



RELIABILITY REPORT  
FOR  
MAX6069C\_AWS+T  
WAFER LEVEL DEVICES

September 24, 2017

**MAXIM INTEGRATED**

160 RIO ROBLES  
SAN JOSE, CA 95134

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## Conclusion

The MAX6069C\_AWS+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 MAX6069 ultra-low-power shunt references are ideal for space-critical and low-power applications. They are offered in a 4-bump wafer-level package (WLP), and the minimum operating current is guaranteed to be less than 1 $\mu$ A. These references feature low temperature coefficients of less than 20ppm/ $^{\circ}$ C and initial accuracy of better than 0.2%. Available with +1.25V, +2.048V, +2.5V, and 3V output voltages, these references can be used as lower-power, higher-precision upgrades to the ICL8069, LM385, LT1004, and LM4040 in much smaller packages. Two grades are available: A and B. The A grade features a temperature coefficient of 25ppm/ $^{\circ}$ C over the extended temperature range of -40 $^{\circ}$ C to +85 $^{\circ}$ C, with an initial accuracy of 0.2%. Grade B features a temperature coefficient of 50ppm/ $^{\circ}$ C over the extended temperature range of -40 $^{\circ}$ C to +85 $^{\circ}$ C, with an initial accuracy of 0.5%. Their tiny wafer-level packages make these references ideal for equipment with very small form factors.

**II. Manufacturing Information**

A. Description/Function:	1iA Ultra-Tiny Shunt Voltage Reference
B. Process:	B12
C. Fabrication Location:	USA
D. Assembly Location:	Taiwan
E. Date of Initial Production:	June 9, 2017

**III. Packaging Information**

A. Package Type:	40-bump WLP
B. Lead Frame:	N/A
C. Lead Finish:	N/A
D. Bondwire:	N/A (N/A mil dia.)
E. Assembly Diagram:	#05-100549
F. Flammability Rating:	Class UL94-V0
G. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
H. Single Layer Theta Ja:	N/A°C/W
I. Single Layer Theta Jc:	N/A°C/W
J. Multi Layer Theta Ja:	102.59°C/W
K. Multi Layer Theta Jc:	N/A°C/W

**IV. Die Information**

A. Dimensions:	47X36 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. Minimum Metal Width:	1.2 microns (as drawn)
E. Minimum Metal Spacing:	1.2 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:

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

(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 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

The RF69-2 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 passes overvoltage testing per JEDEC JESD78.

**Table 1**  
Reliability Evaluation Test Results

**MAX6069C\_AWS+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	80	0	

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