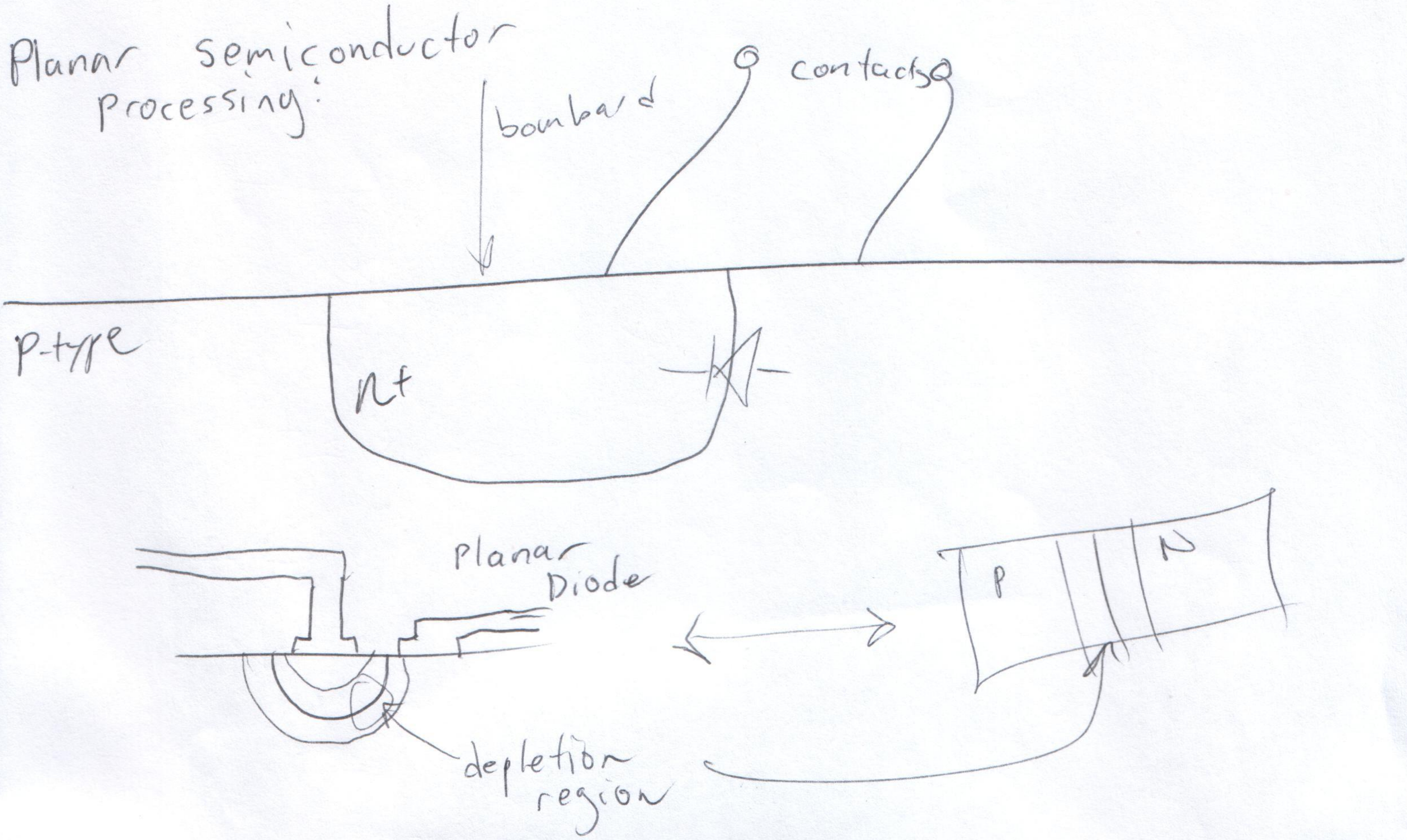
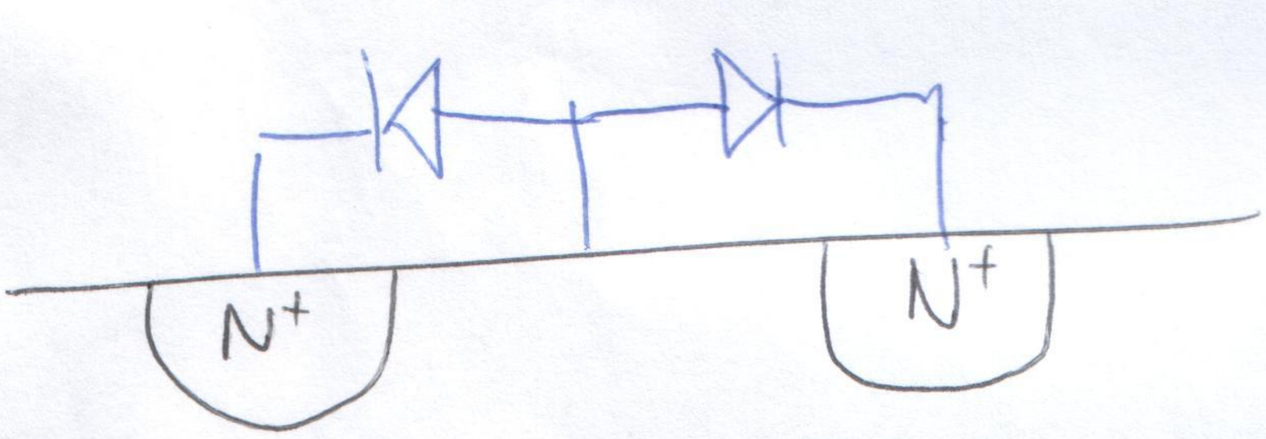
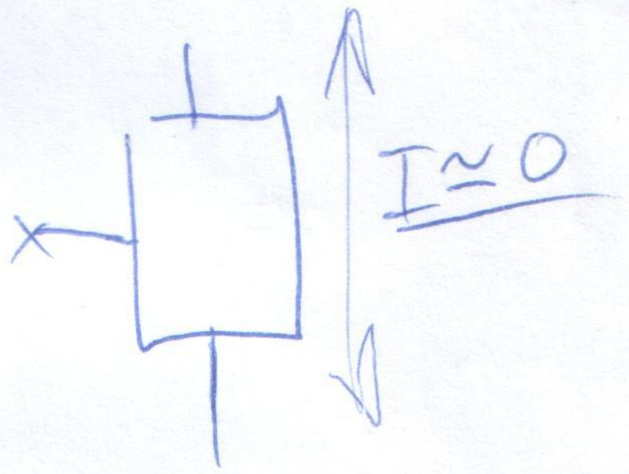
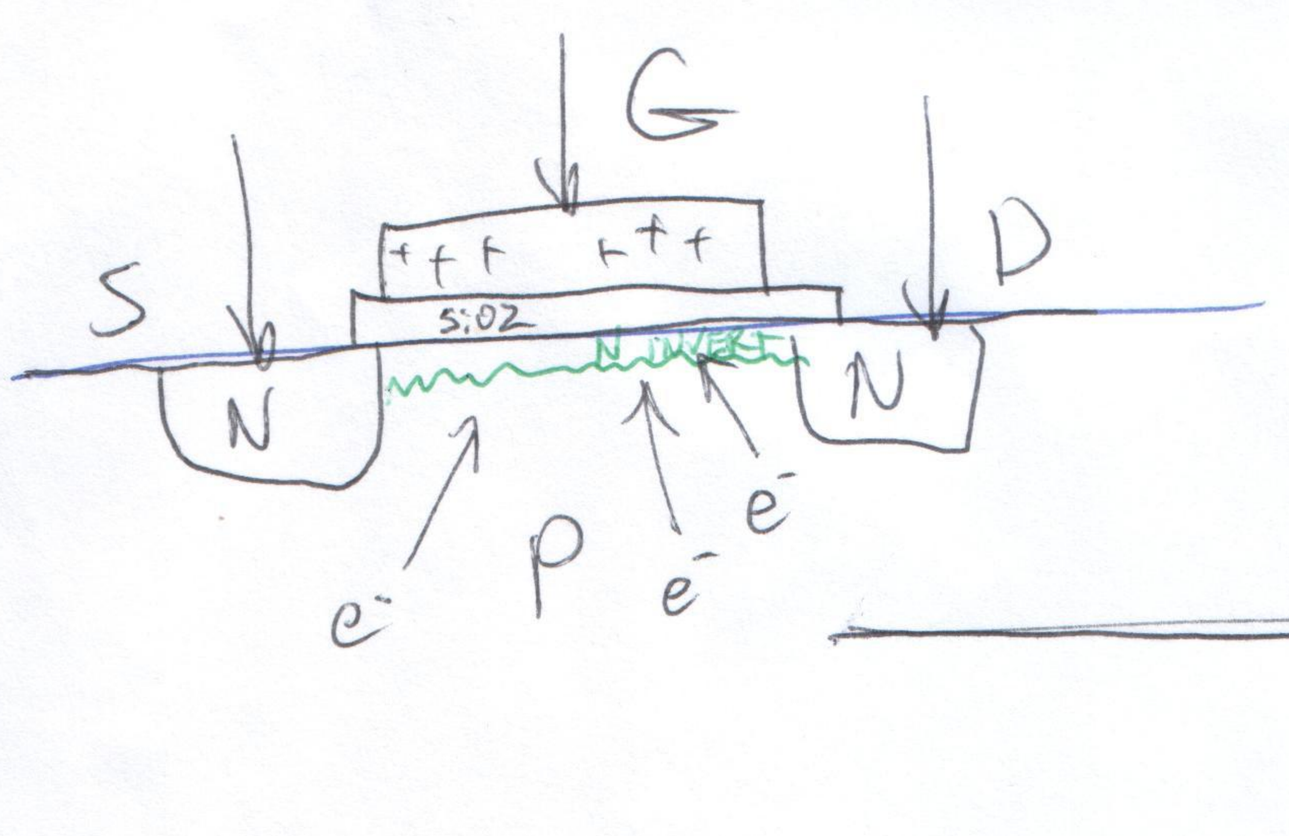
A little bit on MOSFETS (Preview)

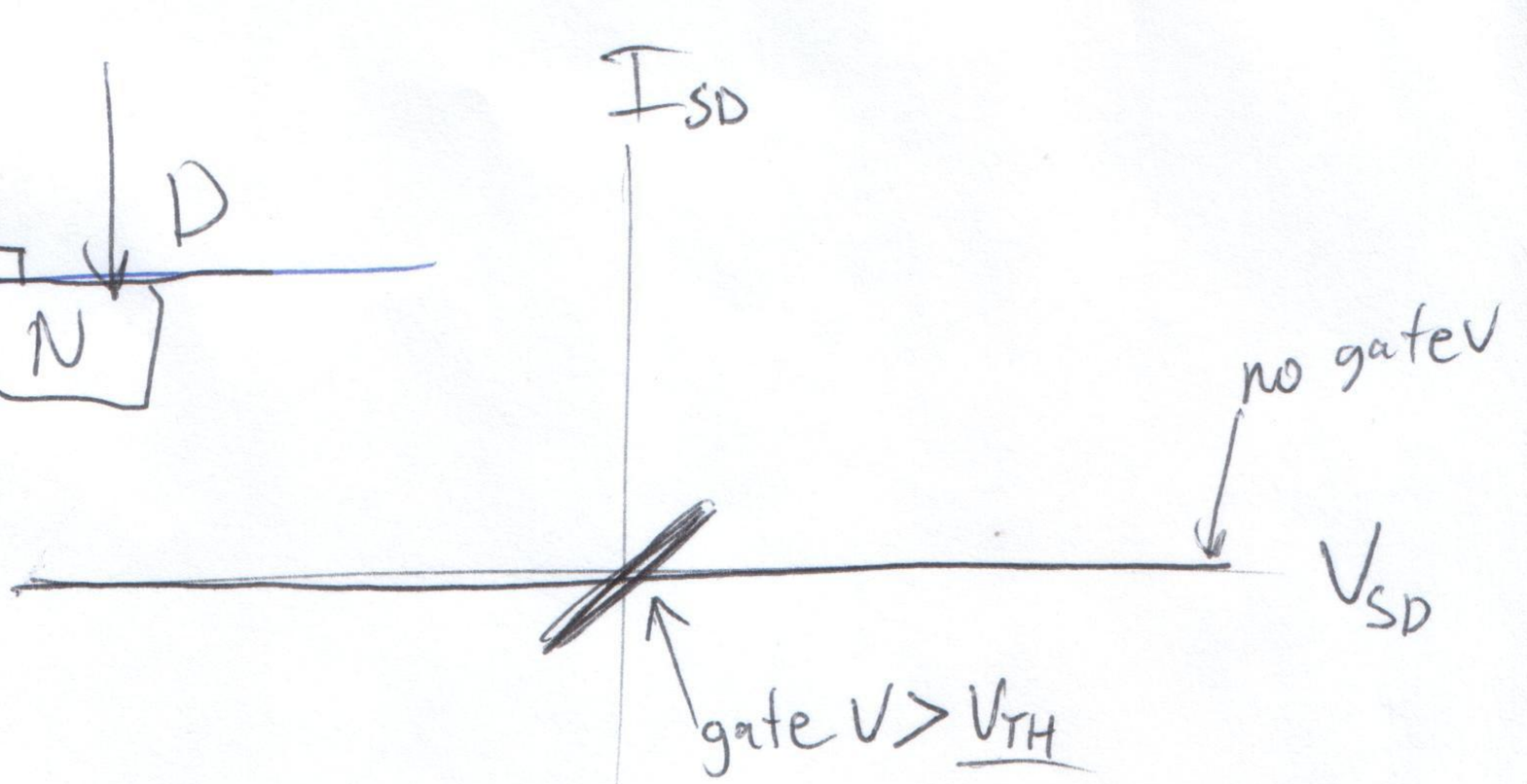
Planar semiconductor processing:

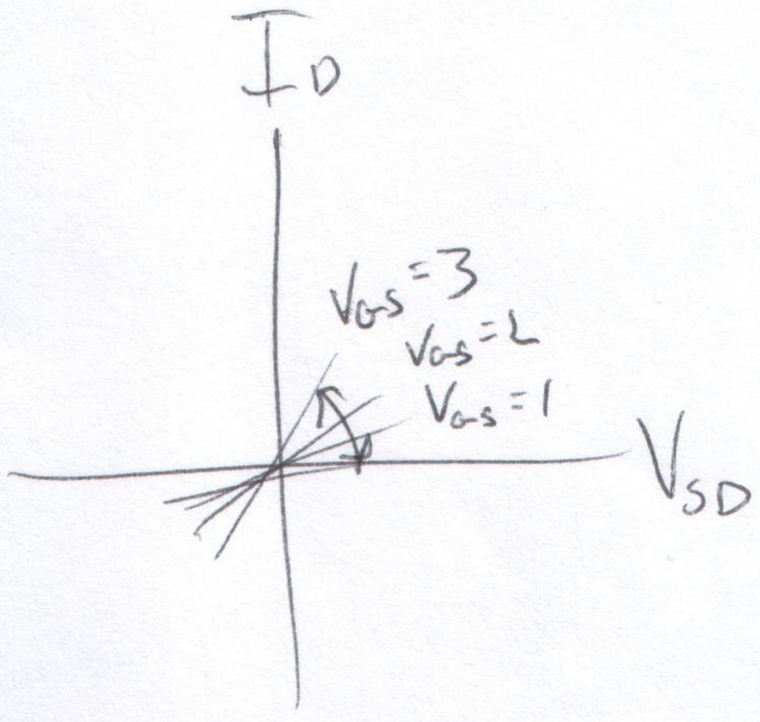




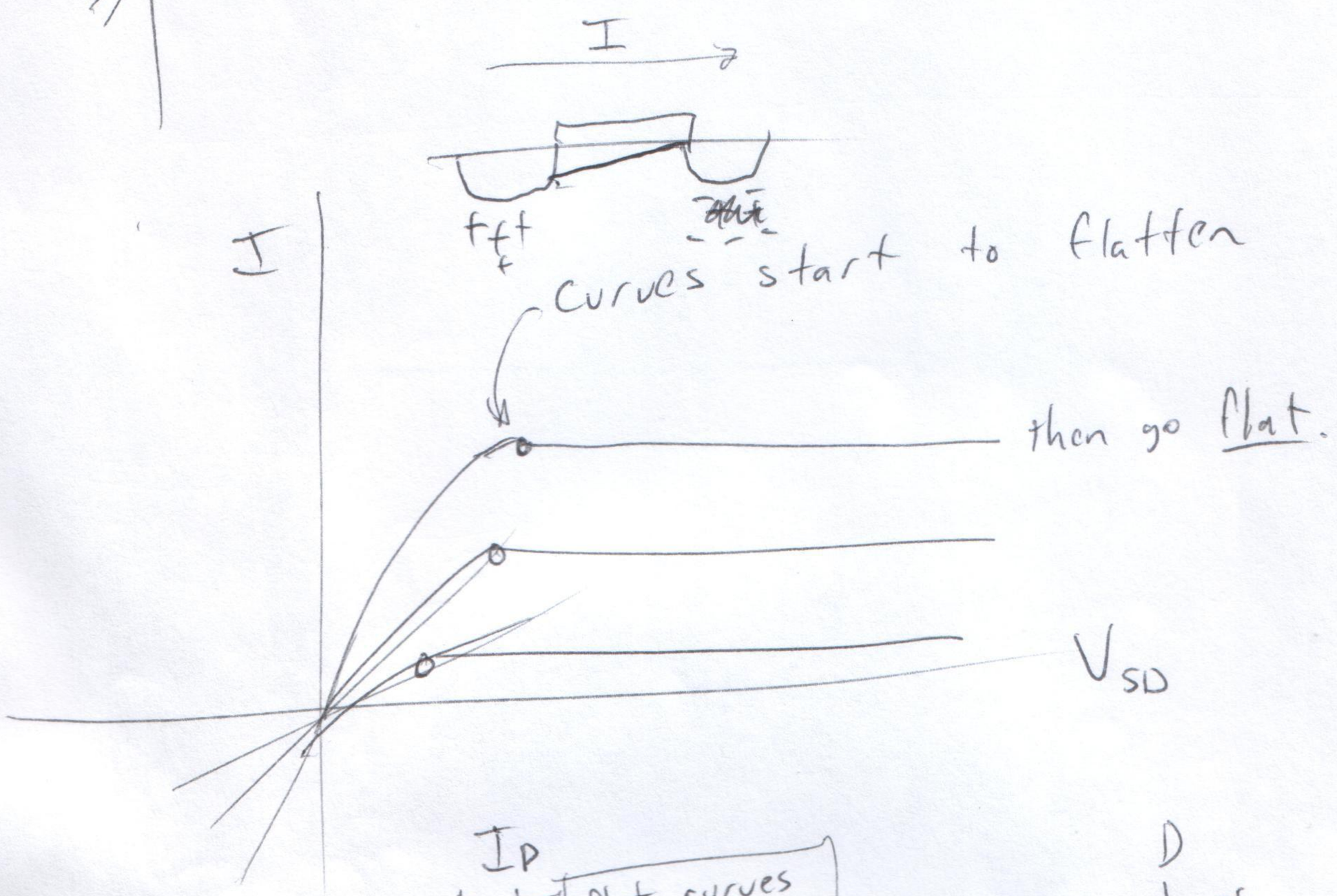


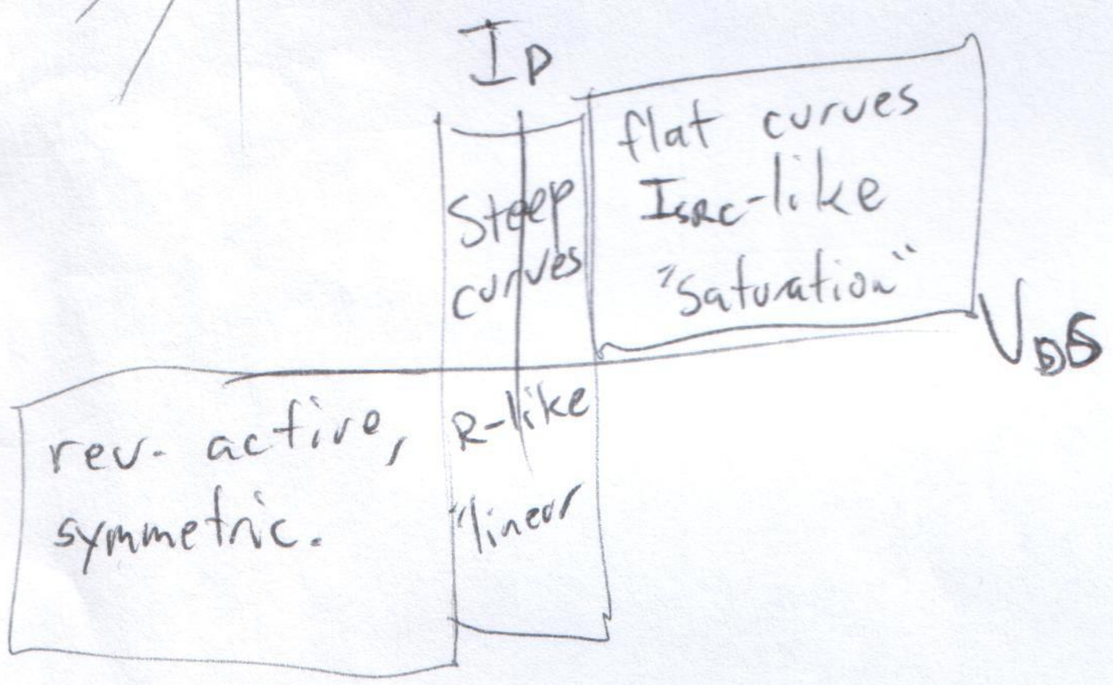


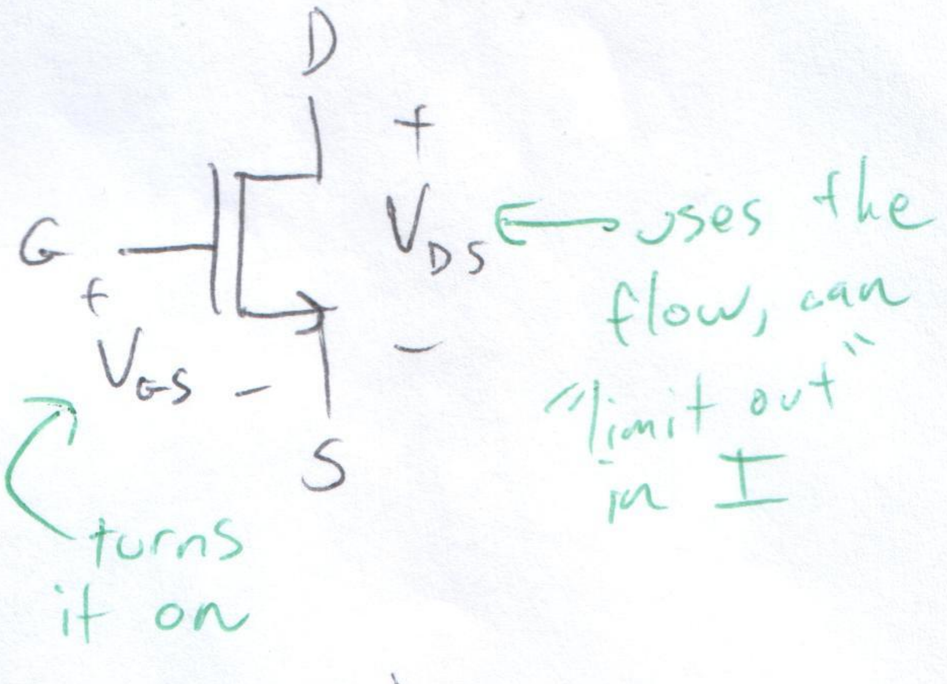




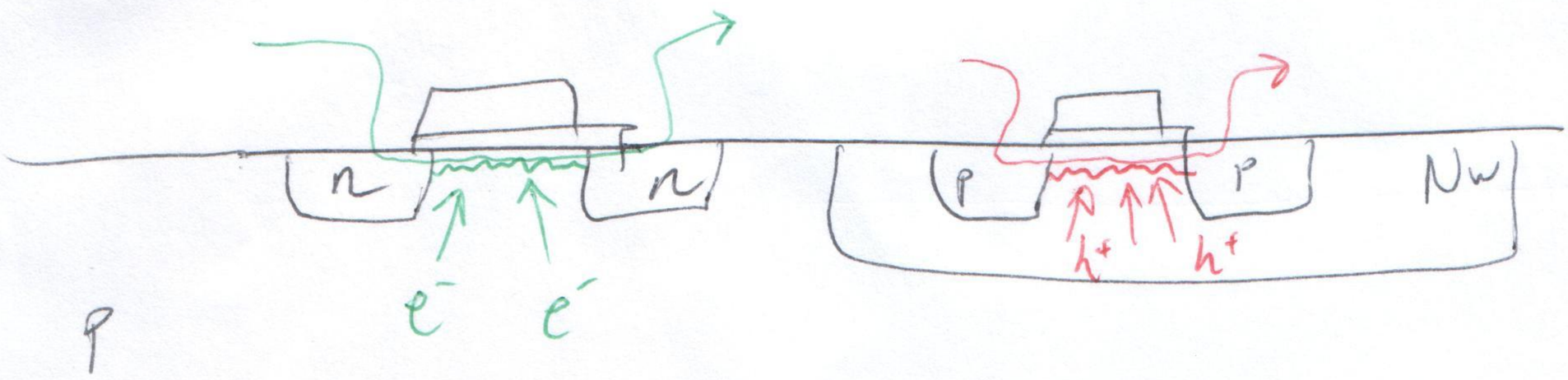
At small values of V_{SD}, this model is accurate.
we have V-ctrl ~~R~~ ~~out~~
~~it's NOT~~





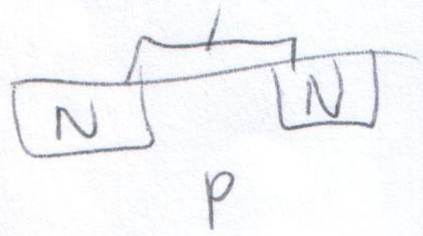
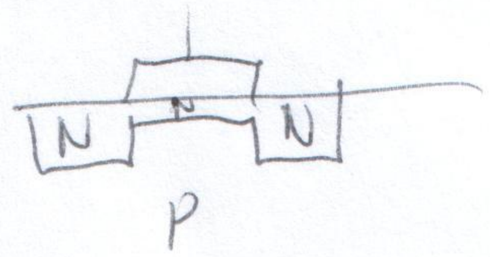
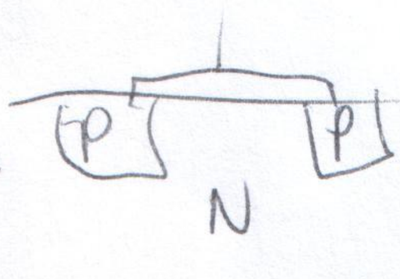
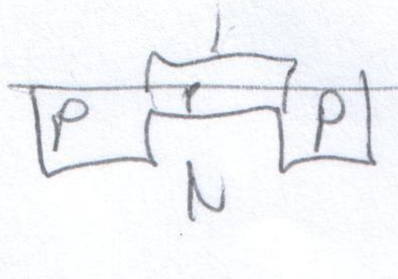


"Enhancement Mode CMOS" (IE everything):

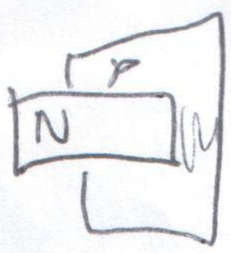


See Also: ~~LabNotes-3.pdf~~
labnotes-3.pdf

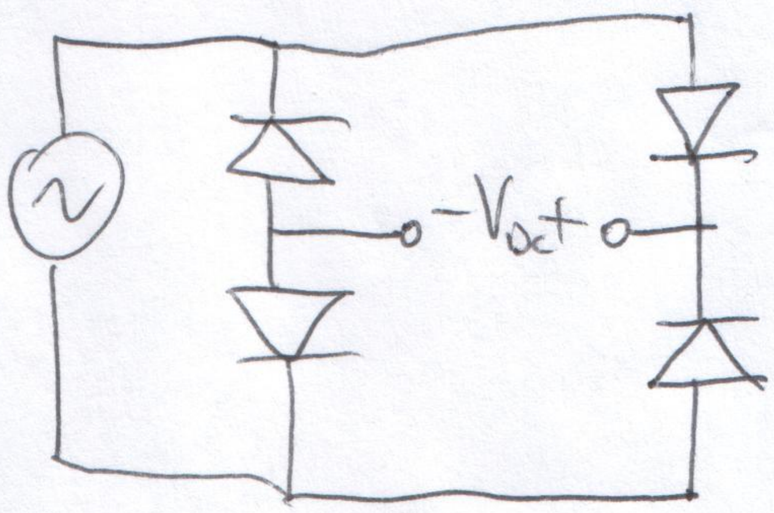
MOSFET:

	Enh ↓	Dep ↓
Nch →		
Pch →		

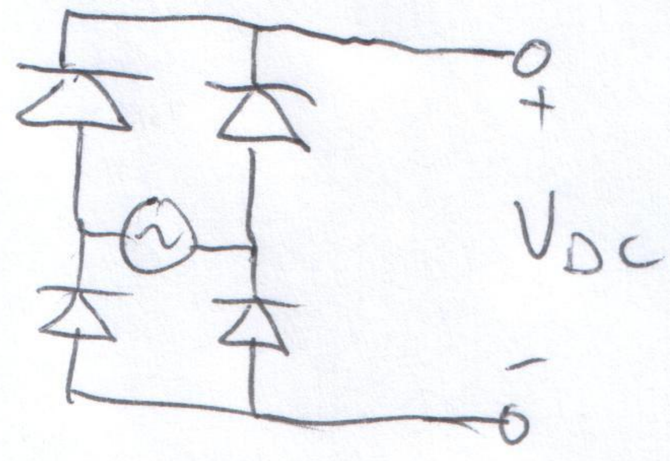
JFET:

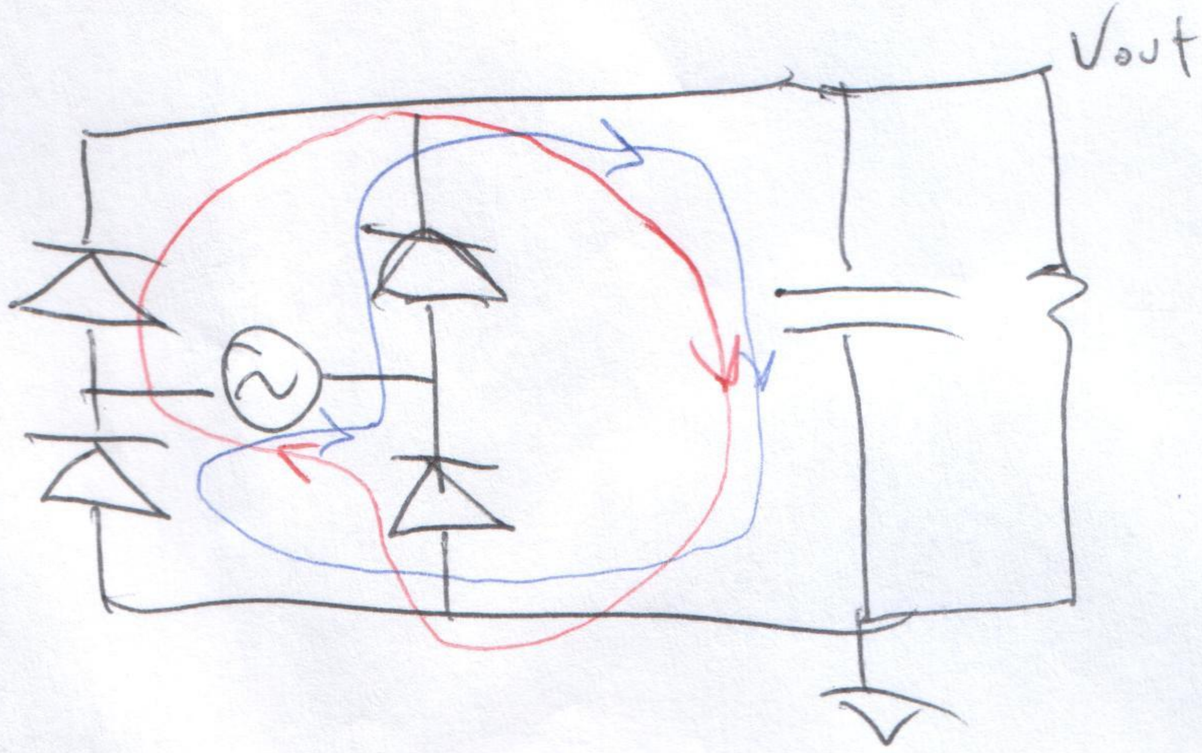
	Enh ↓	Dep ↓
Nch →		
Pch →		

Full-Wave Bridge Rectifier



OR EVEN:

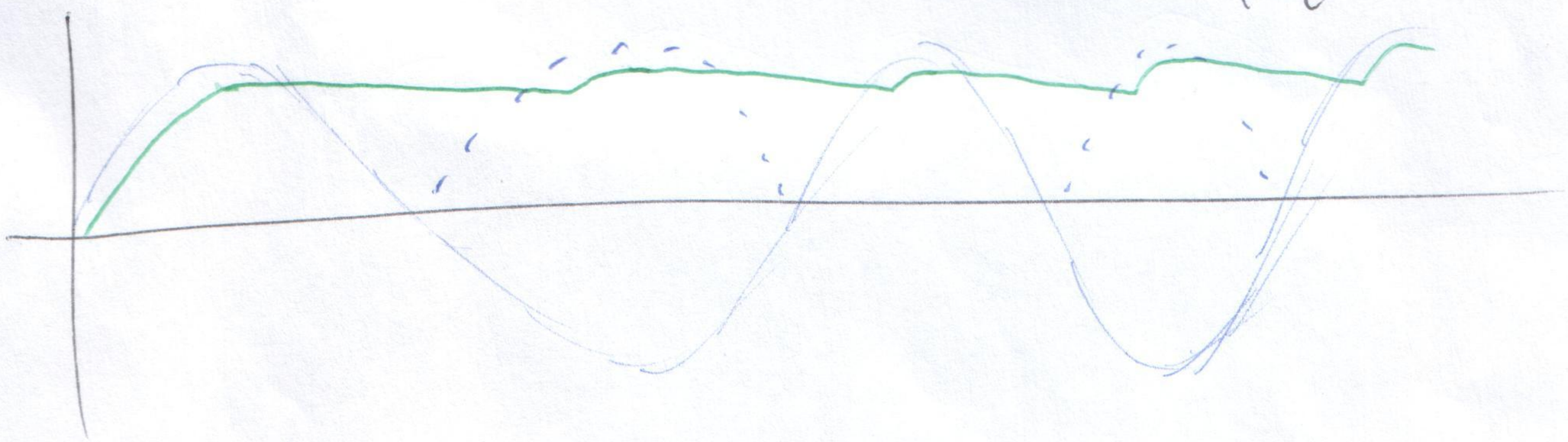




$V_{OUT} = V_p - (V_{DIODE} \cdot 2)$

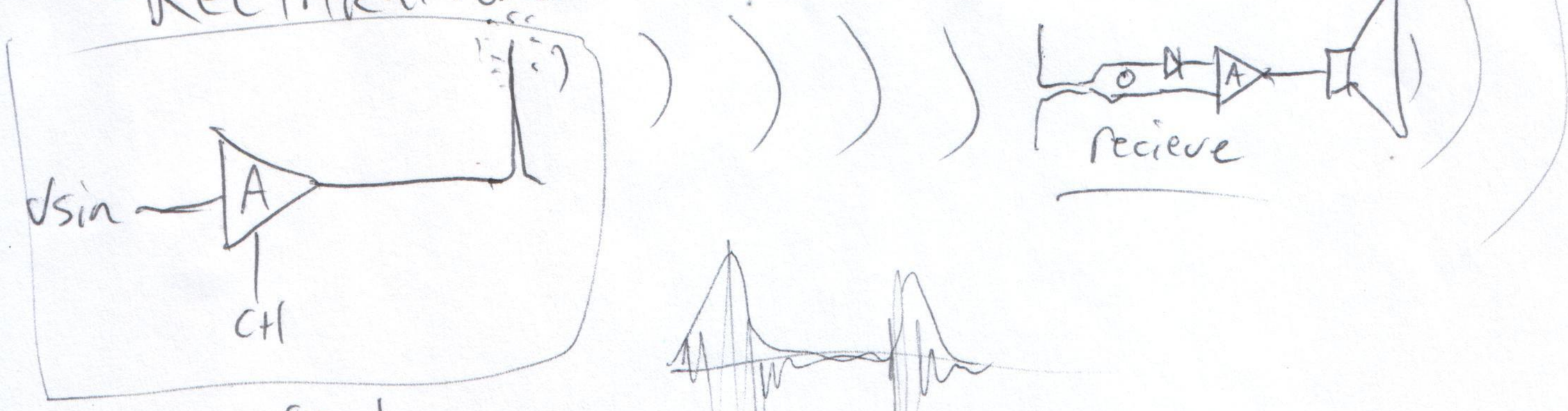
Surge current: Unchanged.
(you could argue it's smaller, but only if you assume V_D is constant rather than V_{DC})

Repetitive Diode Current: reduced by increased freq.

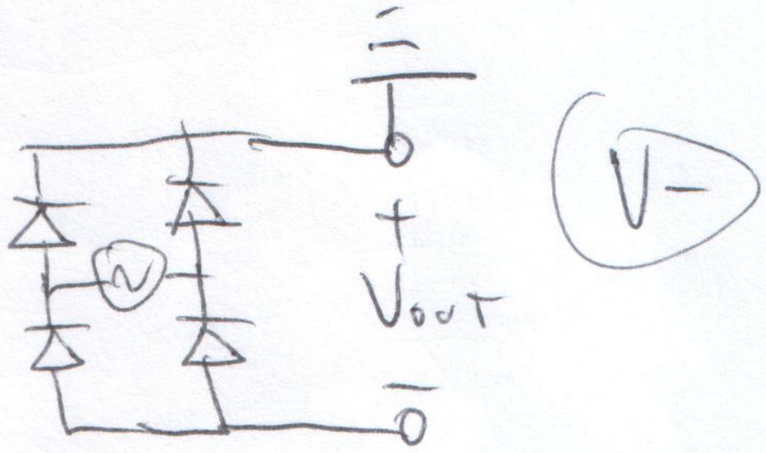


Odds & Ends:

-Rectification & AM Radio:



Rectify for -V:



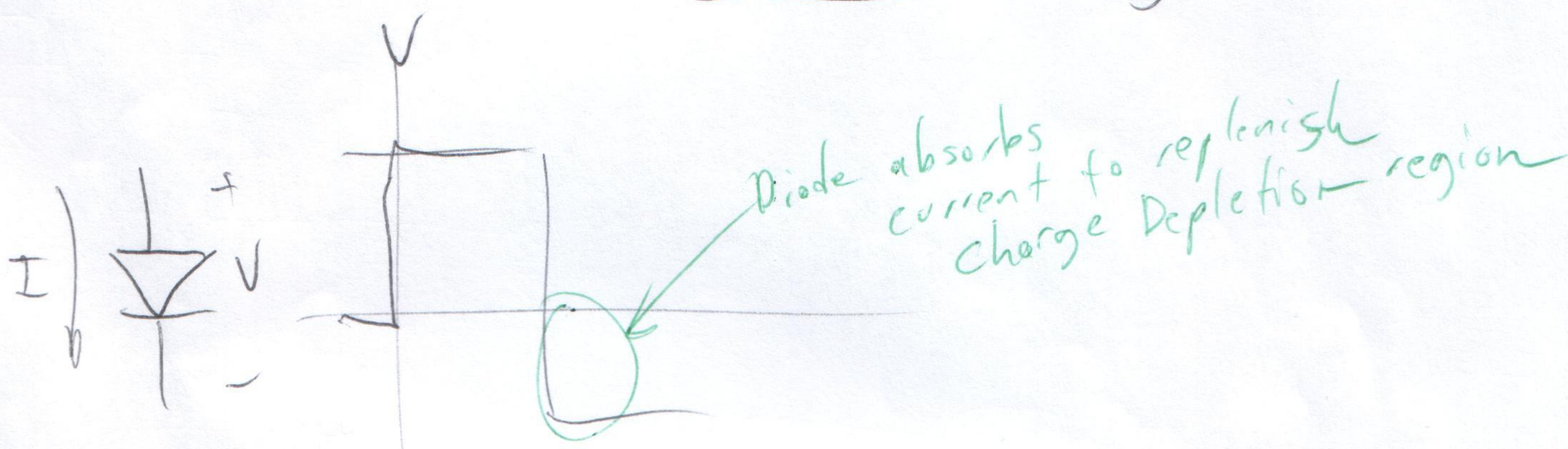
Do it twice for:

+12 ⏚ -12

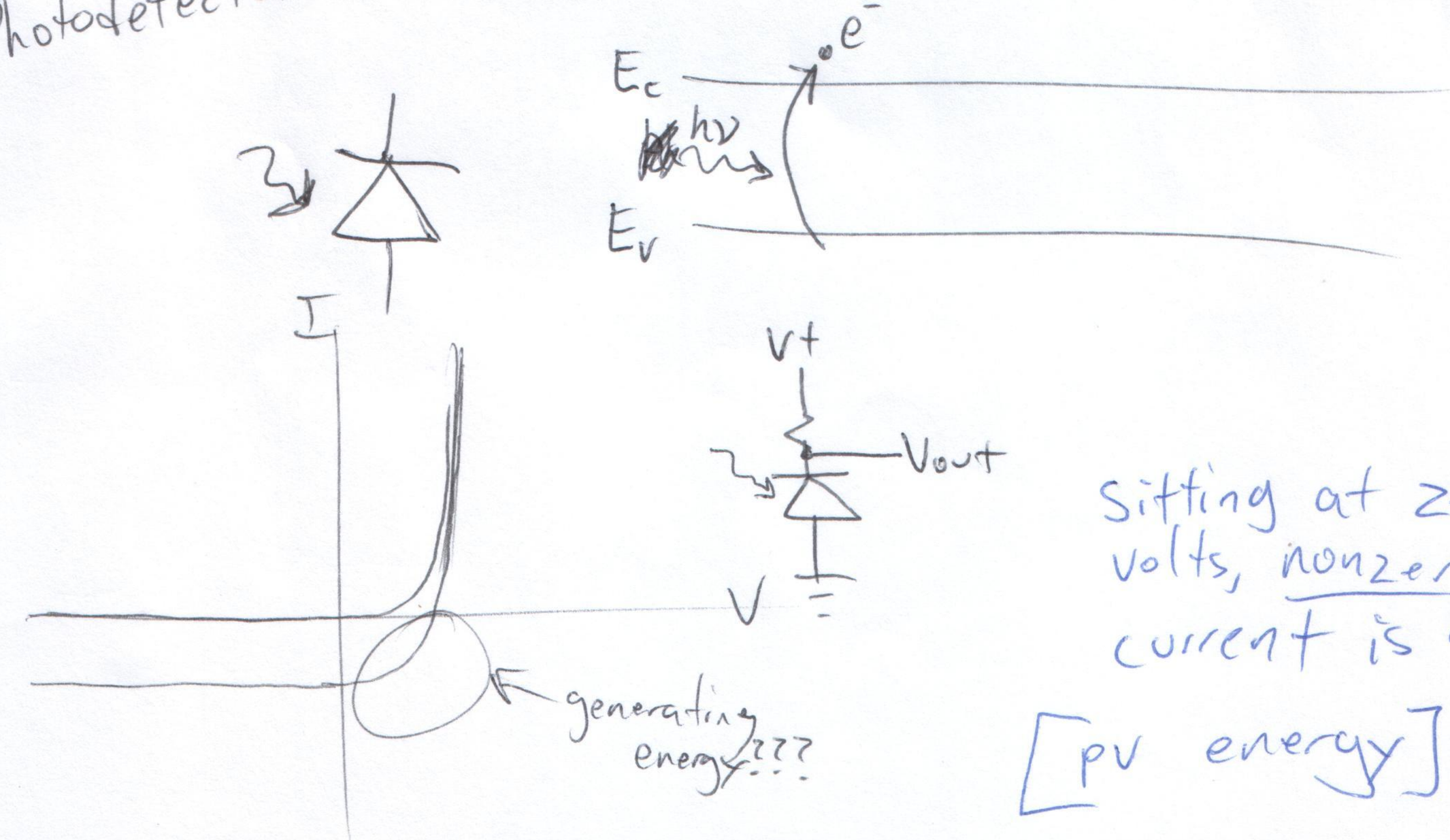
O O O

Diode Transients:

On very short time scales, diodes & other semiconductors exhibit nonlinear timing behavior:



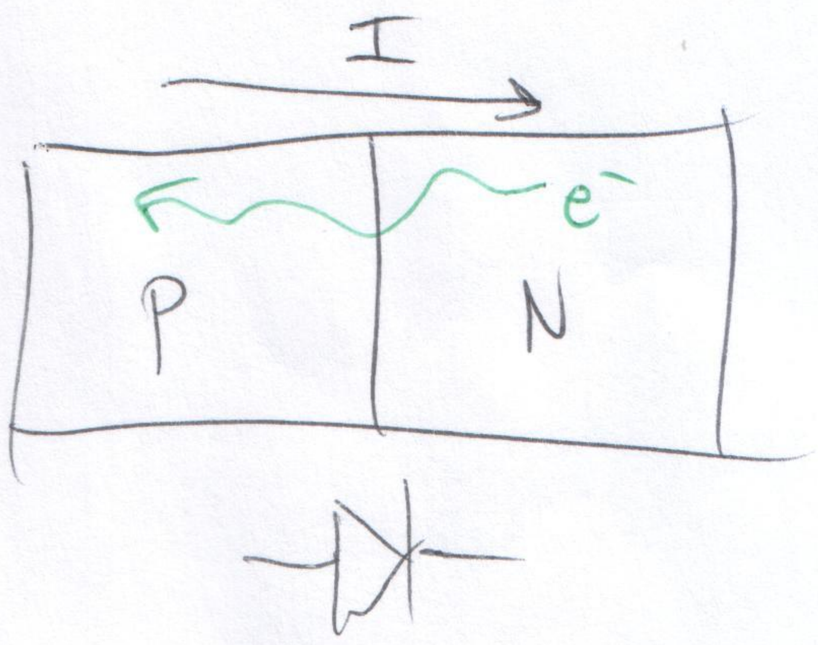
Photodetector:



sitting at zero volts, nonzero current is generated

[pv energy]

Weird Energy Stuff: LEDs



- large population of electrons entering heavily p-type region

$$e^-_{(cond.)} \rightleftharpoons h\nu_{(photon)} + e^-_{(val.)}$$

however! physics also must be satisfied

e^- has a momentum that must be equal to the momentum of an available energy state, or else:

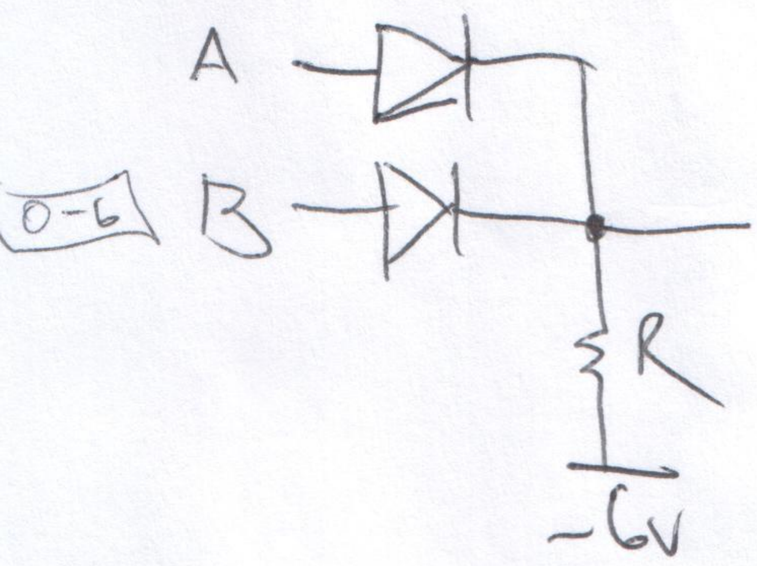
$$e^-_{(cond)} + \langle momentum \rangle = h\nu + e^-_{(val)}$$

crystal must have available energy of exactly the right kind, massively reducing probability of e^- drop.

Some semiconductors have valence energies of equal momentum to their conduction energies (Direct band gap) so the formula is:

— Direct band gap energy

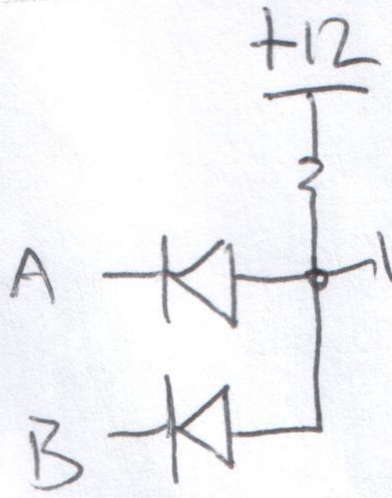
Diode Logic



A, B low: I flowing gives you -.7v

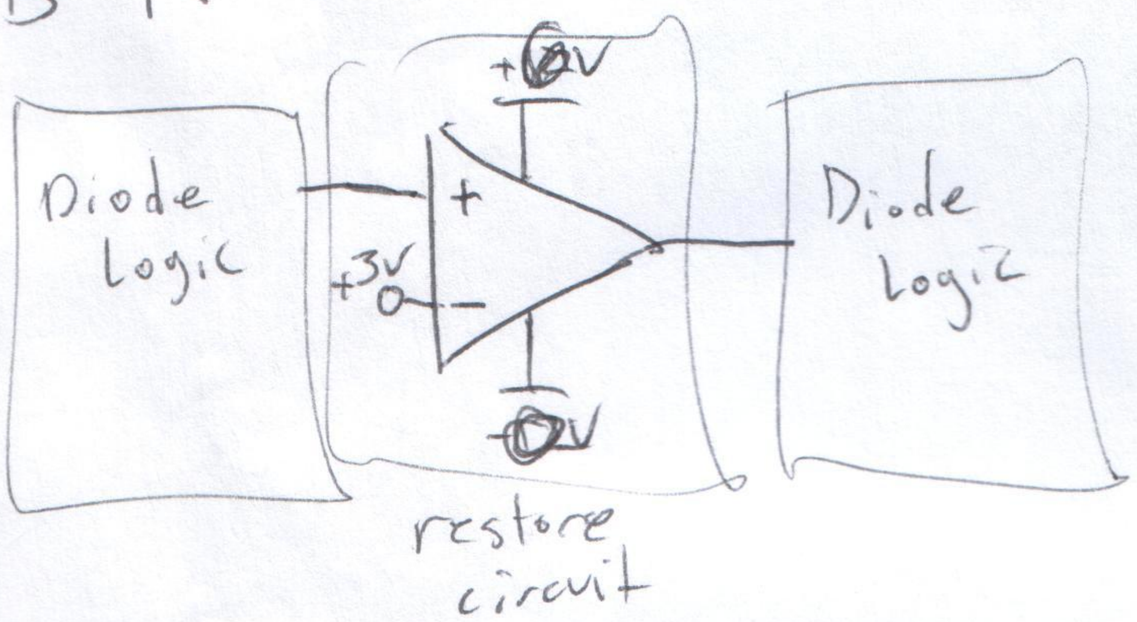
A or B high: I gives you 5.3v

OR



A & B high: 5.3v

A or B low : +.7v



Inverting Gates....
Better use an opamp

...aand that's it for diodes. Now we review!