PUBLIC VERSION

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MONOLITHIC POWER SYSTEMS, INC.,

Petitioner,

v.

GREENTHREAD, LLC,

Patent Owner.

Case No: IPR2024-00552

U.S. Patent No. 11,121,222

PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE

TABLE OF CONTENTS

I. INTRODUCTION 1

II. THE EVIDENCE DEMONSTRATES OBVIOUSNESS 3

A. THE BOARD HAS INVALIDATED THE SUBJECT MATTER OF THE CLAIMS 3

B. PO'S ARGUMENTS DO NOT COMPORT WITH THE CLAIMS AND USPTO ARGUMENTS 3

1. THE CLAIMS SUPPORT THAT A GRADED DOPANT CONCENTRATION MEETS "AID CARRIER MOVEMENT" 3

2. PO ARGUED THAT A "GRADED CONCENTRATION," ITSELF, MEETS "AID THE MOVEMENT" TO OVERCOME SECTION 112 5

3. PO REPEATEDLY MISREPRESENTS THE PROSECUTION HISTORY 8

C. PO'S ALL-FORCE-CALCULATION REQUIREMENT DOES NOT COMPORT WITH OBVIOUSNESS LAW 9

1. PO MISAPPLIES OBVIOUSNESS LAW 10

2. THE SLOPES OF GROUNDS 1-3 RENDER OBVIOUS "AID CARRIER MOVEMENT" 12

3. PO'S ALL-FORCE-CALCULATION PREMISE IS FAULTY 13

III. GROUNDS 1-3 DEMONSTRATE OBVIOUSNESS 15

A. Ground 1: Kawagoe renders the challenged claims obvious 15

B. Ground 1: Dependent claims 6 and 27 17

C. Ground 2: Onoda renders the challenged claims obvious 18

D. Ground 3: Onoda in view of Nishizawa renders the challenged claims obvious 19

IV. PO'S RELIANCE ON DR. CAMPBELL IS MISPLACED 21

V. DR. GLEW'S TESTIMONY SHOULD BE GIVEN NO WEIGHT 22

VI. PO FAILS TO DEMONSTRATE SECONDARY CONSIDERATIONS 23

VII. THE PETITION IS NOT TIME-BARRED 24

VIII. CONCLUSION 28

UPDATED EXHIBIT LIST

Ex. 1001	U.S. Patent No. 11,121,222 (the "'222 Patent")
Ex. 1002	Prosecution History of the '195 Patent
Ex. 1003	Declaration of Dr. Stephen Campbell
Ex. 1004	Curriculum Vitae of Dr. Stephen Campbell
Ex. 1005	U.S. Patent No. 4,684,971 ("Payne")
Ex. 1006	U.S. Patent No. 4,907,058 to Sakai ("Sakai")
Ex. 1007	U.S. Patent No. 6,043,114 to Kawagoe, et al., ("Kawagoe")
Ex. 1008	Wolf and Tauber, Silicon Processing For The VLSI Era, Vol 1, Lattice Press (2000)
Ex. 1009	U.S. Patent No. 4,160,985 ("Kamins")
Ex. 1010	U.S. Patent No. 4,481,522 ("Jastrzebski")
Ex. 1011	U.S. Patent Application Publication No. 2003/0042511 ("Rhodes")
Ex. 1012	U.S. Patent Application Publication No. 2002/0102783 ("Fujimoto")
Ex. 1013	Wang and Agrawal, *Single Event Upset: An Embedded Tutorial*, 21st Intl Conf on VLSI Design, IEEE 2008 ("Wang")
Ex. 1014	Publication Declaration of Alyssa G. Resnick for Wolf.1 and Wolf.2 ("Resnick Decl.")
Ex. 1015	Publication Declaration of Rachel J. Watters for Wolf.3 and Wolf.4 ("Watters Decl.")
Ex. 1016	IPR2020-00289, Patent Owner Preliminary Response
Ex. 1017	U.S. Pat. No. 11,121,222 (the "'222 Patent")
Ex. 1018	U.S. Pat. No. 11,316,014 (the "'014 Patent")

Ex. 1019	Civil Action No. 2:19-cv-00147-JRG, Dkt. 67 (E.D. Tex. Apr. 20, 2019)
Ex. 1020	Prosecution History of U.S. Pat. No. 11,121,222
Ex. 1021	Prosecution History of U.S. Pat. No. 11,316,014
Ex. 1022	U.S. Patent Application Publication No. 2004/0063288 ("Kenney")
Ex. 1023	Jaeger, *Introduction to Microelectronic Fabrication*, Vol. V, Addison-Wesley Modular Series on Solid State Devices (1988) ("Jaeger")
Ex. 1024	U.S. District Courts – Case Statistics, obtained at https://www.uscourts.gov/statistics-reports/analysis-reports/ federal-court-management-statistics, dated June 30, 2023
Ex. 1025	U.S. Patent No. 4,435,896 ("Parrillo")
Ex. 1026	L.C. Parrillo, R.S. Payne et al., *Twin-Tub CMOS - A Technology for VLSI Circuits*, IEEE 1980 ("Parrillo2")
Ex. 1027	U.S. Patent Application Publication No. 2007/0045682 to Hong *et al*. ("Hong")
Ex. 1028	The Oxford American Dictionary and Language Guide, Oxford University Press (1996)
Ex. 1029	U.S. Patent No. 9,190,502 File History
Ex. 1030	Patent Owner's Responsive Claim Construction Brief
Ex. 1031	RESERVED
Ex. 1032	Patent Owner's Sur-Reply Claim Construction Brief
Ex. 1033	Proposed Claim Constructions in the District Court Case
Ex. 1034	Redacted District Court Case Transfer Order
Ex. 1035	Civil Action No. 2:19-cv-00147-JRG, Dkt. 105 (E.D. Tex. Jul. 9, 2020)
Ex. 1036	Publication Declaration of Sylvia Hall-Ellis for Wolf

Ex. 1037	Dec. 21, 2022 Preliminary Claim Constructions in 6:22-CV-00105
Ex. 1038	U.S. Patent Application Publication No. 2003/0183856 to Wieczorek ("Wieczorek")
Ex. 1039	Parrillo IEEE Citation List
Ex. 1040	Dictionary of Engineering, McGraw Hill (2003)
Ex. 1041	Rubin et al., *Ranges and Moments of Depth Distributions of Boron and Phosphorus Implanted into Silicon in the Energy Range 1.7 -5.0 MeV with an Eaton NV-GSD/VHE Implanter*, IEEE 1997 ("Rubin")
Ex. 1042	Certified translation of Japanese Unexamined Patent Application Publication No. H8-279598 ("Onoda")
Ex. 1043	Japanese Unexamined Patent Application Publication No. H8-279598, published on October 22, 1996
Ex. 1044	IPR2020-289, Termination Order
Ex. 1045	Oct. 31, 2022 Giapis Declaration, 6:22-CV-00105
Ex. 1046	U.S. Pat. No. 5,384,476 (the "'576 Patent") ("Nishizawa")
Ex. 1047	U.S. Pat. No. 6,900,091 (the "'091 Patent") ("Williams")
Ex. 1049	Patent Owner's claim construction brief in *Greenthread, LLC v. Cirrus Logic, Inc.*, 1-23-cv-00369-DC-DTG
Ex. 1050	Patent Owner's reply claim construction brief in *Greenthread, LLC v. Cirrus Logic, Inc.*, 1-23-cv-00369-DC-DTG
Ex.1051	CMOS Layout, Plate 4, from Principles of CMOS VLSI Design: A Systems Perspective, by Neil H. E. Weste and Kamran Eshraghian, Addison-Wesley Publishing, Reading PA (1985)
Ex. 1052	Cover Pages of Modern VLSI Design: System-on-Chip Design, Third Edition, by Wayne Wolf, Prentice Hall (January 2002)
NEW EXHIBITS	
Ex. 1053	RESERVED
Ex. 1054	Declaration of Dr. Stephen Campbell

Ex. 1055	Deposition of Dr. Alexander Glew
Ex. 1056	Excerpts from LePlante, Electrical Engineering Dictionary, ISBN 0-8493-2170-0 (2000)
Ex. 1057	Excerpts from Dictionary of Electrical and Computer Engineering, McGraw-Hill, ISB 0-07-144210-3
Ex. 1058	Excerpts from The Authoritative Dictionary of IEEE Standards Terms, 6th Ed ISBN 0-7381-2601-2 (2000)
Ex. 1059	Sproul, Understanding the p-n junction
Ex. 1060	https://www.rpxcorp.com/faqs/#we-are-a-unique-solution-to-all-forms-of-patent-risk
Ex. 1061	https://www.rpxcorp.com/solutions/rpx-network/
Ex. 1062	DigiKey website showing the MP6924
Ex. 1063	Sony website showing PlayStation purchase options
Ex. 1064	DigiKey website showing the MP2935
Ex. 1065	DigiKey website showing a search for chips using the Intel VR12 Platform

I. INTRODUCTION

In multiple Final Written Decisions, the PTAB rejected PO's misrepresentation of the prosecution history and direct contradictions of those unambiguous statements made as patentability arguments in its Patent Owner Response. This panel should do the same.[1]

The claims of U.S. Pat. No. 11,121,222 (the "'222 Patent") recite an apparatus with a "graded dopant concentration" that "aid[s] carrier movement." To overcome § 112 rejections during prosecution of the '222 Patent's parent (U.S. Pat. No. 8,421,195 (the "'195 Patent")), Applicant insisted unequivocally that a graded dopant concentration inherently creates a field that "aid[s] the movement of minority carriers." Now, desperate to evade invalidating prior art, PO disavows its earlier representations and instead argues that (1) alleged "forces" never mentioned in the specification or during prosecution must be calculated to determine the net

[1] *See Semiconductor Components Industries, LLC et al. v. Greenthread, LLC*, IPR2023-01243 (invalidating claims 1-18 of the '842 Patent); *see also* IPR2023-01242 (invalidating claims 1-9, 13-28, 32-42 of family member U.S. Pat. No. 11,121,222 (the "'222 Patent") *and* IPR2023-01244 (invalidating claim 44 of the '222 Patent)).

force on a "carrier" and (2) the actual physical movement of a "carrier" in the prior art must be proven to establish obviousness.

In rejecting PO's specious new arguments, the *Semiconductor Components* panel stated:

> [W]e 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 field[s]" 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***. [Citing Ex. 1002, at 270, 289–290.] The public was entitled to rely on these clear and unambiguous statements when considering the scope of the challenged claims. [Citing *Hockerson-Halberstadt v. Avia Group Int'l,* 222 F.3d 951, 957 (Fed. Cir. 2000).] ***Patent Owner's statements during prosecution contradict its arguments in the present proceeding***.
>
> 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.

IPR2023-01243, Paper 83 at 35-36 (emphases added).

Even if PO were allowed to directly contradict its earlier statements—and its new all-force-calculation argument were given weight—the prior art still renders obvious the "aid carrier movement" limitation. Grounds 1-3 teach a downward force, and a POSITA would have found it obvious that it would affect an electron's movement.

The teachings of Nishizawa and Kawagoe of Grounds 1 and 3, respectively, teach "aid carrier movement." Nishizawa states that "electrons … created by alpha-particle in the p+ type buried region 33a" would normally drift upwards with a uniform dopant concentration (EX1046, 18:36-43), and "to prevent such flow of electrons, it is only necessary to form an impurity concentration gradient" (*id.*, 18:46-48). Kawagoe teaches "electrons produced by the a-ray are attracted to the substrate body 2S by that concentration gradient." (EX1007, 16:7-9.) PO's arguments ignore these teachings and should be rejected.

II. THE EVIDENCE DEMONSTRATES OBVIOUSNESS

A. The Board has invalidated the subject matter of the claims

As stated, the Board has repeatedly rejected PO's all-force-calculation argument. *Semiconductor*, IPR2023-01243, IPR2023-01242, and IPR2023-01244. This panel should as well.

B. PO's arguments do not comport with the claims and USPTO arguments

PO's argument improperly injects limitations requiring carrier movement by requiring a calculation of all device forces. This is not supported by the claims and directly contradicts PO's prosecution and district court arguments.

1. The claims support that a graded dopant concentration meets "aid carrier movement"

The claims are directed to a device capable of aiding carrier movement (as opposed to requiring movement). The claims recite a device (EX1001, 4:39) that

has a "graded dopant concentration." (*Id.*, 4:52-53.) They describe a device's *structure*, not a method and active performance. *ParkerVision, Inc. v. Qualcomm Inc.*, 903 F.3d 1354, 1361 (Fed. Cir. 2018) (device claims "cover what a device *is*, not what a device *does*"). The claims, moreover, merely require that the claimed "graded dopant concentration" "aid carrier movement"—***not*** that it generate a field to overcome all other theoretical forces (none of which are identified the specification, prosecution history, or the cited prior art) that may exist within a theoretical device. *ParkerVision,* 903 F.3d at 1361. PO's restrictions are unsupported.

PO incorrectly argues that Petitioner's interpretation renders the limitations superfluous. (POR, 16-19.) The claims recite a physical element "graded dopant concentration" (EX1001, 4:63-65) that aids carrier movement ***downward*** ("from the first surface to the second surface of the substrate"). (*Id.*, 4:64-65.)

Neither district court order cited by PO supports its arguments. (POR at 17-18.) They involved different disputes and held that the claimed "graded concentration" merely requires a relative slope. The W.D. Texas order addressed the indefiniteness of a "graded concentration." (EX2074, 32, 41.) The parties disputed whether "graded" had any meaning; PO successfully argued that the specification sufficiently depicted "graded" because it depicted a downward slope. (*Id.,* 36, 38-39.) The E.D. Texas order construed the "single drift layer" and its

"unidirectional electric field." (EX2075, 10.) The court addressed whether the construction required a non-varying, constant slope and held that "the slope of the graded concentration need not be solely decreasing or solely increasing to yield the recited 'unidirectional electric drift field.'" (*Id.,* 11.) Neither holding supports PO.

2. PO argued that a "graded concentration," itself, meets "aid the movement" to overcome section 112

PO directly contradicts arguments it made during prosecution of the '195 Patent to overcome § 112 rejections. *Semiconductor*, IPR2023-01243, 35 ("[PO's] statements during prosecution contradict its arguments in the present proceeding").

Specifically, the USPTO rejected the then-claim limitation of "a unidirectional drift field ***drawing all*** minority carriers from said surface layer to said substrate." (EX1002, 269-270 ("It is not clear if simply the application of 'a unidirectional drift field' is sufficient to achieve the effect of 'drawing all minority carriers from said substrate to said surface layer'").) The USPTO reasoned that a graded concentration alone would not necessarily ***draw all*** minority carriers to the substrate due to other forces. (*Id.*, 270 ("movement of minority carriers is affected by multiple forces and fields, and 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'").)

Applicant emphatically disagreed, stating "a unidirectional drift (electric) field ***necessarily affects all*** the present minority carriers in the same way—

moving all minority carriers in the same direction…" (EX1002, 289 (emphases added).) Applicant argued that the USPTO had failed to recognize that "the ***graded dopant concentration itself*** creates a 'built-in' electrical field that ***forces the movement*** of carriers into a particular direction." (*Id*., 289-90 (emphases added).) Applicant went further—"without conceding Applicant's position on this issue," it amended the claims by deleting "drawing all minority carriers" and substituting "aid the movement of minority carriers," and argued that a graded dopant concentration inherently aids movement. (*Id*., 290, 286.) Applicant unequivocally committed itself to the position that a downward dopant gradient, by itself, "aid[s] the movement of minority carriers."

Subsequent exchanges confirm this. After the above, the USPTO rejected the claims, stating the then-pending claim language of "create and maintain a single static unidirectional electric drift field" still failed to comply with § 112. (EX1002, 301, 286.) In response, Applicant removed the language of "maintain" and "single," but argued the "static" field was supported because it was "created by [a] graded concentration of dopants which does not change over time." (*Id*., 318 (internal quotations omitted).) The claims were subsequently allowed. (*Id*., 341.)

Applicant, moreover, relied on the teachings of prior art (Kamins/Jastrzebski) to argue that a graded dopant concentration inherently aids minority carrier movement. (EX1002, 333, 290.) Kamins teaches "carriers created

below the maximum dopant concentration are accelerated into the substrate." (EX1009, 3:8-10.) Jastrzebski teaches "a drift field created by a graded concentration" where the "drift field is… directed to force most of the charge carriers … deep into the substrate." (EX1010, 5:12-19.)

PO also contradicts its argument in district court that "aid the movement" is "a simple term" (EX1030, 25) that is definite because "[e]lectric 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 [sic] it aids the movement of minority carriers." (*Id.*, 26.) PO continued: "[w]hile 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 [Inventor's] invention." (*Id.*, 28 (emphases added).) Those statements directly contradict PO's arguments that a slope's magnitude, and the combined force effect, must be calculated to reach the limitation.

In sum, to convince the USPTO to issue its claims, and to convince the district court that "aid the movement" is sufficiently definite, PO argued that a downward dopant gradient—in itself—aids carrier movement and that a POSITA would understand as much. PO is now precluded from disavowing those statements.

3. PO repeatedly misrepresents the prosecution history

First, PO wrongly states the Examiner argued that "'without knowing other parameters of the device' one cannot say whether the field would aid carrier movement." (POR, 15.) In actuality, the cited rejection did not address the "aid the movement" limitation which was added *in response to* the cited rejection. (EX1002, 270 (rejection for "drawing all").) *After* this rejection, Applicant removed "drawing all" and added "aid the movement of" to the claims. (*Id.*, 286.) Applicant argued that the drift field affects all carriers and the Examiner had not properly recognized that "the graded dopant concentration itself creates a 'built-in' electric field that forces the movement of carriers." (*Id.*, 289.) The claims were subsequently allowed. (*Id.*, 341.)

Second, PO falsely claims that, during prosecution, it argued that the graded dopant concentration must move carriers and emphasized that "aid the movement of minority carriers" is a separate element from the graded concentration of dopants. (POR, 18-19.) PO's alleged support does not come from the prosecution history, it cites a section of its claim construction brief—that did not deal with the prosecution history—against Intel. (*Id.* (citing to EX1030, 29).)[2]

[2] The cite is a typo. The quote is found in EX1030.

Third, PO falsely claims Applicant emphasized the slope's magnitude during prosecution. (POR, 19-20.) In actuality, Applicant emphasized the slope's *direction*, not its *magnitude*:

> "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... ***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)."

(EX1002, 289 (emphases added with Applicant-added emphasis removed).)

Fourth, PO falsely claims Applicant argued in prosecution that aid the movement was an "additional parameter" beyond the dopant gradient. (POR, 19-20.) In actuality, Applicant explicitly stated that the graded dopant concentration inherently creates the field that aids movement:

> "the graded dopant concentration <u>itself</u> creates a 'built-in' electrical field that forces the movement of carriers into a particular direction … [and] ***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***."

(EX1002, 289-90 (underlined emphasis in original and bolded emphases added).) That PO must resort to misrepresentations of the prosecution history demonstrate the lack of merit in its arguments.

C. PO's all-force-calculation requirement does not comport with obviousness law

PO's claim scope arguments are incorrect and, absent that premise, PO lacks

a novelty position. *Semiconductor*, IPR2023-01243 at 39. But even if PO's arguments were entertained, the claims are still obvious because PO misapplies governing law, misstates science, and contradicts the references' literal teachings.

1. PO misapplies obviousness law

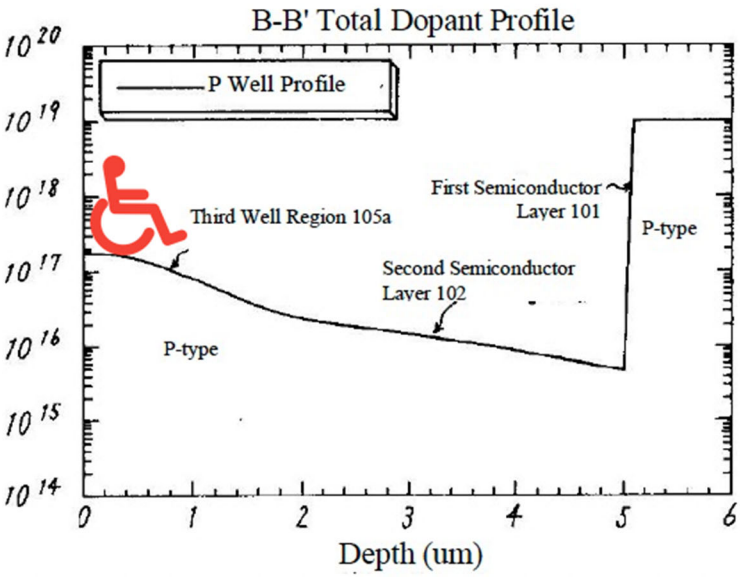
PO misstates the Petition and misapplies obviousness law. It recasts the Petition as relying on inherency, requiring more than a "probability." (POR, 2-3.) PO then argues there are other forces that may prevent an electron from moving downward and one cannot reach obviousness absent their calculation.

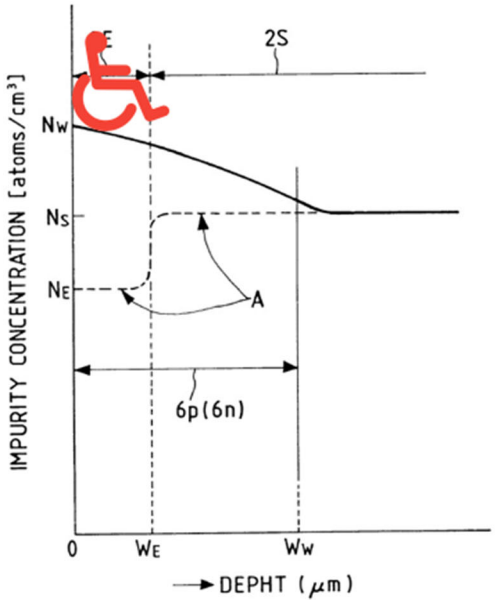
The Petition, however, does not take a missing limitation and state it is inherently present. Rather, it identifies the limitation ("graded dopant concentration") then describes the force applied on a carrier ("aid carrier movement from the first surface towards the area of the substrate where there are no active regions"). (EX1001 at 4:57-60.)

Grounds 1-3 render these limitations obvious. Each of Onoda, Nishizawa, and Kawagoe teaches a graded dopant concentration that generates a field. (EX1042, FIG. 11; EX1046, 18:35-58; EX1007, 16:2-9.) The dopant concentration is graded in a particular direction a POSITA understood that such a gradient generates a unidirectional electric drift field to apply a downward force. (EX1054, ¶4.)

As PO argued to avoid indefiniteness, the graded dopant concentration is

like a wheelchair ramp, and "nobody would dispute that a wheelchair ramp 'aids the movement' of someone in a wheelchair." (EX1030, 25; *see also id.,* 27-28 (stating slope magnitude not required).) The graphics below (Onoda FIG. 11 (left) and Kawagoe FIG. 16 (right)) illustrate the simple point.[3]





Now, however, PO improperly seeks to concoct and apply a rigid test requiring all conceivable, hypothetical forces be calculated to reach obviousness. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 403, (2007) ("Rigid preventative rules that deny recourse to common sense are neither necessary under, nor consistent with, this Court's case law.") Tellingly, if this were the legal requirement, Dr. Glew testified that it would be impossible to reach obviousness absent some undefined physical testing of actual devices. (EX1055, 90:23-93:12 (concluding

[3] Nishizawa teaches this in text. (EX1046, 18:51-59.)

that it "would be impossible to understand or determine the other forces [] acting on the carrier.").) This draconian standard is not the law.

The impropriety of PO's arguments is evident in Grounds 1 and 3. Nishizawa and Kawagoe both describe the downward force applied upon electrons via the dopant concentration gradient (EX1046, 18:35-58; EX1007, 16:2-9) and are silent regarding the other supposed "forces" now hypothesized by PO. A POSITA would have found it obvious that the force introduced via the dopant concentration would have aided an electron's movement. (EX1054, ¶7.)

Finally, PO's arguments defy common sense. PO asserts the prior art prevents upward movement. Logically, if electron movement is prevented upwards, there are two positional options: (1) not allowed to move; or (2) pushed downwards. Locking the electron in place requires that all net-forces be finely tuned to "0." This—which PO appears to argue—is an impractical scenario. Nishizawa's and Kawagoe's electrons' movements would be aided downward. (EX1054, ¶¶6-7.)

2. The slopes of Grounds 1-3 render obvious "aid carrier movement"

PO also overlooks that the prior art dopant gradients match or exceed those of the '222 Patent's specification. PO argues that the relative slope in the '222 Patent (decrease of 10x, EX1001, 2:38-40) generates a sufficient electric field to aid the movement of a minority carrier. (POR, 14-15.) Onoda discloses a 10x

decrease. (EX1042, FIG. 11 (from 10^{17} to 10^{16}).) Kawagoe shows a 46x decrease. (EX1007 at 16:13 (starts at $6x10^{16}$), 6:62-64 (substrate at $1.3x10^{15}$).) Nishizawa shows a 1000x decrease. (EX1046, 18:50-54 (start at 10^{17}), 18:64 (substrate at 10^{14}).) As the prior art slope magnitudes are equal to, or greater than, that in the '222 Patent, they render obvious "aid the movement."

3. PO's all-force-calculation premise is faulty

PO trumpets Dr. Campbell's scientific descriptions as key admissions (POR, 10-13), but that is more misdirection. Dr. Campbell's recognition that other factors theoretically could have influence on carrier movement does not support PO's argument.

Dr. Campbell—in his general background—stated an electric field oriented downward will push minority carriers away from the surface. (EX1003, ¶32.) He testified an electric field must have a direction and have a magnitude to influence a carrier (*e.g.*, an electron). (EX2058, 34:1-14.) This is basic physics: an electron needs force applied upon it to drift and the stronger the electric field, the stronger the force. (EX1054, ¶¶4-5.)

These basics do not support PO. Dr. Glew and PO have expressly—and repeatedly—acknowledged that a graded dopant concentration will create a drift field to aid carrier movement:

> When the dopant concentration is graded in a particular direction, other charge carriers will move in the gradient direction (or opposite direction) depending on the charge

> carrier's polarity. This phenomenon is called "carrier drift."

(EX2057, ¶33; *see also* EX1002, 289; EX1030, 26, 28; EX1055, 72:11-74:11; *Semiconductor*, IPR2023-01243, 39).

PO's listing of other supposed "forces" (POR, 11-12) does nothing to counteract the dopant gradient's drift field. Except for the P-N junction capacitance, PO's purported "forces" are not forces at all. Resistance and temperature are physical properties that increase or decrease the speed of carrier movement equally in all directions. (EX1055, 77:11-23, 79:15-81:5.) Similarly, crystalline imperfections would not generate a field in a singular direction because they typically would be uniform or minimal and non-impactful. (*Id.* at 86:7-89:21 (Dr. Glew stating that calculating imperfections is complex and reduced them).) None of these three identified physical properties/conditions would counteract the force provided by the graded dopant concentration.

This leaves the force introduced by the P-N junction capacitance as the only factor that—theoretically—could affect the direction of carrier movement. The P-N junction capacitance exists in every P-N junction, including those junctions disclosed in the '222 Patent. (EX1001, FIG. 5(b).) But the '222 Patent and prosecution history of it says ***nothing*** about such capacitance, much less (1) attributes any significance to it, (2) suggests that it might counteract the drift field created by the dopant gradient, or (3) claims the capacitance as a problematic force

that the purported "invention" or claims somehow address. PO is improperly trying to sow confusion where it earlier stated there was none.

Moreover, the field effect from the P-N junctions requires an applied voltage for electrons to flow (EX2058, 35:10-17; EX1059, 18-20 (stating that flow in a non-biased PN junction reaches equilibrium)), which the claims do not require. The graded dopant concentration is ***static***—always present regardless of the device's power state. For this reason as well, PO's all-force-calculation argument lacks merit.

Finally, EX2030 supports Petitioner because it recognizes that a graded dopant profile—even with capacitive effects—provides an electric field. (EX2030, 7:4-7.)

III. GROUNDS 1-3 DEMONSTRATE OBVIOUSNESS

PO provides its arguments in a general section and the Reply follows this structure.

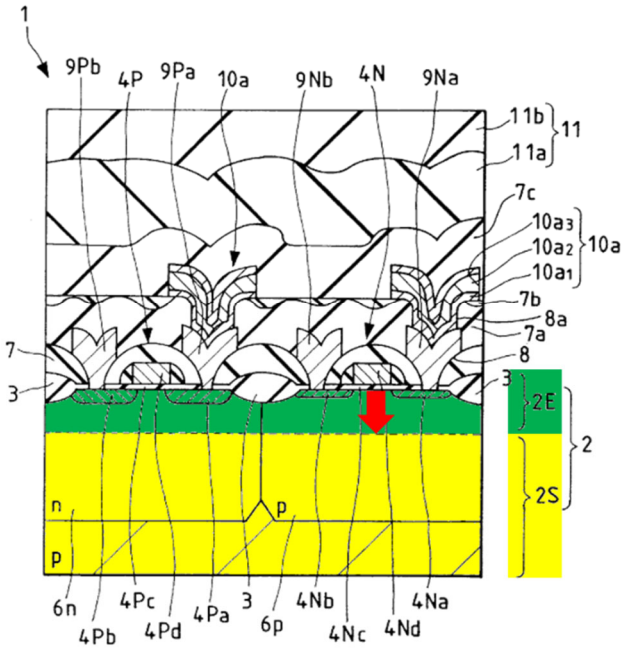
A. Ground 1: Kawagoe renders the challenged claims obvious

PO's arguments go against Kawagoe's literal teachings. *Semiconductor*, IPR2023-01243, 40 (Kawagoe renders the claims obvious).

First, PO's argument that Kawagoe excludes α-rays generating electrons near the surface is wrong. Kawagoe teaches: "electrons produced by the α-ray are attracted to the substrate body 2S." (EX1007, 16:7-9.) Parsing this language, electrons will be attracted to the substrate body 2S (yellow) which means that they

exist outside the substrate body 2S (*i.e.*, epitaxial layer 2E (green)) to be attracted to it (red arrow). Kawagoe, moreover, states that its objective is to reduce the influence of α-rays by including a graded dopant concentration "from the surface of the epitaxial layer 2E, so that the influence to be caused by the carriers (or electrons) due to the α-ray is lowered." (*Id.*, 16:2-7; EX1054, ¶12.)

FIG. 16



PO's argument is also based on the faulty premise that α-rays will not hit Kawagoe's p-well 6p to generate electrons. Nothing in Kawagoe (or other prior art) supports this extreme position.

Second, PO's argument that Kawagoe solely "*inhibits* carrier movement" contradicts its literal text. (POR, 16.) PO illogically suggests that everything following the "and" in 16:7-11 ("prevented") negates everything preceding it

("attracted"). Kawagoe contains literal teachings that "electrons produced by the α-ray are ***attracted*** to the substrate body 2S." (EX1007, 16:7-9 (emphasis added); EX1055, at 122:1-123:7 (Dr. Glew conceding that the gradient imparts a force).) This is enough to render obvious "aid the movement."

Furthermore, even if PO's argument of "prevented" were given its full weight (and "attracted" is ignored), it would still fail. α-rays will hit the p-well, generating electrons, which will have three possible vertical movements: (1) up, (2) down, or (3) locked in place. PO states that they will not go up, and thus there are only two options left. It defies common sense to state that these electrons will be locked in place; they will drift downwards. (EX1054, ¶7.)

PO relies on many of its force arguments which fail as described in §II.A & B.

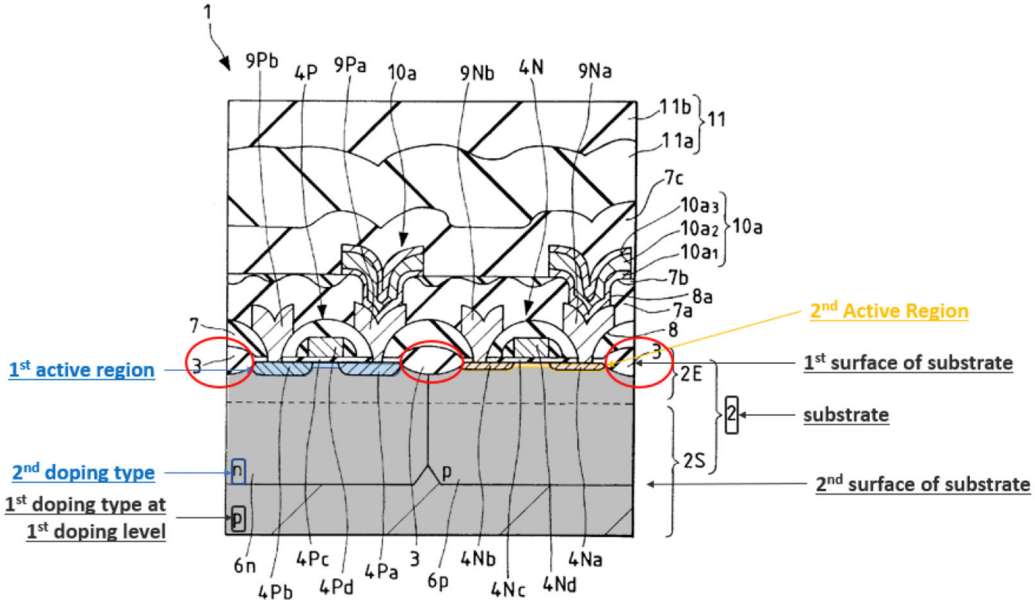
Kawagoe thusly renders obvious the challenged claims.

B. Ground 1: Dependent claims 6 and 27

PO's argument wrongly presupposes that the isolation region must separate the two active regions along their whole depth. *Semiconductor*, IPR2023-01243, 43. The claims do not specify the extent of separation of the isolation region; they merely require "first active region and second active region are each separated by at least one isolation region." ('222 Patent at claims 6 and 27.) The Petition demonstrates that this is met via the field insulating film 3 portions annotated in

red, below. (Pet. at 35-36.) Moreover, "a channel stopper region is formed below the field insulating film 3" (EX1007, 8:43-45) that stops carriers from migrating between transistors, demonstrating that the red-annotated portions are an isolation region.

FIG. 16



C. Ground 2: Onoda renders the challenged claims obvious

Onoda renders obvious "aid carrier movement." Onoda teaches a graded dopant concentration from the surface layer to the substrate and a POSITA would have found it obvious that the graded dopant concentration would aid in the movement of minority carriers. (Pet., 45-65.) As discussed, PO's argument that Petitioner must conduct an all-force-calculation is not supported by the claims, the prosecution history, or the governing law (§II.A & B).

D. Ground 3: Onoda in view of Nishizawa renders the challenged claims obvious

PO misrepresents Petitioner's usage of Nishizawa. PO fails to present rebuttal argument against Ground 3 at a threshold level.

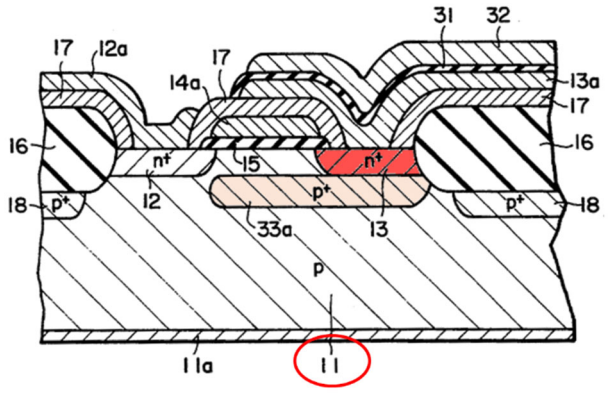
First, PO misrepresents the Petition as relying on Nishizawa to teach the "surface," and aiding carrier movement therefrom to the "substrate." Petitioner did not rely on Nishizawa's device structure. (Pet., 84 (Onoda teaches [1.1]-[1.4]).) Instead, Ground 3 relies on Onoda's device structure supplemented with Nishizawa's recognition that a layer with a downward dopant concentration creates a field that drifts electrons downward. (Pet., 80.) PO does not address the teachings of Nishizawa (column 18) upon which Petitioner relied. (Pet., 84-85.) PO's Nishizawa arguments are divorced from Ground 3.

Second, PO incorrectly argues that Nishizawa prevents the flow of electrons upwards and does not teach aiding them downward (POR, 28-29), and that electrons—generated by alpha-rays—at the surface can be ignored. (POR, 29; *see also Semiconductor*, IPR2023-01243, 44.)

PO's arguments contradict Nishizawa's teachings of a graded dopant concentration to drift electrons downward. Nishizawa teaches that a p+ type buried region 33a (tan)—with a substantially uniform dopant concentration—will prevent electrons generated in the p-type substrate 11 (red circle) from entering the p+ type buried region 33a. (EX1046, 18:4-6, 18:18-22.) A uniform concentration,

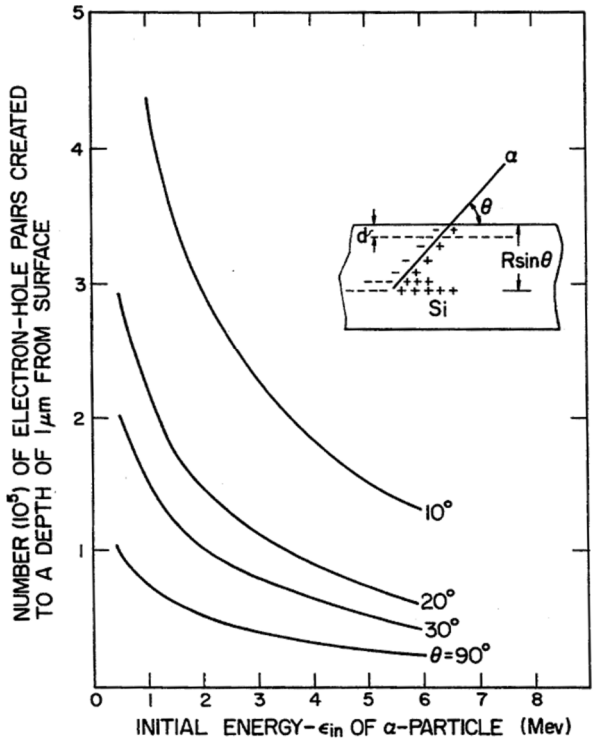
however, does not solve the problem of electrons generated via alpha-rays in the p+ type buried region 33a from reaching the n+ type region 13 (red). (*Id.*, 18:35-43.) To solve this problem, Nishizawa teaches "it is only necessary to form an impurity concentration gradient in the p+ type buried region 33a in the direction toward the p type substrate 11." (*Id.*, 18:46-50; EX1055 at 104:5-14 (stating that this layer is creating a force to push electrons downward), 100:2-18 (same); EX1054, ¶9.)

FIG. 35



Furthermore, PO's arguments that Nishizawa does not create ***any*** electrons at its surface are wrong. (EX1054, ¶10.) Nishizawa teaches that an alpha-ray "will not make many" electrons near the surface, which means that some are created. (EX1046, 17:14-16.) FIG. 36 depicts electrons being generated across the alpha-ray's path in the initial 1 µm. (*Id.,* FIG. 36, 19:67-20:5, 2:45-49 (stating that the n-type region goes 0.5 µm deep); *see also id.*, 19:34-42, 19:56-67; EX1055, 186:12-21 (Dr. Glew stating that the claimed "surface" is not size limited).)

FIG. 36



PO back-references its force arguments which fail as described in §II.A & B. Ground 3 renders the challenged claims obvious.

IV. PO'S RELIANCE ON DR. CAMPBELL IS MISPLACED

PO attempts to sow confusion via its citations to Dr. Campbell's general discussion of the purpose of all references grouped together, arguing that this supports the proposition that the art teaches only prevention of upward movement. (POR, 22, 24.) But Dr. Campbell's discussion was in response to a question directed to "block[ing] the carriers from coming up into the substrate" (EX2058, 43:8-11), which is not specific to the teachings of each references' dopant gradients. This general discussion does not negate the specific evidence from the

prior art disclosures (and Dr. Campbell's discussion of them). *KSR*, 550 U.S. at 402 (regardless of a prior art's purported purpose, its teachings still can provide obvious examples).

PO's citations are also misleading. Dr. Campbell testified that no reference was describing "totally blocking all of the carriers." (EX2058, 43:14.) "[T]otally blocking all" electrons is an impractical scenario because some electrons from an α-ray would be initially excited upwards and could go into upper layers, but would thereafter be aided downward due to a graded dopant concentration. (EX1054, ¶¶4-5.)

V. DR. GLEW'S TESTIMONY SHOULD BE GIVEN NO WEIGHT

Dr. Glew's opinions have been rejected in other IPRs invalidating PO's claims. For the same reasons, his opinions and testimony here should not be given weight. He was evasive, biased, and not credible. He has worked with PO on its numerous litigations and *Inter Partes* Reviews (EX1055, 145:14-19), billing hundreds of hours (*id.* at 145:5-13). He repeatedly took positions that contradict the prior art's plain wording. He took extreme positions: *e.g.*, that no α-rays would hit Kawagoe's p-well to generate electrons. (*Id.*, 116:19-120:19.) He filibustered, and refused to answer simple questions, *e.g.*, whether electrons generated via an α-ray will move up, down, or stay locked in place (*id.*, 106:8-109:21) or plainly what constitutes a minority carrier in a p-layer or an n-layer (*id.*, 127:6-128:12, 129:19-

130:7, 130:25-131:22. 133:19-138:11), even though that is clearly identified in standard references:

> **Minority carrier:** "a hole in an n-type or an electron in a p-type semiconductor." (EX1056; *see also* EX1057, EX1058.)

For all these reasons, Dr. Glew simply was not a credible witness.

VI. PO FAILS TO DEMONSTRATE SECONDARY CONSIDERATIONS

PO fails to demonstrate secondary considerations. *Semiconductor*, IPR2023-01243, 16-19.

PO argues that licenses demonstrate secondary considerations. Bare licenses fail to establish a nexus to the merits of the claimed invention because parties often pay licenses to avoid litigation costs. *Iron Grip Barbell Co. Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1324 (Fed. Cir. 2004).

PO's litigation-based licenses should be accorded no weight.

PO's remaining license is with RPX, which is a cost-saving service that "spread[s] the cost of reducing patent litigation across a large network of participating companies" and "remove[s] patents from circulation before they become costly issues." (EX1060.) For members who join, RPX offers "far less litigation; and far less cost and risk." (EX1061.) An RPX license should, accordingly, be accorded less weight than a typical license because it is an aggregate service for members to save litigation costs. Further, RPX approached PO after PO filed lawsuits against various companies. (EX2072, ¶5.) [redacted]

[redacted] never approached PO (*id.*) because they are presumably RPX members. Moreover, there is no actual evidence that [redacted] obtained licenses. (EX2072, ¶5 (stating, at most, hearsay: "I understand RPX did in fact grant to them" sub-licenses).) There is no nexus.

PO further relies on a decision (*Fox Factory*) that was later vacated. *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1378 (Fed. Cir. 2019). On remand, the Board found the claims unpatentable, concluding that "at best, PO shows a weak nexus" for licenses mentioning the challenged patent and "no nexus with respect to the remaining licenses." *Fox Factory, Inc. v. SRAM, LLC*, IPR2017-00472, Paper 74, 11, 14-15 (2021). Here, the '842 Patent is only one of a long list of included patents, and it cannot be discerned whether any alleged merits are attributable to it. (EX2072, 45, 79, 99.) Further, "there is no nexus unless the evidence presented is 'reasonably commensurate with the scope of the claims.'" *ClassCo, Inc. v. Apple, Inc.*, 838 F.3d 1214, 1257 (Fed. Cir. 2016).

VII. THE PETITION IS NOT TIME-BARRED

PO rehashes previously rejected privity arguments. (Paper 23 at 27-35; *Semiconductor*, IPR2023-01243 at 8-12.)[4] Whether Petitioner is time-barred under

[4] PO's unconstitutionality argument lacks merit. *Oil States Energy Servs., LLC v. Greene's Energy Grp., LLC*, 584 U.S. 325 (2018).

§ 315(b) is part of the institution decision. *See Thryv, Inc. v. Click-to-Call Tech., LP*, 140 S.Ct. 1367, 1373 (2020) ("§ 315(b) expressly governs institution and nothing more"). The Board should not reconsider PO's rehashed arguments unsupported by new evidence or argument. *Achates Reference Publ'g. Inc. v. Apple Inc.*, 803 F.3d 652, 658 (Fed. Cir. 2015). Here, PO has not sought new discovery or presented new evidence. The Board should find, as it did in institution, that there is no time-bar.

For completeness, PO's arguments are addressed below.

PO asserts that Petitioner—via component sales—is in privity with licensees ([redacted] and Intel). But a standard manufacturer-customer relationship, even with indemnity provisions, does not establish privity. *Luminex Int'l Co. Ltd. v. Signify Holdings B.V.,* IPR2024-00101, Paper 20 at 22–24 (2024).

PO's burden of proof arguments are misplaced because it has not come forward with *any* evidence showing privity. *Worlds Inc. v. Bungie, Inc.*, 903 F.3d 1237, 1242–44 (Fed. Cir. 2018). PO's prior cases had nothing to do with Petitioner. PO's infringement allegations against others were not directed to any of Petitioner's products. EX2003, EX2005, EX2006, EX2009. Petitioner had no opportunity to participate in those matters and no knowledge of the resulting settlements. And [redacted] and Intel have no role in the current proceedings or related IPRs.

Petitioner's supplier-customer relationships do not create the type of "substantive legal relationship" that establishes privity. *Luminex,* IPR2024-00101, Paper 20 at 22–24. The products PO identifies are low-cost chips available in the public marketplace that others integrate into larger systems. EX1062; EX1064. The MP6924 sells for less than a dollar. EX1062. The MP2953B complies with Intel's standards, as do competing components from numerous other companies. EX2019, EX1065. Moreover, PO has not accused either chip—or any [redacted] or Intel products—in the litigation. EX2016. This is nothing like PO's cited supplier-customer cases, which involved indemnification relationships, exclusive supply arrangements, and the petitioners' prior assertions of RPI status in other proceedings. *Ventex Co., Ltd. v. Columbia Sportswear N. Am., Inc*., IPR2017-00789, Paper 148 at 12–14 (2019); *Volkswagen Grp. of Am. Inc. v. Argina Tech. Ltd.*, IPR2021-01263, Paper 16 at 5–12 (2022); *Ericsson Inc. v. Regents of Univ. of Minn.*, IPR2017-01197, Paper 56 at 8, 10 (2020).

Further, Petitioner is not a party to any license agreement. PO argues that Petitioner is an "agent" under the licenses by making products on their behalf under the "have made" clause, POR at 37, but any such agency relationship with respect to products has nothing to do with the privity analysis. "[T]he relevant question is whether Petitioner is acting as an agent for Intel or [redacted] in filing a petition for *inter partes* review." (Paper 23 at 30.) PO does not assert that

Petitioner is acting as an agent for Intel or [redacted] in filing the Petition.

PO also argues that Petitioner, on one hand, and Intel and [redacted] on the other, are "preceding and succeeding owners" of the components Petitioner sells to Intel and [redacted]. (POR at 52-53.) As noted above, this is a simple restatement of the ordinary supplier-customer relationship that the PTAB repeatedly has found does not create privity. *Luminex,* IPR2024-00101, Paper 20 at 22-24. PO argues that Petitioner is a third-party beneficiary, POR at 50-51, but the licenses do not reflect an intent to benefit Petitioner and, nonetheless, cannot create privity. PO also argues that the license creates a patent exhaustion defense but cites no authority. (POR at 51-52.)

PO's arguments about the same products being at issue in prior cases and Petitioner's sales being both licensed and infringing are nonsensical. A licensed sale necessarily does not infringe. 35 U.S.C. § 271(a). Any license or exhaustion outcomes are the result of PO's actions, beginning when PO entered the RPX Agreements, followed by RPX later purportedly sublicensing Intel and [redacted]. PO itself created this situation and cannot "ignore[] the practical consequences of its own actions." *Assa Abloy AB v. CPC Patent Tech. Pty., Ltd*., IPR2022-01006, Paper 47 at 18, 42, 45-47 (2023).

If any party's due process rights are at risk, it is Petitioner's. Petitioner was a stranger to prior litigations and IPRs, and it would be unjust to bind Petitioner as

a privy to those cases. *Taylor v. Sturgell*, 553 U.S. 880, 893-95 (2008).

VIII. CONCLUSION

For reasons stated here and in the Petition, Grounds 1-3 render the challenged claims obvious.

Dated: April 3, 2025

Respectfully submitted,

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CERTIFICATION OF WORD COUNT UNDER 37 CFR § 42.24(d)

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE totals 5,573 words, excluding the parts exempted by 37 C.F.R. § 42.24(a). This word count was made by using the built-in word count function tool in the Microsoft Word 365 software used to prepare the document.

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that true copies of the foregoing PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE and EXHIBITS 1054-1065 were served in their entirety April 3, 2025 by electronic mail on the Patent Owner via its attorneys of record:

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