

RELIABILITY REPORT
FOR
MAX127AEAI+
PLASTIC ENCAPSULATED DEVICES

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MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

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Conclusion

The MAX127AEAI+ successfully meets the quality and reliability standards required of all Maxim Integrated products. In addition, Maxim Integrated's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim Integrated's quality and reliability standards.

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I. Device Description

A. General

The MAX127/MAX128 are multirange, 12-bit data acquisition systems (DAS) that require only a single +5V supply for operation, yet accept signals at their analog inputs that may span above the power-supply rail and below ground. These systems provide eight analog input channels that are independently software programmable for a variety of ranges: $\pm 10V$, $\pm 5V$, 0 to +10V, 0 to +5V for the MAX127; and $\pm VREF$, $\pm VREF/2$, 0 to +VREF, 0 to +VREF/2 for the MAX128. This range switching increases the effective dynamic range to 14 bits and provides the flexibility to interface 4-20mA, $\pm 12V$, and $\pm 15V$ -powered sensors directly to a single +5V system. In addition, these converters are fault protected to $\pm 16.5V$; a fault condition on any channel will not affect the conversion result of the selected channel. Other features include a 5MHz bandwidth track/hold, an 8ksps throughput rate, and the option of an internal 4.096V or external reference. The MAX127/MAX128 feature a 2-wire, I²C*-compatible serial interface that allows communication among multiple devices using SDA and SCL lines. A hardware shutdown input (active-low SHDN) and two software-programmable power-down modes (standby and full power-down) are provided for low-current shutdown between conversions. In standby mode, the reference-buffer remains active, eliminating start-up delays. The MAX127/MAX128 are available in 24-pin DIP or space-saving 28-pin SSOP packages.

II. Manufacturing Information

A. Description/Function:	Multirange, +5V, 12-Bit DAS with 2-Wire Serial Interface
B. Process:	S3
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	Philippines, Malaysia
F. Date of Initial Production:	July 25, 1998

III. Packaging Information

A. Package Type:	28-pin SSOP
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:	#05-0101-0461
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:	23.9°C/W
L. Multi Layer Theta Ja:	66.6°C/W
M. Multi Layer Theta Jc:	23°C/W

IV. Die Information

A. Dimensions:	144 X 252 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:	3.0 microns (as drawn)
F. Minimum Metal Spacing:	3.0 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 210 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

(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 Integrated's reliability monitor program. Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maximintegrated.com/qa/reliability/monitor>. Cumulative monitor data for the S3 Process results in a FIT Rate of 0.04 @ 25C and 0.69 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot NQIABX001C D/C 9825)

The AD74 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000V 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

MAX127AEAI+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C	DC Parameters	80	0	NQIABX001C, D/C 9825
	Biased	& functionality	80	0	NQICD3117A, D/C 0134
	Time = 192 hrs.		50	0	NQIACQ002B, D/C 9835

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