# Conversion factor relating PFC Sampled Switch Current & Average Inductor Current

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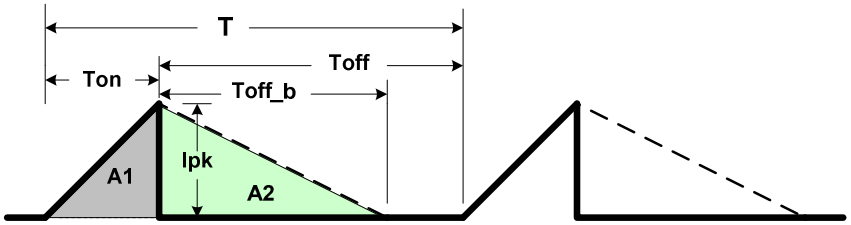
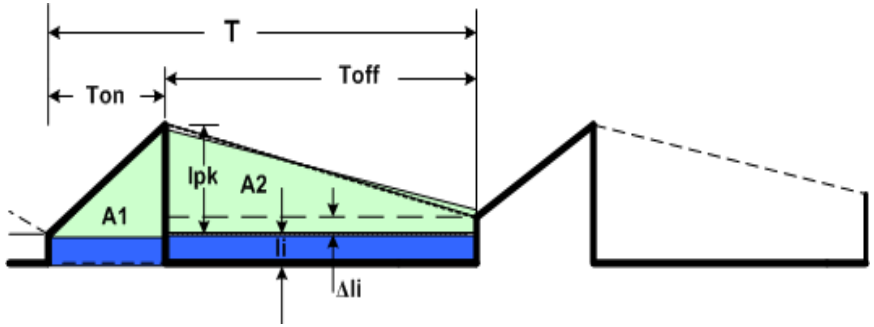
# Bridgeless PFC Sampled Switch Current & Average Inductor Current




**PFC Switch and Inductor Current under DCM**




**PFC Switch and Inductor Current under CCM**

$$L \cdot \Delta I_{L\_ON} \approx L \cdot \Delta I_{L\_OFF}$$

$$\Rightarrow V_{in} T_{ON} = -(V_{in} - V_o) T_{off\_b}$$

$$D_a \cdot V_{in} = D_b (V_o - V_{in}), \quad D_a = \frac{T_{ON}}{T}, \quad D_b = \frac{T_{off\_b}}{T}$$

Average inductor current under DCM,

$$I_{L\_dcm} = (T_{on} + T_{off\_b}) \cdot (\frac{I_{pk}}{2}) \cdot \frac{1}{T} = (D_a + D_b) \frac{I_{pk}}{2}$$

Average inductor current under CCM,

$$I_{L\_ccm} \approx (T_{on} + T_{off}) \cdot (\frac{I_{pk}}{2} + I_i) \cdot \frac{1}{T}$$

$$= (D_a + D_b)(\frac{I_{pk}}{2} + I_i)$$

For bridgeless PFC, switch current is always sensed at the center of the on-time Ton.

So, $I_{sw} = \frac{I_{pk}}{2} + I_i$ under CCM, and $I_{sw} = \frac{I_{pk}}{2}$ under DCM $[I_i = 0]$

Therefore, the switch current $I_{sw}$ in terms of average inductor current $I_L$ in both CCM and DCM modes

$$I_L = (D_a + D_b) I_{sw} \quad \Rightarrow I_{sw} = \frac{I_L \cdot (V_o - V_{in})}{D_a \cdot V_o}$$