

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APTIV SERVICES US, LLC,
Petitioner,

v.

MICROCHIP TECHNOLOGY, INC.,
Patent Owner.

IPR2024-00646
Patent 9,471,074 B2

Before JON M. JURGOVAN, CHRISTOPHER L. OGDEN, and
JASON M. REPKO, *Administrative Patent Judges*.

OGDEN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
Dismissing Patent Owner's Motion to Strike (Paper 27)
35 U.S.C. § 318(a)

I. INTRODUCTION

Petitioner Aptiv Services US, LLC (“Petitioner”) filed a Petition (Paper 1, “Pet.”) under 35 U.S.C. §§ 311–319 requesting *inter partes* review (“IPR”) of claims 1–18 of U.S. Patent No. 9,471,074 B2 (Ex. 1001, “the ’074 patent”). Immersion Corporation (“Patent Owner”) filed a Preliminary Response. Paper 7. After considering the arguments presented in the Preliminary Response, we determined that the information presented in the Petition established that there was a reasonable likelihood that Petitioner would prevail with respect to challenging at least one of the challenged claims of the ’074 patent. We instituted this IPR under 35 U.S.C. § 314 on September 25, 2024, as to all claims and grounds raised in the Petition. Paper 11 (“Institution Decision”).

Patent Owner filed a Response to the Petition (Paper 19, “PO Resp.”), Petitioner filed a Reply (Paper 25, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 29, “PO Sur-reply”). Patent Owner also filed a Motion to Strike Section II.E of Patent Owner’s Reply (Paper 27) and Petitioner filed an opposition (Paper 31). We held an oral hearing on June 27, 2025, and the transcript is entered into the record. Paper 44 (“Tr.”).

On September 12, 2025, we issued an order extending the one-year pendency, for good cause, by up to six months after the normal deadline of September 25, 2025. Paper 46.

This is a final written decision under 35 U.S.C. § 318(a) as to whether the claims challenged in the IPR are unpatentable. For the reasons below, we conclude that all the challenged claims are unpatentable.

II. BACKGROUND

A. THE '074 PATENT (EX. 1001)

The '074 patent describes a USB voltage regulator that “has a large gm^[1] current buffer driver added between a first stage of an operation amplifier and a last stage power transistor.” Ex. 1001, code (57), 1:17.

According to the '074 patent, “USB voltage regulators operate with extremely low equivalent series resistance (ESR) values, for example around 10 milliohms.” *Id.* at 1:25–27. The ESR values “heavily impact the design of [low-drop out (‘LDO’)] voltage regulators due to [their] variable zero pole locations depending upon the load conditions.” *Id.* at 1:39–41. “Therefore existing products having a USB interface use standard voltage regulator architectures that require very large external capacitor sizes with variations of ESR values in order to keep the voltage regulator stable.” *Id.* at 1:41–51.

The '074 patent proposes a voltage regulator with a large-gm current buffer “to reduce compensation capacitor size and provide for a wide range of external compensation capacitor ESR values.” *Id.* at 1:18–21; *see also id.* at 1:55–59. An embodiment is shown in Figure 2, reproduced below:

¹ “gm” (or “ g_m ”) refers to transconductance. *See* Ex. 1001, 3:30; Ex. 1004, 1733.

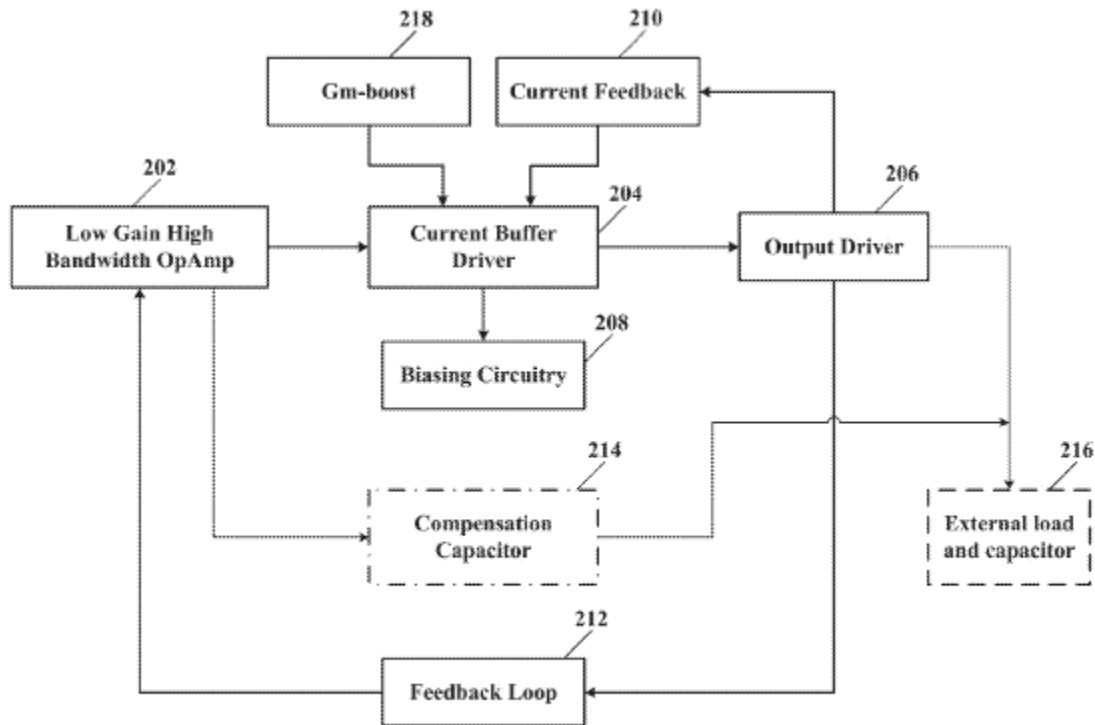


FIGURE 2

Figure 2 is a schematic block diagram of a voltage regulator comprising low-gain operational amplifier (“OpAmp”) 202, low-impedance current buffer driver 204, and power output driver 206. Ex. 1001, 3:55–58. As “[t]he key to being able to use smaller value internal and external capacitances,” current buffer driver 204 is coupled between OpAmp 202 and output driver 206. *Id.* at 3:58–62. The regulator also “comprise[s] biasing circuits 208, current feedback 210, a feedback loop 212, a compensation capacitor 214 and a gm-boost circuit 218.” *Id.* at 3:63–65. The voltage regulator supplies power to external load and capacitor 216. *Id.* at 3:65–67.

“Since the output driver 206 may provide very large amounts of switching current during power supply operation, the gate capacitance is significantly high due to the size of the driver, thereby resulting in the generation of a pole at relatively low frequency.” Ex. 1001, 4:6–11. As a

result, “current buffer driver 204 pushes this pole to a high frequency beyond unity-gain frequency due to its low-impedance characteristics in order to get the pole-splitting effect. To achieve this, it is necessary to provide a fairly large gm value of the current buffer driver 204.” *Id.* at 4:11–15. With the help of current feedback 210, gm-boost circuit 218 “provide[s] a gm-boost technique that will increase the impedance value of the current buffer driver 204 with the help of the current feedback 210 which may sense the current change at the output of the output driver 206.” *Id.* at 4:16–20.

The '074 patent also discloses that biasing circuit 208 contains transistors that “may be shut off during disabling/power down operation to make sure [the bias] circuit will consume substantially no DC current,” and there is an “enable signal coming to the regulator circuit so that the module can be turned off when disabled.” Ex. 1001, 4:44–46, 52–54.

B. CHALLENGED CLAIMS AND GROUNDS

Independent claim 1 is as follows:

1. A voltage regular, comprising:
 - 1a an operational amplifier;
 - 1b a gm enhanced current buffer driver;
 - 1c a biasing circuit coupled to the current buffer driver to set a biasing ratio for gm-boost of the current buffer driver;
 - 1d an enable/disable function to enable/disable the biasing circuit for reducing standby current[;]
 - 1e an output power driver, wherein the current buffer driver is coupled between the operational amplifier and the output power driver;
 - 1f a current feedback circuit coupled between the output power driver and the current buffer driver; and

1g a feedback loop coupled between the output power driver and the operational amplifier.

Ex. 1001, 6:3–16 (Petitioner’s reference numbers added without brackets).

Petitioner argues two grounds for *inter partes* review, as summarized in the following table (*see* Pet. 9–10):

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–18	103(a) ²	Al-Shyoukh, ³ Ivanov, ⁴ Stanescu ⁵
1–18	103(a)	Rincon-Mora, ⁶ Rincon-Mora Paper, ⁷ Al-Shyoukh, Ivanov, Stanescu

C. DECLARATORY TESTIMONY

Petitioner submits a declaration by Dr. Michael S. Chen. Ex. 1002. Patent Owner likewise submits a declaration by Dr. Greg Taylor. Ex. 2021.

² 35 U.S.C. §§ 103 (2006), *amended by Leahy–Smith America Invents Act* (“AIA”), Pub. L. No. 112-29 §§ 102, 103, sec. (n)(1), 125 Stat. 284, 287, 293 (2011) (effective Mar. 16, 2013). Petitioner does not take a position on whether this pre-AIA version or the post-AIA version of §§ 102 and 103 applies. *See* Pet. 10. We note, however, that the ’074 patent claims priority to a provisional application dated March 13, 2013, prior to the effective date of the AIA. *See* Ex. 1001, code (60). Our decision would be the same under either statute.

³ Al-Shyoukh, Lee & Perez, *A Transient-Enhanced Low-Quiescent Current Low-Dropout Regulator With Buffer Impedance Attenuation*, 42 IEEE J. Solid-State Circuits 1732 (2007) (Ex. 1004).

⁴ Ivanov et al., US 6,400,207 B1, issued Jun. 4, 2002 (Ex. 1005).

⁵ Stanescu et al., US 6,710,583 B2, issued Mar. 23, 2004 (Ex. 1006).

⁶ Rincon-Mora et al., US 6,046,577, issued Apr. 4, 2000 (Ex. 1013).

⁷ Rincon-Mora, *A Low-Voltage, Low Quiescent Current, Low Drop-Out Regulator* 33 IEEE J. Solid-State Circuits 36 (1998) (Ex. 1014).

D. RELATED PROCEEDINGS

As a related matter, the parties identify *Microchip Technology Inc. v. Aptiv Services US, LLC*, No. 23-cv-00778 (D. Del. filed July 17, 2023). Pet. 88; Paper 3, 2.

III. ANALYSIS

A. LEVEL OF ORDINARY SKILL IN THE ART

The level of ordinary skill in the pertinent art at the time of the invention is a factor in how we construe patent claims. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc). It is also one of the factors we consider when determining whether a patent claim is obvious over the prior art. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

To assess the level of ordinary skill, we construct a hypothetical “person of ordinary skill in the art,” from whose vantage point we assess obviousness and claim interpretation. *See In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998). This legal construct “presumes that all prior art references in the field of the invention are available to this hypothetical skilled artisan.” *Id.* (citing *In re Carlson*, 983 F.2d 1032, 1038 (Fed. Cir. 1993)).

Relying on Dr. Chen’s testimony, Petitioner argues that a person of ordinary skill in the art would have had “a Master’s Degree in Electrical Engineering, or alternatively a Bachelor’s Degree in Electrical Engineering and two years of experience working on analog circuit design.” Pet. 9 (citing Ex. 1002 ¶ 38).

Patent Owner argues that a person of ordinary skill in the art “would have a bachelor’s degree in electrical engineering, computer science, or equivalent technical degree and substantial experience (e.g., several years) in

analog/mixed-signal IC design. Additional education related to the hardware, architecture, and circuit design aspects could be substituted for professional experience, and vice versa.” PO Resp. 2–3 (citing Ex. 2021 ¶¶ 30–36).

Patent Owner’s proposal is most like Petitioner’s alternative proposal which would include a bachelor’s degree and two years of experience. However, Patent Owner does not provide a specific number of years of industry experience and Patent Owner would include mixed-signal IC design as an alternative to analog circuit design.

We consider analog circuit design to be most pertinent to the problems and solution discussed in the ’074 patent. *See* Ex. 1001, 1:15–2:44. In addition, we find credible Petitioner’s argument that an ordinarily skilled artisan with a bachelor’s degree would have had two years of experience, whereas Patent Owner’s proposal does not provide a specific number of years. Thus, we determine that a person of ordinary skill in the art would have had a bachelor’s degree and two years of experience in analog circuit design. Nevertheless, the outcome of our decision would be the same under either of the party’s proposals.

B. CLAIM CONSTRUCTION

In an IPR, we construe a patent claim “using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” 37 C.F.R. § 42.100(b). This generally includes “construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” *Id.* The ordinary and customary meaning of a claim term “is its meaning to the ordinary

artisan after reading the entire patent” and “as of the effective filing date of the patent application.” *Phillips*, 415 F.3d at 1313, 1321.

There are only two circumstances in which a construction may depart from the ordinary and customary meaning: “1) when a patentee sets out a definition and acts as [their] own lexicographer, or 2) when the patentee disavows the full scope of a claim term either in the specification or during prosecution.” *Thorner v. Sony Comput. Entm’t Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012). Any such special meaning of a term “must be sufficiently clear in the specification that any departure from common usage would be so understood by a person of experience in the field of the invention.” *Multiform Desiccants Inc. v. Medzam Ltd.*, 133 F.3d 1473, 1477 (Fed. Cir. 1998).

1. District Court Constructions

In a separate paper and in its Response, Petitioner notified us that the district court in the parallel district court litigation issued a claim construction order interpreting two terms relevant to this proceeding, as shown below:

Claim Term	District Court’s Construction
“an enable/disable function to enable/disable the biasing circuit for reducing standby current” (claim 1)	Not subject to 35 U.S.C. § 112(f)
“wherein the gm-boost circuit enables the current buffer driver to have large gm value” (claim 4)	“wherein the gm boost circuit increases the gm value of the current buffer driver to be sufficiently large to provide pole-splitting”

Paper 9, 1–2; *accord* Ex. 1020, 1–2; PO Resp. 20 (arguing that these constructions are not contested in this proceeding).⁸

Because neither party has argued that the district-court constructions should be modified or elaborated for this proceeding, and the constructions appear reasonable, we adopt these constructions for this decision. We also take judicial notice of the district court’s Memorandum supporting the claim construction order. Ex. 3001.⁹

2. “*gm enhancement*” and “*gm-boost*”

Petitioner argues, in the Petition, that a current buffer is “gm enhanced” if it “receives a gm boost” such as the boost recited in limitation 1c. Pet. 16.

In its Response, Patent Owner argues that the terms “gm-boost” in limitation 1c and the term “gm enhanced” in limitation 1b¹⁰ should be presumed to refer to “different requirements.” PO Resp. 20–21. According to Patent Owner, both “gm-boosts” and “gm-enhancements” increase the gm value of the current buffer driver, but whereas a “gm boost” relies exclusively on output current feedback, a “gm enhancement” “does *not* rely

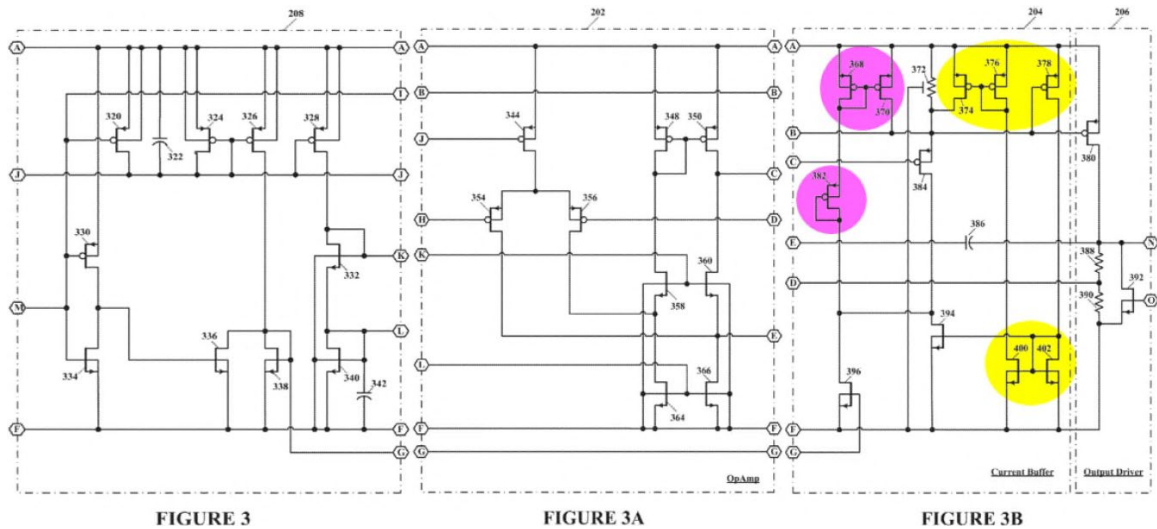
⁸ The district court also determined that claims 8 and 9 were not indefinite, which is outside the scope of this proceeding. Paper 9, 2; *accord* Ex. 1020, 2; *see* 35 U.S.C. § 311(b).

⁹ Aptiv appears to have mistakenly submitted a claim-construction memorandum from *Microchip Technology Inc. v. Aptiv Services, LLC*, No. 23-cv-00307 (D. Del. filed Mar. 20, 2023), which does not appear to involve claims from the ’074 patent. *See* Ex. 1021.

¹⁰ Patent Owner mistakenly locates this term in limitation 1d. PO Resp. 20.

on output current feedback.” PO Resp. 16–17 (citing Ex. 1001, 1:50–62, 4:15–20; Ex. 2021 ¶¶ 66–71, 75, 87).

Patent Owner contends that the ’074 patent “show[s] different transistors for each technique.” *Id.* at 21 (citing Ex. 1001, Fig. 3; Ex. 2021 ¶¶ 66–71, 84–86). These transistors are identified in an annotated version of Figures 3, 3A, and 3B, reproduced below:



current, whereas gm-enhancement changes the allocation of where the current is deployed.” *Id.* at 23 (citing Ex. 2021 ¶ 86).

In its Reply, Petitioner argues that Patent Owner’s distinction between gm boosting and gm enhancing is conclusory and made up by Patent Owner’s expert without reference to any distinction made in the ’074 patent itself. Pet. Reply 2–3. Petitioner contends that the ’074 patent discusses transistors 368, 370, and 382 in the context of a “gm-boosting” circuit, which undermines Patent Owner’s argument that these transistors are part of a separate “gm-enhancement” mechanism. *Id.* at 3–5 (citing Ex. 1001, 5:8–10, 5:15–24).

Petitioner also argues that the ’074 patent uses “boost” and “enhancement” interchangeably to describe boosting the gm, and that boosting is the only enhancement to gm that the ’074 patent describes. Pet. Reply 5–6 (citing Ex. 1001, 2:4–6, 4:11–20, 5:3–7).

In its Sur-reply, Patent Owner argues that “[t]he claim terms *gm-boost* and *gm enhanced* are plainly different even on their face, and are thus presumed to have different meanings. Nothing in the specification changes that.” PO Sur-reply 2. According to Patent Owner, Petitioner has not overcome this alleged presumption. *Id.* at 3–4. Patent Owner also disagrees that its proposed distinction between “gm boosting” and “gm enhancement” lacks evidence because it is based on the claim language, Patent Owner’s annotated version of Figure 3B, testimony by Dr. Taylor, and Rincon-Mora (which according to Patent Owner disclose gm boosting but not gm enhancing, *see* PO Resp. 21). PO Sur-reply 5–8.

We agree with Petitioner that “gm boosting” is the only gm enhancement referred to in the ’074 patent, that the ’074 patent uses the

terms “gm enhanced” and “gm-boost” synonymously, and that Patent Owner has failed to point to any credible intrinsic evidence of this alleged distinction. Although, “[i]n the absence of any evidence to the contrary, we must presume that the use of . . . different terms in the claims connotes different meanings, *CAE Screenplates Inc. v. Heinrich Fiedler GmbH*, 224 F.3d 1308, 1317 (Fed. Cir. 2000), in this case there is evidence to the contrary. In particular, the ’074 patent never refers to “gm enhancement” as a function separate from “gm boosting.” Indeed, the transistors (368, 370, and 382) that Patent Owner identifies as performing the function of “gm enhancement” are disclosed as part of a “gm-boost stage.” Ex. 1001, 5:8–24. Patent Owner’s alleged separation of Figure 3B into distinct “gm boosting” and “gm enhancement” is not consistent with the intrinsic evidence and is based on the conclusory testimony of Dr. Taylor.

Thus, based on the evidence of record, we disagree with Patent Owner’s proposed construction distinguishing the terms “gm enhanced” and “gm-boost” in claim 1. Rather, we find persuasive Petitioner’s argument that a person of ordinary skill in the art would have regarded these terms to be synonymous. We need not otherwise construe these two terms to resolve the contested issues in this proceeding. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs., Inc. v. Am. Sci & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

3. “biasing ratio”

Petitioner argues that in the ’074 patent disclosure, the “biasing ratio for gm-boost” recited in limitation 1c refers to the ratio of the current from

the bias network to the feedback current. Pet. 17–18 (citing Ex. 1001, 5:15–24 (disclosing that current from the bias network and the feedback current are “ratio’ed in transistors 368 and 370 to provide a sufficient amount of current for the driver transistor 384”). According to Petitioner, the disclosure of “ratio’ed” currents in column 5 of the ’074 patent is “the entirety of the patent’s description of how the biasing circuit couples to the current buffer to set a biasing ratio.” Tr. 19:14–16; *see also* Tr. 21:19–22 (“[T]o the extent it’s necessary to understand the term biasing ratio in relation to the [biasing] circuit, we would submit that it would be the ratio of the bias current to the feedback current that is present in transistors 368 and 370.”).

Nevertheless, Petitioner contends that we need not construe the term “biasing ratio” because Al-Shyoukh discloses the same “exact circuitry” as the ’074 patent for coupling the biasing circuit to the current buffer driver to provide a gm boost to the current buffer driver. Tr. 21:14–18; *see also* Tr. 24:10–12 (“The bottom line is, whatever biasing ratio means, the prior art has it because the circuits are the same. And Patent Owner hasn’t done anything to rebut that.”).

In its Response, Patent Owner argues that in the context of the ’074 patent, a person of ordinary skill in the art would have understood the term “biasing ratio” in limitation 1c to mean “the ratio of current in the output transistor to the buffer driver.” PO Resp. 46 (citing Ex. 2021 ¶¶ 80, 118).¹¹

¹¹ Patent Owner alleges that Petitioner’s expert Dr. Chen agrees with this interpretation. PO Resp. 46 (citing Ex. 1002 ¶¶ 145–146). Although Dr. Chen’s testimony refers to a “mirror ratio” between two transistors in Rincon-Mora, we agree with Petitioner that Dr. Chen did not suggest that this was the recited “biasing ratio.” Pet. Reply 14; Ex. 1002 ¶¶ 146–147.

In its Reply, Petitioner argues that Patent Owner fails to justify its proposed construction of “biasing ratio.” Pet. Reply 11.

In its Sur-reply, Patent Owner argues that it was not making a claim-construction argument but merely “provid[ing] a concrete example of *biasing ratio* in the context of the circuits at issue (e.g., Al-Shyoukh).” PO Sur-reply 12 n.6. But according to Patent Owner, its argument regarding Al-Shyoukh would “prevail under any reasonable construction of the plain claim language.” *Id.*

Patent Owner also argues that “[b]ecause current is proportional to transistor width, the [biasing] ratio [in the ’074 patent disclosure] would be $\frac{378*394}{380*402}$, where transistor numbers represent each transistor’s respective width.” PO Sur-reply 13 n.7. This formula is analogous to Dr. Taylor’s calculation of an alleged biasing ratio in Rincon-Mora, a proposed interpretation for which he does not cite any supporting evidence. Ex. 2021 ¶ 118.

At oral argument, Petitioner responds that the formula $\frac{378*394}{380*402}$ could not be a biasing ratio because the transistors in this formula “are not coupled to the biasing circuitry” such that the “biasing circuit” is what sets the biasing ratio as required in limitation 1c. Tr. 23:18–24:9; *see also* Pet. Reply 12–13 (arguing that Dr. Taylor’s proposed “biasing ratio” in Al-Shyoukh “excludes the bias current”).

Clearly, the parties materially disagree on the meaning of the term “biasing ratio” in claim 1. Neither party urges us to adopt a full, explicit construction, but we will construe the claim to the extent necessary to resolve the parties’ contested issues. As Petitioner correctly argues, the

passage in column 5, lines 15–24 of the '074 patent is the only example in the '074 patent specification of a “ratio” relating to boosting the gm of a current buffer driver. This strongly suggests that the term “biasing ratio” in limitation 1c should be read consistently with that disclosure, as Petitioner proposes.

Patent Owner, on the other hand, does not point to any intrinsic or extrinsic evidence (other than Dr. Taylor’s opinion) to support interpreting “biasing ratio” as a “ratio of current in the output transistor to the buffer driver.” PO Resp. 46. Nor does Dr. Taylor point to any supporting evidence for his interpretation. Ex. 2021 ¶¶ 80, 118; *see* 37 C.F.R. § 42.65(a) (2022) (“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.”). Patent Owner’s proposed construction would be implausible because it does not include the output of the biasing circuit (*e.g.*, node G in Figure 3B of the '074 patent).

Therefore, we determine that Petitioner has persuasively shown that the recited “biasing ratio” is between (1) current from the bias network and (2) the feedback current, which are only two currents described as being “ratio’ed” in the '074 patent disclosure. Ex. 1001, 5:15–24.

C. OBVIOUSNESS GROUND BASED ON AL-SHYOUKH, IVANOV, AND STANESCU

Petitioner argues that claims 1–18 are obvious over the combination of Al-Shyoukh, Ivanov, and Stanescu. Pet. 9–52.

A claim is unpatentable as obvious under § 103 if the differences between the claimed subject matter and the prior art are “such that the subject matter as a whole would have been obvious at the time the invention

was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). When a ground in a petition is based on a combination of references, we consider “whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *Id.* at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

We base our obviousness inquiry on factors including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) any objective indicia of obviousness or non-obviousness that may be in evidence.¹² *See Graham*, 383 U.S. at 17–18.

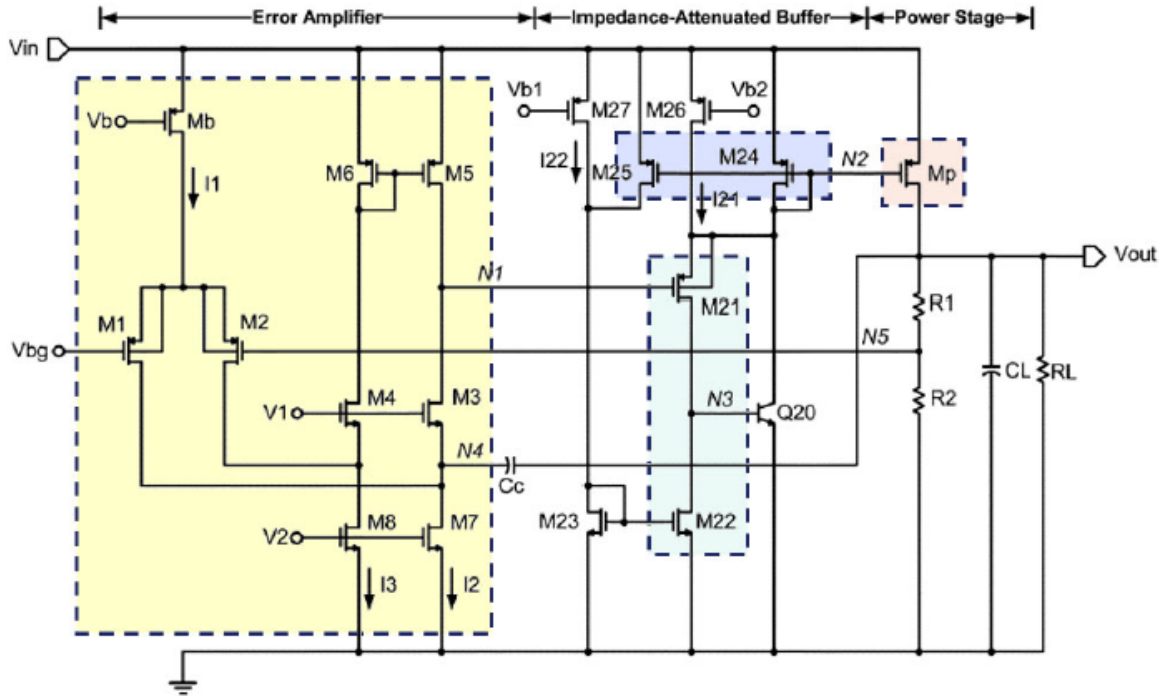
For the reasons below, Petitioner has shown that the challenged claims would have been obvious over Al-Shyoukh, Ivanov, and Stanescu.

1. Overview of Al-Shyoukh

Al-Shyoukh describes an LDO to manage power in portable devices. Ex. 1004, 1732. The LDO employs current-buffer compensation so that “only a single pole is realized within the unity-gain frequency and a good phase margin is achieved for the entire load current range with a small compensation capacitor.” *Id.* at 1733. In an “intermediate buffer stage,” the g_m (transconductance) is increased to allow the pole at the output of the current buffer “to be located at frequencies much higher than the unity-gain frequency of the LDO regulation loop.” *Id.*

¹² Neither party argues that there are objective indicia of obviousness or non-obviousness. *See* Pet; PO Resp. 72.

The LDO is depicted in Figure 8, reproduced below with annotations by Petitioner:



Pet. 11; *accord* Ex. 1004, 1738. Figure 8 is a circuit diagram divided into three portions from left to right: error amplifier, impedance-attenuated buffer, and power stage.

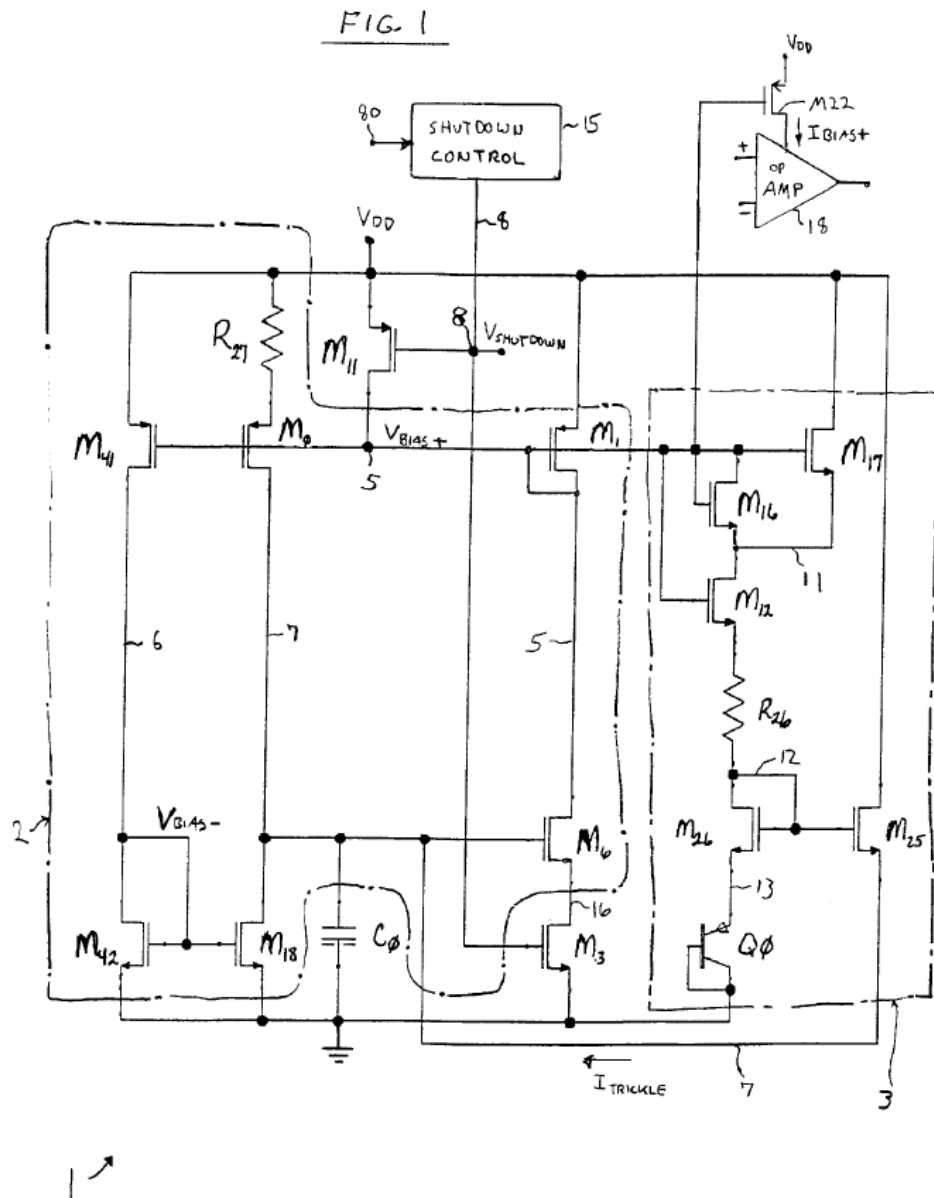
As Petitioner indicates by its yellow box on the left of the diagram, the error amplifier includes transistors M1 to M8, and it has, as one of its inputs, reference voltage V_{bg} . *Id.* On the right of the circuit diagram is the power stage, which includes pass device M_p annotated by Petitioner in pink and has input N2 and output V_{out} (the voltage output of the LDO). *Id.* at 1735. There is also a feedback line (N5) from the power stage back to the error amplifier.

Between the error amplifier and the power stage is the impedance-attenuated buffer, with input N1 from the error amplifier and output N2 to the power stage. Among other transistors, the buffer includes source-

follower transistor M21, part of a box that Petitioner highlights in cyan. Ex. 1004, 1734. Within the buffer, pMOS transistors M24 and M25 (which Petitioner highlights in blue) and npn transistor Q20 “realize dynamically[]biased shunt feedback to [increase g_m] under different load current conditions.” *Id.* at 1734.

2. *Overview of Ivanov*

Ivanov discloses “a fast disable/enable bias control circuit that is very suitable for fast disabling and subsequent fast enabling of the bias circuitry of . . . various circuits, such as high-speed CMOS operational amplifiers usable in applications such as voltage regulators.” Ex. 1005, 6:47–52. This is illustrated in Figure 1, reproduced below:



As shown in Figure 1, bias-control circuit 1 includes bias core circuit 2 and fast-startup circuit 3. Ex. 1005, 1:20–21. Bias core circuit 2 is “coupled between V_{DD} and ground” and produces V_{BIAS+} (conductor 5) and V_{BIAS-} (conductor 6) when bias core circuit 2 is active. *Id.* at 3:54–56, 3:65–4:3, 4:26–33. V_{BIAS+} (conductor 5) “typically is applied to the gates of one or more P-channel current mirror transistors of bias circuitry associated with an electronic circuit, such as CMOS amplifier 18.” *Id.* at 3:56–59.

Bias-control circuit 1 is activated by shutdown control circuit 15 which “ordinarily would simply be a buffer circuit . . . having its output connected to conductor 8 and its input connected to an external conductor 80 on which a user applies an external control signal to disable/enable bias control circuit [1].” Ex. 1005, 4:20–25.

3. *Overview of Stanescu*

Petitioner only relies on Stanescu for dependent claim 11. *See* Pet. 41–44. Stanescu describes an LDO comprising “an error amplifier having a first input coupled to a reference voltage; a voltage follower coupled to an output of the error amplifier; a pass device; and a feedback network.” Ex. 1006, code (57). Instead of a buffer as was known in the prior art, Stanescu teaches using “a unity-gain-configured wide-band [operational transconductance amplifier (OTA)].” *Id.* at 5:36–38.

4. *Claim 1*

(a) Preamble

The preamble of claim 1 recites “[a] voltage regulator.” Ex. 1001, 6:2.

Petitioner argues that “Al-Shyoukh discloses a ‘low-dropout regulator,’ which is a voltage regulator.” Pet. 15 (citing Ex. 1004, code (57)).

Patent Owner does not contest this argument. *See* PO Resp. We agree with Petitioner that Al-Shyoukh discloses the preamble, so we need not decide whether the preamble is limiting.

(b) Limitation 1a

Limitation 1a recites that the claimed voltage regulator comprises “an operational amplifier.” Ex. 1001, 6:3.

Petitioner argues that a person of ordinary skill in the art would have understood that the error amplifier in Al-Shyoukh's LDO is an operational amplifier, and that "[o]perational amplifiers were . . . a conventional design for an error amplifier." Pet. 15–16 (citing Ex. 1004, 1738, 1741, Fig. 8; x. 1002 ¶¶ 50–52).

Patent Owner does not contest this argument. *See* PO Resp. We agree with Petitioner that Al-Shyoukh discloses limitation 1a for the reasons given in the Petition.

(c) Limitation 1b

Limitation 1b recites that the claimed voltage regulator comprises "a gm enhanced current buffer driver." Ex. 1001, 6:4.

Petitioner argues that "Al-Shyoukh's buffer driver discloses this limitation." Pet. 16. According to Petitioner, "Al-Shyoukh's buffer is 'gm enhanced' because it receives a gm boost from a current feedback circuit comprising M_{24} and M_{25} ." *Id.* (citing Ex. 1004, 1733–35, Figs. 3, 4, 8; Ex. 1002 ¶ 53); *see also* Pet. 12–13 (arguing that, in Al-Shyoukh's LDO, when a load is placed on pass device M_p , "the voltages at nodes N_1 and N_2 drop, increasing the source-gate voltage of M_{24} , increasing current through M_{24} , which is mirrored through M_{25} , increasing current through M_{21} (via M_{22} and M_{23}), and thus increasing transconductance g_{m21} " (citing Ex. 1004, 1734–35; Ex. 1002 ¶¶ 46–47)).

Petitioner notes that the '074 patent describes its buffer driver as a "source follower" that results in a low-impedance output to allow pole separation. Pet. 16–17 (citing Ex. 1001, 3:57, 4:64–5:1). Relying on Dr. Chen's testimony, Petitioner argues that a person of ordinary skill in the art "would . . . have understood the patent to be using what was conventionally

known as a *voltage* buffer.” Pet. 17 (citing Ex. 1002 ¶ 54). Petitioner contends that Al-Shyoukh’s buffer driver is equivalent to the one described in the ’074 patent, as Al-Shyoukh’s buffer driver produces a low-impedance output, operates as a “source follower,” and separates a parasitic pole associated with buffer output N_2 from the dominant pole associated with output V_{out} of the LDO. *Id.* (citing Ex. 1004, 17:34–35; Ex. 1002 ¶ 55).

In its Response, Patent Owner argues that Petitioner improperly conflates the term “gm enhanced current buffer driver” with the “gm-boost of the current buffer driver” recited in limitation 1c, and thus fails to identify any gm enhancement in Al-Shyoukh apart from a “gm boost.” PO Resp. 42–44 (citing Ex. 2018, 251:20–253:18; Ex. 2021 ¶¶ 92–97, 111).

In its Reply, Petitioner argues that Patent Owner’s argument for limitation 1b “is entirely based on its proposed construction” and fails because the proposed construction is incorrect. Pet. Reply 9.¹³

As discussed above, we determine that Patent Owner’s proposed claim construction is incorrect. *See supra* Section III.B. Based on the plain and ordinary meaning of “gm enhanced” as including a gm boost, Petitioner has shown that Al-Shyoukh discloses limitation 1b. We agree with Petitioner that Al-Shyoukh’s buffer is gm enhanced because it receives a gm boost from a current feedback circuit. Thus, we determine that Petitioner has shown that Al-Shyoukh discloses limitation 1b for the reasons given in the Petition.

¹³ Petitioner argues, alternatively, that Al-Shyoukh teaches limitation 1b under Patent Owner’s proposed construction. Pet. Reply 9–11. Because we disagree with Patent Owner’s proposed construction, we need not consider Petitioner’s alternative argument.

(d) Limitation 1c

Limitation 1c recites that the claimed voltage regulator comprises “a biasing circuit coupled to the current buffer driver to set a biasing ratio for gm-boost of the current buffer driver.” Ex. 1001, 6:5–6.

Petitioner argues that Al-Shyoukh’s biasing circuit operates the same way as the biasing circuit in the ’074 patent. Pet. 17–19 (citing Ex. 1001, 5:13–24, Fig. 3B; Ex. 1004, 1734, Fig. 8; Ex. 1002 ¶¶ 56–57). For comparison between Al-Shyoukh and the ’074 patent, Petitioner annotates what it regards as equivalent structures between the two circuits, as reproduced below in annotated Figure 3B of the ’047 patent and annotated Figure 8 of Al-Shyoukh:

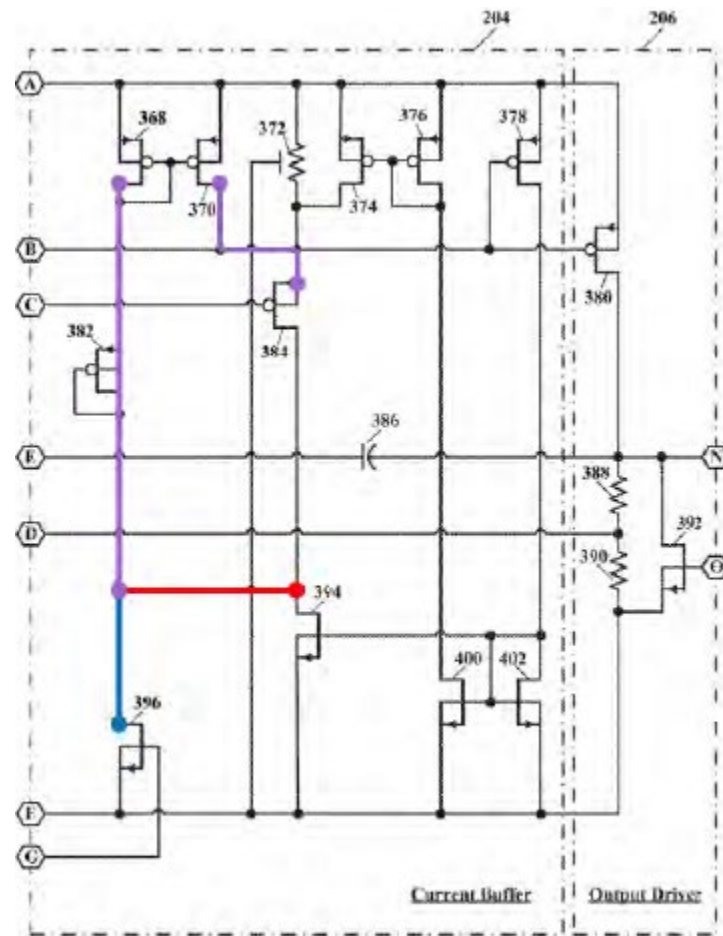
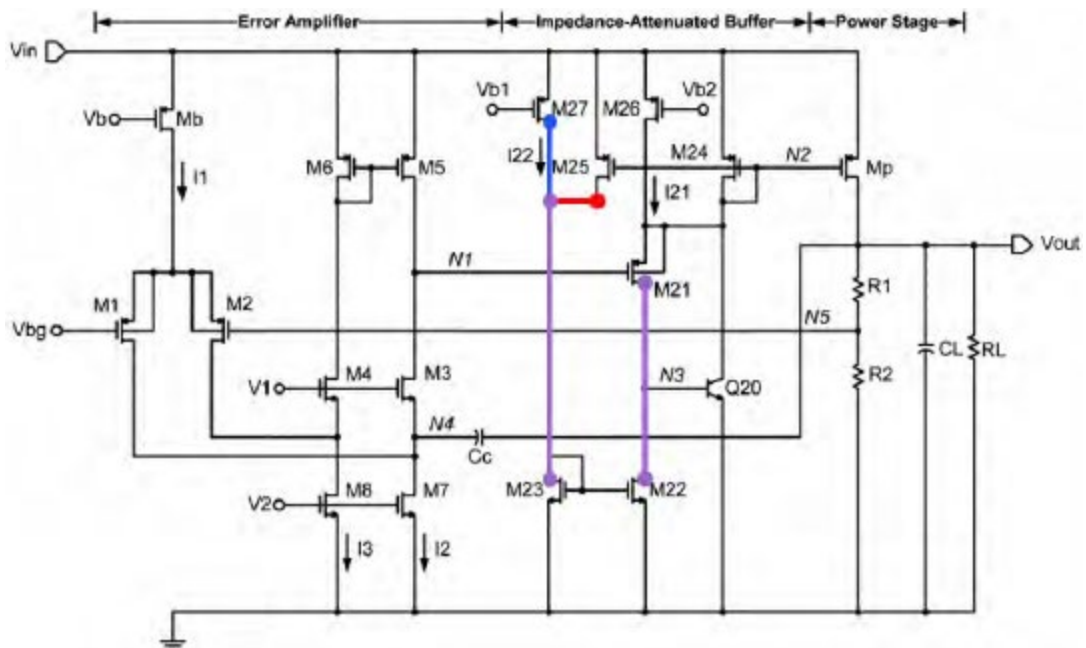


FIGURE 3B



In the two annotated figures above, Petitioner identifies the red current as the feedback current, the blue current as the bias current, and the purple current is the sum of the red and blue currents, the two currents being “ratio’ed” in transistors 368 and 370 (the ’074 patent) or functionally equivalent transistors M_{22} and M_{23} (Al-Shyoukh). Pet. 17–19 (citing Ex. 1001, 5:15–24). According to Petitioner, “Al-Shyoukh’s LDO uses a biasing circuit coupled to the buffer driver to set a voltage V_{b1} at the gate of transistor M_{27} , providing a bias current I_{22} that is mirrored across transistors M_{23} and M_{22} to set a biasing ratio for gm-boost of the current buffer driver.” Pet. 17 (citing Ex. 1004, Fig. 8; Ex. 1002 ¶¶ 56–58).¹⁴

In its Response, Patent Owner argues that Petitioner “conflates bias circuitry (like that in Ivanov used for reference generation) that merely places the voltage regulator circuit in a steady state for operation with the claimed *biasing circuit* that must *set a biasing ratio for gm-boost of the current buffer driver*.” PO Resp. 45.

¹⁴ Alternatively, “to the extent Patent Owner argues that ‘biasing ratio’ should be understood to mean a ratio of current that the current buffer draws from DC relative to the current feedback circuit,” Petitioner argues that Al-Shyoukh discloses this ratio. Pet. 20–21 & n.2 (citing Ex. 1004, Fig. 8; Ex. 1002 ¶ 59). Because Patent Owner does not appear to be proposing this construction, we need not address Petitioner’s alternative argument. *See* PO Resp. 55 (arguing that Petitioner’s alternative argument “does nothing to address the fundamental problems that none of this circuitry *set[s] a biasing ratio for gm-boost of the current buffer driver*” as Patent Owner interprets the term “biasing ratio” (alteration in original)); *id.* at 70–71 (arguing that Petitioner’s alternative argument failed to articulate a reason to modify Al-Shyoukh).

Patent Owner also argues that Petitioner’s argument fails to identify an actual circuit in Al-Shyoukh as the recited “biasing circuit,” and instead focuses solely on currents as part of the recited “biasing ratio.” PO Resp. 45–46. According to Patent Owner, Petitioner’s expert Dr. Chen points to the current coming into V_{b1} as the biasing-circuit output in Al-Shyoukh but does not identify transistors in Al-Shyoukh’s figures corresponding to the biasing circuit. *Id.* at 51–54 (citing Ex. 1002 ¶¶ 56, 145–149; Ex. 2018, 215:10–216:11, 222:7–223:7, 227:6–228:15, 247:21–248:5; Ex. 2015).

Patent Owner also alleges that transistor M_{27} , to which V_{b1} is an input, “does not set the claimed *biasing ratio*” as Patent Owner interprets that term. PO Resp. 54 (citing Ex. 2021 ¶¶ 114, 118). According to Patent Owner, that ratio would be “ $\frac{M_{25} \times M_{22}}{M_p \times M_{23}}$,” which is [the] ratio of currents between M_p and M_{21} (*i.e.*, M_{21}/M_p).” *Id.* at 54–55 (citing Ex. 2021 ¶¶ 114, 118).

In its Reply, Petitioner contends that Patent Owner’s formula for the alleged biasing ratio in Al-Shyoukh is not the “ratio of current in the output transistor to the buffer driver,” which Patent Owner argued was the meaning of “biasing ratio” (PO Resp. 46) because the formula “excludes bias current.” Pet. Reply 12–13 (citing Ex. 2021 ¶¶ 117–118; Ex. 1029, 99:17–101:21). Petitioner also argues that “Patent Owner and Dr. Taylor never explain what their respective ratios have to do with ‘biasing.’” Pet. Reply 13.

Next, Petitioner argues that Al-Shyoukh provides a bias circuit with the same circuitry as the ’074 patent, so Patent Owner’s contention that limitation 1c is missing in Al-Shyoukh would, if it were true, apply equally to the ’074 patent’s only disclosed example of a biasing ratio. Pet. Reply 13–15.

As to Patent Owner’s argument that Petitioner has failed to point to circuits in Al-Shyoukh constituting the recited “biasing circuit” and does not set the alleged biasing ratio, Petitioner contends that it explained in the Petition that Al-Shyoukh’s biasing circuit sets the biasing ratio by setting voltage V_{b1} at the gate of transistor M_{27} , which sets bias current I_{bias} which is part of the recited biasing ratio. Pet. Reply 15 (citing Pet. 17–21; Ex. 1002 ¶¶ 56–59, 145–149). Petitioner also contends that its arguments for limitation 1c need not rely on Ivanov’s teachings, as Petitioner relies on Ivanov specifically for the enable/disable function recited in limitation 1d. *Id.* at 15–16.

In its Sur-reply, Patent Owner argues that its disagreement with Petitioner as to Al-Shyoukh stems from a “fundamental misunderstanding” of the claim language which conflates “gm-boost” (limitation 1c) with “gm enhanced” (limitation 1b). PO Sur-reply 12–13. Patent Owner also alleges that Al-Shyoukh’s transistor M_{27} “provides a constant bias current,” so transistor M_{27} cannot be involved in “setting” a bias ratio. PO Sur-reply 13–14 (citing Ex. 2021 ¶ 118 (stating that M_{27} “does not set a biasing ratio, it merely provides a portion of the current going to the circuit that sets the bias ratio, M_{22} and M_{23} .”)); *see also* PO Resp. 54 (arguing that M_{27} “merely provides a constant current that biases the circuit at its operating point”).

Patent Owner also argues that the transistors Petitioner identifies as taking part in setting the biasing ratio are “connected to—but not part of—the biasing circuitry” (i.e., the circuitry relied on in Ivanov for limitation 1d). PO Sur-reply 14. According to Patent Owner, “if Ivanov discloses the biasing circuitry, Petitioner would need to have pointed to Ivanov for element [1c] as well” as limitation 1d. *Id.* at 16.

As we discuss above, we disagree with Patent Owner’s argument that the “current buffer driver” recited in limitations 1b and 1c must include a gm enhancement *other than* the “gm-boost” recited in limitation 1c. *See supra* section III.B.2.

We also disagree with Patent Owner’s argument that the Petition fails to identify a “biasing circuit” in Al-Shyoukh. Limitation 1c, itself, does not recite any internal structure for the biasing circuit. *See* Ex. 1001, 6:6–7. However, input V_{b1} in Al-Shyoukh’s Figure 8 has the same structure and function as input G in Figure 3B of the ’074 patent, which is the output of bias circuit 208. *See* Ex. 1001, Fig. 3. Thus, we find credible Dr. Chen’s opinion that a person of ordinary skill in the art “reading Al-Shyoukh would have understood that, although not shown, the voltage V_{b1} at the gate of M_{27} is provided by a biasing circuit.” Ex. 1002 ¶ 56.

Patent Owner does not appear to have directly challenged Dr. Chen’s opinion on this point. Indeed, Dr. Taylor grants that in Al-Shyoukh’s disclosure, “at most there is a biasing circuit coupled to the circuit that *sets a biasing ratio for gm-boost of the current buffer driver.*” Ex. 2021 ¶ 114 (cleaned up).

Although in Dr. Taylor’s view, it is not enough that “the biasing circuit is merely coupled to the circuit that sets a biasing ratio” (Ex. 2021 ¶ 114 (cleaned up)), that is exactly what the ’074 patent discloses in its only relevant example. Node G is the output from bias circuit 208 (Figure 3), yet the biasing ratio (under either Petitioner’s or Patent Owner’s construction of that term) is set in Figure 3B downstream of node G using transistors which are part of current buffer 204 or output driver 206, not bias circuit 208. *See* Ex. 1001, Fig. 3B. Indeed, Patent Owner’s mapping of the ’074 patent to the

claim language includes transistors 378, 380, 394, and 402 as part of “[t]he ’074 bias circuitry that sets the biasing ratio for gm-boost,” even though these transistors are only coupled (indirectly) to bias circuit 208. PO Sur-reply 13 n.7 (cleaned up).

We see no inconsistency between Petitioner’s arguments for limitations 1c and 1d. Although we agree with Petitioner that Al-Shyoukh already discloses the input from a biasing circuit, Al-Shyoukh does not disclose other design details of that circuit. *See* Pet. 22. Thus, we find nothing inconsistent with relying on Ivanov for its teaching of a specific, suitable biasing circuit that has an enable/disable function.

We find Petitioner’s arguments persuasive, and Dr. Chen’s testimony credible, that Al-Shyoukh discloses limitation 1c. Although it is the claim language that defines the claimed invention, Petitioner’s arguments are corroborated by the fact that Al-Shyoukh discloses the same structure for boosting the gm of a current buffer driver as the ’074 patent’s only relevant example.

(e) Limitation 1d

Limitation 1d recites that the claimed voltage regulator comprises “an enable/disable function to enable/disable the biasing circuit for reducing standby current.” Ex. 1001, 6:7–8.

Petitioner argues that “Al-Shyoukh discloses inputs from a biasing circuit into its LDO but does not specify a design,” although a person of ordinary skill in the art “would have understood that the biasing circuit could be implemented using conventional, well-understood methods and would have seen that Ivanov disclosed one such method.” Pet. 22 (citing Ex. 1002 ¶¶ 60–70). According to Petitioner, Ivanov discloses a specific design for

implementing the recited enable/disable function “suitable for fast disabling and subsequent fast enabling of the bias circuitry” for “applications such as voltage regulators.” Pet. 22–25 (quoting Ex. 1005, 6:47–52) (citing Ex. 1005, 1:6–9, 1:12–18, 3:43–49, 3:54–63, 4:26–33, 5:19–25, 6:7–22, Figs. 1, 2; Ex. 1002 ¶¶ 61–66).

Petitioner argues that a person of ordinary skill in the art would have had reason “to use Ivanov’s disable/enable control mechanism for Al-Shyoukh’s biasing circuit.” Pet. 25. According to Petitioner, “Al-Shyoukh is highly concerned with power efficiency, and Ivanov’s mechanism saves power by shutting off circuitry when it is not needed.” Pet. 25–26 (citing Ex. 1004, 1732; Ex. 1005, 1:6–18, 6:47–54; Ex. 1002 ¶¶ 67–68). This combination “would have had a signal provided by a shutdown control circuit for enabling and disabling the biasing circuit to reduce standby current.” Pet. 26 (citing Ex. 1001, Fig. 3; Ex. 1005, Fig. 1; Ex. 1002 ¶ 69).

In response, Patent Owner argues that Al-Shyoukh already teaches a voltage regulator with a low quiescent current when operating without a load, so a person of ordinary skill in the art would not have been motivated to look to Ivanov to reduce standby current further. PO Resp. 61–63 (citing Pet. 25; Ex. 1004, 1741; Ex. 2021 ¶¶ 92–97, 131–138). According to Patent Owner, “Al-Shyoukh’s reported results (touted as more than sufficient for battery powered applications) teach away from adding unnecessary enable/disable circuitry that would slow the regulator down and increase design complexity.” *Id.* at 63 (citing Ex. 2021 ¶¶ 92–97, 131–138); *see also* PO Sur-reply 18–20 (arguing that Patent Owner’s teaching away argument overcomes Petitioner’s *KSR*-based argument); PO Sur-reply 24–28 (arguing

that Petitioner seeks to shift the burden of proof as to Patent Owner's teaching-away argument).

Alternatively, Patent Owner argues that other prior art describing voltage regulator designs have better parameters than Al-Shyoukh, such as Rincon-Mora, and that a person of ordinary skill would have looked to these other references instead of Ivanov for reducing the standby current.

PO Resp. 64–65 (citing Ex. 1011, 11; Ex. 2011, 1, 3; Ex. 2019, 2; Ex. 2020, 3; Ex. 2012, 7; Ex. 2016, 6). Patent Owner also argues that there would have been tradeoffs involved in adding enable/disable functionality which Petitioner did not analyze in its Petition, such as adverse changes to “circuit size, speed, complexity, cost, regulator stability, drop-out voltage, system-level considerations, intended applications, etc.” *Id.* at 65 (citing Ex. 2021 ¶¶ 43, 59, 62–63, 130–138); *see also id.* at 66 (citing Ex. 2021 ¶¶ 44, 52, 64, 91, 96, 98; Ex. 2022).

According to Patent Owner, Al-Shyoukh recognizes some of these tradeoffs, as does Petitioner's expert Dr. Chen. PO Resp. 65–66 (citing Ex. 1004, 1, 9; Ex. 2018, 255:13–20, 260:24–262:23, 263:6–16). However, Patent Owner argues that Dr. Chen did not perform an analysis considering these tradeoffs, and particularly the tradeoff that adding an enable/disable function would have required the regulator to come out of standby, thus reducing the regulator's transient response time. *Id.* at 67–68 (citing Ex. 1002 ¶¶ 67, 157; Ex. 2018, 254:13–255:4, 255:21–24, 256:6–25, 257:4–258:1, 264:23–265:10; Ex. 2021 ¶¶ 41–44, 91, 94, 96–98, 100–103, 127, 130, 134, 137–138); *see also* PO Sur-reply 22 (citing Ex. 2018, 264:13–265:10).

Finally, Patent Owner argues that Petitioner has done no more than argue that a person of ordinary skill in the art *could* have modified Al-Shyoukh by adding Ivanov’s enable/disable functionality, not that they *would* have had reason to do so. PO Resp. 71–72 (citing Pet. 22, 25, 64–65; Ex. 1002 ¶¶ 59, 101, 112, 150); *see also* PO Sur-reply 28–29.

In its Reply, Petitioner argues that in district court, Patent Owner’s expert Dr. Taylor agreed that adding an enable/disable function to limit the flow of current “is a fundamental technique that is used in all types of applications” in the prior art. Pet. Reply 17 (emphasis omitted) (quoting Ex. 2007, 50). Thus, Petitioner argues that modifying Al-Shyoukh to add such functionality “would have been the ‘mere application of a known technique to a piece of prior art ready for improvement.’” *Id.* at 17–18 (quoting *KSR*, 550 U.S. at 417) (citing *Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1381 (Fed. Cir. 2023)). According to Petitioner, “the Petition shows that power efficiency was a known problem, that either Ivanov or the conventional use of enable/disable helped improve power efficiency, and that a [person of ordinary skill in the art] had the skill to integrate these solutions into the primary references.” *Id.* at 18. Because it was a known technique, Petitioner argues that it has no burden to evaluate all the potential tradeoffs to show that there was a reason to combine. *Id.* at 23.

Petitioner also argues that Patent Owner has failed to show teaching away because it has not pointed to evidence that any references “criticize, discredit, or otherwise discourage investigation into the claimed invention.” Pet. Reply 18 (quoting *Meiresonne v. Google, Inc.*, 849 F.3d 1379, 1382 (Fed. Cir. 2017)). Petitioner also contests Patent Owner argument that an ordinarily skilled artisan would have looked to Rincon-Mora instead of

Ivanov, because according to Petitioner, Rincon-Mora’s design only claims to avoid standby current in its *transient boost circuit*, not other standby currents in the voltage regulator. *Id.* at 19–20 (citing Ex. 1013, 1:12–17, 2:4–7, 4:41–48, Fig. 3; Ex. 1014, 37; Ex. 1002 ¶¶ 135–136, 145–146).

Petitioner argues that Rincon-Mora “notes enable/disable as a way of improving efficiency,” but “neither criticizes the technique nor suggests incompatibility with its own method.” Pet. Reply 20–21 (citing Ex. 1013, 1:25–30). And according to Petitioner, even if a person of ordinary skill in the art would have considered Al-Shyoukh already sufficient, that does not constitute teaching away. Pet. Reply 21–23. Nor, according to Petitioner, has Patent Owner pointed to evidence that any of the alleged potential tradeoffs would have deterred the use of enable/disable circuitry in combination with Al-Shyoukh. *Id.* at 23–25.

Finally, Petitioner argues that although the word “could” appears in the Petition, the full arguments in the Petition, in context, sufficiently articulate reasons for combining Al-Shyoukh with Ivanov’s enable/disable functionality. Pet. Reply 25–26.

In its Sur-reply, Patent Owner reiterates its position that Rincon-Mora teaches that its entire voltage regulator requires no standby current during zero output current load conditions, and not just the transient boost circuit. PO Sur-reply 21–22 (citing Ex. 1013, 1:12–30, 1:49–53). In any event, Patent Owner argues that there would have been no motivation to enable or disable Rincon-Mora’s transient boost circuit. *Id.* at 23 (citing Ex. 1013, Fig. 3).

We find Petitioner’s argument persuasive that a person of ordinary skill in the art would have had reason to follow Ivanov’s teachings to include

an enable/disable function in Al-Shyoukh's biasing circuit to limit that circuit's standby current for reasons of power-efficiency. Pet. 25–26; Ex. 1002 ¶¶ 67–68. The evidence of record also suggests that an enable/disable function was well known in the art and that it would have been within the level of ordinary skill in the art to add such a function to a biasing circuit, taking into consideration any known tradeoffs. Pet. Reply 17–18; Ex. 1002 ¶¶ 60, 67–68; PO Resp. 13–14 (acknowledging that “any [person of ordinary skill in the art] would attest[that] engineering is full of tradeoffs” and listing some of the known tradeoffs that “a [person of ordinary skill in the art] would need to consider”).

We also disagree with Patent Owner's argument that Al-Shyoukh, Rincon-Mora, or other references teach away from adding an enable/disable function to Al-Shyoukh. Patent Owner has not pointed to anything in the prior art that criticizes, discredits, or otherwise discourages investigation into the claimed invention. *Meiresonne v. Google, Inc.*, 849 F.3d at 1382.

As Petitioner correctly argues, Rincon-Mora only teaches that its *transient boost circuit* requires no standby current, not that there is no standby current in Rincon-Mora's entire voltage regulator. Rincon-Mora states, “[T]he present invention relates to a current efficient LDO voltage regulator incorporating a transient response boost circuit which may be added to selectively apply current to a slew-rate limited node *and yet requires no standby current during zero output current load conditions of the LDO voltage regulator.*” Ex. 1003, 1:12–17. The conjunction “and yet” clearly refers to the immediately preceding phrase, which discusses the “transient response boost circuit.” But even if Rincon-Mora's entire voltage regulator had no quiescent current, Rincon-Mora is not Al-Shyoukh, and

Patent Owner has not pointed to any evidence that a person of ordinary skill in the art would have been dissuaded from making any further reductions to Al-Shyoukh's standby current by adding an enable/disable function.

That there may have been tradeoffs in adding an enable/disable function does not amount to teaching away, nor does that nullify Petitioner's proposed reason to combine Al-Shyoukh with Ivanov. *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) (“[A] given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine.”).

Thus, we determine that Petitioner has shown that Al-Shyoukh, in view of Ivanov, discloses limitation 1d for the reasons given in the Petition.

(f) Limitations 1e–g

Limitations 1e–g recite that the claimed voltage regulator comprises “an output power driver, wherein the current buffer driver is coupled between the operational amplifier and the output power driver; a current feedback circuit coupled between the output power driver and the current buffer driver; and a feedback loop coupled between the output power driver and the operational amplifier.” Ex.1001, 6:10–16.

Petitioner argues that Al-Shyoukh discloses these limitations. Pet. 27–29 (citing Ex. 1004, 1732, Fig. 8; Ex. 1002 ¶¶ 71–73).

Patent Owner does not specifically contest Petitioner's arguments for these limitations. *See* PO Resp. We determine that Petitioner has shown that Al-Shyoukh discloses limitations 1e–g for the reasons given in the Petition.

(g) Conclusion as to claim 1

For the above reasons, we determine that Petitioner has shown, by a preponderance of the evidence, that the combination of Al-Shyoukh and Ivanov teaches all the limitations of claim 1, and that a person of ordinary skill in the art would have had reason and ability to incorporate Ivanov's enable/disable function in Al-Shyoukh LDO. We therefore determine that Petitioner has shown that claim 1 is unpatentable under § 103 based on Al-Shyoukh in view of Ivanov, with or without the further uncontested teachings of Stanescu relevant to claim 11. Pet. 41–44.

5. *Claims 2–18*

Petitioner presents arguments addressing each of the limitations in claims 2–18, which depend from claim 1, with support from the record and the testimony of Dr. Cheng. *See* Pet. 29–52. Patent Owner does not present distinct arguments for these claims. *See* PO Resp. 39 (relying for claims 2–18 on its arguments for claim 1).

As one example, claim 2 depends from claim 1 and recites “further comprising a gm-boost circuit coupled to the current buffer driver.” Ex. 1001, 6:17–19. Petitioner argues that Al-Shyoukh's gm-boost circuit includes its buffer driver, so the two are coupled. Pet. 29–30 (citing Ex. 1004, 1734, Fig. 8; Ex. 1002 ¶¶ 74–76).

We agree with and adopt Petitioner's uncontested analyses for claims 2–18, and credit Dr. Chen's supporting testimony. Thus, we determine that Petitioner has shown that claims 2–18 are unpatentable under § 103 for the reasons given in the Petition.

D. OBVIOUSNESS GROUND BASED ON RINCON-MORA, RINCON-MORA PAPER, AL-SHYOUKH, IVANOV, AND STANESCU

Alternatively to its first ground, Petitioner argues that claims 1–18 are unpatentable under § 103 as obvious over Rincon-Mora, Rincon-Mora Paper, Al-Shyoukh, Ivanov, and Stanescu. Pet. 9–10, 52–88.

Because we determine that all challenged claims are unpatentable under the first ground based on Al-Shyoukh, Ivanov, and Stanescu, we need not reach the second ground which challenges the same claims. *See* Scott R. Boalick, Memorandum re Final Written Decision Procedures for AIA Trial Proceedings (July 29, 2025) (directing the Board to address all grounds raised in a petition but excluding proceedings, such as this one, for which a hearing had already occurred as of July 29, 2025).

IV. PATENT OWNER’S MOTION TO STRIKE

In its Reply, Petitioner argues, alternatively, that Al Shyoukh teaches limitation 1b even under Patent Owner’s proposed construction of the term “gm enhanced.” Pet. 9–11 (Section II.E). Patent Owner moves to strike this argument as allegedly untimely. Paper 27. Petitioner opposes. Paper 31.

Because we disagree with Patent Owner’s proposed construction of “gm enhanced” and “gm-boost,” and we determine that Al-Shyoukh discloses limitation 1b under the plain and ordinary meaning of the term “gm enhanced,” we do not consider Petitioner’s alternative argument.

Thus, under the circumstances, Patent Owner’s Motion to Strike Petitioner’s alternative argument is dismissed as moot.

V. CONCLUSION¹⁵

For the reasons above, Petitioner has shown by a preponderance of the evidence that claims 1–18 of the '074 patent are unpatentable.

In summary:

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
1–18	103	Al-Shyoukh, Ivanov, Stanescu	1–18	
1–18	103	Rincon-Mora, Rincon-Mora Paper, Al-Shyoukh, Ivanov, Stanescu ¹⁶		
Overall Outcome			1–18	

¹⁵ Should Patent Owner wish to pursue amendment of claims in a reissue or reexamination proceeding after this decision, we draw attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

¹⁶ For reasons explained above, we do not reach Petitioner's ground based on Rincon-Mora, Rincon-Mora Paper, Al-Shyoukh, Ivanov, and Stanescu. See *supra* Section III.D.

VI. ORDER

It is

ORDERED that claims 1–18 of the '074 patent are unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Strike (Paper 27) is dismissed as moot; and

FURTHER ORDERED that, because this is a final written decision, parties to this proceeding seeking judicial review of our decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

IPR2024-00646
Patent 9,471,074 B2

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