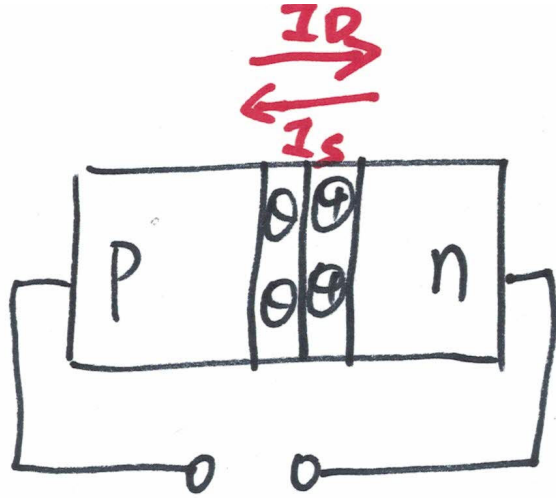


①



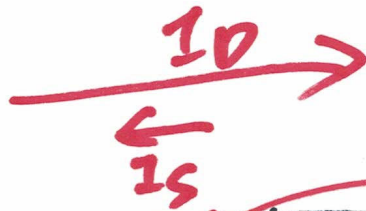
when equilibrium is achieved.

$$I_S = I_D$$

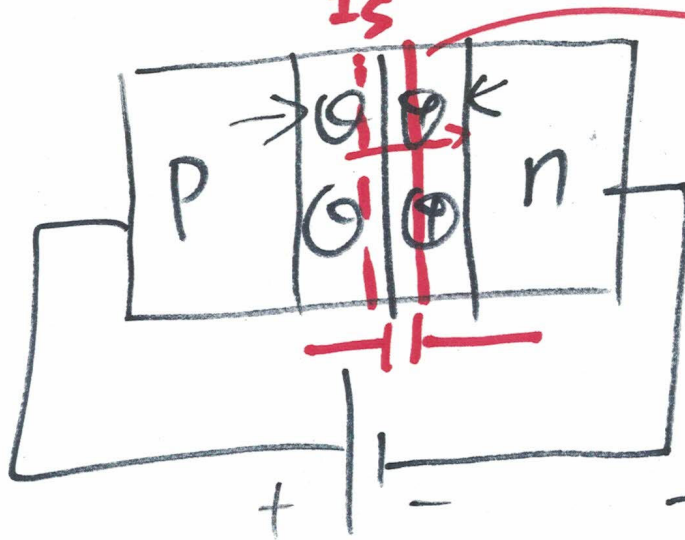
→ Diffusion current



I_S : reverse saturation current (here, is dominated by the drift current)



②



depletion region narrower

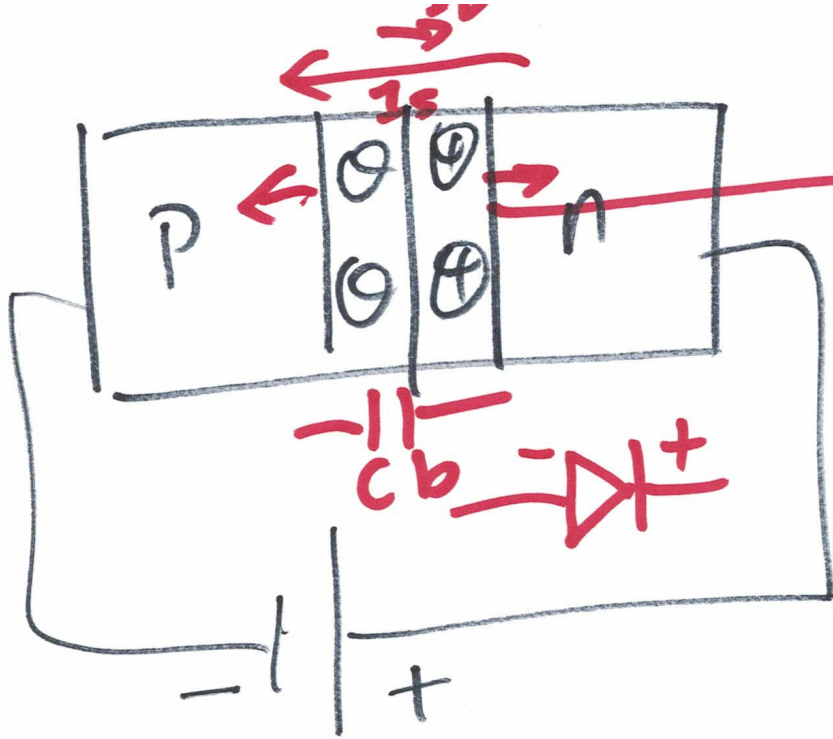
$$C_b \uparrow \quad C = \frac{A}{d} \cdot \epsilon$$

forward bias



①

③



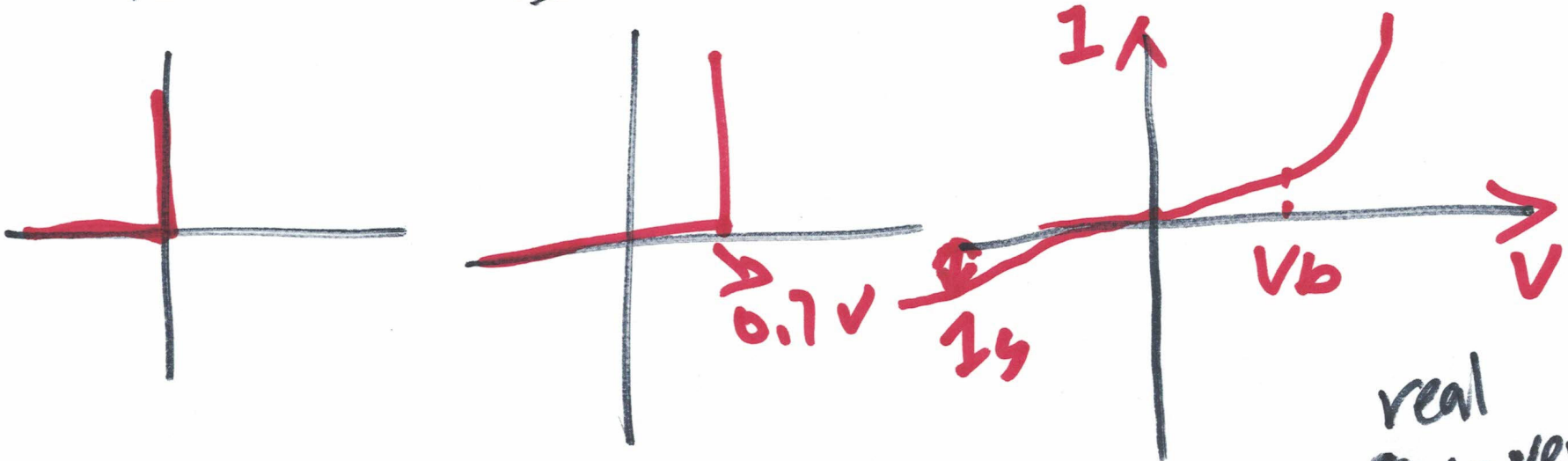
wider
 \Downarrow
 cb \downarrow

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

Reverse bias
 ideal

ideal + V_b

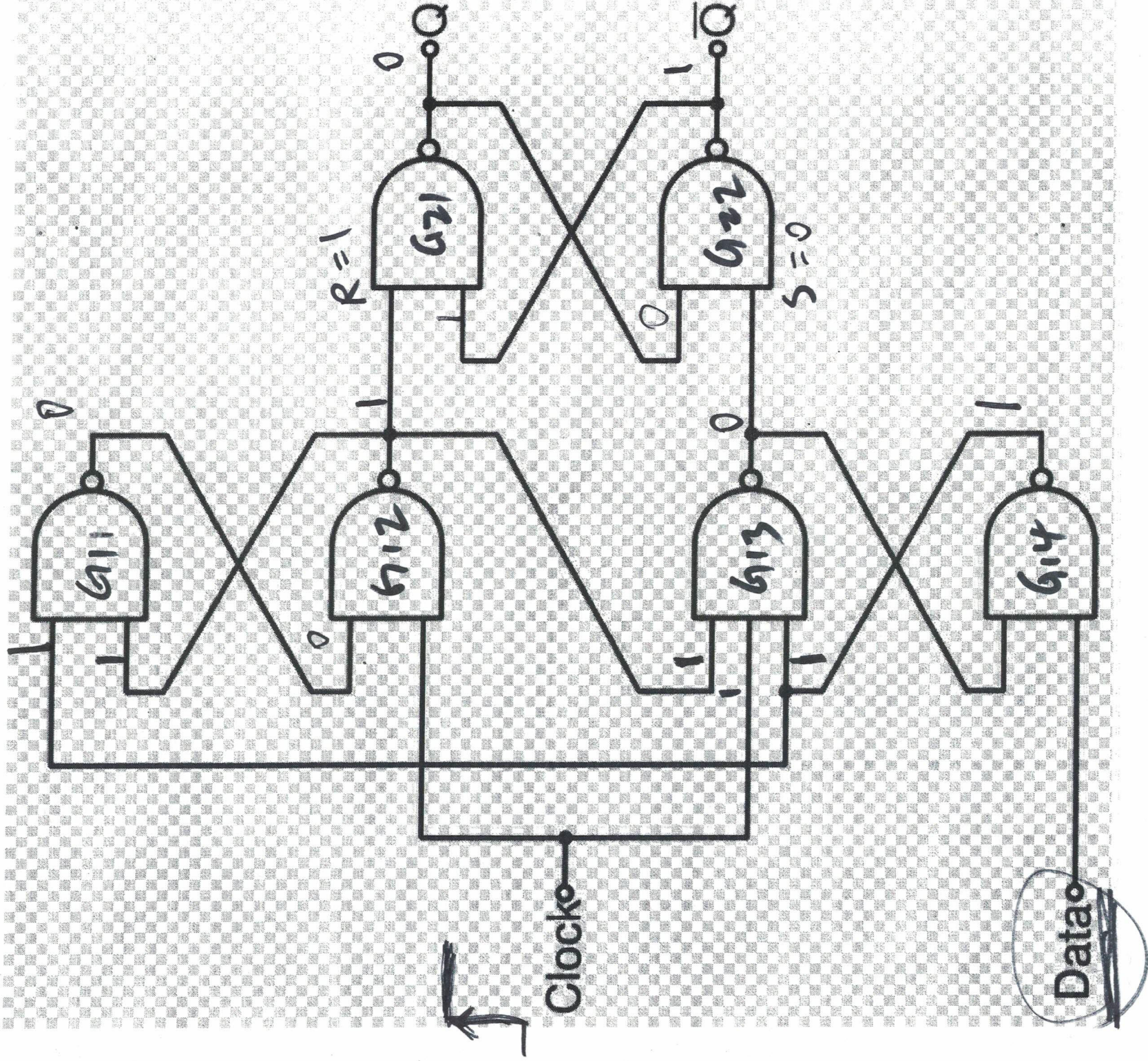
built in voltage
 barrier voltage
 threshold voltage



real
 no reverse breakdown

②

Jack Kilby



synchronous DFF (positive edge-triggered)

