MAX6104EUR
Rev. A

RELIABILITY REPORT

FOR

MAX6104EUR

PLASTIC ENCAPSULATED DEVICES

February 14, 2003

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

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Conclusion

The MAX6104 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
II. .....Manufacturing Information
III. .....Packaging Information
V. .....Quality Assurance Information
VI. .....Reliability Evaluation
IV. .....Die Information
.....Attachments

I. Device Description

A. General

The MAX6104 is a low-cost, low-dropout (LDO), micropower voltage references. This three-terminal reference has an output voltage option of 4.096V. It features a proprietary curvature-correction circuit and laser-trimmed, thin-film resistors that result in a low temperature coefficient of 75ppm/°C (max) and an initial accuracy of ±0.4% (max). This device is specified over the extended temperature range (-40°C to +85°C).

This series-mode voltage reference draws only 90µA of supply current and can source 5mA and sink 2mA of load current. Unlike conventional shunt-mode (two-terminal) references that waste supply current and require an external resistor, this device offers a supply current that is virtually independent of the supply voltage (with only a 4µA/V variation with supply voltage) and does not require an external resistor. Additionally, this internally compensated device does not require an external compensation capacitor and is stable with load capacitance. Eliminating the external compensation capacitor saves valuable board area in space-critical applications. Low dropout voltage and supply-independent, ultra-low supply current makes this device ideal for battery-operated, high-performance, low-voltage systems.

The MAX6104 is available in a tiny 3-pin SOT23 packages.

B. Absolute Maximum Ratings

Item	Rating
(Voltages Referenced to GND)	
IN	-0.3V to +13.5V
OUT	-0.3V to (VIN + 0.3V)
Output Short-Circuit to GND or IN (VIN < 6V)	Continuous
Output Short-Circuit to GND or IN (VIN = 6V)	60s
Operating Temperature Range	-40°C to +85°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10s)	+300°C
Continuous Power Dissipation (TA = +70°C)	
3-Pin SOT23	320mW
Derates above +70°C	
3-Pin SOT23	4.0mW/°C

II. Manufacturing Information

A. Description/Function: Low-Cost, Micropower, Low-Dropout, High-Output-Current, SOT23 Voltage References

B. Process: B12 (Standard 1.2 micron silicon gate CMOS)

C. Number of Device Transistors: 117

D. Fabrication Location: California or Oregon, USA

E. Assembly Location: Malaysia or Thailand

F. Date of Initial Production: January, 2000

III. Packaging Information

A. Package Type: **3-Pin SOT23**

B. Lead Frame: Copper or Alloy 42

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: # 05-0901-0179

H. Flammability Rating: Class UL94-V0

I. Classification of Moisture Sensitivity per JEDEC standard JESD22-112: Level 1

IV. Die Information

A. Dimensions: 44 x 31mils

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: 1.2 microns (as drawn)

F. Minimum Metal Spacing: 1.2 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 (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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4389 \times 160 \times 2}$$

(Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 6.79 \times 10^{-9}$

$\lambda = 6.79$ 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. # 06-5630) 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 RF24-5 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

MAX6104EUR

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		160	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	SOT	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

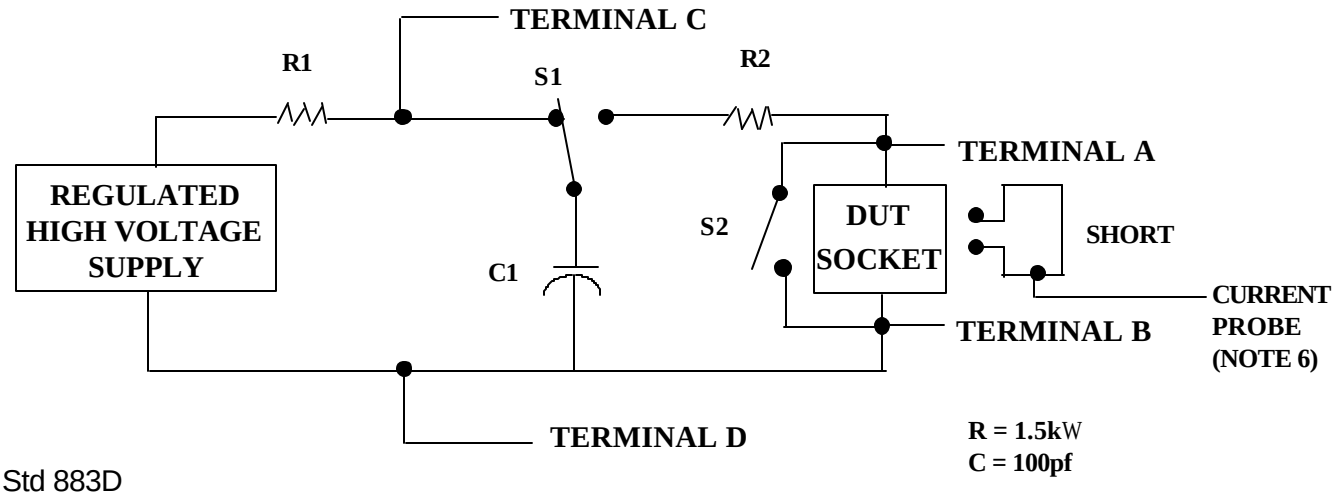
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

3.4 Pin combinations to be tested.

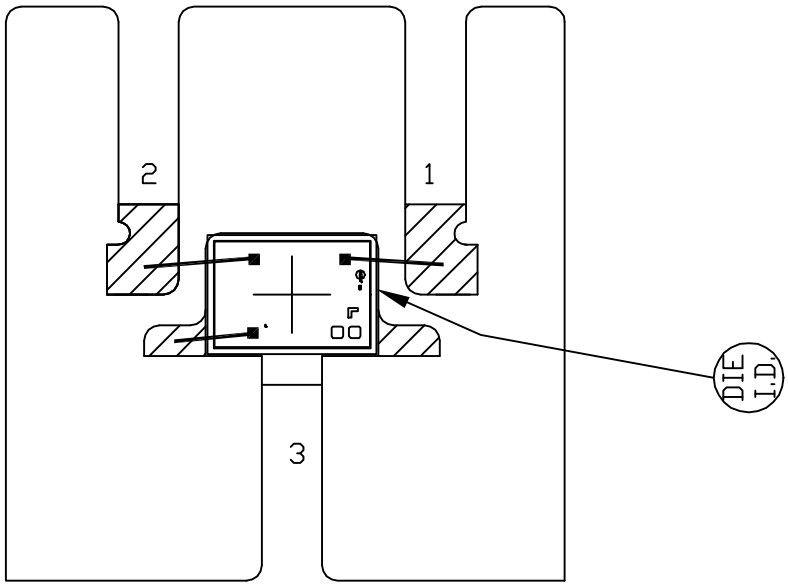
a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.

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

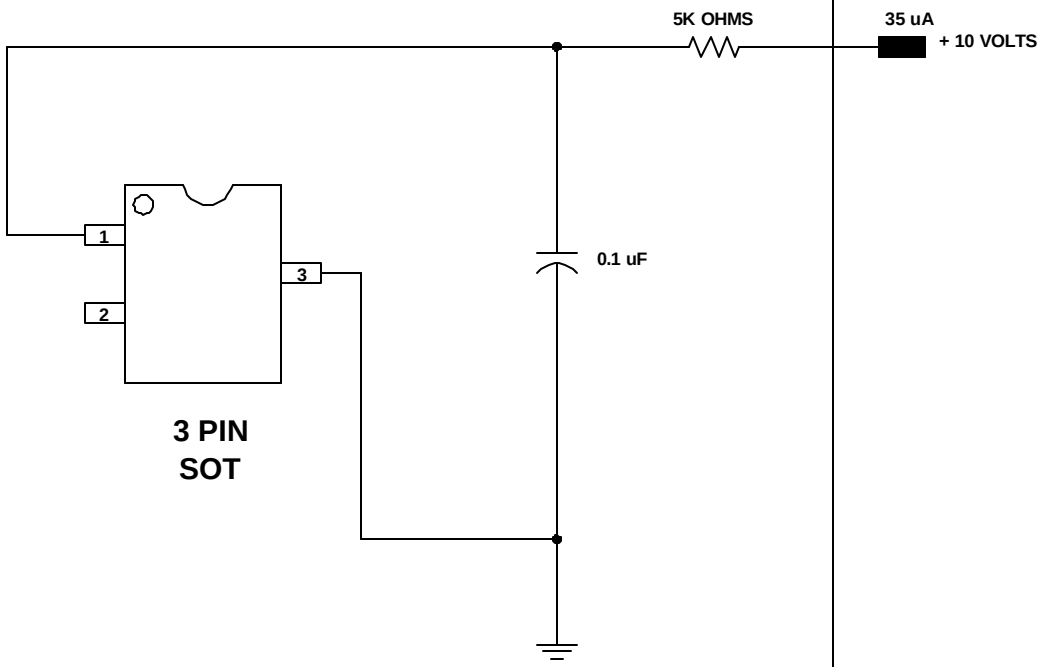


BONDING AREA

PKG. CODE: U3-1		SIGNATURES	DATE	MAXIM CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: 45x32	PKG.			BOND DIAGRAM #: 05-0901-0179	REV: A
	DESIGN				

ONCE PER SOCKET

ONCE PER BOARD



DEVICES: MAX 6012 / 6021 / 6025 / 6030 / 6041 / 6050/6018 6061/6062/6063/6064/6065/6066/6067/6068/6035
Max current = 35 uA /MAX6061-6068= 125uA / MAX6035= 100uA.

Notes: +38 Volts for MAX6035 only. Apply jumper pin to +20V pin. +5.5V for the MAX6018.