

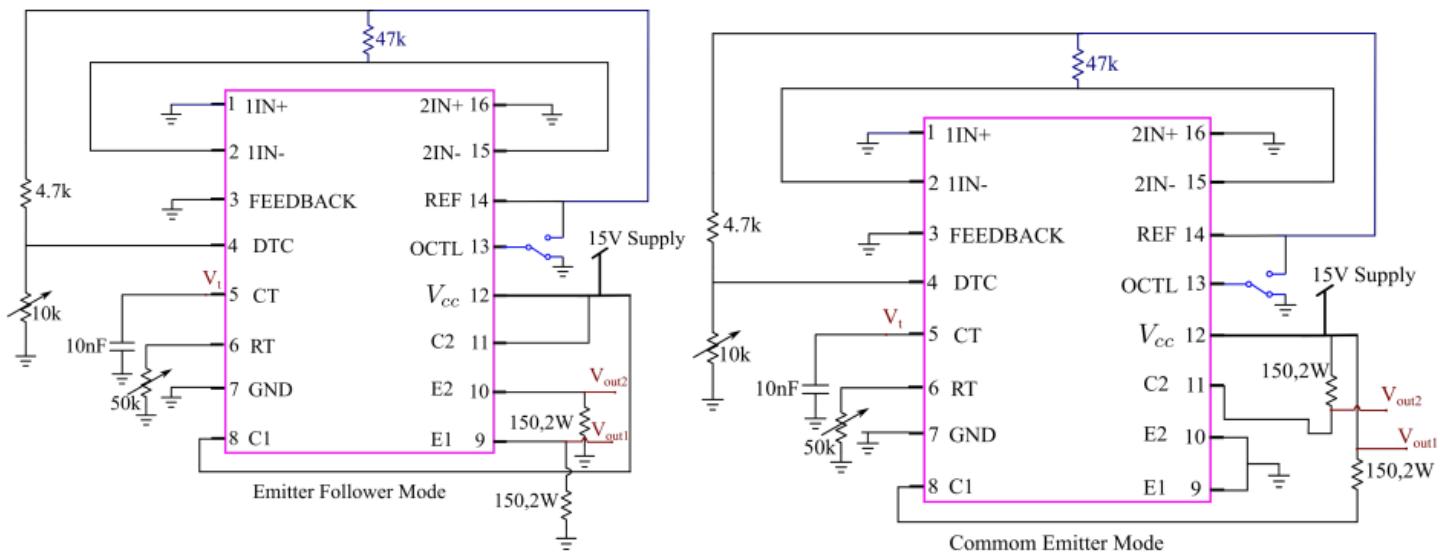
# EE 311: Electrical Machines and Power Electronics Laboratory

## LAB REPORT - 2

**EXPERIMENT 2 :** Generate PWM pulses of a specific frequency(50kHz) using TL494 IC.

**Aim** - Design a TL494 PCB board and power it using the DC voltage supply from the last experiment and observe the output waveforms at both outputs.

### Circuit Diagram / Experimental Setup :

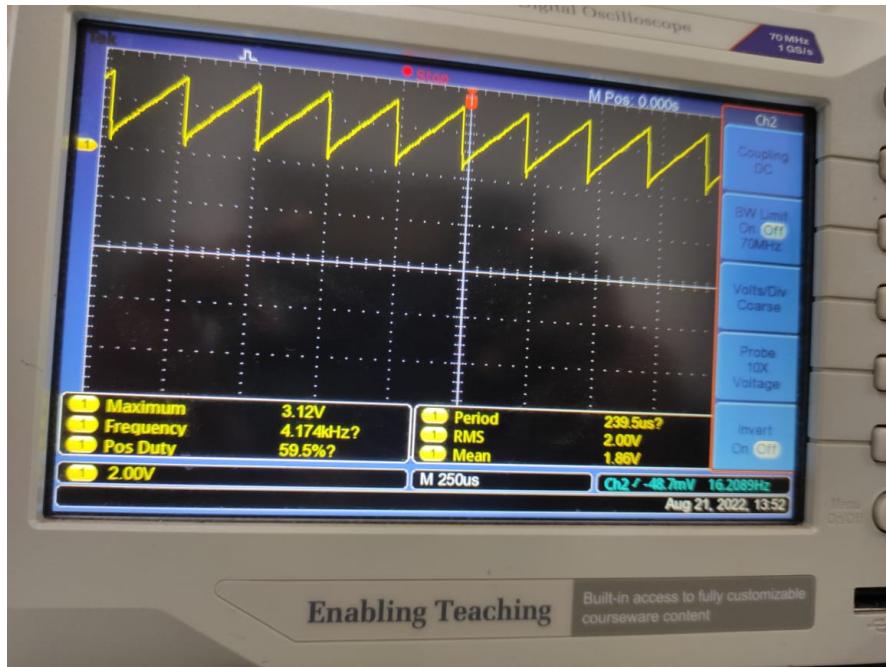


### Procedure / Steps:

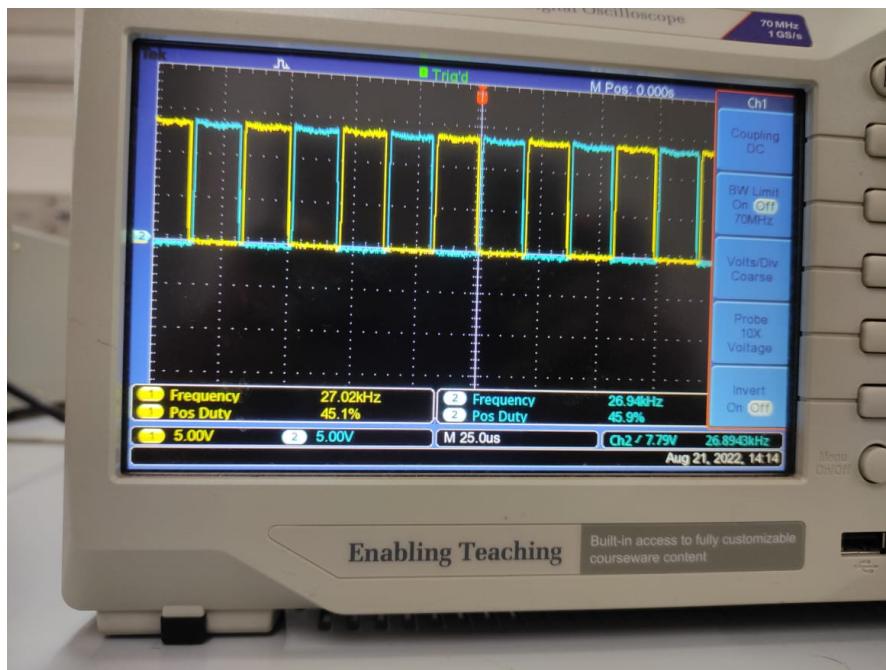
1. Identify the given components with the refdes given below.
2. Solder the components according to the given circuit diagram.
3. The circuit arrangement is to be planned in such a way that both the common emitter mode and emitter follower mode can be conducted on a single layout.
4. Using the jumper wires connect the header pins in common emitter mode and emitter follower mode and obtain the corresponding measurements.
5. The 15V power supply can be given using the DC power supply provided.

**Data recorded & measured:**

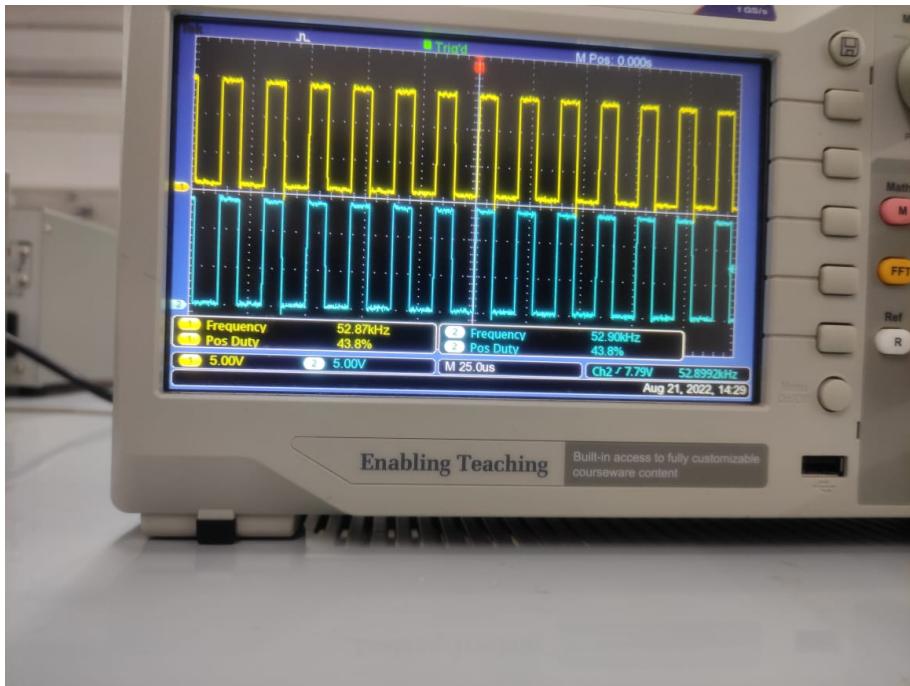
1. VOLTAGE AT PIN 5 - COMPARATOR SIGNAL:



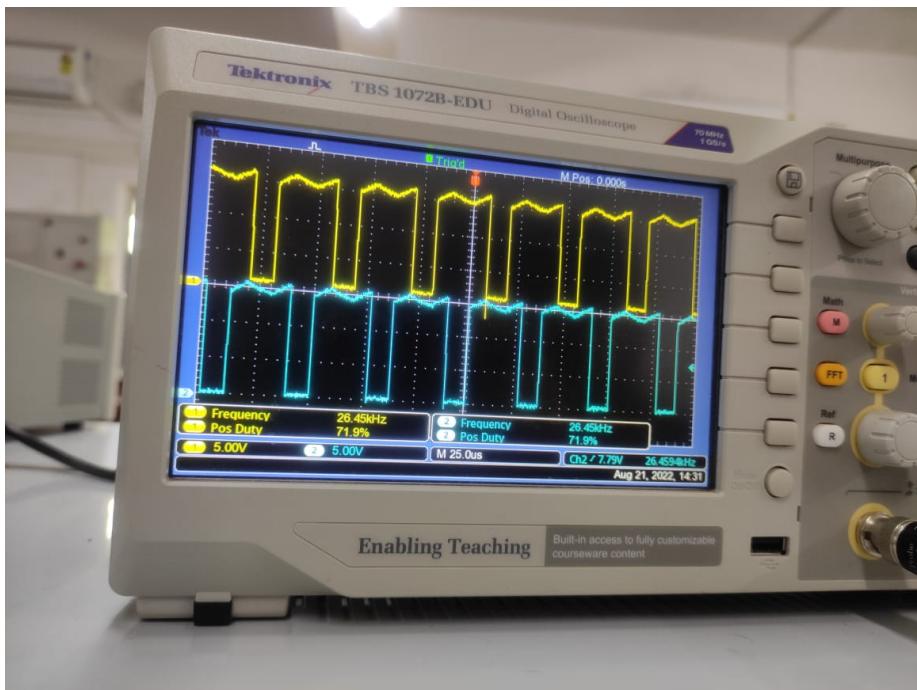
2. EMITTER FOLLOWER MODE - PUSH PULL CONFIGURATION:



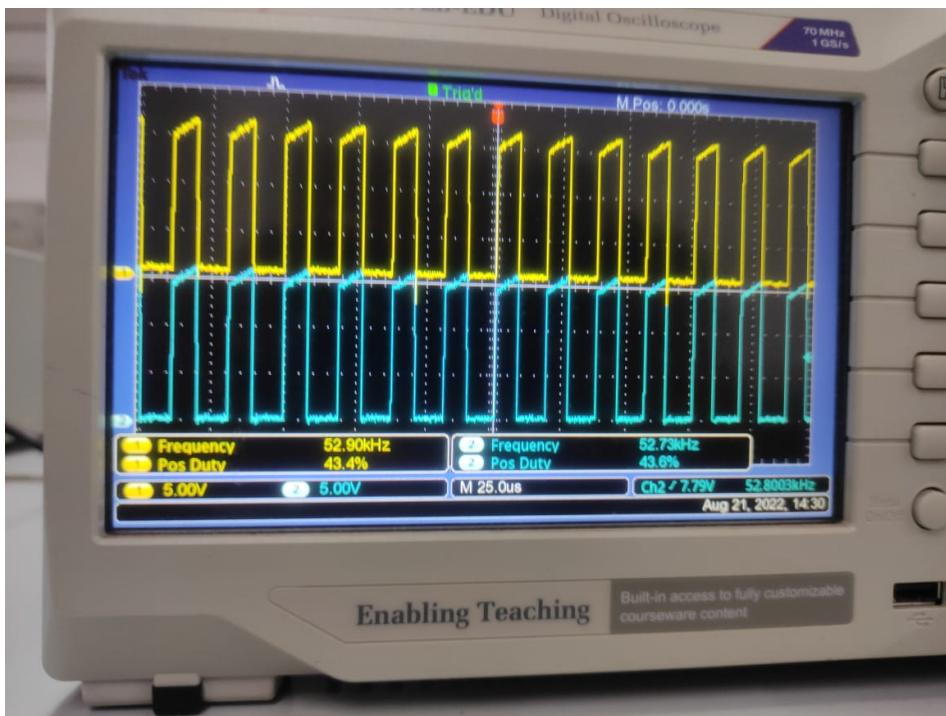
### 3. Emitter Follower Mode - Single Ended Configuration:



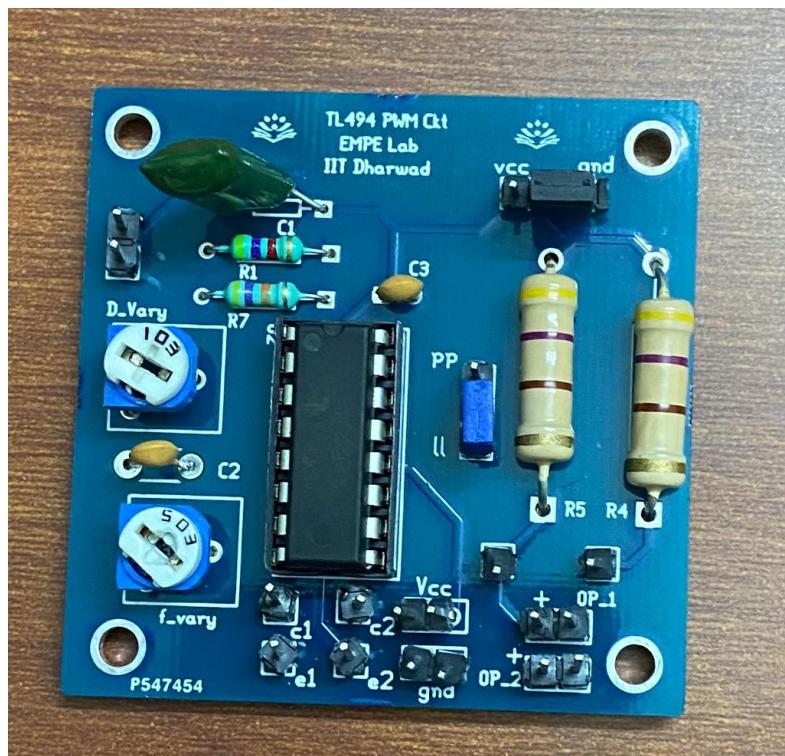
### 4. COMMON Emitter Mode - Push Pull Configuration:



## 5. COMMON Emitter Mode - SINGLE ENDED CONFIGURATION:

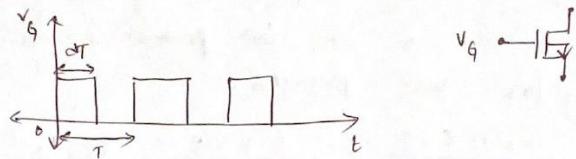


### Soldered Board Snapshot:



## ADDITIONAL RESULTS:

For the given circuit, the input signal to the mosfet should look like the figure below.

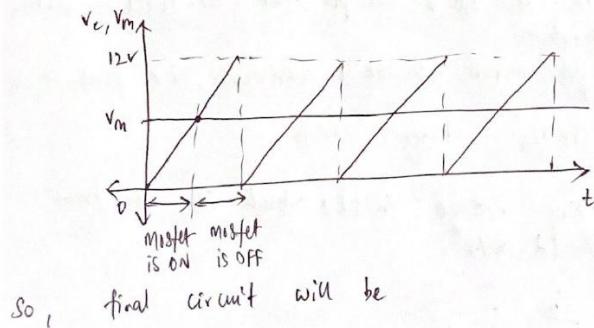


Given this  $v_G$  is provided by the black box, with  $v_m(t)$  and  $v_c(t)$  as inputs

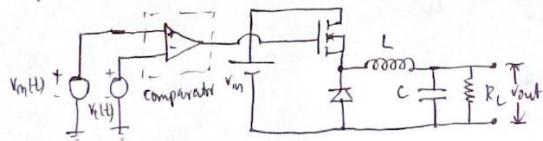


Given  $v_m(t)$  is DC voltage ranging from 0 to 12V as d goes from 0% to 100%.

Hence  $v_c(t)$  correspondingly should look like the figure below, if the black box is assumed to be Comparator.



So, final circuit will be

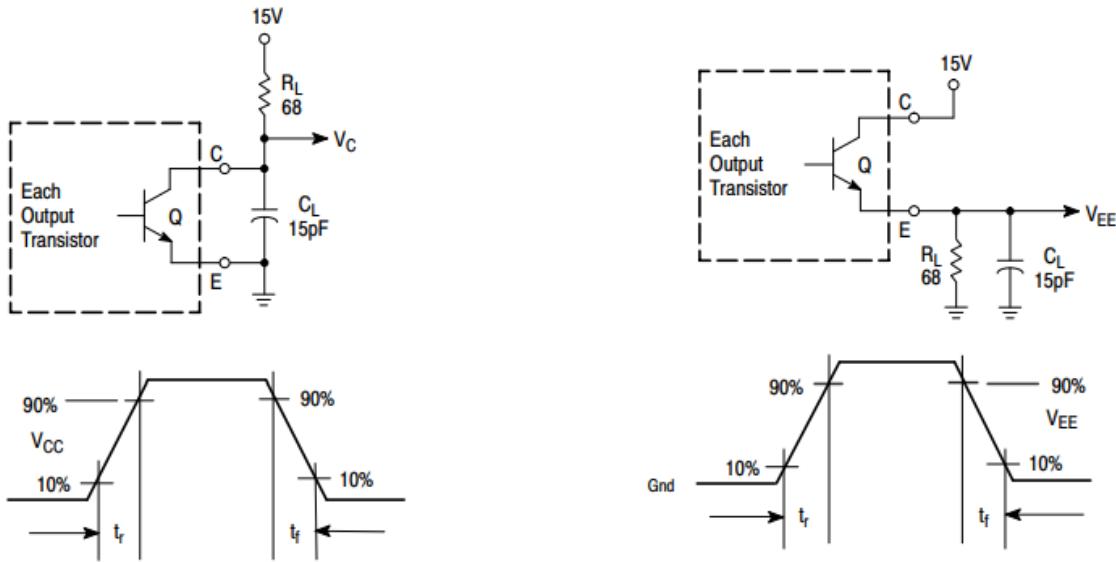


Our final goal is to give gate signals to the mosfet in a buck or boost voltage converter, so we use this TL494 PWM chip to provide the appropriate gate pulses, and the final circuit of the buck converter will look like as mentioned in the figure.

## Analysis:

We operate the PWM generator in 4 different modes, Common emitter & Emitter follower, both having push pull and single ended mode.

The following connections represent the Common emitter & Emitter follower modes.



Source : <https://www.onsemi.com/pdf/datasheet/tl494-d.pdf>

Push pull mode generates a complementary set of signals at the output pins, which is desired for an inverter leg, and single ended mode generates the same set of signals at the output pins.