RELIABILITY REPORT

FOR

MAX3766EEP

PLASTIC ENCAPSULATED DEVICES

April 29, 2003

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

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Conclusion

The MAX3766 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.

Table of Contents

I. Device Description

A. General

The MAX3766 is a complete, easy-to-program laser driver for fiber optic LAN transmitters, optimized for operation at 622Mbps. It includes a laser modulator, automatic power control (APC), and a failure indicator with latched shutdown.

Laser modulation current can be programmed up to 60mA at 622Mbps. A programmable modulation temperature coefficient can be used to keep the transmitted extinction ratio nearly constant over a wide temperature range. The modulator operates at data rates up to 1.25Gbps at reduced modulation current. APC circuitry uses feedback from the laser's monitor photodiode to adjust the laser bias current, producing constant output power regardless of laser temperature or age. The MAX3766 supports laser bias currents up to 80mA.

The MAX3766 provides extensive laser safety features, including a failure indicator with latched shutdown and a smooth start-up bias generator. These features help ensure that the transmitter output does not reach hazardous levels. The MAX3766 is available in a compact 20-pin QSOP and dice.

B. Absolute Maximum Ratings

Item	Rating
Supply Voltage, VCC, VCCOUT	-0.5V to 7.0V
Voltage at IN+, IN-, ENABLE, SAFETY, FAIL	-0.5V to (VCC + 0.5V)
Voltage at MOD, BIASMAX, POWERSET, TC	-0.5V to 4.0V
Current out of REF1, REF2	-0.1mA to 10mA
Current into OUT+, OUT-	-5mA to 100mA
Current into BIAS	-5mA to 130mA
Current into MD	-5mA to 5mA
Current into FAIL	-5mA to 30mA
Current into SAFETY	-5mA to 10mA
Operating Junction Temperature Range	-40°C to +150°C
Storage Temperature Range	-55°C to +150°C
Lead Temperature (soldering, 10sec)	+300°C
Continuous Power Dissipation (TA = +70°C)	
20-Pin QSOP	590mW
Derate above +70°C	
20-Pin QSOP	9.1mW/°C

II. Manufacturing Information

A. Description/Function: 622Mbps LAN/WAN Laser Driver with Automatic Power Control and Safety Shutdown

B. Process: GST2 – High Speed Double Poly-Silicon Bipolar Process

C. Number of Device Transistors: 725

D. Fabrication Location: Oregon, USA

E. Assembly Location: Korea, Thailand, Malaysia or Philippines

F. Date of Initial Production: October, 1997

III. Packaging Information

A. Package Type: **20-QSOP**

B. Lead Frame: Copper

C. Lead Finish: Solder Plate

D. Die Attach: Silver-filled Epoxy

E. Bondwire: Gold (1.0 mil dia.)

F. Mold Material: Epoxy with silica filler

G. Assembly Diagram: # 05-7001-0239

H. Flammability Rating: Class UL94-V0

I. Classification of Moisture Sensitivity per JEDEC standard JESD22-112: Level 1

IV. Die Information

A. Dimensions: 45 x 56 mils

B. Passivation: Si_3N_4 (Silicon nitride)

C. Interconnect: Poly / Au

D. Backside Metallization: None

E. Minimum Metal Width: 2 microns (as drawn)

F. Minimum Metal Spacing: 2 microns (as drawn)

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: Jim Pedicord (Reliability Lab Manager)
Bryan Preeshl (Executive Director**)**
Kenneth Huening (Vice President)

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 150°C biased (static) life test are shown in **Table 1**. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 9823 \times 45 \times 2}$$ (Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 10.78 \times 10^{-9}$

$\lambda = 10.78$ F.I.T. (60% confidence level @ 25°C)

This low failure rate represents data collected from Maxim's reliability monitor program. In addition to routine production Burn-In, Maxim pulls a sample from every fabrication process three times per week and subjects it to an extended Burn-In prior to shipment to ensure its reliability. The reliability control level for each lot to be shipped as standard product is 59 F.I.T. at a 60% confidence level, which equates to 3 failures in an 80 piece sample. Maxim performs failure analysis on any lot that exceeds this reliability control level. Maxim also performs quarterly 1000 hour life test monitors. This data is published in the Product Reliability Report (**RR-B3A**).

B. Moisture Resistance Tests

Maxim pulls pressure pot samples from every assembly process three times per week. Each lot sample must meet an LTPD = 20 or less before shipment as standard product. Additionally, the industry standard 85°C/85%RH testing is done per generic device/package family once a quarter.

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

The HF20 die type has been found to have all pins able to withstand a transient pulse of ±250V, per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of ±50mA.

Table 1
Reliability Evaluation Test Results

MAX3766EEP

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	PACKAGE	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)					
	Ta = 150°C Biased Time = 192 hrs.	DC Parameters & functionality		45	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	QSOP	77	0
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

Attachment #1

TABLE II. Pin combination to be tested. 1/ 2/

	Terminal A (Each pin individually connected to terminal A with the other floating)	Terminal B (The common combination of all like-named pins connected to terminal B)
1.	All pins except V_{PS1} 3/	All V_{PS1} pins
2.	All input and output pins	All other input-output pins

1/ Table II is restated in narrative form in 3.4 below.
2/ No connects are not to be tested.
3/ Repeat pin combination I for each named Power supply and for ground

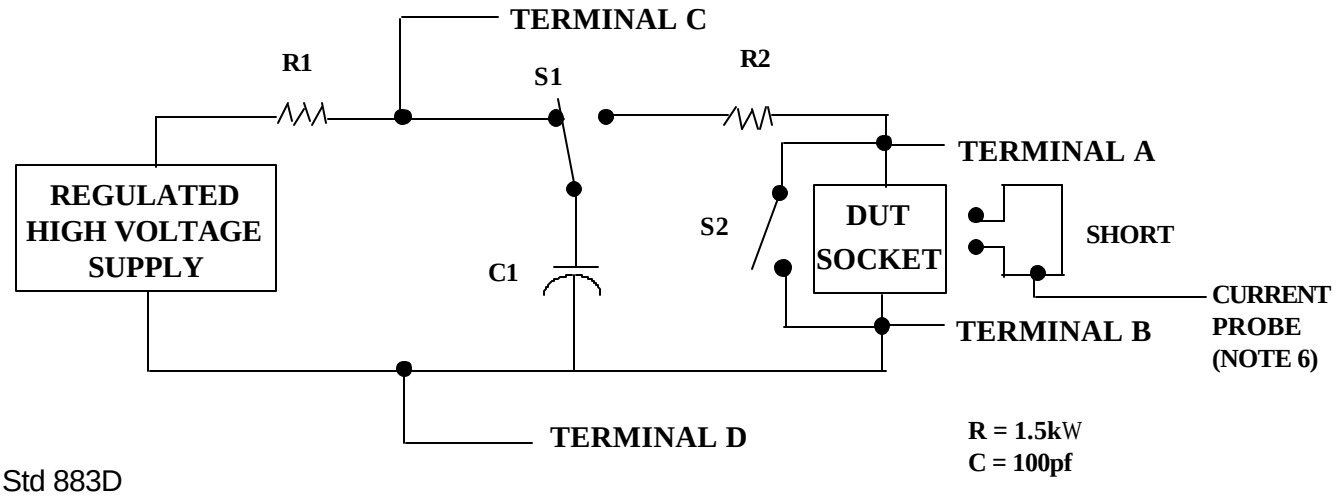
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

3.4 Pin combinations to be tested.

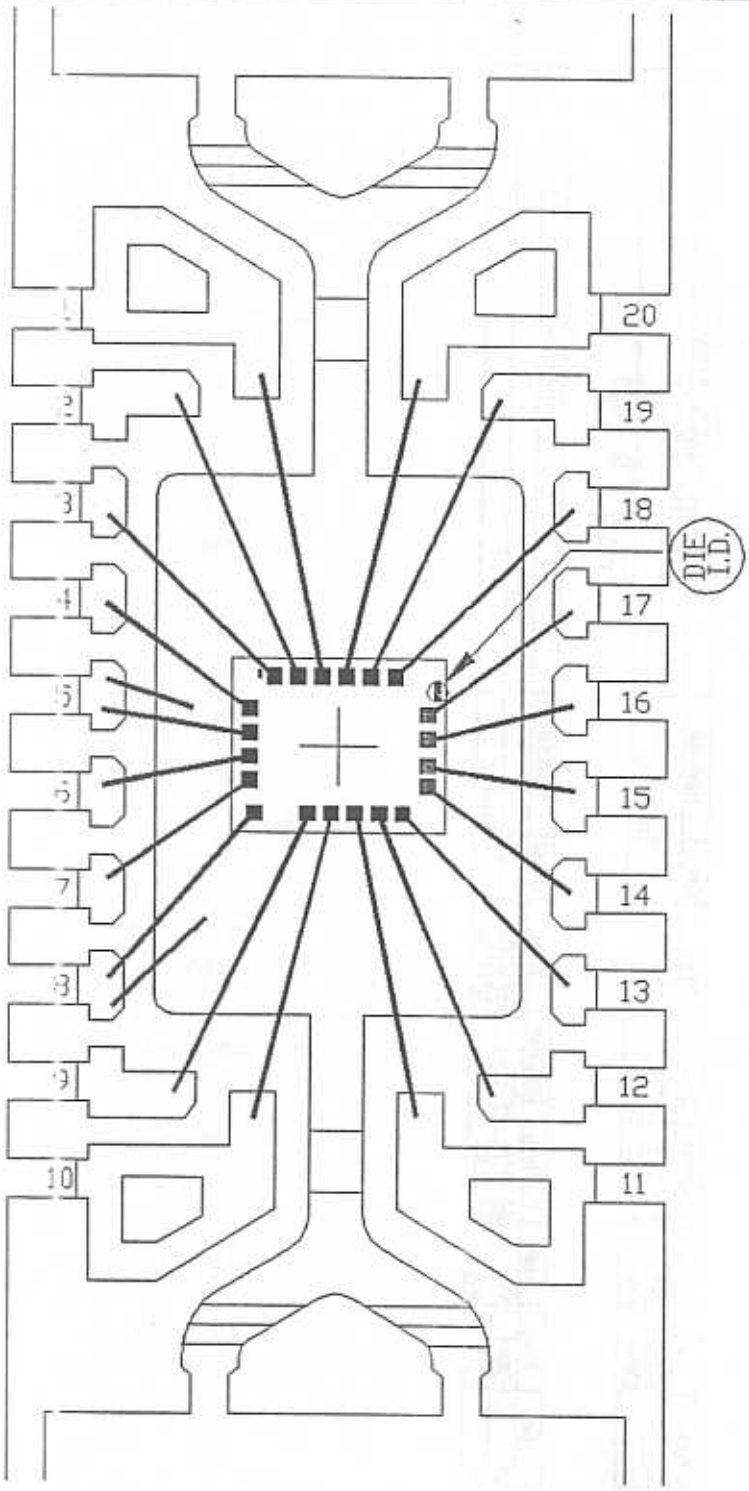
a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.

b. Each pin individually connected to terminal A with respect to each different set of a combination of all named power supply pins (e.g., V_{SS1}, or V_{SS2} or V_{SS3} or V_{CC1}, or V_{CC2}) connected to terminal B. All pins except the one being tested and the power supply pin or set of pins shall be open.

c. Each input and each output individually connected to terminal A with respect to a combination of all the other input and output pins connected to terminal B. All pins except the input or output pin being tested and the combination of all the other input and output pins shall be open.



Mil Std 883D
Method 3015.7
Notice 8



PKG.CODE: E20-1		APPROVALS	DATE	MAXIM
CAV./PAD SIZE: 96X140	PKG. DESIGN			BUILDSHEET NUMBER: 05-7001-0239 / REV.: A