RELIABILITY REPORT

FOR

MAX1270xxxx

PLASTIC ENCAPSULATED DEVICES

May 29, 2002

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by

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Conclusion

The MAX1270 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 MAX1270 is a multirange, 12-bit data-acquisition systems (DAS) that require only a single +5V supply for operation, yet accept signals at it's analog inputs that may span above the power-supply rail and below ground. This system provides eight analog input channels that are independently software programmable for a variety of ranges: ±10V, ±5V, 0 to +10V, 0 to +5V for the MAX1270; $\pm V_{REF}$, $\pm V_{REF}/2$, 0 to V_{REF}, 0 to $V_{REF}/2$ for the MAX1271. This range switching increases the effective dynamic range to 14 bits and provides the flexibility to interface 4-20mA, ±12V, and ±15V powered sensors directly to a single +5V system. In addition, this converter is fault protected to ±16.5V; a fault condition on any channel will **not** affect the conversion result of the selected channel. Other features include a 5MHz bandwidth track/hold, software-selectable internal/external clock, 110ksps throughput rate, and internal 4.096V or external reference operation.

The MAX1270 serial interface directly connects to SPI™/QSPI™ and MICROWIRE™ devices without external logic.

A hardware shutdown input (SHDN-bar) and two software-programmable power-down modes, standby (STBYPD) or full power-down (FULLPD), are provided for low-current shutdown between conversions. In standby mode, the reference buffer remains active, eliminating start-up delays.

The MAX1270 is available in 24-pin narrow DIP or space-saving 28-pin SSOP packages.

B. Absolute Maximum Ratings

Item	Rating
VDD to AGND	-0.3V to +6V
AGND to DGND	-0.3V to +0.3V
CH0–CH7 to AGND	±16.5V
REF, REFADJ to AGND	-0.3V to (VDD + 0.3V)
SSTRB, DOUT to DGND	-0.3V to (VDD + 0.3V)
SHDN, CS, DIN, SCLK to DGND	-0.3V to +6V
Max Current into Any Pin	50mA
Operating Temperature Ranges	
MAX1270C_ _	0°C to +70°C
MAX1270E_ _	-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)	
24-Pin DIP	1067mW
28-Pin SSOP	762Mw
Derates above +70°C	
24-Pin DIP	13.33mW/°C
28-Pin SSOP	9.52mW/°C

II. Manufacturing Information

A. Description/Function:	Multirange, +5V, 8-Channel, Serial 12-Bit ADCs
B. Process:	S3 (Standard 3 micron silicon gate CMOS)
C. Number of Device Transistors:	4219
D. Fabrication Location:	Oregon, USA
E. Assembly Location:	Philippines or Malaysia
F. Date of Initial Production:	September, 1998

III. Packaging Information

A. Package Type:	**24-Pin DIP**	**28-Pin SSOP**
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:	# 05-0101-0463	# 05-0101-0461
H. Flammability Rating:	Class UL94-V0	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC sandard JESD22-112:	Level 1	Level 1

IV. Die Information

A. Dimensions:	144 x 252 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 (Reliability Lab Manager)
Bryan Preeshl (Executive Director**)**
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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4389 \times 210 \times 2}$$

(Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 5.17 \times 10^{-9}$

$\lambda = 5.17$ 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. # 06-5226) 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 AD74 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

MAX1270xxxx

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		210	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	DIP SSOP	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		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

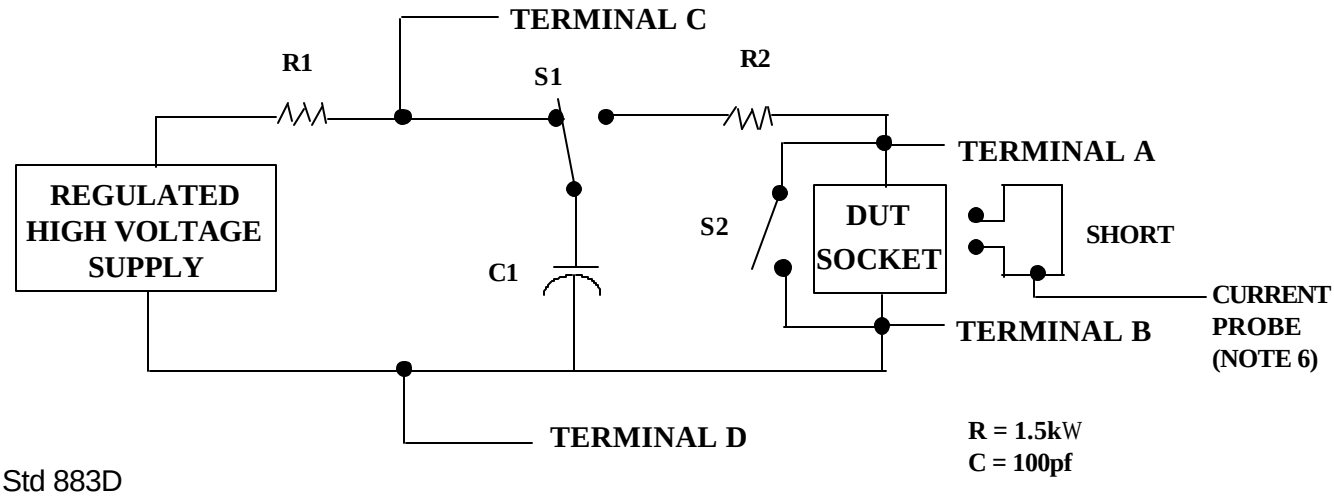
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

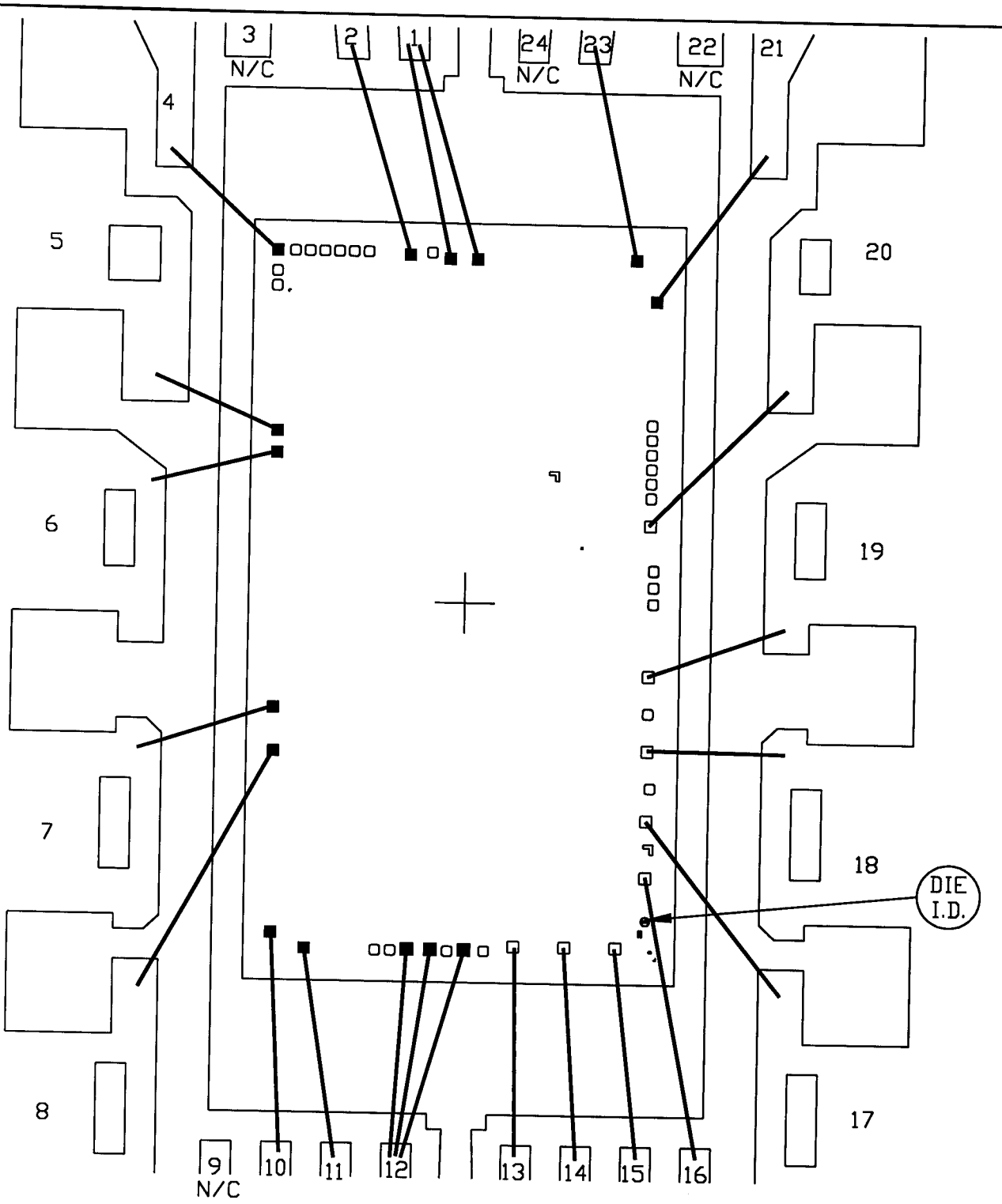
3.4 Pin combinations to be tested.

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.

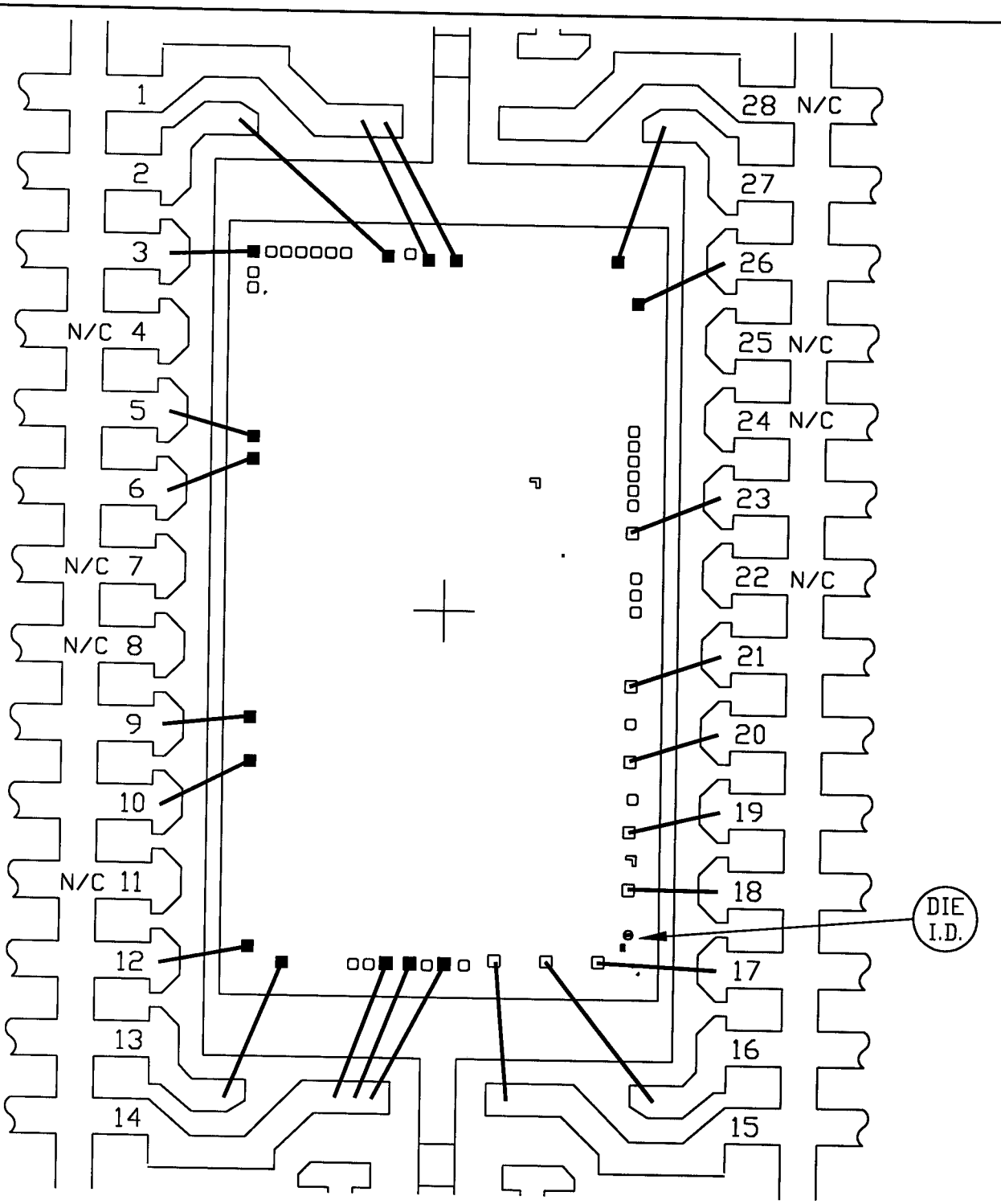
b. Each pin individually connected to terminal A with respect to each different set of a combination of all named power supply pins (e.g., V_{SS1}, or V_{SS2} or V_{SS3} or V_{CC1}, or V_{CC2}) connected to terminal B. All pins except the one being tested and the power supply pin or set of pins shall 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.

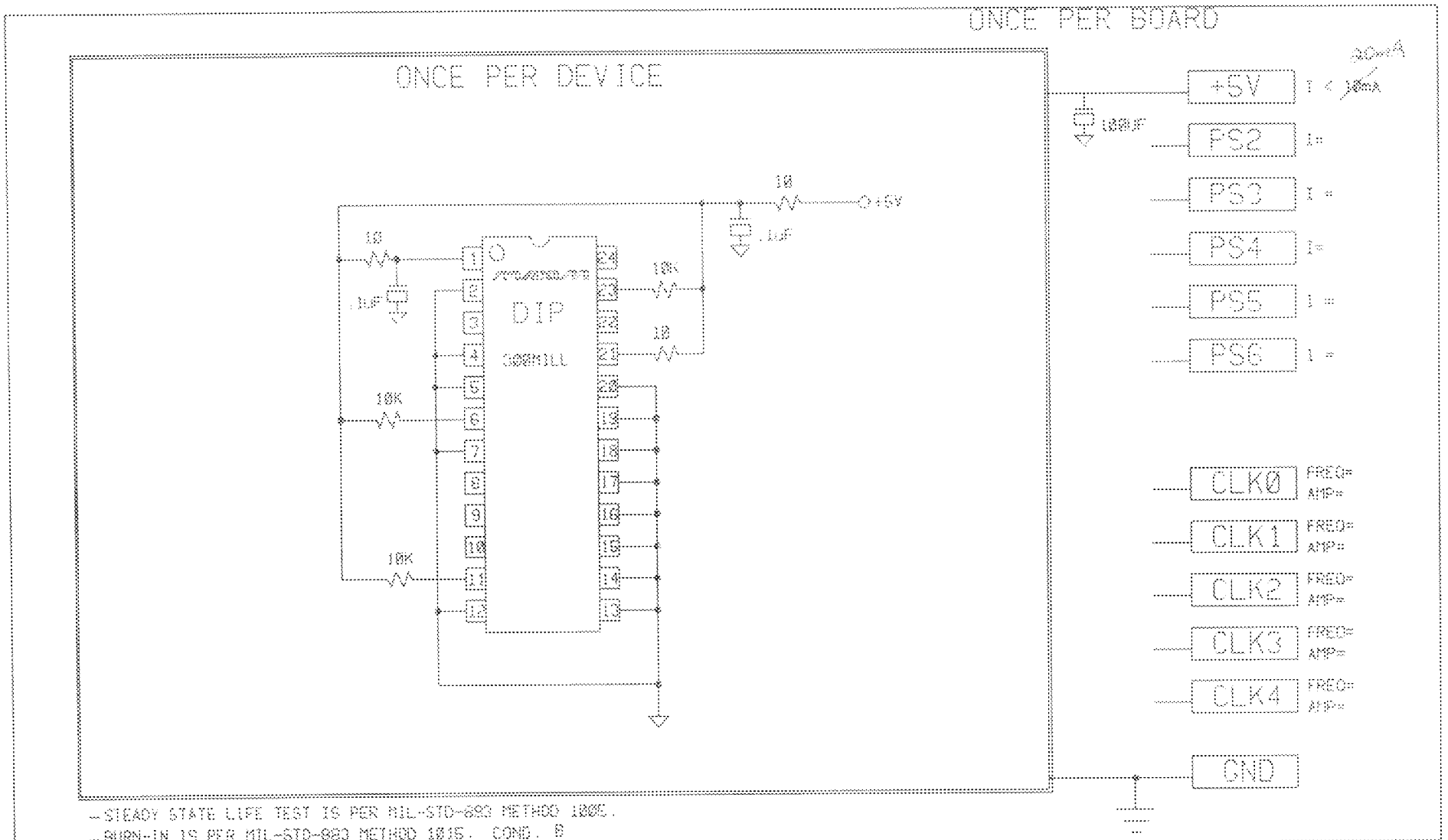




PKG.CODE: N24-8		APPROVALS	DATE	MAXIM
CAV./PAD SIZE: 165 X 340	PKG. DESIGN			BUILDSHEET NUMBER: 05-0101-0463 / REV.: A



PKG.CODE: A28-3		APPROVALS	DATE	MAXIM
CAV./PAD SIZE: 154X291	PKG. DESIGN			BUILDSHEET NUMBER: 05-0101-0461 REV.: A



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

NOTES:

1. TEMPERATURE: 125C OR EQUIVALENT
2. TIME: 160 HOURS MIN. OR EQUIVALENT
3. ALL COMPONENTS AND MATERIAL MUST STAND 150C CONTINUOUS
4. APPROVED FOR [X] COMMERCIAL
   [X] MR/883

SPEC. NO. 06-5226 REV: A

DATE: 8/5/96

DRAWN BY:

MAXIM BURN-IN SCHEMATIC

DEVICE TYPE(S):

MAX127/128