RELIABILITY REPORT

FOR

MAX3209ExUU

PLASTIC ENCAPSULATED DEVICES

July 18, 2006

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by

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Conclusion

The MAX3209 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 MAX3209E is a complete, dual DTE RS-232 serial port (6 transmitters, 10 receivers) for motherboards and desktop PCs that ensures compliance with the stringent ESD requirements of the European Community. The device minimizes board space and power consumption by eliminating the need for a negative power supply; it integrates two serial ports and a charge pump into a single 38-pin TSSOP package.

The MAX3209E features a 50µA low-power standby mode for compliance with system power-management requirements. During standby, while the device operates from the single +3V to +5.5V logic supply, one receiver on each port remains active, allowing automatic system wake-up when peripheral communications resume.

All transmitter outputs and receiver inputs are protected to ±15kV using IEC 1000-4-2 Air-Gap Discharge, ±8kV using IEC 1000-4-2 Contact Discharge, and ±15kV using the Human Body Model, making the device ideal for use in harsh environments or mission-critical equipment. In addition, the MAX3209E withstands ±4kV per IEC 1000-4-4 Electrical Fast Transient/Burst Stressing. As a result of its robust charge-pump structure, the MAX3209E guarantees mouse driveability and true RS-232 operation at data rates up to 460kbps, ensuring compatibility with PC-to-PC communication software (such as LapLink®).

B. Absolute Maximum Ratings

Item	Rating
VDD	-0.3V to +15V
VSTBY	-0.3V to +7V
V-	+0.3V to -15V
Input Voltages	
T_IN	-0.3V to +7V
R_IN	±30V
Output Voltages	
T_OUT	±15V
R_OUT	-0.3V to (VSTBY + 0.3V)
Short-Circuit Duration	
T_OUT (one at a time)	Continuous
R_OUT (one at a time)	Continuous
Continuous Power Dissipation (TA = +70°C)	
TSSOP (derate 11.8mW/°C above +70°C)	941mW
QFN 6 . 6mm (derate 23.2mW/°C above +70°C)	1860mW
Operating Temperature Ranges	
MAX3209EC_ _	0°C to +70°C
MAX3209EE_ _	-40°C to +85°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10s)	+300°C

II. Manufacturing Information

A. Description/Function: ±15kV ESD-Protected, 12V, Dual RS-232 Serial Port with Low-Power Standby for Motherboards/Desktops

B. Process:	S3 (Standard 3.0 micron silicon gate CMOS)
C. Number of Device Transistors:	774
D. Fabrication Location:	Oregon, USA
E. Assembly Location:	Philippines
F. Date of Initial Production:	April, 1999

III. Packaging Information

A. Package Type:	38-pin TSSOP
B. Lead Frame:	Copper
C. Lead Finish:	Solder Plate or 100% Matte Tin
D. Die Attach:	Silver-Filled Epoxy
E. Bondwire:	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	# 05-1901-0222
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C:	Level 1

IV. Die Information

A. Dimensions:	91 x 200 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:	3.0 microns (as drawn)
F. Minimum Metal Spacing:	3.0 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 (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 (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 160 \times 2}$$

(Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 6.87 \times 10^{-9}$

λ = 6.87 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. # 06-5474) 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 S3 Process results in a FIT rate of 0.15 @ 25°C and 2.60 @ 55°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 RS98 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

MAX3209ExUU

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		160	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

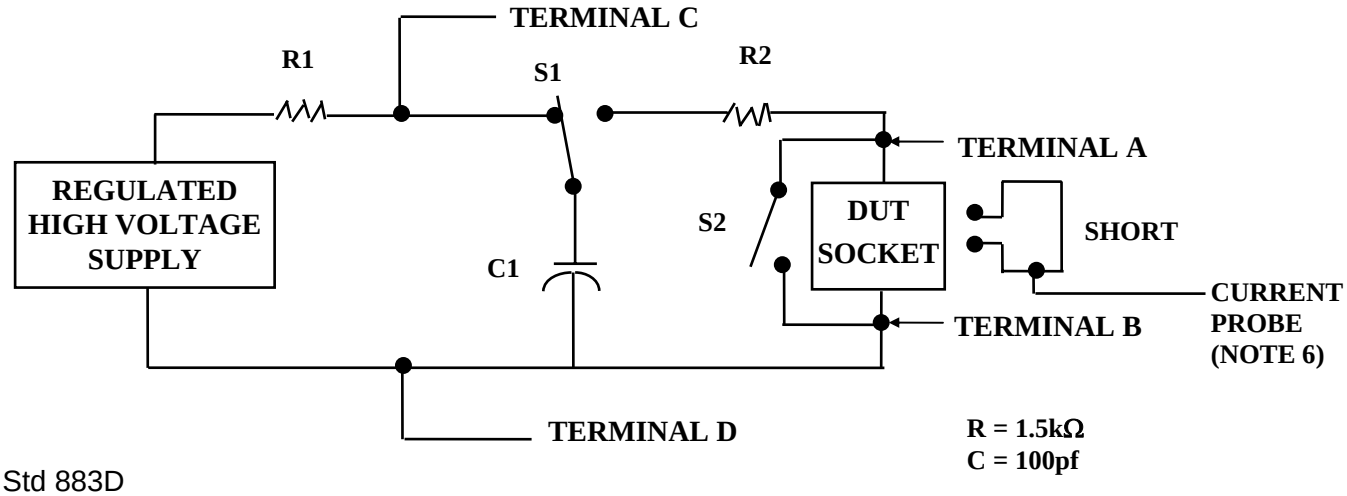
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

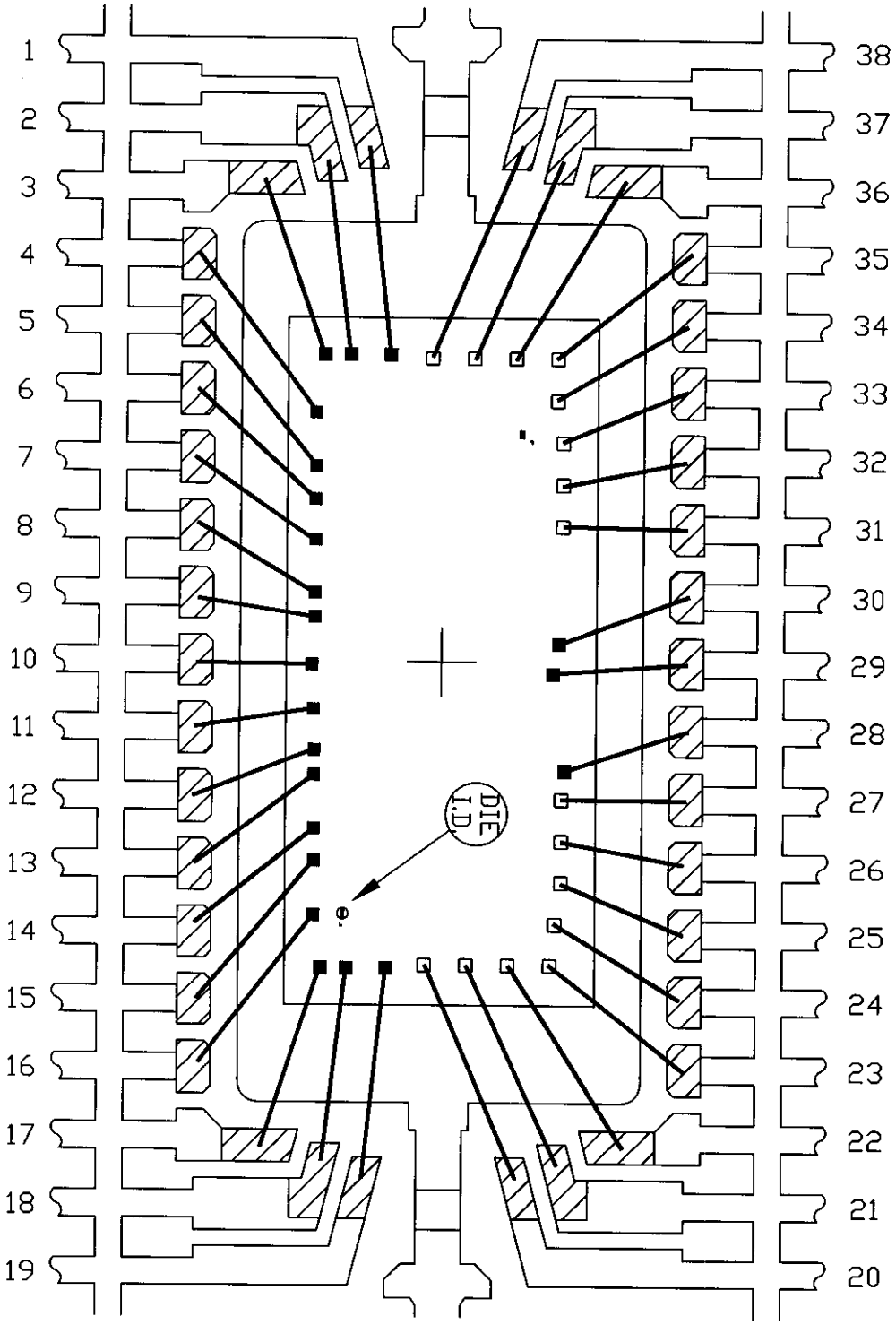
3.4 Pin combinations to be tested.

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.

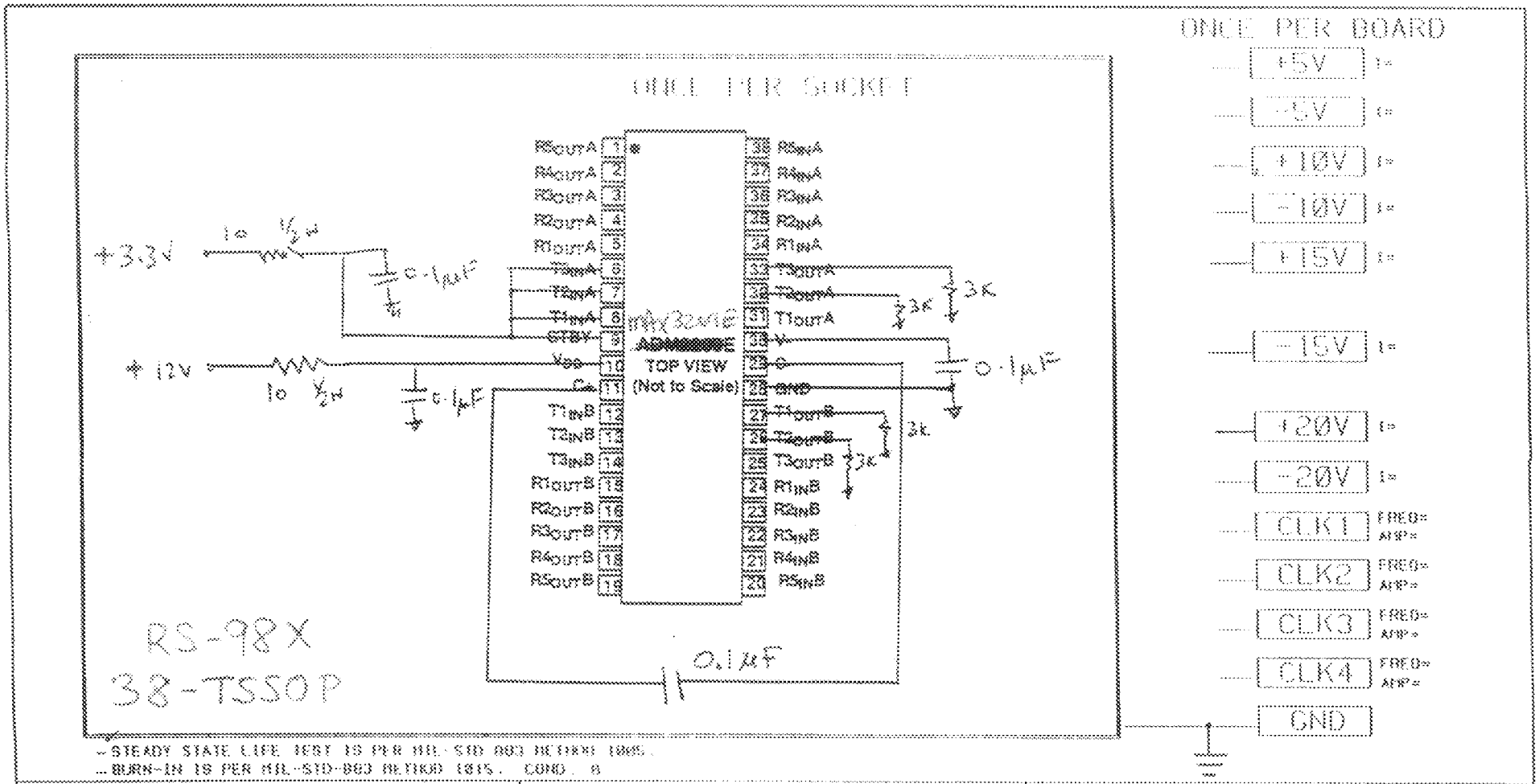




BONDABLE AREA

PKG. CODE: U38-2		SIGNATURES	DATE	MAXIM CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: 118x256	PKG. DESIGN			BOND DIAGRAM #: 05-1901-0222	REV: B

Either power supply can power 4 pins.
Max current draw: 50mA per device from +12V supply
1 mA per device from +3.3V supply



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 EXT COMMERCIAL (#) MR/883

SPEC. 06-5474 REV. A

DATE: 6/15/99

MAXIM BURN-IN SCHEMATIC

DEVICE TYPE:
MAX 3209E