UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION

GREENTHREAD, LLC Plaintiff, v. INTEL CORPORATION, DELL INC., AND DELL TECHNOLOGIES INC. Defendants.	)))))))))))	Case No. 6:22-cv-105-ADA

DEFENDANTS' REPLY CLAIM CONSTRUCTION BRIEF

TABLE OF CONTENTS

I. INTRODUCTION 1

II. DISPUTED CLAIM TERMS 1

A. "surface layer" and related terms 1

B. "substrate" 5

C. "active region" 6

D. "unidirectional electric drift field" terms 8

E. "to aid the movement of minority carriers from … to …" / "to aid carrier movement from … [to/towards] …" 10

F. "well region" 14

G. "active region … within which transistors can be formed" 15

III. CONCLUSION 17

TABLE OF AUTHORITIES

Cases **Page(s)**

Applied Med. Res. Corp. v. U.S. Surgical Corp.,
448 F.3d 1324 (Fed. Cir. 2006).....2

Hoechst Celanese Corp. v. BP Chemicals Ltd.,
78 F.3d 1575 (Fed. Cir. 1996).....6

Infinity Computer Prod., Inc. v. Oki Data Americas, Inc.,
987 F.3d 1053 (Fed. Cir. 2021).....17

Interval Licensing LLC v. AOL Inc.,
766 F.3d 1364 (Fed. Cir. 2014).....10, 13

Nautilus Enzo Biochem, Inc. v. Apllera Corp.,
599 F.3d 1325 (Fed. Cir. 2010).....13

Samsung Elecs. Am., Inc. v. Prisua Eng'g Corp.,
948 F.3d 1342 (Fed. Cir. 2020).....4

Synchronoss Techs., Inc. v. Dropbox, Inc.,
987 F.3d 1358 (Fed. Cir. 2021).....16

Transclean Corp. v. Bridgewood Servs., Inc.,
290 F.3d 1364 (Fed. Cir. 2002).....6

Wasica Fin. GmbH v. Cont'l Automotive Systems, Inc.,
853 F.3d 1272 (Fed. Cir. 2017).....11

TABLE OF EXHIBITS

Exhibit	Description
A	U.S. Patent No. 8.421,195
B	U.S. Patent No. 9,190,502
C	U.S. Patent No. 11,121,222
D	U.S. Patent No. 10,510,842
E	U.S. Patent No. 10,734,481
F	U.S. Patent No. 11,316,014
G	File History of U.S. Patent No. 8,421,195
H	U.S. Patent Application No. 13/854,319
I	U.S. Patent No. 4,160,985
J	U.S. Patent No. 4,684,971
K	U.S. Patent Application Publication No. 2003/0183856 A1.
L	U.S. Patent Application Publication No. 2003/0042511 A1.
M	U.S. Patent Application Publication No. 2007/0045682 A1
N	*Silicon Processing for the VLSI Era* (2000) Volumes 1-4
O	Petition for *Inter Partes Review* of United States Patent No. 8,421,195 Pursuant to 35 U.S.C. §§ 311-319, 37 C.F.R. § 42, *Samsung Electronics Co. Ltd., v. Greenthread LLC*, IPR2020-00289
P	Patent Owner Preliminary Response Under 35 U.S.C. § 313 and 37 C.F.R. §42.107, *Samsung Electronics Co. Ltd., v. Greenthread LLC*, IPR2020-00289
Q	Declaration of Alexander D. Glew, *Samsung Electronics Co. Ltd., v. Greenthread LLC*, IPR2020-00289
R	*McGraw Hill Dictionary of Scientific and Technical Terms*, 6th Ed. (2003)
S	*Microchip Manufacturing,* S. Wolf, (2004)
T	*Semiconductor Devices, Physics and Technology,* S.M. Sze 2nd Ed., (2001)

U	*McGraw-Hill Dictionary of Electrical and Computer Engineering*, 6th Ed., (2003).
V	Declaration of Scott Thompson
W	U.S. Patent No. 8,106,481
X	U.S. Patent No. 6,633,066
Y	U.S. Patent No. 6,930,336
Z	Lin, W., *A Simple Method for Extracting Average Doping Concentration in the Polysilicon and Silicon Surface Layer near the Oxide in Polysilicon-Gate MOS Structures*
AA	Baker, R. J., CMOS Circuit Design, Layout, and Simulation, IEEE (1998)
BB	Chen, J. Y., CMOS Devices and Technology for VLSI, Prentice-Hall (1990)
CC	Webster's Third New International Dictionary of the English Language Unabridged, Merriam-Webster, Inc. (2002),
DD	Weste, N. H. E *et al.*, CMOS VLSI Design: A Circuits and Systems Perspective, Addison-Wesley (2011),
EE	Greenthread's Disclosure of Extrinsic Evidence
FF	U.S. Patent No. 5,536,962
GG	U.S. Patent Application No. 13/854,319
HH	File History of U.S. Patent No. 10,510,842, Office Action, dated July 17, 2018.
II	File History of U.S. Patent No. 10,510,842, Amendment, dated September 16, 2019
JJ	File History of U.S. Patent No. 10,510,842, Amendment, dated January 16, 2019
KK	File History of U.S. Patent No. 10,510,842, Notice of Allowance, dated November 5, 2019
LL	File History of U.S. Patent No. 11,121,222, Notice of Allowance, dated August 11, 2021
MM	File History of U.S. Patent No. 11,316,014, Notice of Allowance, dated

	August 11, 2021
NN	File History of U.S. Patent No. 10,734,481, Notice of Allowance, dated April 7, 2020
OO	File History of U.S. Patent No. 10,510,842, Office Action, dated August 11, 2021.
PP	File History of U.S. Patent No. 10,510,842, Application, dated May 9, 2017.
QQ	Wang, F., Single Event Upset: An Embedded Tutorial, 21 International Conference on VLSI Design, IEEE (2008)
RR	Excerpts from Samsung's Invalidity and Ineligibility Contentions and Disclosure, *Greenthread v. Samsung*, 2-19-cv-00147 (E.D. Tex. 2019), Dkt. 97-9 and 97-10
SS	Excerpts from Samsung's Supplemental Invalidity and Ineligibility Contentions dated June 9, 2020, *Greenthread v. Samsung*, 2-19-cv-00147 (E.D. Tex. 2019), Dkt. 97-8

DISPUTED CLAIM CONSTRUCTIONS

Term	Claims	Defendants	Greenthread
"surface layer" / "an active region . . . disposed on one surface of said surface layer" / "a single drift layer disposed between the other surface of said surface layer and [said/the] substrate"	**'195**: 1 **'502**: 7 **'222**: 44	Indefinite	Plain and ordinary meaning, where the plain and ordinary meaning is "a layer at the surface"
"substrate"	**'195**: 1 **'502**: 7 **'842**: 1, 2, 4, 9-10, 12, 17 **'481**: 1-3, 8, 15, 20, 22-23, 32 **'222**: 1-3, 8, 15, 21, 23-24, 33, 39-42, 44 **'014**: 1-3, 8, 15, 21, 23-24	"the initial material within which or on which the semiconductor device is fabricated"	Plain and ordinary meaning, where the plain and ordinary meaning is an "underlying layer"
"active region"	**'195**: 1 **'502**: 7 **'842**: 1, 5-7, 9, 13-15, 17-18 **'481**: 1, 4-6, 8-9, 13, 20, 24-27 **'222**: 1, 4-6, 8, 13, 20-21, 25-28, 35, 38-42, 44 **'014**: 1, 4-6, 8-9, 13, 20-21, 25-28	"Region that forms the current path of a device" or "the source, drain and channel region of a device"	Plain and ordinary meaning
"said [drift layer further/well region] having a [first/second] static unidirectional electric drift field" "said [drift layer/well	**'195**: 1 **'502**: 7 **'222**: 44	"said [drift layer further/well region . . .] having a [first/second] static electric drift field that is unidirectional over the [drift layer/well	Plain and ordinary meaning

Term	Claims	Defendants	Greenthread
region] having a graded concentration of dopants generating a [first/second] static unidirectional electric drift field"		region]" "said [drift layer/well region] having a graded concentration of dopants generating a [first/second] static electric drift field that is unidirectional over the [drift layer/well region]"	Plain and ordinary meaning
"To aid the movement of minority carriers from … to …" "To aid carrier movement from … [to/towards] …"	**'195**: 1 **'502**: 7 **'842**: 1, 9 **'481**: 1, 20 **'222**: 1, 21, 39, 41, 42, 44 **'014**: 1, 21	Indefinite. Alternative construction: "to sweep the minority carriers from … to …" Indefinite. Alternative construction: "to sweep the carriers from … [to/towards] …"	Plain and ordinary meaning Plain and ordinary meaning
"well region"	**'195**: 1 **'502**: 7 **'481**: 1, 20 **'222**: 1, 21, 40, 44 **'014**: 1, 21	"A well, whether formed by single or multiple implants. Portions of a well are not well regions."	Plain and ordinary meaning, where portions of a well are not well regions.
"active region … within which transistors can be formed"	**'842**: 1, 9 **'481**: 1, 20 **'222**: 1, 21, 39, 41, 42 **'014**: 1, 21	Indefinite.	Plain and ordinary meaning

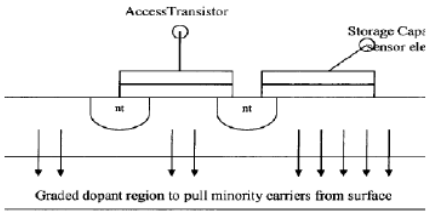
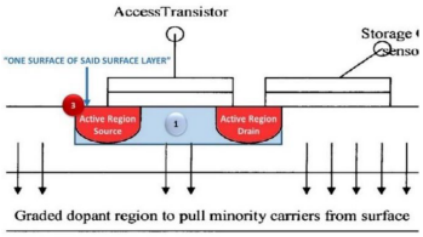
I. INTRODUCTION

Greenthread urges that all disputed terms be construed as "plain meaning," but its responsive brief confirms either that the term has no such meaning and is indefinite, that Greenthread's "plain meaning" fails to resolve the parties' dispute regarding the legal scope of the claims, or that Greenthread's alleged "plain meaning" improperly attempts to recapture claim scope that Greenthread surrendered at the USPTO.

II. DISPUTED CLAIM TERMS

A. "surface layer" and related terms

Greenthread's alleged "plain meaning" is "a layer at the surface." Resp. Br. at 9. But as Defendants demonstrated (Op. Br. at 3-7), no "layer at the surface" that meets the spatial relationships defined by the claims is disclosed in the specification and those claimed relationships are inconsistent with any such layer. *See also* Defendant's Motion for Summary Judgment, ECF No. 81. Faced with these inconvenient facts, Greenthread concocts an alleged "surface layer" by annotating Figure 5B of the patents with an arbitrary box drawn around the active region depicted in that figure. A comparison of the unmodified Figure 5B with the Greenthread's depiction of its alleged "surface layer" (in blue and labeled "1") appears below.

Original Figure 5B	Greenthread's Modified Figure 5B (Resp. Br. at 12)
	

Greenthread's annotation confirms that "surface layer" lacks any discernable meaning because the depth of what constitutes the "surface" is undefined. ***No layer, or any other structure,***

appears in Figure 5B or is otherwise described in the specification that corresponds to Greenthread's newly minted "surface layer." Figure 5B reveals no such layer, but rather depicts the active region to be disposed in what Greenthread concedes is the well region, both of which are other claim elements. Indeed, Greenthread admits that its "surface layer" is not an actual physical layer by referring to it as nothing more than the "blue region." Resp. Br. at 12. To the extent it includes physical structures, Greenthread has drawn its alleged "surface layer" as co-extensive with what it elsewhere defines as the active region—"source and drain and silicon between them" (Resp. Br. at 20)—thereby effectively eliminating "surface layer" as a separate claim element. *Applied Med. Res. Corp. v. U.S. Surgical Corp.*, 448 F.3d 1324, 1333 n. 3 (Fed. Cir. 2006) ("[T]he use of two terms in a claim requires that they connote different meanings . . . ."). Tellingly, Greenthread provides no justification or citation for why the bottom of its "surface layer" coincides with the bottom of the source and drain of the active region, or any explanation of how a POSITA could discern the boundaries of this layer from the surrounding well region.

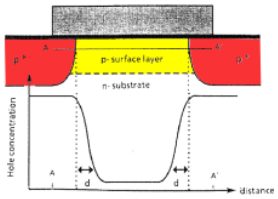
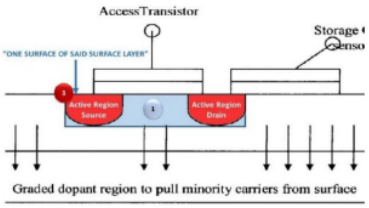
Greenthread's construction is contrary to the claim language. Greenthread argues that "active region . . . disposed on one surface of the surface layer" means that the "active region" is part of the "surface layer" "just like the 'well region' is part of the 'single drift layer.'" Resp. Br. at 11. Greenthread's analogy to the "well region" illustrates its error. The asserted claims use "disposed ***in***" to describe the well region's relationship with the "single drift layer" but use "disposed ***on***" to describe the active region's relationship to the surface layer. *See Applied Med.*, 448 F.3d at 1333 n. 3. Moreover, Greenthread's argument that the active region is part of the surface layer is not supported by any evidence beyond the conclusory testimony of its expert. Resp. Br. at 11. This interpretation is wholly unsupported by the specification, which instead only shows the active region disposed ***in*** the well region. Ex. V, ¶¶ 32-33 (annotating '195 Patent at Fig. 5B).

Greenthread's construction is contrary to the specification. Unable to point to any use in the specification of the term "surface layer," Greenthread attempts to rely on various references to "surface" by contending that "'surface' is often used as a shorthand for 'surface layer.'" Resp. Br. 13-14. But Greenthread fails to support this claim with anything other than its expert's conclusory assertion. *Id.* In any event, as Defendants established (Op. Br. at 5-6; Ex. V, ¶ 34), none of the references to "surface" in the specification correspond to the "surface layer" required by the claims and, tellingly, none correspond to Greenthread's newly concocted "blue region." Ex. V, ¶ 34.

Greenthread's reliance on the prosecution history is misplaced. Greenthread argues that claims of the original priority application support its interpretation (Resp. Br. at 13) but Greenthread ignores that the applicant amended the claims to include both "a surface region" and "an active channel region" (Ex. G at 123 (amendments to Cl. 3)), which confirms those regions are distinct. The subsequent change from "surface region" to "surface layer" and "active channel region" to "active region" in no way implies the active region is part of the surface layer, as Greenthread now argues. Moreover, the Examiner's mapping of "surface layer" to Kamins does not aid Greenthread. The Examiner identified the entire "silane epitaxial film 23" in Kamins as a "surface layer." Ex. G at 182 ("surface layer (23)"); Ex. I at 2:51-53 ("silane epitaxial film 23"), Fig. 2. Kamin's film 23 is an actual physical layer that is analogous to what Greenthread concedes is the ***well region*** of Fig. 5B of the Asserted Patents, and not the arbitrary "blue region" that Greenthread now asserts to be a "surface layer." Ex. I at Fig. 2 (illustrating film 32), 2:51-53.

Greenthread's construction is contrary to the extrinsic evidence. As Defendants demonstrated (Op. Br. at 6-7), "surface layer" has no commonly accepted meaning. The art uses "surface layer" as a nonce word to refer to many different layers depending on context. *Id.*

Greenthread cherry-picks one from Wolf, but even that example is inconsistent with Greenthread's interpretation of "surface layer." There, Wolf uses the term "surface layer" to refer to doping of the channel. Ex. V, ¶ 41 (discussing Ex. N3 at 295 (*11); Ex. N4 at 192, 195 (*7, *10)). But as shown below, even a cursory comparison reveals that Wolf's "surface layer" (yellow) does not correspond to Greenthread's alleged "blue region" "surface layer" of the Asserted Patents since Wolf's surface layer does not include the source and drain (red) and all the silicon in-between.

Wolf Figure 5-57 (Ex. N at 295 (*11))	Greenthread's "blue region"
	

Nor could Greenthread reasonably argue to the contrary: the "active region" shown in Wolf is not disposed on the surface of Wolf's "surface layer" (*id.* ¶ 41 (annotating Fig. 5-57 of Wolf)), but is the opposite: Wolf's "surface layer" is disposed in the "active region." *Id.*; Ex. V. ¶ 41.

Greenthread's reliance on the Samsung litigation is misplaced. Greenthread asserts that "[d]uring the Markman process in the Samsung litigation, Defendants' counsel never argued that 'surface layer' was indefinite or not disclosed in the specification." Resp. Br. at 15. That is simply not true. Samsung argued "surface layer" lacked written description and was indefinite throughout that case. Ex. RR at 198-99; Ex. SS at 259-60, 263. Moreover, statements by Samsung's IPR expert—an expert never retained by any Defendant or its counsel here—are irrelevant, especially as indefiniteness arguments are not available in IPR. *See Samsung Elecs. Am., Inc. v. Prisua Eng'g Corp.*, 948 F.3d 1342, 1350 (Fed. Cir. 2020). In any event, Dr. Smith's testimony is consistent with Defendants' indefiniteness assertions here. Dr. Smith expressly stated that the "specification does not disclose details regarding the 'surface layer'" (Resp. Br., Ex. 6, ¶ 49), and that as a result

he presented multiple "possible mappings" of "surface layer" (*id.*, ¶¶ 51, 53, 57) to the prior art, confirming that a POSITA could not discern the objective metes and bounds of the term.

B. "substrate"

Greenthread argues that "substrate" is "readily understood" as "simply an 'underlying layer.'" Resp. Br. at 15. This proposed construction—which comes from two non-technical dictionary definitions (*id.*)—would untether the term from its technical meaning in the semiconductor field and would arguably encompass almost *any* layer or combination of layers.

First, Greenthread contends (incorrectly) that its construction reflects "how the term is consistently used in the claims, specification, and prosecution history." Resp. Br. at 15-16. To the contrary, when Dr. Rao amended the claims to require an "active region" on a "surface layer" and a "drift layer" including a "well region" between the "surface layer" and the "substrate," he argued that a "critical feature of the invention" is that these layers and regions are "distinct" from (not part of) the "substrate." Ex. G at 174; *see also id*. at 162, 164-65, 167. Accordingly, the figures depict "wells," "regions," and "layers" below the surface of the device, but describe the "substrate" as being **only** the initial supporting foundation on which those structures are fabricated. Ex. A, '195 Patent at 1:50-51, 1:61-63, 2:16-22, 2:27-28, 3:30-43, Figs. 2-5. The specification's description of a "**substrate** with two **wells**, and, an **underlying layer**" (Resp. Br. at 16, emphasis added), confirms these different terms mean different things and not all "underlying layers" are substrates.

The relevant extrinsic evidence also supports Defendants' construction.[1] Because "substrate" is a technical term, these technical dictionaries and semiconductor publications are "a

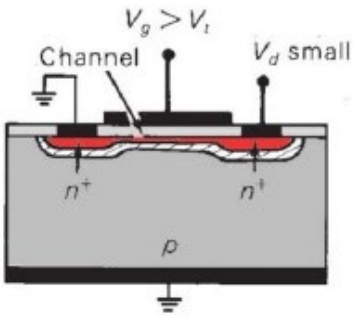
[1] *See, e.g.*, Ex. R at INTEL_GREENTHREAD00015553 (defining "substrate" as the "physical material on which a microcircuit is fabricated"); Resp. Br., Ex. 13 at 327-28, 383 (describing the "starting material" for a CMOS device as being the "silicon wafer (substrate)"); *id.*, Ex. 14 at 523 (distinguishing the "starting substrate" from "wells," and explaining that "[t]he well-formation process starts with a uniform, lightly doped p- or n-type substrate").

better source to inform the meaning of the term" than the general-purpose dictionaries Greenthread relies on for its construction. *See Transclean Corp. v. Bridgewood Servs., Inc.*, 290 F.3d 1364, 1375 (Fed. Cir. 2002); *Hoechst Celanese Corp. v. BP Chemicals Ltd.*, 78 F.3d 1575, 1580 (Fed. Cir. 1996) ("a general dictionary definition is secondary to the specific meaning of a technical term as it is used and understood in a particular technical field"). Moreover, Greenthread acknowledges it is "customary" to construe structures in a semiconductor device according to their "relative position." *See* Resp. Br. at 10. Defendants do exactly that by construing "substrate" as "the initial material within which or on which the semiconductor device is fabricated."

C. "active region"

The parties appear to agree on what is the "active region" in the CMOS (or MOSFET) devices at issue in this case. Greenthread concedes that in such a device the active region is "the source and drain of a MOSFET, and the silicon between the source and drain." Resp. Br. at 20. But that region is the "region that forms the current path of a" CMOS transistor, which Defendants' construction captures. Ex. N2 at 299; Ex. S at INTEL_GREENTHREAD 00015584; Ex. V, ¶¶ 49-56; Op. Br. at 11, 12. Indeed, Defendants' opening brief expressly stated that "in a CMOS transistor, the current path of that transistor is the source, drain, and channel of the device" and illustrated the "channel" as existing in the silicon between the source and drain. Op. Br. at 12, 13.

Despite this apparent agreement, Greenthread incorrectly argues that Defendants' construction requires voltage to be actually applied and current to be ***actually flowing*** in a transistor. *Id.* at 19. To the contrary, Defendants' construction refers to the "region" that forms the current path in a transistor, regardless of whether "a sufficient voltage is applied" to make current flow. Resp. Br. at 19; *see also* Op. Br. at 11-13; Ex. H at 149; Ex. G at 123; Ex. N2 at 299; Ex. N4 at 197; Ex. S at INTEL_GREENTHREAD 00015595;



Ex. T at INTEL_GREENTHREAD00015737; Ex. V, ¶¶ 49-56. Nevertheless, Defendants are willing to adopt Greenthread's formulation of "source, drain, and silicon between them," with one clarification:[2] the "silicon between" the source and drain that is "active" when the transistors is on, *i.e.*, the region that forms the current path, is the "channel region," as Greenthread acknowledges. Resp. Br. at 20 (citing Ex. 4 (Chen), 239); Op. Br. at 12-14; Ex. N2 at 299; Ex. N4 at 197. This channel region will typically exist in only the upper portion of the silicon between the source and drain in the transistor. For example, Greenthread and its expert, Dr. Giapis, refer to the channel region as the "thin layer below the surface (shaded red)," labelled "channel" in the figure to the right from Greenthread's Exhibit 4. Resp. Br. at 4-5 (citing Dkt. 96-4 (Chen) at 19); Dkt. 96-1 (Giapis Decl.) ¶18 ("The current flow occurs in a ***thin layer of silicon near the surface, called the 'channel'***, located between two terminals called the source and the drain."). Thus, the precise meaning of "active region" in a CMOS device is "the source, drain, and channel region." Ex. N2 at 299; Ex. S at INTEL_GREENTHREAD 00015584; Ex. V, ¶¶ 49-56.

Greenthread's alternative characterization of "active region" as "a doped silicon region at the surface of a semiconductor device where a transistor can be formed" fails to provide any meaning for "active region," but rather just incorporates limitations already found in other elements of the relevant claims. *See, e.g.*, Ex. A at 4:25-27 (claiming a "well region having a graded concentration of dopants"); Ex. D (claiming a "first surface of the substrate with a second doping type" and an "active region . . . within which transistors can be formed"). Greenthread's own proffered evidence defines an "active region" as the source, drain, and channel region, *i.e.* the region forming the current path in a CMOS device, and this Court should construe it accordingly.

[2] The asserted claims focus on CMOS (MOSFET) devices and all accused products are such devices. *See. e.g.*, Ex. A, '195 Patent at 4:14-29.

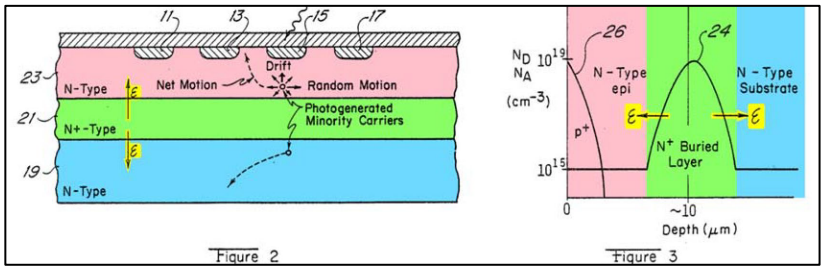
D. "unidirectional electric drift field" terms

Greenthread confirms its belief that its "plain meaning" construction of this term covers an electric field in any portion of the recited drift layer or well region regardless of the presence of other fields of opposing direction. But Greenthread surrendered such an interpretation when it amended the claims to require a "unidirectional" electric drift field—an electric field of a single direction over the recited layer or region—to overcome Kamins during prosecution. Greenthread now argues that "Kamins did not disclose 'a single layer' with graded dopants; instead Kamins has three layers with uniform dopants." Op. Br. at 23. Reproducing an annotated version of Kamins' Figure 2 showing "lightly doped layer 23, a heavily doped layer 21, and a lightly doped layer 19," Greenthread contends that each of these layers have ***uniform*** rather than graded dopants: "***None of these layers have a graded concentration of dopants*** where the dopants gradually change from heavily doped to lightly doped or vice versa. ***Instead, each layer has a uniform concentration of dopants***, where the concentration of dopants abruptly changes where the layers meet." *Id.* Representing that "[t]he Examiner did not disagree with [this] assessment of Kamins," Greenthread argues that "'unidirectional' was added to clarify there was a single layer of graded dopant (as opposed to two layers of uniform dopants)" in the claimed invention. *Id*. at 22, 23.

But Greenthread's characterization of Kamins, along with its assertion that the Examiner agreed with that characterization, cannot withstand even the barest scrutiny. After the Examiner rejected pending claim 10 (now Claim 1), Ex. G at 164; Ex. G at 182; Ex. G at 222, Greenthread ***initially*** made the very same argument that it makes now, namely that Kamins merely disclosed multiple layers of different uniform dopant concentrations "and not a single layer with a gradient established in donor [sic] concentration as required by the claim element." Ex. G at 214. But ***the Examiner expressly rejected this characterization of Kamins***, pointing out that Kamins ***did in fact disclose a single layer with a dopant gradient***. Ex. G at 226-27:

> Further, [Kamins] Figure 3 shows that the N+ buried layer of Figure 2 (i.e. layer 21, which is the drift layer as explained in the rejection of claim 10) ***does have a variable doping profile represented by the central hump of the dopant profile 24 of Figure 3*** (y-axis of Figure 3 representing doping concentration). As can be seen, ***this dopant profile has a gradient***.

Kamins Figure 3—which Greenthread tellingly omits from its brief—confirms the Examiner's understanding. As shown below, Kamins' single "N+ Buried Layer" (annotated in green below in Kamins' Figure 2) employs a ***bidirectional graded*** concentration (annotated in green below in Kamins' Figure 3) that creates ***two electric fields (annotated in yellow) with opposing directions***. Ex. I at 2:32-35, 2:64-3:18, FIGS. 2-3.



Although Greenthread attests here that it "never distinguished a single layer with multiple electric fields" (Resp. Br. at 24), ***this is not true.*** It was the above Kamins disclosure of a single layer having two electric fields of "opposing directions" that force Greenthread to amend pending claim 10 to require a "***unidirectional*** drift layer." Ex. G, 234, 237. Noting that the two fields of Kamins' "N+ Buried Layer" accelerated carriers to the surface ***and*** accelerated carriers to the substrate, Greenthread distinguished Kamins on the basis that the field of the claimed drift layer was "**unidirectional,**" permitting carriers to move in only one direction. *Id*. at 237.

Moreover, contrary to its present contention that it "never said the claims require the electric field to be unidirectional over any of the layers, much less the entire layer" (Resp. Br. at 22), Greenthread said exactly that during prosecution: "In other words, the drift field for the holes (minority carriers) ***is unidirectional, i.e., from the emitter (surface layer) to the collector***

(substrate) *. . .* ***moving all minority carriers in the same direction because of the unidirectional drift*** *. . .*" Ex. G at 254-55. Indeed, any other interpretation of "unidirectional" is nonsensical—permitting multiple fields of different direction within the same layer or region would render the term "unidirectional" superfluous.

Finally, Greenthread contends that "[i]n the Samsung litigation, Judge Gilstrap already held that there was no prosecution disclaimer." Resp. Br. at 25. These arguments were not before Judge Gilstrap and he considered a different term—"graded concentration of dopants." There, Samsung argued that "graded concentration of dopants" required a concentration that "only decreases or only increases across the layer." Resp. Br. Ex. 5, at 10, 13. Judge Gilstrap held that nothing in the term "graded concentration of dopants" itself required that construction. *Id.* at 17. Instead, Judge Gilstrap found that "unidirectional" referred "***to the direction of the drift electric field and the movement of carriers*** rather than the slope of the dopant concentration." *Id*. at 14; *see also id*. at 17. That is precisely Defendants' position here: "unidirectional" imposes the requirement that the ***electric field*** and resultant carrier movement be of a single direction across the layer.

E. "to aid the movement of minority carriers from … to …" / "to aid carrier movement from … [to/towards] …"

Greenthread insists that "the words 'to aid movement' should be given the full scope of their plain meaning." Resp. Br. at 30. But under plain meaning, the "to aid movement" claim phrases, in view of the specification and prosecution history, are "facially subjective claim language without an objective boundary" and are indefinite. *Interval Licensing LLC v. AOL Inc.*, 766 F.3d 1364, 1373 (Fed. Cir. 2014). Greenthread's bald contention that the claims are "not referring to ***any*** movement" and "do ***not*** require … ***a particular result***" in spite of the "to aid movement" terms confirm the lack of objective boundaries. Resp. Br. at 28.

Greenthread in fact concedes the "to aid movement" phrases are nondescript and provide

no guidance regarding claim scope: "Any question about what is meant by 'to aid the movement' is answered by the ***preceding*** claim language." *Id.* at 26. But the "preceding claim language" recites graded dopant(s) without guidance as to what particular graded dopant profile would fall within (or outside) the scope of the claims. According to Greenthread, a graded dopant concentration is the "***who*** [that] is aiding the movement" of carriers. Resp. Br. at 26 (emphasis in original). Yet Greenthread admits that the claims "do not require a specific range of doping [or] a particular doping field," and baldly asserts that "this information is not necessary to understand the scope of [the] invention." *Id.* at 28. The common specification likewise is devoid of any guidance: it is undisputed that it uses "graded" dopant to refer to ***any*** dopant concentration that is not uniform, including prior art "retrograded" dopant concentrations that the specification disparages. Op. Br. 21 (citing '195 Patent at 3:45-49 (discussing "graded channel instead of a uniformly doped channel (as practiced in the prior art)"), 3:38-40 (devices "can be graded or retrograded, as desired"), 1:49-62 ("'Retrograde' wells have been attempted, with little success.")).

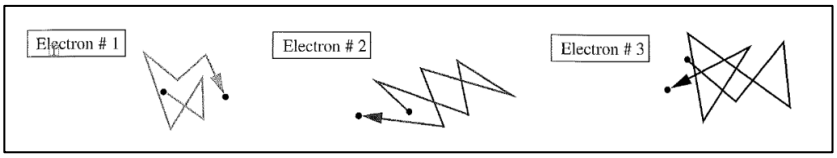
In another attempt at explaining away the "aid" claim phrases, Greenthread argues that a graded dopant concentration creates an electric field, and the "to aid movement" phrases "merely clarify[] what the electric field does." Resp. Br. at 26. "If it [(the electric field)] isn't present, then it doesn't" aid the movement of carriers. *Id.* This interpretation would read out the claim language entirely, which is "highly disfavored." *Wasica Fin. GmbH v. Cont'l Automotive Systems, Inc.*, 853 F.3d 1272, 1288 n.10 (Fed. Cir. 2017) ("It is highly disfavored to construe terms in a way that renders them void, meaningless, or superfluous."). This theory is also untenable in light of Greenthread's repeated statements that "nothing in the specification" ties movement of carriers to properties of electric field(s). Resp. Br. at 22. Indeed, Greenthread points out that the specification "merely says 'doping profiles' without *any* mention of a field" (italics in original), and that it

discusses "how the graded dopants create a drift field to ***sweep*** the minority carriers into the substrate ***without any mention*** of the ***location*** or ***duration*** of the [electric] drift field or the ***total number*** of [electric] fields" and without even mentioning the "***direction*** of the [electric] field." *Id.*

Greenthread's theory, when juxtaposed with Greenthread's argument to distinguish the prior art on the ground that a graded dopant concentration is "inadequate" to meet the "aid" claim terms, further exposes the lack of any objective boundaries. Op. Br. at 24. As Defendants' detailed, Greenthread was faced with prior art in a previous IPR that disclosed a graded dopant concentration. *Id.* Under Greenthread's theory, Payne's graded dopant concentration creates an electric field that aids the movement of carriers and therefore would readily satisfy the "to aid movement" terms at issue in the IPR. But Greenthread argued that "Figure 11 is ***inadequate*** for determining … the resulting impact on minority carrier movement." Op. Br. at 24 (citing Ex. P at 70). Tellingly, Greenthread here does not attempt to reconcile its earlier IPR argument with its theory that "to aid movement" merely clarifies what a graded-dopant-induced electric field does.

Greenthread's argument also ignores that "aiding" carrier movement cannot be considered in a vacuum. Carriers are ***always*** in motion for reasons unrelated to graded doping. Op. Br. at 19-21. The Howe textbook, relied on by Greenthread and its expert Dr. Giapis, explains that, even in the most benign non-operational conditions at room temperature, the millions and billions of carriers in a semiconductor device are in constant "agitated, random motion" at speeds in excess of 200,000 mph ("a factor of 3000 less than the speed of light!"). Resp. Br., Ex. 12 at 34. They also "collide frequently," thereby undergoing numerous random path changes as they traverse a device structure. *Id.* Greenthread does not dispute this, but wrongly dismisses fundamental device physics as "irrelevant." Resp. Br. at 28. Not so. Howe's illustration of the random trajectories of just three carriers (among the millions and billions of carriers in a device) underscores the complex

movement of carriers in any device—and thus it underscores the challenges in determining whether and how graded dopants and any associated electric field "***aid*** the movement" of carriers, if at all, and highlights the deficiencies of the intrinsic record in providing any guidance.



Howe at Fig. 2.7 (excerpted). Howe's illustration also serves as a stark rebuttal to Greenthread's wholly inapt analogies. The illustration makes clear that carriers are not like balls placed on a pool table that predictably roll down if the table is inclined. They are nothing like a wheelchair that may roll more easily down a wheelchair ramp, as Greenthread suggests. Resp. Br. at 25, 27. And they are even more unlike any rusty hinge that a little WD40 may help. *Id.* at 25.

The lone case Greenthread cites, the pre-*Nautilus Enzo Biochem, Inc. v. Apllera Corp.*, 599 F.3d 1325 (Fed. Cir. 2010), fails to support Greenthread's position. *Enzo* mandates that "[w]hen a 'word of degree' is used, the court must determine whether the patent provides 'some standard for measuring that degree.'" *Id.*, 1332; *see also Interval Licensing*, 766 F.3d at 1371. Greenthread contends that the specification complies with *Enzo* because "the preferred embodiment in Fig. 5B explain[s] exactly what is meant by 'to aid the movement of the minority carriers from the surface layer to the substrate.'" Resp. Br. at 26. But the two short paragraphs of the specification directed to CMOS devices illustrated in Figures 5A-C do not provide any guidance to objectively define or assess the "aiding" carrier movement that is claimed. Op. Br. at 21.

In any event, Greenthread severs any linkage between the "to aid movement" claim terms and the embodiment Figure 5B of the specification by rejecting Defendants' alternate proposed construction, which is grounded in the specification describing the alleged "novel technique" illustrated in Figure 5B. Op. Br. at 24-25; Resp. Br. at 30 ("There is no reason to replace the three

simple words 'to aid movement' with the new words 'to sweep.' While the word 'sweep' is used in the specification [to describe the alleged novel technique embodied in the preferred embodiment Figure 5B], the words 'to aid movement' should be given the full scope of their plain meaning.").

Greenthread also attempts to shore up its untenable position through misrepresentations of the prior Samsung litigation record and IPR proceedings. Resp. Br. at 29-30. First, Greenthread points to the agreement in the prior case that certain "aid" claim terms did not require construction. *Id.* (citing Ex. 5 at 32). But Greenthread fails to inform the Court that Samsung in fact argued that the terms were indefinite in its invalidity contentions. Ex. RR at 200; Ex. SS at 264. In any event, this fact is inapposite. The Defendants in the present litigation were not parties to the Samsung litigation and four of the six patents-in-suit were not at issue there. Second, Greenthread misleadingly quotes Samsung's IPR expert Dr. Smith as purportedly supporting its position that the "aid" terms should be accorded plain meaning. Resp. Br. at 29 (citing Ex. 6, ¶ 91). The full paragraph however makes clear that Dr. Smith was commenting on Greenthread's position: "[t]he Patent Owner/applicant also conceded that a downward slope of a graded dopant concentration" generates an electric field that aids movement of carriers. *Id.*, Ex. 6, ¶ 91. Significantly, Dr. Smith hypothesized and addressed no less than ***three*** different possible interpretations of the "aid" claim terms because he could not determine the metes and bounds of the claim. *Id.*, ¶¶ 93-96. Thus, far from supporting Greenthread, Dr. Smith's declaration confirms that the "aid" terms are indefinite.

F. "well region"

Although Greenthread continues to urge "plain meaning," it agrees "that it would be helpful to clarify for the jury that '[p]ortions of a well are not well regions.'" Resp. Br. at 30. Thus, no dispute exists that the Court should include this in its construction. Contrary to Greenthread's arguments, however, the Court should also include the first part of Defendants' proposal. As an affirmative part of its claim-construction arguments in a previous IPR, Greenthread contended that

"[a] single well can be, and frequently is, formed by multiple implants. . . . [T]he fact that multiple implants are used to form a well does not mean that the well becomes a series of *separate wells or well regions.*" Ex. P at 50 (emphasis in original); *see also id.* at 55 ("[The] discussion of well structures, and its treatment of those well structures as monolithic, even though they are formed through multiple implant steps, is consistent with how a POSITA would understand the term 'well region.'"). Similarly, Greenthread's IPR expert opined that a "POSITA would understand that just because more than one implant is used to form a well does not mean that that well constitutes multiple separate wells, or 'well regions.' This would be contrary to how a POSITA would understand wells generally and the term 'well region' in the '195 patent specifically." Ex. Q, ¶ 50. Construing this term as Greenthread impliedly construed it in IPR proceedings does not "introduce[] ambiguity," as Greenthread suggests, but instead resolves any confusion over whether a well region can comprise multiple implants.

G. "active region … within which transistors can be formed"

Greenthread does not explain how a single region can be both (1) an "active region" comprising the current path in a transistor, and (2) a "region . . . within which transistors can be formed." Resp. Br. at 31-35.[3] Instead, Greenthread tries to save the claims by re-writing "**active region** . . . within which transistors can be formed" to mean a "**doped region at the surface of a semiconductor device** . . . where a transistor can be formed." *Id.* at 19, 31-32 (emphasis added). This is improper.

Greenthread admits its construction does not require the "active region" to be "electrically active." *Id.* at 32. It also admits the claims **already require** the "active region" to be a doped region

[3] Greenthread points to "active regions where transistors **are** built," but does not contend those are regions where additional transistors "can be formed." *Id.* at 33, 35.

adjacent to the surface of the semiconductor device. *Id.* at 35. To reconcile the two incompatible terms (an "active region" and a "region . . . within which transistors can be formed"), Greenthread therefore attempts to read one of the incompatible terms ("active region") entirely out of the claims. Courts, however, cannot adopt a construction that "would require rewriting the claims" to save them from being indefinite. *See Synchronoss Techs., Inc. v. Dropbox, Inc.*, 987 F.3d 1358, 1366-67 (Fed. Cir. 2021) (finding claims indefinite and holding "'it is not our function to rewrite claims to preserve their validity'" (citation omitted)).

Greenthread contends that the patents distinguish "active circuitry" or "devices" from an "active region," and describe "active regions" as "doped regions at the surface" without mentioning "current flow." Resp. Br. at 32-33. To the contrary, the intrinsic evidence shows an "active region" is the current path in a device that is electrically active when the device is on. For example, the patents distinguish "device active . . . regions" from "isolation" regions that prevent current flowing in the device from "electrically interfering" with an adjacent device.[4] They also describe the "active" devices and regions as being the location of existing "transistors" and "charge storage nodes."[5] Similarly, Dr. Rao argued during prosecution that a device is "active when a voltage (or current) is applied" causing current to flow. Ex. G at 96-97. As such, Greenthread's purported distinction between "active" and "electrically active" is inconsistent with the intrinsic evidence. And it is ***contradicted by Greenthread's own infringement contentions,*** which identify (1) "active regions" at a "first surface" where "[t]ransistors are formed," i.e., devices forming a current path that is electrically active, and (2) "no active regions" at a "second surface" that is a

[4] Ex. D, '842 Patent, Abstract, Cl. 7; Dkt. 38-12 (Greenthread Complaint), Ex. D-1 at 13 ("the first active region and second active region are each separated by at least one isolation region to avoid one pixel electrically interfering with an adjacent pixel").

[5] Ex. D, '842 Patent, 2:16-18, 2:25-26, 3:62-63, Figs. 3A, 3C, 5A-5C, Cls. 5, 18.

doped region at the surface of a semiconductor device. Dkt. 38-12, Ex. D-1 at 7-9, 12-13, Ex. D-3 at 2 ("there are no active regions at the left side of the [SIMS] graph," where there is a "second surface" with a "first doping level").

Finally, Greenthread does not dispute that the Examiner was unable to ascertain the scope of the claims. Specifically, when the Examiner allowed the '842, '481, '222, and '014 Patents, he had at least three different and contradictory interpretations of what constitutes the claimed "active region . . . within which transistors can be formed": (1) the region (311) of Hong within which the transistors are formed, (2) the region comprising the current path in the existing transistors (21, 22, 5, and 2), and (3) neither of those regions. *See* Op. Br. at 33-34. Greenthread tries to marginalize this critical fact by arguing that any "confusion" was "created by the Examiner, not Dr. Rao." Resp. Br. at 33-35. However, that is simply not true. The examiner initially found that Hong disclosed both a "first" and "second active region." Op. Br., Ex. HH at 2-5, Ex. OO at 3-7. Dr. Rao responded to these rejections by explicitly arguing both that (1) "there is provided only a 'single' active region 311 within which two transistors are formed," and (2) the source/drain region "2 or 5" of Hong is not the claimed "second active region" because it "cannot have a transistor formed therein." *See* Op. Br. at 32-33 (quoting Ex. II at 6-7); Ex. JJ at 6-7. Now, Greenthread argues **exactly the opposite** to save the claims from being indefinite. *See* Resp. Br. at 31-32.

This confusion was the direct result of Dr. Rao's amendments introducing inconsistent and incompatible terms, and the claims are consequently indefinite. *See Infinity Computer Prod., Inc. v. Oki Data Americas, Inc.*, 987 F.3d 1053, 1059-61 (Fed. Cir. 2021) (the patentee's "inconsistent" positions during prosecution provide "no notice to the public" of the scope of the claims).

III. CONCLUSION

Defendants respectfully request the Court to hold the Asserted Patents invalid for indefiniteness and otherwise adopt Defendants' proposed constructions of the remaining terms.

Dated: November 14, 2022

Respectfully submitted,

/s/ J. Stephen Ravel

J. Stephen Ravel
Texas State Bar No. 16584975
KELLY HART & HALLMAN LLP
303 Colorado, Suite 2000
Austin, Texas 78701
Tel: (512) 495-6429
steve.ravel@kellyhart.com

Gregory S. Arovas (*Pro Hac Vice*)
Robert A. Appleby (*Pro Hac Vice*)
Todd M. Friedman (*Pro Hac Vice*)
Leslie M. Schmidt (*Pro Hac Vice*)
Jon R. Carter (*Pro Hac Vice*)
Christopher DeCoro (*Pro Hac Vice*)
KIRKLAND & ELLIS LLP
601 Lexington Avenue
New York, NY 10022
Tel: (212) 446-4800
Fax: (212) 446-4900
garovas@kirkland.com
robert.appleby@kirkland.com
todd.friedman@kirkland.com
leslie.schmidt@kirkland.com
jon.carter@kirkland.com
christopher.decoro@kirkland.com

Nyika O. Strickland (*Pro Hac Vice*)
KIRKLAND & ELLIS LLP
300 North LaSalle Street
Chicago, IL 60654
Tel: (312) 862-2000
Fax: (202) 862-2200
nstrickland@kirkland.com

Abigail Lauer Litow (*Pro Hac Vice*)
John Rhine (*Pro Hac Vice*)
KIRKLAND & ELLIS LLP
1301 Pennsylvania Avenue, N.W.
Washington, D.C. 20004
Tel: (202) 879-5000
Fax: (202) 879-5200
abigail.litow@kirkland.com
john.rhine@kirkland.com

Bao Nguyen (*Pro Hac Vice*)
KIRKLAND & ELLIS LLP
555 California Street 27th Floor
San Francisco, CA 94104
Tel: (415) 439-1400
Fax: (415) 439-1500

Paige Arnette Amstutz
Texas State Bar No. 00796136
SCOTT DOUGLASS & McCONNICO LLP
303 Colorado Street, Suite 2400
Austin, Texas 78701
Telephone: (512) 495-6300
pamstutz@scottdoug.com

Abhishek Bapna (*Pro Hac Vice*)
George S. Soussou (*Pro Hac Vice*)
Ryan Joseph Sheehan (*Pro Hac Vice*)
Lupco (Lewis) V. Popovski (*Pro Hac Vice*)
PATTERSON BELKNAP WEBB & TYLER LLP
1133 Avenue Of The Americas
New York, NY 10036
(212) 336-2000
Fax: (212) 336-2911
abapna@pbwt.com
gsoussou@pbwt.com
rsheehan@pbwt.com
lpopovski@pbwt.com

Attorneys for Defendants Dell Inc. and Dell Technologies Inc.

bnguyen@kirkland.com

Attorneys for Defendants Intel Corporation; Dell Inc.; and Dell Technologies Inc.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that all counsel of record who are deemed to have consented to electronic service are being served with a copy of this document via the Court's CM/ECF system on November 14, 2022.

/s/ J. Stephen Ravel
J. Stephen Ravel

UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION

GREENTHREAD, LLC Plaintiff, v. INTEL CORPORATION, DELL INC., AND DELL TECHNOLOGIES INC. Defendants.	)))))))))))	Case No. 6:22-cv-105-ADA

DECLARATION OF J. STEPHEN RAVEL IN SUPPORT OF DEFENDANTS' REPLY CLAIM CONSTRUCTION BRIEF

I, J. Stephen Ravel, hereby declare as follows:

1. I am an attorney with Kelly, Hart & Hallman LLP and a member of the Texas state bar. I represent Defendants in the above-captioned case.

2. I submit this declaration in support of Defendants' Reply Claim Construction Brief in the above-captioned litigation. I make this Declaration of my own personal knowledge, and I could and would testify competently thereto if called as a witness.

3. Attached hereto as **Exhibit RR** is a true and correct copy of redacted excerpts from Samsung's Invalidity and Ineligibility Contentions and Disclosure, *Greenthread v. Samsung*, 2-19-cv-00147 (E.D. Tex. 2019), Dkt. 97-9 and 97-10, with highlighting.

4. Attached hereto as **Exhibit SS** is a true and correct copy of redacted excerpts from Samsung's Supplemental Invalidity and Ineligibility Contentions dated June 9, 2020, *Greenthread v. Samsung*, 2-19-cv-00147 (E.D. Tex. 2019), Dkt. 97-8, with highlighting.

Dated: November 14, 2022

/s/ J. Stehen Ravel
J. Stephen Ravel

Exhibit RR

[redacted]

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

GREENTHREAD, LLC,	)	
	)	
Plaintiff,	)	Case No. 2:19-CV-00147-JRG
	)	
v.	)	
	)	
SAMSUNG ELECTRONICS CO., LTD., et al.,	)	
	)	
Defendants.	)	

SAMSUNG'S INVALIDITY AND INELIBILITY CONTENTIONS AND DISCLOSURES
PURSUANT TO PATENT RULES 3-3 AND 3-4

[redacted]

TABLE OF CONTENTS

I. THE ’481 PATENT 3

A. Level of Skill in the Art 3

B. Local P. R. 3-3(a), (b), (c): Identification of Prior Art, Basis for Invalidity Under 35 U.S.C. §§ 102, 103 and Claim Charts 4

1. Anticipation 4

2. Obviousness 7

C. Local P. R. 3-3(d): Invalidity Under 35 U.S.C. § 112, ¶¶ 1-2 63

1. The ’915 Application Does Not Describe the Claimed Subject Matter 63

2. Lack of Written Description 65

3. Indefiniteness 65

D. Standing Order Regarding Subject Matter Eligibility: Ineligibility under 35 U.S.C. § 101 66

II. THE ’070 PATENT 66

A. Level of Skill in the Art 66

B. Local P. R. 3-3(a), (b), (c): Identification of Prior Art, Basis for Invalidity Under 35 U.S.C. §§ 102, 103 and Claim Charts 67

1. Anticipation 67

2. Obviousness 69

C. Local P. R. 3-3(d): Invalidity Under 35 U.S.C. § 112, ¶¶ 1-2 110

1. Lack Of Written Description 110

2. Indefiniteness 110

D. Standing Order Regarding Subject Matter Eligibility: Ineligibility under 35 U.S.C. § 101 112

III. THE ’195 AND ’502 PATENTS 112

A. Level of Skill in the Art 112

B. Local P. R. 3-3(a), (b), (c): Identification of Prior Art, Basis for Invalidity Under 35 U.S.C. §§ 102, 103, and Claim Charts 112

1. Anticipation.....112

2. Obviousness 116

3. Asserted Claims Are Invalid for Double Patenting and Obviousness-Type Double Patenting.....188

C. Local P. R. 3-3(d): Invalidity Under 35 U.S.C. § 112, ¶¶ 1-2 198

1. Lack of Written Description 198

2. Indefiniteness 199

D. Standing Order Regarding Subject Matter Eligibility: Ineligibility under 35 U.S.C. § 101..... 201

IV. P. R. 3-4 DOCUMENT PRODUCTION ACCOMPANYING INVALIDITY CONTENTIONS 201

A. P. R. 3-4(a) Source Code, Specifications, Schematics, Flow Charts, Artwork, Formulas, or Other Documentation Sufficient To Show the Operation of Any Aspects or Elements of an Accused Instrumentality Identified by the Patent Claimant in Its P. R. 3-1(c) Chart..... 201

B. P. R. 3-4(b) A Copy of Each Item of Prior Art Identified Pursuant to P. R. 3-3(a) Which Does Not Appear in the File History of the Patents-in-Suit..... 202

[redacted]

C. Local P. R. 3-3(d): Invalidity Under 35 U.S.C. § 112, ¶¶ 1-2

Samsung provides the following contentions relating to the invalidity of the asserted claims under 35 U.S.C. § 112, first and second paragraphs. These contentions are being proffered without expert disclosure or discovery.

1. Lack of Written Description

The asserted claims are invalid under 35 U.S.C. § 112 for lack of written description support. Discovery is ongoing and the Court has yet to issue a Claim Construction Order. As such, Samsung reserves the right to amend these contentions.

"a surface layer" - Claim 1 of the '195 patent and Claim 7 of the '502 patent. This claim limitation is not supported by a sufficient written description. For example, the patents do not discuss, disclose, or mention "a surface layer." Thus a person of skill in the art would not understand the inventors to have possessed "a surface layer."

"an active region including a source and a drain, disposed on one surface of said surface layer" - Claim 1 of the '195 patent and Claim 7 of the '502 patent. This claim limitation is not supported by a sufficient written description. For example, the patents do not discuss, disclose, or mention an "active region" that is "disposed on one surface of said surface layer." Thus a person of skill in the art would not understand the inventors to have possessed "an active region including a source and a drain, disposed on one surface of said surface layer."

"**at least one well region disposed in said single drift layer**" and "**a single drift layer disposed between the other surface of said surface layer and said substrate**" **-** Claim 1 of the '195 patent and Claim 7 of the '502 patent. This claim limitation is not supported by a sufficient written description. The specification contains no examples or other disclosure of a well region disposed in "a single drift layer that is disposed between the other surface of said surface layer and said substrate." For example, Figure 5a shows a CMOS device with p-wells and an n-well.

[redacted]

But it does not disclose the claimed surface layer since the wells are directly adjacent to an active device layer. Accordingly, the disclosed wells cannot be disposed in a single drift layer that is disposed between the other surface of said surface layer and said substrate. Further, Figures 5b and 5c do not disclose either a surface layer or a well region. Thus a person of skill in the art would not understand the inventors to have possessed a "well region disposed in . . ." "a single drift layer disposed between the other surface of said surface layer and said substrate."

2. Indefiniteness

All asserted claims of the patents in suit are invalid as indefinite under 35 U.S.C. § 112, at least under Greenthread's apparent claim construction as applied in Greenthread's infringement contentions. Discovery is ongoing and Claim Construction has not begun. As such, Samsung reserves the right to amend these contentions prior to the deadline for exchange of claim constructions.

"surface layer" - Claim 1 of the '195 patent and Claim 7 of the '502 patent and dependent claims thereof require: "a surface layer." A person having ordinary skill in the art would not have been able to determine the scope of these claims with reasonable certainty, at least under Greenthread's apparent claim construction as applied in Greenthread's infringement contentions. The patents in suit do not mention or define "surface layer" and do not adequately identify what this limitation entails. There is no art-accepted meaning for the term as it is used in the claims, and a person of ordinary skill in the art could reach different conclusions concerning the scope of the claim term, at least under Greenthread's apparent claim construction as applied in Greenthread's infringement contentions.

"an active region including a source and a drain, disposed on one surface of said surface layer" - Claim 1 of the '195 patent and Claim 7 of the '502 patent and dependent claims thereof require this limitation. A person having ordinary skill in the art would not have been able to

[redacted]

determine the scope of these claims with reasonable certainty, at least under Greenthread's apparent claim construction as applied in Greenthread's infringement contentions. The patents in suit do not define "an active region including a source and a drain, disposed on one surface of said surface layer" and do not adequately identify what this limitation entails. And a person of ordinary skill in the art could reach different conclusions concerning the scope of the claim term, at least under Greenthread's apparent claim construction as applied in Greenthread's infringement contentions.

"a single drift layer disposed between the other surface of said surface layer and said substrate" - Claim 1 of the '195 patent and Claim 7 of the '502 patent and dependent claims thereof require this limitation. A person having ordinary skill in the art would not have been able to determine the scope of these claims with reasonable certainty, at least under Greenthread's apparent claim construction as applied in Greenthread's infringement contentions. And a person of ordinary skill in the art could reach different conclusions concerning the scope of the claim term.

"**static unidirectional electric drift field to aid the movement of minority carriers from said surface layer to said substrate**" - Claim 1 of the '195 patent and Claim 7 of the '502 patent and dependent claims thereof require this limitation. A person having ordinary skill in the art would not have been able to determine the scope of these claims with reasonable certainty, at least under Greenthread's apparent claim construction as applied in Greenthread's infringement contentions. And a person of ordinary skill in the art could reach different conclusions concerning the scope of the claim term.

"at least one well region disposed in said single drift layer" - Claim 1 of the '195 patent and Claim 7 of the '502 patent and dependent claims thereof require this limitation. A person having

ordinary skill in the art would not have been able to determine the scope of these claims with reasonable certainty, at least under Greenthread's apparent claim construction as applied in Greenthread's infringement contentions. And a person of ordinary skill in the art could reach different conclusions concerning the scope of the claim term.

D. Standing Order Regarding Subject Matter Eligibility: Ineligibility under 35 U.S.C. § 101

The asserted claims of the '195 and '502 patent are directed to a law of nature and/or a natural phenomenon and are therefore ineligible for patent protection, as described in Exhibit 1 of Appendix F. Claims 1 and 7 are directed to a graded dopant region to aid carrier movement via an electric field. But as the patentee admitted during prosecution of the '195 patent, a graded dopant region necessarily generates an electric field that impacts the movement of carriers. *See, e.g.*, U.S. Pat. No. 4,160,985 at 2:64-3:2; *id.* at Figs. 2-3; *see also* '195 File History, 6/13/2011 Response to Office Action at 6; '195 File History, 11/12/2011 Response to Office Action at 7; '195 File History, 4/17/2012 Response to Office Action at 6-7. Such an electric field is a law of nature and/or a natural phenomenon. And as detailed in Exhibit 1 of Appendix F, the remainder of the elements of the asserted claims were well-understood, routine, and/or conventional such that they do not amount to significantly more than a patent upon an ineligible concept itself.

IV. P. R. 3-4 DOCUMENT PRODUCTION ACCOMPANYING INVALIDITY CONTENTIONS

A.

Exhibit SS

[redacted]

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

GREENTHREAD, LLC,	)	
	)	
Plaintiff,	)	Case No. 2:19-CV-00147-JRG
	)	
v.	)	
	)	
SAMSUNG ELECTRONICS CO., LTD., et al.,	)	
	)	
Defendants.	)	

SAMSUNG'S SUPPLEMENTAL INVALIDITY AND INELIGIBILITY CONTENTIONS
AND DISCLOSURES PURSUANT TO PATENT RULES 3-3 AND 3-4

[redacted]

TABLE OF CONTENTS

I. THE ’481 PATENT 3

A. Level of Skill in the Art 3

B. Local P. R. 3-3(a), (b), (c): Identification of Prior Art, Basis for Invalidity Under 35 U.S.C. §§ 102, 103 and Claim Charts 4

1. Anticipation 4

2. Obviousness 7

C. Local P. R. 3-3(d): Invalidity Under 35 U.S.C. § 112, ¶¶ 1-2 84

1. The ’915 Application Does Not Describe the Claimed Subject Matter 85

2. Lack of Written Description 87

3. Indefiniteness 89

4. Enablement 90

D. Standing Order Regarding Subject Matter Eligibility: Ineligibility under 35 U.S.C. § 101 91

II. THE ’070 PATENT 92

A. Level of Skill in the Art 92

B. Local P. R. 3-3(a), (b), (c): Identification of Prior Art, Basis for Invalidity Under 35 U.S.C. §§ 102, 103 and Claim Charts 92

1. Anticipation 92

2. Obviousness 94

C. Local P. R. 3-3(d): Invalidity Under 35 U.S.C. § 112, ¶¶ 1-2 137

1. Lack Of Written Description 137

2. Indefiniteness 138

D. Standing Order Regarding Subject Matter Eligibility: Ineligibility under 35 U.S.C. § 101 139

III. THE ’195 AND ’502 PATENTS 139

[redacted]

A. Level of Skill in the Art 139

B. Local P. R. 3-3(a), (b), (c): Identification of Prior Art, Basis for Invalidity Under 35 U.S.C. §§ 102, 103, and Claim Charts 140

1. Anticipation 140

2. Obviousness 144

3. Asserted Claims Are Invalid for Double Patenting and Obviousness-Type Double Patenting 248

C. Local P. R. 3-3(d): Invalidity Under 35 U.S.C. § 112, ¶¶ 1-2 258

1. Lack of Written Description 258

2. Indefiniteness 262

3. Enablement 264

D. Standing Order Regarding Subject Matter Eligibility: Ineligibility under 35 U.S.C. § 101 267

IV. P. R. 3-4 DOCUMENT PRODUCTION ACCOMPANYING INVALIDITY CONTENTIONS 268

A. P. R. 3-4(a) Source Code, Specifications, Schematics, Flow Charts, Artwork, Formulas, or Other Documentation Sufficient To Show the Operation of Any Aspects or Elements of an Accused Instrumentality Identified by the Patent Claimant in Its P. R. 3-1(c) Chart 268

B. P. R. 3-4(b) A Copy of Each Item of Prior Art Identified Pursuant to P. R. 3-3(a) Which Does Not Appear in the File History of the Patents-in-Suit 268

[redacted]

C. Local P. R. 3-3(d): Invalidity Under 35 U.S.C. § 112, ¶¶ 1-2

Samsung provides the following contentions relating to the invalidity of the asserted claims under 35 U.S.C. § 112, first and second paragraphs. These contentions are being proffered without expert disclosure or discovery.

Dr. Rao made several admissions at his deposition that demonstrate that there is no written description or enablement for the Asserted Claims. Dr. Rao is the sole named inventor for each of the Asserted Patents, the drafter of the specification, and Greenthread's Rule 30(b)(6) witness. [redacted] Based on these admissions, there can be no enablement or written description of at least the following elements.

1. Lack of Written Description

The asserted claims are invalid under 35 U.S.C. § 112 for lack of written description support. Discovery is ongoing and the Court has yet to issue a Claim Construction Order. As such, Samsung reserves the right to amend these contentions.

Under 35 U.S.C. § 112(a), "[t]he specification shall contain a written description of the invention … in such full, clear, concise, and exact terms as to enable any person skilled in the art

[redacted]

to which it pertains … to make and use the same ….” To satisfy written description, “a patentee must convey in its disclosure that it ‘had possession of the claimed subject matter as of the filing date.’” *Amgen Inc. v. Sanofi*, 872 F.3d 1367, 1373 (Fed. Cir. 2017).

As here, written-description problems are “especially acute with genus claims that use functional language to define the boundaries of a claimed genus. In such a case, the functional claim may simply claim a desired result, and may do so without describing species that achieve that result. But the specification must demonstrate that the applicant has made a generic invention that achieves the claimed result and do so by showing that the applicant has invented species sufficient to support a claim to the functionally-defined genus.” *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1349 (Fed. Cir. 2010) (en banc). To show possession of such claims, a patent must allow a POSITA to “‘visualize or recognize’ the members of the genus” by disclosing either “a representative number of species falling within the scope of the genus” or “structural features common to the members of the genus.” *Amgen*, 872 F.3d at 1373.

To satisfy the “representative species” test, Greenthread must “show that [it] has truly invented the genus, *i.e.*, that [it] has conceived and described sufficient representative species encompassing the breadth of the genus.” *AbbVie Deutschland GmbH & Co., KG v. Janssen Biotech, Inc.*, 759 F.3d 1285, 1300 (Fed. Cir. 2014). Further, A POSITA, “reading the original disclosure, must immediately discern the limitation at issue in the claims.” *Purdue Pharma L.P. v. Faulding Inc.*, 230 F.3d 1320, 1323 (Fed. Cir. 2000). **“a surface layer” -** Claim 1 of the ’195 patent and Claim 7 of the ’502 patent. This claim limitation is not supported by a sufficient written description. For example, the patents do not discuss, disclose, or mention “a surface layer.” Thus a person of skill in the art would not understand the inventors to have possessed “a surface layer.” During his deposition, Dr. Rao—the sole inventor of the asserted

[redacted]

patents, the drafter of the specification, and Greenthread's Rule 30(b)(6) witness—could not identify the surface layer when shown a figure of a purported embodiment of the alleged invention. Tr. at 121. Thus, a POSITA would not understand the inventors to have possessed "a surface layer."

"an active region including a source and a drain, disposed on one surface of said surface layer" - Claim 1 of the '195 patent and Claim 7 of the '502 patent. This claim limitation is not supported by a sufficient written description. For example, the patents do not discuss, disclose, or mention an "active region" that is "disposed on one surface of said surface layer." Thus a person of skill in the art would not understand the inventors to have possessed "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 unidirectional electric drift field to aid the movement of minority carriers from said surface layer to said substrate" (Claim 1 of the '195 patent and Claim 7 of the '502 patent): This claim limitation is not supported by a sufficient written description. As an initial matter, "single drift layer" is never used in the specification. During his deposition, Dr. Rao—the sole inventor of the asserted patents, the drafter of the specification, and Greenthread's Rule 30(b)(6) witness—could not identify the single drift layer when shown a figure of a purported embodiment of the alleged invention. Tr. at 122-124. Nor does the specification describe the requisite "parameters." *Id.* Moreover, under both the plain meaning of the claim and the Court's construction, the "single drift layer …" must have an interface with the surface layer. There is no disclosure in the specification of a surface layer, much less one that abuts an alleged single drift layer.

[redacted]

From the specification, a POSITA would likewise conclude that the patentee did not possess the invention of "a graded concentration of dopants extending between said surface layer and said substrate, said drift layer further having a first static unidirectional electric drift field to aid the movement of minority carriers from said surface layer to said substrate." This limitation is a broad genus ("graded concentration of dopants") defined by the functional result ("having a first static unidirectional electric drift field to aid the movement of minority carriers from said surface layer to said substrate"). Yet the specification contains only a single figure showing one "prior art" graded doping profiles. '195 patent at Fig. 1. That single figure shows a linear graded doping profile. The specification then only mentions quasilinear, exponential, retrograde, and complimentary error functions. No figure shows one of these profiles. For the linear profile, Dr. Rao could not say when a linear graded doping profile creates a unidirectional electric field or bidirectional electric field. Tr. at 101. For the other profiles, Dr. Rao during his deposition could not say when the doping profile would create a unidirectional or bidirectional electric field. Again, he only said that it depends on what the doping profile looks like and "on which location you're looking at." Tr. at 103-108. As Dr. Rao also put it, "[t]here are a lot of possibilities." Tr. at 108. The specification shows a single prior art species for doping profile, yet claims the entire genus. Overall, the specification requires the POSITA to supply the alleged novel aspects. Indeed, to the extent that Greenthread argues that an electric field that moves minority carriers down the slope of the graded dopant concentration and majority carriers up the slope of the graded dopant concentration is not inherent from the slope of the gradient itself, then a POSITA would understand that the inventor and drafter of the specification was not in possession of such a unidirectional electric drift field that aids the movement of minority carriers from the surface layer to the substrate.

[redacted]

Even more, the specification does not disclose any way for a POSITA to analyze doping profiles to determine the electric fields. Dr. Rao discussed two in his deposition that are not in any of the specifications of the Asserted Patents. Tr. at 93.

"**at least one well region disposed in said single drift layer**" and "**a single drift layer disposed between the other surface of said surface layer and said substrate**" - Claim 1 of the '195 patent and Claim 7 of the '502 patent. This claim limitation is not supported by a sufficient written description. The specification contains no examples or other disclosure of a well region disposed in "a single drift layer that is disposed between the other surface of said surface layer and said substrate." For example, Figure 5a shows a CMOS device with p-wells and an n-well. But it does not disclose the claimed surface layer since the wells are directly adjacent to an active device layer. Accordingly, the disclosed wells cannot be disposed in a single drift layer that is disposed between the other surface of said surface layer and said substrate. Further, Figures 5b and 5c do not disclose either a surface layer or a well region. Thus a person of skill in the art would not understand the inventors to have possessed a "well region disposed in . . ." "a single drift layer disposed between the other surface of said surface layer and said substrate." Further, During his deposition, Dr. Rao—the sole inventor of the asserted patents, drafter of the specification, and Greenthread's 30(b)(6) witness—noted that no figure "expressly show[s] a well region." Tr. at 126. And as described above, Dr. Rao admitted that there was no disclosure of a single drift layer. Moreover, for the same reasons as for the first unidirectional electric field, there is no written description of the second unidirectional electric field.

2. Indefiniteness

All asserted claims of the patents in suit are invalid as indefinite under 35 U.S.C. § 112, at least under Greenthread's apparent claim construction as applied in Greenthread's

[redacted]

infringement contentions. Discovery is ongoing and Claim Construction has not begun. As such, Samsung reserves the right to amend these contentions prior to the deadline for exchange of claim constructions.

"surface layer" - Claim 1 of the '195 patent and Claim 7 of the '502 patent and dependent claims thereof require: "a surface layer." A person having ordinary skill in the art would not have been able to determine the scope of these claims with reasonable certainty, at least under Greenthread's apparent claim construction as applied in Greenthread's infringement contentions. The patents in suit do not mention or define "surface layer" and do not adequately identify what this limitation entails. There is no art-accepted meaning for the term as it is used in the claims, and a person of ordinary skill in the art could reach different conclusions concerning the scope of the claim term, at least under Greenthread's apparent claim construction as applied in Greenthread's infringement contentions.

"an active region including a source and a drain, disposed on one surface of said surface layer" - Claim 1 of the '195 patent and Claim 7 of the '502 patent and dependent claims thereof require this limitation. A person having ordinary skill in the art would not have been able to determine the scope of these claims with reasonable certainty, at least under Greenthread's apparent claim construction as applied in Greenthread's infringement contentions. The patents in suit do not define "an active region including a source and a drain, disposed on one surface of said surface layer" and do not adequately identify what this limitation entails. And a person of ordinary skill in the art could reach different conclusions concerning the scope of the claim term, at least under Greenthread's apparent claim construction as applied in Greenthread's infringement contentions.

[redacted]

"a single drift layer disposed between the other surface of said surface layer and said substrate" - Claim 1 of the '195 patent and Claim 7 of the '502 patent and dependent claims thereof require this limitation. A person having ordinary skill in the art would not have been able to determine the scope of these claims with reasonable certainty, at least under Greenthread's apparent claim construction as applied in Greenthread's infringement contentions. And a person of ordinary skill in the art could reach different conclusions concerning the scope of the claim term.

"**static unidirectional electric drift field to aid the movement of minority carriers from said surface layer to said substrate**" - Claim 1 of the '195 patent and Claim 7 of the '502 patent and dependent claims thereof require this limitation. A person having ordinary skill in the art would not have been able to determine the scope of these claims with reasonable certainty, at least under Greenthread's apparent claim construction as applied in Greenthread's infringement contentions. And a person of ordinary skill in the art could reach different conclusions concerning the scope of the claim term.

"at least one well region disposed in said single drift layer" - Claim 1 of the '195 patent and Claim 7 of the '502 patent and dependent claims thereof require this limitation. A person having ordinary skill in the art would not have been able to determine the scope of these claims with reasonable certainty, at least under Greenthread's apparent claim construction as applied in Greenthread's infringement contentions. And a person of ordinary skill in the art could reach different conclusions concerning the scope of the claim term.

3. Enablement

A valid patent must "enable any person skilled in the art … to make and use the" claimed invention. 35 U.S.C. § 112. If "at the effective filing date of the patent, one of ordinary skill in

Dated: June 09, 2020

Respectfully submitted,

/s/ Jeremy D. Wilson

Melissa R. Smith
GILLAM & SMITH, LLP
303 South Washington Avenue
Marshall, TX 75670
Telephone: (903) 934-8450
Facsimile: (903) 934-9257

Gregory S. Arovas, P.C. (*pro hac vice*)
Jeremy D. Wilson (*pro hac vice*)
KIRKLAND & ELLIS LLP
601 Lexington Avenue
New York, NY 10022
Telephone: (212) 446-4800
Facsimile: (212) 446-4900

Edward C. Donovan, P.C. (*pro hac vice*)
F. Christopher Mizzo, P.C. (*pro hac vice*)
John R. Rhine (*pro hac vice*)
KIRKLAND & ELLIS LLP
1301 Pennsylvania Avenue, N.W.
Washington, D.C. 20004
Telephone: (202) 389-5000
Facsimile: (202) 389-5200

Counsel for Defendants Samsung Electronics Co., Ltd., Samsung Semiconductor, Inc., Samsung Electronics America, Inc., and Samsung Austin Semiconductor, LLC.

CERTIFICATE OF SERVICE

The undersigned certifies that the forgoing document was served on all counsel for Plaintiff on June 09, 2020.

/s/ Jeremy D. Wilson
Jeremy D. Wilson