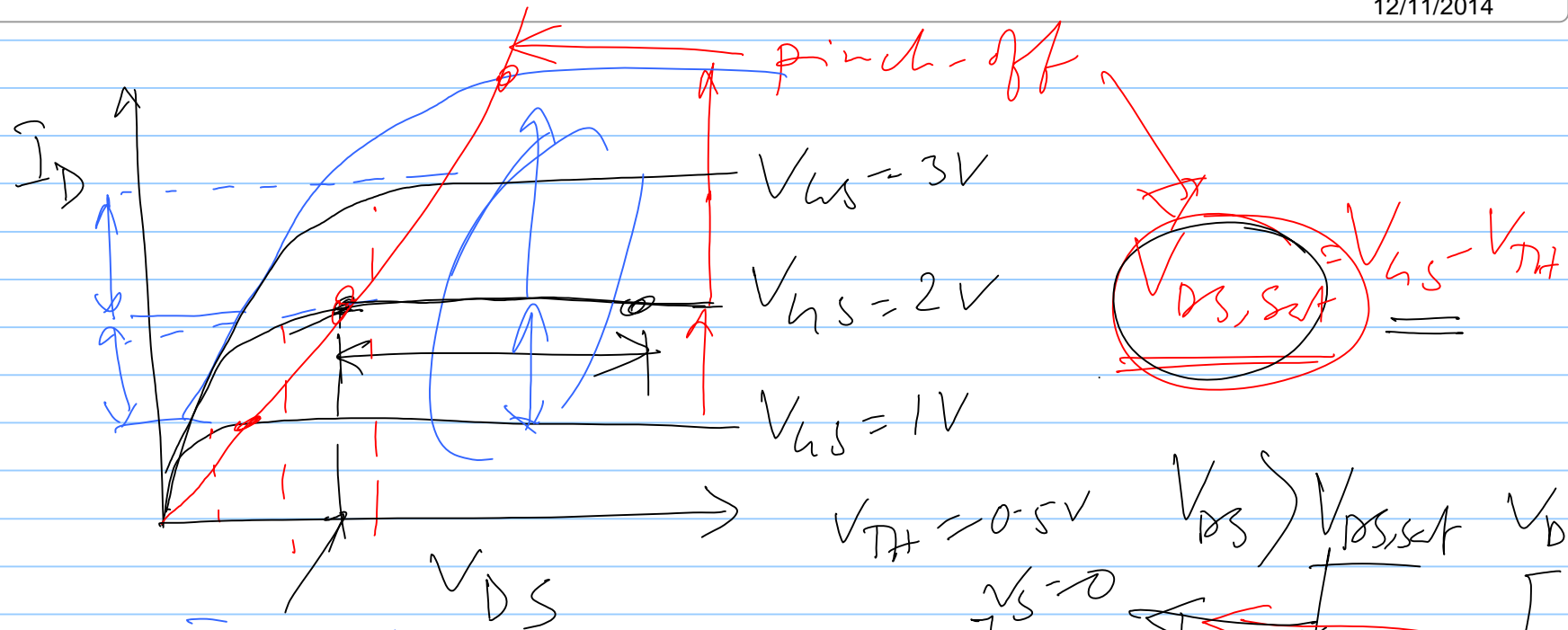
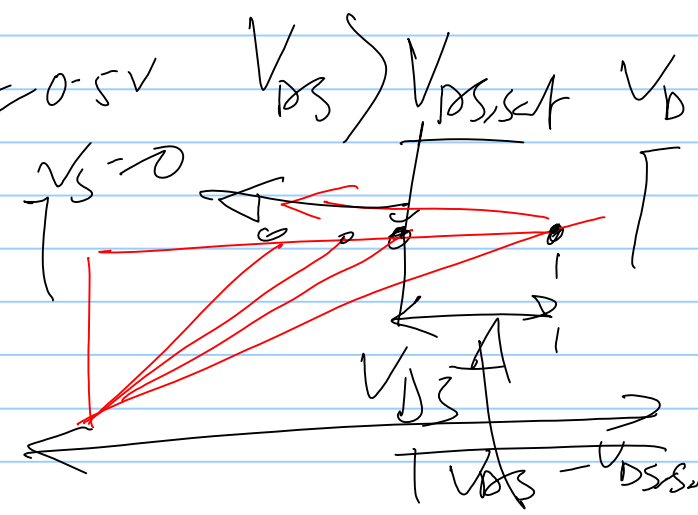


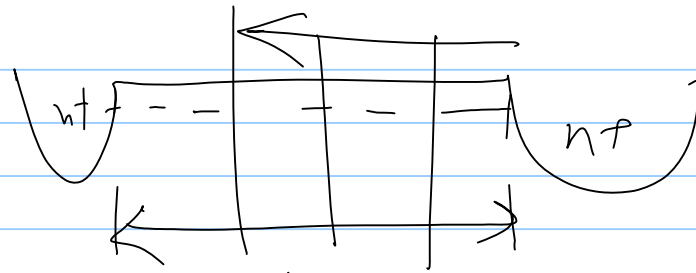
I-V Characteristics of MOSFET

12/11/2014



$$I_D = \frac{\mu_{ns} W C_{ox}}{2L} (V_{GS} - V_{TH})^2$$

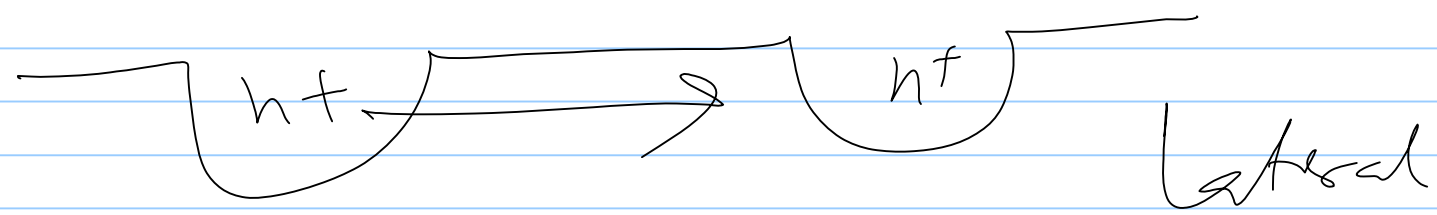
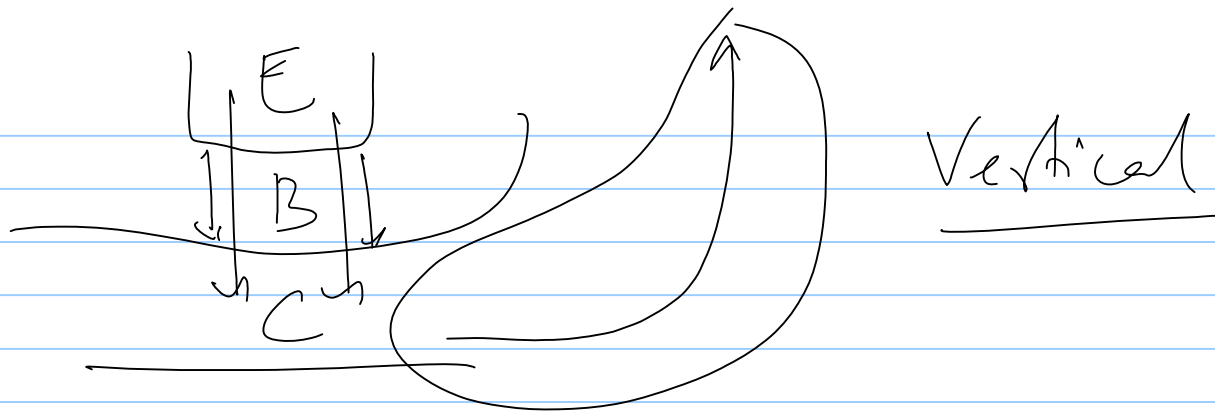




$L \rightarrow$ generation of technology
 \leftarrow scale down transistors

0.25 μm technology.

Transit region \rightarrow gate length
 \rightarrow Base width



$0.25\mu\text{m} \rightarrow L$

20nm $\leftarrow w_b$

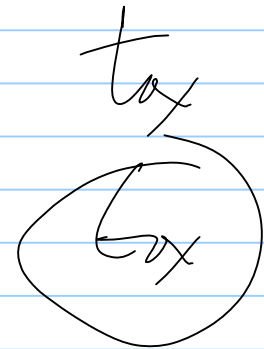
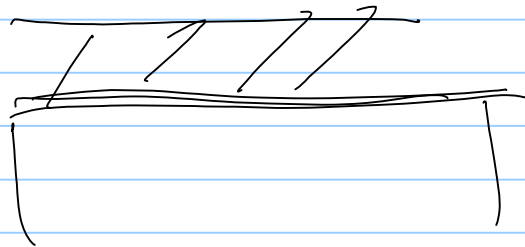
V_{TH}

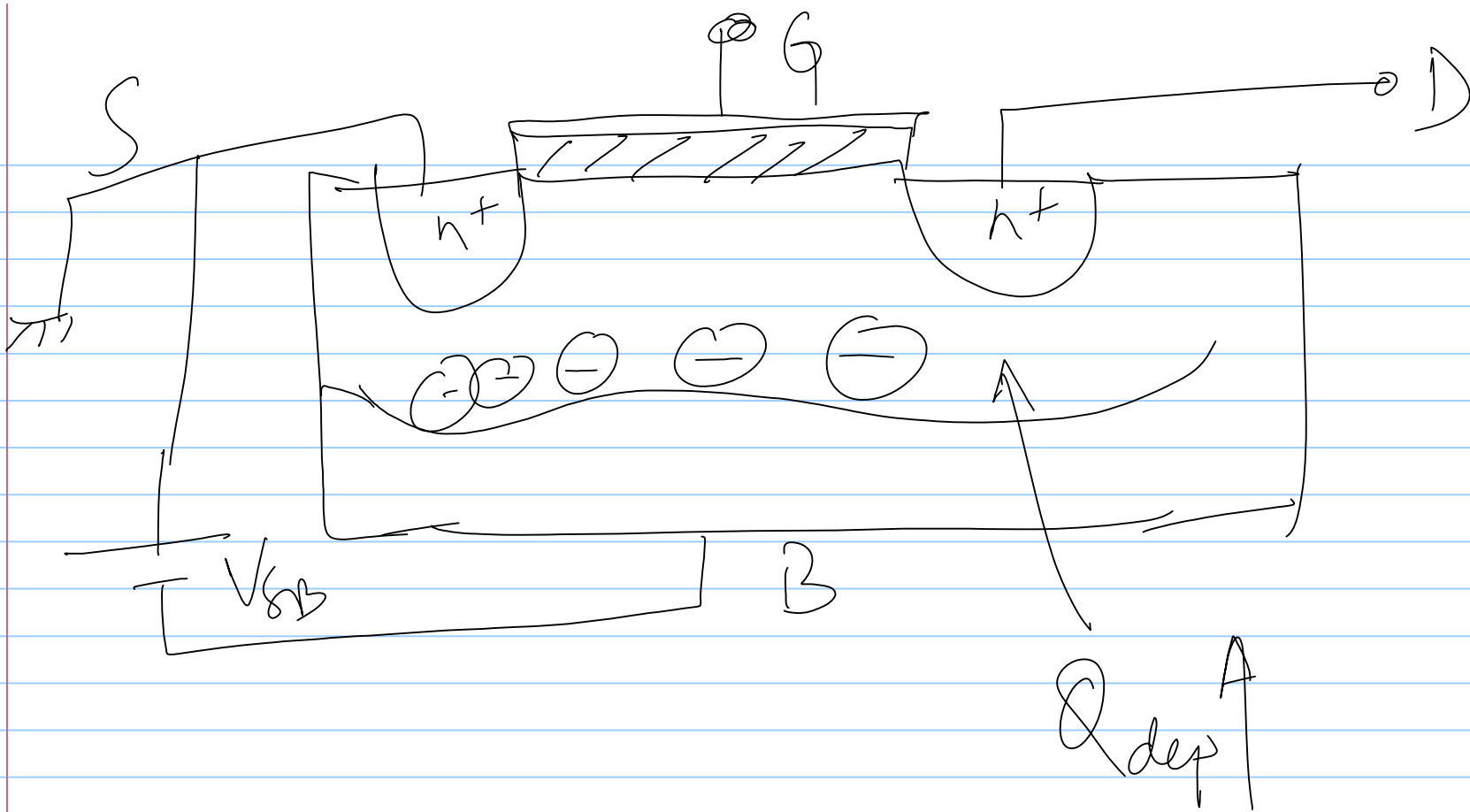
Power supply = 3V

$V_{TH} \neq 4V$

$$V_{TH} = \Phi_{LMS} - \frac{Q_{ox}}{C_{ox}} + 2\phi_F - \frac{Q_{dep}}{C_{ox}}$$

Al, Cu, poly-crystalline Si





$$Q_{dep, new} = -\sqrt{q N_a 2 \epsilon_{si} (2 \phi_F + V_{SD})} = -q N_a W$$

$$Q_{dep} = -\sqrt{q N_a 2 \epsilon_{si} 2 \phi_F}$$

$$W = \sqrt{\frac{2 \epsilon_{si} \phi_F}{q N_a}}$$

$$\underbrace{V_{TH, new} - V_{TH, old}}_{= \Delta V_{TH}} = \frac{\sqrt{q N_a 2 \epsilon_{si} (2 \phi_F + V_{SD})}}{C_{ox}} - \frac{\sqrt{q N_a 2 \epsilon_{si} 2 \phi_F}}{C_{ox}} \sim 0.6V$$

$$\Delta V_{TH} \approx \frac{\sqrt{2qN_A t_0}}{C_{ox}} \sqrt{V_{SB}}$$
