

RESISTOR, CAPACITOR AND INDUCTOR

It is sometimes not obvious whether a color coded component is a resistor, capacitor, or inductor, and this may be deduced by knowledge of its circuit function, physical shape or by measurement. Resistor values are always coded in ohms (symbol Ω), capacitors in picofarads (pF), and inductors in microhenries (μH).



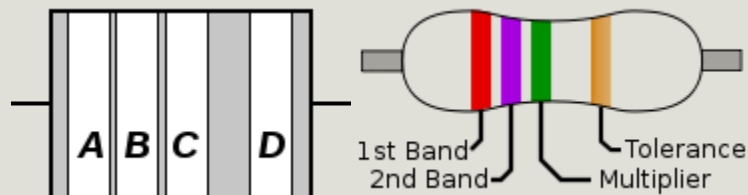
One decade of the preferred E12 values (there are twelve preferred values per decade of values) shown with their electronic color codes on resistors.



A 100 k Ω , 5% through-hole resistor.



A 0Ω resistor, marked with a single black band.



To distinguish left from right there is a gap between the C and D bands.

- band A is first significant figure of component value (left side)
- band B is the second significant figure
- band C is the decimal multiplier
- band D if present, indicates tolerance of value in percent (no color means 20%)

For example, a resistor with bands of yellow, violet, red, and gold will have first digit 4 (yellow in table below), second digit 7 (violet), followed by 2 (red) zeros: 4,700 ohms. Gold signifies that the tolerance is $\pm 5\%$, so the real resistance could lie anywhere between 4,465 and 4,935 ohms.

Resistors manufactured for military use may also include a fifth band which indicates component failure rate (reliability); refer to MIL-HDBK-199 for further details.

Tight tolerance resistors may have three bands for significant figures rather than two, and/or an additional band indicating temperature coefficient, in units of ppm/K.

All coded components will have at least two value bands and a multiplier; other bands are optional (italicised below).

The standard color code per EN 60062:2005 is as follows:

Color	Significant figures	Multiplier	Tolerance	Temp. Coefficient (ppm/K)		
Black	0	×100	–	250	U	
Brown	1	×101	±1%	F	100	S
Red	2	×102	±2%	G	50	R
Orange	3	×103	–		15	P
Yellow	4	×104	–		25	Q
Green	5	×105	±0.5%	D	20	Z

Blue	6	$\times 10^6$	$\pm 0.25\%$	C	10	Z
Violet	7	$\times 10^7$	$\pm 0.1\%$	B	5	M
Gray	8	$\times 10^8$	$\pm 0.05\%$	A	1	K
White	9	$\times 10^9$	–		–	
Gold	–	$\times 10^{-1}$	$\pm 5\%$	J	–	
Silver	–	$\times 10^{-2}$	$\pm 10\%$	K	–	
None	–	–	$\pm 20\%$	M	–	

1. Any temperature coefficient not assigned its own letter shall be marked "Z", and the coefficient found in other documentation.
2. For more information, see EN 60062.

A resistor which (read left to right) displays the colors yellow, violet, yellow, brown. The first two bands represent the digits '4, 7. The third band, another yellow, gives the multiplier 10⁴. The value is then 47 x 10⁴ Ω, or 470 kΩ. The brown band is a tolerance of ±1%.

Resistors use Preferred numbers for their specific values, which are determined by their tolerance. These values repeat for every decade of magnitude; 6.8, 68, 680, and so forth.

Zero ohm resistors are made as lengths of wire wrapped in a resistor-shaped body which can be substituted for another resistor value in automatic insertion equipment. They are marked with a single black band.[3]

The 'body-end-dot' or 'body-tip-spot' system was used for radial-lead composition resistors sometimes found in vacuum-tube equipment; the first band was given by the body color, the second band by the color of the end of the resistor, and the multiplier by a dot or band around the middle of the resistor. The other end of the resistor was colored gold or silver to give the tolerance, otherwise it was 20%. [4]

Extra bands on ceramic capacitors will identify the voltage rating class and temperature coefficient characteristics.[4] A broad black band was applied to some tubular paper capacitors to indicate the end that had the outer electrode; this allowed this end to be connected to chassis ground to provide some shielding against hum and noise pickup.

Polyester film and "gum drop" tantalum electrolytic capacitors are also color coded to give the value, working voltage and tolerance.

Source: http://web.ua.es/docivis/magnet/electronic_color_code.html