

Qualification Report

HBT Products

I. SUMMARY

This report summarizes the reliability qualification of our MMA series HBT products. These devices are produced by Aeroflex-Metelics in Sunnyvale, CA and are available in Die form and assembled in various packages. The reliability data is obtained through the performance of specified accelerated stress tests described in this document.

The MMA devices are high performance HBT products that offer high dynamic range in low-cost surface-mount packages and in die. The parameters monitored for the qualification tests were Supply Current, Gain and OIP3. Failures are defined as any variation of 10% or greater from the initial pre-stressed testing on any of these parameters. The results of the individual qualification tests are located in Section IV.

II. QUALIFICATION TEST PLAN & RESULTS

No.	Stress or Test / Reference Standard	Method / Conditions	Hours / Cycles	P/N or Package Type	Sample Size	Failed Units	Date
1	Preconditioning Level 3 JESD22-A113	External Visual 40X High temp storage life: 24 hrs @+125°C Temp. & Humidity Test 168 hrs. @+85°C / 85% RH Solder Reflow test 3 cycles W/flux immersion, peak temp: 235°C	N/A	MMA500-SOT89	150	0	11/04
				MMA712-2012	25	0	11/04
2	Temperature Cycle JESD22-A104-A	Temp. -55°C to +150°C 10 min. at each extreme (MIL-STD 750-1051) Test Condition C Temp. -65°C to +150°C 10 min. at each extreme	10 cycles	MMA500-SOT89	24	0	11/04
				MMA500-SOT89	150	0	11/04
				SOT-89	32	0	09/04
3	Autoclave JESD22-A102-B	Test Condition C Pressure = 15 PSI	96 hrs	SOIC-8	32	0	09/04
				SOT-89	32	0	01/02
				SOT-89	32	0	01/03
4	High Temp Op Life (HTOL) JESD22-A108-B	Test Condition B Tj = 145°C (+/-5°C) Die MMA612	1000 hrs	MMA612	20	0	07/03
			4000 hrs	MMA707-CM22	20	0	08/04
5	Unbiased High Temperature Storage JESD22-A108-B	Temp. 125°C (MIL-STD 750-1032) Temp. 150°C	24 hrs	MMA500-SOT89	24	0	11/04
			1000 hrs	MMA500-SOT89	50	0	12/04
6	HAST / JESD22-A118	Test Condition A Temp. 130°C, RH = 85%	96 hrs	MMA500-SOT89	50	0	12/04
				MMA712-2012	24	0	12/04
				MMA710-SOT89	25	0	09/04
				MMA701-SOT89	25	0	09/04
				MMA703-2012	25	0	09/04
7	HBM-ESD/ JESD22-A114-B	Class 1B / HBM 500V Die MMA603	N/A	MMA707-SOIC8	10	0	10/04
				MMA703-SOT89	11	0	10/04
				SOT-89	77	0	09/04
8	Moisture Sensitivity/ J-STD-020B	Level 1 Sensitivity Temp. 85°C, RH = 85%	168 hrs	SOIC-8	77	0	09/04
				MMA712-2012	25	0	07/04
				MMA707-3030	25	0	07/04
9	Thermal Shock JESD22-A106-A	Test Condition C Temp. 0°C to +150°C 5 min. at each extreme	15 cycles	SOT-89	32	0	09/04
				SOIC-8	32	0	09/04
10	Moisture Soak	Pre-Bake = 24 hrs	168 hrs	SOT-89	32	0	09/04
11	Mark Permanency	30 strokes Soak Time=3 min.	N/A	SOT-89	32	0	09/04
				SOT-89	32	0	01/02
12	Open / Short	N/A	N/A	SOT-89	32	0	09/04
				SOIC-8	32	0	09/04
13	Solderability JESD22-B102D	Temp. 240°C Steam Aging = 8 hours	N/A	SOT-89	32	0	09/04
				SOT-89	32	0	01/03

III. APPLICABLE DOCUMENTS

All of the test procedures and methods are consistent with industry standards. The standards referenced in this document are JEDEC standard 22 and MIL-STD 883.

IV. DISCUSSION OF RESULTS

1. Pre-Conditioning

A total of 175 MMA500 amplifiers in lead-free SOT-89 package have completed pre conditioning.

2. Temperature Cycle

A total of 238 devices completed 10 temperature cycles with no failures.

3. Unbiased Autoclave

A total of 96 devices completed 96 hours of Autoclave with no failures.

4. High Temp Op Life (HTOL)

A total of 60 devices completed HTOL testing with no failures. 40 units completed 4000 hours and 20 units completed 1000 hours.

5. Unbiased High Temperature Storage

A total of 74 devices have passed 1000 hours of Unbiased High Temperature Storage with no failures. 24 pieces were baked at 125°C, 25 pieces were accelerated to 175°C and 25 pieces were accelerated to 185°C. An additional 25 devices are in process to complete 1000 hours at 150°C.

6. Highly Accelerated Temperature and Humidity Stress Test (HAST)

A total of 149 devices completed 96 hours of HAST testing with no failures. The HAST test was performed by Wyle Labs and parts are tested to Aeroflex/Metelics' RF specifications.

7. ESD

A total of 21 devices with MMA603 die completed HBM ESD testing at a variety of different voltage level and its product family has been classified as a **Class 1B device** (Highest Voltage Level Passed between 500V and 1000V) for Human Body Model (HBM) testing according to JEDEC Standard JESD22-A114. The units were tested using one pulse per each step with 250V step increments from 250V up to 3000V maximum. The failed devices displayed a complete loss of functionality as opposed to partial degradation of RF characteristics. If any device failed at a given voltage level, the device was said to fail at that level. The classification level was assigned according to the last voltage level at which all three parts passed post-ESD RF testing according to the test specifications set by Aeroflex/Metelics.

8. Moisture Sensitivity

A total of 204 devices completed 168 hours of 85°C temperature with 85% relative humidity for Moisture Sensitivity test. With no failures the devices are classified as level 1 sensitive per J-STD-020B.

9. Thermal Shock

A total of 64 devices completed Thermal Shock with no failures.

10. Moisture Soak

A total of 32 devices completed Moisture Soak with no failures.

11. Mark Permanency

A total of 64 devices completed Mark Permanency with no failures.

12. Open / Short

A total of 64 devices completed Open / Short test with no failures.

13. Solderability

A total of 64 devices completed Solderability at 240°C with no failures.

V. CONCLUSIONS

The Reliability Qualification Data illustrates that the HBT products Aeroflex-Metelics, demonstrate high reliability and quality levels. HBT series product utilizes eutectic die attach and all gold bonding system for superior thermal conductivity with maximum reliability. All devices undergo temperature cycle and thermal shock to ensure a high quality product is shipped.