RELIABILITY REPORT

FOR

MAX11607EUA+

PLASTIC ENCAPSULATED DEVICES

June 8, 2009

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

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

**Conclusion**

The MAX11607EUA+ 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 MAX11606–MAX11611 low-power, 10-bit, multichannel analog-to-digital converters (ADCs) feature internal track/hold (T/H), voltage reference, clock, and an I²C-compatible 2-wire serial interface. These devices operate from a single supply of 2.7V to 3.6V (MAX11607/MAX11609/MAX11611) or 4.5V to 5.5V (MAX11606/MAX11608/MAX11610) and require only 670µA at the maximum sampling rate of 94.4ksps. Supply current falls below 230µA for sampling rates under 46ksps. AutoShutdown™ powers down the devices between conversions, reducing supply current to less than 1µA at low throughput rates. The MAX11606/MAX11607 have 4 analog input channels each, the MAX11608/MAX11609 have 8 analog input channels each, while the MAX11610/MAX11611 have 12 analog input channels each. The fully differential analog inputs are software configurable for unipolar or bipolar, and single ended or differential operation.

The full-scale analog input range is determined by the internal reference or by an externally applied reference voltage ranging from 1V to $V_{DD}$. The MAX11607/MAX11609/MAX11611 feature a 2.048V internal reference and the MAX11606/MAX11608/MAX11610 feature a 4.096V internal reference.

The MAX11606/MAX11607 are available in an 8-pin µMAX® package. The MAX11608–MAX11611 are available in a 16-pin QSOP package. The MAX11606–MAX11611 are guaranteed over the extended temperature range (-40°C to +85°C). For pin-compatible 12-bit parts, refer to the MAX11612–MAX11617 data sheet. For pin-compatible 8-bit parts, refer to the MAX11600–MAX11605 data sheet.

## II. Manufacturing Information

| | |
|---|---|
| A. Description/Function: | 2.7V to 3.6V and 4.5V to 5.5V, Low-Power, 4-/8-/12-Channel, 2-Wire Serial 12-Bit ADCs |
| B. Process: | C6Y |
| C. Number of Device Transistors: | 12033 |
| D. Fabrication Location: | Japan |
| E. Assembly Location: | UTL Thailand |
| F. Date of Initial Production: | April 25, 2009 |

## III. Packaging Information

| | |
|---|---|
| A. Package Type: | 8-Pin uMAX Pb-Free |
| B. Lead Frame: | Copper Alloy |
| C. Lead Finish: | Matte Sn Plate |
| D. Die Attach: | Non Conductive Epoxy |
| E. Bondwire: | Au (1.0 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 |
| J. Single Layer Theta Ja: | 170°C/W |
| K. Single Layer Theta Jc: | 8°C/W |
| L. Multi Layer Theta Ja: | 170°C/W |
| M. Multi Layer Theta Jc: | 8°C/W |

## IV. Die Information

| | |
|---|---|
| A. Dimensions: | 75 X 88 mils |
| B. Passivation: | SiO2/SiN3 |
| C. Interconnect: | Al/Cu |
| D. Backside Metallization: | None |
| E. Minimum Metal Width: | 0.6um |
| F. Minimum Metal Spacing: | 0.6um |
| G. Bondpad Dimensions: | 5 mil. Sq. |
| H. Isolation Dielectric: | SiO2 |
| I. Die Separation Method: | 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 190 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 5.6 \times 10^{-9}$

$\lambda = 5.6$ 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 C6Y Process results in a FIT Rate of 0.82 @ 25C and 14.21 @ 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 AC30-3 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500 V per JEDEC JESD22-A114. 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

**MAX11607EUA+**

| 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 | 190 | 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