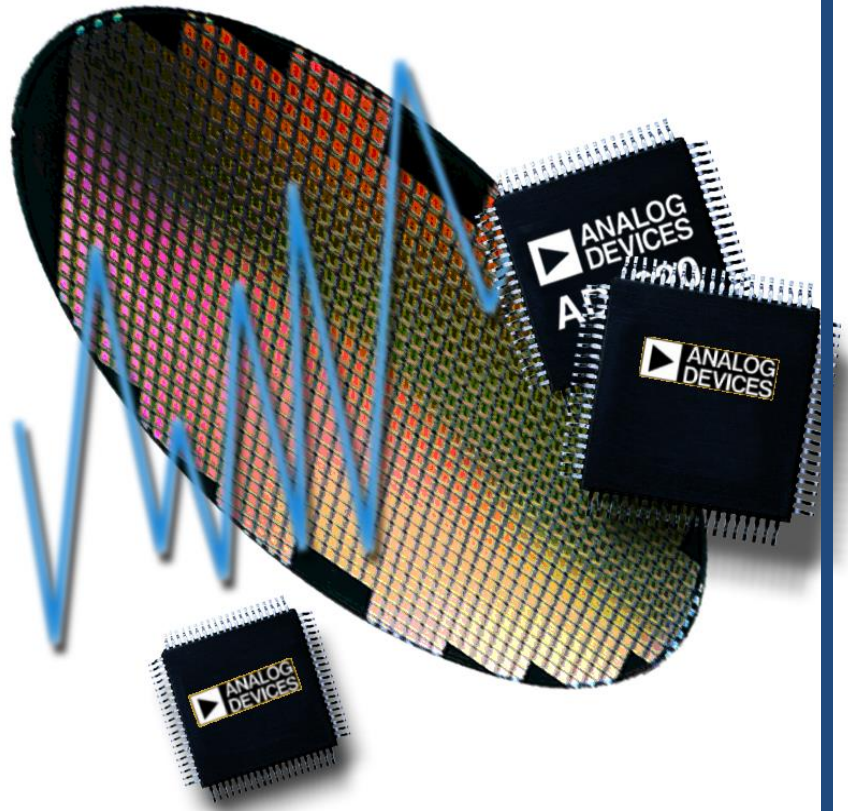


# Analog Devices Welcomes Hittite Microwave Corporation

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:** 2014-00376

**Rev:** 02

**Package:** LC3, LC3B, LC3C

HMC258LC3B	HMC663LC3	HMC748LC3C
HMC260LC3B	HMC670LC3C	HMC749LC3C
HMC264LC3B	HMC671LC3C	HMC773LC3B
HMC292LC3B	HMC672LC3C	HMC774LC3B
HMC329LC3B	HMC673LC3C	HMC787LC3B
HMC338LC3B	HMC674LC3C	HMC814LC3B
HMC341LC3B	HMC675LC3C	HMC850LC3C
HMC344LC3	HMC676LC3C	HMC851LC3C
HMC346LC3B	HMC678LC3C	HMC853LC3C
HMC347LC3B	HMC679LC3C	HMC865LC3C
HMC441LC3B	HMC706LC3C	HMC866LC3C
HMC442LC3B	HMC720LC3C	HMC874LC3C
HMC447LC3	HMC721LC3C	HMC875LC3C
HMC448LC3B	HMC722LC3C	HMC876LC3C
HMC449LC3B	HMC723LC3C	HMC974LC3C
HMC451LC3	HMC724LC3C	HMC1048LC3B
HMC524LC3B	HMC725LC3C	HMC1084LC4
HMC547LC3	HMC726LC3C	
HMC553LC3B	HMC727LC3C	
HMC554LC3B	HMC728LC3C	
HMC558LC3B	HMC729LC3C	
HMC573LC3B	HMC744LC3C	
HMC576LC3B	HMC745LC3C	
HMC578LC3B	HMC746LC3C	
HMC594LC3B	HMC747LC3C	

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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:

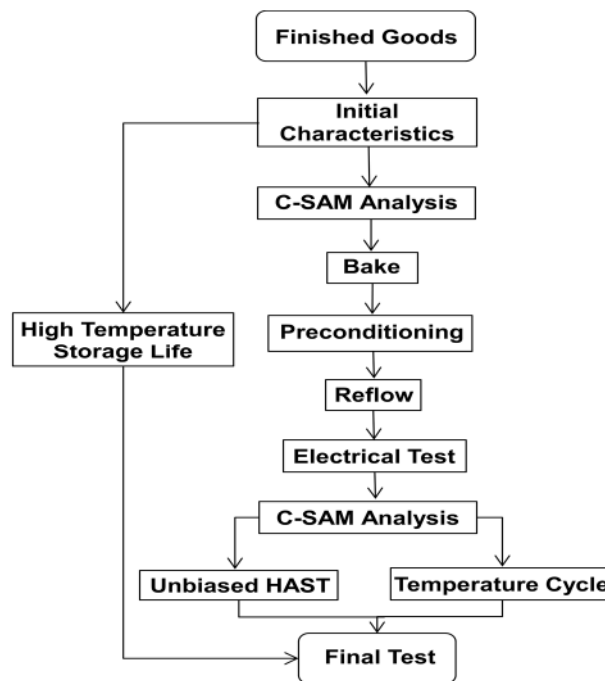
- *Take the initiative to ensure product quality*
- *Create an environment where the highest standards are maintained*
- *Continue to improve quality practices*

## 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. Autoclave:** A highly accelerated moisture stress test (unbiased). Devices are subjected to 96 hours of 100% relative humidity at a temperature of 121°C and pressure (14.7 PSIG). This test is performed in accordance with JEDEC JESD22-A102.
- 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: 2014-00376**

**Rev: 02**

**Package: LC3, LC3B, LC3C**

## Summary of Qualification Tests:

### HMC258LC3B (QTR2008-00001)

TEST	QTY IN	QTY OUT	PASS / FAIL	NOTES
Initial Electrical	174	174	Complete	
MSL Preconditioning	144	144	Complete	
MSL Preconditioning Final Test	144	144	Pass	
Autoclave (Preconditioned)	77	77	Complete	
Autoclave Final Test	77	77	Pass	
Temperature Cycle (Preconditioned)	67	67	Complete	
Temperature Cycle Final Test	67	67	Pass	
Solderability	15	15	Pass	
Physical Dimensions	15	15	Pass	

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**HMC814LC3B (QTR2012-00321)**

TEST	QTY IN	QTY OUT	PASS/FAIL	NOTES
Initial electrical Test	367	367	Pass	
MSL-1 Precondition	156	156	Complete	
Post MSL1 Electrical Test	156	156	Pass	
UHAST (preconditioned)	78	78	Complete	
Post UHAST electrical Test	78	78	Pass	
Temp. Cycle (preconditioned)	78	78	Complete	
Post Temp Cycle electrical Test	78	78	Pass	
HTSL	80	80	Complete	
Post HTSL Electrical Test	80	80	Pass	
HTOL- 1000 hours @ Tj=175°C	77	77	Complete	
Post HTOL Electrical test	77	77	Pass	
Physical Dimensions	15	15	Pass	
Solderability	6	6	Pass	
X-Ray	6	6	Pass	
ESD Exposure	27	27	Complete	
Post ESD Electrical Test	27	27	Complete	HBM Class 0 CDM Class IV

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# Package Qualification Report

**QTR:** 2014-00376

**Rev:** 02

**Package:** LC3, LC3B, LC3C

## Cumulative Summary of All LC3 Package Tests

TEST	Total Units Tested	Total Units Passed	Total Units Failed	Comments
HTSL, 1000 hours	80	80	0	
Temperature Cycle (Preconditioned)	145	145	0	
Autoclave (Preconditioned)	77	77	0	
UHAST (Preconditioned)	78	78	0	
Solderability	21	21	0	
Physical Dimensions	30	30	0	
X-Ray	6	6	0	

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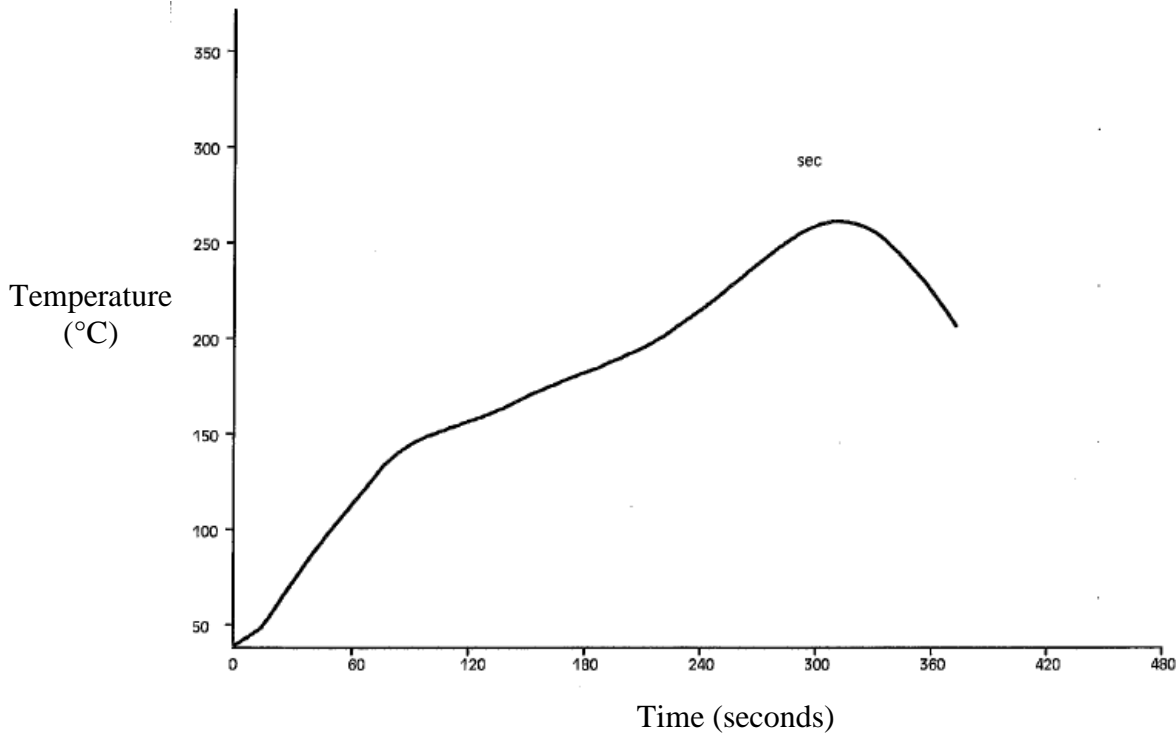
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## Appendix 1

### Reflow Profile for MSL Preconditioning



Hittite Microwave Corporation is committed to:

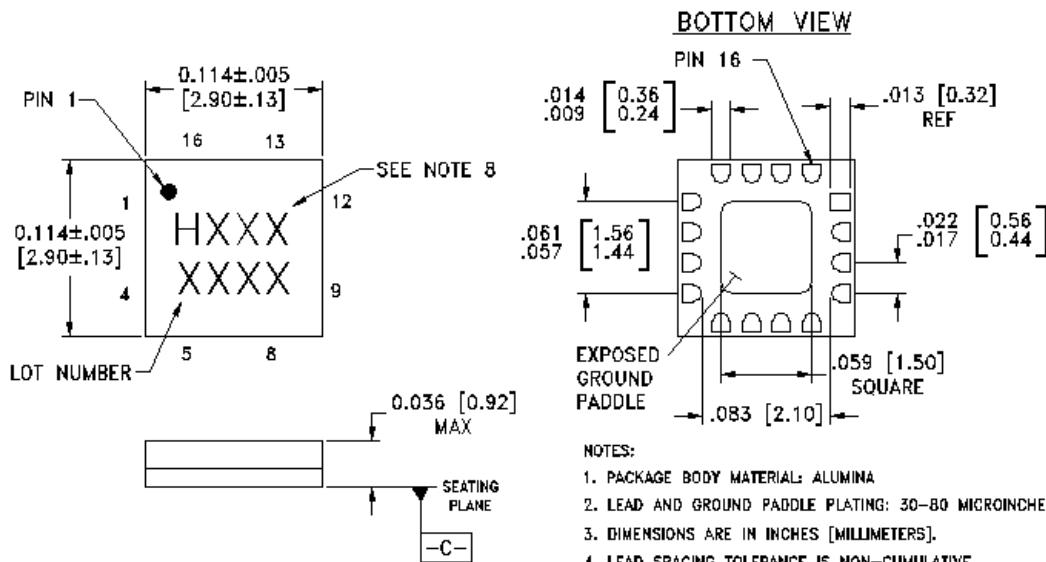
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## Appendix 2

### LC3 Outline



**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 .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.

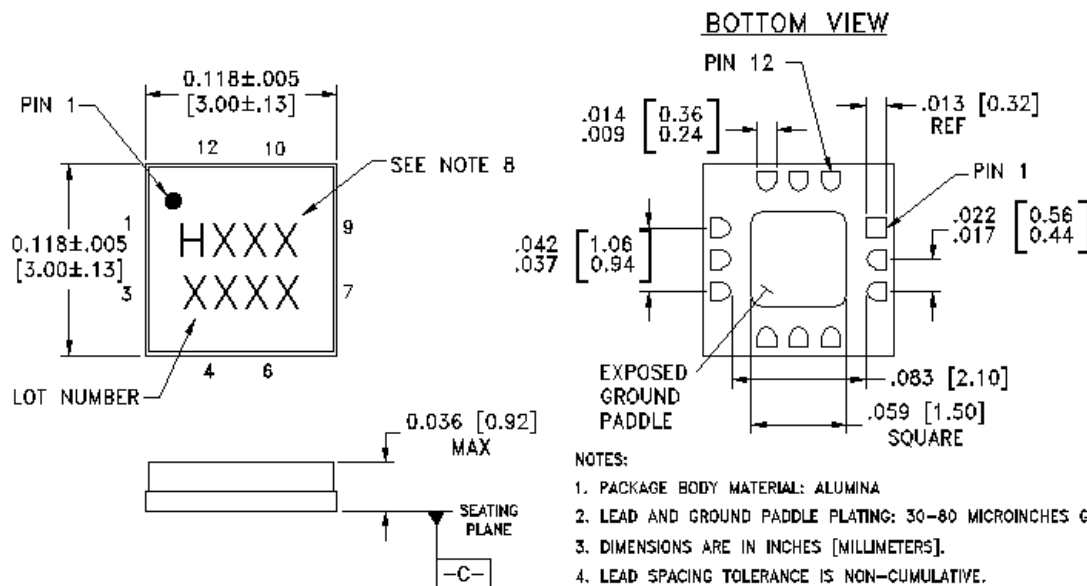
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## LC3B Outline



**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  $.030$ "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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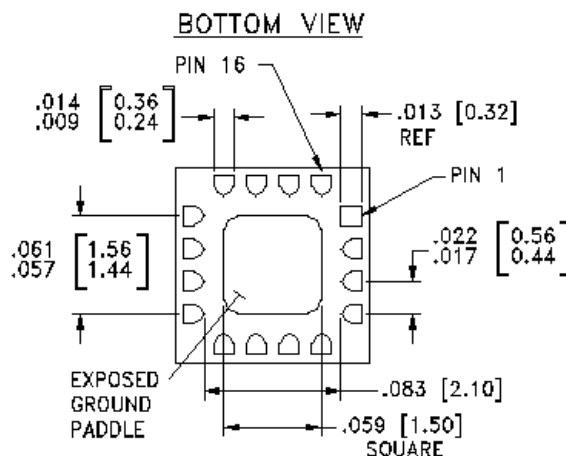
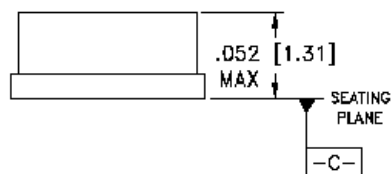
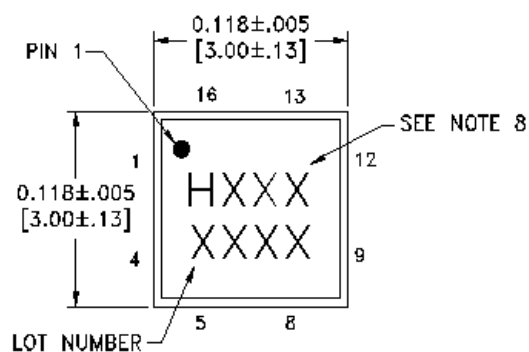
# Package Qualification Report

QTR: 2014-00376

Rev: 02

Package: LC3, LC3B, LC3C

## LC3C Outline



### 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  $.030$ "MAX HEIGHT REQUIREMENTS. UTILIZE MAXIMUM CHARACTER HEIGHT BASED ON LID DIMENSIONS AND BEST FIT. LOCATE APPROX. AS SHOWN.
6. PACKAGE WARP SHALL NOT EXCEED  $0.05$ mm DATUM  $\square$ -C-
7. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.

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