



≠ **Product Features**

- High Q
- High Power
- Low ESR/ESL
- Low Noise
- High Self-Resonance
- Ultra Stable Performance
- Capacitance Range:
0.1pF to 33pF
- Working Voltage: 200V

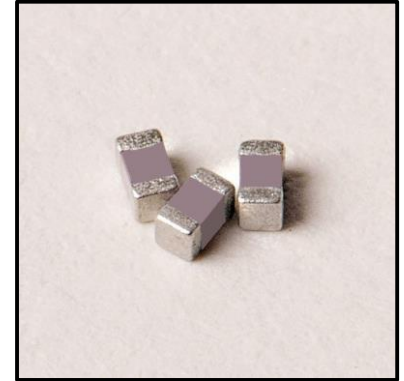
≠ **Product Applications**

Typical Functional Applications

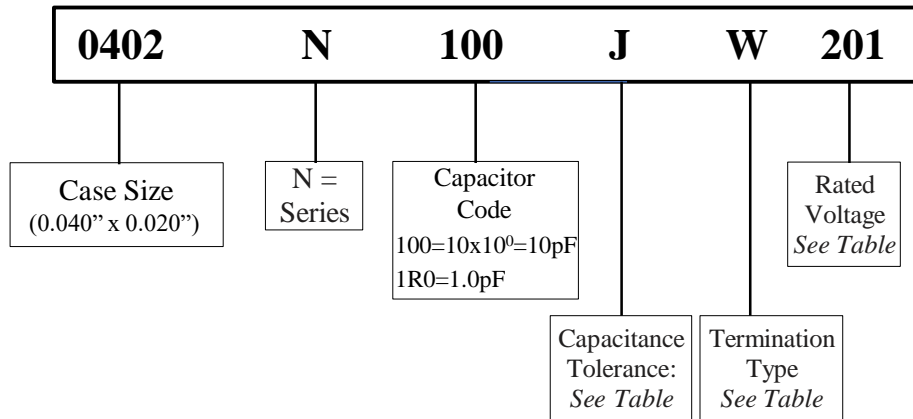
- Tuning • Bypass • Coupling
- Feedback • D.C. Blocking
- Impedance Matching

Typical Circuit Applications

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



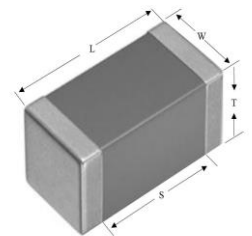
≠ **Part Numbering**



≠ **Capacitor Dimensions**

Unit: inch (millimeter)

Code	Term.	Length	Width	Thickness	Overlap
		Lc	Wc	Tc	B
W	Chip	0.040 ± 0.004 (1.02 ± 0.10)	0.020 ± 0.004 (0.51 ± 0.10)	0.020 ± 0.004 (0.51 ± 0.10)	0.010 ± 0.006 (0.25 ± 0.15)



≠ **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%





EIA Low ESR
Multi-Layer Ceramic Capacitors

0402N (0.040" x 0.020")

≠ Terminations Type and Code

≠ Voltage Codes

Termination Code	Termination
W	100% Sn Solder over Nickel Plating

Voltage	Code
50V	500
200V	201
250V	251



≠ 0402N Capacitance Values

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

Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC
0.1	OR1			2.0	2R0			10	100		
0.2	OR2			2.1	2R1			11	110		
0.3	OR3			2.2	2R2		50V;	12	120		
0.4	OR4			2.4	2R4		200V;	13	130		
0.5	OR5			2.7	2R7		250V	15	150		
0.6	OR6			3.0	3R0			16	160		50V;
0.7	OR7			3.3	3R3			18	180	F,G,J,K	200V
0.8	OR8			3.6	3R6	A,B,C,D		20	200		
0.9	OR9		50V;	3.9	3R9			22	220		
1.0	1R0	A,B,C,D	200V;	4.3	4R3			24	240		
1.1	1R1		250V	4.7	4R7			27	270		
1.2	1R2			5.1	5R1		50V;	30	300		50V
1.3	1R3			5.6	5R6		200V	33	330		
1.4	1R4			6.2	6R2						
1.5	1R5			6.8	6R8						
1.6	1R6			7.5	7R5						
1.7	1R7			8.2	8R2	A,B,C					
1.8	1R8			9.1	9R1						
1.9	1R9										





⚡ 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
Dielectric Withstanding Voltage (WVDC)	250% of Rated Voltage of 5 seconds
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>2000 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.
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 106
Low Voltage Humidity	No mechanical damage Capacitance Change: ±0.3% or 0.3pF max IR: >1 G Ohms Q>300 Breakdown Voltage: 2.5x WVDC	MIL-STD-202, Method 103, Condition A, with 1.5 Volts 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
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: >10 G Ohms Q>500 Breakdown Voltage: 2.5x WVDC	Preheat device to 150°C -180°C for 60 seconds. Dip in 260°C ±5°C solder for 10 ±1 second. Measure after 24± 2 hour cooling period.

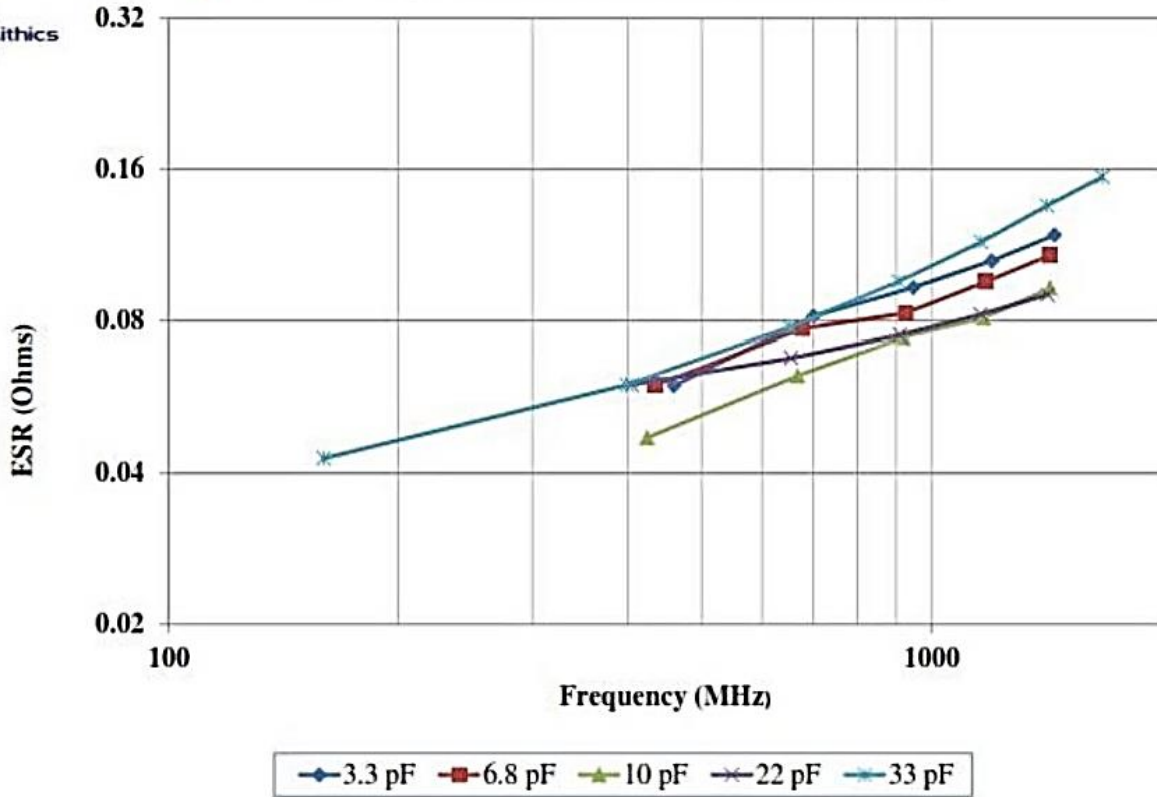
Capacitors are designed and manufactured to meet the requirements of MIL-PRF-55681 and MIL-PRF-123.



≡ ESR vs. Frequency



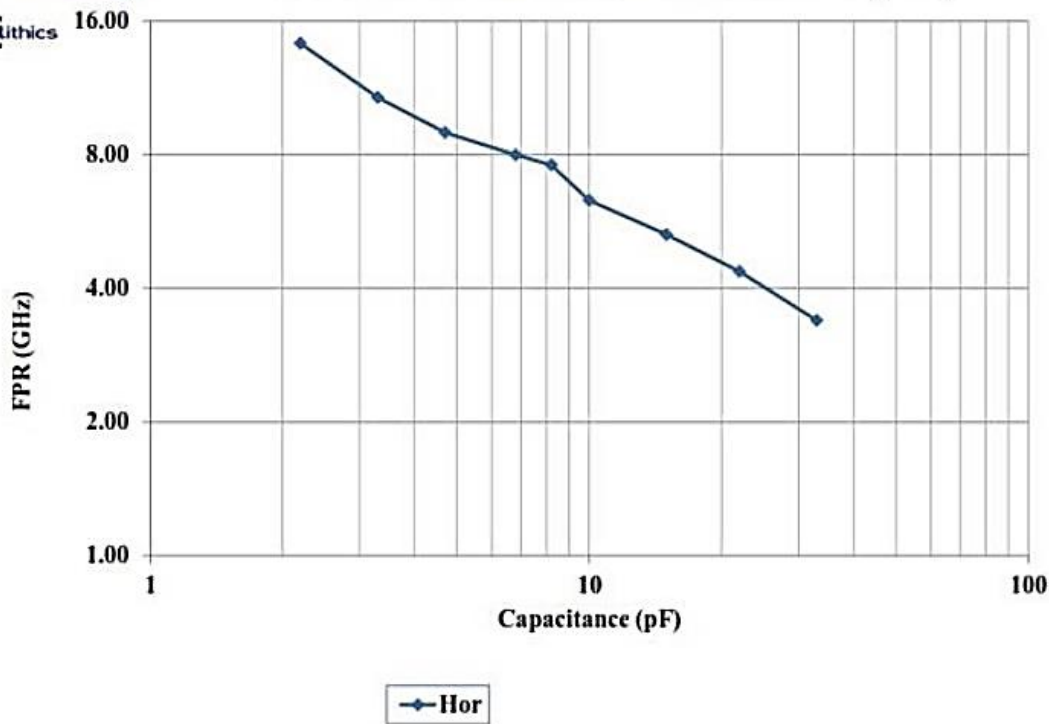
0402N Equivalent Series Resistances (ESRs)



≠ First Parallel Resonance



0402N Horizontal First Parallel Resonance (FPR)



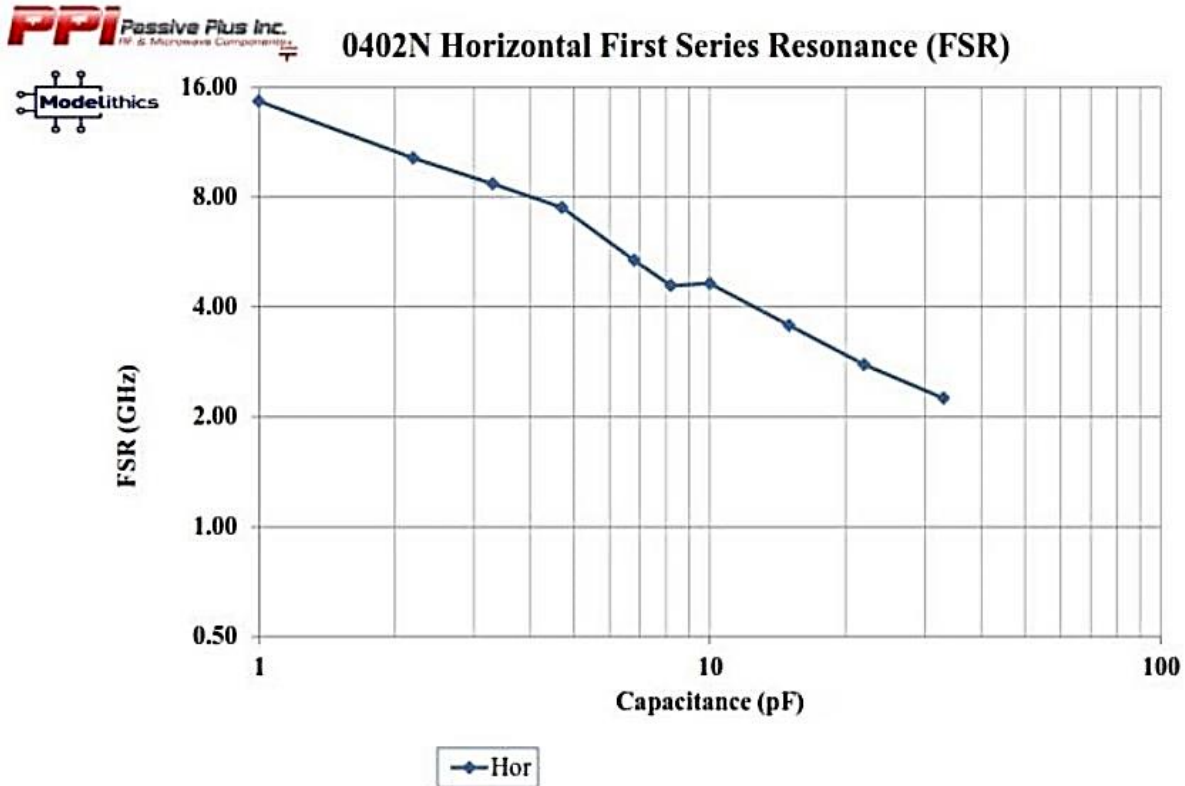
≠ Definitions and Measurement Conditions

The **First Parallel Resonance, FPR**, is defined as the lowest frequency at which a suckout or notch appears in $|S_{21}|$. It is generally independent of substrate thickness or dielectric constant, but does depend on capacitor orientation. A vertical orientation means the electrode planes are perpendicular to the substrate.

The definitions on the charts are for a capacitor in a series configuration, i.e., mounted across a gap in a microstrip trace with 50-Ohm termination. The measurement conditions are: substrate – Rogers RO4350; substrate dielectric constant = 3.48; substrate thickness (mils) = 10; gap in microstrip trace (mils) = 15; microstrip trace width (mils) = 22; 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

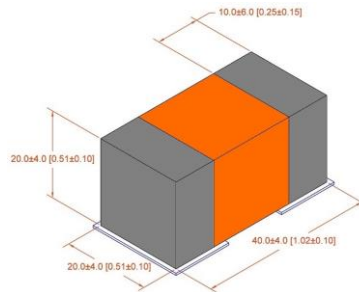
The **First Series Resonance, FSR**, is defined as the lowest frequency at which the imaginary part of the input impedance, $\text{Im}[Z_{in}]$, equals zero. Should $\text{Im}[Z_{in}]$ or the real part of the input impedance, $\text{Re}[Z_{in}]$, not be monotonic with frequency at frequencies lower than those at which $\text{Im}[Z_{in}] = 0$, 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.

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≡ 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 \(http://passiveplus.com/addldocs_resources.php\)](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.

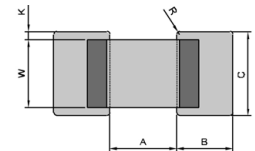
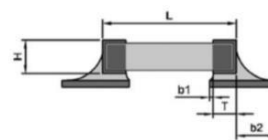


1) The greater the amount of solder, the greater the stress to the elements. This may cause the substrate to break or crack.

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.

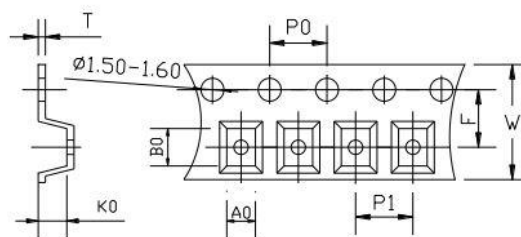
≠ Horizontal Mounting Dimensions: mm

A	B	C
0.41	0.41	0.54



≠ Tape & Reel Specifications Dimensions: mm

Horizontal Orientation



Orientation	A0	B0	K0	W	P0	P1	T	F	Qty Min	Qty/reel	Tape Material
Horizontal	0.60	1.10	1.00	8.00	4.00	2.00	0.20	3.50	500	500	Paper



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0402N (0.040" x 0.020")

≠ 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	Capacitance (pF)	Tolerance	RoHS
DKD0402N01	0.1pF to 2.pF	0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.2, 1.5, 1.6, 1.8, 2.0	±.1pF	✓
DKD0402N02	1.0pF to 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 10	±.1pF ±5%	✓
DKD0402N03	10pF to 33pF	10, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33	±5%	✓

PPI Passive Plus Inc.
RF & Microwave Components

Ultra-Low ESR
Capacitor Design Kit
Size: 0.04" x 0.02"

0402N Series 1.0pF – 2.0pF

TC = NP0 WVDC=2000V DKD0402N01

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Ultra-Low ESR
Capacitor Design Kit
Size: 0.04" x 0.02"

0402N Series 1.0pF - 10pF

TC = NP0 WVDC=2000V DKD0402N02

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