

RELIABILITY REPORT
FOR
MAX9879ERV+
WAFER LEVEL PACKAGE

April 30, 2009

MAXIM INTEGRATED PRODUCTS

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Approved by
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Conclusion

The MAX9879ERV+ 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.

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I. Device Description

A. General

The MAX9879 combines a high-efficiency stereo Class D audio power amplifier with a stereo capacitor-less DirectDrive® headphone amplifier. Maxim's filterless class D amplifiers with active emissions limiting technology provide Class AB performance with Class D efficiency. The Class D power amplifier delivers up to 715mW from a 3.7V supply into an 8 Ω load with 88% efficiency to extend battery life. The filterless modulation scheme combined with active emission limiting circuitry and spread-spectrum modulation greatly reduces EMI while eliminating the need for output filtering used in traditional Class D devices. The headphone amplifier delivers up to 58mW from a 3.7V supply into a 16 Ω load. Maxim's patented DirectDrive architecture produces a ground-referenced output from a single supply, eliminating the need for large DC-blocking capacitors, saving cost, space, and component height. The device utilizes a user-defined input architecture, three preamplifier gain settings, an input mixer, volume control, comprehensive click-and-pop suppression, and I²C control. A bypass mode feature disables the integrated Class D amplifier and utilizes an internal DPST switch to allow an external amplifier to drive the speaker that is connected at the outputs of the MAX9879. The MAX9879 is available in a thermally efficient, space-saving 30-bump UCSP(tm) package.

II. Manufacturing Information

A. Description/Function:	Stereo Class D Audio Subsystem with DirectDrive Headphone Amplifier
B. Process:	S4
C. Number of Device Transistors:	20816
D. Fabrication Location:	Texas
E. Assembly Location:	Texas
F. Date of Initial Production:	January 28, 2009

III. Packaging Information

A. Package Type:	30-bump UCSP
B. Lead Frame:	NA
C. Lead Finish:	SnAgCu Balls
D. Die Attach:	Na
E. Bondwire:	NA (NA mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1

IV. Die Information

A. Dimensions:	104 X 124 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/0.5% Cu
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:	SiO ₂
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 (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)

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

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

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 S45S Process results in a FIT Rate of 0.9 @ 25C and 13.84 @ 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 AX13 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500 V per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of +/-250 mA, 1.5x VCCMax Overvoltage per JESD78.

Table 1
Reliability Evaluation Test Results

MAX9879ERV+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
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 Cycle	-65°C/150°C 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