



RELIABILITY REPORT  
FOR  
MAX4389EUT+  
(MAX4389/MAX4390/MAX4392-MAX4396)  
PLASTIC ENCAPSULATED DEVICES

February 23, 2009

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.  
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<b>Approved by</b>
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## Conclusion

The MAX4389EUT+ 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 MAX4389/MAX4390/MAX4392-MAX4396 family of op amps are unity-gain stable devices that combine high-speed performance, rail-to-rail outputs, and disable mode. These devices are targeted for applications where an input or an output is exposed to the outside world, such as video and communications. The MAX4389/MAX4390/MAX4392-MAX4396 operate from a single 4.5V to 11V supply or from dual  $\pm 2.25\text{V}$  to  $\pm 5.5\text{V}$  supplies. The common-mode input voltage range extends to the negative power-supply rail (ground in single-supply applications). The MAX4389/MAX4390/MAX4392-MAX4396 consume only 5.5mA of quiescent supply current per amplifier while achieving a 85MHz -3dB bandwidth, 27MHz 0.1dB gain flatness, and a 500V/ $\mu\text{s}$  slew rate. Disable mode sets the outputs to high impedance while consuming only 450 $\mu\text{A}$  of current. The MAX4389 single, MAX4393 dual, MAX4394 triple, and MAX4396 quad include disable capabilities. The MAX4389 and MAX4390 are available in ultra-small, 6-pin SC70 packages.

## II. Manufacturing Information

A. Description/Function:	Ultra-Small, Low-Cost, 85MHz Op Amps with Rail-to-Rail Outputs and Disable
B. Process:	CB2
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	UTL Thailand
F. Date of Initial Production:	January 26, 2002

## III. Packaging Information

A. Package Type:	6-pin SOT23
B. Lead Frame:	
C. Lead Finish:	100% matte Tin
D. Die Attach:	Non 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 Jb:	115°C/W
K. Single Layer Theta Jc:	80°C/W
L. Multi Layer Theta Ja:	74.6°C/W
M. Multi Layer Theta Jc:	6.1°C/W

## IV. Die Information

A. Dimensions:	32 X 31 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub> (Silicon nitride)
C. Interconnect:	Gold
D. Backside Metallization:	None
E. Minimum Metal Width:	2 microns (as drawn)
F. Minimum Metal Spacing:	2 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO <sub>2</sub>
I. Die Separation Method:	Wafer 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 150°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate ( $\lambda$ ) 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)

$$\lambda = 13.4 \times 10^{-9}$$

$$\lambda = 13.4 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 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 CB2 Process results in a FIT Rate of 0.14 @ 25C and 2.14 @ 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 VA01 die type has been found to have all pins able to withstand a transient pulse of

HBM: +/-1500 V Per JEDEC JESD22-A114

CDM: +/-250 V JEDEC JESD22-C101

Latch-Up testing has shown that this device withstands a current of +/-200 mA.

**Table 1**  
Reliability Evaluation Test Results

**MAX4389EUT+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
<b>Static Life Test</b> (Note 1)	Ta = 150°C Biased Time = 192 hrs.	DC Parameters & functionality	80	0
<b>Moisture Testing</b> (Note 2) 85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
<b>Mechanical Stress</b> (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