



# High Quality Factor NPO MLCC for High Frequency Applications - CQ Series

**High frequency multi-layer ceramic capacitors – CQ series, 01005 ~ 0805**

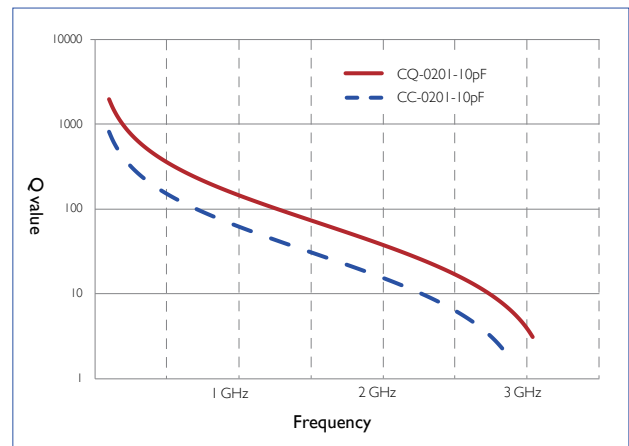


As a family member of the Class I NPO MLCC, CQ series has excellent temperature characteristics, a narrow tolerance of capacitance, even lower ESR, ESL, and dissipation factor than the standard NPO. The CQ series capacitors are offered in EIA case sizes from 01005 to 0805 and available in temperature stable NPO dielectrics with a capacitance range of 0.1 to 100 pF, and rated voltage up to 250V. The development demonstrates Yageo's leading position in innovation and R&D, as well as the firm's commitment to meeting customer's needs.

High-Q capacitors, also known as high quality factor capacitors, provide high Q (low dielectric loss), low power dissipation with greater efficiency than standard MLCCs. The CQ series MLCCs are typically used in

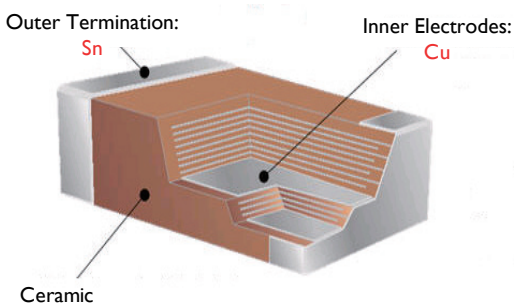
applications with high frequencies ranging from 500MHz to 10GHz. The CQ series applies copper, one of the best conductive metals, inner electrodes that allow for low ESR (Equivalent Serial Resistance), low ESL (Equivalent Serial Inductance), and high SRF (Self Resonant Frequency) in microwave frequency bands.

The quality factor (the inverse of the dissipation factor,  $\tan\delta$ ) of the CQ series is much better than the same item in the CC series.

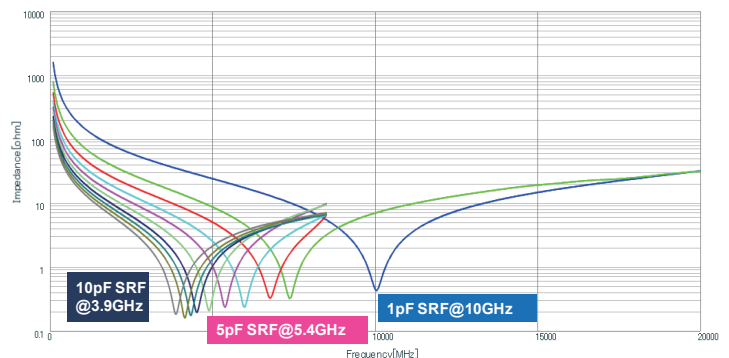


**Figure 2** Q Factor Comparison (CQ vs CC)

The SRF is an effective indicator for the MLCC performance under high frequency application. Lower capacitance MLCC has a higher SRF as illustrated in the figure.



**Figure 1** Cross section of CQ MLCC construction



**Figure 3** Impedance and SRF with Different Capacitance



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Power dissipation is proportional to ESR. As known, dielectric loss and electrode loss both contribute to the ESR. When frequency is increased, electrode loss becomes dominant. Yageo's CQ series displays one of the lowest ESRs in the market, and this ensures the best performance under high frequency application.

CQ is ideal for high frequency applications such as impedance matching, filtering, and resonance circuits; including RF (Radio Frequency) modules such as PA (Power Amplifier) and VCO (Voltage Controlled Oscillator), mobile communications such as base stations for cellular, broadcast satellites, cable TV and telecommunication networks, GPS, Bluetooth® and TV set-top-boxes.

The essence of networking and telecommunication is transferring huge data in between network devices with high speed, therefore good performance with long term accuracy and stability is the first requirement. With the

proven quality factor properties, ESR, ESL, etc., Yageo's CQ series can effectively reduce the power dissipation of wireless signals, and meet all the requirements outlined above for high frequency applications.

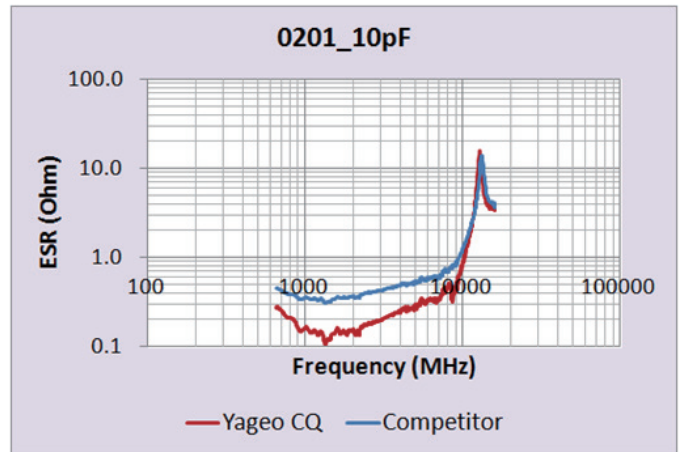


Figure 4 ESR Comparison (Yageo vs Competitor)

## Features

- BME process with copper inner electrodes
- High Q and low ESR in VHF, UHF and microwave frequency bands
- Tight tolerance (min.  $\pm 0.05\text{pF}$ )
- Ultra low ESR and ESL

## Applications

- Mobile front end
- Wireless networking
- Power amplifier
- NB and tablet
- M2M



Yageo's CQ Series Application Map

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