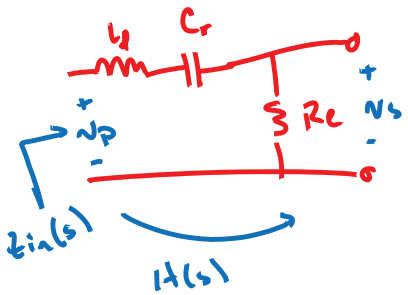
Construction of Tank Transfer Function

SRC as an example (SRC w/ diode FB rectifier)



$$Z_{in}(s) = sL_r + \frac{1}{sC_r} + R_e$$

$$H(s) = \frac{V_s}{V_p} = \frac{R_e}{sL_r + \frac{1}{sC_r} + R_e} = \frac{R_e}{Z_{in}(s)}$$

in standard form:

$$H(s) = \frac{s/Q_e\omega_0}{\left(\frac{s}{\omega_0}\right)^2 + \frac{s}{Q_e\omega_0} + 1}$$

where $\omega_0 = \frac{1}{\sqrt{L_r C_r}}$, $R_0 = \sqrt{\frac{L_r}{C_r}}$, $Q_e = \frac{R_0}{R_e}$

Q_e = "effective" / loaded quality factor

$$M = \frac{V}{V_g} = \|H(j\omega_s)\| = \frac{1}{\sqrt{1 + Q_e^2\left(\frac{1}{F} - F\right)^2}}$$

Tank Input Impedance

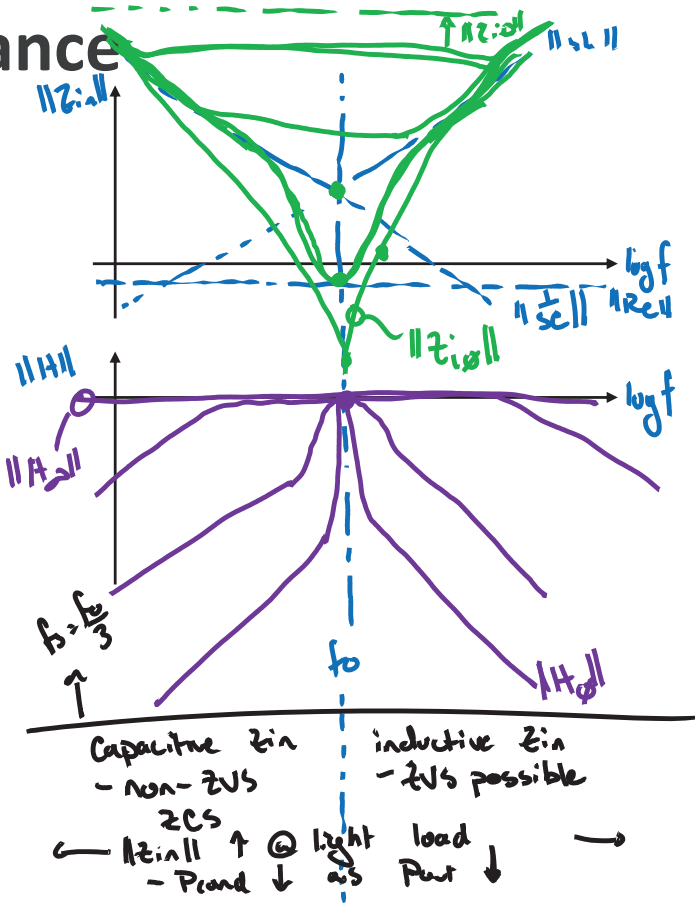
SRC example

$$Z_{in}(s) = sL_r + \frac{1}{sC_r} + R_e$$

$$H(s) = \frac{R_e}{Z_{in}(s)}$$

$\|Z_{in,0}\| \rightarrow \|Z_{in}\|_{R_e \rightarrow 0}\|$

$\|Z_{in,\infty}\| \rightarrow \|Z_{in}\|_{R_e \rightarrow \infty}\|$



Sinusoidal approximation valid when

- $R_e << \infty$
- $f_s \approx f_0$