E151 Lecture 11 – Common Base and Cascodes

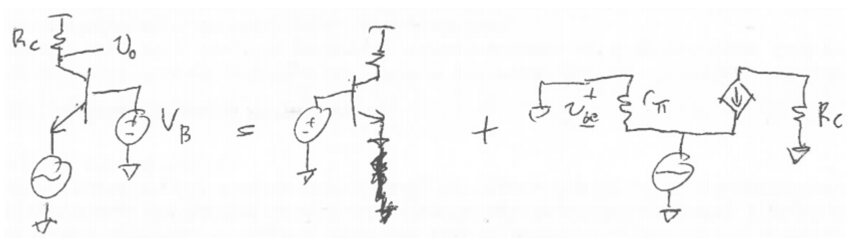
Matthew Spencer
Harvey Mudd College
ENGR151

Disclaimer

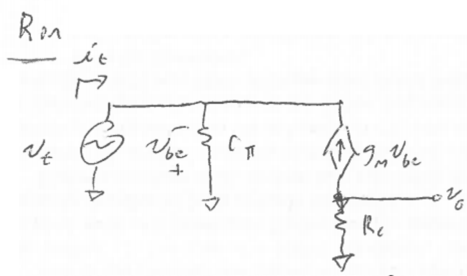
These are notes for Prof. Spencer to give the lecture, they were not intended as a reference for students. Students asked for them anyway, so I'm putting them up as a courtesy. Remember that they are not intended as a substitute for attending lecture.

Common Base Amplifier

- Still missing amplifier capabilities: low rin and very big rout
- Use common base amplifier – good for RF matching, active loads
- Hard to bias this thing: more later



rin, rout, av



$$i_t = \frac{v_t}{r_\pi} - g_m(-v_t)$$

$$\frac{v_t}{i_t} = R_{in} = \frac{1}{\frac{1}{r_\pi} + g_m} = \frac{1}{g_m} \| r_\pi$$

Same pattern as EF output: 1/gm

- Skipping ro here. See G&M.
- They do rin, I do rout & av
- rout depends on vin being shorted
  - See above
  - Does Rs matter? Rl?

Av

$$v_o = -g_m v_{be} R_C$$
$$= -g_m(-v_t) R_C$$

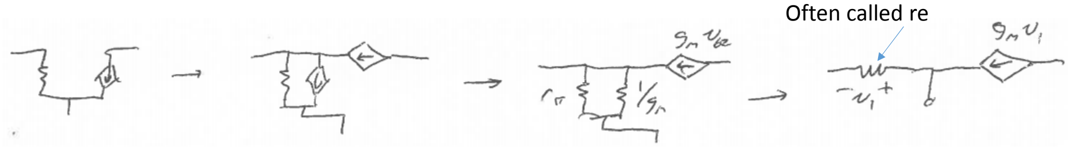
Rout

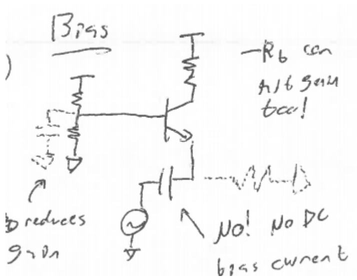
$$R_{out} = R_C$$

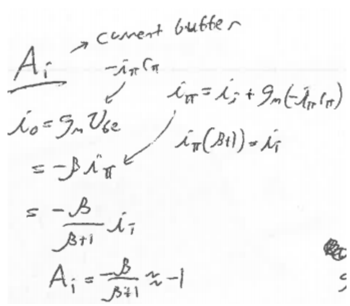
Asides: T-model, biasing, "current buffer"

- Alternative analysis strategy: use a T-model instead of our hybrid-pi

Often called re







Active Loads

- Always trading off between V_SW and av w/ resistive loads
- What's the gain of these two amplifiers (if everything is in FAR)