RELIABILITY REPORT

FOR

MAX3317EEAP+

PLASTIC ENCAPSULATED DEVICES

March 29, 2010

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

| **Approved by** |
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| Don Lipps |
| Quality Assurance |
| Manager, Reliability Engineering |

**Conclusion**

The MAX3317EEAP+ 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 MAX3316E-MAX3319E are 2.5V powered RS-232 compatible transceivers. These devices feature shutdown (MAX3317E), AutoShutdown Plus™ (MAX3318E/MAX3319E), and enhanced electrostatic discharge (ESD) protection integrated into the chip. All transmitter outputs and receiver inputs are protected to ±15kV using the IEC 1000-4-2 Air-Gap Discharge method, ±8kV using the IEC 1000-4-2 Contact Discharge method, and ±15kV using the Human Body Model. All devices are guaranteed at a data rate of 460kbps. The transceivers have a proprietary low-dropout transmitter output stage enabling RS-232 compatible operation from a +2.25V to +3.0V supply with a dual charge pump. The charge pump requires only four 0.1µF capacitors. The MAX3318E/MAX3319E feature a logic-level output (READY) that asserts when the charge pump is regulating and the device is ready to begin transmitting. The MAX3318E/MAX3319E achieve a 1µA supply current using Maxim's revolutionary AutoShutdown Plus feature. These devices automatically enter a low-power shutdown mode when the RS-232 cable is disconnected or the transmitters of the connected peripherals are inactive for more than 30 seconds. They turn on again when they sense a valid transition at any transmitter or receiver input. AutoShutdown Plus saves power without changes to the existing BIOS or operating system. The MAX3317E also features a 1µA shutdown mode that can be entered by driving active-low SHDN low. The MAX3317E's receivers remain active while in shutdown mode, allowing external devices such as modems to be monitored using only 1µA supply current. These devices are available in space-saving packages: MAX3316E (16-pin SSOP and 20-pin TSSOP), MAX3317E/ MAX3318E (20-pin SSOP and 20-pin TSSOP), and MAX3319E (16-pin SSOP).

## II. Manufacturing Information

| | |
|---|---|
| A. Description/Function: | ±15kV ESD-Protected, 2.5V, 1µA, 460kbps, RS-232-Compatible Transceivers |
| B. Process: | B3 |
| C. Number of Device Transistors: | |
| D. Fabrication Location: | Oregon |
| E. Assembly Location: | Malaysia, Philippines |
| F. Date of Initial Production: | January 21, 2000 |

## III. Packaging Information

| | |
|---|---|
| A. Package Type: | 20-pin SSOP |
| 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: | #05-2601-0005 |
| 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: | 125°C/W |
| K. Single Layer Theta Jc: | 33°C/W |
| L. Multi Layer Theta Ja: | 83°C/W |
| M. Multi Layer Theta Jc: | 33°C/W |

## IV. Die Information

| | |
|---|---|
| A. Dimensions: | 159 X 91 mils |
| B. Passivation: | $Si_3N_4/SiO_2$ (Silicon nitride/ Silicon dioxide) |
| C. Interconnect: | Al/0.5%Cu with Ti/TiN Barrier |
| D. Backside Metallization: | None |
| E. Minimum Metal Width: | 3.0 microns (as drawn) |
| F. Minimum Metal Spacing: | 3.0 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: | 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 79 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 2.67 \times 10^{-9}$

$\lambda = 2.67$ 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 B3 Process results in a FIT Rate of 0.51 @ 25C and 8.79 @ 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 RT05 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1500V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250mA.

**Table 1**
Reliability Evaluation Test Results

**MAX3317EEAP+**

| TEST ITEM | TEST CONDITION | FAILURE IDENTIFICATION | SAMPLE SIZE | NUMBER OF FAILURES |
|---|---|---|---|---|
| **Static Life Test** (Note 1) | | | | |
| | Ta = 135°C<br>Biased<br>Time = 1000 hrs. | DC Parameters<br>& functionality | 79 | 0 |
| **Moisture Testing** (Note 2) | | | | |
| HAST | Ta = 130°C<br>RH = 85%<br>Biased<br>Time = 96hrs. | DC Parameters<br>& functionality | 77 | 0 |
| **Mechanical Stress** (Note 2) | | | | |
| Temperature 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