

RELIABILITY REPORT
FOR
MAX942xxA
PLASTIC ENCAPSULATED DEVICES

August 1, 2003

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by



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Conclusion

The MAX942 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 MAX942 is a dual high-speed comparator optimized for systems powered from a 3V or 5V supply. This device combines high speed, low power and rail-to-rail inputs. Propagation delay is 80ns, while supply current is only 350 μ A per comparator.

The input common-mode range of the MAX942 extends beyond both power-supply rails. The outputs pull to within 0.4V of either supply rail without external pull-up circuitry, making this device ideal for interface with both CMOS and TTL logic. All input and output pins can tolerate a continuous short-circuit fault condition to either rail.

Internal hysteresis ensures clean output switch, even with slow-moving input signals.

B. Absolute Maximum Ratings

<u>Item</u>	<u>Rating</u>
Power-Supply Ranges	
Supply Voltage V+ to GND	+7V
Differential Input Voltage	-0.3V to (V+ +0.3V)
Common-Mode Input Voltage	-0.3V to (V+ +0.3V)
Storage Temp.	-65°C to +160°C
Lead Temp. (10 sec.)	+300°C
Continuous Power Dissipation (TA = 70°C)	
8-Pin SO	471mW
8-Pin PDIP	727mW
8-Pin uMAX	330mW
Derates above +70°C	
8-Pin SO	5.88mW/°C
8-Pin PDIP	9.09mW/°C
8-Pin uMAX	4.1mW/°C

II. Manufacturing Information

A. Description/Function:	High-Speed, Low-Power, 3V/5V, Rail-to-Rail Single-Supply Comparator
B. Process:	CB30 - Complimentary Bipolar Process
C. Number of Device Transistors:	190
D. Fabrication Location:	Oregon, USA
E. Assembly Location:	Philippines, Malaysia, or Korea
F. Date of Initial Production:	February, 1994

III. Packaging Information

A. Package Type:	8 Lead SO	8 Lead PDIP	8 Lead uMax
B. Lead Frame:	Copper	Copper	Copper
C. Lead Finish:	Solder Plate	Solder Plate	Solder Plate
D. Die Attach:	Silver-filled Epoxy	Silver-filled Epoxy	Silver-filled Epoxy
E. Bondwire:	Gold (1.0 mil dia.)	Gold (1.3 mil dia.)	Gold (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler	Epoxy with silica filler	Epoxy with silica filler
G. Assembly Diagram:	# 05-1501-0238	# 05-1501-0239	# 05-1501-0275
H. Flammability Rating:	Class UL94-V0	Class UL94-V0	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112:	Level 1	Level 1	Level 1

IV. Die Information

A. Dimensions:	76 x 24 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Gold
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal 1: 1.4 microns Metal 2: 1.4 microns Metal 3: 3 microns (as drawn)
F. Minimum Metal Spacing:	Metal 1: 1.6 microns Metal 2: 1.6 microns Metal 3: 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4389 \times 80 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

└ Temperature Acceleration factor assuming an activation energy of 0.8eV

$$\lambda = 13.57 \times 10^{-9} \quad \lambda = 13.57 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 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 rejects from lots exceeding this level. The attached Burn-In Schematic (Spec. # 06-5261) 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 CM69-1 die type has been found to have all pins able to withstand a transient pulse of $\pm 2000\text{V}$, per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of $\pm 250\text{mA}$.

Table 1
Reliability Evaluation Test Results

MAX942xxA

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		80	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 96hrs.	DC Parameters & functionality	PDIP	77	0
			SO	77	0
			uMAX	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 D.I.P. qualification lots.

Note 2: Generic/Package process data

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

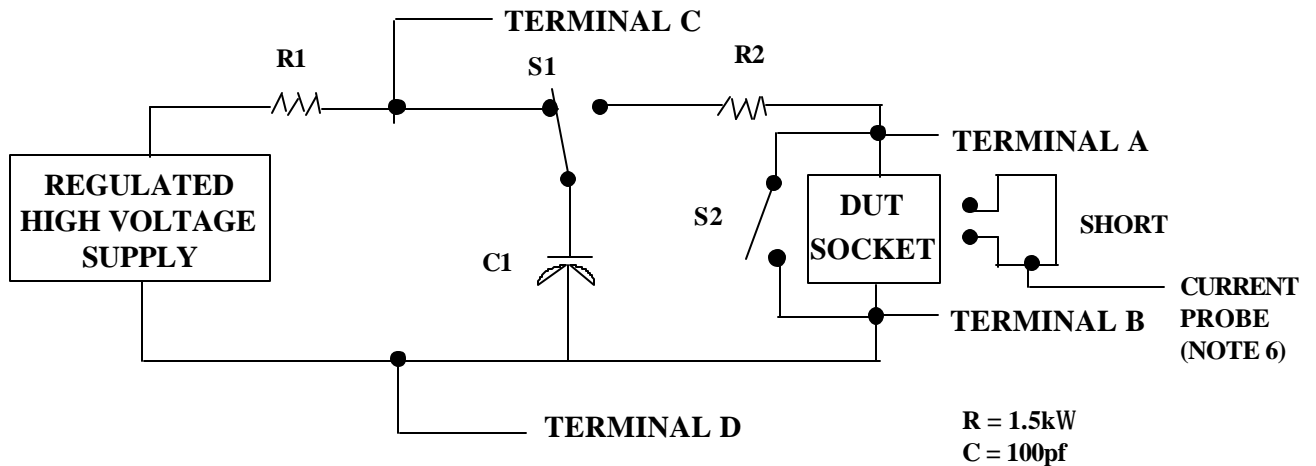
1/ Table II is restated in narrative form in 3.4 below.

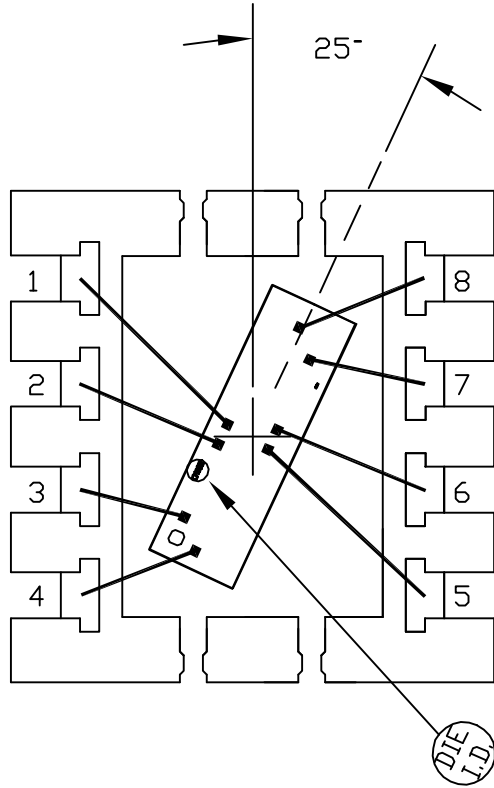
2/ No connects are not to be tested.

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).

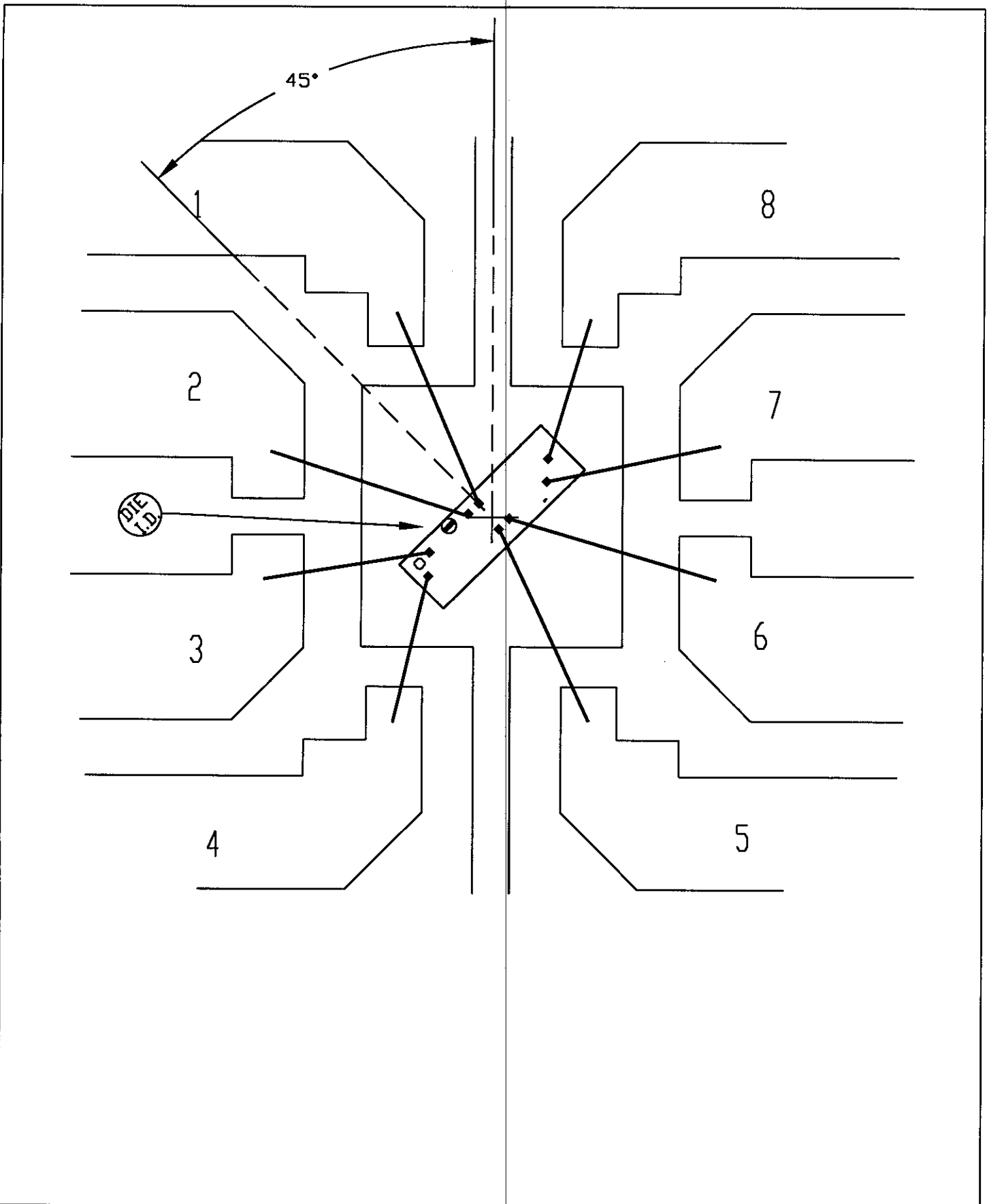
3.4 Pin combinations to be tested.

- 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: U8-1		SIGNATURES	DATE	 CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: 68x94	PKG. DESIGN			BOND DIAGRAM #: 05-1501-0275	REV: A



PKG. CODE: P8-1

CAV./PAD SIZE: 100 X 100

PKG.
DESIGN

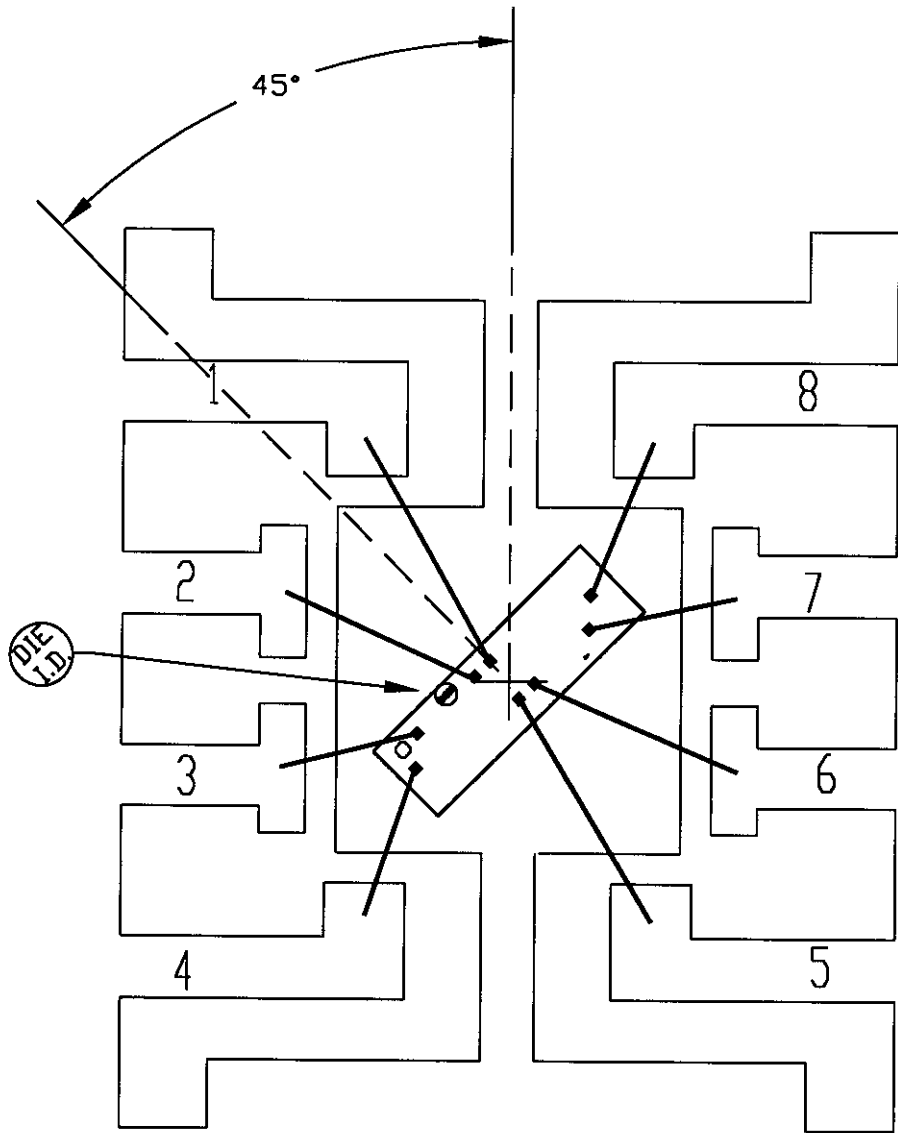
SIGNATURES

DATE

MAXIM
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BOND DIAGRAM #:
05-1501-0239

REV:
A



PKG. CODE:

S8-2

SIGNATURES

DATE

MAXIM
CONFIDENTIAL & PROPRIETARY

CAV./PAD SIZE:

90 X 90

PKG.

DESIGN

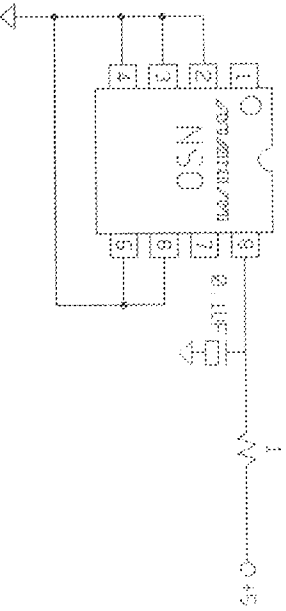
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05-1501-0238

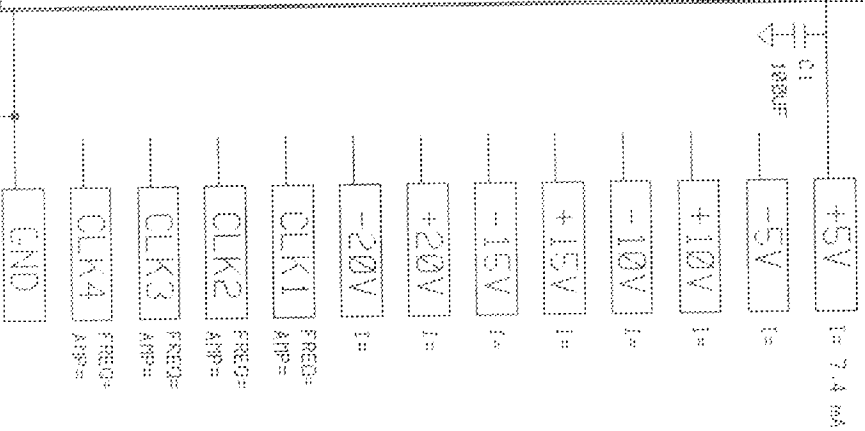
REV:

A

ONCE PER SOCKET



ONCE PER BOARD



- STEADY STATE LIFE TEST IS PER MIL-STD-883 METHOD 1005.
 - BURN-IN IS PER MIL-STD-883 METHOD 2015 - COND. 8

NOTES :

1. TEMPERATURE : 125C OR EQUIVALENT
2. TIME : 100 HOURS MIN. OR EQUIVALENT
3. ALL COMPONENTS AND MATERIAL MUST STAND 1500 CONTINUOUS
4. APPROVED FOR CXJ COMMERCIAL
 CXJ 06/95

SPEC. NO. 06-5261 REV. A

DATE : 12/28/95

DRAWN BY : R. TARRICA

MAXIMUM BURN-IN SCHEMATIC

DEVICE TYPE :

MAX474/492/942

MAX4126/4128/4132