RELIABILITY REPORT

FOR

MAX8686ETL+

PLASTIC ENCAPSULATED DEVICES

January 20, 2010

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX8686ETL+ 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 MAX8686 current-mode, synchronous PWM step-down regulator with integrated MOSFETs operates from a 4.5V to 20V input supply and generates an adjustable output voltage from 0.7V to 5.5V while delivering up to 25A per phase. The MAX8686 employs a peak current-mode architecture that operates with an adjustable switching frequency from 300kHz to 1MHz. An adjustable current-limit threshold allows for optimization for different applications with different load currents. Inductor current sense is achieved either using an external sense resistor or using a lossless inductor current-sense scheme. The foldback and hiccup current limit reduces the power dissipation during overload or short-circuit conditions and allows for autorecovery when the fault condition is removed. The MAX8686 offers the ability to start up monotonically even when there is a prebias output voltage. In addition, an adjustable soft-start capability allows for a controlled turn-on. The MAX8686 features an accurate 1% reference and offers a reference input that allows for a higher accuracy reference to be used for voltage tracking applications such as DDR memory. The MAX8686 can be paralleled (up to eight) together in a true multiphase mode to deliver up to 200A of output current. When operating in this mode, this device achieves better than 10% current balance between phases at full load. The MAX8686 supports programmable phase shedding to improve system efficiency during light load conditions. Other features include an enable input and a power-OK (POK) indicator used for power sequencing. The MAX8686 also features latch overvoltage protection that turns on the low-side MOSFET when the output voltage exceeds 120% of the nominal voltage. The MAX8686 is offered in a thermally enhanced 40-pin, 6mm x 6mm TQFN package.

II. Manufacturing Information

A. Description/Function:	Single/Multiphase, Step-Down, DC-DC Converter Delivers Up to 25A Per Phase
B. Process:	PP67Y: S45 (+ two MOSFETS)
C. Number of Device Transistors:	
D. Fabrication Location:	California, Texas
E. Assembly Location:	Malaysia
F. Date of Initial Production:	4/26/2008

III. Packaging Information

A. Package Type:	40-pin TQFN 6x6
B. Lead Frame:	Copper Alloy
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (2 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#31-4855
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:	37°C/W
K. Single Layer Theta Jc:	1°C/W
L. Multi Layer Theta Ja:	27°C/W
M. Multi Layer Theta Jc:	1°C/W

IV. Die Information

A. Dimensions:	40 x 175 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	N/A
E. Minimum Metal Width:	Metal1 = 0.5 / Metal2 = 0.6 / Metal3 = 0.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 / Metal2 = 0.5 / Metal3 = 0.6 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 48 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 22.4 \times 10^{-9}$

λ = 22.4 F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim"s reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at http://www.maxim-ic.com/qa/reliability/monitor. Cumulative monitor data for the S45 Process results in a FIT Rate of 0.49 @ 25C and 8.49 @ 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 PP82T (= PP67 + 2 Hybrids) die type has been found to have all pins able to withstand a HBM transient pulse of +/-500 V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250 mA, 1.5X VCCMax Overvoltage per JESD78.

Table 1

Reliability Evaluation Test Results

MAX8686ETL+

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	48	0
Moisture Testing (Note 2)				
HAST	Ta = 130°C RH = 85% Biased Time = 96hrs.	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