RELIABILITY REPORT

FOR

MAX4621xxE

PLASTIC ENCAPSULATED DEVICES

January 30, 2003

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by

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Conclusion

The MAX4621 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 MAX4621 is a precision, dual, high-speed analog switch. The single-pole/single-throw (SPST) MAX4621 switches are normally open (NO). The part offers low 5 ohms on-resistance guaranteed to match to within 0.5 ohm between channels and to remain flat over the full analog signal range (Δ0.5 ohm max). It also offer low leakage (<500pA at +25°C, <5nA at +85°C) and fast switching times (turn-on time <250ns, turn-off time <200ns).

This analog switch is ideal in low-distortion applications and is the preferred solution over mechanical relays in automatic test equipment or applications where current switching is required. It has low power requirements, uses less board space, and is more reliable than mechanical relays.

The MAX4621 is a pin-compatible replacement for the DG401, offering improved overall performance. This monolithic switch operatse from a single positive supply (+4.5V to +36V) or with bipolar supplies (±4.5V to ±18V) while retaining CMOS-logic input compatibility.

B. Absolute Maximum Ratings

Item	Rating
(Voltages Referenced to GND)	
V+ to GND	-0.3V to +44V
V- to GND	+0.3V to -44V
V+ to V-	-0.3V to +44V
VL to GND	-0.3V to (V+ + 0.3V)
All Other Pins to GND (Note 1)	(V- - 0.3V) to (V+ + 0.3V)
Continuous Current (COM_, NO_, NC_)	±100mA
Peak Current (COM_, NO_, NC_) (pulsed at 1ms, 10% duty cycle)	±300mA
Operating Temperature Ranges	
MAX4621C_ _	0°C to +70°C
MAX4621E_ _	-40°C to +85°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10sec)	+300°C
Continuous Power Dissipation (TA = +70°C)	
16-Pin NSO	696mW
16-Pin PDIP	842mW
Derates above +70°C	
16-Pin NSO	8.70mW/°C
16-Pin PDIP	10.53mW/°C

Note 1: Signals on NC_, NO_, COM_, or IN_ exceeding V+ or V- will be clamped by internal diodes. Limit forward diode current to maximum

II. Manufacturing Information

A. Description/Function:	Dual, 5 Ohm Analog Switches
B. Process:	S5HV - Medium voltage 5 micron silicon gate CMOS
C. Number of Device Transistors:	82
D. Fabrication Location:	Oregon, USA
E. Assembly Location:	Philippines or Malaysia
F. Date of Initial Production:	July, 1999

III. Packaging Information

A. Package Type:	**16-Lead NSO**	**16-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:	# 05-1201-0086	# 05-1201-0085
H. Flammability Rating:	Class UL94-V0	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD-020-A:	Level 1	Level 1

IV. Die Information

A. Dimensions:	86 x 188 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:	5 microns (as drawn)
F. Minimum Metal Spacing:	5 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4389 \times 80 \times 2}$$

(Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 13.57 \times 10^{-9}$ $\lambda = 13.57$ 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. # 06-1727) 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 AH22 die type has been found to have all pins able to withstand a transient pulse of ±2000V, 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

MAX4621xxE

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 = 168hrs.	DC Parameters & functionality	PDIP NSO	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 I for each named Power supply and for ground

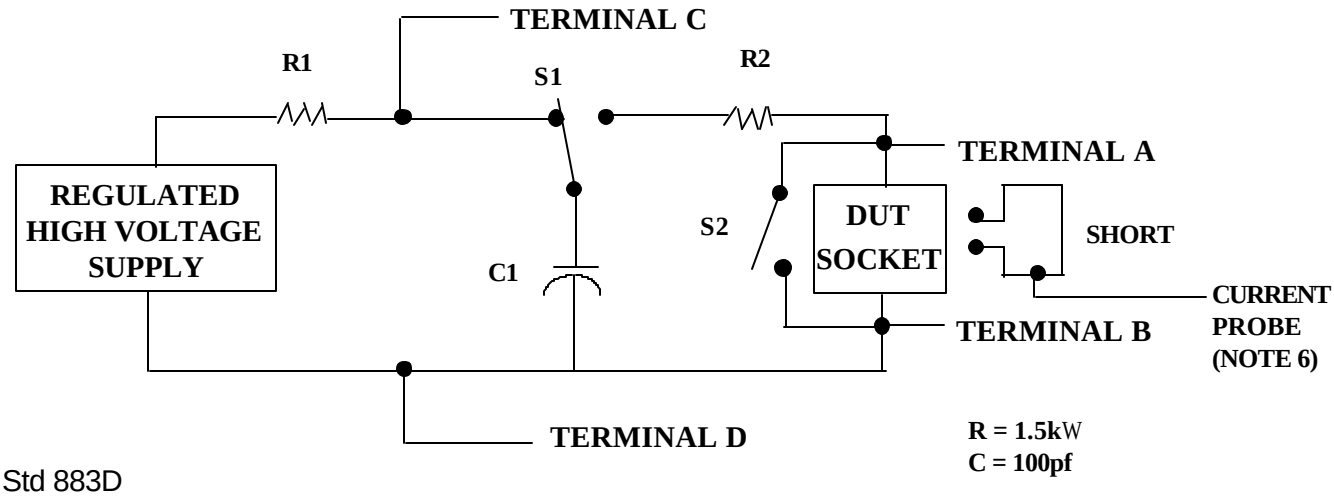
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

3.4 Pin combinations to be tested.

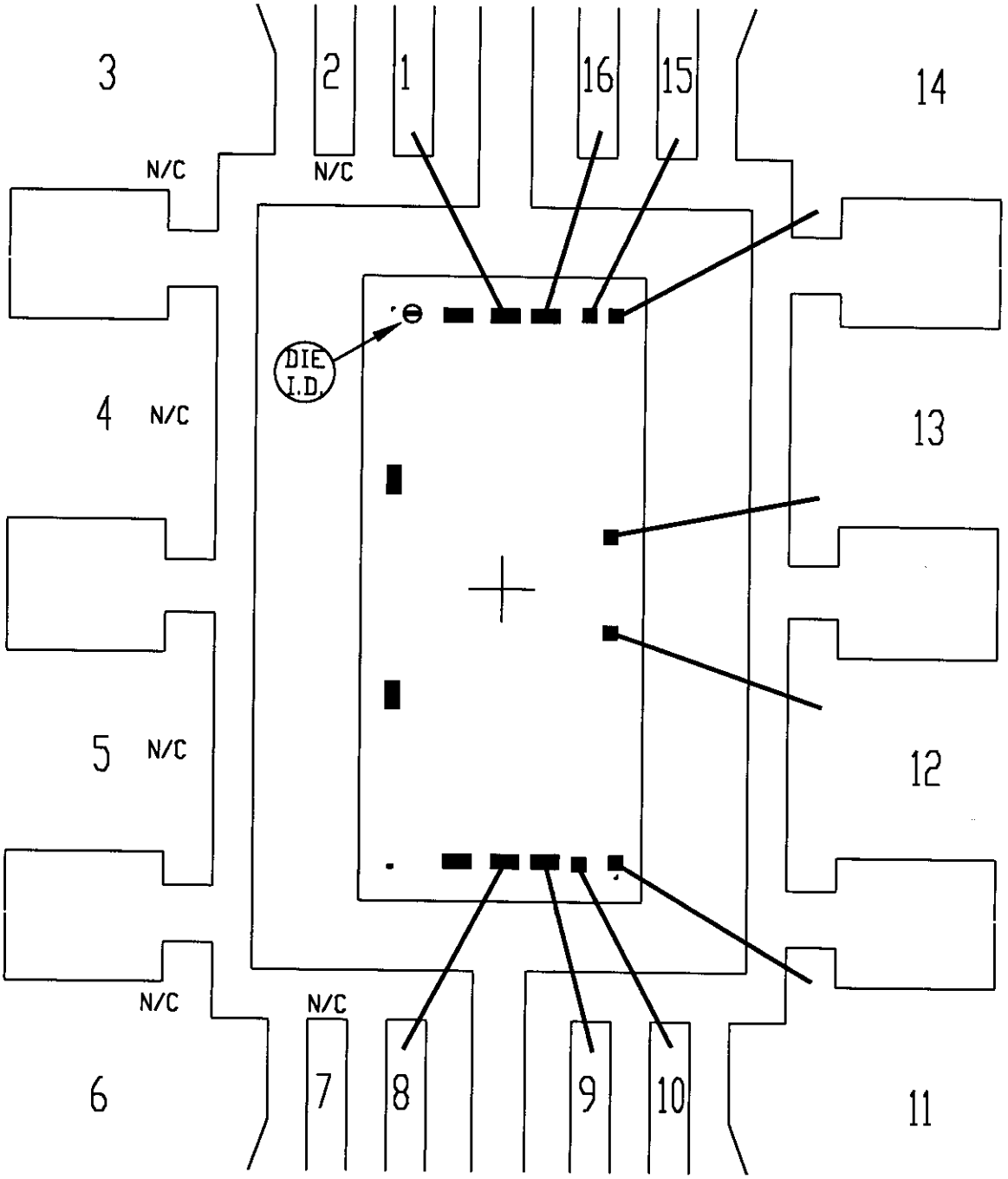
a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.

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.

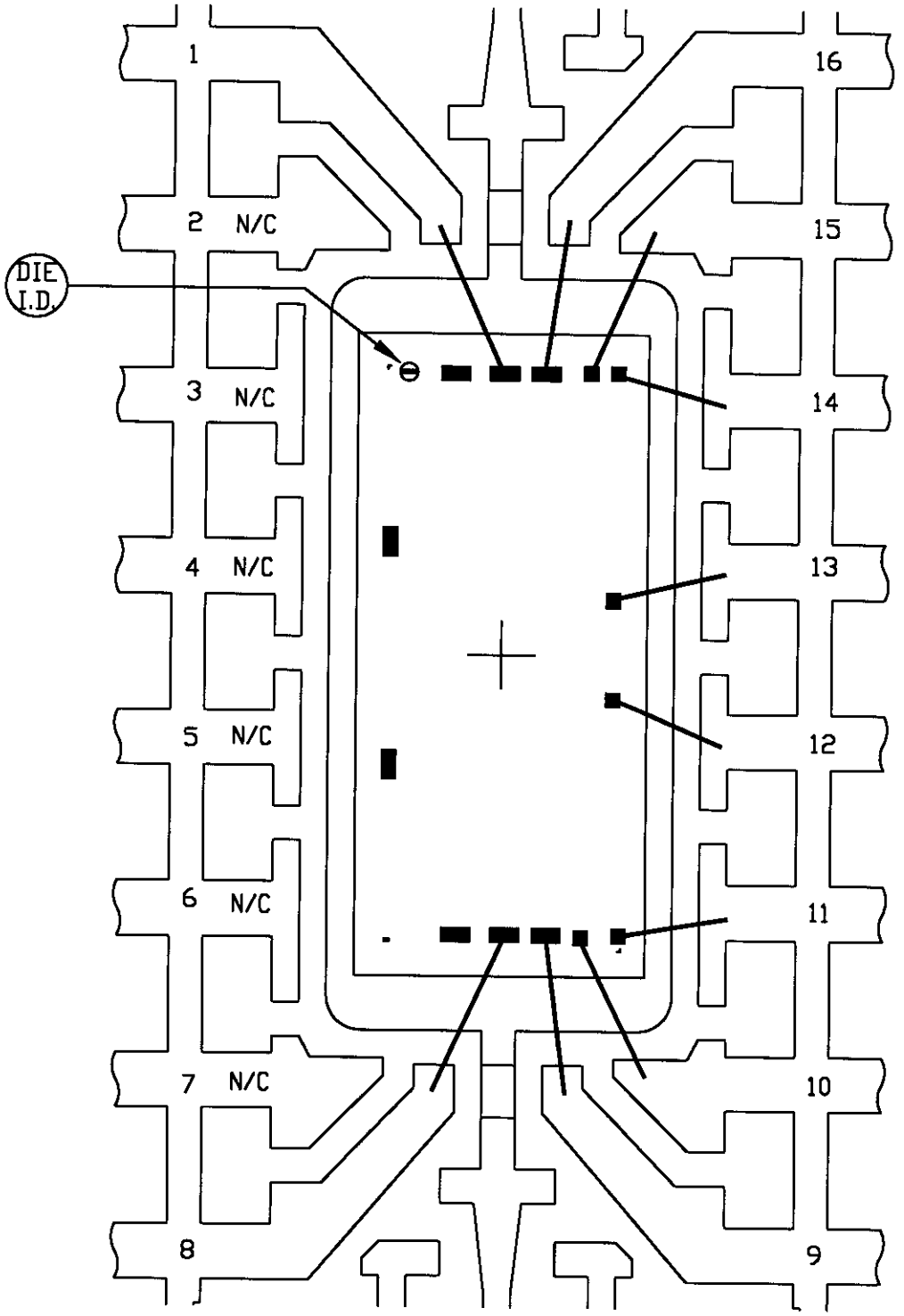
c. Each input and each output individually connected to terminal A with respect to a combination of all the other input and output pins connected to terminal B. All pins except the input or output pin being tested and the combination of all the other input and output pins shall be open.



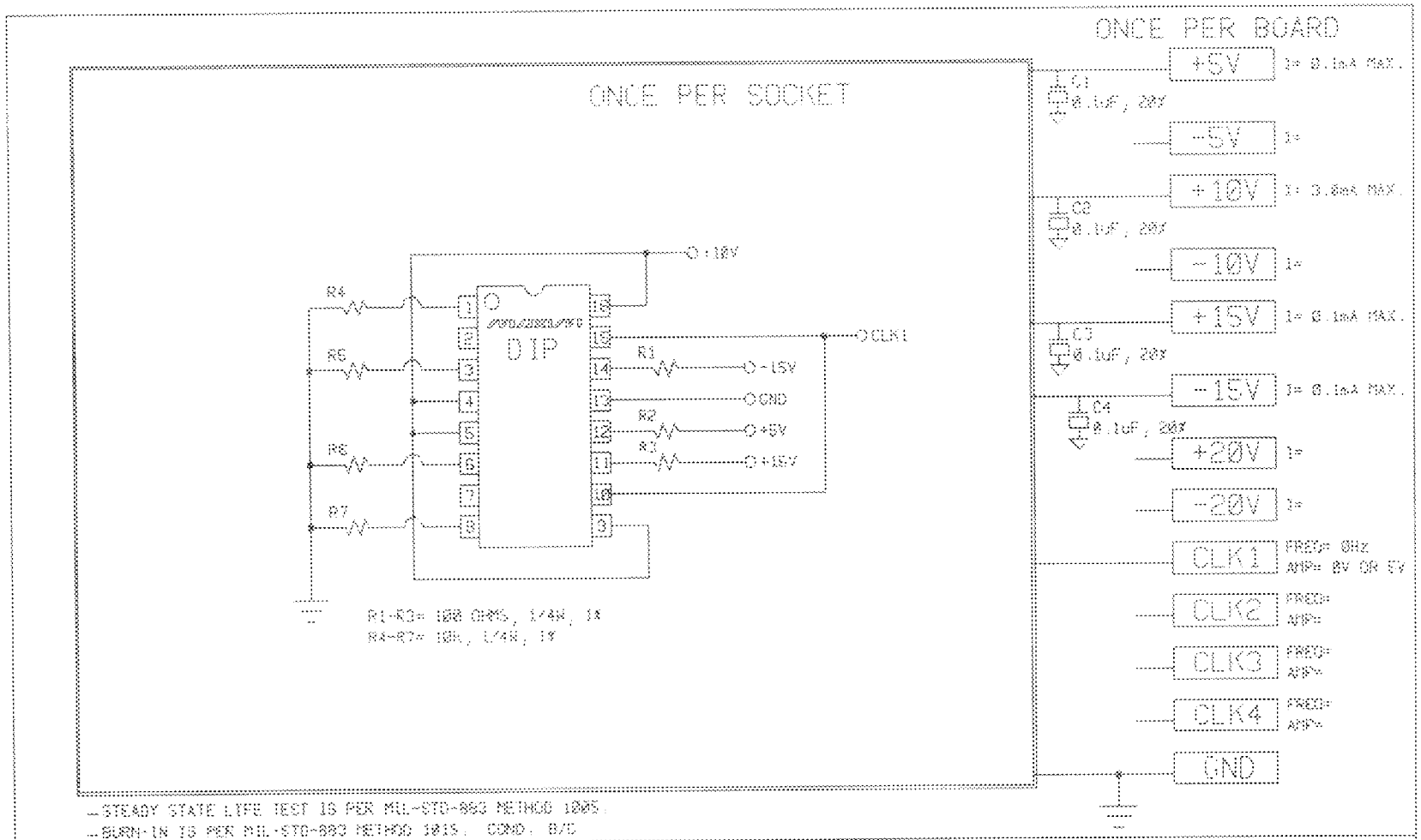
Mil Std 883D
Method 3015.7
Notice 8



PKG.CODE: P16-4		APPROVALS	DATE	MAXIM
CAV./PAD SIZE: 150 X 230	PKG. DESIGN			BUILDSHEET NUMBER: 05-1201-0085 / REV.: A



PKG.CODE: S16-8		APPROVALS	DATE	MAXIM
CAV./PAD SIZE: 102X220	PKG. DESIGN			BUILDSHEET NUMBER: 05-1201-0086 / REV.: A



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

NOTES:

1. TEMPERATURE: 125C OR EQUIVALENT
2. TIME: 168 HOURS MIN. OR EQUIVALENT
3. ALL COMPONENTS AND MATERIAL MUST STAND 150C CONTINUOUS
4. APPROVED FOR EXT COMMERCIAL EXT MR/BSD

SPEC. NO. 06-1727 REV. E

DATE: 4/26/95

DRAWN BY: C. JONES

MAXIM BURN-IN SCHEMATIC

DEVICE TYPE: DC384/88, LH5040/1/2/3/4/5/7/8/9
LH5350/1, LH5140/1/2/3/4/5/7/8
MAX381/383/385
DG401/403/406