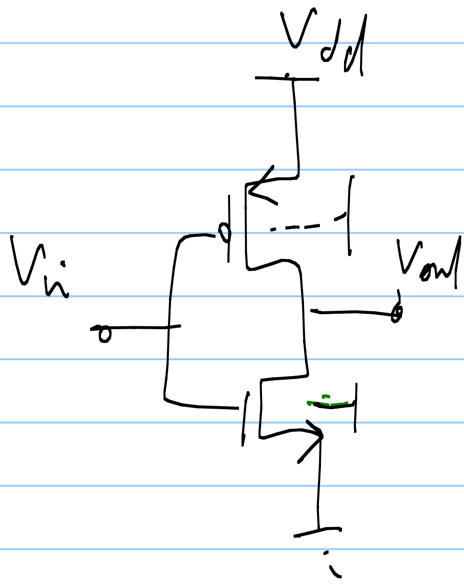
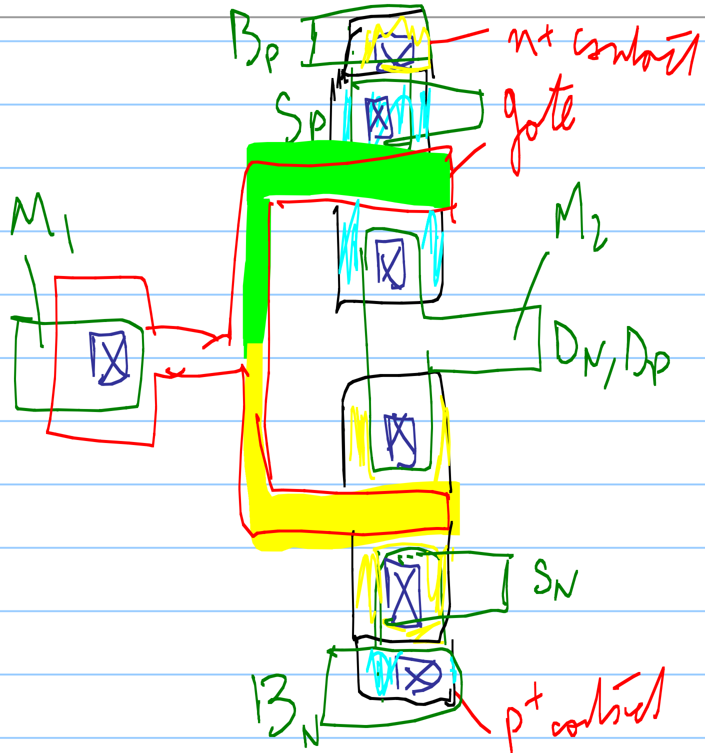
MOS PROCESS INTEGRATION

Note Title ٢٠١٣/١٢/٢٤





V_T Adjust Implant

P-well Implant

STI : Shallow Trench Isolation

$$I_D = \frac{1}{2} \mu C_{ox}' \frac{W}{L} (V_{GS} - V_T)^2$$

$V_{GS}, V_{DS}, —$ operating conditions

$C_{ox}' = \frac{\epsilon_{ox}}{t_{ox}}$ ϵ_{ox} → quality : Dry oxide; t_{ox} → gate oxide thickness

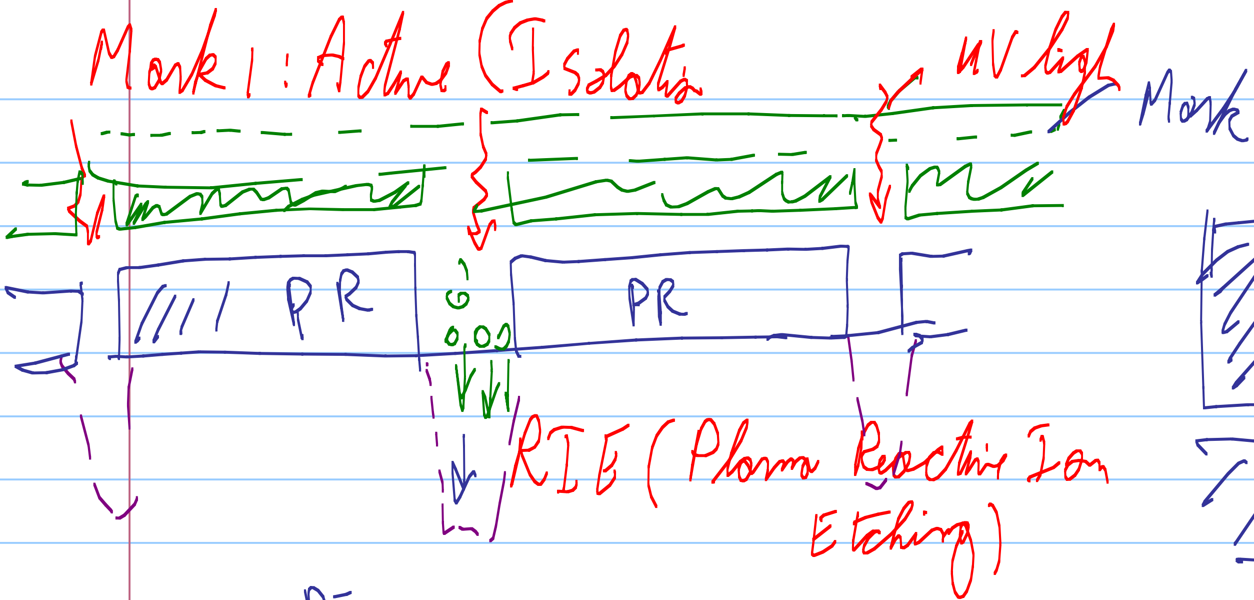
W, L → Layout

V_T → Doping $\propto \sqrt{N_A}$ or $\sqrt{N_D}$

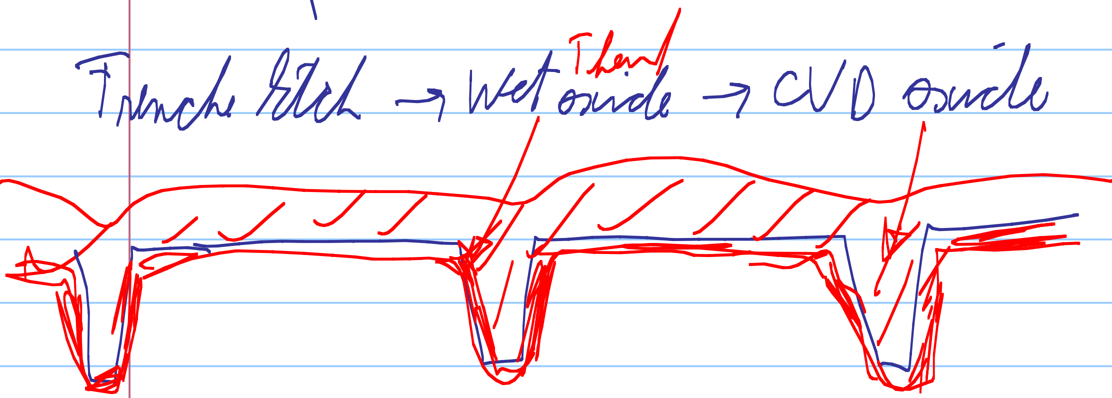
↳ V_T adjust implant

$C_{ox}', V_T, [\mu]$

Process



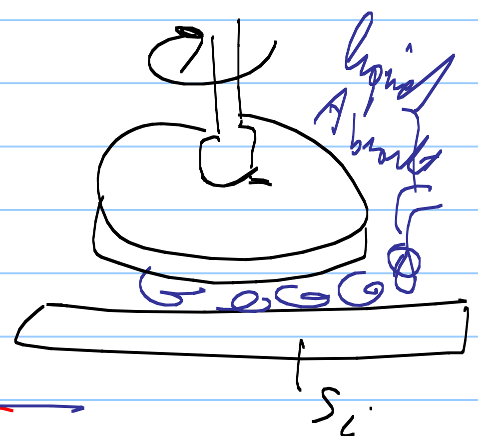
p-

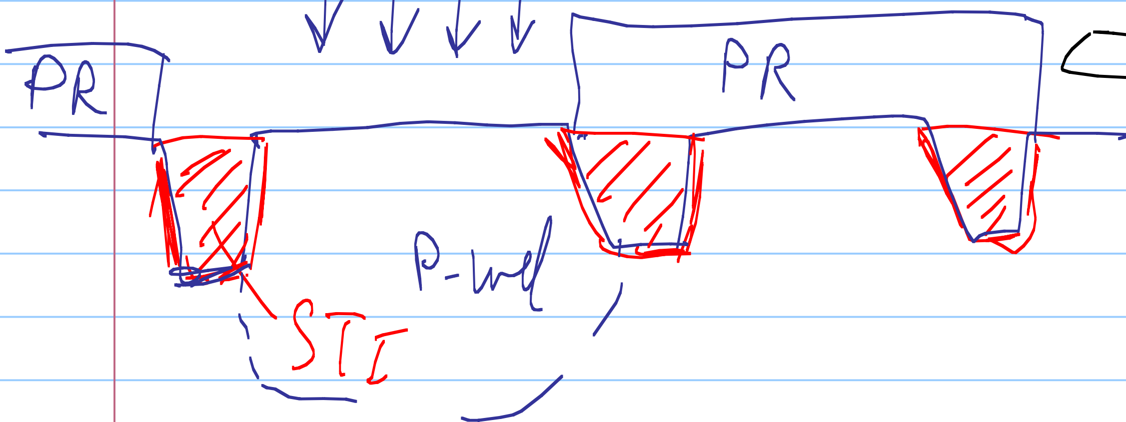


Etch Back or CMP (Chemical Mechanical Polishing)

Mask 2: P-well Implant

Boron Ion Implant
(P-well Implant)



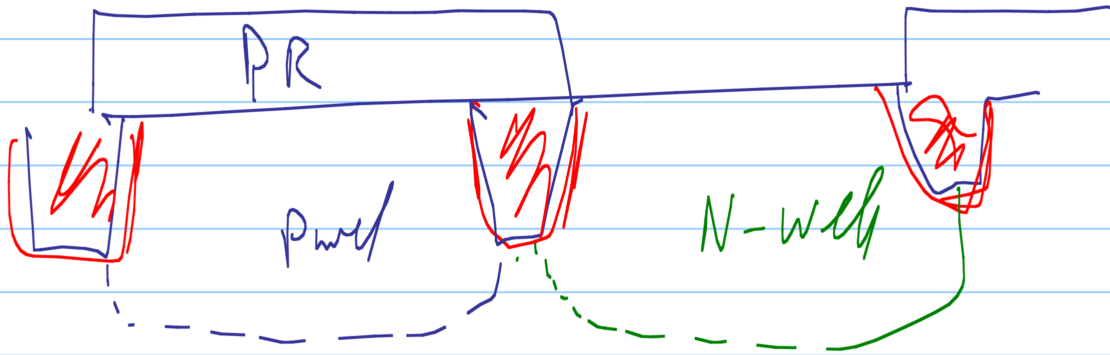


Masks: N-well

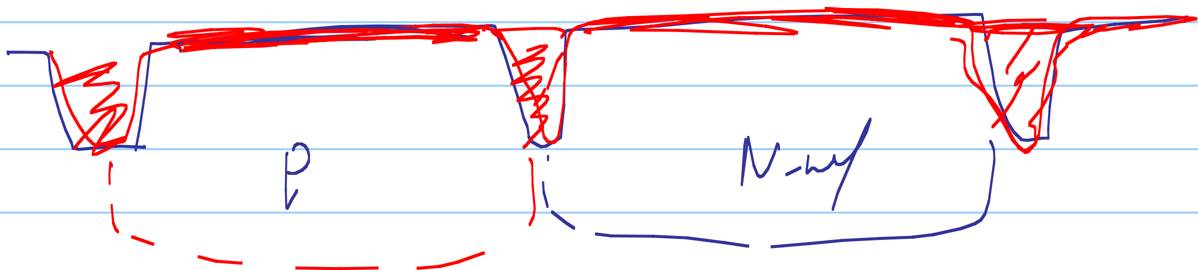
Phosphorus Ion Implant

↓ ↓ ↓ ↓ (N-well Implant

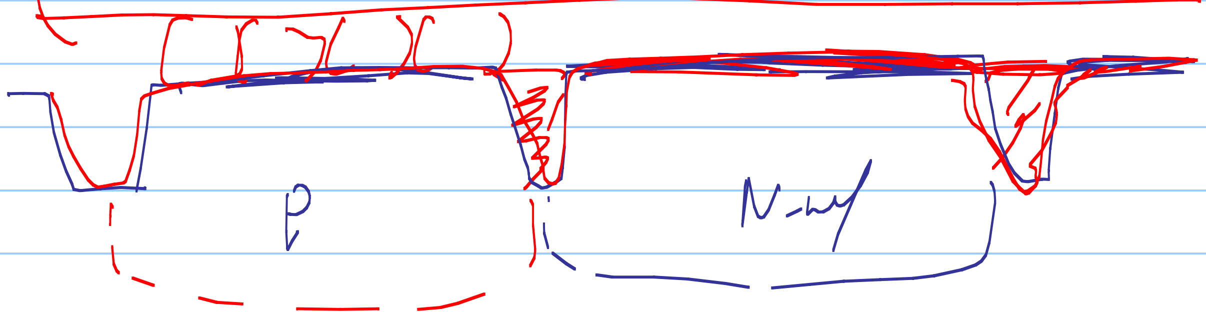
High Energy

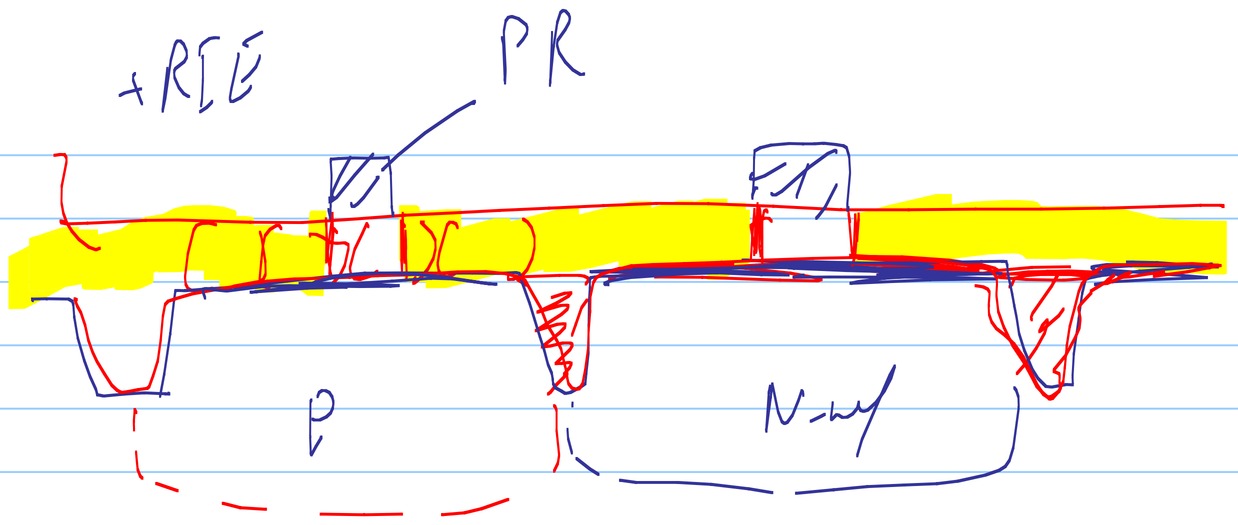


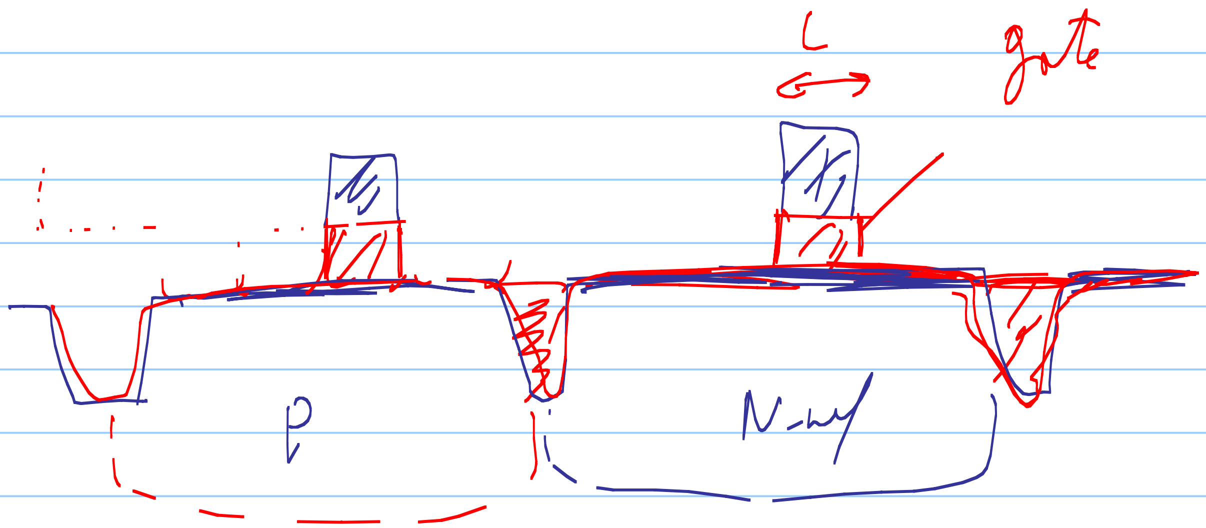
Gate Oxidation (Dry) thin layer, very high Quality (t_{ox} ✓)



CVD (Chemical Vapor Deposition) of Si → Polysilicon

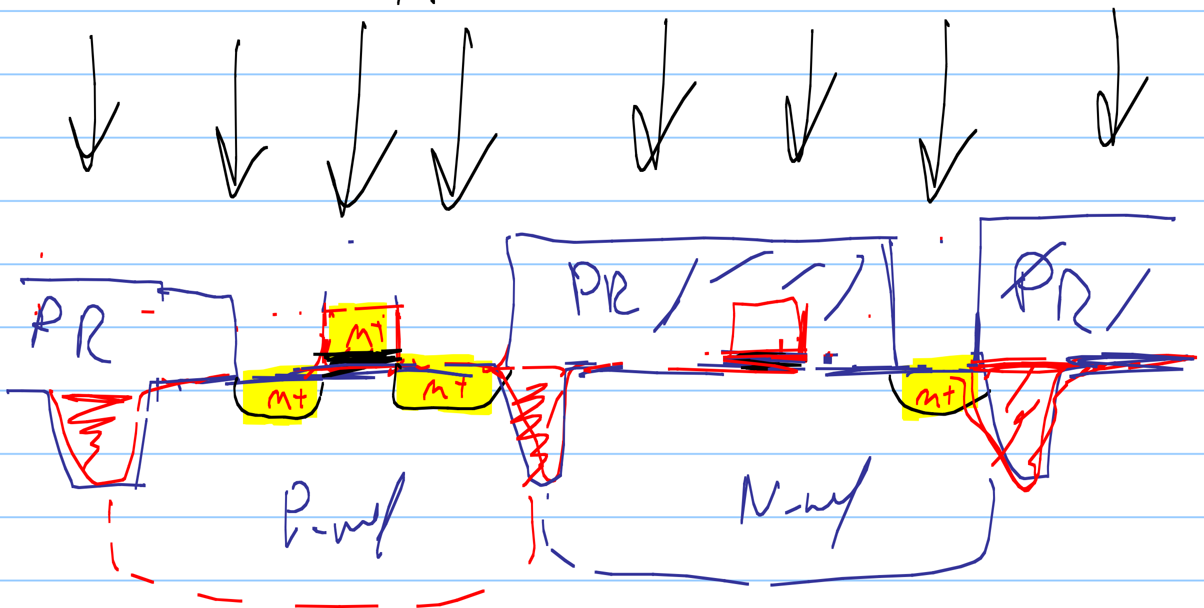




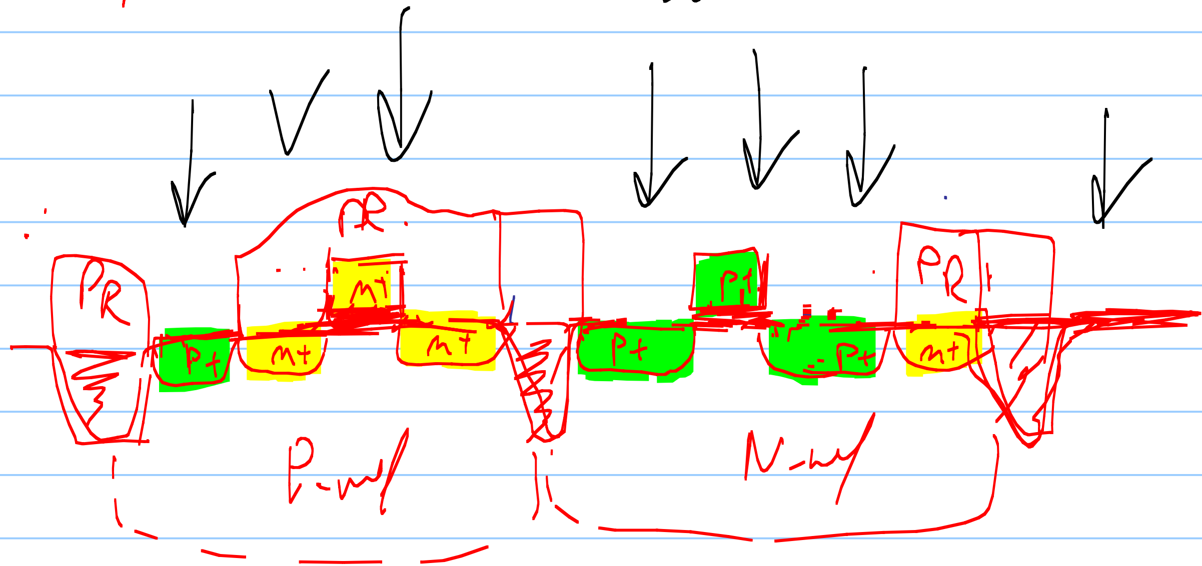


n+ Ion Implant : (High Dose, Low Energy) + Anneal

Arsenic not Phosphorus → Shallow Implant
(Low Diffusion)



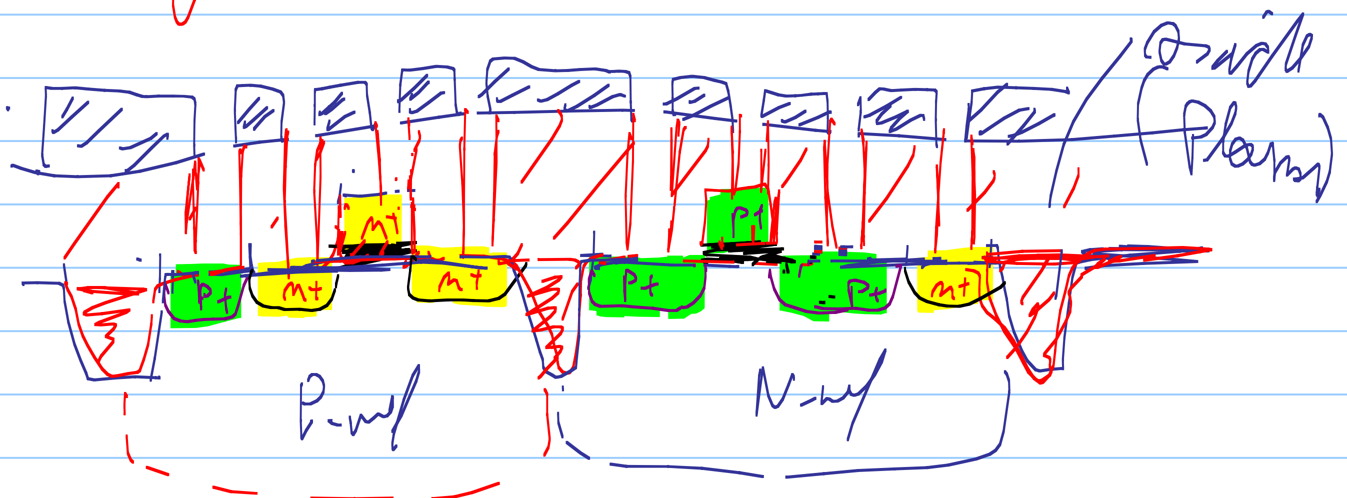
p+ implant (Boron) : low energy, high dose



Contacts to Source/Drain

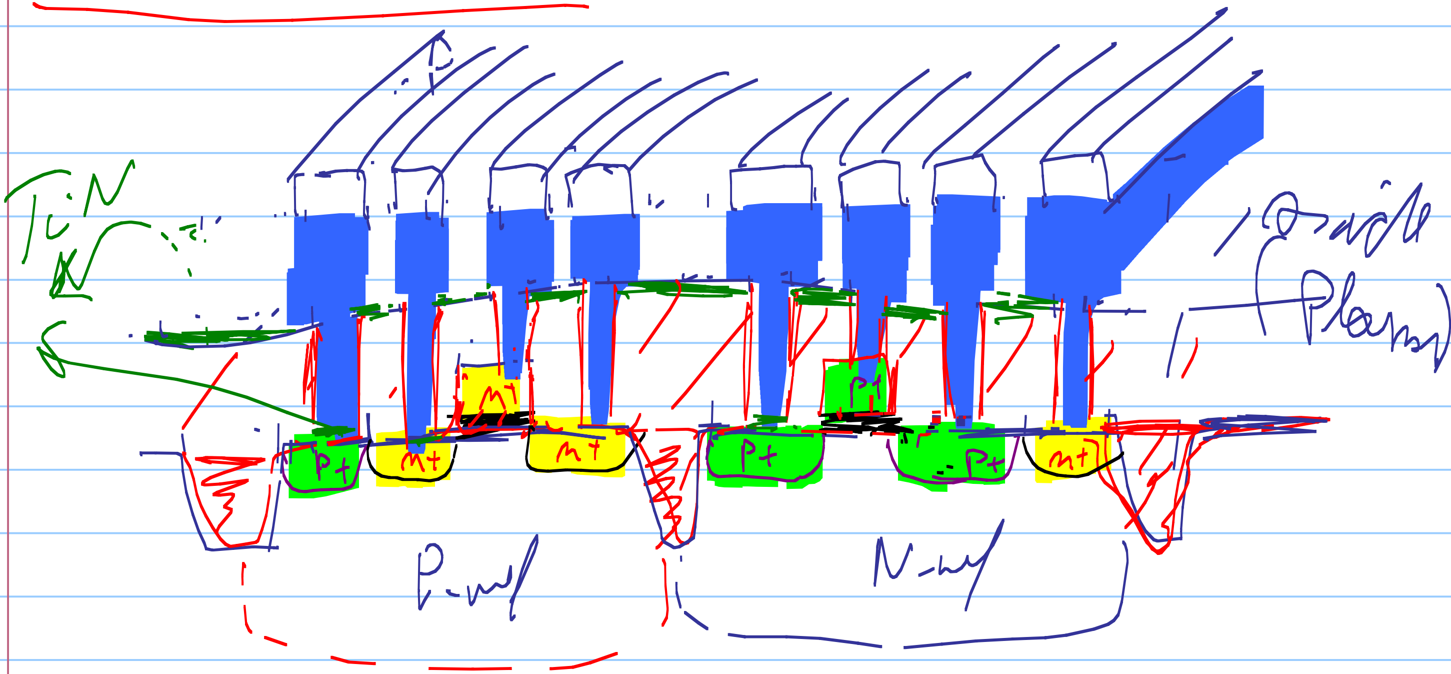
start with lining layer (TiN)

RIE of CVD



TiN + Al Sputtering
+ CMP planarization

Metal 1 (M1) Pattern → Sputter Etch



Metal 2 → PE CVD (Plasma) oxide → Contact Etch

→ Metal sputt → Metal Pattern