RELIABILITY REPORT

FOR

MAX3387ExUG

PLASTIC ENCAPSULATED DEVICES

November 21, 2003

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

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Conclusion

The MAX3387E 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.

Table of Contents

I. Device Description

A. General

The MAX3387E 3V powered EIA/TIA-232 and V.28/V.24 is a communications interface with low power requirements, high data-rate capabilities, and enhanced electrostatic discharge (ESD) protection. The MAX3387E has three receivers and three transmitters. All RS-232 inputs and outputs are protected to ±15kV using the IEC 1000-4-2 Air-Gap Discharge method, ±8kV using the IEC 1000-4-2 Contact Discharge method, and ±15kV using the Human Body Model.

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 0.1µF capacitors for operation from a +3.3V supply. The MAX3387E is capable of running at data rates up to 250kbps while maintaining RS-232 compliant output levels.

The MAX3387E has a unique V_L pin that allows interoperation in mixed-logic voltage systems. Both input and output logic levels are pin programmable through the V_L pin. The MAX3387E is available in a space-saving TSSOP package.

B. Absolute Maximum Ratings

Item	Rating
VCC to GND	-0.3V to +6V
VL to GND	-0.3V to (VCC + 0.3V)
V+ to GND	-0.3V to +7V
V- to GND	+0.3V to -7V
V+ +. V-.(Note 1)	+13V
Input Voltages	
T_IN, FORCEON, FORCEOFF to GND	-0.3V to +6V
R_IN to GND	±25V
Output Voltages	
T_OUT to GND	±13.2V
R_OUT	-0.3V to (VL + 0.3V)
Short-Circuit Duration T_OUT to GND	Continuous
Operating Temperature Ranges	
MAX3387ECUG	0°C to +70°C
MAX3387EEUG	-40°C to +85°C
Junction Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10s)	+300°C
Continuous Power Dissipation (TA = +70°C)	
24-Pin TSSOP	625mW
Derates above +70°C	
24-Pin TSSOP	8.7mW/°C

Note 1: V+ and V- can have maximum magnitudes of 7V, but their absolute difference cannot exceed 13V.

II. Manufacturing Information

A. Description/Function:	3V, ±15kV ESD-Protected, AutoShutdown Plus RS-232 Transceiver for PDAs and Cell Phones
B. Process:	S3 (Standard 3 micron silicon gate CMOS)
C. Number of Device Transistors:	1267
D. Fabrication Location:	Oregon, USA
E. Assembly Location:	Philippines or Malaysia
F. Date of Initial Production:	October, 1999

III. Packaging Information

A. Package Type:	**24-Lead TSSOP**
B. Lead Frame:	Copper
C. Lead Finish:	Solder Plate
D. Die Attach:	Silver-filled Epoxy
E. Bondwire:	Gold (1.0 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram	# 05-2601-0002
H. Flammability Rating:	Class UL94-V0

IV. Die Information

A. Dimensions:	179 x 92 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:	3 microns (as drawn)
F. Minimum Metal Spacing:	3 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, Relaibility Operations)
Bryan Preeshl (Executive Director)
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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4389 \times 219 \times 2}$$

(Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 4.96 \times 10^{-9}$

λ = 4.96 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. # 06-5475) 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 RT03-1 die type has been found to have all pins able to withstand a transient pulse of ±2500V, per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of ±250mA.

Table 1
Reliability Evaluation Test Results

MAX3387ExUG

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		219	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	TSSOP	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

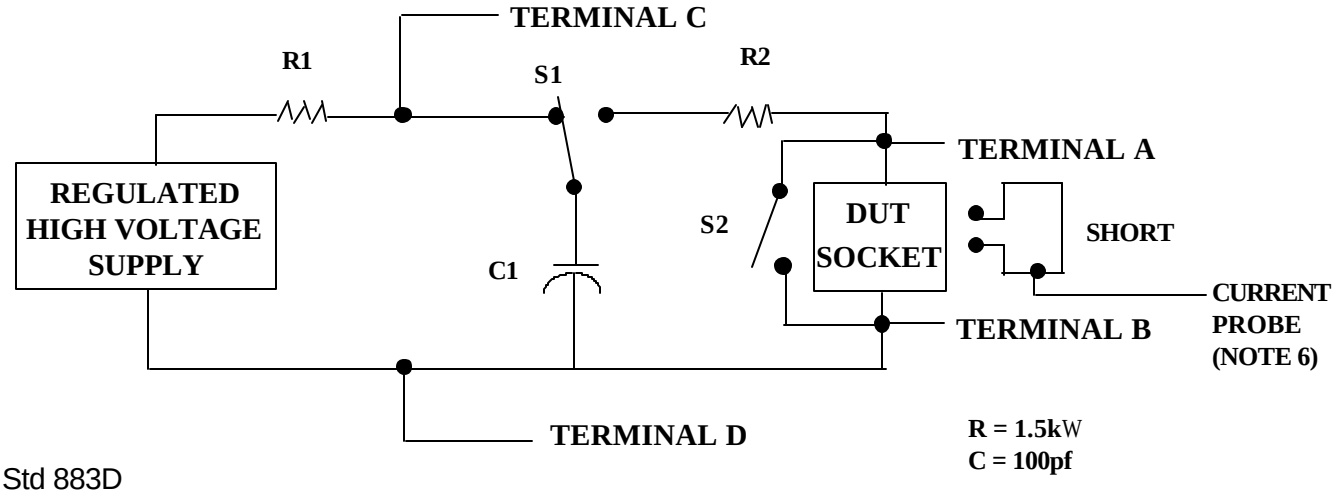
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

3.4 Pin combinations to be tested.

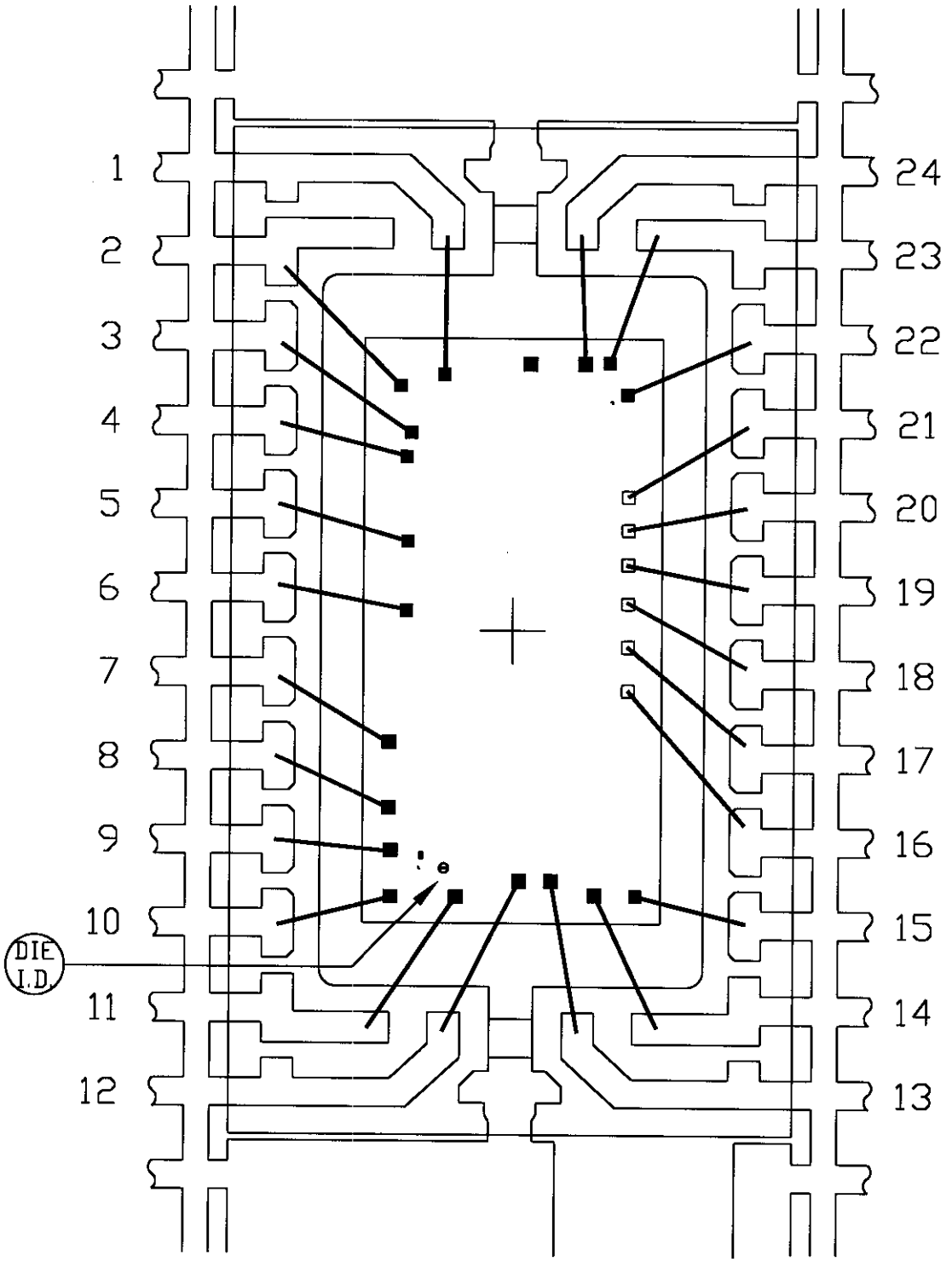
a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.

b. 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.

c. 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.

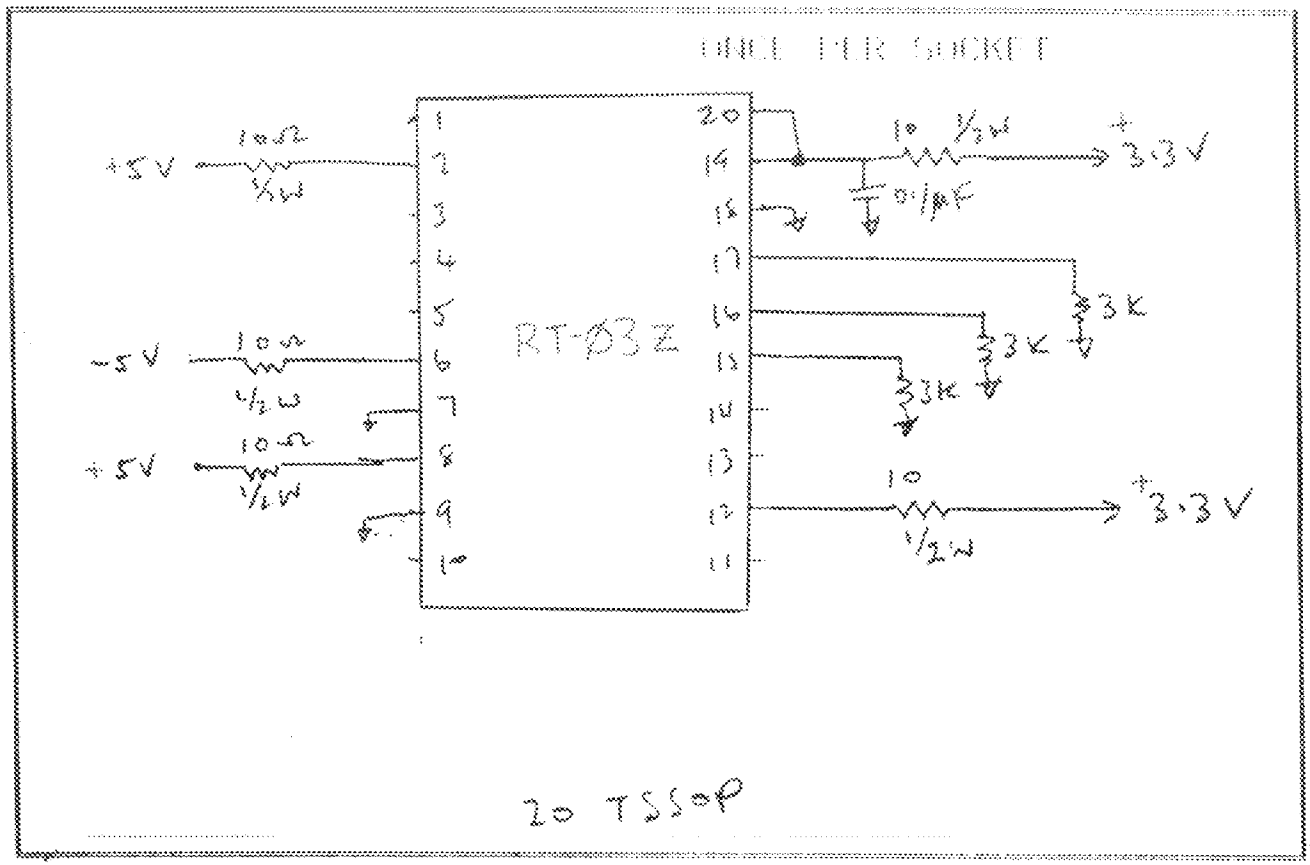


Mil Std 883D
Method 3015.7
Notice 8



PKG.CODE: U24-1		APPROVALS	DATE	MAXIM	
CAV./PAD SIZE: 118x217	PKG. DESIGN			BUILDSHEET NUMBER: 05-2601-0002	REV.: A

Any power supply is OK.
Max current draw:
+5V 5 mA
-5V 5 mA
+3.3V 20 mA



ONCE PER BOARD

+5V
-5V
+10V
-10V
+15V
-15V
+20V
-20V
CLK1 FREQ= AMP=
CLK2 FREQ= AMP=
CLK3 FREQ= AMP=
CLK4 FREQ= AMP=
GND

- STEADY STATE LIFE TEST IS PER MIL-STD 883 METHOD 1005.
- BURN-IN IS PER MIL-STD-883 METHOD 1015. COND. B

NOTES:
1. TEMPERATURE: 125C OR EQUIVALENT
2. TIME: 168 HOURS MIN. OR EQUIVALENT
3. ALL COMPONENTS AND MATERIAL MUST STAND 150C CONTINUOUS
4. APPROVED FOR [X] COMMERCIAL
[ ] IR/883

SPEC. 06-5475 REV. A

DATE: 6/15/99

MAXIM BURN-IN SCHEMATIC

DEVICE TYPE:
MAX 3386