



RELIABILITY REPORT
FOR MAX3946ETG+T
PLASTIC ENCAPSULATED DEVICES

July 23, 2010

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX3946ETG+T 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.

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I. Device Description

A. General

The MAX3946 is a +3.3V, multirate, low-power laser diode driver designed for Ethernet and Fibre Channel 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 use of unmatched TOSAs, greatly reducing headroom limitations and lowering power consumption. The device receives differential CML-compatible signals with on-chip line termination. It can deliver laser modulation current of up to 80mA, at an edge speed of 20ps (20% to 80%), into a 5 to 25 external differential load. The device is designed to have a symmetrical output stage with on-chip back terminations integrated into its outputs. A high-bandwidth, fully differential signal path is implemented to minimize deterministic jitter. An equalization block can be activated to compensate for the SFP+ connector. The integrated bias circuit provides programmable laser bias current up to 80mA. Both the laser bias generator and the laser modulator can be disabled from a single pin, DISABLE. A 3-wire digital interface reduces the pin count and permits adjustment of input equalization, pulse-width adjustment, Tx polarity, Tx deemphasis, modulation current, and bias current without the need for external components. The MAX3946 is available in a 4mm x 4mm, 24-pin TQFN package.

II. Manufacturing Information

A. Description/Function:	1.0625Gbps to 11.3Gbps, SFP+ Laser Driver with Laser Impedance Mismatch Tolerance
B. Process:	MB3
C. Number of Device Transistors:	13077
D. Fabrication Location:	California
E. Assembly Location:	China and Thailand
F. Date of Initial Production:	March 5, 2010

III. Packaging Information

A. Package Type:	24-pin TQFN 4x4
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:	#05-9000-3910
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:	48°C/W
K. Single Layer Theta Jc:	3°C/W
L. Multi Layer Theta Ja:	36°C/W
M. Multi Layer Theta Jc:	3°C/W

IV. Die Information

A. Dimensions:	80.31 X 65.75 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:	5 mil. Sq.
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

- A. Quality Assurance Contacts: Richard Aburano (Manager, Reliability Operations)
Bryan Preeshl (Managing Director 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 (λ) is calculated as follows:

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

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

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

$$\lambda = 22.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 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 SC5ZBQ001D, D/C 1002)

The HQ27 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

MAX3946ETG+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0	SC5ZBQ001D, D/C 1002

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