

Surface Mount Multi-Layer Ceramic Capacitors for RF Power Applications

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Abstract

As a leading supplier of Multi-Layer Ceramic Capacitors (MLCC) for specialty applications, Vishay Intertechnology Inc. has developed a new series of surface mount ceramic capacitors for use in high frequency power applications. These temperature stable, high frequency capacitors are manufactured using a low loss COG dielectric material system and enhanced Noble Metal Electrode (NME) designs. The new QUAD HIFREQ series capacitors, herein referred to as QUAD have an optimized material system and electrode design to minimize Equivalent Series Resistance (ESR), and improve thermal conductivity which intern reduces power loss and MLCC surface temperature. The QUAD MLCC are available in 0505, 1111, 2525, and 3838 case sizes with extended voltage ratings up to 7.2 kVdc and capacitance range from 0.5 pF – 5100 pF.

The QUAD capacitors are benchmarked against leading competitor's RF power MLCC. Electrical characteristics such as Series Insertion loss (S21), Equivalent Series Resistance (ESR) and Continuous Wave (CW) power loss are conducted. Most notable, Vishay's QUAD ESR is 20 - 40 % lower than competitor's, a significant factor improving overall thermal conductivity and power loss. Infrared temperature measurement on the MLCC surface is a good method to compare the capacitor's power dissipation. Capacitors are connected in series with a 50 Ohm load, while 150 W of CW high frequency power is applied. With equal amounts of applied power, Vishay's MLCC run 1.5 - 4 C cooler. The measurements presented in this paper show that QUAD capacitors are a new an exceptional alternative for high frequency power applications.