

E151 Lecture 5

Intro to BJTs

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Disclaimer

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

Case Convention Correction

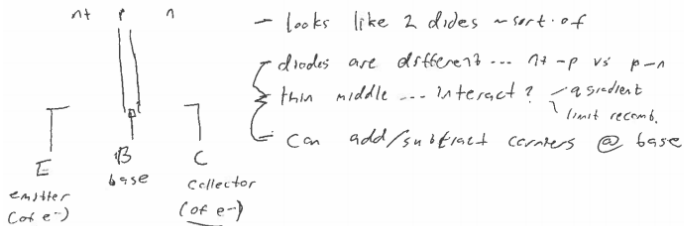
- v_D is total signal ← Formerly wrong
- v_d is small signal
- V_D is large signal
- V_d is sinusoidal steady state phasor coefficient ... comes up later

What is a Transistor?

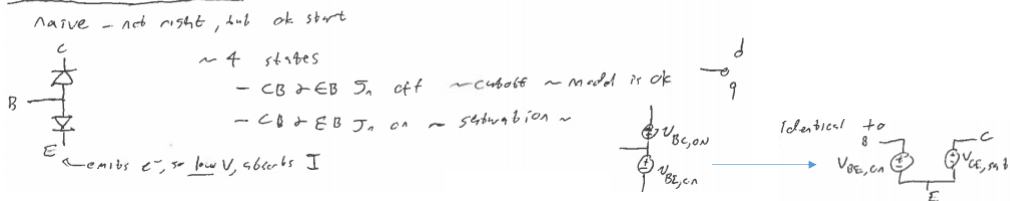
- Transistor – from transfer varistor
 - causes i-v changes in a “distant” terminal
- Many types: MOSFET, JFET, BJT
- Focusing on BJT because they are good to learn with
- MOSFET most popular

What is a BJT

- Two types: NPN, PNP
- Focus on NPN for now.
- Get the room to the naïve model (above), why is it not like a diode?
- Naïve model works OK for some conditions (below)

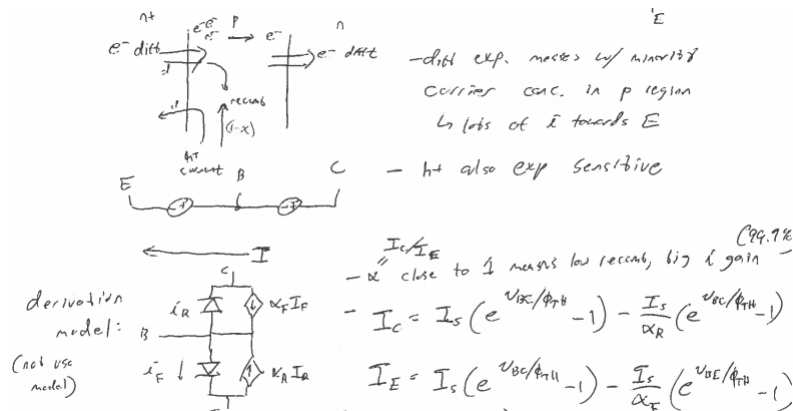


Large signal models



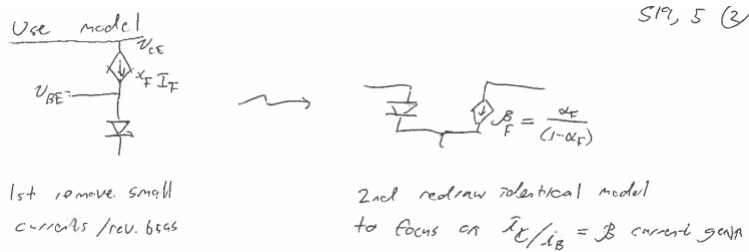
Doesn't Act Like a Diode if 1 Fwd / 1 Rev Bias

- Ebers-Moll: good in all 4 bias regions. Used in computers



How Do We Actually Put This In A Circuit

- Simplifying approximation: Only 2 things on at once
- Redraw as equivalent circuit with easier math

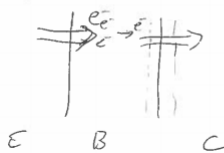


Making the Whole BJT Picture

- There are two ways to draw Ebers-Moll – IC-VBE and IC-VCE
- Important Detail: Base Width Modulation

Base width modulation

- changing pn bias changes depletion region width



- affects base distribution
is BC width changes
- small change in I_C / I_B

