Non-Magnetic Capacitors - High Q, C0G/NP0, X7R - 16V to 7.2kV

knowles
DLI•JohansonMFG•Novacap•Syfer•Voltronics

MLC capacitors with silver/palladium (Ag/Pd) terminations have often been used in medical applications where non-magnetic components are required, for example in MRI equipment - however, conventional nickel barrier terminations are not suitable due to their magnetic properties. In addition, RoHS requirement to use lead-free solders would cause an increase in soldering temperatures and cause solder leaching problems for the Ag/Pd termination. This has meant alternatives have had to be found and one solution is to use a copper barrier instead of a nickel barrier, with a tin finish on top. This non-magnetic termination is offered with selected non-magnetic C0G/NP0, High Q and X7R dielectrics, providing a fully non-magnetic component (μr = 1.0000).

To meet high temperature 260ºC soldering reflow profiles as detailed in J-STD-020, C0G/NP0 dielectrics are supplied with FlexiCap™ or sintered termination whilst X7R dielectrics are supplied only with the FlexiCap™ termination.

Available in chip or ribbon leaded format for certain case sizes (consult sales office).

High Q, C0G/NP0 - minimum/maximum capacitance values

Chip Size	0402	0603	0505	0805	1206	1111 1210	1808	1812	2220
Min Cap	0.1pF	0.1pF	0.2pF	0.2pF	0.5pF	0.3pF	1.0pF	1.0pF	2.0pF
50V 63V	22pF	100pF	220pF	470pF	1.5nF	-	-	-	-
100V	15pF	68pF	150pF	330pF	1.0nF	2.2nF	2.2nF	4.7nF	10nF
150V	10pF	47pF	100pF	220pF	680pF	1.5nF	1.5nF	3.3nF	6.8nF
200V 250V	6.8pF	33pF	56pF	150pF	470pF	1.0nF	1.0nF	2.2nF	4.7nF
300V	-	27pF	47pF	120pF	390pF	820pF	820pF	1.8nF	3.9nF
500V				68pF	270pF	680pF	680pF	1.5nF	3.3nF
630V				-	150pF	390pF	390pF	1.0nF	2.2nF
1000V				-	82pF	220pF	220pF	680pF	1.5nF
2000V				-	18pF	68pF	68pF	150pF	470pF
3000V				-	-	-	-	68pF	150pF

Min Capacitance Tolerance
±0.05pF (<4.7pF)
0.1pF (≥4.7pF & <10pF)
±1% (≥10pF)

X7R - minimum/maximum capacitance values

Chip Size	0402	0603	0805	1206	1210	1808	1812	2220
Min Cap	47pF	100pF	330pF	680pF	1.5nF	2.2nF	3.3nF	6.8nF
16V	10nF	100nF	330nF	1.0μF	1.5μF	1.5μF	3.3μF	5.6μF
25V	6.8nF	68nF	220nF	820nF	1.2μF	1.2μF	2.2μF	4.7μF
50V 63V	4.7nF	47nF	150nF	470nF	1.0μF	680nF	1.5μF	3.3μF
100V	1.5nF	10nF	47nF	150nF	470nF	330nF	1.0μF	1.5μF
200V 250V	680pF	5.6nF	27nF	100nF	220nF	180nF	470nF	1.0μF
500V	-	1.5nF	8.2nF	33nF	100nF	100nF	270nF	560nF
630V			4.7nF	10nF	27nF	33nF	150nF	330nF
1000V			3.3nF	4.7nF	15nF	18nF	56nF	120nF
1200V			-	3.3nF	10nF	10nF	33nF	82nF
1500V			-	2.7nF	6.8nF	6.8nF	22nF	47nF
2000V			-	2.2nF	4.7nF	4.7nF	10nF	27nF

Min Capacitance Tolerance
±5%

High Q, C0G/NP0 High Power RF capacitors - minimum/maximum capacitance values

A range of ultra-low loss High Q ceramic capacitors with C0G/NP0 characteristics suitable for high power applications where minimal power loss and very low self heating is demanded.

Common applications include MRI body coils and wireless charging systems operating in the kHz and MHz frequencies.

Available in chip or ribbon leaded format.

Chip size	Case size 25 - 2225		Case size 40 - 4040	
	Min.	Max.	Min.	Max.
200V	6.2nF	10nF	16nF	27nF
500V	5.1nF	5.6nF	13nF	15nF
630V	3.9nF	4.7nF	12nF	12nF
1kV	1.2nF	3.3nF	5.6nF	10nF
2kV	510pF	1.0nF	1.6nF	5.1nF
3kV	1pF	47*/470pF	910pF	1.5nF
4kV			620pF	820pF
5kV			390pF	560pF
6kV			160pF	330pF
7.0/7.2kV			1pF	56**/150pF

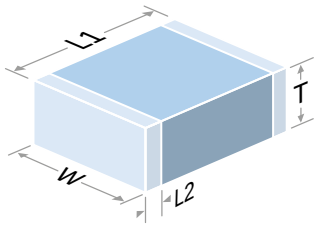
*47pF max. for dual rated @2.5kVac 30MHz
**56pF max. for dual rated @5kVac 30MHz.

Can be ordered as Syfer or Voltronics parts.

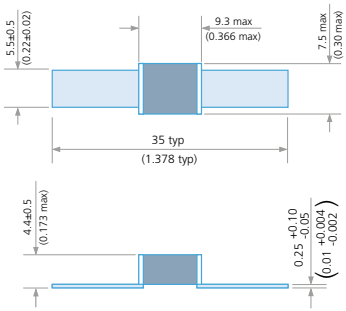
Non-Magnetic Capacitors - High Q, C0G/NP0, X7R - 16V to 7.2kV

Surface Mount See page 20 for dimensions

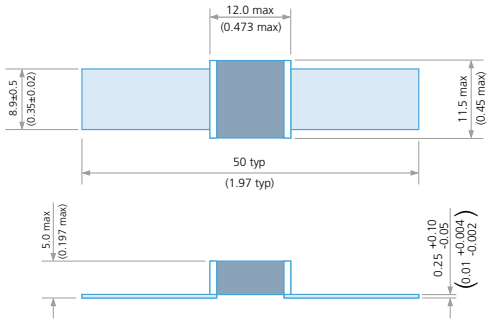
Ribbon Leaded Silver plated copper ribbon attached with HMP solder - (MP greater than 260ºC)



2225



4040



Ordering information - Syfer Non-Magnetic capacitors

1206	2	500	0223	J	Q	T	-	-
4040	2	7K0	0470	G	Q	B	-	AF9
2225	B	3K0	6P80	G	Q	B	R	W221
Chip size	**Termination or Coating (Ribbon Leaded)**	**Voltage**	**Capacitance in picofarads (pF)**	**Capacitance tolerance**	**Dielectric**	**Packing**	**Lead Options**	**Suffix code**
0402* **0603** **0505** **0805** **1206** **1111** **1210** **1808** **1812** **2220** **2225†** **4040†**	**2** = Sintered silver with copper barrier* **3** = FlexiCap™ with copper barrier. **4** = Sintered silver with copper barrier* **5** = FlexiCap™ base with copper barrier. **Ribbon Leaded** **B** = Uncoated **V** = Coated with modified silicone laquer	**50** = 50V **100** = 100V **1K0** = 1kV **2K0** = 2kV **3K0** = 3kV **4K0** = 4kV **5K0** = 5kV **6K0** = 6kV **7K0** = 7kV	<10pF Insert a P for the decimal point, eg **2P20** = 2.2pF. >10pF. 1st digit is 0. 2nd and 3rd digits are significant figures of capacitance code. The 4th digit is number of 0's following eg. **0470** = 47pF **0512** = 5100pF Values <1pF in 0.1pF steps, above this values are E24 series	<4.7pF **H** = ±0.05pF **B** = ±0.1pF **C** = ±0.25pF **D** = ±0.5pF ⩾4.7pF ~ <10pF **B** = ±0.1pF **C** = ±0.25pF **D** = ±0.5pF ⩾10pF **F** = ±1% **G** = ±2% **J** = ±5% **K** = ±10% **M** = ±20%	**C** = C0G/ NP0 (1B) **Q** = High Q **X** = X7R (2R1)	**T** = 178mm (7") reel **R** = 330mm (13") reel **B** = Bulk pack - tubs or trays	**R** = Ribbon leaded **Blank** = SM chip	**W221** = Leaded **W211** = Leaded marked ****AF9** = SM standard chip ****AF9LM** = SM marked standard chip

Note: *0402 - C0G/NP0 and High Q only. †Ribbon Leads available. **AF9 and AF9LM suffix code only available in 1111, 2225 and 4040 chip sizes.

Ordering information - Voltronics Non-Magnetic capacitors

11	470	J	1000	W	F	R
Chip size	**Capacitance**	**Tolerance**	**Voltage**	**Termination**	**Material**	**Lead / Packaging**
4 0402* **5** 0505 **6** 0603* **8** 0805* **11** 1111† **12** 1206* **13** 1210* **18** 1812* **22** 2220* **25** 2225† **38** 3838† **40** 4040†	**0R1** 0.1pF **100** 10pF **101** 100pF **102** 1000pF	**A** ±0.05pF **B** ±0.1pF **C** ±0.25pF **D** ±0.5pF **F** ±1% **G** ±2% **J** ±5% **K** ±10% **M** ±20%	**50** = 50V **100** = 100V **1000** =1000V	**W** = Ag/Cu/Sn **S** = Pd/Ag **M** = Poly/Cu/Sn **2** = Ag/Cu/Sn - (Q dielectric only) **3** = Poly/Cu/Sn - (X dielectric only) **B** = Silver - (Q ribbon only) **V** = Silver, laquer Coated - (Q ribbon only)	**Q** = High Q 0±30ppm/ºC **X** = X7R (2R1)	**R** = Ribbon **T*** = Tape & Reel **B*** = Bulk

Note: *Q and X dielectric only. †Ribbon Leads available.

Can be ordered as Syfer or Voltronics parts.

Non-Magnetic Capacitors, High Power RF - Porcelain High Q

Made from highly stable, low loss dielectric formulations, these traditional porcelain MLCs are known for their high RF power handling capability. Available in all industry common case sizes. The special silver-palladium termination and the proprietary ceramic formulations guarantee consistent non-magnetic performance. All MLCs in these series are RoHS compliant. Chips are available either with standard termination or can be fitted with ribbon leads, depending on your application.

Description

- Porcelain Capacitors • Zero TC • Low Noise • Low ESR, High Q
- High Self-resonance • Established Reliability
- Capacitance range 0.1pF to 5.1nF

Functional Applications

- Impedance Matching • DC Blocking • Bypass • Coupling
- Tuning and Feedback

High Power RF capacitors - F & H materials - Minimum / maximum capacitance values - see ordering information

Chip Size	Case size 5 0505		Case size 11 1111		Case size 25 2225		Case size 38 3838	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
50V	-	-	680pF	1nF	-	-	-	-
100V	-	-	510pF	620pF	-	-	-	-
200V	36pF	100pF	220pF	470pF	-	-	-	-
250V	0.1pF	33pF	-	-	-	-	-	-
300V	-	-	-	-	2.2nF	2.7nF	-	-
500V	-	-	110pF	200pF	1.5nF	1.8nF	2.7nF	5.1nF
1kV	-	-	0.1pF	100pF	510pF	1.2nF	750pF	2.2nF
1.5kV	-	-	-	-	300pF	470pF	-	-
2kV	-	-	-	-	-	-	-	-
2.5kV	-	-	-	-	0.3pF	270pF	430pF	680pF
3.6kV	-	-	-	-	-	-	110pF	390pF
7.2kV	-	-	-	-	-	-	0.3pF	100pF

Note: Special capacitance values available upon request.

Ordering information - Non-Magnetic capacitors

11	470	J	1000	W	F	R
Chip size	Capacitance	Tolerance	Voltage	Termination	Material	Lead
5 0505 **11** 1111† **25** 2225† **38** 3838†	**0R1** 0.1pF **100** 10pF **101** 100pF **102** 1000pF	**A** ±0.05pF **B** ±0.1pF **C** ±0.25pF **D** ±0.5pF **F** ±1% **G** ±2% **J** ±5% **K** ±10%	**50** 50V **100** 100V **1000** 1000V	**W** **Ag/Cu/Sn** **S** **Pd/Ag** **M** **Poly/Cu/Sn**	**H** AH +90±20ppm/°C **F** CF 0±15ppm/°C	**B** = Chip **R** =Ribbon

Note: †Available in chip or ribbon leaded format.

Reeled Quantities

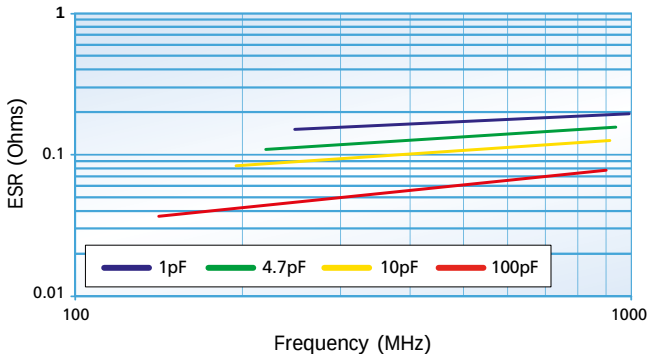
Chip Size	0402	0505	0603	0805	1206	1111 1210	1808	1812	2220	2225
7" Reel	10000	2500	4000	3000	2500	1000 2000	1500	500	500	500
13" Reel	13" reel quantities available on request						6000	2000	2000	2000

Note: Other capacitance values may become available, please contact the Sales Office if you need values other than those shown in the above tables.
For dimensions and soldering information, please go to our website www.knowlescapacitors.com.

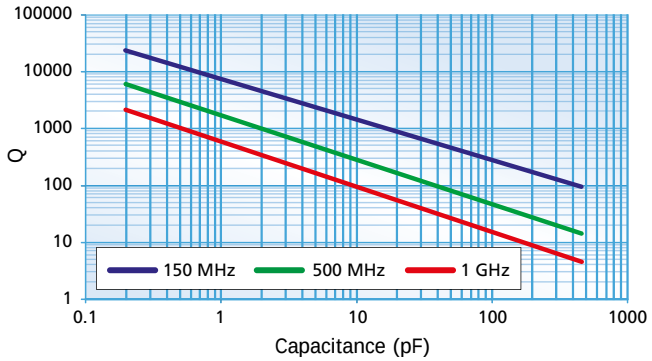
Non-Magnetic Capacitors - High Q, X7R

Typical performance data - chip size 0805 High Q

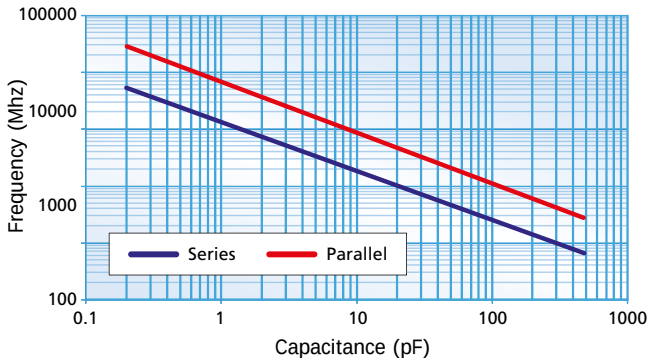
ESR vs Frequency



Q vs Capacitance

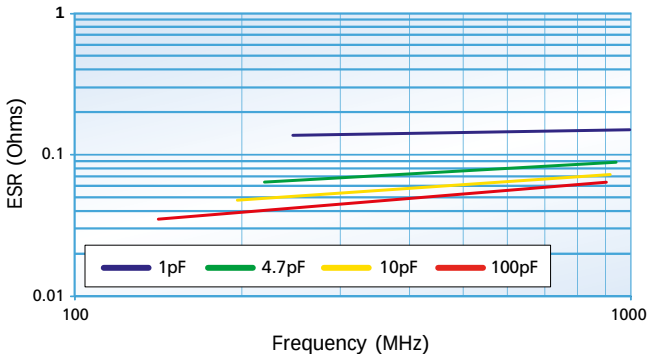


Resonant Frequency vs Capacitance

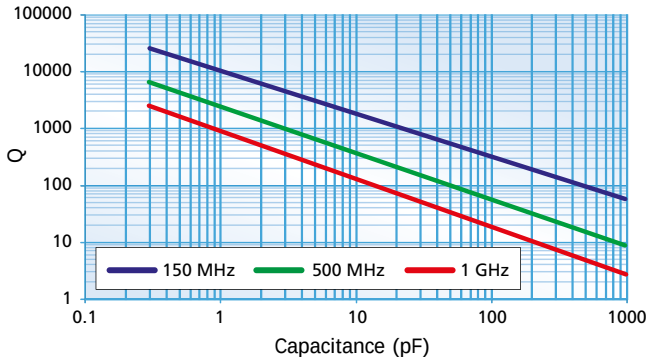


Typical performance data - chip size 1111 High Q

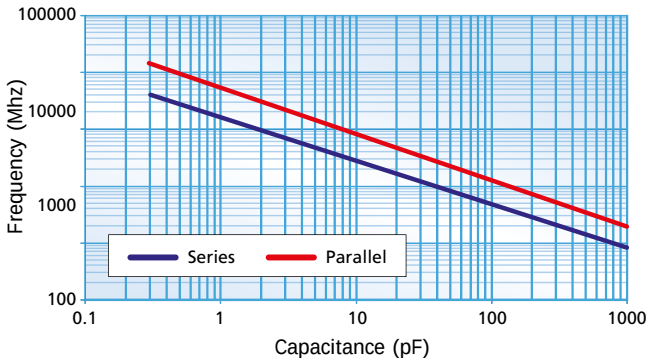
ESR vs Frequency



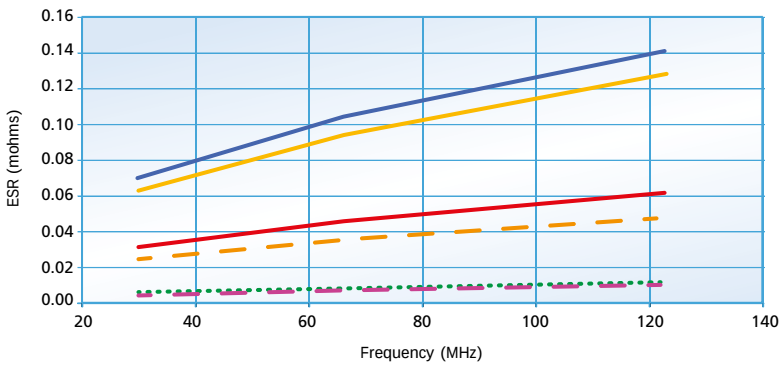
Q vs Capacitance

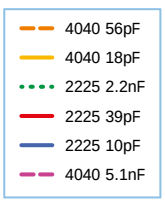


Resonant Frequency vs Capacitance



Typical ESR vs Frequency





ESR Measurement

All ESR figures are measured using a VNA and 2m copper resonant tube and extrapolating to 30MHz by ratio. Measured data can be supplied on request. Measurement of ESR can vary with test method and components should only be compared when tested back-to-back on the same equipment under controlled conditions.