Film Capacitors

Short definition of terms

Date: June 2018

EPCOS AG is a TDK Group Company.

Short definition of terms

Symbol	Term	Short definition	Reference chapter "General technical information"
–	Climatic category	A numerical code that specifies the limits of the category temperature range and the duration of a specified humidity test.	4.1
C_R	Rated capacitance	Capacitance measured at 1 kHz in standard ambient conditions; normally marked on the product.	2.2.1
ΔC_R	Capacitance tolerance	Permissible relative deviation of capacitance from the rated value; expressed in percent.	2.2.1
dV/dt	Rate of voltage rise	The maximum admissible dV/dt defines the capability of a capacitor to withstand high current peaks due to fast voltage changes; expressed in V/µs.	3.3.1
ESR	Equivalent series resistance	Ohmic part of the equivalent series circuit of a capacitor. It represents the losses associated with a capacitor due to metallic contacts, polarization, leakage currents, etc; expressed in milliohms (mΩ).	2.3
i_P	Peak current	The product of the capacitance and the dV/dt. $i_p(A) = C(\mu F) \cdot \frac{dV}{dt}\ (V/\mu s)$	3.3.1
k_0	Pulse characteristic	Characteristic factor of a pulse waveform, indicating its energy content. The maximum admissible k_0 defines the capability of a capacitor to withstand pulses of several current peaks; expressed in $V^2/\mu s$. $k_0 = 2 \cdot \int_0^\tau \left(\frac{dV}{dt}\right)^2 \cdot dt$	3.3.2
R_{ins}	Insulation resistance	Ratio between an applied DC voltage and the resulting leakage current after a specified time; expressed in megohms (MΩ).	2.4
–	Self-healing	The process by which the electrical properties of a metallized capacitor before a local breakdown are rapidly and essentially restored after the breakdown.	6.1
tan δ	Dissipation factor Loss factor	Ratio between effective power (power dissipation) and reactive power for a sinewave load of specified frequency.	2.3

Short definition of terms

Symbol	Term	Short definition	Reference chapter "General technical information"
τ	Time constant	Time in seconds during which the voltage across the wires of a charged capacitor decreases to 37% due to self-discharging. It is the product of nominal capacitance and insulation resistance: τ (s) = R_{ins} (MΩ) · C_R (µF)	2.4
T_A	Ambient temperature	The temperature of the air surrounding the component.	3.1.3, 3.2.3
T_{min} – T_{max}	Category temperature range	The range of ambient temperatures at which a capacitor can operate continuously. The limit temperatures T_{max} and T_{min} (**upper** and **lower** category temperatures, respectively), are defined in the climatic category.	3.1.3, 4.1
T_{op}	Operating temperature	The temperature of a component in steady-state operation is the sum of the ambient temperature and the self-heating due to its operation. $T_{op} = T_A + \Delta T$	3.2.3
T_R	Rated temperature	Maximum ambient temperature or hottest contact point at which the rated voltage can be applied continuously. For higher temperatures (up to the upper category temperature) a **derating** of voltage needs to be applied.	3.1.3
ΔT	Self-heating	When a capacitor is used in AC applications, associated self-heating will increase its surface temperature above the ambient temperature. It is essential to take this into account in order not to exceed the upper category temperature. A temperature check should be performed on a capacitor in case of doubt.	3.2.2, 3.2.3, 4.1
V_C	Category voltage	The maximum voltage (expressed as a fraction of the rated voltage) that may be continuously applied to a capacitor at any working temperature inside the category temperature range.	3.1.3
V_R	Rated voltage	The maximum voltage that may be continuously applied to a capacitor at any ambient temperature below rated temperature.	3.1.1
V_{RMS}	Rated AC voltage	The maximum RMS voltage at the specified frequency (usually 50 Hz) that may be applied continuously to the terminals of a capacitor at any temperature between the lower category temperature T_{min} and rated temperature T_R.	3.2.1