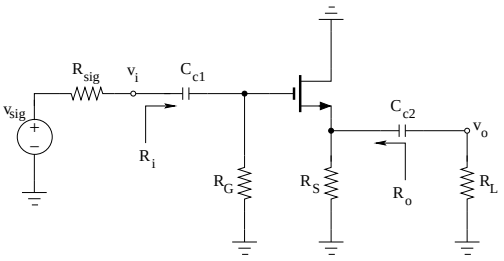
Summary of Discrete MOS Amplifiers•

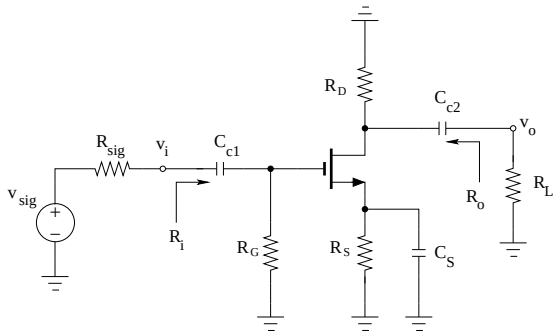
Common Drain (Source Follower):

$$A_v = \frac{g_m(r_o \parallel R_S \parallel R_L)}{1 + g_m(r_o \parallel R_S \parallel R_L)}$$
$$R_i = R_G$$
$$R_o = \frac{1}{g_m} \parallel R_S$$



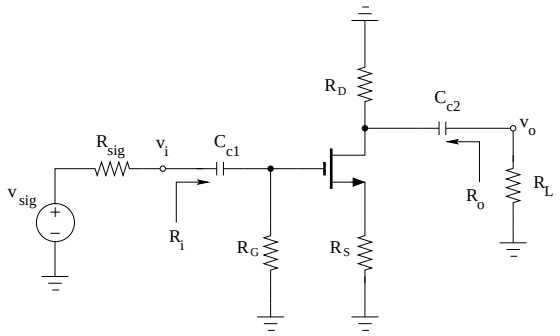
Common Source:

$$A_v = -g_m(r_o \parallel R_D \parallel R_L)$$
$$R_i = R_G$$
$$R_o = R_D \parallel r_o$$
$$f_{p3} = \frac{1}{2\pi C_s[R_S \parallel (1/g_m)]}$$



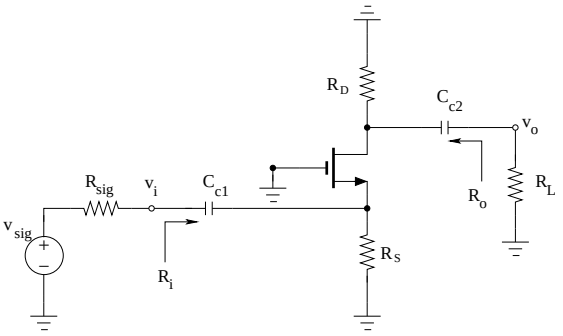
Common Source with Source Resistance:

$$A_v = -\frac{g_m(R_D \parallel R_L)}{1 + g_m R_S + (R_D \parallel R_L)/r_o}$$
$$R_i = R_G$$
$$R_o = R_D \parallel [r_o(1 + g_m R_S)]$$



Common Gate:

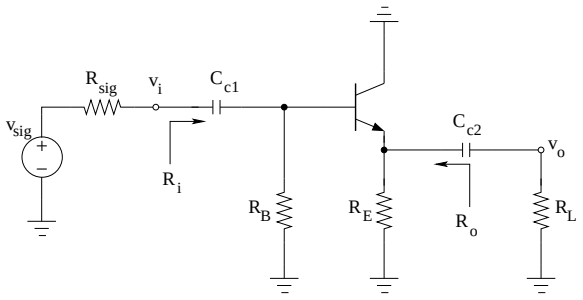
$$A_v = g_m(r_o \parallel R_D \parallel R_L)$$
$$R_i = R_S \parallel \frac{1 + (R_D \parallel R_L)/r_o}{g_m}$$
$$R_o = R_D \parallel [r_o(1 + g_m(R_S \parallel R_{sig}))]$$



• $f_l = \Sigma_j f_{pj}$ and $f_{p1} = 1/[2\pi C_{c1}(R_i + R_{sig})]$ and $f_{p2} = 1/[2\pi C_{c2}(R_L + R_o)]$

Summary of Discrete BJT Amplifiers•

Common Collector (Emitter Follower):

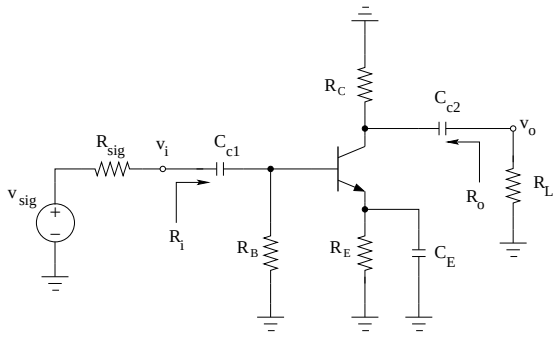


$$A_v = \frac{g_m(r_o \parallel R_E \parallel R_L)}{1 + g_m(r_o \parallel R_E \parallel R_L)}$$

$$R_i = R_B \parallel [r_\pi + \beta(r_o \parallel R_E \parallel R_L)]$$

$$R_o = R_E \parallel r_o \parallel \frac{r_\pi + R_B \parallel R_{sig}}{1+\beta}$$

Common Emitter:



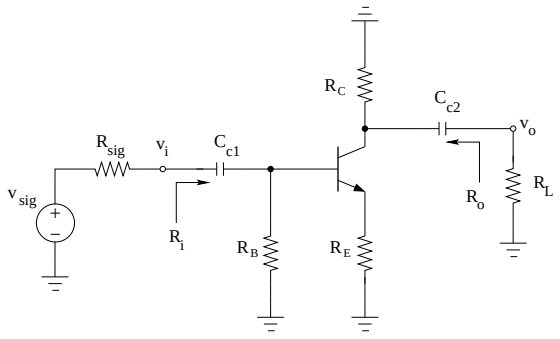
$$A_v = -g_m(r_o \parallel R_C \parallel R_L)$$

$$R_i = R_B \parallel r_\pi$$

$$R_o = R_C \parallel r_o$$

$$f_{p3} = \frac{1}{2\pi C_E[R_E \parallel (1/g_m + (R_B \parallel R_{sig})/\beta)]}$$

Common Emitter with Emitter Resistor:



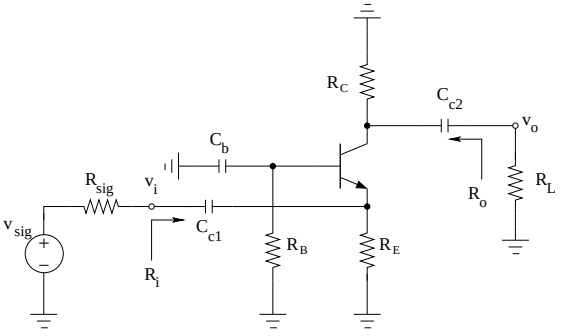
$$A_v \approx -\frac{g_m(R_C \parallel R_L)}{1 + g_m R_E}$$

$$R_i = R_B \parallel [r_\pi + (1+\beta)R_E]$$

$$R_o = R_C \parallel \left[r_o \left(1 + \frac{\beta R_E}{r_\pi + R_E + R_B \parallel R_{sig}} \right) \right]$$

$$R_o \approx R_C$$

Common Base:



$$\frac{v_o}{v_i} = g_m(r_o \parallel R_C \parallel R_L)$$

$$R_i = R_E \parallel r_\pi \parallel \frac{1 + (R_C \parallel R_L)/r_o}{g_m}$$

$$R_o = R_C \parallel [r_o(1 + g_m(R_E \parallel r_\pi \parallel R_{sig}))]$$

$$f_{p3} = 1/[2\pi C_b R_{CB}] \qquad R_{CB} \equiv R_B \parallel [r_\pi + (1+\beta)(R_{sig} \parallel R_E)]$$

• $f_l = \Sigma_j f_{pj}$ and $f_{p1} = 1/[2\pi C_{c1}(R_i + R_{sig})]$ and $f_{p2} = 1/[2\pi C_{c2}(R_L + R_o)]$