

RELIABILITY REPORT
FOR
MAX14782EAU+
PLASTIC ENCAPSULATED DEVICES

August 24, 2015

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

| |
|----------------------|
| Approved by |
| Sokhom Chum |
| Quality Assurance |
| Reliability Engineer |

Conclusion

The MAX14782EAU+ 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.

Table of Contents

| | |
|--|---|
| I.Device Description | IV.Die Information |
| II.Manufacturing Information | V.Quality Assurance Information |
| III.Packaging Information | VI.Reliability Evaluation |
|Attachments | |

I. Device Description

A. General

The MAX14782E is a 3.3V to 5V ESD-protected transceiver intended for half-duplex RS-485/RS-422 communication up to 500kbps. The device is optimized for extended cable runs while maximizing tolerance to noise. The MAX14782E integrated protection features include short-circuit-protected outputs, hot-swap functionality, and a true fail-safe receiver, guaranteeing a logic-high receiver output when inputs are shorted or open. Hot-swap capability eliminates undesired transitions on the bus during power-up or hot insertion. The transceiver draws 1.9mA (typ) supply current when unloaded or when fully loaded with the drivers disabled and draws less than 10 μ A (max) of supply current in low-power shutdown mode. The MAX14782E is available in 8-pin μ MAX®, 8-pin SO, and small, 8-pin (3mm x 3mm) TDFN-EP packages. All packages operate over the -40°C to +125°C temperature range.

II. Manufacturing Information

| | |
|----------------------------------|--|
| A. Description/Function: | 500Kbps 3.3V to 5V RS-485/RS-422 Transceiver with $\pm 35\text{kV}$ HBM ESD Protection |
| B. Process: | B8 |
| C. Number of Device Transistors: | 857 |
| D. Fabrication Location: | California or Texas |
| E. Assembly Location: | Philippines, Thailand |
| F. Date of Initial Production: | August 29, 2013 |

III. Packaging Information

| | |
|--|--------------------------|
| A. Package Type: | 8-pin uMAX |
| B. Lead Frame: | Copper |
| C. Lead Finish: | 100% matte Tin |
| D. Die Attach: | Conductive |
| E. Bondwire: | Au (0.8 mil dia.) |
| F. Mold Material: | Epoxy with silica filler |
| G. Assembly Diagram: | #05-9000-5276 |
| 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: | 221°C/W K. |
| Single Layer Theta Jc: | 41.9°C/W |
| L. Multi Layer Theta Ja: | 206.3°C/W |
| M. Multi Layer Theta Jc: | 41.9°C/W |

IV. Die Information

| | |
|----------------------------|---|
| A. Dimensions: | 55X81 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: | SiO_2 |
| I. Die Separation Method: | Wafer Saw |

V. Quality Assurance Information

- | | |
|-----------------------------------|---|
| A. Quality Assurance Contacts: | Don Lipps (Manager, Reliability Engineering) Bryan Preeshl (Vice President 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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) 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)

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

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

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 JAMI2Q001C, D/C 1323)

The RU82-0 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

MAX14782EAU+

| TEST ITEM | TEST CONDITION | FAILURE IDENTIFICATION | SAMPLE SIZE | NUMBER OF FAILURES | COMMENTS |
|----------------------------------|---|----------------------------------|-------------|--------------------|---------------------|
| Static Life Test (Note 1) | Ta = 135°C Biased Time = 192 hrs. | DC Parameters & functionality | 80 | 0 | JAMI3Q001, D/C 1323 |

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