

RELIABILITY REPORT
FOR
MAX3322EEUP+
PLASTIC ENCAPSULATED DEVICES

September 14, 2009

MAXIM INTEGRATED PRODUCTS

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Approved by
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Conclusion

The MAX3322EEUP+ 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 MAX3322E/MAX3323E 3.0V to 5.5V powered EIA/TIA-232 and V.28/V.24 communications interfaces are designed for multidrop applications with low power requirements, high data-rate capabilities, and enhanced electrostatic discharge (ESD) protection. All RS-232 inputs and outputs are protected to $\pm 15\text{kV}$ using the IEC 1000-4-2 Air-Gap Discharge method, $\pm 8\text{kV}$ using the IEC 1000-4-2 Contact Discharge method, and $\pm 15\text{kV}$ using the Human Body Model. The MAX3322E/MAX3323E have pin-selectable $5\text{k}\Omega$ /high-impedance RS-232 receivers. These devices are capable of receiving data in high-impedance mode. In multidrop applications, one receiver has a $5\text{k}\Omega$ input resistance, while the other receivers are high impedance to ensure the RS-232 standard is observed. Logic control permits selection of the functional mode: high impedance or RS-232 standard load. The transmitters are enabled by logic control to allow the multiplexing of the inputs to a single UART. A proprietary low-dropout transmitter output stage enables 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. The MAX3322E/MAX3323E are capable of running at data rates up to 250kbps while maintaining RS-232-compliant output levels. The MAX3322E/MAX3323E have a unique VL pin that allows operation in mixed-logic voltage systems. Both input and output logic levels are pin programmable through the VL pin. The MAX3322E is a 2Tx/2Rx device for hardware handshaking in standard RS-232 mode, and the MAX3323E is a 1Tx/1Rx, required in most multidrop applications. The MAX3322E is offered in a space-saving TSSOP package. The MAX3323E is offered in 16-pin DIP and space-saving TSSOP packages.

II. Manufacturing Information

A. Description/Function:	±15kV ESD-Protected, RS-232 Transceivers for Multidrop Applications
B. Process:	S3
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	Philippines
F. Date of Initial Production:	October 26, 2002

III. Packaging Information

A. Package Type:	20-pin TSSOP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-0308
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:	91°C/W
K. Single Layer Theta Jc:	20°C/W
L. Multi Layer Theta Ja:	73.8°C/W
M. Multi Layer Theta Jc:	20°C/W

IV. Die Information

A. Dimensions:	108 X 144 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

- A. Quality Assurance Contacts: Ken Wendel (Director, Reliability Engineering)
Bryan Preeshl (Managing Director 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 141 \times 2} \text{ (Chi square value for MTTF upper limit)}$$

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

$$\lambda = 7.6 \times 10^{-9}$$

$\lambda = 7.6$ 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 S3 Process results in a FIT Rate of 0.04 @ 25C and 0.69 @ 55C (0.8 eV, 60% UCL)

B. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

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

The RT55 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

Table 1
Reliability Evaluation Test Results

MAX3322EEUP+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	141	0
Moisture Testing (Note 2)				
HAST	Ta = 130°C RH = 85% Biased Time = 96hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2)				
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality	77	0

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

Note 2: Generic Package/Process data