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

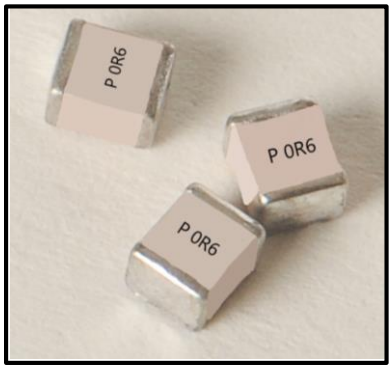
Product Applications

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

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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

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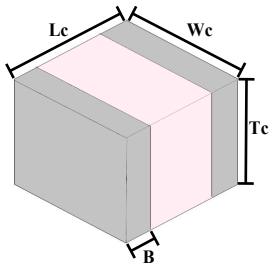
Termination Types and Codes



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.

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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.

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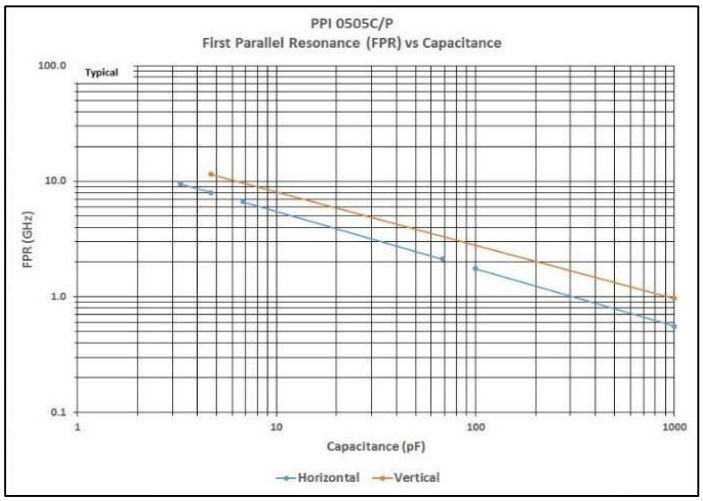
FPR -- First Parallel Resonance (FPRs)

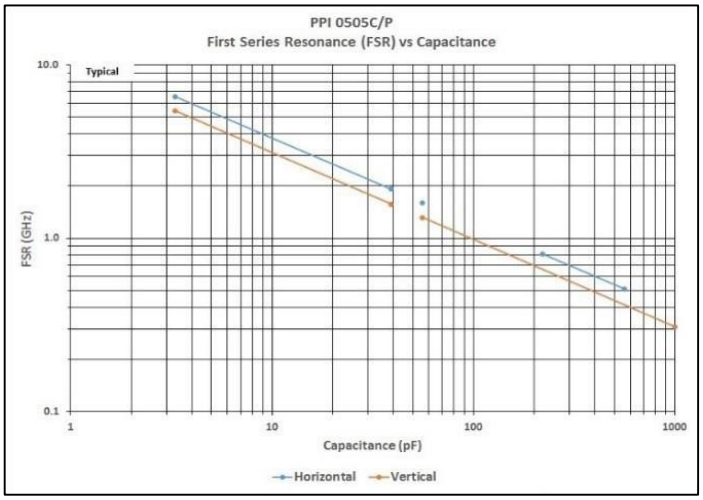


Definitions and Measurement Conditions

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

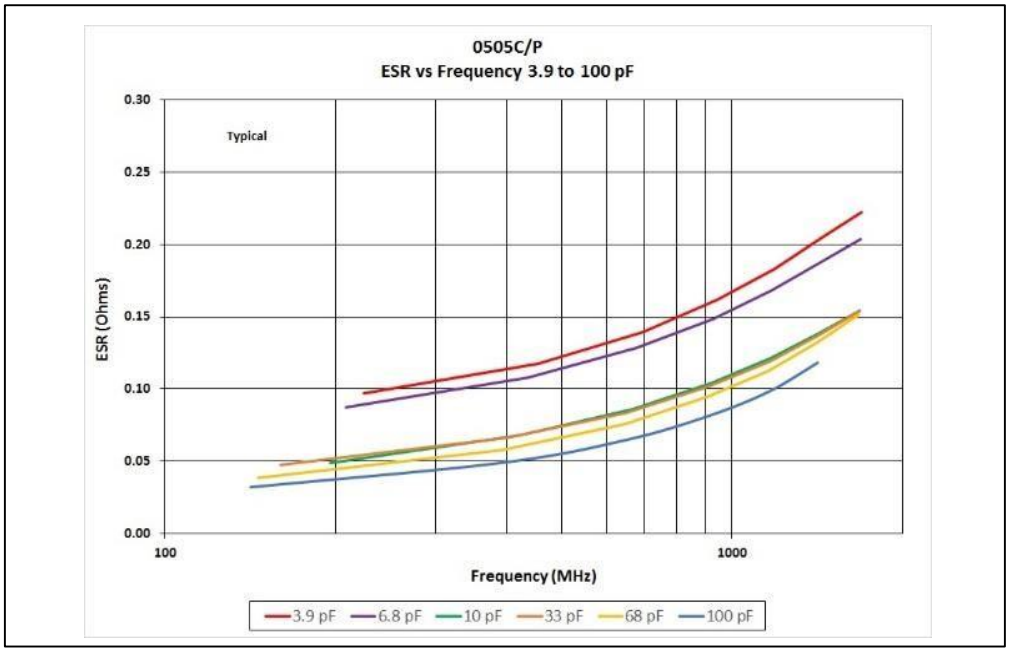
The **First Series Resonance, FSR,** is defined as the lowest frequency at which the imaginary part of the input impedance, Im[Zin], equals zero. Should Im[Zin] or the real part of the input impedance, Re[Zin], not be monotonic with frequency at frequencies lower than those at which Im[Zin] =0, the FSR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

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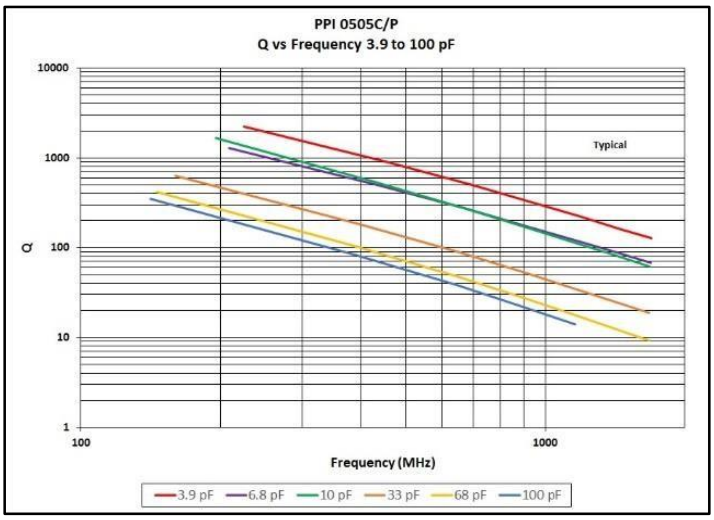
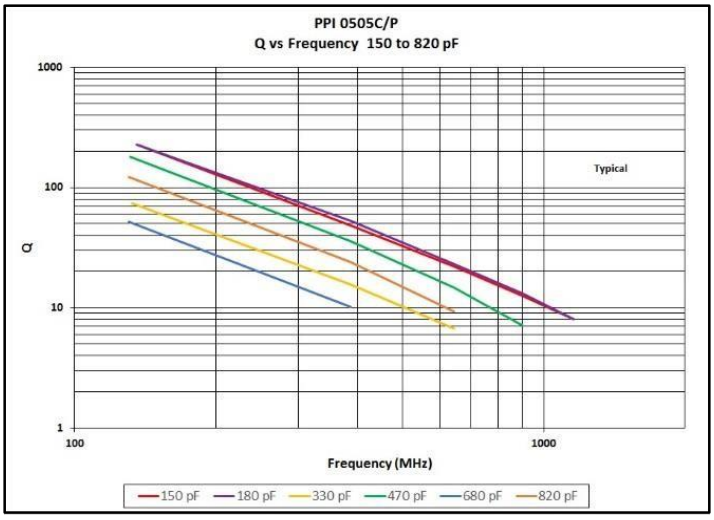
Q vs. Frequency

0505C/P Q vs Frequency

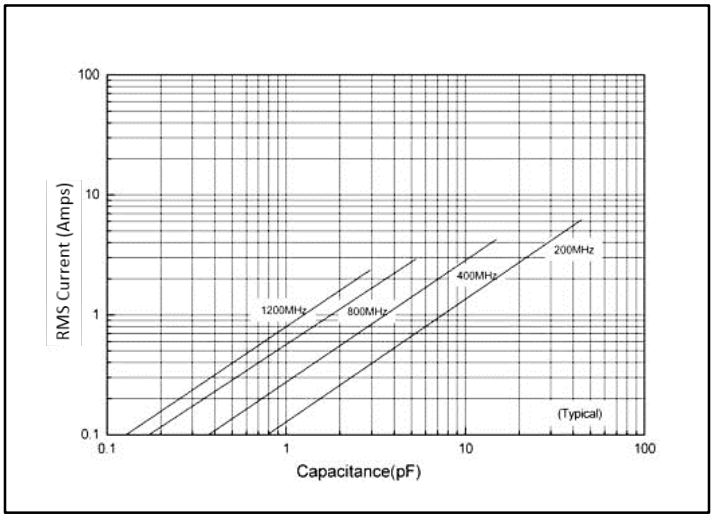


0505C Q vs Frequency

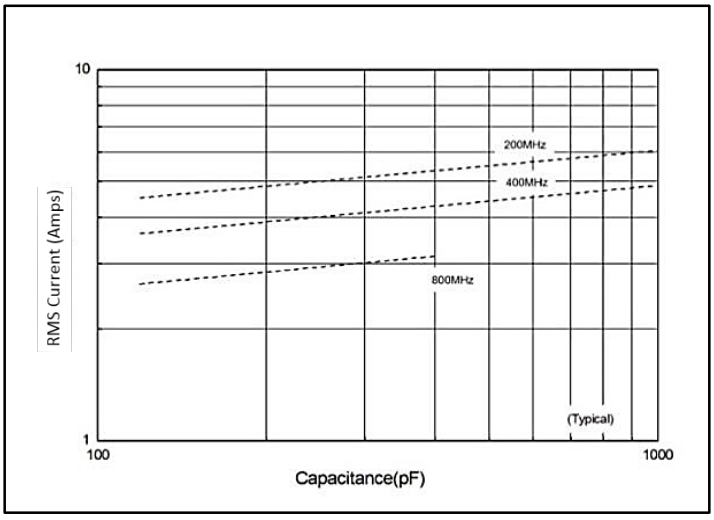


Current Rating vs. Capacitance

0505C/P Current Rating vs Capacitance



0505C Current Rating vs Capacitance



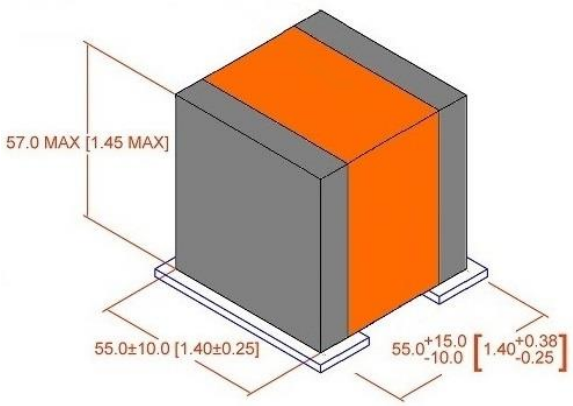
Current limits can depend on two different criteria. The first Voltage Limited Current ($I_{volt\ lim}$, represented by the solid line), the second is Power Dissipation Limited Current ($I_{pow\ diss}$).

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

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

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).

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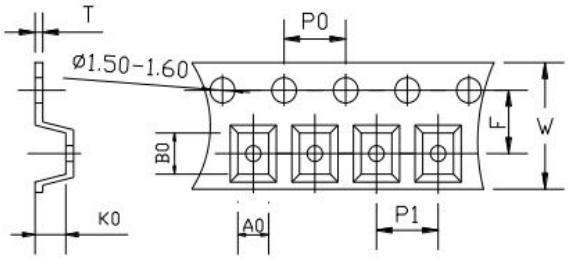
Tape & Reel Specifications

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	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			

Note: Vertical Tape & Reel not available for all values. Contact PPI for availabilty.



$A_0B_0K_0$

- 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