QUALIFICATION TEST REPORT

Wafer Process: PHEMT-H
Lot Number: MN67
Package Type: LP4E

QTR: 11012
Rev: 01

HMC797LP5	Amplifier
HMC863LP4	Amplifier
HMC864	Amplifier
HMC906	Amplifier
HMC907LP5	Amplifier
HMC930	Amplifier
HMC943LP5	Amplifier
HMC968	Amplifier
HMC969	Amplifier
HMC994	Amplifier
HMC998	Amplifier

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RoHS✓ EARTH FRIENDLY

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Introduction

This Reliability test is designed to satisfy the reliability requirements designated by Hittite Microwave Corporation for Hittite's PHEMT-H process. The testing is devised to simulate exposure to environments the product may experience during assembly, test, and life in the end user application. The pass/fail criteria are dependent upon DC and critical RF parameters determined by the appropriate catalog specifications. A complete data sheet for the HMC863LP4E can be found at www.hittite.com.

General Description of Qualification Vehicle

The HMC863LP4E is a three stage GaAs pHEMT MMIC ½ Watt Power Amplifier which operates between 22 and 26.5 GHz. The HMC863LP4E provides 21.5 dB of gain, +27.5 dBm of saturated output power and 15% PAE from a +6V supply. High output IP3 makes the HMC863LP4E ideal for point-to-point and point-to-multi-point radio systems as well as VSAT applications. The RF I/Os are DC blocked and matched to 50 Ohms for ease of integration into higher-level assemblies. The HMC863LP4E can also be operated from a 5V supply with only a slight decrease in output power & IP3.

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Sample Selection: All devices used were from finished goods and met acceptance test requirements.

Reliability Tests:

Initial Characteristics – 71 Devices were electrically tested at room temperature for DC and critical RF parameters.

High Temperature Operating Life (HTOL) – 71 Devices were subjected to 1000 hours of accelerated operating life test. The devices were biased at 6V, 310mA per unit (1.86W) on product evaluation boards in a 125°C ambient oven temp. Figures 1 through 3 show the evaluation board used for the HTOL testing.

Post Stress Electrical Test – 71 Post 1000 hour HTOL devices were electrically tested at room temperature for DC and critical RF parameters.

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HMC863LP4E Evaluation Test Board

Figure 1: Eval Board Top View

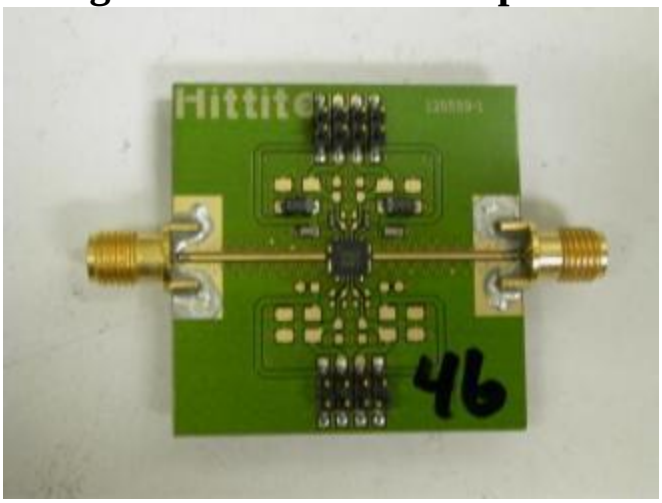


Figure 2: Eval Board Bottom View

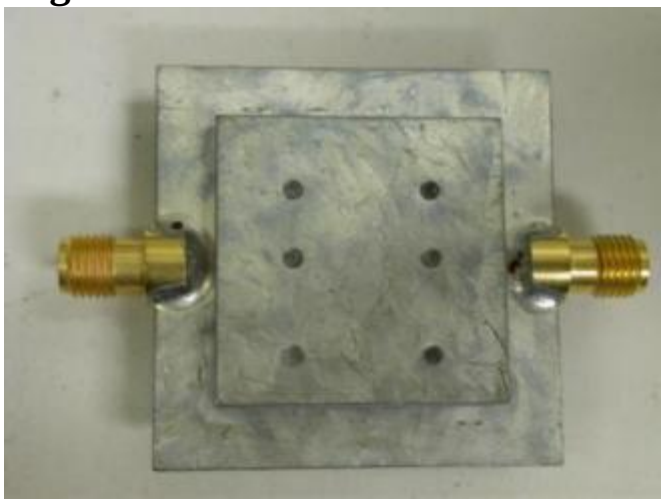
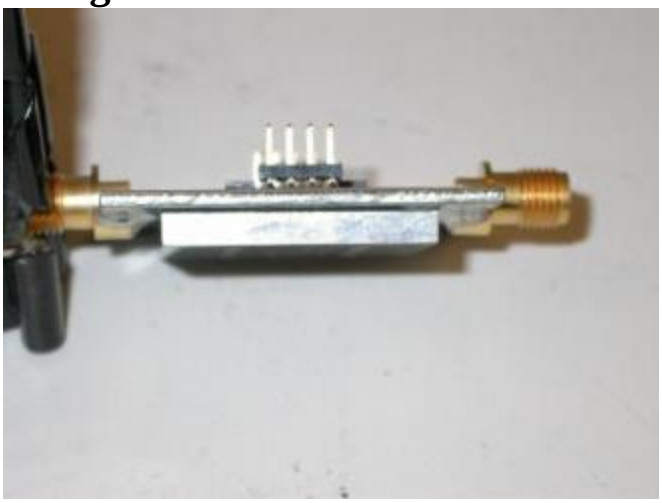


Figure 3: Eval Board Side View



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Summary of Results/Conclusions

All testing is complete. The device meets the requirements for Hittite Reliability Testing.

TEST	QTY IN	QTY OUT	PASS/FAIL	NOTES
Initial Electrical Characterization	71	71	Pass	
1000 hour of RF HTOL	71	71	Completed	
Post HTOL Electrical Test	71	71	Pass	

Calculations based on the thermally modeled HTOL die junction temperature of 242°C and using 150°C as the device maximum use temperature, resulted in a failure rate (FIT) of 8 FIT or a MTTF of 1.3×10^8 hours (14,881 years) at a 90% confidence level (CL). See Appendix for FIT / MTTF calculations.

Appendix

FIT / MTTF Calculation

Stress conditions:

Qty of Parts Tested = 71
Stress Die Junction Temp = 242°C
Max Use Die Junction Temp = 150°C
Activation Energy = 1.7eV

Acceleration Factor (AF): $$AF = \exp\left[\left(\frac{E_A}{k}\right)\cdot\left(\left(\frac{1}{T_{USE}}\right)-\left(\frac{1}{T_{STRESS}}\right)\right)\right]$$, AF=4222.4

Calculating the Upper Confidence Bound Failure Rate at 90% CL:

$$\lambda_{CL} = \frac{\chi^2_{\%CL,2f+2}\cdot 10^9}{2\cdot t\cdot ss\cdot AF}$$, at 90% CL

$\lambda_{90\%}$ = ——————— 8 FIT, or $1.3\text{x}10^8$ hours at the die maximum use temp of 150°C