

RELIABILITY REPORT  
FOR  
MAX3948ETE+  
PLASTIC ENCAPSULATED DEVICES

October 30, 2012

**MAXIM INTEGRATED**

160 RIO ROBLES  
SAN JOSE, CA 95134

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

## Conclusion

The MAX3948ETE+ 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 MAX3948 is a 3.3V, multirate, low-power laser diode driver designed for Ethernet, Fibre Channel, and SONET transmission systems at data rates up to 11.3Gbps. This device is optimized to drive a differential transmitter optical subassembly (TOSA) with a 25 flex circuit. The unique design of the output stage enables DC-coupling to unmatched TOSAs, thereby lowering transmitter power consumption by more than 100mW. The MAX3948 receives differential AC-coupled signals with on-chip termination. It can deliver laser modulation currents of up to 85mA at an edge speed of 26ps (20% to 80%) into a 5 external differential load. The device is designed to have a high-bandwidth differential signal path with on-chip back termination resistors integrated into its outputs. An input equalization block can be activated to compensate for SFP+/QSFP+ host connector losses. The integrated DC circuit provides programmable laser DC currents up to 61mA. Both the laser DC current generator and the laser modulator can be disabled from a single pin. The device offers one dedicated pin (VSEL) to program up to four channel addresses for multichannel applications. The use of a 3-wire digital interface reduces the pin count while permitting adjustment of input equalization, polarity, output deemphasis, and modulation and DC currents without the need for external components. The MAX3948 is available in a 3mm × 3mm, 16-pin TQFN package, and is specified for the -40°C to +95°C extended temperature range.

## II. Manufacturing Information

A. Description/Function:	11.3Gbps, Low-Power, DC-Coupled Laser Driver
B. Process:	MB3
C. Number of Device Transistors:	13406
D. Fabrication Location:	California
E. Assembly Location:	Taiwan, China, Thailand
F. Date of Initial Production:	June 28, 2012

## III. Packaging Information

A. Package Type:	16-pin TQFN 3x3
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-4536 / B
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:	68°C/W
K. Single Layer Theta Jc:	10°C/W
L. Multi Layer Theta Ja:	68°C/W
M. Multi Layer Theta Jc:	10°C/W

## IV. Die Information

A. Dimensions:	70.87 X 70.87 mils
B. Passivation:	BCB
C. Interconnect:	Al with top layer 100% Cu
D. Backside Metallization:	None
E. Minimum Metal Width:	0.35µm
F. Minimum Metal Spacing:	0.35µm
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 135°C 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 MB3 Process results in a FIT Rate of 0.08 @ 25C and 1.33 @ 55C (0.8 eV, 60% UCL)

### B. E.S.D. and Latch-Up Testing (lot SY1ZB3001B D/C 1112)

The HQ45 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 and overvoltage per JEDEC JESD78.

**Table 1**  
Reliability Evaluation Test Results

**MAX3948ETE+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
<b>Static Life Test</b> (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	80	0	SY1ZB3001B, D/C 1112

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