

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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INTEL CORPORATION,  
Petitioner,

v.

R2 SEMICONDUCTOR, INC.,  
Patent Owner.

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Case IPR2017-00707

Case IPR2017-00708

Case IPR2017-01124

Patent 8,233,250 B2

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Before JAMESON LEE, JEAN R. HOMERE, and JENNIFER S. BISK,  
*Administrative Patent Judges.*

HOMERE, *Administrative Patent Judge.*

FINAL WRITTEN DECISION  
*Inter Partes* Review  
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

Case IPR2017-00707  
Case IPR2017-00708  
Case IPR2017-01124  
Patent 8,233,250 B2

## I. INTRODUCTION

Intel Corporation (“Petitioner”) filed three petitions requesting *inter partes* review of U.S. Patent No. 8,233,250 B2 (Ex. 1201, “the ’250 patent”). IPR2017-00707, Paper 4 (“Pet.”); IPR2017-00708, Paper 4 (“’708 Pet.”); IPR2017-01124, Paper 4 (“’1124 Pet.”). In each case we instituted a trial on all challenged claims resulting in review of all claims, 1–31, of the ’250 patent.<sup>1</sup> IPR2017-00707, Paper 10 (“Inst. Dec.”); IPR2017-00708, Paper 10 (“’708 Inst. Dec.”); IPR2017-01124, Paper 10 (“’1124 Inst. Dec.”).

Patent Owner filed a Patent Owner Response in each case. IPR2017-00707, Paper 34 (“PO Resp.”); IPR2017-00708, Paper 34 (“’708 PO Resp.”); IPR2017-01124, Paper 34 (“’1124 PO Resp.”). Similarly, Petitioner filed a Reply in each case. IPR2017-00707, Paper 60 (“Reply”); IPR2017-00708, Paper 58 (“’708 Reply”); IPR2017-01124, Paper 58 (“’1124 Reply”).<sup>2</sup>

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<sup>1</sup> Claims 1–4, 7–9, 13–17, 20–22, and 29 were reviewed in IPR2017-00707, claims 10–12, 23–26, 28, and 31 were reviewed in IPR2017-00708, and claims 5, 6, 18, 19, 27, and 30 were reviewed in IPR2017-01124.

<sup>2</sup> Both parties also filed in each case a Motion to Exclude Evidence, each of which was fully briefed. IPR2017-00707, Papers 67, 69, 72, 74; IPR2017-00708, Papers 66, 68, 71, 73; IPR2017-01124, Papers 66, 68, 71, 73. Subsequently, the parties withdrew each of these motions. IPR2017-00707, Paper 78; IPR2017-00708, Paper 77; IPR2017-01124, Paper 78.

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In each case, Patent Owner filed a Contingent Motion to Amend, each of which was fully briefed.<sup>3</sup> IPR2017-00707, Papers 30, 48, 57, 69; IPR2017-00708, Papers 30, 46, 55, 61, 71; IPR2017-01124, Papers 30, 46, 55, 64.

A transcript of the consolidated oral hearing held on May 1, 2018, has been entered into the record as Paper 79<sup>4</sup> (“Tr.”).

Because of the substantial overlap in substance, we exercise our discretion and consolidate pursuant to 35 U.S.C. § 315(d), for purposes of this Final Written Decision only, the three proceedings.<sup>5</sup> For the reasons that follow, Petitioner has demonstrated by a preponderance of the evidence that claims 1–31 of the ’250 patent are unpatentable.

#### *A. Related Matters*

The parties indicate that the ’250 patent is involved in *R2 Semiconductor, Inc. v. Intel Corp. et al.*, Civil Action No. 2:16-cv-01011

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<sup>3</sup> Upon authorization, Patent Owner filed a corrected motion to amend in IPR2017-00708 and Petitioner filed a surreply in all three cases.

<sup>4</sup> For purposes of this Decision, unless otherwise indicated, a citation to “Paper XX” or “Ex. XXXX” will refer to documents filed in IPR2017-00707. Similarly, “’708 Paper XX” or “’708 Ex. XXXX” will refer to documents filed in IPR2017-00708 and “’1124 Paper XX” or “’1124 Ex. XXXX” will refer to documents filed in IPR2017-01124. Moreover, for efficiency and clarity, unless there is a relevant difference between the cases, we will cite only to documents in IPR2017-00707.

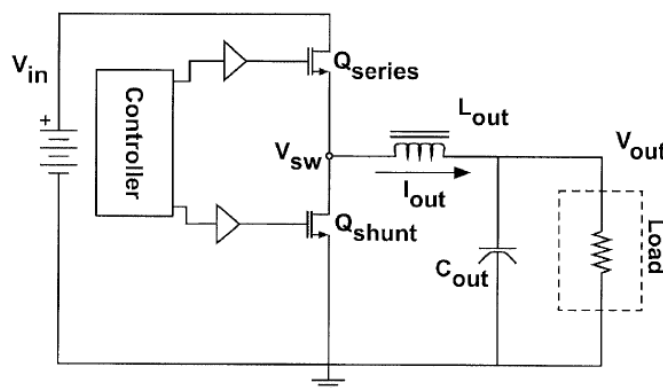
<sup>5</sup> Should the parties decide to file a rehearing request in response this Decision, they are likewise authorize to file a consolidated request.

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(E.D. Tex.) and *Certain Integrated Circuits with Voltage Regulators and Products Containing Same*, Investigation No. 337-TA-1024 (USITC). Pet. 3; Paper 7, 1–2. Petitioner has also challenged the '250 patent in 3 additional petitions (IPR2017-00705, -00706, and -01123). Pet. 3; Paper 7, 1–2.

### B. The '250 Patent

The '250 patent, titled “Over Voltage Protection of Switching Converter,” issued July 31, 2012, from U.S. Patent Application No. 12/646,451. Ex. 1201 at [54], [45], [21]. The '250 patent generally relates to a switched voltage regulator containing regulator circuitry coupled to a voltage spike protection circuitry including a dissipative element and a charge storage circuit such that the spike protection circuitry is able to protect the regulator circuitry against voltage spikes. *Id.* at Abstract. A conventional switched voltage regulator, as described in the '250 patent, is shown in Figure 2 below:



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Figure 2 depicts a conventional switched mode regulator having transistor  $Q_{\text{series}}$  and transistor  $Q_{\text{shunt}}$  connected at common switching node  $V_{\text{sw}}$ .

As shown in Figure 2 above, the '250 patent explains that the transistors are alternately turned on and off such that current  $I_{\text{out}}$  flows from source terminal  $V_{\text{in}}$ , through operating transistor  $Q_{\text{series}}/Q_{\text{shunt}}$ , and through inductor  $L_{\text{out}}$  to charge up capacitor  $C_{\text{out}}$ . *Id.* at 2:2–36.<sup>6</sup> According to the '250 patent, the intermittent switching of the transistors causes rapid switching in the capacitive load and “voltage spikes will occur in any converter that has fast switching transitions” caused by physical inductances present in any realistic packaged device, including the parasitic inductance of the various components of the circuit. *Id.* at 15:42–65, 16:31–37. In addition, according to the Specification, “most switched mode regulators require large valued (and physically large and thick) external inductors and capacitors to operate.” *Id.* at 1:62–64.

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<sup>6</sup> The '250 patent explains that “[w]hen the series switch 301 is rapidly turned off, this parasitic inductor tries to maintain the same output current, causing the voltage  $V_{\text{hi}}$  to increase rapidly in the absence of any preventive measures . . . the parasitic inductance may interact with parasitic capacitances to form a high-frequency resonant circuit, which will create a persistent ringing condition as a result of the initial rapid voltage transition.” Ex. 1201, 16:5–13.

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