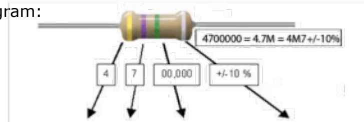
SUPPORT

Resistor Colour Code

Diagram:



Band	1	2	3	4
Meaning	1st Digit	2nd Digit	(No. of zeros)	Tolerance % (No band +/- 20%)
Silver			.00 (divide by 100)	+/-10%
Gold			.0 (divide by 10)	+/-5%
Black	0	0	No Zeros	
Brown	1	1	0	+/-1%
Red	2	2	00	+/-2%
Orange	3	3	,000	
Yellow	4	4	0,000	
Green	5	5	00,000	+/-0.5%
Blue	6	6	,000,000	+/-0.25%
Violet	7	7	0,000,000	+/-0.1%
Grey	8	8		+/-0.05%
White	9	9		

Function:

Resistors use coloured bands to indicate their resistive value and their tolerance. These coloured bands produce a system of identification known as a Resistors Colour Code. Resistors are manufactured in what are called "preferred values" with their resistance value printed onto their body in coloured bands.

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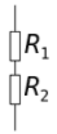
Resistors in Series

Diagram:



$$R_{TOTAL} = R_1 + R_2 \dots R_n$$

Resistors are said to be connected in **"Series"**, when they are daisy chained together in a single line.

Function:

As the resistors are connected together in series the same current passes through each resistor in the chain and the total resistance, R_{Total} of the circuit is equal to the sum of all the individual resistors added together. **Resistors in Series** have a **Common Current** flowing through them.

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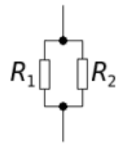
Resistors in Parallel

Diagram:



$$\frac{1}{R_{TOTAL}} = \frac{1}{R_1} + \frac{1}{R_2} \dots \frac{1}{R_n}$$

Resistors are said to be connected together in **"Parallel"** when both of their terminals are connected to each terminal of the other resistor or resistors.

Function:

Here, the 1/R value of the individual resistances are all added together instead of the resistances themselves with the inverse of the total sum giving the equivalent resistance for the set of resistors in parallel. **Resistors in Parallel** have a **Common Voltage** across them.

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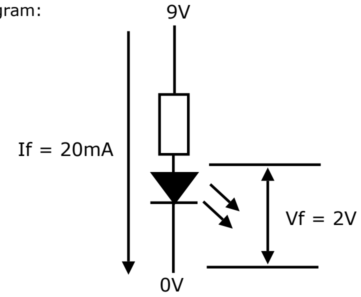
LED Resistor Calculation

Diagram:



R = (Supply V - Vf) / If
R = (9V - 2V) / 20mA
R = 7V / 20mA
R = 0.35K = 350 ohms

Function:

Supply V is the power supply voltage

Vf is the forward voltage needed to make the LED light, most are approx 2V, blue LEDs are 3V

If is the maximum current the LED can safely conduct, normal values between 10mA and 20mA

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Resistors Preferred values

Diagram:

E3step	E6step	E12step	E24step
1	1	1	1
			1.1
		1.2	1.2
			1.3
	1.5	1.5	1.5
			1.6
		1.8	1.8
			2.0
2.2	2.2	2.2	2.2
			2.4
		2.7	2.7
			3.0
	3.3	3.3	3.3
			3.6
		3.9	3.9
			4.3
4.7	4.7	4.7	4.7
			5.1
		5.6	5.6
			6.2
	6.8	6.8	6.8
			7.5
		8.2	8.2
			9.1

Function:

Resistors are available in a number of standard ranges, called preferred values'. The most common series are probably E12 and E24. When designing a circuit you may need to round calculated resistor values up to the next highest preferred value, if your value isn't a one in the series you are using.

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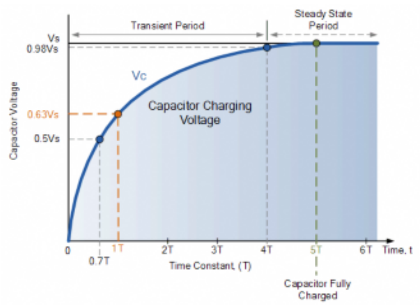
Time constant - RC

Diagram:



The Time constant is given by:

T(s) = R(Ω) x C(F)

Function:

It is the time required to **charge** the capacitor, through the resistor, to ≈ 63.2 percent of the maximum voltage applied. It is used to calculate time delays in a number of circuits involving timing.

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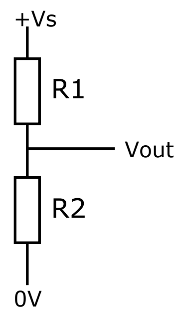
Potential Divider

Diagram:



$$V_{out} = \frac{V_s \times R_2}{(R_1 + R_2)}$$

Function:

A potential divider is made from resistors connected in series between the +Vs and 0V supply lines of a circuit. They are used to create a specific voltage level and are commonly used in sensing circuits or to set voltages used by other components such as transistors.

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RC Charging table

Diagram:

Time Constant	RC Value	Percentage of Maximum	
		Voltage	Current
0.5 time constant	0.5T = 0.5RC	39.3%	60.7%
0.7 time constant	0.7T = 0.7RC	50.3%	49.7%
1.0 time constant	1T = 1RC	63.2%	36.8%
2.0 time constants	2T = 2RC	86.5%	13.5%
3.0 time constants	3T = 3RC	95.0%	5.0%
4.0 time constants	4T = 4RC	98.2%	1.8%
5.0 time constants	5T = 5RC	99.3%	0.7%

Function:

This table contains useful times to reach specific voltages, based on the RC Time constant. Which is useful when designing delay circuits and ones that switch on transistors.