Plastic dielectric film capacitors can undergo two classic failure modes: opens or shorts. Included in these categories are intermittent opens, shorts or high resistance shorts.
In addition to these failures, capacitors may fail due to capacitance drift, instability with temperature, high dissipation factor or low insulation resistance. Failures can be the result of electrical, mechanical or environmental overstress, due to dielectric degradation during operation.

- **Dielectric breakdown (Shorts)**
  The classic capacitor failure mechanism is dielectric breakdown. The dielectric in the capacitor is subjected to the full potential to which the device is charged and, high electrical stresses are common. Dielectric breakdowns may develop after many hours of satisfactory operation.
  There are several causes which could be associated with operational failures. If the device is operating at or below its maximum rated conditions, most dielectric materials gradually deteriorate with time and temperature to the point of eventual failure. Most of the common dielectric materials undergo a **slow ageing process** by which they become brittle and are more susceptible to cracking. The higher the temperature is, the more the process is accelerated.
  Chemical or aqueous cleaning may also have an adverse effect on capacitors. Dielectric breakdown may occur as a result of misapplication of high transients (surges). The capacitor may survive many repeated applications of high voltage transients, however, this may cause a premature failure.
- **Open capacitors**
  Open capacitors usually occur as a result of overstress in application. For instance operation of DC rated capacitors at high AC current levels can cause a localized heating at the end terminations. The localized heating is caused by high RI^2 losses. Continued operation of the capacitor can result in increased end termination resistance, additional heating, and possible failure. The open condition is caused by a separation of the end-connection of the capacitor. Both RMS and Peak currents may cause the open condition when overcome.
  Mounting capacitors by the leads in high vibration environment may also cause an open condition. The lead wire may fatigue and break at the egress area if a severe resonance is reached. The capacitor body must be fastened into place by use of a clamp or a structural adhesive.
- **Environmental considerations**
  The following list is a summary of most common environmentally critical factors affecting the life of capacitors. The design engineer must take into consideration his own applications and the effects caused by combinations of various environmental factors.
- **Service life**
  Service life of a capacitor must be taken into consideration. The service life decreases when the temperature increases (see page 8).
- **Capacitance**
  Capacitance will change up and down with temperature due to the dielectric constant and an expansion or shrinking of the dielectric material (see diagram ΔC/T on page 5).
  Capacitance changes can be the result of excessive clamping pressure on non-rigid cases.
- **Insulation resistance**
  When the capacitor temperature increases the insulation resistance decreases. This is due to increased electron activity. Low insulation resistance can also be the the result of moisture tapped in the windings, caused by a prolonged exposure to excessive humidity.
- **Dissipation factor tgδ**
  The dissipation factor is a complex function involved with the inefficiency of the capacitor. The tgδ may change up and down with increased temperature (see diagram tgδ/T on page 5).
- **Dielectric strength**
  The dielectric strength (dielectric withstanding voltage or “stress” voltage) level decreases as the temperature increases. This is due to chemical activity of the dielectric material which causes a change in the phisical or electrical properties of the capacitor.
- **Sealing**
  Hermetically Sealed Capacitors
  When the temperature increases, the pressure inside the capacitor increases. If the internal pressure is high enough, it can cause a breach in the capacitor, which can then cause leakage of impregnation or filling fluid or moisture susceptibility.
- **Epoxy encased / Wrap and fill capacitors**
  The epoxy seals on both epoxy encased and wrap and fill capacitors will withstand short-term exposure to high humidity environments without degradation. Epoxies and plastic tapes will form a pseudo-impervious barrier to humidity and chemicals. These case materials are somewhat porous and through osmosis can cause contaminants to enter the capacitor. The second area of contaminate absorption is the lead-wire / epoxy interface. Since epoxies cannot 100% bond to tinned wires, there can be a path formed, up to the lead wire, into the capacitor section. This can be aggravated by aqueous cleaning of circuit boards.
- **Vibration, Acceleration and shock**
  A capacitor can be mechanically destroyed or may malfunction if it is not designed,manufactured, or installed to meet the vibrations, shock or acceleration requirement within a particular application. Movement of the capacitor within the case can cause low insulation resistance,shorts or opens. Fatigue in the leads or mounting brackets can also cause a catastrofic failure.
- **Barometric Pressure**
  The altitude at which hermetically sealed capacitors have to be operated controls the voltage rating of the capacitor.
  As the barometric pressure decreases so does the terminal arcover susceptibility increases. Non-hermetic capacitors can be affected by internal stresses due to pressure changes. This can be in the form of capacitance changes or dielectric arc-overs as well as low insulation resistance.
  Heat transfer can be also affected by altitude operation.
  Heat generated in operation cannot be dissipated properly and can result in high RI^2 losses and eventual failure.
- **Radiation**
  Radiation capabilities of capacitors must be taken into consideration. Electrical degradation in the form of dielectric embrittlement can take place causing shorts or opens.