RELIABILITY REPORT
FOR
MAX2057ETX+
PLASTIC ENCAPSULATED DEVICES

February 6, 2009

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

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering
Conclusion

The MAX2057ETX+ 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 MAX2057 general-purpose, high-performance variable-gain amplifier (VGA) is designed to operate in the 1700MHz to 2500MHz frequency range. This device features 15.5dB of gain, 6dB of noise figure, and an output 1dB compression point of 23.8dBm. The MAX2057 also provides an exceptionally high OIP3 level of 37dBm, which is maintained over the entire attenuation range. In addition, the on-chip analog attenuators yield infinite control and high attenuation accuracy over selectable 21dB or 42dB control ranges. Each of these features makes the MAX2057 an ideal VGA for DCS/PCS, cdma2000®, W-CDMA, and PHS/PAS transmitter and power amplifier AGC circuits. The MAX2057 is pin compatible with the MAX2056 800MHz to 1000MHz VGA, making this family of amplifiers ideal for applications where a common PC board layout is used for both frequency bands. The MAX2057 operates from a single +5V supply and is available in a compact 36-pin thin QFN package (6mm x 6mm x 0.8mm) with an exposed paddle. Electrical performance is guaranteed over the extended -40°C to +85°C temperature range.
II. Manufacturing Information

A. Description/Function: 1700MHz to 2500MHz Variable-Gain Amplifier with Analog Gain Control
B. Process: G4
C. Number of Device Transistors: 
D. Fabrication Location: Oregon
E. Assembly Location: ASAT China, UTL Thailand
F. Date of Initial Production: December 22, 2004

III. Packaging Information

A. Package Type: 36-pin TQFN 6x6
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: #05-9000-1375
H. Flammability Rating: Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C
   J. Single Layer Theta Ja: 38°C/W
   K. Single Layer Theta Jc: 1.4°C/W
   L. Multi Layer Theta Ja: 28°C/W
   M. Multi Layer Theta Jc: 1.4°C/W

IV. Die Information

A. Dimensions: 130 X 130 mils
B. Passivation: Si$_3$N$_4$
C. Interconnect: Au
D. Backside Metallization: None
E. Minimum Metal Width: 1.2 microns (as drawn) Metal 1, 2 & 3 5.6 microns (as drawn) Metal 4
F. Minimum Metal Spacing: 1.6 microns (as drawn) Metal 1, 2 & 3, 4.2 microns (as drawn) Metal 4
G. Bondpad Dimensions: 5 mil. Sq.
H. Isolation Dielectric: SiO$_2$
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:

\[ \lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 48 \times 2} \]  
(Chi square value for MTTF upper limit)

\[ \lambda = 22.4 \times 10^{-9} \]  
(\( \text{MTTF} = \frac{1}{22.4 \times 10^{-9}} \))

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 G4 Process results in a FIT Rate of 0.2 @ 25°C and 3.6 @ 55°C (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 CR27 die type has 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, 1.5x VCCMax Overvoltage per JESD78.
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><strong>Static Life Test</strong></td>
<td>Ta = 135°C</td>
<td>DC Parameters &amp; functionality</td>
<td>48</td>
<td>0</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>
</tbody>
</table>

| **Moisture Testing** | Ta = 85°C            | DC Parameters & functionality | 77          | 0                  |
|                      | RH = 85%             |                         |             |                    |
|                      | Biased               |                         |             |                    |
|                      | Time = 1000hrs.      |                         |             |                    |

| **Mechanical Stress** | Temperature -65°C/150°C | DC Parameters & functionality | 77          | 0                  |
|                      | Cycle 1000 Cycles     |                         |             |                    |
|                      | Method 1010           |                         |             |                    |

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