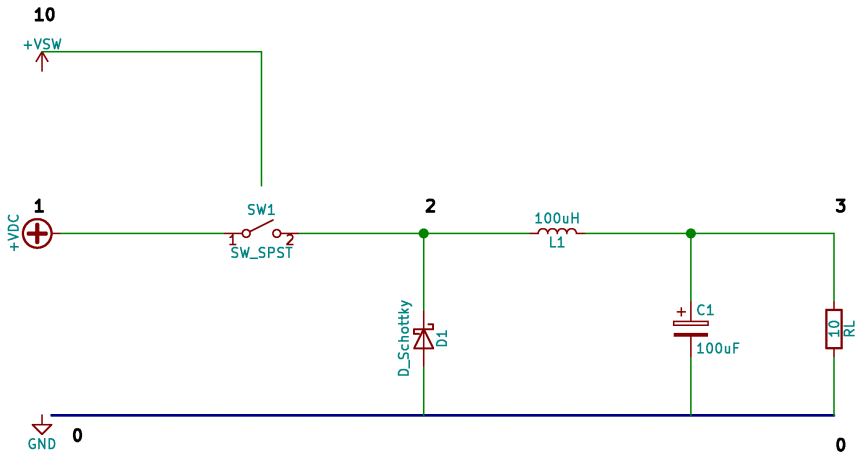
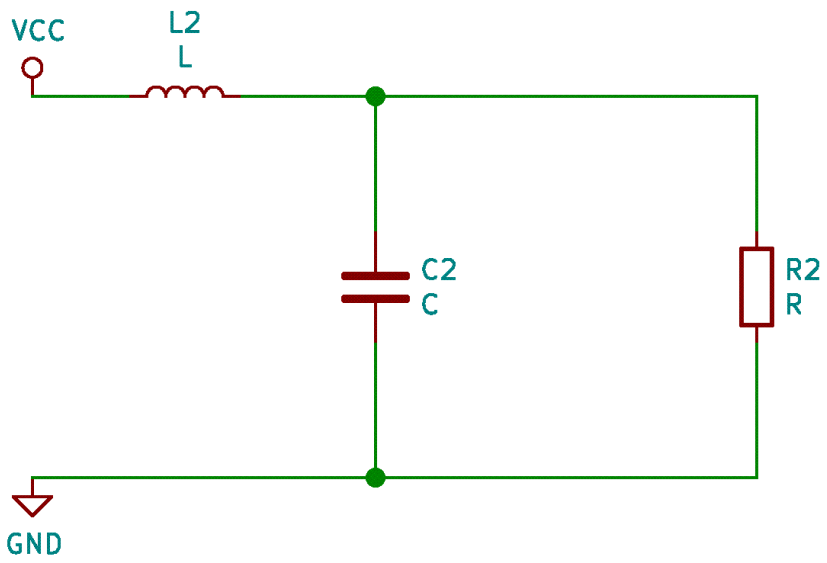

10
+VSW
1
+VDC
SW1
1
2
SW_SPST
2
100uH
L1
3
D_Schottky
D1
C1
100uF
10
RL
GND
0
0

on phase:



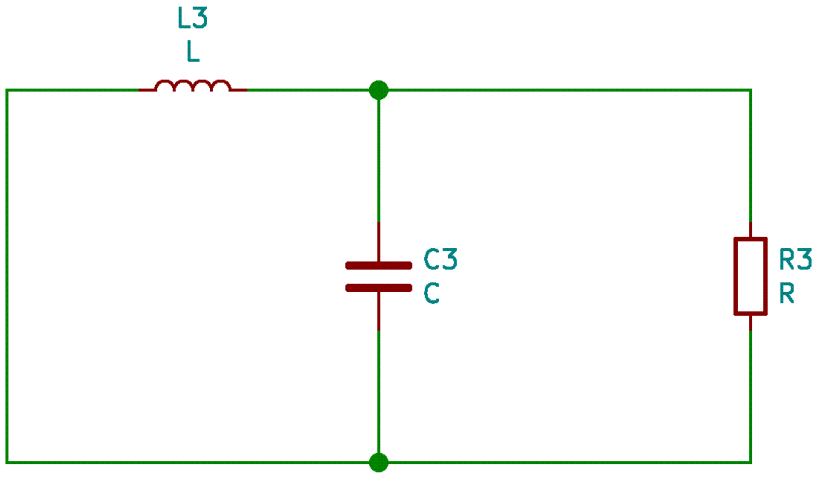
$$\begin{aligned} V_{in} &= V_L + V_o \\ V_{in} &= L\frac{dI_L}{dt} + V_o \\ where V_o &= V_c = V_r \end{aligned} \tag{1}$$

$$\begin{aligned} I_L &= I_c + I_r \\ I_L &= C\frac{dV_o}{dt} + \frac{V_o}{R} \end{aligned} \tag{2}$$

subst 2 in 1

$$\begin{aligned} V_{in} &= L\frac{d}{dt}(C\frac{dV_o}{dt} + \frac{V_o}{R}) + V_o \\ V_{in} &= LC\frac{d^2V_o}{dt^2} + \frac{L}{R}\frac{dV_o}{dt} + V_o \end{aligned} \tag{3}$$

off phase



$$\begin{aligned} V_L &= V_o \\ L\frac{di_L}{dt} &= V_o \end{aligned} \tag{4}$$

$$\begin{aligned} I_L &= I_c + I_r \\ I_L &= C\frac{dV_o}{dt} + \frac{V_o}{R} \end{aligned} \tag{5}$$

subst 5 in 4

$$\begin{aligned} L\frac{d}{dt}(C\frac{dV_o}{dt} + \frac{V_o}{R}) &= V_o \\ LC\frac{d^2V_o}{dt^2} + \frac{L}{R}\frac{dV_o}{dt} &= V_o \\ LC\frac{d^2V_o}{dt^2} + \frac{L}{R}\frac{dV_o}{dt} - V_o &= 0 \end{aligned} \tag{6}$$