RELIABILITY REPORT

FOR

MAX1660EEE+

PLASTIC ENCAPSULATED DEVICES

February 3, 2014

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
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Quality Assurance
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Conclusion

The MAX1660EEE+ 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 MAX1660 digitally controlled fuel-gauge interface executes two essential functions for rechargeable battery-pack management: fuel gauging and pack overcurrent protection. It accurately monitors a battery pack's charge and discharge current flow, and records each using two independent, on-board Coulomb counters. Each counter's contents are externally accessible via a System Management Bus (SMBus(tm))-compatible 2-wire serial interface. An optional third wire interrupts the microcontroller (°C) when the charge or discharge counters reach a preset value, or when an overcurrent condition (charge or discharge) occurs. In the event of an overcurrent or short-circuit condition, the MAX1660 disconnects the load and alerts its host. The MAX1660's flexibility allows accurate fuel gauging for any battery chemistry, using any desired control algorithm. The MAX1660 operates with battery voltages from +4V to +28V and provides two micropower shutdown modes, increasing battery lifetime. To minimize total parts count, the device integrates a precision 2.00V system-reference output, a 3.3V linear-regulator output that can supply up to 5mA to power external circuitry, and a power-on reset output for the system µC. The MAX1660 is available in a 16-pin QSOP package.

II. Manufacturing Information

A. Description/Function:	Digitally Controlled Fuel-Gauge Interface
B. Process:	S12
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon, California or Texas
E. Assembly Location:	Malaysia, Philippines, Thailand
F. Date of Initial Production:	October 25, 1997

III. Packaging Information

A. Package Type:	16-pin QSOP
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:	#05-1101-0024
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:	120°C/W
K. Single Layer Theta Jc:	37°C/W
L. Multi Layer Theta Ja:	103.7°C/W
M. Multi Layer Theta Jc:	37°C/W

IV. Die Information

A. Dimensions:	86X120 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:	1.2 microns (as drawn)
F. Minimum Metal Spacing:	1.2 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:	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 (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)

$\lambda = 13.7 \times 10^{-9}$

$\lambda = 13.7$ 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 S12 Process results in a FIT Rate of 0.02 @ 25C and 0.3 @ 55C (0.8 eV, 60% UCL).

B. E.S.D. and Latch-Up Testing (lot BQCACQ001D, D/C 9739)

The PX24 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

MAX1660EEE+

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	80	0	BQCACQ001D, D/C 9739

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