RELIABILITY REPORT

FOR MAX1785EUU+

PLASTIC ENCAPSULATED DEVICES

May 6, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
Director, Reliability Engineering

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Conclusion

The MAX1785EUU+ 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 MAX1785 smart battery-pack controller integrates a user-programmable microcontroller core, a Coulomb-counting fuel gauge, a multichannel data-acquisition unit, and an SMBus(tm) v1.1-compliant master/slave interface. The 8-bit RISC microcontroller core has an integrated 32kB of user-programmable flash, which provides battery-pack designers with complete flexibity in developing fuel gauging and control algorithms. The MAX1785 is equipped with in-system debug (ISD) capability for efficient firmware development and debugging. The MAX1785 includes a 12-bit data-acquisition unit to measure individual cell voltages, thermistor, instant current, and pack voltage. Individual cell voltage measurements with 0.5% accuracy and overcurrent protection allow the MAX1785 to eliminate a separate first-level protection IC. Internally adjustable overcurrent 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 MAX1785 has a wide 4V to 25V operating voltage range. The MAX1785 is available as a 38-pin TSSOP. The MAX1785 EV kit is available to assist with development.

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II. Manufacturing Information

A. Description/Function:	Smart Battery-Pack Controller
B. Process:	S4
C. Number of Device Transistors:	
D. Fabrication Location:	Texas
E. Assembly Location:	ATP Philippines
F. Date of Initial Production:	July 28, 2007

III. Packaging Information

A. Package Type:	38-pin TSSOP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-2483
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 3
J. Single Layer Theta Ja:	73°C/W
K. Single Layer Theta Jc:	11°C/W
L. Multi Layer Theta Ja:	62.5°C/W
M. Multi Layer Theta Jc:	11°C/W

IV. Die Information

A. Dimensions:	108 X 238 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide
C. Interconnect:	Aluminum/Si (Si = 1%)
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

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V. Quality Assurance Information

A. Quality Assurance Contacts:	Ken Wendel (Director, Reliability Engineering) Bryan Preeshl (Managing Director 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:

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

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

$\lambda = 13.4 \times 10^{-9}$

λ = 13.4 F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at http://www.maxim-ic.com/. Current monitor data for the S4 Process results in a FIT Rate of 4.6 @ 25C and 79.2 @ 55C (0.8 eV, 60% UCL)

B. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

C. E.S.D. and Latch-Up Testing

The UC09-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/-500 V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-100 mA.

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Table 1
Reliability Evaluation Test Results

MAX1785EUU+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	80	0
Moisture Testing (Note 2)				
85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2)				
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality	77	0

Note 1: Life Test Data may represent plastic DIP qualification lots.
Note 2: Generic Package/Process data

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