CAPAX Technologies, Inc

Basic Capacitor Formulas

CAPACITANCE (farads)	English: $C = \frac{.224\ K\ A}{T_D}$ Metric: $C = \frac{.0884\ K\ A}{T_D}$
ENERGY STORED IN CAPACITORS (Joules, watt-sec)	$E = \frac{1}{2} C V^2$
LINEAR CHARGE OF A CAPACITOR (amperes)	$I = C \frac{dV}{dt}$
TOTAL IMPEDANCE OF A CAPACITOR (ohms)	$Z = \sqrt{R_S^2 + (X_C - X_L)^2}$
CAPACITIVE REACTANCE (ohms)	$X_C = \frac{1}{2 \pi fC}$
INDUCTIVE REACTANCE (ohms)	$X_L = 2 \pi fL$
DISSIPATION FACTOR (%)	D.F. = tan ∂ (loss angle) = $\frac{E.S.R.}{X_C}$ = (2 π fC) (E.S.R.)
POWER FACTOR (%)	P.F. = Sine ∂ (loss angle) = Cos Φ (phase angle) P.F. = (when less than 10%) = D.F.
QUALITY FACTOR (dimensionless)	Q = Cotan ∂ (loss angle) = $\frac{1}{D.F.}$
EQUIVALENT SERIES RESISTANCE (ohms)	E.S.R. = (D.F.) (X_C) = (D.F.)/ (2 π fC)
POWER LOSS (watts)	Power loss = ($2 \pi fCV^2$) (D.F.)
KVA (Kilowatts)	KVA = $2 \pi fCV^2 \times 10^{-3}$
TEMPERATURE CHARACTERISTIC (ppm/°C)	T.C. = $\frac{Ct - C_{25}}{C_{25}(T_t - 25)} \times 10^6$
CAP DRIFT (%)	C.D. = $\frac{C_1 - C_2}{C_1} \times 100$
RELIABILITY OF CERAMIC CAPACITORS	$\frac{L_o}{L_t} = \left(\frac{V_t}{V_o}\right)^X \left(\frac{T_t}{T_o}\right)^Y$
CAPACITORS IN SERIES (current the same)	Any Number: $\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} \ldots \frac{1}{C_N}$ Two: $CT = \frac{C_1 C_2}{C_1 + C_2}$
CAPACITORS IN PARALLEL (voltage the same)	$C_T = C_1 + C_2 \ldots + C_N$
AGING RATE	A.R. = %Δ C/ decade of time
DECIBELS	Db = 20 log

Metric Prefixes

Pico	X 10^{-12}
Nano	X 10^{-9}
Micro	X 10^{-6}
Milli	X 10^{-3}
Deci	X 10^{-1}
Deca	X 10^{+1}
Kilo	X 10^{+3}
Mega	X 10^{+6}
Giga	X 10^{+9}
Tera	X 10^{+12}

Symbols

K	= Dielectric Constant	f	= Frequency	L_t	= Test Life
A	= Area	L	= Inductance	V_t	= Test Voltage
T_D	= Dielectric Thickness	∂	= Los Angle	V_o	= Operating Voltage
V	= Voltage	Φ	= Phase Angle	T_t	= Test Temperature
t	= Time	L_o	= Operating Life	T_o	= Operating Temperature
R_S	= Series Resistance	X&Y	= Exponent effect of voltage and temperature		

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