

Switches

Networks and Embedded Software

First Grade Level

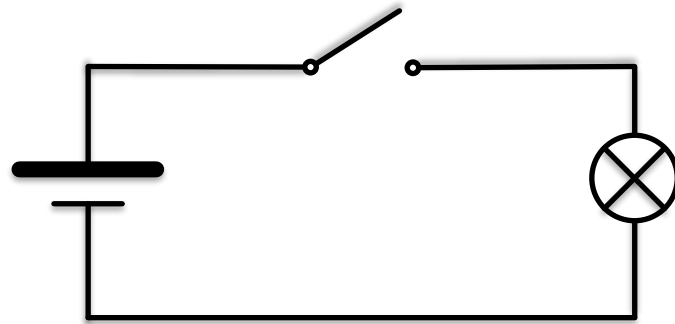
by Wolfgang Neff

Switches (1)

- Electric Control Component

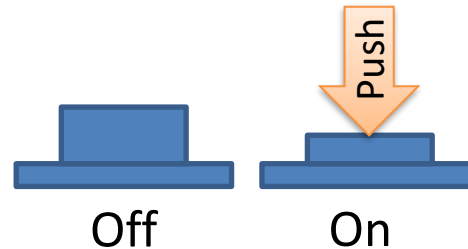
- In general

- Circuit breaker
 - Opens or closes an electric circuit



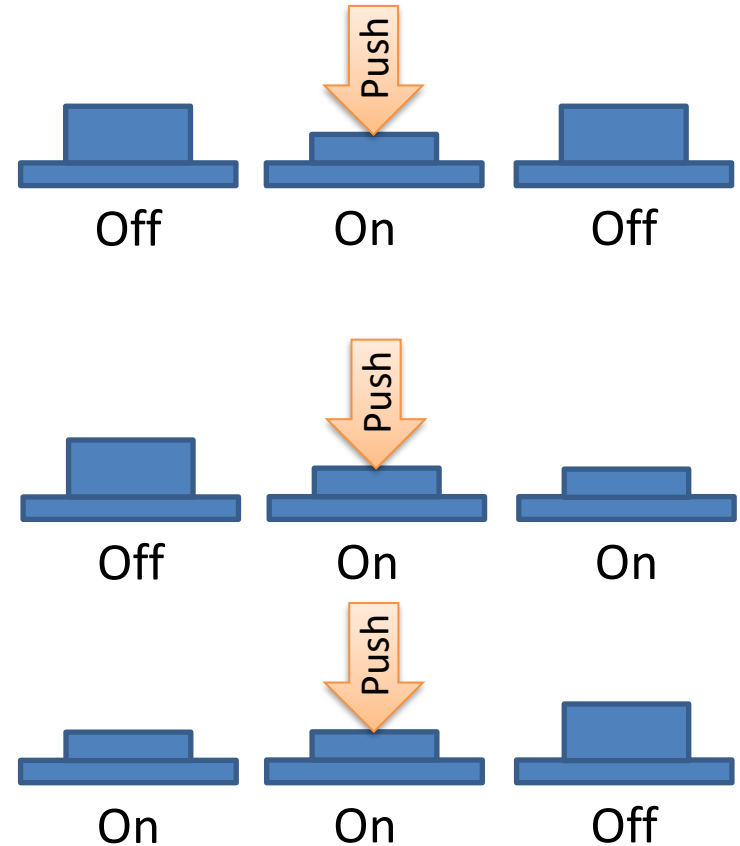
- In particular

- Switches a device on or off



Switches (2)

- Push Button
 - On/off when pressed
 - Off/on when released
- Switch
 - Button with locking
 - On/off when pressed
 - Off/on when pressed again

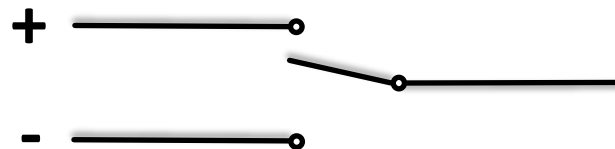


Switches (3)

- Implementations
 - Single pole, single throw (SPST)



- Single pole, double throw (SPDT)



Switches (4)

- Implementations *(finished)*

- “a” Contact

- Closes the circuit if pressed



- “b” Contact

- Opens the circuit if pressed



Switches (5)

- Active High and Active Low

- Active high: if active the output is high



- Active low: if active the output is low





Switches (6)

- Undefined Voltage Levels
 - SPST can produce undefined voltage levels



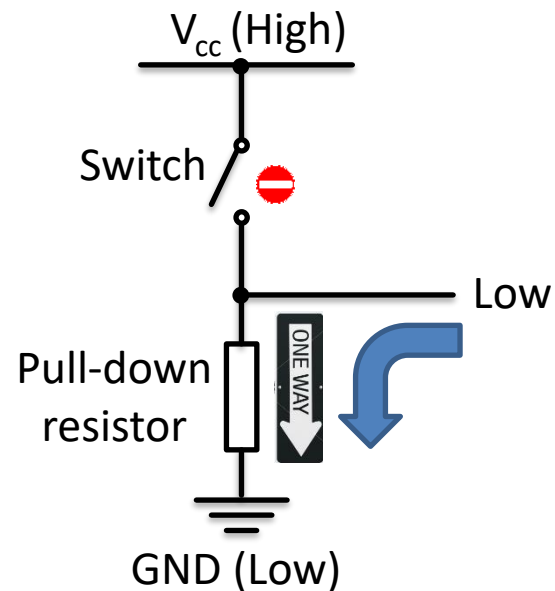
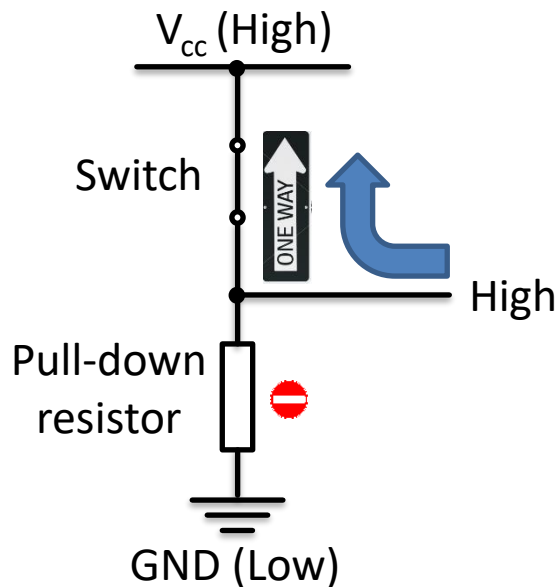
– This is a problem for digital circuits

- High → 1 
- Low → 0

- Undefined → ? 

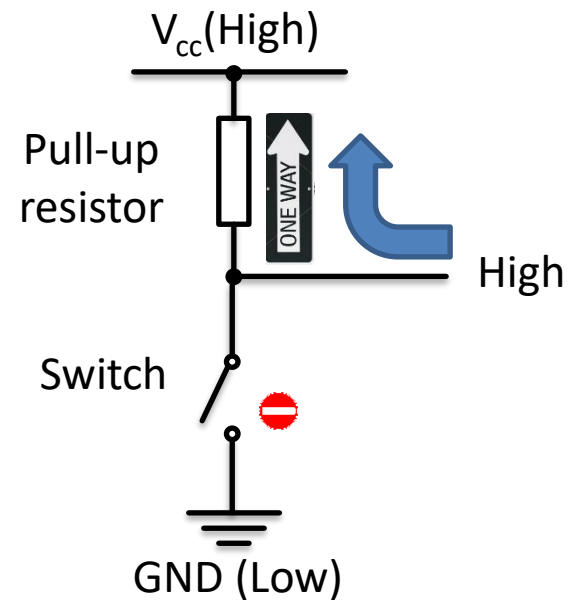
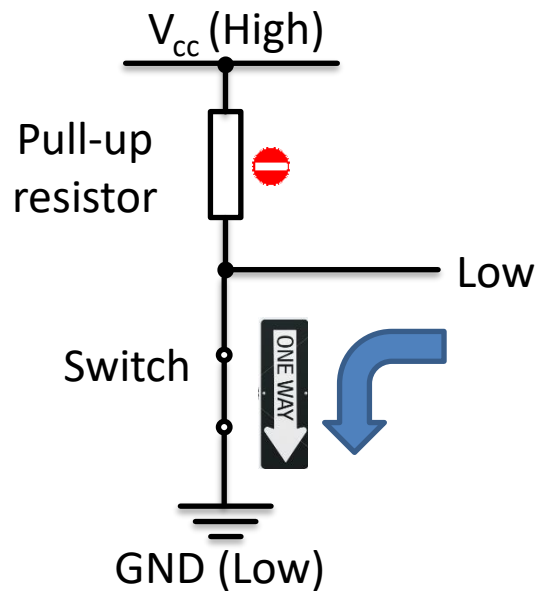
Switches (7)

- Pull-down Resistors
 - Prevent undefined voltage levels



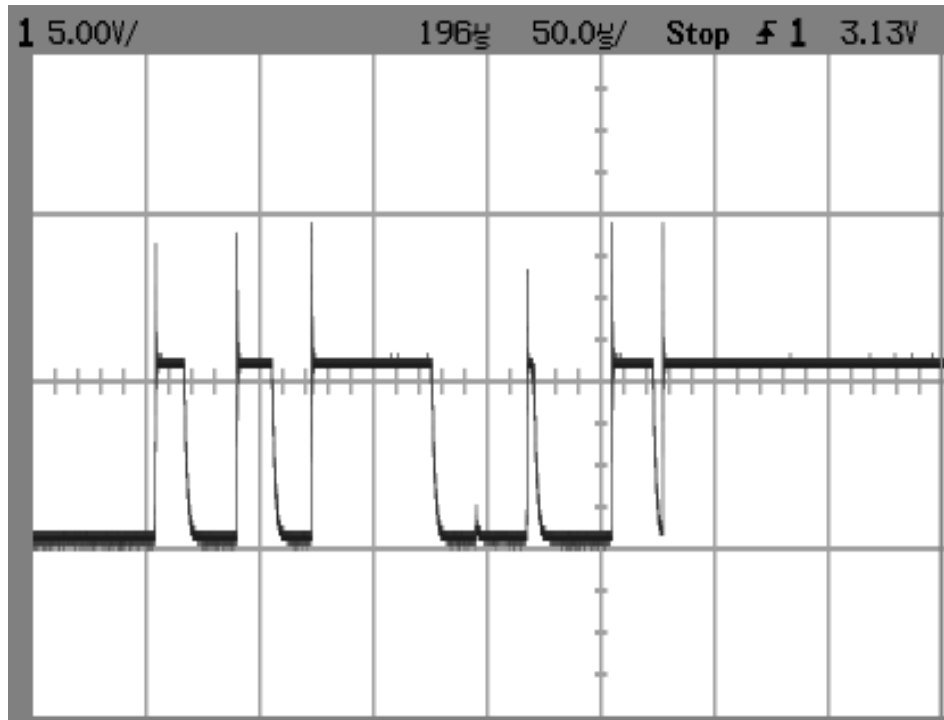
Switches (8)

- Pull-up Resistors
 - Prevent undefined voltage levels



Switches (9)

- Contact Bounce
 - Mechanical switches bounce



Switches (10)

- Contact Bounce (continued)

- Is the button pressed?

- Yes, it is
- Without doubt

- How many times?

- 4, 5 or 6? 🤪
- Debounce required
 - By hardware
 - By software

