

## Passive Components of a Circuit (~ 4100)

(1) A passive component of a circuit is an electronic component containing<sup>1</sup> no source of power, in contrast to active components. (2) The three basic elements used<sup>2</sup> in electric circuits are the resistor, capacitor, and inductor. (3) They are considered to be important components of an electric circuit. (4) They also have their own standard symbols and units of measurement.

(5) Restricting<sup>3</sup> the flow of electrons or electric current to a certain level is called<sup>4</sup> *resistance* and the device or component used to restrict<sup>5</sup> the electric current is called *resistor*.

(6) The amount of electric current restricted by the resistor is determined by using<sup>6</sup> the Ohm's Law equation.

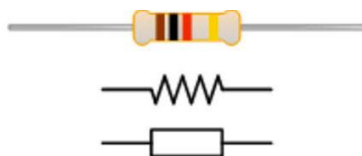
$$R = \frac{V}{I}$$

where R = Resistance, V = Voltage, I = Electric current

(7) The electric current flowing<sup>7</sup> through a resistor is inversely proportional to the resistance of a resistor and directly proportional to the voltage applied<sup>8</sup> across the resistor.

(8) In other words, the amount of electric current flowing through the resistor is expected to decrease with increasing<sup>9</sup> the resistance of a resistor (if voltage applied across resistor is kept constant) and increases with increasing the voltage applied across the resistor (if resistance of a resistor is kept constant). (9) Georg Simon Ohm (16 March 1789 – 6 July 1854) discovered the relationship between voltage and current in electrical circuits ("Ohm's Law").

(10) Resistors are the most commonly used electronic components in the circuits. (11) A resistor is an electronic component that reduces or restricts the flow of electrons or electric current to certain level.



(12) How much electric current a resistor blocks depends on the resistance of a resistor. (13) The resistors with more resistance will block large amount of electric current and allow very small amount of electric current. (14) The resistors with less resistance is sure to block very small amount of electric current and allow large amount of electric current.

(15)The electric current blocked by the resistor is wasted in the form of heat.

(16)Resistors are the passive components. (17)Hence, they cannot control<sup>10</sup> the flow of electrons or electric current through them.

(18)However, they can restrict<sup>11</sup> the electric current to certain level.

(19)The symbol for a resistor is a zigzag line as shown below.  
(20)The letter "R" is used in equations. (21)The resistor consists of two terminals. (22)The terminals of the resistors are used to connect with other components through an electrical wire.



(23)The amount of electric current blocked by the resistor is measured in ohms. (24)The Ohm is often represented<sup>12</sup> by the omega symbol:  $\Omega$ .

(25)Ohm is the amount of electric current blocked by the resistor.  
(26)It allows one ampere of electric current to flow when an applied voltage of one volt is kept constant.

(27)We know that materials are mainly classified into two types: insulators and conductors.

(28)Insulators block large amount of electric current and allow very small amount of electric current whereas conductors allow large amount of electric current.

(29)Resistors with more resistance are known to act as insulators whereas the resistors with less resistance act as conductors.

(30)Resistance of a resistor depends on two factors: length and cross sectional area.

(31)The resistance of a resistor is directly proportional to the length of a resistor. (32)The long length resistors are likely to offer high resistance because the free electrons have to travel<sup>13</sup> large distance. (33)Hence, a large number of free electrons collide with the atoms. (34)Therefore, large amount of energy or electric current will be<sup>14</sup> wasted in the form of heat.

(35)The short length resistors offer low resistance because the free electrons have to travel only a short distance. (36)Hence, a small number of free electrons collides the atoms. (37)Therefore, only a small amount of electric current is wasted in the form of heat.

(38)The resistance of a resistor is<sup>15</sup> inversely proportional to the cross sectional area of resistor. (39)The resistors with large cross sectional area provide more space for the free electrons to move freely.

(40) Hence, the collision of free electrons with the atoms is less.  
(41) Therefore, very small amount of electric current is wasted.

(42) The resistors with small cross sectional area provide very small space for the free electrons. (43) Hence, the collision of free electrons with the atoms is more. (44) Therefore, large amount of electric current is wasted.

(45) Advantages of resistors

Resistors are very small. Hence, it is very easy to carry them from one place to another place.

Resistors are very cheap. Hence, it is easy to replace them.

Resistors do not depend on the external source of voltage. Hence, external voltage or energy is not needed for operating the resistors.

Disadvantages of resistors.

Resistors with high resistance oppose large amount of electric current. Hence, large amount of energy is wasted in the form of heat.