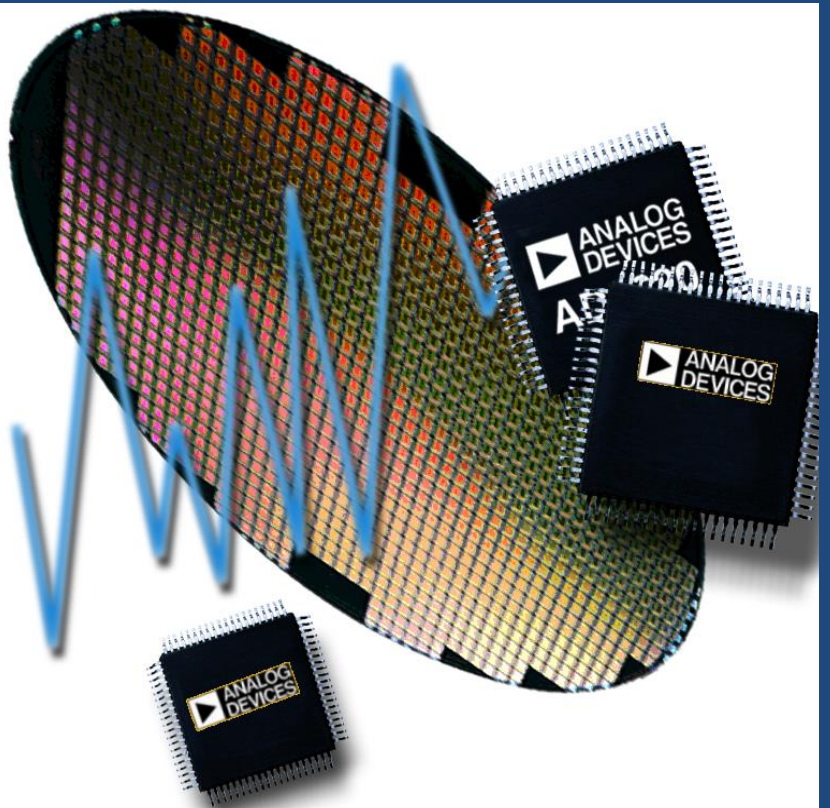


Analog Devices Welcomes Hittite Microwave Corporation

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

Package Type: 6L SC70

Package Style: 6 Lead Plastic SC70 Package

QTR: 08002

Rev: 01

HMC311SC70 (E) Gain Block Amplifier

HMC474SC70 (E) Gain Block Amplifier

HMC476SC70 (E) Gain Block Amplifier

HMC478SC70 (E) Gain Block Amplifier



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- *Continue to improve quality practices*

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1.0 Introduction

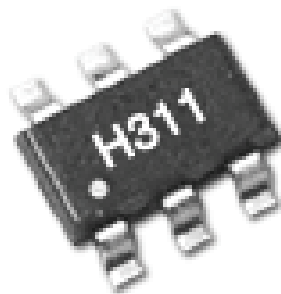
This qualification procedure is designed to satisfy the package reliability requirements for the 6 lead SC70 surface mount plastic encapsulated package. The testing is designed to simulate the worst-case environments the product may experience during assembly, test and life in the end user application. The device is electrically tested to the appropriate catalog specifications. The HMC311SC70E was selected to qualify the SC70 surface mount plastic encapsulated family of packages.

1.1 General Description

The 6L SC70 package uses a copper alloy lead frame. The lead frame is silver plated internally to enable gold wire bonding. The MMIC device is epoxy attached to the paddle. The device interconnection is performed using 1 mil gold ball bonds. The part is encapsulated using Sumitomo EME G600 or equivalent epoxy encapsulating compound. The leads are available finished with either 85/15 SnPb or 100% Matte Sn plating.

The HMC311SC70E used as the qualification test vehicle is a GaAs InGaP Heterojunction Bipolar Transistor (HBT) Gain Block MMIC SMT DC to 8 GHz amplifier. The amplifier can be used as either a cascadable 50 Ohm gain stage or to drive the LO port of HMC mixers with up to +15 dBm output power. The HMC311SC70(E) offers 15 dB of gain and an output IP3 of +30 dBm while requiring only 54 mA from a +5V supply. The Darlington topology results in reduced sensitivity to normal process variations, and yields excellent gain stability over temperature while requiring a minimal number of external bias components.

Figure 1: Typical SC70 Package



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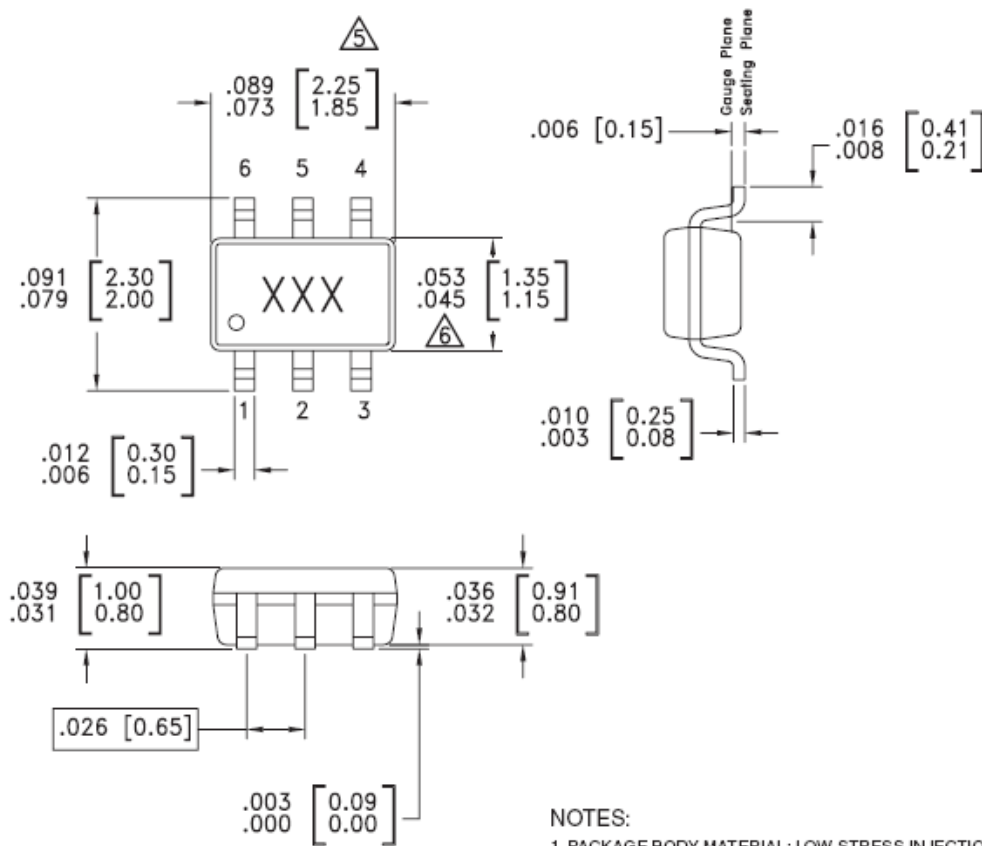
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Figure 2: SC70 Package Outline Drawing



NOTES:

1. PACKAGE BODY MATERIAL: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
2. LEAD MATERIAL: COPPER ALLOY
3. LEAD PLATING: Sn/Pb SOLDER
4. DIMENSIONS ARE IN INCHES [MILLIMETERS]
5. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
6. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
7. ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND.

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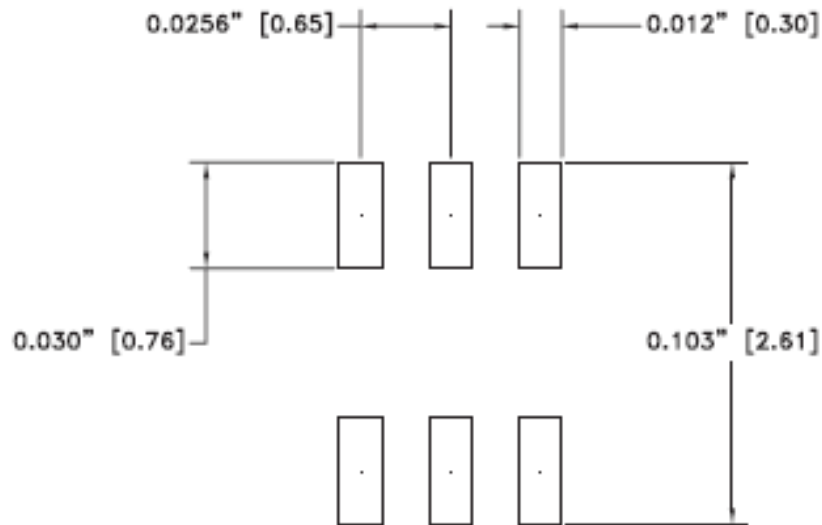
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Figure 3: Suggested PCB Land Pattern



NOTES:

1. DIMENSIONS ARE IN INCHES [MILLIMETERS].
2. PAD WIDTH SHOWN IS FOR SOLDERING ONLY. BEYOND SOLDERING AREA ALL CONDUCTORS THAT CARRY RF AND MICROWAVE SIGNALS SHOULD HAVE 50 OHM CHARACTERISTIC IMPEDANCE.

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2.0 Summary of Results

PARA	TEST	QTY IN	QTY OUT	PASS/FAIL	NOTES
3.1.1	Initial Electrical Test	137	137	Pass/No Failures	
3.1.2	Pre Reflow Acoustic Microscopy	25	25	Complete	
3.1.3	MSL1 260°C Reflow Preconditioning (3 Passes)	137	137	Complete	
3.1.4	Post Reflow Acoustic Microscopy	25	25	Pass/No Failures	
3.1.5	Temperature Cycling Exposure	61	61	Complete	
3.1.6	Post Temperature Cycle Electrical Test	61	61	Pass/No Failures	
3.1.7	Autoclave Exposure	76	76	Complete	
3.1.8	Post Autoclave Electrical Test	76	76	Pass/No Failures	
3.2.1	Lead Co-planarity	15	15	Pass/No Failures	
3.2.2	Physical Dimensions	15	15	Pass/No Failures	
3.2.3	Solderability	14	14	Pass/No Failures	

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

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3.0 Test Procedures

3.1 Package Environmental Tests

These tests are designed to demonstrate that the SC70 surface mount plastic encapsulated family of packages are capable of maintaining the specified parameters throughout their useful life under rated operating conditions. The HMC311SC70E was selected to qualify the SC70 surface mount plastic encapsulated family of packages. The results of these tests qualify by similarity all other product using the same package.

3.1.1 Initial Characteristics - 137 HMC311SC70E 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 Pre Reflow Acoustic Microscopy – 25 serialized devices from 3.1.1 were inspected using a Sonix acoustic microscope. The devices were inspected for delamination and cracking as a baseline prior to MSL 1 260°C reflow. This analysis was performed at Hittite.

3.1.3 MSL1 260°C Reflow Preconditioning – 137 devices from 3.1.1 were subjected to 168 hours at 85°C/ 85% RH then a reflow simulation at a peak temperature of 260°C for 3 passes (see Figure 1 for profile).

3.1.4 Post Reflow Acoustic Microscopy – 25 serialized devices from 3.1.3 were inspected using a Sonix acoustic microscope. The devices were inspected for any package cracking or significant changes in delamination using the pre MSL 1 260°C reflow results as the baseline. The industry standard specification JEDEC J-STD-020 “Moisture/Reflow Sensitivity Classification for Non-Hermetic Solid State Surface Mount Devices” was used as the pass / fail guideline. This analysis was performed at Hittite. There were no failures.

3.1.5 Temperature Cycle - 61 devices from 3.1.3 were subjected to 500 cycles of non-operating temperature cycling from -65°C to 150°C. This test is performed at Hittite.

3.1.6 Final Electrical Test - 61 devices from 3.1.5 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 failures in this test.

3.1.7 Autoclave - 76 devices from 3.1.3 were subjected to 96 hours of humidity (100%), temperature (121°C) and pressure (15 PSIG). This test is performed at Hittite using an Espec environmental chamber.

3.1.8 Final Electrical Test - 76 devices from 3.1.7 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 within 48 hours after removal from the chamber. There were no failures in this test.

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3.2 Package Mechanical Tests

3.2.1 1 Coplanarity - 15 devices were measured for lead coplanarity. Coplanarity in excess of .004" (0.1 mm) was considered a reject. These devices need not be electrically functional. This test is performed at Hittite. There were no failures.

3.2.2 Physical Dimensions - 15 devices were measured to the requirement of the data sheet package outline drawing. These devices need not be electrically functional. Any out of specification parameter is considered a failure. This test is performed at Hittite. There were no failures.

3.2.3 Solderability - 14 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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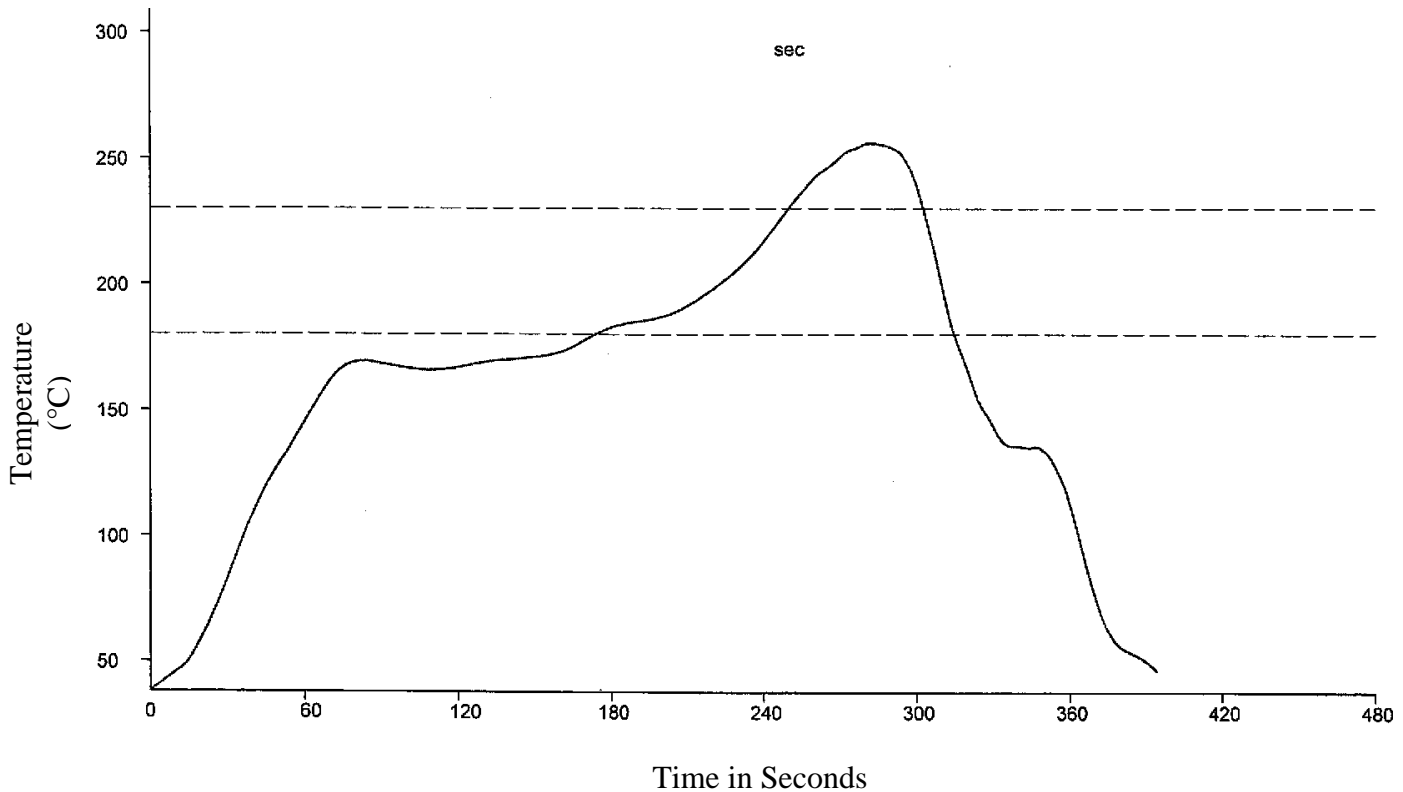
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Figure 4: 260°C Reflow Profile



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