RELIABILITY REPORT

FOR

MAX4061ETA+

PLASTIC ENCAPSULATED DEVICES

July 10, 2009

## MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

| **Approved by** |
|---|
| Ken Wendel |
| Quality Assurance |
| Director, Reliability Engineering |

**Conclusion**

The MAX4061ETA+ 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 MAX4060/MAX4061/MAX4062 are differential-input microphone preamplifiers optimized for notebook and PDA audio systems. These devices feature adjustable gain with excellent power-supply rejection and common-mode rejection ratios, making them ideal for low-noise applications in portable audio systems. The MAX4060/MAX4062 are capable of switching their output between the differential input and a single-ended auxiliary microphone amplifier input. In addition, the MAX4060/MAX4062 have a low-noise microphone bias generator. The differential gain of the MAX4061/MAX4062 is set with a single resistor. The MAX4060 has a fixed gain of 10V/V and is PC99/2001 compliant. The MAX4061 includes a complete shutdown mode. In shutdown, the supply current is reduced to 0.3µA and the current to the microphone bias is cut off for ultimate power savings. The MAX4060 operates from a 4.5V to 5.5V single supply and the MAX4061/MAX4062 operate from 2.4V to 5.5V. All devices are specified over the extended operating temperature range, -40°C to +85°C. The MAX4060/MAX4061 are available in tiny 8-pin thin QFN (3mm x 3mm x 0.8mm) and 8-pin µMAX® packages. The MAX4062 is available in a 10-pin µMAX package.

## II. Manufacturing Information

| | |
|---|---|
| A. Description/Function: | Differential Microphone Preamplifiers with Internal Bias and Complete Shutdown |
| B. Process: | B8 |
| C. Number of Device Transistors: | |
| D. Fabrication Location: | Oregon |
| E. Assembly Location: | Philippines, Thailand, Malaysia |
| F. Date of Initial Production: | April 27, 2002 |

## III. Packaging Information

| | |
|---|---|
| A. Package Type: | 8-pin TDFN 3x3 |
| B. Lead Frame: | Copper |
| C. Lead Finish: | 100% matte Tin |
| D. Die Attach: | Conductive Epoxy |
| E. Bondwire: | Gold (1 mil dia.) |
| F. Mold Material: | Epoxy with silica filler |
| G. Assembly Diagram: | #05-2501-0224 |
| 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: | 54°C/W |
| K. Single Layer Theta Jc: | 8.3°C/W |
| L. Multi Layer Theta Ja: | 41°C/W |
| M. Multi Layer Theta Jc: | 8.3°C/W |

## IV. Die Information

| | |
|---|---|
| A. Dimensions: | 81 X 28 mils |
| B. Passivation: | $Si_3N_4/SiO_2$ (Silicon nitride/ Silicon dioxide |
| C. Interconnect: | Al/0.5%Cu |
| D. Backside Metallization: | None |
| E. Minimum Metal Width: | 0.8 microns (as drawn) |
| F. Minimum Metal Spacing: | 0.8 microns (as drawn) |
| G. Bondpad Dimensions: | 5 mil. Sq. |
| H. Isolation Dielectric: | $SiO_2$ |
| I. Die Separation Method: | Wafer Saw |

## V. Quality Assurance Information

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|---|---|
| A. Quality Assurance Contacts: | Ken Wendel (Director, Reliability Engineering)<br>Bryan Preeshl (Managing Director of QA) |
| B. Outgoing Inspection Level: | 0.1% for all electrical parameters guaranteed by the Datasheet.<br>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 ($\lambda$) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 90 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 11.9 \times 10^{-9}$

$\lambda$ = 11.9 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 B8 Process results in a FIT Rate of 1.29 @ 25C and 15.6 @ 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 OX94-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/-800 V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-150 mA.

**Table 1**

Reliability Evaluation Test Results

**MAX4061ETA+**

| TEST ITEM | TEST CONDITION | FAILURE IDENTIFICATION | SAMPLE SIZE | NUMBER OF FAILURES |
|---|---|---|---|---|
| **Static Life Test** (Note 1) | | | | |
| | Ta = 135°C<br>Biased<br>Time = 192 hrs. | DC Parameters & functionality | 90 | 0 |
| **Moisture Testing** (Note 2) | | | | |
| 85/85 | Ta = 85°C<br>RH = 85%<br>Biased<br>Time = 1000hrs. | DC Parameters & functionality | 77 | 0 |
| **Mechanical Stress** (Note 2) | | | | |
| Temperature Cycle | -65°C/150°C<br>1000 Cycles<br>Method 1010 | DC Parameters & functionality | 77 | 0 |

Note 1: Life Test Data may represent plastic DIP qualification lots.
Note 2: Generic Package/Process data