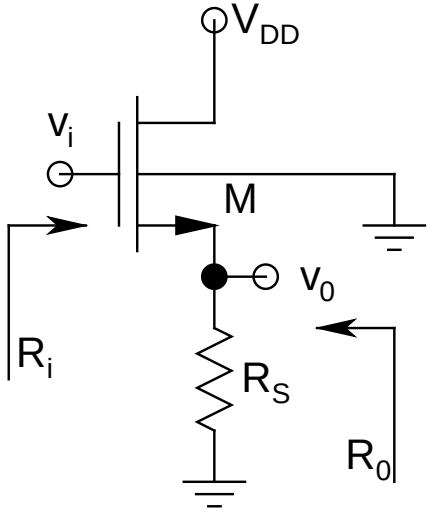
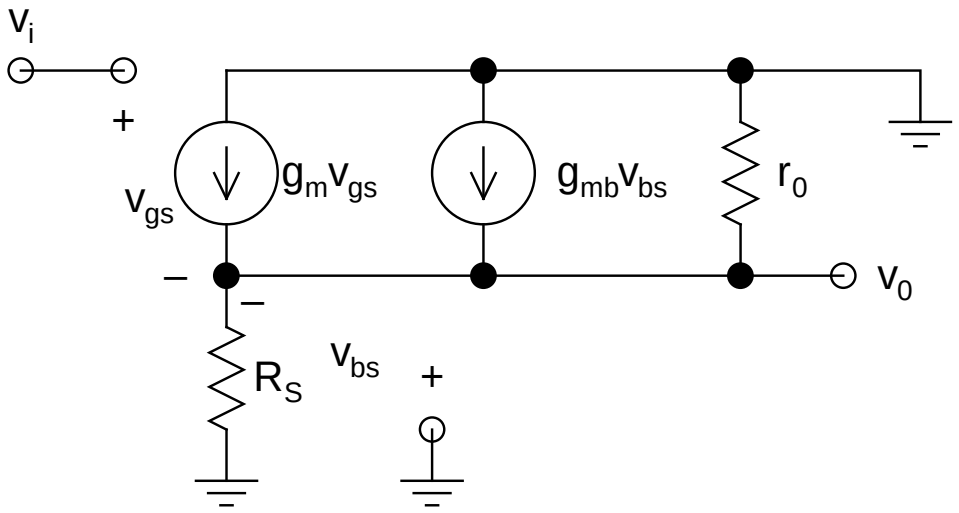
- ***Common-Drain*** (CD):
  - Also known as ***Source Follower***



ac Schematic



ac Low-Frequency Equivalent

  - ***Biasing circuit not shown***

- ***Note***:

$$\chi = \frac{\gamma}{2\sqrt{2\phi_F + V_{SB}}}$$

with $V_{SB} = V_0$ (***DC level of v_0***)

- ***Typical values of $\chi \sim 0.1\text{-}0.5$***
- Thus, ***A_v can depart significantly from its ideal value of unity***
- ***No phase shift between input and output***

➢ ***Input Resistance***: $R_i \rightarrow \infty$

➢ ***Output Resistance***: ***By inspection***:

$$R_0 = (g_m + g_{mb} + g_0 + g_S)^{-1} \; (g_0 = 1/r_0, \; g_S = 1/R_S)$$

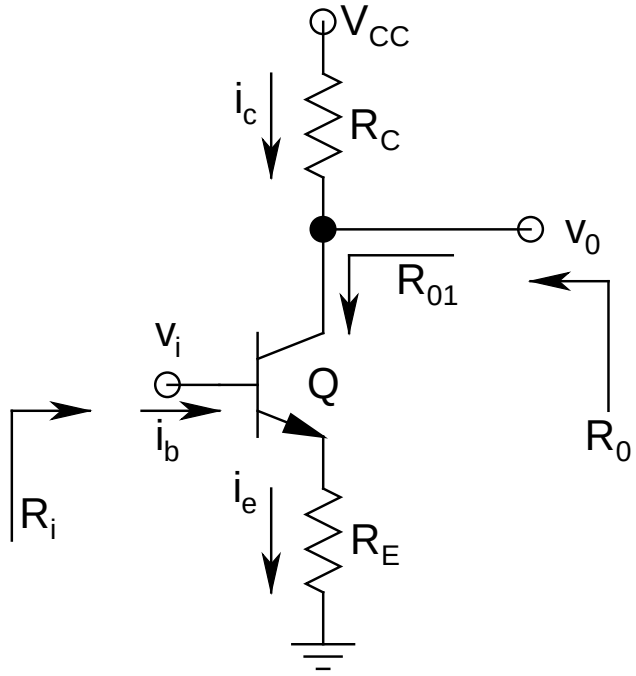
- ***Common-Emitter (Degeneration)*** [CE(D)]:
  - Let's attempt to analyze this circuit by ***inspection***
  - $v_0 = -i_c R_C$

    $v_i = i_e(r_E + R_E)$

    $\Rightarrow \quad A_v = v_0/v_i$

    $\approx -R_C/(r_E + R_E)$

    Piece of cake?
  - $A_i = i_c/i_b = \beta$
  - $R_i = r_\pi + (\beta + 1)R_E = (\beta + 1)(r_E + R_E)$



- $R_0 = R_{01} || R_C$

  Can you identify R_{01} by ***inspection***?

  $R_{01} = r_0[1 + g_m(r_\pi || R_E)]$

  Generally, $R_{01} >> R_C$

  $\Rightarrow R_0 \approx R_C$

- ***Probe A_v further***:

  $A_v = -R_C/(r_E + R_E) \approx -g_m R_C/(1 + g_m R_E)$

  For ***CE stage***, $A_v = -g_m R_C$

  For this stage, A_v is ***lower*** by a ***factor*** $(1 + g_m R_E) \Rightarrow$ ***Gain Degeneration***