

RELIABILITY REPORT
FOR
MAX8601ETD+
PLASTIC ENCAPSULATED DEVICES

April 22, 2011

MAXIM INTEGRATED PRODUCTS

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Approved by
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Quality Assurance
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Conclusion

The MAX8601ETD+ 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 MAX8600/MAX8601 single-/dual-input linear battery chargers safely charge single-cell Li+ batteries. The charging rate is optimized to accommodate the thermal characteristics of a given application. There is no need to reduce the maximum charge current or worst-case charger power dissipation. Charging is optimized for Li+ cells using a control algorithm that includes low-battery precharging, voltage and current-limited fast-charging, and top-off charging, while continuously monitoring the battery for overvoltage, over/undertemperature, and charging time. The charger timeout protection is programmable. The charger status is indicated by three open-drain outputs. The MAX8601 automatically selects between either a USB or AC adapter input source. The AC adapter charge current is programmable, while USB charge current is set not to exceed either 100mA or 500mA, depending on the USEL input. The MAX8600 is a single-input charger with no USB source input. The MAX8600/MAX8601 are available in a 3mm x 3mm power-enhanced TDFN package.

II. Manufacturing Information

A. Description/Function:	Single-/Dual-Input 1-Cell Li+ Chargers with OVP Protection and Programmable Charge Timer
B. Process:	S45
C. Number of Device Transistors:	7277
D. Fabrication Location:	Texas
E. Assembly Location:	Thailand
F. Date of Initial Production:	January 22, 2005

III. Packaging Information

A. Package Type:	14-pin TDFN 3x3
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:	#05-9000-1538
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:	54°C/W
K. Single Layer Theta Jc:	8.0°C/W
L. Multi Layer Theta Ja:	41°C/W
M. Multi Layer Theta Jc:	8.0°C/W

IV. Die Information

A. Dimensions:	70 X 94 mils
B. Passivation:	Si ₃ N 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:	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:	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 (λ) is calculated as follows:

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

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

$$\lambda = 22.9 \times 10^{-9}$$

$$\lambda = 22.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 S45 Process results in a FIT Rate of 0.49 @ 25C and 8.49 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot SXA0BZ001B D/C 0441)

The PN61 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000V 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

MAX8601ETD+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0	SXA0BZ001B, D/C 0441

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