RELIABILITY REPORT

FOR

MAX17005ETP+

PLASTIC ENCAPSULATED DEVICES

November 18, 2008

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX17005ETP+ 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 MAX17005/MAX17006/MAX17015 are high-frequency multichemistry battery chargers. These circuits feature a new high-frequency current-mode architecture that significantly reduces component size and cost*. The charger uses a high-side MOSFET with n-channel synchronous rectifier. Widely adjustable charge current, charge voltage, and input current limit simplify the construction of highly accurate and efficient chargers. The charge voltage and charge current are set with analog control inputs. The charge current setting can also be adjusted with a PWM input. High-accuracy current-sense amplifiers provide fast cycle-by-cycle current-mode control to protect against short circuits to the battery and respond quickly to system load transients. In addition, the charger provides a high-accuracy analog output that is proportional to the adapter current. In the MAX17015, this current monitor remains active when the adapter is absent to monitor battery discharge current. The MAX17005 charges three or four Li+ series cells, and the MAX17006 charges two or three Li+ series cells. The MAX17015 adjusts the charge voltage setting and the number of cells through a feedback resistor-divider from the output. All variants of the charger can provide at least 4A of charge current with a 10m sense resistor. The charger utilizes a charge pump to control an n-channel adapter selection switch. The charge pump remains active even when the charger is off. When the adapter is absent, a p-channel MOSFET selects the battery. The MAX17005/MAX17006/MAX17015 are available in a small, 4mm x 4mm x 0.8mm 20-pin, lead-free TQFN package. An evaluation kit is available to reduce design time.

II. Manufacturing Information

A. Description/Function:	1.2MHz Low-Cost, High-Performance Chargers
B. Process:	S4
C. Number of Device Transistors:	12990
D. Fabrication Location:	California
E. Assembly Location:	UTL (NSEB), Thailand
F. Date of Initial Production:	2008

III. Packaging Information

A. Package Type:	20-pin TQFN 4x4
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-2704
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:	59°C/W
K. Single Layer Theta Jc:	5.7°C/W
L. Multi Layer Theta Ja:	39°C/W
M. Multi Layer Theta Jc:	5.7°C/W

IV. Die Information

A. Dimensions:	78 X 88 mils
B. Passivation:	Si_3N_4/SiO_2 (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:	SiO_2
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 pending. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 45 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 22.37 \times 10^{-9}$

λ = 22.37 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 @ 25C and 4.85 @ 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 PD97 die type has been found to have all pins able to withstand a HBM transient pulse of 1000 V per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of +/-100 mA.

Table 1
Reliability Evaluation Test Results

MAX17005ETP+

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	45	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