

Stuff

Exam 2: Friday 3/7/03

I'll try to keep distributing lecture notes for those people who do come to lecture. I will aim to bring enough each day for those students who are here at the beginning of class. If you're not here, too bad. They will no longer be posted on the web. I don't want to enable bad study habits. I will keep any leftovers for those people who have a decent reason for missing lecture.

SPICE #S1, due: W, 3/5 hw 12 handout

Note changes in due dates below

HW #13, due: M, 3/3 Ex3.10-12, prob. 3.32, 34, 35

Answers: 3.32 $J_p = 8.64 \times 10^{-8} \text{ A/cm}^2$ 3.35: $N_D = 9.3 \times 10^{17} / \text{cm}^3$ HW #14, due: F, 3/7 Ex3.13-15 (Note: units of D_n & D_p are wrong in Ex3.15)

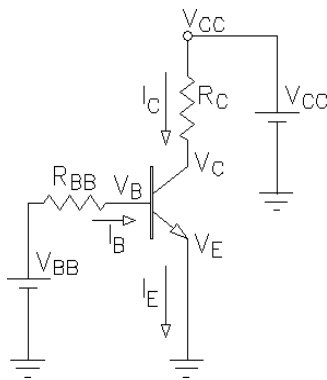
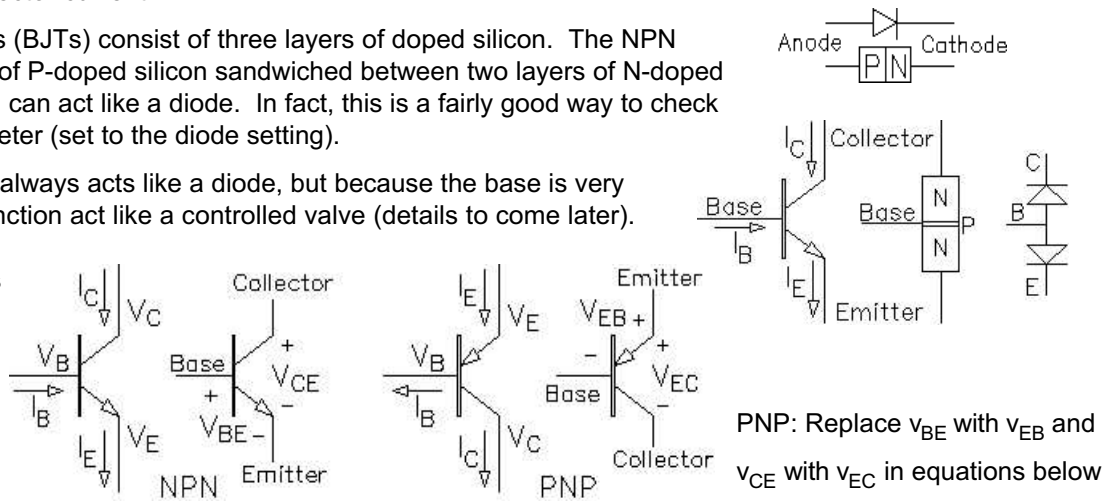
Bipolar Junction Transistor (BJT) basics

A transistor has three terminals-- the base, the collector, and the emitter. The current flow from the collector to the emitter (through the transistor) is controlled by the current flow from the base to the emitter. A small base current can control a much larger collector current.

Bipolar junction transistors (BJTs) consist of three layers of doped silicon. The NPN transistor has a thin layer of P-doped silicon sandwiched between two layers of N-doped silicon. Each P-N junction can act like a diode. In fact, this is a fairly good way to check a transistor with an ohmmeter (set to the diode setting).

The base-emitter junction always acts like a diode, but because the base is very thin, it makes the other junction act like a controlled valve (details to come later).

Symbols and conventions

Modes or regions of operation (v_{BE} and v_{CE} are approximate)

Cutoff (off)	Active (partially on)	Saturation (fully on)
$v_{BE} < 0.7 \text{ V}$	$v_{BE} \approx 0.7 \text{ V}$	$v_{BE} \approx 0.7 \text{ V}$
$i_B = 0$	$i_B > 0$	$i_B > 0$
$i_C = 0$	$v_{CE} \geq 0.7 \text{ V}$	$v_{CE} = 0.2 \text{ to } 0.7 \text{ V}$
	$i_C = \beta \cdot i_B = \alpha \cdot i_E$ controlled by the transistor	$i_C < \beta \cdot i_B$ limited by something outside of the transistor

Typical transistor curves

