



RELIABILITY REPORT  
FOR  
MAX1758EAI+  
PLASTIC ENCAPSULATED DEVICES

January 4, 2011

**MAXIM INTEGRATED PRODUCTS**

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

The MAX1758EAI+ 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 MAX1758 is a switch-mode lithium-ion (Li+) battery charger that charges one-to-four cells. It provides a regulated charging current accurate to  $\pm 10\%$  and a regulated voltage with only a  $\pm 0.8\%$  total voltage error at the battery terminals. The internal high-side switch delivers a programmable current of up to 1.5A to charge the battery. The built-in safety timer automatically terminates charging once the adjustable time limit has been reached. The MAX1758 regulates the voltage set point and charging current using two loops that work together to transition smoothly between voltage and current regulation. An additional control loop monitors the total current drawn from the input source (charging + system), and automatically reduces battery-charging current, preventing overload of the input supply and allowing the use of a low-cost wall adapter. The per-cell battery regulation voltage is set between 4.0V and 4.4V using standard 1% resistors. The number of cells is set from 1-to-4 by pin strapping. Battery temperature is monitored by an external thermistor to prevent charging outside the acceptable temperature range. The MAX1758 is available in a space-saving 28-pin SSOP package. Use the MAX1758EVKIT to help reduce design time. For a stand-alone charger with a 14V switch, refer to the MAX1757 data sheet. For a charger controller capable of up to 4A charging current, refer to the MAX1737 data sheet.



## II. Manufacturing Information

A. Description/Function:	Stand-Alone, Switch-Mode Li+ Battery Charger with Internal 28V Switch
B. Process:	B12
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	Malaysia, Philippines
F. Date of Initial Production:	July 05, 2000

## III. Packaging Information

A. Package Type:	28-pin SSOP
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:	#05-1101-0149
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:	105°C/W
K. Single Layer Theta Jc:	23.9°C/W
L. Multi Layer Theta Ja:	N/A
M. Multi Layer Theta Jc:	N/A

## IV. Die Information

A. Dimensions:	117 X 202 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:	5 mil. Sq.
H. Isolation Dielectric:	SiO <sub>2</sub>
I. Die Separation Method:	Wafer Saw

## V. Quality Assurance Information

A. Quality Assurance Contacts:	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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 80 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 13.7 \times 10^{-9}$$

$$\lambda = 13.7 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 (lot S2LADQ001A D/C 0407)

The PX62 die type has been found to have all pins able to withstand a HBM transient pulse of +/-400V 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

**MAX1758EAI+**

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	80	0	S2LADQ001A, D/C 0407

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