

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SEMICONDUCTOR COMPONENTS INDUSTRIES, LLC,
Petitioner,

v.

GREENTHREAD, LLC,
Patent Owner.

Case: IPR2024-00266
U.S. Patent No. 8,421,195

**PATENT OWNER'S REQUEST FOR DIRECTOR REVIEW
OF FINAL WRITTEN DECISION
37 C.F.R. § 42.75**

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I. INTRODUCTION

Across a series of IPRs, Petitioner has advanced claim construction positions that are divorced from the claims' plain language, specification, prosecution history, and, most concerningly, two prior *Markman* rulings. First, Petitioner's expansive construction of "graded dopant concentration" eviscerates the claims' requirements that minority carriers are not only moved, but moved from the surface of the semiconductor device down into the device's substrate. Second, Petitioner crafts its own understanding of "minority carrier" at odds with how the term is defined in the patent, how previous challengers have understood the term, and Petitioner's own technical admissions regarding MOSFET devices.

As a result, the Board effectively lowered Petitioner's burden of proving that the Challenged Claims would have been obvious over the asserted references and, similarly, failed to hold Petitioner to its burden of proving that the references teach moving *minority* carriers from the required location and in the required direction. Director Review is warranted to correct the Board's errors and prevent further inconsistency between outcomes at the PTAB and district courts.

II. BACKGROUND

Onsemi filed a first set of petitions challenging Greenthread's patent family in October 2023, followed by a second set in December 2023. For each of the IPRs, the technical disputes hinge on the proper construction of the following limitation:

[1.4] a single drift layer ... having a graded concentration of dopants [GDC] extending between [the] surface layer and [the] substrate, [1.5] said drift layer further having a first static unidirectional electric drift field to aid the movement of minority carriers [ACM] from [the] surface layer to [the] substrate

EX1001, 4:18-24.

Petitioner initially contended that any GDC would exert a sufficient force in the proper direction to ACM. PO rebutted this inherency-type argument based on Petitioner's own expert admitting that the net force exerted on minority carriers depends on other forces and factors besides the dopant profile. Paper 32 ("PO Resp.") at 11-14, 18 (citing EX2058); *see also* Paper 13 ("POPR") at 3-9. Petitioner then revised its argument: "'graded' *does not mean* 'aided,' but 'graded' does mean 'electric field,' and an 'electric field' means 'aided' in one direction." Paper 15 at 3.¹ This strained attempt to reconcile Petitioner's unsupported position with the plain meaning of the claim language does nothing to change the core of Petitioner's argument that a dopant profile with *any* grading whatsoever satisfies the functional limitation that the claimed GDC actually aid in moving minority carriers. As argued to the Board (and presented below), this impermissible collapsing of the GDC and ACM limitations is the wrong construction and unsupported by the record.

In a previous Director Review grant, Deputy (then-Acting) Director Stewart recognized that the claim construction dispute only arose after Petitioner changed its

¹ All emphases added unless otherwise noted.

position. *See* IPR2023-01242, Paper 94 at 6 (“[PO] properly argued that the claim construction dispute between the parties crystallized only in Petitioner’s Reply”). Director Review was granted in the first set based, in part, on the Board’s (a) “refusal to admit and consider [] claim construction orders” from two district courts that “were responsive to Petitioner’s arguments” and (b) failure to “consider certain [technical] arguments” timely made in the POR. *Id.* at 4-6. Deputy Director Stewart ordered the Board to take a thoughtful, second look at whether the asserted references teach the claimed limitations under the proper construction of ACM. *Id.*

The Board failed to correct these errors on remand, and reinforced an incorrect claim construction in the second set of IPRs. The Board’s FWD here (Paper 80) is nearly a carbon-copy of its FWDs both pre- and post-remand in the first set.

III. ARGUMENT

Director Review is appropriate to correct the Board’s “erroneous conclusions of law,” namely its improper rejection of two prior claim construction rulings. *See* USPTO, Director Review process, §§ 2.B, 5.A. Even further, the Board’s recalcitrance to reconsider *any* position that contradicts those that it took at the institution stage in the first set of IPRs reveal an “abuse of discretion” and similarly relate to “important issues of law or policy.” *Id.*

The stability of patent rights depends on claim terms having an established and consistent meaning. So when, as here, the Board reaches claim constructions at

odds with prior district court rulings on the same terms, the appropriate remedy is to vacate both the ID and FWD. *See Revvo Techs., Inc. v. Cerebrum Sensor Techs., Inc.*, IPR2025-00632, Paper 20 (PTAB Nov. 3, 2025) (precedential). Beyond this, the Board has openly disregarded Patent Office policies aimed at promoting reliable patent rights and ensuring consistent results in parallel proceedings and failed to defer to Article Three courts' role in assessing patent validity.

A. The Challenged Claims are “configured to”-type claims, not “reasonably capable”-type claims.

The Board's effective construction of the ACM limitation eliminated the claims' requirement that a GDC must actually move minority carriers from the surface to the substrate. This construction defies precedent that assigns considerable weight to functional limitations in apparatus claims. *Cf. Vascular Solns., LLC v. Medtronic, Inc.*, 117 F.4th 1361, 1370 (Fed. Cir. 2024). In fact, it is “not improper” to “defin[e] a particular term by its function,” as the Board believes it to be. *Hill-Rom Servs., Inc. v. Stryker Corp.*, 755 F.3d 1367, 1374-75 (Fed. Cir. 2014).

Instead, the Board recites the out-of-context maxim that “apparatus claims cover what a device *is*, not what a device *does*” and permits Petitioner to prevail on a construction that does not actually require moving minority carriers. FWD at 40 (citing *ParkerVision, Inc. v. Qualcomm Inc.*, 903 F.3d 1354, 1361 (Fed. Cir. 2018) (“*PV*”). Instead, the Board contends that under *PV*, “Petitioner need only show a [GDC] that is *capable* of aid[ing] the movement of minority carriers from said

surface layer to said substrate.” FWD at 41 (cleaned up) (citing *PV*, 903 F.3d at 1361). But to reach this conclusion, the Board overlooks the middle of *PV*’s operative sentence and effectively omits a critical limit on *PV*’s reach—“depending on the claim language.”

PV does distinguish between apparatus and method claims, but that is only step one of a deeper analysis. Using the same language a *PV*, the Federal Circuit later recognized that “differences exist between apparatus claims as well, ***depending on the claim language.***” *INVT SPE LLC v. Int’l Trade Comm’n*, 46 F.4th 1361, 1371 (Fed. Cir. 2022). The Court has long “construed some apparatus claims to require an infringing”—or, in this case, anticipating²—“device to actually perform and operate according to the functional terms recited in the claim.” *Id.*

INVT is not one-off precedent. When using “functional claiming to describe the apparatus, **what the device *does* (and how it does it) is highly relevant to understanding what the device *is*.**” *Rothschild Connected Devices Innovs., LLC v. Coca-Cola Co.*, 2025 WL 2964300, at *2 (Fed. Cir. Oct. 21, 2025) (cleaned up); *K-2 Corp. v. Salomon S.A.*, 191 F.3d 1356, 1363 (Fed. Cir. 1999) (“functional language [] informs us of the structural requirements of the claim.”).

² Though *INVT* involves infringement, it is nevertheless applicable to the present dispute, since claim construction principles apply equally to both infringement and invalidity. *Cf. CommScope Techs. LLC v. Dali Wireless Inc.*, 10 F.4th 1289, 1294 (Fed. Cir. 2021) (“That which infringes, if later, would anticipate, if earlier.”).

“Configured to”-type claims “involve mechanical apparatus claims,” where “actual operation of arranging elements in a particular way was required.” *INVT*, 46 F.4th at 1372. On the other hand, “reasonably capable” claims all follow a similar structure—a component “for performing” a function. *Id.* at 1373 (discussing “‘for performing’-type claim language”); *PV*, 903 F.3d at 1362 (claims “drawn to ‘[a]n apparatus *for frequency up-conversion*’ or ‘[a]n apparatus *for communicating*’”).

The Challenged Claims recite specific (and sufficient) “structural limitations” (*i.e.*, a GDC of sufficient magnitude and direction) that were found lacking in *PV*. *See* 903 F.3d at 1362. As the specification explains, this GDC creates a “suitable aiding drift electric field” that “sweep[s] unwanted minority carriers from the active circuitry at the surface into the substrate ... as quickly as possible.” EX1001, 2:42-45, 3:30-33; FIG. 5B (“Graded dopant region to pull minority carriers from the surface”). Further, that the claimed GDC *aids* minority carrier movement presupposes that minority carrier movement “from [the] surface layer to [the] substrate” is already required in the claims. The specification never imagines a GDC that *might* ACM, or that achieving this critical function is merely optional. Rather, the claims, consistent with the specification and the prior claim construction rulings (discussed below), **require** the devices’ GDC to have sufficient magnitude and be oriented in the proper direction to **actually move** minority carriers from the surface of the device to the substrate.

“[A] patent’s express purpose of the invention” is supposed to “inform[] the proper construction of claim terms.” *Sequoia Tech., LLC v. Dell, Inc.*, 66 F.4th 1317, 1326 (Fed. Cir. 2023). So when mechanical apparatus claims require a specific structure to perform a specific function, a petitioner must prove that the cited references **actually perform** the claimed limitation. *See INVT*, 46 F.4th at 1371. Petitioner has not done that here, and instead relies upon an incorrect claim construction that “eviscerate[s] the stated purpose of the claimed invention.” *KEYnetik, Inc. v. Samsung Elecs. Co., Ltd.*, 837 Fed.Appx. 786, 792 (Fed. Cir. 2020). And in adopting this broad, “reasonably capable” construction, the Board committed the same error, ignored the totality of established precedent, and lowered the standard for proving that the Challenged Claims would have been obvious.

B. The Board’s adopted construction is at odds with two different district courts who have previously ruled on the same claim terms.

In the first set of IPRs, PO introduced two different *Markman* rulings that refuted Petitioner’s belatedly-presented construction. “Given the importance of uniformity,” the Board “would be remiss to overlook a[] district court’s construction of the same claim terms.” *Finisar Corp. v. DirecTV Grp., Inc.*, 523 F.3d 1323, 1329 (Fed. Cir. 2008). And though these orders were not stricken in the second set, the Board gave them the same back-of-the-hand treatment, even offering its own “reasonabl[e] interpret[ation]” of one orders. *See FWD* at 36-37.

Both district courts previously held that a gradient alone does not satisfy the

ACM limitation. The Western District of Texas held that only “sufficiently graded”

GDCs will create a field that aids movement:

The Court concludes that a person of skill would understand that the [GDC] has to be *sufficiently graded* to result in a “static unidirectional electric drift field to aid the movement of minority carriers.” This establishes a *minimum [GDC]*, *i.e.*, a [GDC] ... below this minimum will not aid the movement of minority carriers and thus is not graded.

EX2080, 39-40. The Eastern District of Texas elaborated further:

[T]he slope has both a direction and a *magnitude* and Defendant suggests that the direction of the drift electric field depends solely on the direction of the slope of the [GDC]. This is not justified by the prosecution history statements that Defendant cites.

EX2082, 15. Judge Gilstrap recognized that the mere direction a GDC points is not enough to determine whether it actually moves minority carriers.

The Court also rejected the very prosecution-based arguments the Board adopted here. *Id.*; FWD at 39-40 (PO’s prosecution statements “were clear, unambiguous, and indicate that ... the mere presence of a [GDC] ... facing in the appropriate direction, will [ACM].”). In fact, the prosecution history confirms that a GDC must have sufficient magnitude to overcome other forces and fields acting within the device to actually move minority carriers. *See* EX1040, 270 (Examiner: minority carrier movement is “affected by multiple forces and fields, and it does not appear that simply the presence of a unidirectional drift field in itself can achieve drawing all minority carriers”). Yet the Board turned this against PO, even though prosecution statements “cannot enlarge” claim scope beyond the plain language.

Biogen, Inc. v. Berlex Lab 'ys, Inc., 318 F.3d 1132, 1140 (Fed. Cir. 2003).

Neither *Markman* order required a specific magnitude to be quantified, and, contrary to the Board's understanding, PO has never advanced this position. Instead, PO maintains (consistent with both rulings) that for a GDC to read onto the claimed limitations, it has to be of *sufficient* magnitude to actually move minority carriers from the surface to the substrate. Neither court understood the claims to mean that *any* GDC would ACM. The Board's adopted construction diverges from these established rulings, which undermines the Patent Office's objective to "provid[e] greater predictability and certainty in the patent system." Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340, 51,342-43 (Oct. 11, 2018).

C. The asserted references do not teach the claimed limitations under the proper constructions.

This Petition fails because none of the references discuss the critical functional limitation of moving minority carriers from the surface to the substrate nor disclose a GDC with sufficient magnitude or account for other forces and fields in the device. Petitioner's analysis is entirely devoid of such considerations or detail.

Petitioner's own expert (EX2058) admitted that (a) the magnitude of the force exerted on carriers depends on "the steepness of the gradient" (89:3-10); (b) a gradient will only exert a force that moves carriers with "[a]ll other things being equal" (126:22-127:8); (c) carriers "would move if you didn't have some other

external force acting” (187:11-18); and (d) additional forces “might be larger than the force created by the gradient” (127:16-138:6). Even further, only the “*net field* will exert a force which ... will act to move the carrier.” *Id.*, 188:6-14, 189:8-16. However, all the expert did was identify downward-sloping dopant profiles in the references (*id.*, 195:8-16), which is inconsistent with the two *Markman* orders.

First, Petitioner relies on Figure 17 of Kawagoe (EX1007), contending that in Kawagoe’s GDC, “electrons produced by [an] α -ray are attracted to the substrate body 2S by [a] concentration gradient...” Paper 1 (“Pet.”) at 12, 64 (citing EX1007, 16:2-11). However, Petitioner uses ellipsis to omit that Kawagoe’s GDC is concerned with “prevent[ing]” electrons “from entering the p-well 6p.” EX1007, 16:7-9. Simply put, preventing electrons from entering the well-region from *below* the substrate is different than moving electrons from the surface, *through* the well-region, and *toward* the substrate. Petitioner’s argument that inhibiting in one direction implies aiding in the other simply distracts from Kawagoe’s critical flaw—it never mentions minority carriers at the surface and it is unclear what effect, if any, Figure 17’s GDC would have on a minority carrier at the surface. In fact, it would not have made sense to move an electron from the surface, since these electrons are needed for the transistor to work properly. *See* EX2064, ¶¶74-75; PO Resp. at 23-32; Paper 45 (“Sur-Reply”) at 7-11. For Kawagoe to meet this limitation, it must ignore the requirement that minority carriers move from a specific location to

another specific location.

Second, Petitioner's reliance on Figure 11 of Payne (EX1005) suffers a similar fate. Payne is silent about moving minority carriers from the surface to the substrate; Petitioner relies entirely on its annotations and a wrong understanding of supposed "admissions" made by PO during prosecution. *See* PO Resp. at 32-36; Sur-Reply at 13-14. Further, Figure 11 has no units, so it is impossible to determine where the dopant profile begins to grade, much less whether a GDC acts to move minority carriers from the surface. *See id.* at 12-13. Payne only discloses a *single* "surface impurity concentration" at the surface (EX1005, 5:51-52), and Petitioner even admits that Payne's GDC only "extend[s] *between* the surface layer and the substrate." Pet. at 24, 26. Petitioner's own annotation of Figure 11 demonstrates that the GDC is *flat* in the surface layer, and is thus not even "reasonably capable" to aid movement of minority carriers from the surface. Sur-Reply at 12-13. The Board wrongly suggests that PO reads claim 1 to require "a [GDC] ***through*** said surface layer." FWD at 57 (emphasis original). That is not PO's position. But, giving weight to all claim terms, Petitioner must point to references that actually move minority carriers from the surface, and neither Payne nor Kawagoe do so.

Petitioner has not pointed to any teachings or disclosure that demonstrate the claimed limitations. This is inconsistent with Rule 104(b)(4)'s requirement that an IPR petition "must specify where each element of the claim is found ***in the prior art***

patents or printed publications.” USPTO Memo, Enforcement and Non-Waiver of 37 C.F.R. § 41.104(b)(4) and Permissible Uses of General Knowledge in *Inter Partes* Reviews (July 31, 2025). Instead, Petitioner relies on a faulty claim construction and supposed admissions to fill in the gaps of its obviousness theories.

D. The Board did not hold Petitioner to its burden of proving that the references’ dopant profiles move *minority* carriers from the surface.

To make matters worse, the Board fails to even consider PO’s arguments that Petitioner failed to map the asserted references to the claims’ requirement that *minority* carriers be moved, not just generic charge carriers. At most, the Board briefly summarizes the argument before jumping to its conclusion on the Payne-based ground. *See* FWD at 51-52. When discussing Kawagoe, the Board does not even mention the minority carrier issue. *See id.* at 72-76.

It is axiomatic that the Board must always “consider the claims in light of the specification and teachings in the underlying patent.” *In re Power Integrations, Inc.*, 884 F.3d 1370, 1375 (Fed. Cir. 2018). In fact, claims “do not have meaning removed from the context from which they arose.” *Netword, LLC v. Centraal Corp.*, 242 F.3d 1347, 1352 (Fed. Cir. 2001). So when trying to discern what constitutes a minority carrier, the specification is the “best source for understanding [this] technical term.” *Multiform Desiccants, Inc. v. Medzam, Ltd.*, 133 F.3d 1473, 1478 (Fed. Cir. 1998).

Here, the specification explains that “MOS devices”—like those depicted in Figure 5—“are majority carrier devices for conduction. The conduction is channel

dominated.” EX1001, 1:43-44. PO’s expert understood this. *See* EX2064, ¶36 n.4 (“Because the channel [of FIG. 5(b)] is formed by electrons with a negative charge, the MOSFET is referred to as an n-channel MOSFET, and the ‘minority carriers’ are holes.”); EX1063, 74:24-75:5 (explaining that for NMOS transistors, “the channel needs to be formed out of N, electrons, so the holes would then be minority carriers”). This has also been PO’s stated position in prior litigation. *See* EX1030, 4 n.5 (same as EX2064, ¶36 n.4), 7 (“minority carriers (holes in ... Fig. 5B)”), 11 (“MOS devices are majority carrier devices”). Petitioner knew or should have known this is how PO understood “minority carrier” to be used in the Challenged Patent, since Petitioner cites this prior claim construction brief (EX1030) nearly two dozen times in its Petition. In fact, up until the present IPRs, “[t]here [had been] no dispute what is meant by minority carriers.” *Id.*, 25.

The specification is equally clear as to *why* this understanding of what constitutes a minority carrier is critical, explaining how “[s]purious minority carriers” interfere with the “active circuitry at the surface” of a semiconductor device. EX1001, 3:17-35. PO’s expert explained how, in an NMOS transistor like Figure 5(b), “[w]hen enough electrons have accumulated, they form a conductive channel ... between the source and the drain.” EX2064, ¶36. However, “the channel disappears as the holes return to the surface layer.” *Id.* Holes interfere with and prevent the channel from forming. Since claims are to be understood according to

the “express purpose of the invention,” it is minority carriers (*i.e.*, holes in NMOS) that have to be “[s]wept ... into the substrate as quickly as possible.” *Sequoia Tech.*, 66 F.4th at 1326; EX1001, 3:30-32.

One of Petitioner’s own data sheets³ recognizes that majority and minority carriers are defined by the channel, not the well region, in MOSFET devices:

N-channel and P-channel Considerations. The selection of a P-channel or N-channel load switch depends on the specific needs of the application. The N-channel MOSFET has several advantages over the P-channel MOSFET. ... [T]he *N-channel majority carriers (electrons)* have a higher mobility than the *P-channel majority carriers (holes)*.

But this is not the understanding of minority carrier that Petitioner argued for in this IPR. Petitioner’s expert relies on the type of doping within a *region* to define the majority and minority charge carrier. EX1003, ¶41 (“When a region is doped with p-type dopants, the holes are majority carriers and the electrons are minority carriers” and vice versa). Most crucially, Petitioner’s expert wrongly concludes, then, that the references’ “electric fields result from the downward-sloping graded concentrations ... and aid the movement of minority carriers (holes in N-wells, electrons in P-wells) downward to the substrate. *Id.*, ¶106; Pet. at 32. In the hearing, Petitioner’s counsel argued it was wrong to “be talking about what’s the minority carrier in the active region” and draws the false conclusion that minority is defined

³ ON Semiconductor, “AND9093/D – Using MOSFETS in Load Switch Applications” (Feb. 2014), at 1; available at <https://www.onsemi.com/pub/collateral/and9093-d.pdf>

by the well region. Paper 64 at 20:3-7. Again, this is inconsistent with how minority carriers are defined in the patent. The specification provides just one definition of minority carrier, regardless of where the claimed GDC is located. This definition does not change as the carrier moves between the active and well regions.

Petitioner relies on Kawagoe's Figures 17/23, where the relevant transistor is NMOS and holes are minority carriers. Petitioner, however, wrongly assumed that the minority carrier is an electron, and never addressed what effect, if any, Kawagoe would have on a hole. Similarly, while the relevant transistor in Payne's Figure 10 is PMOS, Petitioner never addressed what effect, if any, Payne would have on an electron. *See* Sur-Reply at 15-19.

As a result, Petitioner has failed to point to any teachings or disclosure in the references demonstrating that their respective dopant profiles move *minority* carriers as understood in the patent. But again, the Board failed to hold Petitioner's grounds to account and treated this defect with the same dismissiveness it has for all other arguments that oppose the positions the Board adopted in the first set of institution decisions. This stands as an independent reason why Director Review is warranted.

IV. CONCLUSION

Because Petitioner has not met its burden of proving that the Challenged Claims would have been obvious under the proper constructions, the Director should reverse the Board's FWD and hold the Challenged Claims not unpatentable.

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Respectfully submitted,

/Alan Whitehurst/

Alan Whitehurst
Reg. No. 43,263
awhitehurst@mckoolsmith.com
McKool Smith, P.C.
1777 K St. NW, Suite 1000
Washington, DC 20006
Telephone: (202) 370-8300
Facsimile: (202) 370-8344

Scott W. Hejny
Reg. No. 45,882
shejny@mckoolsmith.com
McKool Smith, P.C.
300 Crescent Court, Suite 1200
Dallas, TX 75201
Telephone: (214) 978-4000
Facsimile: (214) 978-4044

Archis "Neil" Ozarkar
Reg. No. 71,265
nozarkar@mckoolsmith.com
McKool Smith, P.C.
600 Travis Street, Suite 600
Houston, TX 77002
Telephone: (713) 485-7300
Facsimile: (713) 485-7344

*Counsel for Patent Owner
Greenthread, LLC*

CERTIFICATION OF SERVICE

The undersigned hereby certifies that a copy of this **PATENT OWNER'S REQUEST FOR DIRECTOR REVIEW** has been served on Petitioner via email on the following counsel of record for Petitioner:

Roger Fulghum (roger.fulghum@bakerbotts.com)
Michael Hawes (michael.hawes@bakerbotts.com)
BAKER BOTTS L.L.P.
One Shell Plaza
910 Louisiana Street
Houston, TX 77002

Mark Speegle (mark.speegle@bakerbotts.com)
Ellyar Barazesh (ellyar.barazesh@bakerbotts.com)
BAKER BOTTS L.L.P.
401 South First Street, Suite 1300
Austin, TX 78704

Eliot D. Williams (eliot.williams@bakerbotts.com)
BAKER BOTTS L.L.P.
700 K Street, N.W.
Washington, DC 20001

Dated: March 5, 2026

By: /Alan Whitehurst/
Alan Whitehurst, Reg. No. 43,263

Counsel for Patent Owner
Greenthread, LLC