

RELIABILITY REPORT
FOR
MAX8810AETM+
(MAX8809A/MAX8810A)
PLASTIC ENCAPSULATED DEVICES

January 7, 2009

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX8810AETM+ successfully meets the quality and reliability standards required of all Maxim products. In addition, Maxim's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim's quality and reliability standards.

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I. Device Description

A. General

The MAX8809A/MAX8810A synchronous, 2-/3-/4-phase, step-down, current-mode controllers with integrated dual-phase MOSFET drivers provide flexible solutions that fully comply with Intel® VRD11/VRD10 and AMD K8 Rev F CPU core supplies. The flexible design supplies load currents up to 150A for low-voltage CPU core power requirements. A tri-state SEL input is available to configure the VID logic for either the Intel VRD11/VRD10 or AMD K8 Rev F applications. An enable input (EN) is available to disable the IC. True-differential remote output-voltage sensing enables precise regulation at the load by eliminating the effects of trace impedance in the output and return paths. A high-accuracy DAC combined with precision current-sense amplifiers and droop control enable the MAX8809A/MAX8810A to meet the most stringent tolerance requirements of new-generation high-current CPUs. These ICs use either integral or voltage-positioning feedback control to achieve high output-voltage accuracy. The COMP input allows for either positive or negative voltage offsets from the VID code voltage. A power-good signal (VRREADY) is provided for startup sequencing and fault annunciation. The SS/OVP pin enables the programming of the soft-start period, and provides an indication of an overvoltage condition. A soft-stop feature prevents negative voltage spikes on the output at turn-off, eliminating the need for an external Schottky clamp diode. The MAX8809A/MAX8810A incorporate a proprietary "rapid active average" current-mode control scheme for fast and accurate transient-response performance, as well as precise load current sharing. Either the inductor DCR or a resistive current-sensing element is used for current sensing. When used with DCR sensing, rapid active current averaging (RA²) eliminates the tolerance effects of the inductance and associated current-sensing components, providing superior phase current matching, accurate current limit, and precise load-line. The MAX8809A operates as a single-chip, 2-phase solution with integrated drivers. It also provides a 3rd-phase PWM output and easily supports 3-phase design by adding the MAX8552 high-performance driver. The MAX8810A enables up to 4-phase designs by adding the MAX8523 high-performance dual driver for a compact 2-chip solution.

II. Manufacturing Information

A. Description/Function:	VRD11/VRD10, K8 Rev F 2/3/4-Phase PWM Controllers with Integrated Dual MOSFET Drivers
B. Process:	B8
C. Number of Device Transistors:	
D. Fabrication Location:	Texas
E. Assembly Location:	UTL Thailand
F. Date of Initial Production:	October 22, 2005

III. Packaging Information

A. Package Type:	48-pin TQFN 6x6
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-1851
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Ja:	38°C/W
K. Single Layer Theta Jc:	1.4°C/W
L. Multi Layer Theta Ja:	27°C/W
M. Multi Layer Theta Jc:	1.4°C/W

IV. Die Information

A. Dimensions:	135 X 121 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/Si (Si = 1%)
D. Backside Metallization:	None
E. Minimum Metal Width:	0.8 microns (as drawn)
F. Minimum Metal Spacing:	0.8 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

- A. Quality Assurance Contacts: Ken Wendel (Director, Reliability Engineering)
Bryan Preeshl (Managing Director of QA)
- B. Outgoing Inspection Level: 0.1% for all electrical parameters guaranteed by the Datasheet.
0.1% For all Visual Defects.
- C. Observed Outgoing Defect Rate: < 50 ppm
- D. Sampling Plan: Mil-Std-105D

VI. Reliability Evaluation

A. Accelerated Life Test

The results of the 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 144 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

(where 4340 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$$\lambda = 7.5 \times 10^{-9}$$

$\lambda = 7.5$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at <http://www.maxim-ic.com/>. Current monitor data for the B8 Process results in a FIT Rate of 2.71 @ 25C and 17.30 @ 55C (0.8 eV, 60% UCL)

B. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

C. E.S.D. and Latch-Up Testing

The PP28-2 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1500 V per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

Table 1
Reliability Evaluation Test Results

MAX8810AETM+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	144	0
Moisture Testing (Note 2) 85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2) Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality	77	0

Note 1: Life Test Data may represent plastic DIP qualification lots.

Note 2: Generic Package/Process data