

PRODUCT QUALIFICATION REPORT

ECM168

5 Watt Amplifier Module

I. SUMMARY


The ECM168 Amplifier Module is the first in production of a new family of high power high linearity HBT based Telecom amplifiers built in a small cost effective package. It utilizes a standard FR4 surface mounted PWB using 0402 size SMT components, soldered onto a tin plated metal heat sink. Two custom designed GaAs HBT chip amplifier devices are die attached to a heat spreading carrier, and then soldered onto the heat sink through a clearance in the FR4 PWB. The chips are gold wire bonded to Type III gold plated pads on the PWB and glop topped. The module has a thin sheet metal cover which snaps into place over the component side of the device. Since this is the first device of such makeup and construction to be produced at WJ, a full Qualification schedule was necessary. The qualification was carried out successfully, and as such, the ECM168 5 Watt Amplifier Module is qualified for production.

II. SCOPE

This Qualification of the ECM168 is intended to establish a level of confidence in reliability and performance by subjecting the device to accelerated environmental stresses, which mimic what could be seen in an expected lifetime. Note that the ECM168 is not a single plastic packaged semiconductor device, but rather a more complex surface mounted assembly containing two integrated HBT amplifier devices glop topped within the PCB. With this in mind, additional qualification tests were defined to expose the assembly to environments that would accelerate possible defects associated with the method of assembly.

III. APPLICABLE DOCUMENTS

Environmental Stress Tests, Testing Procedures, and measure of accomplishment for the ECM168 qualification are derived from JEDEC Standard 22, which has been accepted by the industry as the qualification standard of choice.

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IV. QUALIFICATION TEST PLAN

Test	Procedures/Conditions	Hours/ Cycles	Sample Size	Failed Units	Reference Document	Part Tested
High Temp Op Life (HTOL)	Test Condition: Temp. 125°C (+5, -0°C) Devices biased.	1,000 Hours	3 lots, a total of 135 parts	0	JESD22 A108-B	ECM168
High Temperature Storage (HTB)	Temp. 150°C (+ 5°C, -0°C)	1000 hours	1 lot, a total of 45 parts	0	JESD22 A103-C	ECM168
Temperature Cycle	Test Condition: Temp -55°C (+0°/-10°C) to +85°C (+10°/-0°C)	1000 Cycles	3 lots, a total of 135 parts	0	JESD22 A104-B	ECM168
Powered Temperature Cycle	Test Condition: Temp. -40°C to +85°C Bias periodically applied.	1000 Cycles	3 lots, a total of 135 parts	0	JESD22 A105C	ECM168
Solderability Lead solder	Solder: Sn63Pb37 Flux Type: R145 245°C Solder Bath	N/A	3 lots, 2 parts per lot a total of 36 pins	0	IPC/EIA JEDEC J-STD-002B Method 2003	ECM168
Random Vibration	20 – 2000KHz 20G Peak X, Y and Z-Axis	20 minutes per Axis	3 lots, a total of 135 parts	0	Mil-STD 883B	ECM168
Mechanical Shock	1500 G, X, Y and Z-Axis	5 shocks per axis	3 lots, a total of 135 parts	0	Mil-STD 883B	ECM168
Bond Wire Pull	>4 Grams force	30 bonds	1 lot, 5 devices	0	Mil-STD 2011.7	ECM168
Ball Bond Shear	>12.5 Grams force	30 Bonds	1 lot, 5 devices	0	JESD22 B116	ECM168
Electrostatic Discharge (ESD)	Charged Device Model (CDM)	3 I/O	15 total parts	1000V	JESD22 C101-A	ECM168
	Human Body Model (HBM)	3 I/O	15 total parts	1000V	JESD22 A114	ECM168
Physical Dimensions	N/A	N/A	3 lots, 3 parts	N/A	JESD22 B100-A	ECM168

V. DISCUSSION OF RESULTS

Testing Procedures

Devices for qualification were obtained by testing new parts from three production lots using a semi-automated production test station. Baseline and post environmental exposure measurements were made and compared in order to determine whether the performance of any device had significantly been affected by the environmental exposure. Each of the environmental exposure tests were performed using loose parts except for 85/85 and HTOL where it was necessary to mount the devices to a heat sink and use a PCB



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Qualification Results

1. High Temp Op Life (HTOL)
A total of 135 ECM168 devices from three lots completed 1,000 hours of HTOL without any failures.
2. High Temp Storage Life (HTB)
A total of 45 ECM168 devices completed 1,000 hours of HTB without any failures.
3. Steady State Biased Temperature and Humidity Life (85/85)
A total of 135 ECM168 devices from three lots completed 1,000 hours of 85/85 without any failures.
4. Temperature Cycle
A total of 135 ECM168 devices from three lots completed 1,000 temperature cycles without any failures.
5. Powered Temperature Cycle
A total of 45 ECM168 devices completed 1,000 powered temperature cycles without any failures.
6. Random Vibration
A total of 135 ECM168 devices from three lots completed Random Vibration without any failures.
7. Mechanical Shock
The same devices used for vibration were used for the mechanical shock test. A total of 135 ECM168 devices from three lots completed Mechanical Shock without any failures.
8. Solderability
3 ECM168 with solder dipped leads passed the solderability test with 100% coverage.
9. Physical Dimensions
A total of 10 ECM168 devices completed Physical Dimension Inspection without any failures.
10. Charge Device Model ESD
A total of 12 devices were used to determine the CDM ESD level for the ECM168. Three devices one from each of three lots was tested at four exposure levels. The highest exposure level all three lots survived was 500V which gives the ECM168 a Classification of Level III for CDM.
11. Human Body Model ESD
A total of 12 devices were used to determine the HBM ESD level for the ECM168. Three devices one from each of three lots was tested at four exposure levels. The highest exposure level all three lots survived was 1000V which gives the ECM168 a Classification of Class III for HBM.
12. Bond Wire and Ball Shear
Thirty bond wires were tested for each wire pull and ball shear test. 100% of the bond wires passed the requirements for minimum pull and shear force.

VI. CONCLUSIONS

The successful results obtained from all Qualification Testing completed demonstrate that the ECM168 meet the level of reliability and quality accepted by the industry through the test standard JEDEC 22. The ECM168 in this qualification document is considered qualified for production.



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