SMPS

In some of the applications, we requi Very fine quality of DC power supply like ICs, some of the sensitive digital circuits etc. where SMPs becom popular (SMPs provides Very good quali of DC power supply.) ~~with Very mu~~

In SMPs, the switch is used only i 2 modes (ON & OFF). Active region is not used in SMPs hence, the switch operates more efficiently. But in linear power supplies, active region is used for the switch in ON state & hence power dissipation in the switch is severe. Linear power supplies are not efficient power supplies. They require Very large size filter.

SMPs, requires small size filter with less weight because it operates at very high switching freq. to reduce the ripple.

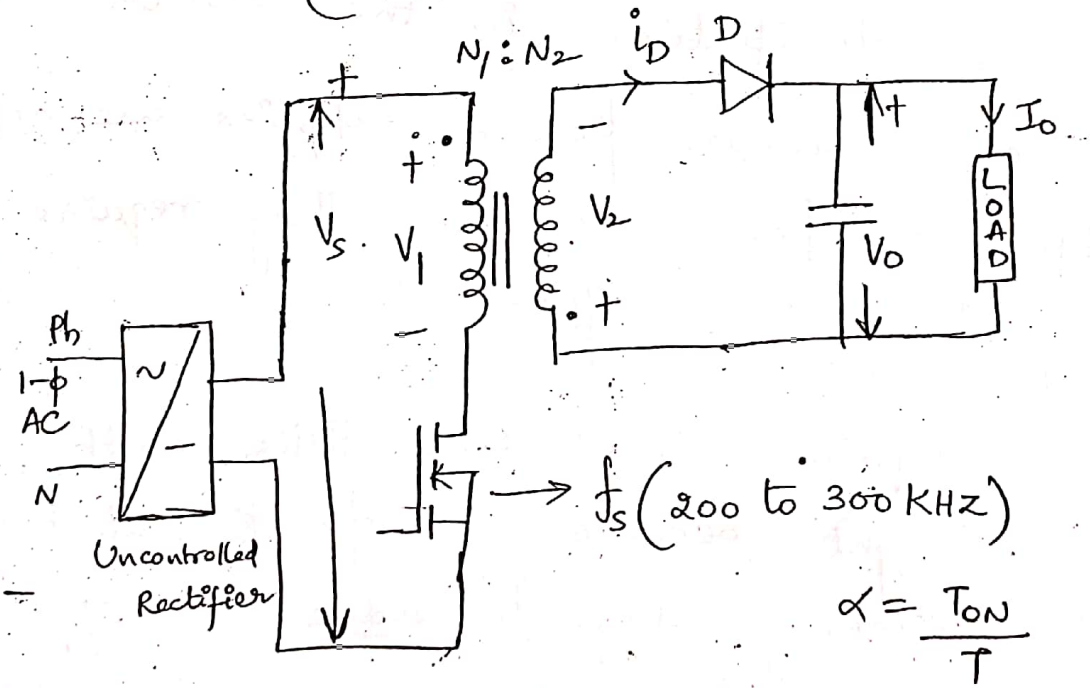
Hence, it is more compact with less weight giving very good DC power supply.

Types of SMPS

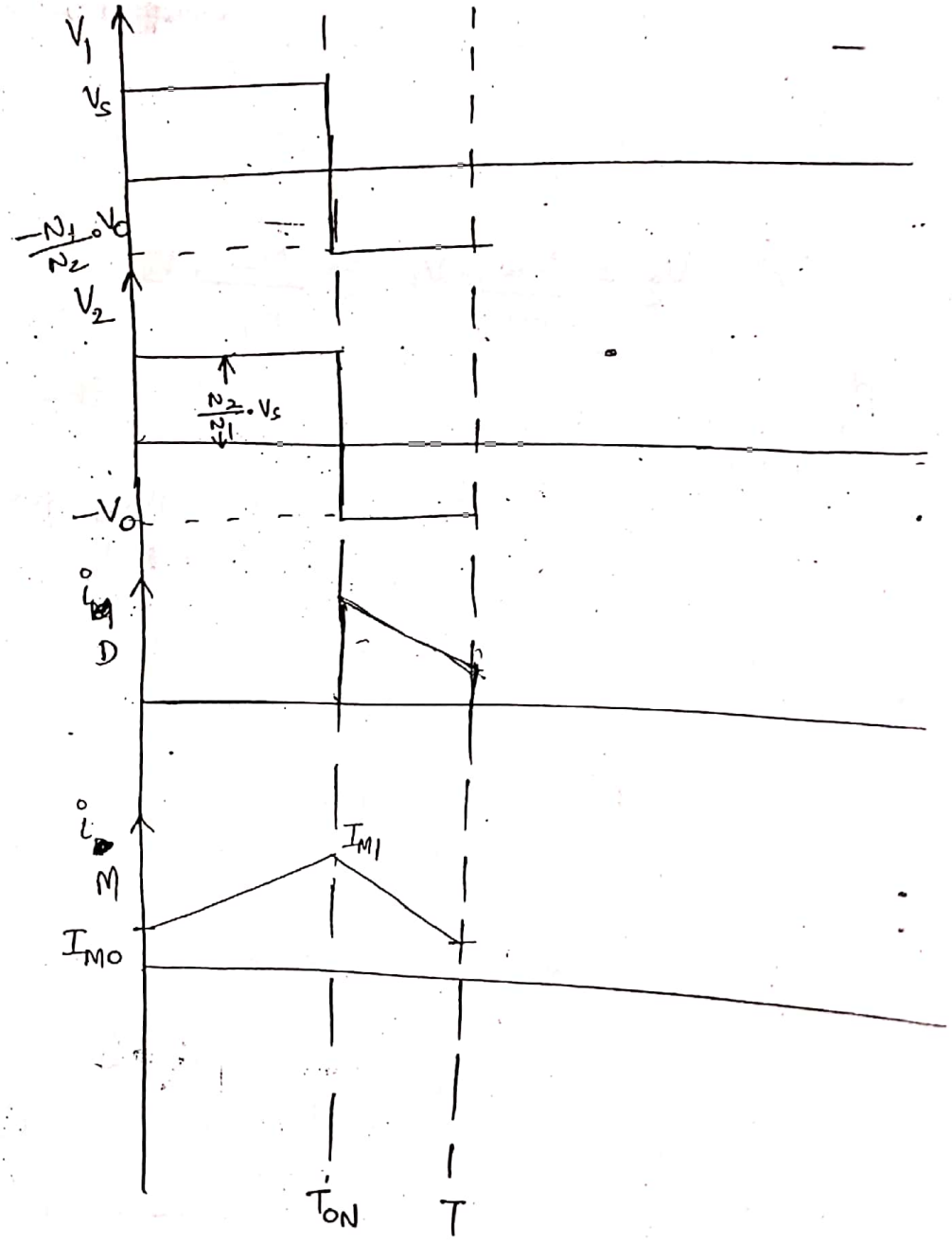
1. Flyback Converter
2. Push pull Converter
3. Half bridge Converter
4. Full bridge Converter

1. Flyback converter

(Isolated buck boost)



$$\alpha = \frac{T_{ON}}{T}$$



i_M is Magnetising current of T/F Core

Model : 0 to T_{ON}

M → ON, ⇒ $V_1 = V_s$

D → OFF

$$\frac{V_2}{V_1} = \frac{N_2}{N_1}$$

$$\Rightarrow V_2 = \frac{N_2}{N_1} \cdot V_1 = \frac{N_2}{N_1} \cdot V_s$$

T/F core stores energy in the form of Mag. field.

$$V_1 = V_s = L \frac{di_M}{dt}$$

$$di_M = \frac{V_s}{L} dt$$

$$\Rightarrow i_M = \frac{V_s}{L} t + K$$

$$\boxed{i_M = \frac{V_s}{L} t + I_{M0}} \rightarrow (1)$$

$$\boxed{I_{M1} = \frac{V_s}{L} \cdot T_{ON} + I_{M0}} \rightarrow (2)$$

Mode 2

M is OFF

$\Rightarrow$ D becomes ON.

$$V_2 = -V_0$$

$$\Rightarrow V_1 = -\frac{N_1}{N_2} \cdot V_0$$

$$i_M = \frac{\left(\frac{-N_1}{N_2} \cdot V_0\right)}{L} \cdot t + I_{M1}$$

$$= \frac{-\left(\frac{N_1}{N_2} \cdot V_0\right)}{L} \cdot (t - T_{ON}) + I_{M1}$$

$\longrightarrow$ (3)

Put $t = T$ in (3)

$$\Rightarrow I_{MO} = \frac{\left(\frac{-N_1}{N_2} \cdot V_0\right)}{L} \cdot (T - T_{ON}) + I_{M1}$$

$$I_{MO} = -\frac{V_0}{aL}(T - T_{ON}) + I_{M1} \longrightarrow (4)$$

where, $a = \frac{N_2}{N_1}$