

RELIABILITY REPORT
FOR
MAX4104Exx
PLASTIC ENCAPSULATED DEVICES

August 29, 2001

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by



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Conclusion

The MAX4104 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 MAX4104 op amp features ultra-high speed, low noise, and low distortion in a SOT23 package. The unity-gain-stable MAX4104 requires only 20mA of supply current while delivering 625MHz bandwidth and 400V/ μ s slew rate.

Low voltage noise density of 2.1nV/ $\sqrt{\text{Hz}}$ and -88dBc spurious-free dynamic range make this device ideal for low-noise/low-distortion video and telecommunications applications. This op amp also features a wide output voltage swing of $\pm 3.7\text{V}$ and $\pm 70\text{mA}$ output current- drive capability. For space-critical applications, the MAX4104 is available in a miniature 5-pin SOT23 package.

B. Absolute Maximum Ratings

<u>Item</u>	<u>Rating</u>
Supply Voltage (V_{CC} to V_{EE})	12V
Voltage on Any Pin to Ground	($V_{EE} - 0.3\text{V}$) to ($V_{CC} + 0.3\text{V}$)
Short-Circuit Duration (V_{OUT} to GND)	Continuous
Continuous Power Dissipation ($T_A = +70^\circ\text{C}$)	
Storage Temp.	-65°C to $+150^\circ\text{C}$
Junction Temperature	$+150^\circ\text{C}$
Lead Temp. (10 sec.)	$+300^\circ\text{C}$
Power Dissipation	
5 Lead SOT-23	571mW
8 Lead SO	471mW
Derates above $+70^\circ\text{C}$	
5 Lead SOT-23	7.1mW/ $^\circ\text{C}$
8 Lead SO	5.9mW/ $^\circ\text{C}$

II. Manufacturing Information

A. Description/Function:	350MHz, Ultra-Low-Noise Op Amp
B. Process:	CB20 (High Speed Complementary Bipolar Process)
C. Number of Device Transistors:	55
D. Fabrication Location:	Oregon, USA
E. Assembly Location:	Philippines, Malaysia, Korea or Thailand
F. Date of Initial Production:	January, 1998

III. Packaging Information

A. Package Type:	5 Lead SOT-23	8 Lead SO
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 mil dia.)	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler	Epoxy with silica filler
G. Assembly Diagram:	Buildsheet # 05-0601-0518	Buildsheet # 05-0601-0517
H. Flammability Rating:	Class UL94-V0	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112:	Level 1	

IV. Die Information

A. Dimensions:	38 x 36 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Gold
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 (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:

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

▲
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-1L**).

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 OA80 die type has been found to have all pins able to withstand a transient pulse of $\pm 2000\text{V}$, per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of $\pm 250\text{mA}$ and/or $\pm 20\text{V}$.

Table 1
Reliability Evaluation Test Results

MAX4104Exx

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	399	0
			SOT23	99	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 D.I.P. qualification lots for the package.

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.

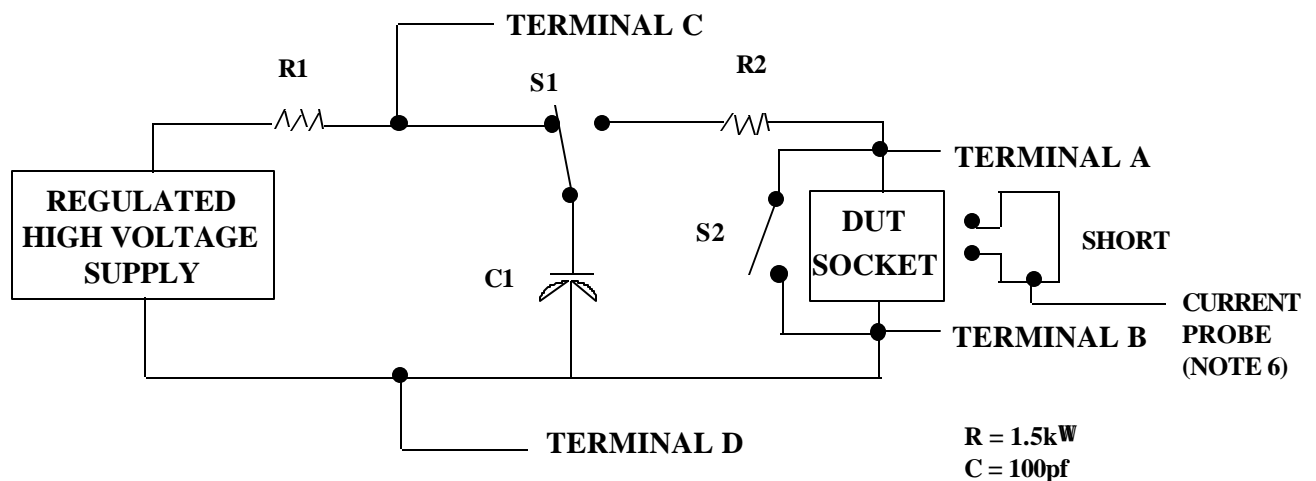
2/ No connects are not to be tested.

3/ Repeat pin combination 1 for each named Power supply and for ground

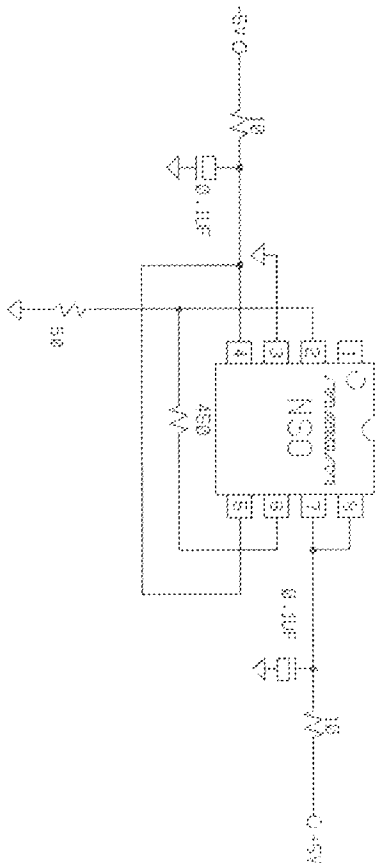
(e.g., where V_{PS1} is V_{DD} , V_{CC} , V_{SS} , V_{BB} , GND, $+V_S$, $-V_S$, V_{REF} , etc).

3.4 Pin combinations to be tested.

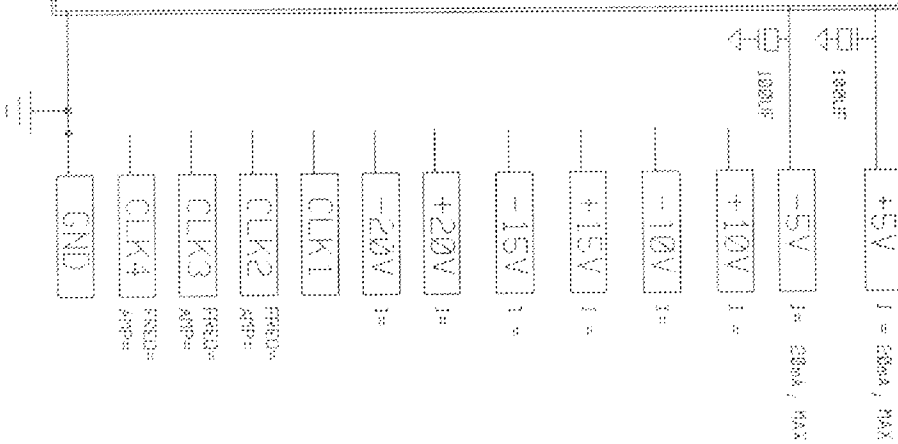
- Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.
- Each pin individually connected to terminal A with respect to each different set of a combination of all named 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.



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 H07880

SPEC. NO. 06-5130 REV. C

MAX IN BURN-IN SCHEMATIC

DATE: 8/4/95

DESIGN TYPE:

MAX100-4100 MAX4200/2/3

NAK477

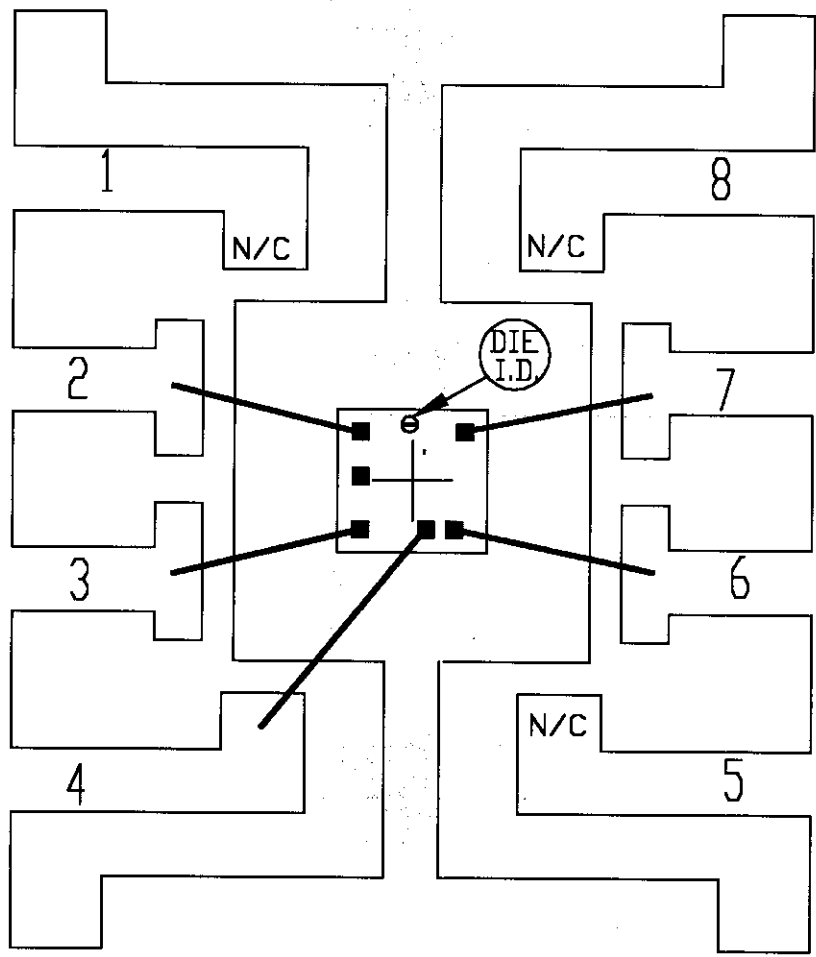
MAX100/4100

MAX4200/1

DRAWN BY:

NAK412/4110

REV4/85/7/6

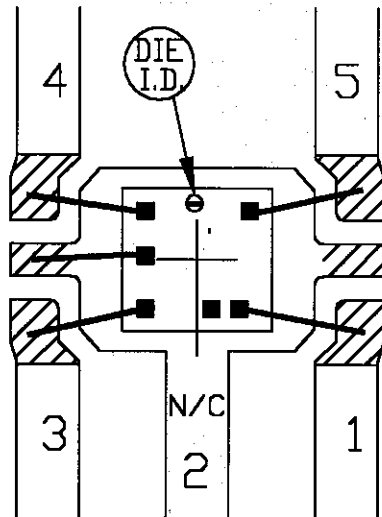


PKG.CODE: S8-2	
CAV./PAD SIZE: 90 X 90	PKG. DESIGN

APPROVALS

DATE

MAXIM	
BUILDSHEET NUMBER: 05-0601-0517	REV: A



PKG.CODE: U5-2

CAV./PAD SIZE: 59X46

APPROVALS

DATE

MAXIM

BUILDSHEET NUMBER: 05-0601-0518

REV: A

PKG.
DESIGN