

# **ELECTRONICS LAB.**

## **PART 3 EXPERIMENTS**

**Yrd. Doç. Dr. Taha İMECİ**

**Arş. Gör. Ezgi YAMAÇ**

**Arş. Gör. Ufuk ŞANVER**

**İSTANBUL COMMERCE UNIVERSITY**

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# EXPERIMENT: 3.1

## DERIVING 1.REGION CHARACTERISTICS OF TRANSISTOR

### EXPERIMENTAL PROCEDURE:

Apply power to supply and adjust output voltage to 0,7 Volt. Cut-off the circuit energy. Plug the Y-0016/007 module. Make the circuit connections as in 12.16

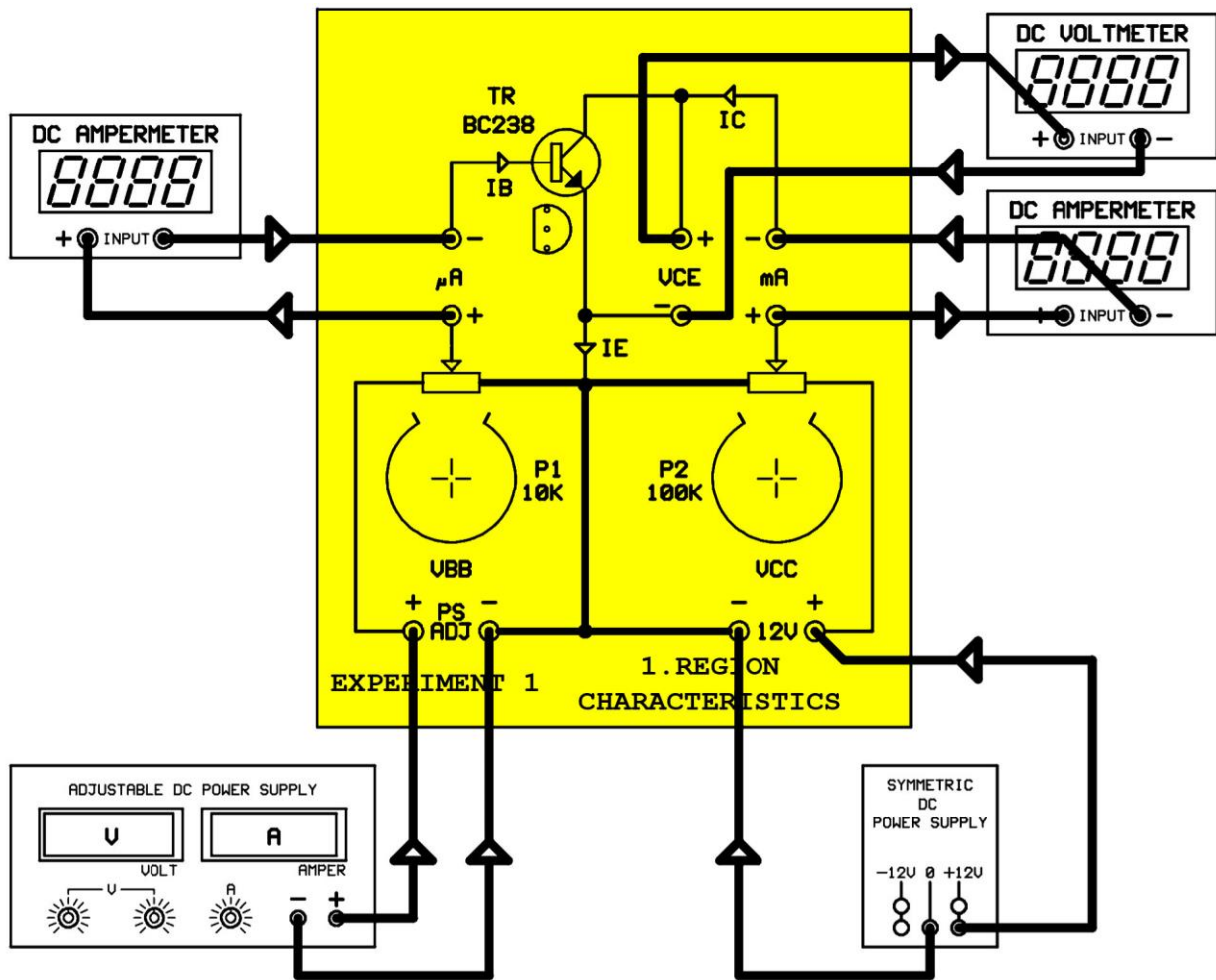


Figure 12.16

- 1- Adjust mid-terminals of P<sub>1</sub> and P<sub>2</sub> potentiometers to 0 Volt. (**Mid-terminals will be in emitter of transistor**)
- 2- Apply energy to the circuit.
- 3- Adjust the base current ( $I_B$ ) to 10μA by P<sub>1</sub> potentiometer. This value should be constant until the end of experiment. If a change occurs, re-adjust it to 10μA.

**4-** Using P2 potentiometer, write the collector-emitter voltage ( $V_{CE}$ ) and collector current ( $I_C$ ) to the table at figure 12.17

IB=10uA Constant		
ORDER	VCE(V)	IC
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

**Figure 12.17**

**5-** Re-adjust the mid-terminals of P1 and P2 potentiometers to 0 Volt.

**6-** Adjust the power supply to  $V_{BB}=0.8\text{Volt}$ .

**7-** Adjust the base current ( $I_B$ ) to  $20\mu\text{A}$  using P1 potentiometer. If a change occurs during experiment, re-adjust it to  $20\mu\text{A}$ .

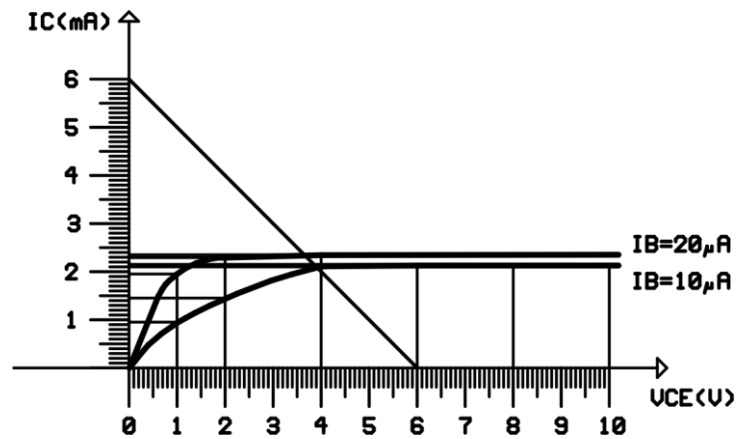
**8-** Using P2 potentiometer, type the collector-emitter voltage ( $V_{CE}$ ) and collector current to ( $I_C$ ) the table in figure 12.18

IB=20uA Constant		
ORDER	VCE(V)	IC
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

**Figure 12.18**

**9-** Draw the  $I_C=f.(V_{CE})$  characteristics using the values you found in steps 4 and 8.

**10-** Find the work point by drawing  $V_{CC}=6\text{V}$  and  $R_L=1\text{K}\Omega$  over load line.



**Figure 12.19**

**11-** Calculate the beta current gain using the characteristics.

For  $V_{CC} = 6\text{V}$  :

$I_{B1} =$		$\beta = \Delta I_C / \Delta I_B$
$I_{C1} =$	$\Delta I_C = I_{C2} - I_{C1} =$	
$I_{B2} =$	$\Delta I_B = I_{B2} - I_{B1} =$	
$I_{C2} =$	$\beta =$	

## EXPERIMENT: 3.2

### DERIVING 2.REGION CHARACTERISTICS OF TRANSISTOR

#### EXPERIMENTAL PROCEDURE:

Apply power to supply and adjust output voltage to 0,7 Volt. Cut-off the circuit energy. Plug the Y-0016/007 module. Make the circuit connections as in 12.21

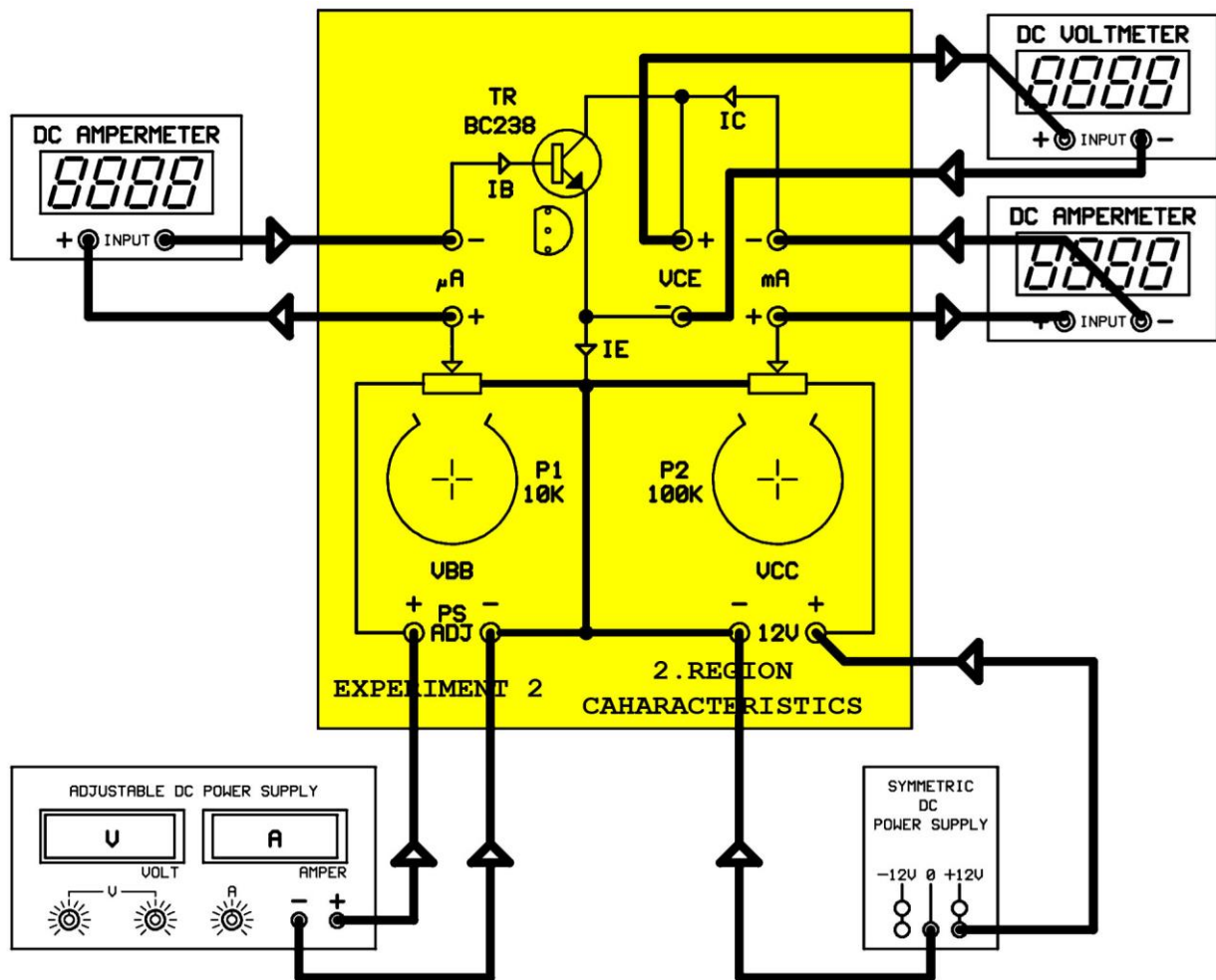


Figure 12.21

1- Adjust mid-terminals of P<sub>1</sub> and P<sub>2</sub> potentiometers to 0 Volt. (**Mid-terminals will be in emitter of transistor**)

2- Apply energy to the circuit

3- Adjust  $V_{CE}=5\text{Volt}$  by P<sub>2</sub> potentiometer. This value should be constant until the end of experiment. If a change occurs, re-adjust it to  $V_{CE}=5\text{Volt}$

4- Using P<sub>1</sub> potentiometer, type the base current (**I<sub>B</sub>**) and collector current (**I<sub>C</sub>**) to the table at figure 12.22

VCE=5V Constant		
ORDER	IB(uA)	IC(mA)
1		
2		
3		
4		
5		
6		
7		

**Figure 12.22**

5- Draw the  $I_C=f(I_B)$  characteristics using the values you reached at step 4.

**Figure 12.23**

## EXPERIMENT: 3.3

### DERIVING 3.REGION CHARACTERISTICS OF TRANSISTOR

#### EXPERIMENTAL PROCEDURE:

Apply power to supply and adjust output voltage to 0,7 Volt. Cut-off the circuit energy. Plug the Y-0016/007 module. Make the circuit connections as in 12.25

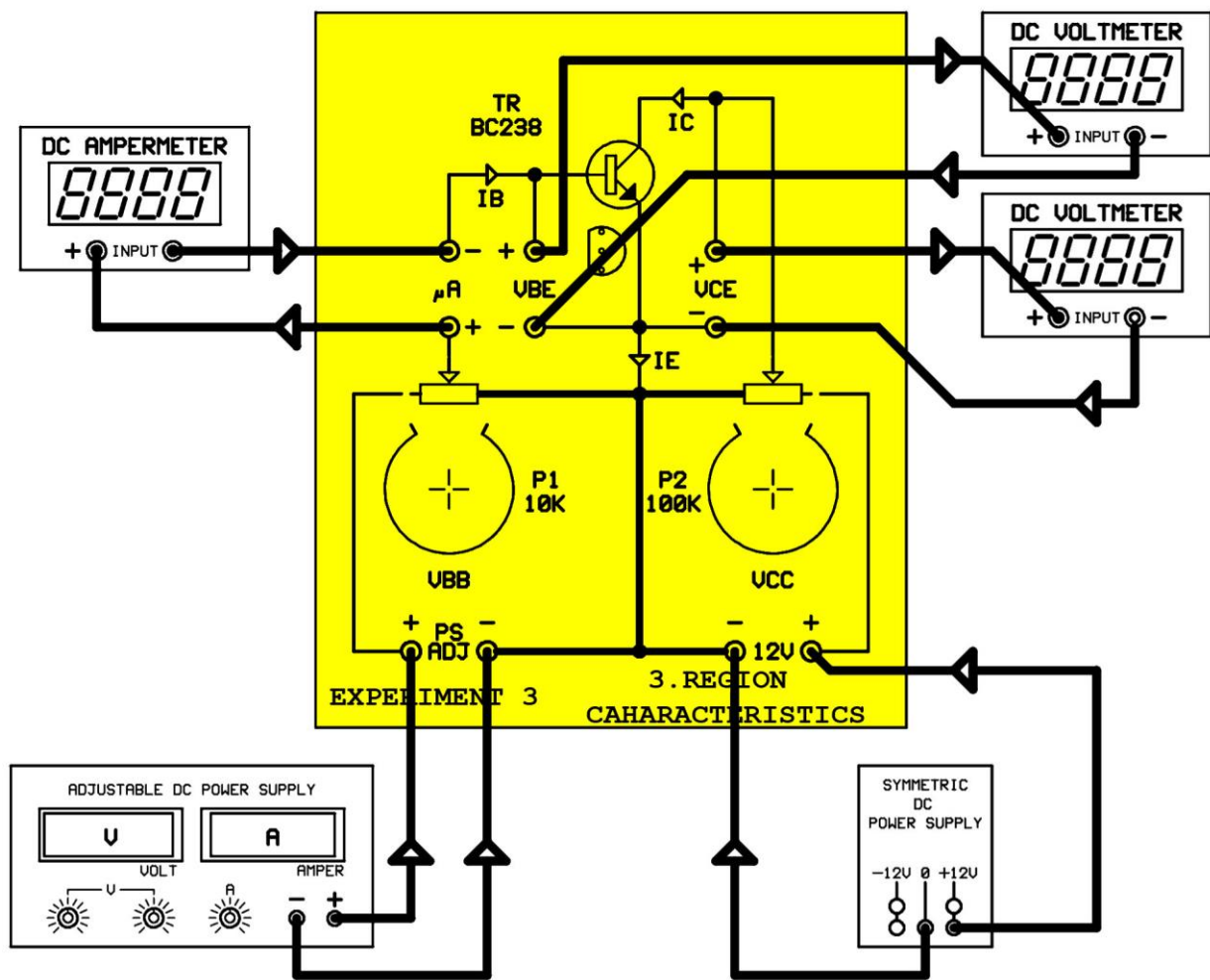


Figure 12.25

1- Adjust mid-terminals of  $P_1$  and  $P_2$  potentiometers to 0 Volt. (**Mid-terminals will be in emitter of transistor**)

2- Apply energy to the circuit.

3- Adjust collector-emitter ( $V_{CE}$ ) to  $V_{CE} = 0,7$  Volt using  $P_2$  potentiometer. This value should be constant during the experiment. If a change occurs, re-adjust it to 0.7 Volt



4- Using P<sub>1</sub> potentiometer, type the base-emitter voltage ( $V_{BE}$ ) and base current ( $I_B$ ) to the table at figure 12.26

VCE=0.7V Constant		
ORDER	VBE(mV)	IB(uA)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

**Figure 12.26**

5- Draw the  $I_B=f.(V_{BE})$  characteristics using the values you found in steps 4.

**Figure 12.27**

## EXPERIMENT: 3.4

### DERIVING 4.REGION CHARACTERISTICS OF TRANSISTOR

#### EXPERIMENTAL PROCEDURE:

Apply power to supply and adjust output voltage to 0,7 Volt. Cut-off the circuit energy. Plug the Y-0016/007 module. Make the circuit connections as in 12.29

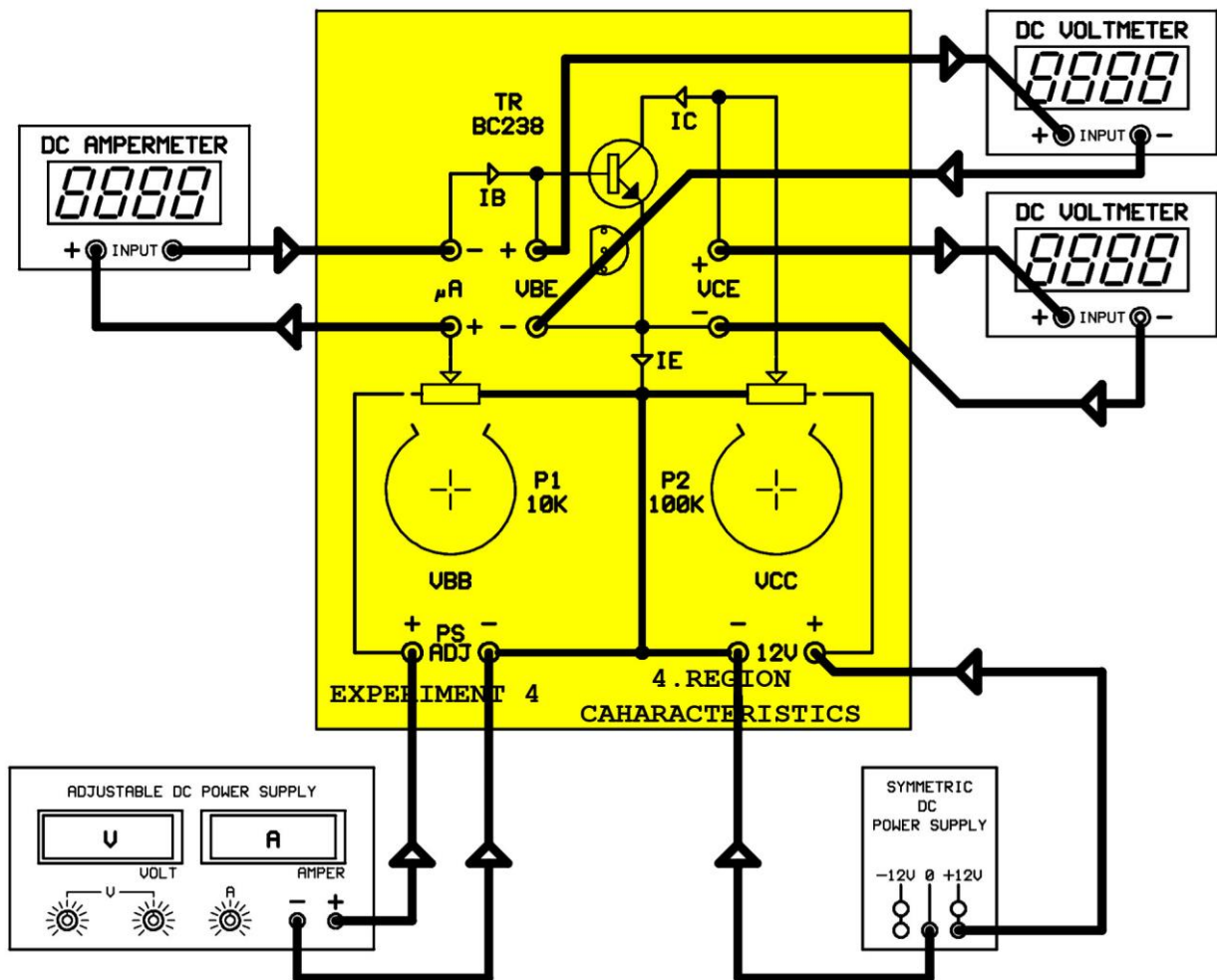


Figure 12.29

1- Adjust mid-terminals of P1 and P2 potentiometers to 0 Volt. (**Mid-terminals will be in emitter of transistor**)

2- Apply energy to the circuit.

3- Adjust the base current ( $I_B$ ) to  $10\mu A$  by P1 potentiometer. This value should be constant until the end of experiment. If a change occurs, re-adjust it to  $10\mu A$

**4-** Using P2 potentiometer, type the collector-emitter voltage ( $V_{CE}$ ) and base-emitter to the table at figure 12.30

IB=10uA Constant		
ORDER	VCE(V)	VBE(V)
1		
2		
3		
4		
5		
6		

**Figure 12.30**

**5-** Re-adjust the mid-terminals of P1 and P2 potentiometers to 0 Volt Adjust the base current ( $I_B$ ) to  $20\mu A$  using P1 potentiometer and do the experiment again.

**6-** Using P2 potentiometer, type the collector-emitter voltage ( $V_{CE}$ ) and base-emitter voltage ( $V_{BE}$ ) to the table in figure 12.31

IB=20uA Constant		
ORDER	VCE(V)	VBE(V)
1		
2		
3		
4		
5		
6		

**Figure 12.31**

**7-** Draw the  $V_{BE}=f.(V_{CE})$  characteristics using the values you found in step 6

**Figure 12.32**