RELIABILITY REPORT
FOR
MAX4291EXK
PLASTIC ENCAPSULATED DEVICES

October 15, 2008

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

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering
Conclusion

The MAX4291EXK 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 MAX4291/MAX4292/MAX4294 family of micropower operational amplifiers operates from a 1.8V to 5.5V single supply or ±0.9V to ±2.75V dual supplies and has Rail-to-Rail input/output capabilities. These amplifiers provide a 500kHz gain-bandwidth product and 120dB open-loop voltage gain while using only 100µA of supply current per amplifier. The combination of low input offset voltage (±200µV) and high open-loop gain makes them ideal for low-power/low-voltage, high-precision portable applications. The MAX4291/MAX4292/MAX4294 have an input common-mode range that extends to each supply rail, and their outputs swing to within 46mV of the rails with a 2kΩ load. Although the minimum operating voltage is specified at 1.8V, these devices typically operate down to 1.5V. The combination of ultra-low-voltage operation, rail-to-rail inputs/output, and low-power consumption makes these devices ideal for any portable/two-cell battery-powered system. The single MAX4291 is offered in an ultra-small 5-pin SC70 package. The dual MAX4292 is offered in a space-saving 8-bump, 1.5mm x 1.5mm footprint, ultra chip-scale package (UCSP™).
II. Manufacturing Information

A. Description/Function: Ultra-Small, +1.8V, µPower, Rail-to-Rail I/O Op Amps
B. Process: B8
C. Fabrication Location: California or Texas
D. Assembly Location: Carsem, NSEB, Unisem
E. Date of Initial Production: January 22, 2000

III. Packaging Information

A. Package Type: 5-pin SC70
B. Lead Frame: Alloy42
C. Lead Finish: 85Sn/15Pb plate D.
D. Die Attach: Conductive Epoxy
E. Bondwire: Gold (1 mil dia.)
F. Mold Material: Epoxy with silica filler
G. Assembly Diagram: #05-2501-0011
H. Flammability Rating: Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C
J. Single Layer Theta Ja: 324°C/W
K. Single Layer Theta Jc: 115°C/W
L. Multi Layer Theta Ja: °C/W
M. Multi Layer Theta Jc: °C/W

IV. Die Information

A. Dimensions: 31 X 30 mils
B. Passivation: Si3N4/SiO2 (Silicon nitride/Silicon dioxide
C. Interconnect: Aluminum/Si (Si = 1%)
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: SiO2
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 pending. Using these results, the Failure Rate (\( \lambda \)) is calculated as follows:

   \[
   \lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 68 \times 2} \quad \text{(Chi square value for MTTF upper limit)}
   \]

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

   \[
   \lambda = 15.8 \times 10^{-9}
   \]

   \[
   \lambda = 15.8 \text{ F.I.T. (60% confidence level @ 25°C)}
   \]

   The following failure rate represents data collected from Maxim’s reliability monitor program. Maxim performs quarterly 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 1.53 @ 25C and 26.4 @ 55C, data limited (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 OX41 die type has been found to have all pins able to withstand a HBM transient pulse of 2000V per pin. Latch-Up testing has shown that this device withstands a current of 250mA.
Table 1
Reliability Evaluation Test Results

<table>
<thead>
<tr>
<th>TEST ITEM</th>
<th>TEST CONDITION</th>
<th>FAILURE IDENTIFICATION</th>
<th>SAMPLE SIZE</th>
<th>NUMBER OF FAILURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static Life Test</td>
<td>Ta = 135°C</td>
<td>DC Parameters &amp; functionality</td>
<td>68</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Biased</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time = 192 hrs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moisture Testing</td>
<td>Ta = 85°C Ra = 85% RH = 85% Biased Time = 1000hrs.</td>
<td>DC Parameters &amp; functionality</td>
<td>77</td>
<td>0</td>
</tr>
<tr>
<td>Mechanical Stress</td>
<td>Temperature -65°C/150°C</td>
<td>DC Parameters &amp; functionality</td>
<td>77</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Cycle 1000 Cycles Method 1010</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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