RELIABILITY REPORT

FOR

MAX1781ETM+

PLASTIC ENCAPSULATED DEVICES

July 8, 2011

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX1781ETM+ 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 MAX1781 smart battery-pack controller integrates a user-programmable microcontroller core, a coulomb-counting fuel gauge, a multi-channel data-acquisition unit, and an SMBus v1.1 compliant master/slave SMBus interface. The 8-bit, RISC microcontroller core has an integrated 12k bytes of user programmable EEPROM, which provides battery-pack designers with complete flexibility in developing fuel gauging and control algorithms. The MAX1781 is equipped with full ICE (in-circuit emulator) capability for efficient firmware development and debugging. The 16-bit data-acquisition unit measures individual cell voltages, cell stack voltage, chip internal/external temperature, and two general purpose analog inputs. Individual cell voltage measurements with 0.5% accuracy and over-current protection allow the MAX1781 to eliminate a separate 1st level protection IC. Adjustable over-current thresholds and delay timers provide a flexible solution. The integrating fuel gauge module provides a typical input offset of less than 1µV, and gain accuracy of better than 1% with no trimming required during pack manufacture. The MAX1781 has a wide 4V to 28V operating voltage range. The IC is available in a 7mm x 7mm 48-TQFN package with a maximum thickness of 0.8mm.

II. Manufacturing Information

A. Description/Function:	Advanced Smart Battery-Pack Controller
B. Process:	EB8
C. Number of Device Transistors:	
D. Fabrication Location:	Texas
E. Assembly Location:	China, Thailand
F. Date of Initial Production:	October 26, 2003

III. Packaging Information

A. Package Type:	48-pin TQFN 7x7
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:	#05-9000-0098
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:	36°C/W
K. Single Layer Theta Jc:	1°C/W
L. Multi Layer Theta Ja:	25°C/W
M. Multi Layer Theta Jc:	1°C/W

IV. Die Information

A. Dimensions:	220 X 220 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:	3.0 microns (as drawn)
F. Minimum Metal Spacing:	3.0 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:	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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{1000 \times 4340 \times 320 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 0.6 \times 10^{-9}$

λ = 0.6 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 EB8 Process results in a FIT Rate of 0.09 @ 25C and 1.58 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (ESD lot TML1J2435B D/C 0650, Latch-Up lot TML1J2389F D/C 0625)

The UC03-5 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.

Table 1
Reliability Evaluation Test Results

MAX1781ETM+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C	DC Parameters	45	0	TML5AA0Z8E, D/C 1036
	Biased	& functionality	45	0	TML5AA6Y8D, D/C 0946
	Time = 1000 hrs.		45	0	TML5AA1Y7B, D/C 0932
			69	0	TML1J2435A, D/C 0623
			71	0	TML1J2260C, D/C 0604
			45	0	SML1IA302Q, D/C 0531

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