	REVISIONS			
	LETTER	DESCRIPTION	DATE	APVD
	1	PRELIMINARY RELEASE	04/01/12	GO

RES-NET MICROWAVE, INC.

Hi-Reliability CVD Diamond Components

1. SCOPE

This document describes the acceptance procedure and tests that are performed on CVD diamond components (Resistors and Terminations) to establish their reliability with screening requirements based on MIL-PRF-55342.

2. APPLICABLE DOCUMENTS

All materials used in the construction of the CVD diamond are qualified by and conform to the following documents (except where noted):

Military Standard

MIL-STD-202 – Test Methods for Electronics & Electrical Component Parts.

Military Specifications

MIL-D-39030 – Dummy Loads, Electrical, Coaxial, and Stripline, General Specification For.

MIL-PRF-55342 – Resistors, Fixed, Film, Chip, Established Reliability, General Specification For.

3. SPECIFICATIONS

3.1 ELECTRICAL

3.1.1 RESISTANCE: See Table I

3.1.2 FREQUENCY RANGE: See Table I

3.1.3 **POWER:** See Table I. For operation at case temperatures in excess of 100°C the components shall be de-rated in accordance with figure 1. The hi-reliability components are de-rated by 30% from the commercial version.

3.2 MECHANICAL

3.2.1 DIMENSIONS: All dimensions are in accordance with applicable figure. See table I

3.2.2 SUBSTRATE: CVD diamond substrate.

3.2.3 RESISTIVE ELEMENT: Thin film.

3.2.4 TERMINALS: Wire bondable and Solderable (Sn96 recommended) thin film gold.

3.2.5 GROUND PLANE: Solderable thin film (Sn96 recommended).

3.2.6 MARKING: Due to the size of the components, the marking is done on individual packaging.

3.3 ENVIROMENTAL:

3.3.1 TEMPERATURE RANGE:

3.3.1.1 STORAGE: -55°C to +150°C.

3.3.1.2 OPERATING: -55°C to +125°C.

4. SCREENING:

The components will be subjected to screening requirements based on MIL-PRF-55342. Group A inspection is performed on 100% of the lot plus six (6) samples for solderability and terminal bondability.

4.1 GROUP A INSPECTION

Percent defective allowable (PDA) of 10% applies to Group A Inspection. If cumulative number of failures exceeds the PDA the entire inspection lot shall be rejected.

4.1.1 VISUAL AND MECHANICAL INSPECTION (100%)

Under 10X magnification, the components will be inspected to verify that the interface, physical dimensions, and workmanship are in accordance with the applicable requirements.

4.1.2 THERMAL SHOCK (100%)

Components will be tested in accordance with method 107 of MIL-STD-202. The following details and exceptions apply:

a. Mounting: Components will not be mounted. Components may be placed in metal baskets, vials, or other apparatus as long as they are subjected to the specified temperature extremes.

b. Measurement before cycling:

DC resistance shall be measured in accordance with MIL-STD-202, Method 303, except at 25°C ±5°C. The dc resistance shall be within the specified resistance tolerance of the nominal resistance value.

c. Test condition B (except that test temperatures will be 150°C +10ºC/-0ºC and -55°C +0ºC/-10°C).

d. Measurement after cycling:

After stabilization at room temperature, the dc resistance shall again be measured as specified in MIL-STD-202, Method 303, except at 25°C ±5°C. The dc resistance shall be within the specified resistance tolerance of the nominal resistance value.

Following the test, the components shall be examined for evidence of mechanical damage.

4.1.3 HIGH TEMPERATURE EXPOSURE (100%):

The components shall then be subjected to a continuous temperature of 150°C ±5°C for a period of 100 hours ±4 hours, in a test chamber. The components shall be stabilized at 25°C ±3°C after which the dc resistance shall be measured as specified. There shall be no evidence of mechanical damage and the change in resistance shall not exceed the value specified in table I.

4.1.4 SOLDERABILITY (Subgroup 1, 3 samples)

3 samples are randomly selected from the lot that has been subjected to visual/mechanical inspection, thermal shock and high temperature exposure.

Components will be tested in accordance with method 208 of MIL-STD-202. Terminals shall be immersed completely by dipping the entire chip in the solder pot. The component will be totally submerged for at least 5 seconds.

When components are tested as specified, the immersed metallized surface shall be at least 95 percent covered with a new clean smooth coating and shall exhibit no de-metallization or leaching of the terminal areas. The remaining 5 percent may contain only small pinholes or rough spots; these shall not be concentrated in one area.

4.1.5 TERMINAL BONDABILITY (Subgroup 2, 3 samples)

3 samples are randomly selected from the lot that has been subjected to visual/mechanical inspection, thermal shock and high temperature exposure.

Components shall be mechanically attached to the test board and electrically connected by wire bonding flying lead interconnections between the chip termination and the ceramic test board metallized land areas. The interconnecting lead shall be .001 inch (0.03 mm) in diameter gold wire. The chip shall be mechanically or adhesively mounted by any procedure which will not be the cause of or contribute to any failures of the chip components in any test.

A pull of 4 grams shall be applied by inserting a hook under the lead wire at approximately the center of the wire as shown in figure 5. The force shall be applied at a 90 degree angle to the surface of the chip, one lead at a time for a minimum of 30 seconds each.

When components are tested as specified, there shall be no evidence of mechanical damage.

4.2 GROUP B QUALIFICATION

Group B qualification is performed on eight (8) samples from lots which have been subjected to and have passed the group A inspection.

If one or more defects are found, the lot will be reworked or screened and defectives removed. After reworking or screening and removal of defectives, a new sample of eight (8) parts will be randomly selected. If one or more defects are found in this second sample, the lot will be rejected

Sample units which have been subjected to group B (destructive tests) qualification will not be delivered on the contract or order unless previously agreed.

4.2.1 POWER BURN IN (Subgroup 1, 2 samples)

Components shall be tested in accordance with method 108A of MIL-STD-202, condition A. The following details and exceptions apply:

a. Sample units will be mounted on a heat sink.

b. Test temperature and tolerance: 100°C ±5°C heat sink temperature.

c. Initial resistance measurement of mounted components: resistance will be measured after mounting at room temperature. This initial measurement will be used as the reference dc resistance for all subsequent measurements under the same condition.

d. Operating conditions: Rated dc continuous working voltage, or filtered or non-filtered full wave rectified ac voltage, shall be applied continuously for 96 +/- 4 hours.

e. Final resistance measurement of mounted components: Components should be disconnected from the test setup for a minimum of 45 minutes and stabilized before measurement.

g. Examination after test: Components shall be examined for evidence of mechanical damage and the change in resistance shall not exceed the value specified in table I.

4.2.2 RESISTANCE TEMPERATURE CHARACTERISITCS (Subgroup 2, 3 samples)

Components shall be tested in accordance with method 304 of MIL-STD-202. The following details and exceptions shall apply:

a. Reference temperature: Room ambient temperature.

b. Test temperature Sequence: 25°C, -55°C, 25°C, +125°C.

c. Accuracy of temperature measurement: Components shall be maintained for thirty minutes +90/-15 minutes within 3°C at each of the test temperatures. This tolerance shall be maintained on the established test temperatures.

d. Mounting: The chip shall be mechanically or adhesively mounted by any procedure which will not be the cause of or contribute to any failures of the component.

4.2.3 SHORT TIME OVERLOAD (Subgroup 3, 3 samples)

The dc resistance will be measured on the component mounted on a heat sink. A dc test potential, 2.5 times the rated continuous working power will be applied for 5 seconds to the component under the following conditions:

a. Component on heat sink shall be mounted so that the larger space of the component is on a horizontal plane.

b. In still air, with no circulation other than that created by the heat of the components being operated.

The components shall be stabilized at 25°C ±3°C after which the dc resistance shall be measured as specified.

There shall be no evidence of arcing, burning, or charring, the change in resistance shall not exceed the value specified in table I.

4.3 GROUP C QUALIFICATION (Subgroup 1, 2 samples)

Group C inspection shall be made on two (2) sample units selected from lots which have passed group A and group B inspection (from **4.2.1 Power Burn In**). Group C samples will be representative of production. If one or more defects are found, the lot will be rejected

4.3.1 LIFE

Components shall be tested in accordance with method 108A of MIL-STD-202, condition D. The following details and exceptions apply:

a. Sample units will be mounted on a heat sink.

b. Test temperature and tolerance: 100°C ±5°C heat sink temperature.

c. Initial resistance measurement of mounted components: resistance will be measured after mounting at room temperature. This initial measurement will be used as the reference dc resistance for all subsequent measurements under the same condition.

d. Operating conditions: Rated dc continuous working voltage, or filtered or non-filtered full wave rectified ac voltage, shall be applied for 1000 +72/- 24 hours.

e. Measurements during test: DC resistance shall be measured at the end of the 30 minutes “off” periods after 250 hours +72/-24 hours; 500 hours +72/-24 hours; 1,000 hours +72/-24 hours;

f. Final resistance measurement of mounted components: Components should be disconnected from the test setup for a minimum of 45 minutes and stabilized before measurement.

g. Examination after test: Components shall be examined for evidence of mechanical damage and the change in resistance shall not exceed the value specified in table I.

5 CERTIFICATION (C of C)

A certificate of conformance, and attributes data (number of units tested, number passed) recorded by test and listing test operator and date performed, shall accompany shipments of deliverable units.

TABLE I

Part Number(1)	Power (Watts)(2)	Resistance (Ohms)	Tolerance (%)	Frequency (GHz)	Mechanical Dimensions
HRPC0402DR1X	14	50	5	DC-30	Figure 2
HRPC0402DR2X	14	100	5	DC-30	Figure 2
HRPC0603DR1X	35	50	5	DC-20	Figure 3
HRPC0603DR2X	35	100	5	DC-20	Figure 3
HRPC0402DTX	10	50	5	DC-12	Figure 4
HRPC0603DTX	35	50	5	DC-26.5	Figure 5

Notes:

1. The “X” in the part number scheme represents the level of screening required (A, B or C).
2. Input power maximum at +100°C mounting base temperature, de-rated linearly to zero power at +150°C base temperature. See Figure 1.

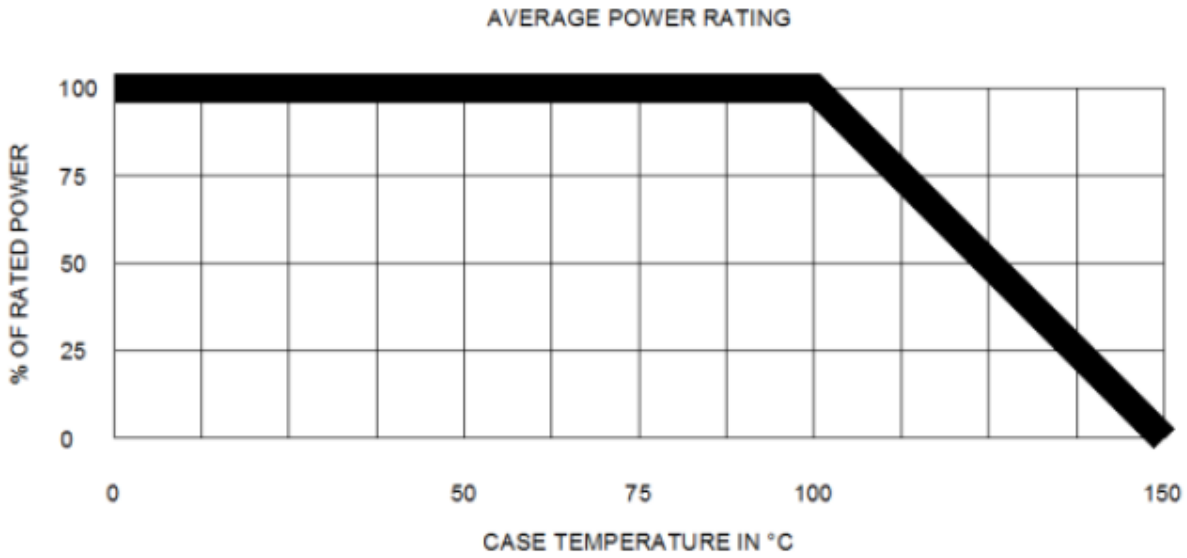

Figure 1 Power De-rating curve

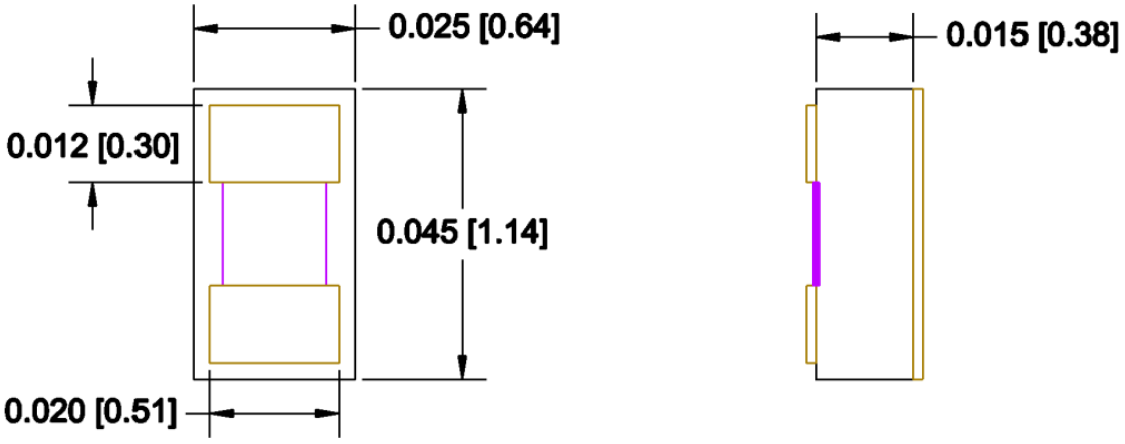

Figure 2 Mechanical Drawing

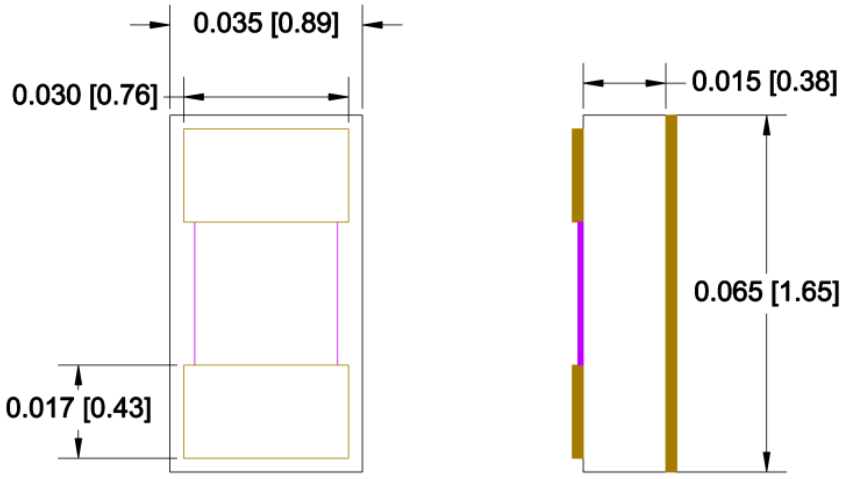

Figure 3 Mechanical Drawing

Dimensions are in inches [mm]

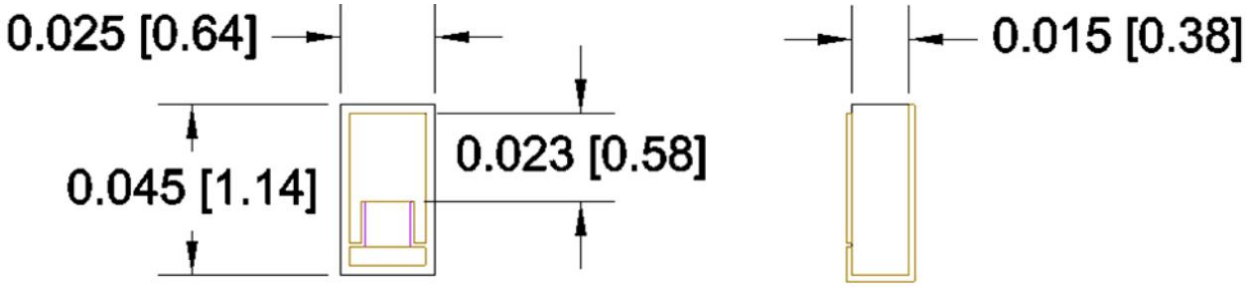

Figure 4 Mechanical Drawing

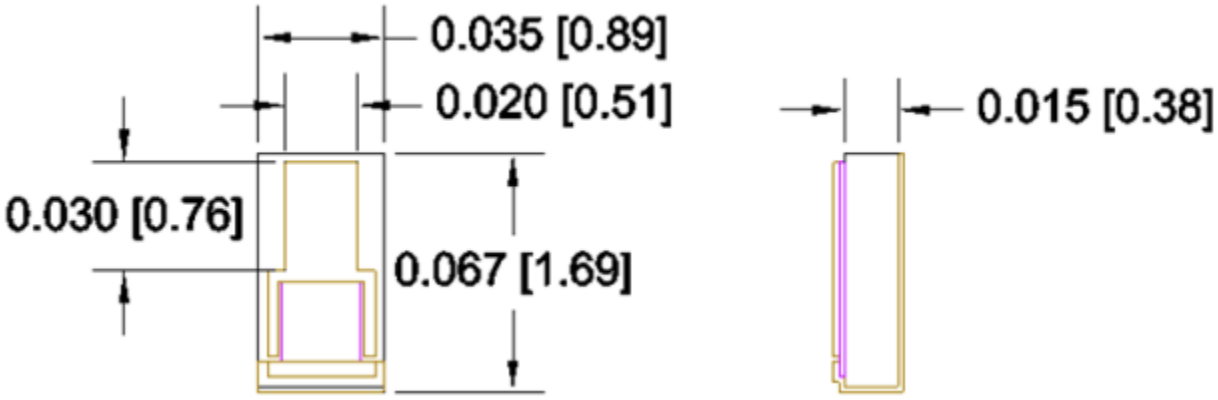

Figure 5 Mechanical Drawing

Dimensions are in inches [mm]

APPENDIX A

TEST SUMMARY

GROUP A (100% + 6 Samples)		
Section	**Description**	**Samples**
4.1.1	Visual/Mechanical Inspection	100%
4.1.2	Thermal Shock	100%
4.1.3	High Temperature Exposure	100%
4.1.4	Solderability (Subgroup 1)	3
4.1.5	Terminal Bondability (Subgroup 2)	3

GROUP B (8 Samples)		
Section	**Description**	**Samples**
4.2.1	Power Burn In	2
4.2.2	Resistance Temperature Characteristics	3
4.2.3	Short Time Overload	3

GROUP C (2 Samples)		
Section	**Description**	**Samples**
4.3.1	Life	2

Additional or custom hi-reliability testing options are available upon request.

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- Transformers and Inductors for Medical Devices and Equipment