RELIABILITY REPORT

FOR

MXL1013xx

PLASTIC ENCAPSULATED DEVICES

March 28, 2004

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by

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Conclusion

The MXL1013 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 Maxim MXL1013 is a precision dual op amp that upgrades the performance of popular devices such as the MC1458/MC1558, LM158 and OP221. This device is pin compatible with industry standards such as the LT1013.

Precision specifications include: 40µV offset voltage, 0.3µV/°C drift (TCVOS), 117dB CMRR, and 120dB PSRR. While supply current is typically only 350µA per amplifier, the outputs can source and sink more than 20mA.

The MXL1013 can be operated from a single +5V power supply. The input voltage range includes ground and the outputs swing to within a few millivolts of ground.

B. Absolute Maximum Ratings

Item	Rating
Supply Voltage	±22V
Input Voltage	Equal to Positive Supply Voltage 5V below Negative Supply Voltage
Output Short-Circuit Duration	Continuous
Differential Input Voltage	±30V
Storage Temp.	-65°C to +150°C
Lead Temp. (10 sec.)	+300°C
Power Dissipation	762mW
Derates above +70°C	9.52mW/°C
Continuous Power Dissipation (TA = +70°C)	
8-Pin PDIP	727mW
8-Pin NSO	471mW
Derates above +70°C	
8-Pin PDIP	9.09mW/°C
8-Pin NSO	5.88mW/°C

II. Manufacturing Information

A. Description/Function:	Dual Precision Op Amp
B. Process:	BB5 (Standard 44V 5 micron Bipolar Process)
C. Number of Device Transistors:	330
D. Fabrication Location:	Arizona, USA
E. Assembly Location:	Philippines, Malaysia, or Korea
F. Date of Initial Production:	September, 1994

III. Packaging Information

	8-Lead PDIP	**8-Lead NSO**
A. Package Type:		
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	#05-0601-0342	#05-0601-0343
H. Flammability Rating:	Class UL94-V0	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-A:	Level 1	Level 1

IV. Die Information

A. Dimensions:	99 x 85 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, Reliability Operations)
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:

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

(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 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. # 06-0052) 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 OA48 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 ±100mA.

Table 1
Reliability Evaluation Test Results

MXL1013xx

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	DIP 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

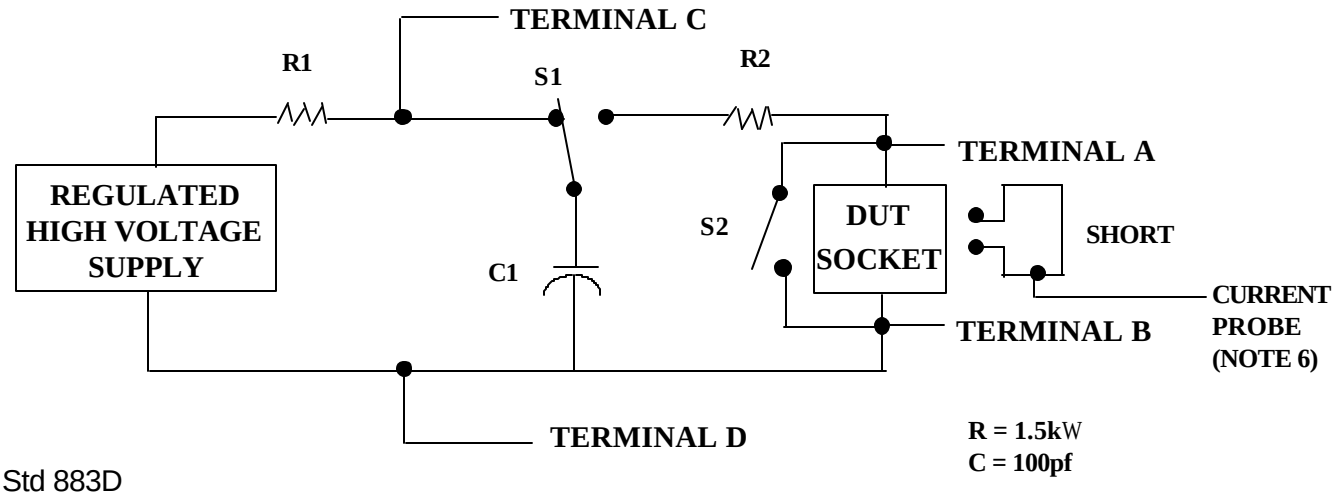
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

3.4 Pin combinations to be tested.

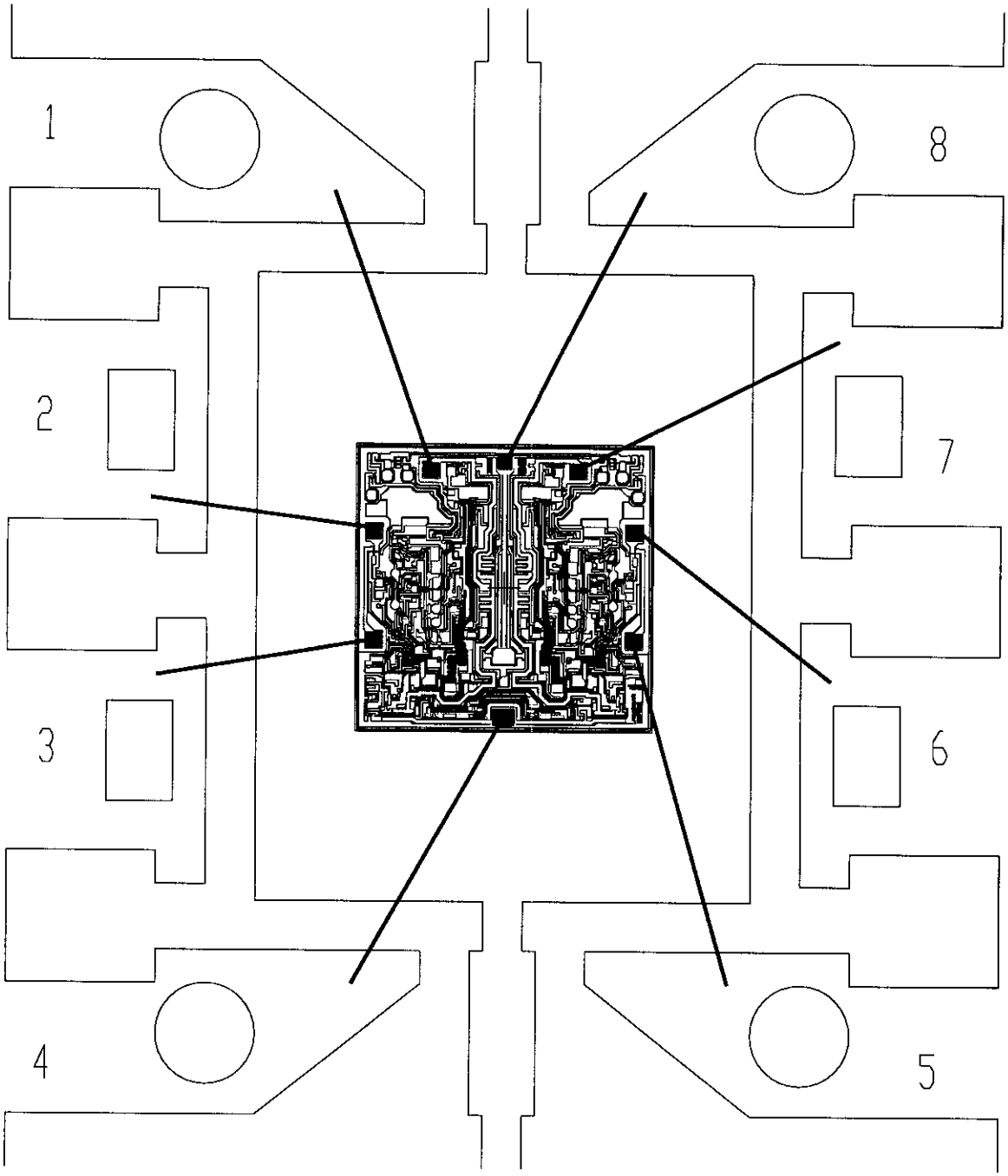
a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.

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.

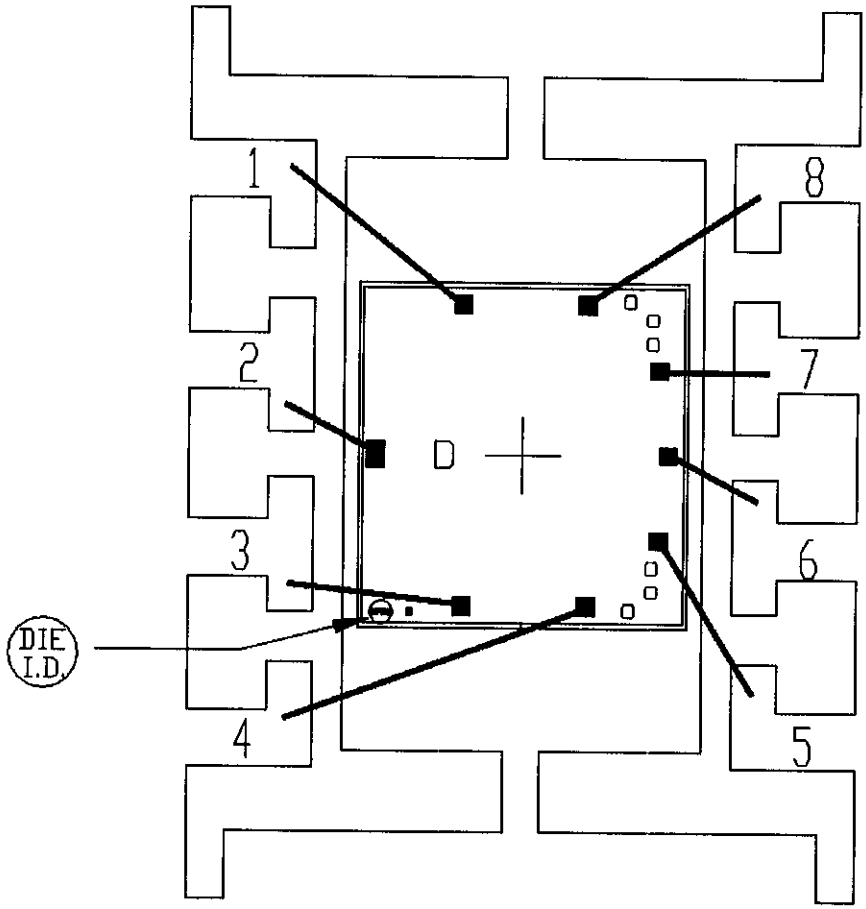
c. Each input and each output individually connected to terminal A with respect to a combination of all the other input and output pins connected to terminal B. All pins except the input or output pin being tested and the combination of all the other input and output pins shall be open.



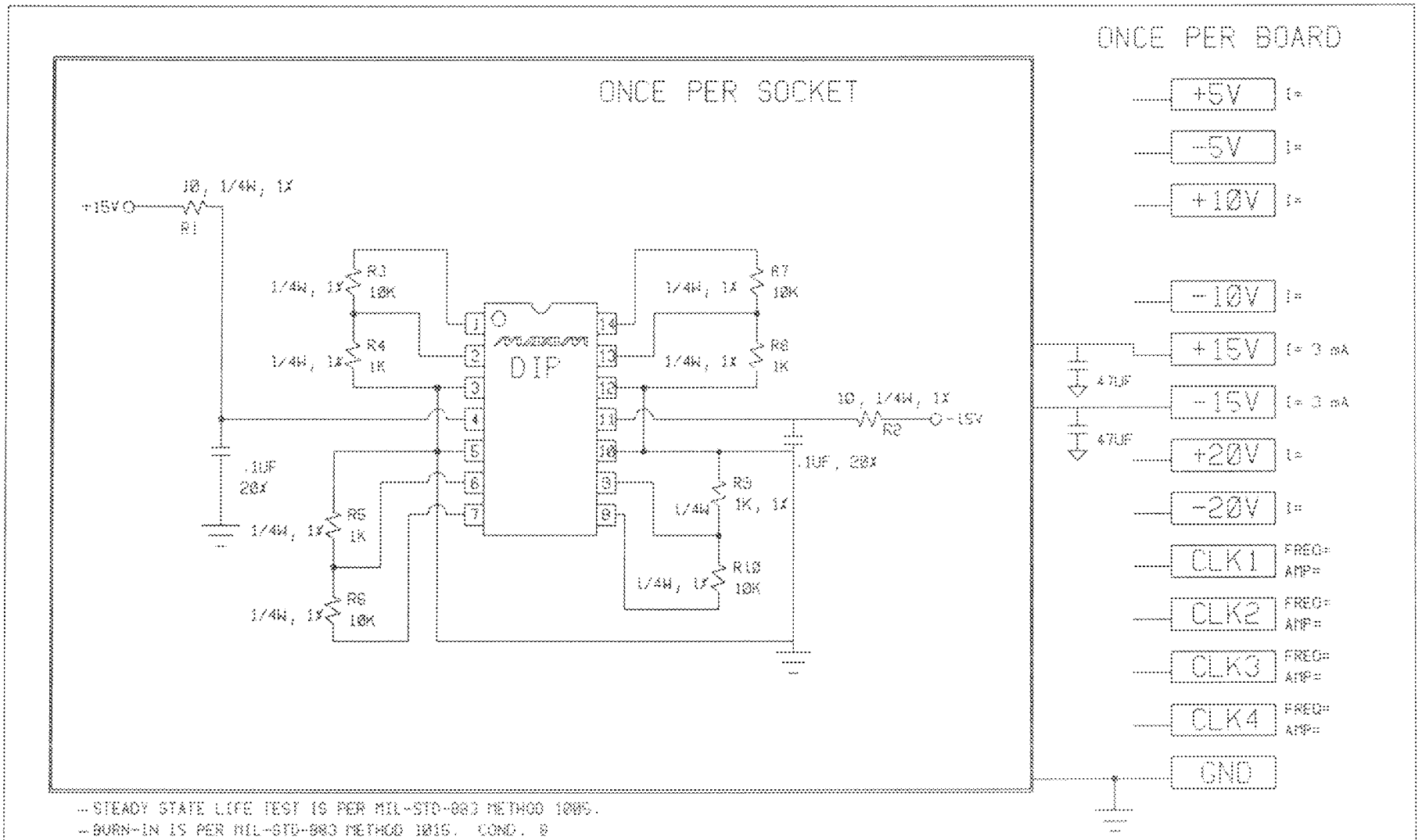
Mil Std 883D
Method 3015.7
Notice 8



PKG.CODE: P8-3		APPROVALS	DATE	MAXIM
CAV./PAD SIZE: 150 X 190	PKG. DESIGN			BUILDSHEET NUMBER: 05-0601-0342 / REV.: B



PKG.CODE: S8-5		APPROVALS	DATE	MAXIM
CAV./PAD SIZE: 95 X 155	PKG. DESIGN			BUILDSHEET NUMBER: 05-0601-0343 / REV.: B



-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] MIL/883

SPEC. NO. 06-0052 REV. B

DATE: 9/20/93

MAXIM BURN-IN SCHEMATIC

DEVICE TYPE:
MAX479
LT1014/1179