RELIABILITY REPORT

FOR

MAX4413EKA

PLASTIC ENCAPSULATED DEVICES

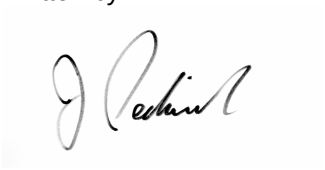
March 5, 2003

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by



Jim Pedicord
Quality Assurance
Reliability Lab Manager

Reviewed by

Bryan J. Preeshl
Quality Assurance
Executive Director

Conclusion

The MAX4413 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 MAX4413 dual operational amplifier is a unity-gain-stable device that combines high-speed performance, low supply current, and ultra-small packaging. The device operates from a single +2.7V to +5.5V supply, has Rail-to-Rail® outputs, and exhibits a common-mode input voltage range that extends from 100mV below ground to within +1.5V of the positive supply rail.

The MAX4413 achieves a 500MHz -3dB bandwidth and a 220V/µs slew rate while consuming only 1.7mA of supply current per amplifier. This makes the MAX4413 ideal for low-power/low-voltage, high-speed portable applications such as video, communications, and instrumentation.

The MAX4413 is available in a space-saving SOT23 package.

B. Absolute Maximum Ratings

Item	Rating
Supply Voltage (VCC to VEE)	6V
Differential Input Voltage	+/-2.5V
In_-, IN_+, OUT_	(VCC +0.3V) to (VEE – 0.3V)
Current into Input Pins	+/-20mA
Output Short-Circuit Duration	Continuous
Operating Temperature Range	-40°C to +85°C
Junction Temperature	+150°C
Storage Temp.	-65°C to +150°C
Lead Temp. (soldering 10 sec.)	+300°C
Continuous Power Dissipation (TA = +70°C)	
8-Pin SOT23	727mW
Derates above +70°C	
8-Pin SOT23	9.1mW/°C

II. Manufacturing Information

A. Description: Low-Cost, Low-Power, Ultra-small 3V/5V, 500MHz Single-Supply Op Amp w/ Rail-to-Rail Outputs

B. Process:	CB30
C. Number of Device Transistors:	192
D. Fabrication Location:	Oregon, USA
E. Assembly Location:	Malaysia
F. Date of Initial Production:	October, 2000

III. Packaging Information

A. Package Type:	**8-Pin SOT23**
B. Lead Frame:	Copper
C. Lead Finish:	Solder Plate
D. Die Attach:	Silver-filled Epoxy
E. Bondwire:	Gold (1.0 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	Buildsheet # 05-2501-0034
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112:	Level 1

IV. Die Information

A. Dimensions:	59 x 23 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Gold
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal 1: 1.4 microns Metal 2: 1.4 microns Metal 3: 3 microns (as drawn)
F. Minimum Metal Spacing:	Metal 1: 1.6 microns Metal 2: 1.6 microns Metal 3: 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 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4389 \times 77 \times 2}$$ (Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 14.10 \times 10^{-9}$ $\lambda = 14.10$ 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 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 rejects from lots exceeding this level. The attached Burn-In Schematic (Spec. # 06-5216) 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 OX09 die type has been found to have all pins able to withstand a transient pulse of ±2500V, per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of ±250mA.

Table 1
Reliability Evaluation Test Results

MAX4413EKA

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		77	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	SOT23	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

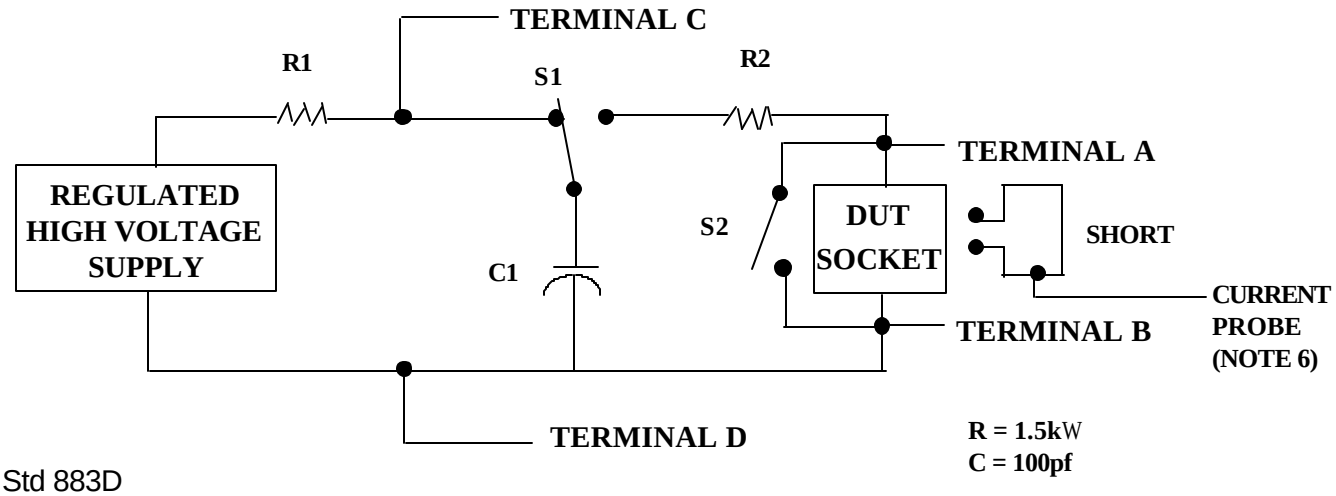
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

3.4 Pin combinations to be tested.

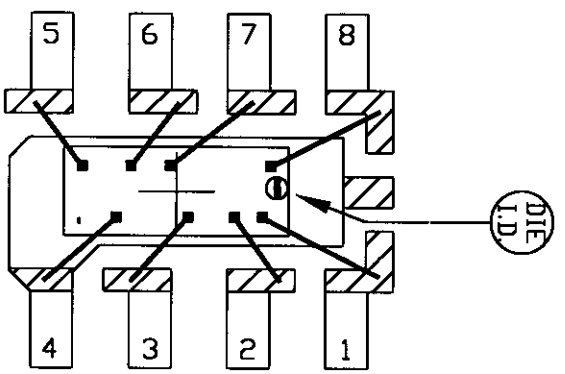
a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.

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

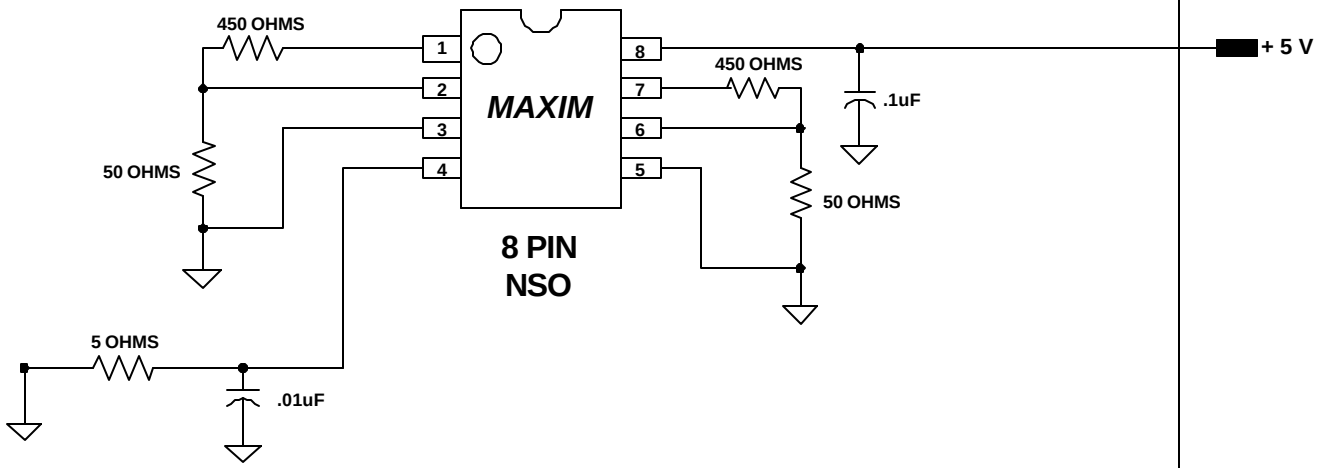


BONDABLE AREA

PKG. CODE: K8-5		SIGNATURES	DATE	MAXIM CONFIDENTIAL & PROPRIETARY
CAV./PAD SIZE: 88x28	PKG. DESIGN			BOND DIAGRAM #: 05-2501-0034 / REV: A

ONCE PER SOCKET

ONCE PER BOARD



DEVICES: MAX 4016; MAX 4126 / 4128 / 4133 / 4167;
MAX 4432/4433/4413/4416/4417/4450/4491;
MAX 4353/4453/4436/4437/4092/4252/4163/4321/4232
MAX. EXPECTED CURRENT = 15mA

DRAWN BY: HAK TAN. Max current for MAX 4092=.5mA, MAX4252= 2mA, MAX4163= 1mA, MAX4321= 1.4mA, MAX4232= 20mA.