

# MULTILAYER POLYMER CAPACITORS

## MLP Capacitor Advantages over Ceramics

Paktron has been manufacturing film capacitors for over 50 years. Paktron holds 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**<sup>®</sup> Miniature Radial

**Capstick**<sup>®</sup> Lead-Framed MLP

**Surfilm**<sup>®</sup> Surface Mount Chip

Other famous lines featured are:

**Quencharc**<sup>®</sup> R-C Network/Snubber

The metallized electrode used in Paktron's proprietary Interleaf<sup>®</sup> 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  $\leq 1\%$

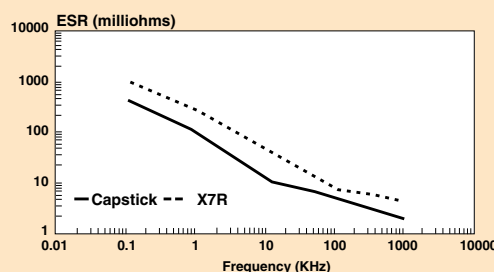
### X7R Ceramic (MLC)

- 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  $\leq 2.5\%$

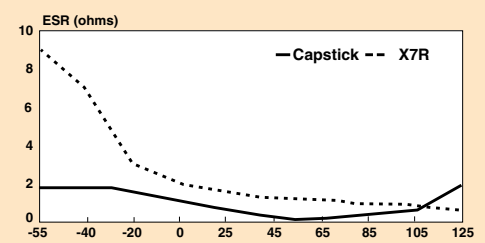
### TYPICAL CHARACTERISTICS

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

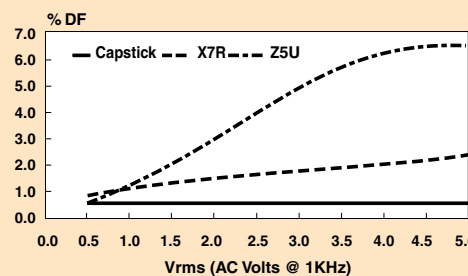
**ESR vs. Frequency**



**120 Hz ESR vs. Temperature**



**Dissipation Factor vs Vrms**



**Capacitance vs DC Bias**

