



**THE DATASHEET OF
060322500270FQTL5M**





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 COG/NPO, High Q and X7R dielectrics, providing a fully non-magnetic component ($\mu_r = 1.0000$).

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

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



High Q, COG/NPO - 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
 $\pm 0.05\text{pF}$ ($< 4.7\text{pF}$)
 0.1pF ($\geq 4.7\text{pF}$ & $< 10\text{pF}$)
 $\pm 1\%$ ($\geq 10\text{pF}$)

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 | 1.0 μ F | 1.5 μ F | 1.5 μ F | 3.3 μ F | 5.6 μ F |
| 25V | 6.8nF | 68nF | 220nF | 820nF | 1.2 μ F | 1.2 μ F | 2.2 μ F | 4.7 μ F |
| 50V 63V | 4.7nF | 47nF | 150nF | 470nF | 1.0 μ F | 680nF | 1.5 μ F | 3.3 μ F |
| 100V | 1.5nF | 10nF | 47nF | 150nF | 470nF | 330nF | 1.0 μ F | 1.5 μ F |
| 200V 250V | 680pF | 5.6nF | 27nF | 100nF | 220nF | 180nF | 470nF | 1.0 μ F |
| 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
 $\pm 5\%$

High Q, COG/NPO High Power RF capacitors - minimum/maximum capacitance values

A range of ultra-low loss High Q ceramic capacitors with COG/NPO 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 led format.

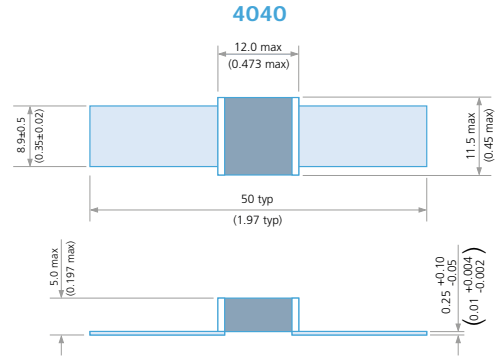
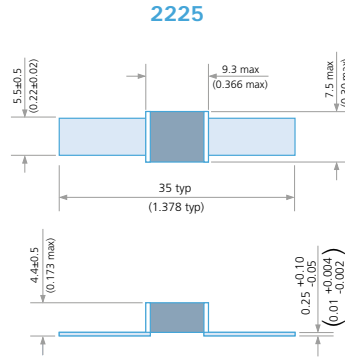
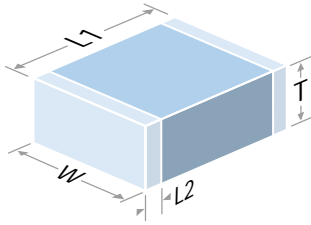
| Chip size | Case size 25 - 2225 | | Case size 40 - 4040 | |
|-----------|---------------------|-----------|---------------------|------------|
| | Min. | Max. | Min. | Max. |
| 200V | 6.2nF | 10nF | 16nF | 27nF |
| 500V | 5.1nF | 5.6nF | 13nF | 15nF |
| 630V | 3.9nF | 4.7nF | 12nF | 12nF |
| 1kV | 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.

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 260°C)



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* | 2 = Sintered silver with copper barrier* | 50 = 50V | <10pF Insert a P for the decimal point, eg 2P20 = 2.2pF. | <4.7pF H = ±0.05pF B = ±0.1pF C = ±0.25pF D = ±0.5pF | 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 |
| 0603 | 3 = FlexiCap™ with copper barrier. | 100 = 100V | >10pF. 1st digit is 0. 2nd and 3rd digits are significant figures of capacitance code. The 4th digit is number of 0's following | ≥4.7pF ~ <10pF B = ±0.1pF C = ±0.25pF D = ±0.5pF | | | | |
| 0505 | 4 = Sintered silver with copper barrier* | 1K0 = 1kV | | ≥10pF F = ±1% G = ±2% J = ±5% K = ±10% M = ±20% | | | | |
| 0805 | 5 = FlexiCap™ base with copper barrier. | 2K0 = 2kV | | | | | | |
| 1206 | | 3K0 = 3kV | | | | | | |
| 1111 | | 4K0 = 4kV | | | | | | |
| 1210 | | 5K0 = 5kV | | | | | | |
| 1808 | | 6K0 = 6kV | | | | | | |
| 1812 | | 7K0 = 7kV | | | | | | |
| 2220 | Ribbon Leaded | | | | | | | |
| 2225† | B = Uncoated | | | | | | | |
| 4040† | V = Coated with modified silicone laquer | | Values <1pF in 0.1pF steps, above this values are E24 series | | | | | |

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* | OR1 0.1pF | A ±0.05pF | 50 = 50V | W = Ag/Cu/Sn | Q = High Q | R = Ribbon |
| 5 0505 | 100 10pF | B ±0.1pF | 100 = 100V | S = Pd/Ag | 0±30ppm/°C | T* = Tape & Reel |
| 6 0603* | 101 100pF | C ±0.25pF | 1000 = 1000V | M = Poly/Cu/Sn | X = X7R (2R1) | B* = Bulk |
| 8 0805* | 102 1000pF | D ±0.5pF | | 2 = Ag/Cu/Sn - (Q dielectric only) | | |
| 11 1111† | | F ±1% | | 3 = Poly/Cu/Sn - (X dielectric only) | | |
| 12 1206* | | G ±2% | | B = Silver - (Q ribbon only) | | |
| 13 1210* | | J ±5% | | V = Silver, laquer Coated - (Q ribbon only) | | |
| 18 1812* | | K ±10% | | | | |
| 22 2220* | | M ±20% | | | | |
| 25 2225† | | | | | | |
| 38 3838† | | | | | | |
| 40 4040† | | | | | | |

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



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 | OR1 0.1pF | A ±0.05pF | 50 50V | W Ag/Cu/Sn | H AH +90±20ppm/°C | B = Chip |
| 11 1111† | 100 10pF | B ±0.1pF | 100 100V | S Pd/Ag | F CF 0±15ppm/°C | R =Ribbon |
| 25 2225† | 101 100pF | C ±0.25pF | 1000 1000V | M Poly/Cu/Sn | | |
| 38 3838† | 102 1000pF | D ±0.5pF | | | | |
| | | F ±1% | | | | |
| | | G ±2% | | | | |
| | | J ±5% | | | | |
| | | K ±10% | | | | |

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.

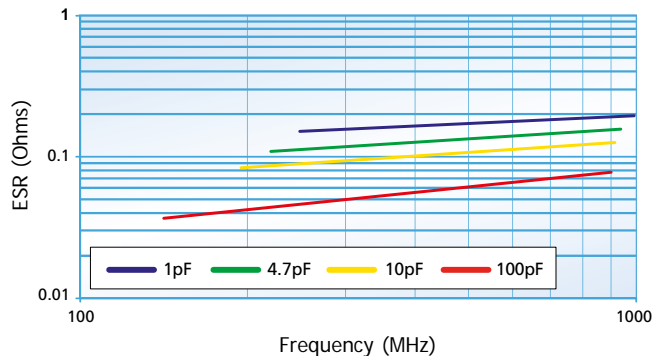
Non-Magnetic Capacitors - High Q, X7R

Typical performance data - chip size 0805 High Q

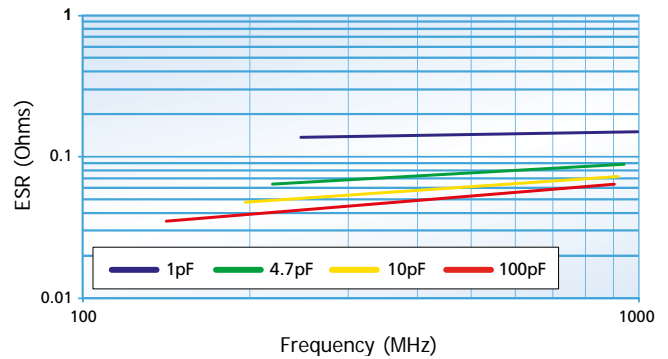
Typical performance data - chip size 1111 High Q



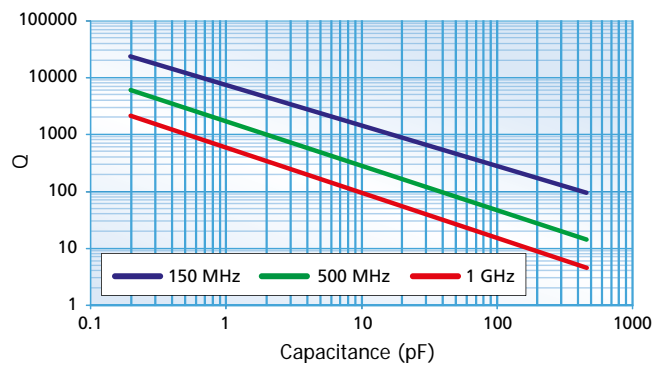
ESR vs Frequency



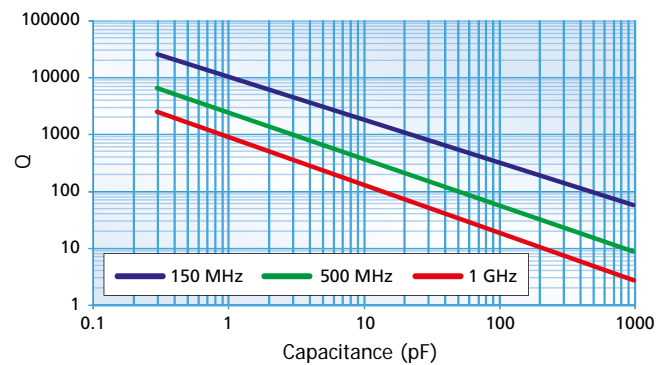
ESR vs Frequency



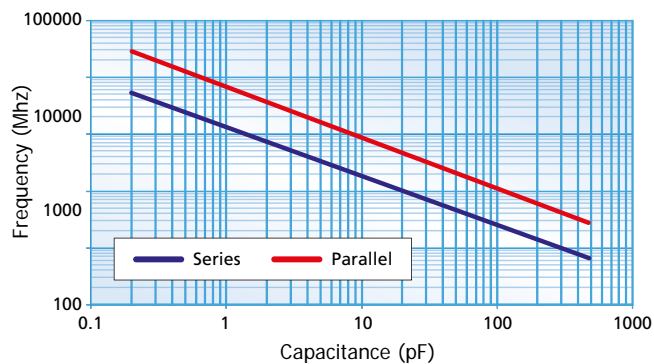
Q vs Capacitance



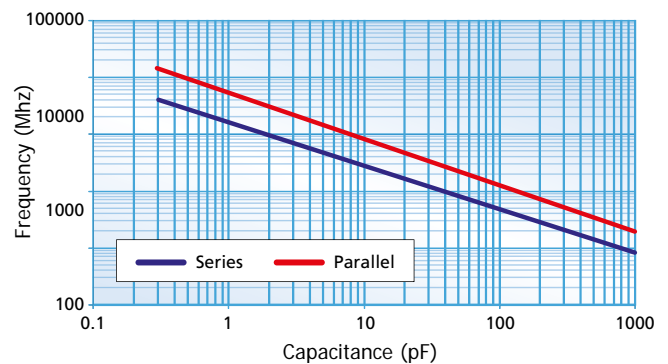
Q vs Capacitance



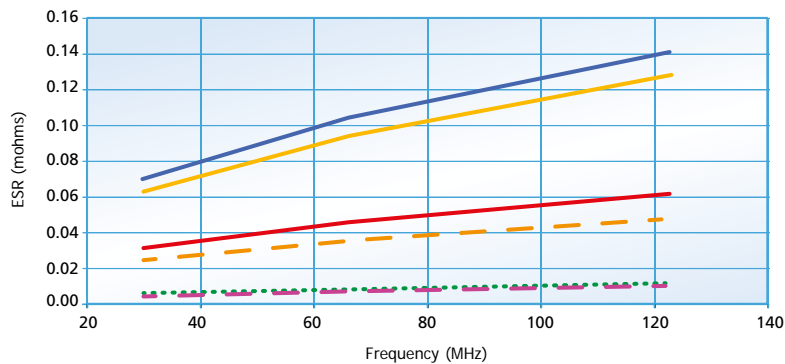
Resonant Frequency vs Capacitance



Resonant Frequency vs Capacitance



Typical ESR vs Frequency



- 4040 56pF
- 4040 18pF
- ... 2225 2.2nF
- 2225 39pF
- 2225 10pF
- - - 4040 5.1nF

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.

Looking for pricing, stock, or lifecycle information?

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