RELIABILITY REPORT

FOR

MAX98502EWE+T

WAFER LEVEL DEVICES

April 26, 2014

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
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Conclusion

The MAX98502EWE+T 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 MAX98502 is a high-efficiency, Class D audio amplifier that features an integrated boost converter to deliver a constant output power over a wide range of battery supply voltages. The boost converter operates at 2MHz, requiring only a small (2.2µH) external inductor and capacitor. The automatic level control has a battery tracking function that reduces the output swing as the supply voltage drops, preventing collapse of battery voltage. The amplifier has differential inputs and an internal fully differential design. The MAX98502 also features three gain settings (6dB, 15.5dB, and 20dB) that are selectable with a logic input. The MAX98502 is available in a small, 0.5mm pitch 16-bump WLP package (2.1mm x 2.1mm). It is specified over the extended -40°C to +85°C temperature range.

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II. Manufacturing Information

- A. Description/Function: Boosted 2.2W Class D Amplifier with Automatic Level Control
- B. Process: S18
- C. Number of Device Transistors: 20072
- D. Fabrication Location: Japan
- E. Assembly Location: Japan
- F. Date of Initial Production: December 20, 2011

III. Packaging Information

- A. Package Type: 16-pin WLP
- B. Lead Frame: N/A
- C. Lead Finish: N/A
- D. Die Attach: None
- E. Bondwire: N/A (N/A mil dia.)
- F. Mold Material: None
- G. Assembly Diagram: #05-9000-4008
- 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: N/A°C/W
- K. Single Layer Theta Jc: N/A°C/W
- L. Multi Layer Theta Ja: 49°C/W
- M. Multi Layer Theta Jc: N/A°C/W

IV. Die Information

- A. Dimensions: 83.07 X 83.07 mils
- B. Passivation: Si_3N_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: 0.23 microns (as drawn)
- F. Minimum Metal Spacing: 0.23 microns (as drawn)
- G. Bondpad Dimensions:
- H. Isolation Dielectric: SiO_2
- I. Die Separation Method: Wafer Saw

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V. Quality Assurance Information

A. Quality Assurance Contacts: 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 45 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 24.4 \times 10^{-9}$

λ = 24.4 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 S18 Process results in a FIT Rate of 0.05 @ 25°C and 0.93 @ 55°C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot EF7YDA004A, D/C 1142)

The AX28-1 die type has been found to have all pins able to withstand an HBM transient pulse of +/-2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-100mA and overvoltage per JEDEC JESD78.

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Table 1
Reliability Evaluation Test Results

MAX98502EWE+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	45	0	SF7ZDQ002C, D/C 1009

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

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