RELIABILITY REPORT

FOR

MAX3241xxI

PLASTIC ENCAPSULATED DEVICES

May 16, 2002

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by

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Conclusion

The MAX3241 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 MAX3241 transceiver has a proprietary low-dropout transmitter output stage enabling true RS-232 performance from a 3.0V to 5.5V supply with a dual charge pump. This device requires only four small 0.1µF external charge-pump capacitors. The MAX3241 is guaranteed to run at data rates of 120kbps while maintaining RS-232 output levels. The MAX3241 is a complete serial port (3 drivers/5 receivers) designed for notebook and subnotebook computers. This device features a shutdown mode in which all receivers can remain active while using only 1µA supply current. Receivers R1 for the MAX3241have extra outputs in addition to their standard outputs. These extra outputs are always active, allowing external devices such as a modem to be monitored without forward biasing the protection diodes in circuitry that may have VCC completely removed. The MAX3241 is available in space-saving TSSOP and SSOP packages.

B. Absolute Maximum Ratings

Item	Rating
V_{CC}	-0.3V to +6V
V+ (Note 1)	-0.3V to +7V
V- (Note 1)	+0.3V to -7V
V+ + V- (Note 1)	+13V
Input Voltages	
T_IN, /SHDN, /EN	-0.3V to +6V
MBAUD	-0.3V to (V_{CC} + 0.3V)
R_IN	±25V
Output Voltages	
T_OUT	±13.2V
R_OUT	-0.3V to (V_{CC} + 0.3V)
Short-Circuit Duration	
T_OUT	Continuous
Continuous Power Dissipation (TA = +70°C)	
28-Pin SO	1W
28-Pin SSOP	762Mw
28-Pin TSSOP	696mW
Derates above +70°C	
28-Pin SO	12.50mW/°C
28-Pin SSOP	9.52mW/°C
28-Pin TSSOP	8.7mW/°C
Operating Temperature Ranges	
MAX3241C_ _	0°C to +70°C
MAX3241E_ _	40°C to +85°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10sec)	+300°C

Note 1: V+ and V- can have a maximum magnitude of 7V, but their absolute difference cannot exceed 13V.

II. Manufacturing Information

A. Description/Function: 3.0V to 5.5V, Low-Power, up to 1Mbps, True RS-232 Transceiver using Four 0.1µF External Capacitor.

B. Process:	SG3 (Standard 3 micron silicon gate CMOS)
C. Number of Device Transistors:	894
D. Fabrication Location:	California or Oregon, USA
E. Assembly Location:	Philippines, Malaysia or Korea
F. Date of Initial Production:	July, 1994

III. Packaging Information

A. Package Type:	**28-Pin SO**	**28-Pin SSOP**	**20-Pin TSSOP**
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 (1.3 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:	# 05-1901-0052	# 05-1901-0053	# 05-1901-0228
H. Flammability Rating:	Class UL94-V0	Class UL94-V0	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC sandard JESD22-112:	Level 1	Level 1	Level 1

IV. Die Information

A. Dimensions:	91 x 151 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4389 \times 745 \times 2}$$ (Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 1.46 \times 10^{-9}$

$\lambda = 1.46$ 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. # 06-5062) 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 RS16 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 and/or ±20V.

Table 1
Reliability Evaluation Test Results

MAX3241xxI

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		745	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	SO SSOP TSSOP	77 77 77	0 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

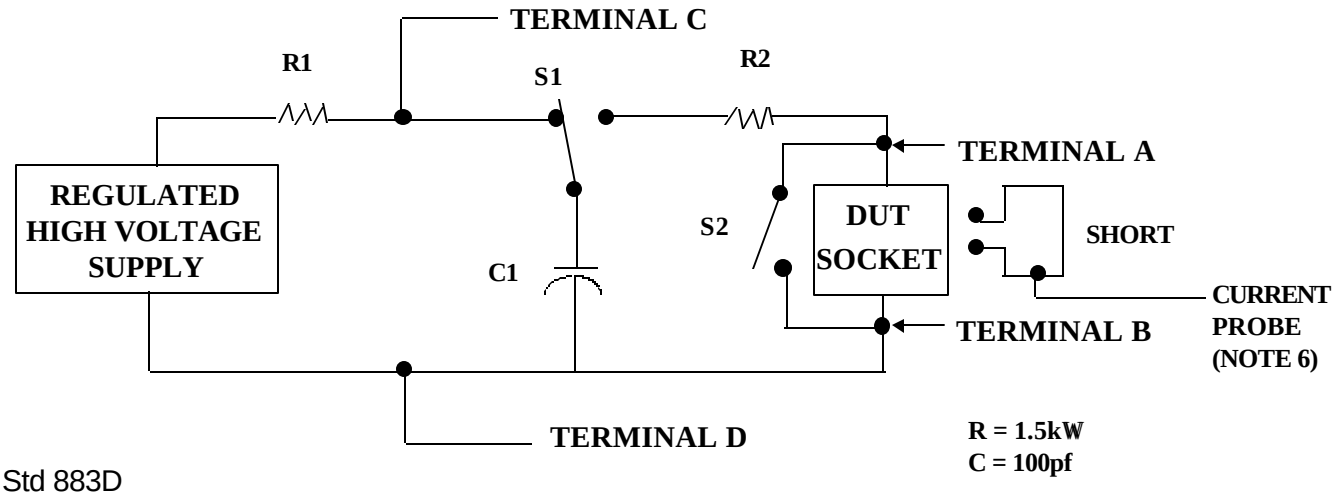
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

3.4 Pin combinations to be tested.

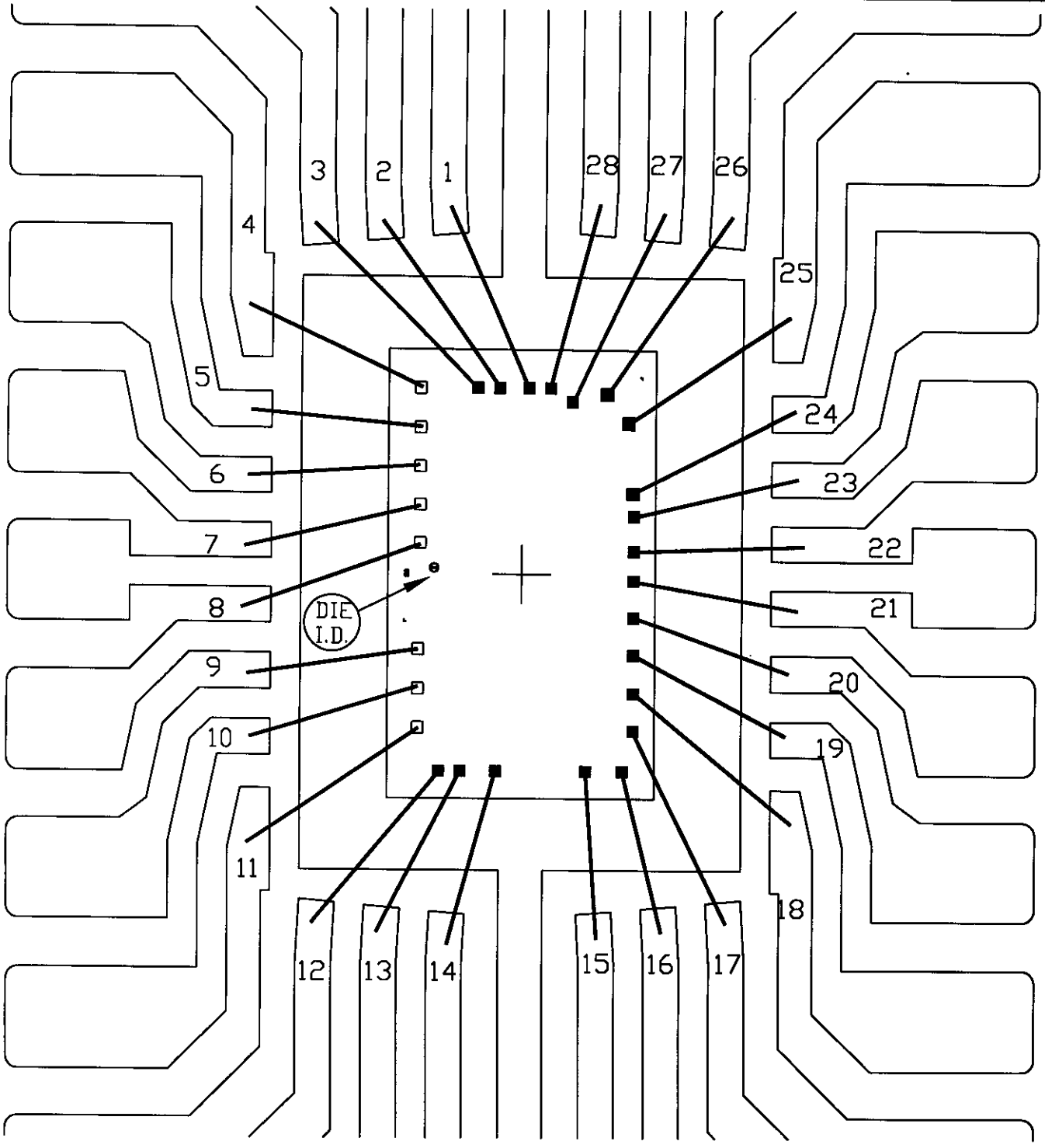
a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.

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.

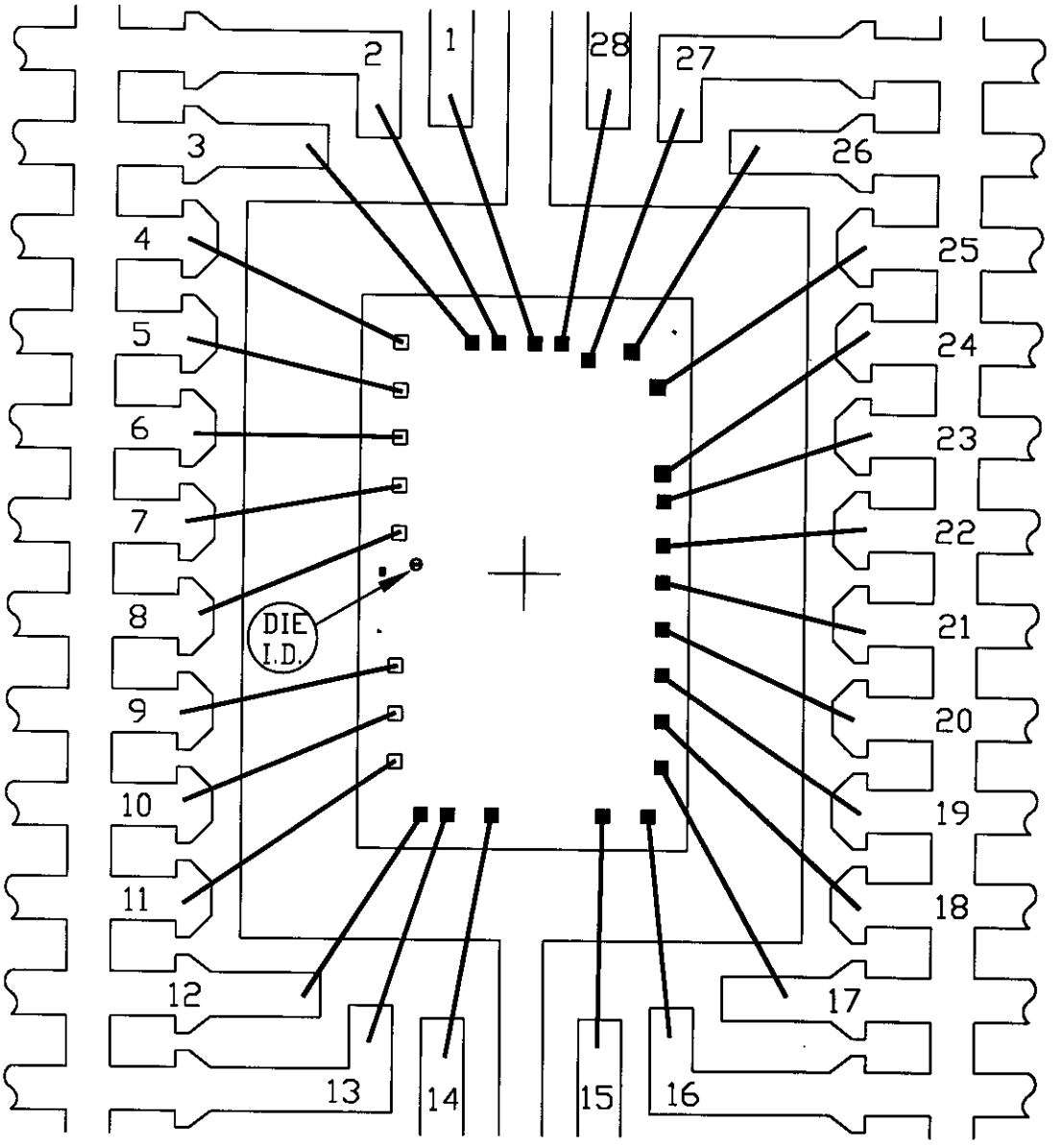
c. Each input and each output individually connected to terminal A with respect to a combination of all the other input and output pins connected to terminal B. All pins except the input or output pin being tested and the combination of all the other input and output pins shall be open.



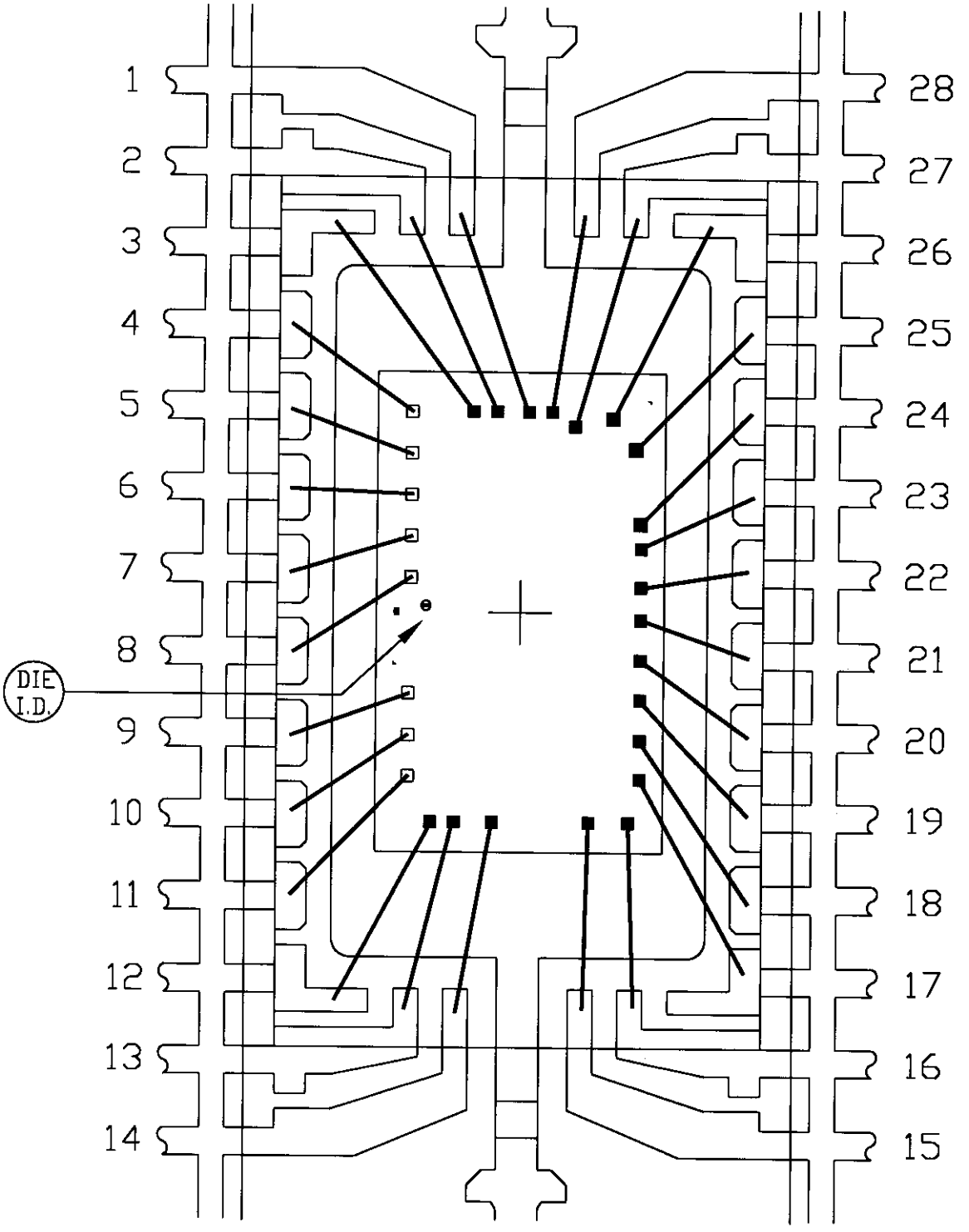
Mil Std 883D
Method 3015.7
Notice 8



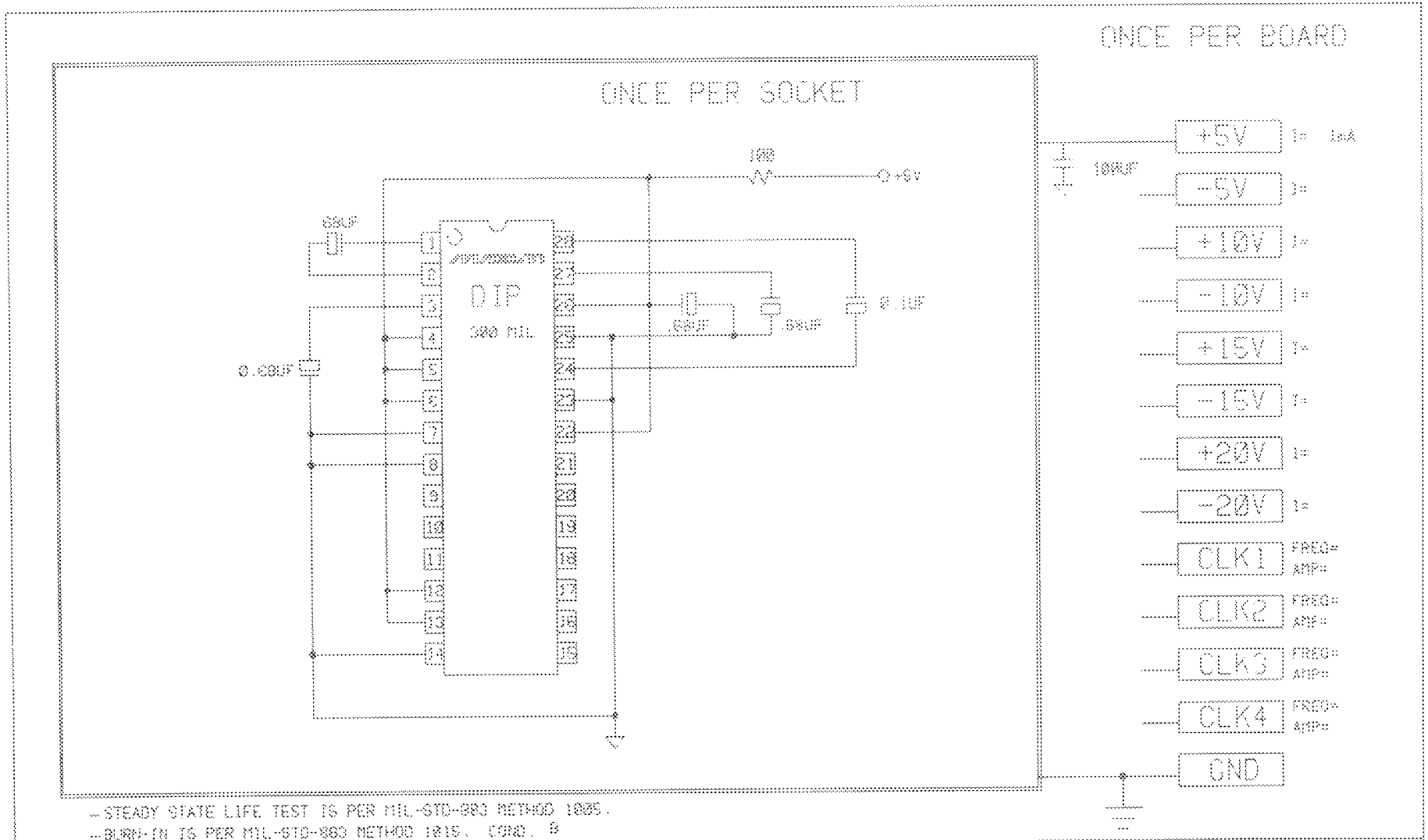
PKG.CODE: W28-6		APPROVALS	DATE	MAXIM
CAV./PAD SIZE: 150X200	PKG. DESIGN			BUILDSHEET NUMBER: 05-1901-0052 / REV.: C



PKG.CODE: A28-1		APPROVALS	DATE	MAXIM
CAV./PAD SIZE: 154X200	PKG. DESIGN			BUILDSHEET NUMBER: 05-1901-0053 / REV.: C



PKG.CODE: U28-2		APPROVALS	DATE	MAXIM
CAV./PAD SIZE: 118×217	PKG. DESIGN			BUILDSHEET NUMBER: 05-1901-0228 / 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: 168 HOURS MIN. OR EQUIVALENT
3. ALL COMPONENTS AND MATERIAL MUST STAND 150C CONTINUOUS
4. APPROVED FOR [X] COMMERCIAL
   [X] MR/883

SPEC. NO. 06-5062 REV. B

DATE: 4/20/94

DRAWN BY:

MAXIM BURN-IN SCHEMATIC

DEVICE TYPE:

MAX3241/3243/3244