

RELIABILITY REPORT
FOR
MAX992ESA+
PLASTIC ENCAPSULATED DEVICES

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MAXIM INTEGRATED

160 RIO ROBLES
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Conclusion

The MAX992ESA+ 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 MAX987/MAX988/MAX991/MAX992/MAX995/ MAX996 single/dual/quad micropower comparators feature low-voltage operation and rail-to-rail inputs and outputs. Their operating voltage ranges from +2.5V to +5.5V, making them ideal for both 3V and 5V systems. These comparators also operate with $\pm 1.25V$ to $\pm 2.75V$ dual supplies. They consume only 48 μA per comparator while achieving a 120ns propagation delay. Input bias current is typically 1.0pA, and input offset voltage is typically 0.5mV. Internal hysteresis ensures clean output switching, even with slow-moving input signals. The output stage's unique design limits supply-current surges while switching, virtually eliminating the supply glitches typical of many other comparators. The MAX987/MAX991/MAX995 have a push-pull output stage that sinks as well as sources current. Large internal output drivers allow rail-to-rail output swing with loads up to 8mA. The MAX988/MAX992/MAX996 have an open-drain output stage that can be pulled beyond VCC to 6V (max) above VEE. These open-drain versions are ideal for level translators and bipolar to single-ended converters. The single MAX987/MAX988 are available in tiny 5-pin SC70 packages, while the dual MAX991/MAX992 are available in ultra-small 8-pin SOT23 and μMAX ® packages.

II. Manufacturing Information

A. Description/Function:	High-Speed, Micropower, Low-Voltage, SOT23, Rail-to-Rail I/O Comparators
B. Process:	S12
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon, California or Texas
E. Assembly Location:	Malaysia, Thailand, or Philippines
F. Date of Initial Production:	July 26, 1997

III. Packaging Information

A. Package Type:	8-pin SOIC (N)
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:	#05-1501-0205
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:	170°C/W
K. Single Layer Theta Jc:	40°C/W
L. Multi Layer Theta Ja:	136°C/W
M. Multi Layer Theta Jc:	38°C/W

IV. Die Information

A. Dimensions:	24 X 67 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:	1.2 microns (as drawn)
F. Minimum Metal Spacing:	1.2 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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 320 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 3.4 \times 10^{-9}$$

$$\lambda = 3.4 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 S12 Process results in a FIT Rate of 0.02 @ 25C and 0.33 @ 55C (0.8 eV, 60% UCL).

B. E.S.D. and Latch-Up Testing (lot NMXDCN031A D/C 0436)

The CM62-3 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

MAX992ESA+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C	DC Parameters & functionality	80	0	NMXDCN031A, D/C 0436
	Biased		80	0	NMXBCX001B, D/C 9809
	Time = 192 hrs.		80	0	BMXBAX001B, D/C 9721
			80	0	BMXAAX001A, D/C 9721

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