RELIABILITY REPORT

FOR

MAX9705BETB+

PLASTIC ENCAPSULATED DEVICES

March 23, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering

Conclusion

The MAX9705BETB+ 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 MAX9705 3rd-generation, ultra-low EMI, mono, Class D audio power amplifier provides Class AB performance with Class D efficiency. The MAX9705 delivers 2.3W into a 4 load and offers efficiencies above 85%. Active emissions limiting (AEL) circuitry greatly reduces EMI by actively controlling the output FET gate transitions under all possible transient output-voltage conditions. AEL prevents high-frequency emissions resulting from conventional Class D free-wheeling behavior in the presence of an inductive load. Zero dead time (ZDT) technology maintains state-of-the-art efficiency and THD+N performance by allowing the output FETs to switch simultaneously without cross-conduction. A patented spread-spectrum modulation scheme eliminates the need for output filtering found in traditional Class D devices. These design concepts reduce an application's component count and extend battery life. The MAX9705 offers two modulation schemes: a fixed-frequency (FFM) mode and a spread-spectrum (SSM) mode that further reduces EMI-radiated emissions due to the modulation frequency. The MAX9705 oscillator can be synchronized to an external clock through the SYNC input, allowing the switching frequency to be externally defined. The SYNC input also allows multiple MAX9705s to be cascaded and frequency locked, minimizing interference due to clock intermodulation. The device utilizes a fully differential architecture, a full-bridged output, and comprehensive click-and-pop suppression. The gain of the MAX9705 is set internally (MAX9705A: 6dB, MAX9705B: 12dB, MAX9705C: 15.6dB, MAX9705D: 20dB), further reducing external component count. The MAX9705 is available in 10-pin TDFN (3mm x 3mm x 0.8mm) and 12-bump UCSP(tm) (1.5mm x 2mm x 0.6mm) packages. The MAX9705 is specified over the extended -40°C to +85°C temperature range.

II. Manufacturing Information

A. Description/Function:	2.3W, Ultra-Low-EMI, Filterless, Class D Audio Amplifier
B. Process:	C6
C. Number of Device Transistors:	
D. Fabrication Location:	California
E. Assembly Location:	ASAT China, Hana Thailand, UTL Thailand, Unisem Malaysia
F. Date of Initial Production:	October 23, 2004

III. Packaging Information

A. Package Type:	10-pin TDFN 3x3
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Au (1.0 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Ja:	54°C/W
K. Single Layer Theta Jc:	8.5°C/W
L. Multi Layer Theta Ja:	41°C/W
M. Multi Layer Theta Jc:	8.5°C/W

IV. Die Information

A. Dimensions:	70 X 60 mils
B. Passivation:	SiO2/SiN3
C. Interconnect:	Al/Cu
D. Backside Metallization:	None
E. Minimum Metal Width:	0.6um
F. Minimum Metal Spacing:	0.6um
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO2
I. Die Separation Method:	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 f 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 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 C6Y Process results in a FIT Rate of 1.6 @ 25C and 19.9 @ 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 AU45 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1500 V per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

Table 1
Reliability Evaluation Test Results

MAX9705BETB+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = f 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