

Lesson 25, 26 :

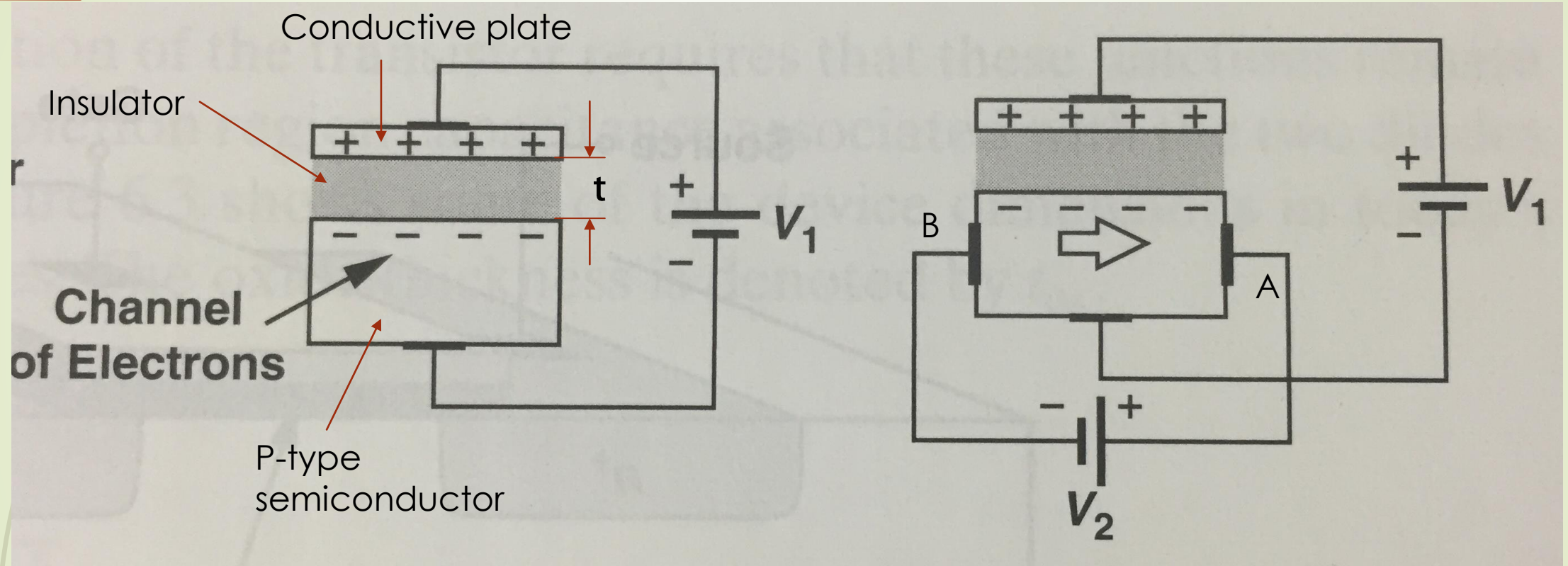
MOSFET

Lecture 29,30

text book 6.1~6.2.2

2012142068 윤여훈

*MOS Structure



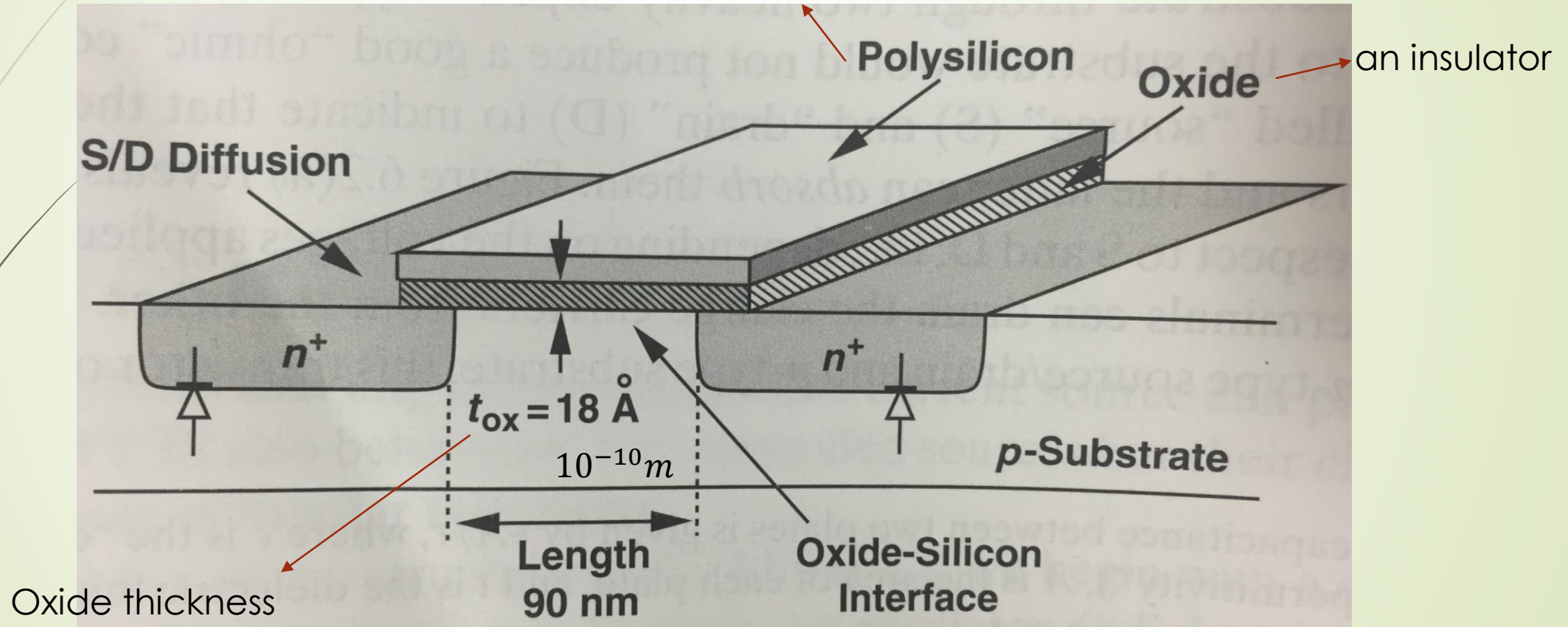
$V_1 \uparrow$ → $Q \uparrow$ → electron density \uparrow
 $t \downarrow$ → $C \uparrow$ → $Q \uparrow$ → electron density \uparrow

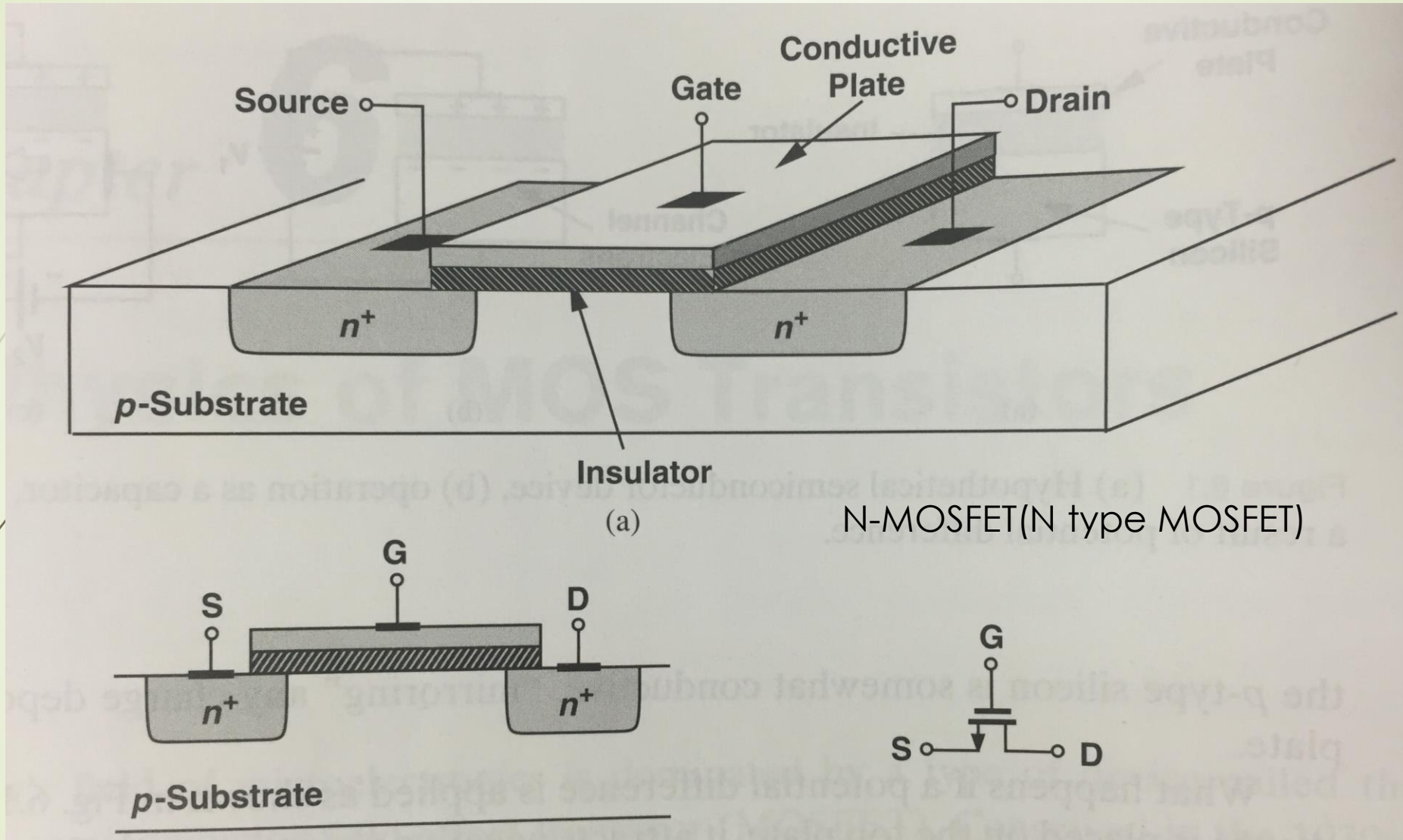
V_2 is applied → I flow from A to B
 $V_1 \uparrow$ → electron density \uparrow → I \uparrow

* Kind of voltage dependent current source

*MOS (Metal - Oxide - Semiconductor)

Not an excellent conductor
but reasonable conductor

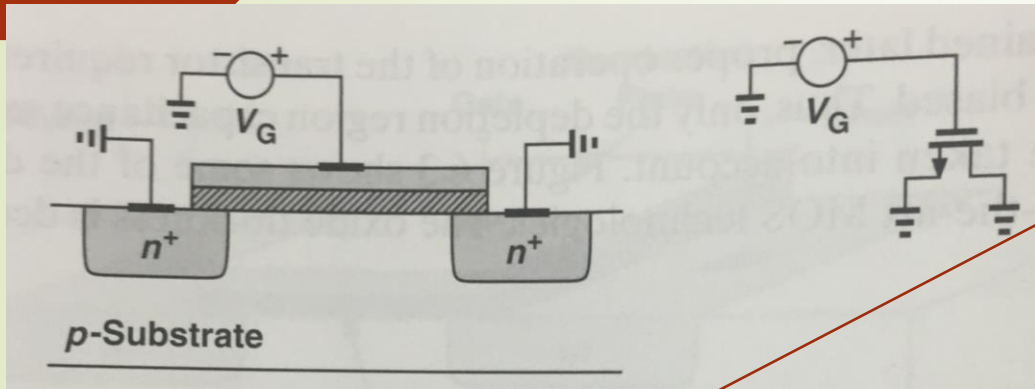




- * MOSFET has four terminals. In many cases we do not draw substrate connection.
- * MOSFET is symmetric.

MOS Operation

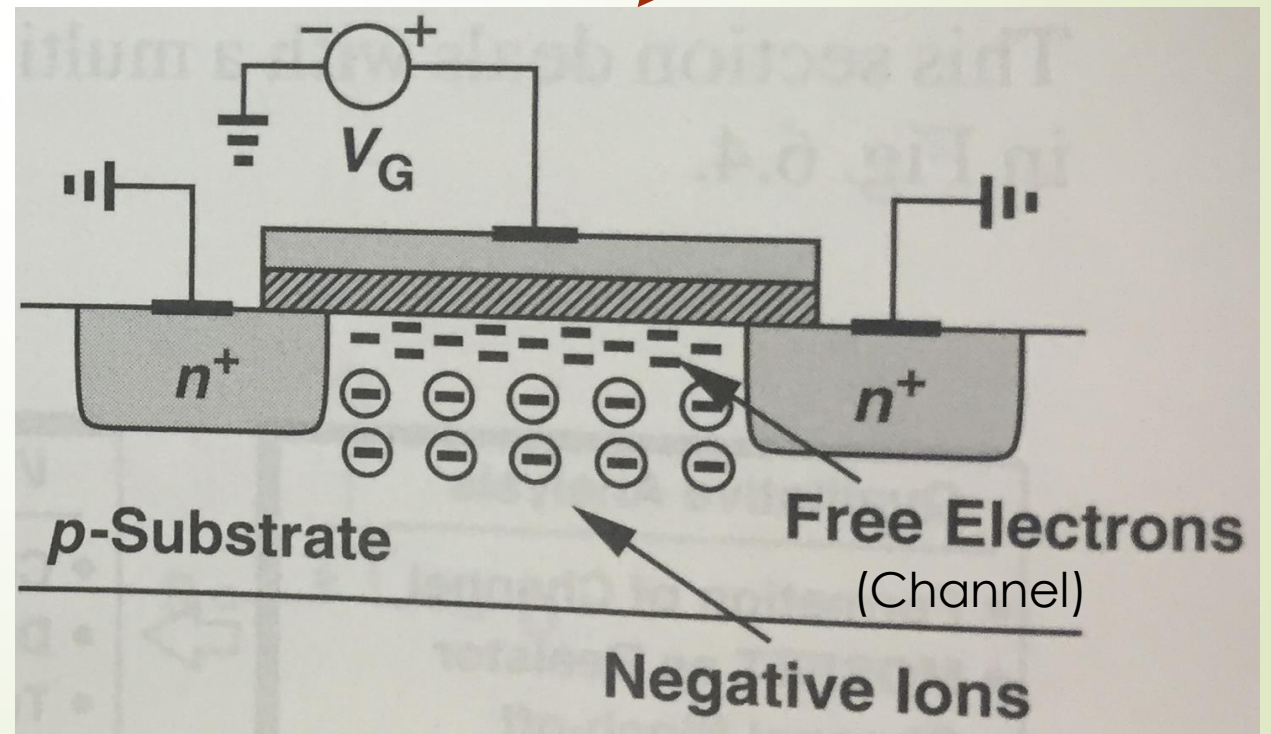
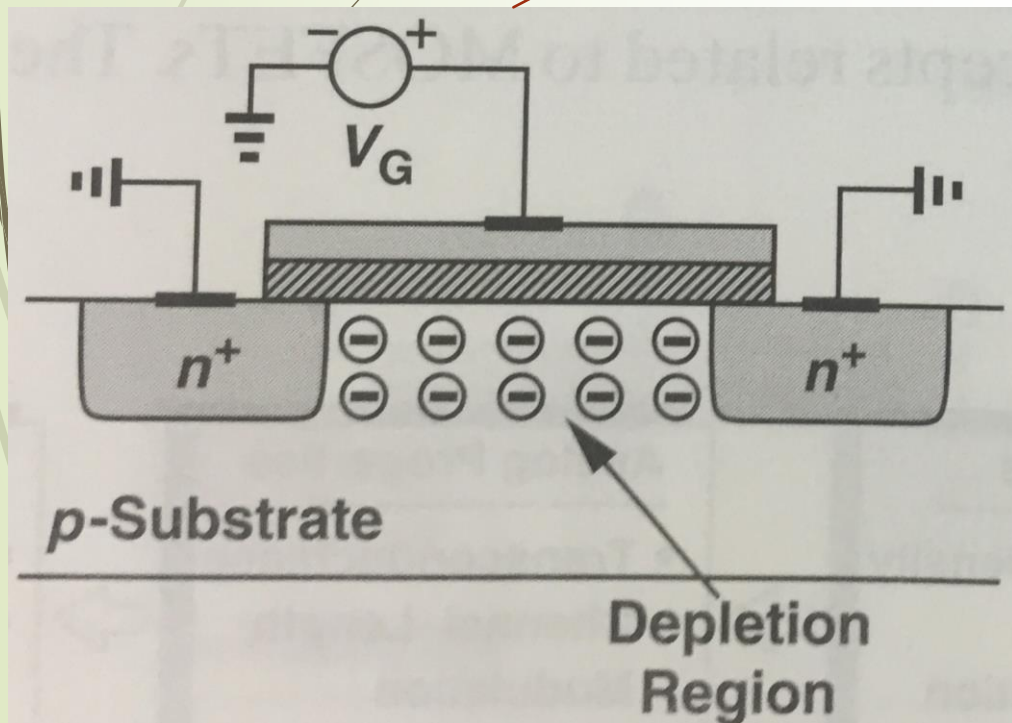
V_{TH} (threshold voltage) is about 0.3~0.4V



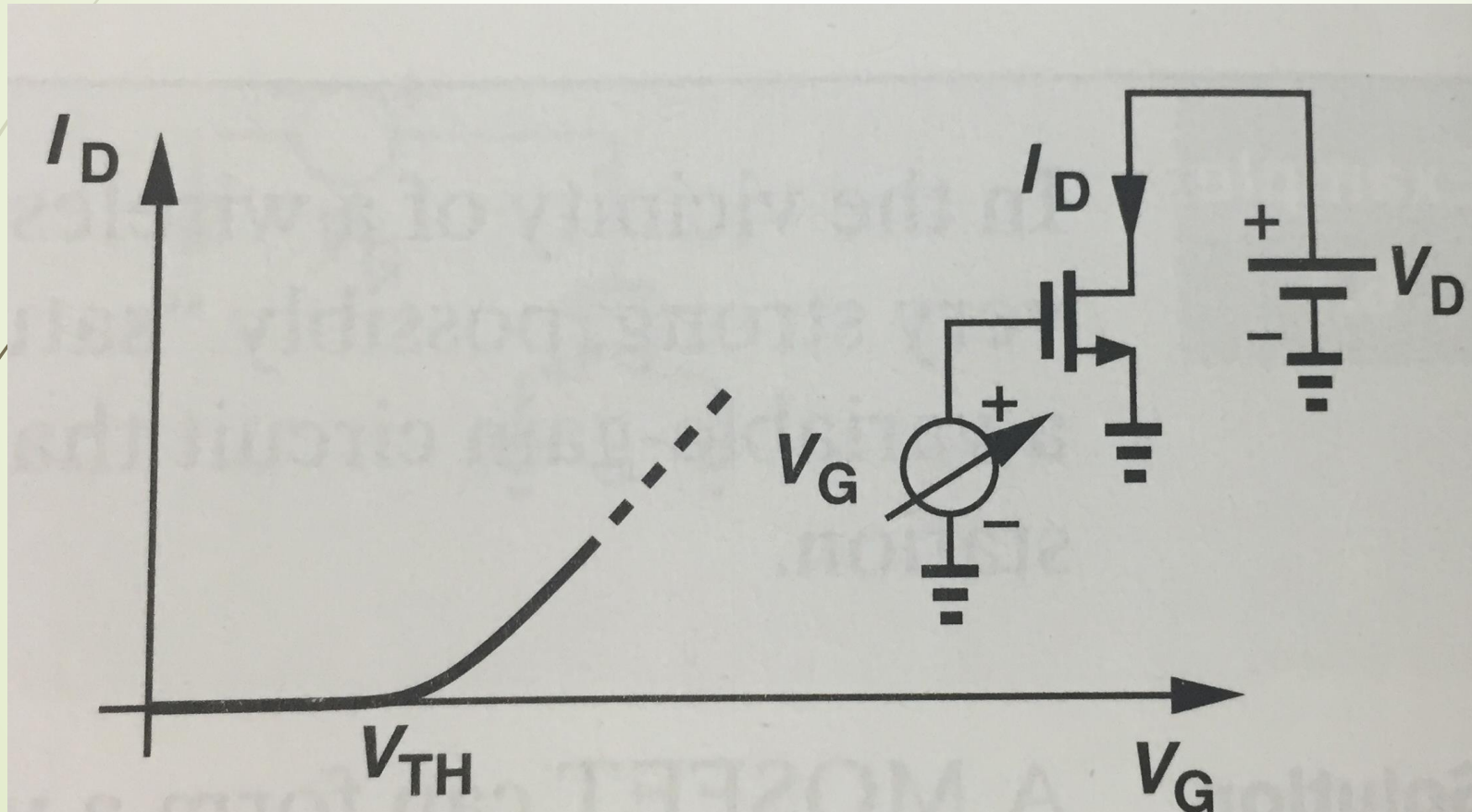
$V_G < V_{TH}$, there's no current between D, S

When V_G reaches V_{TH}

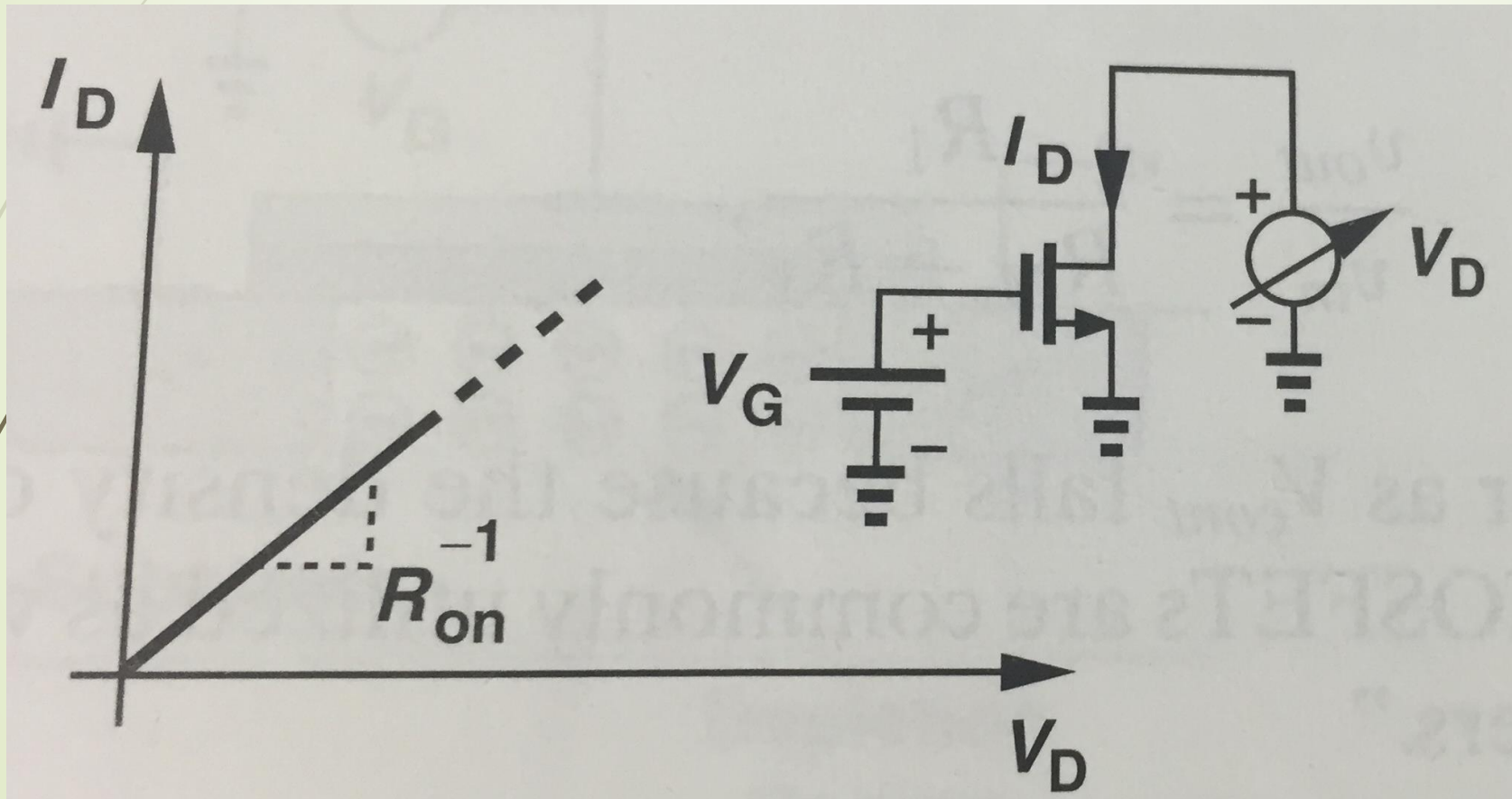
Channel of the electrons can conduct current



Assume $V_D > V_S = 0$, $V_D = \text{constant}$,
and vary V_{GS}

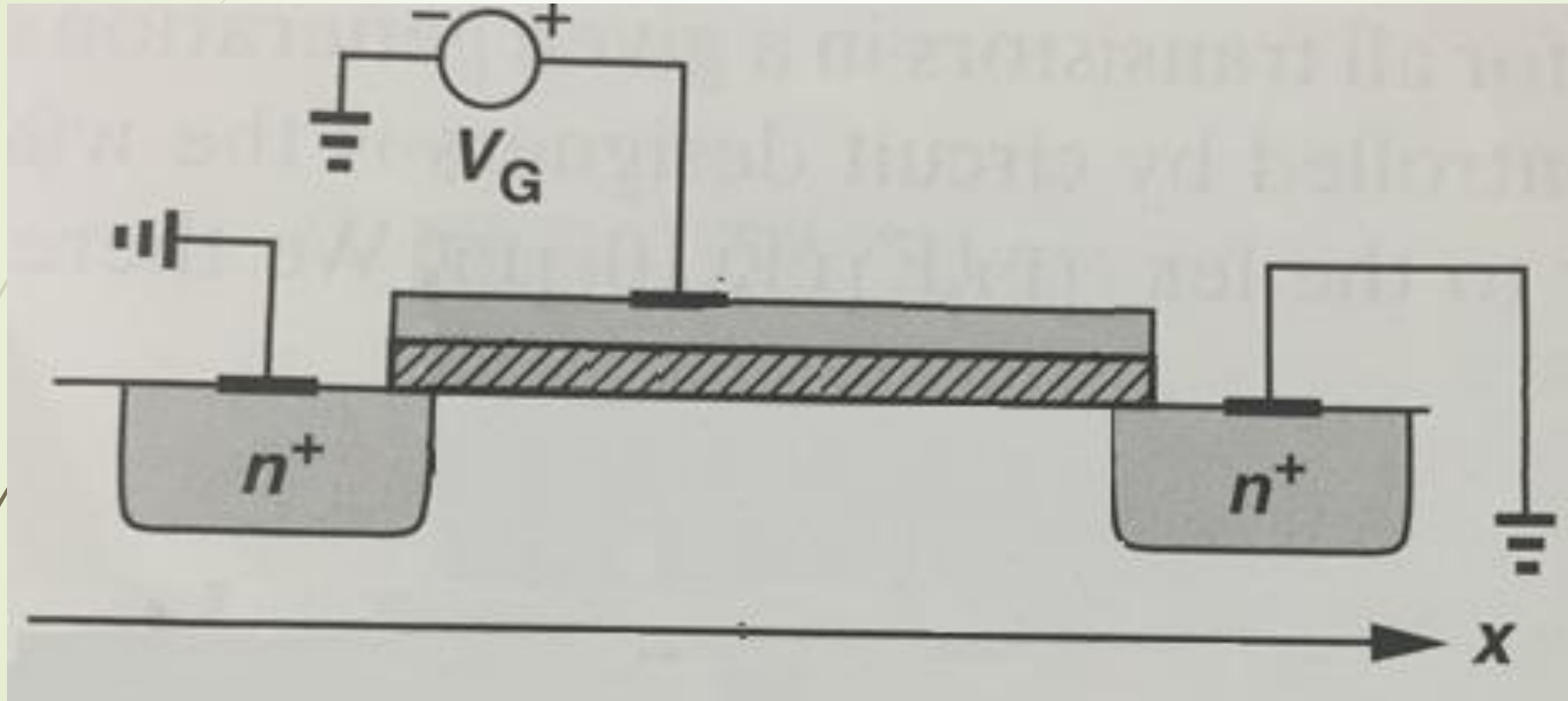


Assume $V_D > V_S = 0$, $V_{GS} = 1V$ (constant),
and vary V_D



* Behavior of channel

Case I : $V_{GS} > V_{TH}$, $V_S = V_D = 0$

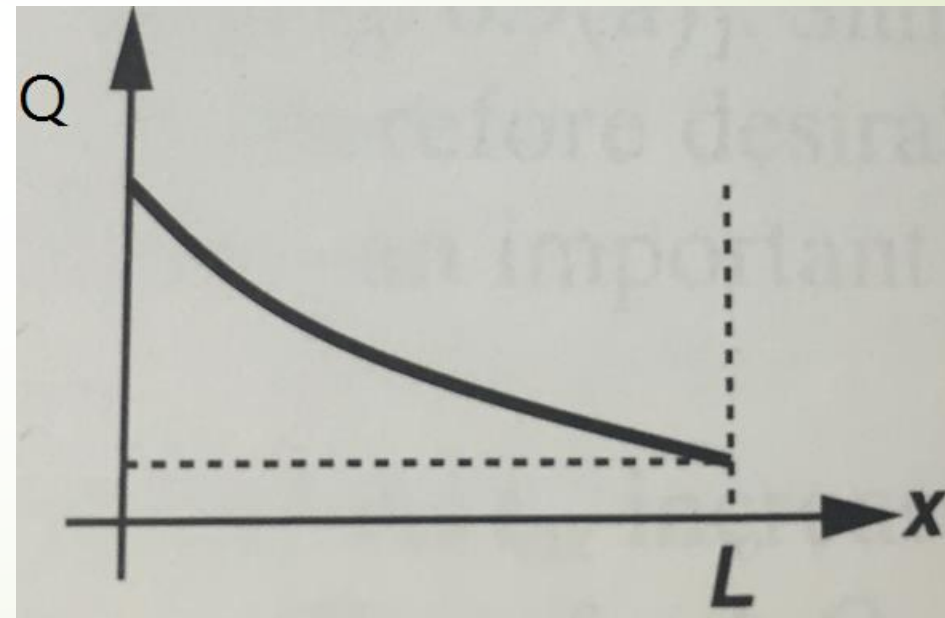
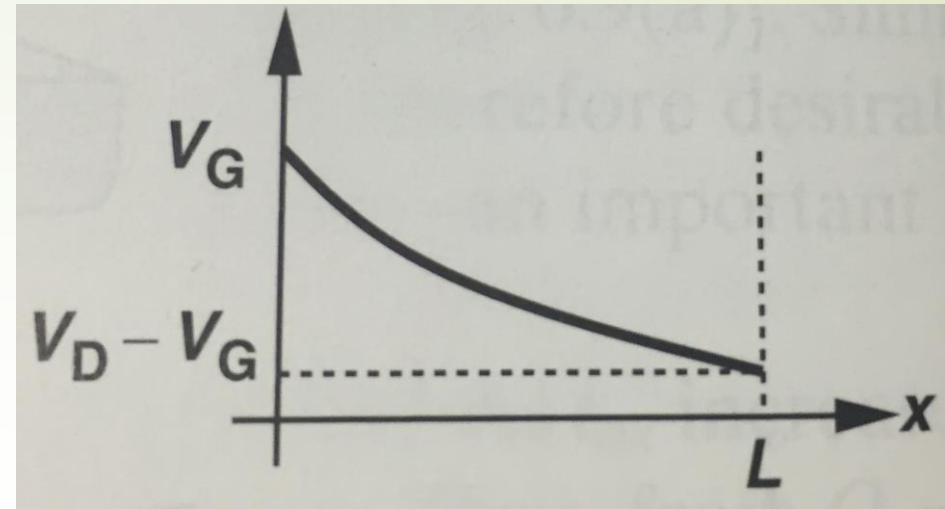
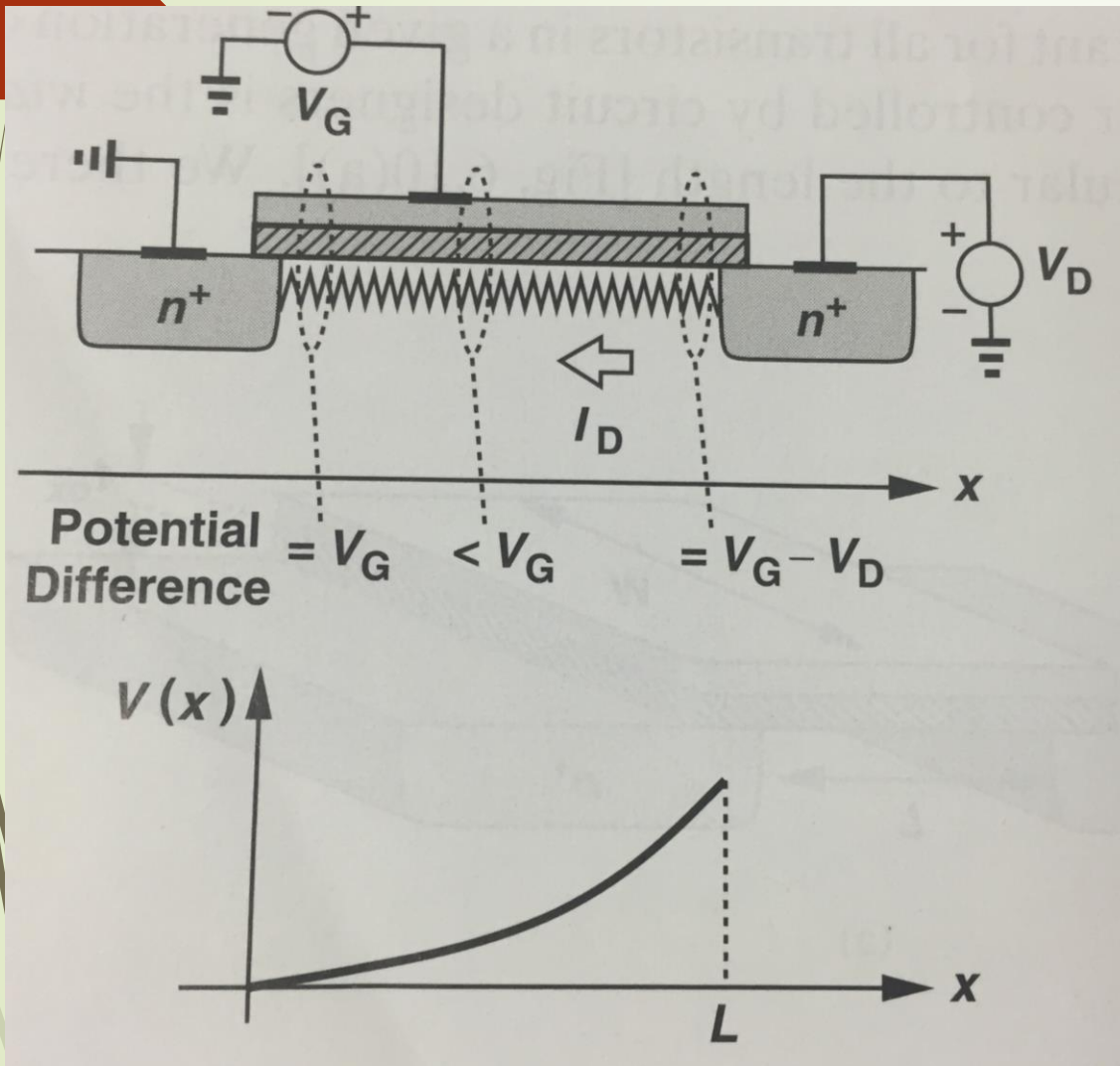



Channel of free electrons exist \rightarrow ON

But no current.

Charge density of all part of channel are same. ($Q = CV$, V is same)

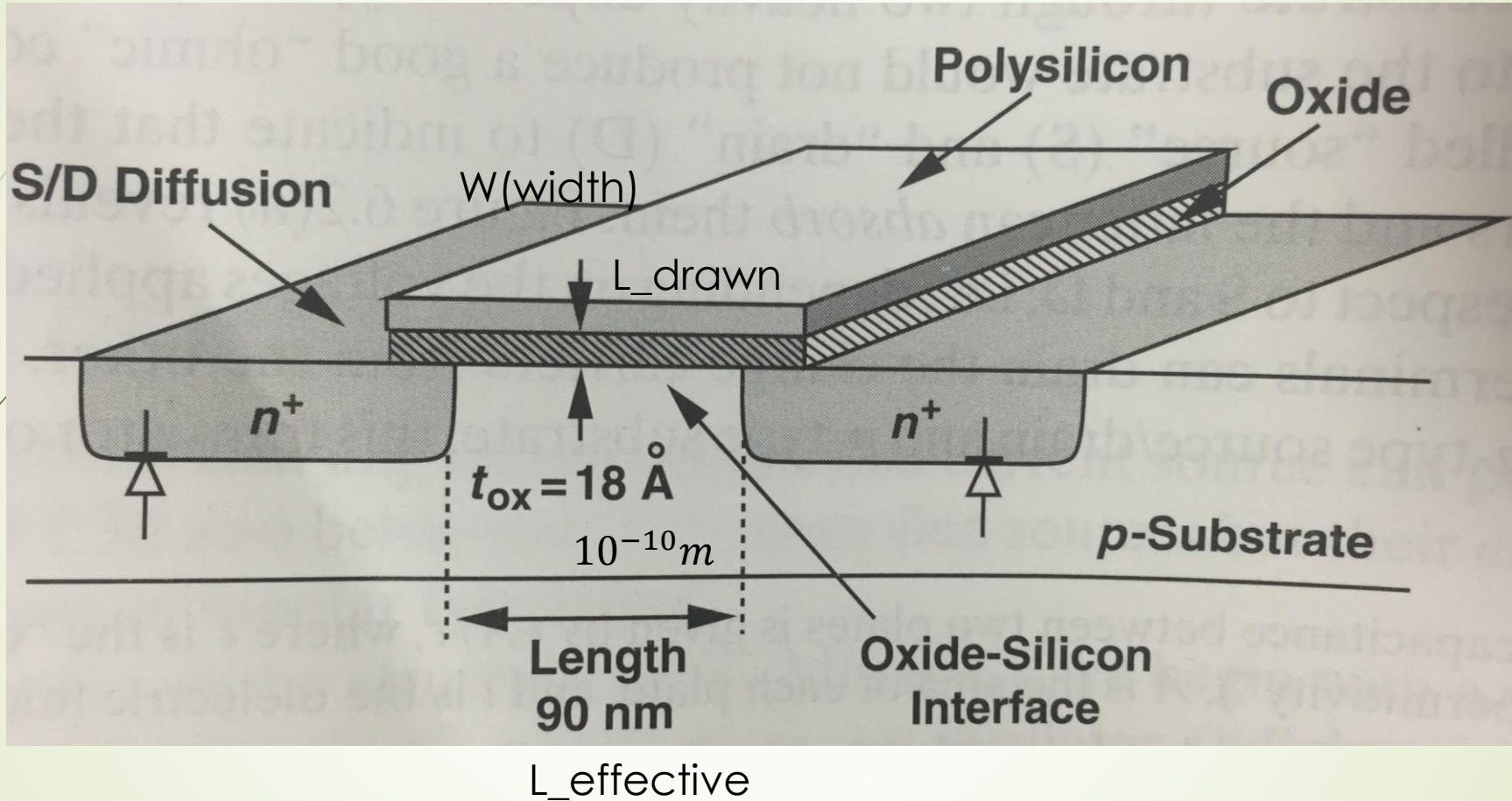
Case II : $V_{GS} > V_{TH}$, $V_S = 0$, $V_D > 0$



Channel of free electrons exist  ON
Conduct current.

Charge density of all part of channel are different.

* Dimension of MOSFET



During fabrication, inevitable overlaps occur.
We will use L_{eff} as L .

