

# EXPERIMENT NO: 3

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## Aim of the Experiment:

Analysis of BJT bias circuit using eSim.

## Theory:

Biasing of the bipolar junction transistor (BJT) is the process of applying external voltages to it. In order to use the BJT for any application like amplification, the two junctions of the transistor CB and BE should be properly biased according to the required application. Depending on whether the two junctions of the transistor are forward or reverse biased, a transistor is capable of operating in three different modes namely the **cutoff mode** in this mode the BJT is fully off, **saturation mode**: the transistor is fully on in this state and the **active mode**: in order to use the transistor as an amplifier, it must be operated in this mode.

## Procedure:

1. Create the schematic of the BJT Bias as shown in Figure-1.
2. Annotate the schematic.
3. Test Electric rules.
4. Generate the netlist.
5. Insert analysis for DC Sweep analysis from 0 to 10v with a step time of 0.05v for V1 and from 0 to 5mA with a step of 1mA for I1
6. Insert Source Details.
7. Add NPN.lib model in Device Modeling for BJT.
8. Convert KiCad netlist to Ngspice netlist.
9. Simulate the Ngspice netlist using Ngspice simulator.

## Source Parameters:

For DC Voltage Source:

1. Enter Value for V1 - 12

For DC Current Source:

1. Enter Value for I1 - 20m

## Schematic Diagram:

The circuit schematic of BJT bias circuit in eSim is as shown below:

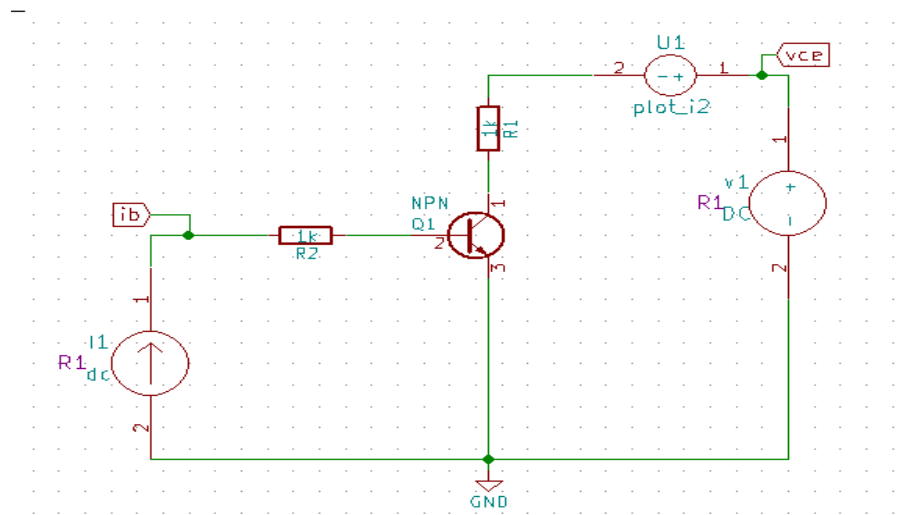


Figure 1: BJT Bias Circuit

## Simulation Results:

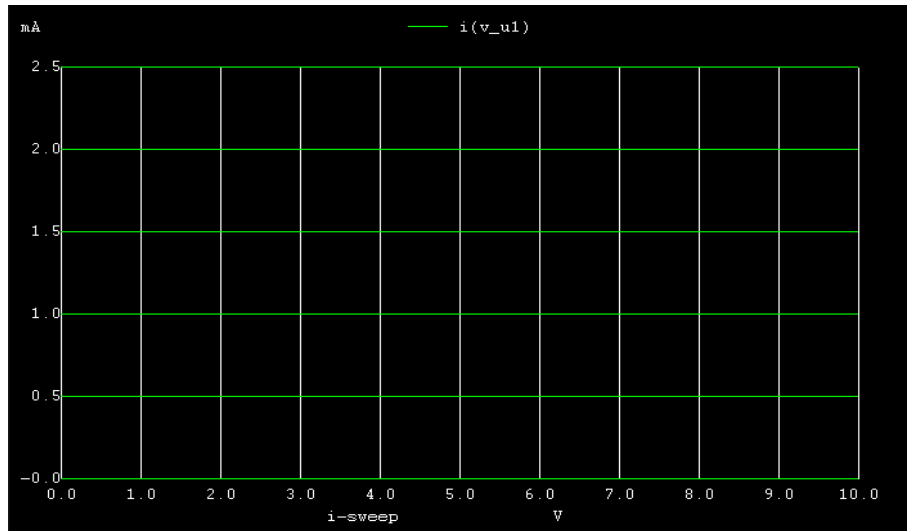


Figure 2: Ngspice Output plot

## Conclusion:

Thus, we have studied the BJT bias circuit using eSim and we get the appropriate waveforms.

## References:

<http://www.electrical4u.com/biasing-of-bipolar-junction-transistor-bjt-or-bipolar-transistor-biasing/>