]. For substantially the same reasons set forth above in Section III.E.2.e., we find Patent Owner’s arguments unpersuasive. We interpret limitation [1.5] under *ParkerVision*, as described above, and therefore Petitioner need only show a graded dopant concentration that is capable of aiding carrier movement; Petitioner is not required to show a particular slope for Wieczorek’s graded dopant concentration. For the reasons set forth in the context of our discussion of the Kawagoe-based challenge, and Petitioner’s detailed showing, we find that the combination of Wieczorek and Wolf discloses limitation [1.5].

b. Conclusion as to Claim 1

For the foregoing reasons, including the evidence of objective indicia of non-obviousness, we determine that Petitioner establishes by a preponderance of the evidence that claim 1 is unpatentable as obvious over the combination of Wieczorek and Wolf.

5. Claims 2, 3, 5–11, and 13–18

We have reviewed Petitioner’s arguments and evidence for claims 2, 3, 5–11, and 13–18 and we are persuaded that the cited portions of Wieczorek and Wolf teach what Petitioner asserts they teach and that Dr. Blalock’s testimony sufficiently supports Petitioner’s arguments. *See*

Pet. 32–40. Patent Owner does not present arguments for these claims beyond that presented for independent claim 1. In view of the foregoing discussion, we determine that Petitioner establishes by a preponderance of the evidence that these dependent claims are unpatentable as obvious over the combination of Wieczorek and Wolf.

G. Remaining Challenges II and IV

For the reasons discussed above, Petitioner has shown by a preponderance of the evidence that claims 1–18 of the '842 patent are unpatentable. We have, thus, addressed all of the challenged claims. *See* 35 U.S.C. § 318(a) (requiring the Board to “issue a final written decision with respect to the patentability of any patent claim challenged by the petitioner and any new claim added under section 316(d)”); *see also SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding that a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”). Accordingly, we need not and do not decide whether Petitioner has shown by a preponderance of the evidence that claims 1, 2, 4–10, and 12–18 are unpatentable over the combination of Kawagoe and Gupta, or that claims 1–3, 5–11, and 13–18 are unpatentable over the combination of Wieczorek, Wolf, and Gupta. *Cf. In re Gleave*, 560 F.3d 1131, 1338 (Fed. Cir. 2009).

IV. CONCLUSION

Petitioner has shown by a preponderance of the evidence that the challenged claims are unpatentable as summarized below:

Claim(s)	35 U.S.C. §	Reference(s)/ Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
1, 2, 4–10, 12–18	103(a)	Kawagoe	1, 2, 4–10, 12–18	
1, 2, 4–10, 12–18	103(a)	Kawagoe, Gupta ²⁰		
1–3, 5–11, 13–18	103(a)	Wieczorek, Wolf	1–3, 5–11, 13–18	
1–3, 5–11, 13–18	103(a)	Wieczorek, Wolf, Gupta ²¹		
Overall Outcome			1–18	

This Decision may discuss confidential matters because it discusses certain papers and exhibits that the parties filed under seal. Accordingly, we issue the present decision under seal, and we order the parties, within ten days after the issuance of this decision, to file a joint motion to seal explaining why this decision should remain under seal and including a redacted version of this decision that can be made publicly available. The present decision shall remain under seal until the joint motion to seal the present decision is resolved.

²⁰As explained above, because we determine that challenged claims 1, 2, 4–10, and 12–18 are unpatentable over Kawagoe, we decline to address this ground.

²¹As explained above, because we determine that challenged claims 1–3, 5–11, and 13–18 are unpatentable over the combination of Wieczorek and Wolf, we decline to address this ground.

V. ORDER

For the reasons given, it is

ORDERED that the Order Granting Motion to Strike (Paper 78) is vacated-in-part with respect to Exhibits 2077 and 2079;

ORDERED that district court claim construction orders (Exhibits 2077 and 2079) are admitted as evidence;

FURTHER ORDERED that Petitioner has shown that claims 1–18 of the '842 patent are unpatentable;

FURTHER ORDERED that, no later than ten days after the issuance of this decision, the parties shall file a joint motion to seal, explaining why this decision should remain under seal, and including a redacted version of this decision that can be made publicly available;

FURTHER ORDERED that the present decision shall remain under seal until the joint motion to seal the present decision is resolved; and

FURTHER ORDERED that because this is a Final Written Decision, parties to this proceeding seeking judicial review of our decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

IPR2023-01243
Patent 10,510,842 B2

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