Process Qualification Report
CMDS pHEMT3 GaAs Process

QUALIFICATION TEST REPORT

Wafer Process: pHEMT3 GaAs
Drawing No.: 102577

CMD240
CMD240C4
CMD240P4
CMD241
CMD241P4
CMD242
CMD243
CMD244
CMD249
CMD249P5
CMD291
CMD292
CMD293
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Introduction

The definition of a qualification family, as defined by EIA/JESD47 Stress Driven Qualification of Integrated Circuits, is all devices that use the same wafer fabrication technology, wafer fabrication process and wafer fabrication site. This qualification report will outline the screening that was performed to satisfy the reliability requirements for a GaAs MMIC amplifier using Custom MMIC’s pHEMT3 GaAs wafer process.

Products Selected

All screening identified as die level was performed on a foundry Standard Evaluation Circuit (SEC). The SEC is a single-stage amplifier, centered at 10GHz, based on a 8x75um cell, 4 mil thick die. All accelerated life testing was performed under RF drive.

All screening identified as package level was performed on the CMD241P4. The CMD241P4 is wideband GaAs MMIC distributed low noise amplifier housed in a leadless 4x4 mm surface mount package. The amplifier operates from 2 to 22 GHz and delivers greater than 13 dB of gain with a corresponding noise figure of 2.3 dB and an output 1 dB compression point of +21 dBm at 11 GHz. The CMD241P4 is a 50 ohm matched design which eliminates the need for external DC blocks and RF port matching.

Please refer to our product datasheets for detailed device information.
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Table 1: Qualification Tests & Results

<table>
<thead>
<tr>
<th>Test</th>
<th>Test Vehicle</th>
<th>Test Conditions</th>
<th>Criteria</th>
<th>Inspection</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage</td>
<td>DIE</td>
<td>275°C, 2000 hours Activation Energy = 1.98eV</td>
<td>MTTF @ 175°C</td>
<td>Electrical</td>
<td>1.15E+7 hours</td>
</tr>
<tr>
<td>Temperature, Humidity, Bias</td>
<td>DIE</td>
<td>1000 hrs at 85°C &amp; 85% RH RF = 10GHz, Vds = 6V Pin = 1dB compression</td>
<td>Pout = ± 1.0dB</td>
<td>Electrical</td>
<td>PASSED</td>
</tr>
<tr>
<td>Thermal Cycling</td>
<td>DIE</td>
<td>-65°C to +150°C, 2 cycles/hr, 500 cycles RF = 10GHz, Vds = 6V Pin = 1dB compression</td>
<td>Pout = ± 1.0dB</td>
<td>Electrical</td>
<td>PASSED</td>
</tr>
<tr>
<td>RF Life Test</td>
<td>DIE</td>
<td>Tj = 200°C, 2000 hours RF = 10GHz, Vds = 6V Pin = 5dB compression</td>
<td>Pout = ± 1.0dB</td>
<td>Electrical</td>
<td>PASSED</td>
</tr>
<tr>
<td>HTRB</td>
<td>DIE</td>
<td>175°C case temperature, Vds = 6V 2000 hours</td>
<td>≤ 20% drift on DC electrical parameters</td>
<td>Electrical</td>
<td>PASSED</td>
</tr>
<tr>
<td>HTOL</td>
<td>DIE</td>
<td>RF = 10GHz, Vds = 6V, Pin = 1dB compression, Tj = 175°C Activation Energy = 1.75eV</td>
<td>Median Time to Failure (T50%)</td>
<td>Electrical</td>
<td>3.4E+7 hours</td>
</tr>
<tr>
<td>ESD Classification</td>
<td>4mm QFN</td>
<td>Class 1A per MIL-STD-883, Method 3015, 499Volts.</td>
<td>Datasheet Parameters</td>
<td>Electrical</td>
<td>PASSED</td>
</tr>
<tr>
<td>Moisture Sensitivity</td>
<td>4mm QFN</td>
<td>24 hour bake @ 125°C Moisture soak: 168 hrs at 85°C &amp; 85% RH 3X Reflow at 235°C</td>
<td>Per J-STD-020E, MSL1</td>
<td>CSAM, Electrical</td>
<td>PASSED</td>
</tr>
</tbody>
</table>

Conclusions

- A failure rate of 18 FIT is calculated at a junction temperature of 175°C and a confidence level of 60% confidence.
- A failure rate of less than 1 FIT is calculated at a junction temperature of 125°C and a confidence level of 60% confidence.
- All material passed the criteria specified in the above Table 1. The conclusion of this reliability screening is that our pHEMT3 GaAs wafer process is qualified to the specified environmental tests.