

RELIABILITY REPORT
FOR
MAX9736AETJ+ / MAX9736BETJ+
PLASTIC ENCAPSULATED DEVICES

May 27, 2009

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX9736AETJ+ / MAX9736BETJ+ 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 MAX9736A/B Class D amplifiers provide high-performance, thermally efficient amplifier solutions. The MAX9736A delivers 2 x 15W into 8 loads, or 1 x 30W into a 4 load. The MAX9736B delivers 2 x 6W into 8 loads or 1 x 12W into a 4 load. These devices are pin-for-pin compatible, allowing a single audio design to work across a broad range of platforms, simplifying design efforts, and reducing PCB inventory. Both devices operate from 8V to 28V and provide a high PSRR, eliminating the need for a regulated power supply. The MAX9736 offers up to 88% efficiency at 12V supply.

Pin-selectable modulation schemes select between filterless modulation and classic PWM modulation. Filterless modulation allows the MAX9736 to pass CE EMI limits with 1m cables using only a low-cost ferrite bead and capacitor on each output. Classic PWM modulation is optimized for best audio performance when using a full LC filter. A pin-selectable stereo/mono mode allows stereo operation into 8 loads or mono operation into 4 loads. In mono mode, the right input op amp becomes available as a spare device, allowing flexibility in system design. Comprehensive click-and-pop reduction circuitry minimizes noise coming into and out of shutdown or mute. Input op amps allow the user to create summing amplifiers, lowpass or highpass filters, and select an optimal gain. The MAX9736A/B are available in 32-pin TQFN packages and specified over the -40°C to +85°C temperature range.

II. Manufacturing Information

A. Description/Function:	Mono/Stereo High-Power Class D Amplifier
B. Process:	S4
C. Number of Device Transistors:	16408
D. Fabrication Location:	Texas
E. Assembly Location:	Thailand
F. Date of Initial Production:	January 26, 2008

III. Packaging Information

A. Package Type:	32-pin TQFN 7x7
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:	#05-9000-2805
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:	37°C/W
K. Single Layer Theta Jc:	1°C/W
L. Multi Layer Theta Ja:	27°C/W
M. Multi Layer Theta Jc:	1°C/W

IV. Die Information

A. Dimensions:	91 X 140 mils
B. Passivation:	Si ₃ N 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

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:

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

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

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

$\lambda = 22.4$ 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 S4 Process results in a FIT Rate of 4.6 @ 25C and 79.2 @ 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 AU76-1 and AU76-2 die types has been found to have all pins able to withstand an ESD transient pulse of

HBM: +/-2500 V JEDEC JESD22-A114
CDM +/-750 JEDEC JESD22-C101

Latch-Up testing has shown that this device withstands a current of +/-250 mA.

Table 1
 Reliability Evaluation Test Results
 MAX9736AETJ+ / MAX9736BETJ+

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