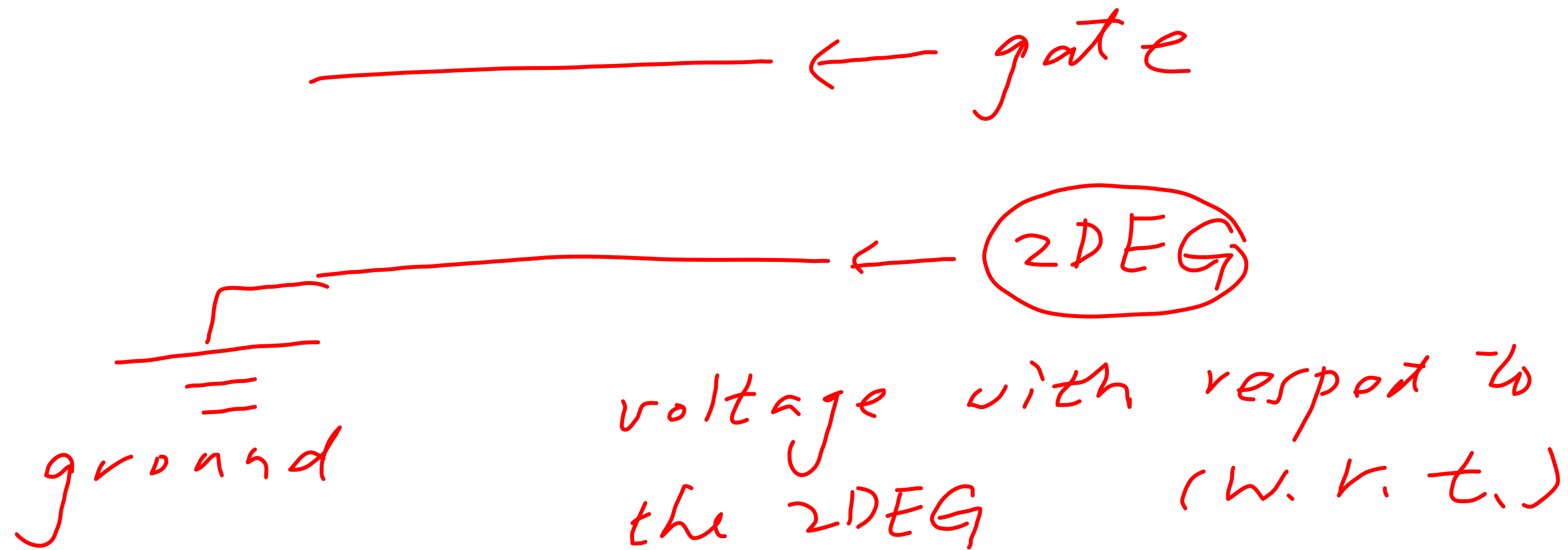


$$\Delta Q = C \Delta V_g$$

$$\Delta Q = e \Delta n_{2D} A$$

(ΔQ ↑ C, e ↑ C)

$\#/m^2$

dielectric constant

$$\epsilon = \epsilon_0 \epsilon_r$$

(ϵ_r: dielectric constant; ϵ_0: vacuum)

$$e A \Delta n_{2D} = C \Delta V_g$$

$$C = \epsilon \frac{A}{d}$$

GaAs = 13.1

FG fixed step in

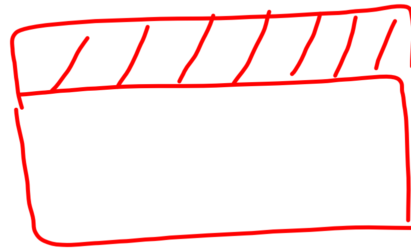
2DEG

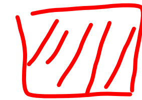
fixed BG

In parallel 並聯

Optical lithography

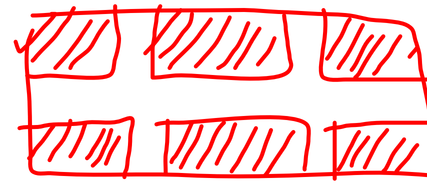
UV

①  → optical resist



light goes through

Mask



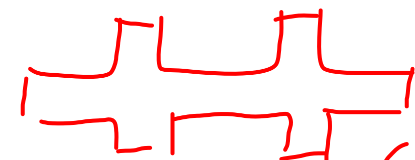
② Spin

③ Bake

④ Expose 曝光 (go) positive resist

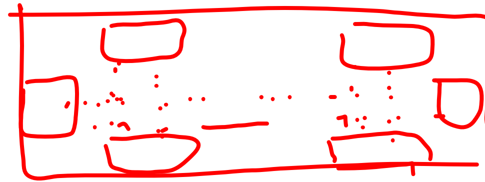
⑤ Develop 顯影 (stay) negative resist

⑥ Wet-etching $H_2SO_4 + H_2O_2$



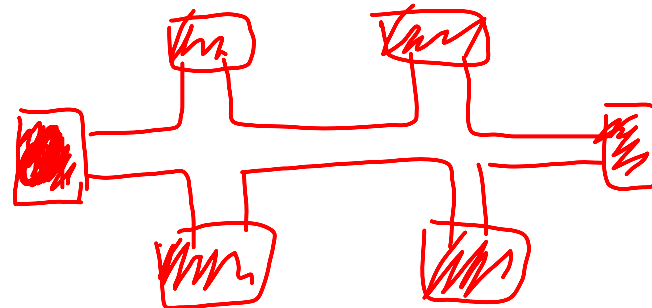
Hall bar (mesa)

Repeat step 1-6



2nd Mask

Evaporation



AuGe/Ni alloy

— Metal

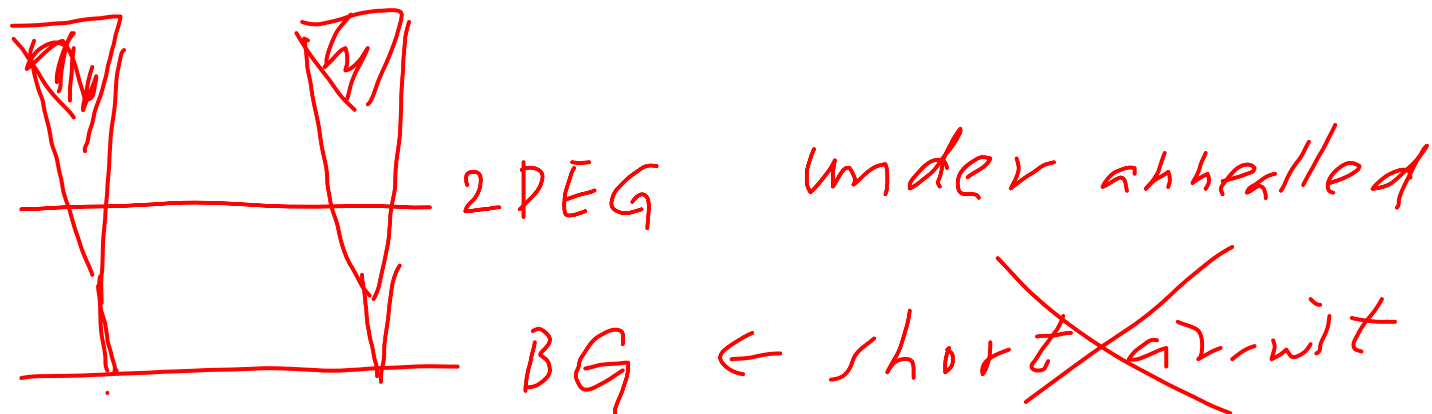
unexposed resist

1/3 of the resist thickness

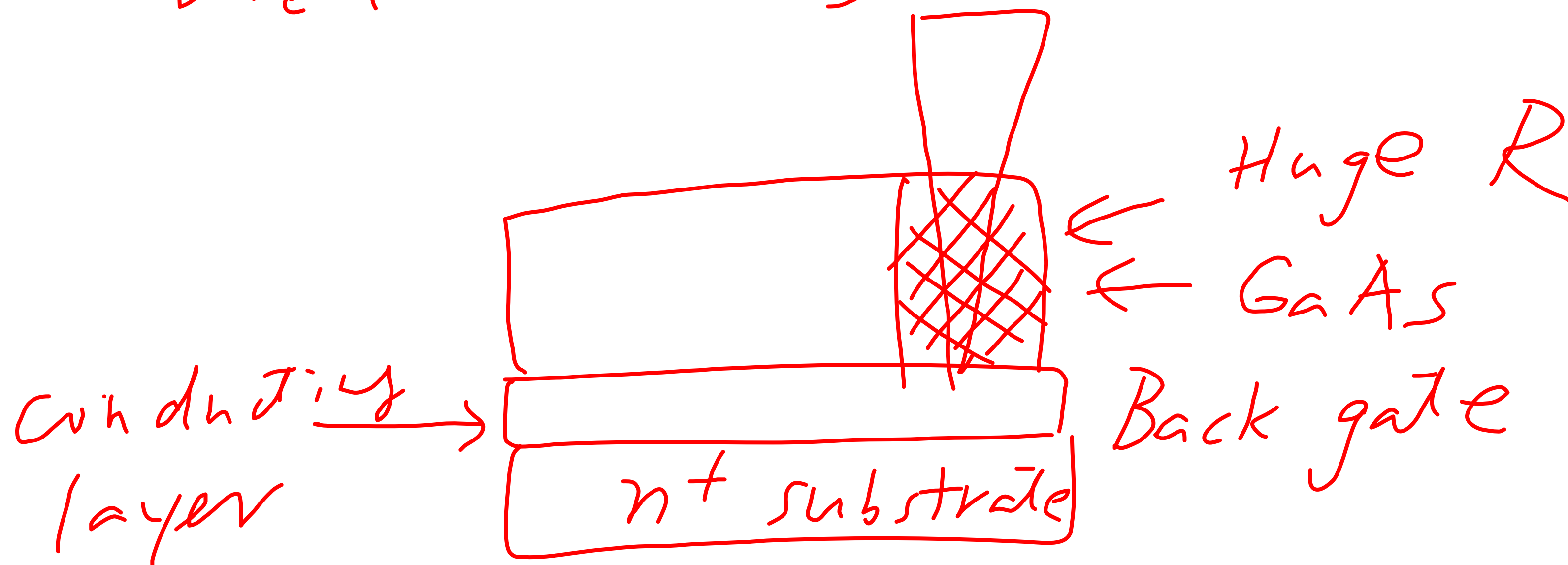
Acetone 丙酮

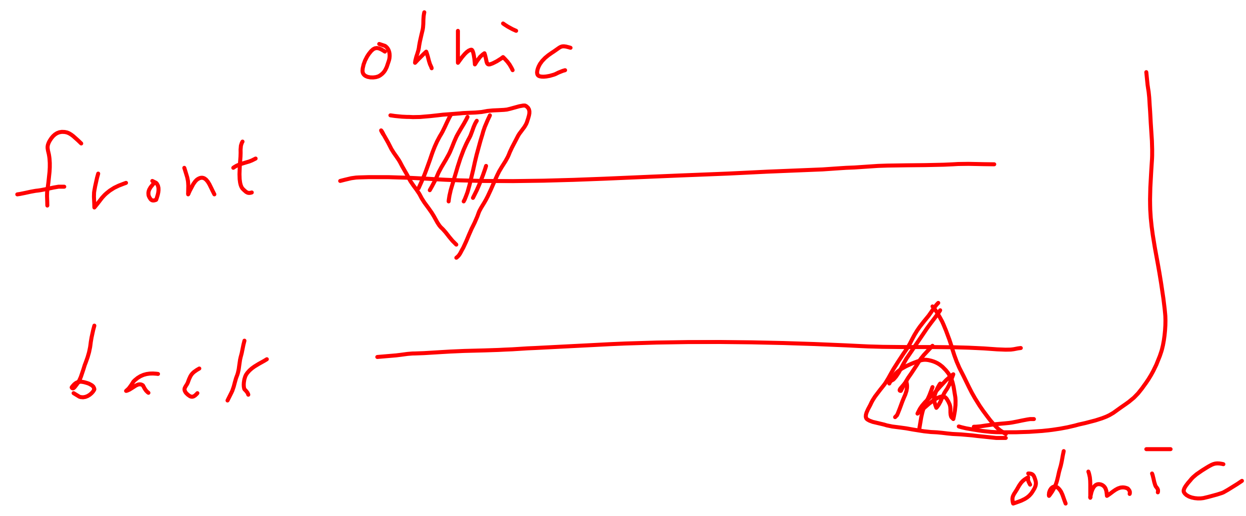
Lift-off

← 2DEG



Ion beam damage a certain area (in-situ)





Independently contacting two closely spaced 2DEGs

Jim Eisenstein Caltech

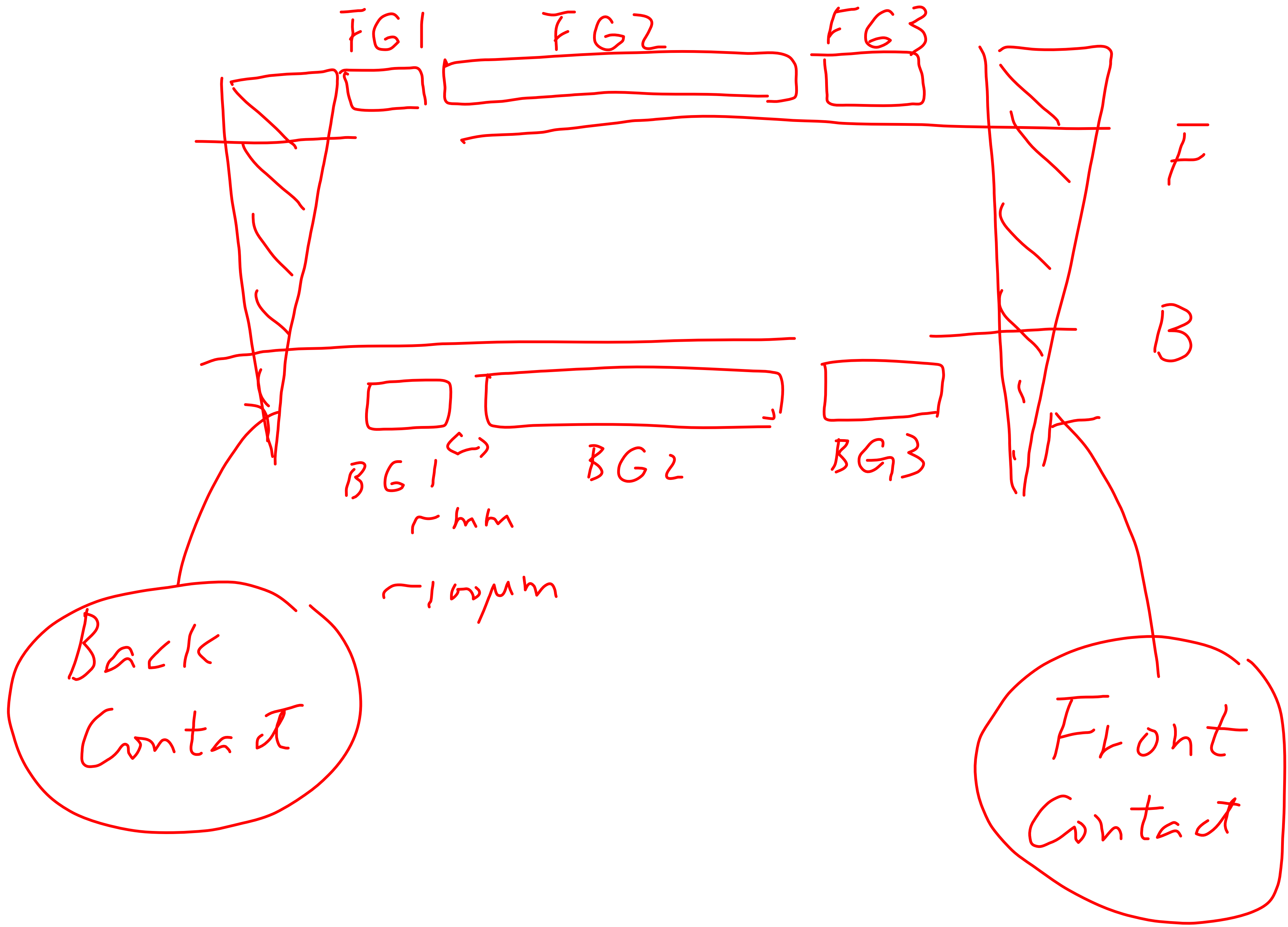
Bell Labs

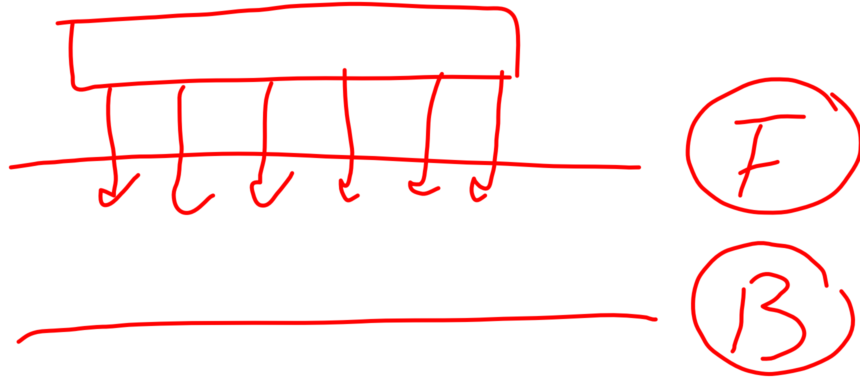
Front 2DEG

back 2DEG

Semi Insulating

Back gate


FG1
FG2
FG3
F
B
BG1
BG2
BG3
~mm
~100μm
Back Contact
Front Contact


F
B