

RELIABILITY REPORT
FOR
MAX14789EGSA+
MAX14789EGSA+T

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MAXIM INTEGRATED

160 RIO ROBLES
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Conclusion

The MAX14789E 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 MAX14784E/MAX14786E/MAX14787E/MAX14789E full-duplex RS-485 transceivers are designed for robust communication in harsh industrial environments. All devices feature $\pm 35\text{kV}$ ESD protection on the RS-485 pins and operate from a 3V to 5.5V supply with a 4mA no-load supply current (max).

The MAX14784E/MAX14787E are optimized for communication over very long cables or short unterminated cables.

The MAX14784E/MAX14786E are available in a 14-pin SO package and operate over the -40°C to $+125^{\circ}\text{C}$ temperature range. The MAX14786E is also available in a 14-pin TSSOP package.

The MAX14787E/MAX14789E are optimized for space constrained applications and are available in an 8-pin SO package, operating over the -40°C to $+105^{\circ}\text{C}$ temperature range.

II. Manufacturing Information

A. Description/Function:	Full-Duplex, $\pm 35\text{kV}$ ESD-Protected, RS-485 Transceivers for High-Speed Communication
B. Process:	B8
C. Device Count:	1063
D. Fabrication Location:	USA
E. Assembly Location:	Philippines, Malaysia, Thailand, Taiwan
F. Date of Initial Production:	June 27, 2014

III. Packaging Information

A. Package Type:	SOIC (N)
B. Lead Frame:	CU194
C. Lead Finish:	Matte Tin
D. Die Attach:	AB8290, 84-1LMISR4, AB2200D, EN4900GC
E. Bondwire:	1 mil Au
F. Mold Material:	G600, G600C, G700H
G. Assembly Diagram:	05-9000-5449
H. Flammability Rating:	UL-94 (V-0 Rating)
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:	132 °C/W
M. Multi Layer Theta Jc:	38 °C/W

IV. Die Information

A. Dimensions:	56X99 mils
B. Passivation:	SiN/SiO ₂

V. Quality Assurance Information

A. Quality Assurance Contacts:	Ryan Wall (Manager, Reliability) Michael Cairnes (Executive Director, Reliability) Bryan Preeshl (SVP 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 125C biased (static) life test are shown in Table 1. Using these results, the Failure Rate λ is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 2454 \times 80 \times 2} \text{ (Chi square value for MTTF upper limit)}$$

(where 2454 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$$\lambda = 24.3 \times 10^{-9}$$

$$\lambda = 24.3 \text{ FITs (60\% confidence level @25°C)}$$

Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <https://www.maximintegrated.com/en/support/qa-reliability/reliability/reliability-monitor-program.html>.

B8 cumulative process Fit

$$\lambda = 0.10 \text{ FITs (60\% confidence level @25°C)}$$

$$\lambda = 1.16 \text{ FITs (60\% confidence level @55°C)}$$

B. ESD and Latch-Up Testing

The MAX14789E has been found to have all pins able to withstand an HBM transient pulse of ± 2500 V per JEDEC / ESDA JS-001. Latch-Up testing has shown that this device withstands ± 250 mA current injection and supply overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results
MAX14784EASD+ (Note 1)

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 2)	Ta = 125°C Biased Time = 192 hrs.	DC parameters & functionality	80	0	

Note 1: MAX14789E qualified by similar silicon.

Note 2: Life Test Data may represent plastic DIP qualification lots.