RELIABILITY REPORT

FOR

MAX3221ECAE+, MAX3221ECAE+T,
MAX3221ECTE+, MAX3221ECTE+T,
MAX3221ECUE+, MAX3221ECUE+T,
MAX3221EEAE+, MAX3221EEAE+T,
MAX3221EETE+, MAX3221EETE+T,
MAX3221EEUE+, MAX3221EEUE+T,
MAX3221EEAE+/GG8

October 12, 2020

MAXIM INTEGRATED

160 RIO ROBLES

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Conclusion

The MAX3221 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 MAX3221E/MAX3223E/MAX3243E are 3V-powered EIA/TIA-232 and V.28/V.24 communications interfaces with automatic shutdown/wakeup features, high data rate capabilities, and enhanced electrostatic discharge (ESD) protection. All transmitter outputs and receiver inputs are protected to ±15kV using IEC 1000-4-2 AirGap Discharge, to ±8kV using IEC 1000-4-2 Contact Discharge, and to ±15kV using the Human Body Model.

The MAX3221E/MAX3223E/MAX3243E achieve a 1µA supply current with Maxim's revolutionary AutoShutdown™ feature. They save power without changes to the existing BIOS or operating system by entering low-power shutdown mode when the RS-232 cable is disconnected, or when the transmitters of the connected peripherals are off.

The transceivers have a proprietary low-dropout transmitter output stage, delivering true RS-232 performance from a +3.0V to +5.5V supply with a dual charge pump. The charge pump requires only four small 0.1µF capacitors for operation from a +3.3V supply. Each device is guaranteed to run at data rates of 250kbps while maintaining RS-232 output levels.

The MAX3221E contains just one driver and one receiver, making it the smallest single-supply RS-232 transceiver. The MAX3223E has two drivers and two receivers. The MAX3243E is a complete 3-driver/5-receiver serial port ideal for notebook or subnotebook computers. It also includes two noninverting receiver outputs that are always active, allowing external devices to be monitored without forward biasing the protection diodes in circuitry that may be powered down.

The MAX3221E, MAX3223E, and MAX3243E are available in space-saving TQFN, SSOP, and TSSOP packages.

II. Manufacturing Information

A. Description/Function:	±15kV ESD-Protected, 1µA, 3.0V to 5.5V, 250kbps, RS-232 Transceivers with AutoShutdown
B. Process:	C3E
C. Device Count:	2445
D. Fabrication Location:	USA
E. Assembly Location:	Taiwan, China, Thailand, Malaysia, Philippines
F. Date of Initial Production:	August 21, 2013

III. Packaging Information

A. Package Type:	SSOP	TQFN	TSSOP
B. Lead Frame:	Cu194	Cu194, EFTEC64T	Cu7025
C. Lead Finish:	Matte Tin	Matte Tin	Matte Tin
D. Die Attach:	AB8290, EN4900GC	EN4900G, AB8200T	AB8200T, QMI-519, AB8290
E. Bondwire:	0.80 mil Au	0.80 mil Au	0.80 mil Au
F. Mold Material:	G770H, G600	G700LA, G770HJ, G770HCD	G605L, G700K, CEL8240HF10-LXC
G. Assembly Diagram:	05-9000-5307	05-9000-5305	05-9000-5309
H. Flammability Rating:	UL-94 (V-0 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	Level 1
J. Single Layer Theta Ja:	140 °C/W	48 °C/W	106 °C/W
K. Single Layer Theta Jc:	34 °C/W	2 °C/W	27 °C/W
L. Multi Layer Theta Ja:	86 °C/W	30 °C/W	90 °C/W
M. Multi Layer Theta Jc:	33 °C/W	2 °C/W	27 °C/W

IV. Die Information

A. Dimensions:	61.811X109.842 mils
B. Passivation:	O2– / N3–

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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{1000\ x\ 2454\ x\ 79\ x\ 2}$$ (Chi square value for MTTF upper limit)

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

$$\lambda = 4.73\ x\ 10^{-9}$$

$$\lambda = 4.73\ FITs\ (60\%\ confidence\ level\ @25°C)$$

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.

C3E cumulative process Fit

$$\lambda = 0.33\ FITs\ (60\%\ confidence\ level\ @25°C)$$

$$\lambda = 4.02\ FITs\ (60\%\ confidence\ level\ @55°C)$$

B. ESD and Latch-Up Testing

The MAX3221E 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

MAX3223EEUP+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 125°C Biased Time = 1000 hrs.	DC parameters & functionality	79	0	

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