

### Design of a Series Resonant Converter

The SRC of Fig. 1 is designed with the following parameters. Note that  $V_{out} \neq nV_g$ .

- $L_l = 30\mu\text{H}$
- $C_r = 5\text{ nF}$
- $V_g = 100\text{ V}$
- $V_{out} = 150\text{ V}$
- $n = 1$
- $F = 1.3$

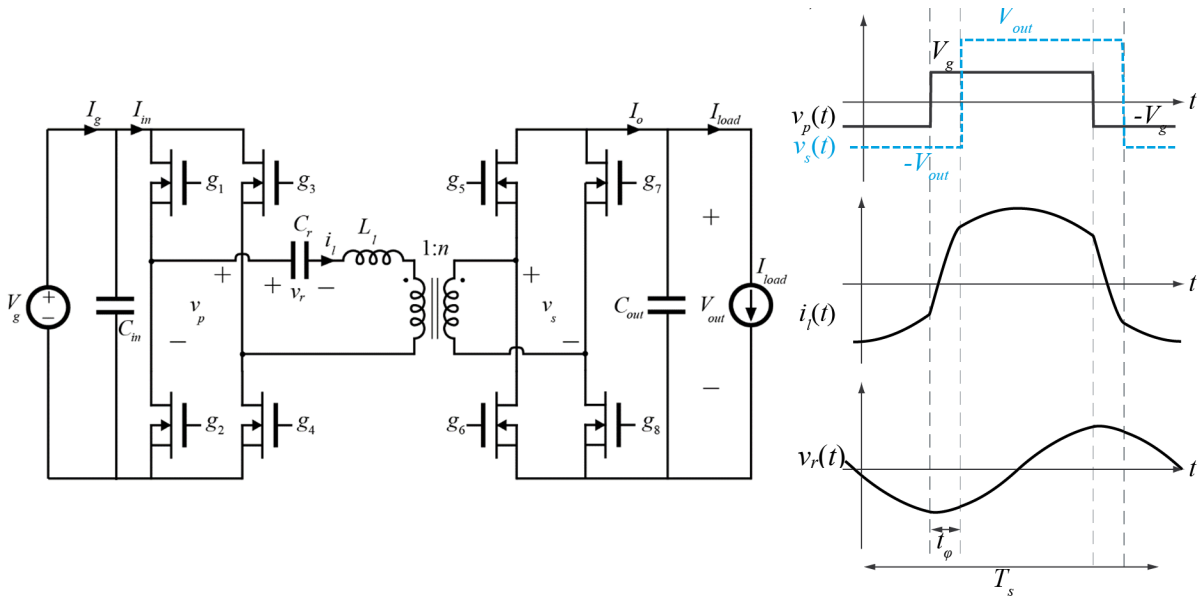


Fig. 1: Series resonant converter

At an operating point of  $P_{out} = 750\text{ W}$ , solve the following. Select an operating point with minimal peak currents, if multiple solutions exist for the given parameters.

- a) Derive a complete set of state plane equations for the SRC at this operating point.
- b) Sketch the  $m_r$ - $j_l$  state plane over one complete period. Label all salient features over one half-period
- c) Solve the state plane Give values for  $f_s$  and  $t_\phi$
- d) Sketch the time-domain waveforms for  $i_l(t)$  and  $v_r(t)$ . Label peak values, as well as the values at each switching instant.