

ZVS-QR Switch Cell SSM

Replace $d(t)$ with $m(t)$

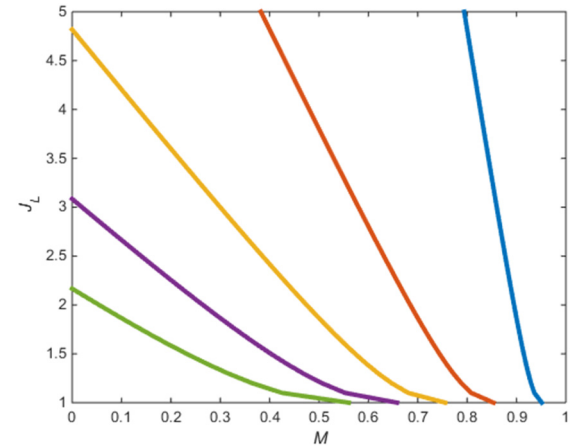
$$m = 1 - \frac{F}{2\pi} \left[\frac{1}{2J_L} + \pi + \sin^{-1}\left(\frac{1}{J_L}\right) + \sqrt{J_L^2 - 1} + J_L \right] = m = f(J_L, F) = f(i_L, v_g, f_s)$$

$$F = \frac{f_s}{f_0}$$

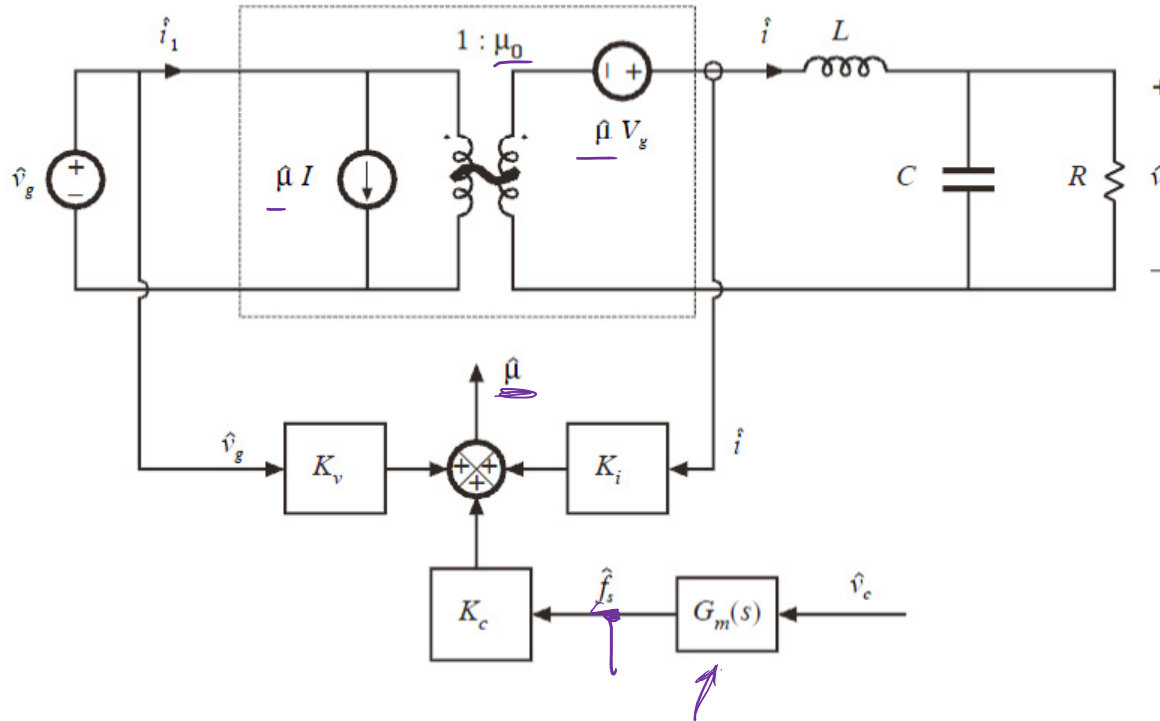
$$J_L = \frac{I_L}{V_g} R_0$$

$$m = f(i_L, v_g, f_s)$$

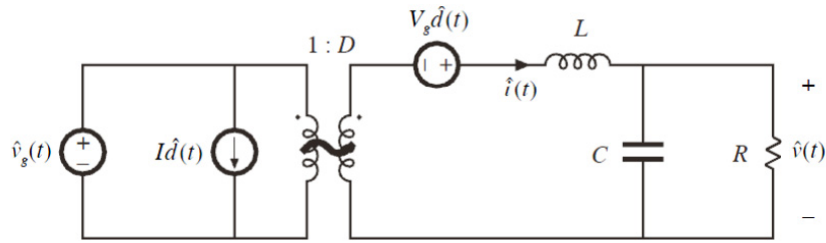
$$\hat{m} = k_i \hat{i}_L + k_v \hat{v}_g + k_c \hat{f}_s \rightarrow \text{small-signal linearization}$$



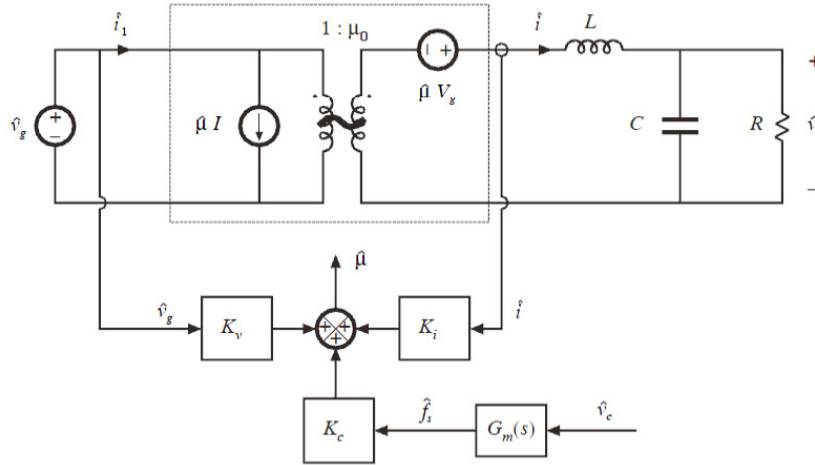
SSM, Soft-Switching Buck



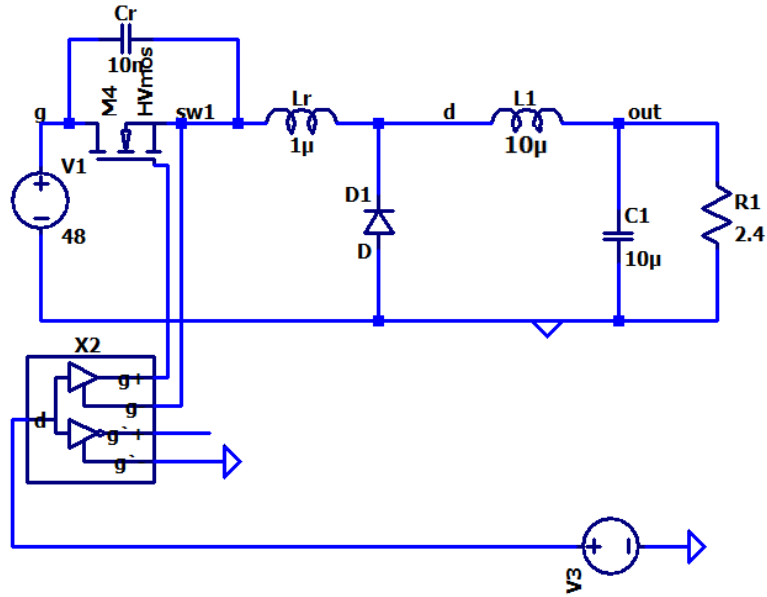
PWM Transfer Functions



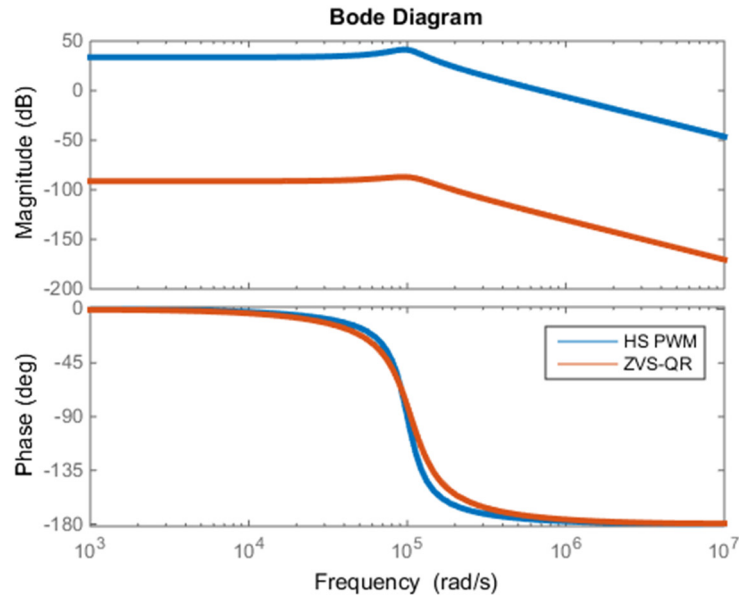
QR Transfer Functions



Example



Control-to-Output Transfer Function



Control-to-Output Transfer Function

