RELIABILITY REPORT FOR

MAX22500

PLASTIC ENCAPSULATED DEVICES

September 21, 2017

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

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Conclusion

The MAX22500 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 MAX22500E/MAX22501E half-duplex ESD-protected RS-485/RS-422 transceivers are optimized for high-speed (up to 100Mbps) communication over long cables. These transceivers feature integrated hot-swap protection and a fail-safe receiver, ensuring a logic-high on the receiver output when input signals are shorted or open for longer than 10ìs (typ). The MAX22500E features integrated preemphasis circuitry that extends the distance and increases the data rate of reliable communication by reducing inter-symbol interference (ISI) caused by long cables. The MAX22500E features a flexible logic interface down to 1.6V. The MAX22501E operates without preemphasis and is powered from a 3V to 5.5V supply. The MAX22500E is available in a 10-pin TDFN-EP package. The MAX22501E is available in an 8-pin TDFN-EP package. Both transceivers operate over the -40°C to +125°C ambient temperature range.

II. Manufacturing Information

A. Description/Function:	100Mbps Half-Duplex RS-485/RS-422 Transceivers for Long Cables
B. Process:	S18
C. Number of Device Transistors:	6685
D. Fabrication Location:	Japan
E. Assembly Location:	Taiwan
F. Date of Initial Production:	June 28, 2017

III. Packaging Information

A. Package Type:	10-pin TDFN
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	En4900g
E. Bondwire:	CuPd (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-100511
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:	54°C/W
K. Single Layer Theta Jc:	9°C/W
L. Multi Layer Theta Ja:	41°C/W
M. Multi Layer Theta Jc:	9°C/W

IV. Die Information

A. Dimensions:	59.8425X78.7401 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Minimum Metal Width:	0.23 microns (as drawn)
E. Minimum Metal Spacing:	0.23 microns (as drawn)
F. Isolation Dielectric:	SiO_2
G. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Eric Wright (Reliability Engineering) Brian Standley (Manager, Reliability) Bryan Preeshl (Vice President 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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

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

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

$\lambda = 13.7 \times 10^{-9}$

$\lambda = 13.7$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim Integrated's reliability monitor program. Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at http://www.maximintegrated.com/qa/reliability/monitor. Cumulative monitor data for the S18 Process results in a FIT Rate of 0.40 @ 25C and 6.96 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing

The RV30 die type has been found to have all pins able to withstand an HBM transient pulse of +/-2000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX22500

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135C Biased Time = 192 hrs.	DC Parameters & functionality	80	0	

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