

RELIABILITY REPORT
FOR
MAX9708ETN+D
PLASTIC ENCAPSULATED DEVICES

February 1, 2013

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

Approved by
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Conclusion

The MAX9708ETN+D successfully meets the quality and reliability standards required of all Maxim Integrated products. In addition, Maxim Integrated's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim Integrated's quality and reliability standards.

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I. Device Description

A. General

The MAX9708 mono/stereo, Class D audio power amplifier delivers up to 2 x 21W into an 8 Ω stereo mode and 1 x 42W into a 4 Ω load in mono mode while offering up to 87% efficiency. The MAX9708 provides Class AB amplifier performance with the benefits of Class D efficiency, eliminating the need for a bulky heatsink and conserving power. The MAX9708 operates from a single +10V to +18V supply, driving the load in a BTL configuration. The MAX9708 offers two modulation schemes: a fixed-frequency modulation (FFM) mode, and a spread-spectrum modulation (SSM) mode that reduces EMI-radiated emissions. The MAX9708 can be synchronized to an external clock from 600kHz to 1.2MHz. A synchronized output allows multiple units to be cascaded in the system. Features include fully differential inputs, comprehensive click-and-pop suppression, and four selectable-gain settings (22dB, 25dB, 29.5dB, and 36dB). A pin-programmable thermal flag provides seven different thermal warning thresholds. Short-circuit and thermal-overload protection prevent the device from being damaged during a fault condition. The MAX9708 is available in 56-pin TQFN (8mm x 8mm x 0.8mm) and 64-pin TQFP (10mm x 10mm x 1.4mm) packages, and is specified over the extended -40°C to +85°C temperature range.

II. Manufacturing Information

A. Description/Function:	20W/40W, Filterless, Spread-Spectrum, Mono/Stereo, Class D Amplifier
B. Process:	BCD8
C. Number of Device Transistors:	5913
D. Fabrication Location:	Oregon
E. Assembly Location:	China, Thailand
F. Date of Initial Production:	April 23, 2005

III. Packaging Information

A. Package Type:	56-pin TQFN 8x8
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-1547
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 3
J. Single Layer Theta Ja:	35°C/W
K. Single Layer Theta Jc:	0.6°C/W
L. Multi Layer Theta Ja:	21°C/W
M. Multi Layer Theta Jc:	0.6°C/W

IV. Die Information

A. Dimensions:	229 X 229 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:	3.0 microns (as drawn)
F. Minimum Metal Spacing:	3.0 microns (as drawn)
G. Bondpad Dimensions:	
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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{1000 \times 4340 \times 47 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 4.5 \times 10^{-9}$$

$$\lambda = 4.5 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim Integrated's reliability monitor program. Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maximintegrated.com/qa/reliability/monitor>. Cumulative monitor data for the BCD8 Process results in a FIT Rate of 0.06 @ 25C and 1.08 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (ESD lot JXJ0CA030E D/C 1216, Latch-Up lot JXJ0CA033H D/C 1227)

The AU51 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 +/-100mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX9708ETN+D

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C Biased Time = 1000 hrs.	DC Parameters & functionality	47	0	JXJ0CA030E, D/C 1216

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