LED-Smiley

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Made in Austria
Back of the LED-Smiley

Polarity of light-emitting diodes (LED)

long connection
short connection

resistors
100 Ω
120 Ω

brown-black-black-black-brown
brown-red-black-black-brown
Example for a calculation with a blue LED on 12 volt

- **Warm** LED-colors: red, orange, yellow ... 1,95 volt
- **Cold** LED-colors: blue, green, violet, warm and cold white ... 3,15 volt

For a calculation you have to know the voltage and the current, that a LED needs for the right function. The voltage depends on the color, the current on the type of the LED.

**Example for a calculation with a blue LED on 12 volt**

- **a)** A ultrabright blue LED needs **3,15 volt** for a right function. More voltage would destroy the LED. Therefore you need a **resistor** in the same circuit as the LED.
- **b)** Commercially LEDs need about **20 mA to 25 mA**, we use 20 mA.
- **c)** The voltage for the circuit in this example is **12 volt**.
- **Calculation:**
  - **d)** For the blue LED we need **3,15 volt**. If you subtract 3,15 volt from the total voltage of 12 volt, you get **8,85 volt**.
  - **e)** Now you use **Ohm's Law**. You get **442,5 Ohm**. You cannot buy this resistor, because it is no standard-resistor.
  - **f)** You may choose 470 Ohm or 390 Ohm. Look at the resistor-series E12! If you choose 390 Ohm, you have little more current than 20 mA, about 22,7 mA. But this is no problem for the LED.

\[ R = \frac{U}{I} = \frac{8,85}{0,02} = 442,5 \text{ Ohm} \]

**Resistor Series E12**

- 1 Ohm   27 Ohm   680 Ohm   18 kOhm   470 kOhm
- 1,2 Ohm 33 Ohm   820 Ohm   22 kOhm   560 kOhm
- 1,5 Ohm 39 Ohm   1 kOhm    27 kOhm   680 kOhm
- 1,8 Ohm 47 Ohm   1,2 kOhm   33 kOhm   820 kOhm
- 2,2 Ohm 56 Ohm   1,5 kOhm   39 kOhm   1 MOhm
- 2,7 Ohm 68 Ohm   1,8 kOhm   47 kOhm   1,2 MOhm
- 3,3 Ohm 82 Ohm   2,2 kOhm   56 kOhm   1,5 MOhm
- 3,9 Ohm 100 Ohm  2,7 kOhm   68 kOhm   1,8 MOhm
- 4,7 Ohm 120 Ohm  3,3 kOhm   82 kOhm   2,2 MOhm
- 5,6 Ohm 150 Ohm  3,9 kOhm   100 kOhm  2,7 MOhm
- 6,8 Ohm 180 Ohm  4,7 kOhm   120 kOhm  3,3 MOhm
- 8,2 Ohm 220 Ohm  5,6 kOhm   150 kOhm  3,9 MOhm
- 10 Ohm 270 Ohm  6,8 kOhm   180 kOhm  4,7 MOhm
- 12 Ohm 330 Ohm  8,2 kOhm   220 kOhm  5,6 MOhm
- 15 Ohm 390 Ohm  10 kOhm   270 kOhm  6,8 MOhm
- 18 Ohm 470 Ohm  12 kOhm   330 kOhm  8,2 MOhm
- 22 Ohm 560 Ohm  15 kOhm   390 kOhm  10 MOhm
More examples for ultrabright LEDs: 12 volt or 9 volt or any other voltage

You may put in the resistor into the circuit, where you like. You have the same current in the LED.

In this circuit it is the same. It does not matter, where you put in the resistor. You have the same current.

If you have a power supply with 12 volt, it is not possible to have more than 3 white (blue, green, violet) LEDs in a row or more than 5 red (orange, yellow) LEDs in a row.

LED-Smiley ....... Circuit diagram with 37 ultrabright LEDs

Complete current: $11 \times 20 \text{mA} = 220 \text{mA}$

Power supply: electronic transformer: 12 volt, 500 mA or more
Your smiley with 37 LEDs
Fix this paper with a tape into the center of the round board.
Drill all points (74 x 1mm) very exactly!
Good luck!