

RELIABILITY REPORT

FOR

MAX14776EASA+, MAX14776EASA+T,
MAX14776EATA+, MAX14776EATA+T

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MAXIM INTEGRATED

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Conclusion

The MAX14776 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 MAX14776E fault-protected RS-485/ RS-422 transceiver features $\pm 65V$ protection for overvoltage signal faults on communication bus lines, ensuring communication in harsh industrial environments. The device contains one driver and one receiver and operates over the 3V to 5.5V supply range. The MAX14776E features slew-rate limited outputs for data rates up to 500kbps.

This transceiver is optimized for robust communication in noisy environments. A large 200mV (typ) hysteresis on receiver inputs ensure for high noise rejection and a failsafe feature guarantees a logic-high on the receiver output when the inputs are open or shorted. Driver outputs are protected against short-circuit conditions. The MAX14776E receiver features a 1/3- unit load input impedance, allowing up to 100 transceivers on a bus.

II. Manufacturing Information

A. Description/Function:	±65V Fault Protected 500kpbs/20Mbps Half-Duplex RS-485/RS-422 Transceiver
B. Process:	S18UM44S
C. Device Count:	5385
D. Fabrication Location:	USA
E. Assembly Location:	Thailand, Malaysia, Philippines, or Taiwan
F. Date of Initial Production:	September 23, 2016

III. Packaging Information

A. Package Type:	SOIC (N)	TDFN
B. Lead Frame:	Cu194	Cu194
C. Lead Finish:	Matte Tin	Matte Tin
D. Die Attach:	AB2200D / AB8290 / 84-1LMISR4	EN4900G
E. Bondwire:	1.0 mil Au	1.00 mil CuPd
F. Mold Material:	G600 / G600C	G700LA
G. Assembly Diagram:	05-100031 / 05-100369	05-100030 / 05-100371
H. Flammability Rating:	UL-94 (V-0 Rating)	UL-94 (V-0 Rating)
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1	Level 1
J. Single Layer Theta Ja:	170 °C/W	54 °C/W
K. Single Layer Theta Jc:	40 °C/W	8 °C/W
L. Multi Layer Theta Ja:	132 °C/W	41 °C/W
M. Multi Layer Theta Jc:	38 °C/W	8 °C/W

IV. Die Information

A. Dimensions:	69.68 x 93.70 mils
B. Passivation:	SiN / SiO2

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>.

S18 cumulative process FIT

$$\lambda = 0.02 \text{ FITs (60\% confidence level @25°C)}$$

$$\lambda = 0.25 \text{ FITs (60\% confidence level @55°C)}$$

B. ESD and Latch-Up Testing

The MAX14776E 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 ± 100 mA current injection and supply overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results
MAX14776E

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 125°C Biased Time = 192 hrs.	DC parameters & functionality	80	0	

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