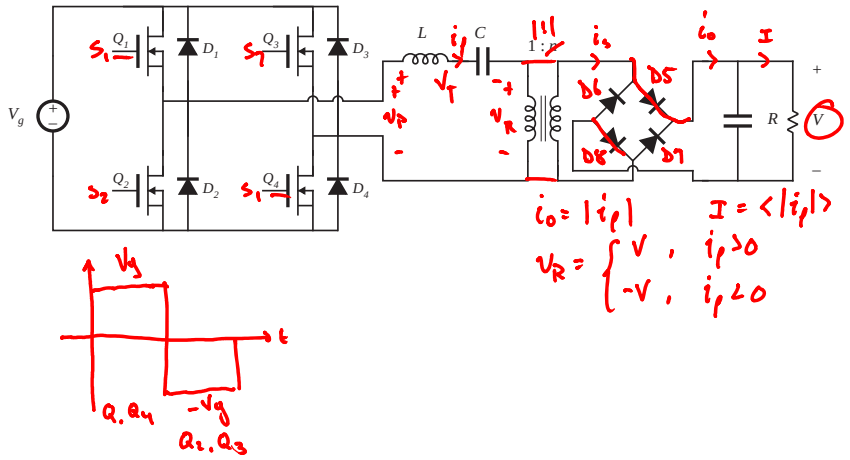
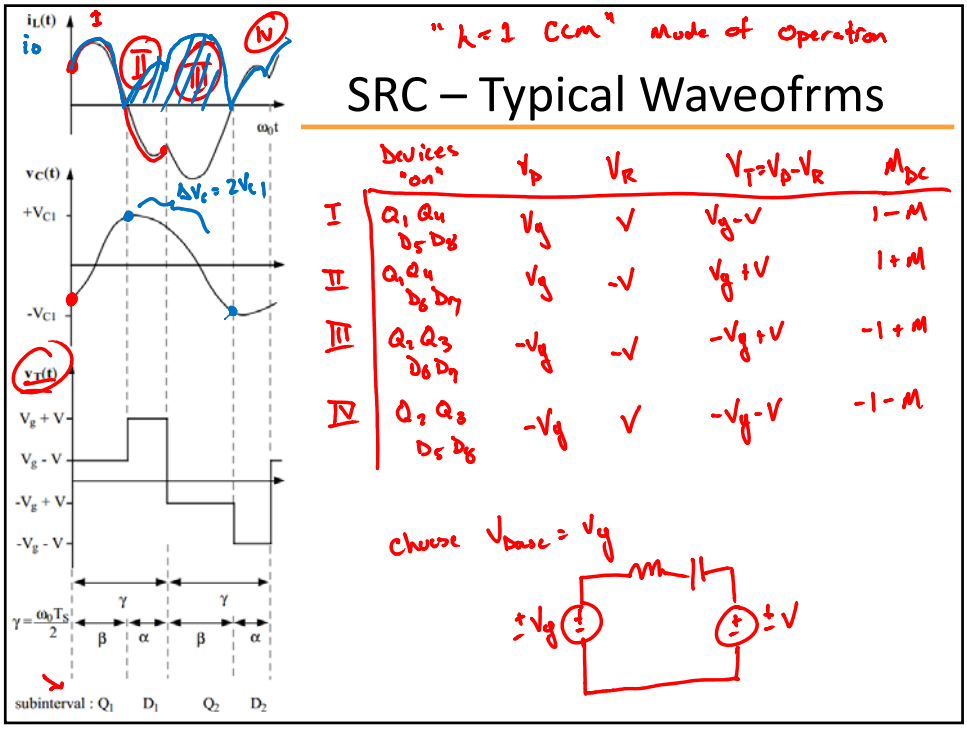
SRC: Diode Rectifier

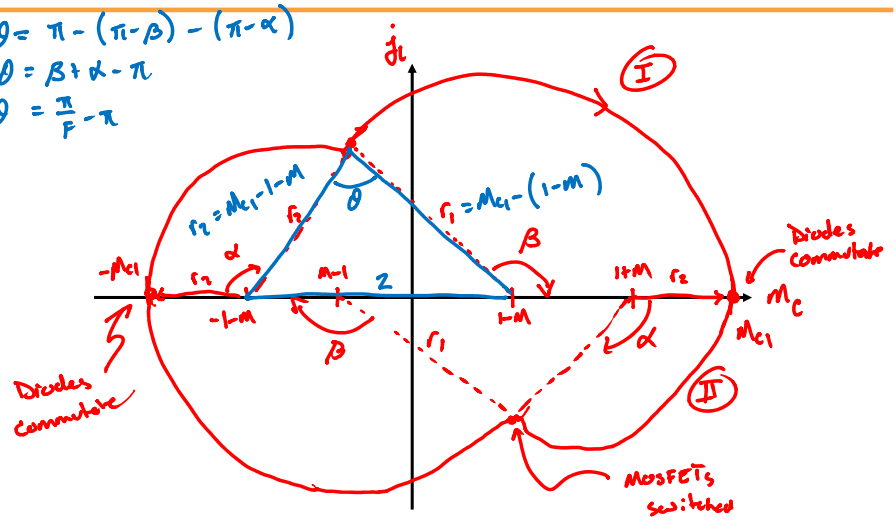




$\theta = \pi - (\pi - \beta) - (\pi - \alpha)$

$\theta = \beta + \alpha - \pi$

$\theta = \frac{\pi}{F} - \pi$



Averaging Step:

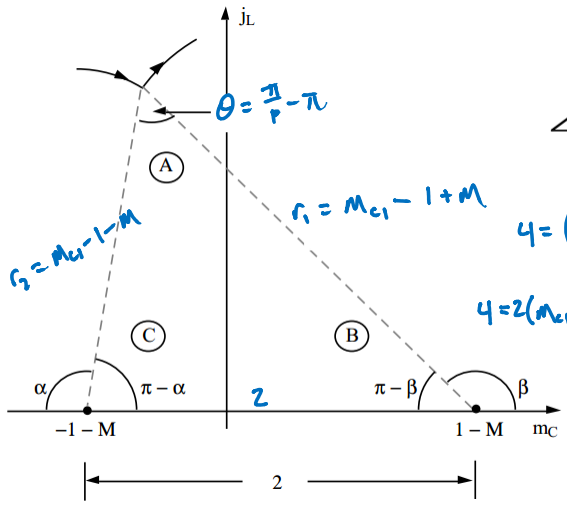
$(n=1)$ $\langle i_{out} \rangle = \frac{2}{T_s}(q) = \frac{2}{T_s} C 2V_{c1}$

$J = 2M_{c1}\frac{2F}{2\pi} = \boxed{2M_{c1}\frac{F}{\pi} = J}$

$t_\alpha + t_\beta = \frac{T_s}{2} \rightarrow \boxed{\alpha + \beta = \frac{\pi}{F}}$

$M_{c1} = J\frac{\pi}{2F}$

State Plane Solution



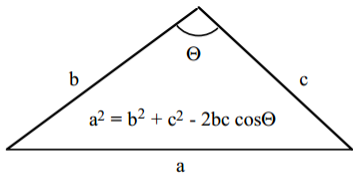


Fig. 4.14 The Law of Cosines

$4 = (m_{c1} - 1 - M)^2 + (m_{c1} - 1 + M)^2 - 2(m_{c1} - 1 - M)(m_{c1} - 1 + M)\cos\theta$

$4 = 2(m_{c1} - 1)^2 + 2M^2 - 2\left((m_{c1} - 1)^2 - M^2\right)\cos\theta$

$4 = 2(m_{c1} - 1)^2\left(1 - \cos\left(\frac{\pi}{F} - \pi\right)\right) + 2M^2\left(1 + \cos\left(\frac{\pi}{F} - \pi\right)\right)$

$\rightarrow \cos\left(\frac{\pi}{F} - \pi\right) = -\cos\left(\frac{\pi}{F}\right)$

$\rightarrow \quad m_{c1} = J\frac{\pi}{2F}$

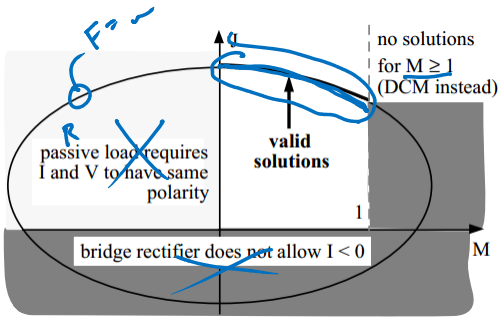
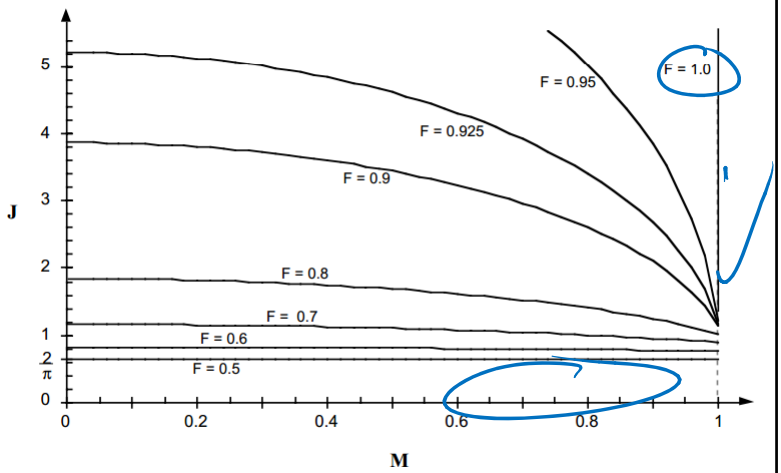
$1 = \frac{1}{2}\left(J\frac{\pi}{2F} - 1\right)^2\left(1 + \cos\left(\frac{\pi}{F}\right)\right) + \frac{1}{2}M^2\left(1 - \cos\left(\frac{\pi}{F}\right)\right)$

$\frac{1 + \cos\left(\frac{\pi}{F}\right)}{2} = \cos^2\left(\frac{\pi}{2F}\right)$

$\frac{1 - \cos\left(\frac{\pi}{F}\right)}{2} = \sin^2\left(\frac{\pi}{2F}\right)$

$$1 = \left(J\frac{\pi}{2F} - 1\right)^2\cos^2\left(\frac{\pi}{2F}\right) + M^2\sin^2\left(\frac{\pi}{2F}\right)$$

Elliptical Output Characteristic



Output Plane