

RELIABILITY REPORT
FOR
MAX98090xEWJ+T / MAX98090xETL+T
WAFER LEVEL PRODUCTS /
PLASTIC ENCAPSULATED DEVICES

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MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

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Conclusion

The MAX98090xEWJ+T / MAX98090xETL+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 MAX98090 is a fully integrated audio codec whose high-performance, ultra-low power consumption and small footprint make it ideal for portable applications. The device features a highly flexible input scheme with six input pins (WLP) that can be configured as analog or digital microphone inputs, differential or single-ended line inputs, or as full-scale direct differential inputs. Analog inputs can be routed to the record path ADC or directly to any analog output mixer. The device accepts master clock frequencies of either $256 \times f_s$ or from 10MHz to 60MHz. The digital audio interface supports master or slave mode operation, sample rates from 8kHz to 96kHz, and standard PCM formats such as I²S, left/right-justified, and TDM.

The record/playback paths feature FlexSound® technology DSP. This includes digital gain and filtering, a biquad filter (record), dynamic range control (playback), and a seven band parametric equalizer (playback) that can improve loudspeaker performance by optimizing the frequency response. The stereo Class D speaker amplifier provides efficient amplification, features low radiated emissions, supports filterless operation, and can drive both 4Ω and 8 Ω loads. The DirectDrive® stereo Class H headphone amplifier provides a ground referenced output eliminating the need for large DC-blocking capacitors. The device also includes a differential receiver (earpiece) amplifier that can be reconfigured as a stereo single-ended line output.

II. Manufacturing Information

A. Description/Function:	Ultra-Low Power Stereo Audio Codec	
B. Process:	S18	
C. Number of Device Transistors:	730513	
D. Fabrication Location:	Japan and Taiwan	China, Taiwan and Thailand
E. Assembly Location:	USA	
F. Date of Initial Production:	February 15, 2013	

III. Packaging Information

A. Package Type:	49-bump WLP 7x7 array	40-pin TQFN 5x5
B. Lead Frame:	N/A	Copper
C. Lead Finish:	N/A	100% matte Tin
D. Die Attach:	None	Conductive
E. Bondwire:	N/A (N/A mil dia.)	Au (1.3 mil dia.)
F. Mold Material:	None	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-4877	# 05-9000-4473
H. Flammability Rating:	Class UL94-V0	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1	Level 1
J. Single Layer Theta Ja:	°C/W	45°C/W
K. Single Layer Theta Jc:	°C/W	2°C/W
L. Multi Layer Theta Ja:	42°C/W	28°C/W
M. Multi Layer Theta Jc:	°C/W	2°C/W

IV. Die Information

A. Dimensions:	127.559X127.559 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:	0.23 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

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:

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

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

$$\lambda = 22.9 \times 10^{-9}$$

$$\lambda = 22.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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

B. E.S.D. and Latch-Up Testing (lot EAJC3Q003B, D/C 1237)

The AX49-0 die type has been found to have all pins able to withstand a transient pulse of:

ESD-HBM:	+/- 2500V per JEDEC JESD22-A114
ESD-MM:	+/- 200V per JEDEC JESD22-A115

Latch-Up testing has shown that this device withstands a current of +/- 250mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX98090xEWJ+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	48	0	EAJC3Q003B, D/C 1237

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