



RELIABILITY REPORT
FOR
MAX3221EEAE+
PLASTIC ENCAPSULATED DEVICES

December 2, 2010

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
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Approved by
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Quality Assurance
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Conclusion

The MAX3221EEAE+ 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 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 $\pm 15\text{kV}$ using IEC 61000-4-2 Air-Gap Discharge, to $\pm 8\text{kV}$ using IEC 61000-4-2 Contact Discharge, and to $\pm 15\text{kV}$ using the Human Body Model. The MAX3221E/MAX3223E/MAX3243E achieve a $1\mu\text{A}$ supply current with Maxim's revolutionary AutoShutdown(tm) 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 $0.1\mu\text{F}$ 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:	B3
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	Philippines
F. Date of Initial Production:	January 24, 1998

III. Packaging Information

A. Package Type:	16-pin SSOP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-1901-0184
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:	140°C/W
K. Single Layer Theta Jc:	34°C/W

IV. Die Information

A. Dimensions:	91 X 159 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	3.0 microns (as drawn)
F. Minimum Metal Spacing:	3.0 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

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|-----------------------------------|---|
| A. Quality Assurance Contacts: | Richard Aburano (Manager, Reliability Operations)
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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 476 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 2.3 \times 10^{-9}$$

$$\lambda = 2.3 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maxim-ic.com/qa/reliability/monitor>. Cumulative monitor data for the B3 Process results in a FIT Rate of 0.51 @ 25C and 8.79 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot NO3BJA7D2B, D/C 0652)

The RS60-1 die type has been found to have all pins able to withstand a transient pulse of:

HBM ESD:	+/- 2500V per JESD22 A114
CDM ESD:	+/- 750V per JESD22 C101

The RS60-1 die type has been found to have transmitter output and receiver input pins able to withstand a transient pulse of:

ESD gun (contact):	+/- 8000V per IEC61000-4-2
ESD gun (air gap):	+/- 15000V per IEC61000-4-2

Latch-Up testing has shown that this device withstands a current of +/-250 mA.

Table 1
Reliability Evaluation Test Results

MAX3221EEAE+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	80	0	NO3BIA032B
			80	0	NO3CH3008Q
			80	0	IO3CGA004B
			80	0	IO3CEA007B
			80	0	XO3BCA010E
			76	0	XO3CBN001B

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