COL215L: Digital Logic & System Design

Lecture 3: CMOS Circuits (Cont.)

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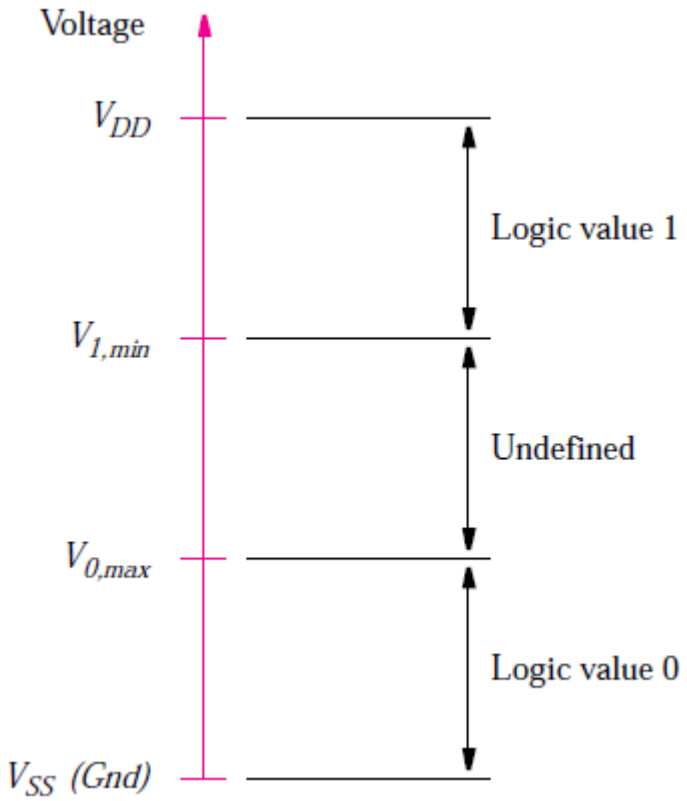
Digital Logic

- Any system
  - Storage
  - Computation
  - Communication

- Implementation of any system
  - Digital logic (0-1)

- Realization of digital logic
  - Transistors for controlling voltages that we interpret as 0 or 1

Digital Logic and Voltage Values



Mapping of digital logic and voltage values [Brown & Vranesic].

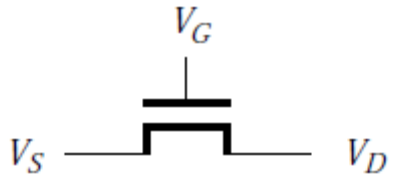
Realizing the Mapping

- Metal Oxide Semiconductor Field-effect Transistor (MOSFET)
  - n-channel MOSFET (NMOS)
  - p-channel MOSFET (PMOS)

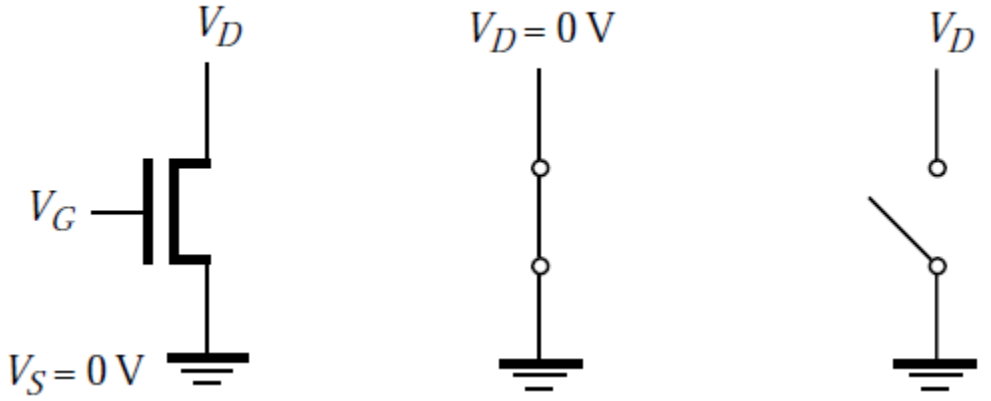
- Complementary MOS (CMOS)
  - Circuits using both NMOS and PMOS

NMOS

- Drain
- Source
- Gate

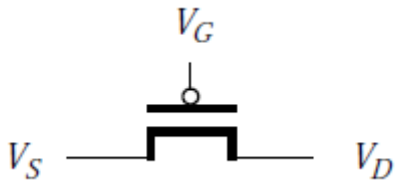


NMOS [Brown & Vranesic].

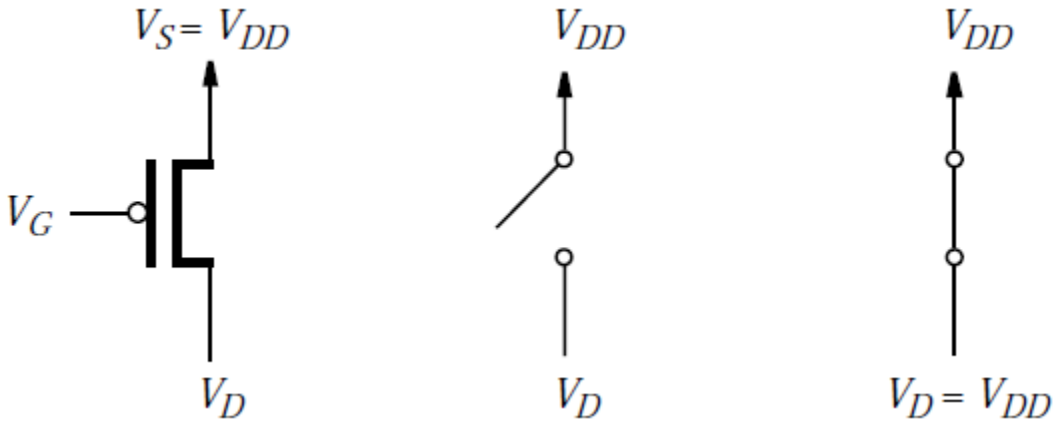


NMOS logic circuit [Brown & Vranesic].

PMOS

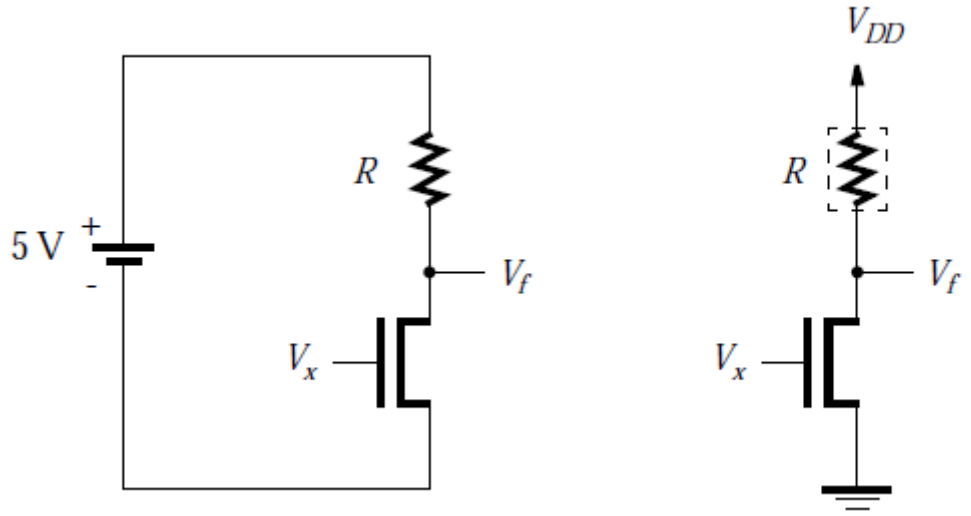


PMOS [Brown & Vranesic].

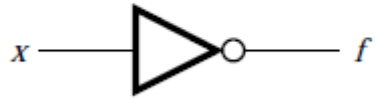


PMOS logic circuit [Brown & Vranesic].

Realizing NOT using NMOS

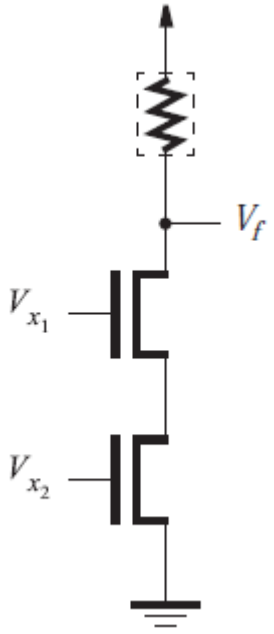


NOT Circuit [Brown & Vranesic].



Representation.

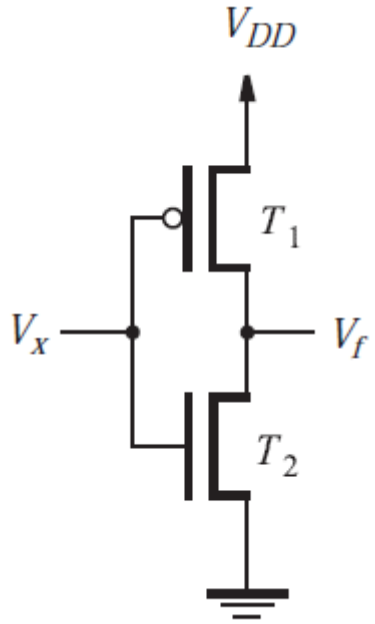
Realizing NAND using NMOS



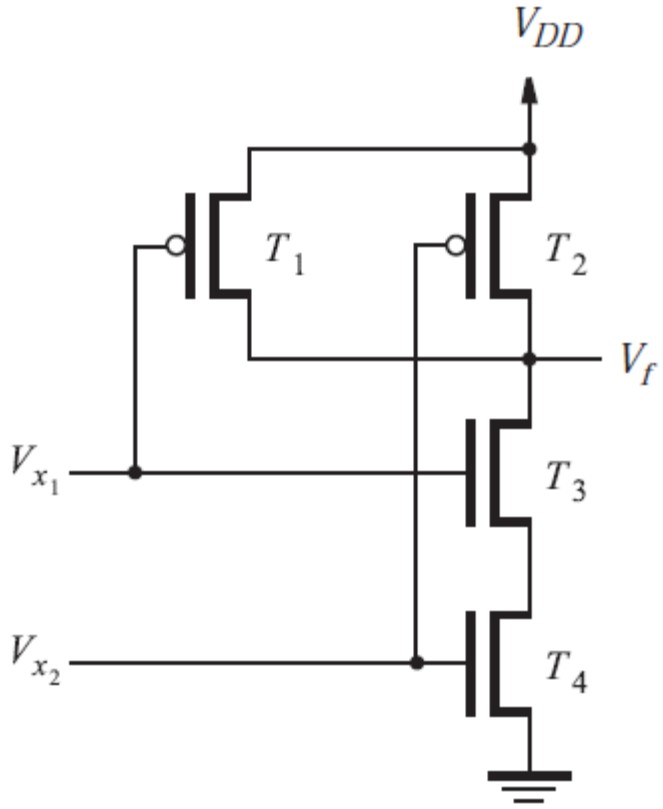
NAND Circuit [Brown & Vranesic].

Representation

Realizing logic gates using CMOS

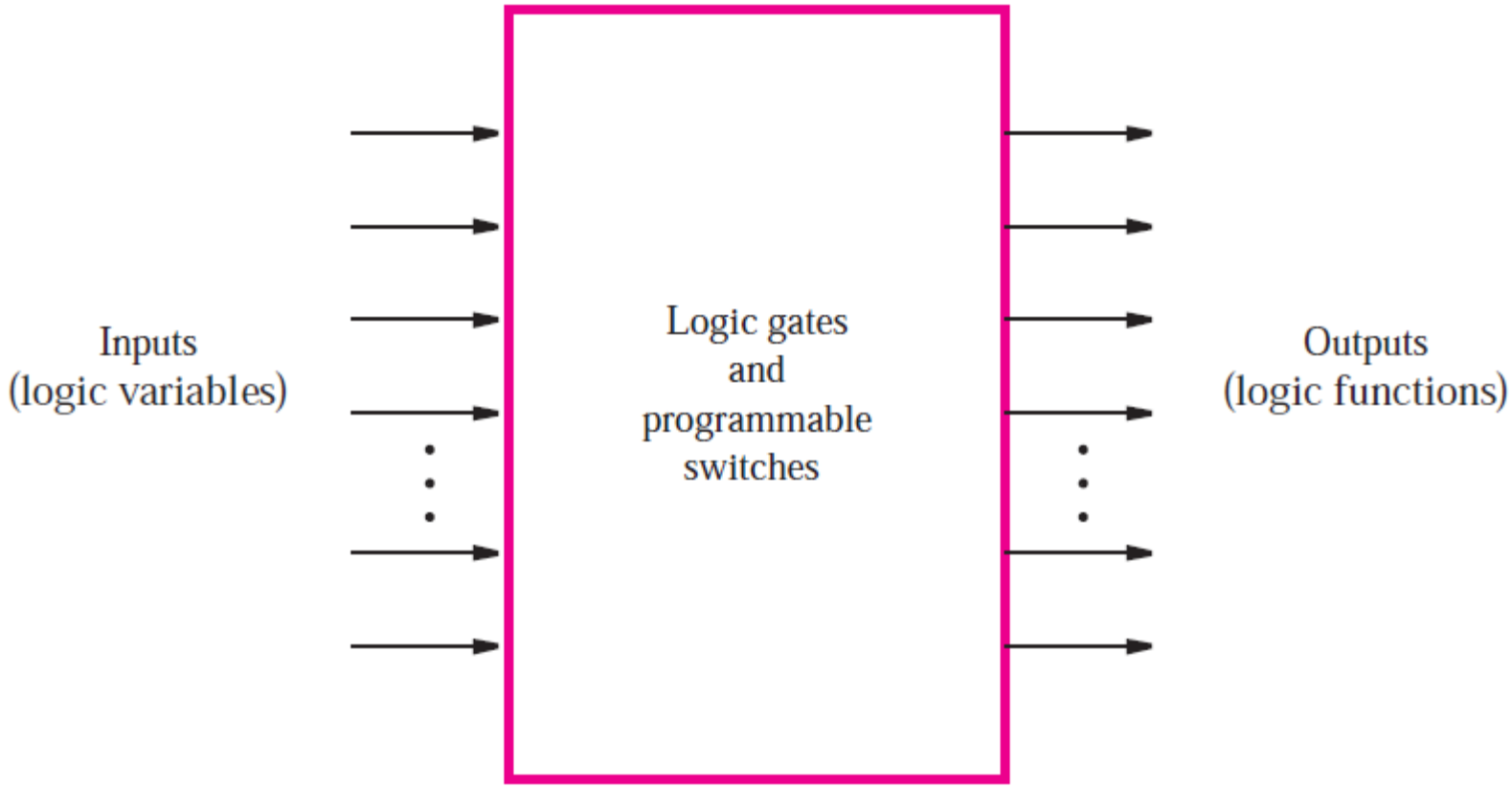


NOT circuit [Brown & Vranesic].



NAND circuit [Brown & Vranesic].

Programmable Logic Array (PLA)



PLA [Brown & Vranesic].