

RELIABILITY REPORT
FOR
MAX4039EUB+T
PLASTIC ENCAPSULATED DEVICES

May 14, 2015

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

Approved by
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Conclusion

The MAX4039EUB+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 single MAX4036/MAX4037 and dual MAX4038/MAX4039 operational amplifiers operate from a single +1.4V to +3.6V (without reference) or +1.8V to +3.6V (with reference) supply and consume only 800nA of supply current per amplifier, and 1.1 μ A for the optional reference. The MAX4036/MAX4038 feature a common-mode input voltage range from 0V to VDD - 0.4V at VDD = 1.4V. The MAX4037/MAX4039 feature a 1.232V voltage reference capable of sourcing 100 μ A and sinking 20 μ A. The MAX4036-MAX4039s' rail-to-rail outputs drive 5k loads to within 25mV of the rails. Ultra-low supply current, low operating voltage, and rail-to-rail outputs make the MAX4036-MAX4039 ideal for use in single-cell lithium-ion (Li+), or two-cell NiCd/NiMH/alkaline battery-powered applications. The MAX4036 is available in an SC70 package, the MAX4037 in a SOT23 package, and the MAX4038/MAX4039 in UCSP(tm), μ MAX®, and TDFN packages.

II. Manufacturing Information

A. Description/Function:	Low I _{sub>BIAS</sub>} , +1.4V/800nA, Rail-to-Rail Op Amps with +1.2V Buffered Reference
B. Process:	S4
C. Number of Device Transistors:	
D. Fabrication Location:	California, Texas or Japan
E. Assembly Location:	Philippines, Thailand, Malaysia
F. Date of Initial Production:	January 23, 2004

III. Packaging Information

A. Package Type:	10-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:	#05-9000-0395
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:	180°C/W
K. Single Layer Theta Jc:	41.9°C/W
L. Multi Layer Theta Ja:	113.1°C/W
M. Multi Layer Theta Jc:	41.9°C/W

IV. Die Information

A. Dimensions:	61X61 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal1 = 0.5 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{1000 \times 4340 \times 232 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 0.91 \times 10^{-9}$$

$\lambda = 0.91$ 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 S4 Process results in a FIT Rate of 0.13 @ 25C and 2.31 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot SDT3AZ003B, D/C 0340)

The OY03-3 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

MAX4039EUB+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C	DC Parameters	137	0	SDT3B2008G, D/C 0518
	Biased	& functionality	47	0	SDT3B2008F, D/C 0515
	Time = 1000 hrs.		48	0	STD3AZ003B, D/C 0340

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