RELIABILITY REPORT

FOR

MXL1344ACAG

PLASTIC ENCAPSULATED DEVICES

December 3, 2002

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

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Conclusion

The MXL1344A 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 MXL1344A contains six software-selectable, multiprotocol cable termination networks. Each network is capable of terminating V.11 (RS-422, RS-530, RS-530A, RS-449, V.36 and X.21) with a 100Ω differential load, V.35 with a T-network load, or V.28 (RS-232) and V.10 (RS-423) with an open-circuit load for use with transceivers having on-chip termination. The termination protocol can be selected by the serial interface cable wiring or by software control. The MXL1344A replaces discrete resistor termination networks and expensive relays required for multiprotocol termination, saving space and cost.

The MXL1344A terminator is designed to form a complete +5V cable- or software-selectable multiprotocol DCE/DTE interface port when used with the MXL1543 and MXL1544/MAX3175 transceiver ICs. The MXL1344A terminator can use the V_{EE} power generated by the MXL1543 charge pump, simplifying system design. The MXL1344A, MXL1543, and MXL1544/MAX3175 are pin-for-pin compatible with the LTC1344A, LTC1543, and LTC1544, but for proper operation the entire Maxim chipset must be used without substituting other manufacturer's parts on a chip-by-chip basis.

The MXL1344A is available in a 24-pin SSOP package and is specified for the 0°C to +70°C commercial temperature range.

B. Absolute Maximum Ratings

Item	Rating
All Voltages to GND Unless Otherwise Noted	
Supply Voltages	
VCC	-0.3V to +6V
VEE	+0.3V to -7V
Logic Input Voltages	
M0, M1, M2, DCE/DTE , LATCH	-0.3V to +6V
Termination Network Inputs	
R_A, R_B	-15V to +15V
R_A to R_B	±15V
Operating Temperature Range	0°C to +70°C
Die Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10s)	+300°
Continous Power Dissipation (T_A = +70^{0}C)	
24-Pin SSOP	640mW
Derates above +70°C	
24-Pin SSOP	8.0mW/°C

II. Manufacturing Information

A. Description/Function:	+5V Multiprotocol, Software-Selectable Cable Terminator
B. Process:	S3 (SG3) Standard 3 micron silicon gate CMOS
C. Number of Device Transistors:	1054
D. Fabrication Location:	Oregon, USA
E. Assembly Location:	Philippines or Malaysia
F. Date of Initial Production:	July, 2000

III. Packaging Information

A. Package Type:	**24-Lead SSOP**
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:	Buildsheet # 05-2601-0026
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112:	Level 1

IV. Die Information

A. Dimensions:	217 x 144 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, 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4389 \times 160 \times 2}$$

(Chi square value for MTTF upper limit)

Thermal acceleration factor assuming a 0.8eV activation energy

$\lambda = 6.79 \times 10^{-9}$ $\lambda = 6.79$ F.I.T. (60% confidence level @ 25°C)

This low failure rate represents data collected from Maxim's reliability qualification and monitor programs. Maxim also performs weekly Burn-In on samples from production to assure the reliability of its processes. The reliability required for lots which receive a burn-in qualification 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 lots exceeding this level. The following Burn-In Schematic (Spec. # 06-5590) shows the static circuit used for this test. Maxim also performs 1000 hour life test monitors quarterly for each process. This data is published in the Product Reliability Report (**RR-1M**).

B. Moisture Resistance Tests

Maxim evaluates pressure pot stress from every assembly process during qualification of each new design. Pressure Pot testing must pass a 20% LTPD for acceptance. Additionally, industry standard 85°C/85%RH or HAST tests are performed quarterly per device/package family.

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

The RT02 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

MXL1344ACAG

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	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	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	77	0

Note 1: Life Test Data may represent plastic D.I.P. qualification lots.
Note 2: Generic process/package 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

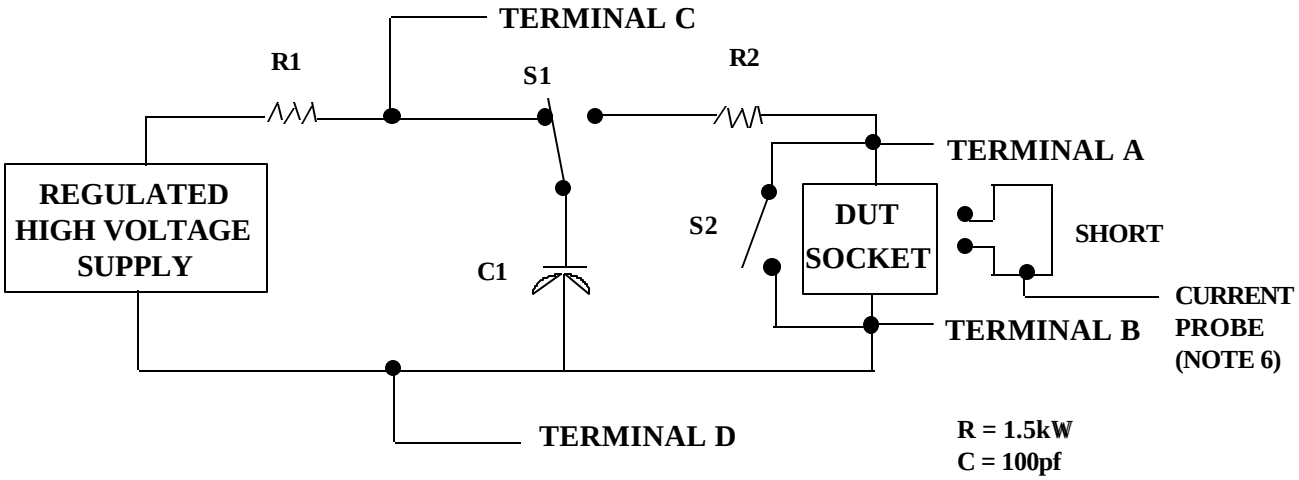
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

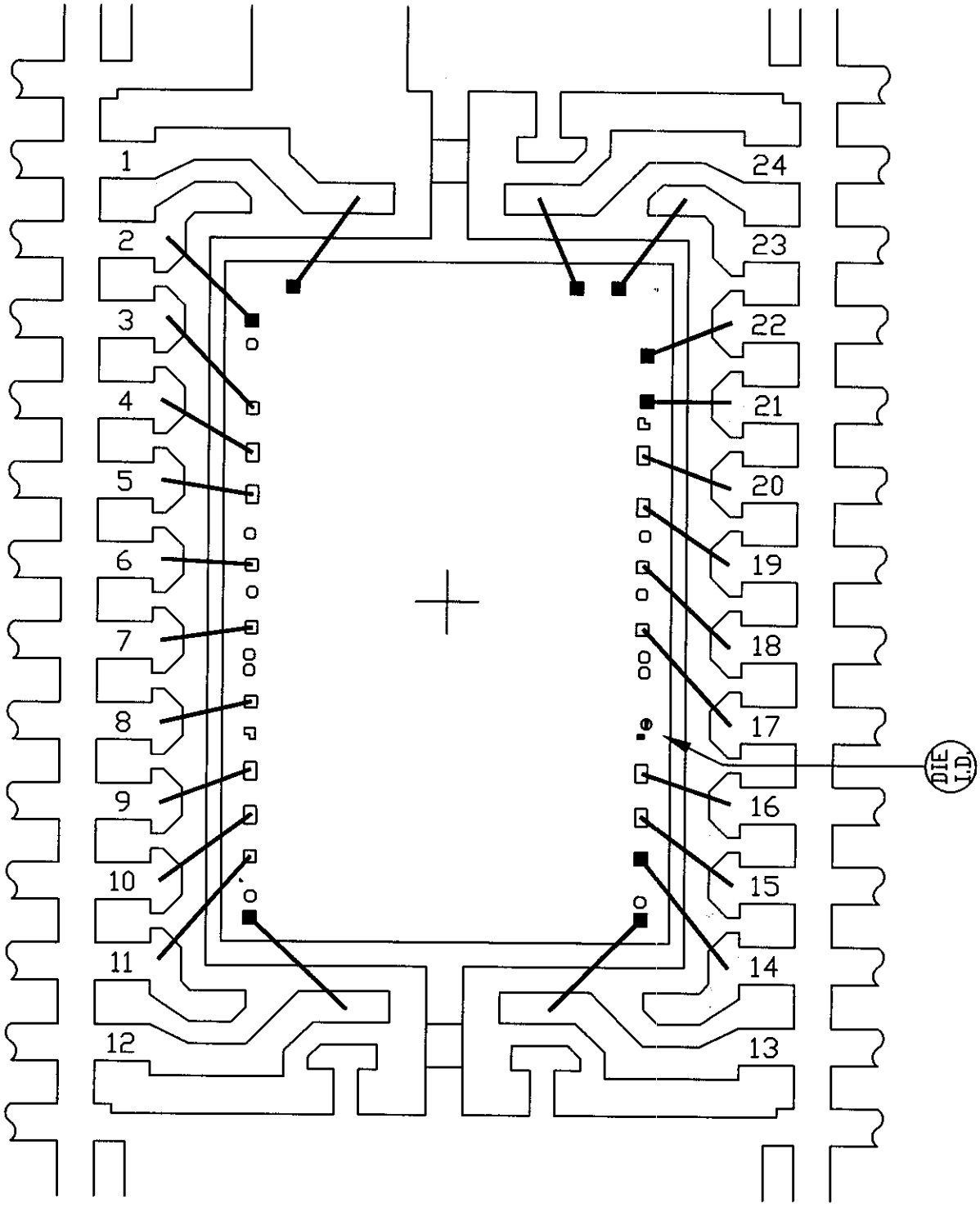
3.4 Pin combinations to be tested.

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.

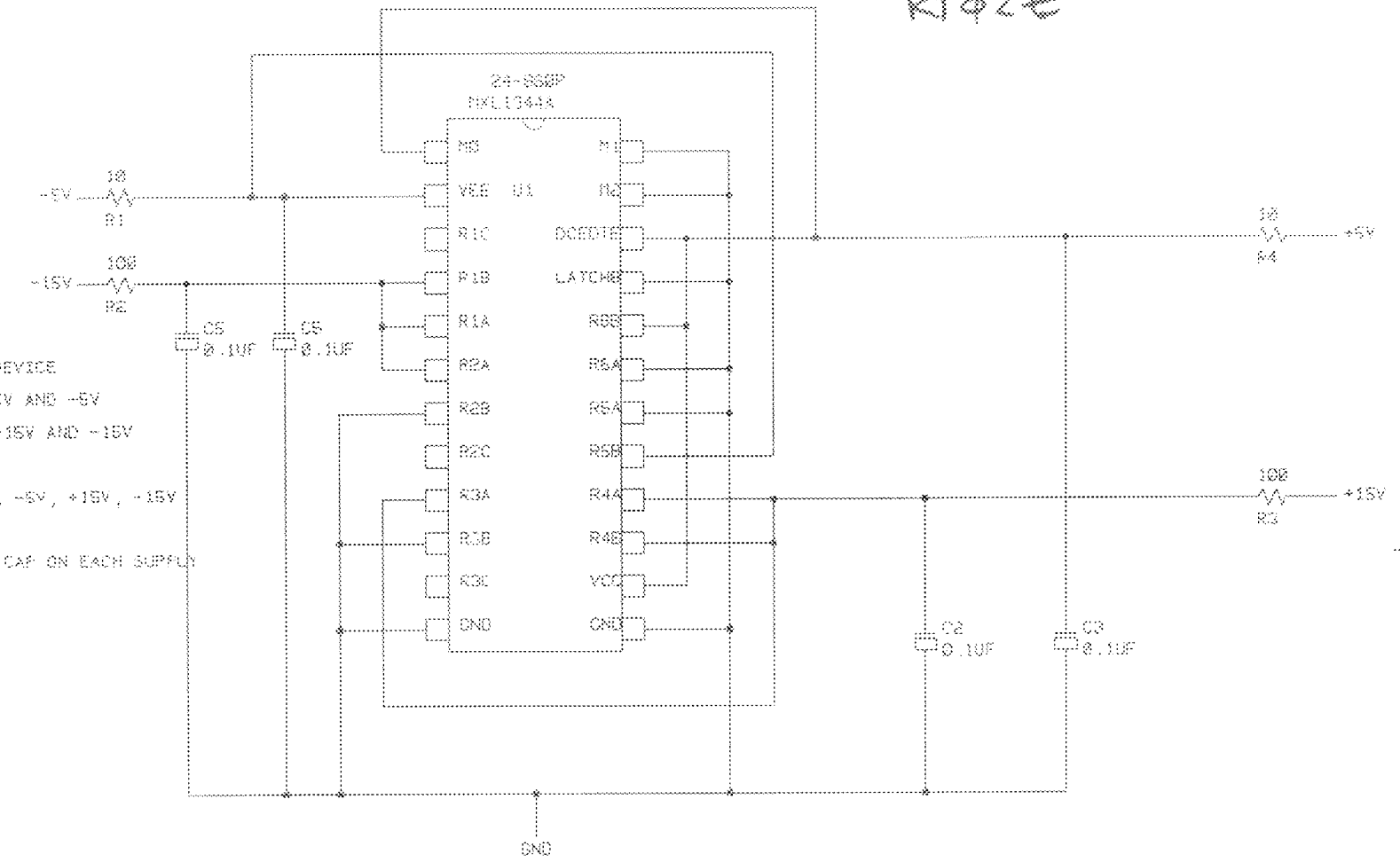




PKG. CODE: A24-3		SIGNATURES	DATE	MAXIM CONFIDENTIAL & PROPRIETARY
CAV./PAD SIZE: 154X232	PKG. DESIGN			BOND DIAGRAM #: 05-2601-0026 / REV: A

MXL1344A BURN IN SCHEMATIC

RT#27



NOTES

1. SCHEMATIC IS ONCE PER DEVICE
2. 60mA PER DEVICE FROM +5V AND -5V
3. < 1mA PER DEVICE FROM +15V AND -15V

5. SUPPLY SEQUENCE -> +5V, -5V, +15V, -15V
6. 900mW PER DEVICE
7. ONCE PER BOARD ~ 100uF CAP ON EACH SUPPLY

MAXIM	CREATED: 4/17/99	BY: KPC			ENG'R: --
	LAST SAVED: 14:09:02 03-09-00		SIZE B	REVISION A 3/20/00	DWG NO. 06-5590
MXL1344A	PROJECT: MXL1344A				
	DESC.: BURN-IN BOARD		FILE: BURNIN.DWG		SHEET 1 OF 40