Capacitor Colour Code

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Capacitor Colour Codes

Generally, the actual values of Capacitance, Voltage or Tolerance are marked onto the body of the capacitors in the form of alphanumeric characters. However, when the value of the capacitance is of a decimal value problems arise with the marking of a "Decimal Point" as it could easily not be noticed resulting in a misreading of the actual value. Instead letters such as p (pico) or n (nano) are used in place of the decimal point to identify its position and the weight of the number.

For example, a capacitor can be labelled as, n47 = 0.47nF, 4n7 = 4.7nF or 47n = 47nF and so on. Also, sometimes capacitors are marked with the capital letter K to signify a value of one thousand pico-Farads, so for example, a capacitor with the markings of 100K would be 100 x 1000pF or 100nF.

To reduce the confusion regarding letters, numbers and decimal points, an International colour coding scheme was developed many years ago as a simple way of identifying capacitor values and tolerances. It consists of coloured bands (in spectral order) known commonly as the **Capacitor Colour Code**system and whose meanings are illustrated below:

Capacitor Colour Code Table

Colour	Digit A	Digit B	Multiplier D	Tolerance (T) > 10pf	Tolerance (T) < 10pf	Temperature Coefficient (TC)
Black	0	0	x1	± 20%	± 2.0pF	
Brown	1	1	x10	± 1%	± 0.1pF	$-33x10^{-6}$
Red	2	2	x100	± 2%	± 0.25pF	$-75x10^{-6}$
Orange	3	3	x1,000	± 3%		$-150x10^{-6}$
Yellow	4	4	x10,000	± 4%		$-220x10^{-6}$
Green	5	5	x100,000	± 5%	± 0.5pF	$-330x10^{-6}$
Blue	6	6	x1,000,000			$-470x10^{-6}$
Violet	7	7				$-750x10^{-6}$
Grey	8	8	x0.01	+80%,-20%		
White	9	9	x0.1	± 10%	± 1.0pF	
Gold			x0.1	± 5%		
Silver			x0.01	± 10%		

Capacitor Voltage Colour Code Table

Colour	Voltage Rating (V)

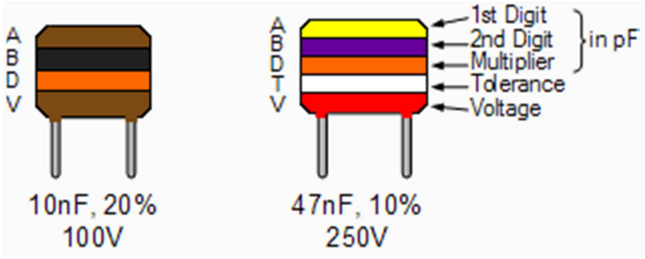
	Type J	Type K	Type L	Type M	Type N
Black	4	100		10	10
Brown	6	200	100	1.6	
Red	10	300	250	4	35
Orange	15	400		40	
Yellow	20	500	400	6.3	6
Green	25	600		16	15
Blue	35	700	630		20
Violet	50	800			
Grey		900		25	25
White	3	1000		2.5	3
Gold		2000			
Silver					

Capacitor Voltage Reference

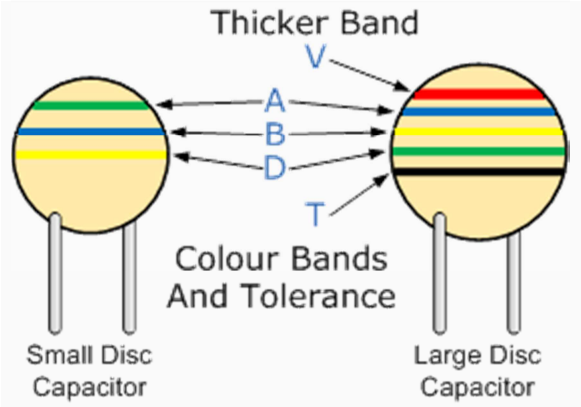
- Type J - Dipped Tantalum Capacitors.
- Type K - Mica Capacitors.
- Type L - Polyester/Polystyrene Capacitors.
- Type M - Electrolytic 4 Band Capacitors.
- Type N - Electrolytic 3 Band Capacitors.

An example of the use of capacitor colour codes is given as:

Metalised Polyester Capacitor



Disc & Ceramic Capacitor



The **Capacitor Colour Code** system was used for many years on unpolarised polyester and mica moulded capacitors. This system of colour coding is now obsolete but there are still many "old" capacitors around. Nowadays, small capacitors such as film or disk types conform to the BS1852 Standard and its new replacement, BS EN 60062, were the colours have been replaced by a letter or number coded system.

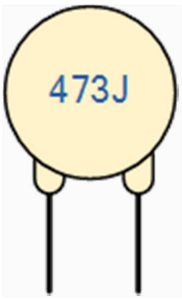
Generally the code consists of 2 or 3 numbers and an optional tolerance letter code to identify the tolerance. Where a two number code is used the value of the capacitor only is given in picofarads, for example, 47 = 47 pF and 100 = 100pF etc. A three letter code consists of the two value digits and a multiplier much like the resistor colour codes in the resistors section.

For example, the digits 471 = 47*10 = 470pF. Three digit codes are often accompanied by an additional tolerance letter code as given below.

Capacitor Tolerance Letter Codes Table

	Letter	B	C	D	F	G	J	K	M	Z
Tolerance	C <10pF ±pF	0.1	0.25	0.5	1	2				
	C >10pF ±%			0.5	1	2	5	10	20	+80-20

Consider the capacitor below:



The capacitor on the left is of a ceramic disc type capacitor that has the code 473J printed onto its body. Then the 4 = 1st digit, the 7 = 2nd digit, the 3 is the multiplier in pico-Farads, pF and the letter J is the tolerance and this translates to:

47pF * 1,000 (3 zero's) = 47,000 pF , 47nF or 0.047 uF

the J indicates a tolerance of +/- 5%

Then by just using numbers and letters as codes on the body of the capacitor we can easily determine the value of its capacitance either in Pico-farad's, Nano-farads or Micro-farads and a list of these "international" codes is given in the following table along with their equivalent capacitances.

Capacitor Letter Codes Table

Picofarad (pF)	Nanofarad (nF)	Microfarad (uF)	Code	Picofarad (pF)	Nanofarad (nF)	Microfarad (uF)	Code

10	0.01	0.00001	100	4700	4.7	0.0047	472
15	0.015	0.000015	150	5000	5.0	0.005	502
22	0.022	0.000022	220	5600	5.6	0.0056	562
33	0.033	0.000033	330	6800	6.8	0.0068	682
47	0.047	0.000047	470	10000	10	0.01	103
100	0.1	0.0001	101	15000	15	0.015	153
120	0.12	0.00012	121	22000	22	0.022	223
130	0.13	0.00013	131	33000	33	0.033	333
150	0.15	0.00015	151	47000	47	0.047	473
180	0.18	0.00018	181	68000	68	0.068	683
220	0.22	0.00022	221	100000	100	0.1	104
330	0.33	0.00033	331	150000	150	0.15	154
470	0.47	0.00047	471	200000	200	0.2	254
560	0.56	0.00056	561	220000	220	0.22	224
680	0.68	0.00068	681	330000	330	0.33	334
750	0.75	0.00075	751	470000	470	0.47	474
820	0.82	0.00082	821	680000	680	0.68	684
1000	1.0	0.001	102	1000000	1000	1.0	105
1500	1.5	0.0015	152	1500000	1500	1.5	155
2000	2.0	0.002	202	2000000	2000	2.0	205
2200	2.2	0.0022	222	2200000	2200	2.2	225
3300	3.3	0.0033	332	3300000	3300	3.3	335

The next tutorial in our section about Capacitors, we look at connecting together **Capacitor in Parallel** and see that the total capacitance is the sum of the individual capacitors.