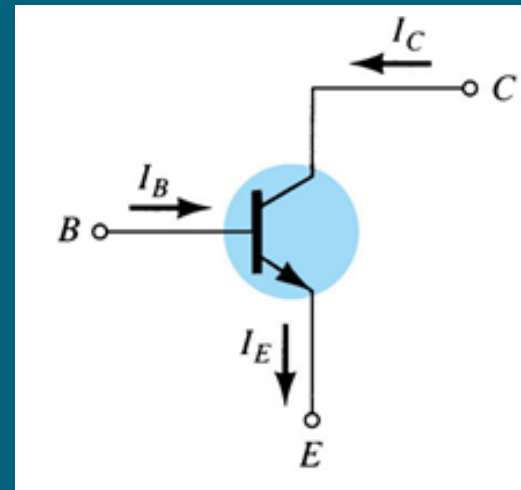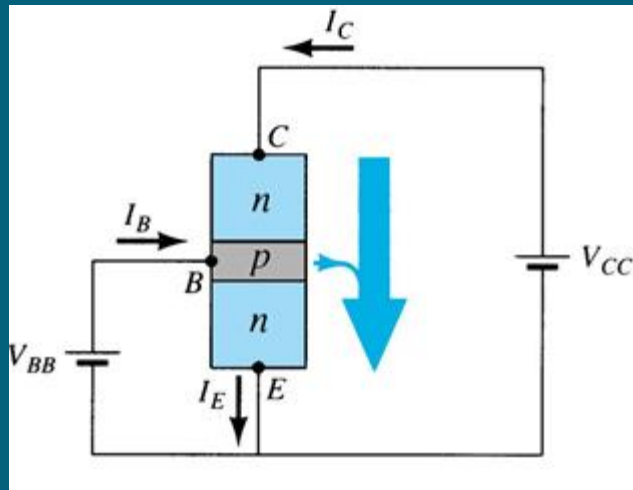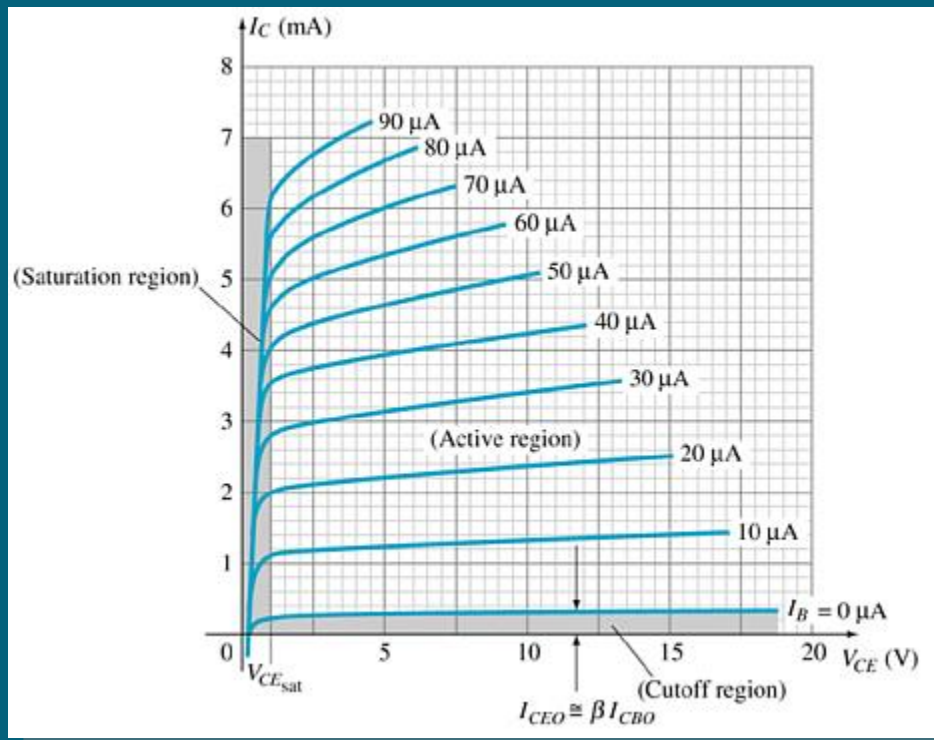# EE-202 Electronics-I-

Chapter 6:
Bipolar Junction Transistors Common Emitter-Common Base Configurations

Common–Emitter Configuration
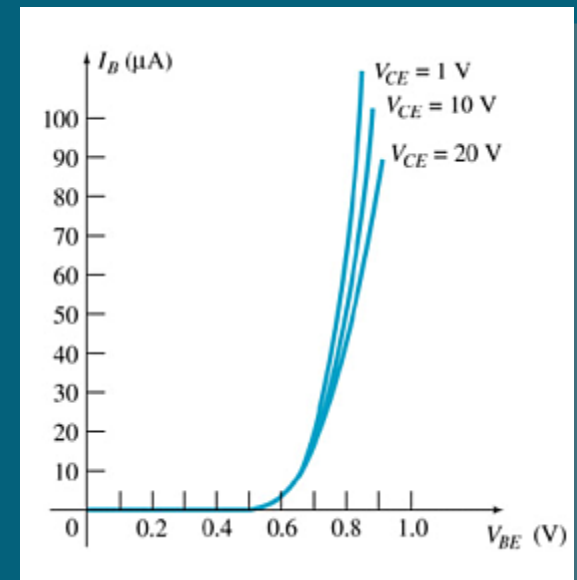
The emitter is common to both input (base-emitter) and output (collector-emitter).

Common-Emitter Characteristics

Collector Characteristics

Base Characteristics

Common-Emitter Amplifier Currents

Ideal

$$I_E = I_C + I_B \qquad\qquad I_C = \alpha \, I_E$$

Actual

where I_{CBO} = minority collector current

$$I_C = \alpha \, I_E + I_{CBO}$$

When $I_B = 0 \, \mu A$ the transistor is in cutoff, but there is some minority current called I_{CEO}.

$$I_{CEO} = \left. \frac{I_{CBO}}{1 - \alpha} \right|_{I_B = 0 \, \mu A}$$

Beta (β)

β : amplification factor.

DC mode:

$$\beta_{dc} = \frac{I_C}{I_B}$$

AC mode:

$$\beta_{ac} = \frac{\Delta IC}{\Delta IB}\bigg|_{V_{CE} = \text{cons} \tan t}$$

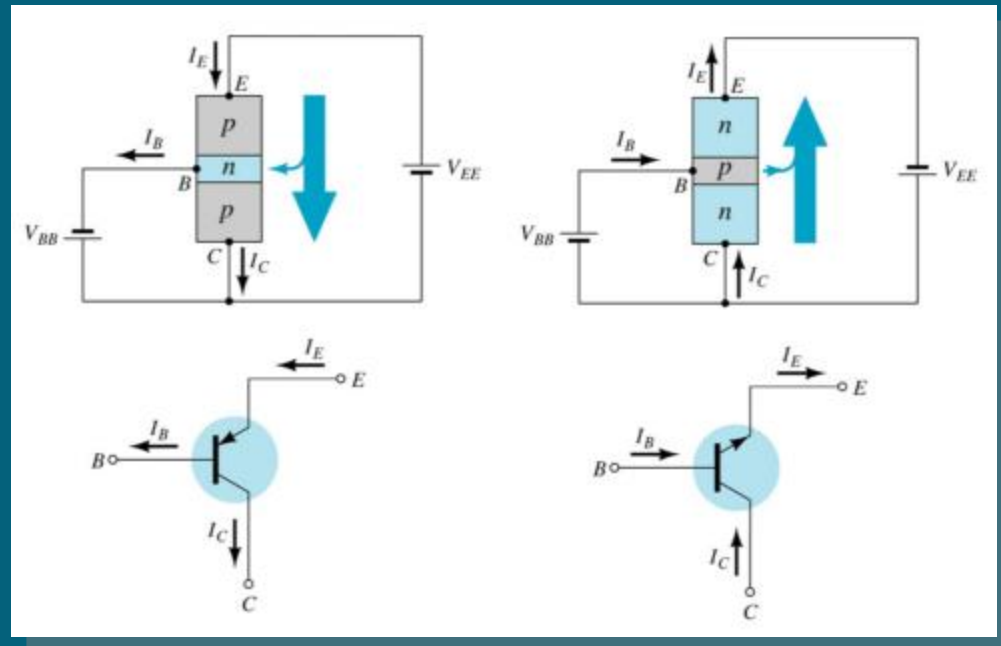# Beta (β)

Relationship between amplification factors β and α

$$\alpha = \frac{\beta}{\beta + 1} \qquad\qquad \beta = \frac{\alpha}{\alpha - 1}$$

Relationship Between Currents

$$I_C = \beta I_B \qquad\qquad I_E = (\beta + 1)I_B$$

Common–Collector Configuration

The input is on the base and the output is on the emitter.

Common–Collector Characteristics

The characteristics are similar to those of the common-emitter configuration, except the vertical axis is I_E.