RELIABILITY REPORT
FOR
MAX6029EUK25-T
MAX6029ESA25
MAX6029EUK30-T
MAX6029EUK33-T
MAX6029EUK41-T
MAX6029ESA41
Max6029EUK50
MAX6029-T
("+" Pb-Free versions included)

PLASTIC ENCAPSULATED DEVICES

May 14, 2009

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

Approved by

Ken Wendel

Quality Assurance

Director, Reliability Engineering
Conclusion

The MAX6029 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 MAX6029 micropower, low-dropout bandgap voltage reference combines ultra-low supply current and low drift in a miniature 5-pin SOT23 surface-mount package that uses 70% less board space than comparable devices in an SO package. An initial accuracy of 0.15% and a 30ppm/°C (max) temperature coefficient make the MAX6029 suitable for precision applications. This series-mode voltage reference sources up to 4mA and sinks up to 1mA of load current. A wide 2.5V to 12.6V supply range, ultra-low 5.25µA (max) supply current, and a low 200mV dropout voltage make these devices ideal for battery-operated systems. Additionally, an internal compensation capacitor eliminates the need for an external compensation capacitor and ensures stability with load capacitances up to 10µF. The MAX6029 provides six output voltages of 2.048V, 2.5V, 3V, 3.3V, 4.096V, and 5V. The MAX6029 is available in a 5-pin SOT23 or an 8-pin SO package and is specified over the extended temperature range (-40°C to +85°C).
II. Manufacturing Information

| A. Description/Function: | Ultra-Low-Power Precision Series Voltage Reference |
| B. Process: | S12 |
| C. Number of Device Transistors: | |
| D. Fabrication Location: | California |
| E. Assembly Location: | UTL Thailand |
| F. Date of Initial Production: | 7/2/2003 |

III. Packaging Information

| A. Package Type: | 5-pin SOT23 | 8-pin SO |
| B. Lead Frame: | Copper | Copper |
| C. Lead Finish: | 85Sn/15Pb or Matte Sn Plate | 85Sn/15Pb or Matte Sn Plate |
| D. Die Attach: | Conductive Epoxy | Conductive Epoxy |
| E. Bondwire: | Au (1.0 mil dia.) | Au (1.0 mil dia.) |
| F. Mold Material: | Epoxy with silica filler | Epoxy with silica filler |
| G. Assembly Diagram: | # | # |
| H. Flammability Rating: | Class UL94-V0 | Class UL94-V0 |
| I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C | Level 1 | Level 1 |
| J. Single Layer Theta Ja: | 324.3°C/W | 170 °C/W |
| K. Single Layer Theta Jc: | 82°C/W | 40°C/W |

IV. Die Information

| A. Dimensions: | 55 X 38 mils |
| B. Passivation: | Si3N4/SiO2 (Silicon nitride/ Silicon dioxide) |
| C. Interconnect: | Aluminum/0.5% Cu |
| D. Backside Metallization: | None |
| E. Minimum Metal Width: | 1.2 microns (as drawn) |
| F. Minimum Metal Spacing: | 1.2 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 shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

   \[
   \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 80 \times 2} \quad \text{(Chi square value for MTTF upper limit)}
   \]

   \[
   \lambda = 13.4 \times 10^9 \quad \text{(where 4340 = Temperature Acceleration factor assuming an activation energy of 0.8eV)}
   \]

   \[
   \lambda = 13.4 \text{ F.I.T. (60% confidence level @ 25°C)}
   \]

   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 S12 Process results in a FIT Rate of 0.09 @ 25C and 1.48 @ 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 RF29 die types have been found to have all pins able to withstand a HBM transient pulse of +/-1000 V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250 mA.
<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>
</table>
| **Static Life Test** (Note 1) | Ta = 135°C  
Biased  
Time = 192 hrs. | DC Parameters & functionality | 80          | 0                  |
| **Moisture Testing** (Note 2) | Ta = 85°C  
RH = 85%  
Biased  
Time = 1000hrs. | DC Parameters & functionality | 77          | 0                  |
| **Mechanical Stress** (Note 2) | Temperature -65°C/150°C  
Cycle 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