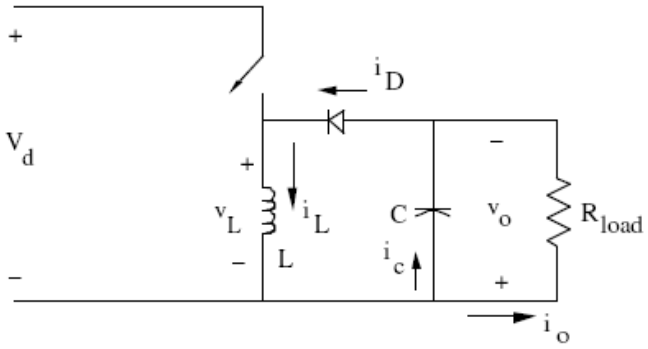
LAB 06

Step-down/Up dc-dc (Buck-Boost) Converter



Nominal Values: $V_d = 8.5$ V
$L = 10\ \mu H$
$rL = 10\ m\Omega$
$C = 100\ \mu F$
$R_{load} = 8\ \Omega$
$f_S = 100$ kHz
switch duty ratio $D = 0.75$

Problems

1. In steady state, obtain the following waveforms using Buck-Boost:
   (a) v_L and i_L
   (b) v_O, i_O and i_C.

2.

Increase the load resistance to 80 Ω. Obtain v_L and i_L waveforms in the discontinuous conduction mode [Hint: use V(o) = 28 V and $I_L(0) = 0$]. Check if the results agree with the analytical calculations.

$$V_o = D\ V_d \sqrt{\frac{I_{oB,\max}}{I_o}} \qquad I_{oB,\max} = \frac{T_s V_o}{2L}$$

3. Calculate a analytical D

$$D = \frac{V_o}{V_d}\sqrt{\frac{I_o}{I_{oB,\max}}}$$

so that V_o is kept constant to the same value as in continuous mode and check to see if results agree with the analytical calculations.

4. Obtain the peak-to-peak ripple in the output voltage and check to see if results agree with the analytical calculations.

5. Calculate the rms value of the current through the output capacitor as a ratio of the average load current Io