RELIABILITY REPORT
FOR
MAX189ACWE+
PLASTIC ENCAPSULATED DEVICES

March 30, 2011

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

Approved by

| Sokhom Chum | Quality Assurance | Reliability Engineer |
Conclusion

The MAX189ACWE+ 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 II. Manufacturing Information III. Packaging Information IV. Die Information V. Quality Assurance Information VI. Reliability Evaluation

I. Device Description

A. General

The MAX187/MAX189 serial 12-bit analog-to-digital converters (ADCs) operate from a single +5V supply and accept a 0V to 5V analog input. Both parts feature an 8.5µs successive-approximation ADC, a fast track/hold (1.5µs), an on-chip clock, and a high-speed 3-wire serial interface. The MAX187/MAX189 digitize signals at a 75ksps throughput rate. An external clock accesses data from the interface, which communicates without external hardware to most digital signal processors and microcontrollers. The interface is compatible with SPI(tm), QSPI(tm), and MICROWIRE(tm). The MAX187 has an on-chip buffered reference, and the MAX189 requires an external reference. Both the MAX187 and MAX189 save space with 8-pin DIP and 16-pin SO packages. Power consumption is 7.5mW and reduces to only 10µW in shutdown. Excellent AC characteristics and very low power consumption combined with ease of use and small package size make these converters ideal for remote DSP and sensor applications, or for circuits where power consumption and space are crucial.
II. Manufacturing Information

A. Description/Function: +5V, Low-Power, 12-Bit Serial ADCs
B. Process: S3
C. Number of Device Transistors:
D. Fabrication Location: Oregon
E. Assembly Location: Malaysia, Philippines
F. Date of Initial Production: Pre 1997

III. Packaging Information

A. Package Type: 16-pin SOIC (W)
B. Lead Frame: Copper
C. Lead Finish: 100% matte Tin
D. Die Attach: Conductive
E. Bondwire: Au (1.3 mil dia.)
F. Mold Material: Epoxy with silica filler
G. Assembly Diagram: #05-0101-0377
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: 105°C/W
K. Single Layer Theta Jc: 22°C/W
L. Multi Layer Theta Ja: 69.1°C/W
M. Multi Layer Theta Jc: 22°C/W

IV. Die Information

A. Dimensions: 117 X 151 mils
B. Passivation: Si₃N₄/SiO₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect: Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization: None
E. Minimum Metal Width: 3.0 microns (as drawn)
F. Minimum Metal Spacing: 3.0 microns (as drawn)
G. Bondpad Dimensions: 5 mil. Sq.
H. Isolation Dielectric: SiO₂
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 ($\lambda$) is calculated as follows:

   \[
   \lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 370 \times 2} \quad \text{(Chi square value for MTTF upper limit)}
   \]

   (where $4340 = \text{Temperature Acceleration factor assuming an activation energy of 0.8eV}$)

   \[
   \lambda = 3.0 \times 10^{-9}
   \]

   \[
   \lambda = 3.0 \text{ F.I.T. (60% confidence level @ 25°C)}
   \]

   The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at [http://www.maxim-ic.com/qa/reliability/monitor](http://www.maxim-ic.com/qa/reliability/monitor).

   Cumulative monitor data for the S3 Process results in a FIT Rate of $0.04 \@ 25\text{C}$ and $0.69 \@ 55\text{C}$ (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot XTKDD8048Q D/C 9503)

   The AD62-3 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-100mA.
# Table 1
## Reliability Evaluation Test Results

**MAX189ACWE+**

<table>
<thead>
<tr>
<th>TEST ITEM</th>
<th>TEST CONDITION</th>
<th>FAILURE IDENTIFICATION</th>
<th>SAMPLE SIZE</th>
<th>NUMBER OF FAILURES</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Static Life Test</strong> (Note 1)</td>
<td>Ta = 135°C</td>
<td>DC Parameters</td>
<td>130</td>
<td>0</td>
<td>ITKDHQ001C, D/C 9936</td>
</tr>
<tr>
<td></td>
<td>Biased</td>
<td>DC Parameters &amp; functionality</td>
<td>80</td>
<td>0</td>
<td>ITKAIQ002B, D/C 9935</td>
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<tr>
<td></td>
<td>Time = 192 hrs.</td>
<td>DC Parameters</td>
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<td>0</td>
<td>ITKEFQ001A, D/C 9931</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>80</td>
<td>0</td>
<td>NTKFGO060A, D/C 9616</td>
</tr>
</tbody>
</table>

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