

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION,
Petitioner,

v.

QUALCOMM, INC.,
Patent Owner.

Case IPR2018-01240
Patent 8,698,558 B2

Before TREVOR M. JEFFERSON, DANIEL N. FISHMAN, and
SCOTT B. HOWARD, *Administrative Patent Judges*.

JEFFERSON, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining Some Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

In this *inter partes* review, Intel Corporation (“Petitioner”) challenges claims 10 and 11 of U.S. Patent No. 8,698,558 B2 (“the ’558 patent,” Ex. 1301) which is assigned to Qualcomm Incorporated (“Patent Owner”). Paper 3 (“Petition” or “Pet.”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision, issued pursuant to 35 U.S.C. § 318(a), addresses issues and arguments raised during the trial in these *inter partes* reviews. For the reasons discussed below, we determine that Petitioner has not demonstrated the unpatentability of claims 10 and 11.

A. Procedural History

Petitioner filed a Petition challenging claims 10 and 11 of the ’558 patent (Pet. 6, 50–51), Patent Owner filed a Preliminary Response (Paper 8). We instituted trial on all grounds of unpatentability. Paper 9 (“Dec. on Inst.”), 23–24. During trial, Patent Owner filed a Response (Paper 16, “PO Resp.”), Petitioner filed a Reply (Paper 19, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 22, “PO Sur-reply”). A combined oral hearing for this *inter partes* review and IPR2019-01154 was held on October 28, 2019, a transcript of which appears in the record in each case. Paper 27.

B. Instituted Grounds of Unpatentability

We instituted *inter partes* review of claims 10 and 11 of the ’558 patent in on the following grounds:

Claim(s) Challenged	35 U.S.C. §	References
10	103(a) ¹	Chu, ² Choi 2010, ³ and Hanington ⁴
11	103(a)	Chu, Choi 2010, Hanington and Myers. ⁵

Dec. on Inst. 6, 20–22; *see* Pet. 6, 50–51.

In support of these grounds, Petitioner relies on the Declaration of Dr. Alyssa ApSEL (Ex. 1303), the Reply Declaration of Dr. Alyssa B. ApSEL (Ex. 1329), and the Deposition of Dr. Arthur Kelley (Ex. 1330) in support the Petition. Patent Owner relies on the Declaration of Dr. Arthur Kelley (Ex. 2002) and Depositions of Dr. Alyssa ApSEL (Ex. 2003; Ex. 2004).

C. Related Proceedings

Apple Inc. is identified as an additional real party-in-interest. Pet. 2. The parties inform us that the '558 patent was asserted against Petitioner in the litigation *Qualcomm Inc. v. Apple Inc.*, Case No. 3:17-cv-01375-DMS-MDD (S.D. Cal.) and against Apple in a proceeding before the International

¹ The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. §§ 102, 103 that became effective on March 16, 2013. Because the '558 patent issued from an application filed before March 16, 2013, we apply the pre-AIA versions of the statutory bases for unpatentability.

² Wing-Yee Chu, et al., *A 10 MHz Bandwidth, 2 mV Ripple PA Regulator for CDMA Transmitters*, IEEE JOURNAL OF SOLID-STATE CIRCUITS 2809–2819 (2008) (Ex. 1304, “Chu”).

³ Jinsung Choi, et al., *Envelope Tracking Power Amplifier Robust to Battery Depletion*, MICROWAVE SYMPOSIUM DIGEST (MTT), 2010 IEEE MTT-S INTERNATIONAL 1074–1077 (2010) (Ex. 1307, “Choi 2010”).

⁴ Gary Hanington, et al., *High-Efficiency Power Amplifier Using Dynamic Power-Supply Voltage for CDMA Applications*, IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES 47:8 (1999) (Ex. 1325, “Hanington”)

⁵ Myers, et al., U.S. Patent No. 5,929,702 (Ex. 1312, “Myers”).

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Trade Commission (“ITC”) captioned *In the Matter of Certain Mobile Electronic Devices and Radio Frequency and Processing Components Thereof*, Inv. No. 337-TA-1065. Pet. 2; Paper 5, 2.

D. The ’558 Patent and Illustrative Claims

The ’558 patent is titled “Low-Voltage Power-Efficient Envelope Tracker” and discloses “[t]echniques for efficiently generating a power supply for a power amplifier” used in communication system transmitters. Ex. 1301, 1:30–31, code (54). The ’558 patent discloses that a

transmitter typically includes a power amplifier (PA) to provide high transmit power for the output RF signal. The power amplifier should be able to provide high output power and have high power-added efficiency (PAE). Furthermore, the power amplifier may be required to have good performance and high PAE even with a low battery voltage.

Id. at 1:21–26. The ’558 patent also discloses that the power amplifier apparatus may include: (1) in one embodiment, an envelope amplifier and a boost converter; (2) in a second embodiment a switcher, an envelope amplifier, and a power amplifier; or (3) in a third embodiment, a switcher that may sense an input current and generate a switching signal to charge and discharge an inductor providing a supply current. *Id.* at 1:31–34, 1:51–52, 1:66–2:2.

Figure 3, below, shows an exemplary switcher and envelope amplifier. Ex. 1301, 4:39–42.

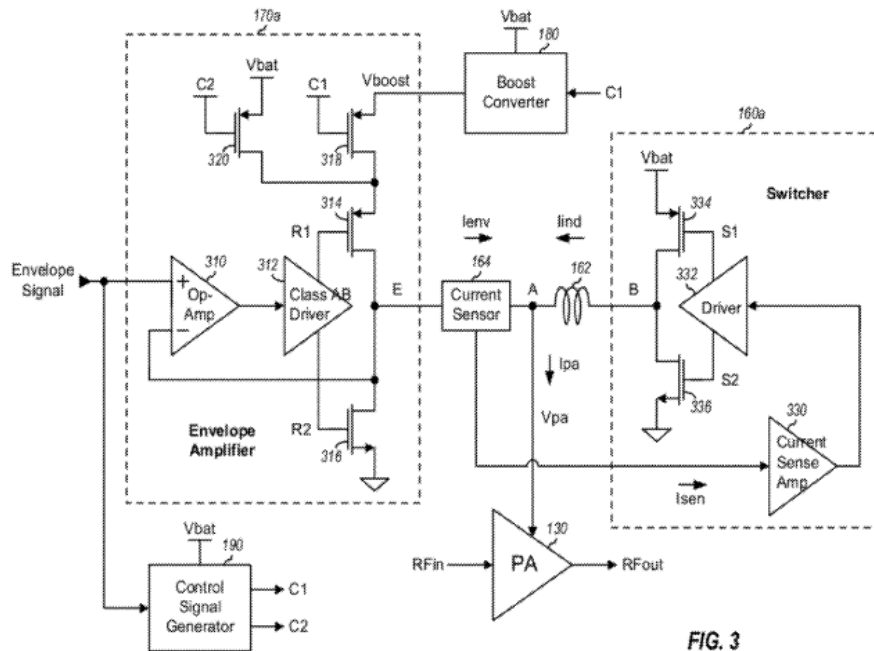


FIG. 3

Figure 3 shows switcher 160a and envelope amplifier 170a, which, in turn, includes operational amplifier (op-amp) 310 that receives the envelope signal. *Id.* at 4:41–63. Driver 312 has output (R1) coupled to the gate of P-channel metal oxide semiconductor (PMOS) transistor 314 and a second output (R2) coupled to N-channel MOS (NMOS) transistor 316. *Id.* PMOS transistor 318 in envelope amplifier 170a is connected to receive C1 control signal via Vboost voltage from Boost Converter 180. *Id.* PMOS transistor 320 in envelope amplifier 170 receives a C2 control signal and Vbat voltage. *Id.*

Within switcher 160a, current sense amplifier 330 has its input coupled to current sensor 164 and its output coupled to an input of switcher driver 332. *Ex.* 1301, 4:64–66. Vbat voltage of switcher 160a provides current to power amplifier 130 via inductor 162 when the switcher is ON, and inductor 120 provides stored energy to power amplifier 130 during the OFF state of the switcher circuit. *Id.* at 5:14–30. In the ON state, the switcher is joined with the current from the envelope amplifier 170a (I_{env})

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