Product Highlight May 2018

Understanding Aluminum Electrolytic Capacitor Characteristics

In the world of Capacitors, engineers have many parameters to consider for their designs. This guide will review the most common terms used so you can become more familiar with this product and easily discuss them with our current and future customers.

1. Nominal Capacitance, (C)

The nominal value of the Capacitance, C, is the most important of all characteristics. For Aluminum Electrolytic Capacitors, this is measured in micro-Farads (µF). When physically looking at a capacitor, this will be directly marked on the body of the capacitor.

2. Working Voltage, (WV)

The Working Voltage is a close second in importance. It defines the maximum continuous voltage that can be applied without failure. For electrolytic capacitors, this value will be a DC Voltage. The voltage will also be printed on the body of the capacitor.

In order for the part to function correctly, the value of the needed voltage must be below the working voltage of the capacitor. It is good practice to try to find the lowest WV spec that will be above the circuit's needs.

3. Tolerance, (±%)

Similar to other electronic components, capacitors have a tolerance rating which specifies the range in which their actual capacitance value can deviate from its declared spec. For Aluminum Electrolytics, the industry standard is ±20%. Our products meet this, though we can also supply products with tolerances as low as ±5% for applications with more stringent requirements.

4. Leakage Current

Unfortunately, the dielectric used inside the capacitor is not a perfect insulator, which results in a very small current flow when applied to a constant supply voltage. These are usually very small, however for some circuits, even the smallest amount can disrupt the functionality of their product. The lower the Leakage Current, the better.

5. Working Temperature, (T)

Changes in temperature around the capacitor affect the overall capacitance because of changes in the dielectric properties. If the air or surrounding temperature becomes too hot or too cold, the capacitance of the device may change so much it can affect the proper operation of the circuit. For electrolytic capacitors, there are options as low as is –55°C, and as high as +130°C.

6. Equivalent Series Resistance, (ESR)

The Equivalent Series Resistance (or "ESR"), of a capacitor is the AC impedance when used at high frequencies and includes the resistance of the dielectric material, the DC resistance of the terminal leads, the DC resistance of the connections to the dielectric and the capacitor plate resistance all measured at a particular frequency and temperature. In Application, the lower the ESR, the better.

7. Ripple Current

Ripple current is the AC component of an applied source (often a switched-mode power supply) whose frequency may be constant or varying. Ripple current causes heat to be generated within the capacitor due to the dielectric losses caused by the changing field strength together with the current flow across the electrolyte in the capacitor. Aluminum electrolytic capacitors suffer a shortening of life expectancy at higher ripple currents. If ripple current exceeds the rated value of the capacitor, it tends to result in explosive failure. Therefore, higher rated ripple current specs yield better performance.

8. Type of Electrolyte

Engineers may have some idea of what they are looking for and want a capacitor that has a specific type of electrolyte. Most Aluminum Electrolytic Capacitors use a liquid electrolyte, however some use a solid polymer, and others a hybrid polymer.

For more details, please email sales@surgecomponents.com for our February 2018 Product Highlight, "Understanding Solid Organic Polymer and Hybrid Polymer Capacitors".