

RELIABILITY REPORT
FOR
MAX4108ESA
PLASTIC ENCAPSULATED DEVICES

April 6, 2004

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by



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Conclusion

The MAX4108 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 MAX4108 op amp combines ultra-high-speed performance with ultra-low-distortion operation. The MAX4109 is compensated for minimum closed-loop gains (AVCL) of 5V/V.

The MAX4108 delivers a 400MHz unity-gain bandwidth with a 1200V/ μ s slew rate. An ultra-low-distortion design provides an unprecedented spurious-free dynamic range of -93dBc (MAX4108) at 5MHz ($V_{OUT} = 2V_{p-p}$, $R_L = 100\Omega$), making these amplifiers ideal for high-performance RF signal processing.

The MAX4108 high-speed op amp features a wide output voltage swing and a high-current output-drive capability of 90mA.

B. Absolute Maximum Ratings

<u>Item</u>	<u>Rating</u>
Supply Voltage (V_{CC} to V_{EE})	12V
Voltage on Any Pin to Ground or Any Other Pin	($V_{EE} - 0.3V$) to ($V_{CC} + 0.3V$)
Short-Circuit Duration (OUT to GND)	Continuous
Operating Temperature Range	-40°C to +85°C
Junction Temperature	+150°C
Storage Temp.	-65°C to +150°C
Lead Temp. (10 sec.)	+300°C
Continuous Power Dissipation ($T_A = +70^\circ\text{C}$)	
8-Pin NSO	471mW
Derates above +70°C	
8-Pin NSO	5.88mW/°C

II. Manufacturing Information

- A. Description/Function: 400MHz, Ultra-Low-Distortion Op Amp
- B. Process: CP10 (Recessed-Oxide-Isolated, High Speed Complementary Bipolar Process)
- C. Number of Device Transistors: 57
- D. Fabrication Location: Oregon, USA
- E. Assembly Location: Philippines, Malaysia, or Thailand
- F. Date of Initial Production: December, 1995

III. Packaging Information

- A. Package Type: **8-Lead Small Outline**
- B. Lead Frame: Copper
- C. Lead Finish: Solder Plate
- D. Die Attach: Silver-filled Epoxy
- E. Bondwire: Gold (1.3 mil dia.)
- F. Mold Material: Epoxy with silica filler
- G. Assembly Diagram: # 05-0601-0459
- H. Flammability Rating: Class UL94-V0
- I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-A: Level 1

IV. Die Information

- A. Dimensions: 45 x 40 mils
- B. Passivation: $\text{Si}_3\text{N}_4/\text{SiO}_2$ (Silicon nitride/ Silicon dioxide)
- C. Interconnect: Aluminum/Si (Si = 1%)
- D. Backside Metallization: None
- E. Minimum Metal Width: 2 microns (as drawn)
- F. Minimum Metal Spacing: 2 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 (Managing 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4389 \times 320 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

Temperature Acceleration factor assuming an activation energy of 0.8eV

$$\lambda = 3.39 \times 10^{-9}$$

$$\lambda = 3.39 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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. # 06-5130) 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 OA82 die type has been found to have all pins able to withstand a transient pulse of $\pm 2000\text{V}$ Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of $\pm 50\text{mA}$.

Table 1
Reliability Evaluation Test Results

MAX4108ESA

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		320	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	NSO	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 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.

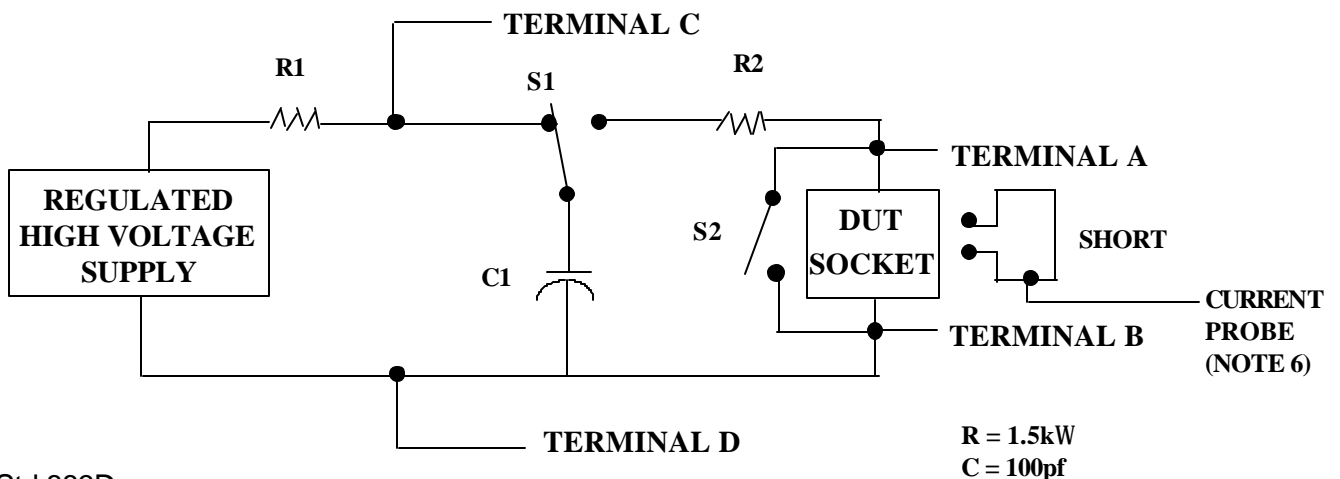
2/ No connects are not to be tested.

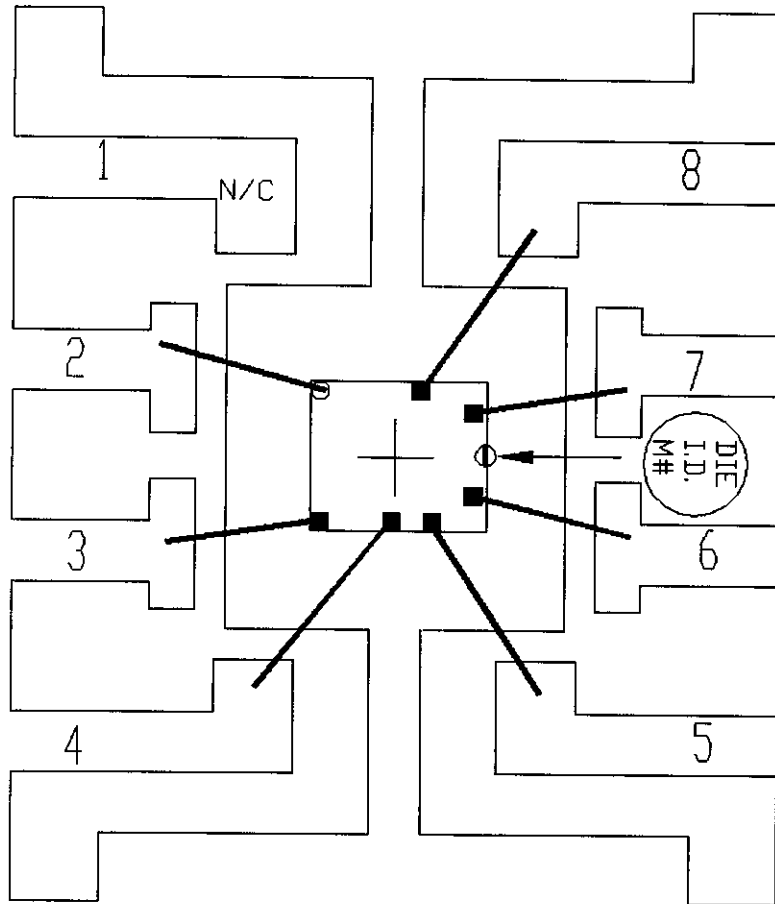
3/ Repeat pin combination I for each named Power supply and for ground

(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.

- 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.
- 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.
- 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: S8-2

CAV./PAD SIZE: 90 X 90

PKG.
DESIGN

APPROVALS

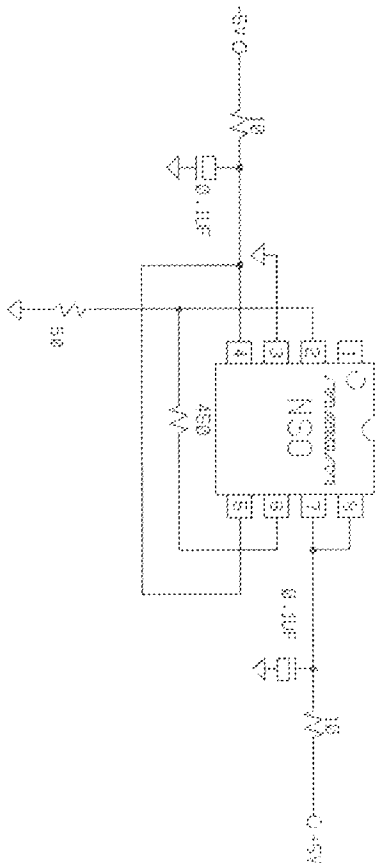
DATE

MAXIM

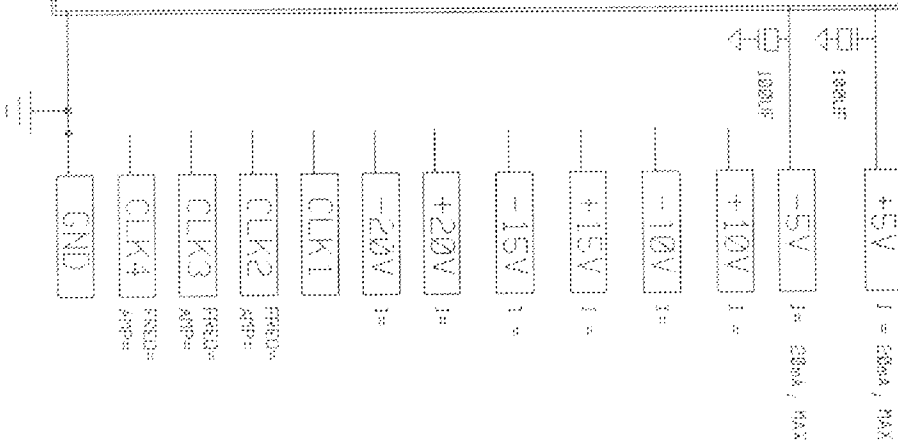
BUILDSHEET NUMBER:
05-0601-0459

REV.:
A

ONCE PER SOCKET



ONCE PER BOARD



... STEADY STATE LIFE TEST IS PER MIL-STD-883 METHOD 1006.
 ... 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 SHOW ISQC CONTINGENTS
4. APPROVED FOR EX COMMERCIAL INJ H0/880

SPEC. NO. 06-5130 REV. C

MAX IN BURN-IN SCHEMATIC

DATE: 8/4/95

1

DEVICE TYPE:	MAX100-4100	MAX4200/2/3
MARK77	8004158/4153	1004158/1
MARK112/4113	8004155/7/8	