

Kirchoff's Rules—Supplementary Material

Because resistors are generally too small for convenient labeling, a color code has been developed using a series of bands for easy identification. Each color is associated with a specific numerical value, and the placement of the band gives information on how that value is used. Table 1 denotes which colors correspond with which value. Resistors have no polarity—it does not matter which direction they face in the circuit. For the purposes of identification, however, the order of the bands does matter. One end of a resistor will have the tolerance band, which is usually farther away from the other three and is commonly silver or gold. The tolerance band is considered the “last” band.

The first two bands are the digits. For the sample resistor shown in Figure 1, the first band is violet, which according to Table 1 corresponds to a value of 7. The second band is black, which corresponds to 0. So these simply come together to form “70.” This is then multiplied by the third band—the multiplier. The third band in this example is green, corresponding to a value of 10^5 , or 100,000. Multiplying 70 by 100,000 gives us the resistance value of 7,000,000 Ω or 7 M Ω (megaohms). Lastly, the tolerance gives the range. The resistance of the resistor may not be exactly the value depicted on the label, but all resistors will have to fall within a certain range of resistance. Since the tolerance band is silver in the sample resistor, the tolerance is $\pm 10\%$. The value of the resistor then could be anywhere within 10% of 7 M Ω —in this case, the range extends from 6,300,000 Ω (6.3 M Ω) to 7,700,000 Ω (7.7 M Ω).

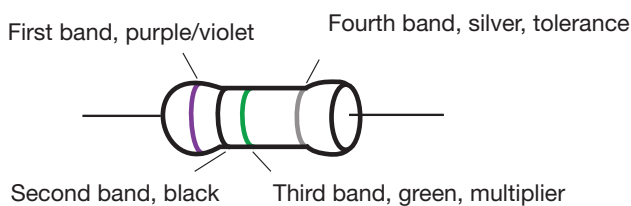


Figure 1.

Color	Numerical Value (1 st and 2 nd bands)	Multiplier (3 rd band)	Tolerance (4 th band)
Black	0	1 (10^0)	
Brown	1	10 (10^1)	1%
Red	2	100 (10^2)	2%
Orange	3	1,000 (10^3)	
Yellow	4	10,000 (10^4)	
Green	5	100,000 (10^5)	0.5%
Blue	6	1,000,000 (10^6)	0.25%
Violet	7	10,000,000 (10^7)	0.1%
Gray	8	100,000,000 (10^8)	
White	9	1,000,000,000 (10^9)	
Silver		0.01	10%
Gold		0.1	5%
None			20%

Table 1. Resistor Color Code Chart