COMMON EMITTER AMPLIFIER

- Emitter is grounded \( \Rightarrow \) “Common Emitter”
- NPN Transistor with positive +Vcc forward biases the base-emitter junction.
- The transistor acts as a “Constant Current Source” when forward biased correctly,
- The resistance across the base-emitter junction is about \( r_E = \frac{25\text{mv}}{I_E} \)
- Rule of Thumb \( \Rightarrow \) \( I_C \sim I_E \sim 1\text{ma} \)
- Usually the input is “AC coupled” by inputing Vin through capacitor C. Only the AC component of a signal is passed through a capacitor!
- \( \text{GAIN} = \frac{V_{out}}{V_{in}} = -\frac{R_C}{R_E} \) and \( V_{out} \) is 180° inverted.
- Input impedance \( r_{IN} = (\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{\beta R_E})^{-1} \)
- if \( R_1 \) and \( R_2 \gg R_E \) \( r_{IN} \sim \beta R_E \)
- \( r_{OUT} \sim R_E \) looking into the output.
- \( VE \sim Vin \) indicating small voltage drop across base-emitter junction.
- \( V_{out} = V_C \)
- \( V_{out} \) maximum \( \sim V_{cc} \) (power supply voltage)

![Common Emitter Amplifier Diagram](image-url)
Since $V_E \sim V_B$ (Remember $r_E$ only about 25 $\Omega$) the output voltage follows the input voltage.  \[ V_{out} = V_{in}. \]

- Unity GAIN = 1
- if $R_1$ and $R_2 \gg R_E$  \[ r_{IN} \sim \beta R_E \]
- $R_{out} \sim (1/R_E + 1/R_{SOURCE})^{-1}$