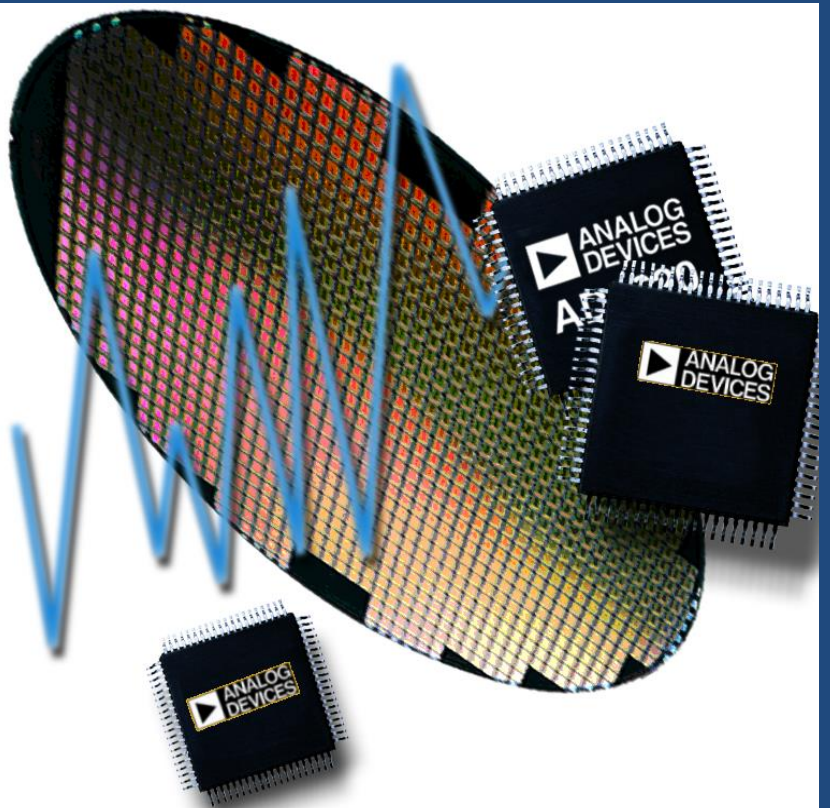


# Analog Devices Welcomes Hittite Microwave Corporation

NO CONTENT ON THE ATTACHED DOCUMENT HAS CHANGED





# ***Reliability Report***

<b>Report Title:</b>	<b>Qualification Test Report</b>
<b>Report Type:</b>	<b>See Attached</b>
<b>Date:</b>	<b>See Attached</b>

# QUALIFICATION TEST REPORT

**Package Type:** LM1

**Package Style:** 8 Lead Plastic LM1 Package

**QTR:** 10003

**Rev:** 02

HMC261LM1

HMC268LM1

HMC283LM1

HMC441LM1

HMC442LM1



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- *Advance in state-of-the-art technology that supports our products*
- *Enhance our competitive position with superior product standards*

**Hittite's employees recognize the responsibility to:**

- *Take the initiative to ensure product quality*
- *Create an environment where the highest standards are maintained*
- *Continue to improve quality practices*

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## 1.0 Introduction

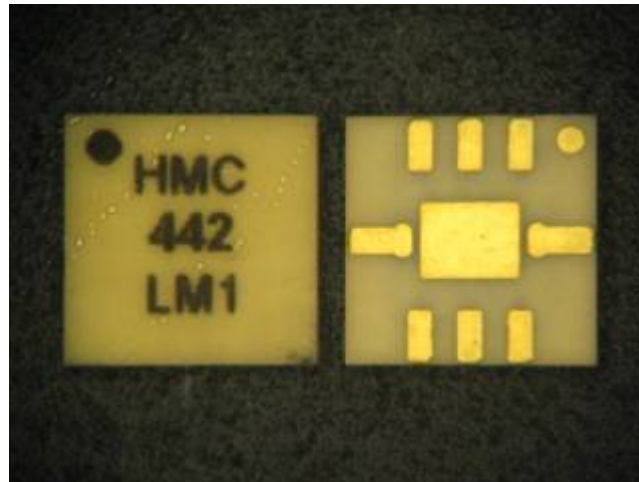
This qualification procedure is designed to satisfy the package reliability requirements for the 8 lead LM1 surface mount, plastic, non-hermetic air cavity package assembled at HEI in Minnesota, USA. The device is electrically tested before and after stress to the appropriate catalog specifications. The HMC442LM1 was selected to qualify the LM1 surface mount, plastic, non-hermetic air cavity family of packages.

## 1.1 General Description

The 8L LM1 package uses a plastic laminate base and copper trace metalization with gold over nickel plating. The MMIC device is attached to the die attach pad using conductive epoxy. The device interconnection is performed using gold wire bonds. The lid is a plastic cavity design that is epoxy attached to the base laminate.

The HMC442LM1 is a broadband 17.5 to 24 GHz GaAs PHEMT MMIC Medium Power Amplifier in a SMT leadless chip carrier package. The LM1 is a true surface mount broadband millimeterwave package offering low loss & excellent I/O match, preserving MMIC chip performance. The amplifier provides 14 dB of gain and +23 dBm of saturated power at 27% PAE from a +5V supply voltage. This 50 Ohm matched amplifier has integrated DC blocks on RF in and out and makes an ideal linear gain block, transmit chain driver or LO driver for HMC SMT mixers.

**Figure 1: Typical 8L LM1 Package**



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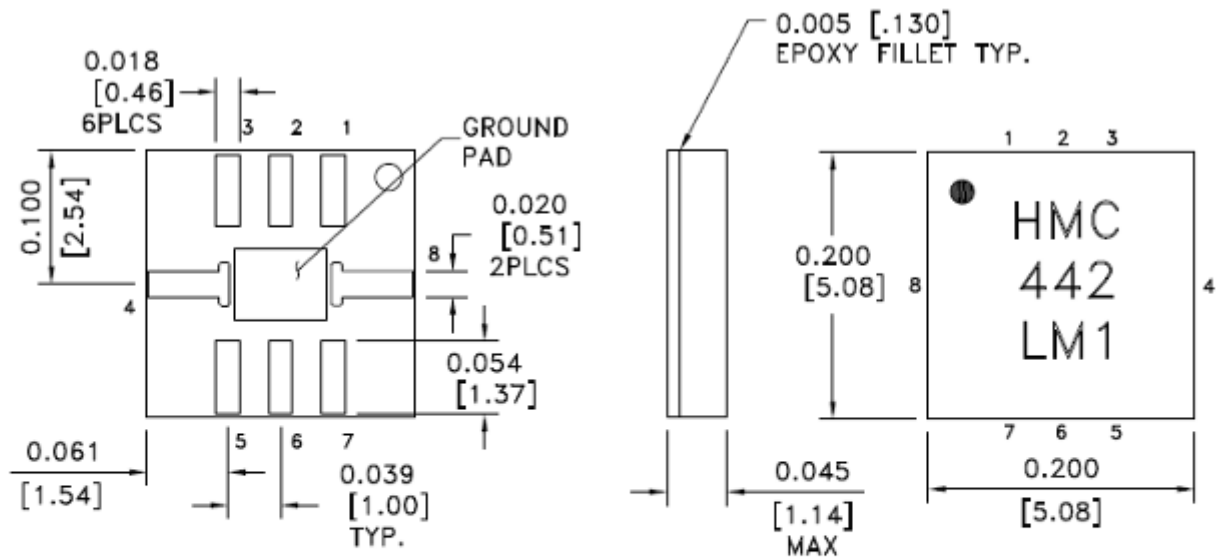
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Figure 2: 8 Lead LM1 Package Outline Drawing



NOTES:

1. MATERIAL: PLASTIC
2. PLATING: GOLD OVER NICKEL
3. DIMENSIONS ARE IN INCHES [MILLIMETERS].
4. ALL TOLERANCES ARE  $\pm 0.005$  [ $\pm 0.13$ ].
5. ALL GROUNDS MUST BE SOLDERED TO PCB RF GROUND.
6. • INDICATES PIN 1.

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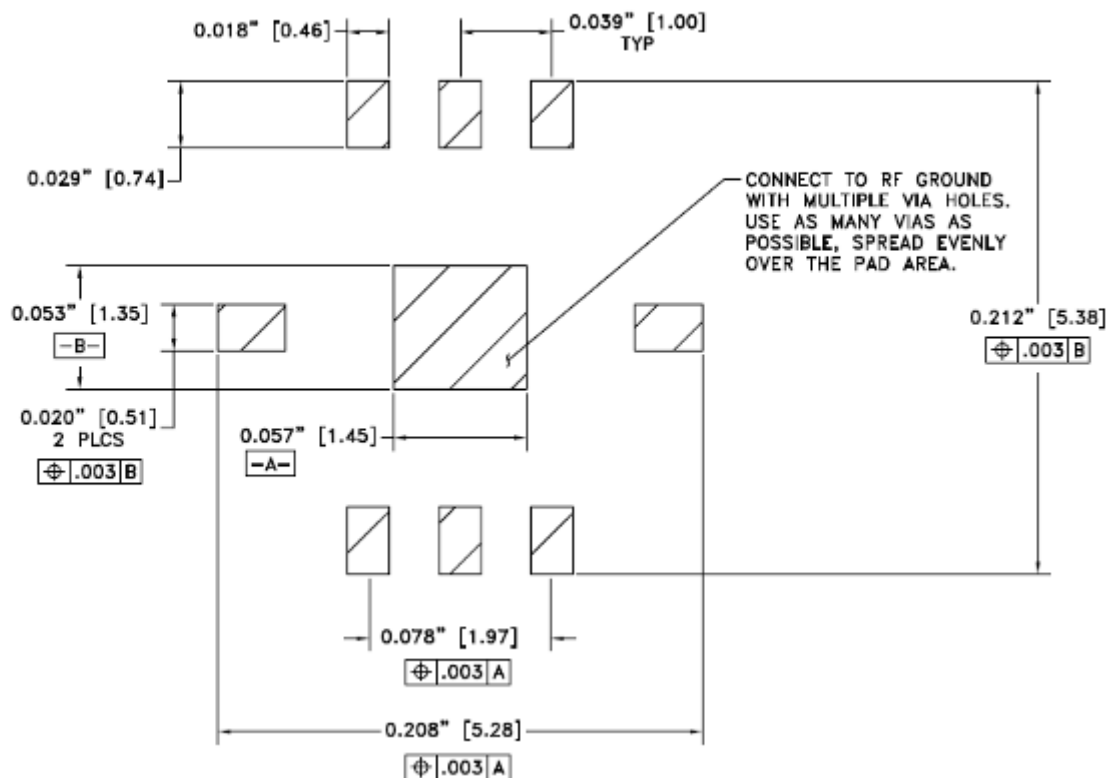
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Figure 3: 8L LM1 Suggested PCB Land Pattern

Suggested LM1 PCB Land Pattern Tolerance:  $\pm 0.003"$  ( $\pm 0.08$  mm)



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## 2.0 Summary of Results

PARA	TEST	QTY IN	QTY OUT	PASS/FAIL	NOTES
3.1.1	Initial Electrical Test	73	73	Pass/No Failures	
3.1.2	MSL1 235°C Reflow Preconditioning (3 Passes)	73	73	Complete	
3.1.3	Temperature Cycling	73	73	Complete	
3.1.4	Post Temperature Cycle Electrical Test	73	73	Pass/No Relevant Failures	
3.1.5	Physical Dimensions	15	15	Pass/No Failures	Note: The lead length dimension for pins 1-3 and 5-7 is shorter than our current drawing. Outline drawing was ECN'd to accommodate the package.
3.1.6	Solderability	15	15	Pass/No Failures	

*All testing has been completed. There were no relevant failures.*

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20 Alpha Road, Chelmsford, MA 01824  
Ph: 978.250.3343 Fax: 978.250.3373  
www.hittite.com



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## 3.0 Test Procedures

### 3.1 Package Environmental Tests

These tests are designed to demonstrate that the 8 lead LM1 surface mount, plastic, non-hermetic air cavity package assembled at HEI are capable of maintaining the specified parameters throughout their useful life under rated operating conditions. The HMC442LM1 was selected to qualify the LM1 surface mount, plastic, non-hermetic air cavity family of packages. The results of these tests qualify by similarity all other product using the same package.

**3.1.1 Initial Characteristics** - 73 HMC442LM1 devices were electrically tested for DC and critical RF parameters. These tests are performed at ambient temperature (+25°C). This test was performed at Hittite. There were no failures in this test.

**3.1.2 MSL1 235°C Reflow Preconditioning** – 73 devices from 3.1.1 were subjected to 192 hours at 85°C/ 85% RH then a reflow simulation at a peak temperature of 235°C for 3 passes (see Figure 4 for profile).

**3.1.3 Temperature Cycle** - 73 devices from 3.1.2 were subjected to 500 cycles of non-operating temperature cycling from -65°C to 150°C. This test is performed at Hittite.

**3.1.4 Final Electrical Test** - 73 devices from 3.1.3 were electrically tested at ambient temperature to DC and critical RF parameters. Any out of specification parameter is considered a failure. This test was performed at Hittite. There were no relevant failures in this test.

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## 3.2 Package Mechanical Tests

**3.2.1 Physical Dimensions** - 15 devices were measured to the requirement of the data sheet package outline drawing. These devices need not be electrically functional. Note: The lead length dimension for pins 1-3 and 5-7 is shorter than our current drawing. Outline drawing was ECN'd to accommodate this package.

**3.2.1 Solderability** - 15 devices were subjected to the steam aging and solderability test in accordance with MIL-STD-883 Method 2003. These devices need not be electrically functional. This test was performed at Hittite. There were no failures.

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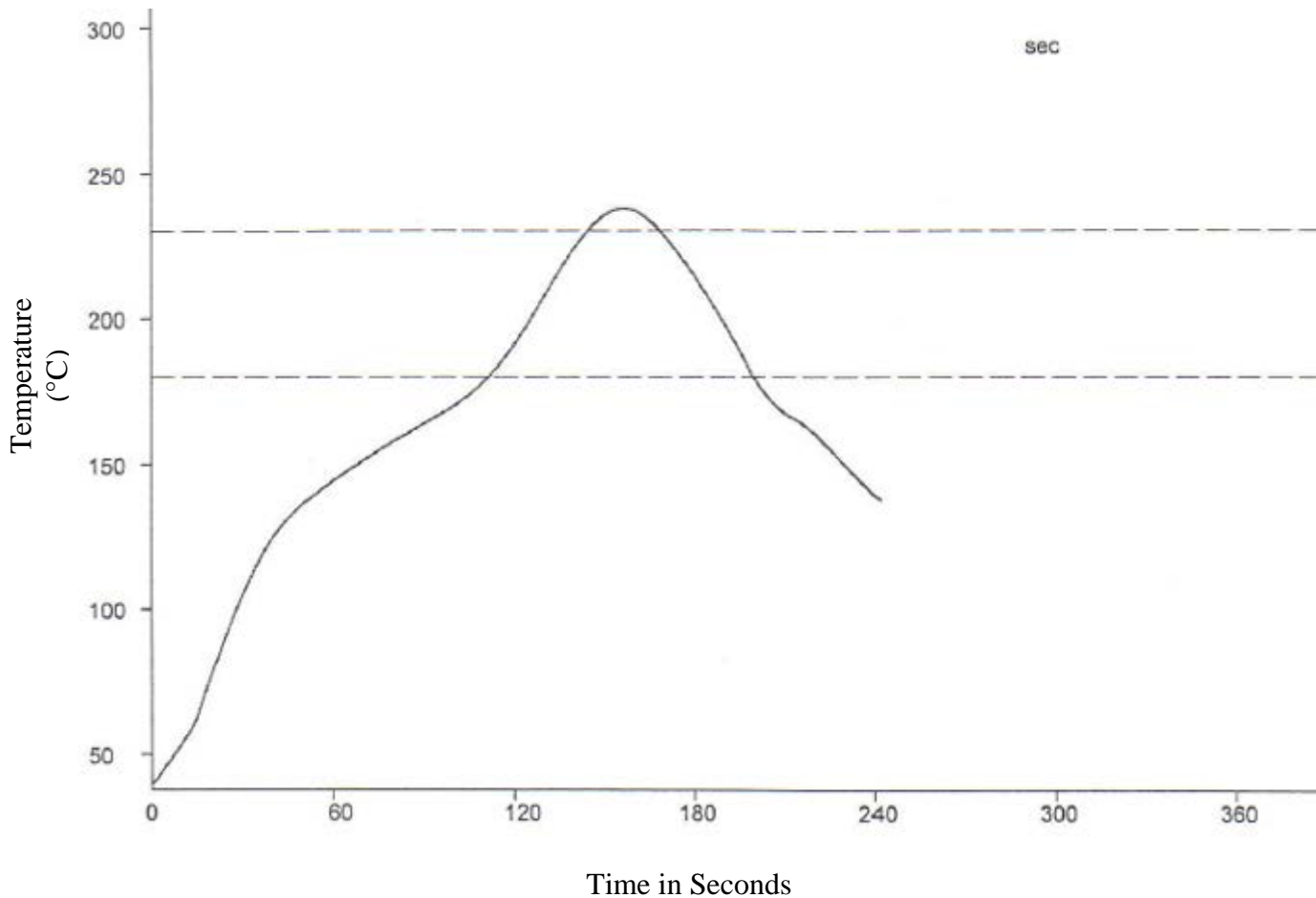
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Figure 4: 235°C Reflow Profile



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