



RELIABILITY REPORT  
FOR  
MAX1586CETM+T  
PLASTIC ENCAPSULATED DEVICES

August 11, 2010

**MAXIM INTEGRATED PRODUCTS**

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## Conclusion

The MAX1586CETM+T 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

<b>I. ....Device Description</b>	<b>V. ....Quality Assurance Information</b>
<b>II. ....Manufacturing Information</b>	<b>VI. ....Reliability Evaluation</b>
<b>III. ....Packaging Information</b>	<b>IV. ....Die Information</b>
<b>.....Attachments</b>	

### I. Device Description

#### A. General

The MAX1586/MAX1587 power-management ICs are optimized for devices using Intel XScale® microprocessors, including third-generation smart cell phones, PDAs, internet appliances, and other portable devices requiring substantial computing and multimedia capability at low power. The ICs integrate seven high-performance, low-operating-current power supplies along with supervisory and management functions. Regulator outputs include three step-down DC-DC outputs, three linear regulators, and a seventh always-on output. DC-DC converter outputs power I/O, DRAM, and the CPU core. The I/O supply can be preset to 3.3V or 3.0V, or can be adjusted to other values. The DRAM supply on the MAX1586A and MAX1587A is preset for 1.8V or 2.5V, while the MAX1586B DRAM supply is preset for 3.3V or 2.5V. The DRAM supply on all parts can also be adjusted with external resistors. The CPU core supply is serial programmed for dynamic voltage management. Linear-regulated outputs are provided for SRAM, PLL, and USIM supplies. To minimize sleep-state quiescent current, critical power supplies have bypass "sleep" LDOs that can be activated to minimize battery drain when output current is very low. Other functions include separate on/off control for all DC-DC converters, low-battery and dead-battery detection, a reset and power-OK output, a backup-battery input, and a two-wire serial interface. All DC-DC outputs use fast, 1MHz PWM switching and small external components. They operate with fixed-frequency PWM control and automatically switch from PWM to skip-mode operation at light loads to reduce operating current and extend battery life. The core output is capable of operating in forced-PWM mode at all loads to minimize ripple and noise. A 2.6V to 5.5V input voltage range allows 1-cell lithium-ion (Li+), 3-cell NiMH, or a regulated 5V input. The MAX1587 is available in a tiny 6mm x 6mm, 40-pin thin QFN package. The MAX1586 features an additional linear regulator (V6) for VCC\_USIM and low-battery and dead-battery comparators. The MAX1586 is available in a 7mm x 7mm, 48-pin thin QFN package.

## II. Manufacturing Information

A. Description/Function:	High-Efficiency, Low-IQ PMICs with Dynamic Core for PDAs and Smartphones
B. Process:	B8
C. Number of Device Transistors:	
D. Fabrication Location:	California or Texas
E. Assembly Location:	China, Thailand
F. Date of Initial Production:	October 23, 2004

## III. Packaging Information

A. Package Type:	48-pin TQFN 7x7
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:	#05-9000-0682
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:	36°C/W
K. Single Layer Theta Jc:	1.0°C/W
L. Multi Layer Theta Ja:	25°C/W
M. Multi Layer Theta Jc:	1.0°C/W

## IV. Die Information

A. Dimensions:	163 X 156 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.8 microns (as drawn)
F. Minimum Metal Spacing:	0.8 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO <sub>2</sub>
I. Die Separation Method:	Wafer Saw

## V. Quality Assurance Information

- A. Quality Assurance Contacts: Richard Aburano (Manager, Reliability Operations)  
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 ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 191 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 5.8 \times 10^{-9}$$

$\lambda = 5.8$  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 B8 Process results in a FIT Rate of 0.06 @ 25C and 0.99 @ 55C (0.8 eV, 60% UCL)

### B. E.S.D. and Latch-Up Testing (lot DIP5AA029B, D/C 0438)

The PN32-5 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 1000V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/- 250mA.

**Table 1**  
Reliability Evaluation Test Results

**MAX1586CETM+T**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
<b>Static Life Test</b> (Note 1)	Ta = 135°C	DC Parameters	48	0	DIP0FA016A, D/C 0453
	Biased	& functionality	48	0	TIP0EA028A, D/C 0437
	Time = 192 hrs.		47	0	TIP2CQ003A, D/C 0432
				48	0

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