

RELIABILITY REPORT

FOR

MAX14954ETO+  
MAX14954ETO+T

October 24, 2019

**MAXIM INTEGRATED**

160 RIO ROBLES  
SAN JOSE, CA 95134



Norbert Paul Gerena  
Engineer, Reliability



Michael Cairnes  
Executive Director, Reliability

## Conclusion

The MAX14954 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 MAX14954 is a quad equalizer/redriver designed to improve PCI Express® (PCIe) signal integrity by providing programmable input equalization at its receiver and programmable redrive circuitry. The output circuitry re-establishes deemphasis lost on the board and compensates for circuit-board loss. The device permits optimal placement of key PCIe components. The device is useful with stripline, microstrip printed circuits, and balanced 100Ω cable. The device is tailored for PCIe and features electrical idle and receiver detection on each channel. It is optimized for PCIe Gen III (8.0GT/s) and Gen II (5.0GT/s) data rates, while still handling Gen I (2.5GT/s). The MAX14954 is available in a small, lead-free, 42-pin (3.5mm x 9.0mm) TQFN package for optimal layout and minimal space requirements. The device is specified over -40°C to +85°C extended operating temperature range.

## II. Manufacturing Information

A. Description/Function:	Ruggedized Quad PCIe Redriver with Equalization and Extended Temperature Operation
B. Process:	MB3
C. Device Count:	23807
D. Fabrication Location:	Japan
E. Assembly Location:	Thailand or Taiwan
F. Date of Initial Production:	March 2013

## III. Packaging Information

A. Package Type:	TQFN
B. Lead Frame:	EFTEC64T
C. Lead Finish:	Matte Tin
D. Die Attach:	AB8200T or EN4900G
E. Bondwire:	Au (1.00 mil dia.)
F. Mold Material:	G770HCD or G770HJ
G. Assembly Diagram:	05-9000-4200
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:	40 °C/W
K. Single Layer Theta Jc:	2 °C/W
L. Multi Layer Theta Ja:	29 °C/W
M. Multi Layer Theta Jc:	2 °C/W

## IV. Die Information

A. Dimensions:	61.4173X220.0787 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub>

## V. Quality Assurance Information

A. Quality Assurance Contacts:	Norbert Gerena (Engineer, Reliability) Michael Cairnes (Executive Director, Reliability) Bryan Preeshl (SVP 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 48 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 22.9 \times 10^{-9}$$

$$\lambda = 22.9 \text{ FITs (60\% confidence level @25°C)}$$

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>.

Epson MB3 Quarterly Process FIT from Q2CY19

$$\lambda = 1.2 \text{ FITs (60\% confidence level @25°C)}$$

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

The MAX14954 has been found 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

**MAX14954**

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	48	0	

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