



DEPT. Of Computer Science Engineering

SRM IST, Kattankulathur – 603 203

Sub Code & Name: 18CSS201J - ANALOG AND DIGITAL ELECTRONICS

Experiment No	04
Title of Experiment	Design and implementation of transistor as a switch
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Register Number	RA1911030010094
Date of Experiment	13/09/2020

Mark Split Up

S.No	Description	Maximum Mark	Mark Obtained
1	Oral Viva / Online Quiz	5	
2	Execution	10	
3	Model Calculation / Result Analysis	5	
Total		20	

Staff Signature with date

Aim

1. To observe the action of a Transistor as an electronic switch.
2. To measure the voltage across the transistor when it is ON and when it is OFF.

Apparatus

Required:

S.No	Apparatus	Type	Range	Quantity
1	Transistor	Q1 100 A/A		1
2	Resistor		1 k Ω , 10k Ω	1 each
3	DC power source		1.5 V, 12 V	1 each
4	Switch	SPST		1
5	Probes	Voltage, current		1 each
6	LED			1
7	Ground connection			1
8	Connecting wires			As required

Software Required:

<https://www.multisim.com/>

Theory

The computers of today do not process numbers in the base 10 (i.e., 0, 1, 2, 3, ...,9). Computers instead use binary logic of base 2 (0 and 1) to perform their functions. One fundamental circuit is the transistor switch, also known as an inverter. Here, a transistor connected in a common-emitter fashion inverts a signal. That is, if a high-input signal is applied, a low-output signal is created. If a low-input signal is applied, then a high output signal is created.

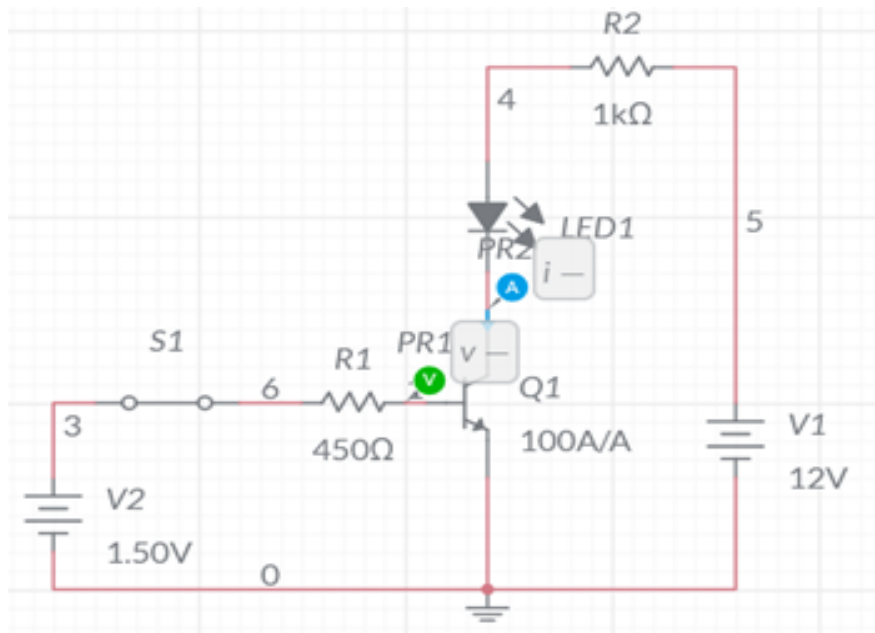
In a transistor switch circuit, a voltage level applied to the base terminal will control the potential at the collector. In this fashion, the transistor can be used to turn on or off circuitry connected to the collector. This common-emitter circuit is being switched from cutoff to saturation. In this experiment, a transistor will be connected to demonstrate this switching ability.

Procedure:

1. Log in Multisim Live Online Circuit Simulator.
2. Click create circuit button.

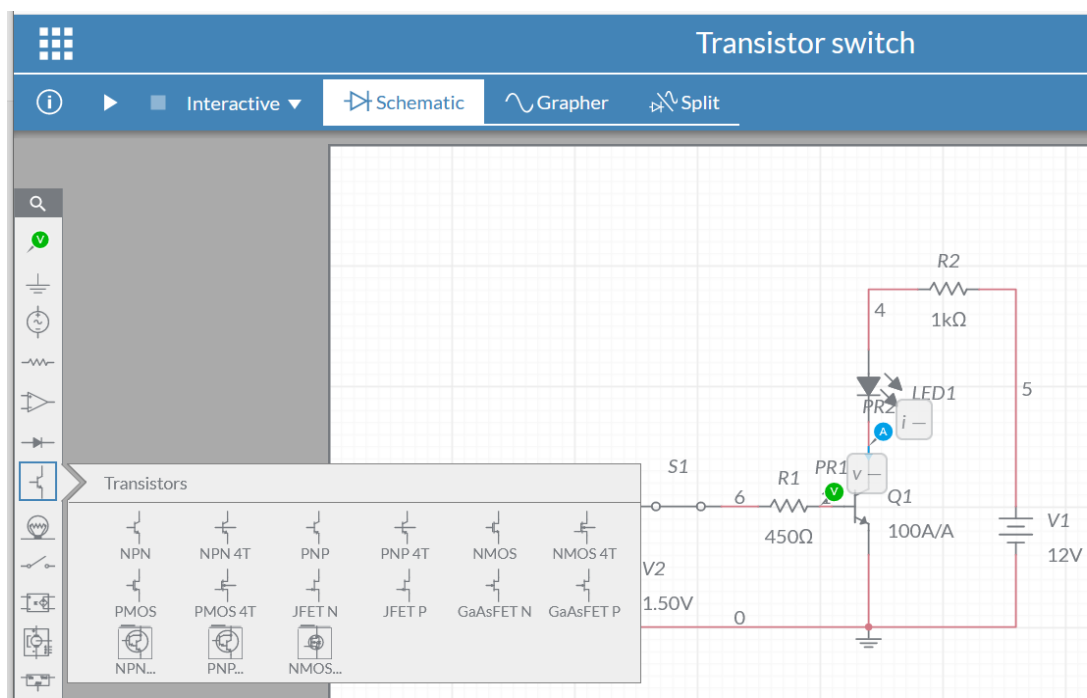
3. Change the untitled circuit as Transistor as a switch.
4. Click search for component and type components. Select it and drag to the Schematic window
5. Click search for transistor and NPN. Select it and drag to the Schematic window. Follow this step to select the entire apparatus given in table to complete the circuit.
6. Click schematic connector and select junction drag to the Schematic window and left click at the point and drag to the other point to make the wire connection. Complete the connection according to the diagram.
7. Click analysis and annotation and select voltage probe and drag to the schematic window and place at the input source and left click. Another current probe place at the top side of the collector of transistor and left click.
8. Click the value of the components in circuit and enter the value in the circuit document.
9. Save the file by clicking the file navigation menu at the left top and save with a file name.
10. Click grapher. Enter end time as $1e29$ s.
11. Run the simulation by clicking the run simulation. Switch on and off SPST switch at regular intervals.
12. Observe the input and output wave form and note down the values during ON and OFF condition of the transistor.

Circuit Diagram:



Transistor as a switch

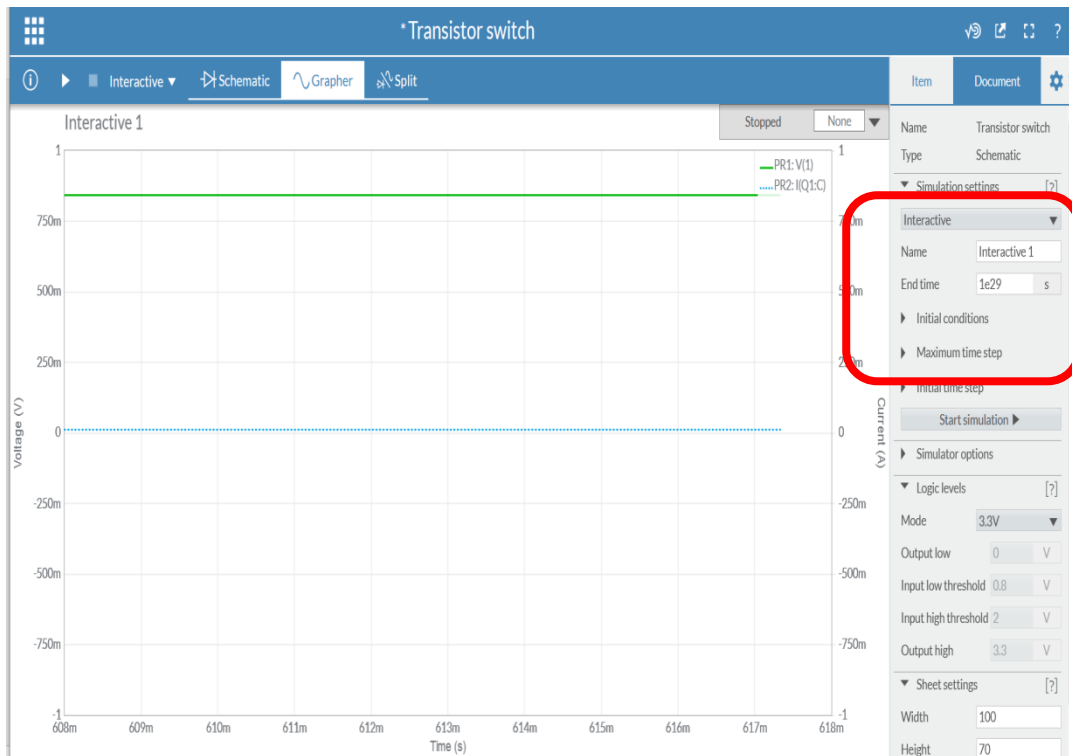
Method for component selection



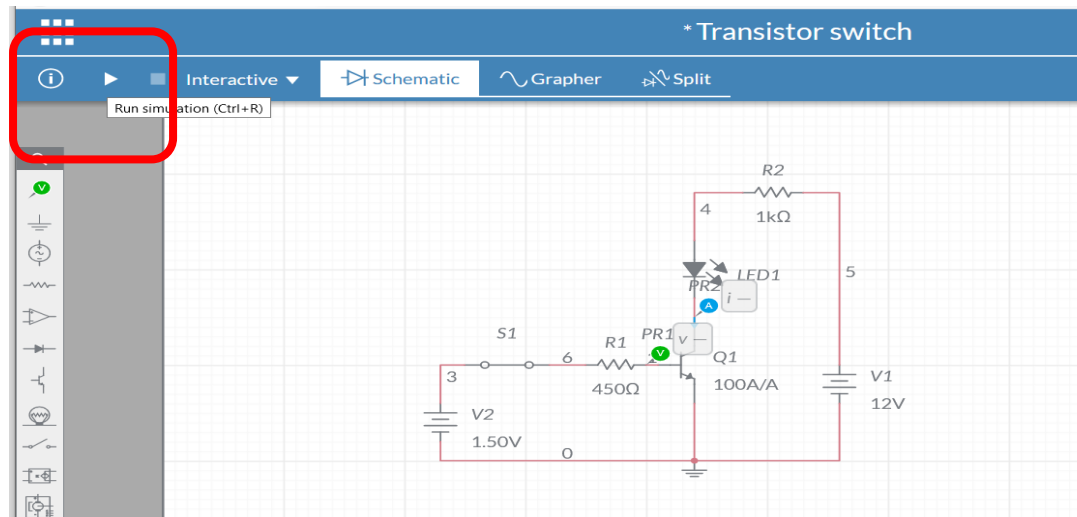
- Click search for transistor and NPN. Select it and drag to the Schematic window.
- Follow this step to make entire circuit as shown in table

Method for observing the grapher to provide time details

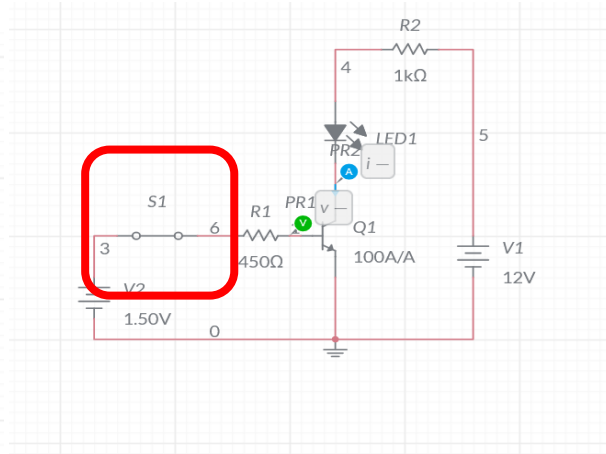
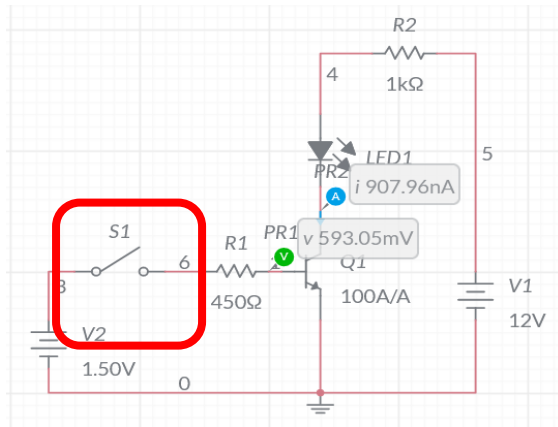
Enter time value here



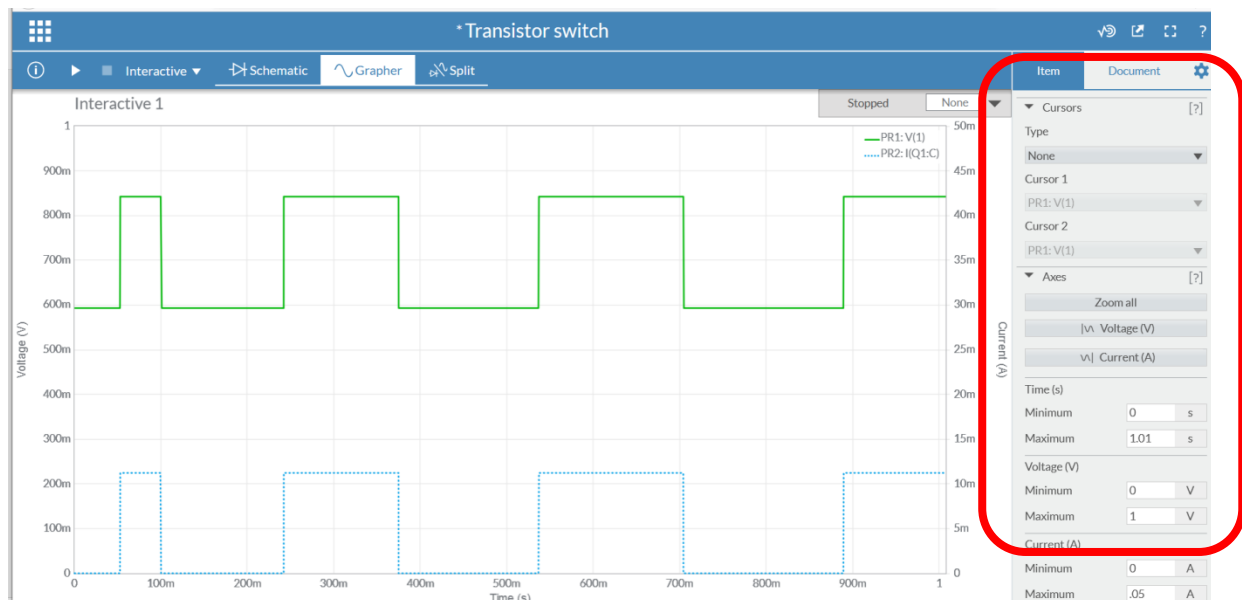
Method to run the simulation



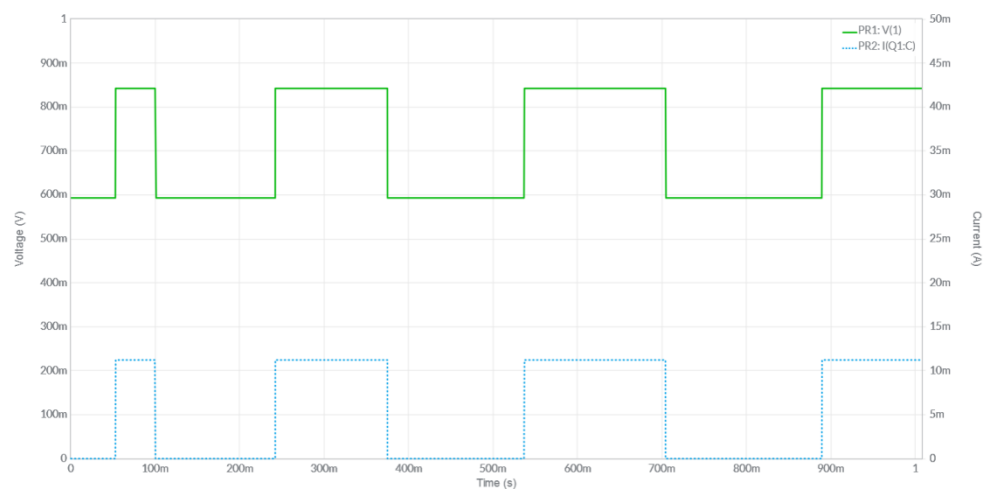
Switch ON and OFF condition



Method to get proper scales for the waveforms



Expected output waveforms



Tabulation

Switch	Status of probe	Voltage value
ON	ON	842.22 mV 60 mV
OFF	OFF	593.05 mV 11.525 mV

RESULT

Thus, the transistor as a switch was designed and the output voltage and status of the Probe was tabulated.