

Switches

Electrical Engineering

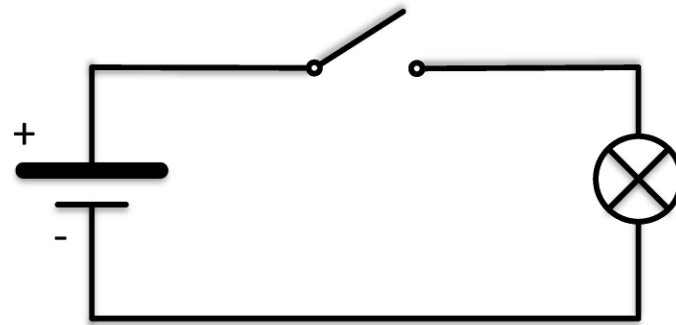
by Wolfgang Neff

Switches (1)

- Electric Control Component

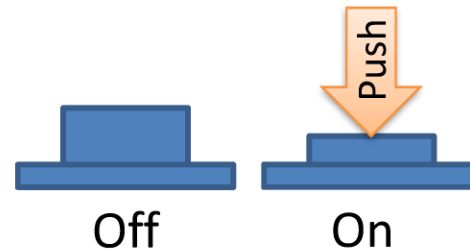
- In general

- Circuit breaker
- Opens or closes an electric circuit



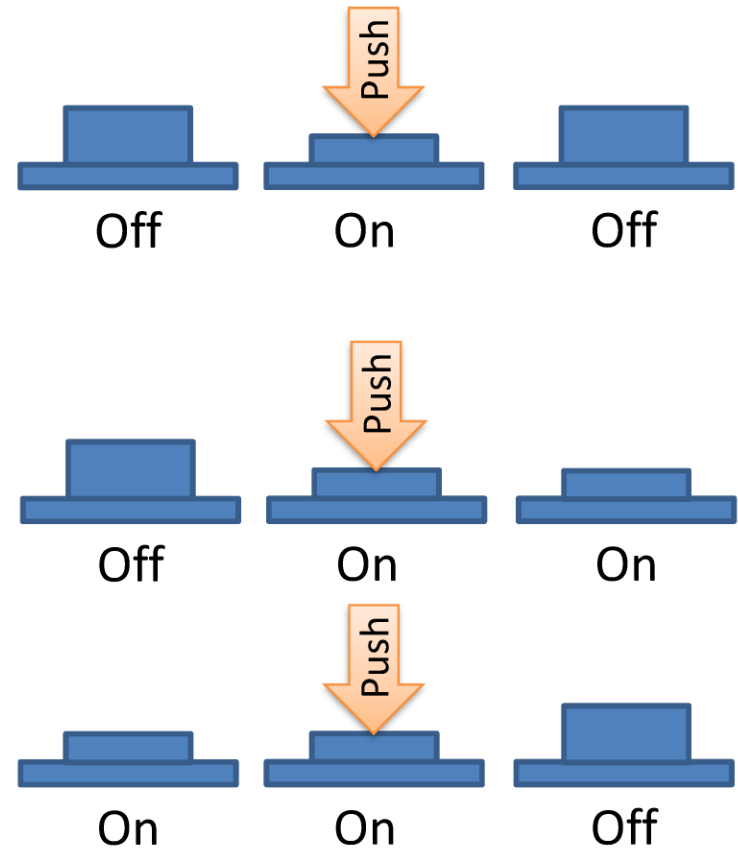
- In particular

- 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)

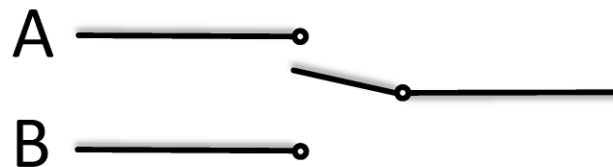
- Implementations

- Single pole, single throw (SPST)



Circuit breaker

- Single pole, double throw (SPDT)



Line selector

Switches (4)

- Implementations (finished)

- “a” Contact

- Closes the circuit if pressed



- “b” Contact

- Opens the circuit if pressed





Switches (5)

- Undefined Voltage Levels
 - SPST can produce undefined voltage levels



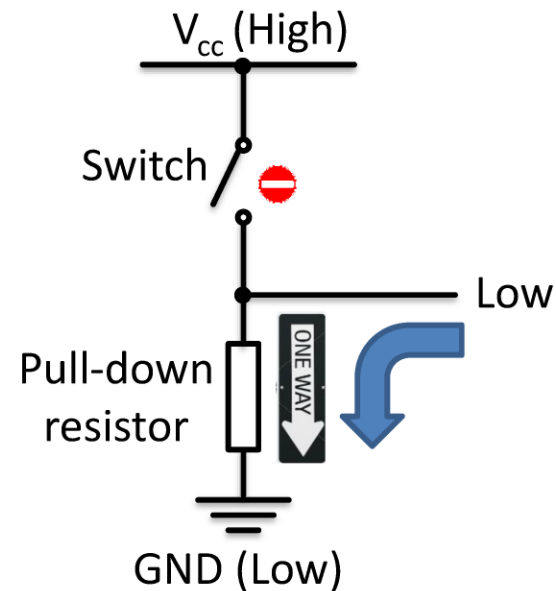
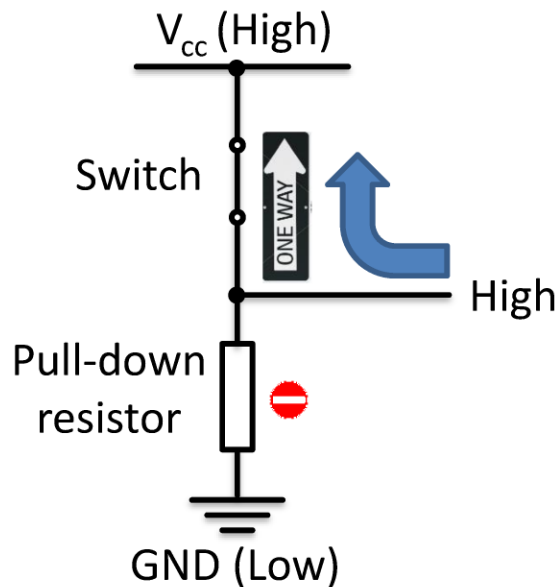
- This is a problem for digital circuits

- High → 1 
- Low → 0

- Undefined → ? 

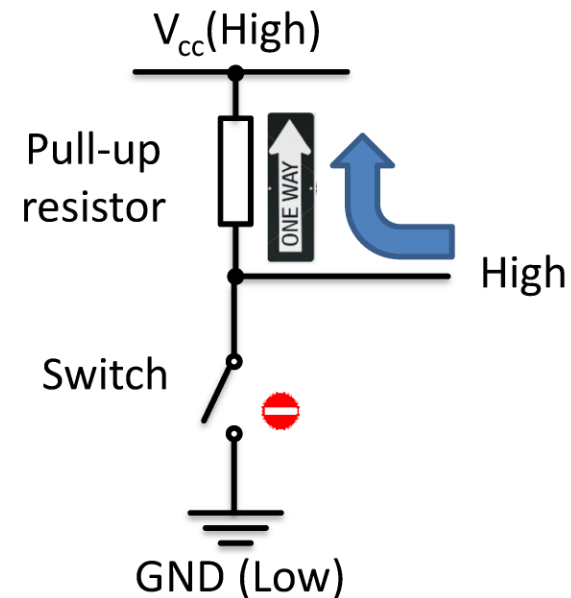
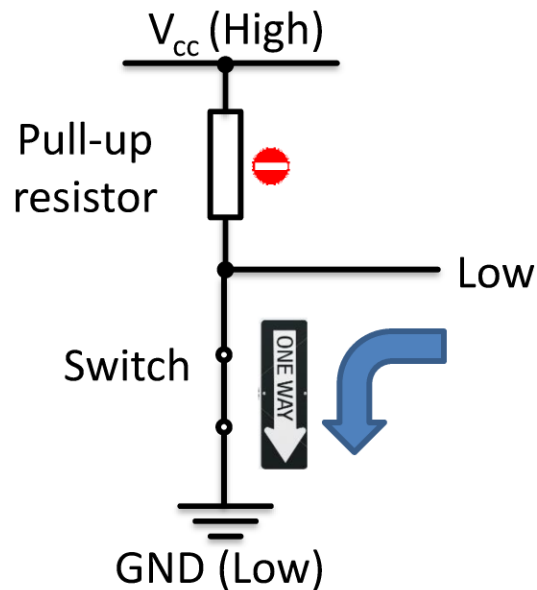
Switches (6)

- Pull-down Resistors
 - Prevent undefined voltage levels



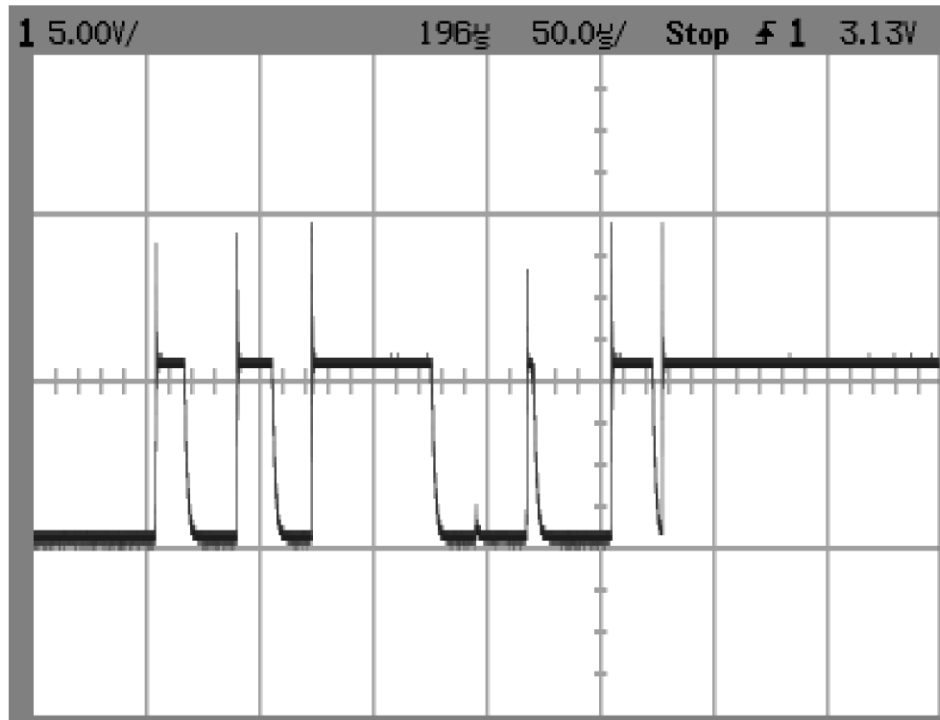
Switches (7)

- Pull-up Resistors
 - Prevent undefined voltage levels



Switches (8)

- Contact Bounce
 - Mechanical switches bounce



Switches (9)

- 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

