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.

IPR2024-00266
U.S. Patent No. 8,421,195

PATENT OWNER'S SUR-REPLY

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EXHIBIT LIST

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Ex. 2001	*Greenthread, LLC v. Intel Corp.*, No. 6:22-cv-00105-ADA, Dkt. 7 (summons returned executed) (W.D. Tex. Feb. 7, 2022)	X
Ex. 2002	[SEALED] Email communication from Petitioner's counsel to Patent Owner's counsel October 16, 2023	X
Ex. 2003	Presentation entitled "Accelerating the Journey Towards a Sustainable Ecosystem" (2023) available at Petitioner's website at https://www.onsemi.com/site/pdf/2023_Analyst_Day_Presentation.pdf	X
Ex. 2004	"Clock Devices for Servers" (Aug. 2020) available at https://cdrdv2-public.intel.com/620306/620306_Clock_Devices_For_Server_Rv1p3.pdf	X
Ex. 2005	On Semiconductor Corporation Form 10-K filing with U.S. Securities and Exchange Commission for the fiscal year ended December 31, 2016	X
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Ex. 2007	OnSemi data sheet entitled "+ 1 Phase Output Controller with SVID Interface for Computer CPU Applications" (May 2023) available at https://www.onsemi.com/download/data-sheet/pdf/ncp81566-d.pdf	X

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Ex. 2008	Onsemi data sheet entitled "+ 2 Phase Output Controller with SVID Interface for Computer CPU Applications (May 2023) available at https://www.onsemi.com/download/data-sheet/pdf/ncp81567-d.pdf	X
Ex. 2009	Article entitled "If You Invested $1000 in ON Semiconductor Corp. a Decade Ago, This is How Much It'd Be Worth Now," May 8, 2023 available at https://finance.yahoo.com/news/invested-1000-semiconductor-corp-decade-123012312.html	X
Ex. 2010	Onsemi Standard Terms and Conditions of Sale, Rev.08102021 available at https://www.onsemi.com/site/pdf/ONSEMI_T&C.pdf	X
Ex. 2011	Plaintiff's First Set of Common Interrogatories to Defendants ON Semiconductor Corporation and Monolithic Power Services, Inc., Et Al., *Greenthread, LLC v. ON Semiconductor Corp.*, No. 23-443-RGA (D. Del.) (served Sept. 27, 2023)	X
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Ex. 2013	Definition of "privity" in Black's Law Dictionary (11th ed. 2019) available from Westlaw at westlaw.com	X
Ex. 2014	[SEALED] Email communication from Petitioner's counsel to Patent Owner's counsel October 11, 2023	X

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Ex. 2015	Plaintiff's Identification of Accused Products and Asserted Patents, *Greenthread, LLC v. ON Semiconductor Corp.*, No. 23-443-RGA (D. Del.) (served Oct. 12, 2023)	X
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Ex. 2017	Petition (Paper 1) in *Sony Group Corp. v. Greenthread, LLC*, IPR2023-00376	X
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Ex. 2031	*Greenthread, LLC v. Intel Corp.*, No. 6:22-cv-00105-ADA, Dkt. 113 (Redacted Memorandum Opinion and Order) (W.D. Tex. Dec. 27, 2022)	X
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Ex. 2035	Plaintiff's Supplemental Identification of Asserted Patents and Accused Products in *Greenthread, LLC v. ON Semiconductor Corp.*, No. 23-443-RGA (served to Petitioner's counsel on Nov. 10, 2023)	X
Ex. 2036	Webpage regarding iFixIt, PlayStation 5 Teardown (https://www.ifixit.com/Teardown/PlayStation+5+Teardown/138280)	X
Ex. 2037	Webpage from Mouser Electronics, Inc. for NCP252160 (https://www.mouser.com/ProductDetail/onsemi/NCP252160MNTWG?qs=sPbYRqrBIVkc9klNZ2pXbg%3D%3D)	X
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Ex. 2040	Webpage from DigiKey for NB3L202K (https://www.digikey.com/en/products/detail/onsemi/NB3L202KMNTXG/7220446)	X
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Ex. 2063	[SEALED] Confidential agreement	X

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Ex. 2064	Declaration of Dr. Alexander Glew	X
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Ex. 2083	Exhibit 2022 in *Texas Instruments Inc. v. Greenthread LLC*, IPR2024-00771 (including excerpts of the Deposition Transcript of Scott Warrick taken on June 7, 2024 along with marked Exhibits 3-5 in Greenthread, LLC vs. Cirrus Logic, Inc., 1:23-cv-00369-DC (W.D. Tex.))	X
Ex. 2084	Excerpts of Kittel, Charles, Introduction to Solid State Physics, John Wiley & Sons, Inc. (1996).	X
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I. INTRODUCTION

PO recently filed Director Review requests in IPR2023-01242 to -01244 ("Wave I IPRs"). These requests are also relevant to IPR2024-00263 to -00266 ("Wave II IPRs"). Under *Worlds*, Petitioner has the burden to produce "actual evidence" to prove lack of privity. 903 F.3d 1237, 1244 n.8 & 1246 (Fed. Cir. 2018). But Petitioner produced ***zero*** "actual evidence." Should the Director reverse the FWDs and terminate the Wave I IPRs, the Board should immediately terminate all of the Wave II IPRs as well.

Petitioner also has the burden to prove that the cited references have a "graded concentration of dopants [GDC]" and a "first static unidirectional electric drift field to aid the movement of minority carriers from [the] surface layer," where an "active region" is located. EX1001 ('195 patent), 4:20-24. In order for the GDC to do this, the GDC must (1) create an electric field that is in the ***correct*** location; (2) the electric field must point in the ***correct*** direction; and (3) the electric field must have sufficient magnitude to overcome other forces in the "active region." POR (Paper 32), 13, 16, 22-23, 27 (citing EX2064, ¶¶54, 56, 70, 74, 90). But Petitioner has presented ***zero*** evidence on these points.

Instead, Petitioner argues that under *ParkerVision*, it must only show that the cited references are merely "capable" of performing the claimed limitations. But this is ***not*** the test. The Federal Circuit made it clear in *INVT* that not all apparatus

claims are the same, and for apparatus claims with "structural limitations," like a GDC and a "static unidirectional electric drift field," Petitioner must show that the claimed structures *actually perform* the claimed limitations.

Whether the Board uses the correct test under *INVT*, or the incorrect test under *ParkerVision*, the Petitioner cannot meet its burden either way. Kawagoe and Payne ***never*** mention moving any carriers, much less minority carriers, from the "surface layer." In Kawagoe, the alleged GDC is merely used to keep SEU electrons ***out*** of the well region. In Payne, the dopant concentration is "uniform" in the "surface layer" (*i.e.*, there is no GDC, much less one that would move minority carriers from the "surface layer"). Therefore, there is no evidence that either reference is *even* "capable" of moving minority carriers ***from*** the "surface layer."

II. ARGUMENT

A. Under *INVT*, Petitioner must show that the cited references actually move carriers from the "surface layer."

The Federal Circuit has *never* said that the test for obviousness—for *all* apparatus claims—is whether the prior art is "capable" of performing the claimed limitation. In fact, the Federal Circuit has made it clear that there are "configuration-type *apparatus* claims" and "capability-type *apparatus* claims." *INVT SPE LLC v. Int'l Trade Comm'n*, 46 F.4th 1361, 1371-72 (Fed. Cir. 2022) (citing *ParkerVision*). The type of claim does *not* turn on whether the claim is an apparatus or a method

claim. *Id.* at 1372. Rather, it "depend[s] on the claim language," since "differences exist between apparatus claims." *Id*. at 1371.

The Federal Circuit has recognized that for "mechanical apparatus claims" (as opposed to computer or software claims), the claims are "configuration-type claims." *Id*. at 1371-72 (citing *Ball Aerosol* and *Cross Medical*). Here, the claims are clearly "mechanical apparatus claims." The claims require a "graded concentration of dopants … to aid the movement of minority carriers ***from*** said surface layer ***to*** said substrate." EX1001, 4:20-24. The claims recite a specific structure (*i.e*., a GDC and a "static unidirectional electric drift field") that "aids the movement of minority carriers" from a first location (*i.e*., "surface layer" where the "active region" is located) to a second location (*i.e*., "substrate"). As the specification explains, the GDC creates "a suitable aiding drift electric field." *Id*., 2:43-44. In the embodiment shown in Figure 5(b), the GDC "creates a drift field to sweep these unwanted minority carriers into the substrate as quickly as possible, from the active circuitry at the surface. *Id*., 3:30-33. The claims *never* say the GDC is "capable" of moving minority carriers. Rather, the claims and specification make it clear that the minority carriers move "as quickly as possible." When, as here, an apparatus claim requires a specific structure to perform a specific limitation, the Petitioner must prove that the cited references ***actually perform*** that limitation. *See INVT*, 46 F.4th at 1371.

Instead, Petitioner relies on a misleading quote from *INVT*'s predecessor, *ParkerVision*, to dismiss PO's arguments as "irrelevant." Reply (Paper 41), 1. But Petitioner cannot simply ignore a critical limitation of the claims. The claims do not require a GDC that is merely "capable" of moving carriers from the "active region." Instead, they require a GDC that *actually moves* carriers from the "active region."

In its Reply, Petitioner cites to past IPR proceedings between the parties. *Id.* But in those proceedings, *ParkerVision* was *not* cited or briefed by *either* party. Rather the Board introduced its own legal argument without ever giving PO the opportunity to address it.

As PO explained in the parallel Cirrus Logic IPRs, *ParkerVision* does not apply to the Challenged Claims. IPR2024-00017, Paper 75 (Hearing Tr.), 51:6-7. The claims-at-issue in *ParkerVision* "recite[d] ***no structural limitations*** that would preclude a prior art reference that discloses a different structure from performing the claimed function." *ParkerVision, Inc. v. Qualcomm Inc.*, 903 F.3d 1354, 1362 (Fed. Cir. 2018) (emphasis added). PO's claims are clear that "aid[ing] carrier movement" can only be achieved by a GDC. There is no "different structure" that can "perform the claimed function." The Challenged Claims are entirely distinguishable from the claims-at-issue in *ParkerVision*, *Ericsson*, and *Finjan*. In those cases, the claims recited software "modules," or other generic components, that did not require "actual performance of [the] operative steps." *INVT*, 46 F.4th at 1372-73.

Throughout its Reply, Petitioner erroneously argues that "[b]ecause the challenged claims are all ***apparatus*** claims, Petitioner does not need to establish that the prior art actually moves any given carrier." Reply, 9 (emphasis in original). But the type of claim does *not* turn on whether it is an *apparatus* or *method* claim. Rather, it depends on the nature of the claim and the actual claim language. Petitioner *never* provided *any* justification (nor can it) for why a mechanical, non-computer, non-software claim that recites a specific structure ("GDC") for moving the carriers, should be read to mean the GDC does *not* actually have to move them.

B. Petitioner relies upon an incorrect claim construction of "aid the movement of minority carriers."

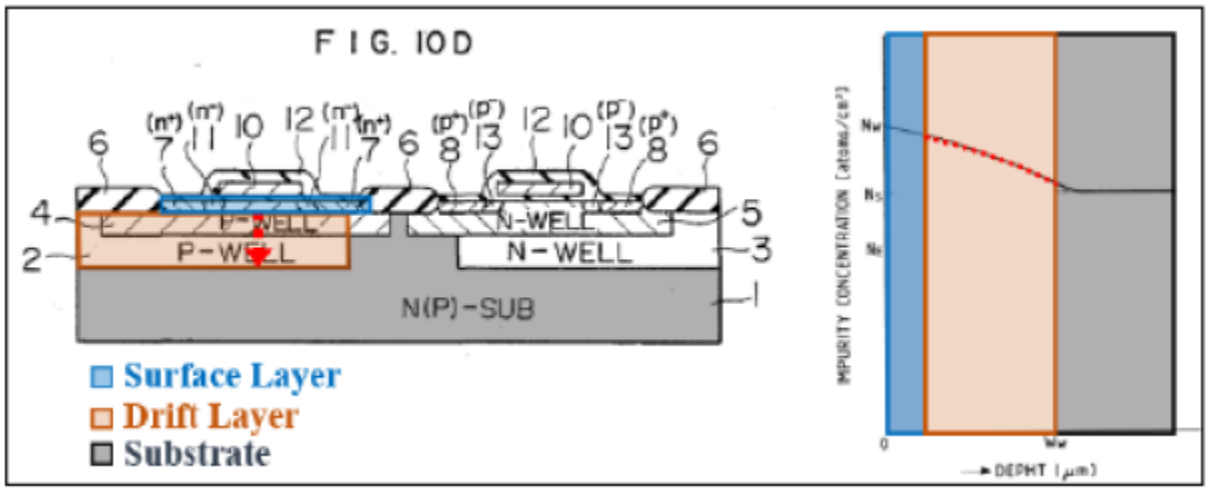
In its Reply, Petitioner relies upon a new and nonsensical claim construction that "aid carrier movement" does *not* mean the carriers actually have to move. Reply, 3. To use an analogy, this is like arguing that a person can "aid movement" by pushing on a parked car. But a person cannot aid movement of the car, unless the car actually moves. Even Petitioner's own expert understood "aiding carrier movement" to refer to "sweeping carriers from the active circuity at the surface into the substrate." EX1003, ¶¶51, 61 (cleaned up). "Sweeping" the carriers means "moving" the carriers, and to argue otherwise is contrary to the surrounding claim language.

To improve performance of the claimed transistor, the minority carriers must not only *move*, they must *move in the correct direction*, ***from*** the "active region" to

deeper in the substrate. The Federal Circuit has made it clear that claims should be construed to properly reflect the "purpose of the invention." *Sequoia Tech., LLC v. Dell, Inc.*, 66 F.4th 1317, 1326 (Fed. Cir. 2023) ("The specification further supports this construction. We have explained that a patent's express purpose of the invention 'informs the proper construction of claim terms.'") (quoting *Kaken Pharm. Co. v. Iancu*, 952 F.3d 1346, 1352 (Fed. Cir. 2020)). Here, Petitioner relies upon an incorrect claim construction that "would eviscerate the stated purpose of the claimed invention." *KEYnetik, Inc. v. Samsung Elecs. Co., Ltd.*, 837 Fed.Appx. 786, 792 (Fed. Cir. 2020).

C. Petitioner presented *zero* evidence that Kawagoe is *even* capable of moving a carrier, much less a minority carrier, from the "surface layer."

In its Petition, Petitioner cites to Kawagoe's Figure 17 and Sakai's Figure 10D for the "graded concentration of dopants…to aid the movement of minority carriers from [the] surface layer" limitation.



Pet. (Paper 1), 59-68. But Kawagoe *never* mentions moving carriers, much less moving carriers from the "surface layer." The best Petitioner could do was cite to the following *altered* sentence: "electrons produced by the α-ray are attracted to the substrate body 2S by that concentration gradient," *id.*, 12, while removing the second half saying that the electrons are "prevented from entering the p-well 6p," EX1007, 16:7-11. But whatever Kawagoe is doing, it is in the *wrong* location. As PO explained in its POR, Kawagoe is *not* moving carriers from the "surface layer," where the "active region" is located. POR, 2, 24-27. Instead, it is preventing electrons produced by the α-ray (*i.e.*, the SEU electrons) from entering the p-well.

Id., 24-26 (citing EX1007, 16:7-11; EX2064, ¶57). When Kawagoe keeps the SEU electrons that are already in the substrate, in the substrate, this is clearly not the same as moving carriers *from* the "surface layer." *Id.*, ¶69. It is telling that Kawagoe used the word "attracted" instead of the word "move." When Kawagoe says the SEU electrons are *attracted* to the substrate, it simply means the SEU electrons *stay* in the substrate. *Id*.

In its Reply, Petitioner argues that Dr. Glew admitted that Kawagoe pushes electrons downward from the surface. Reply, 15. This is *not* true. When Dr. Glew was asked whether Figure 17 would sweep electrons from the active region, he answered: "It doesn't disclose that it does that." EX1054, 121:11-17. As he explained shortly thereafter, "the patent only describes that this dopant gradient is able to keep SEU electrons out of the well. It doesn't tell you what's happening in the well. *Id.*, 122:6-9. The only plausible reading of Kawagoe is that whatever Figure 17 is doing, Figure 17 is keeping the electrons "in the large substrate body below the wells" where they were produced. EX2064, ¶72.

The Petition *never* identified an electric field, much less the location, direction, and magnitude of the electric field. Instead, Petitioner relies entirely on the prosecution history. In its Reply, Petitioner gravely misrepresents the prosecution history. To be exact, Petitioner states:

> PO represented that a downward-sloping graded dopant concentration was known to create an "inherent 'built-in' unidirectional field" that sweeps carriers down into the substrate.

Reply, 4 (citing EX1002, 289-290). But this is *not* what Applicant said. Applicant actually said:

> Yet, this argument 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.

Id. (emphases added). Applicant *never* said a "downward-sloping dopant concentration" would "sweep carriers down into the substrate." Rather, Applicant said the "direction" of the electric field, and the resulting direction of the carrier movement, depends on the *slope* of the "graded concentration." *Id*. Whether the "resulting direction" is "up" or "down" (or whether the carrier moves at all) depends on a number of factors including:

(1) Whether the dopants are n-type or p-type?
(2) Whether the dopants are increasing or decreasing?
(3) Whether the carrier is a hole or an electron?
(4) Whether the electric field generates a force that is sufficient to overcome the resistance of the semiconductor?
(5) Whether the resulting force is in the same direction or the opposite direction of another force; and
(6) Whether the force is greater than or less than the other forces?

POR, 16 (citing EX2064, ¶90). Petitioner *never* addressed any of these factors in its Petition or elsewhere. Even Petitioner's expert admitted that when two forces push on the carrier in opposite directions, the net force determines the movement of the carrier. EX2058, 187:8-188:14. In other words, only one of the forces (the greater force) can possibly aid carrier movement. POR, 12-14.

Finally, Petitioner argues that "carriers are present throughout Kawagoe's semiconductor device." Reply, 10-13. But this argument completely misses the mark. Kawagoe was *not* concerned with just *any* carriers. Kawagoe was *only* concerned about keeping SEU electrons ***out*** of the p-well. EX2064, ¶¶57, 66, 72. The fact that there might be other electrons in the "surface layer" or "active region" does *not* mean Kawagoe would move them out of the "surface layer." This argument does not make any sense because these electrons are needed for the transistor to operate properly. *Id*., ¶¶74-75. As Dr. Glew explained, when a positive voltage is applied to the gate, an electric field forms in the oxide, and electrons move in an upward direction towards the gate. *Id.* It does not make sense to say that Kawagoe's GDC would overcome the upward force to move the electrons in a downward direction. Petitioner's own expert admitted that any movement will depend on the "net force." EX2058, 187:8-188:14.

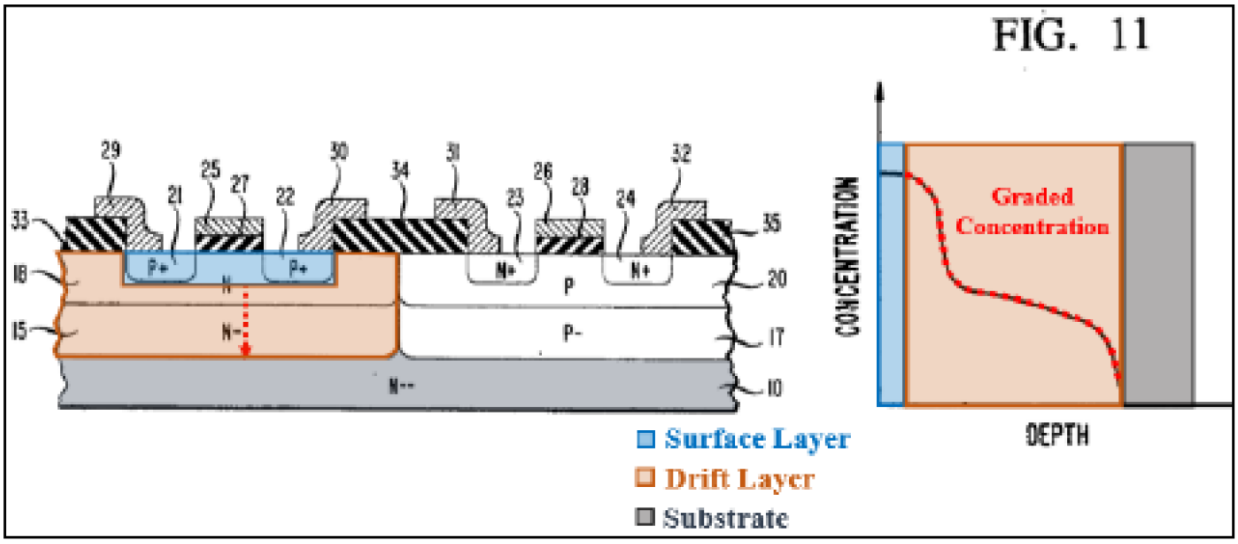
To summarize, Kawagoe never mentions moving carriers, much less moving carriers from the "surface layer." Dr. Glew never testified that Kawagoe would

move carriers from the "surface layer." In fact, he confirmed that Kawagoe does *not* disclose moving carriers from the "surface layer." EX1054, 121:11-17, 122:6-9. There is nothing in the prosecution history that would support this argument either. The prosecution history never said that a "downward sloping dopant concentration" would "sweep carriers down into the substrate." To the contrary, it said the movement will depend on the *slope* of the "graded concentration." EX1002, 289-290.

Petitioner never identified an electric field, much less the location, direction, and magnitude of the electric field, or whether the electric field is sufficient to overcome other forces in the active region. Not only is there *no* evidence that Kawagoe moves carriers from the "active region," there is also *no* evidence that Kawagoe is *even* "capable" of moving carriers from the "active region."

D. Petitioner presented *zero* evidence that Payne is *even* capable of moving a carrier, much less a minority carrier, from the "surface layer."

In its Petition, Petitioner cites to Payne's Figures 10 and 11 for the "graded concentration of dopants generating a first static unidirectional drift field to aid the movement of minority carriers" limitation.



Pet., 23-26. But like Kawagoe, Payne *never* mentions moving carriers, much less moving carriers from the "active regions." Petitioner provides no citations to the specification for this point. *Id.*, 26-32. Instead, Petitioner relies entirely on the pictures above. *Id.*

Payne has a ***uniform*** concentration in the "surface layer" (where the "active regions" are located). For doping in the "surface layer," the Petition points to the blue region and a conclusory sentence that Payne's "[GDC] extend[s] ***between*** the surface layer and the substrate." Pet., 23. But Figure 11 does ***not*** disclose a graded

concentration that would actually aid carrier movement where it is required—***from*** the "surface layer." As Payne explains, "[t]he surface impurity concentration of the surface regions is typically 0.5-5X10^{16} ions/cm^3." EX1005, 5:51-52. But Payne *only* discloses using a *single* concentration in the "surface layer." Thus, there is not a graded concentration.

Petitioner's annotated Figure 11 demonstrates the same thing—the alleged "graded concentration" is flat throughout the surface layer. Moreover, there is no support in Payne for Petitioner's annotations to Figure 11. Petitioner cites to various impurity concentrations and depths disclosed in Payne's specification, *see* Pet., 25, but Figure 11 itself has no scale, numbers, or other indications to show where these values should be placed on the chart. As a result, it was improper for Petitioner to impose its own annotations of the various regions recited in the Challenged Claims ("surface layer," "drift layer," and "substrate").

Even if the concentration is graded within the "surface layer" (which it is not), Payne never mentions using the grading to affect carrier movement. POR, 1. Instead, Petitioner relies entirely on the prosecution history. Pet., 27-30. But once again, Petitioner gravely misrepresents the prosecution history. *Id*. Applicant never said that a "downward-sloping dopant concentration" would "sweep carriers down into the substrate." EX1016, 289-290. Rather, Applicant said the "direction" of the electric field, and the resulting direction of the carrier movement, depends on the

slope of the "graded concentration." *Id*. Whether the "resulting direction" is "up" or "down" (or whether the carrier moves at all) depends on a number of factors. POR, 14, 16; EX2064, ¶90. Petitioner never addressed any of these factors in its Petition or elsewhere. Even Petitioner's expert admitted that when two forces push on the carrier in opposite directions, the net force determines the movement of the carrier. EX2058, 187:8-188:14. In other words, only one of the forces (the greater force) can possibly aid carrier movement. POR, 12-14.

To summarize, Payne never mentions moving carriers, much less moving carriers from the active region. Even if Petitioner can show that there is a graded concentration in the active region (which it has not and cannot), there is no evidence that it would moving carriers from the active region. The prosecution history never said that a "downward sloping dopant concentration" would "sweep carriers down into the substrate." To the contrary, it said the movement will depend on the slope of the "graded concentration." EX1016, 289-90.

Petition never identified an electric field, much less the location, direction, and magnitude of the electric field, or whether the electric field is sufficient to overcome other forces in the active region. Not only is there no evidence that Payne moves carriers from the "active region," there is also no evidence that Payne is *even* "capable" of moving carriers from the active region.

E. Petitioner presented *zero* evidence that the cited references move "*minority* carriers" from the "surface layer."

Just as Petitioner has not shown that the asserted references move carriers ***from*** the "surface layer," Petitioner has not shown that the references move ***minority*** carriers ***from*** the "surface layer."

In its Petition, Petitioner cites to Kawagoe's Figure 17 for the "graded concentration of dopants…to aid the movement of minority carriers from [the] surface layer" limitation. But in Figure 17, the relevant transistor is an NMOS transistor, where the "majority" carrier is an electron, and the "minority carrier is a hole. Petitioner, however, assumed that the minority carrier is an electron, and never addressed what effect, if any, Kawagoe would have on a hole. Thus, Petitioner cannot possibly meet its burden.

Similarly, the relevant transistor in Payne is a PMOS, where the "minority carrier" is an electron. Because Petitioner never addressed what effect, if any, Payne would have on an electron, Petitioner again cannot possibly meet its burden.

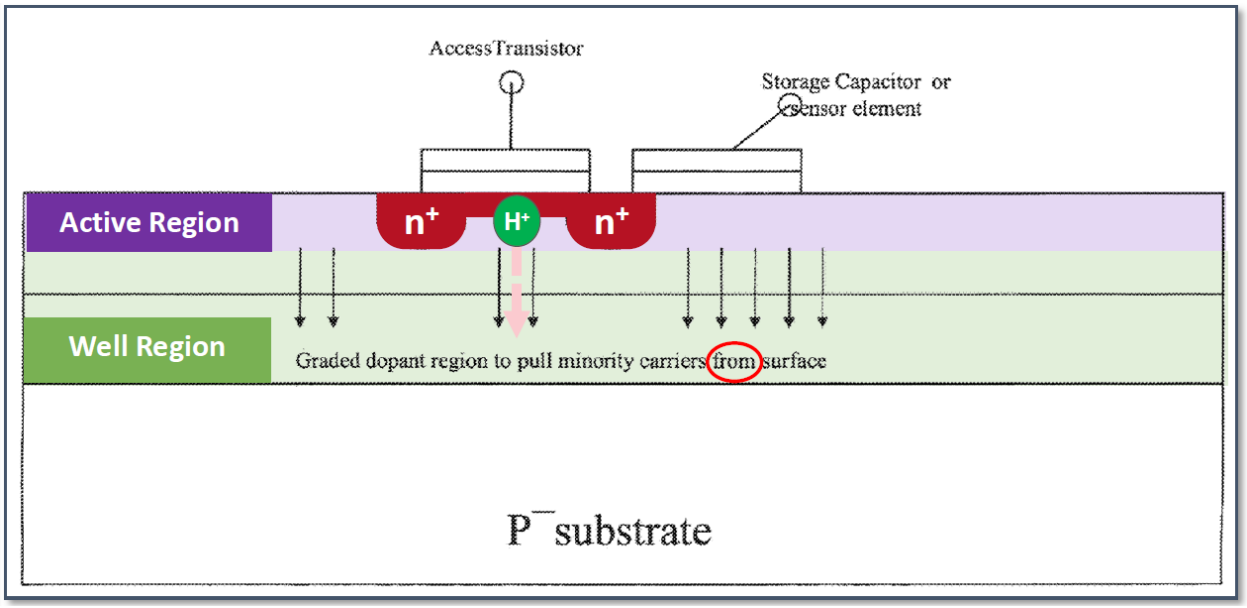
The Board must always "consider the claims in light of the specification and teachings in the underlying patent." *In re Power Integrations, Inc.*, 884 F.3d 1370, 1375 (Fed. Cir. 2018). "[B]oth are to be read with a view to ascertaining the invention." *U.S. v. Adams*, 383 U.S. 39, 49, 86 S.Ct. 708, 713 (1966). The claims "do not have meaning removed from the context from which they arose." *Netword, LLC v. Centraal Corp.*, 242 F.3d 1347, 1352 (Fed. Cir. 2001). When construing a

term like "minority carrier," the Federal Circuit has held that the specification is the "best source for understanding a technical term." *Multiform Desiccants, Inc. v. Medzam, Ltd.*, 133 F.3d 1473, 1478 (Fed. Cir. 1998).

The specification explains that "MOS devices are majority carrier devices for conduction. The conduction is channel dominated." EX1001, 1:43-44. In other words, ***majority*** carriers are used for channel conduction. PO's expert uunderstands this. EX2064, ¶ 36 n.4 ("Because the channel [of FIG. 5(b)] is formed by electrons with a **n**egative charge, the MOSFET is referred to as an **n**-channel MOSFET, and the 'minority carriers' are holes."); POR, 8. This is PO's position in prior litigation. *See* EX1030, 4 n.5 (same), 11 ("explaining MOS devices are majority carrier devices"). Petitioner knew or should have known that this is how the PO's patents understand majority/minority carriers. Petitioner cites PO's prior claim construction brief (EX1030) almost two dozen times in its Petition.

The specification is equally clear as to *why* this understanding of majority/minority carriers is critical, explaining how "[s]purious minority carriers" interfere with the "active circuitry at the surface" of a semiconductor device. *See* EX1001, 3:17-33. PO's expert explained how, for the NMOS transistor of Fig. 5(b), "[w]hen enough electrons have accumulated, they form a conductive channel … between the source and the drain." EX2064, ¶ 36 (cited at POR, 8). However, "the channel disappears as the holes return to the surface layer." *Id.* Holes prevent the

channel from forming. Since the claims are to be understood according to the "express purpose of the invention," it is the ***minority*** carrier that has to be "[swept]…into the substrate as quickly as possible. EX1001, 3:30-35; *Sequoia Tech.*, 66 F.4th at 1326.



EX1001, Fig. 5(b) (annotated). For the NMOS of Figure 5(b), the minority carrier has to be holes. EX2064, ¶ 36 n.4; EX1054, 74:24-75:5 (explaining that for an NMOS, "the channel needs to be formed out of N, electrons, so the holes would then be minority carriers."); POR, 8. The electric field (indicated above) ***must*** point downward, since holes travel in the direction of the generated field, to move the minority carrier away from the "active region" or "surface layer" toward the substrate.

But this is not the understanding of "minority carrier" that Petitioner adopted. Petitioner's expert, Dr. Blalock, recognizes that only holes or electrons, but not both,

can "be the minority carrier in any given surface layer." EX1003, ¶101; Pet., 30. But in his declaration, Dr. Blalock relies on the type of doping within a region to define which carrier is majority and which is minority. *Id.*, ¶41 ("When a region is doped with p-type dopants, the holes are majority carriers and the electrons are minority carriers.…When a region is doped with n-type dopants, the electrons are majority carriers and the holes are minority carriers."). Most crucially, when Dr. Blalock is talking about this exact limitation, he wrongly concludes that the references' "electric fields result from the downward-sloping graded concentrations … and aid the movement of minority carriers (holes in N-wells, electrons in P-wells) downward to the substrate." *Id.*, ¶106; Pet., 32. But Dr. Blalock's—and Petitioner's—understanding of what constitutes a minority carrier is inconsistent with how that term is used in the patent.

Not only is the Petition silent as to the references' impact on "minority carriers," but the Petition is incorrect in what a "minority carrier" even is. Properly understood, since "MOS devices are majority carrier devices," an NMOS forms an N-channel and a PMOS forms a P-channel. EX1001, 1:43. Thus, in an NMOS device, electrons are the majority carriers and holes are the minority carriers. POR, 8. In a PMOS device, it is the opposite; holes are the majority carriers and electrons are the minority carriers. Thus, the only way for the electric field in Fig. 5(b) to move the carrier from the "surface layer" to the substrate is if the carrier is a

positively-charged hole. It would be physically impossible for the electric field to pull a negatively-charged electron, because the electron would move in the opposite direction (*i.e.*, *toward* the "active circuitry"). EX2064, ¶¶70-71, 74. If the minority carrier in an NMOS transistor were understood to be electron, it would inevitably exclude the specification's preferred embodiment. *SynQor, Inc. v. Artesyn Techs., Inc.*, 709 F.3d 1365, 1378-79 (Fed. Cir. 2013) ("A claim construction that excludes the preferred embodiment is rarely, if ever, correct.") (internal citation omitted).

Petitioner gets this critical point wrong. In addition to reciting the same arguments for the distinct "aid carrier movement" limitation from other patents, Petitioner relies on its own understanding of majority and minority carriers, at odds with what the specification requires. Because Petitioner failed to produce any evidence for the correct "minority carrier," Petitioner cannot possibly meet its burden.

F. PO's prior licenses are objective indicia of non-obviousness that support patentability.

Petitioner has manufactured various issues regarding PO's prior licenses with major semiconductor companies to avoid some of "the most probative and cogent evidence in the record. *See Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983). There is zero doubt that there is "a legally and factually sufficient connection [*i.e.*, nexus] between the [licenses] and the patented invention." *See*, *e.g.*, *Quanergy Sys., Inc. v. Velodyne Lidar USA, Inc.*, 24 F.4th 1406, 1417 (Fed. Cir.

2022). Each license agreement covers a ***single patent family*** with nearly identical specifications, and the "claimed feature of using a graded dopant" ***is*** recited in the licenses. EX2078, ¶ 2-3, p. 19, 45. It is also undisputed that RPX *approached Greenthread* on behalf of [redacted] and [redacted]—two companies under no threat of litigation. *Id.*, ¶ 4. Petitioner's reliance on RPX's marketing material is simply out of place, as it can point to zero evidence that [redacted] or [redacted] were "motivated by avoiding litigation costs." Reply, 20.

G. Petitioner has not shown that the Petition is timely.

Petitioner's outsized focus on the "RPX Agreements" is a red herring. Reply, 21. Privity does not hinge on PO's licenses or relationships with Intel, Sony, or Samsung, but ***Petitioner's*** relationship with those time-barred parties. PO has presented evidence on this "highly fact-dependent question." *Apps. in Internet Time, LLC v. RPX Corp.*, IPR2015-01750, Paper 128 at 7 (PTAB Oct. 2, 2020) (precedential). By showing that Petitioner manufactured the accused products in the *Intel* litigation, PO produced "evidence to sufficiently put this issue into dispute," and Petitioner could no longer rely on "attorney argument." *Worlds*, 903 F.3d at 1244 n.8, 1246. Petitioner had to provide affidavits, declarations, or other "actual evidence." *Id.* Because Petitioner failed to do this, Petitioner cannot possibly meet its burden.

III. CONCLUSION

For at least the foregoing reasons, the Challenged Claims should be found patentable over the cited references and grounds presented in the IPR proceeding.

Dated: March 21, 2025

Respectfully submitted,

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PUBLIC VERSION

CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. §42.24(d), Petitioner hereby certifies that the word count for the foregoing **PATENT OWNER'S SUR-REPLY** is 4,314 words, which is within the 5,600 word limit set in 37 C.F.R. §42.24(c)(4). This word count does not include the table of contents, table of authorities, exhibit list, certificate of word count, and certificate of service. This word count was prepared using Microsoft Word.

Dated: March 21, 2025

By: */Alan Whitehurst/*
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CERTIFICATION OF SERVICE

The undersigned hereby certifies that a copy of this **PATENT OWNER'S SUR-REPLY** has been served on Petitioner via email on the following counsel of record for Petitioner:

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