

RELIABILITY REPORT  
FOR  
MAX9723xETE+  
PLASTIC ENCAPSULATED DEVICES

May 21, 2009

**MAXIM INTEGRATED PRODUCTS**

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## Conclusion

The MAX9723xETE+ 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 MAX9723 stereo DirectDrive headphone amplifier with BassMax and volume control is ideal for portable audio applications where space is at a premium and performance is essential. The MAX9723 operates from a single 1.8V to 3.6V power supply and includes features that reduce external component count, system cost, board space, and improves audio reproduction. The headphone amplifier uses Maxim's patented DirectDrive architecture that produces a ground-referenced output from a single supply, eliminating the need for large DC-blocking capacitors. The headphone amplifiers deliver 62mW into a 16  $\Omega$  load, feature low 0.006% THD+N, and high 90dB PSRR. The MAX9723 features Maxim's industry-leading click-and-pop suppression. The BassMax feature boosts the bass response of the amplifier, improving audio reproduction when using inexpensive headphones. The integrated volume control features 32 discrete volume levels, eliminating the need for an external potentiometer. BassMax and the volume control are enabled through the I<sup>2</sup>C/SMBus(tm)-compatible interface. Shutdown is controlled through either the hardware or software interfaces. The MAX9723 consumes only 3.7mA of supply current at 1.8V, provides short-circuit and thermal-overload protection, and is fully specified over the extended -40°C to +85°C temperature range. The MAX9723 is available in a tiny (2mm x 2mm x 0.62mm) 16-bump chip-scale package (UCSP(tm)) or 16-pin thin QFN (4mm x 4mm x 0.8mm) package.

## II. Manufacturing Information

A. Description/Function:	Stereo DirectDrive® Headphone Amplifier with BassMax, Volume Control, and I <sup>2</sup> C
B. Process:	B6
C. Number of Device Transistors:	
D. Fabrication Location:	California
E. Assembly Location:	ASAT China, UTL Thailand
F. Date of Initial Production:	October 13, 2005

## III. Packaging Information

A. Package Type:	16-pin TQFN 4x4
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-1171
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:	59.3°C/W
K. Single Layer Theta Jc:	5.7°C/W
L. Multi Layer Theta Ja:	40°C/W
M. Multi Layer Theta Jc:	5.7°C/W

## IV. Die Information

A. Dimensions:	81 X 81 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/0.5% Cu
D. Backside Metallization:	None
E. Minimum Metal Width:	0.6 microns (as drawn)
F. Minimum Metal Spacing:	0.6 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO <sub>2</sub>
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 ( $\lambda$ ) is calculated as follows:

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

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

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

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

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 B6 Process results in a FIT Rate of 0.8 @ 25C and 14.2 @ 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 AU36-3 die type has been found to have all pins able to withstand a HBM transient pulse of +/-700 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

**MAX9723xETE+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
<b>Static Life Test</b> (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0
<b>Moisture Testing</b> (Note 2) 85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
<b>Mechanical Stress</b> (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