EAST WEST UNIVERSITY
Department of Computer Science and Engineering

# Lab-report:03

Course Name: Electronic Circuits
Course Code: CSE 251
Section No: 01

**Name of experiment: Introduction to Transistor**

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## Objectives:

1. Identify base, emitter and collector terminals and connections of NPN and PNP transistors.
2. Demonstrate and measure the effects on base current of forward and reverse bias in the emitter base circuit.

## Circuit Diagram:

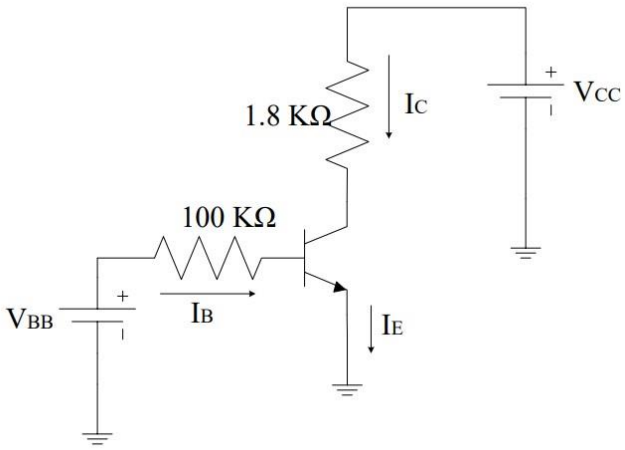



Figure 01: Circuit diagram for measuring I-V characteristics of Transistor

1. **Simulation of the DC circuit shown in lab Manual 3 to calculate the values α and β.**

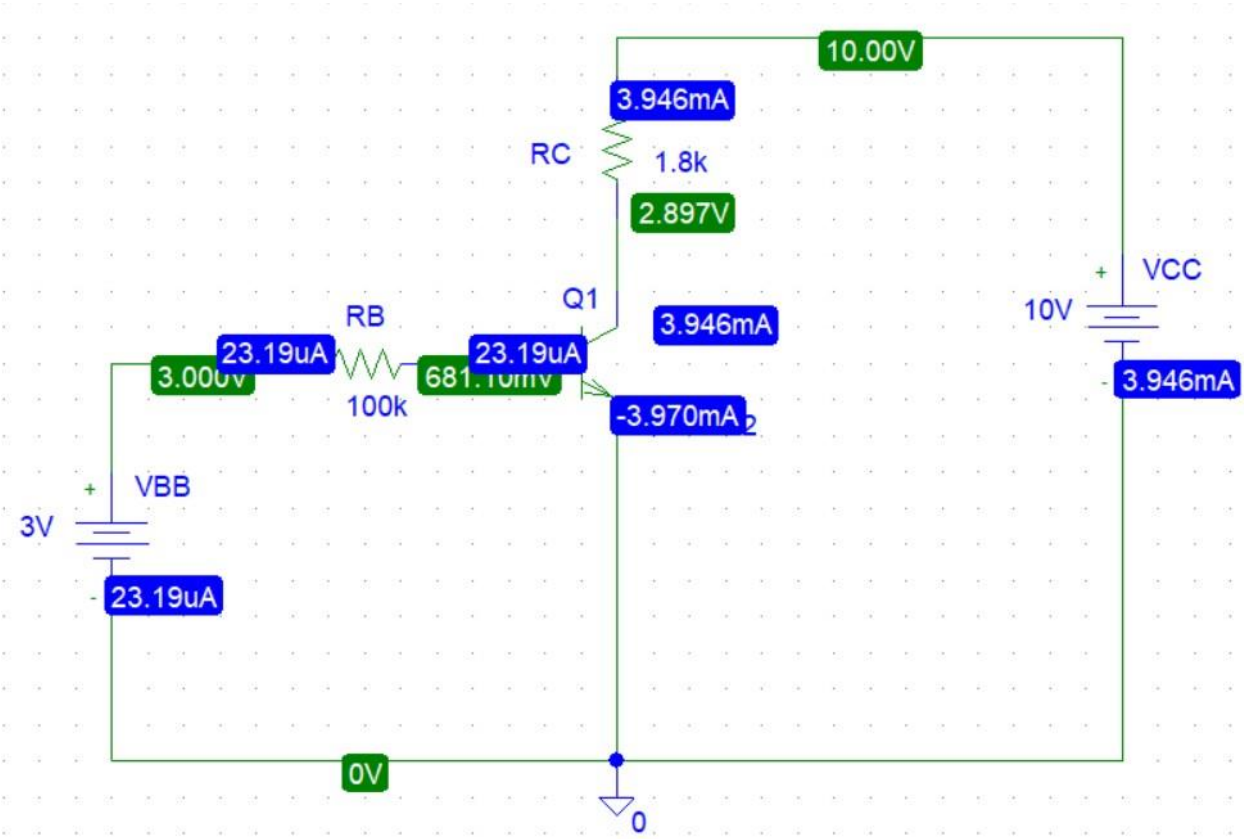



Figure 02: NPN Transistor circuit diagram with current & voltage

From the simulation circuit we get,

collector current,$I_c$=3.946$mA$

Base Current, $I_B$ = 23.19$uA$

Emitter current, $I_E$ = 3.970$mA$

We know, $\beta = I_C/I_B$

$=3.946mA/23.19uA$

$= 170$

And, $\alpha = I_C/I_E$

$= 3.946mA/3.970mA$

$=0.9939$

## 2. Collector current with respect to Base to Emitter Voltage and model Collector current

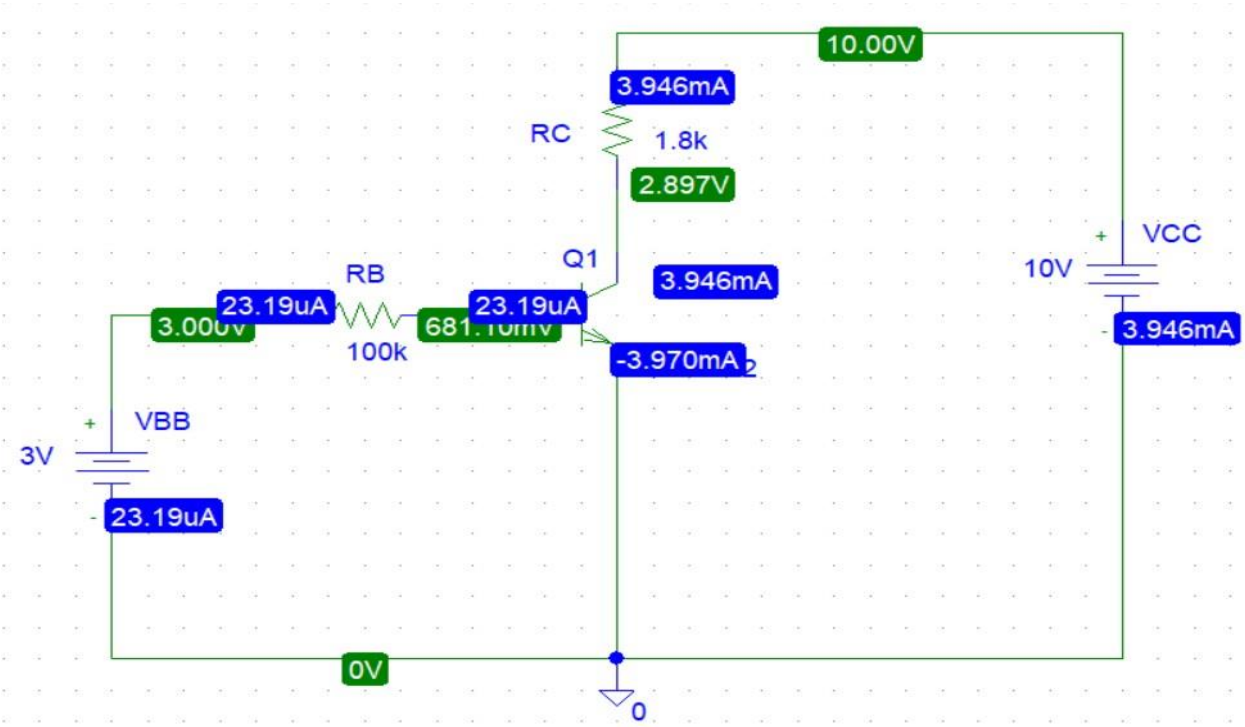



Figure 03: NPN Transistor circuit diagram with current & voltage

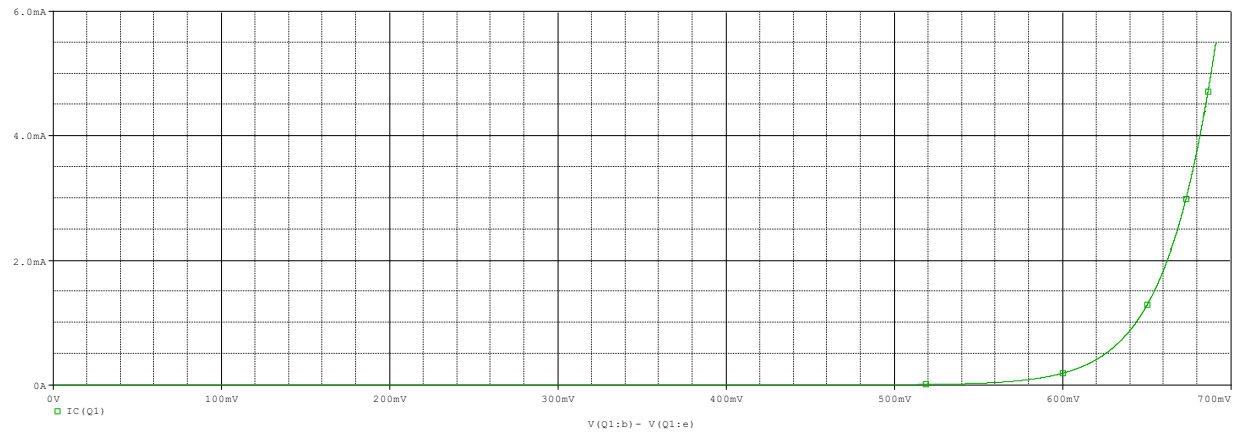



Figure 04: VBE vs IC plot

Given,

$V_T$ = 26mV.

We got,

$I_{C1}$ =1.5017 mA

$I_{C2}$ =2.5063 mA

$V_{BE1}$ =654.272mV

$V_{BE2}$ = 668.222mV

$IC1 = ISe[VBE1/nVT]$ ……(1)

$IC2 = ISe[VBE2/nVT]$ ……(2)

(2) ÷ (1), We get

$$\frac{I_{C2}}{I_{C1}} = \frac{I_S(e[V_{Be2}/nV_T] - 1)}{I_S(e\,[V_{BE1}/nV^T] - 1)}$$

Or, $\ln (I_{C2}/I_{C1}) = (V_{BE2}/V_{BE1})/\, nV^T$

So, n = 1.04

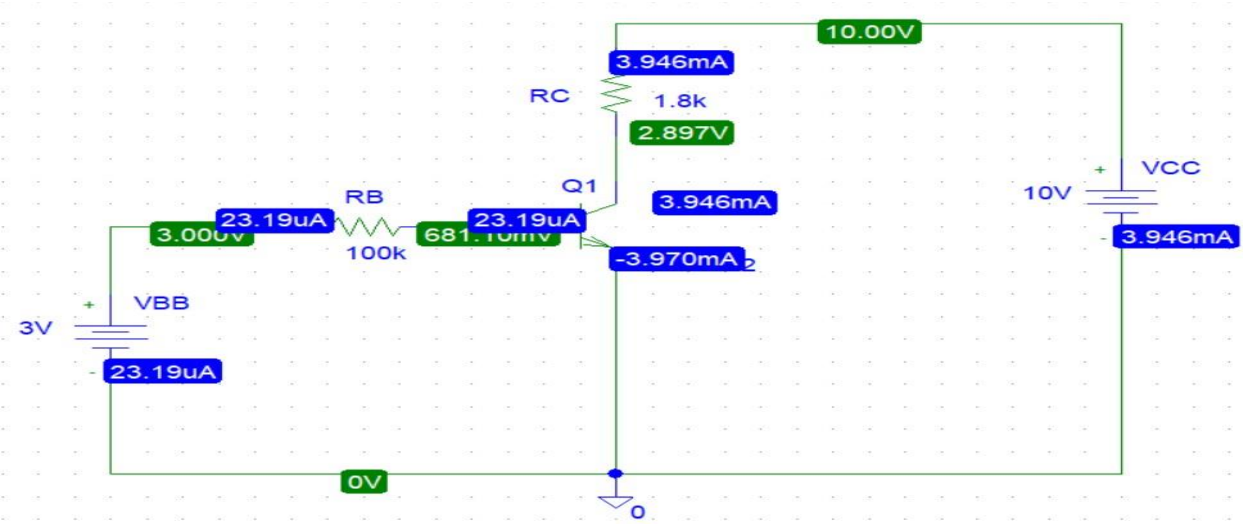
Putting the value of n in equation (1),

$I_{C2} = I_S e^{[V_{BE2}/nVT]}$

$$= \frac{2.5063}{5.40*10^{10}}$$

$= 4.64*10^{-14}A$

## 3.Collector current with respect to Collector to Emitter Voltage with varying Base to Emitter voltage



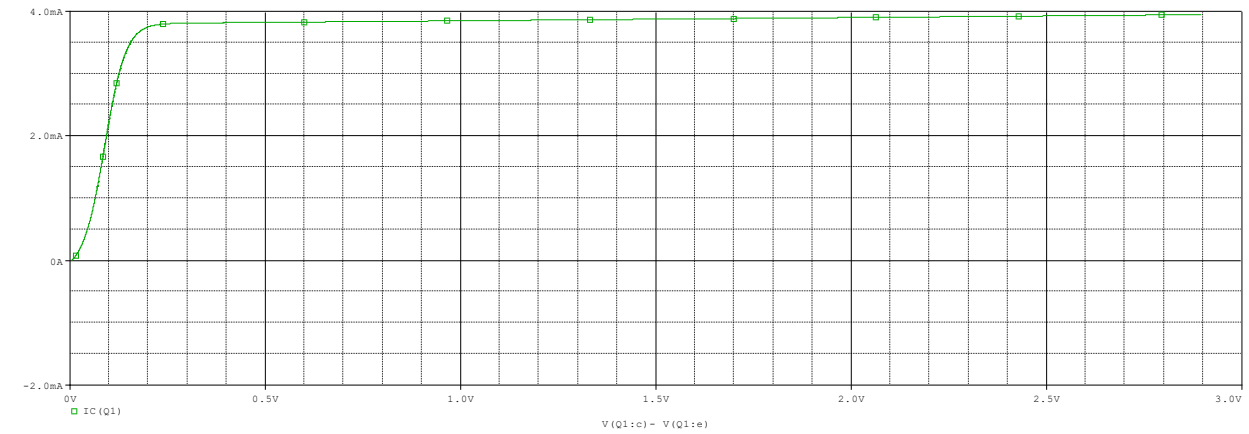



Figure 05: VCE vs IC plot

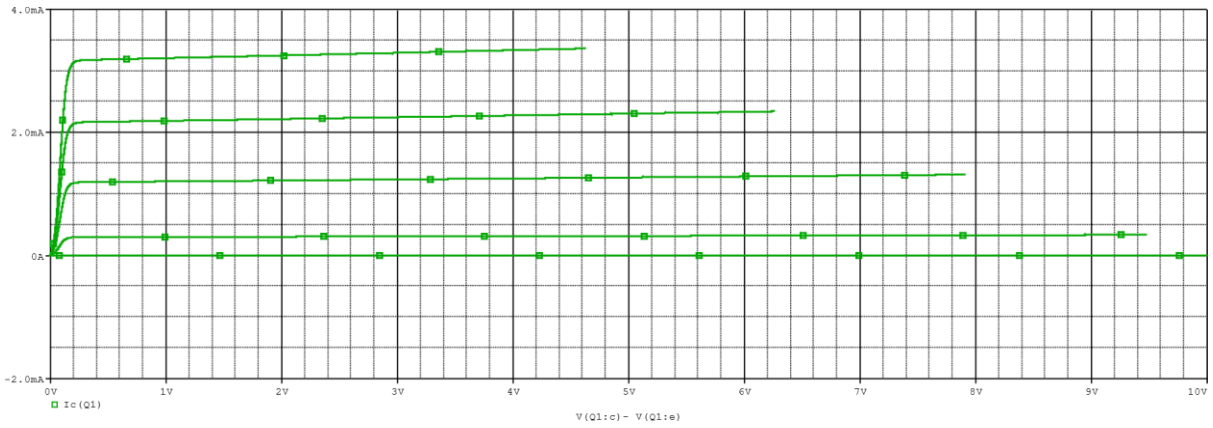



Figure 06 : $I_C$-$V_{CE}$ plot

## Conclusion:

In this experiment, we used BJT transistors. We see various characteristics of the transistors and the plot graph on various terms. Here, all the graphs & values are calculated in the PSpice simulation software.