

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SEMICONDUCTOR COMPONENTS INDUSTRIES, LLC,
Petitioner,

v.

GREENTHREAD, LLC,
Patent Owner.

Case: IPR2024-00264
U.S. Patent No. 10,734,481

**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 a claim construction position that is divorced from the claims’ plain language, specification, prosecution history, and, most concerningly, two *Markman* rulings from prior litigation. Petitioner’s expansive construction of “graded dopant concentration” completely eviscerates the claims’ requirements that charge carriers are not only moved, but moved from the surface of the semiconductor device down into the device’s substrate. In adopting this construction, the Board ignored these critical limitations and, along the way, disparaged district court claim construction orders that reached a different conclusion than the Board did at institution. Petitioner has been allowed to prevail on references that either do not teach moving carriers from the correct location or do not even clearly disclose a doping profile that is graded where it matters. 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 limitations:

[1.5] at least a portion of at least one of the first and second active regions [AR] having at least one graded dopant concentration [GDC] to aid carrier movement [ACM] from the first surface to the second surface of the substrate; and [1.6] at least one well region adjacent to

the first or second [AR] containing at least one graded dopant region, the graded dopant region to [ACM] from the first surface to the second surface of the substrate.

EX1001, 4:62-5:3.

Petitioner initially argued that “carriers [must move] in a particular direction” and added the bracketed language to a prior PO claim construction brief to argue that any GDC inherently exerts a sufficient force in the proper direction to ACM. Paper 1 (“Pet.”) at 23, 55. PO rebutted this inherency-type argument based on Petitioner’s own expert admitting that the net force exerted on the carriers depends on other forces and factors besides the dopant profile. Paper 32 (“PO Resp.”) at 11-14 (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 However, 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 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.

The Board contends that this dispute is a product of PO’s making (*see* Paper

¹ All emphases added unless otherwise noted.

77 (“FWD”) at 35), but in a previous Director Review grant, Deputy (then-Acting) Director Stewart recognized that this only arose after Petitioner changed its position. *See* IPR2023-01242, Paper 94 (“DR Grant”) 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” that were 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. *Id.*

The Board failed to correct these errors on remand in the first set of IPRs, and reinforced this incorrect claim construction in the second set. The Board’s FWD here (Paper 77) is nearly a carbon-copy of its FWDs both pre- and post-remand in the first set of IPRs (*e.g.*, IPR2023-01242, Papers 84 and 125).

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 Board’s errors lie in its refusal to give weight to the district court claim construction orders, its reliance on incomplete precedent, and its misunderstanding of the prosecution history. The Board arbitrarily *eliminated* the claims’ requirement that a GDC actually move carriers from the surface of the semiconductor device down into the substrate and, as a result, lowered Petitioner’s burden of proving that the Challenged Claims would have been obvious over the asserted references.

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). The Board *continued* in this course of action despite the Deputy Director’s instruction to reconsider the merits of this IPR in light of the claim construction rulings that form part of the long history of Greenthread’s patents. Beyond that, the Board has openly disregarded the Patent Office’s policy directives 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 limitations [1.5] and [1.6] eliminated

the claims’ requirement that a GDC must actually move 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*” to hold that “Petitioner does not need to show that [the references] teach[] actually moving any given carrier.” FWD at 62, 79 (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 that [the asserted references] teach[] or at least fairly suggest[] a “graded dopant concentration” that is *reasonably capable* of “aid[ing] carrier movement from the first surface to the second surface of the substrate.”

FWD at 79 (citing *PV*, 903 F.3d at 1361). However, to reach this conclusion, the Board adds an ellipsis to the middle of *PV*’s operative sentence and *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 more thorough analysis. Using the same language from *PV*, the Federal Circuit later explained 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 isolated precedent. “[W]hen, as here, an apparatus claim depends on 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); *see also K-2 Corp. v. Salomon S.A.*, 191 F.3d 1356, 1363 (Fed. Cir. 1999) (“This clause includes functional language that informs us of the structural requirements of the claim.”).

A claim element does not recite capability where an apparatus requires a certain configuration, structure, or function, instead of a capacity to perform a function. *Cf. Ball Aerosol & Specialty Container, Inc. v. Ltd. Brands, Inc.*, 555 F.3d 984, 988, 994-95 (Fed. Cir. 2009). Instead, the cases involving “reasonably capable” claims all follow a similar structure—a component “for performing” a function. *See INVT*, 46 F.4th at 1373 (discussing “‘for performing’-type claim language”); *PV*, 903 F.3d at 1362 (explaining that the claims were “fundamentally dissimilar to

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.”).

those in *Ball Aerosol*” because they were “drawn to ‘[a]n apparatus *for frequency up-conversion*’ or ‘[a]n apparatus *for communicating*’”).

“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. 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, 3:6-9, 4:64-5:1; FIG. 5B (“Graded dopant region to pull minority carriers from the surface”). Further, that the claimed GDC *aids* carrier movement presupposes that “carrier movement from the first surface to the second surface of the substrate” is already required in the semiconductor device. The specification does not envision a scenario where the GDC *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** carriers from the surface of the device to the substrate.

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. As will be explained below, Petitioner has not done that. Yet, in adopting the broad “reasonably capable” construction, the Board ignored the totality of established precedent and created a lower standard for proving that the Challenged Claims would have been obvious.

B. The prosecution history of Greenthread family patents does not support the Board’s faulty construction of the Challenged Claims.

The Board also erred in how it treated the prosecution history of the Greenthread patents, finding that it supports the broad construction advocated by Petitioner. However, the prosecution history confirms that a GDC must have a sufficient magnitude to overcome other forces and fields acting within the device to actually move carriers from the surface to the substrate.

During prosecution of a parent patent, the Examiner stated that “[i]n a complex electronic device, *movement of minority carriers 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 from said surface layer to said substrate.’” EX1016, 270. That second clause is exactly Petitioner’s position here. The Examiner proceeded: “[S]uch a unidirectional drift field may attempt to apply a force on all minority carriers in a specific direction, [but] it does not appear to ensure (without knowing other parameters of the device) that it will draw ‘all’ minority carriers from said surface layer to said surface.” EX1016, 270. Greenthread agrees (and has maintained in these IPRs) that “[i]t is not clear if simply the application of

‘a unidirectional drift field’ is sufficient to achieve the effect of ‘drawing all minority carriers from said substrate to said surface layer.” *Id.*

The Board adopted Petitioner’s argument that PO’s remarks to this Office Action somehow establish the proper scope of the disputed limitations. FWD at 73-74. First, reliance on this response is misplaced, since Greenthread was arguing in support of an *entirely different claim term*. Greenthread “removed the word ‘all’ from the rejected claim language” and further amended the limitation to its issued form: “aiding carrier movement.” EX1016, 290.

Second, it is unclear that the cited portions of PO’s remarks (FWD at 72-73) even support the idea that a GDC (and its resultant electric field) is the only factor to consider when determining whether carriers move from surface to substrate. PO noted that “minority carriers are either swept ‘down’ ... or ‘up’” “[d]epending on the *particular slope* of the [GDC].” EX1016, 289. Any middle-school math student (and the rest of the evidence in these proceedings) could explain that slope has two components: **direction and magnitude**. Nothing in PO’s remarks isolates the GDC’s *direction* at the expense of its magnitude. PO further explained that the GDC-generated “unidirectional electric field is the *additional parameter* for ensuring that all minority carriers are being moved in one direction.” *Id.*, 290. PO agreed with the Examiner that there are “other parameters of the device” that affect carrier movement. *See* PO Resp. at 14 (“[PO’s expert] and the specification

also show that the slope of the dopant concentration is a relevant parameter for determining whether a concentration gradient will aid carrier movement.”).

Third, PO has *never* argued that a GDC is all that matters. Tellingly, the Board does not point to any contemporaneous (or post-issuance) arguments from PO that carrier movement is not required or that calculating the effect of other forces and fields in the device is irrelevant. Instead, it excises various paragraphs of a claim construction brief from PO’s prior litigation. FWD at 80-81. These statements are unavailing to expand the scope of the claims because (a) the Board takes the “particular result” line out of its context as an indefiniteness challenge and (b) the next paragraph articulates PO’s consistent position: “The claims and the specification make clear that the electric field ***must move carriers*** in a particular direction (from the surface layer to the substrate).” EX1020, 29.

Petitioner and the Board also cite to the ongoing prosecution of related patents and cherry-pick PO’s statement that “‘relative slope’ [] means ... that one-side is relatively lower than the other side.” FWD at 64 (citing EX1058, 12). But again, this statement is taken entirely out of context. The Applicant is discussing “relative slope” in relation to Figure 1, which “shows the relative doping concentration versus distance in a [Prior Art] BJT [bi-polar junction transistor].” EX1058, 12; EX1001, 2:66-67, 3:6-11 (“The relative slope of the donor concentration ... help[s] the holes (p-n-p transistor) transverse from emitter to collector.”). The Challenged Claims do

not feature the terms “relative” or “slope” and are not concerned with BJT transistors. Instead, the “slope” the Challenged Claims are concerned with is the doping profile of the active and well regions to “pull minority carriers from the surface” (*see id.*, FIG. 5B, 3:48-4:18 (discussing the invention in the context of MOS devices)).

The intrinsic record fully supports PO’s consistent claim construction position requiring carrier movement from the surface to the substrate. However, the Board turned this prosecution history *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). The Board also mischaracterizes the prosecution history by stating that PO is only concerned with a GDC “facing in the appropriate direction.” FWD at 73. That is an incomplete picture of PO’s position. The GDC must face in the proper direction, but it must also have a ***sufficient magnitude***—the other component of slope—to overcome other forces and fields in the semiconductor device to actually move carriers.

C. 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 76.

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—which is all Petitioner argues here—is insufficient to prove whether it actually moves carriers. The Court rejected the very prosecution-based argument that the Board adopted here. *Id.* Neither court opines that a specific magnitude must 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 carriers from the surface to the substrate. Neither court understood the claims to mean that *any* GDC would aid carrier movement. 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).

D. The asserted references do not teach the claimed limitations under the proper construction.

Finally, this Petition fails because none of the references discuss the critical functional limitation of moving carriers from the surface to the substrate nor disclose a GDC with sufficient magnitude or account for other counteracting forces and fields. 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...” Pet. at 22 (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. Petitioner admits that “[t]his refers to electrons produced in the large substrate body below the wells,” rather than carriers at the active region. Pet. at 23 n.9.

Simply put, preventing electrons from entering the well-region from *below* the substrate is different than moving electrons from the channel/active region, *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 carriers at the active region and it is unclear what effect, if any, Figure 17’s GDC would have on a carrier in the active region. In fact, it would not have made sense to move an electron from the active region, since these electrons are needed for the transistor to work properly. See EX2064, ¶¶74-75; see also PO Resp. at 23-33; Paper 44 (“Sur-Reply”) at 6-11. For Kawagoe to meet limitations [1.5]/[1.6], it must ignore the requirement that the carriers move from one specific *location* to another specific *location*.

Second, Petitioner’s reliance on Figure 2b of Wieczorek (EX1006) suffers a similar fate. Not only is Wieczorek silent about moving carriers from the surface to the substrate, but this figure has no units, so it is impossible to determine where the dopant profile begins to grade, much less whether a GDC acts at the active region

(limitation [1.5]). *See* PO Resp. at 33-35; Sur-Reply at 11-14. Wieczorek even admits that, under certain conditions, its GDC may, in fact, not even be graded at the surface. *See* EX1006, ¶[0011] (the doping “profile in the vicinity of the surface of the semiconductor device ... become[s] substantially ***uniformly distributed***”). The Board’s one-paragraph analysis of this issue does not even address this major argument. *See* FWD at 101-102.

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.

IV. CONCLUSION

Because Petitioner has not met its burden of proving that the Challenged Claims would have been obvious under the proper construction (despite the Board lowering that bar), the Director should reverse the Board’s FWD and hold the Challenged Claims not unpatentable.

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Respectfully submitted,

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CERTIFICATION OF SERVICE

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