

RELIABILITY REPORT  
FOR  
MAX3070EASD+  
PLASTIC ENCAPSULATED DEVICES

February 23, 2010

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.  
SUNNYVALE, CA 94086

|                                  |
|----------------------------------|
| <b>Approved by</b>               |
| Don Lipps                        |
| Quality Assurance                |
| Manager, Reliability Engineering |

## Conclusion

The MAX3070EASD+ 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 MAX3070E-MAX3079E 3.3V,  $\pm 15\text{kV}$  ESD-protected, RS-485/RS-422 transceivers feature one driver and one receiver. These devices include fail-safe circuitry, guaranteeing a logic-high receiver output when receiver inputs are open or shorted. The receiver outputs a logic high if all transmitters on a terminated bus are disabled (high impedance). The MAX3070E-MAX3079E include a hot-swap capability to eliminate false transitions on the bus during power-up or hot insertion. The MAX3070E/MAX3071E/MAX3072E feature reduced slew-rate drivers that minimize EMI and reduce reflections caused by improperly terminated cables, allowing error-free data transmission up to 250kbps. The MAX3073E/MAX3074E/MAX3075E also feature slew-rate-limited drivers but allow transmit speeds up to 500kbps. The MAX3076E/MAX3077E/MAX3078E driver slew rates are not limited, making transmit speeds up to 16Mbps possible. The MAX3079E slew rate is pin selectable for 250kbps, 500kbps, and 16Mbps. The MAX3072E/MAX3075E/MAX3078E are intended for half-duplex communications, and the MAX3070E/MAX3071E/MAX3073E/MAX3074E/MAX3076E/MAX3077E are intended for full-duplex communications. The MAX3079E is selectable for half-duplex or full-duplex operation. It also features independently programmable receiver and transmitter output phase through separate pins. The MAX3070E-MAX3079E transceivers draw  $800\mu\text{A}$  of supply current when unloaded or when fully loaded with the drivers disabled. All devices have a 1/8-unit load receiver input impedance, allowing up to 256 transceivers on the bus.

**II. Manufacturing Information**

|                                  |   |
|----------------------------------|---|
| A. Description/Function:         | +3.3V, ±15kV ESD-Protected, Fail-Safe, Hot-Swap, RS-485/RS-422 Transceivers |
| B. Process:                      | B8  |
| C. Number of Device Transistors: | 1228  |
| D. Fabrication Location:         | California or Texas   |
| E. Assembly Location:            | Malaysia, Philippines, Thailand   |
| F. Date of Initial Production:   | January 25, 2003  |

**III. Packaging Information**

|  |                          |
|--|--------------------------|
| A. Package Type:   | 14-pin SOIC (N)          |
| B. Lead Frame:   | Copper                   |
| C. Lead Finish:  | 100% matte Tin           |
| D. Die Attach:   | Conductive               |
| E. Bondwire:   | Au (1 mil dia.)          |
| F. Mold Material:  | Epoxy with silica filler |
| G. Assembly Diagram:   | #05-9000-0186            |
| 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:   | °C/W                     |
| M. Multi Layer Theta Jc:   | °C/W                     |

**IV. Die Information**

|                            |   |
|----------------------------|---|
| A. Dimensions:             | 71 X 107 mils   |
| B. Passivation:            | Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (Silicon nitride/ Silicon dioxide) |
| C. Interconnect:           | Al/0.5%Cu with Ti/TiN Barrier   |
| D. Backside Metallization: | None  |
| E. Minimum Metal Width:    | 0.8 microns (as drawn)  |
| F. Minimum Metal Spacing:  | 0.8 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)<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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 80 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 13.7 \times 10^{-9}$$

$$\lambda = 13.7 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 B8 Process results in a FIT Rate of 0.06 @ 25C and 0.99 @ 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 RT52 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1500 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

**MAX3070EASD+**

| TEST ITEM                         | TEST CONDITION                                    | FAILURE IDENTIFICATION           | SAMPLE SIZE | NUMBER OF FAILURES |
|-----------------------------------|---|----------------------------------|-------------|--------------------|
| <b>Static Life Test</b> (Note 1)  |   |                                  |             |                    |
|                                   | Ta = 135°C<br>Biased<br>Time = 192 hrs.           | DC Parameters<br>& functionality | 80          | 0                  |
| <b>Moisture Testing</b> (Note 2)  |   |                                  |             |                    |
| HAST                              | Ta = 130°C<br>RH = 85%<br>Biased<br>Time = 96hrs. | DC Parameters<br>& functionality | 77          | 0                  |
| <b>Mechanical Stress</b> (Note 2) |   |                                  |             |                    |
| Temperature<br>Cycle              | -65°C/150°C<br>1000 Cycles<br>Method 1010         | DC Parameters<br>& functionality | 77          | 0                  |

Note 1: Life Test Data may represent plastic DIP qualification lots.

Note 2: Generic Package/Process data