RELIABILITY REPORT
FOR
MAX1647EAP+
PLASTIC ENCAPSULATED DEVICES

November 23, 2010

MAXIM INTEGRATED PRODUCTS
120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

Approved by
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Quality Assurance
Manager, Reliability Engineering
Conclusion

The MAX1647EAP+ 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 MAX1647/MAX1648 provide the power control necessary to charge batteries of any chemistry. In the MAX1647, all charging functions are controlled through the Intel® System Management Bus (SMBus(tm)) interface. The SMBus 2-wire serial interface sets the charge voltage and current, and provides thermal status information. The MAX1647 functions as a level 2 charger, compliant with the Duracell®/Intel Smart Battery Charger Specification. The MAX1648 omits the SMBus serial interface, and instead sets the charge voltage and current proportional to the voltage applied to external control pins. In addition to the feature set required for a level 2 charger, the MAX1647 generates interrupts to signal the host when power is applied to the charger or a battery is installed or removed. Additional status bits allow the host to check whether the charger has enough input voltage, and whether the voltage on or current into the battery is being regulated. This allows the host to determine when lithium-ion batteries have completed charge without interrogating the battery. The MAX1647 is available in a 20-pin SSOP with a 2mm profile height. The MAX1648 is available in a 16-pin SO package.
II. Manufacturing Information

A. Description/Function: Chemistry-Independent Battery Chargers
B. Process: S12
C. Number of Device Transistors: 
D. Fabrication Location: Oregon or Texas
E. Assembly Location: Malaysia, Philippines
F. Date of Initial Production: Pre 1997

III. Packaging Information

A. Package Type: 20-pin SSOP
B. Lead Frame: Copper
C. Lead Finish: 100% matte Tin
D. Die Attach: Conductive
E. Bondwire: Au (1.3 mil dia.)
F. Mold Material: Epoxy with silica filler
G. Assembly Diagram: #05-1101-0087
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: 125°C/W
K. Single Layer Theta Jc: 33°C/W
L. Multi Layer Theta Ja: 83°C/W
M. Multi Layer Theta Jc: 33°C/W

IV. Die Information

A. Dimensions: 86 X 156 mils
B. Passivation: Si₃N₄/SiO₂ (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: 5 mil. Sq.
H. Isolation Dielectric: SiO₂
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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate ($\lambda$) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 79 \times 2}$$
(Chi square value for MTTF upper limit)

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

$$\lambda = 13.9 \times 10^{-9}$$

$$\lambda = 13.9 \text{ F.I.T. (60% confidence level @ 25°C)}$$

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 S12 Process results in a FIT Rate of 0.17 @ 25C and 3.00 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot NW4ABA004A, D/C 0217)

The PX79 die type has been found to have all pins able to withstand a HBM transient pulse of +/-600V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-100mA.
# Table 1
Reliability Evaluation Test Results

## MAX1647EAP+

<table>
<thead>
<tr>
<th>TEST ITEM</th>
<th>TEST CONDITION</th>
<th>FAILURE IDENTIFICATION</th>
<th>SAMPLE SIZE</th>
<th>NUMBER OF FAILURES</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static Life Test</td>
<td>Ta = 135°C</td>
<td>DC Parameters &amp; functionality</td>
<td>79</td>
<td>0</td>
<td>NW4ABA004A, DC 0217</td>
</tr>
<tr>
<td>Biased</td>
<td>Time = 192 hrs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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