

RELIABILITY REPORT
FOR
MAX3294AUT
PLASTIC ENCAPSULATED DEVICES

January 27, 2004

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by



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Conclusion

The MAX3294 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 MAX3294 low-power, high-speed transmitter for RS-485/RS-422 communications operates from a single +3.3V power supply. This device contains one differential transmitter. The MAX3295 transmitter operates at data rates up to 2.5Mbps and is slew-rate limited to minimize EMI and reduce reflections caused by improperly terminated cables.

The MAX3294 output level is guaranteed at +1.5V with a standard 54 Ω load, compliant with RS-485 specifications. The transmitter draws 5mA of supply current when unloaded, and 1 μ A in low-power shutdown mode (DE = GND).

Hot-swap circuitry eliminates false transitions on the data cable during circuit initialization or connection to a live backplane, and short-circuit current limiting and thermal-shutdown circuitry protect the driver against excessive power dissipation.

The MAX3294 is available in a 6-pin SOT23 package, and is specified over the automotive temperature range.

B. Absolute Maximum Ratings

<u>Item</u>	<u>Rating</u>
(All voltages referenced to GND, unless otherwise noted.)	
Supply Voltage (VCC)	+6V
DE, DI	-0.3V to +6V
Y, Z	-7V to +12.5V
Maximum Continuous Power Dissipation (TA = +70°C)	
Operating Temperature Ranges	
MAX3294EEUT	-40°C to +85°C
MAX3294EAUT	-40°C to +125°C
Storage Temperature Range	-65°C to +160°C
Junction Temperature	+160°C
Lead Temperature (soldering, 10s)	+300°C
Continuous Power Dissipation (TA = +70°C)	
6-Pin SOT23	500mW
Derates above +70°C	
6-Pin SOT23	6.25mW/°C

II. Manufacturing Information

A. Description/Function:	2.5Mbps, +3.3V, SOT23 RS-485/RS-422 Transmitters
B. Process:	B8 (Standard 0.8 micron silicon gate CMOS)
C. Number of Device Transistors:	263
D. Fabrication Location:	California, USA
E. Assembly Location:	Malaysia, Philippines or Thailand
F. Date of Initial Production:	January, 2003

III. Packaging Information

A. Package Type:	6-Lead SOT
B. Lead Frame:	Copper
C. Lead Finish:	Solder Plate
D. Die Attach:	Non-Conductive Epoxy
E. Bondwire:	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	# 05-9000-0352
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-112:	Level 1

IV. Die Information

A. Dimensions:	75 x 45 mils
B. Passivation:	Si ₃ N 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 ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information


- A. Quality Assurance Contacts: Jim Pedicord (Manager, Reliability Operations)
Bryan Preeshl (Executive Director of QA)
Kenneth Huening (Vice President)
- 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4389 \times 48 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

 Temperature Acceleration factor assuming an activation energy of 0.8eV

$$\lambda = 22.62 \times 10^{-9}$$

$$\lambda = 22.62 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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. Maxim performs failure analysis on any lot that exceeds this reliability control level. Attached Burn-In Schematic (Spec. # 06-6110) shows the static Burn-In circuit. Maxim also performs quarterly 1000 hour life test monitors. This data is published in the Product Reliability Report (**RR-1M**).

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 RT66-1 die type has been found to have all pins able to withstand a transient pulse of $\pm 1500\text{V}$ per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of $\pm 250\text{mA}$.

Table 1
Reliability Evaluation Test Results

MAX3294AUT

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	PACKAGE	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)					
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality		48	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	SOT	77	0
85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	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

Attachment #1

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

	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_{PS1} 3/	All V_{PS1} pins
2.	All input and output pins	All other input-output pins

1/ Table II is restated in narrative form in 3.4 below.

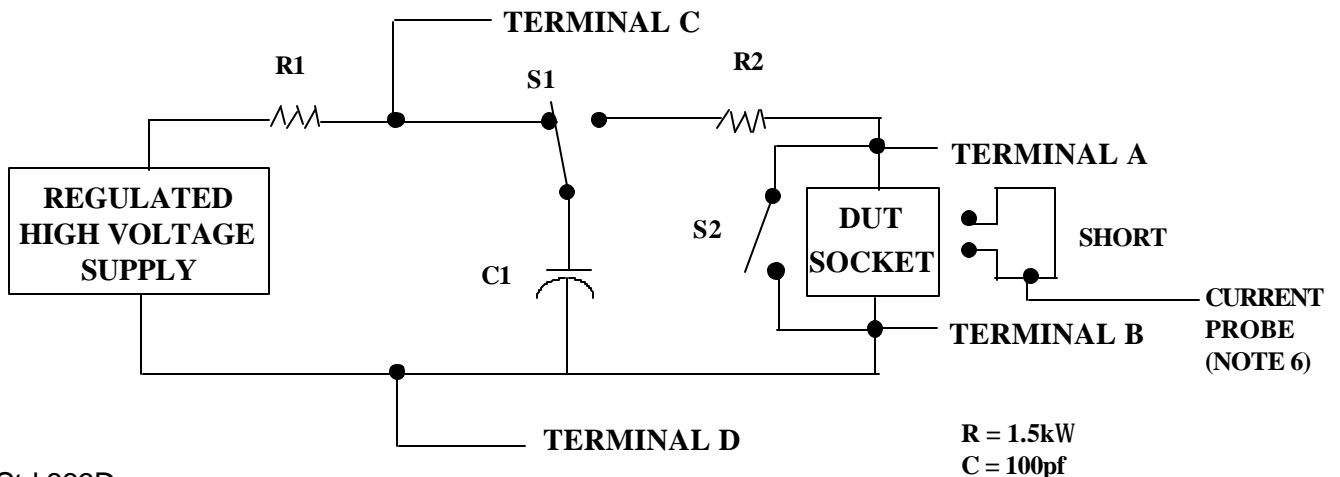
2/ No connects are not to be tested.

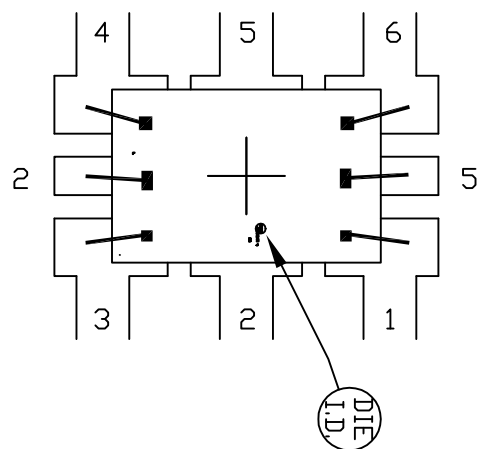
3/ Repeat pin combination I for each named Power supply and for ground

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

3.4 Pin combinations to be tested.

- Each pin individually connected to terminal A with respect to the device ground pin(s) connected 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 of all named power supply pins (e.g., V_{SS1} , or V_{SS2} or V_{SS3} or V_{CC1} , or V_{CC2}) 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 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.





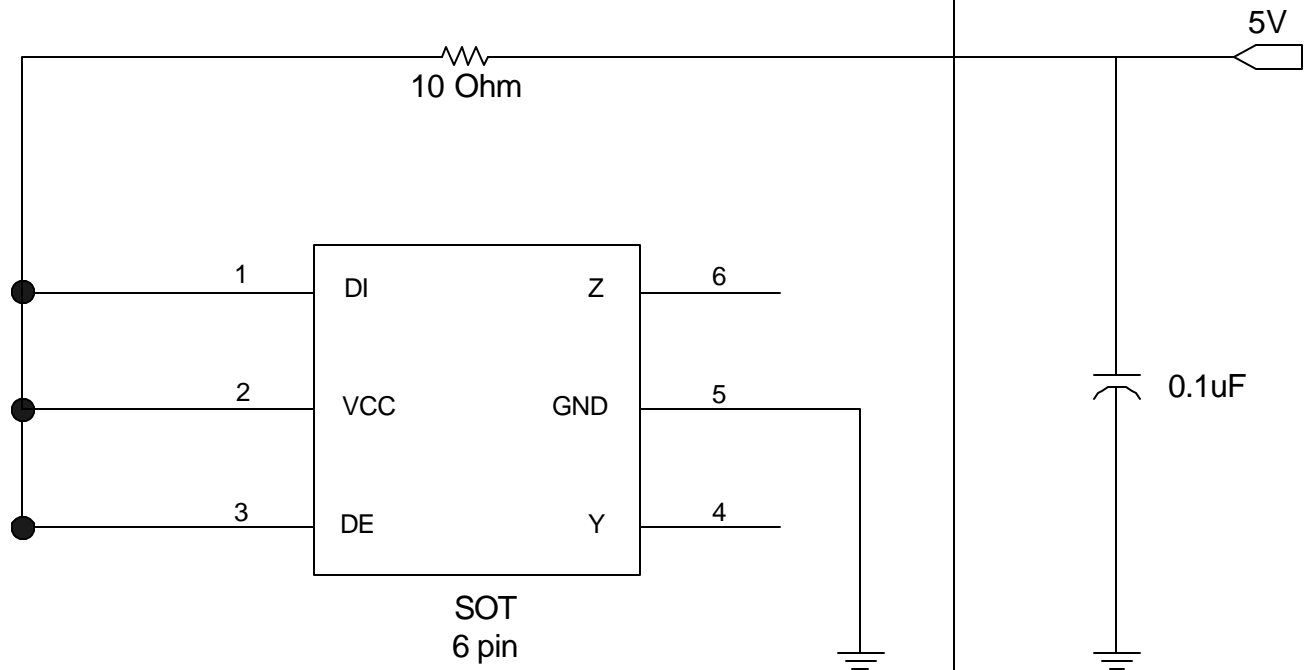
USE NON-CONDUCTIVE EPOXY

NOTE: CAVITY DOWN

PKG. CODE: U6C-8		SIGNATURES	DATE	 CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: CHIP ON LEAD	PKG. DESIGN			BOND DIAGRAM #: 05-9000-0352	REV: A

ONE PER SOCKET

ONE PER BOARD



MAX CURRENT = 150mA (+5V)

MAX3293/3294/3295