RELIABILITY REPORT
FOR
MAX3442EESA+
PLASTIC ENCAPSULATED DEVICES

April 15, 2015

MAXIM INTEGRATED
160 RIO ROBLES
SAN JOSE, CA 95134

Approved by

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<th>Sokhom Chum</th>
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<tr>
<td>Quality Assurance</td>
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<td>Reliability Engineer</td>
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Conclusion

The MAX3442EEESA+ 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 MAX3440E-MAX3444E fault-protected RS-485 and J1708 transceivers feature ±60V protection from signal faults on communication bus lines. Each device contains one differential line driver with three-state output and one differential line receiver with three-state input. The 1/4-unit-load receiver input impedance allows up to 128 transceivers on a single bus. The devices operate from a 5V supply at data rates of up to 10Mbps. True fail-safe inputs guarantee a logic-high receiver output when the receiver inputs are open, shorted, or connected to an idle data line. Hot-swap circuitry eliminates false transitions on the data bus during circuit initialization or connection to a live backplane. Short-circuit current-limiting and thermal shutdown circuitry protect the driver against excessive power dissipation, and on-chip ±15kV ESD protection eliminates costly external protection devices. The MAX3440E-MAX3444E are available in 8-pin SO and PDIP packages and are specified over industrial and automotive temperature ranges.
II. Manufacturing Information

A. Description/Function: ±15kV ESD-Protected, ±60V Fault-Protected, 10Mbps, Fail-Safe RS-485/J1708 Transceivers
B. Process: BCD8
C. Number of Device Transistors: 1553
D. Fabrication Location: Oregon
E. Assembly Location: Malaysia, Philippines, Thailand
F. Date of Initial Production: October 26, 2002

III. Packaging Information

A. Package Type: 8-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: #05-2601-0087
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: 170°C/W
K. Single Layer Theta Jc: 40°C/W
L. Multi Layer Theta Ja: 128.4°C/W
M. Multi Layer Theta Jc: 36°C/W

IV. Die Information

A. Dimensions: 145X85 mils
B. Passivation: Si₃N₄/SiO₂ (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:
H. Isolation Dielectric: SiO₂
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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

\[
\chi = \frac{1}{\lambda} = \frac{1.83}{MTTF} \quad (Chi \ square \ value \ for \ MTTF \ upper \ limit)
\]

\[
MTTF = \frac{192 \times 4340 \times 93 \times 2}{(where \ 4340 = \ Temperature \ Acceleration \ factor \ assuming \ an \ activation \ energy \ of \ 0.8eV)}
\]

\[
\chi = 11.8 \times 10^{-9}
\]

\[
\chi = 11.8 \text{ F.I.T.} \ (60\% \ confidence \ level @ 25°C)
\]

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 BCD8 Process results in a FIT Rate of 0.04 @ 25°C and 0.69 @ 55°C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot NA22EA042A, D/C 0540)

The RT29-2 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.
Table 1
Reliability Evaluation Test Results

<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 (Note 1)</td>
<td>Ta = 135°C</td>
<td>DC Parameters</td>
<td>48</td>
<td>0</td>
<td>NA23EA042A, D/C 0538</td>
</tr>
<tr>
<td></td>
<td>Biased</td>
<td>&amp; functionality</td>
<td>45</td>
<td>0</td>
<td>IA20BQ001D, D/C 0232</td>
</tr>
</tbody>
</table>

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