

RELIABILITY REPORT
FOR
DG506ACxx
PLASTIC ENCAPSULATED DEVICES

February 5, 2003

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by



Jim Pedicord
Quality Assurance
Reliability Lab Manager

Reviewed by



Bryan J. Preeshl
Quality Assurance
Executive Director

Conclusion

The DG506A 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

Maxim's DG506A is a monolithic CMOS analog multiplexer. The DG506A is a single 16 channel (1 of 16) multiplexer.

This device features break-before-make switching. Maxim guarantees that this multiplexer will not latch-up if the power supplies are turned off with the input signals still present as long as absolute maximum ratings are not violated. The multiplexer operates over a wide range of power supplies from $\pm 4.5V$ to $\pm 18V$.

The DG506A consumes significantly less power than the original manufacturer's device, making it ideal for portable equipment.

B. Absolute Maximum Ratings

<u>Item</u>	<u>Rating</u>
Voltage Referenced to V-	
V+	44V
GND	25V
Digital Inputs V_S , V_D (Note 1)	-2V to ($V_+ + 2V$) or 20mA, whichever occurs first
Current, Any Terminal Except S or D	30mA
Continuous Current, S or D	20mA
Peak Current, S or D (Pulse at 1msec, 10% duty cycle max)	40mA
Storage Temp.	-65°C to +150°C
Lead Temp. (10 sec.)	+300°C
Power Dissipation	1000mW
Derates above +70°C	12.5mW/°C
Continuous Power Dissipation ($T_A = +70^\circ\text{C}$)	
28-Pin PDIP	625mW
28-Pin WSO	1000mW
Derates above +70°C	
28-Pin PDIP	8.3mW/°C
28-Pin WSO	12.5mW/°C

Note 1: Signals on S_X , D_X , or IN_X exceeding V_+ or V_- will be clamped by internal diodes. Limit forward diode current to maximum current ratings.

II. Manufacturing Information

A. Description/Function:	Monolithic CMOS Analog Multiplexer
B. Process:	M6 (SMG) - 6 micron metal gate CMOS
C. Number of Device Transistors:	300
D. Fabrication Location:	Oregon, USA
E. Assembly Location:	Philippines or Malaysia
F. Date of Initial Production:	March, 1991

III. Packaging Information

A. Package Type:	28-Lead WSO	28-Lead PDIP
B. Lead Frame:	Copper	Copper
C. Lead Finish:	Solder Plate	Solder Plate
D. Die Attach:	Silver-filled Epoxy	Silver-filled Epoxy
E. Bondwire:	Gold (1.3 mil dia.)	Gold (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler	Epoxy with silica filler
G. Assembly Diagram:	#05-0301-0324	#05-0301-0320
H. Flammability Rating:	Class UL94-V0	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112:	Level 1	Level 1

IV. Die Information

A. Dimensions:	114 x 160 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/Si (Si = 1%)
D. Backside Metallization:	None
E. Minimum Metal Width:	6 microns (as drawn)
F. Minimum Metal Spacing:	6 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, Rel 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4389 \times 720 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

└ Temperature Acceleration factor assuming an activation energy of 0.8eV

$$\lambda = 1.51 \times 10^{-9} \quad \lambda = 1.51 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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. # 06-3476) 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 AG30 die type has been found to have all pins able to withstand a transient pulse of $\pm 400\text{V}$, 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

DG506ACxx

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		720	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	PDIP WSO	77 77	0 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.

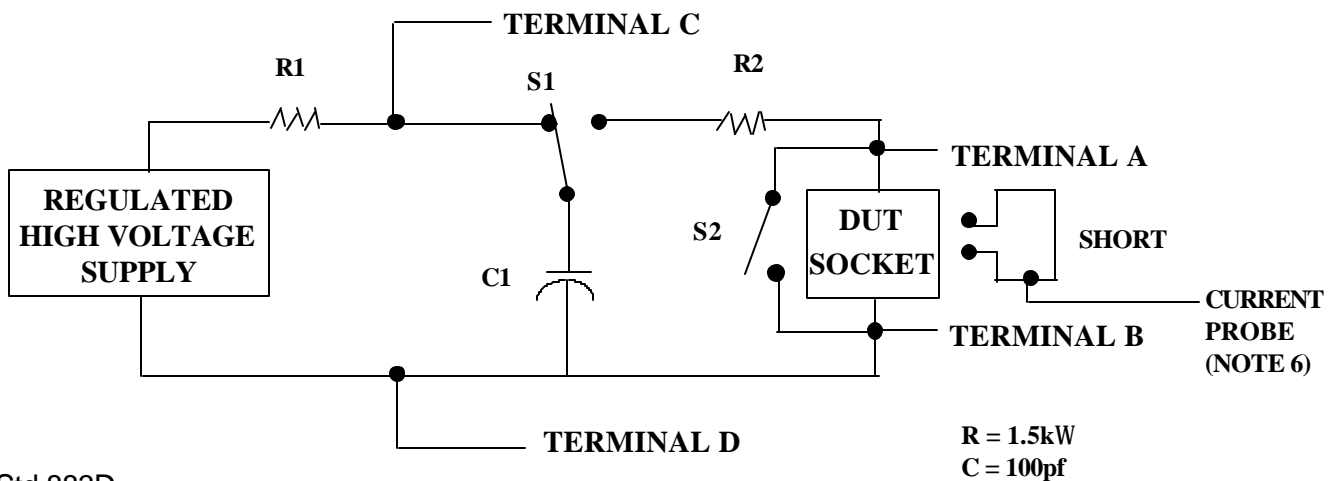
2/ No connects are not to be tested.

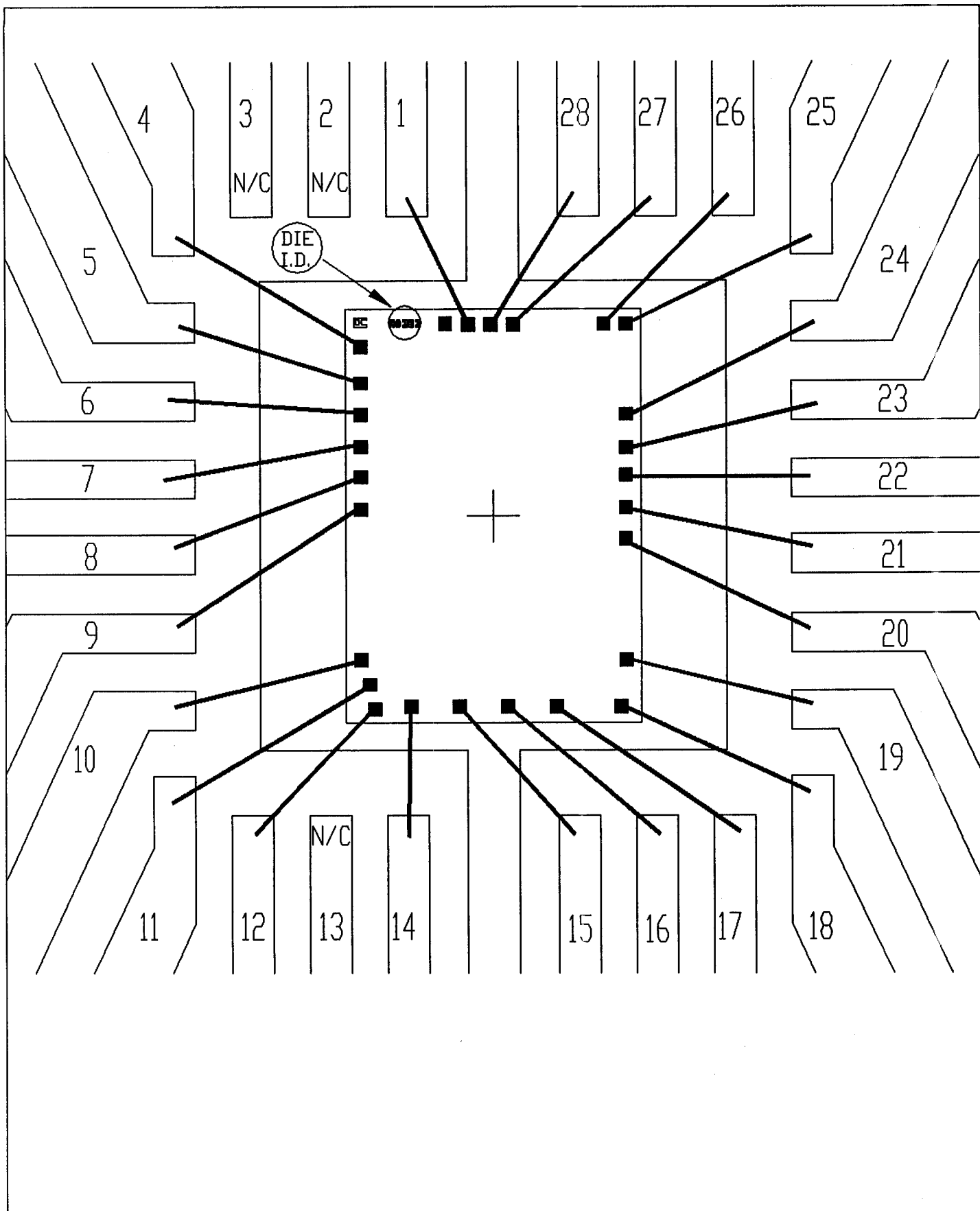
3/ Repeat pin combination 1 for each named Power supply and for ground

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

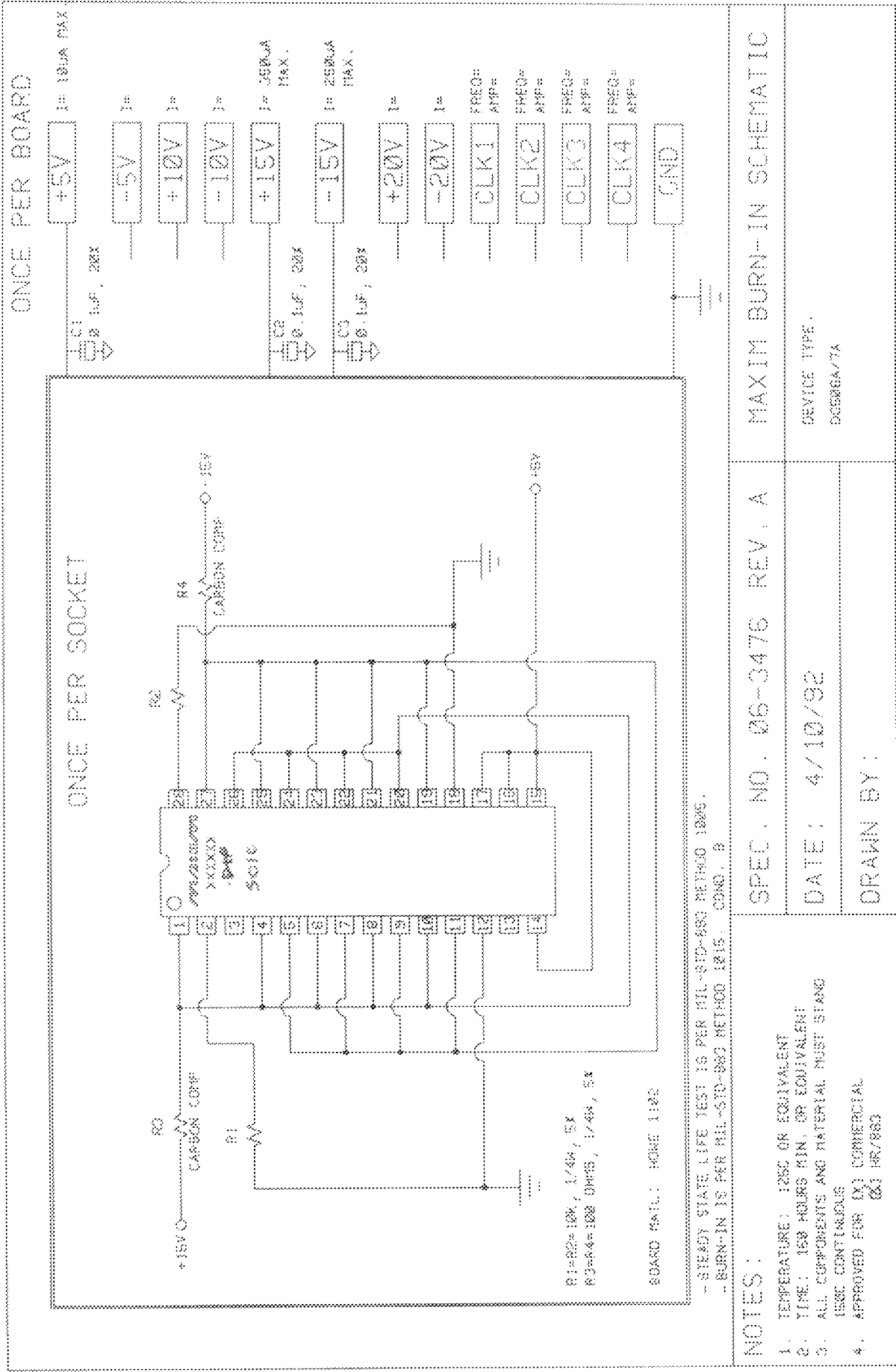
3.4 Pin combinations to be tested.

- 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: P28-2		APPROVALS	DATE	MAXIM
CAV./PAD SIZE: 180 X 180	PKG. DESIGN			BUILDSHEET NUMBER: 05-0301-0320
				REV: A



ONCE PER BOARD

ONCE PER SOCKET

SPEC. NO. 06-3476 REV. A MAXIM BURN-IN SCHEMATIC

DATE: 4/10/92

DRAWN BY:

DEVICE TYPE:
50586A/7A

NOTES:

1. TEMPERATURE: 125C OR EQUIVALENT
2. TIME: 150 HOURS MIN. OR EQUIVALENT
3. ALL COMPONENTS AND MATERIAL MUST STAND 155C CONTINUOUS
4. APPROVED FOR COMMERCIAL HR/863

- STEADY STATE LIFE TEST IS PER MIL-STD-883 METHOD 1005.
- BURN-IN IS PER MIL-STD-883 METHOD 1015. COND. B

R1=22k 1/4W, 5K
R2=44k 100 OHMS, 1/4W, 5K
R3=44k 100 OHMS, 1/4W, 5K

BOARD PART: HOME 1182