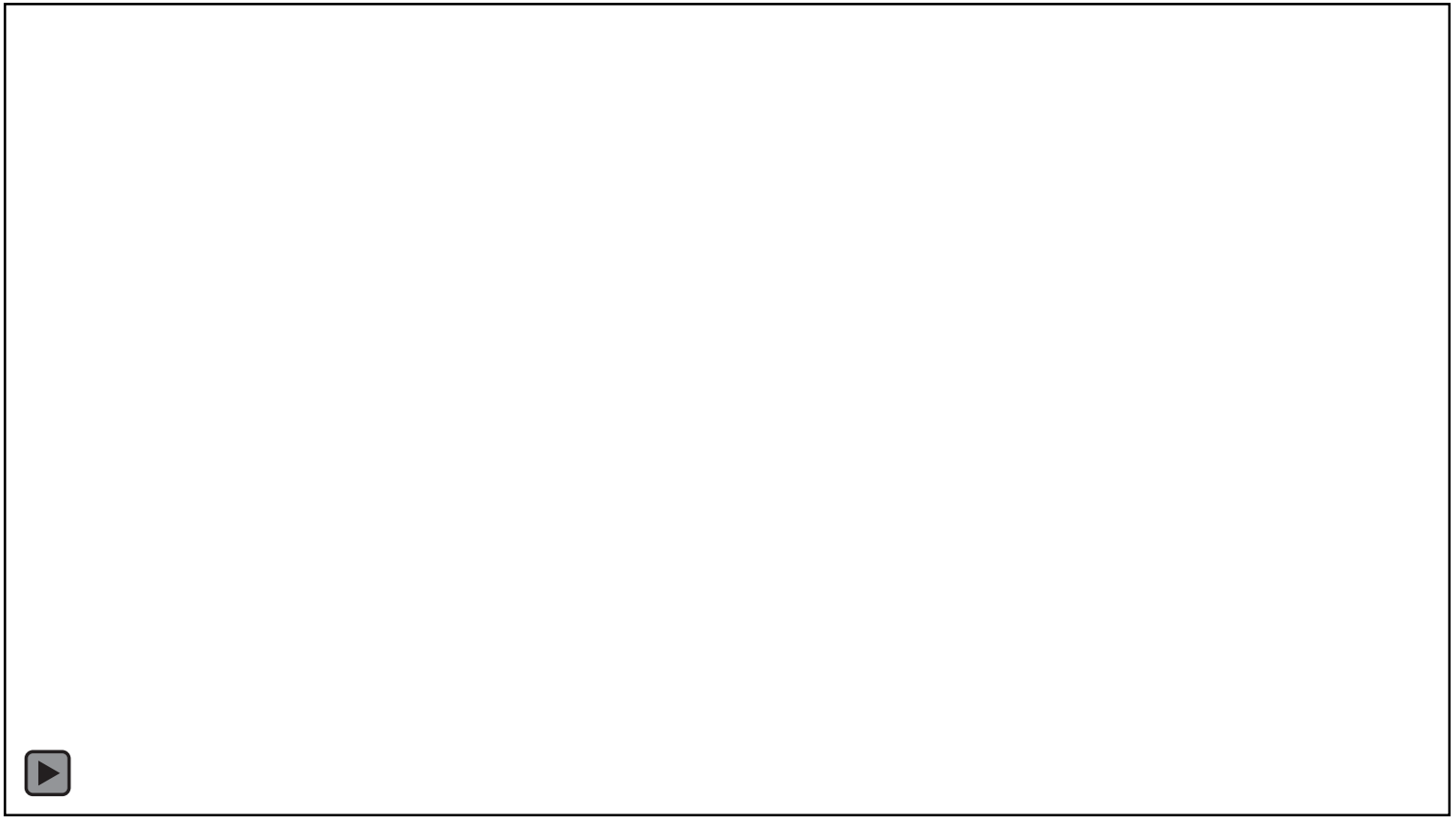
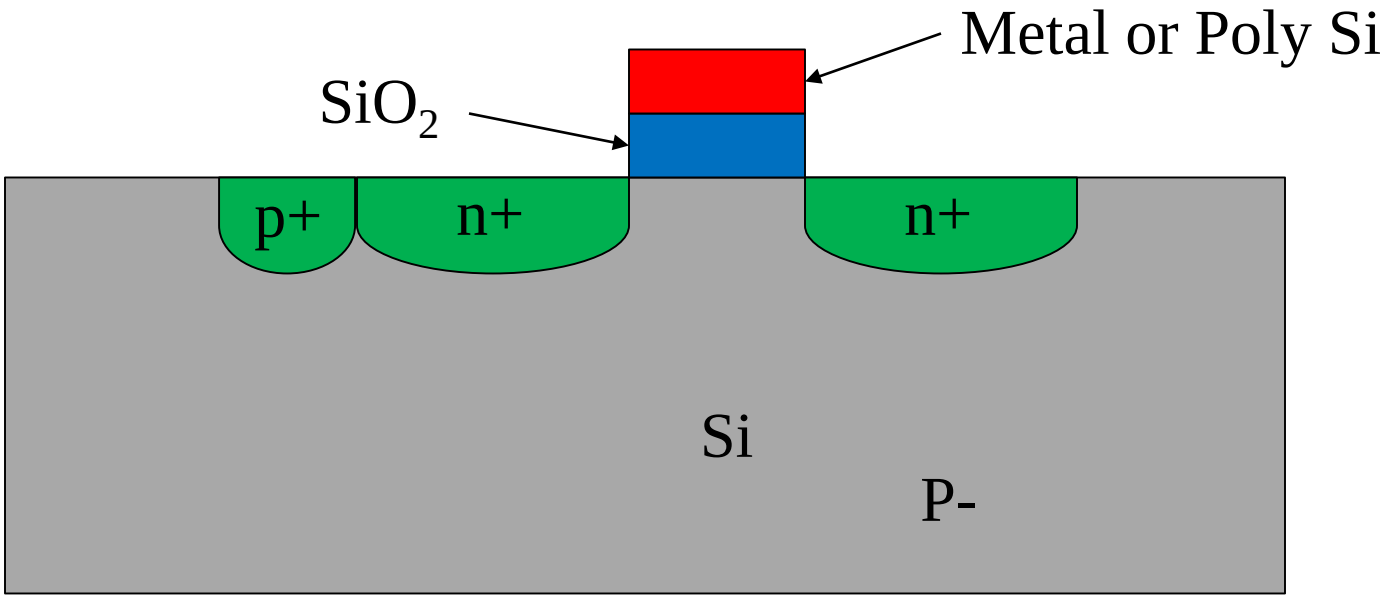
19장 전계 효과 트랜지스터 (FET)

History of Transistors

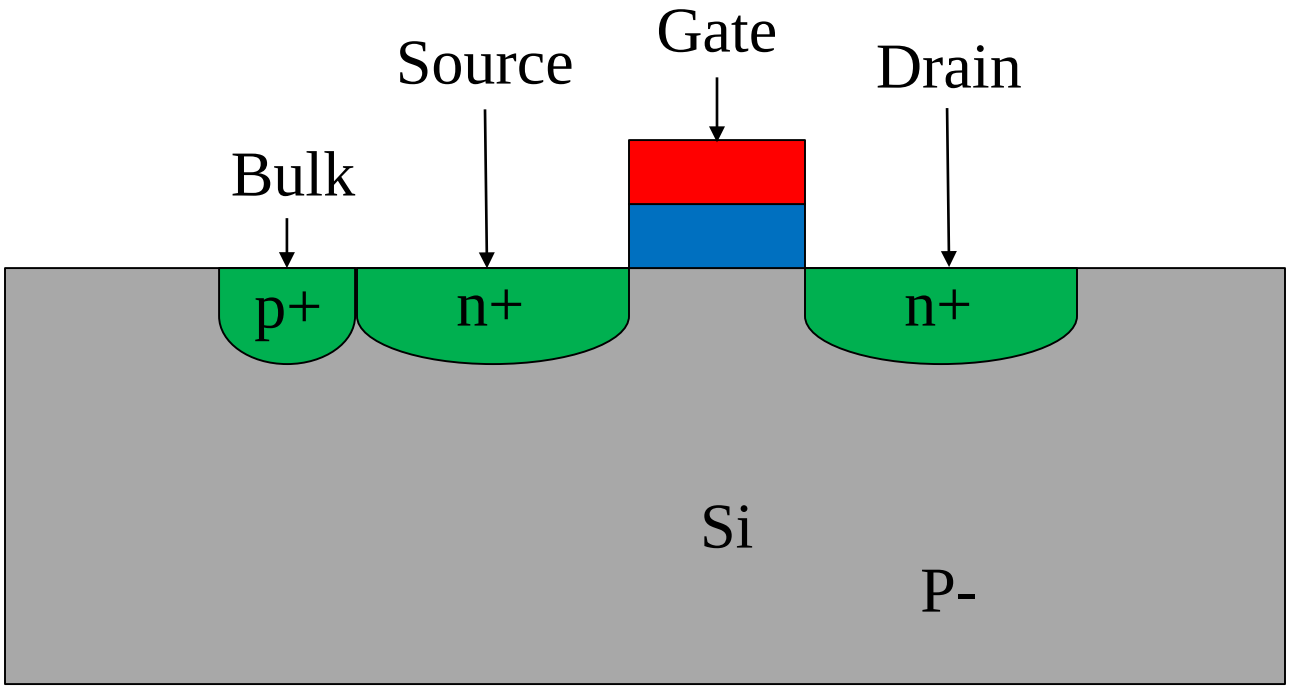


What is MOS

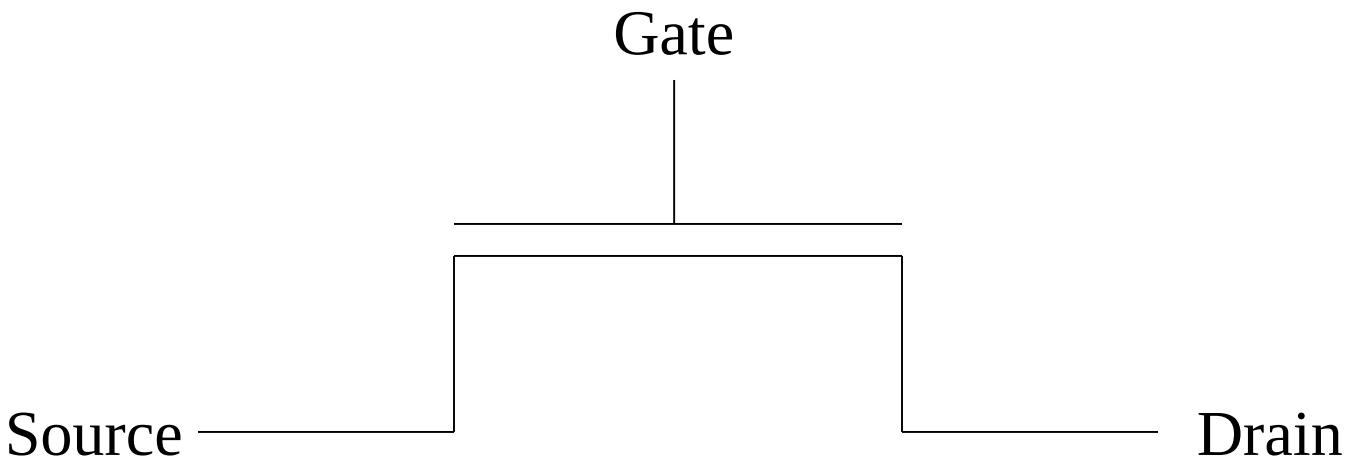


HW: Bipolar Transistor 와 Field Effect Transistor 차이

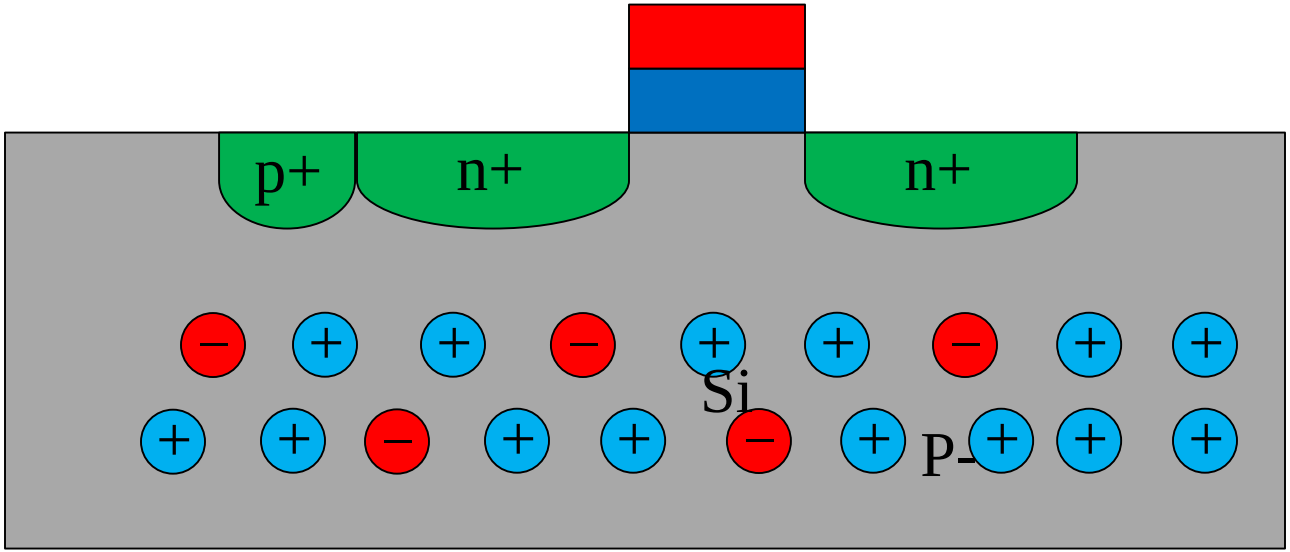
NMOS Transistor



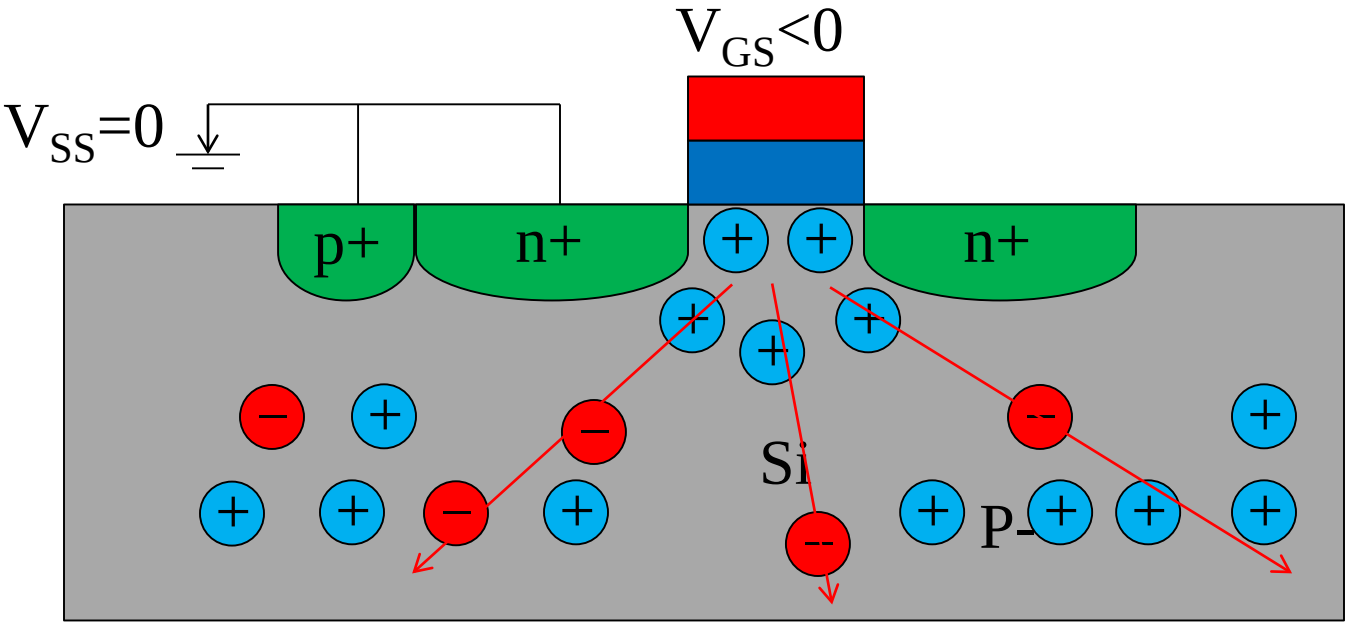
NMOS Transistor



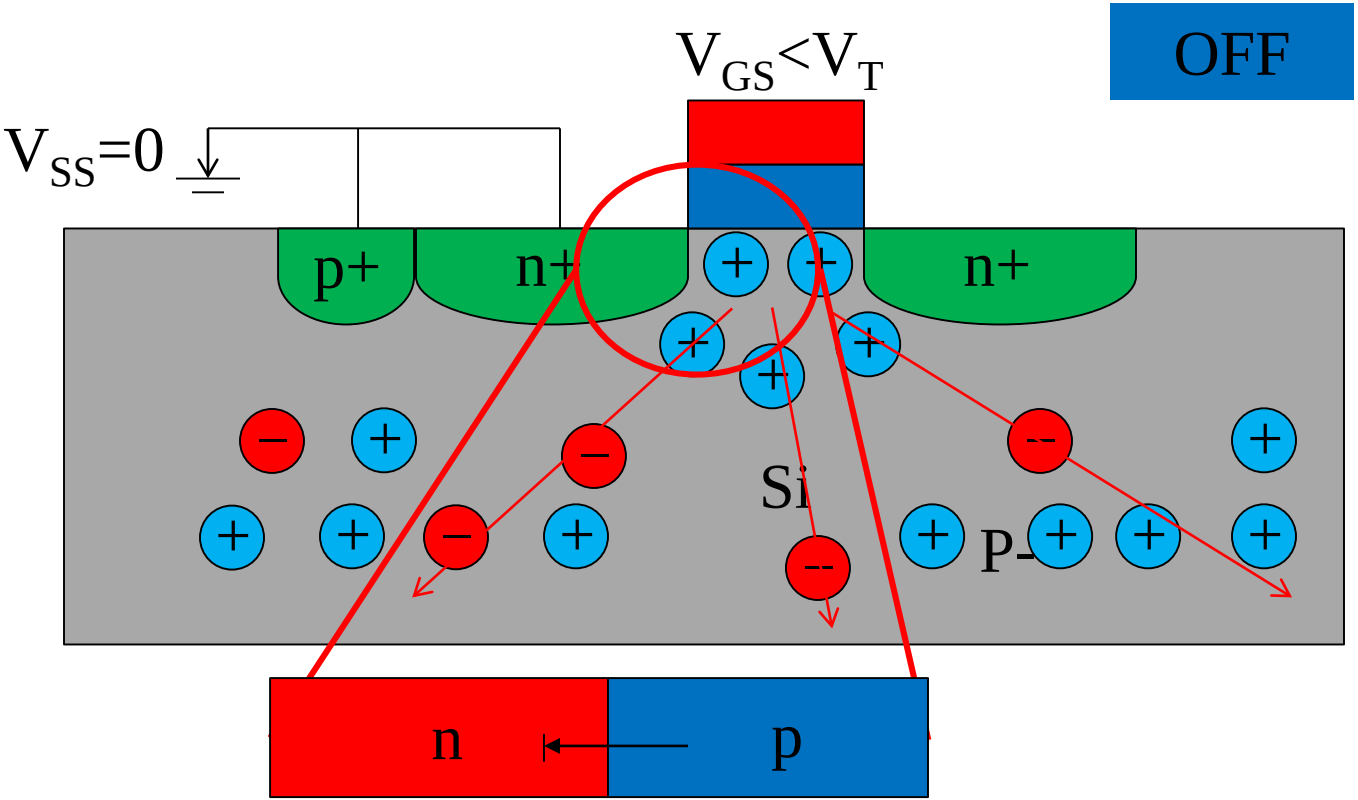
NMOS Transistor Operation



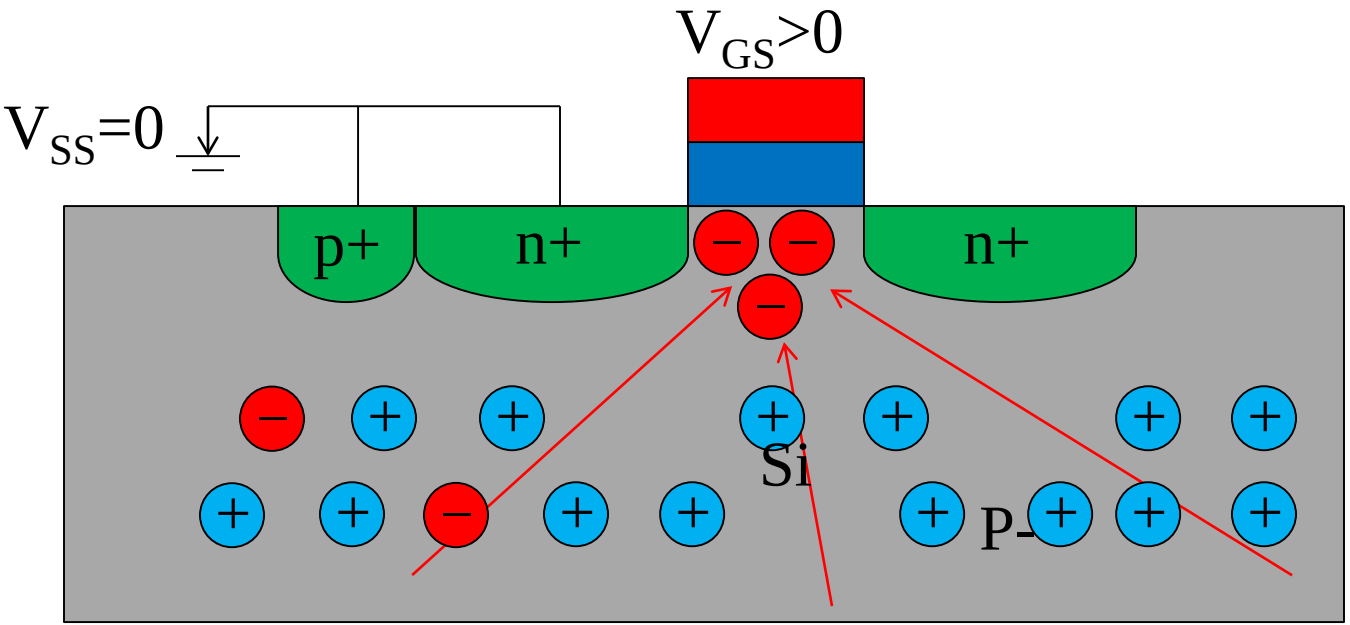
NMOS Transistor Operation



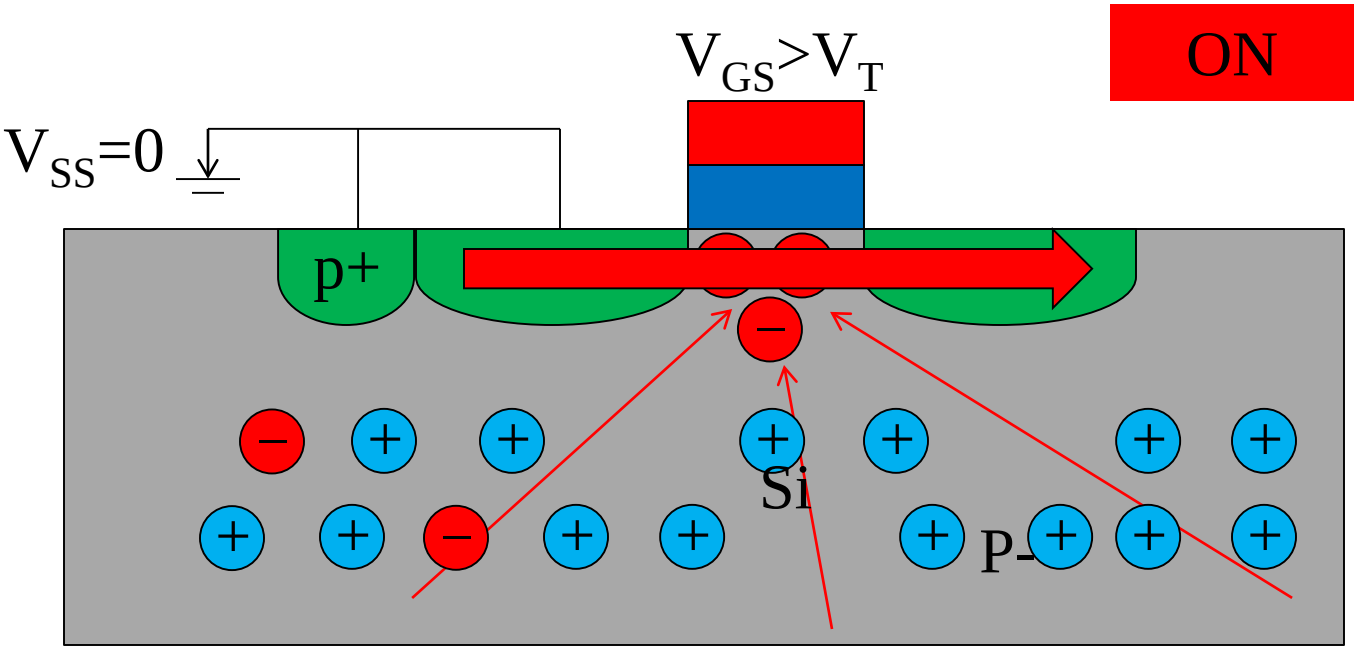
NMOS Transistor Operation



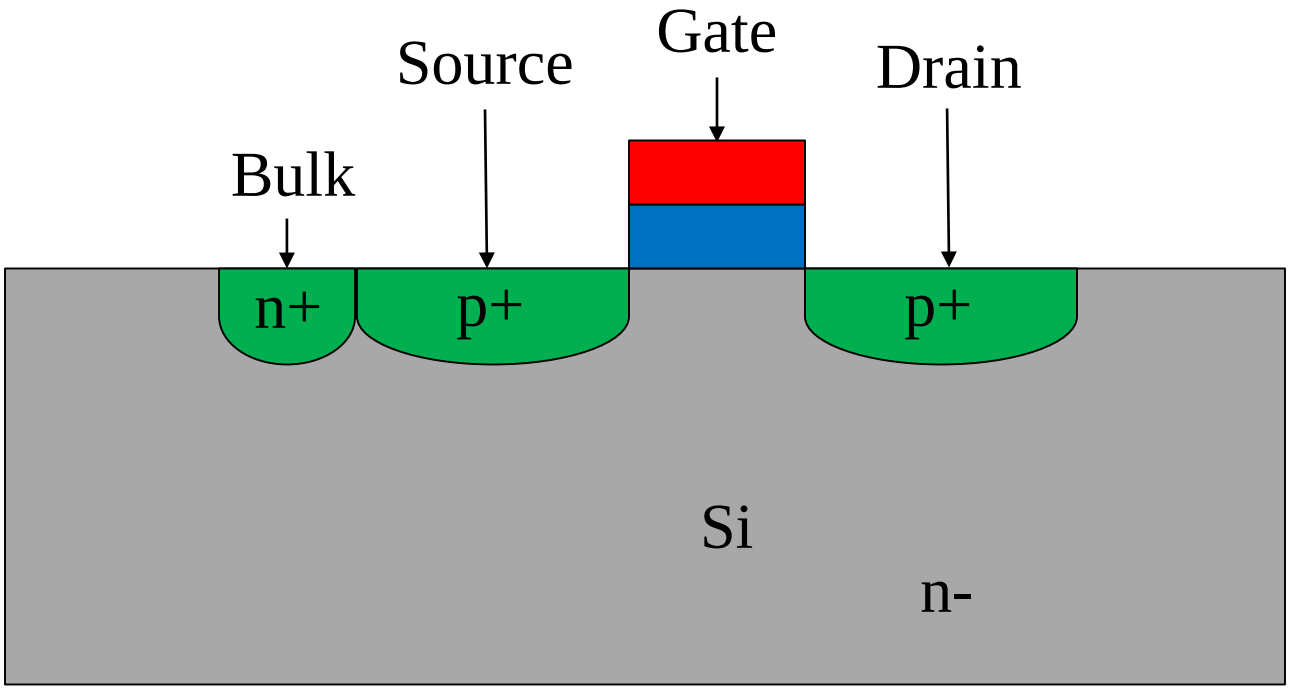
NMOS Transistor Operation



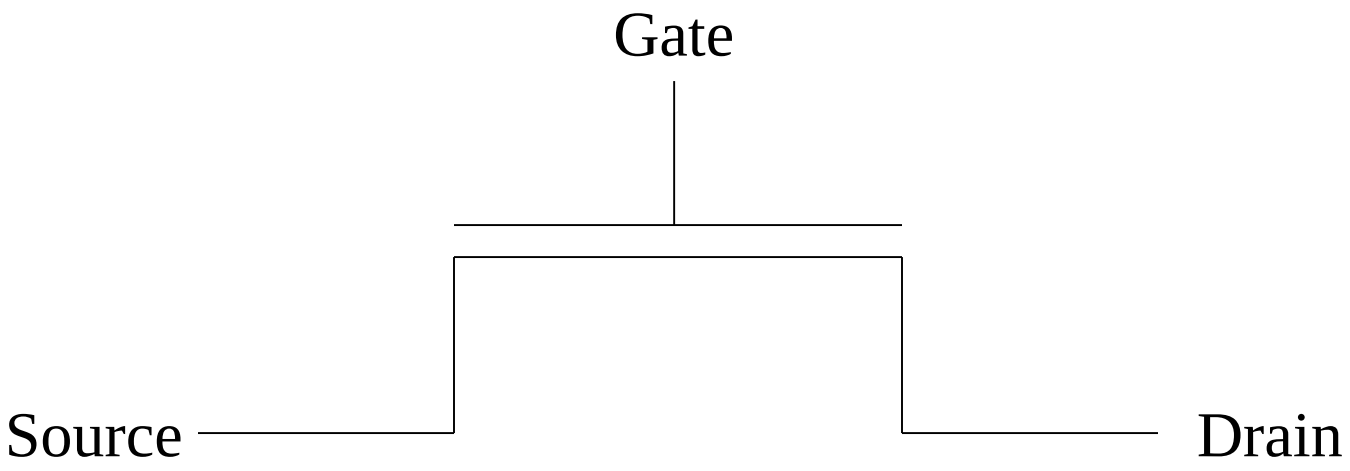
NMOS Transistor Operation



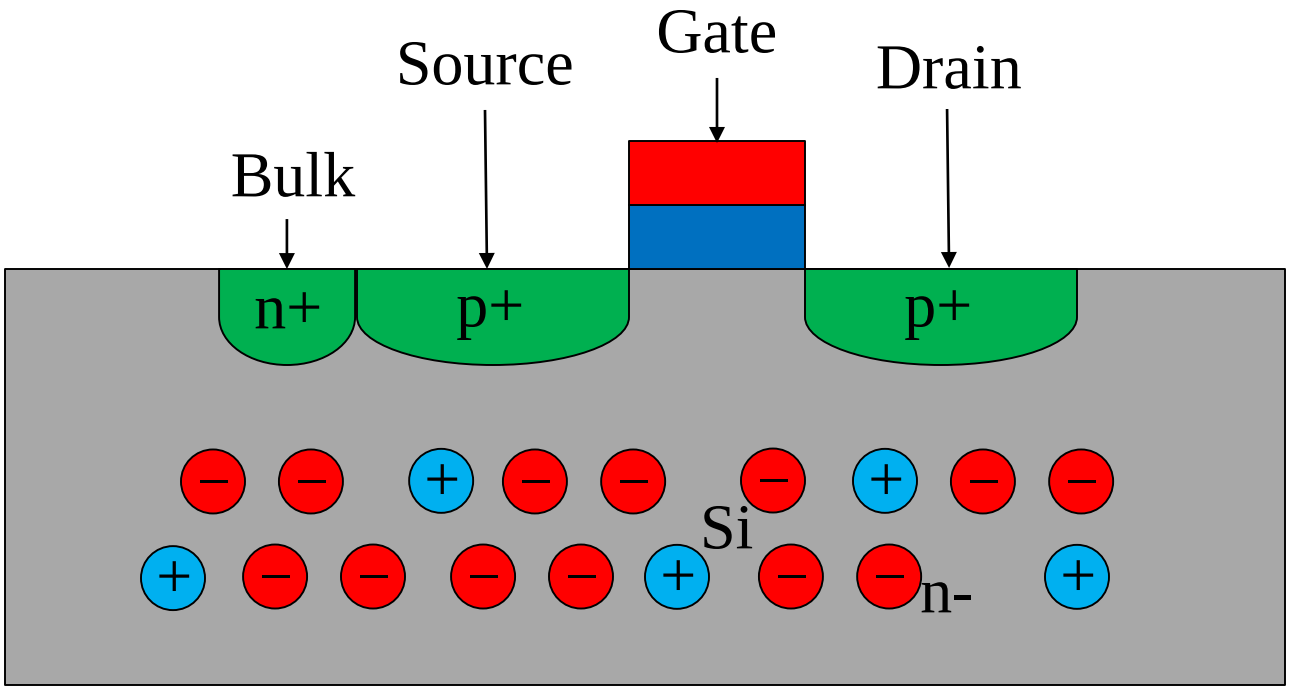
PMOS Transistor Operation



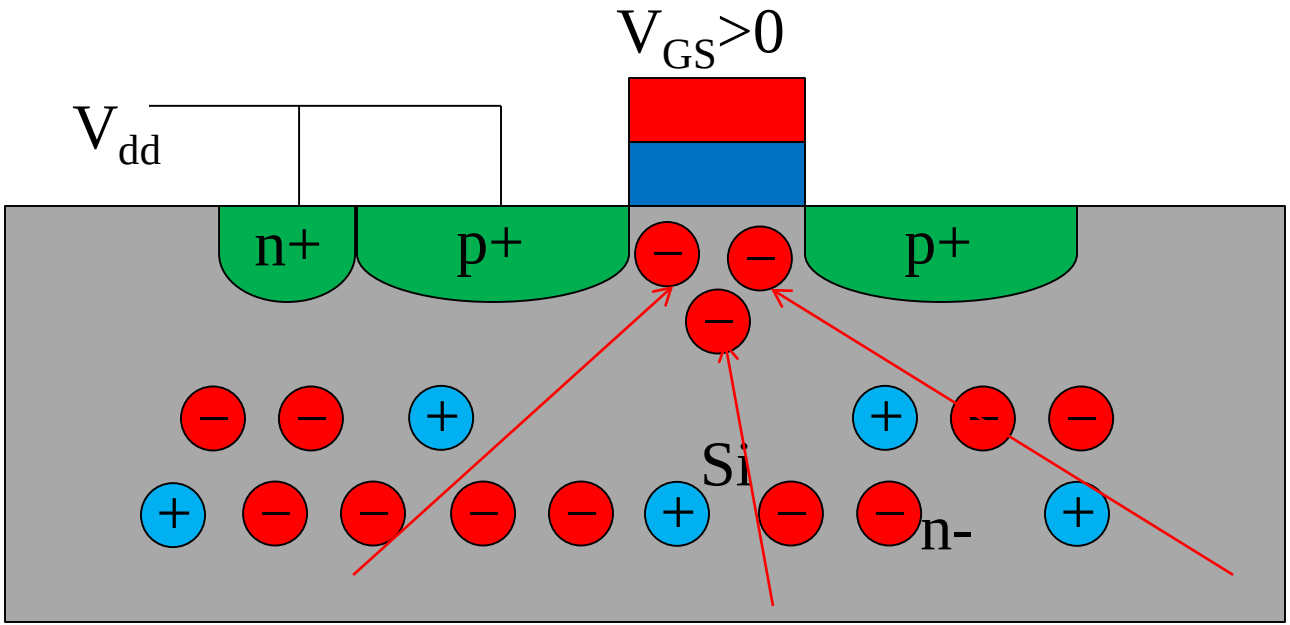
PMOS Transistor Operation



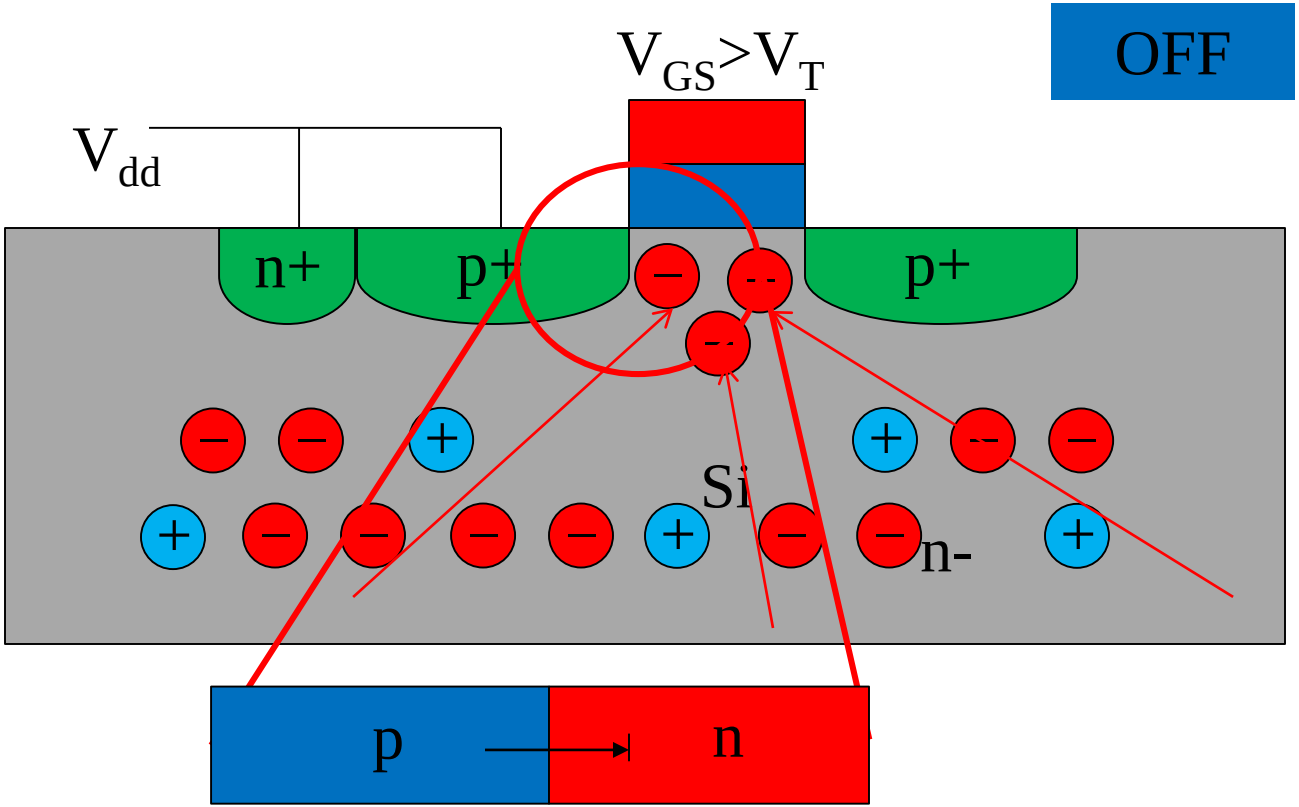
PMOS Transistor Operation



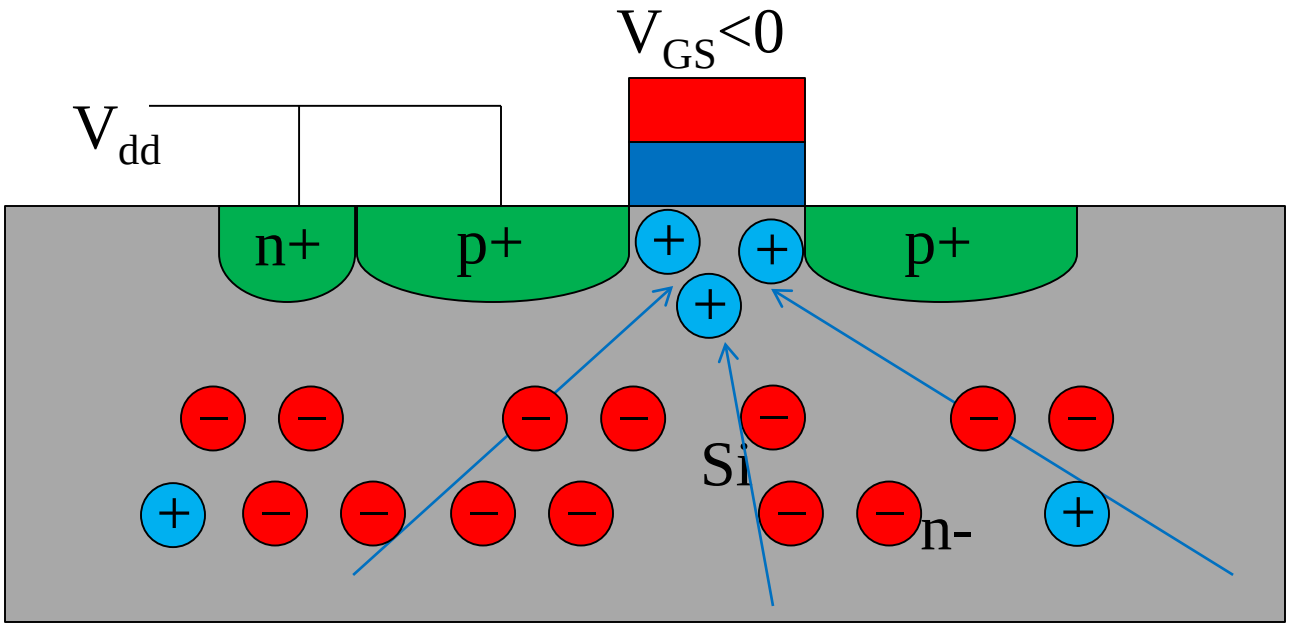
PMOS Transistor Operation



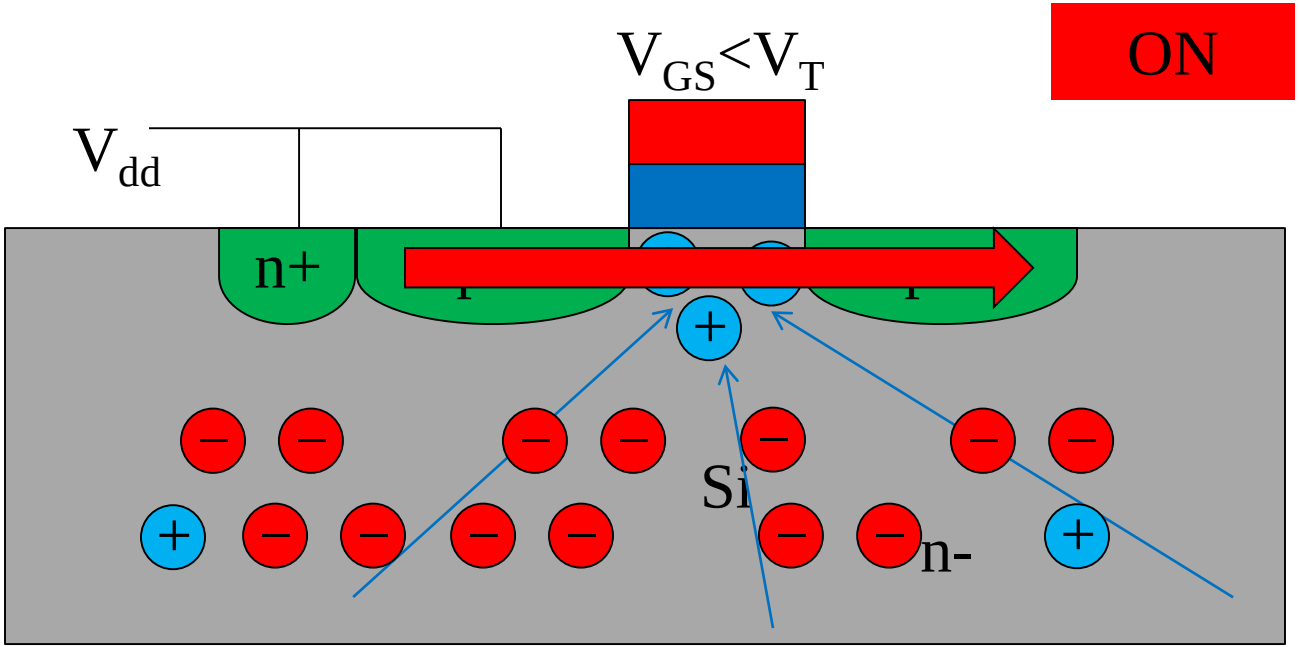
PMOS Transistor Operation



PMOS Transistor Operation



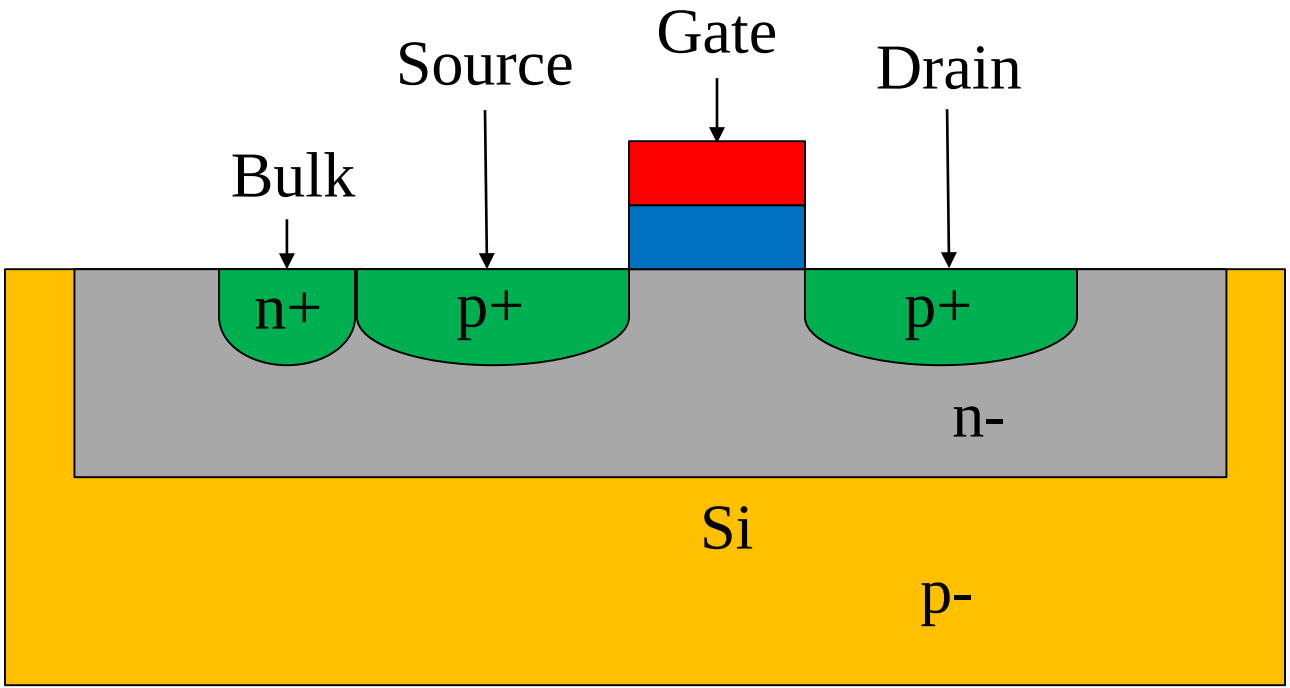
PMOS Transistor Operation



N/P MOS Transistor

	NMOS	PMOS
Source and Drain	n-type	p-type
Carrier	Electron	Hole
Threshold volt (V_T)	~ 0.6 V	~ -0.6 V
High voltage	Drain	Source
Bulk voltage	V_{ss}	V_{dd}
$V_{GS} > V_T$	ON	OFF
$V_{GS} < V_T$	OFF	ON
Working Speed	Fast	Slow
Power consumption	High	Low

CMOS Transistor



Transistor Failure

- If a transistor fails:
  - It is generally caused by high temperature, high current, or high voltage.
  - Failure can also be caused by extreme mechanical stress.

- Two methods to determine functionality:
  - Use an ohmmeter.
  - Use a transistor tester.

Transistor Failure

To use an ohmmeter to test a transistor:

- Resistance tests are made between two junctions in the following way:
  - emitter to base.
  - collector to base.
  - collector to emitter.

- Connect any two terminals one way.
- Then reverse the leads.
- In one connection, the resistance should be high, 10,000 ohms or more.
- In the other connection, the resistance should be lower, less than 10,000 ohms.

Transistor Failure

- To use a transistor tester that is more reliable than an ohmmeter:
  - Designed specifically for testing transistors.
  - Two types:
    - An in-circuit tester.
    - An out-of-circuit tester.