RELIABILITY REPORT

FOR

MAX794xxE

PLASTIC ENCAPSULATED DEVICES

December 10, 2002

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by

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Conclusion

The MAX794 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 MAX794 microprocessor (µP) supervisory circuit monitors and controls the activities of +3.0V/+3.3V µPs by providing backup-battery switchover, among other features such as low-line indication, µP reset, write protection for CMOS RAM, and a watchdog (see the Selector Guide below). The backup-battery volt-age can exceed V_{CC}, permitting the use of 3.6V lithium batteries in systems using 3.0V to 3.3V for V_{CC}.
The MAX794's reset threshold is set externally with a resistor divider. The MAX794 is available in a 16-pin DIP and narrow SO packages. For similar devices designed for 5V systems, see the µP Supervisory Circuits table at the back of this data sheet.

B. Absolute Maximum Ratings

Item	Rating
Terminal Voltage (with respect to GND)	
V_{CC}	-0.3V to 6.0V
V_{BATT}	-0.3V to 6.0V
All Other Inputs	-0.3V to the higher of V_{CC} or V_{BATT}
Continuous Input Current	
V_{CC}	200mA
V_{BATT}	50mA
GND	20mA
Output Current	
V_{OUT}	200mA
All Other Outputs	20mA
Continuous Power Dissipation (TA = +70°C)	
16-Pin Plastic DIP	842mW
16-Pin Narrow SO	696mW
Derates above +70°C	
16-Pin Plastic DIP	10.53mW/°C
16-Pin Narrow SO	9.52mW/°C
Operating Temperature Ranges	
MAX794Cxx	0°C to +70°C
MAX794Exx	-40°C to +85°C
Storage Temperature Range	-65°C to +160°C
Lead Temperature (soldering, 10sec)	+300°C

II. Manufacturing Information

A. Description/Function:	3.0V/3.3V Adjustable Microprocessor Supervisory Circuits
B. Process:	S3 (Standard 3 micron silicon gate CMOS)
C. Number of Device Transistors:	1271
D. Fabrication Location:	Oregon, USA
E. Assembly Location:	Philippines, Thailand or Malaysia
F. Date of Initial Production:	December, 1994

III. Packaging Information

A. Package Type:	**16-Pin SO**	**16-Pin 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:	# 05-1701-0230	#05-1701-0229
H. Flammability Rating:	Class UL94-V0	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-112:	Level 1	Level 1

IV. Die Information

A. Dimensions:	85 x 146 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4389 \times 1280 \times 2}$$

(Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 0.85 \times 10^{-9}$

$\lambda = 0.85$ 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. # 06-5094) 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 PW46-3 die type has been found to have all pins able to withstand a transient pulse of ±1000V, 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

MAX794xxE

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		1280	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	PDIP SO	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

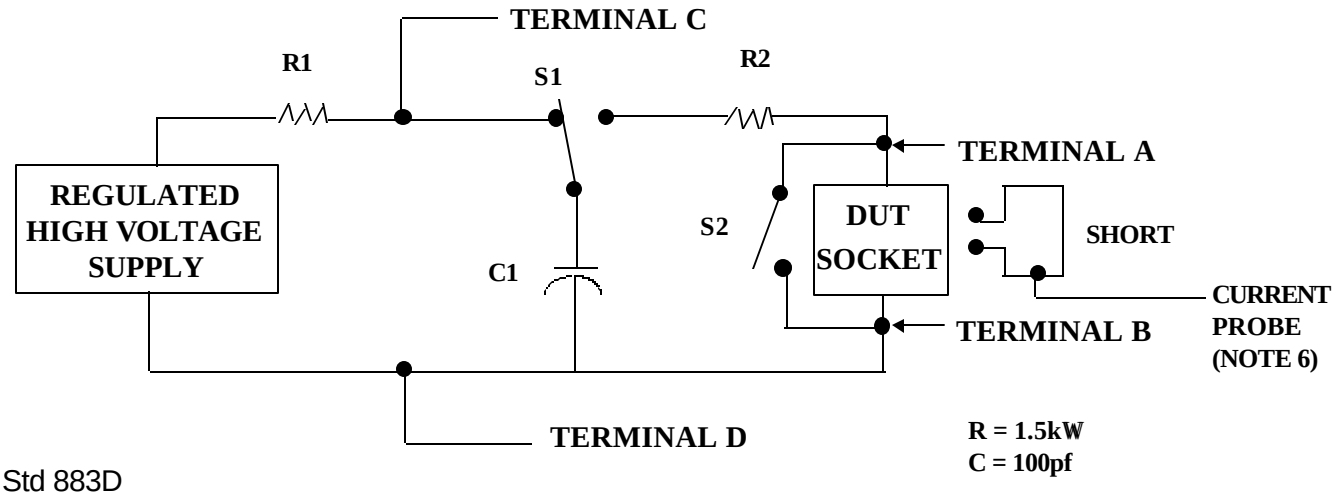
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

3.4 Pin combinations to be tested.

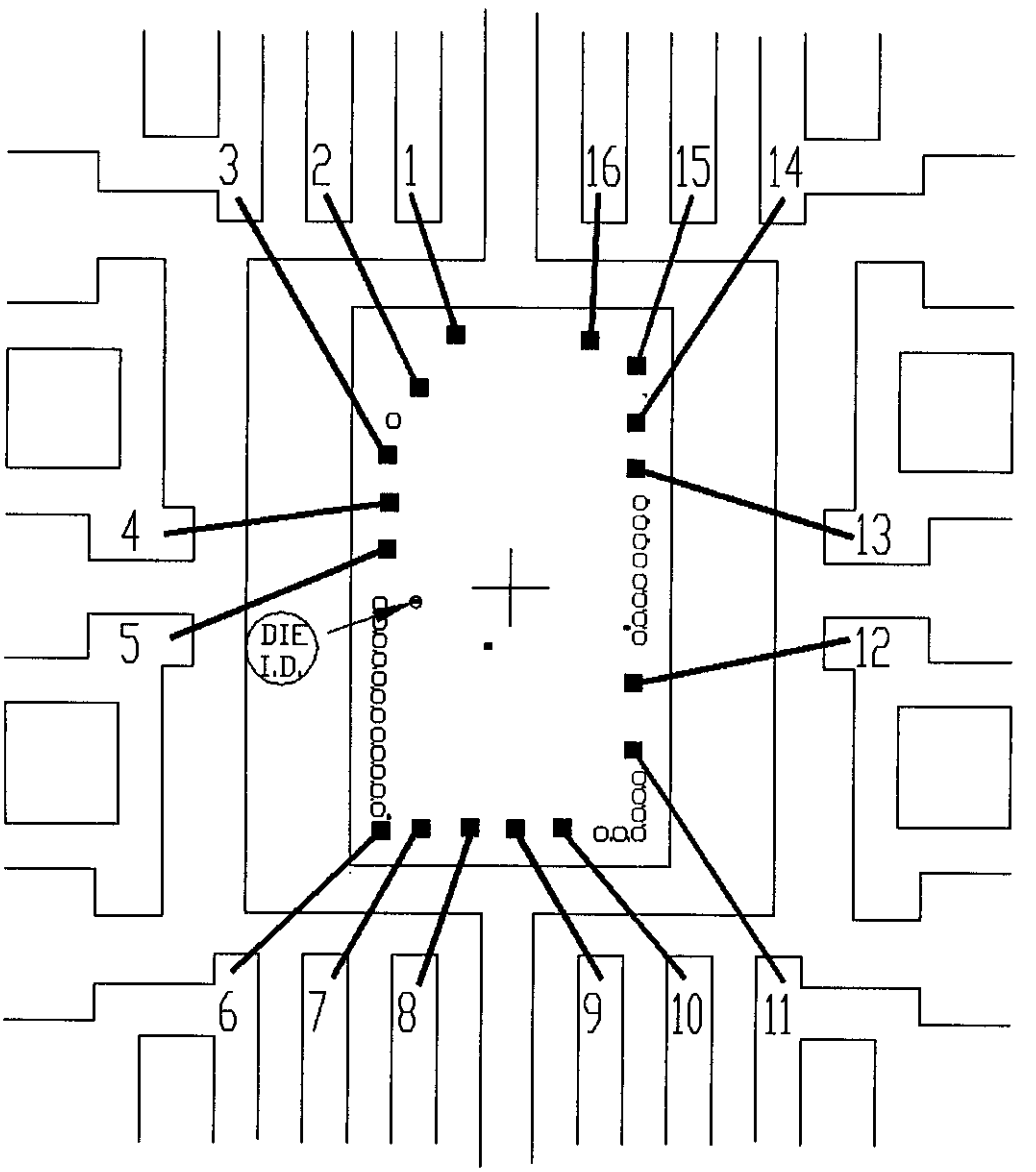
a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.

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.

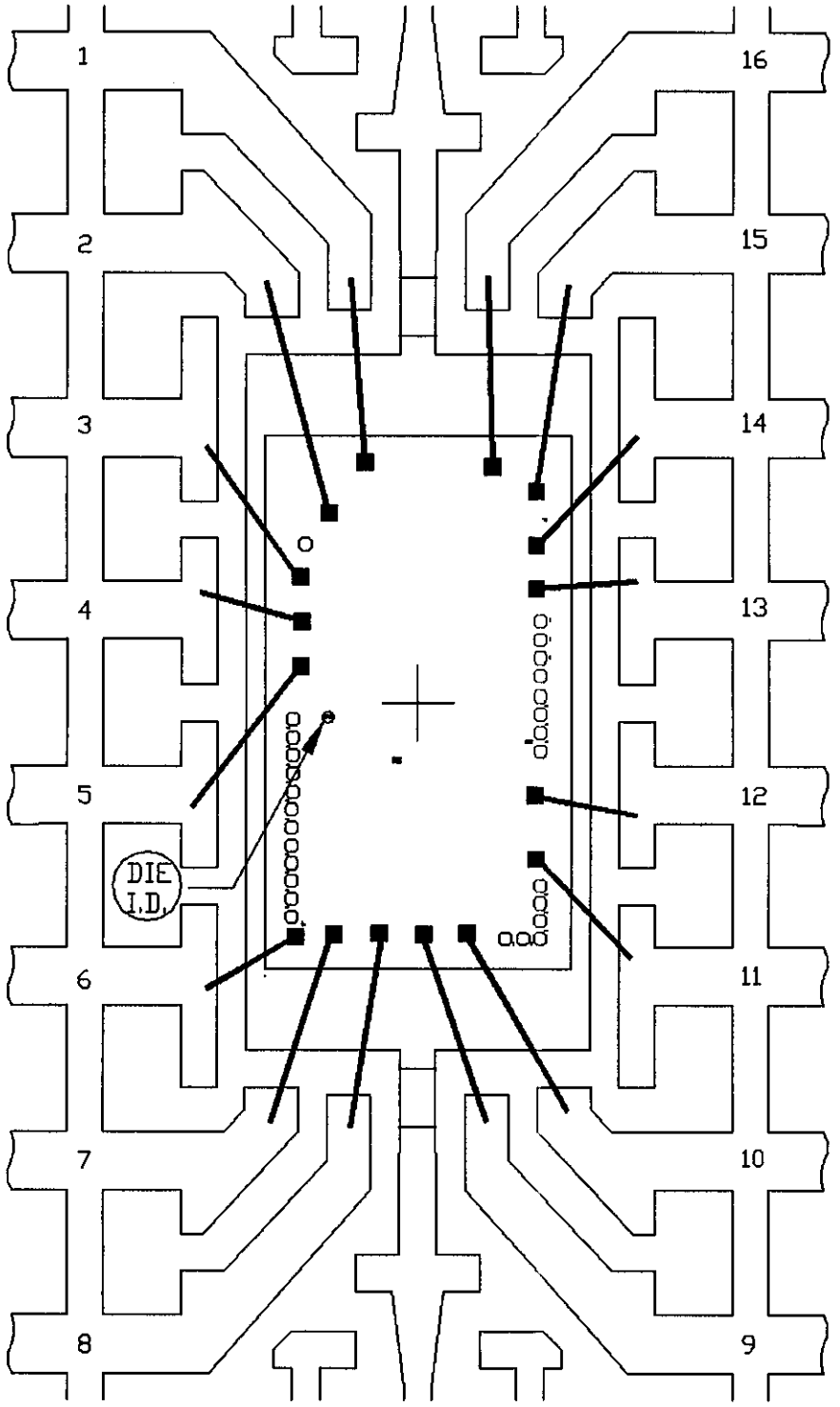
c. Each input and each output individually connected to terminal A with respect to a combination of all the other input and output pins connected to terminal B. All pins except the input or output pin being tested and the combination of all the other input and output pins shall be open.



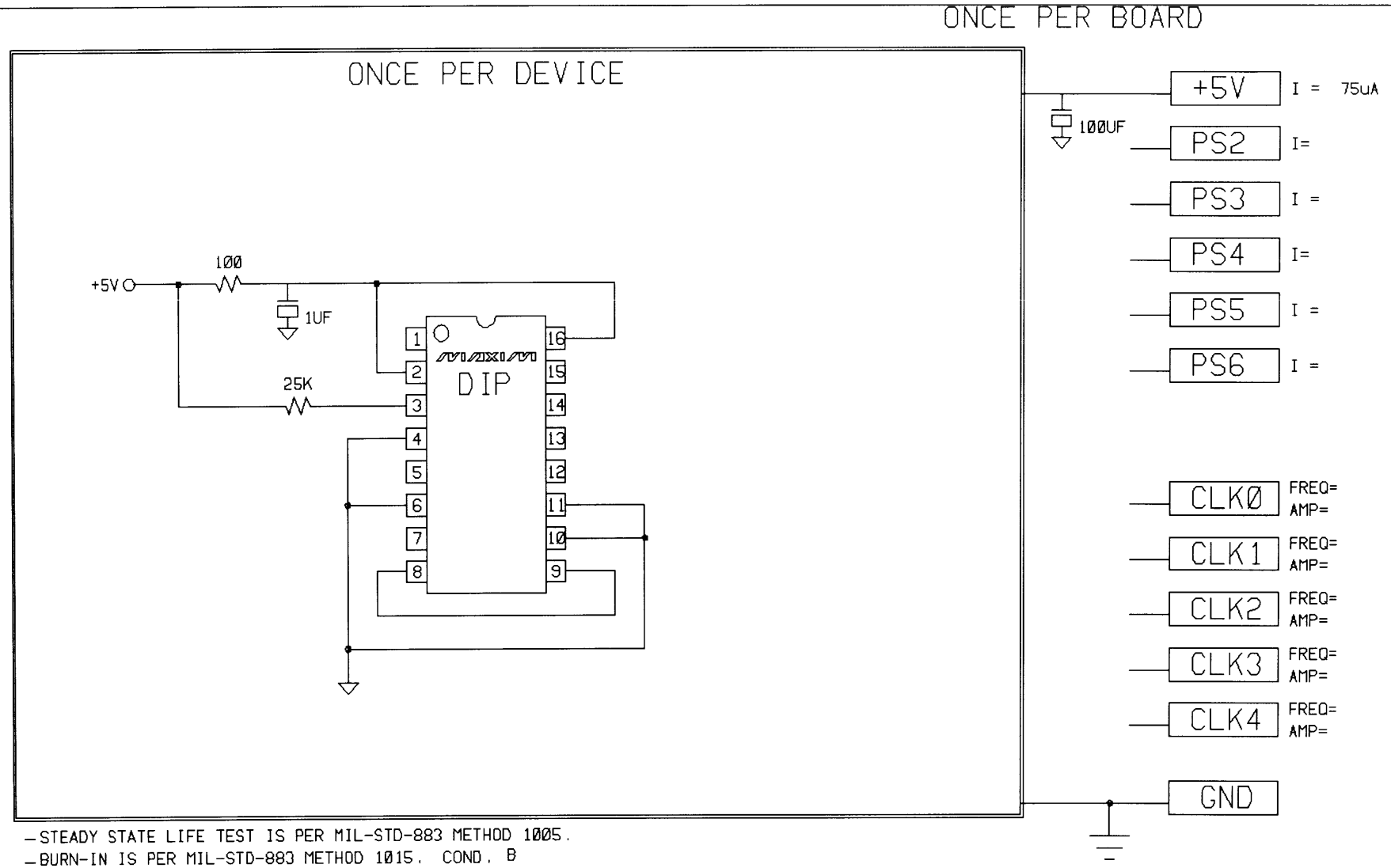
Mil Std 883D
Method 3015.7
Notice 8



PKG.CODE: P16-2		APPROVALS	DATE	MAXIM
CAV./PAD SIZE: 140 x 170	PKG. DESIGN	[redacted]	10/7/94.	BUILDSHEET NUMBER: 05-1701-0229 / REV.: A



PKG.CODE: S16-5		APPROVALS	DATE	MAXIM	
CAV./PAD SIZE: 96X190	PKG. DESIGN	[redacted]	10/7/94.	BUILDSHEET NUMBER: 05-1701-0230	REV.: A



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] HR/883

SPEC. NO. 06-5094 REV: A

DATE: 12/1/94

DRAWN BY: C. JONES

MAXIM BURN-IN SCHEMATIC

DEVICE TYPE(S):

MAX793/794