

RELIABILITY REPORT
FOR
MAX1238EEE+T
PLASTIC ENCAPSULATED DEVICES

January 18, 2011

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX1238EEE+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 MAX1236-MAX1239 low-power, 12-bit, multichannel analog-to-digital converters (ADCs) feature internal track/hold (T/H), voltage reference, clock, and an I²C-compatible 2-wire serial interface. These devices operate from a single supply of 2.7V to 3.6V (MAX1237/MAX1239) or 4.5V to 5.5V (MAX1236/MAX1238) and require only 670 μ A at the maximum sampling rate of 94.4ksps. Supply current falls below 230 μ A for sampling rates under 46ksps. AutoShutdown(tm) powers down the devices between conversions, reducing supply current to less than 1 μ A at low throughput rates. The MAX1236/MAX1237 have four analog input channels each, while the MAX1238/MAX1239 have 12 analog input channels each. The fully differential analog inputs are software configurable for unipolar or bipolar, and single-ended or differential operation. The full-scale analog input range is determined by the internal reference or by an externally applied reference voltage ranging from 1V to VDD. The MAX1237/MAX1239 feature a 2.048V internal reference and the MAX1236/MAX1238 feature a 4.096V internal reference. The MAX1236/MAX1237 are available in an 8-pin μ MAX[®] package. The MAX1238/MAX1239 are available in a 16-pin QSOP package. The MAX1236-MAX1239 are guaranteed over the extended temperature range (-40°C to +85°C). For pin-compatible 10-bit parts, refer to the MAX1136-MAX1139 data sheet. For pin-compatible 8-bit parts, refer to the MAX1036-MAX1039 data sheet.

II. Manufacturing Information

A. Description/Function:	2.7V to 3.6V and 4.5V to 5.5V, Low-Power, 4-/12-Channel, 2-Wire Serial, 12-Bit ADCs
B. Process:	C6Y
C. Number of Device Transistors:	12956
D. Fabrication Location:	Japan
E. Assembly Location:	Malaysia, Philippines, Thailand
F. Date of Initial Production:	January 26, 2002

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 (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-2101-0044
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:	86 X 80 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.6 microns (as drawn)
F. Minimum Metal Spacing:	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:	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 (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)

$$\lambda = 22.9 \times 10^{-9}$$
$$\lambda = 22.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 C6Y Process results in a FIT Rate of 0.90 @ 25C and 15.55 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot E3N01A012B D/C 0922)

The AC31 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-100mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX1238EEE+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0	E3N5FA009A, D/C 0922

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