EIA Low ESR
Multi-Layer Ceramic Capacitors

1111N (0.110” x 0.110”)

Product Features

- High Q
- High Power
- Low ESR/ESL
- Low Noise
- High Self-Resonance
- Ultra Stable Performance
- Capacitance Range: 0.2pF to 1000pF

Product Applications

Typical Functional Applications

• Tuning • Bypass • Coupling
• Feedback • D.C. Blocking
• Impedance Matching

Typical Circuit Applications

• UHF/Microwave RF Power Amplifiers
• Mixers • Oscillators • Filter Networks
• Low Noise Amplifiers • Timing Circuits and Delay Lines

Marking shown for illustration purposes only. Actual marking may differ.

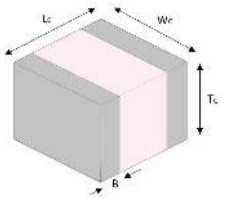
Part Numbering

1111	N	100	J	W	501	X	TV
Case Size (.110” x .110”)	N = NP0 (COG)	Capacitor Code 100=10x10⁰=10pF 1R0=1.0pF	Capacitance Tolerance *See Table*	Termination Type *See Table*	Rated Voltage *See Table*	Laser Marking	Add TV for Vertical Orientation

Capacitor Dimensions

Unit: inch (millimeter)

Code	Term.	Length Lc	Width Wc	Thickness Tc	Overlap B
W	Chip	0.110 + 0.020 to -0.010 (2.79 +0.51 to -0.25)	0.110 ± 0.015 (2.79 ±0.38)	0.10 (2.60 max)	0.015 (0.024 max)



Capacitance Tolerance Codes

Code	A	B	C	D	F	G	J	K
Tol.	±0.05pF	±0.1pF	±0.25pF	±0.5pF	±1%	±2%	±5%	±10%

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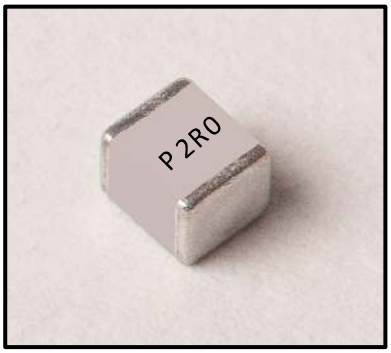
Terminations Types and Codes

Termination Code	Termination
W (RoHS)	100% Sn Solder over Nickel Plating
L	90%Sn10%Pb Tin/Lead

Voltage Code

Voltage	Code
100V	101
200V	201
500V	501
1000V	102



Marking shown for illustration purposes only. Actual marking may differ.

1111N Capacitance Values

For special capacitances, tolerances and WVDC, please contact PPI.

Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.
0.2	0R2	A,B, C,D	500V	1000V	**2.7**	2R7	A,B, C,D	500V	1000V	**22**	220	F,G, J,K	500V	1000V	**180**	181	F,G, J,K	500V	1000V
0.3	0R3				**3.0**	3R0				**24**	240				**200**	201			
0.4	0R4				**3.3**	3R3				**27**	270				**220**	221	F,G, J,K	200V	500V
0.5	0R5				**3.6**	3R6				**30**	300				**240**	241			
0.6	0R6				**3.9**	3R9				**33**	330				**270**	271			
0.7	0R7				**4.3**	4R3				**36**	360				**300**	301			
0.8	0R8				**4.7**	4R7				**39**	390				**330**	331			
0.9	0R9				**5.1**	5R1	B,C, D	500V	1000V	**43**	430				**360**	361			
1.0	1R0				**5.6**	5R6				**47**	470				**390**	391			
1.1	1R1				**6.2**	6R2				**51**	510				**430**	431	G,J, K	200V	500V
1.2	1R2				**6.8**	6R8				**56**	560	F,G, J,K			**470**	471			
1.3	1R3				**7.5**	7R5				**62**	620				**510**	511	G,J, K	100V	500V
1.4	1R4				**8.2**	8R2				**68**	680				**560**	561			
1.5	1R5				**9.1**	9R1				**75**	750				**620**	621			
1.6	1R6				**10**	100	F,G, J,K	500V	1000V	**82**	820				**680**	681	G,J, K	50V	N/A
1.7	1R7				**11**	110				**91**	910				**750**	751			
1.8	1R8				**12**	120				**100**	101				**820**	821			
1.9	1R9				**13**	130				**110**	111				**910**	911			
2.0	2R0				**15**	150				**120**	121				**1000**	102			
2.1	2R1				**16**	160				**130**	131								
2.2	2R2				**18**	180				**150**	151								
2.4	2R4				**20**	200				**160**	161								

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Electrical Specifications

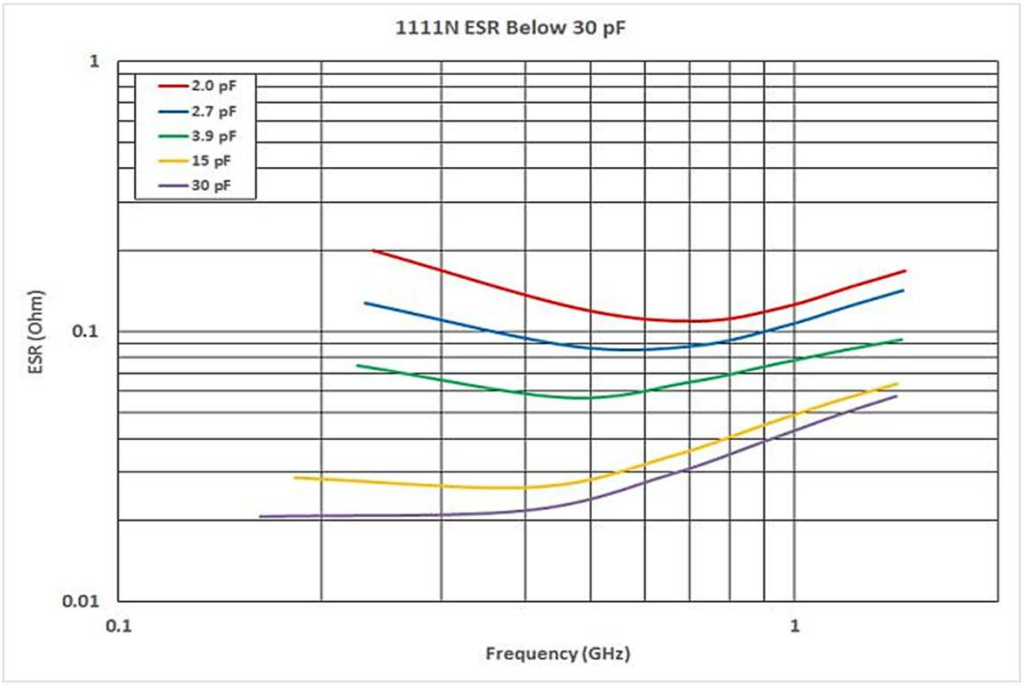
Quality Factor (Q)	2,000 at 1 MHz
Insulation Resistance (IR)	10^5 Megaohms min. @ +25°C rated WVDC 10^4 Megaohms min. @ +125°C rated WVDC
Rated Voltage	See Rated Voltage Table
Dielectric Withstanding Voltage (WVDC)	250% of Rated Voltage of 5 seconds, Rated Voltage ≤ 500VDC 150% of Voltage for 5 seconds, 500VDC <Rated Voltage ≤ 1250 VDC 120% of Voltage for 5 seconds, Rated Voltage > 1250 VDC
Operating Temperature Range	-55°C to 175°C
Temperature Coefficient (TC)	0±30ppm/°C
Capacitance Drift	±0.02% or ±0.02pF, whichever is greater
Piezoelectric Effects	None

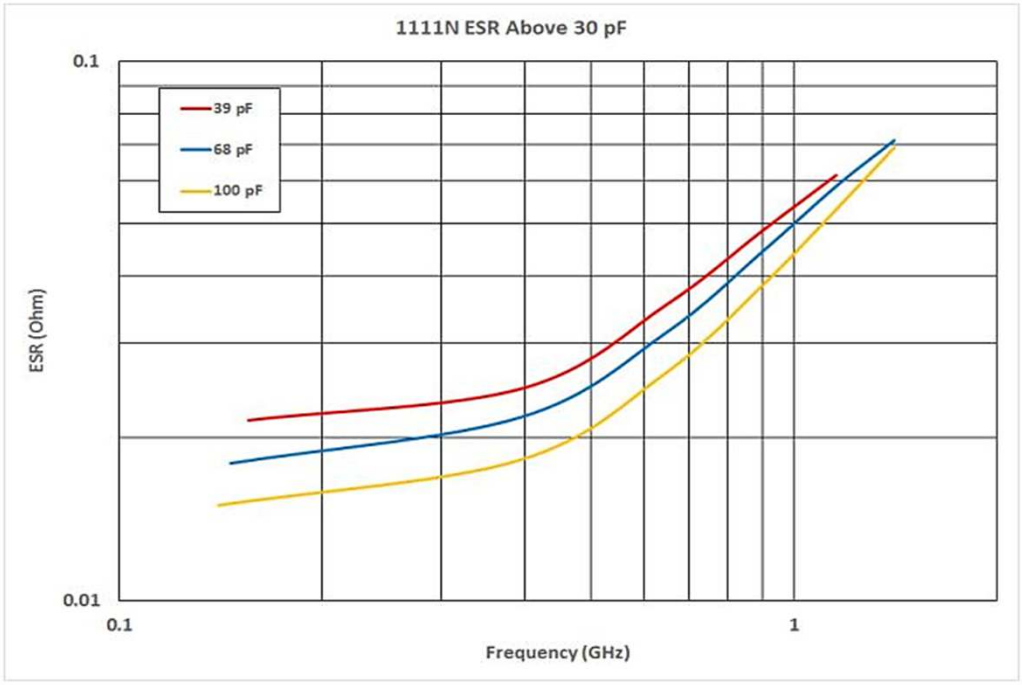
Environmental Specifications

	Specification	Test Parameters
Thermal Shock	No mechanical damage **Capacitance Change:** ±0.5% or 0.5pF max **IR:** >1 G Ohms Q>500 Breakdown Voltage: 2.5x WVDC	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature (-55°C and 175°C) stay 30 minutes, the time of removing shall not be more than 3 minutes. Perform five cycles.
Moisture Resistance		MIL-STD-202, Method 106
Humidity (Steady State)	No mechanical damage **Capacitance Change:** ±0.5% or 0.5pF max **IR:** >1 G Ohms Q>300 Breakdown Voltage: 2.5x WVDC	MIL-STD-202, Method 103, Condition A With 1.5Volts DC applied while subjected to an environment of 85°C with 85% relative humidity for 240 hours minimum.
Life	No mechanical damage **Capacitance Change:** ±2.0% or 0.5pF max **IR:** >1 G Ohms Q>500 Breakdown Voltage: 2.5x WVDC	MIL-STD-202, Method 108. For 1000 hours, at 175°C. 200% of Voltage for Capacitors, Rated Voltage ≤ 500VDC; 120% of Voltage for Capacitors, 500VDC< Rated Voltage ≤1250VDC; 100% for Voltage for Capacitors, Rated Voltage >1250VDC
Terminal Adhesion	Termination should not pull off. Ceramic should remain undamaged	Linear pull force exerted on axial leads soldered to each terminal. 2.0lbs.
Resistance to Soldering Heat	No mechanical damage **Capacitance Change:** -1.0%~+2.0 **IR:** >1 G Ohms Q>500 Breakdown Voltage: 2.5x WVDC	Preheat device to 150°C -180°C for 60 seconds. Dip in 260°C ±5C solder for 10 ±1 second. Measure after 24± 2 hour cooling period.

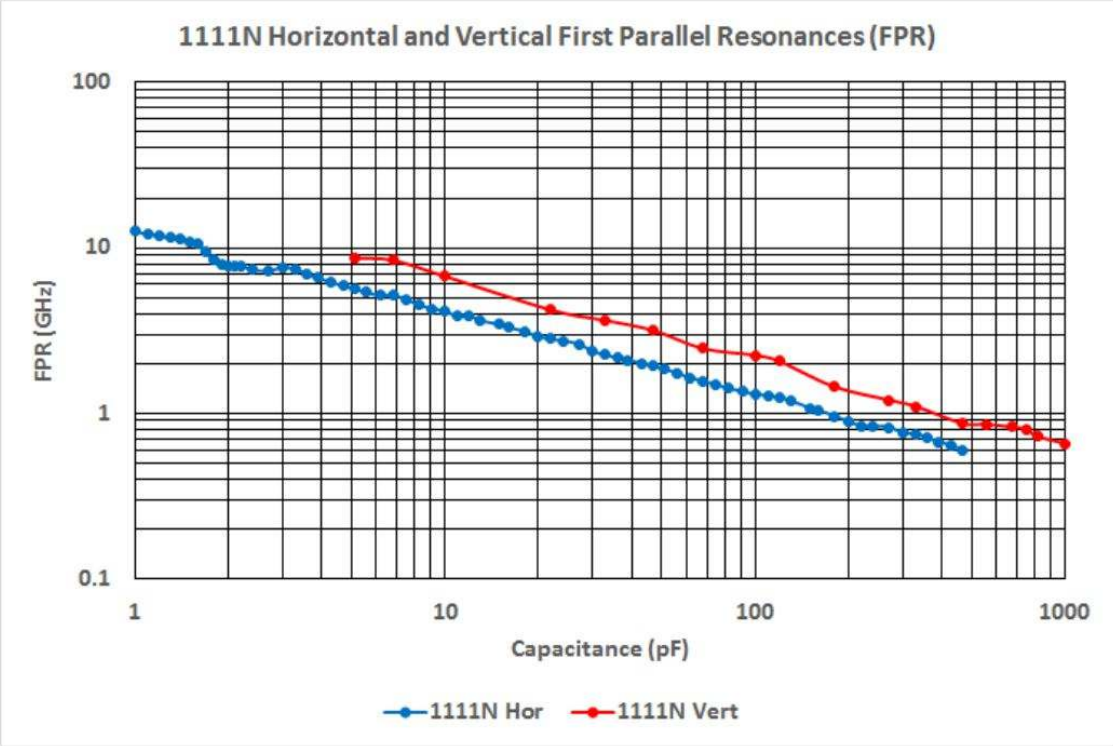
Capacitors are designed and manufactured to meet the requirements of MIL-PRF-55681 and MIL-PRF-123.

ESR vs. Frequency





First Parallel Resonance



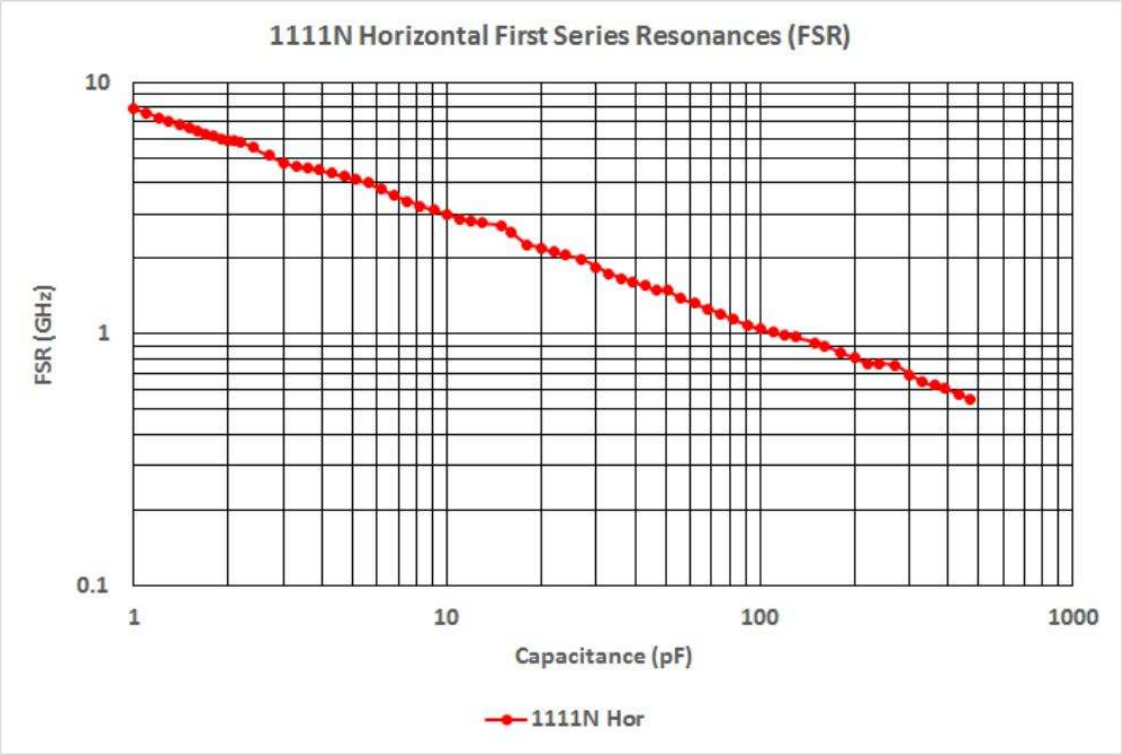
Definitions and Measurement Conditions

The **First Parallel Resonance, FPR,** is defined as the lowest frequency at which a suckout or notch appears in |S21|. It is generally independent of substrate thickness or dielectric constant, but does depend on capacitor orientation. A horizontal orientation means the capacitor electrode planes are parallel to the plane of the substrate; a vertical orientation means the electrode planes are perpendicular to the substrate.

The definitions on the carts are for a capacitor in a series configuration, i.e., mounted across a gap in a microstrip trace with a 50-Ohm termination. The measurement conditions are: substrate – Rogers RO4350; substrate dielectric constant = 3.48; horizontal mount substrate thickness (mils) = 55; vertical mount substrate thickness (mils) = 45; gap in microstrip trace (mils) = 61.1; horizontal mount microstrip trace width (mils) = 123.7; vertical mount microstrip trace width (mils) = 101.0. Reference planes at sample edges.

All data has been derived from electrical models created by Modelithics, Inc., a specialty vendor contracted by PPI. The models are derived from measurements on a large number of parts disposed on several different substrates.

First Series Resonance



Definitions and Measurement Conditions

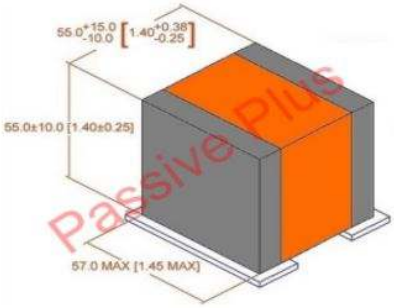
The **First Series Resonance, FSR,** is defined as the lowest frequency at which the imaginary part of the input impedance, Im[Zin], equals zero. Should Im[Zin] or the real part of the input impedance, Re[Zin], not be monotonic with frequency at frequencies lower than those at which Im[Zin] =0, the FSR shall be considered as undefined (represented as a gap in the plot). FSR is dependent on internal capacitor structure; substrate thickness and dielectric constant; capacitor orientation, as defined alongside the FPR plot; and mounting pad dimensions.

The definitions on the carts are for a capacitor in a series configuration, i.e., mounted across a gap in a microstrip trace with a 50-Ohm termination. The measurement conditions are: substrate – Rogers RO4350; substrate dielectric constant = 3.48; horizontal mount substrate thickness (mils) = 55; vertical mount substrate thickness (mils) = 45; gap in microstrip trace (mils) = 61.1; horizontal mount microstrip trace width (mils) = 123.7; vertical mount microstrip trace width (mils) = 101.0. Reference planes at sample edges.

All data has been derived from electrical models created by Modelithics, Inc., a specialty vendor contracted by PPI. The models are derived from measurements on a large number of parts disposed on several different substrates.

Capacitor Application Program

Passive Plus, Inc.’s brand new **online Capacitor Application Program (**C.A.P.) helps Engineers and Designers select capacitors according to parameters such as cap value and frequency. C.A.P. allows engineers to insert capacitors requirements (Cap value, Frequency), producing Scattering Matrices (S2P) Charts while providing options (Case Size, Terminations, Mounting), and parameters (ESR, Q, Impedance) along with Datasheets. Once engineers have determined their capacitor requirements, C.A.P. also includes online Requests For Quotes (RFQs) and/or sample requests.



Modelithics Vendor Program

PPI offers design engineers a Free 90-Day Trial license for the Modelithics PPI Component Library. This program provides engineers access to extremely accurate scalable simulation models for Passive Plus capacitors with advanced features that enable a more precise and rapid design process.

Microwave Global Models include every part value in a series and permit users to input substrate thickness, dielectric constant, and loss tangent, as well as mounting pad layout dimensions. Selected models also include capacitor orientation – vertical or horizontal – as an input. Engineers can request FREE use of the models, by either visiting the Passive Plus Resources page (http://passiveplus.com/addldocs_resources.php).

Recommended Land Pattern Dimensions

When mounting the capacitor to substrate, it's important to carefully consider that the amount of solder (size of fillet) used has a direct effect upon the capacitor once it's mounted.

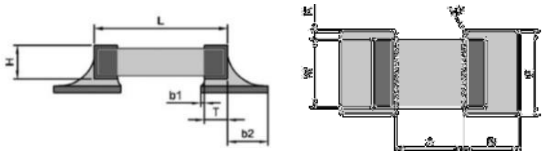
1) The greater the amount of solder, the greater the stress to the elements. This may cause the substrate to break or crack.

2) In the situation where two or more devices are mounted onto a common land, be sure to separate the device into exclusive pads by using soldering resist.

Horizontal Mounting

Dimensions: mm

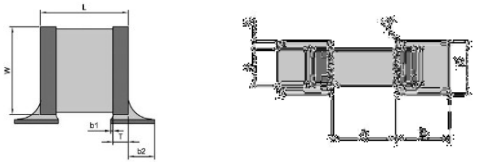
A	B	C
1.90	1.70	2.90



Vertical Mounting

Dimensions: mm

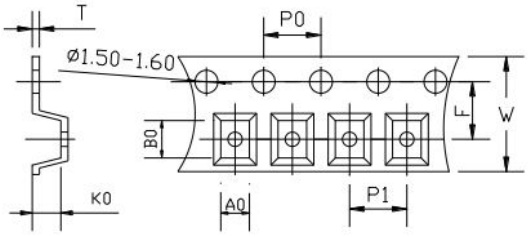
A	B	C
1.90	1.70	2.50



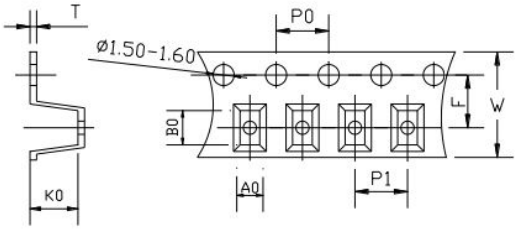
Tape & Reel Specifications

Dimensions: mm

Horizontal Orientation



Vertical Orientation



Orientation	A0	B0	K0	W	P0	P1	T	F	Qty Min	Qty/ reel	Tape Material
Horizontal	2.92	3.51	2.34	8.00	4.00	4.00	0.254	3.50	500	500	Embossed
Vertical	2.92	3.51	2.34	12.00	4.00	4.00	0.254	3.50	500	500	Embossed

Dimensions: mm

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Engineering Design Kits

PPI offers Design Kits for engineers who are building and testing prototypes. Each kit contains 16 values;10 pieces per value.

Kits are 100% RoHS compliant.

Kit Number	Value Range	Values	
DKD1111N01	**1.0 - 10pF**	1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.4, 2.7, 3.0, 3.3, 3.9, 4.7, 5.6, 6.8, 8.2, 10pF	RoHS
DKD1111N02	**10 - 100pF**	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF	RoHS
DKD1111N03	**100 - 1000pF**	100, 120, 150, 180, 200, 220, 240, 270, 300, 330, 390, 470, 560, 680, 820, 1000pF	RoHS