RELIABILITY REPORT
FOR
MAX8903AETI+
PLASTIC ENCAPSULATED DEVICES

January 30, 2009

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

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering
Conclusion

The MAX8903AETI+ 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.

Table of Contents

I. Device Description
   A. General

II. Manufacturing Information

III. Packaging Information

IV. Die Information

V. Quality Assurance Information

VI. Reliability Evaluation

.....Attachments

I. Device Description

MAX8903A is an integrated 1-cell Li+ charger and Smart Power Selector™ with dual (AC adapter and USB) power inputs. The switch mode charger uses a high switching frequency to eliminate heat and allow tiny external components. It can operate with either separate inputs for USB and AC adapter power, or from a single input that accepts both. All power switches for charging and switching the load between battery and external power are included on-chip. No external MOSFETs, blocking diodes, or current-sense resistors are required.

The MAX8903A features optimized smart power control to make the best use of limited USB or adapter power. Battery charge current and SYS output current limit are independently set. Power not used by the system charges the battery. Charge current and SYS output current limit can be set up to 2A while USB input current can be set to 100mA or 500mA. Automatic input selection switches the system from battery to external power. The DC input operates from 4.15V to 16V with up to 20V protection, while the USB input has a range of 4.1V to 6.3V with up to 8V protection.

The MAX8903A internally blocks current from the battery and system back to the DC and USB inputs when no input supply is present. Other features include prequalcharging and timer, fast charge timer, taper current detection for charge status, overvoltage protection, charge status and fault outputs, power-OK monitors, and a battery thermistor monitor. In addition, on-chip thermal limiting reduces battery charge rate and AC adapter current to prevent charger overheating.

The MAX8903A is available in a 4mm x 4mm 28-pin thin QFN package.
II. Manufacturing Information

A. Description/Function: 2A 1-Cell Li+ DC-DC Charger for USB* and Adapter Power
B. Process: S4
C. Number of Device Transistors: 16483
D. Fabrication Location: Texas
E. Assembly Location: UTL Thailand
F. Date of Initial Production: 2008

III. Packaging Information

A. Package Type: 28-pin TQFN 4x4
B. Lead Frame: Copper
C. Lead Finish: 100% matte Tin
D. Die Attach: Conductive Epoxy
E. Bondwire: Au (1.3 mil dia.)
F. Mold Material: Epoxy with silica filler
G. Assembly Diagram: #
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: 48°C/W
K. Single Layer Theta Jc: 2.7°C/W
L. Multi Layer Theta Ja: 35°C/W
M. Multi Layer Theta Jc: 2.7°C/W

IV. Die Information

A. Dimensions: 104 X 104 mils
B. Passivation: Si₃N₄/SiO₂  (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: SiO₂
I. Die Separation Method: Wafer Saw
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:

   \[
   \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 48 \times 2}
   \]

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

   \[\lambda = 22.4 \times 10^{-9}\]

   \[\lambda = 22.4 \text{ F.I.T. (60% confidence level @ 25°C)}\]

   The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 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 0.28 @ 25°C and 4.85 @ 55°C (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 PP91 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000 V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250 mA and a 1.5x VCCmax overvoltage stress per JESD78.
Table 1
Reliability Evaluation Test Results
MAX8903AETI+

<table>
<thead>
<tr>
<th>TEST ITEM</th>
<th>TEST CONDITION</th>
<th>FAILURE IDENTIFICATION</th>
<th>SAMPLE SIZE</th>
<th>NUMBER OF FAILURES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Static Life Test</strong> (Note 1)</td>
<td>Ta = 135°C Biased</td>
<td>DC Parameters &amp; functionality</td>
<td>48</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Time = 192 hrs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Moisture Testing</strong> (Note 2)</td>
<td>Ta = 85°C Biased</td>
<td>DC Parameters &amp; functionality</td>
<td>77</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>RH = 85% Biased</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time = 1000hrs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mechanical Stress</strong> (Note 2)</td>
<td>Temperature Cycle</td>
<td>DC Parameters &amp; functionality</td>
<td>77</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>-65°C/150°C 1000 Cycles Method 1010</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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