



Traditional High-Q ($\geq 10,000$) 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 10000pF
- Working Voltage: 500V
- Extended Voltage: 1500V

Product Applications

Typical Functional Applications:

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

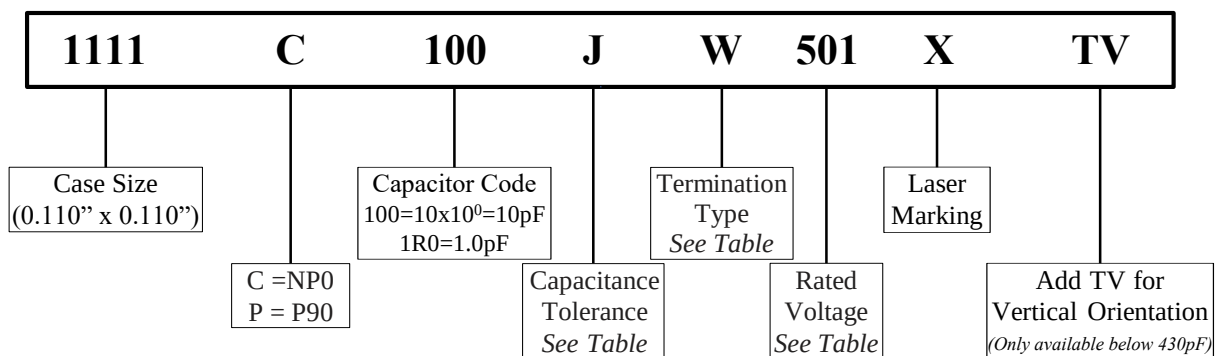
Typical Circuit Applications:

- 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



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



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± 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		Cap. pF	Cap Code	Tol.	Rated WVDC		Cap. pF	Cap Code	Tol.	Rated WVDC		Cap. pF	Cap Code	Tol.	Rated WVDC	
			Std.	Ext.				Std.	Ext.				Std.	Ext.				Std.	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			
0.5	0R5	A,B, C,D	500V	1000V or 1500V	4.7	4R7	F,G, J,K	500V	1000V or 1500V	51	510	F,G, J,K	300V	1000V	560	561	F,G, J,K	100V	200V
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	F,G, J,K	500V	1000V or 1500V	75	750	F,G, J,K	200V	600V	820	821	F,G, J,K	100V	N/A
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	500V	1000V or 1500V	110	111	F,G, J,K	300V	1000V	1200	122*	F,G, J,K	200V	N/A
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*			
1.7	1R7				15	150	F,G, J,K	500V	1000V or 1500V	160	161	F,G, J,K	200V	600V	2200	222*	F,G, J,K	100V	N/A
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	F,G, J,K	500V	1000V or 1500V	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								

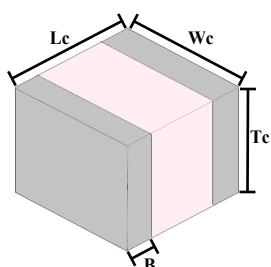
*Available in NP0 only



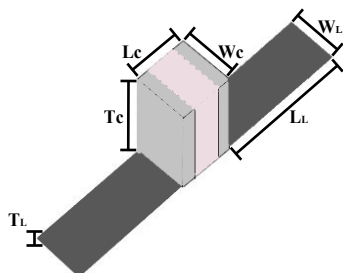
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Termination Types & Mechanical Specifications



Chip Termination:
Codes: W, L, P



Microstrip Termination:
Codes: MS, MN

Magnetic Terminations

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

Magnetic Terminations								
Code	Term	Capacitor Dimensions			Unit: inch (millimeter) Overlap B	Lead Dimensions		
		Length Lc	Width Wc	Thickness Tc		Length LL	Width WL	Thickness TL
W/L	Chip	0.110 +0.025 to -0.010 (2.79 +0.63 to -0.25)	0.110 ± .010 (2.79 ± 0.25)	0.10 (2.54 max)	0.016 ~ 0.39 (0.40 ~ 1.00)	-	-	-
MS	Microstrip	0.135 ± 0.015 (3.43 ± 0.38)	0.110 ± .010 (2.79 ± 0.25)	0.10 (2.54 max)	-	.250 (6.35) min	.093 ± .010 (2.36 ± 0.25)	.004 ± .001 (0.1 ± 0.025)

Non-Magnetic Terminations								
Code	Term	Capacitor Dimensions			Unit: inch (millimeter) Overlap B	Lead Dimensions		
		Length Lc	Width Wc	Thickness Tc		Length LL	Width WL	Thickness TL
P	Chip	0.110 +0.025 to -0.010 (2.79 +0.63 to -0.25)	0.110 ± .010 (2.79 ± 0.25)	0.10 (2.54 max)	0.016 ~ 0.39 (0.40 ~ 1.00)	-	-	-
MN	Microstrip	0.135 ± 0.015 (3.43 ± 0.38)	0.110 ± .010 (2.79 ± 0.25)	0.10 (2.54 max)	-	.250 (6.35) min	.093 ± .010 (2.36 ± 0.25)	.004 ± .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.



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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 $\leq$ 500VDC 150% of Voltage for 5 seconds, 500VDC < Rated Voltage $\leq$ 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 $\pm$ 30ppm/°C; >125°C to 200°C 0 $\pm$ 60ppm/°C P: -55°C to 200°C +90 $\pm$ 20ppm/°C
Capacitance Drift	$\pm$ 0.02% or $\pm$ 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:	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	No more than 0.5% or 0.5pF, whichever is greater.	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 $\leq$ 500VDC; 120% of Voltage for Capacitors, 500VDC < Rated Voltage $\leq$ 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.



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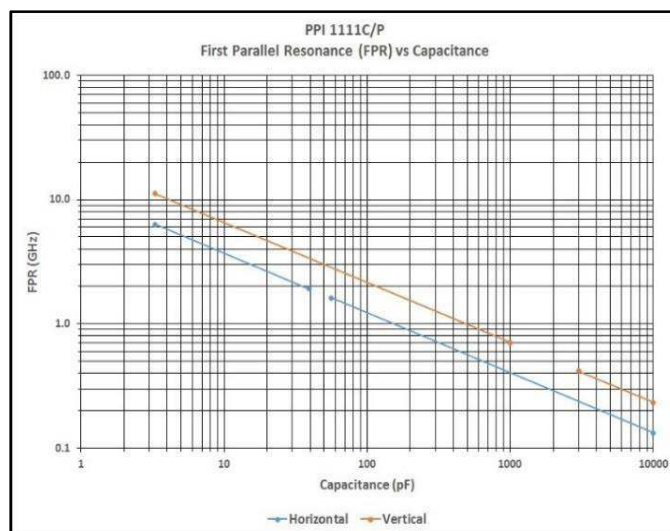
1111C/P (0.110" x 0.110")

≠ 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 $|S_{21}|$.

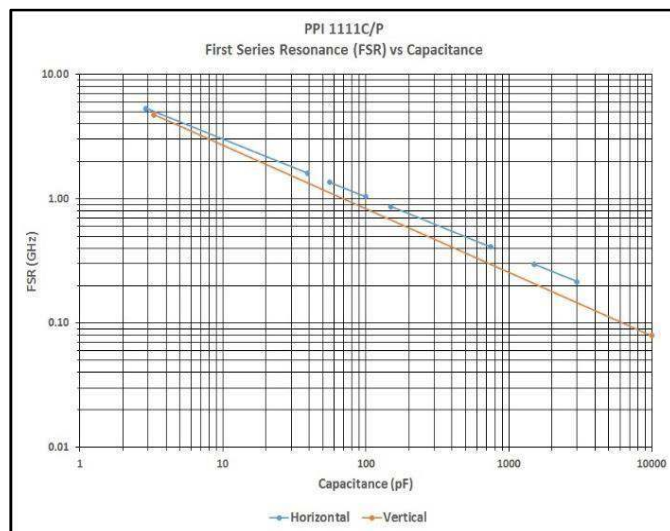
It is generally independent of substrate thickness or dielectric constant, but does depend on capacitor orientation. A horizontal orientation means the capacitor electrode planes are parallel to the plane of the substrate; a vertical orientation means the electrode planes are perpendicular to the substrate.



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



The measurement conditions are: substrate – Rogers RO4350; substrate dielectric constant = 3.66; horizontal mount substrate thickness (mils) = 50; gap in microstrip trace (mils) = 72; horizontal mount microstrip trace width (mils) = 110. 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.

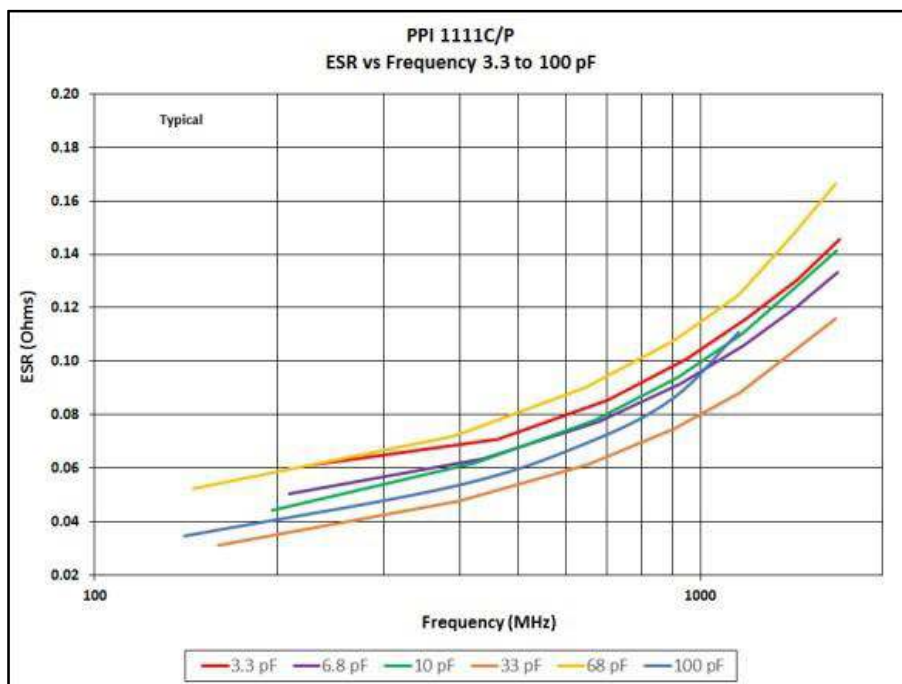


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⚡ ESR vs. Frequency

1111C/P ESR vs Frequency



1111C ESR vs Frequency



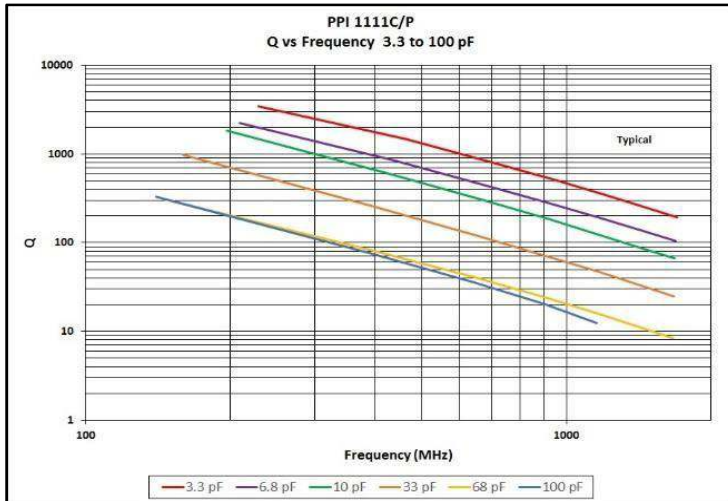


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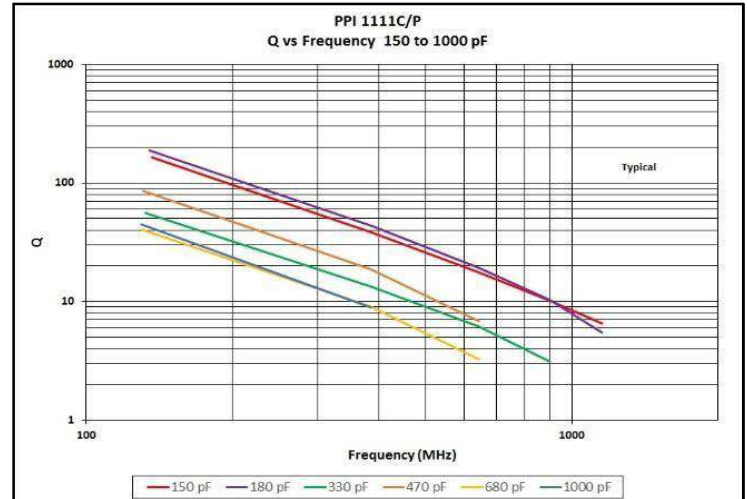
1111C/P (0.110" x 0.110")

≠ Q vs. Capacitance

1111C/P Q vs Frequency

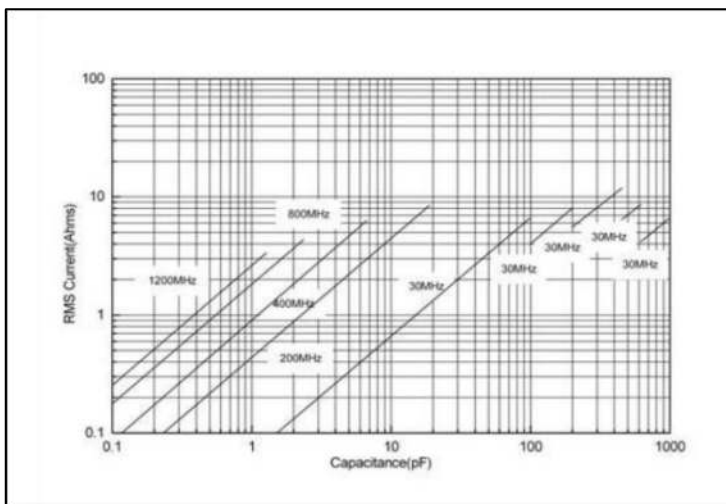


1111C Q vs Frequency

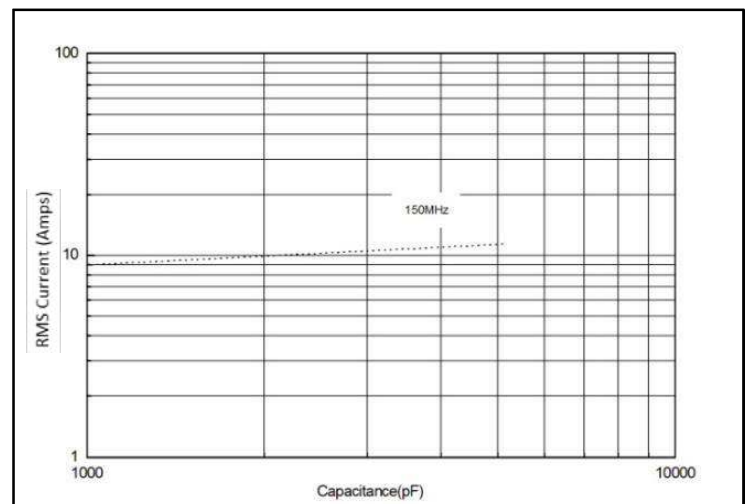


≠ Current Rating vs. Capacitance

1111C/P Current Rating vs Capacitance



1111C Current Rating vs Capacitance



The current depends on voltage limited:

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

The current depends on power dissipation limited:

$$I = \sqrt{\frac{P_{dissipation}}{ESR}}$$

Note: If the thermal resistance of mounting surface is 20°C/W, then a power dissipation of 3 W will result in the current limited we can calculate the current limited:

$$I = \sqrt{\frac{P_{dissipation}}{ESR}}$$

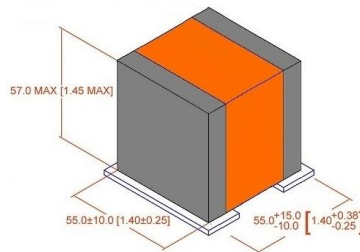


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≠ Capacitor Application Program

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



≠ Modelithics Vendor Program

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

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



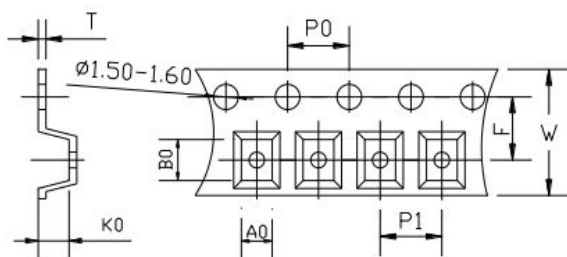


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Tape & Reel Specifications

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			



A₀B₀K₀

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

