

## I. INTRODUCTION

The AG101, AG102, and AM1 are general-purpose gain blocks that offer good dynamic range and low noise figure in a low-cost surface-mount package. The combination of near-constant OIP3 and low noise figure performance over frequency makes it attractive for both narrowband and broadband applications. The devices use a GaAs MMIC technology and only require DC-blocking and bypass capacitors, and an inductive RF choke for operation. Internal matching provides a 50 ohm input / output impedance minimizing the number of required external components. The broadband devices are well suited for various current and next generation wireless technologies such as GPRS, GSM, CDMA, and W-CDMA. In addition, they will work for other applications within the 60 to 3000 MHz frequency range such as fixed wireless.

## II. SCOPE

This report summarizes the reliability qualification of the AG101, AG102, and AM1 high dynamic range amplifiers from WJ Communications and assembled in a SOT-89 plastic package. The reliability data are obtained through the performance of specified accelerated stress tests described in this document. The AG101, AG102, and AM1 are processed using the same process flow and packaged in the SOT-89 package, therefore qualification testing done on one part qualifies the entire family of parts.

## III. APPLICABLE DOCUMENTS

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

## IV. QUALIFICATION TEST PLAN AND RESULTS

Stress or Test	Procedures / Conditions	Device Hours/ Cycles	Sample Size	Failed Units	Date	Reference Document	Part Tested
Preconditioning Level 3	External visual 40x High temp storage life: 24 hrs @+125°C Temp. & Humidity Test 168 hrs. @ +85°C / 85% RH Infrared Solder Reflow (IR) test 3 cycles w/flux immersion, peak temp: 235°C	N/A	231 parts (used for TC, UA, & HAST tests)	N/A		JESD22-A113 JESD22-A101 JESD22-B101 JESD22-103 JESD22-A112.4	AM1
Temperature Cycle	Test Condition C Temp. -65°C to +150°C Dwell time = 10 to 15 min.	1000 cycles	77 parts	1	2000	JESD22-A104-B	AM1
Highly-Accelerated Temperature and Humidity Stress Test (HAST)	Test Condition A Temp. 130°C, 33.3 psig, RH = 85%	96 hours	77 parts	0	2000	JESD22-A110-A	AM1
High Temp Op Life (HTOL)	Test Condition B Temp. 125°C (+5, -0°C)	1000 hours	77 parts	0	2000	JESD22-A108-B	AM1
Unbiased Autoclave	Test Condition C Temp. 121°C, 15 psig, RH = 100%	96 hours	77 parts	1	2000	JESD22-A102-C	AM1
ESD Complete details are given in section V	Charged Device Model (CDM)	N/A	18 parts	Class IV	1997	JESD22-C101-A	AM1
	Human Body Model (HBM)	N/A	18 parts	Class 1B	1997	JESD22-A114	AM1
Physical Dimensions	N/A	N/A	12 parts	0	2001	JESD22-B100-A	AH1
Solderability	N/A	N/A	74 parts	0	2000	JESD22-B102	AH1
Lead Integrity	N/A	N/A	36 parts	0	1997	JESD22-B105	AH1, AH3
Mark Permanency	N/A	N/A	9 parts	0	2001		AH1, AH3
Res. To Solvents	N/A	N/A	15 parts	0	1997		AH1
Flammability	N/A	N/A	3 parts	0	1997	IEC 695-2-2	AH1



### V. DISCUSSION OF RESULTS

#### 1. Temperature Cycle

77 AM1 parts have completed 77,000 temperature cycles with one failure. After failure analysis, including electrical test and de-encapsulation, one part was determined to have failed due to ESD.

#### 2. Unbiased Autoclave

77 AM1 parts have completed 7392 hours of Autoclave with one failure. After failure analysis, including electrical test and de-encapsulation, one part was determined to have failed due to ESD.

#### 3. Electrostatic Discharge

18 AM1 devices completed CDM testing and another 18 devices completed HBM ESD testing at a variety of different voltage level with no unexpected failures. 2 additional devices were used in the testing as control units. The AM1 device (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 and as a **Class IV device** (Highest Voltage Level Passed between 1000V and 2000V) for Charged Device Model (CDM) testing according to JEDEC Standard JESD22-C101.

3 units were subjected at each test voltage for both CDM and HBM ESD testing. The CDM test voltages were 200, 400, 500, 600, 800, and 1000 volts. The HBM test voltages were 250, 400, 500, 600, 800, and 1000 volts. No failures occurred for the devices used in the CDM ESD tests. Failures occurred at 800 volts or greater for the HBM ESD tests. The failed devices displayed a complete loss of functionality as opposed to partial degradation of RF characteristics. If any one of the three devices 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 WJ Communications.

### VI. CONCLUSIONS

The Reliability Qualification Data demonstrates that the AG101, AG102, and AM1 WJ Communications amplifiers demonstrate high reliability and quality levels.