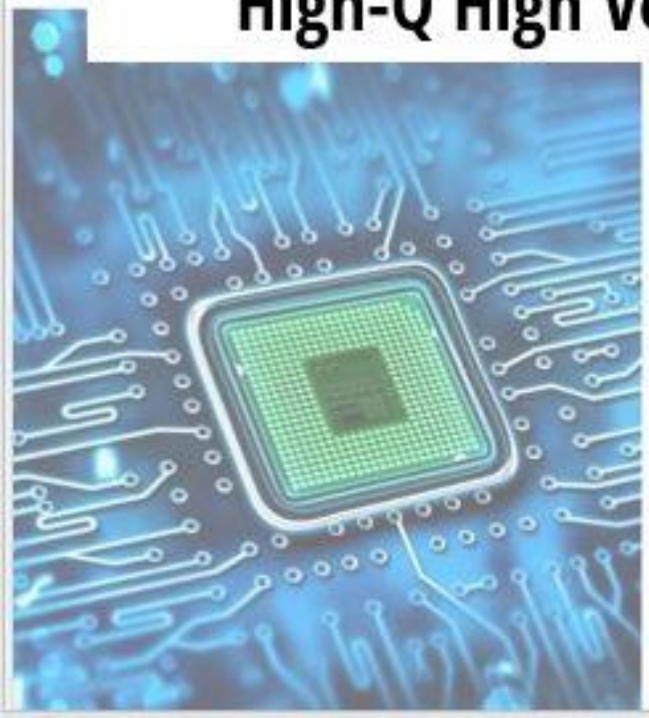
RF & MICROWAVE COMPONENTS

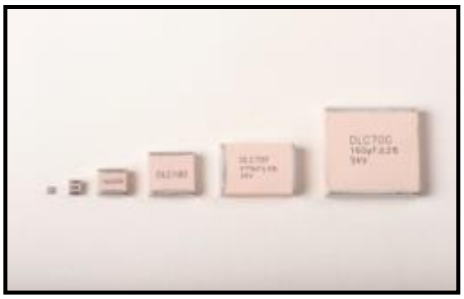
PPI®

High-Q, Low ESR Multi-Layer Ceramic Capacitors
High-Q High Voltage Custom Assemblies



Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

Passive Plus (PPI) specializes in Magnetic & Non-Magnetic HI-Q Components, supplying reliable quality components to the Aerospace, Telecommunications, Medical Semiconductor, and Military industries.



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

PPI is an American (New York), Woman owned Business.

- PPI is ISO9001:2015 certified.
- S level reliability
- Mil C 55681
- Mil C 123
- EAR 99 Compliant
- No ITAR Issues
- Export Compliant
- RoHS and REACH Compliant

PPI has been audited by some of the largest and most successful companies in the world and has received extremely high audit ratings. We believe our audit ratings are best in class. PPI is known for Outstanding Customer Service and RF Engineering Support.

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

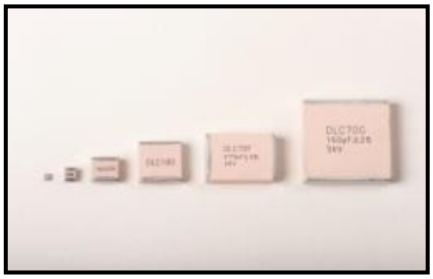
Product Features

- High Q
- High Power
- Low ESR/ESL
- Low Noise
- High Self-Resonance
- Ultra Stable Performance

Product Applications

Typical Functional Applications:

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



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

Typical Circuit Applications:

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

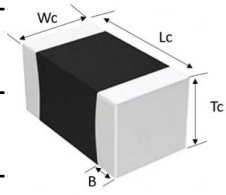
Part Numbering

0505 C 100 J W 151 X TV

Case Size (0.055" x 0.055")	C =NP0 P = P90	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

Case Size (Chip) Dimensions

	0505	1111	2225	3838	6040	7676
Length (L_c)	0.055 + 0.015 to -0.010 (1.40 +0.38 to -0.25)	0.110 + 0.020 to -0.010 (2.79 +0.51 to -0.25)	0.225 -0.010+0.25 (5.72 -0.25+ 0.64)	0.380 -0.010+0.015 (9.65 -0.25+0.38)	0.614 -0.010+0.015 (15.6 -0.25+0.38)	0.760 -0.010+0.015 (19.3 -0.25+0.38)
Width (W_c)	0.055 ± .010 (1.40 ±0.25)	0.110 ± 0.010 (2.79 ±0.25)	0.250 ± 0.015 (6.35 ± 0.38)	0.380 ±0.010 (9.65±0.25)	0.433±0.010 (11.0±0.25)	0.760±0.010 (19.3±0.25)
Thickness (T_c)	0.057 (1.45 max)	0.10 (2.54 max)	0.165 (4.19) max	0.170 (4.32) max	0.154±0.008 (3.90±0.20) max	0.154±0.008 (3.90±0.20) max
Overlap (B)	0.02 (0.51max)	0.024 (0.60max)	0.020~0.047 (0.50~1.20) max	0.024~0.059 (0.60~1.50)	0.063 (1.60) max	0.063 (1.60) max



Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

Temperature Coefficient

C: -55°C to 125°C 0±30ppm/°C; >125 °C to 200°C 0±60ppm/°C
P: +90±20ppm/°C

Rated Capacitance

Capacitance is less than 10pF; for example: 1R0=1.0pF, R denotes decimal point
Capacitance greater than 10pF; for example: 101=100pF, the third number is the power of 10

Tolerance

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

Termination Types and Codes

Magnetic			Non-Magnetic		
Termination Code	Type	Magnetic Termination	Termination Code	Type	Non-Magnetic Terminations
W	Chip	100% Sn Solder over Nickel Plating	P	Chip	100%Sn Solder over Copper Plating
L	Chip	90% Sn10%Pb Tin/Lead Solder over Nickel Plating	MN	Microstrip	Silver-Plated Copper
			AN	Axial Ribbon	
MS	Microstrip	Silver-Plated Copper	FN	Radial Ribbon	
AR	Axial Ribbon		RN	Axial Wire	
RR	Radial Ribbon		BN	Radial Wire	
RW	Axial Wire				
AW	Radial Wire				

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

Voltages

Code	Rated Voltage	Code	Rated Voltage
500	50V	152	1500V
101	100V	202	2000V
151	150V	252	2500V
201	200V	302	3000V
301	300V	362	3600V
501	500V	502	5000V
102	1000V	722	7200V

Laser Marking

An “X” at the end of the part number indicates the part is marked.

Packing Orientation Option

TV: Tape carrier packaging Vertical Orientation.

Vertical orientation means that if the part is lifted from the tape without any rotation and placed on a substrate, its electrodes will be perpendicular to the substrate plane. This impacts the frequency of First Parallel Resonance (suckout).

Performance Requirements

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

All products are in compliance with RoHS instruction.

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

0505C/P (0.055” x 0.055”)

Product Features

- High Q
- High Power
- Low ESR/ESL
- Low Noise
- High Self-Resonance
- Ultra Stable Performance
- Capacitance Range: 0.1pF to 1000pF
- Working Voltage: 150V
- Extended Voltage: 300V

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

0505 C 100 J W 151 X TV

- 0505: Case Size (0.055” x 0.055”)
- C: C =NP0, P = P90
- 100: Capacitor Code, 100=10x10⁰=10pF, 1R0=1.0pF
- J: Capacitance Tolerance *See Table*
- W: Termination Type *See Table*
- 151: Rated Voltage *See Table*
- X: Laser Marking
- TV: Add TV for Vertical Orientation *(Only available below 430pF)*

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%

Voltage Codes

Voltage	Code	Voltage	Code
50V	500	200V	201
100V	101	250V	251
150V	151	300V	301

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

0505C/P (0.055" x 0.055")

0505C/P Capacitance Values

- **NP0=C; P90=P**
- **Maximum Capacitance: 0505P=100pF; 0505C=1000pF**
- ** - Available in NP0 only.*

Special capacitances, tolerances and WVDC are available. Please contact PPI.

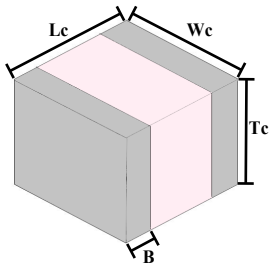
Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.
0.1	0R1	A,B, C,D	150V	250V or 300V	**2.4**	2R4	A,B, C,D	150V	250V or 300V	**20**	200	F,G, J,K	150V	250V or 300V	**160**	161*	F,G, J,K	150V	200V
0.2	0R2				**2.7**	2R7				**22**	220				**180**	181*			
0.3	0R3				**3.0**	3R0				**24**	240				**200**	201*			
0.4	0R4				**3.3**	3R3				**27**	270				**220**	221*			
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*	F,G, J,K	150V	N/A
0.9	0R9				**5.1**	5R1				**43**	430				**360**	361*			
1.0	1R0				**5.6**	5R6				**47**	470				**390**	391*			
1.1	1R1				**6.2**	6R2				**51**	510	F,G, J,K	150V	200V	**430**	431*			
1.2	1R2				**6.8**	6R8				**56**	560				**470**	471*			
1.3	1R3				**7.5**	7R5				**62**	620				**510**	511*			
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	150V	250V or 300V	**82**	820				**680**	681*	F,G, J,K	50V	100V
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*								

*Available in NP0 only

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

0505C/P (0.055” x 0.055”)

Termination Types and Codes



Chip Termination:
Codes: **W, L, P**

Magnetic Terminations	
Termination Code	**Termination**
W (RoHS)	100% Tin Solder over Nickel Barrier
L	90%Tin/10%Lead Solder over Nickel Barrier

Non-Magnetic Terminations	
Termination Code	**Termination**
P (RoHS)	100% Tin Solder over Copper Barrier

Dimensions

Unit: inch (millimeter)

Magnetic Termination					
Code		**Length**	**Width**	**Thickness**	**Overlap**
		Lc	Wc	Tc	B
W/L	Chip	0.055 +0.015 -0.010	0.055 ± 0.010	0.057 max	0.014 ± 0.006
		(1.40 +0.38 -0.25)	(1.40 ± 0.25)	(1.45 max)	(0.356 ± 0.152)

Non-Magnetic Termination					
Code		**Length**	**Width**	**Thickness**	**Overlap**
		Lc	Wc	Tc	B
P	Chip	0.055 +0.015 -0.010	0.055 ± 0.010	0.057 max	0.014 ± 0.006
		(1.40 +0.38 -0.25)	(1.40 ± 0.25)	(1.45 max)	(0.356 ± 0.152)

Note: “Non-Magnetic” means no magnetic materials.

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

0505C/P (0.055” x 0.055”)

Electrical Specifications

Quality Factor (Q)	Greater than 10,000 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 in Capacitance Table
Dielectric Withstanding Voltage (DWV)	250% of Rated Voltage of 5 seconds
Operating Temperature Range	-55°C to 200°C
Temperature Coefficient (TC)	**C:** -55°C to 125°C 0±30ppm/°C; >125°C to 200°C 0±60ppm/°C **P:** -55°C to 200°C +90±20ppm/°C
Capacitance Drift	±0.02% or ±0.02pF, whichever is greater
Piezoelectric Effects	None
Termination Type	See Termination Type Table

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

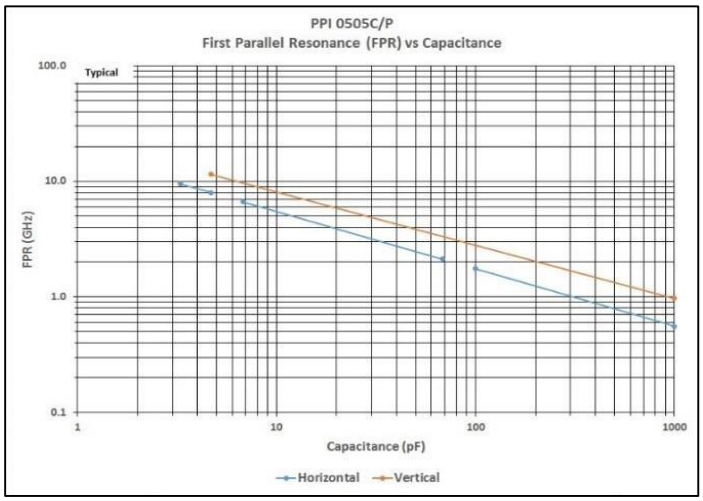
Environmental Specifications

	Specification	Test Parameters
Thermal Shock	**DWV:** The initial Value **IR:** Shall not be less than 30% of the initial value. **Capacitance Change:** No more than 0.5% or 0.5pF, whichever is greater.	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature (-55°C and 200°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)	**DWV:** The initial Value **IR:** The initial value. **Capacitance Change:** No more than 0.5% or 0.5pF, whichever is greater.	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	**IR:** Shall not be less than 30% of the initial value. **Capacitance Change:** No more than 2.0% or 0.5pF, whichever is greater.	MIL-STD-202, Method 108. For 2000 hours, at 200°C. Rated Voltage DC applies.
Terminal Strength	**Force:** 10lbs typical, 5lbs. Minimum. **Duration Time:** 5 to 10 seconds	MIL-STD-202, Method 211A, Test Condition A. Applied a force and maintained for a period of 5 to 10 seconds. The force shall be in the direction of the axes of the terminations.

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

0505C/P (0.055” x 0.055”)

FPR -- First Parallel Resonance (FPRs)

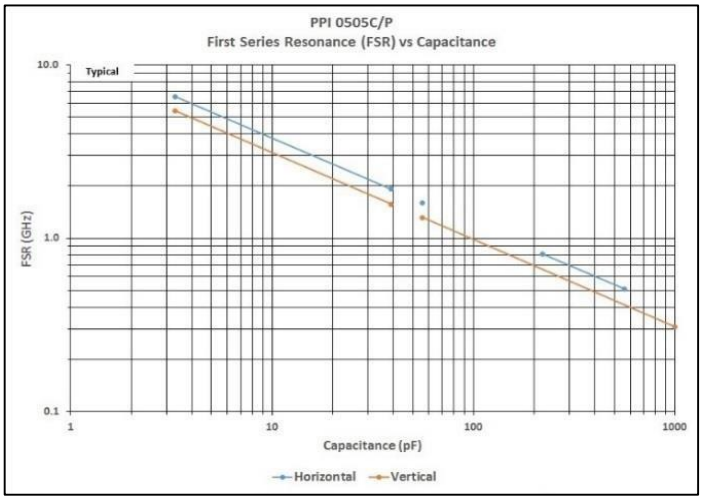


Definitions and Measurement Conditions

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.

FSR -- First Series Resonance (FSRs)



Definitions and Measurement Conditions

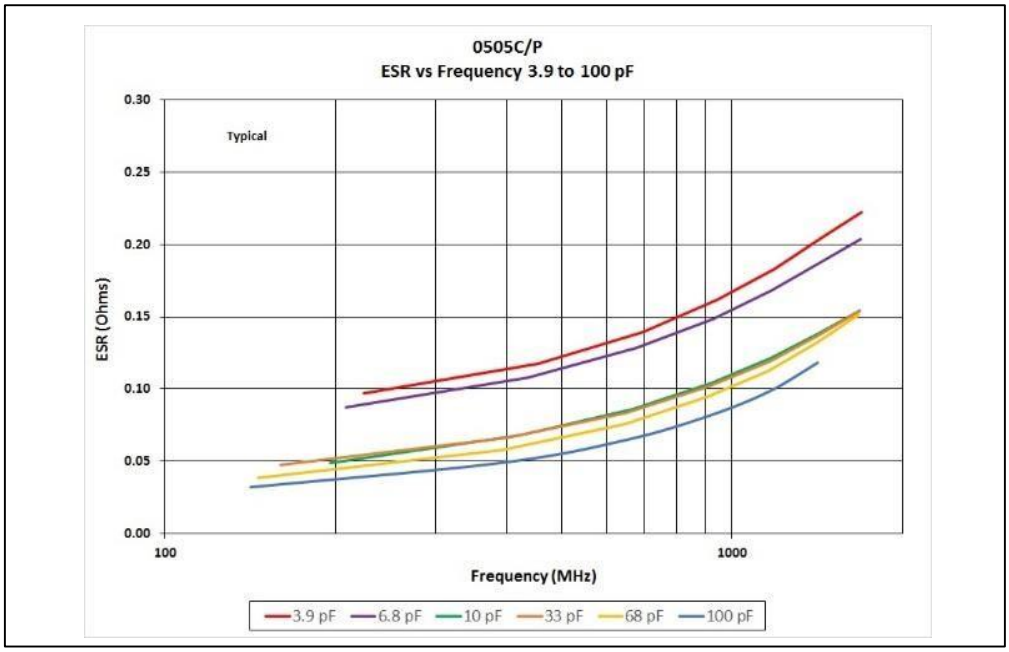
The **First Series Resonance, FSR,** is defined as the lowest frequency at which the imaginary part of the input impedance, Im[Zin], equals zero. Should Im[Zin] or the real part of the input impedance, Re[Zin], not be monotonic with frequency at frequencies lower than those at which Im[Zin] =0, the FSR 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 measurement conditions are: substrate – Rogers RO4350; substrate dielectric constant = 3.66; horizontal mount substrate thickness (mils) =25; gap in microstrip trace (mils) = 15; horizontal mount microstrip trace width (mils) = 55. 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.

ESR vs. Frequency

0505C/P ESR vs Frequency



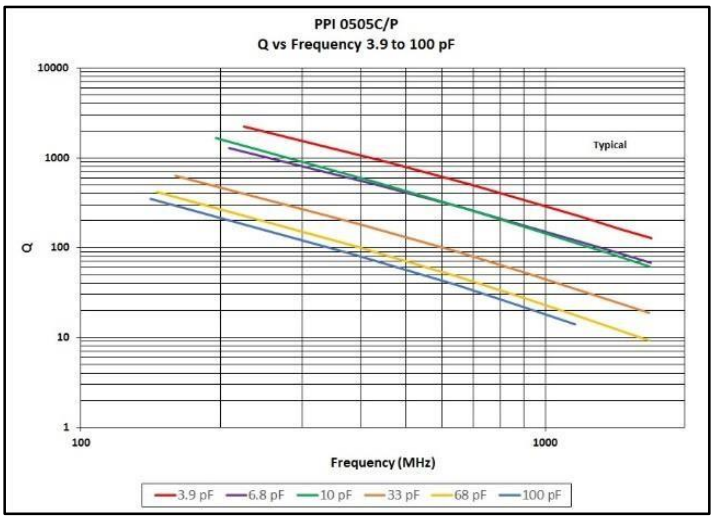
0505C ESR vs Frequency

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

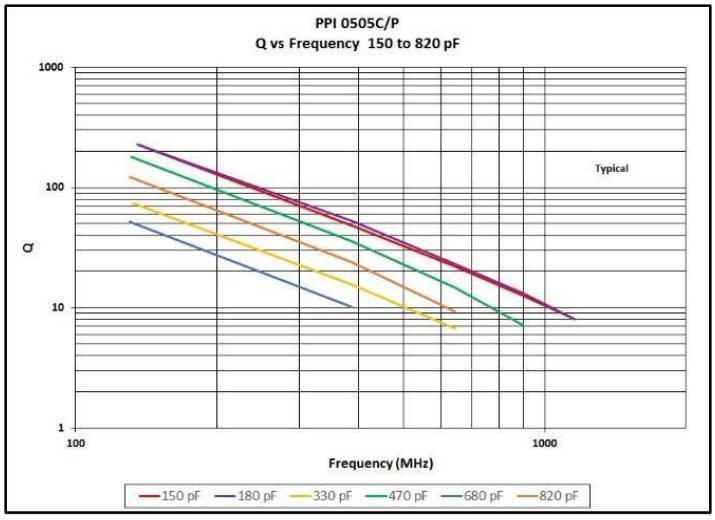
0505C/P (0.055” x 0.055”)

Q vs. Frequency

0505C/P Q vs Frequency

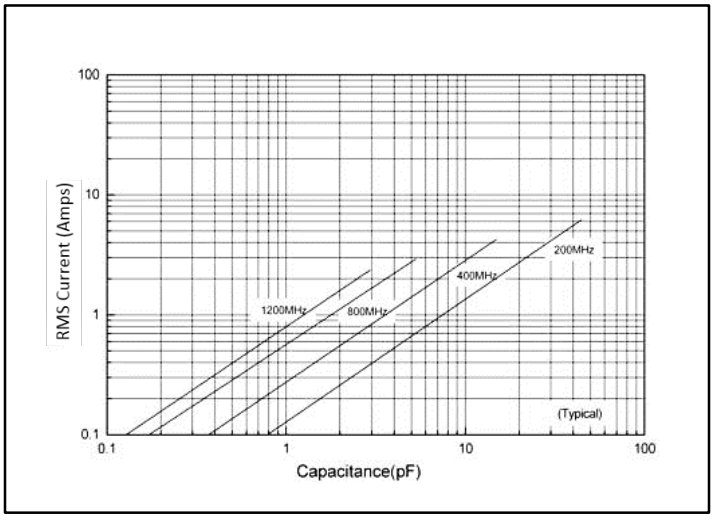


0505C Q vs Frequency

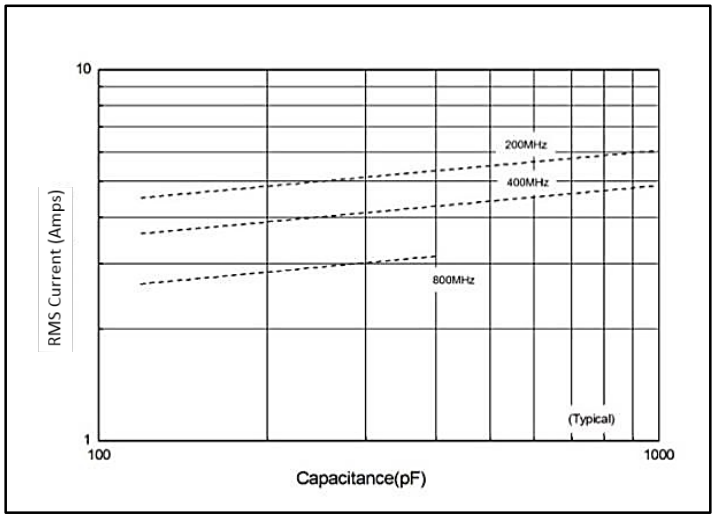


Current Rating vs. Capacitance

0505C/P Current Rating vs Capacitance



0505C Current Rating vs Capacitance



Current limits can depend on two different criteria. The first Voltage Limited Current ($I_{volt\ lim}$, represented by the solid line), the second is Power Dissipation Limited Current ($I_{pow\ diss}$).

$$I_{volt\ lim} = \frac{\sqrt{2}}{2} I_{peak} = \frac{\sqrt{2}}{2} \times \frac{V_{rated}}{X_C} = \sqrt{2}\pi FCV_{rated}$$

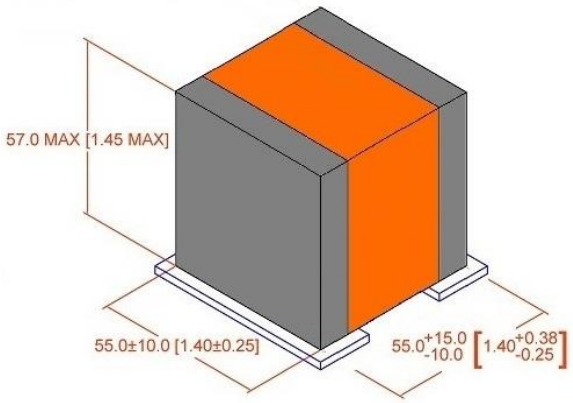
$I_{pow\ diss} = \sqrt{\frac{P_{dissipation}}{ESR}}$ (If the thermal resistance of the mounting surface is 40°C/W, then you will reach the power dissipated limit of 1.5W)

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

0505C/P (0.055” x 0.055”)

Capacitor Application Program

PPI’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 visiting the https://www.modelithics.com/MVP/PPI.

Recommended Land Pattern Dimensions

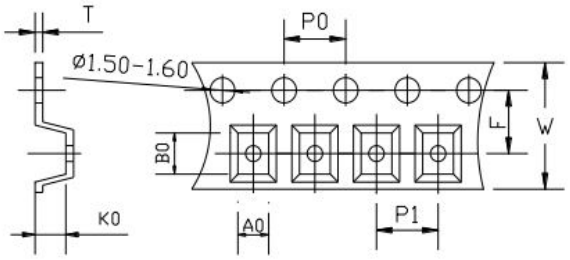
Regarding Landing Patterns, please refer to IPC-7351B (table 3-5, 3-6).

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

0505C/P (0.055” x 0.055”)

Tape & Reel Specifications

Orientation	Measurement Unit	W	P0	P1	T	F	Minimum Qty per Reel	Std Qty per Reel	Tape Material
H	in.	0.315	0.157	0.157	0.009	0.138	500	3000	Plastic
	mm	8.00	4.00	4.00	0.22	3.50			
V	in.	0.472	0.157	0.157	0.012	0.217	500	2000	
	mm	12.00	4.00	4.00	0.30	5.50			



$A_0B_0K_0$

- Determined by component size. Typical clearance between the cavity and the component is: .50 (.002) min to .65 (.026) max for 12mm tape.
- The component cannot rotate more than 20° within the determined cavity.

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 offered in Magnetic or Non-Magnetic Terminations. Kits are 100% RoHS compliant.

Kit Number MAGNETIC	Kit Number NON-MAGNETIC	Value Range	Values
DKD0505C01 DKD0505P01	DKD0505C05 DKD0505P05	**0.1 - 2.0pF**	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, 2.0pF
DKD0505C02 DKD0505P02	DKD0505C06 DKD0505P06	**1 - 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
DKD0505C03 DKD0505P03	DKD0505C07 DKD0505P07	**10 - 100pF**	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF
DKD0505C04	DKD0505C08	**100 - 1000pF**	100, 120, 150, 180, 200, 220, 240, 270, 300, 330, 390, 470, 560, 680, 820, 1000pF

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

1111C/P (0.110”x 0.110”)

Product Features

- High Q
- High Power
- Low ESR/ESL
- Low Noise
- High Self-Resonance
- Ultra Stable Performance
- Capacitance Range: 0.1pF to 1000pF
- Working Voltage: 500V
- Extended Voltage: 1500V

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 C 100 J W 501 X TV

- 1111: Case Size (0.110” x 0.110”)
- C: C =NP0, P = P90
- 100: Capacitor Code 100=10x10⁰=10pF, 1R0=1.0pF
- J: Capacitance Tolerance *See Table*
- W: Termination Type *See Table*
- 501: Rated Voltage *See Table*
- X: Laser Marking
- TV: Add TV for Vertical Orientation *(Only available below 430pF)*

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%

Voltage Codes

Voltage	Code	Voltage	Code
50V	500	500V	501
100V	101	600V	601
200V	201	1000V	102
300V	301	1500V	152

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

1111C/P (0.110”x 0.110”)

1111C/P Capacitance Values

- **NP0=C; P90=P**
- **Maximum Capacitance: 1111P=1000pF; 1111C=10000pF**
- ** - Available in NP0 only.*

Special capacitances, tolerances and WVDC are available. Please contact PPI.

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

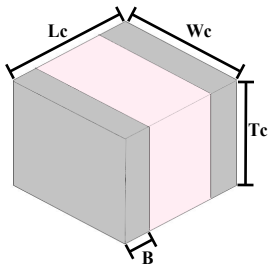
Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.
0.1	0R1	A,B	500V	1000V or 1500V	3.3	3R3	A,B C,D	500V	1000V or 1500V	36	360	F,G, J,K	500V	1000V or 1500V	390	391	F,G, J,K	200V	600V
0.2	0R2				3.6	3R6				39	390				430	431			
0.3	0R3				3.9	3R9				43	430				470	471			
0.4	0R4				4.3	4R3				47	470				510	511	F,G, J,K	100V	200V
0.5	0R5	A,B, C,D	500V	1000V or 1500V	4.7	4R7				51	510				560	561			
0.6	0R6				5.1	5R1				56	560				620	621			
0.7	0R7				5.6	5R6				62	620				680	681			
0.8	0R8				6.2	6R2				68	680				750	751			
0.9	0R9				6.8	6R8				75	750				820	821			
1.0	1R0				7.5	7R5				82	820				910	911			
1.1	1R1				8.2	8R2				91	910				1000	102			
1.2	1R2				9.1	9R1				100	101				1100	112*	F,G, J,K	200V	N/A
1.3	1R3				10	100	F,G, J,K	500V	1000V or 1500V	110	111	F,G, J,K	300V	1000V	1200	122*			
1.4	1R4				11	110				120	121				1500	152*			
1.5	1R5				12	120				130	131				1800	182*			
1.6	1R6				13	130				150	151				2000	202*	F,G, J,K	100V	N/A
1.7	1R7				15	150				160	161				2200	222*			
1.8	1R8				16	160				180	181				2700	272*			
1.9	1R9				18	180				200	201				3000	302*			
2.0	2R0				20	200				220	221	F,G, J,K	200V	600V	3300	332*			
2.1	2R1				22	220				240	241				4700	472*			
2.2	2R2				24	240				270	271				5100	512*			
2.4	2R4				27	270				300	301				5600	562*	F,G, J,K	50V	N/A
2.7	2R7				30	300				330	331				10000	103*			
3.0	3R0				33	330				360	361								

*Available in NP0 only

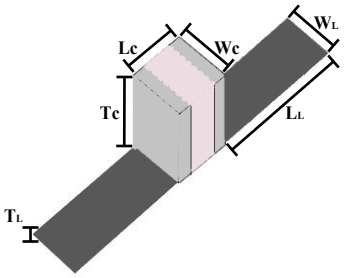
Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

1111C/P (0.110”x 0.110”)

Termination Types and Codes



Chip Termination:
Codes: **W, L, P**



Microstrip Termination:
Codes: **MS, MN**

Magnetic Terminations	
Termination Code	**Termination**
W RoHS	100% Tin Solder over Nickel Barrier
L	90%Tin/10%Lead Solder over Nickel Barrier
MS RoHS	100% Silver
Non-Magnetic Termination	
P RoHS	100% Tin Solder over Copper Barrier
MN RoHS	Silver-Plated Copper

Dimensions Unit: inch (millimeter)

Code		Magnetic Termination Capacitor Dimensions Length Lc	Width Wc	Thickness Tc	Overlap B	Lead Dimensions Length LL	Width WL	Thickness TL
W/L	Chip	0.110 +0.025 -0.010 (2.79 +0.36 -0.25)	0.110 ± 0.010 (2.79 ± 0.25)	0.10 max (2.54 max)	0.016 ~ 0.039 (0.40 ~ 1.00)	-	-	-
MS	Microstrip	0.135 ± 0.015 (3.45 ± 0.38)	0.110 ± 0.010 (2.79 ± 0.25)	0.10 max (2.54 max)	- -	0.250 min (6.35 min)	0.093 ± 0.010 (2.36 ± 0.25)	0.004 ± 0.001 (0.1 ± 0.025)

Code		Non-Magnetic Termination Capacitor Dimensions Length Lc	Width Wc	Thickness Tc	Overlap B	Lead Dimensions Length LL	Width WL	Thickness TL
P	Chip	0.110 +0.025 -0.010 (2.79 +0.36 -0.25)	0.110 ± 0.010 (2.79 ± 0.25)	0.10 max (2.54 max)	0.016 ~ 0.039 (0.40 ~ 1.00)	-	-	-
MN	Microstrip	0.135 ± 0.015 (3.45 ± 0.38)	0.110 ± 0.010 (2.79 ± 0.25)	0.10 max (2.54 max)	- -	0.250 min (6.35 min)	0.093 ± 0.010 (2.36 ± 0.25)	0.004 ± 0.001 (0.1 ± 0.025)

Note: Non-Magnetic means no magnetic materials. All leads are attached with high temperature solder and parts are RoHS Compliant.

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

1111C/P (0.110”x 0.110”)

Electrical Specifications

Quality Factor (Q)	Greater than 10,000 at 1 MHz
Insulation Resistance (IR)	0.1pF to 470pF: 10^6 Megaohms min. @ +25°C rated WVDC 10^5 Megaohms min. @ +125°C rated WVDC 510pF to 1000pF: 10^5 Megaohms min. @ +25°C rated WVDC 10^4 Megaohms min. @ +125°C rated WVDC
Rated Voltage	See Rated Voltage in Capacitance Table
Dielectric Withstanding Voltage (DWV)	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 200°C
Temperature Coefficient (TC)	C: -55°C to 125°C 0±30ppm/°C; >125°C to 200°C 0±60ppm/°C P: -55°C to 200°C +90±20ppm/°C
Capacitance Drift	±0.02% or ±0.05pF, whichever is greater
Piezoelectric Effects	None
Termination Type	See Termination Type Table

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

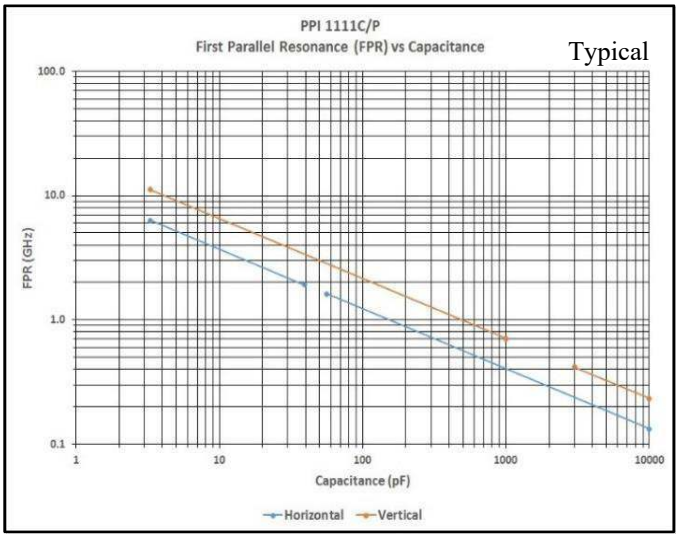
Environmental Specifications

	Specification	Test Parameters
Thermal Shock	**DWV:** The initial Value **IR:** Shall not be less than 30% of the initial value. **Capacitance Change:** No more than 0.5% or 0.5pF, whichever is greater.	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature (-55°C and 200°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)	**DWV:** The initial Value **IR:** The initial value. **Capacitance Change:** No more than 0.3% or 0.3pF, whichever is greater.	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	**IR:** Shall not be less than 30% of the initial value. **Capacitance Change:** No more than 2.0% or 0.5pF, whichever is greater.	MIL-STD-202, Method 108. For 2000 hours, at 200°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 Strength	**Force:** 10lbs typical, 5lbs. Minimum. **Duration Time:** 5 to 10 seconds	MIL-STD-202, Method 211A, Test Condition A. Applied a force and maintained for a period of 5 to 10 seconds. The force shall be in the direction of the axes of the terminations.

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

1111C/P (0.110”x 0.110”)

FPR -- First Parallel Resonance (FPRs)

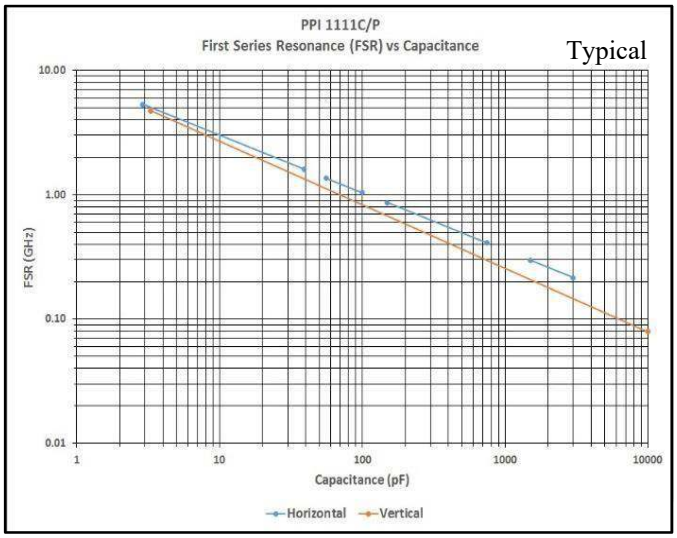


Definitions and Measurement Conditions

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.

FSR -- First Series Resonance (FSRs)



Definitions and Measurement Conditions

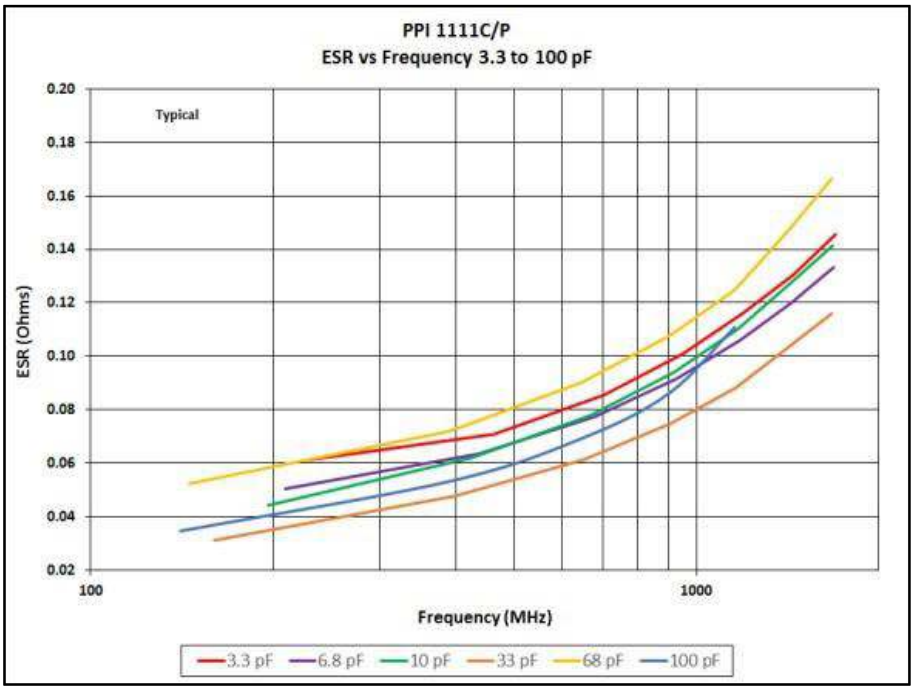
The **First Series Resonance, FSR,** is defined as the lowest frequency at which the imaginary part of the input impedance, Im[Zin], equals zero. Should Im[Zin] or the real part of the input impedance, Re[Zin], not be monotonic with frequency at frequencies lower than those at which Im[Zin] =0, the FSR 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 measurement conditions are: substrate – Rogers RO4350; substrate dielectric constant = 3.66; horizontal mount substrate thickness (mils) =25; gap in microstrip trace (mils) = 15; horizontal mount microstrip trace width (mils) = 55. Reference planes at sample edges.

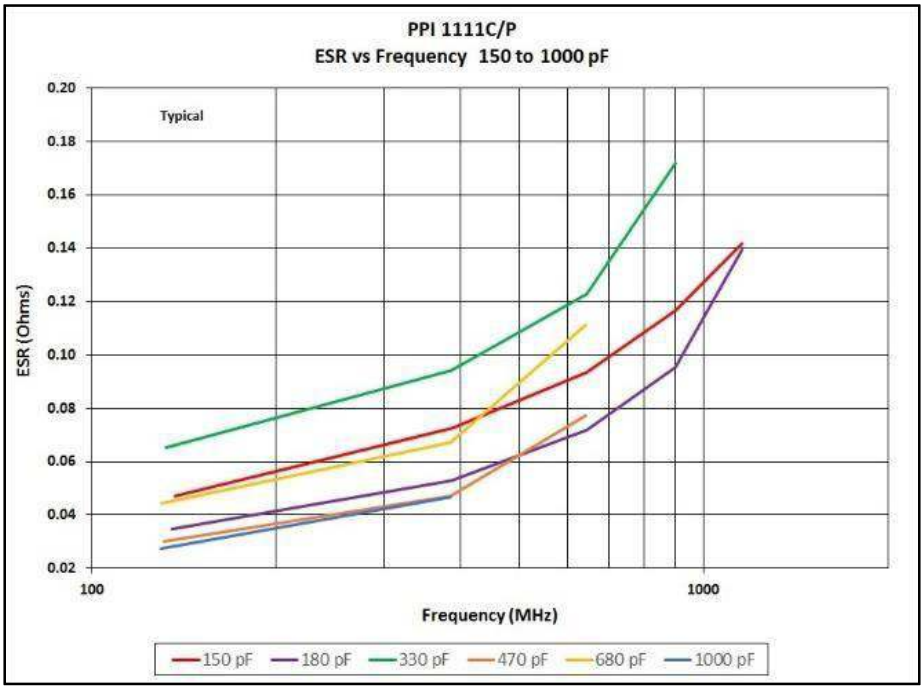
All data has been derived from electrical models created by Modelithics, Inc., a specialty vendor contracted by PPI. The models are derived from measurements on a large number of parts disposed on several different substrates.

ESR vs. Frequency

1111C/P ESR vs Frequency



1111C ESR vs Frequency

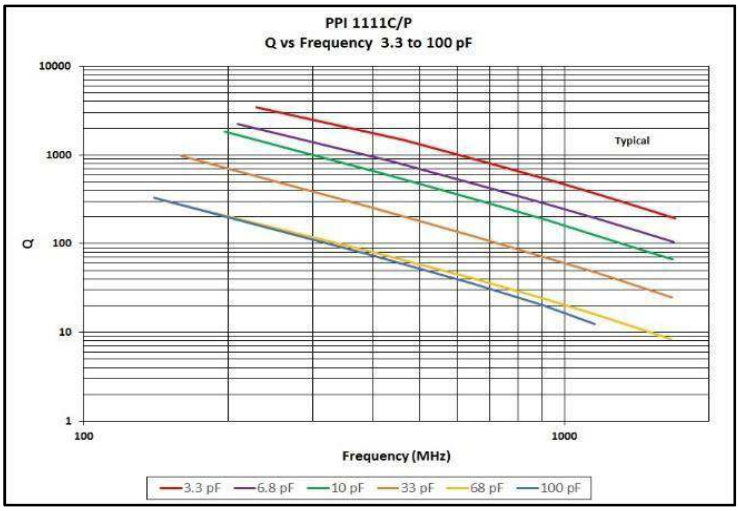


Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

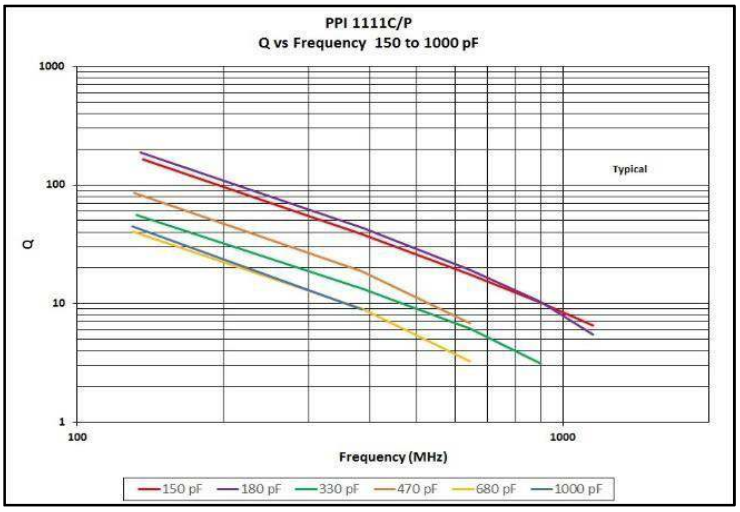
1111C/P (0.110”x 0.110”)

Q vs. Capacitance

1111C/P Q vs Frequency

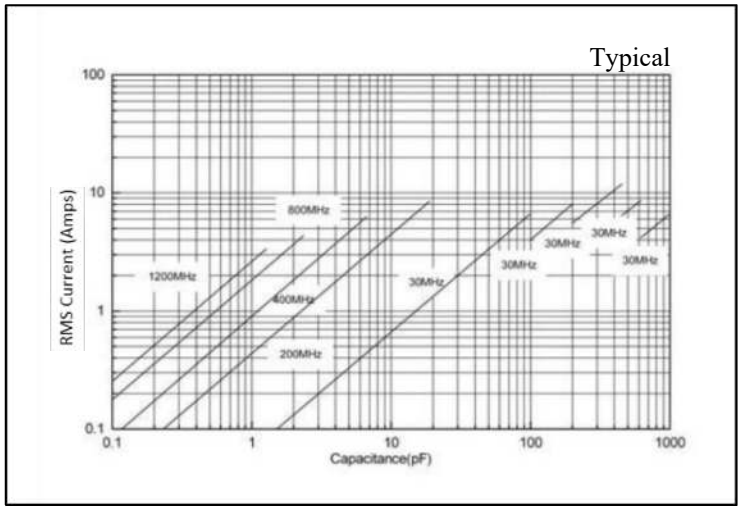


1111C Q vs Frequency

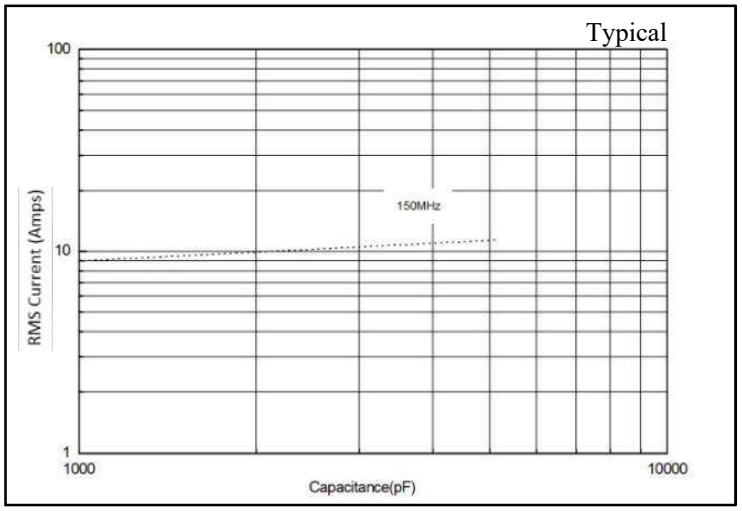


Current Rating vs. Capacitance

1111C/P Current Rating vs Capacitance



1111C Current Rating vs Capacitance



Current limits can depend on two different criteria. The first Voltage Limited Current ($I_{volt\ lim}$, represented by the solid line), the second is Power Dissipation Limited Current ($I_{pow\ diss}$).

$$I_{volt\ lim} = \frac{\sqrt{2}}{2} I_{peak} = \frac{\sqrt{2}}{2} \times \frac{V_{rated}}{X_C} = \sqrt{2}\pi FCV_{rated}$$

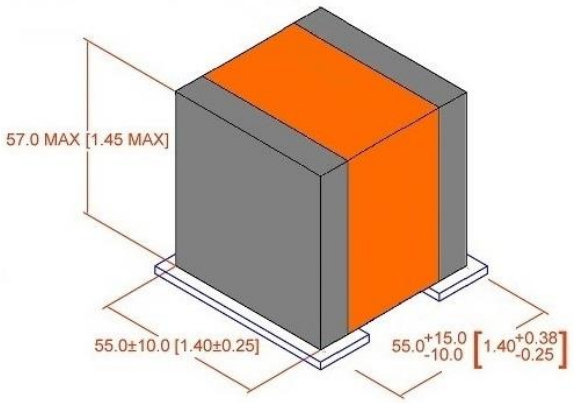
$I_{pow\ diss} = \sqrt{\frac{P_{dissipation}}{ESR}}$ (If the thermal resistance of the mounting surface is 20°C/W, then you will reach the power dissipated limit of 3W)

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

1111C/P (0.110”x 0.110”)

Capacitor Application Program

PPI’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 visiting the https://www.modelithics.com/MVP/PPI.

Recommended Land Pattern Dimensions

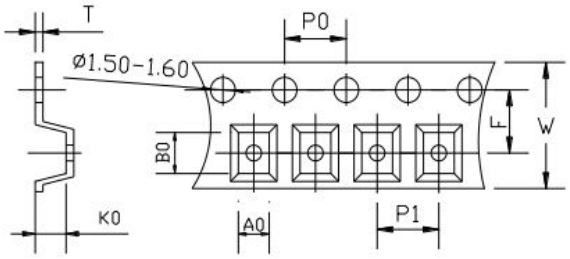
Regarding Landing Patterns, please refer to IPC-7351B (table 3-5, 3-6).

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

1111C/P (0.110”x 0.110”)

Tape & Reel Specifications

Orientation	Measurement Unit	W	P0	P1	T	F	Minimum Qty per Reel	Std Qty per Reel	Tape Material
H	in.	0.315	0.157	0.157	0.009	0.138	500	2000	Plastic
	mm	8.00	4.00	4.00	0.22	3.50			
V	in.	0.315	0.157	0.157	0.009	0.138	500	1500	
	mm	8.00	4.00	4.00	0.22	3.50			
V	in.	0.472	0.157	0.157	0.016	0.217	500	1500	
	mm	12.00	4.00	4.00	0.40	5.50			



$A_0B_0K_0$

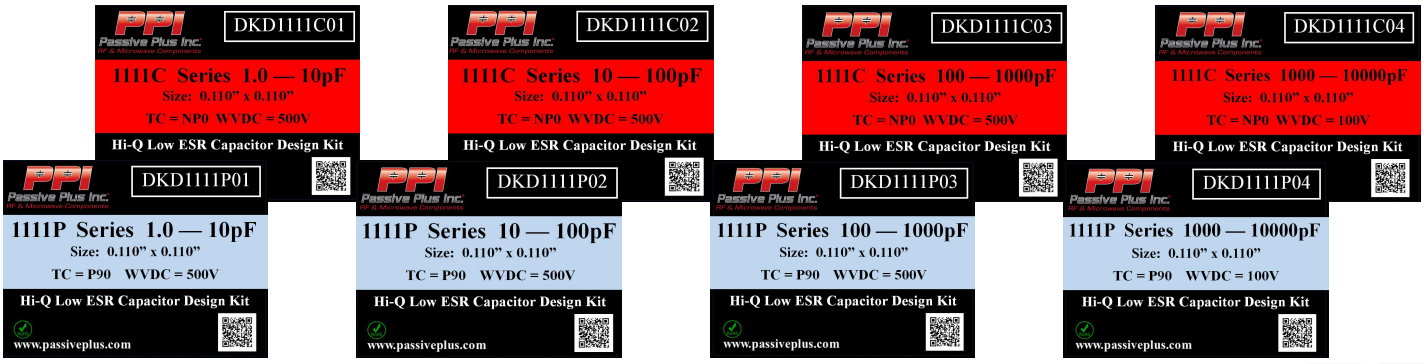
- Determined by component size. Typical clearance between the cavity and the component is: .50 (.002) min to .65 (.026) max for 12mm tape.
- The component cannot rotate more than 20° within the determined cavity.

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 offered in Magnetic or Non-Magnetic Terminations. Kits are 100% RoHS compliant.

Kit Number MAGNETIC	Kit Number NON-MAGNETIC	Value Range	Values	
DKD1111C01 DKD1111P01	DKD1111C05 DKD1111P05	**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
DKD1111C02 DKD1111P02	DKD1111C06 DKD1111P06	**10 - 100pF**	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF	RoHS
DKD1111C03 DKD1111P03	DKD1111C07 DKD1111P07	**100 - 1000pF**	100, 120, 150, 180, 200, 220, 240, 270, 300, 330, 390, 470, 560, 680, 820, 1000pF	RoHS
DKD1111C04 DKD1111P04	DKD1111C08 DKD1111P08	**1000 - 10000pF**	1000, 1100, 1200, 1500, 1800, 2000, 2200, 2700, 3000, 3300, 3900, 4700, 5100, 5600, 10000pF	RoHS



Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

2225C/P (0.220” x 0.250”)

Product Features

- High Q
- High RF Current/Voltage
- Ultra Stable Performance
- Capacitance Range: 0.5pF to 2700pF
- Working Voltage: 2500V
- Extended Voltage: 3600V

Product Applications

Typical Functional Applications:

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

Typical Circuit Applications:

- UHF/Microwave RF Power Amplifiers
- Antenna Tuning • Plasma Chambers
- Medical Equipment

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

Part Numbering

2225	C	100	J	W	252	X	TV

- 2225: Case Size (0.220” x 0.250”)
- C: C = NP0, P = P90
- 100: Capacitor Code, 100=10x10⁰=10pF, 1R0=1.0pF
- J: Capacitance Tolerance *See Table*
- W: Termination Type *See Table*
- 252: Rated Voltage *See Table*
- X: Laser Marking
- TV: Add TV for Vertical Orientation

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%

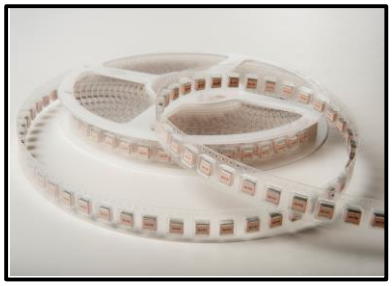
Voltage Codes

Voltage	Code	Voltage	Code
500V	501	2500V	252
1000V	102	3000V	302
1500V	152	3600V	362
2000V	202		

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

2225C/P (0.220” x 0.250”)

2225C/P Capacitance Values



- **NP0=C; P90=P**

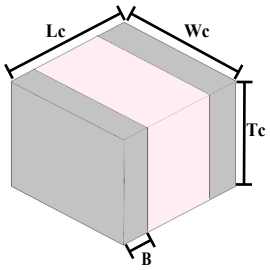
Special capacitances, tolerances and WVDC are available. Please contact PPI.

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.
0.5	0R5	B,C, D	2500V	3600V	**4.3**	4R3	B,C, D	2500V	3600V	**43**	430	F,G, J,K	2500V	3600V	**430**	431	F,G, J,K	1500V	2000V
0.6	0R6				**4.7**	4R7				**47**	470				**470**	471			
0.7	0R7				**5.1**	5R1				**51**	510				**510**	511	F,G, J,K	1000V	1500V
0.8	0R8				**5.6**	5R6				**56**	560				**560**	561			
0.9	0R9				**6.2**	6R2				**62**	620				**620**	621			
1.0	1R0				**6.8**	6R8				**68**	680				**680**	681			
1.1	1R1				**7.5**	7R5				**75**	750				**750**	751			
1.2	1R2				**8.2**	8R2				**82**	820				**820**	821			
1.3	1R3				**9.1**	9R1				**91**	910				**910**	911			
1.4	1R4				**10**	100	F,G, J,K	2500V	3600V	**100**	101				**1000**	102			
1.5	1R5				**11**	110				**110**	111	F,G, J,K	2500V	3000V	**1100**	112			
1.6	1R6				**12**	120				**120**	121				**1200**	122			
1.7	1R7				**13**	130				**130**	131				**1500**	152	F,G, J,K	500V	N/A
1.8	1R8				**15**	150				**150**	151				**1800**	182			
1.9	1R9				**16**	160				**160**	161				**2200**	222			
2.0	2R0				**18**	180				**180**	181				**2700**	272			
2.1	2R1				**20**	200				**200**	201								
2.2	2R2				**22**	220				**220**	221								
2.4	2R4				**24**	240				**240**	241								
2.7	2R7				**27**	270				**270**	271								
3.0	3R0				**30**	300				**300**	301	F,G, J,K	1500V	2000V					
3.3	3R3				**33**	330				**330**	331								
3.6	3R6				**36**	360				**360**	361								
3.9	3R9				**39**	390				**390**	391								

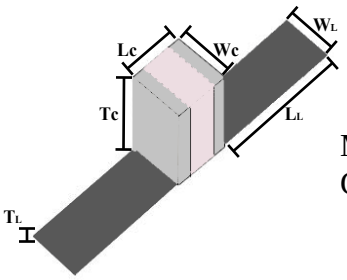
Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

2225C/P (0.220” x 0.250”)

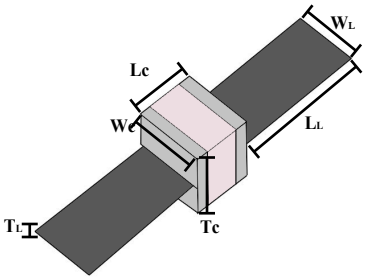
Termination Types and Codes



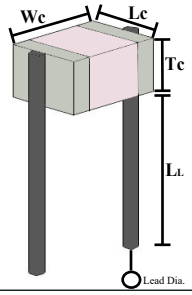
Chip Termination:
Codes: W, L, P



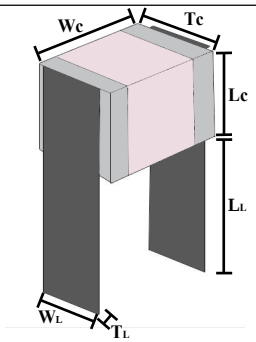
Microstrip Termination:
Codes: MS, MN



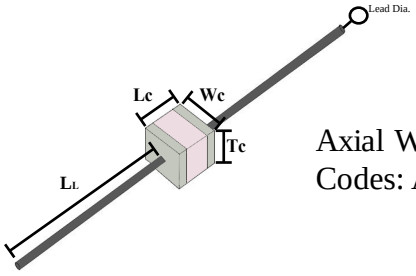
Axial Ribbon Termination:
Code: AR, AN



Radial Wire Termination:
Codes: RW, RN



Radial Ribbon Termination:
Code: RR, FN



Axial Wire Termination:
Codes: AW, BN

Termination Code	Magnetic Termination
W	100% Tin Solder over Nickel Barrier
L	90%Tin/10%Lead Solder over Nickel Barrier
MS	Silver-Plated Copper
AR	
RR	
RW	
AW	

Termination Code	Non-Magnetic Termination
P	100% Tin Solder over Copper Barrier
MN	Silver-Plated Copper
AN	
FN	
RN	
BN	

Note: “Non-Magnetic” means no magnetic materials.

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

2225C/P (0.220" x 0.250")

Dimensions - For Termination Types images, see previous page

Unit: inch (millimeter)

Code		Magnetic Termination Capacitor Dimensions Length Lc	Width Wc	Thickness Tc	Overlap B	Lead Dimensions Length LL	Width WL	Thickness TL
W/L	Chip	0.225 +0.025 -0.010 (5.72 +0.64 -0.25)	0.250 ± 0.015 (6.35 ± 0.38)	0.165 max (4.19 max)	0.020 ~ 0.047 (0.50 ~ 1.20)	-	-	-
MS	Microstrip	0.245 ± 0.025 (6.22 ± 0.64)	0.250 ± 0.015 (6.35 ± 0.38)	0.150 max (3.81 max)	-	0.500 min (12.70 min)	0.240 ± 0.005 (6.1 ± 0.13)	0.008 ± 0.001 (0.2 ± 0.025)
AR	Axial Ribbon							
RR	Radial Ribbon					0.354 min (9.00 min)	0.118 ± 0.005 (3.00 ± 0.13)	0.012 ± 0.001 (0.3 ± 0.025)
RW	Radio Wire					0.709 min (18.00 min)	Dia. = 0.031 ± 0.004	
AW	Axial Wire					0.906 min (23.00 min)	Dia. = (0.80 ± 0.10)	

Code		Non-Magnetic Termination Capacitor Dimensions Length Lc	Width Wc	Thickness Tc	Overlap B	Lead Dimensions Length LL	Width WL	Thickness TL
P	Chip	0.225 +0.025 -0.010 (5.72 +0.64 -0.25)	0.250 ± 0.015 (6.35 ± 0.38)	0.165 max (4.19 max)	0.020 ~ 0.047 (0.50 ~ 1.20)	-	-	-
MN	Microstrip	0.245 ± 0.025 (6.22 ± 0.64)	0.250 ± 0.015 (6.35 ± 0.38)	0.150 max (3.81 max)	-	0.500 min (12.70 min)	0.240 ± 0.005 (6.1 ± 0.13)	0.008 ± 0.001 (0.2 ± 0.025)
AN	Axial Ribbon							
FN	Radial Ribbon					0.354 min (9.00 min)	0.118 ± 0.005 (3.00 ± 0.13)	0.012 ± 0.001 (0.3 ± 0.025)
RN	Radio Wire					0.709 min (18.00 min)	Dia. = 0.031 ± 0.004	
BN	Axial Wire					0.906 min (23.00 min)	Dia. = (0.80 ± 0.10)	

Note: Non-Magnetic means no magnetic materials. All leads are attached with high temperature solder and parts are RoHS Compliant.

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

2225C/P (0.220” x 0.250”)

Electrical Specifications

Quality Factor (Q)	Greater than 10,000 at 1 MHz
Insulation Resistance (IR)	Test Voltage: 500V 10^5 Megaohms min. @ +25°C 10^4 Megaohms min. @ +125°C
Rated Voltage	See Rated Voltage in Capacitance Table
Dielectric Withstanding Voltage (DWV)	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 200°C
Temperature Coefficient (TC)	C: -55°C to 125°C 0±30ppm/°C; >125°C to 200°C 0±60ppm/°C P: -55°C to 200°C +90±20ppm/°C
Capacitance Drift	±0.02% or ±0.02pF, whichever is greater
Piezoelectric Effects	None
Termination Type	See Termination Type Table

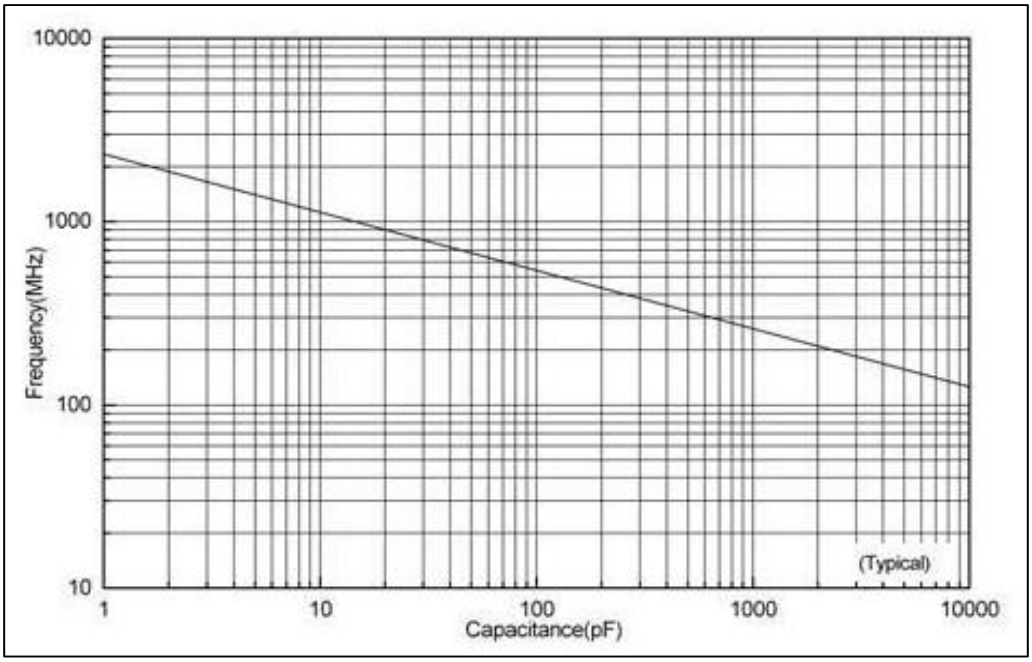
Capacitors are designed and manufactured to meet the requirements of MIL-PRF-55681 and MIL-PRF-123.

Environmental Specifications

	Specification	Test Parameters
Thermal Shock	**DWV:** The initial Value **IR:** Shall not be less than 30% of the initial value. **Capacitance Change:** No more than 0.5% or 0.5pF, whichever is greater.	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature (-55°C and 200°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)	**DWV:** The initial Value **IR:** The initial value. **Capacitance Change:** No more than 0.3% or 0.3pF, whichever is greater.	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	**IR:** Shall not be less than 30% of the initial value. **Capacitance Change:** No more than 2.0% or 0.5pF, whichever is greater.	MIL-STD-202, Method 108. For 2000 hours, at 200°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 Strength	**Force:** 20lbs typical, 10lbs. Minimum. **Duration Time:** 5 to 10 seconds	MIL-STD-202, Method 211A, Test Condition A. Applied a force and maintained for a period of 5 to 10 seconds. The force shall be in the direction of the axes of the terminations.

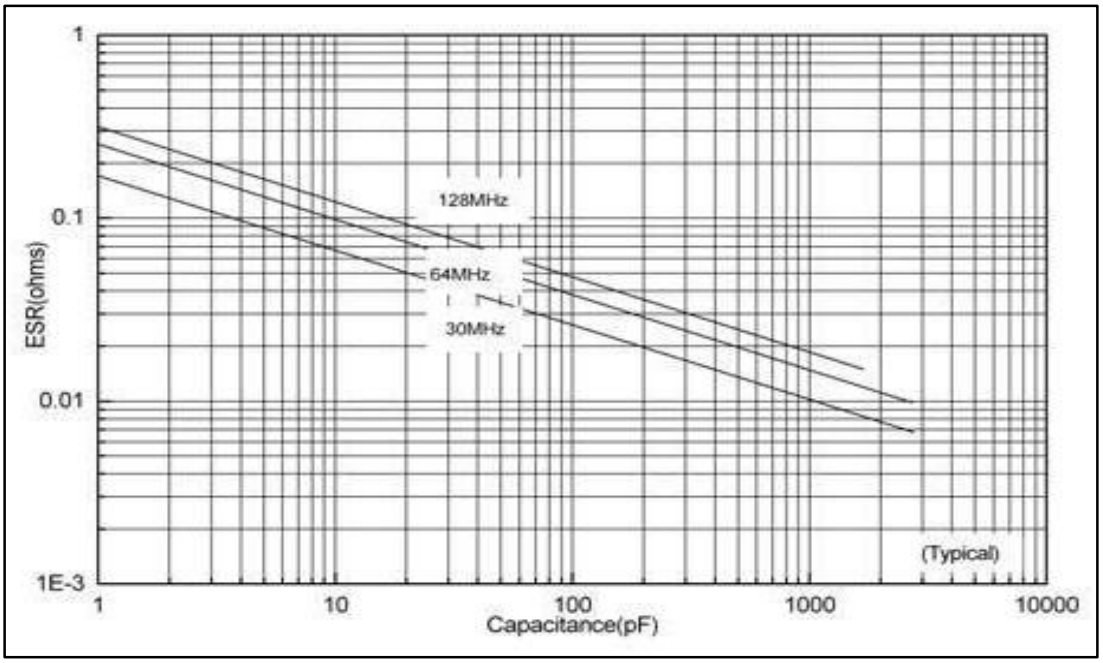
Series Resonance vs. Capacitance

Series Resonance vs. Capacitance



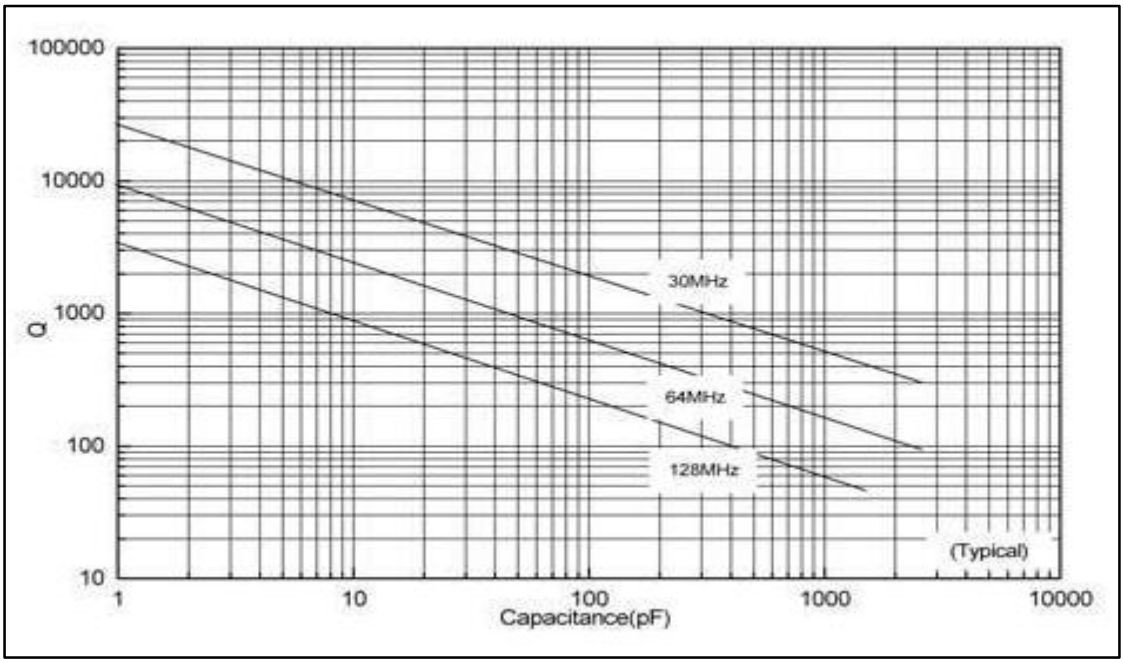
ESR vs. Frequency

2225C/P ESR vs Frequency



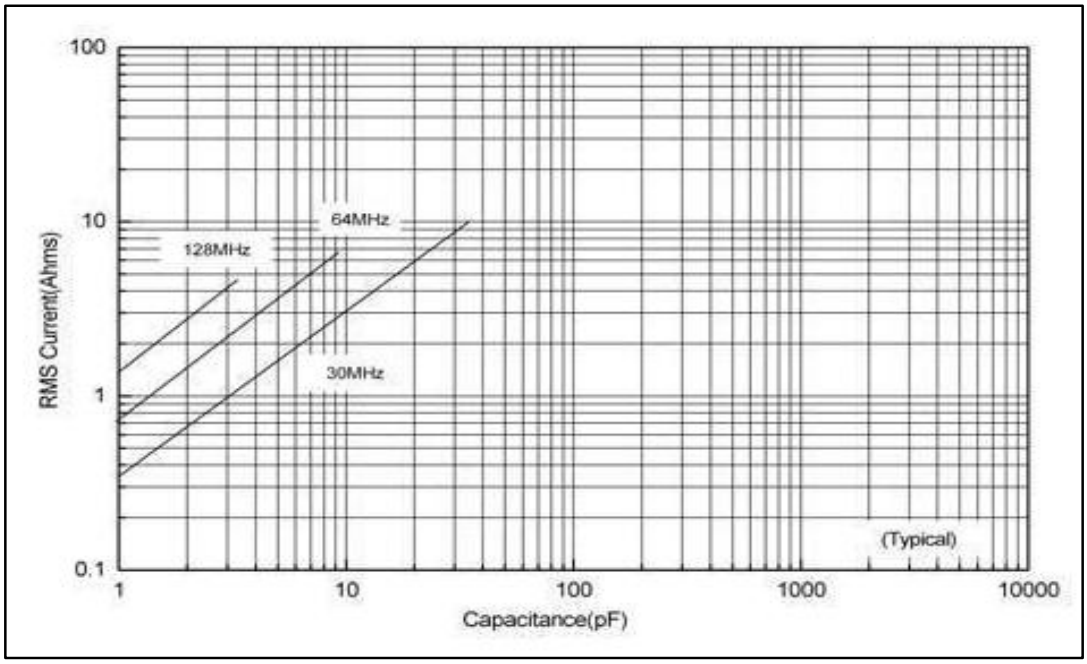
Q vs. Capacitance

Q vs Capacitance



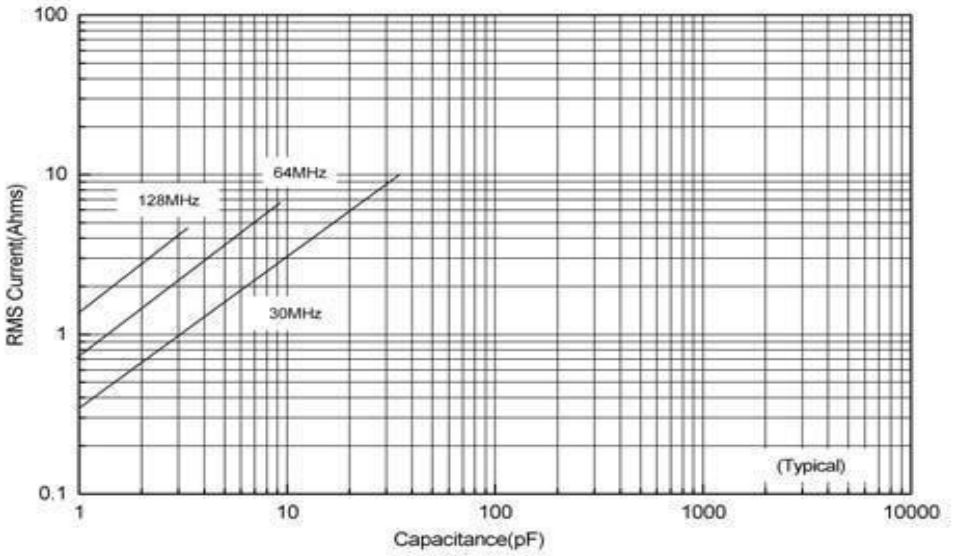
Current Rating vs. Capacitance

2225C/P Current Rating vs Capacitance



Current Rating vs. Capacitance

2225C/P Current Rating vs Capacitance



Current limits can depend on two different criteria. The first Voltage Limited Current ($I_{volt\ lim}$, represented by the solid line), the second is Power Dissipation Limited Current ($I_{pow\ diss}$).

$$I_{volt\ lim} = \frac{\sqrt{2}}{2} I_{peak} = \frac{\sqrt{2}}{2} \times \frac{V_{rated}}{X_C} = \sqrt{2}\pi FCV_{rated}$$

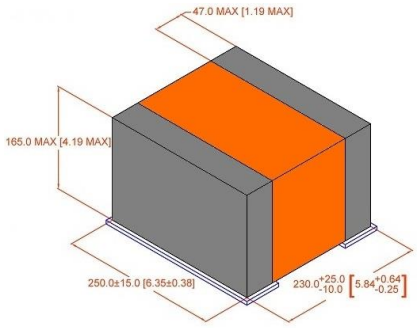
$I_{pow\ diss} = \sqrt{\frac{P_{dissipation}}{ESR}}$ (If the thermal resistance of the mounting surface is 15°C/W, then you will reach the power dissipated limit of 4W)

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

2225C/P (0.220” x 0.250”)

Capacitor Application Program

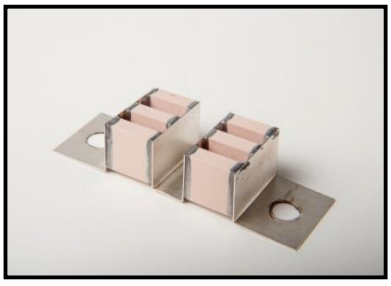
PPI’s brand new online Capacitor Application Program (C.A.P.) helps Engineers and Designers select capacitors according to parameters such as cap value and frequency. C.A.P. allows engineers to insert capacitors requirements (Cap value, Frequency), producing Scattering Matrices (S2P) Charts while providing 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.



Recommended Land Pattern Dimensions

Regarding Landing Patterns, please refer to IPC-7351B (table 3-5, 3-6).

Custom Assemblies

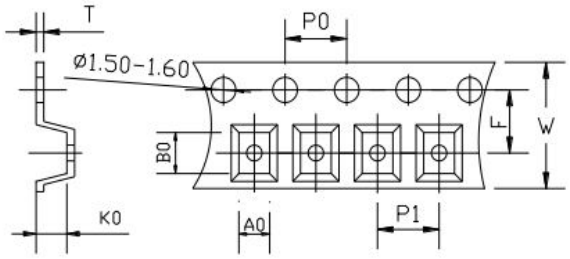


Passive Plus offers Capacitor Assemblies for high power requirements. Typical assemblies are configured in series and/or parallel combinations, producing higher voltage/current handling capabilities, extended capacitance range and tighter tolerances.

To get started, simply send us either a mechanical drawing or circuit conditions and we can recommend a solution. All components are 100% up-screened for Partial Discharge and Sonoscanned. All assemblies include a 100hr Military burn in.

Tape & Reel Specifications (mm)

Orientation	Measurement Unit	W	P0	P1	T	F	Minimum Qty per Reel	Std Qty per Reel	Tape Material
H	in.	0.630	0.157	0.472	0.012	0.295	500	500	Plastic
	mm	16.00	4.00	12.00	0.30	7.50			
V	in.	0.630	0.157	0.315	0.020	0.295	500	500	Plastic
	mm	16.00	4.00	8.00	0.50	7.50			



$A_0B_0K_0$

- Determined by component size. Typical clearance between the cavity and the component is: .50 (.002) min to .65 (.026) max for 12mm tape.
- The component cannot rotate more than 20° within the determined cavity.

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

3838C/P (0.380” x 0.380”)

Product Features

- High Q
- High RF Current/Voltage
- Ultra Stable Performance
- Capacitance Range: 0.5pF to 5100pF
- Working Voltage: 3600V
- Extended Voltage: 7200V

Product Applications

Typical Functional Applications:

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

Typical Circuit Applications:

• HF/RF Power Amplifiers
• Antenna Tuning • Plasma Chambers
• Medical Equipment • Transmitters

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

Part Numbering

3838 C 100 J W 362 X

- 3838: Case Size (0.380” x 0.380”)
- C: C=NP0 P=P90
- 100: Capacitor Code 100=10x10^0=10pF 1R0=1.0pF
- J: Capacitance Tolerance *See Table*
- W: Termination Type *See Table*
- 362: Rated Voltage *See Table*
- X: Laser Marking

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%

Voltage Codes

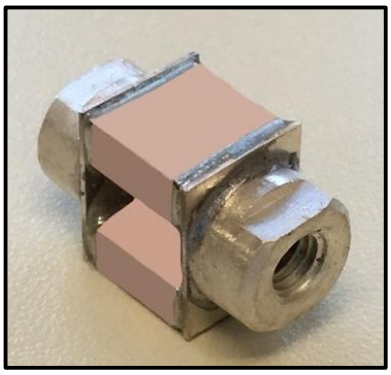
Voltage	Code
500V	501
1000V	102
2500V	252
3600V	362
7200V	722

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

3838C/P (0.380” x 0.380”)

3838C/P Capacitance Values

Special capacitances, tolerances and WVDC are available. Please contact PPI.

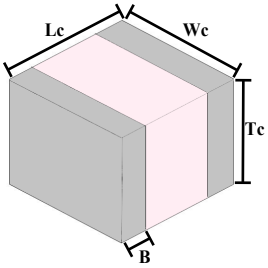


Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC
0.5	0R5	B,C, D	3600V	7200V	**4.7**	4R7	B,C, D	3600V	7200V	**51**	510	F,G, J,K	3600V	7200V	**560**	561	F,G, J,K	2500V
0.6	0R6				**5.1**	5R1				**56**	560				**620**	621		
0.7	0R7				**5.6**	5R6				**62**	620				**680**	681		
0.8	0R8				**6.2**	6R2				**68**	680				**750**	751		
0.9	0R9				**6.8**	6R8				**75**	750				**820**	821	F,G, J,K	1000V
1.0	1R0				**7.5**	7R5				**82**	820				**910**	911		
1.1	1R1				**8.2**	8R2				**91**	910				**1000**	102		
1.2	1R2				**9.1**	9R1				**100**	101				**1100**	112		
1.3	1R3				**10**	100	F,G, J,K	3600V	7200V	**110**	111				**1200**	122		
1.4	1R4				**11**	110				**120**	121				**1500**	152		
1.5	1R5				**12**	120				**130**	131				**1800**	182		
1.6	1R6				**13**	130				**150**	151				**2200**	222		
1.7	1R7				**15**	150				**160**	161				**2400**	242		
1.8	1R8				**16**	160				**180**	181				**2700**	272	F,G, J,K	500V
1.9	1R9				**18**	180				**200**	201	F,G, J,K	3600V	N/A	**3000**	302		
2.0	2R0				**20**	200				**220**	221				**3300**	332		
2.1	2R1				**22**	220				**240**	241				**3600**	362		
2.2	2R2				**24**	240				**270**	271				**3900**	392		
2.4	2R4				**27**	270				**300**	301				**4300**	432		
2.7	2R7				**30**	300				**330**	331				**4700**	472		
3.0	3R0				**33**	330				**360**	361				**5100**	512		
3.3	3R3				**36**	360				**390**	391							
3.6	3R6				**39**	390				**430**	431	F,G, J,K	2500V	N/A				
3.9	3R9				**43**	430				**470**	471							
4.3	4R3				**47**	470				**510**	511							

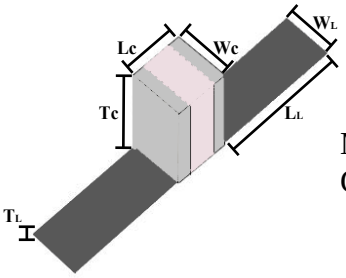
Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

3838C/P (0.380” x 0.380”)

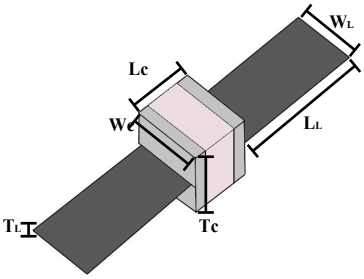
Termination Types and Codes



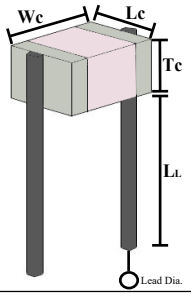
Chip Termination:
Codes: W, L, P



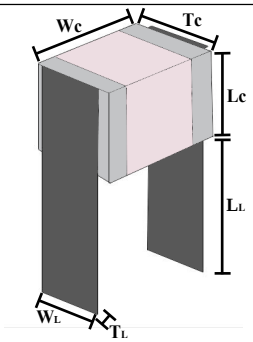
Microstrip Termination:
Codes: MS, MN



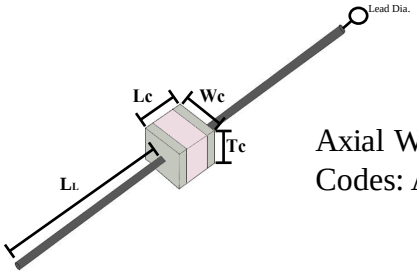
Axial Ribbon Termination:
Code: AR, AN



Radial Wire Termination:
Codes: RW, RN



Radial Ribbon Termination:
Code: RR, FN



Axial Wire Termination:
Codes: AW, BN

Termination Code	Magnetic Termination
W RoHS	100% Tin Solder over Nickel Barrier
L	90%Tin/10%Lead Solder over Nickel Barrier
MS RoHS	Silver-Plated Copper
AR RoHS	
RR RoHS	
RW RoHS	
AW RoHS	

Termination Code	Non-Magnetic Termination
P RoHS	100% Tin Solder over Copper Barrier
MN RoHS	Silver-Plated Copper
AN RoHS	
FN RoHS	
RN RoHS	
BN RoHS	

Note: “Non-Magnetic” means no magnetic materials.

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

3838C/P (0.380” x 0.380”)

Dimensions - For Termination Types images, see previous page

Unit: inch (millimeter)

Code		Magnetic Termination Capacitor Dimensions Length Lc	Width Wc	Thickness Tc	Overlap B	Lead Dimensions Length LL	Width WL	Thickness TL
W/L	Chip	0.380 +0.015 -0.010 (9.65 +0.38 -0.25)	0.380 ± 0.010 (9.65 ± 0.25)	0.170 max (4.32 max)	0.024 ~ 0.059 (0.60 ~ 1.50)	-	-	-
MS	Microstrip	0.380 +0.015 -0.010 (9.65 +0.38 -0.25)	0.380 ± 0.010 (9.65 ± 0.25)	0.177 max (4.50 max)	-	0.728 min (18.50 min)	0.350 ± 0.020 (8.89 ± 0.50)	0.008 ± 0.001 (0.20 ± 0.025)
AR	Axial Ribbon					0.728 min (18.50 min)	0.315 ± 0.010 (8.00 ± 0.25)	0.008 ± 0.001 (0.20 ± 0.025)
RR	Radial Ribbon					0.354 min (9.00 min)	0.118 ± 0.005 (3.00 ± 0.13)	0.012 ± 0.001 (0.3 ± 0.025)
RW	Radio Wire					0.709 min (18.00 min)	Dia. = 0.031 ± 0.004	
AW	Axial Wire					0.906 min (23.00 min)	Dia. = (0.80 ± 0.10)	

Code		Non-Magnetic Termination Capacitor Dimensions Length Lc	Width Wc	Thickness Tc	Overlap B	Lead Dimensions Length LL	Width WL	Thickness TL
P	Chip	0.380 +0.015 -0.010 (9.65 +0.38 -0.25)	0.380 ± 0.010 (9.65 ± 0.25)	0.170 max (4.32 max)	0.024 ~ 0.059 (0.60 ~ 1.50)	-	-	-
MN	Microstrip	0.380 +0.015 -0.010 (9.65 +0.38 -0.25)	0.380 ± 0.010 (9.65 ± 0.25)	0.177 max (4.50 max)	-	0.728 min (18.50 min)	0.350 ± 0.020 (8.89 ± 0.50)	0.008 ± 0.001 (0.20 ± 0.025)
AN	Axial Ribbon					0.728 min (18.50 min)	0.315 ± 0.010 (8.00 ± 0.25)	0.008 ± 0.001 (0.20 ± 0.025)
FN	Radial Ribbon					0.354 min (9.00 min)	0.118 ± 0.005 (3.00 ± 0.13)	0.012 ± 0.001 (0.3 ± 0.025)
RN	Radio Wire					0.709 min (18.00 min)	Dia. = 0.031 ± 0.004	
BN	Axial Wire					0.906 min (23.00 min)	Dia. = (0.80 ± 0.10)	

Note: Non-Magnetic means no magnetic materials. All leads are attached with high temperature solder and parts are RoHS Compliant.

Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

3838C/P (0.380” x 0.380”)

Electrical Specifications

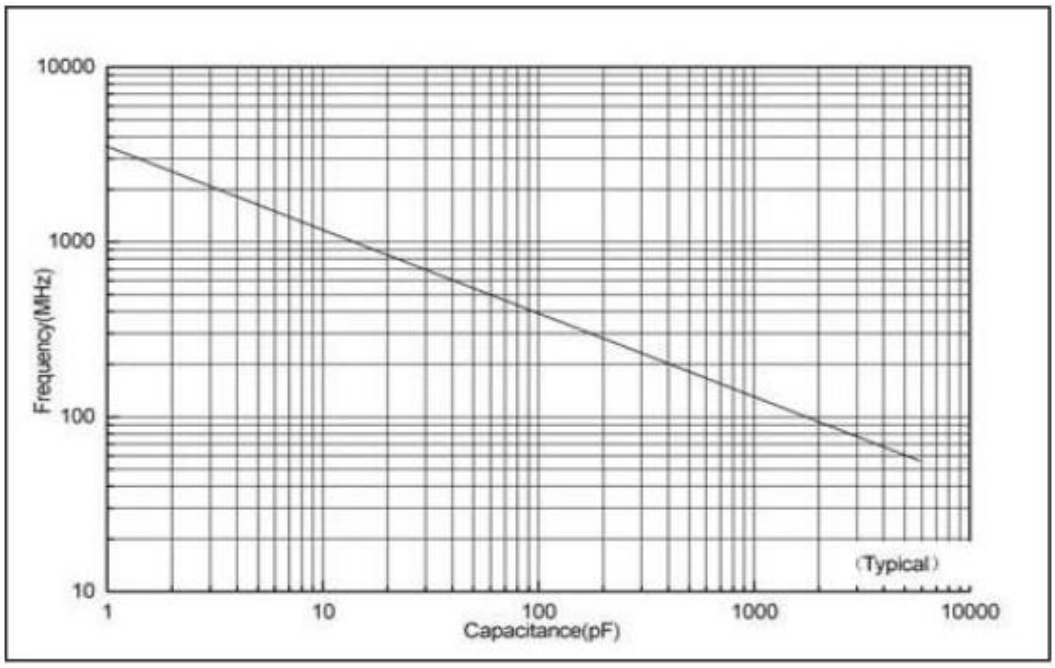
Quality Factor (Q)	Greater than 10,000 at 1 MHz
Insulation Resistance (IR)	Test Voltage: 500V 10^5 Megaohms min. @ +25°C 10^4 Megaohms min. @ +125°C
Rated Voltage	See Rated Voltage in Capacitance Table
Dielectric Withstanding Voltage (DWV)	250% of Rated Voltage of 5 seconds, Rated Voltage ≤ 500VDC 150% 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 200°C
Temperature Coefficient (TC)	C: -55°C to 125°C 0±30ppm/°C; >125°C to 200°C 0±60ppm/°C P: -55°C to 200°C +90±20ppm/°C
Capacitance Drift	±0.02% or ±0.02pF, whichever is greater
Piezoelectric Effects	None
Termination Type	See Termination Type Table

Environmental Specifications

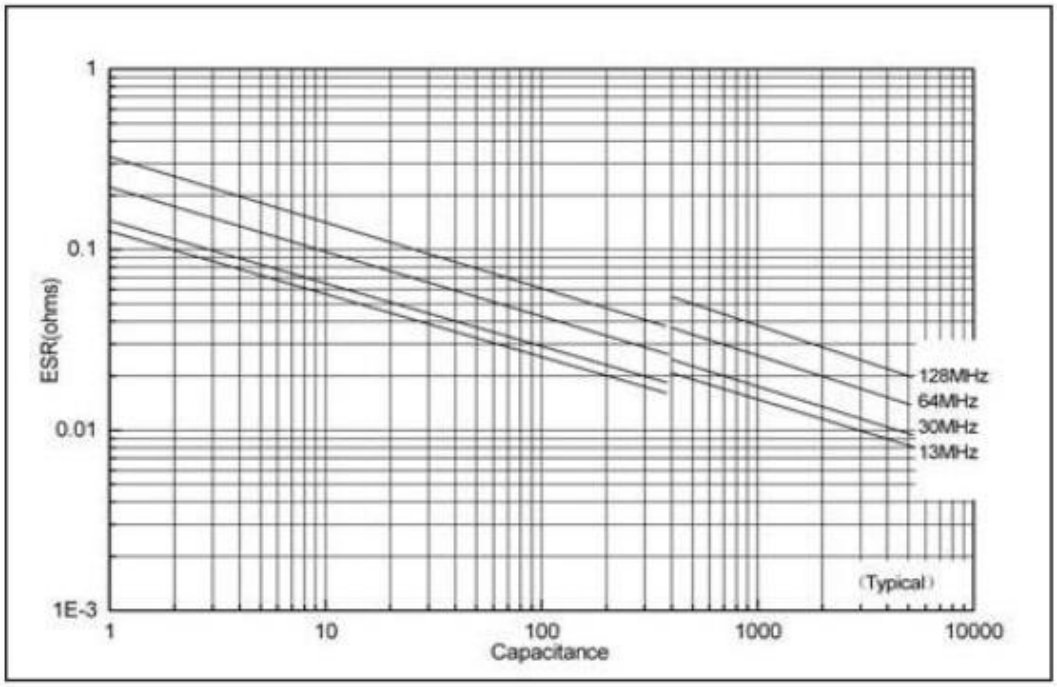
	Specification	Test Parameters
Thermal Shock	**DWV:** The initial value **IR:** Shall not be less than 30% of the initial value. **Capacitance Change:** No more than 0.5% or 0.5pF, whichever is greater.	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature (-55°C and 200°C) stay 30 minutes, the time of removing shall not be more than 3 minutes. Perform five cycles.
Moisture Resistance		MIL-STD-202, Method 106
Humidity (Steady State)	**DWV:** The initial value **IR:** The initial value **Capacitance Change:** No more than 0.3% or 0.3pF, whichever is greater.	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	**IR:** Shall not be less than 30% of the initial value. **Capacitance Change**: No more than 2.0% or 0.5pF, whichever is greater.	MIL-STD-202, Method 108. For 2000 hours, at 200°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 Strength	**Force:** 20lbs typical, 10lbs. min. **Duration Time:** 5 to 10 seconds	MIL-STD-202, Method 211A, Test Condition A. Applied a force and maintained for a period of 5 to 10 seconds. The force shall be in the direction of the axes of the terminations.

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

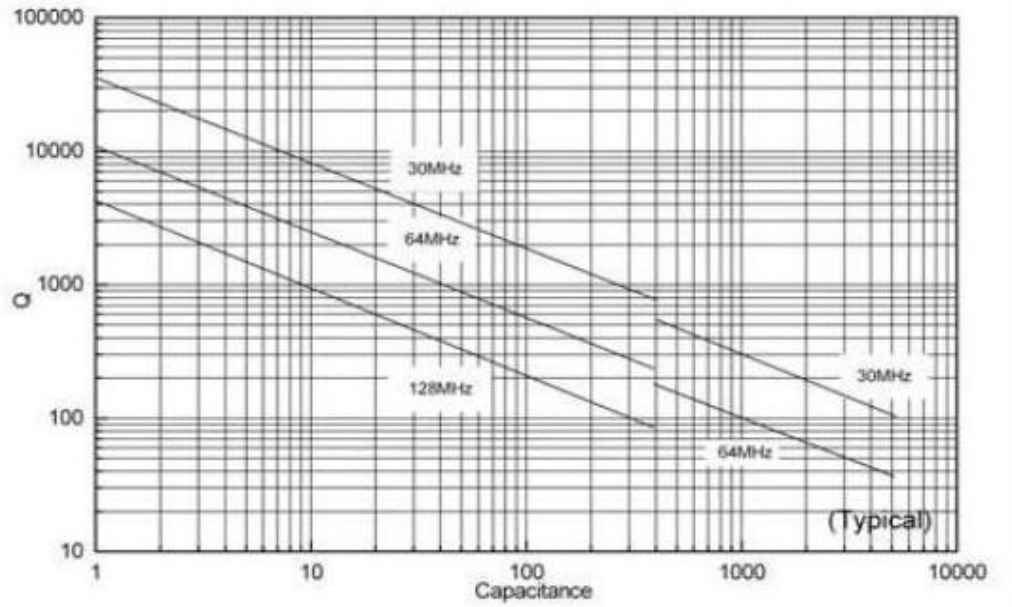
Series Resonance vs. Capacitance



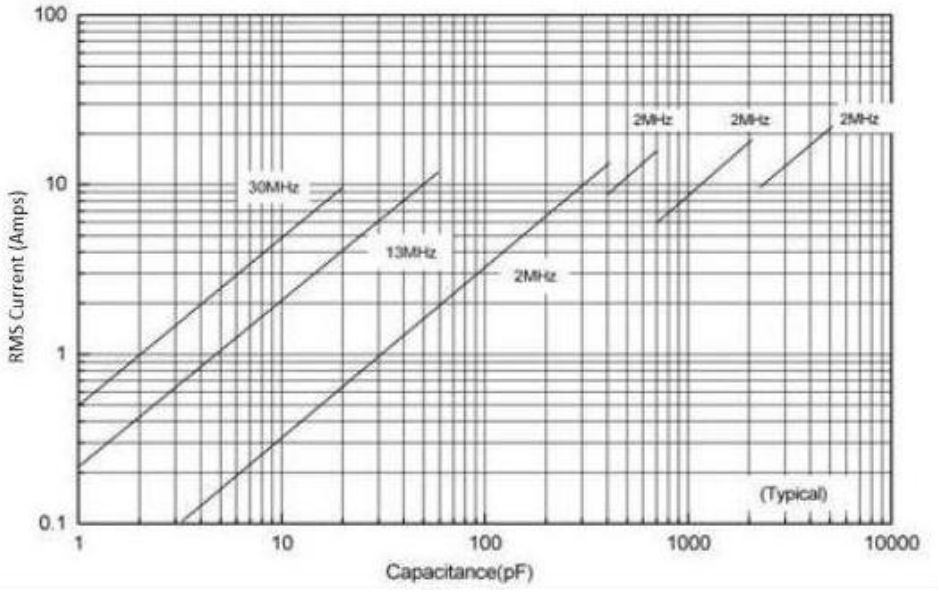
ESR vs. Frequency



Q vs. Capacitance



Current Rating vs. Capacitance



Current limits can depend on two different criteria. The first Voltage Limited Current ($I_{volt\ lim}$, represented by the solid line), the second is Power Dissipation Limited Current ($I_{pow\ diss}$).

$$I_{volt\ lim} = \frac{\sqrt{2}}{2} I_{peak} = \frac{\sqrt{2}}{2} \times \frac{V_{rated}}{X_C} = \sqrt{2}\pi FCV_{rated}$$

$I_{pow\ diss} = \sqrt{\frac{P_{dissipation}}{ESR}}$ (If the thermal resistance of the mounting surface is 12°C/W, then you will reach the power dissipated limit of 5W)

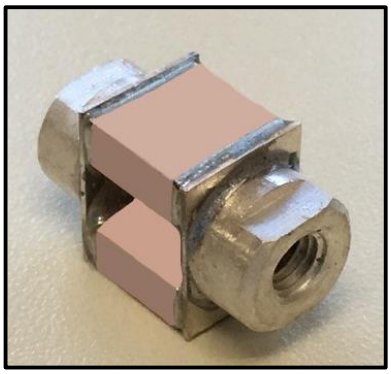
Recommended Land Pattern Dimensions

Regarding Landing Patterns, please refer to IPC-7351B (table 3-5, 3-6).

Custom Assemblies

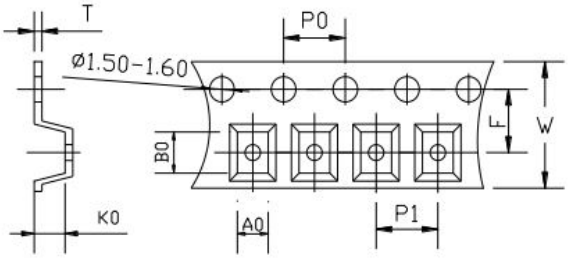
Passive Plus offers Capacitor Assemblies for high power requirements. Typical assemblies are configured in series and/or parallel combinations, producing higher voltage/current handling capabilities, extended capacitance range and tighter tolerances.

To get started, simply send us either a mechanical drawing or circuit conditions and we can recommend a solution. All components are 100% up-screened for Partial Discharge and Sonoscanned. All assemblies include a 100hr Military burn in.



Tape & Reel Specifications (mm)

Orientation	Measurement Unit	W	P0	P1	T	F	Minimum Qty per Reel	Std Qty per Reel	Tape Material
H	in.	0.630	0.157	0.630	0.012	0.295	50	200	Plastic
	mm	16.00	4.00	16.00	0.30	7.50			



$A_0B_0K_0$

- Determined by component size. Typical clearance between the cavity and the component is: .50 (.002) min to .65 (.026) max for 12mm tape.
- The component cannot rotate more than 20° within the determined cavity.

UHF/RF High-Q Power Transmitter
Multi-Layer Ceramic Capacitors

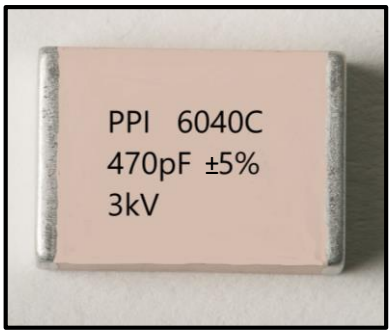
6040C (0.600” x 0.400”)

Product Features

- High Q
- High RF Current/Voltage
- Ultra Stable Performance
- Capacitance Range: 1.0pF to 6800pF
- Working Voltage: 5000V
- Extended Voltage: 8000V

Typical Circuit Applications

- Semiconductor Manufacturing
- High Energy Power Transfers
- Plasma Chambers
- Medical Equipment



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

Part Numbering

6040	C	100	J	W	502	X
Case Size (0.600” x 0.400”)	C=NP0	Capacitor Code 100=10x10⁰=10pF 1R0=1.0pF	Capacitance Tolerance *See Table*	Termination Type *See Table*	Rated Voltage *See Table*	Laser Marking

Capacitance Tolerance Codes

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

Voltage Codes

Voltage	Code
1000V	102
2000V	202
3000V	302
5000V	502
8000V	802

UHF/RF High-Q Power Transmitter
Multi-Layer Ceramic Capacitors

6040C (0.600” x 0.400”)

6040C Capacitance Values

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

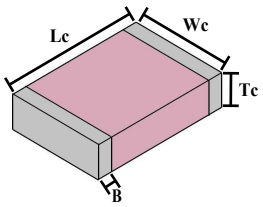
Marking shown for illustration purposes only.
Actual marking may differ.

Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.
1.0	1R0	B,C, D	5000V	8000V
1.2	1R2			
1.5	1R5			
1.8	1R8			
2.2	2R2			
2.7	2R7			
3.3	3R3			
3.9	3R9			
4.7	4R7			
5.6	5R6			
6.8	6R8			
8.2	8R2			
10	100	F,G, J,K	5000V	8000V
12	120			
15	150			
18	180			
22	220			
27	270			
33	330			
39	390	F,G, J,K	5000V	8000V
47	470			
56	560			
68	680			
82	820			
100	101			
120	121	F,G, J,K	3000V	5000V
150	151			
180	181			
220	221			
270	271			
330	331			
390	391			
470	471			
560	561			
680	681			
820	821	F,G, J,K	2000V	3000V
1000	102			
1200	122			
1500	152	F,G, J,K	2000V	3000V
1800	182			
2200	222			
2700	272	F,G, J,K	1000V	2000V
3300	332			
4700	472			
5100	512			
5600	562			
6800	682			

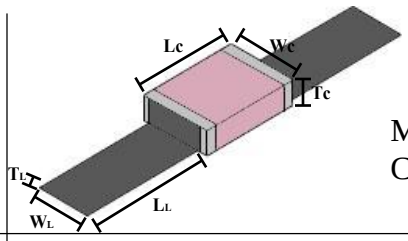
UHF/RF High-Q Power Transmitter
Multi-Layer Ceramic Capacitors

6040C (0.600” x 0.400”)

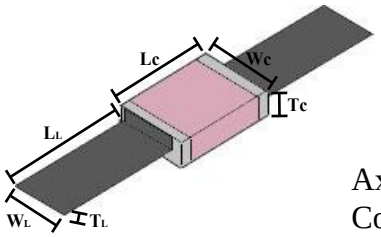
Termination Types and Codes



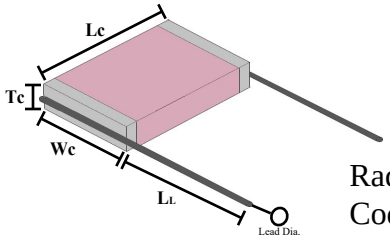
Chip Termination:
Codes: **W, L, P**



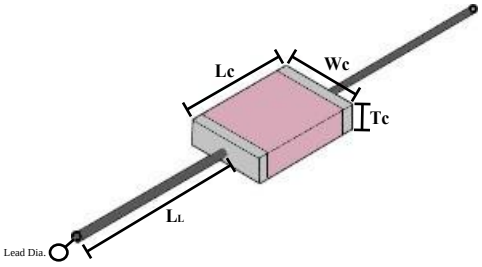
Microstrip Termination:
Codes: **MS, MN**



Axial Ribbon Termination:
Code: **AR, AN**



Radial Wire Termination:
Codes: **RW, RN**



Axial Wire Termination:
Codes: **AW, BN**

Termination Code	Magnetic Termination
W	100% Tin Solder over Nickel Barrier
L	90%Tin/10%Lead Solder over Nickel Barrier
MS	Silver-Plated Copper
AR	
RW	
AW	

Termination Code	Non-Magnetic Termination
P	100% Tin Solder over Copper Barrier
MN	Silver-Plated Copper
AN	
RN	
BN	

Note: “Non-Magnetic” means no magnetic materials.

UHF/RF High-Q Power Transmitter
Multi-Layer Ceramic Capacitors

6040C (0.600” x 0.400”)

Dimensions - For Termination Types images, see previous page

Unit: inch (millimeter)

Code		Magnetic Termination Capacitor Dimensions Length Lc	Width Wc	Thickness Tc	Overlap B	Lead Dimensions Length LL	Width WL	Thickness TL
W/L	Chip	0.614 +0.015 -0.010 (15.6 +0.38 -0.25)	0.433 ± 0.010 (11.0 ± 0.25)	0.154 ± 0.008 (3.90 ± 0.20)	0.063 max (1.60 max)	-	-	-
MS	Microstrip	0.614 +0.015 -0.010 (15.6 +0.38 -0.25)	0.433 ± 0.010 (11.0 ± 0.25)	0.154 ± 0.008 (3.90 ± 0.20)	-	0.787 min (20.0 min)	0.350 ± 0.010 (8.89 ± 0.50)	0.008 ± 0.001 (0.20 ± 0.025)
AR	Axial Ribbon					0.787 min (20.0 min)	0.350 ± 0.010 (8.89 ± 0.50)	0.008 ± 0.001 (0.20 ± 0.025)
RW	Radio Wire					0.787 min (20.0 min)	Dia. = 0.030 ± 0.004	
AW	Axial Wire					0.984 min (25.00 min)	Dia. = (0.80 ± 0.10)	

Code		Non-Magnetic Termination Capacitor Dimensions Length Lc	Width Wc	Thickness Tc	Overlap B	Lead Dimensions Length LL	Width WL	Thickness TL
P	Chip	0.614 +0.015 -0.010 (15.6 +0.38 -0.25)	0.433 ± 0.010 (11.0 ± 0.25)	0.154 ± 0.008 (3.90 ± 0.20)	0.063 max (1.60 max)	-	-	-
MN	Microstrip	0.614 +0.015 -0.010 (15.6 +0.38 -0.25)	0.433 ± 0.010 (11.0 ± 0.25)	0.154 ± 0.008 (3.90 ± 0.20)	-	0.787 min (20.0 min)	0.350 ± 0.010 (8.89 ± 0.50)	0.008 ± 0.001 (0.20 ± 0.025)
AN	Axial Ribbon					0.787 min (20.0 min)	0.350 ± 0.010 (8.89 ± 0.50)	0.008 ± 0.001 (0.20 ± 0.025)
RN	Radio Wire					0.787 min (20.0 min)	Dia. = 0.030 ± 0.004	
BN	Axial Wire					0.984 min (25.00 min)	Dia. = (0.80 ± 0.10)	

Note: Non-Magnetic means no magnetic materials. All leads are attached with high temperature solder and parts are RoHS Compliant.

UHF/RF High-Q Power Transmitter
Multi-Layer Ceramic Capacitors

6040C (0.600” x 0.400”)

Electrical Specifications

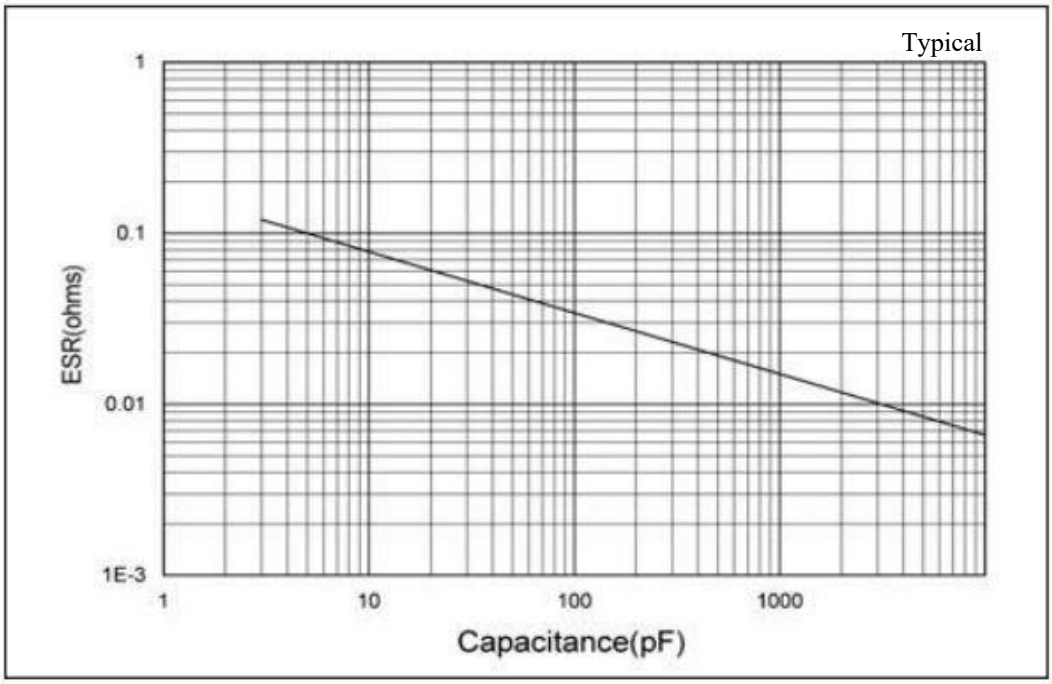
Quality Factor (Q)	No less than 1000pF, Q value more than 2000, Test Frequency 1MHz; More than 1000pF, Q value more than 2000, Test Frequency 1MHz
Insulation Resistance (IR)	Test Voltage: 500V 10^5 Megaohms min. @ +25°C 10^4 Megaohms min. @ +125°C
Rated Voltage	See Rated Voltage in Capacitance Table
Dielectric Withstanding Voltage (DWV)	250% of 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)	-55°C to 125°C 0±30ppm/°C >125°C to 175°C 0±60ppm/°C
Capacitance Drift	±0.02% or ±0.02pF, whichever is greater
Piezoelectric Effects	None
Termination Type	See Termination Type Table

Environmental Specifications

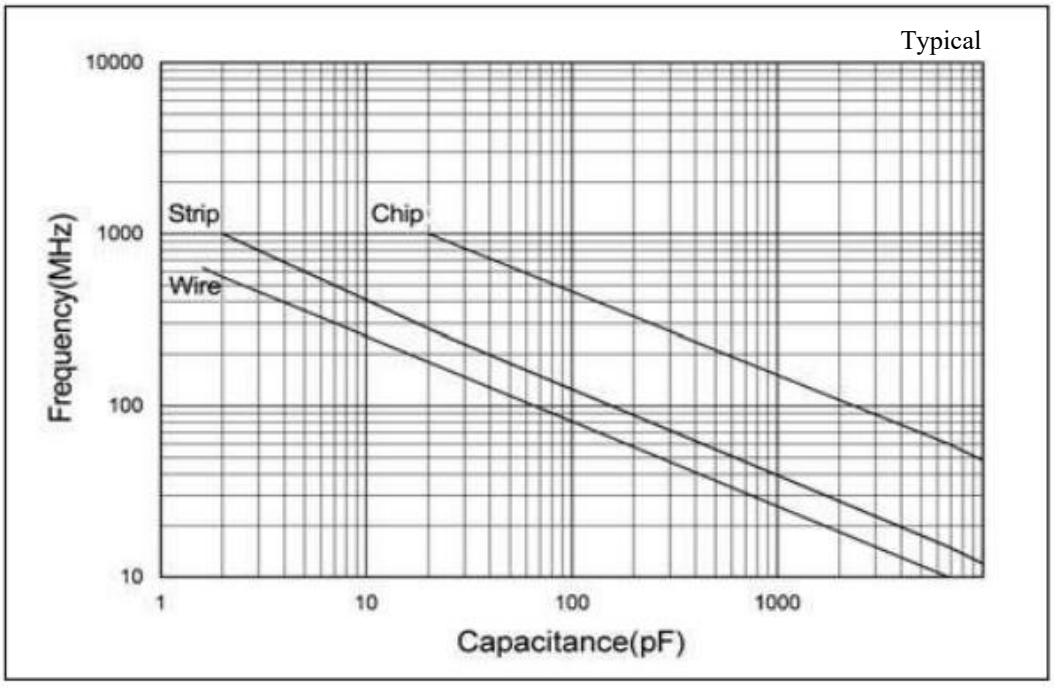
	Specification	Test Parameters
Thermal Shock	**DWV:** The initial value **IR:** Shall not be less than 30% of the initial value. **Capacitance Change:** No more than 0.5% or 0.5pF, whichever is greater.	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature (-55°C and 175°C) stay 30 minutes, the time of removing shall not be more than 3 minutes. Perform five cycles.
Moisture Resistance		MIL-STD-202, Method 106
Humidity (Steady State)	**DWV:** The initial value **IR:** The initial value **Capacitance Change:** No more than 0.3% or 0.3pF, whichever is greater.	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	**IR:** Shall not be less than 30% of the initial value. **Capacitance Change**: No more than 2.0% or 0.5pF, whichever is greater.	MIL-STD-202, Method 108. For 2000 hours, at 125°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 Strength	**Force:** 25lbs typical, 20lbs. min. **Duration Time:** 5 to 10 seconds	MIL-STD-202, Method 211A, Test Condition A. Applied a force and maintained for a period of 5 to 10 seconds. The force shall be in the direction of the axes of the terminations.

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

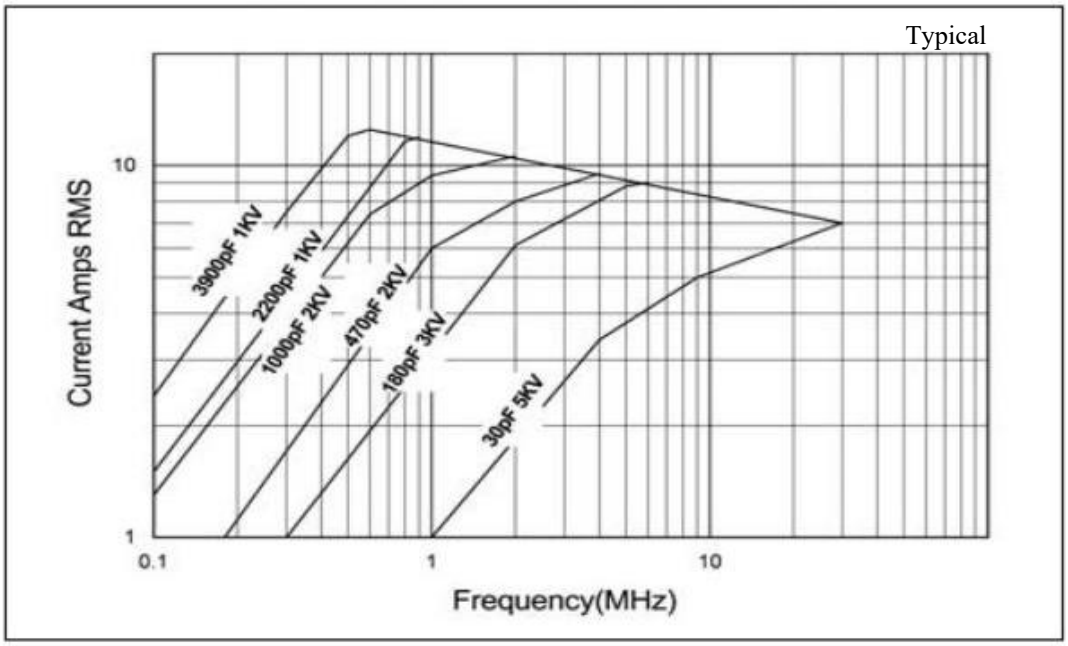
ESR vs. Capacitance Measured @ 30MHz



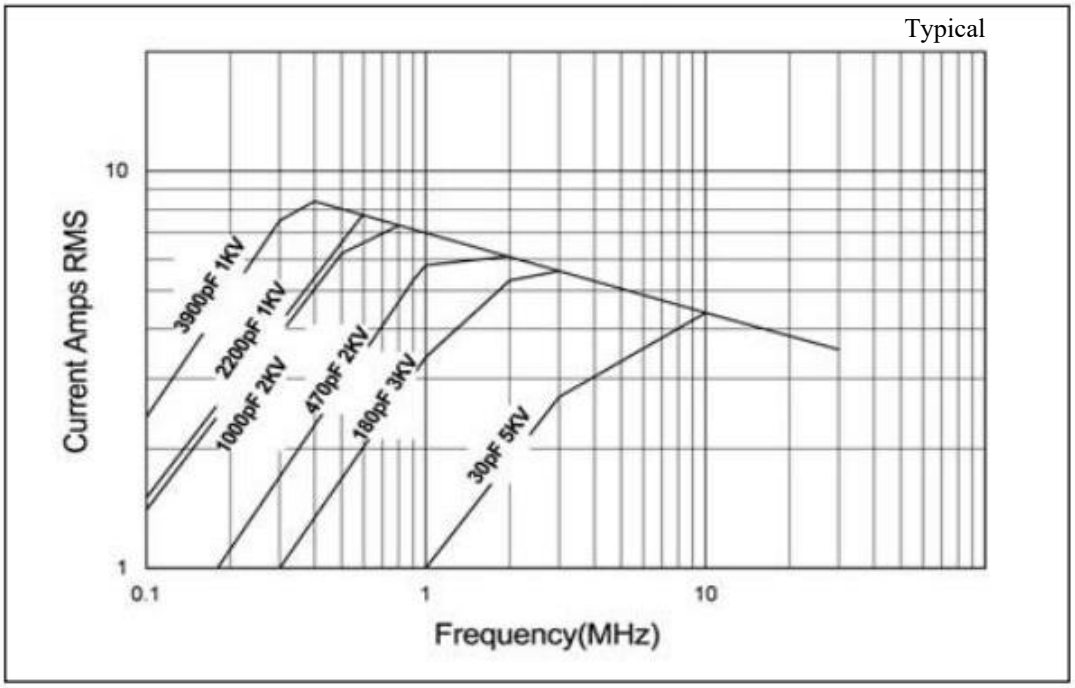
Self Resonant Frequency vs. Capacitance



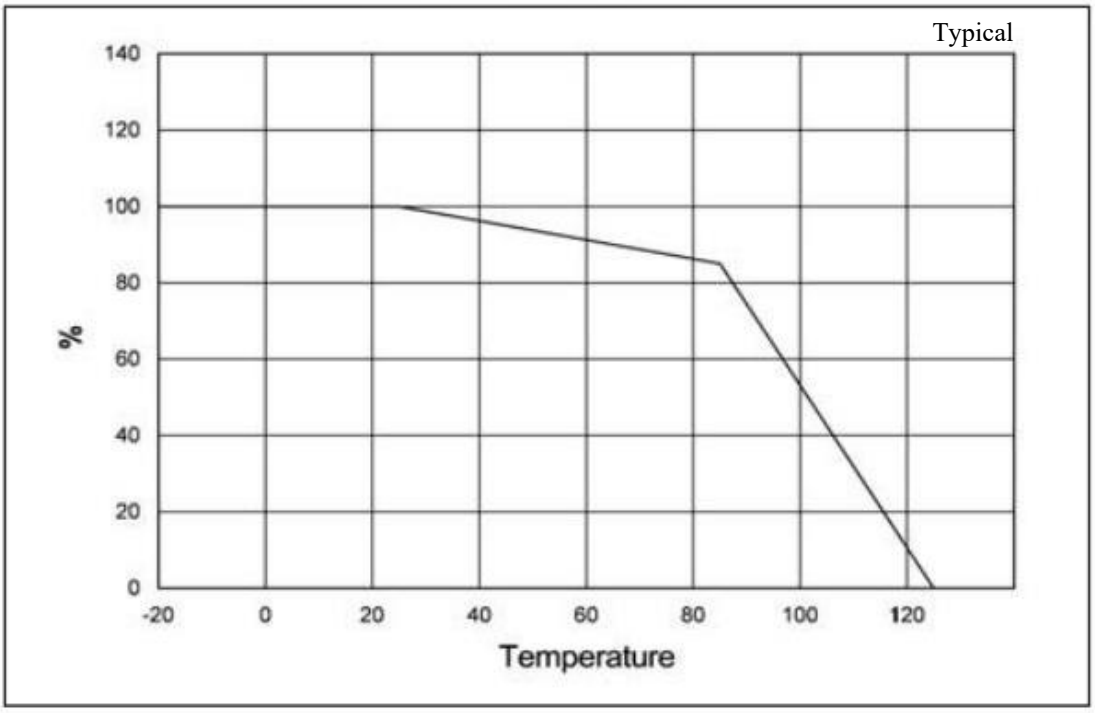
Strip Terminals Rated Current vs. Frequency



Wire Terminals Rated Current vs. Frequency



% Maximum Current vs. Ambient Temperature



Recommended Land Pattern Dimensions

Regarding Landing Patterns, please refer to IPC-7351B (table 3-5, 3-6).

Custom Assemblies

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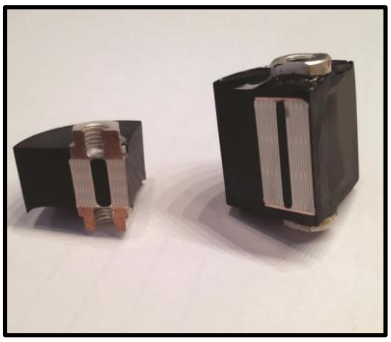


UHF/RF High-Q Power Transmitter
Multi-Layer Ceramic Capacitors

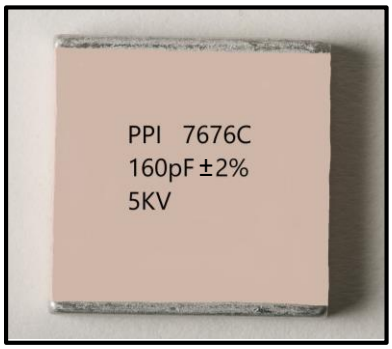
7676C (0.760” x 0.760”)

Product Features

- High Q
- High RF Current/Voltage
- Ultra Stable Performance
- Capacitance Range: 1.0pF to 20000pF
- Working Voltage: 5000V
- Extended Voltage: 8000V

Typical Circuit Applications

- Semiconductor Manufacturing
- High Energy Power Transfers
- Plasma Chambers
- Medical Equipment



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

Part Numbering

7676 C 100 J W 502 X

- 7676 — Case Size (0.760” x 0.760”)
- C — C=NP0
- 100 — Capacitor Code: 100=10x10⁰=10pF, 1R0=1.0pF
- J — Capacitance Tolerance *See Table*
- W — Termination Type *See Table*
- 502 — Rated Voltage *See Table*
- X — Laser Marking

Capacitance Tolerance Codes

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

Voltage Codes

Voltage	Code
1000V	102
2000V	202
3000V	302
5000V	502
8000V	802

UHF/RF High-Q Power Transmitter
Multi-Layer Ceramic Capacitors

7676C (0.760” x 0.760”)

7676C Capacitance Values

Special capacitances, tolerances and WVDC are available. Please contact PPI.

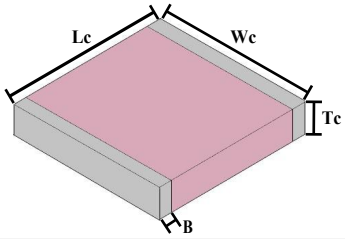
Marking shown for illustration purposes only. Actual marking may differ.

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.
1.0	1R0	B,C, D	5000V	8000V	**33**	330	F,G, J,K	5000V	8000V	**1000**	102	G,J, K	3000V	5000V
1.2	1R2				**39**	390				**1200**	122			
1.5	1R5				**47**	470				**1500**	152			
1.8	1R8				**56**	560				**1800**	182			
2.2	2R2				**68**	680				**2200**	222			
2.7	2R7				**82**	820				**2700**	272			
3.3	3R3				**100**	101				**3300**	332			
3.9	3R9				**120**	121				**4700**	472			
4.7	4R7				**150**	151				**5100**	512			
5.6	5R6				**180**	181				**5600**	562	G,J, K	1000V	3000V
6.8	6R8				**220**	221				**6800**	682			
8.2	8R2				**270**	271	F,G, J,K	3000V	5000V	**7500**	752			
10	100	F,G, J,K	5000V	8000V	**300**	301				**8200**	822			
12	120				**390**	391				**10000**	103			
15	150				**470**	471				**12000**	123	G,J, K	1000V	2000V
18	180				**560**	561				**15000**	153			
22	220				**680**	681				**18000**	183			
27	270				**820**	821				**20000**	203			

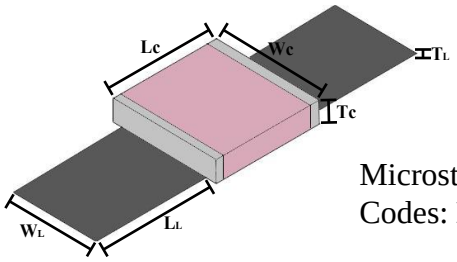
UHF/RF High-Q Power Transmitter
Multi-Layer Ceramic Capacitors

7676C (0.760” x 0.760”)

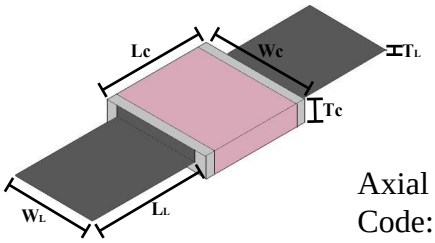
Termination Types and Codes



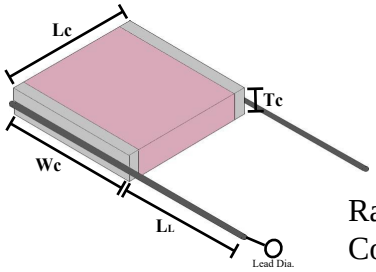
Chip Termination:
Codes: **W, L, P**



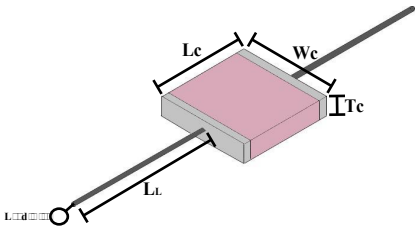
Microstrip Termination:
Codes: **MS, MN**



Axial Ribbon Termination:
Code: **AR, AN**



Radial Wire Termination:
Codes: **RW, RN**



Axial Wire Termination:
Codes: **AW, BN**

Termination Code	Magnetic Termination
W (RoHS)	100% Tin Solder over Nickel Barrier
L	90%Tin/10%Lead Solder over Nickel Barrier
MS (RoHS)	Silver-Plated Copper
AR (RoHS)	
RW (RoHS)	
AW (RoHS)	

Termination Code	Non-Magnetic Termination
P (RoHS)	100% Tin Solder over Copper Barrier
MN (RoHS)	Silver-Plated Copper
AN (RoHS)	
RN (RoHS)	
BN (RoHS)	

Note: “Non-Magnetic” means no magnetic materials.

UHF/RF High-Q Power Transmitter
Multi-Layer Ceramic Capacitors

7676C (0.760” x 0.760”)

Dimensions - For Termination Types images, see previous page

Unit: inch (millimeter)

Code		Magnetic Termination Capacitor Dimensions Length Lc	Width Wc	Thickness Tc	Overlap B	Lead Dimensions Length LL	Width WL	Thickness TL
W/L	Chip	0.760 +0.015 -0.010 (19.3 +0.38 -0.25)	0.760 ± 0.010 (19.3 ± 0.25)	0.197 max (5.00 max)	0.024 ~ 0.059 (0.60 ~ 1.50)	-	-	-
MS	Microstrip	0.760 +0.015 -0.010 (19.3 +0.38 -0.25)	0.760 ± 0.010 (19.3 ± 0.25)	0.197 max (5.00 max)	-	0.748 min (19.0 min)	0.591 ± 0.010 (15.00 ± 0.25)	0.008 ± 0.001 (0.20 ± 0.025)
AR	Axial Ribbon	0.760 +0.015 -0.010 (19.3 +0.38 -0.25)	0.760 ± 0.010 (19.3 ± 0.25)	0.197 max (5.00 max)	-	0.748 min (19.0 min)	0.591 ± 0.010 (15.00 ± 0.25)	0.008 ± 0.001 (0.20 ± 0.025)
RW	Radio Wire	0.760 +0.015 -0.010 (19.3 +0.38 -0.25)	0.760 ± 0.010 (19.3 ± 0.25)	0.197 max (5.00 max)	-	0.748 min (19.0 min)	Dia. = 0.031 ± 0.006 Dia. = (0.80 ± 0.15)	
AW	Axial Wire	0.760 +0.015 -0.010 (19.3 +0.38 -0.25)	0.760 ± 0.010 (19.3 ± 0.25)	0.197 max (5.00 max)	-	0.906 min (23.00 min)	Dia. = 0.031 ± 0.006 Dia. = (0.80 ± 0.15)	

Code		Non-Magnetic Termination Capacitor Dimensions Length Lc	Width Wc	Thickness Tc	Overlap B	Lead Dimensions Length LL	Width WL	Thickness TL
P	Chip	0.760 +0.015 -0.010 (19.3 +0.38 -0.25)	0.760 ± 0.010 (19.3 ± 0.25)	0.197 max (5.00 max)	0.024 ~ 0.059 (0.60 ~ 1.50)	-	-	-
MN	Microstrip	0.760 +0.015 -0.010 (19.3 +0.38 -0.25)	0.760 ± 0.010 (19.3 ± 0.25)	0.197 max (5.00 max)	-	0.748 min (19.0 min)	0.591 ± 0.010 (15.00 ± 0.25)	0.008 ± 0.001 (0.20 ± 0.025)
AN	Axial Ribbon	0.760 +0.015 -0.010 (19.3 +0.38 -0.25)	0.760 ± 0.010 (19.3 ± 0.25)	0.197 max (5.00 max)	-	0.748 min (19.0 min)	0.591 ± 0.010 (15.00 ± 0.25)	0.008 ± 0.001 (0.20 ± 0.025)
RN	Radio Wire	0.760 +0.015 -0.010 (19.3 +0.38 -0.25)	0.760 ± 0.010 (19.3 ± 0.25)	0.197 max (5.00 max)	-	0.748 min (19.0 min)	Dia. = 0.031 ± 0.006 Dia. = (0.80 ± 0.15)	
BN	Axial Wire	0.760 +0.015 -0.010 (19.3 +0.38 -0.25)	0.760 ± 0.010 (19.3 ± 0.25)	0.197 max (5.00 max)	-	0.906 min (23.00 min)	Dia. = 0.031 ± 0.006 Dia. = (0.80 ± 0.15)	

Note: Non-Magnetic means no magnetic materials. All leads are attached with high temperature solder and parts are RoHS Compliant.

UHF/RF High-Q Power Transmitter
Multi-Layer Ceramic Capacitors

7676C (0.760” x 0.760”)

Electrical Specifications

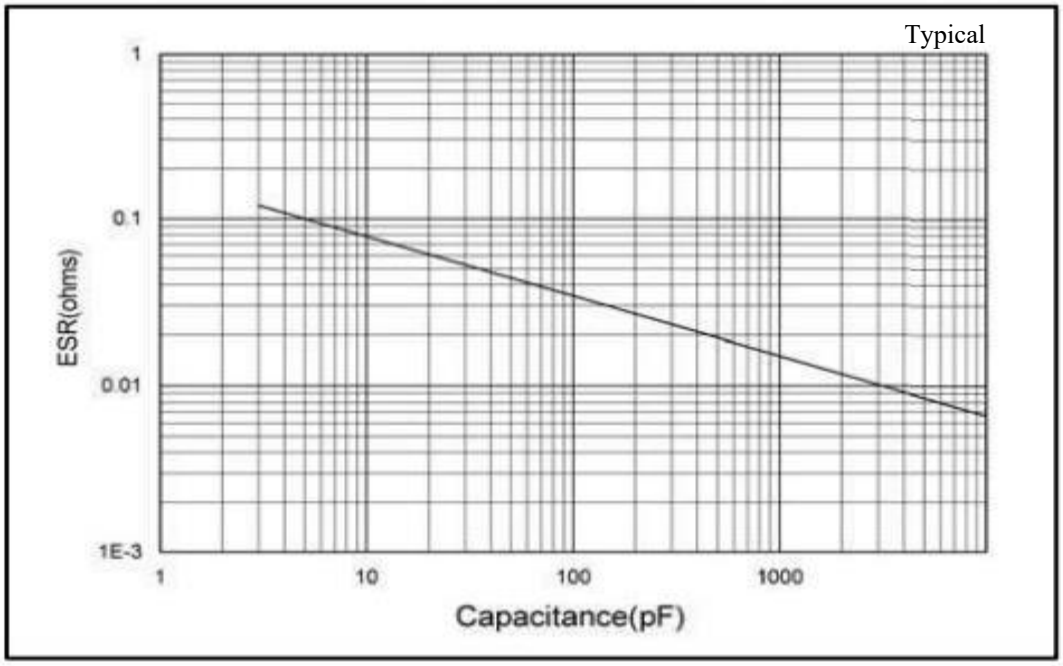
Quality Factor (Q)	No less than 1000pF, Q value more than 2000, Test Frequency 1MHz; More than 1000pF, Q value more than 2000, Test Frequency 1kHz
Insulation Resistance (IR)	Test Voltage: 500V 10^5 Megaohms min. @ +25°C 10^4 Megaohms min. @ +125°C
Rated Voltage	See Rated Voltage in Capacitance Table
Dielectric Withstanding Voltage (DWV)	250% of 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)	-55°C to 125°C 0±30ppm/°C >125°C to 175°C 0±60ppm/°C
Capacitance Drift	±0.2% or ±0.05pF, whichever is greater
Piezoelectric Effects	None
Termination Type	See Termination Type Table

Environmental Specifications

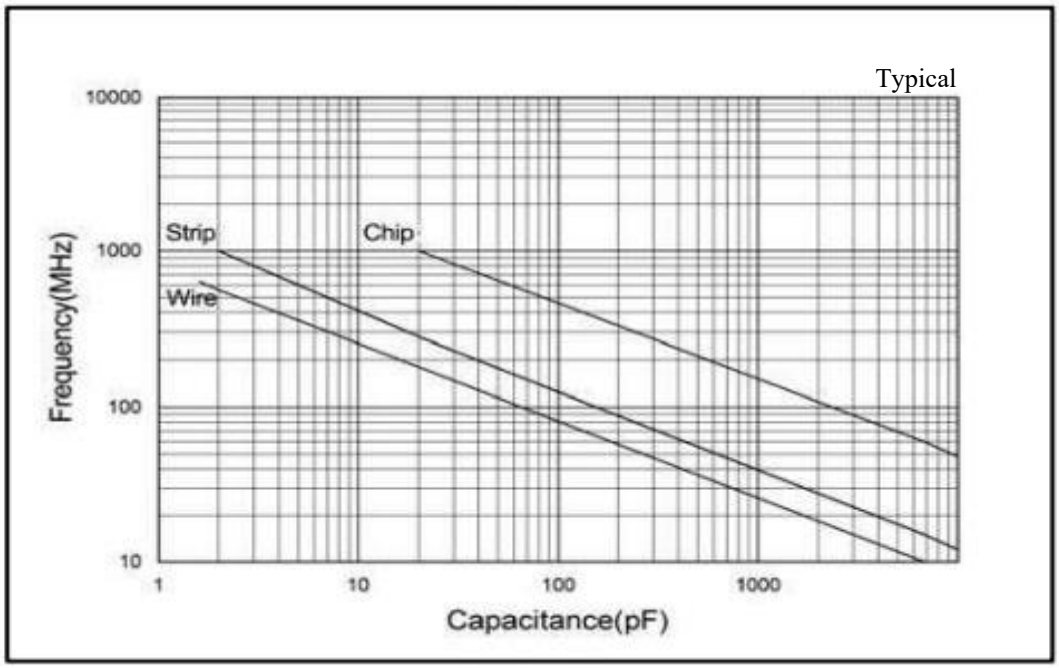
	Specification	Test Parameters
Thermal Shock	**DWV:** The initial value **IR:** Shall not be less than 30% of the initial value. **Capacitance Change:** No more than 0.5% or 0.5pF, whichever is greater.	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature (-55°C and 175°C) stay 30 minutes, the time of removing shall not be more than 3 minutes. Perform five cycles.
Moisture Resistance		MIL-STD-202, Method 106
Humidity (Steady State)	**DWV:** The initial value **IR:** The initial value **Capacitance Change:** No more than 0.3% or 0.3pF, whichever is greater.	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	**IR:** Shall not be less than 30% of the initial value. **Capacitance Change**: No more than 2.0% or 0.5pF, whichever is greater.	MIL-STD-202, Method 108. For 2000 hours, at 125°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 Strength	**Force:** 30lbs. min. **Duration Time:** 5 to 10 seconds	MIL-STD-202, Method 211A, Test Condition A. Applied a force and maintained for a period of 5 to 10 seconds. The force shall be in the direction of the axes of the terminations.

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

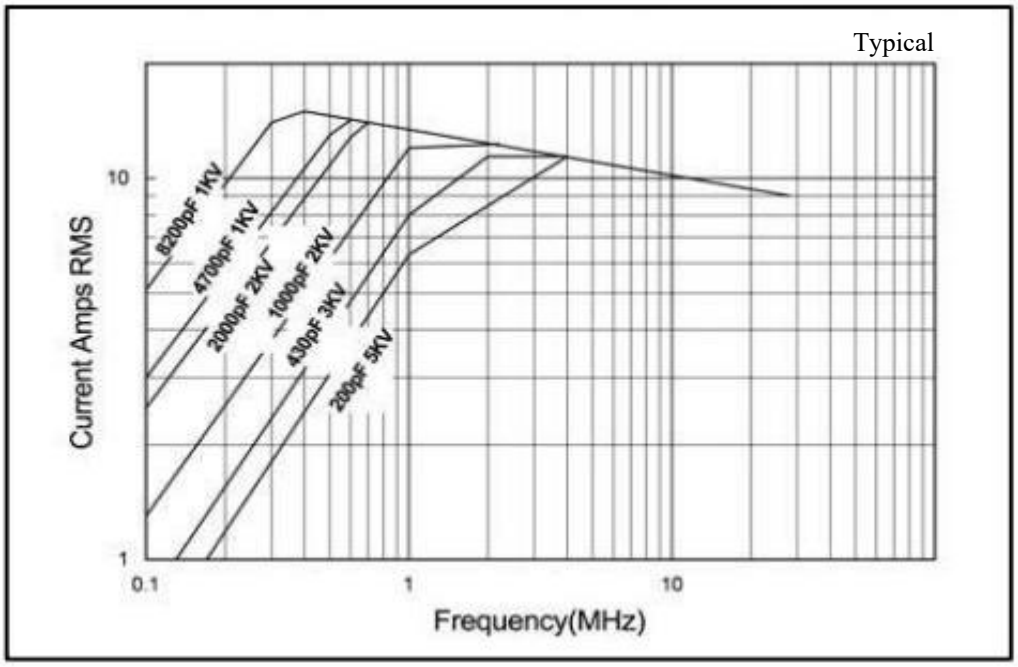
ESR vs. Capacitance Measured @ 30MHz



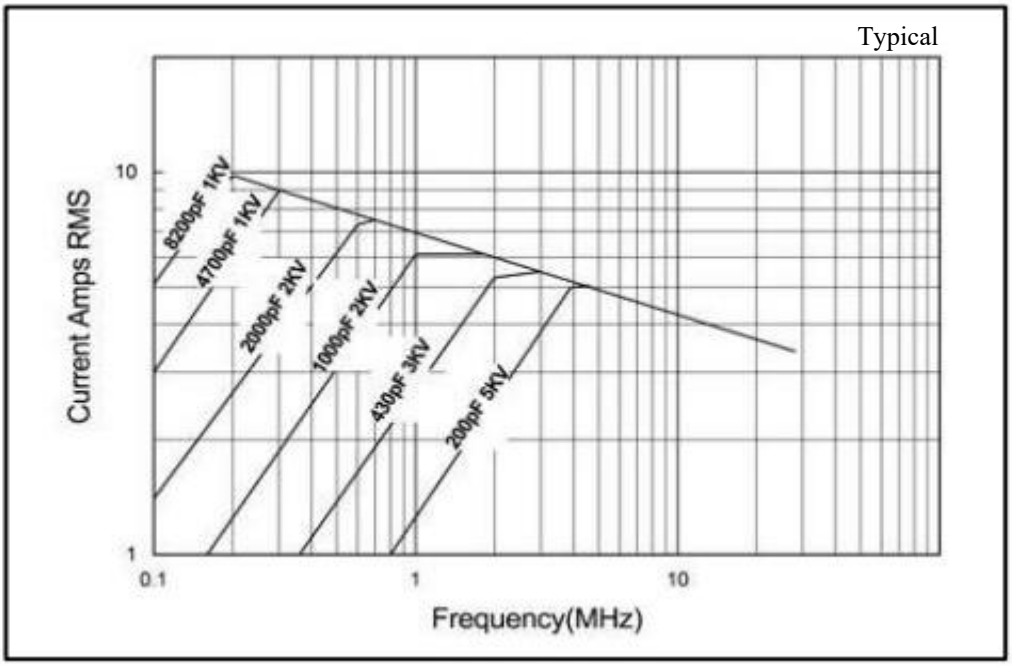
Self Resonant Frequency vs. Capacitance



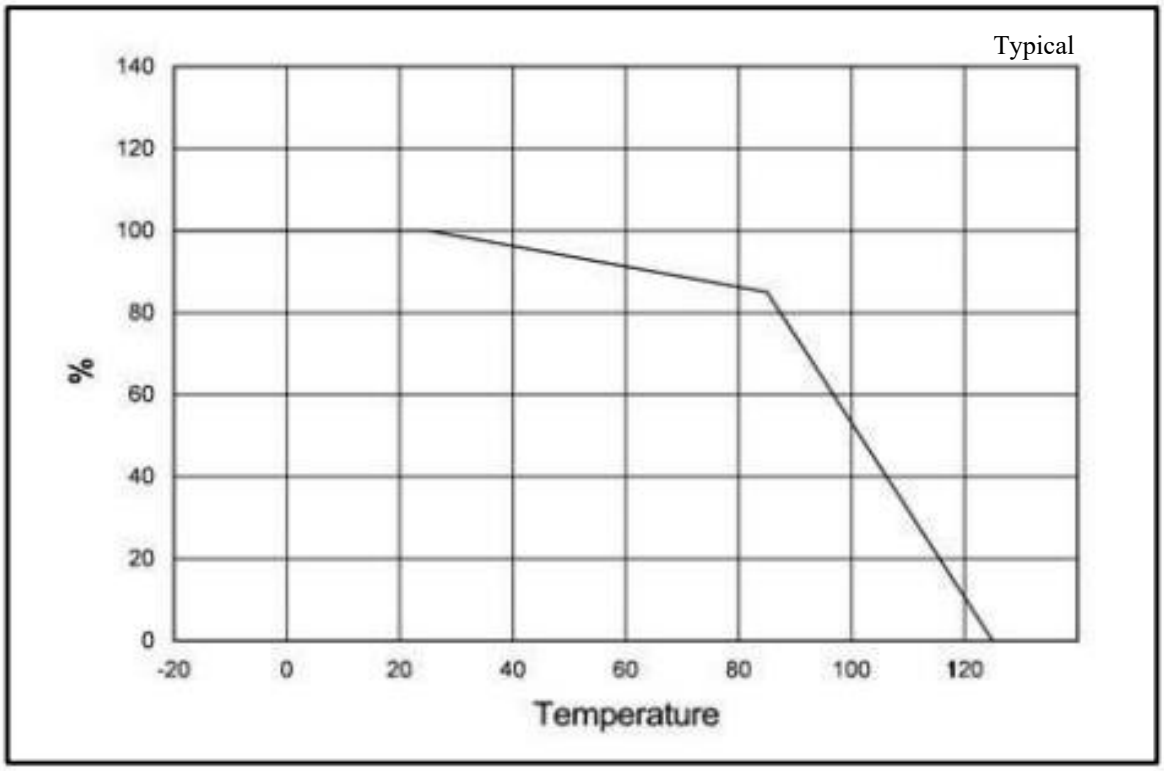
Strip Terminals Rated Current vs. Frequency



Wire Terminals Rated Current vs. Frequency



% Maximum Current vs. Ambient Temperature



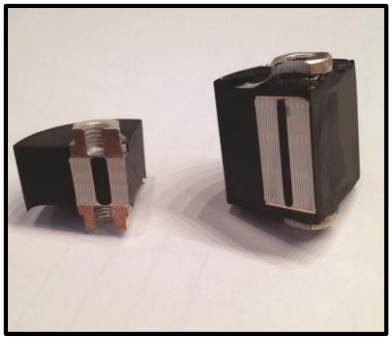
Recommended Land Pattern Dimensions

Regarding Landing Patterns, please refer to IPC-7351B (Table 3-5, 3-6).

Custom Assemblies

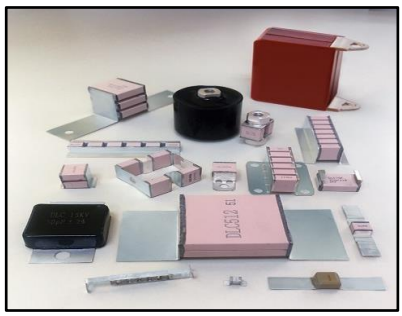
Passive Plus offers Capacitor Assemblies for high power requirements. Typical assemblies are configured in series and/or parallel combinations, producing higher voltage/current handling capabilities, extended capacitance range and tighter tolerances.

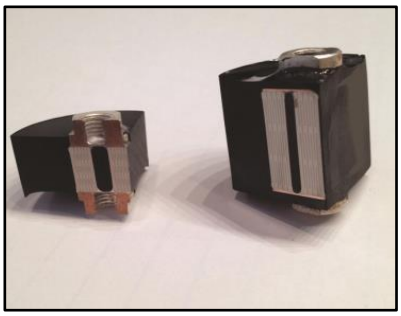
To get started, simply send us either a mechanical drawing or circuit conditions and we can recommend a solution. All components are 100% up-screened for Partial Discharge and Sonoscanned. All assemblies include a 100hr Military burn in.

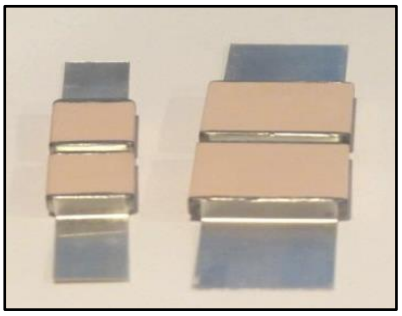


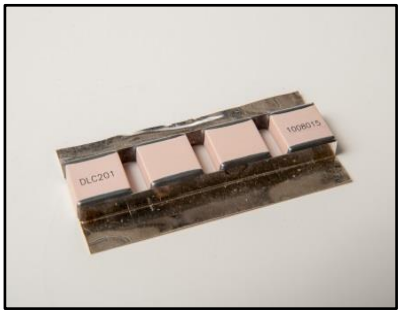
UHF/RF High-Q Power Transmitter
Multi-Layer Ceramic Capacitors

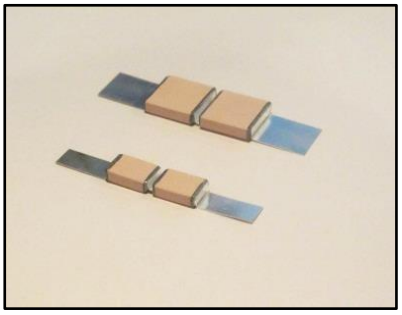
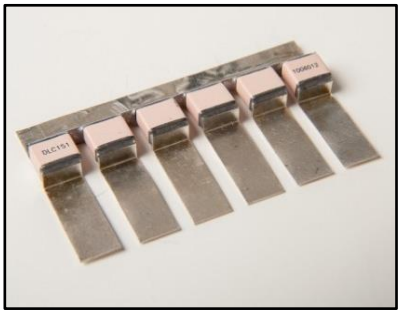
Custom Capacitor Assemblies

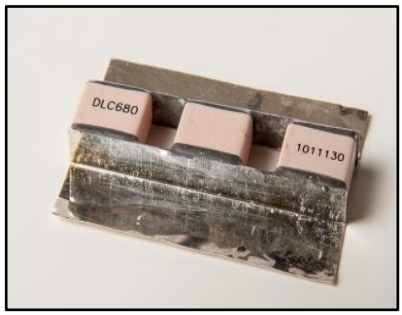


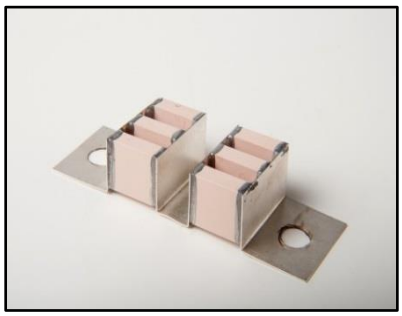
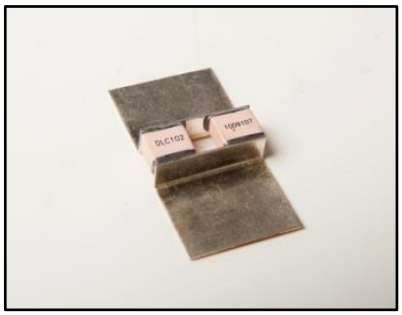




Marking shown for illustration purposes only.
Actual marking may differ.

Please contact PPI (sales@passiveplus.com) to discuss custom assembly options.

UHF/RF High-Q Power Transmitter
Multi-Layer Ceramic Capacitors

Custom Capacitor Assemblies

Product Features

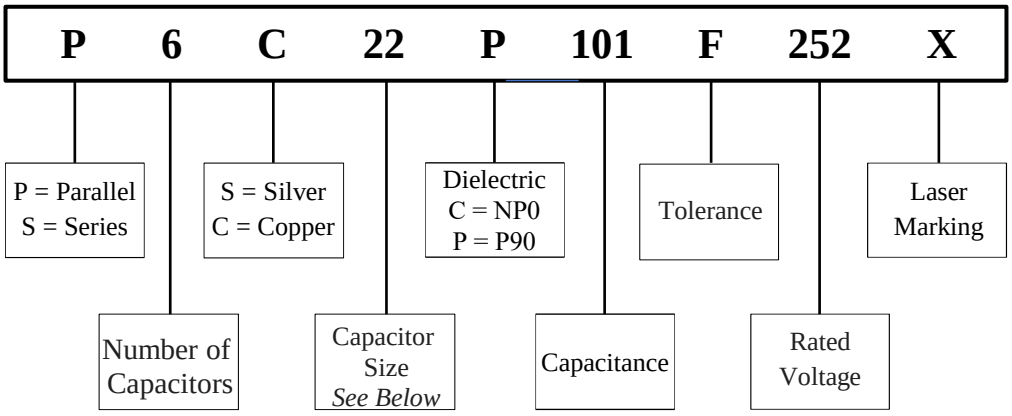
High Operating Voltage, High Operating Current, Extended Capacitance, Tighter Tolerances, High Reliability, High Q, Ultra-low ESR, Non-Magnetic

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

Typical Applications Field

High Power RF, Medical Electronics, Broadcast, Semiconductor Manufacturing, High Magnetic Environments, Inductive Heating

Part Numbering



Capacitor Size:

11 = 1111; 22 = 2225; 38 = 3838; 60 = 6040; 76 = 7676

Capacitance: For capacitor values requiring 3 significant digits,

e.g. 1222.5pF =1222R5

e.g. P6S22P101F252X

Silver bracket assembly with six 2225C pieces in parallel, Capacitance is 100pF, Capacitance tolerance is ±1%, WVDC is 2500 V and Laser marking.

e.g. S2S25C1222R5G203X

Silver bracket assembly with two 2225C pieces in series, Capacitance is 1222.5pF, Capacitance tolerance is ±2%, WVDC is 20,000V and Laser marking.

Capacitance and Voltage

By Buyer's requirements using existing drawings, mechanical sketches, or we can help with capable modeling of assemblies thermal rise predictions.

UHF/RF High-Q Power Transmitter
Multi-Layer Ceramic Capacitors

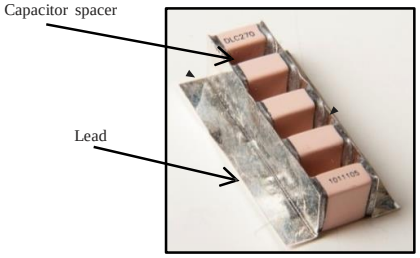
Custom Capacitor Assemblies

Typical Assembly Configurations

Parallel Assemblies

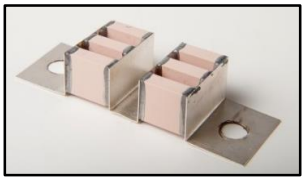
unit:inch (millimeter)

	1111C/P	22225C/P	3838C/P	6040C	7676C
Lead Material	Silver plated Copper or Silver				
Lead Thickness	.004 or .010 (0.1 or 0.25)			.010 or .020 (0.25 or 0.51)	
Lead Length (max.)	.50 (12.7)	.75 (19.8)		2.0 (50.8)	
Capacitor Spacer (typ.)	.050 or .078 (1.3 or 2)			.090 (2.3)	.050 or .157 (1.3 or 4)
Mounting Configuration	Horizontal / Vertical				



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

3838 Series/Parallel Combination

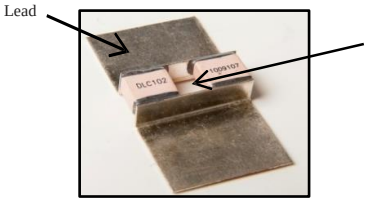


Series Assemblies

unit:inch (millimeter)

	22225C/P	3838C/P	6040C	7676C
Lead Type	L Bracket			
Lead Material	Silver plated Copper or Silver			
Lead Thickness	.010 (0.25)		.010 or .020 (0.25 or 0.51)	
Lead Length (max.)	.75 (19.8)	1.0 (25.4)		
Capacitor Spacer (typ.)	.050 or .157 (1.3 or 4)			
Mounting Configuration	Horizontal			

- Epoxy Molding Available



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

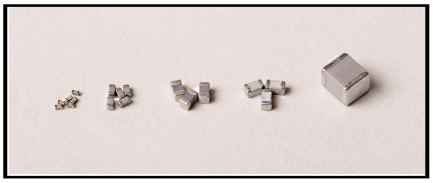
Other Assemblies: By Buyer's requirement. Contact PPI.

EIA Low ESR Microwave Capacitors

Product Features

- Lowest ESR
- Low Noise
- High Self-Resonance

Product Applications



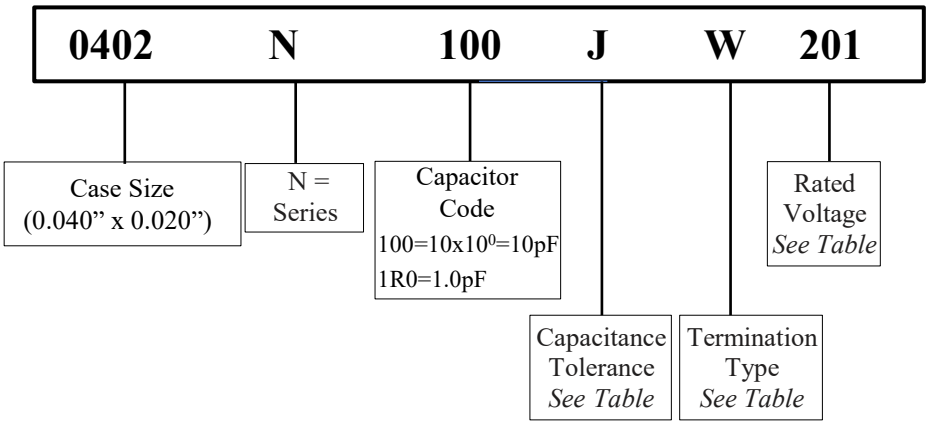
Typical Functional Applications

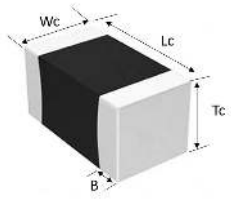
- Tuning • Bypass • Coupling
- Feedback • D.C. Blocking
- Impedance Matching

Typical Circuit Applications

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

Part Numbering





Case Size (Chip) Dimensions

	0201	0402	0603	0708	0805	1111
Length Lc	0.024 ± 0.001 (0.60 ± 0.03)	0.040 ± 0.004 (1.02 ± 0.10)	0.062 ± 0.006 (1.57 ± 0.15)	0.065 ± 0.006 (1.65 ± 0.15)	0.080 ± 0.008 (2.03 ± 0.20)	0.110 $^{+0.020}_{-0.010}$ (2.79 $^{+0.51}_{-0.25}$)
Width Wc	0.012 ± 0.001 (0.30 ± 0.03)	0.020 ± 0.004 (0.51 ± 0.10)	0.032 ± 0.006 (0.81 ± 0.15)	0.080 ± 0.006 (2.02 ± 0.15)	0.050 ± 0.008 (1.27 ± 0.20)	0.110 ± 0.015 (2.79 ± 0.38)
Thickness Tc	0.012 ± 0.001 (0.30 ± 0.03)	0.020 ± 0.004 (0.51 ± 0.10)	0.030 $^{+0.005}_{-0.003}$ (0.76 $^{+0.20}_{-0.08}$)	0.100 ± 0.008 (2.54 ± 0.20)	0.040 ± 0.006 (1.02 ± 0.15)	0.10 max (2.60 max)
Overlap B	0.008 (0.20)	0.010 ± 0.006 (0.25 ± 0.15)	0.014 ± 0.006 (0.35 ± 0.15)	0.020 ± 0.004 (0.50 ± 0.10)	0.020 ± 0.010 (0.50 ± 0.25)	0.015 max (0.025 max)

EIA Low ESR Microwave Capacitors

Temperature Coefficient

N: 0±30ppm/°C

Rated Capacitance

Capacitance is less than 10pF; for example: 1R0=1.0pF, R denotes decimal point

Capacitance greater than 10pF; for example: 101=100pF, the third number is the power of 10

Tolerance

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

Termination Types and Codes

Termination Code	Type	Magnetic Termination
W RoHS	Chip	100% Sn Solder over Nickel Plating
L	Chip	90% Sn10%Pb Tin/Lead Solder over Nickel Plating

Voltages

Code	Rated Voltage
250	25V
500	50V
251	250V
501	500V
102	1000V

Laser Marking

An “X” at the end of the part number indicates the part is marked.

Laser Marking is available on the 0805N & 1111N case sizes.

Packing Orientation Option

TV: Tape carrier packaging Vertical Orientation.

Vertical orientation means that if the part is lifted from the tape without any rotation and placed on a substrate, its electrodes will be perpendicular to the substrate plane. This extends the frequency of the First Parallel Resonance (FPR), typically twice the FPR of an equivalent part mounted horizontally.

Performance Requirements

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

All products are in compliance with RoHS instruction.

EIA Low ESR
Multi-Layer Ceramic Capacitors

0201N (0.020” x 0.010”)

Product Features

- High Q
- High Power
- Low ESR/ESL
- Low Noise
- High Self-Resonance
- Ultra Stable Performance
- Capacitance Range: 0.1pF to 100pF
- Working Voltage: 50V

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

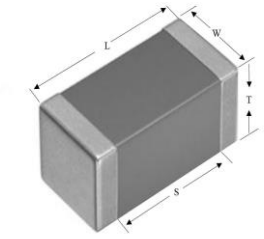
0201 N 100 J W 500

0201	N	100	J	W	500
Case Size (0.020” x 0.010”)	N = NP0 (COG)	Capacitor Code 100=10x10⁰=10pF 1R0=1.0pF	Capacitance Tolerance: *See Table*	Termination Type *See Table*	Rated Voltage *See Table*

Capacitor Dimensions

Unit: inch (millimeter)

Code	Term.	Length	Width	Thickness	Overlap
		Lc	Wc	Tc	B
W	Chip	0.024 ± 0.001 (0.60 ± 0.03)	0.012 ± 0.001 (0.30 ±0.03)	0.012 ± 0.001 (0.30 ±0.03)	0.008 (0.20)



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

0201N (0.020” x 0.010”)

Terminations Type and Code

Termination Code	Termination
W	100% Tin Solder over Nickel Barrier

Voltage Codes

Voltage	Code
25V	250
50V	500

0201N 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 WVD Std.	Rated WVD Ext.
0.1	0R1	A,B, C,	25V	50V	**2.2**	2R2	A,B, C,	25V	50V	**16**	160	F,G, J,K	25V	50V
0.2	0R2				**2.4**	2R4				**18**	180			
0.3	0R3				**2.7**	2R7				**20**	200			
0.4	0R4				**3.0**	3R0				**22**	220			
0.5	0R5				**3.3**	3R3				**24**	240			
0.6	0R6				**3.6**	3R6				**27**	270			
0.7	0R7				**3.9**	3R9				**30**	300			
0.8	0R8				**4.3**	4R3				**33**	330			
0.9	0R9				**4.7**	4R7				**36**	360			
1.0	1R0				**5.1**	5R1	B,C, D	25V	50V	**39**	390			
1.1	1R1				**5.6**	5R6				**43**	430			
1.2	1R2				**6.2**	6R2				**47**	470			
1.3	1R3				**6.8**	6R8				**51**	510			
1.4	1R4				**7.5**	7R5				**56**	560			
1.5	1R5				**8.2**	8R2				**62**	620			
1.6	1R6				**9.1**	9R1				**68**	680			
1.7	1R7				**10**	100	F,G, J,K	25V	50V	**75**	750			
1.8	1R8				**11**	110				**82**	820			
1.9	1R9				**12**	120				**91**	910			
2.0	2R0				**13**	130				**100**	101			
2.1	2R1				**15**	150								

EIA Low ESR
Multi-Layer Ceramic Capacitors

0201N (0.020” x 0.010”)

Electrical Specifications

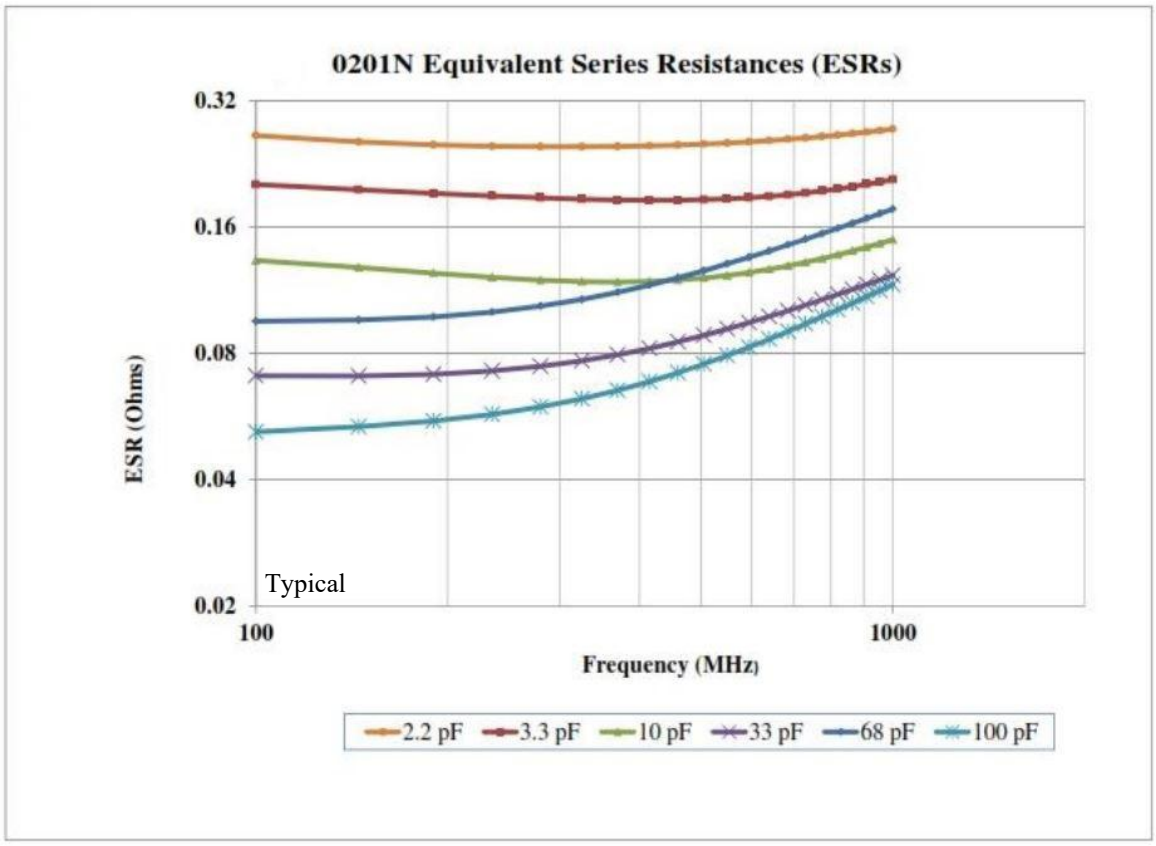
Quality Factor (Q)	2,000 at 1 MHz min.
Insulation Resistance (IR)	10^5 Megaohms min. @ +25°C rated WVDC 10^4 Megaohms min. @ +125°C rated WVDC
Rated Voltage	25V or 50V
Dielectric Withstanding Voltage (WVDC)	250% of Rated Voltage of 5 seconds
Operating Temperature Range	-55°C to 175°C
Temperature Coefficient (TC)	0±30ppm/°C
Capacitance Drift	±0.02% or ±0.02pF, whichever is greater
Piezoelectric Effects	None

Environmental Specifications

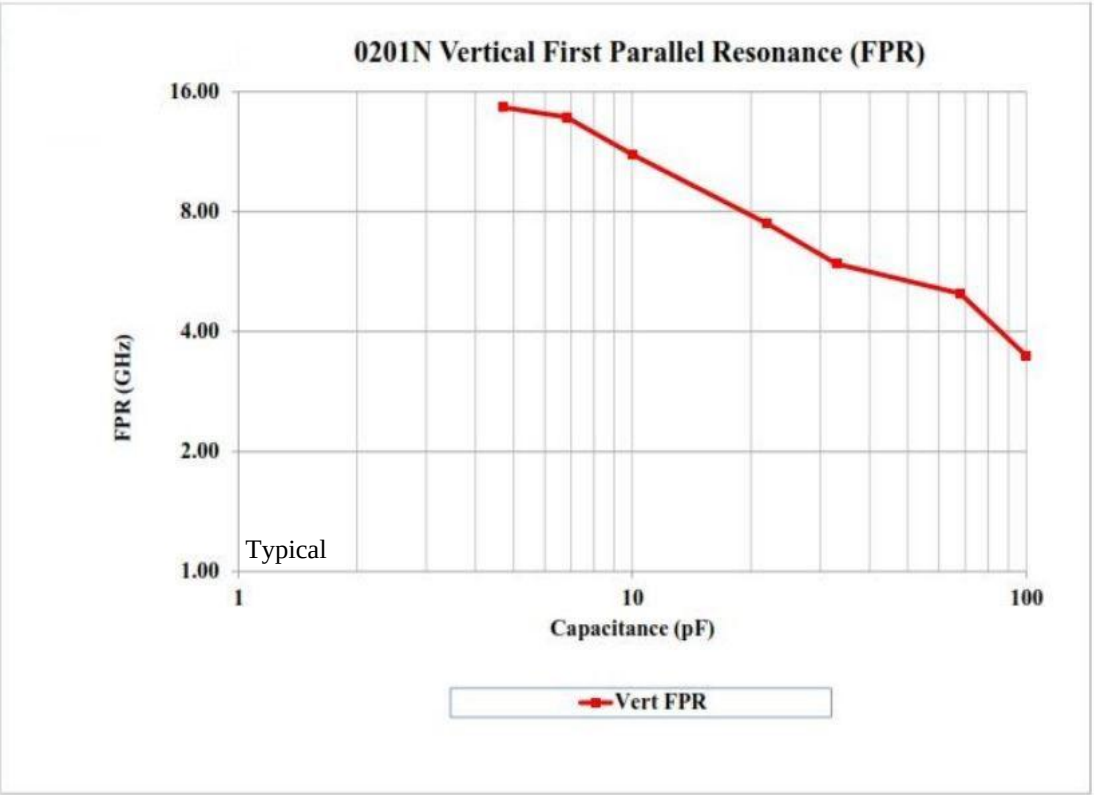
	Specification	Test Parameters
Thermal Shock	No mechanical damage **Capacitance Change:** ±0.5% or 0.5pF max **IR:** >10 G Ohms Q>2000 Breakdown Voltage: 2.5x WVDC	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature (-55°C and 175°C) stay 30 minutes, the time of removing shall not be 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



First Parallel Resonance



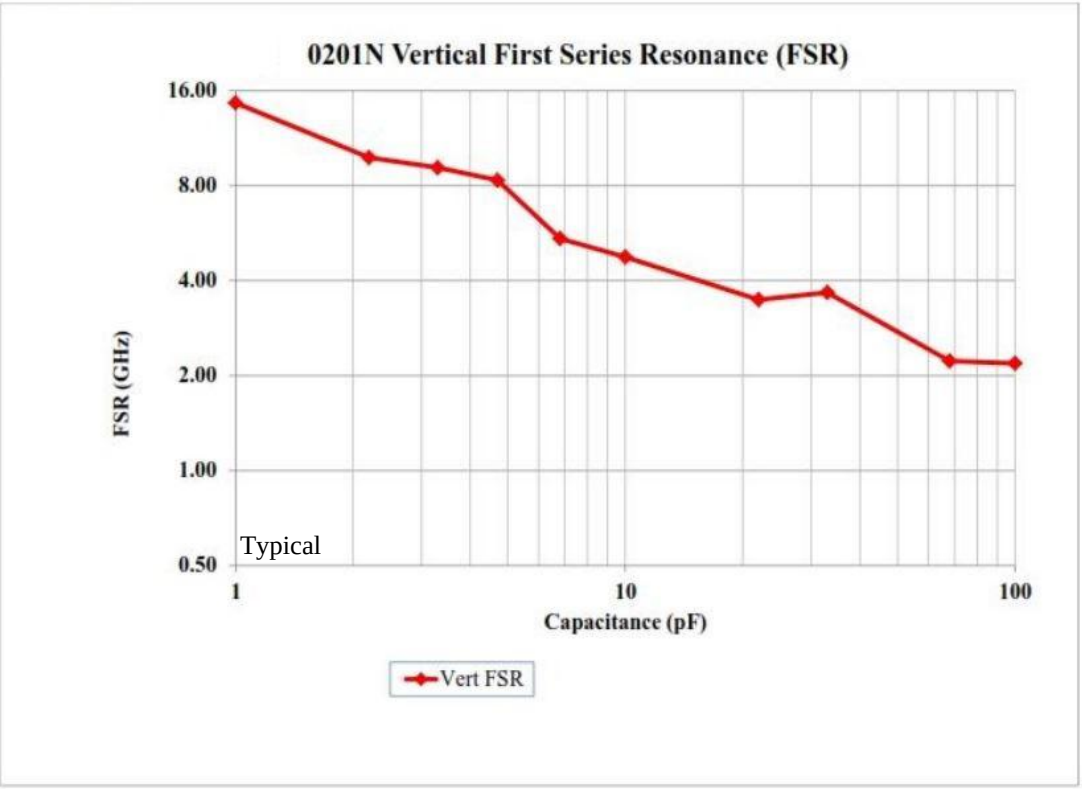
Definitions and Measurement Conditions

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 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 RO3006; substrate dielectric constant = 6.15; substrate thickness (mils) = 10; gap in microstrip trace (mils) = 6.0; microstrip trace width (mils) = 14.1; 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.

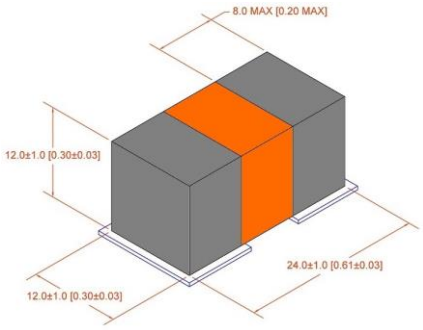
The definitions on the charts are for a capacitor in a series configuration, i.e., mounted across a gap in a microstrip trace with 50-Ohm termination. The measurement conditions are: substrate – Rogers RO3006; substrate dielectric constant = 6.15; substrate thickness (mils) = 10; gap in microstrip trace (mils) = 6.0; microstrip trace width (mils) = 14.1; 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.

0201N (0.020” x 0.010”)

Capacitor Application Program

PPI’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 visiting the https://www.modelithics.com/MVP/PPI.

Recommended Land Pattern Dimensions

Regarding Landing Patterns, please refer to IPC-7351B (table 3-5, 3-6).

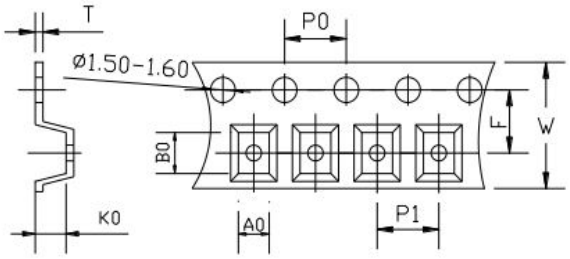
EIA Low ESR
Multi-Layer Ceramic Capacitors

0201N (0.020” x 0.010”)

Tape & Reel Specifications

Dimensions: mm

Orientation	Measurement Unit	W	P0	P1	T	F	Minimum Qty per Reel	Std Qty per Reel	Tape Material
H	in.	0.315	0.157	0.079	0.017	0.138	1000	15000	Paper
	mm	8.00	4.00	2.00	0.42	3.50			



$A_0B_0K_0$

- Determined by component size. Typical clearance between the cavity and the component is: .50 (.002) min to .65 (.026) max for 12mm tape.
- The component cannot rotate more than 20° within the determined cavity.

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	
DKD0201N01	**0.1 - 2.0pF**	0.1, 0.2, 0.3, 0.5, 0.7, 0.8, 0.9, 1.0, 1.3, 1.5, 1.7, 1.9, 2.0pF	RoHS
DKD0201N02	**1.0 - 10pF**	1.0, 1.3, 1.5, 1.7, 1.9, 2.0, 2.2, 2.7, 3.0, 3.9, 4.7, 5.6, 6.8, 7.5, 8.2, 10pF	RoHS
DKD0201N03	**10 - 100pF**	10, 13, 15, 18, 20, 22, 27, 30, 39, 47, 56, 68, 75, 82, 91, 100pF	RoHS

EIA Low ESR
Multi-Layer Ceramic Capacitors

0402N (0.040” x 0.020”)

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

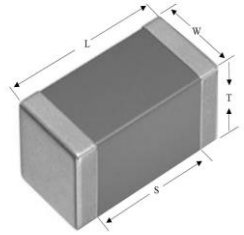
0402 N 100 J W 201

- 0402 — Case Size (0.040” x 0.020”)
- N — N = NP0 (COG)
- 100 — Capacitor Code: 100=10x10^0=10pF; 1R0=1.0pF
- J — Capacitance Tolerance: *See Table*
- W — Termination Type: *See Table*
- 201 — Rated Voltage: *See Table*

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

Termination Code	Termination
W	100% Tin Solder over Nickel Barrier

Voltage Codes

Voltage	Code
50V	500
200V	201
250V	251

0402N 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.
0.1	0R1	A,B, C,D	50V or 200V	250V	1.7	1R7	A,B, C,D	50V or 200V	250V	6.8	6R8	A,B, C	50V or 200V	N/A
0.2	0R2				1.8	1R8				7.5	7R5			
0.3	0R3				1.9	1R9				8.2	8R2			
0.4	0R4				2.0	2R0	A,B, C,D	50V or 200V	250V	9.1	9R1			
0.5	0R5				2.1	2R1				10	100	F,G, J,K	50V or 200V	N/A
0.6	0R6				2.2	2R2				11	110			
0.7	0R7				2.4	2R4				12	120			
0.8	0R8				2.7	2R7				13	130			
0.9	0R9				3.0	3R0				15	150			
1.0	1R0				3.3	3R3				16	160			
1.1	1R1				3.6	3R6	A,B, C,D	50V or 200V	N/A	18	180			
1.2	1R2				3.9	3R9				20	200			
1.3	1R3				4.3	4R3				22	220			
1.4	1R4				4.7	4R7				24	240			
1.5	1R5				5.1	5R1				27	270			
1.6	1R6				5.6	5R6				30	300	F,G, J,K	50V	N/A
					6.2	6R2				33	330			

EIA Low ESR
Multi-Layer Ceramic Capacitors

0402N (0.040” x 0.020”)

Electrical Specifications

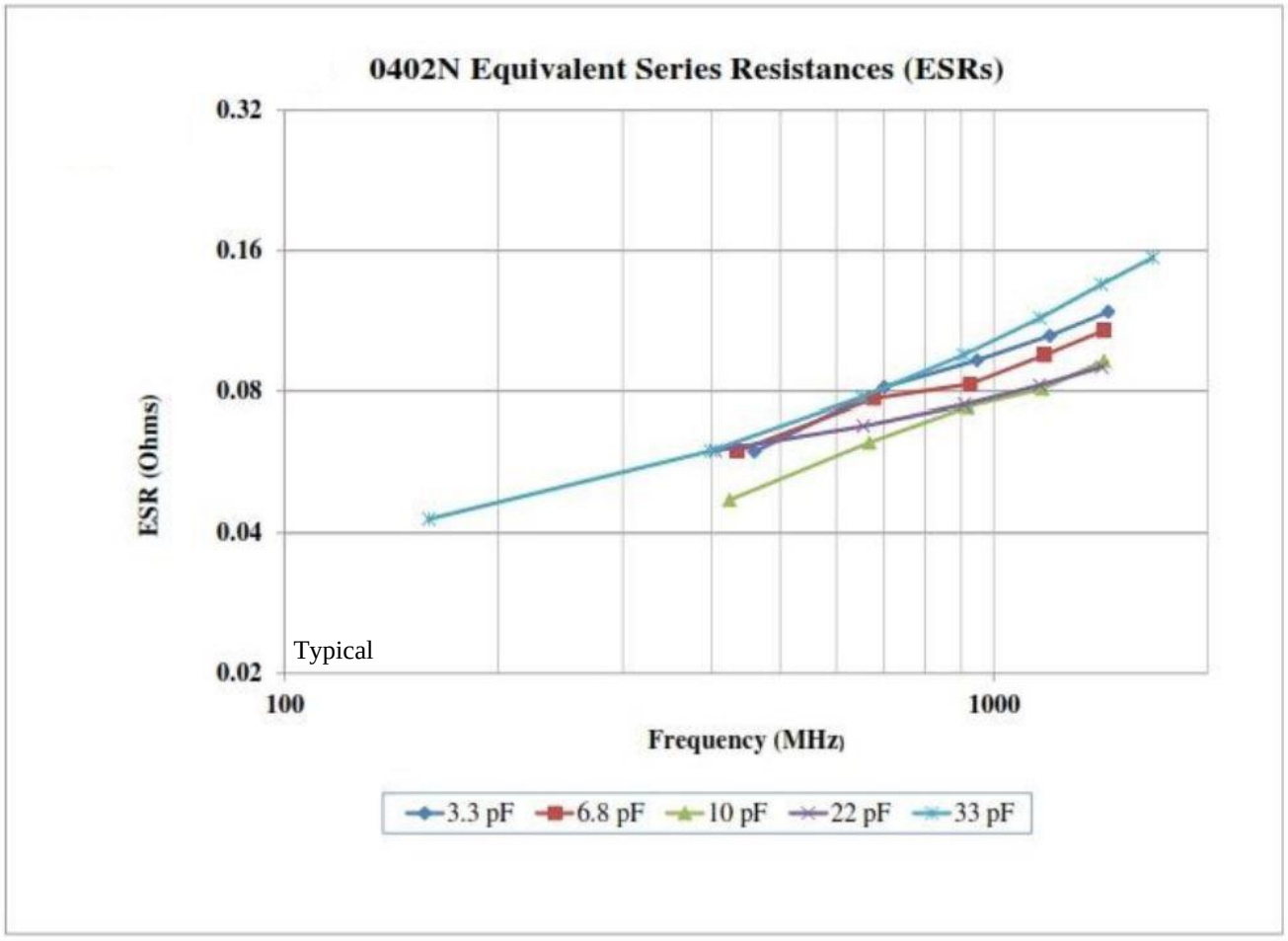
Quality Factor (Q)	2,000 at 1 MHz min.
Insulation Resistance (IR)	10^5 Megaohms min. @ +25°C rated WVDC 10^4 Megaohms min. @ +125°C rated WVDC
Rated Voltage	See Rated Voltage
Dielectric Withstanding Voltage (WVDC)	250% of Rated Voltage of 5 seconds
Operating Temperature Range	-55°C to 175°C
Temperature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

Environmental Specifications

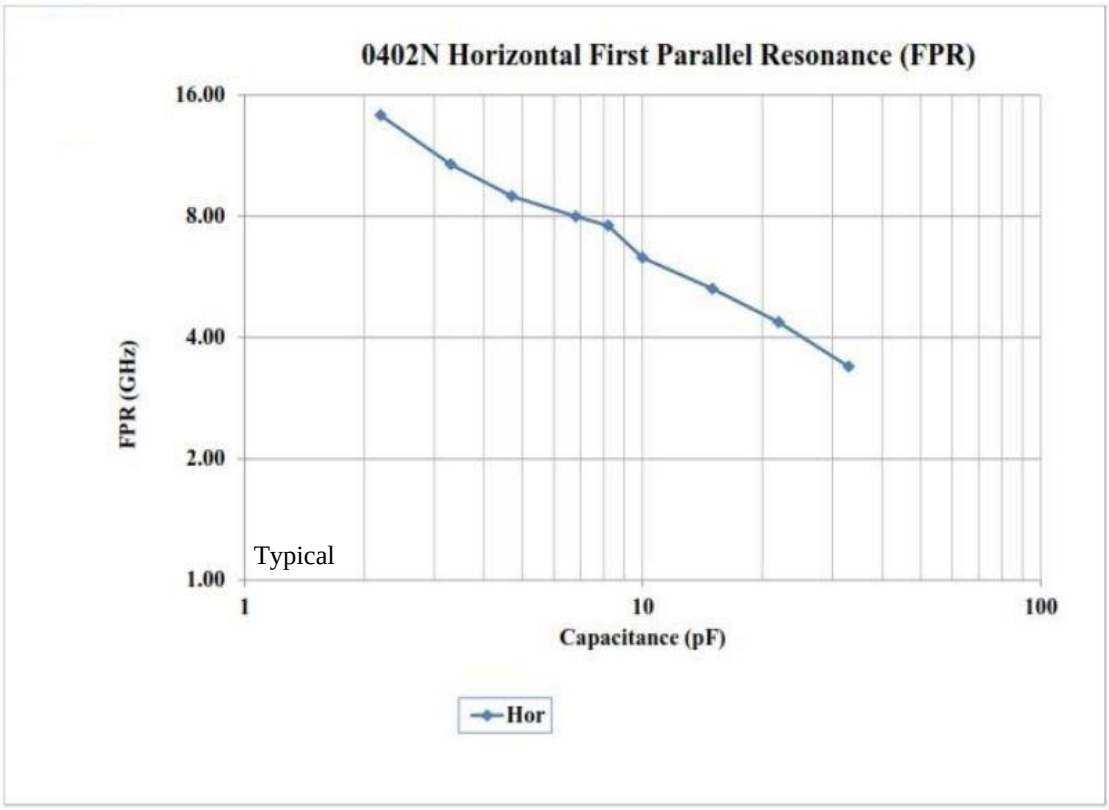
	Specification	Test Parameters
Thermal Shock	No mechanical damage **Capacitance Change:** ±0.5% or 0.5pF max **IR:** >10 G Ohms Q>2000 Breakdown Voltage: 2.5x WVDC	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature (-55°C and 175°C) stay 30 minutes, the time of removing shall not be 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



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 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.

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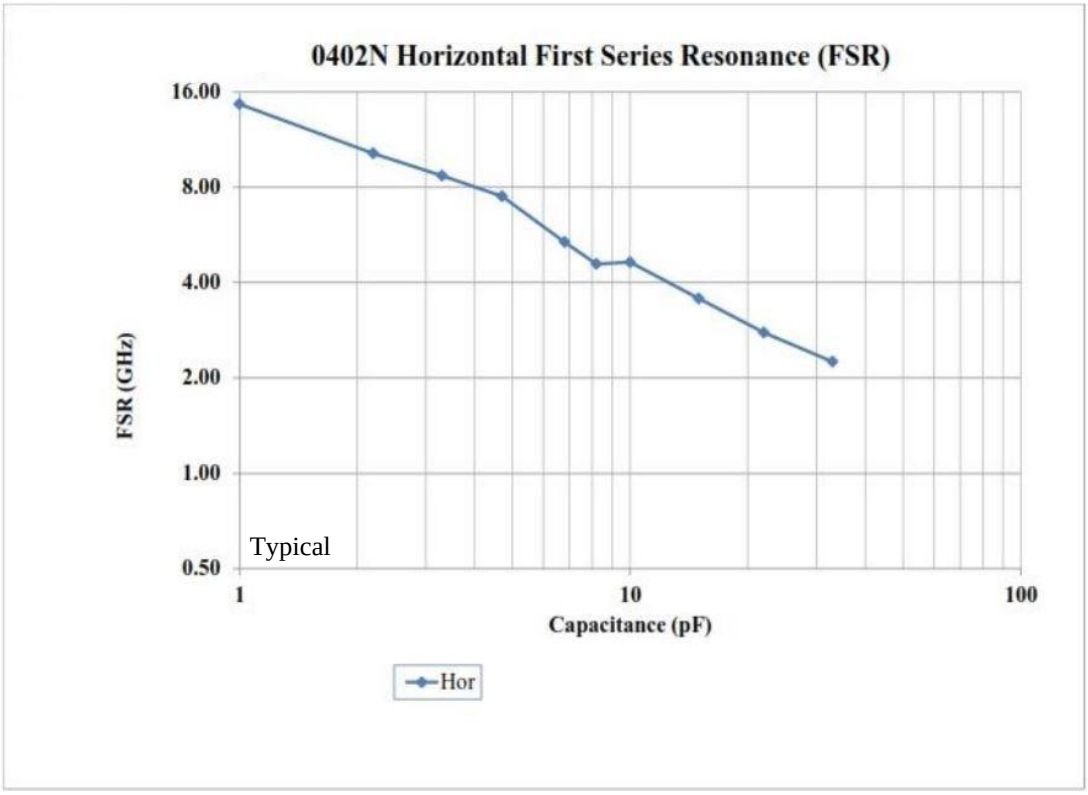
First Series Resonance



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 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.

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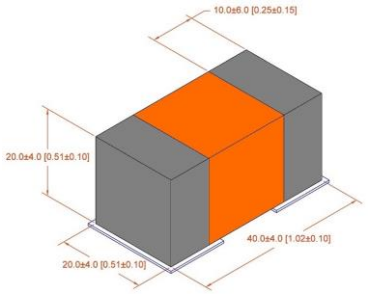
0402N (0.040” x 0.020”)

Capacitor Application Program

PPI’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.



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Recommended Land Pattern Dimensions

Regarding Landing Patterns, please refer to IPC-7351B (table 3-5, 3-6).

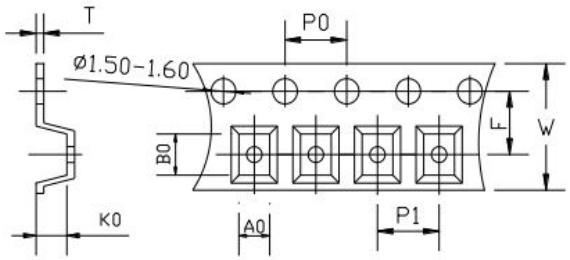
EIA Low ESR
Multi-Layer Ceramic Capacitors

0402N (0.040” x 0.020”)

Tape & Reel Specifications

Dimensions: mm

Orientation	Measurement Unit	W	P0	P1	T	F	Minimum Qty per Reel	Std Qty per Reel	Tape Material
H	in.	0.315	0.157	0.079	0.003	0.138	1000	10000	Paper
	mm	8.00	4.00	2.00	0.07	3.50			



$A_0B_0K_0$

- Determined by component size. Typical clearance between the cavity and the component is: .50 (.002) min to .65 (.026) max for 12mm tape.
- The component cannot rotate more than 20° within the determined cavity.

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	
DKD0402N01	**0.1 - 2.0pF**	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, 2.0pF	RoHS
DKD0402N02	**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
DKD0402N03	**10 - 33pF**	10, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33pF	RoHS

EIA Low ESR
Multi-Layer Ceramic Capacitors

0603N (0.060” x 0.030”)

Product Features

- High Q
- High Power
- Low ESR/ESL
- Low Noise
- High Self-Resonance
- Ultra Stable Performance
- Capacitance Range: 0.1pF to 100pF
- Working Voltage: 250V

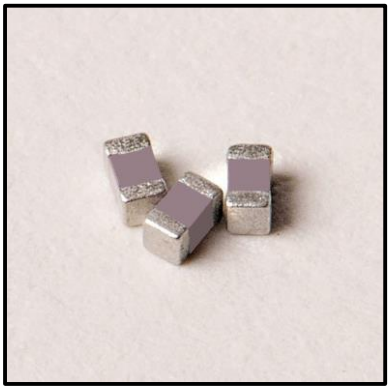
Product Applications

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

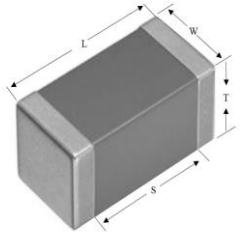
0603 N 101 J W 251

- 0603 — Case Size (0.060” x 0.030”)
- N — N = NP0 (COG)
- 101 — Capacitor Code: 100=10x10⁰=10pF; 1R0=1.0pF
- J — Capacitance Tolerance *See Table*
- W — Termination Type *See Table*
- 251 — Rated Voltage *See Table*

Capacitor Dimensions

Unit: inch (millimeter)

Code	Term.	Length	Width	Thickness	Overlap
		Lc	Wc	Tc	B
W	Chip	0.062 ± 0.006 (1.57 ± 0.15)	0.032 ± 0.006 (0.81 ±0.15)	0.030 ± 0.005-0.003 (0.76 ±0.20-0.08)	0.014±0.006 (0.35±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

0603N (0.060” x 0.030”)

Terminations Types and Codes

Termination Code	Termination
W	100% Tin Solder over Nickel Barrier
L	90%Tin/10%Lead Solder over Nickel Barrier

Voltage Code

Voltage	Code
250V	251

0603N Capacitance Values

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

Cap. pF	Cap Code	Tol.	Rated WVDC	Cap. pF	Cap Code	Tol.	Rated WVDC	Cap. pF	Cap Code	Tol.	Rated WVDC	Cap. pF	Cap Code	Tol.	Rated WVDC
0.1	0R1	A,B, C,D	250V	1.7	1R7	A,B, C,D	250V	6.2	6R2	A,B, C	250V	30	300	F,G, J,K	250V
0.2	0R2			1.8	1R8			6.8	6R8			33	330		
0.3	0R3			1.9	1R9			7.5	7R5			36	360		
0.4	0R4			2.0	2R0			8.2	8R2			39	390		
0.5	0R5			2.1	2R1			9.1	9R1			43	430		
0.6	0R6			2.2	2R2			10	100	F,G, J,K	250V	47	470		
0.7	0R7			2.4	2R4			11	110			51	510		
0.8	0R8			2.7	2R7			12	120			56	560		
0.9	0R9			3.0	3R0			13	130			62	620		
1.0	1R0			3.3	3R3			15	150			68	680		
1.1	1R1			3.6	3R6			16	160			75	750		
1.2	1R2			3.9	3R9			18	180			82	820		
1.3	1R3			4.3	4R3			20	200			91	910		
1.4	1R4			4.7	4R7			22	220			100	101		
1.5	1R5			5.1	5R1			24	240						
1.6	1R6			5.6	5R6			27	270						

EIA Low ESR
Multi-Layer Ceramic Capacitors

0603N (0.060” x 0.030”)

Electrical Specifications

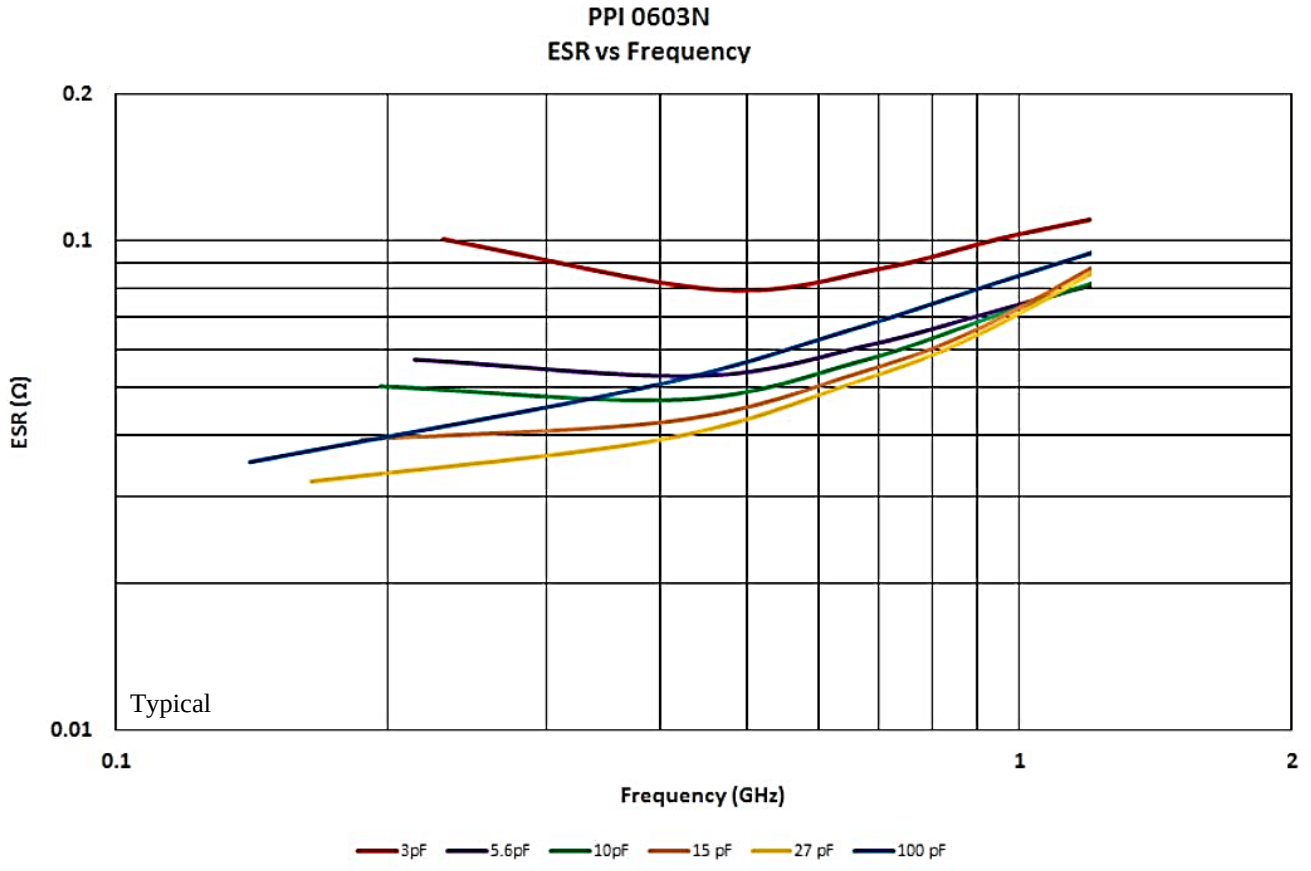
Quality Factor (Q)	2,000 at 1 MHz min.
Insulation Resistance (IR)	10^5 Megaohms min. @ +25°C rated WVDC 10^4 Megaohms min. @ +125°C rated WVDC
Rated Voltage	250V
Dielectric Withstanding Voltage (WVDC)	250% of Rated Voltage of 5 seconds
Operating Temperature Range	-55°C to 175°C
Temperature Coefficient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

Environmental Specifications

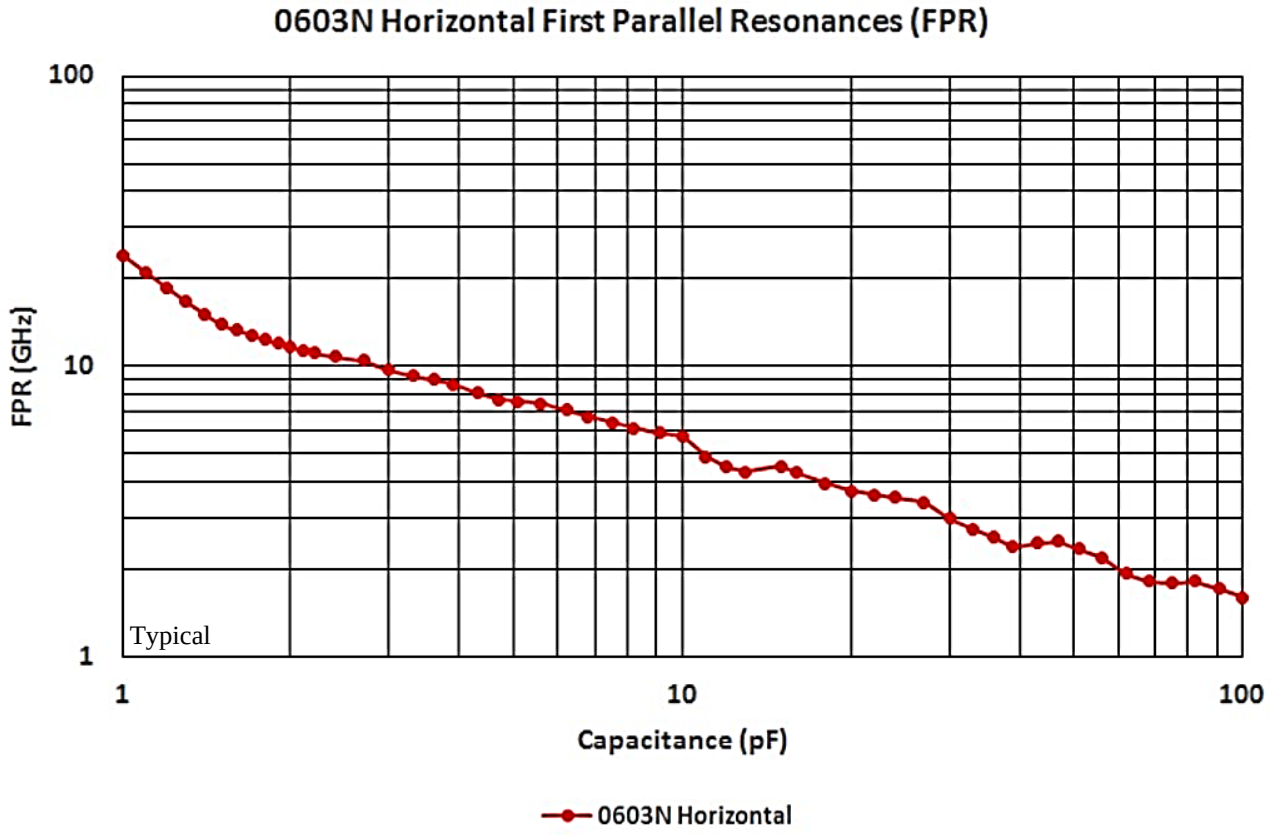
	Specification	Test Parameters
Thermal Shock	No mechanical damage **Capacitance Change:** ±0.5% or 0.5pF max **IR:** >10 G Ohms Q>2000 Breakdown Voltage: 2.5x WVDC	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature (-55°C and 175°C) stay 30 minutes, the time of removing shall not be 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



First Parallel Resonance



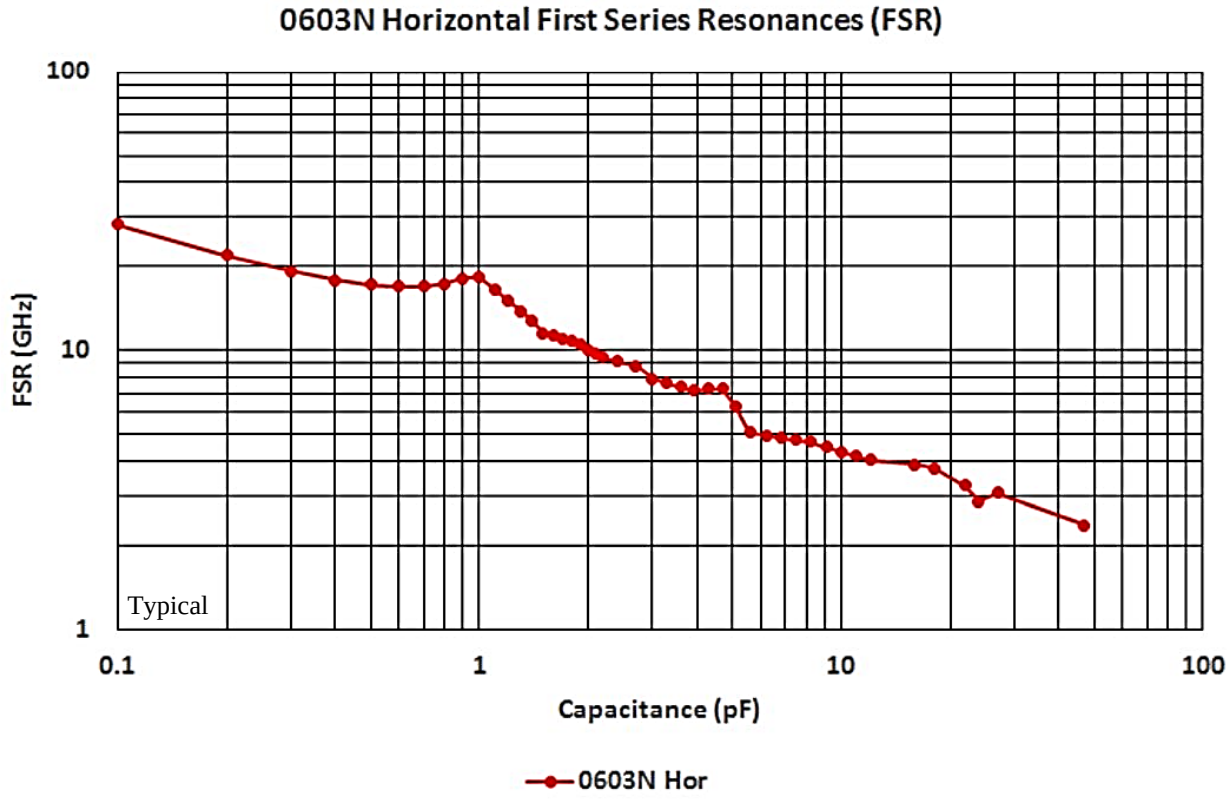
Definitions and Measurement Conditions

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 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 RT/duriod® 5880; substrate dielectric constant = 2.20; substrate thickness (mils) = 10; gap in microstrip trace (mils) = 23.7; microstrip trace width (mils) = 30.0; 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 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 RT/duriod® 5880; substrate dielectric constant = 2.20; substrate thickness (mils) = 10; gap in microstrip trace (mils) = 23.7; microstrip trace width (mils) = 30.0; Reference planes at sample edges.

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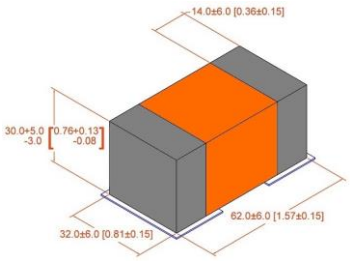
Capacitor Application Program

PPI’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

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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 visiting the https://www.modelithics.com/MVP/PPI.

Recommended Land Pattern Dimensions

Regarding Landing Patterns, please refer to IPC-7351B (table 3-5, 3-6).

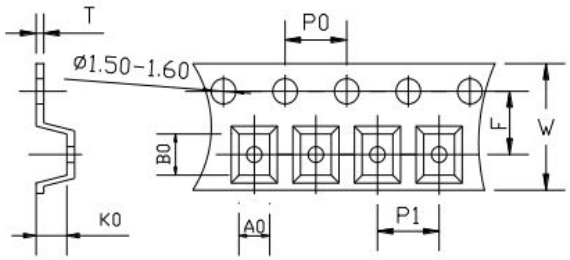
EIA Low ESR
Multi-Layer Ceramic Capacitors

0603N (0.060” x 0.030”)

Tape & Reel Specifications

Dimensions: mm

Orientation	Measurement Unit	W	P0	P1	T	F	Minimum Qty per Reel	Std Qty per Reel	Tape Material
H	in.	0.315	0.157	0.157	0.004	0.138	500	4000	Paper
	mm	8.00	4.00	4.00	0.10	3.50			



$A_0B_0K_0$

- Determined by component size. Typical clearance between the cavity and the component is: .50 (.002) min to .65 (.026) max for 12mm tape.
- The component cannot rotate more than 20° within the determined cavity.

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	
DKD0603N01	**0.1 - 2.0pF**	0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.5, 1.6, 1.8, 2.0pF	RoHS
DKD0603N02	**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
DKD0603N03	**10 - 100pF**	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 100pF	RoHS

EIA Low ESR
Multi-Layer Ceramic Capacitors

0708N (0.070” x 0.080”)

Product Features

- High Q
- High Power
- Low ESR/ESL
- Low Noise
- High Self-Resonance
- Ultra Stable Performance
- Capacitance Range: 0.1pF to 100pF
- Working Voltage: 500V

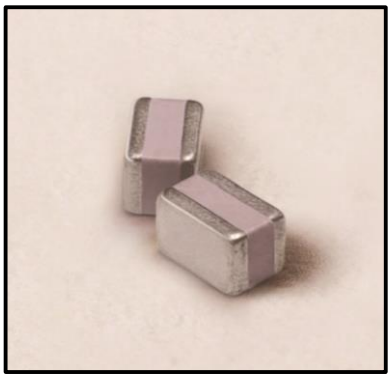
Product Applications

Typical Functional Applications:

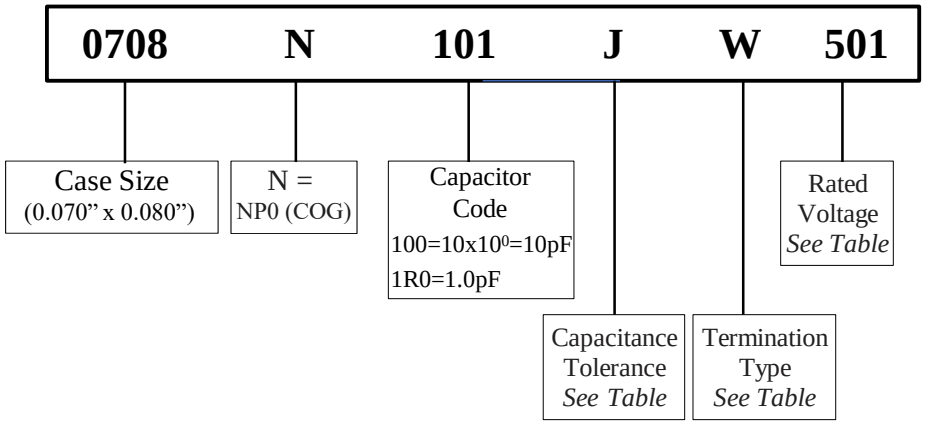
- Tuning • Bypass • Coupling
- Feedback • D.C. Blocking
- Impedance Matching

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	0.065 ± 0.006 (1.65 ± 0.15)	0.080 ± 0.006 (2.02 ±0.15)	0.100 ±0.008 (2.54 ±0.20)	0.020±0.004 (0.50±0.10)

Capacitance Tolerance Codes

Code	B	C	G	J
Tol.	±0.1pF	±0.25pF	±2%	±5%

EIA Low ESR
Multi-Layer Ceramic Capacitors

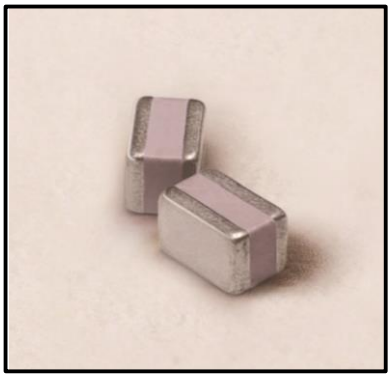
0708N (0.070” x 0.080”)

Terminations Types and Codes

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

Voltage Code

Voltage	Code
500V	501



0708N Capacitance Values

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

Cap. pF	Cap Code	Tol.	Rated WVDC	Cap. pF	Cap Code	Tol.	Rated WVDC	Cap. pF	Cap Code	Tol.	Rated WVDC	Cap. pF	Cap Code	Tol.	Rated WVDC
1.0	1R0	B,C	500V	2.7	2R7	B,C	500V	10	100	G,J	500V	39	390	G,J	500V
1.1	1R1			3.0	3R0			11	110			43	430		
1.2	1R2			3.3	3R3			12	120			47	470		
1.3	1R3			3.6	3R6			13	130			51	510		
1.4	1R4			3.9	3R9			15	150			56	560		
1.5	1R5			4.3	4R3			16	160			62	620		
1.6	1R6			4.7	4R7			18	180			68	680		
1.7	1R7			5.1	5R1			20	200			75	750		
1.8	1R8			5.6	5R6			22	220			82	820		
1.9	1R9			6.2	6R2			24	240			91	910		
2.0	2R0			6.8	6R8			27	270			100	101		
2.1	2R1			7.5	7R5			30	300						
2.2	2R2			8.2	8R2			33	330						
2.4	2R4			9.1	9R1			36	360						

EIA Low ESR
Multi-Layer Ceramic Capacitors

0708N (0.070” x 0.080”)

Electrical Specifications

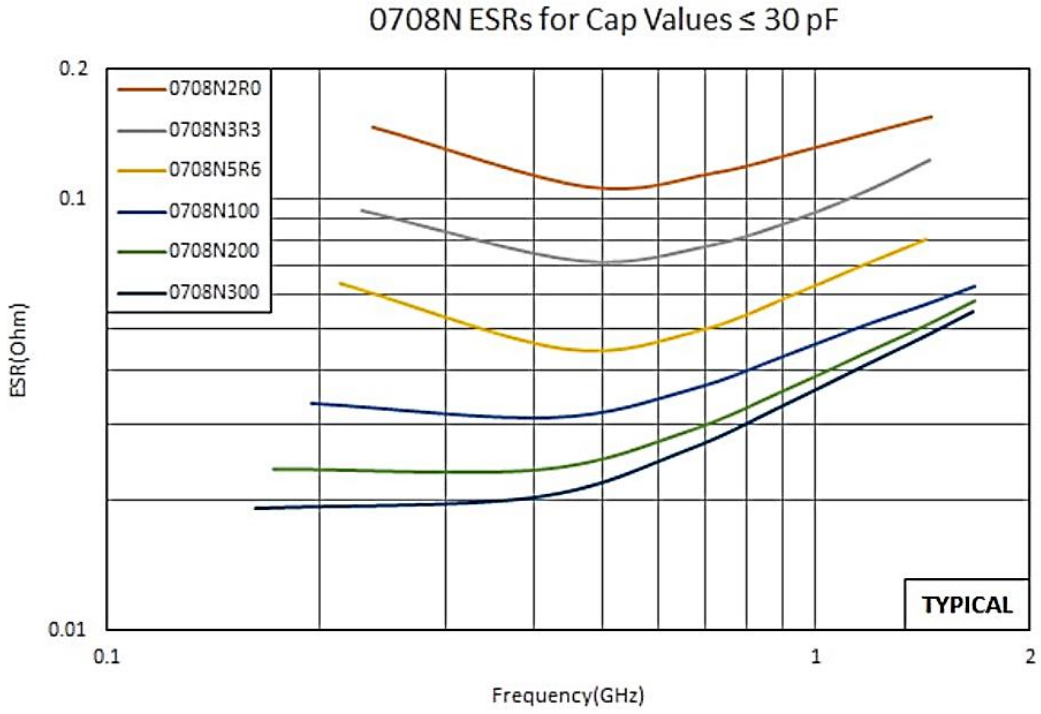
Quality Factor (Q)	2,000 at 1 MHz min.
Insulation Resistance (IR)	10^5 Megaohms min. @ +25°C rated WVDC 10^4 Megaohms min. @ +125°C rated WVDC
Rated Voltage	500V
Dielectric Withstanding Voltage (WVDC)	250% of Rated Voltage of 5 seconds, Rated Voltage ≤500 VDC
Operating Temperature Range	-55°C to 175°C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

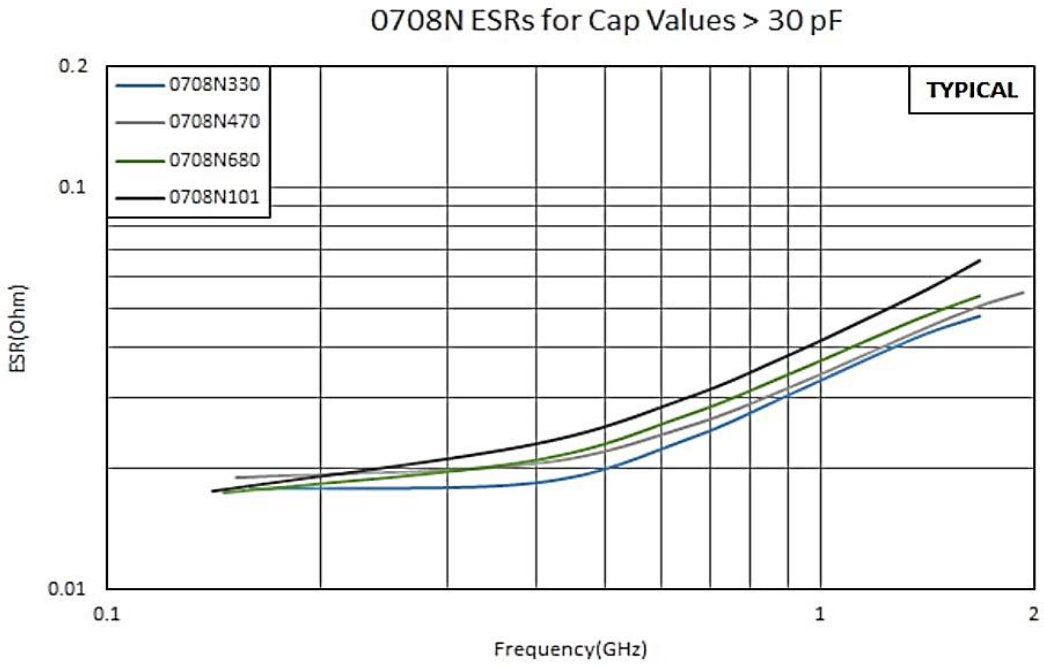
Environmental Specifications

	Specification	Test Parameters
Thermal Shock	No mechanical damage **Capacitance Change:** ±0.5% or 0.5pF max **IR:** >10 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.
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, Rated Voltage ≤ 500VDC
Terminal Adhesion	Termination should not pull off. Ceramic should remain undamaged	Test per MIL-STD-202, Method 211. Terminations for chips withstand a pull of 5lbs min., 15lbs typical, for 5 seconds in direction perpendicular to the termination surface of the capacitor.
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.

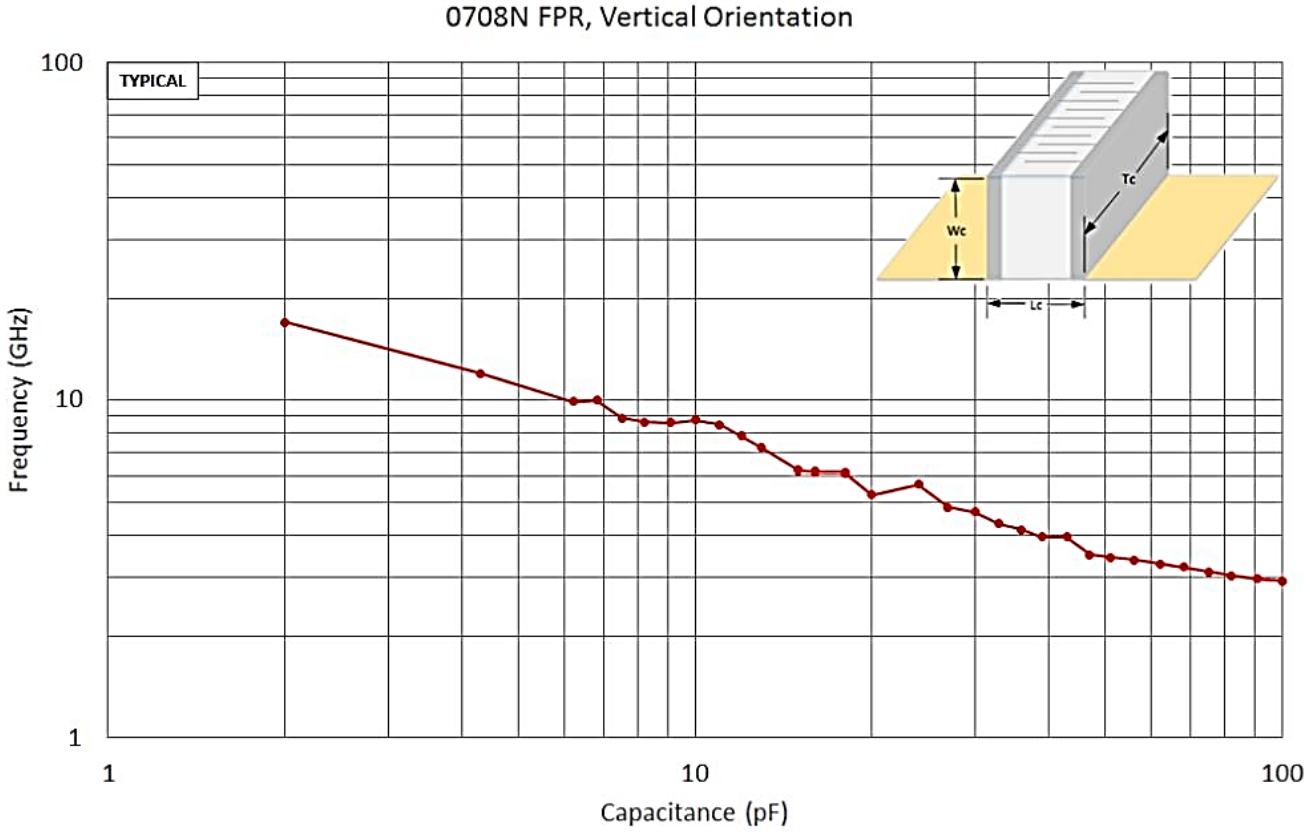
Capacitors are designed and manufactured to meet the requirements of MIL-PRF-55681 and MIL-PRF-123.

ESR vs. Frequency





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 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 3003C; substrate dielectric constant = 3.00; substrate thickness (mils) = 40; gap in microstrip trace (mils) = 28; microstrip trace width (mils) = 100; Reference planes at sample edges.

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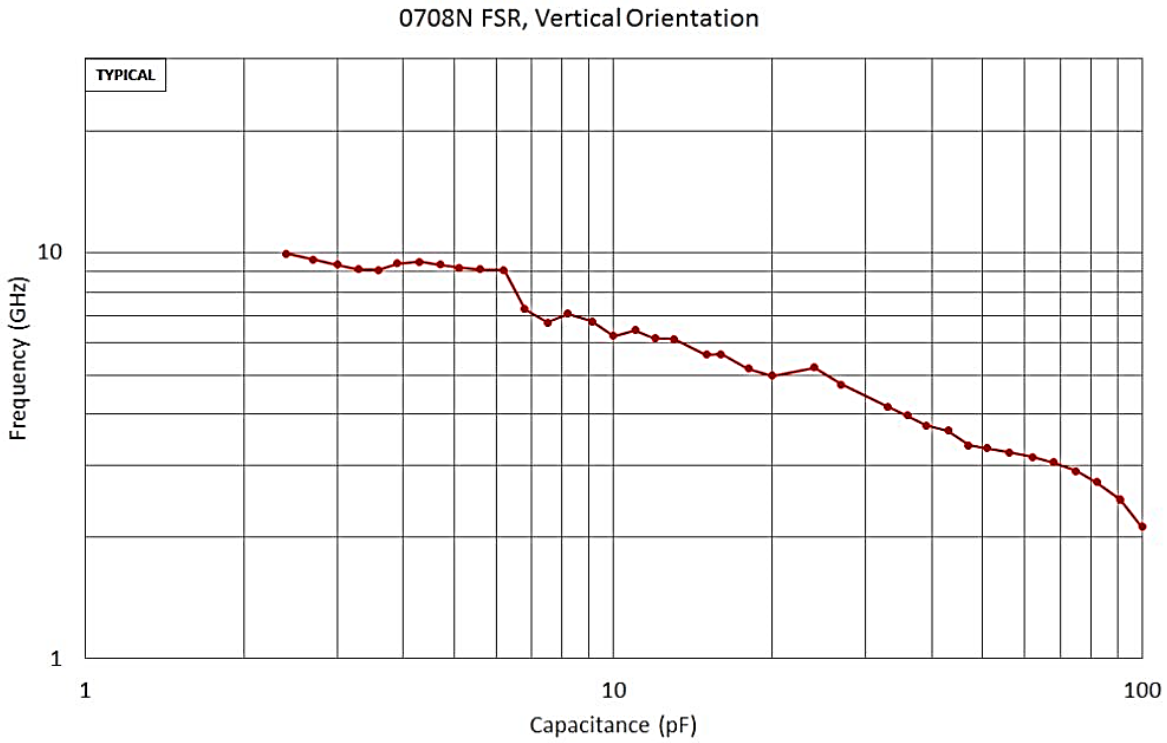
First Series Resonance



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.

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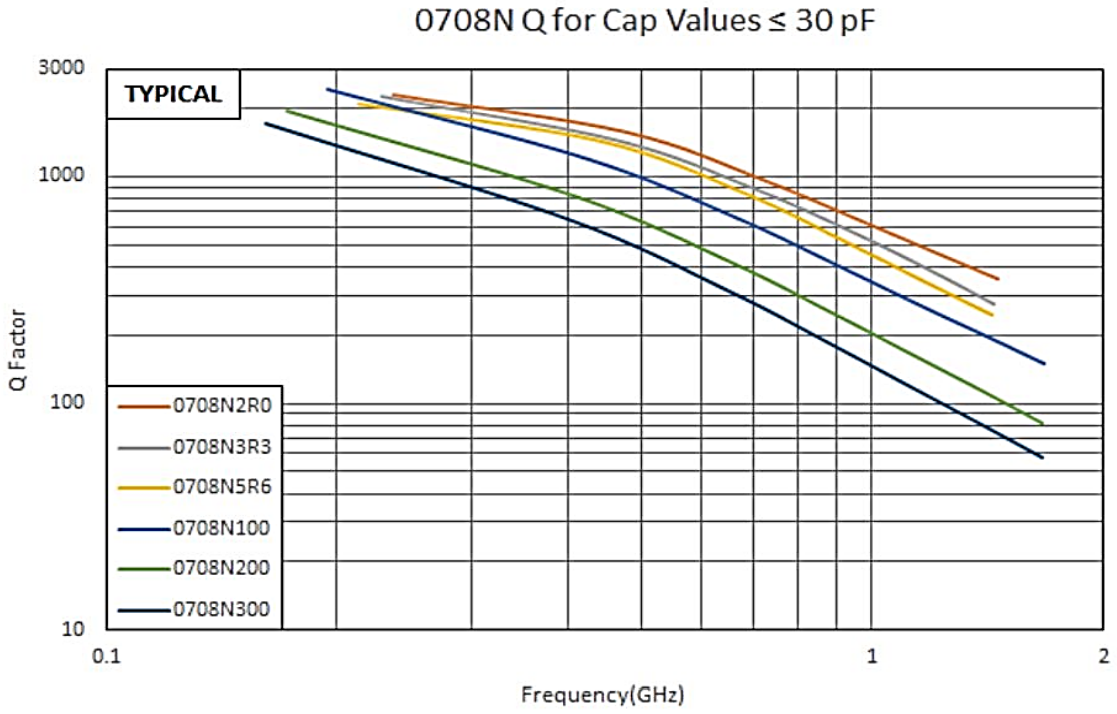
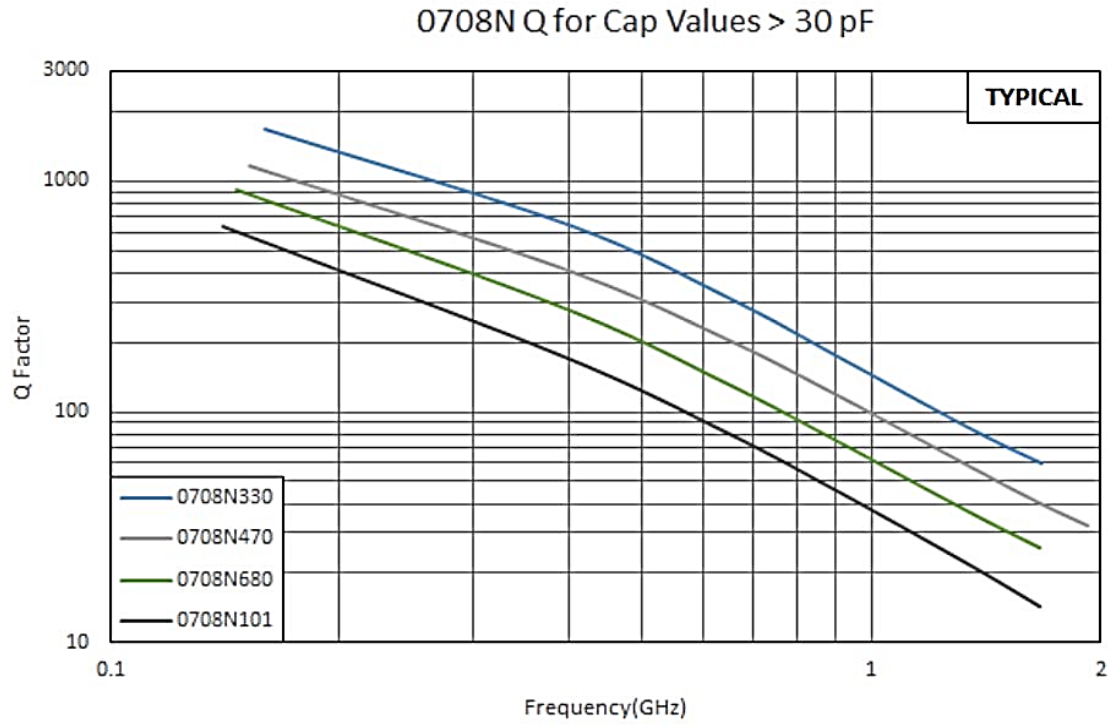
Q vs. Capacitance





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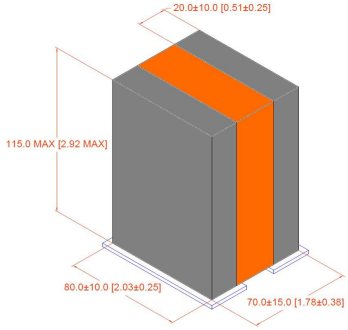

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Recommended Land Pattern Dimensions

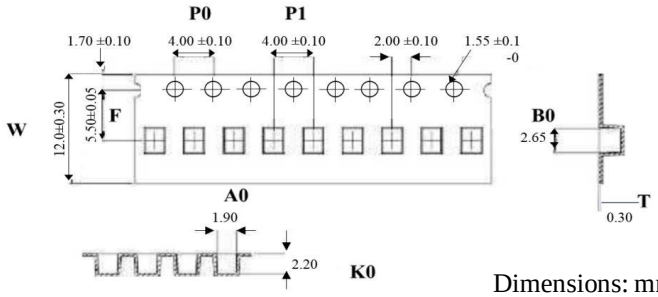
Regarding Landing Patterns, please refer to IPC-7351B (table 3-5, 3-6).

EIA Low ESR
Multi-Layer Ceramic Capacitors

0708N (0.070” x 0.080”)

Tape & Reel Specifications – Vertical Orientation

Orientation	Measurement Unit	W	P0	P1	T	F	Minimum Qty per Reel	Std Qty per Reel	Tape Material
V	in.	0.472	0.157	0.157	0.012	0.217	500	1500	Plastic
	mm	12.00	4.00	4.00	0.30	5.50			



Dimensions: mm

$A_0B_0K_0$

- Determined by component size. Typical clearance between the cavity and the component is: .50 (.002) min to .65 (.026) max for 12mm tape.
- The component cannot rotate more than 20° within the determined cavity.

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	
DKD0708N01	**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
DKD0708N02	**10 - 100pF**	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF	RoHS

EIA Low ESR
Multi-Layer Ceramic Capacitors

0805N (0.080” x 0.050”)

Product Features

- High Q
- High Power
- Low ESR/ESL
- Low Noise
- High Self-Resonance
- Ultra Stable Performance
- Capacitance Range: 0.1pF to 220pF
- Working Voltage: 250V

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

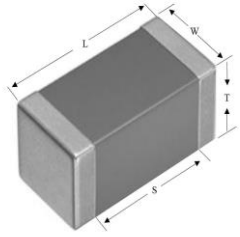
0805	N	101	J	W	251	X	TV

- 0805: Case Size (0.080” x 0.050”)
- N: N = NP0 (COG)
- 101: Capacitor Code 100=10x10⁰=10pF 1R0=1.0pF
- J: Capacitance Tolerance *See Table*
- W: Termination Type *See Table*
- 251: Rated Voltage *See Table*
- X: Laser Marking
- TV: Add TV for Vertical Orientation

Capacitor Dimensions

Unit: inch (millimeter)

Code	Term.	Length	Width	Thickness	Overlap
		Lc	Wc	Tc	B
W	Chip	0.080 ± 0.008 (2.03±0.20)	0.050 ± 0.008 (1.27 ±0.20)	0.040±0.006 (1.02±0.15)	0.020±0.010 (0.50±0.25)



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

0805N (0.080” x 0.050”)

Terminations Types and Codes

Termination Code	Termination
W	100% Tin Solder over Nickel Barrier
L	90%Tin/10%Lead Solder over Nickel Barrier

Voltage Code

Voltage	Code
250V	251

0805N Capacitance Values

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

Cap. pF	Cap Code	Tol.	Rated WVDC	Cap. pF	Cap Code	Tol.	Rated WVDC	Cap. pF	Cap Code	Tol.	Rated WVDC	Cap. pF	Cap Code	Tol.	Rated WVDC
0.1	0R1	A,B, C,D	250V	**2.1**	2R1	A,B, C,D	250V	**13**	130	F,G, J,K	250V	**91**	910	F,G,J,K	250V
0.2	0R2			**2.2**	2R2			**15**	150			**100**	101		
0.3	0R3			**2.4**	2R4			**16**	160			**110**	111		
0.4	0R4			**2.7**	2R7			**18**	180			**120**	121		
0.5	0R5			**3.0**	3R0			**20**	200			**130**	131		
0.6	0R6			**3.3**	3R3			**22**	220			**150**	151		
0.7	0R7			**3.6**	3R6			**24**	240			**160**	161		
0.8	0R8			**3.9**	3R9			**27**	270			**180**	181		
0.9	0R9			**4.3**	4R3			**30**	300			**200**	201		
1.0	1R0			**4.7**	4R7			**33**	330			**220**	221		
1.1	1R1			**5.1**	5R1			**36**	360						
1.2	1R2			**5.6**	5R6			**39**	390						
1.3	1R3			**6.2**	6R2			**43**	430						
1.4	1R4			**6.8**	6R8	B,C	250V	**47**	470						
1.5	1R5			**7.5**	7R5			**51**	510						
1.6	1R6			**8.2**	8R2			**56**	560						
1.7	1R7			**9.1**	9R1			**62**	620						
1.8	1R8			**10**	100	F,G, J,K	250V	**68**	680						
1.9	1R9			**11**	110			**75**	750						
2.0	2R0			**12**	120			**82**	820						

EIA Low ESR
Multi-Layer Ceramic Capacitors

0805N (0.080” x 0.050”)

Electrical Specifications

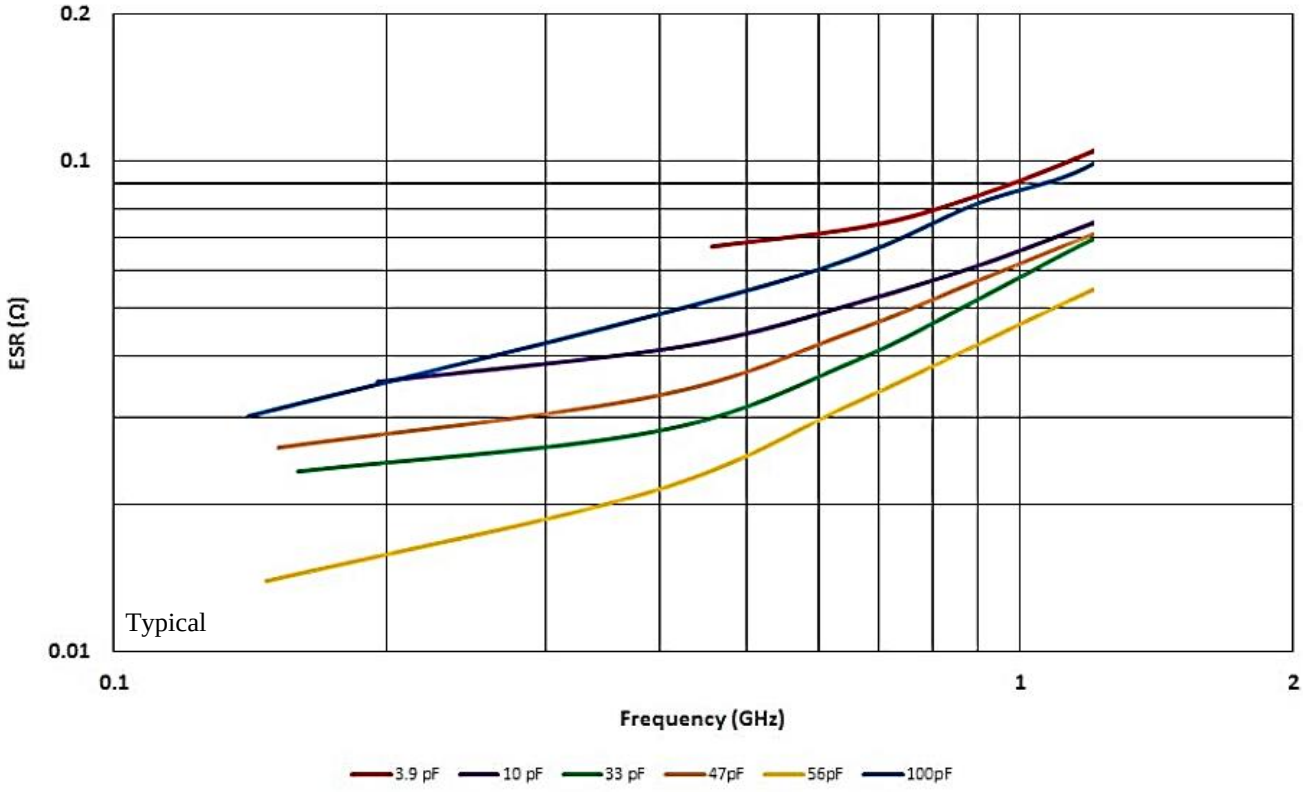
Quality Factor (Q)	2,000 at 1 MHz min.
Insulation Resistance (IR)	10^5 Megaohms min. @ +25°C rated WVDC 10^4 Megaohms min. @ +125°C rated WVDC
Rated Voltage	250V
Dielectric Withstanding Voltage (WVDC)	250% of Rated Voltage of 5 seconds
Operating Temperature Range	-55°C to 175°C
Temperature Coefficient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

Environmental Specifications

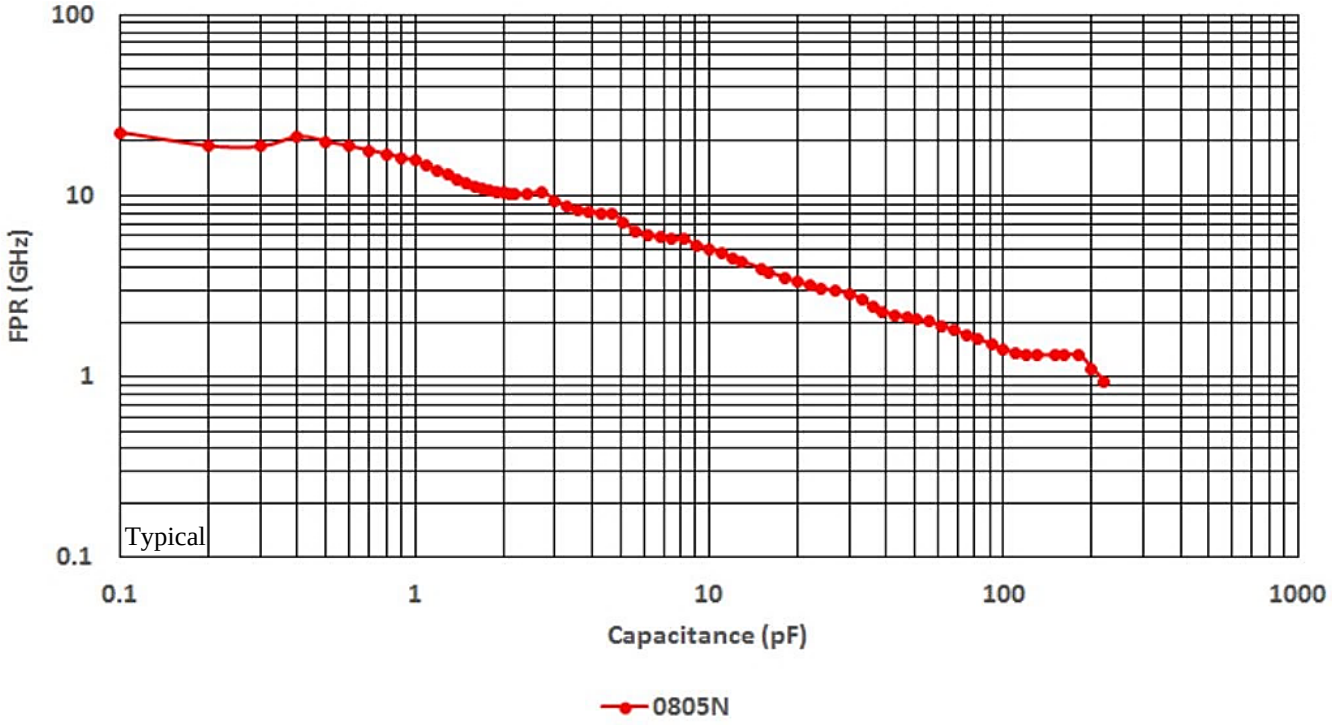
	Specification	Test Parameters
Thermal Shock	No mechanical damage **Capacitance Change:** ±0.5% or 0.5pF max **IR:** >10 G Ohms Q>2000 Breakdown Voltage: 2.5x WVDC	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature (-55°C and 175°C) stay 30 minutes, the time of removing shall not be 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
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:** >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 3.9pF to 100pF



First Parallel Resonance



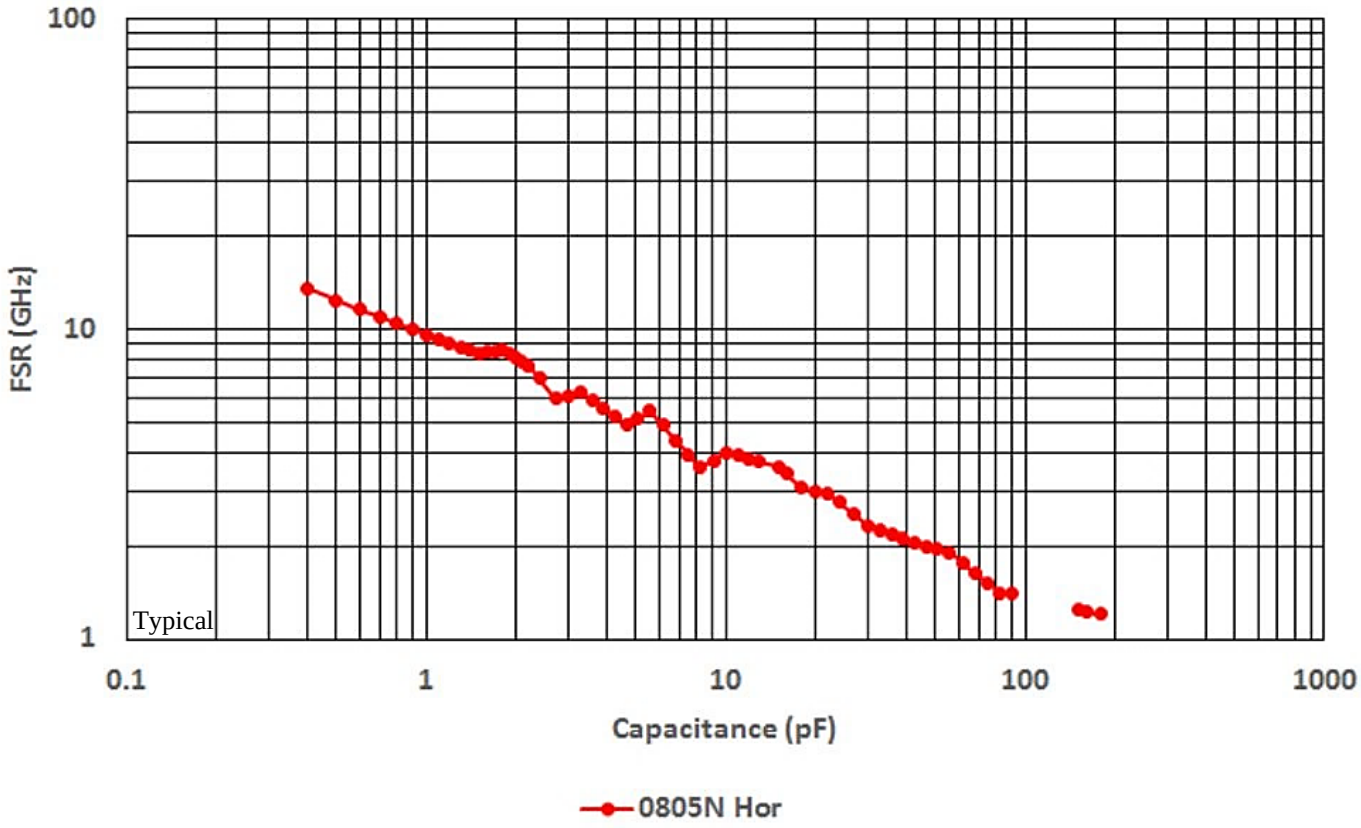
Definitions and Measurement Conditions

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 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 RO3003; substrate dielectric constant = 3.00; substrate thickness (mils) = 23; gap in microstrip trace (mils) = 23.6; microstrip trace width (mils) = 57.1; 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 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 RO3003; substrate dielectric constant = 3.00; substrate thickness (mils) = 23; gap in microstrip trace (mils) = 23.6; microstrip trace width (mils) = 57.1; Reference planes at sample edges.

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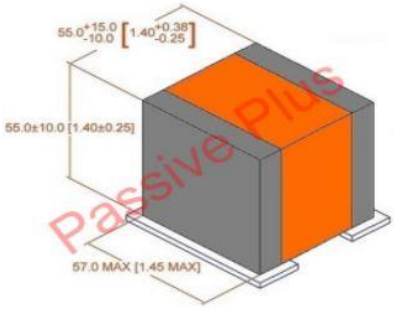
Capacitor Application Program

PPI’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 visiting the https://www.modelithics.com/MVP/PPI.

Recommended Land Pattern Dimensions

Regarding Landing Patterns, please refer to IPC-7351B (table 3-5, 3-6).

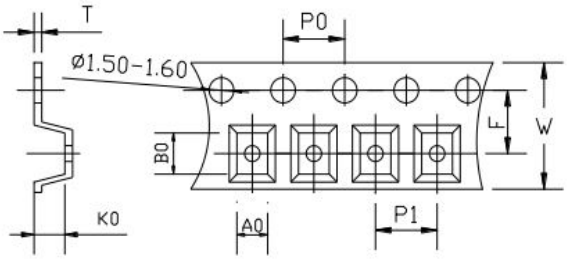
EIA Low ESR
Multi-Layer Ceramic Capacitors

0805N (0.080” x 0.050”)

Tape & Reel Specifications

Dimensions: mm

Orientation	Measurement Unit	W	P0	P1	T	F	Minimum Qty per Reel	Std Qty per Reel	Tape Material
H	in.	0.315	0.157	0.157	0.009	0.138	500	3000	Plastic
	mm	8.00	4.00	4.00	0.22	3.50			
V	in.	0.315	0.157	0.157	0.009	0.138	500	1000	Plastic
	mm	8.00	4.00	4.00	0.22	3.50			



$A_0B_0K_0$

- Determined by component size. Typical clearance between the cavity and the component is: .50 (.002) min to .65 (.026) max for 12mm tape.
- The component cannot rotate more than 20° within the determined cavity.

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	
DKD0805N01	**0.1 - 2.0pF**	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, 2.0pF	RoHS
DKD0805N02	**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
DKD0805N03	**10 - 100pF**	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF	RoHS
DKD0805N04	**10 - 220pF**	10, 15, 18, 20, 24, 27, 30, 39, 47, 56, 68, 82, 100, 120, 150, 180, 220pF	RoHS

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
- Working Voltage: 500V

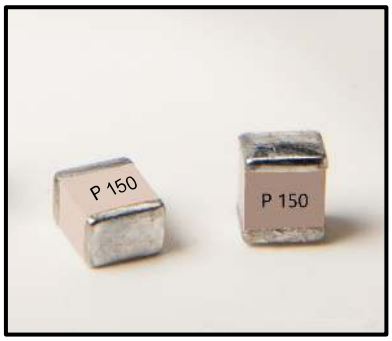
Product Applications

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.

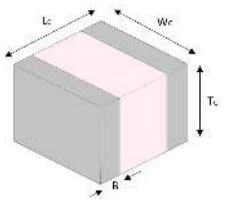
Part Numbering

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 (mm)

Code		Length Lc	Width Wc	Thickness Tc	Overlap B
W	Chip	0.11 +0.020 -0.010	0.110 ± 0.015	0.10 max	0.015 max
		(2.79 +0.51 -0.25)	(2.79 ± 0.38)	(2.60 max)	(0.025 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%

EIA Low ESR
Multi-Layer Ceramic Capacitors

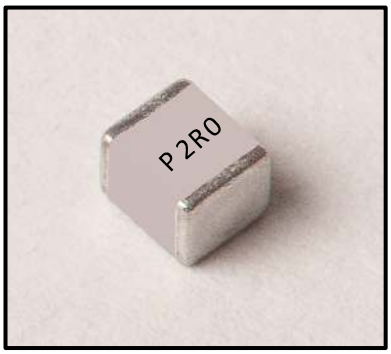
1111N (0.110” x 0.110”)

Terminations Types and Codes

Termination Code	Termination
W	100% Tin Solder over Nickel Barrier
L	90%Tin/10%Lead Solder over Nickel Barrier

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				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								

EIA Low ESR
Multi-Layer Ceramic Capacitors

1111N (0.110” x 0.110”)

Electrical Specifications

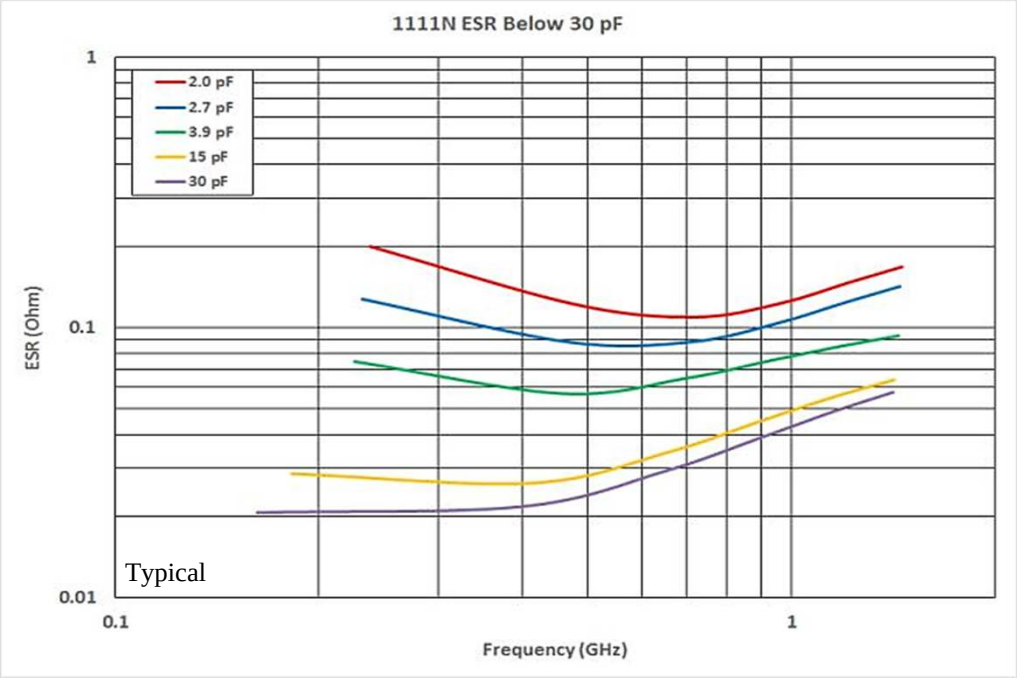
Quality Factor (Q)	2,000 at 1 MHz min.
Insulation Resistance (IR)	10^5 Megaohms min. @ +25°C rated WVDC 10^4 Megaohms min. @ +125°C rated WVDC
Rated Voltage	See Rated Voltage Table
Dielectric Withstanding Voltage (WVDC)	250% of Rated Voltage of 5 seconds, Rated Voltage ≤ 500VDC 150% of Voltage for 5 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

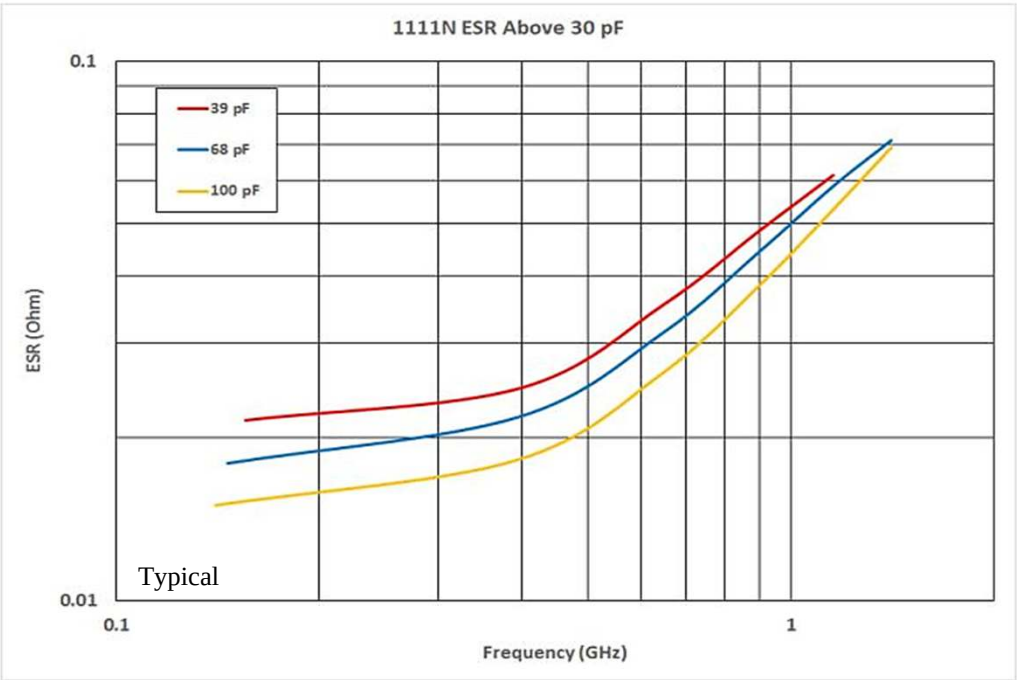
Environmental Specifications

	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.

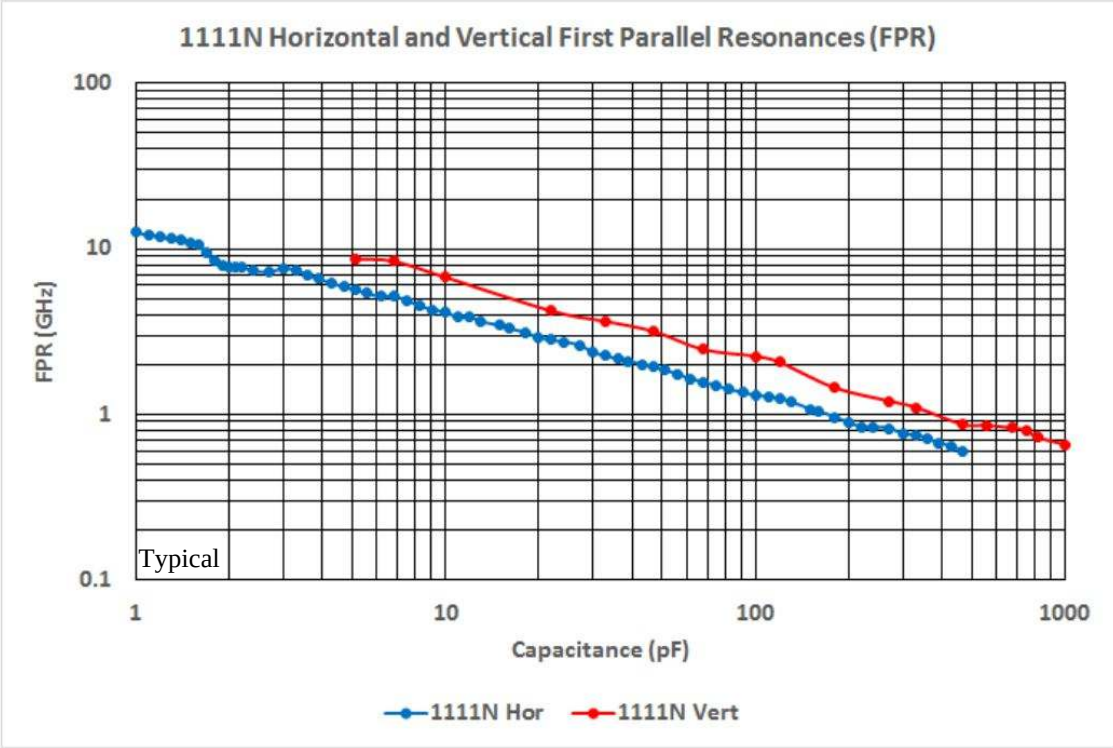
Capacitors are designed and manufactured to meet the requirements of MIL-PRF-55681 and MIL-PRF-123.

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.

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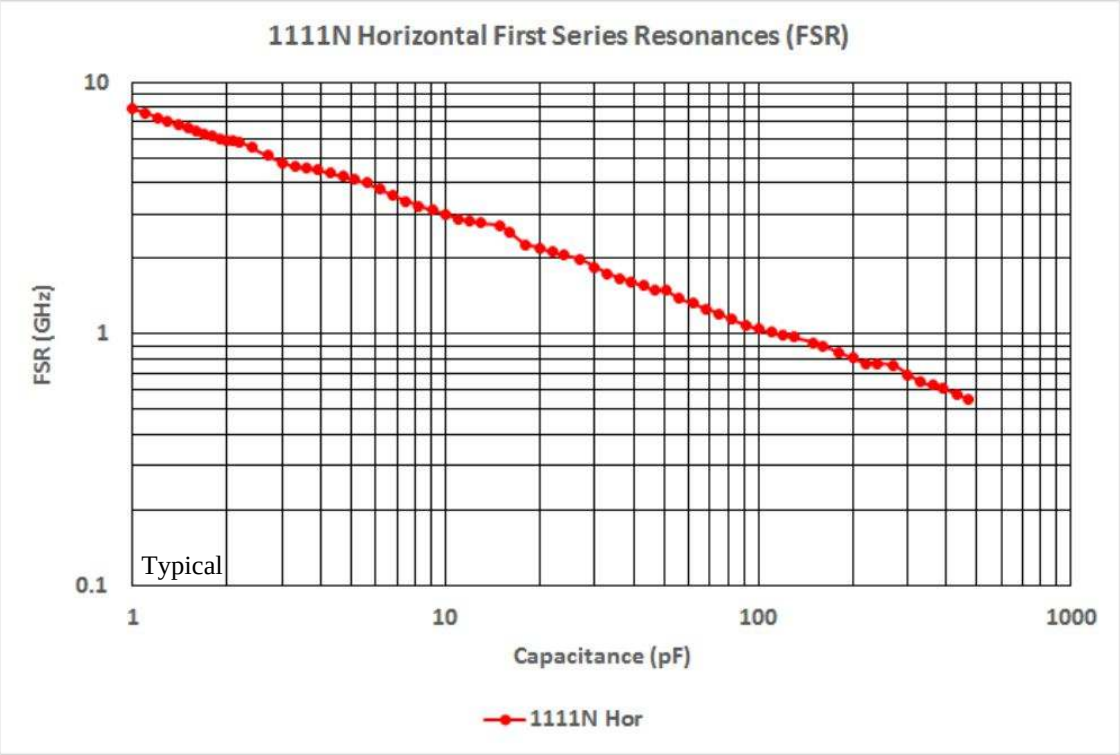
First Series Resonance



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.

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1111N (0.110” x 0.110”)

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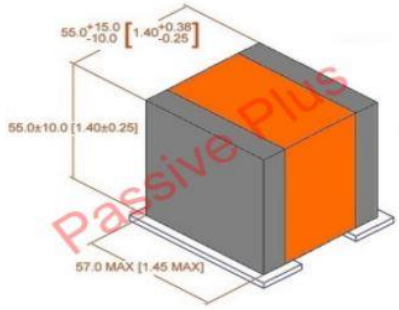

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Modelithics®

Recommended Land Pattern Dimensions

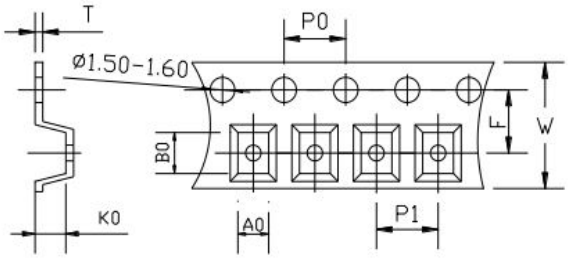
Regarding Landing Patterns, please refer to IPC-7351B (table 3-5, 3-6).

EIA Low ESR
Multi-Layer Ceramic Capacitors

1111N (0.110” x 0.110”)

Tape & Reel Specifications

Orientation	Measurement Unit	W	P0	P1	T	F	Minimum Qty per Reel	Std Qty per Reel	Tape Material
H	in.	0.315	0.157	0.157	0.010	0.138	500	2000	Plastic
	mm	8.00	4.00	4.00	0.25	3.50			
V	in.	0.472	0.157	0.157	0.016	0.217	500	1500	
	mm	12.00	4.00	4.00	0.40	5.50			



$A_0B_0K_0$

- Determined by component size. Typical clearance between the cavity and the component is: .50 (.002) min to .65 (.026) max for 12mm tape.
- The component cannot rotate more than 20° within the determined cavity.

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

Standard Design Kits

DKD0201N01

0201N Series 0.1 — 2.0pF

Size: 0.020" x 0.010"
TC = NP0 WVDC = 50V

Hi-Q Low ESR Capacitor Design Kit

www.passiveplus.com

DKD0402N01

0402N Series 0.1 — 2.0pF

Size: 0.040" x 0.020"
TC = NP0 WVDC = 200V

Hi-Q Low ESR Capacitor Design Kit

www.passiveplus.com

DKD0603N01

0603N Series 0.1 — 2.0pF

Size: 0.060" x 0.030"
TC = NP0 WVDC = 250V

Hi-Q Low ESR Capacitor Design Kit

www.passiveplus.com

DKD0708N01

0708N Series 1.0 — 10pF

Size: 0.070" x 0.080"
TC = NP0 WVDC = 500V

Hi-Q Low ESR Capacitor Design Kit

www.passiveplus.com

DKD0805N01

0805N Series 0.1 — 2.0pF

Size: 0.080" x 0.050"
TC = NP0 WVDC = 250V

Hi-Q Low ESR Capacitor Design Kit

www.passiveplus.com

DKD1111N01

1111N Series 1.0 — 10pF

Size: 0.110" x 0.110"
TC = NP0 WVDC = 500V

Hi-Q Low ESR Capacitor Design Kit

www.passiveplus.com

DKD0505C01

0505C Series 0.1 — 2.0pF

Size: 0.055" x 0.055"
TC = NP0 WVDC = 150V

Hi-Q Low ESR Capacitor Design Kit

www.passiveplus.com

DKD1111C01

1111C Series 1.0 — 10pF

Size: 0.110" x 0.110"
TC = NP0 WVDC = 500V

Hi-Q Low ESR Capacitor Design Kit

www.passiveplus.com

DKD0505P01

0505P Series 0.1 — 2.0pF

Size: 0.055" x 0.055"
TC = P90 WVDC = 150V

Hi-Q Low ESR Capacitor Design Kit

www.passiveplus.com

0505 & 1111 case size kits are available in Magnetic & Non-Magnetic Terminations

DKD1111P01

1111P Series 1.0 — 10pF

Size: 0.110" x 0.110"
TC = P90 WVDC = 500V

Hi-Q Low ESR Capacitor Design Kit

www.passiveplus.com

Standard Design Kits

High Q Capacitor Design Kits

According to the customer's demand, PPI can provide many kinds of tool kits for engineers to design and debug the circuit. All of our products satisfy the requirement of RoHS instruction.

PPI also offers kits for Non-Magnetic MRI applications. Engineering design kits are also available in multiple sizes as well. All kits are RoHS Compliant.

Standard Values updated in 2022.

Kit Number		Value Range	Values
Magnetic	Non-Magnetic		
DKD0505C01 DKD0505P01	DKD0505C05 DKD0505P05	**0.1 - 2.0pF**	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, 2.0pF
DKD0505C02 DKD0505P02	DKD0505C06 DKD0505P06	**1 - 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
DKD0505C03 DKD0505P03	DKD0505C07 DKD0505P07	**10 - 100pF**	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF
DKD0505C04	DKD0505C08	**100 - 1000pF**	100, 120, 150, 180, 200, 220, 240, 270, 300, 330, 390, 470, 560, 680, 820, 1000pF
DKD1111C01 DKD1111P01	DKD1111C05 DKD1111P05	**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
DKD1111C02 DKD1111P02	DKD1111C06 DKD1111P06	**10 - 100pF**	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF
DKD1111C03 DKD1111P03	DKD1111C07 DKD1111P07	**100 - 1000pF**	100, 120, 150, 180, 200, 220, 240, 270, 300, 330, 390, 470, 560, 680, 820, 1000pF
DKD1111C04 DKD1111P04	DKD1111C08 DKD1111P08	**1000 - 10000pF**	1000, 1100, 1200, 1500, 1800, 2000, 2200, 2700, 3000, 3300, 3900, 4700, 5100, 5600, 10000pF

Standard Design Kits

EIA Low ESR Design Kits

Kit Number	Value Range	Values
DKD0201N01	**0.1 - 2.0pF**	0.1, 0.2, 0.3, 0.5, 0.7, 0.8, 0.9, 1.0, 1.3, 1.5, 1.7, 1.9, 2.0pF
DKD0201N02	**1.0 - 10pF**	1.0, 1.3, 1.5, 1.7, 1.9, 2.0, 2.2, 2.7, 3.0, 3.9, 4.7, 5.6, 6.8, 7.5, 8.2, 10pF
DKD0201N03	**10 - 100pF**	10, 13, 15, 18, 20, 22, 27, 30, 39, 47, 56, 68, 75, 82, 91, 100pF
DKD0402N01	**0.1 - 2.0pF**	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, 2.0pF
DKD0402N02	**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
DKD0402N03	**10 - 33pF**	10, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33pF
DKD0603N01	**0.1 - 2.0pF**	0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.5, 1.6, 1.8, 2.0pF
DKD0603N02	**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
DKD0603N03	**10 - 100pF**	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 100pF
DKD0708N01	**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
DKD0708N02	**10 - 100pF**	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF
DKD0805N01	**0.1 - 2.0pF**	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, 2.0pF
DKD0805N02	**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
DKD0805N03	**10 - 100pF**	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF
DKD0805N04	**10 - 220pF**	10, 15, 18, 20, 24, 27, 30, 39, 47, 56, 68, 82, 100, 120, 150, 180, 220pF
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
DKD1111N02	**10 - 100pF**	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF
DKD1111N03	**100 - 1000pF**	100, 120, 150, 180, 200, 220, 240, 270, 300, 330, 390, 470, 560, 680, 820, 1000pF

Custom Kits

According to the customer's demand, PPI can provide many kinds of tool kits for engineers to design and debug the circuit. All our products satisfy the requirement of RoHS instruction.

Passive Plus will develop a custom kit using the engineer's specific requirements for the engineer's projects (case size, temperature coefficient, value range, tolerances, voltages, and quantities per value). Once these requirements are determined, PPI will then provide customer with a price. Please contact PPI directly to start this process.

All kits are RoHS Compliant.

Custom Kits


PPI Passive Plus Inc.
RF & Microwave Capacitors


PPI Passive Plus Inc.
RF & Microwave Capacitors


PPI Passive Plus Inc.
RF & Microwave Capacitors
www.passiveplus.com
+ (631) 425-0938
sales@passiveplus.com


PPI Passive Plus Inc.
sales@passiveplus.com
+(631)-425-0938
>67GHZ
P/N: 01005BB104MW4R0
Qty: 50 Value: 0.1µF
Tol: ±20% Voltage: 4V
Lot: FF2N01LL5F
>65GHZ
P/N: 0201BB104KW160
Qty: 50 Value: 1µF
Tol: ±10% Voltage: 16V
Lot: 150702-11
>16GHZ
P/N: 0402BB103KW160
Qty: 50 Value: 10000pf
Tol: ±10% Voltage: 16V
Lot: 130C313206
>35GHZ
P/N: 0402BB104KW250
Qty: 50 Value: 1µF
Tol: ±10% Voltage: 25V
Lot: BYBBPCESL
>50GHZ
P/N: 0402BB104KW500
Qty: 50 Value: .1µF
Tol: ±10% Voltage: 50V
Lot: 140708-10
PPI Passive Plus Inc.
sales@passiveplus.com
+(631)-425-0938

X7R RF By-Pass Capacitors

0505X (0.055” x 0.055”)

Product Features

- High Q
- High Power
- Low ESR/ESL
- Low Noise
- High Self-Resonance
- Ultra Stable Performance
- Capacitance Range: 470pF to 10000pF
- Working Voltage: 50V

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

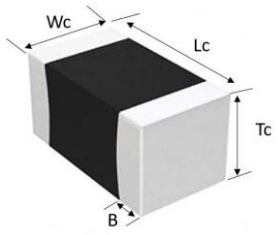
0505 X 103 M W 500

- 0505 — Case Size (0.055” x 0.055”)
- X — Dielectric: X7R
- 103 — Capacitor Code: 100=10x10⁰=10pF, 1R0=1.0pF
- M — Capacitance Tolerance *See Table*
- W — Termination Type *See Table*
- 500 — Rated Voltage

Capacitor Dimensions

Unit: inch (mm)

Length		Width	Thickness	Overlap
Lc		Wc	Tc	B
0.055	+0.015 -0.010	0.055 ± 0.010	0.057	0.014 ± 0.006
(1.40	+0.38 -0.25)	(1.40 ± 0.25)	(1.45 max)	(0.356 ± 0.152)



X7R RF By-Pass Capacitors

0505X (0.055” x 0.055”)

Capacitance Tolerance Codes

Code	K	M
Tol.	±10%	±20%

Termination Types

Termination Code	Termination
W	100% Tin Solder over Nickel Barrier
L	90%Tin/10%Lead Solder over Nickel Barrier
P **(Non-Magnetic)**	100% Tin Solder over Copper Barrier
C	100% Silver Solder over Palladium Barrier

Note: “Non-Magnetic” means no magnetic materials.

0505X Capacitance Values

Special capacitances, tolerances and WVDC are available. Please contact PPI.

Cap. pF	Cap Code	Tol.	Rated WVDC	Cap. pF	Cap Code	Tol.	Rated WVDC	Cap. pF	Cap Code	Tol.	Rated WVDC
470	471	K,M	50V	**1500**	152	K,M	50V	**4700**	472	K,M	50V
560	561			**1800**	182			**5000**	502		
680	681			**2200**	222			**5600**	562		
820	821			**2700**	272			**6800**	682		
1000	102			**3300**	332			**8200**	822		
1200	122			**3900**	392			**10000**	103		

0505X (0.055” x 0.055”)

Electrical Specifications

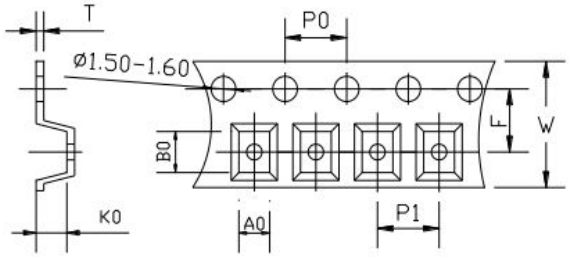
Operating Temperature Range	-55°C to +125°C
Insulation Resistance (IR)	Insulation Resistance @ +25°C > 1000ΩF Insulation Resistance @ +125°C > 100ΩF
Temperature Voltage Coefficient	+15/-25% ΔC (-55°C to +125°C)
Dielectric Withstanding Voltage (DWV)	2.5x WVDC, 5 seconds
Max Dissipation Factor	0.025 (2.5%) max
Test Parameters	1kHz, 1.0 VRMS, 25°C

Recommended Land Pattern Dimensions

Regarding Landing Patterns, please refer to IPC-7351B (table 3-5, 3-6).

Tape & Reel Specifications

Orientation	Measurement Unit	W	P0	P1	T	F	Min. Qty per Reel	Std. Qty per Reel	Tape Material
H	in.	0.32	0.16	0.16	0.01	0.14	500	4000	Plastic
	mm	8.00	4.00	4.00	0.30	3.50			



$A_0B_0K_0$

- Determined by component size. Typical clearance between the cavity and the component is: .50 (.002) min to .65 (.026) max for 12mm tape.
- The component cannot rotate more than 20° within the determined cavity.

X7R RF By-Pass Capacitors

1111X (0.110” x 0.110”)

Product Features

- High Q
- High Power
- Low ESR/ESL
- Low Noise
- High Self-Resonance
- Ultra Stable Performance
- Capacitance Range: 470pF to 10nF
- Working Voltage: 50V

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

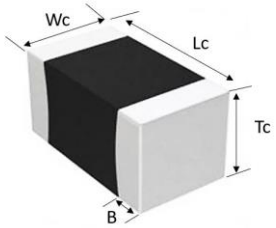
Part Numbering

1111	X	103	M	W	500	X
Case Size (0.110” x 0.110”)	Dielectric: X7R	Capacitor Code 100=10x10^0=10pF 1R0=1.0pF	Capacitance Tolerance *See Table*	Termination Type *See Table*	Rated Voltage	Laser Marking

Capacitor Dimensions

Unit: inch (mm)

Length		Width	Thickness	Overlap
Lc		Wc	Tc	B
0.11	+0.025 -0.010	0.110 ± 0.015	0.102 max	0.020 ± 0.010
(2.79	+0.64 -0.25)	(2.79 ± 0.38)	(2.59 max)	(0.508 ± 0.250)



X7R RF By-Pass Capacitors

1111X (0.110” x 0.110”)

Capacitance Tolerance Codes

Code	K	M
Tol.	±10%	±20%

Termination Types

Termination Code	Termination
W	100% Tin Solder over Nickel Barrier
L	90%Tin/10%Lead Solder over Nickel Barrier
P **(Non-Magnetic)**	100% Tin Solder over Copper Barrier
C	100% Silver Solder over Palladium Barrier

Note: “Non-Magnetic” means no magnetic materials.

1111X Capacitance Values

Special capacitances, tolerances and WVDC are available. Please contact PPI.

Cap. pF	Cap Code	Tol.	Rated WVDC	Cap. pF	Cap Code	Tol.	Rated WVDC	Cap. pF	Cap Code	Tol.	Rated WVDC
4700	472	K,M	50V	**15000**	153	K,M	50V	**47000**	473	K,M	50V
5600	562			**18000**	183			**50000**	503		
6800	682			**22000**	223			**56000**	563		
8200	822			**27000**	273			**68000**	683		
10000	103			**33000**	333			**82000**	823		
12000	123			**39000**	393			**100000**	104		

X7R RF By-Pass Capacitors

1111X (0.110” x 0.110”)

Electrical Specifications

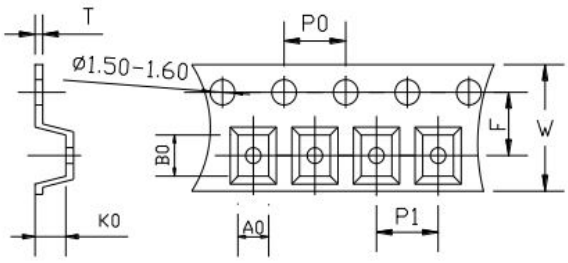
Operating Temperature Range	-55°C to +125°C
Insulation Resistance (IR)	Insulation Resistance @ +25°C > 1000ΩF Insulation Resistance @ +125°C > 100ΩF
Temperature Voltage Coefficient	+15/-25% ΔC (-55°C to +125°C)
Dielectric Withstanding Voltage (DWV)	2.5x WVDC, 5 seconds
Max Dissipation Factor	0.025 (2.5%) max
Test Parameters	1kHz, 1.0 VRMS, 25°C

Recommended Land Pattern Dimensions

Regarding Landing Patterns, please refer to IPC-7351B (table 3-5, 3-6).

Tape & Reel Specifications (mm)

Orientation	Measurement Unit	W	P0	P1	T	F	Min. Qty per Reel	Std. Qty per Reel	Tape Material
H	in.	0.32	0.16	0.16	0.01	0.14	500	2000	Plastic
	mm	8.00	4.00	4.00	0.30	3.50			



$A_0B_0K_0$

- Determined by component size. Typical clearance between the cavity and the component is: .50 (.002) min to .65 (.026) max for 12mm tape.
- The component cannot rotate more than 20° within the determined cavity.

X7R RF By-Pass Capacitors

2225X (0.220” x 0.250”)

Product Features

- High Q
- High RF Current/Voltage
- Ultra Stable Performance
- Capacitance Range: 10nF to 1µF
- Working Voltage: 300V

Product Applications

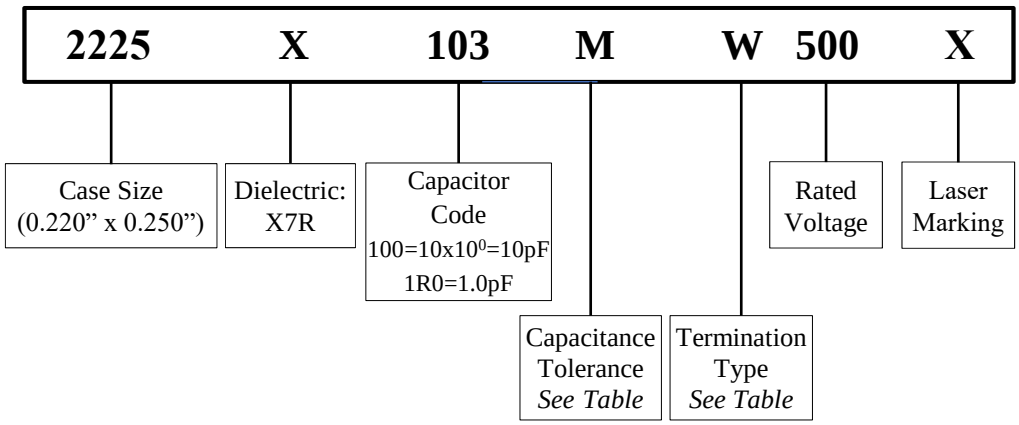
Typical Functional Applications:

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

Typical Circuit Applications

• UHF/Microwave RF Power Amplifiers
• Antenna Tuning • Plasma Chambers
• Medical Equipment

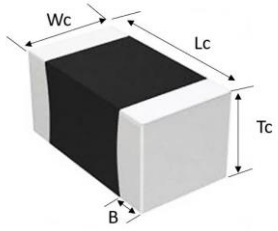
Part Numbering



Capacitor Dimensions

Unit: inch (mm)

Length	Width	Thickness	Overlap
Lc	Wc	Tc	B
0.230 +0.020 -0.012	0.250 ± 0.015	0.165 max	0.030 ± 0.015
(5.84 +0.51 -0.30)	(6.35 ± 0.38)	(4.19 max)	(0.762 ± 0.380)



X7R RF By-Pass Capacitors

2225X (0.220” x 0.250”)

Capacitance Tolerance Codes

Code	K	M
Tol.	±10%	±20%

Voltage Codes

Voltage	Code
100V	101
150V	151
200V	201
250V	251
300V	301

Termination Types

Termination Code	Termination
W	100% Tin Solder over Nickel Barrier
L	90%Tin/10%Lead Solder over Nickel Barrier
P **(Non-Magnetic)** 	100% Tin Solder over Copper Barrier
C	100% Silver Solder over Palladium Barrier

Note: “Non-Magnetic” means no magnetic materials.

2225X Capacitance Values

Special capacitances, tolerances and WVDC are available. Please contact PPI.

Cap. uF	Cap Code	Tol.	Rated WVDC	Cap. uF	Cap Code	Tol.	Rated WVDC	Cap. uF	Cap Code	Tol.	Rated WVDC
0.010	103	K,M	300V	**0.082**	823	K,M	200V	**0.560**	564	K,M	150V
0.012	123			**0.100**	104			**0.680**	684		
0.015	153			**0.120**	124			**0.820**	824	K,M	100V
0.022	223			**0.150**	154			**1.000**	105		
0.033	333	K,M	250V	**0.220**	224						
0.047	473			**0.330**	334	K,M	150V				
0.068	683			**0.470**	474						

X7R RF By-Pass Capacitors

2225X (0.220” x 0.250”)

Electrical Specifications

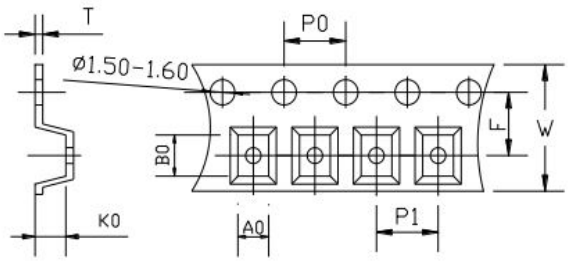
Operating Temperature Range	-55°C to +125°C
Insulation Resistance (IR)	Insulation Resistance @ +25°C > 1000ΩF Insulation Resistance @ +125°C > 100ΩF
Temperature Voltage Coefficient	± 15% Maximum
Dielectric Withstanding Voltage (DWV)	2.5x WVDC, 5 seconds
Max Dissipation Factor	0.025 (2.5%) max
Test Parameters	1kHz, 1.0 VRMS, 25°C

Recommended Land Pattern Dimensions

Regarding Landing Patterns, please refer to IPC-7351B (table 3-5, 3-6).

Tape & Reel Specifications (mm)

Orientation	Measurement Unit	W	P0	P1	T	F	Min. Qty per Reel	Std. Qty per Reel	Tape Material
H	in.	0.47	0.16	0.16	0.02	0.22	500	4000	Plastic
	mm	12.00	4.00	4.00	0.40	5.50			



$A_0B_0K_0$

- Determined by component size. Typical clearance between the cavity and the component is: .50 (.002) min to .65 (.026) max for 12mm tape.
- The component cannot rotate more than 20° within the determined cavity.

Hand Soldering Guide

Hand Soldering Chip Capacitors

Among the most common reasons multilayer ceramic chip capacitors (MLCCs) fail is improper hand soldering to printed circuit boards. Typically, one or more hairline cracks develop in the ceramic, defects that may even have an imperceptible effect on initial performance, but that manifest with time, circuit board flexure, or temperature excursions. Herein are a few tips, suggestions, and caveats to be aware of in performing a reliable hand soldering attachment.

Solders. Before selecting a solder, one should know the metallization on the chip. Starting at the component ceramic surface from which the electrodes protrude (typically < 1 mil), a contacting "termination" is applied that most often contains silver (Ag) or nickel (Ni). Over this is plated a barrier metal, typically nickel or copper (for non-magnetic applications), followed by a finishing metallization of tin (Sn) or lead (Pb)-tin. Other finishes may include palladium- silver (Pd/Ag), Ag, or gold (Au).

For finishes that include Ag, a silver bearing solder such as Sn62 is recommended to combat leaching of the component's silver into the solder joint. Silver bearing solders also improve resistance to thermal fatigue. For finishes that include Au, a solder such as In50 is suggested to avoid gold scavenging that may cause embrittlement (which occurs when gold comprises approximately 3% or greater by weight of the solder joint). For finishes that do not contain noble metals, SN63 is often used, or Sn95.5 or Sn96 where there is a no-lead, e.g. ROHS, requirement.

Fluxes. An appropriate flux helps to clean the surfaces to be soldered and facilitates solder spread; it may also remove oxidation. Check with the solder manufacturer for a recommended flux. Rosin based fluxes are most common but require post solder cleaning.

Fluxes are available both separately as pastes and as internal cores within wire solder. Each form has advantages and disadvantages. Use of an external flux permits precise placement in exact quantities, but consideration must be given to the activation temperature of the flux, which will be lower than that of the solder liquidus, and the time spent at this temperature. Too long at the latter will result in boiling off the flux and reducing its effectiveness. Flux core solder is easy and convenient to use but may require more solder than desirable to have sufficient flux for good coverage.

In practice, external flux seems to work best for parts of size 0603 or 0505 and below, while flux core solder appears satisfactory for larger component sizes.

Soldering iron. A temperature-controlled iron of suitable wattage is strongly recommended. The iron temperature should typically be set 20-30°C above the solder liquidus temperature. Tip size is important; it should be about the same size as the part. Too small a tip (corresponding to an iron of insufficient wattage) will take too long to heat the printed circuit board land and part, while too large a tip (too high a wattage iron) may damage the board or component.

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Soldering Procedure

The initial consideration is which end of the capacitor to solder first. The choice can generally be decided by recognizing that it is desirable to minimize the heat flowing directly through the component. Thus, it is best to start from the end that has the poorest heat conduction (equals highest thermal resistance) to a heat sink. (Were one to start from the opposite end, a good heat path would have been created through the capacitor to the heat sink when one soldered the second joint.) If it is not apparent which land has the poorer connection to a heat sink, begin with the one having the smallest area.

Follow these steps in soldering:

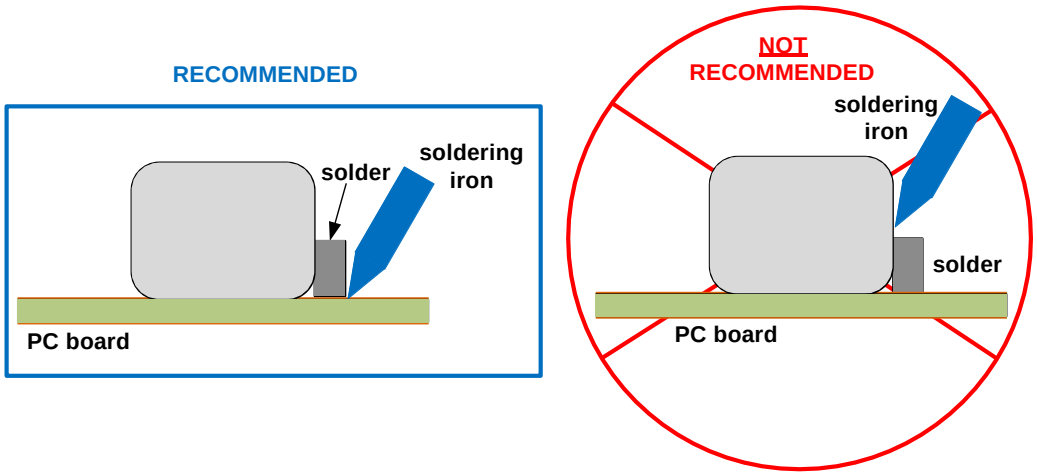
1. Pre-heat the substrate. Where possible, it is very desirable to gradually pre-heat the substrate, e.g. on a hotplate, to about 30°C below the solder liquidus temperature. Two steps are usually sufficient: Start the hotplate at a temperature about halfway to the desired pre-heat temperature, place the board on it and wait till the board temperature stabilizes, then increase the hotplate temperature to the desired final pre-heat value.

2. Pre-" tin" the traces. Select one of the PC board lands and clean it with isopropyl alcohol. If the solder you are using does not contain its own flux, place a small quantity of flux on the land, and a small amount of solder into the flux. (A razor may be used to cut a tiny custom preform from solid wire.) Place the iron on the printed circuit trace adjacent to the flux (but not touching) and heat the land until the solder melts into a flat, shallow pool. Remove the iron, then clean off any remaining flux with isopropyl alcohol. Repeat the procedure for the second land, then add fresh flux and a fresh solder preform (if not using flux-core solder) to each tinned land. (The preform should have sufficient mass to create a proper fillet – see step 5 – on the component.)

3. Pick up the component with either a hand tweezer or vacuum tweezer. (Stainless steel or ceramic- tipped tweezers are preferred.)

4. Place the component so that it straddles the circuit board lands, and make sure it lies flat on the board. As shown in **Fig. 1**, **Do not touch the component directly with the soldering iron**. Rather, touch the iron to the land adjacent to the capacitor until the solder begins to flow; then move the iron slowly toward the component.

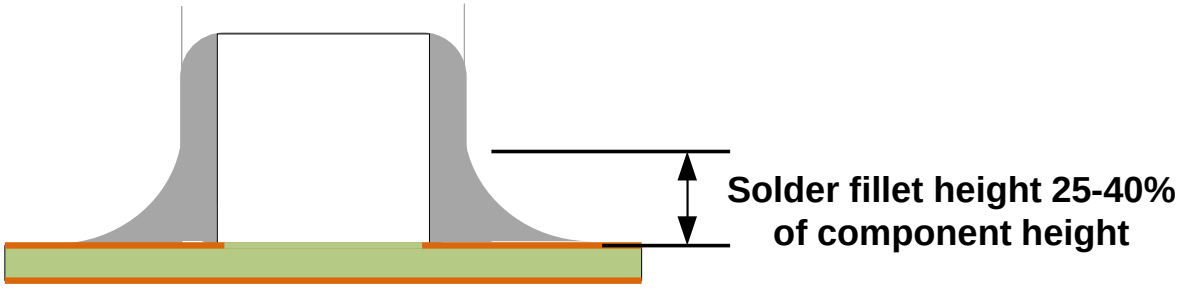
Fig. 1



5. When a fillet forms, remove the iron. As shown in **Fig. 2**, solder fillets should occupy about 25-40% of the component's height, have a concave profile, and be free of peaks and voids.

6. Repeat steps 1-5 for the second joint, then let the board cool gradually to room temperature. Use isopropyl alcohol to remove any residual flux from each joint.

Fig. 2



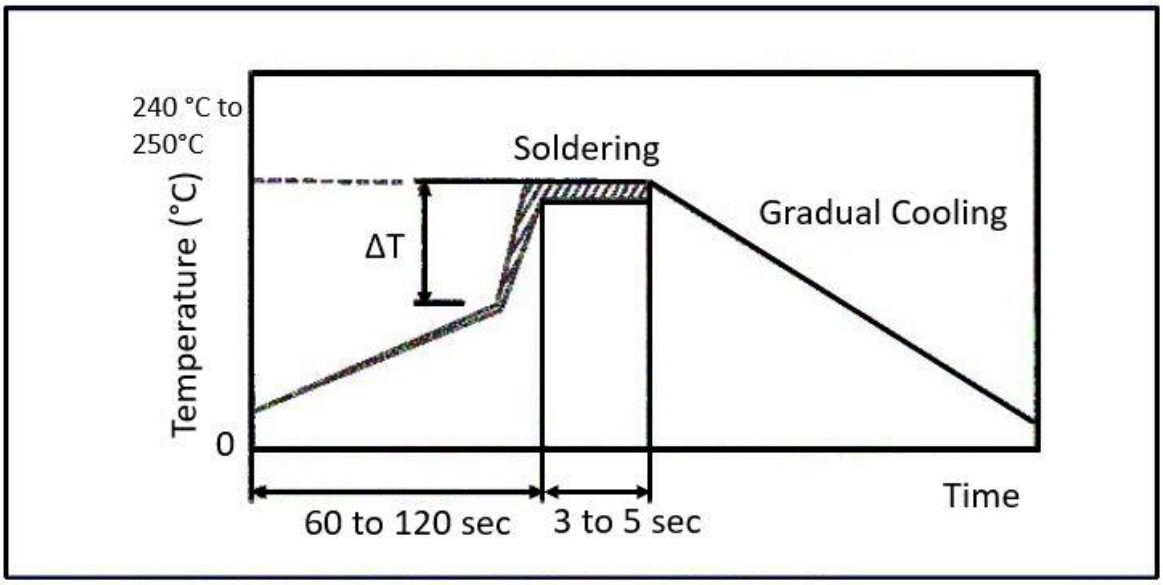
Wave Soldering

When sudden heat is applied to the elements, the mechanical strength of the components should decrease because remarkable temperature change can cause deformity of components inside. Also, long soldering time or high soldering temperatures, result in leaching by the external electrodes, causing poor adhesion or a reduction in capacitance value due to loss of contact between electrodes and end termination.

In order to avoid mechanical damage in the elements, preheating should be requested for both of the components and the PCB board. Preheating conditions are given in the table below. It is requested to keep the temperature gap between the soldering and the elements surface (.T) as small as possible.

When elements are submerged in solvent after mounting, be sure to maintain the temperature gas (.T) between the element and solvent within the range shown in the table below.

Do not apply the flow soldering to capacitors not listed in the table below.

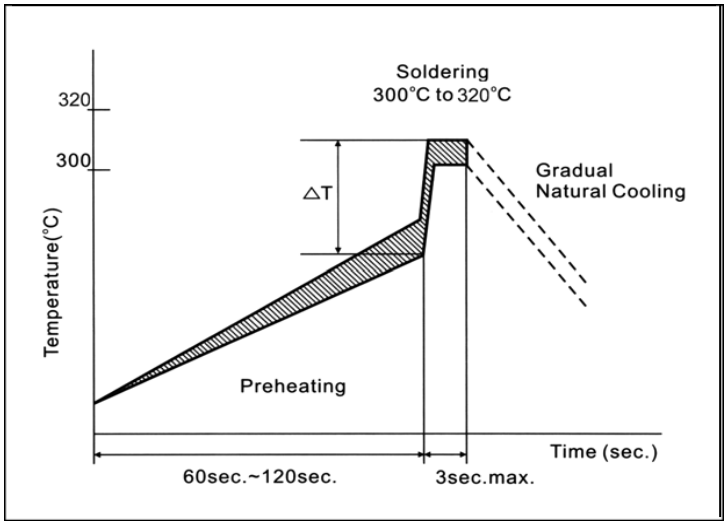


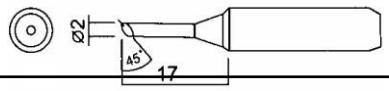
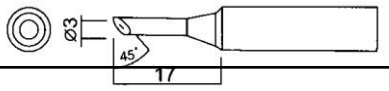
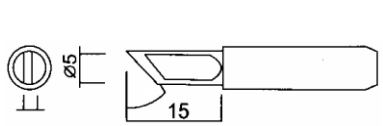
Chip Capacitor	01005/0201/0402/0603/0505/0805
Preheating	ΔT≤150℃

PPI does not recommend flow soldering for its 1111P/1111C, 2225P/2225C, 3838P/3838C.

Soldering Iron

When sudden heat is given to the elements by soldering iron, the mechanical strength of the components should weaken because sharp temperature change can cause deformity of components inside. In order to avoid mechanical damage in the elements, preheating should be requested for both of the components and the PCB board. Preheating conditions are given in the below table. It is requested to keep the temperature gap between the soldering and the elements surface (ΔT) as small as possible. After the soldering, it should not be allowed to cool down suddenly.



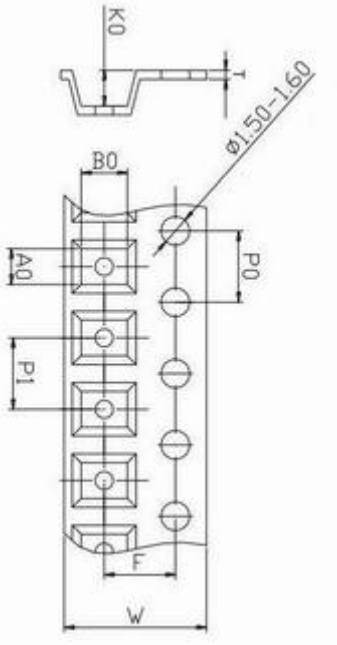
Size	Soldering Iron	Temperature	Soldering Iron head Size	Solder
0505/0805	70W Thermostat Iron	330°C		63Sn/37Pb, 95.5Sn/3.8Ag /0.7Cu
1111		350°C		
2225		370°C		
3838		370°C		

Tape & Reel Specifications

High-Q Low ESR Capacitors

High-Q Low ESR Capacitor Tape & Reel Specifications

Case Size	Orientation	Measurement Unit	W	P0	P1	T	F	Minimum Qty per Reel	Std Qty per Reel	Tape Material
0201N	H	in.	0.315	0.157	0.079	0.017	0.138	1000	15000	Paper
		mm	8.00	4.00	2.00	0.42	3.50			
0402N	H	in.	0.315	0.157	0.079	0.003	0.138	1000	10000	Paper
		mm	8.00	4.00	2.00	0.07	3.50			
0603N	H	in.	0.315	0.157	0.157	0.004	0.138	500	4000	Paper
		mm	8.00	4.00	4.00	0.10	3.50			
0708N	V	in.	0.472	0.157	0.157	0.012	0.217	500	1500	Plastic
		mm	12.00	4.00	4.00	0.30	5.50			
0805N	H	in.	0.315	0.157	0.157	0.009	0.138	500	3000	Plastic
		mm	8.00	4.00	4.00	0.22	3.50			
	V	in.	0.315	0.157	0.157	0.009	0.138	500	1000	Plastic
		mm	8.00	4.00	4.00	0.22	3.50			
1111N	H	in.	0.315	0.157	0.157	0.010	0.138	500	2000	Plastic
		mm	8.00	4.00	4.00	0.25	3.50			
	V	in.	0.472	0.157	0.157	0.016	0.217	500	1500	
		mm	12.00	4.00	4.00	0.40	5.50			
0505CP	H	in.	0.315	0.157	0.157	0.009	0.138	500	3000	Plastic
		mm	8.00	4.00	4.00	0.22	3.50			
	V	in.	0.472	0.157	0.157	0.012	0.217	500	2000	
		mm	12.00	4.00	4.00	0.30	5.50			
1111CP	H	in.	0.315	0.157	0.157	0.009	0.138	500	2000	Plastic
		mm	8.00	4.00	4.00	0.22	3.50			
	V	in.	0.315	0.157	0.157	0.009	0.138	500	1500	
		mm	8.00	4.00	4.00	0.22	3.50			
	V	in.	0.472	0.157	0.157	0.016	0.217	500	1500	
		mm	12.00	4.00	4.00	0.40	5.50			
2225CP	H	in.	0.630	0.157	0.472	0.012	0.295	500	500	Plastic
		mm	16.00	4.00	12.00	0.30	7.50			
	V	in.	0.630	0.157	0.315	0.020	0.295	300	300	Plastic
		mm	16.00	4.00	8.00	0.50	7.50			
3838CP	H	in.	0.630	0.157	0.630	0.012	0.295	50	200	Plastic
		mm	16.00	4.00	16.00	0.30	7.50			
0505X	H	in.	0.315	0.157	0.157	0.012	0.138	500	4000	Plastic
		mm	8.00	4.00	4.00	0.30	3.50			
1111X	H	in.	0.315	0.157	0.157	0.012	0.138	500	2000	Plastic
		mm	8.00	4.00	4.00	0.30	3.50			
2225X	H	in.	0.472	0.157	0.157	0.016	0.217	500	500	Plastic
		mm	12.00	4.00	4.00	0.40	5.50			



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- Determined by component size. Typical clearance between the cavity and the component is: .50 (.002) min to .65 (.026) max for 12mm tape.
- The component cannot rotate more than 20° within the determined cavity.

PPI Passive Plus
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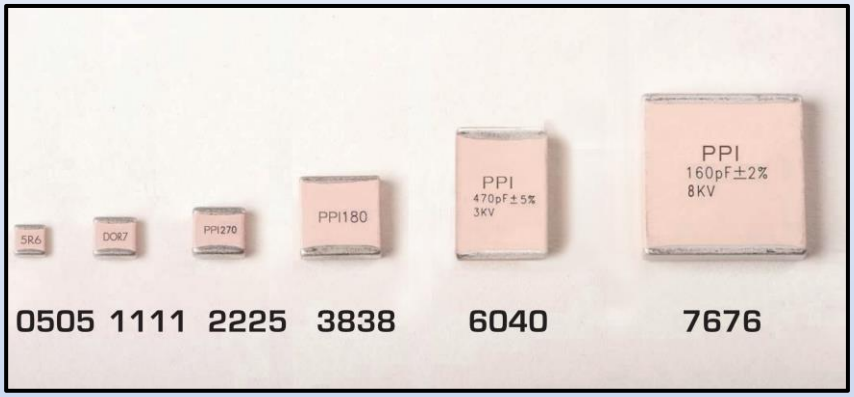
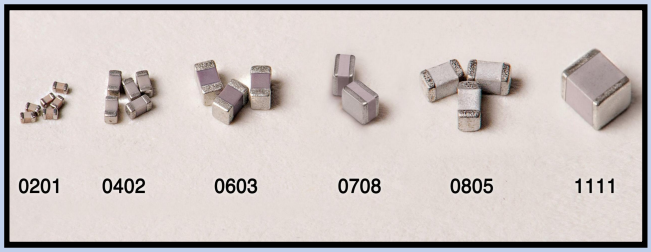


Marking shown for illustration purposes only.
Actual marking may differ.



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