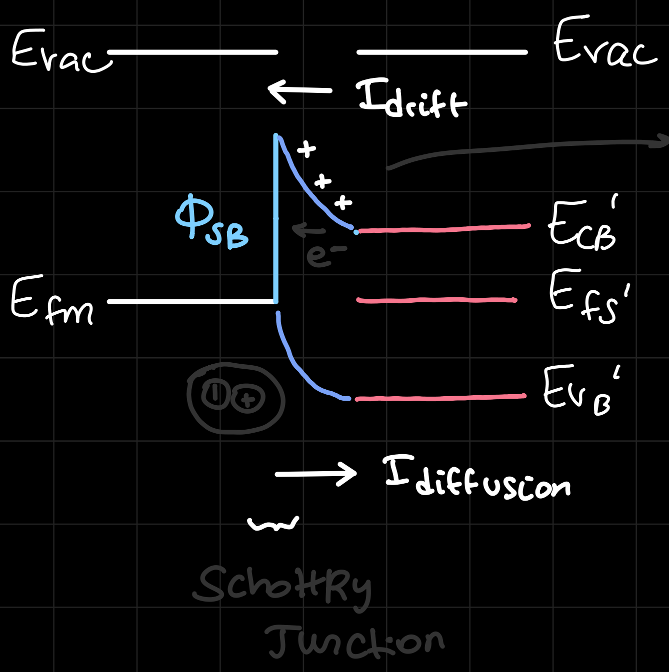
$\phi_m > \phi_s \rightarrow$ schottky effect

SB → schottky barrier



$e^- \leftarrow$ so +ve ions remain and hence called depletion region for e^- and only till band bending

since $I_{diffusion} > I_{drift}$

due to motion of e^-

↳ hence called a majority carrier device because we have a N type semiconductor

for a schottky barrier → majority carrier based device

Whereas most other are minority " " eg: MOSFET

$\phi_{SB} = \phi_m - \phi_s = V_{bi}$

forward bias

↳ V_{bi} decreases with V

↳ depletion width decreases

↳ barrier decreases

↳ ez for e- to pass throug

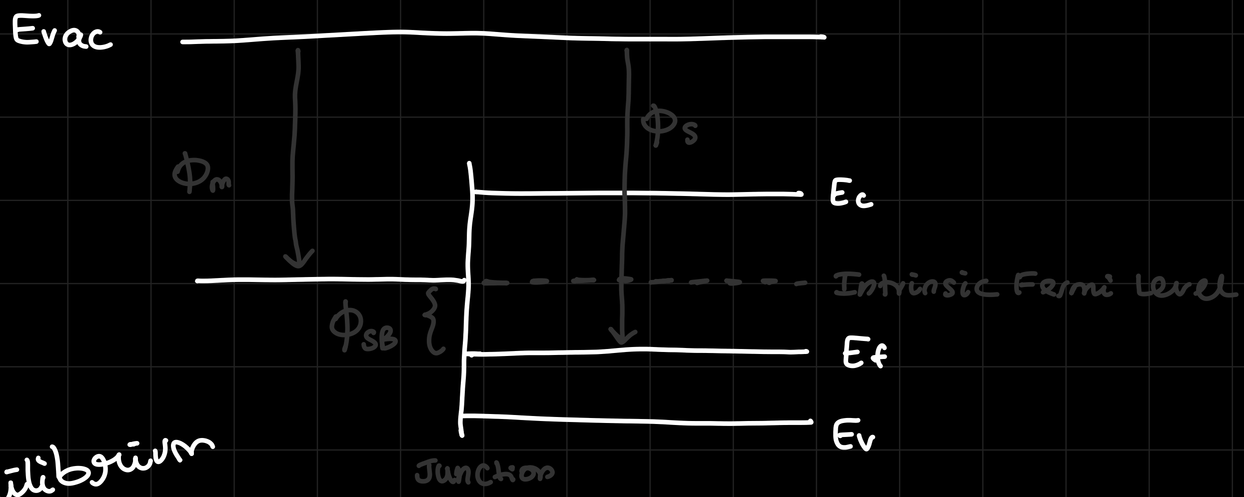
↳ $I_{diff} > I_{drift}$

↳ low band bending

for OHMIC CONTACT

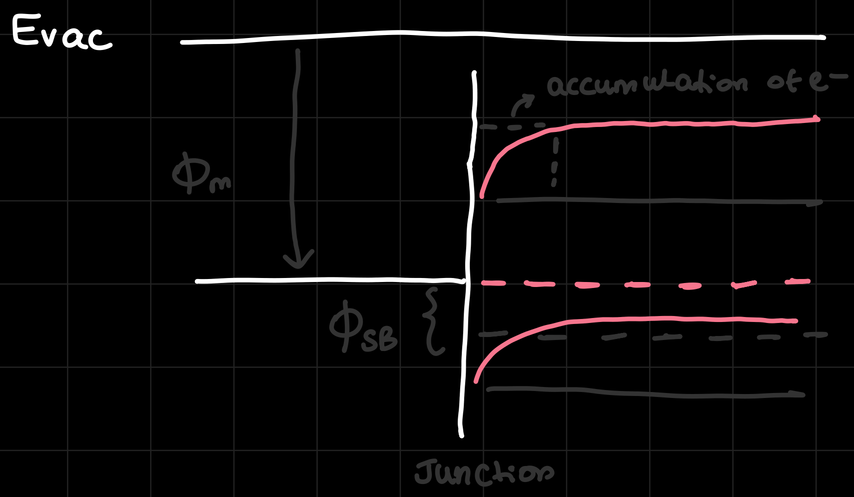
↳ $\phi_m \leq \phi_s$

for P type sc →

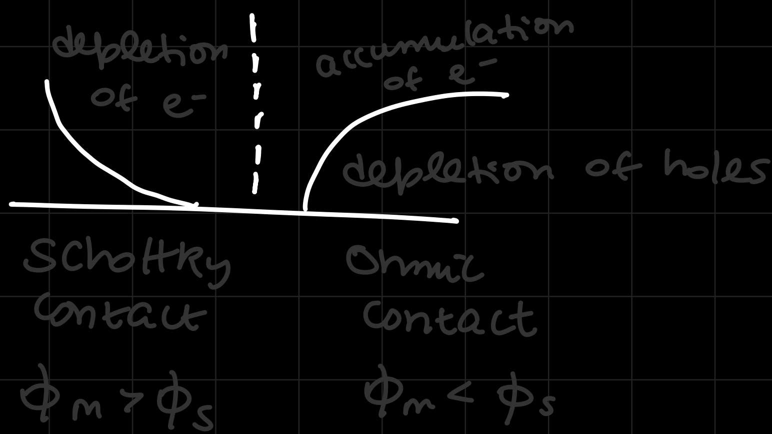


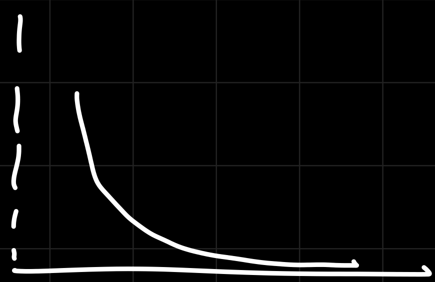
non equilibrium

equilibrium



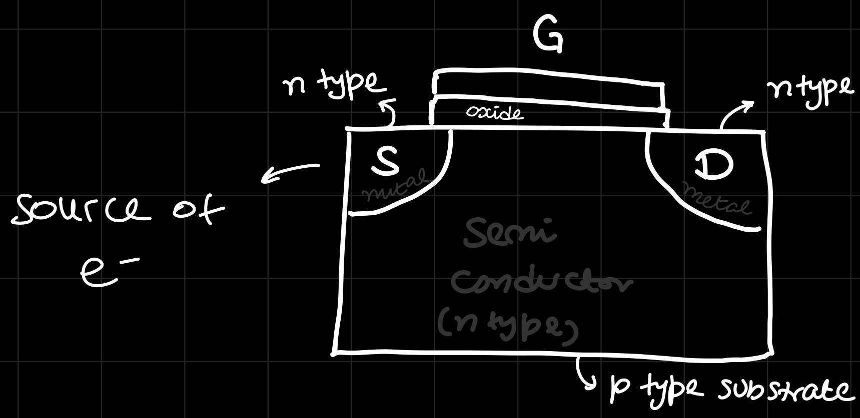
upwards bending





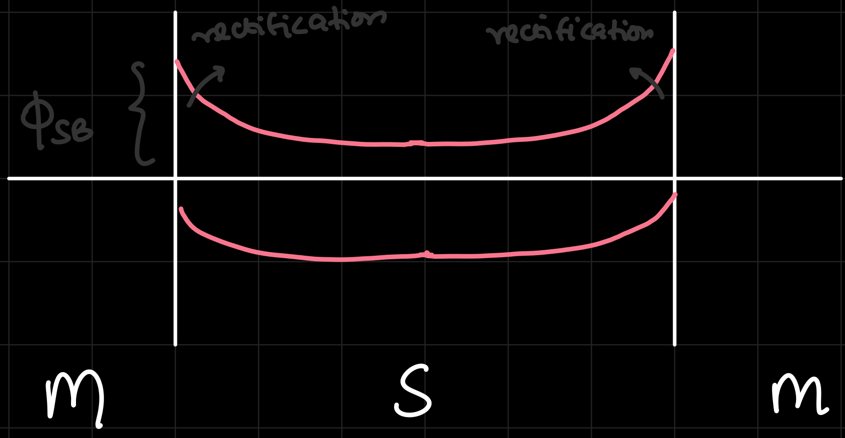
for p-type →

$\phi_m > \phi_s$



lets replace the SC in SRC & drain by a metal in a MOSFET which contact would we need?
↳ Schottky
(~PN Junction)

lateral diagram →



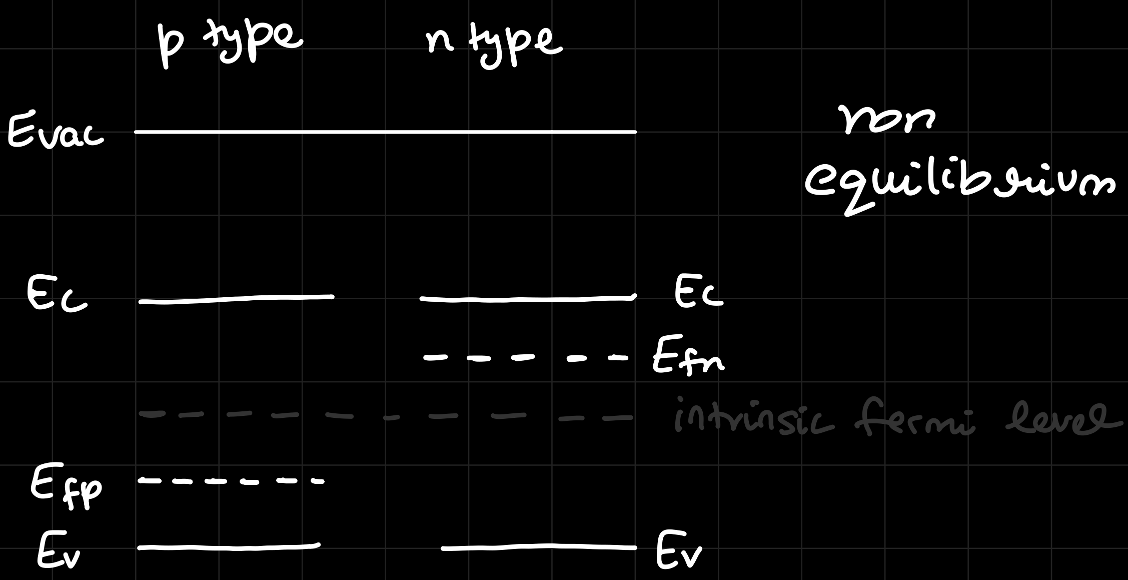
NPN Junction
similar to BJT besides the C, B, E region width

guasi Fermi Level : E_f splits when bias applied

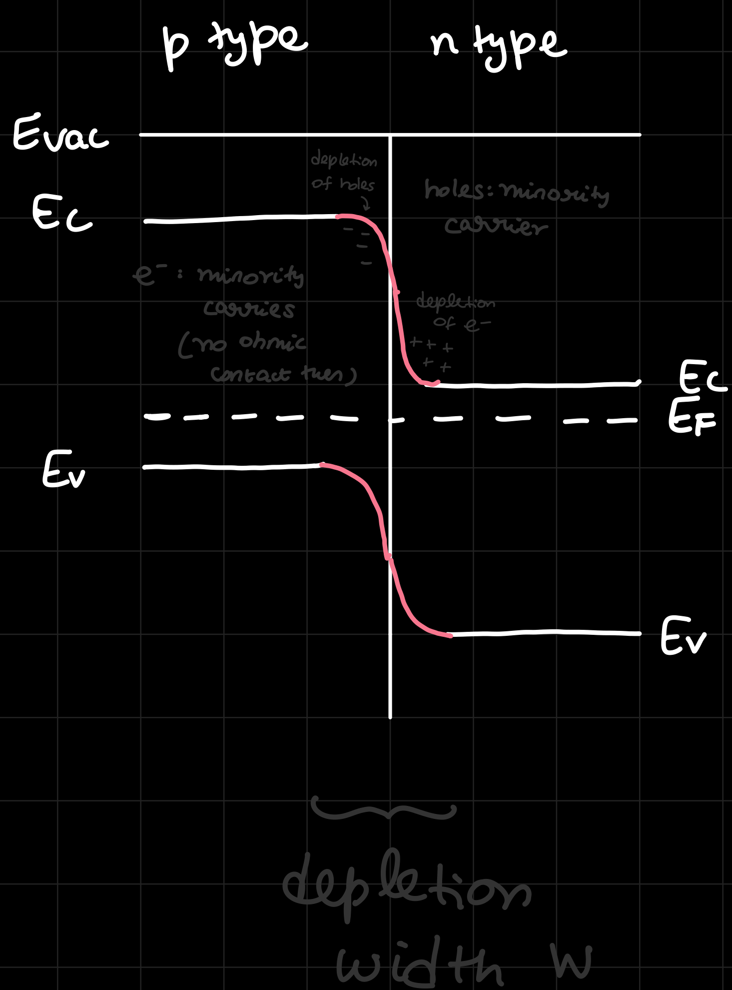
Homo JUNCTION : between same SC but could have different doping

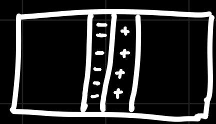
same material → same e- affinity χ_e ($E_{vac} - E_c$)
and same band gap

non equilibrium



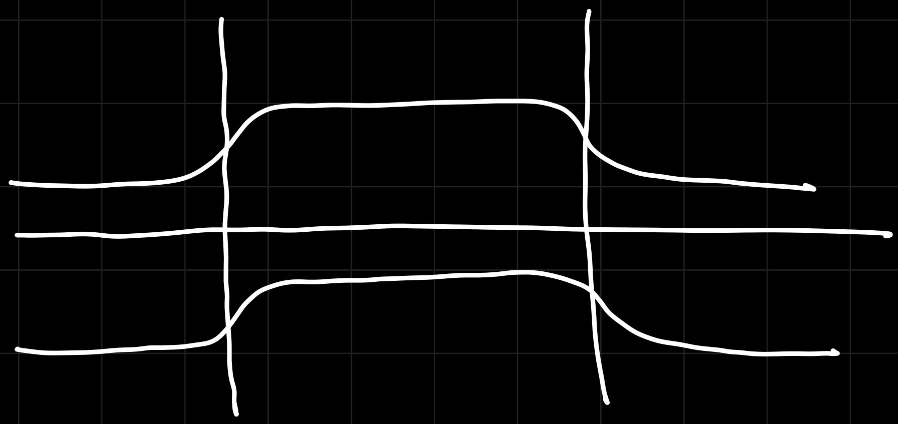
equilibrium

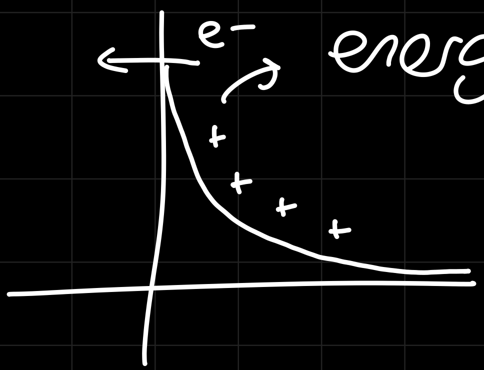




PN Junction

for npn MOSFET

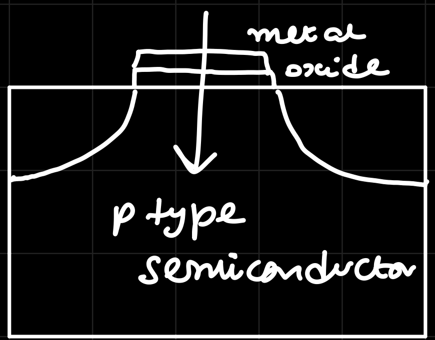




energy goes down

e^- would want to go to the other side

hence depletion of e^-



longitudinally,

$M \rightarrow I \rightarrow S$
(insulator)

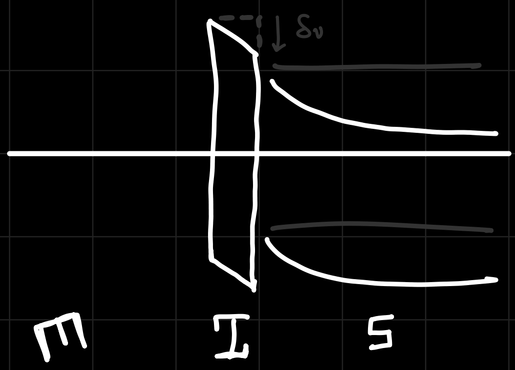
In MSM, replace $S \rightarrow I$ and 2nd $M \rightarrow S$ and we achieve the MIS junction metal

 Insulator → barrier → potential drop

Semi-conductor

earlier: $\phi_{SB} = \phi_m - \phi_s$

now: $\phi_{SB} = \phi_m - \phi_s - \delta_v$



Defects: Any impurity

Fermi level pinning