RELIABILITY REPORT
FOR
MAX13051ESA+
PLASTIC ENCAPSULATED DEVICES

December 3, 2009

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

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering
Conclusion

The MAX13051ESA+ 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
   A. General

II. Manufacturing Information

III. Packaging Information

IV. Die Information

V. Quality Assurance Information

VI. Reliability Evaluation

.....Attachments

I. Device Description

A. General

The MAX13051 ±80V fault-protected CAN transceiver with autobaud is ideal for device net and other industrial network applications where overvoltage protection is required. The MAX13051 provides a link between the CAN protocol controller and the physical wires of the bus lines in a control area network (CAN). The MAX13051 features three different modes of operation: high speed, slope control, and standby. High speed mode allows data rates up to 1Mbps. The slope-control mode can be used to program the slew rate of the transmitter for data rates of up to 500kbps, reducing the effects of EMI and allowing the use of unshielded-twisted or parallel cable. In standby mode, the transmitter shuts off and a low-power receiver monitors the bus, waiting for a wake-up signal. The MAX13051 provides a transmitter data (TXD) dominant timeout function that prevents erroneous CAN controllers from clamping the bus to a dominant level if the TXD input is held low for greater than 1ms. The MAX13051 also provides an autobaud feature allowing the microcontroller to compute the incoming baud rate without destroying CAN protocol communication. The MAX13051 input common-mode range is greater than ±12V, exceeding the ISO 11898 specification of -2V to +7V, and features ±6kV Human Body Model protection, making these devices ideal for harsh environments. The MAX13051 is available in an 8-pin SO package and is specified from the -40°C to +85°C and -40°C to +125°C temperature ranges.
II. Manufacturing Information

A. Description/Function: ±80V Fault-Protected CAN Transceiver with Autobaud
B. Process: BCD80
C. Number of Device Transistors:
D. Fabrication Location: Oregon
E. Assembly Location: Philippines, Thailand
F. Date of Initial Production: October 23, 2004

III. Packaging Information

A. Package Type: 8-pin SOIC (N)
B. Lead Frame: Copper
C. Lead Finish: 100% matte Tin
D. Die Attach: Non-conductive
E. Bondwire: Au (1 mil dia.)
F. Mold Material: Epoxy with silica filler
G. Assembly Diagram: #31-4782
H. Flammability Rating: Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C

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: 40°C/W

IV. Die Information

A. Dimensions: Hybrid
B. Passivation: Si₃N₄/SiO₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect: STRINTERCONNECT
D. Backside Metallization: NONE
E. Minimum Metal Width: 3.0 micron (as drawn)
F. Minimum Metal Spacing: 3.0 micron (as drawn)
G. Bondpad Dimensions: 5 mil. Sq.
H. Isolation Dielectric: SiO₂
I. Die Separation Method: Saw
V. Quality Assurance Information

A. Quality Assurance Contacts:
   Ken Wendel (Director, Reliability Engineering)
   Bryan Preeehl (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 shown in Table 1. Using these results, the Failure Rate ($\lambda$) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 48 \times 2}$$

(Chi square value for MTTF upper limit)

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

$\lambda = 24.2 \times 10^{-9}$

$\lambda = 24.2$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim’s reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at http://www.maxim-ic.com/qa/reliability/monitor. Cumulative monitor data for the BCD80 Process results in a FIT Rate of 0.06 @ 25°C and 1.08 @ 55°C (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 RT73-RT73S die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000 V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250 mA.
<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 (Note 1)</td>
<td>Ta = 135°C</td>
<td>DC Parameters &amp; functionality</td>
<td>48</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Biased</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Time = 192 hrs.</td>
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<tr>
<td>Moisture Testing (Note 2)</td>
<td>HAST</td>
<td>DC Parameters &amp; functionality</td>
<td>77</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Ta = 130°C</td>
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<tr>
<td></td>
<td>RH = 85%</td>
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</tr>
<tr>
<td></td>
<td>Biased</td>
<td></td>
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<tr>
<td></td>
<td>Time = 96hrs.</td>
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<tr>
<td>Mechanical Stress (Note 2)</td>
<td>Temperature Cycle</td>
<td>DC Parameters &amp; functionality</td>
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<td>0</td>
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<tr>
<td></td>
<td>-65°C/150°C</td>
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<tr>
<td></td>
<td>1000 Cycles</td>
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<td></td>
<td>Method 1010</td>
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</table>

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