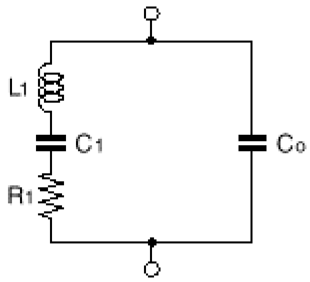
Passive Components

Resistor	$V = I.R$
Capacitor	Time Domain: $i_C(t) = C.\frac{dv_C(t)}{dt}$ or $v_C(t) = v_C(t_0) + \frac{1}{C}\int_{t_0}^{t} i_C(\tau).d\tau$ Frequency Domain: $z = \frac{1}{j.\omega.C}$ S Domain: $z = \frac{1}{s.C}$ S Domain with Initial Voltage: - Parallel Current Source $I = +C.V_C(0^-)$ Series Voltage source $V = \frac{+V_C(0^-)}{s}$
Inductor	Time Domain: $v_L(t) = L.\frac{di_L(t)}{dt}$ or $i_L(t) = i_L(t_0) + \frac{1}{L}\int_{t_0}^{t} v_L(\tau).d\tau$ Frequency Domain: $z = j.\omega.L$ S Domain: $z = s.L$ S Domain with Initial Current: - Parallel Current Source $I = \frac{-i_L(0^-)}{s}$ Series Voltage source $V = -L.i_L(0^-)$
Quartz Crystal	 L_1 = Dynamic or motional Inductance (mH) C_1 = Dynamic or motional Capacitance (fF - Fempto Farads) R_1 = Equivalent Series Resistance (Ω) C_0 = Parallel or Static Capacitance (pF) (holder capacitance) Series Resonant Frequency $f_S = \frac{1}{2\pi\sqrt{L_1C_1}}$ Parallel Resonant Frequency $f_P = \frac{1}{2\pi\sqrt{\frac{L_1C_1C_0}{(C_1+C_0)}}} \approx f_S\left(1+\frac{1}{2\gamma}\right)$ Capacitance Ratio $\gamma = \frac{C_0}{C_1}$ Quality Factor $Q = \frac{2\pi f_S L_1}{R_1} = \frac{1}{2\pi f_S C_1 R_1}$ Figure of Merit $M = \frac{Q}{\gamma} = \frac{1}{2\pi f_S C_0 R_1}$

Polyswitch	$m.C_p\left(\frac{\Delta T}{\Delta t}\right) = I^2R - U(T - T_a)$ $or:$ $R = \frac{m.C_p\left(\frac{\Delta T}{\Delta t}\right) + U(T - T_a)}{I^2}$ $\text{m} = \text{Mass of device (Kg)}$ $\text{C}_\text{p} = \text{Heat capacity of device } (\text{J.Kg}^{-1}.°\text{K}^{-1})$ $\Delta\text{T} = \text{Change in Temperature of device (°K)}$ $\Delta\text{t} = \text{Change in time (s)}$ $\text{I} = \text{Current flowing through device (Amps)}$ $\text{R} = \text{Resistance of device } (\Omega)$ $\text{U} = \text{Overall Heat Transfer Coefficient } (\text{W.°K}^{-1})$ $\text{T} = \text{Temperature of device (°K)}$ $\text{T}_\text{a} = \text{Ambient Temperature (°K)}$
Metal Oxide Varistor (MOV)	$I = k.V^{\alpha}$ Where: $\text{k} = \text{constant dependent on geometry}$ $\alpha = \text{Nonlinear Exponent - Can be determined from two V - I points:}$ $\alpha = \frac{\log(I_1 / I_2)}{\log(V_1 / V_2)}$