

RESISTORS

Resistors are electric devices used for adjusting current and potential in a circuit. They obey Ohm's law $V = R \cdot I$, where R is the resistance of the resistor.

There are resistors with fixed and others with variable resistance (see figures 1 and 2*). If the value of a resistor can be changed by means of a dial or a slider, it is called a *trimmer* resistor (two terminals) or a *potentiometer* (three terminals).

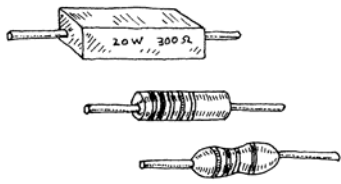


FIGURE 1: Fixed-value resistors

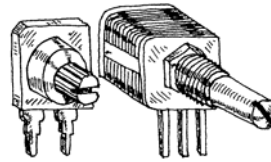


FIGURE 2: Trimmer and potentiometer

The resistance can also depend on parameters such as temperature (\rightarrow *thermistor*) or light (\rightarrow *photoresistor*) (see figures 3 and 4).

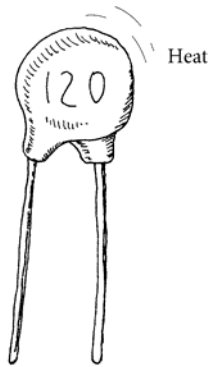


FIGURE 3: Thermistor

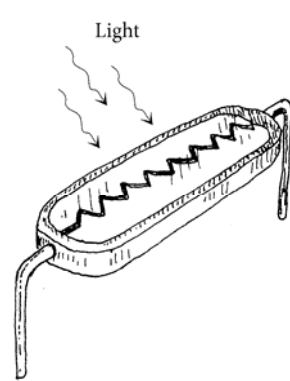


FIGURE 4: Photoresistor

In a lot of typical electric circuits, *carbon film* resistors (see figure 5) are used as fixed-value resistors. They are produced by coating a small ceramic cylinder with a very thin layer of carbon. The resistance can be further increased by a spiral carved in the carbon layer. The tolerance of carbon film resistors is typically only 5 %, but they are very cheap. If greater precision is required, *metal film* resistors with a tolerance of about 1 % are a good choice (see figure 6). For both types the resistance can easily be determined from the standardised colour code printed on the resistor.



FIGURE 5: Carbon film resistor

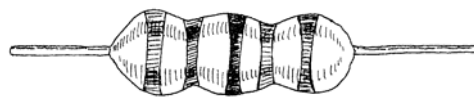


FIGURE 6: Metal film resistor

Resistors transform electric energy into heat. The power dissipated in the resistor must be limited to prevent the resistance from increasing beyond the value allowed by the tolerance. Typical power ratings range from 1/8 W to 2 W. For high power resistors, heat transfer to the surrounding air must be sufficiently high. This can be realised with *coil* resistors (wires wound around a ceramic cylinder) with a comparably huge surface (see figure 7).

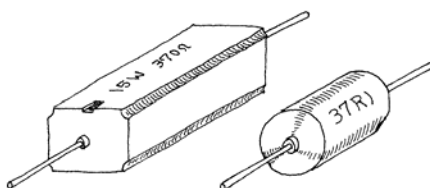


FIGURE 7: Coil resistors

* All figures are from the (excellent) book „Practical Electronics for Inventors“ by Paul Scherz (McGraw-Hill, 2000).