EE105 – Fall 2015
Microelectronic Devices and Circuits

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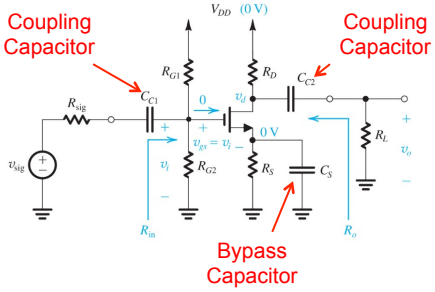
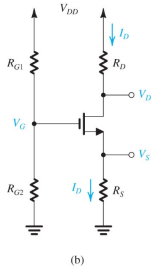
CS Amplifier with Bias Circuit

Both coupling and bypass capacitors are DC-open and AC-short

Capacitively Coupled Amplifier



DC:

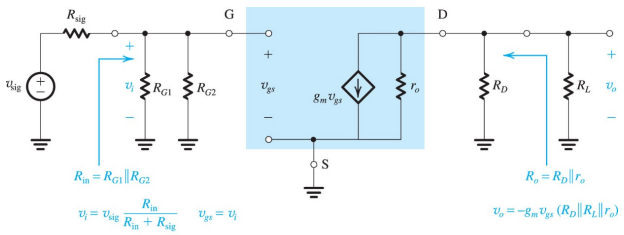


$$R_{in} = R_{G1} \parallel R_{G2}$$

$$R_o = R_D \parallel r_o$$

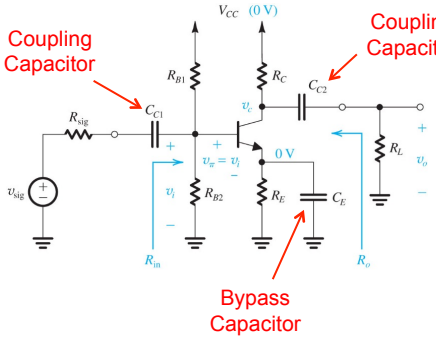
$$G_v = -\frac{R_{in}}{R_{sig} + R_{in}} g_m (R_o \parallel R_L)$$

AC:



CE Amplifier with Bias Circuit

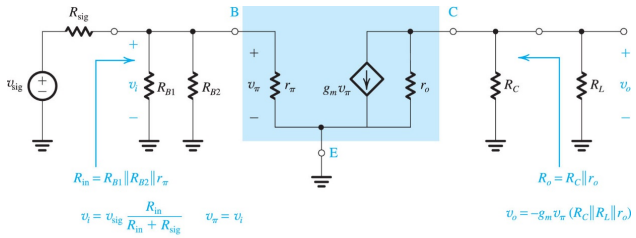
Both coupling and bypass capacitors are DC-open and AC-short



$$R_{in} = R_{B1} \parallel R_{B2} \parallel r_\pi$$

$$R_o = R_C \parallel r_o$$

$$G_v = -\frac{R_{in}}{R_{sig} + R_{in}} g_m (R_o \parallel R_L)$$



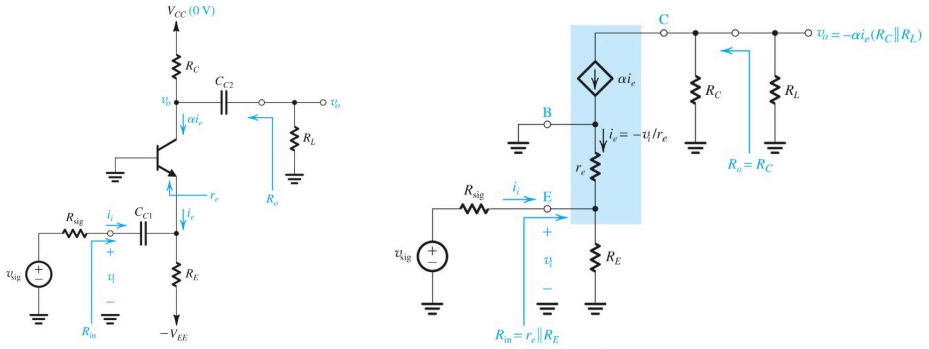
Emitter-Degenerated CE Amplifier with Bias Circuit

$$R_{in} = R_{B1} \parallel R_{B2} \parallel \left[(1+\beta) \left(\frac{1}{g_m} + R_e \right) \right]$$

$$R_o = R_C$$

$$G_v = \frac{R_{in}}{R_{sig} + R_{in}} \left(-\alpha \frac{R_C \parallel R_L}{\frac{1}{g_m} + R_e} \right)$$

CB Amplifier with Bias Circuit

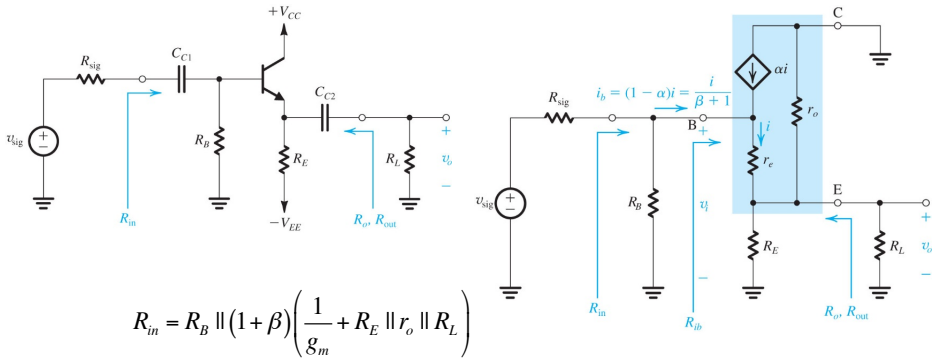


$$R_{in} = \frac{1}{g_m} \| R_E \approx \frac{1}{g_m}$$

$$R_o = R_C$$

$$G_v = \frac{R_{in}}{R_{sig} + R_{in}} \left(\frac{R_C \| R_L}{\frac{1}{g_m}} \right) = \frac{R_{in}}{R_{sig} + R_{in}} g_m (R_C \| R_L)$$

Emitter Follower with Bias Circuit



$$R_{in} = R_B \| (1+\beta)\left(\frac{1}{g_m} + R_E \| r_o \| R_L \right)$$

$$R_o = r_o \| R_E \| \left(\frac{1}{g_m} + \frac{R_B \| R_{sig}}{1+\beta} \right)$$

$$G_v = \frac{R_{in}}{R_{sig} + R_{in}} \left(\frac{r_o \| R_E \| R_L}{\frac{1}{g_m} + r_o \| R_E \| R_L} \right)$$

Typical Frequency Response of Capacitively Coupled CE Amplifier