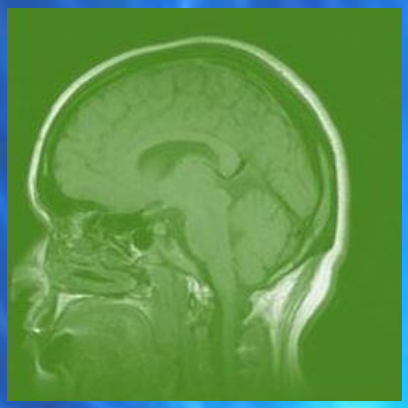
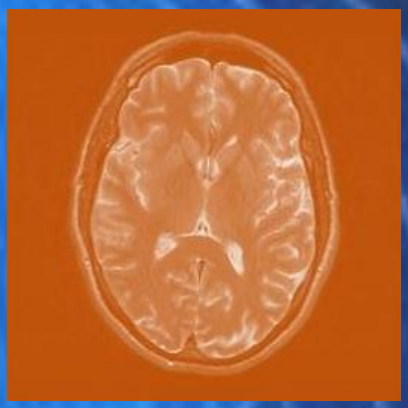
PPI®

NON-MAGNETIC COMPONENTS



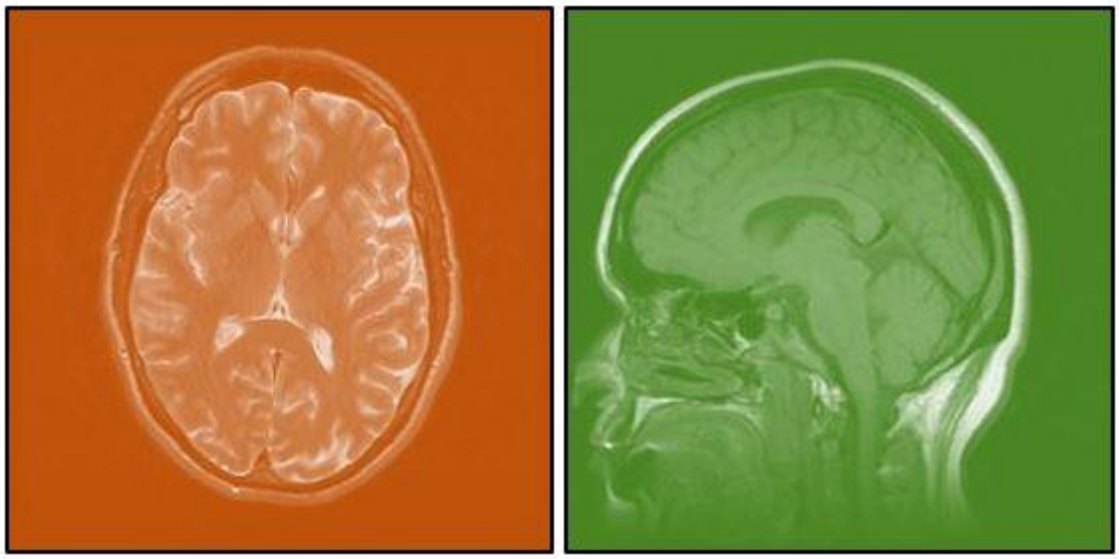


- High-Q Capacitors
- High Power Custom Assemblies
- Variable Capacitors
- Thin Film Components
- Single Layer Capacitors

Non-Magnetic Components

Non-magnetic component material choice is essential when developing projects where even the smallest trace of magnetism is not suitable for medical applications such as Magnetic Resonance Imaging (MRI) and Nuclear Magnetic Resonance (NMR) scanners, hi-Rel medical systems, test and diagnostic equipment, and laboratory analysis systems.

Non-magnetic components are also used in other sectors of the electronics industry, including the military, telecommunication, and aerospace industries.



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

0505C/P (0.055” x 0.055”)

Product Features

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

Product Applications

Typical Functional Applications:

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

Typical Circuit Applications:

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

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

Part Numbering

0505 C 100 J W 151 X TV

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

Capacitance Tolerance Codes

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

Voltage Codes

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

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

0505C/P (0.055" x 0.055")

0505C/P Capacitance Values

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

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

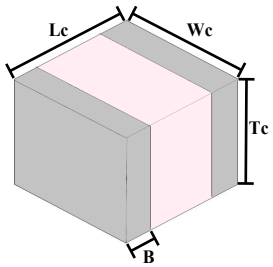
Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.
0.1	0R1	A,B, C,D	150V	250V or 300V	**2.4**	2R4	A,B, C,D	150V	250V or 300V	**20**	200	F,G, J,K	150V	250V or 300V	**160**	161*	F,G, J,K	150V	200V
0.2	0R2				**2.7**	2R7				**22**	220				**180**	181*			
0.3	0R3				**3.0**	3R0				**24**	240				**200**	201*			
0.4	0R4				**3.3**	3R3				**27**	270				**220**	221*			
0.5	0R5				**3.6**	3R6				**30**	300				**240**	241*			
0.6	0R6				**3.9**	3R9				**33**	330				**270**	271*			
0.7	0R7				**4.3**	4R3				**36**	360				**300**	301*			
0.8	0R8				**4.7**	4R7				**39**	390				**330**	331*	F,G, J,K	150V	N/A
0.9	0R9				**5.1**	5R1				**43**	430				**360**	361*			
1.0	1R0				**5.6**	5R6				**47**	470				**390**	391*			
1.1	1R1				**6.2**	6R2				**51**	510	F,G, J,K	150V	200V	**430**	431*			
1.2	1R2				**6.8**	6R8				**56**	560				**470**	471*			
1.3	1R3				**7.5**	7R5				**62**	620				**510**	511*			
1.4	1R4				**8.2**	8R2				**68**	680				**560**	561*			
1.5	1R5				**9.1**	9R1				**75**	750				**620**	621*			
1.6	1R6				**10**	100	F,G, J,K	150V	250V or 300V	**82**	820				**680**	681*	F,G, J,K	50V	100V
1.7	1R7				**11**	110				**91**	910				**750**	751*			
1.8	1R8				**12**	120				**100**	101				**820**	821*			
1.9	1R9				**13**	130				**110**	111*				**910**	911*			
2.0	2R0				**15**	150				**120**	121*				**1000**	102*			
2.1	2R1				**16**	160				**130**	131*								
2.2	2R2				**18**	180				**150**	151*								

*Available in NP0 only

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

0505C/P (0.055” x 0.055”)

Termination Types and Codes



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

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

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

Dimensions

Unit: inch (millimeter)

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

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

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

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

0505C/P (0.055” x 0.055”)

Electrical Specifications

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

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

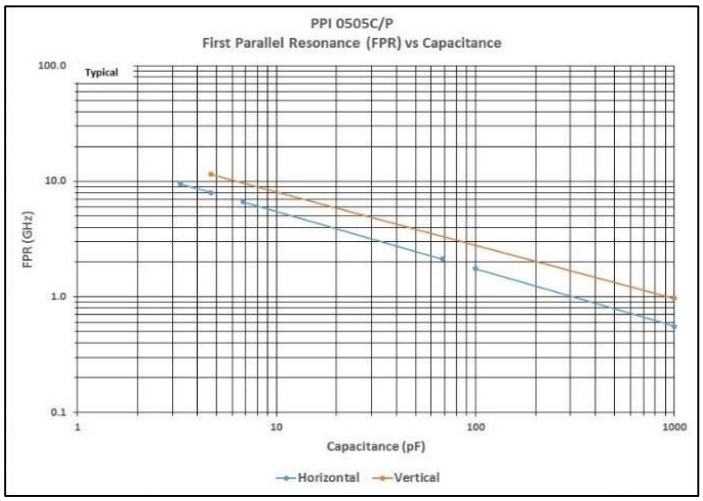
Environmental Specifications

	Specification	Test Parameters
Thermal Shock	**DWV:** The initial Value **IR:** Shall not be less than 30% of the initial value. **Capacitance Change:** No more than 0.5% or 0.5pF, whichever is greater.	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature (-55°C and 200°C) stay 30 minutes, the time of removing shall not be more than 3 minutes. Perform five cycles.
Moisture Resistance		MIL-STD-202, Method 106
Humidity (Steady State)	**DWV:** The initial Value **IR:** The initial value. **Capacitance Change:** No more than 0.5% or 0.5pF, whichever is greater.	MIL-STD-202, Method 103, Condition A With 1.5Volts DC applied while subjected to an environment of 85°C with 85% relative humidity for 240 hours minimum.
Life	**IR:** Shall not be less than 30% of the initial value. **Capacitance Change:** No more than 2.0% or 0.5pF, whichever is greater.	MIL-STD-202, Method 108. For 2000 hours, at 200°C. Rated Voltage DC applies.
Terminal Strength	**Force:** 10lbs typical, 5lbs. Minimum. **Duration Time:** 5 to 10 seconds	MIL-STD-202, Method 211A, Test Condition A. Applied a force and maintained for a period of 5 to 10 seconds. The force shall be in the direction of the axes of the terminations.

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

0505C/P (0.055” x 0.055”)

FPR -- First Parallel Resonance (FPRs)

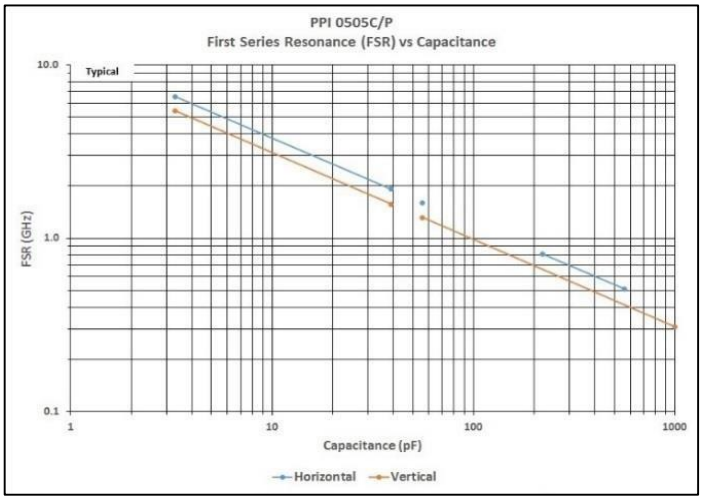


Definitions and Measurement Conditions

The **First Parallel Resonance, FPR,** is defined as the lowest frequency at which a suckout or notch appears in |S21|.

It is generally independent of substrate thickness or dielectric constant, but does depend on capacitor orientation. A horizontal orientation means the capacitor electrode planes are parallel to the plane of the substrate; a vertical orientation means the electrode planes are perpendicular to the substrate.

FSR -- First Series Resonance (FSRs)



Definitions and Measurement Conditions

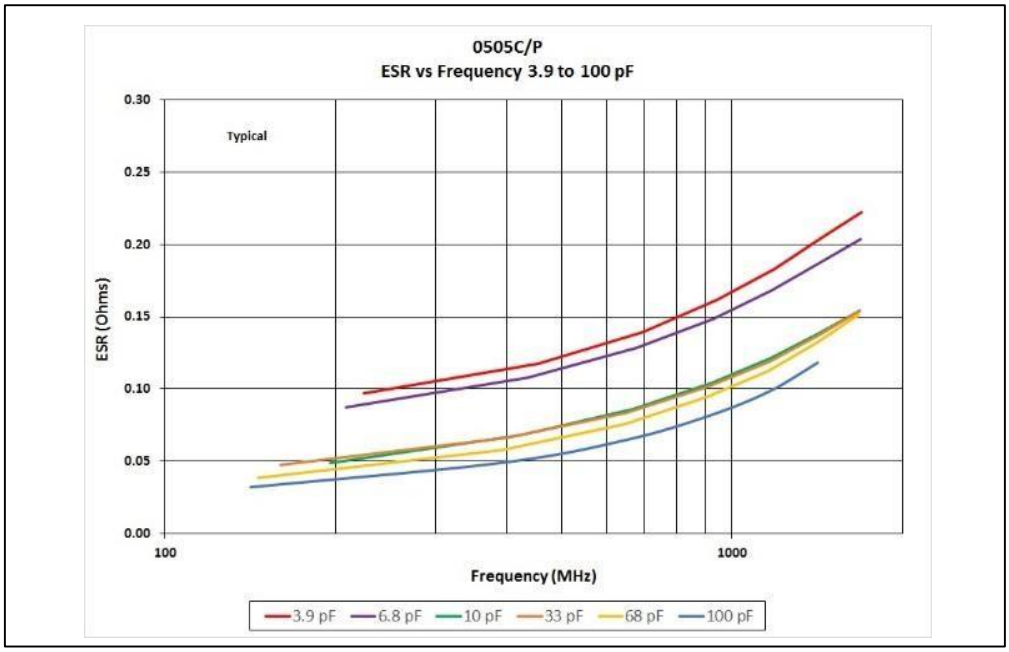
The **First Series Resonance, FSR,** is defined as the lowest frequency at which the imaginary part of the input impedance, Im[Zin], equals zero. Should Im[Zin] or the real part of the input impedance, Re[Zin], not be monotonic with frequency at frequencies lower than those at which Im[Zin] =0, the FSR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

The measurement conditions are: substrate – Rogers RO4350; substrate dielectric constant = 3.66; horizontal mount substrate thickness (mils) =25; gap in microstrip trace (mils) = 15; horizontal mount microstrip trace width (mils) = 55. Reference planes at sample edges.

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

ESR vs. Frequency

0505C/P ESR vs Frequency



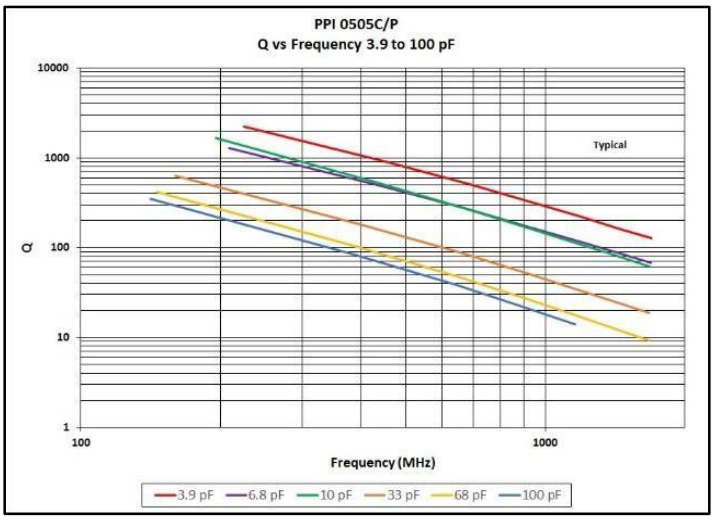
0505C ESR vs Frequency

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

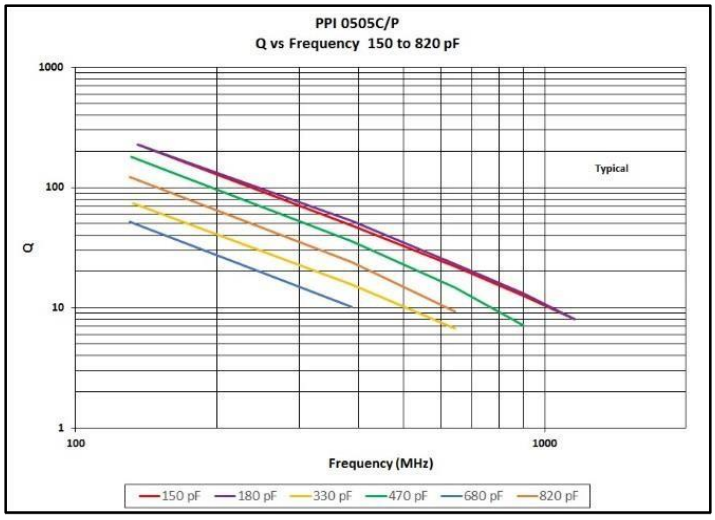
0505C/P (0.055” x 0.055”)

Q vs. Frequency

0505C/P Q vs Frequency

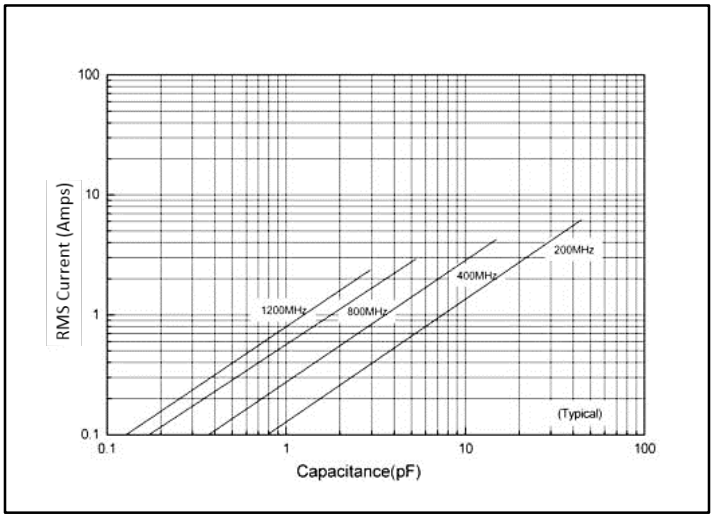


0505C Q vs Frequency

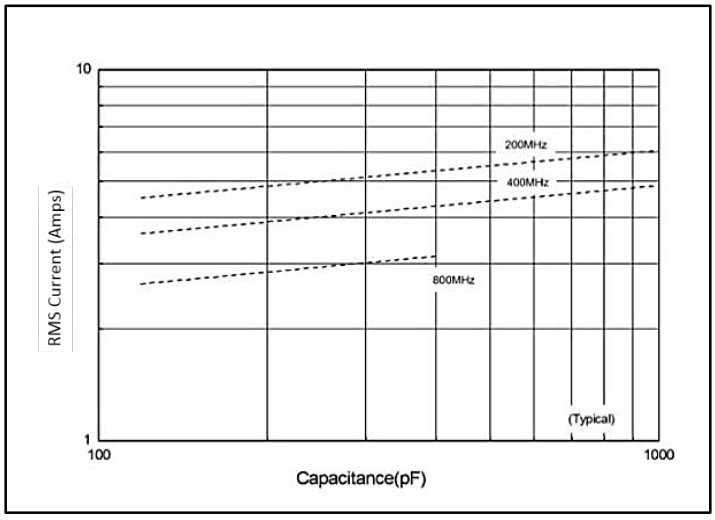


Current Rating vs. Capacitance

0505C/P Current Rating vs Capacitance



0505C Current Rating vs Capacitance



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

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

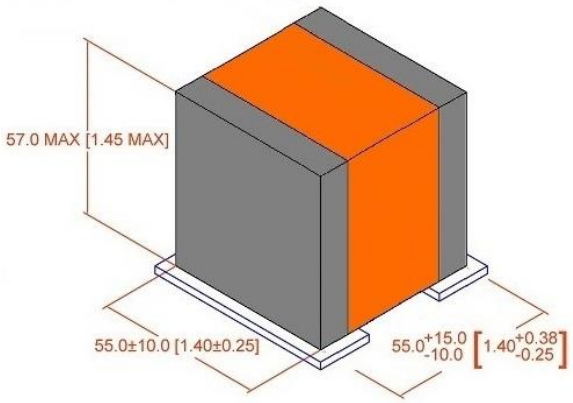
$I_{pow\ diss} = \sqrt{\frac{P_{dissipation}}{ESR}}$ (If the thermal resistance of the mounting surface is 40°C/W, then you will reach the power dissipated limit of 1.5W)

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

0505C/P (0.055” x 0.055”)

Capacitor Application Program

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



Modelithics Vendor Program

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

Microwave Global Models include every part value in a series and permit users to input substrate thickness, dielectric constant, and loss tangent, as well as mounting pad layout dimensions. Selected models also include capacitor orientation – vertical or horizontal – as an input. Engineers can request FREE use of the models by visiting the https://www.modelithics.com/MVP/PPI.

Recommended Land Pattern Dimensions

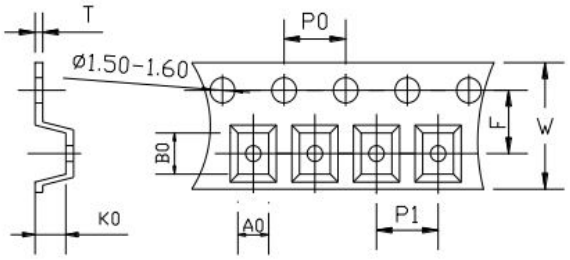
Regarding Landing Patterns, please refer to IPC-7351B (table 3-5, 3-6).

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

0505C/P (0.055” x 0.055”)

Tape & Reel Specifications

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



$A_0B_0K_0$

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

Engineering Design Kits

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

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

Kit Number MAGNETIC	Kit Number NON-MAGNETIC	Value Range	Values
DKD0505C01 DKD0505P01	DKD0505C05 DKD0505P05	**0.1 - 2.0pF**	0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.2, 1.5, 1.6, 1.8, 2.0pF
DKD0505C02 DKD0505P02	DKD0505C06 DKD0505P06	**1 - 10pF**	1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.4, 2.7, 3.0, 3.3, 3.9, 4.7, 5.6, 6.8, 8.2, 10pF
DKD0505C03 DKD0505P03	DKD0505C07 DKD0505P07	**10 - 100pF**	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF
DKD0505C04	DKD0505C08	**100 - 1000pF**	100, 120, 150, 180, 200, 220, 240, 270, 300, 330, 390, 470, 560, 680, 820, 1000pF

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

1111C/P (0.110”x 0.110”)

Product Features

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

Product Applications

Typical Functional Applications:

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

Typical Circuit Applications:

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

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

Part Numbering

1111 C 100 J W 501 X TV

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

Capacitance Tolerance Codes

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

Voltage Codes

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

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

1111C/P (0.110”x 0.110”)

1111C/P Capacitance Values

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

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

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

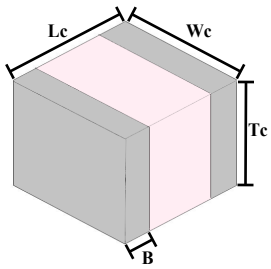
Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.
0.1	0R1	A,B	500V	1000V or 1500V	3.3	3R3	A,B C,D	500V	1000V or 1500V	36	360	F,G, J,K	500V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

*Available in NP0 only

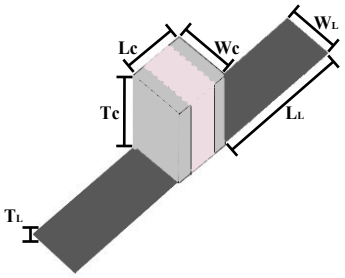
Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

1111C/P (0.110”x 0.110”)

Termination Types and Codes



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



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

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

Dimensions Unit: inch (millimeter)

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

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

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

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

1111C/P (0.110”x 0.110”)

Electrical Specifications

Quality Factor (Q)	Greater than 10,000 at 1 MHz
Insulation Resistance (IR)	0.1pF to 470pF: 10^6 Megaohms min. @ +25°C rated WVDC 10^5 Megaohms min. @ +125°C rated WVDC 510pF to 1000pF: 10^5 Megaohms min. @ +25°C rated WVDC 10^4 Megaohms min. @ +125°C rated WVDC
Rated Voltage	See Rated Voltage in Capacitance Table
Dielectric Withstanding Voltage (DWV)	250% of Rated Voltage of 5 seconds, Rated Voltage ≤ 500VDC 150% of Voltage for 5 seconds, 500VDC <Rated Voltage ≤ 1250 VDC 120% of Voltage for 5 seconds, Rated Voltage > 1250 VDC
Operating Temperature Range	-55°C to 200°C
Temperature Coefficient (TC)	C: -55°C to 125°C 0±30ppm/°C; >125°C to 200°C 0±60ppm/°C P: -55°C to 200°C +90±20ppm/°C
Capacitance Drift	±0.02% or ±0.05pF, whichever is greater
Piezoelectric Effects	None
Termination Type	See Termination Type Table

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

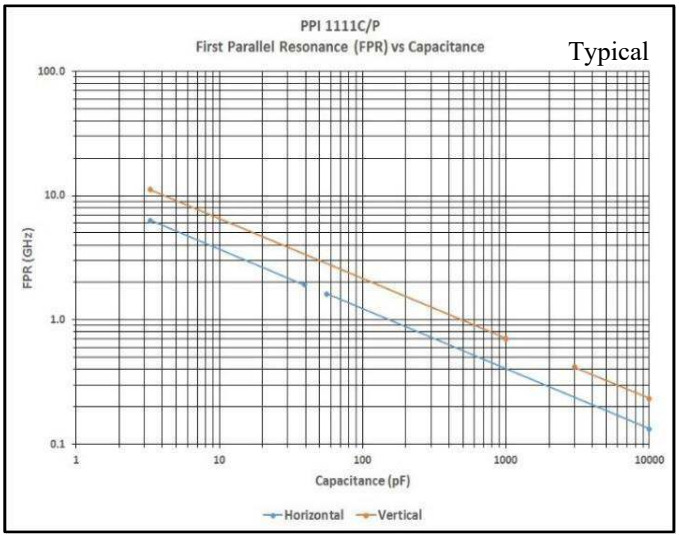
Environmental Specifications

	Specification	Test Parameters
Thermal Shock	**DWV:** The initial Value **IR:** Shall not be less than 30% of the initial value. **Capacitance Change:** No more than 0.5% or 0.5pF, whichever is greater.	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature (-55°C and 200°C) stay 30 minutes, the time of removing shall not be more than 3 minutes. Perform five cycles.
Moisture Resistance		MIL-STD-202, Method 106
Humidity (Steady State)	**DWV:** The initial Value **IR:** The initial value. **Capacitance Change:** No more than 0.3% or 0.3pF, whichever is greater.	MIL-STD-202, Method 103, Condition A With 1.5Volts DC applied while subjected to an environment of 85°C with 85% relative humidity for 240 hours minimum.
Life	**IR:** Shall not be less than 30% of the initial value. **Capacitance Change:** No more than 2.0% or 0.5pF, whichever is greater.	MIL-STD-202, Method 108. For 2000 hours, at 200°C. 200% of Voltage for Capacitors, Rated Voltage ≤ 500VDC; 120% of Voltage for Capacitors, 500VDC< Rated Voltage ≤1250VDC; 100% for Voltage for Capacitors, Rated Voltage >1250VDC
Terminal Strength	**Force:** 10lbs typical, 5lbs. Minimum. **Duration Time:** 5 to 10 seconds	MIL-STD-202, Method 211A, Test Condition A. Applied a force and maintained for a period of 5 to 10 seconds. The force shall be in the direction of the axes of the terminations.

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

1111C/P (0.110”x 0.110”)

FPR -- First Parallel Resonance (FPRs)

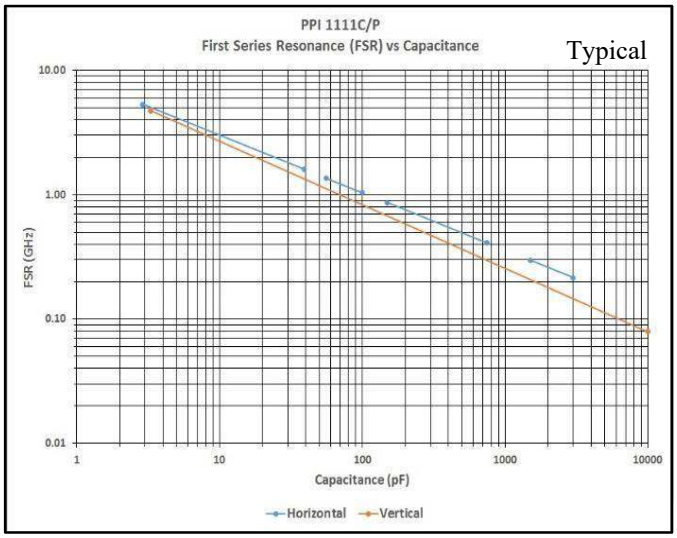


Definitions and Measurement Conditions

The **First Parallel Resonance, FPR,** is defined as the lowest frequency at which a suckout or notch appears in |S21|.

It is generally independent of substrate thickness or dielectric constant, but does depend on capacitor orientation. A horizontal orientation means the capacitor electrode planes are parallel to the plane of the substrate; a vertical orientation means the electrode planes are perpendicular to the substrate.

FSR -- First Series Resonance (FSRs)



Definitions and Measurement Conditions

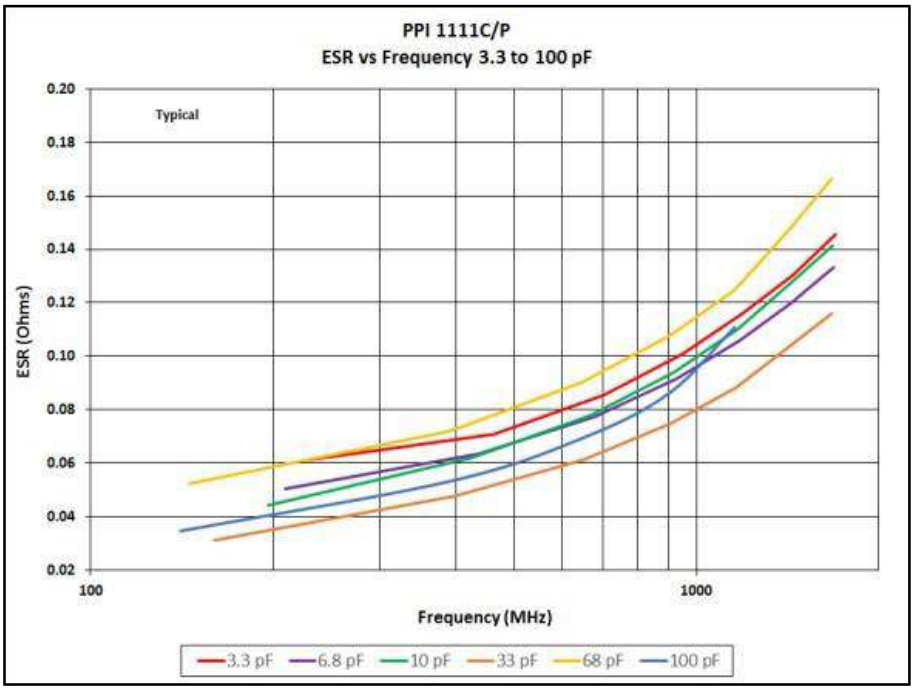
The **First Series Resonance, FSR,** is defined as the lowest frequency at which the imaginary part of the input impedance, Im[Zin], equals zero. Should Im[Zin] or the real part of the input impedance, Re[Zin], not be monotonic with frequency at frequencies lower than those at which Im[Zin] =0, the FSR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

The measurement conditions are: substrate – Rogers RO4350; substrate dielectric constant = 3.66; horizontal mount substrate thickness (mils) =25; gap in microstrip trace (mils) = 15; horizontal mount microstrip trace width (mils) = 55. Reference planes at sample edges.

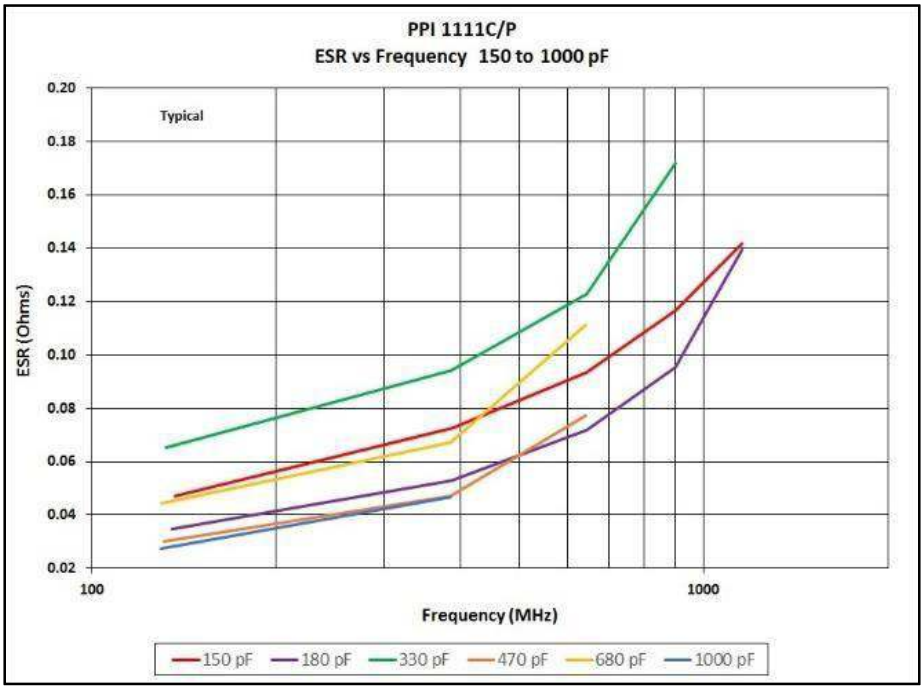
All data has been derived from electrical models created by Modelithics, Inc., a specialty vendor contracted by PPI. The models are derived from measurements on a large number of parts disposed on several different substrates.

ESR vs. Frequency

1111C/P ESR vs Frequency



1111C ESR vs Frequency

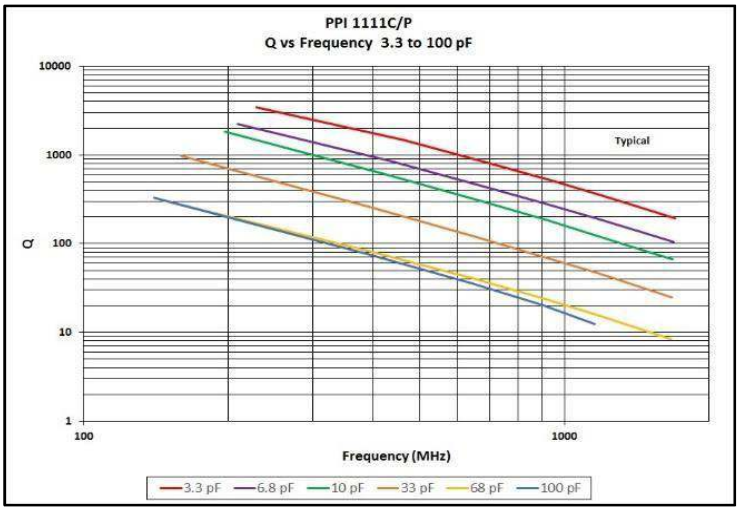


Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

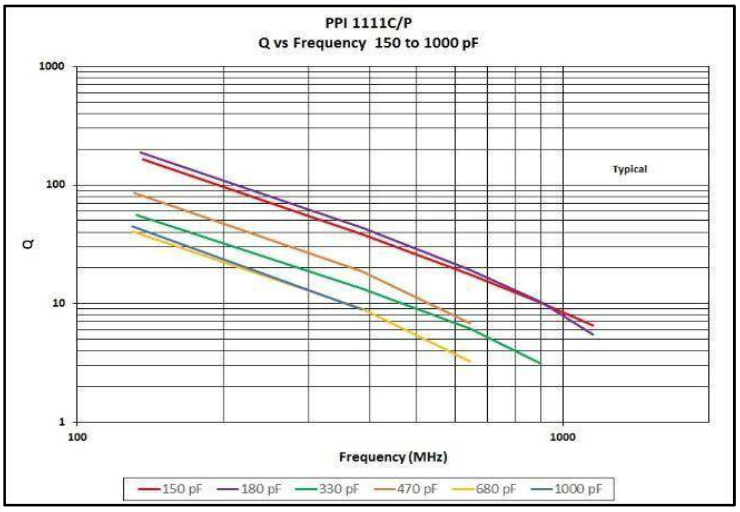
1111C/P (0.110”x 0.110”)

Q vs. Capacitance

1111C/P Q vs Frequency

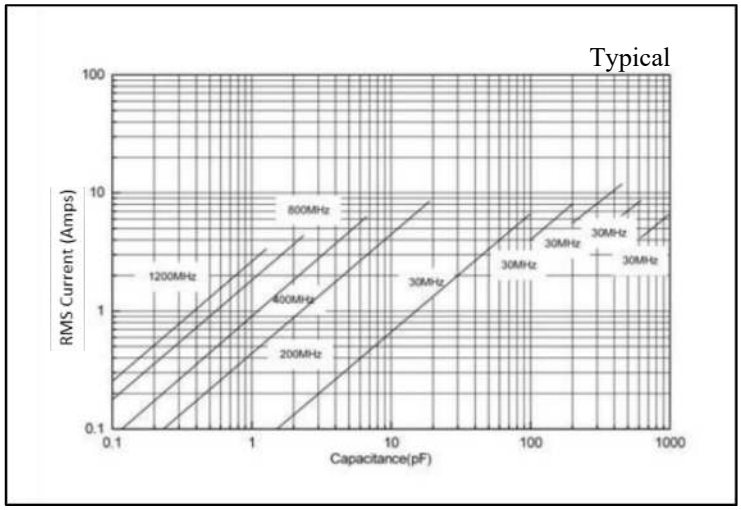


1111C Q vs Frequency

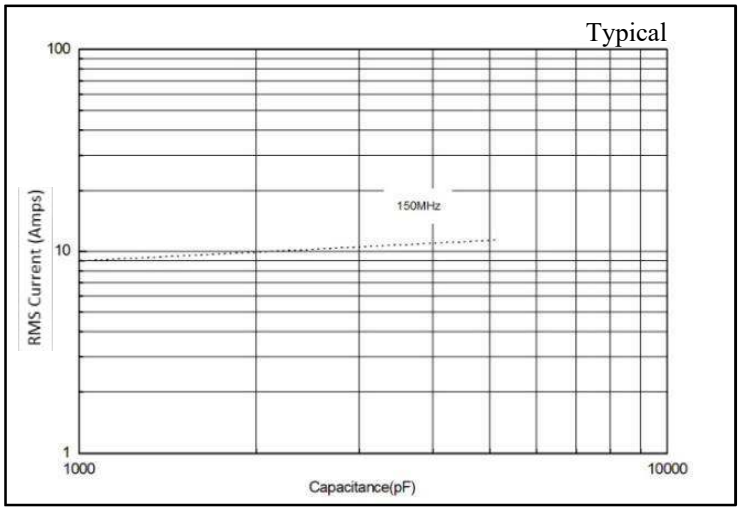


Current Rating vs. Capacitance

1111C/P Current Rating vs Capacitance



1111C Current Rating vs Capacitance



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

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

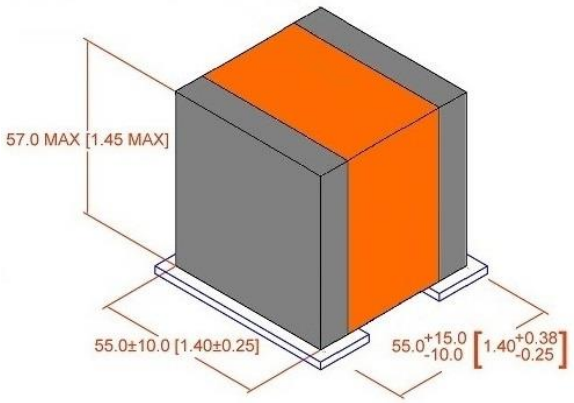
$I_{pow\ diss} = \sqrt{\frac{P_{dissipation}}{ESR}}$ (If the thermal resistance of the mounting surface is 20°C/W, then you will reach the power dissipated limit of 3W)

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

1111C/P (0.110”x 0.110”)

Capacitor Application Program

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



Modelithics Vendor Program

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

Microwave Global Models include every part value in a series and permit users to input substrate thickness, dielectric constant, and loss tangent, as well as mounting pad layout dimensions. Selected models also include capacitor orientation – vertical or horizontal – as an input. Engineers can request FREE use of the models by visiting the https://www.modelithics.com/MVP/PPI.

Recommended Land Pattern Dimensions

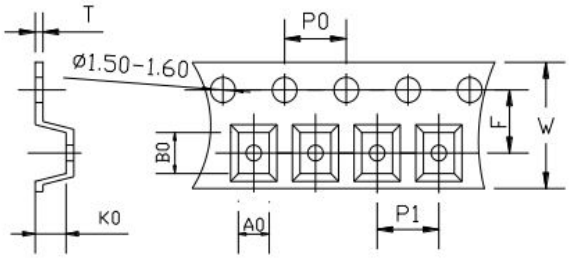
Regarding Landing Patterns, please refer to IPC-7351B (table 3-5, 3-6).

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

1111C/P (0.110”x 0.110”)

Tape & Reel Specifications

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



$A_0B_0K_0$

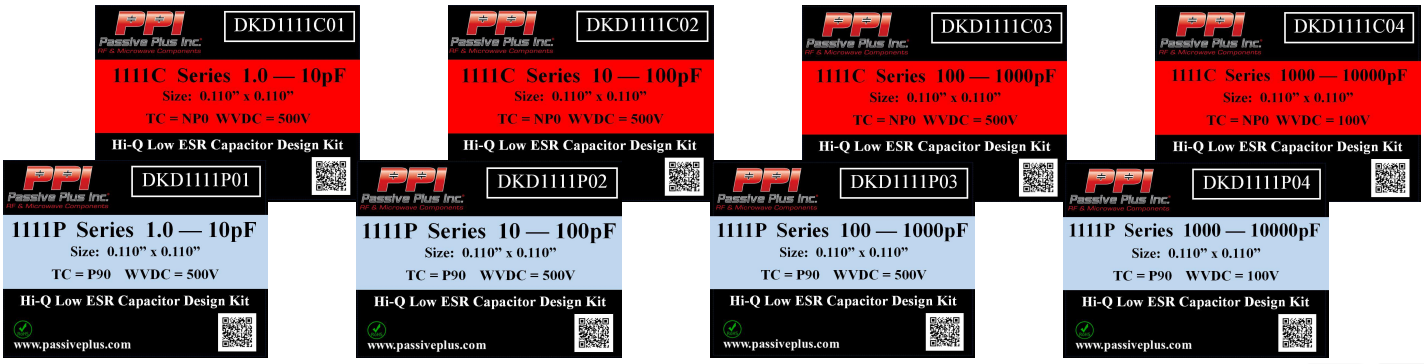
- Determined by component size. Typical clearance between the cavity and the component is: .50 (.002) min to .65 (.026) max for 12mm tape.
- The component cannot rotate more than 20° within the determined cavity.

Engineering Design Kits

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

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

Kit Number MAGNETIC	Kit Number NON-MAGNETIC	Value Range	Values	
DKD1111C01 DKD1111P01	DKD1111C05 DKD1111P05	**1.0 - 10pF**	1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.4, 2.7, 3.0, 3.3, 3.9, 4.7, 5.6, 6.8, 8.2, 10pF	RoHS
DKD1111C02 DKD1111P02	DKD1111C06 DKD1111P06	**10 - 100pF**	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF	RoHS
DKD1111C03 DKD1111P03	DKD1111C07 DKD1111P07	**100 - 1000pF**	100, 120, 150, 180, 200, 220, 240, 270, 300, 330, 390, 470, 560, 680, 820, 1000pF	RoHS
DKD1111C04 DKD1111P04	DKD1111C08 DKD1111P08	**1000 - 10000pF**	1000, 1100, 1200, 1500, 1800, 2000, 2200, 2700, 3000, 3300, 3900, 4700, 5100, 5600, 10000pF	RoHS



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

2225C/P (0.220” x 0.250”)

Product Features

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

Product Applications

Typical Functional Applications:

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

Typical Circuit Applications:

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

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

Part Numbering

2225	C	100	J	W	252	X	TV

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

Capacitance Tolerance Codes

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

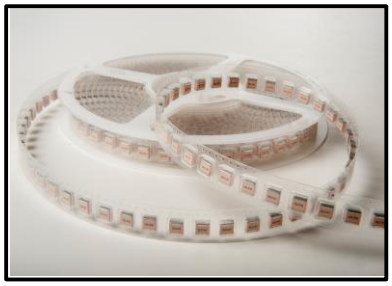
Voltage Codes

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

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

2225C/P (0.220” x 0.250”)

2225C/P Capacitance Values



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

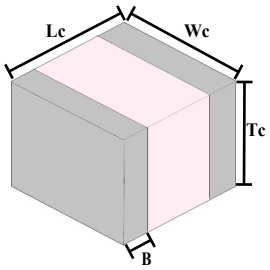
Special capacitances, tolerances and WVDC are available. Please contact PPI.

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

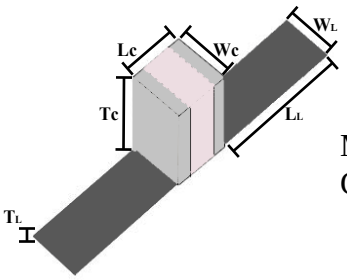
Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

2225C/P (0.220” x 0.250”)

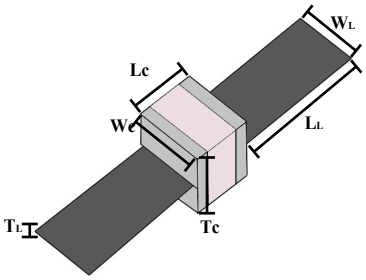
Termination Types and Codes



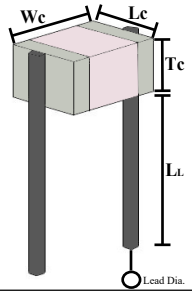
Chip Termination:
Codes: W, L, P



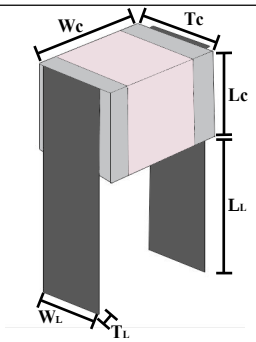
Microstrip Termination:
Codes: MS, MN



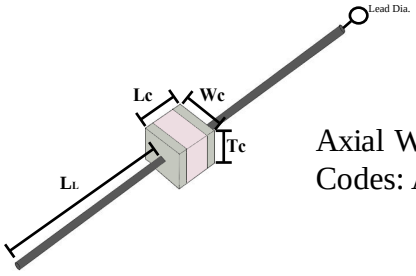
Axial Ribbon Termination:
Code: AR, AN



Radial Wire Termination:
Codes: RW, RN



Radial Ribbon Termination:
Code: RR, FN



Axial Wire Termination:
Codes: AW, BN

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

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

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

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

2225C/P (0.220" x 0.250")

Dimensions - For Termination Types images, see previous page

Unit: inch (millimeter)

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

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

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

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

2225C/P (0.220” x 0.250”)

Electrical Specifications

Quality Factor (Q)	Greater than 10,000 at 1 MHz
Insulation Resistance (IR)	Test Voltage: 500V 10^5 Megaohms min. @ +25°C 10^4 Megaohms min. @ +125°C
Rated Voltage	See Rated Voltage in Capacitance Table
Dielectric Withstanding Voltage (DWV)	250% of Rated Voltage of 5 seconds, Rated Voltage ≤ 500VDC 150% of Voltage for 5 seconds, 500VDC <Rated Voltage ≤ 1250 VDC 120% of Voltage for 5 seconds, Rated Voltage > 1250 VDC
Operating Temperature Range	-55°C to 200°C
Temperature Coefficient (TC)	C: -55°C to 125°C 0±30ppm/°C; >125°C to 200°C 0±60ppm/°C P: -55°C to 200°C +90±20ppm/°C
Capacitance Drift	±0.02% or ±0.02pF, whichever is greater
Piezoelectric Effects	None
Termination Type	See Termination Type Table

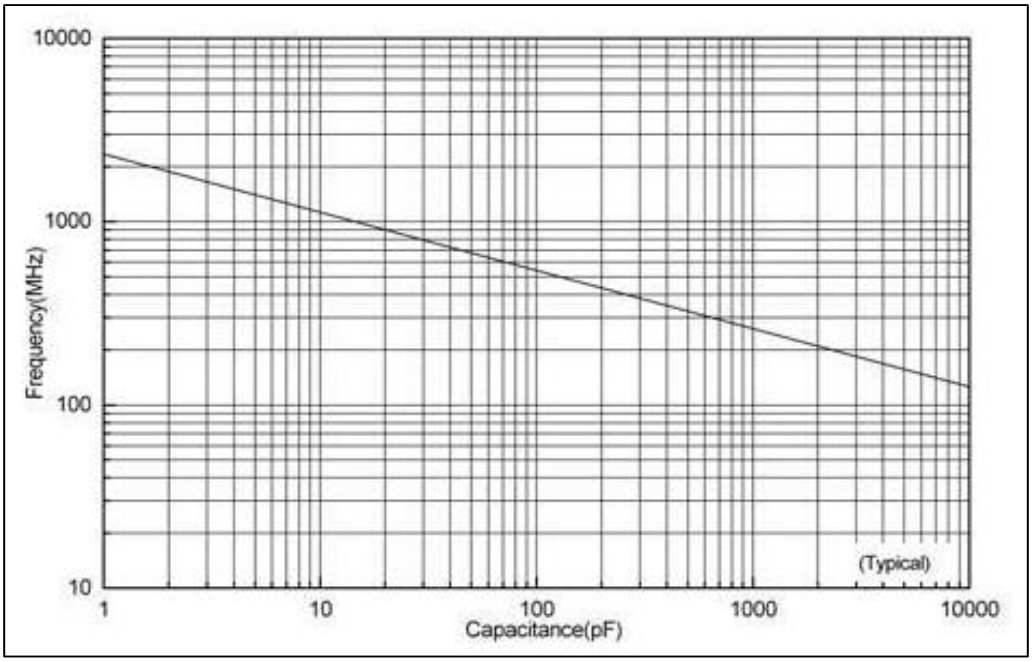
Capacitors are designed and manufactured to meet the requirements of MIL-PRF-55681 and MIL-PRF-123.

Environmental Specifications

	Specification	Test Parameters
Thermal Shock	**DWV:** The initial Value **IR:** Shall not be less than 30% of the initial value. **Capacitance Change:** No more than 0.5% or 0.5pF, whichever is greater.	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature (-55°C and 200°C) stay 30 minutes, the time of removing shall not be more than 3 minutes. Perform five cycles.
Moisture Resistance		MIL-STD-202, Method 106
Humidity (Steady State)	**DWV:** The initial Value **IR:** The initial value. **Capacitance Change:** No more than 0.3% or 0.3pF, whichever is greater.	MIL-STD-202, Method 103, Condition A With 1.5Volts DC applied while subjected to an environment of 85°C with 85% relative humidity for 240 hours minimum.
Life	**IR:** Shall not be less than 30% of the initial value. **Capacitance Change:** No more than 2.0% or 0.5pF, whichever is greater.	MIL-STD-202, Method 108. For 2000 hours, at 200°C. 200% of Voltage for Capacitors, Rated Voltage ≤ 500VDC; 120% of Voltage for Capacitors, 500VDC< Rated Voltage ≤1250VDC; 100% for Voltage for Capacitors, Rated Voltage >1250VDC
Terminal Strength	**Force:** 20lbs typical, 10lbs. Minimum. **Duration Time:** 5 to 10 seconds	MIL-STD-202, Method 211A, Test Condition A. Applied a force and maintained for a period of 5 to 10 seconds. The force shall be in the direction of the axes of the terminations.

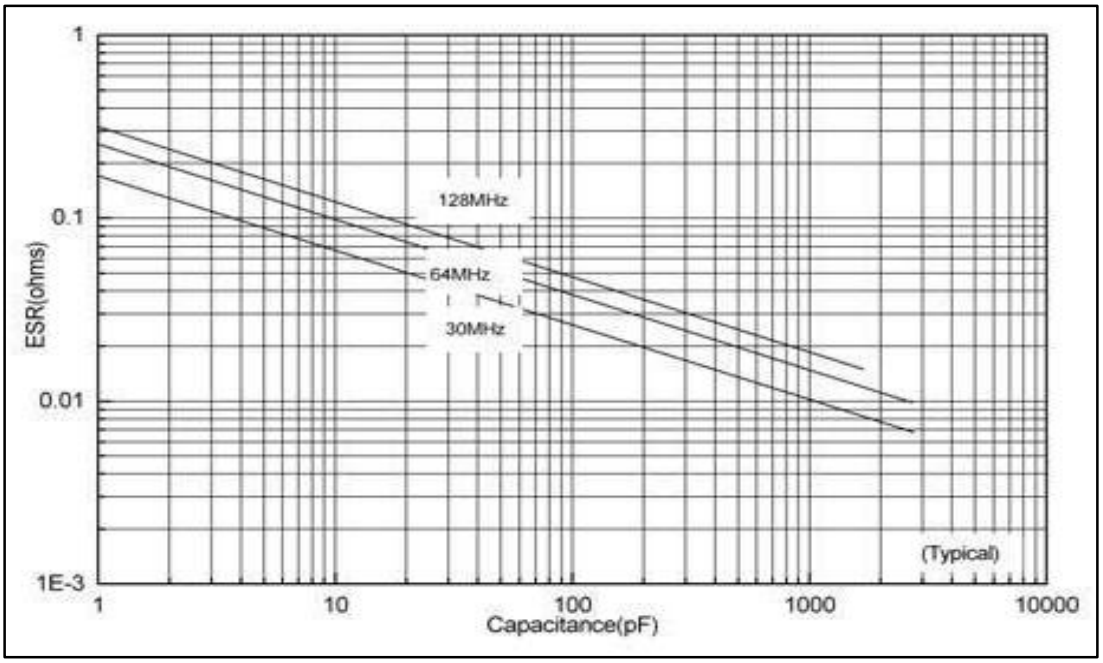
Series Resonance vs. Capacitance

Series Resonance vs. Capacitance



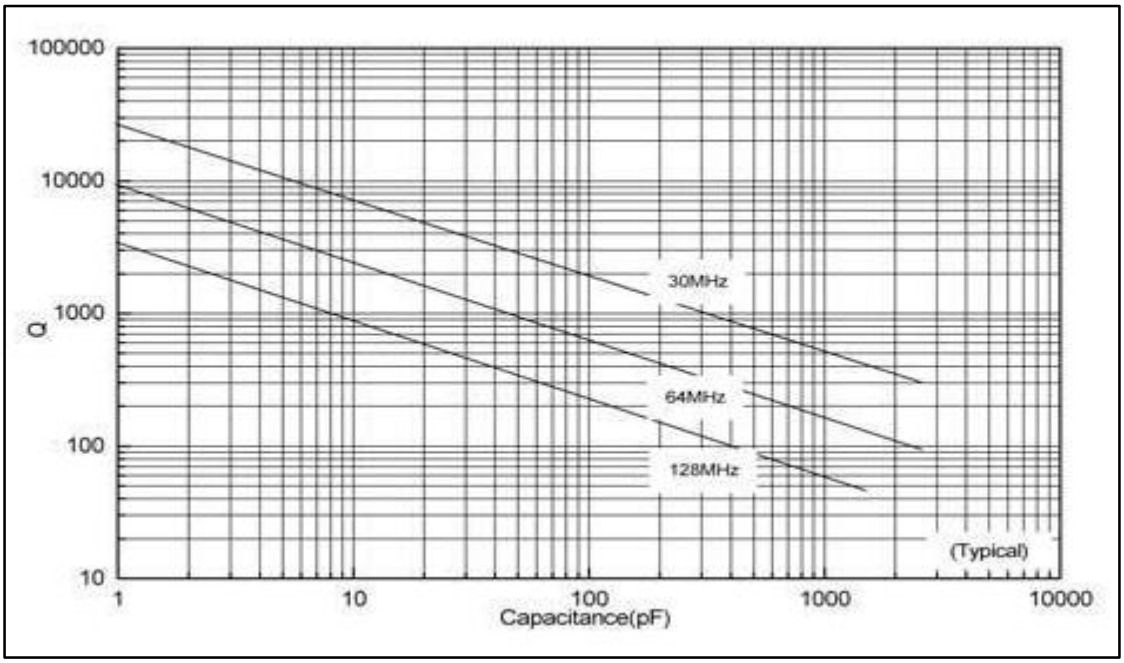
ESR vs. Frequency

2225C/P ESR vs Frequency



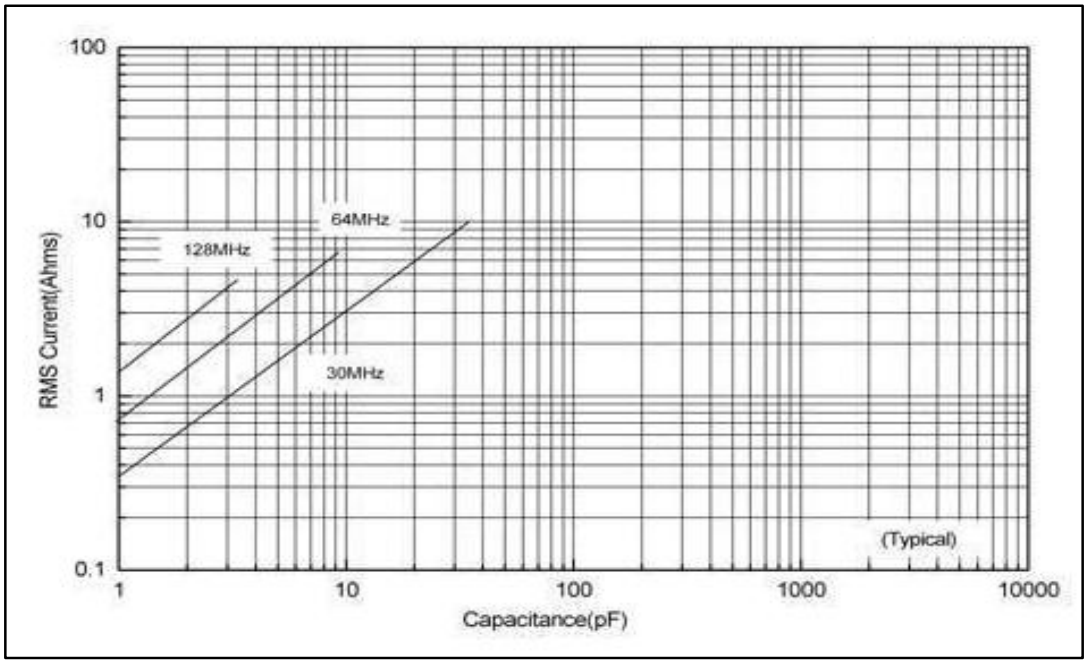
Q vs. Capacitance

Q vs Capacitance



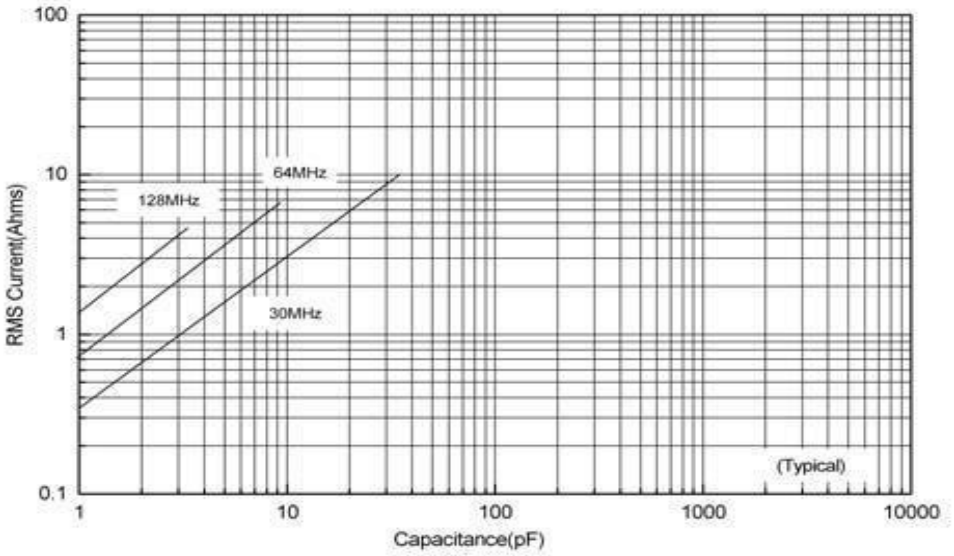
Current Rating vs. Capacitance

2225C/P Current Rating vs Capacitance



Current Rating vs. Capacitance

2225C/P Current Rating vs Capacitance



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

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

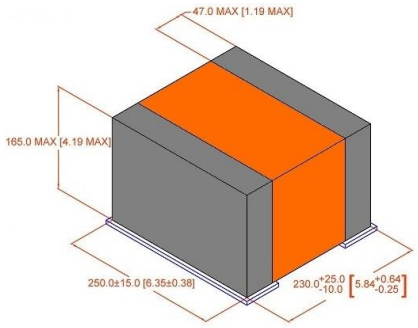
$I_{pow\ diss} = \sqrt{\frac{P_{dissipation}}{ESR}}$ (If the thermal resistance of the mounting surface is 15°C/W, then you will reach the power dissipated limit of 4W)

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

2225C/P (0.220” x 0.250”)

Capacitor Application Program

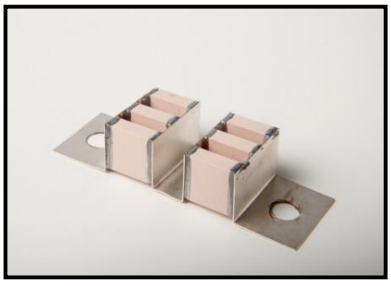
PPI’s brand new online Capacitor Application Program (C.A.P.) helps Engineers and Designers select capacitors according to parameters such as cap value and frequency. C.A.P. allows engineers to insert capacitors requirements (Cap value, Frequency), producing Scattering Matrices (S2P) Charts while providing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



Recommended Land Pattern Dimensions

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

Custom Assemblies

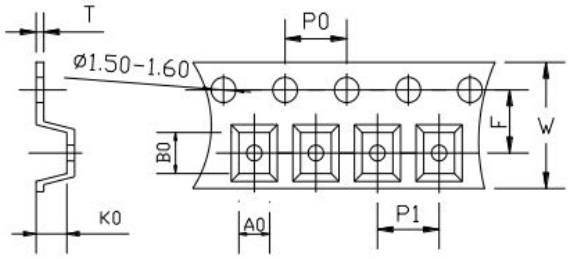


Passive Plus offers Capacitor Assemblies for high power requirements. Typical assemblies are configured in series and/or parallel combinations, producing higher voltage/current handling capabilities, extended capacitance range and tighter tolerances.

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

Tape & Reel Specifications (mm)

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



$A_0B_0K_0$

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

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

3838C/P (0.380” x 0.380”)

Product Features

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

Product Applications

Typical Functional Applications:

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

Typical Circuit Applications:

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

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

Part Numbering

3838 C 100 J W 362 X

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

Capacitance Tolerance Codes

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

Voltage Codes

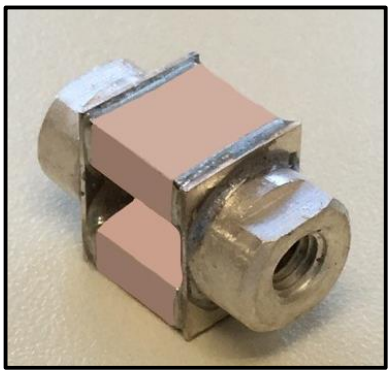
Voltage	Code
500V	501
1000V	102
2500V	252
3600V	362
7200V	722

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

3838C/P (0.380” x 0.380”)

3838C/P Capacitance Values

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

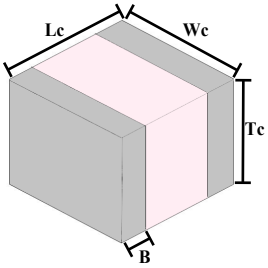


Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC Std.	Rated WVDC Ext.	Cap. pF	Cap Code	Tol.	Rated WVDC
0.5	0R5	B,C, D	3600V	7200V	**4.7**	4R7	B,C, D	3600V	7200V	**51**	510	F,G, J,K	3600V	7200V	**560**	561	F,G,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

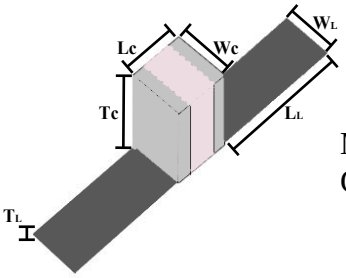
Traditional High Q (>10,000) Low ESR Multi-Layer Ceramic Capacitors

3838C/P (0.380” x 0.380”)

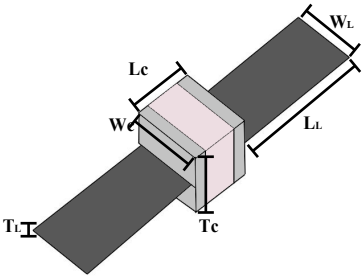
Termination Types and Codes



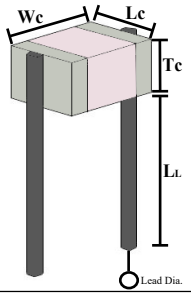
Chip Termination:
Codes: W, L, P



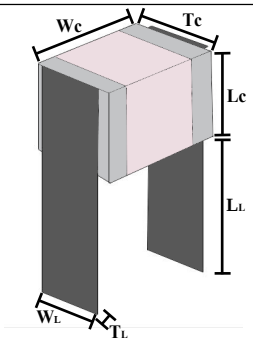
Microstrip Termination:
Codes: MS, MN



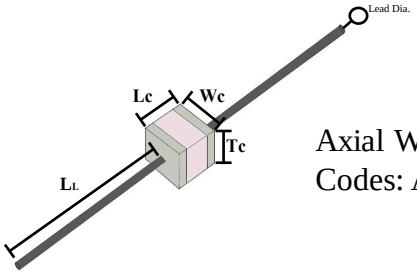
Axial Ribbon Termination:
Code: AR, AN



Radial Wire Termination:
Codes: RW, RN



Radial Ribbon Termination:
Code: RR, FN



Axial Wire Termination:
Codes: AW, BN

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

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

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

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

3838C/P (0.380” x 0.380”)

Dimensions - For Termination Types images, see previous page

Unit: inch (millimeter)

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

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

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

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

3838C/P (0.380” x 0.380”)

Electrical Specifications

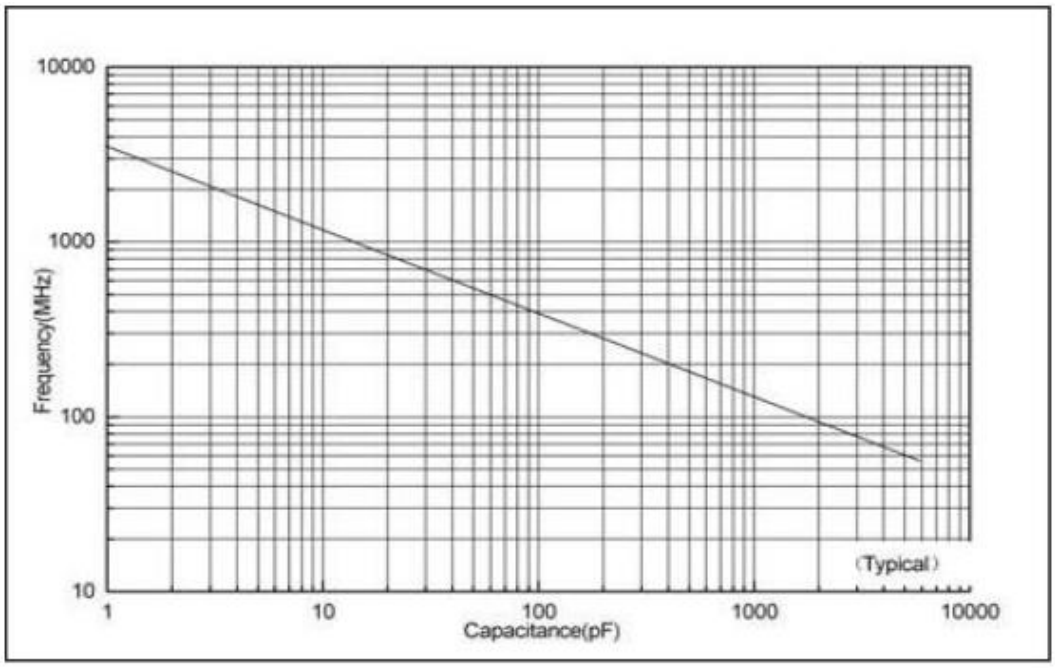
Quality Factor (Q)	Greater than 10,000 at 1 MHz
Insulation Resistance (IR)	Test Voltage: 500V 10^5 Megaohms min. @ +25°C 10^4 Megaohms min. @ +125°C
Rated Voltage	See Rated Voltage in Capacitance Table
Dielectric Withstanding Voltage (DWV)	250% of Rated Voltage of 5 seconds, Rated Voltage ≤ 500VDC 150% of Voltage for 5 seconds, 500VDC <Rated Voltage ≤ 1250 VDC 120% of Voltage for 5 seconds, Rated Voltage > 1250 VDC
Operating Temperature Range	-55°C to 200°C
Temperature Coefficient (TC)	C: -55°C to 125°C 0±30ppm/°C; >125°C to 200°C 0±60ppm/°C P: -55°C to 200°C +90±20ppm/°C
Capacitance Drift	±0.02% or ±0.02pF, whichever is greater
Piezoelectric Effects	None
Termination Type	See Termination Type Table

Environmental Specifications

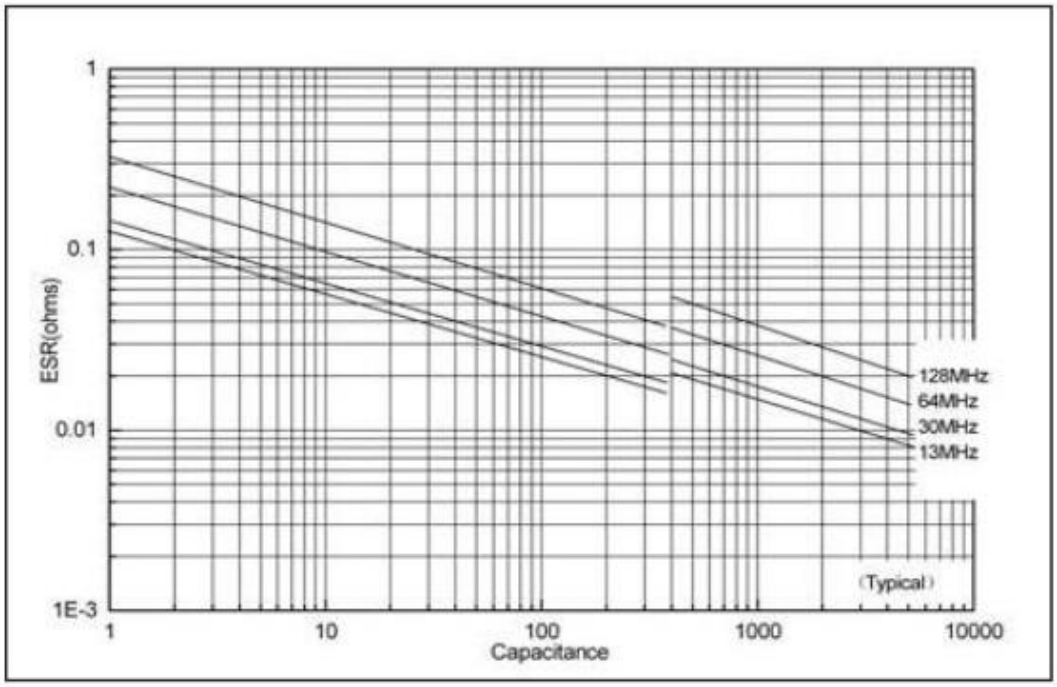
	Specification	Test Parameters
Thermal Shock	**DWV:** The initial value **IR:** Shall not be less than 30% of the initial value. **Capacitance Change:** No more than 0.5% or 0.5pF, whichever is greater.	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature (-55°C and 200°C) stay 30 minutes, the time of removing shall not be more than 3 minutes. Perform five cycles.
Moisture Resistance		MIL-STD-202, Method 106
Humidity (Steady State)	**DWV:** The initial value **IR:** The initial value **Capacitance Change:** No more than 0.3% or 0.3pF, whichever is greater.	MIL-STD-202, Method 103, Condition A With 1.5Volts DC applied while subjected to an environment of 85°C with 85% relative humidity for 240 hours minimum.
Life	**IR:** Shall not be less than 30% of the initial value. **Capacitance Change**: No more than 2.0% or 0.5pF, whichever is greater.	MIL-STD-202, Method 108. For 2000 hours, at 200°C. 200% of Voltage for Capacitors, Rated Voltage ≤ 500VDC; 120% of Voltage for Capacitors, 500VDC< Rated Voltage ≤1250VDC; 100% for Voltage for Capacitors, Rated Voltage >1250VDC
Terminal Strength	**Force:** 20lbs typical, 10lbs. min. **Duration Time:** 5 to 10 seconds	MIL-STD-202, Method 211A, Test Condition A. Applied a force and maintained for a period of 5 to 10 seconds. The force shall be in the direction of the axes of the terminations.

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

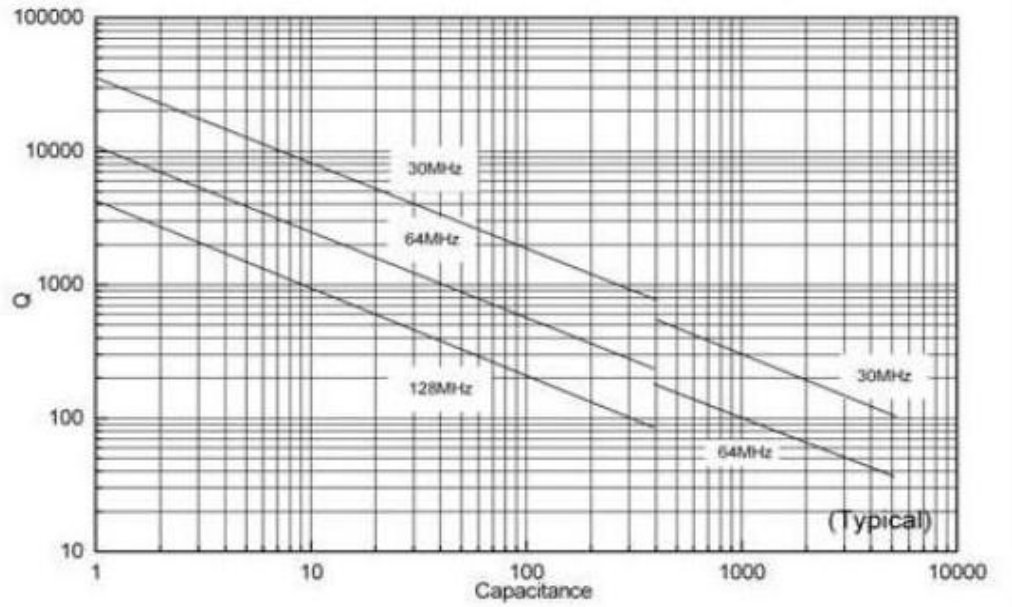
Series Resonance vs. Capacitance



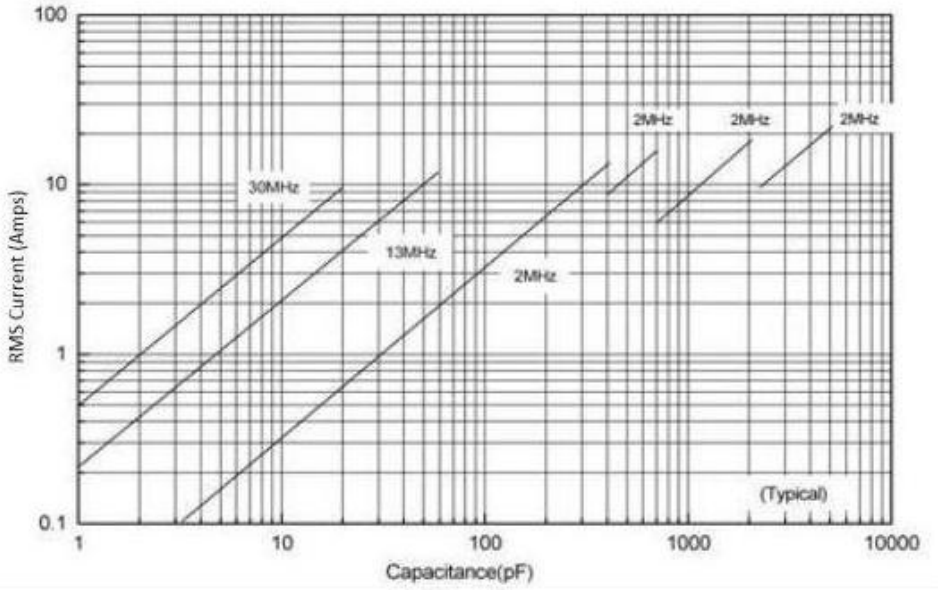
ESR vs. Frequency



Q vs. Capacitance



Current Rating vs. Capacitance



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

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

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

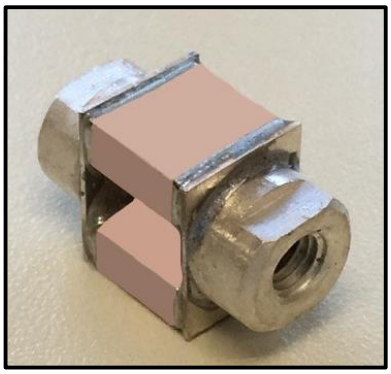
Recommended Land Pattern Dimensions

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

Custom Assemblies

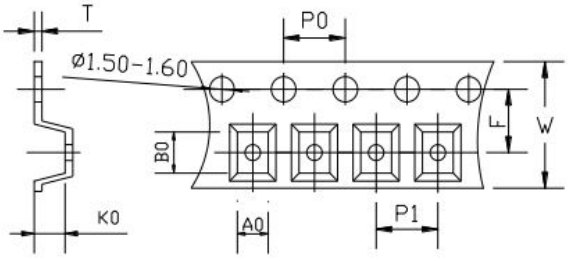
Passive Plus offers Capacitor Assemblies for high power requirements. Typical assemblies are configured in series and/or parallel combinations, producing higher voltage/current handling capabilities, extended capacitance range and tighter tolerances.

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



Tape & Reel Specifications (mm)

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



$A_0B_0K_0$

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

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

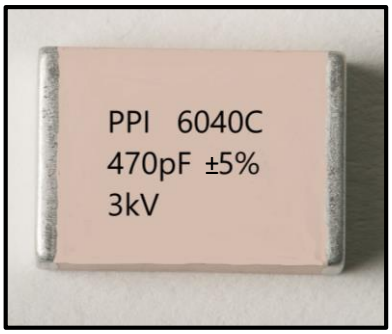
6040C (0.600” x 0.400”)

Product Features

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

Typical Circuit Applications

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



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

Part Numbering

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

Capacitance Tolerance Codes

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

Voltage Codes

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

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

6040C (0.600” x 0.400”)

6040C Capacitance Values

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

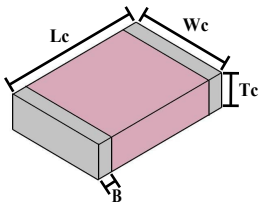
Marking shown for illustration purposes only.
Actual marking may differ.

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

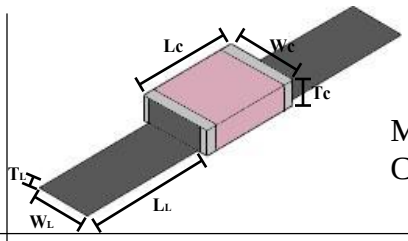
UHF/RF High-Q Power Transmitter
Multi-Layer Ceramic Capacitors

6040C (0.600” x 0.400”)

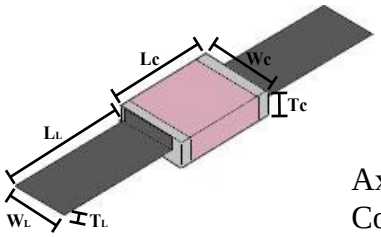
Termination Types and Codes



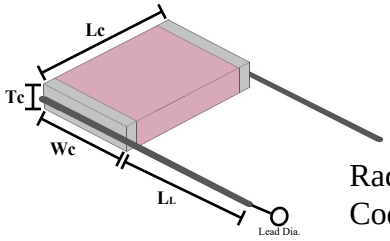
Chip Termination:
Codes: **W, L, P**



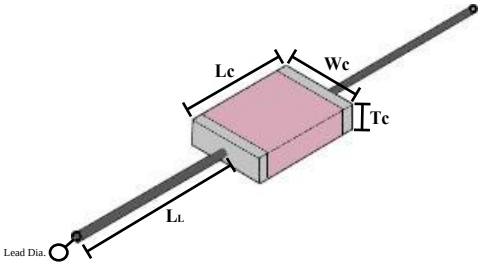
Microstrip Termination:
Codes: **MS, MN**



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



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



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

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

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

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

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

6040C (0.600” x 0.400”)

Dimensions - For Termination Types images, see previous page

Unit: inch (millimeter)

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

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

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

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

6040C (0.600” x 0.400”)

Electrical Specifications

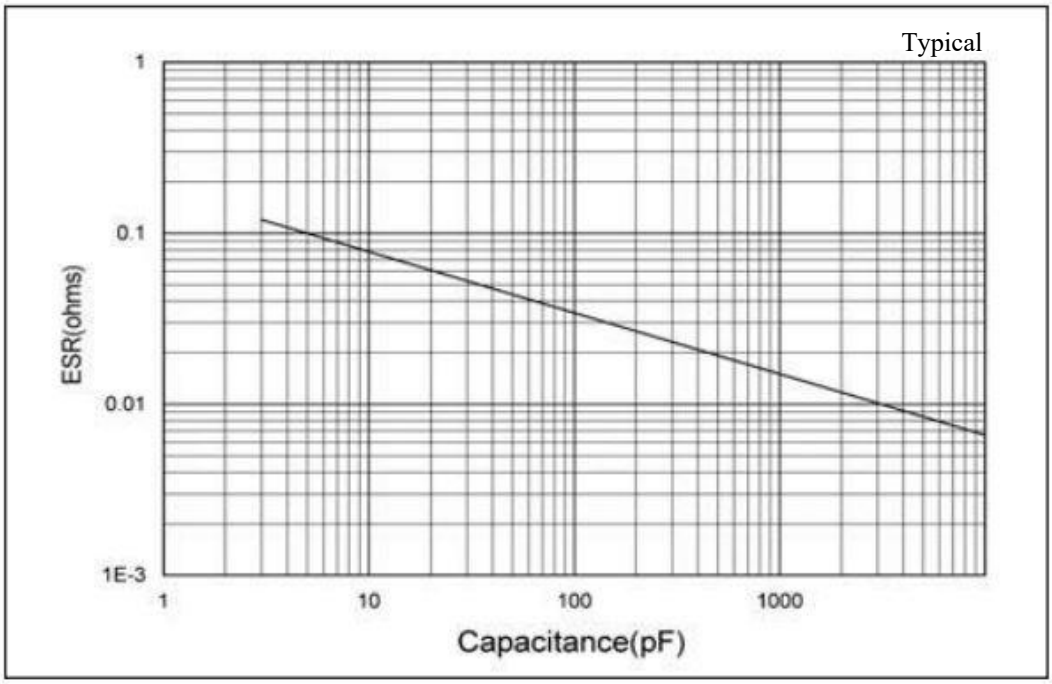
Quality Factor (Q)	No less than 1000pF, Q value more than 2000, Test Frequency 1MHz; More than 1000pF, Q value more than 2000, Test Frequency 1MHz
Insulation Resistance (IR)	Test Voltage: 500V 10^5 Megaohms min. @ +25°C 10^4 Megaohms min. @ +125°C
Rated Voltage	See Rated Voltage in Capacitance Table
Dielectric Withstanding Voltage (DWV)	250% of Voltage of 5 seconds, Rated Voltage ≤ 500VDC 150% of Voltage for 5 seconds, 500VDC <Rated Voltage ≤ 1250 VDC 120% of Voltage for 5 seconds, Rated Voltage > 1250 VDC
Operating Temperature Range	-55°C to 175°C
Temperature Coefficient (TC)	-55°C to 125°C 0±30ppm/°C >125°C to 175°C 0±60ppm/°C
Capacitance Drift	±0.02% or ±0.02pF, whichever is greater
Piezoelectric Effects	None
Termination Type	See Termination Type Table

Environmental Specifications

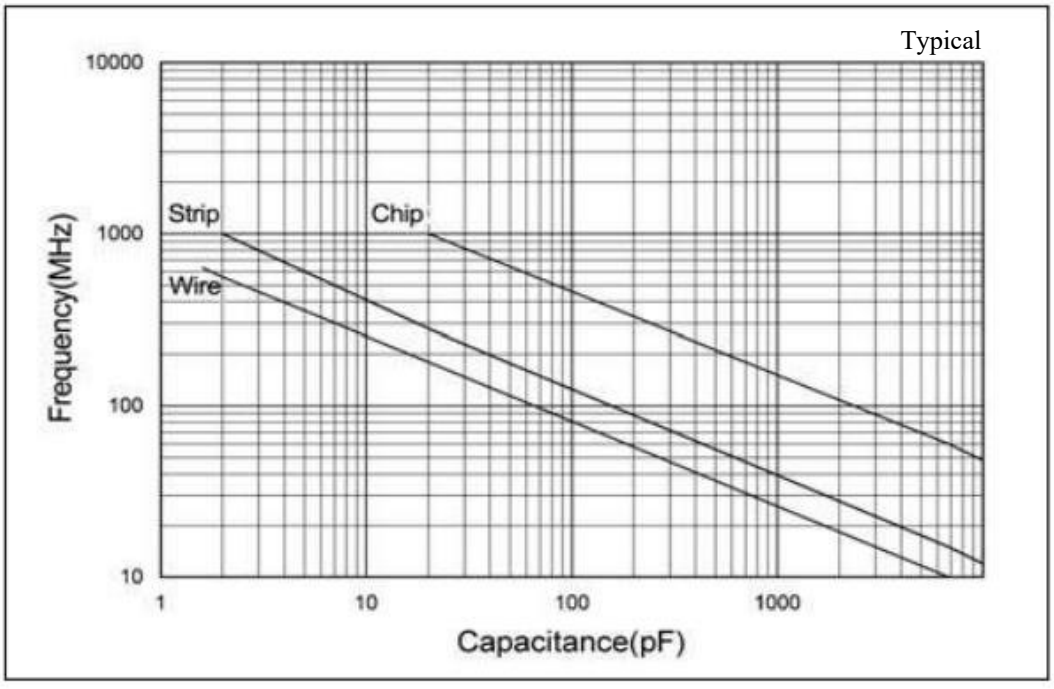
	Specification	Test Parameters
Thermal Shock	**DWV:** The initial value **IR:** Shall not be less than 30% of the initial value. **Capacitance Change:** No more than 0.5% or 0.5pF, whichever is greater.	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature (-55°C and 175°C) stay 30 minutes, the time of removing shall not be more than 3 minutes. Perform five cycles.
Moisture Resistance		MIL-STD-202, Method 106
Humidity (Steady State)	**DWV:** The initial value **IR:** The initial value **Capacitance Change:** No more than 0.3% or 0.3pF, whichever is greater.	MIL-STD-202, Method 103, Condition A With 1.5Volts DC applied while subjected to an environment of 85°C with 85% relative humidity for 240 hours minimum.
Life	**IR:** Shall not be less than 30% of the initial value. **Capacitance Change**: No more than 2.0% or 0.5pF, whichever is greater.	MIL-STD-202, Method 108. For 2000 hours, at 125°C. 200% of Voltage for Capacitors, Rated Voltage ≤ 500VDC; 120% of Voltage for Capacitors, 500VDC< Rated Voltage ≤1250VDC; 100% for Voltage for Capacitors, Rated Voltage >1250VDC
Terminal Strength	**Force:** 25lbs typical, 20lbs. min. **Duration Time:** 5 to 10 seconds	MIL-STD-202, Method 211A, Test Condition A. Applied a force and maintained for a period of 5 to 10 seconds. The force shall be in the direction of the axes of the terminations.

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

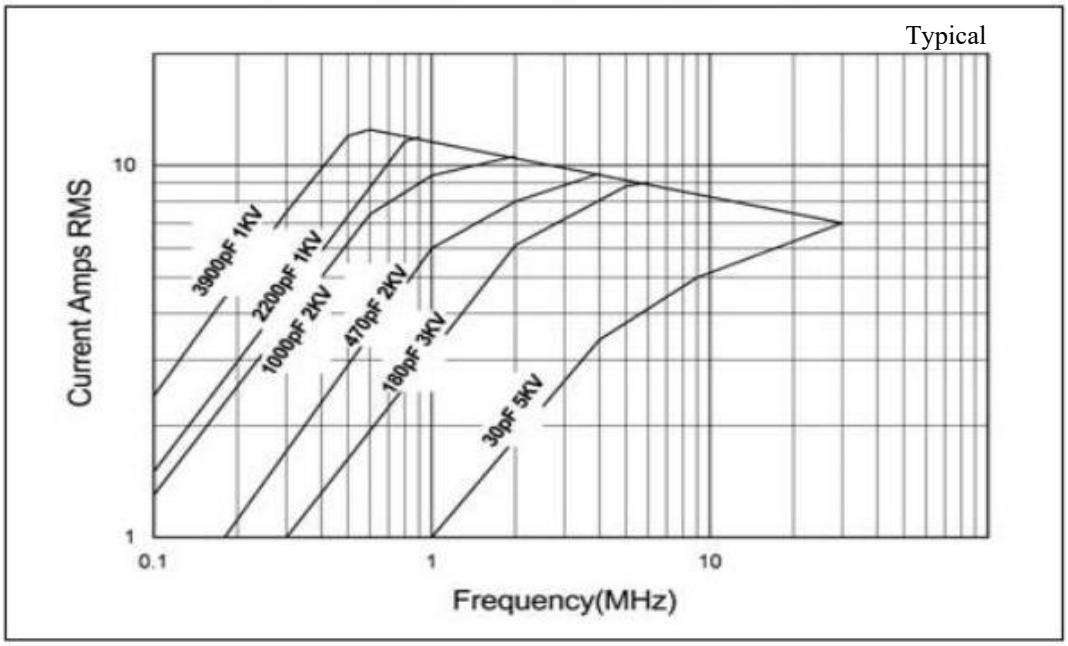
ESR vs. Capacitance Measured @ 30MHz



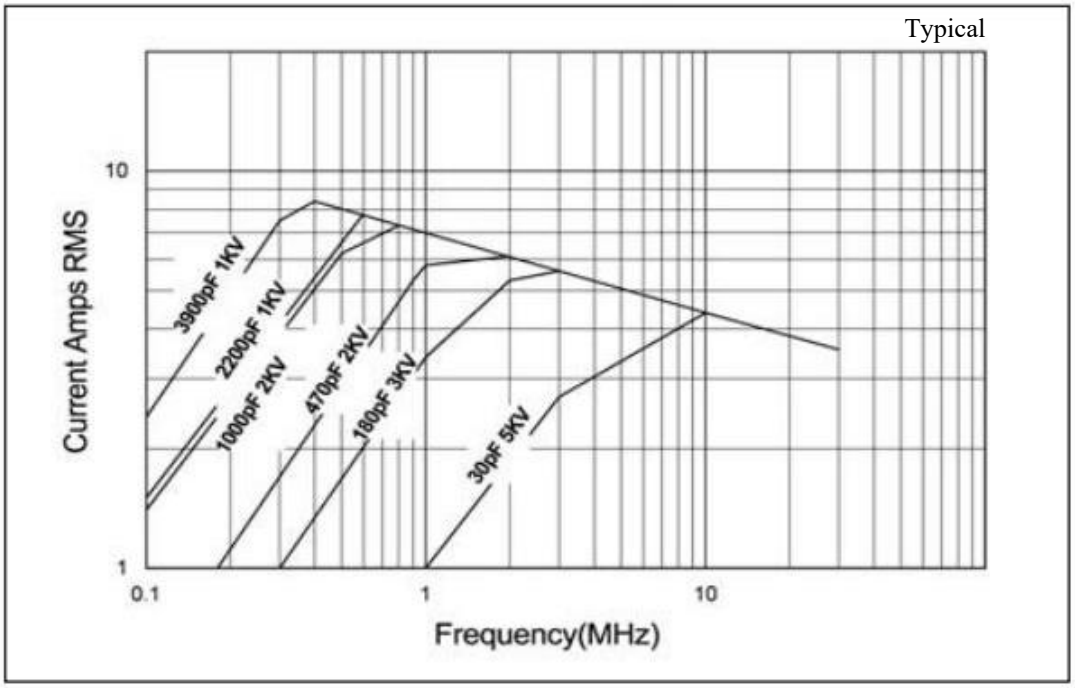
Self Resonant Frequency vs. Capacitance



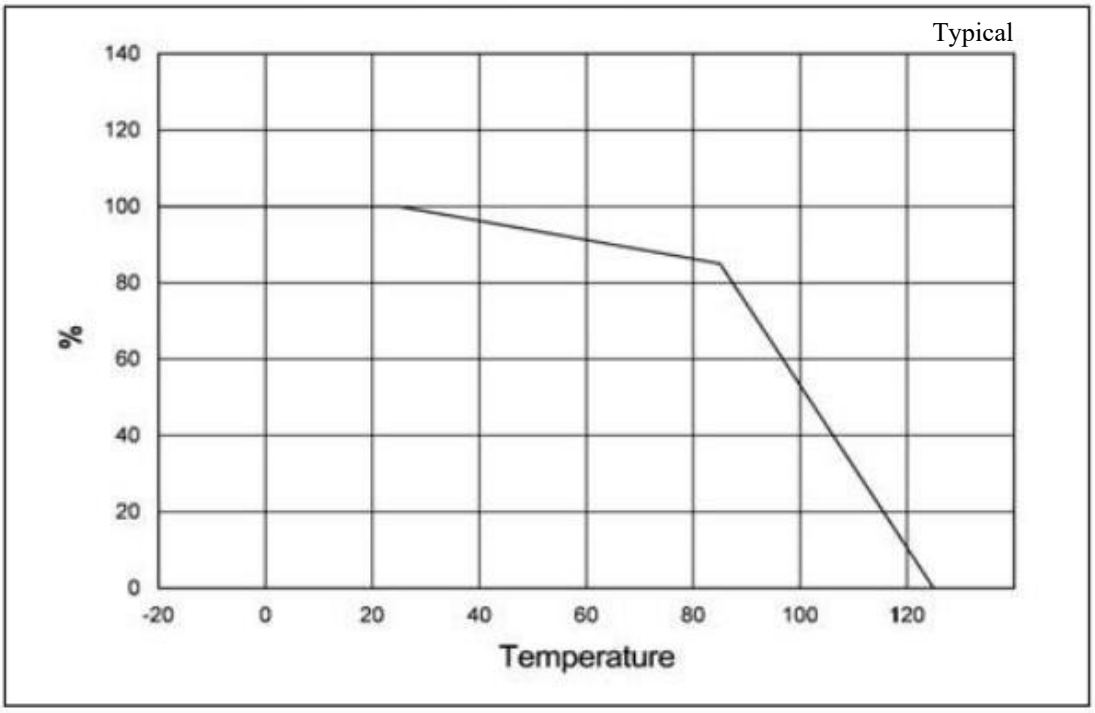
Strip Terminals Rated Current vs. Frequency



Wire Terminals Rated Current vs. Frequency



% Maximum Current vs. Ambient Temperature



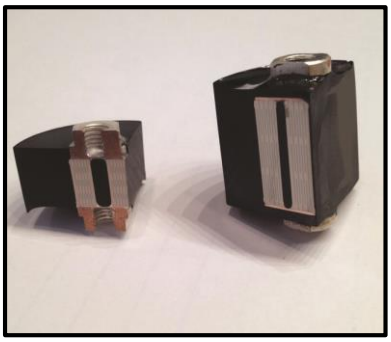
Recommended Land Pattern Dimensions

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

Custom Assemblies

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

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



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

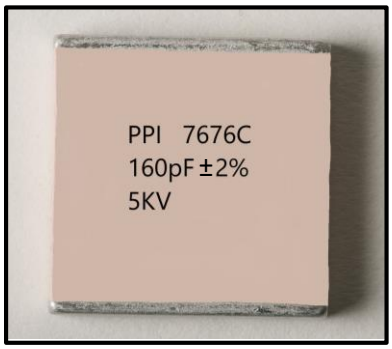
7676C (0.760” x 0.760”)

Product Features

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

Typical Circuit Applications

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



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

Part Numbering

7676 C 100 J W 502 X

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

Capacitance Tolerance Codes

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

Voltage Codes

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

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

7676C (0.760” x 0.760”)

7676C Capacitance Values

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

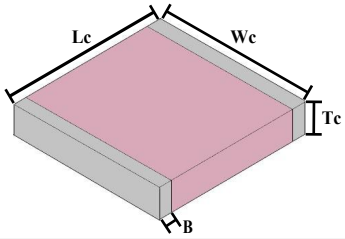
Marking shown for illustration purposes only. Actual marking may differ.

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

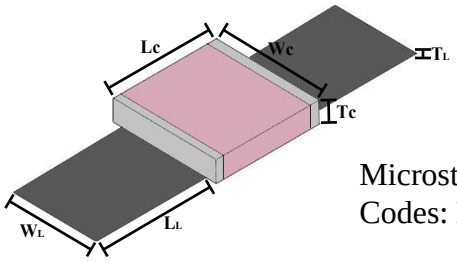
UHF/RF High-Q Power Transmitter
Multi-Layer Ceramic Capacitors

7676C (0.760” x 0.760”)

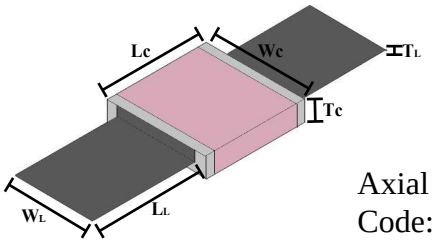
Termination Types and Codes



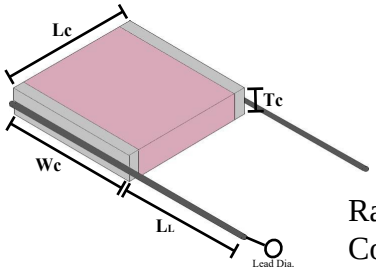
Chip Termination:
Codes: **W, L, P**



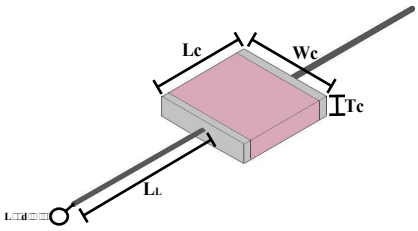
Microstrip Termination:
Codes: **MS, MN**



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



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



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

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

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

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

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

7676C (0.760” x 0.760”)

Dimensions - For Termination Types images, see previous page

Unit: inch (millimeter)

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

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

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

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

7676C (0.760” x 0.760”)

Electrical Specifications

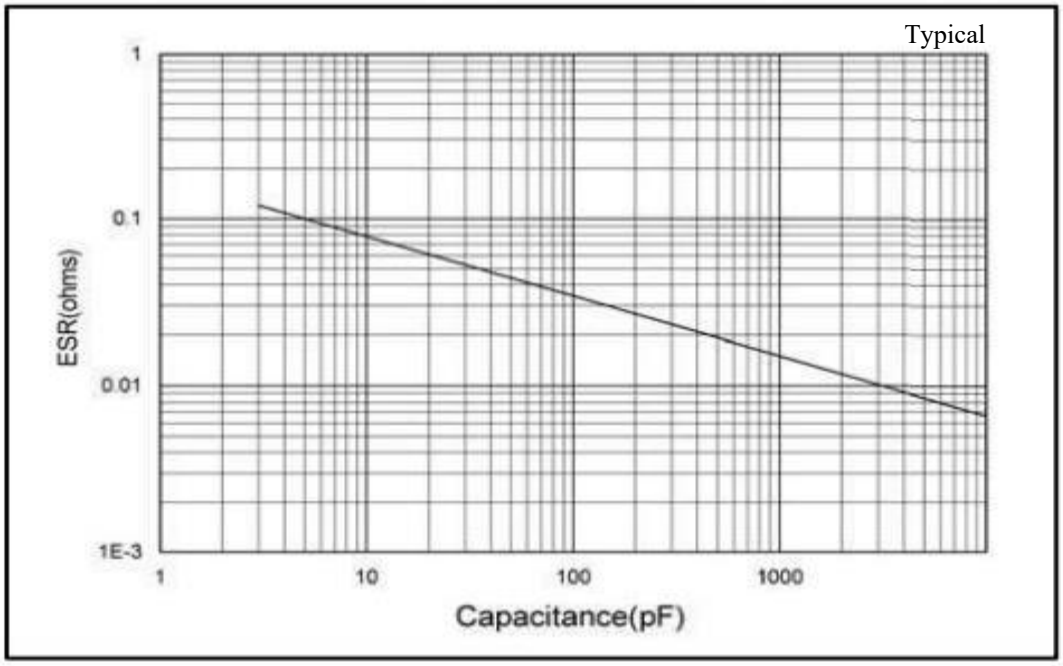
Quality Factor (Q)	No less than 1000pF, Q value more than 2000, Test Frequency 1MHz; More than 1000pF, Q value more than 2000, Test Frequency 1kHz
Insulation Resistance (IR)	Test Voltage: 500V 10^5 Megaohms min. @ +25°C 10^4 Megaohms min. @ +125°C
Rated Voltage	See Rated Voltage in Capacitance Table
Dielectric Withstanding Voltage (DWV)	250% of Voltage of 5 seconds, Rated Voltage ≤ 500VDC 150% of Voltage for 5 seconds, 500VDC <Rated Voltage ≤ 1250 VDC 120% of Voltage for 5 seconds, Rated Voltage > 1250 VDC
Operating Temperature Range	-55°C to 175°C
Temperature Coefficient (TC)	-55°C to 125°C 0±30ppm/°C >125°C to 175°C 0±60ppm/°C
Capacitance Drift	±0.2% or ±0.05pF, whichever is greater
Piezoelectric Effects	None
Termination Type	See Termination Type Table

Environmental Specifications

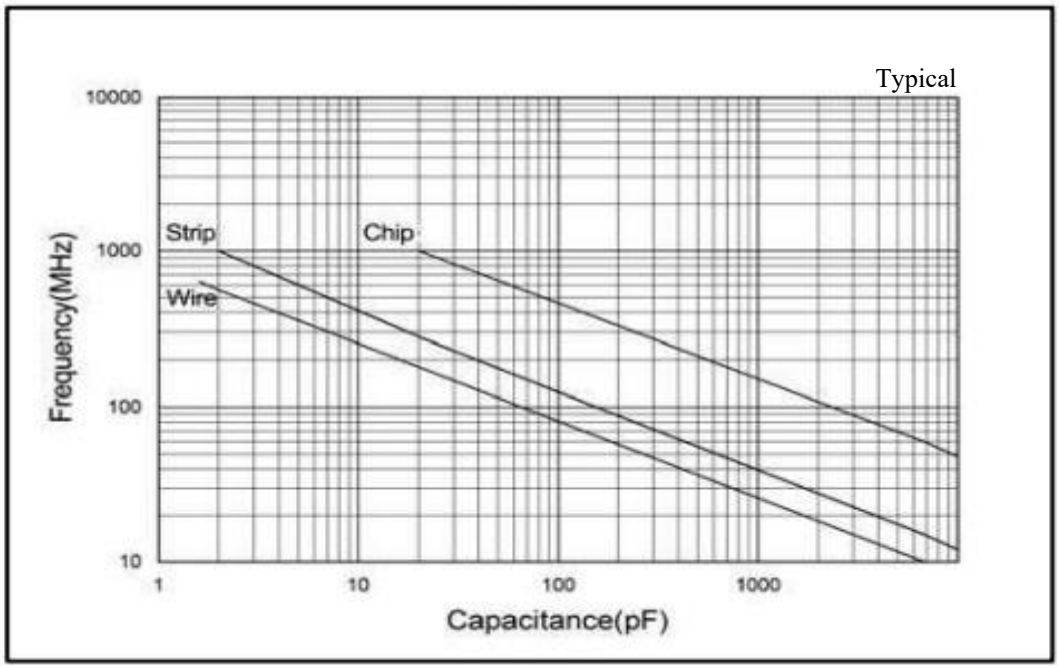
	Specification	Test Parameters
Thermal Shock	**DWV:** The initial value **IR:** Shall not be less than 30% of the initial value. **Capacitance Change:** No more than 0.5% or 0.5pF, whichever is greater.	MIL-STD-202, Method 107, Condition A. At the maximum rated temperature (-55°C and 175°C) stay 30 minutes, the time of removing shall not be more than 3 minutes. Perform five cycles.
Moisture Resistance		MIL-STD-202, Method 106
Humidity (Steady State)	**DWV:** The initial value **IR:** The initial value **Capacitance Change:** No more than 0.3% or 0.3pF, whichever is greater.	MIL-STD-202, Method 103, Condition A With 1.5Volts DC applied while subjected to an environment of 85°C with 85% relative humidity for 240 hours minimum.
Life	**IR:** Shall not be less than 30% of the initial value. **Capacitance Change**: No more than 2.0% or 0.5pF, whichever is greater.	MIL-STD-202, Method 108. For 2000 hours, at 125°C. 200% of Voltage for Capacitors, Rated Voltage ≤ 500VDC; 120% of Voltage for Capacitors, 500VDC< Rated Voltage ≤1250VDC; 100% for Voltage for Capacitors, Rated Voltage >1250VDC
Terminal Strength	**Force:** 30lbs. min. **Duration Time:** 5 to 10 seconds	MIL-STD-202, Method 211A, Test Condition A. Applied a force and maintained for a period of 5 to 10 seconds. The force shall be in the direction of the axes of the terminations.

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

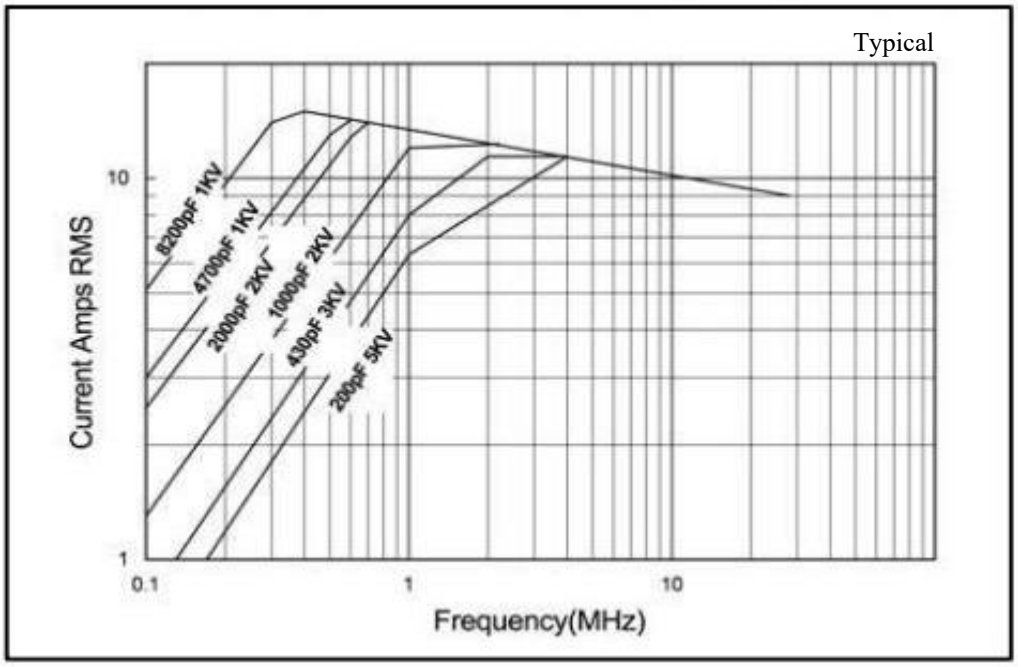
ESR vs. Capacitance Measured @ 30MHz



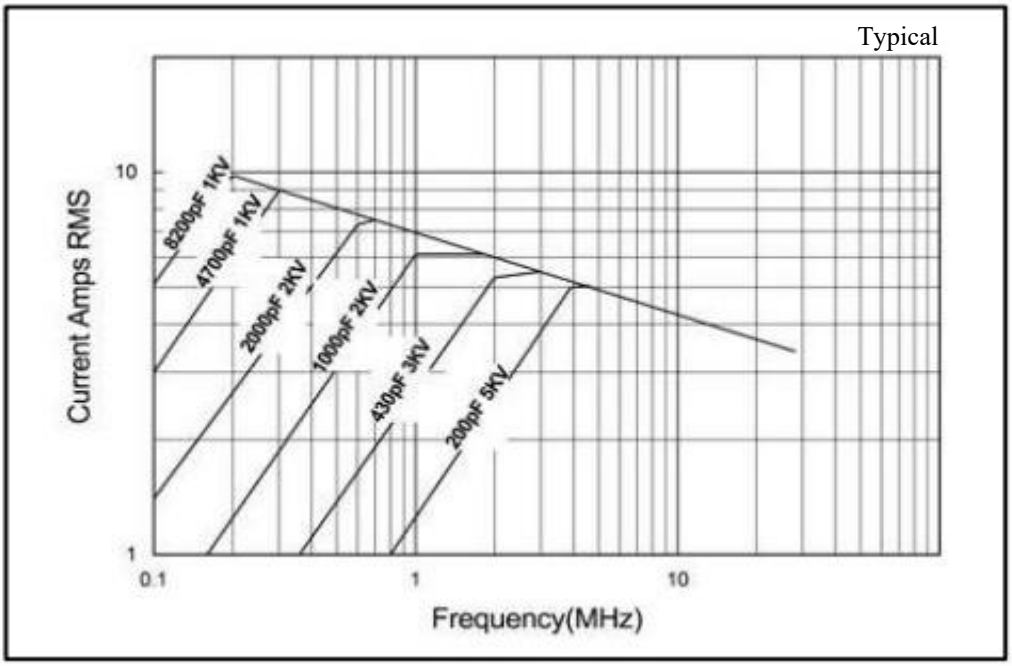
Self Resonant Frequency vs. Capacitance



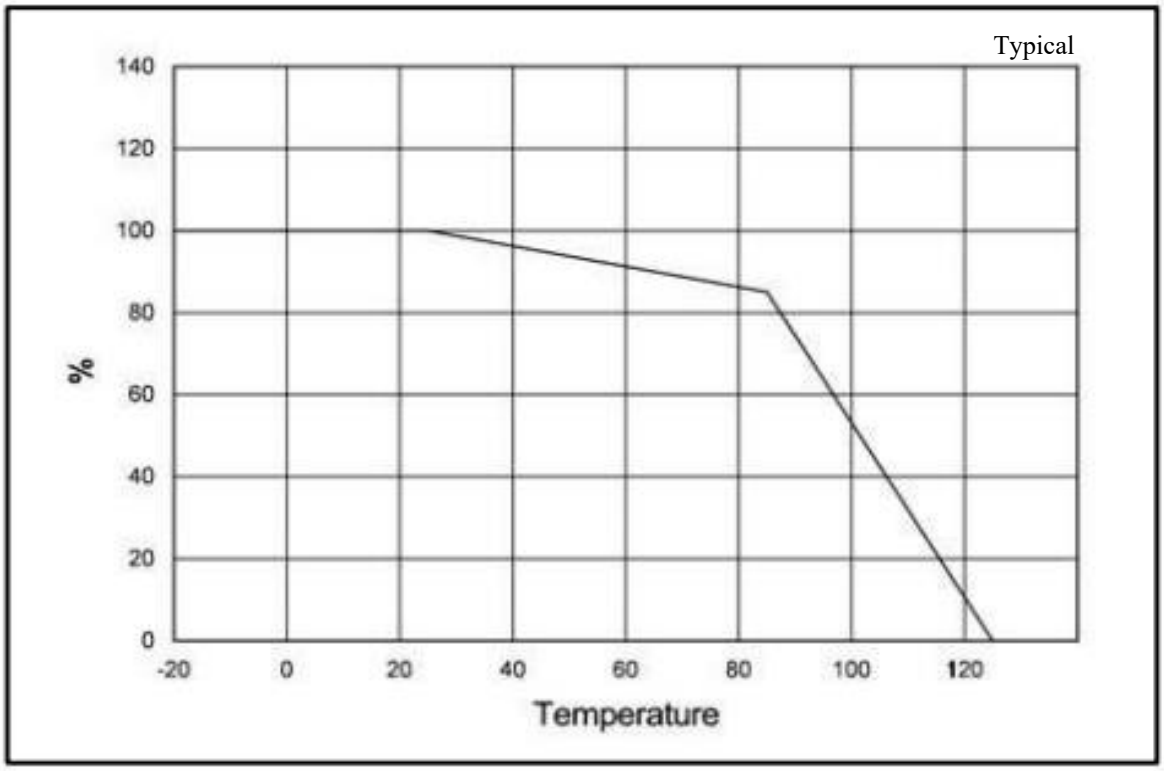
Strip Terminals Rated Current vs. Frequency



Wire Terminals Rated Current vs. Frequency



% Maximum Current vs. Ambient Temperature



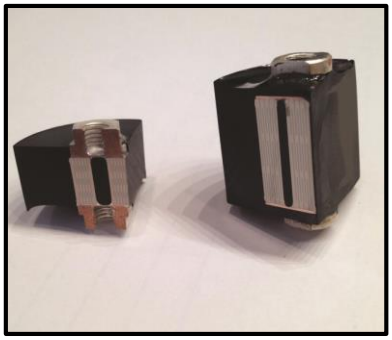
Recommended Land Pattern Dimensions

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

Custom Assemblies

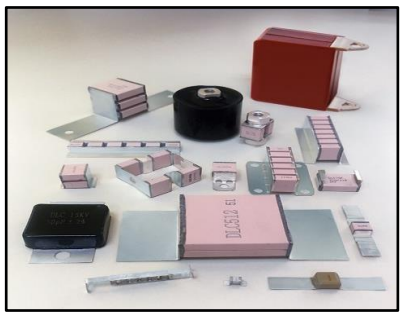
Passive Plus offers Capacitor Assemblies for high power requirements. Typical assemblies are configured in series and/or parallel combinations, producing higher voltage/current handling capabilities, extended capacitance range and tighter tolerances.

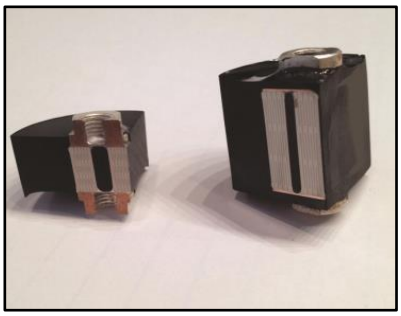
To get started, simply send us either a mechanical drawing or circuit conditions and we can recommend a solution. All components are 100% up-screened for Partial Discharge and Sonoscanned. All assemblies include a 100hr Military burn in.

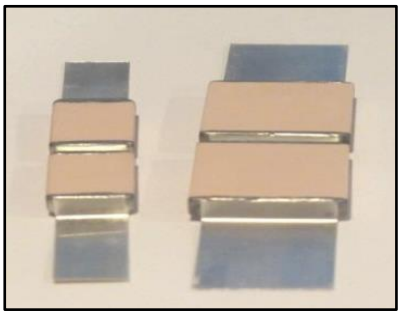


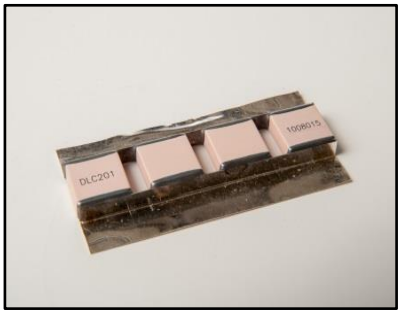
UHF/RF High-Q Power Transmitter
Multi-Layer Ceramic Capacitors

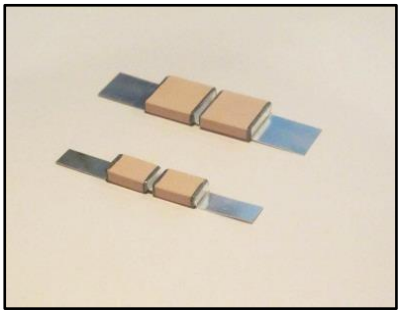
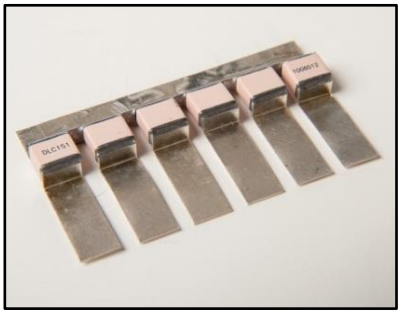
Custom Capacitor Assemblies

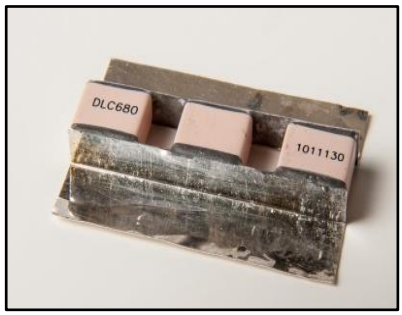


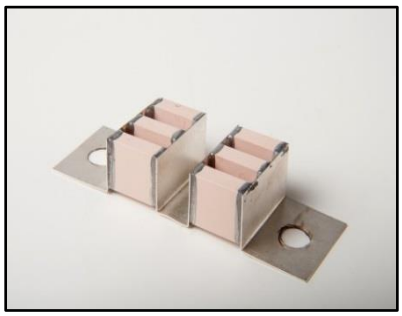
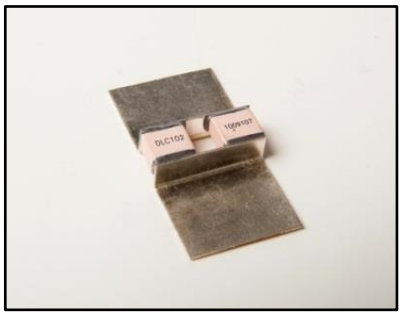




Marking shown for illustration purposes only.
Actual marking may differ.

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

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

Custom Capacitor Assemblies

Product Features

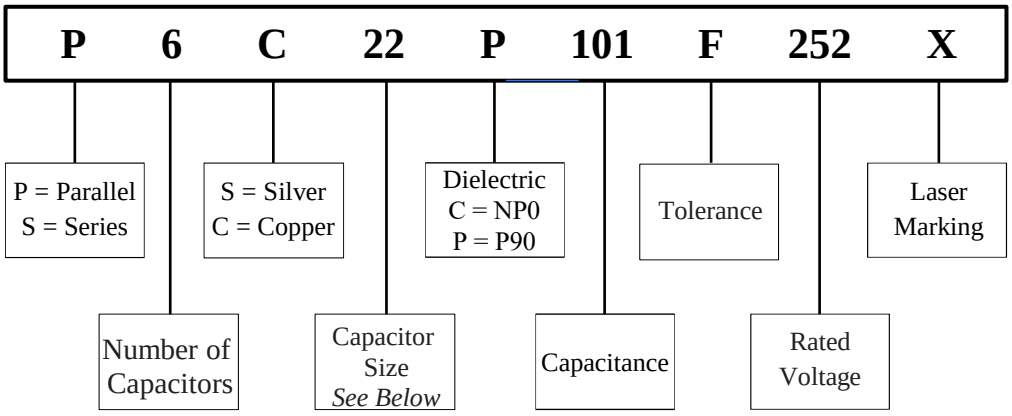
High Operating Voltage, High Operating Current, Extended Capacitance, Tighter Tolerances, High Reliability, High Q, Ultra-low ESR, Non-Magnetic

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

Typical Applications Field

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

Part Numbering



Capacitor Size:

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

Capacitance: For capacitor values requiring 3 significant digits,

e.g. 1222.5pF =1222R5

e.g. P6S22P101F252X

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

e.g. S2S25C1222R5G203X

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

Capacitance and Voltage

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

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

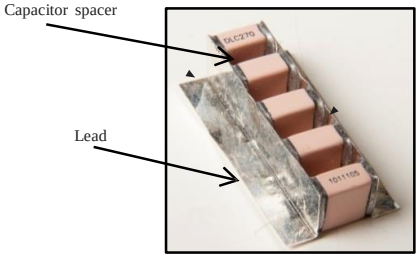
Custom Capacitor Assemblies

Typical Assembly Configurations

Parallel Assemblies

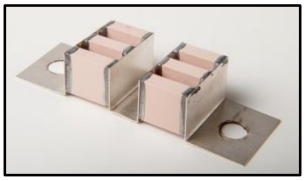
unit:inch (millimeter)

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



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

3838 Series/Parallel Combination

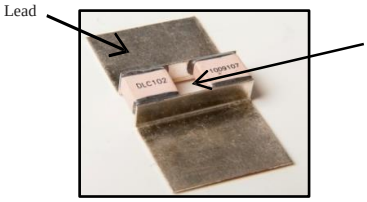


Series Assemblies

unit:inch (millimeter)

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

- Epoxy Molding Available



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

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

Non-Magnetic

Custom & Engineering Design Kits

0505 & 1111 case size kits are also available in Magnetic Terminations

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

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

Standard Values updated in 2022.

Kit Number	Value Range	Values
DKD0505C05 DKD0505P05	**0.1 - 2.0pF**	0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.2, 1.5, 1.6, 1.8, 2.0pF
DKD0505C06 DKD0505P06	**1 - 10pF**	1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.4, 2.7, 3.0, 3.3, 3.9, 4.7, 5.6, 6.8, 8.2, 10pF
DKD0505C07 DKD0505P07	**10 - 100pF**	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF
DKD0505C08	**100 - 1000pF**	100, 120, 150, 180, 200, 220, 240, 270, 300, 330, 390, 470, 560, 680, 820, 1000pF
DKD1111C05 DKD1111P05	**1.0 - 10pF**	1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.4, 2.7, 3.0, 3.3, 3.9, 4.7, 5.6, 6.8, 8.2, 10pF
DKD1111C06 DKD1111P06	**10 - 100pF**	10, 12, 15, 18, 20, 22, 24, 27, 30, 33, 39, 47, 56, 68, 82, 100pF
DKD1111C07 DKD1111P07	**100 - 1000pF**	100, 120, 150, 180, 200, 220, 240, 270, 300, 330, 390, 470, 560, 680, 820, 1000pF
DKD1111C08 DKD1111P08	**1000 - 10000pF**	1000, 1100, 1200, 1500, 1800, 2000, 2200, 2700, 3000, 3300, 3900, 4700, 5100, 5600, 10000pF

Custom Kits

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

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

All kits are RoHS Compliant.

Custom Kits


PPI Passive Plus Inc.
RF & Microwave Capacitors

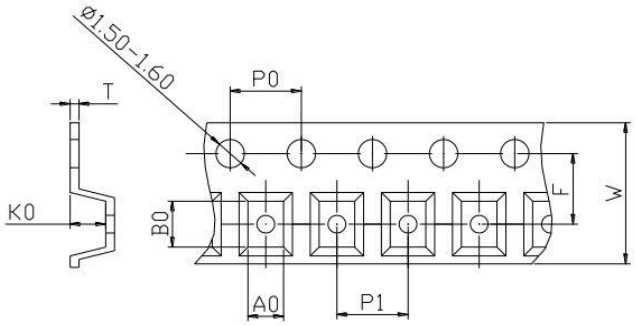

PPI Passive Plus Inc.
RF & Microwave Capacitors


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


>67GHZ
>65GHZ
>16GHZ
>35GHZ
>50GHZ
sales@passiveplus.com
+(631)-425-0938

Non Magnetic Capacitor Tape & Reel Specifications

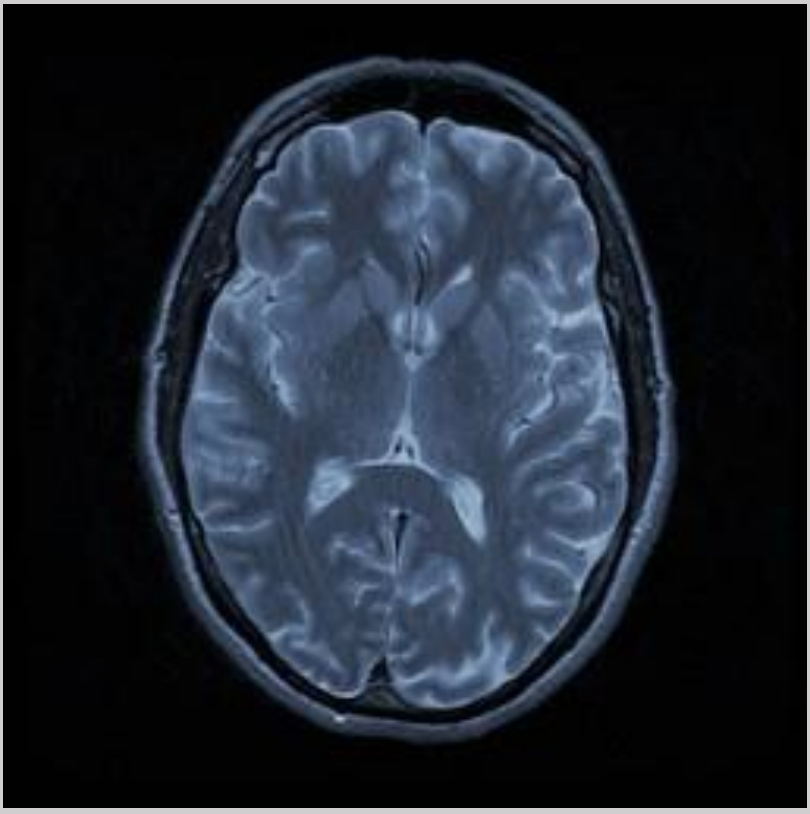
Case Size	Orientation	Measurement Unit	W	P0	P1	T	F	Minimum Qty per Reel	Std Qty per Reel	Tape Material
0505CP	H	in.	0.315	0.157	0.157	0.009	0.138	500	3000	Plastic
		mm	8.00	4.00	4.00	0.22	3.50			
	V	in.	0.472	0.157	0.157	0.012	0.217	500	2000	
		mm	12.00	4.00	4.00	0.30	5.50			
1111CP	H	in.	0.315	0.157	0.157	0.009	0.138	500	2000	Plastic
		mm	8.00	4.00	4.00	0.22	3.50			
	V	in.	0.315	0.157	0.157	0.009	0.138	500	1500	
		mm	8.00	4.00	4.00	0.22	3.50			
	V	in.	0.472	0.157	0.157	0.016	0.217	500	1500	
		mm	12.00	4.00	4.00	0.40	5.50			
2225CP	H	in.	0.630	0.157	0.472	0.012	0.295	500	500	Plastic
		mm	16.00	4.00	12.00	0.30	7.50			
	V	in.	0.630	0.157	0.315	0.020	0.295	500	500	Plastic
		mm	16.00	4.00	8.00	0.50	7.50			
3838CP	H	in.	0.630	0.157	0.630	0.012	0.295	50	200	Plastic
		mm	16.00	4.00	16.00	0.30	7.50			



$A_0B_0K_0$

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

Non-Magnetic Trimmer Capacitors



Variable Capacitors

Air Tubular Trimmers

Part Attributes

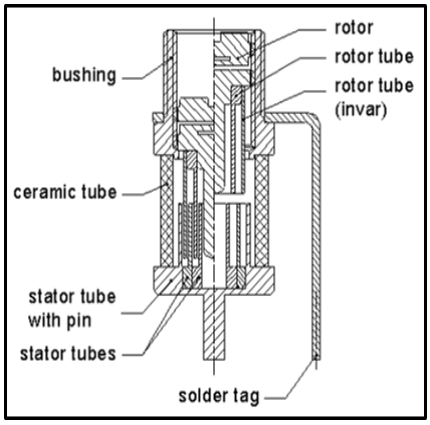
- Finer Tuning/ Multi-Turn
- High Q
- Medium Size
- Lower Voltage
- Medium Capacitance Range

Product Applications

- L – C Filters
- Radio Transmitters & Receivers
- Quartz Oscillators Insulation Resistance
- Coils for NMR – Systems
- Impedance Matching

Product Specifications

Capacitance Range	0.3pF – 30pF
Q-Factor	>5000 @ 200 MHz
DC Working Voltage	1.75kV
DC Withstanding Voltage	3.5kV
Operating Temperature Range	-65°C to +125°C
TCC (ppm/°C)	0 ± 50 to 65 ± 30 (model dependent)
Insulation Resistance	>10^6 Mohm @ VDC
Vibration	60g, 10-2000Hz
Shock	100g, 6msec.
Resolution	High Resolution
Non-Magnetic	For MRI/NMR
Custom Designs Available	
PPI SERIES	PPI-60



RoHS

Variable Capacitors

Sapphire Trimmers

Part Attributes

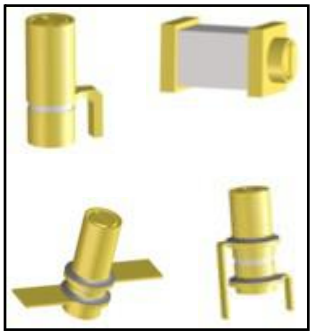
- Smallest Size
- Finer Tuning/Multi-Turn
- High Q
- Lower Voltage
- Lower Capacitance Range

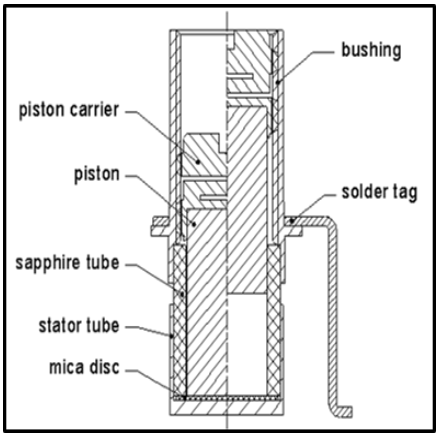
Product Applications

- L – C Filters
- Radio Transmitters & Receivers
- Quartz Oscillators Insulation Resistance
- Coils for NMR – Systems
- Low Noise Amplifiers

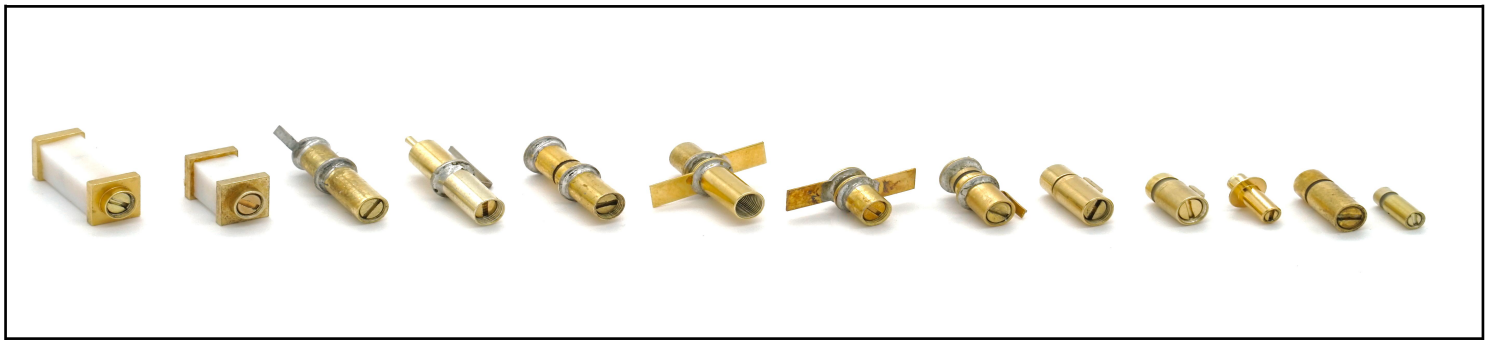
Product Specifications

• Capacitance Range	1.0pF – 18.5pF
• Q-Factor	>5000 @ 200 MHz
• DC Working Voltage	500V
• DC Withstanding Voltage	1kV
• Operating Temperature Range	-65°C to +125°C
• TCC (ppm/°C)	0 ± 75 to 350 ± 75 (model dependent)
• Insulation Resistance	>10^6 Mohm @ VDC
• Vibration	60g, 10-2000Hz
• Shock	100g, 6msec.
• Resolution	High Resolution
• Non-Magnetic	For MRI/NMR
• Custom Designs Available	
• PPI SERIES	PPI-66





RoHS



Variable Capacitors

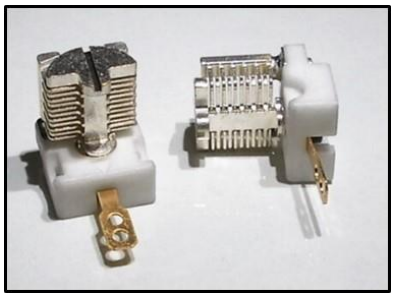
Air Plate Trimmers

Part Attributes

- Wide Capacitance Range
- Highest Q
- Higher Voltage
- Large Size
- Open Construction

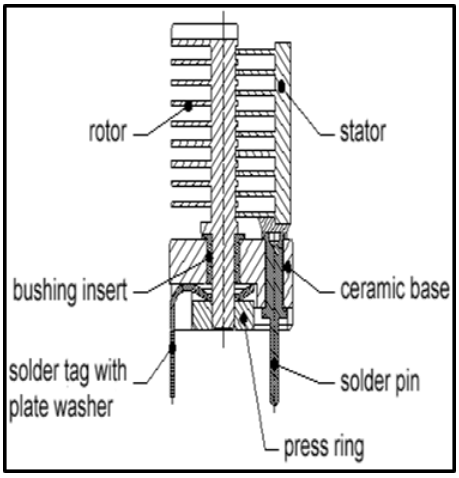
Product Applications

- L – C Filters
- Radio Transmitters & Receivers
- Quartz Oscillators Insulation Resistance
- Coils for NMR – Systems
- Low Noise Amplifiers

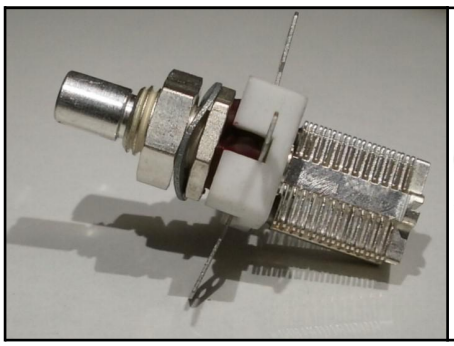


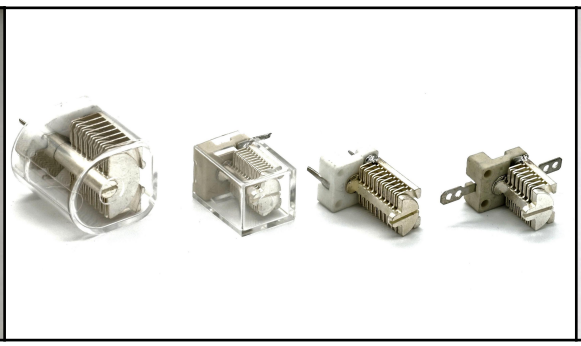
Product Specifications

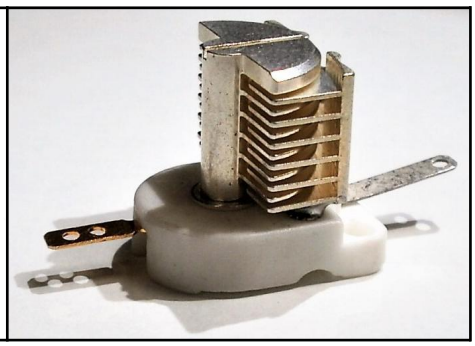
• Capacitance Range	1pF – 146pF (select models up to 200pF)
• Q-Factor	>1500 @ 200 MHz/800 @ 1MHz
• DC Working Voltage	3.25kV
• DC Withstanding Voltage	6.5kV
• Operating Temperature Range	-65°C to +125°C
• TCC (ppm/°C)	30 ± 20 to 90 ± 40 (model dependent)
• Insulation Resistance	>10^6 Mohm @ VDC
• Vibration	60g, 10-2000Hz
• Shock	100g, 6msec.
• Resolution	180°Resolution
• Non-Magnetic	For MRI/NMR
• Custom Designs Available	
• PPI SERIES	PPI-10



RoHS







PTFE Tubular Trimmer

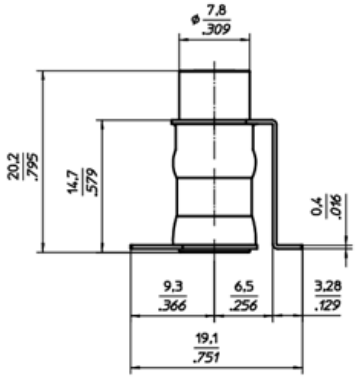
PPI-63-1001-00030-600

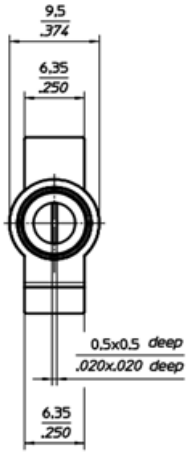
PART SPECIFICATIONS

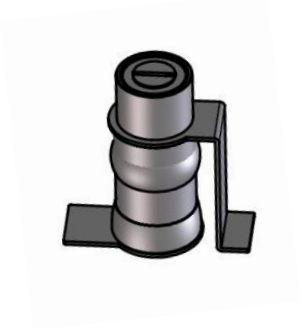
TUNING TORQUE	1.0 - 8.0 in. Oz
STOP TORQUE	11.1 in. oz
ROTATIONAL LIFE	≥ 75 cycles, IEC 418
VIBRATION	60 g / 10-2000Hz
SHOCK	1500g / 0.5ms
OPERATING TEMPERATURE	-65°C….+125°C
ADJUSTMENT ACCURACY	≤ 1 x 10^{-3} of adjusted value
CONTACT RESISTANCE	< 0.001 Ω
DIELECTRIC	PTFE

Part Number	Cmin (pF)	Cmax (pF)	Working Voltage (VDC)	Q-Factor (@200MHz)	IR (MΩ)	TC (ppm/°C)	Dim. A (mm)	Dim. B (mm)	Weight (g)
PPI-63-1001-00030-600	3.5	28.0	1250	➢ 2000	$>10^6$	0±100	---	---	6.1

RoHS







Dimensions are in mm / inches

PTFE Tubular Trimmer

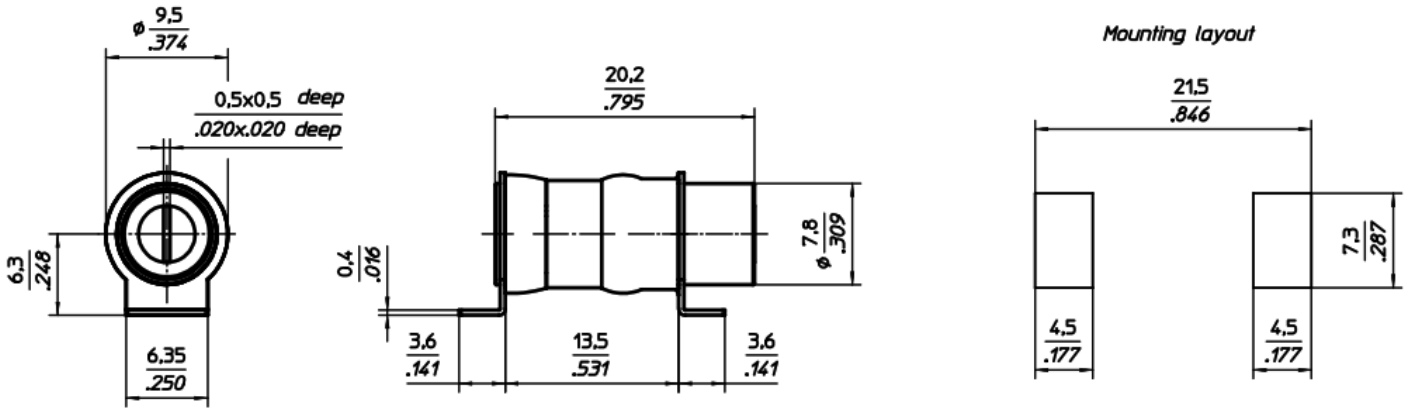
PPI-63-1002-00030-600

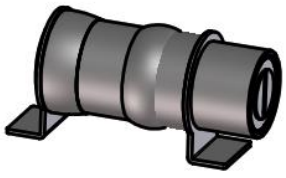
PART SPECIFICATIONS

TUNING TORQUE	1.0 - 8.0 in. oz
STOP TORQUE	11.1 in. oz
ROTATIONAL LIFE	≥ 75 cycles, IEC 418
VIBRATION	60 g / 10-2000Hz
SHOCK	1500g / 0.5ms
OPERATING TEMPERATURE	-65°C….+125°C
ADJUSTMENT ACCURACY	≤ 1 x 10^{-3} of adjusted value
CONTACT RESISTANCE	< 0.001 Ω
DIELECTRIC	PTFE

Part Number	Cmin (pF)	Cmax (pF)	Working Voltage (VDC)	Q-Factor (@200MHz)	IR (MΩ)	TC (ppm/°C)	Dim. A (mm)	Dim. B (mm)	Weight (g)
PPI-63-1002-00030-600	3.5	28.0	1250	>2000	$>10^6$	0±100	---	---	5.5

RoHS





Dimensions are in mm / inches

FilmTrim Variable Capacitors

Product Line Overview

Product Features

- Four Dielectrics:
  - Standard PTFE
  - Polyproplyene
  - Polyimide
  - Polycarbonate
- Four Different Sizes:
  - 5mm, 7.5mm, 9.5mm, 16mm
- SMD and lead-through-hole mounting
- Top, bottom and Side Mount models
- Wide capacitance ranges
- Low cost
- Linear capacitance change vs. rotation
- Q = 200 @ 1 MHz
- PPM/°C: +150±250
- Compact size

Product Applications

Typical Applications:

- Antennas
- RF Equipment
- Transmitters
- Instruments

Modifications & Variations:

- Special capacitance ranges
- Extended Adjust shafts
- Silver and/or Gold Plating
- Special terminal sizes & shapes
- High temperature versions for PTFE

For requests for options such as special adjustments, pin configurations, dielectrics, etc., please contact PPI directly.

Production Qualification

FilmTrim Capacitors are in accordance with DIN IEC 418-1 and 4-former DIN 44261 part 3.

Testing methods for manufacturing quality are in accordance with MIL-STD-105D and IEC410 (former DIN44260).

Solderability or heat resistance for the FilmTrim Capacitors comply with DIN IEC 68-2-20 part 2, Test Ta and Tb.

Each FilmTrim Capacitor is tested for minimum and maximum capacitance value and is also subjected to full test voltage.

FilmTrim Variable Capacitors

Product Line Overview

Part Numbering

See charts below for details

PP	Z	B	3R0	00
PPI	Dielectric	Style	Capacitance	Options

RoHS

Dielectrics

Dielectrics	
Code	**Description**
X	PTFE (Polytetrafluoroethylene)
Y	PP (Polypropylene)
Z	PC (Polycarbonate) or PI (Polyimide)

Capacitance

Capacitance Code
1R6 = 1.6pF
400 = 40pF
301 = 300pF

Special Options

Special Options (Top Adjust Models)	
Code	**Description**
00	Standard
02	7.5mm, 2 leads
03	9.5mm, 3 lead special
04	9.5mm, 2 leads

Style

Style	
Code	**Description**
A	7.5mm Top/Bottom Adjust
B	7.5mm Side Adjust
C	9.5mm Top/Bottom Adjust
D	9.5mm Side Adjust
E*	7.5mm Top/Bottom Adjust
F*	9.5mm Top/Bottom Adjust
L	5mm Top Adjust
N	16mm Top Adjust
P	16mm Side Adjust
R*	7.5mm Side Adjust
T*	9.5mm Side Adjust

** Extended Temperature range: -40 to +125°C*

For other modifications such as high temperature base material or special lead plating, contact PPI.

FilmTrim Variable Capacitors

Product Line Overview

Product Features

Series	Size (mm)	Heights (mm)		Dielectric	Qmin	Capacitance Range		Voltage Rating (VDC)	Test Voltage (VDC)
		From	To			Min	Max		
XL	5.0	5.0	6.0	PTFE	1500	0.9pF	18pF	150	300
ZL	5.0	5.0	6.3	Polyimide	300	1.0pF	32pF	150	300
XA	7.5	10.2	11.4	PTFE	1500	1.3pF	45pF	200	300
XB	7.5	10.2	11.4	PTFE	1500	1.3pF	45pF	200	300
XE	7.5	10.2	11.4	PTFE High Temp	1500	1.3pF	45pF	200	300
XE NM	7.5	10.2	11.4	PTFE High Temp	1500	1.3pF	45pF	200	300
XR	7.5	10.2	11.4	PTFE High Temp	1500	1.3pF	45pF	200	300
YA	7.5	10.2	10.2	Polypropylene	1000	1.3pF	36pF	200	300
YB	7.5	10.2	10.2	Polypropylene	1000	1.3pF	27pF	200	300
ZA	7.5	10.2	10.2	Polycarbonate	200	2.5pF	40pF	200	300
ZB	7.5	10.2	10.2	Polycarbonate	200	2.5pF	40pF	200	300
XC	9.5	10.2	12.0	PTFE	1500	2.0pF	150pF	200	300
XD	9.5	10.2	12.0	PTFE	1500	2.0pF	150pF	200	300
XF	9.5	10.2	12.4	PTFE High Temp	1500	2.2pF	90pF	200	300
XF NM	9.5	10.2	12.4	PTFE High Temp	1500	2.2pF	90pF	200	300
XT	9.5	10.2	12.4	PTFE High Temp	1500	2.2pF	90pF	200	300
YC	9.5	10.2	10.2	Polypropylene	1000	2.0pF	60pF	200	300
YD	9.5	10.2	10.2	Polypropylene	1000	2.0pF	60pF	200	300
ZC	9.5	10.2	12.0	Polycarbonate	500	7.0pF	180pF	200	300
ZD	9.5	10.2	12.0	Polycarbonate	500	7.0pF	180pF	200	300
ZN	16.0	13.8	16.8	Polycarbonate #1	200	8.0pF	300pF	150	300
ZN	16.0	16.8	16.8	Polycarbonate #2	100	23pF	600pF	150	300
ZP	16.0	13.8	16.8	Polycarbonate #1	200	8.0pF	300pF	150	300
ZP	16.0	16.8	16.8	Polycarbonate #2	100	23pF	600pF	150	300

FilmTrim Variable Capacitors

5mm Top Adjust

Product Features

- Dielectrics:
  Standard PTFE
  Polyimide
- SMD and lead-through-hole mounting
- Top Mount models
- Wide capacitance ranges
- Low cost
- Linear capacitance change vs. rotation
- Compact size

Product Applications

Typical Applications:

- Antennas • Transmitters
- RF Equipment
- Test Equipment

Modifications & Variations:

- Special capacitance ranges
- Special terminal sizes & shapes
- Extended Adjust shafts
- High temperature versions for PTFE
- Silver and/or Gold Plating

Part Numbering

PP	Z	L	4R0	00
PP = Passive Plus	Dielectric Code *See Table*	Style *L = 5mm Top Adjust*	Capacitor Code *100=10x10⁰=10pF, 4R0=4.0pF*	Options

RoHS

For special requests, please contact □□I directly.

Dielectrics

Dielectrics	
Code	**Description**
X	PTFE (Polytetrafluoroethylene)
Z	PC (Polycarbonate) or PI (Polyimide)

Style

Style	
Code	**Description**
L	5mm Top Adjust

Capacitance

Capacitance Code
2R0 = 2.0pF
270 = 27pF

Special Options

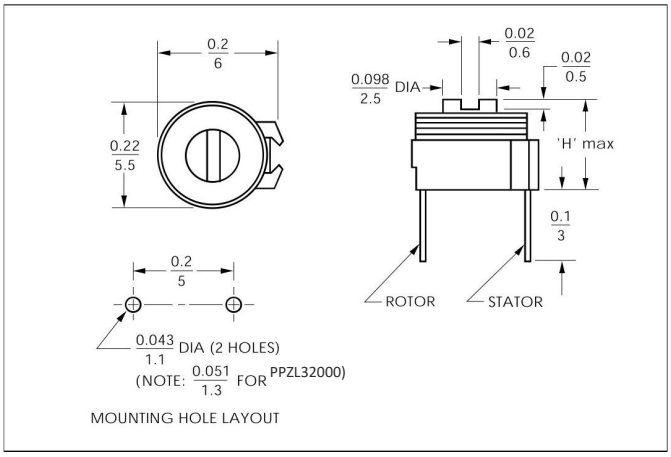
Special Options (Top Adjust Models)	
Code	**Description**
00	Standard

FilmTrim Variable Capacitors

5mm Top Adjust

Electrical Specifications

Dielectrics	• High Temperature PTFE • Polyimide (PI)
Voltage Rating	150 VDC
Dielectric Withstanding Voltage	300 VDC
Contact Resistance	≤0.010mΩ
Insulation Resistance	≥10.000MΩ
Rotation Torque	Cmax <20pF 0.10…1.5Ncm Cmax >20pF 0.15…2.5Ncm



All dimensions are in/mm.

General Specifications

Dielectric	Capacitance (pF) min	Capacitance (pF) max	Q min (1MHz)	TCC (ppm/°C)	Operating Temperature (°C)	H max in/mm	Color Code	Model Number
	0.8	3.0		-100±250		0.20/5.0	Brown	PPXL3R000
	0.9	4.0		-100±250		0.20/5.0	Brown	PPXL4R000
	1.0	5.0		-100±250		0.20/5.0	Brown	PPXL5R000
PTFE*	1.3	8.0	1500	-100±200	-40 to +125	0.23/5.8	Black	PPXL8R000
	1.8	10		-100±200		0.23/5.8	Black	PPXL10000
	2.0	15		-100±200		0.24/6.0	White	PPXL15000
	2.3	18		-100±200		0.24/6.0	Green	PPXL18000
	1.0	5.0	300			0.20/5.0	Brown	PPZL5R000
	1.2	8.0	300			0.20/5.0	Brown	PPZL8R000
	1.3	10	300			0.20/5.0	Black	PPZL10000
PI	2.0	15	300	-100±250	-40 to +85	0.23/5.8	White	PPZL15000
	2.7	20	300			0.23/5.8	Green	PPZL20000
	2.8	25	300			0.23/5.8	Green	PPZL25000
	3.6	32	150			0.25/6.3	None	PPZL32000

**High Temperature PTFE available upon request*

Production Qualification

- FilmTrim Capacitors are in accordance with DIN IEC 418-1 and 4-former DIN 44261 part 3.
- Testing methods for manufacturing quality are in accordance with MIL- STD-105D and IEC410 (former DIN44260).
- Solderability or heat resistance for the FilmTrim Capacitors comply with DIN IEC 68-2-20 part 2, Test Ta and Tb.
- Each FilmTrim Capacitor is tested for minimum and maximum capacitance value and is also subjected to full test voltage.

FilmTrim Variable Capacitors

5mm Top Adjust

Specifications Notes

1 Parts are 100% tested for capacitance range and dielectric withstanding voltage.

2 Capacitance range specified is that which is guaranteed and is measured at 1 MHz at room temperature.

3 Q factor is measured at maximum rated capacitance and at room temperature.

4 Dielectric strength is measured at maximum rated capacitance and room temperature, with test voltage (as listed for each model) applied for 60 seconds.

5 Insulation resistance is measured at maximum rated capacitance and room temperature and at rated voltage, unless otherwise specified.

6 Temperature coefficient of capacitance (TCC) is measured at 1 MHz over the operating temperature range, with capacitor set at maximum rated capacitance.

7 Axial load during tuning should not exceed 200 grams force. At maximum axial load, capacitance change is no more than 15%.

8 Capacitors should not be operated outside of rated capacitance range and working voltage.

Soldering FilmTrim Capacitors

Dip soldering:
260°C ± 10°C for 7 seconds maximum.

Hand Soldering
(for lead-through-hole models):
Tip temperature 350°C ± 10°C for 3 to 4 seconds

Cleaning FilmTrim Capacitors

1 Water soluble fluxes and detergents with a water flush after soldering of the boards can be used for all parts.

2 Do not immerse FilmTrim models in chlorinated or fluorinated hydrocarbon solvents as this would adversely affect the plastic dielectrics and base materials.
Some customers have successfully used X models in scrubbers or sprayers where only bottom of the printed circuit boards is exposed to solvents.
If the process requires immersion in solvents for cleaning boards, the FilmTrim capacitors should be hand soldered to board after the boards have been cleaned.

FilmTrim Variable Capacitors

7.5mm FilmTrim

Product Features

- Dielectrics:
  Standard PTFE/ High Temp PTFE
  Polyproplyene
  Polycarbonate
- SMD and lead-through-hole mounting
- Top, Bottom and Side Mount models
- Wide capacitance ranges
- Low cost
- Linear capacitance change vs. rotation
- Compact size

Product Applications

Typical Applications:

- Antennas • Transmitters
- RF Equipment
- Test Equipment

Modifications & Variations:

- Special capacitance ranges
- Special terminal sizes & shapes
- Extended Adjust shafts
- High temperature versions for PTFE
- Silver and/or Gold Plating

Part Numbering

PP	Z	A	5R0	00
PP = Passive Plus	Dielectric Code *See Table*	Style *A = 7.5mm Top Adjust*	Capacitor Code *100=10x10⁰=10pF 5R0=5.0pF*	Options

RoHS

For special requests, please contact □□I directly.

Dielectrics

Dielectrics	
Code	**Description**
X	PTFE (Polytetrafluoroethylene)
Y	PP (Polypropylene)
Z	PC (Polycarbonate) or PI (Polyimide)

Style

Style	
Code	**Description**
A	7.5mm Top/Bottom Adjust
B	7.5mm Side Adjust
E*	7.5mm Top/Bottom Adjust
R*	7.5mm Side Adjust

** Extended Temperature range: -40 to +125°C*

Capacitance

Capacitance Code
2R0 = 2.0pF
270 = 27pF

Special Options

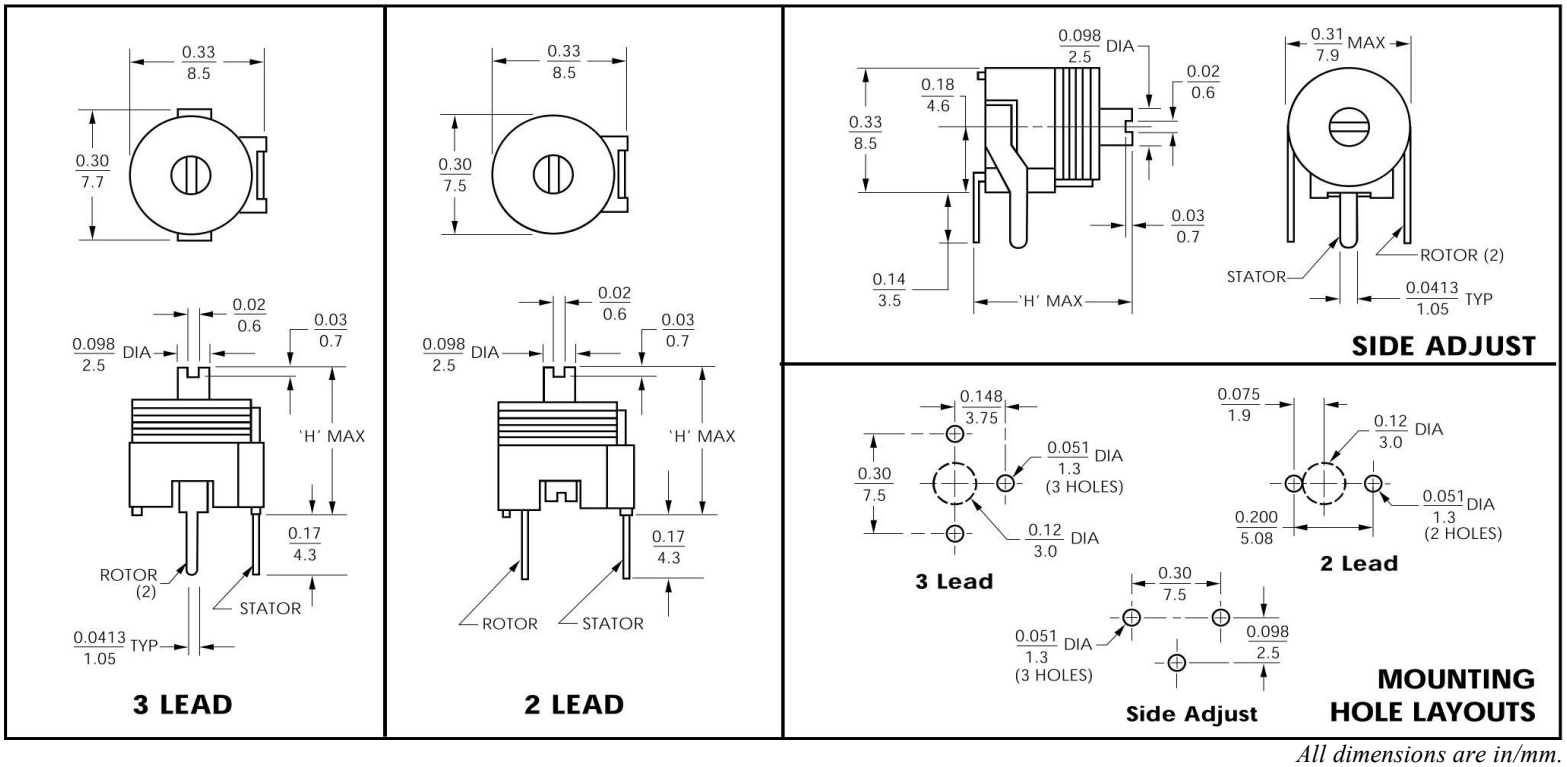
Special Options (Top Adjust Models)	
Code	**Description**
00	Standard
02	7.5mm, 2 leads

FilmTrim Variable Capacitors

7.5mm FilmTrim

Electrical Specifications

Dielectrics	• High Temperature PTFE • Standard PTFE • Polypropylene (PP) • Polycarbonate (PC)
Voltage Rating	200V High Temp PTFE 100V all other Dielectrics
Dielectric Withstanding Voltage	300V High Temp PTFE 200V all other Dielectrics
Contact Resistance	≤ 0.010mΩ
Insulation Resistance	≥10,000MΩ
Rotation Torque	0.15….3.5Ncm



All dimensions are in/mm.

FilmTrim Variable Capacitors

7.5mm FilmTrim

General Specifications

Dielectric	Capacitance (pF) min	Capacitance (pF) max	Q min (1MHz)	TCC (ppm/°C)	Operating Temperature (°C)	H max in/mm	Color Code	Model Number Top/Bottom 3 Lead	Model Number Top/Bottom 2 Lead	Model Number Side Adjust	Model Number Non Magnetic 3 Lead
PTFE	1.3	5.0	1500	-100±250	-40 to +85	0.40/10.2	Grey	PPXA5R000	PPXA5R002	PPXB5R000	
	1.5	9.0		-100±250	-40 to +85	0.40/10.2	Yellow	PPXA9R000	PPXA9R002	PPXB9R000	
	2.0	18		-100±200	-40 to +125	0.40/10.2	Green	PPXA18000	PPXA18002	PPXB18000	
	3.9	27		-100±200	-40 to +125	0.40/10.2	Red	PPXA27000	PPXA27002	PPXB27000	
	4.5	36		-100±200	-40 to +125	0.45/11.4	Violet	PPXA36000	PPXA36002	PPXB36000	
	5.0	45		-100±200	-40 to +125	0.45/11.4	Orange	PPXA45000	PPXA45002	PPXB45000	
PTFE High Temp	1.3	5.0	1500	-100±150	-40 to +125	0.40/10.2	Grey	PPXE5R000	PPXE5R002	PPXR5R000	PPXE5R000NM
	1.5	9.0				0.40/10.2	Yellow	PPXE9R000	PPXE9R002	PPXR9R000	PPXE9R000NM
	2.6	18				0.40/10.2	Green	PPXE18000	PPXE18002	PPXR18000	PPXE18000NM
	3.5	27				0.40/10.2	Red	PPXE27000	PPXE27002	PPXR27000	PPXE27000NM
	4.5	36				0.45/11.4	Violet	PPXE36000	PPXE36002	PPXR36000	PPXE36000NM
	5.0	45				0.45/11.4	Orange	PPXE45000	PPXE45002	PPXR45000	PPXE45000NM
PP	1.3	5.0	1000	0±300	-40 to +70	0.40/10.2	Grey	PPYA5R000	PPYA5R002	PPYB5R000	
	1.5	10		0±300		0.40/10.2	Yellow	PPYA10000	PPYA10002	PPYB10000	
	2.0	15		-100±300		0.40/10.2	Blue	PPYA15000	PPYA15002	PPYB15000	
	2.2	22		-100±300		0.40/10.2	Green	PPYA22000	PPYA22002	PPYB22000	
	2.3	27		-100±250		0.40/10.2	Red	PPYA27000	PPYA27002	PPYB27000	
	3.0	36		-100±250		0.40/10.2	Violet	PPYA36000	PPYA36002		
PC	2.5	30	200	+150±250	-40 to +85	0.40/10.2	Red	PPZA30000	PPZA30002	PPZB30000	
	4.0	40		+150±250		0.40/10.2	Violet	PPZA40000	PPZA40002	PPZB40000	

Gold plated metal parts are standard on PPXE and PPXR models above.

Production Qualification

- FilmTrim Capacitors are in accordance with DIN IEC 418-1 and 4-former DIN 44261 part 3.
- Solderability or heat resistance for the FilmTrim Capacitors comply with DIN IEC 68-2-20 part 2, Test Ta and Tb.
- Testing methods for manufacturing quality are in accordance with MIL- STD-105D and IEC410 (former DIN44260).
- Each FilmTrim Capacitor is tested for minimum and maximum capacitance value and is also subjected to full test voltage.

FilmTrim Variable Capacitors

7.5mm FilmTrim

Specifications Notes

1 Parts are 100% tested for capacitance range and dielectric withstanding voltage.

2 Capacitance range specified is that which is guaranteed and is measured at 1 MHz at room temperature.

3 Q factor is measured at maximum rated capacitance and at room temperature.

4 Dielectric strength is measured at maximum rated capacitance and room temperature, with test voltage (as listed for each model) applied for 60 seconds.

5 Insulation resistance is measured at maximum rated capacitance and room temperature and at rated voltage, unless otherwise specified.

6 Temperature coefficient of capacitance (TCC) is measured at 1 MHz over the operating temperature range, with capacitor set at maximum rated capacitance.

7 Axial load during tuning should not exceed 200 grams force. At maximum axial load, capacitance change is no more than 15%.

8 Capacitors should not be operated outside of rated capacitance range and working voltage.

Soldering FilmTrim Capacitors

Dip soldering:
260°C ± 10°C for 7 seconds maximum.

Hand Soldering
(for lead-through-hole models):
Tip temperature 350°C ± 10°C for 3 to 4 seconds

Cleaning FilmTrim Capacitors

1 Water soluble fluxes and detergents with a water flush after soldering of the boards can be used for all parts.

2 Do not immerse FilmTrim models in chlorinated or fluorinated hydrocarbon solvents as this would adversely affect the plastic dielectrics and base materials.
Some customers have successfully used X models in scrubbers or sprayers where only bottom of the printed circuit boards is exposed to solvents.
If the process requires immersion in solvents for cleaning boards, the FilmTrim capacitors should be hand soldered to board after the boards have been cleaned.

FilmTrim Variable Capacitors

9.5mm FilmTrim

Product Features

- Dielectrics:
  Standard PTFE/ High Temp PTFE
  Polypropylene
  Polycarbonate
- SMD and lead-through-hole mounting
- Top, Bottom and Side Mount models
- Wide capacitance ranges
- Low cost
- Linear capacitance change vs. rotation
- Compact size

Product Applications

Typical Applications:

- Antennas • Transmitters
- RF Equipment
- Test Equipment

Modifications & Variations:

- Special capacitance ranges
- Special terminal sizes & shapes
- Extended Adjust shafts
- High temperature versions for PTFE
- Silver and/or Gold Plating

Part Numbering

PP	Z	C	130	00
PP = Passive Plus	Dielectric Code *See Table*	Style *C = 9.5mm Top Adjust*	Capacitor Code *100=10x10⁰=10pF 130=13pF*	Options

RoHS

For special requests, please contact □□I directly.

Dielectrics

Dielectrics	
Code	**Description**
X	PTFE (Polytetrafluoroethylene)
Y	PP (Polypropylene)
Z	PC (Polycarbonate) or PI (Polyimide)

Style

Style	
Code	**Description**
C	9.5mm Top/Bottom Adjust
D	9.5mm Side Adjust
F*	9.5mm Top/Bottom Adjust
T*	9.5mm Side Adjust

** Extended Temperature range: -40 to +125°C*

Capacitance

Capacitance Code
2R0 = 2.0pF
400 = 40pF
151 = 150pF

Special Options

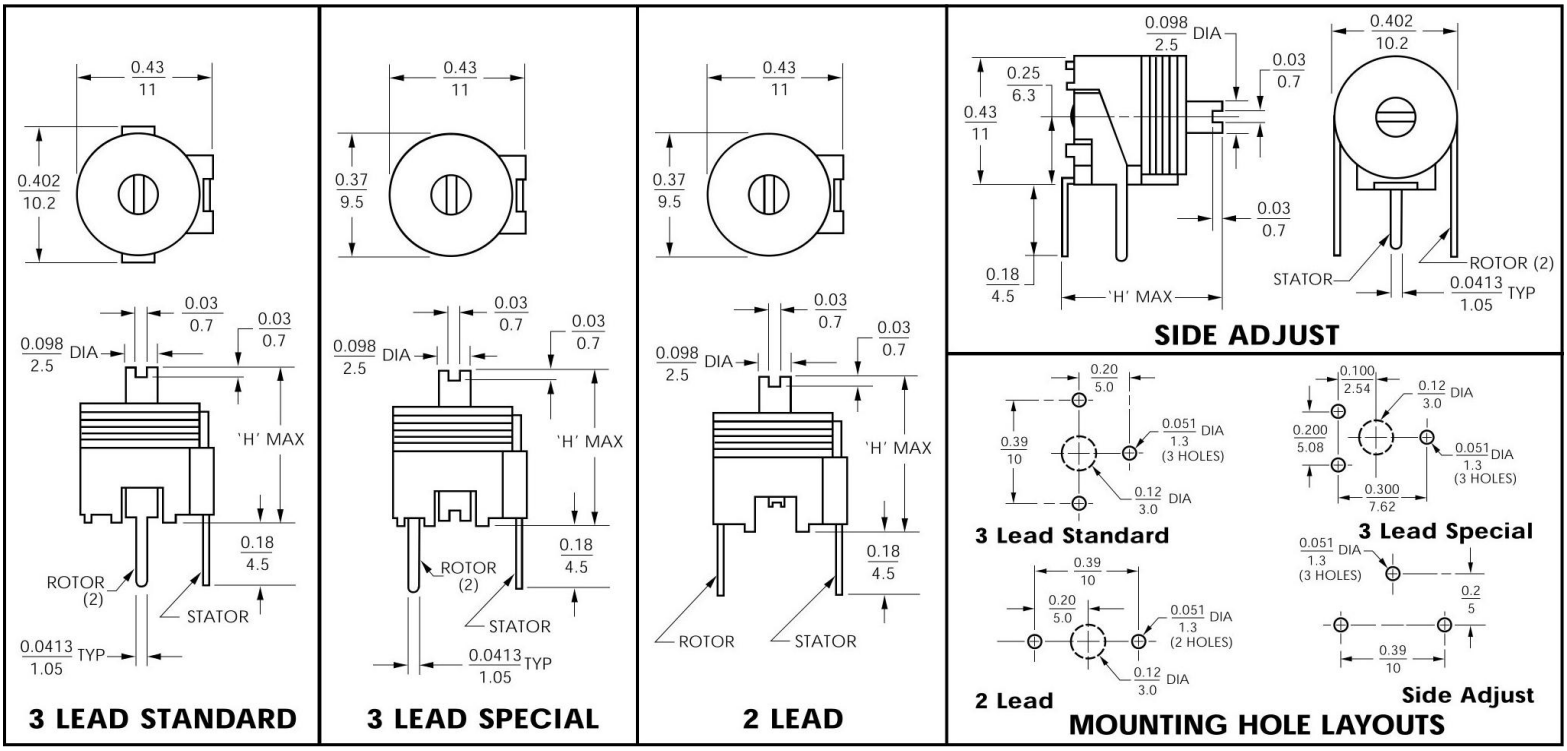
Special Options (Top Adjust Models)	
Code	**Description**
00	Standard
03	9.5mm, 3 lead special
04	9.5mm, 2 leads

FilmTrim Variable Capacitors

9.5mm FilmTrim

Electrical Specifications

Dielectrics	• High Temperature PTFE • Standard PTFE • Polypropylene (PP) • Polycarbonate (PC)
Voltage Rating	200V High Temp PTFE 100V all other Dielectrics
Dielectric Withstanding Voltage	300V High Temp PTFE 200V all other Dielectrics
Contact Resistance	≤ 0.010mΩ
Insulation Resistance	≥10,000MΩ
Rotation Torque	0.15….3.5Ncm



All dimensions are in/mm.

FilmTrim Variable Capacitors

9.5mm FilmTrim

General Specifications

Dielectric	Capacitance (pF) min	Capacitance (pF) max	Q min (1MHz)	TCC (ppm/°C)	Operating Temperature (°C)	H max in/mm	Color Code	Model Number Top/Bottom 3 Lead	Model Number Top/Bottom 3 Lead Special	Model Number Top/Bottom 2 Lead	Model Number Side Adjust
PTFE	2.0	13	1500	-100±300	-40 to +85	0.40/10.2	Blue	PPXC13000	PPXC13003	PPXC13004	PPXD13000
	3.0	26		-100±250		0.40/10.2	Green	PPXC26000	PPXC26003	PPXC26004	PPXD26000
	3.5	38		-100±200		0.40/10.2	Grey	PPXC38000	PPXC38003	PPXC38004	PPXD38000
	5.5	60		-100±200		0.45/11.4	Yellow	PPXC60000	PPXC60003	PPXC60004	PPXD60000
	6.0	75		-100±200		0.45/11.4	Red	PPXC75000	PPXC75003	PPXC75004	PPXD75000
	8.0	90		-100±200		0.49/12.0	Violet	PPXC90000	PPXC90003	PPXC90004	PPXD90000
	10	150		-100±200		0.49/12.0	Orange	PPXC15100	PPXC15103	PPXC15104	PPXD15100
PTFE High Temp	2.2	9.0	1500	-100±150	-40 to +125	0.40/10.2	Green	PPXF9R000	PPXF9R003	PPXF9R004	PPXT9R000
	2.5	15		-100±150		0.40/10.2	Red	PPXF15000	PPXF15003	PPXF15004	PPXT15000
	3.0	25		-100±150		0.40/10.2	Grey	PPXF25000	PPXF25003	PPXF25004	PPXT25000
	4.0	40		-100±150		0.40/10.2	Yellow	PPXF40000	PPXF40003	PPXF40004	PPXT40000
	5.5	60		-100±150		0.45/11.4	Blue	PPXF60000	PPXF60003	PPXF60004	PPXT60000
	6.0	75		-100±150		0.45/11.4	Violet	PPXF75000	PPXF75003	PPXF75004	PPXT75000
	8.0	90		-100±150		0.49/12.4	Orange	PPXF90000	PPXF90003	PPXF90004	PPXT90000
PP	2.0	15	1000	0±400	-40 to +70	0.40/10.2	Blue	PPYC15000	PPYC15003	PPYC15004	PPYD15000
	3.0	20		0±400		0.40/10.2	Green	PPYC20000	PPYC20003	PPYC20004	PPYD20000
	3.5	40		0±350		0.40/10.2	Grey	PPYC40000	PPYC40003	PPYC40004	PPYD40000
	4.5	65		0±350		0.40/10.2	Yellow	PPYC65000	PPYC65003	PPYC65004	PPYD65000
PC	7.0	80	500	0±200	-40 to +85	0.40/10.2	Red	PPZC80000	PPZC80003	PPZC80004	PPZD80000
	8.0	100		+100±300		0.45/11.4	Violet	PPZC10100	PPZC10103	PPZC10104	PPZD10100
	9.0	120		+100±250		0.45/11.4	Orange	PPZC12100	PPZC12103	PPZC12104	PPZD12100
	10	150		+100±250		0.47/12.0	Orange	PPZC15100	PPZC15103	PPZC15104	PPZD15100
	12	180		+100±250		0.47/12.0	Orange	PPZC18100	PPZC18103	PPZC18104	PPZD18100

Production Qualification

- FilmTrim Capacitors are in accordance with DIN IEC 418-1 and 4-former DIN 44261 part 3.
- Testing methods for manufacturing quality are in accordance with MIL- STD-105D and IEC410 (former DIN44260).
- Solderability or heat resistance for the FilmTrim Capacitors comply with DIN IEC 68-2-20 part 2, Test Ta and Tb.
- Each FilmTrim Capacitor is tested for minimum and maximum capacitance value and is also subjected to full test voltage.

FilmTrim Variable Capacitors

9.5mm FilmTrim

Specifications Notes

1 Parts are 100% tested for capacitance range and dielectric withstanding voltage.

2 Capacitance range specified is that which is guaranteed and is measured at 1 MHz at room temperature.

3 Q factor is measured at maximum rated capacitance and at room temperature.

4 Dielectric strength is measured at maximum rated capacitance and room temperature, with test voltage (as listed for each model) applied for 60 seconds.

5 Insulation resistance is measured at maximum rated capacitance and room temperature and at rated voltage, unless otherwise specified.

6 Temperature coefficient of capacitance (TCC) is measured at 1 MHz over the operating temperature range, with capacitor set at maximum rated capacitance.

7 Axial load during tuning should not exceed 200 grams force. At maximum axial load, capacitance change is no more than 15%.

8 Capacitors should not be operated outside of rated capacitance range and working voltage.

Soldering FilmTrim Capacitors

Dip soldering:
260°C ± 10°C for 7 seconds maximum.

Hand Soldering
(for lead-through-hole models):
Tip temperature 350°C ± 10°C for 3 to 4 seconds

Cleaning FilmTrim Capacitors

1 Water soluble fluxes and detergents with a water flush after soldering of the boards can be used for all parts.

2 Do not immerse FilmTrim models in chlorinated or fluorinated hydrocarbon solvents as this would adversely affect the plastic dielectrics and base materials.
Some customers have successfully used X models in scrubbers or sprayers where only bottom of the printed circuit boards is exposed to solvents.
If the process requires immersion in solvents for cleaning boards, the FilmTrim capacitors should be hand soldered to board after the boards have been cleaned.

FilmTrim Variable Capacitors

16mm FilmTrim

Product Features

- Dielectrics:
  Polycarbonate
  Polymide
- SMD and lead-through-hole mounting
- Top, Bottom and Side Mount models
- Wide capacitance ranges
- Low cost
- Linear capacitance change vs. rotation
- Compact size

Product Applications

Typical Applications:

- Antennas • Transmitters
- RF Equipment
- Test Equipment

Modifications & Variations:

- Special capacitance ranges
- Special terminal sizes & shapes
- Extended Adjust shafts
- High temperature versions for PTFE
- Silver and/or Gold Plating

Part Numbering

PP	Z	N	201	00
PP = Passive Plus	Dielectric Code *See Table*	Style *N = 16mm Top Adjust*	Capacitor Code *100=10x10⁰=10pF 201=201pF*	Options

RoHS

For special requests, please contact □□I directly.

Dielectrics

Dielectrics	
Code	**Description**
Z	PC (Polycarbonate) or PI (Polyimide)

Style

Style	
Code	**Description**
N	16mm Top Adjust
P	16mm Side Adjust

Capacitance

Capacitance Code
201 = 200pF

Special Options

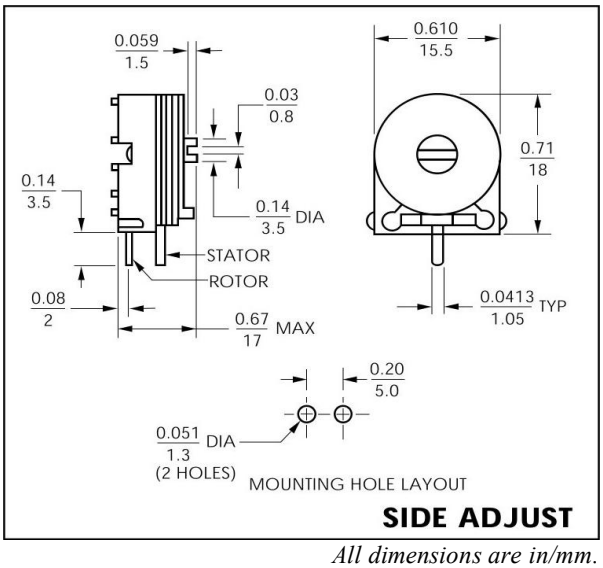
Special Options (Top Adjust Models)	
Code	**Description**
00	Standard

FilmTrim Variable Capacitors

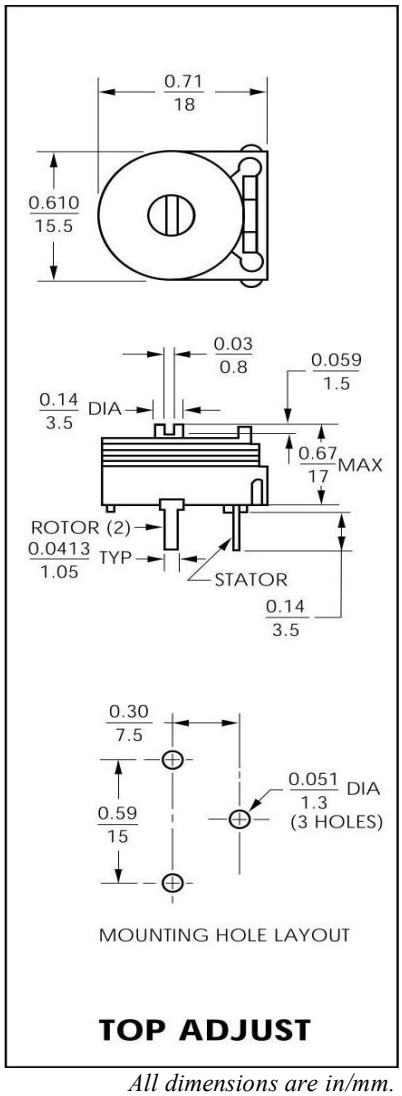
16mm FilmTrim

Electrical Specifications

Dielectrics	• Polypropylene (PP) • Polycarbonate (PC)
Voltage Rating	150 VDC
Dielectric Withstanding Voltage	300 VDC
Contact Resistance	≤ 0.010mΩ
Insulation Resistance	≥10,000MΩ
Rotation Torque	0.15….3.5Ncm



All dimensions are in/mm.



All dimensions are in/mm.

General Specifications

Dielectric	Capacitance (pF) min	Capacitance (pF) max	Q min (1MHz)	TCC (ppm/°C)	Operating Temperature (°C)	H max in/mm	Color Code	Model Number Top Adjust	Model Number Side Adjust
PC	8.0	120	200	0±300	-40 to +85	0.66/16.8	Red	PPZN12100	PPZP12100
	9.0	160	200	0±300		0.66/16.8	Violet	PPZN16100	PPZP16100
	9.0	200	200	0±300		0.66/16.8	Orange	PPZN20100	PPZP20100
	18	300	200	0±300		0.66/16.8	Red	PPZN30100	PPZP30100
	23	350	100	0±350		0.66/16.8	Red	PPZN35100	PPZP35100
	23	380	100	0±350		0.66/16.8	Red	PPZN38100	PPZP38100
	25	430	100	0±350		0.66/16.8	Violet	PPZN43100	PPZP43100
	26	600	100	0±350		0.66/16.8	Grey	PPZN60100	PPZP60100
	40	770	100	0±350		0.66/16.8	Grey	PPZN77100	PPZP77100
PTFE	16	250	1000	-100±200	-40 to +85	0.66/16.8	None	PPXN25100	PPXP25100

16mm FilmTrim

Specifications Notes

1. Parts are 100% tested for capacitance range and dielectric withstanding voltage.
2. Capacitance range specified is that which is guaranteed and is measured at 1 MHz at room temperature.
3. Q factor is measured at maximum rated capacitance and at room temperature.
4. Dielectric strength is measured at maximum rated capacitance and room temperature, with test voltage (as listed for each model) applied for 60 seconds.
5. Insulation resistance is measured at maximum rated capacitance and room temperature and at rated voltage, unless otherwise specified.
6. Temperature coefficient of capacitance (TCC) is measured at 1 MHz over the operating temperature range, with capacitor set at maximum rated capacitance.
7. Axial load during tuning should not exceed 200 grams force. At maximum axial load, capacitance change is no more than 15%.
8. Capacitors should not be operated outside of rated capacitance range and working voltage.

Soldering FilmTrim Capacitors

Dip soldering:
260°C ± 10°C for 7 seconds maximum.

Hand Soldering
(for lead-through-hole models):
Tip temperature 350°C ± 10°C for 3 to 4 seconds

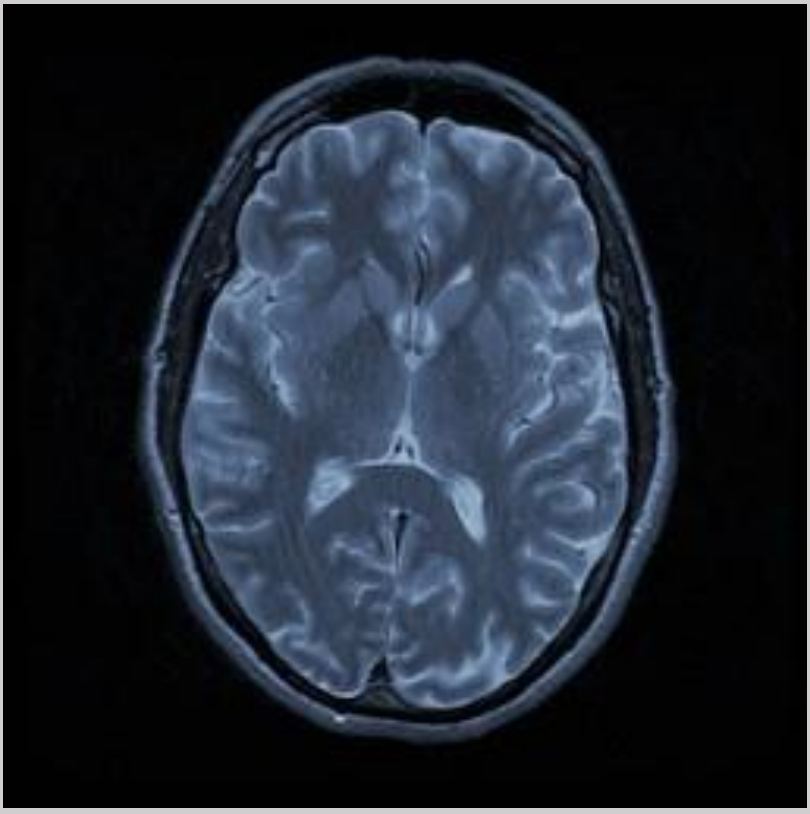
Cleaning FilmTrim Capacitors

1. Water soluble fluxes and detergents with a water flush after soldering of the boards can be used for all parts.

2. Do not immerse FilmTrim models in chlorinated or fluorinated hydrocarbon solvents as this would adversely affect the plastic dielectrics and base materials.
Some customers have successfully used X models in scrubbers or sprayers where only bottom of the printed circuit boards is exposed to solvents.
If the process requires immersion in solvents for cleaning boards, the FilmTrim capacitors should be hand soldered to board after the boards have been cleaned.

PPI®

Thin Film Products

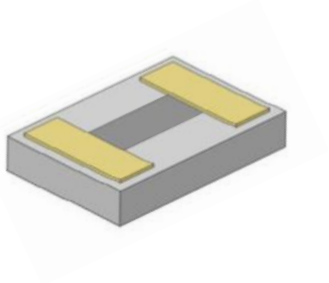


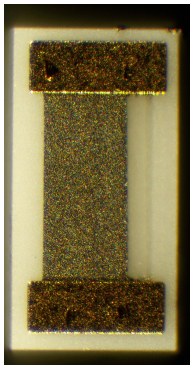
Thin Film Products

Standard Chip Resistors – PR Series

Product Features

- Solderable and Wire-bondable Thin Film Resistors
- Operating frequencies from DC to 500 MHz
- Can be used in Non-Magnetic Applications





Product Specifications

Resistance Range	0.5Ω to 35MΩ
Resistance Tolerance	±0.01% to ±20%, value dependent

Part Numbering

Example shown: Standard Resistor, TaN resistive element, alumina substrate, case size 0.020" × 0.020" × 0.010", PdAu bonding pad, bottom side bare, resistance 1000 Ω ± 5%, 150 ppm TCR, microwave trim, 100 mW max power handling.

P R T 1 35 – 20×20× 10 D 10000 J Q E W

RoHS

- P = Passive Plus
- Resistive Material *See Table*
- Substrate *See Table*
- Thickness
- Resistance Value *See Table*
- TCR *See Table*
- Packaging *W = Waffle Pack*
- Resistor Style *R = Standard (<500MHz)*
- Number of Resistors
- Length & Width (mils)
- Termination *See Table*
- Resistance Tolerance *See Table*
- Power Handling *See Table*

**Flip Chip – wire bondable or solderable*

Resistive Materials

Code	Material	Passivation	Sheet Resistivity (Ω/ Sq)	Abs. Tolerance	Ratio Tolerance
T	**Tantalum Nitride (TaN)**	Self Passivating Ta_2O_5	5 to 270	From ±0.01%	From ±0.01%
N	**NiChrome (NiCr)**	SiO_2	5 to 250	From ±0.01%	From ±0.01%

The standard dimensional tolerance for length and width is ± 2 mils. The standard dimensional tolerance for thickness is ± 1 mil.

All parts are supplied in waffle packs. Other packaging may be available. Contact PPI for additional packaging options.

Thin Film Products

Standard Chip Resistors – PR Series

Substrate Materials

Code	Material	Thickness	Surface Finish	Dielectric Constant (@ 1MHz)	Coefficient of Thermal Expansion (x 10^6/ °C)	Thermal Conductivity (W/m*K)
35	Alumina (Al_2O_3)	0.005" - 0.010"	2µ" - 3µ"	9.9	7 (25°C to < 300°C)	26.9
28	Aluminum Nitride (AlN)	0.005" - 0.010"	6µ" - 8µ"	8.0 - 9.1	4.6 - 5.7 (25°C to < 1000°C)	170
25	Beryllium Oxide (BeO)	0.005" - 0.010"	<5µ"	6.76	9 (25°C to < 1000°C)	285
22	Silicon (Si) (with 12kÅ SiO_2)	0.005" - 0.010"	Chemical Polish	N/A (SiO_2 K=1.38)	2.49 - 4.44 (25°C to < 1000°C)	149 (SiO_2 1.38)
20	Quartz (Fused Silica)	0.005" - 0.010"	60/40 Optical Polish	3.826	0.55 (25°C to < 1000°C)	1.38

Resistance Tolerance Codes

Code	B	D	F	G	H	J	K	L	M	Q	S
Tolerance	± 0.1%	± 0.5%	± 1%	± 2%	± 3%	± 5%	± 10%	± 15%	± 20%	± 0.05%	± 0.01%

Standard Thickness

L x W	Thickness
12 x 09	5 mils
All other Sizes	10 mils

**For other thickness requirements, please contact PPI*

Temperature Coefficient of Resistance

Code	TCC	Material	
		Tantallum Nitride (TaN)	NiChrome (NiCr)
Q	±150 PPM/°C	Standard	---
V	±100 PPM/°C	Yes	---
W	±50 PPM/°C	---	Yes
X	±25 PPM/°C	---	Standard
Y	±10 PPM/°C	---	Yes
Z	±5 PPM/°C	---	Yes

Terminations

Code	Top Side		Bottom Side	
	Metallization	Attachement Options	Metallization	Attachement Options
A	Pd/Au	Wirebond, Non-Cond. Epoxy	–	–
R	Flip Chip (Ti/Pt/Au)	Cond. Epoxy Non-Cond. Epoxy Eutectic Attach Solder	–	–
D	Pd/Au	Wirebond Non-Cond. Epoxy	Ta/Pd/Au	Cond. Epoxy Non-Cond. Epoxy Eutectic Attach Solder

Power Handling Codes

Code	Watts	Code	Watts	Code	Watts	Code	Watts
A	10 mW	**F**	150 mW	**J**	750 mW	**P**	4.0 W
B	20 mW	**O**	200 mW	**K**	1.0 W	**Q**	5.0 W
C	50 mW	**G**	250 mW	**U**	1.4 W	**Z**	6.0 W
D	75 mW	**M**	350 mW	**L**	2.0 W	**S**	10 W
E	100 mW	**R**	400 mW	**Y**	2.8 W		
I	125 mW	**H**	500 mW	**N**	3.0 W		

Thin Film Products

Standard Chip Resistors – PR Series

Power Handling & Standard Resistance Ranges by Material and Case Size

Case Size		Alumina (35)		AlN (28)		BeO (25)		Silicon (22)		Quartz (20)		High Power Resistor				
												Resistance Range		Power Handling		
mils (inches)	Min (Ω)	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Min (Ω)	Max (Ω)	Alumina (35)	AlN (28)	BeO (25)
12 x 9 (0.012 x 0.009)	1-3	25K	50 mW	25K	200 mW	25K	400 mW	150K	50 mW	150K	10 mW	-	-	-	-	-
14 x 12 (0.014 x 0.012)	1-3	40K	100 mW	40K	400 mW	40K	750 mW	200K	100 mW	200K	20 mW	-	-	-	-	-
20 x 10 (0.020 x 0.010)	1-3	60K	100 mW	60K	400 mW	60K	750 mW	250K	100 mW	250K	20 mW	2	1000	250 mW	1.0 W	2.0 W
15 x 15 (0.015 x 0.015)	1-2	70K	100 mW	70K	400 mW	70K	750 mW	500K	100 mW	500K	20 mW	2	1000	250 mW	1.0 W	2.0 W
20 x 20 (0.020 x 0.020)	1-2	125K	250 mW	125K	1.0 W	125K	2.0 W	750K	250 mW	750K	50 mW	2	1000	500 mW	2.0 W	4.0 W
30 x 20 (0.030 x 0.020)	1-2	200K	250 mW	200K	1.0 W	200K	2.0 W	1M	250 mW	1M	50 mW	2	1000	500 mW	2.0 W	4.0 W
40 x 20 (0.040 x 0.020)	1-2	250K	250 mW	250K	1.0 W	250K	2.0 W	1.5M	250 mW	1.5M	50 mW	2	1000	750 mW	3.0 W	6.0 W
30 x 30 (0.030 x 0.030)	1-2	275K	250 mW	275K	1.0 W	275K	2.0 W	2M	250 mW	2M	50 mW	2	1000	750 mW	2.0 W	6.0 W
35 x 35 (0.035 x 0.035)	1-2	300K	250 mW	300K	1.0 W	300K	2.0 W	3M	250 mW	3M	50 mW	2	1000	1.0 W	4.0 W	6.0 W
40 x 40 (0.040 x 0.040)	1-2	500K	350 mW	500K	1.4 W	500K	2.8 W	5M	350 mW	5M	70 mW	2	1000	1.0 W	4.0 W	6.0 W
50 x 25 (0.050 x 0.025)	1-2	300K	350 mW	300K	1.4 W	300K	2.8 W	3M	350 mW	3M	70 mW	2	1000	1.0 W	4.0 W	6.0 W
60 x 30 (0.060 x 0.030)	1-2	500K	500 mW	500K	2.0 W	500K	4.0 W	6M	500 mW	6M	100 mW	2	1000	1.4 W	5.0 W	10.0 W
50 x 50 (0.050 x 0.050)	1-2	700K	500 mW	700K	2.0 W	700K	4.0 W	7M	500 mW	7M	100 mW	2	1000	1.4 W	5.0 W	10.0 W
60 x 60 (0.060 x 0.060)	1-2	2M	500 mW	2M	2.0 W	2M	4.0 W	15M	500 mW	15M	100 mW	2	1000	1.4 W	5.0 W	10.0 W
80 x 50 (0.080 x 0.050)	1-2	2M	500 mW	2M	2.0 W	2M	4.0 W	20M	500 mW	20M	100 mW	2	1000	2.8 W	10.0 W	15.0 W
100 x 50 (0.100 x 0.050)	1-2	2.5M	500 mW	2.5M	2.0 W	2.5M	4.0 W	25M	500 mW	25M	100 mW	2	1000	2.8 W	10.0 W	15.0 W
120 x 60 (0.120 x 0.060)	1-2	3M	750 mW	3M	3.0 W	3M	6.0 W	30M	750 mW	30M	125 mW	2	1000	2.8 W	10.0 W	15.0W
100 x 100 (0.100 x 0.100)	1-2	3.5M	750 mW	3.5M	3.0 W	3.5M	6.0 W	35M	750 mW	35M	125 mW	2	1000	2.8 W	10.0 W	15.0 W

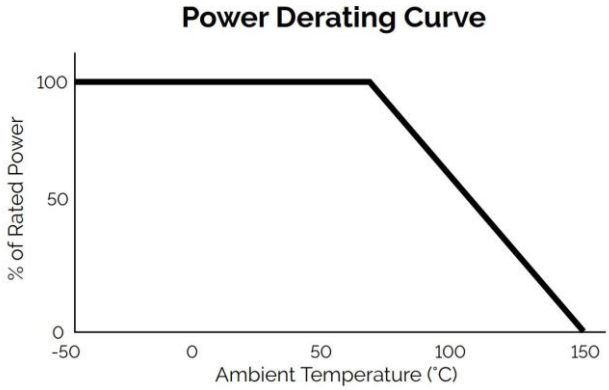
Typical PPI commercial testing includes 100% visual inspection, 100% electrical testing with short time overload, and TCR sampling.
Our parts meet or exceed additional MIL-PRF-55342 and MIL-STD-202 requirements.

Thin Film Products

Standard Chip Resistors – PR Series

General Properties

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Operating Frequency	DC to 500 MHz
Voltage Rating	100V maximum
Power Derating *(See Chart at Right)*	Full power up to 70°C Derated linearly to zero power at 150°C



Testing

Testing Performed	Specification / Standard
Visual Inspection	MIL-PRF-55342 MIL-STD-883
Mechanical Inspection	MIL-PRF-55342
DC Resistance	MIL-PRF-55342 MIL-STD-202
Resistance Temperature Characteristics (TCR)	MIL-PRF-55342
Short Time Overload	MIL-PRF-55342
High Temperature Exposure	MIL-PRF-55342
Thermal Shock	MIL-PRF-55342 MIL-STD-202
Resistance to Bonding Exposure	MIL-PRF-55342
Wire Bonding Integrity	MIL-PRF-55342
Life Test	MIL-PRF-55342 MIL-STD-202

Performance Specifications

Higher power ratings, additional sizes, and custom resistors available. Please contact sales@passiveplus.com.

Packaging

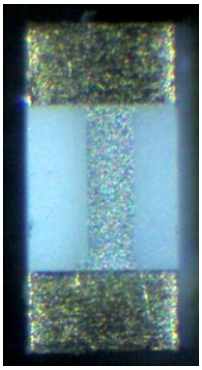
ESD waffle packs are standard. Film rings and gel pack packaging are available upon request.

Thin Film Products

Standard Edge Wrapped Chip Resistors – PR Series

Product Features

- Half wrap style chips have solid gold back contiguous with one pad, therefore eliminating one wirebond
- Full wrap style chips have both pads continue to the back side, allowing elimination of all wirebonds
- Can be used in Non-Magnetic Applications

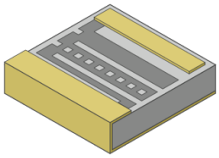


20x10 392Ω
Full Wrap Resistor

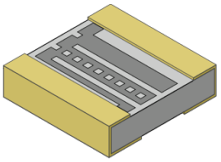
Product Specifications

Resistance Range	1 Ω to 3.5MΩ
Resistance Tolerance	±0.01% to ±20%, value dependent

Half Wrap



Full Wrap



Part Numbering

Example shown: Microwave Resistor, TaN resistive element, alumina substrate, case size 0.020" × 0.020" × 0.010", PdAu bonding pad, bottom side bare, resistance 1000 Ω ± 5%, 150 ppm TCR, microwave trim, 100 mW max power handling.

P R T 1 35 – 40×20× 10 N 200R0 G Q K W

RoHS

P = Passive Plus	Resistive Material *See Table*	Substrate *See Table*	Thickness	Resistance Value *See Table*	TCR *See Table*	Packaging *W = Waffle Pack*				
	Resistor Style *R = Standard (<500MHz)*	Number of Resistors	Length & Width (mils)	Termination *See Table*	Resistance Tolerance *See Table*	Power Handling *See Table*				

Resistive Materials

Code	Material	Passivation	Sheet Resistivity (Ω/ Sq)	Abs. Tolerance	Ratio Tolerance
T	**Tantalum Nitride (TaN)**	Self Passivating Ta_2O_5	5 to 270	From ±0.01%	From ±0.01%
N	**NiChrome (NiCr)**	SiO_2	5 to 250	From ±0.01%	From ±0.01%

The standard dimensional tolerance for length and width is ± 2 mils. The standard dimensional tolerance for thickness is ± 1 mil.

All parts are supplied in waffle packs. Other packaging may be available. Contact PPI for additional packaging options.

Thin Film Products

Standard Edge Wrapped Chip Resistors – PR Series

Substrate Materials

Code	Material	Thickness	Surface Finish	Dielectric Constant (@ 1MHz)	Coefficient of Thermal Expansion (x 10^6/ °C)	Thermal Conductivity (W/m*K)
35	Alumina (Al_2O_3)	0.005" - 0.010"	2µ" - 3µ"	9.9	7 (25°C to < 300°C)	26.9
28	Aluminum Nitride (AlN)	0.005" - 0.010"	6µ" - 8µ"	8.0 - 9.1	4.6 - 5.7 (25°C to < 1000°C)	170
25	Beryllium Oxide (BeO)	0.005" - 0.010"	<5µ"	6.76	9 (25°C to < 1000°C)	285

Resistance Tolerance Codes

Code	B	D	F	G	H	J	K	L	M	Q	S
Tolerance	± 0.1%	± 0.5%	± 1%	± 2%	± 3%	± 5%	± 10%	± 15%	± 20%	± 0.05%	± 0.01%

** Limit of ± 50mΩs*

Standard Thickness

L x W	Thickness
12 x 09	5 mils
All other Sizes	10 mils

**For other thickness requirements, please contact PPI*

Terminations

Code	Metallization	Description	Attachement Options
H	Ta/Pd/Au	1 Side Wrap	Wirebond, Non-Cond. Epoxy
M	TiW/Ni/Au	1 Side Wrap	Wirebond, Cond. Epoxy, Non-Cond. Epoxy, Eutectic Attach Solder
S	TiW/Ni/Au - Solder Dipped	1 Side Wrap	Sn Solder Ball
J	Ta/Pd/Au	2 Side Wrap	Wirebond, Non-Cond. Epoxy
N	TiW/Ni/Au	2 Side Wrap	Wirebond, Cond. Epoxy, Non-Cond. Epoxy, Eutectic Attach Solder
T	TiW/Ni/Au - Solder Dipped	2 Side Wrap	Sn Solder Ball

Temperature Coefficient of Resistance

Code	TCC	Material	
		Tantallum Nitride (TaN)	NiChrome (NiCr)
Q	±150 PPM/°C	Standard	---
V	±100 PPM/°C	Yes	---
W	±50 PPM/°C	---	Yes
X	±25 PPM/°C	---	Standard
Y	±10 PPM/°C	---	Yes
Z	±5 PPM/°C	---	Yes

Power Handling Codes

Code	Watts	Code	Watts	Code	Watts	Code	Watts
A	10 mW	**F**	150 mW	**J**	750 mW	**P**	4.0 W
B	20 mW	**O**	200 mW	**K**	1.0 W	**Q**	5.0 W
C	50 mW	**G**	250 mW	**U**	1.4 W	**Z**	6.0 W
D	75 mW	**M**	350 mW	**L**	2.0 W	**S**	10 W
E	100 mW	**R**	400 mW	**Y**	2.8 W		
I	125 mW	**H**	500 mW	**N**	3.0 W		

Thin Film Products

Standard Edge Wrapped Chip Resistors – PR Series

Power Handling & Standard Resistance Ranges by Material and Case Size

Case Size		Alumina (35)		AlN (28)		BeO (25)		Silicon (22)		Quartz (20)		High Power Resistor				
												Resistance Range		Power Handling		
mils (inches)	Min (Ω)	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Min (Ω)	Max (Ω)	Alumina (35)	AlN (28)	BeO (25)
12 x 9 (0.012 x 0.009)	1-3	25K	50 mW	25K	200 mW	25K	400 mW	150K	50 mW	150K	10 mW	-	-	-	-	-
14 x 12 (0.014 x 0.012)	1-3	40K	100 mW	40K	400 mW	40K	750 mW	200K	100 mW	200K	20 mW	-	-	-	-	-
20 x 10 (0.020 x 0.010)	1-3	60K	100 mW	60K	400 mW	60K	750 mW	250K	100 mW	250K	20 mW	2	1000	250 mW	1.0 W	2.0 W
15 x 15 (0.015 x 0.015)	1-2	70K	100 mW	70K	400 mW	70K	750 mW	500K	100 mW	500K	20 mW	2	1000	250 mW	1.0 W	2.0 W
20 x 20 (0.020 x 0.020)	1-2	125K	250 mW	125K	1.0 W	125K	2.0 W	750K	250 mW	750K	50 mW	2	1000	500 mW	2.0 W	4.0 W
30 x 20 (0.030 x 0.020)	1-2	200K	250 mW	200K	1.0 W	200K	2.0 W	1M	250 mW	1M	50 mW	2	1000	500 mW	2.0 W	4.0 W
40 x 20 (0.040 x 0.020)	1-2	250K	250 mW	250K	1.0 W	250K	2.0 W	1.5M	250 mW	1.5M	50 mW	2	1000	750 mW	3.0 W	6.0 W
30 x 30 (0.030 x 0.030)	1-2	275K	250 mW	275K	1.0 W	275K	2.0 W	2M	250 mW	2M	50 mW	2	1000	750 mW	2.0 W	6.0 W
35 x 35 (0.035 x 0.035)	1-2	300K	250 mW	300K	1.0 W	300K	2.0 W	3M	250 mW	3M	50 mW	2	1000	1.0 W	4.0 W	6.0 W
40 x 40 (0.040 x 0.040)	1-2	500K	350 mW	500K	1.4 W	500K	2.8 W	5M	350 mW	5M	70 mW	2	1000	1.0 W	4.0 W	6.0 W
50 x 25 (0.050 x 0.025)	1-2	300K	350 mW	300K	1.4 W	300K	2.8 W	3M	350 mW	3M	70 mW	2	1000	1.0 W	4.0 W	6.0 W
60 x 30 (0.060 x 0.030)	1-2	500K	500 mW	500K	2.0 W	500K	4.0 W	6M	500 mW	6M	100 mW	2	1000	1.4 W	5.0 W	10.0 W
50 x 50 (0.050 x 0.050)	1-2	700K	500 mW	700K	2.0 W	700K	4.0 W	7M	500 mW	7M	100 mW	2	1000	1.4 W	5.0 W	10.0 W
60 x 60 (0.060 x 0.060)	1-2	2M	500 mW	2M	2.0 W	2M	4.0 W	15M	500 mW	15M	100 mW	2	1000	1.4 W	5.0 W	10.0 W
80 x 50 (0.080 x 0.050)	1-2	2M	500 mW	2M	2.0 W	2M	4.0 W	20M	500 mW	20M	100 mW	2	1000	2.8 W	10.0 W	15.0 W
100 x 50 (0.100 x 0.050)	1-2	2.5M	500 mW	2.5M	2.0 W	2.5M	4.0 W	25M	500 mW	25M	100 mW	2	1000	2.8 W	10.0 W	15.0 W
120 x 60 (0.120 x 0.060)	1-2	3M	750 mW	3M	3.0 W	3M	6.0 W	30M	750 mW	30M	125 mW	2	1000	2.8 W	10.0 W	15.0W
100 x 100 (0.100 x 0.100)	1-2	3.5M	750 mW	3.5M	3.0 W	3.5M	6.0 W	35M	750 mW	35M	125 mW	2	1000	2.8 W	10.0 W	15.0 W

Typical PPI commercial testing includes 100% visual inspection, 100% electrical testing with short time overload, and TCR sampling.

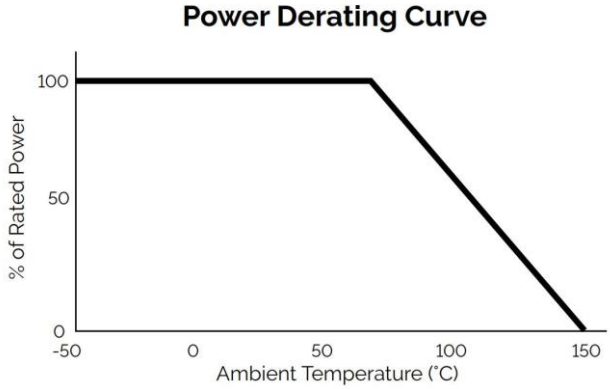
Our parts meet or exceed additional MIL-PRF-55342 and MIL-STD-202 requirements.

Thin Film Products

Standard Edge Wrapped Chip Resistors – PR Series

General Properties

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Operating Frequency	DC to 500 MHz
Voltage Rating	100V maximum
Power Derating *(See Chart at Right)*	Full power up to 70°C Derated linearly to zero power at 150°C



Testing

Testing Performed	Specification / Standard
Visual Inspection	MIL-PRF-55342 MIL-STD-883
Mechanical Inspection	MIL-PRF-55342
DC Resistance	MIL-PRF-55342 MIL-STD-202
Resistance Temperature Characteristics (TCR)	MIL-PRF-55342
Short Time Overload	MIL-PRF-55342
High Temperature Exposure	MIL-PRF-55342
Thermal Shock	MIL-PRF-55342 MIL-STD-202
Resistance to Bonding Exposure	MIL-PRF-55342
Wire Bonding Integrity	MIL-PRF-55342
Life Test	MIL-PRF-55342 MIL-STD-202

Performance Specifications

Higher power ratings, additional sizes, and custom resistors available. Please contact sales@passiveplus.com.

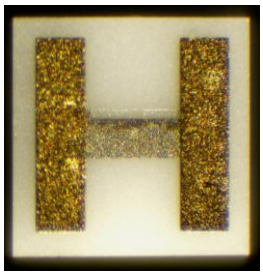
Packaging

ESD waffle packs are standard. Film rings and gel pack packaging are available upon request.

Thin Film Products

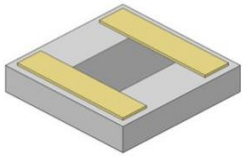
Microwave Chip Resistors – PM Series

Product Features



- Special microwave laser-trimming to ensure a tight tolerance at high frequencies
- Compatible with flip-chip configurations
- Operating frequencies up to 60 GHz; higher frequencies are available
- Can be used in Non-Magnetic Applications

Product Specifications



Resistance Range	2 Ω to 5kΩ		
Resistance Tolerance	±0.01% to ±20%, value dependent		
VSWR	DC to 10 GHz	10 to 20 GHz	20 to 60 GHZ
	1.2:1	1.3:1	1.5:1

Part Numbering

Example shown: Microwave Resistor, TaN resistive element, alumina substrate, case size 0.020" × 0.020" × 0.010", PdAu bonding pad, bottom side bare, resistance 1000 Ω ± 5%, 150 ppm TCR, microwave trim, 100 mW max power handling.

P M T 1 35 – 20×20× 10 A 10000 J Q E W

RoHS

- P = Passive Plus
- Resistive Material *See Table*
- Substrate *See Table*
- Thickness
- Resistance Value *See Table*
- TCR *See Table*
- Packaging *W = Waffle Pack*
- Resistor Style *M = Microwave*
- Number of Resistors
- Length & Width (mils)
- Termination *See Table*
- Resistance Tolerance *See Table*
- Power Handling *See Table*

Resistive Materials

Code	Material	Passivation	Sheet Resistivity (Ω/ Sq)	Abs. Tolerance	Ratio Tolerance
T	**Tantalum Nitride (TaN)**	Self Passivating Ta_2O_5	5 to 270	From ±0.01%	From ±0.01%
N	**NiChrome (NiCr)**	SiO_2	5 to 250	From ±0.01%	From ±0.01%

The standard dimensional tolerance for length and width is ± 2 mils. The standard dimensional tolerance for thickness is ± 1 mil.

All parts are supplied in waffle packs. Other packaging may be available. Contact PPI for additional packaging options.

Thin Film Products

Microwave Chip Resistors – PM Series

Substrate Materials

Code	Material	Thickness	Surface Finish	Dielectric Constant (@ 1MHz)	Coefficient of Thermal Expansion (x 10^6/ °C)	Thermal Conductivity (W/m*K)
35	Alumina (Al_2O_3)	0.005" - 0.010"	2µ" - 3µ"	9.9	7 (25°C to < 300°C)	26.9
28	Aluminum Nitride (AlN)	0.005" - 0.010"	6µ" - 8µ"	8.0 - 9.1	4.6 - 5.7 (25°C to < 1000°C)	170
25	Beryllium Oxide (BeO)	0.005" - 0.010"	<5µ"	6.76	9 (25°C to < 1000°C)	285
20	Quartz (Fused Silica)	0.005" - 0.010"	60/40 Optical Polish	3.826	0.55 (25°C to < 1000°C)	1.38

Resistance Tolerance Codes

Code	B	D	F	G	H	J	K	L	M	Q	S
Tolerance	± 0.1%	± 0.5%	± 1%	± 2%	± 3%	± 5%	± 10%	± 15%	± 20%	± 0.05%	± 0.01%

Standard Thickness

L x W	Thickness
12 x 09	5 mils
All other Sizes	10 mils

**For other thickness requirements, please contact PPI*

Temperature Coefficient of Resistance

Code	TCC	Material	
		Tantallum Nitride (TaN)	NiChrome (NiCr)
Q	±150 PPM/°C	Standard	---
V	±100 PPM/°C	Yes	---
W	±50 PPM/°C	---	Yes
X	±25 PPM/°C	---	Standard
Y	±10 PPM/°C	---	Yes
Z	±5 PPM/°C	---	Yes

Terminations

Code	Top Side		Bottom Side	
	Metallization	Attachement Options	Metallization	Attachement Options
A	Pd/Au	Wirebond, Non-Cond. Epoxy	–	–
R	Flip Chip (Ti/Pt/Au)	Cond. Epoxy Non-Cond. Epoxy Eutectic Attach Solder	–	–
D	Pd/Au	Wirebond Non-Cond. Epoxy	Ta/Pd/Au	Cond. Epoxy Non-Cond. Epoxy Eutectic Attach Solder

Power Handling Codes

Code	Watts	Code	Watts	Code	Watts	Code	Watts
A	10 mW	F	150 mW	J	750 mW	P	4.0 W
B	20 mW	O	200 mW	K	1.0 W	Q	5.0 W
C	50 mW	G	250 mW	U	1.4 W	Z	6.0 W
D	75 mW	M	350 mW	L	2.0 W	S	10 W
E	100 mW	R	400 mW	Y	2.8 W		
I	125 mW	H	500 mW	N	3.0 W		

Thin Film Products

Microwave Chip Resistors – PM Series

Power Handling & Standard Resistance Ranges by Material and Case Size

Case Size		Alumina (35)		AlN (28)		BeO (25)		Silicon (22)		Quartz (20)		High Power Resistor				
												Resistance Range		Power Handling		
mils (inches)	Min (Ω)	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Min (Ω)	Max (Ω)	Alumina (35)	AlN (28)	BeO (25)
12 x 9 (0.012 x 0.009)	1-3	25K	50 mW	25K	200 mW	25K	400 mW	150K	50 mW	150K	10 mW	-	-	-	-	-
14 x 12 (0.014 x 0.012)	1-3	40K	100 mW	40K	400 mW	40K	750 mW	200K	100 mW	200K	20 mW	-	-	-	-	-
20 x 10 (0.020 x 0.010)	1-3	60K	100 mW	60K	400 mW	60K	750 mW	250K	100 mW	250K	20 mW	2	1000	250 mW	1.0 W	2.0 W
15 x 15 (0.015 x 0.015)	1-2	70K	100 mW	70K	400 mW	70K	750 mW	500K	100 mW	500K	20 mW	2	1000	250 mW	1.0 W	2.0 W
20 x 20 (0.020 x 0.020)	1-2	125K	250 mW	125K	1.0 W	125K	2.0 W	750K	250 mW	750K	50 mW	2	1000	500 mW	2.0 W	4.0 W
30 x 20 (0.030 x 0.020)	1-2	200K	250 mW	200K	1.0 W	200K	2.0 W	1M	250 mW	1M	50 mW	2	1000	500 mW	2.0 W	4.0 W
40 x 20 (0.040 x 0.020)	1-2	250K	250 mW	250K	1.0 W	250K	2.0 W	1.5M	250 mW	1.5M	50 mW	2	1000	750 mW	3.0 W	6.0 W
30 x 30 (0.030 x 0.030)	1-2	275K	250 mW	275K	1.0 W	275K	2.0 W	2M	250 mW	2M	50 mW	2	1000	750 mW	2.0 W	6.0 W
35 x 35 (0.035 x 0.035)	1-2	300K	250 mW	300K	1.0 W	300K	2.0 W	3M	250 mW	3M	50 mW	2	1000	1.0 W	4.0 W	6.0 W
40 x 40 (0.040 x 0.040)	1-2	500K	350 mW	500K	1.4 W	500K	2.8 W	5M	350 mW	5M	70 mW	2	1000	1.0 W	4.0 W	6.0 W
50 x 25 (0.050 x 0.025)	1-2	300K	350 mW	300K	1.4 W	300K	2.8 W	3M	350 mW	3M	70 mW	2	1000	1.0 W	4.0 W	6.0 W
60 x 30 (0.060 x 0.030)	1-2	500K	500 mW	500K	2.0 W	500K	4.0 W	6M	500 mW	6M	100 mW	2	1000	1.4 W	5.0 W	10.0 W
50 x 50 (0.050 x 0.050)	1-2	700K	500 mW	700K	2.0 W	700K	4.0 W	7M	500 mW	7M	100 mW	2	1000	1.4 W	5.0 W	10.0 W
60 x 60 (0.060 x 0.060)	1-2	2M	500 mW	2M	2.0 W	2M	4.0 W	15M	500 mW	15M	100 mW	2	1000	1.4 W	5.0 W	10.0 W
80 x 50 (0.080 x 0.050)	1-2	2M	500 mW	2M	2.0 W	2M	4.0 W	20M	500 mW	20M	100 mW	2	1000	2.8 W	10.0 W	15.0 W
100 x 50 (0.100 x 0.050)	1-2	2.5M	500 mW	2.5M	2.0 W	2.5M	4.0 W	25M	500 mW	25M	100 mW	2	1000	2.8 W	10.0 W	15.0 W
120 x 60 (0.120 x 0.060)	1-2	3M	750 mW	3M	3.0 W	3M	6.0 W	30M	750 mW	30M	125 mW	2	1000	2.8 W	10.0 W	15.0W
100 x 100 (0.100 x 0.100)	1-2	3.5M	750 mW	3.5M	3.0 W	3.5M	6.0 W	35M	750 mW	35M	125 mW	2	1000	2.8 W	10.0 W	15.0 W

Typical PPI commercial testing includes 100% visual inspection, 100% electrical testing with short time overload, and TCR sampling.

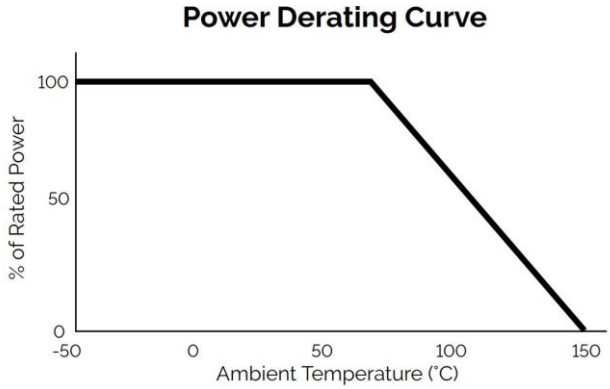
Our parts meet or exceed additional MIL-PRF-55342 and MIL-STD-202 requirements.

Thin Film Products

Microwave Chip Resistors – PM Series

General Properties

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Operating Frequency	DC to 60 GHz
Voltage Rating	100V maximum
Power Derating *(See Chart at Right)*	Full power up to 70°C Derated linearly to zero power at 150°C



Testing

Testing Performed	Specification / Standard
Visual Inspection	MIL-PRF-55342 MIL-STD-883
Mechanical Inspection	MIL-PRF-55342
DC Resistance	MIL-PRF-55342 MIL-STD-202
Resistance Temperature Characteristics (TCR)	MIL-PRF-55342
Short Time Overload	MIL-PRF-55342
High Temperature Exposure	MIL-PRF-55342
Thermal Shock	MIL-PRF-55342 MIL-STD-202
Resistance to Bonding Exposure	MIL-PRF-55342
Wire Bonding Integrity	MIL-PRF-55342
Life Test	MIL-PRF-55342 MIL-STD-202

Performance Specifications

Higher power ratings, additional sizes, and custom resistors available. Please contact sales@passiveplus.com.

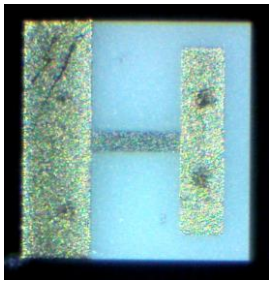
Packaging

ESD waffle packs are standard. Film rings and gel pack packaging are available upon request.

Thin Film Products

Microwave Edge Wrapped Chip Resistors

Product Features

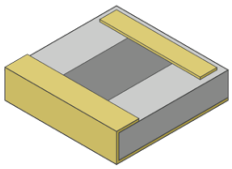


- Edge Wrap similar in construction to our standard surface mount wrap resistors, with half wrap and full wrap styles available.
- The addition of a microwave design allows for operation at frequencies up to 60 GHz.
- Can be used in Non-Magnetic Applications

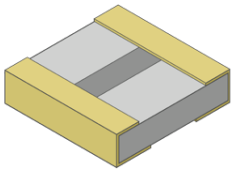
Product Specifications

Resistance Range	2 Ω to 5kΩ
Resistance Tolerance	±0.5% to ±20%, value dependent

Half Wrap



Full Wrap



Part Numbering

Example shown below: Microwave Resistor, TaN resistive element, AlN substrate, case size 0.040" × 0.020" × 0.010", dual edge wrap, resistance 200 Ω ± 2%, 150 ppm TCR, 1.0 W max power handling.

P M T 1 28 – 40×20× 10 N 200R0 G Q K W

RoHS

P = Passive Plus	Resistive Material *See Table*	Substrate *See Table*	Thickness	Resistance Value *See Table*	TCR *See Table*	Packaging *W = Waffle Pack*				
Resistor Style *M = Microwave*	Number of Resistors	Length & Width (mils)	Termination *See Table*	Resistance Tolerance *See Table*	Power Handling *See Table*					

Resistive Materials

Code	Material	Passivation	Sheet Resistivity (Ω/ Sq)	Abs. Tolerance	Ratio Tolerance
T	**Tantalum Nitride (TaN)**	Self Passivating Ta_2O_5	5 to 270	From ±0.01%	From ±0.01%
N	**NiChrome (NiCr)**	SiO_2	5 to 250	From ±0.01%	From ±0.01%

The standard dimensional tolerance for length and width is ± 2 mils. The standard dimensional tolerance for thickness is ± 1 mil.

All parts are supplied in waffle packs. Other packaging may be available. Contact PPI for additional packaging options.

Thin Film Products

Microwave Edge Wrapped Chip Resistors

Substrate Materials

Code	Material	Thickness	Surface Finish	Dielectric Constant (@ 1MHz)	Coefficient of Thermal Expansion (x 10^6/ °C)	Thermal Conductivity (W/m*K)
35	Alumina (Al_2O_3)	0.005" - 0.010"	2µ" - 3µ"	9.9	7 (25°C to < 300°C)	26.9
28	Aluminum Nitride (AlN)	0.005" - 0.010"	6µ" - 8µ"	8.0 - 9.1	4.6 - 5.7 (25°C to < 1000°C)	170
25	Beryllium Oxide (BeO)	0.005" - 0.010"	<5µ"	6.76	9 (25°C to < 1000°C)	285

Resistance Tolerance Codes

Code	B	D	F	G	H	J	K	L	M	Q	S
Tolerance	± 0.1%	± 0.5%	± 1%	± 2%	± 3%	± 5%	± 10%	± 15%	± 20%	± 0.05%	± 0.01%

** Limit of ± 50mΩs*

Standard Thickness

L x W	Thickness
12 x 09	5 mils
All other Sizes	10 mils

**For other thickness requirements, please contact PPI*

Temperature Coefficient of Resistance

Code	TCC	Material	
		Tantallum Nitride (TaN)	NiChrome (NiCr)
Q	±150 PPM/°C	Standard	---
V	±100 PPM/°C	Yes	---
W	±50 PPM/°C	---	Yes
X	±25 PPM/°C	---	Standard
Y	±10 PPM/°C	---	Yes
Z	±5 PPM/°C	---	Yes

Terminations

Code	Metallization	Description	Attachement Options
H	Ta/Pd/Au	1 Side Wrap	Wirebond, Non-Cond. Epoxy
M	TiW/Ni/Au	1 Side Wrap	Wirebond, Cond. Epoxy, Non-Cond. Epoxy, Eutectic Attach Solder
S	TiW/Ni/Au - Solder Dipped	1 Side Wrap	Sn Solder Ball
J	Ta/Pd/Au	2 Side Wrap	Wirebond, Non-Cond. Epoxy
N	TiW/Ni/Au	2 Side Wrap	Wirebond, Cond. Epoxy, Non-Cond. Epoxy, Eutectic Attach Solder
T	TiW/Ni/Au - Solder Dipped	2 Side Wrap	Sn Solder Ball

Power Handling Codes

Code	Watts	Code	Watts	Code	Watts	Code	Watts
A	10 mW	**F**	150 mW	**J**	750 mW	**P**	4.0 W
B	20 mW	**O**	200 mW	**K**	1.0 W	**Q**	5.0 W
C	50 mW	**G**	250 mW	**U**	1.4 W	**Z**	6.0 W
D	75 mW	**M**	350 mW	**L**	2.0 W	**S**	10 W
E	100 mW	**R**	400 mW	**Y**	2.8 W		
I	125 mW	**H**	500 mW	**N**	3.0 W		

Thin Film Products

Microwave Edge Wrapped Chip Resistors

Power Handling & Standard Resistance Ranges by Material and Case Size

Case Size		Alumina (35)		AlN (28)		BeO (25)		Silicon (22)		Quartz (20)		High Power Resistor				
												Resistance Range		Power Handling		
mils (inches)	Min (Ω)	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Max (Ω)	Power Handling	Min (Ω)	Max (Ω)	Alumina (35)	AlN (28)	BeO (25)
12 x 9 (0.012 x 0.009)	1-3	25K	50 mW	25K	200 mW	25K	400 mW	150K	50 mW	150K	10 mW	-	-	-	-	-
14 x 12 (0.014 x 0.012)	1-3	40K	100 mW	40K	400 mW	40K	750 mW	200K	100 mW	200K	20 mW	-	-	-	-	-
20 x 10 (0.020 x 0.010)	1-3	60K	100 mW	60K	400 mW	60K	750 mW	250K	100 mW	250K	20 mW	2	1000	250 mW	1.0 W	2.0 W
15 x 15 (0.015 x 0.015)	1-2	70K	100 mW	70K	400 mW	70K	750 mW	500K	100 mW	500K	20 mW	2	1000	250 mW	1.0 W	2.0 W
20 x 20 (0.020 x 0.020)	1-2	125K	250 mW	125K	1.0 W	125K	2.0 W	750K	250 mW	750K	50 mW	2	1000	500 mW	2.0 W	4.0 W
30 x 20 (0.030 x 0.020)	1-2	200K	250 mW	200K	1.0 W	200K	2.0 W	1M	250 mW	1M	50 mW	2	1000	500 mW	2.0 W	4.0 W
40 x 20 (0.040 x 0.020)	1-2	250K	250 mW	250K	1.0 W	250K	2.0 W	1.5M	250 mW	1.5M	50 mW	2	1000	750 mW	3.0 W	6.0 W
30 x 30 (0.030 x 0.030)	1-2	275K	250 mW	275K	1.0 W	275K	2.0 W	2M	250 mW	2M	50 mW	2	1000	750 mW	2.0 W	6.0 W
35 x 35 (0.035 x 0.035)	1-2	300K	250 mW	300K	1.0 W	300K	2.0 W	3M	250 mW	3M	50 mW	2	1000	1.0 W	4.0 W	6.0 W
40 x 40 (0.040 x 0.040)	1-2	500K	350 mW	500K	1.4 W	500K	2.8 W	5M	350 mW	5M	70 mW	2	1000	1.0 W	4.0 W	6.0 W
50 x 25 (0.050 x 0.025)	1-2	300K	350 mW	300K	1.4 W	300K	2.8 W	3M	350 mW	3M	70 mW	2	1000	1.0 W	4.0 W	6.0 W
60 x 30 (0.060 x 0.030)	1-2	500K	500 mW	500K	2.0 W	500K	4.0 W	6M	500 mW	6M	100 mW	2	1000	1.4 W	5.0 W	10.0 W
50 x 50 (0.050 x 0.050)	1-2	700K	500 mW	700K	2.0 W	700K	4.0 W	7M	500 mW	7M	100 mW	2	1000	1.4 W	5.0 W	10.0 W
60 x 60 (0.060 x 0.060)	1-2	2M	500 mW	2M	2.0 W	2M	4.0 W	15M	500 mW	15M	100 mW	2	1000	1.4 W	5.0 W	10.0 W
80 x 50 (0.080 x 0.050)	1-2	2M	500 mW	2M	2.0 W	2M	4.0 W	20M	500 mW	20M	100 mW	2	1000	2.8 W	10.0 W	15.0 W
100 x 50 (0.100 x 0.050)	1-2	2.5M	500 mW	2.5M	2.0 W	2.5M	4.0 W	25M	500 mW	25M	100 mW	2	1000	2.8 W	10.0 W	15.0 W
120 x 60 (0.120 x 0.060)	1-2	3M	750 mW	3M	3.0 W	3M	6.0 W	30M	750 mW	30M	125 mW	2	1000	2.8 W	10.0 W	15.0W
100 x 100 (0.100 x 0.100)	1-2	3.5M	750 mW	3.5M	3.0 W	3.5M	6.0 W	35M	750 mW	35M	125 mW	2	1000	2.8 W	10.0 W	15.0 W

Typical PPI commercial testing includes 100% visual inspection, 100% electrical testing with short time overload, and TCR sampling.

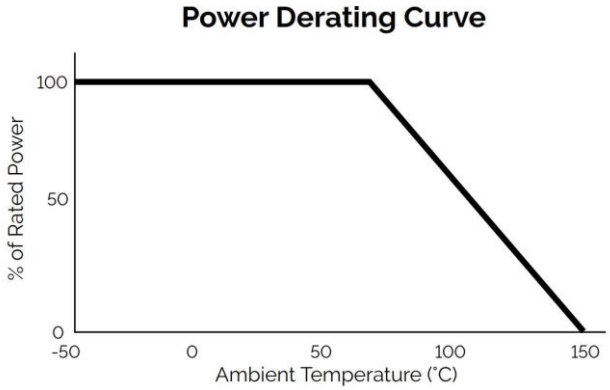
Our parts meet or exceed additional MIL-PRF-55342 and MIL-STD-202 requirements.

Thin Film Products

Microwave Edge Wrapped Chip Resistors

General Properties

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Operating Frequency	DC to 60 GHz
Voltage Rating	100V maximum
Power Derating *(See Chart at Right)*	Full power up to 70°C Derated linearly to zero power at 150°C



Testing

Testing Performed	Specification / Standard
Visual Inspection	MIL-PRF-55342 MIL-STD-883
Mechanical Inspection	MIL-PRF-55342
DC Resistance	MIL-PRF-55342 MIL-STD-202
Resistance Temperature Characteristics (TCR)	MIL-PRF-55342
Short Time Overload	MIL-PRF-55342
High Temperature Exposure	MIL-PRF-55342
Thermal Shock	MIL-PRF-55342 MIL-STD-202
Resistance to Bonding Exposure	MIL-PRF-55342
Wire Bonding Integrity	MIL-PRF-55342
Life Test	MIL-PRF-55342 MIL-STD-202

Performance Specifications

Higher power ratings, additional sizes, and custom resistors available. Please contact sales@passiveplus.com.

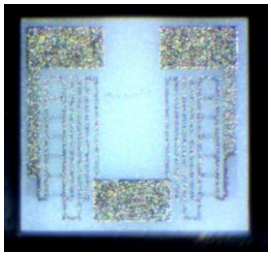
Packaging

ESD waffle packs are standard. Film rings and gel pack packaging are available upon request.

Thin Film Products

Dual Chip Resistors – PD Series

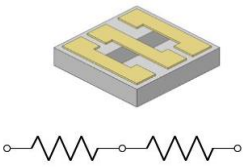
Product Features



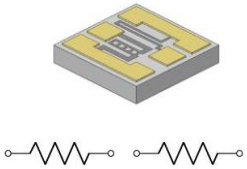
- Two resistors on a single chip area.
- Available styles are common or isolated node.
- The nature of this design lends itself to tightly matched TCR and electrical tolerance, with resistance ratios within 0.01% possible (value dependent).
- Can be used in Non-Magnetic Applications

Product Specifications

Resistance Range	2Ω - 1MΩ per resistor (Silicon or Quartz) 2Ω - 160kΩ per resistor (Al_2O_3, BeO, or AlN)
Resistance Tolerance	±0.01% to ±20% value dependent
Standard Size	30 mil x 30 mil x 10 mil 0.03” x 0.03” x 0.01”



Common Node Configuration



Isolated Node Configuration

Part Numbering

P D T – 35 – 30×30 – 10000–20000 – A J Q K

- P = Passive Plus
- Resistive Material *See Table*
- Length & Width (mils)
- Termination *See Table*
- TCR *See Table*
- Resistor Style *See Table*
- Substrate *See Table*
- Resistance for First & Second Resistors
- Resistance Tolerance *See Table*
- Resistance Ratio

Resistor Style

Code	Style
D	Common Node
I	Isolated Node

Resistive Materials

Code	Material	Passivation	Sheet Resistivity (Ω/ Sq)	Abs. Tolerance	Ratio Tolerance
T	**Tantalum Nitride (TaN)**	Self Passivating Ta_2O_5	5 to 270	From ±0.01%	From ±0.01%
N	**NiChrome (NiCr)**	SiO_2	5 to 250	From ±0.01%	From ±0.01%

All parts are supplied in waffle packs. Other packaging may be available. Contact PPI for additional packaging options.

Thin Film Products

Dual Chip Resistors – PD Series

Substrate Materials

Code	Material	Thickness	Surface Finish	Dielectric Constant (@ 1MHz)	Coefficient of Thermal Expansion (x 10^6/ °C)	Thermal Conductivity (W/m*K)
35	Alumina (Al_2O_3)	0.005" - 0.010"	2µ" - 3µ"	9.9	7 (25°C to < 300°C)	26.9
28	Aluminum Nitride (AlN)	0.005" - 0.010"	6µ" - 8µ"	8.0 - 9.1	4.6 - 5.7 (25°C to < 1000°C)	170
25	Beryllium Oxide (BeO)	0.005" - 0.010"	<5µ"	6.76	9 (25°C to < 1000°C)	285
22	Silicon (Si) (with 12kÅ SiO_2)	0.005" - 0.010"	Chemical Polish	N/A (SiO_2 K=1.38)	2.49 - 4.44 (25°C to < 1000°C)	149 (SiO_2 1.38)
20	Quartz (Fused Silica)	0.005" - 0.010"	60/40 Optical Polish	3.826	0.55 (25°C to < 1000°C)	1.38

Resistance Tolerance Codes

Code	B	D	F	G	H	J	K	L	M	Q	S
Tolerance	± 0.1%	± 0.5%	± 1%	± 2%	± 3%	± 5%	± 10%	± 15%	± 20%	± 0.05%	± 0.01%

Terminations

Code	Top Side		Bottom Side	
	Metallization	Attachement Options	Metallization	Attachement Options
A	Pd/Au	Wirebond, Non-Cond. Epoxy	–	–
R	Flip Chip (Ti/Pt/Au)	Cond. Epoxy Non-Cond. Epoxy Eutectic Attach Solder	–	–
D	Pd/Au	Wirebond Non-Cond. Epoxy	Ta/Pd/Au	Cond. Epoxy Non-Cond. Epoxy Eutectic Attach Solder

Temperature Coefficient of Resistance

Code	TCC	Material	
		Tantallum Nitride (TaN)	NiChrome (NiCr)
Q	±150PPM/°C	Standard	---
V	±100PPM/°C	Yes	---
W	±50PPM/°C	---	Yes
X	±25PPM/°C	---	Standard
Y	±10PPM/°C	---	Yes
Z	±5PPM/°C	---	Yes

Resistance Ratio Codes

Code	Tolerance to Other Resistors	Code	Tolerance to Other Resistors
G	±0.01%	**M**	±0.50%
H	±0.05%	**N**	±1.00%
J	±0.10%	**R**	No Ratio
K	±0.25%		

Power Handling Range by Material

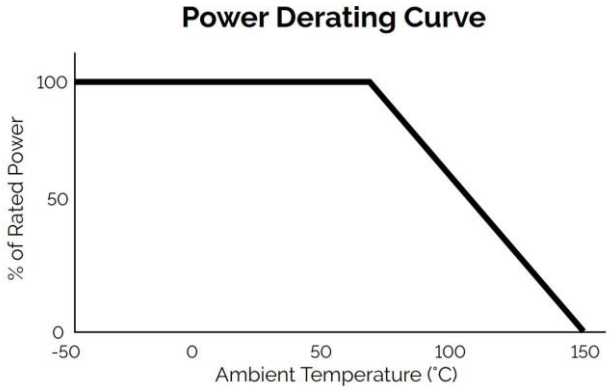
Case Size mils (inches)	Alumina (35)	Silicon (22)	AlN (28)	BeO (25)	Quartz (20)
30 x 30 (0.030 x 0.030)	125 mW	125 mW	500 mW	1.0 W	25 mW

Thin Film Products

Dual Chip Resistors – PD Series

General Properties

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Operating Frequency	DC to 500 MHz
Voltage Rating	100V maximum
Power Derating *(See Chart at Right)*	Full power up to 70°C Derated linearly to zero power at 150°C



Testing

Testing Performed	Specification / Standard
Visual Inspection	MIL-PRF-55342 MIL-STD-883
Mechanical Inspection	MIL-PRF-55342
DC Resistance	MIL-PRF-55342 MIL-STD-202
Resistance Temperature Characteristics (TCR)	MIL-PRF-55342
Short Time Overload	MIL-PRF-55342
High Temperature Exposure	MIL-PRF-55342
Thermal Shock	MIL-PRF-55342 MIL-STD-202
Resistance to Bonding Exposure	MIL-PRF-55342
Wire Bonding Integrity	MIL-PRF-55342
Life Test	MIL-PRF-55342 MIL-STD-202

Performance Specifications

Higher power ratings, additional sizes, and custom resistors available. Please contact sales@passiveplus.com.

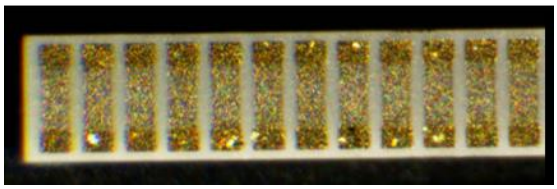
Packaging

ESD waffle packs are standard. Film rings and gel pack packaging are available upon request.

Thin Film Products

Standard Resistor Array – PS, PB, PI Series

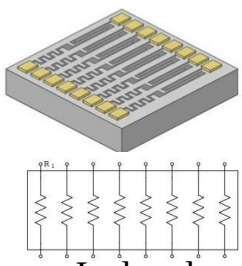
Product Features



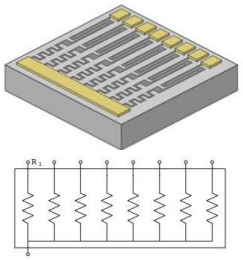
- Configured in 3 to 12 resistor combinations with all resistors at the same value and tolerance.
- Custom arrays can be designed to engineer's specifications.
- Can be used in Non-Magnetic Applications

Product Specifications

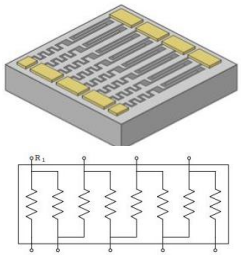
Resistance Range	5Ω to 100 kΩ per resistor (Alumina) 5Ω to 1 MΩ per resistor (Silicon)
Resistive Material	Tantalum Nitride
Ratio Tolerance	To 0.01% value dependent



Isolated



Common



Series

Part Numbering

P I T 12 35 – 130×60× 10 A 200R0 G Q C W

- P = Passive Plus
- Resistive Material *See Table*
- Substrate *See Table*
- Thickness
- Resistance Value
- TCR *See Table*
- Packaging *See Table*
- Resistor Style *See Table*
- Number of Resistors
- Length & Width
- Termination *See Table*
- Resistance Tolerance *See Table*
- Power Handling *See Table*

Resistor Style

Code	Style
I	Isolated Array
B	Common-Bus Array
S	Series Array

Resistive Material

Code	Material	Passivation	Sheet Resistivity (Ω/ Sq)	Abs. Tolerance	Ratio Tolerance
T	**Tantalum Nitride (TaN)**	Self Passivating Ta_2O_5	5 to 270	From ±0.01%	From ±0.01%

Thin Film Products

Standard Resistor Array – PS, PB, PI Series

Substrate Materials

Code	Material	Thickness	Surface Finish	Dielectric Constant (@ 1MHz)	Coefficient of Thermal Expansion (x 10^6/ °C)	Thermal Conductivity (W/m*K)
35	Alumina (Al_2O_3)	0.005" - 0.010"	2µ" - 3µ"	9.9	7 (25°C to < 300°C)	26.9
20	Quartz (Fused Silica)	0.005" - 0.010"	60/40 Optical Polish	3.826	0.55 (25°C to < 1000°C)	1.38

Resistance Tolerance Codes

Code	B	D	F	G	H	J	K	L	M	Q	S
Tolerance	± 0.1%	± 0.5%	± 1%	± 2%	± 3%	± 5%	± 10%	± 15%	± 20%	± 0.05%	± 0.01%

Terminations

Code	Top Side		Bottom Side	
	Metallization	Attachement Options	Metallization	Attachement Options
A	Pd / Au	Wirebond, Non-Cond. Epoxy	–	–
D	Pd / Au	Wirebond, Non-Cond. Epoxy	Ta/Pd/Au	Cond. Epoxy, Non-Cond. Epoxy, Eutectic Attach, Solder
K	Pd/ Au	Wirebond, Non-Cond. Epoxy	Au Sputtered	Solder

Temperature Coefficient of Resistance

Code	TC	Material
Q*	±150 ppm/°C	Tantalum Nitride (TaN)
V	±100 ppm/°C	

Power Handling

Resistors	3	4	5	6	7	8	9	10	11	12
Length (mils)	40 (0.04")	50 (0.05")	60 (0.06")	70 (0.07")	80 (0.08")	90 (0.09")	100 (0.10")	110 (0.11")	120 (0.12")	130 (0.13")
Width	60 mils (0.06") standard									
Thickness	10 mils (0.01") standard									
Power	50 mW/ Resistor standard									

Packaging

Code	Style
W	Waffle Pack (Standard)
G	Gel Pack

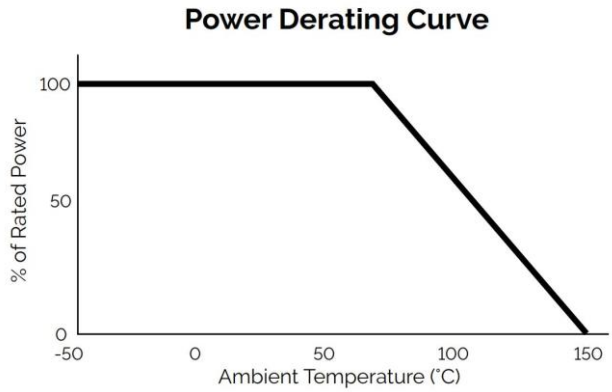
Contact PPI for additional packaging options.

Thin Film Products

Standard Resistor Array – PS, PB, PI Series

General Properties

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Operating Frequency	DC to 500 MHz
Voltage Rating	100V maximum
Power Derating *(See Chart at Right)*	Full power up to 70°C Derated linearly to zero power at 150°C



Testing

Testing Performed	Specification / Standard
Visual Inspection	MIL-PRF-55342 MIL-STD-883
Mechanical Inspection	MIL-PRF-55342
DC Resistance	MIL-PRF-55342 MIL-STD-202
Resistance Temperature Characteristics (TCR)	MIL-PRF-55342
Short Time Overload	MIL-PRF-55342
High Temperature Exposure	MIL-PRF-55342
Thermal Shock	MIL-PRF-55342 MIL-STD-202
Resistance to Bonding Exposure	MIL-PRF-55342
Wire Bonding Integrity	MIL-PRF-55342
Life Test	MIL-PRF-55342 MIL-STD-202

Performance Specifications

Higher power ratings, additional sizes, and custom resistors available. Please contact sales@passiveplus.com.

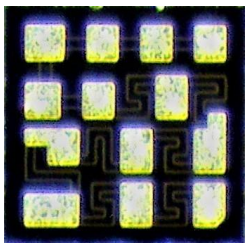
Packaging

ESD waffle packs are standard. Film rings and gel pack packaging are available upon request.

Thin Film Products

Network Resistor Array – PN Series

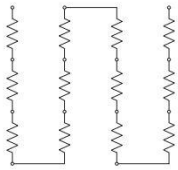
Product Features



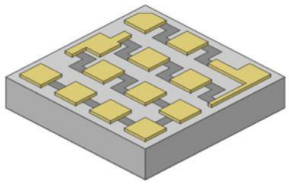
- Multiple resistances in a single, space saving chip.
- Single chip geometry offers excellent TCR tracking and resistance ratio tracking.
- PPI offers chips with 12 or 20 resistive elements as standard.
- Other configurations are available upon request.
- Can be used in Non-Magnetic Applications

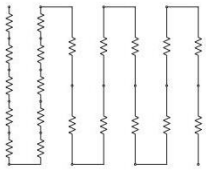
Product Specifications

Resistive Material	Tantalum Nitride
Ratio Tolerance	To 0.01% value dependent



12 Resistor Configuration





20 Resistor Configuration

Part Numbering

P N T 20 35 – 38 × 38 × 10 A 200R0 J Q C W

- P = Passive Plus
- Resistive Material *See Table*
- Substrate *See Table*
- Resistor Style *See Table*
- Number of Resistors *12 or 20*
- Length & Width
- Thickness
- Termination *See Table*
- Resistance Value
- Resistance Tolerance *See Table*
- TCR *See Table*
- Power Handling *See Table*
- Packaging *See Table*

Resistor Style

Code	Style
N	Network Array

Resistive Material

Code	Material	Passivation	Sheet Resistivity (Ω/ Sq)	Abs. Tolerance	Ratio Tolerance
T	**Tantalum Nitride (TaN)**	Self Passivating Ta_2O_5	5 to 270	From ±0.01%	From ±0.01%

Thin Film Products

Network Resistor Array – PN Series

Resistance Range

Code	Size	Substrate Metallization	Resistance Range	Resistance Distribution
12	30x30 (0.030"x0.030")	Silicon	80Ω to 240kΩ	R_1 to R_7 = R_t/8 R_8 to R_{12} = R_t/40
		Alumina	80Ω to 50kΩ	
20	38x38 (0.038"x0.038")	Silicon	550Ω to 500kΩ	R_1 to R_{10} = R_t/110 R_{11} to R_{20} = R_t/11
		Alumina	550Ω to 50kΩ	

Substrate Materials

Code	Material	Thickness	Surface Finish	Dielectric Constant (@ 1MHz)	Coefficient of Thermal Expansion (x 10^6/ °C)	Thermal Conductivity (W/m*K)
35	Alumina (Al_2O_3)	0.005" - 0.010"	2µ" - 3µ"	9.9	7 (25°C to < 300°C)	26.9
22	Silicon (Si) (with 12kÅ SiO_2)	0.005" - 0.010"	Chemical Polish	N/A (SiO_2 K=1.38)	2.49 - 4.44 (25°C to < 1000°C)	149 (SiO_2 1.38)

Terminations

Code	Top Side		Bottom Side	
	Metallization	Attachement Options	Metallization	Attachement Options
A	Pd / Au	Wirebond, Non-Cond. Epoxy	–	–
D	Pd / Au	Wirebond, Non-Cond. Epoxy	Ta/Pd/Au	Cond. Epoxy, Non-Cond. Epoxy, Eutectic Attach, Solder
K	Pd/ Au	Wirebond, Non-Cond. Epoxy	Au Sputtered	Solder

Resistance Tolerance Codes

Code	J	K	M
Tolerance	± 5%	± 10%	± 20%

Temperature Coefficient of Resistance

Code	TC	Material
Q*	±150 ppm/°C	Tantalum Nitride (TaN)
V	±100 ppm/°C	

**Standard*

Power Handling

Code	Rating
C	250mW

Packaging

Code	Style
W	Waffle Pack (Standard)
G	Gel Pack

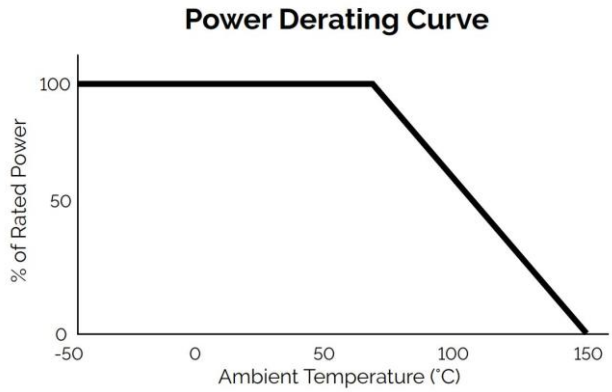
Contact PPI for additional packaging options.

Thin Film Products

Network Resistor Array – PN Series

General Properties

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Operating Frequency	DC to 500 MHz
Voltage Rating	100V maximum
Power Derating *(See Chart at Right)*	Full power up to 70°C Derated linearly to zero power at 150°C



Testing

Testing Performed	Specification / Standard
Visual Inspection	MIL-PRF-55342 MIL-STD-883
Mechanical Inspection	MIL-PRF-55342
DC Resistance	MIL-PRF-55342 MIL-STD-202
Resistance Temperature Characteristics (TCR)	MIL-PRF-55342
Short Time Overload	MIL-PRF-55342
High Temperature Exposure	MIL-PRF-55342
Thermal Shock	MIL-PRF-55342 MIL-STD-202
Resistance to Bonding Exposure	MIL-PRF-55342
Wire Bonding Integrity	MIL-PRF-55342
Life Test	MIL-PRF-55342 MIL-STD-202

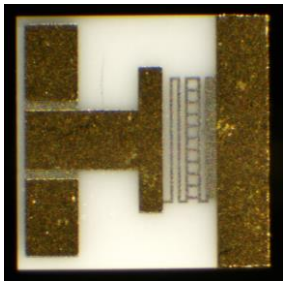
Performance Specifications

Higher power ratings, additional sizes, and custom resistors available. Please contact sales@passiveplus.com.

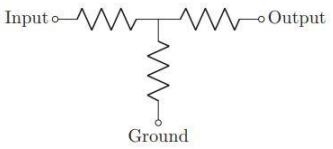
Thin Film Products

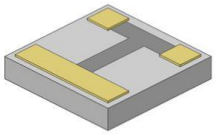
Attenuators – PAT Series

Product Features

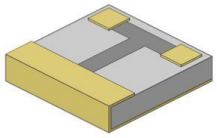


- Reduces amplitude or power of a signal by a known value. This is achieved with very little distortion of the signal, maintaining accuracy up to 40 GHz.
- Attenuators are available with or without center Taps
- Single wraps of the ground pad to a full gold backside available
- Additional Attenuator configurations, including balanced attenuators, are available as custom parts
- Can be used in Non-Magnetic Applications

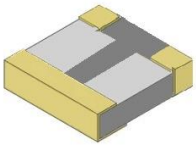




Attenuator Top Contact



Attenuator, Single Pad Wrap



Attenuator, 3-Sided Wrap

Part Numbering

P A T S 35 – 50×50× 10 A 3R00 F Q G W

P = Passive Plus	Attenuator	Resistive Metallization *See Table*	Attenuator Type *See Table*	Material *See Table*	Length & Width	Thickness	Bond Pad Metallization *See Table*	Attenuation (dB)	Attenuation Tolerance *See Table*	TCR *See Table*	Power Handling *See Table*	Packaging *See Table*

Resistive Metallization

Code	Material	Passivation	Sheet Resistivity (Ω/ Sq)	Abs. Tolerance	Ratio Tolerance
T	**Tantalum Nitride (TaN)**	Self Passivating Ta_2O_5	5 to 270	From ±0.01%	From ±0.01%

Attenuator Type

Code	Description
S	T-Pattern

Thin Film Products

Attenuators – PAT Series

Materials

(LxWxT) Dimensions (mils)	Power (W) Al_2O_3	AlN	BeO	Value Min	Value Max
CODE	35	28	25		
50x50x10	250mW	1W	2W	0.5dB	24.5dB
80x60x15	250mW	1W	2W	0.5dB	24.5dB
150x120x25	2W	8W	16W	0.5dB	24.5dB

Bond Pad Metallizations

Code	Metallization	Description	Attachement Options
A	Pd/Au	Top Only	Wirebond, Non-Cond. Epoxy
M	TiW/Ni/Au	Single Wrap, Full GRD Place	Wirebond, Cond. Epoxy, Non-Cond. Epoxy, Eutectic Attach Solder
R	Pd/Au	Flip Chip	Wirebond, Non-Cond. Epoxy
X	TiW/Ni/Au	3-Sided Wrap	Wirebond, Cond. Epoxy, Non-Cond. Epoxy, Eutectic Attach Solder

Attenuation Tolerance

Code	Tolerance
F	±0.1dB (-0.5 to -6.0dB)
G	±0.2dB (-6.5 to -24.5dB)

Temperature Coefficient of Resistance

Code	TC	Material
Q*	±150 ppm/°C	Tantalum Nitride (TaN)
V	±100 ppm/°C	

Power Handling

Code	Watts
G	250mW
K	1.0W
L	2.0W
R	8.0W
Y	16.0W

Power Ratings assume proper heat sinking is used.

Packaging

Code	Style
W	Waffle Pack (Standard)
G	Gel Pack

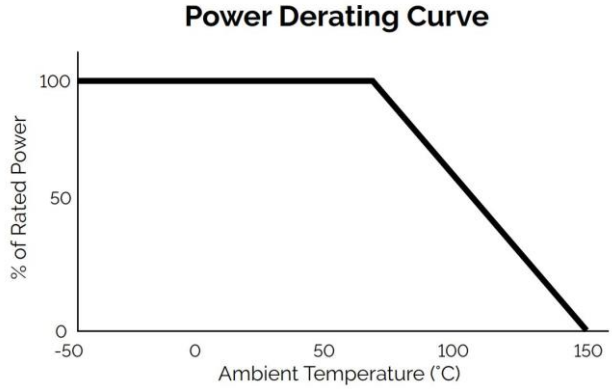
Contact PPI for additional packaging options.

Thin Film Products

Attenuators – PAT Series

General Properties

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Operating Frequency	DC to 40 GHz
Voltage Rating	100V maximum
Power Derating *(See Chart at Right)*	Full power up to 70°C Derated linearly to zero power at 150°C



Testing

Testing Performed	Specification / Standard
Visual Inspection	MIL-PRF-55342 MIL-STD-883
Mechanical Inspection	MIL-PRF-55342
DC Resistance	MIL-PRF-55342 MIL-STD-202
Resistance Temperature Characteristics (TCR)	MIL-PRF-55342
Short Time Overload	MIL-PRF-55342
High Temperature Exposure	MIL-PRF-55342
Thermal Shock	MIL-PRF-55342 MIL-STD-202
Resistance to Bonding Exposure	MIL-PRF-55342
Wire Bonding Integrity	MIL-PRF-55342
Life Test	MIL-PRF-55342 MIL-STD-202

Performance Specifications

Higher power ratings, additional sizes, and custom resistors available. Please contact sales@passiveplus.com.

Packaging

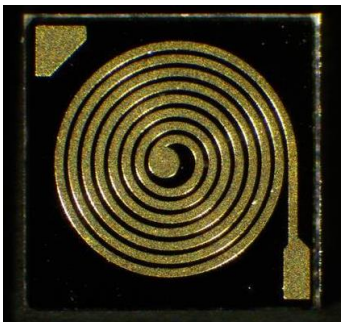
ESD waffle packs are standard. Gel pack packaging also available. Film rings are available upon request for Top Contact Attenuators only. Please contact PPI for availability.

Thin Film Products

Spiral Inductors

PPI Spiral Inductors consist of a thin film gold spiral patterned on a substrate for use in a wide variety of uses, including storing electrical energy in the form of magnetic energy, in frequencies from DC to RF.

An optional polyimide coating over the coil is available for increased resistance to scratches or shorts. Non-conductive epoxy is recommended as a mounting method, backside metallization is also available. A second corner pad is provided for easy wire-bonding from the center pad for edge-contact mounting.



50x50 Spiral Inductor

Product Features

- Low Capacitance
- Less Resistive & Capacitive losses
- RoHS Compliant

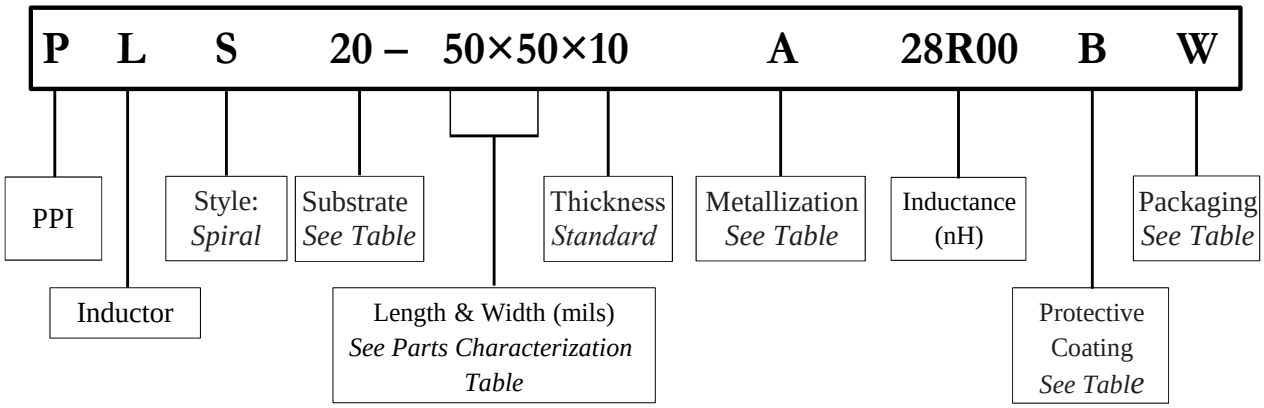
Applications

- Microwave Circuit Resonant elements
- Electrical Power & Electronic Devices

Functional Applications

- Choking, Blocking, Attenuating, or filtering/smoothing high frequency noise
- Storing & transferring energy in power converters
- Creates tuned oscillators or LC "tank" circuits
- Impedance matching

Part Numbering



Other inductance values, DC resistance values, substrates, geometries, metallizations, and custom inductors are available.

Substrate Materials

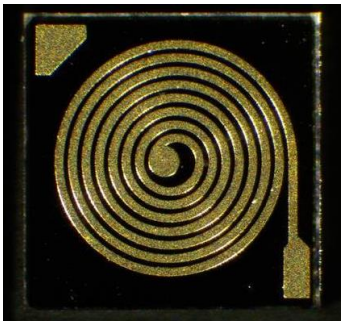
Code	Material	Thickness	Surface Finish	Dielectric Constant (@ 1MHz)	Coefficient of Thermal Expansion (x 10^6/ °C)	Thermal Conductivity (W/m*K)
35	Alumina (Al_2O_3)	0.005" - 0.010"	2µ" - 3µ"	9.9	7 (25°C to < 300°C)	26.9
20	Quartz (Fused Silica)	0.005" - 0.010"	60/40 Optical Polish	3.826	0.55 (25°C to < 1000°C)	1.38

Thin Film Products

Spiral Inductors

Parts Characterizations

Case Size (Mils)	Inductances	# of Turns	DC Resistance	Q (@ 200MHz)	Q (@ 500MHz)
25 x 25	1.2 nH	1.5	0.6Ω	3	7
25 x 25	2.0 nH	2.0	0.9Ω	3	8
25 x 25	3.0 nH	2.5	1.2Ω	4	9
30 x 30	4.4 nH	3.0	1.5Ω	4	10
30 x 30	6.0 nH	3.5	1.9Ω	4	11
30 x 30	7.9 nH	4.0	2.3Ω	4	11
40 x 40	10 nH	4.5	2.7Ω	5	12
40 x 40	13 nH	5.0	3.2Ω	5	12
40 x 40	16 nH	5.5	3.7Ω	5	13
40 x 40	19 nH	6.0	4.2Ω	6	13
40 x 40	23 nH	6.5	4.7Ω	6	14
50 x 50	28 nH	7.0	5.3Ω	7	14



50x50 Spiral Inductor

Metallizations

Code	Top Side		Bottom Side	
	Metallization	Attachement Options	Metallization	Attachement Options
A	Pd/Au	Wirebond, Non-Cond. Epoxy	–	–
D	Pd/Au	Wirebond Non-Cond. Epoxy	Ta/Pd/Au	Cond. Epoxy Non-Cond. Epoxy Eutectic Attach Solder

Other metallizations available. Please contact PPI.

Inductance Codes

Inductance (nH)
Digits 1-4 are significant figures
The "R" is used as a decimal point.
e.g. 28R0 = 28nH, 1R50 = 1.5nH

Inductance values are computed in free air, using a magnetic permeability for free air of $\mu = 4.0 \times 10^{-7}$. DC resistance is based on a gold metallization.

Protective Coating

Code	Polyimide Coating
B	Without Coating
P	With Polyimide Coating

Packaging

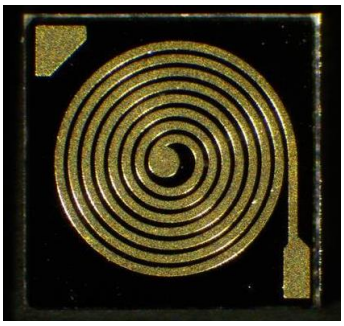
Code	Style
W	Waffle Pack (Standard)
G	Gel Pack

Contact PPI for additional packaging options.

Thin Film Products

Spiral Inductors

General Properties

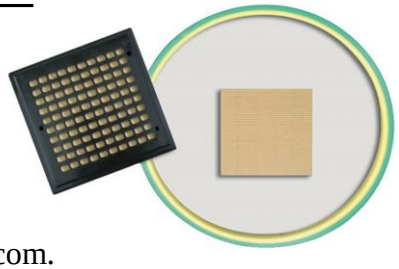


50x50 Spiral Inductor

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Operating Frequency	DC to 500 MHz
Insulation Resistance	$10^{12}\Omega$ · min at 25°C

Testing

Testing Performed	Specification / Standard
Visual Inspection	MIL-PRF-55342 MIL-STD-883
Mechanical Inspection	MIL-PRF-55342
DC Resistance	MIL-PRF-55342 MIL-STD-202
High Temperature Exposure	MIL-PRF-55342
Thermal Shock	MIL-PRF-55342 MIL-STD-202
Resistance to Bonding Exposure	MIL-PRF-55342
Wire Bonding Integrity	MIL-PRF-55342
Life Test	MIL-PRF-55342 MIL-STD-202

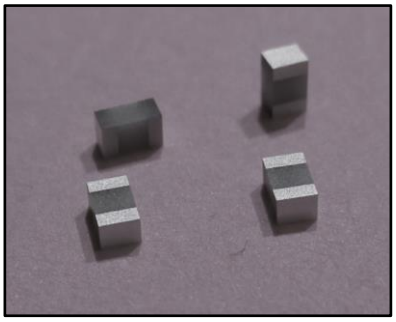


Performance Specifications

Additional sizes and custom inductors available. Please contact sales@passiveplus.com.

Thin Film Products

Thermal Conductors – PTC Series



λ Product Features

With the increase in heat dissipation from microelectronics devices and the reduction in overall form factors, thermal management becomes a more and more important element of electronic product design.

PPI's Thermal conductors are a passive heat exchanger that transfers the heat generated by an electronic device to a thermal ground plane or any specific thermal point where it gets dissipated away from the device.

Our thermal conductors are available in a variety of sizes including standard EIA case sizes and are constructed using Aluminum Nitride (AlN) or Beryllium Oxide (BeO).

λ Product Features

- High Thermal Conductivity
- Low Thermal Resistance
- Low Capacitance
- One piece construction
- RoHS Compliant
- EIA case sizes
- More efficient thermal management

λ Applications

- GaN Power Amplifiers
- High RF Power Amplifiers
- Filters
- Synthesizers
- Switch Mode Power Supplies
- Pin & Laser Diodes

λ Functional Applications

- Between active device & adjacent ground planes
- Specific contact pad to case
- Contact pad to contact pad
- Direct component contact to via pad or trace
- Edges fully metalized

λ Part Numbering

Example shown below: Thermal Conductor, AlN, 1005, thickness (40 mils), Platinum/Gold (Pt/Au), Waffle Pack

P	TC0	28	100×50×40	N	W
P = Passive Plus	Thermal Conductor	Material *See Table*	Length, Width & Thickness *See Parts Characterization Table*	Metallization *See Table*	Packaging *See Table*

RoHS

Thin Film Products

Thermal Conductors – PTC Series

λ Parts Characterizations

Case Size	Length (L) mils / (mm)	Width (W) mils / (mm)	Thickness (T) mils / (mm)	Terminal (t)	Thermal Resistance (°C/W)		Thermal Conductivity (mW/°C)	
					AlN	BeO	AlN	BeO
0302	30 ± 2 (.762 ± .051)	20 ± 2 (.508 ± .051)	20 (.508)	10 0.25	19	12	53	81
0402	40 ± 2 (1.016 ± .051)	20 ± 2 (.508 ± .051)	20 (.508)	10 0.25	25	16	40	61
0505	50 ± 2 (1.270 ± .051)	50 ± 2 (1.270 ± .051)	25 (.635)	15 0.38	10	7	100	153
0603	60 ± 2 (1.524 ± .051)	30 ± 2 (.762 ± .051)	25 (.635)	15 0.38	20	13	50	76
0805	80 ± 2 (2.032 ± .051)	50 ± 2 (1.27 ± .051)	40 (1.016)	20 0.51	10	7	100	153
1005	100 ± 2 (2.540 ± .051)	50 ± 2 (1.27 ± .051)	40 (1.016)	20 0.51	13	8	77	122
1020	100 ± 2 (2.540 ± .051)	200 ± 2 (5.080 ± .051)	40 (1.016)	20 0.51	3	2	320	508
1111	110 ± 2 (2.794 ± .051)	110 ± 2 (2.794 ± .051)	40 (1.016)	20 0.51	7	4	153	240
2010	195 ± 10 (4.953 ± .254)	195 ± 10 (4.953 ± .254)	60 (1.524)	30 0.77	10	6	100	159
2525	240 ± 10 (6.096 ± .254)	250 ± 10 (6.350 ± .254)	60 (1.524)	40 1.02	4	3	240	380
3725	370 ± 10 (9.398 ± .254)	245 ± 10 (6.223 ± .254)	60 (1.524)	50 1.27	6	4	160	254
3737	365 ± 10 (9.271 ± .254)	375 ± 10 (9.525 ± .254)	60 (1.524)	50 1.27	4	3	240	380

λ Materials

	AlN	BeO
CODE	**28**	**25**

λ Metallizations

Code	Metallization	Attachement Options
N*	Platinum/Gold (Pt/Au)	Solder Only
X	Platinum/Silver (Pt/Ag)	Solder Only

**Recommended*

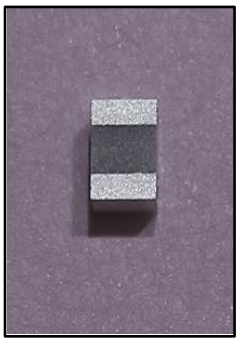
λ Packaging

Code	Style
W	Waffle Pack (Standard)
G	Gel Pack

Contact PPI for additional packaging options.

Thin Film Products

Thermal Conductors – PTC Series



λ General Properties

Operating Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Insulation Resistance	10^{12} Ω min at 25°C

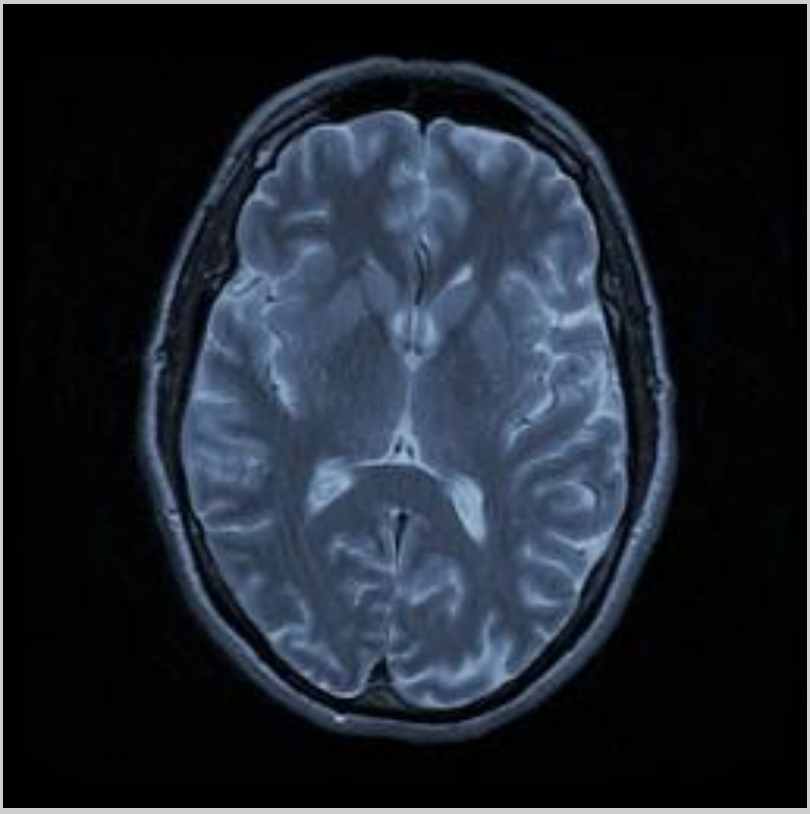
λ Testing

Testing Performed	Specification / Standard
Visual Inspection	MIL-PRF-55342 MIL-STD-883
Mechanical Inspection	MIL-PRF-55342
DC Resistance	MIL-PRF-55342 MIL-STD-202
Resistance Temperature Characteristics (TCR)	MIL-PRF-55342
Short Time Overload	MIL-PRF-55342
High Temperature Exposure	MIL-PRF-55342
Thermal Shock	MIL-PRF-55342 MIL-STD-202
Resistance to Bonding Exposure	MIL-PRF-55342
Wire Bonding Integrity	MIL-PRF-55342
Life Test	MIL-PRF-55342 MIL-STD-202

λ Performance Specifications

Higher power ratings, additional sizes, and custom resistors available. Please contact sales@passiveplus.com.

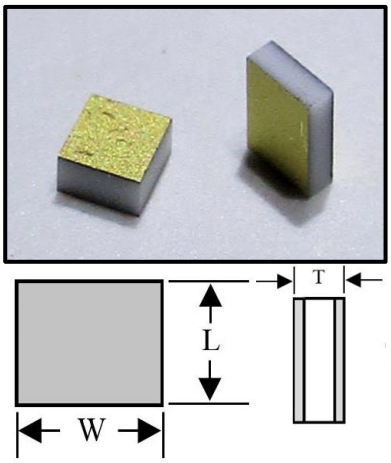
Single Layer Capacitors



Single Layer Capacitors

Standard Edge to Edge

Product Features



PPI offers Standard Edge to Edge SLC with tight tolerances to the required size, shape and value. Thicknesses of up to 25+ mils are available utilizing temperature-stable low-loss materials and special terminations to improve the all solder process. Chip size, shape and electrical properties may be determined from the dielectric material.

- Capacitance: 0.04 to 10,000pF
- Square or rectangle, length or width .005" and up

Part Numbering

PP S – AS7 – 10×10 × 6 – D4 – 1R0 – K – 3 W

RoHS

PP	S	AS7	10×10	6	D4	1R0	K	3	W
PP = Passive Plus	Capacitor Style	Dielectric Code *See Table*	Length & Width (mils)	Thickness (mils)	Metallization *See Table*	Capacitance Value *See Table*	Tolerance *See Table*	Voltage *See Table*	Packaging W = Waffle Pack *Standard*

Thicknesses (mils)

Length & Width	L or W Tolerance	Margin Nominal	Thickness
≤ 10	± 2	1	± 1.5
11 - 29	± 2	2	
≥ 30	± 3	2	

Capacitance Codes

Value	Code
<10pF	1R0 = 1.0pF
>10pF	101 = 100pF

Metallization Codes

Code	Description
D4	Ti/Pt/Au - Titanium/Platinum/Gold **(70 µin Gold)**
D5	Ti/NiV/Au - Titanium/Nickel Vanadium/Gold **(70 µin Gold)**
S7	Ti/Pt/Ag - Titanium/Platinum/Silver **(20 µin Silver)**
K2	Ta/Pd/Au - Tantalum/Palladium/Gold **(75 µin Gold)**
L3	Ta/Pd/Au - Tantalum/Palladium/Gold **(100 µin Gold)**

Contact PPI for available metallizations.

Single Layer Capacitors

Standard Edge to Edge

Substrates

Substrates can be supplied as follows:

- **Bare**

• **Metallized:**	• Gold over Platinum, Palladium, or Nickel • Silver over Platinum • Custom schemes and patterns to Customer specifications
Thickness Range	3 mils +
Length and Width	Up to 4” depending on material

Standard Electrode Metallizations

Gold (D4) This metallization consists of a minimum of 70 micro-inches of Gold over Platinum or Nickel which is ideal for all wirebonding methodologies.

Silver (S7) This metallization consists of 20 micro-inches of Silver over Platinum which is ideal for all solder applications whenever the use of Gold is unacceptable.

Capacitance Tolerance & Dimensional Tolerances Codes

Class I Dielectrics: AS1 - KS2

Tolerance	Code	Tolerance	Code
± .50pF	D	± 20%	M
± .25pF	C	± 15%	L
±.10pF	B	± 10%	K
± .05pF	A	± 5%	J
± .01pF	P	± 3%	H
		± 2%	G

Material	L or W Dimension	Tolerance
AS1 - ZS1	< 20 mils	±15%
	≥ 20 mils	±10%

Class II Dielectrics: MS1 - ZS4

Tolerance	Code	Tolerance	Code
-10% thru +40%	Y	± 20%	M
-20% thru +80%	Z	± 15%	L
0% thru +100%	V	± 10%	K
Guaranteed Min. Value	GMV	± 5%	J

Material	L or W Dimension	Tolerance
ZS4 - ZS6	≤ 15 mils	± 2 mils
	> 15 mils; ≤ 30 mils	± 3 mils
	> 30 mils	± 5 mils

Rated Voltage Codes

Code	Voltage	Dielectric Thickness
2	50V	≤5 mils
3	100V	≥6 mils

Packaging

PPI SLCs are available in Waffle Packs (Standard). Other packaging options may be available. Please contact PPI.

Dielectric Materials – Class I

Dielectrics below consist of material exhibiting very low losses, extremely low or closely controlled temperature coefficients, negligible voltage and frequency coefficients, negligible aging effects and high insultation and dielectric breakdown.

Type	IR Min. @ 25°C Ω	Temperature Coefficient PPM°C -55 to +125°C	Dissipation Factor (@ 10GHz)	Dielectric Constant (K)	Material
AS1	10^{12}	Negligible	0.0001	3.8	Quartz
AS6	10^{12}	P120 ± 25	0.0001	8.7	AlN
AS7	10^{12}	P180 ± 50	0.0006	9.6	Alumina 96
AS8	10^{12}	P180 ± 50	0.0006	9.8	Alumina 99.6
BS2	10^{12}	NP0 0 ± 30	0.0001	12.6	Titanate
CS1	10^{12}	0 ± 30	0.0010	20	Titanate
ES1	10^{12}	0 ± 30	0.0020	40	Titanate
FS1	10^{12}	0 ± 30	0.0050	50	Titanate
IS2	10^{4}	N750 ± 200	0.0050	85	Alumina
JS2	10^{6}	0 ± 30	0.0050	93	Titanate
KS3	10^{6}	N1500 ± 500	0.0025	160	Titanate

Dielectric Materials – Class II

Dielectrics below are characterized by high dielectric constants, increased losses and higher temperature coefficients. These properties are inherent with this class of material but the high dielectric constants permit the use of smaller size to achieve low series inductance and meet dimensional requirements. Capacitors made with these materials are often used for coupling of microstrip line circuits where a small chip is necessary. Used as a bypass capacitor, the small size provides low series inductance and dielectric losses are typically of little concern.

Type	IR Min. @ 25°C Ω	Temperature Coefficient % -55 to +125°C	Dissipation Factor (@ 1MHz)	Aging (%) HR/Decade	Dielectric Constant (K)
MS1	10^{11}	-10 to 5	0.010	2.0	300
PS1	10^{4}	-10 to 10	0.025	3.0	700
RS2	10^{4}	-10 to 10	0.025	3.0	1250
SS3	10^{11}	-10 to 3	0.015	3.5	2200
US1	10^{5}	-35 to 0	0.020	3.0	4000
US3	10^{11}	-15 to 15	0.030	3.0	4500
ZS1	10^{11}	-80 to 0	0.025	3.0	11000
ZS4	*	-15 to 15	0.035	3.0	25000
ZS6	*	-15 to 15	0.035	3.0	35000

Other dielectric materials available depending on application requirements

Capacitance, Case Size & Dielectric Availability - Class I Dielectrics

Cap (pF)	Size mils (mm)																	
	10x10 (.254 x .254)		12x12 (.305 x .305)		15x15 (.381 x .381)		20x20 (.508 x .508)		25x25 (.635 x .635)		30x30 (.762 x .762)		35x35 (.889 x .889)		40x40 (1.016 x 1.016)		50x50 (1.270 x 1.270)	
	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness
0.04	AS7	5	AS7	6	AS7	10												
0.06	AS7	4	AS7	5	AS7	8	AS2	5	AS2	10								
0.08	ES1	10	AS7	4	AS7	6	AS7	10	AS2	7	AS2	9						
0.1	ES1	8	ES1	11	AS7	5	AS7	9	AS2	5	AS2	7	AS2	10				
0.2	ES1	5	ES1	7	ES1	10	AS7	4	AS7	7	AS7	10	AS2	5	AS2	7	AS2	10
0.3	IS1	6	ES1	4	ES1	6	ES1	11	AS7	4	AS7	7	AS7	9	AS2	5	AS2	7
0.4	IS1	5	IS1	7	ES1	5	ES1	9	ES1	15	AS7	5	AS7	7	AS7	9	AS2	5
0.5	IS1	4	IS1	5	ES1	4	ES1	7	ES1	11	AS7	5	AS7	5	AS7	7	AS2	4
0.6	KS2	6	IS1	5	IS1	7	ES1	6	ES1	10	ES1	15	AS7	4	AS7	6	AS7	9
0.8	MS1	8	KS2	6	IS1	5	ES1	5	ES1	7	ES1	10	ES1	15	AS7	4	AS7	7
1.0	MS1	7	KS2	5	IS1	4	IS1	7	ES1	6	ES1	8	ES1	10	AS7	4	AS7	5
1.2	MS1	6	KS2	4	IS1	4	IS1	6	ES1	5	ES1	7	ES1	9	AS7	3	AS7	5
1.5	MS1	5	MS1	7	KS2	5	IS1	5	ES1	4	ES1	6	ES1	7	ES1	10	AS7	4
1.8	MS1	4	MS1	5	KS2	4	IS1	4	IS1	6	ES1	5	ES1	6	ES1	8	ES1	11
2.0	MS1	4	MS1	5	KS2	4	KS2	7	IS1	6	ES1	4	ES1	5	ES1	7	ES1	11
2.2	RS1	4	MS1	5	KS2	4	KS2	6	IS1	5	IS1	7	ES1	5	ES1	7	ES1	10
2.7	RS1	8	MS1	4	MS1	6	KS2	5	IS1	4	IS1	6	ES1	4	ES1	5	ES1	8
3.3	RS1	7	RS1	10	MS1	5	KS2	4	KS2	6	IS1	5	IS1	7	ES1	4	ES1	7
3.9	RS1	6	RS1	9	MS1	4	MS1	7	KS2	5	IS1	4	IS1	6	IS1	8	ES1	6
4.7	RS1	5	RS1	7	RS1	11	MS1	6	KS2	4	KS2	6	IS1	5	IS1	6	ES1	5
5.6	RS1	4	RS1	6	RS1	10	MS1	5	MS1	7	KS2	5	IS1	4	IS1	5	ES1	4
6.8	RS1	4	RS1	5	RS1	8	MS1	4	MS1	6	KS2	5	KS2	6	IS1	4	IS1	7
8.2	SS3	6	RS1	4	RS1	7	MS1	4	MS1	5	KS2	4	KS2	5	KS2	7	KS2	10
10	SS3	5	RS1	4	RS1	5	RS1	9	MS1	4	MS1	6	KS2	4	KS2	5	KS2	8
12	SS3	4	SS3	6	RS1	5	RS1	8	RS1	11	MS1	5	MS1	7	KS2	4	KS2	7
15	US1	6	SS3	5	RS1	4	RS1	6	RS1	10	MS1	4	MS1	6	MS1	7	KS2	6
18	US1	5	SS3	4	SS3	6	RS1	5	RS1	8	RS1	11	MS1	4	MS1	6	KS2	5
20	US1	5	SS3	4	SS3	6	RS1	5	RS1	8	RS1	11	MS1	4	MS1	5	KS2	4
22	US1	4	US1	6	SS3	5	RS1	4	RS1	7	RS1	9	MS1	4	MS1	5	KS2	4

Other dielectric materials available depending on application requirements

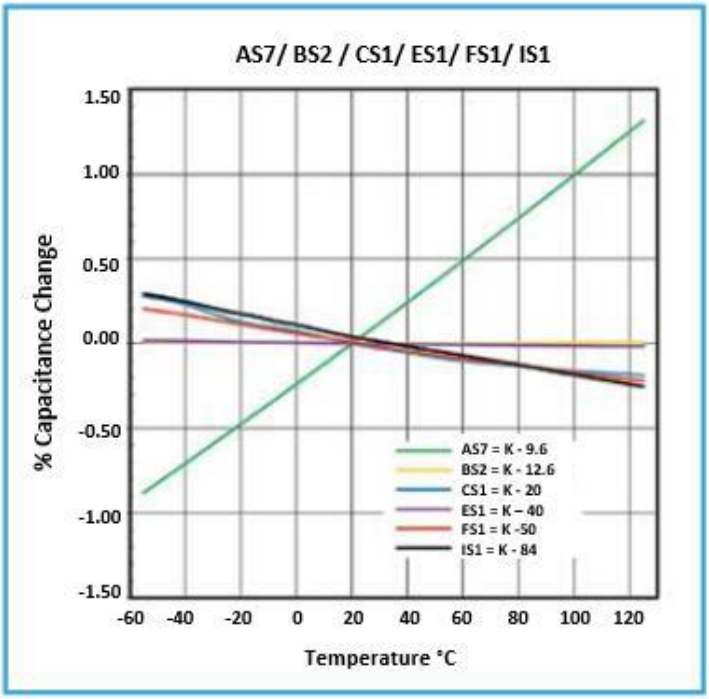
Shaded cells indicate Class II Dielectrics

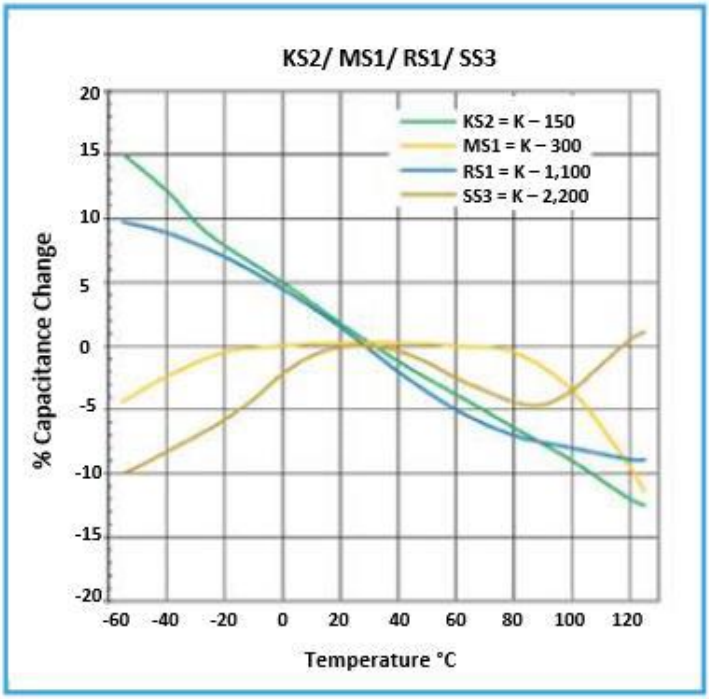
Capacitance, Case Size & Dielectric Availability – Class II Dielectrics

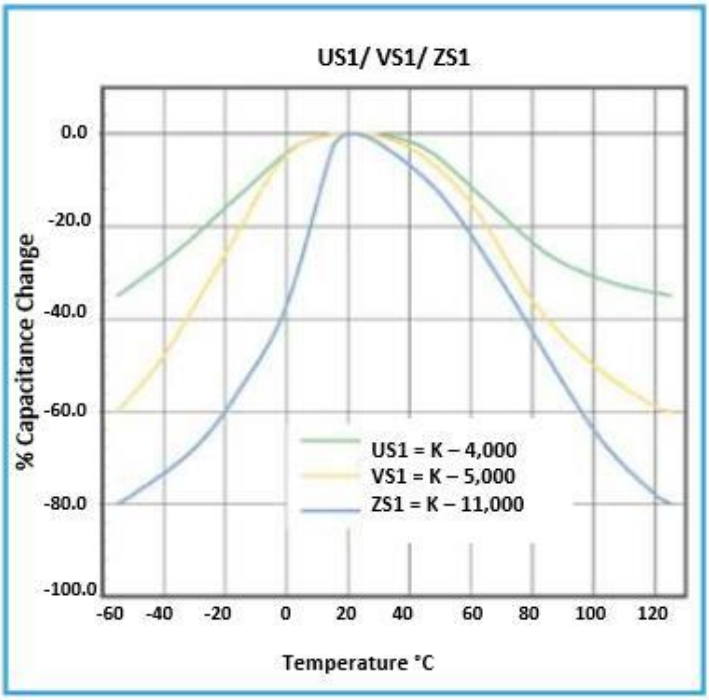
Cap (pF)	Size mils (mm)																	
	10x10 (.254 x .254)		12x12 (.305 x .305)		15x15 (.381 x .381)		20x20 (.508 x .508)		25x25 (.635 x .635)		30x30 (.762 x .762)		35x35 (.889 x .889)		40x40 (1.016 x 1.016)		50x50 (1.270 x 1.270)	
	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness
27	US1	4	US1	5	SS3	4	RS1	4	RS1	6	RS1	8	MS1	3	MS1	4	MS1	6
33	VS1	4	US1	4	US1	6	SS3	6	RS1	5	RS1	6	RS1	11	MS1	4	MS1	5
39	ZS1	6	US1	4	US1	5	SS3	5	RS1	4	RS1	5	RS1	7	RS1	10	MS1	4
47	ZS1	5	ZS1	7	US1	5	SS3	4	SS3	6	RS1	5	RS1	6	RS1	8	MS1	4
56	ZS1	4	ZS1	6	VS1	5	US1	7	SS3	5	RS1	4	RS1	5	RS1	7	RS1	10
68	ZS1	4	ZS1	5	VS1	4	US1	6	SS3	5	SS3	6	RS1	4	RS1	6	RS1	9
82	ZS4	7	ZS1	4	ZS1	7	VS1	6	SS3	4	SS3	5	SS3	7	SS3	10	RS1	7
100	ZS4	6	ZS4	8	ZS1	6	VS1	5	US1	6	SS3	5	SS3	6	SS3	8	RS1	6
120	ZS4	5	ZS4	7	ZS1	5	ZS1	8	VS1	6	SS3	4	SS3	5	SS3	7	RS1	5
150	ZS4	4	ZS4	5	ZS1	4	ZS1	7	VS1	5	VS1	7	SS3	4	SS3	5	RS1	4
180	ZS6	4	ZS4	5	ZS4	7	ZS1	6	VS1	4	VS1	6	VS1	8	US1	8	SS3	7
200	ZS6	4	ZS4	4	ZS4	6	ZS1	5	ZS1	8	VS1	5	VS1	7	US1	7	SS3	6
220	ZS6	4	ZS6	5	ZS4	6	ZS1	4	ZS1	7	VS1	5	VS1	6	US1	6	SS3	6
270			ZS6	4	ZS4	5	ZS4	8	ZS1	6	VS1	4	VS1	5	US1	5	SS3	5
330					ZS4	4	ZS4	7	ZS1	5	ZS1	7	VS1	4	US1	4	US1	7
390					ZS6	4	ZS4	6	ZS1	4	ZS1	6	ZS1	7	ZS1	10	US1	6
470					ZS6	4	ZS4	5	ZS4	7	ZS1	5	ZS1	6	ZS1	8	US1	5
560							ZS4	4	ZS4	6	ZS1	4	ZS1	5	ZS1	7	US1	4
680							ZS6	5	ZS4	5	ZS4	8	ZS1	5	ZS1	6	VS1	4
820							ZS6	4	ZS6	6	ZS4	6	ZS1	4	ZS1	5	ZS1	7
1000									ZS6	5	ZS4	5	ZS4	7	ZS1	4	ZS1	6
1200									ZS6	4	ZS4	4	ZS4	6	ZS4	7	ZS1	5
1500											ZS6	5	ZS4	5	ZS4	6	ZS1	4
1800											ZS6	4	ZS6	6	ZS4	5	ZS4	8
2200													ZS6	5	ZS4	4	ZS4	6
2700													ZS6	4	ZS6	5	ZS4	5
3300																	ZS6	6

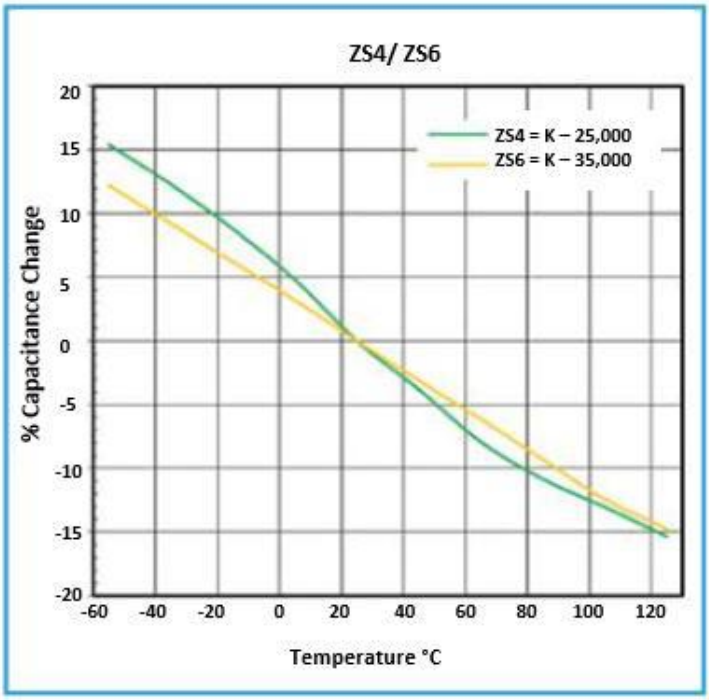
Other dielectric materials available depending on application requirements

Typical Temperature Characteristics









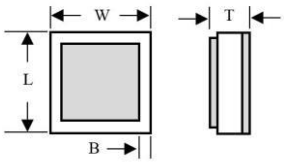
Single Layer Capacitors

Border Cap

Product Features

Border Caps have the topside electrode withdrawn from the edges in order to increase the distance between electrodes and dramatically decrease the possibilities of shorting when epoxy die-mounting. This style is also widely used for optical recognition-based assembly.

Increased margin sizes and special terminations are available for high power LC filter applications. Border Caps can be customized to any sized square or rectangle. Contact PPI for more information.



- Capacitance: 0.04 to 3300pF

Part Numbering

PP B – FS1 – 29×19 × 6 – D4 – 1R0 – K – 3 W

RoHS

PP = Passive Plus	Capacitor Style *B = Border*	Dielectric Code *See Table*	Length & Width (mils)	Thickness (mils)	Metallization *See Table*	Capacitance Value *See Table*	Tolerance *See Table*	Voltage *See Table*	Packaging W = Waffle Pack *Standard*

Thicknesses (mils)

Length & Width	L or W Tolerance	Margin Nominal	Thickness
≤ 10	± 2	1	± 1.5
11 - 29	± 2	2	
≥ 30	± 3	2	

Capacitance Codes

Value	Code
<10pF	1R0 = 1.0pF
>10pF	101 = 100pF

Metallization Codes

Code	Description
D4	Ti/Pt/Au - Titanium/Platinum/Gold **(70 µin Gold)**
D5	Ti/NiV/Au - Titanium/Nickel Vanadium/Gold **(70 µin Gold)**
S7	Ti/Pt/Ag - Titanium/Platinum/Silver **(20 µin Silver)**
K2	Ta/Pd/Au - Tantalum/Palladium/Gold **(75 µin Gold)**
L3	Ta/Pd/Au - Tantalum/Palladium/Gold **(100 µin Gold)**

Contact PPI for available metallizations.

Single Layer Capacitors

Border Cap

Substrates

Substrates can be supplied as follows:

• **Bare**	
• **Metallized:**	• Gold over Platinum, Palladium, or Nickel • Silver over Platinum • Custom schemes and patterns to Customer specifications
Thickness Range	3 mils +
Length and Width	Up to 4” depending on material

Standard Electrode Metallizations

Gold (D4) This metallization consists of a minimum of 70 micro-inches of Gold over Platinum or Nickel which is ideal for all wirebonding methodologies.

Silver (S7) This metallization consists of 20 micro-inches of Silver over Platinum which is ideal for all solder applications whenever the use of Gold is unacceptable.

Capacitance Tolerance & Dimensional Tolerances Codes

Class I Dielectrics: AS1 - KS2			
Tolerance	**Code**	**Tolerance**	**Code**
± .50pF	D	± 20%	M
± .25pF	C	± 15%	L
±.10pF	B	± 10%	K
± .05pF	A	± 5%	J
± .01pF	P	± 3%	H
		± 2%	G

Material	L or W Dimension	Tolerance
AS1 - ZS1	< 20 mils	±15%
	≥ 20 mils	±10%

Class II Dielectrics: MS1 - ZS4			
Tolerance	**Code**	**Tolerance**	**Code**
-10% thru +40%	Y	± 20%	M
-20% thru +80%	Z	± 15%	L
0% thru +100%	V	± 10%	K
Guaranteed Min. Value	GMV	± 5%	J

Material	L or W Dimension	Tolerance
ZS4 - ZS6	≤ 15 mils	± 2 mils
	> 15 mils; ≤ 30 mils	± 3 mils
	> 30 mils	± 5 mils

Rated Voltage Codes

Code	Voltage	Dielectric Thickness
2	50V	≤5 mils
3	100V	≥6 mils

Packaging

PPI SLCs are available in Waffle Packs (Standard). Other packaging options may be available. Please contact PPI.

Dielectric Materials – Class I

Dielectrics below consist of material exhibiting very low losses, extremely low or closely controlled temperature coefficients, negligible voltage and frequency coefficients, negligible aging effects and high insultation and dielectric breakdown.

Type	IR Min. @ 25°C Ω	Temperature Coefficient PPM°C -55 to +125°C	Dissipation Factor (@ 10GHz)	Dielectric Constant (K)	Material
AS1	10^{12}	Negligible	0.0001	3.8	Quartz
AS6	10^{12}	P120 ± 25	0.0001	8.7	AlN
AS7	10^{12}	P180 ± 50	0.0006	9.6	Alumina 96
AS8	10^{12}	P180 ± 50	0.0006	9.8	Alumina 99.6
BS2	10^{12}	NP0 0 ± 30	0.0001	12.6	Titanate
CS1	10^{12}	0 ± 30	0.0010	20	Titanate
ES1	10^{12}	0 ± 30	0.0020	40	Titanate
FS1	10^{12}	0 ± 30	0.0050	50	Titanate
IS2	10^{4}	N750 ± 200	0.0050	85	Alumina
JS2	10^{6}	0 ± 30	0.0050	93	Titanate
KS3	10^{6}	N1500 ± 500	0.0025	160	Titanate

Dielectric Materials – Class II

Dielectrics below are characterized by high dielectric constants, increased losses and higher temperature coefficients. These properties are inherent with this class of material but the high dielectric constants permit the use of smaller size to achieve low series inductance and meet dimensional requirements. Capacitors made with these materials are often used for coupling of microstrip line circuits where a small chip is necessary. Used as a bypass capacitor, the small size provides low series inductance and dielectric losses are typically of little concern.

Type	IR Min. @ 25°C Ω	Temperature Coefficient % -55 to +125°C	Dissipation Factor (@ 1MHz)	Aging (%) HR/Decade	Dielectric Constant (K)
MS1	10^{11}	-10 to 5	0.010	2.0	300
PS1	10^{4}	-10 to 10	0.025	3.0	700
RS2	10^{4}	-10 to 10	0.025	3.0	1250
SS3	10^{11}	-10 to 3	0.015	3.5	2200
US1	10^{5}	-35 to 0	0.020	3.0	4000
US3	10^{11}	-15 to 15	0.030	3.0	4500
ZS1	10^{11}	-80 to 0	0.025	3.0	11000
ZS4	*	-15 to 15	0.035	3.0	25000
ZS6	*	-15 to 15	0.035	3.0	35000

Other dielectric materials available depending on application requirements

Single Layer Capacitors

Border Cap

Capacitance, Case Size & Dielectric Availability - Class I Dielectrics

Cap (pF)	Size mils (mm)																	
	10x10 (.254 x .254)		12x12 (.305 x .305)		15x15 (.381 x .381)		20x20 (.508 x .508)		25x25 (.635 x .635)		30x30 (.762 x .762)		35x35 (.889 x .889)		40x40 (1.016 x 1.016)		50x50 (1.270 x 1.270)	
	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness
0.04	AS7	4	AS7	4	AS7	5	AS1	5										
0.06	ES1	10	AS7	4	AS7	6	AS1	5	AS1	8	AS1	10						
0.08	ES1	7	ES1	10	AS7	5	AS7	10	AS1	6	AS1	8	AS1	11				
0.1	ES1	6	ES1	9	AS7	4	AS7	7	AS1	5	AS1	7	AS1	10				
0.2	IS1	4	ES1	4	ES1	5	AS7	4	AS7	5	AS7	7	AS1	4	AS1	5	AS1	10
0.3	KS2	6	IS1	5	ES1	4	ES1	8	AS7	4	AS7	5	AS7	7	AS1	4	AS1	6
0.4	KS2	4	IS1	4	IS1	6	ES1	6	ES1	10	AS7	4	AS7	5	AS7	7	AS1	5
0.5	MS1	5	KS2	4	IS1	5	ES1	4	ES1	7	ES1	10	AS7	4	AS7	6	AS7	10
0.6	MS1	5	KS2	5	IS1	4	ES1	4	ES1	6	ES1	10	AS7	4	AS7	5	AS7	7
0.8	MS1	5	MS1	5	KS2	5	IS1	6	ES1	5	ES1	7	ES1	10	AS7	4	AS7	6
1.0	MS1	4	MS1	5	KS2	4	IS1	5	ES1	4	ES1	6	ES1	8	ES1	10	AS7	5
1.2	RS1	6	MS1	5	MS1	7	IS1	4	IS1	7	ES1	5	ES1	7	ES1	10	AS7	4
1.5	RS1	7	MS1	4	MS1	6	KS2	6	IS1	6	IS1	8	ES1	6	ES1	7	ES1	15
1.8	RS1	6	MS1	4	MS1	5	KS2	5	IS1	5	IS1	7	ES1	5	ES1	7	ES1	10
2.0	RS1	6	RS1	8	MS1	4	KS2	5	IS1	5	IS1	6	ES1	4	ES1	6	ES1	10
2.2	RS1	5	RS1	7	MS1	4	MS1	7	KS2	7	IS1	6	ES1	4	ES1	5	ES1	10
2.7	RS1	5	RS1	6	MS1	4	MS1	6	KS2	6	IS1	6	IS1	8	ES1	5	ES1	8
3.3	SS3	6	RS1	6	RS1	8	MS1	5	KS2	5	IS1	4	IS1	6	IS1	7	ES1	6
3.9	SS3	5	RS1	5	RS1	7	MS1	4	KS2	4	KS2	6	IS1	5	IS1	6	ES1	5
4.7	SS3	5	RS1	5	RS1	7	MS1	4	MS1	6	KS2	5	IS1	4	IS1	5	IS1	8
5.6	SS3	5	SS3	6	RS1	5	MS1	4	MS1	5	KS2	4	KS2	6	IS1	5	IS1	7
6.8	US1	5	SS3	6	RS1	5	RS1	8	MS1	5	MS1	7	KS2	5	KS2	7	IS1	6
8.2	US1	4	SS3	5	RS1	4	RS1	7	MS1	4	MS1	6	KS2	4	KS2	5	IS1	5
10	US1	5	SS3	4	SS3	6	RS1	6	MS1	4	MS1	5	MS1	6	KS2	5	IS1	4
12	US1	5	US1	6	SS3	5	RS1	5	RS1	8	MS1	4	MS1	6	KS2	4	KS2	6
15	US1	4	US1	5	SS3	5	RS1	5	RS1	7	MS1	4	MS1	5	MS1	6	KS2	5
18	VS1	4	VS1	6	US1	7	SS3	7	RS1	5	RS1	9	MS1	4	MS1	5	KS2	4
20	ZS1	5	VS1	5	US1	6	SS3	6	RS1	5	RS1	8	MS1	4	MS1	5	KS2	4

Class I Dielectrics

Other dielectric materials available depending on application requirements

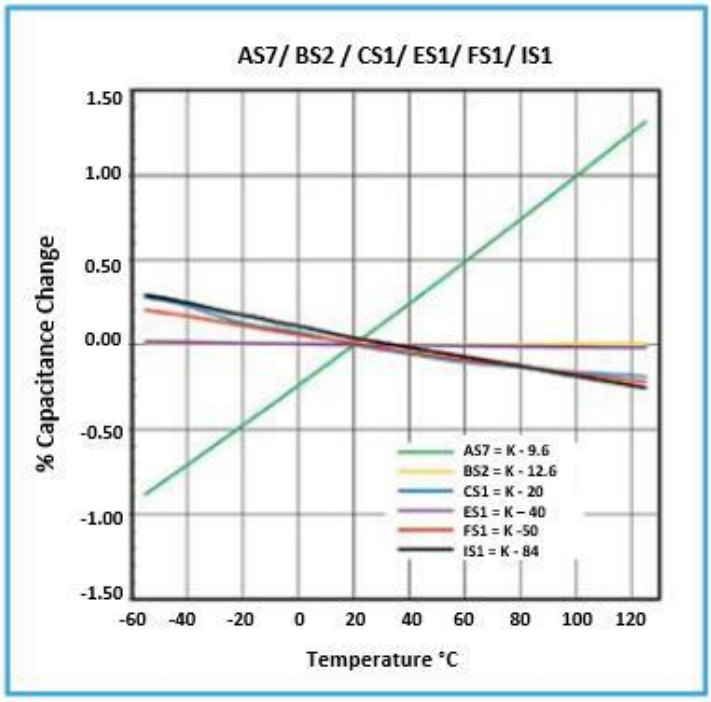
Shaded cells indicate Class II Dielectrics

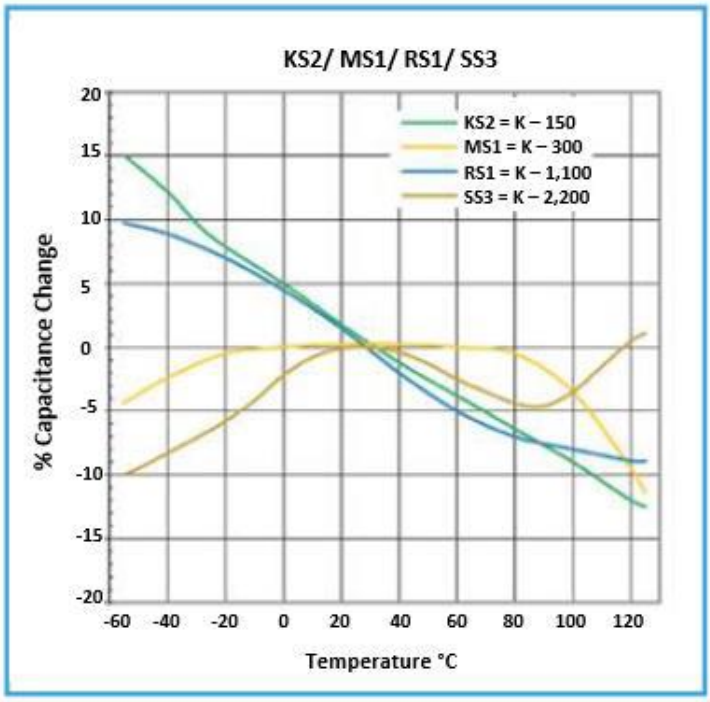
Capacitance, Case Size & Dielectric Availability – Class II Dielectrics

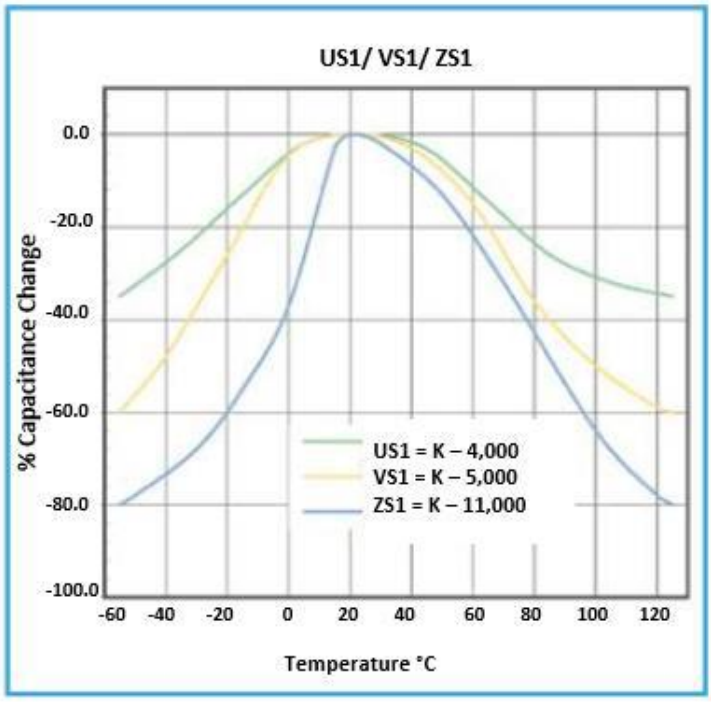
Cap (pF)	Size mils (mm)																	
	10x10 (.254 x .254)		12x12 (.305 x .305)		15x15 (.381 x .381)		20x20 (.508 x .508)		25x25 (.635 x .635)		30x30 (.762 x .762)		35x35 (.889 x .889)		40x40 (1.016 x 1.016)		50x50 (1.270 x 1.270)	
	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness
22	ZS1	7	VS1	4	US1	5	SS3	6	RS1	5	RS1	7	RS1	10	MS1	4	MS1	6
27	ZS1	6	VS1	4	VS1	5	SS3	5	RS1	4	RS1	6	RS1	8	MS1	4	MS1	5
33	ZS1	5	ZS1	6	VS1	4	SS3	4	SS3	6	RS1	5	RS1	7	RS1	9	MS1	5
39	ZS1	4	ZS1	5	VS1	4	US1	6	SS3	6	RS1	4	RS1	6	RS1	8	MS1	4
47	ZS4	8	ZS1	5	ZS1	6	US1	5	SS3	5	SS3	7	RS1	5	RS1	7	RS1	11
56	ZS4	6	ZS1	4	ZS1	5	VS1	5	SS3	4	SS3	6	RS1	4	RS1	6	RS1	9
68	ZS4	5	ZS4	8	ZS1	5	VS1	4	US1	6	SS3	5	RS1	4	RS1	5	RS1	7
82	ZS6	6	ZS4	6	ZS1	4	VS1	4	US1	5	SS3	4	SS3	6	RS1	4	RS1	6
100	ZS6	5	ZS4	6	ZS1	4	ZS1	6	VS1	5	US1	6	SS3	5	SS3	7	RS1	5
120			ZS4	5	ZS4	6	ZS1	5	VS1	4	VS1	6	SS3	4	SS3	5	RS1	4
150			ZS4	6	ZS4	6	ZS1	4	ZS1	7	VS1	5	VS1	7	SS3	4	SS3	7
180			ZS6	5	ZS4	5	ZS1	4	ZS1	6	VS1	4	VS1	6	SS3	4	SS3	6
200					ZS6	5	ZS1	4	ZS1	6	VS1	4	VS1	5	US1	6	SS3	5
220					ZS6	5	ZS4	8	ZS1	5	VS1	4	VS1	5	US1	5	SS3	5
270					ZS6	5	ZS4	6	ZS1	4	ZS1	7	VS1	4	VS1	6	SS3	4
330							ZS4	5	ZS1	4	ZS1	5	ZS1	7	VS1	5	US1	6
390							ZS4	5	ZS4	6	ZS1	5	ZS1	6	VS1	4	US1	5
470							ZS4	4	ZS4	6	ZS1	4	ZS1	5	ZS1	7	VS1	5
560							ZS6	5	ZS6	6	ZS1	4	ZS1	5	ZS1	6	VS1	4
680									ZS6	6	ZS4	6	ZS1	4	ZS1	5	ZS1	8
820									ZS6	5	ZS4	5	ZS4	8	ZS1	4	ZS1	7
1000											ZS6	6	ZS4	6	ZS4	8	ZS1	6
1200											ZS6	5	ZS4	5	ZS4	7	ZS1	5
1500													ZS6	6	ZS4	5	ZS1	4
1800													ZS6	5	ZS6	6	ZS4	7
2200															ZS6	5	ZS4	6
2700															ZS6	5	ZS4	5
3300																	ZS6	5

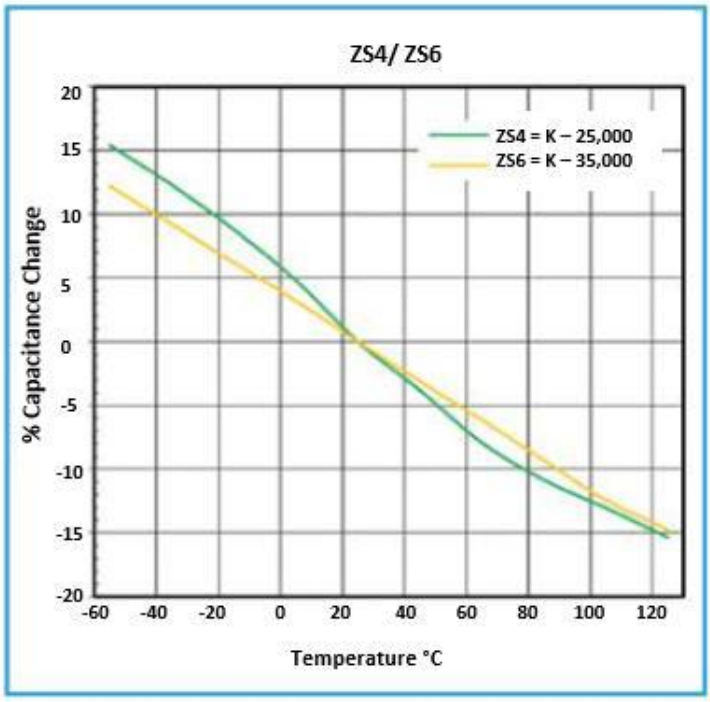
Other dielectric materials available depending on application requirements

Typical Temperature Characteristics





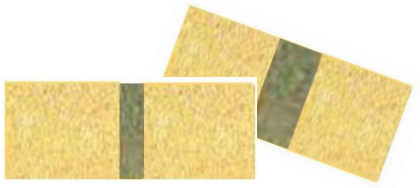




Single Layer Capacitors

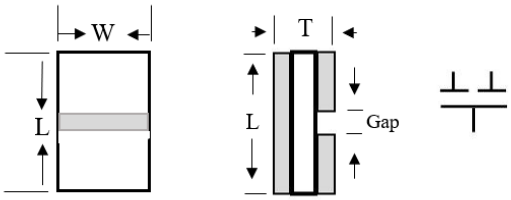
Twin Cap

Product Features



A single full electrode is provided on one side of the capacitor and split electrodes on the other side. This is a three-terminal capacitor which can be used as a two capacitor with a common electrode or as serially connected capacitors so that connections may be made on one side of the chip only (surface mount). This design is often used in microstrip coupling to eliminate lead inductance and raise the self resonant frequency.

Product Characteristics



Capacitance: 0.06 picofarads and up
Chip shape: Twin pads with gap
Gap widths: 5, 10, 15, 20 mil or custom

Standard dimensional tolerance for length and width is ±15% up to 20 mils. For dimensions greater than 20 mils, standard tolerance is ±10%. In cases where dimension cannot be exceeded, insert "M" to signify a maximum dimension. The thickness tolerance is ± 1.5 mils.

Part Numbering

PP T – US3 – 20×10 × 4 – D4 – 100 – K – 2 W

RoHS

PP	T	US3	20×10	4	D4	100	K	2	W
PP = Passive Plus	Capacitor Style *T = Twin*	Dielectric Code *See Table*	Length & Width (mils)	Thickness (mils)	Metallization *See Table*	Capacitance Value *See Table*	Tolerance *See Table*	Voltage *See Table*	Packaging W = Waffle Pack *Standard*

Thicknesses (mils)

Length & Width	L or W Tolerance	Margin Nominal	Thickness
≤ 10	± 2	1	± 1.5
11 - 29	± 2	2	
≥ 30	± 3	2	

Capacitance Codes

Value	Code
<10pF	1R0 = 1.0pF
>10pF	101 = 100pF

Metallization Codes

Code	Description
D4	Ti/Pt/Au - Titanium/Platinum/Gold **(70 µin Gold)**
S7	Ti/Pt/Ag - Titanium/Platinum/Silver **(20 µin Silver)**
K2	Ta/Pd/Au - Tantalum/Palladium/Gold **(75 µin Gold)**
L3	Ta/Pd/Au - Tantalum/Palladium/Gold **(100 µin Gold)**

Contact PPI for available metallizations.

Substrates

Substrates can be supplied as follows:

• **Bare**	
• **Metallized:**	• Gold over Platinum, Palladium, or Nickel • Silver over Platinum • Custom schemes and patterns to Customer specifications
Thickness Range	3 mils +

Standard Electrode Metallizations

Gold (D4) This metallization consists of a minimum of 70 micro-inches of Gold over Platinum or Nickel which is ideal for all wirebonding methodologies.

Silver (S7) This metallization consists of 20 micro-inches of Silver over Platinum which is ideal for all solder applications whenever the use of Gold is unacceptable.

Capacitance Tolerance & Dimensional Tolerances Codes

Class I Dielectrics: AS1 - KS2			
Tolerance	**Code**	**Tolerance**	**Code**
± .50pF	D	± 20%	M
± .25pF	C	± 15%	L
±.10pF	B	± 10%	K
± .05pF	A	± 5%	J
± .01pF	P	± 3%	H
		± 2%	G

Material	L or W Dimension	Tolerance
AS1 - ZS1	< 20 mils	±15%
	≥ 20 mils	±10%

Class II Dielectrics: MS1 - ZS4			
Tolerance	**Code**	**Tolerance**	**Code**
-10% thru +40%	Y	± 20%	M
-20% thru +80%	Z	± 15%	L
0% thru +100%	V	± 10%	K
Guaranteed Min. Value	GMV	± 5%	J

Material	L or W Dimension	Tolerance
ZS4 - ZS6	≤ 15 mils	± 2 mils
	> 15 mils; ≤ 30 mils	± 3 mils
	> 30 mils	± 5 mils

Rated Voltage Codes

Code	Voltage	Dielectric Thickness
2	50V	4 mils
3	100V	6 mils

Packaging

PPI SLCs are available in Waffle Packs (Standard).
Other packaging options may be available.
Please contact PPI.

Twin Caps are available in a wide range of size configurations, dielectric and termination materials to fit your application. Please contact PPI for designs not listed in this catalog.

Dielectric Materials – Class I

Dielectrics below consist of material exhibiting very low losses, extremely low or closely controlled temperature coefficients, negligible voltage and frequency coefficients, negligible aging effects and high insultation and dielectric breakdown.

Type	IR Min. @ 25°C Ω	Temperature Coefficient PPM°C -55 to +125°C	Dissipation Factor (@ 10GHz)	Dielectric Constant (K)	Material
AS1	10^{12}	Negligible	0.0001	3.8	Quartz
AS6	10^{12}	P120 ± 25	0.0001	8.7	AlN
AS7	10^{12}	P180 ± 50	0.0006	9.6	Alumina 96
AS8	10^{12}	P180 ± 50	0.0006	9.8	Alumina 99.6
BS2	10^{12}	NP0 0 ± 30	0.0001	12.6	Titanate
CS1	10^{12}	0 ± 30	0.0010	20	Titanate
ES1	10^{12}	0 ± 30	0.0020	40	Titanate
FS1	10^{12}	0 ± 30	0.0050	50	Titanate
IS2	10^{4}	N750 ± 200	0.0050	85	Alumina
JS2	10^{6}	0 ± 30	0.0050	93	Titanate
KS3	10^{6}	N1500 ± 500	0.0025	160	Titanate

Dielectric Materials – Class II

Dielectrics below are characterized by high dielectric constants, increased losses and higher temperature coefficients. These properties are inherent with this class of material but the high dielectric constants permit the use of smaller size to achieve low series inductance and meet dimensional requirements. Capacitors made with these materials are often used for coupling of microstrip line circuits where a small chip is necessary. Used as a bypass capacitor, the small size provides low series inductance and dielectric losses are typically of little concern.

Type	IR Min. @ 25°C Ω	Temperature Coefficient % -55 to +125°C	Dissipation Factor (@ 1MHz)	Aging (%) HR/Decade	Dielectric Constant (K)
MS1	10^{11}	-10 to 5	0.010	2.0	300
PS1	10^{4}	-10 to 10	0.025	3.0	700
RS2	10^{4}	-10 to 10	0.025	3.0	1250
SS3	10^{11}	-10 to 3	0.015	3.5	2200
US1	10^{5}	-35 to 0	0.020	3.0	4000
US3	10^{11}	-15 to 15	0.030	3.0	4500
ZS1	10^{11}	-80 to 0	0.025	3.0	11000
ZS4	*	-15 to 15	0.035	3.0	25000
ZS6	*	-15 to 15	0.035	3.0	35000

Other dielectric materials available depending on application requirements

Capacitance, Case Size & Dielectric Availability

This component functions as two capacitors operating in series, each of which is twice the desired equivalent capacitance. Allow us to custom design for your application.

Capacitance (pF)	Case Size *Mils* *(mm)*							
	20x10 (.508 x .254)		40x20 (1.016 x .508)		60x30 (1.524 x .762)		80x40 (2.032 x 1.016)	
	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness
	Class I Dielectrics							
0.06	ES1	6	AS7	6	AS1	6	AS1	8
0.08	ES1	4	AS7	4	AS1	4	AS1	7
0.1	IS1	7	ES1	15	AS7	8	AS1	5
0.2	KS3	6	ES1	7	AS7	4	AS7	7
0.3	MS1	8	ES1	5	ES1	10	AS7	4
0.4	MS1	6	IS1	7	ES1	8	ES1	15
0.5	MS1	5	IS1	6	ES1	7	ES1	10
0.6	MS1	4	IS1	5	ES1	6	ES1	9
0.8	PS1	11	KS3	6	IS1	4	ES1	7
1	PS1	9	KS3	5	IS1	7	ES1	6
1.2	PS1	7	KS3	4	IS1	6	ES1	5
1.5	PS1	6	MS1	7	IS1	5	IS1	8
1.8	PS1	5	MS1	6	IS1	4	IS1	6
2	PS1	4	MS1	5	IS1	4	IS1	6
2.2	PS1	4	MS1	5	KS3	6	IS1	5
2.7	SS3	7	MS1	4	KS3	5	IS1	4
3.3	SS3	6	PS1	11	KS3	4	KS3	6
3.9	SS3	5	PS1	9	MS1	7	KS3	5
4.7	SS3	4	PS1	8	MS1	5	KS3	4
5.6	US1	6	PS1	6	MS1	5	MS1	7
6.8	US1	5	PS1	5	MS1	4	MS1	6
8.2	US3	5	PS1	4	PS1	11	MS1	5
10	US3	4	SS3	7	PS1	9	MS1	4
12	ZS1	8	SS3	6	PS1	7	PS1	11

Other dielectric materials available depending on application requirements

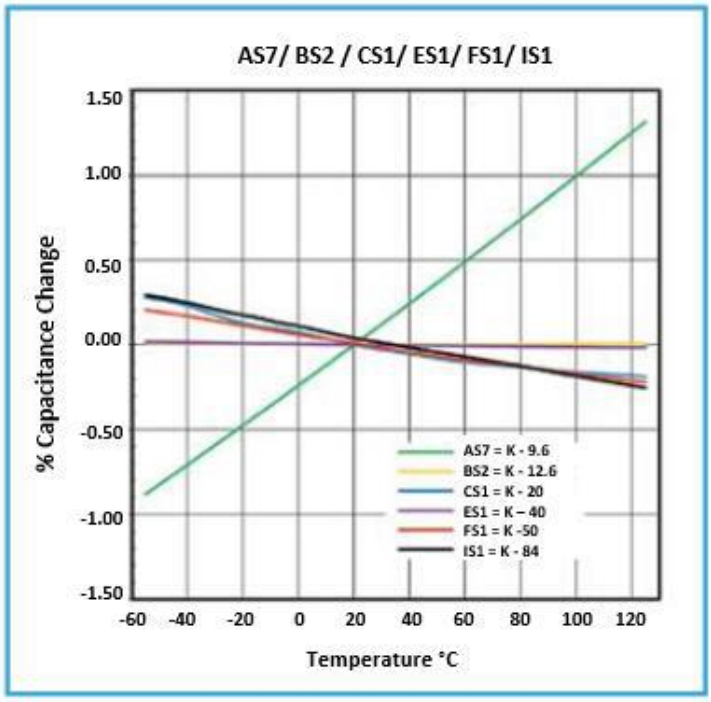
Shaded cells indicate Class II Dielectrics

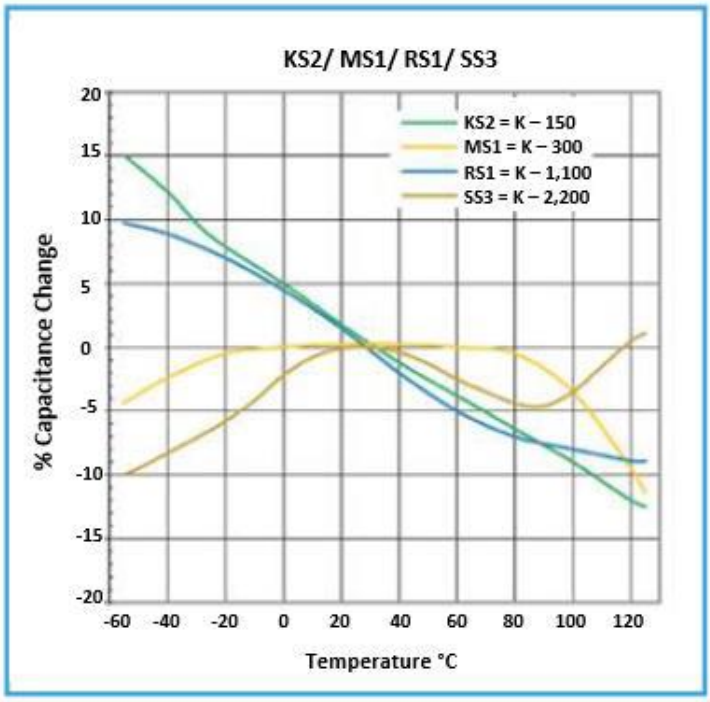
Capacitance, Case Size & Dielectric Availability - continued

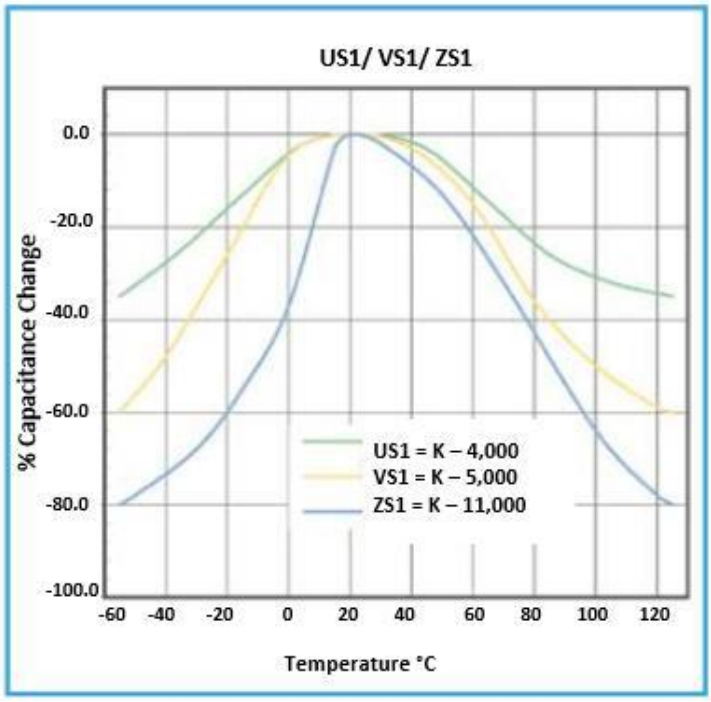
15	ZS1	6	SS3	5	PS1	6	PS1	9
18	ZS1	5	SS3	4	PS1	5	PS1	8
20	ZS1	5	US1	7	PS1	4	PS1	7
22	ZS1	4	US1	6	PS1	4	PS1	6
27	ZS4	8	US1	5	SS3	7	PS1	5
33	ZS4	6	US3	5	SS3	6	SS3	9
39	ZS4	5	US3	4	SS3	5	SS3	8
47	US3	6	ZS1	8	SS3	4	SS3	6
56	US3	5	ZS1	7	US1	6	SS3	5
68	US3	4	ZS1	5	US1	5	US1	8
82			ZS1	4	US3	5	US3	8
100			ZS4	8	US3	4	US3	7
120			ZS4	7	ZS1	8	US3	6
150			ZS4	5	ZS1	6	US3	5
180			ZS4	5	ZS1	5	ZS1	8
200			ZS6	6	ZS1	5	ZS1	7
220			ZS6	5	ZS4	9	ZS1	7
270			ZS6	4	ZS4	8	ZS1	6
330					ZS4	6	ZS1	5
390					ZS4	5	ZS4	9
470					ZS6	6	ZS4	7
560					ZS6	5	ZS4	6
680					ZS6	4	ZS4	5
820							ZS6	6
1000							ZS6	5
1200							ZS6	4
	Class II Dielectrics							

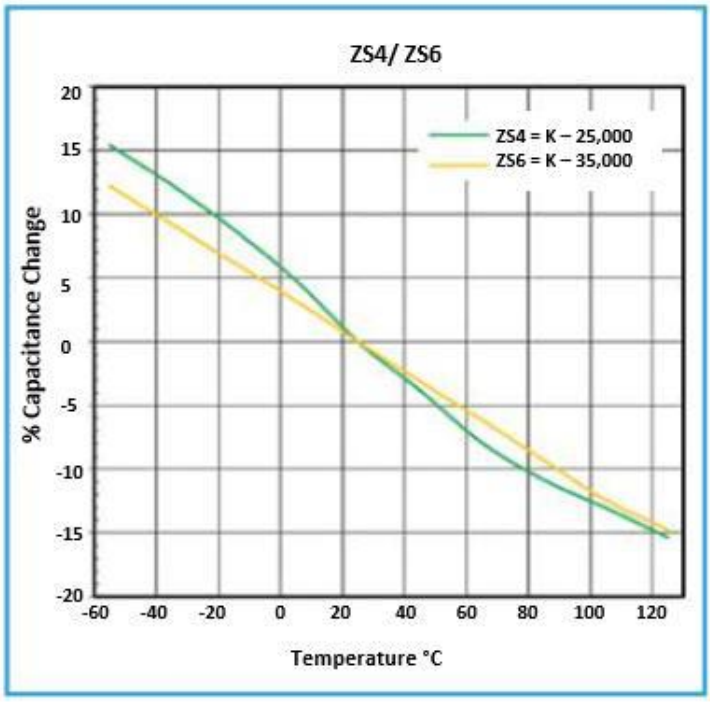
Other dielectric materials available depending on application requirements

Typical Temperature Characteristics





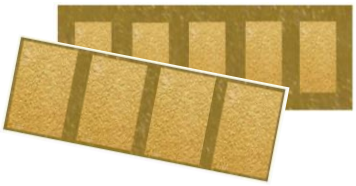




Single Layer Capacitors

Array Cap

Product Features

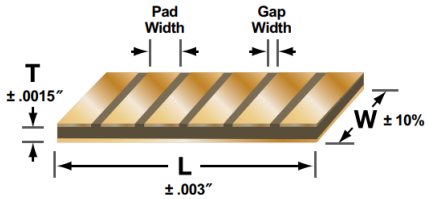


Array Caps are used where arrays of capacitors are needed, usually for decoupling or bypass of GaAs integrated circuits. Standard arrays can contain up to 10 capacitors starting at 0.04pF. Typical overall dimensions range start at 20x10 mils. Array Caps can be fully customized to meet Customer's application requirements.

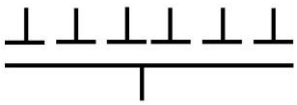
Array Caps are available with (B) or without borders (A) surrounding the edges to help prevent epoxy shorts and aid optical recognition systems.

The stated capacitance value for the Array Caps is for the value of each individual pad.

Dimensions and Electrode Configuration



Standard border is 2 mils and the gap is between 4 – 6 mills depending on the capacitance required.



Part Numbering

PP AB – FS1 – 4 – 105×25 × 4 D4 – 101 – K – 2 – W

PP = Passive Plus	Style Code *AA=Array-No Border AB=Array-Border*	Dielectric Code *See Table*	Number of Capacitors	Length & Width (mils)	Thickness (mils)	Metallization *See Table*	Capacitance Value *See Table*	Tolerance *See Table*	Voltage *See Table*	Packaging W = Waffle Pack *Standard*

Thicknesses (mils)

Length & Width	L or W Tolerance	Margin Nominal	Thickness
≤ 10	± 2	1	± 1.5
11 - 29	± 2	2	
≥ 30	± 3	2	

Capacitance Codes

Value	Code
<10pF	1R0 = 1.0pF
>10pF	101 = 100pF

Metallization Codes

Code	Description
D4	Ti/Pt/Au - Titanium/Platinum/Gold **(70 µin Gold)**
S7	Ti/Pt/Ag - Titanium/Platinum/Silver **(20 µin Silver)**
K2	Ta/Pd/Au - Tantalum/Palladium/Gold **(75 µin Gold)**
L3	Ta/Pd/Au - Tantalum/Palladium/Gold **(100 µin Gold)**

Contact PPI for available metallizations.

Substrates

Substrates can be supplied as follows:

• **Bare**	
• **Metallized:**	• Gold over Platinum, Palladium, or Nickel • Silver over Platinum • Custom schemes and patterns to Customer specifications
Thickness Range	3 mils +

Standard Electrode Metallizations

Gold (D4) This metallization consists of a minimum of 70 micro-inches of Gold over Platinum or Nickel which is ideal for all wirebonding methodologies.

Silver (S7) This metallization consists of 20 micro-inches of Silver over Platinum which is ideal for all solder applications whenever the use of Gold is unacceptable.

Capacitance Tolerance & Dimensional Tolerances Codes

Class I Dielectrics: AS1 - KS2

Tolerance	Code	Tolerance	Code
± .50pF	D	± 20%	M
± .25pF	C	± 15%	L
±.10pF	B	± 10%	K
± .05pF	A	± 5%	J
± .01pF	P	± 3%	H
		± 2%	G

Material	L or W Dimension	Tolerance
AS1 - ZS1	< 20 mils	±15%
	≥ 20 mils	±10%

Class II Dielectrics: MS1 - ZS4

Tolerance	Code	Tolerance	Code
-10% thru +40%	Y	± 20%	M
-20% thru +80%	Z	± 15%	L
0% thru +100%	V	± 10%	K
Guaranteed Min. Value	GMV	± 5%	J

Material	L or W Dimension	Tolerance
ZS4 - ZS6	≤ 15 mils	± 2 mils
	> 15 mils; ≤ 30 mils	± 3 mils
	> 30 mils	± 5 mils

Rated Voltage Codes

Code	Voltage	Dielectric Thickness
2	50V	≤5 mils
3	100V	≥6 mils

Packaging

PPI SLCs are available in Waffle Packs (Standard).
Other packaging options may be available.
Please contact PPI.

Dielectric Materials – Class I

Dielectrics below consist of material exhibiting very low losses, extremely low or closely controlled temperature coefficients, negligible voltage and frequency coefficients, negligible aging effects and high insultation and dielectric breakdown.

Type	IR Min. @ 25°C Ω	Temperature Coefficient PPM°C -55 to +125°C	Dissipation Factor (@ 10GHz)	Dielectric Constant (K)	Material
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AS6	10^{12}	P120 ± 25	0.0001	8.7	AlN
AS7	10^{12}	P180 ± 50	0.0006	9.6	Alumina 96
AS8	10^{12}	P180 ± 50	0.0006	9.8	Alumina 99.6
BS2	10^{12}	NP0 0 ± 30	0.0001	12.6	Titanate
CS1	10^{12}	0 ± 30	0.0010	20	Titanate
ES1	10^{12}	0 ± 30	0.0020	40	Titanate
FS1	10^{12}	0 ± 30	0.0050	50	Titanate
IS2	10^{4}	N750 ± 200	0.0050	85	Alumina
JS2	10^{6}	0 ± 30	0.0050	93	Titanate
KS3	10^{6}	N1500 ± 500	0.0025	160	Titanate

Dielectric Materials – Class II

Dielectrics below are characterized by high dielectric constants, increased losses and higher temperature coefficients. These properties are inherent with this class of material but the high dielectric constants permit the use of smaller size to achieve low series inductance and meet dimensional requirements. Capacitors made with these materials are often used for coupling of microstrip line circuits where a small chip is necessary. Used as a bypass capacitor, the small size provides low series inductance and dielectric losses are typically of little concern.

Type	IR Min. @ 25°C Ω	Temperature Coefficient % -55 to +125°C	Dissipation Factor (@ 1MHz)	Aging (%) HR/Decade	Dielectric Constant (K)
MS1	10^{11}	-10 to 5	0.010	2.0	300
PS1	10^{4}	-10 to 10	0.025	3.0	700
RS2	10^{4}	-10 to 10	0.025	3.0	1250
SS3	10^{11}	-10 to 3	0.015	3.5	2200
US1	10^{5}	-35 to 0	0.020	3.0	4000
US3	10^{11}	-15 to 15	0.030	3.0	4500
ZS1	10^{11}	-80 to 0	0.025	3.0	11000
ZS4	*	-15 to 15	0.035	3.0	25000
ZS6	*	-15 to 15	0.035	3.0	35000

Other dielectric materials available depending on application requirements

Capacitance, Case Size & Dielectric Availability - Class I Dielectrics

Selection Chart is for guidance only. The square area and capacitance parameters are for a single pad. All PPI parts are built to specific customer requirements.

Cap (pF)	Size mils (mm)																	
	10x10 (.254 x .254)		12x12 (.305 x .305)		15x15 (.381 x .381)		20x20 (.508 x .508)		25x25 (.635 x .635)		30x30 (.762 x .762)		35x35 (.889 x .889)		40x40 (1.016 x 1.016)		50x50 (1.270 x 1.270)	
	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness
0.04	AS7	5	AS7	6	AS7	10												
0.06	AS7	4	AS7	5	AS7	8	AS2	5	AS2	10								
0.08	ES1	10	AS7	4	AS7	6	AS7	10	AS2	7	AS2	9						
0.1	ES1	8	ES1	11	AS7	5	AS7	9	AS2	5	AS2	7	AS2	10				
0.2	ES1	5	ES1	7	ES1	10	AS7	4	AS7	7	AS7	10	AS2	5	AS2	7	AS2	10
0.3	IS1	6	ES1	4	ES1	6	ES1	11	AS7	4	AS7	7	AS7	9	AS2	5	AS2	7
0.4	IS1	5	IS1	7	ES1	5	ES1	9	ES1	15	AS7	5	AS7	7	AS7	9	AS2	5
0.5	IS1	4	IS1	5	ES1	4	ES1	7	ES1	11	AS7	5	AS7	5	AS7	7	AS2	4
0.6	KS2	6	IS1	5	IS1	7	ES1	6	ES1	10	ES1	15	AS7	4	AS7	6	AS7	9
0.8	MS1	8	KS2	6	IS1	5	ES1	5	ES1	7	ES1	10	ES1	15	AS7	4	AS7	7
1.0	MS1	7	KS2	5	IS1	4	IS1	7	ES1	6	ES1	8	ES1	10	AS7	4	AS7	5
1.2	MS1	6	KS2	4	IS1	4	IS1	6	ES1	5	ES1	7	ES1	9	AS7	3	AS7	5
1.5	MS1	5	MS1	7	KS2	5	IS1	5	ES1	4	ES1	6	ES1	7	ES1	10	AS7	4
1.8	MS1	4	MS1	5	KS2	4	IS1	4	IS1	6	ES1	5	ES1	6	ES1	8	ES1	11
2.0	MS1	4	MS1	5	KS2	4	KS2	7	IS1	6	ES1	4	ES1	5	ES1	7	ES1	11
2.2	RS1	4	MS1	5	KS2	4	KS2	6	IS1	5	IS1	7	ES1	5	ES1	7	ES1	10
2.7	RS1	8	MS1	4	MS1	6	KS2	5	IS1	4	IS1	6	ES1	4	ES1	5	ES1	8
3.3	RS1	7	RS1	10	MS1	5	KS2	4	KS2	6	IS1	5	IS1	7	ES1	4	ES1	7
3.9	RS1	6	RS1	9	MS1	4	MS1	7	KS2	5	IS1	4	IS1	6	IS1	8	ES1	6
4.7	RS1	5	RS1	7	RS1	11	MS1	6	KS2	4	KS2	6	IS1	5	IS1	6	ES1	5
5.6	RS1	4	RS1	6	RS1	10	MS1	5	MS1	7	KS2	5	IS1	4	IS1	5	ES1	4
6.8	RS1	4	RS1	5	RS1	8	MS1	4	MS1	6	KS2	5	KS2	6	IS1	4	IS1	7
8.2	SS3	6	RS1	4	RS1	7	MS1	4	MS1	5	KS2	4	KS2	5	KS2	7	KS2	10
10	SS3	5	RS1	4	RS1	5	RS1	9	MS1	4	MS1	6	KS2	4	KS2	5	KS2	8
12	SS3	4	SS3	6	RS1	5	RS1	8	RS1	11	MS1	5	MS1	7	KS2	4	KS2	7
15	US1	6	SS3	5	RS1	4	RS1	6	RS1	10	MS1	4	MS1	6	MS1	7	KS2	6
18	US1	5	SS3	4	SS3	6	RS1	5	RS1	8	RS1	11	MS1	4	MS1	6	KS2	5
20	US1	5	SS3	4	SS3	6	RS1	5	RS1	8	RS1	11	MS1	4	MS1	5	KS2	4
22	US1	4	US1	6	SS3	5	RS1	4	RS1	7	RS1	9	MS1	4	MS1	5	KS2	4

Other dielectric materials available depending on application requirements

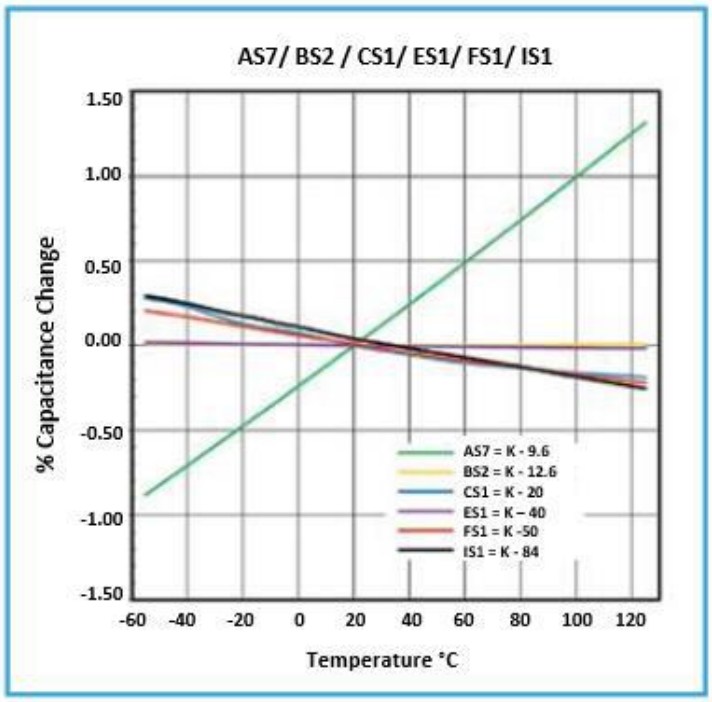
Shaded cells indicate Class II Dielectrics

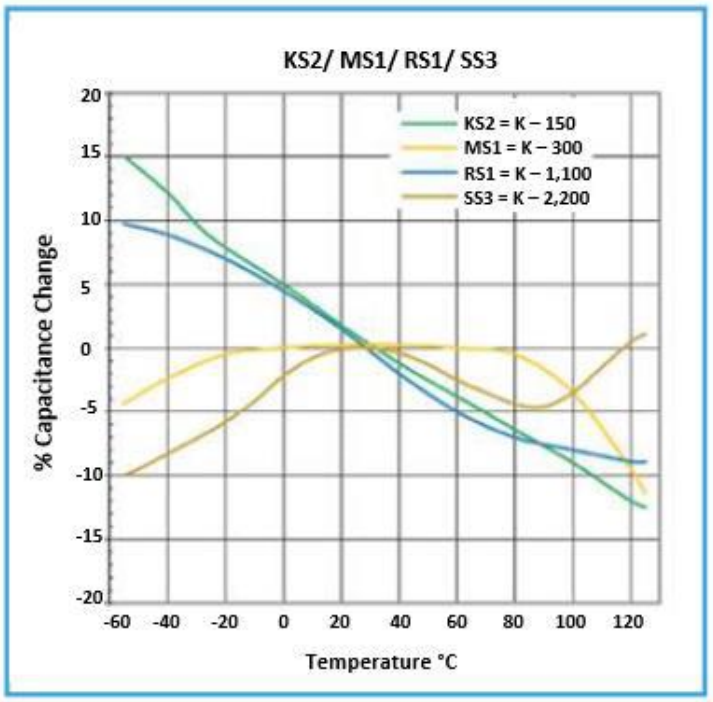
Capacitance, Case Size & Dielectric Availability – Class II Dielectrics

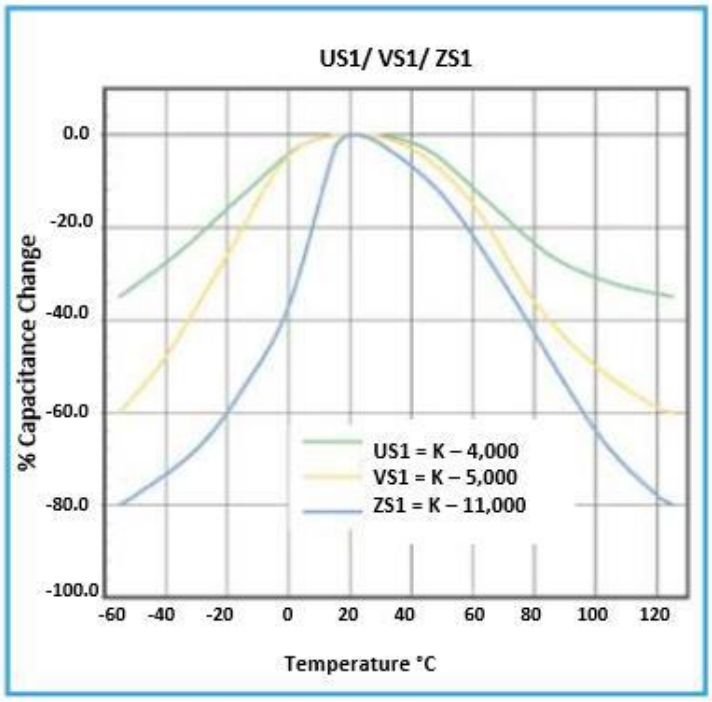
Cap (pF)	Size mils (mm)																	
	10x10 (.254 x .254)		12x12 (.305 x .305)		15x15 (.381 x .381)		20x20 (.508 x .508)		25x25 (.635 x .635)		30x30 (.762 x .762)		35x35 (.889 x .889)		40x40 (1.016 x 1.016)		50x50 (1.270 x 1.270)	
	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness
27	US1	4	US1	5	SS3	4	RS1	4	RS1	6	RS1	8	MS1	3	MS1	4	MS1	6
33	VS1	4	US1	4	US1	6	SS3	6	RS1	5	RS1	6	RS1	11	MS1	4	MS1	5
39	ZS1	6	US1	4	US1	5	SS3	5	RS1	4	RS1	5	RS1	7	RS1	10	MS1	4
47	ZS1	5	ZS1	7	US1	5	SS3	4	SS3	6	RS1	5	RS1	6	RS1	8	MS1	4
56	ZS1	4	ZS1	6	VS1	5	US1	7	SS3	5	RS1	4	RS1	5	RS1	7	RS1	10
68	ZS1	4	ZS1	5	VS1	4	US1	6	SS3	5	SS3	6	RS1	4	RS1	6	RS1	9
82	ZS4	7	ZS1	4	ZS1	7	VS1	6	SS3	4	SS3	5	SS3	7	SS3	10	RS1	7
100	ZS4	6	ZS4	8	ZS1	6	VS1	5	US1	6	SS3	5	SS3	6	SS3	8	RS1	6
120	ZS4	5	ZS4	7	ZS1	5	ZS1	8	VS1	6	SS3	4	SS3	5	SS3	7	RS1	5
150	ZS4	4	ZS4	5	ZS1	4	ZS1	7	VS1	5	VS1	7	SS3	4	SS3	5	RS1	4
180	ZS6	4	ZS4	5	ZS4	7	ZS1	6	VS1	4	VS1	6	VS1	8	US1	8	SS3	7
200	ZS6	4	ZS4	4	ZS4	6	ZS1	5	ZS1	8	VS1	5	VS1	7	US1	7	SS3	6
220	ZS6	4	ZS6	5	ZS4	6	ZS1	4	ZS1	7	VS1	5	VS1	6	US1	6	SS3	6
270			ZS6	4	ZS4	5	ZS4	8	ZS1	6	VS1	4	VS1	5	US1	5	SS3	5
330					ZS4	4	ZS4	7	ZS1	5	ZS1	7	VS1	4	US1	4	US1	7
390					ZS6	4	ZS4	6	ZS1	4	ZS1	6	ZS1	7	ZS1	10	US1	6
470					ZS6	4	ZS4	5	ZS4	7	ZS1	5	ZS1	6	ZS1	8	US1	5
560							ZS4	4	ZS4	6	ZS1	4	ZS1	5	ZS1	7	US1	4
680							ZS6	5	ZS4	5	ZS4	8	ZS1	5	ZS1	6	VS1	4
820							ZS6	4	ZS6	6	ZS4	6	ZS1	4	ZS1	5	ZS1	7
1000									ZS6	5	ZS4	5	ZS4	7	ZS1	4	ZS1	6
1200									ZS6	4	ZS4	4	ZS4	6	ZS4	7	ZS1	5
1500											ZS6	5	ZS4	5	ZS4	6	ZS1	4
1800											ZS6	4	ZS6	6	ZS4	5	ZS4	8
2200													ZS6	5	ZS4	4	ZS4	6
2700													ZS6	4	ZS6	5	ZS4	5
3300																	ZS6	6

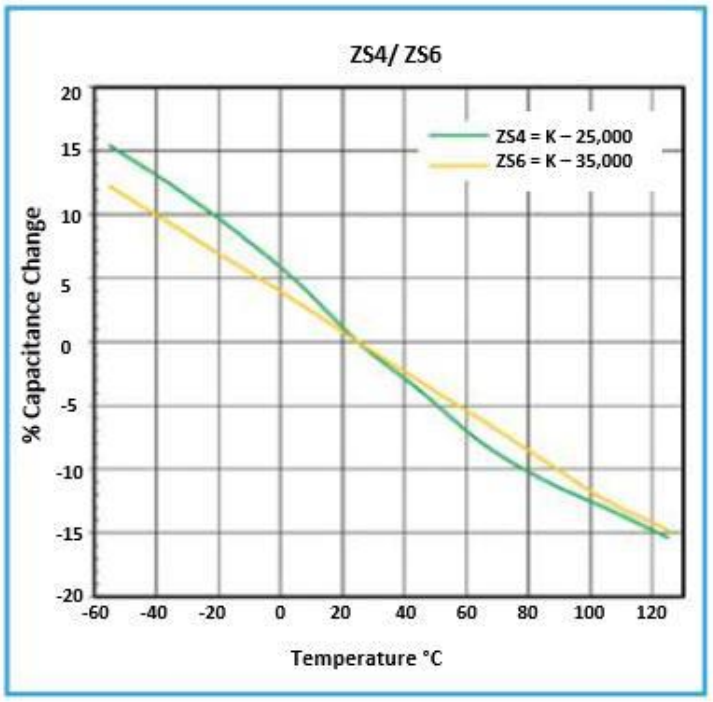
Other dielectric materials available depending on application requirements

Typical Temperature Characteristics









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