

RELIABILITY REPORT
FOR
MAX975ESA+T
PLASTIC ENCAPSULATED DEVICES

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MAXIM INTEGRATED

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Conclusion

The MAX975ESA+T 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 MAX975/MAX977 single/dual comparators feature three different operating modes, and are optimized for +3V and +5V single-supply applications. The operating modes are as follows: high speed, high speed with auto-standby, and low power. Propagation delay is 28ns in high-speed mode, while supply current is only 250 μ A. Supply current is reduced to 3 μ A in low-power mode. The auto-standby feature allows the comparator to automatically change from low-power mode to highspeed mode upon receipt of an input signal. In the absence of an input signal, the comparator reverts back to low-power mode after an adjustable timeout period. The timeout period for the MAX975 to enter standby is set by a single capacitor. The dual MAX977 features independently adjustable timeout periods for each comparator using separate capacitors. The MAX975/MAX977's inputs have a common-mode voltage range of -0.2V to (VCC - 1.2V). The differential input voltage range extends rail to rail. The outputs are capable of rail-to-rail operation without external pull-up circuitry, making these devices ideal for interface with CMOS/TTL logic. All inputs and outputs can tolerate a continuous short-circuit fault condition to either rail. The comparator's internal hysteresis in high-speed mode ensures clean output switching, even with slow-moving input signals. The single MAX975 is available in 8-pin SO and 8-pin μ MAX® packages, while the dual MAX977 is available in 14-pin SO and 16-pin QSOP packages.

II. Manufacturing Information

A. Description/Function:	Single/Dual, +3V/+5V Dual-Speed Comparators with Auto-Standby
B. Process:	S12
C. Fabrication Location:	USA
D. Assembly Location:	Malaysia, Philippines, Thailand
E. Date of Initial Production:	Pre 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:	#05-1501-0110
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:	40X44 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:	1.8 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: 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 80 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 13.7 \times 10^{-9}$$

$$\lambda = 13.7 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 0.03 @ 25°C and 0.5 @ 55°C (0.8 eV, 60% UCL)

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

The CM26 die type has been found to have all pins able to withstand an 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

MAX975ESA+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	80	0	

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