

RELIABILITY REPORT  
FOR  
MAX3966CEE+  
PLASTIC ENCAPSULATED DEVICES

December 22, 2009

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.  
SUNNYVALE, CA 94086

|                                   |
|-----------------------------------|
| <b>Approved by</b>                |
| Ken Wendel                        |
| Quality Assurance                 |
| Director, Reliability Engineering |

## Conclusion

The MAX3966CEE+ 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 MAX3966 is a programmable LED driver for fiber optic transmitters operating at data rates up to 266Mbps. The circuit contains a high-speed current driver with programmable temperature coefficient (tempco), adjustments for LED prebias voltage, and a VBB reference voltage generator. The circuit accepts PECL data inputs, and operates from a single +3V to +5.5V power supply.

The MAX3966 can switch up to 100mA into typical high-speed light-emitting diodes. As temperature increases, the device's modulation current increases with a tempco that is programmable from 2500ppm/°C to 12,000ppm/°C. The modulation current is programmed with a single external resistor.

The MAX3966's LED prebias voltage is programmable from 400mV to 925mV. The prebias circuit produces peaking current, which improves the LED switching speed.

Complementary current outputs help to maintain a constant supply current, reducing EMI and supply noise generated by the transmitter module. The MAX3966 is available in die form, or in 16-pin and 24-pin QSOP packages.

## II. Manufacturing Information

|                                  |  |
|----------------------------------|--|
| A. Description/Function:         | LED Driver with Programmable Prebias Voltage |
| B. Process:                      | CB2  |
| C. Number of Device Transistors: |  |
| D. Fabrication Location:         | Oregon                                       |
| E. Assembly Location:            | Philippines, Thailand                        |
| F. Date of Initial Production:   | Pre 1997                                     |

## III. Packaging Information

|  |                          |
|--|--------------------------|
| A. Package Type:   | 16-pin QSOP              |
| B. Lead Frame:   | Copper                   |
| C. Lead Finish:  | 100% matte Tin           |
| D. Die Attach:   | Conductive Epoxy         |
| E. Bondwire:   | Au (1.0 mil dia.)        |
| F. Mold Material:  | Epoxy with silica filler |
| G. Assembly Diagram:   | #05-7001-0295            |
| 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:  | 120°C/W                  |
| K. Single Layer Theta Jc:  | 37°C/W                   |
| L. Multi Layer Theta Ja:   | 103.7°C/W                |
| M. Multi Layer Theta Jc:   | 37°C/W                   |

## IV. Die Information

|                            |  |
|----------------------------|--|
| A. Dimensions:             | 72 X 46 mils                                     |
| B. Passivation:            | Si <sub>3</sub> N <sub>4</sub> (Silicon nitride) |
| C. Interconnect:           | 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 <sub>2</sub>                                 |
| 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 150°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 45 \times 2} \text{ (Chi square value for MTTF upper limit)}$$

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

$$\lambda = 23.9 \times 10^{-9}$$

$$\lambda = 23.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 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 CB2 Process results in a FIT Rate of 0.14 @ 25C and 2.48 @ 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 HF40 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000 V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-50 mA.

**Table 1**  
Reliability Evaluation Test Results

**MAX3966CEE+**

| TEST ITEM                         | TEST CONDITION                                    | FAILURE IDENTIFICATION        | SAMPLE SIZE | NUMBER OF FAILURES |
|-----------------------------------|---|-------------------------------|-------------|--------------------|
| <b>Static Life Test</b> (Note 1)  |   |                               |             |                    |
|                                   | Ta = 150°C<br>Biased<br>Time = 192 hrs.           | DC Parameters & functionality | 45          | 0                  |
| <b>Moisture Testing</b> (Note 2)  |   |                               |             |                    |
| HAST                              | Ta = 130°C<br>RH = 85%<br>Biased<br>Time = 96hrs. | DC Parameters & functionality | 77          | 0                  |
| <b>Mechanical Stress</b> (Note 2) |   |                               |             |                    |
| Temperature<br>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