RELIABILITY REPORT

FOR

MAX3737ExJ

PLASTIC ENCAPSULATED DEVICES

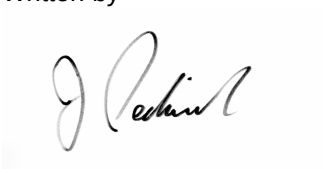
July 16, 2003

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by



Jim Pedicord
Quality Assurance
Reliability Lab Manager

Reviewed by

Bryan J. Preeshl
Quality Assurance
Executive Director

Conclusion

The MAX3737 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 MAX3737 is a +3.3V laser driver designed for multirate transceiver modules with data rates from 155Mbps to 2.7Gbps. Lasers can be DC-coupled to the MAX3737 for reduced component count and ease of multirate operation.

Laser extinction ratio control (ERC) combines the features of automatic power control (APC), modulation compensation, and built-in thermal compensation. The APC loop maintains constant average optical power. Modulation compensation increases the modulation current in proportion to the bias current. These control loops combined with thermal compensation maintain a constant optical extinction ratio over temperature and lifetime.

The MAX3737 accepts differential data input signals. The wide 5mA to 60mA (up to 85mA AC-coupled) modulation current range and up to 100mA bias current range make the MAX3737 ideal for driving FP/DFB lasers in fiber-optic modules. External resistors set the required laser current levels. The MAX3737 provides transmit-disable control (TX_DISABLE), single-point fault tolerance, bias-current monitoring, modulation-current monitoring, and photocurrent monitoring. The device also offers a latched failure output (TX_FAULT) to indicate faults, such as when the APC loop is no longer able to maintain the average optical power at the required level. The MAX3737 is compliant with the SFF-8472 transmitter diagnostic and SFP MSA timing requirements.

The MAX3737 is offered in a 5mm x 5mm 32-pin thin QFN and QFN package and operates over the -40°C to +85°C extended temperature range.

B. Absolute Maximum Ratings

Item	Rating
Supply Voltage VCC	-0.5V to +6.0V
IN+, IN-, TX_DISABLE, TX_FAULT, SHUTDOWN, MC_MON, BC_MON, PC_MON, VBS, VMD, APCFILT1, APCFILT2, MD, TH_TEMP, MODTCOMP, MODBCOMP, MODSET, and APCSET Voltage	-0.5V to VCC + 0.5V
OUT+, OUT-, BIAS Current	-20mA to +150mA
Operating Junction Temperature Range	-55°C to +150°C
Storage Temperature Range	-55°C to +150°C
Continuous Power Dissipation (TA = +85°C)	
32-Pin QFN-EP	1.3W
Derates above +85°C	
32-Pin QFN-EP	21.2mW/°C

II. Manufacturing Information

A. Description/Function:	Multirate Laser Driver with Extinction Ratio Control
B. Process:	GST4-F60
C. Number of Device Transistors:	2727
D. Fabrication Location:	Oregon, USA
E. Assembly Location:	Korea or Thailand
F. Date of Initial Production:	April, 2003

III. Packaging Information

	32-Pin QFN-EP (5x5)	**32-Pin ThinQFN-EP (5x5)**
A. Package Type:		
B. Lead Frame:	Copper	Copper
C. Lead Finish:	Solder Plate	Solder Plate
D. Die Attach:	Conductive Epoxy	Conductive Epoxy
E. Bondwire:	Gold (1.2 mil dia.)	Gold (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler	Epoxy with silica filler
G. Assembly Diagram:	# 05-9000-0600	# 05-9000-0455
H. Flammability Rating:	Class UL94-V0	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112:	Level 1	Level 1

IV. Die Information

A. Dimensions:	99 x 77 mils
B. Passivation:	Si_3N_4 (Silicon nitride)
C. Interconnect:	Au
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal1: 1.2; Metal2: 1.2; Metal3: 1.2; Metal4: 5.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1: 1.6; Metal2: 1.6; Metal3: 1.6; Metal4: 4.2 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 of QA)
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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 9823 \times 46 \times 2}$$

(Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 10.55 \times 10^{-8}$ $\lambda = 10.55$ F.I.T. (60% confidence level @ 25°C)

This low failure rate represents data collected from Maxim's reliability qualification and monitor programs. Maxim also performs weekly Burn-In on samples from production to assure reliability of its processes. The reliability required for lots which receive a burn-in qualification 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 rejects from lots exceeding this level. The Burn-In Schematic (Spec.# 06-7139) shows the static circuit used for this test. Maxim also performs 1000 hour life test monitors quarterly for each process. This data is published in the Product Reliability Reports (**RR-1M** & **RR-B3A**).

B. Moisture Resistance Tests

Maxim evaluates pressure pot stress from every assembly process during qualification of each new design. Pressure Pot testing must pass a 20% LTPD for acceptance. Additionally, industry standard 85°C/85%RH or HAST tests are performed quarterly per device/package family.

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

The HT41 die type has been found to have all pins able to withstand a transient pulse of +/-1000V, per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of ±250mA.

Table 1
Reliability Evaluation Test Results

MAX3737ExJ

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = 150°C Biased Time = 192 hrs.	DC Parameters & functionality	46	0
Moisture Testing (Note 2)				
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	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 process/package 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

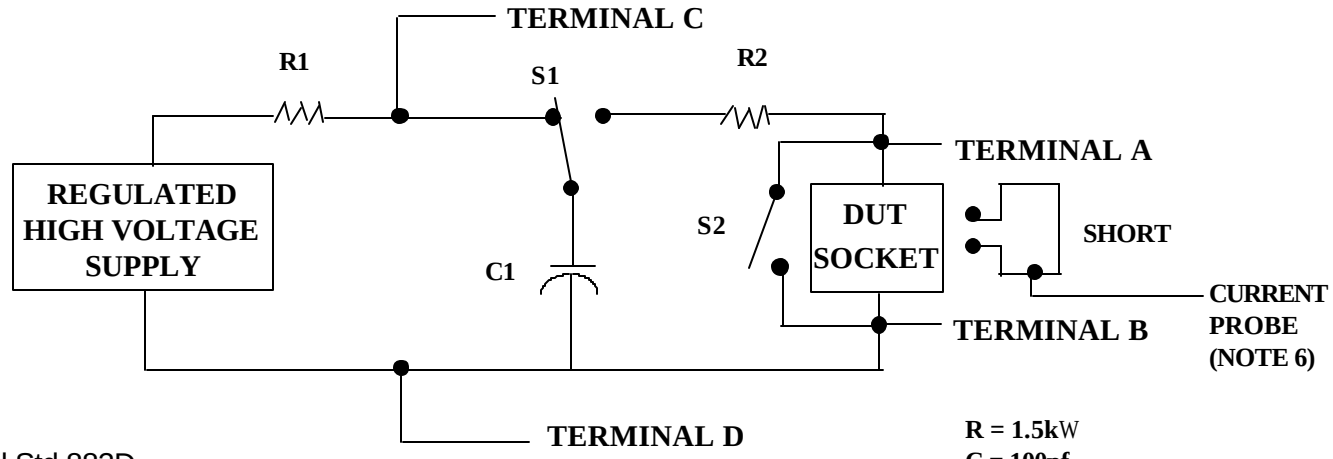
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

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.

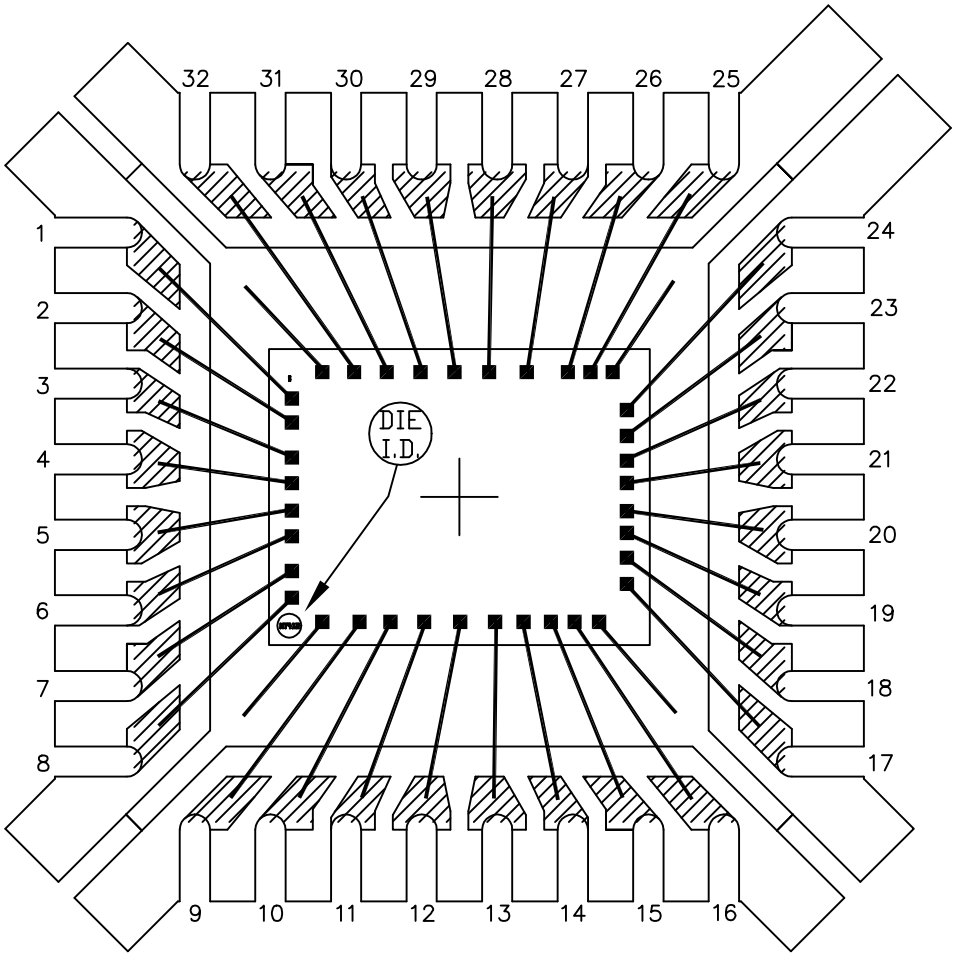
b. Each pin individually connected to terminal A with respect to each different set of a combination of all named power supply pins (e.g., V_{SS1}, or V_{SS2} or V_{SS3} or V_{CC1}, or V_{CC2}) connected to terminal B. All pins except the one being tested and the power supply pin or set of pins shall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

EXPOSED PAD PKG.

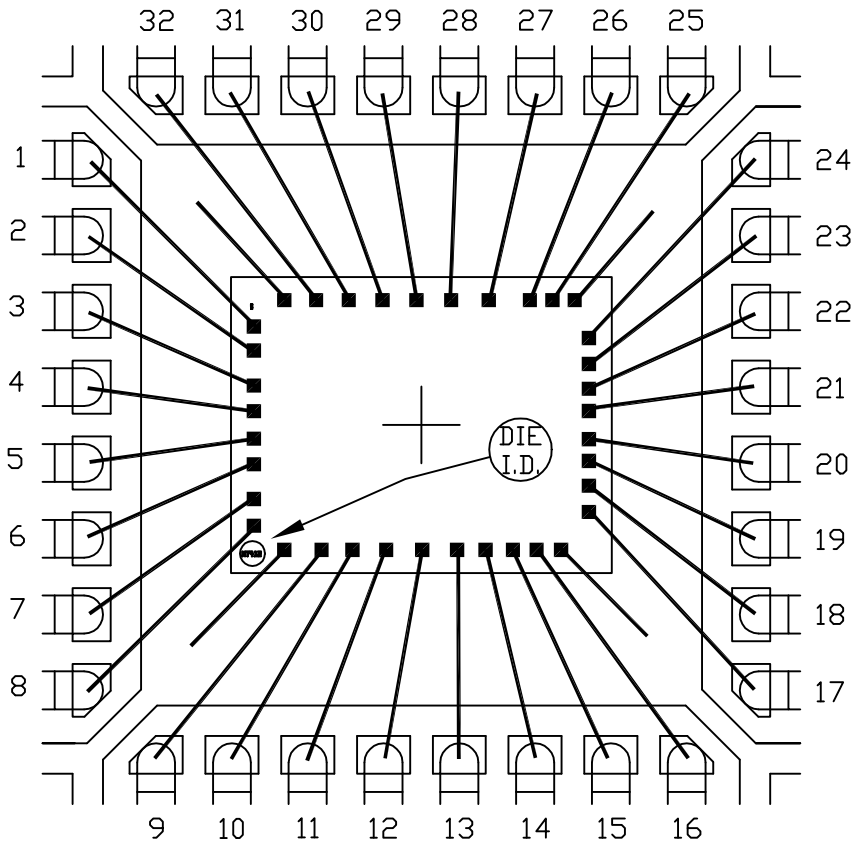


BONDABLE AREA

PKG. BODY SIZE: 5x5 mm

PKG. CODE: G3255-1		SIGNATURES	DATE	MAXIM CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: 130x130	PKG.			BOND DIAGRAM #: 05-9000-0600	REV: A
	DESIGN				

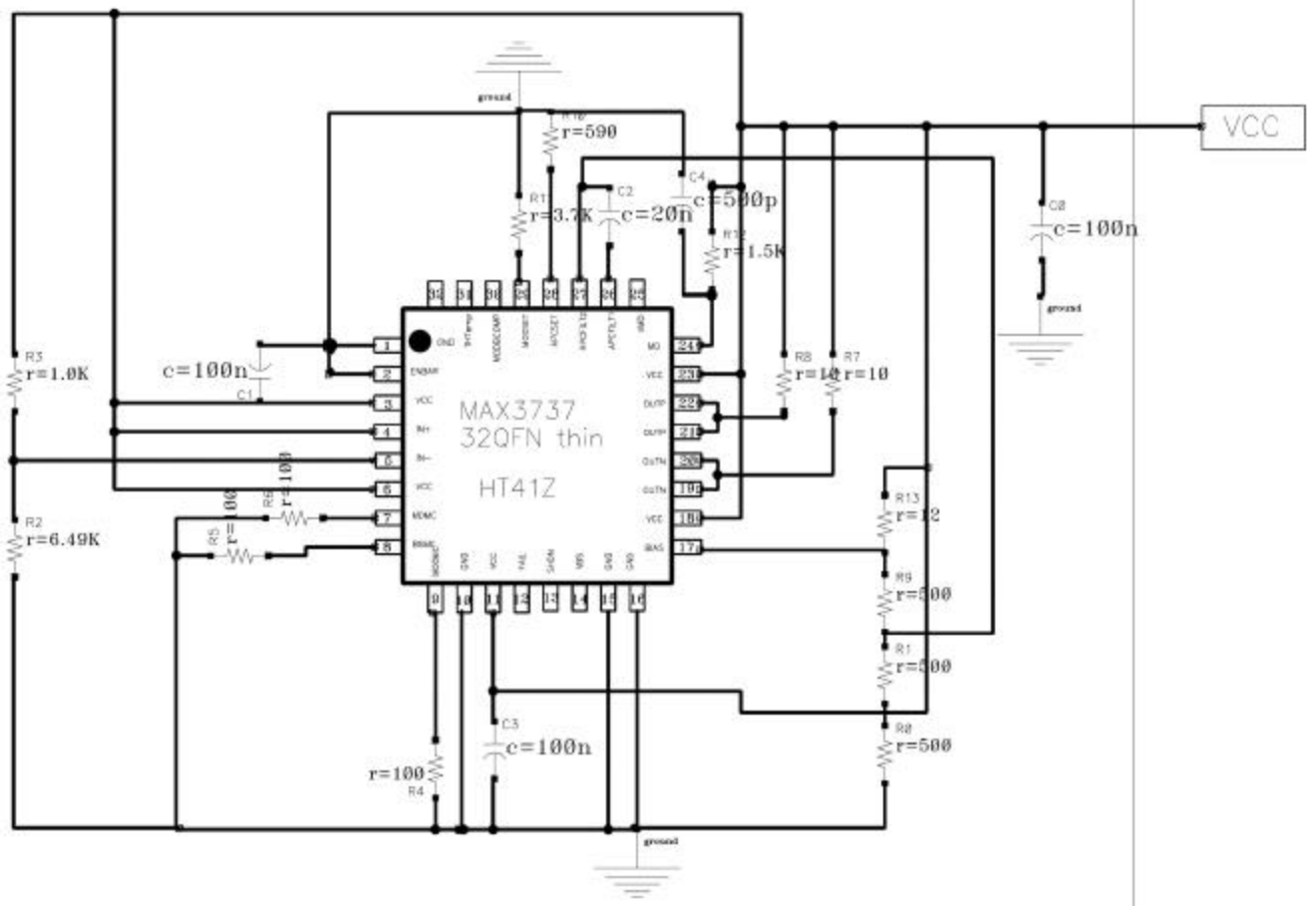
5x5x0.8mm QFN THIN PKG. EXPOSED PAD PKG.



PKG. CODE: T3255-2		SIGNATURES	DATE	MAXIM CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: 146x146	PKG.			BOND DIAGRAM #: 05-9000-0455	REV: A
	DESIGN				

ONCE PER SOCKET

ONCE PER BOARD



HEADER GROUNDED (Yes/No): Yes

PRODUCT: MAX 3737 PACKAGE TYPE: 32QFN Thin-EP 5x5x0.8 mm	DRAWN BY:
VERSION #: DATE : Feb 20 09:52:33 2003	NOTES: Exposed paddle must be connected to ground.
ICC (MAX) : 250mA	
VCC : 3.6 VOLTS	