



RF Capacitors

High-Q, Ultra-Low Loss, SMT



Johanson High-Q Capacitors are made in North America. These lines of SMT (surface-mount), Multi-Layer High-Q, were developed for High-Q and microwave applications. RoHS compliance is standard of all unleaded parts.

Features:

- Ultra Low Loss / Low ESR
- Designed and Manufactured to Control SRFs
- EIA Case Sizes 0201 to 3838
- AEC-Q200 Available

Common Applications:

- High Frequency Communications
- All Wireless Communications
- Battery-Powered Products
- RF Power Amplifiers
- RF Generators
- Matching Networks



Product Range Summary

Series	EIA Size	Capacitance Range	Additional Features
QL	0201 (QLCD Series)	0.1 to 50pF	• Made with Silver/Palladium Electrode • Mid High-Q Performance • Exhibit NP0 Temperature Characteristics • Temperature Range: -55°C to +125°C
QC	0402 (QCCF Series)	0.1pF to 33pF	• Made with Copper Electrodes • Ultra High-Q, and Low ESR (Enhanced ESR over 1.5GHz) • Performance with NP0 • Temperature Range: -55°C to +150°C
	0603 (QCCP Series)	0.1pF to 100pF	
	0805 (QCCT Series)	0.1pF to 220pF	
QS	0402 (QSCF Series)	0.1pF to 33pF	• Made with Silver/Palladium Electrodes • Ultra High-Q, and Low ESR • Performance with NP0 • Temperature Range: -55° C to +125 ° C
	0603 (QSCP Series)	0.1pF to 100pF	
	0805 (QSCT Series)	0.3pF to 220pF	
QE	1111 (QEDB Series)	0.2pF to 1000pF	• Made with Silver/Palladium Electrodes • Excellent high-Q, low ESR • High RF power, from HF to microwave • High Voltage High-Q • Temperature Range: -55°C to +125°C • Automotive version (AEC-Q200) available upon request for 1111
	2525 (QEEV Series)	1.0pF to 2700pF	
	3838 (QEFM Series)	1.0pF to 5100pF	
QG	0805 (QGCT Series)	0.3pF to 47pF: 1000V	• Non-Magnetic • For MRI & High Inductance Applications See web for details
		51pF to 100pF: 500V	

On request: Any of the High-Q Series, highest temperature can be extended to +150°C


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Multi-Layer High-Q, Ultra-Low Loss
Mechanical Characteristics

Size	Units	Length	Width	Thickness	End Band
EIA 0201	In	.024 ± .001	.012 ± .001	.012 ± .001	.008 Max.
Metric 0603	mm	(0.60 ± 0.03)	(0.30 ± 0.03)	(0.30 ± 0.03)	(0.20 Max.)
EIA 0402	In	.040 ± .004	.020 ± .004	.020 ± .004	.010 ± .006
Metric 1005	mm	(1.02 ± 0.1)	(0.51 ± 0.1)	(0.51 ± 0.1)	(0.25 ± .15)
EIA 0603	In	.062 ± .006	.032 ± .006	.030 + .005 /- .003	.014 ± .006
Metric 1608	mm	(1.57 ± 0.15)	(0.81 ± 0.15)	(0.76 + .13 - .08)	(0.35 ± .15)
EIA 0805	In	.080 ± .008	.050 ± .008	.040 ± .006	.020 ± .010
Metric 2012	mm	(2.03 ± 0.20)	(1.27 ± 0.20)	(1.02 ± .15)	(0.50 ± .25)
EIA 1111	In	0.110	0.110	0.102 Max.	0.015
Metric 2727	mm	(2.79)	(2.79)	(2.59) Max.	(0.38)
EIA 2525	In	0.230	0.250	0.150 Max.	0.025
Metric 6363	mm	(5.84)	(6.35)	(3.81) Max.	(0.63)
EIA 3838	In	0.380	0.380	0.170 Max.	0.025
Metric 9797	mm	(9.65)	(9.65)	(4.32) Max.	(0.63)

Environmental Characteristics

	Specification	Test Parameters
Solderability	Solder coverage ≥ 90% of metalized areas No termination degradation.	Preheat chip to 120° - 150°C for 60 sec., dip terminals in rosin flux then dip in Sn62 solder @ 240° ± 5°C for 5 ± 1 sec.
Resistance to Soldering Heat	Solder coverage ≥ 90% of metalized areas No termination degradation.	Preheat device to 80° - 100°C for 60 sec. followed by 150° - 180°C for 60 sec. Dip in 260° ± 5°C solder for 10 ± 1 sec. Measure after 24 ± 2 hour cooling period.
Terminal Adhesion	Termination should not pull off. Ceramic should remain undamaged.	Linear pull force* exerted on axial leads soldered to each terminal. *0402 ≥ 2.0lbs, 0603 ≥ 4.0lbs (min.)
PCB Deflection	Termination should not pull off. Ceramic should remain undamaged.	PCB Deflection Spec
Vibration	No mechanical damage. Capacitance change: ± 2.5% or 0.25pF Q>1000 I.R. ≥ 10 G-Ohm. Breakdown voltage: 2.5 x WVDC	Cycle performed for 2 hours in each of three perpendicular directions. Frequency range 10Hz to 55 Hz to 10 Hz traversed in 1 minute. Harmonic motion amplitude: 1.5mm.
Humidity, Steady State	No mechanical damage. Capacitance change: ± 5.0% or 0.50pF max. Q>300 I.R. ≥ 1 G-Ohm. Breakdown voltage: 2.5 x WVDC	Relative humidity: 90 - 95%. Temperature: 40° ± 2°C Test time: 500 +12/-0 Hours Measure after 24 ± 2 hour cooling period
Humidity, Low Voltage	No mechanical damage. Capacitance change: ± 5.0% or 0.50pF max. Q>300 I.R. = 1 G-Ohm min. Breakdown voltage: 2.5 x WVDC	Applied voltage: 1.5 VDC, 50 mA max. Relative humidity: 85 ± 2%. Temperature: 40° ± 2°C. Test time: 240 +12 / -0 Hours Measure after 24 ± 2 hour cooling period
Thermal Cycle	No mechanical damage. Capacitance change: ± 2.5% or 0.25pF Q>2000 I.R. >10 G Ohms. Breakdown voltage: 2.5 x WVDC	5 cycles of: 30 ± 3 minutes @ -55° + 0 / -3°C, 2-3 min. @ 25°C, 30 ± 3 min. @ +125° + 3 / -0°C, 2-3 min. @ 25°C Measure after 24 ± 2 hour cooling period.
Life Test	MIL-STD-202, Method 108 No mechanical damage. Capacitance change: ± 3.0% or 0.3 pF Q>500 I.R. >1 G Ohms. Breakdown voltage: 2.5 x WVDC	Applied voltage: 200% of WVDC for capacitors rated at 500 volts DC or less. Temperature: 125° ± 3°C. Test time: 1000 + 48 - 0 hours



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Technical Notes:

 S-Parameter Application Note: <https://www.johansontechnology.com/s-parameter-app-note>

 Download Measured S-Parameters: <https://www.johansontechnology.com/s-parameter>

 Recommended Land Pattern: <https://www.johansontechnology.com/pcb-pad-layout-recommendations>

 Typical Soldering Profiles: <https://www.johansontechnology.com/typical-soldering-profile>

 RoHS Compliance: <https://www.johansontechnology.com/rohs-compliance>

Dielectric

Characteristics (NP0)	Test Parameters
Temperature Coefficient	0 ± 30ppm /°C, -55 to 150°C
Quality Factor / DF	Q >1,000 @ 1 MHz, Typical 10,000
Insulation Resistance	>10 GΩ @ 25°C, WVDC; 125°C IR is 10% of 25°C rating
Dielectric Strength	500 V ≤ 2.5 X WVDC ¹ Min., 25°C, 50 mA max* 1000 V ≤ 1.5 X WVDC ¹ Min., 25°C, 50 mA max* > 1500 = 1.2 X WVDC ¹ Min., 25°C, 50 mA max*
Test Parameters	1MHz ±50kHz, 1.0±0.2VRMS for capacitance values ≤ 1,000pF 1kHz ±50Hz, 1.0±0.2VRMS for capacitance values > 1,000pF
Available Capacitance	Size 0201: 0.2 - 100 pF Size 0402: 0.2 - 33 pF Size 0603: 0.2 - 100 pF Size 0805: 0.3 - 220 pF Size 1111: 0.2 - 1000 pF Size 2525: 0.5 - 2700 pF Size 3838: 0.5 - 5100 pF

*On request, we can extend the highest temperature to +150°C for any of our High-Q Series



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Voltage Ratings Chart

EIA Size		RF Power Applications															
		0201 (QLCD)	0402 (QSCF)	0402 (QCCF)	0603 (QSCP)	0603 (QCCP)	0805 (QSCT)	0805 (QLCT)	0805 (QCCT)	1111 (QEDB)	2525 (QEEV)	3838 (QEFM)					
Cap. Value																	
Capacitance		Tolerance															
pF	Code																
0.1	0R1	A	25/50 V	50/250 V	250V	250 V	500V			1000V							
0.2	0R2		25/50 V	50/250 V	250V	250 V	500V			1000V	500V	1500V					
0.3	0R3		25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V					
0.4	0R4		25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V					
0.5	0R5		25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V				
0.6	0R6		25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
0.7	0R7		25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
0.8	0R8		25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
0.9	0R9		25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
1.0	1R0		25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
1.1	1R1		25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
1.2	1R2		25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
1.3	1R3		25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
1.4	1R4		B	25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V	
1.5	1R5			25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V	
1.6	1R6			C	25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V
1.7	1R7				25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V
1.8	1R8		25/50 V		50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V	
1.9	1R9		D		25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V
2.0	2R0			25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V	
2.1	2R1	25/50 V		50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
2.2	2R2	25/50 V		50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
2.4	2R4	25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V			
2.7	2R7	25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V			
3.0	3R0	25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V			
3.3	3R3	25/50 V	50/250 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V			
3.6	3R6	25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V			
3.9	3R9	25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V			
4.3	4R3	25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V			
4.7	4R7	25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V			
5.1	5R1	B	25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
5.6	5R6		25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
6.2	6R2		25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
6.8	6R8		C	25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V	
7.5	7R5			25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V	
8.2	8R2	D	25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
9.1	9R1		25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
10	100	A*	25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
11	110		25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
12	120		25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
13	130		F	25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V	
15	150	25/50 V		50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
16	160	G	25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
18	180		25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
20	200	J	25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
22	220		25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
24	240	K	25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
27	270		25/50 V	50/200 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
30	300		25/50 V	50 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		
33	330		25/50 V	50 V	250V	250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V		

NOTE: A* - Tolerance only available for 0402 and 0603 sizes



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Multi-Layer High-Q, Ultra-Low Loss

Voltage Ratings Chart

EIA Size		RF Power Applications													
		0201 (QLCD)	0402 (QSCF)	0402 (QCCF)	0603 (QSCP)	0603 (QCCP)	0805 (QSCT)	0805 (QLCT)	0805 (QCCT)	1111 (QEDB)	2525 (QEEV)	3838 (QEFM)			
Cap. Value		Tolerance													
pF	Code														
36	360	F	25/50 V			250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V
39	390		25/50 V			250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V
43	430		25/50 V			250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V
47	470		25/50 V			250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V
51	510					250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V
56	560					250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V
62	620					250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V
68	680					250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V
75	750					250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V
82	820					250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V
91	910	G				250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V
100	101					250 V	500V	250 V		1000V	500V	1500V	3600V	3600V	7200V
110	111	J						250 V		500V	300V	1500V	2500V	3600V	7200V
120	121							250 V		500V	300V	1000V	2500V	3600V	7200V
130	131	K						250 V		500V	300V	1000V	2500V	3600V	7200V
150	151							250 V		500V	300V	1000V	2500V	3600V	7200V
160	161						250 V		500V	300V	1000V	2500V	3600V	7200V	
180	181						250 V		500V	300V	1000V	2500V	3600V	7200V	
200	201						250 V		500V	300V	1000V	2500V	3600V		
220	221						250 V		500V	200V	1000V	2500V	3600V		
240	241							200/500V		200V	600V	2500V	3600V		
270	271							200/500V		200V	600V	2500V	3600V		
300	301							200/500V		200V	600V	1500V	3600V		
330	331							200/500V		200V	600V	1500V	3600V		
360	361							200/500V		200V	600V	1500V	3600V		
390	391							200/500V		200V	500V	1500V	3600V		
430	431	F						200/500V		200V	500V	1500V	2500V		
470	471							500V		200V	500V	1500V	2500V		
510	511							100V		200V	500V	1000V	2500V		
560	561							100V		200V	500V	1000V	2500V		
620	621							100V		200V	500V	1000V	2500V		
680	681							50V		200V		1000V	2500V		
750	751							50V		200V		1000V	2500V		
820	821		G						50V		200V		1000V	2500V	
910	911								50V		200V		1000V	1000V	
1000	102		J						50V		200V		1000V	1000V	
1200	122							50V				1000V	1000V		
1500	152	K						50V				500V	1000V		
1800	182							50V				500V	1000V		
2200	222							50V				300V	1000V		
2700	272											300V	500V		
3300	332												500V		
3900	392												500V		
4700	472												500V		
5100	512												500V		
10000	103														


RF Capacitors
Multi-Layer High-Q, Ultra-Low Loss
HOW TO ORDER

QC	CT	102	Q	910	G	1	GV	001	K
Subfamily	Size	Voltage	DTC	Capacitance	Tol	Mark	Termination	Special Code	Pack
QS = S Series QE = E Series QL = L Series QC = C Series QG = G Series	CD = 0201 CF = 0402 CP = 0603 CT = 0805 DB = 1111 EV = 2525 FM = 3838	250 = 25V 500 = 50V 201 = 200V 251 = 250V 501 = 500V 102 = 1000V 152 = 1500V 252 = 2500V 362 = 3600V 722 = 7200V	Q = Hi-Q NP0/C0G G = NP0/C0G	1st two digits are significant; 3rd digit denotes number of zeros. 102 = 1000 pF 104 = 0.10 μ F	<10pF A = ± 0.05 pF B = ± 0.1 pF C = ± 0.25 pF D = ± 0.5 pF ≥ 10pF F = $\pm 1\%$ G = $\pm 2\%$ J = $\pm 5\%$ K = $\pm 10\%$ X = $+80\%/-20\%$	1 = No mark 2 = EIA mark 3 = Cap Code & Tol Marking Available on 0805 and larger sizes AR = Axial Wire (RoHS) AN = Axial Wire (Ni/SnPb) R1 = Radial Ribbon RR = Radial Wire (Ni/Sn RoHS) RN = Radial Wire (Ni/SnPb) ZZ = Special Code	Nickel Barrier GV = Ni/Sn (RoHS) NT = Ni/SnPb GG = Ni/Au (RoHS) Non-Mag¹ GU = Cu/Sn (RoHS) NC = Cu/SnPb Mag¹ M1 = Microstrip A2 = Axial Ribbon	001 = Default catalog item 002³ = Default for AEC-Q200 0805 - 3838 K = 5" Reel Emb E = 7" Reel Emb U = 13" Reel Emb M = 5" Reel Emb Horizontally Oriented Electrodes Q¹ = 5" Reel Emb Vertically Oriented Electrodes G¹ = 7" Reel Emb Horizontally Oriented Electrodes P¹ = 7" Reel Emb Vertically Oriented Electrodes Tape Specs conform to EIA RS481	B = Bulk W = Waffle Pack 0201 - 0603 Y = 5" Reel Paper T = 7" Reel Paper R¹ = 13" Reel Paper

Example: **QCCT102Q910G1GV001K** Capacitors High-Q MLC C-Series, 0805, Hi-Q NP0/C0G, 1,000.00V, 91.00pF $\pm 2\%$, Ni/Sn (RoHS), 5" Reel Embossed Tape

¹ - Not available for all MLCC. Contact factory for info.

² - WVDC - Working Voltage DC

³ - Qualification required for automotive application. Not available for all series. Contact factory for info.

Got questions on the part numbers?

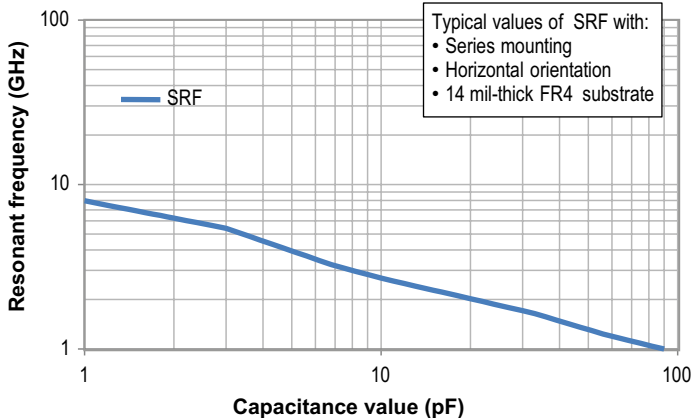
Contact the Johanson technical team at: <https://www.johansontechnology.com/ask-a-question>

RF Capacitors

Multi-Layer High-Q, Ultra-Low Loss - 0201 Size

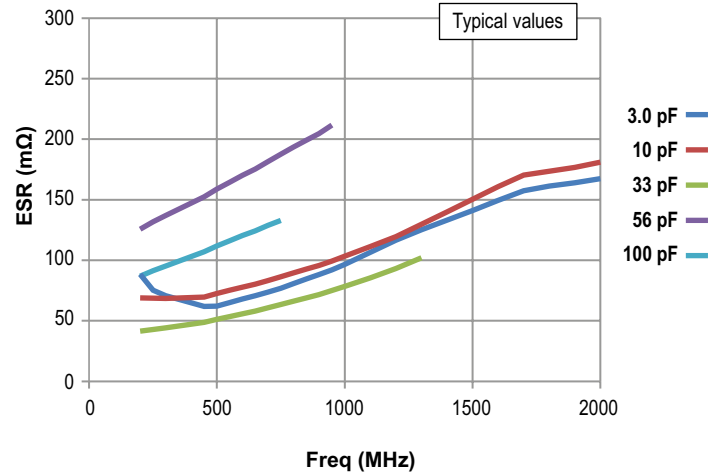
RF Characteristics

0201 - Resonant Frequency

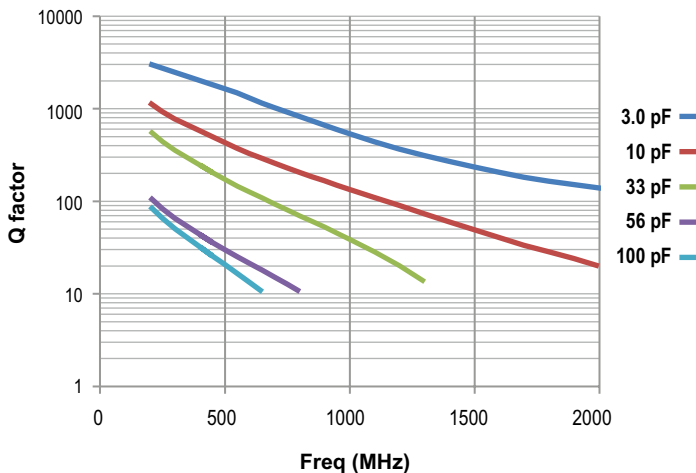


The Series Resonant Frequency is highly dependent on the substrate, pad dimensions, and measurement method. The above chart is for reference only.

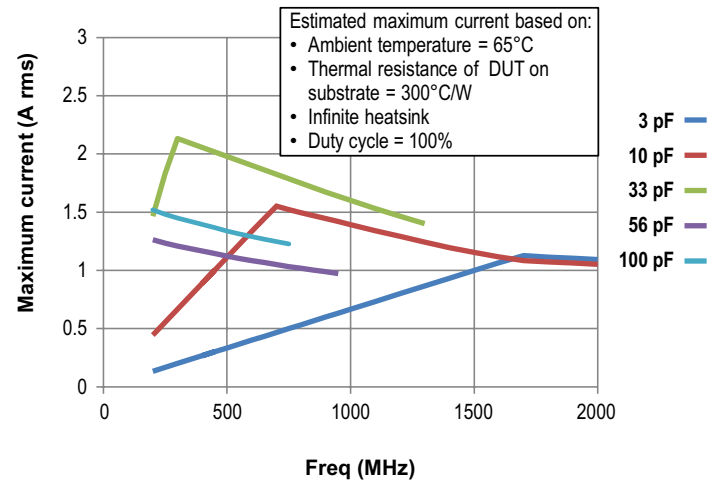
0201 - Equivalent Series Resistance (ESR)



0201 - Q factor



0201 - Max Current

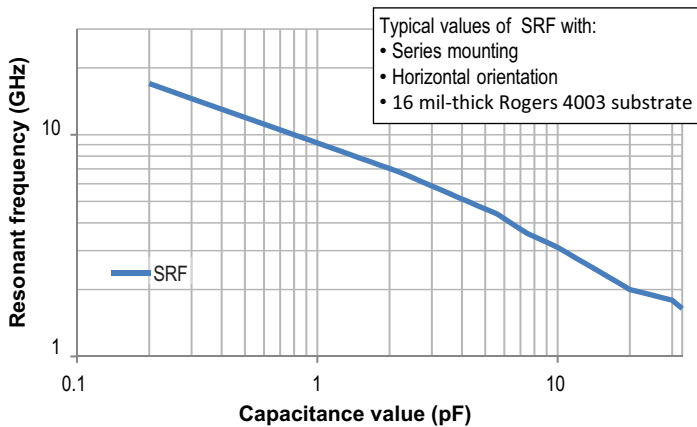


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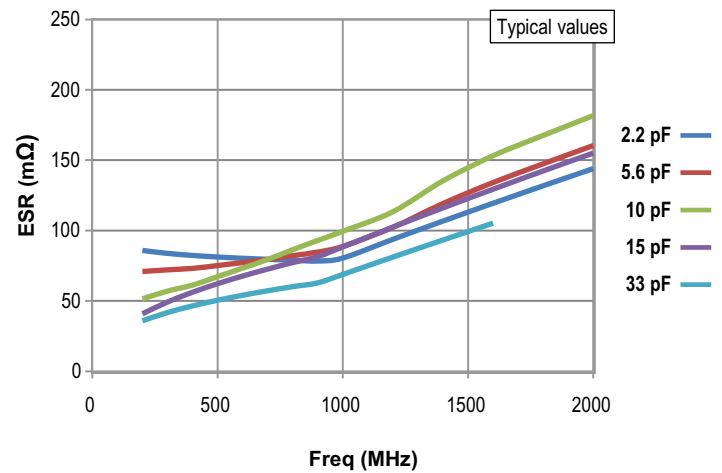
Multi-Layer High-Q, Ultra-Low Loss - 0402 Size

RF Characteristics

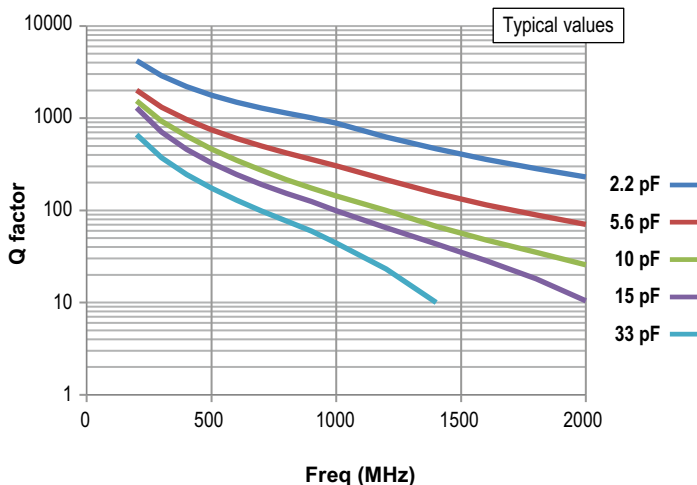
0402 - Series Resonant frequency



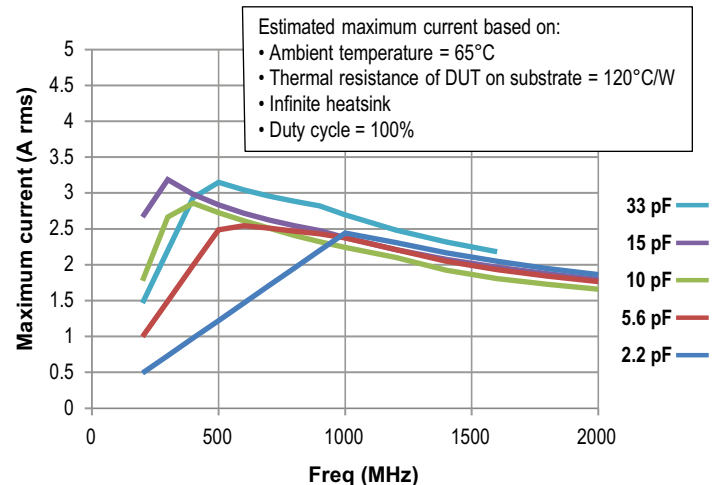
0402 - Equivalent Series Resistance (ESR)



0402 - Q factor



0402 - Max Current

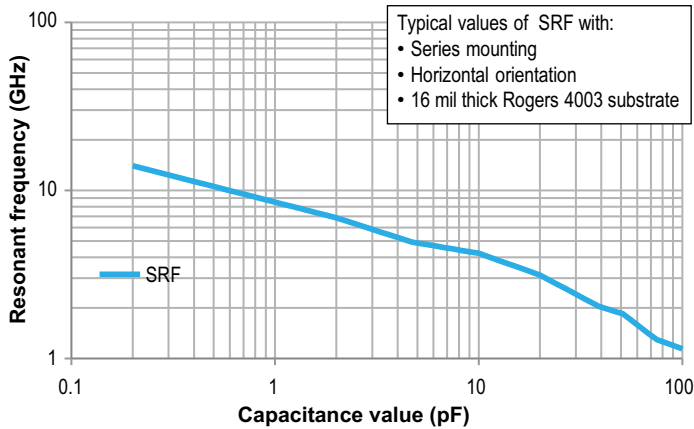


RF Capacitors

Multi-Layer High-Q, Ultra-Low Loss - 0603 Size

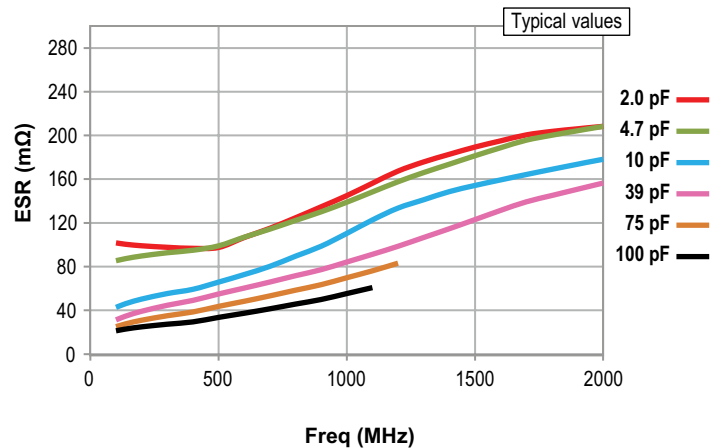
RF Characteristics

0603 - Resonant frequency

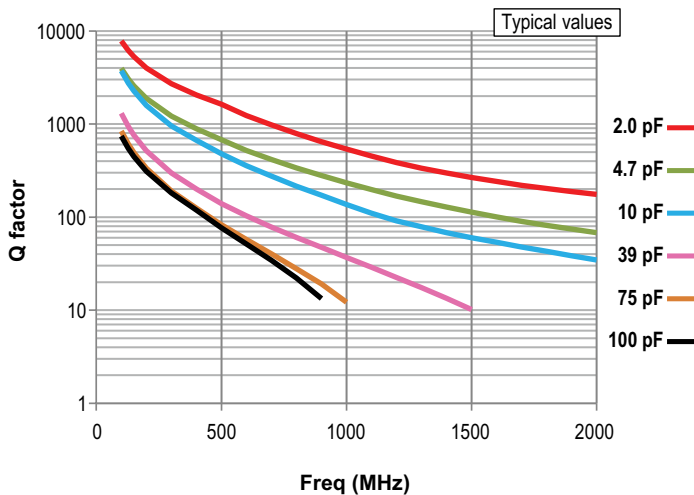


The Series Resonant Frequency is highly dependent on the substrate, pad dimensions, and measurement method. The above chart is for reference only.

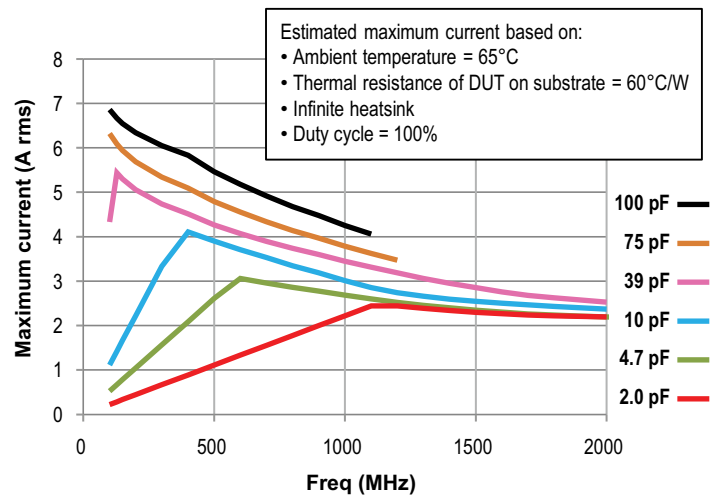
0603 - Equivalent Series Resistance (ESR)



0603 - Q factor



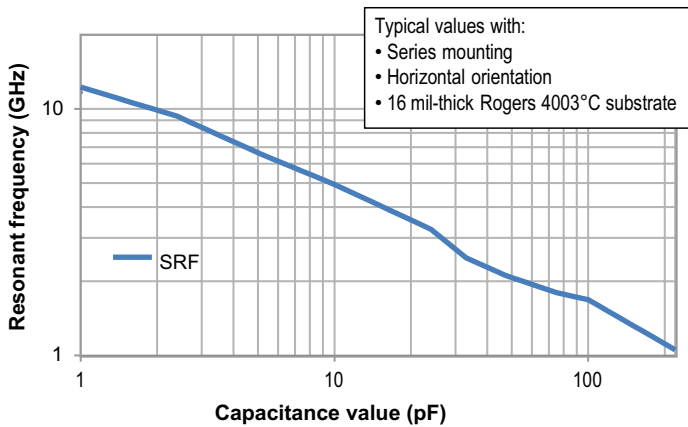
0603 - Max Current



RF Capacitors - Characteristics

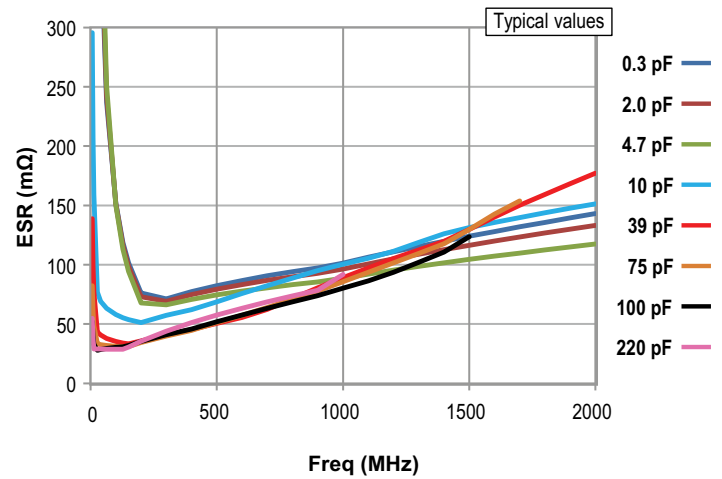
Multi-Layer High-Q, Ultra-Low Loss - 0805 Size

0805 - Resonant frequency

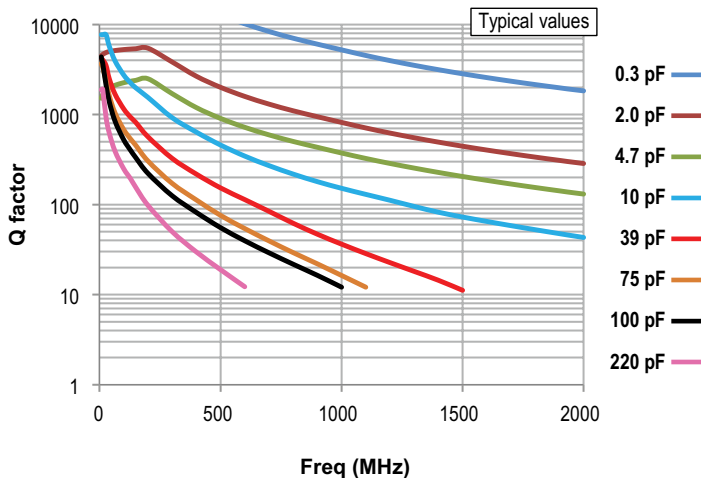


The Series Resonant Frequency is highly dependent on the substrate, pad dimensions, and measurement method. The above chart is for reference only.

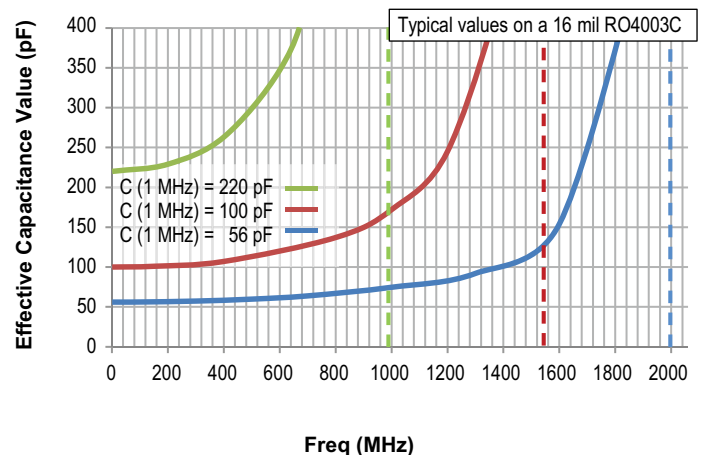
0805 - Equivalent Series Resistance (ESR)



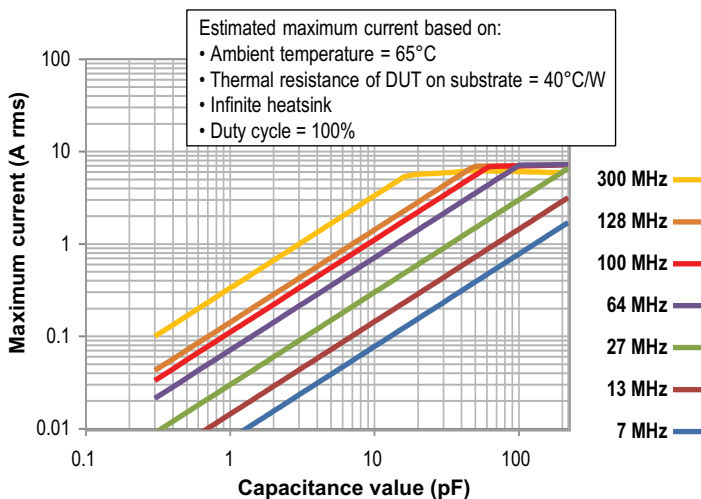
0805 - Q factor



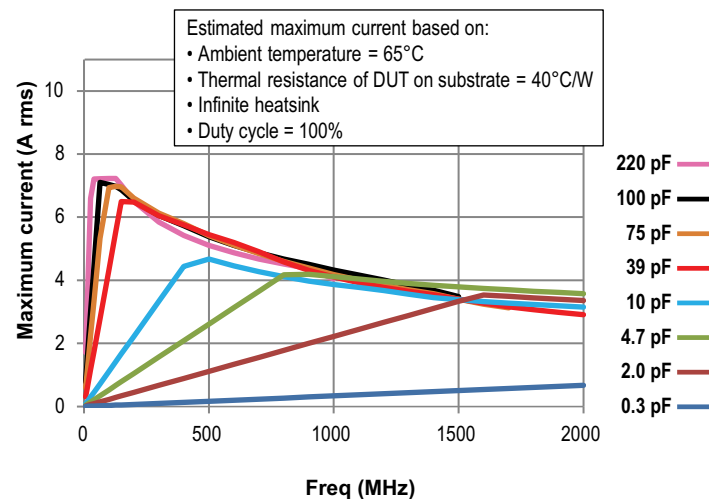
0805 - Effective capacitance value



0805 - Max Current vs. Cap. Value



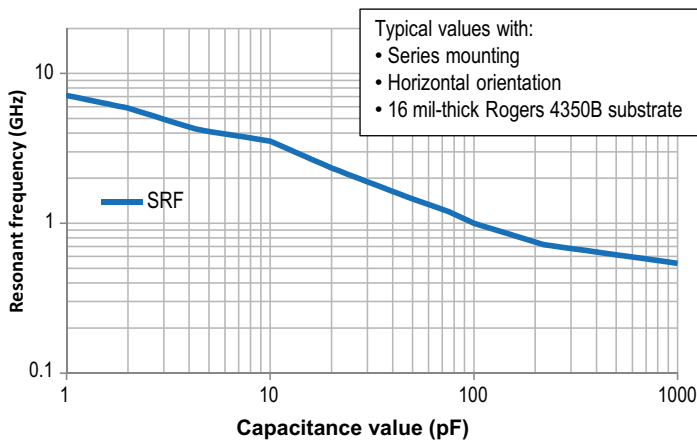
0805 - Max Current vs. Frequency



RF Capacitors - Characteristics

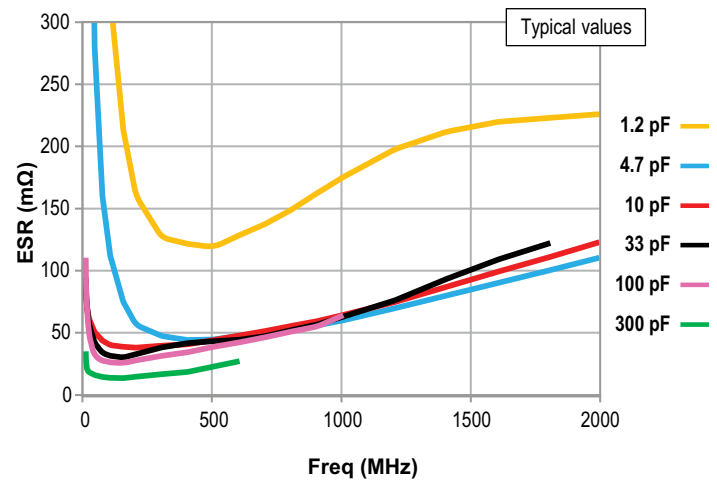
Multi-Layer High-Q, Ultra-Low Loss - 1111 Size

1111 - Resonant frequency

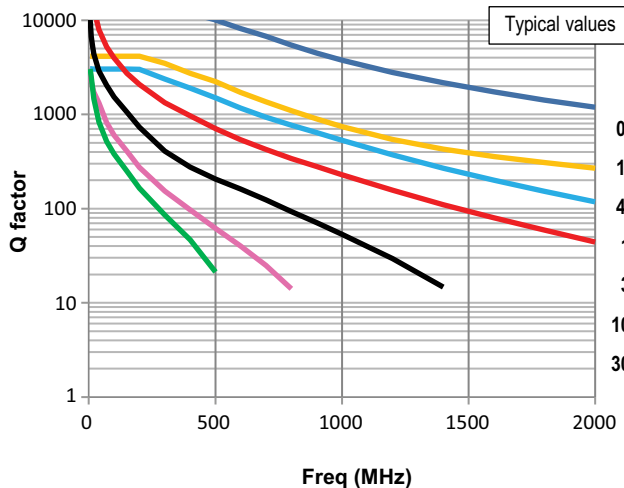


The Series Resonant Frequency is highly dependent on the substrate, pad dimensions, and measurement method. The above chart is for reference only.

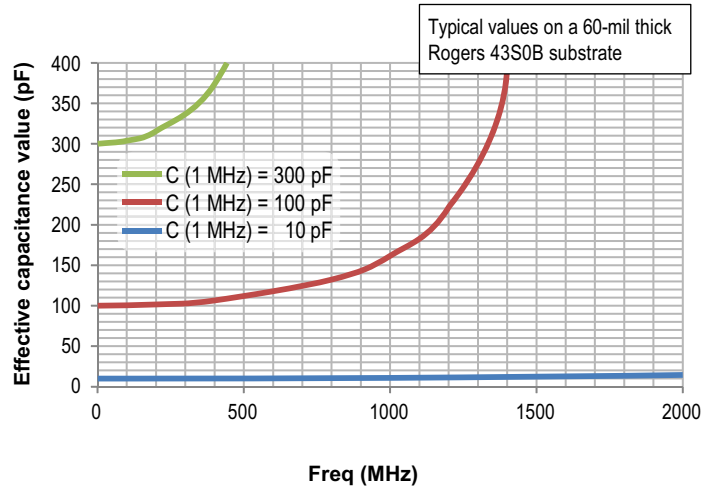
1111 - Equivalent Series Resistance (ESR)



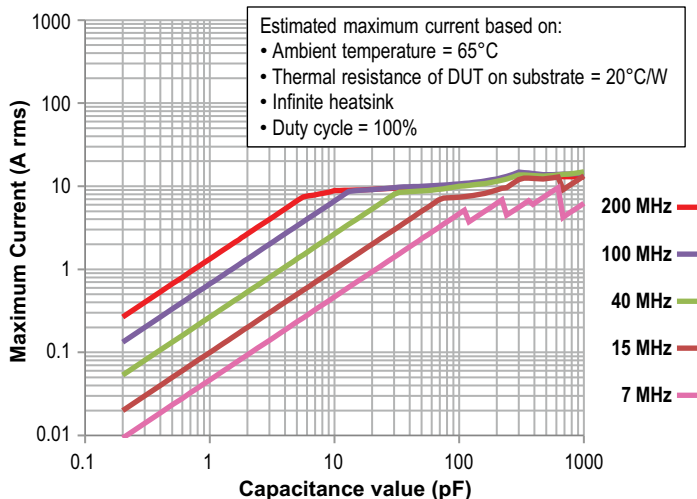
1111 - Q factor



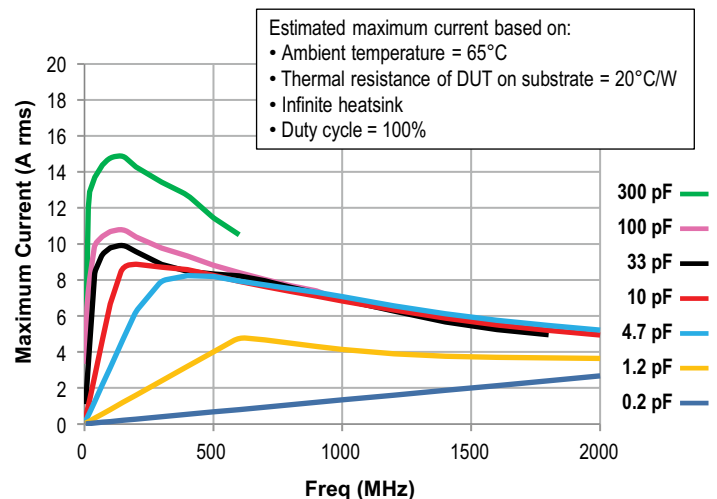
1111 - Effective capacitance value



1111 - Max Current vs. Capacitance Value



1111 - Max Current vs. Frequency

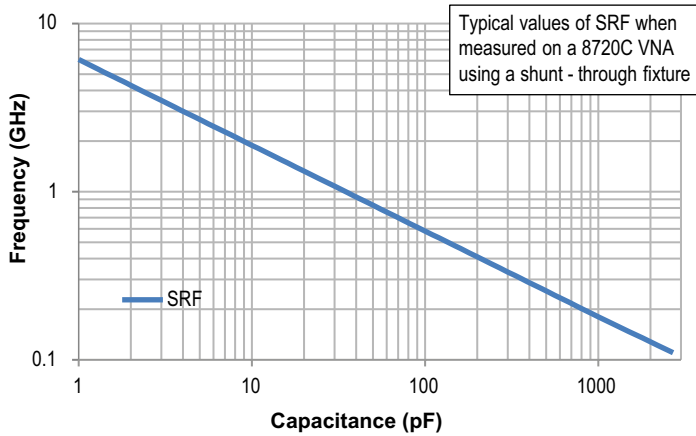


RF Capacitors

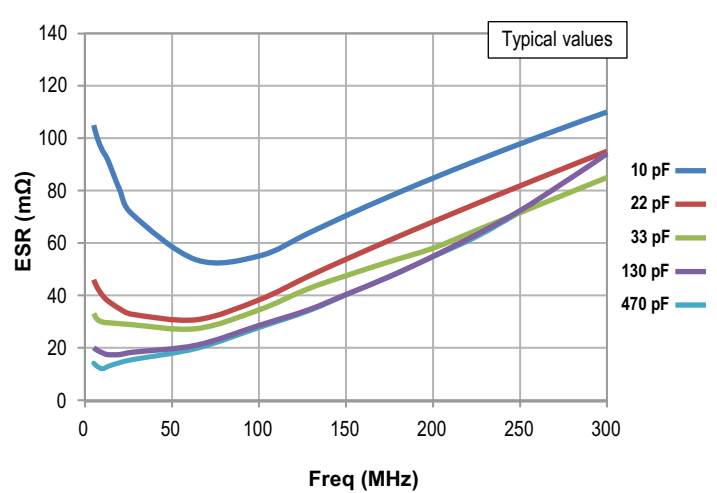
Multi-Layer High-Q, Ultra-Low Loss - 2525 Size

RF Characteristics

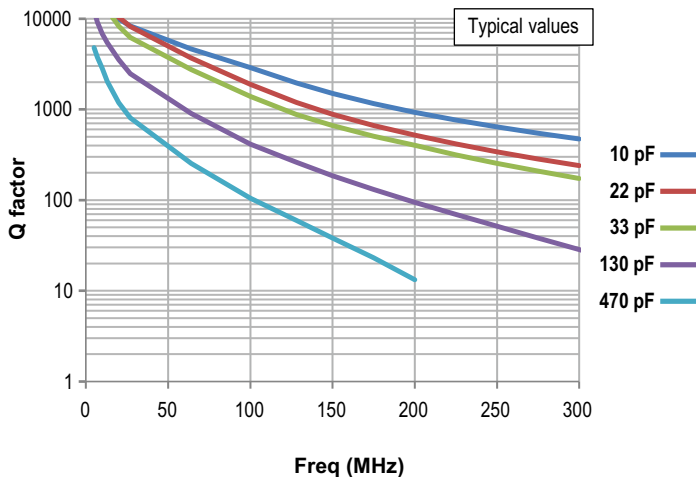
2525 - Series Resonant Frequency



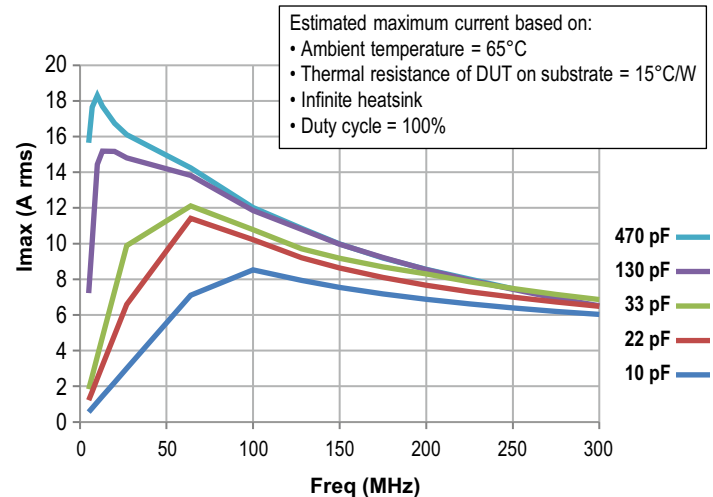
2525 - Equivalent Series Resistance (ESR)



2525 - Q factor



2525 - Max Current vs. Frequency

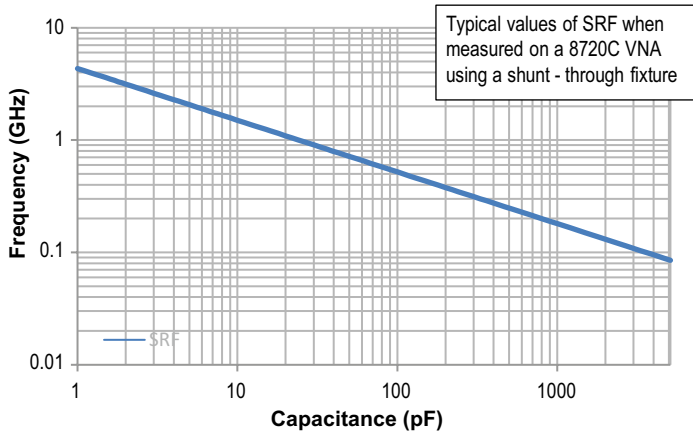


RF Capacitors

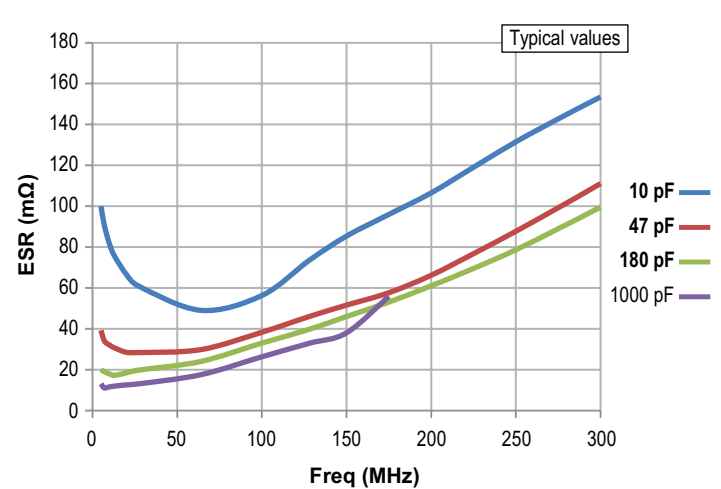
Multi-Layer High-Q, Ultra-Low Loss - 3838 Size

RF Characteristics

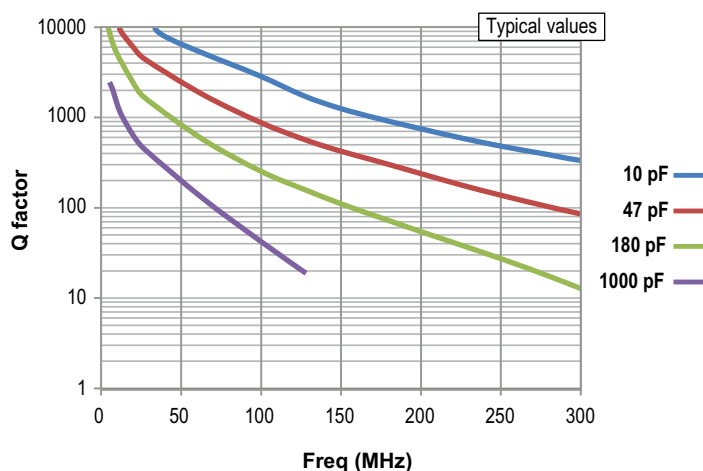
3838 - Resonant Frequency



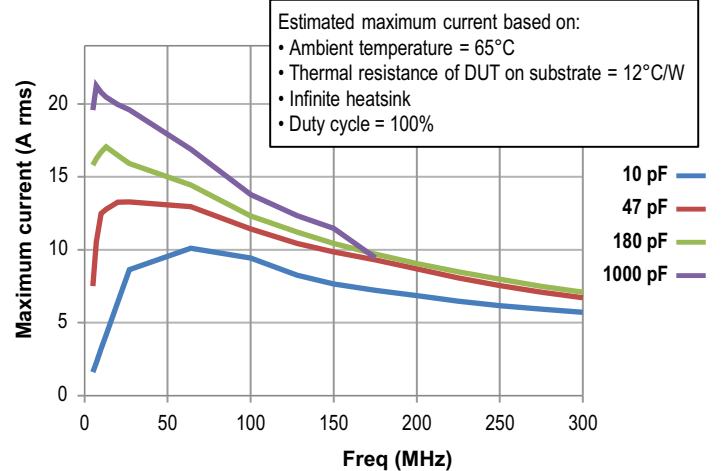
3838 - Equivalent Series Resistance (ESR)



3838 - Q factor



3838 - Max Current vs. Frequency





RF Capacitors

High-Q Porcelain P90 Capacitors - QP Series



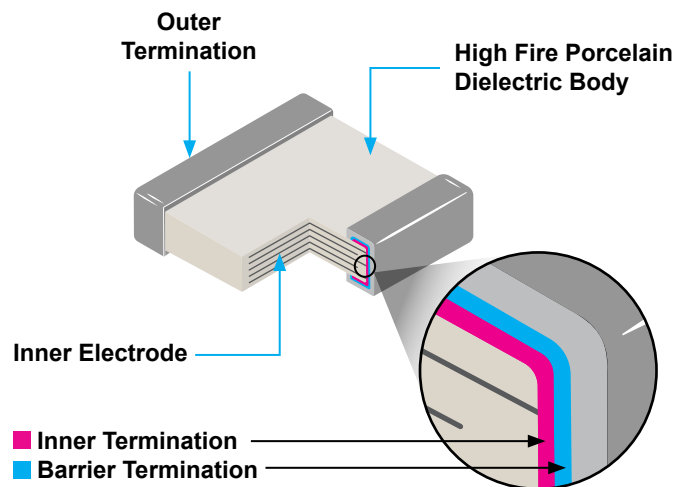
Features:

- Non-Magnetic Construction
- High Fire Porcelain Dielectric Body
- Highly Reliable Low Loss Performance
- EIA Case Sizes: 1111, 2525, 3838 and 7676
- Low Frequency Power Handling Performance: <100MHZ
- Tape & Reel for Surface Mount Assembly 7" Reels Standard
- External Termination Layer on Chip: 100% Sn Standard (RoHS) and SnPb Optional
- Enhanced High-Q / Low Loss P90 – Lower Loss Than Standard NP0
- P90 Temperature Coefficient: -55°C to +150°C (-65°F to +302°F)
- Controlled Series Resonant Frequencies and Parallel Resonant Frequencies (SRF/PRF)

Common Applications:

- RF Matching and Filter Networks
- High Inductance Environments
- Decoupling, Bypass, and DC Block
- Cellular Base Station Equipment
- RF and Microwave Test Equipment
- MRI Coil Matching
- Broadband Wireless Equipment
- High Voltage RF Requirements
- High Power Radio and Radar
- Plasma Generator Equipment
- High Voltage RF Resonant Circuits

Basic Construction



Advantages of a Low Loss Capacitor:

- Increased power output and higher efficiency from RF power amplifiers
- Reduced amount of heat generated through ultra-low ESR / High-Q
- Signal to noise ratio and overall noise temperature can be improved by lower losses
- Lower in-band insertion loss (S21) when used in filter networks
- Lower resistivity through the heat generation plane to transfer heat allowing higher power dissipation



RF Capacitors

High-Q Porcelain P90 Capacitors - QP Series

External Capacitor Dimensions

Size Code	Units	Length "L"	Width "W"	Thickness "T"	End Band "EB"	Mechanical Characteristics
1111 DB	In	.110+.020 -.010	0.110±.010	0.100 max.	0.024 max	
	mm	2.79 +0.51 -0.25	2.79±0.25	2.54 max.	.61 max	
2525 EV	In	.225+.025 - .010	0.250±.015	0.150 max.	0.020 to 0.047	
	mm	5.72 +0.64 -0.25	6.35±0.38	3.81 max.	0.51 to 1.19	
3838 FM	In	.380+.015 -.010	0.380±.010	0.170 max.	0.024 to 0.059	
	mm	9.65 +0.38 -0.25	9.65±0.25	4.32 max.	0.61 to 1.50	
7676 KG	In	0.760 ± 0.015 - 0.010	0.760± 0.010	0.197 max	0.024 to 0.059	
	mm	19.3 + 0.28 to 0.25	19.3 ± 0.25	5.00 max	0.60 ± 1.50	

Electrical Characteristics

Characteristics	Test Parameters
Dielectric Strength	Ultra-Low Loss, High-Q NP0
Rated Voltage (VDC)	200 to 8000 Volts DC (See List Below)
Capacitance Range (EIA)	0.2 to 20000 pF (See List Below)
Capacitance Tolerance	A, B, C, D, F, G, J, K
Test Parameters	1 MHz ± 50 kHz @ 1.0 ± 0.2 VRMS, 25°C for <1000pF 1 kHz ± 50 kHz @ 1.0 ± 0.2 VRMS, 25°C for >1000pF
Temperature Coefficient	P90 -55° to 125°C +90ppm +/- 20ppm P90 125° to 200°C +90ppm +/- 30ppm
Dissipation Factor	0.1% maximum
Quality Factor	Q > 1,000 @ 1 MHz 50 kHz, 25°C, 1.0 VRMS for cap < 1000pF Q > 1,000 @ 1 kHz 50 Hz, 25°C, 1.0 VRMS for cap > 1000pF Typically, greater than 10,000
Insulation Resistance	> 100 GΩ minimum at 25°C, Test Voltage 500V >10 GΩ @ 125°C, Test Voltage 500V
Operating Environment Range	-55° to +200°C
Storage Post Assembly Non-Operating	-65° to 200°C
Storage Environment in packaging	Tape & Reeled: 5 to 40 C & 20% to 70% RH
Breakdown Voltage (DWV)	250% of Rated Voltage for 5 sec for rated voltage <500V 150% of Rated Voltage for 5 sec for 500V < rated voltage <1250V 120% of Rated Voltage for 5 sec for rated voltage > 1250V



RF Capacitors

High-Q Porcelain P90 Capacitors - QP Series

Capacitance and Voltage Range

Case Size EIA (Metric)	Standard Capacitance and Rated Voltages (0.2 pF to 7.5 pF)																																
	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.4	2.7	3.0	3.3	3.6	3.9	4.3	4.7	5.1	5.6	6.2	6.8
1111 (2828)	1500V																																
2525 (6464)				3600V																													
3838 (9696)					7200V																												
7676 (193193)																										8000V							

EIA (Metric)	Case Size	Standard Capacitance and Rated Voltages (8.2 pF to 100 pF)																											
		8.2	9.1	10	11	12	13	14	15	16	18	20	22	24	27	30	33	36	39	43	47	51	56	62	68	75	82	91	100
1111 (2828)		1500V																											
2525 (6464)		3600V																											
3838 (9696)		7200V																											
7676 (193193)		8000V																											

EIA (Metric)	Case Size	Standard Capacitance and Rated Voltages (110 pF to 1200 pF)																							
	110	120	130	140	150	160	180	200	220	240	270	300	360	390	430	470	510	560	620	680	750	820	910	1000	1200
1111 (2828)	1000V								600V								300V								
2525 (6464)	3000V										2000V						1500V								
3838 (9696)	7200V							3600V							2500V							1000V			
7676 (193193)	8000V									5000V															



RF Capacitors

High-Q Porcelain P90 Capacitors - QP Series

Capacitance and Voltage Range

EIA (Metric)	Caes Size	Standard Capacitance and Rated Voltages (1500 pF to 20000 pF)																			
		1500	1800	2200	2400	2700	3300	3900	4700	5100	5600	6200	6800	7500	8200	9100	10000	12000	15000	18000	20000
1111 (2828)																					
2525 (6464)		500V																			
3838 (9696)		1000V			500V																
7676 (193193)		5000V										3000V						2000V			

HOW TO ORDER

QP	DB	152	9	1R0	J	1	GU	001	E
Subfamily	Size	Voltage	DTC	Capacitance	Tolerance	Mark	Termination	Special Code	Pack
QP = High-Q P Series	DB = 1111 EV = 2525 FM = 3838 KG = 7676	201 = 200V 501 = 500V 601 = 600V 102 = 1000V 152 = 1500V 202 = 2000V 252 = 2500V 362 = 3600V 502 = 5000V 722 = 7200V 802 = 8000V ZZZ = Special Code	9 = Hi-Q P90	1st two digits are significant; 3rd digit denotes number of zeros. 1R0 = 1 pF 150 = 15 pF 472 = 4,700 pF + Alpha Cap Codes ZZZ = Special Code	<10pF T = ± 0.02 pF A = ± 0.05 pF B = ± 0.1 pF C = ± 0.25 pF D = ± 0.5 pF ≥ 10pF F = $\pm 1\%$ G = $\pm 2\%$ H = $\pm 3\%$ J = $\pm 5\%$ K = $\pm 10\%$ Z = Special Code	1 = No Mark 2 = EIA Mark 3 = Cap Code & Tol Z = Special Code	Non-Mag¹ GU = Cu/Sn (RoHS) NC = Cu/SnPb GV = Ni/Sn (RoHS) NT = Ni/SnPb Leaded AR = Axial Wire Lead (Ni/Sn RoHS) AN = Axial Wire Lead (Ni/SnPb) A2 = Axial Ribbon Lead M1 = Microstrip Lead M2 = Microstrip Lead - Short R1 = Radial Wire (Ni/Sn RoHS) RR = Radial Wire (Ni/SnPb) RN = Radial Wire (Ni/Sn/Pb)	001 = Default catalog item 003 = 1st Special Code	B = Bulk C = Non-Conductive Bags W = Waffle Pack Embossed Tape K = 5" Reel Emb Tape E = 7" Reel Emb Tape U = 13" Reel Emb Tape

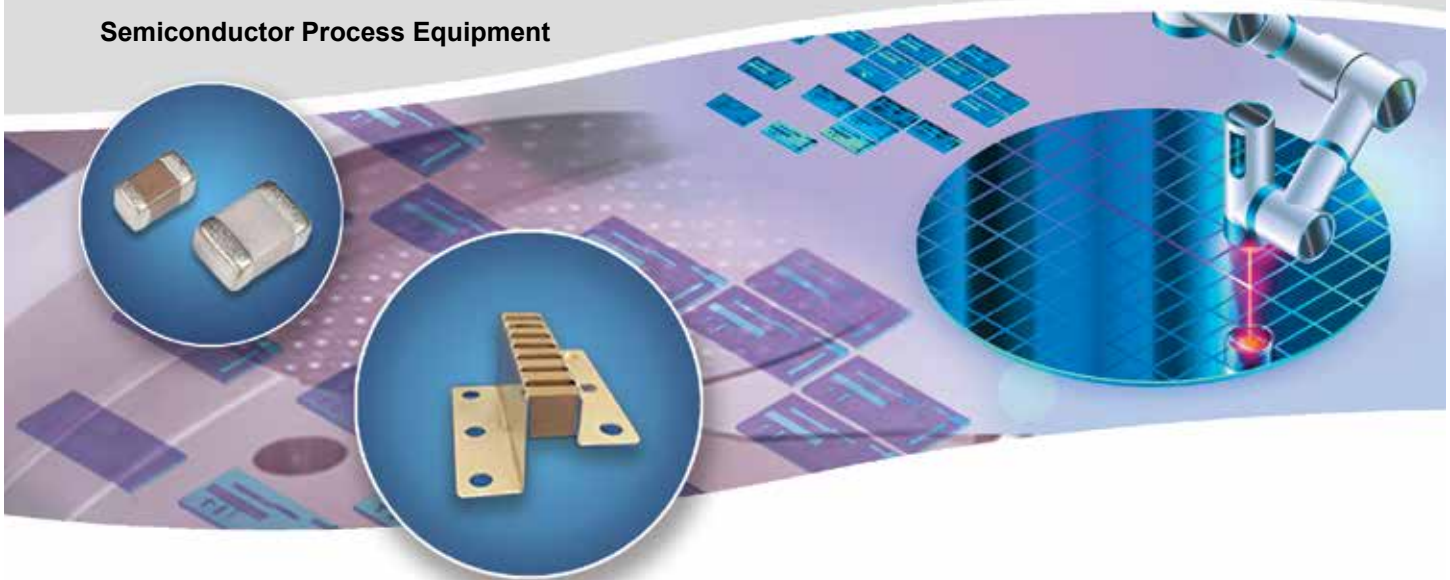
Example: QPDB15291R0J1GU001E Capacitors High-Q MLC P-Series, 1111, H1500V, Hi-Q P90, 1pF, $\pm 5\%$, No Mark, Cu/Sn (RoHS), Default catalog item, 7" Reel Embossed Tape



RF Capacitors

Power High-Q, & High Voltage Assemblies

Semiconductor Process Equipment



Optimized to meet your specific requirements. Our engineers will work with you to optimize the design, evaluate trade-offs (dimensions, cost, voltage, power and more. [Contact Johanson engineers for your specific needs.](#)

Features:

- NP0/COG Temperature Stability
- Conformal Quoting When Required
- Made with High Temperature Solder (melting point near 300°C)
- Matched Capacitance Tolerances
- Many Possible Materials, and Plating Types for the Leads
- Consistent Performance Lot-to-Lot, Month-to-Month

Common Applications:

- RF Power Generators
- MRI Transmit Coil
- RF Induction Heating
- RF Plasma Generator
- RF Power Amplifiers
- Matching Box

