RELIABILITY REPORT

FOR

MAX97220DETE+T

PLASTIC ENCAPSULATED DEVICES

July 7, 2011

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX97220DETE+T 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 MAX97220 is a differential input DirectDrive® line driver/headphone amplifier. This device is capable of driving line level loads with 3V_{RMS} into 1kΩ with a 5V supply and 2V_{RMS} into 600Ω loads from a 3.3V supply. A headphone load is capable of being driven with 125mW into 32Ω with a 5V supply. The IC is offered with an internally fixed 6dB gain or an externally set gain through external resistors. The external gain setting nodes can also be used to configure filters for set-top box applications. The IC has exceptional THD+N over the full audio bandwidth.

Two versions of the IC are available with different turn-on times (t_{ON}). The A and C versions for headphone applications feature a t_{ON} of 5.5ms while the B and D versions, intended for set-top-box applications, feature a 130ms t_{ON}. An on-chip charge pump inverts the power-supply input, creating a negative rail. The output stage of the amplifier is powered between the positive input supply and the output of the charge pump. The bipolar supplies bias the output about ground, eliminating the need for large, distortion-introducing output coupling capacitors. The IC powers on and off without clicks or pops.

The IC is available in a 3mm x 3mm x 0.8mm, 16-pin TQFN and is specified over the extended -40°C to +85°C temperature range.

II. Manufacturing Information

A. Description/Function:	Differential Input DirectDrive Line Drivers/Headphone Amplifiers
B. Process:	S18
C. Number of Device Transistors:	12500
D. Fabrication Location:	California
E. Assembly Location:	Taiwan and Thailand
F. Date of Initial Production:	March 2, 2011

III. Packaging Information

A. Package Type:	16-pin TQFN 3x3
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-4161
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:	64°C/W
K. Single Layer Theta Jc:	7°C/W
L. Multi Layer Theta Ja:	48°C/W
M. Multi Layer Theta Jc:	7°C/W

IV. Die Information

A. Dimensions:	47.24 X 43.31 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.18µm
F. Minimum Metal Spacing:	0.18µm
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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 96 \times 2} \text{ (Chi square value for MTTF upper limit)}$$

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

$\lambda = 11.5 \times 10^{-9}$

λ = 11.5 F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at http://www.maxim-ic.com/qa/reliability/monitor. Cumulative monitor data for the S18 Process results in a FIT Rate of 0.40 @ 25C and 6.96 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot SM9YCQ001N, D/C 1036)

The AX32-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/- 250mA and overvoltage per JEDEC JESD78.

Table 1

Reliability Evaluation Test Results

MAX97220DETE+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C	DC Parameters	48	0	SM9ZCQ001M, D/C 1041
	Biased	& functionality	48	0	SM9ZCQ001N, D/C 1041
	Time = 192 hrs.				

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