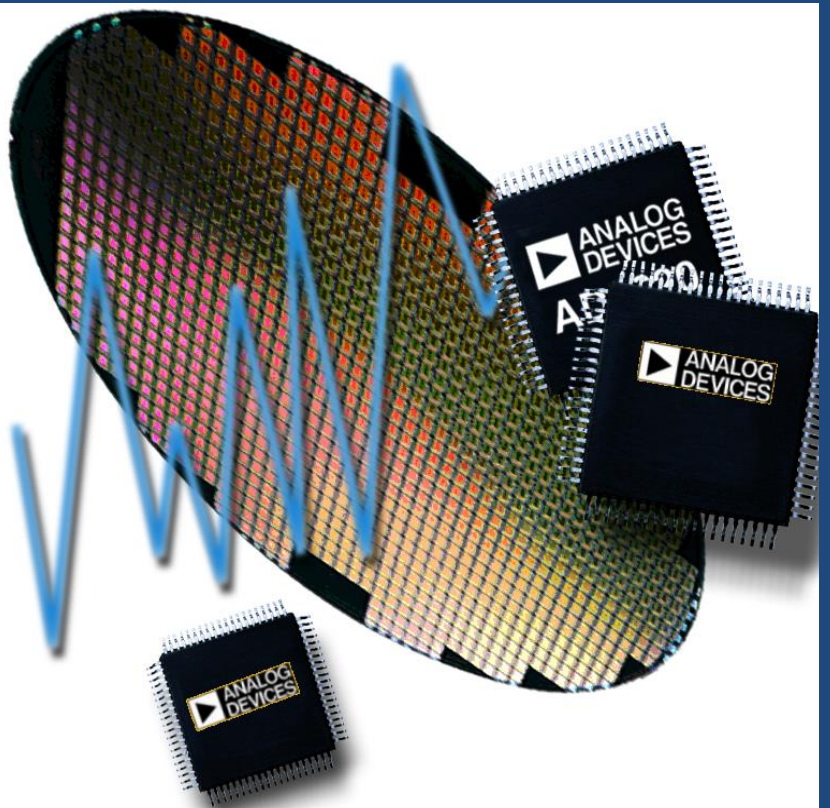


Analog Devices Welcomes Hittite Microwave Corporation

NO CONTENT ON THE ATTACHED DOCUMENT HAS CHANGED





Reliability Report

Report Title:	Qualification Test Report
Report Type:	See Attached
Date:	See Attached

QUALIFICATION TEST REPORT

QTR: 05007 REV: 01

QUALITY POLICY

Hittite
Microwave
Corporation
is committed to:

- *Be a supplier of products of the highest quality*
- *Advance the state-of-the-art of the technology supporting our products*
- *Enhance our competitive position with superior products*

Hittite's quality policy recognizes responsibilities of every individual to:

- *Take the initiative to promote quality*
- *Create an environment where highest standards are maintained*
- *Participate in continuous improvement practices*

PACKAGE TYPE: PLASTIC ENCAPSULATED
PACKAGE FAMILY: 4-LEAD MICRO-P

HMC474MP86
HMC476MP86
HMC478MP86
HMC479MP86
HMC481MP86

1.0 Introduction

This qualification procedure was designed to satisfy the package reliability requirements for a plastic Micro-P surface mount package. The testing was designed to simulate the worst-case environments the product may experience during assembly, test and life in the end user application. The device was electrically tested to the appropriate catalog specifications. This testing was performed by the subcontract manufacturer.

1.1 General Description

The Micro-P package uses a copper lead frame. The lead frame is spot plated with silver to enable gold wire bonding. The MMIC device is epoxy attached to the paddle using silver filled epoxy. The MMIC contains gold bond pads. The interconnection is performed using 1 mil gold ball bonds. The part is encapsulated using Sumitomo EME series encapsulating compound. The terminals are finished with 85/15 Sn/Pb.

The samples used for the qualification have the following attributes:

Pad Size: 30 X 39

Die Size: 24X17

Die Attach Epoxy: 84-1 LMI-SR4

Mold Compound: Sumitomo EME-6710S

Manufacturing Date Code: 0216



Photo 1: Typical Micro-P Package

2.0 Summary of Results

All testing has been completed. There were no failures in any subgroup. The device meets the requirements for a reliable Micro-P plastic encapsulated package.

PARA	TEST	QTY IN	QTY OUT	PASS/FAIL	NOTES
3.1	Sample Selection	95	95	Pass	
3.1.1	Internal Destructive Examination	5	5	Pass	
3.1.2	Open/Short Test	90	90	Pass	
3.1.3	External Visual	20	20	Pass	
3.1.4	CSAM	20	20	Pass	
3.2	MSL-1 Exp. (240 C)	90	90	Pass	
3.2.1	Open/Short Test	90	90	Pass	
3.2.2	External Visual	20	20	Pass	
3.2.3	CSAM	20	20	Pass	
3.3	Temp Cycle 100 cycles	30	30	Pass	
3.3.1	Open/Short Test	30	30	Pass	
3.3.2	External Visual	20	20	Pass	
3.3.3	Internal Destructive Examination	3	3	Pass	
3.3(cont)	Temp Cycle 500 cycles	27	27	Pass	
3.3.4	Open/Short Test	27	27	Pass	
3.3.5	External Visual	20	20	Pass	
3.3.6	Internal Destructive Examination	3	3	Pass	
3.4	Autoclave Exposure 96 Hours	30	30	Pass	
3.4.1	Open/Short Test	30	30	Pass	
3.4.2	Internal Destructive Examination	3	3	Pass	
3.4(cont)	Autoclave Exposure 168 hours	27	27	Pass	
3.4.3	Open/Short Test	27	27	Pass	
3.4.4	Internal Destructive Examination	3	3	Pass	
3.5	High Temp. Storage	30	30	Pass	
3.5.1	Open/Short Test	30	30	Pass	
3.5.2	Internal Destructive Examination	3	3	Pass	

3.0 Procedure

3.1 Pre-Test Screening: 95 samples were selected for the qualification.

3.1.1 Internal Destructive Examination: 5 parts were decapsulated and subjected to internal destructive analysis. There were no failures in this test

3.1.2 Electrical Test: 90 parts from 3.1 were subjected to an opens/shorts electrical test. There were no failures in this test.

3.1.3 External Visual: 20 parts from 3.1 were subjected to a visual inspection to look for cracks in the package. There were no failures in this test.

3.1.4 C-SAM: 20 parts from 3.1 were subjected to acoustic microscopy to look for internal cracks and delamination. The criteria is no delamination on the die surface, less than 50% delamination on the die paddle and less than 50% on 2 or more leads. There were no failures in this test.

3.2 Moisture Sensitivity Test (MSL-1) 90 parts were subjected to the moisture stress test per JEDEC J-STD-020B, level 1 including a dry bake at 125°C for 24 hours, a moisture soak at 85°C /85%RH for 168 hours, followed by IR Reflow with a peak temperature of 240°C for 3 cycles.

3.2.1 Electrical Test: All 90 parts from 3.2 were subjected to an opens/shorts electrical test. There were no failures in this test.

3.2.2 External Visual: 20 parts from 3.2 were subjected to a visual inspection to look for cracks in the package. There were no failures in this test.

3.2.3 C-SAM: 20 parts from 3.2 were subjected to acoustic microscopy to look for internal cracks/delamination. The criteria is no delamination on the die surface, less than 50% delamination on the die paddle and less than 50% on 2 or more leads. There were no failures in this test.

3.3 Temperature Cycling: Temperature cycling exposure was performed on 30 parts from 3.2 per JESD22-AI04-B condition C (-65 to +150) for of 500 cycles, with interim testing after 100 cycles.

3.3.1 Electrical Test: 30 parts from 3.3 were subjected to an interim opens/shorts electrical test after 100 temperature cycles. There were no failures in this test.

3.3.2 External Visual: 20 parts from 3.3 were subjected to a visual inspection to look for cracks in the package. There were no failures in this test.

3.3.3 Internal Destructive Examination: 3 parts from 3.3.2 were decapsulated and subjected to internal destructive examination. There were no failures in this test.

3.3.4 Electrical Test: 27 parts from 3.3 were subjected to a final opens/shorts electrical test after 500 temperature cycles. There were no failures in this test.

3.3.5 External Visual: 20 parts from 3.3 were subjected to a visual inspection to look for cracks in the package. There were no failures in this test.

3.3.6 Internal Destructive Examination: 3 parts from 3.3.5 were decapsulated and subjected to internal destructive examination. There were no failures in this test.

3.4 Autoclave: Autoclave exposure was performed on 30 parts from 3.2 per JESD22-A102-B condition C (+121 C, 100% RH, 15 PSI) for a minimum of 96 hours and condition D (+121 C, 100% RH, 15 PSI) for a minimum of 168 hours .

3.4.1 Electrical Test: 30 parts from 3.4 were subjected to an interim opens/shorts electrical test after 96 hours of exposure. There were no failures in this test.

3.4.2 Internal Destructive Examination: 3 parts from 3.4.1 were decapsulated and subjected to internal destructive examination. There were no failures in this test.

3.3.3 Electrical Test: 27 parts from 3.2 were subjected to an interim opens/shorts electrical test after 100 temperature cycles. There were no failures in this test.

3.3.4 Internal Destructive Examination: 3 parts from 3.3.1 were decapsulated and subjected to internal destructive examination. There were no failures in this test.

3.5 High Temperature Storage Life: 30 parts from 3.2 were subjected to high temperature storage per JESD22-A103-B, Condition B, 150°C for 500 hours.

3.5.1 Electrical Test: 30 parts from 3.5 were subjected to an interim opens/shorts electrical test after 500 hours of exposure. There were no failures in this test.

3.5.2 Internal Destructive Examination: 3 parts from 3.5.1 were decapsulated and subjected to internal destructive examination. There were no failures in this test.

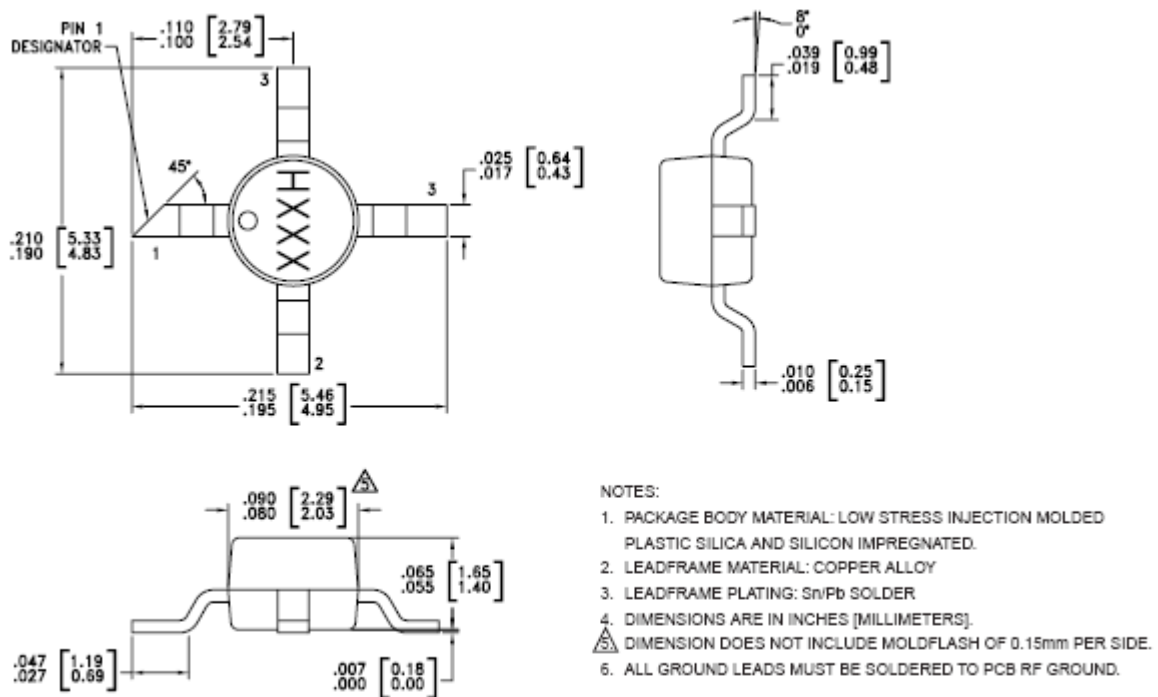


Figure 1: Outline Drawing