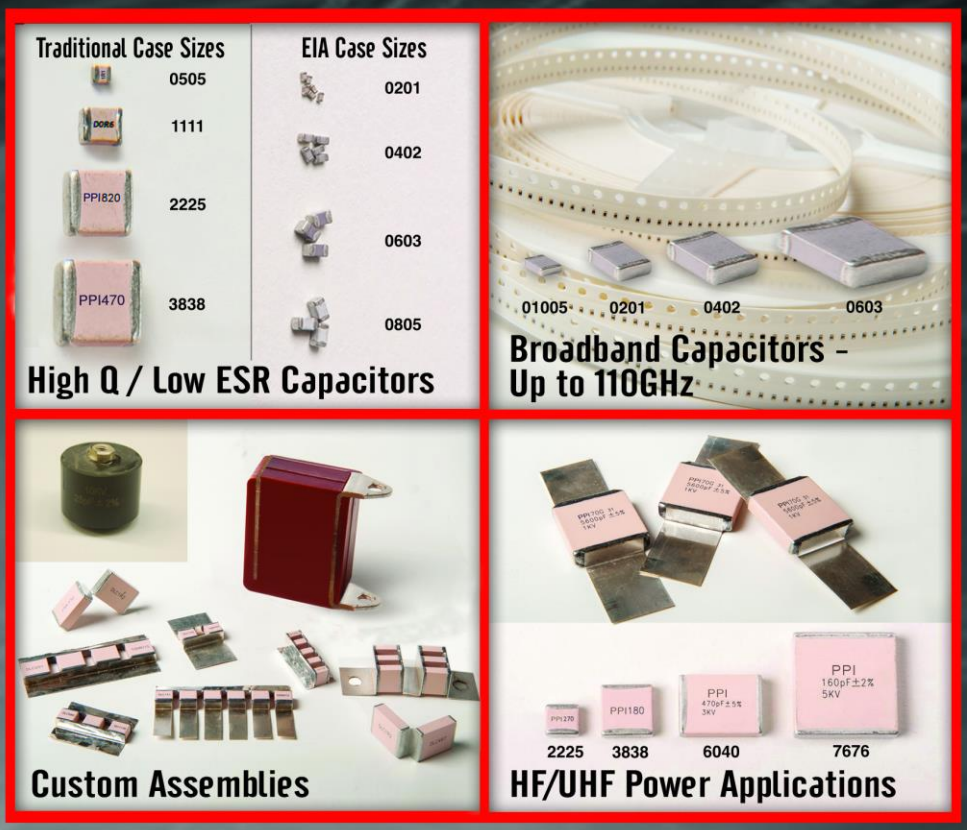
PPI Passive Plus Inc.

RF & Microwave Capacitors



High Q / Low ESR
Ceramic Capacitors

www.PassivePlus.com

- Manufacturing Site
- Established 1988
- ISO-9001 Certified
- ISO-14001 Certified
- MRI-Non-Magnetic Components
- S Level Reliability
- The products have been widely used in various RF/Microwave Communication Systems, MRI Medical Systems, Broadcast Equipment and various Military Applications

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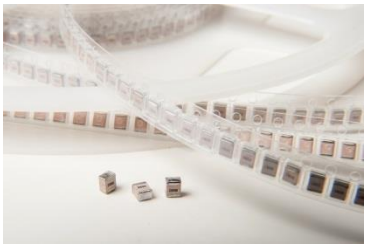
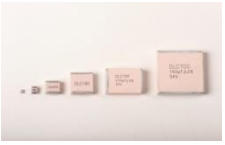


Traditional High Q (> 10,000) Low ESR Capacitors (NP0 & P90 TC)

Traditional High Q (>10,000) Low ESR Capacitors



◆ Product Features

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

◆ Typical Applications Field

Wireless Broadcasting Equipment, Mobile Base Stations, GPS Portables, Medical (MRI coils), Radar

◆ Part Numbering

0505	C	101	J	W	151	X	T
❶ Dimensions Code	❷ Temperature Coefficient	❸ Rated Capacitance	❹ Tolerance	❺ Termination Type	❻ Rated Voltage	❼ Laser Marking	❽ Packing Type

① Dimensions Code

unit:inch (millimeter)

	0505	1111	2225	3838
Length	0.055 +.015 ~ -.010 (1.4 +0.38 ~ -0.25)	0.110 +.020 ~ -.010 (2.79 +0.51 ~ -0.25)	0.220 +.020 ~ -.010 (5.84 +0.51 ~ -0.25)	0.380 +.015 ~ -.010 (9.65 +0.38 ~ -0.25)
Width	.055±.010 (1.4±0.25)	.110±.010 (2.79±0.25)	.250±.015 (6.35±0.38)	.380±.010 (9.65±0.25)
Thickness	.057(1.45)max	.10(2.6)max	.165(4.19)max	0.177(4.5)max

② Temperature Coefficient: C: 0±30ppm/° C, P: +90±20ppm/° C.

③ Rated Capacitance

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

Capacitance is not less than 10pF; for example: 101=100pF, the third number is the power of 10.

④ Tolerance

Code	A	B	C	D	F	G	J	K	M
Tolerance	±0.05pF	±0.1pF	±0.25pF	±0.5pF	±1%	±2%	±5%	±10%	±20%

⑤ Termination Type

Code	W	P	C	MS	AR	RR	AW	RW
Type	Nickel, Plated 100% Sn(RoHS)	Non-magnetic Copper Plated 100% Sn(RoHS)	Palladium Silver	Microstrip	Axial Ribbon	Radial Ribbon	Axial Wire	Radial Wire

Code	MN	AN	FN	BN	RN
Type	Non-mag Microstrip	Non-mag Axial Ribbon	Non-mag Radial Ribbon	Non-mag Axial Wire	Non-mag Radial Wire

⑥ Rated Voltage

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

⑦ Laser Marking

X denotes Marking. Capacitance is less than 10pF; for example: the marking of 1.0pF is 1R0. Capacitance is not less than 10pF; for example: the marking of 100pF is 101.

⑧ Packaging Type

	0505	1111	2225	3838
T: Tape carrier packaging	√	√	√	√
I: Special packaging		Consult with PASSIVE PLUS		

Quantity per Reel: 0505: 300, 500, 1000, 2000, 3000pcs/reel; 1111: 300, 500, 1000, 2000pcs/reel;

◆ 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.

0505C/P (.055" x.055")

◆ Product Features

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

◆ Product Application

Typical Functional Applications: Tuning, Bypass, Coupling, Feedback, D.C. Blocking and Impedance Matching.

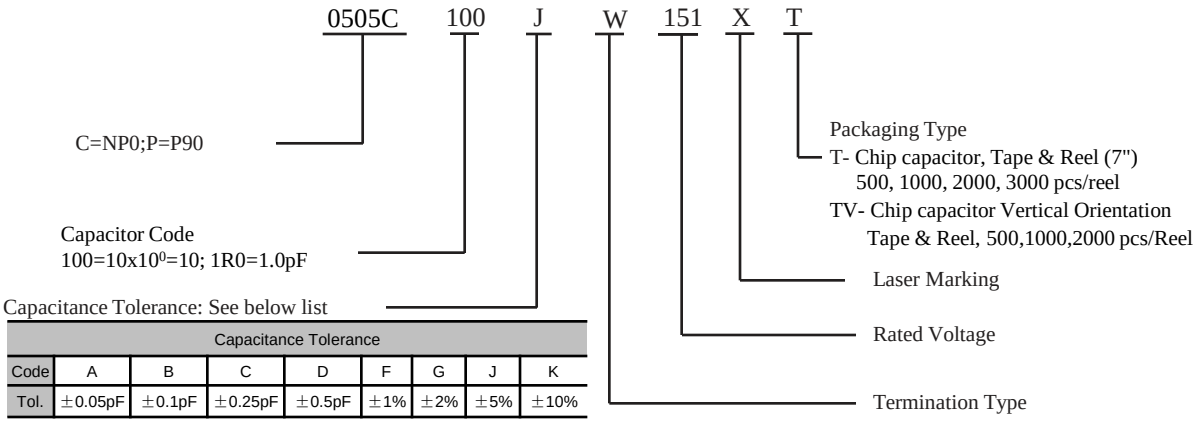
Typical Circuit Applications: UHF/Microwave RF Power Amplifiers, Mixers, Oscillators, Low Noise Amplifiers, Filter Networks, Timing Circuits and Delay Lines

◆ 0505C/P Capacitance Table NPO=C; P90=P Max. capacitance: 0505P 100pF; 0505C 1000pF

Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC
0.1	0R1	A,B, C,D	150V Code 151 or 300V Code 301	2.4	2R4	A,B, C,D	150V Code 151 or 300V Code 301	20	200	F,G, J,K	150V Code 151 or 300V Code 301	160	161	F,G, J,K	150V Code 151 or 200V Code 201
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		150V Code 151
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		150V Code 151 or 200V Code 201	430	431		
1.2	1R2			6.8	6R8	B,C, J,K		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		82	820			680	681		50V Code 500 or 100V Code 101
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						

Remark: special capacitance, tolerance and WVDC are available, consult with PASSIVE PLUS.

◆ Part Numbering



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

◆0505C/P Magnetic and Non-Magnetic Dimensions

Note: non-mag is no magnetism.

unit:inch(millimeter)

Series	Term. Code	Type/Outlines	Capacitor Dimensions				Plated Material
			Length Lc	Width Wc	Thickness Tc	Overlap B	
0505C 0505P	W	Chip	.055 +.015 to -.010 (1.40 +0.38 to -0.25)	.055±.010 (1.40±0.25)	.057 (1.45max)	.020 (0.51max)	Plated Nickel Plated 100%Sn, RoHS Compliant
0505C 0505P	P (non-mag)	Chip (Non-mag)					Plated Copper Plated 100%Sn RoHS Compliant

◆ Performance

Item	Specifications
Quality Factor (Q)	greater than 10000 at 1MHz.
Insulation Resistance (IR)	10^5 Megohms min. @ +25 ℃ at rated WVDC. 10^4 Megohms min. @ +125 ℃ at rated WVDC.
Rated Voltage	See Rated Voltage Table.
Dielectric Withstanding Voltage (DWV)	250% of rated Voltage for 5 seconds.
Operating Temperature Range	-55℃ to +175℃
Temperature coefficient (TC)	C: 0±30ppm/℃; P: +90±20ppm/℃
Capacitance Drift	±0.02% or ±0.02pF, whichever is greater.
Piezoelectric Effects	None
Termination Type	See Termination Type Table.

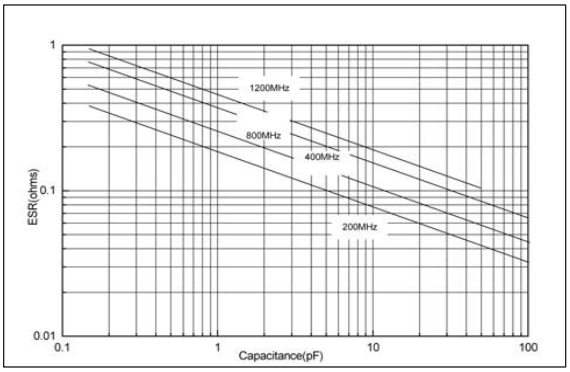
Capacitors are designed and manufactured to meet the requirements of MIL-PRF-55681 and MIL-PRF-123.

◆ Environmental Tests

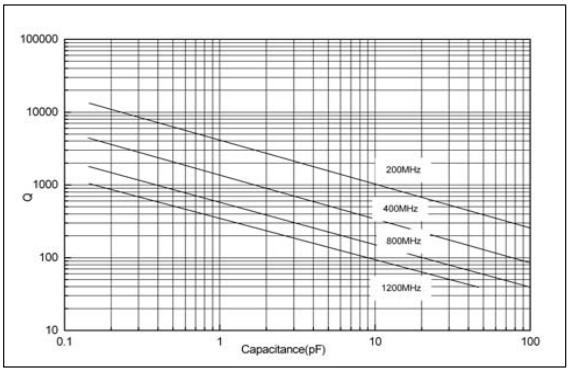
Item	Specifications	Method
Thermal shock	DWV: the initial value IR: Shall not be less than 30% of the initial value Capacitance change: no more than 0.5% or 0.5 pF, whichever is greater.	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature(-55℃ and 175℃) stay 30min, The time of removing shall not be more than 3 minutes. Perform the 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 1.5 Volts D.C. applied while subjected to an environment of 85℃ 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 0.2% or 0.5pF, whichever is greater.	MIL-STD-202, Method 108, for 2000 hours, at 125℃. 200% Rated voltage D.C. applies.

◆ 0505C/P Performance Curve

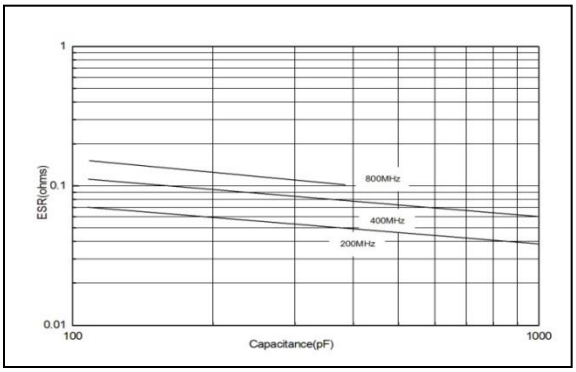
0505C/P ESR vs Capacitance



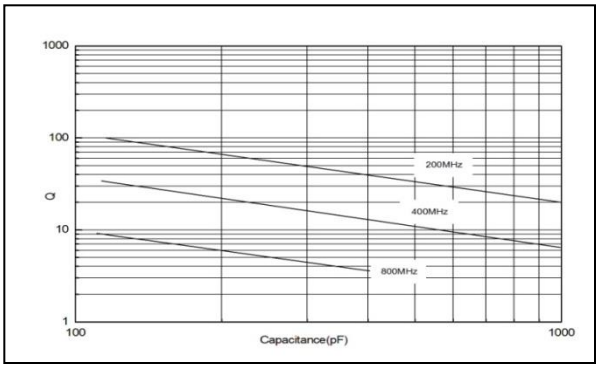
0505C/P Q vs Capacitance

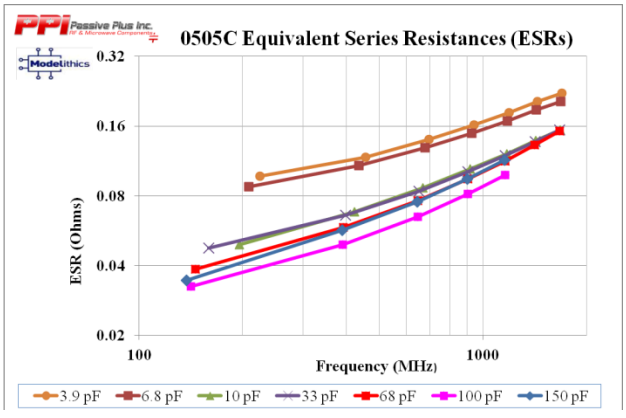


0505C ESR vs Capacitance

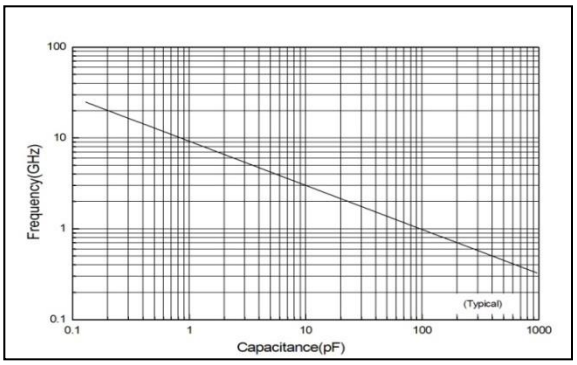


0505C Q vs Capacitance

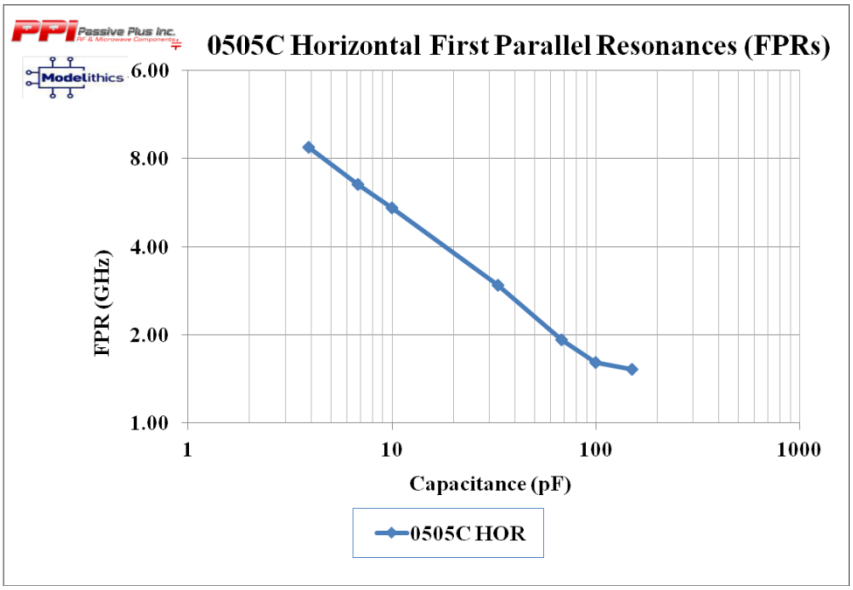




0505C/P Series Resonance vs Capacitance

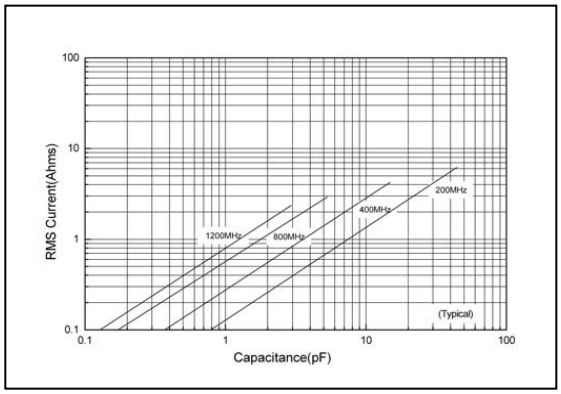


0505C/P (.055" x .055")

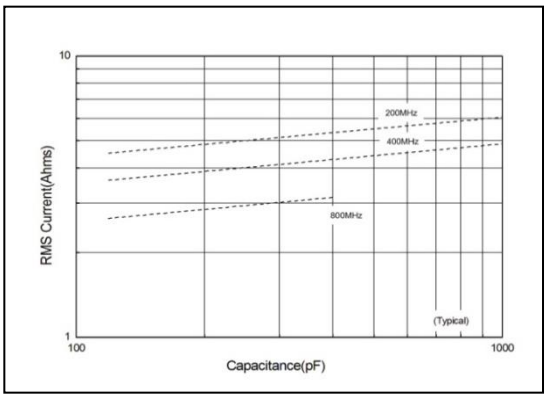


The First Parallel Resonance, FPR, is defined as the lowest frequency at which a suckout or notch appears in |S21|. It is generally independent of substrate thickness or dielectric constant, but does depend on capacitor orientation. A horizontal orientation means the capacitor electrode planes are parallel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

0505C/P Current Rating vs Capacitance



0505C Current Rating vs Capacitance



The current depends on voltage limited:

$$I = \frac{\sqrt{2}}{2} I_{peak} = \frac{\sqrt{2}}{2} \times \frac{V_{rated}}{X_C} = \sqrt{2}\pi f C V_{rated}$$

The current depends on power dissipation limited: $I = \sqrt{\frac{P_{dissipation}}{ESR}}$

Note: If the thermal resistance of mounting surface is 40° C/W. then a power dissipation of 1.5 W will result in the current limited we can calculate the current limited: $I = \sqrt{\frac{P_{dissipation}}{ESR}}$

◆ Tape & Reel Specifications

ORIENTATION	EIA	A0	B0	K0	W	P0	P1	T	F	Qty/reel	Tape Material
Horizontal	0505	1.38	1.68	0.98	8.00	4.00	4.00	0.22	3.50	3000	Plastic
Vertical	0505	1.10	1.60	1.40	12.00	4.00	4.00	0.30	5.50	2000	Plastic

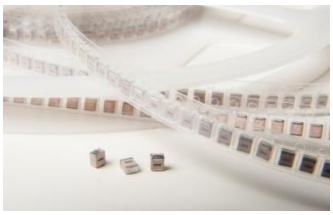
◆ Design Kits

These capacitors are 100% RoHS. Kits are available in Magnetic and Non-Magnetic that contain 10 (ten) pieces per value ; 16 values per kit.

DKD0505C01 DKD0505P01	0.1pF- 2.0pF	0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8pF 0.9,1.0,1.1, 1.2, 1.5pF	± 0.1pF
		1.6, 1.8, 2.0pF	± 0.25pF
DKD0505C02 DKD0505P02	1.0pF - 10pF	1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.4, 2.7pF	± 0.1pF
		3.0,3.3,3.9, 4.7, 5.6, 6.8, 8.2pF	± 0.25pF
		10pF	± 5%
DKD0505C03 DKD0505P03	10pF -100pF	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF	± 5%
DKD0505C04	100pF-1000pF	100, 120, 150, 180, 200, 220, 240, 270, 300, 330pF,	± 5%
		390, 470, 560, 680, 820, 1000pF	± 5%
DKD0505C05 DKD0505P05	0.1pF- 2.0pF Non-magnetic	0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8pF 0.9,1.0,1.1, 1.2, 1.5pF	± 0.1pF
		1.6, 1.8, 2.0pF	± 0.25pF
DKD0505C06 DKD0505P06	1.0pF - 10pF Non-magnetic	1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.4, 2.7pF	± 0.1pF
		3.0,3.3,3.9, 4.7, 5.6, 6.8, 8.2pF	± 0.25pF
		10pF	± 5%
DKD0505C07 DKD0505P07	10pF - 100pF Non-magnetic	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF	± 5%
DKD0505C08	100pF- 1000pF Non-magnetic	100, 120, 150, 180, 200, 220, 240, 270, 300, 330pF,	± 5%
		390, 470, 560, 680, 820, 1000pF	± 5%

1111C/P (.110" x .110")

1111C/P (.110" x .110")



◆ Product Features

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

◆ Product Application

Typical Functional Applications: Bypass, Coupling, Tuning, Feedback, Impedance Matching and D.C. Blocking.

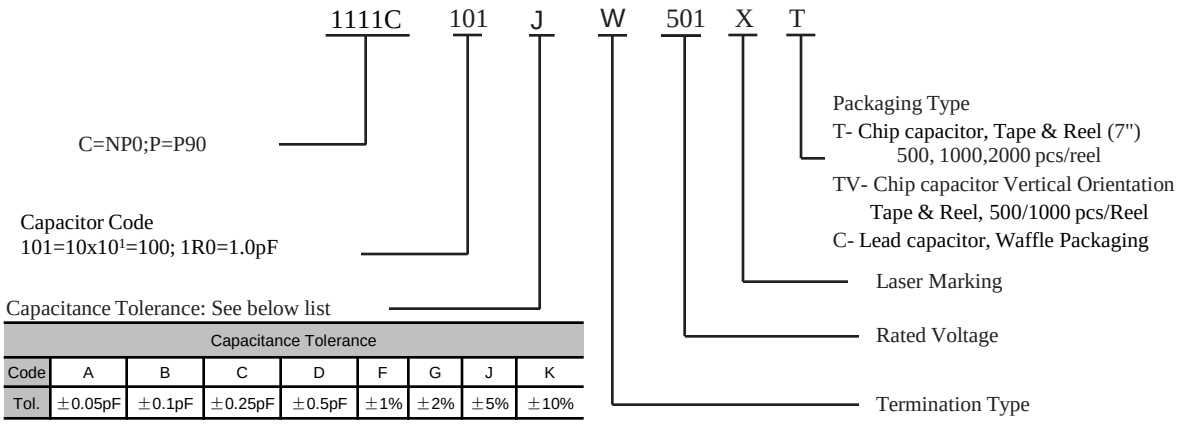
Typical Circuit Applications: UHF/Microwave RF Power Amplifiers, Mixers, Oscillators, Low Noise Amplifiers, Filter Networks, Timing Circuits and Delay Lines

◆ 1111C/P Capacitance Table NPO=C; P90=P

Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC
0.1	0R1	A,B,	500V Code 501 or 1500V Code 152	3.6	3R6	A,B, C,D	500V Code 501 or 1500V Code 152	43	430	F,G, J,K	500V Code 501 or 1500V Code 152	510	511	F,G, J,K	100V Code 101 or 200V Code 201
0.2	0R2			3.9	3R9			47	470			560	561		
0.3	0R3			4.3	4R3			51	510			620	621		
0.4	0R4			4.7	4R7			56	560			680	681		
0.5	0R5	A,B, C,D		5.1	5R1			62	620			750	751		
0.6	0R6			5.6	5R6			68	680			820	821		
0.7	0R7			6.2	6R2			75	750			910	911		
0.8	0R8			6.8	6R8			82	820			1000	102		200V Code 201
0.9	0R9			7.5	7R5			91	910			1100	112		
1.0	1R0			8.2	8R2			100	101			1200	122		
1.1	1R1			9.1	9R1			110	111		300V Code 301 or 1000V Code 102	1500	152		
1.2	1R2			10	100	F,G, J,K		120	121			1800	182		
1.3	1R3			11	110			130	131			2200	222		100V Code 101
1.4	1R4			12	120			150	151			2700	272		
1.5	1R5			13	130			160	161			3000	302		
1.6	1R6			15	150			180	181			3300	332		
1.7	1R7	A,B, C,D		16	160			200	201			3900	392		
1.8	1R8			18	180			220	221		200V Code 201 or 600V Code 601	4700	472		
1.9	1R9			20	200			240	241			5100	512		
2.0	2R0			22	220			270	271			5600	562		50V Code 500
2.1	2R1			24	240			300	301			10000	103		
2.2	2R2			27	270			330	331						
2.4	2R4			30	300			360	361						
2.7	2R7			33	330			390	391						
3.0	3R0			36	360			430	431						
3.3	3R3			39	390			470	471						

Remark: special capacitance, tolerance and WVDC are available, consult with PASSIVE PLUS.

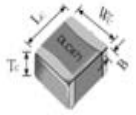
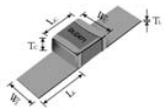
◆ Part Numbering

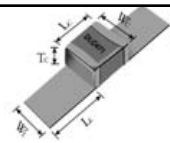


Capacitance Tolerance								
Code	A	B	C	D	F	G	J	K
Tol.	±0.05pF	±0.1pF	±0.25pF	±0.5pF	±1%	±2%	±5%	±10%

◆ 1111C/P Lead Type and Dimensions

unit:inch(millimeter)

Series	Term. Code	Type/ Outlines	Capacitor Dimensions				Overlap and Lead Dimensions			Plated Material
			Length Lc	Width Wc	Thick. Tc	Overlap B	Length L_L	Width W_L	Thickness T_L	
1111C 1111P	W	 Chip	.110 +.020 to -.010 (2.79 +0.51 to -0.25)	.110 ±.010 (2.79± 0.25)	.10 (2.54) max	.024 (0.60) Max	-	-	-	Plated Nickel Plated 100%Sn, RoHS Compliant
1111C 1111P	MS	 Microstrip	.135 ± .015 (3.43± 0.38)	.110 ±.010 (2.79± 0.25)	.10 (2.54) max	-	.250 (6.35) min	.093 ± .005 (2.36 ±0.13)	.008±.001 (0.2±0.025)	Silver-plated Copper
									.004±.001 (0.1±0.025)	100%Silver

Series	Term. Code	Type/ Outlines	Capacitor Dimensions				Overlap and Lead Dimensions			Plated Material
			Length Lc	Width Wc	Thick. Tc	Overlap B	Length L_L	Width W_L	Thickness T_L	
1111C 1111P	P	Chip (non-mag)	.110 +.020 to -.010 (2.79 +0.51to -0.25)	.110 ±.010 (2.79± 0.25)	.10 (2.54) max	.024 (0.60) Max	-	-	-	Copper Plated 100%Sn, RoHS Compliant
1111C 1111P	MN	 Microstrip (non-mag)	.135 ± .015 (3.43± 0.38)	.110 ±.010 (2.79± 0.25)	.10 (2.54) max	-	.250 (6.35) min	.093 ± .005 (2.36± 0.13)	.008±.001 (0.2±0.025)	Silver-plated Copper
									.004±.001 (0.1±0.025)	100%Silver

Note: non-mag is no magnetism.

◆ Performance

Item	Specifications
Quality Factor (Q)	greater than 10000 at 1MHz.
Insulation Resistance (IR)	0.1 pF to 470 pF: 10^6Megohms min. @ +25 ℃ at rated WVDC. 10^5 Megohms min. @ +125 ℃ at rated WVDC. 510 pF to 10000 pF: 10^5 Megohms min. @ +25 ℃ at rated WVDC. 10^4 Megohms min. @ +125 ℃ at rated WVDC.
Rated Voltage	See Rated Voltage Table.
Dielectric Withstanding Voltage (DWV)	250% of Voltage for 5seconds, Rated Voltage≦500VDC 150% of Voltage for 5 seconds, 500VDC< Rated Voltage ≦1250VDC 120% of Voltage for 5 seconds, Rated Voltage>1250VDC
Operating Temperature Range	0.1pF to 330pF ≦ 500V: -55 ℃ to +175 ℃, Other: -55 ℃ to +125 ℃
Temperature coefficient (TC)	C: 0±30ppm/℃; P: +90±20ppm/℃;
Capacitance Drift	±0.02% or ±0.02pF, whichever is greater.
Piezoelectric Effects	None
Termination Type	See Termination Type Table.

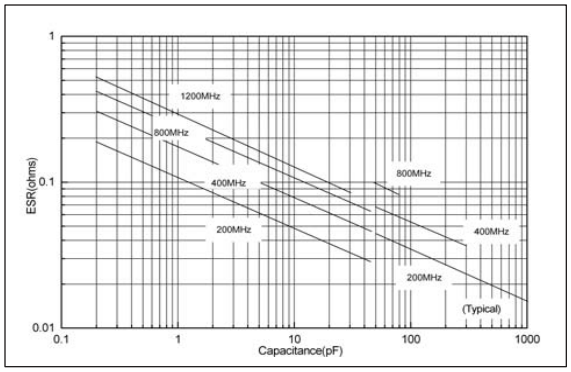
Capacitors are designed and manufactured to meet the requirements of MIL-PRF-55681 and MIL-PRF-123.

◆ Environmental Tests

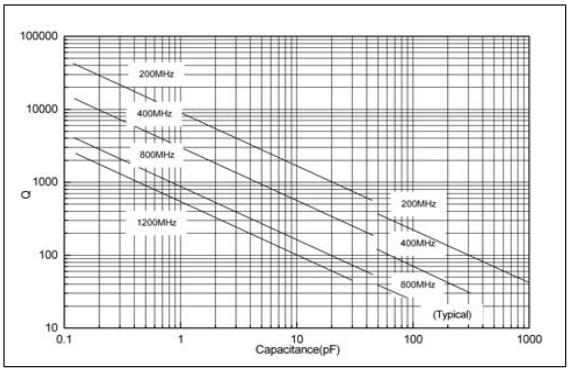
Item	Specifications	Method
Thermal shock	DWV: the initial value IR: Shall not be less than 30% of the initial value Capacitance change: no more than 0.5% or 0.5pF, whichever is greater.	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature(-55℃ and 175℃) stay 30min,The time of removing shall not be more than 3 minutes. Perform the 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 1.5 Volts D.C. applied while subjected to an environment of 85℃ 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,for2000hours,at125℃, 200% of Voltage for Capacitors, RatedVoltage≦500VDC; 120% of Voltage for Capacitors, 500VDC< Rated Voltage ≦1250VDC; 100% of Voltage for Capacitors, RatedVoltage>1250VDC.

◆ 1111C/P Performance Curve

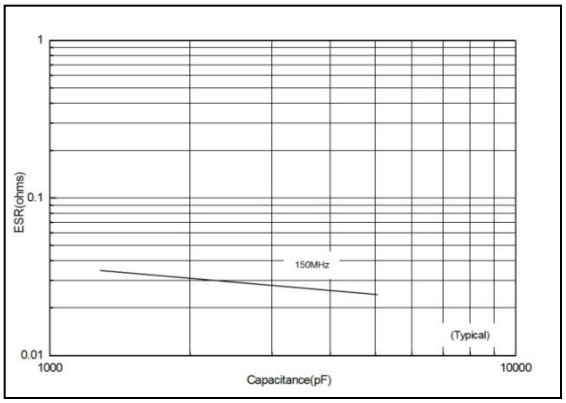
1111C/P ESR vs Capacitance



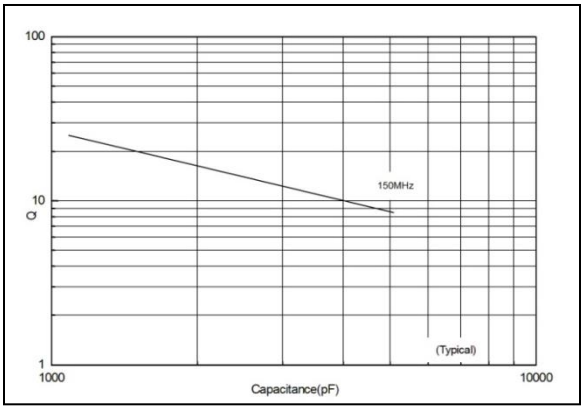
1111C/P Q vs Capacitance

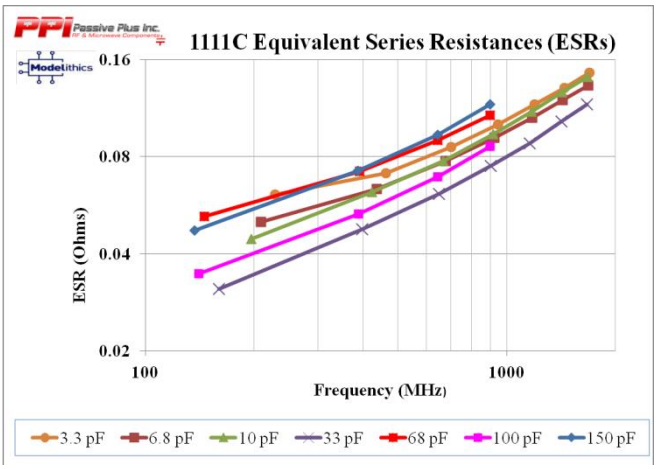


1111C ESR vs Capacitance

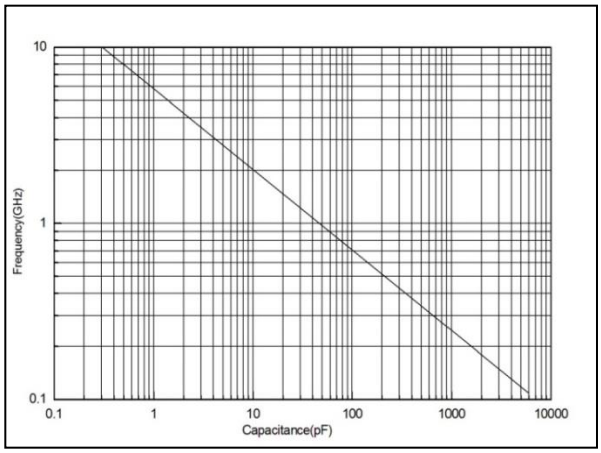


1111C Q vs Capacitance

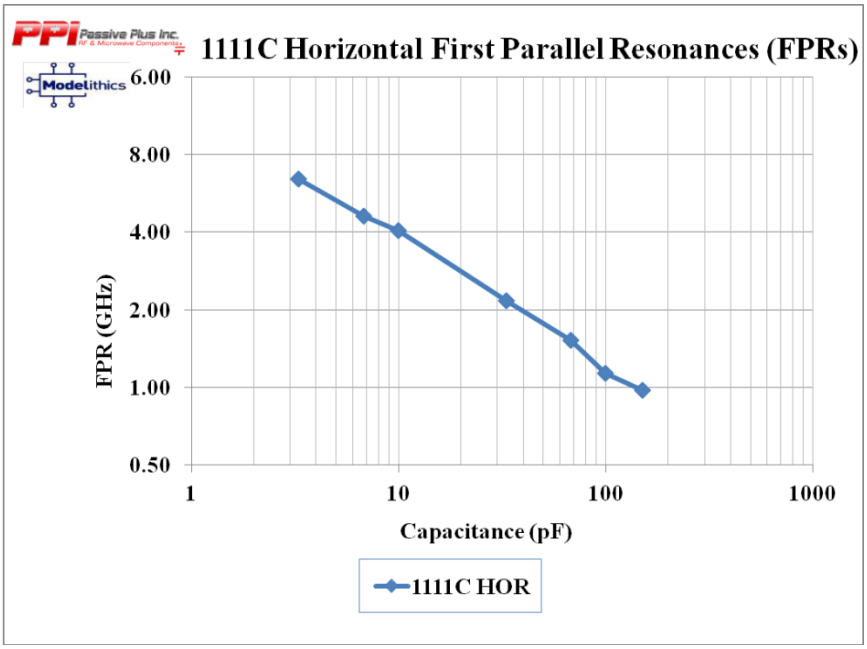




1111C/P Series Resonance vs Capacitance

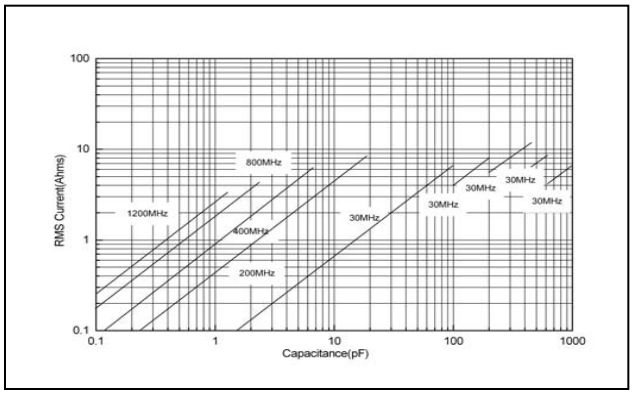


◆ 1111C/P Performance Curve

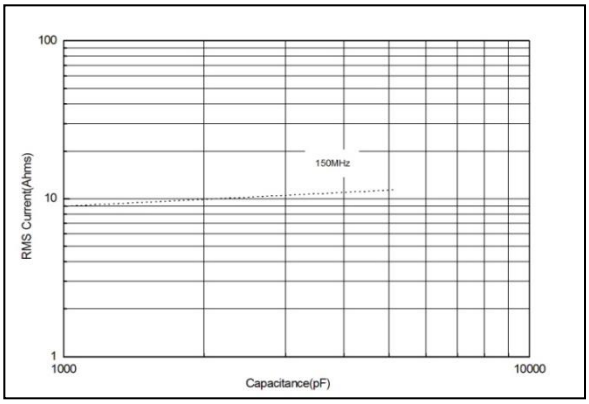


The First Parallel Resonance, FPR, is defined as the lowest frequency at which a suckout or notch appears in |S21|. It is generally independent of substrate thickness or dielectric constant, but does depend on capacitor orientation. A horizontal orientation means the capacitor electrode planes are parallel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

1111C/P Current Rating vs Capacitance



1111C Current Rating vs Capacitance



The current depends on voltage limited:

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

The current depends on power dissipation limited: $I = \sqrt{\frac{P_{dissipation}}{ESR}}$

Note: If the thermal resistance of mounting surface is 20 ℃ /W.

then a power dissipation of 3 W will result in the current limited

we can calculate the current limited: $I = \sqrt{\frac{P_{dissipation}}{ESR}}$

◆ Tape & Reel Specifications

ORIENTATION	EIA	A0	B0	K0	W	P0	P1	T	F	Qty/reel	Tape Material
Horizontal	1111	2.85	3.90	1.95	8.00	4.00	4.00	0.22	3.50	2000	Plastic
Vertical	1111	2.00	3.50	2.70	12.00	4.00	4.00	0.40	5.50	1500	Plastic
Vertical	1111	2.96	3.60	2.40	8.00	4.00	4.00	0.22	3.50	1500	Plastic

◆ Design Kits

These capacitors are 100% RoHS. Kits are available in Magnetic and Non-Magnetic that contain 10 (ten) pieces per value; 16 values per kit.

Design Kit	Description	Values (pF)	No. of values	Toler-ances
DKD1111C01 DKD1111P01	1.0pF - 10pF	1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.4, 2.7, pF	16	± 0.1pF
		3.0,3.3,3.9, 4.7, 5.6, 6.8, 8.2pF		± 0.25pF
		10pF		± 5%
DKD1111C02 DKD1111P02	10pF -100pF	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF	16	± 5%
DKD1111C03 DKD1111P03	100pF-1000pF	100, 120, 150, 180, 200, 220, 240, 270, 300, 330, 390, 470, 560, 680, 820,1000 pF	16	± 5%
DKD1111C04 DKD1111P04	1000pF-10000pF	1000, 1200, 1500, 1800, 2000, 2200, 2400, 2700, 3000, 3300, 3900, 4700, 5600, 10000 pF	14	± 5%
DKD1111C05 DKD1111P05	1.0pF - 10pF Non-magnetic	1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.4, 2.7, pF	16	± 0.1pF
		3.0,3.3,3.9, 4.7, 5.6, 6.8, 8.2pF		± 0.25pF
		10pF		± 5%
DKD1111C06 DKD1111P06	10pF - 100pF Non-magnetic	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF	16	± 5%
DKD1111C07 DKD1111P07	100pF- 1000pF Non-magnetic	100, 120, 150, 180, 200, 220, 240, 270, 300, 330, 390, 470, 560, 680, 820,1000 pF	16	± 5%
DKD1111C08 DKD1111P08	1000pF- 10000pF Non-magnetic	1000, 1200, 1500, 1800, 2000, 2200, 2400, 2700, 3000, 3300, 3900, 4700, 5600, 10000 pF	14	± 5%

2225C/P (.220" x .250")

◆ Product Features

High Q, High RF Current/Voltage, High RF Power, Low ESR/ESL, Ultra- Stable Performance.

◆ Product Application

Typical Functional Applications: Bypass, Coupling, Tuning, Impedance Matching and D.C. Blocking.

Typical Circuit Applications: UHF/VHF RF Power Amplifiers, Antenna Tuning, Plasma Chambers and Medical.

◆ 2225C/P Capacitance Table NPO=C; P90=P

Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC
0.5	0R5	B, C,D	2500V Code 252 or 3600V Code 362	3.9	3R9	B, C,D	2500V Code 252 or 3600V Code 362	36	360	F,G, J,K	2500V Code 252 or 3600V Code 362	330	331	F,G, J,K	1500V Code 152 or 2000V Code 202
0.6	0R6			4.3	4R3			39	390			360	361		
0.7	0R7			4.7	4R7			43	430			390	391		
0.8	0R8			5.1	5R1			47	470			430	431		
0.9	0R9			5.6	5R6			51	510			470	471		
1.0	1R0			6.2	6R2			56	560			510	511		1000V Code 102 or 1500V Code 152
1.1	1R1			6.8	6R8			62	620			560	561		
1.2	1R2			7.5	7R5			68	680			620	621		
1.3	1R3			8.2	8R2			75	750			680	681		
1.4	1R4			9.1	9R1			82	820			750	751		
1.5	1R5			10	100	F,G, J,K		91	910			820	821		
1.6	1R6			11	110			100	101			910	911		
1.7	1R7			12	120			110	111		2500V Code 252 or 3000V Code 302	1000	102		
1.8	1R8			13	130			120	121			1100	112		
1.9	1R9			15	150			130	131			1200	122		
2.0	2R0			16	160			150	151			1500	152		500V Code 501
2.1	2R1			18	180			160	161			1800	182		
2.2	2R2			20	200			180	181			2200	222		
2.4	2R4			22	220			200	201			2700	272		
2.7	2R7			24	240			220	221						
3.0	3R0			27	270			240	241						
3.3	3R3			30	300			270	271						
3.6	3R6			33	330			300	301						

Remark: special capacitance, tolerance and WVDC are available, consult with PASSIVE PLUS.

◆ Part Numbering

2225C 101 J W 252 X T

C=NP0;P=P90

Capacitor Code
101=10x10¹=100; 1R0=1.0pF

Capacitance Tolerance: See below list

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

Packaging Type
T- Chip capacitor, Tape & Reel (7")
500 pcs/reel
C- Lead capacitor, Waffle Packaging

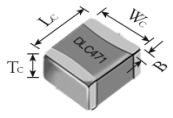
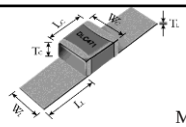
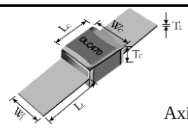
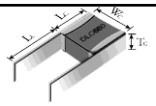
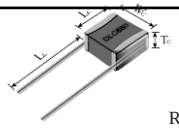
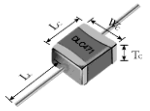
Laser Marking

Rated Voltage

Termination Type

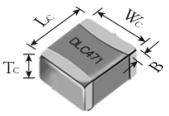
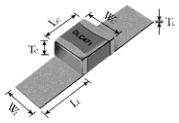
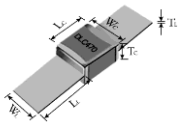
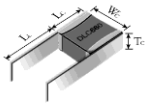
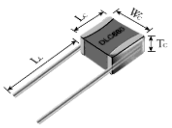
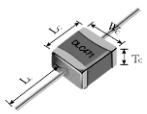
◆ 2225C/P Lead Type and Dimensions

unit: inch (millimeter)

Series	Term. Code	Type/ Outlines	Capacitor Dimensions				Overlap and Lead Dimensions			Plated Material
			Length Lc	Width Wc	Thick-ness Tc	Overlap B	Length LL	Width WL	Thick-ness TL	
2225C 2225P	W	 Chip	.230 +.025 to -.010 (5.84 +0.51 to -0.25)	.250 ±.015 (6.35±0.38)	.165 (4.19) max	.047 (1.20) max	-	-	-	Plated Nickel Plated Sn, RoHS Compliant
2225C 2225P	MS	 Microstrip	.245 ± .025 (6.22± 0.64)	.250 ±.015 (6.35±0.38)	.150 (3.81) max	-	.500 (12.70)min	.240 ±.005 (6.1± 0.13)	.008 ±.001 (0.2± 0.025)	Silver-plated Copper
2225C 2225P	AR	 Axial Ribbon								
2225C 2225P	RR	 RadialRibbon					.394 (10.00)min	.118± .005 (3.0±0.13)	.012 ±.001 (0.3± 0.025)	
2225C 2225P	RW	 Radial Wire					.787 (20.00)min	Dia.=.031±.004 (0.80 ± 0.10)		
2225C 2225P	AW	 Axial Wire					.984 (25.00)min			

◆ 2225 C /P Non-Magnetic Lead Type and Dimensions

unit:inch(millimeter)

Series	Term. Code	Type/ Outlines	Capacitor Dimensions				Overlap and Lead Dimensions			Plated Material
			Length Lc	Width Wc	Thick-ness Tc	Overlap B	Length LL	Width WL	Thick-ness TL	
2225C 2225P	P	 Chip (Non-Mag)	.230 +.020 to -.010 (5.84 +0.51 to -0.25)	.250 ±.015 (6.35± 0.38)	.165 (4.19) max	.047 (1.20) max	-	-	-	Copper Plated 100%Sn, RoHS Compliant
2225C 2225P	MN	 Microstrip (Non-Mag)	.245 ±.025 (6.22± 0.64)	.250 ±.015 (6.35± 0.38)	.150 (3.81) max	-	.500 (12.70) min	.240 ±.005 (6.1± 0.13)	.008 ±.001 (0.2± 0.025)	Silver-plated Copper
2225C 2225P	AN	 Axial Ribbon (Non-Mag)								
2225C 2225P	FN	 RadialRibbon (Non-Mag)					.394 (10.00) min	.118 ±.005 (3.0±0.13)	.012 ±.001 (0.3± 0.025)	
2225C 2225P	RN	 Radial Wire(Non-Mag)					.787 (20.00) min	Dia.=.031±.004 (0.80 ± 0.10)		
2225C 2225P	BN	 Axial Wire (Non-Mag)					.984 (25.00) min			

Note: Non-Mag is no magnetism.

◆ Tape & Reel Specifications

ORIENTATION	EIA	A0	B0	K0	W	P0	P1	T	F	Qty/reel	Tape Material
Horizontal	2225	6.70	6.20	3.40	16.00	4.00	12.00	0.30	7.50	500	Plastic

◆ Performance

Item	Specifications
Quality Factor (Q)	greater than 10000 at 1MHz.
Insulation Resistance (IR)	Test Voltage: 500V 10^5 Megohms min. @ +25℃ at rated WVDC. 10^4 Megohms min. @ +125℃ at rated WVDC.
Rated Voltage	See Rated Voltage Table.
Dielectric Withstanding Voltage (DWV)	250% of Voltage for 5seconds, Rated Voltage≦500VDC 150% of Voltage for 5seconds, 500VDC<RatedVoltage≦1250VDC 120% of Voltage for 5 seconds, Rated Voltage>1250VDC
Operating Temperature Range	-55℃ to +175℃
Temperature coefficient (TC)	C: 0±30ppm/℃; P: +90±20ppm/℃;
Capacitance Drift	±0.02% or ±0.02pF, whichever is greater.
Piezoelectric Effects	None
Termination Type	See Termination Type Table.

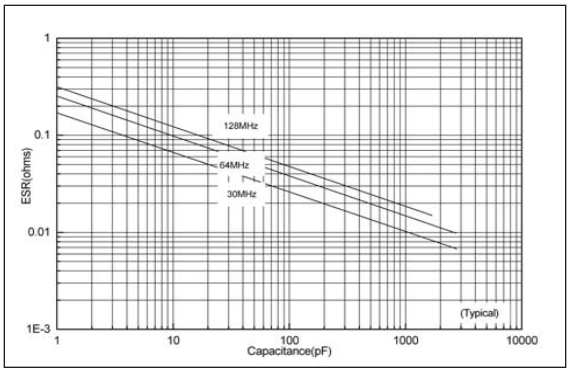
Capacitors are designed and manufactured to meet the requirements of MIL-PRF-55681 and MIL-PRF-123.

◆ Environmental Tests

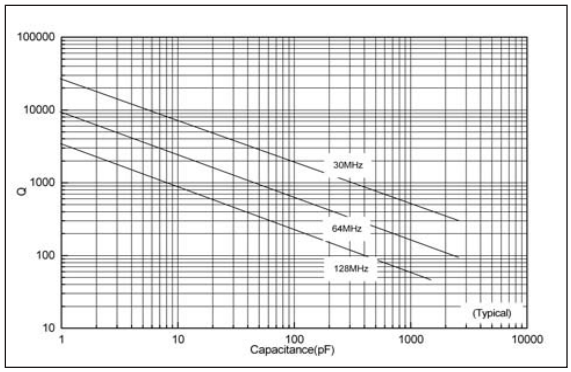
Item	Specifications	Method
Thermal shock	DWV: the initial value IR: Shall not be less than 30% of the initial value. Capacitance change: no more than 0.5% or 0.5 pF, whichever is greater.	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature(-55℃ and 175℃) stay 30min, The time of removing shall not be more than 3 minutes. Perform the 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 1.5 Volts D.C. applied while subjected to an environment of 85℃ 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 0.5 pF, whichever is greater.	MIL-STD-202, Method 108, for 2000 hours, at 125 ℃, 200% of Voltage for Capacitors, Rated Voltage≦500VDC; 120% of Voltage for Capacitors, 500VDC<RatedVoltage≦1250VDC; 100% of Voltage for Capacitors, Rated Voltage>1250VDC.

◆ 2225C/P Performance Curve

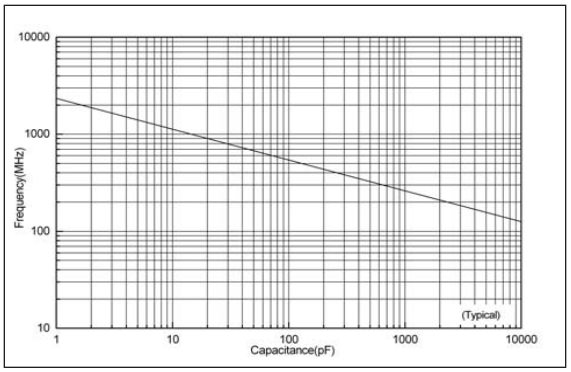
ESR vs Capacitance



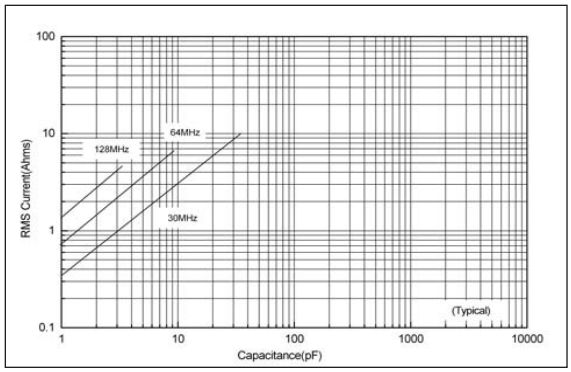
Q vs Capacitance



Series Resonance vs Capacitance



Current Rating vs Capacitance



The current depends on voltage limited:

$$I = \frac{\sqrt{2}}{2} I_{peak} = \frac{\sqrt{2}}{?} \times \frac{V_{rated}}{X} = \sqrt{2}\pi FCV_{rated}$$

The current depends on power dissipation limited: $I = \sqrt{\frac{P_{dissipation}}{ESR}}$

Note: If the thermal resistance of mounting surface is 15oC/W.

then a power dissipation of 4 W will result in the current limited

we can calculate the current limited $I = \sqrt{\frac{P_{dissipation}}{ESR}}$

3838C/P (.380" x .380")

◆Product Features

High Q, High RF Current/Voltage, High RF Power, Low ESR/ESL, Low Noise, Ultra-Stable Performance.

◆ Product Application

Typical Functional Applications: Bypass, Coupling, Tuning, Impedance Matching and D.C. Blocking.

Typical Circuit Applications: HF/RF Power Amplifiers, Transmitters, Antenna Tuning, Plasma Chambers, and Medical.

◆ 3838C/P Capacitance Table NPO= C; P90=P

Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC
0.5	0R5	B, C,D	3600V Code 362 or 7200V Code 722	4.7	4R7	B, C,D	3600V Code 362 or 7200V Code 722	51	510	F,G, J,K	3600V Code 362 or 5000V Code 502	560	561	F,G, J,K	2500V Code 252
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		1000V Code 102
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		3600V Code 362 or 5000V Code 502	1100	112		
1.3	1R3			10	100	F,G, J,K		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		500V Code 501
1.9	1R9			18	180			200	201		3600V Code 362	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		2500V Code 252				
3.9	3R9			43	430			470	471						
4.3	4R3			47	470			510	511						

Remark: special capacitance, tolerance and WVDC are available, consult with PASSIVE PLUS.

◆ Part Numbering

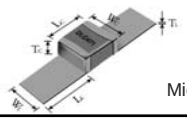
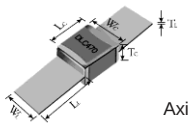
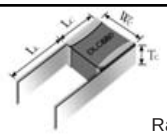
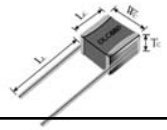
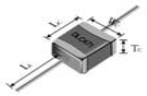
3838C 101 J W 362 X T

- 3838C — C=NP0;P=P90
- 101 — Capacitor Code: 101=10x10¹=100; 1R0=1.0pF
- J — Capacitance Tolerance: See below list
- W — Termination Type
- 362 — Rated Voltage
- X — Laser Marking
- T — Packaging Type
  - T- Chip capacitor, Tape & Reel (7") 300 pcs/reel
  - C- Lead capacitor, Waffle Packaging

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

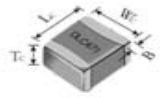
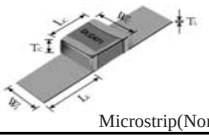
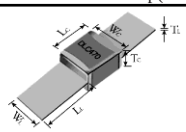
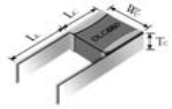
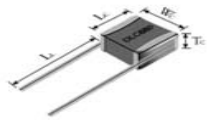
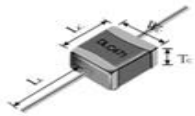
◆ 3838C/P Lead Type and Dimensions

unit:inch(millimeter)

Series	Term. Code	Type/ Outlines	Capacitor Dimensions				Overlap and Lead Dimensions			Plated Material
			Length Lc	Width Wc	Thick-ness Tc	Overlap B	Length L_L	Width W_L	Thick-ness T_L	
3838C 3838P	W	Chip	.380+.015 to - .010 (9.65+0.38 to -0.25)	.380 ±.010 (9.65± 0.25)	.170 (4.32) max	.063 (1.60) max	-	-	-	Plated Nickel Plated Sn, RoHS Compliant
3838C 3838P	MS	 Microstrip	.380+.015 to -.010 (9.65+0.38 to -0.25)	.380 ±.010 (9.65± 0.25)	.177 (4.50) max	-	.750 (19.05) min	.35 ± .01 (8.89± 0.25)	.008 ± .001 (0.20± 0.025)	Silver-plated Copper
3838C 3838P	AR	 Axial Ribbon								
3838C 3838P	RR	 Radial Ribbon					.394 (10.00) Min	.118± .005 (3.0± 0.13)	.012± .001 (0.3± 0.05)	
3838C 3838P	RW	 Radial Wire					.787 (20.00) Min	Dia.=.031±.004 0.80 ± 0.10		
3838C 3838P	AW	 Axial Wire					.984 (25.00) min			

◆ 3838C/P Non-Magnetic Lead Type and Dimensions

unit: inch (millimeter)

Series	Term. Code	Type/ Outlines	Capacitor Dimensions				Overlap and Lead Dimensions			Plated Material
			Length Lc	Width Wc	Thick-ness Tc	Overlap B	Length L_L	Width W_L	Thick-ness T_L	
3838C 3838P	P	 Chip(Non-Mag)	.380+.015 to -.010 (9.65+0.38 to -0.25)	.380± .010 (9.65± 0.25)	.170 (4.32) max	.063 (1.60) max	-	-	-	Copper Plated 100%Sn, Non-mag, RoHS Compliant
3838C 3838P	MN	 Microstrip(Non-Mag)	.380+.015 to -.010 (9.65+0.38to -0.25)	.380± .010 (9.65± 0.25)	.177 (4.50) max	-	.750 (19.05) min	.350 ± .010 (8.89± 0.25)	.008 ± .001 (0.20± 0.025)	Silver Or Silver-plated Copper
3838C 3838P	AN	 Axial Ribbon(Non-Mag)								
3838C 3838P	FN	 Radial Ribbon(Non-Mag)					.394 (10.00) min	.118 ±.005 (3.0± 0.13)	.012± .001 (0.3± 0.05)	
3838C 3838P	RN	 Radial Wire(Non-Mag)					.787 (20.00) min	Dia.=.031±.004 (0.80 ± 0.10)		
3838C 3838P	BN	 Axial Wire(Non-Mag)					.984 (25.00) min			

Note: Non-Mag is no magnetism.

◆ Tape & Reel Specifications

ORIENTATION	EIA	A0	B0	K0	W	P0	P1	T	F	Qty/reel	Tape Material
Horizontal	3838	10.10	10.10	3.30	16.00	4.00	16.00	0.30	7.50	300	Plastic

◆Performance

Item	Specifications
Quality Factor (Q)	greater than 10000 at 1MHz.
Insulation Resistance (IR)	Test Voltage: 500V 10^5 Megohms min. @ +25℃ at rated WVDC. 10^4 Megohms min. @ +125℃ at rated WVDC.
Rated Voltage	See Rated Voltage Table.
Dielectric Withstanding Voltage (DWV)	250% of Voltage for 5seconds, Rated Voltage≦500VDC 150% of Voltage for 5seconds, 500VDC<RatedVoltage≦1250VDC 120% of Voltage for 5 seconds, Rated Voltage>1250VDC
Operating Temperature Range	-55℃ to +175℃
Temperature coefficient (TC)	C: 0±30ppm/℃; P: +90±20ppm/℃;
Capacitance Drift	±0.02% or ±0.02pF, whichever is greater.
Piezoelectric Effects	None
Termination Type	See Termination Type Table.

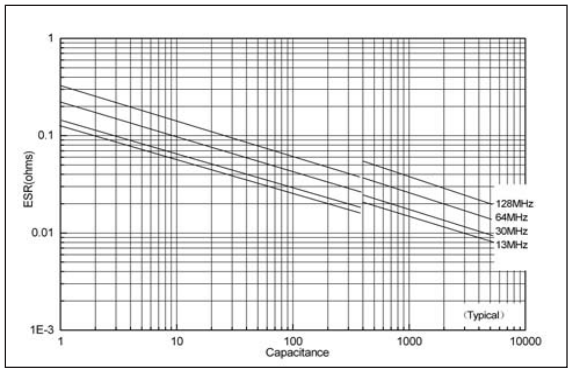
Capacitors are designed and manufactured to meet the requirements of MIL-PRF-55681 and MIL-PRF-123.

◆ Environmental Tests

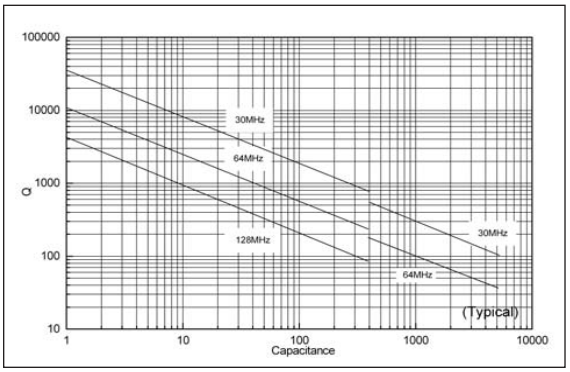
Item	Specifications	Method
Thermal shock	DWV: the initial value IR: Shall not be less than 30% of the initial value Capacitance change: no more than 0.5% or 0.5 pF. whichever is greater.	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature(-55℃ and 175℃) stay 30min, The time of removing shall not be more than 3 minutes. Perform the 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 1.5 Volts D.C. applied while subjected to an environment of 85℃ 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,for2000hours,at125℃, 200% of Voltage for Capacitors, RatedVoltage≦500VDC; 120% of Voltage for Capacitors, 500VDC< Rated Voltage ≦ 1250VDC; 100% of Voltage for Capacitors, RatedVoltage>1250VDC.

◆ 3838C/P Performance Curve

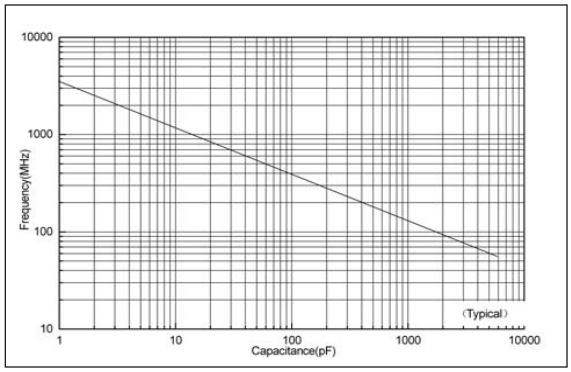
ESR vs Capacitance



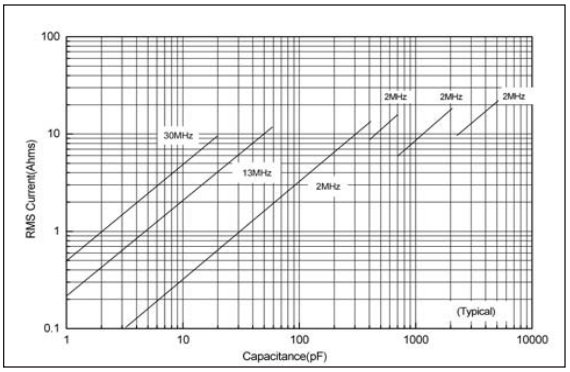
Q vs Capacitance



Series Resonance vs Capacitance



Current Rating vs Capacitance



The current depends on voltage limited: $I = \frac{\sqrt{2}}{2} I_{peak} = \frac{\sqrt{2}}{2} \times \frac{V_{rated}}{X_C} = \sqrt{2}\pi FCV_{rated}$

The current depends on power dissipation limited: $I = \sqrt{\frac{P_{dissipation}}{ESR}}$

Note: If the thermal resistance of mounting surface is 12oC/W.

then a power dissipation of 5 W will result in the current limited

we can calculate the current limited $I = \sqrt{\frac{P_{dissipation}}{ESR}}$

DLC70G
150nF 5.5%
5KV

Power Transmitter Capacitors
UHF/RF High Q Ceramic Capacitors (NP0 TC)

UHF/RF High Q Ceramic Capacitors (NP0 TC)

◆ Product Features

High Q, High RF Current/Voltage, High RF Power, Low ESRIESL, Low Noise.

◆ Part Numbering

6040	C	101	J	AR	502	X	T
❶ Dimensions Code	❷ Temperature Coefficient	❸ Rated Capacitance	❹ Tolerance	❺ Termination Type	❻ Rated Voltage	❼ Laser Marking	❽ Packing Type

① Dimensions Code

unit:inch(millimeter)

	6040C	7676C
Length	.614 + .015 ~ -.010 (15.60 + 0.38 ~ -0.25)	.760 + .015 ~ -.010 (19.30 + 0.38 ~ -0.25)
Width	.433±.01(11.0±0.25)	.760±.01(19.30±0.25)
Thickness	.154±.008 (3.90±0.20)	.154±.008 (3.90±0.20)

② Temperature Coefficient: 0±30ppm/° C

③ Rated Capacitance

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

Capacitance is not less than 10pF; for example: 101=100pF. The third number is the power of 10.

④ Tolerance

Code	B	C	D	F	G	J	K	M
Tolerance	±0.1pF	±0.25pF	±0.5pF	±1%	±2%	±5%	±10%	±20%

⑤ Termination Type

Code	W	P	MS	AR	AW	RW
Type	Nickel,Plated 100% Sn(RoHS)	Non-magnetic Copper Plated 100% Sn(RoHS)	Microstrip	Axial Ribbon	Axial Wire	Radial Wire

Code	MN	AN	BN	RN
Type	Non-mag Microstrip	Non-mag Axial Ribbon	Non-mag Axial Wire	Non-mag Radial Wire

⑥ Rated Voltage

Code	Rated Voltage	Code	Rated Voltage
301	300V	252	2500V
501	500V	302	3000V
102	1000V	362	3600V
152	1500V	502	5000V
202	2000V	802	8000V

⑦ Laser Marking

X denotes Marking.

Capacitance is less than 10pF; for example: The marking of 1.0pF is 1R0.

Capacitance is not less than 10pF; for example: The marking of 100pF is 101.

⑧ Packaging Type

	6040C	7676C
T: Bulk packaging in a tray	√	√
C: Gridiron packaging	√	√
I: Special packaging	Consult with PASSIVE PLUS	

◆ Performance Requirements

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

6040C (.600" x .400")

◆ Product Features

High Q, High RF Current/Voltage, High RF Power, Low ESR/ESL, Low Noise, Ultra- Stable Performance.

◆ 6040C Capacitance Table

Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC
1.0	1R0	B,C,D	5000V Code502 Extended Voltage 8000V Code802	33	330	F,G, J,K	5000V Code502 Extended Voltage 8000V Code802	820	821	F,G, J,K	2000V Code202 Extended Voltage 3000V Code302
1.2	1R2			39	390			1000	102		
1.5	1R5			47	470			1200	122		
1.8	1R8			56	560			1500	152		
2.2	2R2			68	680			1800	182		
2.7	2R7			82	820			2200	222		
3.3	3R3			100	101			2700	272		1000V Code102 Extended Voltage 2000V Code202
3.9	3R9			120	121		3000V Code 302 Extended Voltage 5000V Code 502	3300	332		
4.7	4R7			150	151			4700	472		
5.6	5R6			180	181			5100	512		
6.8	6R8			220	221			5600	562		
8.2	8R2			270	271			6800	682		
10	100	F,G, J,K		330	331						
12	120			390	391						
15	150			470	471						
18	180			560	561						
22	220			680	681						
27	270										

◆ Part Numbering

6040 — 6040C Series

101 — Capacitor Code
101=10x10¹=100, 1R0=1.0pF

J — Capacitance Tolerance
See below list

AR — Termination Type

502 — Rated Voltage

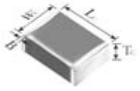
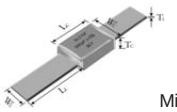
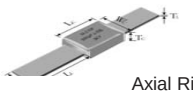
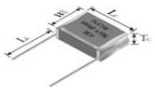
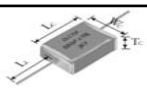
X — Laser Marking

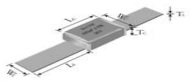
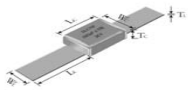
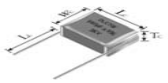
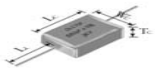
T — Packaging Type
B:Bulk packaging in a bag

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

◆ 6040C Lead Type and Dimensions

unit: inch(millimeter)

Series	Term. Code	Type/ Outlines	Capacitor Dimensions				Overlap and Lead Dimensions			Plated Material
			Length Lc	Width Wc	Thick-ness Tc	Overlap B	Length L_L	Width W_L	Thick-ness T_L	
6040C	W	 Chip	.614 +.015 to -.010 (15.6 +0.38 to -0.25)	.433 ±.010 (11.0± 0.25)	.154 ± .008 (3.90 ±0.20)	.063 (1.60) max	-	-	-	Nickel , Plated 100%Sn,
6040C	MS	 Microstrip				-	.787 (20.00) min	.35 ± .01 (8.89± 0.25)	.008 ± .001 (0.20± 0.025)	Silver-plated Copper
6040C	AR	 Axial Ribbon								
6040C	RW	 Radial Wire					.787 (20.00) min	Dia.=.03±.004 (0.80 ± 0.10)		
6040C	AW	 Axial Wire					.984 (25.00) min			

Series	Term. Code	Type/ Outlines	Capacitor Dimensions				Overlap and Lead Dimensions			Plated Material
			Length Lc	Width Wc	Thick-ness Tc	Overlap B	Length L_L	Width W_L	Thick-ness T_L	
6040C	P	Chip(Non-Mag)	.614 +.015 to -.010 (15.6 +0.38 to -0.25)	.433 ±.010 (11.0± 0.25)	.154 ± .008 (3.90 ±0.20)	.063 (1.60) max	-	-	-	Non-mag, Copper Plated 100% Sn
6040C	MN	 Microstrip(Non-Mag)				-	.787 (20.00)min	.35 ± .01 (8.89± 0.25)	.008 ± .001 (0.20± 0.025)	Silver-plated Copper
6040C	AN	 Axial Ribbon(Non-Mag)								
6040C	RN	 Radial Wire(Non-Mag)					.787 (20.00)min	Dia.=.03±.004 (0.80 ± 0.10)		
6040C	BN	 Axial Wire(Non-Mag)					.984 (25.00)min			

Note: non-mag is no magnetism.

◆ Performance

Item	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 Megohms min. @ +25℃ at rated WVDC. 10^4 Megohms min. @ +125℃ at rated WVDC.
Rated Voltage	See Rated Voltage Table.
Dielectric Withstanding Voltage (DWV)	250% of Voltage for 5 seconds, Rated Voltage ≦500VDC 150% of Voltage for 5 seconds, 500VDC< Rated Voltage ≦1250VDC 120% of Voltage for 5 seconds, Rated Voltage >1250VDC
Operating Temperature Range	-55℃ to +175℃
Temperature coefficient (TC)	0±30ppm/℃
Capacitance Drift	±0.02% or ±0.02pF, whichever is greater.
Piezoelectric Effects	None
Termination Type	See Termination Type Table.

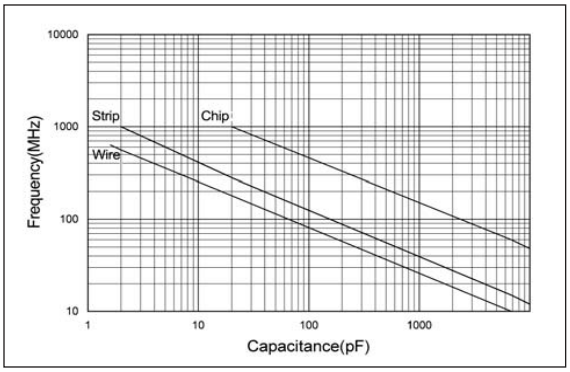
Capacitors are designed and manufactured to meet the requirements of MIL-PRF-55681 and MIL-PRF-123.

◆ Environmental Tests

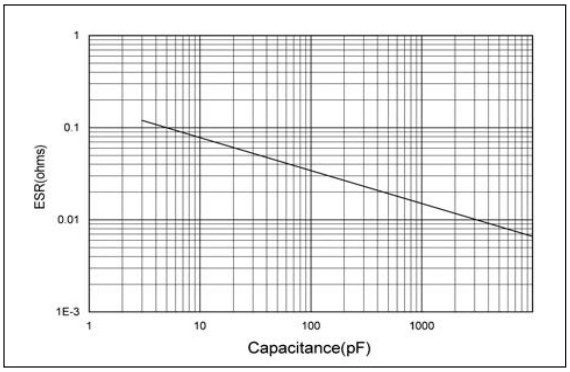
Item	Specifications	Method
Thermal shock	DWV: the initial value IR: Shall not be less than 30% of the initial value Capacitance change: no more than 0.5% or 0.5 pF, whichever is greater.	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature(-55℃ and 175℃) stay 30min, The time of removing shall not be more than 3 minutes. Perform the 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 0.3 pF, whichever is greater.	MIL-STD-202, Method 103, Condition A, With 1.5 Volts D.C. applied while subjected to an environment of 85℃ 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 0.5 pF, whichever is greater.	MIL-STD-202, Method 108, for 2000 hours, at 125℃, 200% of Voltage for Capacitors, Rated Voltage ≦500VDC; 120% of Voltage for Capacitors, 500VDC < Rated Voltage ≦ 1250VDC; 100% of Voltage for Capacitors, Rated Voltage >1250VDC.

◆ 6040C Performance Curve

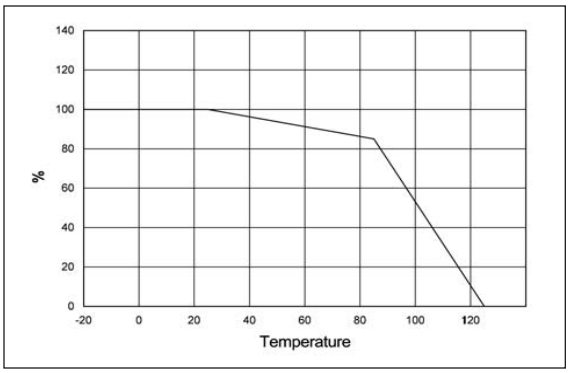
Self Resonant Frequency vs Capacitance



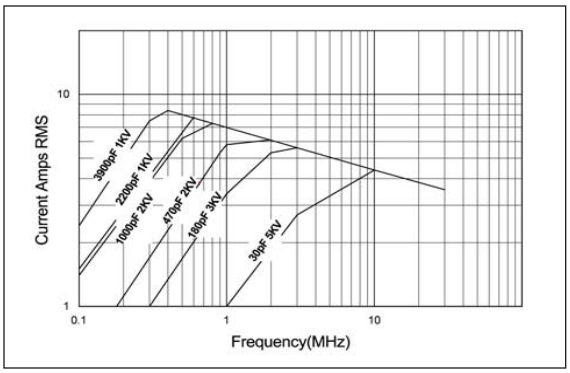
ESR vs Capacitance
Measured @ 30MHz



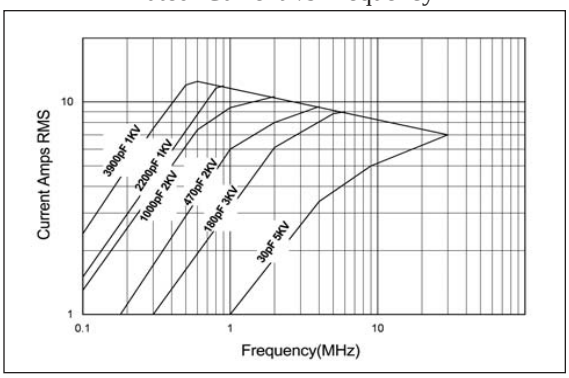
% Maximum Current vs Amhient Temperature



6040C Wire Terminals
Rated Current vs Frequency



6040C Strip Terminals
Rated Current vs Frequency



7676C (.760" x .760")

7676C (.760" x .760")

◆ Product Features

High Q, High RF Current/Voltage, High RF Power, Low ESR/ESL, Low Noise, Ultra- Stable Performance.

◆ 7676C Capacitance Table

Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC
1.0	1R0	B,C,D	5000V Code502 Extended Voltage 8000V Code802	33	330	F,G, J,K	5000V Code502 Extended Voltage 8000V Code802	820	821	F,G, J,K	2000V Code202 Extended Voltage 5000V Code502
1.2	1R2			39	390			1000	102		
1.5	1R5			47	470			1200	122		
1.8	1R8			56	560			1500	152		
2.2	2R2			68	680			1800	182		
2.7	2R7			82	820			2200	222		
3.3	3R3			100	101			2700	272		
3.9	3R9			120	121			3300	332		
4.7	4R7			150	151			4700	472		
5.6	5R6			180	181			5100	512		
6.8	6R8			220	221			5600	562	G, J,K	1000V Code102 Extended Voltage 3000V Code302
8.2	8R2			270	271		3000V Code302 Extended Voltage 5000V Code502	6800	682		
10	100	F,G, J,K		300	301			7500	752		
12	120			390	391			8200	822		
15	150			470	471			10000	103		
18	180			560	561						
22	220			680	681						
27	270										

◆ Part Numbering

7676C 101 J AR 502 X T

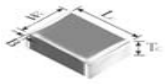
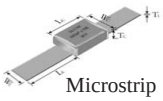
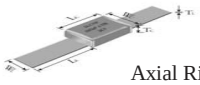
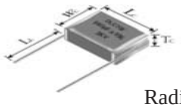
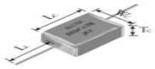
- 7676C: 7676 Series
- 101: Capacitor Code 101=10x10¹=100, 1R0=1.0pF
- J: CapacitanceTolerance See below list
- AR: Termination Type
- 502: Rated Voltage
- X: Laser Marking
- T: Packaging Type — T:Bulk packaging in a tray

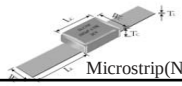
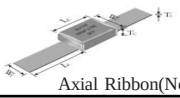
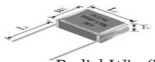
Capacitance Tolerance								
Code	A	B	C	D	F	G	J	K
Tolerance	±0.05pF	±0.1pF	±0.25pF	±0.5pF	±1%	±2%	±5%	±10%

◆ 7676C Lead Type and Dimensions

7676C (.760" x .760")

unit: inch (millimeter)

Series	Term. Code	Type/ Outlines	Capacitor Dimensions				Overlap and Lead Dimensions			Plated Material
			Length Lc	Width Wc	Thick-ness Tc	Overlap B	Length LL	Width WL	Thick-ness TL	
7676C	W	 Chip	.760 +.015 to -.010 (19.3 +0.38 to -0.25)	.760 ±.010 (19.3± 0.25)	.154 ± .008 (3.90 ±0.20)	.063 (1.60) max	-	-	-	Nickel , Plated 100%Sn,
7676C	MS	 Microstrip				-	.787 (20.00) min	.591 ± .010 (15.0± 0.25)	.008 ± .001 (0.20± 0.025)	Silver-plated Copper
7676C	AR	 Axial Ribbon								
7676C	RW	 Radial Wire					.787 (20.00) min	Dia.=.03± .004 0.80 ± 0.10		
7676C	AW	 Axial Wire					1.181 (30.00) min			

Series	Term. Code	Type/ Outlines	Capacitor Dimensions				Overlap and Lead Dimensions			Plated Material
			Length Lc	Width Wc	Thick-ness Tc	Overlap B	Length LL	Width WL	Thick-ness TL	
7676C	P	Chip(Non-Mag)	.760 +.015 to -.010 (19.3 +0.38 to -0.25)	.760 ±.010 (19.3± 0.25)	.154 ± .008 (3.90 ±0.20)	.063 (1.60) max	-	-	-	Non-mag, Copper Plated 100% Sn
7676C	MN	 Microstrip(Non-Mag)				-	.787 (20.00)min	.591 ± .01 0 (15.0 ± 0.25)	.008 ± .0 01 (0.20 ± 0.02 5)	Silver-plated Copper
7676C	AN	 Axial Ribbon(Non-Mag)								
7676C	RN	 Radial Wire(Non-Mag)					.787 (20.00)min	Dia.=.03± .004 0.80 ± 0.10		
7676C	BN	Axial Wire(Non-Mag)					1.181 (30.00)min			

Note: non-mag is no magnetism.

◆ Performance

Item	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 Megohms min. @ +25℃ at rated WVDC. 10^4 Megohms min. @ +125℃ at rated WVDC.
Rated Voltage	See Rated Voltage Table.
Dielectric Withstanding Voltage (DWV)	250% of Voltage for 5 seconds, Rated Voltage ≦500VDC 150% of Voltage for 5 seconds, 500VDC < Rated Voltage ≦1250VDC 120% of Voltage for 5 seconds, Rated Voltage >1250VDC
Operating Temperature Range	-55℃ to +175℃
Temperature coefficient (TC)	0±30ppm/℃
Capacitance Drift	±0.02% or ±0.02pF, whichever is greater.
Piezoelectric Effects	None

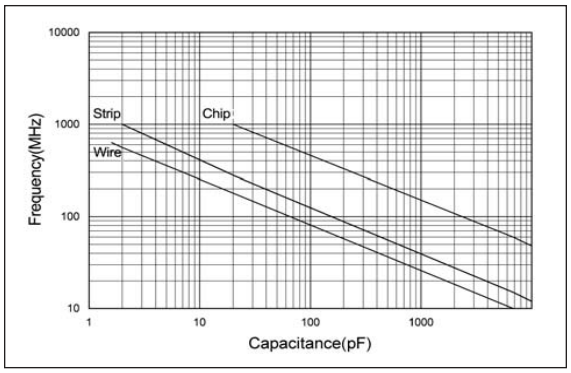
Capacitors are designed and manufactured to meet the requirements of MIL-PRF-55681 and MIL-PRF-123.

◆ Environmental Tests

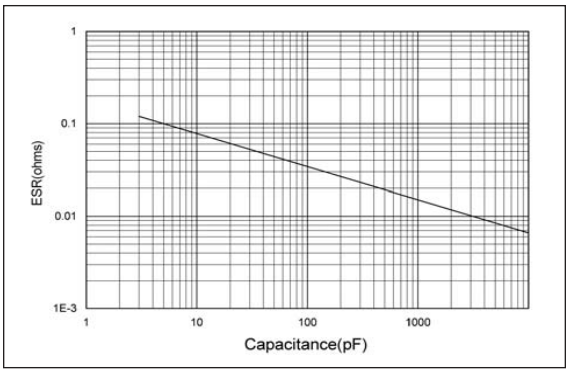
Item	Specifications	Method
Thermal shock	DWV: the initial value IR: Shall not be less than 30% of the initial value. Capacitance change: no more than 0.5% or 0.5 pF, whichever is greater.	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature(-55℃ and 175℃) stay 30min,The time of removing shall not be more than 3 minutes. Perform the 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 1.5 Volts D.C. applied while subjected to an environment of 85℃ 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 0.5 pF, whichever is greater.	MIL-STD-202, Method 108, for 2000 hours, at 125℃, 200% of Voltage for Capacitors, Rated Voltage ≦500VDC; 120% of Voltage for Capacitors, 500VDC < Rated Voltage ≦ 1250VDC; 100% of Voltage for Capacitors, Rated Voltage >1250VDC.
Terminal Strength	Microstrip：more than 20 N; Lead wire: more than 10 N.	MIL-STD-202, Method 211.

◆ 7676C Performance Curve

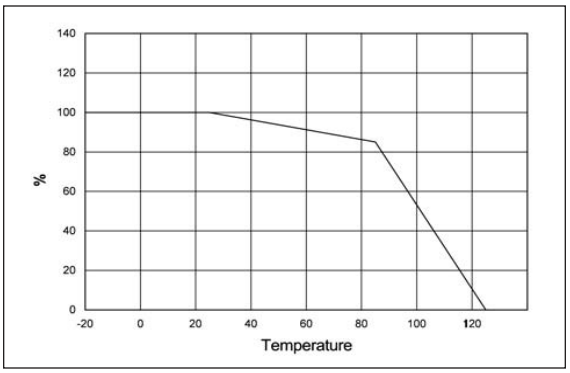
Self Resonant Frequency vs Capacitance



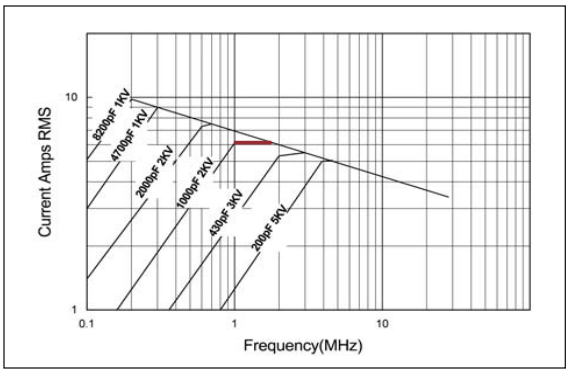
ESR vs Capacitance measured @ 30MHz



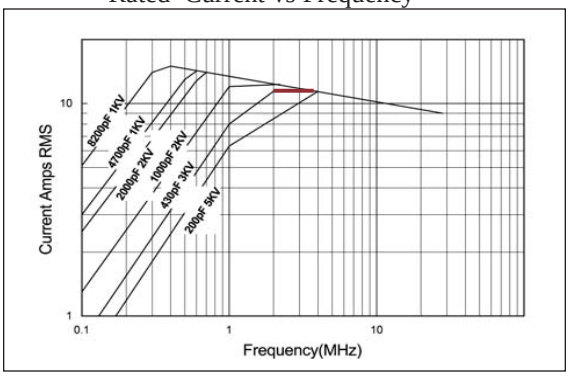
% Maximum Current vs Amhient Temperature

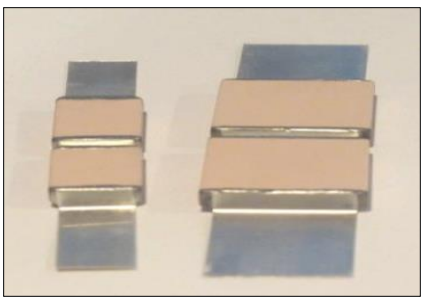


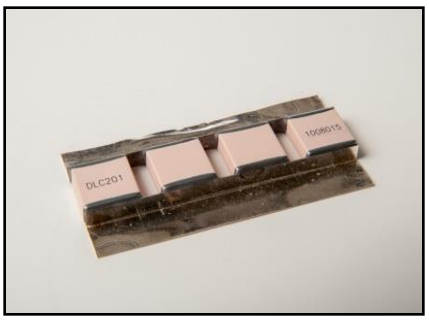
7676C Wire Terminals Rated Current vs Frequency

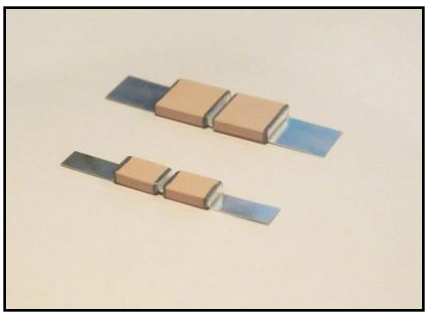


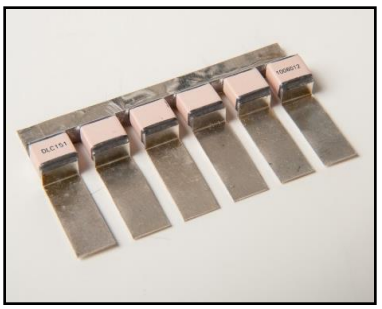
7676C Strip Terminals Rated Current vs Frequency

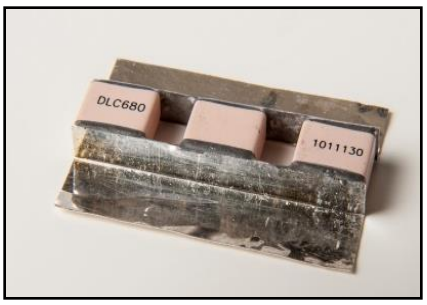


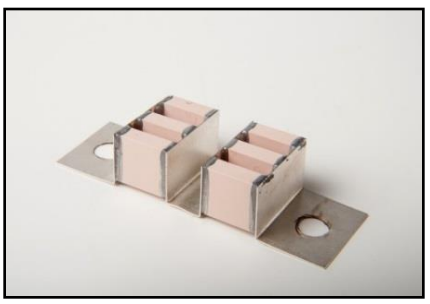


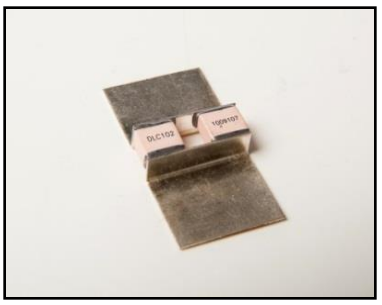












Please contact PPI (sales@passiveplus.com) to discuss custom assembly options.

Custom Capacitor Assemblies

◆ Product Features

High Operating Voltage, High Operating Current, Extended Capacitance, Tighter Tolerances,

High Reliability, High Q, Ultra-low ESR, Non-Magnetic.

◆ Typical Applications Field

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

◆ Part Numbering

P	6	C	22P	101	F	252	X
❶	❷	❸	❹	❺	❻	❼	❽
P : Parallel S : Series	Number Capacitors	S : Silver C : Copper	Cap. Size 11P: 1111 22P:2225 38P: 3838 60P: 6040 76P:7676	Capacitance	Tolerance	Rated Voltage	Laser Marking

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. S2S76P1222R5G203X

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

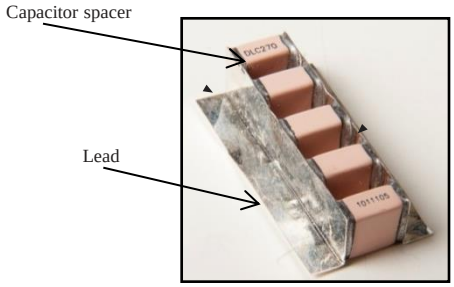
By Buyer's requirements using existing drawings, mechanical sketches, or we can help with capable modeling of assemblies thermal rise predictions.

◆ Typical Assembly Configurations

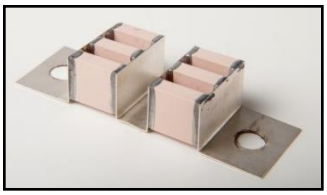
① Parallel Assemblies

unit:inch(millimeter)

	1111P/C	2225P/C	3838P/C	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 (19.1)	2.0 (50.8)		
Capacitor Spacer (typ.)	.050 or .078 (1.3 or 2)		.090(2.3)	.050 or .157 (1.3 or 4)	
Mtg Configuration	Horizontal/Vertical				



3838 Series/Parallel Combination

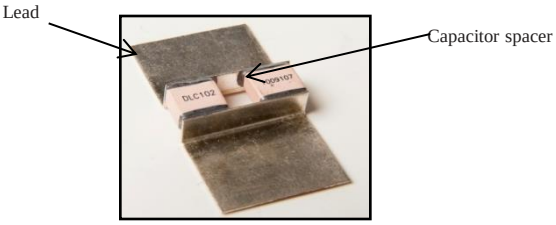


② Series Assemblies

unit:inch(millimeter)

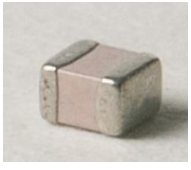
	2225P/C	3838P/C	6040C	7676C
Lead Type	L Bracket			
Lead Material	Silver-plated Copper or silver			
Lead Thickness	.010 (0.25)		.010 or .020 (0.25 or 0.51)	
Lead Length (max.)	.75 (19.1)	1.0 (25.4)		
Capacitor Spacer (typ.)	.050 to .157 (1.3 to 4)			
Mtg Configuration	Horizontal			

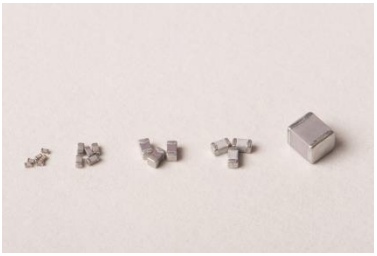
- Epoxy Molding Available



③ Other Assemblies

By Buyer's requirement





EIA Low ESR Microwave Capacitors

EIA Low ESR Microwave Capacitors

◆ Product Features

Lowest ESR, Highest working voltage, High self resonance frequencies (to25GHz).

◆ Product Application

Base station Products, L/C Filter.

◆ Part Numbering

0402	N	100	J	W	500	T
❶	❷	❸	❹	❺	❻	❽
Dimensions Code	Temperature Coefficient	Rated Capacitance	Tolerance	Termination Type	Rated Voltage	Packing Type

① Dimensions Code

unit: inch(millimeter)

	0201N	0402N	0603N	0805N	1111N
Length	.024±.001 (0.60±0.3)	.040±.004 (1.02±0.1)	.06±.006 (1.52±0.15)	.08±.010 (2.0 + 0.25 ~ -0.25)	0.110+.020~ .010 (2.79+0.51 ~ -0.25)
Width	.012±.001 (0.30±0.03)	.020±.004 (0.51±0.1)	.030±.006 (0.81±0.15)	.05±.010 (1.2±0.25)	.110±.010 (2.79±0.25)
Thickness	.012±.001 (0.30±0.3)	.020±.004 (0.51±0.1)	.03+.005 ~ -.003 (0.76+0.13 ~ -0.08)	.057(1.45)max	.10(2.6)max

② Temperature Coefficient: 0±30ppm/° C

③ Rated Capacitance

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

Capacitance is not less than 10pF; for example: 101=100pF. The third number is the power of 10.

④ Tolerance

Code	A	B	C	D	F	G	J	K	M
Tolerance	±0.05pF	±0.1pF	±0.25pF	±0.5pF	±1%	±2%	±5%	±10%	±20%

⑤ Termination Type

Code	W
Type	Nickel,Plated100% Sn(RoHS)

⑥ Rated Voltage

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

⑦ Laser Marking

Available upon request

⑧ Packaging Type

	0201N	0402N	0603N	0805N	1111N
T: Tape carrier packaging	√	√	√	√	√
B: Bulk packaging in a bag			√	√	√

◆ 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.

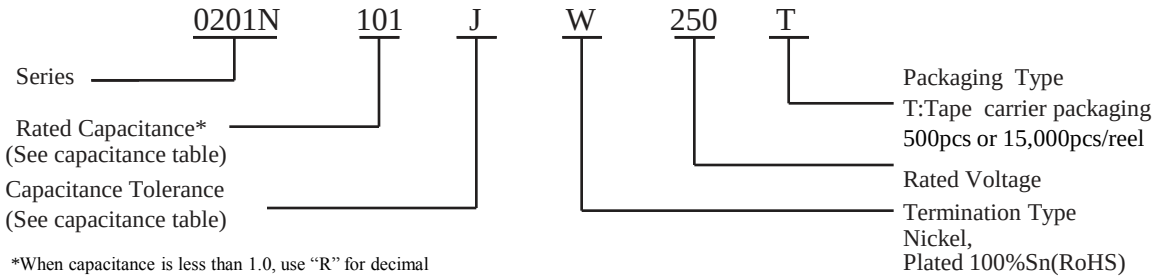
0201N (.020" x .010")

◆ 0201N Capacitance & Rated Voltage Table

Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC
0.1	0R1	A,B, C,D	25V Code 250	2.2	2R2	A,B, C,D	25V Code 250	16	160	F,G, J,K	25V Code 250
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			39	390		
1.1	1R1			5.6	5R6			43	430		
1.2	1R2			6.2	6R2	B,C, J,K		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		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						

Remark: special capacitance, tolerance and WVDC are available, consult with PASSIVE PLUS.

◆ Part Numbering



*When capacitance is less than 1.0, use "R" for decimal

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

◆ 0201N Chip Dimensions

unit:inch(millimeter)

Series	Term. Code	Type/Outlines	Capacitor Dimensions			Plated Material
			Length Lc	Width Wc	Thickness Tc	
0201N	W	Chip	.024±.001 (0.60±0.03)	.012±.001 (0.30±0.03)	.012±.001 (0.30±0.03)	Sn/Ni (RoHS)

Remark: for Non-Magnetic NP0 products please refer to page 67.

◆ Design Kits

These capacitors are 100% RoHS. Kits are available in Magnetic and Non-Magnetic that contain 10 (ten) pieces per value; number of values per kit varies, depending on case size and capacitance.

Kit	Description	Values	Tolerance
DKD0201N01	0201N .1pF - 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	+/-.1pF
DKD0201N02	0201N 1.0pF - 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, 8.2pF,	+/-.1pF
		10pF	+/-5%
DKD0201N03	0201N 10 - 100pF	10, 13, 15, 18, 20, 22, 27, 30, 39, 47, 56, 68, 75, 82, 91, 100pF	+/-5%

◆ Performance

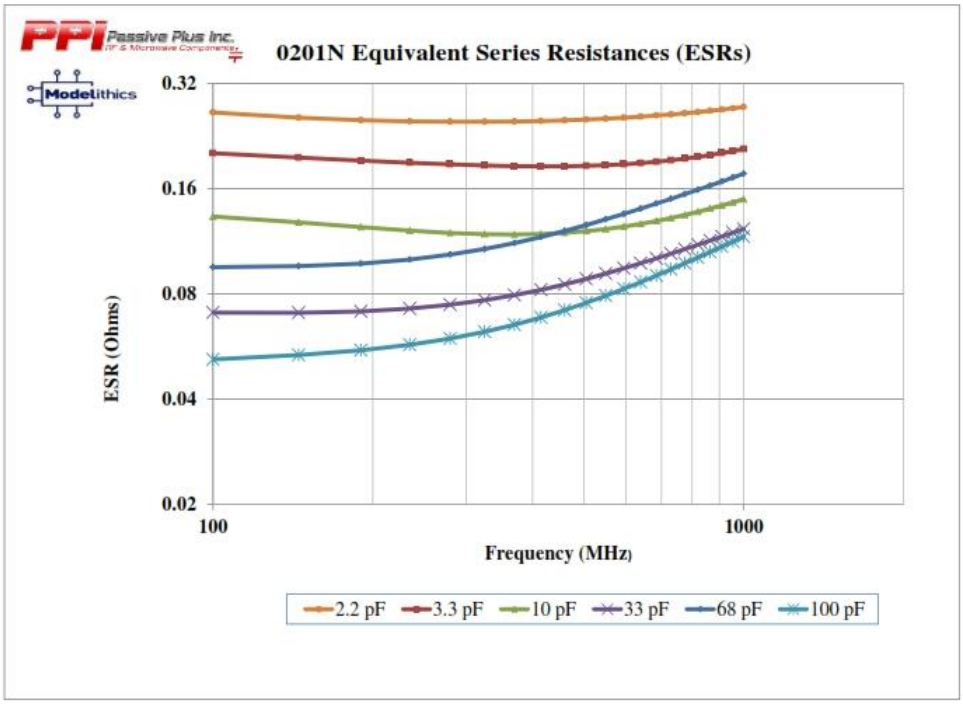
Item	Specifications
Quality Factor (Q)	2,000 min.
Insulation Resistance (IR)	10^5 Megohms min. @ +25 ℃ at rated WVDC. 10^4 Megohms min. @ +125 ℃ at rated WVDC.
Rated Voltage	25V
Dielectric Withstanding Voltage (DWV)	250% of rated Voltage for 5 seconds.
Operating Temperature Range	-55℃ to +125℃
Temperature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

◆ Environmental Tests

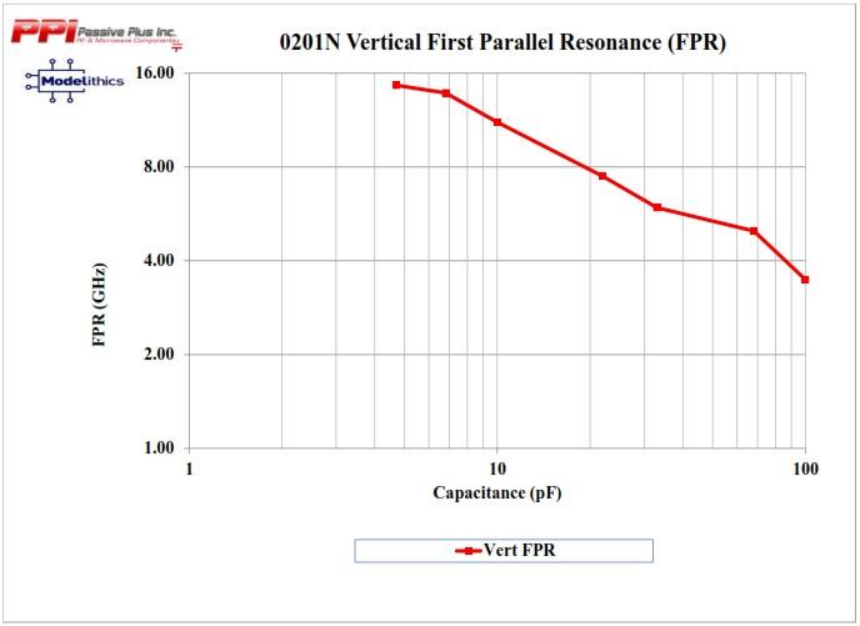
Item	Specifications	Method
Terminal Adhesion	Termination should not pull off. Ceramic should remain undamaged.	Linear pull force exerted on axial leads soldered to each terminal. 2.0lbs.
Resistance to soldering heat	No mechanical damage Capacitance change: -1.0% ~+2.0% Q>500 I.R. >10 G Ohms Breakdown voltage: 2.5 x WVDC	Preheat device to 150° C-180° C for 60 sec. Dip in 260 ℃±5 ℃solder for 10±1 sec. Measure after 24±2 hour cooling period.
Thermal Shock	No mechanical damage Capacitance change: ±0.5% or 0.5pF max Q>2000 I.R. >10 G Ohms Breakdown voltage: 2.5 x WVDC	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature(-55° Cand125° C) stay 30 minutes. The time of removing shall not be more than 3 minutes. Perform the five cycles.
Humidity, Steady State	No mechanical damage Capacitance change: ±0.5% or 0.5pF max. Q>300 I.R. >1 G Ohms Breakdown voltage: 2.5 x WVDC	MIL-STD-202, Method 106.
Low Voltage Humidity	No mechanical damage Capacitance change: ±0.3% or 0.3pF max. Q>300 I.R. >1 G Ohms Breakdown voltage: 2.5 x WVDC	MIL-STD-202, Method 103, Condition A, with 1.5 Volts D.C. 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. Q>500 I.R. >1 G Ohms Breakdown voltage: 2.5 x WVDC	MIL-STD-202, Method 108, for 1000 hours, at 125° C. 200% Rated voltage D.C. applied.

◆ 0201N Electrical Performance

ESR vs. Frequency



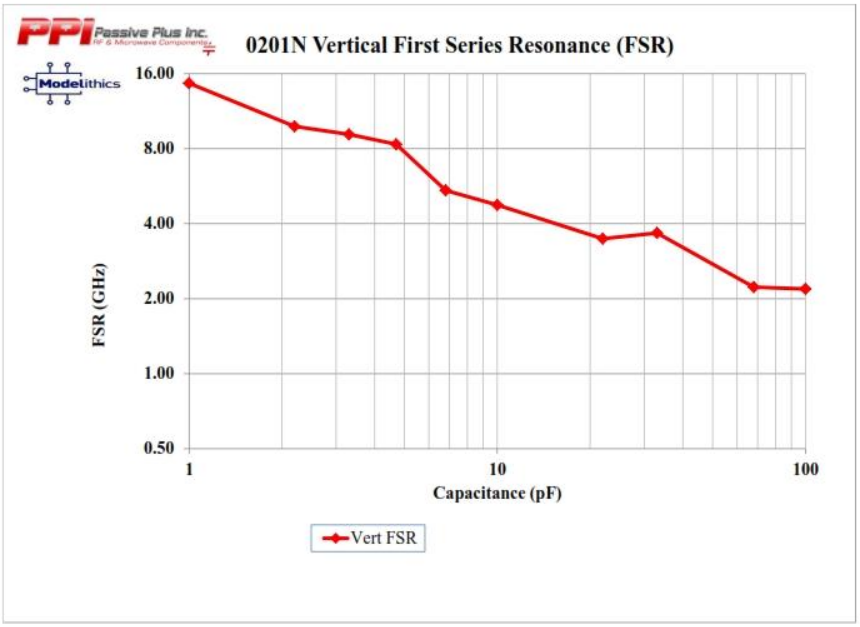
First Parallel Resonant Frequency vs. Capacitance



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.

◆ 0201N Performance Curve

First Series Resonant Frequency vs. Capacitance



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. FSR is dependent on internal capacitor structure; substrate thickness and dielectric constant; capacitor orientation, as defined alongside the FPR plot; and mounting pad dimensions.

Definitions and Measurement Conditions:

The definitions on the FPR and FSR charts 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 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.

S-Parameters can be found on the PPI website -- http://www.passiveplus.com/designsupp.php

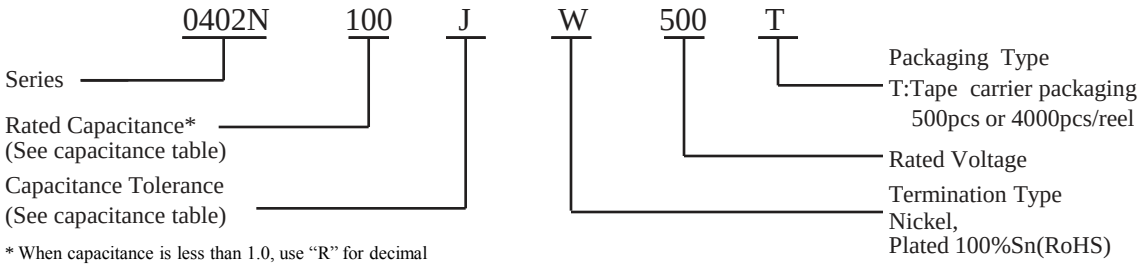
0402N (.040" x .020")

◆ 0402N Capacitance & Rated Voltage Table

Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC
0.1	0R1	A,B, C,D	50V Code 500 or 200V Code 201	2.0	2R0	A,B, C,D	50V Code 500 or 200V Code 201	10	100	F,G, J,K	50V Code 500
0.2	0R2			2.1	2R1			11	110		
0.3	0R3			2.2	2R2			12	120		
0.4	0R4			2.4	2R4			13	130		
0.5	0R5			2.7	2R7		50V Code 500	15	150		
0.6	0R6			3.0	3R0			16	160		
0.7	0R7			3.3	3R3			18	180		
0.8	0R8			3.6	3R6			20	200		
0.9	0R9			3.9	3R9			22	220		
1.0	1R0			4.3	4R3			24	240		
1.1	1R1			4.7	4R7			27	270		
1.2	1R2			5.1	5R1			30	300		
1.3	1R3			5.6	5R6			33	330		
1.4	1R4			6.2	6R2						
1.5	1R5			6.8	6R8	B,C, J,K					
1.6	1R6			7.5	7R5						
1.7	1R7			8.2	8R2						
1.8	1R8			9.1	9R1						
1.9	1R9										

Remark: special capacitance, tolerance and WVDC are available, consult with PASSIVE PLUS.

◆ Part Numbering



* When capacitance is less than 1.0, use "R" for decimal

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

◆ 0402N Chip Dimensions

unit:inch(millimeter)

Series	Term. Code	Type/Outlines	Capacitor Dimensions			Plated Material
			Length Lc	Width Wc	Thickness Tc	
0402N	W	Chip	040±.004 (1.02±0.1)	.020±.004 (0.51±0.1)	.020±.004 (0.51±0.1)	Sn/Ni (RoHS)

Remark: for Non-Magnetic NP0 products please refer to page 67.

◆ Design Kits

These capacitors are 100% RoHS. Kits are available in Magnetic and Non-Magnetic that contain 10 (ten) pieces per value; number of values per kit varies, depending on case size and capacitance.

Kit	Description	Values	Tolerance
DKD0402N01	0402N .1pF - 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	+/-.1pF
DKD0402N02	0402N 1.0pF - 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, 8.2pF,	+/-.1pF
		10pF	+/-5%
DKD0402N03	0402N 10 - 100pF	10, 13, 15, 18, 20, 22, 27, 30, 39, 47, 56, 68, 75, 82, 91, 100pF	+/-5%

◆ Performance

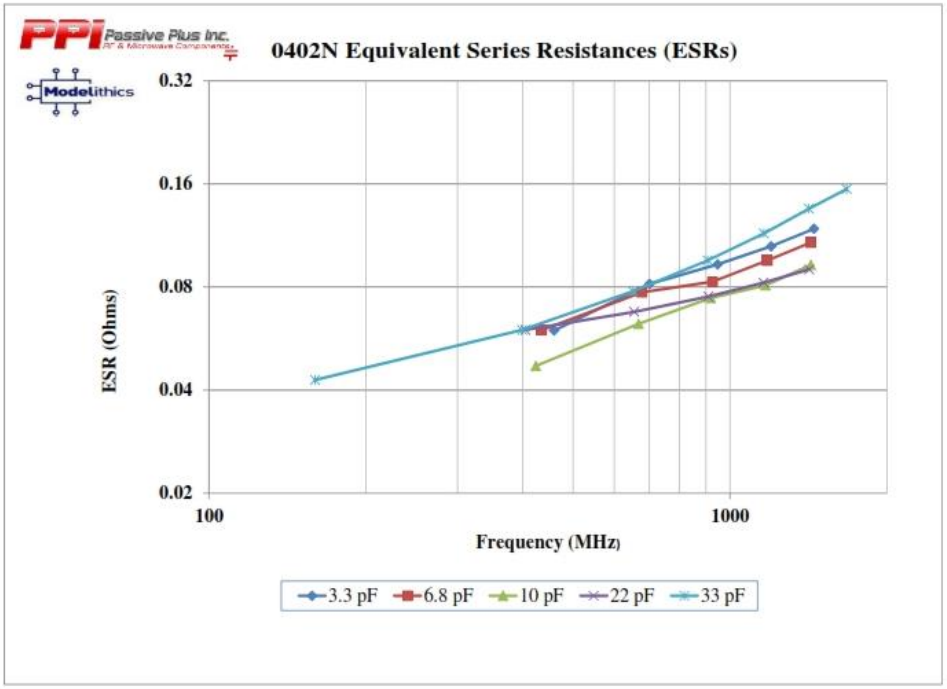
Item	Specifications
Quality Factor (Q)	2,000 min.
Insulation Resistance (IR)	10^5 Megohms min. @ +25 ℃ at rated WVDC 10^4 Megohms min. @ +125 ℃ at rated WVDC
Rated Voltage	50V
Dielectric Withstanding Voltage (DWV)	250% of rated voltage for 5 seconds.
Operating Temperature Range	-55 ℃ to +125 ℃
Temperature coefficient (TC)	0±30ppm/℃
Capacitance Drift	±0.02% or ±0.02pF, whichever is greater.
Piezoelectric Effects	None

◆ Environmental Tests

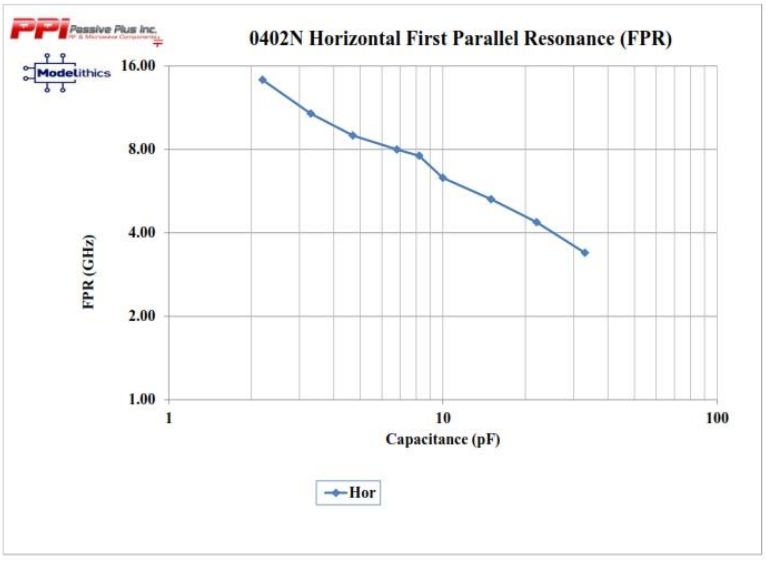
Item	Specifications	Method
Terminal Adhesion	Termination should not pull off. Ceramic should remain undamaged.	Linear pull force exerted on axial leads soldered to each terminal. 2.0lbs.
Resistance To soldering heat	No mechanical damage Capacitance change: -1.0% ~ +2.0% Q>500 I.R. >10 G Ohms Breakdown voltage: 2.5 x WVDC	Preheat device to 150 ℃ -180 ℃ for 60 sec. Dip in 260 ℃±5 ℃solder for 10±1 sec. Measure after 24±2 hour cooling period.
Thermal Shock	No mechanical damage Capacitance change: ±0.5% or 0.5pF max Q>2000 I.R. >10 G Ohms Breakdown voltage: 2.5x WVDC	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature (-55 ℃ and 125 ℃) stay 30 minutes. The time of removing shall not be more than 3 minutes. Perform the five cycles.
Humidity, Steady State	No mechanical damage Capacitance change: ±0.5% or 0.5pF max. Q>300 I.R. >1 G Ohms Breakdown voltage: 2.5 x WVDC	MIL-STD-202, Method 106.
Low Voltage Humidity	No mechanical damage Capacitance change: ±0.3% or 0.3pF max. Q>300 I.R. >1 G Ohms Breakdown voltage: 2.5 x WVDC	MIL-STD-202, Method 103, Condition A, with 1.5 Volts D.C. applied while subjected to an environment of 85 ℃ with 85% relative humidity for 240 hours minimum.
Life	No mechanical damage Capacitance change: ±2.0% or 0.5pF max. Q>500 I.R. >1 G Ohms Breakdown voltage: 2.5 x WVDC	MIL-STD-202, Method 108, for 1000 hours, at 125 ℃ . 200% Rated voltage D.C. applied.

◆ 0402N Electrical Performance

ESR vs. Frequency



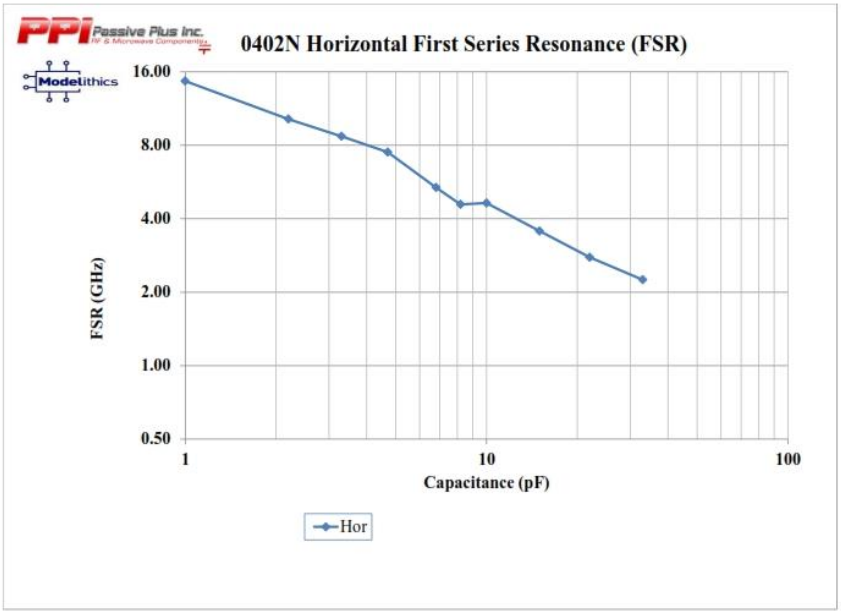
First Parallel Resonant Frequency vs. Capacitance



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 electrode planes are parallel to the substrate.

0402N (.040" x .020")

First Series Resonant Frequency vs. Capacitance



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. FSR is dependent on internal capacitor structure; substrate thickness and dielectric constant; capacitor orientation, as defined alongside the FPR plot; and mounting pad dimensions.

Definitions and Measurement conditions:

The definitions on the charts 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; substrate thickness (mils) = 10; gap in microstrip trace (mils) = 15; microstrip trace width (mils) = 22; **Reference planes at sample edges.**

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

S-Parameters can be found on the PPI Website http://www.passiveplus.com/designsupp.php

0603N (.060" x .030")

◆ 0603N Capacitance & Rated Voltage Table

Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC
0.1	0R1	A,B, C,D	250V Code 251	2.2	2R2	A,B, C,D	250V Code 251	16	160	F,G, J,K	250V Code 251
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			39	390		
1.1	1R1			5.6	5R6			43	430		
1.2	1R2			6.2	6R2	B,C, J,K		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		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						

Remark: special capacitance, tolerance and WVDC are available, consult with PASSIVE PLUS.

◆ Part Numbering

0603N 101 J W 251 T

- 0603N — Series
- 101 — Rated Capacitance * (See capacitance table)
- J — Capacitance Tolerance (See capacitance table)
- W — Termination Type Nickel,Plated 100%Sn(RoHS) Note:Laser marking is available on request.
- 251 — Rated Voltage
- T — Packaging Type T:Tapecarrierpackaging500 pcs or 4000pcs/reel

* When capacitance is less than 1.0, use "R" for decimal

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

◆ 0603N Chip Dimensions

unit: inch (millimeter)

Series	Term. Code	Type/Outlines	Capacitor Dimensions			Plated Material
			Length Lc	Width Wc	Thickness Tc	
0603N	W	Chip	.060±.006 (1.52±0.15)	.030±.006 (0.81±0.15)	.030 ±.005 ~ -.003 (0.76 +0.13 ~ -0.08)	Sn/Ni (RoHS)

Remark: for Non-Magnetic NP0 products please refer to page 67.

◆ Design Kits

These capacitors are 100% RoHS. Kits are available in Magnetic and Non-Magnetic that contain 10 (ten) pieces per value; number of values per kit varies, depending on case size and capacitance.

Kit	Description	Values	Tolerance
DKD0603N01	0603N .1pF - 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	+/-.1pF
DKD0603N02	0603N 1.0pF - 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, 8.2pF,	+/-.1pF
		10pF	+/-5%
DKD0603N03	0603N 10 - 100pF	10, 13, 15, 18, 20, 22, 27, 30, 39, 47, 56, 68, 75, 82, 91, 100pF	+/-5%

◆ Performance

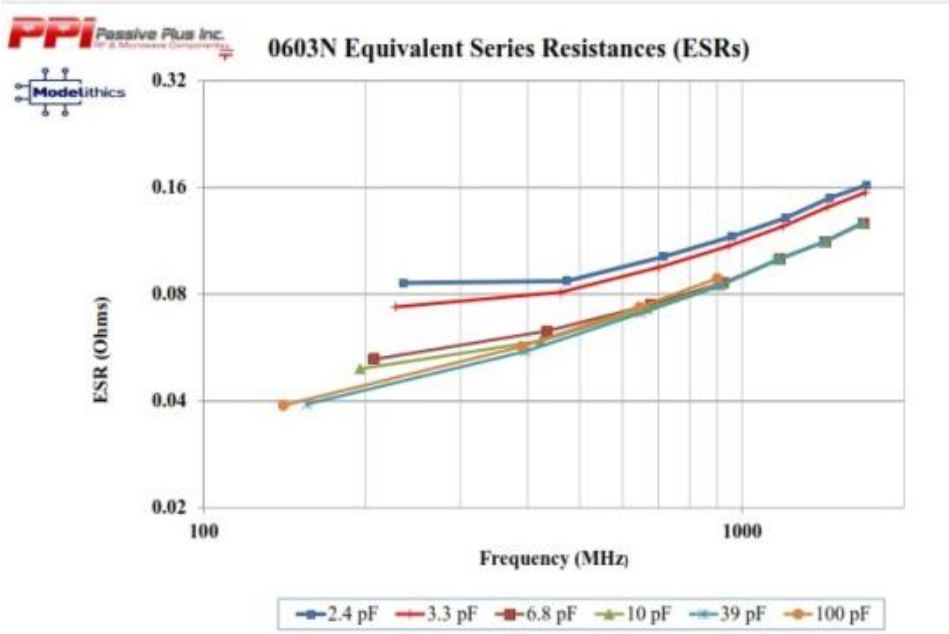
Item	Specifications
Quality Factor (Q)	2,000 min.
Insulation Resistance (IR)	10^5 Megohms min. @ +25 ℃ at rated WVDC. 10^4 Megohms min. @ +125 ℃ at rated WVDC.
Rated Voltage	250V
Dielectric Withstanding Voltage (DWV)	250% of rated Voltage for 5 seconds.
Operating Temperature Range	-55℃ to +125℃
Temperature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

◆ Environmental Tests

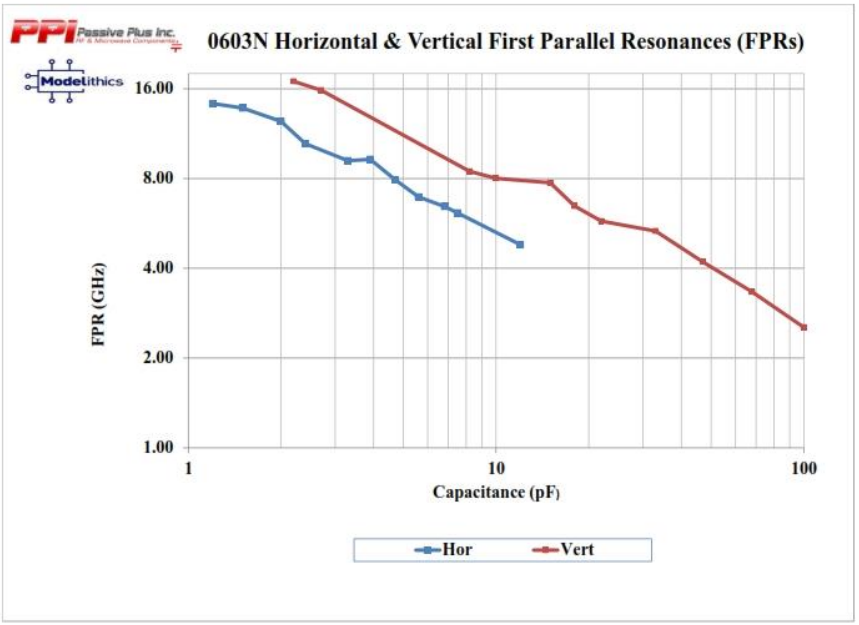
Item	Specifications	Method
Terminal Adhesion	Termination should not pull off. Ceramic should remain undamaged.	Linear pull force exerted on axial leads soldered to each terminal. 2.0lbs.
Resistance To soldering heat	No mechanical damage Capacitance change: -1.0% ~+2.0% Q>500 I.R. >10 G Ohms Breakdown voltage: 2.5 x WVDC	Preheat device to 150° C-180° C for 60 sec. Dip in 260 ℃±5 ℃solder for 10±1 sec. Measure after 24±2 hour cooling period.
Thermal Shock	No mechanical damage Capacitance change: ±0.5% or 0.5pF max Q>2000 I.R. >10 G Ohms Breakdown voltage: 2.5 x WVDC	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature(-55° Cand125° C) stay 30 minutes. The time of removing shall not be more than 3 minutes. Perform the five cycles.
Humidity, Steady State	No mechanical damage Capacitance change: ±0.5% or 0.5pF max. Q>300 I.R. >1 G Ohms Breakdown voltage: 2.5 x WVDC	MIL-STD-202, Method 106.
Low Voltage Humidity	No mechanical damage Capacitance change: ±0.3% or 0.3pF max. Q>300 I.R. >1 G Ohms Breakdown voltage: 2.5 x WVDC	MIL-STD-202, Method 103, Condition A, with 1.5 Volts D.C. 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. Q>500 I.R. >1 G Ohms Breakdown voltage: 2.5 x WVDC	MIL-STD-202, Method 108, for 1000 hours, at 125° C. 200% Rated voltage D.C. applied.

◆ 0603N Electrical Performance

ESR vs. Frequency

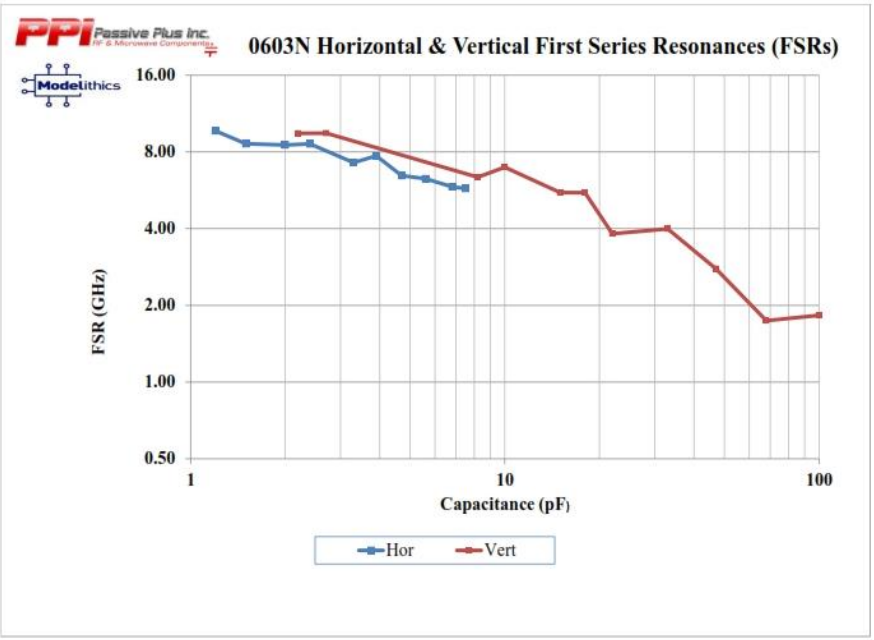


First Parallel Resonant Frequency vs. Capacitance



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.

First Series Resonant Frequency vs. Capacitance



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. FSR is dependent on internal capacitor structure; substrate thickness and dielectric constant; capacitor orientation, as defined alongside the FPR plot; and mounting pad dimensions.

Definitions and Measurement conditions:

The definitions on the charts 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 RT/duroid® 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.

S-Parameters can be found on the PPI Website-- http://www.passiveplus.com/designsupp.php

0805N (.080" x .050")

◆0805N Capacitance & Rated Voltage Table

Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC
0.1	0R1	A,B, C,D	250V Code 251	3.0	3R0	A,B, C,D	250V Code 251	30	300	F,G, J,K	250V Code 251
0.2	0R2			3.3	3R3			33	330		
0.3	0R3			3.6	3R6			36	360		
0.4	0R4			3.9	3R9			39	390		
0.5	0R5			4.3	4R3			43	430		
0.6	0R6			4.7	4R7			47	470		
0.7	0R7			5.1	5R1			51	510		
0.8	0R8			5.6	5R6			56	560		
0.9	0R9			6.2	6R2			62	620		
1.0	1R0			6.8	6R8	B,C, J,K		68	680		
1.1	1R1			7.5	7R5			75	750		
1.2	1R2			8.2	8R2			82	820		
1.3	1R3			9.1	9R1			91	910		
1.4	1R4			10	100	F,G, J,K		100	100		
1.5	1R5			11	110			110	111		
1.6	1R6			12	120			120	121		
1.7	1R7			13	130			130	131		
1.8	1R8			15	150			150	151		
1.9	1R9			16	160			160	161		
2.0	2R0			18	180			180	181		
2.1	2R1			20	200			200	201		
2.2	2R2			22	220			220	221		
2.4	2R4			24	240						
2.7	2R7			27	270						

Remark: special capacitance, tolerance and WVDC are available, consult with PASSIVE PLUS.

◆ Part Numbering

0805N 101 J W 251 T

Series

Rated Capacitance*
(See capacitance table)

Capacitance Tolerance
(See capacitance table)

Packaging Type
T:Tape carrier packaging500pcs or 4000pcs/reel

Rated Voltage

Termination Type
Nickel, Plated 100%Sn(RoHS)
Note: Laser marking is available on request.

*When capacitance is less than 1.0, use "R" for decimal

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

◆ 0805N Chip Dimensions

unit:inch(millimeter)

Series	Term. Code	Type/Outlines	Capacitor Dimensions			Plated Material
			Length Lc	Width Wc	Thickness Tc	
0805N	W	Chip	.080±.01 (2.0+0.25 ~-0.25)	.050±.01 (1.2±0.25)	.057(1.45) max	Sn/Ni (RoHS)

Remark: for Non-Magnetic NP0 products please refer to page 67.

◆ Design Kits

These capacitors are 100% RoHS. Kits are available in Magnetic and Non-Magnetic that contain 10 (ten) pieces per value ; number of values per kit varies, depending on case size and capacitance.

Kits	Description	Values	Tolerances
DKD0805N01	0805N .1pF - 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	+/-.1pF
DKD0805N02	0805N 1.0pF - 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, 8.2pF,	+/-.1pF
		10pF	+/-5%
DKD0805N03	0805N 10pF - 100pF	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF	+/-5%
DKD0805N04	0805N 10pF - 220pF	10, 15, 18, 20, 24, 27, 30, 39, 47, 56, 68, 82, 100, 120, 150, 180, 220pF	+/-5%

◆ Performance

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

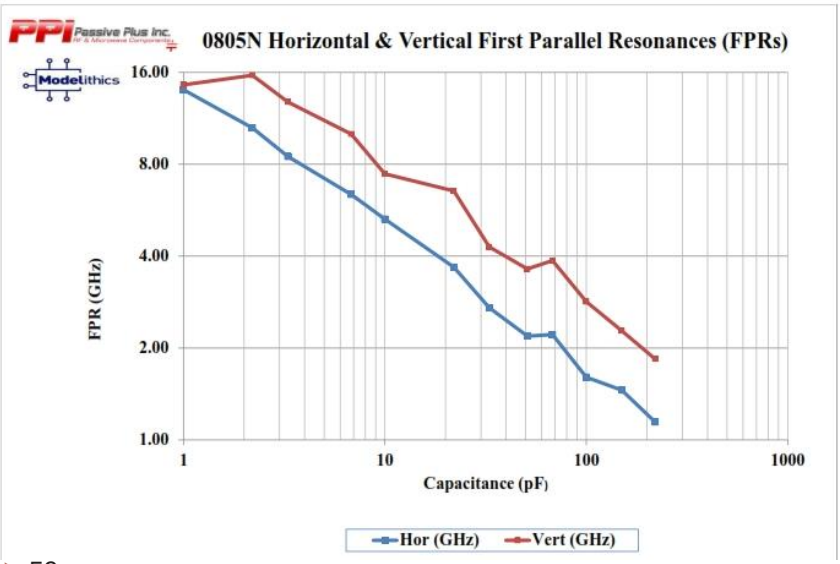
◆ Environmental Tests

Item	Specifications	Method
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% Q>500 I.R. >10 G Ohms Breakdown voltage: 2.5 x WVDC	Preheat device to 150° C-180° C for 60 sec. Dip in 260 ℃±5 ℃solder for 10±1 sec. Measure after 24±2 hour cooling period.
Thermal Shock	No mechanical damage Capacitance change: ±0.5% or 0.5pF max Q>2000 I.R. >10 G Ohms Breakdown voltage: 2.5 x WVDC	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature(-55° Cand125° C) stay 30 minutes. The time of removing shall not be more than 3 minutes. Perform the five cycles.
Humidity, Steady State	No mechanical damage Capacitance change: ±0.5% or 0.5pF max. Q>300 I.R. >1 G Ohms Breakdown voltage: 2.5 x WVDC	MIL-STD-202, Method 106.
Low Voltage Humidity	No mechanical damage Capacitance change: ±0.3% or 0.3pF max. Q>300 I.R. >1 G Ohms Breakdown voltage: 2.5 x WVDC	MIL-STD-202, Method 103, Condition A, with 1.5 Volts D.C. 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. Q>500 I.R. >1 G Ohms Breakdown voltage: 2.5 x WVDC	MIL-STD-202, Method 108, for 1000 hours, at 125° C. 200% Rated voltage D.C. applied.

◆ 0805N Electrical Performance

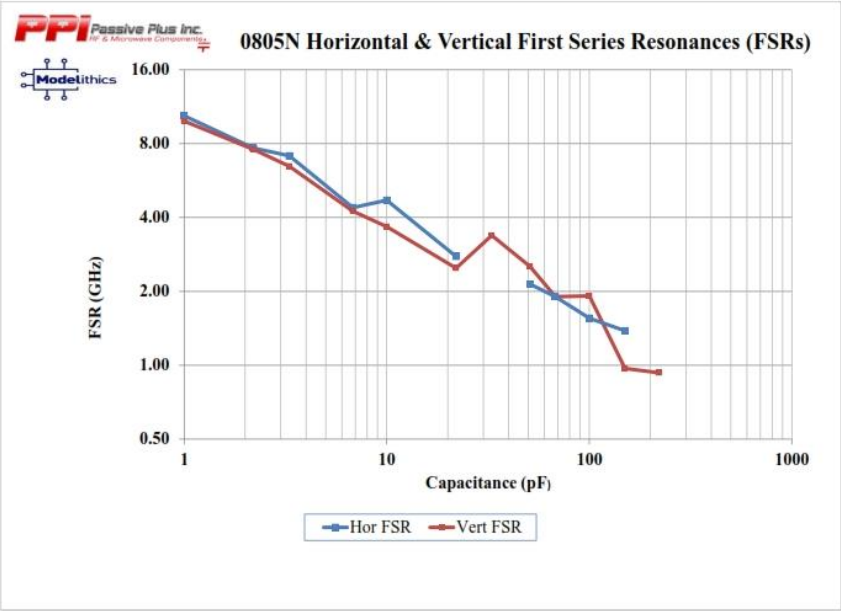
ESR vs. Frequency

First Parallel Resonant Frequency vs. Capacitance



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.

First Series Resonant Frequency vs. Capacitance



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. FSR is dependent on internal capacitor structure; substrate thickness and dielectric constant; capacitor orientation, as defined alongside the FPR plot; and mounting pad dimensions.

Definitions and Measurement conditions:

The definitions on the charts 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 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.

S-Parameters can be found on the PPI Website -- http://www.passiveplus.com/designsupp.php

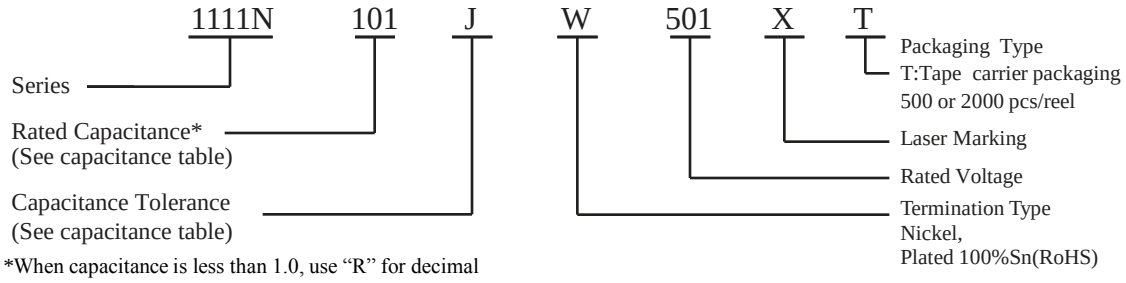
1111N (.110”x .110”)

◆ 1111N Capacitance & Rated Voltage Table

Cap. pF	Code	Tol.	WVDC V	Cap. pF	Code	Tol.	WVDC V	Cap. pF	Code	Tol.	WVDC V	Cap. pF	Code	Tol.	WVDC V
0.2	0R2	A, B, C,D	500V Code 501 Or 1000V Code 102	2.7	2R7	A, B, C, D	500V Code 501 Or 1000V Code 102	22	220	F, G, J, K	500V Code 501 Or 1000V Code 102	180	181	F, G, J, K	300V Code 301
0.3	0R3			3.0	3R0			24	240			200	201		
0.4	0R4			3.3	3R3			27	270			220	221		200V Code 201
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			43	430			360	361		
1.0	1R0			5.6	5R6			47	470			390	391		
1.1	1R1			6.2	6R2			51	510			430	431		
1.2	1R2			6.8	6R8			56	560			470	471		
1.3	1R3			7.5	7R5			62	620			510	511		100V Code 101
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		82	820			680	681		50V Code 500
1.7	1R7			11	110			91	910			750	751		
1.8	1R8			12	120			100	100			820	821		
1.9	1R9			13	130			110	111		300V Code 301	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						

Remark: special capacitance, tolerance and WVDC are available, consult with PASSIVE PLUS.

◆ Part Numbering



*When capacitance is less than 1.0, use "R" for decimal

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

◆ 1111N Chip Dimensions

unit:inch(millimeter)

Series	Term. Code	Type/Outlines	Capacitor Dimensions			Plated Material
			Length Lc	Width Wc	Thickness Tc	
1111N	W	Chip	.110 ±.020 ~ -.010 (2.79 +0.51 ~ -0.25)	.110±.010 (2.79±0.25)	.10 (2.6)max	Sn/Ni (RoHS)

Remark: for Non-Magnetic NP0 products please refer to page 67.

◆ Design Kits

These capacitors are 100% RoHS. Kits are available in Magnetic and Non-Magnetic that contain 10 (ten) pieces per value; number of values per kit varies, depending on case size and capacitance.

Kit	Description	Values	Tolerances
DKD1111N01	1111N 0.2pF - 10pF	0.2, 0.5, 0.7, 0.8, 1.0, 1.2, 1.5, 1.8, 2.0, 2.4, 2.7, 3.0, 3.3, 3.9, 4.7, 5.6, 6.8, 8.2pF,	+/-.1pF
		10pF	+/-5%
DKD1111N02	1111N 10-100pF	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF	+/-5%
DKD1111N03	1111N 100-1000pF	100, 120, 150, 180, 200, 220, 240, 270, 300, 390, 470, 560, 680, 820, 1000pF	+/-5%

1111N (.110" x .110")

◆ Performance

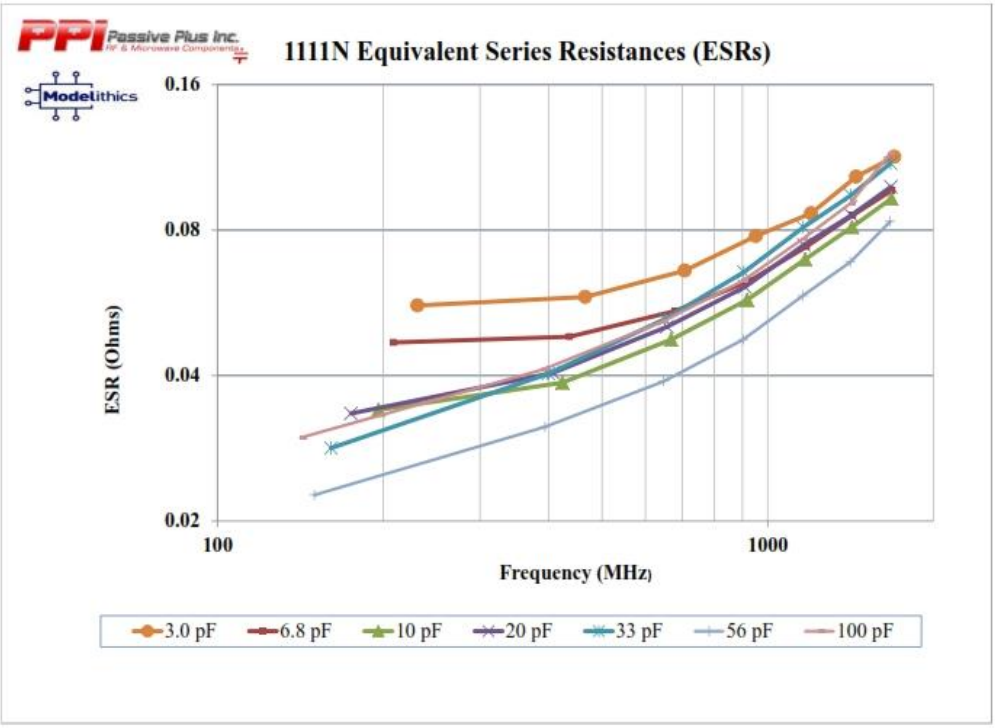
Item	Specifications
Quality Factor (Q)	2,000 min.
Insulation Resistance (IR)	10^5 Megohms min. @ +25 ℃ at rated WVDC. 10^4 Megohms min. @ +125 ℃ at rated WVDC.
Rated Voltage	See Capacitance Table
Dielectric Withstanding Voltage (DWV)	250% of Voltage for 5 seconds, Rated Voltage≤500VDC 150%of Voltage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

◆ Environmental Tests

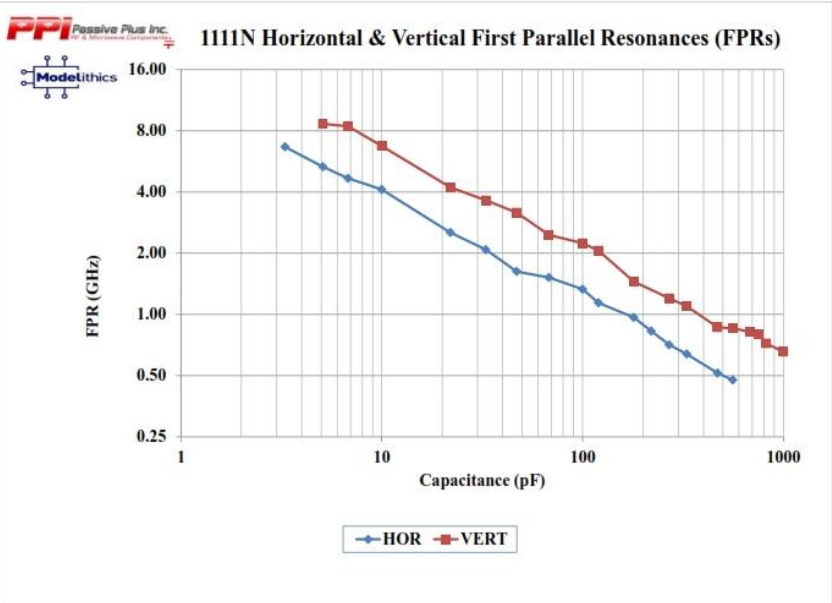
Item	Specifications	Method
Terminal Adhesion	Termination should not pull off. Ceramic should remain undamaged.	Linear pull force exerted on axial leads soldered to each terminal. 2.0lbs.
Resistance To soldering heat	No mechanical damage Capacitance change: -1.0% ~+2.0% Q>500 I.R. >10 G Ohms Breakdown voltage: 2.5 x WVDC	Preheat device to 150° C-180° C for 60 sec. Dip in 260 ℃±5 ℃solder for 10±1 sec. Measure after 24±2 hour cooling period.
Thermal Shock	No mechanical damage Capacitance change: ±0.5% or 0.5pF max Q>500 I.R. >10 G Ohms Breakdown voltage: 2.5 x WVDC	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature(-55° Cand125° C) stay 30 minutes. The time of removing shall not be more than 3 minutes. Perform the five cycles.
Humidity, Steady State	No mechanical damage Capacitance change: ±0.5% or 0.5pF max. Q>300 I.R. >1 G Ohms Breakdown voltage: 2.5 x WVDC	MIL-STD-202, Method 106.
Low Voltage Humidity	No mechanical damage Capacitance change: ±0.3% or 0.3pF max. Q>300 I.R. >1 G Ohms Breakdown voltage: 2.5 x WVDC	MIL-STD-202, Method 103, Condition A, with 1.5 Volts D.C. 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. Q>500 I.R. >1 G Ohms Breakdown voltage: 2.5 x WVDC	MIL-STD-202, Method 108, for 1000 hours, at 125° C. 200% of Voltage for Capacitors, Rated Voltage≤500VDC 120% of Voltage for Capacitors, 500VDC< Rated Voltage ≤1250VDC 100% of Voltage for Capacitors,Rated Voltage>1250VDC

◆ 1111N Electrical Performance

ESR vs. Frequency

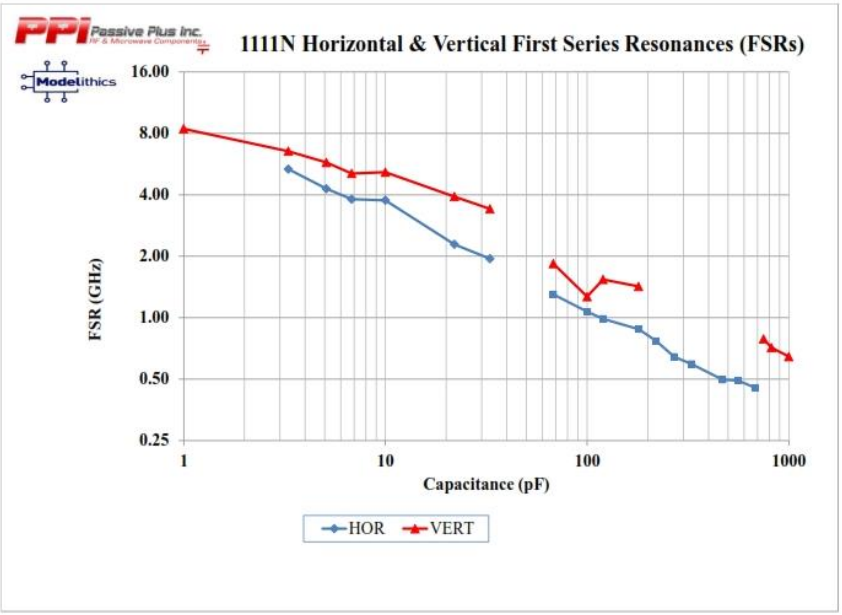


First Parallel Resonant Frequency vs. Capacitance



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.

First Series Resonant Frequency vs. Capacitance



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. FSR is dependent on internal capacitor structure; substrate thickness and dielectric constant; capacitor orientation, as defined alongside the FPR plot; and mounting pad dimensions.

Definitions and Measurement conditions:

The definitions on the charts 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, horizontal or vertical mount (mils) = 61.1; horizontal mount microstrip trace width (mils) = 123.7; vertical mount microstrip trace width (mils) = 101.0. **Reference planes at sample edges.**

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

S-Parameters can be found on the PPI Website -- http://www.passiveplus.com/designsupp.php

X7R RF By-Pass Capacitors

0505X (.055"x .055")

0505X (.055" x .055")

◆ 0505X Capacitance & Rated Voltage Table

Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC
470	471	K,M	50V Code 500	1500	152	K,M	50V Code 500	4700	472	K,M	50V Code 500
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		

Remark: special capacitance, tolerance and WVDC are available, consult with PASSIVE PLUS.

◆ 0505X Dimensions

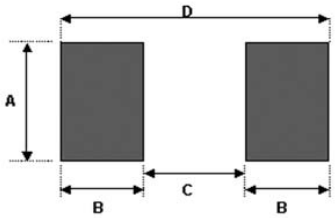
unit:inch(millimeter)

Series	Term. Code	Type/Outlines	Length(Lc)	Width(Wc)	Thickness(Tc)	B	Plated Material
0505X	W	Chip	.055+.015 ~ -.010 (1.40+0.38 ~ -0.25)	.055±.015 (1.40±0.38)	.057 (1.45) max	.014 ±.006 (.356 ±0.152)	Sn/Ni (RoHS)
	P						Cu (RoHS)
	L						Sn (90%)/Pb(10%)
	C						Ag/Pb
	CA						Au/Ni

◆ 0505X Recommended Mounting Pads

Size	A Min.	B Min.	C Min.	D Min.
VERT	.070"	.050"	.030"	.130"
HORIZ	.080"	.050"	.030"	.130"

VERT= Vertical Mount, HORIZ = Horizontal Mount



◆ Performance

Item	Specifications
Operating Temperature Range	-55℃to +125℃
Insulation Resistance (IR)	Insulation resistance @ +25℃ >1000ΩF Insulation resistance @ +125℃ >100ΩF
Temp Voltage Coefficient	+15/-25% Delta C (-55℃to +125℃)
Dielectric Withstanding Voltage (DWV)	2.5X WVDC, 5 seconds.
Max Dissipation Factor	.025(2.5%)Max
Test Parameters	1KHz,1.0VRMS,25℃
Terminal Strength	5lbs min per Mil-STD-202 method 211
Aging	3% max per decade hour
Working Voltage	See table

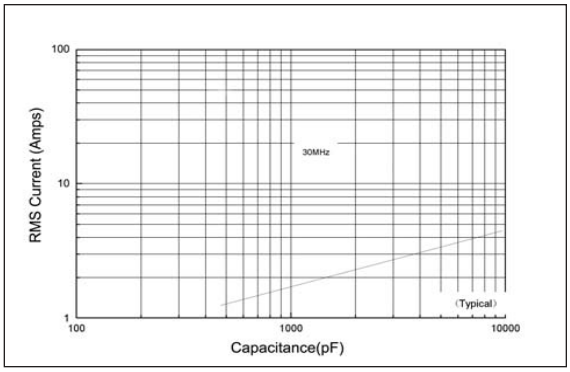
◆ Part Numbering

0505 X 10 2 M W 50 0 T

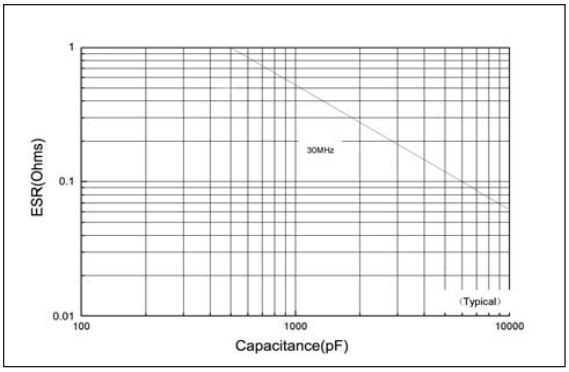
- 0505 — Case Size
- X — X7R Dielectric
- 10 — Capacitance Code -First 2 significant digits for capacitance
- 2 — Indicates number of zeros following digits of capacitance in pF
- M — Capacitance Tolerance (M tolerance = ±20%)
- W — Termination Choices: W=Sn/Ni(RoHS), L=Sn(90%)Pb(10%)Ni, C=Ag/Pb, CA=Au/Ni
- 50 — WVDC First 2 significant digits for Voltage
- 0 — Indicates number of zeros following digits of Voltage
- T — -7"Tape & Reel, 3000 pcs max per reel, TV= Vertical Tape & Reel (2000pcs)

◆ 0505X Performance Curve

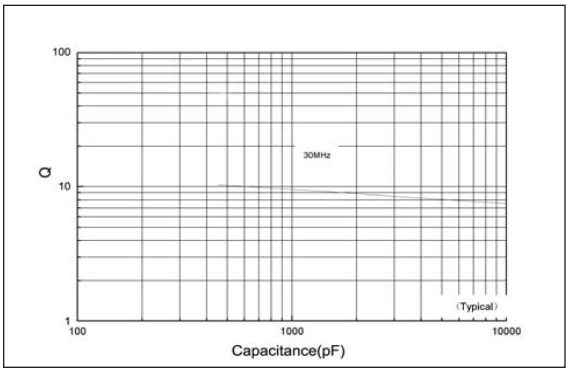
Current Rating vs Capacitance
RF 0505 Series



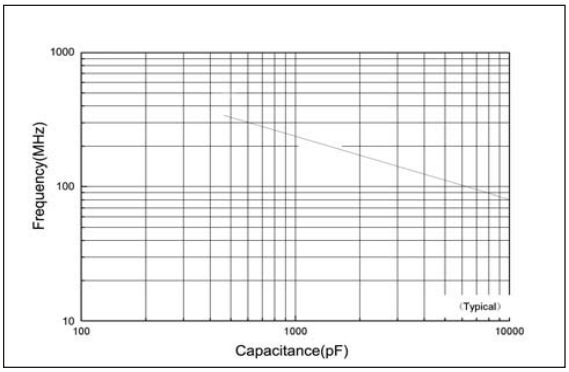
ESR vs Capacitance
RF 0505 Series



Q vs Capacitance
RF 0505 Series



Series Resonance vs Capacitance
RF 0505 Series



1111X (.110" x .110")

◆ 1111X Capacitance & Rated Voltage Table

Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC	Cap. pF	Code	Tol.	Rated WVDC
4700	472	K,M	50V Code 500	15000	153	K,M	50V Code 500	47000	473	K,M	50V Code 500
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		

Remark: special capacitance, tolerance and WVDC are available, consult with PASSIVE PLUS.

◆ 1111X Dimensions

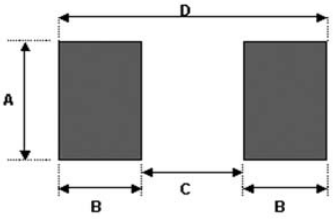
unit:inch(millimeter)

Series	Term. Code	Type/Outlines	Length(Lc)	Width(Wc)	Thickness(Tc)	B	Plated Material
1111X	W	Chip	.110+.025 ~ -.010 (2.79+0.64 ~ -0.25)	.110±.015 (2.79±0.38)	.102 (2.59) Max	.020 ±.010 (0.508 ±0.25)	Sn/Ni (RoHS)
	P						Cu (RoHS)
	L						Sn (90%)/Pb(10%)
	C						Ag/Pb
	CA						Au/Ni

◆ 1111X Recommended Mounting Pads

Size	A Min.	B Min.	C Min.	D Min.
VERT	.120"	.050"	.075"	.175"
HORIZ	.130"	.050"	.075"	.175"

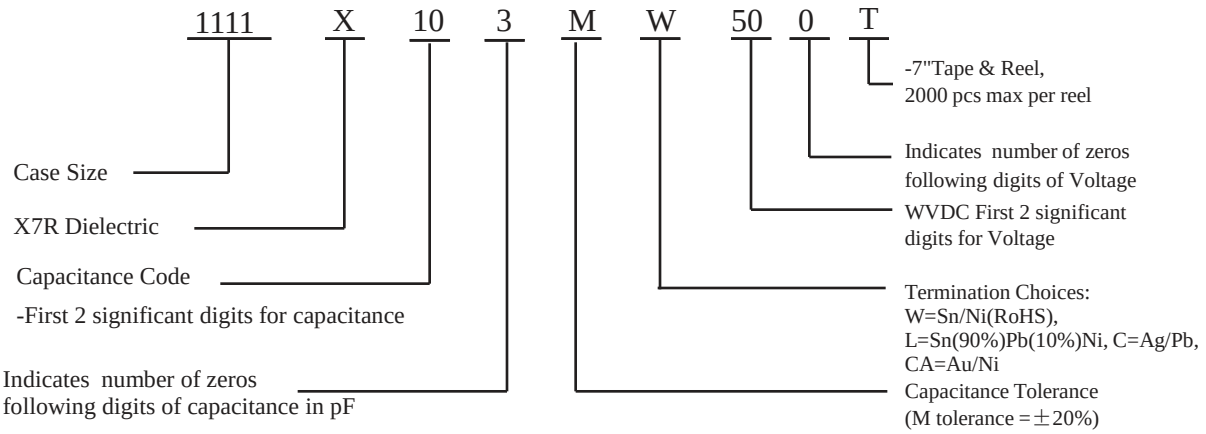
VERT= Vertical Mount, HORIZ = Horizontal Mount



◆ Performance

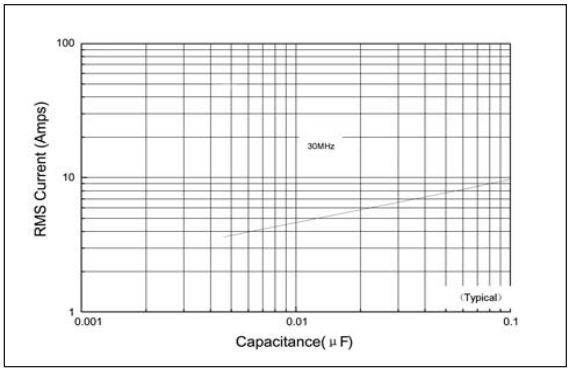
Item	Specifications
Operating Temperature Range	-55℃to +125℃
Insulation Resistance (IR)	Insulation resistance @ +25℃ >1000ΩF Insulation resistance @ +125℃ >100ΩF
Temp Voltage Coefficient	+15/-25% Delta C (-55℃to +125℃)
Dielectric Withstanding Voltage (DWV)	2.5X WVDC, 5 seconds.
Max Dissipation Factor	.025(2.5%)Max
Test Parameters	1KHz,1.0VRMS,25℃

◆ Part Numbering

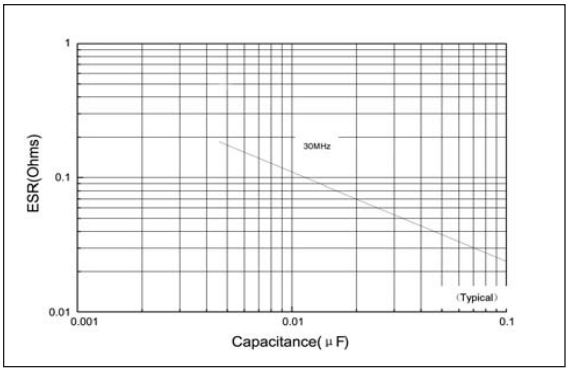


◆ 1111X Performance Curve

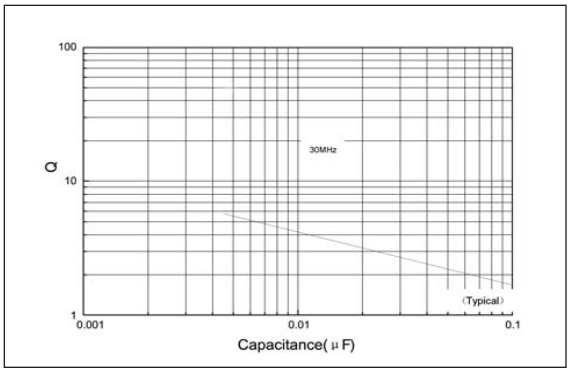
Current Rating vs Capacitance
RF 1111 Series



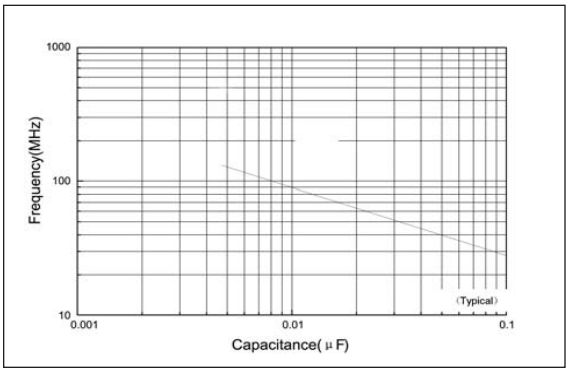
ESR vs Capacitance
RF 1111 Series



Q vs Capacitance
RF 1111 Series



Series Resonance vs Capacitance
RF 1111 Series



2225X (.220" x .250")

◆ 2225X Capacitance & Rated Voltage Table

Cap. uF	Code	Tol.	Rated WVDC	Cap. uF	Code	Tol.	Rated WVDC	Cap. uF	Code	Tol.	Rated WVDC
0.010	103	K,M	300V Code 301	0.082	823	K,M	200V Code 201	0.330	334	K,M	150V Code 151
0.012	123			0.100	104			0.470	474		
0.015	153			0.120	124			0.560	564		
0.022	223			0.150	154			0.680	684		
0.033	333		250V Code 251	0.220	224			0.820	824		100V Code 101
0.047	473							1.000	105		
0.068	683										

Remark: special capacitance, tolerance and WVDC are available, consult with PASSIVE PLUS.

◆ 2225X Dimensions

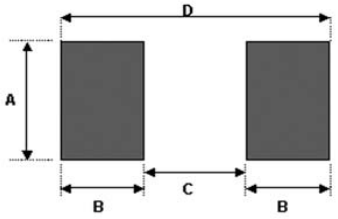
unit:inch(millimeter)

Series	Term. Code	Type/Outlines	Length (Lc)	Width (Wc)	Thickness (Tc)	B	Plated Material
2225X	W	Chip	.230+.020 ~ -.012 (5.84+0.51 ~ -0.30)	.250±.015 (6.35±0.38)	.165 (4.19) Max	.030 ±.015 (0.762 ±0.38)	Sn/Ni (RoHS)
	P						Cu (RoHS)
	L						Sn (90%)/Pb(10%)
	C						Ag/Pb
	CA						Au/Ni

◆ 2225X Recommended Mounting Pads

Size	A Min.	B Min.	C Min.	D Min.
VERT	.185"	.050"	.200"	.300"
HORIZ	.280"	.050"	.200"	.300"

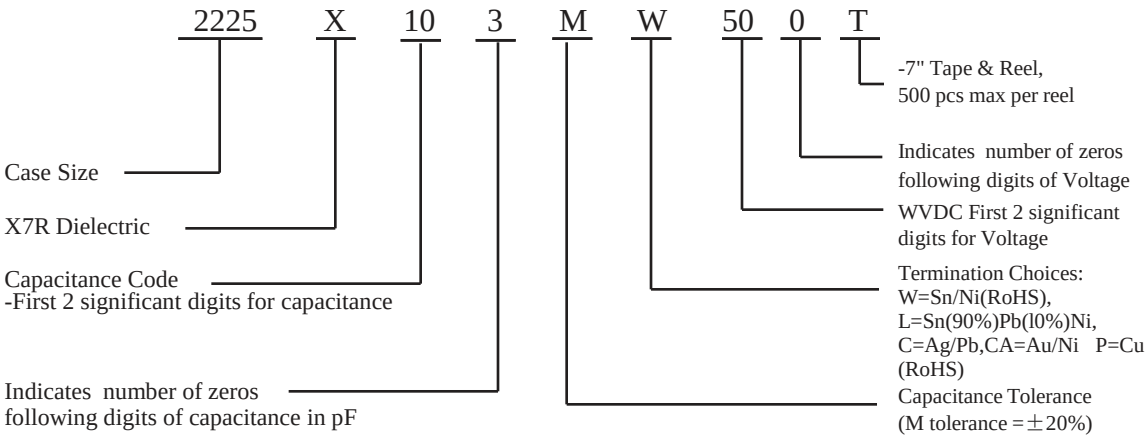
VERT= Vertical Mount, HORIZ = Horizontal Mount



◆ Performance

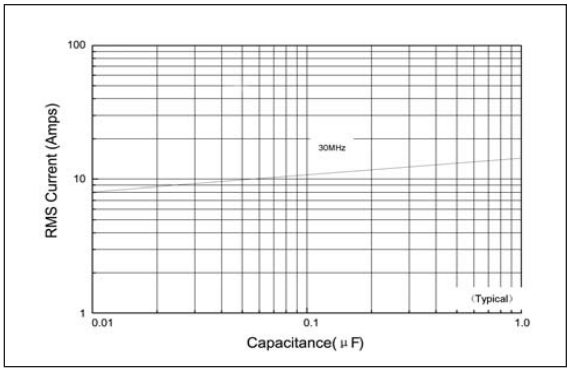
Item	Specifications
Operating Temperature Range	-55℃to +125℃
Insulation Resistance (IR)	Insulation resistance @ +25℃ >1000ΩF Insulation resistance @ +125℃ >100ΩF
Temp Voltage Coefficient	±15%Maximum
Dielectric Withstanding Voltage (DWV)	2.5X WVDC, 5 seconds.
Max Dissipation Factor	.025(2.5%)Max
Test Parameters	1KHz,1.0VRMS,25℃

◆ Part Numbering

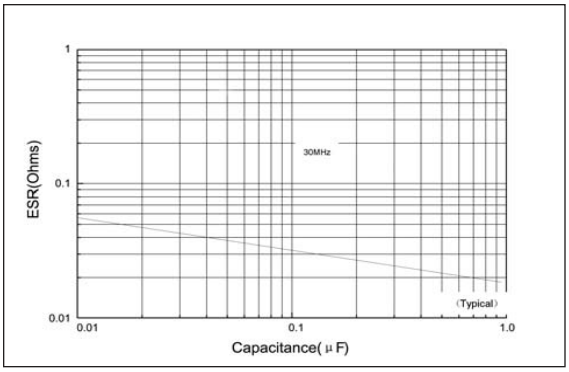


◆ 2225X Performance Curve

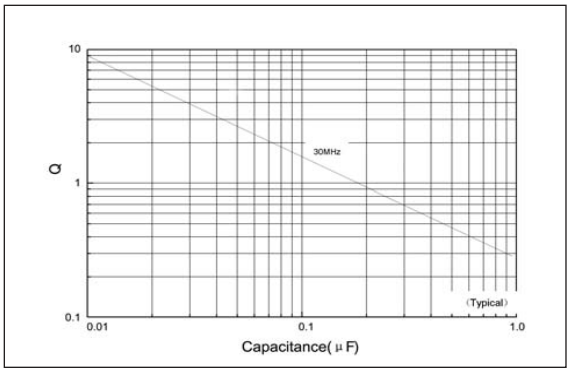
Current Rating vs Capacitance
RF 2225 Series



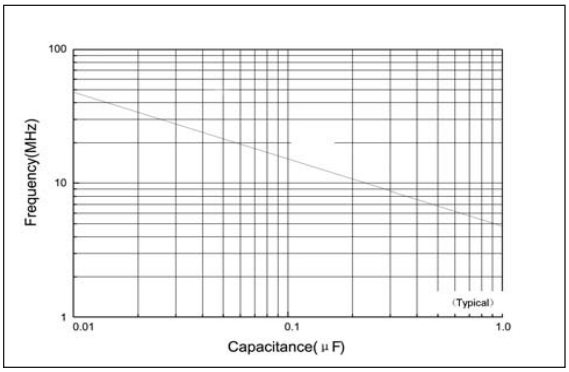
ESR vs Capacitance
RF 2225 Series

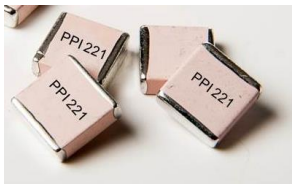


Q vs Capacitance
RF 2225 Series



Series Resonance vs Capacitance
RF 2225 Series




PPI 221
PPI 221
PPI 221

EIA High Q Non-Magnetic Multilayer Ceramic Capacitors

NP0 Dielectric Non-Magnetic Multilayer Ceramic Capacitors

◆ Product Features

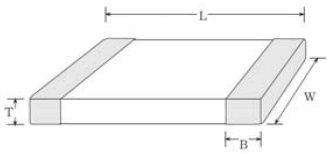
Non-Magnetism, Suitable for MRI

◆ Part Numbering

C	0603	CG	101	J	500	P	T
①	②	③	④	⑤	⑥	⑦	⑧
Chip Capacitor	Dimensions	Temperature Coefficient	Rated Capacitance	Tolerance	Rated Voltage	Termination Type	Packing Type

① Chip Capacitor

② Dimensions



Type	Dimensions (Unit: mm)				
	L	W	T（max）	B(min)	B(max)
0603	1.6±0.1	0.8±0.1	0.8±0.1	0.20	0.50
0805	2.0±0.2	1.2±0.2	1.40	0.25	0.70
1206	3.2±0.2	1.6±0.2	1.40	0.25	0.76
1210	3.2±0.2	2.5±0.2	2.00	0.25	0.76

③ Temperature Coefficient

Code(EIA)	Temperature Coefficients	Operating Temperature Range
CG(C0G)	0±30ppm/℃	-55℃~ +125℃

④ Rated Capacitance

Code	Capacitance
1R5	1.5pF
101	100pF

⑤ Tolerance

Code	Tolerance	Capacitance Range
B	±0.1pF	<10pF
C	±025pF	
D	±0.5pF	
F	±1%	≥10pF
G	±2%	
J	±5%	

⑥ Rated Voltage

Code	Rated Voltage (DC)	Code	Rated Voltage (DC)
25	25V	251	250V
50	50V	501	500V
101	100V	102	1000V
201	200V	202	2000V

⑦ Termination Type

Code	Termination Type
P	Non-magnetic Copper Plated 100% Sn(RoHS)
C	Palladium Silver

⑧ Packing Type

Code	Packing Type
T	Tape carrier packing
B	Bulk packing in a bag

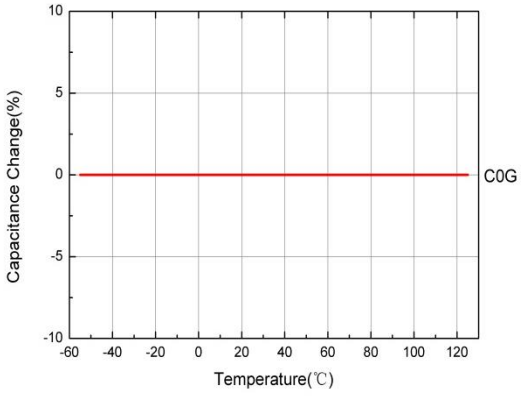
◆ Rated Capacitance Range Table (Unit:pF)

Dielectric		C0G																								
Size		0603					0805				1206							1210								
Rated Voltage		25	50	100	200	250	50	100	200	250	50	100	200	250	500	1000	2000	50	100	200	250	500	1000	2000		
Capacitance	1pF																									
	10pF																									
	101 100pF																									
	102 1000pF			561	331	331										681	391								561	
	103 10nF	102	102				272	272	182	182					392						123	123	102			
	104 100nF										103	103	822	822				153	153	153						

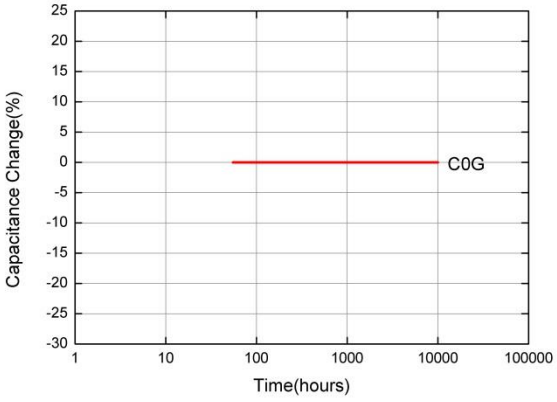
Remark: special capacitance, tolerance and WVDC are available, consult with PASSIVE PLUS.

◆ Characteristics Curve

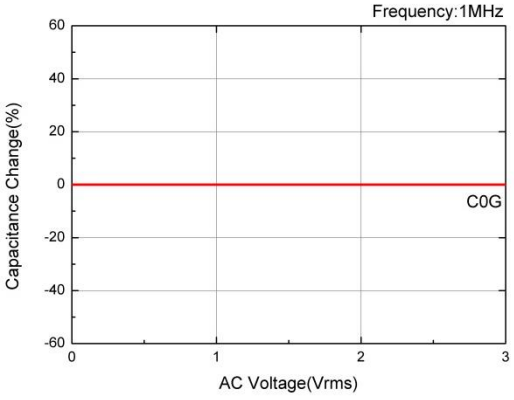
Capacitance vs Temperature



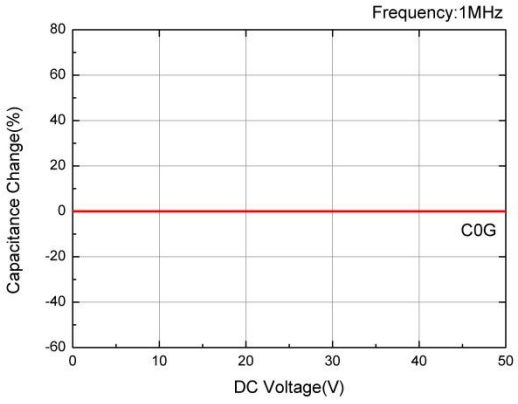
Capacitance Change vs Aging



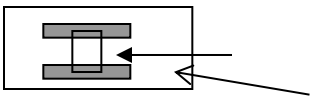
Capacitance Change vs AC Voltage



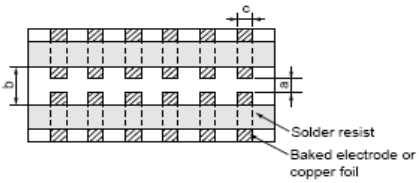
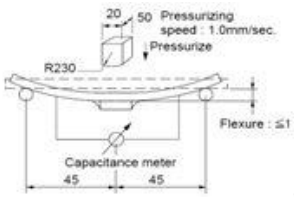
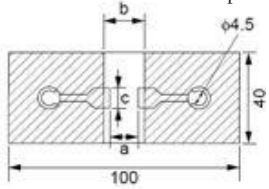
Capacitance Change vs DC Voltage



◆ Specifications and Test Methods

<table>
<tr><th>NO.</th><th>Item</th><th>Specification</th><th>Test Method</th></tr>
<tr><td>1</td><td>Operating Temperature Range</td><td>-55 ℃ ~ +125 ℃</td><td></td></tr>
<tr><td>2</td><td>Rated Voltage</td><td>See pages 73</td><td>The rated voltage means the maximum direct voltage or peak value of pulse voltage which may be applied continuously to a capacitor</td></tr>
<tr><td>3</td><td>Appearance</td><td>No defects or abnormality</td><td>Visual inspection</td></tr>
<tr><td>4</td><td>Dimensions</td><td>See the previous pages</td><td>Callipers inspection</td></tr>
<tr><td>5</td><td>Dielectric Strength</td><td>No defects or abnormality</td><td>2.5 RV for 5 seconds, RV ≦500VDC;
1.5 RV for 5 seconds, 500VDC < RV ≦1250V DC;
1.2 RV for 5 seconds, RV >1250VDC;
RV-Rated Voltage,</td></tr>
<tr><td>6</td><td>Insulation Resistance</td><td>More than 10GΩ</td><td>The insulation resistance shall be measured with the rated voltage at 25° C, 75%oRH and within 1 minute of charging.</td></tr>
<tr><td>7</td><td>Capacitance</td><td>Within the specified tolerance</td><td rowspan="2">The capacitance/Q shall be measured at 25 ℃ with the frequency and voltage shown in the table.
<table><tr><th>Frequency</th><th>Voltage</th></tr><tr><td>1±0.1MHz</td><td>1±0.2Vrms</td></tr></table></td></tr>
<tr><td>8</td><td>Q</td><td>Q is not less than 1000</td></tr>
<tr><td>9</td><td>Temperature Coefficient</td><td>0±30ppm/℃
Capacitance drift:
Within 0.3% or 0.05pF
(whichever is large)</td><td>The temperature cycling sequential is from the step 1 through 5. The temperature coefficient shall be within the specified tolerance for the temperature coefficient. The temperature coefficient equals [(Ci-C3)/C3]/(Ti-T3). The capacitance drift is calculated by dividing the differences between the maximum and minimum measured values in the Step 1, 3 and 5 by the capacitance value in Step 3.
<table><tr><th>Step</th><th>Temperature</th></tr><tr><td>1</td><td>25±2 ℃</td></tr><tr><td>2</td><td>55±3 ℃</td></tr><tr><td>3</td><td>25±2 ℃</td></tr><tr><td>4</td><td>125±3 ℃</td></tr><tr><td>5</td><td>25±2 ℃</td></tr></table></td></tr>
<tr><td>10</td><td>Adhesive strength of Termination</td><td>No removal of the erminations or other defect shall occur</td><td>Solder a capacitor to test jig (glass epoxy board) shown in fig below using a eutectic solder, then apply 10N force in the direction of the arrow.
The soldering should be done either by hand iron or using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock.
 
10Newton
Glass Epoxy Resin Board</td></tr>
</table>

◆ Specifications and Test Methods

<table>
<tr><th>NO.</th><th colspan="2">Item</th><th>Specification</th><th>Test Method</th></tr>
<tr><td rowspan="3">11</td><td rowspan="3">Vibration Resistance</td><td>Appearance</td><td>No defect or abnormality</td><td rowspan="3">Solder the capacitor to test jig (glass epoxy board) shown in fig below. Soldering should be done either by hand iron of using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock. The capacitor shall be subjected to a simple harmonic motion having a total amplitude of 1.5 mm. The frequency being varied uniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, shall be traversed in approximately 1 minute. This motion shall be applied for a period of 2 hours in each 3 mutually perpendicular directions (total 6 hours).
 
</td></tr>
<tr><td>Capacitance</td><td>Within the specified tolerance</td></tr>
<tr><td>Q</td><td>Q≥1000</td></tr>
<tr><td>12</td><td colspan="2">Deflection</td><td>No cracking or marking defects shall occur, Δ C/C<5%
 
</td><td>Solder the capacitor to the glass epoxy boards shown in below fig. Then apply a force in the direction and measured the capacitance.
 

<table><tr><th>Size</th><th>a</th><th>b</th><th>C</th></tr><tr><td>0603</td><td>1.0</td><td>3.0</td><td>1.2</td></tr><tr><td>0805</td><td>1.2</td><td>4.0</td><td>1.65</td></tr><tr><td>1206</td><td>2.2</td><td>5.0</td><td>2.0</td></tr></table></td></tr>
<tr><td>13</td><td colspan="2">Solderability of Termination</td><td>More than 75% of the terminations is to be soldered evenly and continuously.</td><td>Immerse the capacitor first in an ethanol solution of rosin. Preheat at 80 ℃ to 120 ℃ for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 250±5 ℃.</td></tr>
<tr><td rowspan="4">14</td><td rowspan="4">Resistance to Soldering Heat</td><td>Appearance</td><td>No marking defects</td><td rowspan="4">Preheat capacitor at 120 ℃ to 200 ℃ for 1 minute. Then immerse the capacitor in a eutectic solder at 260 ℃ to 265 ℃ for 10±1 second, the immersed depth is 10mm. Set it for 24±2 hours at room.</td></tr>
<tr><td>Capacitance Range</td><td>Less than ±2.5% or ±0.25pF (Whichever is larger)</td></tr>
<tr><td>Q</td><td>Q≥1000</td></tr>
<tr><td>Insulation Resistance</td><td>More than 10GΩ</td></tr>
</table>

◆Specifications and Test Methods

<table>
<tr><th>NO.</th><th colspan="2">Item</th><th>Specification</th><th>Test Method</th></tr>
<tr><td rowspan="4">15</td><td rowspan="4">Tempertyure Cycle</td><td>Appearance</td><td>No marking defects</td><td rowspan="4">Fix the capacitor to the supporting jig in the same manner and under the same conditions as (11).
Perform the five cycles according to the four heat treatments listed in the following table.
Set it for 24±2 hours at room temperature.
<table><tr><th>Step</th><th>Temperature(℃)</th><th>Time(minutes)</th></tr><tr><td>1</td><td>Min.operating temp. -3 to 0</td><td>30±3</td></tr><tr><td>2</td><td>Room temperature</td><td>2to3</td></tr><tr><td>3</td><td>Max.operating temp. -3 to 0</td><td>30±3</td></tr><tr><td>4</td><td>Room temperature</td><td>2to3</td></tr></table></td></tr>
<tr><td>Capacitance Range</td><td>Less than ±2.5% or ±0.25pF (Whichever is larger)</td></tr>
<tr><td>Q</td><td>Q≥1000</td></tr>
<tr><td>Insulation Resistance</td><td>More than 10GΩ</td></tr>
<tr><td rowspan="4">16</td><td rowspan="4">Humidity Steady State</td><td>Appearance</td><td>No marking defects</td><td rowspan="4">Set the capacitor at 40±2 ℃ and 90% to 95% humidity for 500 ±12 hours.
Remove and let sit for 24 ±2 hours at room temperature, then measure.</td></tr>
<tr><td>Capacitance Range</td><td>Less than ±5% or ±0.5pF (Whichever is larger)</td></tr>
<tr><td>Q</td><td>Q≥1000</td></tr>
<tr><td>Insulation Resistance</td><td>More than 1GΩ</td></tr>
<tr><td rowspan="4">17</td><td rowspan="4">Humidity Load</td><td>Appearance</td><td>No marking defects</td><td rowspan="4">Apply the rated voltage(500Vmax) at 40±2 ℃ and 90% to 95% humidity for 500±12 hours.
Remove and let sit for 24±2 hours at room temperature, then measure.
The charge/discharge current is less than 50mA.</td></tr>
<tr><td>Capacitance Range</td><td>Less than ±7.5% or ±0.75pF (Whichever is larger)</td></tr>
<tr><td>Q</td><td>Q≥1000</td></tr>
<tr><td>Insulation Resistance</td><td>More than 1GΩ</td></tr>
<tr><td rowspan="4">18</td><td rowspan="4">High Temperature Load</td><td>Appearance</td><td>No marking defects</td><td rowspan="4">Apply a voltage for 1000±12 hours at 125±3 ℃, and set it for 24±2 hours at room temperature, then easure.
The charge/discharge current is less than 50mA.
Apply voltage:
＜500V, apply 200% rated voltage;
500V, apply 150% rated voltage;
＞500V, apply 120% rated voltage;</td></tr>
<tr><td>Capacitance Range</td><td>Less than ±3% or ±0.3pF (Whichever is larger)</td></tr>
<tr><td>Q</td><td>Q≥1000</td></tr>
<tr><td>Insulation Resistance</td><td>More than 1GΩ</td></tr>
</table>

X7R Dielectric Non-Magnetic Multilayer Ceramic Capacitors

◆ Product Features

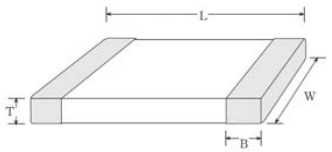
Non-Magnetism, Suitable for MRI

◆ Part Numbering

C	0603	X	222	K	500	P	T
① Chip Capacitor	② Dimensions	③ Temperature Characteristic	④ Rated Capacitance	⑤ Tolerance	⑥ Rated Voltage	⑦ Termination Type	⑧ Packing Type

① Chip Capacitor

② Dimensions



Type	Dimensions (Unit:mm)				
	L	W	T（max）	B(min)	B(max)
0603	1.6±0.1	0.8±0.1	0.8±0.1	0.20	0.50
0805	2.0±0.2	1.2±0.2	1.40	0.25	0.70
1206	3.2±0.2	1.6±0.2	1.40	0.25	0.76
1210	3.2±0.2	2.5±0.2	2.00	0.25	0.76

③ Temperature Characteristics

Code(EIA)	Temperature Coefficients	Operating Temperature Range
X(X7R)	±15%	-55℃~ +125℃

④ Rated Capacitance

Code	Capacitance
102	1000pF
222	2200pF

⑤ Tolerance

Code	Tolerance
J	±5%
K	±10%
M	±20%

⑥ Rated Voltage

Code	Rated Voltage (DC)	Code	Rated Voltage (DC)
25	25V	251	250V
50	50V	501	500V
101	100V	102	1000V
201	200V	202	2000V

⑦ Termination Type

Code	Termination Type
P	Non-magnetic Copper Plated 100% Sn(RoHS)
C	Palladium Silver

⑧ Packing Type

Code	Packing Type
T	Tape carrier packing
B	Bulk packing in a bag

◆ Rated Capacitance Range Table (Unit:pF)

Size	0603			0805			1206			1210			
Volt.	50V	100V	200V	50V	100V	200V	50V	100V	200V	50V	100V	200V	500V
470pF													
1nF													
2.2nF													
4.7nF													
10nF													
22nF													
47nF													
0.1uF													
0.22uF													
0.47uF													
1uF													

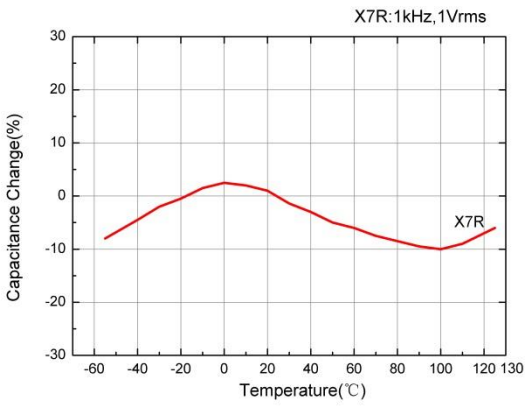
Capacitance

Remark: special capacitance, tolerance and WVDC are available, consult with PASSIVE PLUS.

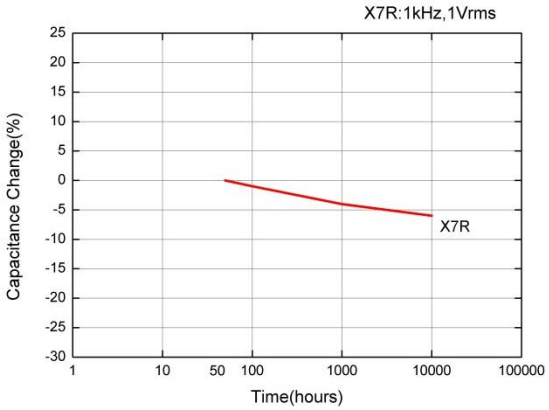
◆ Characteristics Curve

105

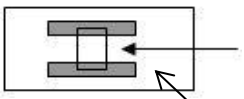
Capacitance vs Temperature



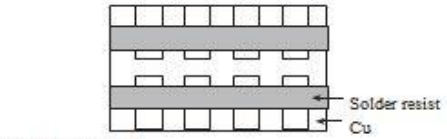
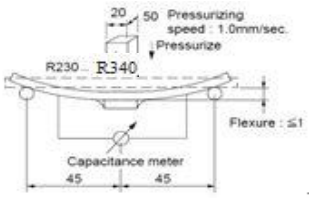
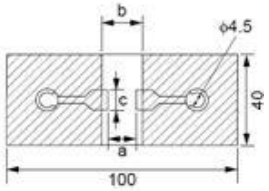
Capacitance Change vs Aging



◆ Specifications and Test Methods

<table>
<tr><th>NO.</th><th>Item</th><th>Specification</th><th>Test Method</th></tr>
<tr><td>1</td><td>Operating Temperature Range</td><td>-55 ℃ ~ +125 ℃</td><td></td></tr>
<tr><td>2</td><td>Rated Voltage</td><td>See pages 73</td><td>The rated voltage means the maximum direct voltage or peak value of pulse voltage which may be applied continuously to a capacitor</td></tr>
<tr><td>3</td><td>Appearance</td><td>No defects or abnormality</td><td>Visual inspection</td></tr>
<tr><td>4</td><td>Dimensions</td><td>See the previous pages</td><td>Callipers inspection</td></tr>
<tr><td>5</td><td>Dielectric Strength</td><td>No defects or abnormality</td><td>No failure shall be observed when the given coefficient of the ratedvoltage is applied betweentheterminationsfor1toS seconds, provided the charge/discharge current is less than 50mA.</td></tr>
<tr><td>6</td><td>Insulation Resistance</td><td>More than 100MΩ·uF</td><td>The insulation resistance shall be measured with the testing voltage at normal temperature and with humidity, within 2 minute of charging.</td></tr>
<tr><td>7</td><td>Capacitance</td><td>Within the specified tolerance</td><td rowspan="2">The capacitance D.F. shall be measured at 25 ℃ with the frequency and voltage shown in the table.
<table>
<tr><th></th><th>Frequency</th><th>Voltage</th></tr>
<tr><td>X7R</td><td>1±0.1KHz</td><td>1±0.2Vrms</td></tr>
</table></td></tr>
<tr><td>8</td><td>Dissipation Factor (D.F.)</td><td>D.F≤ 5%</td></tr>
<tr><td>9</td><td>Temperature Coefficient</td><td>± 15%</td><td>Refer to the test methods of general ceramic Chip capacitors.</td></tr>
<tr><td>10</td><td>Adhesive strength of Termination</td><td>No removal of the terminations or other defect shall occur</td><td>Solder a capacitor to test jig (glass epoxy board) shown in fig below using a eutectic solder, then apply 10N force in the direction of the arrow. The soldering should be done either by hand iron or using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock.
 
10Newton
Glass Epoxy Resin Board</td></tr>
</table>

◆ Specifications and Test Methods

<table>
<tr><th>NO.</th><th colspan="2">Item</th><th>Specification</th><th>Test Method</th></tr>
<tr><td rowspan="3">11</td><td rowspan="3">Vibration Resistance</td><td>Appearance</td><td>No defect or abnormality</td><td rowspan="3">Solder the capacitor to test jig (glass epoxy board) shown in fig below. Soldering should be done either by hand iron of using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock. The capacitor shall be subjected to a simple harmonic motion having a total amplitude of 1.5mm. The frequency being varied uniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, shall be traversed in approximately 1 minute. This motion shall be applied for a period of 2 hours in each 3 mutually perpendicular directions (total 6 hours)
 
</td></tr>
<tr><td>Capacitance</td><td>Within the specified tolerance</td></tr>
<tr><td>D.F.</td><td>D.F≤5%</td></tr>
<tr><td>12</td><td colspan="2">Deflection</td><td>No cracking or marking defects shall occur,
Δ C/C<12.5%
 
</td><td>Solder the capacitor to test jig (glass epoxy board) direction shown in below fig.
 

<table>
<tr><th>Size</th><th>a</th><th>b</th><th>c</th></tr>
<tr><td>0603</td><td>1.0</td><td>3.0</td><td>1.2</td></tr>
<tr><td>0805</td><td>1.2</td><td>4.0</td><td>1.65</td></tr>
</table></td></tr>
<tr><td>13</td><td colspan="2">Solderability of Termination</td><td>More than 75% of the terminations is to be soldered evenly and continuously.</td><td>Immerse the capacitor first in a ethanol solution of rosin. Preheat at 80 ℃ to 120 ℃ for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 250±5 ℃.</td></tr>
<tr><td rowspan="4">14</td><td rowspan="4">Resistance to Soldering Heat</td><td>Appearance</td><td>No marking defects</td><td rowspan="4">Preheat capacitor at 120 ℃ to 200 ℃ for 1 minute. Then immerse the capacitor in a eutectic solder at 260 ℃ to 265 ℃ for 10±1 seconds, Set it for 24±2 hours at room temperature, then measure.</td></tr>
<tr><td>Capacitance Range</td><td>Less than ±7.5%</td></tr>
<tr><td>D.F.</td><td>D.F≤5%</td></tr>
<tr><td>Insulation Resistance</td><td>I.R: More than 100MΩ·uF</td></tr>
</table>

◆ Specifications and Test Methods

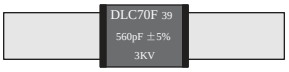
<table>
<tr><th>NO.</th><th colspan="2">Item</th><th>Specification</th><th>Test Method</th></tr>
<tr><td rowspan="4">15</td><td rowspan="4">Temperature Cycle</td><td>Appearance</td><td>No marking defects</td><td rowspan="4">Fix the capacitor to the supporting jig in the same manner and under the same conditions as (11).
Perform the five cycles according to the four heat treatments listed in the following table.
Set it for 24±2 hours at room temperature.
<table><tr><th>Step</th><th>Temperature(℃)</th><th>Time(minutes)</th></tr><tr><td>1</td><td>Min.operating temp. -3 to 0</td><td>30±3</td></tr><tr><td>2</td><td>Room temperature</td><td>2to3</td></tr><tr><td>3</td><td>Max.operating temp. -3 to 0</td><td>30±3</td></tr><tr><td>4</td><td>Room temperature</td><td>2to3</td></tr></table></td></tr>
<tr><td>Capacitance Range</td><td>≤7.5%</td></tr>
<tr><td>D.F</td><td>D.F≤5%</td></tr>
<tr><td>Insulation Resistance</td><td>More than 100MΩ·uF</td></tr>
<tr><td rowspan="4">16</td><td rowspan="4">Humidity Steady State</td><td>Appearance</td><td>No defect or abnormality</td><td rowspan="4">Sit the capacitor at 40±2 ℃ and 90% to 95% humidity for 500±12 hours.temperature, then measure.</td></tr>
<tr><td>Capacitance Range</td><td>≤12.%</td></tr>
<tr><td>D.F</td><td>D.F≤5%</td></tr>
<tr><td>Insulation Resistance</td><td>More than 50MΩ·uF</td></tr>
<tr><td rowspan="4">17</td><td rowspan="4">High Temperature Load</td><td>Appearance</td><td>No marking defects</td><td rowspan="4">Apply a DC voltage of 150% of the rated voltage for 1000 hours at the maximun operating temperature, and set it for 48 hours at room temperature, then measure.
The charge/discharge current is less than 50mA.</td></tr>
<tr><td>Capacitance Range</td><td>≤12.5%</td></tr>
<tr><td>D.F</td><td>D.F≤5%</td></tr>
<tr><td>Insulation Resistance</td><td>More than 50MΩ·uF</td></tr>
</table>

◆ Laser Marking

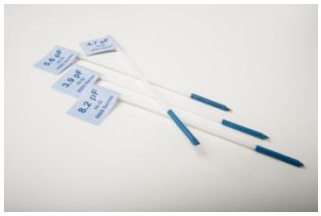
Most of Passive Plus products are identified by laser marking technology. Generally it can be visually observed. Under normal storage and application, the marking won't be disappeared.

Passive Plus applies different kinds of laser marking methods towards different sizes of capacitors. See the below tables for detail.

Capacitor Series	1111C/1111P/1111N	2225C/2225P	3838C/3838P
Example			
Meaning	102:1000pF	222:2200pF 3A: capacitor identification code	561:560pF 39: Capacitor identification code

Capacitor Series	6040C	7676C
Example		
Meaning	Capacitance:560pF Tolerance:±5% WVDC:3000V 39: Capacitor identification code	Capacitance:100pF Tolerance:±5% WVDC:8000V 3P: Capacitor identification code

If the customer needs a special laser marking, please contact Passive Plus directly.


8.2 pF

Custom and Engineering Design Kits

Standard 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

◆ High-Q Capacitor Design Kits

Design Kit	Description	Values	No. of Values	Tolerances
DKD0505C01 DKD0505P01	0.1pF- 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, 1.5pF	16	+/- 0.1pF
		1.6, 1.8, 2.0pF		+/- 0.25pF
DKD0505C02 DKD0505P02	1.0pF - 10pF	1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.4, 2.7pF,	16	+/- 0.1pF
		3.0, 3.3, 3.9, 4.7, 5.6, 6.8, 8.2pF		+/- 0.25pF
		10pF		+/- 5%
DKD0505C03 DKD0505P03	10pF – 100pF	10, 12, 15, 18, 20, 22, 24, 27, 30, 33pF	16	+/- 5%
		39, 47, 56, 68, 82, 100pF		
DKD0505C04	100pF- 1000pF	100, 120, 150, 180, 200, 220, 240, 270, 300, 330pF	16	+/- 5%
		390, 470, 560, 680, 820, 1000pF		
DKD0505C05 DKD0505P05	0.1pF- 2.0pF Non-Magnetic	0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.5pF	16	+/- 0.1pF
		1.6, 1.8, 2.0pF		+/- 0.25pF
DKD0505C06 DKD0505P06	1.0pF - 10pF Non-Magnetic	1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.4, 2.7pF	16	+/- 0.1pF
		3.0, 3.3, 3.9, 4.7, 5.6, 6.8, 8.2pF,		+/- 0.25pF
		10pF		+/- 5%
DKD0505C07 DKD0505P07	10pF – 100pF Non-Magnetic	10, 12, 15, 18, 20, 22, 24, 27, 30, 33pF	16	+/- 5%
		39, 47, 56, 68, 82, 100pF		
DKD0505C08	100pF- 1000pF Non-Magnetic	100, 120, 150, 180, 200, 220, 240, 270, 300, 330pF	16	+/- 5%
		390. 470, 560, 680, 820, 1000pF		

◆ High-Q Capacitor Design Kits

Design Kit	Description	Values (pF)	No. of values	Toler-ances
DKD1111C01 DKD1111P01	1.0pF - 10pF	1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.4, 2.7, pF	16	± 0.1pF
		3.0,3.3,3.9, 4.7, 5.6, 6.8, 8.2pF		± 0.25pF
		10pF		± 5%
DKD1111C02 DKD1111P02	10pF -100pF	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF	16	± 5%
DKD1111C03 DKD1111P03	100pF-1000pF	100, 120, 150, 180, 200, 220, 240, 270, 300, 330, 390, 470, 560, 680, 820,1000 pF	16	± 5%
DKD1111C04 DKD1111P04	1000pF-10000pF	1000, 1200, 1500, 1800, 2000, 2200, 2400, 2700, 3000, 3300, 3900, 4700, 5600, 10000 pF	14	± 5%
DKD1111C05 DKD1111P05	1.0pF - 10pF Non-magnetic	1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.4, 2.7, pF	16	± 0.1pF
		3.0,3.3,3.9, 4.7, 5.6, 6.8, 8.2pF		± 0.25pF
		10pF		± 5%
DKD1111C06 DKD1111P06	10pF - 100pF Non-magnetic	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF	16	± 5%
DKD1111C07 DKD1111P07	100pF- 1000pF Non-magnetic	100, 120, 150, 180, 200, 220, 240, 270, 300, 330, 390, 470, 560, 680, 820,1000 pF	16	± 5%
DKD1111C08 DKD1111P08	1000pF- 10000pF Non-magnetic	1000, 1200, 1500, 1800, 2000, 2200, 2400, 2700, 3000, 3300, 3900, 4700, 5600, 10000 pF	14	± 5%

◆ EIA Low ESR Design Kits

Design Kit	Description	Values	No. of Values	Tolerance
DKD0201N01	0201N .1pF - 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	13	+/-.1pF
DKD0201N02	0201N 1.0pF - 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, 8.2pF,	16	+/.1pF
		10pF		+/-5%
DKD0201N03	0201N 10 - 100pF	10, 13, 15, 18, 20, 22, 27, 30, 39, 47, 56, 68, 75, 82, 91, 100pF	16	+/-5%
DKD0402N01	0402N .1pF - 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	15	+/-.1pF
DKD0402N02	0402N 1.0pF - 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, 8.2pF,	16	+/-.1pF
		10pF		+/-5%
DKD0402N03	0402N 10pF - 33pF	10 12, 13, 15, 16. 18, 20, 22, 24, 27, 30, 33pF	12	+/-5%
DKD0603N01	0603N .1pF - 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	16	+/-.1pF
DKD0603N02	0603N 1.0pF - 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, 8.2pF,	16	+/-.1pF
		10pF		+/-5%
DKD0603N03	0603N 10pF - 100pF	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF	16	+/-5%
DKD0805N01	0805N .1pF - 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	15	+/-.1pF
DKD0805N02	0805N 1.0pF - 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, 8.2pF,	16	+/-.1pF
		10pF		+/-5%
DKD0805N03	0805N 10pF - 100pF	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF	16	+/-5%
DKD0805N04	0805N 10pF - 220pF	10, 15, 18, 20, 24, 27, 30, 39, 47, 56, 68, 82, 100, 120, 150, 180, 220pF	17	+/-5%

Design Kit	Description	Values (pF)	# of values	Tolerance
DKD1111N01	1111N 0.2pF - 10pF	0.2, 0.5, 0.7, 0.8, 1.0, 1.2, 1.5, 1.8, 2.0, 2.4, 2.7, 3.0, 3.3,	19	+/-.1pF
		3.9, 4.7, 5.6, 6.8, 8.2pF,		
		10pF		+/-5%
DKD1111N02	1111N 10-100pF	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF	16	+/-5%
DKD1111N03	1111N 100-1000pF	100, 120, 150, 180, 200, 220, 240, 270, 300, 390, 470,	15	+/-5%
		560, 680, 820, 1000pF		

◆ Engineer Adjustment Stick Kits

Adjustment Stick Kits for engineers for their in-circuit tuning prove to be valuable tools for the engineer enabling them to precisely tune a circuit board without running the risk of damaging the board while changing out capacitors. Now, engineers can "tweak" their boards using these adjustment sticks to determine the better values needed for their projects.

Adjustment Stick Kit	Description	Values (pF)	# of values	Tolerance
TSD0505C01	ADJUSTMENT STICKS DESIGN KIT 0505C .1 - 2.0pF	0.1pF, 0.2pF, 0.3pF, 0.4pF, 0.5pF, 0.6pF, 0.7pF, 0.8pF, 0.9pF,	16	+/-.1pF
		1.0pF, 1.1pF, 1.2pF, 1.5pF, 1.6pF, 1.8pF, 2.0pF		+/-.25pF
TSD0505C02	ADJUSTMENT STICKS DESIGN KIT 0505C 1.0 - 10pF	1.0pF, 1.2pF, 1.5pF, 1.8pF, 2.0pF, 2.2pF, 2.4pF, 2.7pF, 3.0pF, 3.3pF,	16	+/-.25pF
		3.9pF, 4.7pF, 5.6pF, 6.8pF, 8.2pF		
		10pF		+/-5%
TSD0505C03	ADJUSTMENT STICKS DESIGN KIT 0505C 10 - 100pF	10pF, 12pF, 15pF, 18pF, 20pF, 22pF, 24pF, 27pF, 30pF, 33pF, 39pF,	16	+/-5%
		47pF, 56pF, 68pF, 82pF, 100pF		
TSD1111C01	ADJUSTMENT STICKS DESIGN KIT 1111C 0.1 - 1.0pF	0.1pF, 0.2pF, 0.3pF, 0.4pF, 0.5pF,	10	+/-.1pF
		0.6pF, 0.7pF, 0.8pF, 0.9pF & 1.0pF		+/-.25pF
TSD1111C02	ADJUSTMENT STICKS DESIGN KIT 1111C 1.0 - 10pF	1.0pF, 1.2pF, 1.5pF, 1.8pF, 2.0pF, 2.2pF, 2.4pF, 2.7pF, 3.0pF, 3.3pF	16	+/-.25pF
		3.9pF, 4.7pF, 5.6pF, 6.8pF,8.2pF		
		10pF		+/-5%
TSD1111C03	ADJUSTMENT STICKS DESIGN KIT 1111C 10 - 100pF	10pF, 12pF, 15pF, 18pF, 20pF, 22pF, 24pF, 27pF, 30pF, 33pF, 39pF, 47pF,	16	+/-5%
		56pF, 68pF, 82pF , 100pF		
TSD1111C04	ADJUSTMENT STICKS DESIGN KIT 1111C 100 - 1000pF	100pF, 120pF, 150pF, 180pF, 200pF, 220pF, 240pF, 270pF, 300pF, 330pF,	16	+/-5%
		390pF, 470pF, 560pF, 680pF, 820pF, 1000pF		
TSD2225C01	ADJUSTMENT STICKS DESIGN KIT 2225C 1.0 - 100pF	1.0pF, 1.5pF, 2.2pF, 3.3pF,	17	+/-.1pF
		4.7pF, 5.6pF, 6.8pF, 8.2pF,		+/-.25pF
		10pF, 15pF, 22pF, 33pF, 47pF, 56pF, 68pF, 82pF , 100pF		+/-5%
TSD2225C02	ADJUSTMENT STICKS DESIGN KIT 2225C 100 - 2700pF	100pF, 150pF, 220pF, 330pF, 470pF, 560pF, 680pF, 820pF, 1000pF	12	+/-5%
		1500pF, 2200pF, 2700pF		

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 of 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.

Notes

PPI

Ultra-Broadband Capacitors

Ultra-Broadband Capacitors

◆ Product Overview

Passive Plus, Inc. (PPI) has developed a series of Broadband and Ultra-Broadband capacitors: the 0402BB103, 0402BB104, and the 0201BB104 and 01005BB104. These capacitors are intended primarily for coupling RF signals or, occasionally, for bypassing them to ground, while blocking DC. The applications for which they are intended require small, surface-mountable devices that provide low RF impedances, i.e., low insertion losses and reflections, across extremely large RF bandwidths and temperatures typically ranging from -55 to +85 ° C.

Small, single-layer capacitors, apart from not being surface-mountable, usually do not have sufficiently large capacitance values to cover the required frequency range, which may extend from the tens or hundreds of kilohertz to the tens of gigahertz. Ordinary multi-layer capacitors, when operated over these ranges, display "parallel resonances," narrow frequency bands over which they have high impedances and insertion losses. The Passive Plus "BB" series overcomes these objections to achieve bandwidths as high as -- in the case of the 0201BB104 -- a remarkable 16 KHz to >50 GHz.

Applications for the BB series are primarily found in the so-called "signal integrity" market:

- Optoelectronics/high- speed data
- ROSA/TOSA (Transmit/Receive optical subassemblies)
- SONET(Synchronous Optical Networks)
- Broadband test equipment
- Broadband microwave and millimeter wave amplifiers and oscillators

In general, best results are achieved by capacitors that are close in width to that of the transmission line trace. Most trace widths on commonly used substrates that must function well above 12 GHz lie in the 8- to 24-mil range, and so 0402 and 0201 SMT devices are well suited to the applications.

To reiterate, customers requiring surface-mountable, 10 nF or 100 nF X7R capacitors that provide resonance-free, low insertion loss, low reflection operation over extremely large RF bandwidths will be well served by Passive Plus' s BB series.

- EAR99 Compliant. Capacitors are exempt from ITAR
- **TAPE & REEL**: 15K/Reel
- **RoHS COMPLIANT**
- **S-PARAMETERS:** Available on PPI website
- **RECOMMENDED ATTACHMENT TECHNIQUES:** Hand Solder or Reflow Technique

01005BB (.010" x .005") 01005BB104

◆ Product Features

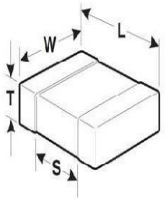
• Typical operating frequency range: 16 KHz (- 3 dB point) to > **46 GHz;** Insertion Loss: < 1 db, typical; 4 WVDC; 40K pcs/ reel; lower quantities in cut tape

◆ Electrical Specifications

• Capacitance: 100 nF, nom.
• Operating Temperature Range: -55° C to +85° C
• Temperature Coefficient of Capacitance (TCC): X5R (±15% ,-55° C to +85° C)
• Rated Voltage: 4 WVDC
• Dielectric Withstanding Voltage (DWV): 250% of rated WVDC for 5 secs.
• Insulation Resistance: $10^{11}\Omega$ min. @ +25° C @ rated WVDC

◆ Mechanical Dimensions

L = 0.016 in. ±0.001 in. (0.4 mm ±0.02 mm)
W = 0.008 in. ±0.001 in. (0.2mm ±0.02 mm)
T = 0.008 in. ±0.001 in. (0.2mm ±0.02 mm)
S = 0.005 in., min. (0.13 mm, min.)

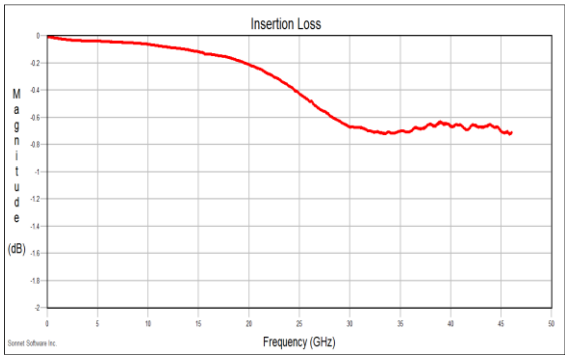


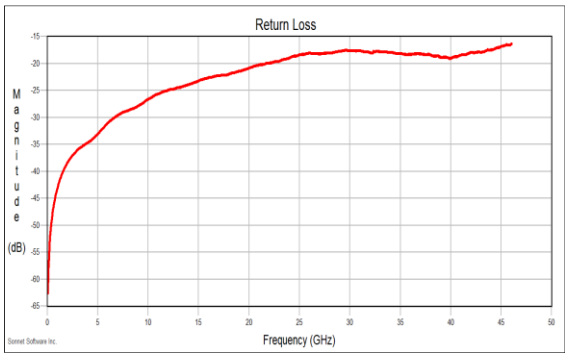
◆ Part Numbering

01005 BB 104 M W 4R0

- 4R0 — WVDC
- W — Tin Plated over Nickel Barrier (RoHS) Compliant
- M — Capacitance Tolerance (M tolerance = ±20%)
- 104 — Indicates number of zeros following digits of capacitance in pF
- 104 — Capacitance Code – First 2 significant digits for capacitance
- BB — Passive Plus Series
- 01005 — Case Size

◆ Performance Curves – Insertion and Return Loss Charts





Typical responses for sample placed across a 5-mil gap on a 12-mil wide trace on 6.6 mil Rogers RO4350. Measurements de-embedded to sample edges using TRL calibration procedures

0201BB (.020" x .010") 0201BB104

◆ Product Features

Typical operating frequency range: 16 KHz (- 3 dB point) to > **65GHz;**

Insertion Loss: < 1 db, typical; 16 WVDC;

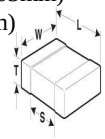
15K pcs/reels; lower quantities in cut tape

◆ Electrical Specifications

- Capacitance: 100nF
- Operating Temperature Range: -55ºC to +125ºC
- Temperature Coefficient of Capacitance (TCC):
  ±15% (-55ºC to +125ºC)
- Rated Voltage: 16 WVDC
- Dielectric Withstanding Voltage (DWV):
  250% of rated WVDC for 5 secs.
- Insulation Resistance:
  10^11Ω min. @ +25ºC @ rated WVDC

◆ Mechanical Dimensions

L = 0.0236 in. ±0.004 in. (0.6mm ±0.03mm)
W = 0.0118 in. ±0.004 in. (0.3mm ±0.03mm)
T = 0.0118 in. MAX. (0.3mm ±0.03mm)
S = 0.0078 in. MIN. (0.2mm MIN.)



◆ Test Conditions

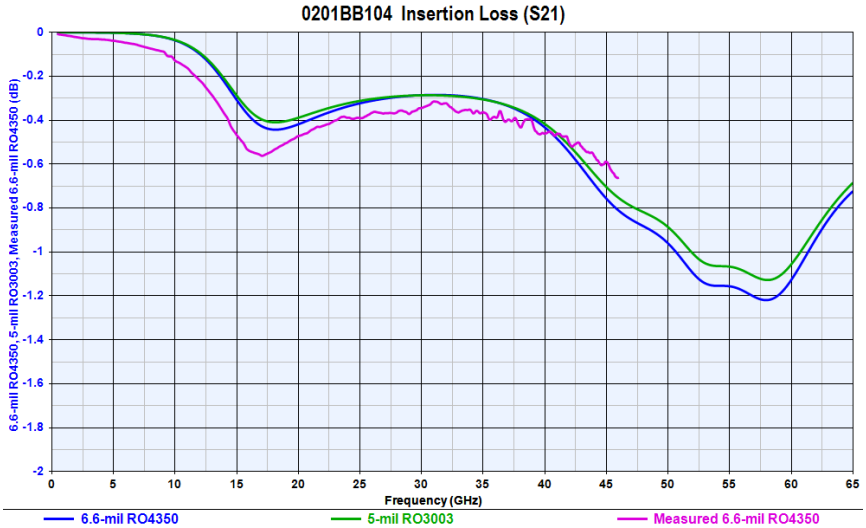
Typical responses for sample placed across a 5-mil gap in a 13-mil-wide trace on 6.6mil RO4350.

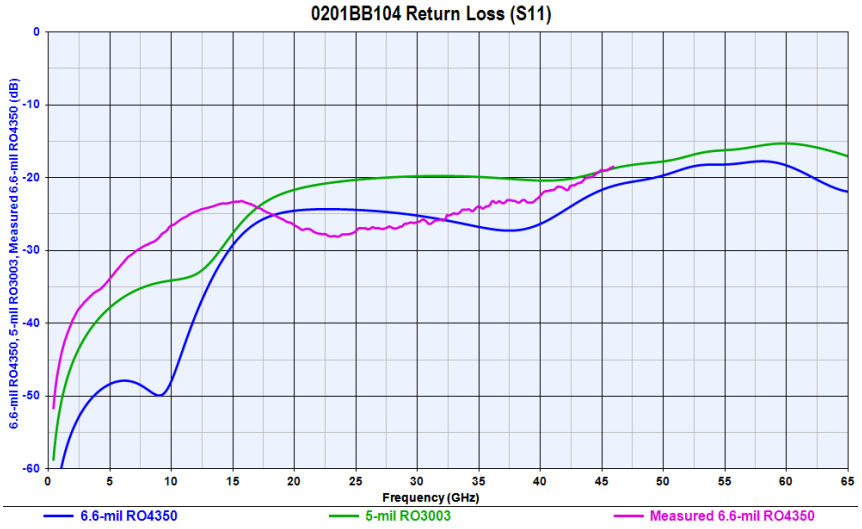
Measurements de-embedded to sample edges using TRL calibration procedures.

◆ Modeling Data

- S-Parameters available on PPI website (http://www.passiveplus.com/designsupp.php).
- Full models also available on Modelithics website at http://www.modelithics.com/mvp/PassivePlus/

◆ Performance Curves -- Insertion and Return Loss Charts





◆ Part Numbering

0201 BB 10 4 K W 160

- 160 — WVDC
- W — W = Tin Plated over Nickel Barrier (RoHS) Compliant; G = Gold
- K — Capacitance Tolerance (K tolerance = +/-10%)
- 4 — Indicates number of zeroes following digits of capacitance in pF
- 10 — Capacitance Code – First 2 significant digits for capacitance
- BB — Passive Plus Series
- 0201 — Case Size

0402BB (.040" x .020") 0402BB104

◆ Product Features

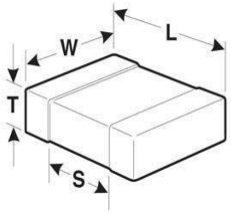
- Typical operating frequency range:16 KHz (-3 dB point) to **35 GHz**; Case size 0402 (.040" x .020")
- Insertion Loss: < 1.2 db, typical; **25 WVDC**

◆ Electrical Specifications

- Capacitance: 100 nF
- Operating Temperature Range: -55° C to +125° C
- Temperature Coefficient of Capacitance (TCC): ±15% (-55° C to +125° C)
- Rated Voltage: **25 WVDC**
- Dielectric Withstanding Voltage (DWV): 250% of rated WVDC for 5 secs.
- Insulation Resistance: $10^{11}\Omega$ min. @ +25° C @ rated WVDC

◆ Mechanical Dimensions

L = 0.040 in. ±0.004 in. (1.016mm ±0.102mm)
W = 0.020 in. ±0.004 in. (0.508 mm ±0.102 mm)
T = 0.024 in. MAX. (0.610 mm MAX.)
S = 0.016 in. MIN. (0.406 mm MIN.)



◆ Part Numbering

0402 BB 10 4 K W 250

- 250 — WVDC
- W — Tin Plated over Nickel Barrier (RoHS) Compliant
- K — Capacitance Tolerance (K tolerance = ±10%)
- 4 — Indicates number of zeros following digits of capacitance in pF
- 10 — Capacitance Code - First 2 significant digits for capacitance
- BB — Passive Plus Series
- 0402 — Case Size

Modelithics®

◆ Performance Curves --Insertion and Return Loss Charts

Typical responses for samples placed on a 10-mil-thick Rogers 4350B microstrip board, sample spanning a 10-mil gap in the 20-mil-wide center trace. All using TRL de-embedding procedures.

0402BB (.040" x .020") 0402BB103

◆ Product Features

• Typical operating frequency range: 16 KHz (-3 dB point) to **16 GHz**; Case size 0402 (.040" x .020")

• Insertion Loss: < 1 db, typical; • 16 WVDC

◆ Electrical Specifications

• Capacitance: 10 nF

• Operating Temperature Range: -55° C to +125° C

• Temperature Coefficient of Capacitance (TCC): ±15% (-55° C to +125° C)

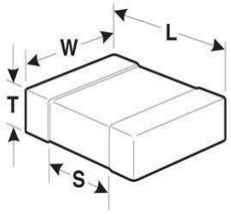
• Rated Voltage: 16 WVDC

• Dielectric Withstanding Voltage (DWV): 250% of rated WVDC for 5 secs.

• Insulation Resistance: $10^{11}\Omega$ min. @ +25° C @ rated WVDC

◆ Mechanical Dimensions

L = 0.040 in. ±0.004 in. (1.016mm ±0.102mm)
W = 0.020 in. ±0.004 in. (0.508 mm ±0.102 mm)
T = 0.024 in. MAX. (0.610 mm MAX.)
S = 0.016 in. MIN. (0.406 mm MIN.)

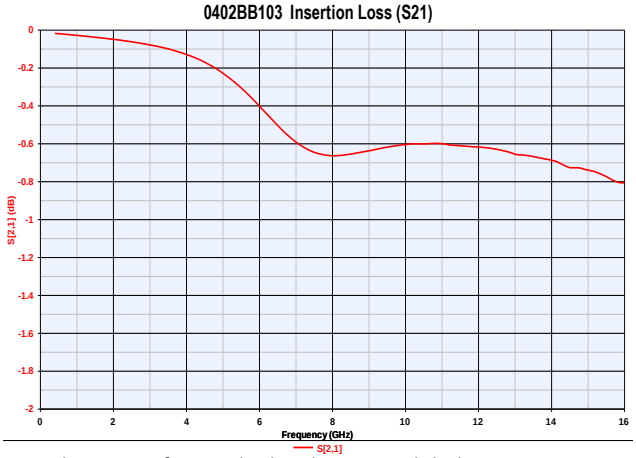


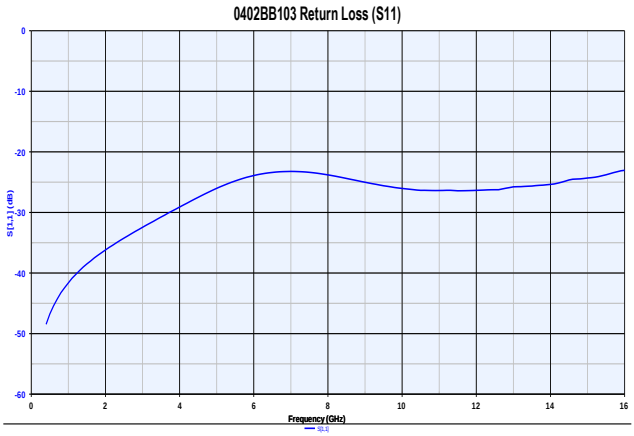
◆ Part Numbering

0402 BB 10 3 K W 160

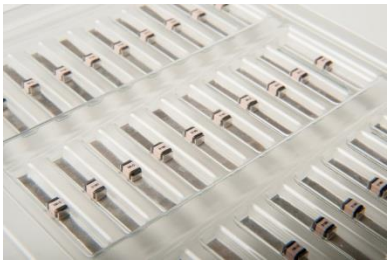
- 160 — WVDC
- W — Tin Plated over Nickel Barrier (RoHS) Compliant
- K — Capacitance Tolerance (K tolerance = ±10%)
- 3 — Indicates number of zeros following digits of capacitance in pF
- 10 — Capacitance Code - First 2 significant digits for capacitance
- BB — Passive Plus Series
- 0402 — Case Size

◆ Performance Curves --Insertion and Return Loss Charts





Typical responses for sample placed on a 10-mil-thick Rogers 4350B microstrip board, sample spanning a 10-mil gap in the 20-mil-wide center trace. All measurements made using TRL de-embedding procedures.



Notes

◆ Storage

① The chip capacitors shall be packaged in carrier tapes or bulk cases.

② Keep storage facility temperatures from +5C to +35C, humidity from 45 to 70% RH.

③ The storage atmosphere must be free of gas containing sulfur and chlorine. Also, avoid exposing the product to saline moisture. If the product is exposed to such atmospheres, the terminations will oxidize and solderability will be affected.

④ If the above storage condition is followed, Then the solderability is assured for 12 months from our final inspection date.

◆ Circuit Design

① Once application and assembly environments have been checked, the capacitor may be used in conformance with the rating and performance, provided in both the catalog and the specifications. Exceeding the specifications listed may result in inferior performance. It may also cause a short, open or smoking to occur, etc.

② Please use the capacitors in conformance with the operating temperature provided in both the catalog and the specifications. Be especially cautious not to exceed the maximum temperature. If the maximum temperature set forth in both the catalog and specifications is exceeded, the capacitor's insulation resistance may deteriorate. Power may suddenly surge and short-circuit may occur. The capacitor has a loss, and may self-heat due to equivalent series resistance when alternating electric current is passed through. As this effect becomes especially pronounced in high frequency circuits, please exercise caution. When using the capacitor in a (self-heating) circuit, please make sure the surface of the capacitor remains under the maximum temperature for usage. Also, please make certain temperature rise remains below 20℃.

③ Please keep voltage under the Rated Voltage, which is applied to the capacitor. Also, please make certain the Peak Voltage remains below the Rated Voltage when AC or voltage is super-imposed to the DC voltage. In the situation where AC or pulse voltage is employed, ensure average peak voltage does not exceed the Rated Voltage. Exceeding the Rated Voltage provided in both the catalog and specifications may lead to defect with standing voltage. In worse case situations, It may cause the capacitor to smoke or flame.

◆ Handling

Chip capacitors should be handled with care to avoid contamination or damage. The use of vacuum pick-up or plastic tweezers is recommended for manual placement. Tape and reeled packages are suitable for automatic pick and placement machines.

◆ Flux

① An excessive amount of flux or too rapid temperature rise causes solvent burst, and solder can generate a large quantity of gas. The gas spreads small solder particles which can cause a solder balling effect or bridging problem.

② Flux containing too high a percentage of halide may cause corrosion of termination unless sufficiently cleaned.

③ Use rosin-type flux, and do not use a highly acidic flux (halide content less than 0.2 wt%).

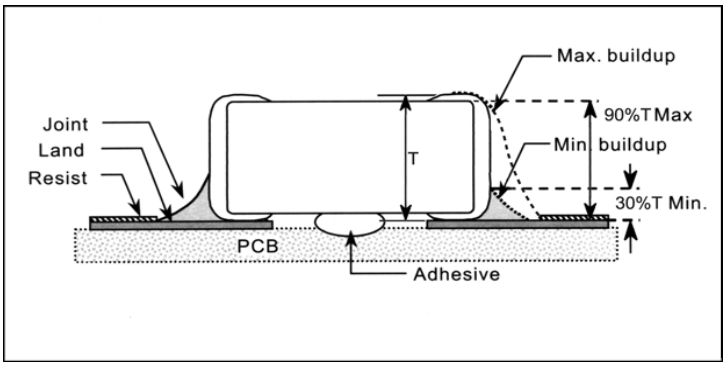
④ The water soluble flux causes deteriorated insulation resistance between outer termination unless sufficiently cleaned.

◆ Component Spacing

For wave soldering components, the spacing must be sufficiently far apart to prevent bridging or shadowing. This is not so important for the reflow process, but sufficient space for rework should be considered. The suggested spacing for reflow soldering and wave soldering is 0.5mm and 1.0mm, respectively.

◆ Solder Fillet

Too much solder amount may increase solder stress and cause cracking risks. Insufficient solder amount may PCB. When soldering, confirm that the solder is 30%T to reduce adhesive strength and cause parts to fall off 90%T.



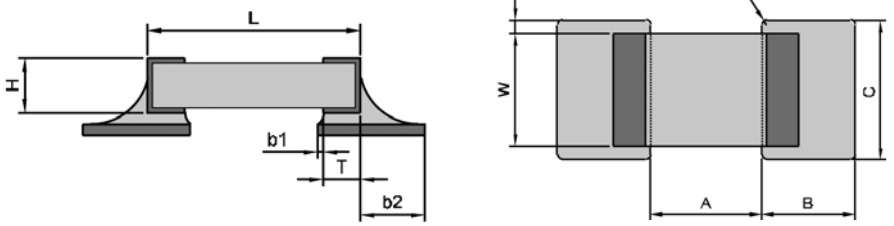
◆ Recommended Land Pattern Dimensions

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

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

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

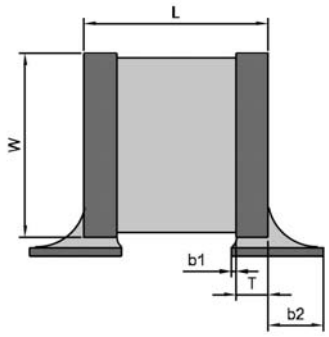
● Horizontal Mounting

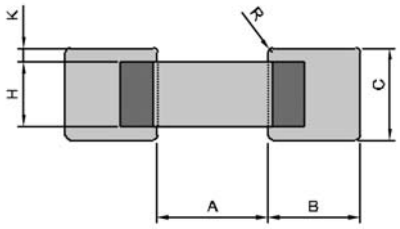


Horizontal Mounting – Recommended Land Pattern Dimensions of Reflow soldering (unit: millimeter)								
	0603	0505	0805	1111	2225	3838	6040	7676
A	0.70	0.70	1.10	1.90	3.90	7.10	13.00	16.00
B	0.90	0.90	1.10	1.70	2.50	3.00	3.30	3.30
C	0.90	1.40	1.40	2.90	7.00	10.20	11.30	19.60
T	0.40	0.40	0.50	0.70	1.00	1.30	1.30	1.30
b1	0.05	0.05	0.10	0.10	0.10	0.10	0.10	0.10
b2	0.50	0.50	0.60	1.00	1.50	1.70	2.00	2.00
K	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10
R	0.00	0.00	0.30	0.50	0.80	0.80	1.00	1.00

Horizontal Mounting – Recommended Land Pattern Dimensions of Iron soldering (unit: millimeter)						
	0603	0505	0805	1111	2225	3838
A	0.70	0.70	1.10	1.90	3.90	7.10
B	2.00	2.00	2.00	2.50	4.00	5.00
C	0.90	1.40	1.40	2.90	7.00	10.20
T	0.40	0.40	0.50	0.70	1.00	1.30
b1	0.05	0.05	0.10	0.10	0.10	0.10
b2	0.50	0.50	0.60	1.00	1.50	1.70
K	0.00	0.00	0.10	0.10	0.10	0.10
R	0.00	0.00	0.30	0.50	0.80	0.80

● Vertical Mounting





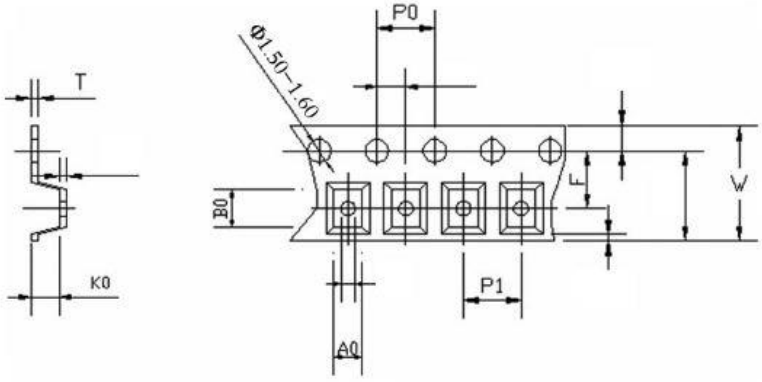
Vertical Mounting – Recommended Land Pattern Dimensions of Reflow soldering (unit: millimeter)					
	0505	0805	1111	2225	3838
A	0.70	1.10	1.90	3.90	7.10
B	0.90	1.10	1.70	2.50	3.00
C	1.40	1.40	2.50	4.00	5.00
T	0.40	0.50	0.70	1.00	1.30
b1	0.05	0.10	0.10	0.10	0.10
b2	0.50	0.60	1.00	1.50	1.70
K	0.00	0.10	0.10	0.10	0.10
R	0.00	0.30	0.50	0.80	0.80

Vertical Mounting – Recommended Land Pattern Dimensions of Iron soldering (unit: millimeter)					
	0505	0805	1111	2225	3838
A	0.70	1.10	1.90	3.90	7.10
B	2.00	2.00	2.50	4.00	5.00
C	1.40	1.40	2.50	4.00	5.00
T	0.40	0.50	0.70	1.00	1.30
b1	0.05	0.10	0.10	0.10	0.10
b2	0.50	0.60	1.00	1.50	1.70
K	0.00	0.10	0.10	0.10	0.10
R	0.00	0.30	0.50	0.80	0.80

● Tape & Reel Specifications

	A0	B0	K0	W	P0	P1	T	F	QTY/REEL	TAPE MATERIAL
0201N - H	0.406	0.749	0.422	8.00	4.00	2.00	0.42	3.50	500	Paper
0402N - H	0.60	1.10	1.00	8.00	4.00	2.00	0.20	3.50	500	Paper
0603N - H	0.95	1.80	0.85	8.00	4.00	4.00	0.20	3.50	500	Paper
0805N - H	1.60	1.60	2.40	8.00	4.00	4.00	0.20	3.50	500	Paper
1111N - H	2.92	3.51	2.34	8.00	4.00	4.00	0.254	3.50	500	Embossed
0603CG	0.95	1.80	0.85	8.00	4.00	4.00	0.90	3.50	4000	Paper
0505 - H	1.38	1.68	0.98	8.00	4.00	4.00	0.22	3.50	3000	Plastic
0505 - V	1.10	1.60	1.40	12.00	4.00	4.00	0.30	5.50	2000	Plastic
0805CG	1.80	2.20	1.20	8.00	4.00	4.00	0.22	3.50	3000	Plastic
1111 - H	2.85	3.50	1.95	8.00	4.00	4.00	0.22	3.50	2000	Plastic
1111 - V1*	2.96	3.60	2.40	8.00	4.00	4.00	0.22	3.50	1500	Plastic
1111 - V2*	2.00	3.50	2.70	12.00	4.00	4.00	0.40	5.50	1500	Plastic
2225	6.70	6.20	3.40	16.00	4.00	12.00	0.30	7.50	500	Plastic
3838	10.10	10.10	3.30	16.00	4.00	16.00	0.30	7.50	300	Plastic

*1111 - V1 Thickness of capacitor is less than 1.9mm
*1111 - V2 Thickness of capacitor is more than 1.9mm



◆ Resin Mold

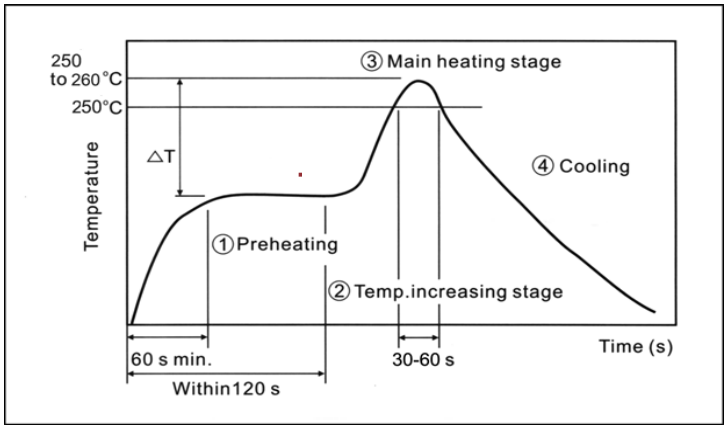
If a large amount of resin is used for molding the chip, cracks may occur due to contraction stress during curing. To avoid such cracks, use a low shrinkage resin. The insulation resistance of the chip will degrade due to moisture absorption. Use a low moisture absorption resin. Check carefully that the resin does not generate a decomposition gas or reaction gas during the curing process or during normal storage. Such gases may crack the chip capacitor or damage the device itself.

◆ Soldering For Chip Capacitors

● Reflow Soldering

When sudden heat is applied to the elements, the mechanical strength of the components decrease because change can cause deformity of components inside. In order to avoid mechanical damage in the elements, preheating should be requested for both of 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 (ΔT) as small as possible.

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



Chip Capacitor	0402/0603/0505/0805/1111	2225/3838
Preheating	ΔT≤190℃	ΔT≤150℃

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 ^{0}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.

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:

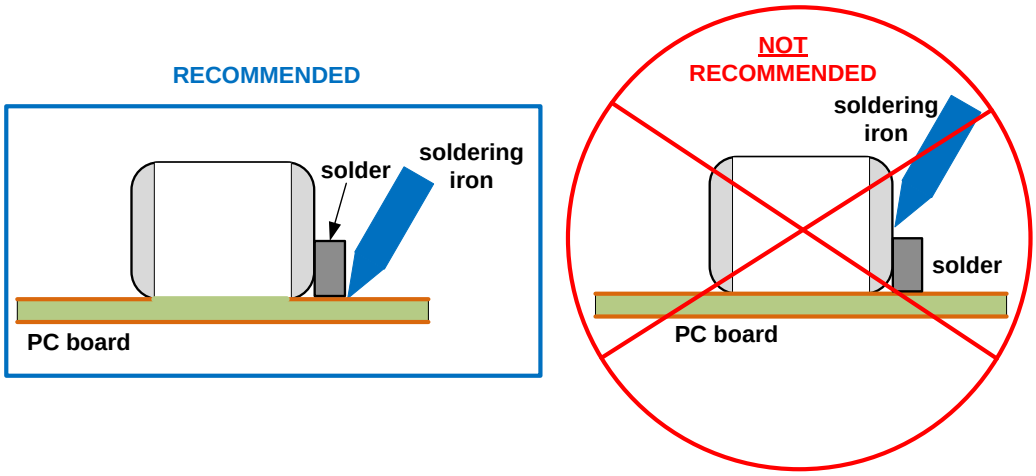
1. Pre-heat the substrate. Where possible, it is very desirable to gradually pre-heat the substrate, e.g. on a hotplate, to about 30 ^{0}C below the solder liquidus temperature. Two steps are usually sufficient: Start the hotplate at a temperature about halfway to the desired pre-heat temperature, place 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.

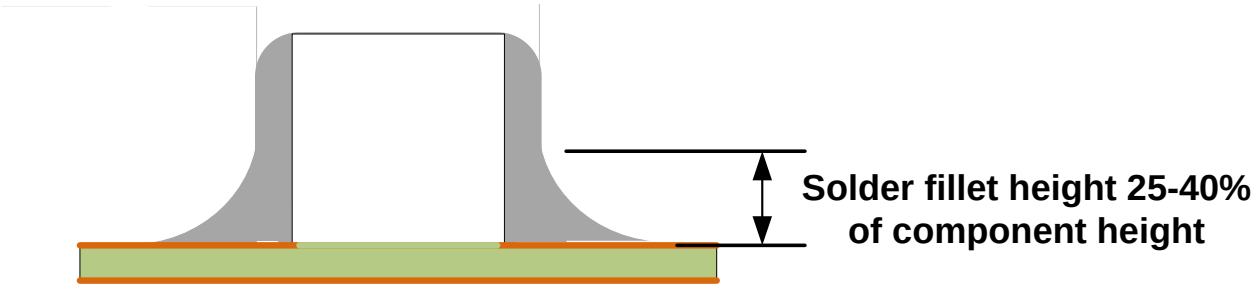
Fig. 1



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



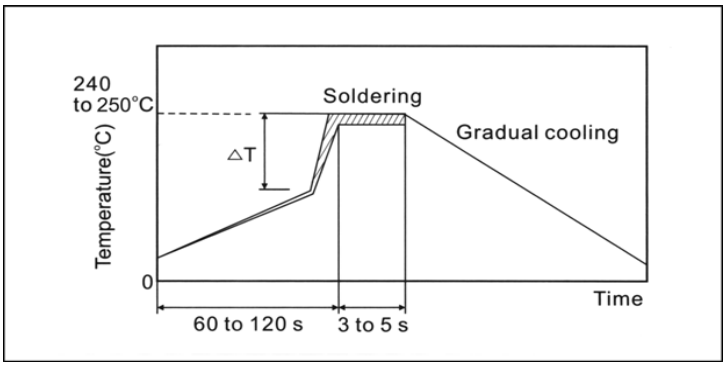
● Wave Soldering

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.

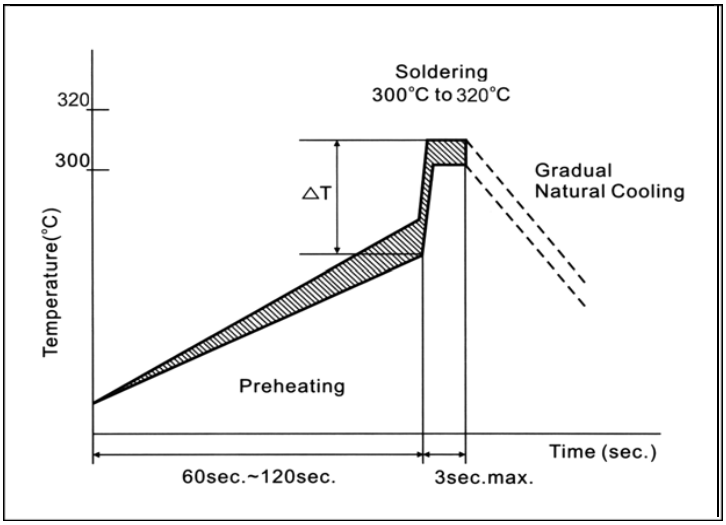


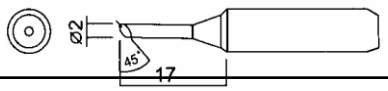
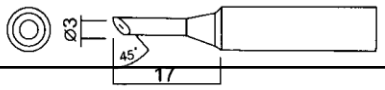
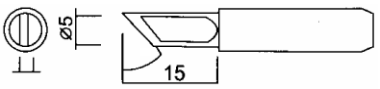
Chip Capacitor	0402/0603/0505/0805
Preheating	ΔT≤150℃

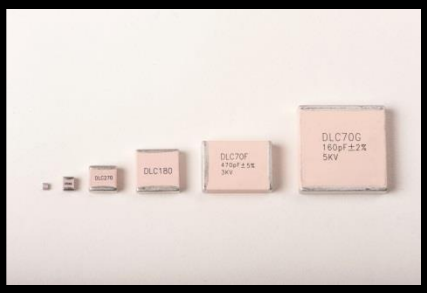
Passive Plus does not recommend flow soldering for its 1111P/1111C, 2225P/2225C, 3838P/3838C.

● 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.

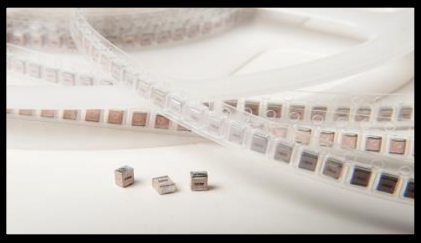


Size	Soldering Iron	Temperature	Soldering Iron head Size	Solder
0505/0805	70W Thermostat Iron	330℃		63Sn/37Pb, 95.5Sn/3.8Ag /0.7Cu
1111		350℃		
2225		370℃		
3838		370℃		



Hi-Q Ceramic Capacitors

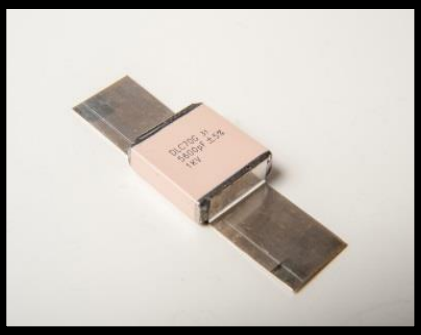
EIA Low ESR Microwave Capacitors



Ultra-Low ESR MicrowaveCapacitors

Broadband Capacitors

Axial Wires



UHF RF Super Power Capacitors

Custom Assemblies

Custom Engineering Kits

Adjustment Stick Kits

Engineer Design Kits

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