

RELIABILITY REPORT
FOR
MAX1231BEEG+
PLASTIC ENCAPSULATED DEVICES

July 8, 2011

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

Approved by
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Conclusion

The MAX1231BEEG+ 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 MAX1227/MAX1229/MAX1231 are serial 12-bit analog-to-digital converters (ADCs) with an internal reference and an internal temperature sensor. These devices feature on-chip FIFO, scan mode, internal clock mode, internal averaging, and AutoShutdown(tm). The maximum sampling rate is 300ksps using an external clock. The MAX1231 has 16 input channels, the MAX1229 has 12 input channels, and the MAX1227 has 8 input channels. All input channels are configurable for single-ended or differential inputs in unipolar or bipolar mode. All three devices operate from a +3V supply and contain a 10MHz SPI(tm)/QSPI(tm)/MICROWIRE(tm)-compatible serial port. The MAX1231 is available in 28-pin 5mm x 5mm TQFN with exposed pad and 24-pin QSOP packages. The MAX1227/MAX1229 are only available in QSOP packages. All three devices are specified over the extended -40°C to +85°C temperature range. **Complete the Signal Chain! [Recommended Op Amps](#)**

II. Manufacturing Information

A. Description/Function:	12-Bit 300ksp ADCs with FIFO, Temp Sensor, Internal Reference
B. Process:	C6
C. Number of Device Transistors:	30893
D. Fabrication Location:	California
E. Assembly Location:	Thailand
F. Date of Initial Production:	April 26, 2003

III. Packaging Information

A. Package Type:	24-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:	#05-9000-0241 / 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:	105°C/W
K. Single Layer Theta Jc:	34°C/W
L. Multi Layer Theta Ja:	88°C/W
M. Multi Layer Theta Jc:	34°C/W

IV. Die Information

A. Dimensions:	121 X 87 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:	0.6 microns (as drawn)
F. Minimum Metal Spacing:	0.6 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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 47 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 23.4 \times 10^{-9}$$

$$\lambda = 23.4 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 C6 Process results in a FIT Rate of 0.43 @ 25C and 7.50 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot SMP1DA052W D/C 1013)

The AC19-1 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 +/-250mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX1231BEEG+

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	47	0	SMP1CQ001B, D/C 0539

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