PRODUCT FEATURE

As surface-mount technology responds to the challenge of functioning at higher microwave frequencies, the performance demands on both active and passive components have become increasingly stringent. Typically, ceramic multilayer chip capacitors (MLC) are required to operate at frequencies closer to (or even exceeding) those at which they are self-resonant. Alternate approaches using fragile, lower parasitic, single-layer capacitors (SLC) (typically 0.004" to 0.006" thick to achieve useful capacitance values) involve difficult trade-offs between meeting the temperature characteristics necessary for sensitive tuned circuit and impedance-matching applications, and maintaining the form factor and mechanical robustness necessary for large-scale, surface-mount production. SLCs requiring bonding wires for attachment compromise performance by adding series inductance and resistance, as well as necessitating additional manufacturing effort and costs.

The KYOCERA AVX 500 series capacitors provide a capability that was previously unavailable: rugged, surface-mountable, stable NPO-temperature-characteristic, laser-marked devices with very high self-resonant frequen-cies in values up to 10 pF. The new capacitors have first parallel resonant (FPR) frequencies exceeding 35 GHz for values of 0.1 to 2.2 pF and exceeding 20 GHz for values up to 10 pF, as shown in **Figure 1**.

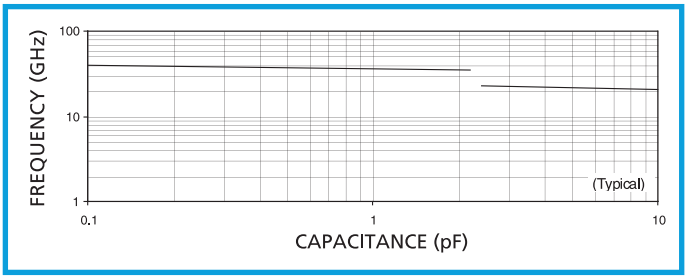

Figure 1. Typical first parallel resonant frequency.

Two attributes enable the KYOCERA AVX 500 capacitors to achieve superior performance: They utilize a new type of ceramic dielectric and a unique, patented construction. **Figure 2** shows a typical longitudinal cross section.

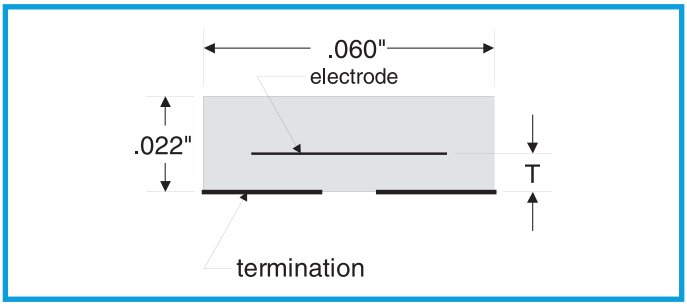

Figure 2. Typical longitudinal cross section.

An internal gold electrode forms twin capacitors with external, readily solderable terminations. The difference between this configuration and prior versions is the encapsulation of the active structure within a dielectric body. This construction permits the separation T between the internal electrode and terminations to be extremely small (less than 0.5 mils for the larger capacitance values) without sacrificing mechanical integrity. Thus, for a given footprint, higher capacitance values can be achieved without resorting to higher dielectric constant materials (as required by SLCs) and their concomitant increased loss and poorer temperature characteristics. The high FPR makes these capacitors ideally suited for broadband dc blocking/RF coupling applications. Intended primarily to subtend a gap in a microstrip center conductor, the capacitors' 0.030" width produces minimal parasitics in 50 Ω transmission lines on substrates such as 0.025"-thick alumina (K = 9.9), or 0.010"-thick Duroid 5880 or Arlon Isoclad 917 (K = 2.2). Additional applications include use as a filter element or impedance-matching element. In these applications, the low equivalent series inductance produces a response that is more capacitor-like than comparable-size and comparable-value MLCs, while the NPO characteristic provides stable temperature behavior that is superior to comparable-value SLCs. **Table 1** lists the KYOCERA AVX 500 capacitors' salient specifications.

The KYOCERA AVX 500 capacitors' significant electrical advantages and thermal stability combined with their rugged, laser-marked, surface-mount package provide designers with uniquely versatile devices to help meet today's demanding wireless applications. The capacitors are available currently with a delivery time of stock to four weeks.

KEY SPECIFICATIONS	
Capacitor Range	0.1 to 10 pF
Tight Tolerances 0.1 to 10 pF 1.1 to 6.2 pF 6.8 to9.1 pF 10 pF (%)	 ±0.05 pF ±0.10 pF ±0.25 pF ±2.00 p%
FPR Frequency (typ) (GHz) 0.1 to 2.2 pF 2.4 to 10.0 pF	 > 35 GHz > 20 GHz
Equivalent Series Resistance (typ) (mΩ)	200 @ 1 GHz
Temp. Coefficient of Capacitance 0.1 to 2.2 pF 2.4 to 10.0 pF (VDC)	 0 ± 30 ppm/°C 0 ± 60 ppm/°C
DC Working Voltage 0.1 to 4.7 pF (VDC) 5.1 to 10.0 pF (VDC)	 100 50
Size (")	0.060 x 0.030 x 0.022

Table 1.

NORTH AMERICA
Tel: +1 864-967-2150

ASIA
Tel: +65 6286-7555

CENTRAL AMERICA
Tel: +55 11-46881960

EUROPE
Tel: +44 1276-697000

JAPAN
Tel: +81 740-321250