RELIABILITY QUALIFICATION REPORT FOR LEAD-FREE/RoHS-COMPLIANT/GREEN MH302-G and MH303-G

I. SUMMARY

The MH302-G and MH303-G are MMIC mixers that utilize unbiased Quad-MOSFETS and include integral RF and LO baluns within a 3 x 3mm, 6 pin DFN, surface mount package. The MH302-G and MH303-G have been lead-free/RoHS/Green qualified to a maximum reflow profile of 260°C, and the MSL rating at this reflow profile is level 1. The lead finish is 100% Tin, 300 – 1,000 microinches thick. The parameters monitored for the qualification tests were IIP3, Input P1dB and Conversion loss. Failures are defined as any parameter outside of the minimum or maximum as stated on their respective datasheet.

II. SCOPE

This report summarizes the reliability qualification of the MH302-G and by similarity the MH303-G. The reliability data are obtained through the performance of the specified accelerated stress tests described in this document

III. APPLICABLE DOCUMENTS

All the test procedures and test methods are consistent with industry standards. The standards referenced in this document are JEDEC standard 22 and J-STD-020C.

IV. QUALIFICATION TEST PLAN

Stress or Test	**Procedures/Conditions**	**Device Hours/ Cycles**	**Sample Size**	**Failed Units**	**Reference Document**	**Part Tested**
Preconditioning Level 1 Lead Free	External visual 40x Temp. & Humidity Test 168 hrs. @ +85°C/ 85% RH	N/A	3 lots, a total of 55 parts	0	J-STD-020C	MH302-G
Temperature cycle	Test Condition C Temp. -65°C (+0°/-10°C) to +150°C (+10°/-0°C) Dwell time = 15 min.	1000 cycles	3 lots, a total of 51 parts	0	JESD22-A104-B	MH302-G
Thermal shock	Test Condition D Temp. -65°C (+0°/-10°C) to +150°C (+10°/-0°C)	100 cycles	3 lots, a total of 51 parts	0	JESD22-A106-A	MH302-G

Stress or Test	Procedures/Conditions	Device Hours/ Cycles	Sample Size	Failed Units	Reference Document	Part Tested
Highly-Accelerated Temperature and Humidity Stress Test (HAST)	Test Condition A Temp. 130°C (+2/ - 0°C) Relative Humidity = 85%	168 (-0, +2) hours	3 lots, a total of 55 parts	1*	JESD22-A110-B	MH302-G
Solderability Lead-Free solder	Lead-Free Solder: Sn96Ag4 Flux Type: R145 Solder Bath Requirements: 260°C	N/A	3 lots, a total of 15 parts, 90 pins	0	MIL-STD-883 (Method 2003)	MH302-G
High Temp Op Life (HTOL)	Test Condition B Temp. 125°C (+5, -0°C)	1,000 (-0, +10) hours	3 lots, a total of 120 parts	0	JESD22-A108-B	MH302-G
Unbiased High Temperature Storage (HTS)	Temp. 150°C (+ 5°C, -0°C)	1,000 (-0, +10) hours	3 lots, a total of 120 parts	0	JESD22-A103-C	MH302-G
Wire Pull	Lower Limit: 3 Gram Force	N/A	3 lots, a total of 75 parts	0	Mil-STD-883 Method 2011	MH302-G
Ball Shear	Lower Limit: 20 Gram	N/A	3 lots, a total of 75 parts	0	EIA / JESD22-B116	MH302-G
Die Shear	Mode 1: Silicon remain > 50%; minimum requirement = 1.92 kg	N/A	3 lots, a total of 75 parts	0	Mil-STD-883 Method 2019	MH302-G

* One failure that was not attributed to assembly or HAST, the serialization of the test data is suspect. One device was marginal at pre-test screening and #24 failed at post HAST test. No delamination on any device was observed.

V. DISCUSSION OF RESULTS

1. Testing procedures

The HAST and the HTOL test were performed with the devices mounted in to a PCB. All other testing was done on loose parts. Components are considered to have failed if they do not meet the minimum or maximum specifications on the datasheet. Acceptance criterion consists of having zero failures out of 55 parts to meet WJ's requirement of LTPD=5 for each test.

2. Pre-Conditioning

Devices from three lots for a total of 55 MH302-G devices, completed pre-conditioning with no electrical failures. 10 of the 55 devices underwent pre and post stress Scanning Acoustic Microscope inspection with no failures. No delamination was observed.

3. Temperature Cycle

A total of 51 MH302-G devices from three lots completed 1,000 cycles of temperature cycling with no failure.

4. Thermal Shock

A total of 51 MH302-G devices from three lots completed 100 cycles of thermal shock with no failures.

5. Highly Accelerated Temperature and Humidity (HAST)

Devices from three lots for a total of 55 MH302-G devices, completed HAST with one failure that was not attributed to the HAST.

6. Solderability

Devices from three lots for a total of 15 MH302-G devices completed Lead-free solder with no failures.

7. High Temp Op Life (HTOL)

Devices from three lots for a total of 120 MH302-G devices completed 1,000 hours of HTOL with no failures.

8. High Temperature Storage

Devices from three lots for a total of 120 MH302-G devices, completed 1,000 hours with no failures.

9. Assembly Level Test: Wire Pull

Devices from three lots for a total of 75 MH302-G devices, completed wire pull with no failures.

10. Assembly Level Test: Ball Shear

Devices from three lots for a total of 75 MH302-G devices completed ball shear with no failures.

11. Assembly Level Test: Die Shear

Devices from three lots for a total of 75 MH302-G devices, completed die shear with no failures.

VI. CONCLUSIONS

The Reliability Qualification Data demonstrates that the MH302-G devices assembled in a lead-free/RoHS-compliant/Green surface-mount package are of high reliability and meet or exceed the industry standards. Other products in the family are also qualified in the lead-free/RoHS-compliant/Green DFN package by similarity. This includes the following device models: MH303-G.