RELIABILITY REPORT

FOR

MAX3172CAI

PLASTIC ENCAPSULATED DEVICES

January 23, 2002

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

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Conclusion

The MAX3172 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 MAX3172 contains five 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 device replaces discrete resistor termination networks and expensive relays required for multiprotocol termination. The MAX3172, along with the MAX3170 and MAX3171/MAX3173, form a complete +3.3V software-selectable DTE or DCE interface port supporting V.11/RS-422, RS-530, RS-530A, V.36/RS-449, V.35, V.28/RS-232, V.10/RS-423, and X.21 serial interfaces.

In addition to the five multiprotocol cable termination networks, the MAX3172 contains a 1Tx/1Rx multiprotocol transceiver designed to use V+ and V- generated by the MAX3171/MAX3173 charge pump. The MAX3172 transceiver is software selectable between V.10 and V.28 modes of operation. The MAX3172 features 10µs deglitching on the V.10/V.28 receiver input to facilitate unterminated operation. This device is available in a 28-pin SSOP package.

B. Absolute Maximum Ratings

Item	Rating
VCC to GND	-0.3V to +4V
V+ to GND (Note 1)	-0.3V to +7V
V- to GND (Note 1)	+0.3V to –7V
V+ to V- (Note 1)	13V
M0,M1,M2,DCE/DTE, INVERT, T4IN to GND	-0.3V to +6V
R4OUT to GND	-0.3V to (VCC + 0.3V)
T4OUT to GND	-15V to +15V
R4INA to GND	-15V to +15V
Termination Network Inputs (applied individually) R_A,R_B	-15V to +15V
Storage Temp.	-65°C to +150°C
Lead Temp. (10 sec.)	+300°C
Power Dissipation	
28-Pin SSOP	762mW
Derates above +70°C	
28-Pin SSOP	9.52mW/°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: +3.3V Multiprotocol, 3 Tx/3 RX, Software-Selectable Cable Terminator & Transceivers

B. Process: SG3 (Standard 3 micron silicon gate CMOS)

C. Number of Device Transistors: 2506

D. Fabrication Location: California or Oregon, USA

E. Assembly Location: Philippines

F. Date of Initial Production: July, 2000

III. Packaging Information

A. Package Type: **28-Pin 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: # 05-1901-0236

H. Flammability Rating: Class UL94-V0

I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112: Level 1

IV. Die Information

A. Dimensions: 144x233 mils

B. Passivation: SiN/SiO (nitride/oxide)

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 (Reliability Lab Manager
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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4389 \times 237 \times 2}$$ (Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 4.58 \times 10^{-9}$

$\lambda = 4.58$ 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. #06-5563) 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 RS88 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
MAX3172CAI

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		237	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 96hrs.	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		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

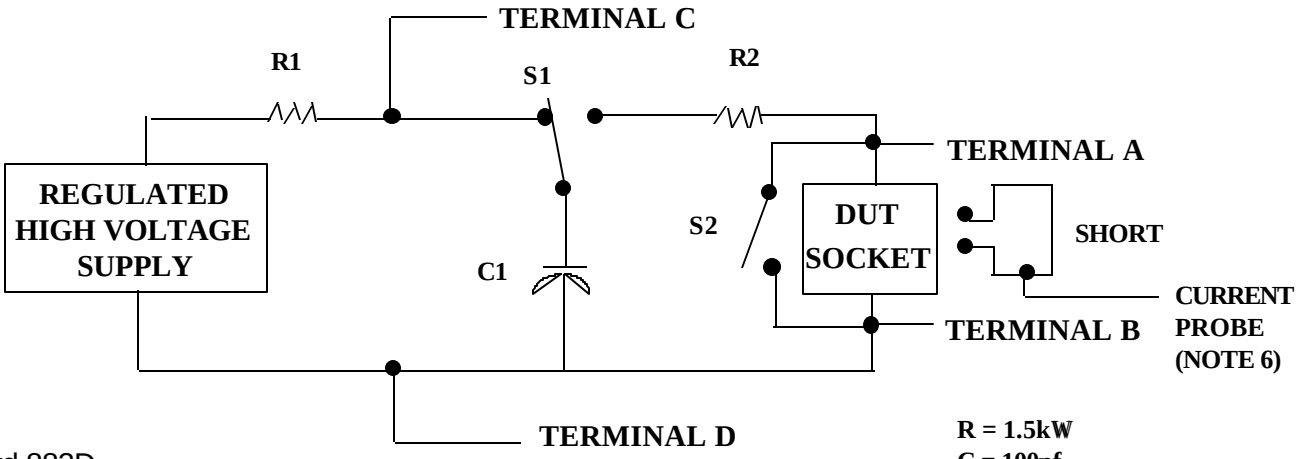
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

3.4 Pin combinations to be tested.

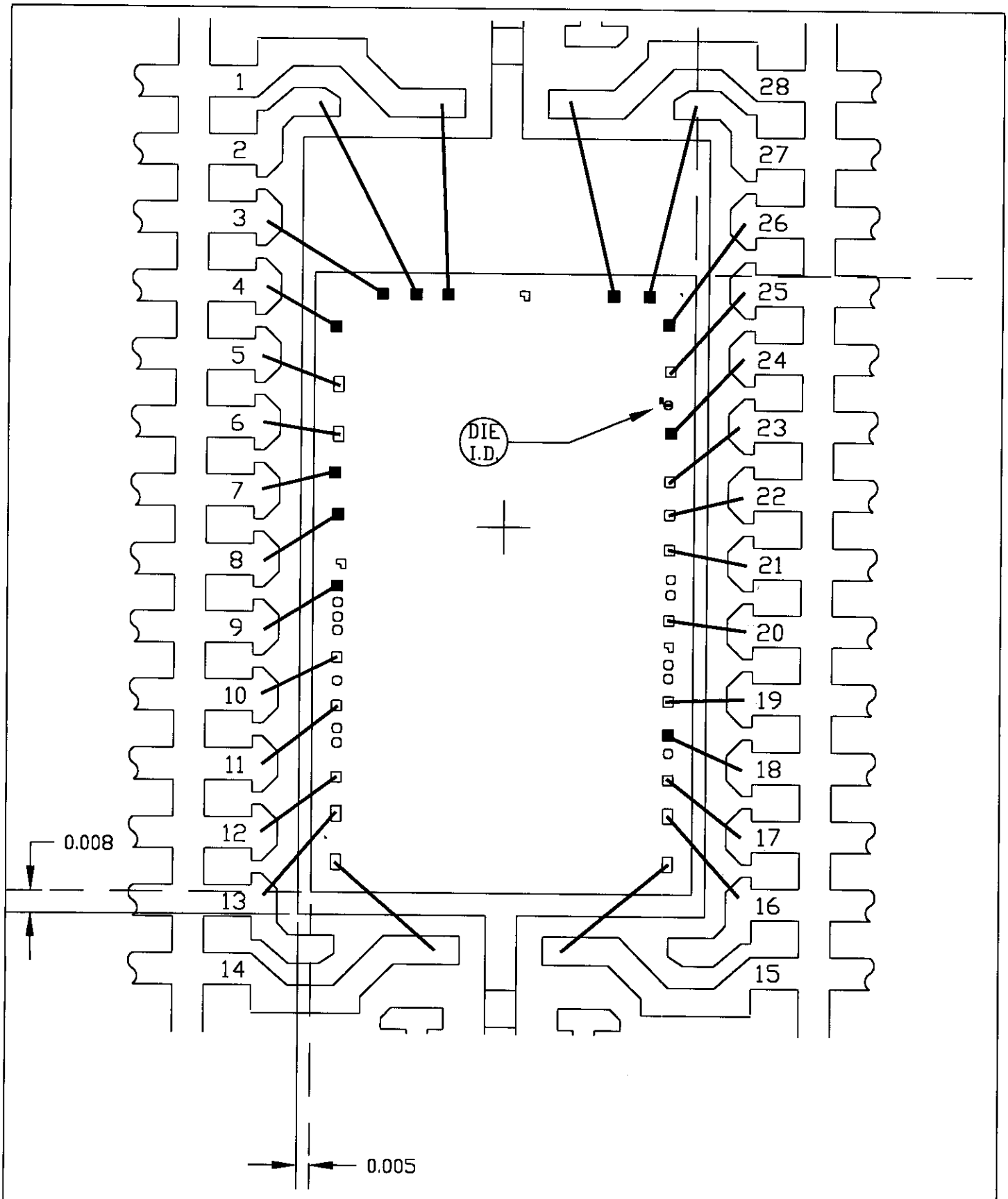
a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.

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.

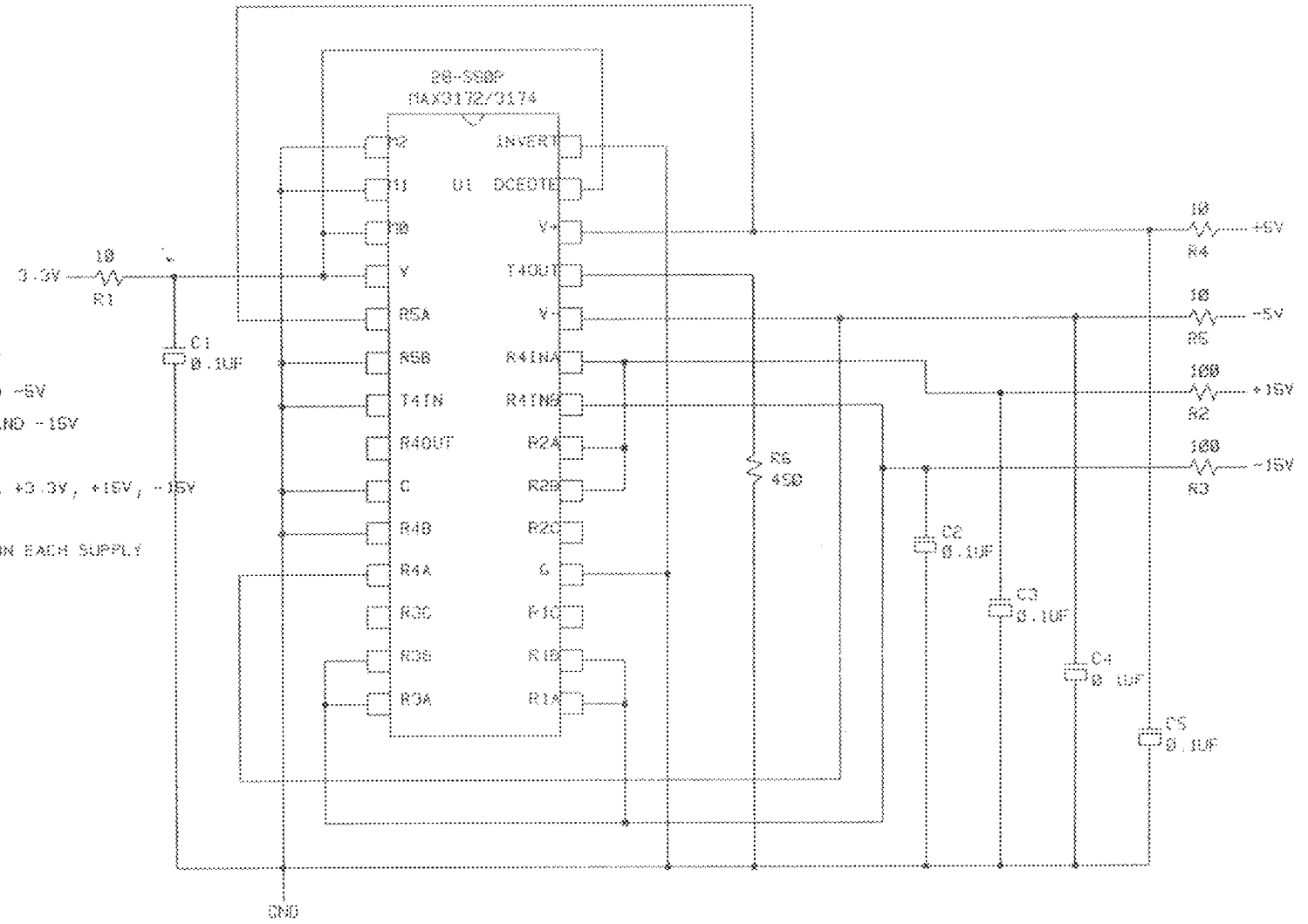


Mil Std 883D
Method 3015.7
Notice 8



PKG. CODE: A28-3		SIGNATURES	DATE	MAXIM CONFIDENTIAL & PROPRIETARY
CAV./PAD SIZE: 154X291	PKG. DESIGN			BOND DIAGRAM #: 05-1901-0236 / REV: A

MAX3172/3174 (RS88) Burn-In Schematic



NOTES

1. SCHEMATIC IS ONCE PER DEVICE
2. 60mA PER DEVICE FROM +5V AND -5V
3. < 1MA PER DEVICE FROM +15V AND -15V
4. < 2MA FROM 3.3V
5. SUPPLY SEQUENCE -> +5V, -5V, +3.3V, +15V, -15V
6. 500mW PER DEVICE
7. ONCE PER BOARD - 100uF CAP ON EACH SUPPLY

MAXIM	CREATED: 4/17/99	BY: EPC	ENG1:		ENG2:
	LAST SAVED: 17:56:26 10-22-98		SIZE B	REVISION 4/17/99	DWG NO. 06-5563
MAX3172/3174	PROJECT: MAX3172/3174				
	DESC.: BURN-IN BOARD		FILE: BURNIN.DRW		SHEET 1 OF 40