



RELIABILITY REPORT  
FOR  
MAX3799ETJ+  
PLASTIC ENCAPSULATED DEVICES

March 24, 2011

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.  
SUNNYVALE, CA 94086

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

## Conclusion

The MAX3799ETJ+ 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 MAX3799 is a highly integrated limiting amplifier and VCSEL driver that operates up to 14Gbps, making it suitable for Ethernet and Fibre Channel applications. By providing a selectable data path with a noise-shaping filter, the MAX3799 enables a module with 10G optics to be fully compliant with both 1000BASE-SR and 10GBASE-SR specifications. Operating from a single +3.3V supply, this low-power integrated limiting amplifier and VCSEL driver IC enables a platform design for SFP MSA as well as for SFP+ MSA-based optical transceivers. The high-sensitivity limiting amplifier limits the differential input signal generated by a transimpedance amplifier into a CML-level differential output signal. The compact VCSEL driver provides a modulation and a bias current for a VCSEL diode. The optical average power is controlled by an average power control (APC) loop implemented by a controller that interfaces to the VCSEL driver through a 3-wire digital interface. All differential I/Os are optimally back-terminated for a 50 transmission line PCB design. The use of a 3-wire digital interface reduces the pin count while enabling advanced Rx (rate selection, LOS threshold, LOS squelch, LOS polarity, CML output level, signal path polarity, deemphasis, and fast mode-select change time) and Tx settings (modulation current, bias current, polarity, and eye safety control) without the need for external components. The MAX3799 provides multiple current and voltage DACs to allow the use of low-cost controller ICs. The MAX3799 is packaged in a lead-free, 5mm x 5mm, 32-pin TQFN package.

**II. Manufacturing Information**

A. Description/Function:	1Gbps to 14Gbps, SFP+ Multirate Limiting Amplifier and VCSEL Driver
B. Process:	MB3
C. Number of Device Transistors:	21090
D. Fabrication Location:	California
E. Assembly Location:	China, Thailand
F. Date of Initial Production:	July 20, 2009

**III. Packaging Information**

A. Package Type:	32-pin TQFN 5x5
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:	#05-9000-2803
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:	47°C/W
K. Single Layer Theta Jc:	1.7°C/W
L. Multi Layer Theta Ja:	29°C/W
M. Multi Layer Theta Jc:	1.7°C/W

**IV. Die Information**

A. Dimensions:	110.24 X 100.39 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 <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:

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

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

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

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

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 SUXZBQ001D D/C 0919)

The HQ31 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-100mA and overvoltage per JEDEC JESD78.

**Table 1**  
Reliability Evaluation Test Results

**MAX3799ETJ+**

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	48	0	SUXZBQ001D, D/C 0919

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