RELIABILITY REPORT

FOR

MAX3737ExJ

PLASTIC ENCAPSULATED DEVICES

July 16, 2003

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

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Reviewed by
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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.

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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

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage VCC</td>
<td>-0.5V to +6.0V</td>
</tr>
<tr>
<td>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</td>
<td>-0.5V to VCC + 0.5V</td>
</tr>
<tr>
<td>OUT+, OUT-, BIAS Current</td>
<td>-20mA to +150mA</td>
</tr>
<tr>
<td>Operating Junction Temperature Range</td>
<td>-55°C to +150°C</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>-55°C to +150°C</td>
</tr>
<tr>
<td>Continuous Power Dissipation (TA = +85°C) 32-Pin QFN-EP</td>
<td>1.3W</td>
</tr>
<tr>
<td>Derates above +85°C 32-Pin QFN-EP</td>
<td>21.2mW/°C</td>
</tr>
</tbody>
</table>
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

A. Package Type: 32-Pin QFN-EP (5x5) 32-Pin ThinQFN-EP (5x5)
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: Si₃N₄ (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: SiO₂
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 ($\lambda$) is calculated as follows:

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

<table>
<thead>
<tr>
<th>TEST ITEM</th>
<th>TEST CONDITION</th>
<th>FAILURE IDENTIFICATION</th>
<th>SAMPLE SIZE</th>
<th>NUMBER OF FAILURES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Static Life Test</strong></td>
<td>Ta = 150°C</td>
<td>DC Parameters</td>
<td>46</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Biased</td>
<td>&amp; functionality</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time = 192 hrs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Moisture Testing</strong></td>
<td>Ta = 121°C</td>
<td>DC Parameters</td>
<td>77</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Pressure Pot</td>
<td>&amp; functionality</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P = 15 psi.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RH = 100%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time = 168 hrs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>85/85</td>
<td>DC Parameters</td>
<td>77</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Ta = 85°C</td>
<td>&amp; functionality</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RH = 85%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Biased</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time = 1000 hrs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mechanical Stress</strong></td>
<td>-65°C/150°C</td>
<td>DC Parameters</td>
<td>77</td>
<td>0</td>
</tr>
<tr>
<td>Cycle</td>
<td>1000 Cycles</td>
<td>&amp; functionality</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Method 1010</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note 1:** Life Test Data may represent plastic DIP qualification lots.
**Note 2:** Generic process/package data.
TABLE II. Pin combination to be tested. 1/ 2/

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

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.
EXPOSED PAD PKG.

PKG. BODY SIZE: 5x5 mm

PKG. CODE: G3255-1

CAV./PAD SIZE: 130x130

SIGNATURES

DATE

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BOND DIAGRAM #: 05-9000-0600
REV: A
HEADER GROUNDED (Yes/No): Yes

PRODUCT: MAX 3737
PACKAGE TYPE: 320FN Thin-EP 5x5.8 mm

DATE: Feb 20 2003

IC (MAX): 250mA
VCC: 3.6 VOLS

NOTES: Exposed paddle must be connected to ground.