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Paper 11
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SEMICONDUCTOR COMPONENTS INDUSTRIES, LLC
(d/b/a ON SEMICONDUCTOR),
Petitioner,

v.

POWER INTEGRATIONS, INC.,
Patent Owner.

Case IPR2016-01600
Patent 7,834,605 B2

Before THOMAS L. GIANNETTI, BRIAN J. McNAMARA, and LYNNE E. PETTIGREW, *Administrative Patent Judges*.

PETTIGREW, *Administrative Patent Judge*.

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

I. INTRODUCTION

Petitioner, Semiconductor Components Industries, LLC, d/b/a ON Semiconductor, filed a Petition for *inter partes* review of claims 1, 2, 5,

and 9 of U.S. Patent No. 7,834,605 B2 (Ex. 1001, "the '605 patent"). Paper 1 ("Pet."). Patent Owner, Power Integrations, Inc., filed a Preliminary Response. Paper 8 ("Prelim. Resp."). Institution of an *inter partes* review is authorized by statute when "the information presented in the petition . . . and any response . . . 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." 35 U.S.C. § 314(a); *see* 37 C.F.R. § 42.108. Upon consideration of the Petition and Preliminary Response, we conclude the information presented shows there is a reasonable likelihood that Petitioner would prevail in establishing the unpatentability of at least one of the challenged claims of the '605 patent.

A. Related Matters

The '605 patent was involved in the following district court proceeding: *Power Integrations, Inc. v. Fairchild Semiconductor Int'l, Inc.*, No. 1:08-cv-00309 (D. Del.). Pet. 2; Paper 4, 2. An appeal from the district court to the United States Court of Appeals for the Federal Circuit was pending at the time the Petition and Preliminary Response in this case were filed. *See* Pet. 2, 25–26; Paper 4, 2. On December 12, 2016, the Federal Circuit reversed the jury verdict that claims 1 and 2 of the '605 patent were not anticipated by U.S. Patent No. 4,763,238 to Maige (Ex. 1008). *Power Integrations, Inc. v. Fairchild Semiconductor Int'l, Inc.*, 843 F.3d 1315, 1335–39 (Fed. Cir. 2016); *see* Paper 9, 2.

B. The '605 Patent

The '605 patent describes a switch mode power supply with an approximately constant output voltage when the output current is below an output current threshold and an approximately constant output current when

the output voltage is below an output voltage threshold. Ex. 1001, 1:32–38, 1:51–53. In a described embodiment, the power supply includes a regulator circuit that controls the voltage and current at the output of the power supply. *Id.* at 5:31–49, Fig. 4. The regulator includes an internal switch (e.g., a power metal oxide semiconductor field effect transistor (MOSFET)) coupled to the primary winding of the power supply's energy transfer element (e.g., a transformer). *Id.* at 5:37–43, Fig. 4. The regulator may modify the duty cycle of the switch to control the output voltage based on feedback from the output of the power supply. *Id.* at 4:50–53, 5:37–39. The regulator also may modify the duty cycle by turning off the switch when the switch current reaches a current limit. *Id.* at 5:40–43.

According to the '605 patent, there is a fixed delay between the time the switch current reaches a current limit threshold and the time the switch is finally disabled. *Id.* at 3:18–24. This results in a current "overshoot" that will vary based on the input voltage of the power supply. *Id.* at 3:24–27. More specifically, at higher direct current (DC) input voltages, the actual current ramps to a higher level above the current limit threshold than at lower DC input voltages. *Id.* at 3:31–33.

The '605 patent attempts to overcome the problem of current variations and thereby achieve a power supply with an approximately constant output current. *Id.* at 2:45–50, 3:14–17. The purported solution is a power supply regulator circuit that creates a variable current limit threshold that increases during the on-time of the switch. *Id.* at Abstract, 1:53–59. Because the current overshoot is greater at higher DC input voltages than at lower DC input voltages, a variable current limit threshold should be lower for higher DC input voltages to compensate for the excess current during the

delay time. *Id.* at 3:40–44; *see* Ex. 1003 ¶ 22 (Declaration of Dr. Douglas Holberg). Further, because the switch current increases more quickly when the DC input voltage is high, a current limit will be reached earlier in a switching cycle when the DC input voltage is higher than when it is lower. Ex. 1001, 3:45–49; *see* Ex. 1003 ¶¶ 22–23. Thus, a variable current limit threshold that increases from a first level to a second level during the on-time of the switch results in an effective current limit (the sum of the variable current limit and the excess current during the delay) that is approximately constant across different input voltages. Ex. 1001, 3:50–62; *see* Ex. 1003 ¶ 23.

Figure 1 of the ’605 patent is reproduced below:

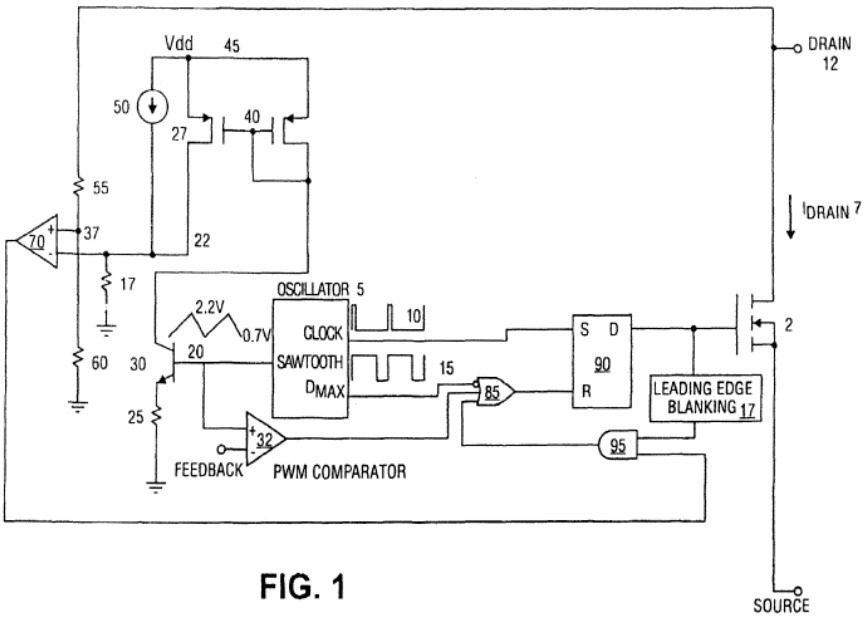

FIG. 1

Figure 1 illustrates an embodiment of a power supply regulator circuit described in the ’605 patent. Clock signal 10 sets latch 90 to enable power MOSFET 2 (i.e., turn the switch on). Ex. 1001, 4:19–24. Power MOSFET 2 is disabled (i.e., the switch is turned off) when latch 90 is reset by any one of three inputs to OR gate 85. *Id.* at 4:24–53. First,

comparator 32 may reset latch 90 based on the feedback voltage from the output of the power supply. *Id.* at 4:50–53. Second, comparator 70 may reset latch 90 when the drain current of MOSFET 2 exceeds a variable current limit threshold. *Id.* at 4:29–49. The variable current limit threshold at node 22 is the combination of constant current source 50 and linearly increasing current source 27. *Id.* at 4:32–42. Finally, maximum duty cycle signal D_{MAX} 15 may reset latch 90. *Id.* at 4:24–25.

C. Illustrative Claim

Claim 1 is the only independent claim of the '605 patent and is illustrative of the subject matter of the challenged claims:

> 1. A power supply regulator, comprising:
>
> a comparator having a first input coupled to sense a voltage representative of a current flowing through a switch during an on time of the switch, the comparator having a second input coupled to receive a variable current limit threshold that increases during the on time of the switch;
>
> a feedback circuit coupled to receive a feedback signal representative of an output voltage at an output of a power supply; and
>
> a control circuit coupled to generate a control signal in response to an output of the comparator and in response to an output of the feedback circuit, the control signal to be coupled to a control terminal of the switch to control switching of the switch.

Id. at 6:10–23.

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