

RELIABILITY REPORT
FOR
MAX3798ETJ+
PLASTIC ENCAPSULATED DEVICES

July 20, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering

Conclusion

The MAX3798ETJ+ 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 MAX3798 is a highly integrated limiting amplifier and VCSEL driver designed for 1x/2x/4x/8x Fibre Channel transmission systems at data rates up to 8.5Gbps as well as for 10GBASE-SR transmission systems at a data rate of 10.3125Gbps. 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 (mode selection, LOS threshold, LOS squelch, LOS polarity, CML output level, signal path polarity, slew-rate control, deemphasis, and fast mode-select change time) and Tx settings (modulation current, bias current, polarity, programmable deemphasis, eye-crossing adjustment, and eye safety control) without the need for external components. The MAX3798 provides multiple current and voltage DACs to allow the use of low-cost controller ICs. The MAX3798 is packaged in a lead-free, 5mm x 5mm, 32-pin TQFN package.

II. Manufacturing Information

A. Description/Function:	1.0625Gbps to 10.32Gbps, Integrated, Low-Power SFP+ 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:	October 25, 2008

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:	#
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:	2.7°C/W

IV. Die Information

A. Dimensions:	110.24X100.39 mils
B. Passivation:	BCB
C. Interconnect:	Al, 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:	Ken Wendel (Director, Reliability Engineering) 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:

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

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

$$\lambda = 22.4 \times 10^{-9}$$

$$\lambda = 22.4 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at <http://www.maxim-ic.com/>. Current monitor data for the MB3 Process results in a FIT Rate of 1.84 @ 25C and 22.3 @ 55C (0.8 eV, 60% UCL)

B. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

C. E.S.D. and Latch-Up Testing

The HD95 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1500 V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250 mA, 1.5x VCCMax Overvoltage per JESD78.

Table 1
Reliability Evaluation Test Results

MAX3798ETJ+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0
Moisture Testing (Note 2) 85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2) Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality	77	0

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

Note 2: Generic Package/Process data