

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SEMICONDUCTOR COMPONENTS INDUSTRIES, LLC

Petitioner,

v.

GREENTHREAD, LLC,

Patent Owner

IPR2024-00263

Patent 11,316,014

**PETITIONER'S OBJECTIONS TO PATENT OWNER'S
DEMONSTRATIVES**

Pursuant to the Board’s Order Setting Oral Argument (Paper 47 at 3–4), Petitioner respectfully submits the following objections to the demonstratives filed by Patent Owner (EX2913). The parties met and conferred on Friday, May 2, 2025, and were able to narrow the dispute, but they did not reach resolution as to the objections below. Petitioner objects to the slides below because, in addition to other noted objections, the slides violate the Board’s order which stated “Demonstratives are not a mechanism for making new arguments.” Paper 47 at 3.

I. Objections

<u>Slide #</u>	<u>New argument / objection</u>	<u>Copy of slide</u>
8	New argument that refers to a decision that is not part of the record of this proceeding.	1. The Petitions Are Time-Barred 8. For purposes of deciding this case, we need not address the quantum of support required from a patent owner. If it were not framed in terms of a presumption, the standard used in <i>Atlantic Gas Light</i>—evidence that “reasonably brings into question the accuracy of a petitioner’s identification of the real parties in interest”—may prove useful. In this case, it suffices to say that, as discussed below, <i>Worlds</i> presented more than enough evidence to sufficiently put this issue into dispute. IPR2012-01243 (Panel 11, 12, 122282); IPR2012-01243 (Panel 11, 12, 122282); IPR2012-01243 (Panel 11, 12, 122282); Before CHURCHMAN, STEVENS, and CROWLEY, Chief Judge, sitting by designation. CHURCHMAN, Chief Judge, presiding. CROWLEY, Judge, concurring. STEVENS, Judge, concurring. CROWLEY, Judge, dissenting. CHURCHMAN, Chief Judge, dissenting. CROWLEY, Judge, dissenting. STEVENS, Judge, dissenting. CROWLEY, Judge, dissenting. <i>Worlds Inc. v. Bungie, Inc.</i>, 903 F.3d 1237, 1244 n.8 (Fed. Cir. 2018) I agree with Patent Owner that the Board abused its discretion in denying the discovery motions. In the motions, Patent Owner raised more than a mere possibility that discovery would yield useful information on the privity issue given that Petitioner was a supplier of a time-barred party, Intel. <i>Garmin Int’l, Inc. v. Cuozzo Speed Techs. LLC</i>, IPR2012-00001, Paper 26 at 6 (PTAB Mar. 5, 2013) (precedential). While Patent Owner’s requested discovery was broad, it was not harassing or abusive. Under these circumstances, the Board either should have allowed whatever narrower discovery was appropriate or made it clear that Patent Owner could amend or resubmit its discovery motions. Instead, the Board denied Patent Owner’s motions and then cited the absence of evidence as a basis not to find a privity relationship. -01242, 43, 44: Director Review Decision [94] at 3 -00263: PO Prelim. Resp. [13] at 26-28; PO Resp. [31] at 49-51; PO Sur-Reply [43] at 1, 15 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenhead Ex. 2013 p. 8 of 135 Semiconductor v. Greenhead 8

<u>Slide #</u>	<u>New argument / objection</u>	<u>Copy of slide</u>
33	Untimely argument that was not properly raised in the Patent Owner's Response (regarding <i>INVT</i>).	2. Movement of Carriers <u>from</u> the Surface Layer <i>ParkerVision</i> is not controlling law here—<i>INVT</i> is.  (Fed. Cir. 2002)); <i>see also ParkerVision, Inc.</i>, 903 F.3d at 1361 (articulating a distinction between configuration-type and capability-type claims). Possibly the most straightforward example of this is the common distinction between method claims and apparatus claims. <i>See, e.g., Finjan</i>, 626 F.3d at 1203– Cir. 2009))). <i>Cf. ParkerVision, Inc.</i>, 903 F.3d at 1363 (similarly differentiating apparatus claims and method claims in the patent invalidity context). However, differences exist between apparatus claims as well, depending on the claim language. We have construed some apparatus claims to require an infringing device to actually perform and operate according to the functional terms recited in the claim. The intervenors cite two such cases, <i>Cross Medical</i> and <i>Ball Aerosol</i>. <i>See</i> Intervenors' Br. 64, 67–68. We have construed other apparatus claims to require only capability, such as in <i>Finjan</i> and <i>Silicon Graphics</i>. <i>INVT SPE LLC v. Int'l Trade Comm'n</i>, 46 F.4th 1361, 1371-72 (Fed. Cir. 2022) -00263: PO Sur-Reply [43] at 1-5 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenthread Ex. 2013 p. 33 of 135 Semiconductor v. Greenthread
43-61	Untimely argument that was not properly raised in the Patent Owner's Response ("Movement of <u>Minority</u> Carriers from the Surface Layer").	<i>See, e.g.,</i> Slide 45.

Slide #	New argument / objection	Copy of slide
		3. Movement of <u>Minority</u> Carriers from the Surface Layer The Challenged Claims must be considered in light of the specification.  ¶¶ 1,2. The claims are directed to the invention that is described in the specification; they do not have meaning removed from the context from which they arose. Thus the claims are construed to state the legal scope of each patented invention, on examination of the language of the claims, the description in the specification, and the prosecution history. See <i>Renishaw PLC v. Marposs Societa' per Azioni</i>, 158 F.3d 1243, 1250, 48 USPQ2d 1117, 1122 (Fed. Cir.1998) ("[T]he interpretation to be given a term can only be determined and confirmed with a full understanding of what the inventors actually invented and intended to envelop with the claim."). Although <i>Netword LLC v. Centraal Corp.</i>, 242 F.3d 1347, 1352 (Fed. Cir. 2001) [1–3] “If the intrinsic record fully governs the proper construction of a term, we review the [b]oard’s claim construction <i>de novo</i>.” <i>Wasica Fin. GmbH v. Cont’l Auto. Sys., Inc.</i>, 853 F.3d 1272, 1278 (Fed. Cir. 2017). During reexamination, “the PTO must give claims their broadest reasonable construction consistent with the specification.” <i>In re ICON Health & Fitness, Inc.</i>, 496 F.3d 1374, 1379 (Fed. Cir. 2007). Even under the broadest reasonable construction rubric, however, the board must always “consider the claims in light of the specification and teachings in the underlying patent.” <i>In re CSB-Sys. Int’l, Inc.</i>, 832 F.3d 1335, 1341 (Fed. Cir. 2016) (citations and internal quotation marks omitted). And there is no reason why this construction could not coincide with that of a court in litigation. <i>In re Power Integrations</i>, 884 F.3d 1370, 1375 (Fed. Cir. 2018) <i>Multiform Desiccants, Inc. v. Medzam, Ltd.</i>, 133 F.3d 1473, 1478 (Fed. Cir. 1998) Courts must exercise caution lest dictionary definitions, usually the least controversial source of extrinsic evidence, be converted into technical terms of art having legal, not linguistic, significance. The best source for understanding a technical term is the specification from which it arose, informed, as needed, by the prosecution history. The evolution of restrictions in the claims, in the course of examination in the PTO, reveals how those closest to the patenting process—the inventor and the patent examiner—viewed the subject matter. See <i>Hoechst Celanese Corp. v. BP Chemicals Ltd.</i>, 78 F.3d 1575, 1578, 38 USPQ2d 1126, 1129 (Fed. Cir. 1996) (“A technical term used in a patent document is interpreted as having the meaning that it would be given by persons experienced in the field of the invention, unless it is apparent from the patent and the prosecution history that the inventor used the term with a different meaning.”) When the specification explains and defines a term used in the claims, without ambiguity or incompleteness, there is no need to search further for the meaning of the term.

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		Overview of Issues 1. Petitioner has presented <u>zero</u> “actual evidence” that the Petitions are timely. 2. The Claims require “movement of carriers” <u>from</u> the “surface layer. 3. The ‘195 and ‘502 Claims require “movement of <u>minority</u> carriers” from the “surface layer.” 4. Kawagoe does not disclose “movement of carriers” and “movement of minority carriers” from the “surface layer.” 5. Wieczorek does not disclose “movement of carriers” from the “surface layer.” 6. Payne does not disclose “movement of minority carriers” from the “surface layer.” 7. Petitioner has the burden to identify electric fields that would “aid carrier movement.” 8. Experts confirm that carriers in the “surface layer” are affected by numerous other fields and forces. 9. The “movement of carriers” depends on the sum of <u>all</u> of the fields in the “surface layer.” 10. Dr. Blalock did <u>not</u> analyze any of the fields or force magnitudes in the “surface layer.” 11. Petitioner's prosecution-related arguments are incorrect. 12. Greenthread’s licensing agreements provide substantial evidence of objective indicia of non-obviousness. DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenthread Ex. 2013.p. 43 of 135 Semiconductor v. Greenthread 43

<u>Slide #</u>	<u>New argument / objection</u>	<u>Copy of slide</u>
		3. Movement of <u>Minority</u> Carriers from the Surface Layer The '195 and '502 claims require “movement of <u>minority</u> carriers.” US 8,421,195 1. A CMOS Semiconductor device comprising: a surface layer; a substrate; an active region including a source and a drain, disposed on one surface of said surface layer; 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 extending between said surface layer and said substrate, said drift layer further having a first static <u>unidirectional</u> electric drift field to <u>aid the movement of minority carriers from said surface layer to said substrate</u>; and at least one well region disposed in said single drift layer, said well region having a graded concentration of dopants and a second static <u>unidirectional</u> electric drift field to <u>aid the movement of minority carriers from said surface layer to said substrate</u>. -00266: Ex. 1001 ('195 pat.) at 4:13-29 US 9,190,502 7. A semiconductor device comprising: a surface layer; a substrate; an active region including a source and a drain, disposed on one surface of said surface layer; 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 <u>unidirectional</u> electric drift field to <u>aid the movement of minority carriers from said surface layer to said substrate</u>; and at least one well region disposed in said single drift layer, said well region having a graded concentration of dopants generating a second static <u>unidirectional</u> electric drift field to <u>aid the movement of minority carriers from said surface layer to said substrate</u>. -00265: Ex. 1001 ('502 pat.) at 4:52-67 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenhead Ex. 2013 p. 44 of 135 Semiconductor v. Greenhead

Slide #	New argument / objection	Copy of slide
		3. Movement of <u>Minority</u> Carriers from the Surface Layer The Challenged Claims must be considered in light of the specification.  <i>Network LLC v. Centraal Corp.</i>, 242 F.3d 1347, 1352 (Fed. Cir. 2001) ¶¶ 1,2. The claims are directed to the invention that is described in the specification; they do not have meaning removed from the context from which they arose. Thus the claims are construed to state the legal scope of each patented invention, on examination of the language of the claims, the description in the specification, and the prosecution history. See <i>Renishaw PLC v. Marposs Societa' per Azioni</i>, 158 F.3d 1243, 1250, 48 USPQ2d 1117, 1122 (Fed. Cir.1998) ("[T]he interpretation to be given a term can only be determined and confirmed with a full understanding of what the inventors actually invented and intended to envelop with the claim."). Although [1-3] "If the intrinsic record fully governs the proper construction of a term, we review the [b]oard's claim construction <i>de novo</i>." <i>Wasica Fin. GmbH v. Cont'l Auto. Sys., Inc.</i>, 853 F.3d 1272, 1278 (Fed. Cir. 2017). During reexamination, "the PTO must give claims their broadest reasonable construction consistent with the specification." <i>In re ICON Health & Fitness, Inc.</i>, 496 F.3d 1374, 1379 (Fed. Cir. 2007). Even under the broadest reasonable construction rubric, however, the board must always "consider the claims in light of the specification and teachings in the underlying patent." <i>In re CSB-Sys. Int'l, Inc.</i>, 832 F.3d 1335, 1341 (Fed. Cir. 2016) (citations and internal quotation marks omitted). And there is no reason why this construction could not coincide with that of a court in litigation. <i>In re Power Integrations</i>, 884 F.3d 1370, 1375 (Fed. Cir. 2018) <i>Multiform Desiccants, Inc. v. Medzam, Ltd.</i>, 133 F.3d 1473, 1478 (Fed. Cir. 1998) Courts must exercise caution lest dictionary definitions, usually the least controversial source of extrinsic evidence, be converted into technical terms of art having legal, not linguistic, significance. The best source for understanding a technical term is the specification from which it arose, informed, as needed, by the prosecution history. The evolution of restrictions in the claims, in the course of examination in the PTO, reveals how those closest to the patenting process—the inventor and the patent examiner—viewed the subject matter. See <i>Hoechst Celanese Corp. v. BP Chemicals Ltd.</i>, 78 F.3d 1375, 1378, 38 USPQ2d 1126, 1129 (Fed.Cir. 1996) ("A technical term used in a patent document is interpreted as having the meaning that it would be given by persons experienced in the field of the invention, unless it is apparent from the patent and the prosecution history that the inventor used the term with a different meaning.") When the specification explains and defines a term used in the claims, without ambiguity or incompleteness, there is no need to search further for the meaning of the term.

-00266: PO Sur-Reply [45] at 15-16

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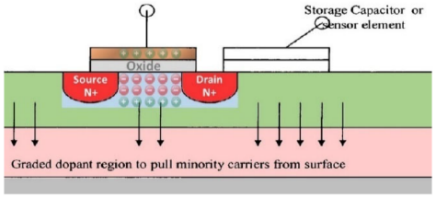
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Slide #	New argument / objection	Copy of slide
		3. Movement of <u>Minority</u> Carriers from the Surface Layer The specification explains the “majority carriers” are the majority carrier in the MOSFET channel. Bipolar Junction transistors (BJT) are minority carrier devices as the principle device conduction mechanism. However, majority carriers also a small yet finite role in modulating the conductivity in BJTs. Consequently, both carriers (electrons and holes) play a role in the switching performance of BJTs. The maximum frequency of operation in BJTs is limited by the base transit time as well as the quick recombination of the majority carriers when the device is switched off (prior to beginning the next cycle). The dominant carrier mechanism in BJTs is carrier diffusion. Carrier drift current component is fairly small, especially in uniformly doped base BJTs. Efforts have been made in graded base transistors to create an ‘aiding drift field’, to enhance the diffusing minority carrier’s speed from emitter to collector. However, most semiconductor devices, including various power MOSFETs (traditional, DMOS, lateral, vertical and a host of other configurations), IGBT’s (Insulated Gated Base Transistors), still use a uniformly doped drift epitaxial region in the base. FIG. 1 shows the relative doping concentration versus distance in a BJT. FIG. 2 shows the uniformly doped epi region in a IGBT. In contrast to BJTs, MOS devices are <u>majority carrier devices for conduction. The conduction is channel dominated.</u> The channel can be a surface in one plane in planar devices. Other -00266: Ex. 1001 at 1:23-45 -00266: Ex. 1001 ('195 pat.) at Fig. 5B ⁴ Because the channel is formed by electrons with a <u>negative</u> charge, the MOSFET is referred to as an <u>n</u>-channel MOSFET, and the “minority carriers” are holes. -00266: Ex. 2064 (Glew Decl.) at ¶136, n. 4 -00266: PO Resp. [32] at 7-8; PO Sur-Reply [45] at 16 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE GreenThread Ex. 2013 p. 46 of 135 Semiconductor v. GreenThread

Slide #	New argument / objection	Copy of slide
		3. Movement of <u>Minority</u> Carriers from the Surface Layer The “spurious minority carriers” interfere with the “active circuitry at the surface.” As illustrated in FIGS. 5(a), 5(b), 5(c), donor gradient is also of benefit to very large scale integrated circuits (VLSI)– VLSI logic, DRAM, nonvolatile memory like NAND flash. Spurious minority carriers can be generated by clock switching in digital VLSI logic and memory IC's. These unwanted carriers can discharge dynamically-held 'actively held high' nodes. Statically held nodes (with V_{cc}) can not be affected, in most cases. Degradation of refresh time in DRAM's is one of the results, because the capacitor holds charge dynamically. Similarly, degradation of CMOS digital images, in digital imaging IC's is another result of the havoc caused by minority carriers. Pixel and color resolution can be significantly enhanced in imaging IC's with the embodiments described here. Creating 'Sub Terrain' recombination centers underneath the wells (gold doping, platinum doping) as is done in some high-voltage diodes is not practical for VLSI circuits. Hence, a novel technique has been described here by creating a drift field to sweep these unwanted minority carriers into the substrate as quickly as possible, from the active circuitry at the surface. In a preferred embodiment, the subterrain n-layer has a graded donor concentration to sweep the minority carriers deep into the substrate. One or more of such layers can also be implemented through wafer to wafer bonding or similar “transfer” mechanisms. This n-layer can be a deeply-implemented layer. It can also be an epitaxial layer. The n-well and p-well also can be graded or retrograded in dopants, as desired, to sweep those carriers away from the surface as well. P⁻ substrate -00266: PO Resp. [32] at 7-8; PO Sur-Reply [45] at 3, 16-17 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenhead Ex. 2013 p. 47 of 135 Semiconductors v. Greenhead

Slide #	New argument / objection	Copy of slide
		3. Movement of <u>Minority</u> Carriers from the Surface Layer The “minority carriers” interfere with the MOSFET’s channel. As illustrated in FIGS. 5(a), 5(b), 5(c), donor gradient is also of benefit to very large scale integrated circuits (VLSI)– VLSI logic, DRAM, nonvolatile memory like NAND flash. Spurious minority carriers can be generated by clock switching in digital VLSI logic and memory IC’s. These unwanted carriers can discharge dynamically-held ‘actively held high’ nodes. Statically held nodes (with V_{cc}) can not be affected, in most cases. Degradation of refresh time in DRAM’s is one of the results, because the capacitor holds charge dynamically. Similarly, degradation of CMOS digital images, in digital imaging IC’s is another result of the havoc caused by minority carriers. Pixel and color resolution can be significantly enhanced in imaging IC’s with the embodiments described here. Creating ‘Sub Terrain’ recombination centers underneath the wells (gold doping, platinum doping) as is done in some high-voltage diodes is not practical for VLSI circuits. Hence, a novel technique has been described here by creating a drift field to sweep these unwanted minority carriers into the substrate as quickly as possible, from the active circuitry at the surface. In a preferred embodiment, the subterrain n-layer has a graded donor concentration to sweep the minority carriers deep into the substrate. One or more of such layers can also be implemented through wafer to wafer bonding or similar “transfer” mechanisms. This n-layer can be a deeply-implanted layer. It can also be an epitaxial layer. The n-well and p-well also can be graded or retrograded in dopants, as desired, to sweep those carriers away from the surface as well. P⁻ substrate -00266: Ex. 1001 ('195 pat.) at Fig. 5B -00266: Ex. 1001 ('195 pat.) at 3:14-40 -00266: PO Resp. [32] at 7-8; PO Sur-Reply [45] at 3, 16-17 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE GreenThread Ex. 2013 p. 48 of 135 Semiconductor v. GreenThread

Slide #	New argument / objection	Copy of slide
		3. Movement of <u>Minority</u> Carriers from the Surface Layer A “drift field” with a “graded dopant region” sweeps the minority carriers <u>from</u> the surface. As illustrated in FIGS. 5(a), 5(b), 5(c), donor gradient is also of benefit to very large scale integrated circuits (VLSI)– VLSI logic, DRAM, nonvolatile memory like NAND flash. Spurious minority carriers can be generated by clock switching in digital VLSI logic and memory IC's. These unwanted carriers can discharge dynamically-held 'actively held high' nodes. Statically held nodes (with V_{cc}) can not be affected, in most cases. Degradation of refresh time in DRAM's is one of the results, because the capacitor holds charge dynamically. Similarly, degradation of CMOS digital images, in digital imaging IC's is another result of the havoc caused by minority carriers. Pixel and color resolution can be significantly enhanced in imaging IC's with the embodiments described here. Creating 'Sub Terrain' recombination centers underneath the wells (gold doping, platinum doping) as is done in some high-voltage diodes is not practical for VLSI circuits. Hence, a novel technique has been described here by creating a drift field (to sweep these unwanted minority carriers) into the substrate as quickly as possible, from the active circuitry at the surface. In a preferred embodiment, the subterrain n-layer has a graded donor concentration to sweep the minority carriers deep into the substrate. One or more of such layers can also be implemented through wafer to wafer bonding or similar “transfer” mechanisms. This n-layer can be a deeply-implanted layer. It can also be an epitaxial layer. The n-well and p-well also can be graded or retrograded in dopants, as desired, to sweep those carriers away from the surface as well. -00266: PO Resp. [32] at 7-8; PO Sur-Reply [45] at 3, 16-17 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenhead Ex. 2913 p. 49 of 135 Semiconductor v. Greenhead

Slide #	New argument / objection	Copy of slide
		3. Movement of <u>Minority</u> Carriers from the Surface Layer • Dr. Glew explained that in Fig. 5B, the “minority carriers” are holes. 36. When a positive voltage is applied to the gate, an electric field forms in the oxide. This positive electric field repels the “positive” holes downwards, while When enough electrons have accumulated in the surface layer below the oxide, they form a conductive channel (as annotated in Figure 5B below) of electrons between the source and the drain, and current can begin to flow through the transistor.  '014 Patent, FIG. 5B (annotated).⁴ 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. ⁴ Because the channel is formed by electrons with a <u>negative</u> charge, the MOSFET is referred to as an <u>n</u>-channel MOSFET, and the “minority carriers” are holes. -00266: Ex. 2064 (Glew Decl.) at ¶36, n. 4 -00266: PO Resp. [32] at 8; PO Sur-Reply [45] at 16-17 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenhead Ex. 2013 p. 50 of 135 Semiconductor v. Greenhead 50

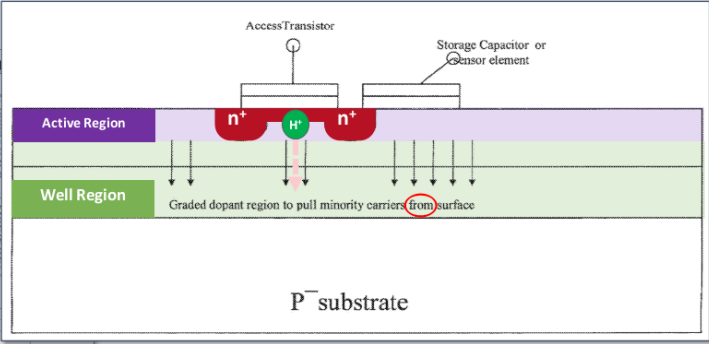
Slide #	New argument / objection	Copy of slide
		3. Movement of <u>Minority</u> Carriers from the Surface Layer Dr. Glew confirmed the same when cross-examined by Petitioner's counsel. '014 Patent, FIG. 5B (annotated).⁴ In order to turn the transistor "off," the positive voltage is removed from the gate and the channel disappears as the holes return to the surface layer. ⁴ Because the channel is formed by electrons with a <u>negative charge</u>, the MOSFET is referred to as an <u>n-channel MOSFET</u>, and the "minority carriers" are holes. -00266: Ex. 2064 (Glew Decl.) at ¶36, n. 4 24 Q. And the minority carriers in the 25 annotation you directed me to on page 17, are those 1 holes or electrons? 2 A. In this case, <u>the channel needs to be</u> 3 <u>formed out of N, electrons, so the holes would then</u> 4 <u>be minority carriers.</u> So the majority carriers -- 5 majority carrier for an N source drain is an N. -00266: Ex. 1054 (Glew Dep. Tr.) at 74:24-75:5

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		3. Movement of <u>Minority</u> Carriers from the Surface Layer Petitioner was aware of Greenthread's position when it filed its Petitions in December 2023 and cited Greenthread's prior claim construction briefing. Case 6:22-cv-00105-ADA Document 96 Filed 10/31/22 Page 13 of 46 Greenthread, LLC Plaintiff, v. Intel Corporation, Defendant. Intel Technology Inc. Respondent. GREENTHREAD JOINT TRIAL BRIEFING GREENTHREAD 1030, Page 1 ⁵ Because the channel is formed by electrons with a <u>negative</u> charge, the MOSFET is referred to as an <u>n</u>-channel MOSFET. In an <u>n-channel MOSFET</u>, the electrons are referred to as the "majority carriers," and the "minority carriers" are holes. Ex. 1, ¶22 n.5. -00266: Ex. 1030 (Claim Constr. Brief) at 13 -00266: Pet. [1] at vii; PO Sur-Reply [45] at 16 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenthread Ex. 2013 p. 52 of 135 Semiconductor v. Greenthread 52

<u>Slide #</u>	<u>New argument / objection</u>	<u>Copy of slide</u>
		3. Movement of <u>Minority</u> Carriers from the Surface Layer Dr. Blalock acknowledged that “minority carrier” is understood in terms of the “surface layer.” Declaration of Dr. Blalock for Joint Parties Review of U.S. Patent No. 8,431 UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE PATENT TRIAL AND APPEAL BOARD SEMICONDUCTOR COMPONENTS INDUSTRIES, LLC, Plaintiff, v. GREENHEAD LLC, Defendant. U.S. PATENT NO. 8,431,898 Case 07B-1044-00360 DECLARATION OF TRAVIS BLALOCK, PhD. GREENHEAD EXHIBIT 1003, Page 1 101. 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. EX1013, 431 (“A[n] α-particle can induce SEU when it strikes at the <i>channel region</i> of an off NMOS transistor or the <i>drain region</i> of an off PMOS transistor.”), FIG. 2. As shown in Figure 2, such event generates both types of carriers (holes, denoted “+” and electrons, denoted “-”), one of which will be the <u>minority carrier in any given surface layer.</u> -00266: Ex. 1003 (Blalock Decl.) at ¶101 -00266: PO Sur-Reply [45] at 17-18 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenhead Ex. 2013 p. 53 of 135 Semiconductor v. Greenhead 53

<u>Slide #</u>	<u>New argument / objection</u>	<u>Copy of slide</u>
		3. Movement of <u>Minority</u> Carriers from the Surface Layer Dr. Blalock also relies on the doping type within a region/well to define the “minority carrier.” 41. Impurities known as “dopants” are added to the active areas and wells to add charge carriers and tailor the electrical properties of these regions such as their conductivity. Charge carriers can be electrons or holes. EX1008C, 86. When a region is doped with p-type dopants, the holes are majority carriers and the electrons are minority carriers. EX1008C, 86. When a region is doped with n-type dopants, the electrons are majority carriers and the holes are minority carriers. EX1008C, 86. 106. In both cases, these electric fields result from the downward-sloping graded concentrations in Payne’s and Sakai’s N-wells and P-wells and aid the movement of minority carriers (holes in N-wells, electrons in P-wells) downward to the substrate. See also Sections X.A.1.g, X.B.1.f-g, X.B.2, X.D.1. -00266: Ex. 1003 (Blalock Decl.) at ¶106 -00266: Ex. 1003 at ¶41 -00266: PO Sur-Reply [45] at 17-18 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenthread Ex. 2013 p. 54 of 135 Semiconductor v. Greenthread 54

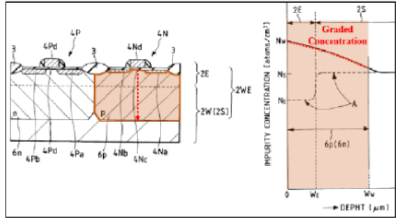
Slide #	New argument / objection	Copy of slide
		3. Movement of <u>Minority</u> Carriers from the Surface Layer - In an <u>N</u>MOS transistor, the “majority carrier” is an electron, and the “minority carrier” is a hole. - In an <u>P</u>MOS transistor, the “majority carrier” is a hole, and the “minority carrier” is an electron. -00266: Ex. 1001 at Fig. 5B -00266: Ex. 1001 ('195 pat.) at Fig. 5B 00266: PO Resp. [32] at 7-8; PO Sur-Reply [45] at 16-17

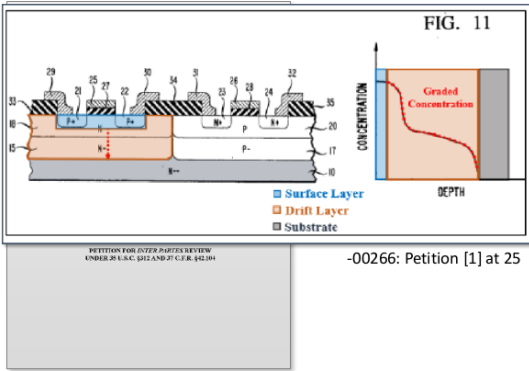
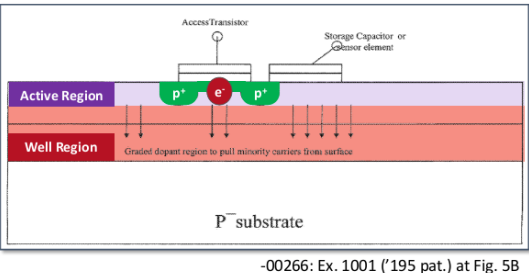
Slide #	New argument / objection	Copy of slide
		3. Movement of <u>Minority</u> Carriers from the Surface Layer The only “carrier” that Fig. 5B’s electric field can move from the “surface layer” is a positively-charged hole.  -00266: Ex. 1001 ('195 pat.) at Fig. 5B -00266: PO Resp. [32] at 7-8; PO Sur-Reply [45] at 16-17 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenthread Ex. 2913 p. 56 of 135 Semiconductor v. Greenthread 56

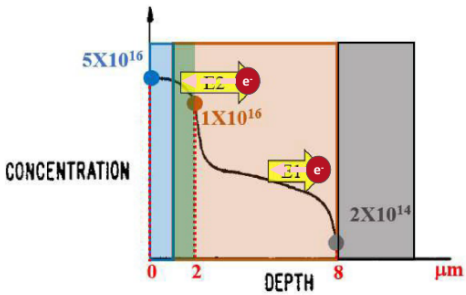
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		3. Movement of <u>Minority</u> Carriers from the Surface Layer Dr. Glew explained that it would be impossible for Fig. 5B's electric field to pull a negatively-charged electron from the surface. UNITED STATES OF AMERICA v. GREENHEAD EX. 2013 DECLARATION 70. The basic laws of electronics and physics guarantee that the electric field identified by Petitioner in its demonstratives would not aid carrier movement (move) an electron <i>from</i> the active region portion (surface) of the p-well <i>to</i> the non-active region portion of the p-well (substrate). This would be impossible. To the extent this electric field moves an electron at all, it would <i>not</i> move it from the surface to the substrate. Rather it would move the electron in the <i>opposite</i> direction <i>from the substrate to the surface</i>. This is because an electron moves in the opposite direction of an electric field towards the source of the electric field, where the positive charge is the greatest. 74. More specifically, in paragraph 36, I explained that when a positive voltage is applied to the gate, an electric field forms in the oxide. Because the positive voltage is greatest at the surface, and it decreases deeper in the substrate, the electric field points <i>from the surface to the substrate in a downward direction</i>. As I explained in Paragraph 36, when holes and electrons encounter an electric field in a downward direction, and they do move due to this electric field, the positively charged holes move in the <i>same</i> direction as the electric field in a <i>downward</i> direction. The negatively charged electrons move in the <i>opposite</i> direction of the electric field in an <i>upward</i> direction. -00266: Ex. 2064 (Glew Decl.) at ¶¶ 70, 74 -00266: PO Sur-Reply [45] at 19 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenhead Ex. 2013 p. 57 of 135 Semiconductor v. Greenhead 57

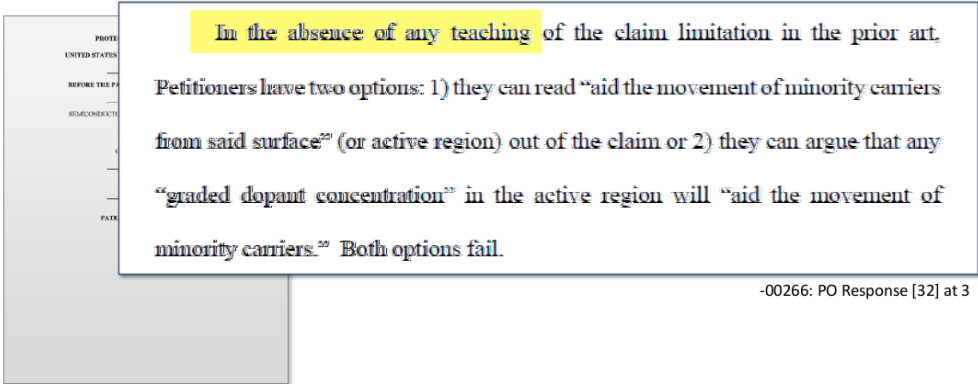
Slide #	New argument / objection	Copy of slide
		3. Movement of <u>Minority</u> Carriers from the Surface Layer Monolithic's expert agrees that the downward-facing electric field can only move holes. 1 Q. What did you mean by 2 "properly constructed"? 3 A. You would have to construct an 4 electric field that moves the carriers away, and 5 that means the electric field has to be, the 6 direction has to be correct. 7 If you're moving holes, then you 8 have to have the electric field that points 9 downward. 10 If you're moving electrons, the 11 electric field has to be pointing upward and you 12 have to have a sufficient electric field 13 intensity to prevent most of the carriers from 14 being collected by the drain. -00266: Ex. 2085 (Campbell Dep. Tr.) at 34:1-14 -00266: PO Resp. [32] at 15 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE GreenThread Ex. 2013 p. 58 of 135 Semiconductor v. GreenThread

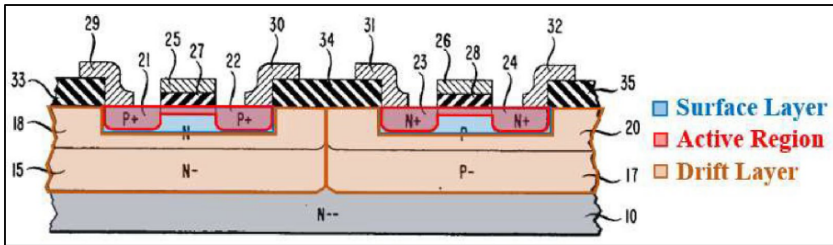
<u>Slide #</u>	<u>New argument / objection</u>	<u>Copy of slide</u>
		3. Movement of <u>Minority</u> Carriers from the Surface Layer • If the “minority carrier” in an NMOS transistor were an electron, it would exclude the specification’s preferred embodiment.  [17] Moreover, Defendants’ expert admitted that construing the claims such that “employ[ing] the common technique of grounding the system” would cause the converter to be considered non-isolated would prevent the claims from encompassing the preferred embodiment. J.A. at 45070–71. A claim construction that “excludes the preferred embodiment is rarely, if ever, correct” and would require highly persuasive evidentiary support.” <i>Adams Respiratory Therapeutics, Inc. v. Perrigo Co.</i>, 616 F.3d 1283, 1290 (Fed.Cir.2010). In this case, the specification, including the claims, supports a reading that encompasses the preferred embodiment. <i>SynQor, Inc. v. Artesyn Techs., Inc.</i>, 709 F.3d 1365, 1378-79 (Fed. Cir. 2013) -00266: PO Sur-Reply [45] at 19 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenthread Ex. 2013 p. 59 of 135 Semiconductor v. Greenthread 59

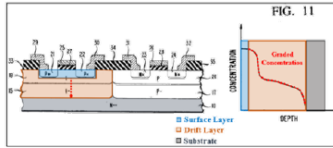
Slide #	New argument / objection	Copy of slide
		3. Movement of <u>Minority</u> Carriers from the Surface Layer - Kawagoe's graded concentration is only concerned with electrons. - But the Petition says nothing about Payne's effect on "minority carriers" (<i>i.e.</i>, holes). C. Kawagoe Kawagoe discloses a CMOS device in which wells have graded dopant concentrations that decrease with depth, as illustrated below right. EX1007, 14:46-55, 15:26-40, 15:62-16:40 ("p-well 6p and n-well 6n have their impurity concentrations <i>gradually lowered</i> in the depthwise direction ...").³  <i>Id.</i>, FIGS. 17, 23. The graded dopant concentrations reduce soft errors by sweeping unwanted carriers into the substrate body. <i>Id.</i>, 16:2-11 "electrons produced by the α-ray are attracted to the substrate body 25 by that concentration gradient ... so that the soft errors can be reduced ..."; EX1003, ¶68. -00266: Petition [1] at 12

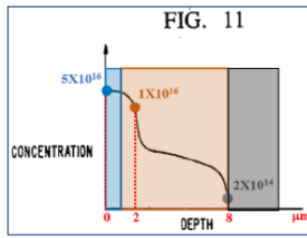
Slide #	New argument / objection	Copy of slide
		3. Movement of <u>Minority</u> Carriers from the Surface Layer - Petitioner relies on Payne's PMOS transistor in an N-well whose "minority carrier" is an electron. - But the Petition says nothing about Payne's effect on "minority carriers" (<i>i.e.</i>, holes).  FIG. 11 CONCENTRATION DEPTH Graded Concentration Surface Layer Drift Layer Substrate PETITION FOR EXTER PARTIES REVIEW UNDER 35 U.S.C. §102 AND 37 C.F.R. §1.104 -00266: Petition [1] at 25  Access Transistor Storage Capacitor or Sensor element Active Region Well Region Graded dopant region to pull minority carriers from surface P⁻ substrate -00266: Ex. 1001 ('195 pat.) at Fig. 5B -00266: PO Sur-Reply [45] at 15 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenhead Ex. 2013 p. 61 of 135 Semiconductors v. Greenhead
90-97	Untimely argument regarding movement of "minority carrier" from the "surface layer" that was not properly raised in the Patent Owner's Response.	<i>See, e.g., Slide 96.</i>

Slide #	New argument / objection	Copy of slide
		6. Payne Does Not Move “Minority Carriers” from the “Surface Layer” • Petitioner identified two electric fields that will <u>not</u> move electrons from the surface layer. Payne’s Figure 11 is further annotated below to show the exemplary first static unidirectional electric drift field (“E1”) present in a deep portion of the SDL (discussed in §IX.A.1.f), and a different, exemplary second static unidirectional electric drift field (“E2”) present in the well region disposed in the SDL. EX1003, ¶¶118-122; <i>see also</i> fn.5.  FIG. 11  -00266: Petition [1] at 40

<u>Slide #</u>	<u>New argument / objection</u>	<u>Copy of slide</u>
		6. Payne Does Not Move “Minority Carriers” from the “Surface Layer” • Because Payne does not expressly teach moving carriers from the “surface layer,” Petitioners had the burden to identify an electric field in the “surface layer.”  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 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. -00266: PO Response [32] at 3 -00266: PO Resp. [32] at 3 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenhead Ex. 2913 p. 90 of 135 Semiconductor v. Greenhead 90

Slide #	New argument / objection	Copy of slide
		6. Payne Does Not Move “Minority Carriers” from the “Surface Layer” Petitioner identifies the “active region” in the “surface layer.”  -00266: Petition [1] at 23 -00266: PO Sur-Reply [45] at 12-13 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenthread Ex. 2013 p. 91 of 135 Semiconductors, Greenthread 91

Slide #	New argument / objection	Copy of slide
		6. Payne Does Not Move “Minority Carriers” from the “Surface Layer” Petitioner admits the graded dopant concentration “<u>starts</u> at the bottom of the surface layer.” Division for Patent Practice Division of U.S. Patent No. 8,421,895 UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE PATENT TRIAL AND APPEAL BOARD SEMICONDUCTOR COMPONENTS INDUSTRIES, LLC, Petitioner v. GREENTHREAD LLC, Patent Owner U.S. PATENT NO. 8,421,895 Case 09-201-00266 PETITION FOR INTER PARTES REVIEW UNDER 35 U.S.C. 4212 AND 37 C.F.R. 42.104 Graded dopant concentration – The ‘195 Patent admits that graded-dopant concentrations were known. EX1001, 2:13-15, FIG. 1 (“Prior Art”), and that it was known to grade the dopant concentration in CMOS devices to affect the movement of minority carriers. <i>Id.</i> 1:34-2:5, FIGS. 3(a)-3(d) (all “Prior art”). Payne’s SDL has a graded-dopant concentration extending between the surface layer and the substrate. EX1003 ¶¶90-94. Payne explains that the “impurity profile in both ribs [15:17] thereby has the general shape illustrated in FIG. 11” which exhibits “[t]he major advantage” of a “high-low implant profile.” EX1005, 2:38-41, 5:14-17, 5:56-57. Payne’s Figure 11 (below right) illustrates the dopant concentration measured along the red dotted line in Figure 10 (below left), which starts at the bottom of the surface layer (blue) and extends to the substrate (grey). As below, Payne discloses a downward-sloping graded-dopant concentration in the SDL (tan) associated with Payne’s PMOS transistor (left).⁶  FIG. 11 Graded Concentration DEPTH 10 Surface Layer 11 Substrate Layer 12 Substrate -00266: Petition [1] at 23-24 -00266: PO Sur-Reply [45] at 12-13 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenthread Ex. 2013 p. 92 of 135 Semiconductor v. Greenthread 92

Slide #	New argument / objection	Copy of slide
		6. Payne Does Not Move “Minority Carriers” from the “Surface Layer” Payne’s added annotations to FIG. 11 does not disclose a graded concentration that would actually aid carrier movement where it is required—<i>from</i> the “surface layer.” Petition for Inter Partes Review of U.S. Patent No. 8,421,895 UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE PATENT TRIAL AND APPEAL BOARD SEMICONDUCTOR COMPONENTS INDUSTRIES, LLC, vs. GREENTHREAD, LLC, Patent Owner U.S. PATENT NO. 8,421,895 Case 17-303-0026 PETITION FOR INTER PARTES REVIEW UNDER 35 U.S.C. §102 AND 37 C.F.R. §42.104 EX1005, FIGS. 10-11 Dr. Blalock has annotated Figure 11 to reflect exemplary (maximum) dopant concentrations at various depths disclosed in Payne: (1) 5×10^{16} ions/cm³ at the surface of the shallow wells (depth 0 μm), (2) 10^{16} ions/cm³ at a depth of $\sim 2 \mu\text{m}$ (boundary of deep and shallow wells), and (3) 2×10^{14} ions/cm³ at a depth of $\sim 8 \mu\text{m}$ (boundary of substrate and deep wells). EX1003, ¶¶90-94.  -00266: Petition [1] at 25

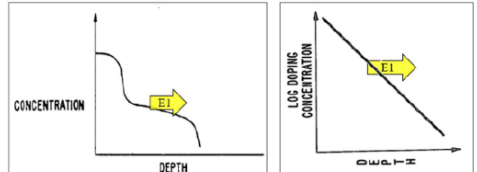
-00266: PO Sur-Reply [45] at 12-13

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Slide #	New argument / objection	Copy of slide
		6. Payne Does Not Move “Minority Carriers” from the “Surface Layer” - Payne discloses only a <u>single</u> impurity concentration for the “surface regions.” - Payne’s FIG. 11 does not disclose a sloped concentration through the “surface regions.” The surface impurity concentration of the surface regions is typically $0.5\text{--}5 \times 10^{16}$ ions/cm³ and that of the tub regions is typically $10^{15}\text{--}10^{16}$ ions/cm³, with the former concentration being at least twice as much as the latter over these ranges. -00266: Ex. 1005 (Payne) at 5:51-55 EX1005, FIGS. 10-11. Dr. Bialock has annotated Figure 11 to reflect exemplary (maximum) dopant concentrations at various depths disclosed in Payne: (1) 5×10^{16} ions/cm³ at the surface of the shallow wells (depth $0\mu\text{m}$), (2) 10^{16} ions/cm³ at a depth of $\sim 2\mu\text{m}$ (boundary of deep and shallow wells), and (3) 2×10^{14} ions/cm³ at a depth of $\sim 8\mu\text{m}$ (boundary of substrate and deep wells). EX1003, ¶¶90-94. -00266: Petition [1] at 25 -00266: PO Sur-Reply [45] at 12-13 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenhead Ex. 2013 p. 94 of 135 Semiconductor v. Greenhead 94

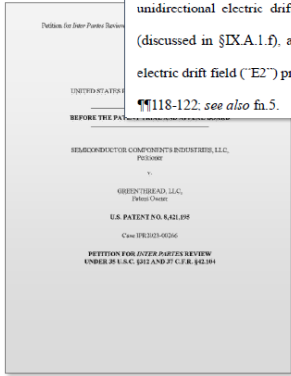
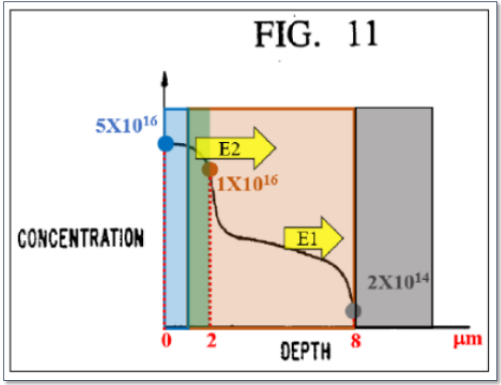
Slide #	New argument / objection	Copy of slide
		6. Payne Does Not Move “Minority Carriers” from the “Surface Layer” • Petitioner identifies an electric field that does <u>not</u> start in the surface layer. <i>Petition for Inter Partes Review of U.S. Patent No. 8,021,895</i> UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE PATENT TRIAL AND APPEAL BOARD SEMICONDUCTOR COMPONENTS INDUSTRIES, LLC, Petitioner v. GREENTHREAD LLC, Respondent U.S. PATENT NO. 8,021,895 Case 19L-0034-0006 PETITION FOR INTER PARTES REVIEW UNDER 35 U.S.C. §102 AND 37 C.F.R. §42.104 Thus, according to Jastrzebski, Kamins, Applicant, and PO, Payne's profile generates a (first) “built-in” static unidirectional electric drift field (illustrated by the yellow arrow labelled “E1” below left) that aids the movement of minority carriers from the surface layer to the substrate.⁵ EX1003, ¶¶95-104.  -00266: Petition [1] at 31-32

-00266: PO Sur-Reply [45] at 12-14

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Slide #	New argument / objection	Copy of slide
		6. Payne Does Not Move “Minority Carriers” from the “Surface Layer” • Petitioner later identifies two electric fields that do <u>not</u> start in the surface layer. Payne’s Figure 11 is further annotated below to show the exemplary first static unidirectional electric drift field (“E1”) present in a deep portion of the SDL (discussed in §IX.A.1.f), and a different, exemplary second static unidirectional electric drift field (“E2”) present in the well region disposed in the SDL. EX1003, ¶¶118-122; see also fn.5.   -00266: Petition [1] at 40 -00266: PO Sur-Reply [45] at 12-14 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenhead Ex. 2913 p. 96 of 135 Semiconductor v. Greenhead 96

Slide #	New argument / objection	Copy of slide
		6. Payne Does Not Move “Minority Carriers” from the “Surface Layer” Petitioner identified two electric fields that will <u>not</u> move electrons from the surface layer. Payne’s Figure 11 is further annotated below to show the exemplary first static unidirectional electric drift field (“E1”) present in a deep portion of the SDL (discussed in §IX.A.1.f), and a different, exemplary second static unidirectional electric drift field (“E2”) present in the well region disposed in the SDL. EX1003, ¶¶118-122; <i>see also</i> fn.5. FIG. 11 CONCENTRATION DEPTH μm 5X10¹⁶ 1X10¹⁶ 2X10¹⁴ 0 2 8 -00266: Petition [1] at 40 -00266: PO Sur-Reply [45] at 12-14 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenhead Ex. 2013 p. 97 of 135 Semiconductor v. Greenhead 97

<u>Slide #</u>	<u>New argument / objection</u>	<u>Copy of slide</u>
58	Untimely argument that was not properly raised in the Patent Owner's Response ("Movement of <u>Minority</u> Carriers from the Surface Layer") and relies on impermissible hearsay from an unrelated third-party's expert (Campbell Deposition Transcript, EX2085) under F.R.E. 801-803.	3. Movement of <u>Minority</u> Carriers from the Surface Layer Monolithic's expert agrees that the downward-facing electric field can only move holes. 1 Q. What did you mean by 2 "properly constructed"? 3 A. You would have to construct an 4 electric field that moves the carriers away, and 5 that means the electric field has to be, the 6 direction has to be correct. 7 If you're moving holes, then you 8 have to have the electric field that points 9 downward. 10 If you're moving electrons, the 11 electric field has to be pointing upward and you 12 have to have a sufficient electric field 13 intensity to prevent most of the carriers from 14 being collected by the drain. -00266: Ex. 2085 (Campbell Dep. Tr.) at 34:1-14 -00266: PO Resp. [32] at 15 DEMONSTRATIVE EXHIBIT – NOT EVIDENCE Greenbraid Ex. 2013 p. 58 of 135 Semiconductor v. Greenbraid 58

Dated: May 05, 2025

Respectfully submitted,

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CERTIFICATE OF SERVICE

In accordance with 37 C.F.R. § 42.6(e), the undersigned certifies that on the 5th day of May, 2025, a complete and entire copy of this **PETITIONER'S OBJECTIONS TO PATENT OWNER'S DEMONSTRATIVES** were served on Patent Owner electronically via email to counsel for the Patent Owner:

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