PRODUCT HIGHLIGHT

# UNDERSTANDING SOLID POLYMER AND HYBRID POLYMER CAPACITORS

## THE EVOLUTION

For decades, Aluminum Electrolytic Capacitors (E-Caps) have served as a cornerstone of the electronics industry, offering a cost-effective solution for energy storage. However, as circuit demands increase, traditional liquid electrolytes present inherent limitations in ESR and thermal endurance. To address these challenges, two primary innovations have emerged: Solid Organic Polymer and Hybrid Polymer technologies.

### SOLID POLYMER CAPACITORS: ENGINEERED FOR PERFORMANCE

Solid Polymer Capacitors share a foundational architecture with traditional E-Caps but replace the liquid electrolyte with a conductive solid polymer. This material shift yields significant performance advantages, including:

- Ultra-Low ESR: Minimizes energy loss and heat generation.
- Enhanced Endurance: Superior stability over extended operating lifecycles.
- High Ripple Current Ratings: The high efficiency of a single solid polymer device often allows engineers to replace multiple parallel-aligned E-Caps, reducing the overall PCB footprint.

### HYBRID POLYMER CAPACITORS: MULTI-DISCIPLINARY SOLUTION

By integrating both a conductive polymer and a liquid electrolyte, Hybrid Polymer Capacitors bridge the gap between traditional and solid-state technologies. This provides a unique set of mechanical and electrical characteristics:

- Mechanical Resilience: The hybrid core is more flexible than a strictly solid polymer, offering superior resistance to mechanical shock and vibration.
- Optimized Leakage Control: Hybrid construction is the preferred choice for applications where maintaining low leakage current (DCL) is mission-critical.
- Thermal Stability: These components provide a balanced profile that maintains performance across a wider range of environmental stressors.

| CHARACTERISTICS | SOLID POLYMER | HYBRID POLYMER | TRADITIONAL E-CAP |
|---|---|---|---|
| Capacitance Range | 6.8 - 2,700 µF | 10 - 470 µF | 0.33 - 820,000 µF |
| Voltage Range | 2.5 - 35 V | 16 - 80 V | 4 - 525 V |
| Ripple Current[1] | 900 - 8,100 mA | 700 - 2,900 mA | 3 - 1,400 mA |
| Impedance/ESR[1] | 5 - 90 mΩ | 16 - 120 mΩ | 46 - 5,000 mΩ |
| Vibration Resistance | Standard | High | Superior |
| Ripple Current Efficiency | Superior | High | Standard |
| Leakage Current Control | Marginal | Superior | Superior |
| Operating Lifetime | Superior | Superior | Standard |
| Failure Mode | Open/Short | Open | Open |

(1) Relative to size and voltage

**For more info contact Surge at technical@surgecomponents.com or call 631.595.1818**