Lab 4: Power converters
(Part 3 - Boost converter)

The boost converter is used to step up DC voltages. It uses the same elements as a buck converter, but a different topology. During this lab we will be looking at the efficiency and generated waveforms of the boost converter.

Equipment

- Diode
- MOSFETS
- Inductor
- Capacitors
- Gate driver (IR2117)
- 500Ω load (5W) WARNING: THIS WILL GET HOT
- 10Ω gate resistor

Deliverables

1. Use the information in the table below to calculate a boost converters:
   (a) Output voltage
   (b) Inductor current ripple (assume it is 20%)
   (c) Switching frequency
   (d) Output current
   (e) Output voltage ripple
2. Print the oscilloscope screen showing the waveform on the drain of the MOSFET. Give a brief description of the waveform.
3. Create a graph showing the Efficiency vs output current of the converter.

Methodology

Assemble the schematic shown in figure 1 on your breadboard. Add an ammeter between the 20V supply and the MOSFET. Connect the signal generator on "pulse" mode at the calculated frequency, to the gate driver. Set the Duty cycle to 10%, the Vpp to 5V and the offset to 2.5V. Attach a probe to the gate of the MOSFET to ensure the gate driver is creating the PWM. Increase the duty cycle to 30% and probe the source of the

MOSFET to complete deliverable 2. Next attach the probe across the load, and measure the output voltage ignoring the output ripple. Note down the input current and output voltage for duty cycles 10% to 50% in increments of 5%. From here you should be able to calculate the input and output power to complete deliverable number 3.

Table 1: Boost converter specs

Inductor	4mH
Capacitor	100uF
V_{in}	20V
Load	500Ω
Duty cycle	33.3%

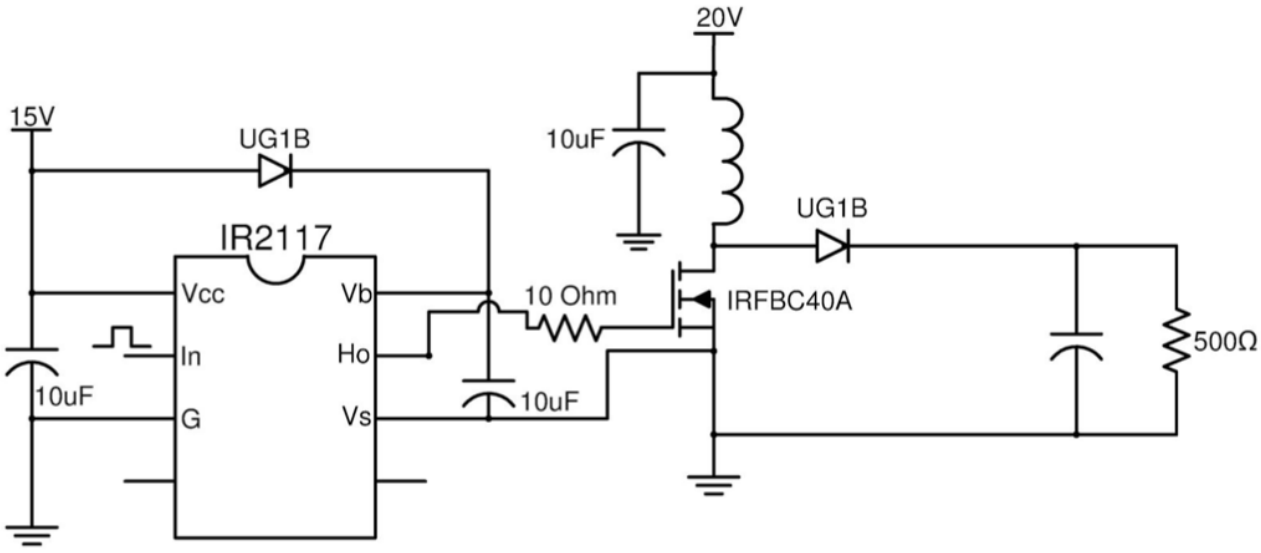

Figure 1: Boost converter