

RELIABILITY REPORT  
FOR  
MAX6164AESA+  
PLASTIC ENCAPSULATED DEVICES

November 4, 2011

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.  
SUNNYVALE, CA 94086

<b>Approved by</b>
Sokhom Chum
Quality Assurance
Reliability Engineer

## Conclusion

The MAX6164AESA+ 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.

## Table of Contents

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

### I. Device Description

#### A. General

The MAX6161-MAX6168 are precision, low-dropout, micropower voltage references. These three-terminal devices operate with an input voltage range from (VOUT + 200mV) to 12.6V and are available with output voltage options of 1.25V, 1.8V, 2.048V, 2.5V, 3V, 4.096V, 4.5V, and 5V. They feature a proprietary curvature-correction circuit and laser-trimmed thin-film resistors that result in a very low temperature coefficient of 5ppm/°C (max) and an initial accuracy of  $\pm 2\text{mV}$  (max). Specifications apply to the extended temperature range (-40°C to +85°C). The MAX6161-MAX6168 typically draw only 100 $\mu\text{A}$  of supply current and can source 5mA (4mA for MAX6161) or sink 2mA of load current. Unlike conventional shunt-mode (two-terminal) references that waste supply current and require an external resistor, these devices offer a supply current that is virtually independent of the supply voltage (8 $\mu\text{A/V}$  variation) and do not require an external resistor. Additionally, the internally compensated devices do not require an external compensation capacitor. Eliminating the external compensation capacitor saves valuable board area in space-critical applications. Low dropout voltage and supply independent, ultra-low supply current make these devices ideal for battery-operated, high-performance, low-voltage systems. The MAX6161-MAX6168 are available in 8-pin SO packages.

## II. Manufacturing Information

A. Description/Function:	Precision, Micropower, Low-Dropout, High-Output-Current, SO-8 Voltage References
B. Process:	B12
C. Number of Device Transistors:	
D. Fabrication Location:	California
E. Assembly Location:	Thailand
F. Date of Initial Production:	Pre 1997

## III. Packaging Information

A. Package Type:	150 mil 8L SOIC
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:	#05-9000-1537 / A
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	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:	45 X 45 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (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 <sub>2</sub>
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 biased (static) life test are shown in Table 1. Using these results, the Failure Rate ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{1000 \times 4340 \times 225 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 0.9 \times 10^{-9}$$

$$\lambda = 0.9 \text{ F.I.T. (60\% confidence level @ 25}^\circ\text{C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maxim-ic.com/qa/reliability/monitor>. Cumulative monitor data for the B12 Process results in a FIT Rate of 0.06 @ 25C and 1.06 @ 55C (0.8 eV, 60% UCL)

### B. E.S.D. and Latch-Up Testing (lot SXE5AQ002D D/C 0517)

The RF44-5 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.

**Table 1**  
Reliability Evaluation Test Results

**MAX6164AESA+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
<b>Static Life Test</b> (Note 1)	Ta = 135°C	DC Parameters	135	0	SXE0AA004Q, D/C 0612
	Biased	& functionality	90	0	SXE0AA004E, D/C 0612
	Time = 1000 hrs.				

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