PUBLIC VERSION

[redacted]

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SEMICONDUCTOR COMPONENTS INDUSTRIES, INC.,
Petitioner,

v.

GREENTHREAD, LLC,
Patent Owner.

Case IPR2024-00265
U.S. Patent 9,190,502

PATENT OWNER'S RESPONSE

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EXHIBIT LIST

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EX2001	*Greenthread, LLC v. Intel Corp.*, No. 6:22-cv-00105-ADA, Dkt. 7 (summons returned executed) (W.D. Tex. Feb. 7, 2022)	X
EX2002	**[SEALED]** Email communication from Petitioner's counsel to Patent Owner's counsel October 16, 2023	X
EX2003	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
EX2004	"Clock Devices for Servers" (Aug. 2020) available at https://cdrdv2-public.intel.com/620306/620306_Clock_Devices_For_Server_Rv1p3.pdf	X
EX2005	On Semiconductor Corporation Form 10-K filing with U.S. Securities and Exchange Commission for the fiscal year ended December 31, 2016	X
EX2006	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
EX2007	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?
EX2008	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
EX2009	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
EX2010	Onsemi Standard Terms and Conditions of Sale, Rev.08102021 available at https://www.onsemi.com/site/pdf/ONSEMI_T&C.pdf	X
EX2011	Plaintiff's First Set of Common Interrogatories to Defendants ON Semiconductor Corporation and Monolithic Power Services, Inc., Et Al., *Greenthread, LLC v. ON Semiconductor Corp.*, No. 23-443-RGA (D. Del.) (served Sept. 27, 2023)	X
EX2012	Plaintiff's First Set of Common Requests for the Production of Documents to Defendants ON Semiconductor Corporation and Monolithic Power Services, Inc., Et Al., *Greenthread, LLC v. ON Semiconductor Corp.*, No. 23-443-RGA (D. Del.) (served Sept. 27, 2023)	X
EX2013	Definition of "privity" in Black's Law Dictionary (11th ed. 2019) available from Westlaw at westlaw.com	X
EX2014	**[SEALED]** Email communication from Petitioner's counsel to Patent Owner's counsel October 11, 2023	X
EX2015	Plaintiff's Identification of Accused Products and Asserted Patents, *Greenthread, LLC v. ON Semiconductor Corp.*, No. 23-443-RGA (D. Del.) (served Oct. 12, 2023)	X

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EX2016	Petition (Paper 2) in *Sony Group Corp. v. Greenthread, LLC*, IPR2023-00324	X
EX2017	Petition (Paper 1) in *Sony Group Corp. v. Greenthread, LLC*, IPR2023-00376	X
EX2018	*Greenthread, LLC v. Intel Corp.*, No. 6:22-cv-00105-ADA, Dkt. 1 (Complaint) (W.D. Tex. Jan. 27, 2022)	X
EX2019	*Greenthread, LLC v. Dell Inc.*, No. 6:22-cv-105-ADA, Dkt. 120 (Second Amended Complaint)	X
EX2020	*Greenthread, LLC v. ON Semiconductor Corp.*, No. 23-443-RGA, Dkt. 1 (Complaint with accompanying exhibits) (D. Del. Apr. 21, 2023)	X
EX2021	*Greenthread, LLC v. ON Semiconductor Corp.*, No. 23-443-RGA, Dkt. 24 (Scheduling Order) (D. Del. Sept. 11, 2023)	X
EX2022	**[SEALED]** Confidential agreement	X
EX2023	Petition (Paper 1) in *Intel Corp. v. Greenthread LLC*, IPR2023-00308	X
EX2024	Petition (Paper 1) in *Intel Corp. v. Greenthread LLC*, IPR2023-00420	X
EX2025	Petition (Paper 1) in *Intel Corp. v. Greenthread LLC*, IPR2023-00552	X
EX2026	Petition (Paper 1) in *Dell Techs. Inc. v. Greenthread LLC*, IPR2023-00506	X
EX2027	Petition (Paper 1) in *Dell Techs. Inc. v. Greenthread LLC*, IPR2023-00509	X
EX2028	**[SEALED]** Confidential declaration	X

Exhibit No.	Description	Submitted Previously?
EX2029	**[SEALED]** Email communication from Patent Owner's counsel to Petitioner's counsel between May 26 to June 1, 2023	X
EX2030	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
EX2031	*Greenthread, LLC v. Intel Corp.*, No. 6:22-cv-00105-ADA, Dkt. 113 (Redacted Memorandum Opinion and Order) (W.D. Tex. Dec. 27, 2022)	X
EX2032	*Greenthread, LLC v. Intel Corp.*, 6:22-cv-00105-ADA, Dkt. 38 (First Amended Complaint for Patent Infringement) (W.D. Tex., filed Apr. 29, 2022)	X
EX2033	*Greenthread, LLC v. Intel Corp.*, 6:22-cv-00105-ADA, Dkt. 38-8 (Greenthread's Amended Preliminary Infringement Contentions) (W.D. Tex., filed Apr. 29, 2022)	X
EX2034	*Greenthread, LLC v. Intel Corp.*, 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
EX2035	Plaintiff's Supplemental Identification of Asserted Patents and Accused Products in *Greenthread, LLC v. ON Semiconductor Corp.*, No. 23-443-RGA (served to Petitioner's counsel on Nov. 10, 2023)	X
EX2036	Webpage regarding iFixIt, PlayStation 5 Teardown (https://www.ifixit.com/Teardown/PlayStation+5+Teardown/138280)	X

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EX2037	Webpage from Mouser Electronics, Inc. for NCP252160 (https://www.mouser.com/ProductDetail/onsemi/NCP252160MNTWG?qs=sPbYRqrBIVkc9klNZ2pXbg%3D%3D)	X
EX2038	Webpage from DigiKey for NCP252160 (https://www.digikey.com/en/products/detail/onsemi/NCP252160MNTWG/15859992)	X
EX2039	Webpage from Mouser Electronics, Inc. for NB3L202K (https://www.mouser.com/ProductDetail/onsemi/NB3L202KMNTXG?qs=z6PAvqrnkvR8PcLN2EnUzg%3D%3D)	X
EX2040	Webpage from DigiKey for NB3L202K (https://www.digikey.com/en/products/detail/onsemi/NB3L202KMNTXG/7220446)	X
EX2041	Definition of "agent" in Black's Law Dictionary (11th ed. 2019) available from Westlaw at westlaw.com	X
EX2042	*Greenthread, LLC v. Intel Corp.*, 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
EX2043	[RESERVED]	
EX2044	Email communication from Patent Owner to Petitioner's litigation counsel dated September 13, 2023	X
EX2045	*Greenthread, LLC v. Intel Corp.*, 6:22-cv-00105-ADA, Dkt. 49 (Notice of Appearance of Additional Counsel) (W.D. Tex., filed June 9, 2022)	X
EX2046	[RESERVED]	
EX2047	[RESERVED]	

Exhibit No.	Description	Submitted Previously?
EX2048	*Greenthread, LLC v. Intel Corp.*, 6:22-cv-00105-ADA, Dkt. 120-8 (Greenthread's Amended Preliminary Infringement Contentions) (W.D. Tex., filed Jan. 23, 2023)	X
EX2049	**[SEALED]** Email communications between Petitioner's counsel and Patent Owner's counsel, dated Oct. 31, 2023 - Nov. 1, 2023	X
EX2050	**[SEALED]** Email communications between Petitioner's counsel and Patent Owner's counsel, dated Nov. 2-7, 2023	X
EX2051	**[SEALED]** Email communications between Petitioner's counsel and Patent Owner's counsel, dated Nov. 14-15, 2023	X
EX2052	**[SEALED]** Email communications between Petitioner's counsel and Patent Owner's counsel, dated Dec. 12-13, 2023	X
EX2053	Web page from website of Onsemi (https://www.onsemi.com/products/custom-assp/soc-sip-custom-products)	X
EX2054	Greenthread, LLC v. ON Semiconductor Corp., No. 23-443-RGA, Dkt. 36 (Second Amended Complaint) (D. Del. Nov. 22, 2023)	X
EX2055	Greenthread, LLC v. ON Semiconductor Corp., No. 23-443-RGA, Dkt. 42 (Defendants' Answer, Affirmative Defenses, and Counterclaims to Plaintiff's Second Amended Complaint) (D. Del. Dec. 20, 2023)	X
EX2056	**[SEALED]** Email communications between the Board, Petitioner's counsel and Patent Owner's counsel dated November 27, 2023	X
EX2057	*Greenthread, LLC v. Samsung Electronics Co., Ltd.. et al*, Civil Action No. 2-19-cv-00147 (EDTX), Dkt. No. 6, Order regarding service	X

Exhibit No.	Description	Submitted Previously?
EX2058	Deposition Transcript of Dr. Travis Blalock taken in *Semiconductor Components Indus., LLC v. Greenthread, LLC*, IPR2023-01242, -01243 and -01244, dated May 2, 2024	X
EX2059	Declaration of Dr. Travis Blalock filed in *Semiconductor Components Indus., LLC v. Greenthread, LLC*, IPR2023-01242 as Exhibit 1003	X
EX2060	U.S. Patent No. 11,121,222	X
EX2061	Petition (Paper 3) in *Sony Group Corp. v. Greenthread, LLC*, IPR2023-00325	X
EX2062	Petition (Paper 1) in *Sony Group Corp. v. Greenthread, LLC*, IPR2023-00375	X
EX2063	**[SEALED]** Confidential agreement	X
EX2064	Declaration of Dr. Alexander Glew	
EX2065	Excerpts from Chen, J. Y., CMOS Devices and Technology for VLSI, Prentice-Hall (1990)	
EX2066	U.S. Patent No. 5,384,476 ("Nishizawa")	
EX2067	CV of Dr. Alexander Glew	
EX2068	U.S. Patent No. 8,421,195	
EX2069	U.S. Patent No. 9,190,502	
EX2070	U.S. Patent No. 10,510,842	
EX2071	U.S. Patent No. 10,734,481	
EX2072	U.S. Patent No. 11,316,014	

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EX2073	File History of U.S. Patent No. 8,421,195	
EX2074	File History of U.S. Patent No. 9,190,502	
EX2075	File History of U.S. Patent No. 10,510,842	
EX2076	File History of U.S. Patent No. 10,734,481	
EX2077	File History of U.S. Patent No. 11,316,014	
EX2078	**[SEALED]** Declaration of Mohan Rao	
EX2079	Statista Information	
EX2080	*Greenthread, LLC v. Cirrus Logic Inc.*, No. 1:23-cv-369-DC-DTG, Dkt. 53 (Claim Construction Order and Memorandum in Support Thereof) (W.D. Tex. Mar. 13, 2024)	
EX2081	*Greenthread, LLC v. Cirrus Logic Inc.*, No. 1:23-cv-369-DC-DTG, Dkt. 37 (Opening Claim Construction Brief by Greenthread) (W.D. Tex. Nov. 27, 2023)	
EX2082	*Greenthread, LLC v. Samsung Elecs. Co.*, No. 2:19-CV-00147-JRG, 2020 WL 1911200 (Claim Construction Memorandum Opinion and Order) (E.D. Tex. Apr. 20, 2020)	
EX2083	Exhibit 2022 in *Texas Instruments Inc. v. Greenthread LLC*, IPR2024-00771 (including excerpts of the Deposition Transcript of Scott Warrick taken on June 7, 2024 along with marked Exhibits 3-5 in *Greenthread, LLC vs. Cirrus Logic, Inc.*, 1:23-cv-00369-DC (W.D. Tex.))	
EX2084	Excerpts of Kittel, Charles, Introduction to Solid State Physics, John Wiley & Sons, Inc. (1996)	

Exhibit No.	Description	Submitted Previously?
EX2085	Transcript of Deposition of Dr. Stephen A. Campbell, *Monolithic Power Systems, Inc. v. Greenthread, LLC*, IPR2024-00468, EX2058.	
EX2086	Declaration of Dr. Stephen A. Campbell, *Monolithic Power Systems, Inc. v. Greenthread, LLC*, IPR2024-00468, EX1003.	
EX2087	Petitioner onsemi's Demonstratives, *onsemi v. Greenthread, LLC*, IPR2023-01242 (EX1056).	
Ex. 2088-2900	[RESERVED]	
Ex. 2901	**[SEALED]** IPR2023-01242 Patent Owner's Motion for Additional Discovery, Paper 8	X
Ex. 2902	**[SEALED]** IPR2023-01242 Petitioner's Opposition to Patent Owner's Motion for Additional Discovery, Paper 11	X
Ex. 2903	**[SEALED]** IPR2023-01242 Patent Owner's Reply In Support of PO's Motion for Additional Discovery, Paper 14	X
Ex. 2904	**[SEALED]** IPR2023-01242 Order Denying Patent Owner's Motion for Additional Discovery, Paper 30	X
Ex. 2905	**[SEALED]** IPR2023-01243 Patent Owner's Motion for Additional Discovery, Paper 7	X
Ex. 2906	**[SEALED]** IPR2023-01243 Petitioner's Opposition to Patent Owner's Motion for Additional Discovery, Paper 10	X
Ex. 2907	**[SEALED]** IPR2023-01243 Patent Owner's Reply In Support of PO's Motion for Additional Discovery, Paper 13	X

Exhibit No.	Description	Submitted Previously?
Ex. 2908	**[SEALED]** IPR2023-01243 Order Denying Patent Owner's Motion for Additional Discovery, Paper 29	X
Ex. 2909	**[SEALED]** IPR2023-01244 Patent Owner's Motion for Additional Discovery, Paper 8	X
Ex. 2910	**[SEALED]** IPR2023-01244 Petitioner's Opposition to Patent Owner's Motion for Additional Discovery, Paper 11	X
Ex. 2911	**[SEALED]** IPR2023-01244 Patent Owner's Reply In Support of PO's Motion for Additional Discovery, Paper 14	X
Ex. 2912	**[SEALED]** IPR2023-01244 Order Denying Patent Owner's Motion for Additional Discovery, Paper 30	X

I. INTRODUCTION[1]

The Petition fails, because none of Petitioners' references expressly teach "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," and "the graded dopant region to aid carrier movement from the surface towards the area of the substrate where there are no active regions."

First, Petitioner cannot show that Payne has the claimed "graded dopant concentration." Payne does not say anything about grading at the surface. Further, Payne does not say anything at all about using graded dopants to move carriers. It just has a concentration that Petitioners claim is graded. Payne does not teach anything about "aiding movement of minority carriers."

Petitioner's other primary combination, Kawagoe-Sakai, fares no better. First, Kawagoe says nothing about aiding the movement of minority carriers in the p-well. Kawagoe's electrons are not minority carriers in the p-well. The Petition claims that Kawagoe Figure 17 shows a graded dopant concentration in Kawagoe's

[1] Patent Owner Greenthread, LLC submits this Response to the decision to institute IPR ("Decision") and to the Petition for *Inter Partes* Review ("Petition") filed by Semiconductor Components Industries, LLC, d/b/a onsemi ("onsemi" or "Petitioner").

p-well, and that the p-type dopants shown in Figure 17 would aid carrier movement from the active region of the p-well (surface) towards an area of the substrate where there are no active regions (substrate). But Kawagoe never says that is the effect or purpose of the dopant concentrations it describe. Rather, Petitioner *admits* that Kawagoe is discussing carriers in the substrate below the p-well—*not in the active region*. Kawagoe expressly describes how the carriers with which it is concerned are "attracted" to the substrate, and "prevented from entering the p-well 6p." Kawagoe says nothing at all about carriers *in the active region*, as recited in the claims.

In parallel IPRs[2], Petitioner tried to twist two lines of Dr. Glew's (Greenthread's expert) deposition testimony to argue that the dopant gradient purportedly shown in Kawagoe would cause the electrons to move in a downward direction. But this is not true. Dr. Glew was simply saying that Kawagoe was preventing the electrons from entering the p-well. Dr. Glew never testified that Kawagoe teaches moving carriers from the active region. When asked that question specifically, he said the exact opposite of what Petitioner's claim. Furthermore, the alleged electric field would not move the electrons from the active region to the substrate. If it did anything, it would move them in the opposite direction.

[2] IPR2023-01242, IPR2023-01243, and IPR2023-01244.

In the absence of any teaching of the claim limitation in the prior art, Petitioners have two options: 1) they can read "aid the movement of minority carriers from the said surface" (or active region) out of the claim or 2) they can argue that any "graded dopant concentration" in the active region will "aid the movement of minority carriers." Both options fail.

The first option is clearly wrong, because it is "contrary to the well-established rule that claims are interpreted with an eye toward giving effect to all terms in the claim." *Digital-Vending Servs. Int'l, LLC v. Univ. of Phoenix, Inc.*, 672 F.3d 1270, 1275 (Fed. Cir. 2012) (internal quotation marks omitted). Petitioners cannot ignore a claim limitation.

The second option—inherency—also fails. The "probability or possibility" that a dopant gradient aids carrier movement "is insufficient." *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999). The prior art "must *necessarily* include the unstated limitation." *Transclean Corp. v. Bridgewood Servs., Inc.*, 290 F.3d 1364, 1373 (Fed. Cir. 2002) (emphasis in original). Petitioners cannot possibly overcome this high bar.

First, 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. 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*." EX2058, 137-138.

Further, in parallel district court proceedings, the District Court said that "the graded concentration has to be sufficiently graded" to cause movement. Petitioner's expert does not dispute Dr. Glew's (Patent Owner's expert) testimony that "if two forces are acting on an object in opposite directions, both forces cannot aid its movement." EX2058 at 29. Far from disputing the District Court's construction or Dr. Glew's testimony, Petitioner's expert, Dr. Blalock, previously construed "aid the movement of minority carriers" as "sweeping" carriers (i.e., moving them). In his deposition here, Dr. Blalock also agreed that a "net force" is what matters for aiding carrier movement. EX2058, 188:16-189:16.

Second, one of the petitioners in a co-pending IPR proceeding (Cirrus Logic) *admitted that a graded dopant concentration does not inherently aid carrier movement*. Cirrus' reasoning was the same as Dr. Blalock's. Its corporate representative, Scott Warrick, testified that "there's a long list of … physical attributes which affect the movement of carriers." EX2083, 72:6-8. He said that "there's other things that might affect carrier movement besides the gradient." *Id.* at 96:1-13 (PDF pages 15, 21 of 118). When Greenthread showed Mr. Warrick a dopant gradient in an accused product, he said it was not possible to say from the

gradient alone whether the product met the "aid the movement of minority carriers" claim limitation because of these other "physical attributes." *Id.* at 72:6-8, 95:2-5, 96:1-13 (PDF pages 15, 20-21 of 118). An expert of Petitioner's co-defendant in district court likewise said that only a "properly constructed" electric field would aid carrier movement. EX2086, ¶32; *see also* EX2086, 34:1-14 (dopant gradient must "have a sufficient electric field intensity.").

Finally, objective indicia of non-obviousness confirm the patentability of Greenthread's claims. Two multibillion dollar semiconductor companies, [redacted] and [redacted] paid for licenses covering *just the patent family at issue here without any threat of litigation*. Moreover, Greenthread has never threatened litigation against those companies. These companies 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. [redacted] could have joined those petitions or their own (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 [redacted] and confirm the patentability of the Challenged Claims.

II. THE CHALLENGED PATENT

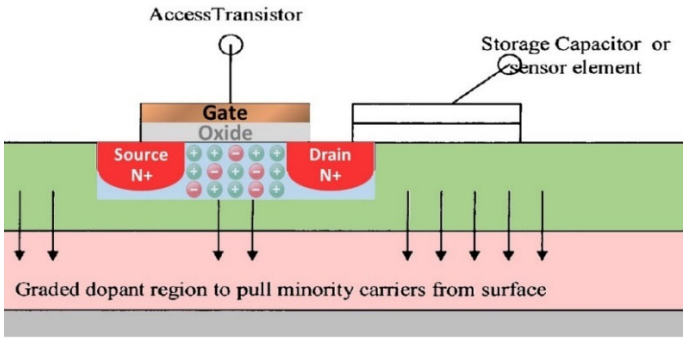
At the time of invention of the Challenged Patent, most semiconductor devices relied on spatially uniform concentrations of dopants. EX2072, Abstract, 1:64-2:11.[3] Dr. Rao (the named inventor) recognized, however, that graded concentrations of dopants can be used to improve certain aspects of the performance of transistors and other semiconductor devices. *Id.*, Abstract, 3:36-47, 4:1-3. The claimed invention is clearly disclosed in, e.g., Figs. 5B-5C of the Challenged Patent, and the corresponding parts of the specification. EX2064, ¶34; *id.* at ¶¶34-37; *see also id.* at ¶¶1-33 (Dr. Glew's background and overview of relevant technology).

A surface-channel MOSFET is a common type of transistor capable of controlling current flow at or along the surface of the semiconductor substrate. EX2065, 27 ("carriers propagate at the semiconductor surface"). Figure 5B shows an NMOS[4] transistor that is formed in a p-type surface layer. EX2072. 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). EX2072, 3:44-45 ("electrons can be swept from source to drain"), 4:10-11 ("accelerate

[3] Citations are made to the '014 Patent, EX2072, but each of Greenthread's Challenged Patents have similar substantive disclosures.

[4] MOS stands for "metal oxide semiconductor." EX2064, ¶35 n.2.

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).[5] The specification explains that the NMOS transistor in Fig. 5B can be a surface-channel MOSFET. Ex. 2064, ¶35.

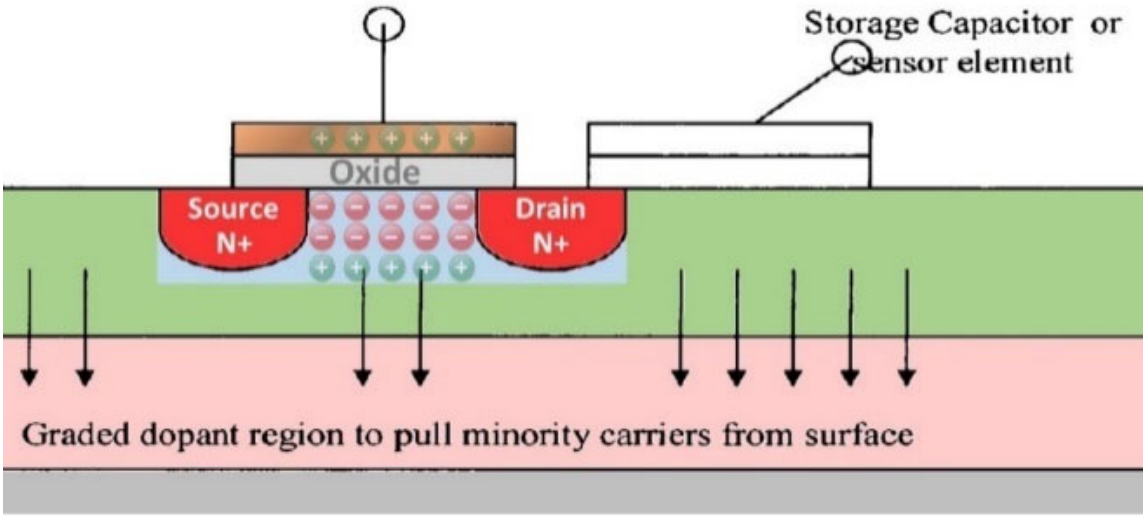


Id., ¶35 (explaining Fig. 5B above); EX2072, 4:9-11. Meanwhile, the p-type silicon between the source and drain (shaded blue) has an abundance of positively charged holes (green circles). When the holes separate the source's electrons from the drain's electrons, current cannot flow through the transistor, and the transistor is in an "off" state. Ex. 2064, ¶¶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

[5] An "N" region or layer has more electrons, and thus a "**n**egative charge." A "P" layer has more holes, and a "**p**ositive charge." A "+" or "-" means heavily or lightly doped. EX2064, ¶35 n.3.

layer. *Id.* 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.



EX2064, ¶36.[6] 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. EX2072, Fig. 5B (annotated above). In this example, pulling the holes from the surface layer when a positive voltage is applied to the gate, allows

[6] Because the channel is formed by electrons with a **n**egative charge, the MOSFET is referred to as an **n**-channel MOSFET, and the "minority carriers" are holes. EX2064, ¶36 n.4.

the transistor to turn "on" more quickly. This improves the speed and performance of the transistor. EX2064, ¶37; EX2072, 3:42-47.

III. ALLEGED PRIOR ART

The Petition's primary references include Kawagoe-Sakai and Payne. The Petition also uses Wolf, Parillo, and Silverbrook in the grounds as secondary references. Dr. Glew provides an overview of pertinent portions of these references relevant to the present dispute. EX2064, ¶¶38-47.

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. EX2064, ¶¶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). "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 plain and ordinary meaning. EX2064, ¶¶20-25, 48.

However, as discussed below, Petitioner's argument rests on an improper collapsing of the terms "graded concentration of dopants" and "aid the movement of carriers." Further, Petitioner suggests that the "aid the movement of minority carriers" limitation can be met in situations where there is no carrier movement—an absurd result. *Infra* Section VI.A.1. This is contrary to the position of Petitioner's expert which interpreted aiding movement to "sweep" i.e. move. EX1003, ¶52. Petitioner's position is also contrary to district court claim construction orders regarding the same patent family. The Western District of Texas unequivocally stated, "a graded concentration…that is [not 'sufficiently graded'] will not aid in the movement of minority carriers[.]" EX2080, 39-40. And the Eastern District of Texas understood that direction alone does not determine whether a gradient aids carrier movement—the ***magnitude*** of the gradient must also be considered. EX2082, 15 (explaining that "the slope [of the gradient] has both a direction and a magnitude and [d]efendant [incorrectly] suggests that the direction of the drift electric field depends solely on ***the direction*** of the slope of the graded concentration") (emphasis in

original).In light of Petitioner's positions, the Board should clarify that these are separate terms and that the plain and ordinary meaning of "aid the movement of minority carriers" requires that a carrier move in the specified direction.

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

The Petition is deficient because it fails to establish that the references identified in the Petition teach or render obvious at least the "aid the movement of minority carriers" limitations (Elements [7.4], [7.5]) which are found in the challenged independent claims.

A. "Graded" does not mean "aided" and "aided" is not inherent in "graded."

Petitioner's references do not teach the "aid carrier movement" claim limitations. Therefore, to locate "aid carrier movement" in the prior art, the Petition assumes that *any* "graded dopant concentration" will "aid carrier movement." Petitioner is wrong.

1. A "graded concentration of dopants" does not inherently "aid carrier movement."

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.[7] Like the patent examiner, EX1016, 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*

[7] EX2058, 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.").

force created by the gradient." EX2058, 137-138.[8][9] Additionally, if two forces are acting on an object in opposite directions, both forces cannot aid its movement. EX2064, ¶¶52-55. 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.*, ¶54. The smaller force does not "aid" the movement of the object, because it is pushing *against* the

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[8] *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 movement is a statistical process. So it's not like you can reach in and say that carrier will move in this direction.").

[9] All emphasis added unless noted otherwise.

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*.

EX2058, 187-188.

A review of Dr. Blalock's report confirms that he failed to address the net force exerted on the carrier or on the magnitude of the relevant electric fields. Dr. Blalock and the Petition point to the mere gradient itself as evidence that the prior art gradients "aids movement." That is insufficient, as Dr. Blalock admitted.

Greenthread's expert, Dr. Glew also testifies that the inherent resistance of silicon also affects carrier movement. EX2064, ¶¶54, 90, 101, 104. Dr. Glew and the specification also show that the slope of the dopant concentration is a relevant parameter for determining whether a concentration gradient will aid carrier movement.

> The relative doping concentrations of emitter and collector regions varies from 10^{18} to $10^{20}/cm^3$, where as the base region is 10^{14} to $10^{16}/cm^3$ depending on the desired characteristics of the BJT. In graded base p-n-p transistors, the donor dopant concentration may be 10 to 100× at the emitter-base junction, relative to the base-collector junction (1×). 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.

EX2072, 2:66-3:15; EX2064, ¶¶53-61. Yet, Dr. Blalock fails to address any of these numerous factors in his declaration. The expert proffered by petitioner Monolithic Power Systems in parallel IPR's further confirms that "graded" is not inherently "aided." He testified that only a gradient generating a "properly constructed" electric field would aid carrier movement. EX2085, 33:14-34:15. Like every other witness in these proceedings, Dr. Campbell identified other factors that affect whether and how a carrier moves. For example, Dr. Campbell said that capacitance created by a PN junction "creates a fairly substantial electric field" that affects carrier motion. He also said that temperature and imperfections in silicon lattice structure can affect carrier motion. *Id*. at 34:15-19; 39:8-12. Dr. Blaylock's report and the petition do not address any of these factors.

The importance of the factors which Dr. Blalock failed to address are confirmed by a petitioner from a co-pending IPR, Cirrus Logic. Greenthread showed

Cirrus Logic's corporate representative, Scott Warrick, a doping profile from one of the Cirrus Logic accused products and asked him if the downward sloping gradient met the "aid carrier movement" claim limitation. He said "***I cannot tell you that***." *Id.* (emphasis added). Greenthread then asked "***is that because there's other things that might affect carrier movement besides the gradient***?" to which Mr. Warrick replied "***Yes.***" EX2083 at 95:2-5; 96:1-13 (PDF pages 20-21). Mr. Warrick further testified that "there's a ***long list of … physical attributes which affect the movement of carriers***" and "there's other things that might affect carrier movement besides the gradient." EX2083 at 72:6-8, 96:1-13 (PDF pages 15 and 21).

During prosecution, the examiner likewise 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. EX1002, 270. This is exactly what Petitioner's expert, Cirrus Logic's 30(b)(6) witness, and Greenthread's expert testified. EX2064, ¶52-54, 90, 97, 101.

The net force acting on a carrier—the result of all of these factors and forces—is what determines whether it moves and the direction of motion. EX2064, ¶¶49-53. These other forces may prevent movement or push in the opposite direction from the force exerted by the gradient. Petitioner's assumption that the gradients in their prior

art references would aid carrier movement fails, because the Petition fails to analyze whether the specific gradients at issue in the context of the disclosed devices would suffice to overcome the other forces that are present. Since Petitioner does not measure or account for these forces, and does not compare them to the magnitude of the force exerted by the gradients in the alleged prior art, they fail to establish that the disclosed gradients would "aid carrier movement." EX2064, ¶52.

Further, 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." EX1007, 16:7-11. Kawagoe proves that graded dopant concentrations don't *always* aid carrier movement, as Petitioner claims, because sometimes the "concentration gradient" can "prevent" carrier movement. EX2064, ¶¶49-52.

2. A finding that a "graded concentration of dopants" "aid carrier movement" is inconsistent with the claim language and district court Markman orders.

Finding that any gradient satisfies the "aid movement" claim term also goes against the plain language of the claim. If <u>*any*</u> "graded concentration of dopants"

would "aid carrier movement" then there was no reason to include the separate claim term. Greenthread included "aided" and "graded" as two separate claim terms, because they have separate meaning. As the Federal Circuit said in *Phillips v. AWH Corp.,* "[w]hen a claim refers to 'steel baffles,'" that "strongly implies that the term 'baffles' does not inherently mean objects made of steel." 415 F.3d 1303, 1314 (Fed. Cir. 2005). Here, "a graded concentration of dopants [] *to aid the movement of carriers*" "strongly implies" that a "graded concentration of dopants" "does not inherently" "aid the movement of carriers." *Id.*

Petitioner's apparent position that *any* gradient aids carrier movement, leads to absurd results that are plainly inconsistent with the claim language. For example, if the forces acting on a carrier—i.e. the force exerted by a gradient and any other forces—cancel each other out, the carriers do not move at all. Yet, Petitioner's "graded" entails "aided" assumption (or claim construction) implies that a gradient can "aid" the movement of carriers that do not move at all. "Aid[ing] the movement of carriers" requires "movement." Petitioner fails to address this claim limitation, except to say that it is "inherent"—a position which Petitioner's expert admits is wrong. EX2058, 187-188; *see also id.* at 89, 126-127.

Not one but two District Courts have previously agreed with Greenthread that not *all* doping gradients aid carrier movement. The Western District of Texas unequivocally stated, "a graded concentration…that is [not 'sufficiently graded']

will not aid in the movement of minority carriers[.]" EX2080, 39-40. And the Eastern District of Texas understood that direction alone does not determine whether a gradient aids carrier movement—the ***magnitude*** of the gradient must also be considered. EX2082, 15 (explaining that "the slope [of the gradient] has both a direction and a magnitude and [d]efendant [incorrectly] suggests that the direction of the drift electric field depends solely on ***the direction*** of the slope of the graded concentration") (emphasis in original).

3. The prosecution history supports Greenthread.

Petitioner points to the prosecution history to support conflating "graded" with "aided," but—setting aside the fact that Petitioner misrepresents that history—the prosecution history is the wrong place to start. "The prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of that negotiation, it often lacks the clarity of the specification and thus is less useful" in understanding the scope of the patent. *Phillips*, 415 F.3d at 1317. The prosecution history cannot overcome the clear claim language distinguishing the "graded" and "aided" terms.

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)'" IPR2023-00263, Pet., 22, 55. 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.

EX1020, 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." EX1020, 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 represented 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 moves carriers deep into the substrate." Pet., 27. Most of this quote is from Petitioner, not Greenthread. Greenthread, however, added that the movement of carriers "[*d*]*epend*[*s*] *on the particular slope* of the graded concentration of dopant[s]." EX1016, 289. 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." EX1016, 286. Those additional claim limitations were, as Greenthread said, an "*additional parameter* for ensuring that all minority carriers are moved in one direction." EX1016, 290. 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."

B. The Petition fails to establish that the prior art discloses or suggests the "aid the movement of minority carriers" limitation. (Elements [7.4], [7.5]).

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 the movement of minority carriers."[10]

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 the movement of minority carriers." *See supra* Section VI.A. Yet, Dr. Blalock admitted that, to determine whether a dopant concentration gradient would "aid the movement of minority carriers," he looked *only* at the direction of the slope. He did not look at the magnitude of the slope or other possible forces acting on a carrier. As Dr. Glew

[10] (A) Elements [7.4]: "a single drift layer disposed between the other surface of said surface layer and said substrate, said drift layer having a graded concentration of dopants generating a first static unidirectional electric drift field to ***aid the movement of minority carriers*** from said substrate to said surface layer," and (B) Elements [7.5]: "at least one well region disposed in said single drift layer, said well region having a graded concentration of dopants generating a second static unidirectional electric drift field to ***aid the movement of minority carriers*** from said substrate to said surface layer."

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. EX2064, ¶¶52-53.

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*." EX2058, 195. 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*." EX2058, 91-92. 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. EX2064, ¶¶54-58.

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

The Petition fails to demonstrate that Kawagoe teaches the "aid the movement of minority carriers" claim limitation.

[redacted]

a. The electrons Kawagoe describes never enter the p-well—much less the surface or active region.

First, Kawagoe says nothing about aiding the movement of minority carriers in the p-well. Kawagoe's electrons are not minority carriers in the p-well. The carriers that Kawagoe describes are not in the "surface" or "active region." Every challenged independent claim requires "*active regions* having at least one graded dopant concentration to aid carrier movement," Kawagoe does not teach that its gradient would have any effect on carriers in the "surface" or "active region."

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* EX1003, ¶94 n.6. Kawagoe's electrons are ***below*** p-well 6p, and prevented from moving ***upward*** into p-well 6p. EX2064, ¶57. Kawagoe's 6p extends to the very top of the device. Therefore, carriers travelling vertically could only enter 6p from below. [11] EX2064, ¶¶56-57. Kawagoe does not address carriers in the "active

[11] 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 the movement of minority carriers *from said surface layer*" 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." EX2064, ¶57.

The Petition strategically uses square brackets to conceal the fact that Kawagoe has nothing to do with carriers in the active region. 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 EX1007, 16:2-11, emphasis and square brackets after "gradient" added by Petitioner). What is missing from Petitioner's quotation is Kawagoe's

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carriers from an alpha ray at the top of a device is "extremely low" and any such carriers can be "disregarded." EX2066, 29.

teaching that the graded concentration actually *inhibits* carrier movement of carriers coming up from the p-well. 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.

EX1007, 16:7-11 (emphasis and highlighting added). Since Kawagoe teaches inhibiting carrier movement, it does not teach aiding carrier movement. EX2064, ¶¶54-58.

Indeed, Dr. Blalock agreed that Kawagoe's structure would cause electrons generated below the concentration gradient to be repelled from entering the P-well of Kawagoe:

> Q. You agree that electrons are repelled from moving upwards into the P-well? …
>
> A: I mean, one of the things that happens is if an electron is generated below the concentration gradient in the well and happens to be moving toward the well and toward -- more importantly, towards the concentration gradient, it will be -- ***when it approaches the concentration gradient, it will be approach- -- it will be acted upon by the electric field and then repelled***.

EX2058, 144:13-145:3.

b. Petitioner's arguments are contrary to the laws of physics.

Even if Kawagoe discussed electrons in the p-well (or the active region) Petitioner's analysis still fails. Petitioner's annotations of Kawagoe Figure 17 in parallel IPRs allege that there is an electric field pointing downward that pushes electrons in the same direction. EX2087, 14 . That is wrong. Electrons move in the *opposite* direction of an electric field. If the field points down, electrons will move up. EX2064, ¶¶68-82. Petitioner's own references agree. *Id.* at ¶¶76-82; *see also id.* at ¶¶83-106. Thus, the alleged electric field would move electrons up, not down.

c. Kawagoe cannot be modified to address carriers in the active region.

Apparently recognizing that Kawagoe doesn't teach anything about carriers in the "active region"[12] 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.

[12] 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*,"

But Petitioner is using hindsight to fill gaps in the prior art. First, in support of that assertion, Dr. Blalock *only* cites Wang (EX1009)—a document whose public availability Petitioner has not established, and which purports to be from ***2008, i.e., four years after the critical date*** for the Challenged Patent. EX1003, ¶95 (citing EX1009); Pet. at ix (Table of Exhibits, listing "2008" for EX1009); EX1009, 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" (EX1003, ¶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. EX2064, ¶¶65-67. 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.*, ¶65. 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.

As explained by Dr. Glew, Petitioner's understanding of Kawagoe's disclosure regarding electrons generated by alpha-rays is incorrect. EX2064, ¶¶51-58, 67, 106. 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" (EX1007, 16:7-11), Kawagoe is *not* describing electrons near the surface. EX2064, ¶¶51-57. 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.

EX2066, 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."); EX2064, ¶¶57, 66-67.

During cross-examination, Dr. Blalock testified that the location of an alpha-ray strike cannot be predicted: "If you have a random alpha ray strike, ***you cannot predict where it will happen.***" EX2058, 147-148. 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, EX1007, 16:7-11) is *extremely low* near the surface (as demonstrated by Nishizawa). EX2064, ¶67. Therefore, the better reading of Kawagoe is that

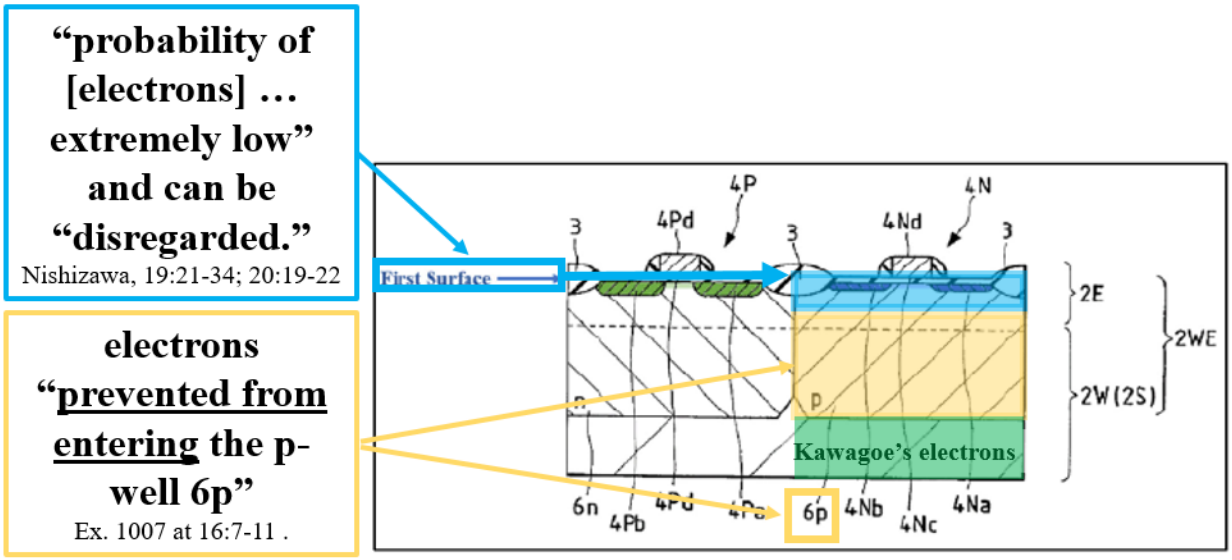
Kawagoe is describing electrons "***produced in the large substrate body below the wells***," as Dr. Blalock conceded. *Id.* Thus, a POSITA would have understood that Kawagoe's electrons that are prevented from entering the p-well are *not* created near the surface. *Id.*

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 the movement of minority carriers" of elements [7.4] or [7.5]. Pet., 18-28; EX1003, ¶¶90-97; EX2058, 171:13-181:11. Silverbrook is relied upon as another secondary reference, but not for the but not for the "aid the movement of minority carriers."

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.

[redacted]



d. 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?
>
> …
>
> 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.

EX2058, 181-182. 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 EX2058, 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.[13] The importance of the factors which Dr. Blalock failed to address are confirmed by a petitioner from a co-pending IPR, Cirrus Logic. Greenthread showed Cirrus Logic's corporate representative, Scott Warrick, a doping profile from one of the Cirrus Logic accused products and asked him if the downward sloping gradient met the "aid carrier movement" claim limitation. He said "I cannot tell you that." *Id.* Greenthread then asked "is that because there's other things that might affect carrier movement besides the gradient?" to which Mr. Warrick replied, "Yes." EX2083, 95:2-5; 96:1-13 (PDF pages 20-21 of 118). Mr. Warrick further testified that "there's a long list of … physical attributes which affect the movement of carriers" and "there's other things that might affect carrier movement besides the gradient." EX2083, 72:6-8, 96:1-13

[13] 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."); *see also* EX1003, ¶97.

(PDF pages 15 and 21 of 118). The expert of Petitioner Monolithic testified similarly. EX2085, 33:14-33:19; 39:8-12.

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

The Petition's Payne grounds fail at least for similar reasons as the Sakai-Kawagoe grounds. Ex. 2064, ¶¶62-67.

The Petition points to Figures 10-11 of Payne for the claimed "graded concentration of dopants" recited in element [7.4]. But for the claimed "aid the movement of carriers" feature of elements [7.4]/[7.5], the Petition relies entirely on Greenthread's supposed admissions:

> Payne's downward-sloping graded-dopant concentration aids the movement of minority carriers from the surface layer to the substrate—more precisely, to an area of the substrate where there are no active regions, as discussed above— *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., 27. Dr. Blalock repeated the Petition's language nearly verbatim without analyzing anything actually disclosed in Payne for the "aid the movement of carriers…" feature. Pet., 21-41; Ex. 1003, ¶¶95-108, 117-121.

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

> Q. And where did you analyze the slope of Payne's gradient in your declaration?
>
> [objection omitted]
>
> THE WITNESS: This is why I'm citing to the patent. I don't -- if there's a gradient, the applicant has said -- oh, yes, here it is. Depends solely on the slope. The patent owner has said, if there's a gradient, that's enough. You know, if there's -- ***if there's a gradient of this trend, high or low, as you go deeper into the substrate, then that is sufficient***. The carriers will move.

Ex. 2058, 165 (emphasis added).

> Q. So you're relying just on the property of it being downward sloping and not the particular slope; right?
>
> A. There's no teaching in the patent about a necessary particular slope.

Ex. 2058, 167.

> Q. The particular slope that you mentioned in your earlier response, you did not analyze any particular slope of Payne, did you?
>
> [objection omitted]
>
> THE WITNESS: I did not measure the slope and do a set of calculations. However, it's already been disclosed that downward -- a downward-sloping gradient is sufficient. ***And I've looked at***

> ***this figure and I see that it's a downward-sloping gradient, and so it meets it.***

Ex. 2058, 167-168 (emphasis added).

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. 2064, ¶¶54-58.

As an additional matter, the Petitioner cites Wang (Ex. 1013) in Ground I but it is not apparent (and not clearly explained in the Petition) how Wang might be in any way relevant to Ground I (which is a single-reference obviousness ground based on Payne). The Petition states 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" and cites page 431 and Figure 2 of Wang. Pet., 29-30 (citing Ex. 1013 at 431, FIG. 2). But the Petition has not clearly explained what has to do with Payne or the Petition's analysis of Payne. The Petition's discussion of Wang should be disregarded for that reason alone.

Additionally, Wang is a document whose public availability Petitioner has not established, and which purports to be from ***2008, i.e., four years after the critical date*** for the Challenged Patent. Ex. 1003, ¶18 (stating that Wang was allegedly "[p]ublished and publicly available in 2008"), 100 (citing Ex. 1013); Pet. at v (Table

of Exhibits, listing "2008" for Ex. 1013); Ex. 1013, 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, ¶100). Therefore, the Petition contains no evidence that a POSITA would have known about SEU carriers at the surface at the time of the Challenged Patent. Accordingly, the Petition cannot properly rely on Wang to demonstrate knowledge of a POSITA regarding any teachings of Payne. EX2064, ¶¶65-67.

Furthermore, as explained by Dr. Glew—who has experience working with alpha-rays (EX2064, ¶10)—a POSITA would have understood that in the context of alpha-rays, carriers are rarely created near the surface. Ex. 2060, 19:21-34 ("[T]he alpha-particle immediately after irradiation to the surface of a semiconductor body has an energy of several MeV, for example about 5 MeV, and [] accordingly, ***the probability of creation of electron-hole pairs is extremely low near the surface.***") (emphasis added); *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."); EX2064 ¶¶57, 66-67. Therefore, a POSITA would not have thought Wang relevant. *See supra* Section IV.B.2 (discussing Wang). EX2064, ¶65.

Therefore, Petitioner cannot rely on obviousness to save its faulty arguments regarding "aid the movement of minority carriers" in the Payne-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.

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]. EX2078 (Rao Decl.). The license covered only the patent family at issue here—no other patents. Moreover, Greenthread had never threatened litigation against either [redacted] 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. 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, are sophisticated semiconductor companies with billions in annual revenue. EX2079. Both companies also frequently file IPR petitions. Yet, without any threat of litigation, both paid for licenses covering just the single patent family at issue here.[14]

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." EX1001, 3:52-56.

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 at the "surface" or "active region" 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

[14] Greenthread later acquired two patents as part of its most recently signed license. However, at the time of the earlier licenses no party had an expectation that Greenthread would acquire additional patents. EX2078.

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, Payne, at best, shows a downward sloping gradient, with no information about whether, why, or how such a gradient might be useful. *Supra* Section VI. Greenthread's licenses discredit Petitioner's argument as hindsight. [redacted] 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, in addition to [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. EX2078. Eight major semiconductor companies have paid more than $50 million—more than $6 million per company on average—for licenses all of which covered <u>*only one patent family*</u>. 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.[15]

a. [redacted] Litigation

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, the litigation settled and Greenthread granted a license to [redacted].

b. Intel[redacted] Litigation

On February 1, 2022, Greenthread served Intel and [redacted] and [redacted] with a complaint filed in the Western District of Texas alleging infringement all of the Challenged Patents, except the ’014 patent. EX2018 (Complaint), 1-4; EX2039 (Returned Summons). After the ’014 Patent’s issuance, Greenthread filed a First Amended Complaint against [redacted] and Intel, served on April 29, 2022. EX2032. The cases were severed and the case

[15] *See* IPR2023-01242, IPR2023-01243, IPR2023-01244, IPR2023-00263, IPR2023-00264, IPR2023-00265, IPR2023-00266.

against Intel was transferred to the District of Oregon. EX2031, 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. EX2032, ¶¶18, 60, 76-81; EX2033, 8 ("[redacted] Accused Products"), 18-20 (section entitled "[redacted] Accused Products"); EX2034, 1-34. After Greenthread served the April 29 complaint accusing [redacted] products, additional counsel stepped in to represent [redacted] with respect to [redacted] products. EX2045. [redacted] then filed its own IPRs against the Challenged Patents that had been asserted against [redacted] products. [redacted] The [redacted] petitions named [redacted] as a real-party-in-interest. *E.g.*, EX2017, 7; EX2016, 7; EX2061, 7; EX2062, 8. Afterwards, Greenthread added [redacted] as a party to the [redacted] litigation. EX2019. Greenthread and Intel, [redacted] settled their disputes and Greenthread granted [redacted] and Intel licenses.

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"). EX2022, 2. Greenthread licensed [redacted] (and [redacted] and [redacted]) in one agreement signed

July 8, 2020. EX2078. Greenthread signed the second agreement, licensing Intel and [redacted] on April 7, 2023. EX2022. The two agreements are similar in 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." EX2028.

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." EX2022, 3 (definition of "Patent License"); EX2078, Appendix B, 3 (definition of "Patent License"); *see also* EX2028.

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. EX2022, 2; EX2078, Appendix B, 2.

The Licenses cover all of Greenthread's patents, including the Challenged Patent. *See* EX2022, 3-4 and 17; *see also* EX2063, 3 and 15.

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." EX2022, 2-3; *see also* EX2078, 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"). EX2020.

On July 27, 2023, Petitioner filed three IPRs challenging the '842 and '222 Patents. IPR2023-01242; IPR2023-01243; IPR2023-01244. Those IPRs were instituted on February 12, 2024. 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,'014, '502, '195 Patents. 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 (EX2003 at 12 (identifying [redacted] and [redacted]), EX2014, 3-4; Paper 8, 1 (citing EX2003-EX2008); EX2004, 10; EX2036, 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] are customers of Petitioner." IPR2023-01242, Paper 11 (onsemi's Opposition to Patent Owner's Motion for Additional Discovery), 10. *See also* EX2036, 11; EX2019, ¶¶12, 28-30, 36, 79, 85, 101-104; EX2006, EX2015; EX2032, ¶¶50-52; EX2035, 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.

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 … can establish privity" when the indemnity obligations "directly relate to the" accused products). 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 petition's timeliness "into dispute," "the Board c[an] no longer merely rely upon" the petitioner's assertion that its petition is timely. *Id.* at 1246. 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. EX2001, 2, 4; EX2018. [redacted] was an RPI to the First Amended Complaint against [redacted] (served by ECF on April 29, 2022). EX2032; EX2017, 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 to controvert. Accordingly, the Petition should be dismissed.

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

In 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; EX2014, 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).

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 that "Petitioner is not barred or estopped from requesting IPR of the Challenged Claims on the grounds identified in this Petition." Pet., 5. That is inadequate as 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. However, Petitioner refused to provide any discovery whatsoever. Therefore, 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.

Even 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 on the one hand and Licensees on the other 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. Uder 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 , which was accused in the litigation. EX2036, 11; *see* EX2019, ¶¶12, 28-30, 36, 79, 85, 101-104; EX2048, 18. Similarly, Petitioner's data sheets describe its NCP81248 product as being "optimized for Intel's … CPUs," and including an "Intel Proprietary Interface." EX2006, EX2015. The NCP81248 chip is accused in the current district court litigation and numerous Intel CPUs were accused in the Intel litigation. EX2032, ¶¶50-52; EX2035, 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. EX2004, 10-13, 21; EX2035, 5. Further, it would be unfair for Petitioner to dispute that it sells accused products to Intel and 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. EX2021, 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). Likewise the Intel and [redacted] litigation settled early in discovery before Greenthread's accusations in those cases could expand in discovery.

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. 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.

Finally, how Petitioner's products end up in Licensees' products is irrelevant. Petitioner is still a preceding owner of property that was previously accused and is accused again, even if the property flows through another party.

c. Petitioner and RPI are a beneficiaries 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' agreements with Patent Owner.

Those agreements are "directly related to" the accused products, because they licenses some of them. *Id.*

Under the Licenses, "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." EX2022, 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 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." EX2010, 3. The agreement further gives Petitioner "sole control of the defense" in any action for which it will indemnify the purchaser. *Id.* Presumably, Petitioner's 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.

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. 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.

e. 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"). EX2041. 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. 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 damages 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.[16]

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 128 at 10 (PTAB Oct. 2, 2020) (precedential). Therefore, the fact that the Petitioner

[16] Patent Owner is not suggesting that Petitioner could make its Petition timely by disclaiming a license defense in district court. Petitioner cannot turn privity on and off at will.

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 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 there is no evidence to support this conclusion.

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). 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. THE AIA IS UNCONSTITUTIONAL.

The Board should dismiss this IPR, because the AIA violates the Supreme Court's non-delegation doctrine and the Constitution. "Congress generally cannot delegate its legislative power to [the Executive] Branch" without identifying an "intelligible principle" to guide the Executive's exercise of that power. *Mistretta v. United States*, 488 U.S. 361, 372 (1989). In determining whether a statutory scheme violates the non-delegation doctrine, Courts consider "(1) whether Congress has delegated power to the agency that would be legislative power but-for an intelligible principle to guide its use and, if it has, (2) whether it has provided an intelligible principle such that the agency exercises only executive power." *Jarkesy v. Sec. & Exch. Comm'n*, 34 F.4th 446, 461 (5th Cir. 2022).

The power to determine whether a dispute proceeds before an "Article III court" or in an "agency adjudication" is a "legislative power" "that Congress uniquely possesses." *Id.* at 462. Here, Greenthread and Petitioner is currently litigating its dispute, including the issue of patent validity, in Article III Courts. In the AIA, however, Congress delegated to the Director the power to determine whether the PTAB should decide the very same dispute. In other words, the Director

decides whether Greenthread "should receive *certain legal processes* (those accompanying Article III proceedings)" such as the protections of a jury trial and the clear and convincing evidence standard for patent validity. *Id.* (emphasis in original); *see also Microsoft Corp. v. i4i Ltd. P'ship*, 564 U.S. 91, 95 (2011) (affirming the clear and convincing evidence standard).

In § 314(a), Congress has told the Director when she can institute proceedings—i.e., only if "there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims"—but once that criterion is satisfied, the decision to institute is committed "to the Director's unreviewable discretion" without any further guiding principle. 35 U.S.C. § 314(a); *United States v. Arthrex, Inc.*, 141 S. Ct. 1970, 1977 (2021); *Aple Inc. v. Vidal*, 63 F.4th 1, 6 (Fed. Cir. 2023). After making the threshold finding under § 314(a), the Director can institute or not institute for any reason, no reason, or a completely arbitrary reason, like the flip of a coin. She could institute every petition meeting the § 314(a) or no petitions at all, if she prefers. She need not give any reasons for her decision. Since Congress provided no intelligible principle for the Director to apply in deciding whether to institute IPR proceedings, the statute governing these proceedings is unconstitutional and the Petition must be dismissed.

X. 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: November 21, 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 13,417 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: November 21, 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 **November 21, 2024**, in its entirety on the following counsel of record for Petitioner:

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