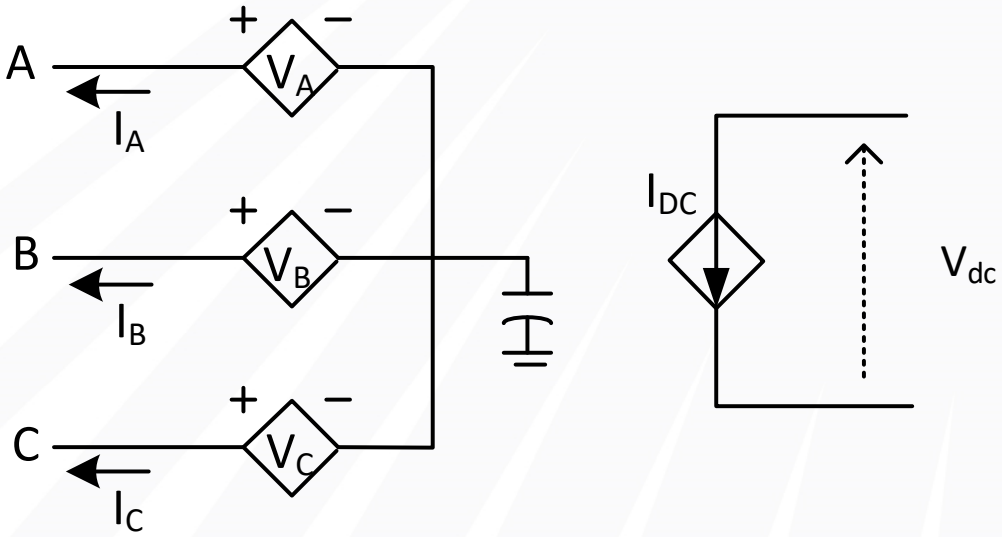
Average models use energy-conserving, controlled sources to produce the reference phase voltages.

Control modulation indices:

$$m_a = \sin(\omega t)$$
$$m_b = \sin(\omega t + 2\pi/3)$$
$$m_c = \sin(\omega t - 2\pi/3)$$



AC voltage sources:

$$V_A = \frac{m_a V_{DC}}{2}$$
$$V_B = \frac{m_b V_{DC}}{2}$$
$$V_B = \frac{m_c V_{DC}}{2}$$

DC current source:

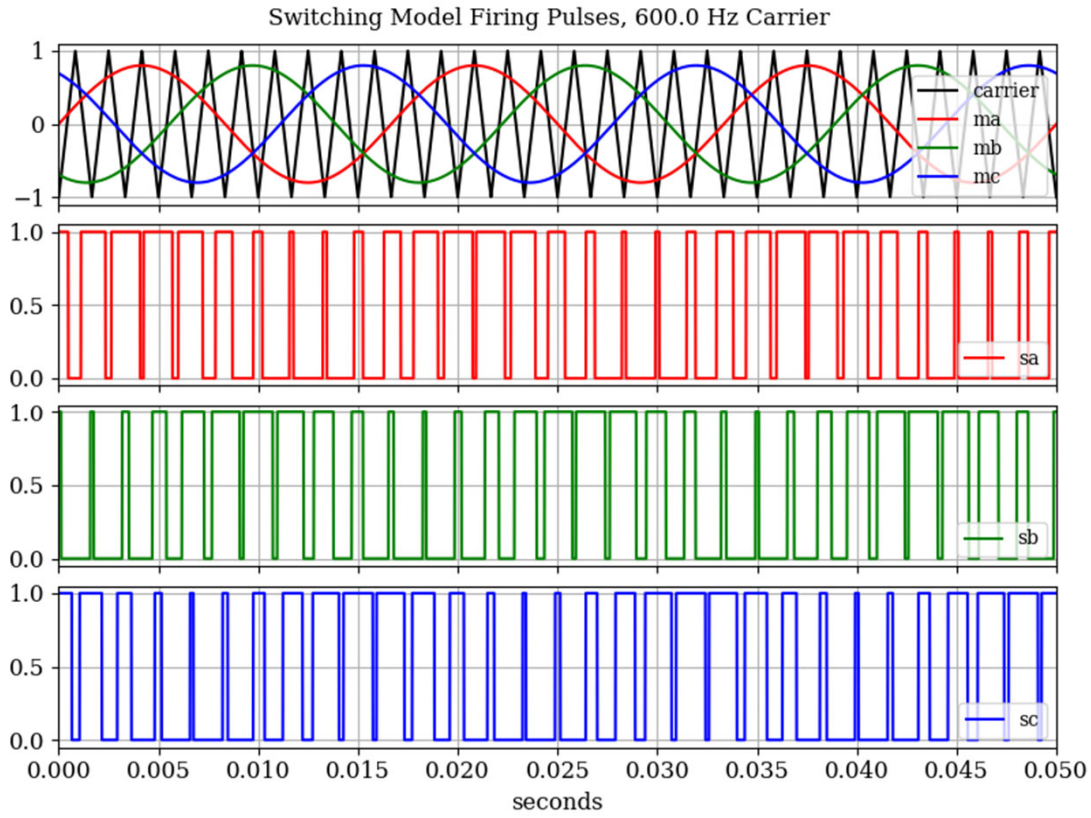
$$I_{DC} = \frac{m_a I_A + m_b I_B + m_c I_C}{2}$$

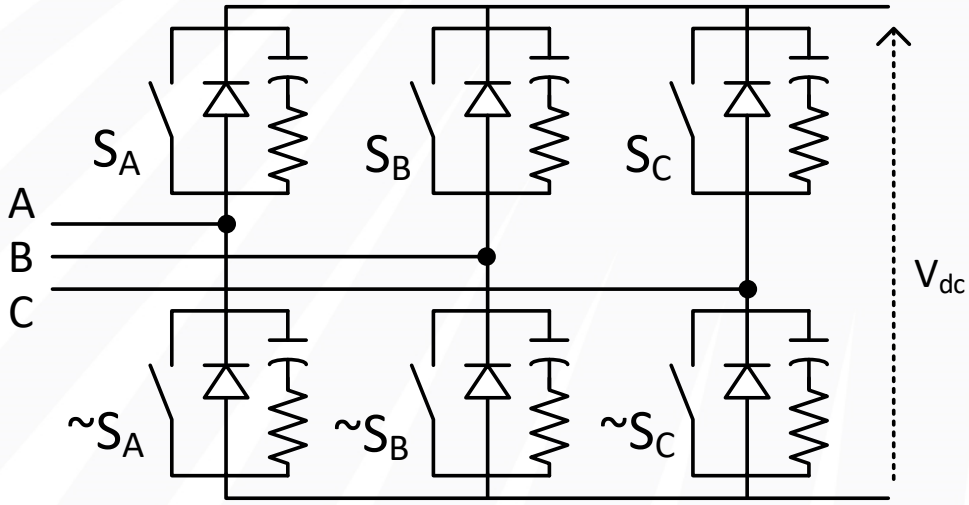
Check power balance:

$$I_A V_A + I_B V_B + I_C V_C = I_{DC} V_{DC}$$

Ref: Yazdani and Iravani, pp. 119-121

Switching (detailed) models are driven by the same reference voltages, or modulation indices, as the average models.





$S_A = m_A >$ carrier

$S_B = m_B >$ carrier

$S_C = m_C >$ carrier