RELIABILITY REPORT
FOR
MAX5406EUM+
PLASTIC ENCAPSULATED DEVICES

November 23, 2009

MAXIM INTEGRATED PRODUCTS
120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering

Conclusion

The MAX5406EUM+ 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.

Table of Contents

I. Device Description

A. General

The MAX5406 stereo audio processor provides a complete audio solution with volume, balance, bass, and treble controls. It features dual 32-tap logarithmic potentiometers for volume control, dual potentiometers for balance control, and linear digital potentiometers for tone control. A simple debounced pushbutton interface controls all functions. The MAX5406 advances the wiper setting once per button push. Maxim's proprietary SmartWiper(tm) control eliminates the need for a microcontroller (µC) to increase the wiper transition rate. Holding the control input low for more than 1s advances the wiper at a rate of 4Hz for 4s and 16Hz thereafter. An integrated click/pop suppression feature eliminates the audible noise generated by the wiper's movements. The MAX5406 provides a subwoofer output that internally combines the left and right channels. An external filter capacitor allows for a customized cut-off frequency for the subwoofer output. A bass-boost mode enhances the low-frequency response of the left and right channels. An integrated bias amplifier generates the required (VDD + VSS) / 2 bias voltage, eliminating the need for external op amps for unipolar operation. The MAX5406 also features ambience control to enhance the separation of the left- and right-channel outputs for headphones and desktop speakers systems, and a pseudostereo feature that approximates stereo sound from a monophonic signal. The MAX5406 is available in a 7mm x 7mm, 48-pin TQFN package and in a 48-pin TSSOP package and is specified over the extended (-40°C to +85°C) temperature range.

II. Manufacturing Information

A. Description/Function:	Audio Processor with Pushbutton Interface
B. Process:	B6
C. Number of Device Transistors:	
D. Fabrication Location:	California
E. Assembly Location:	Malaysia, Philippines
F. Date of Initial Production:	April 22, 2006

III. Packaging Information

A. Package Type:	48-pin TSSOP
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:	#05-9000-1623
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 3
J. Multi Layer Theta Ja:	62.4°C/W

IV. Die Information

A. Dimensions:	108 X 179 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:	0.6 microns (as drawn)
F. Minimum Metal Spacing:	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:

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

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

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

λ = 22.4 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 B6 Process results in a FIT Rate of 0.06 @ 25C and 1.04 @ 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 DP26 die type has been found to have all pins able to withstand a HBM transient pulse of +/-500 V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

Table 1

Reliability Evaluation Test Results

MAX5406EUM+

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)				
HAST	Ta = 130°C RH = 85% Biased Time = 96hrs.	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