



RELIABILITY REPORT  
FOR  
MAX4213EUA+T  
PLASTIC ENCAPSULATED DEVICES

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**MAXIM INTEGRATED**

160 RIO ROBLES  
SAN JOSE, CA 95134

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## Conclusion

The MAX4213EUA+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.

## Table of Contents

<b>I. ....Device Description</b>	<b>IV. ....Die Information</b>
<b>II. ....Manufacturing Information</b>	<b>V. ....Quality Assurance Information</b>
<b>III. ....Packaging Information</b>	<b>VI. ....Reliability Evaluation</b>
<b>.....Attachments</b>	

### I. Device Description

#### A. General

The MAX4212/MAX4213 single, MAX4216 dual, MAX4218 triple, and MAX4220 quad op amps are unity-gain-stable devices that combine high-speed performance with Rail-to-Rail outputs. The MAX4213/MAX4218 have a disable feature that reduces power-supply current to 400 $\mu$ A and places the outputs into a high-impedance state. These devices operate from a 3.3V to 10V single supply or from  $\pm$ 1.65V to  $\pm$ 5V dual supplies. The common-mode input voltage range extends beyond the negative power-supply rail (ground in single-supply applications). These devices require only 5.5mA of quiescent supply current while achieving a 300MHz -3dB bandwidth and a 600V/ $\mu$ s slew rate. Input-voltage noise is only 10nV Hz and input-current noise is only 1.3pA Hz for either the inverting or noninverting input. These parts are an excellent solution in low-power/low-voltage systems that require wide bandwidth, such as video, communications, and instrumentation. In addition, when disabled, their high-output impedance makes them ideal for multiplexing applications. The MAX4212 comes in a miniature 5-pin SOT23 package, while the MAX4213/MAX4216 come in 8-pin  $\mu$ MAX® and SO packages. The MAX4218/MAX4220 are available in space-saving 16-pin QSOP and 14-pin SO packages.

## II. Manufacturing Information

A. Description/Function:	Miniature, 300MHz, Single-Supply, Rail-to-Rail Op Amps with Enable
B. Process:	CB2
C. Fabrication Location:	USA
D. Assembly Location:	Philippines, Thailand, Malaysia
E. Date of Initial Production:	Pre 1997

## III. Packaging Information

A. Package Type:	8-pin uMAX
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:	#05-3001-0039
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:	221°C/W
K. Single Layer Theta Jc:	41.9°C/W
L. Multi Layer Theta Ja:	206.3°C/W
M. Multi Layer Theta Jc:	41.9°C/W

## IV. Die Information

A. Dimensions:	38X57 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub> (Silicon nitride)
C. Interconnect:	Au
D. Minimum Metal Width:	2 microns (as drawn)
E. Minimum Metal Spacing:	2 microns (as drawn)
F. Isolation Dielectric:	SiO <sub>2</sub>
G. Die Separation Method:	Wafer Saw

## V. Quality Assurance Information

- A. Quality Assurance Contacts: Eric Wright (Reliability Engineering)  
Brian Standley (Manager, Reliability)  
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 ( $\lambda$ ) 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)

$$\lambda = 3.44 \times 10^{-9}$$

$$\lambda = 3.44 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 CB2 Process results in a FIT Rate of 0.14 @ 25C and 2.48 @ 55C (0.8 eV, 60% UCL)

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

The OP05 die type has been found to have all pins able to withstand an HBM transient pulse of +/-2000V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-100mA and overvoltage per JEDEC JESD78.

**Table 1**  
Reliability Evaluation Test Results

**MAX4213EUA+T**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
<b>Static Life Test</b> (Note 1)	Ta = 135C Biased Time = 192 hrs.	DC Parameters & functionality	320	0	

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