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Paper 10
Entered: September 25, 2013

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.
Petitioner

v.

UNIFI SCIENTIFIC BATTERIES, LLC
Patent Owner

Case IPR2013-00236
Patent 6,791,298 B2

Before JONI Y. CHANG, MICHAEL R. ZECHER, and JUSTIN T. ARBES, *Administrative Patent Judges.*

ARBES, *Administrative Patent Judge.*

DECISION
Institution of *Inter Partes* Review
37 C.F.R. § 42.108

Samsung Electronics Co., Ltd. filed a Petition ("Pet.") to institute an *inter partes* review of claims 1, 4-10, 13, 14, 17, and 18 of U.S. Patent No. 6,791,298 B2 (the "'298 patent") pursuant to 35 U.S.C. § 311 *et seq*. Patent Owner Unifi Scientific Batteries, LLC filed a preliminary response ("Prelim. Resp.") to the Petition. We have jurisdiction under 35 U.S.C. § 314. For the reasons that follow, the Board has determined to institute an *inter partes* review.

I. BACKGROUND

The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a):

> THRESHOLD—The Director may not authorize an inter partes review to be instituted unless the Director determines that the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.

Petitioner challenges claims 1, 4, 7-10, 13, 14, 17, and 18 as anticipated under 35 U.S.C. § 102(b) and claims 1, 4-10, 13, 14, 17, and 18 as unpatentable under 35 U.S.C. § 103(a). Pet. 5-60. We grant the Petition as to claims 1, 4-10, 13, 14, 17, and 18 on certain grounds of unpatentability as discussed below.

A. The '298 Patent (Ex. 1001)

The '298 patent, entitled "Monolithic Battery Charging Device," issued on September 14, 2004 based on Application No. 10/288,177, filed November 5, 2002, which claims priority to Provisional Application No. 60/337,301, filed November 5, 2001.

The ’298 patent relates to “monolithically formed battery charging devices having at least one voltage step-down direct-current-to-direct-current [DC-DC] converter.” Col. 1, ll. 25-28. A step-down DC-DC converter “provides an output voltage that is stepped down from (i.e., less than) an applied input voltage.” Col. 1, ll. 33-38. Because the output voltage is less than the input voltage, the output current can be greater than the input current. Col. 1, ll. 42-46. A step-down DC-DC converter may be used to charge a rechargeable battery and may be characterized by its “duty ratio,” which is the ratio of the output voltage to the input voltage. Col. 1, ll. 46-64.

The ’298 patent describes how prior art step-down DC-DC converters used certain external components (e.g., transformers, inductors, and capacitors), which increased the package size and resulting cost to manufacture. Col. 2, ll. 31-46. As a result, manufacturers began using “monolithic” DC-DC converters, but such converters also had problems, such as “high inductor current, inductor saturation and switch saturation, which result in low efficiency and small duty ratios.” Col. 2, ll. 47-56. The ’298 patent states that there was a need in the art for “an efficient, monolithically-formed-step-down DC-DC converter that can supply enough drive current to charge a battery without inductor and switch saturation” and that can “provide small as well as large duty ratios.” Col. 2, ll. 57-62.

Figure 1 of the ’298 patent is reproduced below:

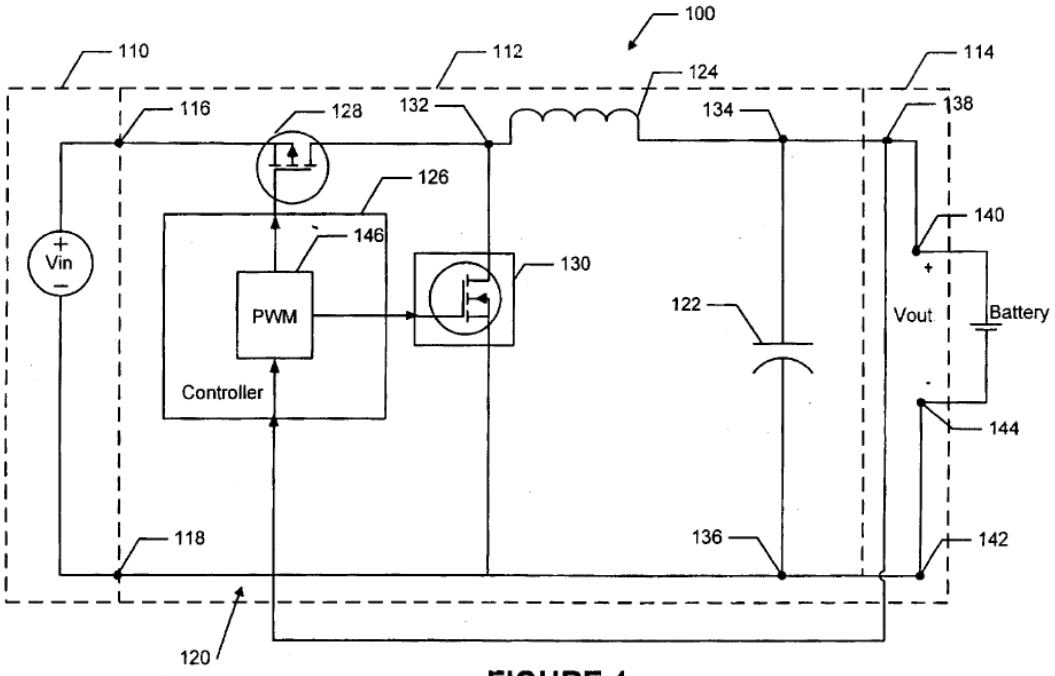


FIGURE 1

As shown in Figure 1 above, monolithic battery charger 100 comprises (1) an external DC input supply 110 that supplies an input voltage V_{in} and corresponding input current; (2) a step-down converter 112; and (3) a battery-terminal interface 114 that supplies an output voltage V_{out} and corresponding output current to a rechargeable battery. Col. 4, ll. 1-33. Step-down converter 112 comprises a “monolithically-formed DC-DC converter 120 in standard buck-style configuration (hereinafter referred to as a ‘synchronous-buck regulator’),” which includes capacitor 122, inductor 124, controller 126, switch 128, and rectifier 130. Col. 4, ll. 48-57. The ’298 patent describes a process by which synchronous-buck regulator 120 performs a voltage step-down of input voltage V_{in} to output voltage V_{out}. Col. 7, l. 14-col. 8, l. 2.

B. Exemplary Claim

Claim 1 of the ’298 patent is exemplary of the claims at issue:

> 1. A monolithic battery charger comprising:
>
> a step-down converter having a duty ratio in the range of approximately 10 to approximately 95 and comprising at least one monolithically formed buck-type regulator coupled to a capacitor and an inductor, wherein the at least one monolithically formed buck-type regulator comprises a switching controller, a switch, and a rectifier in a standard buck configuration, and wherein the controller operates at a switching frequency of at least 1 megahertz; and
>
> a battery-terminal interface connected to the step-down converter for providing an output current and an output voltage to a rechargeable battery.

C. The Prior Art

Petitioner relies on the following prior art:

1. U.S. Patent No. 5,959,439, issued Sept. 28, 1999 (“Shenai”) (Ex. 1007);

2. U.S. Patent No. 6,184,659 B1, filed Feb. 16, 1999, issued Feb. 6, 2001 (“Darmawaskita”) (Ex. 1005);

3. *HIP5020: Integrated-Power Buck Converter Controller With Synchronous Rectification*, Intersil Corp., Jan. 1997 (“HIP5020 Datasheet”) (Ex. 1003);

4. *LT1620/LT1621: Rail-to-Rail Current Sense Amplifier*, Linear Tech. Corp., Jan. 1997 (“LTC1620 Datasheet”) (Ex. 1006);

5. *ADP3804: High Frequency Switch Mode Li-Ion Battery Charger*, Analog Devices, Inc., Dec. 5, 2000 (“ADP3804 Datasheet”) (Ex. 1004); and

6. *LTC3404: 1.4 MHz High Efficiency Monolithic Synchronous Step-Down Regulator*, Linear Tech. Corp., Feb. 2001 (“LTC3404 Datasheet”) (Ex. 1002).

D. The Asserted Grounds

Petitioner challenges claims 1, 4-10, 13, 14, 17, and 18 of the '298 patent on the following grounds:

Reference(s)	**Basis**	**Claims Challenged**
HIP5020 Datasheet	35 U.S.C. § 102(b)	1, 4, 7-10, 13, 14, 17, 18
HIP5020 Datasheet	35 U.S.C. § 103(a)	1, 4, 7-10, 13, 14, 17, 18
HIP5020 Datasheet and Darmawaskita[1]	35 U.S.C. § 103(a)	1, 4, 7-10, 13, 14, 17, 18
HIP5020 Datasheet and ADP3804 Datasheet	35 U.S.C. § 103(a)	1, 4, 7-10, 13, 14, 17, 18
HIP5020 Datasheet and LT1620 Datasheet	35 U.S.C. § 103(a)	1, 4, 7-10, 13, 14, 17, 18
ADP3804 Datasheet and Darmawaskita	35 U.S.C. § 103(a)	1, 4, 7-10, 13, 14, 17, 18
ADP3804 Datasheet and Shenai	35 U.S.C. § 103(a)	1, 4, 7-10, 13, 14, 17, 18
LTC3404 Datasheet and Darmawaskita	35 U.S.C. § 103(a)	1, 4, 5, 6

E. Claim Interpretation

Consistent with the statute and legislative history of the America Invents Act (AIA), the Board interprets claims using the "broadest reasonable construction in light of the specification of the patent in which [they] appear[]." 37 C.F.R. § 42.100(b); *see also* Office Patent Trial

[1] Petitioner includes in the Petition a number of grounds based on different disclosures of the same prior art references. For example, Petitioner's ground 4 is based on "HIP5020 in view of Darmawaskita" and Petitioner's ground 10 is based on "Darmawaskita in view of HIP5020." Pet. 5. Likewise, ground 7 is based on "ADP3804 in view of Darmawaskita" and ground 9 is based on "Darmawaskita in view of ADP3804." *Id*. We refer to these grounds collectively to the extent possible.

Practice Guide, 77 Fed. Reg. 48756, 48766 (Aug. 14, 2012). There is a "heavy presumption" that a claim term carries its ordinary and customary meaning. *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002). However, a "claim term will not receive its ordinary meaning if the patentee acted as his own lexicographer and clearly set forth a definition of the disputed claim term in either the specification or prosecution history." *Id*. "Although an inventor is indeed free to define the specific terms used to describe his or her invention, this must be done with reasonable clarity, deliberateness, and precision." *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). Also, we must be careful not to read a particular embodiment appearing in the written description into the claim if the claim language is broader than the embodiment. *See In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993) ("[L]imitations are not to be read into the claims from the specification.").

For purposes of this decision, we construe certain claim limitations as follows:

1. Preamble of Claim 1

Claim 1 recites a "monolithic battery charger" comprising a "step-down converter" and a "battery-terminal interface connected to the step-down converter for providing an output current and an output voltage to a rechargeable battery." Petitioner argues that the language of the preamble is not limiting. Pet. 11-12. Patent Owner does not propose an interpretation in its preliminary response. We conclude that the preamble limits the claimed invention.

Petitioner makes three arguments. First, Petitioner contends that the Specification of the '298 patent "makes clear that the claimed 'monolithic battery charger' need not be monolithic, nor must it be a battery charger." *Id*. at 11. We do not read the Specification in that manner. The Specification describes an exemplary "monolithic battery charger 100" and states that the battery charger "may be fabricated as (i) an integral part of a multifunctional integrated circuit, (ii) one or more independent monolithically formed integrated circuits, (iii) a single independent monolithically formed integrated circuit, and/or (iv) any other monolithic or hybrid formation." Ex. 1001, col. 4, ll. 2-8. Thus, while monolithic battery charger 100 may be part of a broader apparatus, it is still a distinct component in and of itself. Claim 1 recites a "monolithic battery charger," not a broader apparatus of which the battery charger may be a part.

Second, Petitioner contends that if the term "monolithic" in the preamble is limiting, the phrase "monolithically formed" in the body of the claim would be superfluous. Pet. 11-12. However, "monolithically formed" applies to a sub-component of the battery charger (i.e., the "buck-type regulator"), while "monolithic" applies to the battery charger itself. Given that the terms "monolithic" and "monolithically formed" are different and apply to different things, we do not read "monolithically formed" as being superfluous to "monolithic" in the preamble.

Third, Petitioner argues that "battery charger" is merely an intended use of the claimed apparatus. *Id*. at 12. "In general, a preamble limits the invention if it recites essential structure or steps, or if it is 'necessary to give life, meaning, and vitality' to the claim. Conversely, a preamble is not limiting 'where a patentee defines a structurally complete invention in the

claim body and uses the preamble only to state a purpose or intended use for the invention.'" *Catalina Mktg. Int'l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002) (citations omitted). In claim 1, the recitation of a "battery charger" in the preamble describes fundamentally what the claimed apparatus is, not merely how it is intended to be used. Further, charging a battery is an essential characteristic of the claimed invention. *See Vizio, Inc. v. ITC*, 605 F.3d 1330, 1340 (Fed. Cir. 2010) ("[T]he 'for decoding' language . . . is properly construed as a claim limitation, and not merely a statement of purpose or intended use for the invention, because 'decoding' is the essence or a fundamental characteristic of the claimed invention."). This is reinforced by the body of the claim, which recites providing an output current and voltage to a "rechargeable battery," as well as the Specification of the '298 patent, which describes various exemplary embodiments of a "monolithic battery charger" that charges a battery. *See, e.g.*, Ex. 1001, Abstract; col. 1, ll. 25-28; col. 2, l. 65-col. 3, l. 32; *see also On Demand Machine Corp. v. Ingram Indus., Inc.*, 442 F.3d 1331, 1343 (Fed. Cir. 2006) (preamble was limiting where "the entirety of the claim implements the preamble's high speed manufacture of a single copy" and "[t]he preamble embraces the totality of these limitations, and limits the claim to the subject matter of the preamble"); *Poly-America, L.P. v. GSE Lining Tech., Inc.*, 383 F.3d 1303, 1309-10 (Fed. Cir. 2004) ("blown-film" in the preamble was limiting where the specification was "replete with references to the invention as a 'blown-film' liner" and described it as a fundamental characteristic of the invention).

Applying the broadest reasonable interpretation of the claim in light of the Specification, we conclude that the preamble's recitation of a "monolithic battery charger" limits the claimed invention.

2. "Duty Ratio in the Range of Approximately 10 to Approximately 95" (Claim 1)

Claim 1 recites "a step-down converter having a duty ratio in the range of approximately 10 to approximately 95." Petitioner argues that "duty ratio in the range of approximately 10 to approximately 95" should be interpreted to mean "any duty ratio between about 10 and 95 percent." Pet. 12-13. Patent Owner does not challenge Petitioner's interpretation in its preliminary response.[2] Prelim. Resp. 16.

The Specification explains that a duty ratio is the ratio of the "output voltage to the input voltage" (i.e., V_{out}/V_{in}), which, in the case of a step-down converter, will be less than one. *See* Ex. 1001, col. 1, ll. 46-55. The Specification further describes a specific duty ratio of "approximately 10 to 95 percent." *Id*., col. 2, ll. 65-67; col. 3, ll. 27-30. While claim 1 does not use the term "percent," a person of ordinary skill in the art would read the claim language in light of the disclosures in the Specification and would understand "approximately 10 to approximately 95" to refer to percentages. Applying the broadest reasonable interpretation of the claim in light of the Specification, for purposes of this decision, we interpret "duty ratio in the

[2] In another proceeding involving the '298 patent, Patent Owner argued that the duty ratio of a step-down converter is "a fraction between zero and one, or a percentage between zero and 100," and a person of ordinary skill in the art would understand a range of 10-95 to represent a percentage and a range of 0.1-0.95 to represent a numerical ratio value. IPR2013-00213, Paper 11 at 14.

range of approximately 10 to approximately 95" to mean a duty ratio of approximately 10% to approximately 95%.[3]

3. "Monolithically Formed" (Claim 1)

Claim 1 recites "a step-down converter . . . comprising at least one monolithically formed buck-type regulator." Petitioner argues that "monolithically formed" should be interpreted to mean "formed in a single integrated circuit package." Pet. 9-10. In support, Petitioner cites the Specification of the '298 patent, which describes a "monolithically formed coupling capacitor" that is "preferably integrated into . . . the same package or wafer die as the synchronous buck converter." Ex. 1001, col. 6, ll. 45-64; *see* Pet. 9-10. Petitioner further relies on the Declaration of Leo F. Casey, Sc.D. (Ex. 1011). Pet. 10. Dr. Casey testifies that a "package" is broader than a "wafer die" because an integrated circuit package may contain more than one die and, therefore, the claim language should be interpreted to require a single integrated circuit "package." Ex. 1011 ¶ 17. Patent Owner does not challenge Petitioner's interpretation in its preliminary response. Prelim. Resp. 16.

We conclude that the broadest reasonable interpretation of "monolithically formed" means formed in a single integrated circuit package or wafer die. One dictionary defines "monolithic" as a "[t]erm applied to an integrated circuit in which all the elements are formed *in situ* within a *single* semiconductor chip." NEWNES DICTIONARY OF ELECTRONICS at 204 (1999)

[3] Although the meaning of the claim phrase is ascertainable in light of the Specification, Patent Owner will have an opportunity to move to amend the claims to correct the measure of the range. *See* 37 C.F.R. § 42.121(a).

(Ex. 3001) (emphasis added). The example in the Specification is of a capacitor and synchronous buck converter integrated into the "same package or wafer die." Ex. 1001, col. 6, ll. 45-64. Applying the broadest reasonable interpretation of the claim in light of the Specification, we interpret "monolithically formed" to mean formed in a single integrated circuit package or wafer die.

4. Other Terms

All other terms in claims 1, 4-10, 13, 14, 17, and 18 are given their ordinary and customary meaning as would be understood by one with ordinary skill in the art and need not be further construed at this time.

II. DISCUSSION

We turn now to Petitioner's asserted grounds of unpatentability and Patent Owner's arguments in its preliminary response to determine whether Petitioner has met the threshold standard of 35 U.S.C. § 314(a).

A. Asserted Grounds Based on the HIP5020 Datasheet

Petitioner contends that claims 1, 4, 7-10, 13, 14, 17, and 18 are (1) anticipated by the HIP5020 Datasheet under 35 U.S.C. § 102(b); (2) unpatentable over the HIP5020 Datasheet under 35 U.S.C. § 103(a); (3) unpatentable over the HIP5020 Datasheet and Darmawaskita under 35 U.S.C. § 103(a); (4) unpatentable over the HIP5020 Datasheet and ADP3804 Datasheet under 35 U.S.C. § 103(a); and (5) unpatentable over the HIP5020 Datasheet and LT1620 Datasheet under 35 U.S.C. § 103(a). Pet. 19-49, 57-58. To support its assertions, Petitioner relies on the analysis

of Dr. Casey (Ex. 1011). We are persuaded that Petitioner has established a reasonable likelihood of prevailing on its assertion that claims 1, 4, 7-10, 13, 14, 17, and 18 are unpatentable for the reasons explained below.[4]

1. The HIP5020 Datasheet (Ex. 1003)

The HIP5020 Datasheet is a product datasheet describing a "high-efficiency, buck converter controller with synchronous rectification and integral power MOSFETs [metal-oxide-semiconductor field-effect transistors]." Ex. 1003 at 1. The converter has a "Wide Input Voltage . . . Range" of "4.5VDC to 18VDC (5 to 12 NiCd Battery Cells)" and a "100kHz to 1MHz PWM Switching Frequency." *Id*. The HIP5020 Datasheet discloses that "[t]he HIP5020 is optimized for battery power systems with a 4.5V to 18V input. The integrated MOSFETs along with an LC output filter form a synchronous rectified, step-down (buck) converter." *Id*. at 8.

2. Darmawaskita (Ex. 1005)

Darmawaskita discloses a "single integrated circuit package for controlling the charging circuits of a battery charger." Ex. 1005, Abstract.

[4] We note that Petitioner contends that the challenged claims are not entitled to the November 5, 2001 filing date of Provisional Application No. 60/337,301, and instead have an effective filing date of November 5, 2002, the filing date of the application that issued as the '298 patent. Pet. 6-8. We need not resolve this issue at this time, however, because, based on the current record, all of the references on which a trial is instituted (the HIP5020 Datasheet, Darmawaskita, ADP3804 Datasheet, and LTC3404 Datasheet) qualify as prior art under at least one provision of 35 U.S.C. § 102 even if the claims are entitled to the earlier filing date.

The battery charger comprises "a microcontroller, a switch mode power supply (SMPS) controller, a power converter circuit, and a feedback circuit for the battery voltage and/or current (depending on battery type and design requirements)." *Id.*, col. 1, ll. 17-23.

Figure 1 of Darmawaskita is reproduced below:

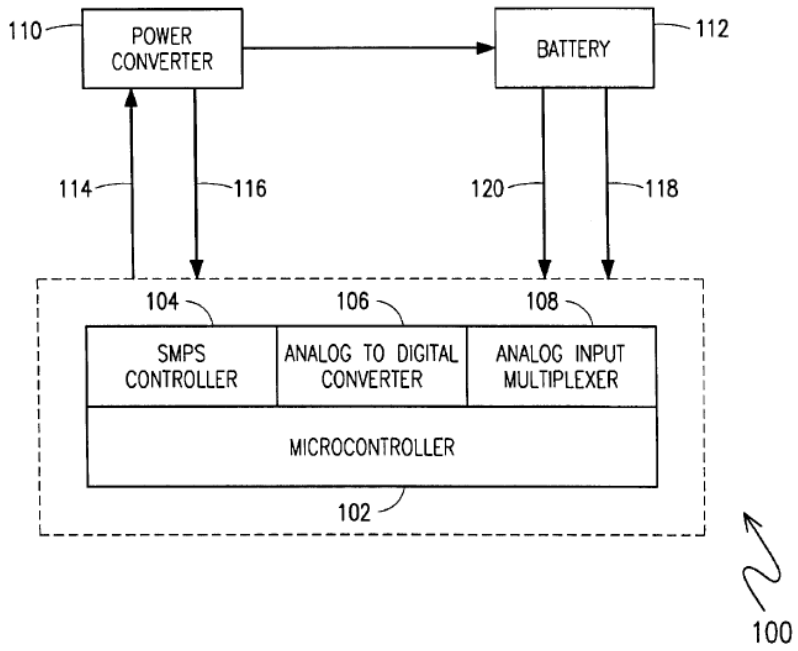
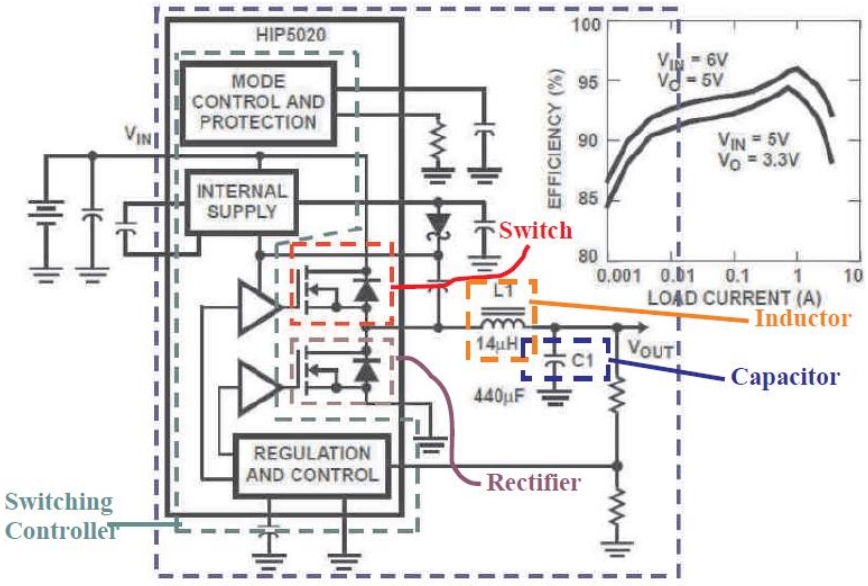


Figure 1 above depicts a switch mode power supply (SMPS) controller 104 and a power converter 110 for charging a battery 112. *Id.*, col. 4, ll. 48-59. SMPS controller 104 "controls the power converter 110 and monitors battery 112 current and/or voltage during charging thereof." *Id.*, col. 4, ll. 59-62. Darmawaskita discloses that SMPS controller 104 generates pulses to drive power converter 110, which may have "either buck or boost topologies." *Id.*, col. 9, ll. 51-60. "Using a 4 MHz internal oscillator mode, the switching frequency can be set, for example but not limit[ed], to 62.5 kHz, 125 kHz, or 250 kHz. The duty cycle of this output waveform

preferably may be selected between 25%, 50%, 75%, and 93%.[5] However, any duty cycle may be utilized depending on the application." *Id.*, col. 9, ll. 60-65.

3. Analysis

Petitioner contends that the HIP5020 Datasheet discloses the limitations of independent claim 1. Pet. 19-23. For example, Petitioner provides an annotated version of the "Typical Application" figure on page 1 of the reference to demonstrate how the HIP5020 Datasheet discloses a "monolithically formed buck-type regulator" comprising a "switching controller," "switch," and "rectifier," and coupled to a "capacitor" and "inductor." *Id.* at 20-21. Petitioner's annotated version is reproduced below:



[5] Dr. Casey explains the relationship between "duty cycle" and "duty ratio" as follows: "In a buck converter, duty cycle (on time / period) and step-down ratio (V_{OUT} / V_{IN}) are the same, apart from circuit losses, which the '298 patent assumes to be negligible when defining duty ratio." Ex. 1011 ¶ 110 (citing Ex. 1001, col. 1, ll. 45-48).

Id. at 21. Based on the graph shown in the above annotated version of the "Typical Application" figure, Petitioner argues that the HIP5020 Datasheet discloses duty ratios (V_{OUT}/V_{IN}) of approximately 66% (3.3 V / 5 V) and 83% (5 V / 6 V). *Id*. at 20. Dr. Casey also testifies that because the HIP5020 Datasheet discloses an output voltage of 3.3 V and an input voltage of 4.5 to 18 V, the reference discloses a duty ratio range of approximately 18% (3.3 V / 18 V) to 73% (3.3 V / 4.5 V). Ex. 1011 ¶ 61; *see* Pet. 20. Petitioner has shown sufficiently that the HIP5020 Datasheet discloses the majority of limitations of claim 1.

The preamble of claim 1, however, recites a "monolithic battery charger," which we interpret to limit the claimed invention. *See supra* Section I.E.1. Petitioner relies on various secondary references, such as Darmawaskita, as teaching the use of a step-down converter (like the one disclosed in the HIP5020 Datasheet) as a battery charger. *See, e.g.*, Pet. 27-29, 34-36, 58 (analysis as to the combination of the HIP5020 Datasheet and Darmawaskita); Ex. 1011 ¶¶ 77-80, 107-23. Darmawaskita discloses using a "battery charger" device comprising a power converter 110, which may be in a "buck" configuration, to provide an output current and voltage to a rechargeable battery. *See* Ex. 1005, Abstract; Fig. 1; col. 1, ll. 19-23; col. 9, ll. 51-67; Pet. 34-36. Petitioner argues that a person of ordinary skill in the art would have had reason to modify the circuitry described in the HIP5020 Datasheet to charge a battery, citing the testimony of Dr. Casey in support. Pet. 27-29 (citing Ex. 1011 ¶¶ 77-78). Petitioner also relies on Darmawaskita for a teaching of a "current-sensing feedback controller" as recited in claims 13 and 17. Pet. 37 (citing Ex. 1005, col. 9, ll. 20-54, and Fig. 2, and Ex. 1011 ¶ 122). Upon review of Petitioner's analysis and

supporting declaration, we are persuaded that Petitioner's asserted ground of unpatentability based on the combination of the HIP5020 Datasheet and Darmawaskita has merit as to independent claim 1 and dependent claims 4, 7-10, 13, 14, 17, and 18.

Patent Owner makes four arguments as to independent claim 1.[6] First, Patent Owner argues that the HIP5020 device could not have been used as a battery charger. Prelim. Resp. 19-22. Dr. Casey opines that the HIP5020 Datasheet discloses an output voltage of at least 15 V (based on an input voltage of 18 V and duty ratio of 83.33%), which is "sufficient voltage to charge at least a conventional 12 V lead-acid battery, consisting of six series-connected lead-acid cells, using a constant voltage charging scheme of 2.4 volts per cell." Ex. 1011 ¶ 64 (citing an article on battery charging, Ex. 1019 at 4, as support). Patent Owner disputes this conclusion, citing online simulation software of Harris Semiconductor (later known as Intersil Corporation, which manufactured the HIP5020 device). Prelim. Resp. 20-22. Patent Owner states that it "tried innumerable combinations [with the software] but failed to arrive at a satisfactory solution for which the HIP5020 may work in accordance with Dr. Casey's Declaration, much less charge a battery." *Id*. at 21-22.

Patent Owner's argument is not persuasive. Patent Owner does not explain sufficiently the relevance of the simulation software or how it is indicative of all that the HIP5020 Datasheet would teach to a person of ordinary skill in the art. Nor does Patent Owner provide any detail regarding the specific tests it purports to have conducted using the simulation software.

[6] Patent Owner does not argue separately any of the challenged dependent claims.

On this record, and absent evidence to the contrary, only attorney argument, we credit Dr. Casey's testimony and determine that Petitioner has made a sufficient showing regarding the combination of the HIP5020 Datasheet and Darmawaskita.[7]

Second, Patent Owner argues that a person of ordinary skill in the art would not have had reason to combine the teachings of the HIP5020 Datasheet and Darmawaskita because the references disclose unrelated circuits, with (1) the HIP5020 Datasheet being used to discharge a battery and Darmawaskita being used to charge a battery, and (2) the HIP5020 Datasheet using an analog control system and Darmawaskita using a digital microcontroller. Prelim. Resp. 33-35. Patent Owner's arguments, however, do not rebut specifically Petitioner's alleged reasons or Dr. Casey's testimony as to why an ordinarily skilled artisan would use the HIP5020 Datasheet converter to charge a battery in light of Darmawaskita. *See* Pet. 27-28; Ex. 1011 ¶¶ 34, 47, 77-78. Patent Owner does not explain why it believes those reasons are incorrect or why it would be beyond the level of ordinary skill to combine the teachings of the references. *See, e.g.*, *Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007) (finding that the patent owner "present[ed] no evidence that the inclusion of a reader in [a prior art] type of device was uniquely challenging or difficult for one of ordinary skill in the art" or "any evidence that the inclusion of a device commonly used in the field of electronics (a reader) . . . represented an unobvious step over the prior art"). Indeed, it is often necessary and

[7] We also note that, while unavailable to Patent Owner at this stage of the proceeding, should Patent Owner intend to rely on the simulation software in its response, Patent Owner must provide a supporting affidavit. *See* 37 C.F.R. § 42.65(b).

within the level of ordinary skill in the art to modify the teachings of two references in order to combine them. *See In re Sneed*, 710 F.2d 1544, 1550 (Fed. Cir. 1983) ("[I]t is not necessary that the inventions of the references be physically combinable to render obvious the invention under review."); *In re Keller*, 642 F.2d 413, 425 (CCPA 1981) ("The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference . . . . Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art."). Further, Patent Owner's argument regarding the difference in the reference's control mechanisms is not persuasive given that claim 1 is directed to a battery charger, not a controller for such a battery charger.

Third, Patent Owner argues that other references indicate various problems with using a non-battery charging converter like that described in the HIP5020 Datasheet to charge a battery, and using the HIP5020 converter to charge a battery would cause the converter to "break down." Prelim. Resp. 4-7. Patent Owner cites U.S. Patent No. 6,437,549 B1 ("Takagishi") (Ex. 2001), which discloses that "[m]ost switching regulators available [in 2000 when Takagishi was filed were] not intended to be used as battery chargers." Ex. 2001, col. 1, ll. 48-49; *see* Prelim. Resp. 4-6. Takagishi states that one reason for this was that a battery can supply power *to* or receive power *from* a switching regulator:

> [T]he entire switching regulator is (in some sense) symmetric in that it can either transmit power from its input to its output (the normal "buck" direction), or it can transmit power from its output to its input (the reverse "boost" direction). As a result, if the primary power source (e.g., input) is turned off, the synchronous buck switching regulator can draw power from the

> battery and charge its input filter capacitor. The voltage on the input filter capacitor will increase until some component breaks down. This is a problem that requires special attention on the part of a charger designer.

Ex. 2001, col. 1, l. 59-col. 2, l. 6. Similarly, Patent Owner cites a 2004 article ("Formenti") (Ex. 2003) stating that "using standard controllers for a synchronous conversion potentially can cause various problems when a battery load is used, unless additional circuits are designed into the overall solution." Ex. 2003 at 9; *see* Prelim. Resp. 6. According to Patent Owner, the HIP5020 Datasheet does not account for these problems. Prelim. Resp. 4-6.

Patent Owner does not point to sufficient and credible evidence demonstrating that the specific converter in the HIP5020 Datasheet would suffer the problems described in Takagishi and Formenti or that, even if that was the case, a person of ordinary skill in the art would not have been able to overcome such problems. Indeed, Takagishi itself describes a prior art "attempted solution" of adding a "large, high current rectifier diode in series with the output filter inductor," as well as Takagishi's own improved battery charger. *See* Ex. 2001, col. 2, ll. 7-19; col. 2, l. 52-col. 5, l. 47. Thus, we are not persuaded that an ordinarily skilled artisan would not have been able to combine the references based on the problems described in Takagishi and Formenti.

Fourth, Patent Owner argues that Darmawaskita discloses a switching frequency of only 250 kilohertz and, therefore, "to the extent that any of the components of the HIP5020 could be modified in accordance with Darmawaskita, it would mean stepping down the switching frequency to 250KHz or lower," which would not be a "switching frequency of at least

1 megahertz" as recited in claim 1. Prelim. Resp. 35-36. Petitioner's contention, however, is that the HIP5020 Datasheet alone discloses a "switching frequency of at least 1 megahertz." *See* Pet. 22 (citing Ex. 1003 at 1 ("100kHz to 1MHz PWM Switching Frequency")), 36. Petitioner has shown sufficiently that the HIP5020 Datasheet teaches the structural limitations of the claim, including a switching controller operating at a "switching frequency of at least 1 megahertz," and that an ordinarily skilled artisan would have had reason to use the device as a battery charger based on the teachings of Darmawaskita.

Finally, Patent Owner argues generally as to all of Petitioner's proposed grounds of unpatentability that Dr. Casey's declaration is conclusory and should be excluded or given little weight. Prelim. Resp. 54-56. We have reviewed the declaration and determine that it supports Petitioner's analysis as to all of the grounds on which an *inter partes* review is instituted, including the combination of the HIP5020 Datasheet and Darmawaskita.

In conclusion, Petitioner has demonstrated a reasonable likelihood of prevailing on its assertion that claims 1, 4, 7-10, 13, 14, 17, and 18 are unpatentable over the combination of the HIP5020 Datasheet and Darmawaskita. Petitioner also asserts that claims 1, 4, 7-10, 13, 14, 17, and 18 are anticipated by the HIP5020 Datasheet, unpatentable over the HIP5020 Datasheet, unpatentable over the combination of the HIP5020 Datasheet and ADP3804 Datasheet, and unpatentable over the combination of the HIP5020 Datasheet and LT1620 Datasheet. The additional asserted grounds are denied as redundant in light of our determination that there is a reasonable likelihood that the challenged claims are unpatentable based on the

combination of the HIP5020 Datasheet and Darmawaskita. *See* 37 C.F.R. § 42.108.

B. Asserted Grounds Based on the ADP3804 Datasheet

Petitioner contends that claims 1, 4, 7-10, 13, 14, 17, and 18 are (1) unpatentable over the ADP3804 Datasheet and Darmawaskita under 35 U.S.C. § 103(a); and (2) unpatentable over the ADP3804 Datasheet and Shenai under 35 U.S.C. § 103(a). Pet. 49-57. To support its assertions, Petitioner relies on the analysis of Dr. Casey (Ex. 1011). We are persuaded that Petitioner has established a reasonable likelihood of prevailing on its assertion that claims 1, 4, 7-10, 13, 14, 17, and 18 are unpatentable for the reasons explained below.

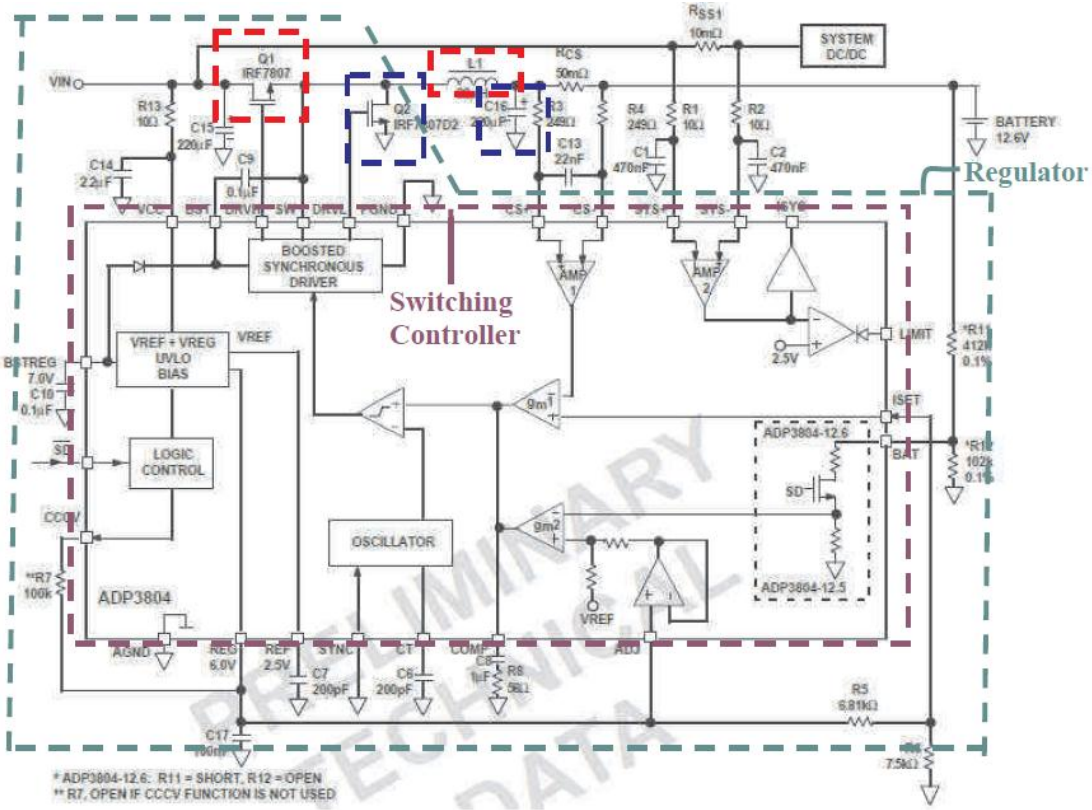
1. The ADP3804 Datasheet (Ex. 1004)

The ADP3804 Datasheet is a product datasheet describing a "High Frequency Switch Mode Li-Ion Battery Charger." Ex. 1004 at 1. The datasheet states that "[t]he ADP3804 is a complete Li-Ion battery charging IC. The device combines high output voltage accuracy with constant current control to simplify the implementation of Constant-Current, Constant-Voltage (CCCV) chargers." *Id*. The device is "available in three versions, a fixed 12.525 V output, a fixed 12.6 V output and an adjustable output." *Id*. at 5.

2. Analysis

Petitioner contends that the ADP3804 Datasheet discloses all of the limitations of independent claim 1 except a switch and rectifier being part of

a "monolithically formed" buck-type regulator. Pet. 43-45, 49-50. For example, Petitioner provides an annotated version of Figure 1 of the reference to demonstrate how the ADP3804 Datasheet discloses a "buck-type regulator" comprising a "switching controller," "switch," and "rectifier," and coupled to a "capacitor" and "inductor." *Id*. at 43-44. Petitioner's annotated version is reproduced below:



Id. at 44. Petitioner argues that the ADP3804 Datasheet discloses duty ratios of "less than 10% through 96% at 200 KHz, or less than 10% through 80% at 1 MHz." *Id*. at 31-32, 43 (citing Ex. 1011 ¶ 90). For example, the reference describes an output voltage (V_{BAT}) of 12.6 V and input voltage (V_{CC}) of 16 V, for a duty ratio of approximately 79% (12.6 V / 16 V). *See* Ex. 1004 at 2.

Petitioner acknowledges that the switch Q1 and rectifier Q2 shown in Figure 1 above are outside the "ADP3804" device and, therefore, not part of a "monolithically formed" buck-type regulator. Pet. 44, 49-50. Petitioner relies on Darmawaskita for a teaching of a "monolithically formed" buck-type regulator. *Id*. at 49-50 (citing Darmawaskita, Abstract, Fig. 7, and col. 12, ll. 38-45). Petitioner argues that a person of ordinary skill in the art would have had reason to modify the circuitry described in the ADP3804 Datasheet to be monolithically formed, citing the testimony of Dr. Casey in support. *Id*. at 41-42, 49-50 (citing Ex. 1011 ¶¶ 86-87). Upon review of Petitioner's analysis and supporting declaration, we are persuaded that Petitioner's asserted ground of unpatentability based on the combination of the ADP3804 Datasheet and Darmawaskita has merit as to independent claim 1 and dependent claims 4, 7-10, 13, 14, 17, and 18.

Patent Owner disputes Dr. Casey's opinion that it would have been obvious to combine the teachings of the ADP3804 Datasheet and Darmawaskita to arrive at the battery charger recited in independent claim 1.[8] Prelim. Resp. 42-43. Dr. Casey testifies that modifying the ADP3804 Datasheet circuitry to be monolithically formed "would have been obvious given that it was well known that battery charging buck converters with power and logic MOSFETs could be formed monolithically." Ex. 1011 ¶ 86. As support for this proposition, Dr. Casey cites two references: D. Rossi *et al.*, "Fully Integrated Fast Battery Charger with PWM Current Control and Microprocessor on Board," *Solid-State Circuits Conference, ESSCIRC '95*, pp. 94-97 (Sept. 1995) ("Rossi") (Ex. 1015); and Vladimir

[8] Patent Owner does not argue separately any of the challenged dependent claims.

Rumennik, "Power Devices are in the Chips," *IEEE Spectrum* (July 1985) ("Rumennik") (Ex. 1016). Patent Owner contends that contrary to Dr. Casey's representation, the cited documents do *not* show specifically a buck converter with power and logic MOSFETs formed monolithically that can be used to charge a battery. Prelim. Resp. 42-43.

We have reviewed the references and agree that they do not appear to disclose specifically "battery charging *buck converters* with power and logic MOSFETs" that are "formed monolithically." *See* Ex. 1011 ¶ 86 (emphasis added). The references, however, disclose generally the concept of integrating power and logic MOSFETS in a battery charger, and, therefore, provide some support for Dr. Casey's conclusion. Regardless, though, Dr. Casey provides other reasons why a person of ordinary skill in the art would combine the ADP3804 Datasheet and Darmawaskita, which Patent Owner does not address. Dr. Casey testifies:

> [M]odifying ADP3804 to form the "switch" and "rectifier" on-chip in light of well-known monolithically formed step-down converters, or a monolithically formed step-up converter is nothing more than "[a]pplying a known technique to a known device ready for improvement to yield predictable results." In particular, integrating power MOSFETs (a known technique) into a battery charging step-down converter such as ADP3804 (a known device) in order to reduce the size, number, and cost of components (improvement) and still regulate the voltage and current flow to a battery (predictable results) supports a conclusion of obviousness.

Ex. 1011 ¶ 87 (internal footnotes omitted) (citing paragraphs 59, 105, and 108 addressing the HIP5020 Datasheet, Shenai, and Darmawaskita's disclosure of monolithically formed components). Based on Dr. Casey's analysis and Darmawaskita's teaching of a "monolithically formed" buck-type regulator, we are persuaded that Petitioner has made a sufficient

showing regarding the combination of the ADP3804 Datasheet and Darmawaskita.

We also are not persuaded by Patent Owner's other arguments regarding the combination of the ADP3804 Datasheet and Darmawaskita. Patent Owner contends that a person of ordinary skill in the art would not have combined the references because the ADP3804 Datasheet uses an analog control system while Darmawaskita uses a digital microcontroller. Prelim. Resp. 43-44. This argument is similar to the argument Patent Owner makes with respect to the combination of the HIP5020 Datasheet and Darmawaskita, which we do not find persuasive for the reasons stated above. *See id*. at 33-35; *supra* Section II.A.3. Patent Owner further argues that Darmawaskita discloses a switching frequency of only 250 kilohertz, not a "switching frequency of at least 1 megahertz" as recited in claim 1. Prelim. Resp. 44-45. This argument is similar to Patent Owner's earlier argument as well. *See id*. at 35-36. Petitioner's contention is that the ADP3804 Datasheet alone, not Darmawaskita, teaches the limitation. Pet. 45 (citing Ex. 1004 at 2 (oscillator operating at 1000 kHz, which is 1 MHz)), 50. Thus, Patent Owner's argument is not persuasive for the reasons stated above. *See supra* Section II.A.3.

In conclusion, Petitioner has demonstrated a reasonable likelihood of prevailing on its assertion that claims 1, 4, 7-10, 13, 14, 17, and 18 are unpatentable over the combination of the ADP3804 Datasheet and Darmawaskita. Petitioner also asserts that claims 1, 4, 7-10, 13, 14, 17, and 18 are unpatentable over the combination of the ADP3804 Datasheet and Shenai. This additional asserted ground is denied as redundant in light of our determination that there is a reasonable likelihood that the challenged

claims are unpatentable based on the combination of the ADP3804 Datasheet and Darmawaskita. *See* 37 C.F.R. § 42.108.

C. Asserted Ground Based on the LTC3404 Datasheet

Petitioner contends that claims 1, 4, 5, and 6 are unpatentable over the LTC3404 Datasheet and Darmawaskita under 35 U.S.C. § 103(a). Pet. 58-60. To support its assertions, Petitioner relies on the analysis of Dr. Casey (Ex. 1011). We are persuaded that Petitioner has established a reasonable likelihood of prevailing on its assertion that claims 1, 4, 5, and 6 are unpatentable for the reasons explained below.

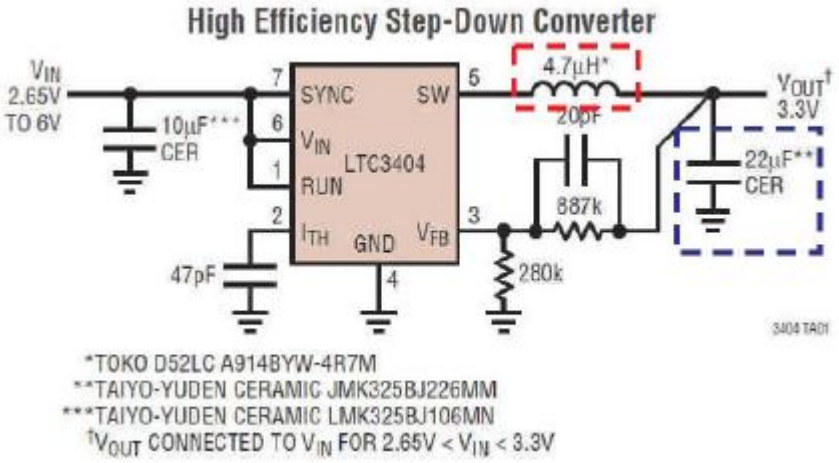
1. The LTC3404 Datasheet (Ex. 1002)

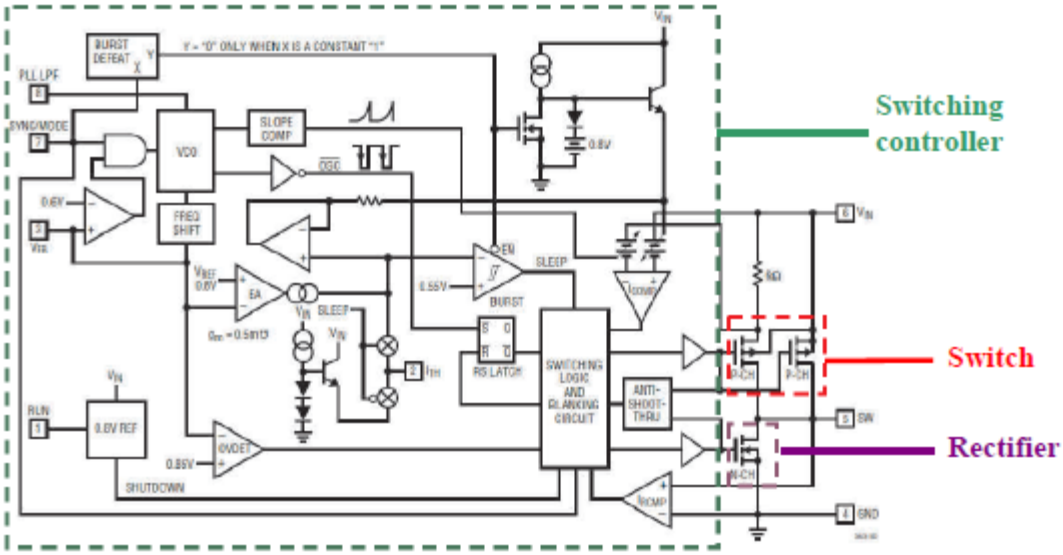
The LTC3404 Datasheet is a product datasheet describing a "1.4MHz High Efficiency Monolithic Synchronous Step-Down Regulator." Ex. 1002 at 1. The regulator has a "2.65V to 6V Input Voltage Range" and "Low Output Voltages." *Id.* The LTC3404 Datasheet discloses that "[s]witching frequency is internally set at 1.4MHz, allowing the use of small surface mount inductors and capacitors. For noise sensitive applications the LTC3404 can be externally synchronized from 1MHz to 1.7MHz. Burst Mode operation is inhibited during synchronization or when the SYNC/MODE pin is pulled low, preventing low frequency ripple from interfering with audio circuitry." *Id*.

2. Analysis

Petitioner contends that the LTC3404 Datasheet discloses a "chip similar to HIP5020" and, in combination with Darmawaskita, renders claims

1, 4, 5, and 6 unpatentable, citing the analysis of Dr. Casey in support. Pet. 58-60; *see* Ex. 1011 ¶¶ 124-35. Dr. Casey, for example, provides the following annotated versions of the figures on pages 1 and 6 of the LTC3404 Datasheet:





Ex. 1011 ¶ 127 (citing Ex. 1002). The above annotated versions of the figures on pages 1 and 6 of the LTC3404 Datasheet depict, for example, a "switching controller," "switch," and "rectifier." *Id*. Further, as explained above, Darmawaskita teaches the use of a step-down converter as a battery

charger. As to dependent claims 5 and 6, which recite a "P-type Metal Oxide Semiconductor switch" and a "P-type Metal Oxide Semiconductor switch" comprising a "plurality of P-type Metal Oxide Semiconductor Field Effect Transistors," Petitioner points to the P-channel MOSFETs designated as "P-CH" in the second figure above. Pet. 59-60 (citing Ex. 1011 ¶¶ 132-35). Upon review of Petitioner's analysis and supporting declaration, we are persuaded that Petitioner's asserted ground of unpatentability based on the combination of the LTC3404 Datasheet and Darmawaskita has merit as to independent claim 1 and dependent claims 4, 5, and 6.

Patent Owner argues that Petitioner has not shown a reasonable likelihood of prevailing as to independent claim 1[9] because Dr. Casey's testimony regarding the LTC3404 Datasheet is incorrect. Prelim. Resp. 48-50. Specifically, Dr. Casey cites the graph on page 1 of the datasheet showing a duty ratio of approximately 92% (3.3 V / 3.6 V) in "Burst Mode OPERATION." Ex. 1011 ¶¶ 126, 129; *see* Ex. 1002 at 1. Patent Owner argues that Dr. Casey provides no reason to believe the LTC3404 device can "be used to charge a battery in the Burst Mode Operation" or "operate at a frequency of at least 1MHz in the Burst Mode Operation." Prelim. Resp. 48-49. Similarly, Patent Owner asserts that the LTC3404 Datasheet discloses only that "the internal power MOSFETs operate intermittently based on load demand" in Burst Mode operation, not that the device has a switching frequency of at least 1 MHz in Burst Mode operation. *Id*. at 49-50; *see* Ex. 1002 at 7.

[9] Patent Owner does not argue separately any of the challenged dependent claims.

Patent Owner's arguments are not persuasive, as Dr. Casey's analysis is based primarily on disclosures in the LTC3404 Datasheet directed to the device in general, not the device operating in Burst Mode in particular. *See, e.g.*, Ex. 1011 ¶¶ 126 (relying on page 8 of the reference regarding duty cycles for a teaching of the claimed duty ratio range), 128 (relying on pages 1-2 of the reference showing a switching frequency of 1.25-1.65 MHz), 129. Dr. Casey's analysis is not premised entirely on the Burst Mode operation graph as Patent Owner suggests. On this record, and absent evidence to the contrary, only attorney argument, we credit Dr. Casey's testimony and determine that Petitioner has made a sufficient showing regarding the combination of the LTC3404 Datasheet and Darmawaskita.

Patent Owner's other arguments are similar to the arguments addressed above regarding the combination of the HIP5020 Datasheet and Darmawaskita. *See* Prelim. Resp. 50-54. These arguments are not persuasive for the reasons stated above. *See supra* Section II.A.3.

In conclusion, Petitioner has demonstrated a reasonable likelihood of prevailing on its assertion that claims 1, 4, 5, and 6 are unpatentable over the combination of the LTC3404 Datasheet and Darmawaskita.

D. Whether the Petition Should be Denied Because Petitioner's Counsel Also Represents Another Party in the Related Litigation

Finally, Patent Owner in its preliminary response argues that the Board should exercise its discretion to deny the Petition because the same law firm that represents Petitioner in this proceeding (Baker Botts L.L.P.) also represents Research in Motion Corporation ("RIM," now known as BlackBerry Corporation) in a related litigation where the '298 patent is being asserted, *Unifi Scientific Batteries, LLC v. Research in Motion Corp.*,

et al., E.D. Tex. Case No. 6:12-cv-00223-LED-JDL. Prelim. Resp. 56-57. Patent Owner argues that if the Petition is granted, Baker Botts L.L.P. could represent Petitioner in challenging the patentability of the asserted claims in this proceeding and then, if unsuccessful, represent RIM in challenging validity in the related litigation. *Id*. According to Patent Owner, this is unfairly prejudicial as it would "circumvent" the estoppel provisions of 35 U.S.C. § 315(e). *Id.*

We are not persuaded that the Petition should be denied based on which attorneys are representing Petitioner in this proceeding. The estoppel provisions in 35 U.S.C. § 315(e) apply to a "petitioner" and "real party in interest or privy of the petitioner," not a petitioner's counsel. Petitioner does not point to anything in the statute, legislative history, or rules indicating that a law firm may not represent multiple parties to an infringement lawsuit, some of whom may be estopped by virtue of an *inter partes* review and others who may not. We also are mindful of respecting a party's choice of counsel. Finally, Patent Owner's concern over potential estoppel is speculative, as the estoppel provisions of 35 U.S.C. § 315(e) only occur when there has been a final written decision in an *inter partes* review, which has not yet occurred. Thus, we decline to dismiss the Petition based on Petitioner's choice of counsel.

E. Conclusion

We conclude that Petitioner has demonstrated a reasonable likelihood of prevailing on the following grounds of unpatentability asserted in the Petition:

Claims 1, 4, 7-10, 13, 14, 17, and 18 under 35 U.S.C. § 103(a) as unpatentable over the HIP5020 Datasheet and Darmawaskita;

Claims 1, 4, 7-10, 13, 14, 17, and 18 under 35 U.S.C. § 103(a) as unpatentable over the ADP3804 Datasheet and Darmawaskita; and

Claims 1, 4, 5, and 6 under 35 U.S.C. § 103(a) as unpatentable over the LTC3404 Datasheet and Darmawaskita.

The Board, however, has not made a final determination under 35 U.S.C. § 318(a) with respect to the patentability of the challenged claims.

F. Joinder

The AIA permits joinder of *inter partes* review proceedings:

> (c) JOINDER.—If the Director institutes an inter partes review, the Director, in his or her discretion, may join as a party to that inter partes review any person who properly files a petition under section 311 that the Director, after receiving a preliminary response under section 313 or the expiration of the time for filing such a response, determines warrants the institution of an inter partes review under section 314.

35 U.S.C. § 315(c); *see* 37 C.F.R. § 42.122(a) ("[w]here another matter involving the patent is before the Office, the Board may during the pendency of the *inter partes* review enter any appropriate order regarding the additional matter including providing for the stay, transfer, consolidation, or termination of any such matter"). The Board's rules for AIA proceedings "shall be construed to secure the just, speedy, and inexpensive resolution of every proceeding." 37 C.F.R. § 42.1(b); *see* Office Patent Trial Practice Guide, 77 Fed. Reg. at 48758.

On March 26, 2013, prior to the Petition in the instant proceeding being filed, Texas Instruments Incorporated ("TI") filed a petition to institute

an *inter partes* review of claims 1 and 4-18 of the '298 patent. *See* IPR2013-00213, Paper 1 at 3. In a decision entered concurrently with this decision, TI's petition is granted as to claims 1 and 4-18. Thus, Case IPR2013-00213 overlaps with this proceeding as to claims 1, 4-10, 13, 14, 17, and 18. The parties should be prepared to discuss during the initial conference call whether this proceeding should be joined with Case IPR2013-00213, taking into account the need for a just, speedy, and inexpensive resolution of both proceedings.

III. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that the Petition is granted as to claims 1, 4-10, 13, 14, 17, and 18 of the '298 patent;

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(a), *inter partes* review of the '298 patent is hereby instituted commencing on the entry date of this Order, and pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial;

FURTHER ORDERED that the trial is limited to the grounds identified under the heading "Conclusion" above, and no other grounds set forth in the Petition as to claims 1, 4-10, 13, 14, 17, and 18 of the '298 patent are authorized; and

FURTHER ORDERED that an initial conference call with the Board is scheduled for 3:30 PM Eastern Time on October 16, 2013. The parties are directed to the Office Patent Trial Practice Guide, 77 Fed. Reg. 48756, 48765-66 (Aug. 14, 2012), for guidance in preparing for the initial conference call, and should come prepared to discuss any proposed changes

to the Scheduling Order entered herewith and any motions the parties anticipate filing during the trial. The parties also should be prepared to discuss whether this proceeding should be joined with Case IPR2013-00213.

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