

RELIABILITY REPORT  
FOR  
MAX14786EAUD+T  
PLASTIC ENCAPSULATED DEVICES

October 19, 2015

**MAXIM INTEGRATED**

160 RIO ROBLES  
SAN JOSE, CA 95134

| Approved by          |
|----------------------|
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| Quality Assurance    |
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## Conclusion

The MAX14786EAUD+T successfully meets the quality and reliability standards required of all Maxim Integrated products. In addition, Maxim Integrated's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim Integrated's quality and reliability standards.

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### I. Device Description

#### A. General

The MAX14784E/MAX14786E/MAX14787E/MAX14789E full-duplex RS-485 transceivers are designed for robust communication in harsh industrial environments. All devices feature  $\pm 35\text{kV}$  ESD protection on the RS-485 pins and operate from a 3V to 5.5V supply with a 4mA no-load supply current (max). The MAX14784E/MAX14787E are optimized for communication over very long cables or short unterminated cables. The MAX14784E/MAX14786E are available in a 14-pin SO package and operate over the  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  temperature range. The MAX14786E is also available in a 14-pin TSSOP package. The MAX14787E/MAX14789E are optimized for space-constrained applications and are available in an 8-pin SO package and operate over the  $-40^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$  temperature range.-

**II. Manufacturing Information**

|                                  |  |
|----------------------------------|--|
| A. Description/Function:         | Full-Duplex, $\pm 35\text{kV}$ ESD-Protected, RS-485 Transceivers for High-Speed Communication |
| B. Process:                      | B8   |
| C. Number of Device Transistors: | 1063   |
| D. Fabrication Location:         | California or Texas  |
| E. Assembly Location:            | Malaysia, Philippines, Thailand  |
| F. Date of Initial Production:   | December 19, 2013  |

**III. Packaging Information**

|  |                          |
|--|--------------------------|
| A. Package Type:   | 14-pin TSSOP             |
| 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:   | #05-9000-5554            |
| 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:  | 110°C/W                  |
| K. Single Layer Theta Jc:  | 30°C/W                   |
| L. Multi Layer Theta Ja:   | 100.4°C/W                |
| M. Multi Layer Theta Jc:   | 30°C/W                   |

**IV. Die Information**

|                            |   |
|----------------------------|---|
| A. Dimensions:             | 56X99 mils  |
| B. Passivation:            | $\text{Si}_3\text{N}_4/\text{SiO}_2$ (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:     |   |
| H. Isolation Dielectric:   | $\text{SiO}_2$  |
| I. Die Separation Method:  | Wafer Saw   |

## V. Quality Assurance Information

- |                                   |   |
|-----------------------------------|---|
| A. Quality Assurance Contacts:    | Don Lipps (Manager, Reliability Engineering)<br>Bryan Preeshl (Vice President 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 135C 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 Integrated's reliability monitor program. Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maximintegrated.com/qa/reliability/monitor>. Cumulative monitor data for the B8 Process results in a FIT Rate of 0.01 @ 25C and 0.26 @ 55C (0.8 eV, 60% UCL)

### B. E.S.D. and Latch-Up Testing (lot JAPE6Q0011, D/C 1341)

The RU94-2 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA and overvoltage per JEDEC JESD78.

**Table 1**  
Reliability Evaluation Test Results

**MAX14786EAUD+T**

| TEST ITEM                        | TEST CONDITION                          | FAILURE IDENTIFICATION           | SAMPLE SIZE | NUMBER OF FAILURES | COMMENTS             |
|----------------------------------|---|----------------------------------|-------------|--------------------|----------------------|
| <b>Static Life Test</b> (Note 1) | Ta = 135°C<br>Biased<br>Time = 192 hrs. | DC Parameters<br>& functionality | 80          | 0                  | JAPE4Q001D, D/C 1345 |

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