

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SEMICONDUCTOR COMPONENTS INDUSTRIES, INC.,
Petitioner,

v.

GREENTHREAD, LLC,
Patent Owner.

Case IPR2023-01242
U.S. Patent 11,121,222

PATENT OWNER'S RESPONSE

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EXHIBIT LIST

Exhibit No.	Description	Submitted Previously?
Ex. 2001	<i>Greenthread, LLC v. Intel Corp.</i> , No. 6:22-cv-00105-ADA, Dkt. 7 (summons returned executed) (W.D. Tex. Feb. 7, 2022)	X
Ex. 2002	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
Ex. 2006	ON Semiconductor data sheet entitled “NCP81248 Three-Rail Controller with Intel Proprietary Interface for IMVP8 CPU Applications” (Feb. 2018) available at https://www.onsemi.com/pdf/datasheet/ncp81248-d.pdf	X
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

Exhibit No.	Description	Submitted Previously?
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., <i>Greenthread, LLC v. ON Semiconductor Corp.</i> , No. 23-443-RGA (D. Del.) (served Sept. 27, 2023)	X
Ex. 2012	Plaintiff’s First Set of Common Requests for the Production of Documents to Defendants ON Semiconductor Corporation and Monolithic Power Services, Inc., Et Al., <i>Greenthread, LLC v. ON Semiconductor Corp.</i> , No. 23-443-RGA (D. Del.) (served Sept. 27, 2023)	X
Ex. 2013	Definition of “privity” in Black’s Law Dictionary (11 th ed. 2019) available from Westlaw at westlaw.com	X
Ex. 2014	Email communication from Petitioner’s counsel to Patent Owner’s counsel October 11, 2023	X
Ex. 2015	Plaintiff’s Identification of Accused Products and Asserted Patents, <i>Greenthread, LLC v. ON Semiconductor Corp.</i> , No. 23-443-RGA (D. Del.) (served Oct. 12, 2023)	X

Exhibit No.	Description	Submitted Previously?
Ex. 2016	Petition (Paper 2) in <i>Sony Group Corp. v. Greenthread, LLC</i> , IPR2023-00324	X
Ex. 2017	Petition (Paper 1) in <i>Sony Group Corp. v. Greenthread, LLC</i> , IPR2023-00376	X
Ex. 2018	<i>Greenthread, LLC v. Intel Corp.</i> , No. 6:22-cv-00105-ADA, Dkt. 1 (Complaint) (W.D. Tex. Jan. 27, 2022)	X
Ex. 2019	<i>Greenthread, LLC v. Dell Inc.</i> , No. 6:22-cv-105-ADA, Dkt. 120 (Second Amended Complaint)	X
Ex. 2020	<i>Greenthread, LLC v. ON Semiconductor Corp.</i> , No. 23-443-RGA, Dkt. 1 (Complaint with accompanying exhibits) (D. Del. Apr. 21, 2023)	X
Ex. 2021	<i>Greenthread, LLC v. ON Semiconductor Corp.</i> , No. 23-443-RGA, Dkt. 24 (Scheduling Order) (D. Del. Sept. 11, 2023)	X
Ex. 2022	Confidential agreement	X
Ex. 2023	Petition (Paper 1) in <i>Intel Corp. v. Greenthread LLC</i> , IPR2023-00308	X
Ex. 2024	Petition (Paper 1) in <i>Intel Corp. v. Greenthread LLC</i> , IPR2023-00420	X
Ex. 2025	Petition (Paper 1) in <i>Intel Corp. v. Greenthread LLC</i> , IPR2023-00552	X
Ex. 2026	Petition (Paper 1) in <i>Dell Techs. Inc. v. Greenthread LLC</i> , IPR2023-00506	X
Ex. 2027	Petition (Paper 1) in <i>Dell Techs. Inc. v. Greenthread LLC</i> , IPR2023-00509	X

Exhibit No.	Description	Submitted Previously?
Ex. 2028	Confidential declaration	X
Ex. 2029	Email communication from Patent Owner's counsel to Petitioner's counsel between May 26 to June 1, 2023	X
Ex. 2030	Web pages from websites of Onsemi (www.onsemi.com), Mouser Electronics, Inc. (www.mouser.com), Rochester Electronics (www.rocelec.com), and DigiKey Corporation (www.digikey.com) (URLs for web pages are indicated on respective pages)	X
Ex. 2031	<i>Greenthread, LLC v. Intel Corp.</i> , No. 6:22-cv-00105-ADA, Dkt. 113 (Redacted Memorandum Opinion and Order) (W.D. Tex. Dec. 27, 2022)	X
Ex. 2032	<i>Greenthread, LLC v. Intel Corp.</i> , 6:22-cv-00105-ADA, Dkt. 38 (First Amended Complaint for Patent Infringement) (W.D. Tex., filed Apr. 29, 2022)	X
Ex. 2033	<i>Greenthread, LLC v. Intel Corp.</i> , 6:22-cv-00105-ADA, Dkt. 38-8 (Greenthread's Amended Preliminary Infringement Contentions) (W.D. Tex., filed Apr. 29, 2022)	X
Ex. 2034	<i>Greenthread, LLC v. Intel Corp.</i> , 6:22-cv-00105-ADA, Dkt. 38-12 (Exs. D-1, D-2, D-3, D-6 to Greenthread's Preliminary Infringement Contentions) (W.D. Tex., filed Apr. 29, 2022)	X
Ex. 2035	Plaintiff's Supplemental Identification of Asserted Patents and Accused Products in <i>Greenthread, LLC v. ON Semiconductor Corp.</i> , 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

Exhibit No.	Description	Submitted Previously?
Ex. 2037	Webpage from Mouser Electronics, Inc. for NCP252160 (https://www.mouser.com/ProductDetail/onsemi/NCP252160MNTWG?qs=sPbYRqrBIVkc9kINZ2pXbg%3D%3D)	X
Ex. 2038	Webpage from DigiKey for NCP252160 (https://www.digikey.com/en/products/detail/onsemi/NCP252160MNTWG/15859992)	X
Ex. 2039	Webpage from Mouser Electronics, Inc. for NB3L202K (https://www.mouser.com/ProductDetail/onsemi/NB3L202KMNTXG?qs=z6PAvqrnkvrR8PcLN2EnUzg%3D%3D)	X
Ex. 2040	Webpage from DigiKey for NB3L202K (https://www.digikey.com/en/products/detail/onsemi/NB3L202KMNTXG/7220446)	X
Ex. 2041	Definition of “agent” in Black’s Law Dictionary (11 th ed. 2019) available from Westlaw at westlaw.com	X
Ex. 2042	<i>Greenthread, LLC v. Intel Corp.</i> , 6:22-cv-00105-ADA, Dkt. 135 (Motion for Admission Pro Hac Vice of L. Popovski on Behalf of Sony) (W.D. Tex., filed January 30, 2023)	X
Ex. 2043	[RESERVED]	
Ex. 2044	Email communication from Patent Owner to Petitioner’s litigation counsel dated September 13, 2023	X
Ex. 2045	<i>Greenthread, LLC v. Intel Corp.</i> , 6:22-cv-00105-ADA, Dkt. 49 (Notice of Appearance of Additional Counsel) (W.D. Tex., filed June 9, 2022)	X
Ex. 2046	[RESERVED]	

Exhibit No.	Description	Submitted Previously?
Ex. 2047	[RESERVED]	
Ex. 2048	<i>Greenthread, LLC v. Intel Corp.</i> , 6:22-cv-00105-ADA, Dkt. 120-8 (Greenthread's Amended Preliminary Infringement Contentions) (W.D. Tex., filed Jan. 23, 2023)	X
Ex. 2049	Email communications between Petitioner's counsel and Patent Owner's counsel, dated Oct. 31, 2023 - Nov. 1, 2023	X
Ex. 2050	Email communications between Petitioner's counsel and Patent Owner's counsel, dated Nov. 2-7, 2023	X
Ex. 2051	Email communications between Petitioner's counsel and Patent Owner's counsel, dated Nov. 14-15, 2023	X
Ex. 2052	Email communications between Petitioner's counsel and Patent Owner's counsel, dated Dec. 12-13, 2023	X
Ex. 2053	Web page from website of Onsemi (https://www.onsemi.com/products/custom-ssp/soc-sip-custom-products)	X
Ex. 2054	<i>Greenthread, LLC v. ON Semiconductor Corp.</i> , No. 23-443-RGA, Dkt. 36 (Second Amended Complaint) (D. Del. Nov. 22, 2023)	X
Ex. 2055	<i>Greenthread, LLC v. ON Semiconductor Corp.</i> , No. 23-443-RGA, Dkt. 42 (Defendants' Answer, Affirmative Defenses, and Counterclaims to Plaintiff's Second Amended Complaint) (D. Del. Dec. 20, 2023)	X
Ex. 2056	Email communications between the Board, Petitioner's counsel and Patent Owner's counsel dated November 27, 2023	X
Ex. 2057	Declaration of Dr. Alexander Glew	

Exhibit No.	Description	Submitted Previously?
Ex. 2058	Transcript of Deposition of Dr. Travis Blalock in IPR2013-01242, -01243, -01244	
Ex. 2059	Excerpts from Chen, J. Y., <u>CMOS Devices and Technology for VLSI</u> , Prentice-Hall (1990)	
Ex. 2060	U.S. Patent No. 5,384,476 (“Nishizawa”)	
Ex. 2061	CV of Dr. Alexander Glew	
Ex. 2062	U.S. Patent No. 8,421,195	
Ex. 2063	U.S. Patent No. 9,190,502	
Ex. 2064	U.S. Patent No. 10,510,842	
Ex. 2065	U.S. Patent No. 10,734,481	
Ex. 2066	U.S. Patent No. 11,316,014	
Ex. 2067	File History of U.S. Patent No. 8,421,195	
Ex. 2068	File History of U.S. Patent No. 9,190,502	
Ex. 2069	File History of U.S. Patent No. 10,510,842	
Ex. 2070	File History of U.S. Patent No. 10,734,481	

Exhibit No.	Description	Submitted Previously?
Ex. 2071	File History of U.S. Patent No. 11,316,014	
Ex. 2072	Declaration of Phil John	
Ex. 2073	Statista Information	
Ex. 2074	Petition in <i>Sony Group Corp. v. Greenthread</i> , LLC, IPR2023-00325	
Ex. 2075	Petition in <i>Sony Group Corp. v. Greenthread</i> , LLC, IPR2023-00375	
Ex. 2076	[RESERVED]	

I. INTRODUCTION

The Board should enter judgement against Petitioner, because it has not and cannot show that the challenged claims are patentable (35 U.S.C. § 316(e)).¹ The Petition fails to establish even a *prima facie* case of unpatentability, because, among other deficiencies, none of its references disclose the “aid carrier movement” claim limitation. To overcome that hurdle, Petitioner inserts ellipses into Greenthread’s statements during prosecution history and more ellipses into quotations from its own prior art references. Petitioner’s editing hides what Greenthread actually said and the fact that one of its references actually teaches “prevent[ing]” carrier movement—the exact opposite of what Greenthread claims. Even if Petitioner were right about

¹ Greenthread, LLC (“Patent Owner,” “PO,” or “Greenthread”) submits this Response to the Board’s decision to institute *inter partes* review (IPR) (Paper 35, the “Decision”) and to the Petition for *Inter Partes* Review (Paper 1, “Petition”) filed by Semiconductor Components Industries, LLC, d/b/a onsemi (“onsemi” or “Petitioner”). This Response is timely filed in accordance with the parties’ stipulation (Paper 42). The Board instituted review of U.S. Patent No. 11,121,222 (“the ’222 patent” or “the Challenged Patent”) (Ex. 1001) on six grounds that challenge claims 1–9, 13–28, and 32–42 (“the Challenged Claims”) of the Challenged Patent. Decision, 43.

what the prior art says, Patent Owner's expert shows that they are wrong as a matter of physics.²

Additionally, objective indicia of non-obviousness confirm the patentability of Greenthread's claims. Two multibillion dollar semiconductor companies, SK Hynix and Kioxia, paid for licenses covering *just the patent family at issue here*. Moreover, Greenthread has never threatened litigation against those companies. Rather, *they approached Greenthread first*. If either company had wanted to, it could have challenged Greenthread's patents at virtually no expense. At the time of the licenses, [REDACTED] had IPRs pending against Greenthread's patents. SK Hynix and Kioxia could have joined those petitions, filed copycat petitions, or drafted their own petitions (as they regularly do). There is no plausible explanation for these transactions, except that two of Petitioner's competitors looked at the evidence and came to the opposite conclusion than Petitioner urges here. The Board should reach the same conclusion as SK Hynix and Kioxia and confirm the patentability of the Challenged Claims.

II. THE '222 PATENT

A. Background Technology Regarding Dopants

² Patent Owner submits the declaration of Dr. Glew (Ex. 2057), an expert in the field of the Challenged Patent. (Ex. 2057, ¶¶1-16).

Silicon is an example of a semiconductor. In its pure form, it is typically an insulator, but it can become an electrical conductor when impurities called “dopants” are added into the silicon crystal. These dopants are often phosphorous or boron atoms that have one more or one less valence electron than a silicon atom. If the dopant has one less valence electron, then it creates what is called a “hole” where there was an electron, which can be thought of as a positive unit of charge. The extra electrons or holes disturb the local charge equilibrium in the silicon and can become mobile in response to electric fields. Thus, the electrons and holes are called “charge carriers.” Ex. 2057 (“Glew Decl.”), ¶33; *id.*, ¶¶34-37.

These dopants can also change the local net electrical charge distribution in the surrounding silicon, influencing the motion of other charge carriers passing by. 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.” *Id.*, ¶33.

B. Overview of Challenged Patent

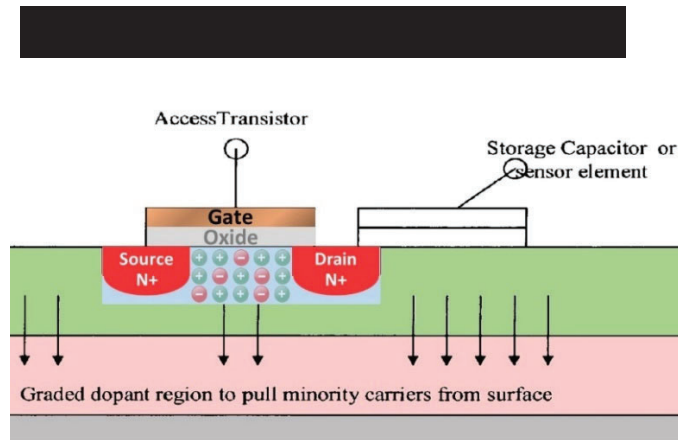
At the time of invention of the Challenged Patent, most semiconductor devices relied on spatially uniform concentrations of dopants. Ex. 1001 (Challenged Patent), Abstract, 1:48-63. Dr. Rao recognized, however, that graded concentrations of dopants can be used to improve certain aspects of the performance of transistors and other semiconductor devices. *Id.*, Abstract, 3:25-35, 3:56-58. The claimed

invention is clearly disclosed in, e.g., Figs. 5B-5C of the Challenged Patent, and the corresponding parts of the specification. Ex. 2057, ¶34.

A surface-channel MOSFET is a common type of transistor capable of controlling current flow at or along the surface of the semiconductor substrate. Ex. 2059, 27 (“carriers propagate at the semiconductor surface”). Figure 5B shows an NMOS³ transistor that is formed in a p-type surface layer. The transistor comprises (1) a gate; (2) a thin oxide separating the gate from the surface layer; and (3) two doped regions called the source and drain (shaded red). Ex. 1001, 3:31-34 (“electrons can be swept from source to drain”), 3:64-66 (“accelerate majority carriers towards the drain”). In Fig. 5B, the N+ means these regions are heavily doped with an n-type dopant that creates a surplus of negative carriers (i.e., electrons).⁴ The specification explains that the NMOS transistor in Fig. 5B can be a surface-channel MOSFET. Ex. 2057, ¶¶35.

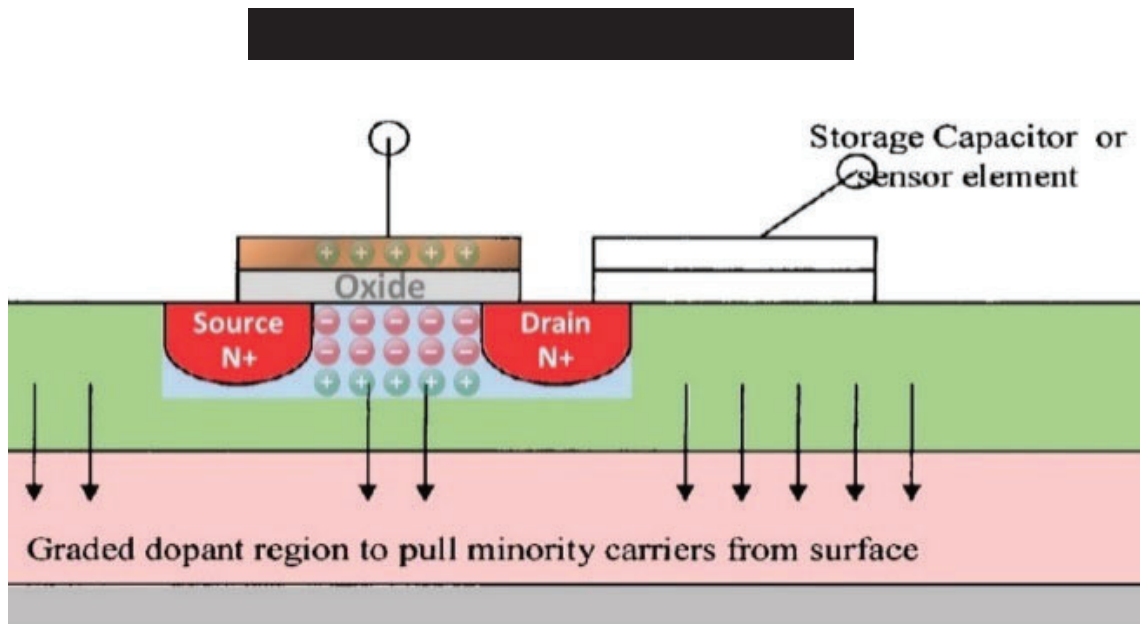
³ MOS stands for “metal oxide semiconductor.” Ex. 2057, ¶35 n.1.

⁴ An “N” region or layer has more electrons, and thus a “negative charge.” A “P” layer has more holes, and a “positive charge.” A “+” or “-” means heavily or lightly doped. Ex. 2057, ¶35 n.2.



Id., ¶35 (explaining Fig. 5B above); Ex. 1001, 3:64-66. Meanwhile, the p-type silicon between the source and drain (shaded blue) has an abundance of positively charged holes (green circles). When the holes separate the source’s electrons from the drain’s electrons, current cannot flow through the transistor, and the transistor is in an “off” state. Ex. 2057, ¶¶34-35.

When a positive voltage is applied to the gate, an electric field forms in the oxide. *Id.*, ¶36. This positive electric field repels the “positive” holes downwards, while the negative electrons (red circles) are attracted to move into the blue surface layer. When enough electrons have accumulated in the surface layer below the oxide, they form a conductive channel of electrons between the source and the drain, and current can begin to flow through the transistor.



Ex. 2057, ¶36.⁵ In order to turn the transistor “off,” the positive voltage is removed from the gate and the channel disappears as the holes return to the surface layer. *Id.*

Dr. Rao recognized that by using graded concentrations of dopants in the well region and a drift layer (shaded pink), it is possible to “pull” carriers from the silicon’s surface. Ex. 1001, Fig. 5B (annotated above). In this example, pulling the holes from the surface layer when a positive voltage is applied to the gate, allows the transistor to turn “on” more quickly. This improves the speed and performance of the transistor. Ex. 2057, ¶37; Ex. 1001, 3:30-35.

III. ALLEGED PRIOR ART

A. Kawagoe (Ex. 1007)

⁵ Because the channel is formed by electrons with a negative charge, the MOSFET is referred to as an n-channel MOSFET, and the “minority carriers” are holes. Ex. 2057, ¶36 n.3.

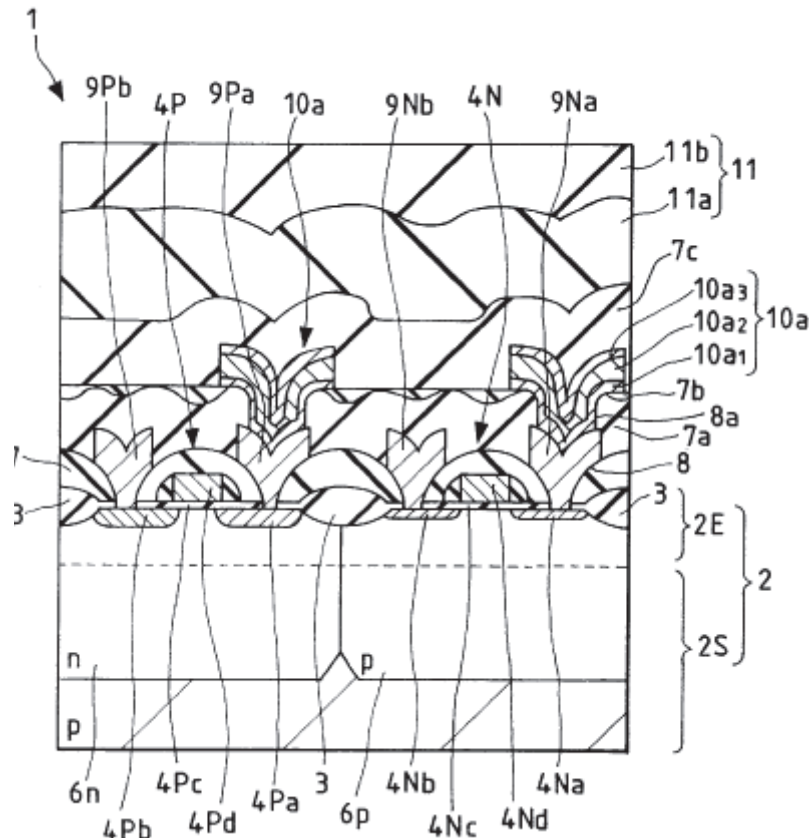
The Petition's first ground relies on single-reference obviousness over Kawagoe (Ex. 1007), and the third and fifth grounds use Kawagoe as the primary reference for obviousness combinations. Pet., 5. Below is an overview of pertinent portions of Kawagoe relevant to the present dispute. Ex. 2057, ¶¶39-41.

Kawagoe is a patent that:

relates to a process for manufacturing a semiconductor wafer, a semiconductor wafer, a process for manufacturing a semiconductor integrated circuit device, and a semiconductor integrated circuit device and, more particularly, to a technique which is effective if applied to the so-called 'epitaxial wafer manufacturing process' for forming an epitaxial layer over the surface of a semiconductor substrate body, an epitaxial wafer, a process for manufacturing a semiconductor integrated circuit device by using the epitaxial wafer, and a semiconductor integrated circuit device.

Ex. 1007, 1:13-23.

Figure 16 of Kawagoe (shown below) is "a section showing an essential portion of a semiconductor integrated circuit device according to" Kawagoe's fourth embodiment. *Id.*, 14:46-49.



Id., FIG. 16.

Figure 16 shows, in part, an n-well 6n and a p-well 6p. Kawagoe discloses that in p-well 6p:

the impurity concentration of the p-well 6p is given such a gradient that it is gradually lowered in the depthwise direction from the surface of the epitaxial layer 2E, so that the influence to be caused by the carriers (or electrons) due to the α -ray is lowered. Specifically, *the electrons produced by the α -ray are attracted to the substrate body 2S by that concentration gradient and prevented from entering the p-well 6p* so that the soft errors can be reduced in case the MIS memory of the DRAM or the like is formed in the p-well 6p. The impurity concentration

NW in the principal surface of the epitaxial layer 2E of the p-well 6p and the n-well 6n is at about 6×10^{16} atoms/cm³, so that the impurity concentration of the p-well 6p and the n-well 6n is at 5×10^{15} to 6×10^{16} atoms/cm³.

Id., 16:2-15 (emphasis added); *see also infra* Sections VI.A.2, VI.B.2 (discussing this portion of Kawagoe).

B. Wieczorek (Ex. 1006)

The Petition's second, fourth, and sixth grounds rely on Wieczorek (Ex. 1006) as the primary reference for obviousness combinations. Pet., 5. Below is an overview of pertinent portions of Kawagoe relevant to the present dispute. Ex. 2057, ¶¶42-45.

Wieczorek is a patent publication that “relates to the field of manufacturing integrated circuits, and, more particularly, to a semiconductor device, such as a field effect transistor, having an improved retrograde dopant profile in a channel region of the transistor element, and a method of manufacturing such a semiconductor device.” Ex. 1006, ¶[0002].

Much of the Petition's discussion focuses on Figures 1B and 2B (shown below), which are described in relatively cursory manner in the background section of Wieczorek. The entirety of Wieczorek's description of Figure 1B is:

FIG. 1b schematically shows the semiconductor device 100 in an advanced manufacturing stage. In FIG. 1b, the semiconductor device 100 comprises within the P-well structure 110 heavily N-

doped source and drain regions 131, including lightly doped extensions 132. In the N-well structure 120, similarly, heavily P-doped source and drain regions 141, including lightly doped extensions 142, are provided. A gate insulation layer 135, for example, a gate oxide layer, is provided on the entire surface of the semiconductor device 100 to separate a gate electrode 134 from a corresponding channel region 136 and a gate electrode 144 from the corresponding channel region 146. Spacer elements 133 are provided at the sidewalls of the gate electrode 134 and respective spacer elements 143 are located at the sidewalls of the gate electrode 144. Thus, the semiconductor device 100 includes an N-channel transistor 130 and a P-channel transistor 140.

Ex. 1006, ¶[0012]; *see also id.*, ¶[0020] (“FIGS. 1a-1b show schematic cross-sectional views of an exemplary conventional semiconductor device at different manufacturing stages.”).

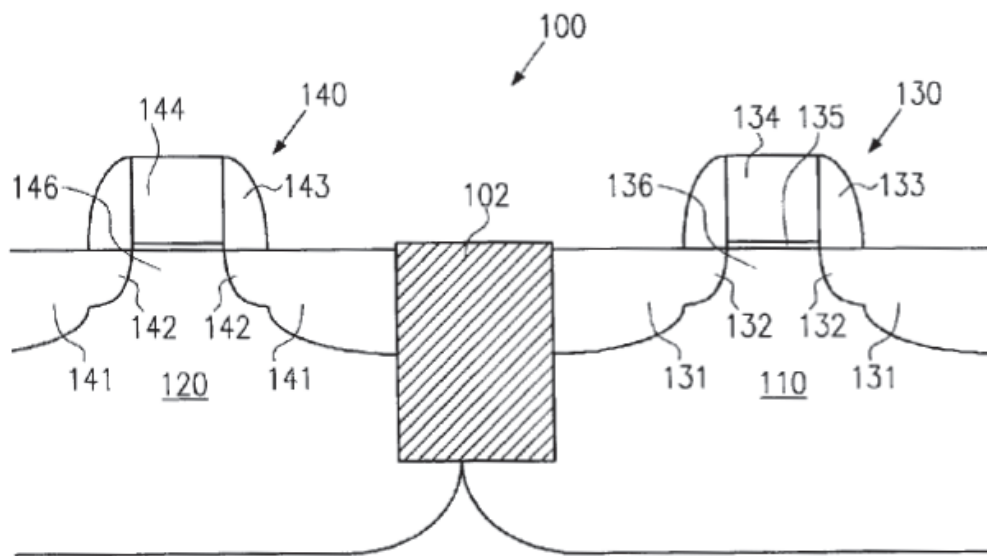


FIG.1b
(Prior Art)

Id., FIG. 1B.

Figure 2B (shown below) is described in the background section of Wiczorek:

FIG. 2b shows a corresponding graph with a typical dopant profile with respect to the depth of the respective well structure. Due to the up-diffusion of the dopant atoms during the heat treatment, the initially retrograde profile in the vicinity of the surface of the semiconductor device 100, as indicated by reference number 200, may have become substantially uniformly distributed.

Id., ¶[0011].

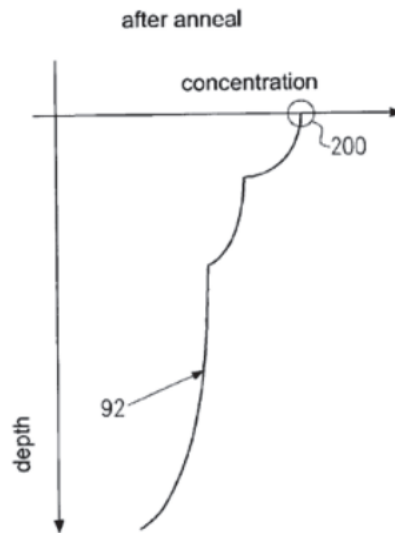


FIG.2b
(Prior Art)

Id., FIG. 2B.

IV. LEVEL OF ORDINARY SKILL

A person of ordinary skill in the art (POSITA) in the technology field of the Challenged Patent would be a person with at least a Bachelor's of Science degree in electrical or computer engineering, materials science, chemical engineering, applied physics, or a related field, with emphasis on semiconductor manufacturing, or an equivalent degree, and at least four years of experience in semiconductor design and manufacturing. Additional education in a relevant field or industry experience may compensate for a deficit in one of the other aspects of the requirements stated above. Ex. 2057, ¶¶17-18.

V. CLAIM CONSTRUCTION

The claims in an IPR are construed using the same standard that applies in district court proceedings, as set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc); 37 C.F.R. § 100(b) (2019). Claim terms are afforded “their ordinary and customary meaning,” which is “the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention.” *Phillips*, 415 F.3d at 1312–13. “The Board only construes the claims when necessary to resolve the underlying controversy. *Toyota Motor Corp. v. Cellport Systems, Inc.*, IPR2015-00633, Paper 11 at 16 (PTAB Aug. 14, 2015) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)). Patent Owner does not believe express claim construction is necessary for any claim terms of the

Challenged Claims. Each term of the Challenged Claims should be given its ordinary and customary meaning. Ex. 2057, ¶¶20-25, 46.

VI. THE CITED REFERENCES DO NOT RENDER OBVIOUS THE CHALLENGED CLAIMS

Petitioner fails to establish that the references identified in the Petition teach or render obvious at least the “aid carrier movement” limitations (Elements [1.5]/[21.5]/[39.5]/[41.5]/[42.5] and [1.6]/[21.6]) of the challenged independent claims.

A. “Graded” does not mean “aided.”

Petitioner’s references do not teach the “aid carrier movement” claim limitation. Therefore, to locate “aid carrier movement” in the prior art, Petitioner asserts that Greenthread has previously admitted that *any* “graded dopant concentration” will “aid carrier movement.” That is not what Greenthread said—explicitly or implicitly. Moreover, as a matter of physics, Petitioner is wrong.

1. Greenthread never said all graded dopant concentrations aid carrier movement.

First, Petitioner writes: “According to [Greenthread], the claims make clear that ‘carriers **must move** in a particular direction (from the surface layer to the substrate)’” Pet., 22, 59. But the bold and underlined language in brackets are *Petitioner’s* words, not Greenthread’s. The point of the sentence Greenthread actually wrote is that a “graded dopant concentration” “must move” carriers *to meet the claim limitation*, not that any and every graded dopant concentration “must

move” carriers. Greenthread was emphasizing that “aid carrier movement” is a separate claim element from “graded dopant concentration”—the exact opposite of what Petitioner asserts. In context, Greenthread said:

Defendants assert that the specification does not provide guidance on how to assess or measure carrier movement. This is not true. The claims and the specification make clear that the electric field must move the carriers in a particular direction (from the surface layer to the substrate). Whether the carrier movement has a particular speed or acceleration is beyond the scope of the claim, as long as it meets the other limitations of the claim.

Ex. 1020, 29.

Next, Petitioner attributes to Greenthread the statement that ““when the dopant concentration is graded in a particular direction, [certain] charge carriers will move in the [same] gradient direction”” This comes from the *background* section of a Greenthread claim construction brief where Greenthread was describing a phenomenon called “carrier drift.” Ex. 1020, 2. By definition, carrier drift involves the movement of carriers. *Supra* Section II.A. The fact that a phenomenon definitionally involves carrier movement and graded dopant concentrations does not mean that the phenomenon always occurs.

Finally, Petitioner claims that Greenthread said during prosecution of a related patent that “a downward-sloping graded dopant concentration was known in the

prior art to create an ‘inherent “built-in” unidirectional electric field’ that sweeps carriers down.” Pet., 23. Most of this quote is from Petitioner, not Greenthread. Furthermore, Petitioner does not quote Greenthread’s full statement. In fact, Greenthread added that the movement of carriers “[d]epend[s] on the particular slope of the graded concentration of dopant[s].” Ex. 1016, 289 (emphasis added). Moreover, Greenthread was responding to an Office Action regarding a claim that required a “single static unidirectional electric drift field to aid the movement of carriers.” Ex. 1016, 286. Those additional claim limitations were, as Greenthread said, an “*additional parameter* for ensuring that all minority carriers are moved in one direction.” Ex. 1016, 290 (emphasis added). The fact that an “additional parameter” *besides* the graded dopants is necessary to “ensur[e] that all minority carriers are moved” shows that Greenthread was not asserting that “graded” entails “aided.”

2. Other evidence confirms that “graded” does not mean “aided.”

Even if there were any ambiguity in Greenthread’s statements, any notion that Greenthread was claiming “graded” as necessarily “aided” is implausible. First, the specification, like Greenthread’s statements during prosecution, describes the slope of the dopant concentration as a relevant parameter for determining whether a concentration gradient will aid carrier movement. “The gradient can be linear, quasi linear, exponential or complimentary error function. The relative slope of the donor

concentration throughout the base creates a suitable aiding drift electric field, to help the” carriers move. Ex. 1001, 2:60-64.

Second, during prosecution, the examiner said that in “a complex electronic device, movement of minority carriers is affected by multiple forces and fields” and that a “drift field may attempt to apply a force on all minority carriers in a specific direction” but that “without knowing other parameters of the device” one cannot say whether the field would aid carrier movement. Ex. 1016, 270.

Third, Petitioner’s own reference, Kawagoe, confirms that graded dopant concentrations do not necessarily *aid* carrier movement, because Kawagoe teaches using a graded slope to *impede* carrier movement. Kawagoe is concerned with naturally occurring α -rays striking a semiconductor device and generating free electrons in the substrate. These free electrons can disrupt the operation of the device during a “single event upset” (“SEU”). Kawagoe teaches a “concentration gradient” to “*prevent*” [these SEU-generated carriers] from entering the p-well.” Ex. 1007, 16:7-11 (emphasis added). Kawagoe proves that graded dopant concentrations don’t *always* aid carrier movement, as Petitioner claims, because sometimes the “concentration gradient” can “prevent” carrier movement. Ex. 2057, ¶¶47-50.

Finally, Petitioner’s expert, Dr. Blalock actually agrees that Petitioner’s “aided” implies “graded” theory is an artificial assumption Petitioner created for this IPR. Dr. Blalock agrees that the magnitude of the force a dopant gradient exerts on

a carrier depends on the slope of the gradient's curve.⁶ Like the patent examiner, Ex. 1016, 270. Dr. Blalock acknowledged that other forces and factors besides a dopant gradient act on a carrier and that "additional force" "*might be larger than the force created by the gradient.*" Ex. 2058, 137-138.⁷ Additionally, if two forces are

⁶ Ex. 2058, 89 ("Q. How do you know the magnitude of the force a dopant concentration puts on carriers? A. ... Anyway, it's related to the -- the steepness of the gradient, the slope of the concentration gradient. And that was also well known by a POSITA as well, which the patent owner pointed out also.").

⁷ *Id.*, 126-127 ("Q. And you just said, 'if you have a gradient, you'll get a force and it will tend to move carriers.' Will it move carriers or -- what do you mean "tend to move carriers"? A. Well, it creates a force on the carriers. *All other things being equal*, they'll move. I mean, you could have, I suppose -- I don't want to theorize...."), 213 (Q. So if you had an electric field that applied a force to an electron moving in material, how would a recombination rate impact the travel of that electron? A. *As the recombination rate gets higher and higher*, it will travel -- on average, it will travel a shorter distance), 187 ("Q. And you said that there could be some additional force. Do you recall that testimony? A. I said they would move *if you didn't have some other external force acting*. I also pointed out that the

acting on an object in opposite directions, both forces cannot aid its movement. Ex. 2057, ¶¶51-52. Either the opposing forces are equal—and there is no movement—or the two forces are not equal and the object moves in the direction of the larger force, albeit diminished by the counter force. *Id.*, ¶52. The smaller force does not “aid” the movement of the object, because it is pushing *against* the movement. *Id.* Dr. Blalock testified that, when multiple forces act on a carrier, the carrier moves according to the “net force”:

Q. Suppose there are two forces pushing on the carrier in opposite directions. Do both of those forces aid the movement of the carrier?

[objection omitted]

THE WITNESS: The *net* field will exert a force which -- it will have some direction depending on what the field directions were, but *we can calculate the net force*. And it will have -- *it* [i.e. the net force] *will act to move the carrier*.

Ex. 2058, 187-188 (emphasis added).

- B. The Petition fails to establish that the prior art discloses or suggests the “aid carrier movement” limitation. (Elements [1.5], [1.6], [21.5], [21.6], [39.5], [41.5], [42.5]).**

movement is a statistical process. So it’s not like you can reach in and say that carrier will move in this direction.”) (all emphasis added).

For all of the asserted grounds, the Petition fails to show that any of the primary references disclose any of the claim elements requiring “aid carrier movement.”⁸

1. The Petition fails, because Dr. Blalock expressly restricted his analysis to the direction of the gradient—and nothing else.

Dr. Blalock’s testimony should be rejected, because it rests on a false premise. As discussed above, a mere downward sloping gradient does *not* necessarily “aid carrier movement.” *See supra* Section VI.A. Yet, Dr. Blalock admitted that, to determine whether a dopant concentration gradient would “aid carrier movement,” he looked *only* at the direction of the slope. He did not look at the magnitude of the

⁸ (A) Elements [1.5] / [21.5]: “at least a portion of at least one of the first and second active regions having at least one graded dopant concentration to ***aid carrier movement***” “from the first and second active regions towards an area of the substrate where there are no active regions” (claim 1) or “from the surface to an area of the substrate where there are no active regions” (claim 21) (elements [39.5], [41.5], and [42.5] are similar), and (B) Elements [1.6] / [21.6]: “at least one well region adjacent to the first or second active region containing at least one graded dopant region, the graded dopant region to ***aid carrier movement*** from the surface [towards | to] the area of the substrate where there are no active regions” (claims 1/21).

slope or other possible forces acting on a carrier. As Dr. Glew explains, the magnitude of the concentration gradient plays a big role, because a small gradient may not be sufficient to overcome the resistance of the material in which the gradient exists. Ex. 2057, ¶52.

If there was any slope at all, Dr. Blalock concluded that the slope “aid[ed] carrier movement,” regardless of the slope’s magnitude or other possible forces. Greenthread’s counsel asked: “have you looked at any aspect of the gradient other than its being downward sloping?” Dr. Blalock replied: “As I’ve said, the patent owner tells us that that’s sufficient, so *[t]hat’s what I did. I have not done calculations of the slope per se.*” Ex. 2058, 195 (emphasis added). Greenthread’s counsel also asked Dr. Blalock: “Do you need to know the magnitude of the force on carriers to know if their movement is being aided?” Dr. Blalock said: “Well, the patent owner -- the patent hasn’t given us a threshold for aiding. ... *when I look at the prior art, when I find a concentration gradient, ... if there was a gradient, then it was producing that force and aiding the movement.*” Ex. 2058, 91-92 (emphasis added). Since the mere direction of the gradient is *not* sufficient to determine whether there is a “net force”—as Dr. Blalock testified (*supra* Section VI.A.2)—the premise of Dr. Blalock’s analysis is false. Therefore, his conclusions are irrelevant and incorrect. Ex. 2057, ¶53.

2. Petitioner’s Kawagoe-Based Arguments are Deficient.

The Petition fails to demonstrate that Kawagoe teaches the “aid carrier movement” claim limitation.

Dr. Blalock did not consider the relevant factors in analyzing Kawagoe:

Dr. Blalock admitted specifically regarding Kawagoe that he did not calculate or consider the slope.

Q. In your analysis of the Limitation 1.5 of the ‘222 patent, you did not analyze any particular slope of Kawagoe; correct?

[objection omitted]

THE WITNESS: *I did not do a calculation of the slope* because that was not needed. There’s nothing in the language of the patent, in the disclosure or in the elements that define that we have – that requires a particular slope.

Ex. 2058, 181-182 (emphasis added). That admission dooms the Petition’s analysis of Kawagoe. Dr. Blalock admitted that the magnitude of the slope is necessary to calculate the net force on carriers, and it is the *net* force that determines carrier movement. *Supra* Section VI.A.2 (citing Ex. 2058, 89, 187-188).

Further, the Petition and Dr. Blalock's declaration contain no discussion of the magnitude of the slope or net forces. To the contrary, the Petition and Dr. Blalock's declaration focus on the *direction* of Kawagoe's slope.⁹

Kawagoe's concentration gradient impedes carrier movement: *See supra* Section VI.A.2. According to the Petition, Kawagoe teaches that a "downward-sloping graded dopant concentration aids carrier movement from the surface of the epitaxial layer towards/to the area of the substrate where there are no active regions." Pet. at 24. But the Petition strategically uses square brackets to conceal the fact that Kawagoe's graded dopant concentration is quite different from what Petitioner

⁹ Pet., 22 ("Here, Kawagoe's Figure 17 shows that the dopant concentration is downward-sloping with increasing depth towards/to the bottom of the substrate where there are no active regions, and thus, according to Patent Owner (and also *in light of Patent Owner's representation to the Patent Office, discussed in §VII.A.1.g*), causes carriers to move deeper into the substrate as well."); Ex. 1003, ¶97 ("Here, Kawagoe's Figure 17 shows that the *dopant concentration is downward-sloping* with increasing depth towards/to the bottom of the substrate where there are no active regions, *and thus*, according to Patent Owner (and also in light of Patent Owner's representation to the Patent Office, discussed in X.A.1.g), *causes carriers to move deeper* into the substrate as well.").

claims. The Petition reproduces the following passage from Kawagoe in which Greenthread has highlighted Petitioner's square brackets:

[T]he impurity concentration of the p-well 6p is given such a gradient that it is *gradually lowered in the depthwise direction from the surface* of the epitaxial layer 2E, so that the influence to be caused by the carriers (or electrons) due to the α -ray is lowered. Specifically, the *electrons produced by the α -ray are attracted to the substrate body 2S by that concentration gradient* so that the soft errors can be reduced in case the MIS memory of the DRAM or the like is formed in the p-well 6p.

Pet. at 24 (quoting Ex. 1007, 16:2-11, emphasis and square brackets after “gradient” added by Petitioner). What is missing from Petitioner's quotation is Kawagoe's teaching that the graded concentration actually *inhibits* carrier movement. The full sentence from Kawagoe that Petitioner elides actually states:

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

Ex. 1007, 16:7-11 (emphasis and highlighting added). Since Kawagoe teaches inhibiting carrier movement, it does not teach aiding carrier movement. Ex. 2057, ¶53.

Kawagoe's carriers are not in the active region: Not only does Kawagoe not disclose aiding carrier movement, the carriers that its graded dopant concentration affects are in the wrong place. Every challenged independent claim requires “*active regions* having at least one graded dopant concentration to aid carrier movement,” but Kawagoe’s graded dopant concentration and the electrons it seeks to affect are not in the “active regions” of the device.

Dr. Blalock admitted that, according to Kawagoe, SEUs generate “electrons produced in the large substrate body below the wells”—far below the active regions. *See* Ex. 1003, ¶94 n.6. Kawagoe’s electrons are *below* p-well 6p, and prevented from moving *upward* into p-well 6p. Ex. 2057, ¶54. Kawagoe’s 6p extends to the very top of the device. Therefore, carriers travelling vertically could only enter 6p from below.¹⁰ Ex. 2057, ¶¶53-54. Kawagoe does not address carriers in the “active

¹⁰ Even if carriers could be located above 6p those carriers would not satisfy the claim limitation. Those carriers would be in what Petitioner identifies as the surface or active regions. Since they are “prevented from entering” 6p, they would remain above 6p and Kawagoe’s gradient would not aid their movement downward. As explained below, Dr. Glew confirms (citing Nishizawa) that Kawagoe is discussing carriers outside the surface layer. Nishizawa explicitly states that that probability of

region,” and does not “aid carrier movement *from the [first and second active regions | first or second active region | surface]*” because Kawagoe’s carriers are nowhere near what Petitioner identifies as the “surface” or first/second “active regions” and are in fact “*prevented from entering the p-well 6p*” which stands between them and the “active regions.” Ex. 2057, ¶54.

The Petition relies on a post-priority date reference to make up for Kawagoe’s deficiency: Apparently recognizing that Kawagoe doesn’t teach anything about carriers in the “active region” or moving carriers “*from the [first and second active regions | first or second active region | surface]*” “*[to | towards] [an | the] area of the substrate where there are no active regions,*” the Petition relies on testimony from Dr. Blalock and another reference to fill the gap. The Petition says that “Dr. Blalock explains that during a so-called single event upset (SEU), an α -ray generates millions of carriers, *some of which are produced in or near the active regions at the surface of the substrate.*” Pet., 21.

But Dr. Blalock doesn’t (and can’t) fill the gap. First, in support of that assertion, Dr. Blalock *only* cites Wang (Ex. 1009)—a document whose public availability Petitioner has not established, and which purports to be from **2008, i.e.,**

carriers from an alpha ray at the top of a device is “extremely low” and any such carriers can be “disregarded.” Ex. 1046, 29.

four years after the critical date for the Challenged Patent. Ex. 1003, ¶95 (citing Ex. 1009); Pet. at ix (Table of Exhibits, listing “2008” for Ex. 1009); Ex. 1009, 429 (listing copyright date of 2008). Dr. Blalock did not cite any other reference or basis for his assertion that during an SEU “some [carriers] are produced in or near the active region at the surface” (Ex. 1003, ¶95). Therefore, the Petition contains no evidence that a POSITA would have known about SEU carriers in the active region at the time of the Challenged Patent.

Second, setting aside the date issue, Wang does not give a POSITA a reason to use Kawagoe in the active region. Ex. 2057, ¶55. Wang’s image—just like Kawagoe—shows that the SEU carriers are primarily generated deep in the device. *Id.* Wang shows some carriers in the active region, *but never says that they are known to be a problem.* *Id.*, ¶56. Dr. Blalock does not say that either. He merely asserts that some carriers are in the active region, without saying how many or that a POSITA would have been concerned about them.

Alpha-ray carriers are not generated at the “surface” or “active regions” of semiconductor devices: As explained by Dr. Glew, Petitioner’s understanding of Kawagoe’s disclosure regarding electrons generated by alpha-rays is incorrect. Ex. 2057, ¶57. As explained by Dr. Glew—who has experience working with alpha-rays/alpha particles (*id.*, ¶10)—a POSITA would have understood when Kawagoe mentions “electrons produced by the α -ray” (Ex. 1007, 16:7-11), Kawagoe is *not*

describing electrons near the surface. Ex. 2057, ¶57. Dr. Glew cites Nishizawa—a reference from *before* the Challenged Patent’s priority date—to demonstrate what a POSITA would have known:

Accordingly, it will be understood that the alpha-particle immediately after irradiation to the surface of a semiconductor body has an energy of several MeV, for example about 5 MeV, and that, accordingly, *the probability of creation of electron-hole pairs is extremely low near the surface*. The alpha-particle will begin to create electron-hole pairs after it has entered into the semiconductor substrate to a certain distance.

Ex. 2060, 19:21-34; *see also id.*, 20:19-22 (“[T]he amount of electrons created which adversely affect the memory action is no greater than only 10% of the stored electric charge, and thus it can be disregarded.”); Ex. 2057, ¶57.

During cross-examination, Dr. Blalock testified that the location of an alpha-ray strike cannot be predicted:

Q. In that passage that you quoted of Kawagoe, it doesn’t say that some of the electrons produced by the alpha ray are up near the surface; right? Can you point me to where it says that?

[objection omitted]

THE WITNESS: Kawagoe doesn’t need to say that. This is obvious. *If you have a random alpha ray strike, you cannot predict where it will happen. ...*

Ex. 2058, 147-148 (emphasis added). But Dr. Blalock misses that even if the location of an alpha-ray strike cannot be predicted, a POSITA would have known

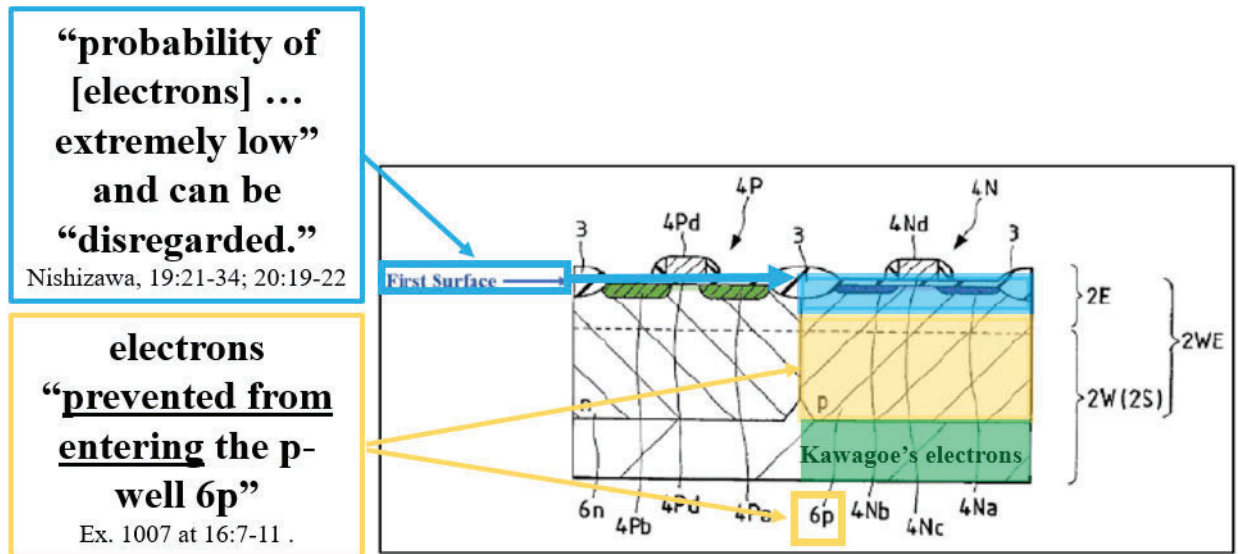
that the probability of the alpha-ray strike creating electrons (like disclosed in Kawagoe, Ex. 1007, 16:7-11) is extremely low near the surface (as demonstrated by Nishizawa). Ex. 2057, ¶58. Therefore, the better reading of Kawagoe is that Kawagoe is describing electrons “*produced in the large substrate body below the wells*,” as Dr. Blalock conceded. *Id.* Thus, a POSITA would have understood that Kawagoe’s electrons that are prevented from entering the p-well are not created near the surface. *Id.*

In short, the Petition cites no evidence that a POSITA would have known of or thought about α -rays generating carriers at the top of a semiconductor device on the critical date, much less adopted Kawagoe’s solution (misconstrued by Petitioner) to solve the problem.

The Petition does not include any obviousness arguments, or cite Dr. Blalock for any obviousness rationale/evidence, regarding the “aid carrier movement” of elements [1.5] or [1.6] (and the corresponding “aid carrier movement” limitation of the other challenged independent claims) for Ground I. Pet., 18-28; Ex. 1003, ¶¶90-97; Ex. 2058, 171:13-181:11. Ground III of the Petition relies on Gupta (Ex. 1014) as a secondary reference, but not regarding the “aid carrier movement” limitation of the independent claims. Pet., 78-83.

Therefore, Petitioner cannot rely on obviousness to save its faulty arguments regarding “aid carrier movement” in the Kawagoe-based grounds. And due to the

Petition's deficient arguments regarding that limitation in the challenged independent claims, the Petition is deficient regarding the challenged dependent claims, too.



3. Petitioner's Wieczorek-Based Arguments are Deficient.

The Petition's Wieczorek grounds fail for similar reasons as the Kawagoe grounds.

The Petition points to Figure 2B of Wieczorek for the claimed "graded dopant concentration" of limitation [1.5]. Pet., 56-57. But for the claimed "aid carrier movement" feature of limitation [1.5], the Petition relies entirely on Greenthread's supposed admissions:

Further, Wieczorek's downward-sloping graded dopant concentrations aid carrier movement from the surface and from the first and second active regions towards/to an area of the substrate where there are no active regions *to the same extent* to

which Applicant relied on the prior art and admitted to the Patent Office that such carrier movement would occur under the same scenario.

Pet., 58. (emphasis added). As he did for the Kawagoe-based ground regarding claim 1, Dr. Blalock repeated the Petition's language nearly verbatim without analyzing anything actually disclosed in Wieczorek for the "aid carrier movement..." feature. Pet. at 58-60; Ex. 1003, ¶¶156-163; Ex. 2057, ¶59.

Furthermore, Dr. Blalock admitted that he did not calculate the slope of the graded concentration curve in Wieczorek.

Q. And regarding any of these three references [including Wieczorek], for the mapping of the claim phrase 'aid carrier movement,' have you looked at any aspect of the gradient other than its being downward sloping?

[objection omitted]

THE WITNESS: As I've said, the patent owner tells us that that's sufficient, so *[t]hat's what I did. I have not done calculations of the slope per se.*

Ex. 2058, 195 (emphasis added). Indeed, it would have been impossible for Dr. Blalock to make such a calculation, because the dopant gradient Petitioner points to in Figure 2B (and Wieczorek generally) does not have any values from which one could calculate a slope. Ex. 2057, ¶60. As Dr. Blalock testified and Dr. Glew

confirms, the magnitude of the slope is essential to determine the magnitude of the force the dopant gradient places on the carrier and thus the net force. *Supra* Section VI.A.2; Ex. 2057, ¶60.

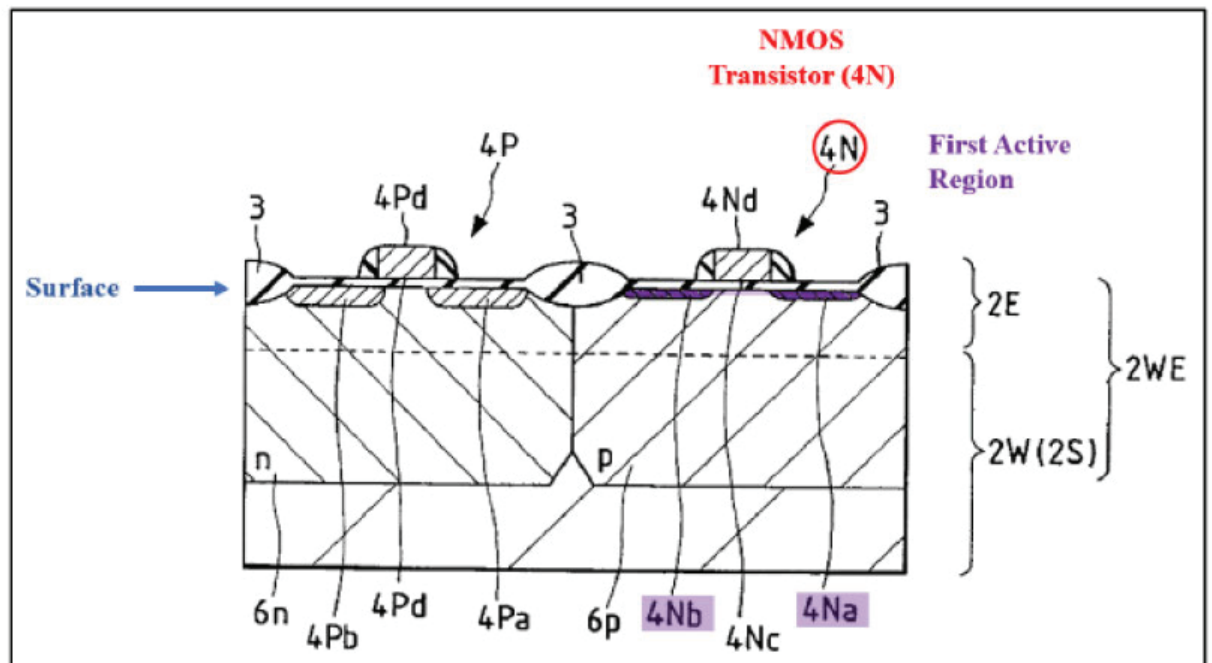
The Petition does not include any obviousness arguments, or cite Dr. Blalock for any obviousness rationale/evidence, regarding the “aid carrier movement” of elements [1.5] or [1.6] (and the corresponding “aid carrier movement” limitation of the other challenged independent claims) for Ground II. Pet., 55-62; Ex. 1003, ¶¶156-167. Although the Petition introduces Wolf as a secondary reference in Ground II (Pet., 46), it does not rely on Wolf for the “aid carrier movement” limitation. Pet. at 55-62; Ex. 1003, ¶¶156-167. Ground IV of the Petition relies on Gupta (Ex. 1014) as a secondary reference, but not regarding the “aid carrier movement” limitation of the independent claims. Pet., 78-83.

Therefore, Petitioner cannot rely on obviousness to save its faulty arguments regarding “aid carrier movement” in the Wieczorek-based grounds. And due to the Petition’s deficient arguments regarding that limitation in the independent claims, the Petition is deficient regarding the challenged dependent claims, too.

C. The Petition fails to establish that Kawagoe discloses or suggests the “first active region ... with a second doping type opposite in conductivity to the first doping type” limitation. (Elements [1.2], [21.2], [39.2], [41.2], [42.2]).

For the Kawagoe-based grounds (Grounds I, III, V), the Petition has not established that Kawagoe discloses or suggests a “first active region ... with a second

doping type opposite in conductivity to the first doping type” as required by each challenged independent claim (elements [1.2], [21.2], [39.2], [41.2], [42.2]). Ex. 2057, ¶¶61-63. For elements [1.1]/[21.1]/[39.1]/[41.1]/[42.1] (where antecedent basis for “the first doping type” is found), the Petition mapped “a first doping type” to p-type doping. Pet., 8. For elements [1.2]/[21.2]/[39.2]/[41.2]/[42.2], the Petition states that Kawagoe’s regions 4Na and 4Nb “have a second doping type (n-type) opposite in conductivity to the first doping type (p-type) of the substrate.” Pet., 14. Kawagoe discloses that regions 4Na and 4Nb are doped n-type (Ex. 1007, 8:66-9:3), but the Petition also states that the *channel* of transistor 4N is part of the first active region. Pet., 13 (“Source-drain regions 4Na/4Nb (purple) form part of the claimed first active region, which also includes the channel region....”). And for element [1.5], which recites “at least a portion of at least one of the first and second active regions having at least one graded dopant concentration...,” the Petition pointed to the concentration profile under the *channel*. Pet., 18-20. But the channel of transistor 4N is doped p-type, because it is the top portion of a p-well (as shown in Figure 23 of Kawagoe):



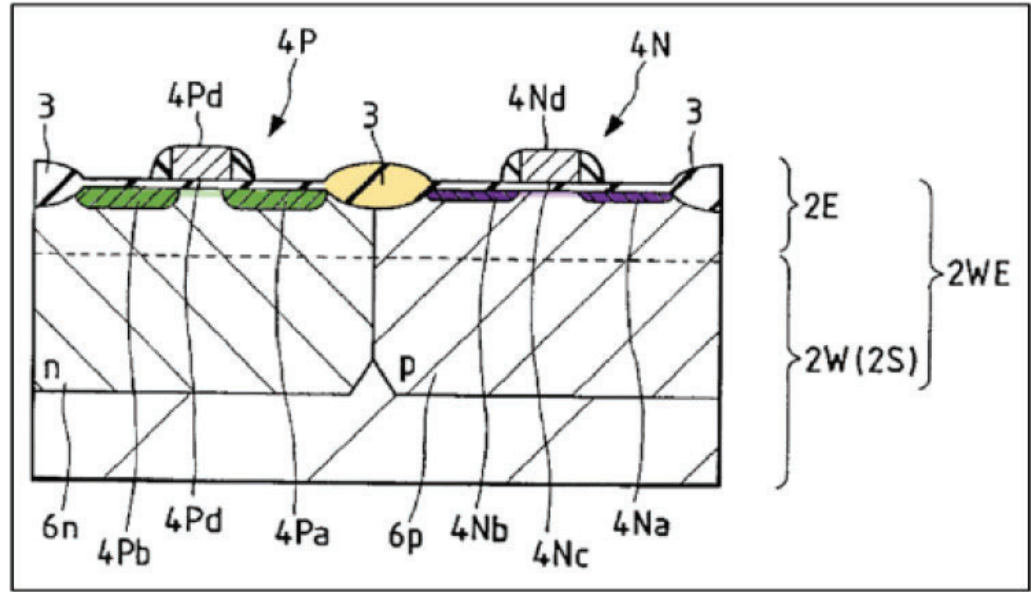
Pet., 14 (citing Ex. 1007, FIG. 23, which shows channel of transistor 4N at the top of p-well 6p); *see also id.*, 13 (“the channel region (light purple) between source-drain regions 4Na/4Nb”); Ex. 2057, ¶62 (explaining that the channel in a CMOS transistor has the same doping type as the well in which the source and drain are formed). Simply, the channel of NMOS 4N made from the p-well, the p-well, and the p type substrate are all doped p-type. Ex. 2057, ¶62.

Therefore, under the Petition’s mapping in which the source, drain, and channel are all part of Kawagoe’s first active region, the Petition has not established that the active region has n-type doping (which is what the Petition would need to establish for element [1.2], in light of the Petition’s analysis for element [1.1]). Ex. 2057, ¶63.

The above deficiency in the Petition's analysis of the challenged independent claims carries through to the challenged dependent claims. Although Gupta (in Ground III) and Silverbrook (in Ground V) are introduced as secondary references for various claims, the Petition does not rely upon those references for the above feature of the challenged independent claims. Pet., 78-85.

D. The Petition fails to establish that Kawagoe alone or in view of Gupta discloses or suggests the “first active region and second active region are each separated by at least one isolation region” (Claims 6 and 27).

The Petition has not established for Ground I that Kawagoe discloses or suggests the feature “the first active region and second active region are each separated by at least one isolation region” as recited in dependent claims 6 and 27. Ex. 2057, ¶¶64-66. The Petition provides the following annotated Figure 23 of Kawagoe and maps Kawagoe's source/drain 4Na/4Nb and channel of nMOS 4N to the claimed “first active region,” and maps Kawagoe's source/drain 4Pa/4Pb and channel of pMOS 4P to the claimed “second active region.” Pet., 31-32 (“As shown below, the first (purple/light purple) and second active regions (green/light green) are separated by ‘field insulating film 3’ (claimed ‘isolation region’) (yellow).”).



Pet., 32 (citing Ex. 1007, FIG. 23). The Petition further maps Kawagoe’s field insulating film 3 to the claimed “isolation region.” *Id.*, 31.

But the Petition fails to appreciate that regions 4Na and 4Nb, which “are regions for forming the source-drain regions of the nMOS 4N” (Ex. 1007, 8:66-67), “are made as deep as about 0.5 μm and *formed in the range of the thickness of the epitaxial layer 2E.*” Ex. 1007, 9:3-6 (emphasis added). Kawagoe provides similar disclosure regarding regions 4Pa and 4Pb. *Id.*, 9:47-53. Thus, a POSITA would have understood that the first and second active regions extend to about the depth of the epitaxial layer 2E and abut each other laterally, and therefore they are not separated by Kawagoe’s field insulating film 3, as required by claims 6 and 27. Ex. 2057, ¶66. The field insulating film 3 is formed “[o]ver the principal surface of the

epitaxial layer 2E” (Ex. 1007, 8:40-42) and a POSITA would have understood that it does not extend deep enough to separate the two active regions. Ex. 2057, ¶66.

VII. OBJECTIVE INDICIA OF NON-OBVIOUSNESS ESTABLISH THAT THE CHALLENGED CLAIMS ARE PATENTABLE.

“Objective evidence of nonobviousness ... may often be the most probative and cogent evidence in the record. It may often establish that an invention appearing to have been obvious in light of the prior art was not.” *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Drilling USA, Inc.*, 699 F.3d 1340, 1349 (Fed. Cir. 2012). During its prior litigation against [REDACTED] RPX Corp. (“RPX”) approached Greenthread about negotiating a license on behalf of [REDACTED] and other companies. Greenthread and RPX then negotiated a license for [REDACTED] Kioxia Corp., and SK Hynix Inc. Ex. 2072 (John Decl.). The license covered only the patent family at issue here—no other patents. Moreover, Greenthread had never threatened litigation against either Kioxia or SK Hynix in any way. *Id.* Rather, both companies first approached Greenthread through RPX.

“[L]icenses with companies under no apparent threat of litigation” are especially probative of non-obviousness. *Transocean*, 699 F.3d at 1353. For example, the Board has previously found claims not unpatentable based on licenses that were not “prompted by a threat of litigation.” *Samsung Electronics Co. Ltd., et al, v. Neonode Smartphone LLC*, IPR2021-00144, Paper 59 at 51 (PTAB Dec. 15, 2022). Here, both Kioxia and SK Hynix are sophisticated semiconductor companies

[REDACTED]

with substantial annual revenue—in excess of \$7 billion (Kioxia) and \$20 billion (SK Hynix). Ex. 2073. Both companies also frequently file IPR petitions. *See, e.g., Kioxia Corp., et al. v. Sonrai Memory Ltd.*, IPR2022-00255; *SK Hynix Inc. et al. v. Netlist, Inc.*, IPR2020-01421. In short, both companies know how to evaluate semiconductor technology and challenge patents they believe are invalid. Moreover, the expense for SK Hynix and Kioxia to challenge Greenthread’s patents would have been trivial. In addition to filing their own IPRs, they could have sought to join [REDACTED] then-pending IPRs or filed copy-cat petitions. Yet, without any threat of litigation, both paid for licenses covering just the single patent family at issue here.¹¹

Furthermore, the specification of the Challenged Patent, which is common to the Greenthread family, identifies “a novel technique” of creating “a drift field to sweep these unwanted minority carriers from the active circuitry at the surface into the substrate.” Ex. 1001, 3:52-56. The specification also ties that part of the

¹¹ Greenthread later acquired two patents as part of its most recently signed license. Greenthread’s earlier licenses provide for a springing license to future-acquired patents to ensure permanent peace between the parties and, because it is part of RPX’s standard terms. However, at the time of the earlier licenses no party had an expectation that Greenthread would acquire patents outside the Greenthread family. Ex. 2072.

invention to “important performance enhancements” in semiconductor devices such as “decrease[d] programming time in nonvolatile memory devices” and “[p]ixel and color resolution ... enhance[ments] in imaging ICs.” *Id.*, 3:30-35.

This aspect of Greenthread’s invention is part and parcel of Greenthread’s licenses, because every patent in the family contains claim language relating to using graded dopants to move carriers “from the active circuitry at the surface” further down into the device. *See, e.g.*, U.S. Pat. Nos. 11,316,014; 11,121,222; 10,510,842; 10,734,481 (“graded dopant concentration to aid carrier movement from the [first surface or active region]...”); U.S. Pat. Nos. 8,421,195; 9,190,502 (“a graded concentration of dopants... to aid the movement of minority carriers from said surface...”).

Moreover, moving carriers “from the active circuitry at the surface” is missing from the prior art. As explained above, Kawagoe does not address carriers near the surface of the device, much less disclose a technique for moving them. *Supra* Section VI. Likewise, Weiczorek, at best, shows a downward sloping gradient, with no information about whether, why, or how such a gradient might be useful. *Supra* Section VI. Petitioner relies entirely on post-hoc expert testimony, a post-priority date reference (Wang), and misreading of the prosecution history to locate that claim limitation in the prior art. Greenthread’s licenses discredit Petitioner’s argument as hindsight. SK Hynix and Kioxia had access to the same prosecution history and

employ numerous semiconductor experts, but decided to license Greenthread's invention, without any threats or coercion.

Finally, licenses that are part of litigation settlements can also be probative of non-obviousness. *Fox Factory Inc. v. SRAM LLC*, IPR2017-00472, Paper 64 at 44 (PTAB April 18, 2018). Here, in addition to SK Hynix, Kioxia, and [REDACTED] other major semiconductor companies—Intel, [REDACTED] Micron, and Western Digital, and AMS-OSRAM—have all taken licenses to Greenthread's patents (with no expectation of receiving licenses to other patents) to settle litigation. Ex. 2072. In total, eight major semiconductor companies have paid more than \$50 million—more than \$6 million per company on average—for licenses all of which covered only one patent family. These agreements confirm that Greenthread's patents have been widely recognized in the industry and valid and valuable. *Id.*

VIII. THE PETITION IS UNTIMELY UNDER 35 U.S.C. § 315(B).

A. Background

1. Prior Litigation Involving the Challenged Patent

Greenthread owns a family of patents which all claim priority to the same provisional application. OnSemi has filed IPRs challenging six of those patents.¹²

a. [REDACTED] Litigation

¹² See IPR2023-01242, IPR2023-01243, IPR2023-01244, IPR2023-00263, IPR2023-00264, IPR2023-00265, IPR2023-00266.

On April 30, 2019, Greenthread filed a complaint against [REDACTED] in the Eastern District of Texas alleging infringement of the '195 patent, the '502 patent, and other patents not at issue in the Petitions. On July 8, 2020, Greenthread and [REDACTED] settled the litigation and Greenthread granted a license to [REDACTED] as described below.

b. Intel-[REDACTED]-[REDACTED] Litigation

On February 1, 2022, Greenthread served Intel and [REDACTED] and [REDACTED] (collectively, [REDACTED]) with a complaint filed in the Western District of Texas alleging infringement all of the Challenged Patents, except the '014 patent. Ex. 2018 (Complaint), 1-4; Ex. 2039 (Returned Summons). After the '014 patent issued, Greenthread filed a First Amended Complaint against [REDACTED] and Intel which it served via ECF on April 29, 2022. Ex. 2032. The cases against Intel and [REDACTED] were severed and the case against Intel was transferred to the District of Oregon. Ex. 2031, 22. The [REDACTED] litigation remained in Texas and continued in parallel with the *Intel* litigation.

[REDACTED] was a real-party-in-interest to the [REDACTED] litigation. Greenthread's allegations in the First Amended Complaint against [REDACTED] (i.e. the April 29 complaint) were based on, among other things, [REDACTED] components in [REDACTED] products. Ex. 2032, ¶¶18, 60, 76-81; Ex. 2033, 8 ("[REDACTED] Accused Products"), 18-20 (section entitled "[REDACTED] Accused Products"); Ex. 2034, 1-34. After Greenthread served

the April 29 complaint accusing [REDACTED] products, additional counsel stepped in to represent [REDACTED] with respect to [REDACTED] products. Ex. 2045. [REDACTED] then filed its own IPRs against the Challenged Patents that had been asserted against [REDACTED] products. Ex. 2017 (IPR2023-00376, Petition), Ex. 2016 (IPR2023-00324, Petition), Ex. 2074 (IPR2023-00325, Petition), Ex. 2075 (IPR2023-00375, Petition). The [REDACTED] petitions named [REDACTED] as a real-party-in-interest. *E.g.*, Ex. 2017, 7; Ex. 2016, 7; Ex. 2074, 7; Ex. 2075, 8. Afterwards, Greenthread added [REDACTED] as a party to the [REDACTED] litigation. Ex. 2019. After [REDACTED] was added to the case, [REDACTED] counsel for [REDACTED] products appeared in the case for [REDACTED] Ex. 2042. [REDACTED] other counsel did not represent [REDACTED] Greenthread and Intel, [REDACTED] and [REDACTED] settled their disputes and Greenthread granted [REDACTED] and Intel licenses as described below.

c. Greenthread Licenses to [REDACTED] Intel, and [REDACTED]

As part of the settlements, Greenthread granted [REDACTED] Intel, and [REDACTED] releases for past infringement and a license to Greenthread's patents, by way of sublicense through RPX Corporation ("RPX") ("Licenses"). Ex. 2022, 2. Greenthread licensed [REDACTED] (and SK Hynix and Kioxia) in one agreement signed July 8, 2020. Ex. 2072. Greenthread signed the second agreement, licensing Intel and [REDACTED] on April 7, 2023. Ex. 2022. The two agreements are similar in all relevant respects. According to RPX: "By operation of their membership agreements with RPX, [RPX sub-licensees] acquired the full scope of sublicensable rights

Greenthread granted to RPX at the time the RPX-Greenthread Agreement was executed.” Ex. 2028.

The Licenses grant Licensees (i.e. [REDACTED] Intel, and [REDACTED] via RPX) the right “to make, have made, use, have used, sell, ... offer for sale, have offered for sale, have sold, ... import, have imported, own, order, ... purchase, ... obtain, keep, acquire, receive, ... and otherwise exploit or dispose of any Licensed Product and Service.” Ex. 2022, 3 (definition of “Patent License”); Ex. 2072, Appendix B, 3 (definition of “Patent License”); *see also* Ex. 2028.

The Licenses define “Licensed Product and Service” to include “any product ... made, have made, used, purchased, provided, hosted, sold, leased, licensed, distributed, transmitted, exported, imported or offered for sale, lease, or import or otherwise exploited or disposed of by or on behalf of” Licensees. Ex. 2022, 2; Ex. 2072, Appendix B, 2.

The Licenses cover all of Greenthread’s patents, including the Challenged Patent. *See* Ex. 2022, 3-4 (“‘Patents’ shall mean”) and 17 (listing patents); *see also* Ex. 2063, 3 (“‘Patents’ shall mean”) and 15 (listing patents).

Accordingly, “any product” Licensees “have made” by Petitioner or “purchase” from Petitioner is a “Licensed Product or Service” which Licensees have the right to “use, ... sell, ... obtain, ... acquire, ... receive, ... and otherwise exploit.” Ex. 2022, 2-3; *see also* Ex. 2072, Appendix B, 2-3.

2. The Current and Co-Pending Proceedings

On April 21, 2023, Greenthread filed a complaint alleging that Petitioner infringes U.S. Patent Nos. 10,510,842 (the “’842 Patent”) and 11,121,222 (the “’222 Patent”). Ex. 2020. Greenthread’s motion to amend the complaint to allege infringement of U.S. Patent Nos. 10,734,481 (the “’481 Patent”) and 11,316,014 (the “’014 Patent”) is pending in the district court.

On July 27, 2023, Petitioner filed three IPRs challenging the ’842 and ’222 Patents. IPR2023-01242, Paper 1; IPR2023-01243, Paper 1; IPR2023-01244, Paper 1. Those IPRs were instituted on February 12, 2024. *See, e.g.*, IPR2023-01242, Paper 32. Greenthread timely sought Director Review of each of the institution decisions. *See, e.g.*, IPR2023-01242, Paper 37. The Director Reviews were denied on April 24, 2024. *See, e.g.*, IPR2023-01242, Paper 44). On December 11, 2023, Petitioner filed four IPR petitions, including the petition in the instant proceeding, challenging claims from the ’481 Patent, the ’014 Patent, and U.S. Patent Nos. 9,190,502 and 8,421,195. IPR2023-00263; IPR2023-00264; IPR2023-00265; IPR2023-00266. Greenthread filed its POPRs in those proceedings on December 11, 2023.

3. Petitioner’s Relationship with Licensees

Licensees are Petitioner’s customers (Ex. 2003 at 12 (identifying [REDACTED] and [REDACTED] Ex. 2014, 3-4; Paper 8, 1 (citing Exs. 2003-2008); Ex. 2004, 10; Ex. 2036, 11 (identifying Petitioner’s products in Licensees’ products), and in opposing

Greenthread's motion for discovery, Petitioner did not dispute that fact. Petitioner said that "Intel, [REDACTED] and [REDACTED] are customers of Petitioner." IPR2023-01242, Paper 11 (OnSemi's Opposition to Patent Owner's Motion for Additional Discovery), 10. *See also* Exs. 2036, 11; 2019, ¶¶12, 28-30, 36, 79, 85, 101-104; 2006, 2015; 2032, ¶¶50-52; Ex. 2035, 5; 2004, 10-13, 21.

B. The Petition should be dismissed under 35 U.S.C. § 315(b).

1. Legal Standard for Privity

a. Control of prior litigation is not required to establish privity.

Section 315(b) provides that "[a]n inter partes review may not be instituted if the petition requesting the proceeding is filed more than 1 year after the date on which the petitioner, real party in interest, or privy of the petitioner is served with a complaint alleging infringement of the patent." 35 U.S.C. § 315(b). In its institution, the panel said that "the rationale behind § 315(b)'s time bar, [is] 'to prevent successive challenges to a patent by those who previously have had the opportunity to make such challenges in prior litigation.'" Decision, 19. Greenthread respectfully contends that the purpose of § 315(b) and the privity inquiry is not so narrow.

Whether two parties are privies with respect to one another is evaluated under the "common law" framework set forth in *Taylor v. Sturgell*, 553 U.S. 880 (2008). *WesternGeco LLC v. ION Geophysical Corp.*, 889 F.3d 1308, 1317 (Fed. Cir. 2018); *see also* Office Trial Practice Guide at 13 (citing *Taylor*). Control of the prior

litigation is *sufficient* to establish privity between the parties. *See, e.g., WesternGeco LLC v. ION Geophysical Corp.*, 889 F.3d 1308, 1319 (Fed. Cir. 2018). But control or even awareness of the prior litigation are not necessary to establish privity. Rather, *Taylor* identifies a “pre-existing ‘substantive legal relationship’” as one reason to find privity and litigation via “proxy” or “control over the [prior] litigation” as different reasons to find privity. 553 U.S. at 894-95 (cleaned up.). Preclusion based on a pre-existing substantive legal relationship is justified by the “needs of property law,” *not* because a precluded party was adequately represented in prior litigation, controlled prior litigation, or served as a proxy. *Id.* “Preclusion is extended or denied in an effort to protect conflicting property interests *rather than an effort to implement concepts of participation or representation.*” *Wright & Miller* (3d ed.) § 4448 Persons Affected by Preclusion (emphasis added).

The Board also has distinguished between privity based on a proxy relationship and privity based on pre-existing substantive legal relationship. For example, in the *Worlds* remand decision, the Board rejected the argument that the petitioner was not in privity when it “was not placed on notice of the infringement” previously and could not “control the [prior] District Court litigation.” *Bungie Inc. v. Worlds Inc.*, IPR2015-01264, Paper 64 at 38, 44 (PTAB Jan. 14, 2020).

Therefore, *Taylor* and the Board have identified “a variety of pre-existing ‘substantive legal relationship[s]’ between” two parties that can create privity, even

in the absence of control over the prior litigation. *Taylor*, 553 U.S. at 894 (alterations in original). For example, customer-supplier relationships can and frequently do create privity. See, e.g., *Ventex Co., Ltd. v. Columbia Sportswear N. Am., Inc.*, IPR2017-00789, Paper 148 at 14, (PTAB Jan. 24, 2019) (precedential); *Volkswagen Grp. of Am. Inc. v. Argina Tech. Ltd.*, IPR2021-01263, Paper 16 (PTAB Jan. 21, 2022); *Ericsson Inc. v. Regents of Univ. of Minn.*, IPR2017-01197, Paper 56 at 8, 10 (PTAB Sept. 18, 2020). “[A]n indemnity relationship is [also] the type of relationship that can establish privity,” particularly when the indemnity obligations “directly relate to the” accused products. *Ericsson Inc. v. Regents of Univ. of Minnesota*, IPR2017-01197, Paper 56 at 8, 10 (PTAB Sept. 18, 2020). A finding of privity is also appropriate when two parties are “preceding and succeeding owners of property” and when one party acts as the “agent” for the other. *Taylor*, 553 U.S. 894-95.

b. Petitioner bears the burden to show that its petition is timely—i.e. it is not in privity with a time-barred party.

“[T]he IPR petitioner bears the burden of persuasion to demonstrate that its petitions are not time-barred” under § 315(b). *Samsung Electronics Co. Ltd. v. Netlist, Inc.*, IPR2022-00615, Paper 40 at 2 (PTAB Feb. 3, 2023) (quoting *Worlds Inc. v. Bungie, Inc.*, 903 F.3d 1237, 1242 (Fed. Cir. 2018)). There is no “rebuttable presumption that formally shifts a burden of production to the patent owner” or a

presumption that a petition is timely because a petitioner asserts that it is. *Worlds*, 903 F.3d at 1242. Such a presumption would be unfair, because it would “disfavor the party that likely has inferior access to potential sources of proof.” *Id.* at 1244. As in this case, a patent owner is unlikely to know the details (or even existence) of a petitioner’s relationships that might give rise to privity. Therefore, to dispute the timeliness of the petition, “a patent owner must produce *some* evidence that” a petition is time barred—but only “*some*.” *Worlds*, 903 F.3d at 1244 (emphasis in original). Once the patent owner has “presented evidence sufficient to put” the timeliness of the petition “into dispute,” “the Board c[an] no longer merely rely upon” the petitioner’s assertion that its petition is timely. *Id.* at 1246. Throughout the proceeding, the “burden remains with the petitioner to establish” that its petition is timely. *Id.* at 1242.

Intel and [REDACTED] were served with a complaint alleging infringement of the Challenged Patent on February 1, 2022. Ex. 2001, 2, 4; Ex. 2018. [REDACTED] was an RPI to the First Amended Complaint against [REDACTED] (served by ECF on April 29, 2022). Ex. 2032; Ex. 2017, 7. Thus, the Petition is untimely if Petitioner is in privity with Intel, or [REDACTED] Greenthread has disputed the timeliness of the Petition with evidence showing that Petitioner is in privity with Licensees. Petitioner has offered no evidence whatsoever to controvert Greenthread’s evidence or demonstrate the timeliness of its Petition. Accordingly, the Petition should be dismissed.

2. Greenthread had no opportunity to raise a res judicata defense in district court.

In its decision denying additional discovery, the Board noted that Greenthread “has not pleaded the affirmative defense of *res judicata* or collateral estoppel in answer to Petitioner’s invalidity counterclaims in district court.” Paper 31, 8. The panel’s statement was incorrect. When a patent owner and the same alleged infringer are involved in successive litigation regarding the same patent, the alleged infringer may re-assert an invalidity defense if the accused products in the second litigation are materially different than those in the first litigation. *Hallco Mfg. Co. v. Foster*, 256 F.3d 1290, 1297 (Fed. Cir. 2001). Here, Greenthread is alleging infringement based on some products that were at issue in the prior litigation, but also other products that are materially different. Therefore, even if Greenthread were litigating against Intel or [REDACTED] themselves, those parties would be able to re-assert their invalidity defenses, because the products in the litigations are different.

3. The Petition should be dismissed, because Petitioner has not even attempted to carry its burden to show that the Petition is timely.

a. Greenthread has satisfied its “practical” burden under *Worlds*.

There can be no serious dispute that Greenthread here has met its initial “practical” burden under *Worlds*. *Worlds*, 903 F.3d at 1243-44. First, it is well-established that customer-supplier relationships can create privity and there is no dispute that Petitioner and the Licensees have such a relationship. *See supra*

Section VIII.B.1; Ex. 2014, 3-4. The burden therefore falls on Petitioner to establish that the relationship does *not* create privity. Meeting its burden requires Petitioner to put into the record evidence about its relationships. The privity inquiry is a “highly fact-dependent question,” “handled by the Office on a case-by-case basis.” *Ventex Co., Ltd. v. Columbia Sportswear N. Am., Inc.*, IPR2017-00651, Paper 148 at 6 (PTAB Jan. 24, 2019) (precedential). Therefore, in virtually every case where the Board has found that a petitioner met its burden, the Board examined the actual agreements and correspondence between the alleged privies. *See, e.g., WesternGeco LLC v. ION Geophysical Corp.*, 889 F.3d 1308, 1321 (Fed. Cir. 2018) (“the Board reviewed the purchase agreements”); *Samsung Electronics Co. Ltd. v. Netlist Inc.*, IPR2022-00615, Paper 64 at 14-15 (PTAB Jun. 30, 2023) (examining “indemnification correspondence” and contracts); *Assa Abloy AB v. CPC Patent Tech. Pty., Ltd.*, IPR2022-01093, Paper 20 at 18 (PTAB Feb. 2, 2023) (citing an “88-page agreement”). When the documents are *not* in the record the Board has consistently said that the absence of evidence “cuts against” the *petitioner*, not the patent owner. *Ventex Co., Ltd. v. Columbia Sportswear N. Am., Inc.*, IPR2017-00789, Paper 148 at 14 (PTAB Jan. 24, 2019) (precedential). Moreover, to the extent that control of the prior litigation is relevant, “the lack of evidence” regarding control should count against Petitioner, not Greenthread. *Bungie Inc. v. Worlds Inc.*, IPR2015-01264, Paper 64 at 35 (PTAB Jan. 14, 2020).

The only exception of which Greenthread is aware are decisions involving Greenthread. *E.g.*, *Semiconductor Components Indus., LLC v. Greenthread, LLC*, IPR2023-01242, Paper 31 (PTAB Feb. 5, 2024). *See also* IPR2023-01243, Paper 30 (PTAB Feb. 5, 2024); IPR2023-01244, Paper 31 (PTAB Feb. 5, 2024). Greenthread respectfully urges the panel decide this case in accordance with the Board’s other post-*Worlds* precedents.

b. Petitioner has done nothing to satisfy its burden under Section 315(b).

Here, institution should be denied because (1) it has the burden to show that its Petition is timely and (2) Petitioner has introduced no relevant evidence—absolutely none—to support such a finding. “Failure to prove [a] matter ... means that the party with the burden of persuasion loses on that point—thus, if the fact trier of the issue is left uncertain, the party with the burden loses.” *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378–79 (Fed. Cir. 2015). *Id.* Since Petitioner has not even attempted to meet its burden, it should “lose[]”. *Id.*

The Petition simply asserts, without support or explanation, that “Petitioner is not barred or estopped from requesting IPR of the Challenged Claims on the grounds identified in this Petition.” Pet., 4. That is inadequate on these facts. Mere “attorney argument that itself fail[s] to cite evidence” cannot meet Petitioner’s burden. *Worlds*, 903 F.3d at 1246. Further, Greenthread provided Petitioner the opportunity to come forward with evidence or explanation for the timeliness of its Petition—and

even sought to compel the production of such evidence. Paper 8 (PO's Motion for Additional Discovery). However, Petitioner refused to provide any discovery whatsoever or put into the record a single piece of evidence. Therefore, Petitioner cannot rely on its mere assertion, and in the absence of evidence to show that its Petition is timely, Petitioner "loses." *Dynamic Drinkware*, 800 F.3d at 1379.

Moreover, not only does Petitioner lose in the *absence* of any evidence, the "lack of evidence" that would presumably be in Petitioner's possession affirmatively "cuts against the party bearing the burden of proof on these issues." *Ventex Co., Ltd. v. Columbia Sportswear N. Am., Inc.*, IPR2017-00789, Paper 148 at 14, 2019 WL 858745, at *6 (PTAB Jan. 24, 2019) (precedential). Therefore, the Board can reasonably infer from Petitioner's resistance to providing evidence to meet its burden that the evidence (not in the record) is unfavorable to Petitioner.

Since Petitioner is "the party with the burden" and adduced no relevant evidence, Petitioner "loses." *Dynamic Drinkware*, 800 F.3d at 1379.

4. The Petition should be dismissed, because evidence of record shows that the Petition is time-barred.

The Board need not evaluate whether Greenthread's evidence suffices to show that the Petition is time-barred, because Petitioner bears the burden of proof on that issue and has not even attempted to meet its burden. If the Board chooses to look at the evidence of record, however, it is clear that the Petition is time-barred.

a. Petitioner and Licensees are "preceding and

succeeding owners of property” and parties to sales of accused goods.

It is undisputed that Petitioner and Licensees are “preceding and succeeding owners of” the licensed and/or infringing products that Petitioner makes and supplies to Licensees. *Taylor*, 553 U.S. at 894. Under the America Invents Act (“AIA”), privity “extend[s] to parties to transactions and other activities relating to the property in question,” i.e., infringing goods. *WesternGeco LLC v. ION Geophysical Corp.*, 889 F.3d 1308, 1318 (Fed. Cir. 2018) (quoting legislative history of the AIA). Here, the “transactions ... in question” are the sales Petitioner makes to Licensees and “the property in question” is the goods conveyed in those sales. *Id.* Indeed, some of the same products that were at issue in the litigation with Licensees are at issue again in the litigation with Petitioner. As parties to the same transactions involving the same property at issue in successive litigation, Petitioner and Licensees are unquestionably in privity.

b. Petitioner supplies accused goods to Licensees.

Some of the same products were at issue in the litigation with Licensees and are at issue again in the litigation with Petitioner. For example, Petitioner’s NCP252160 chip is a component in the [REDACTED]. Ex. 2036, 11. The [REDACTED] was accused in the [REDACTED] litigation. Ex. 2019, ¶¶12, 28-30, 36, 79, 85, 101-104; Ex. 2048, 18 (“Exemplary [REDACTED] Accused products that are gaming products include [REDACTED] and associated

[redacted]

[peripheral] equipment.”). Similarly, Petitioner’s data sheets describe its NCP81248 product as being “optimized for Intel’s ... CPUs,” and including an “Intel Proprietary Interface.” Exs. 2006, 2015. The NCP81248 chip is accused in the current district court litigation and numerous Intel CPUs were accused in the Intel litigation. Ex. 2032, ¶¶50-52; Ex. 2035, 5. Intel’s documents identify other products accused in the current district court litigation, like Petitioner’s NB3L202K, NB3L204K, and NB3N1900K chips (among others), as components of licensed Intel servers. Exs. 2004, 10-13, 21; 2035, 5. Further, it would be unfair for Petitioner to dispute that it sells accused products to Intel and [redacted] at this point, having taken the position that that additional “information on specific products is [not] necessary” to the instant proceeding. IPR2023-01242, Paper 11 (OnSemi’s Opposition to Patent Owner’s Motion for Additional Discovery), 10.

Additionally, even if none of the products currently accused by model number were sold to Licensees, the district court litigation is in its early stages and stayed. Ex. 2021, 4-5. Many more products are likely to be accused as the case progresses. *Arigna Tech. Ltd. v. Volkswagen AG*, No. 2:21-cv-00054, 2022 WL 2761288, at *2 (E.D. Tex. Jan. 19, 2022) (“‘It is expected that during [] discovery, infringement contentions may be clarified or refined’ based upon information produced during discovery.”). Likewise the Intel and [redacted] litigation settled early in discovery.

Greenthread's accusations in those cases were likely to expand in discovery, including potentially to encompass specific components of Intel and [REDACTED] products.

Indeed, Greenthread's district court complaint specifically alleges that Petitioner sells additional types of infringing products that have not yet been specifically accused, because Greenthread has not yet received relevant discovery. For example, the complaint recites that that "[t]he infringing structures within semiconductor devices have application in many types of devices designed and manufactured by ON Semiconductor, including discrete & power modules, ... wireless connectivity, and timing, logic, and memory devices." Ex. 2020, ¶14. An Intel document indicates that Petitioner is one of its suppliers of "Clock Devices," i.e., the "timing ... devices" mentioned in the complaint. Ex. 2004, 1, 3, 10. Each sale of accused products to Licensees is a "transaction" regarding a piece of "property" which puts Petitioner and Licensees in privity. *WesternGeco*, 889 F.3d at 1318.

c. Petitioner is a beneficiary of Licensees' "agreement[] directly related" to the accused products.

"[A]greements directly related to the product accused of infringing the patent at issue in this proceeding" satisfy *Taylor's* "pre-existing substantive legal relationship" test. *Ventex Co. v. Columbia Sportswear North America, Inc.*, IPR2017-00651, Paper 148 (PTAB Jan. 24, 2019) (precedential)). Here, Petitioner operates under and is a beneficiary of Licensees' agreement with Greenthread. That

agreement is “directly related to” the accused products, because it licenses some of them. *Id.*

Under the license “any product” Licensees “have made” by Petitioner or “purchase” from Petitioner is a “Licensed Product or Service” which Licensees have the right to “use, ... sell, ... obtain, ... acquire, ... receive, ... and otherwise exploit.” Ex. 2022, 2-3. Furthermore, the license grants a limited sublicense to Licensees’ “have-made vendors” (for the limited purposes of making products for Licensees). *Id.*, 5. Petitioner is one such vendor and is therefore a (limited) sublicensee of Licensees under the license. Even if that were not the case, “have-made vendors” are entitled to a limited implied license. *See LaserDynamics, Inc. v. Quanta Computer, Inc.*, 694 F.3d 51, 73 (Fed. Cir. 2012). Therefore, Petitioner is a beneficiary of Licensees’ “agreements directly related to the product accused of infringing the patent at issue in this proceeding” satisfying *Taylor’s* “pre-existing substantive legal relationship” test. *Ventex Co.*, IPR2017-00651, Paper 148 (precedential).

d. Petitioner’s licensed sales encumber otherwise infringing articles.

Under the doctrine of exhaustion, a licensed “sale is treated, for purposes of patent exhaustion, as if the patentee made the sale itself. The result: The sale exhausts the patentee’s rights *in that item.*” *Impression Prod., Inc. v. Lexmark Int’l, Inc.*, 581 U.S. 360, 376 (2017) (emphasis added). Therefore, after Petitioner sells

products under the license, any downstream user of the article sold would have an exhaustion defense against Greenthread. Put differently, the “property” of which Petitioner and Licensees are “preceding and succeeding owners” becomes encumbered under the doctrine of exhaustion. *Taylor*, 553 U.S. at 894. Further, it does not matter whether the products were accused in the instant litigation *or whether Petitioner even asserts its license defense*. Petitioner still limits Greenthread’s rights vis-à-vis the “property” it sells under the license by giving future owners an exhaustion defense. Thus, Petitioner is effectively providing rights to third-parties under the license and, therefore, is in privity with Licensees.

e. Petitioner’s indemnity obligations to Licensees further support a finding of privity.

“[A]n indemnity relationship is the type of relationship that can establish privity,” particularly when the indemnity obligations “directly relate to the” accused products. *Ericsson*, IPR2017-01197, Paper 56 at 8, 10. Petitioner’s “Standard Terms and Conditions of Sale” agreement requires Petitioner “to defend any claim” that its product “infringes any patent,” and “to pay settlements or costs and damages.” Ex. 2010, 3. The agreement further gives Petitioner “sole control of the defense” in any action for which it will indemnify the purchaser. *Id.* Presumably, two of Petitioner’s most significant customers, [REDACTED] and Intel, received terms at least as generous as the “Standard” conditions it offers to any purchaser. Petitioner has not disputed that they did receive at least those terms.

[REDACTED]

To distinguish cases where the Board has found that an indemnity obligation created privity, Petitioner has pointed to the supposedly “ambiguous and undefined” or “non-specific” nature of the indemnity clause in its standard terms. Opp., 9. However, Petitioner has not produced its indemnity agreements with Licensees—or even asserted that *those* agreements have “ambiguous,” “undefined,” or “non-specific” indemnity clauses. Petitioner has claimed only that its “standard agreement” is non-specific, which, even if true, is irrelevant. Petitioner bears the burden of proving that it is not in privity *with Licensees*, but has refused to produce the agreements *with Licensees*. *Id.* The refusal to produce documents “suggest[s] that the [document] does not support [Petitioner] in meeting its burden regarding the” time bar. *Volkswagen Grp. of Am., Inc. v. Arigna Tech. Ltd.*, IPR2021-01263, 2022 WL 211526, at *4 n.4 (PTAB Jan. 21, 2022).

Further, assuming that there is a clause in Petitioner’s agreements with [REDACTED] and Intel similar to the one in Petitioner’s standard terms, it is hardly “ambiguous,” “undefined,” or “non-specific.” Rather, it covers the goods Petitioner sold to Licensees and at issue in both the prior and current district court litigation. It therefore “directly relate[s] to the” accused products and establishes privity. *Ericsson*, IPR2017-01197, Paper 56 at 8, 10.

f. Petitioner acts as Licensees’ “agent” for Licensees’ “have made” rights.

It is well established that “agents and principals are in privity for res judicata purposes ‘if the prior action concerned a matter within the agency.’” *Herrion v. Children's Hosp. Nat. Med. Ctr.*, 448 F. App'x 71, 73 (D.C. Cir. 2011). The D.C. Circuit is “hardly alone in this approach to privity between principals and their agents.” *Herrion v. Children's Hosp. Nat. Med. Ctr.*, 786 F. Supp. 2d 359, 371 n.9 (D.D.C.), *aff'd*, 448 F. App'x 71 (D.C. Cir. 2011). Courts around the country have held similarly and the leading treatise on Federal procedure agrees. *Id.* (citing cases from the Supreme Court, First, Second, Third, Fifth, Sixth, Seventh, Ninth, and Eleventh Circuits); *Wright & Miller* § 4460 (3d ed.).

For example, in *John St. Leasehold, LLC v. Cap. Mgmt. Res., L.P.*, 283 F.3d 73, 75 (2d Cir. 2002), the FDIC contracted with asset managers to exercise its rights as receiver for a failed bank. The Second Circuit held that the asset managers were the FDIC's agents, acting within “the scope of their agency,” and thus “in privity with the” FDIC. *Id.* at 75.

Likewise in, *Fiumara v. Fireman's Fund Ins. Companies*, 746 F.2d 87, 87 (1st Cir. 1984), a motel operator sued his fire insurer for denying his claim in bad faith. The motel operator lost and then sued the *contractors* the insurer used to investigate his claim. *Id.* The First Circuit affirmed summary judgment for the contractors, holding that the contractors were “acting as agents of the” insurer and therefore

“clearly qualify as persons in privity” for the purposes of collateral estoppel. *Id.* at 92.

Here, Petitioner is Licensees’ contractor exercising their rights under the license, including by making accused products on their behalf under the “have made” clause. This is no different than the contract asset managers in *John St. Leasehold* acting on behalf of the FDIC or the contract investigators acting on behalf of the insurance company in *Fiumara*. See also Black’s Law Dictionary (11th ed. 2019) (defining “agent” as “[s]omeone who is authorized to act for or in place of another”). Ex. 2041. Therefore, Petitioner is Licensees’ agent and is in privity with Licensees. *Herrion*, 448 F. App’x at 73.

5. Due Process and the policy underlying the AIA support dismissing the petition.

a. Petitioner is trying to take inconsistent positions before the Board and in district court.

“[T]o protect the integrity of the judicial process,” “courts have uniformly ... prohibit[ed] parties deliberately changing [litigation] positions according to the exigencies of the moment.” *New Hampshire v. Maine*, 532 U.S. 742, 750 (2001). That is what Petitioner is attempting here. Right now, Petitioner wants to claim that it is a stranger to Licensees’ agreement, and therefore not in privity with them. But, Petitioner refuses to produce any evidence to support that conclusion or to say whether it will later claim the benefit of the agreement to reduce the likely damages

against it in district court. Petitioner is “playing fast and loose” with the Board and the district court. *Id.* Petitioner stepped into Licensees’ shoes by making and selling products under their license. Petitioner should not be able to take those shoes off when standing before the Board, only to put them back on again when it appears in district court.¹³

b. Petitioner’s other interests are irrelevant.

“Congress ‘chose language that bars petitions where proxies or privies would *benefit* from an instituted IPR, even where the petitioning party might separately have its own interest in initiating an IPR.’” *Power Integrations, Inc. v. Semiconductor Comps. Indus., LLC*, 926 F.3d 1306, 1316 (Fed. Cir. 2019) (emphasis in original); *RPX Corp. v. Applications in Internet Time LLC*, IPR2015-01750, Paper

¹³ Patent Owner is not suggesting that Petitioner could make its Petition timely by disclaiming a license defense in district court. Whether or not Petitioner actually asserts its license defense, it still has been acting under the license and reaping benefits from it, such as not owing any indemnity to Licensees. *Supra* § VIII.B.2. Petitioner also has been selling goods subject to exhaustion, thereby limiting Patent Owner’s rights, whether or not Petitioner disclaims any license. *Supra* § VIII.B.1.c. Petitioner cannot turn privity on and off at will. Patent Owner’s point is simply that Petitioner’s apparent strategy is unfair and the Board should not condone it.

128 at 10 (PTAB Oct. 2, 2020) (precedential) (same). Therefore, the fact that the Petitioner benefits from a license that does not cover *all* of Petitioner's sales is irrelevant. Petitioner *still benefits* from the license (and exercises Licensees' "have made" rights). Therefore, Petitioner is in privity with Licensees. Petitioner will have the opportunity to challenge the validity of the Challenged Patent in district court. The only question before the Board is whether Petitioner can avail itself of *additional* challenges here. The answer Congress provided in § 315(b) is "no."

c. A finding in Petitioner's favor here would violate due process.

A finding in favor of Petitioner on § 315(b) would violate Greenthread's constitutional right to due process. First, "[i]n almost every setting where important decisions turn on questions of fact, due process requires an opportunity to confront and cross-examine adverse witnesses." *Goldberg v. Kelly*, 397 U.S. 254, 269 (1970). Here, Petitioner made various "factual assertions" in its preliminary reply to support institution, such as "Petitioner did not indemnify or even receive a request for indemnification from Intel." Paper 22 at 5, 10. But Greenthread has had no opportunity to cross examine any witness about those assertions, because Petitioner did not identify a declarant, other than Petitioner's counsel.

Second, "where governmental action seriously injures an individual, and the reasonableness of the action depends on fact findings, the evidence used to prove the Government's case must be disclosed to the individual so that he has an opportunity

to show that it is untrue.” *Greene v. McElroy*, 360 U.S. 474, 496 (1959). Here, Greenthread has received no notice of any evidence to support a finding for Petitioner under § 315(b). For example, it is undisputed that Petitioner has a customer-supplier relationship with time-barred parties and that such relationships can create privity. The Board could only institute IPR if it found that Petitioner’s customer-supplier relationships do not create privity by examining the terms of those relationships. However, Greenthread has not seen the documents governing petitioner’s relationships, or any other evidence to support a finding for Petitioner under § 315(b). Therefore Greenthread has not had the “opportunity to show that [Petitioner’s assertions about the facts are] untrue.” *Id.*

IX. CONCLUSION

For the foregoing reasons, Petitioner has failed to prove by a preponderance of the evidence that any of the Challenged Claims are unpatentable. Patent Owner respectfully requests that the Board confirm the patentability of the Challenged Claims and enter judgment against Petitioner.

Dated: May 20, 2024

Respectfully submitted,

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CERTIFICATE OF WORD COUNT

The undersigned hereby certifies that the portions of the above-captioned **PATENT OWNER'S RESPONSE** specified in 37 C.F.R. § 42.24 have 12,242 words, in compliance with the 14,000 word limit set forth in 37 C.F.R. § 42.24(b)(1). This word count was prepared using Microsoft Word 2016.

Dated: May 20, 2024

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that the foregoing **PATENT OWNER'S RESPONSE** and supporting exhibits were served electronically via e-mail on **May 20, 2024**, in its entirety on the following counsel of record for Petitioner:

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