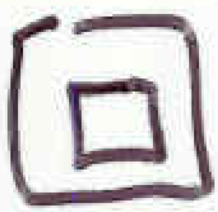
Why L_m small in Flyback?

$\mathcal{E}$(trf from primary to secondary) each sw cycle

$$\mathcal{E} = \frac{1}{2} L_m \underbrace{i_m^2}_{\left(\frac{V_g}{L_m} D\right)^2} \Rightarrow \sim \frac{1}{L_m}$$

$L_m \downarrow$ $\mathcal{E}$(trf) $\uparrow$ each sw cycle

$$L_m = \frac{N^2}{\mathcal{R}_c}$$



air gap l_g μ_0

$$\mathcal{R} = \frac{l_c}{\mu_c A_c}$$

$\mathcal{R}$ small

L_m big

$$\mathcal{R} = \cancel{\frac{l_c}{\mu_c A_c}}_{\to 0} + \frac{l_g}{\mu_0 A_g}$$

dominates

$\mathcal{R}$ big

L_m small

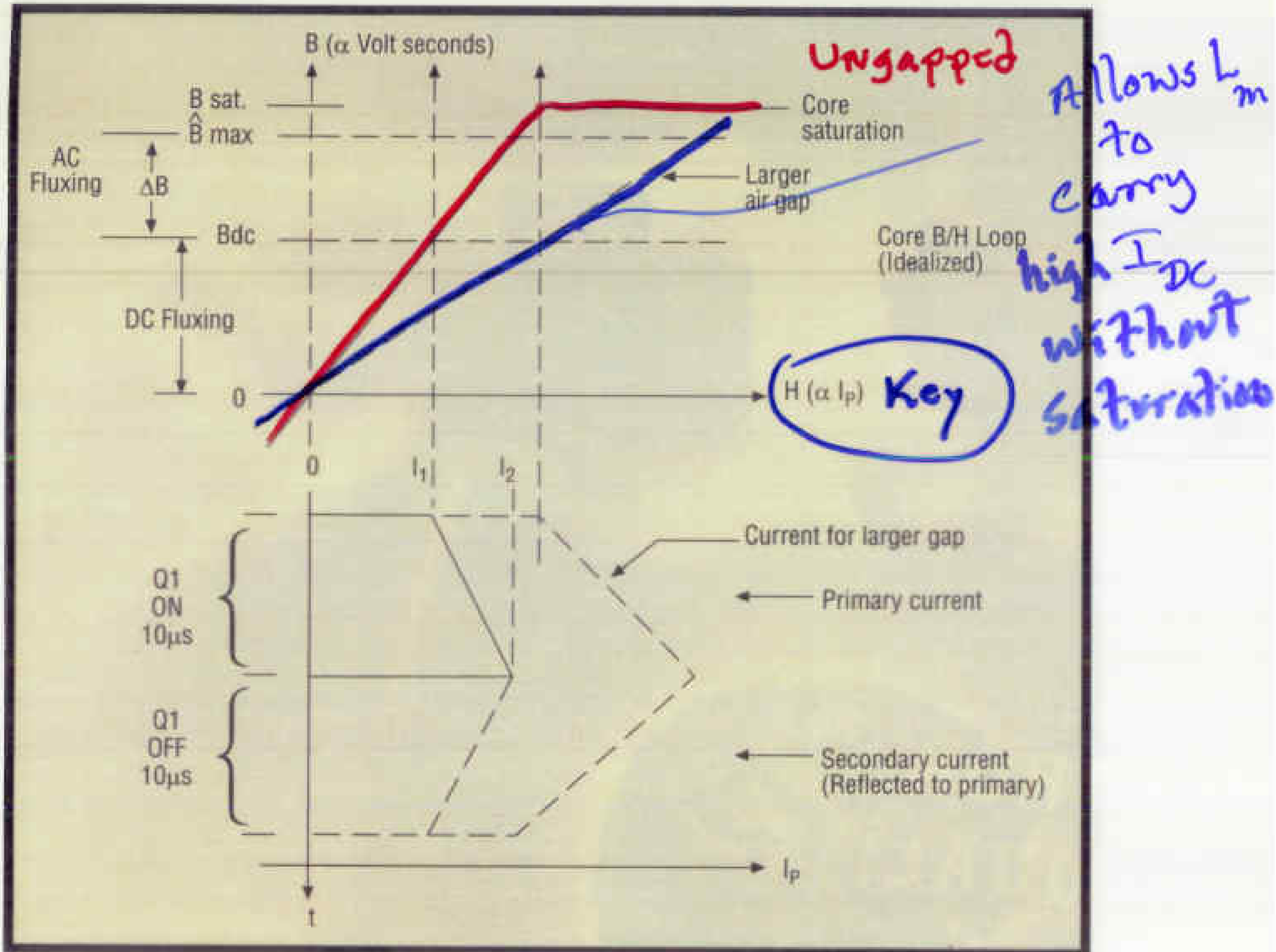


Fig. 3. *An idealized B/H characteristic for the continuous mode flyback transformer.*

$L_m \downarrow$ causes $\Delta i_{L_m} \uparrow$

What if

$\Delta i_{L_m} > I^{DC}_{L_m}$?

DCM could occurr

$\underbrace{L_m \downarrow \Delta i_{L_m} \uparrow}$ $\underbrace{R_L \uparrow I^{DC}_{L_m} \downarrow}$

Get third circuit when $i_L = 0$

Both Q and D off

1st state: Q ON D off

2nd state: Q off D ON

3 state: Both Q D off

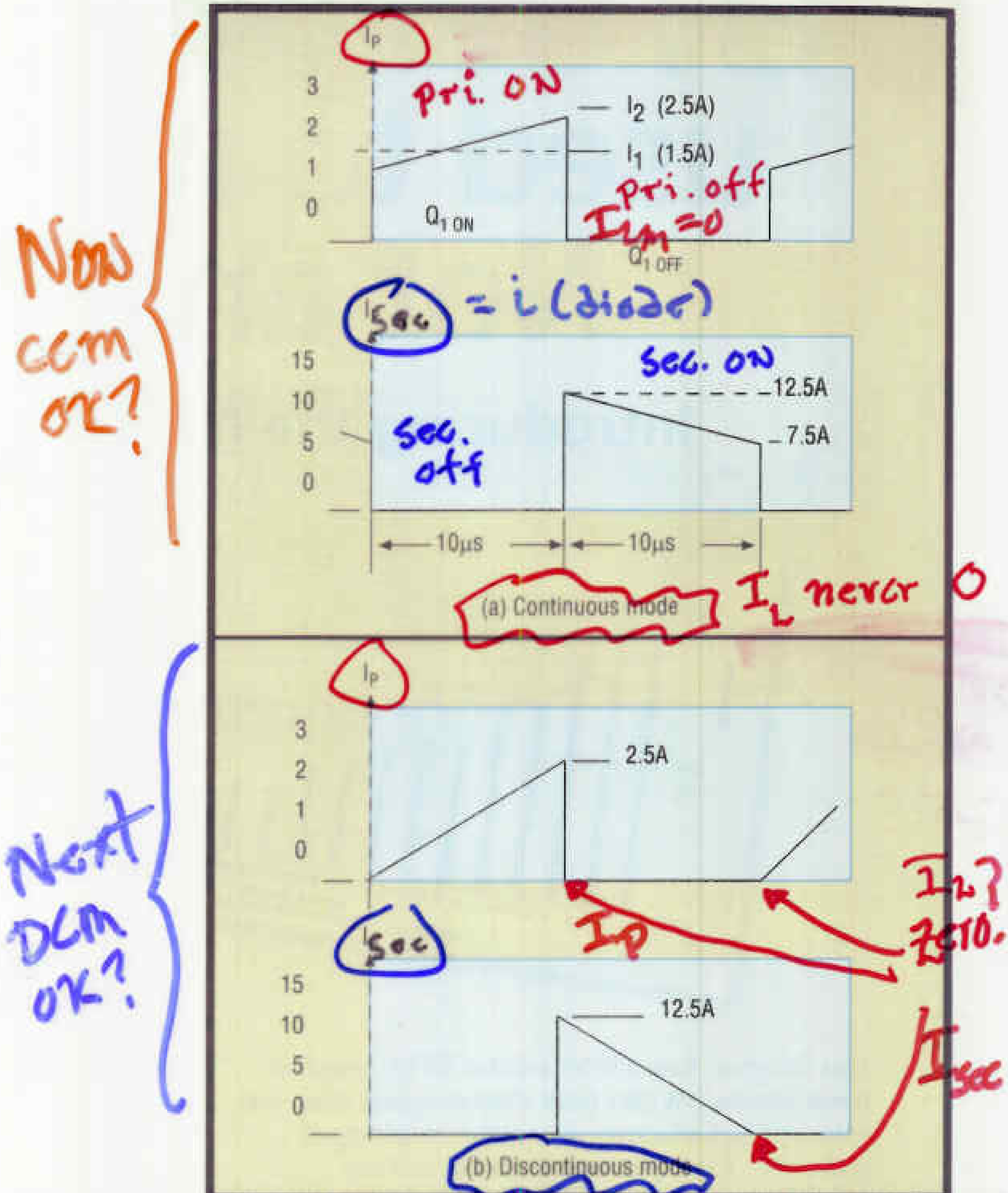


Fig. 2. *Current waveforms for* **(a)** *Continuous mode and* **(b)** *Discontinuous mode.*