

# **MLCC and Tantalum Electrolytic Capacitor Interchangeability in High Capacitance Applications**

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While component qualification is geared toward high reliability and harsh environment for defense space-level applications, the industry is not completely isolated from the ripple effects of commercial market trends; the recent lengthening of multilayer ceramic chip (MLCC) capacitor leadtimes being a case in point.

Over the years, ceramic capacitors have been used interchangeably with tantalum in many standard applications, class II ceramics being the one version of electrostatic technology that can achieve the high capacitance values associated with electrolytic capacitors. We are currently at a point in the commercial sector where more electrolytic designs are being re-considered for applications that had switched to class II ceramic in recent years.

While most applications are amenable to such interchangeability, some parametric factors arise due to the differences in technology, so these need to be taken into consideration. This paper discusses the differences between electrostatic and electrolytic technologies, explaining the origin and effects of temperature and voltage coefficients, piezo and noise effects in class II ceramics, and polarity and ESR in solid tantalum electrolytic capacitors.

Next, we look at the possibility of reliability grading high capacitance and low ESR options for solid tantalum electrolytics, including recent work on developing a MIL-PRF specification for polymer tantalum electrolytic capacitors to include polymer lifetime and charging characterization.