Lecture 29

- Last time:
  - Bipolar single-stage ampliers: biasing, common-emitter, common-base, common-collector
- Today :
  - Overview of single-stage amplifiers
  - Frequency response of CS stage operated as a current amplifier

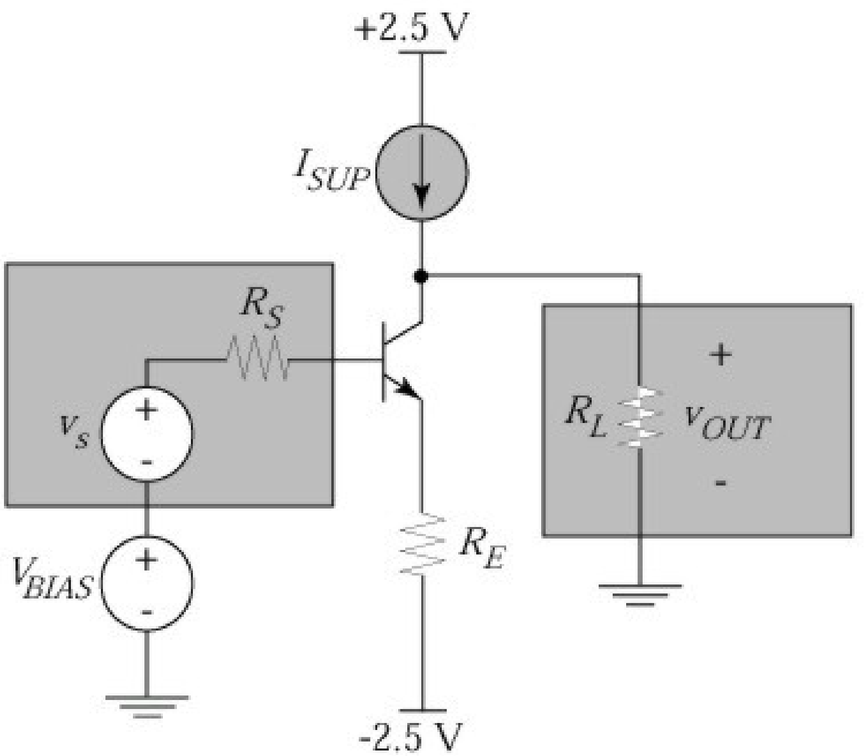
Common-Collector Summary

- Typo in Fig. 8.47 in text … R_{in} can't depend upon R_S!
- Input and output resistances depend on load and source resistances, respectively
- See Appendix to Chapter 8 for limits to using this model with very low values of R_L

Summary of Two-Port Parameters for CE/CS, CB/CG, CC/CD Amplifiers

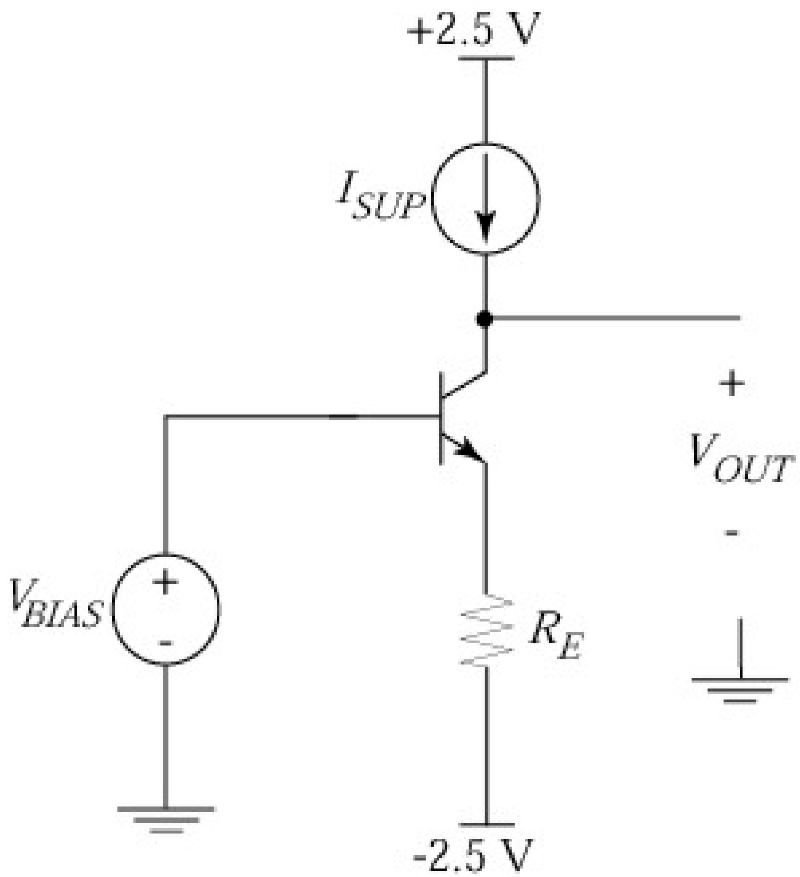
Amplifier Type	Controlled Source	Input Resistance R_{in}	Output Resistance R_{out}
Common Emitter	$G_m = g_m$	r_π	$r_o \parallel r_{oc}$
Common Source	$G_m = g_m$	infinity	$r_o \parallel r_{oc}$
Common Base	$A_i = -1$	$1 / g_m$	$r_{oc} \parallel [(1 + g_m(r_\pi \parallel R_S))\, r_o]$, for $g_m r_o >> 1$
Common Gate	$A_i = -1$	$1 / g_m$, $(v_{sb} = 0)$ -otherwise- $1 / (g_m + g_{mb})$	$r_{oc} \parallel [(1 + g_m R_S) r_o]$, $(v_{sb}=0)$ -otherwise- $r_{oc} \parallel [(1+ (g_m + g_{mb})R_S)\, r_o]$ both for $r_o >> R_S$
Common Collector	$A_v = 1$	$r_\pi + \beta_o(r_o \parallel r_{oc} \parallel R_L)$	$(1 / g_m) + R_S / \beta_o$
Common Drain	$A_v = 1$ if $v_{sb} = 0$, -otherwise- $g_m / (g_m + g_{mb})$	infinity	$1 / g_m$ if $v_{sb} = 0$, -otherwise- $1 / (g_m + g_{mb})$

The "Chapter 8" Method for Single-Stage Amplifier Analysis



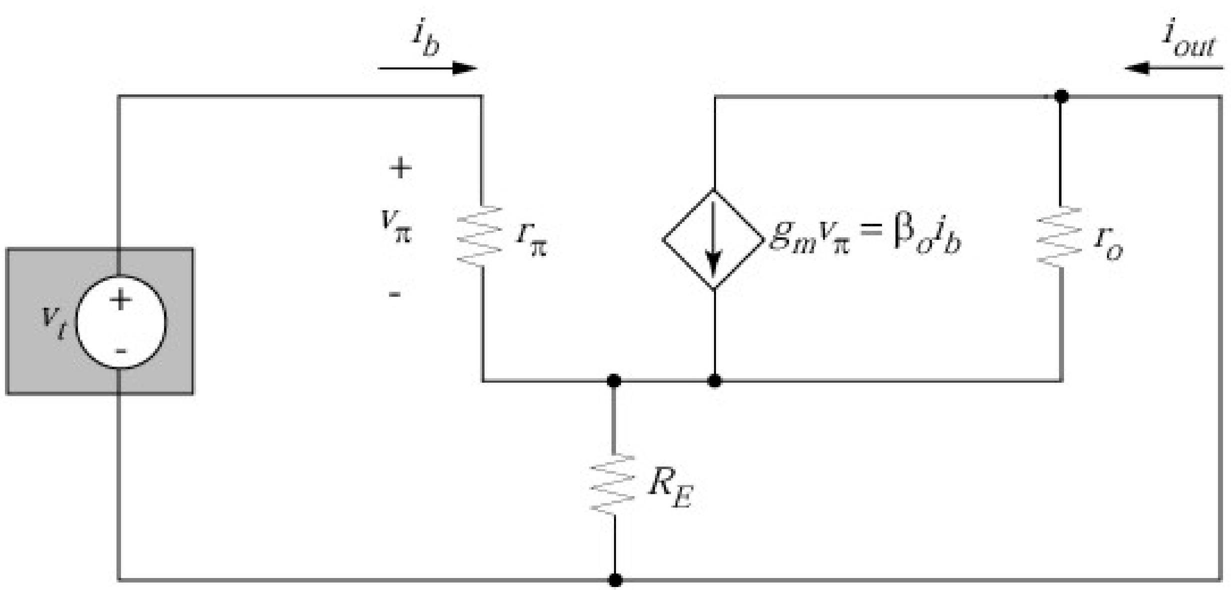
1. What is it?
2. DC Bias
3. Small-signal 2-port model
4. Output swing

DC Bias for CE_{deg}



Two-Port Model for CE_{deg}

- Input looks like CC → R_{in} =
- Output looks like CB (see p. 504 for details) → R_{out} =
- Transconductance: G_m =



Two-Port Model for CE_{deg} (cont.)

- Find G_m

- Voltage Gain:

- Is it a good voltage amplifier (vs. CE)?

Output "Swing"

- Maximum $v_{OUT} = V_{OUT} + v_{out} = v_{out}$

- Minimum v_{OUT}