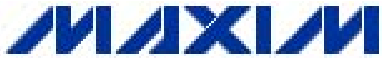

RELIABILITY REPORT

FOR

MAX9877xyz+/Axyz+/Bxyz+

WAFER LEVEL PACKAGE

April 18, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering

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Conclusion

The MAX9877xyz+/Axyz+/Bxyz+ 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 MAX9877 combines a high-efficiency Class D audio power amplifier with a stereo Class AB capacitor-less DirectDrive® headphone amplifier. Maxim's 3rd generation, filterless Class D amplifier with active emissions limiting technology provides Class AB performance with Class D efficiency. The MAX9877 delivers up to 725mW from a 3.7V supply into an 8Ù load with 87% efficiency to extend battery life. The filterless modulation scheme combined with active emissions limiting circuitry and spread-spectrum modulation greatly reduces EMI while eliminating the need for output filtering used in traditional Class D devices. The stereo Class AB headphone amplifier in the MAX9877 uses Maxim's patented DirectDrive architecture, that produces a ground-referenced output from a single supply, eliminating the need for large DC-blocking capacitors, saving cost, space, and component height. The device utilizes a user-defined input architecture, three preamplifier gain settings, an input mixer, volume control, comprehensive click-and-pop suppression, and I²C control. A bypass mode feature disables the integrated Class D amplifier and utilizes an internal DPST switch to allow an external amplifier to drive the speaker that is connected at the outputs of the MAX9877. The MAX9877 is available in a thermally efficient, space-saving 20-bump WLP package.

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II. Manufacturing Information

A. Description/Function:	Industry's Smallest Size, Highest D-Class Output Power and Best-in-Class RF Susceptibility (TDMA Noise Free)
B. Process:	S45Y & S45S
C. Number of Device Transistors:	17571
D. Fabrication Location:	Epson & Texas
E. Assembly Location:	Casio
F. Date of Initial Production:	2008

III. Packaging Information

A. Package Type:	20-Pin WLP
B. Lead Frame:	NA
C. Lead Finish:	NA
D. Die Attach:	NA
E. Bondwire:	SAC (12 mil dia. bump)
F. Mold Material:	NA
G. Flammability Rating:	Class UL94-V0
H. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1

IV. Die Information

A. Dimensions:	104 X 84 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/0.5%Cu
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

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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 pending. 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)

$\lambda = 22.37 \times 10^{-9}$

λ = 22.37 F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at http://www.maxim-ic.com/.

Current monitor data for the S45S Process results in a FIT Rate of 1.02 @ 25C and 12.34 @ 55C (0.8 eV, 60% UCL).

Current monitor data for the S45Y Process results in a FIT Rate of 2.06 @ 25C and 24.97 @ 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 AU88Y 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.

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Table 1
Reliability Evaluation Test Results

MAX9877xyz+/Axyz+/Bxyz+

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)				
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

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