

Notes: Basic Switches and Gates

We'll begin with Quiz 1 and have lecture afterwards.

A. Why?

It's natural to use on/off switches to manipulate the voltages/currents that represent binary data. In computers, transistor circuits act as switches, and collections of transistors act as "logic gates" (components that take and produce binary data). In later classes, we'll build up from logic gates to logic circuits to simple computers.

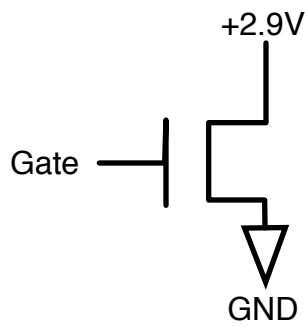
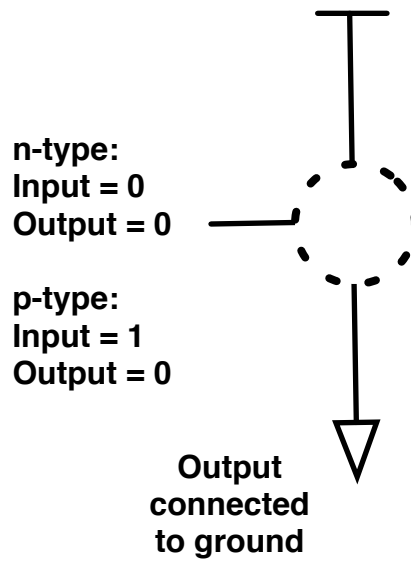
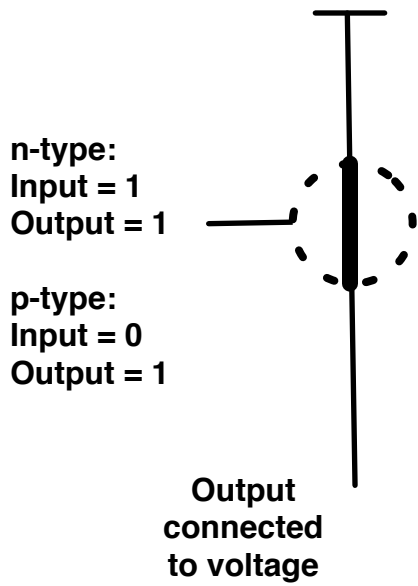
B. Outcomes

By the end of the class you should

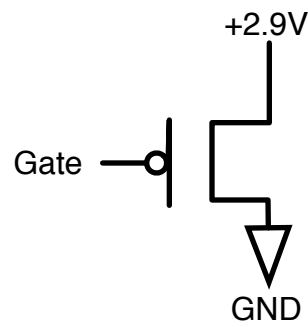
- Know what transistor switches do.
- Know how to read a simple voltage/current diagram.
- Know how to read a transistor-level diagram.

C. Transistors and Switches

- Computers use switches
 - Switches turn current on/off
 - We combine switches to implement logic functions (AND, OR, etc).
 - Which we combine to build higher-level structures (memory, registers, etc).
- Simple Switch Circuit
 - Switch open? No current, voltage exists
 - Switch closed? Current flows, voltage is zero.
- Complementary Metal-Oxide Semiconductor (CMOS)
 - n-type: Close switch when gate has voltage
 - p-type: Close switch when gate has no voltage
 - Transistor-level diagram; voltage diagram
- Voltage Inverter
 - Device takes input voltage and produces an output voltage
 - The voltages of the input and output are opposite.
 - Gate also needs to be connected to power and ground.
 - Inverter Uses 2 switches



n-type transistor:
Closes when gate has voltage



p-type transistor
Closes when gate has no voltage

