

RELIABILITY REPORT
FOR
MAX9502xExx
PLASTIC ENCAPSULATED DEVICES

August 26, 2005

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX9502 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 MAX9502 small, low-power video amplifier with integrated reconstruction filter operates from a supply voltage as low as 2.5V. The small size and the low minimum supply voltage make the MAX9502 ideal for portable applications such as mobile phones, digital still cameras, and camcorders.

The MAX9502 DC-couples the input and the output, resulting in a very small solution. The MAX9502 input can be directly connected to the output of a video digital-to-analog converter (DAC). The reconstruction filter is implemented as a 4th-order Chebyshev with a minimum passband of 5.5MHz, 3dB attenuation at 8MHz, and 55dB attenuation at 27MHz.

The output amplifier provides a closed-loop gain of +6dB (MAX9502G) or +12dB (MAX9502M), and can drive a 2V_{P-P} video signal into a 150Ω load to ground. The output signal is level-shifted so the sync tip is 110mV (typ) above ground.

The MAX9502 operates from a 2.5V to 3.6V single supply and consumes only 5.3mA quiescent supply current. An active-low shutdown mode reduces the supply current to 0.01μA.

The MAX9502 is available in tiny 6-pin μDFN (1mm x 1.5mm x 0.8mm) and 5-pin SC70 packages. The device is specified over the -40°C to +85°C extended temperature range.

B. Absolute Maximum Ratings

<u>Item</u>	<u>Rating</u>
VCC to GND	-0.3V to +4V
SHDN, IN, OUT to GND	-0.3V to (VCC + 0.3V)
OUT Short-Circuit Duration to VCC, GND	Continuous
Operating Temperature Range	-40°C to +85°C
Junction Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10s)	+300°C
Continuous Power Dissipation (TA = +70°C)	
5-Pin SC70	247mW
6-Pin μDFN	168mW
Derates above +70°C (Note 1)	
5-Pin SC70	3.1mW/°C
6-Pin μDFN	2.1mW/°C

II. Manufacturing Information

A. Description/Function:	2.5V Video Amplifier with Reconstruction Filter
B. Process:	S4
C. Number of Device Transistors:	498
D. Fabrication Location:	California, USA
E. Assembly Location:	Malaysia, Philippines or Thailand
F. Date of Initial Production:	April, 2005

III. Packaging Information

A. Package Type:	5-Pin SC70	6-Pin μDFN
B. Lead Frame:	Copper	Copper
C. Lead Finish:	Solder Plate or 100% Matte Tin	Solder Plate or 100% Matte Tin
D. Die Attach:	Silver-Filled Epoxy	Silver-Filled Epoxy
E. Bondwire:	Gold (1.0 mil dia.)	Gold (1.0 mil dia.)
F. Mold Material:	Epoxy with silica filler	Epoxy with silica filler
G. Assembly Diagram:	# 05-9000-1687	# 05-9000-1686
H. Flammability Rating:	Class UL94-V0	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C:	Level 1	Level 1

IV. Die Information

A. Dimensions:	31 x 30 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:	Metal1, Metal2 & Metal3 = 0.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1, Metal2 & Metal3 = 0.4 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)
- 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 will be shown in **Table 1** when completed. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 48 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

Δ Temperature Acceleration factor assuming an activation energy of 0.8eV

$$\lambda = 22.91 \times 10^{-9}$$

$$\lambda = 22.91 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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. # 06-6483) 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-1N**). Current monitor data for the S4 Process results in a FIT Rate of 0.56 @ 25C and 9.60 @ 55C (0.8 eV, 60% UCL)

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 VA42 die type has been found to have all pins able to withstand a transient pulse of $\pm 2500\text{V}$, per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of $\pm 250\text{mA}$.

Table 1
Reliability Evaluation Test Results

MAX9502xExx

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		48	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	SC70	77	0
			uDFN	77	0
85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	SC70	77	0
			uDFN	77	0
Mechanical Stress (Note 2)					
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality	SC70	77	0
			uDFN	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.

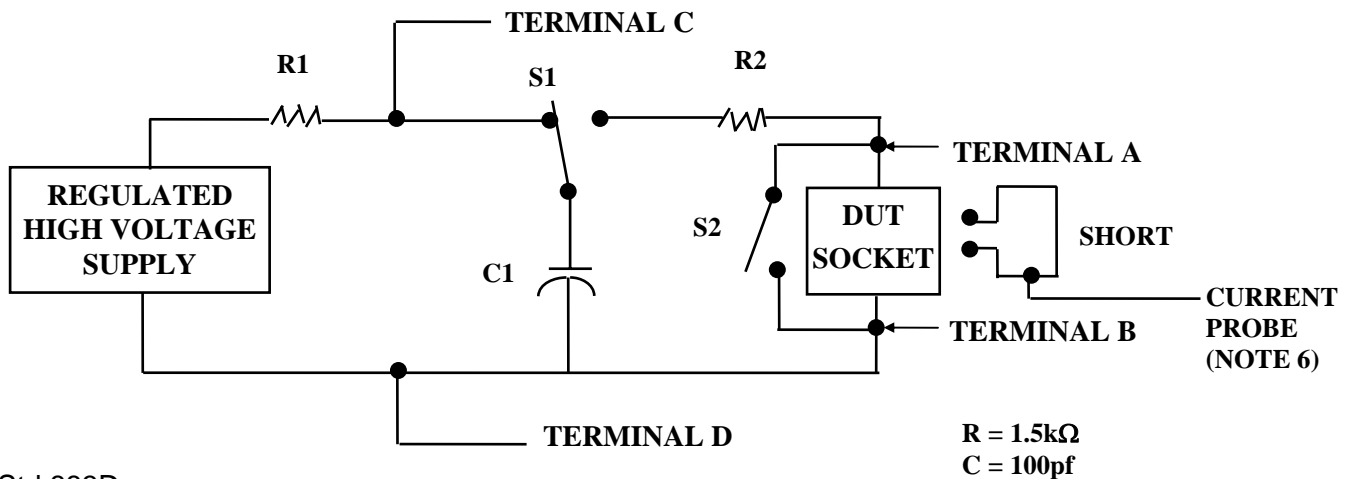
2/ No connects are not to be tested.

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).

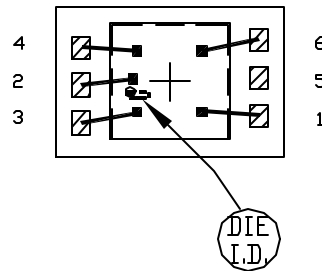
3.4 Pin combinations to be tested.

- 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.

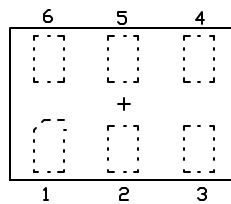


1.5x1.0x0.8mm uDFN

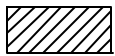
TOP VIEW



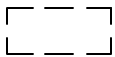
TOP VIEW OF BOTTOM LEADS



USE NON-CONDUCTIVE EPOXY



BONDABLE AREA



MAX. DIE PLACEMENT AREA

PKG. CODE:

L611-1

SIGNATURES

DATE

MAXIM
CONFIDENTIAL & PROPRIETARY

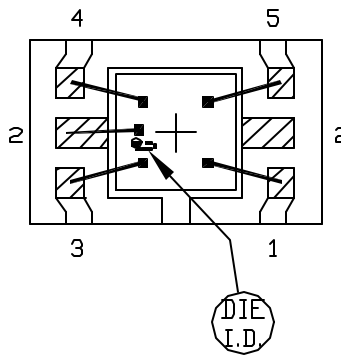
CAV./PAD SIZE:

- -

PKG.
DESIGN

BOND DIAGRAM #:
05-9000-1686

REV:
B



▨ BONDABLE AREA

NOTE: CAVITY DOWN

PKG. CODE: X5-1		SIGNATURES	DATE	 CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: 35x34	PKG. DESIGN			BOND DIAGRAM #: 05-9000-1687	REV: A

