2. Testing and Troubleshooting of Diodes, Zener Diodes and Transistors

Course: ECE1008 – Electronic Hardware Troubleshooting LAB

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CHENNAI

Aim of the experiment:

1) To learn the testing and trouble shooting of Diodes
2) To obtain diode characteristics (V-I)
3) To learn the testing and trouble shooting of Zener Diodes
4) To obtain VI characteristics of Zener Diodes (2 diodes)
5) To learn the testing and trouble shooting of Transistors
6) To obtain Input and output characteristics of NPN Transistor circuit with
   a) CE configuration
   b) CB configuration
   c) CC configuration

Important NOTE

- Enter your registration number and Full Name next to all your circuits and the output plots.

1. Testing and trouble shooting of Diodes

- Black coated: Positive
- Silver coated: Negative

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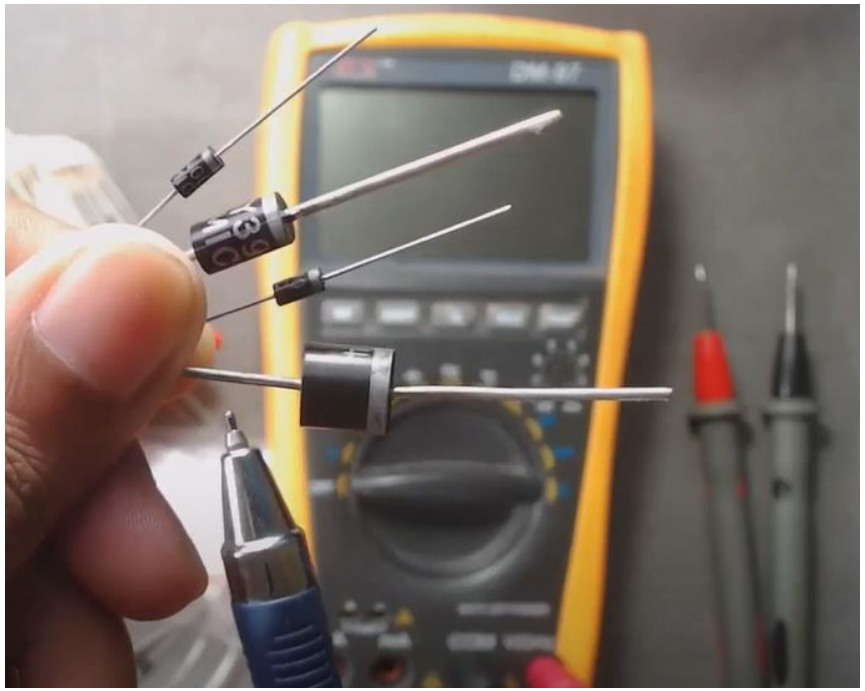

1. Diode: Checks to be performed

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- **<u>Damaged diode:</u>**
  Opened or Shorted

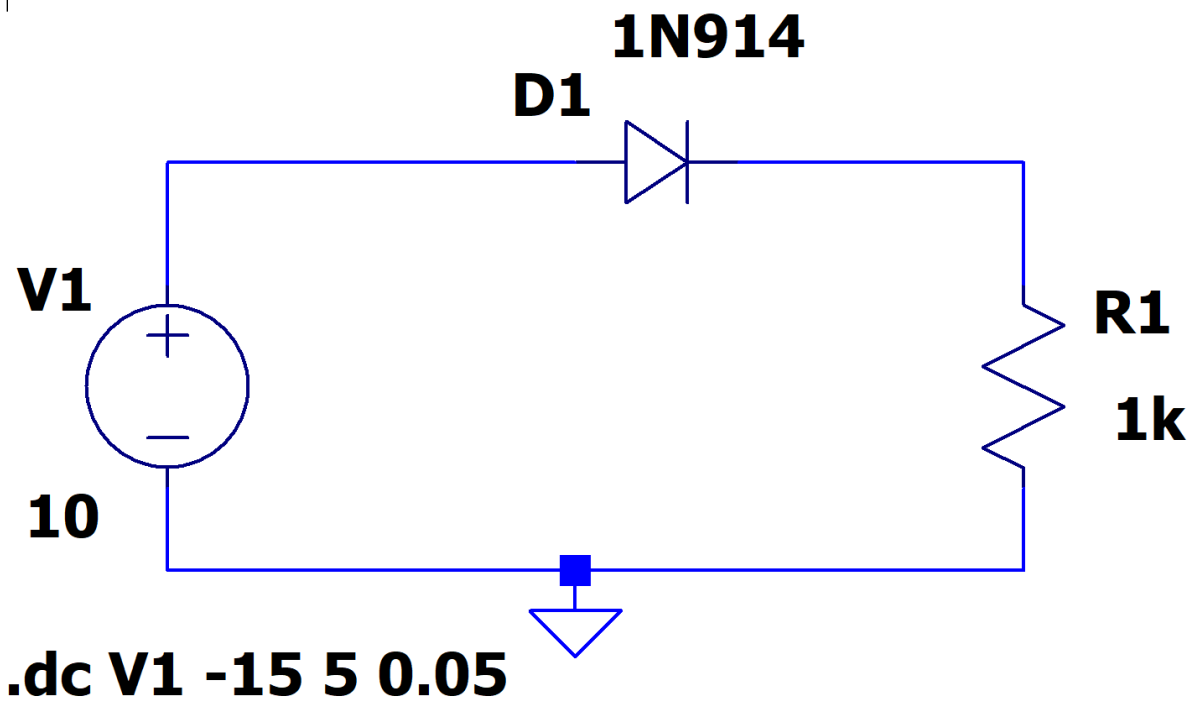
  Open circuit in both directions
  Opened diode

  0 to 0.4V in both directions
  Shorted diode

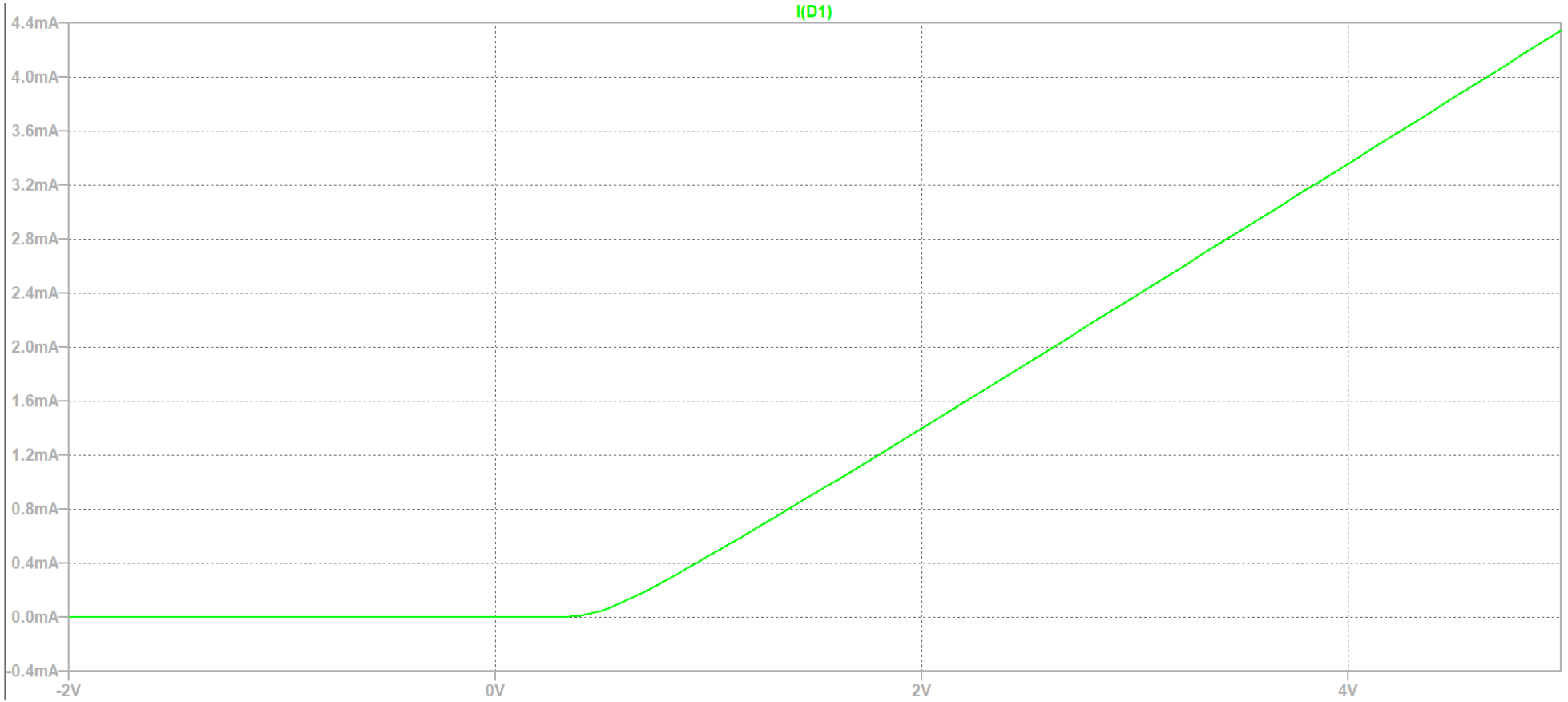
2. VI Characteristics of PN junction Diode

Perform the connections as provided in the figure
Select the simulation command as DC sweep.
Enter the source “V1” and provide
Start value: -15V
Stop value: 5V
Increment: 0.05

Obtain the diode current:
V1 vs ID1

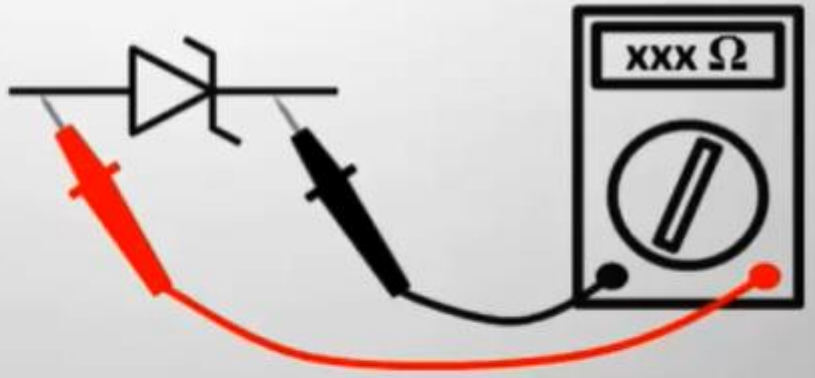


2. VI Characteristics of PN junction Diode

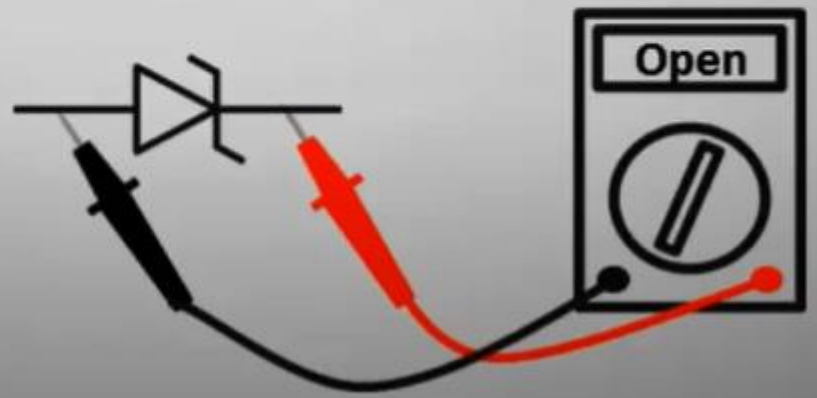


3. 1. Testing and trouble shooting of Zener Diodes: Checks to be performed

- **Forward bias (using Ω range)**



- **Reverse bias (using Ω range)**

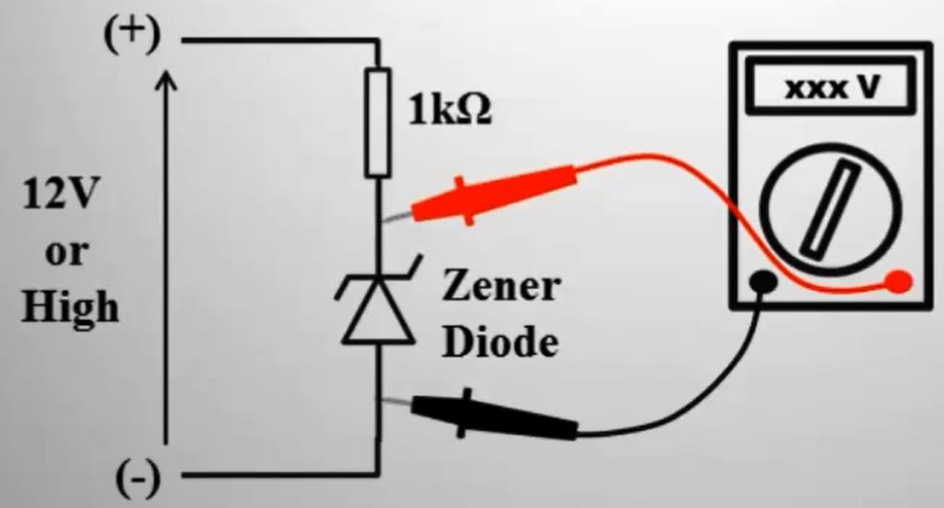


3. 1. Testing and trouble shooting of Zener Diodes: Checks to be performed

- Red to Anode(+ve) and Black to Cathode (-ve marked in silver)

3. 2. Testing and trouble shooting of Zener Diodes: Checks to be performed

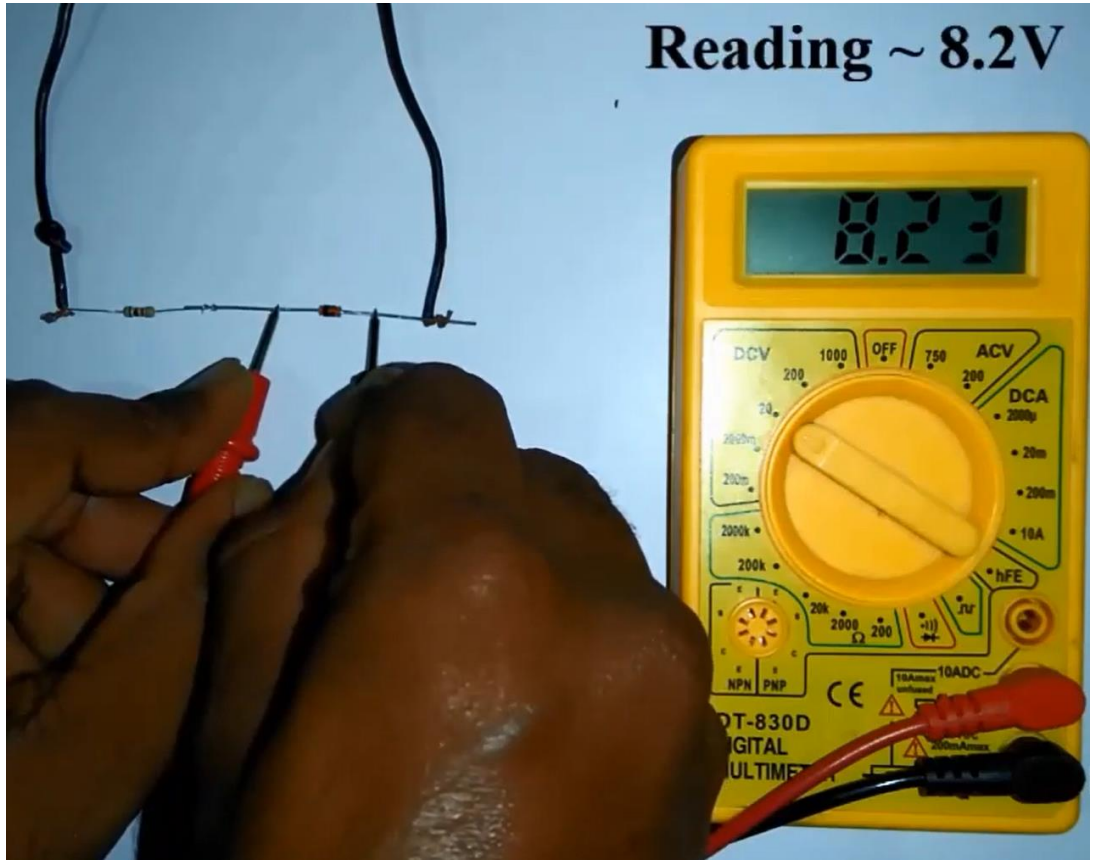
➢ **Voltage across Zener Diode (V_{ZD})**



Use a power supply slightly higher than Zener voltage (V_{ZD}).

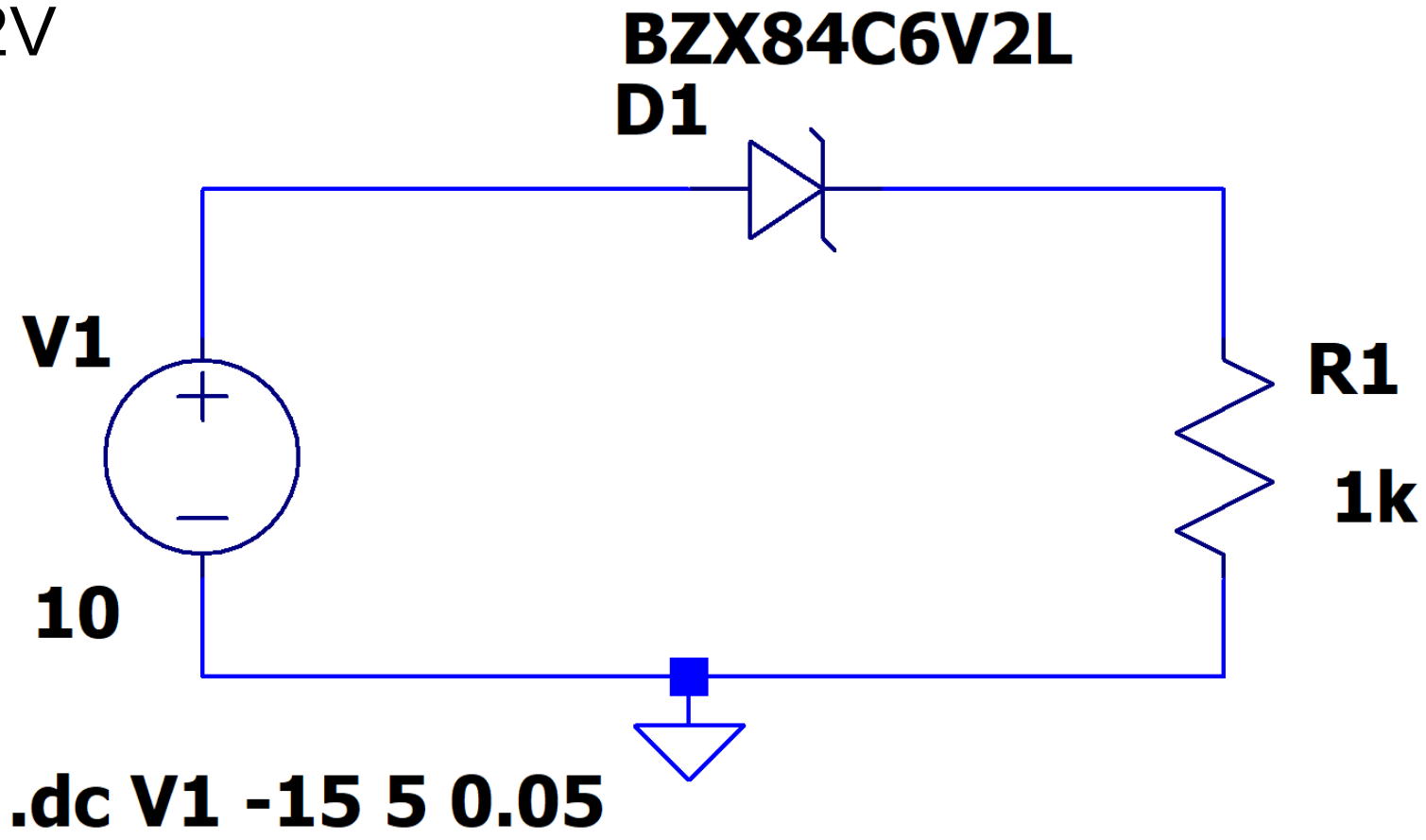
Mentioned voltage in Zener diode should be shown in multimeter, otherwise it is faulty.

3. 2. Testing and trouble shooting of Zener Diodes: Checks to be performed

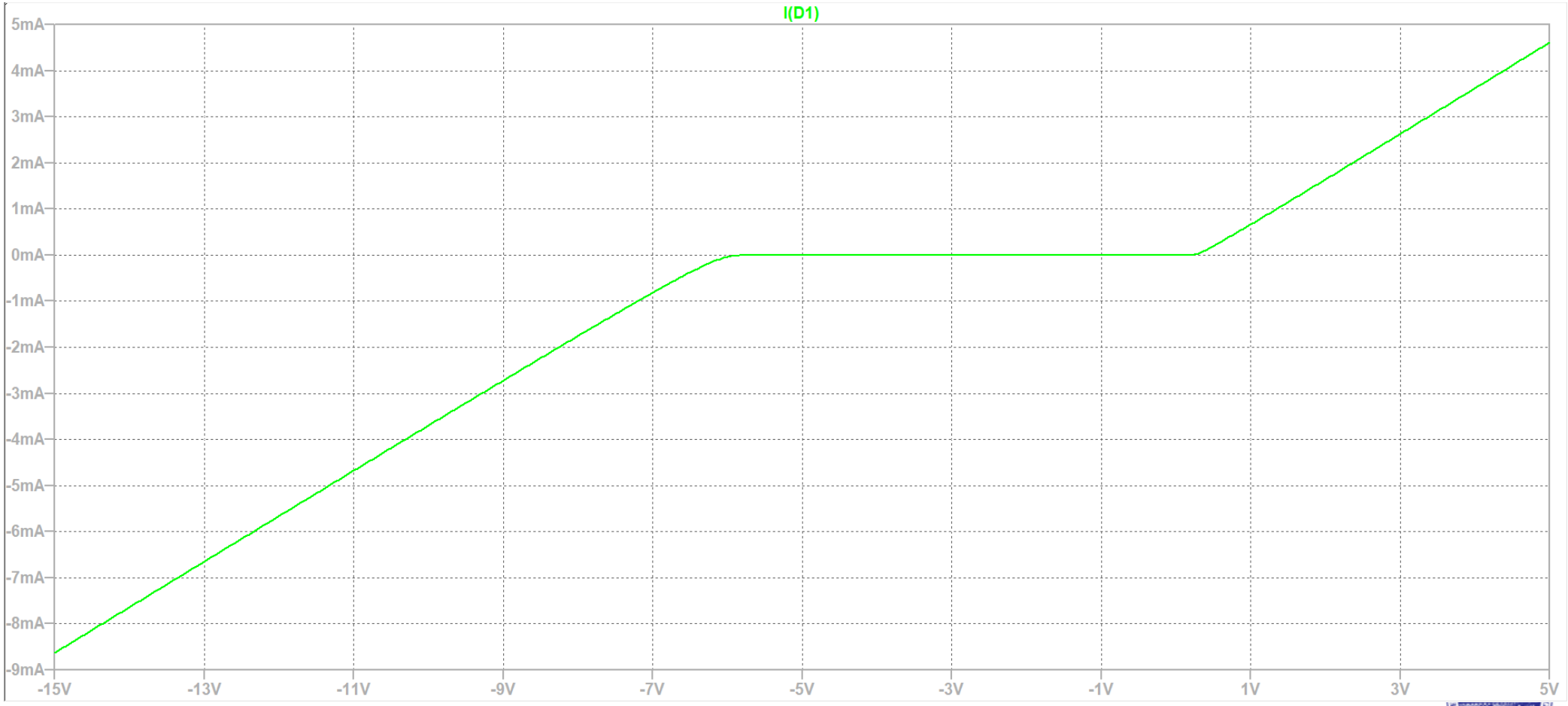


4. VI characteristics of Zener Diode

- **<u>Zener Diode: BZX84C6V2LD1</u>**
- Reverse bias voltage: 6.2V

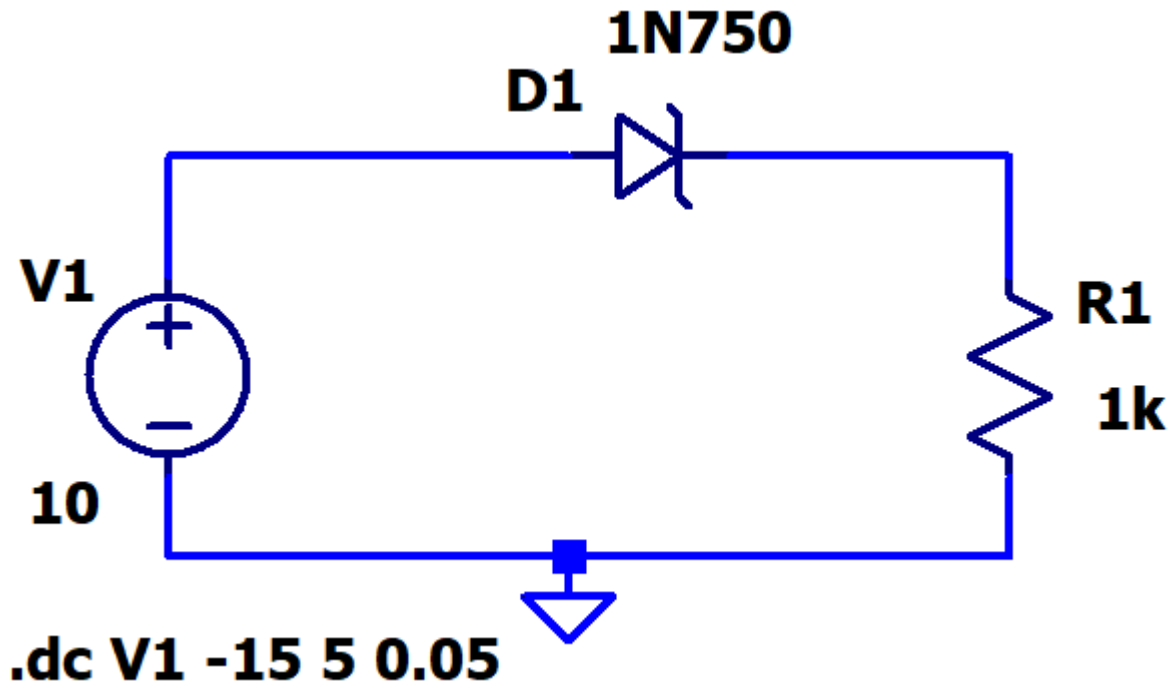


4. VI characteristics of Zener Diode



4. VI characteristics of Zener Diode

- **Zener Diode: 1N750**
- Voltage vs Current
- V1 vs ID1



5. Troubleshooting of Transistors

- hFE in multimeter: Hybrid
  Forward (current)
  (Common) Emitter

- https://www.youtube.com/watch?v=7ukDKVHnac4
- Current gain (Ic/Ib)

5. Troubleshooting of Tran

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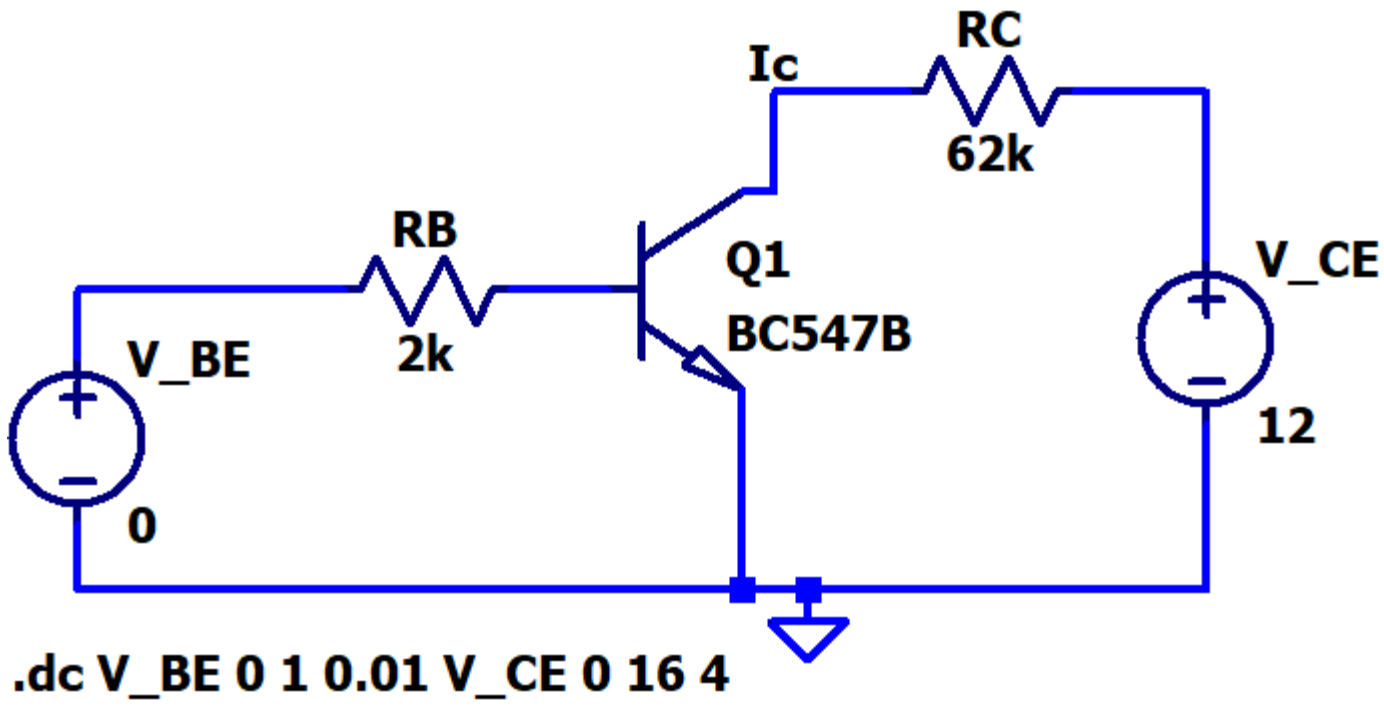
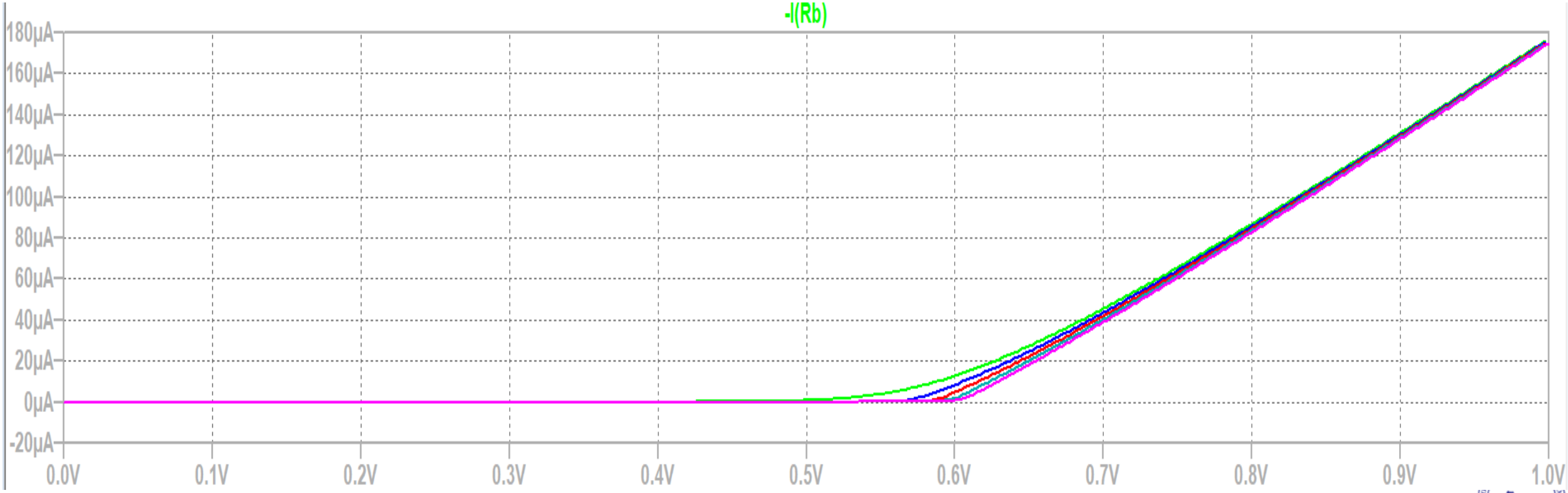
- Current gain (Ic/Ib)

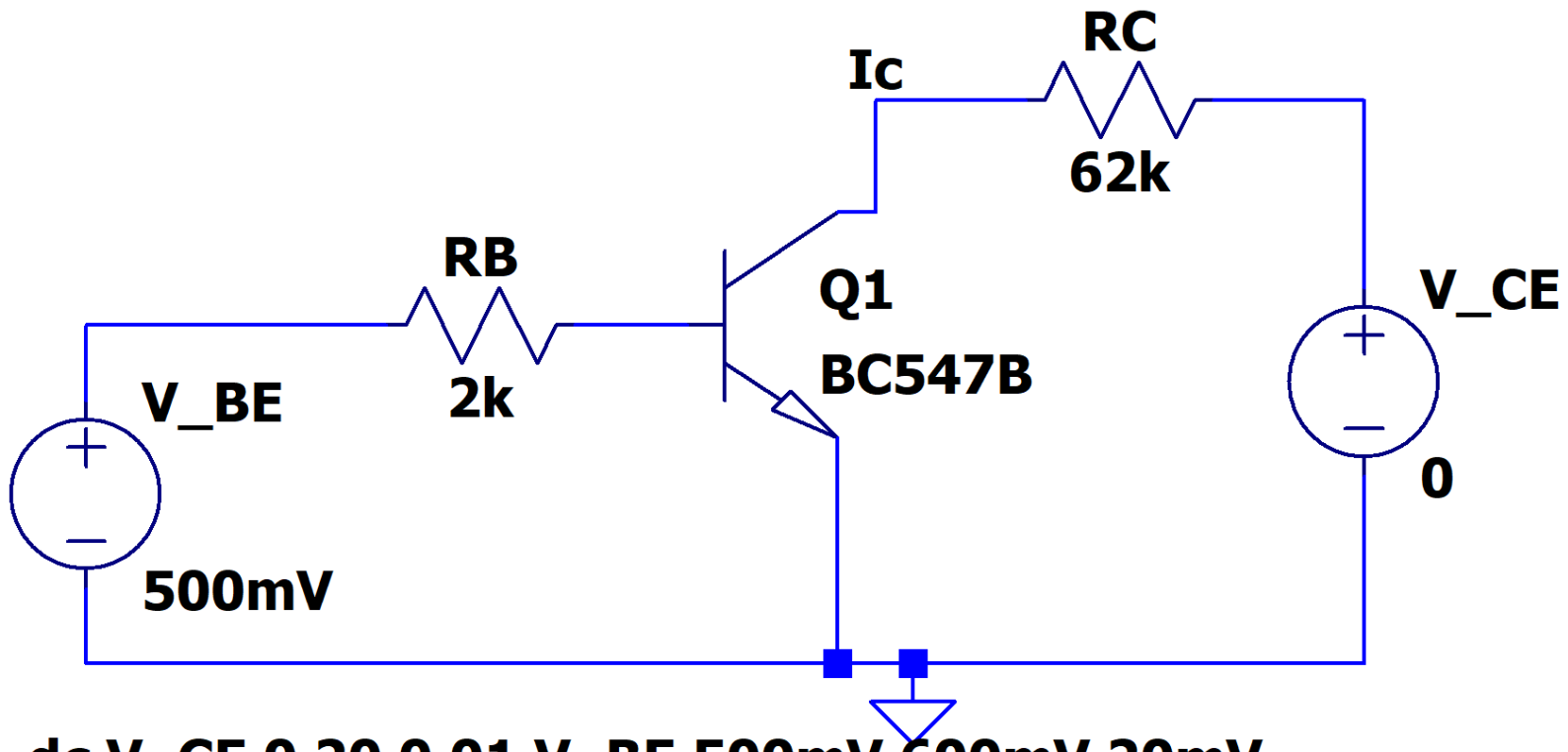
6a -1) Transistor in CE: Input characteristics:



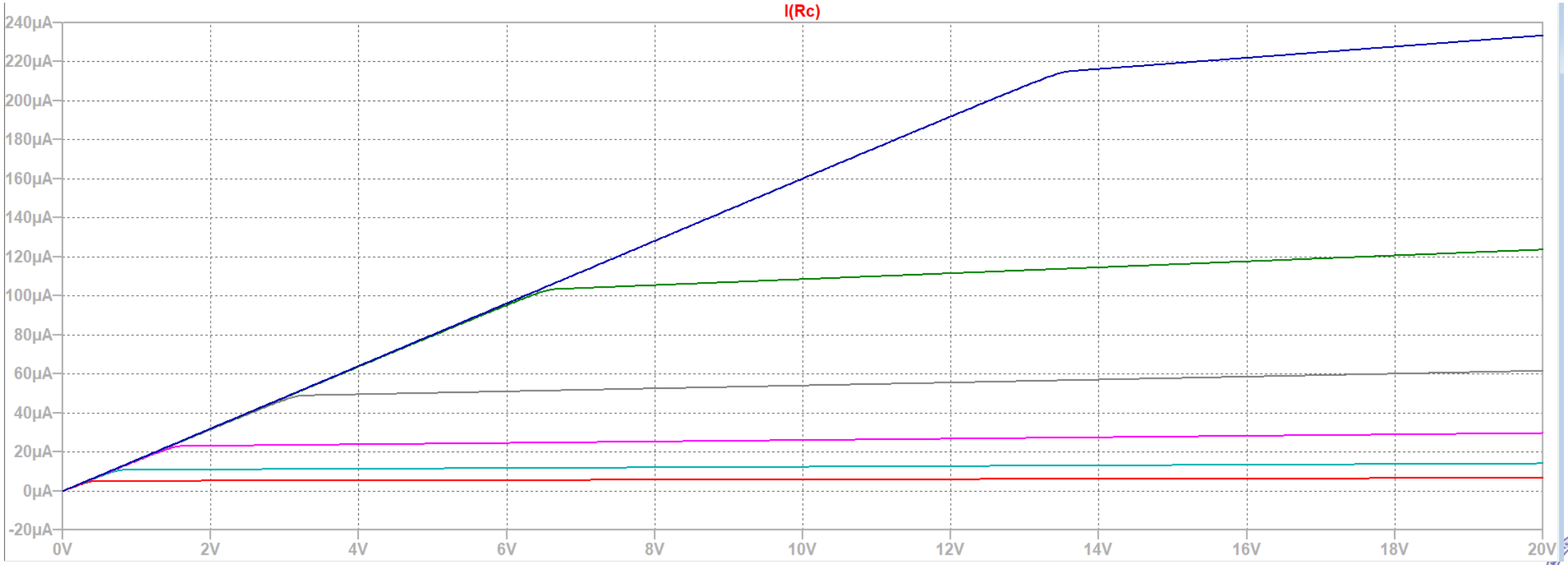
6a -1) Transistor in CE: Input characteristics:



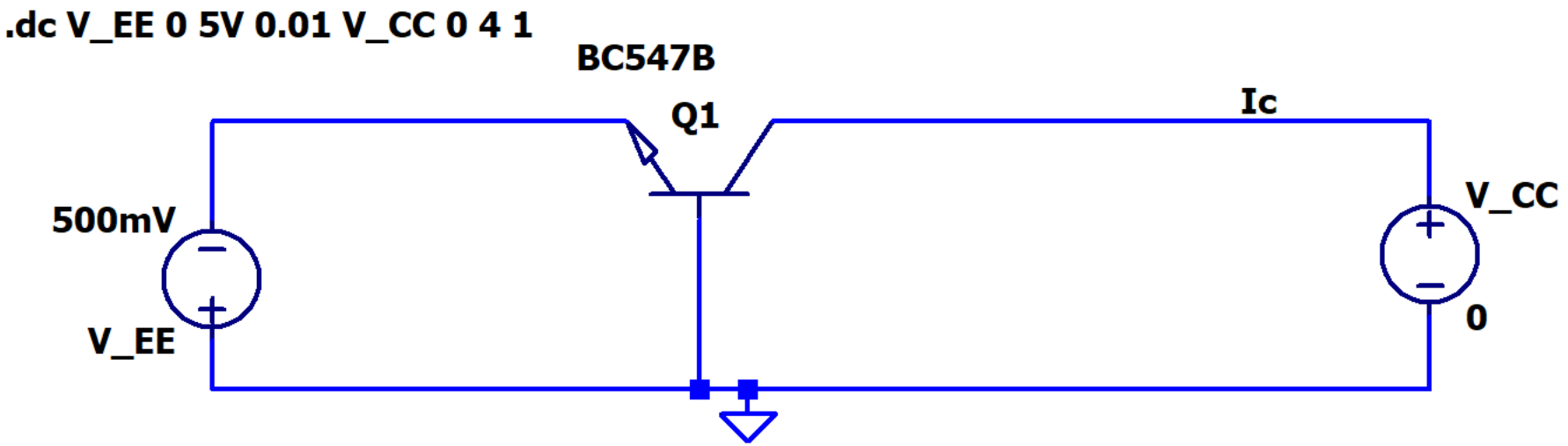
6a-2) CE: Output characteristics:



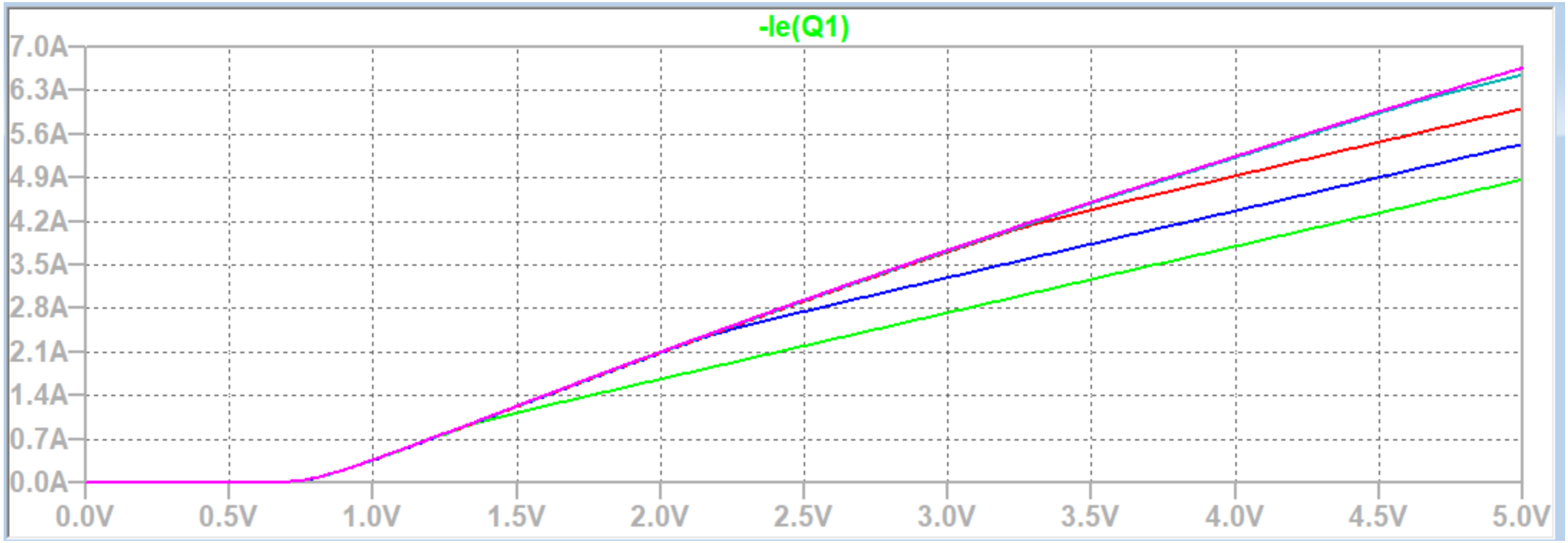
6a-2) CE: Output characteristics:



6b-1) CB: Input characteristics:

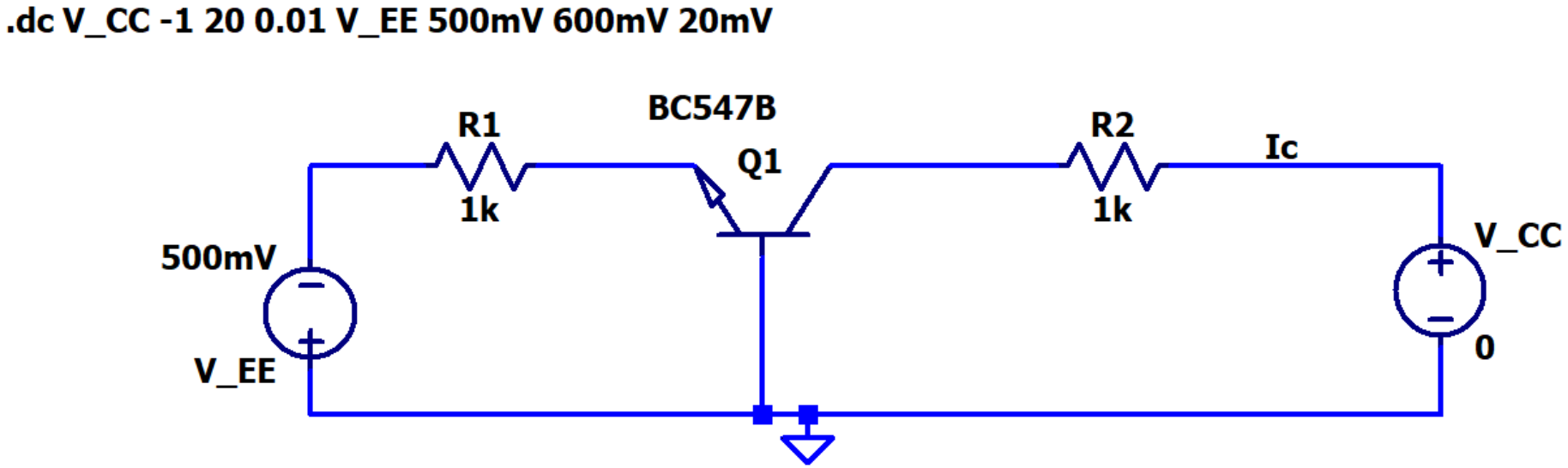


6b-1) CB: Input characteristics: VEE vs IE

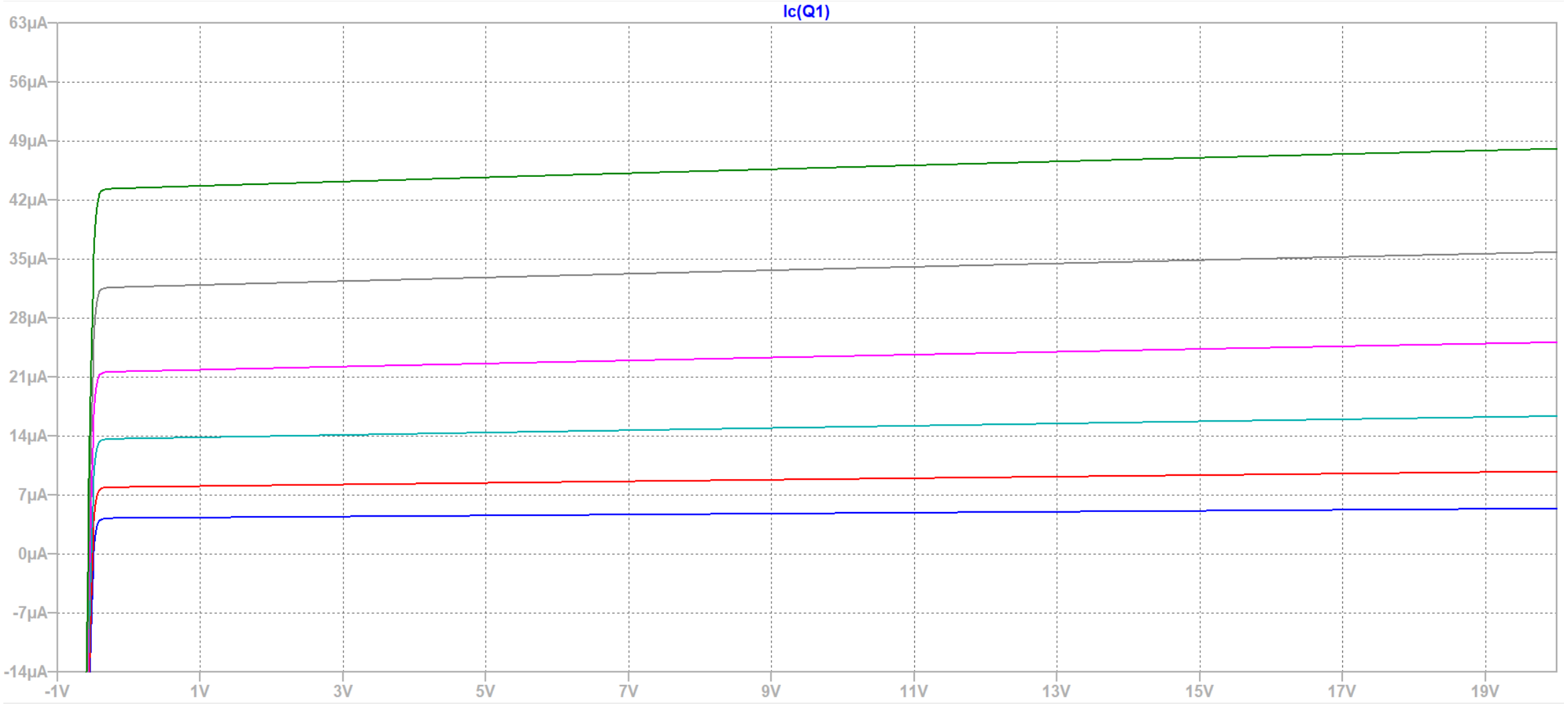


6b-2) CB: Output characteristics:

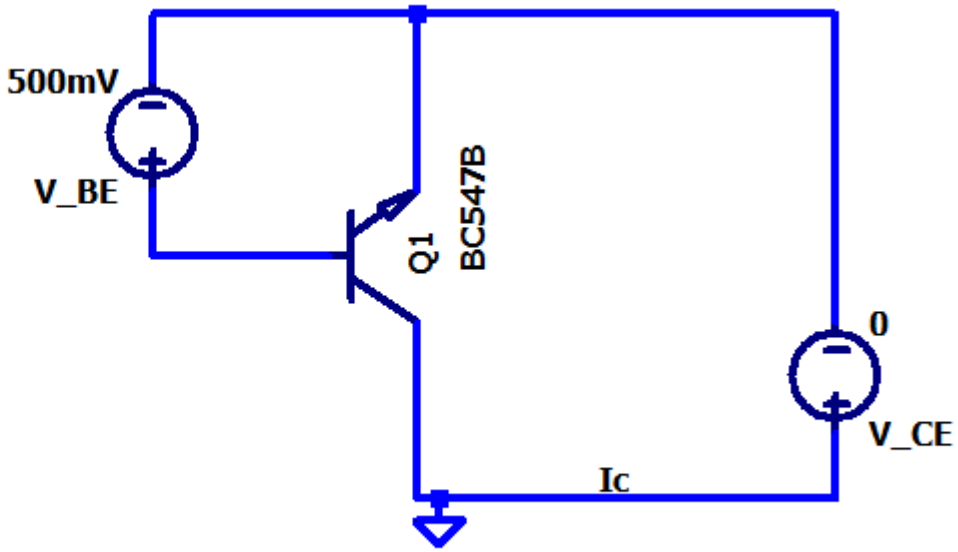
- For different values of input (V_EE), plot V_CC vs IC



6b-2) CB: Output characteristics: VCC vs IC

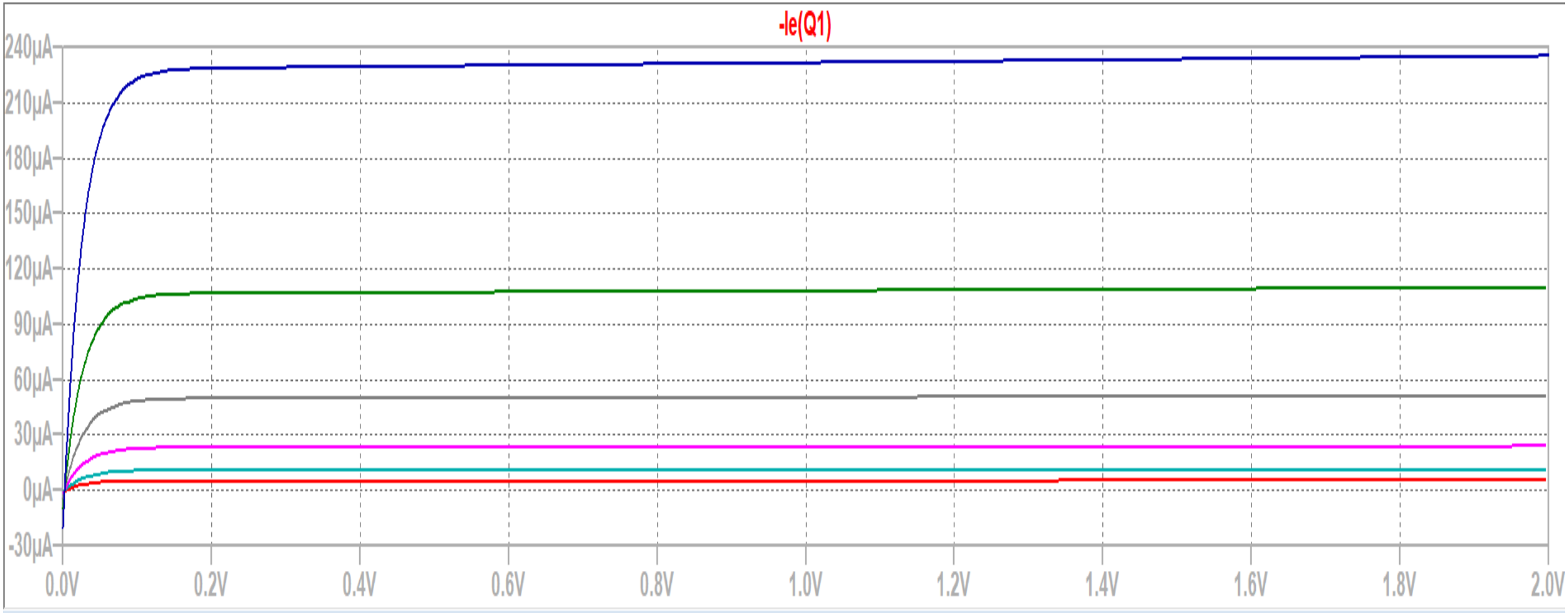


6c-1) CC: Input Characteristics: VBE Vs IE

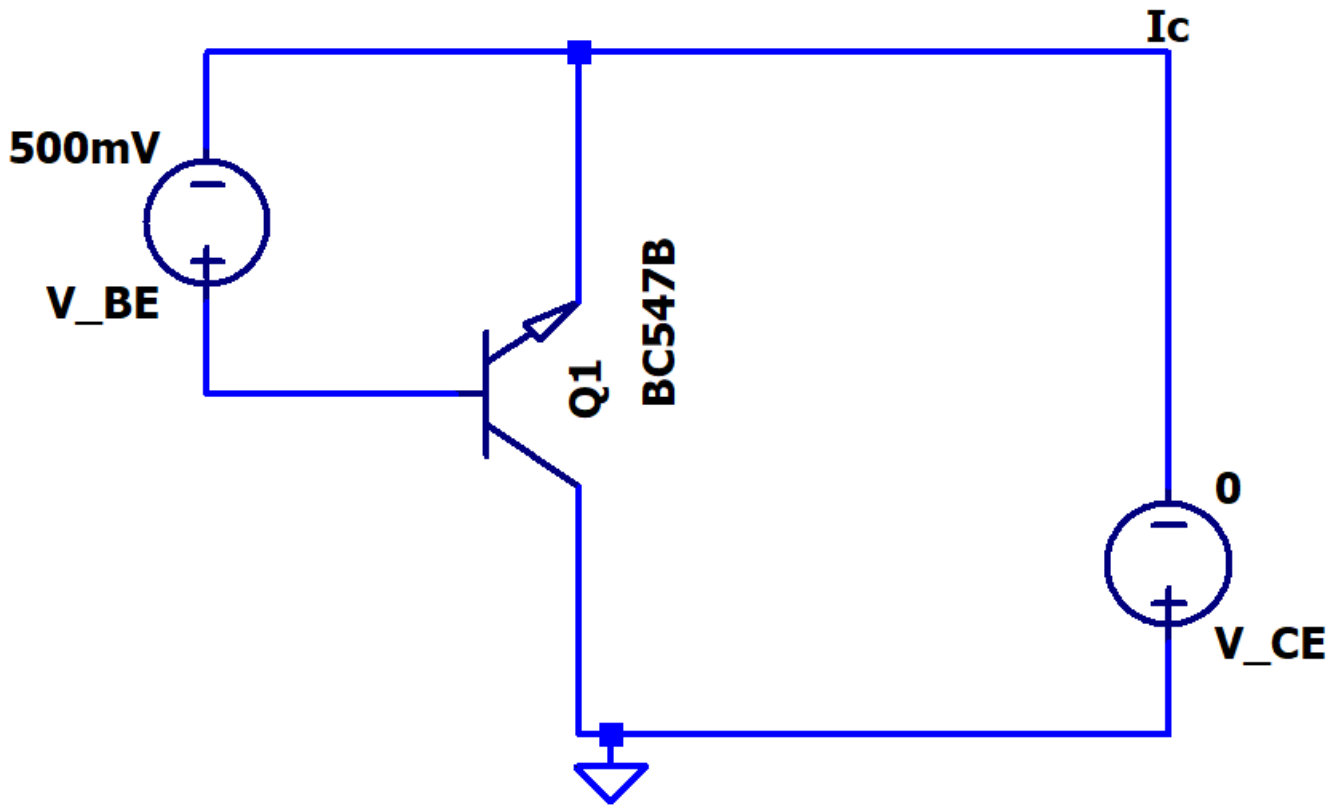


.dc V_CE 0 2 0.01 V_BE 500mV 600mV 20mV

6c-1) CC: Input Characteristics: VBE Vs IE

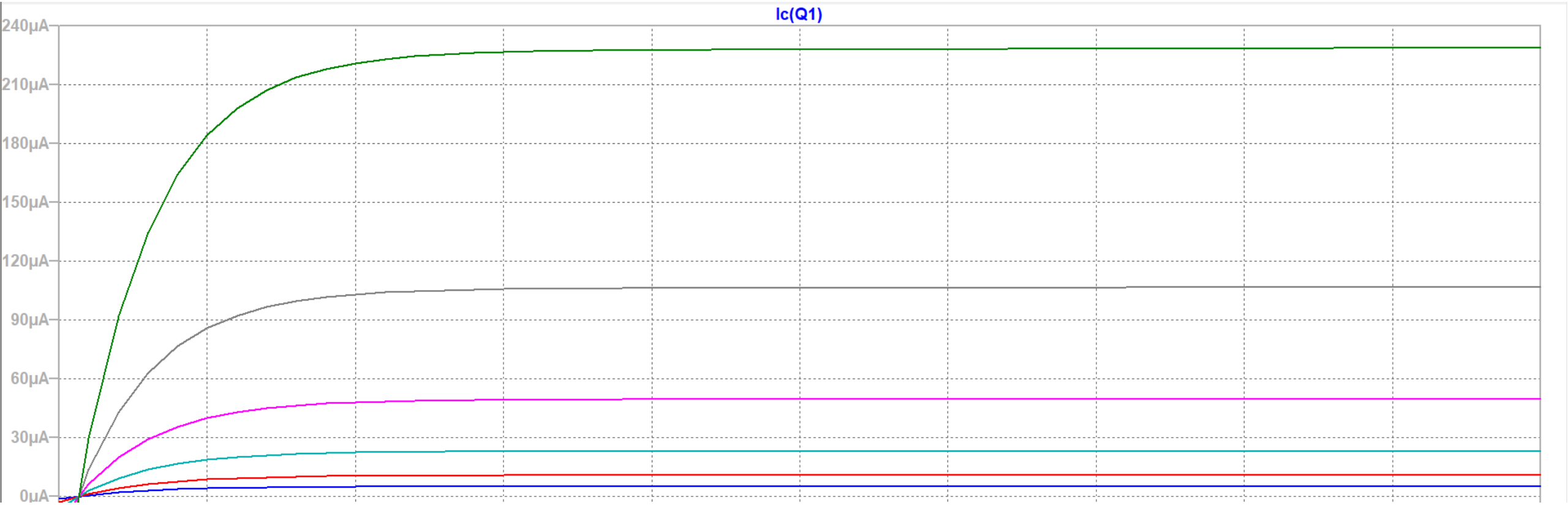


6c-2) CC:Output characteristics: VCE vs IC



.dc V_CE 0 0.5 0.01 V_BE 500mV 600mV 20mV

6c-2) CC:Output characteristics: VCE vs IC



LAB record instructions:

For the lab experiment,

- Write the **Aim**.
- Complete the **Software/Hardware components used**.
- **Obtain the expression for the outputs.**
- Place the respective **circuits in LT Spice**.
- Connect the inputs and outputs. Name them and **write the same in the lab copy(inputs and outputs section)**.
- Use probe in LT spice to plot all possible combinations.
- Write a **concluding statement for each circuit**.
- **Submit** the document's soft copy **on time** in lms.vit.ac.in when available.

Sources

- https://www.youtube.com/watch?v=eVnO_bbP8y8
- https://www.youtube.com/watch?v=mx9WWga8xX8