

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CIRRUS LOGIC, INC.;
OMNIVISION TECHNOLOGIES, INC.; AND
TEXAS INSTRUMENTS INCORPORATED,
Petitioner,
v.

GREENTHREAD LLC,
Patent Owner.

Case No. IPR2024-00018¹
Patent No. 9,190,502

**PETITIONER’S AUTHORIZED RESPONSE TO
DIRECTOR REVIEW REQUEST**

¹ Texas Instruments Inc. (“TI”), which filed a petition in IPR2024-00773, has been joined as a party to this proceeding.

[REDACTED]

On May 22, 2025, Patent Owner Greenthread (“PO”) sought Director Review of two FWDs (IPR2024-00001, Paper 83 and IPR2024-00016, Paper 79) and raised only one issue—“privity” with Intel. PO did not raise any other challenge in those requests. Now that the Board has again thoroughly considered and rejected PO’s privity argument, PO takes the proverbial “throw in the kitchen sink” approach. Each of PO’s six challenges can be summarily rejected because the Board correctly: (A) determined that prior art discloses a “graded dopant concentration” in an active region that aids movement of charge carriers, as claimed; (B) concluded that the claim construction orders from the district courts do not address the dispute between the parties regarding the scope of the “to aid carrier movement” limitation; (C) determined that Petitioner’s identification of “minority carriers” was correct; (D) ordered discovery that was consistent with the Director’s Order (even though PO said it did not want the discovery); (E) gave appropriate weight to PO’s licenses when evaluating secondary considerations; and (F) gave appropriate weight to the testimony of Dr. Banerjee, Petitioner’s expert.

In addition, PO alleges that the Board did not adhere to the Director’s Order in other IPRs, PO Req., 2–3, not this IPR. That is immaterial because the Board faithfully complied with the Director’s instructions to investigate whether Petitioner is in privity with Intel. After allowing discovery consistent with the Director’s Order, the Board correctly concluded that the petition is not time barred.

I. Background

A. The Initial Final Written Decisions and the Remand Proceedings

In fall 2023, Petitioner filed seven petitions challenging claims from six patents owned by PO. IPR2024-00001 & IPR2024-00016–00021. On April 22, 2025, the Board entered two FWDs holding that all challenged claims were unpatentable in two of the IPRs. IPR2024-00001, Papers 78, 80; IPR2024-00016, Papers 74, 76. On April 24, 2025, the then-Acting Director granted Director review in three of the onsemi IPRs, holding that “the case is remanded to the Board with instructions to allow discovery” into alleged privity between onsemi and Intel. IPR2023-01242, -01243, -01244, Paper 91, 3 (Director Apr. 24, 2025).

On May 2, 2025, the Board held a hearing regarding the remaining five petitions filed by Petitioner challenging PO’s patents (i.e., IPR2024-00017, IPR2024-00018, IPR2024-00019, IPR2024-00020, and IPR2024-00021) “to discuss . . . what scope of discovery would be appropriate.” Ex. 1073, 5:9–13. Subsequently, the Board instructed the parties to file a “joint paper, which includes a proposed discovery order approved by both parties or explains any areas of disagreement surrounding the scope of discovery.” IPR2024-00018, Ex. 3010.² On

² The Board’s instructions and the parties’ responses were the same in the other IPRs. *See* IPR2024-00017, -00019, -00020, and -00021, Exs. 3010 & 3011.

May 12, 2025, PO along with Petitioner informed the Board that “*no additional discovery is needed*” in each proceeding. IPR2024-00018, Ex. 3011.

Nevertheless, the Board issued an order on June 27, 2025 stating that “[t]he Board *sua sponte* determines that post-hearing discovery on the privity issue may be helpful to the panel in reaching a fair and efficient resolution of the instant cases.” Paper 82, 4. The Board then instructed Petitioner to provide discovery consistent with that ordered in the onsemi IPRs. *Id.*, 6.

On May 22, 2025, PO filed requests for Director Review in IPR2024-00001 and IPR2024-00016 raising two questions regarding privity: whether the Panel erred by (1) not requiring Petitioner to submit evidence of lack of privity; and (2) denying discovery on privity. IPR2024-00001, Paper 83, 1; IPR2024-00016, Paper 79, 1. On July 23, 2025, the Director ordered that “the cases are remanded to the Board with instructions to allow discovery, narrowly tailored to the privity issue, as the Board already has authorized in the first set of IPRs and the other related cases.” IPR2024-00001, Paper 89, 2–3. The Director instructed the Board to determine “whether Patent Owner has produced some evidence to support its argument that *Intel should be named as a privity* so as to have put the issue into dispute.” *Id.*, 3. The Board accordingly ordered the identical discovery regarding “Intel Accused Products” in the other two IPRs. IPR2024-00001, Paper 91, 2–3.

B. Post-Remand Proceedings and the Final Written Decisions

Petitioner and real party in interest GlobalFoundries provided declarations, Ex. 2080, Ex. 2081, Ex. 2082, and each declarant submitted to a cross-examination, Ex. 2083, Ex. 2084, Ex. 2085. Subsequently, the Board issued a second set of FWDs in IPR2024-00001, Paper 113, and IPR2024-00016, Paper 109. The Board also issued FWDs in IPR2024-00017, Paper 114; IPR2024-00018, Paper 113; IPR2024-00019, Paper 109; IPR2024-00020, Paper 105; and IPR2024-00021, Paper 107. The Board uniformly concluded that all challenged claims were unpatentable, and that Petitioner was not in privity with any time-barred party.

II. Argument**A. The Board Correctly Evaluated Both the Location of the Graded Dopant Concentration and Its Effect on the Carriers**

The record in this IPR is replete with the Board's analysis of the scope of the "graded dopant concentration" limitation and how the prior art discloses that limitation. *See* Papers 30 (Institution Decision), 74 (Hearing) and 113 (FWD).

1. The Board Correctly Concluded That a "Graded Dopant Concentration" Is Sufficient to "Aid Carrier Movement"

The Board evaluated the specification of the patent, the file history of U.S. Patent No. 8,421,195 ("the '195 patent") regarding the "graded dopant concentration," the built-in electric field created by that graded dopant concentration, and the influence of that electric field on the minority carriers, Paper 113, 52–76, and rejected PO's contention that "the claims require movement of

[REDACTED]

carriers and that there may be other forces at play.” *Id.*, 61-63, 75-76. The Board concluded that “evidence of a sloping gradient that creates a unidirectional drift field in the appropriate location, and pointing in the appropriate direction, is sufficient to demonstrate the ‘aid the movement of minority carriers’ limitation of the claims.” *Id.*, 61. The Board noted that although myriad forces may act upon carriers in a transistor, PO made clear during prosecution that the phrase “‘aid the movement of minority carriers’ limitation does not require an analysis of these parameters [or forces], nor does the disclosure of the ’195 patent specification ... mention such forces or the need to account for them.” *Id.*, 61. PO’s statements made during prosecution were clear and unambiguous, and the public was entitled to rely upon them. *Id.*, 61.

The Board observed that by contending now that “the claims require movement of carriers,” PO had reversed course in this proceeding. *Id.*, 56–57. PO’s arguments were at odds with the prosecution history where PO had unequivocally stated that the graded dopant concentration *itself* creates a “built-in” electric field that forces the movement of carriers into a particular direction, and the direction of movement depends solely upon the direction of the slope of the graded dopant concentration. *Id.*, 63. The Board also observed PO’s current position contradicts its argument in district court where PO acknowledged in its *Markman* brief that a POSITA would have “recognized that when ‘a static unidirectional electric drift

field' is present that it aids the movement of minority carriers.” *Id.*, 61 (citing Ex. 1030, 26). In addition, PO did not identify the type of detail in the specification that it now argues is necessary in the prior art for this limitation. *Id.*, 62 (citing *In re Epstein*, 32 F.3d 1559, 1568 (Fed. Cir. 1994)). Thus, the graded dopant concentration ensures that all minority carriers are moved in one direction. *Id.*

2. The Board Concluded That Prior Art Discloses a “Graded Dopant Concentration” That “Aids Carrier Movement”

The Board concluded that both Payne and Onoda disclose a graded concentration of dopants that decreases from the surface into the substrate that creates the claimed electric field, which in turn aids the movement of minority carriers into the substrate. Payne discloses a first tub region that corresponds to the single drift layer and the well region of the '195 patent. *Id.*, 49-507. “Payne’s Figure 11 shows a dopant concentration in tubs 15, 17 that decreases with increasing depth.” *Id.*, 50. Dr. Banerjee provided a side-by-side comparison of Figures 10 and 11 and testified that the transistor in Payne has *a downward-sloping graded dopant concentration*. *Id.*, 53–54. Likewise, Onoda discloses a semiconductor layer 102 that corresponds to the drift layer, and has a graded concentration of dopants extending between the surface and the substrate. Petition, 47–67.

PO now argues for the first time that the dopant concentration in Payne and Onoda is initially flat. PO Req., 5. The argument is untimely because PO has not

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made it before, as evidenced by PO's omission of cites to either the POR or the Sur-Reply in its Director review request. *See, e.g., In re Nuvasive, Inc.*, 842 F.3d 1376, 1381 (Fed. Cir. 2016). PO's argument is without merit in any event. As discussed above, Petitioner, supported with the unrebutted testimony of Dr. Banerjee, has demonstrated that the graded dopant concentration decreases from the surface with increasing depth. PO provides no valid reason to disturb the FWD.

B. The Board Correctly Analyzed the Prior *Markman* Orders

The Board also correctly rejected PO's mischaracterization of two district court claim construction orders. Neither order construed the term "to aid carrier movement" as requiring actual movement, or any specific magnitude for the graded dopant concentration. Instead, the Western District of Texas determined that "graded" was not indefinite and that it requires a sloped doping concentration. Paper 113, 66. As the Board correctly noted, the order can reasonably be interpreted to require that the dopant concentration must be "sufficiently graded" to create a static unidirectional electric drift field, and, as the PO argued during prosecution and to the court in its *Markman* brief, the field would aid movement of minority carriers. *Id.* The Board could not discern any requirement in the order that "one must quantify the magnitude of the field in order to know if the electric field will 'aid the movement of the minority carriers.'" *Id.*

The Eastern District of Texas evaluated (1) whether the "graded

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concentration of dopants” must increase or decrease uniformly, and (2) whether the “single drift layer” must be a single layer. *Id.*, 67. The latter is self-evident, and, as to the former, the court had found that PO had affirmatively argued during prosecution that a graded dopant concentration will provide a unidirectional electric field to move the minority carriers in a single direction. *Id.*, 67-68. In fact, the Board observed that the court’s conclusion regarding the scope of the claims was consistent with Petitioner’s earlier arguments in this proceeding and PO’s argument during prosecution, but contrary to PO’s later-presented argument. *Id.*

PO’s reliance on statements of Mr. Warrick, a Rule 30(b)(6) witness of Cirrus Logic, is misplaced. PO does not assert that Mr. Warrick is a person of ordinary skill or that he had considered PO’s statements regarding the “to aid carrier movement” limitation during the prosecution of the ’195 patent. *Id.*, 64–65. Thus, Mr. Warrick’s statements cannot “outweigh [PO’s] express assertions during prosecution that [PO’s] reasoning [based on Mr. Warrick’s statements] is incorrect in view of the scope of the claims.” *Id.*, 65 (citing Ex. 1002, 289–290.).

Thus, the Board correctly rejected PO’s assertion that the claims require a particular magnitude. PO fully presented its arguments about the prior *Markman* orders in its POR, Paper 45, 10, which the Board expressly considered in its FWD. Paper 113, 65–68. The Board’s rejection of PO’s mischaracterizations demonstrates that PO’s arguments lack merit, not that the Board is not fair.

C. The Board Correctly Determined That Petitioner's Identification of "Minority Carriers" Was Consistent with the Intrinsic Record

At the hearing, PO raised an argument that it had never raised before—Petitioner's identification of "minority carriers" in the prior art was incorrect. Paper 113, 78, 45 n.16. PO could not identify an express statement in the POR or the Sur-Reply that clearly articulated PO's position. *Id.*, 79. Nor could the Board locate one. *Id.*, 79. PO could only point to paragraph 36 and a footnote in Dr. Glew's declaration. Ex. 2057. That paragraph describes how the electrons in Figure 5B of the '502 patent "form a conductive channel" when a positive voltage is applied to the gate, and the footnote states that because the channel is formed by electrons, the minority carriers are holes. The Board appropriately concluded that Dr. Glew's declaration fell short of putting Petitioner on notice that, under PO's view, its identification of "minority carriers" was erroneous. Paper 113, 79–80. The Board determined PO's argument were "untimely and forfeited." *Id.*, 81.

The Board nevertheless evaluated PO's untimely argument and concluded that the argument was meritless. Petitioner has consistently asserted that the region and the dopant type dictate what constitutes majority and minority carriers in a transistor. *Id.*, 82. The Board noted that relying upon persuasive objective evidence, Petitioner has identified minority carriers as holes in N-wells and electrons in P-wells, and that Petitioner had applied that understanding when identifying majority and minority carriers in its unpatentability challenges. *Id.* For

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example, when discussing Payne, Petitioner identified holes as minority carriers in N-wells and electrons as minority carriers in P-wells. *Id.*

PO, on the other hand, asserts that in the context of the '502 patent, majority and minority carriers are dictated by what is going to flow between the source and the drain. *Id.*, 82-830. Under PO's view, in an n-p-n transistor (i.e., a transistor with n-type source and drain formed in a p-type layer), electrons conduct charge between the source and the drain, and, as a result, form the majority carriers, while the holes are the minority carriers. *Id.* The Board noted that PO's position was inconsistent with PO's prior statements to the Office, pointing to no less than four occasions where the PO had indicated that the dopant type determines what constitutes majority carriers. *Id.*, 82–84. The Board observed that PO's "unequivocal statements made during prosecution" not only contradicted PO's new interpretation of what constitutes "minority carriers," but fully supported Petitioner's position. *Id.*, 85. Notably, PO did not attempt to reconcile its position first raised at the hearing with its numerous contrary statements to the Office. The Board observed that Jastrzebski, a reference cited by PO during prosecution, also refers to holes as the minority carriers in an n-type semiconductor. *Id.* Finally, the Board correctly assigned little weight to Dr. Glew's testimony as it was conclusory and unsupported by cites to "any textbook, technical disclosure, or other objective evidence to support this statement." *Id.*, 87. After having conducted a thorough

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analysis, the Board disagreed with the PO that Petitioner had incorrectly identified the minority carriers in prior art. *Id.*, 88.

D. The Board’s Grant of Discovery Mirrors the Director’s Order

PO’s complaints about the scope of discovery lack merit. Although PO asserted that it did not need discovery, the Board ordered discovery that was entirely consistent with the previous grant of Director Review. *Id.*, 38. Indeed, in granting the Director Review for IPR2024-00001 and IPR2024-00016, the Director implicitly approved the Board’s similar Orders on discovery in related IPRs. IPR2024-00001, Paper 89, 3 (limiting discovery only to Intel). The scope of the discovery the Board ordered was appropriate for several reasons.

First, contrary to PO’s assertion that the Board “enabled Petitioners to entirely avoid the real issue” of whether “IAPs [Intel Accused Products] include *components* made and sold by Petitioners,” the Board ordered Petitioner to provide discovery on “whether Petitioner was supplier of any product, or *component of a product*, accused of infringement in the Intel litigation.” IPR2024-00016, Paper 87, 6. Petitioner duly provided relevant declaration testimony by declarants who stated under penalty of perjury that no Petitioner has supplied any components of the IAPs. Ex. 2080 (Ng Decl.), ¶8; Ex. 2083 (Ng Tr.), 15:16–18, 48:11–17; Ex. 2081 (Leach Decl.), ¶6; Ex. 2084 (Leach Tr.), 43:22–45:8, 70:5–18 Ex. 2082 (Cleary Decl.), ¶¶7, 12; Ex. 2085 (Cleary Tr.), 34:5–35:12. PO had a full and fair

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opportunity to depose each of Petitioner’s declarants but failed to uncover any evidence supporting its assertion, and the Board did not “discern that Petitioner’s investigations were in any way insufficient.” Paper 113, 36. The Board agreed with Petitioner that PO’s detailed teardown analyses of the IAPs do not show that the IAPs contain any components supplied by any third parties, much less Petitioner. *Id.*, 37. In fact, PO’s teardowns of the IAPs corroborate Petitioner’s testimony. *Id.*

Second, contrary to PO’s assertion about the scope of discovery, the Director only ordered the Board to evaluate “whether Patent Owner has produced some evidence to support its argument that *Intel* should be named as a privy so as to have put the issue into dispute,” IPR2024-00001, Paper 89, 3, and did not include either [REDACTED] or [REDACTED]. Indeed, PO had not even asked the Director for discovery on [REDACTED] and [REDACTED] IPR2024-00001, Paper 83, 2 n.2 (“For purposes of this Request, PO has focused on just the privy with *Intel*.”). PO’s assertion that the Board did not comply with the Director’s Order when limiting discovery to Intel is incorrect. Discovery regarding [REDACTED] and [REDACTED] would have been futile. Paper 113, 38–39.

The Board concluded that the PO “did not produce ‘some evidence’ tending to show that Petitioner [wa]s in privy with Intel, and the burden never shifted to Petitioner.” *Id.*, 26. Moreover, the Board noted that, even if PO did produce sufficient evidence to put the privy issue in dispute, the evidence adduced during trial clearly supports that Petitioner is not time barred under § 315(b). *Id.* PO does

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not offer any legitimate reason to disturb the FWD because, as the Board concluded, “the only record evidence on point supports Petitioner’s position that it did not control, or have any opportunity to control, the litigation.” *Id.*, 26.

E. The Board Gave Appropriate Weight to Greenthread’s Licenses

PO’s complaints about the Board’s decision not to attribute significant weight to the RPX licenses are baseless. The Board correctly found that PO’s licenses were not entitled to significant weight because the record demonstrates that the licenses were motivated in part by potential legal costs. *See id.*, 41–44. The Board noted that “because RPX is a litigation risk mitigation service” the license reflected the value of avoiding the risk of litigation. *Id.*, 42.

Contrary to PO’s assertion that the Board ignored *Ancora Technologies, Inc. v Roku, Inc.*, 140 F.4th 1351 (Fed. Cir. 2025), the Board cited and relied upon *Ancora* to conclude that there was a nexus between the challenged claims and the objective indicia. Paper 113, 39–40. But the Board also concluded that the record did not provide sufficient evidence that the amount paid for the RPX license was exclusively due to the licensed technology, rather than some other reason. *Id.*, 41. The Board also relied on Federal Circuit authority holding that licenses are not relevant when the feature allegedly creating commercial success was not known in the prior art. *Id.*, 41–42. Finally, the Board expressly stated that “Petitioner’s showings of *prima facie* obviousness, particularly in view of the strength of the

grounds . . . *outweigh* Patent Owner’s objective evidence of non-obviousness.” *Id.*,

44. Thus, PO fails to offer any credible basis to justify vacating the FWD.

F. The Board Appropriately Considered Dr. Banerjee’s Testimony

PO’s objections regarding Dr. Banerjee’s testimony are without merit.

First, when Dr. Banerjee submitted his initial declaration on October 10, 2023, TI was neither a petitioner nor an RPI. Dr. Banerjee did not list the grant from TI in his CV filed in Oct. 2023 because the funding from TI did not start until April 2024. IPR2024-00018, Paper 74, 33. Thus, PO’s arguments are baseless.

Second, PO mischaracterizes excerpts from Dr. Banerjee’s textbook to incorrectly imply that forces “may be insufficient” to effect electron movement. Consistent with his declaration, Dr. Banerjee states in his textbook that when a weak electric field is applied to an electron, the electron experiences a net force from the field but “[t]his force may be insufficient to alter *appreciably* the random path of an individual electron.” Ex.1062A, 98–99. The book clarifies that the force may be insufficient to *appreciably* alter the path of an electron. *Id.* It does not state that the forces don’t move the electrons, as PO incorrectly implies.

Third, PO complains about Dr. Banerjee’s redirect testimony and Petitioner’s instruction not to reveal any conversation during the break. Dr. Banerjee was able to clearly articulate that the three categories of forces mentioned during cross-examination either do not impact carrier movement or are not mentioned in the

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'195 patent. Paper 113, 76 n.24. PO's objections clearly lack merit because, as even the Board noted, PO did not move or strike Dr. Banerjee's redirect testimony and, that his re-direct testimony was consistent with his direct testimony and, importantly, with the intrinsic record. *Id.* Moreover, Petitioner is allowed to "confer with [a] witness before redirect examination begins." *Focal Therapeutics, Inc. v. Senorx.*, IPR2014-00016, Paper 19 at 3 (PTAB July 1, 2014) (citation omitted).

Fourth, PO complaints about certain overlap between Dr. Banerjee's declaration and the declaration submitted by Intel's expert in IPR2023-00260 are irrelevant. Dr. Banerjee stated in his declaration that he had reviewed the declaration in the earlier IPR proceeding, and after conducting his own independent analysis, he excerpted portions of that declaration for efficiency. Ex. 1003, ¶3. The experts are allowed broad latitude in how they research, structure, and draft their declarations. Paper 113, 91. Importantly, PO does not point to any testimony regarding the key disputed issues in the case that Dr. Banerjee could not explain or provide a basis for. *Id.* The Board rejected PO's assertion that Petitioner is required to show that "Prior Art *actually moves carriers*" because the claims only require a graded dopant concentration of appropriate slope to aid movement of carriers, and the magnitude does not matter. *Id.*, 61–77.

III. Conclusion

The Board's Final Written Decision on remand should not be disturbed.



Date: December 9, 2025

Respectfully submitted,

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §42.6(e), I hereby certify that the foregoing
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