MXL1544CAI
Rev. A

RELIABILITY REPORT

FOR

MAX1544CAI

PLASTIC ENCAPSULATED DEVICES

September 6, 2008

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

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Written by

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Conclusion

The MXL1544 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 MXL1544 is a four-driver/four-receiver multiprotocol transceiver that operates from a single +5V supply in conjunction with the MXL1543. The MXL1544, along with the MXL1543 and MXL1344A, form a complete software-selectable data terminal equipment (DTE) or data communication equipment (DCE) interface port that supports the V.28 (RS-232), V.10/V.11 (RS-449/V.36, EIA-530, EIA-530A, X.21, RS-423), and V.35 protocols. The MXL1544 transceiver carries serial interface control signaling, while the MXL1543 carries the high-speed clock and data signals. Typically, the MXL1543 is terminated using the MXL1344A. The MXL1544 is available in 28-pin SSOP packages.

B. Absolute Maximum Ratings

Item	Rating
Continuous Power Dissipation (All Voltages to GND Unless Otherwise Noted	
Supply Voltages	
VCC	-0.3V to +6V
VDD	-0.3V to +7.2V
VEE	+0.3V to -7V
VDD to VEE (Note 1)	13V
Logic Input Voltage	
M0, M1, M2, DCE/DTE, INVERT, T_IN	-0.3V to +6V
Logic Output Voltage	
R_OUT	-0.3V to (VCC + 0.3V)
Transmitter Outputs	
T_OUT_, T_OUT_/R_IN	-15V to +15V
Short-Circuit Duration	Continuous
Receiver Inputs	
R_IN_, T_OUT_/R_IN_	-15V to +15V
Continuous Power Dissipation (TA = +70°C)	
28-Pin SSOP (derate 11.1mW/°C above +70°C)	889mW
Operating Temperature Range	0°C to +70°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:	+5V Multiprotocol, Software-Selectable Control Transceivers
B. Process:	S3 (Standard 3.0 micron silicon gate CMOS)
C. Number of Device Transistors:	2348
D. Fabrication Location:	Oregon, USA
E. Assembly Location:	Philippines
F. Date of Initial Production:	April, 2001

III. Packaging Information

A. Package Type:	**28-Pin SSOP**
B. Lead Frame:	Copper
C. Lead Finish:	Solder Plate or 100% Matte Tin
D. Die Attach:	Silver-Filled Epoxy
E. Bondwire:	Gold (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	# 05-2601-0044
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:	144 x 276 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_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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 45 \times 2}$$ (Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 24.43 \times 10^{-9}$

λ = 24.43 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. # 06-5712) 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 RT01-1 die type has been found to have all pins able to withstand a transient pulse of ±1500V, 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

MXL1544CAI

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		45	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	SSOP	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

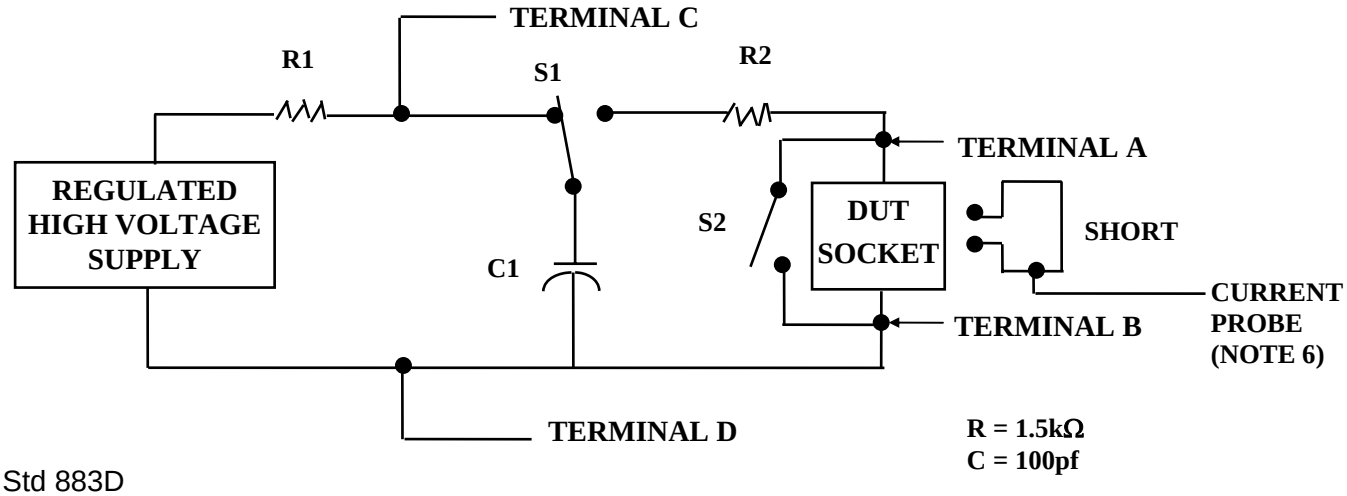
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

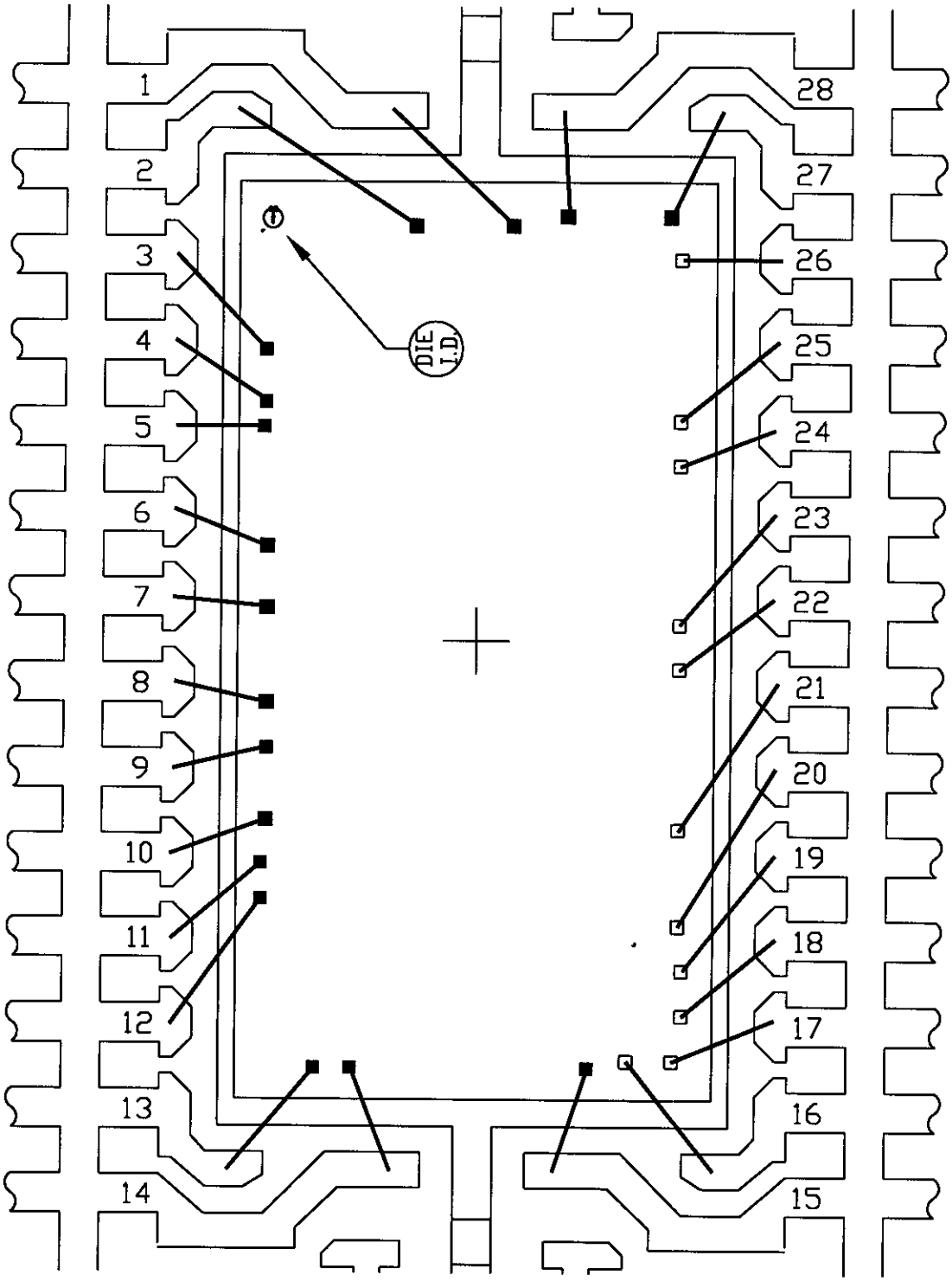
3.4 Pin combinations to be tested.

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.

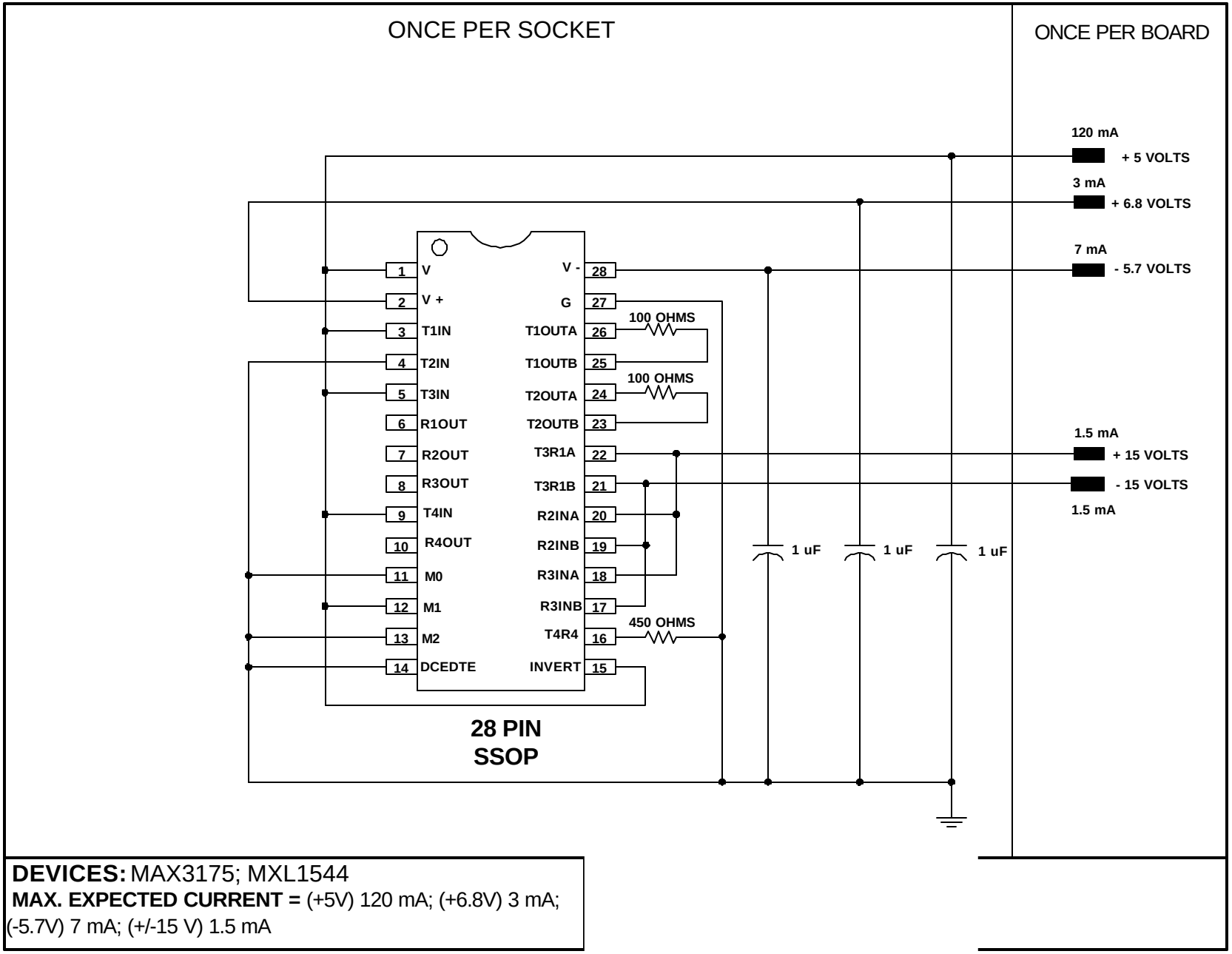
b. Each pin individually connected to terminal A with respect to each different set of a combination of all named power supply pins (e.g., V_{SS1}, or V_{SS2} or V_{SS3} or V_{CC1}, or V_{CC2}) connected to terminal B. All pins except the one being tested and the power supply pin or set of pins shall 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.





PKG. CODE: A28-3		SIGNATURES	DATE	MAXIM CONFIDENTIAL & PROPRIETARY
CAV./PAD SIZE: 154X291	PKG.			BOND DIAGRAM #: 05-2601-0044 REV: A
	DESIGN			



DEVICES: MAX3175; MXL1544
MAX. EXPECTED CURRENT = (+5V) 120 mA; (+6.8V) 3 mA; (-5.7V) 7 mA; (+/-15 V) 1.5 mA