

RELIABILITY REPORT FOR MAX3161EEAG+T PLASTIC ENCAPSULATED DEVICES

January 22, 2013

# **MAXIM INTEGRATED**

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#### Conclusion

The MAX3161EEAG+T 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.

#### **Table of Contents**

- I. .....Device Description
- II. ......Manufacturing Information
- IV. .....Die Information
- V. .....Quality Assurance Information
- III. .....Packaging Information
- VI. .....Reliability Evaluation

# I. Device Description

A. General

.....Attachments

The MAX3160E/MAX3161E/MAX3162E are programmable RS-232/RS-485/RS-422 multiprotocol transceivers. The MAX3160E/MAX3161E are pin programmable as a 2Tx/2Rx RS-232 interface or a single RS-485/RS-422 transceiver. The MAX3162E is configured as a 2Tx/2Rx RS-232 interface, and a single RS-485/RS-422 transceiver simultaneously. The MAX3160E/MAX3161E/MAX3162E feature enhanced electrostatic discharge (ESD) protection. All of the transmitter outputs and receiver inputs are protected to ±15kV using the Human Body Model. All devices incorporate a proprietary low-dropout transmitter output stage, and an on-board dual charge pump to allow RS-232- and RS-485-/RS-422-compliant performance from a +3V to +5.5V supply. The receivers feature true fail-safe circuitry that guarantees a logic-high receiver output when the receiver inputs are open or shorted. These devices also feature pin-selectable transmitter slew rates for RS-232 and RS-485/RS-422 modes. Slew-rate limiting minimizes EMI and reduces reflections caused by improperly terminated cables, allowing error-free data transmission up to 250kbps. Disabling slew-rate limiting allows these devices to transmit at data rates up to 10Mbps in RS-485/RS-422 mode and up to 1Mbps in RS-232 mode. The MAX3160E/MAX3161E/MAX3162E feature a 10nA shutdown mode, short-circuit limiting, and thermal shutdown circuitry to protect against excessive power dissipation. The MAX3160E/MAX3162E offer a flow-through pinout that facilitates board layout. The MAX3160E/MAX3161E/MAX3162E are available in tiny SSOP packages and operate over the commercial and extended temperature ranges.

#### II. Manufacturing Information

- A. Description/Function:
  - B. Process:
  - C. Number of Device Transistors:
  - D. Fabrication Location: Oregon
  - E. Assembly Location:Malaysia, PhilippinesF. Date of Initial Production:January 22, 2005

#### III. Packaging Information

A. Package Type:	24-pin SSOP	
B. Lead Frame:	Copper	
C. Lead Finish:	100% matte Tin	
D. Die Attach:	Conductive	
E. Bondwire:	Au (1 mil dia.)	
F. Mold Material:	Epoxy with silica filler	
G. Assembly Diagram:	#05-9000-0561	
H. Flammability Rating:	Class UL94-V0	
I. Classification of Moisture Sensitivity per Level 1 JEDEC standard J-STD-020-C		
J. Single Layer Theta Ja:	125°C/W	
K. Single Layer Theta Jc:	26°C/W	
L. Multi Layer Theta Ja:	66.9°C/W	
M. Multi Layer Theta Jc:	24.6°C/W	

#### IV. Die Information

Α.	Dimensions:	144 X 180 mils
В.	Passivation:	$Si_3N_4/SiO_2$ (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:	
Н.	Isolation Dielectric:	SiO <sub>2</sub>
I.	Die Separation Method:	Wafer Saw



±15kV ESD-Protected, +3.0V to +5.5V, 10nA, RS-232/RS-485/RS-422

Multiprotocol Transceivers

S3



#### V. Quality Assurance Information

A.	Quality Assurance Contacts:	Richard Aburano (Manager, Reliability Engineering) Don Lipps (Manager, Reliability Engineering) Bryan Preeshl (Vice President of QA)
В.	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 ( $\lambda$ ) is calculated as follows:

$$\lambda = \underbrace{1}_{\text{MTTF}} = \underbrace{1.83}_{192 \times 4340 \times 54 \times 2}$$
(Chi square value for MTTF upper limit)  
$$\lambda = 20.3 \times 10^{-9}$$

3. = 20.3 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 S3 Process results in a FIT Rate of 0.04 @ 25C and 0.69 @ 55C (0.8 eV, 60% UCL)

#### B. E.S.D. and Latch-Up Testing (lot NGO1BQ001C D/C 0439)

The RT35-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250mA.



# Table 1 Reliability Evaluation Test Results

# MAX3161EEAG+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Not	e 1)				
	Ta = 135°C	DC Parameters	54	0	NGO1EQ001A, D/C 0743
	Biased	& functionality			
	Time = 192 hrs.				

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