

RELIABILITY REPORT
FOR
MAX9790AETJ+
PLASTIC ENCAPSULATED DEVICES

April 8, 2011

MAXIM INTEGRATED PRODUCTS

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Approved by
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Quality Assurance
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Conclusion

The MAX9790AETJ+ 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 MAX9789/MAX9790 combine a stereo, 2W Class AB speaker power amplifier with a stereo 100mW DirectDrive® headphone amplifier in a single device. The MAX9789/MAX9790 are designed for use with the Microsoft Windows Vista® operating system and are fully compliant with Microsoft's Windows Vista specifications. The headphone amplifier features Maxim's DirectDrive architecture that produces a ground-referenced output from a single supply to eliminate the need for large DC-blocking capacitors, as well as save cost, board space, and component height. A high +90dB PSRR and low 0.002% THD+N ensures clean, low-distortion amplification of the audio signal. Separate speaker and headphone amplifier control inputs provide independent shutdown of the speaker and headphone amplifiers, allowing speaker and headphone amplifiers to be active simultaneously, if required. The industry-leading click-and-pop suppression circuitry reduces audible transients during startup and shutdown cycles. The MAX9789 features an internal LDO that can be used as a clean power supply for a CODEC or other circuits. The LDO output voltage is set internally at 4.75V or can be adjusted between 1.21V and 4.75V using a simple resistive divider. The LDO is protected against thermal overloads and short circuits while providing 120mA of continuous output current and can be enabled independently of the audio amplifiers. By disabling the speaker and headphone amplifiers, and the LDO (for MAX9789), the MAX9789/MAX9790 enter low-power shutdown mode and draw only 0.3µA. The MAX9789/MAX9790 operate from a single 4.5V to 5.5V supply and feature thermal-overload and output short-circuit protection. Devices are specified over the -40°C to +85°C extended temperature range.

II. Manufacturing Information

A. Description/Function:	Windows Vista-Compliant, Stereo Class AB Speaker Amplifiers and DirectDrive Headphone Amplifiers
B. Process:	C6
C. Number of Device Transistors:	6311
D. Fabrication Location:	California
E. Assembly Location:	Thailand
F. Date of Initial Production:	October 10, 2006

III. Packaging Information

A. Package Type:	32-pin TQFN 5x5
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Non-conductive
E. Bondwire:	Au (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-2347
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:	53.7°C/W
K. Single Layer Theta Jc:	20.0°C/W
L. Multi Layer Theta Ja:	40.2°C/W
M. Multi Layer Theta Jc:	20.0°C/W

IV. Die Information

A. Dimensions:	108 X 122 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
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 ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

- A. Quality Assurance Contacts: Richard Aburano (Manager, Reliability Engineering)
Don Lipps (Manager, Reliability Engineering)
Bryan Preeshl (Vice President 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{1000 \times 4340 \times 235 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 0.9 \times 10^{-9}$$

$$\lambda = 0.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 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 C6 Process results in a FIT Rate of 0.43 @ 25C and 7.50 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (ESD lot SZ02AA142D D/C 0726, Latch-Up lot SZ00BQ001A D/C 0623)

The AU73 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.

Table 1
Reliability Evaluation Test Results

MAX9790AETJ+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C	DC Parameters	80	0	SZ00GA346E, D/C 0807
	Biased	& functionality	77	0	EZ00HQ002D, D/C 0806
	Time = 1000 hrs.		78	0	EZ00HQ001B, D/C 0747

Note 1: Life Test Data may represent plastic DIP qualification lots.