IIT ROORKEE

NPTEL ONLINE CERTIFICATION COURSE

Microelectronics: Devices to Circuits

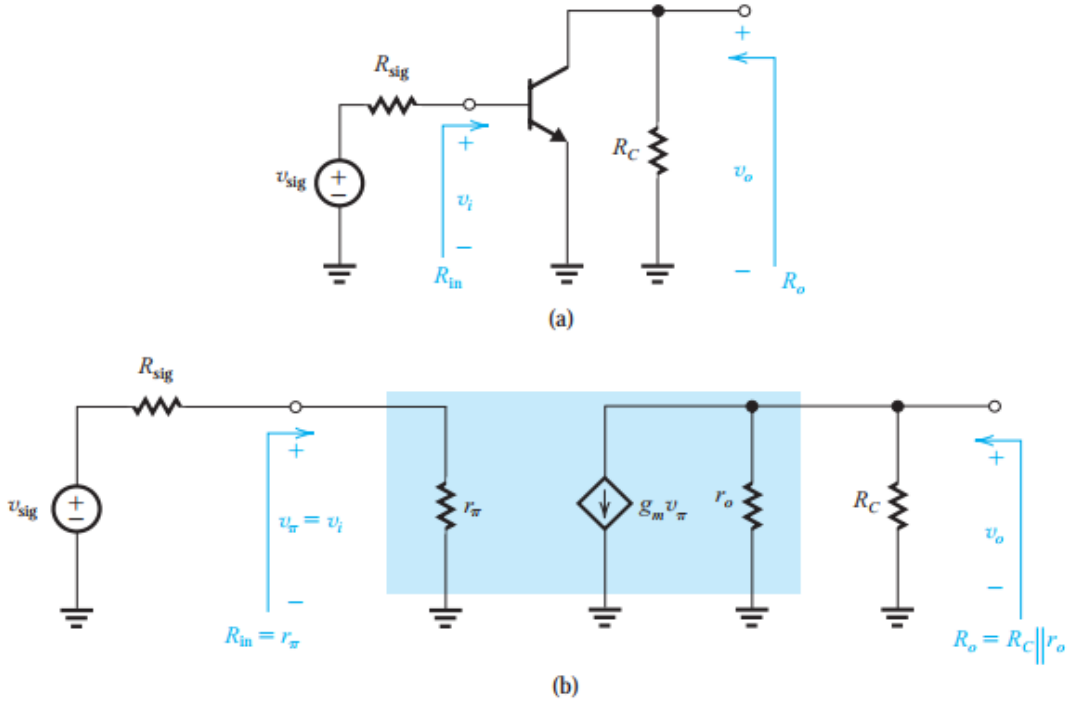
BJT : Small Signal Circuit Model

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Common –emitter configuration



$$R_{in} = r_\pi$$

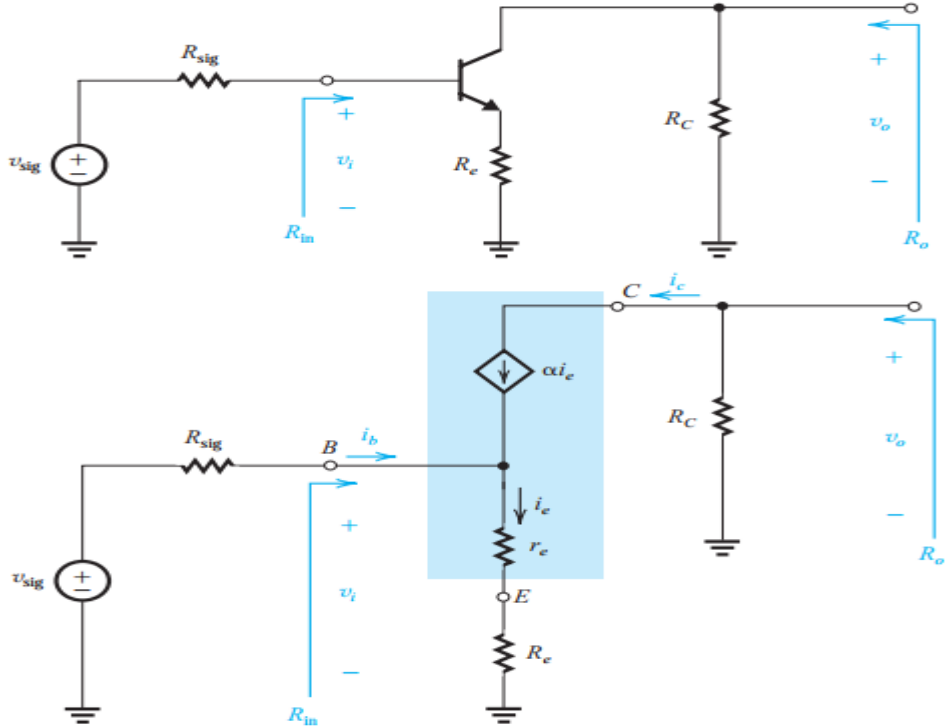
$$v_o = -(g_m v_\pi)(R_C \| r_o)$$

$$R_0 = (R_C \| r_o)$$

Fig.7. Common –emitter amplifier

Source: Microelectronics Circuits, Sedra and Smith, Fifth edition

Common –emitter configuration with emitter resistance



$$R_{in} = (\beta + 1)(r_e + R_e)$$

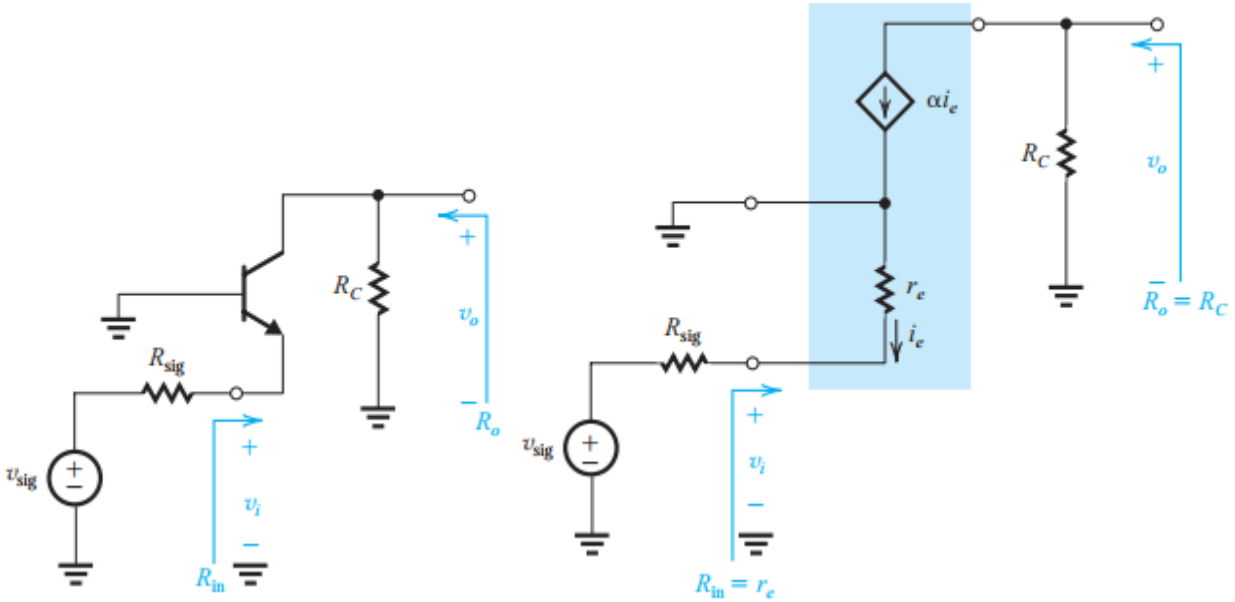
$$A_{vo} = -\frac{g_m R_C}{1 + g_m R_e}$$

$$R_0 = R_C$$

Fig.7. Common –emitter amplifier with emitter resistance

Source: Microelectronics Circuits, Sedra and Smith, Fifth edition

Common –base Amplifier



$$R_{in} = r_e$$

$$A_{vo} = g_m R_C$$

$$R_o = R_C$$

Fig.7. Common –base amplifier

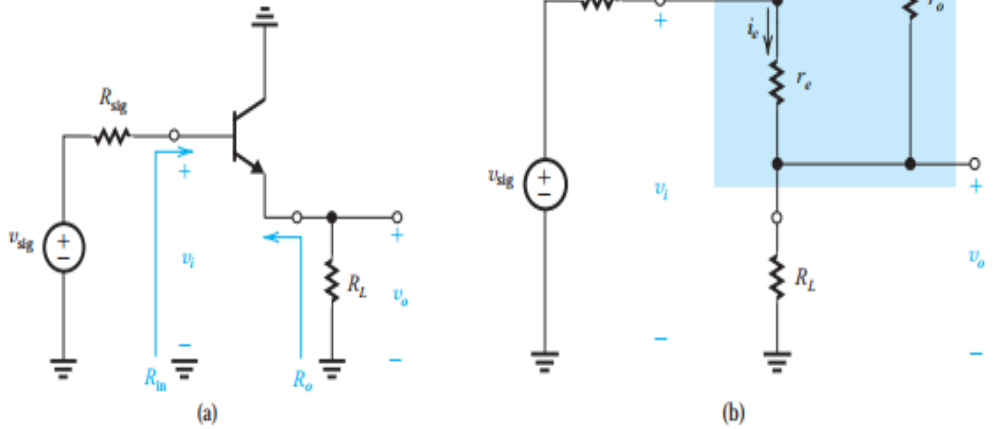
Source: Microelectronics Circuits, Sedra and Smith, Fifth edition

Common –collector Amplifier or emitter follower

$$R_{in} = (\beta + 1)(r_e + R_L)$$

$$R_o = r_e$$

$$A_{vo} = 1$$



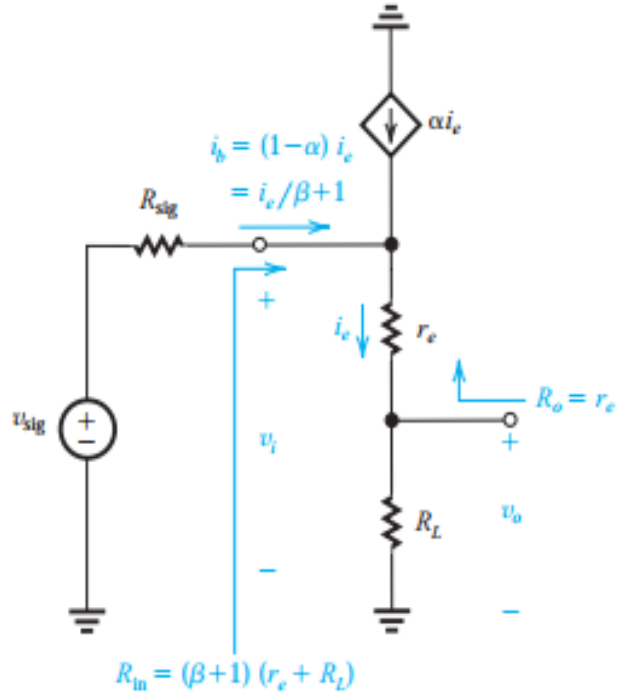


Fig.7. Common –collector amplifier

Source: Microelectronics Circuits, Sedra and Smith, Fifth edition

Recapitulation

- The CE configuration is the one best suited for realizing the bulk of gain required in an amplifier.
- The CB amplifier use as a high frequency amplifier due to low input resistance.
- The emitter follower finds application as a voltage buffer for connecting a high source to a low-resistance load.

Source: Microelectronics Circuits, Sedra and Smith, Fifth edition

Thank You