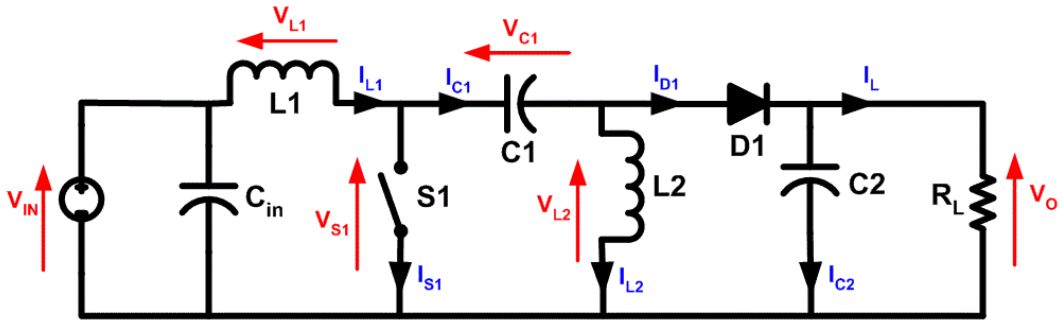
# Design of SEPIC (Single-Ended Primary Inductor Converter) Converter




**Design parameter:**

Input Voltage ($V_{in}$) = 9V

Output Voltage required ($V_o$) = 6V

Load = 12W

Switching Frequency = 100 kHz

$\Delta i_{l1} = \Delta i_{l2} = 0.4$

**Step 1: Determine the Duty Ratio**

$$D = \frac{Vo}{Vin + Vo} = \frac{6}{6+9} = 0.4$$

**Step 2: Determine the average inductor current**

$$I_{l1} = \frac{Pin}{Vin} = \frac{12 + P_{losses}}{9} = 1.33\ A$$

$$I_{l2} = \frac{Po}{Vo} = \frac{12}{6} = 2\ A$$

**Step 3: Calculate maximum inductance current $I_{L1,\,max}$.**

$$I_{L1,max} = I_{L1} + 0.5 \times \Delta I_{l1} = 1.33 + \frac{0.4}{2} = 1.53\ A$$

$$I_{L1,min} = I_{L1} - 0.5 \times \Delta I_{l1} = 1.33 - \frac{0.4}{2} = 1.13\ A$$

**Step 4: Calculate maximum inductance current $I_{L2,\,max}$.**

$$I_{L2,max} = I_{L2} + 0.5 \times \Delta I_{l2} = 2 + \frac{0.4}{2} = 2.2\ A$$

$$I_{L2,min} = I_{L2} - 0.5 \times \Delta I_{l2} = 2 - \frac{0.4}{2} = 1.8\ A$$

**Step 5: Determine Inductor Size**

$$\Delta i_l = \frac{VinD}{Lf}$$

From above equation we can calculate inductance values as:

$$L_1 = \frac{VinD}{\Delta i_{l1} f} = 90uH$$

$$L_2 = \frac{VinD}{\Delta i_{l2} f} = 90uH$$

**Step 6: Calculate load resistance**

$$R = \frac{V_o^2}{P} = 3\ ohm$$

**Step 7: Determine Capacitor size**

(Assuming 1% ripple)

$$C_1 = C_2 = \frac{VinD}{Rf\Delta V_{c1}} = 80uF$$