RELIABILITY REPORT

FOR

MAX9509ATA+

PLASTIC ENCAPSULATED DEVICES

December 3, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering

Conclusion

The MAX9509ATA+ 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

Operating from a 1.8V single power supply, the MAX9509/MAX9510 amplify standard-definition video signals and only consume 5.8mW quiescent power and 11.7mW average power. The MAX9509/MAX9510 leverage Maxim's DirectDrive(tm) technology to generate a clean, internal negative supply. Combining the internal negative power supply with the external positive 1.8V supply, the MAX9509/MAX9510 are able to drive a 2VP-P video signal into a 150 load. Besides increasing the output voltage range, Maxim's DirectDrive technology eliminates large output-coupling capacitors and sets the output video black level near ground. DirectDrive requires an integrated charge pump and an internal linear regulator to create a clean negative power supply so that the amplifier can pull the sync below ground. The charge pump injects little noise into the video output, making the picture visibly flawless. The MAX9509/MAX9510 are designed to operate from the 1.8V digital power supply. The high power-supply rejection ratio (49dB at 100kHz) allows the MAX9509/MAX9510 to reject the noise from the digital power supply. The MAX9509 features an internal reconstruction filter that smoothes the steps and reduces the spikes on the video signal from the video digital-to-analog converter (DAC). The reconstruction filter typically has ±1dB passband flatness of 8.1MHz and 46dB attenuation at 27MHz. The large-signal, ±1dB passband flatness of the MAX9510 video amplifier is typically 8.4MHz, and the large signal -3dB frequency is typically 11.4MHz. The input of the MAX9509/MAX9510 can be directly connected to the output of a video DAC. The MAX9509/MAX9510 also feature a transparent input sync-tip clamp, allowing AC-coupling of input signals with different DC biases. The MAX9509/MAX9510 have an internal fixed gain of 8. The input full-scale video signal is nominally 0.25VP-P, and the output full-scale video signal is nominally 2VP-P. The devices operate from a 1.8V or 2.5V single supply and feature a 10nA low-power shutdown mode. The MAX9509 is offered in an 8-pin TDFN package and the MAX9510 is offered in an 8-pin µMAX® package.

II. Manufacturing Information

A. Description/Function:	1.8V, Ultra-Low Power, DirectDrive Video Filter Amplifiers
B. Process:	S4
C. Number of Device Transistors:	
D. Fabrication Location:	California, Texas or Japan
E. Assembly Location:	Malaysia, Thailand
F. Date of Initial Production:	January 20, 2007

III. Packaging Information

A. Package Type:	8-pin TDFN 2x2
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-2543
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Jc:	10.8°C/W
K. Multi Layer Theta Ja:	83.9°C/W
L. Multi Layer Theta Jc:	36.6°C/W

IV. Die Information

A. Dimensions:	31 X 57 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal1 = 0.5 / Metal2 = 0.6 / Metal3 = 0.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 / Metal2 = 0.5 / Metal3 = 0.6 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:	Ken Wendel (Director, Reliability Engineering) 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 are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

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

(where 4340 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$\lambda = 22.4 \times 10^{-9}$

$\lambda = 22.4$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim"s reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at http://www.maxim-ic.com/qa/reliability/monitor. Cumulative monitor data for the S4 Process results in a FIT Rate of 0.05 @ 25C and 0.83 @ 55C (0.8 eV, 60% UCL)

B. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

C. E.S.D. and Latch-Up Testing

The MV06 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500 V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

Table 1

Reliability Evaluation Test Results

MAX9509ATA+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	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)				
HAST	Ta = 130°C RH = 85% Biased Time = 96hrs.	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