RELIABILITY REPORT

FOR

MAX3863ETJ+

PLASTIC ENCAPSULATED DEVICES

February 17, 2010

# MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

| **Approved by** |
|---|
| Ken Wendel |
| Quality Assurance |
| Director, Reliability Engineering |

## Conclusion

The MAX3863ETJ+ 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 MAX3863 is designed for direct modulation of laser diodes at data rates up to 2.7Gbps. An automatic power-control (APC) loop is incorporated to maintain a constant average optical power. Modulation compensation is available to increase the modulation current in proportion to the bias current. The optical extinction ratio is then maintained over temperature and lifetime. The laser driver can modulate laser diodes at amplitudes up to 80mA. Typical (20% to 80%) edge speeds are 50ps. The MAX3863 can supply a bias current up to 100mA. External resistors can set the laser output levels. The MAX3863 includes adjustable pulse-width control to minimize laser pulse-width distortion. The device offers a failure monitor output to indicate when the APC loop is unable to maintain the average optical power. The MAX3863 accepts differential CML clock and data input signals with on-chip 50  termination resistors. If a clock signal is available, an input data-retiming latch can be used to reject input pattern-dependent jitter. The laser driver is fabricated with Maxim's in-house second-generation SiGe process.

## II. Manufacturing Information

| | |
|---|---|
| A. Description/Function: | 2.7Gbps Laser Driver with Modulation Compensation |
| B. Process: | G4 |
| C. Number of Device Transistors: | |
| D. Fabrication Location: | Oregon |
| E. Assembly Location: | China, Thailand |
| F. Date of Initial Production: | January 22, 2002 |

## 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: | #05-9000-1876 |
| 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: | 81 X 81 mils |
| B. Passivation: | $Si_3N_4$ |
| C. Interconnect: | Au |
| D. Backside Metallization: | None |
| E. Minimum Metal Width: | 1.2 microns (as drawn) Metal 1, 2 & 3 5.6 microns (as drawn) Metal 4 |
| F. Minimum Metal Spacing: | 1.6 microns (as drawn) Metal 1, 2 & 3, 4.2 microns (as drawn) Metal 4 |
| 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)<br>Bryan Preeshl (Managing Director of QA) |
| B. Outgoing Inspection Level: | 0.1% for all electrical parameters guaranteed by the Datasheet.<br>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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{6.21}{192 \times 9706 \times 95 \times 2} \quad \text{(Chi square value for MTTF upper limit)}$$

(where 9706 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$\lambda = 17.5 \times 10^{-9}$

$\lambda$ = 17.5 F.I.T. (60% confidence level @ 25°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 G4 Process results in a FIT Rate of 0.02 @ 25C and 0.37 @ 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 HF87 die type has been found to have all pins able to withstand a HBM transient pulse of +/-400 V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

**Table 1**
Reliability Evaluation Test Results

**MAX3863ETJ+**

| TEST ITEM | TEST CONDITION | FAILURE IDENTIFICATION | SAMPLE SIZE | NUMBER OF FAILURES |
|---|---|---|---|---|
| **Static Life Test** (Note 1) | | | | |
| | Ta = 150°C<br>Biased<br>Time = 192 hrs. | DC Parameters & functionality | 95 | 2 |
| **Moisture Testing** (Note 2) | | | | |
| HAST | Ta = 130°C<br>RH = 85%<br>Biased<br>Time = 96hrs. | DC Parameters & functionality | 77 | 0 |
| **Mechanical Stress** (Note 2) | | | | |
| Temperature Cycle | -65°C/150°C<br>1000 Cycles<br>Method 1010 | DC Parameters & functionality | 77 | 0 |

Note 1: Life Test Data may represent plastic DIP qualification lots.
Note 2: Generic Package/Process data