PUBLIC VERSION

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SEMICONDUCTOR COMPONENTS INDUSTRIES, LLC
Petitioner

v.

GREENTHREAD LLC
Patent Owner

Case IPR2024-00263
U.S. Patent No. 11,316,014

PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE

I. INTRODUCTION

Because the challenged *apparatus* claims do not require an active step of affirmatively moving carriers, Patent Owner's (PO's) arguments about net forces, whether "graded" means "aided," inherency, and calculation of a slope are all irrelevant.[1] "[A]pparatus claims cover what a device *is*, not what a device *does*." *ParkerVision, Inc. v. Qualcomm Inc.*, 903 F.3d 1354, 1361 (Fed. Cir. 2018) (emphasis original) (quoting *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1468 (Fed. Cir. 1990). "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." IPR2023-01243, Paper 82 (Final Written Decision), 44.

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[1] In parallel proceedings on related patents that reached Final Written Decisions ("Parallel IPRs" herein), the Board reached the same conclusion for analogous "to aid carrier movement" limitations. *See* IPR2023-01242, Paper 84, 39; IPR2023-01243, Paper 82, 35-36; and IPR2023-01244, Paper 83, 28-29. The same construction should apply in this case because, "we presume, unless otherwise compelled, that the same claim term in the same patent or related patents carries the same construed meaning." *Omega Eng'g, Inc, v. Raytek Corp.*, 334 F.3d 1314, 1334 (Fed. Cir. 2003).

Kawagoe's graded dopant concentration "is capable of performing the claimed limitation." *See id*. PO's expert, Dr. Glew, admitted that starting at the surface of the device (i.e., throughout the active region), Kawagoe's graded dopant concentration produces an electric field that pushes electrons (carriers) downward from the surface to the substrate. EX1056, 113:4–114:10. And PO admitted: "Of course Kawagoe's transistor, like any transistor, will have carriers in the active region." Paper 18 (PO's Preliminary Sur-Reply), 6. These admissions demonstrate that Kawagoe's graded dopant concentration would aid the movement of carriers from the active region "towards an area of the substrate where there are no active regions." EX1001, 4:65-67.

PO's remaining arguments should also be rejected. First, because Kawagoe discloses a CMOS device, one of the active regions in Kawagoe must have an opposite doping type from the substrate. Second, a POSITA would also understand that the insulating film in Kawagoe acts as an "isolation region" between the two active regions in Kawagoe. Third, PO's suggestion that Wieczorek lacks a graded dopant concentration in the active region is contrary to the plain disclosures in the reference. Fourth, PO has failed to show the required nexus for its alleged secondary considerations of non-obviousness. Fifth, the Board has correctly determined—repeatedly—that Petitioner is not in privity with any time-barred party. Sixth, PO's argument that the IPR system is unconstitutional lacks merit.

II. CLAIM CONSTRUCTION

As the Board correctly held in the Parallel IPRs, the challenged ***apparatus*** claims do not require affirmatively moving a carrier. *See e.g.*, IPR2023-01243, Paper 82, 36. The Board should therefore reject PO's assertion "that the plain and ordinary meaning of 'aid carrier movement' requires that a carrier move in the specified direction."[2]

A. The plain claim language does not require actually moving a carrier

Because the challenged claims are apparatus claims—not method claims—the "to aid carrier movement" terms should be understood to "cover what a device *is*, not what a device *does*." *ParkerVision*, 903 F.3d at 1361. Moreover, *aiding* movement is different from *creating* movement. Nothing in the claims requires the graded dopant concentration to create movement where none exists.

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[2] Petitioner does not dispute that "at least one graded concentration of dopants" and "to aid carrier movement…" are separate terms. *Contra* POR, 10. As the Board recognized in a pending parallel proceeding on a related patent, "Petitioner is not arguing or assuming that 'graded dopant concentrations equals aid carrier movement,' nor is Petitioner attempting to read out the 'aid the movement of minority carriers' element." IPR2024-00265, Paper 22 (I.D.), 17.

B. Prosecution history confirms external forces are irrelevant

During prosecution of related U.S. Patent 8,421,195, PO contradicted the arguments it makes here.[3] Specifically, PO represented that a downward-sloping graded dopant concentration was known to create an "inherent 'built-in' unidirectional electric field" that sweeps carriers down into the substrate. EX1016, 289-290. PO wrongly tries to twist this plain statement by arguing that the movement of carriers "'[d]epend[s] on the particular slope of the graded concentration of dopant[s]'" POR, 12, 21. But, when read in context, the use of "particular slope" in the prosecution history relates to whether the slope is positive or negative and thereby creates an electric field that sweeps *all* carriers "up" or "down." And further cutting against PO's position, it represented in ongoing prosecution of a related application (U.S. 17/728,588) that "'relative slope' [] means nothing more than the fact that one-side is relatively lower than the other side."

[3] The Board correctly recognized PO's contradictory arguments at institution and in the Parallel IPRs. IPR2023-00264, Paper 21 at 31 (PTAB Aug. 5, 2024) ("[T]he statements made by Patent Owner during prosecution of the '195 parent patent contradict its arguments in the present proceeding."); IPR2023-01243, Paper 82, 35 (citing EX1016, 270, 289–290).

EX1058, 12; EX1059, 5. PO's statements demonstrate that no specific magnitude or absolute value of slope is required, and no actual movement is needed.

C. No district court said "to aid carrier movement" means "to cause movement"

Contrary to PO's statement, no district court has ever "said that 'the graded concentration has to be sufficiently graded' to cause movement." *Contra* POR, 4. PO does not provide a citation for this assertion, but it appears to be a misunderstanding of a claim construction order from a Western District of Texas ("WDTX") case, which does not involve Petitioner. However, at PO's request, the WDTX court construed "to aid carrier movement" simply as "plain and ordinary meaning." EX2080, 81.

The "sufficiently graded" language that PO borrows comes from the WDTX's analysis of an indefiniteness argument for the "graded dopant concentration" terms. EX2080, 39-40. Defendants in the WDTX case argued that "graded dopant concentration" was indefinite because it was unclear when a given concentration became "graded" for purposes of the claim. *Id*., 32-35. The WDTX court disagreed, holding that "graded dopant concentration" was not indefinite because "the graded concentration has to be sufficiently graded to result in a 'static unidirectional electric drift field to aid the movement of minority carriers.'" *Id*. Nothing in the court's holding suggests "to aid the movement" means "to cause movement."

PO's briefing to the WDTX court on this issue further confirms that any non-zero magnitude is sufficient for the "to aid carrier movement" limitation. PO told the WDTX court that the only requirement for a graded dopant concentration to "aid[] the movement of minority carriers" is being non-uniform:

> The claims themselves specify that the graded dopants generate a "first static unidirectional electric field" that "aids the movement of minority carriers." In order for the graded dopants to do this they must change or vary (as opposed to being uniform).

EX1061, 17-18. PO further emphasized the simplicity of this assessment: "Anyone that has taken high school math knows that 'slope' measures how much the line changes. If there is zero slope, the line is flat. On the other hand, if there is slope, the line goes up or down (*i.e.*, it varies or changes)." *Id.*, 18. These arguments directly contradict PO's assertion in these IPRs that Dr. Blalock needed to measure the magnitude gradient slopes to determine whether the prior art would "aid carrier movement." *See, e.g.*, POR, 23.

PO also cites a claim construction order from an Eastern District of Texas ("EDTX") case that Petitioner was not party to. POR, 10. However, the Eastern District of Texas did not construe the "to aid carrier movement" language. The section of the EDTX claim construction order that PO cites addresses whether the dopant concentration must be only increasing or only decreasing. EX2082, 13-15. When evaluating this issue, the EDTX court accepted from the prosecution history

"that the direction of the electrical field and the carrier movement 'depends solely on the slope of the graded concentration of dopant[.]'" *Id*., 15 (citing '195 Patent File Wrapper). However, the EDTX court concluded that this prosecution history was insufficient to establish that the graded dopant concentration must uniformly increase or decrease. *Id*. Whether or not the graded dopant concentration must uniformly increase or decrease has no bearing on the present IPRs, and PO's citation to the EDTX case should thus be disregarded.

D. Kawagoe's graded dopant concentration actually moves carriers

Notwithstanding the foregoing, it may be unnecessary for the Board to resolve these disagreements about the scope of the "to aid carrier movement" terms because Kawagoe teaches that electrons impacted by the graded dopant concentration would actually move. Specifically, Kawagoe says that "the impurity [or dopant] concentration is given such a gradient" so that certain electrons "***are attracted*** to the substrate body 2S by that concentration gradient and prevented from entering the p-well[.]" EX1007, 16:2-11 (emphasis added). The electrons "are attracted" language means that graded dopant concentration in Kawagoe is "given such a gradient" that the electrons would affirmatively move, notwithstanding any unstated external forces. Thus, even under PO's narrow construction requiring actual movement (and without relying on inherency), Kawagoe would still meet the "to aid carrier movement" limitation.

III. THE CITED REFERENCES HAVE A "GRADED DOPANT CONCENTRATION TO AID CARRIER MOVEMENT" IN THE CLAIMED DIRECTION

PO's arguments about the "to aid carrier movement" limitations rest on the mistaken position that this language requires actually moving a carrier. As explained above, this is wrong. With a correct interpretation, all of PO's arguments about the language fail.

A. Petitioner is not relying on inherency

Rather than inherency, Petitioner's analysis correctly focuses on how the prior art expressly discloses graded dopant concentrations. *See* Paper 1 (Petition), 21-23 and 54-55. The experts agree that a graded dopant concentration create electric fields that interact with carriers. EX2058, 166:1-6 (Petitioner's expert: "[I]f you have a downward-sloping graded dopant concentration, we know from the basic physics that that will lead to an electric field…")[4]; EX1056, 87:2-94:1 (PO's expert: "the graded dopant concentration creates a potential [or, electric field] that can act

[4] PO's allegation that "Petitioner's expert, Dr. Blalock actually agrees that Petitioner's 'aided' implies 'graded' theory is an artificial assumption Petitioner created for this IPR" is baseless. POR, 11. Petitioner is not arguing "'aided' implies 'graded,'" and Dr. Blalock never referenced an "artificial assumption" or otherwise called into question his conclusions about the prior art.

on charge carriers.") and 102:2-109:14 (PO's expert: an electric field "aids movement in the direction of the field"). Kawagoe goes even further, and expressly states that electrons "are attracted to the substrate body 2S by that concentration gradient and prevented from entering the p-well[.]" EX1007, 16:2-11.

Moreover, inherency is a doctrine for anticipation, and Petitioner has brought only obviousness challenges. *See* IPR2023-01243, Paper 82, 37 (distinguishing *Transclean Corp. v. Bridgewood Servs., Inc.*, 290 F.3d 1364, 1373 (Fed. Cir. 2002)).

B. Hypothetical opposing forces are irrelevant

PO's repeated arguments about a "net force" (POR, 11-17, 22-23, 31-35) should all be disregarded. As the Board has recognized, PO's prosecution statements "were clear, unambiguous, and indicate that one of ordinary skill in the art need not know whether there are other 'forces and field' in an electronic device[.]" IPR2023-01243, Paper 82, 35.

Moreover, PO's arguments about "net forces" rest on the flawed premise that the claims require actually moving a carrier. *See e.g.*, POR, 32 ("…it is the *net* force that determines carrier movement"). Because the challenged claims are all ***apparatus*** claims, Petitioner does not need to establish that the prior art actually moves any given carrier. Instead, "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

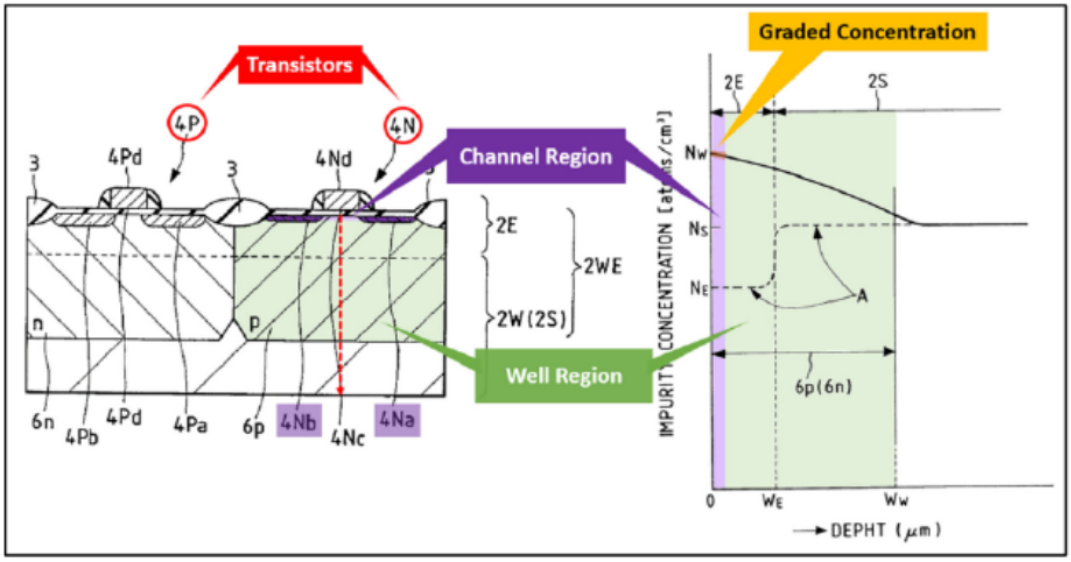
substrate.'" IPR2023-01243, Paper 82, 36 (emphasis original). And the prior art graded dopant concentrations are all capable of aiding the movement of carriers in the claimed direction, notwithstanding hypothetical forces or resistances that could sometimes prevent motion.

Lastly, even setting claim construction aside, PO's arguments fail factually. Kawagoe teaches that the graded dopant concentration is sufficiently strong to "attract[] [electrons] to the substrate body 2S" and to "prevent[] [electrons] from entering the p-well" (EX1007, 16:2-11). *Contra* POR, 17-18. As the Board correctly recognized, "the fact that carriers are prevented from entering the active regions in Kawagoe, such as p-well 6p, appears to be strong evidence that the downward facing electric field is not negated or reversed by other fields or forces." Paper 21 (Institution Decision), 19. None of PO's arguments change this conclusion. So, while Petitioner continues to dispute whether "aid[ing] carrier movement" requires showing that a graded dopant concentration is stronger than other potential forces, Kawagoe would meet this requirement regardless.

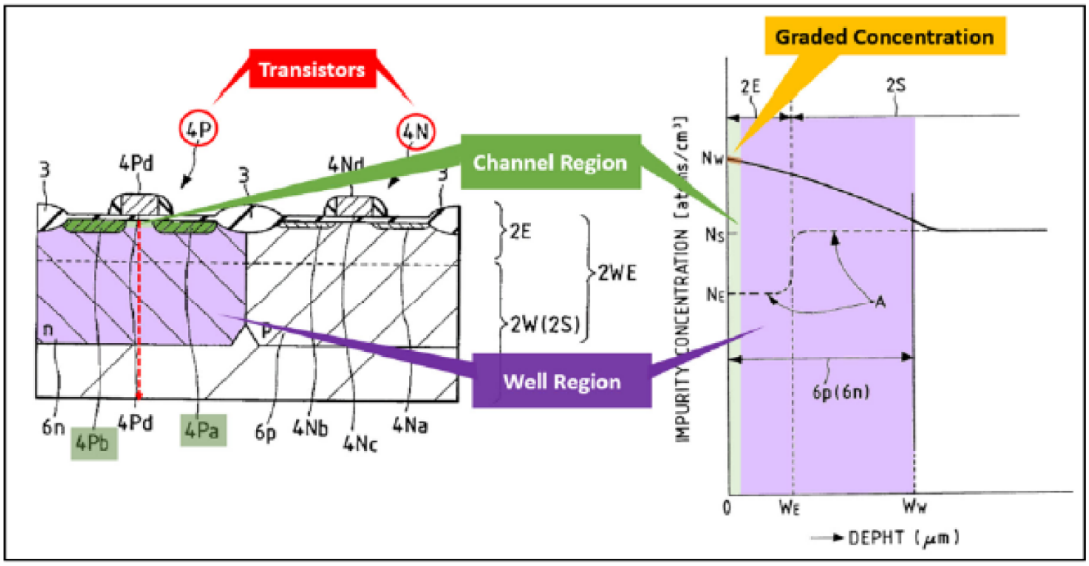
C. Carriers are present throughout Kawagoe's semiconductor device

PO's assertion that "[t]he carriers that Kawagoe describes are not in the 'active region'" is baseless. POR, 24. PO previously admitted it would be "silly" to dispute whether Kawagoe has carriers in the active region. Paper 18, 6 ("Greenthread never said anything so silly. Of course Kawagoe's transistor, like any

transistor, will have carriers in the active region."). PO's expert also agreed that "there is an electric field pushing electrons down," throughout the depth of the device in Kawagoe—from zero through W_W—which includes the active region. EX1056, 112:8-113:16 (agreeing: "Yes, there's that field shown in Figure 17."). This means Kawagoe has electrons in the right place (i.e., the active region) and there is an electric field pushing downward on those electrons.



Petition, 19 (showing annotated Figures 17/23)



(Petition, 20) (showing annotated Figures 17/23)

Because there are electrons in the active region of Kawagoe, PO's arguments about alpha rays not occurring in the active region are irrelevant. POR, 24-29. The Board correctly recognized that "whether an α-particle strike is *likely* (or how often they would statistically occur) in the active regions, or whether such a strike would produce a *disruptive number* of carriers, appears to be irrelevant." Paper 21 (I.D.), 20 (emphasis original); *see also* IPR2024-01243, Paper 82, 43 ("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."). Nonetheless, PO's arguments about alpha ray strikes are flawed.

PO cites a separate prior art reference (Nishizawa) to argue that alpha ray strikes in Kawagoe would only result in producing electrons in the substrate below

the well, but Nishizawa itself disproves this point. POR, 29-30 (citing EX2066). Instead, Nishizawa says after an alpha ray strike "several ten thousand electrons will flow into the n+ type region 13," which is part of the active region. EX2066, 19:41-42, Figs. 34-36; EX1056, 123:17-128:11. Because the challenged claims do not require a specific number or portion of electrons, it does not matter whether more electrons are also created in the substrate—an alpha ray strike still creates thousands of electrons in the relevant region. EX1056, 82:6-83:7, 116:4-123:15. Additionally, Nishizawa discloses various examples—which PO ignores—where an alpha ray strike actually generates the majority of electron-hole pairs at a depth closer to a device's "top-most surface." EX2066, 19:54-20:11, Fig. 36; POR, 27-28. Agreeing with Petitioner, the Board recognized these teachings of Nishizawa in the Parallel IPRs. *See, e.g.*, IPR2023-01243, Paper 82, 44.

PO's arguments about Wang's date should also be disregarded. POR, 28. First, PO's argument about whether Wang "give[s] a POSITA a reason to use Kawagoe in the active region" is irrelevant because Petitioner is ***not*** proposing any modification of Kawagoe in view of Wang. *Contra* POR, 28. Kawagoe's Figure 17 already teaches a graded dopant concentration in the active region that will aid movement of carriers in the claimed direction—no modification is necessary. Second, regardless of Wang, PO's cited Nishizawa reference (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 priority date. EX1056, 82:6-83:7, 116:4-123:15; EX2064 at 33 n. 7.

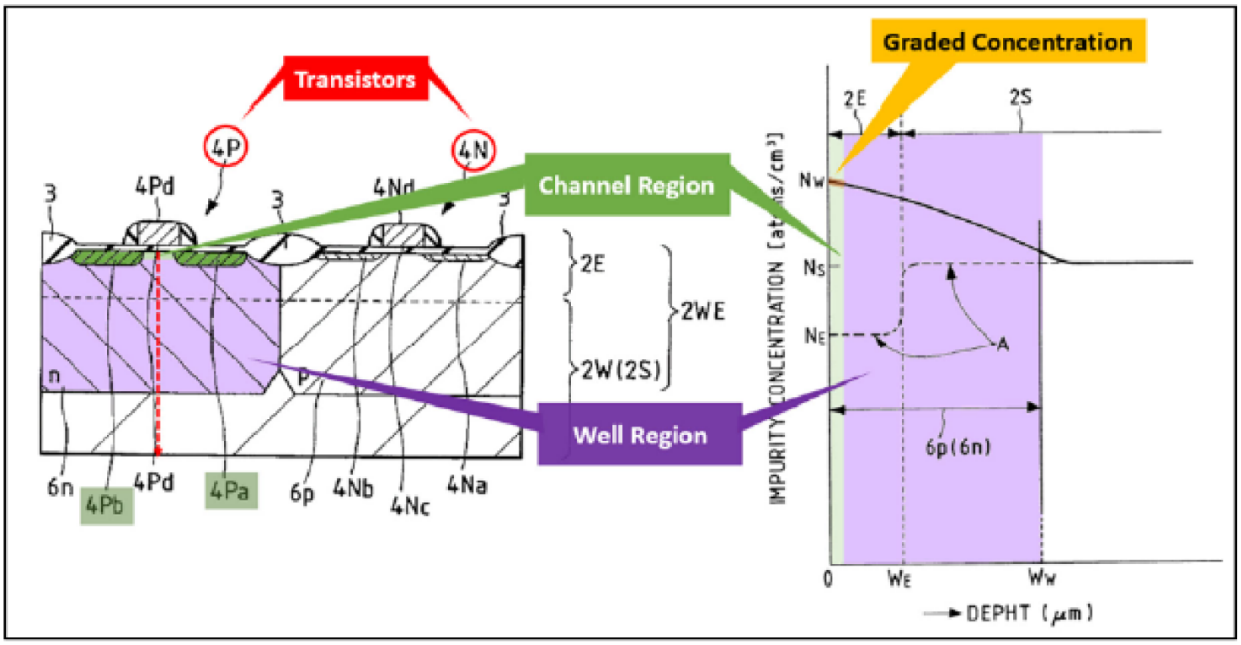
D. Kawagoe's graded dopant concentration aids and impedes movement

PO repeatedly misinterprets a statement in Kawagoe that electrons are "prevented from entering the p-well 6p" by the concentration gradient, even wrongly questioning Petitioner's candor to the Board. *See* POR, 17, 24-25 (falsely accusing Petitioner of "strategically us[ing] square brackets to conceal" aspects of Kawagoe). Petitioner is not hiding anything, and this statement in Kawagoe is perfectly consistent with Dr. Blalock's (and Petitioner's) position that the graded concentration in Kawagoe aids carrier movement. *Contra* POR, 22-23; *see also* EX1003, ¶94 and n.6.

PO's fixation on impeding versus aiding reflects a fundamental misunderstanding about how vectors and electric fields work. PO's own expert explained that an electric field "aids movement in the direction of the field" and "in [] the 180 degree opposite direction [] it will repel, and it pushes [a charge] away." EX1056, 102:2-109:14. In other words, an electric field from a graded dopant concentration "aids carrier movement" in one direction and inhibits carrier movement in the opposite direction. *Id.* Which is exactly what Kawagoe says: 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). EX1007, 16:2-11.

For the same reasons, PO's argument that Kawagoe only teaches "using a graded slope to *impede* carrier movement" is incomprehensible. POR, 17 (emphasis in original). As PO's expert Dr. Glew admitted, whether an electric field from a graded dopant concentration aids movement or impedes movement ***depends on the direction of the movement***. EX1056, 83:13-89:13, 92:2-97:8, 102:2-109:14, 109:25-116:3, 121:19-123:15. So, when Kawagoe says that "electrons produced by the α-ray are attracted to the substrate body 2S by that concentration gradient and prevented from entering the p-well," this means an electric field aids carrier movement "to the substrate body 2S" and impedes carrier movement in the opposite direction "entering the p-well." *Id.*; EX1007, 16:2-11, Figs. 17, 23; Petition, 20-23.



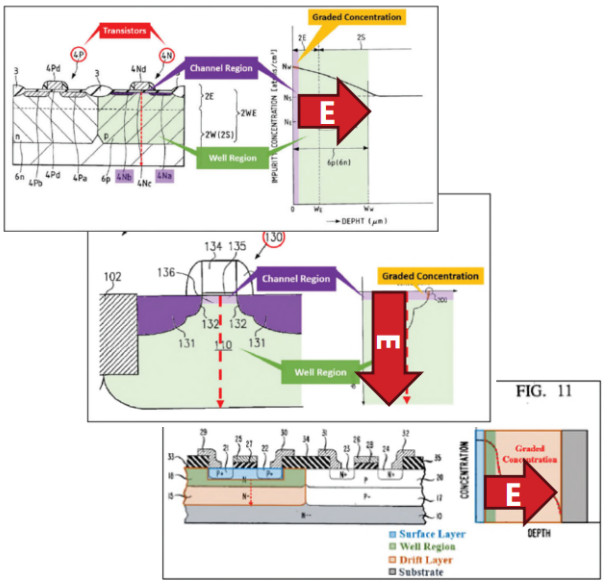
EX1007, Figs 17, 23 (annotated)

Without expert support, PO also wrongly states in footnote 11 that Kawagoe's concentration gradient would prevent carriers ***above*** well region 6p from entering the well. POR, 24. This is wrong and contrary to the testimony of PO's own expert. EX1056, 113:4-16. The downward force from the graded dopant concentration in Kawagoe—which PO's expert confirmed exists from the surface 0 past depth Ww—would push electrons above well 6p towards the well 6p and then towards substrate body 2S. *See id*.; EX1007, 16:2-11, Figs. 17, 23.

E. Petitioner's slides are not contrary to the laws of physics

PO misinterprets demonstratives that Petitioner submitted in parallel IPRs. POR, 27. By convention, electric fields "point" in the direction that they act on positive charges, which is opposite of the direction that electric fields act on negative charges. However, the arrows that Petitioner used to annotate Kawagoe (below) reflects the direction of the ***force*** from the electric field on an electron—not the conventional direction in which the electric field "points."

No dispute that graded concentrations generate electric fields



EX1052 (-01242, -01243, -01244), 83:24-84:23

Q. And how does the -- how does a graded dopant concentration relate to the idea of carrier drift?

A. There's really two things that go on, but one is **the gradient of a charge causes electrical -- electrical field**...The gradient is just the first derivative. It's a differential operator. So it's the slope, literally. **So the slope of the charge densities are proportional to the field that's given off. So this charge gradient produces a field which will act upon other charge particles**.

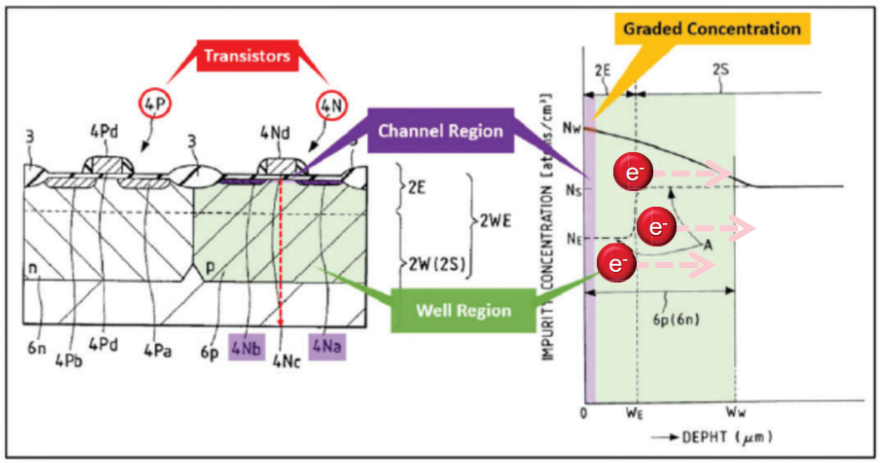
Reply, Paper 62 (-01242), 1-3;
Reply, Paper 61 (-01243), 1-3;
Reply, Paper 61 (-01244), 1-2

BAKER BOTTS DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenthread Ex. 2087, p. 35 of 81 Semiconductor v. Greenthread 35

It should be undisputed that these forces "aid carrier movement"

Kawagoe: "electrons produced by the α-ray are **attracted to the substrate body 2S by that concentration gradient** and prevented from entering the p-well"

Kawagoe, EX1007 (-01242, -01243, -01244), 16:2-11, Figs. 17, 23



Petition, Paper 2 (-01242), 24-28;
POR, Paper 47 (-01242), 16;
Reply, Paper 62 (-01242), 7-10;
Petition, Paper 2 (-01243), 27-32;
POR, Paper 46 (-01243), 16-17;
Reply, Paper 61 (-01243), 7-10;
Petition, Paper 2 (-01244), 57-67;
POR, Paper 46 (-01244), 16-17;
Reply, Paper 61 (-01244), 6-9

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EX2087, 35 and 38. Moreover, Petitioner's slides are not evidence. The testimony of PO's expert is evidence, and that testimony confirms that the graded dopant

concentration depicted in Figure 17 of Kawagoe exerts a downward force on electrons. EX1056, 113:4-16.

F. Hearsay from third-party witness should not be considered

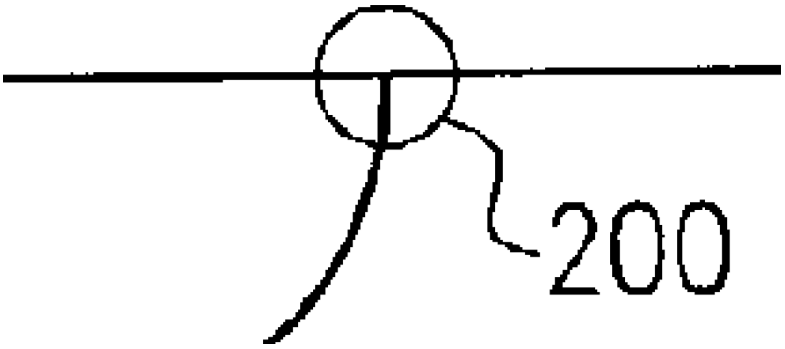
The Board has previously rejected PO's attempts to use hearsay testimony from third-party witnesses in the IPRs between Petitioner and PO. *See* IPR2023-01242, Paper 80 (Granting Petitioner's Motion to Strike). PO nonetheless again cites to statements by third-party witnesses, from proceedings that did not involve Petitioner. POR, 15 (citing an expert retained by Monolithic Power Systems) and 4, 16, and 32-33 (citing a Cirrus Logic representative). The Board should again decline to consider out of court statements made by witnesses with no relation to Petitioner, and whom Petitioner did not have the opportunity to cross-examine. These statements are hearsay and no exception to the rule against hearsay applies. *See* Fed. R. Evid. 801-803; *see also* IPR2023-01242, Paper 80, 8.

Nonetheless, the third-party testimony that PO cites is not persuasive. The cited testimony from the unrelated declarant (Dr. Campbell) in a separate IPR does not say that an electric field must be "properly constructed" to aid carrier movement. *Contra*, POR, 15. Dr. Campbell's cited testimony instead involved when a "properly constructed" electric field "will push the minority carriers away from the surface." EX2085, 33:18-19. As explained above, the challenged apparatus claims do not require actually moving carriers.

Similarly—contrary to PO's misleading editing—the testimony of Mr. Warrick, a corporate representative for Cirrus Logic in litigation not involving Petitioner, does not support PO's position. *Contra*, POR, 16. Mr. Warrick explained that he did not know if the gradient of a Cirrus product would meet the aid carrier movement limitation because: "I don't have an understanding of what the benefit of that gradient would be or the degradation of that gradient." EX2083, 95:2-9. Whether a Cirrus Logic representative understands the features of a gradient in a Cirrus product has no bearing on whether Kawagoe discloses a graded dopant concentration that meets the Challenged Claims.

IV. PO'S CHALLENGE TO THE WIECZOREK-WOLF GROUND FAILS

Wieczorek does not say that the graded dopant concentration in the active region is uniform. *Contra* POR, 33. What Wieczorek says is that the area near the surface indicated by number 200 "may have become substantially uniformly distributed" after annealing. EX1006 ¶11. Figure 2b itself, however, confirms that "substantially uniform" does not mean "uniform," as the distribution in area 200 remains non-uniform, i.e., the line is not straight:



Id, Fig. 2b (excerpt). While the change shown in area 200 is slight, PO has emphasized elsewhere that any variation is enough: "If there is zero slope, the line is flat. On the other hand, if there is slope, the line goes up or down (*i.e.*, it varies or changes)." EX1061, 18.

Area 200 is also not coextensive with the active region in Wieczorek. Figure 2a (showing elements 124, 123, 122, and 121) and Figures 1a and 1b (showing same) provide perspective on the relative depth of area 200 compared with the source and drain regions (e.g., 141, 131):

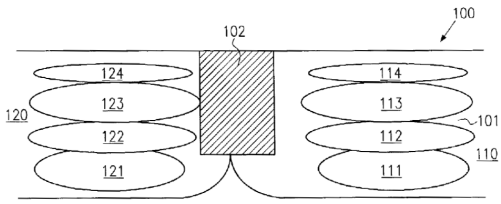


FIG.1a
(Prior Art)

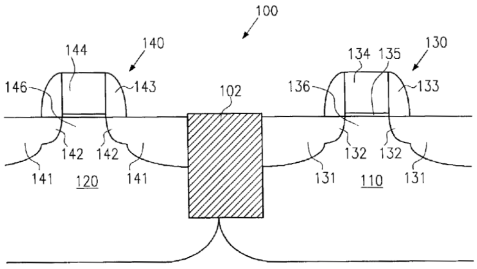


FIG.1b
(Prior Art)

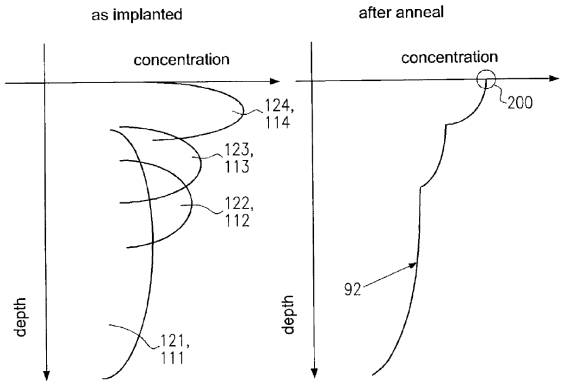


FIG.2a
(Prior Art)

FIG.2b
(Prior Art)

From the above Figures, area 200 is shown to occupy only a small portion of the active region.

PO's further arguments about Wieczorek fail for the same reasons as discussed above. POR, 33-35. Wieczorek describes a downward-sloping graded dopant concentration, and there is no dispute that the graded dopant concentration will create an electric field that points in the direction required by the claims. EX1056, 32:15-33:25, 56:20-62:15, 69:3-71:9, 75:15-23, 83:17-89:13, 92:2-94:1, 102:2-109:14, 109:25-116:3, 120:11-123:15, 147:4-151:15. While PO hypothesizes that unidentified forces may overcome the graded dopant concentration, no such forces are identified by PO or PO's expert. Further, the Board previously recognized that "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

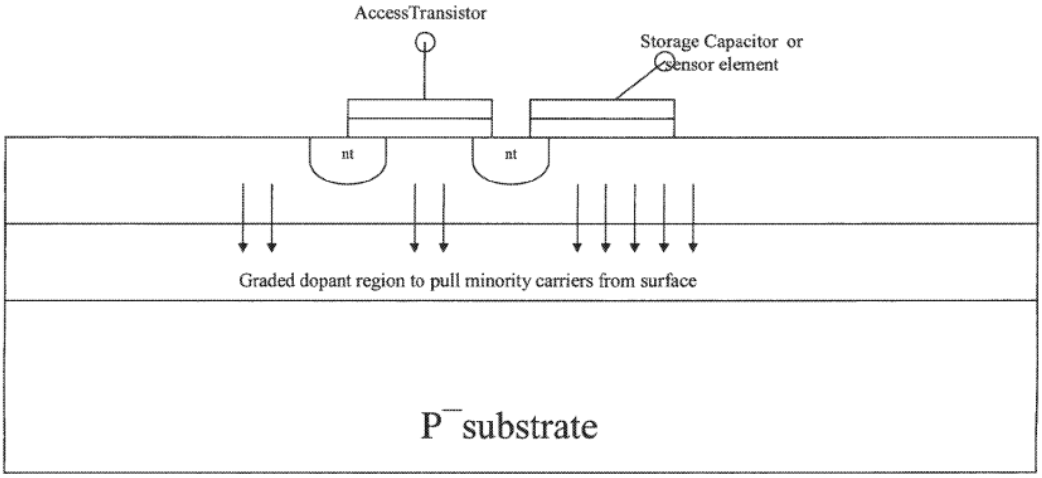
Wieczorek's graded dopant concentration." IPR2023-01243, Paper 82, 53. The identified graded dopant concentration and resulting field in Wieczorek meets this standard. *See* Petition, 54-55.

V. KAWAGOE SATISFIES THE "FIRST ACTIVE REGION…WITH A SECOND DOPING TYPE OPPOSITE IN CONDUCTIVITY TO THE FIRST DOPING TYPE" LIMITATIONS

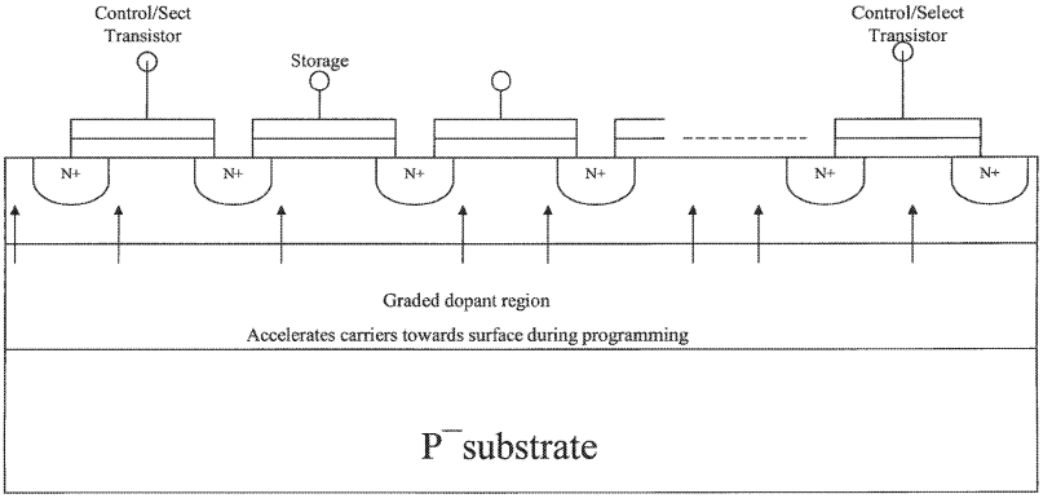
PO wrongly argues that the first active region Petitioner identified in Kawagoe (an NMOS) is not opposite to the conductivity of the substrate in Kawagoe (p-type) because "the channel of the transistor 4N is doped *p-type*." POR, 36 (emphasis original). PO's argument is based on an unsupported narrow interpretation of this claim language, which the Board correctly rejected in the Parallel IPRs. *See* IPR2023-01243, Paper 82, 26-27 ("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." (emphasis original, internal quotations omitted)).

Kawagoe has a first active region with a doping type opposite to the substrate because the first active region identified in Figure 23 of Kawagoe has n-type doped source and drain regions, which are opposite to a p-type substrate. Petition, 13-16, 50-53; EX1056, 136:15-137:14. The general convention for identifying NMOS/PMOS transistors also focuses on the doping type of the source and drain regions. *See* EX1008B, 32-34 (native pages 298-300). This feature in Kawagoe is consistent with Figures 5B and 5C of the '014 Patent, which PO and Dr. Glew say

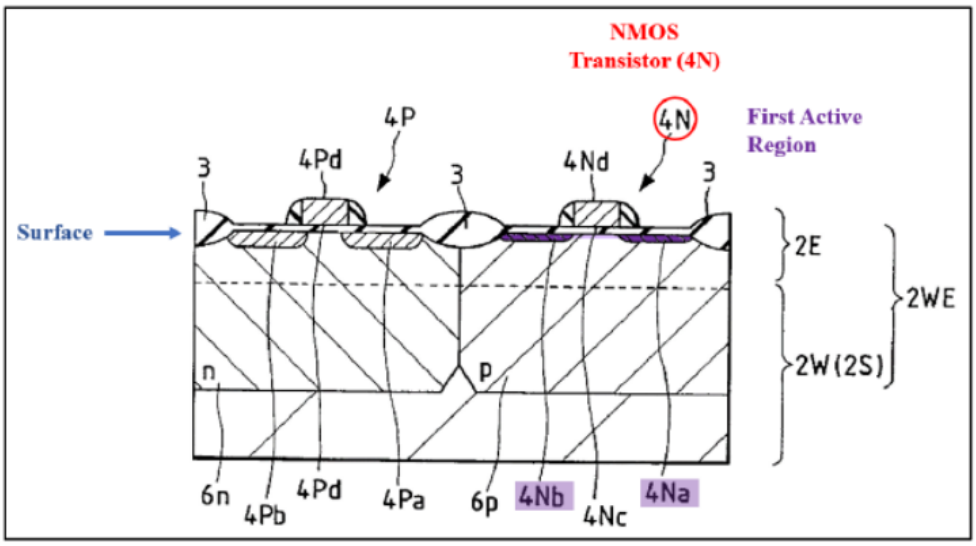
"clearly disclose[]" the "claimed invention." POR, 6; EX2064, ¶34. These figures (below) show NMOS devices having n-type source and drain regions (labeled "nt" or "N+"), and a p-type substrate. EX1056, 23:21-24:25.



EX1001, Fig. 5B

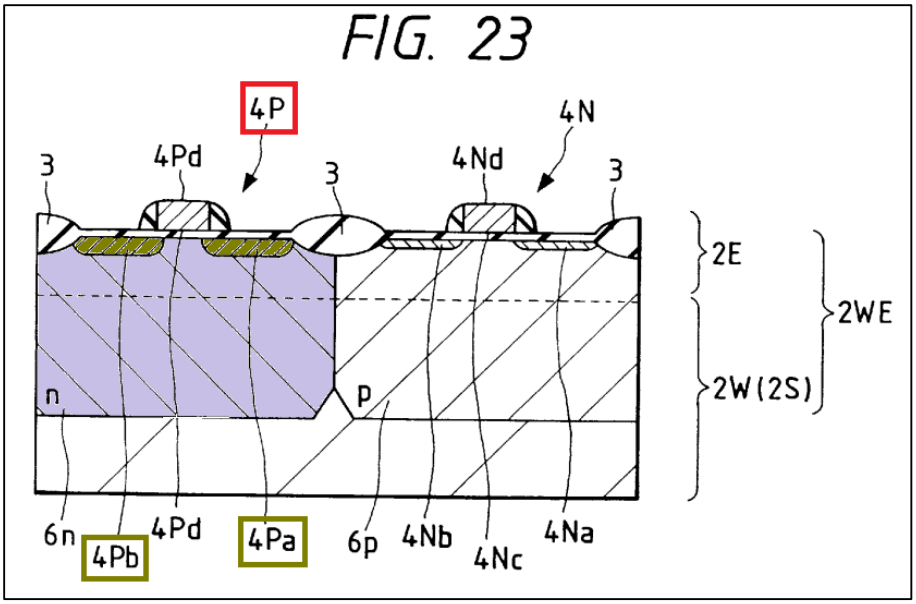


EX1001, Fig. 5C



EX1007, Fig. 23 (annotated)

However, the Board need not resolve this dispute because even under the PO's incorrect interpretation, Kawagoe still teaches this limitation. Specifically, Kawagoe describes a CMOS device that has both the NMOS device ***and*** an adjacent PMOS transistor 4P having source and drain regions 4Pa, 4Pb formed with an n-type channel in n-type well 6n. EX1007, 9:40-54, 17:50-54, 18:15-23, 21:55-61, Fig. 23.



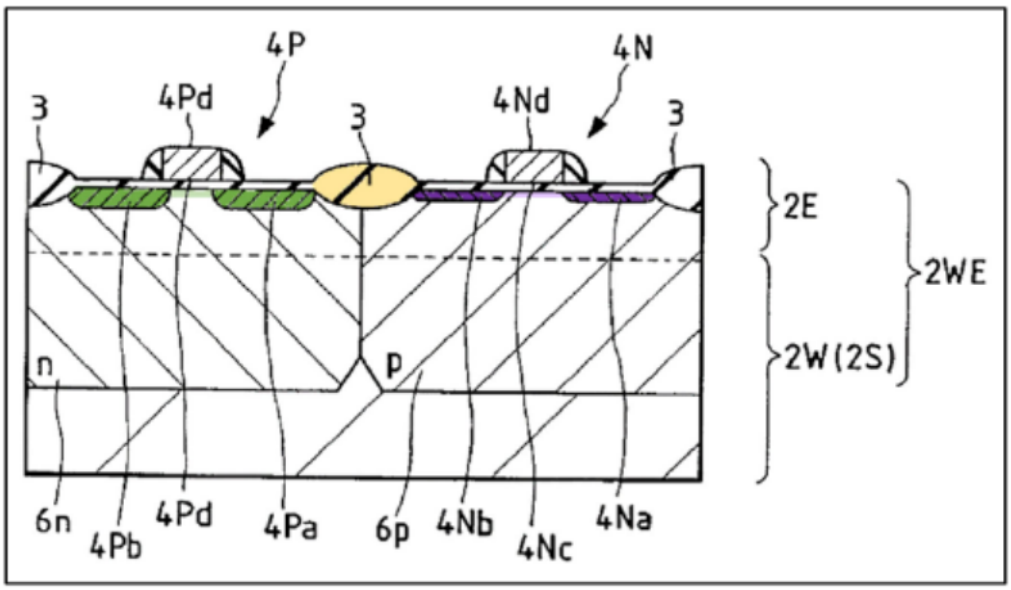
EX1007, Fig. 23 (annotated)

Dr. Glew agreed that a p-type transistor having an n-type channel ("PNP") would be opposite to a p-type substrate. EX1056, 73:6-13; *see also id.*, 22:7-28:24, 71:12-75:23, 132:24-137:14. Because Kawagoe discloses such a PNP transistor, even using PO's incorrect construction, Kawagoe still meets this limitation. *See* IPR2023-01242, Paper 84, 34-35.

VI. KAWAGOE DISCLOSES AN ISOLATION REGION

PO's argument about dependent claims 6 and 27 rests on an incorrect assumption that claims 6 and 27 require the isolation region to separate the first and second active regions at all points along their respective depth. POR, 37-38. The Board already rejected this interpretation of analogous claims in the Parallel IPRs: "the claims do not require the 'isolation region' to completely separate the active regions[.]" IPR2023-01243, Paper 82, 48-49. Nothing in the claims or specification

suggest that the isolation region must separate the active regions entirely, and insulating film 3 separates at least the surface portions of the first and second active regions. EX1007, 8:40-52, 15:37-40, 17:62-18:8; EX1008A, 818-20, FIG. 16-11(f); EX1003, ¶116; Petition, 31-32.



EX1007, FIG. 23

PO's argument also rests on two misunderstandings of the geometry in Kawagoe. First, while Kawagoe contemplates examples where the active regions are "formed in the range of the thickness of the epitaxial layer 2E," Kawagoe also teaches such active regions having a depth that is significantly less than that of epitaxial layer 2E—for example, active regions having a depth of 0.5 μm versus epitaxial layer 2E having a depth of 5 μm—which is consistent with Figure 23. EX1007, 8:36-40, 9:3-6, 9:47-53, 17:22-25. Second, Kawagoe teaches that

insulating film 3 is formed via LOCOS which "consumes a portion of the silicon and works its way downward." EX1056, 139:2-142:2. This means that the insulating film 3 does not simply rest on the top of the device.

Lastly, Kawagoe also teaches that "a channel stopper region is formed below the field insulating film 3, although not shown." EX1007, 8:43-45. The purpose of a channel stopper region "is to stop errant carriers from migrating from one transistor to another" and "[i]t needs to be deep enough to do that." EX1056, 142:4-143:11. So, even if PO is correct that insulating film 3 does not satisfy claims 6 and 27 alone (and Petitioner maintains that PO is wrong), Kawagoe's channel stopper region would still provide an "isolation region" as claimed.

VII. PO'S LICENSE AGREEMENTS DO NOT SHOW NON-OBVIOUSNESS

PO's purported secondary considerations of non-obviousness should be rejected because PO has not established a nexus between the licenses and any limitation missing from the challenged claims. For a license agreement to support non-obviousness, Federal Circuit caselaw "specifically require affirmative evidence of nexus […] because it is often cheaper to take licenses than to defend infringement suits." *Iron Grip Barbell Co. v. USA Sports Inc.*, 392 F.3d 1317, 1324 (Fed. Cir. 2004) (internal quotation marks omitted).

PO does nothing to establish a nexus, other than to assert that the idea of sweeping carriers away from active regions is "part and parcel of Greenthread's

licenses." POR, 40. This is not sufficient. As the Board recognized in the Parallel IPRs when faced with near identical arguments, "on its face [PO's license] does not refer to the claimed feature of using a graded dopant that PO asserts as 'part and parcel' of all of the licensed patents, nor does it refer to any technical merits of the challenged claims." IPR2023-01243, Paper 82, 17-18. "Further, Patent Owner offers no evidence that any licensee mentioned the challenged [] patent or the claimed feature of using a graded dopant during negotiation of the RPX license, and no information relating to [the licensee's] consideration of the potential exposure of their products." *Id.*

Other facts show that PO's licenses were likely motivated by avoiding litigation costs. All but one of the licenses that PO cites are direct settlements of active litigation. POR, 39-41. The one exception is a license negotiated through RPX. *Id*. RPX, however, "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.'" EX1057; *see also* IPR2023-01243, Paper 82, 19 (citing the content of EX1057 at 1). "RPX further markets itself as working on behalf of its clients to prevent potential litigation and associated legal defense costs and settlements." *Id*.

VIII. THE PETITION IS TIMELY UNDER 35 U.S.C. §315(b)

PO parrots the same privity arguments that were already rejected by the Board

and during Director review, but now alleges that Petitioner is in privity with [redacted] as well as [redacted] and Intel.[5]

PO's arguments about the burden of proof are misplaced because PO has not come forward with *any* evidence showing that Intel or [redacted] and Petitioner are in privity. *See Worlds Inc. v. Bungie, Inc.,* 903 F.3d 1237, 1242–44 (Fed. Cir. 2018) ("[A] patent owner must produce some evidence that tends to show that a particular third party should be named a real party in interest."). The RPX Agreements—entered into without Petitioner's knowledge—are irrelevant to the relationship between Petitioner and Intel or [redacted]. It is also well established that a standard manufacturer/customer relationship, even with indemnity provisions, does not establish privity. *See, e.g.*, *WesternGeco*, 889 F.3d at 1319-1322; *Wi-Fi One, LLC v. Broadcom Corp.*, 887 F.3d 1329, 1340–41 (Fed. Cir. 2018); *Samsung Electronics*

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[5] PO did not add [redacted] as a party to the Intel litigation until a second amended complaint dated January 23, 2023; thus, the Board need not address whether [redacted] is a privy. EX2019, EX2032, EX2018; *Shark Ninja Operating LLC v. iRobot Corp*., IPR2020-00734, Paper 11 at 18 (PTAB Oct. 6, 2020); *Unified Patents, LLC v. MemoryWeb, LLC*, IPR2021-01413, Paper 76 at 4-5 (PTAB May 22, 2023) (Decision Granting Director Review). However, the same arguments for Intel and [redacted] would also apply to [redacted].

Co. Ltd. v. Netlist Inc., IPR2022-00615, Paper 64 at 22-26 (PTAB, June 30, 2023).

PO's arguments about the same products being at issue in the prior cases and Petitioner's sales being both licensed and infringing is nonsensical. A licensed sale is not infringing. 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 sublicensing Intel and [redacted] (if such a sublicense was in fact granted). PO itself created this situation, and PO 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 (PTAB Nov. 30, 2023). Nor does the bare supply of products create an agency relationship. *See In re Google LLC*, 949 F.3d 1338, 1345 (Fed. Cir. 2020) (quoting Restatement (Third) of Agency § 1.01). And, in a district court action involving the subject patent, PO has not pleaded any affirmative defense of *res judicata* or collateral estoppel in answer to Petitioner's invalidity counterclaims, further showing PO's privity argument is nothing but a red herring. *See* IPR2023-01242, Paper 31, 7-8. Moreover, if any party's due process rights are at risk, it is Petitioner's; PO would bar Petitioner from challenging the subject patent based on an agreement *between PO and a third party* made without Petitioner's knowledge.

At bottom, Petitioner's standard manufacturer/customer relationship with Intel and [redacted] did not provide Petitioner a "full and fair" opportunity to

challenge the validity of any patents in any previous matter. Petitioner was a stranger to the Intel and [redacted] litigations, and it would be unjust and contrary to precedent to bind Petitioner as a privy to those cases. *Taylor*, 553 U.S. at 893-95; *WesternGeco*, 889 F.3d at 1319-22.

IX. IPRS ARE CONSTITUTIONAL

The Supreme Court has already upheld the constitutionality of IPRs. *Oil States Energy Servs., LLC v. Greene's Energy Grp., LLC*, 584 U.S. 325, 344–45, (2018). The specific challenged raise by PO is also logically flawed. According to PO, IPRs are unconstitutional because "the Director decides whether Greenthread 'should receive *certain legal processes* (those accompanying Article III proceedings)' such as the protections of a jury trial and the clear and convincing evidence standard for patent validity." POR, 62-63 (citing *Jarkesy v. Sec. & Exch. Comm'n*, 34 F.4th 446, 461 (5th Cir. 2022)). But these IPRs did not foreclose PO from litigating its patents in an Article III court. PO pushed for an Article III court (the District of Delaware) to evaluate the validity of its patents in parallel to these IPRs. *C.f.* EX1060 (PO Opp. to Mot. to Stay). The Article III court simply exercised its own discretion and stayed the case.

Dated: March 7, 2025

Respectfully submitted,

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Attorney for Petitioner

CERTIFICATE OF COMPLIANCE

I hereby certify that this Petitioner's Reply to Patent Owner's Response complies with the type-volume limitations of 37 C.F.R. § 42.24(c)(1) because it contains 5,584 words (as determined by the Microsoft Word word-processing system used to prepare the reply), excluding the parts of the reply exempted by 37 C.F.R. § 42.24(c).

March 7, 2025
Date

/Roger Fulghum/
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Attorney for Petitioner

CERTIFICATE OF SERVICE

In accordance with 37 C.F.R. § 42.6(e), the undersigned certifies that on the 7th day of March, 2025, a complete and entire copy of the foregoing **PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE** and supporting exhibits were served on Patent Owner via electronic mail at the below addresses:

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