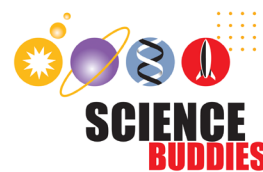


Build an Arduino Self-Driving Car

Resistor Guide



Resistors are small electronic parts that resist the flow of electrical current. Resistors have many uses, but in this project you will use them for two things:

- A current-limiting resistor to limit the amount of current flowing through an LED. This prevents the LED from burning out.
- A pull-up or pull-down resistor, which "pulls" the voltage in a circuit in a certain direction (either up to 5 volts or down to 0 volts). Pull-up and pull-down resistors are used with Arduino inputs in order to help avoid "floating" or undefined values.

A resistor's amount of opposition to the flow of current is called its resistance. Resistance is measured in ohms, abbreviated Ω (the capital Greek letter Omega). Resistance may have a metric prefix, for example kilo-ohms ($k\Omega$). The resistance value is indicated by color-coded bands on the resistor. You will need two types of resistors from your BlueBot kit.

Resistance	Use	Band colors	Diagram
220 Ω	Current-limiting	Red, red, brown, gold	
10 $k\Omega$	Pull-up or pull-down	Brown, orange, black, gold	

More generally, you can identify the resistance of a 4-band resistor using the following table. The first two bands are the base resistance value, the third band is a power of 10 multiplier, and the fourth band (which is spaced farther away from the other three bands) is the tolerance. So, for example red, red, brown, gold indicates $22 \times 10^1 \pm 5\% = 220\Omega \pm 11\Omega$. Brown, black, orange, gold indicates $10 \times 10^3 \pm 5\% = 10k\Omega \pm 500\Omega$.

Color	1 st band (1 st digit)	2 nd band (2 nd digit)	3 rd band (multiplier)	4 th band (tolerance)
Black	0	0	$\times 10^0$	
Brown	1	1	$\times 10^1$	$\pm 1\%$
Red	2	2	$\times 10^2$	$\pm 2\%$
Orange	3	3	$\times 10^3$	$\pm 3\%$
Yellow	4	4	$\times 10^4$	$\pm 4\%$
Green	5	5	$\times 10^5$	$\pm 0.5\%$
Blue	6	6	$\times 10^6$	$\pm 0.25\%$
Violet	7	7	$\times 10^7$	$\pm 0.1\%$
Grey	8	8	$\times 10^8$	$\pm 0.05\%$
White	9	9	$\times 10^9$	
Gold			$\times 10^{-1}$	$\pm 5\%$
Silver			$\times 10^{-2}$	$\pm 10\%$