RELIABILITY REPORT
FOR
MAX13442EASA+
(MAX13442E/MAX13444E)
PLASTIC ENCAPSULATED DEVICES

April 9, 2009

MAXIM INTEGRATED PRODUCTS
120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering
Conclusion

The MAX13442EASA+ 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.

Table of Contents

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

I. Device Description

A. General

The MAX13442E/MAX13444E are fault-protected RS-485 and J1708 transceivers that feature ±80V protection from signal faults on communication bus lines. The MAX13442E/MAX13444E feature a reduced slew-rate driver that minimizes EMI and reflections, allowing error-free transmission up to 250kbps. The MAX13443E driver can transmit up to 10Mbps. The high-speed MAX13443E RS-485 transceiver features ±60V protection from signal faults on communication bus lines. These transceivers feature foldback current limit. 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. 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 MAX13442E/MAX13443E/MAX13444E are available in an 8-pin SO package and are specified over the automotive temperature range.
II. Manufacturing Information

A. Description/Function: ±80V Fault Protected RS-485 Half-Duplex Transceiver with Foldback Current Limit
B. Process: BCD8
C. Number of Device Transistors: 1553
D. Fabrication Location: Oregon
E. Assembly Location: ATP Philippines, UTL Thailand
F. Date of Initial Production: Pre 1997

III. Packaging Information

A. Package Type: 8-pin SOIC (N)
B. Lead Frame: Copper
C. Lead Finish: 100% matte Tin
D. Die Attach: Conductive Epoxy
E. Bondwire: Gold (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: 145 X 85 mils
B. Passivation: Si₃N₄/SiO₂ (Silicon nitride/ Silicon dioxide
C. Interconnect: Aluminum/Cu (Cu = 0.5%)
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: SiO₂
I. Die Separation Method: Wafer Saw
V. Quality Assurance Information

A. Quality Assurance Contacts: Ken Wendel (Director, Reliability Engineering)
   Bryan Preeshl (Managing Director 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 pending. Using these results, the Failure Rate (λ) is calculated as follows:

\[
\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 93 \times 2} \quad \text{(Chi square value for MTTF upper limit)}
\]

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

\[
\lambda = 11.5 \times 10^{-9}
\]

\[
\lambda = 11.5 \text{ F.I.T.} \quad (60\% \text{ confidence level @ 25°C})
\]

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at http://www.maxim-ic.com. Current monitor data for the BCD8 Process results in a FIT Rate of 2.3 @ 25C and 39.6 @ 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 RT29-7 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500 V per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of +/-250 mA.
### Table 1
Reliability Evaluation Test Results

#### MAX13442EASA+

<table>
<thead>
<tr>
<th>TEST ITEM</th>
<th>TEST CONDITION</th>
<th>FAILURE IDENTIFICATION</th>
<th>SAMPLE SIZE</th>
<th>NUMBER OF FAILURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static Life Test</td>
<td>Ta = 135°C</td>
<td>DC Parameters &amp; functionality</td>
<td>93</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Biased</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time = 192 hrs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moisture Testing</td>
<td>Ta = 85°C</td>
<td>DC Parameters &amp; functionality</td>
<td>77</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>RH = 85%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Biased</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time = 1000hrs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical Stress</td>
<td>Temperature</td>
<td>DC Parameters &amp; functionality</td>
<td>77</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>-65°C/150°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cycle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1000 Cycles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Method 1010</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note 1: Life Test Data may represent plastic DIP qualification lots.
Note 2: Generic Package/Process data