

RELIABILITY REPORT

FOR

MAX98390EWX+
MAX98390EWX+T

September 26, 2019

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134



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Conclusion

The MAX98390 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 MAX98390 is a high-efficiency mono Class-D DSM smart amplifier that features an integrated boost converter, integrated Dynamic Speaker Management™, and FET scaling for higher-efficiency at low output power. The maximum boost converter output voltage is programmable from 6.5V to 10V in 0.125V increments from a battery voltage as low as 2.65V. The boost converter supports bypass mode for lower quiescent current and improved mid-power efficiency as well as envelope tracking which automatically adjusts the output voltage for maximum efficiency. The boosted supply efficiently delivers up to 6.2W at 10% THD+N into a 4Ω load. Integrated IV sense and Dynamic Speaker Management allows louder, fuller audio while protecting the speaker against damage and improving sound quality. The PCM interface supports I2S, left-justified, and 16-channel TDM formats as a slave or master device with I2C control. Either BCLK or MCLK can be used as the internal clock source providing system level flexibility. Thermal and other status data can also be read from the I2C interface. Patented active emissions limiting edge rate and overshoot control circuitry minimizes EMI and eliminates the need for output filtering found in traditional Class-D devices. A flexible brownout-detection engine (BDE) can be programmed to initiate various current limiting, signal limiting, and clip functions to prevent dips in battery voltage. Threshold, hysteresis, and attack-and-release rates are programmable.

II. Manufacturing Information

A. Description/Function:	Boosted Class-D Amplifier with Integrated Dynamic Speaker Management
B. Process:	S90
C. Device Count:	1457120
D. Fabrication Location:	Taiwan
E. Assembly Location:	Taiwan
F. Date of Initial Production:	April 2019

III. Packaging Information

A. Package Type:	36-bump WLP
B. Lead Frame:	N/A
C. Lead Finish:	N/A
D. Die Attach:	N/A
E. Bondwire:	N/A
F. Mold Material:	N/A
G. Assembly Diagram:	05-101038
H. Flammability Rating:	UL-94 (V-0 Rating)
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Ja:	N/A
K. Single Layer Theta Jc:	N/A
L. Multi Layer Theta Ja:	45.72 °C/W
M. Multi Layer Theta Jc:	N/A

IV. Die Information

A. Dimensions:	103.937X96.4567 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂

V. Quality Assurance Information

A. Quality Assurance Contacts:	Norbert Gerena (Engineer, Reliability) Michael Cairnes (Executive Director, Reliability) Bryan Preeshl (SVP 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 125C biased (static) life test are shown in Table 1. Using these results, the Failure Rate λ is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 2454 \times 47 \times 2} \text{ (Chi square value for MTTF upper limit)}$$

(where 2454 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$$\lambda = 41.37 \times 10^{-9}$$

$$\lambda = 41.37 \text{ FITs (60\% confidence level @25°C)}$$

Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <https://www.maximintegrated.com/en/support/qa-reliability/reliability/reliability-monitor-program.html>.

Fab 102 S90 Quarterly Process FIT from Q2CY19

$$\lambda = 2.3 \text{ FITs (60\% confidence level @25°C)}$$

B. E.S.D. and Latch-Up Testing

The MAX98390 has been found to withstand an HBM transient pulse of +/- 2000 V per JEDEC / ESDA JS-001. Latch-Up testing has shown that this device withstands +/- 250 mA current injection and supply overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX98390

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 125C Biased Time = 192 hrs.	DC Parameters & functionality	47	0	

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