

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SEMICONDUCTOR COMPONENTS INDUSTRIES, LLC,
Petitioner,

v.

GREENTHREAD, LLC,
Patent Owner.

IPR2023-01242
U.S. Patent No. 11,121,222

PATENT OWNER'S SUR-REPLY

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OTHER AUTHORITIES

37 C.F.R. § 42.23(b) 5

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EXHIBIT LIST

Exhibit No.	Description	Submitted Previously?
Ex. 2001	<i>Greenthread, LLC v. Intel Corp.</i> , No. 6:22-cv-00105-ADA, Dkt. 7 (summons returned executed) (W.D. Tex. Feb. 7, 2022)	X
Ex. 2002	Email communication from Petitioner’s counsel to Patent Owner’s counsel October 16, 2023	X
Ex. 2003	Presentation entitled “Accelerating the Journey Towards a Sustainable Ecosystem” (2023) available at Petitioner’s website at https://www.onsemi.com/site/pdf/2023_Analyst_Day_Presentation.pdf	X
Ex. 2004	“Clock Devices for Servers” (Aug. 2020) available at https://cdrdv2-public.intel.com/620306/620306_Clock_Devices_For_Server_Rv1p3.pdf	X
Ex. 2005	On Semiconductor Corporation Form 10-K filing with U.S. Securities and Exchange Commission for the fiscal year ended December 31, 2016	X
Ex. 2006	ON Semiconductor data sheet entitled “NCP81248 Three-Rail Controller with Intel Proprietary Interface for IMVP8 CPU Applications” (Feb. 2018) available at https://www.onsemi.com/pdf/datasheet/ncp81248-d.pdf	X
Ex. 2007	onsemi data sheet entitled “+ 1 Phase Output Controller with SVID Interface for Computer CPU Applications” (May 2023) available at https://www.onsemi.com/download/datasheet/pdf/ncp81566-d.pdf	X

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Ex. 2008	Onsemi data sheet entitled “+ 2 Phase Output Controller with SVID Interface for Computer CPU Applications (May 2023) available at https://www.onsemi.com/download/data-sheet/pdf/ncp81567-d.pdf	X
Ex. 2009	Article entitled “If You Invested \$1000 in ON Semiconductor Corp. a Decade Ago, This is How Much It’d Be Worth Now,” May 8, 2023 available at https://finance.yahoo.com/news/invested-1000-semiconductor-corp-decade-123012312.html	X
Ex. 2010	Onsemi Standard Terms and Conditions of Sale, Rev.08102021 available at https://www.onsemi.com/site/pdf/ONSEMI_T&C.pdf	X
Ex. 2011	Plaintiff’s First Set of Common Interrogatories to Defendants ON Semiconductor Corporation and Monolithic Power Services, Inc., Et Al., <i>Greenthread, LLC v. ON Semiconductor Corp.</i> , No. 23-443-RGA (D. Del.) (served Sept. 27, 2023)	X
Ex. 2012	Plaintiff’s First Set of Common Requests for the Production of Documents to Defendants ON Semiconductor Corporation and Monolithic Power Services, Inc., Et Al., <i>Greenthread, LLC v. ON Semiconductor Corp.</i> , No. 23-443-RGA (D. Del.) (served Sept. 27, 2023)	X
Ex. 2013	Definition of “privity” in Black’s Law Dictionary (11 th ed. 2019) available from Westlaw at westlaw.com	X
Ex. 2014	Email communication from Petitioner’s counsel to Patent Owner’s counsel October 11, 2023	X
Ex. 2015	Plaintiff’s Identification of Accused Products and Asserted Patents, <i>Greenthread, LLC v. ON Semiconductor Corp.</i> , No. 23-443-RGA (D. Del.) (served Oct. 12, 2023)	X

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

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Exhibit No.	Description	Submitted Previously?
Ex. 2028	Confidential declaration	X
Ex. 2029	Email communication from Patent Owner's counsel to Petitioner's counsel between May 26 to June 1, 2023	X
Ex. 2030	Web pages from websites of Onsemi (www.onsemi.com), Mouser Electronics, Inc. (www.mouser.com), Rochester Electronics (www.rocelec.com), and DigiKey Corporation (www.digikey.com) (URLs for web pages are indicated on respective pages)	X
Ex. 2031	<i>Greenthread, LLC v. Intel Corp.</i> , No. 6:22-cv-00105-ADA, Dkt. 113 (Redacted Memorandum Opinion and Order) (W.D. Tex. Dec. 27, 2022)	X
Ex. 2032	<i>Greenthread, LLC v. Intel Corp.</i> , 6:22-cv-00105-ADA, Dkt. 38 (First Amended Complaint for Patent Infringement) (W.D. Tex., filed Apr. 29, 2022)	X
Ex. 2033	<i>Greenthread, LLC v. Intel Corp.</i> , 6:22-cv-00105-ADA, Dkt. 38-8 (Greenthread's Amended Preliminary Infringement Contentions) (W.D. Tex., filed Apr. 29, 2022)	X
Ex. 2034	<i>Greenthread, LLC v. Intel Corp.</i> , 6:22-cv-00105-ADA, Dkt. 38-12 (Exs. D-1, D-2, D-3, D-6 to Greenthread's Preliminary Infringement Contentions) (W.D. Tex., filed Apr. 29, 2022)	X
Ex. 2035	Plaintiff's Supplemental Identification of Asserted Patents and Accused Products in <i>Greenthread, LLC v. ON Semiconductor Corp.</i> , No. 23-443-RGA (served to Petitioner's counsel on Nov. 10, 2023)	X
Ex. 2036	Webpage regarding iFixIt, PlayStation 5 Teardown (https://www.ifixit.com/Teardown/PlayStation+5+Teardown/138280)	X

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Exhibit No.	Description	Submitted Previously?
Ex. 2037	Webpage from Mouser Electronics, Inc. for NCP252160 (https://www.mouser.com/ProductDetail/onsemi/NCP252160MNTWG?qs=sPbYRqrBIVkc9klnZ2pXbg%3D%3D)	X
Ex. 2038	Webpage from DigiKey for NCP252160 (https://www.digikey.com/en/products/detail/onsemi/NCP252160MNTWG/15859992)	X
Ex. 2039	Webpage from Mouser Electronics, Inc. for NB3L202K (https://www.mouser.com/ProductDetail/onsemi/NB3L202KMNTXG?qs=z6PAvqrmkvR8PcLN2EnUzg%3D%3D)	X
Ex. 2040	Webpage from DigiKey for NB3L202K (https://www.digikey.com/en/products/detail/onsemi/NB3L202KMNTXG/7220446)	X
Ex. 2041	Definition of “agent” in Black’s Law Dictionary (11 th ed. 2019) available from Westlaw at westlaw.com	X
Ex. 2042	<i>Greenthread, LLC v. Intel Corp.</i> , 6:22-cv-00105-ADA, Dkt. 135 (Motion for Admission Pro Hac Vice of L. Popovski on Behalf of Sony) (W.D. Tex., filed January 30, 2023)	X
Ex. 2043	[RESERVED]	
Ex. 2044	Email communication from Patent Owner to Petitioner’s litigation counsel dated September 13, 2023	X
Ex. 2045	<i>Greenthread, LLC v. Intel Corp.</i> , 6:22-cv-00105-ADA, Dkt. 49 (Notice of Appearance of Additional Counsel) (W.D. Tex., filed June 9, 2022)	X
Ex. 2046	[RESERVED]	

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

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

Exhibit No.	Description	Submitted Previously?
Ex. 2071	File History of U.S. Patent No. 11,316,014	X
Ex. 2072	Declaration of Phil John	X
Ex. 2073	Statista Information	X
Ex. 2074	Petition in <i>Sony Group Corp. v. Greenthread, LLC</i> , IPR2023-00325	X
Ex. 2075	Petition in <i>Sony Group Corp. v. Greenthread, LLC</i> , IPR2023-00375	X
Ex. 2076	[RESERVED]	
Ex. 2077	<i>Greenthread, LLC v. Cirrus Logic Inc.</i> , No. 1:23-cv-369-DC-DTG, Dkt. 53 (Claim Construction Order and Memorandum in Support Thereof) (W.D. Tex. Mar. 13, 2024)	
Ex. 2078	<i>Greenthread, LLC v. Cirrus Logic Inc.</i> , No. 1:23-cv-369-DC-DTG, Dkt. 37 (Opening Claim Construction Brief by Greenthread) (W.D. Tex. Nov. 27, 2023)	
Ex. 2079	<i>Greenthread, LLC v. Samsung Elecs. Co.</i> , No. 2:19-CV-00147-JRG, 2020 WL 1911200 (Claim Construction Memorandum Opinion and Order) (E.D. Tex. Apr. 20, 2020)	
Ex. 2080	Exhibit 2022 in <i>Texas Instruments Inc. v. Greenthread LLC</i> , IPR2024-00771 (including excerpts of the Deposition Transcript of Scott Warrick taken on June 7, 2024 along with marked Exhibits 3-5 in <i>Greenthread, LLC vs. Cirrus Logic, Inc.</i> , 1:23-cv-00369-DC (W.D. Tex.))	

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Exhibit No.	Description	Submitted Previously?
Ex. 2081	Email communications between the Board, Petitioner's counsel and Patent Owner's counsel dated August 13, 2024	

I. INTRODUCTION¹

As Petitioner says, “[t]here is no dispute among the experts on the[] ‘basic physics.’” Paper 62 at 9. There cannot be a dispute because Petitioner submitted no rebuttal declaration and Petitioner’s expert largely agrees with Greenthread. The record confirms that simply grading dopants does not guarantee carrier movement. For at least this reason, the Petition should be denied because the “aid carrier movement” limitation is not in the prior art.

Since Petitioner cannot show the “aid carrier movement” limitation in the prior art, Petitioner says it “disagrees with PO’s characterization of the ‘aid carrier movement’ limitation.” Paper 62 at 2 (emphasis added). In other words, Petitioner is seeking a new claim construction. Setting aside the merits of Petitioner’s belated construction, Greenthread has had no opportunity to introduce evidence supporting a contrary construction or cross examine Petitioner’s expert on its proposed construction. The Petition can be denied on this basis alone.

Petitioner’s new construction also fails on the merits. Petitioner argues that the prior art shows a “force,” and that a mere “force” “aids carrier movement.” But,

¹ Greenthread, LLC (“Patent Owner,” “PO,” or “Greenthread”) submits this Sur-Reply to the Petition for *Inter Partes* Review (“Petition”). This Sur-Reply is timely filed in accordance with the parties’ stipulation. Paper 42.

a force cannot “aid movement” when there is no movement. A force also cannot push in one direction and “aid movement” in the opposite direction. Petitioner’s construction is absurd. It is also contrary to prior district court constructions of the term and the record evidence here.

In parallel district court proceedings, the District Court said that “the graded concentration has to be sufficiently graded” to cause movement. Petitioner 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.” Ex. 2057 at 29. Far from disputing the District Court’s construction or Dr. Glew’s testimony, Petitioner’s expert, Dr. Blalock, previously construed “aid carrier movement” 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. Ex. 2058, 188:16-189:16. Stuck with Dr. Blalock’s admissions, Petitioner tries to introduce a new claim construction, without any support, and contrary to how the claims have been previously construed. The Petition should be denied and the challenged claims should be found to be patentable.

II. ARGUMENT

A. **Petitioner relies on a tardy and erroneous claim construction that is contrary to its own expert’s prior opinions.**

In its reply, Petitioner claims for the first time that it “disagrees with PO’s characterization of the ‘aid carrier movement’ limitation” and argues that “any given

electric field will aid electron movement.” Paper 62 at 2, 7 (emphasis added). Petitioner claims that “an ‘electric field’ means ‘aided’ in one direction.” *Id.* at 9 (emphasis added). Petitioner thus seeks to “characterize” (i.e., construe) “aid carrier movement” as satisfied by *any* force that pushes in *any* direction—even if there is no carrier movement or the force pushes opposite to the movement. Petitioner’s attempt to rely on a new claim construction in its reply is improper.

The Board should reject Petitioner’s new claim construction because it was not in the Petition and Greenthread had no basis to expect it or chance to address it with its own expert testimony or other evidence. *M & K Holdings, Inc. v. Samsung Elecs. Co.*, 985 F.3d 1376, 1385 (Fed. Cir. 2021). Greenthread could not reasonably have anticipated Petitioner’s new construction because it is contrary to a construction adopted by Petitioner’s expert in other proceedings on the same patent. In another IPR on the same patents, Dr. Blalock said that “aid carrier movement from” means “to sweep the carriers from.” *Dell Technologies Inc. et al, v. Greenthread LLC*, IPR2023-00509, Ex. 1003 at 22 (“I support Petitioner’s proposed constructions.”) (“Prior Blalock Declaration”).² Carriers are not “swept” in a direction by a force that pushes in the opposite direction or when they do not move

² Petitioner acknowledged Dr. Blalock’s prior constructions in the Petition. *See* Pet. at 6.

at all. Greenthread is unfairly prejudiced by the lack of an opportunity to cross examine Dr. Blalock on the inconsistency between his prior position and the one Petitioner now adopts.

Unsurprisingly, since its own expert previously proposed an incompatible construction, Petitioner does not offer a supporting declaration from Dr. Blalock about which he could be deposed. The undisputed record evidence is counter to Petitioner's implicit construction. Dr. Glew averred that "if two forces are acting on an object in opposite directions, both forces cannot aid its movement." Ex. 2057 at 29.

Furthermore, two district courts have held that the mere gradient itself does not satisfy the "aid carrier movement" limitation. The Western District of Texas said that "the graded concentration has to be sufficiently graded" to create the electric field that will cause movement and that "a graded concentration...that is [not 'sufficiently graded'] will not" "aid movement." Ex. 2077, 39-40 ("WDTX *Markman* Order").³ In another decision, the Eastern District of Texas said that "the

³ Patent Owner recognizes that exhibits are not traditionally introduced at the sur-reply stage. Patent Owner only included exhibits now to respond to arguments first introduced in Petitioner's Reply. Additionally, Exhibits 2077-2080 are publicly

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.” *Greenthread, LLC v. Samsung Elecs. Co.*, 2020 WL 1911200, at *9 (E.D. Tex. Apr. 20, 2020) (Ex. 2079) (emphasis added).

Finally, the petitioner in a parallel IPR, Cirrus, also admitted that one cannot know from a gradient alone that the “aid carrier movement” limitation is met, because other forces must be considered. Ex. 2080 (“Cirrus Testimony Exhibit”) at 20.⁴

available, and the Board may take judicial notice of them. Patent Owner attached these Exhibits for the convenience of the Board.

⁴ On August 30, 2024, Patent Owner emailed the Board requesting waiver of 37 C.F.R. § 42.23(b) to make the Cirrus Testimony Exhibit of record in these proceedings. Email from counsel for Greenthread to trials@uspto.gov, dated August 30, 2024. The testimony did not exist at the time of Greenthread’s POR. As of this filing, the Board has not responded to Greenthread’s request. Petitioner’s arguments for excluding this testimony are meritless. The exhibit was public and part of the prosecution history of the Challenged Patents before Petitioner filed its reply. Petitioner’s reply addresses *other* parts of the recent prosecution history and includes

B. A gradient alone does not “aid carrier movement.”

The “probability or possibility” that a dopant gradient aids carrier movement “is insufficient” for Petitioner to make out its prima facie case. *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999). In the absence of an express teaching that a specific gradient disclosed in the prior art is “sufficiently graded” to “aid carrier movement,” Petitioner must show that the prior art “*necessarily* include[s] the unstated

new prosecution history exhibits. *See* Paper 62 at 6 (citing Exs. 1054, 1055). Petitioner also liberally cites to institution decisions in other IPRs that issued after Greenthread’s POR. *E.g. id.* at 1 n.1; 11; 14 n.4. Petitioner cannot pick some parts of the subsequent prosecution history to make part of the record while blocking others. Petitioner’s citations to these later filings show that it has been monitoring subsequent prosecution history and Greenthread’s arguments. Therefore, Petitioner knew (or should have known) of the Cirrus testimony and if Petitioner wanted to depose Cirrus it could have sought permission to do that. Petitioner chose not to do that, because Cirrus and Petitioner are in a joint defense group. The Cirrus Testimony Exhibit is admissible as part of the prosecution history, as a statement against interest, *see* Fed. R. Evid. 804(b)(3), and as evidence of secondary indicia of non-obviousness. *See infra* Section II.J (citing *Vulcan Eng’g Co. v. Fata Aluminium, Inc.*, 278 F.3d 1366, 1373 (Fed. Cir. 2002)).

limitation.” *Transclean Corp. v. Bridgewood Servs., Inc.*, 290 F.3d 1364, 1373 (Fed. Cir. 2002) (emphasis in original); WDTX *Markman* Order at 39-40. A gradient alone does not “*necessarily*” or inherently “aid carrier movement,” because there is no dispute that other forces affect carrier movement and can overwhelm the force of the gradient.

Petitioner’s expert admitted that a gradient does not “*necessarily*” aid carrier movement:

Q. Is there a gradient that would be so steep or so shallow, that it would not aid carrier movements?

A. ...who knows...someone [could] create[] an additional force, that might be larger than the force created by the gradient.

Ex. 2058, 137:17-139:6 (emphasis added); *see also* POR at 16-18 nn.7-8 (collecting admissions from Dr. Blalock). Dr. Blalock’s statement is similar to the WDTX claim construction order. Petitioner’s expert also said that “environmental effect[s]” can affect carrier movement. Ex. 2058 at 132:12. Petitioner offers no rebuttal to Dr. Glew’s testimony that “the resistance of the material in which the gradient exists [i.e. silicon],” diffusional forces, or any other “form of energy” can affect carrier movement, potentially overwhelming any effect of a gradient. Paper 47 at 20; Ex. 2057 at 30; Ex. 1052 at 87:14-88:7. Since the Petition fail to address whether these

forces are present and whether they counteract the force of the gradients in the prior art, the Petition fails to show that the gradients “aid carrier movement.”

Petitioner dismisses these undisputed forces as “hypothetical,” but offers no rebuttal to Dr. Glew’s testimony. The forces are not hypothetical. They are “always” present. Ex. 1052 at 87:14-88:7 (emphasis added). A parallel Petitioner agreed with Dr. Glew. Cirrus Testimony Exhibit at 15 (“[T]here’s an inherent level of resistance in silicon? A. Correct.”).

Regardless, the forces at issue do not need to be more than hypothetical to defeat inherency. Petitioner cannot rely on the “probability” that these forces would defeat the gradient. *In re Robertson*, 169 F.3d at 745. Petitioner must show that they would never overwhelm the gradient. The fact that a reference does not explicitly discuss a force does not mean that the force is absent or that a POSITA would disregard it.

Petitioner’s argument that the non-gradient “forces are not shown in the prior art,” fails for similar reasons. Paper 62 at 8. First, it is undisputed that resistance is “always” present. Ex. 1052 at 146:16-18 (emphasis added). Therefore, at least this force is present in Petitioner’s prior art references.

Second, Petitioner is simply flipping the burden of proof. To carry its burden, Petitioner must affirmatively show that other forces are absent or that the gradient is stronger. There is no basis to assume that a gradient aids carrier movement when a

reference is silent about (1) whether it does, and (2) the factors that would determine that it does.

Finally, petitioner in parallel IPRs, Cirrus, admitted that a graded dopant concentration does not inherently aid carrier movement. Cirrus's corporate representative testified that "there's a long list of...physical attributes which affect the movement of carriers" and that "there's other things that might affect carrier movement besides the gradient." Cirrus Testimony Exhibit at 72:6-8; 96:1-13.

C. Kawagoe's graded dopant concentration does not "aid carrier movement from ... the active regions."

Petitioner's observation that Kawagoe's transistor has carriers in the active region is irrelevant. The issue is what Kawagoe *teaches* about carriers in the active region and the gradient in the active region. Kawagoe does not teach anything relevant about them. Since Petitioner is "*not* proposing any modification of Kawagoe," Petitioner cannot apply Kawagoe's teachings about *other* carriers and structures in Kawagoe to the carriers and structures in the active region. Paper 62 at 15 (emphasis in original).

All of Kawagoe's (purported) teachings about a gradient that "aids carrier movement" refer to gradients and carriers *outside* the active region. The Petition itself confirms that Kawagoe's teaching "refers to electrons produced in the large substrate body below the wells." Pet. at 21 n.7. The carriers Kawagoe discusses are "prevented from entering the p-well," and are thus below it. Paper 47 at 23.

Dr. Glew testified that Kawagoe “only describes that this dopant gradient is able to keep SEU electrons out of the well,” and says nothing about drawing carriers “from the...active regions.” Ex. 1052 at 122:6-9; 121:11-17 (Q. And this electric field resulting from the graded dopant concentration of Figure 17 would sweep those electrons [in the active region] from the active region down into the substrate? A: It doesn’t disclose that.”). Petitioner’s expert Dr. Blalock does not dispute Dr. Glew’s analysis and failed to submit a rebuttal declaration. Rather, Dr. Blalock relied on Wang to supplement Kawagoe, in an attempt to apply its teachings to carriers in the active region. This is improper. Because Petitioner now says it is not modifying Kawagoe, its argument fails.

Furthermore, Petitioner offers no analysis of Kawagoe’s electric field to show that it has the same effect in the active region as further down. Whether Kawagoe’s “downward facing electric field is...negated or reversed by other fields or forces” depends on location. Paper 62 at 11. The strength of an electric field changes over distance. Ex. 1052 at 96:24-97:2 (“[C]harge particles interact to a certain distance, and then at some point, that distance can be canceled out or the charge is canceled out so they[] no longer -- interact.”). Therefore, the force created by a gradient may be “negated or reversed” in one location, but not in another. Carriers in one location (the active region) will not be subject to the same forces as carriers in another location (e.g. “large substrate body below the wells”). Even when they are subject

to the same forces, they would not be affected to the same degree. Petitioner points to no evidence that Kawagoe’s field is the same throughout and is not “negated or reversed” *in the active region*. Kawagoe only discusses “electrons produced in the large substrate body below the wells.” Pet. at 21 n.7.

D. Petitioner’s Kawagoe Grounds rely on an incorrect mapping of the claims.

Petitioner mapped the claims in Kawagoe to a transistor that does not meet the claim elements of the Challenged Patent. The Petition maps the Challenged Patent to the “4N” transistor in Kawagoe. The doping in the “active region” of the 4N transistor is P-type, because it is created in a P-well.⁵ According to Petitioner Kawagoe’s substrate is *also* P-type.⁶ However, the Challenged Claims require that

⁵ Ex. 1007 at 15:29 (“The p-well 6p is doped with a p-type impurity...”); Ex. 1052 at 24:22-25 (“[A]ctive region exists before the transistors, the well exists before the transistors are formed, it has a type, n or p, and then the transistors are formed in that doped region.”); 27:25-28:2 (“The source and drain are formed by counter-doping, doping opposite the active region.”).

⁶ Ex. 1007 at 6:62-63 (“The semiconductor substrate body 2S is doped with a p-type impurity...”); Ex. 1003 at 32 (“first doping type (p-type)”).

this “active region” doping and the substrate doping be “opposite in conductivity.”⁷ Since the “active region” and “substrate” Petitioner mapped are both P-type, Petitioner’s mapping fails.

To correct this obvious problem, Petitioner makes two arguments. First, Petitioner asks for a claim construction. Petitioner asks the Board to construe “the ‘doping type’ of the ‘first active region’ [a]s the doping type of the associated source and drain regions.” Paper 62 at 18. This claim construction fails for several reasons.

First, the argument is late and therefore improper. “[T]he Board must base its decision on arguments that were advanced by a party, and to which the opposing party was given a chance to respond.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1381 (Fed. Cir. 2016). Greenthread has had no opportunity to submit additional evidence to dispute this claim construction or cross examine Petitioner’s expert on it. Indeed, Petitioner cannot even say that its own expert agrees with this construction, because he did not submit a rebuttal declaration supporting it.

Second, the Petitioner’s proposed construction is wrong on the merits. The doping type of the “active region” cannot be the doping type of the source and drain,

⁷ The doping of the substrate is the “first doping type” and the “first active region” (i.e. 4N in Petitioner’s mapping) must have “a second doping type opposite in conductivity to the first doping type.”

as Petitioner proposes, because an “active region” can exist without a source and drain. The claim recites that a transistor is “formed in” the active region. As Dr. Glew testified the “active region exists before the transistors.” Ex. 1052 at 24:22-25. “The source and drain are formed by counter-doping, doping opposite the active region.” *Id.* at 27:25-28:2 (emphasis added). The textbook that Petitioner cites says the same.⁸

Petitioner tries to bolster its argument by claiming that the “active regions” in Figures 5B and 5C in the Challenged Patent are not “opposite in conductivity” to the substrate in those examples. However, as Dr. Glew explained, Petitioner is ignoring Figure 5A. “Looking back at 5A, one can see a p-well and an n-well. ... [S]ources and drains are of the opposite type of well or active area they’re formed in. So if I have an n-type source and drain, it will be formed in a p-type [active] region.” Ex. 1052 at 24:1-9. There is no requirement that every figure in a specification disclose every aspect of every claim and Petitioner’s cherry picking cannot support its argument.

⁸ Ex. 1008A at 123 (“An n-type implant heavy enough to overcompensate for the boron implant in the active regions of the n-channel devices is used to form the sources and drains of the NMOS transistors.”); Ex.1008B at 63 (“Patterning of the active region”); 64 (“Active region formation”).

Petitioner's second argument is that a different "adjacent" transistor in Kawagoe would satisfy the claim limitations. This is obviously improper. *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d at 1381. Even if part of a prior art reference is discussed in the petition, it cannot be used to satisfy a claim element when the Petition does not use it for that purpose. *Oren Techs., LLC v. Proppant Express Invs. LLC*, No. 2019-1778, 2021 WL 3120819, at *4 (Fed. Cir. July 23, 2021). Petitioner offers attorney argument that the "adjacent" transistor is "indistinguishable" from transistors described in the Challenged Patent, but that assertion is not supported by any testimony from Petitioner's expert. Greenthread has not had the opportunity to depose Petitioner's expert on this claim or submit evidence to dispute that claim. Greenthread's expert report and Patent Owner Response (POR, Paper 47) focused on the 4N transistor, because that is what was in the Petition. Ex. 1052 at 130:16-17.

E. Petitioner's Wieczorek-Wolf grounds fail.

Petitioner incorrectly claims that Greenthread failed to address its Wieczorek-based invalidity theories. Greenthread addressed them in its POR under the heading "Petitioner's Wieczorek-Based Arguments are Deficient." Paper 47 at 29-31. Wieczorek does not disclose anything other than a dopant gradient, which for the reasons discussed above, does not by itself satisfy the "aid carrier movement" claim limitation. Petitioner's reply does not identify any disclosure in Wieczorek other

than this gradient. More importantly, Petitioner did not point to any such disclosure in the Petition.

Petitioner again claims that Greenthread is relying on “hypothetical” forces that might counteract the gradient, but that fails for the reasons stated above. The forces are not hypothetical. The undisputed record is that “there’s always some resistance to a semiconductor.” Ex. 1052 at 146:18. Regardless, if Petitioner claims that a gradient inherently “aids carrier movement” it must show that it *necessarily* and *always* does so. *Supra* Section II.B. Petitioner must show that these forces are not present in Wieczorek which it does not attempt to do.

F. Greenthread’s supposed “admissions” do not support Petitioner.

Petitioner’s Reply regurgitates numerous strawmen from the Petition, all of which should be disregarded.

Petitioner criticizes Greenthread’s statement that “[w]hether the carrier movement has a particular speed or acceleration is beyond the scope of the claim.” Paper 62 at 3. The statement is perfectly consistent with Greenthread’s argument here, which also does not require “a particular speed or acceleration.” The problem with Petitioner’s implicit claim construction is that it encompasses any gradient, even if it imparts *no* speed to the carriers, or the carriers accelerate in the *opposite* direction from the gradient.

Petitioner says Greenthread wants to construe the claims to “require[] calculating the slope of a dopant concentration” or a “specific slope magnitude.” Paper 62 at 3. This is untrue. Slope determines the magnitude of the force of a dopant gradient. Therefore, the slope is relevant to the claims, because it must be compared with other forces. A POSITA knows how to do that. However, the claims do not require any particular slope other than one sufficient to “aid carrier movement” under the circumstances. Two district courts have agreed with Greenthread that magnitude is relevant, without reading a “specific slope” into the claims. WDTX *Markman* Order at 39-40; *Greenthread*, 2020 WL 1911200 at *9. The Petition fails because Petitioner’s expert failed to consider magnitude at all.

Petitioner also repeats its argument that Greenthread has said that “charge carriers will move.” Reply at 3-4. The quote comes from the background section of a claim construction brief, where Greenthread was explaining a phenomenon called “carrier drift.” Ex. 1020, 2. By definition, carrier drift is carrier movement. Ex. 2057, ¶33.⁹ Greenthread’s explanation, therefore, assumed the conditions under

⁹ The textbook Petitioner cites confirms that drift is a category of carrier movement. Ex. 1008B at 143 (“Some of these electrons...will drift out...”); Ex. 1008C at 34 (“electrons are likewise drifted toward the surface”); 116 (“carrier transport in the

which carrier drift occurred. Greenthread was not saying that a gradient could cause drift even if other forces overwhelmed the gradient. No reasonable reader would construe Greenthread's statements as Petitioner does. Greenthread included the identical statement that "carriers will move" when drift occurs in another claim construction brief. Ex. 2078 at 2. The District Court did not construe Greenthread's statements as Petitioner does. Rather, the Court said that "the graded concentration has to be sufficiently graded" to cause movement. WDTX *Markman* Order at 39.

Petitioner again quotes Greenthread's prior statement that "[d]epending on the particular slope of the graded concentration of dopant, all minority carriers are either swept 'down'...or 'up'..." Paper 62 at 5 (quoting Ex. 1016, 289). The "particular slope" determines the magnitude of the gradient's force, and this is how the District Court understood the claims. "[T]he graded concentration has to be sufficiently graded to result in a 'static unidirectional electric drift field to aid the movement of minority carriers.'" WDTX *Markman* Order at 39-40.

Petitioner selectively quotes from a recent office action response in which Greenthread said that a "'relative slope'...means nothing more than the fact that one-side is relatively lower than the other side." Ex. 1054 at 12. However, Petitioner

channel by both drift and diffusion current"); 194 ("The current at the drain is given by the product of the carrier density and the drift velocity.").

omits the rest of the statement which says that the slope must “create a suitable aiding drift electric field, to help the” carriers move. *Id.* (internal quotation marks omitted). This is no different than the WDTX claim construction order, which says that the “graded concentration has to be sufficiently graded to result in a ‘static unidirectional electric drift field....’” WDTX *Markman* Order at 39-40.

During prosecution, the examiner noted that carrier movement “is affected by multiple forces and fields” which must be evaluated to determine whether a gradient would aid carrier movement. Ex. 1016 at 270. In a parallel institution decision, the Board said that Greenthread previously “disagreed with the Examiner’s position.” IPR2024-00265, Paper 22 at 18-19. This is incorrect.

Greenthread disagreed with the Examiner’s conclusion that the claim at issue there (which never issued) should be rejected, but was not disagreeing with the relevant part of the Examiner’s statement. A gradient is not the only force acting on a carrier. As Greenthread previously explained, the other claim elements modify the gradient and are an “additional parameter” so that a gradient alone does not satisfy the claim limitation. Paper 47 at 15. Even if Greenthread had disagreed with the Examiner, the Examiner never changed his position that a carrier “is affected by multiple forces and fields” besides the gradient and the claims that ultimately issued are different than the ones that were the subject of the relevant office action. Ex. 1016 at 270. Estoppel only applies if “the party was successful in getting a court [or

agency] to adopt its earlier position.” *Sherwin-Williams Co. v. PPG Indus., Inc.*, No. 2022-2059, 2024 WL 3534113, at *9 (Fed. Cir. July 25, 2024). Greenthread cannot be estopped based on statements that failed to persuade the Examiner to adopt the position that Petitioner now attributes to Greenthread. *Solomon v. Overton’s Inc.*, No. CIV.A. 2-02-CV-60TJW, 2003 WL 25782758, at *2 (E.D. Tex. Dec. 9, 2003) (“An applicant’s arguments..., should they ultimately persuade the examiner, may inform the scope of the issued claims...”) (emphasis added).

G. Greenthread’s supposed “admissions” do not justify Petitioner’s new claim construction.

In an institution decision in a parallel IPR, the Board said that “the statements made by Patent Owner during prosecution of the ’195 parent patent contradict its arguments in the present proceeding.” IPR2023-00264, Paper 21 at 31. For the reasons above, Greenthread disagrees. Regardless, any “contradiction” is not a reason to grant the Petition.

First, “[t]he 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 v. AWH Corp.*, 415 F.3d 1303, 1317 (Fed. Cir. 2005). Petitioner’s focus on a few sentences regarding claims that never issued among hundreds of pages of prosecution history and claim construction briefing are exactly what *Phillips* warns against. Petitioner is essentially attempting a reverse

prosecution history disclaimer to broaden the claims beyond their plain and ordinary meaning to encompass the prior art, which the Federal Circuit rejects. “Any ambiguity” in the prosecution history must be resolved in favor of the plain claim language, because “the claims represent the final product of a sometimes imperfect process. Representations during prosecution cannot enlarge” the claims. *Biogen, Inc. v. Berlex Lab’ys, Inc.*, 318 F.3d 1132, 1140 (Fed. Cir. 2003).

Second, even if the Board is inclined to treat Greenthread’s statements as “admissions,” those “admissions” must be weighed against Petitioner’s admissions, including Dr. Blalock’s statement that “net force” is what controls carrier movement and his prior “sweeping” claim construction for “aid carrier movement.” Petitioner bears the burden of proof in an IPR proceeding. Therefore, Petitioner’s admissions are the ones that matter.

H. Greenthread’s specification discusses relative slope.

In an institution decision in a parallel IPR, the Board stated “Patent Owner does not direct us to any discussion in the [specification] regarding a specific slope value that is necessary to ‘aid the movement of minority carriers.’” IPR2024-00265, Paper 22 at 19. The Greenthread specification does disclose specific slopes. Greenthread cited that disclosure in its POR. Paper 47 at 15-16. The specification recites “the donor dopant concentration may be 10 to 100x” at one end of the gradient compared to the other. Ex. 1001 at 14. The next sentence recites that “[t]he 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....” *Id.* (emphasis added). In the context of a bipolar junction transistor (“BJT”), the specification recites that “the relative doping concentrations of emitter and collector regions varies from 10^{18} to $10^{20}/\text{cm}^3$, whereas the base region is 10^{14} to $10^{16}/\text{cm}^3$.” *Id.*

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

Petitioner has never come forward with evidence that its petition is timely. There is no dispute that it has a customer-manufacturer relationship with time barred parties. Since it is well established that those relationships can create privity, Petitioner’s admission that the relationships exist is “some evidence” that it is in privity with them. *Worlds Inc. v. Bungie, Inc.*, 903 F.3d 1237, 1242–44 (Fed. Cir. 2018). For the Board to conclude on the current record that Petitioner’s relationships are “standard”—when only petitioner has seen the agreements—violates Greenthread’s right to due process. *Greene v. McElroy*, 360 U.S. 474, 496 (1959).

Petitioner’s argument that its due process rights may be violated by a determination that it failed to carry its burden under § 315(b) is meritless. Petitioner’s due process rights are not violated by requiring it to come forward with evidence when it is the party that both possesses the evidence and has the burden of

proof. Petitioner has had numerous opportunities to come forward with that evidence but has refused to do so.

J. Objective indicia of non-obviousness support patentability.

Petitioner argues that the [REDACTED] licenses were motivated by the cost of litigation, but there is no evidence to support that. RPX approached Greenthread on behalf of [REDACTED]. Ex. 2072 at 2. Greenthread had never spoken to [REDACTED] or threatened litigation against them. *Id.* Paying \$5 million to a patent owner who never even contacted them is an absurd strategy to achieve “cost savings.” There were no “costs” to be saved and no reason to think that costs would ever be incurred.

The only evidence of this bizarre cost saving strategy Petitioner has is RPX’s website. But there is no evidence that either [REDACTED] had even read any of the RPX advertisements Petitioner cites. Even if they had, there is no evidence that the cost savings RPX advertises were motivations for [REDACTED]. Companies interested in minimizing litigation costs do not initiate contact with a patent owner and offer to pay millions of dollars.

Petitioner’s claim that the license agreements are not “specifically related to the technology of the challenged patents” is simply false. Paper 62 at 23. The only patents covered by the licenses are the single family of patents at issue here. All of the licensed patents include claims directed to graded dopants used for moving

carriers from the active region. The specification identifies that aspect of the claims as novel and that novelty is precisely the grounds on which Greenthread defends the patent now. Paper 47 at 37 (citing Ex. 1001, 3:52-56).

The fact that Greenthread's President, Phil John, was not able to point to specific claims in patents that were relevant to the license is not surprising, because he testified that he is not an engineer, and that his [REDACTED]

[REDACTED]. Ex. 1053 at 26:12; 55:4-25. Greenthread offered Petitioner the opportunity to depose another witness on these issues, but Petitioner chose not to do that, and withdrew its motion to strike Mr. John's testimony.¹⁰

Regardless, there is no need to focus on a specific claim because all of the licensed claims are similar. The admissions from Cirrus that a dopant gradient alone does not meet the claim limitations, constitutes additional support for the conclusion that [REDACTED] simply came to the conclusion that Greenthread's patents were valid and valuable. Cirrus's corporate representative had more than twenty years in technical roles in the semiconductor industry and was designated to testify

¹⁰ Ex. 2081 (Email from trials@uspto.gov to counsel of record for parties, dated August 13, 2024).

about “the movement of carriers in the Accused Products.” Cirrus Testimony Exhibit at 7, 22-23, 37. When he was put under oath, he declined to support the invalidity theory advanced by both Cirrus and Petitioner. Cirrus’s corporate representative agreed that “there’s other things that might affect carrier movement besides the gradient.” Cirrus Testimony Exhibit at 21; *Vulcan Eng’g Co. v. Fata Aluminium, Inc.*, 278 F.3d 1366, 1373 (Fed. Cir. 2002) (“Appreciation by contemporaries skilled in the field of the invention is a useful indicator of whether the invention would have been obvious...”).

III. CONCLUSION

For the foregoing reasons, the challenged claims should be held to be patentable over the cited art and grounds presented in the IPR proceeding.

Dated: September 23, 2024

Respectfully submitted,

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CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. §42.24(d), Petitioner hereby certifies that the word count for the foregoing **PATENT OWNER’S SUR-REPLY** is 5,372 words, which is within the 5,600 word limit set in 37 C.F.R. §42.24(c)(4). This word count does not include the table of contents, table of authorities, exhibit list, certificate of word count, and certificate of service. This word count was prepared using Microsoft Word.

Dated: September 23, 2024

By: /Alan Whitehurst/
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CERTIFICATION OF SERVICE

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

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