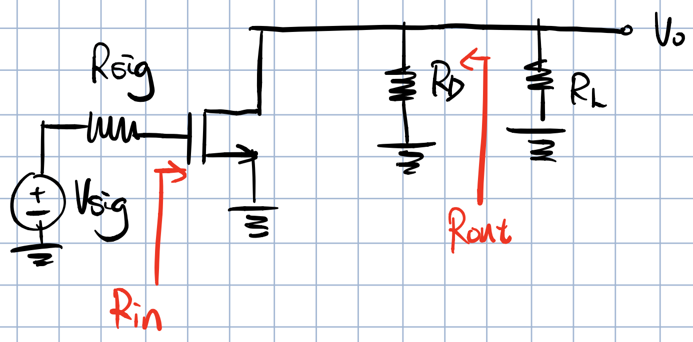
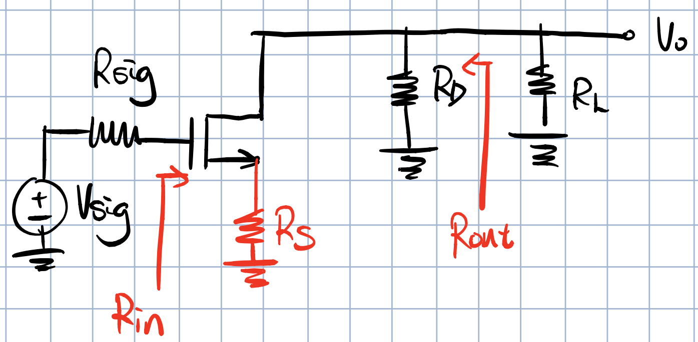
single transistor Amplifier comparison.



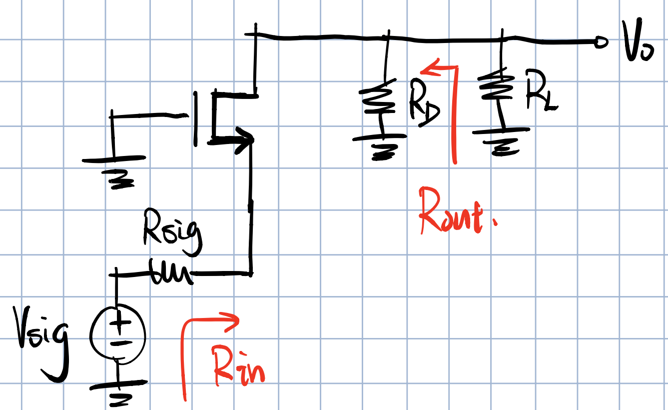
CS/CE amplifier.

- high Rin
- high voltage gain.
- moderate Rout



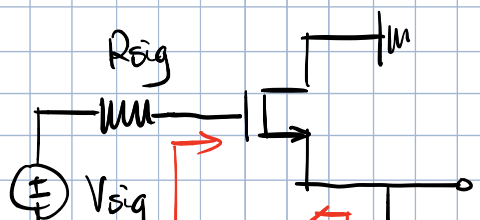
CS/CE with RS/RE amplifier.

- high Rin
- reduced gain compare to CS/CE
- moderate Rout
- reduce signal distortion.
- less sensitive to device varian



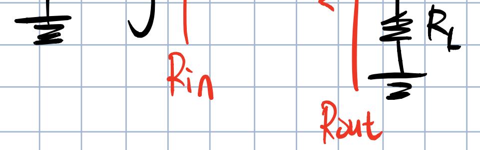
CG/CB amplifier.

- low Rin
- lower voltage gain compare to CS/CE
- moderate Rout
- limited application.



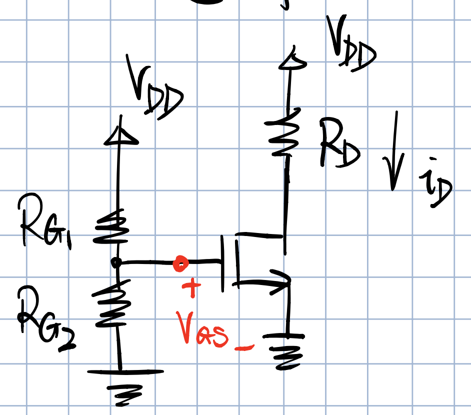
CD/CC (Source/emitter follower)

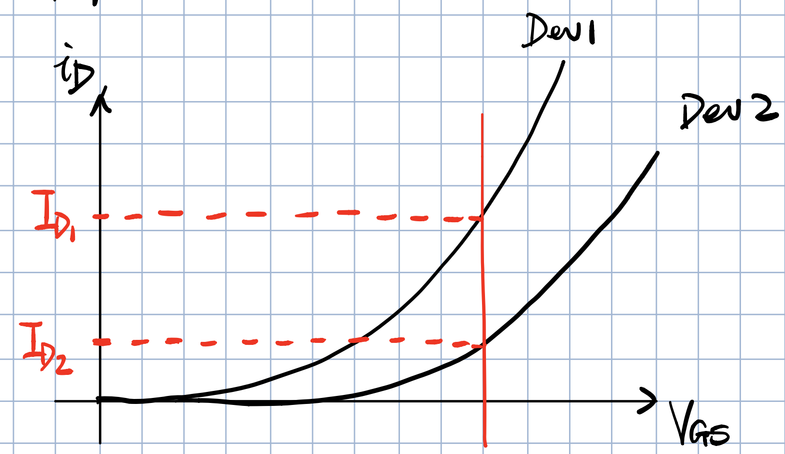
- high Rin



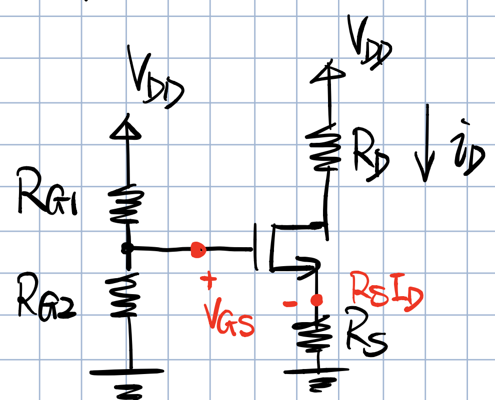
- voltage gain $\simeq 1$
- low R_{out}
- good buffer.

Biasing for discrete amplifier.

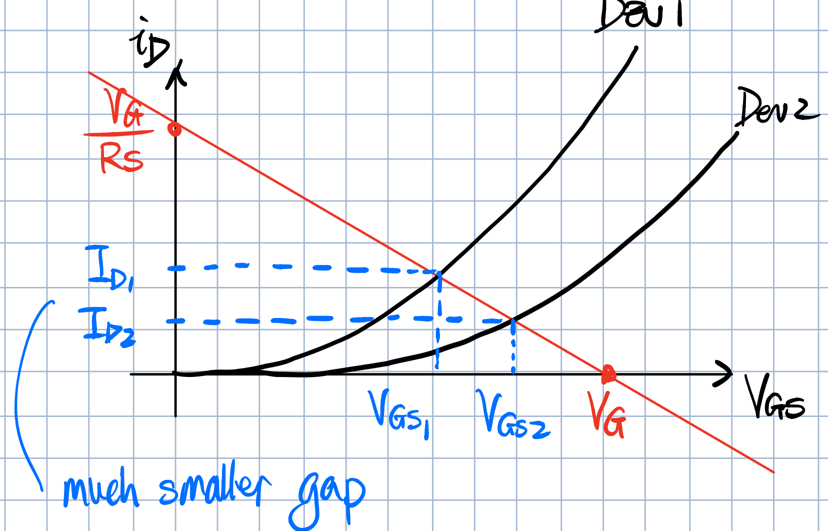


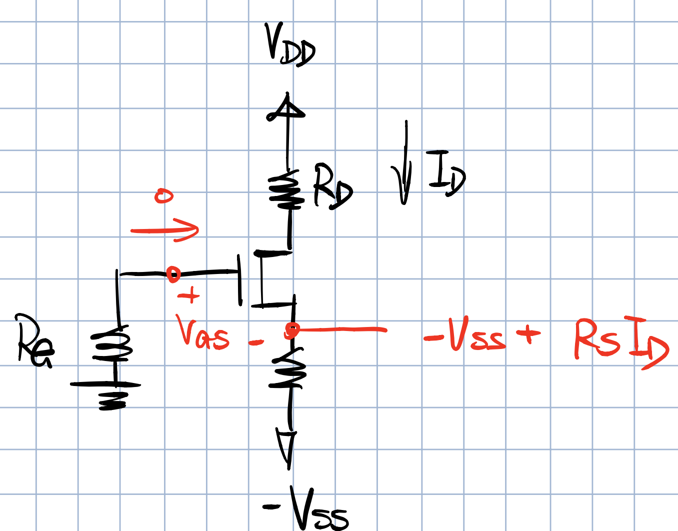


fixed V_{GS} (not good design choice)

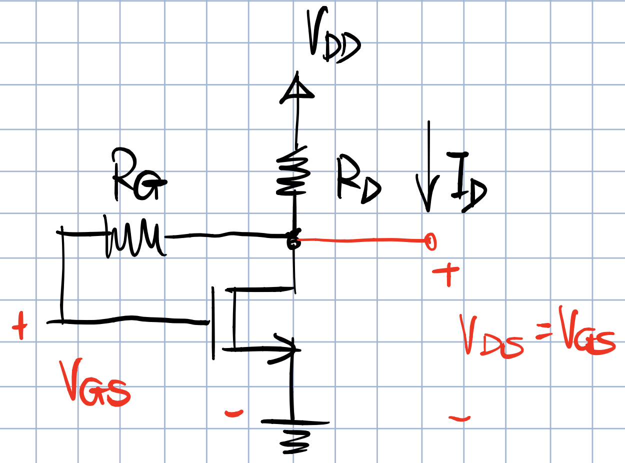


$V_{GS} = V_G - R_S I_D$



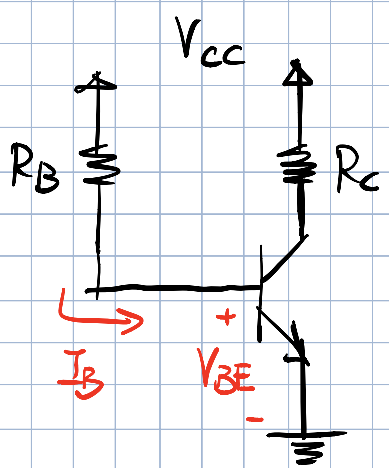


$$V_{GS} = 0 - (-V_{SS} + R_S I_D)$$
$$= V_{SS} - R_S I_D$$



$$V_{GS} + R_D I_D = V_{DD}$$

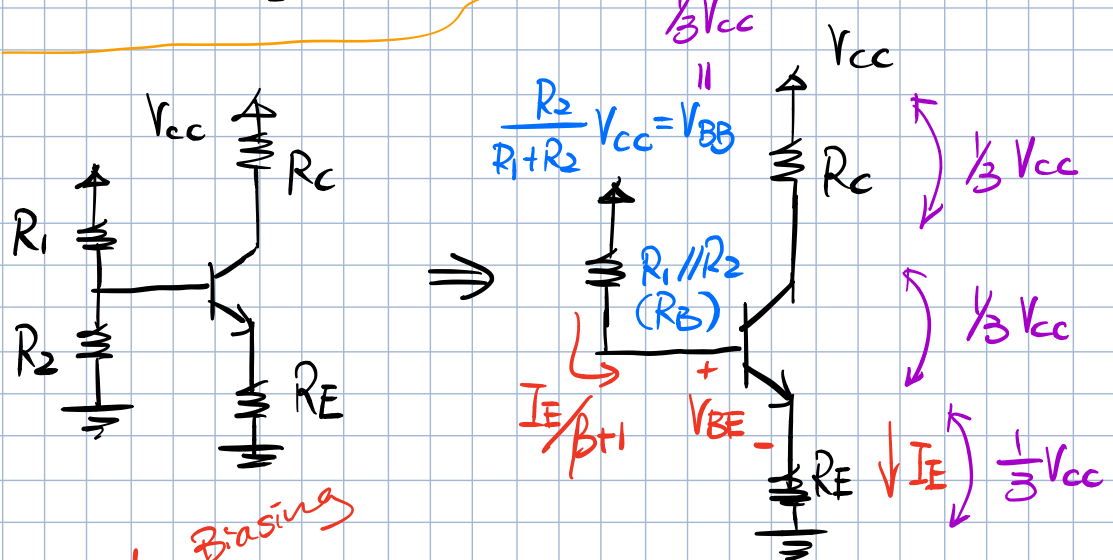
$$V_{GS} = V_{DD} - R_D I_D$$



$$(V_{cc} - V_{BE})/R_B = I_B$$

$$I_c = \beta I_B$$

↳ sensitive to β value.
(not a good biasing style)



rule of thumb
of choice

(Good Biasing example)

$$R_E I_E + V_{BE} + R_B \frac{I_E}{\beta+1} = V_{BB}$$

$$I_E = \frac{V_{BB} - V_{BE}}{R_E + R_B/_{\beta+1}}$$

→ to make the design less sensitive to β value + temp.

$V_{BB} >> V_{BE}$ ($\sim 0.7V$)

$R_E >> R_B / \beta+1$ → select R_1 & R_2, so that the current through them is $I_E - 0.1 I_E$