

Voltage divider

Goal: Handling of voltage dividers

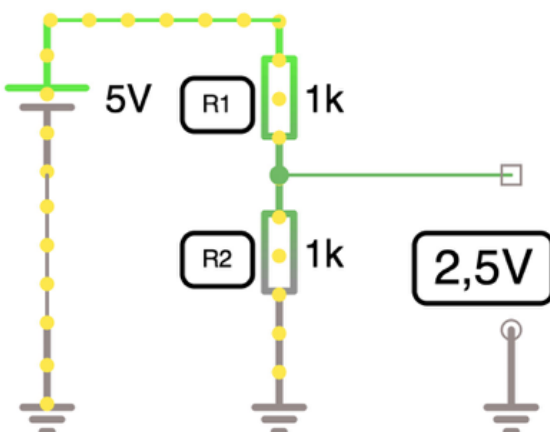
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Possible application

A voltage divider consists of 2 resistors connected in series and divides – as the name indicates – the input voltage in a specific ratio.

Sometimes, 2 or more voltages are required in a circuit (on a PCB). For example, a 5V microcontroller can be used while a sensor is supplied with 3.3V. By means of a voltage divider, the required 3.3V can be generated from the 5V.

Calculation



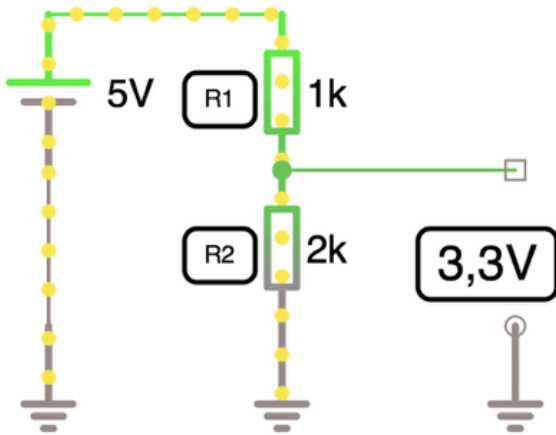
If R1 and R2 are equal, the total voltage of 5V is divided in a ratio of 1:1 and 2.5V are applied at the output.

For calculation of the desired output voltage, the following formula is used:

$$V_{out} = \frac{R2}{R1+R2} * V_{in}$$

Example:

A voltage source V_{in} of 5V is to provide a voltage of 3.3V for a sensor. One of the two resistors must be assumed. For this, a resistor R_2 with 2kOhm (2000Ohm) is assumed.



$$V_{out} = \frac{R_2}{R_1 + R_2} * V_{in}$$

$$3,3 = \frac{2000}{R_1 + 2000} * 5$$

$$3,3 * (R_1 + 2000) = 2000 * 5$$

$$3,3 R_1 + 6600 = 10000$$

$$3,3 R_1 = 3400$$

$$R_1 = 1030 \sim 1k\Omega$$

Assignment:

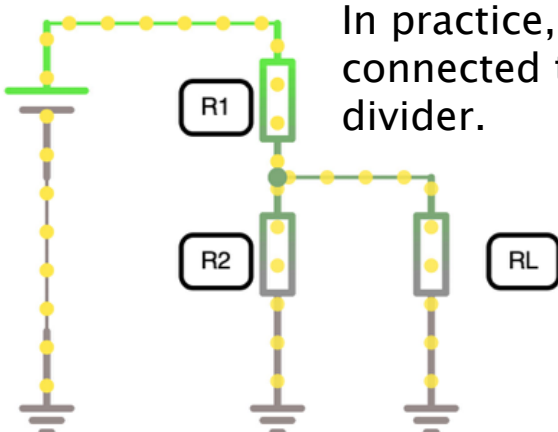
An input voltage from of 4 Mignon batteries ($4 \times 1.5V = 6V$) is to be applied to generate a voltage of 3.3V for an inclination sensor. For R_2 , 2kOhm is assumed.

Which rating must be selected for resistor R_1 ?

Solution: 1,6kOhm

Please note

In practice, an additional resistor R_L (load resistor) is often connected to the output of a circuit => capacitive voltage divider.



For calculation of a capacitive voltage divider, the calculated value from the parallel circuit $R_2 || R_L$ must be respectively applied instead of R_2 .