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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VIZIO, INC.,
Petitioner

v.

POLARIS POWERLED TECHNOLOGIES, LLC
Patent Owner

IPR2024-00073
Patent No. 7,843,148

PETITIONER'S REPLY

TABLE OF CONTENTS

	Page No.
I. INTRODUCTION	1
II. CLAIM CONSTRUCTION	1
III. GROUNDS 3 AND 4: <i>ZANE</i> ANTICIPATES AND/OR RENDERS OBVIOUS THE CHALLENGED CLAIMS	2
A. PO Did Not Dispute that <i>Zane</i> Anticipates and/or Renders Obvious Claims 1–4, 11–15, 17, and 22	2
B. Dr. Zane Is Qualified to Provide Expert Opinions About <i>Zane</i>	2
C. “Anticipation Is the Epitome of Obviousness”	6
D. Claims 5 and 16: A Variation in the Location of an On/Off Switch Would Have Been Obvious.....	6
IV. GROUNDS 1 AND 2A-2C: THOMAS ANTICIPATES AND/OR RENDERS OBVIOUS THE CHALLENGED CLAIMS	13
A. The Board Does Not Need to Address Claims 3 and 13 Under the Thomas Grounds	13
B. Claims 1 and 14: Thomas Anticipates Regardless of the Construction of “Current Set Circuit”	13
1. Thomas Discloses the Same Current Set Circuit Described in the ’148 Patent	13
2. Thomas Applies the PWM Signal to the Current Set Circuit.....	17
C. Claim 3: Thomas’ Resistor Is a Basic Current Regulator.....	19
D. Claim 7: A Clock Is Inherent in Thomas’ Shift Register.....	19

TABLE OF CONTENTS
(*cont'd*)

	Page No.
E. The Obviousness Grounds Are Sufficient.....	23
F. Claim 13: The Petition Argued the Entire Driver Would Be Formed as an Integrated Circuit	23
V. CONCLUSION.....	26

TABLE OF AUTHORITIES

Page No(s).

<i>Axonics, Inc. v. Medtronic, Inc.</i> , 75 F.4th 1374 (Fed. Cir. 2023)	16
<i>Bos. Sci. Scimed, Inc. v. Cook Grp. Inc.</i> , 809 F. App'x 984 (Fed. Cir. 2020)	13
<i>EIS GmbH v. Novoluto GmbH</i> , IPR2019-01444, Paper 45 (PTAB Aug. 5, 2021).....	5
<i>Glaxo Grp. Ltd. v. Apotex, Inc.</i> , 376 F.3d 1339 (Fed. Cir. 2004)	4
<i>KSR Int'l Co. v. Teleflex Inc.</i> , 550 U.S. 398 (2007).....	9, 12
<i>NeuroGrafix v. Brainlab, Inc.</i> , No. 1:12-cv-06075, 2020 WL 3643057 (N.D. Ill. July 6, 2020).....	5
<i>Nvidia Corp. v. Invensas Corp.</i> , IPR2020-00603, Paper 52 (PTAB Sept. 1, 2021).....	3
<i>Realtime Data, LLC v. Iancu</i> , 912 F.3d 1368 (Fed. Cir. 2019)	6, 23
<i>In re Robertson</i> , 169 F.3d 743 (Fed. Cir. 1999)	20

OTHER AUTHORITIES

Federal Rule of Evidence 702.....	6
35 U.S.C. § 102.....	6
35 U.S.C. § 103.....	6

EXHIBIT LIST

Exhibit No.	Description
1001	U.S. Patent No. 7,843,148 to Gater et al.
1002	Prosecution History of U.S. Pat. No. 7,843,148
1003	Declaration of Regan A. Zane, Ph.D.
1004	Regan Zane Curriculum Vitae
1005	U.S. Patent No. 5,317,307 to Thomas, Jr. (“Thomas”)
1006	Montu Doshi & Regan Zane, “Digital Architecture for Driving Large LED Arrays with Dynamic Bus Voltage Regulation and Phase Shifted PWM,” APEC 07 (“Zane”)
1007	U.S. Patent No. 6,402,354 to Tatewaki et al. (“Tatewaki”)
1008	Excerpts from Paul Horowitz & Winfield Hill, <i>The Art of Electronics</i> (2nd ed. 1989)
1009	Declaration of Rachel J. Watters re <i>The Art of Electronics</i>
1010	U.S. Patent No. 3,972,031 to Riemenschneider et al.
1011	Excerpt from Noel M. Morris, <i>Digital Electronic Circuits and Systems</i> (The Macmillan Press Ltd. 1974)
1012	UK Patent Application Publication GB 2459009A to Gater et al.
1013	PDF Printout dated October 6, 2023 of Case Details for GB2459009 from UK Intellectual Property Office website, available at https://www.ipo.gov.uk/p-ipsu/Case/PublicationNumber/GB2459009 (
1014	Excerpt from <i>Comprehensive Dictionary of Electrical Engineering</i> (2nd ed. 2005)
1015	Plaintiff’s Disclosure of Asserted Claims and Infringement Contentions Against Vizio Pursuant to Northern District of

Exhibit No.	Description
	California Patent Local Rules 3-1 and 3-2, in <i>Polaris PowerLED Technologies, LLC v. VIZIO, Inc. et al.</i> , No. 2:23-cv-03478-GW-PDx
1016	Montu Doshi & Regan Zane, “Digital Architecture for Driving Large LED Arrays with Dynamic Bus Voltage Regulation and Phase Shifted PWM,” APEC 07 Digest
1017	Table of Contents for APEC 07
1018	Montu Doshi & Regan Zane, “Digital Architecture for Driving Large LED Arrays with Dynamic Bus Voltage Regulation and Phase Shifted PWM,” APEC 07 Presentation
1019	List of APEC 2007 Exhibitors
1020	Declaration of Gordon MacPherson from IEEE re <i>Zane</i>
1021	U.S. Patent Application Publication No. US 2007/0257869A1 to Huang et al. (“Huang”)
1022	<i>Stratosaudio v. Hyundai</i> , 22-CV-01712, GW-PD (C.D. Cal.), Tentative Ruling on Motion to Stay, April 26, 2022
1023	<i>Stratosaudio v. Hyundai</i> , 22-CV-01712, GW-PD (C.D. Cal.), Order Adopting Tentative Ruling, April 28, 2022
1024	<i>Vivint, Inc. v. Skybell Technologies, Inc.</i> , 21-CV-9472, GW-GJS, Order Granting Motion to Stay, November 10, 2022
1025	<i>Blackberry Limited v. Facebook, Inc.</i> , 18-CV-1844, GW-KS, Order on Motion to Stay, Feb. 13, 2020
1026	Linear Technology, <i>LTC3783 Specification Sheet</i> , 2005
1027	U.S. Patent No. 6,621,235 to Chang (“Chang”)
1028	Katherine K. Vidal, “Updated Guidance on the Treatment of Statements of the Applicant in the Challenged Patent in Inter Partes Reviews Under § 311” (Memorandum to

Exhibit No.	Description
	Members of the Patent Trial and Appeal Board dated June 9, 2022)
1029	Tentative Ruling on Defendant’s Markman/Claim Construction Following Supplemental Briefing in Polaris PowerLED Technologies, LLC v. VIZIO, Inc. et al., No. 2:23-cv-03478-GW-PDx (C.D. Cal. Apr. 5, 2024)
1030	Final Rulings on Markman/Claim Construction in Polaris PowerLED Technologies, LLC v. VIZIO, Inc. et al., No. 2:23-cv-03478-GW-PDx (C.D. Cal. May 8, 2024)
1031	Declaration of Regan A. Zane, Ph.D. in support of Petitioner’s Reply

TABLE OF ABBREVIATIONS

PO	Patent Owner
Pet.	Corrected Petition (Paper 16)
POR	Patent Owner Response (Paper 18)
Inst.	Institution Decision (Paper 6)
'148 Patent	U.S. Patent No. 7,843,148

I. INTRODUCTION

Patent Owner (“PO”) did not substantively challenge VIZIO’s showing that Claims 1-4, 11-15, 17, and 22 of the ’148 Patent are unpatentable based on *Zane*-based Grounds 3 and 4. For those claims, PO and its expert, Mr. Credelle, presented *no* arguments on the merits. Instead, PO asked the Board to ignore the opinions of VIZIO’s expert Dr. Zane for Grounds 3 and 4 because he co-authored *Zane*. But PO’s invitation to ignore Dr. Zane’s opinions is contrary to Board practice. The Board should find these claims unpatentable based on the Petition’s unrebutted arguments.

PO disputed whether Claims 5 and 16 would have been obvious in view of *Zane* in Ground 4. But as explained below, the proposed modification was to move an on/off switch to one of several possible locations in a circuit, with no impact on the circuit’s overall operation. The claims recite nothing more than an obvious variation of the circuit described in *Zane*.

PO also disputed VIZIO’s Thomas-based Grounds 1 and 2 for Claims 1, 3, 7, 13, and 14. But PO’s arguments ring hollow because Thomas discloses essentially the same LED driver as disclosed in the ’148 Patent.

II. CLAIM CONSTRUCTION

PO relies on constructions of three phrases to challenge Claims 1, 3, 13, and 14 for *only* the Thomas-based grounds: “current set circuit” (Claims 1 and 14),

“current regulator” (Claim 3), and “the driver is formed as an integrated circuit” (Claim 13). *See* POR at 8–12, 17–19, 25–28. VIZIO addresses these arguments in their respective sections below. However, none impact the conclusion of unpatentability because either (1) Thomas discloses these limitations even under PO’s construction and/or (2) PO did not contest that *Zane* discloses these limitations in the *Zane*-based grounds.

The parties also submitted the claim construction order from the related district court proceedings, but neither party has proposed that the Board needs to adopt the district court’s rulings to resolve the issues here. *See* EX1030; EX2007 (duplicate).

III. GROUNDS 3 AND 4: ZANE ANTICIPATES AND/OR RENDERS OBVIOUS THE CHALLENGED CLAIMS

A. PO Did Not Dispute that *Zane* Anticipates and/or Renders Obvious Claims 1–4, 11–15, 17, and 22

PO did not dispute that *Zane* is prior art to the ’148 Patent or that *Zane* anticipates Claims 1–4, 11, 12, 14, 17, and 22. *See generally* POR at 29–40. PO also did not dispute that Claims 13 and 15 would have been obvious over *Zane* in view of the knowledge of a POSITA. *Id.*

B. Dr. Zane Is Qualified to Provide Expert Opinions About *Zane*

Instead of substantively disputing the merits of *Zane* and Claims 1–4, 11–15, 17 and 22, PO argued that because Dr. Zane co-authored *Zane*, the Board should

ignore his testimony. But neither PO nor its expert suggested that Dr. Zane's opinions were incorrect. His opinions stand unrebutted.

Moreover, PO's attacks on Dr. Zane's credibility are unsupported. First, PO cited no authority holding that an author of a prior art reference is unqualified to opine on that reference. Indeed, the Board previously rejected a similar argument. In *Nvidia v. Invensas*, the patent owner criticized the petitioner's expert for authoring a prior art reference, suggesting that his authorship "means that he cannot form an objective opinion regarding the reference and he can be expected to have bias typical of inventors." *Nvidia Corp. v. Invensas Corp.*, IPR2020-00603, Paper 52 at 16 (PTAB Sept. 1, 2021) ("*Nvidia*"). The Board disagreed, explaining that "experts in patent cases routinely engage in the legal fiction of putting themselves in the mind of a person of ordinary skill in the art who is often a person of less skill than the expert." *Id.* Moreover, the Board found that the expert's "prior knowledge of the specific prior art would tend to make him *more* qualified to testify about the art." *Id.* at 16–17 (original emphasis).

Like *Nvidia*, PO argued that as an author, Dr. Zane could have relied on "undisclosed assumptions that would not be understood (or even known) by an *ordinary* person of skill when simply reading *Zane's* text." POR, 30 (citing *Glaxo Grp. Ltd. v. Apotex, Inc.*, 376 F.3d 1339, 1348–49 (Fed. Cir. 2004)). But PO identified ***no*** instance where Dr. Zane's opinions went beyond what a POSITA

would have understood from *Zane*. Indeed, Dr. Zane explained, “[W]hile my declaration analyzes and presents opinions about *Zane*, which is a paper that I co-authored, my analysis of that paper is from the perspective of a POSITA reviewing that paper at the relevant time.” EX1003, ¶32. If anything, Dr. Zane’s affirmative recognition of the issue and conscious effort to perform the correct analysis bolsters his credibility.

Moreover, PO’s reliance on *Glaxo* is misplaced because that case involved experiments that an expert crafted using his knowledge of the patent-at-issue. *See Glaxo*, 376 at 1348–49. *Glaxo* is not relevant to an expert providing opinions about a prior art reference.

PO also distorted Dr. Zane’s testimony to argue “Dr. Zane believes that *he* invented the technology ... before the inventors of the ’148 patent.” POR, 31 (citing EX2004, 61:22-62:21). But Dr. Zane testified that it was a “mischaracterization” to suggest that he believes he invented the technology before the ’148 Patent inventors. EX2004, 59:4–61:21. Indeed, Dr. Zane opined that Thomas—an older reference than *Zane*—also anticipates the claims of the ’148 Patent.

PO referenced funding Dr. Zane received for work in 2007 leading to *Zane* and an issued patent while he was a professor at the University of Colorado. POR, 31–32. But Dr. Zane no longer works at that university, (EX1004, 1), and does not

own or receive any remuneration from that patent (EX2004, 64:12–17). PO did not explain why funding Dr. Zane received years ago should impact his credibility today.

PO referenced masking author names during the peer-review process for scientific publications. *See* POR 31, (citing EX2004, 41:4–8, 42:13–22). But that peer-review process is irrelevant to expert testimony about the prior art.

PO attempted to analogize Dr. Zane’s opinions to “uncorroborated inventor testimony in the context of an interference proceeding.” POR, 33–34 (citing *Medtronic v. Teleflex*, *Medichem v. Rolabo*, and *Thomson v. Quixote*). But PO’s argument makes no sense because those cases involved *fact* testimony about when an invention was made, not *expert* opinions about the prior art.

Finally, PO argued that if the Board does not credit Dr. Zane’s opinions, then the Petition would be based solely on “unsupported attorney argument, which are insufficient to meet Petitioner’s burden.” POR, 33 (citing *In re Geisler* and *Invitrogen v. Clontech*). But the Petition relied on Dr. Zane’s testimony and therefore is not “unsupported attorney argument.” Dr. Zane’s testimony has not been excluded, nor could it be under these circumstances, because PO’s allegations of bias “go[] to the issue of credibility, not admissibility.” *EIS GmbH v. Novoluto GmbH*, IPR2019-01444, Paper 45 at 47 (PTAB Aug. 5, 2021); *see also NeuroGrafix v. Brainlab, Inc.*, No. 1:12-cv-06075, 2020 WL 3643057, at *5 (N.D. Ill. July 6, 2020) (refusing to exclude testimony by expert, whom the challenging party

criticized as believing he invented the technology at issue because “[a]n expert’s alleged bias, however, is not a proper basis on which to exclude his or her testimony under *Daubert* or Rule 702.”).

PO failed to demonstrate any reason to ignore Dr. Zane’s opinions, and those un rebutted opinions confirm the unpatentability of the challenged claims.

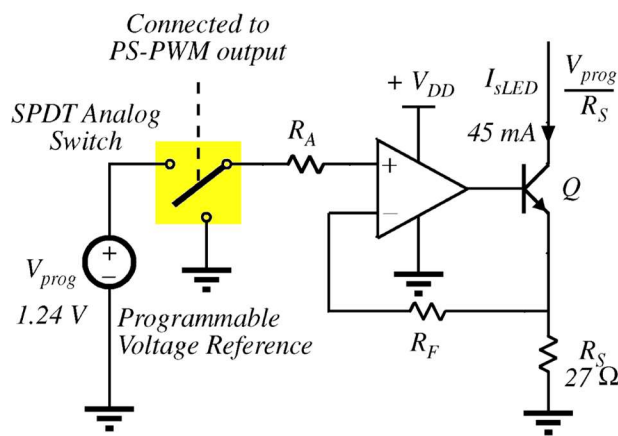
C. “Anticipation Is the Epitome of Obviousness”

PO argued that the obviousness arguments for Claims 1 and 14 in Ground 4 are insufficient because they rely on the anticipation arguments from Ground 3. POR, 34–36. But “it is well settled that a disclosure that anticipates under § 102 also renders the claim invalid under § 103, for anticipation is the epitome of obviousness.” *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1373 (Fed. Cir. 2019) (cleaned up).

D. Claims 5 and 16: A Variation in the Location of an On/Off Switch Would Have Been Obvious

Claims 5 and 16 further specify the structure of the current set circuit of Claims 1 and 14, respectively. The only difference between the current set circuits recited in those claims and *Zane* is the location of a transistor (in the SPDT analog switch) that turns *Zane*’s current sink “on” and “off” according to the PWM duty

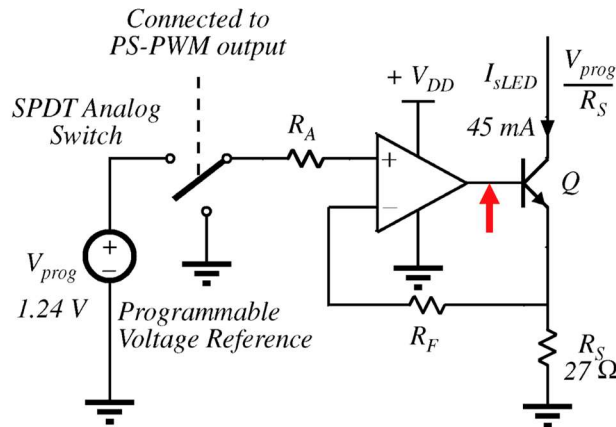
cycle.¹ See POR, 36–40; see also EX1031, ¶30. In *Zane*, that transistor is located in the current sink as highlighted below:



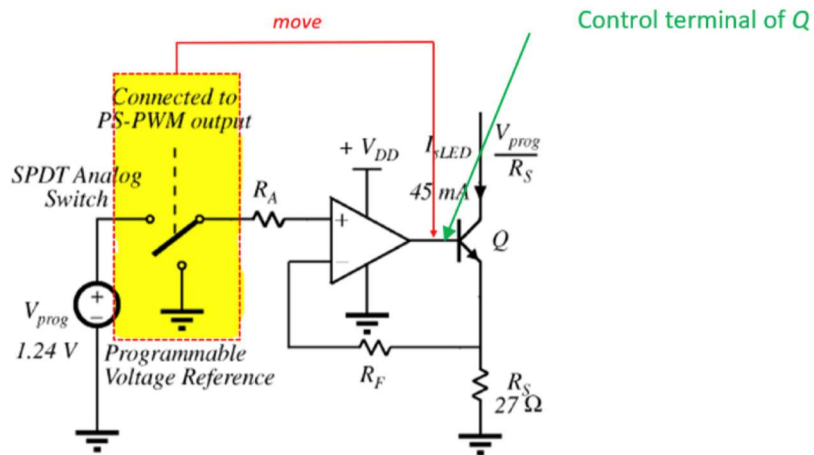
EX1006, Fig. 4 (annotated). In contrast, Claims 5 and 16 require that transistor to be located between the op amp output and the current control transistor, Q, as shown by the red arrow below.² See Pet., 77–78, 83–84.

¹ That transistor is called a “PWM brightness control transistor” in Claim 5 and a “pass transistor” in Claim 16. See Pet., 83.

² Claim 5 recites “a PWM brightness control transistor connected between an output of the feedback circuit and a control terminal of the current control transistor.” Claim 16 similarly requires a “pass transistor being connected between a control terminal of a respective current control transistor and a regulating control voltage.”



EX1006, Fig. 4 (annotated). Thus, as the Petition and Dr. Zane explained, Claims 5 and 16 recite nothing more than an obvious variation of Zane's current sink wherein the transistor is relocated to the output of the op amp, as shown below.



Pet., 78 (annotating EX1006, Fig. 4); EX1003, ¶184; see also EX1031, ¶30.

PO mischaracterized the Petition as only arguing that a POSITA *could* make the modification, not that a POSITA *would* do so. POR, 39–40 (relying on Petition's statement that the transistor "*may* be placed in several locations in this circuit" (PO's emphasis)). But the Petition explained that a POSITA would have been motivated

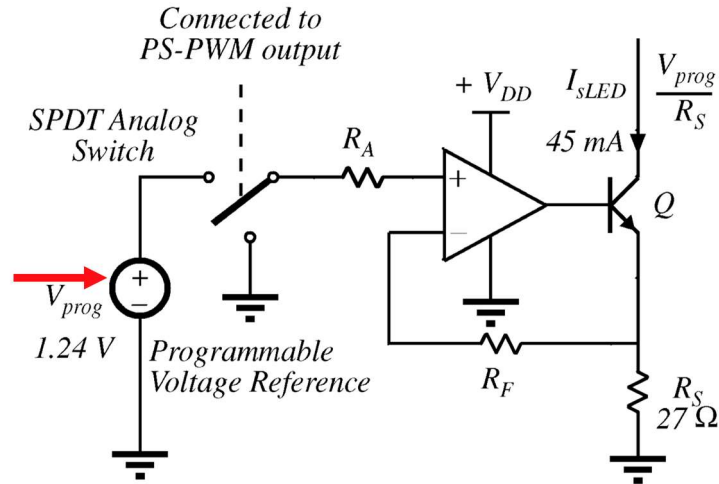
to modify *Zane* because “there are a finite number of ways in which the PWM brightness control transistor could be connected to *Zane*’s programmable current sink, and it **would have been obvious to try** any of those solutions as a design choice.” Pet., 78–79; EX1003, ¶186 (“it **would have been obvious for the POSITA to try** any of those solutions as a design choice”); see also EX2004, 115:17–121:1; *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 402–403 (2007) (“When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill in the art has good reason to pursue the known options within his or her technical grasp.”).³ That the transistor “may be placed in several locations in this circuit without changing the overall operation of the circuit” is not the motivation to combine; it is the explanation why there are a finite number of identified, predictable solutions. Thus, the Petition sufficiently set forth a motivation to modify *Zane* to achieve the claimed inventions.

PO disputed whether the modification would have been obvious based on Credelle’s opinion that it “would frustrate the purpose and function of the circuit by hampering its ability to maintain a precision voltage.” POR, 40 (quoting EX2002, ¶57). But that is wrong because, as Dr. Zane explained at length, placing the switch at a different location in *Zane*’s current sink would not change its overall operation. See EX1003, ¶185 (“[T]he switch (the PWM brightness control transistor) may be

³ All emphases added unless otherwise noted.

placed in several locations in this circuit without changing the overall operation of the circuit, because the purpose of the switch is to turn the programmable current sink “on” or “off”, and hence, to control the passing of current through the LEDs in the associated path.”); *see also* EX2004, 121:2–123:21 (further elaborating why the various options would achieve the same result); EX1031, ¶¶31–32. Moreover, the location of the switch has no effect on the “precision voltage” because that voltage is supplied by a different component. EX1031, ¶33.

Credelle attempts to inject uncertainty into the proposed modification, but his arguments only demonstrate that his understanding of *Zane* is flawed. *See* EX2002, ¶57. First, Credelle argued “the analog SPDT switch characteristics are not disclosed by *Zane*, but it is clear that *Zane* has designed the analog SPDT switch to apply a precision voltage to the positive terminal of the op amp to achieve a precision current flow V_{prog}/R_s in the LED strings.” EX2002, ¶57. That is incorrect because the SPDT switch does not apply precision voltage to the “+” terminal of the op amp. EX1031, ¶33. Rather, “the purpose of the switch is to turn the programmable current sink ‘on’ or ‘off.’” EX1003, ¶185; *see also* EX1031, ¶33. The precision voltage V_{prog} is applied to the “+” terminal of the op amp by a different component, identified by the red arrow below.



EX1006, Fig. 4 (annotated); EX1031, ¶33. Indeed, Credelle’s statement is inconsistent with his acknowledgement that if the SPDT switch were relocated according to the proposed modification, V_{prog} would be applied to R_A . EX2002, ¶57.

Second, Credelle argued that “[i]f the precision voltage V_{prog} is simply applied to R_A ... a POSITA would not know how to adjust the op amp settings to achieve the correct voltage on the base of transistor Q .” EX2002, ¶57. That is incorrect because when the SPDT switch closes the circuit, V_{prog} is, in fact, applied directly to R_A and to the “+” terminal of the op amp. *See* EX1031, ¶34; *see also* EX2004, 121:15–122:11 (explaining that without the switch, the “circuit acts as a current sink” and the purpose of the switch “is to disable that path so we get the pulse width modulating output response for the current in the LED.”). Credelle offers no credible reason why a POSITA would be confused by the circuit’s normal operation. EX1031, ¶34. To the extent Credelle was referring to the voltage drop across the

switch, a POSITA would have understood that any such voltage drop would have been negligible given the extremely high input impedance of an op amp. *Id.*

Finally, Credelle argued that “if the analog SPDT switch were placed after the op amp, a POSITA would not know if the precision voltage V_{prog} would still set the LED current to the desired current because the properties of the analog SPDT switch are unknown.” EX2002, ¶57. That is incorrect because the SPDT switch does not play a role in setting the value of the current—the switch turns the current “on” or “off.” EX1003, ¶185. The current in this well-understood circuit is set by two variables: V_{prog} and R_s . EX1031, ¶35; EX1006, Fig. 4 (I_{sLED} defined as V_{prog}/R_s), 290-291 (“ V_{prog} reference is fixed to a bandgap value and the LED string current is regulated to a value of 45 mA by the choice of appropriate resistor, R_s .”); EX1003, ¶164; EX2002, ¶54 (Credelle agreeing that the LED current is set as V_{prog}/R_s). Moreover, a POSITA would have understood that the purpose of using an op amp in a negative feedback loop as shown in *Zane* is to have the op amp automatically adjust its output to cause the voltage across the resistor R_s to match the reference voltage V_{prog} . EX1031, ¶35. Thus, a POSITA would have understood that no adjustments would be necessary as a result of the modification. *Id.*

Accordingly, because Credelle’s opinions regarding *Zane* are incorrect, PO fails to rebut that Claims 5 and 16 would have been obvious over *Zane*. EX1031, ¶36.

**IV. GROUNDS 1 AND 2A-2C: THOMAS ANTICIPATES AND/OR RENDERS
OBVIOUS THE CHALLENGED CLAIMS**

**A. The Board Does Not Need to Address Claims 3 and 13 Under the
Thomas Grounds**

PO specifically challenged only Claims 1, 3, 7, 13, and 14 under the Thomas-based grounds. However, PO did not substantively challenge the unpatentability of Claims 3 and 13 under *Zane*-based Grounds 3 and 4. Thus, if the Board finds Claims 3 and 13 unpatentable under Grounds 3 and 4, it need not address those claims under the Thomas-based grounds. *See Bos. Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App'x 984, 990 (Fed. Cir. 2020) (Board has “discretion to decline to decide additional instituted grounds once the petitioner has prevailed on all its challenged claims.”).

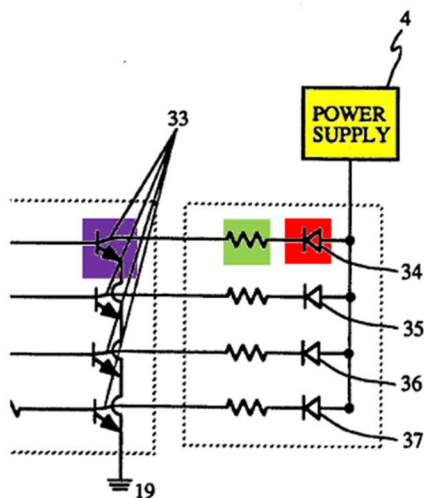
Additionally, while PO has failed to substantively dispute that Claims 1 and 14 are anticipated by or obvious over *Zane*, the Board should still address the disputes regarding Claim 1 to reach Claim 7.

**B. Claims 1 and 14: Thomas Anticipates Regardless of the Construction of
“Current Set Circuit”**

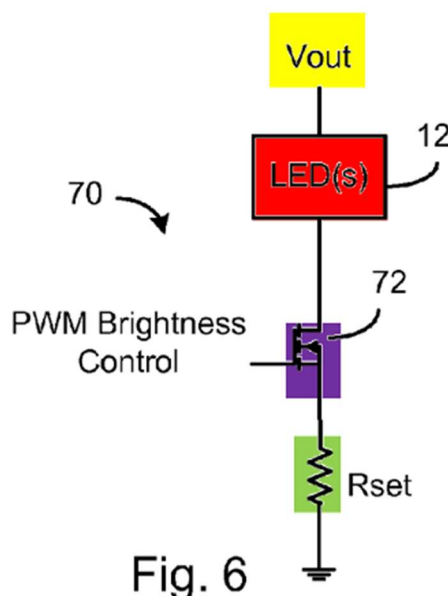
**1. Thomas Discloses the Same Current Set Circuit Described in the
'148 Patent**

As shown below, Thomas discloses essentially the same LED driver and current set circuit as described and claimed in the '148 Patent.

Thomas Fig. 2



'148 Patent Fig. 6



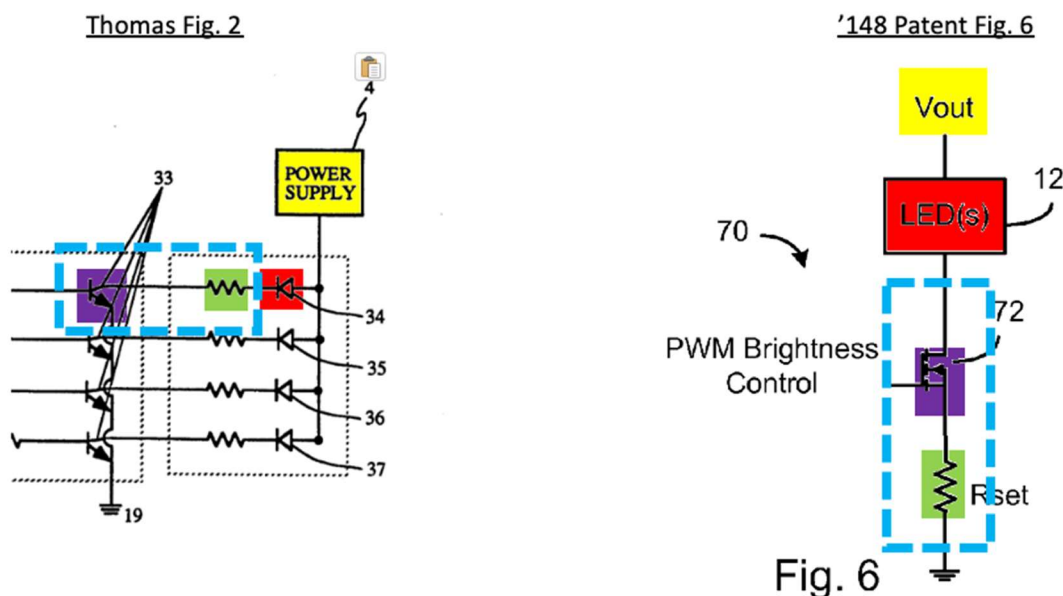
EX1005, Fig. 2 (annotated); EX1001, Fig. 6 (annotated); EX1031, ¶8.

PO did not dispute that Thomas discloses a current set circuit. *See* POR, 7–12. Instead, PO argued that the Petition failed to *identify enough components* as the “current set circuit” because a single electrical component cannot be a “current set circuit.” *See, e.g., id.* at 7 (“Petitioner’s *identification* of individual passive resistors ... does not satisfy independent claims 1 and 14.”); *id.* at 8 (“The Petition does not *identify* an actual ‘circuit’....”); *see also* EX1031, ¶7. But PO mischaracterized the Petition and expert declaration. Neither Petitioner nor Dr. Zane identified the resistor as the current set circuit to the *exclusion* of other components. Consistent with the Board’s finding that “the ’148 patent itself identifies a resistor in series with one or more LEDs in an LED string as a current set circuit” (Inst., 14), the Petition and Dr. Zane explained that Thomas discloses “a resistor in series with the LED

group in each parallel path.” Pet., 25; *see also* EX1003, ¶62. The Petition and Dr. Zane also explained how Thomas’s resistor connects to the power supply, LEDs, and resistor to limit the current to $I=(V-V_{LED})/R$. Pet., 26; *see also* EX1003, ¶63; EX1031, ¶9. Furthermore, in addressing Claim 6, the Petition and Dr. Zane explained that Thomas’s transistor is also part of the current set circuit. *See* Pet., 46–50; EX1003, ¶¶110–16; EX1031, ¶9. Thus, PO ignored how the Petition and Dr. Zane explained the resistor limits the current based on the other electrical components connected in series to it.

Within the context of the claims, a POSITA would understand that the entire LED driver is a “circuit,” and “current set circuits” refers to the portions of that LED driver that “control[s] a peak current through one or more LEDs connected in each parallel path.” EX1031, ¶10. PO’s argument that a “current set circuit” must have at least two components is inconsistent with the ’148 Patent, which identifies a single resistor as an example of a current set circuit. *See* EX1001, 1:67-2:3 (“A current setting circuit 20-22 for each parallel path is shown, where each circuit 20-22 may comprise *a current set resistor* or a current regulator.”); EX1031, ¶10. Moreover, PO identified no intrinsic evidence clearly disavowing a single-component “current set circuit.” EX1031, ¶10. Further, PO’s argument makes no sense because, under its construction, two resistors in series could be a current set circuit, but a single equivalent resistor could not. EX1031, ¶11.

Moreover, even if the Board adopted PO's construction, Thomas still anticipates. For example, PO argued that the current set circuit in Figure 6 of the '148 Patent comprises "[a] *current set resistor Rset and MOSFET 72* [that] are connected in series with the one or more LEDs." POR, 11 (original emphasis). As shown in the dashed blue lines below, Thomas also discloses a resistor and transistor in series with one or more LEDs, just like in Figure 6 of the '148 Patent. EX1031, ¶¶12–13. Thus, even under PO's construction, Thomas discloses a "current set circuit."



EX1005, Fig. 2 (annotated); EX1001, Fig. 6 (annotated); EX1031, ¶13.

PO cannot avoid invalidity by raising a new claim construction post-institution when the prior art still discloses the claim limitation under that construction. *See Axonics, Inc. v. Medtronic, Inc.*, 75 F.4th 1374, 1383–84 (Fed.

Cir. 2023) (petitioner must be permitted to present argument and evidence under a new construction presented by patent owner after institution).

2. Thomas Applies the PWM Signal to the Current Set Circuit

PO argued Thomas does not disclose limitations [1.d] and [14.d] because it does not apply a PWM brightness control signal directly to the resistor. POR 12–17. That argument is unavailing for several reasons.

First, PO relies on its mischaracterization that the Petition identified Thomas’ resistors as the current set circuits to the exclusion of other components connected to the resistors. *See* POR, 12–13. But as explained above, the Petition did not identify the resistors in isolation. *See supra* Section IV.B.1; EX1031, ¶14.

Second, PO fails to distinguish Thomas from the ’148 Patent claims because Thomas’s circuit works the same way as the ’148 Patent—by applying the PWM brightness control signal to the transistor connected to the current set resistor. *See* EX1001, 6:7-16, FIG. 6; EX1031, ¶15. Furthermore, PO reads in a requirement that the PWM signals must be applied *directly* to the current set circuits without other components in between. *See* POR, 14; EX2002, ¶41. The claims have no such requirement. EX1031, ¶16.

PO argued that “the Petition makes no specific argument that the PWM brightness control signal is somehow applied to the resistors.” POR 15–16 (citing Pet., 30-32, 42). But PO overlooked the Petition’s explanation that “different

staggered PWM signals are applied to the plurality of current set circuits *via the switches 5-8.*” Pet., 29; *see also* EX1003, ¶¶66–70; EX1031, ¶16.

PO also misrepresented that Dr. Zane “confirmed that Thomas’s PWM signal is applied to the AND gates that are part of the activation switches, *not* to the resistors.” POR, 15 (citing EX2004, 79:19-83:8) (original emphasis). PO never asked Dr. Zane to confirm that the PWM signal is not applied to the resistor. *See* EX2004, 79:19-83:8. Further, Dr. Zane’s declaration explained why “*the resistance* in Thomas ‘draw[s] the peak current ... at a duty cycle substantially corresponding to a duty cycle *of a PWM brightness control signal applied to it.*’” EX1003, ¶¶67–70.

Third, PO’s argument fails because under PO’s construction of “current set circuit,” Thomas does apply a PWM signal *directly* to the current set circuit. As explained above, Thomas discloses a current set circuit comprising a resistor in series with a switch, just like the ’148 Patent. *See supra* Section IV.B.1; EX1031, ¶¶8, 17. Thomas indisputably applies the PWM signal directly to the current set circuit because the PWM signal is applied to the switch. *See* EX1031, ¶17; POR, 14 (“[T]he PWM signals go to the activation switches”); EX2002, ¶40 (“Control of the current flow through these resistors is accomplished through a switch or AND gate ... to which the alleged PWM brightness control signal is applied.”). Accordingly, Thomas anticipates Claim 1.

C. Claim 3: Thomas' Resistor Is a Basic Current Regulator

PO argued a resistor is not a “current regulator” because it is a “passive” element rather than having “components that can make changes to the current in real time.” POR, 17–18. In support, PO argued that the ’148 Patent describes Figure 5, but not Figure 6, as a current regulator. POR, 18. But a POSITA would understand that Figure 6 also provides a regulated current because it provides a “substantially constant” voltage, V_{out} , in series with a fixed resistance, R_{set} . *See* EX1001, 6:11–13; *see also id.* at 5:26–47 (describing the voltage source as a voltage regulator); EX1031, ¶¶18–19. A regulated voltage in series with a fixed resistance provides a regulated current. EX1031, ¶19.

Similarly, Thomas explains that Thomas’ LED driver helps the power supply maintain a regulated voltage, indicating that Thomas’ LED driver is used with a regulated voltage supply. *See* EX1005, 1:66–2:4; EX1031, ¶20; *see also* EX2004, 88:6–90:1. Thus, Thomas discloses a current regulator because the resistor is used in series with a regulated voltage, leading to a regulated current. EX1031, ¶20; *see also* EX1003, ¶73. Accordingly, Thomas anticipates Claim 3.

D. Claim 7: A Clock Is Inherent in Thomas' Shift Register

PO disputed the statement that “[a]ll shift registers must have a clock connected to them for shifting the bits.” POR, 19 (quoting Pet., 34) (emphasis omitted). But PO did not address the relevant question before the Board: whether a

clock is inherent in **Thomas**' shift register. *See In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999) ("To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.'"); *see also* EX1031, ¶21.

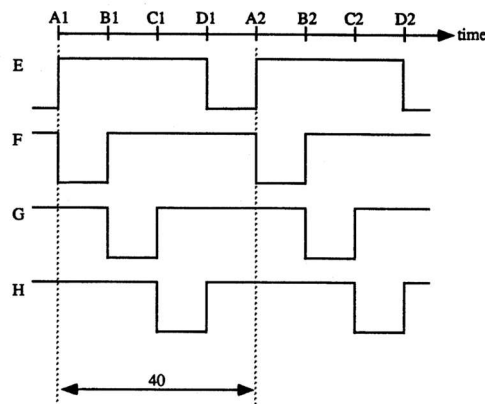
Indeed, PO and Credelle **never** suggested that Thomas' shift register could be implemented without a clock. EX1031, ¶¶25, 28. Instead, they generally argued that a shift register without a clock could exist in other contexts. *See id.*; POR, 19–21; EX2002, ¶50; EX1031, ¶¶25, 26, 28. But merely arguing a shift register without a clock might exist in some unrelated application does not rebut inherent anticipation by Thomas' shift register—PO and Credelle needed to demonstrate that Thomas' shift register could work without a clock. They did not.

The fact that Thomas' shift register has a clock is not a "mere possibility," but a **certainty** based on Thomas's description. POR, 21; EX1031, ¶¶22, 24. Thomas explains:

[A] twelve bit shift register (31) is used to generate the delayed modulating signals (F, G, H) by ***sequentially storing twelve binary values corresponding to the pulses or lack of pulses in the first modulating signal (E)***. The second, third and fourth modulating signals (F, G, H) are then generated by tapping the values stored within the

fourth, eighth and twelfth cells of the shift register (31) *as the values are sequentially shifted through the twelve cells of the shift register* (31).

EX1005, 4:19–28. Thomas’ Figure 3 further illustrates how the signals *F*, *G*, and *H* are continuously generated and are aligned in time with each new pulse or lack of pulse from the original modulating signal *E*. EX1031, ¶¶22–23.



EX1005, Fig. 3. Because the shift register continuously generates delayed signals *F*, *G*, and *H* as the original PWM signal *E* is being fed into the shift register, the shift register must be shifting the bits synchronously with each new pulse or lack of pulse from *E*. EX1031, ¶¶22–24. That shift in pulse, which occurs at a regular time interval, is a clock signal. EX1031, ¶23. Without a clock, Thomas’ shift register would not be able to shift synchronously with *E*. EX1031, ¶24.

Thus, PO’s reference to an asynchronous shift register is irrelevant because Thomas’ shift register is synchronous with the PWM signal *E*. EX1031, ¶27. Moreover, Dr. Zane explained why Thomas’ shift register could not be implemented

as an asynchronous shift register. “[A]ll shift registers require a signal to shift the data down the register.” EX2004, 97:11-13. In a synchronous register, there would be a “dedicated input where the clock would typically be connected that would be the signal that shifts the data down that register.” *Id.* at 98:2-5. In contrast, an asynchronous register “is one that would effectively derive the clock or derive the decision to shift down the register from the data itself.” *Id.* at 98:6-12.⁴ Because Thomas’ PWM signal E is not described as containing that extra data, it would be “impossible to extract the effective clock or the ability to shift the data down the register without ... a clock signal to achieve that function.” *Id.* at 98:21-99:10; *see also id.* at 99:11-100:4 (further explaining why Thomas’ shift register is not an asynchronous register).

Additionally, PO’s reference to a dynamic shift register is unavailing. *See* POR, 20–21 (referencing EX1011, Fig. 12.4). In that dynamic register, the data is shifted by alternating two signals, ϕ_1 and ϕ_2 . *See* EX1011, 117–18; EX1031, ¶26; *see also* EX2002, ¶¶48–50. Even if Thomas’ shift register were implemented like that dynamic shift register, that shift register would still be receiving the signals from

⁴ Dr. Zane also explained “either the concept of the clock is embedded in the data” for an asynchronous register “or there’s a dedicated clock that shifts the data that’s available,” which is why the Petition’s assertion that all shift registers must have a clock connected to them to shift the bits is accurate. EX2004, 98:15-20.

ϕ_1 and ϕ_2 to shift the bits synchronously with the PWM signal E—in other words, ϕ_1 and ϕ_2 are a clock signal. *See* EX1031, ¶26; EX1005, 4:19-28.

Because Thomas’ shift register shifts synchronously with the PWM signal E to generate delayed signals F, G, and H, Thomas’ shift register must be implemented with a clock. EX1031, ¶¶28–29. PO and Credelle did not show otherwise. Accordingly, Thomas anticipates Claim 7.

E. The Obviousness Grounds Are Sufficient

PO argued that the obviousness arguments for Claims 1 and 14 based on Thomas are insufficient because they track the anticipation arguments. *See* POR, 21–25. As explained above, a reference that anticipates also renders the claims obvious. *Realtime Data*, 912 F.3d at 1373. PO also referenced other Thomas-based obviousness combinations in a section heading, but presented no arguments about those combinations. *See* POR, 21 (Section III.A.3. heading). PO has thus waived any such arguments. *See* Scheduling Order, 9.

F. Claim 13: The Petition Argued the Entire Driver Would Be Formed as an Integrated Circuit

PO mischaracterized the Petition as “premised on a construction that a ‘majority’ of the driver components must be included in the integrated circuit,” rather than *all* of the driver components. POR, 25. But the Petition argued both that “it would have been obvious to a POSITA to *implement the driver, or the majority*

of the driver, as an integrated circuit.” Pet., 52. PO addressed only one of the two arguments, and thus failed to rebut the Petition’s arguments.

PO also misrepresented that Dr. Zane “expressly testified during his deposition that a POSITA would *not* have actually been motivated to place all of the elements of the driver into a single package.” POR, 27–28 (original emphasis). Dr. Zane said no such thing. Instead, PO cited testimony from Dr. Zane where he explained that it would not be “necessary” to include all components that are part of a voltage source as part of the integrated circuit to satisfy Claim 13. *Id.* (citing EX2004, 111:10-18, 114:6-11). That testimony does not exclude a situation where all components are formed as an integrated circuit. Indeed, Dr. Zane explained that a POSITA would have been motivated to do just that. *See* EX1003, ¶125 (“Thomas does not expressly state that the driver is formed as an integrated circuit or that the majority of the circuitry is part of an integrated circuit. However, it would have been obvious to a POSITA that the driver in Thomas would be formed as an integrated circuit....”); *see also id.* at ¶129 (“[I]t would have been obvious to a POSITA to implement Thomas’ LED driver as an integrated circuit....”). Dr. Zane’s opinions did not depend on excluding any elements from the integrated circuit—rather, Dr. Zane merely expressed that, consistent with the ’148 Patent specification, Claim 13 could still be met even if some “large components of the driver, such as inductors or

capacitors” were external to the integrated circuit. EX1003, ¶126; EX1001, 5:12–17.

Additionally, PO’s position that all components of the voltage source must also be formed as an integrated circuit is unsupported and inconsistent with both the ’148 Patent and PO’s infringement contentions. In fact, PO’s position is entirely attorney argument, as Credelle offered no opinions regarding Claim 13. *See* EX2002. The ’148 Patent states that “[a]ll circuitry, *except* for inductors, large capacitors, and the LEDs may be formed on the same integrated circuit,” and that “[a]ll elements shown in FIG. 4, *except* the LEDs, may be within the same package, with *pins for connection to the LEDs, power*, and an external dimming control circuit.” EX1001 at 5:12–17; *see also id.* at 1:42–43 (“Most components of the driver 10 are formed on an integrated circuit chip.”). Thus, contrary to PO’s position, the ’148 Patent expressly stated that some large components need not be in the same integrated circuit. Dr. Zane’s testimony merely reflected the ’148 Patent’s own disclosure.

PO also argued that VIZIO misinterpreted PO’s infringement contentions. *See* POR, 26. But in those contentions, PO asserted that Claim 13 was infringed by integrated circuits that do not encompass their voltage source. *See* EX1015, 64–67. In fact, PO accused an integrated circuit AS3824 and relied upon its website which indicated that it drew power from an external power supply. *Id.* at 67 (“Dynamic

power feedback controls *the external power supply* to guarantee best efficiency.”).

None of the integrated circuits identified in PO’s infringement contentions appear to contain their own voltage source. Thus, VIZIO understood PO to contend that Claim 13 can be infringed even if the voltage source is external to the integrated circuit.

Regardless, the Petition and Dr. Zane explained that it would have been obvious to form all of Thomas’ LED driver as an integrated circuit. Those arguments stand un rebutted.

V. CONCLUSION

For the foregoing reasons, VIZIO respectfully requests the Board cancel all claims of the ’148 Patent.

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CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. §§ 42.24(a) and (d), the undersigned certifies that this PETITIONER'S REPLY contains 5,570 words according to the word-processing program used to prepare this paper. The foregoing word count complies with the 5,600 word type-volume limit specified by 37 C.F.R. § 42.24(c)(1). Pursuant to § 42.24(c), the word count does not include the table of contents, table of authorities, certificate of service or word count, or appendix of exhibits.

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