RELIABILITY REPORT

FOR

MAX13089EASD+

PLASTIC ENCAPSULATED DEVICES

October 20, 2008

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX13089EASD+ 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.

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I. Device Description

A. General

The MAX13080E-MAX13089E +5.0V, ±15kV ESD-protected, RS-485/RS-422 transceivers feature one driver and one receiver. These devices include fail-safe circuitry, guaranteeing a logic-high receiver output when receiver inputs are open or shorted. The receiver outputs a logic-high if all transmitters on a terminated bus are disabled (high impedance). The MAX13080E-MAX13089E include a hot-swap capability to eliminate false transitions on the bus during power-up or hot insertion. The MAX13080E/MAX13081E/MAX13082E feature reduced slew-rate drivers that minimize EMI and reduce reflections caused by improperly terminated cables, allowing error-free data transmission up to 250kbps. The MAX13083E/MAX13084E/MAX13085E also feature slew-rate-limited drivers but allow transmit speeds up to 500kbps. The MAX13086E/MAX13087E/MAX13088E driver slew rates are not limited, making transmit speeds up to 16Mbps possible. The MAX13089E slew rate is pin selectable for 250kbps, 500kbps, and 16Mbps. The MAX13082E/MAX13085E/MAX13088E are intended for half-duplex communications, and the MAX13080E/MAX13081E/MAX13083E/MAX13084E/MAX13086E/MAX13087E are intended for full-duplex communications. The MAX13089E is selectable for half-duplex or full-duplex operation. It also features independently programmable receiver and transmitter output phase through separate pins. The MAX13080E-MAX13089E transceivers draw 1.2mA of supply current when unloaded or when fully loaded with the drivers disabled. All devices have a 1/8-unit load receiver input impedance, allowing up to 256 transceivers on the bus. The MAX13080E/MAX13083E/MAX13086E/MAX13089E are available in 14-pin PDIP and 14-pin SO packages. The MAX13081E/MAX13082E/MAX13084E/MAX13085E/MAX13087E/MAX13088E are available in 8-pin PDIP and 8-pin SO packages. The devices operate over the commercial, extended, and automotive temperature ranges.

II. Manufacturing Information

A. Description/Function:	+5.0V, ±15kV ESD-Protected, Fail-Safe, Hot-Swap, RS-485/RS-422 Transceivers
B. Process:	B8
C. Number of Device Transistors:	1228
D. Fabrication Location:	California or Texas
E. Assembly Location:	Thailand, Philippines, Malaysia, China
F. Date of Initial Production:	April 22, 2005

III. Packaging Information

A. Package Type:	14-pin SOIC (N)
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Ab2200d
E. Bondwire:	Au (.001 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-0187
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:	120°C/W
K. Single Layer Theta Jc:	37°C/W
L. Multi Layer Theta Ja:	84°C/W
M. Multi Layer Theta Jc:	34°C/W

IV. Die Information

A. Dimensions:	71 X 107 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide
C. Interconnect:	Aluminum/Si (Si = 1%)
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:	5 mil. Sq.
H. Isolation Dielectric:	SiO_2
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:

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

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

$\lambda = 13.74 \times 10^{-9}$

$\lambda = 13.74$ F.I.T. (60% 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 B8 Process results in a FIT Rate of 2.71 @ 25C and 17.30 @ 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 RT52-9 die type has been found to have all pins able to withstand a HBM transient pulse of 1kV per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of 250mA.

Table 1
Reliability Evaluation Test Results

MAX13089EASD+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	80	0
Moisture Testing (Note 2)				
85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2)				
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality	77	0

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