

RELIABILITY REPORT
FOR
MAX872xxA
PLASTIC ENCAPSULATED DEVICES

August 1, 2003

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by



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Conclusion

The MAX872 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 MAX872 precision 2.5V micropower voltage reference consumes a maximum of only 10 μ A and operates from supply voltages up to 20V. The combination of ultra-low quiescent current and low, 200mV dropout makes it ideal for battery-powered equipment. It sources and sinks up to 500 μ A with only 200mV input voltage headroom which makes the 2.5V MAX872 ideal for use with 3V supply.

Initial accuracy of 0.2% at +25°C (\pm 5mV) and low 40ppm/°C max drift make this reference suitable for a wide range of precision applications.

B. Absolute Maximum Ratings

<u>Item</u>	<u>Rating</u>
Supply Voltage	24V
Output Short-Circuit Duration	Continuous to Either Supply
C _{COMP} Input	-0.3V to V _{OUT}
TRIM Input	-0.3V to (V _{IN} + 0.3V)
TEMP Output	-0.3V to (V _N + 0.3V)
Junction Temperature Range	-65°C to +150°C
Storage Temp.	-65°C to +150°C
Lead Temp. (10 sec.)	+300°C
Continuous Power Dissipation (TA = 70°C)	
8-Pin SO	471mW
8-Pin PDIP	727mW
Derates above +70°C	
8-Pin SO	5.88mW/°C
8-Pin PDIP	9.09mW/°C

II. Manufacturing Information

A. Description/Function:	10 μ A, Low-Dropout, Precision Voltage Reference
B. Process:	BA5 (Standard 24V 5 micron Bipolar Process)
C. Number of Device Transistors:	89
D. Fabrication Location:	Arizona, USA
E. Assembly Location:	Philippines, Malaysia, or Korea
F. Date of Initial Production:	May, 1996

III. Packaging Information

A. Package Type:	8-Lead NSO	8-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:	# 05-0901-0065	# 05-0901-0063
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:	72 x 115 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:	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, Reliability 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4389 \times 866 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

└ Thermal acceleration factor assuming a 0.8eV activation energy

$$\lambda = 1.25 \times 10^{-9} \quad \lambda = 1.25 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 the 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 lots exceeding this level. The following Burn-In Schematic (Spec. # 06-4567) 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 RF17 die type has been found to have all pins able to withstand a transient pulse of $\pm 3000\text{V}$, 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

MAX872xxA

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		866	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 96hrs.	DC Parameters & functionality	PDIP	77	0
			SO	77	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 D.I.P. qualification lots.

Note 2: Generic/Package process data

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

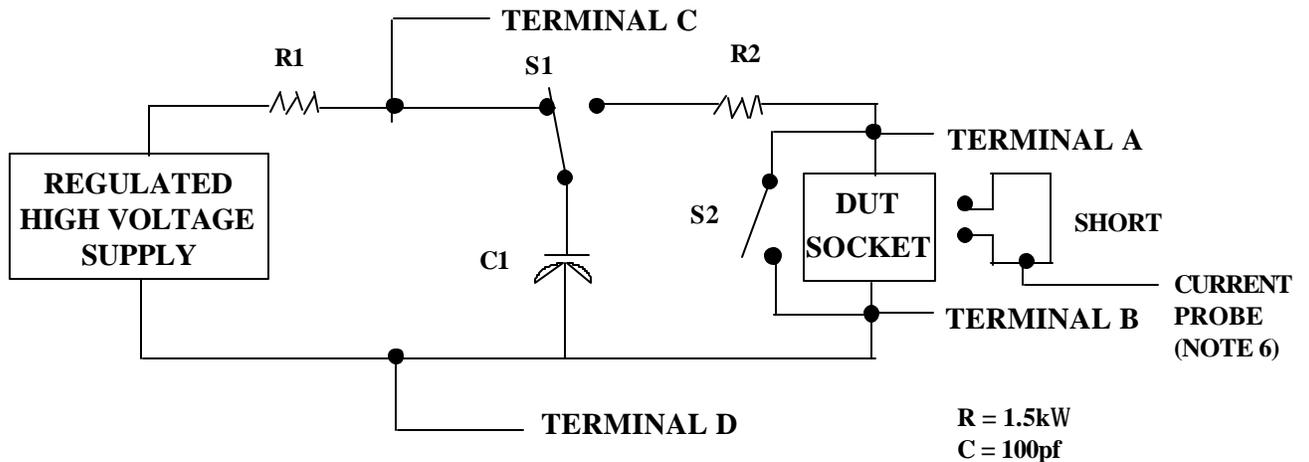
1/ Table II is restated in narrative form in 3.4 below.

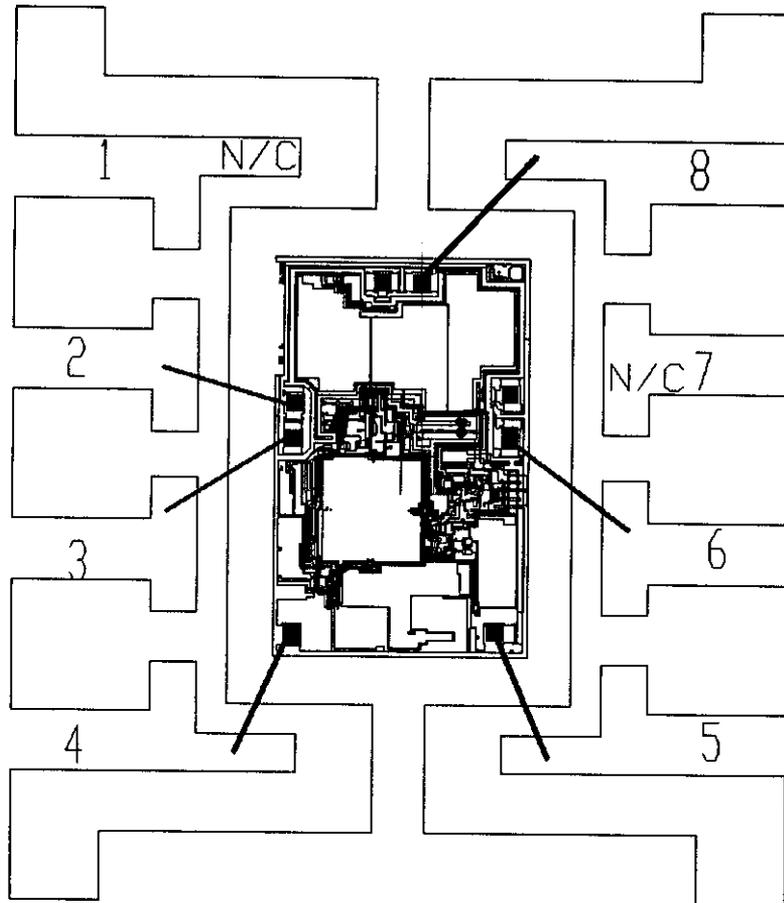
2/ No connects are not to be tested.

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: S8-4

APPROVALS

DATE

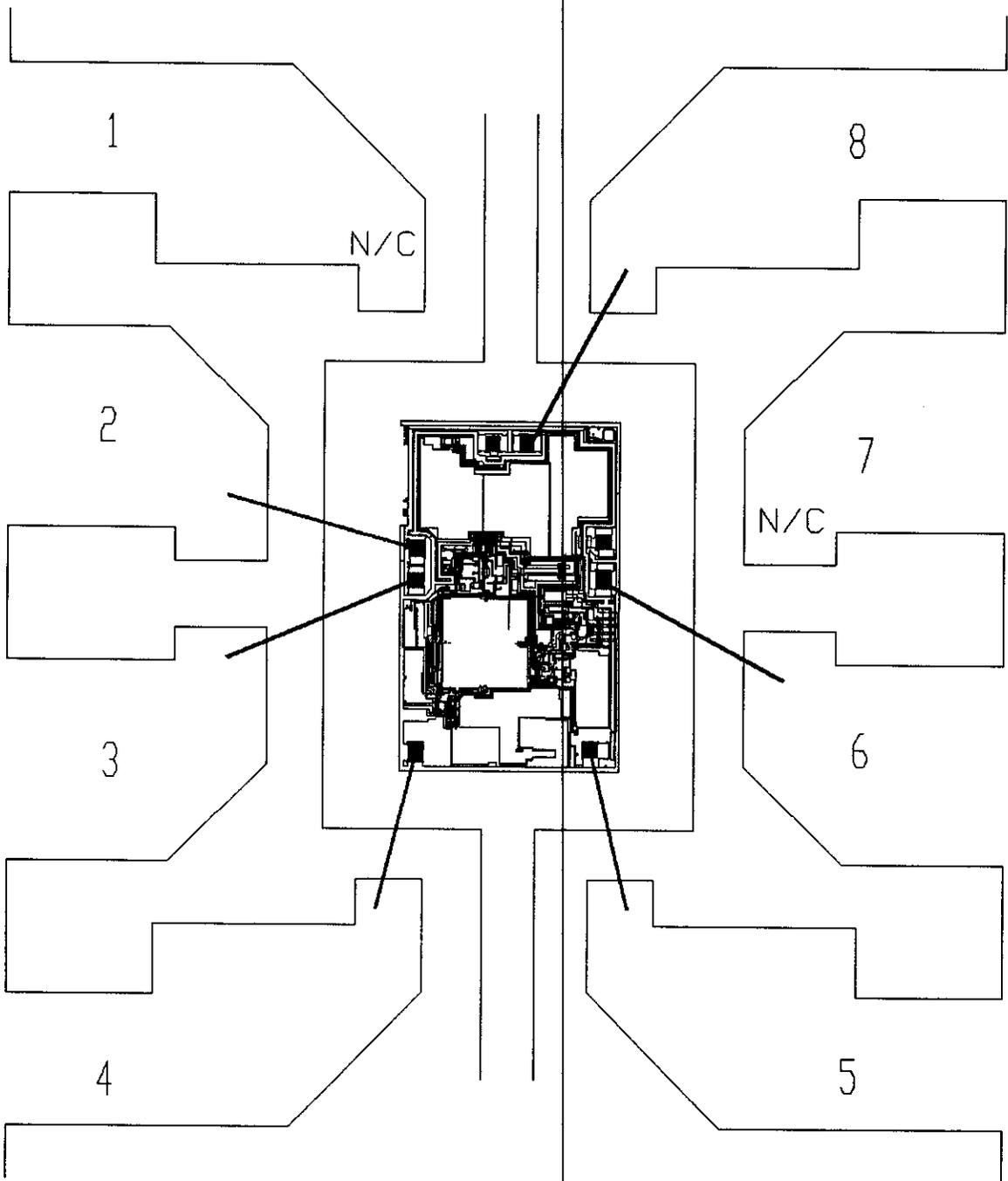
MAXIM

CAV./PAD SIZE:
90 X 130

PKG.
DESIGN

BUILDSHEET NUMBER:
05-0901-0065

REV:
B



PKG.CODE: P8-2

CAV./PAD SIZE: 110 X 140

APPROVALS

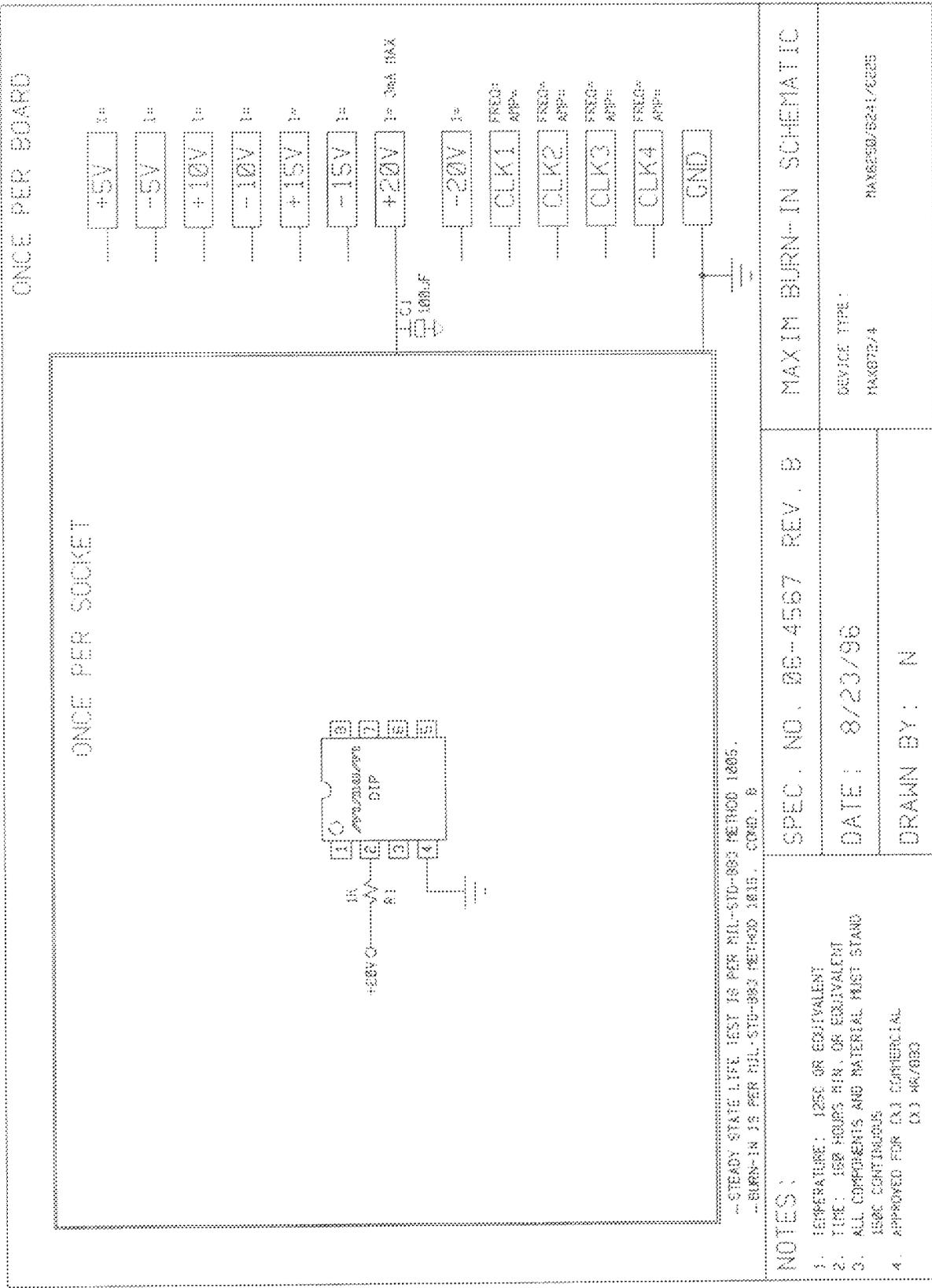
DATE



PKG.
DESIGN

BUILDSHEET NUMBER:
05-0901-0063

REV:
B



-- STEADY STATE LIFE TEST IS PER MIL-STD-883 METHOD 1805.
 -- BURN-IN IS PER MIL-STD-883 METHOD 1815 COND. B

NOTES:

1. TEMPERATURE: 125C OR EQUIVALENT
2. TIME: 100 HOURS MIN. OR EQUIVALENT
3. ALL COMPONENTS AND MATERIAL MUST STAND 150C CONTINUOUS
4. APPROVED FOR (X) CONFIDENTIAL (X) 46/083

SPEC. NO. 08-4567 REV. B

DATE: 8/23/96

DRAWN BY: N

MAXIM BURN-IN SCHEMATIC

SERVICE TYPE:
 MAX6274

NAME: 58/52-11/2225