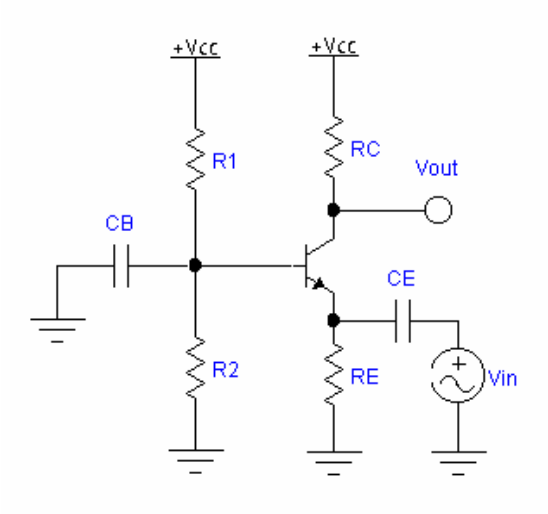
Transistor Amplifiers

Small Signal Modeling Examples

5. Common Base (C-B)Amplifier



DC Bias

$V_B = V_{CC} [R_2 / (R_1+R_2)]$

if $(\beta+1) R_E >> R_1 \| R_2$

$V_E = V_B - 0.7$

$I_E = V_E / R_E$

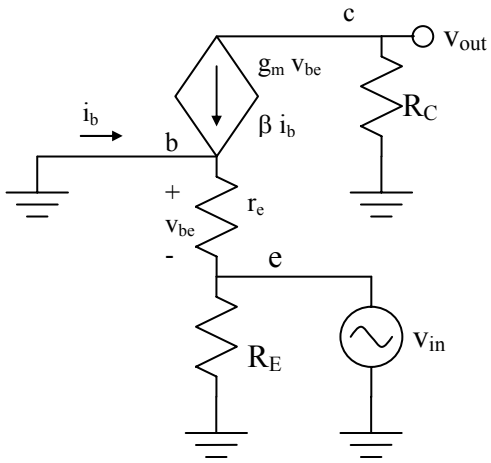
$I_C \approx I_E$

$V_{RC} = I_C (R_C)$

Check for saturation, ($V_{RC} > V_{CC}$)

$V_{OUT\ (BIAS)} = V_{CC} - V_{RC}$

Small Signal Model



Small Signal (ac) Parameters

$g_m = I_{C\ (BIAS)} / V_T$

$r_e = \beta / (\beta+1) (1/g_m)$

$\approx 1 / g_m$

Voltage Gain (Av)

$v_{out} = - g_m v_{be} R_C$

$v_{in} = - v_{be}$

$Av = v_{out} / v_{in}$

$= - g_m v_{be} R_C / (- v_{be})$

$= + g_m R_C \approx + R_C / r_e$

Input & Output Impedance (Rin, Rout)

$R_{in} = R_E \| r_e$

$R_{out} = R_C$

Notes:

(1) R_{in} can be made low.

(2) Same voltage gain as C-E amp.

(3) The common base amplifier can operate at higher frequencies.