RELIABILITY REPORT
FOR
MAX14783ExUA+T / MAX14783ExTA+T / MAX14783ExSA+T
PLASTIC ENCAPSULATED DEVICES

August 18, 2013

MAXIM INTEGRATED
160 RIO ROBLES
SAN JOSE, CA 95134

Approved by
Richard Aburano
Quality Assurance
Manager, Reliability Engineering
Conclusion

The MAX14783ExUA+T / MAX14783ExTA+T / MAX14783ExSA+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 MAX14783E is a 3.3V/5V ESD-protected transceiver intended for half-duplex RS-485/RS-422 communication up to 42Mbps. The device is optimized for high speeds over extended cable runs while maximizing tolerance to noise. The MAX14783E 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. Hotswap 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 10µA (max) of supply current in low-power shutdown mode. The MAX14783E is available in 8-pin µMAX, 8-pin SO, and small, 8-pin (3mm x 3mm) TDFN-EP packages. The device in the TDFN-EP package operates over the -40°C to +125°C temperature range. The MAX14783E in the µMAX and SO packages operates over the -40°C to +85°C and -40°C to +125°C temperature ranges.
II. Manufacturing Information

A. Description/Function: High-Speed 3.3V/5V RS-485/RS-422 Transceiver with ±35kV HBM ESD Protection

B. Process: B8

C. Number of Device Transistors: 857

D. Fabrication Location: USA

E. Assembly Location: Philippines & Thailand Malaysia Philippines & Thailand China Taiwan & Thailand

F. Date of Initial Production: June 27, 2013

III. Packaging Information

A. Package Type: 8-pin uMAX 8-pin SOIC 8-pin TDFN 3x3

B. Lead Frame: Copper Copper Copper

C. Lead Finish: 100% matte Tin 100% matte Tin 100% matte Tin

D. Die Attach: Conductive Conductive Conductive

E. Bondwire: Au (0.8 mil dia.) Au (0.8 mil dia.) Au (0.8 mil dia.)

F. Mold Material: Epoxy with silica filler Epoxy with silica filler Epoxy with silica filler

G. Assembly Diagram: #05-9000-5276 #05-9000-5368 #05-9000-5277

H. Flammability Rating: Class UL94-V0 Class UL94-V0 Class UL94-V0

I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C

J. Single Layer Theta Ja: 221°C/W 170°C/W 54°C/W

K. Single Layer Theta Jc: 42°C/W 40°C/W 8°C/W

L. Multi Layer Theta Ja: 206.3°C/W 132°C/W 41°C/W

M. Multi Layer Theta Jc: 42°C/W 38°C/W 8°C/W

IV. Die Information

A. Dimensions: 55X81 mils

B. Passivation: BCB

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: 1.2 microns (as drawn)

G. Bondpad Dimensions:

H. Isolation Dielectric: SiO₂

I. Die Separation Method: Wafer Saw
V. Quality Assurance Information

A. Quality Assurance Contacts:  
Richard Aburano (Manager, Reliability Engineering)  
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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate ($\lambda$) is calculated as follows:

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

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

$$\chi = 13.7 \times 10^{-9}$$  
$$\chi = 13.7 \text{ F.I.T. (60% confidence level @ 25°C)}$$

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 0.05 @ 25C and 0.90 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot JAMI3Q001H, D/C 1323)

The RU82-1 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>
<thead>
<tr>
<th>TEST ITEM</th>
<th>TEST CONDITION</th>
<th>FAILURE IDENTIFICATION</th>
<th>SAMPLE SIZE</th>
<th>NUMBER OF FAILURES</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static Life Test</td>
<td>Ta = 135°C</td>
<td>DC Parameters</td>
<td>80</td>
<td>0</td>
<td>JAMI3Q001H, D/C 1323</td>
</tr>
<tr>
<td></td>
<td>Biased</td>
<td>&amp; functionality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time = 192 hrs.</td>
<td></td>
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Note 1: Life Test Data may represent plastic DIP qualification lots.