



RELIABILITY REPORT  
FOR  
MAX1111EEE+T  
PLASTIC ENCAPSULATED DEVICES

July 19, 2011

**MAXIM INTEGRATED PRODUCTS**

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<b>Approved by</b>
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## Conclusion

The MAX1111EEE+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.

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### I. Device Description

#### A. General

The MAX1110/MAX1111 low-power, 8-bit, 8-channel analog-to-digital converters (ADCs) feature an internal track/hold, voltage reference, clock, and serial interface. They operate from a single 2.7V to 5.5V supply and consume only 85 $\mu$ A while sampling at rates up to 50ksps. The MAX1110's 8 analog inputs and the MAX1111's 4 analog inputs are software-configurable, allowing unipolar/bipolar and single-ended/differential operation. Successive-approximation conversions are performed using either the internal clock or an external serial-interface clock. The full-scale analog input range is determined by the 2.048V internal reference, or by an externally applied reference ranging from 1V to VDD. The 4-wire serial interface is compatible with the SPI(tm), QSPI(tm), and MICROWIRE(tm) serial-interface standards. A serial-strobe output provides the end-of-conversion signal for interrupt-driven processors. The MAX1110/MAX1111 have a software-programmable, 2 $\mu$ A automatic power-down mode to minimize power consumption. Using power-down, the supply current is reduced to 6 $\mu$ A at 1ksps, and only 52 $\mu$ A at 10ksps. Power-down can also be controlled using the active-low SHDN input pin. Accessing the serial interface automatically powers up the device. The MAX1110 is available in a 20-pin SSOP package. The MAX1111 is available in a small 16-pin QSOP package.

## II. Manufacturing Information

A. Description/Function:	+2.7V, Low-Power, Multichannel, Serial, 8-Bit ADCs
B. Process:	B12
C. Number of Device Transistors:	538
D. Fabrication Location:	Oregon
E. Assembly Location:	Thailand
F. Date of Initial Production:	April 26, 1997

## III. Packaging Information

A. Package Type:	16-pin QSOP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (0.8 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-4519 / A
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:	120°C/W
K. Single Layer Theta Jc:	37°C/W
L. Multi Layer Theta Ja:	103.7°C/W
M. Multi Layer Theta Jc:	37°C/W

## IV. Die Information

A. Dimensions:	72 X 96 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:	1.2 microns (as drawn)
F. Minimum Metal Spacing:	1.2 microns (as drawn)
G. Bondpad Dimensions:	
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 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 ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 160 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 6.9 \times 10^{-9}$$

$$\lambda = 6.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 B12 Process results in a FIT Rate of 0.06 @ 25C and 1.06 @ 55C (0.8 eV, 60% UCL)

### B. E.S.D. and Latch-Up Testing (lot NQBBDA149F D/C 0920)

The AD86-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-100mA.

**Table 1**  
Reliability Evaluation Test Results

**MAX1111EEE+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	80	0	BQBBBZ002B, D/C 9714
	Biased	& functionality	80	0	BQBABZ001C, D/C 9707
	Time = 192 hrs.				

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