

RELIABILITY REPORT  
FOR  
MAX8765ETI+ / MAX8765AETI+  
PLASTIC ENCAPSULATED DEVICES

July 7, 2011

**MAXIM INTEGRATED PRODUCTS**

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<b>Approved by</b>
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## Conclusion

The MAX8765ETI+ / MAX8765AETI+ 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 MAX1908/MAX8724/MAX8765/MAX8765A highly integrated, multichemistry battery-charger control ICs simplify the construction of accurate and efficient chargers. These devices use analog inputs to control charge current and voltage, and can be programmed by the host or hardwired. The MAX1908/MAX8724/MAX8765/MAX8765A achieve high efficiency using a buck topology with synchronous rectification. The MAX1908/MAX8724/MAX8765/MAX8765A feature input current limiting. This feature reduces battery charge current when the input current limit is reached to avoid overloading the AC adapter when supplying the load and the battery charger simultaneously. The MAX1908/MAX8724/MAX8765/MAX8765A provide outputs to monitor current drawn from the AC adapter (DC input source), battery-charging current, and the presence of an AC adapter. The MAX1908's conditioning charge feature provides 300mA to safely charge deeply discharged lithium-ion (Li+) battery packs. The MAX1908 includes a conditioning charge feature while the MAX8724/MAX8765/MAX8765A do not. The MAX1908/MAX8724/MAX8765/MAX8765A charge two to four series Li+ cells, providing more than 5A, and are available in a space-saving, 28-pin, thin QFN package (5mm x 5mm). An evaluation kit is available to speed designs.

## II. Manufacturing Information

A. Description/Function:	Low-Cost Multichemistry Battery Chargers
B. Process:	B12
C. Fabrication Location:	USA
D. Assembly Location:	China, Malaysia, Thailand
E. Date of Initial Production:	October 08, 2005

## III. Packaging Information

A. Package Type:	28-pin TQFN 5x5
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-0022
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:	47°C/W
K. Single Layer Theta Jc:	2°C/W
L. Multi Layer Theta Ja:	29°C/W
M. Multi Layer Theta Jc:	2°C/W

## IV. Die Information

A. Dimensions:	120 X 120 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	1.2 microns (as drawn)
F. Minimum Metal Spacing:	1.2 microns (as drawn)
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO <sub>2</sub>
I. Die Separation Method:	Wafer Saw

## V. Quality Assurance Information

- A. Quality Assurance Contacts: Richard Aburano (Manager, Reliability Engineering)  
Don Lipps (Manager, Reliability Engineering)  
Bryan Preeshl (Vice President 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 ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 46 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 23.9 \times 10^{-9}$$

$$\lambda = 23.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 B12 Process results in a FIT Rate of 0.06 @ 25C and 1.06 @ 55C (0.8 eV, 60% UCL)

### B. E.S.D. and Latch-Up Testing (ESD lot JLI3FA7B5D D/C 1016, Latch-Up lot TLI3CA005B D/C 0602)

The PD15-3 die type has been found to have all pins able to withstand a HBM transient pulse of +/-500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.

**Table 1**  
Reliability Evaluation Test Results  
**MAX8765ETI+ / MAX8765AETI+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
<b>Static Life Test</b> (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	46	0	SLI0CQ003A, D/C 0422

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