RELIABILITY REPORT

FOR

MAX1757EAI+T

PLASTIC ENCAPSULATED DEVICES

November 13, 2014

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
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Quality Assurance
Reliability Engineer

Conclusion

The MAX1757EAI+T successfully meets the quality and reliability standards required of all Maxim Integrated products. In addition, Maxim Integrated's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim Integrated's quality and reliability standards.

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I. Device Description

A. General

The MAX1757 is a switch-mode lithium-ion (Li+) battery charger that charges one to three cells. It provides a regulated charging current accurate to ±10% and a regulated voltage with only a ±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 MAX1757 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 by automatically reducing battery-charging current prevents overload of the input supply, 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 3 by pin strapping. Battery temperature is monitored by an external thermistor to prevent charging outside the acceptable temperature range. The MAX1757 is available in a space-saving 28-pin SSOP package. Use the MAX1757EVKIT to help reduce design time. For a stand-alone charger with a 28V switch, refer to the MAX1758 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 14V Switch
B. Process:	S12
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon, California or Texas
E. Assembly Location:	Philippines, Malaysia
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:	#05-1101-0148
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:	67°C/W
M. Multi Layer Theta Jc:	25°C/W

IV. Die Information

A. Dimensions:	202X117 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:	1.2 microns (as drawn)
F. Minimum Metal Spacing:	1.2 microns (as drawn)
G. Bondpad Dimensions:	
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 (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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 160 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 6.87 \times 10^{-9}$

$\lambda = 6.87$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim Integrated's reliability monitor program. Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at http://www.maximintegrated.com/qa/reliability/monitor. Cumulative monitor data for the S12 Process results in a FIT Rate of 0.02 @ 25C and 0.33 @ 55C (0.8 eV, 60% UCL).

B. E.S.D. and Latch-Up Testing (ESD lot NOMACA005A D/C 0235, Latch-Up lot SOMADQ001A D/C 0441)

The PX61 die type has been found to have all pins able to withstand a HBM transient pulse of +/-600V 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

MAX1757EAI+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C	DC Parameters	80	0	NOMACA006A, D/C 0235
	Biased	& functionality	80	0	IOMABQ001A, D/C 0014
	Time = 192 hrs.				

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