

RELIABILITY REPORT
FOR
MAX5087BATE+
PLASTIC ENCAPSULATED DEVICES

March 12, 2012

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

Approved by
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Conclusion

The MAX5087BATE+ 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 MAX5087 high-voltage linear regulator operates from an input voltage of 6.5V to 45V and delivers up to 400mA of output current. The device consumes only 70 μ A of quiescent current with no load and 11 μ A in shutdown. The device includes a SET input, that when connected to ground, selects a preset output voltage of 3.3V (MAX5087A) or 5.0V (MAX5087B). Alternatively, the output voltage can be adjusted from 2.5V to 11V by simply connecting SET to the regulator's output through a resistive divider network. The MAX5087 also provides an open-drain, active-low microprocessor (μ P) reset output that asserts when the regulator output drops below the preset output voltage threshold. An external capacitor programs the reset timeout period. Other features include an enable input, thermal shutdown, and short-circuit protection. The MAX5087 operates over the automotive temperature range of -40°C to +125°C and is available in a 16-pin TQFN thermally enhanced package.

II. Manufacturing Information

A. Description/Function:	45V, 400mA, Low-Quiescent-Current Linear Regulator with Adjustable Reset Delay
B. Process:	BCD88
C. Number of Device Transistors:	1386
D. Fabrication Location:	Oregon
E. Assembly Location:	China, Thailand
F. Date of Initial Production:	January 21, 2006

III. Packaging Information

A. Package Type:	16L TQFN 5x5
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:	#05-9000-1701 / C
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	1
J. Single Layer Theta Ja:	48°C/W
K. Single Layer Theta Jc:	2°C/W
L. Multi Layer Theta Ja:	30°C/W
M. Multi Layer Theta Jc:	2°C/W

IV. Die Information

A. Dimensions:	107 X 113 mils
B. Passivation:	Si ₃ N 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:	3.0 microns (as drawn)
F. Minimum Metal Spacing:	3.0 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 biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 93 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 11.8 \times 10^{-9}$$

$$\lambda = 11.8 \text{ F.I.T. (60\% confidence level @ 25}^\circ\text{C)}$$

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 BCD88 Process results in a FIT Rate of 0.06 @ 25C and 1.08 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot JY0DCQ002B D/C 0926)

The NP80-3 die type has been found to have all pins able to withstand a transient pulse of:

ESD-HBM:	+/- 1000V per JEDEC JESD22-A114
ESD-CDM:	+/- 750V per JEDEC JESD22-C101

Latch-Up testing has shown that this device withstands a current of +/- 250mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX5087BATE+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C	DC Parameters	45	0	NBEYAQ001C, D/C 0641
	Biased Time = 192 hrs.	& functionality	48	0	NY0ABQ003E, D/C 0541

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