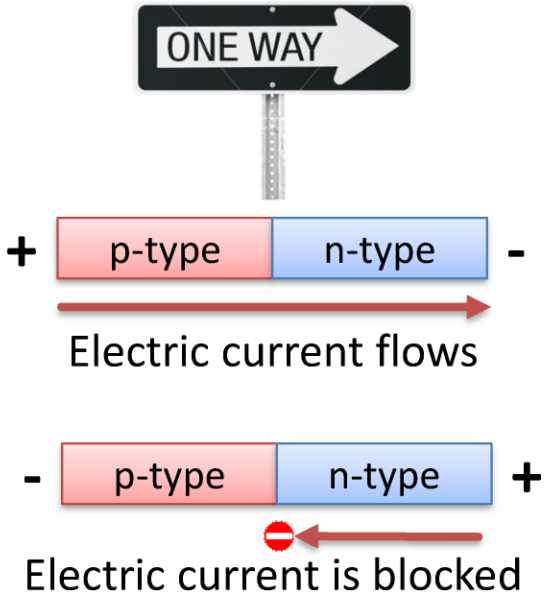
Diodes

Digital Electronics

by Wolfgang Neff

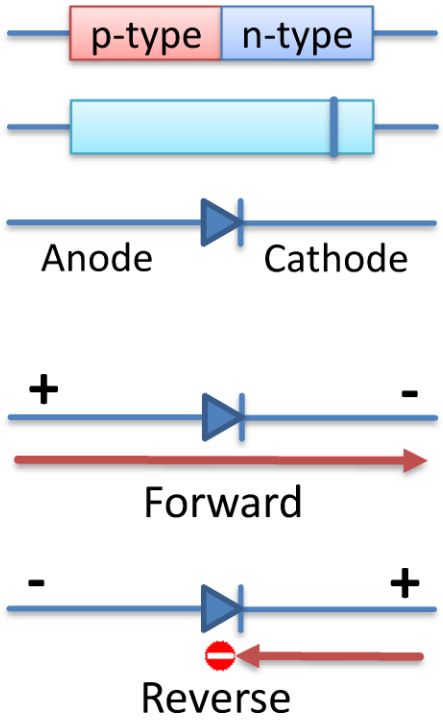
Diodes (1)

- P–n junctions are diodes
  - Flow Control Valve
    - One-Way Road
  - Forward
    - P-type: +, n-type: -
    - Current flows
  - Reverse
    - P-type: -, n-type: +
    - Current gets blocked



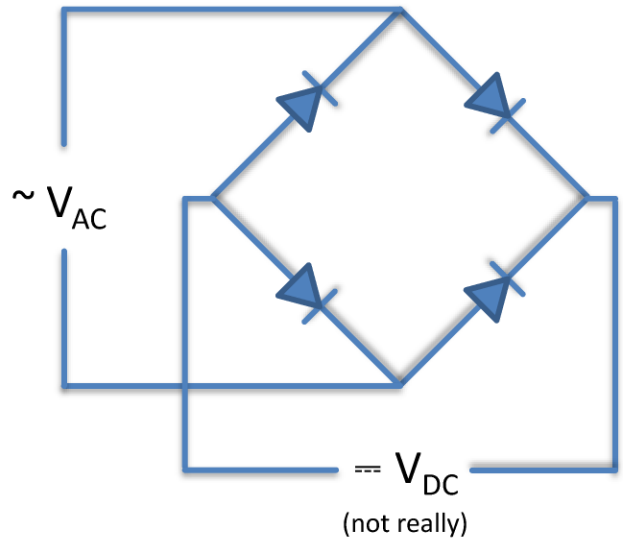
Diodes (2)

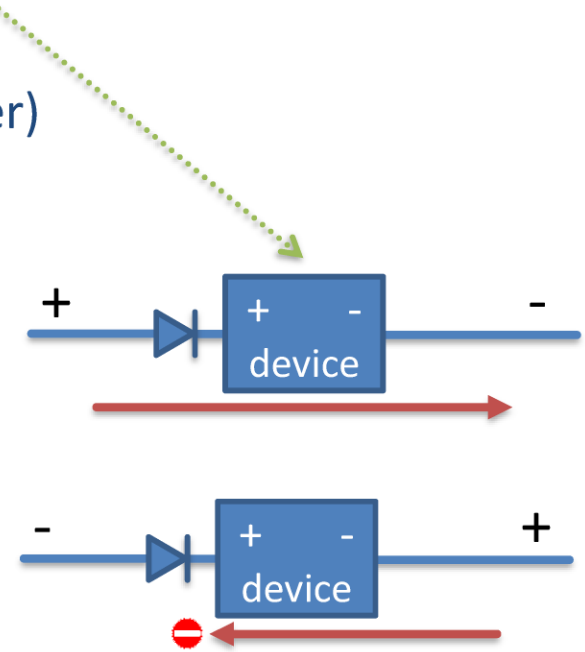
- Example: 1N4148
  - Maximum forward current
    - I_F = 300 mA
  - Maximum reverse voltage
    - V_R = 100 V
  - Reverse Leakage
    - I_R = 0.025 µA (V_R = 20 V)
    - I_R = 5.0 µA (V_R = 70 V)



Diodes (3)

- Applications
  - Reverse voltage protection
  - Rectifier (e. g. mobile phone charger)

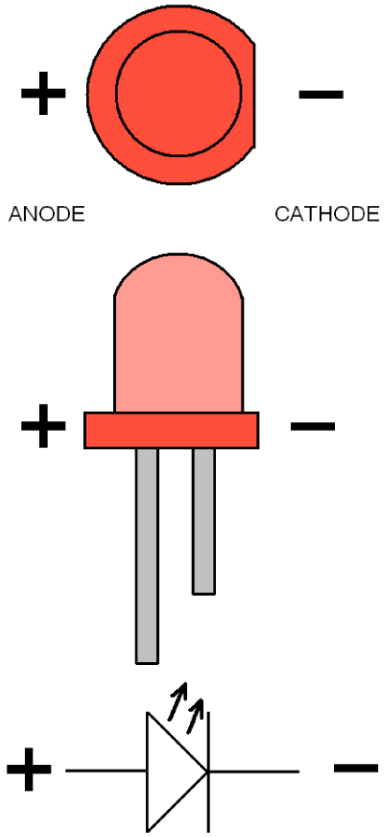




Diodes (4)

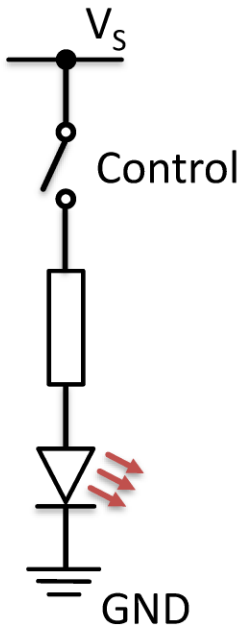
- Light-emitting diodes
  - They emit light
  - They have different colors

  - They have two leads
    - Long one: anode (+)
    - Short one: cathode (-)

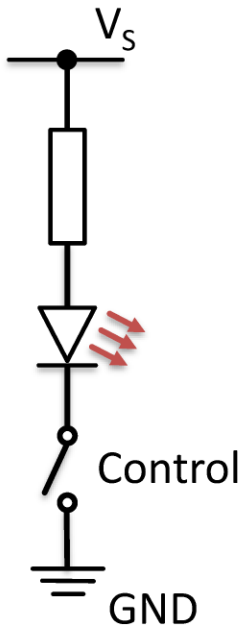


Diodes (5)

- Control of LED
  - They can be switched on or off
  - There are two options
    - Control by anode
      - Cathode with GND
    - Control by cathode
      - Anode with PWR



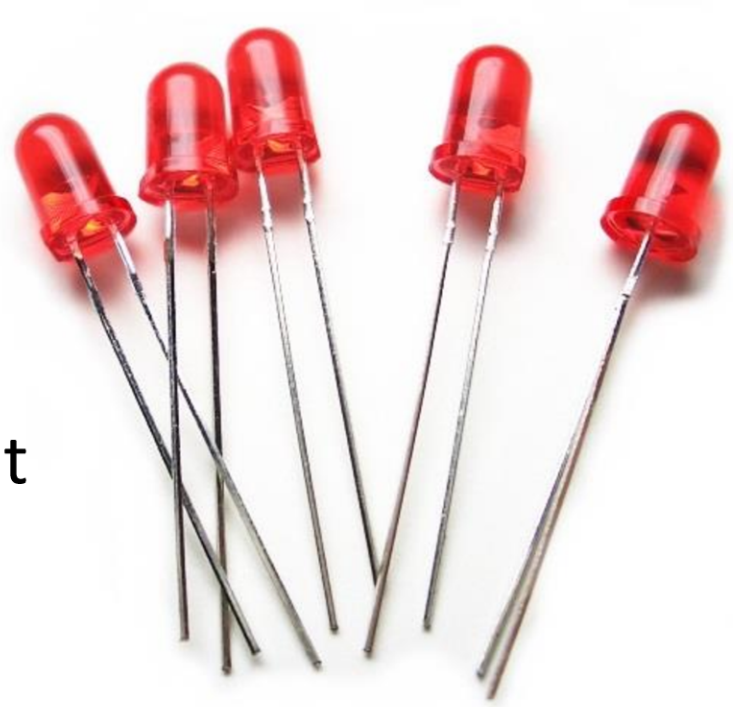
Controlled by anode



Controlled by cathode

Diodes (6)

- Example: L-63ID
  - Typical wavelength
    - λ = 627 nm (red)
  - Typical forward voltage
    - V_F = 1.9 V
  - Maximum forward current
    - I_F = 30 mA



Diodes (7)

- Series resistor
  - $I_R = I_F$
  - $V_R = V_S - V_F$
  - $R = \frac{V_R}{I_R} = \frac{V_S - V_F}{I_F}$
  - $R = \frac{5\ V - 1.9\ V}{20\ mA} = \frac{3.1\ V}{0.02\ A}$
  - $R = 155\ \Omega \rightarrow 180\ \Omega$

E12 Series of Resistors