



RELIABILITY REPORT
FOR
MAX17015BETP+
PLASTIC ENCAPSULATED DEVICES

September 2, 2011

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
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Quality Assurance
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Conclusion

The MAX17015BETP+ 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 MAX17005B/MAX17006B/MAX17015B 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 MAX17015B, this current monitor remains active when the adapter is absent to monitor battery discharge current. The MAX17005B charges three or four Li+ series cells, and the MAX17006B charges two or three Li+ series cells. The MAX17015B 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 MAX17005B/MAX17006B/MAX17015B 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:	USA
E. Assembly Location:	China, Taiwan and Thailand
F. Date of Initial Production:	October 25, 2008

III. Packaging Information

A. Package Type:	20-pin TQFN
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:	#05-9000-2704
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:	6°C/W
L. Multi Layer Theta Ja:	39°C/W
M. Multi Layer Theta Jc:	6°C/W

IV. Die Information

A. Dimensions:	78 X 88 mils
B. Passivation:	Si ₃ N 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 = 0.5 / Metal2 = 0.6 / 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 biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 48 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 22.9 \times 10^{-9}$$

$$\lambda = 22.9 \text{ F.I.T. (60\% confidence level @ 25}^\circ\text{C)}$$

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 S4 Process results in a FIT Rate of 0.75 @ 25C and 13.0 @ 55C (0.8 eV, 60% UCL)

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

The PD97-2 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 2500V per JEDEC JESD22-A114 (lot SEGXLA031B, D/C 0907). Latch-Up testing has shown that this device withstands a current of +/- 100mA and overvoltage per JEDEC JESD78, except pin 17 (ACIN) which passes +100/-50mA (lot TEGXK3007G, D/C 1130).

Table 1
Reliability Evaluation Test Results

MAX17015BETP+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135 Biased Time = 192 hrs.	DC Parameters & functionality	48	0	SEGXLA031B, D/C 0907

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