

RELIABILITY REPORT  
FOR  
MAX6780LTA+  
PLASTIC ENCAPSULATED DEVICES

January 22, 2014

**MAXIM INTEGRATED**

160 RIO ROBLES  
SAN JOSE, CA 95134

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

The MAX6780LTA+ 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 MAX6775-MAX6781 low-power, 1%-accurate battery monitors are available in the ultra-small  $\mu$ DFN package (1.0mm x 1.5mm) and SC70 packages. These low-power devices are ideal for monitoring single lithium-ion (Li+) cells, or multicell alkaline/NiCd/NiMH power sources. These devices offer single (MAX6775/MAX6776/MAX6777/MAX6778) or dual (MAX6779/MAX6780/MAX6781) low-battery outputs and feature fixed or resistor-adjustable hysteresis. Hysteresis eliminates the output chatter sometimes associated with battery voltage monitors, usually due to input-voltage noise or battery terminal voltage recovery after load removal. These devices are available in several versions: with single- or dual-voltage monitors, and with fixed or adjustable hysteresis. The MAX6775/MAX6776 offer a single battery monitor and factory-set hysteresis of 0.5%, 5%, or 10%. The MAX6779/MAX6780/MAX6781 have two battery monitors in a single package and factory-set hysteresis of 0.5%, 5%, or 10%. The MAX6777/MAX6778 offer a single battery monitor with external inputs for the rising and falling thresholds, allowing external hysteresis control. For convenient interface with system power circuitry or microprocessors, both open-drain and push-pull outputs are available. The single-channel devices are available with open-drain or push-pull outputs. The dual-channel devices are available with both outputs open-drain, both outputs push-pull, or one of each (see the *Selector Guide* in the full data sheet). This family of devices is offered in small 5-pin SC70 and ultra-small 6-pin  $\mu$ DFN packages, and is fully specified over the -40°C to +85°C extended temperature range.

## II. Manufacturing Information

A. Description/Function:	Low-Power, 1%-Accurate Battery Monitor in $\mu$ DFN and SC70 Packages
B. Process:	C6
C. Number of Device Transistors:	496
D. Fabrication Location:	California
E. Assembly Location:	Thailand
F. Date of Initial Production:	January 21, 2006

## III. Packaging Information

A. Package Type:	6-pin uDFN
B. Lead Frame:	Substrate
C. Lead Finish:	Gold
D. Die Attach:	Non-conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-1854
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:	N/A
K. Single Layer Theta Jc:	N/A
L. Multi Layer Theta Ja:	477°C/W
M. Multi Layer Theta Jc:	122°C/W

## IV. Die Information

A. Dimensions:	31X30 mils
B. Passivation:	$\text{Si}_3\text{N}_4/\text{SiO}_2$ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.6 microns (as drawn)
F. Minimum Metal Spacing:	0.6 microns (as drawn)
G. Bondpad Dimensions:	
H. Isolation Dielectric:	$\text{SiO}_2$
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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 45 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 24.4 \times 10^{-9}$$

$$\lambda = 24.4 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 C6 Process results in a FIT Rate of 0.17 @ 25C and 2.89 @ 55C (0.8 eV, 60% UCL).

### B. E.S.D. and Latch-Up Testing (lot S0000Q150B, D/C 0551)

The MS90-5 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.

**Table 1**  
Reliability Evaluation Test Results

**MAX6780LTA+**

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	45	0	S0000Q109C, D/C 0525

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