

RELIABILITY REPORT
FOR
MAX1039AEEE+
(MAX1036-MAX1039)
PLASTIC ENCAPSULATED DEVICES

December 22, 2008

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX1039AEEE+ 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 MAX1036-MAX1039 low-power, 8-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 and require only 350 μ A at the maximum sampling rate of 188ksps. AutoShutdown(tm) powers down the devices between conversions reducing supply current to less than 1 μ A at low throughput rates. The MAX1036/MAX1037 have four analog input channels each, while the MAX1038/MAX1039 have twelve analog input channels. The analog inputs are software configurable for unipolar or bipolar and singleended or pseudo-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 MAX1037/MAX1039 feature a 2.048V internal reference and the MAX1036/MAX1038 feature a 4.096V internal reference. The MAX1036/MAX1037 are available in 8-pin SOT23 packages. The MAX1038/MAX1039 are available in 16-pin QSOP packages. The MAX1036-MAX1039 are guaranteed over the extended industrial temperature range (-40°C to +85°C). Refer to MAX1136-MAX1139 for 10-bit devices and to the MAX1236-MAX1239 for 12-bit devices.

II. Manufacturing Information

A. Description/Function:	2.7V to 5.5V, Low-Power, 4-/12-Channel 2-Wire Serial 8-Bit ADCs
B. Process:	0.6um CMOS
C. Number of Device Transistors:	7237
D. Fabrication Location:	Japan
E. Assembly Location:	ATP Philippines, UTL Thailand
F. Date of Initial Production:	April 27, 2002

III. Packaging Information

A. Package Type:	16-pin QSOP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Au (1.0 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#
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:	67 X 63 mils
B. Passivation:	SiO ₂ /SiN ₃
C. Interconnect:	Al/Cu
D. Backside Metallization:	None
E. Minimum Metal Width:	0.6um
F. Minimum Metal Spacing:	0.6um
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Ken Wendel (Director, Reliability Engineering) 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 (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 205 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 5.2 \times 10^{-9}$$

$$\lambda = 5.2 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at <http://www.maxim-ic.com/>. Current monitor data for the C6 Process results in a FIT Rate of 0.82 @ 25C and 14.21 @ 55C (0.8 eV, 60% UCL)

B. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

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

The AC33-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000 V per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

Table 1
Reliability Evaluation Test Results

MAX1039AEEE+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	205	0
Moisture Testing (Note 2) 85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2) Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality	77	0

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

Note 2: Generic Package/Process data