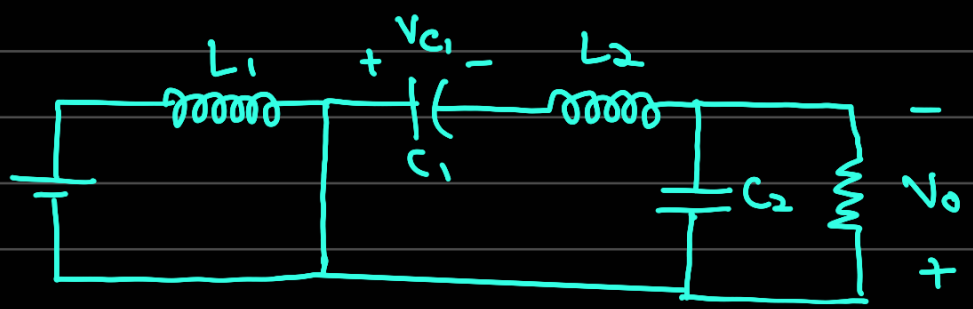
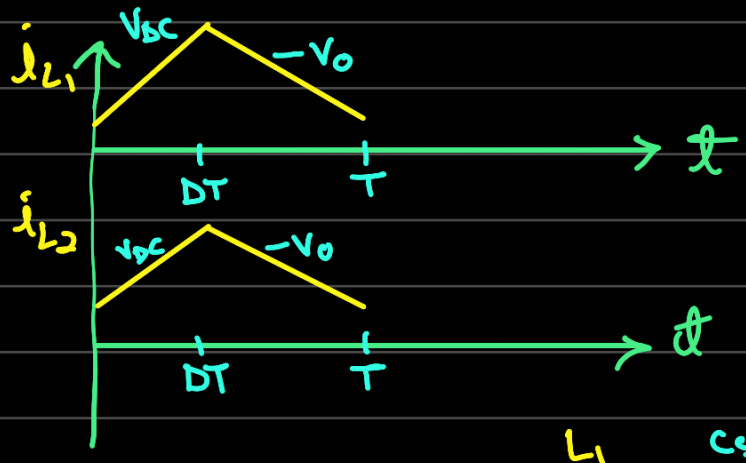
Day-17

→ Revisiting Cuk Converter-

ON State:



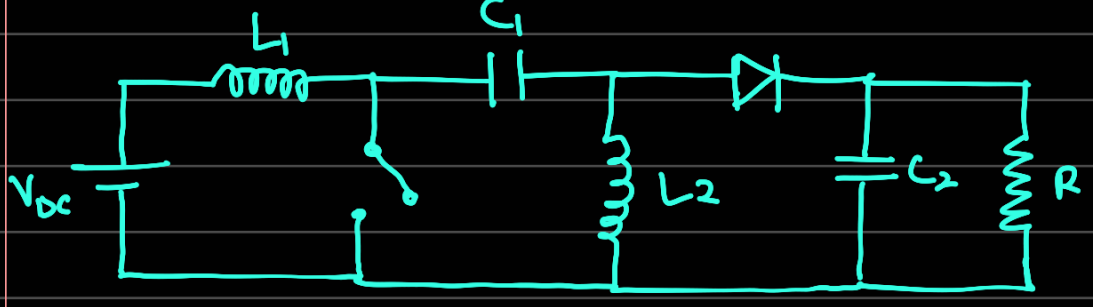
$$+V_o + V_{DC} - V_{C_1} = 0 \implies V_{C_1} = V_o + V_{DC}$$



OFF State

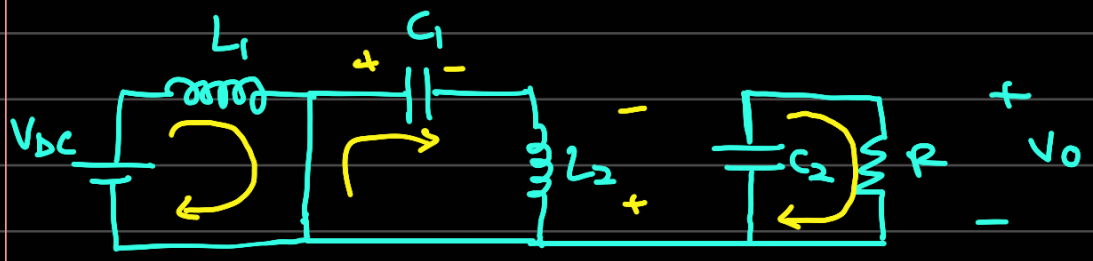
$$V_{DC}\,DT = V_o(1-D)T \implies \frac{V_o}{V_{DC}} = \frac{D}{1-D}$$

→

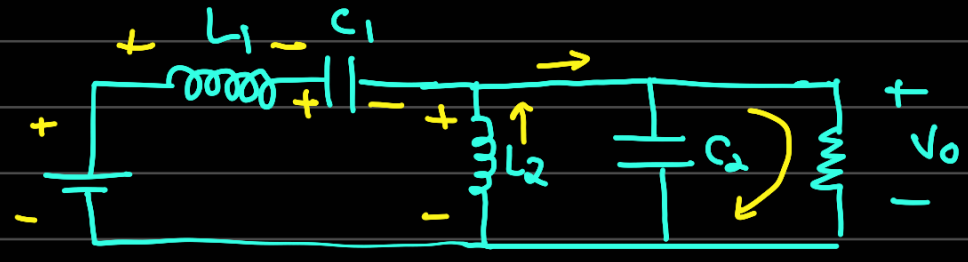


Single Ended Primary Inductance Converter (SEPIC)

ON state :



OFF state



ON

$$V_{L_1} = V_{DC}$$
$$V_{L_2} = -V_{C_1}$$

OFF

$$V_{DC} + V_{L_1} - V_{C_1} - V_{L_2} = 0$$

$$V_{L_2} = V_o \quad \Rightarrow V_{L_1} = V_{DC} - V_{C_1} - V_o$$

So $V_{DC}\, DT = -(V_{DC} - V_{C_1} - V_o)(1-D)T$

$$\Rightarrow V_{DC} D = -V_{DC} + V_{C_1} + V_o + D V_{DC} - V_{C_1} D - V_o D$$

$$\Rightarrow V_{DC} = (V_{C_1} + V_o)(1-D)$$

$$-V_{C_1} DT = -V_o (1-D) T$$

$$\Rightarrow V_{C_1} = V_o \frac{(1-D)}{D}$$

$$\text{So} \quad V_{DC} = \left(V_o \frac{(1-D)}{D} + V_o \right)(1-D)$$

$$= V_o \frac{(1-D)}{D}$$

$$\Rightarrow \frac{V_o}{V_{DC}} = \frac{D}{1-D}$$