

E1-B10:BUCK CONVERTOR

Objective:

a) Specifications: Input 20 V, Output 7.5 V, Switching frequency 7.5 kHz, Output current 1 A.

Waveforms of inductor current and diode voltage in CCM.

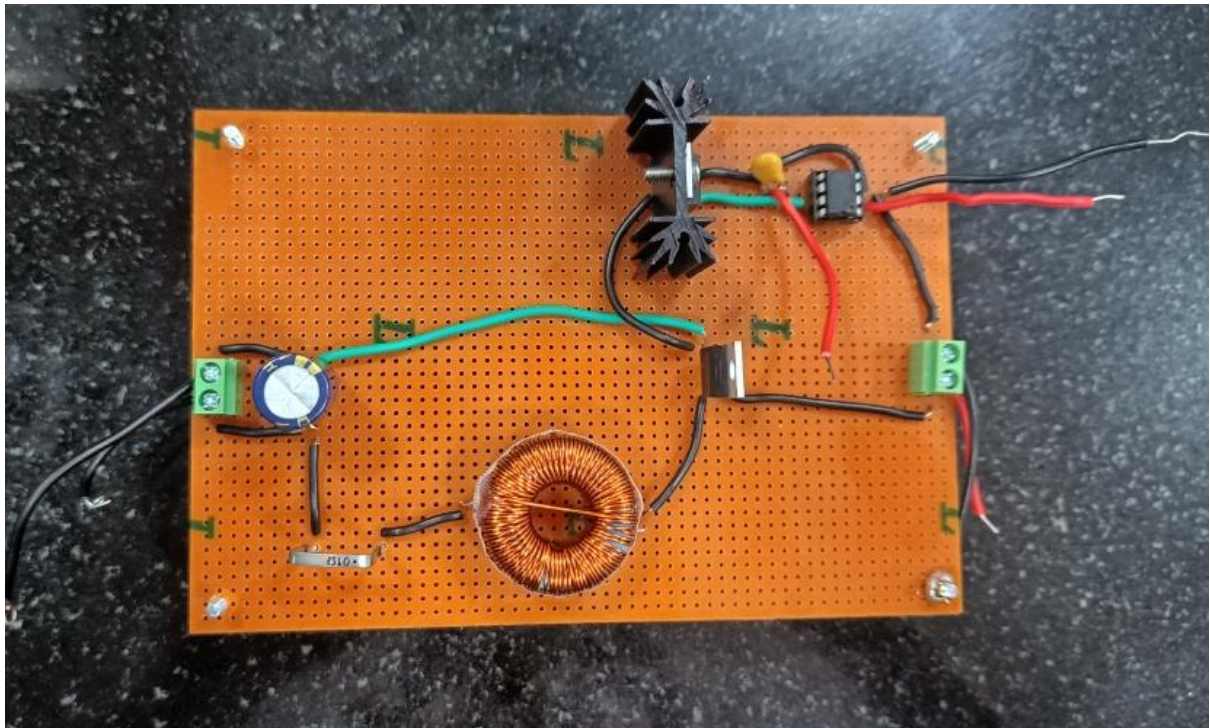
b) Increase load resistance to demonstrate DCM.

Apparatus:

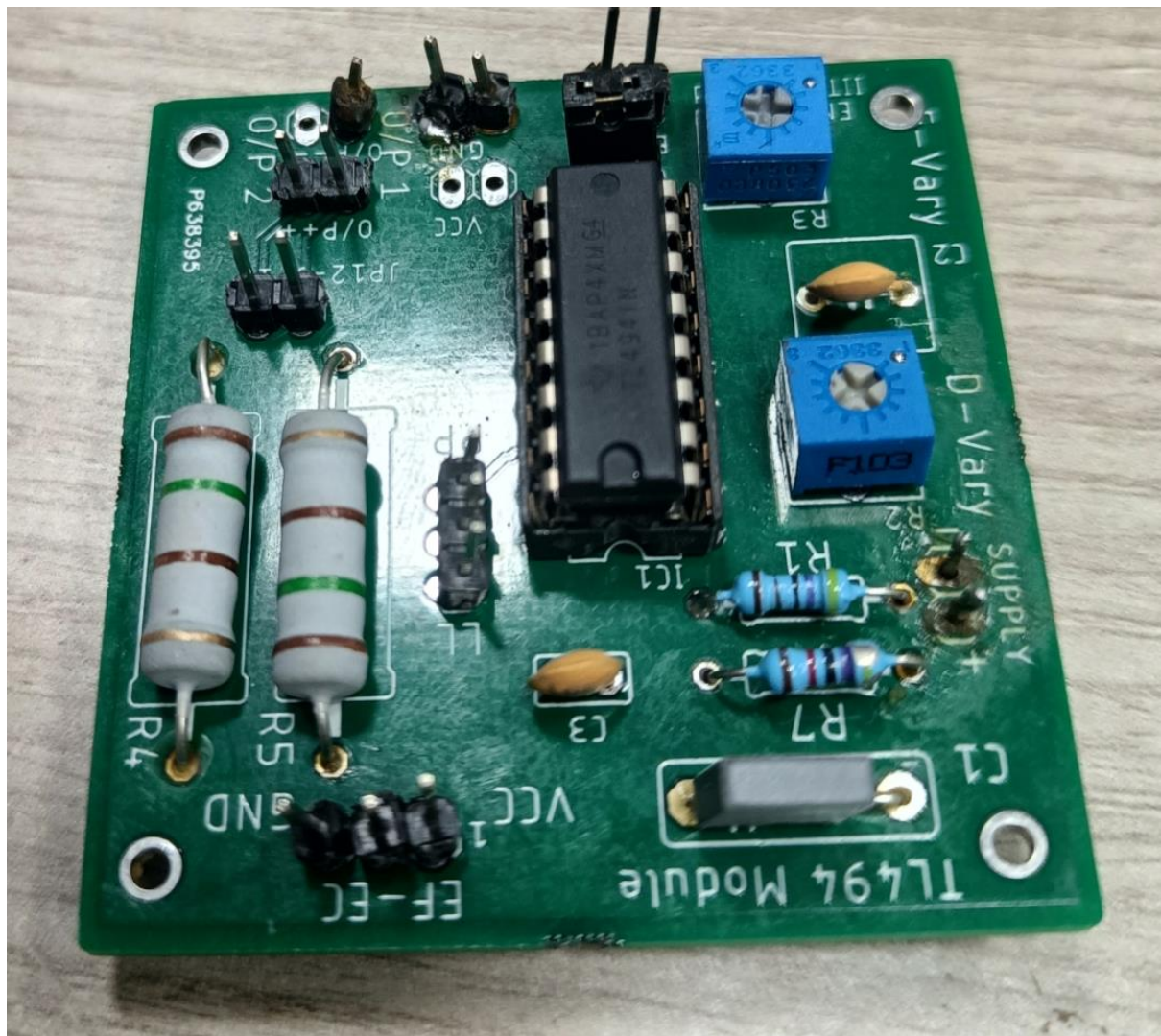
PWM Module, MOSFET Driver, Power MOSFET, Power Diode, 1mH Inductor, 470 μ F Capacitor, and Rheostat.

Observations:

Convertor me made:

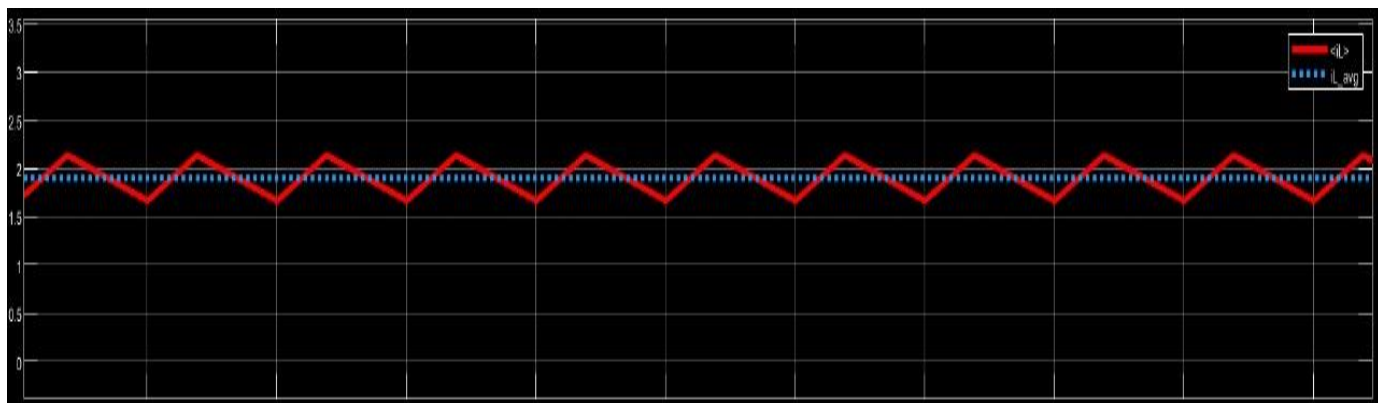


Pulse Width Modulator:

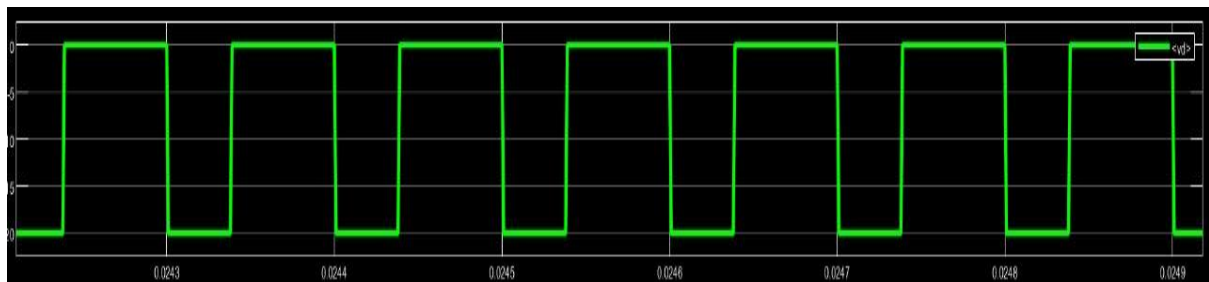


a) MATLAB generated waveforms:

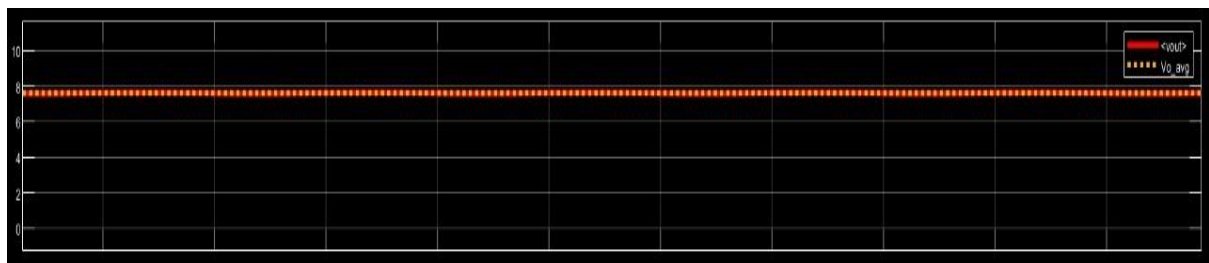
1. Inductor current:



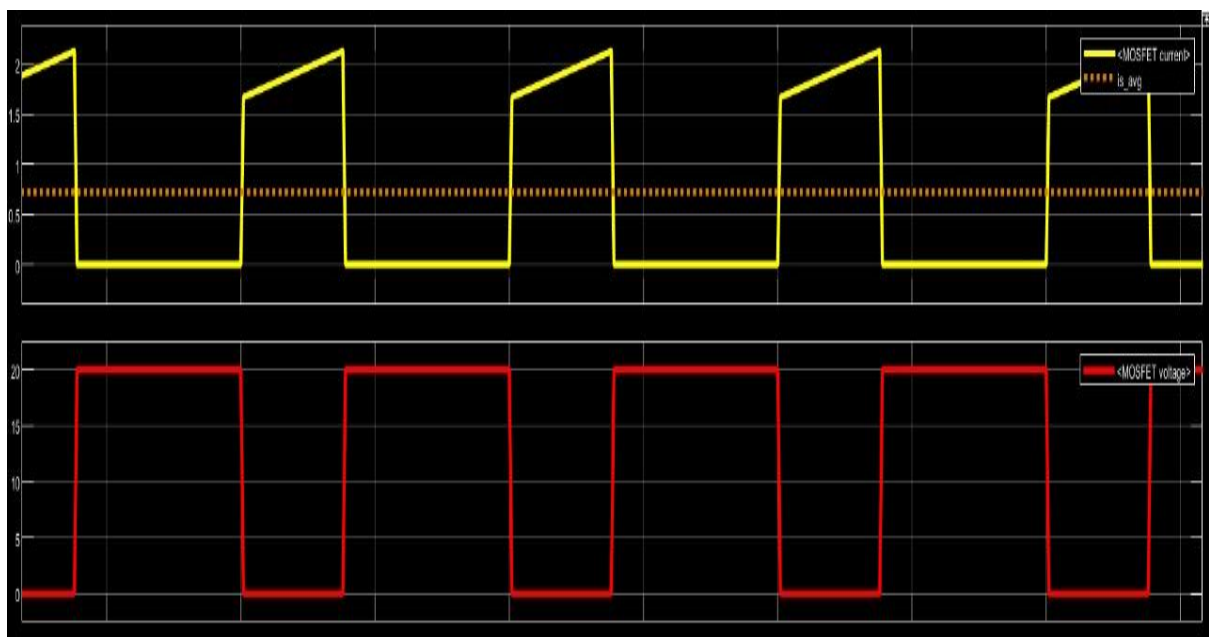
2. Diode Voltage:



3. Output Voltage:

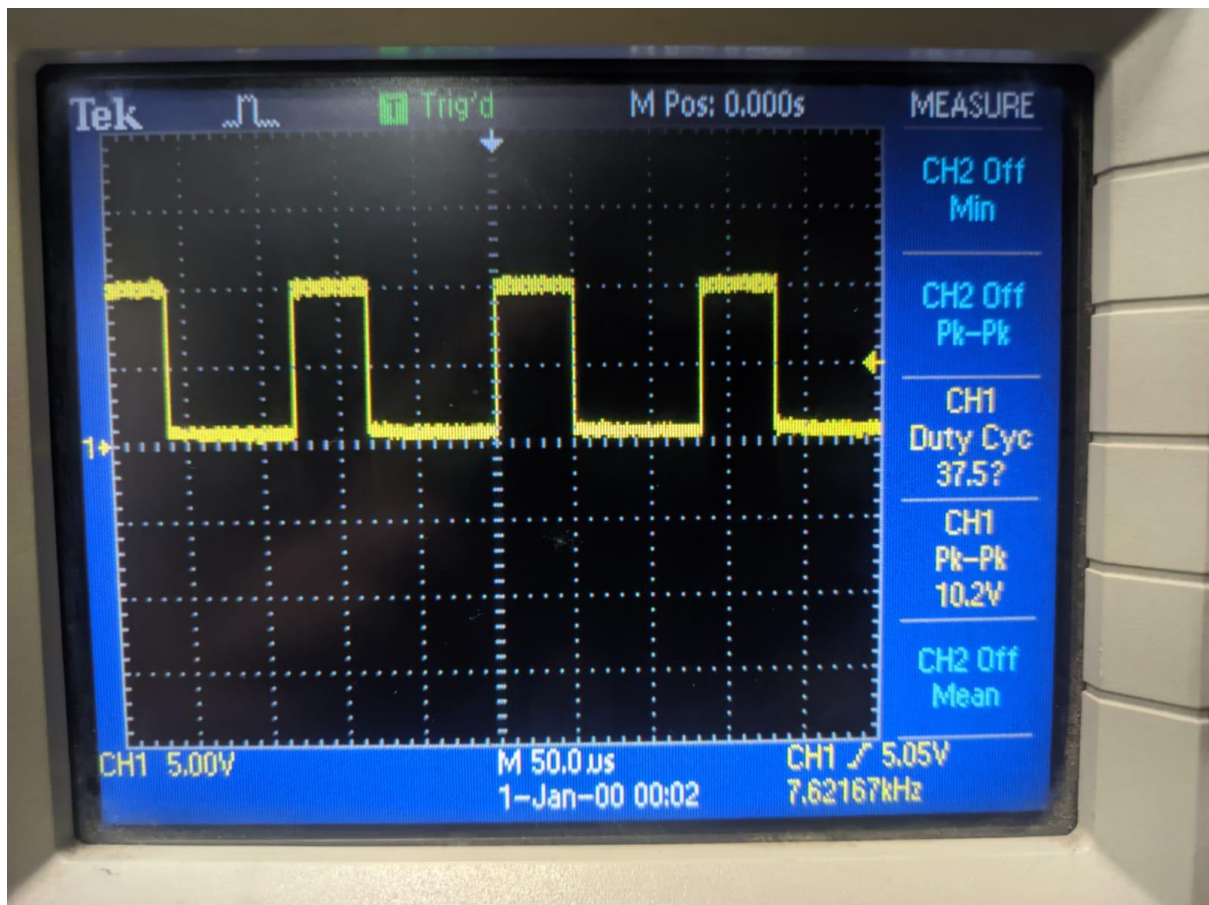


4. Switch current and voltage:



Observed waveform(Practical)

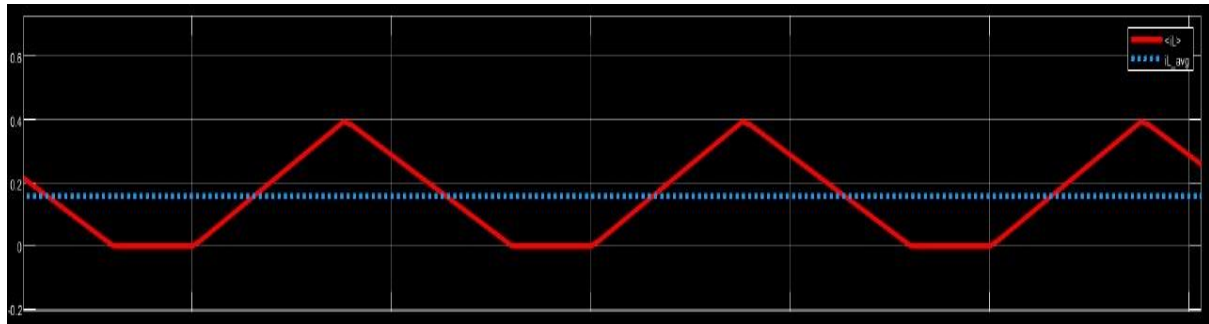
4. Pulse Width Modulator :



b) The factor by which the load resistance needs to be decreased to transition from CCM to DCM can be calculated using the critical conduction ratio(k):

$$K = v(\text{out})/v(\text{in})$$

So we have taken reading at 60ohm load resistance and the observed waveform is as follow



Conclusion:

1. We tried to make Buck Convertor with the required specifications, on MATLAB readings we saw $V_{out}=DV_{in}$, where :

V_{out} : output voltage

V_{in} : input voltage

D : Duty cycle ratio.

2. Supply voltage increases when we increase the load but output voltage remains constant.