MAX3075ExxA Rev. A

RELIABILITY REPORT

FOR

### MAX3075ExxA

PLASTIC ENCAPSULATED DEVICES

July 27, 2006

# MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by

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#### Conclusion

The MAX3075E 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 MAX3075E 3.3V, ±15kV ESD-protected, RS-485/RS-422 transceiver features one driver and one receiver. This device includes fail-safe circuitry, guaranteeing a logic-high receiver output when receiver inputs are open or shorted. The receiver outputs a logic high if all transmitters on a terminated bus are disabled (high impedance). The MAX3075E includes a hot-swap capability to eliminate false transitions on the bus during power-up or hot insertion.

The MAX3075E also features slew-rate-limited drivers but allows transmit speeds up to 500kbps. The MAX3075E is intended for half-duplex communications.

The MAX3075E transceiver draws 800µA of supply current when unloaded or when fully loaded with the drivers disabled. This device has a 1/8-unit load receiver input impedance, allowing up to 256 transceivers on the bus.

#### B. Absolute Maximum Ratings

Item	Rating
(All voltages referenced to GND)	
Supply Voltage (VCC)	+6V
Control Input Voltage (RE, DE, SLR,	
H/F, TXP, RXP)	-0.3V to +6V
Driver Input Voltage (DI)	-0.3V to +6V
Driver Output Voltage (Z, Y, A, B)	-8V to +13V
Receiver Input Voltage (A, B)	-8V to +13V
Receiver Input Voltage	
Full Duplex (A, B)	-8V to +13V
Receiver Output Voltage (RO)	-0.3V to (VCC + 0.3V)
Driver Output Current	±250mA
Continuous Power Dissipation (TA = +70°C)	
8-Pin SO (derate 5.88mW/°C above +70°C)	471mW
8-Pin Plastic DIP (derate 9.09mW/°C above +70°C)	727mW
14-Pin SO (derate 8.33mW/°C above +70°C)	667mW
14-Pin Plastic DIP (derate 10.0mW/°C above +70°C)	800mW
Operating Temperature Ranges	
MAX307_EE	-40°C to +85°C
MAX307_EA	-40°C to +125°C
Junction Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10s)	+300°C

# II. Manufacturing Information

A. Description/Function:	+3.3V, ±15kV ESD-Protected, Fail-Safe, Hot-Swap, RS-485/RS-422 Transceivers
B. Process:	B8 (Standard 0.8 micron silicon gate CMOS)
C. Number of Device Transistors:	1,228
D. Fabrication Location:	Texas or California, USA
E. Assembly Location:	Malaysia, Philippines, Thailand
F. Date of Initial Production:	January, 2003

# III. Packaging Information

Α.	Package Type:	8-Pin PDIP	8-Pin SO
В.	Lead Frame:	Copper	Copper
C.	Lead Finish:	Solder Plate or 100% Matte Tin	Solder Plate or 100% Matte Tin
D.	Die Attach:	Silver-Filled Epoxy	Silver-Filled Epoxy
E.	Bondwire:	Gold (1 mil dia.)	Gold (1 mil dia.)
F.	Mold Material:	Epoxy with silica filler	Epoxy with silica filler
G.	Assembly Diagram:	# 05-9000-0188	#05-9000-0185
H.	Flammability Rating:	Class UL94-V0	Class UL94-V0
I.	Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C:	Level 1	Level 1

### IV. Die Information

A. Dimensions:	71 x 107 mils
B. Passivation:	$Si_3N_4/SiO_2$ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/Si (Si = 1%)
D. Backside Metallization:	None
E. Minimum Metal Width:	0.8 microns (as drawn)
F. Minimum Metal Spacing:	0.8 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO <sub>2</sub>
I. Die Separation Method:	Wafer Saw

#### V. Quality Assurance Information

- A. Quality Assurance Contacts: Jim Pedicord (Manager, Reliability Operations) 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:

 $\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 80 \times 2}$  (Chi square value for MTTF upper limit) Temperature Acceleration factor assuming an activation energy of 0.8eV

 $\lambda = 13.74 \times 10^{-9}$ 

 $\lambda = 13.74$  F.I.T. (60% confidence level @ 25°C)

This low failure rate represents data collected from Maxim's reliability monitor program. In addition to routine production Burn-In, Maxim pulls a sample from every fabrication process three times per week and subjects it to an extended Burn-In prior to shipment to ensure its reliability. The reliability control level for each lot to be shipped as standard product is 59 F.I.T. at a 60% confidence level, which equates to 3 failures in an 80 piece sample. Attached Burn-In Schematic (Spec. # 06-5007) shows the static Burn-In circuit. Maxim performs failure analysis on any lot that exceeds this reliability control level. Maxim also performs quarterly 1000 hour life test monitors. This data is published in the Product Reliability Report (**RR-1N**). Current monitor data for the B8/S8 Process results in a FIT rate of 0.17 @  $25^{\circ}$ C and 2.92 @  $55^{\circ}$ C (eV = 0.8, UCL = 60%).

#### B. Moisture Resistance Tests

Maxim pulls pressure pot samples from every assembly process three times per week. Each lot sample must meet an LTPD = 20 or less before shipment as standard product. Additionally, the industry standard 85°C/85%RH testing is done per generic device/package family once a quarter.

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

The RT52-5 die type has been found to have all pins able to withstand a transient pulse of  $\pm 2000$ V, per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of  $\pm 250$ mA.

#### Table 1 **Reliability Evaluation Test Results**

#### MAX3075ExxA

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	PACKAGE	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Tes	t (Note 1)				
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality		80	0
Moisture Testi	ing (Note 2)				
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	PDIP SO	77 77	0 0
85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality		77	0
Mechanical St	ress (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

## Attachment #1

	Terminal A (Each pin individually connected to terminal A with the other floating)	Terminal B (The common combination of all like-named pins connected to terminal B)
1.	All pins except V <sub>PS1</sub> 3/	All V <sub>PS1</sub> pins
2.	All input and output pins	All other input-output pins

# TABLE II. Pin combination to be tested. 1/2/

- 1/ Table II is restated in narrative form in 3.4 below.
- $\frac{32}{2}$  No connects are not to be tested.  $\frac{32}{2}$  Repeat pin combination I for each named Power supply and for ground

(e.g., where  $V_{PS1}$  is  $V_{DD}$ ,  $V_{CC}$ ,  $V_{SS}$ ,  $V_{BB}$ , GND,  $+V_S$ ,  $-V_S$ ,  $V_{RFF}$ , etc).

#### 3.4 Pin combinations to be tested.

- Each pin individually connected to terminal A with respect to the device ground pin(s) connected a. to terminal B. All pins except the one being tested and the ground pin(s) shall be open.
- Each pin individually connected to terminal A with respect to each different set of a combination b. of all named power supply pins (e.g., V<sub>SS1</sub>, or V<sub>SS2</sub> or V<sub>SS3</sub> or V<sub>CC1</sub>, or V<sub>CC2</sub>) connected to terminal B. All pins except the one being tested and the power supply pin or set of pins shall be open.
- Each input and each output individually connected to terminal A with respect to a combination of C. all the other input and output pins connected to terminal B. All pins except the input or output pin being tested and the combination of all the other input and output pins shall be open.



PKG. CODE: S8-4	SI	GNATURES	DATE	CONFIDENTIAL & PROPRIETARY
CAV./PAD SIZE: 90 X 130	PKG. DESIGN			BOND DIAGRAM #:  REV:    05-9000-0185   A





<b>DOCUMENT I.D.</b> 06-5007	REVISION F	<i>MAXIM</i> TITLE: BI Circuit: MAX488E/489E/491E (RS29) MAX3070/3073/3076 (RT52)	PAGE	2
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