

RELIABILITY REPORT

FOR

MAX9646EBS+G45

MAX9646EBS+TG45

MAX9646EBS+CK0

MAX9646EBS+TCK0

WAFER LEVEL DEVICES

March 12, 2019

**MAXIM INTEGRATED**

160 RIO ROBLES

SAN JOSE, CA 95134



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## Conclusion

The MAX9646 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 MAX9644/MAX9645/MAX9646 are small, single comparators, ideal for a wide variety of portable electronics applications such as cell phones, media players, and notebooks that have extremely tight board space and power constraints. These comparators are offered in both a miniature 4-bump UCSP™ package with a 1mm x 1mm footprint (as small as two 0402 resistors) and a 5-pin SOT23 package. The ICs feature an input voltage range of -0.3V to +5.5V, independent of supply voltage. These devices maintain high impedance at the inputs even when powered down ( $V_{CC}$  or  $V_{REF} = 0V$ ). They also feature internal filtering to provide high RF immunity. The ICs have an internal 0.2V reference. These devices feature either a push-pull or an open-drain output. They consume only 700nA (max) supply current and operate down to  $V_{CC} = 1V$  over the extended  $-40^{\circ}C$  to  $+85^{\circ}C$  temperature range.

**II. Manufacturing Information**

A. Description/Function:	nanoPower Comparators with Precision Reference in 4-Bump UCSP
B. Process:	B8
C. Device Count	202
D. Fabrication Location:	USA
E. Assembly Location:	Taiwan
F. Date of Initial Production:	March 25, 2011

**III. Packaging Information**

A. Package Type:	UCSP
B. Lead Frame:	N/A
C. Lead Finish:	N/A
D. Die Attach:	N/A
E. Bondwire:	N/A
F. Mold Material:	N/A
G. Assembly Diagram:	05-9000-4389
H. Flammability Rating:	UL-94 (V-0 Rating)
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Ja:	N/A
K. Single Layer Theta Jc:	N/A
L. Multi Layer Theta Ja:	335 °C/W
M. Multi Layer Theta Jc:	N/A

**IV. Die Information**

A. Dimensions:	41X41 mils
B. Passivation:	SiO <sub>2</sub> /Si <sub>3</sub> N <sub>4</sub>

## V. Quality Assurance Information

- |                                   |  |
|-----------------------------------|--|
| A. Quality Assurance Contacts:    | Norbert Gerena (Engineer, Reliability)<br>Michael Cairnes (Executive Director, Reliability)<br>Bryan Preeshl (SVP of QA) |
| B. Outgoing Inspection Level:     | 0.1% for all electrical parameters guaranteed by the Datasheet.<br>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 125C biased (static) life test are shown in Table 1. Using these results, the Failure Rate  $\lambda$  is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 2454 \times 48 \times 2} \text{ (Chi square value for MTTF upper limit)}$$

(where 2454 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$$\lambda = 40.51 \times 10^{-9}$$

$$\lambda = 40.51 \text{ FITs (60\% confidence level @25°C)}$$

Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <https://www.maximintegrated.com/en/support/qa-reliability/reliability/reliability-monitor-program.html>.

MFN B8 Quarterly Process FIT from Q3CY18

$$\lambda = 0.6 \text{ FITs (60\% confidence level @25°C)}$$

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

The MAX9646EBS+ has been found to have all pins able to withstand an HBM transient pulse of +/- 2500 V per JEDEC / ESDA JS-001. Latch-Up testing has shown that this device withstands +/- 250 mA current injection and supply overvoltage per JEDEC JESD78.

**Table 1**  
Reliability Evaluation Test Results  
**MAX9644EUK+ (MAX9646EBS+ QBS)**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
<b>Static Life Test</b> (Note 1)	Ta = 125C Biased Time = 192 hrs.	DC Parameters & functionality	48	0	

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