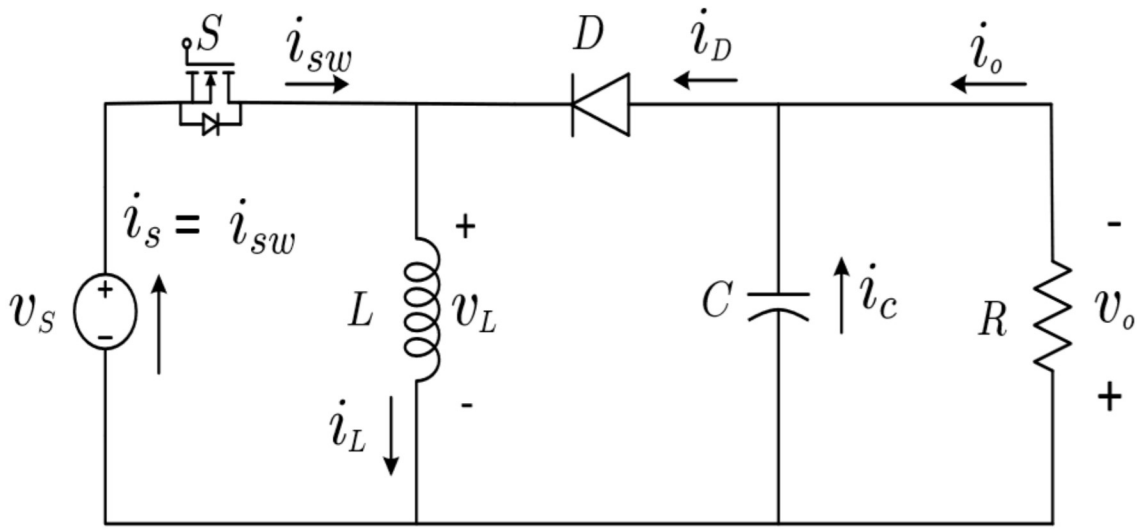
BUCK-BOOST CONVERTER

Definition: Buck-Boost converter is a converter which can step up and down the output voltage compared to input source voltage.

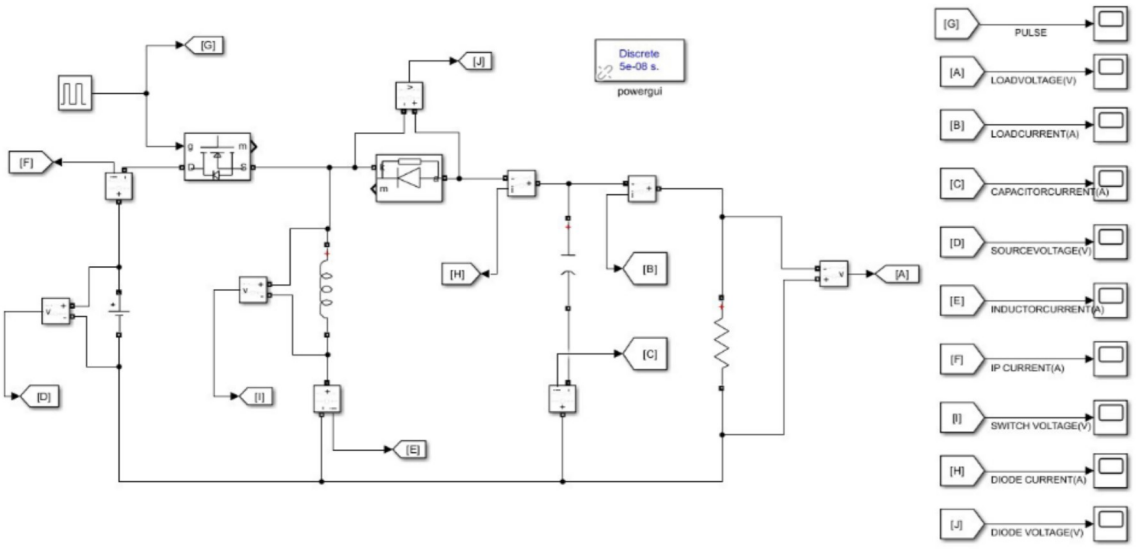
Circuit Diagram:



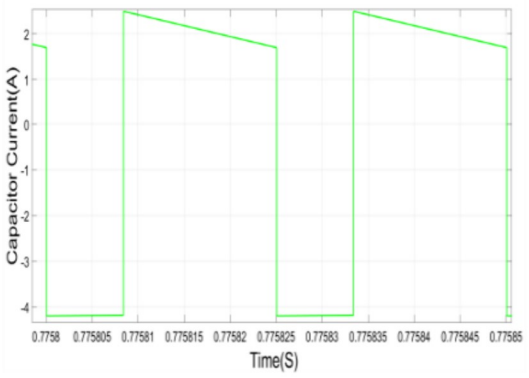
Designed Circuit Parameters:

Parameters	Values
Vs	100 V
D	0.33
L	1.04 mH
C	6.67 mF
R	12.5 Ω
Vo	50 V
f	40 KHz

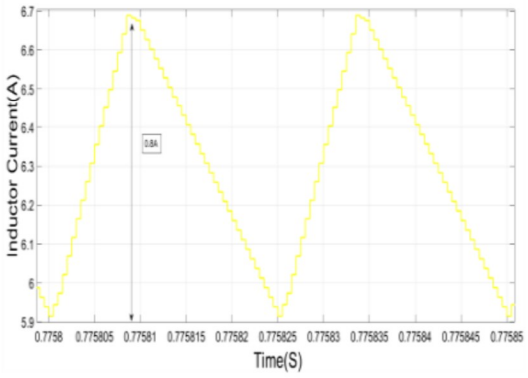
Simulated Circuit:



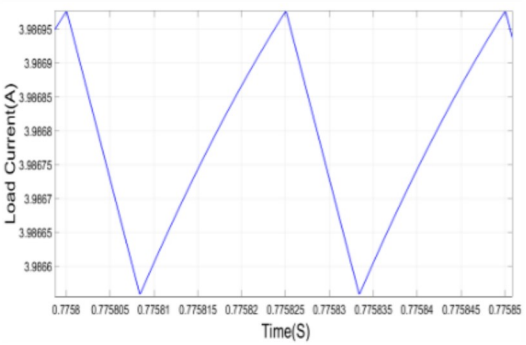
Simulated Output Results:



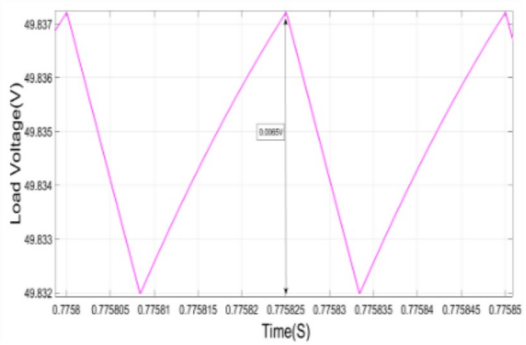
(a) figure 1



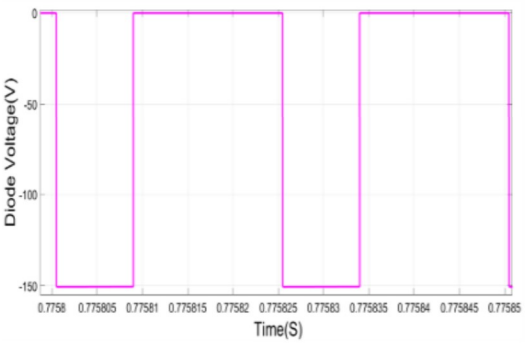
(b) figure 2



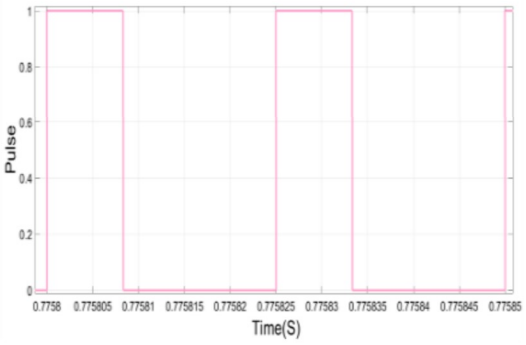
(a) figure 3



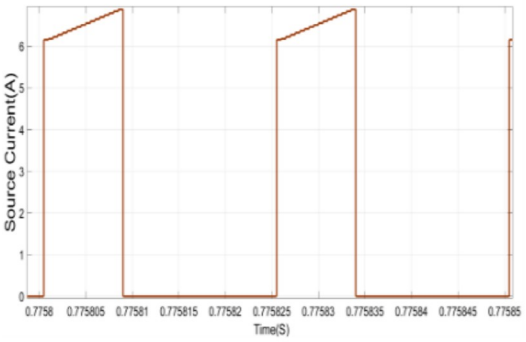
(b) figure 4



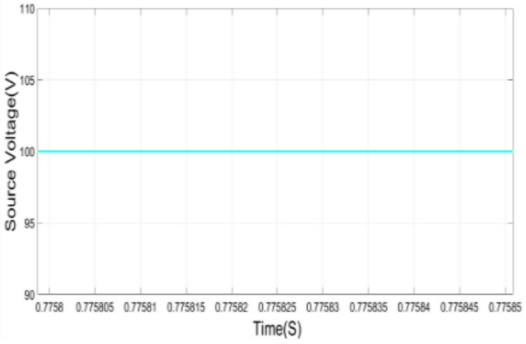
(c) figure 5



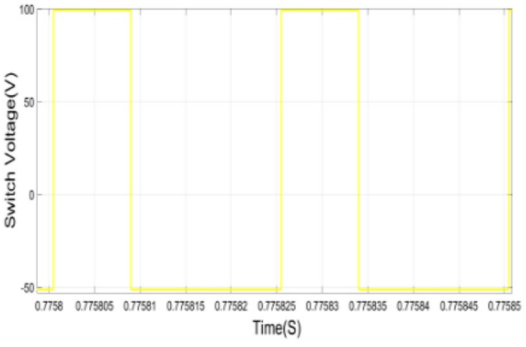
(d) figure 6



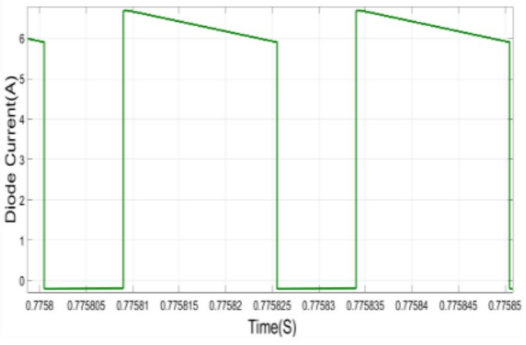
(e) figure 7



(f) figure 8

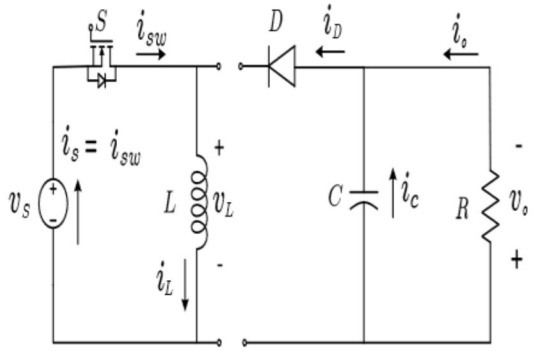


(g) figure 9

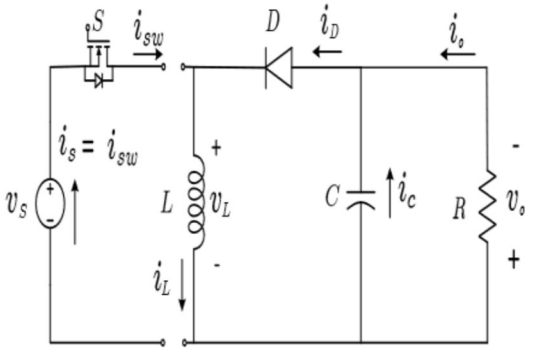


(h) figure 10

Calculations:



When S=1



When S=0

- **KVL**

$$-V_{in} + V_L = 0 \tag{16}$$

$$L * \frac{\triangle I}{DT} = V_{in} \tag{17}$$

Assumed $\triangle I = 0.8A$

$$L * \frac{0.8 * 40k}{0.333} = 100 \tag{18}$$

L =1.041 mH

- **KVL**

$$V_L + V_o = 0 \tag{19}$$

$$L * \frac{\triangle I}{(1-D)T} = -V_o \tag{20}$$

Assumed $\triangle I = 0.8A$

$$L * \frac{0.8 * 40K}{1 - 0.333} = -50 \tag{21}$$

L = 1.041 mH

- **For C**

$$I_o * D * T = Q = c * (\triangle V) \tag{22}$$

Assumed $\triangle V = 0.005V$

$$C = \frac{4 * 0.333}{40K * 0.005} \tag{23}$$

C = 6.67 mF