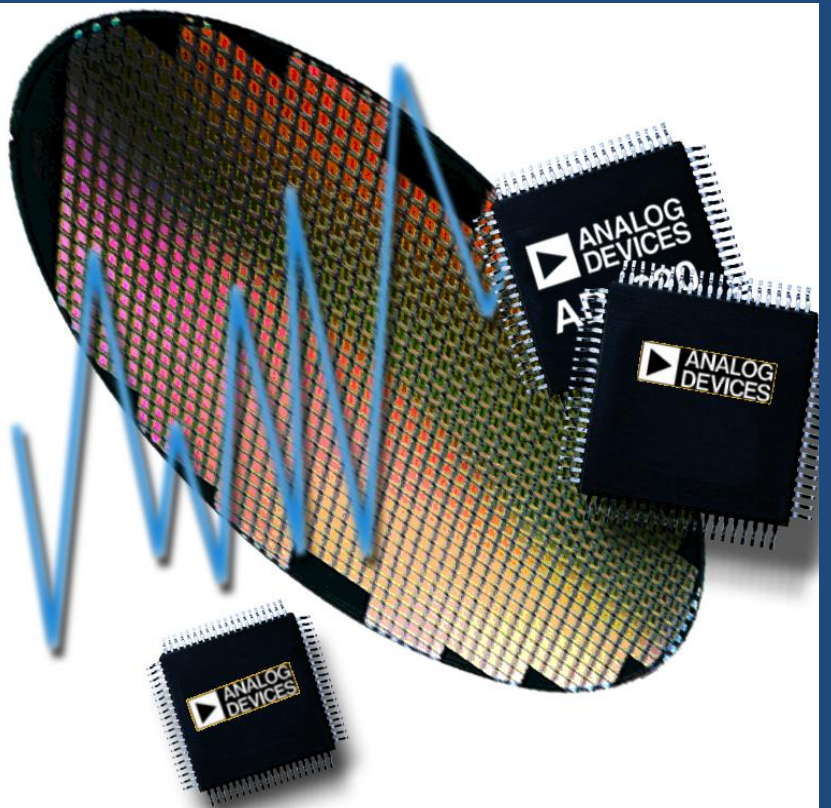


# Analog Devices Welcomes Hittite Microwave Corporation

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>

# Package Qualification Report

**QTR: 2014-00384**

**Rev: 01**

**Package: LC5, LC5A**

HMC460LC5	HMC644LC5	HMC856LC5
HMC516LC5	HMC659LC5	HMC857LC5
HMC565LC5	HMC709LC5	HMC869LC5
HMC567LC5	HMC710LC5	HMC870LC5
HMC568LC5	HMC711LC5	HMC871LC5
HMC569LC5	HMC775LC5	HMC904LC5
HMC570LC5	HMC815LC5	HMC908LC5
HMC571LC5	HMC819LC5	HMC924LC5
HMC572LC5	HMC847LC5	HMC925LC5
HMC606LC5	HMC848LC5	HMC958LC5
HMC635LC5	HMC853LC5	HMC6146BLC5A
HMC642LC5	HMC854LC5	HMC6147ALC5A
HMC643LC5	HMC855LC5	HMC6787ALC5A

## Hittite Microwave Corporation is committed to:

- *Supplying products of the highest quality*
- *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:

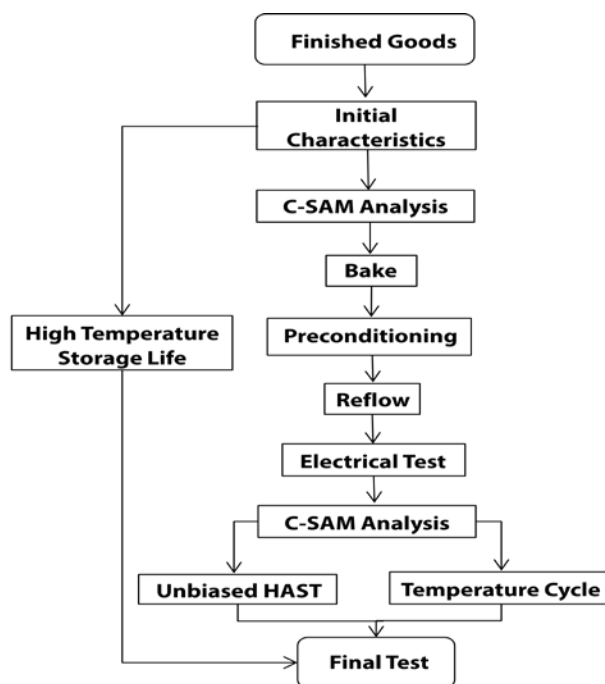
- *Take the initiative to ensure product quality*
- *Create an environment where the highest standards are maintained*
- *Continue to improve quality practices*

## Introduction

The Reliability tests summarized in this report are designed to satisfy the reliability requirements designated by Hittite Microwave Corporation. The testing was 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 devices tested can be found at [www.hittite.com](http://www.hittite.com).

The Package Reliability Plan is as follows:

## Package Reliability



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## Glossary of Terms & Definitions:

- 1. HTOL:** High Temperature Operating Life. This test is used to determine the effects of bias conditions and temperature on semiconductor devices over time. It simulates the devices' operating condition in an accelerated way, through high temperature and/or bias voltage, and is primarily for device qualification and reliability monitoring. This test was performed in accordance with JEDEC JESD22-A108.
- 2. HTSL:** High Temperature Storage Life. Devices are subjected to 1000 hours at 150°C. This test is performed in accordance with JEDEC JESD22-A103.
- 3. MSL Preconditioning:** Moisture sensitivity level pre-conditioning is performed in accordance with JEDEC JESD22-A113, lead free, 260°C peak temperature (see Appendix 1 for reflow profile).
- 4. Physical Dimensions:** Devices are inspected to the current package outline drawing to ensure all package dimensions are within specification (see Appendix 2 for applicable outline drawings).
- 5. Solderability:** Devices are subjected to 8 hours of steam age and Method 1 Dip and Look testing in accordance with JEDEC JESD22-B102.
- 6. Temperature Cycle:** Devices are subjected to 500 non-operating temperature cycling from -65°C to 150°C in accordance with JEDEC JESD22-A104.
- 7. UHAST:** Unbiased Highly Accelerated Stress Test. Devices are subjected to 96 hours of 85% relative humidity at a temperature of 130°C and pressure (18.6 PSIG). This test was performed in accordance with JEDEC JESD22-A118.
- 8. X-Ray Analysis:** Devices are inspected to the current assembly drawing to ensure devices are assembled correctly and are free of any assembly anomalies.

## Qualification Sample Selection:

All qualification devices used were manufactured and tested on standard production processes and met pre-stress acceptance test requirements.

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# Package Qualification Report

**QTR: 2014-00384**

**Rev: 01**

**Package: LC5, LC5A**

## Summary of Qualification Tests:

### HMC6505LC5 (QTR2012-00267)

TEST	QTY IN	QTY OUT	PASS / FAIL	NOTES
Initial Electrical	351	351	Complete	
HTOL, 1000 hours	80	80	Complete	
Post HTOL Electrical Test	80	80	Pass	
HTSL, 1000 hours	80	80	Complete	
Post HTSL Electrical Test	80	80	Pass	
MSL3 Preconditioning	160	160	Complete	
MSL3 Preconditioning Final Test	160	160	Pass	
UHAST (Preconditioned)	80	80	Complete	
UHAST Final Test	80	80	Pass	
Temperature Cycle (Preconditioned)	80	80	Complete	
Temperature Cycle Final Test	80	80	Pass	
Solderability	6	6	Pass	
Physical Dimensions	15	15	Pass	
X-Ray	10	10	Pass	

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# Package Qualification Report

**QTR: 2014-00384**

**Rev: 01**

**Package: LC5, LC5A**

## HMC869LC5 (QTR2012-00319)

TEST	QTY IN	QTY OUT	PASS / FAIL	NOTES
Initial Electrical	347	347	Complete	
HTOL, 1000 hours	80	80	Complete	
Post HTOL Electrical Test	80	80	Pass	
HTSL, 1000 hours	80	80	Complete	
Post HTSL Electrical Test	80	80	Pass	
MSL3 Preconditioning	160	160	Complete	
MSL3 Preconditioning Final Test	160	160	Pass	
UHAST (Preconditioned)	80	80	Complete	
UHAST Final Test	80	80	Pass	
Temperature Cycle (Preconditioned)	80	80	Complete	
Temperature Cycle Final Test	80	80	Pass	
Solderability	6	6	Pass	
Physical Dimensions	15	15	Pass	
X-Ray	6	6	Pass	

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# Package Qualification Report

**QTR: 2014-00384**

**Rev: 01**

**Package: LC5, LC5A**

## HMC815LC5 (QTR2013-00021)

TEST	QTY IN	QTY OUT	PASS / FAIL	NOTES
Initial Electrical	175	175	Complete	
HTSL, 1000 hours	80	80	Complete	
Post HTSL Electrical Test	80	80	Pass	
MSL3 Preconditioning	80	80	Complete	
MSL3 Preconditioning Final Test	80	80	Pass	
Temperature Cycle (Preconditioned)	80	80	Complete	
Temperature Cycle Final Test	80	80	Pass	
Physical Dimensions	15	15	Pass	

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# Package Qualification Report

**QTR: 2014-00384**

**Rev: 01**

**Package: LC5, LC5A**

## Cumulative Summary of All LC5 Package Tests

TEST	Total Units Tested	Total Units Passed	Total Units Failed	Comments
HTOL, 1000 hours	160	160	0	
HTSL, 1000 hours	240	240	0	
UHAST (Preconditioned)	160	160	0	
Temperature Cycle (Preconditioned)	240	240	0	
Solderability	12	12	0	
Physical Dimensions	45	45	0	
X-Ray	16	16	0	

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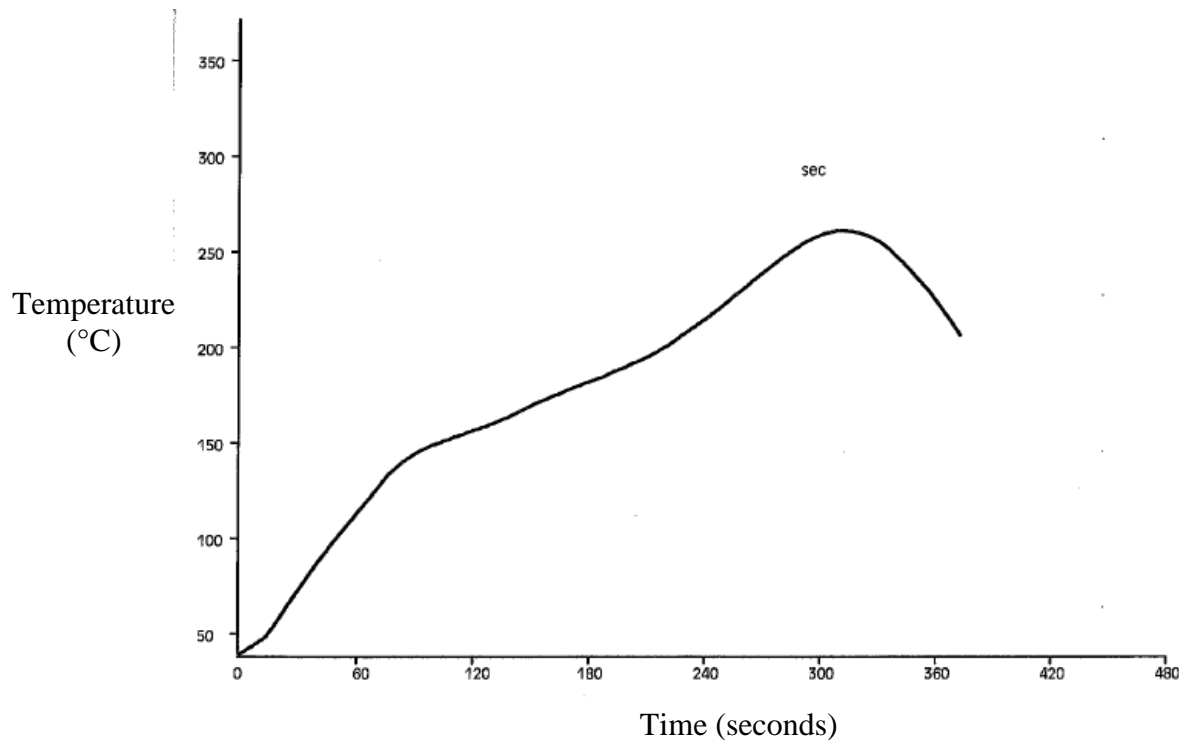
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## Appendix 1

### Reflow Profile for MSL Preconditioning



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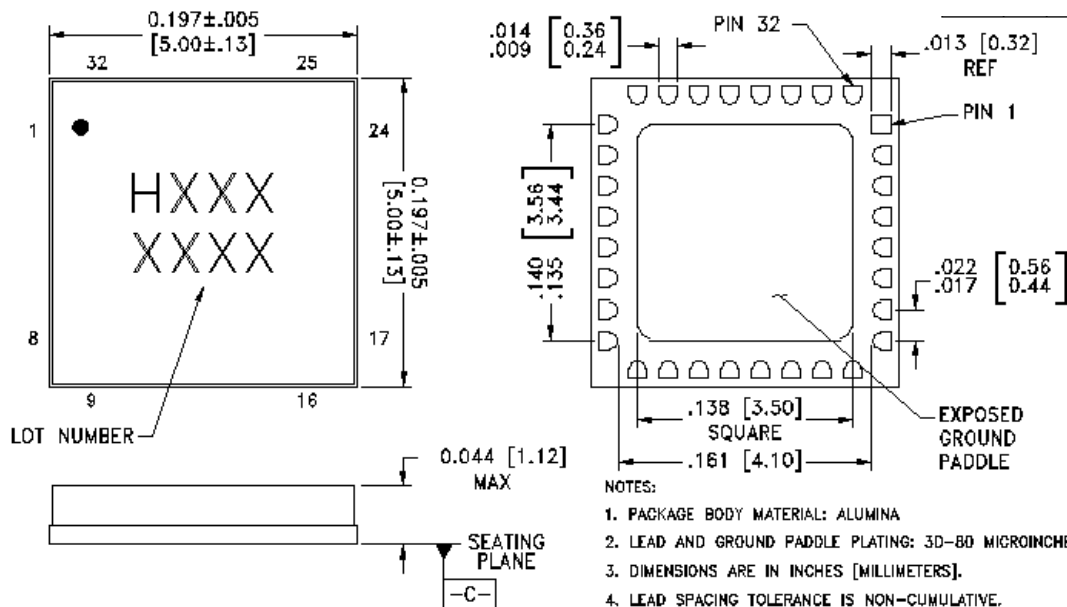
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## Appendix 2

### LC5 Outline

#### BOTTOM VIEW



#### NOTES:

1. PACKAGE BODY MATERIAL: ALUMINA
2. LEAD AND GROUND PADDLE PLATING: 30-80 MICROINCHES GOLD OVER 50 MICROINCHES MINIMUM NICKEL.
3. DIMENSIONS ARE IN INCHES [MILLIMETERS].
4. LEAD SPACING TOLERANCE IS NON-CUMULATIVE.
5. CHARACTERS TO BE BLACK INK MARKED WITH .018" MIN to .050" MAX HEIGHT REQUIREMENTS. UTILIZE MAXIMUM CHARACTER HEIGHT BASED ON LID DIMENSIONS AND BEST FIT. LOCATE APPROX. AS SHOWN.
6. PACKAGE WARP SHALL NOT EXCEED 0.05mm DATUM  $\square-C$
7. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.

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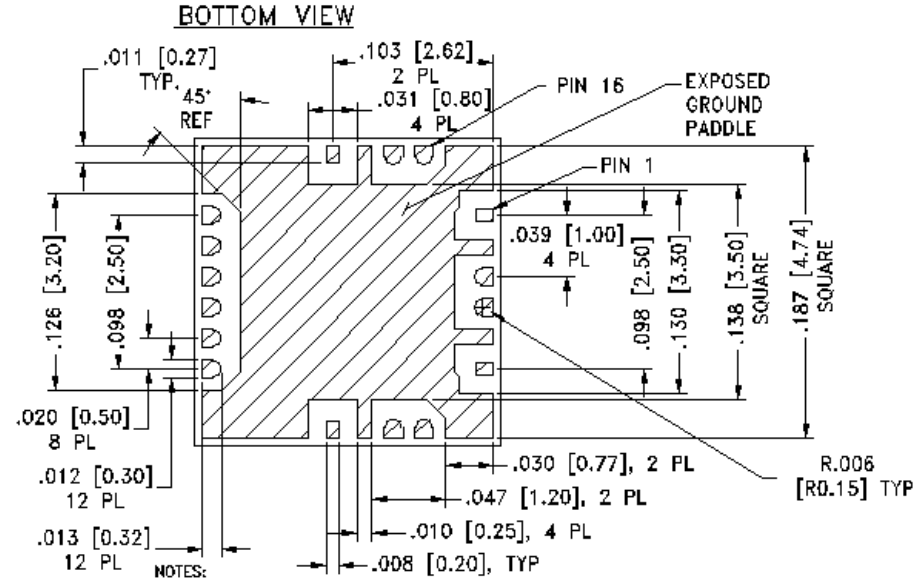
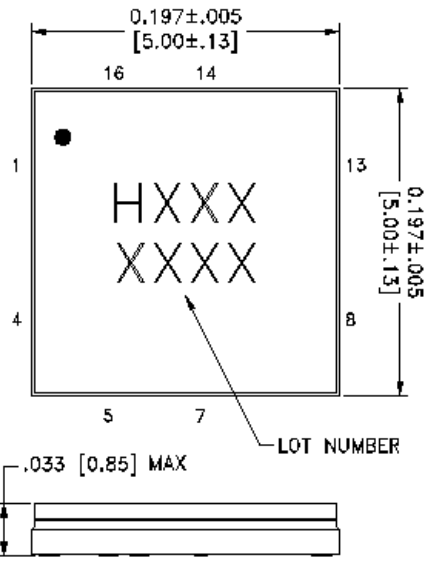
# Package Qualification Report

QTR: 2014-00384  
Package: LC5, LC5A

Rev: 01

## LC5A Outline

DO NOT SCALE PRINT



- NOTES:
1. PACKAGE BODY MATERIAL: ALUMINA
  2. LEAD AND GROUND PADDLE PLATING: 30-80 MICROINCHES GOLD OVER 50 MICROINCHES MINIMUM NICKEL.
  3. DIMENSIONS ARE IN INCHES [MILLIMETERS] AND NOMINAL UNLESS OTHERWISE SPECIFIED.
  4. LEAD SPACING TOLERANCE IS NON-CUMULATIVE.
  5. CHARACTERS TO BE BLACK INK MARKED WITH .018" MIN to .030" MAX HEIGHT REQUIREMENTS. UTILIZE MAXIMUM CHARACTER HEIGHT BASED ON LID DIMENSIONS AND BEST FIT. LOCATE APPROX. AS SHOWN.
  6. PACKAGE WARP SHALL NOT EXCEED 0.05mm DATUM [-C-]
  7. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.

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