Buck (Step-Down DC-DC) Converters

- Applications
- Operation in Steady State

SWITCHING ANALYSIS IN DC STEADY STATE (CCM)

(a)

$$V_o = V_A = DV_{in}$$

(b)

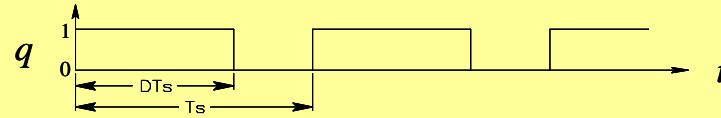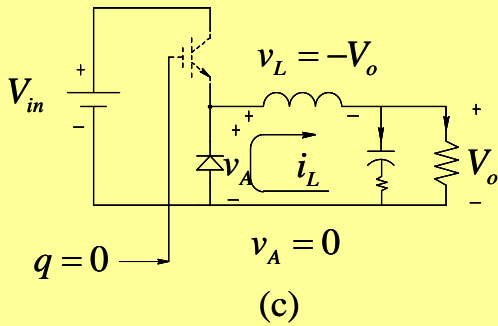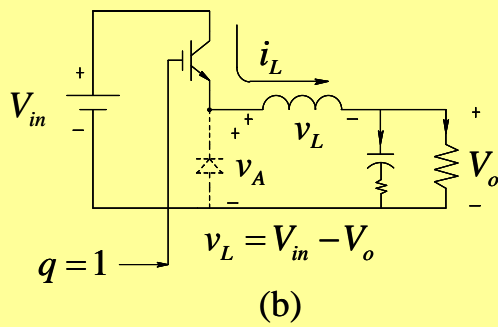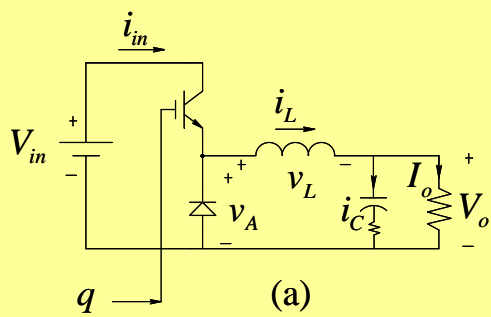$$v_L = V_{in} - V_o$$

$$q = 1$$
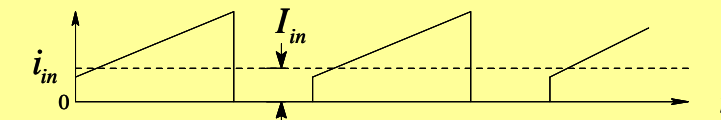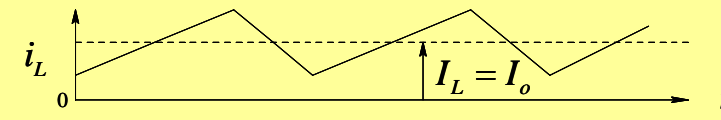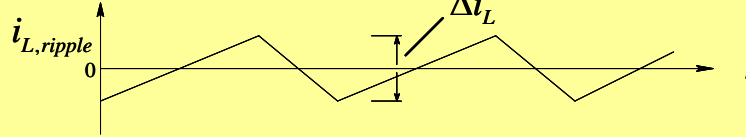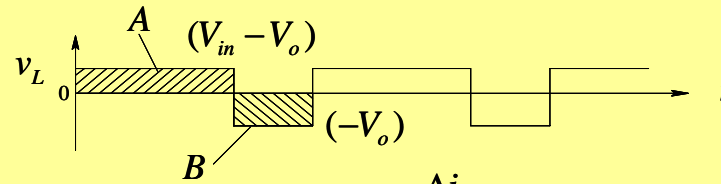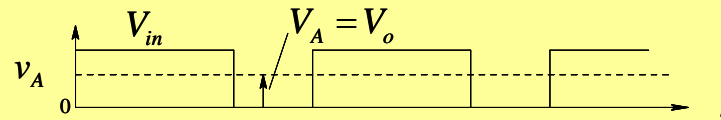
$$\Delta i_L = \frac{V_{in} - V_o}{L} DT_s = \frac{V_o}{L}(1-D)T_s$$

(c)

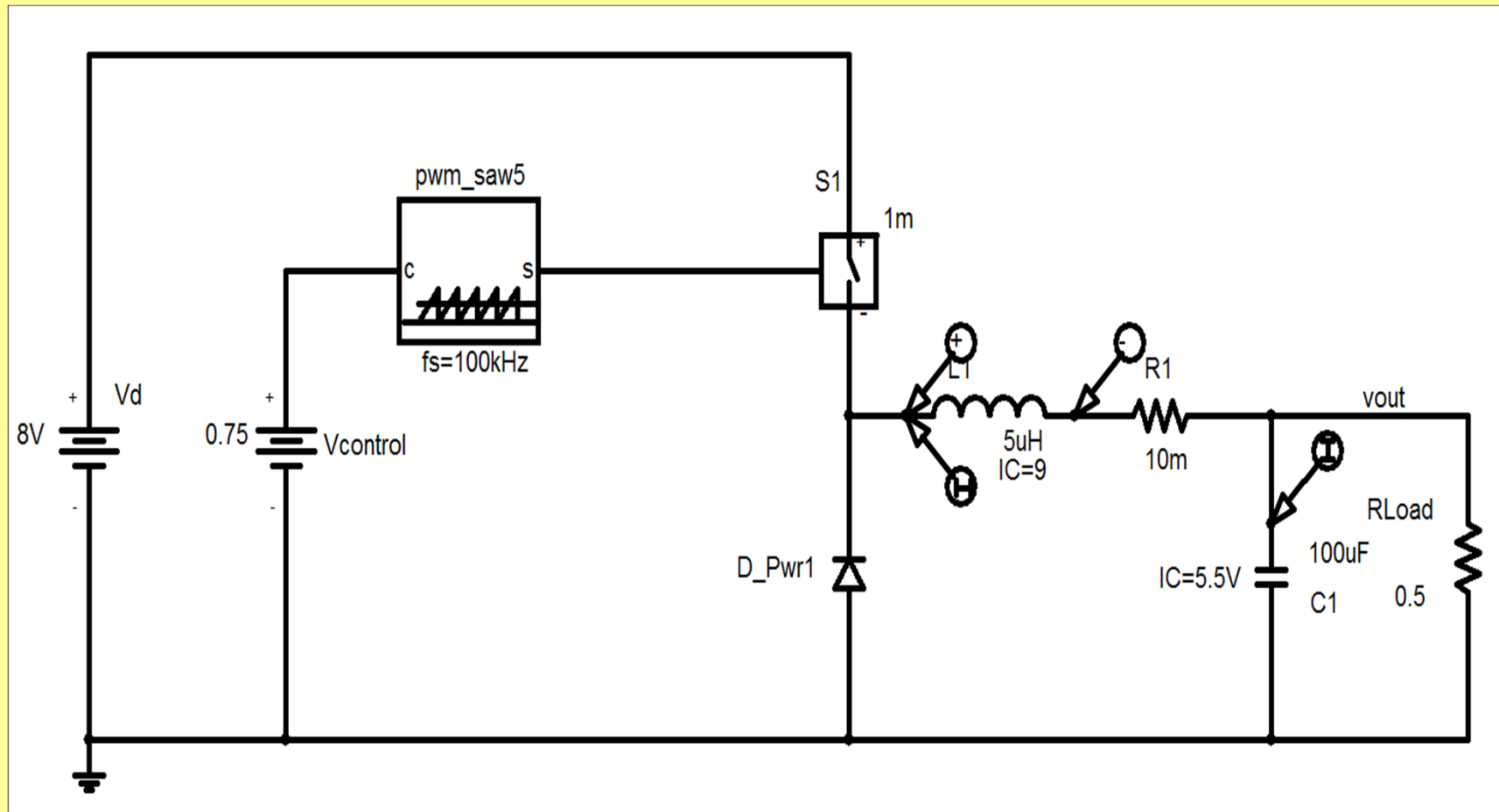$$v_L = -V_o$$

$$v_A = 0$$

$$q = 0$$

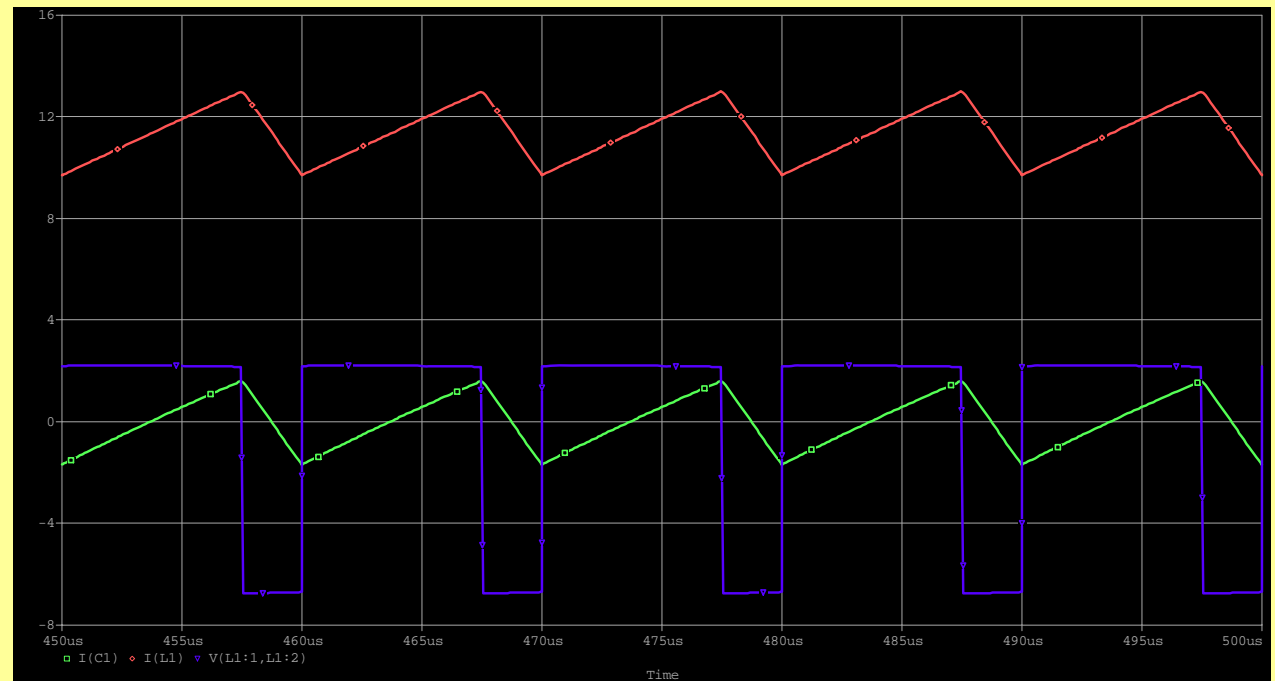$$I_L = I_o = \frac{V_o}{R}$$

$$V_{in}I_{in} = V_o I_o$$

$$I_{in} = DI_L = DI_o$$

$$i_C(t) \simeq i_{L,ripple}(t)$$

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PSpice Modeling:

Simulation Results

Summary Buck (Step-Down DC-DC) Converters

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