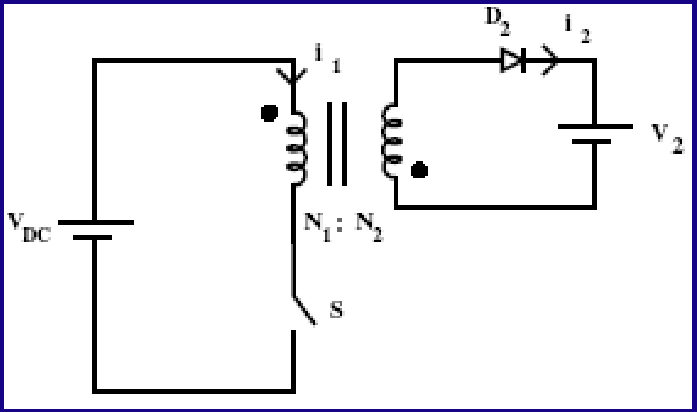
Review

1. Buck, Boost, Buck – Boost & Cuk' Inverter → No isolation

⇒ $|V_{DC}|$ & $|V_0|$ can not be greatly different

⇒ Use a transformer & do not allow it to saturate



Close 'S' for 'DT' duration:

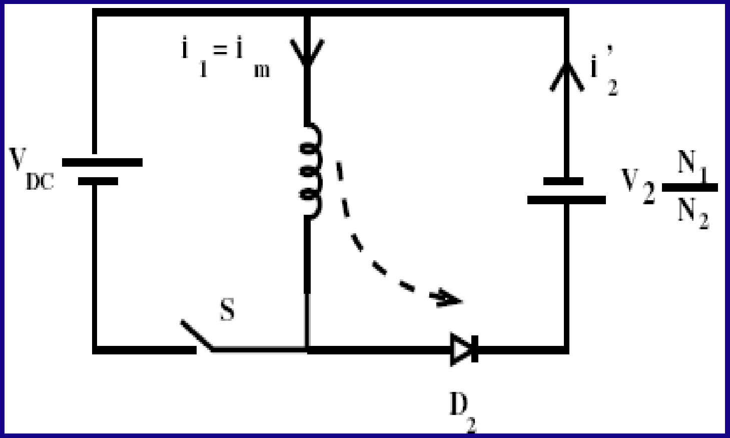
'i_1' enters the dot in the primary.

$i_2 = 0$, because of D_2

$\therefore i_1 = i_m$ source supplying as the magnetising current,

↑ linearly with time.

'ϕ' in the core also ↑ linearly with time.



Open 'S'

$\Rightarrow$ 'ϕ' in the core must be continuous

$\therefore$ 'ϕ' due to i_2 should be in the same direction as that due to i_1 (they are not produced at the same time).

$\Rightarrow \therefore$ i_2 also enters the '$\bullet$'

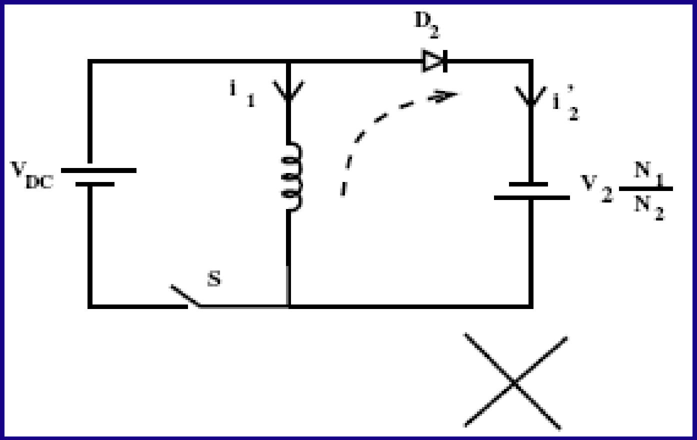
i_1 & i_2' will flow simultaneously when 'S' is opened.

$\Rightarrow$ No path for i_m

$\Rightarrow$ 'V' spike across 'S'

$\Rightarrow$ Instead of feeding power to another 'V' source, connect a parallel combination of C & R

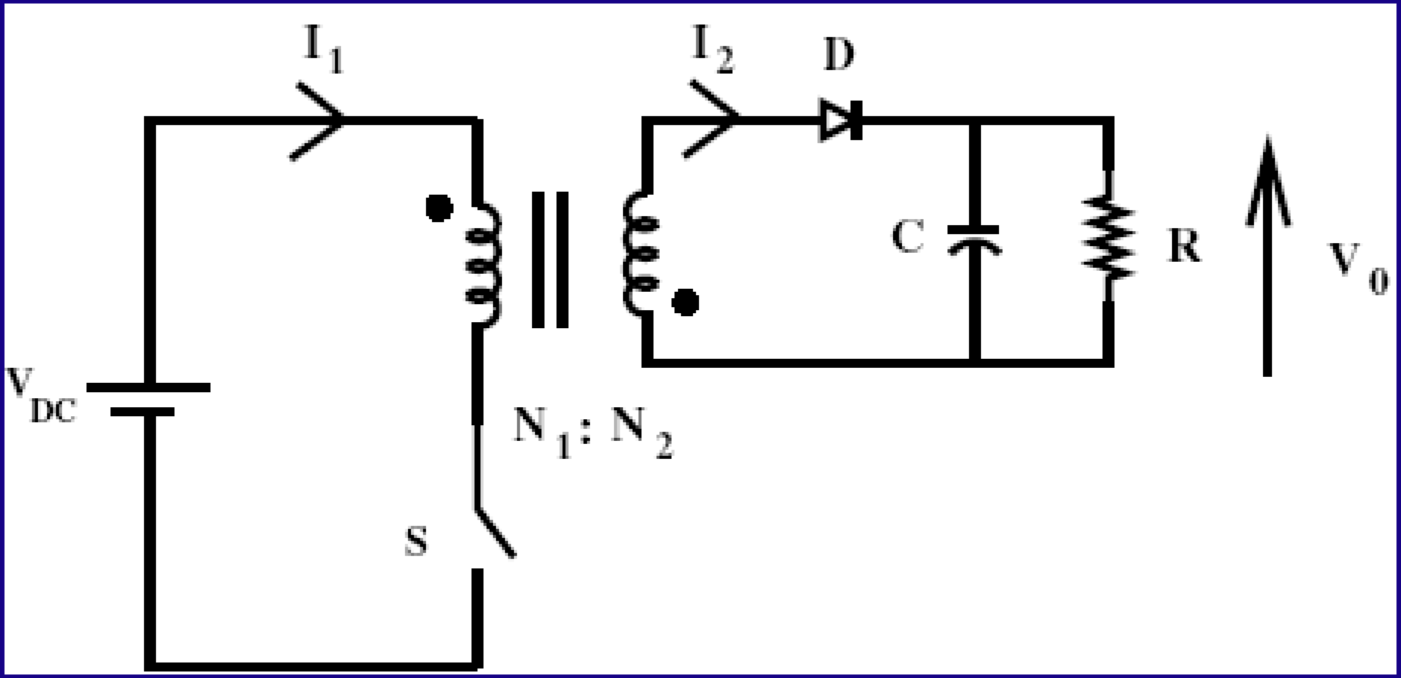
$\Rightarrow$ Fly back converter



FLYBACK CONVERTER :

Freewheeling diode also known as flywheel diode.

Very popular upto 200 W.



Close S :

Current enters the dotted terminal.

I_2 should leave the dot in the secondary.

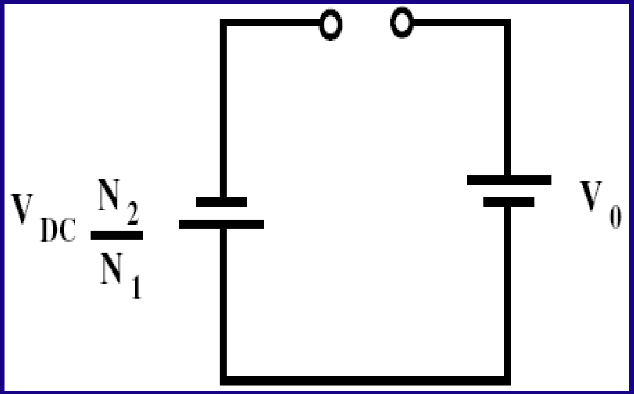
$\Rightarrow$ Not possible due to D

$\therefore I_2 = 0 \quad \therefore I_1 = I_s = i_m \rightarrow$ only the magnetizing 'I'.

i_1 & $\therefore \phi \uparrow$ linearly.

'C' supplies power to the load.

'V' across $N_1 = V_{DC}$ ('•' is +ve)



$\therefore$ 'V' induced in secondary $= V_{DC}\dfrac{N_2}{N_1}$ ('•' is +ve)

Open S :

'ϕ' in the core must be continuous.

$\Rightarrow$ i_2 will flow in the sec. in such a way that direction of 'ϕ' due to i_1 is same

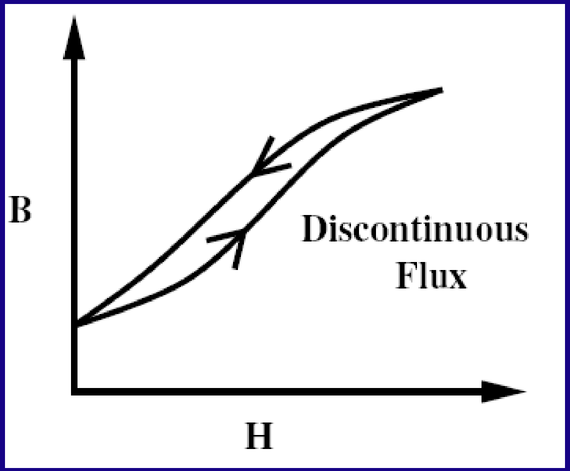
$\Rightarrow$ i_2 enters the dot in secondary

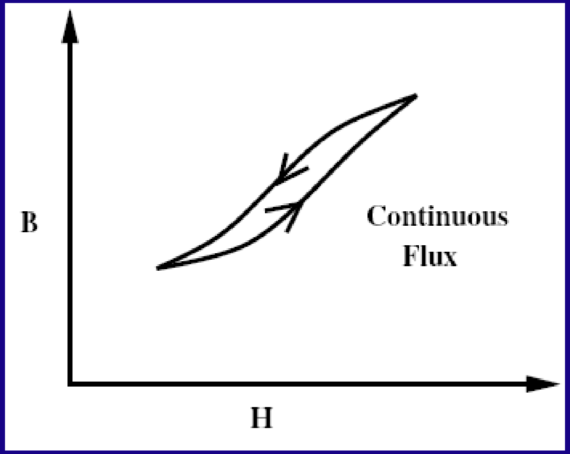
$\Rightarrow$ Stored energy is transferred to the load

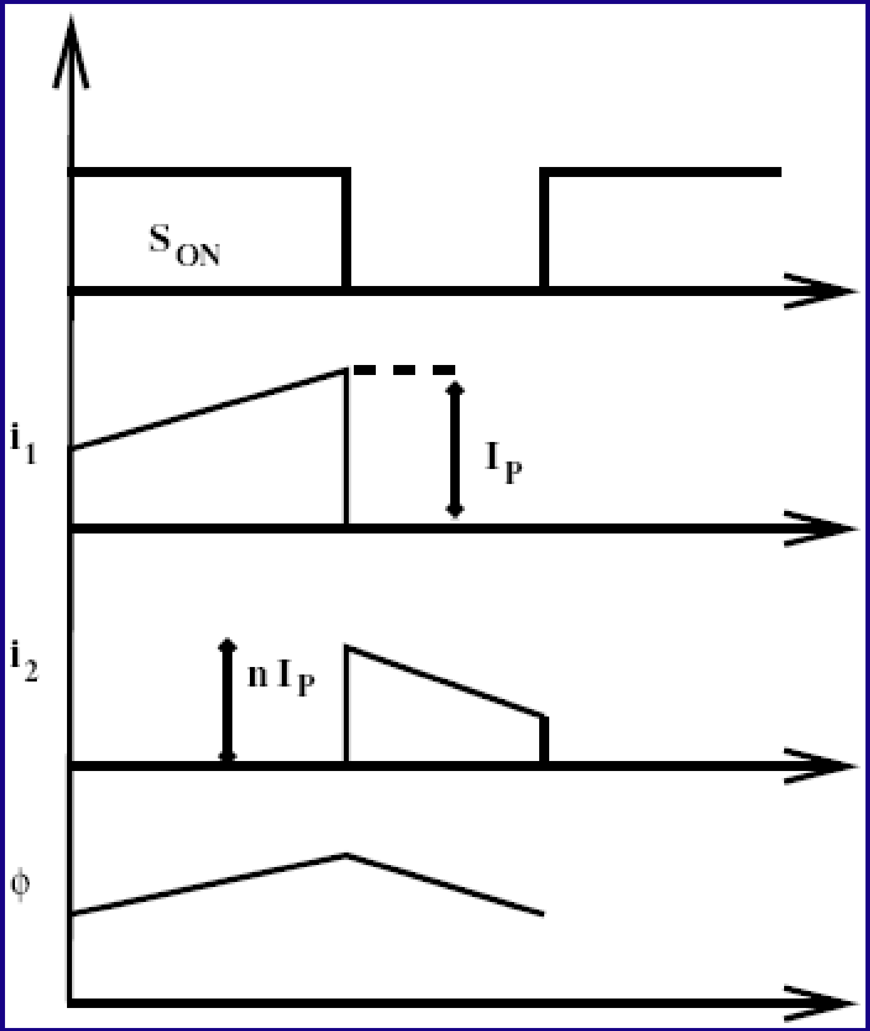
$\Rightarrow$ i_2 may or may not become zero

$\Rightarrow$ $i_2 \neq 0$ just prior to turn ON of 'S'

$\Rightarrow$ 'ϕ' is continuous (unidirectional 'ϕ')


B
H
Discontinuous
Flux

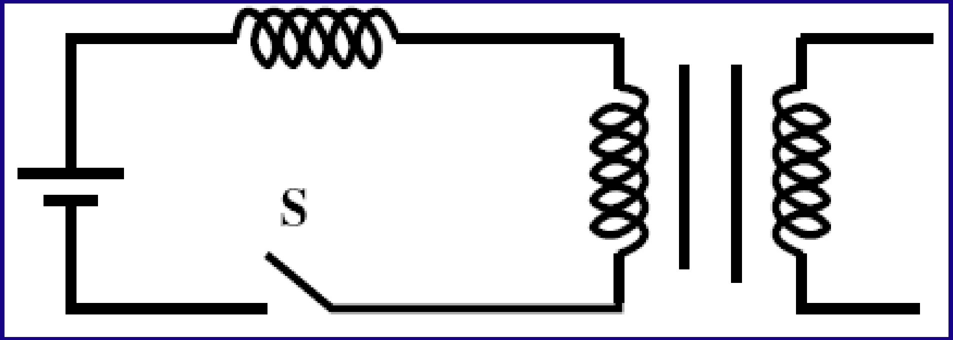

B
H
Continuous
Flux

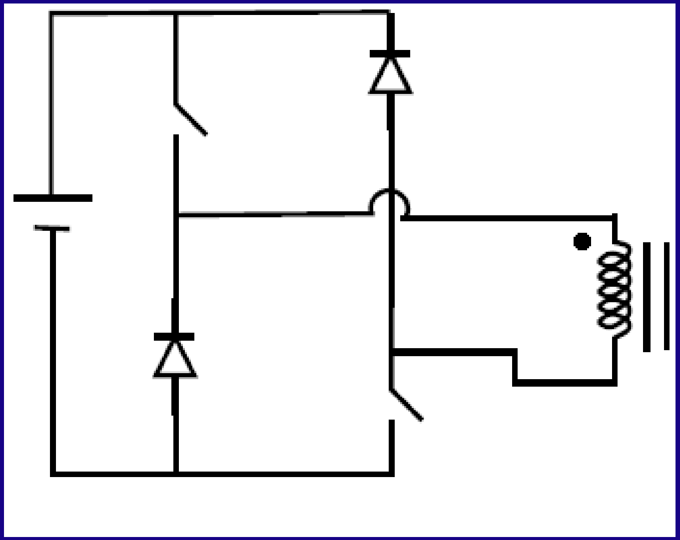

S_{ON}
i_1
I_P
i_2
$n\,I_P$
ϕ

$\Rightarrow$ Generally operated in discontinuous mode because if accidentally D$\uparrow$, core may saturate $\Rightarrow$ 'S' may fail

$\Rightarrow$ Airgap is provided in the airgap

$\Rightarrow$ Not tightly coupled $\Rightarrow$ Leakage flux





$\Rightarrow$ **Flux will follow the above path only if there is Volt. Sec. / Turn balance**

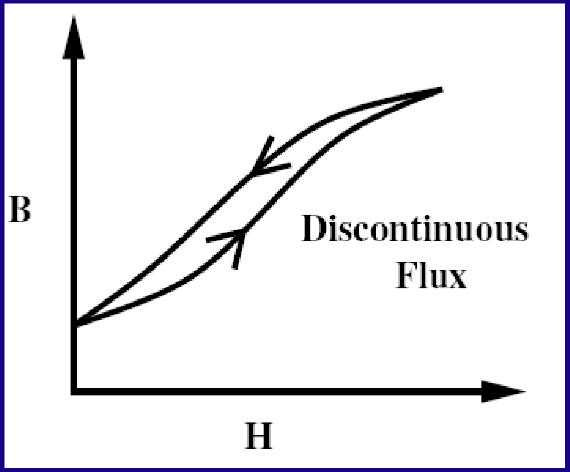
$$\uparrow \text{in } d\phi = \downarrow \text{in } d\phi$$

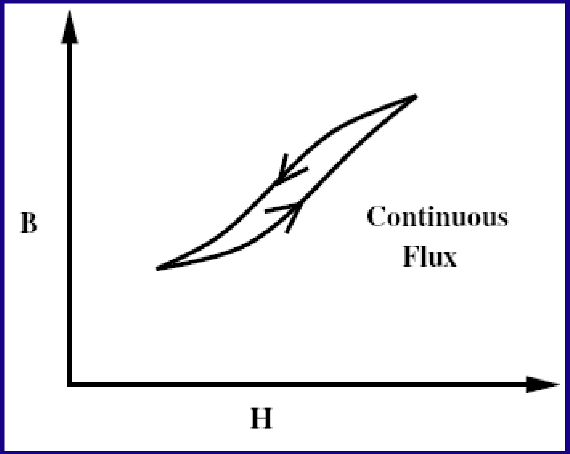
$$\uparrow \text{in } d\phi = \frac{V_{DC}}{N_1} DT$$

$$\downarrow \text{in } d\phi = \frac{V_0}{N_2}(1-D)T$$

$$\therefore \frac{V_0}{N_2}(1-D)T = \frac{V_{DC}}{N_1} DT$$

$$\therefore V_0 = V_{DC}\left(\frac{N_2}{N_1}\right)\left(\frac{D}{1-D}\right)$$





$\Rightarrow |V_0|$ & $|V_{DC}|$ can be significantly different

$\Rightarrow D_{MAX} = 0.5$

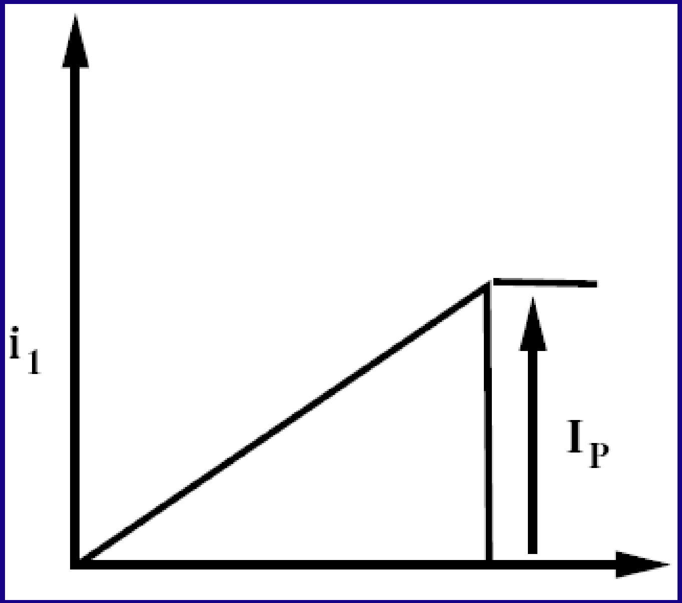
$\Rightarrow$ Choose $\dfrac{N_2}{N_1}$ suitably

$\Rightarrow$ Primary 'L' is a very important parameter

$$I_P = \frac{V_{DC}}{L_1} DT$$

$$\therefore P_{in} = V_{DC}\left[\frac{1}{2} I_P \frac{DT}{T}\right] \approx P_0$$

$$\therefore I_P = \frac{2P_{in}}{DV_{DC}} \approx \frac{2P_0}{DV_{DC}}$$



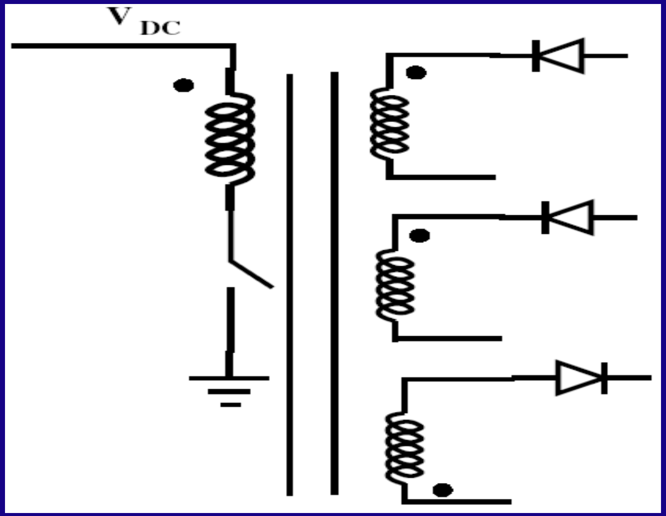
Advantage :

1) o / p can be significantly different.

2) Multiple o / p ' s are possible.

3) Isolation.

$\Rightarrow$ Closed loop is a must



Various configuration :