RELIABILITY REPORT
FOR
MAX9744ETH+
PLASTIC ENCAPSULATED DEVICES

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MAXIM INTEGRATED PRODUCTS
120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering
Conclusion

The MAX9744ETH+ 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

<table>
<thead>
<tr>
<th>I.  Device Description</th>
<th>V.  Quality Assurance Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>II. Manufacturing Information</td>
<td>VI. Reliability Evaluation</td>
</tr>
<tr>
<td>III. Packaging Information</td>
<td>IV. Die Information</td>
</tr>
<tr>
<td></td>
<td>VI. Attachments</td>
</tr>
</tbody>
</table>

I. Device Description

A. General

The MAX9744 20W stereo Class D audio power amplifier provides Class AB amplifier performance with Class D efficiency, conserving board space and eliminating the need for a bulky heatsink. This device features single-supply operation, adjustable gain, shutdown mode, a SYNC output, speaker mute, and industry-leading click-and-pop suppression. The MAX9744 features a 64-step dual-mode (analog or digital), programmable volume control and mute function. The MAX9744 operates from a 4.5V to 14V single supply and can deliver up to 20W per channel into a 4 speaker with a 14V supply. The MAX9744 offers two modulation schemes: a fixed-frequency modulation mode that allows one of several preset switching frequencies to be selected, and a spread-spectrum modulation mode that helps to reduce EMI-radiated emissions. The MAX9744 features high 75dB PSRR, low 0.04% THD+N, and SNR in excess of 90dB. Robust short-circuit and thermal-overload protection prevent device damage during a fault condition. The MAX9744 is available in a 44-pin thin QFN-EP (7mm x 7mm x 0.8mm) package and is specified over the extended -40°C to +85°C temperature range.
II. Manufacturing Information

A. Description/Function: 20W Stereo Class D Speaker Amplifier with Volume Control
B. Process: S4
C. Number of Device Transistors:
D. Fabrication Location: California
E. Assembly Location: ASAT China, UTL Thailand
F. Date of Initial Production: April 23, 2008

III. Packaging Information

A. Package Type: 44-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: #05-9000-2248
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: 177 X 126 mils
B. Passivation: Si₃N₄/SiO₂ (Silicon nitride/ Silicon dioxide
C. Interconnect: Aluminum/Si (Si = 1%)
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: SiO₂
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:

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

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

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

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

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 S4 Process results in a FIT Rate of 0.28 @ 25C and 4.85 @ 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 AU67 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>
<thead>
<tr>
<th>TEST ITEM</th>
<th>TEST CONDITION</th>
<th>FAILURE IDENTIFICATION</th>
<th>SAMPLE SIZE</th>
<th>NUMBER OF FAILURES</th>
</tr>
</thead>
</table>
| 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  
-65°C/150°C  
Cycle  
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