RELIABILITY REPORT

FOR

MAX8598ETE+

PLASTIC ENCAPSULATED DEVICES

April 7, 2010

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
Manager, Reliability Engineering

Conclusion

The MAX8598ETE+ 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.

Table of Contents

I. Device Description

A. General

The MAX8597/MAX8598/MAX8599 voltage-mode PWM step-down controllers are designed to operate from a 4.5V to 28V input supply and generate output voltages down to 0.6V. A proprietary switching algorithm stretches the duty cycle to > 99.5% for low-dropout design. Unlike conventional step-down regulators using a p-channel high-side MOSFET to achieve high duty cycle, the MAX8597/MAX8598/MAX8599 drive n-channel MOSFETs resulting in high efficiency and high-current-capability designs. The MAX8597 is available in a 20-pin thin QFN package and is designed for applications that use an analog signal to control the output voltage with an adjustable offset, such as DC fan-speed control. This is achieved with an internal uncommitted operational amplifier. The MAX8597 is also targeted for tracking output-voltage applications for chipsets, ASIC and DSP cores, and I/O supplies. The MAX8598/MAX8599 are available in a 16-pin thin QFN package and do not have the uncommitted operational amplifier, reference input, and reference output, but offer an open-drain, power-OK output. The MAX8597/MAX8598/MAX8599 allow startup with prebias voltage on the output for applications where a backup supply or a tracking device may charge the output capacitor before the MAX8597/MAX8598/MAX8599 are enabled. In addition, the MAX8599 features output overvoltage protection. These controllers also feature lossless high-side peak inductor current sensing, adjustable current limit, and hiccup-mode short-circuit protection. Switching frequency is set with an external resistor from 200kHz to 1.4MHz. This wide frequency range combined with a wide-bandwidth error amplifier enables the loop compensation scheme to give the user ample flexibility to optimize for cost, size, and efficiency.

II. Manufacturing Information

A. Description/Function:	Low-Dropout, Wide-Input-Voltage, Step-Down Controllers
B. Process:	B8
C. Number of Device Transistors:	
D. Fabrication Location:	California or Texas
E. Assembly Location:	China, Thailand
F. Date of Initial Production:	October 23, 2004

III. Packaging Information

A. Package Type:	16-pin TQFN 4x4
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-1413
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:	59.3°C/W
K. Single Layer Theta Jc:	5.7°C/W
L. Multi Layer Theta Ja:	40°C/W
M. Multi Layer Theta Jc:	5.7°C/W

IV. Die Information

A. Dimensions:	84 X 84 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:	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: Don Lipps (Manager, 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 132 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 8.3 \times 10^{-9}$

λ = 8.3 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 B8 Process results in a FIT Rate of 0.06 @ 25C and 0.99 @ 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 PN76-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/-200V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250mA.

Table 1
Reliability Evaluation Test Results

MAX8598ETE+

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	132	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