RELIABILITY REPORT

FOR

MAX8903YETI+

PLASTIC ENCAPSULATED DEVICES

September 13, 2011

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Conclusion

The MAX8903YETI+ 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 MAX8903A-MAX8903E/MAX8903G/MAX8903H/MAX8903J/MAX8903Y are integrated 1-cell Li+ chargers and Smart Power Selectors™ 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 MAX8903_ feature 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 MAX8903_ internally block current from the battery and system back to the DC and USB inputs when no input supply is present. Other features include prequal charging and timer, fast charge timer, 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 MAX8903_ is available in a 4mm x 4mm, 28-pin thin QFN package.

The various versions of the MAX8903_ allow for design flexibility to choose key parameters such as system regulation voltage, battery prequalification threshold, and battery regulation voltage. The MAX8903B/MAX8903E/MAX8903G also includes power-enable on battery detection. See the *Selector Guide* section in the full data sheet for complete details.

II. Manufacturing Information

A. Description/Function:	2A 1-Cell Li+ DC-DC Charger for USB and Adapter Power
B. Process:	S45
C. Number of Device Transistors:	16483
D. Fabrication Location:	USA or Japan
E. Assembly Location:	China, Taiwan and Thailand
F. Date of Initial Production:	May 24, 2011

III. Packaging Information

A. Package Type:	28-pin TQFN 4x4
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:	#05-9000-2972
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:	3°C/W
L. Multi Layer Theta Ja:	35°C/W
M. Multi Layer Theta Jc:	3°C/W

IV. Die Information

A. Dimensions:	104 X 104 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:	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:	
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Richard Aburano (Manager, Reliability Engineering) 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 (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 47 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 23.4 \times 10^{-9}$

$\lambda = 23.4$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 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 S45 Process results in a FIT Rate of 0.49 @ 25C and 8.49 @ 55C (0.8 eV, 60% UCL)

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

The PP91-4 die type has been found to have all pins able to withstand a transient pulse of:

ESD-HBM:	+/- 1500V per JEDEC JESD22-A114 (lot TJJUCA283H, D/C 1127)
ESD-CDM:	+/- 750V per JEDEC JESD22-C101 (lot TJJUAA142E, D/C 1115)

Latch-Up testing has shown that this device withstands a current of +/- 100mA and overvoltage per JEDEC JESD78 (lot TJJUCA283H, D/C 1127).

Table 1
Reliability Evaluation Test Results

MAX8903YETI+

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	47	0	TJJZHQ001A, D/C 0851

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