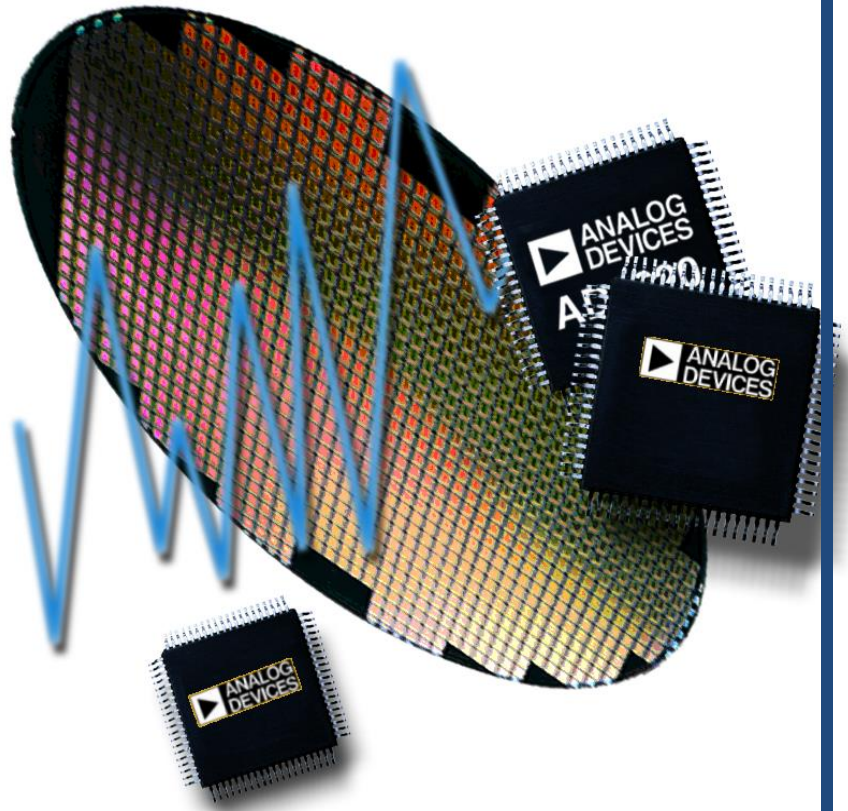


# Analog Devices Welcomes Hittite Microwave Corporation

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: 2014-00393**

**Rev: 02**

**Package: MS8G**

HMC204MS8G	HMC410MS8G	HMC585MS8G
HMC213AMS8G	HMC411MS8G	HMC784MS8G
HMC270MS8G	HMC412AMS8G	
HMC278MS8G	HMC412BMS8G	
HMC279MS8G	HMC412MS8G	
HMC280MS8G	HMC414MS8G	
HMC284AMS8G	HMC422MS8	
HMC284MS8G	HMC423MS8	
HMC310MS8G	HMC435MS8G	
HMC318MS8G	HMC436MS8G	
HMC320MS8G	HMC437MS8G	
HMC324MS8G	HMC438MS8G	
HMC326MS8G	HMC469MS8G	
HMC327MS8G	HMC471MS8G	
HMC336MS8G	HMC483MS8G	
HMC346MS8G	HMC484MS8G	
HMC349MS8G	HMC485AMS8G	
HMC358MS8G	HMC485MS8G	
HMC393MS8G	HMC488MS8G	
HMC406MS8G	HMC536MS8G	
HMC407MS8G	HMC546MS8G	
HMC410AMS8G	HMC549MS8G	

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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:

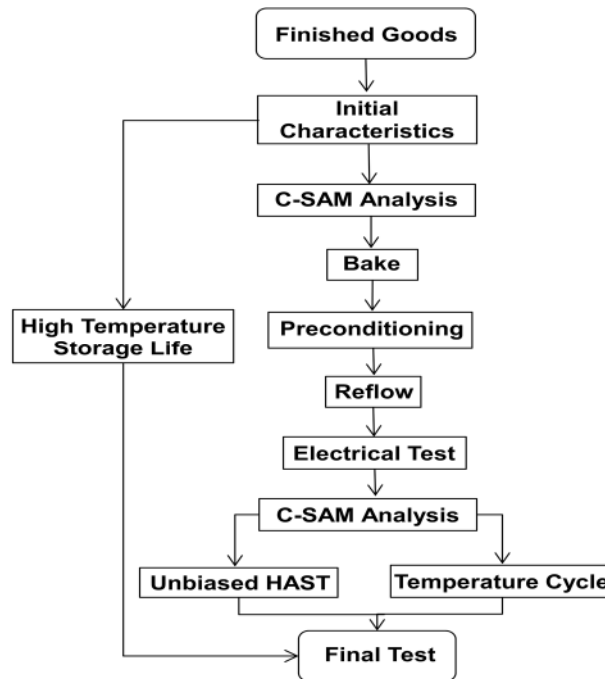
- *Take the initiative to ensure product quality*
- *Create an environment where the highest standards are maintained*
- *Continue to improve quality practices*

## 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. 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. THB:** Temperature Humidity Bias. Devices are subjected to 1000 hours of 85% relative humidity at a temperature of 85°C, while DC biased. This test is performed in accordance with JESD22-A101.
- 8. 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.
- 9. 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: 2014-00393**

**Rev: 02**

**Package: MS8G**

## Summary of Qualification Tests:

### HMC284AMS8G (QTR2012-00461)

TEST	QTY IN	QTY OUT	PASS / FAIL	NOTES
Initial Electrical	448	448	Complete	
HTOL, 1000 hours	160	160	Complete	
HTOL Final Test	160	160	Pass	
HTSL, 1000 hours	80	80	Complete	
HTSL Final Test	80	80	Pass	
MSL1 Preconditioning	208	208	Complete	
MSL1 Preconditioning Final Test	208	208	Pass	
Temperature Cycle (Preconditioned)	80	80	Complete	
Temperature Cycle Final Test	80	80	Pass	
UHAST (Preconditioned)	50	50	Complete	
UHAST Final Test	50	50	Pass	
THB (Preconditioned)	78	78	Complete	
THB Final Test	78	78	Pass	

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# Package Qualification Report

**QTR: 2014-00393**

**Rev: 02**

**Package: MS8G**

## HMC784MS8G (QTR2013-00040)

TEST	QTY IN	QTY OUT	PASS / FAIL	NOTES
Physical Dimensions	15	15	Pass	
Solderability	6	6	Pass	
X-Ray	15	15	Pass	

## HMC784MS8G (QTR2013-00055)

TEST	QTY IN	QTY OUT	PASS / FAIL	NOTES
Physical Dimensions	15	15	Pass	
Solderability	6	6	Pass	
X-Ray	15	15	Pass	

## HMC784MS8G (QTR2013-00056)

TEST	QTY IN	QTY OUT	PASS / FAIL	NOTES
Physical Dimensions	15	15	Pass	
Solderability	6	6	Pass	
X-Ray	15	15	Pass	

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# Package Qualification Report

**QTR: 2014-00393**

**Rev: 02**

**Package: MS8G**

## Cumulative Summary of All MS8G Package Tests

TEST	Total Units Tested	Total Units Passed	Total Units Failed	Comments
HTOL, 1000 hours	160	160	0	
HTSL, 1000 hours	80	80	0	
UHAST (Preconditioned)	50	50	0	
Temperature Cycle (Preconditioned)	80	80	0	
THB (Preconditioned)	78	78	0	
Solderability	18	18	0	
Physical Dimensions	45	45	0	
X-Ray	45	45	0	

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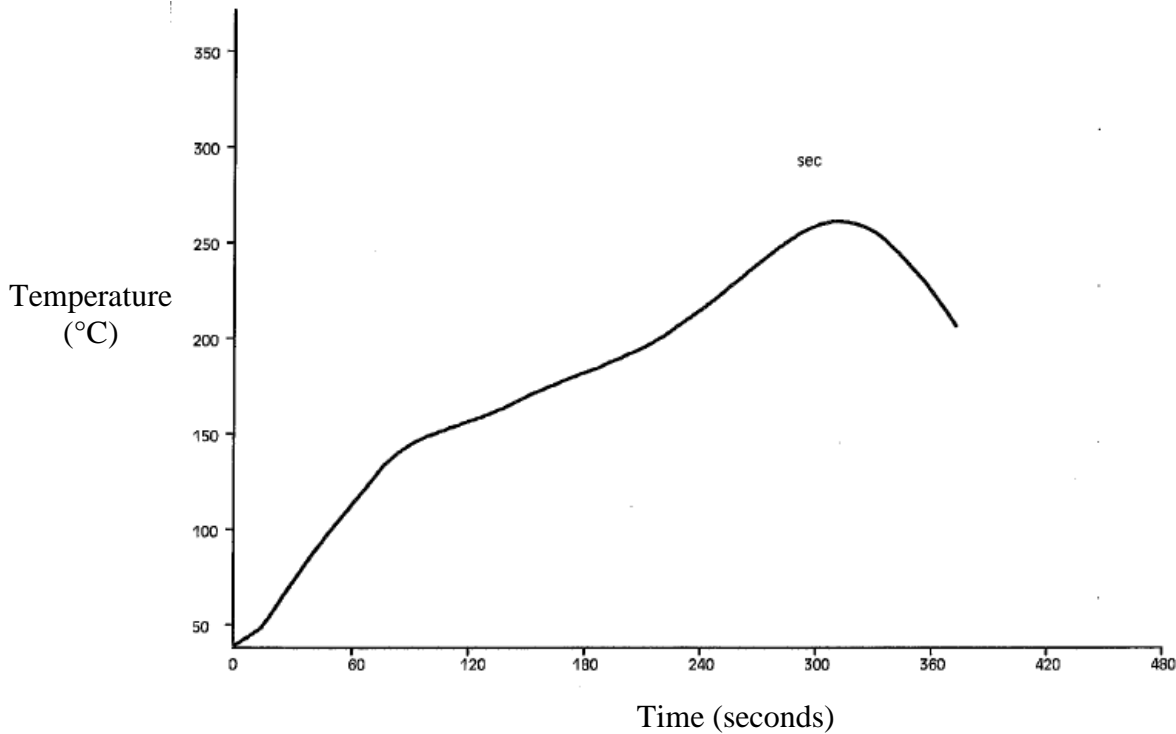
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## Appendix 1

### Reflow Profile for MSL Preconditioning



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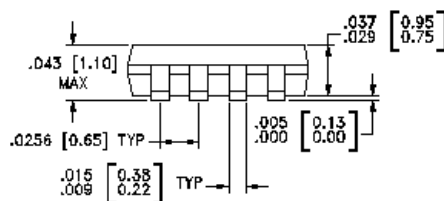
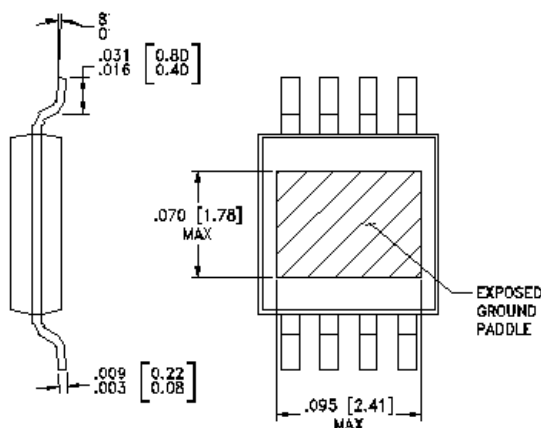
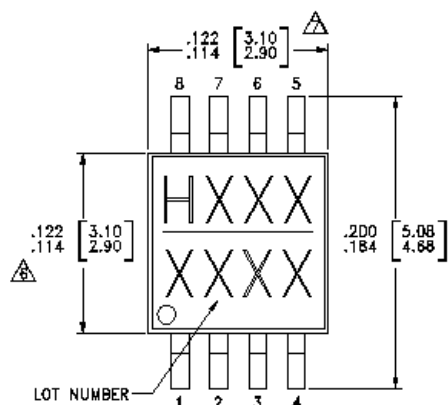
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## Appendix 2

### MS8G Outline



#### NOTES:

1. PACKAGE BODY MATERIAL: LOW STRESS INJECTION MOLDED PLASTIC. SILICA AND SILICON IMPREGNATED.
2. LEAD AND GROUND PADDLE MATERIAL: COPPER ALLOY
3. LEAD AND GROUND PADDLE PLATING: 100% MATTE TIN.
4. DIMENSIONS ARE IN INCHES [MILLIMETERS]
5. CHARACTERS TO BE HELVETICA MEDIUM, .030 HIGH, LASER OR WHITE INK, LOCATED APPROXIMATELY AS SHOWN.

△ DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.

△ DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.

6. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.

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