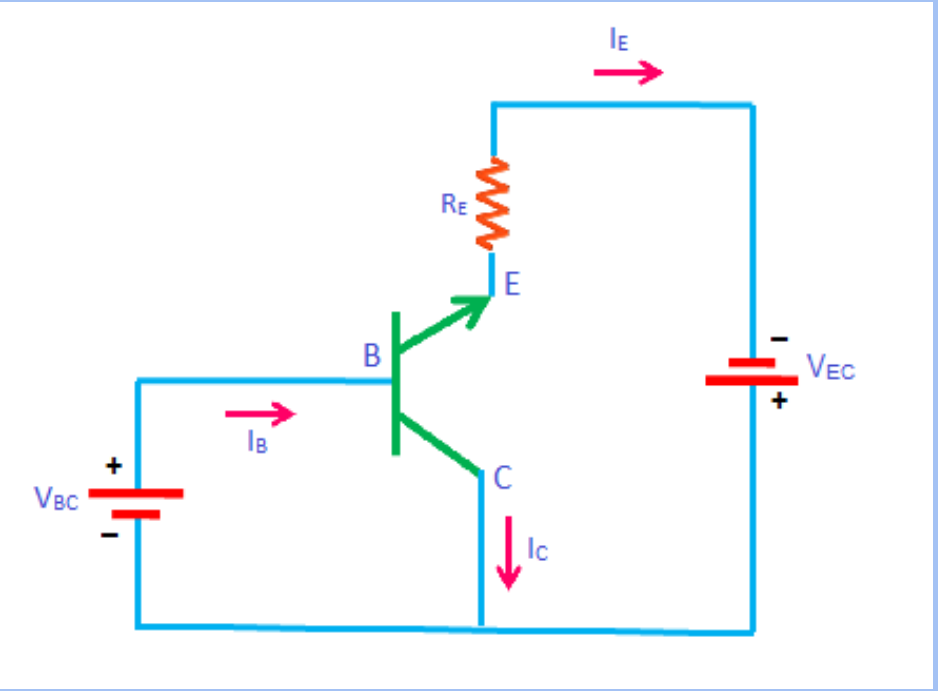
SUBJECT: BASIC ELECTRONICS

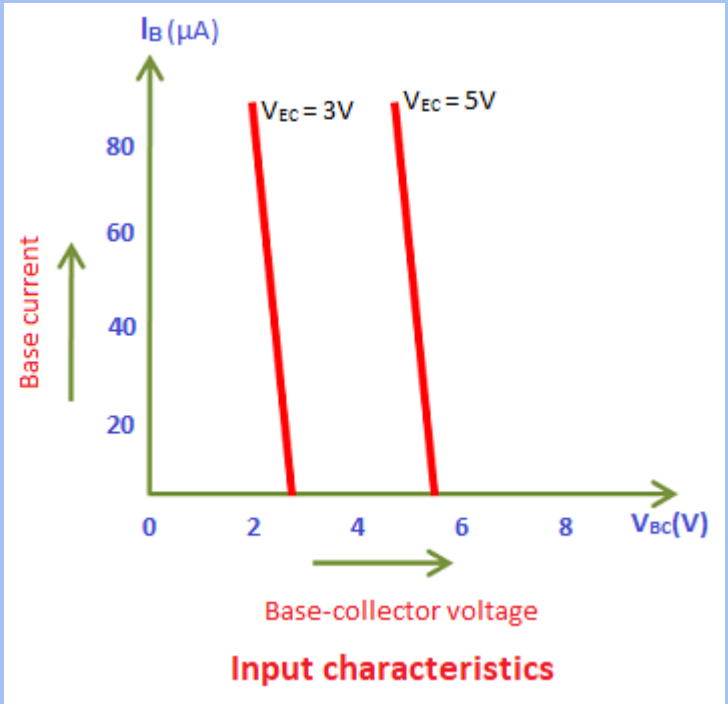
Common Collector Configuration of Transistor Input/Output Characteristics

Elementrix Classes

Common Collector Configuration Characteristics



Input Characteristics



- The input characteristics describe the relationship between input current or base current (I_B) and input voltage or base-collector voltage (V_{BC}).

- First, draw a vertical line and a horizontal line. The vertical line represents y-axis and horizontal line represents x-axis.

- The input current or base current (I_B) is taken along y-axis (vertical line) and the input voltage or base-collector voltage (V_{BC}) is taken along x-axis (horizontal line).

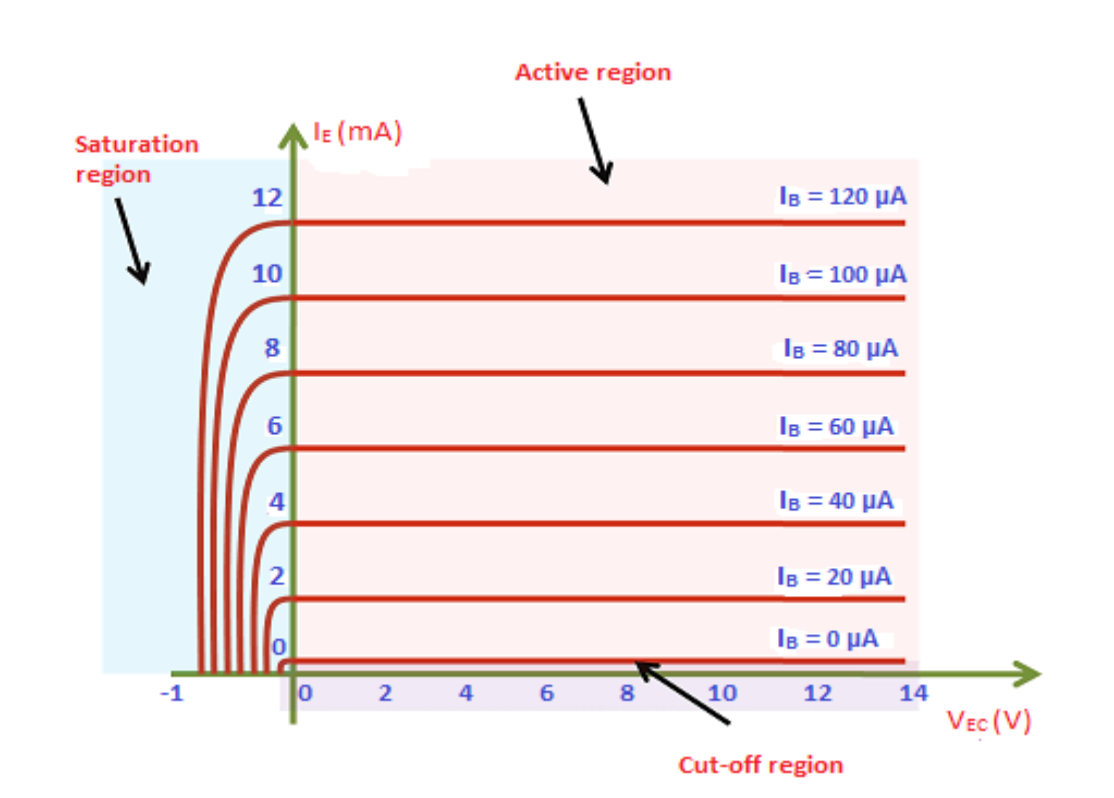
- To determine the input characteristics, the output voltage V_{EC} is kept constant at 3V and the input voltage V_{BC} is increased from zero volts to different voltage levels. For each level of input voltage V_{BC}, the corresponding input current I_B is noted. A curve is then drawn between input current I_B and input voltage V_{BC} at constant output voltage V_{EC} (3V).

- Next, the output voltage V_{EC} is increased from 3V to different voltage level, say for example 5V and then kept constant at 5V. While increasing the output voltage V_{EC}, the input voltage V_{BC} is kept constant at zero volts.

- After we kept the output voltage V_{EC} constant at 5V, the input voltage V_{BC} is increased from zero volts to different voltage levels. For each level of input voltage V_{BC}, the corresponding input current I_B is noted. A curve is then drawn between input current I_B and input voltage V_{BC} at constant output voltage V_{EC} (5V).

- This process is repeated for higher fixed values of output voltage (V_{EC}).

Output Characteristics



- The output characteristics describe the relationship between output current or emitter current (I_E) and output voltage or emitter-collector voltage (V_{EC}).

- First, draw a vertical line and a horizontal line. The vertical line represents y-axis and horizontal line represents x-axis.

- The output current or emitter current (I_E) is taken along y-axis (vertical line) and the output voltage or emitter-collector voltage (V_{EC}) is taken along x-axis (horizontal line).

- To determine the output characteristics, the input current I_B is kept constant at zero micro amperes and the output voltage V_{EC} is increased from zero volts to different voltage levels. For each level of output voltage V_{EC}, the corresponding output current I_E is noted. A curve is then drawn between output current I_E and output voltage V_{EC} at constant input current I_B (0 μA).

- Next, the input current (I_B) is increased from 0 μA to 20 μA and then kept constant at 20 μA. While increasing the input current (I_B), the output voltage (V_{EC}) is kept constant at 0 volts.

- After we kept the input current (I_B) constant at 20 μA, the output voltage (V_{EC}) is increased from zero volts to different voltage levels. For each level of output voltage (V_{EC}), the corresponding output current (I_E) is recorded. A curve is then drawn between output current I_E and output voltage V_{EC} at constant input current I_B (20μA). This region is known as the active region of a transistor.

- This process is repeated for higher fixed values of input current I_B (I.e. 40 μA, 60 μA, 80 μA and so on).

- In common collector configuration, if the input current or base current is zero then the output current or emitter current is also zero. As a result, no current flows through the transistor. So the transistor will be in the cutoff region. If the base current is slightly increased then the output current or emitter current also increases. So the transistor falls into the active region. If the base current is heavily increased then the current flowing through the transistor also heavily increases. As a result, the transistor falls into the saturation region.

Transistor Parameters

- **Dynamic input resistance (r_i)**

$$r_i = \frac{\Delta V_{BC}}{\Delta I_B}, \qquad V_{EC} = \text{constant}$$

The input resistance of common collector amplifier is high.

❑ **Dynamic output resistance (r_o)**

$$r_o = \frac{\Delta V_{EC}}{\Delta I_E}, \quad I_B = \text{constant}$$

The output resistance of common collector amplifier is low.

❑ **Current amplification factor (γ)**

$$\gamma = \frac{\Delta I_E}{\Delta I_B}$$

The current gain of a common collector amplifier is high.

पढ़िए और पढ़ाइये

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