Resistors

What is a Resistor?

A **resistor** is used to *resist* the flow of electrical current. It is one of the more commonly used components in electrical circuits.

Types of Resistors

Fixed Resistor

Thick Fillm Type

LDR Resistor

Thin Film Type

Potentiometer

Trimming Pot

Surface Mount
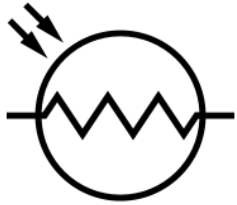
Thermistor

Rheostat

Varistor

Wire Wound Type

Resistor Schematic Symbols

The schematic symbol for the **photoresistor**

The schematic symbol for the **fixed resistor**

The schematic symbol for the **potentiometer**

Who Invented the Resistor?


**Otis Frank Boykin
1920-1982**

The inventor Otis Frank Boykin, known for inventing the *wire precision resistor*. Variations of his resistor technologies are used in many things like televisions, radios, computers, pacemakers, and cars.

What is Resistance

Resistance is a *measure* of the opposition to current flow in an electric circuit.

Resistors resist or limit the amount of electrical flow through a wire.
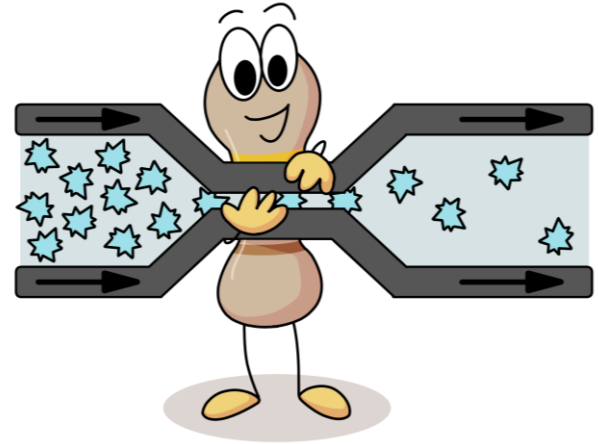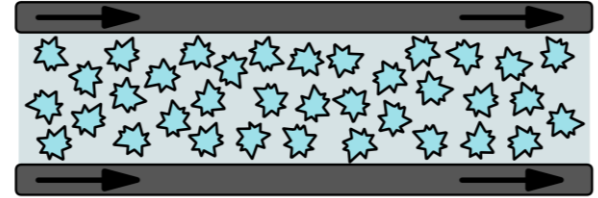
Unit of Measure for Resistance

The unit **Ohm (Ω)** is the way we measure resistance everywhere in the world! It is named after the German physicist and mathematician Georg Simon Ohm.

Georg Simon Ohm
1789-1854

Ω

The Greek symbol Omega is used by the International System of Units (SI) to symbolize the standard unit of electrical resistance!

How To Calculate Resistance?

Fixed resistors are marked with bands of different color.

These color bands help us identify
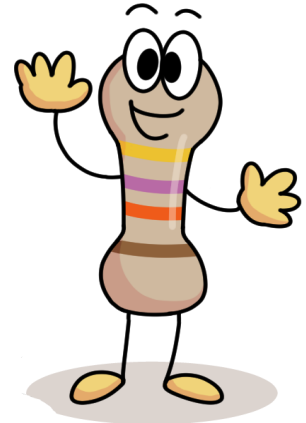the resistance value of any resistor.

How To Calculate Resistance?

	1st Digit	2nd Digit	Multiplier	Tolerance
Black	0	0	x 1	
Brown	1	1	x10	
Red	2	2	$x10^2$	
Orange	3	3	$x10^3$	
Yellow	4	4	$x10^4$	
Green	5	5	$x10^5$	
Blue	6	6	$x10^6$	
Violet	7	7	$x10^7$	
Grey	8	8	$x10^8$	
White	9	9	$x10^9$	
Gold			$x10^{-1}$	±5%
Silver			$x10^{-2}$	±10%

This chart shows us the numerical values of each color depending on their position on the resistor.
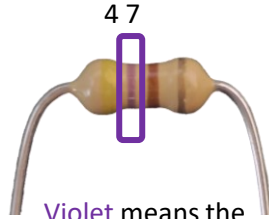
The more you practice, the better you will get at calculating resistance using the color bands!
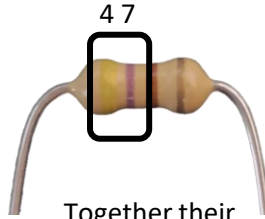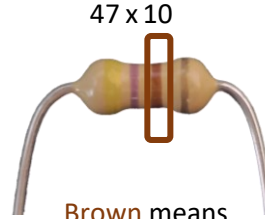
How To Calculate Resistance?

4
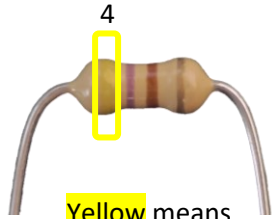
Yellow means the value is 4

4 7

Violet means the value is 7

4 7

Together their value is 47

47 x 10

Brown means multiply by 10

470

The value of this resistor is 470 or **470Ω**

470Ω

Gold means tolerance is ±5%

Measured Resistance can vary between 446.5Ω-493.5Ω

	1st Digit	2nd Digit	Multiplier	Tolerance
Black	0	0	x 1	
Brown	1	1	x10	
Red	2	2	x10^2	
Orange	3	3	x10^3	
Yellow	4	4	x10^4	
Green	5	5	x10^5	
Blue	6	6	x10^6	
Violet	7	7	x10^7	
Grey	8	8	x10^8	
White	9	9	x10^9	
Gold			x10^{-1}	±5%
Silver			x10^{-2}	±10%

Here is an example of using the color bands to determine the *Rated Resistance*.

How To Calculate Resistance?
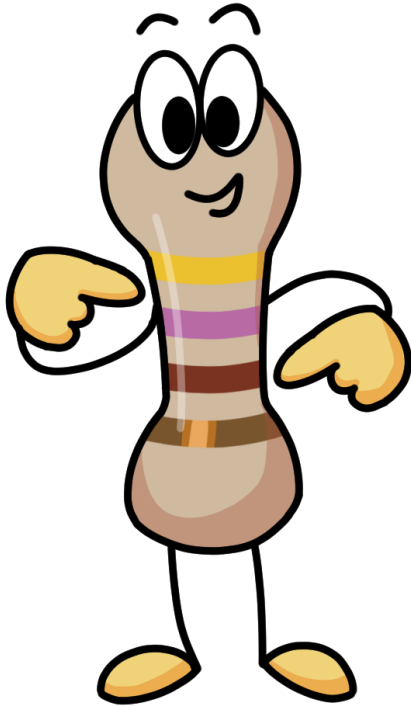
1ˢᵗ Band = 1ˢᵗ Digit = YELLOW = 4
2ⁿᵈ Band = 2ⁿᵈ Digit = VIOLET = 7
3ʳᵈ Band = Multiplier = BROWN = 10^1 = 10
4ᵗʰ Band = Tolerance = GOLD = ± 5%

47 X 10 = 470Ω

The 470Ω Resistor at ± 5% tolerance makes the actual value somewhere between 446.5 Ω and 493.5 Ω

How To Calculate Resistance?

1st Band = 1st Digit = BROWN = 1
2nd Band = 2nd Digit = BLACK = 0
3rd Band = Multiplier = RED = 10^2 = 100
4th Band = Tolerance = GOLD = ± 5%

10 X 100 = 1000Ω or 1KΩ

The1KΩ Resistor at ± 5% tolerance makes the actual value somewhere between 1050 Ω and 950 Ω

How To Calculate Resistance?

1st Band = 1st Digit = YELLOW = 4

2nd Band = 2nd Digit = VIOLET = 7

3rd Band = Multiplier = RED = 10^2 = 100

4th Band = Tolerance = GOLD = ± 5%

47 X 100 = 4700Ω or 47KΩ

The 47KΩ Resistor at ± 5% tolerance makes the actual value somewhere between 44765Ω and 47235 Ω

How To Measure Resistance?

Another method to figure out resistance is to measure it by using a multimeter!

SQUARE BRAIN
Resistors