RELIABILITY REPORT

FOR

MAX11080GUU+

PLASTIC ENCAPSULATED DEVICES

March 29, 2010

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX11080GUU+ 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 MAX11080 is a battery-pack fault-monitor IC capable of monitoring up to 12 lithium-ion (Li+) battery cells. This device is designed to provide an overvoltage or undervoltage fault indication when any of the cells cross the user-selectable threshold for longer than the set program-delay interval. The overvoltage levels are pin selectable from +3.3V to +4.8V in 100mV increments, and have a guaranteed accuracy of ±25mV over the entire temperature range. The undervoltage level is also user selectable from +1.6V to +2.8V in 200mV increments. These levels are guaranteed to ±100mV over the entire temperature range. Undervoltage detection can be disabled as one of the user-configuration options.

The MAX11080 has a built-in level-shifter that allows up to 31 MAX11080 devices to be connected in a daisy-chain fashion to reduce the number of interface signals needed for large stacks of series batteries. Each cell is monitored differentially and compared to the overvoltage and undervoltage thresholds. When any of the cells exceeds this threshold for longer than the set program delay interval, the MAX11080 inhibits the heartbeat signal from being passed down the daisy chain. Built-in comparator hysteresis prevents threshold chattering. The MAX11080 is designed to be the perfect complement to the MAX11068 high-voltage measurement IC for redundant fault-monitoring applications. This device is offered in a 9.7mm x 4.4mm, 38-pin TSSOP package with 0.5mm pin spacing. The package is lead-free and RoHS compliant with an extended operating temperature range of -40°C to +105°C.

II. Manufacturing Information

A. Description/Function:	12-Channel, High-Voltage Battery-Pack Fault Monitor
B. Process:	S45J
C. Number of Device Transistors:	11398
D. Fabrication Location:	California
E. Assembly Location:	ATP Philippines
F. Date of Initial Production:	April 22, 2009

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:	Au (1.0 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-3164
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:	63°C/W
M. Multi Layer Theta Jc:	11°C/W

IV. Die Information

A. Dimensions:	90 X 130 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide
C. Interconnect:	Al/0.5% Cu
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 Operations) 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:

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

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

$\lambda = 22.4 \times 10^{-9}$

$\lambda = 22.4$ 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 S45 Process results in a FIT Rate of 0.49 @ 25C and 8.49 @ 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 CO15 die type has been found to have all pins able to withstand a transient pulse of

ESD-HBM:	+/- 2500V per JEDEC JESD22-A114
ESD-MM:	+/- 200V per JEDEC JESD22-A115

Latch-Up testing has shown that this device withstands a current of +/- 100mA and overvoltage per JEDEC JESD78, except for one pin CP-. Pin CP- passed the negative current injection stress to -25mA. In system applications, pin CP- must only be connected to companion pin CP+ and nothing else through a 0.01uF external capacitor. Such a configuration is recognized by JEDEC JESD78 Annex A as a very unlikely source for latch-up on CP- (and CP+).

Table 1
Reliability Evaluation Test Results

MAX11080GUU+

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	48	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