DIC L1: Introduction

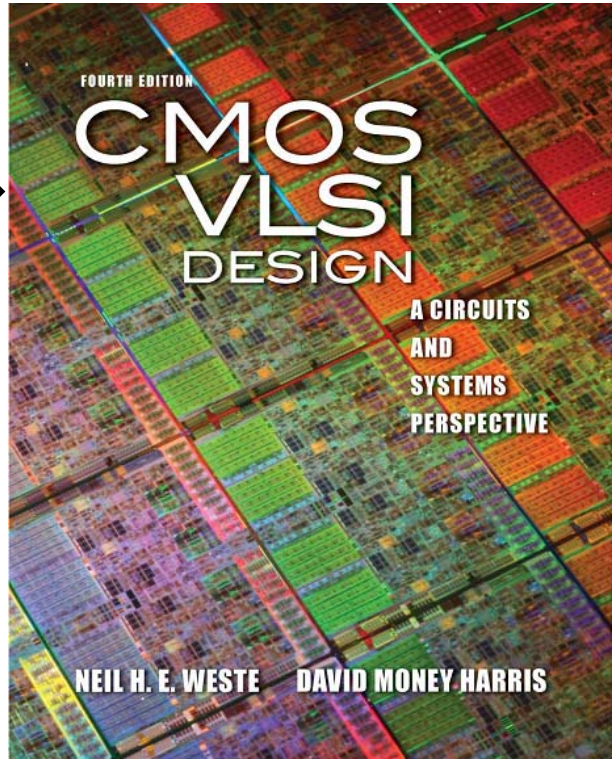
Sung-Min Hong (smhong@gist.ac.kr)

Semiconductor Device Simulation Lab.
School of Electrical Engineering and Computer Science
Gwangju Institute of Science and Technology

GIST Lecture on September 10, 2019

Course

- Digital Integrated Circuits, Fall 2019
  - Instructor: Sung-Min Hong
  - Textbook ➔➔➔➔➔➔➔➔➔➔➔➔➔➔➔



Resources

- Lecture PPT files (Converted to PDF format)
  - GitHub repository is found as

    https://github.com/hi2ska2/dic2019f
- YouTube channel
  - Sorry, limited availability in this semester

    https://www.youtube.com/channel/UCSmzU9aDVgIa4bo_R47mI2Q?view_as=subscriber
- Textbook
  - Supplementary materials are available at:

    http://pages.hmc.edu/harris/cmosvlsi/4e/index.html

1.3. MOS transistors (1)

- Metal-Oxide-Semiconductor Field Effect Transistor (MOSFET)
  - Four terminals: Gate, source, drain, and body(/substrate)
  - NMOSFET & PMOSFET

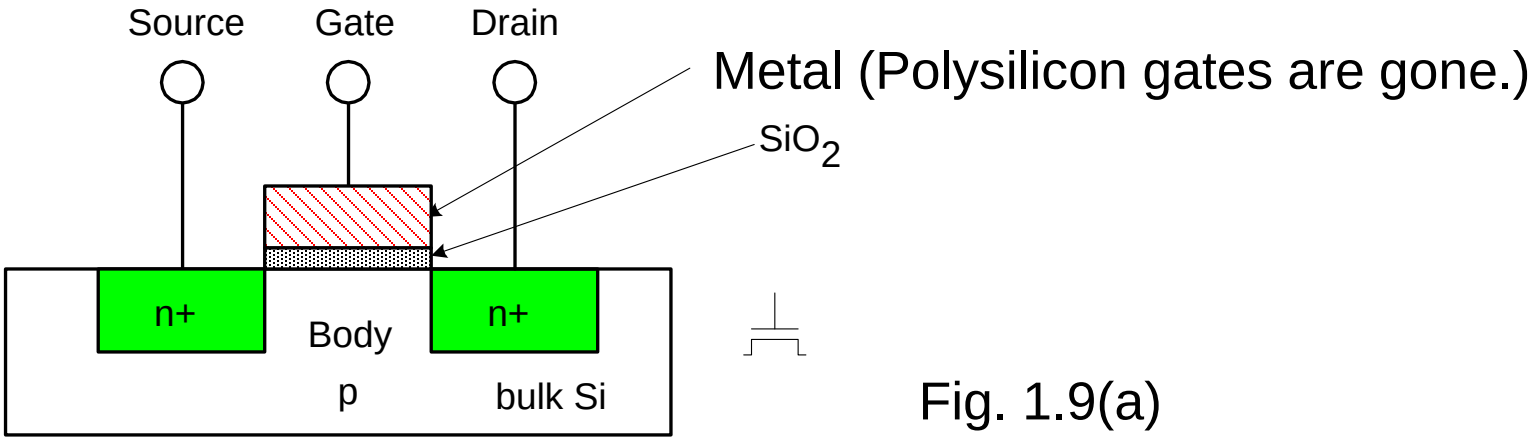
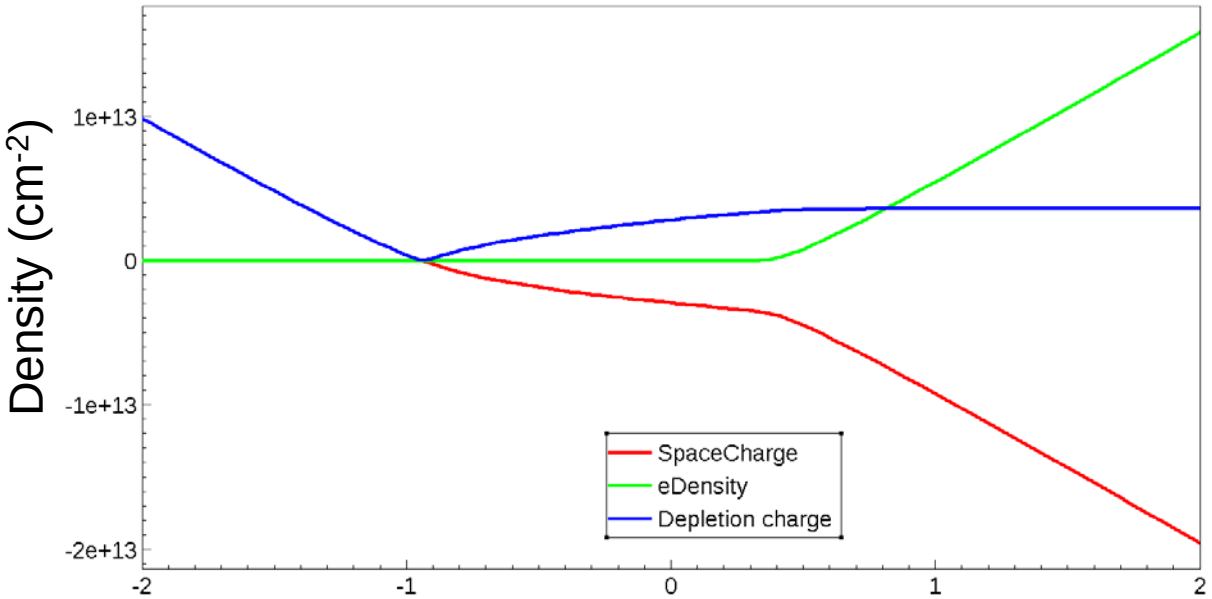


Fig. 1.9(a)

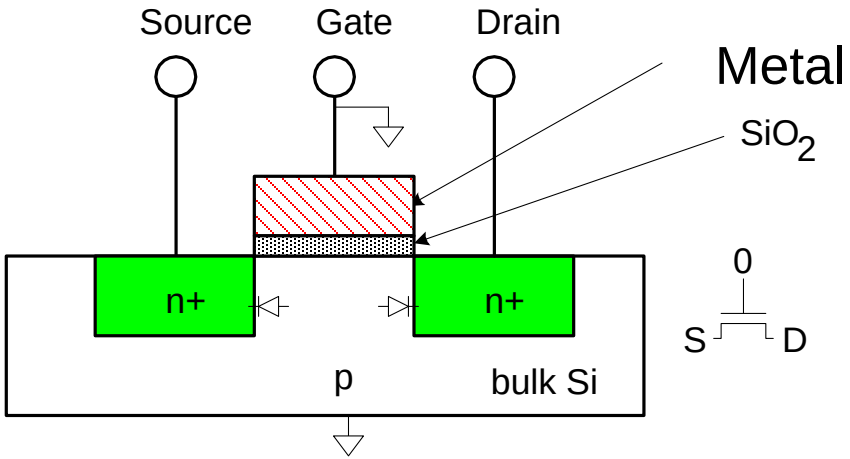
1.3. MOS transistors (2)

- MOS capacitor
  - It is a “nonlinear” capacitor.



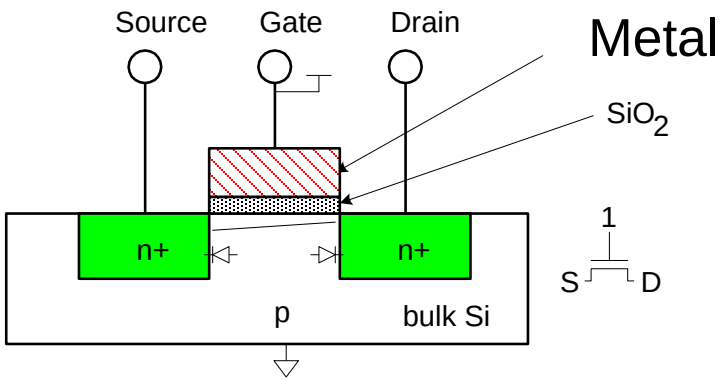
1.3. MOS transistors (3)

- Body is tied to ground (GND).
- When $V_{GS} \equiv V_G - V_S$ is low, (BTW, “low” means what?)
  - No current flows.
  - The transistor is said to be OFF.



1.3. MOS transistors (4)

- When $V_{GS} \equiv V_G - V_S$ is high, (Again, “high” means what?)
  - Current can flow from the source thorugh the channel to the drain.
  - The transistor is said to be ON.



1.3. MOS transistors (5)

- PMOS
  - Similar, but doping and voltages are reversed.
  - Body is tied to V_{DD}.
  - V_{GS} is negative.

Metal (Polysilicon gates are gone.)

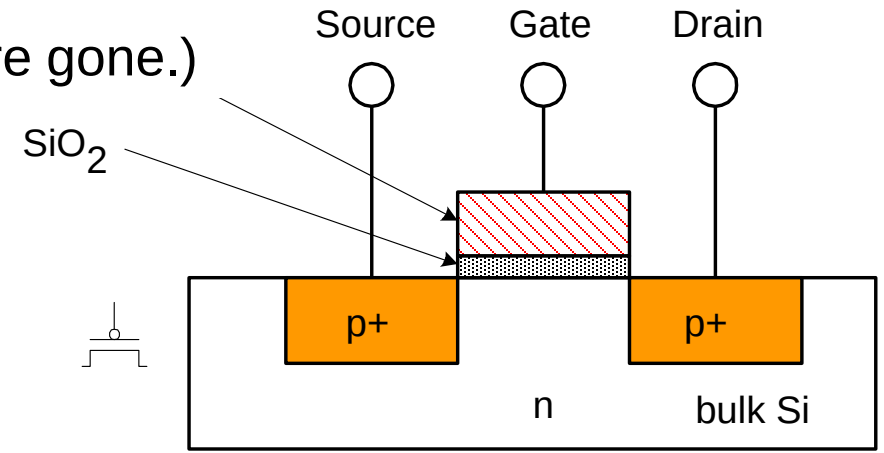


Fig. 1.9(b)