

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MICRON TECHNOLOGY INC.,

Petitioner,

v.

SONRAI MEMORY LIMITED,

Patent Owner.

Case IPR2023-00909

Patent 6,724,241

PATENT OWNER'S SUR-REPLY

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TABLE OF CONTENTS

	Page
I. INTRODUCTION.....	1
II. THE CLAIMS OF THE '241 PATENT.....	2
A. Petitioner Concedes That the Claims Require the Generation of a Selected Output Voltage from Among Two or More Possible Voltages.....	2
B. The Totality of the Claims Require the Generation of a Selected Output Voltage from Among Two or More Possible Voltages	4
1. “Plurality of Loads”	5
2. “Load Selector Means”	7
III. GROUNDS 1A AND 1B FAIL BECAUSE THE <i>DOLUCA-BUTI</i> COMBINATION DOES NOT MEET THE LIMITATIONS OF THE INDEPENDENT CLAIMS	12
A. <i>Doluca</i> Does Not “Generate a Selected One of a Plurality of Pump Voltages”	12
B. <i>Doluca-Buti</i> Does Not Describe “a Plurality of Loads ... Each Load Associated With a Specific Pump Voltage” or “a Load Selector Means”	14
IV. GROUNDS 2A, 2B, 2C, 3A AND 3B FAIL BECAUSE A POSITA WOULD NOT BE MOTIVATED TO COMBINE <i>LE</i> WITH <i>UJIIE</i>	18
V. CONCLUSION	23

TABLE OF AUTHORITIES

Cases

<i>DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.</i> , 567 F.3d 1314 (Fed. Cir. 2009)	22
<i>Intel Corp. v. PACT XPP Schweiz AG</i> , 62 F4th 1373 (Fed. Cir. 2023)	22

PATENT OWNER’S EXHIBIT LIST

Exhibit No.	Description
2001	Plaintiff’s Notice of IPR Petition, <i>Sonrai Memory Limited v. Micron Technology, Inc.</i> , No. 6:22-cv-0085-ADA, Dkt. No. 40 (W.D. Tex. May 22, 2023)
2002	Order Granting Motion for Entry of Scheduling Order, <i>Sonrai Memory Limited v. Micron Technology, Inc.</i> , No. 6:22-cv-0085-ADA, Dkt. No. 40 (W.D. Tex. May 22, 2023)
2003	Docket Sheet, <i>Sonrai Memory Limited v. Micron Technology, Inc.</i> , No. 6:22-cv-0085-ADA (W.D. Tex. Sept. 10, 2023)
2004	Law360 Article: <i>West Texas Judge Says He Can Move Faster Than PTAB</i>
2005	Order Granting Joint Motion for Extension of Time To Extend Venue Discovery and Claim Construction Deadlines, <i>Sonrai Memory Limited v. Micron Technology, Inc.</i> , No. 6:22-cv-0085-ADA, Dkt. No. 51 (W.D. Tex. Aug. 3, 2023)
2006	Text Order Denying Motion to Stay Pending IPR, <i>Solas OLED Ltd. v. Google, Inc.</i> , Case No. 6:19-cv-00515-ADA (W.D. Tex. June 23, 2020)
2007	Order Denying Motion to Stay Pending IPR, <i>Multimedia Content Management LLC v. DISH Network L.L.C.</i> , Case No. 6:18-cv-00207-ADA, Dkt. No. 73 (W.D. Tex. May 30, 2019)
2008	U.S. District Courts—Federal Court Management Statistics—Profiles—During the 12-Month Periods Ending June 30, 2018 Through 2023 available at https://www.uscourts.gov/statistics/table/na/federal-court-management-statistics/2023/06/30-1
2009	Micron Technology, Inc’s Preliminary Invalidity Contentions, <i>Sonrai Memory Limited v. Micron Technology, Inc.</i> , No. 6:22-cv-0085-ADA (W.D. Tex. June 7, 2023)

Exhibit No.	Description
2010	Amended Scheduling Order, <i>Sonrai Memory Limited v. Apple Inc.</i> , No. 6:22-cv-00787-ADA, Dkt. No. 79 (W.D. Tex. Sept. 5, 2023)
2011	Claim Construction Order, <i>Sonrai Memory Limited v. Apple Inc.</i> , No. 6:22-cv-00787-ADA, Dkt. No. 53 (W.D. Tex. Apr. 6, 2023)
2012	Apple Inc.’s First Supplemental Invalidity Contentions, <i>Sonrai Memory Limited v. Apple Inc.</i> , No. 6:22-cv-00787-ADA (W.D. Tex. June 15, 2023)
2013	Declaration of Dr. Michael C. Brogioli
2014	Curriculum Vitae of Dr. Michael C. Brogioli
2015	Joint Claim Construction Statement, <i>Sonrai Memory Limited v. Micron Technology, Inc.</i> , No. 6:22-cv-0085-ADA, Dkt. No. 70 (W.D. Tex. October 18, 2023)
2016	Preliminary Claim Constructions, <i>Sonrai Memory Limited v. Micron Technology, Inc.</i> , No. 6:22-cv-0085-ADA (W.D. Tex. November 14, 2023)
2017	Declaration of John Petrsoric in Support of Motion for Admission <i>Pro Hac Vice</i>

I. INTRODUCTION

Patent Owner submits this sur-reply to Petitioner Micron Technology Inc.’s (“Petitioner”) Reply (“Reply”), for *inter partes* review of U.S. Patent No. 6,724,241 (“the ’241 Patent”).

First, the Board should find the claims of the ’241 Patent not unpatentable because Petitioner fails to show invalidity for any independent claim. For Grounds 1A and 1B, Petitioner asserts that either *Doluca* alone, or *Doluca* in combination with *Buti*, disclose the limitations for independent claims 1, 13 and 24. However, neither *Doluca* alone, nor *Doluca* in combination with *Buti*, disclose charge pumps, for example, that “generate a selected one of a plurality of pump voltages,” that have “a plurality of loads, ... each load associated with a specific pump voltage,” or that have “a load selector means for selectively coupling a load associated with a specific pump voltage to the output of said pumping circuit.” Consequently, Petitioner cannot establish that the limitations of the independent claims are satisfied by the prior art and therefore cannot establish that any of the claims of the ’241 Patent are unpatentable under Grounds 1A and 1B.

Second, Grounds 2A, 2B, 2C, 3A, and 3B are deficient because they rely on an allegation of obviousness for the proposed combination of *Le* with *Ujiie* that is negated by *Le*’s teaching away from a charge pump that increases the use of a shunting regulator (or the proposed substitute, the clamping diodes of *Ujiie*) that

leads to greater power consumption in the charge pump. Consequently, Grounds 2A, 2B, 2C, 3A, and 3B of the Petition fail.

For the above reasons, and as explained in further detail both below and in the Patent Owner’s Response (“POR”), the Petition fails to establish that any challenged claims are unpatentable.

II. THE CLAIMS OF THE ’241 PATENT

A. **Petitioner Concedes That the Claims Require the Generation of a Selected Output Voltage from Among Two or More Possible Voltages**

The claims of the ’241 Patent require a charge pump circuit to generate a “selected” output voltage, that “selected” output voltage being of two or more possible voltages. More specifically, and as discussed further below in Section II.B, the selection of the output voltage is effectuated through a specific load associated with that specific output voltage, from among a “plurality of loads” where each load is associated with a different output voltage, when that specific load is electrically connected to the charge pump output through the use of the “load selector means.” In Reply, Petitioner argues that neither the claims nor the specification of the ’241 Patent requires selection of the output voltage, from among a group of possible output voltages, “*at runtime*.”¹ See Reply at 4-10. But

¹ All emphasis added, unless otherwise noted.

the claims of the '241 Patent place no requirement on the selection of an output voltage such that it had to occur “at runtime” and Patent Owner never proffered such an argument.

Petitioner tacitly acknowledges Patent Owner’s position. For example, in response to the explanation by Patent Owner and its expert that the *Doluca-Buti*² combination could only generate a single output voltage of 6.1 V, *see* POR at 11-15, 26-29, Petitioner introduces a new theory, that the output voltage of *Doluca*’s charge pump can be adjusted dynamically by adjusting the V_{REF} value, *see* Reply at 12-13. As discussed in Section III.A, *infra*, *Doluca* does not teach that the V_{REF} value is adjustable. Nevertheless, the advancement of this argument confirms that the plain language of the claims, e.g., that the charge pump circuit “generate a selected one of a plurality of pump voltages,” Ex. 1001, 8:20-21, requires the

² Petitioner originally asserted that the motivation to combine *Doluca* and *Buti* arose from *Doluca* not providing “further structural or functional description of the charge bleeder ... A POSITA who, upon reviewing *Doluca*’s disclosure, wanted to know more about the bleeder 45 circuitry, and/or how it functions to lower the output voltage, would have looked at other sources for relevant information.” Petition at 13. Petitioner now admits that *Doluca* discloses transistor 79, as part of bleeder control circuit 27, “that serves as a non-linear current regulator having a generally parabolic current-voltage characteristic.” Reply at 14-15. Petitioner asserts that a “POSITA would have understood that while *Doluca* describes ... transistor 79, it does not provide any information on how to design or implement such a bleeder circuit for a specific voltage-current relationship ... [and that] [t]o fill the gap, a POSITA would need to look at other technical references” including *Buti*, *id.* at 15, but does not explain how *Buti* provides the information regarding a specific voltage-current relationship.

generation of a “selected” output voltage, that “selected” output voltage being from a pool of two or more possible voltages.

B. The Totality of the Claims Require the Generation of a Selected Output Voltage from Among Two or More Possible Voltages

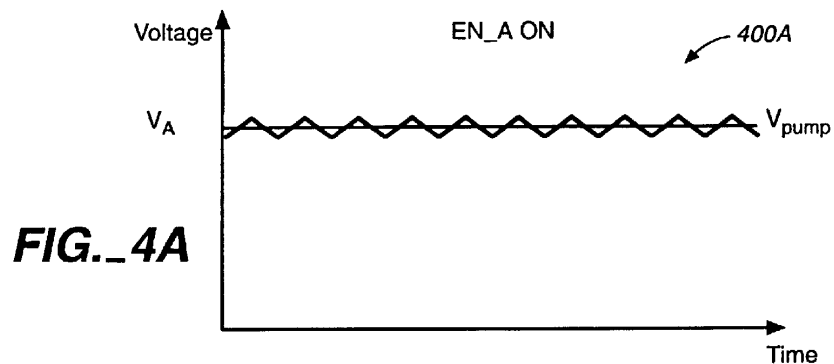
Petitioner argues that the concept of “selection of the output voltage of the pump circuit [as] a function of the load selection” is contrary to the disclosure of the '241 Patent. Reply at 3. As discussed below, this is demonstrably incorrect.

Petitioner claims that the '241 Patent “repeatedly describes that the purported invention ... is operable to generate one or more pump voltages.” Reply at 3 (citing Ex. 1001, Abstract, 3:8:10). When these cited portions are read in light of the detailed disclosure of the specification and the claims, it is clear that the charge pump of the '241 Patent can generate a “selected” output voltage, that “selected” output voltage being from a pool of two or more possible voltages, by way of the disclosed and claimed “plurality of loads” and “load selector means.”

First, the '241 Patent specifically gives the example of a charge pump circuit that can generate multiple different output voltages. More specifically the specification identifies three different output voltages, V_A , V_B , and V_C , with the example given that V_B is two times V_A and V_C is four times V_A . See Ex. 1001, 2:29-33. In this example, if V_A is 5 V, V_B would be 10 V and V_C would be 20 V.

See also *id.*, 2:38-45 (referring to V_A as the “lowest pump output voltage,” V_B as the “higher pump voltage,” and V_C as the “highest pump voltage”).

With respect to the circuit of Fig. 3, the '241 Patent further describes that one of output voltages, either V_A , V_B , or V_C , is generated by the charge pump circuit. For example, “FIG. 4A is a response of the charge pump circuit of FIG. 3 when EN_A is on.” See Ex. 1001, 3:36-37. Fig. 4A shows the target output voltage of the charge pump circuit to be V_A :



Id., Fig. 4A; see also *id.*, 3:38-41, Figs. 4B and 4C (V_B and V_C are “a response of the charge pump circuit of FIG. 3” when “EN_B is on” and when “EN_C is on,” respectively.)

1. “Plurality of Loads”

The '241 Patent teaches that each of the target output voltages, V_A , V_B , and V_C , are tied exclusively to each one of load A, load B, and load C in Fig. 3:

Each load is associated with a different pump output voltage V_{out} .

* * *

A given load can be associated to a fixed output voltage or to a small voltage interval. The first load 322 [Load A] is associated with a pump output voltage V_A and is connected to a first switch 320.

* * *

Similarly, the second load 324 [sic, 326] [Load B] is associated with a pump output voltage V_B and is connected to a second switch 324.

* * *

Finally, the third load 330 [Load C] is associated with a pump output voltage V_C and is connected to a switch 328.

Id., 4:35-47.

The '241 Patent is unequivocal in both its disclosure and claims. In the disclosure, a particular load (of load A, load B, and load C) is tied to a particular output pump voltage. In other words, the number of loads will match the number of output voltages. *See id.*, 4:36-38 (“The number of loads provided to the circuit may vary, depending on the number of target pump voltages that can be provided.”). If there are two loads, the charge pump circuit can generate two different output voltages; if there are three loads, the charge pump circuit can generate three different output voltages, etc. Moreover, Claims 1 and 13 require a “plurality of loads,” *i.e.*, two or more loads. *Id.*, 8:21, 10:29. These limitations also require that “each load [be] associated with a specific pump voltage.” *Id.*, 8:21-23, 10:29-31. The plain language of these limitations indicate that the claimed charge pump must generate a “selected” output voltage, that “selected” output voltage being from a pool of two or more possible voltages.

Based on the foregoing, Petitioner is wrong that Patent Owner has presented an “erroneous argument that each load is tied to a particular pump voltage.” Reply at 4. Indeed, Petitioner’s expert, Dr. Dickens, agreed with Patent Owner, stating in his original declaration that “[t]he ’241 Patent explains that *each load (e.g., Load A, B, or C) is ‘associated’ with a specific pump voltage* and that *the load is attached to the output when that specific pump voltage is selected.*” Ex. 1003, ¶ 50. Similarly, in an earlier *inter partes* review of the ’241 Patent, the petitioners’ expert similarly noted that “a POSITA would deduce that a load is ‘associated’ with a voltage if *the load was predetermined to be particularly suited for that voltage such that the load will be used with that voltage in all situations* and not just on an as-needed basis.” IPR2021-01561, Ex. 1003 (Declaration of Vivek Subramanian, Ph.D.), ¶ 42.

2. “Load Selector Means”

Petitioner further argues that Patent Owner’s reliance on the “load selector means” limitation to reinforce the ’241 Patent’s clear teaching and claiming of a single load for each output voltage is also erroneous. Reply at 4. More specifically, with reference to the ’241 Patent’s disclosure that “[o]nly one load can be selected at a time,” Reply at 4-5 (citing Ex. 1001, 4:52-62), Petitioner asserts that “[a] POSITA would have understood that this description in the ’241 Patent merely discloses that one load is added *at a time* by closing the corresponding switch ...

[and] does not require having only one load connected to the pump output at all times.” Reply at 5 (emphasis in original). Petitioner is wrong.

As an initial matter, the parties agree that the function of the “load selector means” of claim 1 of the ’241 Patent is “selectively coupling a load associated with a specific pump voltage to the output of said pumping circuit.” See Petition at 7-8; POR at 8-9. The parties agree that the corresponding structure includes at least switches 320, 324, and 328. Further, the District Court has construed the corresponding structure to also include switches 720, 724 and 728, and the transistor implementations of switches 320, 324, 328, 720, 724, and 728 shown in Figs. 5A and 5B. See Ex. 2016.

In Fig. 3, switches 320, 324, and 328 are responsible for electrically connecting Load A, Load B, and Load C, respectively, to the charge pump output. See Ex. 1001, 4:2-5 (The charge pump circuit 300 includes several different loads 322, 326, and 330, each connectable via a respective switch 320, 324, 328 to the output 334 of the charge pump circuit.”). Similarly, in Fig. 7, switches 720, 724, and 728 are responsible for electrically connecting Load A, Load B, and Load C, respectively, to the charge pump output. The specification of the ’241 Patent makes clear that the switches are operated *exclusively*, meaning that *only one switch*, of 320, 324 or 328 for example, can be *enabled at a time*.

As Petitioner acknowledges, Reply at 4-5, the '241 Patent describes that “[o]nly one load can be selected at a time,” and that “if voltage V_A is selected, EN_A causes the first switch 320 to close, connecting the first load to the output terminal of the charge pump circuit 300. The remaining loads 326 and 330 are disconnected from the output terminal because their respective switches 324 and 328 are open.” Ex. 1001, 4:56-62; *see also id.*, 5:4-6 (“When load B 326 is selected load A 320 [sic, 322] and load C 330 are disconnected from the output of the charge pump circuit 300.”); 5:15-17 (“When load C 330 is selected load A 322 and load B 326 are disconnected from the output of the charge pump circuit 300.”). Because any of Load A, Load B, or Load C are connected to the output of the charge pump circuit to the exclusion of the others of these loads, the enabling of any of the switches 320, 324, or 328, each associated with Load A, Load B, and Load C, respectively, is to the exclusion of the others of these switches.

Petitioner also argues “that more than one load can be associated with a specific voltage.” Reply at 5. In support of this argument, Petitioner references the '241 Patent's teaching that a supplemental load, Load S, can be connected to the pump output along with one of Load A, Load B, or Load C. *See* Reply at 5-7 (citing Dr. Brogioli's agreement, and Ex. 1001, Fig. 7, Fig. 10, 7:6-8:14). While Petitioner is correct that the '241 Patent describes a supplemental load, Load S, that can be connected to the pump output along with one of Load A, Load B, or Load C,

Petitioner fails to recognize that the supplemental load structure does not fall under the scope of “the plurality of loads” and “load selector means” limitations of claims 1 and 13.

The '241 Patent describes that Load S 718 is added to the output of the pump circuit “whenever the maximum acceptable ripple on target output sampled at node Vcfrb is greater than the reference voltage (Vref).” Ex. 1001, 6:12-15; *see also id.*, 7:25-26 (“Whenever Vcfrb is greater than Vref, adding a load”). The supplemental Load S is associated with “maximum acceptable ripple” of the output voltage, but is **not** associated with “a specific pump voltage.” Indeed, Petitioner’s expert, Dr. Dickens, confirmed this distinction in his original declaration when he stated that “[t]he '241 Patent also discloses that a different load (e.g., Load S) can be added if needed based on a measurement of the output voltage; **that different load is not described as being ‘associated’ with the particular output voltage** because it is not added at the time of the target pump voltage selection.” Ex. 1003, ¶ 50; *see also* IPR2021-01561, Ex. 1003, ¶ 42 (With respect to the disclosure of the supplemental load S, “a POSITA would deduce that a load is ‘associated’ with a voltage if the load was predetermined to be particularly suited for that voltage such that the load will be used with that voltage in all situations and not just on an as-needed basis.”); *see also* Ex. 1001, Fig 10, 7:38-41, 7:56-64 (at step 1006, enabling

either Load A, B or C corresponding to the selected voltage; at steps 1010, 1012, when $V_{\text{cfb}} \geq V_{\text{ref}}$, add supplemental load S).

Accordingly, the supplemental Load S does not fall under the scope of the “plurality of loads” limitations of claims 1 and 13 of the ’241 Patent because it is not a “load associated with a specific pump voltage,” as the limitations require. *See* Ex. 1001, 8:22-24; *see also id.*, 10:29-31. Because the supplemental Load S is not a “load associated with a specific pump voltage,” the switch 716 in Fig. 7 that connects/disconnects supplemental Load S 718 to the pump output is not part of the corresponding structure of the “load selector means” of claim 1 because switch 716 does not perform the function of “selectively coupling a load associated with a specific pump voltage to the output of said pumping circuit.” Ex. 1001, 8:25-27; *see also id.*, 10:32-33 (“load selector means” of claim 13 “for selecting a load that satisfies a specific pump voltage”). It is therefore unsurprising that the District Court’s construction of the corresponding structure of the “load selector means” limitation of claim 1 did not include the switch 716 that connects/disconnects supplemental Load S 718 to the pump output:



Id., Fig. 7 (annotated to show switch S not included as corresponding structure of the “load selector means” of claim 1).

III. GROUNDS 1A AND 1B FAIL BECAUSE THE *DOLUCA-BUTI* COMBINATION DOES NOT MEET THE LIMITATIONS OF THE INDEPENDENT CLAIMS

A. *Doluca* Does Not “Generate a Selected One of a Plurality of Pump Voltages”

As detailed in the POR, *Doluca* describes circuitry that generates a capacitor plate voltage, V_{CP} , based on V_{CC} and the bandgap voltage of silicon, V_{BG} . See Ex. 2013, ¶ 41. The circuitry first consists of “[a] $V_{CC}/2$ circuit 21, which may be nothing more than a voltage divider, connects to a source of voltage V_{CC} at its input, and provides a voltage $V_{CC}/2$ to a V_{BG} generator 23 at its output. V_{BG} generator 23 generates a voltage V_{BG} which is a stable facsimile of the bandgap voltage of silicon, or about 1.2 volts.” Ex. 1006, 3:62-67; see also Ex. 2013, ¶ 41. “The output of

generator 23, consisting of the sum of $V_{CC}/2$ and V_{BG} is connected to a V_{REF} line 25, such that: $V_{REF} = V_{CC}/2 + V_{BG}$.” Ex. 1006, 4:4-8; *see also* Ex. 2013, ¶ 41.

In reply, Petitioner contends that “a POSITA would have understood that an adjustment to the value of V_{ref} could cause a change in the pumping circuit output voltage.” Reply at 11. More specifically, Petitioner asserts that “*Doluca* teaches that (i) V_{REF} is a function of $V_{CC}/2$ that is generated by voltage divider circuit 21, which a POSITA would have understood as being adjustable, and (ii) V_{REF} is variable.” *Id.* at 12. Petitioner provides no explanation as to how the voltage divider circuit 21 would be understood as adjustable. That voltage divider takes V_{CC} , which *Doluca* identifies as being 5 V, *see* Ex. 1006, 3:47-48 and outputs half of that 5 V, or 2.5 V. *Doluca* does not describe either V_{CC} as adjustable or the voltage divider circuit 21 as adjustable, and Petitioner provides no citation within *Doluca* that either is adjustable.

In addition to V_{REF} being a function of $V_{CC}/2$, V_{REF} is also a function of V_{BG} because $V_{REF} = V_{CC}/2 + V_{BG}$. *See, e.g.*, Ex. 1006, 4:4-8. *Doluca* describes V_{BG} as being “1.2 volts.” *Id.*, 3:65-67. *Doluca* does not describe V_{BG} as adjustable. Because V_{CC} is not adjustable and V_{BG} is not adjustable, V_{REF} , being equal to $V_{CC}/2$ plus V_{BG} , is also not adjustable. Petitioner also points to the claims of *Doluca* as disclosing that the “capacitor-plate voltage [V_{CP}]” is kept “within a preselected range of voltages.” Reply at 12-13 (citing Ex. 1006, 7:33-8:14). As Dr. Brogioli

described, the “range of voltages” disclosed in *Doluca*’s specification is the range of 6.1 V, where *Doluca*’s charge pump turns off, to 6.1 V *plus* a small offset voltage, where *Doluca*’s charge bleeder turns on. *See* Ex. 2013, ¶¶ 45, 47. Petitioner is incorrect that *Doluca*’s charge pump circuit is dynamically adjustable.

B. *Doluca-Buti* Does Not Describe “a Plurality of Loads ... Each Load Associated With a Specific Pump Voltage” or “a Load Selector Means”

Petitioner challenges the POR for “map[ping] each of the FETs 42, 48, 54 and 60 as distinct loads.” Reply at 18. Petitioner contends that “[t]his argument does not withstand scrutiny,” *id.*, further asserting that “FETs 42, 48, 54, and 60 in Buti’s bleeder circuit, and in *Doluca*’s modified bias circuit, are analogous to loads,” where “different subsets of FETs 42, 48, 54, and 60 [are] ‘loads’ in Buti’s bleeder circuit[] depending on the range of V_{out} .” *Id.* (emphasis in original). It is Petitioner’s cobbling together of quotes across multiple sections of its own Petition that doesn’t withstand scrutiny. First, Petitioner cites pages 20-22 of the Petition across multiple limitations of claim 1 of the ’241 Patent. But Petitioner only addresses limitation 1[b], “a plurality of loads selectively coupleable to an output of the pumping circuit, each load associated with a specific pump voltage,” at pages 20-21 of the Petition.

Moreover, Patent Owner’s “map[ping] each of the FETs 42, 48, 54 and 60 as distinct loads” comes directly from Petitioner’s expert, Dr. Dickens. In his original declaration, he unequivocally stated that “[g]iven the behaviors of FETs 42, 48, 54,

and 60, a POSITA would have considered these FETs as ‘loads’ of charge pump

37. Each of these FET loads 42, 48, 54, and 60 is associated with a specific pump output voltage, the value of which equals the threshold voltage of the corresponding diode stack(s).” Ex. 1003, ¶ 86. In his supplemental declaration, he confirmed that original opinion. See Ex. 1023, ¶ 48 (“As I have mentioned in my earlier Declaration, ‘each of FET loads 42, 48, 54, and 60 can be selectively activated, i.e., selectively coupled to charge pump 37,’ depending on the charge pump voltage V_{CP} . This would read on the claim language ‘a plurality of loads ... each load associated with a specific pump voltage.’”).

Dr. Dickens also presents a new theory, that “FET 42 can be considered a first load, FETs 42 and 48 can be considered a second load, FETs 42, 48, and 54 can be considered a third load, and FETs 42, 48, 54, and 60 can be considered a fourth load.” *Id.* This new theory fails for the same reason as the original theory, because Buti does not disclose that “each load [is] associated with a specific pump voltage.” To counter this failure, Petitioner repeats its argument that the “Specification discloses embodiments that show multiple loads being added for a target output voltage.” As discussed above in Section II.B.1, the “multiple loads” that Petitioner references can only consist of (1) a single load of the “plurality of loads” and (2) a supplemental load S. But the supplemental load S does not satisfy the claimed requirement that “each load [be] associated with a specific pump

voltage.” Only a *single* load associated with a specific pump voltage can satisfy this requirement.

Petitioner also complains that “Patent Owner bases this argument by advancing—for the first time—the interpretation that the limitation ‘load selector means for selectively coupling a load associated with a specific pump voltage’ means that ‘only one switch can be active at any time’ in the ’241 Patent embodiments, such that each load is coupled to the output to the exclusion of other loads.” Reply at 19. Again, Petitioner asserts that the “Specification discloses that more than one load can be associated with a target output voltage, e.g., by adding an extra load to reduce voltage ripple.” *Id.* But as Petitioner points out, the extra load is added to reduce voltage ripple. The extra load is not associated with a “specific pump voltage” and thus the extra load does not fall under the scope of “a plurality of loads ... each load associated with specific pump voltage” and its corresponding switch does not perform the function of “selectively coupling a load associated with a specific pump voltage to the output of said pumping circuit” of the “load selector means.” See Sections II.B.1, II.B.2, *supra*.

To the extent Petitioner contends this is a “new” interpretation, its own expert explained that “each load (e.g., Load A, B, or C) is ‘associated’ with a specific pump voltage and that the load is attached to the output when that specific pump voltage is selected.” Ex. 1003, ¶ 50 (citing 4:33-51 (“*Each load is associated with a*

different pump output voltage V_{out} ... The first load 322 [Load A] is associated with a pump output voltage V_A ...”), 7:7-16 (“dynamically selecting the best load that yield the desired result, including the decision whether to set load S in addition to **one of the loads A, B or C.**”), 7:31-42 (“the switch enables a load corresponding to the selected pump voltage by switching on the load that provides the best voltage ripple by means of either EN_A, EN_B, or EN_C”)). The description in the ’241 Patent, including in the specific portions identified by Petitioner’s expert, supports the interpretation advanced by Patent Owner.

The new theory also fails because the components of *Doluca-Buti* that the Petitioner and Dr. Dickens identify still fails to meet the corresponding structure of the switches and/or transistors of the “load selector means” of the ’241 Patent that operate exclusively to one another, whether it be the combination of diode stacks 46, 52, 58, and 64 with (i) inverters 44, 50, 56, and 62, *see* Ex. 1003, ¶ 88, (ii) buffers, *see id.*, ¶ 89, or replacing FETs 42, 48, 54, and 60 with PMOS transistors, *see id.*, ¶ 90. As explained above in Section II.B.2, the corresponding structure for the “load selector means,” e.g., switches 320, 324, and 328, are operated ***exclusively***, meaning that ***only one switch***, of 320, 324 or 328 for example, can be ***enabled at a time***. The various proposed modifications to *Buti* do not meet this requirement. For example, the inverters in the combination of diode stacks 46, 52, 58, and 64 with inverters 44, 50, 56, and 62, *see* Ex. 1003, ¶¶ 88, 90, are not operated exclusively, and neither are

the inverters in the combination of diode stacks 46, 52, 58, and 64 with buffers, *see* Ex. 1003, ¶ 89.

IV. GROUNDS 2A, 2B, 2C, 3A AND 3B FAIL BECAUSE A POSITA WOULD NOT BE MOTIVATED TO COMBINE *Le* WITH *Ujiie*

In addressing the proposed combination of *Le* with *Ujiie*, Petitioner claims that Patent Owner’s contention that a POSITA would not be motivated to combine *Le* with *Ujiie* “are based on a fundamental misreading of *Le* and *Ujiie*’s teachings and a disregard of the case law.” Reply at 20. Neither is the case.

Petitioner mischaracterizes both *Le* and Patent Owner’s arguments related to *Le*. First, Petitioner claims that “a POSITA would have immediately understood that *Le* describes” the problems identified by Dr. Brogioli and Patent Owner are “found in a ‘**conventional two stage charge pump**,’ and *not because of the use of a shunt regulator*.” Reply at 20-21 (emphasis in original). This ignores that the problems identified by *Le* are tied to the use of a shunt regulator. In the prior art charge pumps, *Le* describes that large capacitor values are used “to compensate for the lowest power supply voltage.” Ex. 1008, 3:34-36. The problem with these prior art charge pumps is that “when the V_{CC} is not at its lowest level, *the use of large capacitor values wastes power supply charge which may be simply shorted to ground through the shunt regulator*, resulting in an overall loss of pump efficiency.” *Id.*, 3:37-40. This shorting to ground results in increased power

consumption, as well as the manifestation of larger noise spikes and valleys, at the shunt regulator. *See id.*, 3:63-4:3; *see also id.*, 4:63-67 (“In the conventional system, a high input supply level produces a bigger over-voltage on the output of the charge pump. ***Large noise spikes and valleys are produced at the shunt regulator output at high supply voltage conditions.***”).

Le consequently indicates that “there is a need for a low power, low noise means of compensation for the variations in the VCC supply applied to the charge pump circuit, while maintaining a simple regulator design.” Ex. 1008, 4:15-18. The solution that *Le* provides is to “vary the capacitance of the bootstrap capacitor values within the stages ... as a function of the input supply voltage.” *Id.*, 4:31-35; *see also id.*, 7:4-25. *Le*’s result, *i.e.*, its design goal or intended purpose, is that “***a shunt regulator circuit*** which may operate in conjunction with such a charge pump circuit ***will consume less power*** and regulate the charge pump output with less ripple than with conventional charge pump circuits.” *Id.*, 6:21-25.

Petitioner cites Dr. Brogioli’s testimony as indicative that “*Le* discloses [the] use of shunt regulator with *Le*’s improved charge pump to reduce power consumption and increase power savings.” Reply at 23. In doing so, Petitioner misses the point by ignoring the crux of Dr. Brogioli’s testimony explaining that *Le* teaches ***reducing the use of the shunt regulator*** in order to reduce power consumption and increase power savings:

- “Le talks about using Le's pump and Le's shunt regulator, but the way that Le operates and by *reducing the amount -- the amount of shunting that occurs in Le, there's a -- there's a reduced -- or a reduction in power consumption or improved power savings.*” Ex. 1024, 143:22-144:5.
- “Le states the very bottom of column 10: The charge pump circuit of the *present invention reduces an amount of shunting by the regulator, thereby reducing power.*” *Id.*, 144:6-21.
- “[T]he shunt regulator circuit operating in conjunction with Le or such a charge pump consumes less power.” *Id.*, 145:11-22.
- “[Le] talks about the wasting of *power supply charge*, which in this paragraph *is being shorted to ground through a shunt and it's negatively impacting the pump efficiency.* There's an overall loss of efficiency.” *Id.*, 150:3-12.

Dr. Brogioli's testimony is consistent with his declaration opinion that “Le's design goal is to minimize the use of the shunting regulator to minimize power consumption within the memory device.”³ Ex. 2013, ¶ 84; *see also* Ex. 1008, 10:67-11:3 (“The charge pump circuit of the present invention reduces an amount of such shunting by the regulator, thereby reducing power.”). Petitioner is wrong that Patent Owner misrepresents *Le's* objectives. *Le's* objectives are clear—reducing the use of shunting regulators to reduce power consumption.

Petitioner contends that it “established a motivation to combine Le and Ujiie: Le contemplates using its novel charge pump circuit with a shunt regulator—no

³ To the extent that Petitioner takes issue with Patent Owner's use of “minimizing,” it should be noted that the plain and ordinary meaning of “minimize” is “to reduce.”

restrictions on the type—and Ujiie discloses one such shunt regulator that can be customized depending on the target voltage output.” Reply at 25. Petitioner also contends that “Ujiie contemplates customizing the breakdown voltages of the clamp diodes depending on the target output voltage of the charge pump.” Reply at 24. While this may be true, Petitioner ignores the fact that it relies on *Ujiie* for the disclosure of multiple clamp diodes associated with different voltages to meet the “plurality of loads” requirement of the claims. *See* Petition at 54 (“Ujiie further teaches that diodes D1 and D2 are associated with write voltage V_{pp1} and erase voltage V_{pp2} , respectively.”); *see also* Ex. 1009, [14], [22] (describing erase voltage V_{pp2} higher than write voltage V_{pp1}).

Furthermore Dr. Brogioli acknowledged that using one of *Ujiie*’s clamping diodes with a breakdown voltage at the target output voltage of the charge pump was consistent with *Le*’s disclosure and objectives. *See* Ex. 2013, ¶ 85. However, in the additional clamping diodes that are necessary to satisfy the “plurality of loads” limitation of the apparatus claims of the ’241 Patent, the breakdown voltage of those clamping diodes would be less than the target output voltage of *Le*’s charge pumps. Dr. Brogioli explains how those clamping diode would have to “sink significant amounts of current to reduce *Le*’s charge pump’s” output voltage to the breakdown voltage of those clamping diodes, resulting in *increased* power consumption contrary to *Le*’s objective of *reduced* power consumption. *See id.*, ¶¶ 86-87.

Finally, with respect to the proposed combination of *Le* with *Ujii*, Petitioner argues that, pursuant to the Federal Circuit’s holding in *Intel Corp. v. PACT XPP Schweiz AG*, 62 F4th 1373, 1379 (Fed. Cir. 2023), there is sufficient motivation to combine because “any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.” This argument misses the point. As the Federal Circuit has explained, even if a proposed combination of prior art yields predictable results, a conclusion of non-obviousness “would follow ... if the prior art indicated that the invention would not have worked for its intended purpose or otherwise taught away from the invention.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1326 (Fed. Cir. 2009) (citations omitted). As set forth in the POR, and not refuted by Petitioner, this is the case of the proposed combination of *Le* with *Ujii*.

The intended purpose of *Le* is an improved charge pump design that reduces the use of a shunt regulator and therefore reduces power consumption (in addition to reducing voltage ripple and noise). *See* Ex. 1008, 4:12-18, 4:46-50, 5:1-6, 6:21-25, 8:52-57, 10:61-11:3. To incorporate the multiple clamping diodes of *Ujii*, *Le*’s charge pump must be modified to consume more power when a clamping diode with breakdown voltages less than *Le*’s target output voltage is coupled to the pump output. This increased power consumption is exactly what *Le* teaches away from.

As explained in the POR, a POSITA would therefore not be motivated to combine *Le* with *Ujiie* as the Petition suggests.⁴

V. CONCLUSION

For all of the reasons above, Patent Owner respectfully requests that all challenged claims be found not unpatentable.

Date: July 26, 2024

Respectfully submitted,

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⁴ With respect to *Kuriyama*, Petitioner misses Dr. Brogioli's point, *id.*, ¶ 88, that turning *Le*'s charge pump off below its target voltage, such that the load capacitance is higher than is necessary to support the voltage at turn-off and where there will be delayed reactions in turning on and off the pump and the regulator/clamping diode, will lead to significant voltage swings, spike and valleys that are contrary to *Le*'s objectives.

CERTIFICATE OF WORD COUNT (37 C.F.R. § 42.24(d))

The undersigned hereby certifies that the word count in this Patent Owner's Sur-Reply is 5,580 words, as counted by the word-processing program Microsoft Word that was used to generate this Patent Owner's Sur-Reply, where such word count excludes the table of contents, table of authorities, mandatory notices, certificate of service, appendix of exhibits, claim listing, and this certificate of word count. This Patent Owner's Sur-Reply is in compliance with the 5,600-word limit set forth in 37 C.F.R. § 42.24(c)(4).

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CERTIFICATE OF SERVICE (37 C.F.R. § 42.6(e))

The undersigned hereby certifies that the above document was served on July 26, 2024, by filing this document through the Patent Trial and Appeal Case Tracking System as well as delivering a copy via electronic mail upon the following attorneys of record for the Petitioner:

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