



MLP Capacitor Advantages over Ceramics

ITW Paktron has been manufacturing film capacitors for over 50 years. Paktron and its parent, Illinois Tool Works Inc., hold in excess of seventy-five patents for film capacitors and machine design.

Paktron specializes in Ultra Low ESR multilayer polymer film capacitors and leads in Film-Chip and SMT designs. Capacitors featured are:

- Angstor®** Miniature Radial
 - Capstick®** Lead-Framed MLP
 - Surfilm®** Surface Mount Chip
- Other famous lines featured are:
- Quencharc®** R-C Network/Snubber

The metallized electrode used in Paktron's proprietary Interleaf® Technology process assures reliable performance. Multilayer Polymer (MLP) surface mount, chip and lead framed capacitors are replacing MLC (ceramic) capacitors in higher voltage and reliability-sensitive equipment. This includes the popular -48 volt telecom bus, off-line HVAC and PFC front ends.

Today, the fastest-growing market segment that Paktron serves is Power Conversion for industries such as Telecommunications/Datacom, military infrastructure, automotive, medical and high-end industrial. The 100 volt rated MLP film capacitor is becoming the part of choice for input/output filtering in -48 volt telecom bus power applications (on-board or dc/dc modules). The MLP capacitor provides improved stability, both electrically and mechanically, compared to multilayer ceramics. The MLP features "non-shorting" operation and does not crack like large ceramic blocks.

Multilayer Polymer Film (MLP)

- ✓ Stable under voltage
- ✓ Stable under AC voltage
- ✓ Chip is plastic with good TCE
- ✓ Stable over temperature
- ✓ No aging mechanism
- ✓ Resilient under thermal shock
- ✓ Self-clearing thin electrodes
- ✓ Stable under mechanical stress
- ✓ Low cost
- ✓ Ultra Low ESR
- ✓ Dissipation Factor $\leq 1\%$

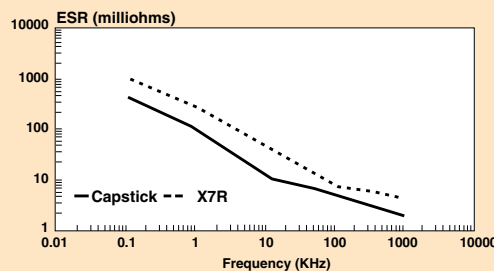
X7R Ceramic (MLC)

- Cap drops 40% at 100 volts bias
- DF increases with AC voltage
- Body is ceramic which cracks
- DF increases at low temperature
- Cap drops per decade hour
- Ceramic body cracks easily
- Thick film electrodes fail short
- Piezoelectric voltage sensitive
- Precious metal electrodes
- Low ESR
- Dissipation Factor $\leq 2.5\%$

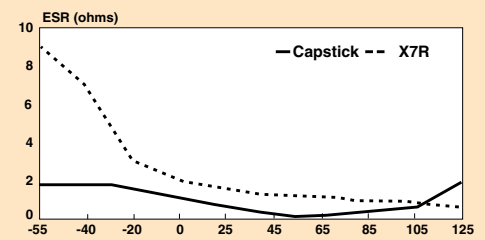
TYPICAL CHARACTERISTICS

The following graphs contrast important characteristics of MLP Capstick to MLC ceramic units in typical, dynamic converter conditions. The electrical stability of the MLP capacitor is clear.

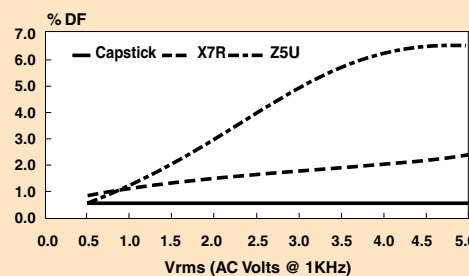
ESR vs. Frequency



120 Hz ESR vs. Temperature



Dissipation Factor vs Vrms



Capacitance vs DC Bias

