

RELIABILITY REPORT  
FOR  
MAX3110ECWI+  
PLASTIC ENCAPSULATED DEVICES

April 1, 2009

**MAXIM INTEGRATED PRODUCTS**

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## Conclusion

The MAX3110ECWI+ 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 MAX3110E/MAX3111E combine a full-featured universal asynchronous receiver/transmitter (UART) with  $\pm 15\text{kV}$  ESD-protected RS-232 transceivers and integrated charge-pump capacitors into a single 28-pin package for use in space-, cost-, and power-constrained applications. The MAX3110E/MAX3111E also feature an SPI™/QSPI™/MICROWIRE™-compatible serial interface to save additional board space and microcontroller ( $\mu\text{C}$ ) I/O pins.

A proprietary low-dropout output stage enables the 2-driver/2-receiver interface to deliver true RS-232 performance down to  $V_{CC} = +3\text{V}$  (+4.5V for MAX3110E) while consuming only  $600\mu\text{A}$ . The receivers remain active in a hardware/software-invoked shutdown, allowing external devices to be monitored while consuming only  $10\mu\text{A}$ . Each device is guaranteed to operate at up to 230kbps while maintaining true EIA/TIA-232 output voltage levels..

The MAX3110E/MAX3111E's UART includes a crystal oscillator and baud-rate generator with software-programmable divider ratios for all common baud rates from 300baud to 230kbaud. The UART features an 8-word-deep receive FIFO that minimizes processor overhead and provides a flexible interrupt with four maskable sources. Two control lines (one input and one output) are included for hardware handshaking..

The UART and RS-232 functions can be used together or independently since the two functions share only supply and ground connections (the MAX3110E/ MAX3111E are hardware- and software-compatible with the MAX3100 and MAX3222E).

## II. Manufacturing Information

A. Description/Function:	SPI/MICROWIRE-Compatible UART and $\pm 15\text{kV}$ ESD-Protected RS-232 Transceivers with Internal Capacitors
B. Process:	S3 & S12
C. Number of Device Transistors:	
D. Fabrication Location:	California
E. Assembly Location:	ATP Philippines
F. Date of Initial Production:	Pre 1997

## III. Packaging Information

A. Package Type:	28-pin SOIC (W)
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Hybrid
E. Bondwire:	hybrid (hybrid mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#
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:	80°C/W
K. Single Layer Theta Jc:	18°C/W
L. Multi Layer Theta Ja:	59°C/W
M. Multi Layer Theta Jc:	18°C/W

## IV. Die Information

A. Dimensions:	N/A mils
B. Passivation:	$\text{SiO}_2/\text{Si}_3\text{N}_4$
C. Interconnect:	Al/Cu (0.5%)
D. Backside Metallization:	none
E. Minimum Metal Width:	N/A
F. Minimum Metal Spacing:	N/A
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	$\text{SiO}_2$
I. Die Separation Method:	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 ( $\lambda$ ) is calculated as follows:

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

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

$$\lambda = 13.4 \times 10^{-9}$$

$$\lambda = 13.4 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at <http://www.maxim-ic.com/>. Current monitor data for the S3 Process results in a FIT Rate of 3.6 @ 25C and 66.0 @ 55C (0.8 eV, 60% UCL)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at <http://www.maxim-ic.com/>. Current monitor data for the S12 Process results in a FIT Rate of 0.09 @ 25C and 1.48 @ 55C, data limited (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 RS80-RS80W die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000 V 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

**MAX3110ECWI+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
<b>Static Life Test</b> (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	80	0
<b>Moisture Testing</b> (Note 2) 85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
<b>Mechanical Stress</b> (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