

Diodes

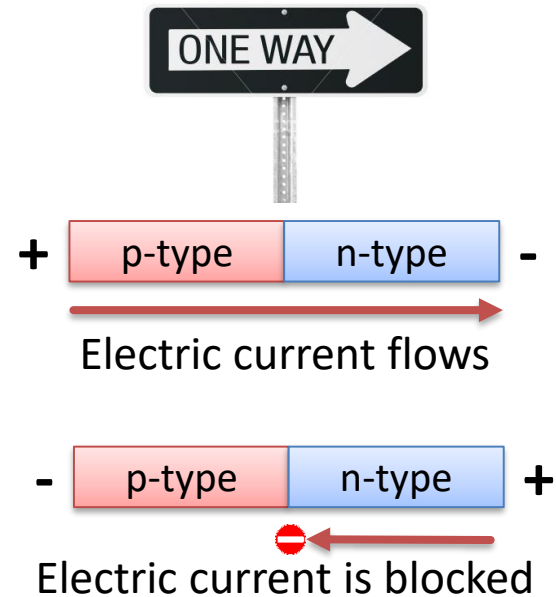
Networks and Embedded Software

First Grade Level

by Wolfgang Neff

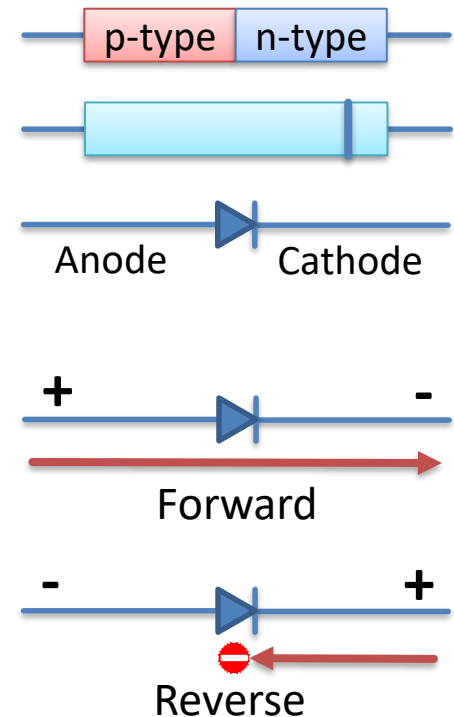
Diodes (1)

- 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)

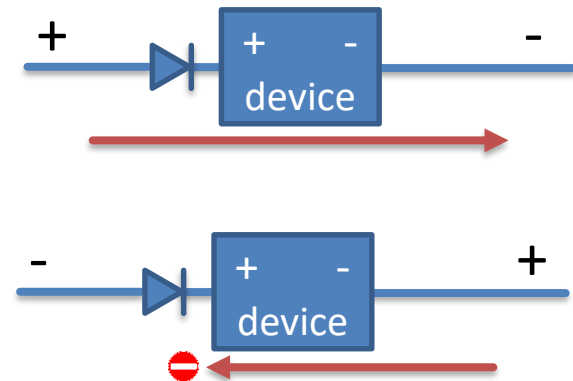
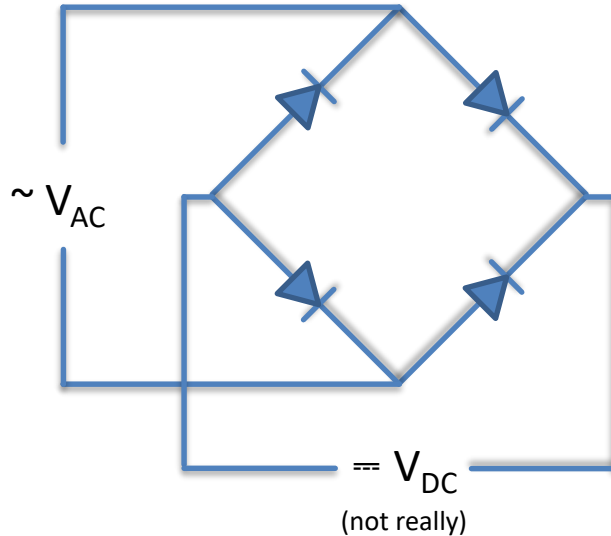
- Example: 1N4148
 - Maximum forward current
 - $I_F = 300 \text{ mA}$
 - Maximum reverse voltage
 - $V_R = 100 \text{ V}$
 - Reverse Leakage
 - $I_R = 0.025 \text{ }\mu\text{A}$ ($V_R = 20 \text{ V}$)
 - $I_R = 5.0 \text{ }\mu\text{A}$ ($V_R = 70 \text{ V}$)



Diodes (3)

- Applications

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



Diodes (4)

- Light-emitting diodes

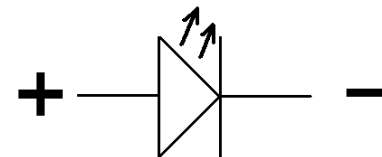
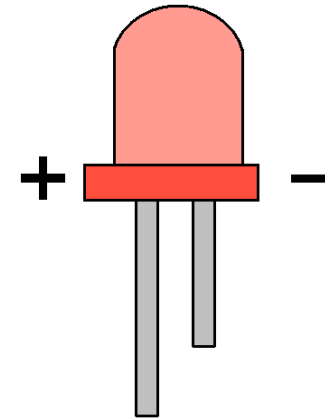
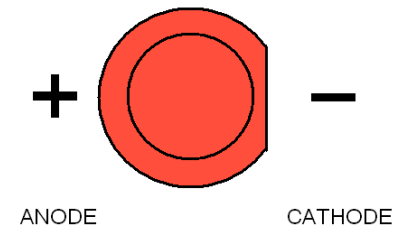
- They emit light

- They have different colors



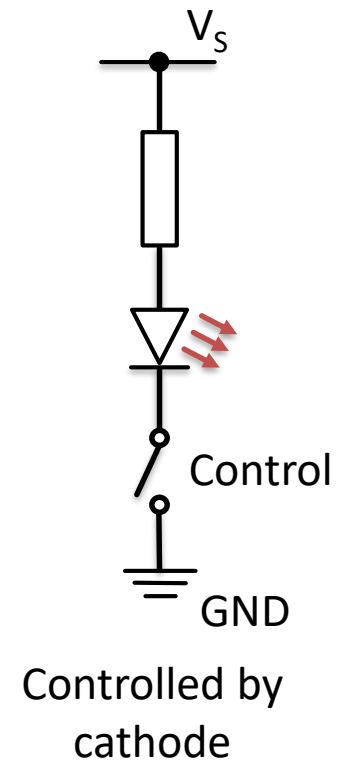
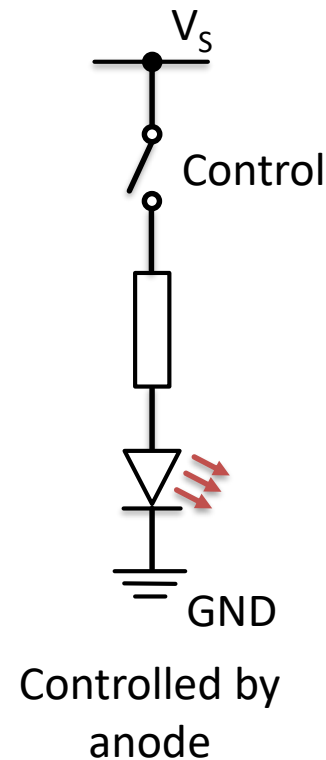
- They have two leads

- Long one: anode (+)
 - Short one: cathode (-)



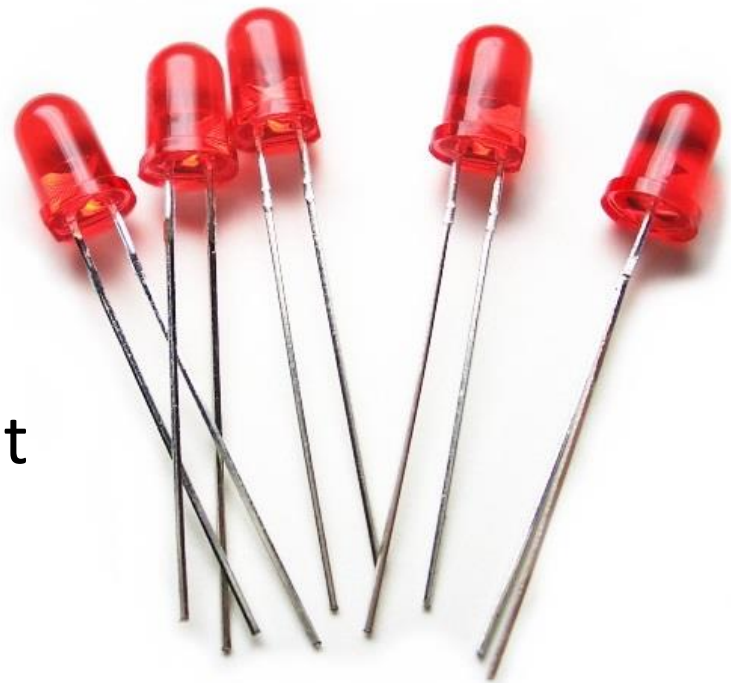
Diodes (5)

- 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



Diodes (6)

- Example: L-63ID
 - Typical wavelength
 - $\lambda = 627 \text{ nm}$ (red)
 - Typical forward voltage
 - $V_F = 1.9 \text{ V}$
 - Maximum forward current
 - $I_F = 30 \text{ mA}$



Diodes (7)

- Series resistor

$$- I_R = I_F$$

$$- V_R = V_S - V_F$$

$$- R = \frac{V_R}{I_R} = \frac{V_S - V_F}{I_F}$$

$$- R = \frac{5\text{ V} - 1.9\text{ V}}{20\text{ mA}} = \frac{3.1\text{ V}}{0.02\text{ A}}$$

$$- R = 155\ \Omega \rightarrow 180\ \Omega$$

E12 Series of Resistors

