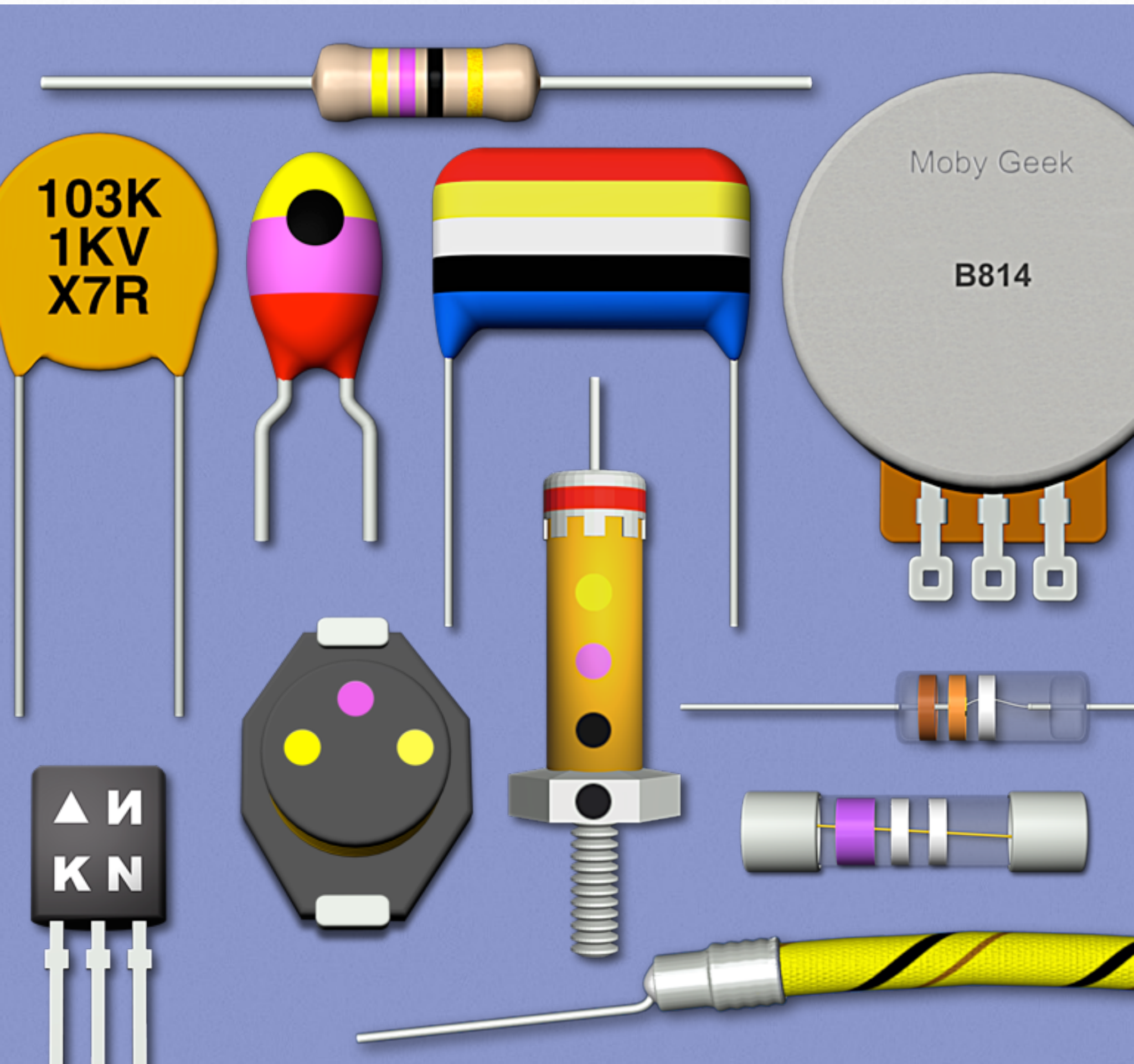
Tio Luigi's

Components Codification Guide



Tio Luigi's

Components Codification Guide

Luiz "Tio Luigi" Ferreira

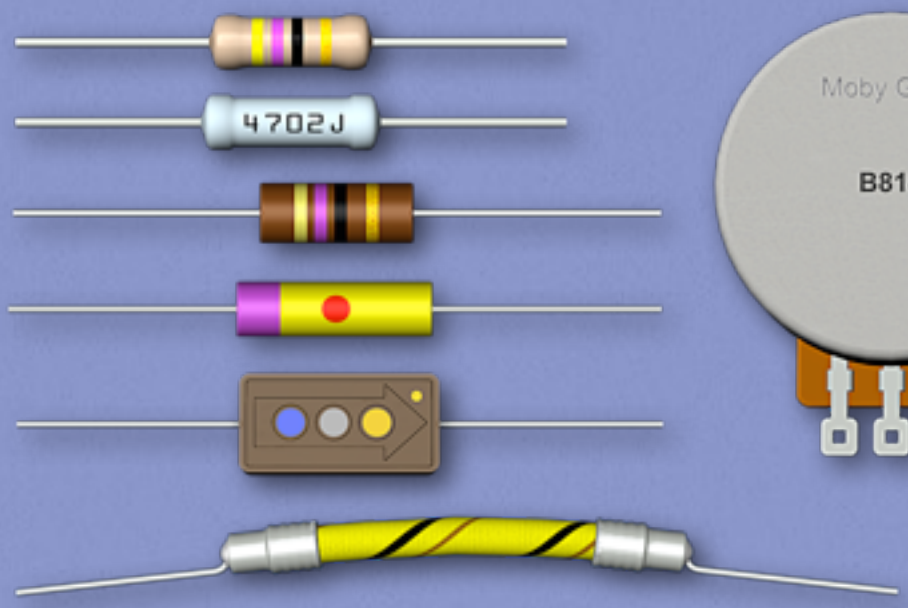
Author, Illustrator

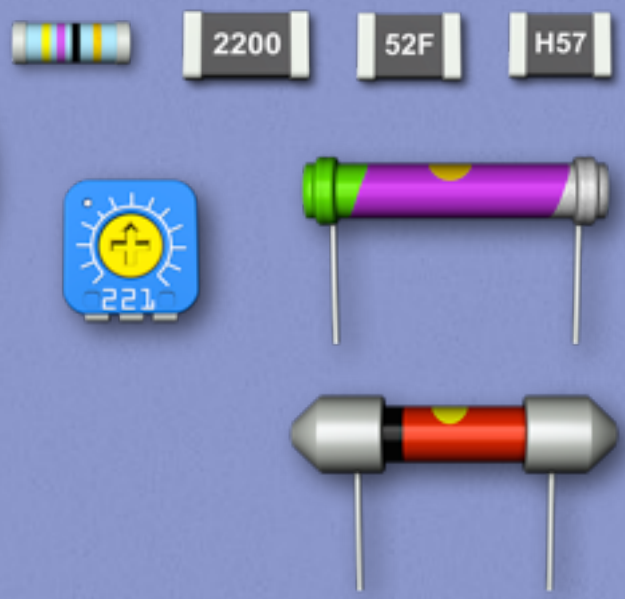
Rose Nunes

Revisor

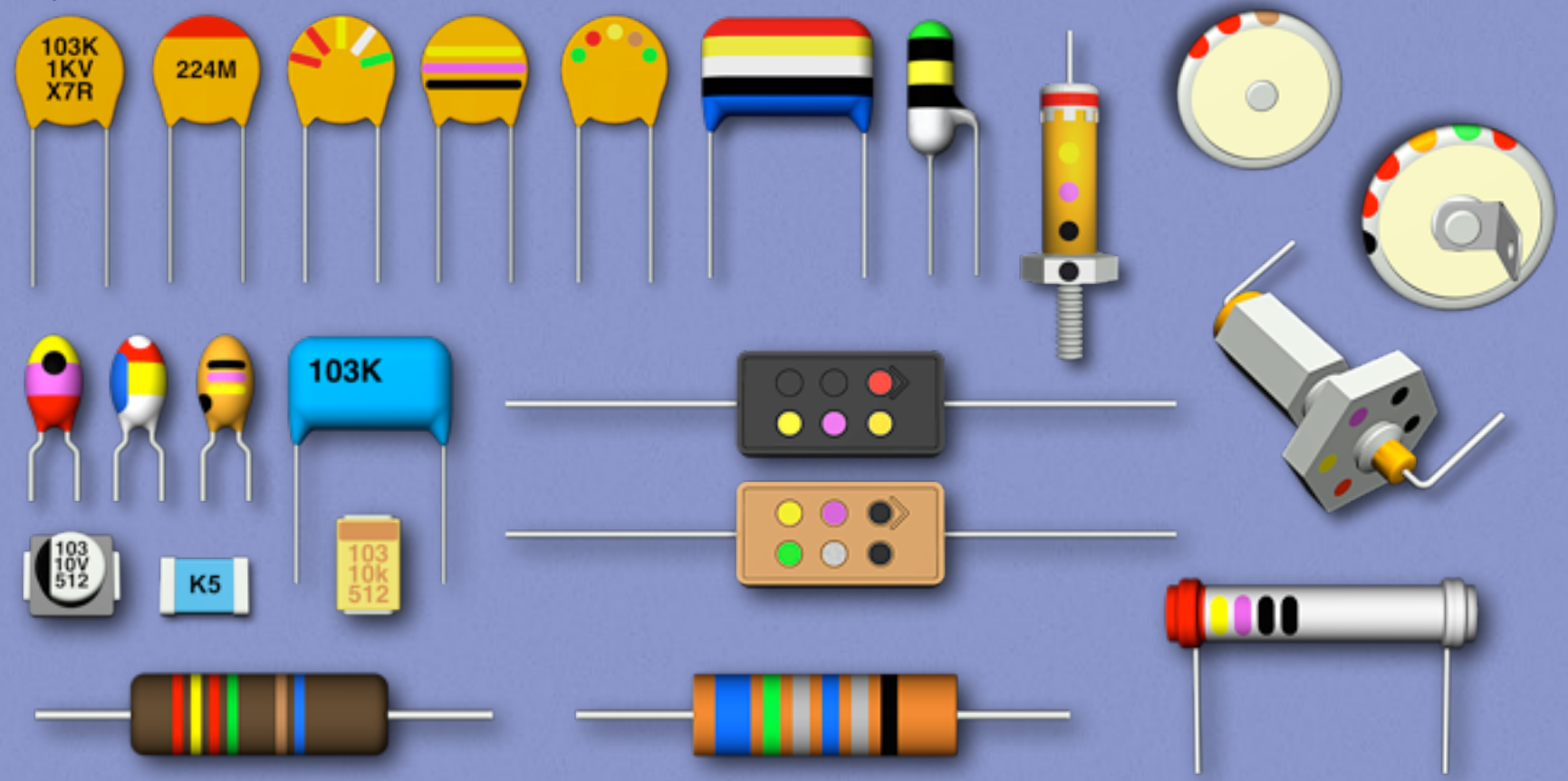
Index

Resistors



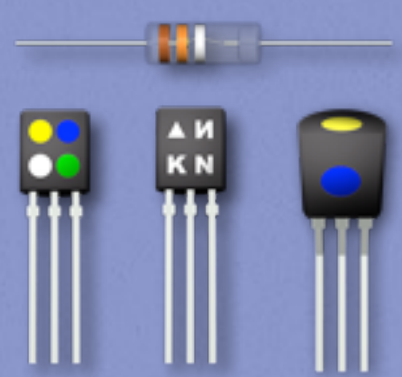


Capacitors

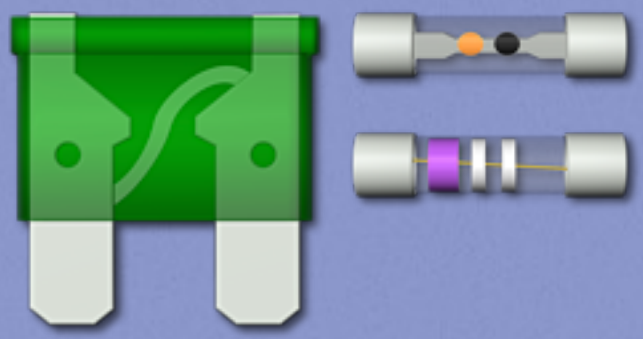


Inductors

Semiconductors



Fuses

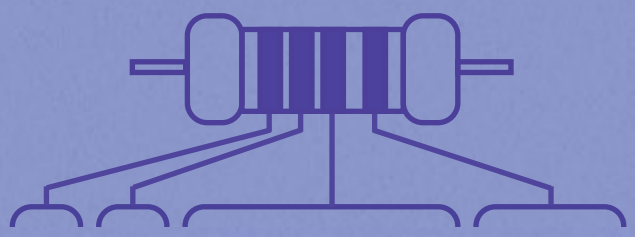
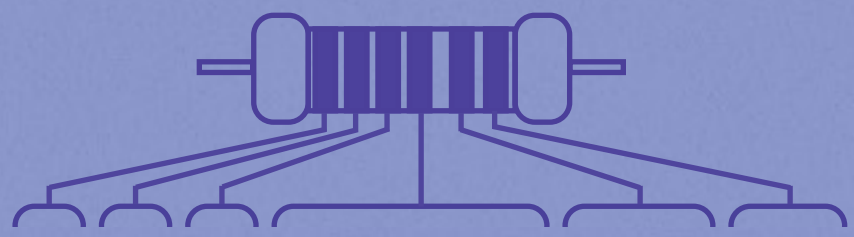


R 

Resistors

Axial Film Resistors

Codification Chart

	Carbon Film Resistors (4 bands)				Metal Film Resistors (5 or 6 bands)					
										
Black	0	0	x1		0	0	0	x1		
Brown	1	1	x10	1%	1	1	1	x10	1%	100
Red	2	2	x100	2%	2	2	2	x100	2%	50
Orange	3	3	x1 000		3	3	3	x1 000		15
Yellow	4	4	x10 000		4	4	4	x10 000		25
Green	5	5	x100 000	0.5%	5	5	5	x100 000	0.5%	
Blue	6	6	x1 000 000	0.25%	6	6	6	x1 000 000	0.25%	10
Purple	7	7	x10 000 000	0.1%	7	7	7	x10 000 000	0.1%	5
Grey	8	8			8	8	8			
White	9	9			9	9	9			
Gold			÷10	5%				÷10	5%	
Silver			÷100	10%				÷100	10%	
	1° band: First digit 2° band: Second digit 3° band: Multiplier/divider 4° band: Tolerance (+/-)				1° band: First digit 2° band: Second digit 3° band: Third digit 4° band: Multiplier/divider 5° band: Tolerance (+/-) 6° band: Temperature Coefficient (in PPM/°C)					

Examples

47Ω ±5%
yellow (4), purple (7), black (x1), gold (5%)

820KΩ ±10%
grey (8), red (2), yellow (x10000), silver (10%)

Examples (Axial Film Resistors)

2.77MΩ ±5%
red (2), purple (7), purple (7), yellow (x10000), gold (5%)

3.6KΩ ±5%, 50PPM/°C
orange (3), blue (6), black (0), brown (x10), gold (5%), red (50 PPM/°C)

755Ω ±5%, 25PPM/°C
purple (7), green (5), green (5), black (x1), gold (5%), yellow (25 PPM/°C)

More Info

The temperature coefficient is in Parts Per Million (PPM) or 10^{-6} . Example: a resistor with the 6th color red has a temperature coefficient of $50x10^{-6}$/°C.

It is possible to find zero ohm resistors. They are used mostly like configuration resistors (where the presence of a resistor works like a closed switch and the lack of it is an open one) or in circuit boards where they are just bridges avoiding crossing tracks. The zero ohm resistors has one, two or three black bands. Examples:

Five bands resistors with fourth color gold or silver it's deprecated, used for special applicatons. First band is first digit, second band is second digit, third band is multiplier or divider, fourth band (gold or silver) is tolerance and the fifth color is the temperature coefficient. Examples:

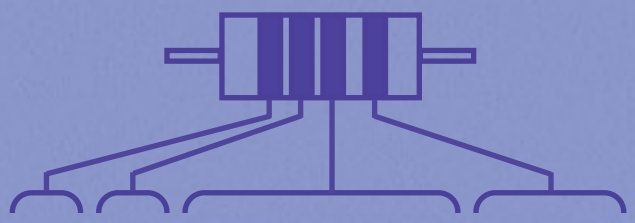
62Ω ±5%, 50PPM/°C | 470KΩ ±5%, 100PPM/°C | 220Ω ±5%, 25PPM/°C

In high voltage resistors, the colors gold and silver are replaced by yellow and gray, to prevent metal particles in the coat. Examples:

820KΩ ±10%, gray instead of silver | 2.77MΩ ±5%, yellow instead of gold

Axial Molded Carbon Resistors

Codification Chart



Black	0	0	x1	
Brown	1	1	x10	
Red	2	2	x100	
Orange	3	3	x1 000	
Yellow	4	4	x10 000	
Green	5	5	x100 000	
Blue	6	6	x1 000 000	
Purple	7	7	x10 000 000	
Grey	8	8		
White	9	9		
Gold			÷10	5%
Silver			÷100	10%
None				20%

1° band: First digit
2° band: Second digit
3° band: Multiplier
4° band: Tolerance (+/-). If this color is not present, the tolerance is ±20%.

Examples

47Ω ±5%
yellow (4), purple (7), black (x1), gold (5%)

820KΩ ±10%
grey (8), red (2), yellow (x10000), silver (10%)

22Ω ±20%
red (2), red (2), black (x1), none (20%)

68KΩ ±10%
blue (6), grey (8), orange (x1000), silver (10%)

3.7KΩ ±10%
orange (3), purple (7), red (x100), silver (10%)

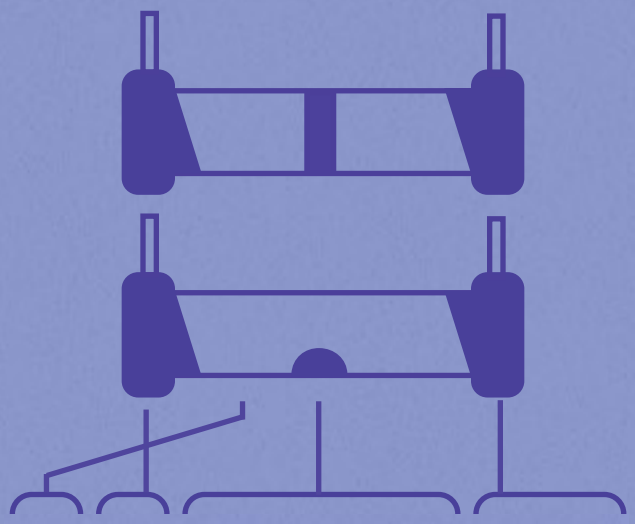
4.7Ω ±5%
yellow (4), purple (7), gold (÷10), gold (5%)

More Info

The production of this type of resistor has stopped in the 90's. However, because of their non-magnetic and non-inductive characteristics it continued to be a great option for sound applications. In the 2000's, some components manufacturers started to produce it again.

Tubular Carbon Resistors

Codification Chart

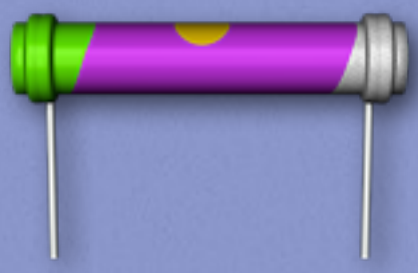


Black	0	0	x1
Brown	1	1	x10
Red	2	2	x100
Orange	3	3	x1 000
Yellow	4	4	x10 000
Green	5	5	x100 000
Blue	6	6	x1 000 000
Purple	7	7	x10 000 000
Grey	8	8	
White	9	9	
Gold		÷10	5%
Silver		÷100	10%
None			20%

Examples

5KΩ ±5%

Body: green (5)
Tip: black (0)
Dot: red (x100)
4° color: gold (5%)



75KΩ ±10%

Body: purple (7)
Tip: green (5)
Dot: orange (x1000)
4° color: silver (10%)

200KΩ ±20%

Body: red (2)
Tip: black (0)
Ring: yellow (x10000)
4° color: none (20%)

30KΩ ±20%

Body: orange (3)
Tip: black (0)
Dot: orange (x1000)
4° color: none (20%)

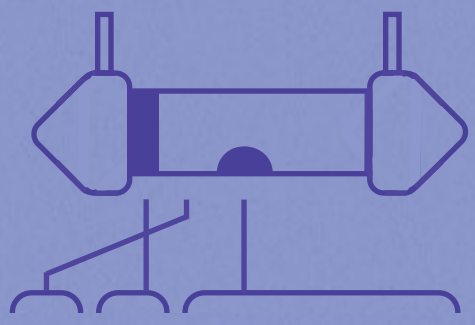
Body color: First digit
Tip color: Second digit
Dot or ring color: Multiplier
4° color: Tolerance (+/-). If this color is not present, the tolerance is ±20%.

More Info

In this type of resistor, it is possible to find values like 51K instead of 50K or 99K instead of 100K, due to some of the larger manufacturers (Philco, for example) used mercury-vapor lighting in their assembly plants and certain colors are difficult to distinguish under the bluish-green light from this lamps. For example, the black in the green-black-orange color of a 50,000-ohm resistor is not clearly distinguishable under this light. Therefore, instead of using a 50,000-ohm resistor, a 51,000-ohm unit was used instead, since each of the code colors (green-brown-green) for this value would show up sufficiently well.

“Dogbone” Tubular Carbon Resistors

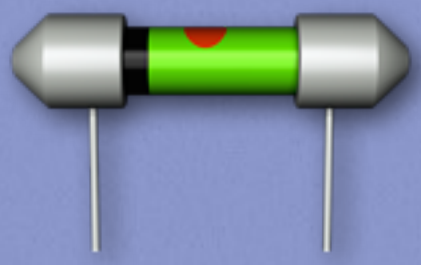
Codification Chart



Black	0	0	x1
Brown	1	1	x10
Red	2	2	x100
Orange	3	3	x1 000
Yellow	4	4	x10 000
Green	5	5	x100 000
Blue	6	6	x1 000 000
Purple	7	7	x10 000 000
Grey	8	8	
White	9	9	

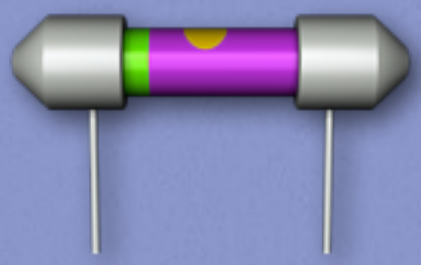
Body color: First digit
Tip color: Second digit
Dot color: Multiplier

Examples



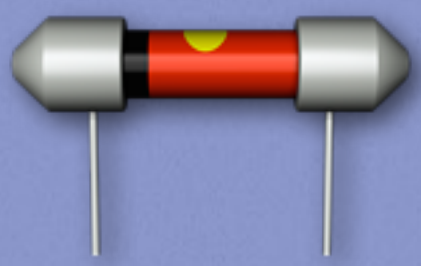
5KΩ

Body: green (5)
Tip: black (0)
Dot: red (x100)



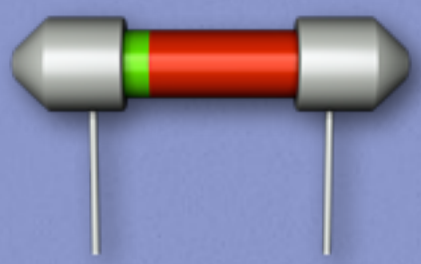
75KΩ

Body: purple (7)
Tip: green (5)
Dot: orange (x1000)



200KΩ

Body: red (2)
Tip: black (0)
Dot: yellow (x10000)



2.5KΩ

Body: red (2)
Tip: green (5)
Dot: red (x100)

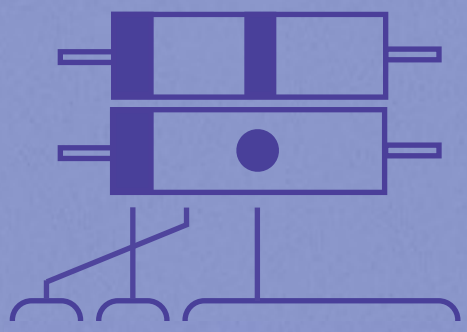
More Info

This component has no tolerance marking. If not declared by the manufacturer, it should be considered 20%.

In this type of resistor, it is possible to find values like 51K instead of 50K or 99K instead of 100K, due to some of the larger manufacturers (Philco, for example) used mercury-vapor lighting in their assembly plants and certain colors are difficult to distinguish under the bluish-green light from this lamps. For example, the black in the green-black-orange color of a 50,000-ohm resistor is not clearly distinguishable under this light. Therefore, instead of using a 50,000-ohm resistor, a 51,000-ohm unit was used instead, since each of the code colors (green-brown-green) for this value would show up sufficiently well.

Old Axial Molded Carbon Resistors

Codification Chart



Black	0	0	x1
Brown	1	1	x10
Red	2	2	x100
Orange	3	3	x1 000
Yellow	4	4	x10 000
Green	5	5	x100 000
Blue	6	6	x1 000 000
Purple	7	7	x10 000 000
Grey	8	8	
White	9	9	

Examples

4.7KΩ (Body: yellow (4), Tip: purple (7), Dot: red (2))

2.4MΩ (Body: red (2), Tip: yellow (4), Dot: green (5))

220Ω (Body: red (2), Tip: red (2), Dot: brown (1))

50Ω (Body: green (5), Tip: black (0), Dot: black (0))

Body color: First digit
Tip color: Second digit
Dot color: Multiplier

More Info

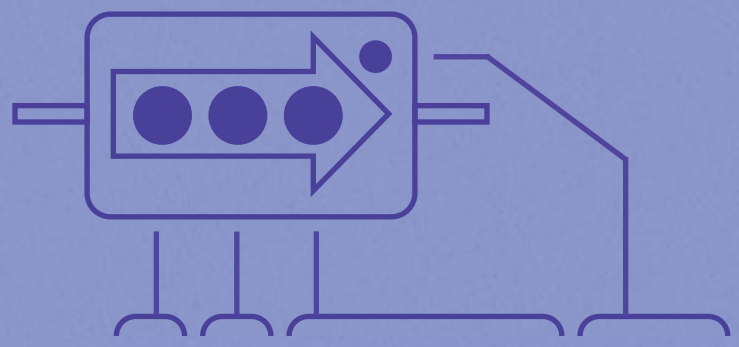
This component has no tolerance marking. If not declared by the manufacturer, it should be considered 20%.

In 1936 Philco adopted a new part number system and the carbon resistors came with a small metal tag with the value writen. It was called “Identified Resistors”. The tag could be removed with a soldering iron. Examples:

In this type of resistor, it is possible to find values like 51K instead of 50K or 99K instead of 100K, due to some of the larger manufacturers (Philco, for example) used mercury-vapor lighting in their assembly plants and certain colors are difficult to distinguish under the bluish-green light from this lamps. For example, the black in the green-black-orange color of a 50,000-ohm resistor is not clearly distinguishable under this light. Therefore, instead of using a 50,000-ohm resistor, a 51,000-ohm unit was used instead, since each of the code colors (green-brown-green) for this value would show up sufficiently well.

Flat Molded Carbon Resistors

Codification Chart



Black	0	0	x1
Brown	1	1	x10
Red	2	2	x100
Orange	3	3	x1 000
Yellow	4	4	x10 000
Green	5	5	x100 000
Blue	6	6	x1 000 000
Purple	7	7	x10 000 000
Grey	8	8	
White	9	9	

Gold	÷10	5%
Silver	÷100	10%
None		20%

1° dot: First digit
2° dot: Second digit
3° dot: Multiplier
Corner dot: Tolerance (+/-). If this color is not present, the tolerance is ±20%.

Examples

47Ω ±20%
yellow (4), purple (7), black (x1), none (20%)

820KΩ ±20%
grey (8), red (2), yellow (x10000), none (20%)

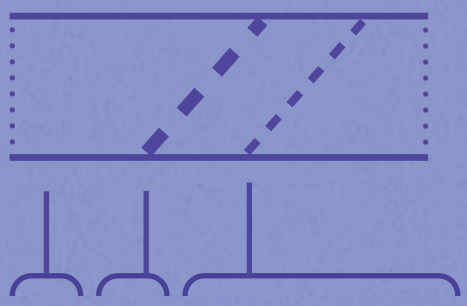
22Ω ±20%
red (2), red (2), black (x1), none (20%)

680KΩ ±5%
blue (6), grey (8), yellow(x10000), gold (5%)

4.7KΩ ±5%
yellow (4), purple (7), red (x100), gold (5%)

Flexible Wirewound Resistors

Codification Chart



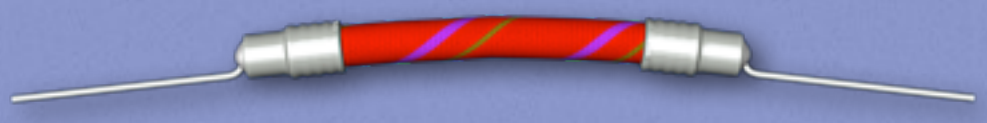
Black	0	0	x1
Brown	1	1	x10
Red	2	2	x100
Orange	3	3	x1 000
Yellow	4	4	x10 000
Green	5	5	x100 000
Blue	6	6	x1 000 000
Purple	7	7	x10 000 000
Grey	8	8	
White	9	9	

Body color: First digit
Thickest thread color: Second digit
Thinnest thread color: Multiplier

Examples

400Ω yellow (4), black (0), brown (x10)

270Ω red (2), purple (7), brown (x10)



75Ω purple (7), green (5), black (x1)

50Ω green (5), black (0), black(x1)

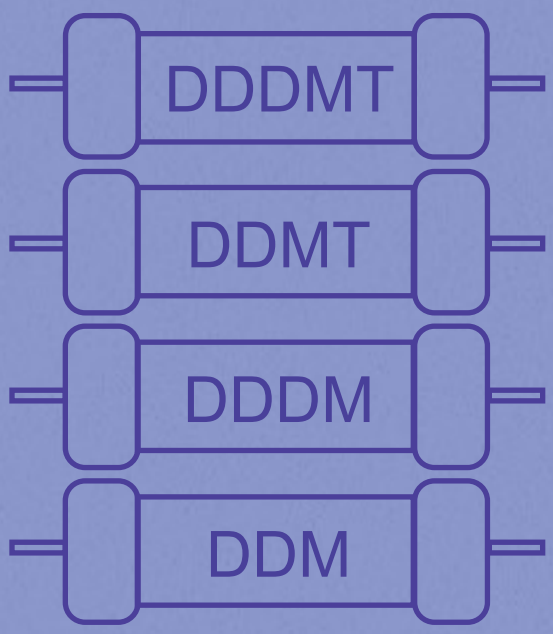
2KΩ red (2), black (0), red (x100)

More Info

This component has no tolerance marking. If not declared by the manufacturer, it should be considered 20%.

Numbered Resistors

Codification Chart



Legend:

Symbol	Meaning
D	Digit
M	Multiplier (number of zeros)
T	Tolerance code, acording to the table below. May be or may not be present.

Tolerance Table:

A	0.05%	H	3%
B	0.1%	J	5%
C	0.25%	K	10%
D	0.5%	L	15%
F	1%	M	20%
G	2%		None: Check manufacturer's data

It's possible to find "R", "K" or "M" letters too, with the following meaning:

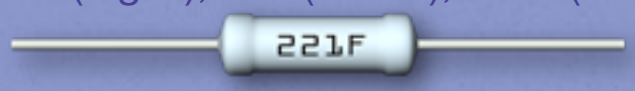
Letter	Meaning
R	Decimal point
K	Decimal point x 1 000 (Kilo)
M	Decimal point x 1 000 000 (Mega)

When "R", "K" or "M" letters are present, there is no multiplier. All other symbols are digits.

Examples

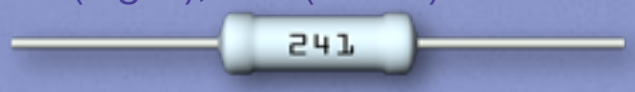
47KΩ ±10%
470 (digits), x100 (2 zeros), ±5% (J=5%)

220Ω ±1%
22 (digits), x10 (1 zero), ±1% (F=1%)

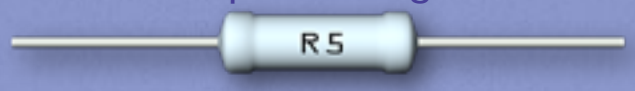


330MΩ
330 (digits), x1000000 (6 zeros)

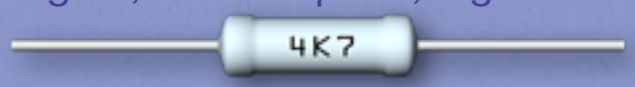
240Ω
24 (digits), x10 (1 zero)



0.5Ω
R=decimal point + digit 5

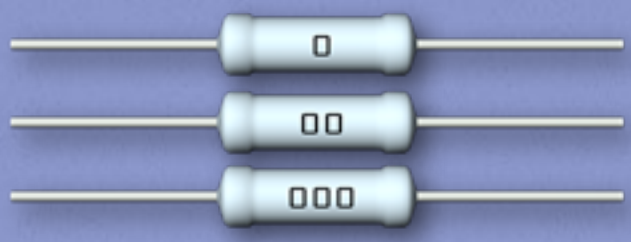


4.7KΩ
digit 4, decimal point, digit 7 x1000 (K=x1000)



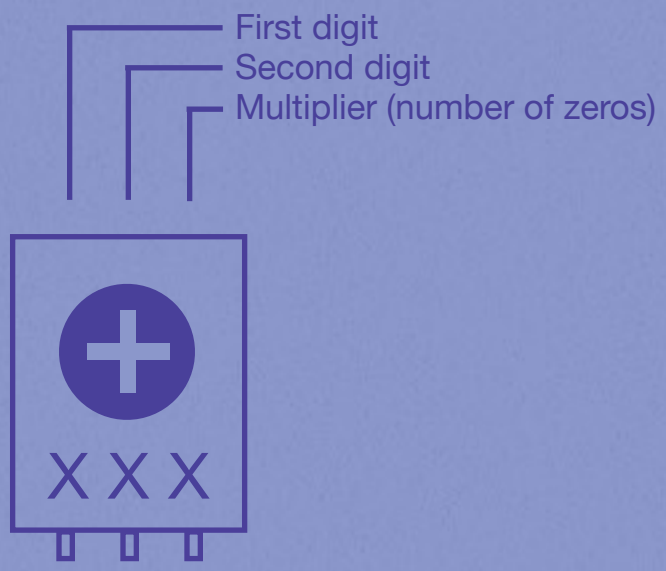
More Info

It is possible to find zero ohm resistors. They are used mostly like configuration resistors (where the presence of a resistor works like a closed switch and the lack of it is an open one) or in circuit boards where they are just bridges avoiding crossing tracks. The zero ohm numbered resistors may have one, two or three zeros. Examples:



Variable Resistors

Codification Chart



Examples

10KΩ
1 (first digit), 0 (second digit), x1000 (3 zeros)

10Ω
1 (first digit), 0 (second digit), x1 (no zeros)

220Ω
2 (first digit), 2 (second digit), x10 (1 zero)

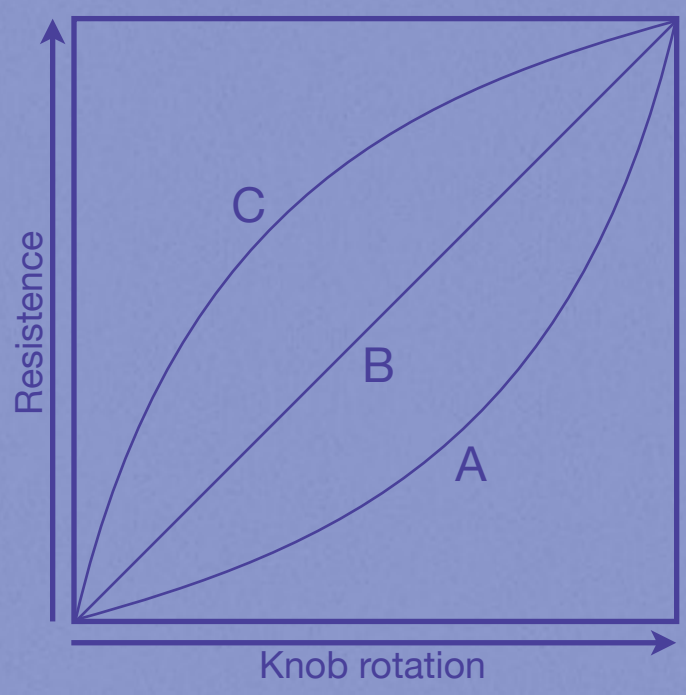
1MΩ
1 (first digit), 0 (second digit), x100000 (5 zeros)

More Info

Potentiometers may also have their resistence value not coded, writen directly in their back side. However, there is an indicator of their resistence curve type, that can be logarithmic (large used in audio applications), linear or inverse logarithmic, acording to the table:

Possible Symbols	Curve Type
“A”, “C” (old code), “LOG” (alternative)	Logarighmic
“B”, “A” (old code), “LIN” (alternative)	Linear
“C”, “F” (old code)	Inverse Logarithmic

It is always a good idea to double check the curve type by measurement with a multimeter. Examples (back side view):



810KΩ logarithmic
LOG = logarithmic

810KΩ linear
B = linear

50KΩ linear
LIN = linear

50KΩ logarithmic
A = logarithmic

SMD Resistors

Codification Chart

1% tolerance

5% tolerance

Legend:

Symbol	Meaning
D	Digit
M	Multiplier (number of zeros)

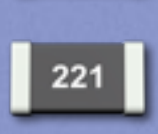
It's possible to find "R", "K" or "M" letters too, with the following meaning:

Letter	Meaning
R	Decimal point
K	Decimal point x 1 000 (Kilo)
M	Decimal point x 1 000 000 (Mega)

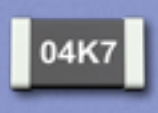
When "R", "K" or "M" letters are present, there is no multiplier. All other symbols are digits.

Examples

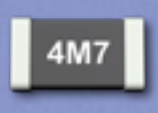
220Ω ±1%
220 (digits), x1 (no zeros), ±1% (4 symbols = 1%)



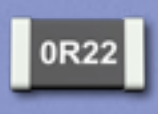
220Ω ±5%
22 (digits), x10 (1 zero), ±5% (3 symbols = 5%)



4.7KΩ ±1%
04 (digits), decimal point, 7 (digit), x1000 (K=x1000), ±1% (4 symbols = 1%)



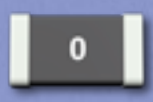
4.7MΩ ±5%
4 (digit), decimal point, 7 (digit), x1000000 (M=x1000000), ±5% (3 symbols = 5%)

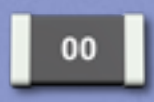


0.22Ω ±1%
0 (digit), decimal point, 22 (digits), ±1% (4 symbols = 1%)

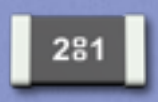
More Info

It is possible to find zero ohm resistors. They are used mostly like configuration resistors (where the presence of a resistor works like a closed switch and the lack of it is an open one) or in circuit boards where they are just bridges avoiding crossing tracks. The zero ohm numbered resistors may have one, two or three zeros. Examples:





Some manufactures use two small boxes (colon symbol) to represent the number eight. Example:



280Ω ±5%

EIA-96 SMD Resistors (1%)

Codification Chart

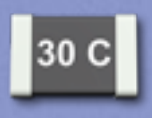
01	100	17	147	33	215	49	316	65	464	81	681
02	102	18	150	34	221	50	324	66	475	82	698
03	105	19	154	35	226	51	332	67	487	83	715
04	107	20	158	36	232	52	340	68	499	84	732
05	110	21	162	37	237	53	348	69	511	85	750
06	113	22	165	38	243	54	357	70	523	86	768
07	115	23	169	39	249	55	365	71	536	87	787
08	118	24	174	40	255	56	374	72	549	88	806
09	121	25	178	41	261	57	383	73	562	89	825
10	124	26	182	42	267	58	392	74	576	90	845
11	127	27	187	43	274	59	402	75	590	91	866
12	130	28	191	44	280	60	412	76	604	92	887
13	133	29	196	45	287	61	422	77	619	93	909
14	137	30	200	46	294	62	432	78	634	94	931
15	140	31	205	47	301	63	442	79	649	95	953
16	143	32	210	48	309	64	453	80	665	96	976

A	x 1
H	x 10
C	x 100
D	x 1 000
E	x 10 000
F	x 100 000
X	÷ 10
Y	÷ 100
Z	÷ 1000

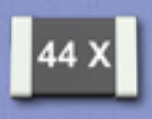
Deprecated:

B	x 10
S	÷ 10
R	÷ 100

Examples

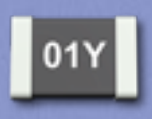


20KΩ ±1%
200 (30=200), x100 (C=x100)



28Ω ±1%
280 (44=280), ÷10 (X=÷10)

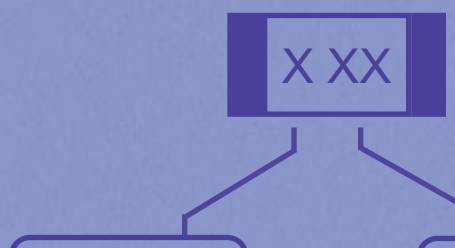
34MΩ ±1%
340 (52=340), x100000 (F=x100000)



1Ω ±1%
100 (01=100), ÷100 (Y=÷100)

EIA-96 SMD Resistors (2%, 5% and 10%)

Codification Chart



A	x 1
H	x 10
C	x 100
D	x 1 000
E	x 10 000
F	x 100 000
X	÷ 10
Y	÷ 100
Z	÷ 1000

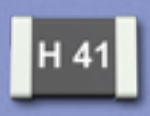
Deprecated:

B	x 10
S	÷ 10
R	÷ 100

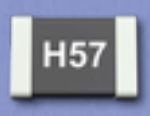
2%		5%		10%
01 100	13 330	25 100	37 330	49 100
02 110	14 360	26 110	38 360	50 120
03 120	15 390	27 120	39 390	51 150
04 130	16 430	28 130	40 430	52 180
05 150	17 470	29 150	41 470	53 220
06 160	18 510	30 160	42 510	54 270
07 180	19 560	31 180	43 560	55 330
08 200	20 620	32 200	44 620	56 390
09 220	21 680	33 220	45 680	57 470
10 240	22 750	34 240	46 750	58 560
11 270	23 820	35 270	47 820	59 680
12 300	24 910	36 300	48 910	60 820

Examples

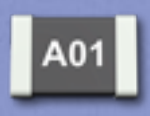
4.7KΩ ±2%
470 (17=470 in 2% table), x10 (H=x10)



4.7KΩ ±5%
470 (41=470 in 5% table), x10 (H=x10)



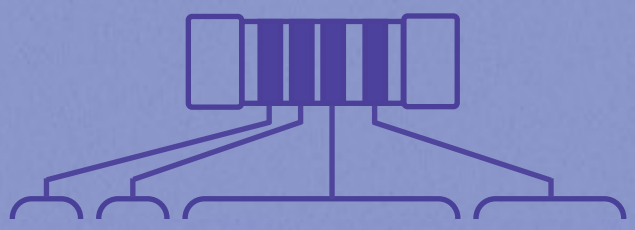
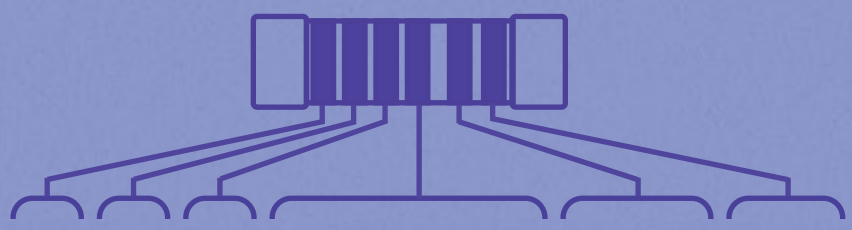
4.7KΩ ±10%
470 (57=470 in 10% table), x10 (H=x10)



100Ω ±2%
100 (01=100 in 2% table), x1 (A=x1)

MELF SMD Resistors

Codification Chart

	4 Bands				5 or 6 bands					
										
Black	0	0	x1		0	0	0	x1		
Brown	1	1	x10	1%	1	1	1	x10	1%	100
Red	2	2	x100	2%	2	2	2	x100	2%	50
Orange	3	3	x1 000		3	3	3	x1 000		15
Yellow	4	4	x10 000		4	4	4	x10 000		25
Green	5	5	x100 000	0.5%	5	5	5	x100 000	0.5%	
Blue	6	6	x1 000 000	0.25%	6	6	6	x1 000 000	0.25%	10
Purple	7	7	x10 000 000	0.1%	7	7	7	x10 000 000	0.1%	5
Grey	8	8			8	8	8			
White	9	9			9	9	9			
Gold			÷10	5%				÷10	5%	
Silver			÷100	10%				÷100	10%	
	1° band: First digit 2° band: Second digit 3° band: Multiplier/divider 4° band: Tolerance (+/-)				1° band: First digit 2° band: Second digit 3° band: Third digit 4° band: Multiplier/divider 5° band: Tolerance (+/-) 6° band: Temperature Coefficient (in PPM/°C)					

Examples

47Ω ±5%
yellow (4), purple (7), black (x1), gold (5%)

820KΩ ±10%
grey (8), red (2), yellow (x10000), silver (10%)

Examples (MELF SMD Resistors)

2.77MΩ ±5%
red (2), purple (7), purple (7), yellow (x10000), gold (5%)

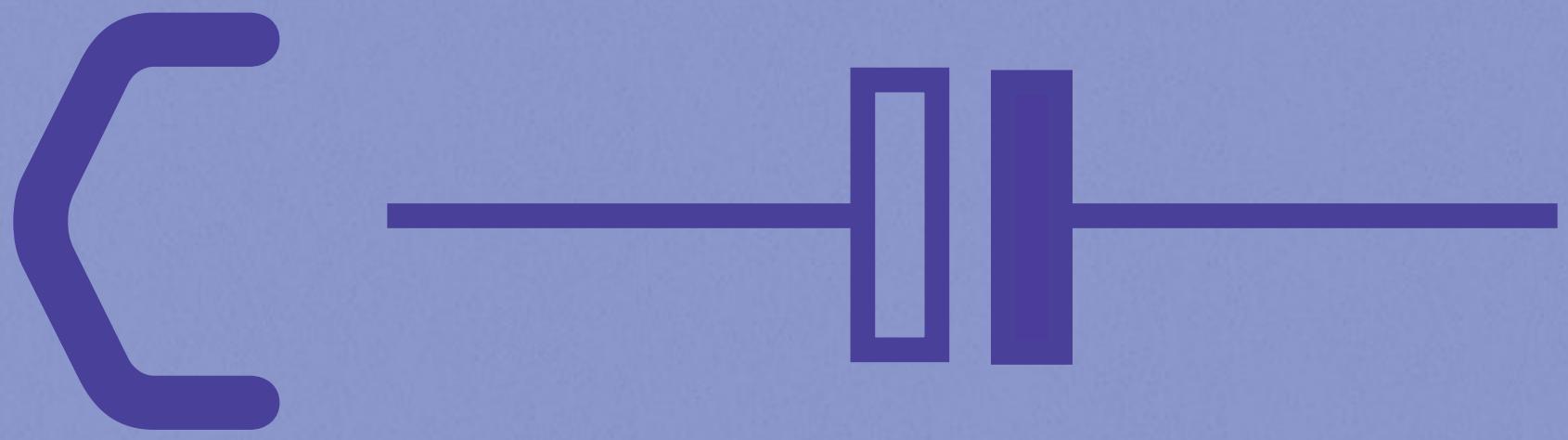
3.6KΩ ±5%, 50PPM/°C
orange (3), blue (6), black (0), brown (x10), gold (5%), red (50 PPM/°C)

755Ω ±5%, 25PPM/°C
purple (7), green (5), green (5), black (x1), gold (5%), yellow (25 PPM/°C)

More Info

The temperature coefficient is in Parts Per Million (PPM) or 10^{-6} . Example: a resistor with the 6th color red has a temperature coefficient of $50x10^{-6}$ /°C.

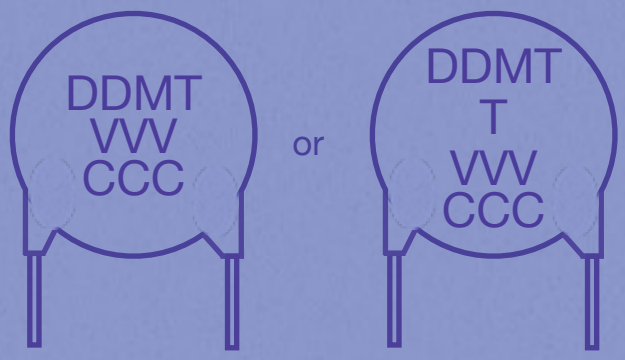
It is possible to find zero ohm resistors. They are used mostly like configuration resistors (where the presence of a resistor works like a closed switch and the lack of it is an open one) or in circuit boards where they are just bridges avoiding crossing tracks. The zero ohm resistors has one, two or three black bands. Examples:



Capacitors

Ceramic Disc Capacitors

Codification Chart



Legend:

Symbol	Meaning
D	Digit
M	Multiplier (number of zeros)
T	Tolerance code. May not be present.
VVV	Working Voltage. If not marked, generally 500VDC.
CCC	Temperature coefficient markings.

For capacitance value, it is possible to find “p”, “n” letters too, with the following meaning:

Letter	Meaning
p	Decimal point, value in pF
n	Decimal point, value in nF

When “p” or “n” letters are present, there is no multiplier. All other symbols are digits
For working voltage, it is possible to find the “K”or “KV” letter too. In this cases, “K” means the decimal point x 1000, while “KV” means “Kilovolt”.

Examples

10nF ±10% 1KV
±15% Δ°C from -55°C to +125°C

1 (digit), 0 (digit), x1000 (3 zeros)
±10% (K=±10%)
1KV (voltage)
X7R = EIA Table

220nF ±20% 500V
-220PPM/°C

2 (digit), 2 (digit), x10000 (4 zeros)
±20% (M=±20%)
500V (500)
-220PPM /°C (N220 = -220)

Tolerance Code Table:

B	±0.1pF	K	±10%
C	±0.25pF	M	±20%
D	±0.5pF	P	0 to 100%
E	±25%	S	-20 to 50%
F	0.1pF if <10pF ±1% if ≥10pF	W	0 to 200%
G	±2%	X	-20 to 40%
H	±2.5%	Z	-20 to 80%
J	±5%		

For the temperature coefficient values, “P” means positive value while “N” means negative value, for example:

N220 = -220 PPM/°C
P100 = 100 PPM/°C
NP0 = 0 PPM/°C

If the temperature coefficient is not written this way, may be written according to the EIA 3-digits code:

1st Digit:
Low Temperature Limit:

X	-55°C
Y	-30°C
Z	+10°C

2nd Digit:
High Temperature Limit:

5	+85°C
6	+105°C
7	+125°C
8	+150°C (special)

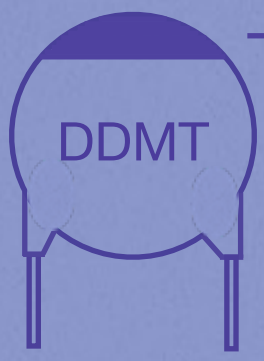
3rd Digit:
Maximum Allowable Capacitance Change From +25°C (0 VDC):

F	±7.5%
P	±10%
R	±15%
S	±22%
T	+22% / -33%
U	+22% / -56%
V	+22% / -82%

Example: X7R = ±15% Δ°C from -55°C to +125°C.

Color Marked Ceramic Disc Capacitors

Codification Chart



Legend:

Symbol	Meaning
D	Digit
M	Multiplier (number of zeros)
T	Tolerance code. May not be present.

It's possible to find "p", "n" letters too, with the following meaning:

Letter	Meaning
p	Decimal point, value in pF
n	Decimal point, value in nF

When "p" or "n" letters are present, there is no multiplier. All other symbols are digits.

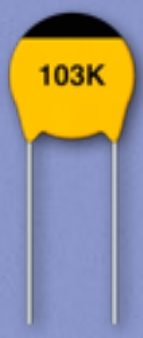
Temp Coefficient Table:

Black	0
Brown	-30
Red	-80
Orange	-150
Yellow	-220
Green	-330
Blue	-470
Purple	-750
Grey	30
White	100

Tolerance Code Table:

B	±0.1pF
C	±0.25pF
D	±0.5pF
E	±25%
F	0.1pF if <10pF ±1% if ≥10pF
G	±2%
H	±2.5%
J	±5%
K	±10%
M	±20%
P	0 to 100%
S	-20 to 50%
W	0 to 200%
X	-20 to 40%
Z	-20 to 80%

Examples



10nF ±10% 0PPM/°C

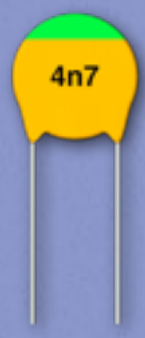
1 (digit)
0 (digit)
x1000 (3 zeros)
±10% (K=±10%)
0PPM/°C (Black=0)

4.7pF ±0.5pF -220PPM/°C

4.7pF ("4p7" value)
±0.5pF (D=±0.5pF)
-220PPM/°C (Yellow=-220)

220nF ±20% -80PPM/°C

2 (digit)
2 (digit)
x10000 (4 zeros)
±20% (M=±20%)
-80PPM/°C (Red=-80)

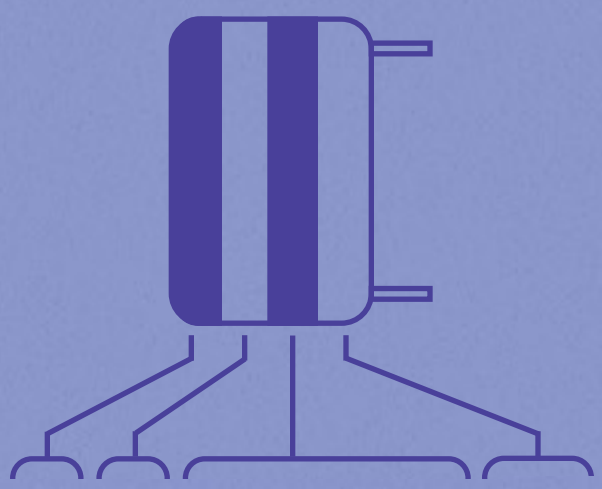


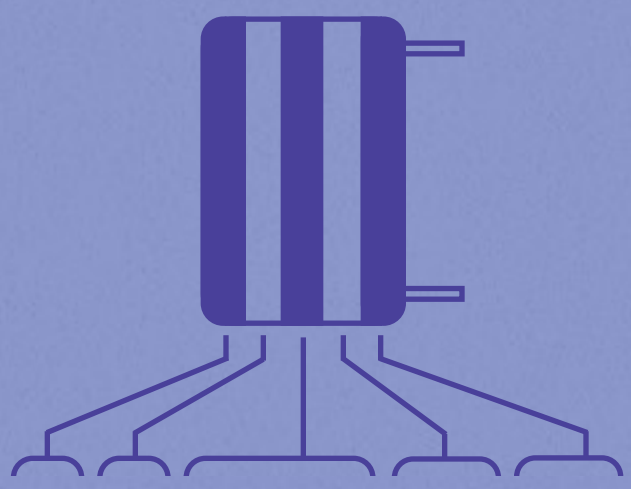
4.7nF -330PPM/°C

4.7nF ("4n7" value)
-330PPM/°C (Green=-330)
Tolerance not informed

Metalized Polyester Capacitor

Codification Chart



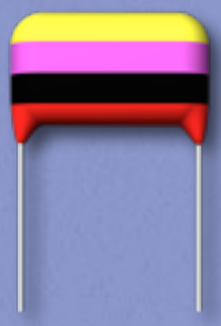


	4 Bands				5 Bands				
Black	0	0	x1		0	0	x1	20%	
Brown	1	1	x10	100V	1	1	x10		100V
Red	2	2	x100	250V	2	2	x100		250V
Orange	3	3	x1 000		3	3	x1 000		
Yellow	4	4	x10 000	400V	4	4	x10 000		400V
Green	5	5			5	5			
Blue	6	6		630V	6	6			630V
Purple	7	7			7	7			
Grey	8	8	÷100		8	8	÷100		
White	9	9	÷10		9	9	÷10	10%	

1° band: First digit
2° band: Second digit
3° band: Multiplier/divider
4° band: Voltage (V)

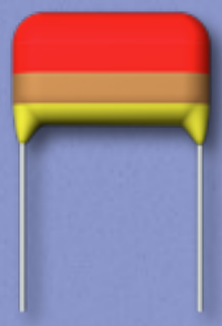
1° band: First digit
2° band: Second digit
3° band: Multiplier/divider
4° band: Tolerance (+/-)
5° band: Voltage (V)

Examples (Metalized Polyester Capacitors)



47pF 250V

Yellow (4)
Purple (7)
Black (x1)
Red (250V)



220pF 400V

Red (2)
Red (2)
Brown (x10)
Yellow (400V)

240pF ±10% 250V

Red (2)
Yellow (4)
Brown (x10)
White (10%)
Red (250V)

2.4pF ±20% 630V

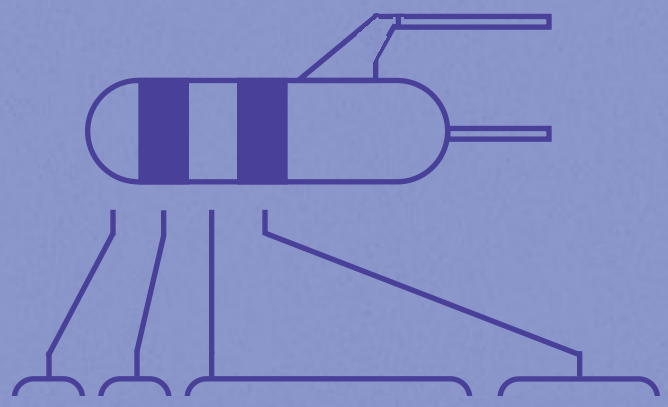
Red (2)
Yellow (4)
White (÷10)
Black (20%)
Blue (630V)

More Info

The tolerance is 20% for 4 bands capacitors.

Pin-Up Capacitors

Codification Chart



Black	0	0	x1	20%
Brown	1	1	x10	
Red	2	2	x100	
Orange	3	3	x1 000	
Yellow	4	4	x10 000	
Green	5	5		
Blue	6	6		
Purple	7	7		
Grey	8	8	÷100	
White	9	9	÷10	
None				20% to 50%

1° band: First digit
2° band: Second digit
3° band: Multiplier/divider
4° band: Tolerance (+/-)

Examples

47pF ±20 to ±50%

Yellow (4)
Purple (7)
Black (x1)
None (20 to 50)

240pF ±20 to ±50%

Red (2)
Yellow (4)
Brown (x10)
None (20 to 50)

68nF ±20%

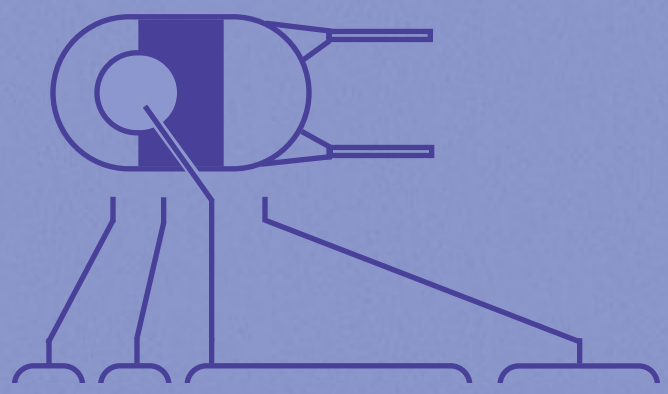
Blue (6)
Grey (8)
Orange (x1000)
Black (20%)

500nF ±20%

Green (5)
Black (0)
Yellow (x10000)
None (20%)

Tantalum Capacitors

Codification Chart



Black	0	0	x1	10
Brown	1	1	x10	
Red	2	2	x100	4
Orange	3	3	x1 000	40
Yellow	4	4	x10 000	6.3
Green	5	5		16
Blue	6	6		20
Purple	7	7		
Grey	8	8	÷100	25
White	9	9	÷10	3
Pink				35

1° band: First digit
2° band: Second digit
Dot: Multiplier/divider
3° band: Working voltage

Examples

47µF 4V

Yellow (4)
Purple (7)
Black (x1)
Red (4V)

540µF 10V

Green (5)
Yellow (4)
Brown (x10)
Black (10V)

2.4µF 20V

Red (2)
Yellow (4)
White (÷10)
Blue (20V)

220µF 40V

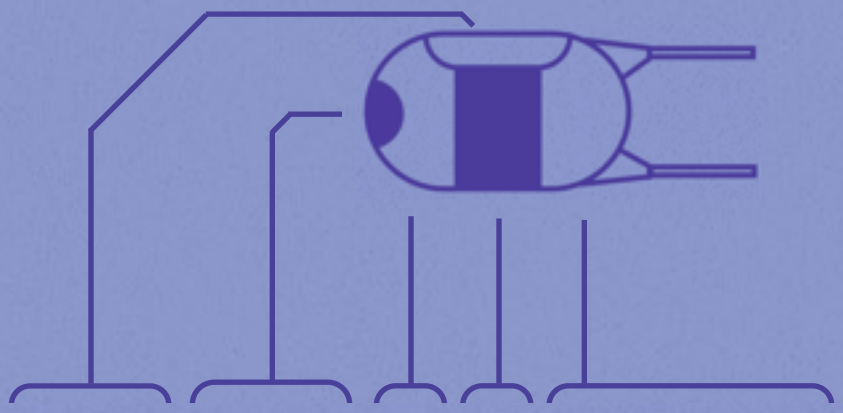
Red (2)
Red (2)
Brown (x10)
Orange (40V)

More Info

This component has no tolerance marking. If not declared by the manufacturer, it should be considered 20%.

Dipped Tantalum Capacitors

Codification Chart



Black	10	20%	0	0	x1
Brown		1%	1	1	x10
Red	4	2%	2	2	x100
Orange	40	3%	3	3	x1 000
Yellow	6.3	4%	4	4	x10 000
Green	16	5%	5	5	
Blue	20		6	6	
Purple			7	7	
Grey	25	30%	8	8	÷100
White	3	10%	9	9	÷10
Pink	35				
Gold		5%			
Silver		10%			

1° band: First digit
2° band: Second digit
3° band: Multiplier/divider
Small dip: Tolerance (+/-)
Large dip: Working voltage

Examples

47µF ±20% 4V

Yellow (4)
Purple (7)
Black (x1)
Black (±20%)
Red (4V)

540µF ±20% 10V

Green (5)
Yellow (4)
Brown (x10)
Black (±20%)
Black (10V)

2.4µF ±10% 20V

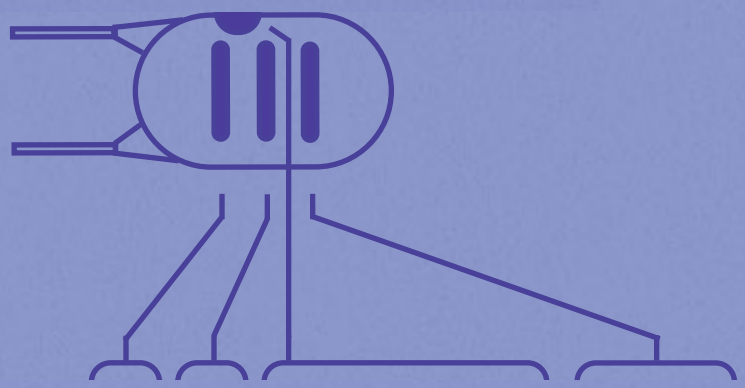
Red (2)
Yellow (4)
White (÷10)
White (±10%)
Blue (20V)

220µF ±5% 40V

Red (2)
Red (2)
Brown (x10)
Green (±5%)
Orange (40V)

3 Bands Tantalum Capacitors

Codification Chart



Black	0	0	x1	10%
Brown	1	1	x10	1%
Red	2	2	x100	2%
Orange	3	3	x1 000	3%
Yellow	4	4	x10 000	4%
Green	5	5		5%
Blue	6	6		
Purple	7	7		
Grey	8	8	÷100	30%
White	9	9	÷10	10%
Gold				5%
Silver				10%

3° band: First digit
2° band: Second digit
Dot: Multiplier/divider
1° band: Tolerance (+/-)

Examples

47µF ±10%

Yellow (4)
Purple (7)
Black (x1)
Black (±10%)

540µF ±10%

Green (5)
Yellow (4)
Brown (x10)
Black (±10%)

2.4µF ±10%

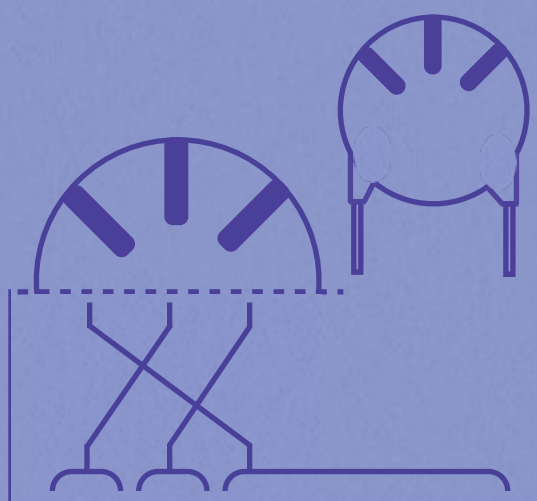
Red (2)
Yellow (4)
White (÷10)
White (±10%)

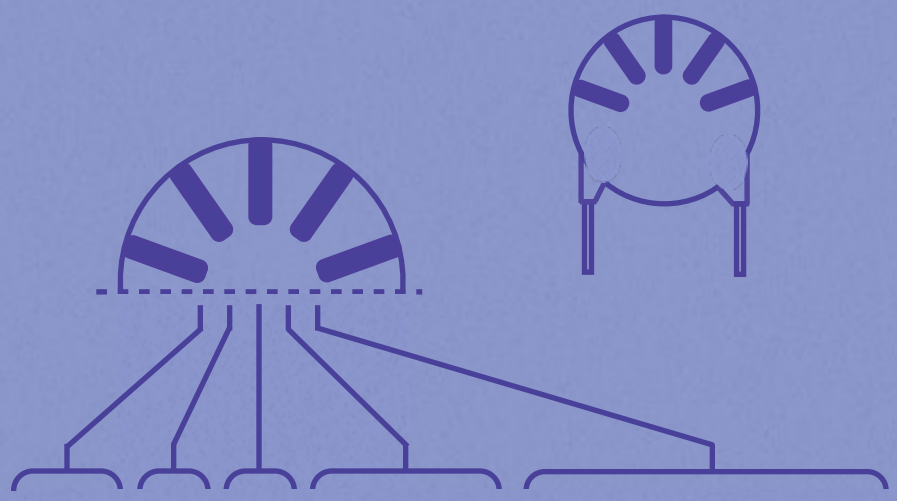
220µF ±5%

Red (2)
Red (2)
Brown (x10)
Green (±5%)

Radial Bands Ceramic Disc Capacitors

Codification Chart





	3 Bands			5 Bands					
Black	0	0	x1	0	0	0	x1	2pF	20%
Brown	1	1	x10	-30	1	1	x10		1%
Red	2	2	x100	-80	2	2	x100		2%
Orange	3	3	x1 000	-150	3	3	x1 000		
Yellow	4	4	x10 000	-220	4	4	x10 000		
Green	5	5		-330	5	5		0.5pF	5%
Blue	6	6		-470	6	6			
Purple	7	7		-750	7	7			
Grey	8	8	÷100	30	8	8	÷100	0.25 pF	
White	9	9	÷10	-750 to 120	9	9	÷10	1 pF	10%
Silver				100					
None				-750 to 120					
								<10pF	≥10pF

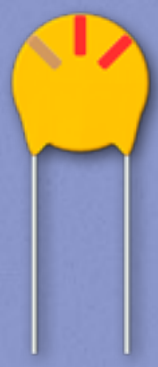
1° band: Multiplier/divider
2° band: First digit
3° band: Second digit

1° band: Temperature Coefficient (in PPM/°C)
2° band: First digit
3° band: Second digit
4° band: Multiplier/divider
5° band: Tolerance (+/-)

Examples (Radial Stripes Ceramic Disc Capacitors)

47pF

Yellow (4)
Purple (7)
Black (x1)



220pF

Red (2)
Red (2)
Brown (x10)

240pF ±5% -330PPM/°C

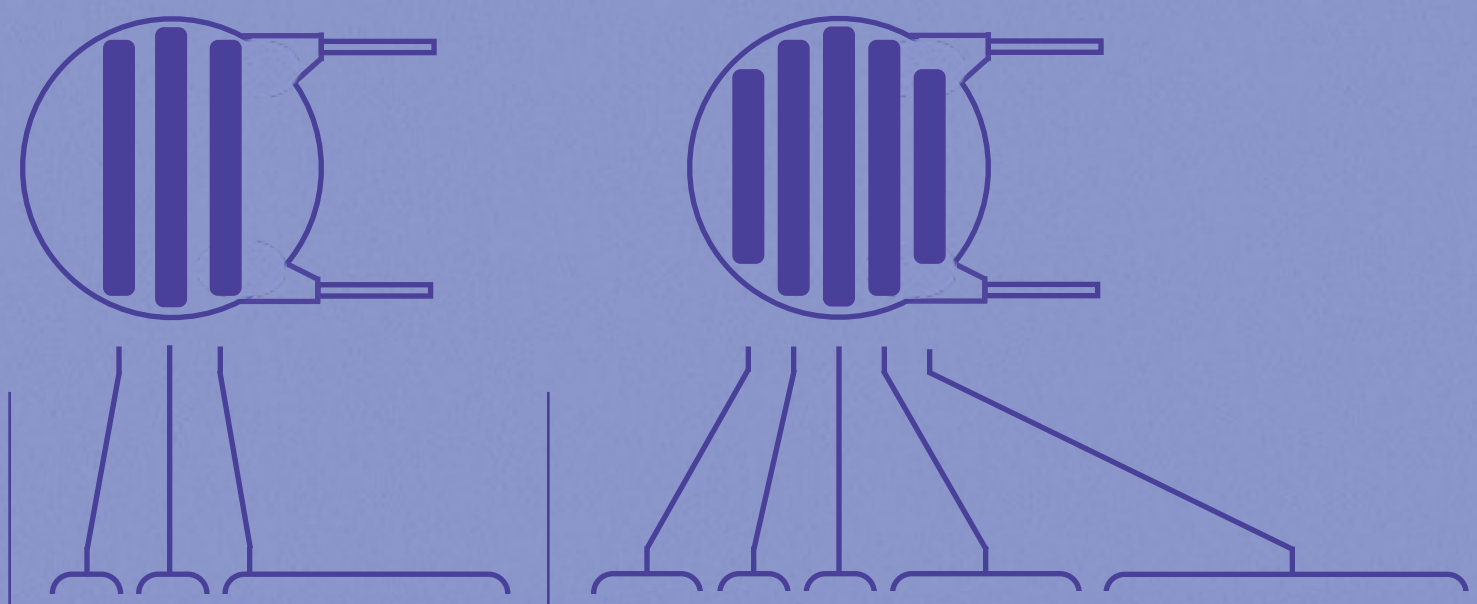
Green (-330)
Red (2)
Yellow (4)
Brown (x10)
Green (5%)

2.4pF ±0.5pF -80PPM/°C

Red (-80)
Red (2)
Yellow (4)
White (÷10)
Green (0.5pF)

Parallel Bands Ceramic Disc Capacitors

Codification Chart

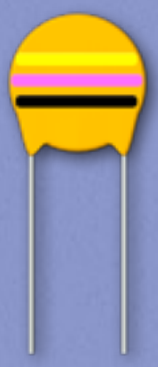


	3 Bands			5 Bands					
Black	0	0	x1	0	0	0	x1	2pF	20%
Brown	1	1	x10	-30	1	1	x10		1%
Red	2	2	x100	-80	2	2	x100		2%
Orange	3	3	x1 000	-150	3	3	x1 000		
Yellow	4	4	x10 000	-220	4	4	x10 000		
Green	5	5		-330	5	5		0.5pF	5%
Blue	6	6		-470	6	6			
Purple	7	7		-750	7	7			
Grey	8	8	÷100	30	8	8	÷100	0.25 pF	
White	9	9	÷10	-750 to 120	9	9	÷10	1 pF	10%
Silver				100					
None				-750 to 120					
								<10pF	≥10pF

1° band: First digit
2° band: Second digit
3° band: Multiplier/divider

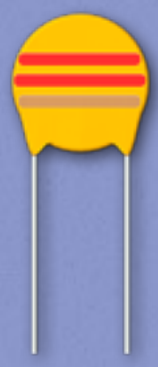
1° band: Temperature Coefficient (in PPM/°C)
2° band: First digit
3° band: Second digit
4° band: Multiplier/divider
5° band: Tolerance (+/-)

Examples (Parallel Stripes Ceramic Disc Capacitors)



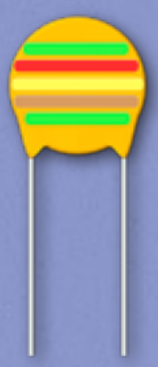
47pF

Yellow (4)
Purple (7)
Black (x1)



220pF

Red (2)
Red (2)
Brown (x10)



240pF ±5% -330PPM/°C

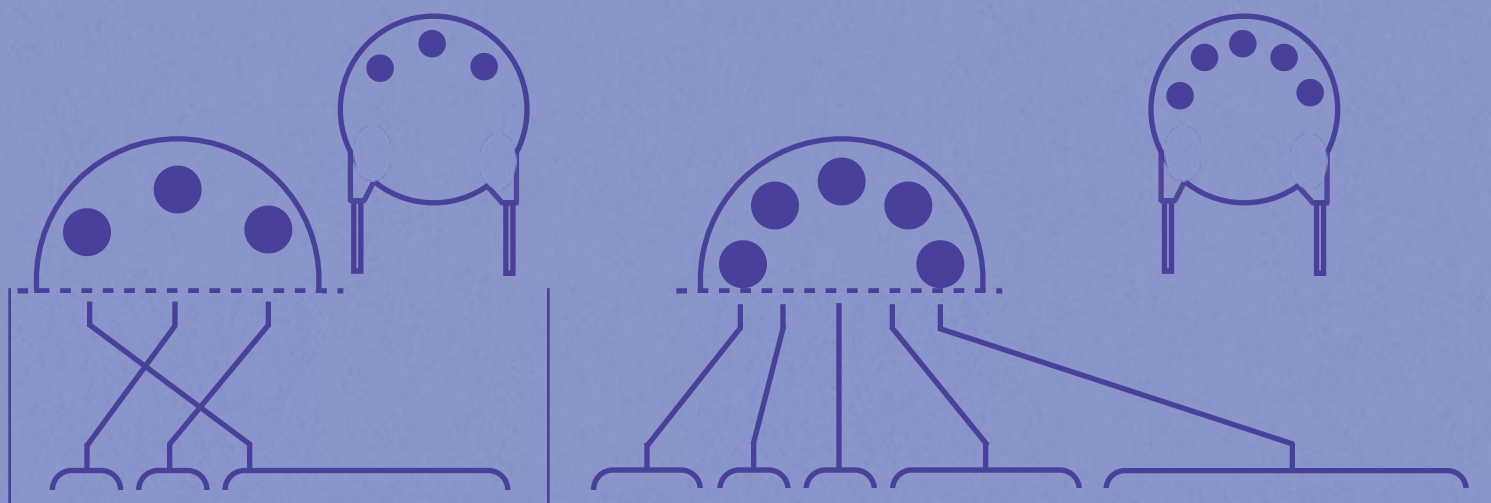
Green (-330)
Red (2)
Yellow (4)
Brown (x10)
Green (5%)

2.4pF ±0.5pF -80PPM/°C

Red (-80)
Red (2)
Yellow (4)
White (÷10)
Green (0.5pF)

Color Dots Ceramic Disc Capacitors

Codification Chart



	3 Dots			5 Dots					
Black	0	0	x1	0	0	0	x1	2pF	20%
Brown	1	1	x10	-30	1	1	x10		1%
Red	2	2	x100	-80	2	2	x100		2%
Orange	3	3	x1 000	-150	3	3	x1 000		
Yellow	4	4	x10 000	-220	4	4	x10 000		
Green	5	5		-330	5	5		0.5pF	5%
Blue	6	6		-470	6	6			
Purple	7	7		-750	7	7			
Grey	8	8	÷100	30	8	8	÷100	0.25 pF	
White	9	9	÷10	-750 to 120	9	9	÷10	1 pF	10%
Silver				100					
None				-750 to 120					
								<10pF	≥10pF

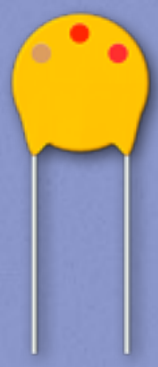
1° dot: Multiplier/divider
2° dot: First digit
3° dot: Second digit

1° dot: Temperature Coefficient (in PPM/°C)
2° dot: First digit
3° dot: Second digit
4° dot: Multiplier/divider
5° dot: Tolerance (+/-)

Examples (Color Dots Ceramic Disc Capacitors)

47pF

Yellow (4)
Purple (7)
Black (x1)



220pF

Red (2)
Red (2)
Brown (x10)

240pF ±5% -330PPM/°C

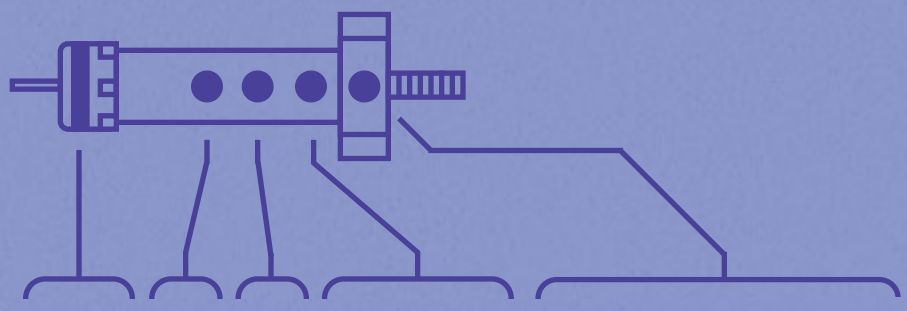
Green (-330)
Red (2)
Yellow (4)
Brown (x10)
Green (5%)

2.4pF ±0.5pF -80PPM/°C

Red (-80)
Red (2)
Yellow (4)
White (÷10)
Green (0.5pF)

Standoff Ceramic Capacitors

Codification Chart



	Black	0	0	0	x1	2pF	20%
	Brown	-30	1	1	x10		1%
	Red	-80	2	2	x100		2%
	Orange	-150	3	3	x1 000		
	Yellow	-220	4	4	x10 000		
	Green	-330	5	5		0.5pF	5%
	Blue	-470	6	6			
	Purple	-750	7	7			
	Grey	30	8	8	÷100	0.25 pF	
	White	-750 to 120	9	9	÷10	1 pF	10%
	Silver	100					
	None	-750 to 120					
						<10pF	≥10pF

1° band: Temperature Coefficient (in PPM/°C)
1° dot: First digit
2° dot: Second digit
3° dot: Multiplier/divider
4° dot: Tolerance (+/-)

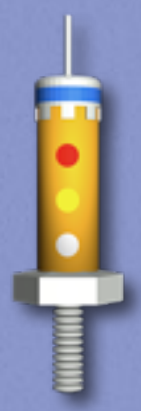
Examples

47µF ±20%
-80PPM/°C

Red (-80)
Yellow (4)
Purple (7)
Black (x1)
Black (±20%)

540µF ±20%
-330PPM/°C

Green (-330)
Green (5)
Yellow (4)
Brown (x10)
Black (±20%)



2.4µF ±10%
-470PPM/°C

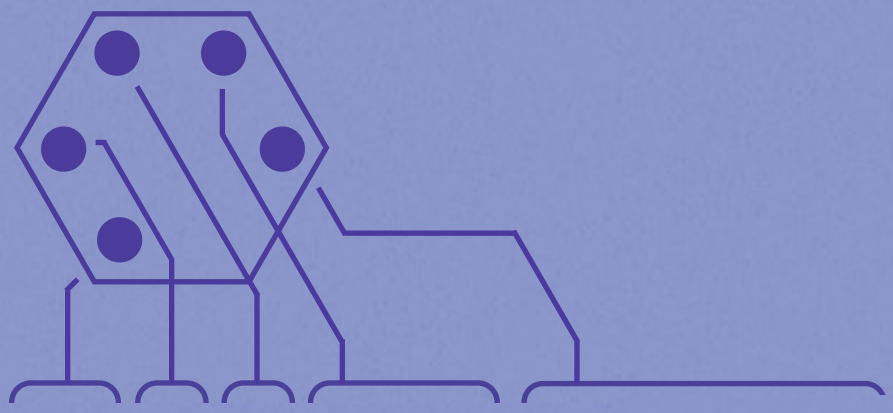
Blue (-470)
Red (2)
Yellow (4)
White (÷10)
White (±10%)

220µF ±5%
-750 to 120 PPM/°C

None (-750 to 120)
Red (2)
Red (2)
Brown (x10)
Green (±5%)

Feed-Thru Capacitors

Codification Chart



Black	0	0	0	x1	2pF	20%
Brown	-30	1	1	x10		1%
Red	-80	2	2	x100		2%
Orange	-150	3	3	x1 000		
Yellow	-220	4	4	x10 000		
Green	-330	5	5		0.5pF	5%
Blue	-470	6	6			
Purple	-750	7	7			
Grey	30	8	8	÷100	0.25 pF	
White	-750 to 120	9	9	÷10	1 pF	10%
Silver	100					
None	-750 to 120					
					<10pF	≥10pF

1° dot: Temperature coefficient (in PPM/°C)
2° dot: First digit
3° dot: Second digit
4° dot: Multiplier/divider
5° dot: Tolerance (+/-)

Examples

47µF ±20%
-80PPM/°C

Red (-80)
Yellow (4)
Purple (7)
Black (x1)
Black (±20%)

540µF ±20%
-330PPM/°C

Green (-330)
Green (5)
Yellow (4)
Brown (x10)
Black (±20%)

2.4µF ±10%
-470PPM/°C

Blue (-470)
Red (2)
Yellow (4)
White (÷10)
White (±10%)

220µF ±5%
-750 PPM/°C

Purple (-750)
Red (2)
Red (2)
Brown (x10)
Green (±5%)

Ceramic Button Capacitors

Codification Chart

Black	0	0	x1
Brown	1	1	x10
Red	2	2	x100
Orange	3	3	x1 000
Yellow	4	4	x10 000
Green	5	5	x100 000
Blue	6	6	x1 000 000
Purple	7	7	x10 000 000
Grey	8	8	
White	9	9	
Gold			
Silver			
None			

1° dot: First digit
2° dot: Second digit
3° dot: Multiplier/divider

Examples

47pF

Yellow (4)
Purple (7)
Black (x1)

540pF

Green (5)
Yellow (4)
Brown (x10)

240nF

Red (2)
Yellow (4)
Yellow (x10 000)

220pF

Red (2)
Red (2)
Brown (x10)

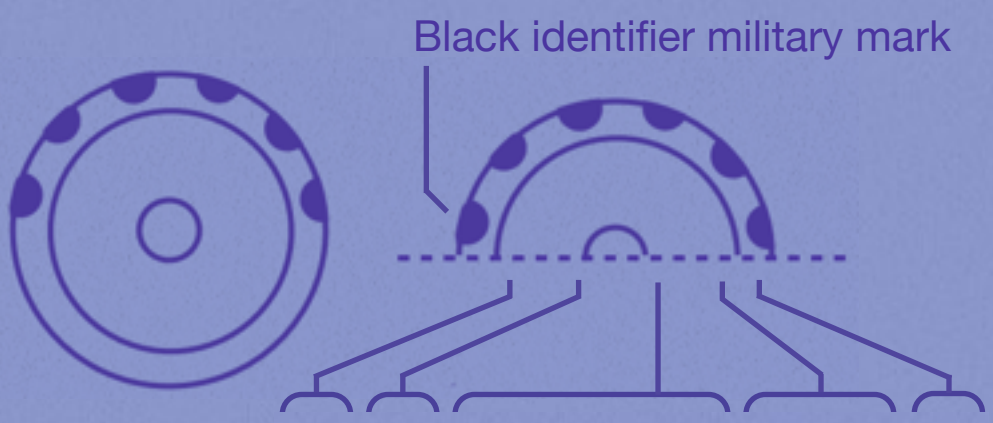
More Info

This component has no tolerance marking. If not declared by the manufacturer, it should be considered 20%.

The working voltage of this type of capacitor is generally 300V.

Mica Button Capacitors

Codification Chart



Black	0	0	x1	20%	A
Brown	1	1	x10	1%	B
Red	2	2	x100	2%	C
Orange	3	3	x1 000	3%	D
Yellow	4	4	x10 000		E
Green	5	5			F
Blue	6	6			G
Purple	7	7			
Grey	8	8			
White	9	9			
Gold			÷10	5%	
Silver			÷100	10%	
None				20%	

1° dot: Black dot (military mark)
2° dot: First digit
3° dot: Second digit
4° dot: Multiplier / divider
5° dot: Tolerance (+/-)
6° dot: Class

Examples

47pF ±20% Class A

Yellow (4)
Purple (7)
Black (x1)
Black (20%)
Black (Class A)

220pF ±10% Class B

Red (2)
Red (2)
Brown (x10)
Silver (10%)
Brown (Class B)

220pF ±5% Class B

Red (2)
Red (2)
Brown (x10)
Gold (5%)
Brown (Class B)

6.8pF ±5% Class F

Blue (6)
Grey (8)
Gold (÷10)
Gold (5%)
Green (Class F)

More Info

The black identifier is omitted if the capacitance must be specified in three significant digits.

The working voltage of this type of capacitor is generally 300V.

Parallel Leads Numbered Capacitors

Codification Chart

Legend:

Symbol	Meaning
D	Digit
M	Multiplier (number of zeros)
T	Tolerance code, acording to the table below. May be or may not be present.
V	Working voltage (if present)

Tolerance Table:

A	0.05pF	K	10%
B	0.1pF	L	15%
C	0.25pF	M	20%
D	0.5pF	N	30%
E	0.5%	P	0 to 100%
F	1%	S	-20 to 50%
G	2%	W	0 to 200%
H	3%	X	-20 to 40%
J	5%	Z	-20 to 80%

It's possible to find "R", "K" or "M" letters too, with the following meaning:

Letter	Meaning
R	Decimal point
K	Decimal point x 1 000 (Kilo)
M	Decimal point x 1 000 000 (Mega)

When "R", "K" or "M" letters are present, there is no multiplier. All other symbols are digits.

Examples

10nF ±10%

1 (first digit)
0 (second digit)
x1000 (3)
±10% (K=10%)

220pF ±1%

2 (first digit)
2 (second digit)
x10 (1)
±1% (F=1%)

240pF ±5% 63V

2 (first digit)
4 (second digit)
x10 (1)
±5% (J=5%)

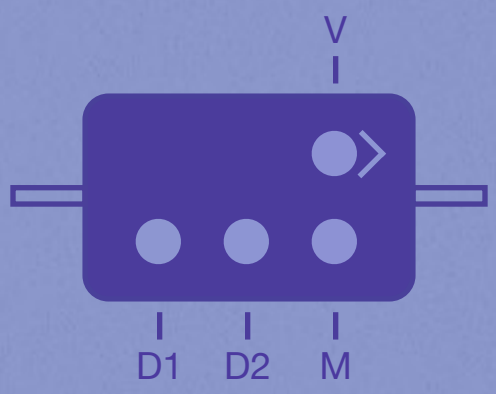
280nF ±20% 250V

2 (first digit)
8 (second digit)
x10000 (4)
±20% (M=20%)

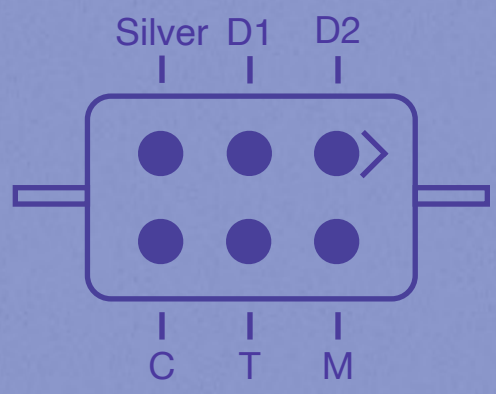
Flat Molded Paper Capacitors

Codification Chart

RMA Code



JAN Code



	D1	D2	M	V	T	C
Black	0	0	x1		20%	A
Brown	1	1	x10	100		E
Red	2	2	x100	200		H
Orange	3	3	x1 000	300	30%	J
Yellow	4	4	x10 000	400		P
Green	5	5	x100 000	500		R
Blue	6	6	x1 000 000	600		S
Purple	7	7	x10 000 000	700		T
Grey	8	8	÷100	800		
White	9	9	÷10	900		
Gold			÷10	1000		
Silver			÷100	2000	10%	
None				500		

D1: First digit
D2: Second digit
M: Multiplier/divider
V: Working voltage
T: Tolerance characteristics
C: Class

Examples (Flat Molded Paper Capacitors)

4.7pF 200V
(commercial specification)

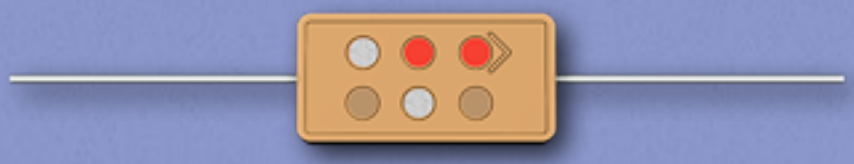
D1=Yellow (4)
D2=Purble (7)
M=Golden (÷10)
V=Red (200V)

220pF 400V
(commercial specification)

D1=Red (2)
D2=Red (2)
M=Brown (x10)
V=Yellow (400V)

4.7pF ±20% Class A
(military specification)

D1=Yellow (4)
D2=Purble (7)
M=White (÷10)
T=Black (20%)
C=Black (Class A / wax impregnation)



220pF ±10 Class E
(military specification)

D1=Red (2)
D2=Red (2)
M=Brown (x10)
T=Silver (10%)
C=Brown (Class E / mineral oil impregnation)

More Info

The RMA (Radio Manufacturers Association) code is the common commercial code. RMA coded paper capacitors have a black body.
JAN stands for Joint Army-Navy (military specification).

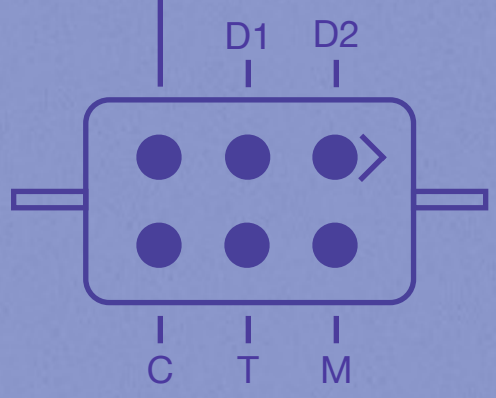
In commercial specification, there is no tolerance marking. It should be considered 20%.

Flat Molded Mica Capacitors

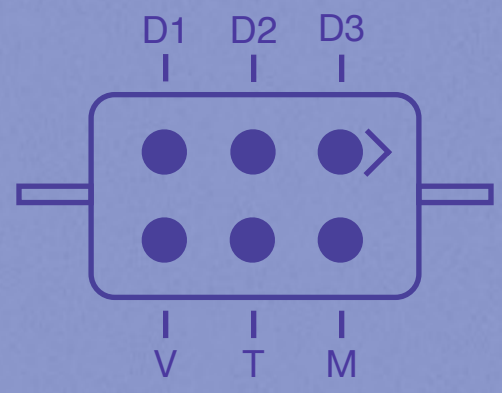
Codification Chart

Most Recent System

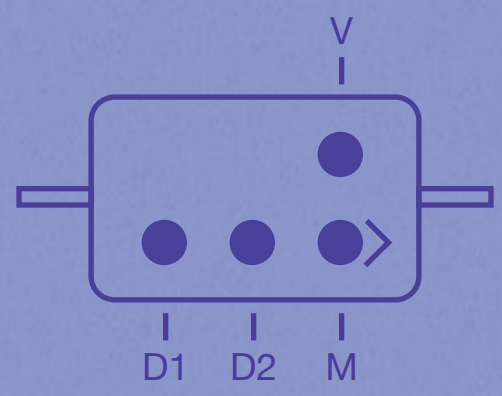
⬜	**White**	RMA Specification
⬛	**Black**	JAN Specification



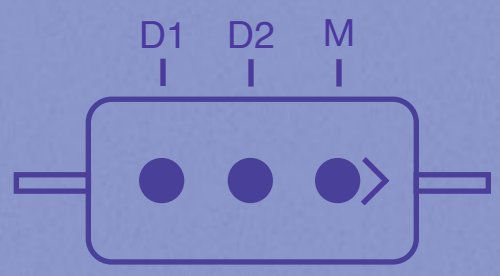
RMA 6-Dots Obsolete Code



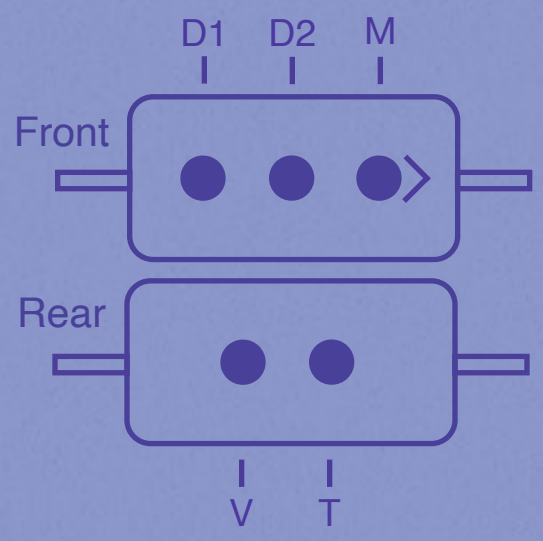
RMA 4-Dots Obsolete Code

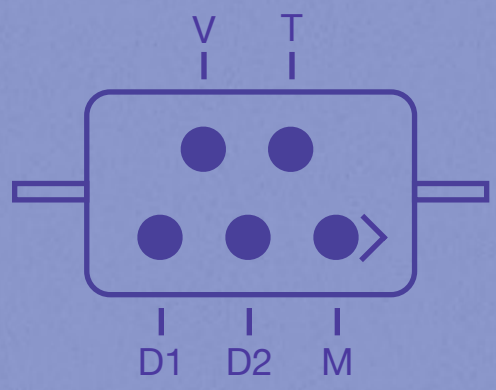


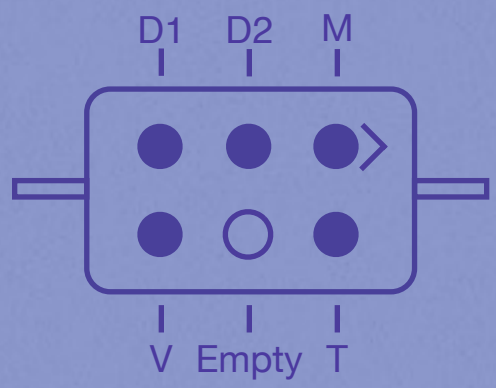
RMA 3-Dots Obsolete Code



RMA 5-Dots Obsolete Codes





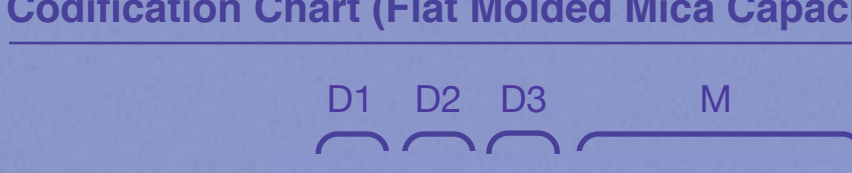


D1: First digit
D2: Second digit
D3: Third digit
M: Multiplier/divider
V: Working voltage
T: Tolerance
C: Class

Codification Chart (Flat Molded Mica Capacitors)

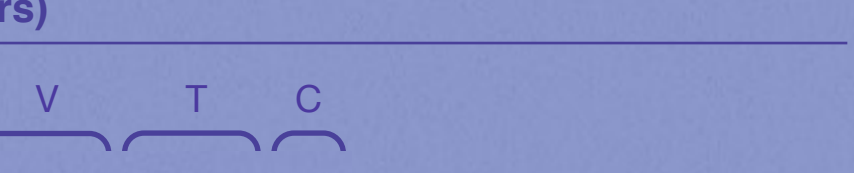
	D1	D2	D3	M	V	T	C
Black	0	0	0	x1		20%	A
Brown	1	1	1	x10	100		E
Red	2	2	2	x100	200		H
Orange	3	3	3	x1 000	300	30%	J
Yellow	4	4	4	x10 000	400		P
Green	5	5	5	x100 000	500		R
Blue	6	6	6	x1 000 000	600		S
Purple	7	7	7	x10 000 000	700		T
Grey	8	8	8	÷100	800		
White	9	9	9	÷10	900		
Gold				÷10	1000	5%	
Silver				÷100	2000	10%	
None					500		

Examples



470pF ±10% 500V

D1, D2, D3, M = 4, 7, 0, 0 (Yellow, Purple, Black, Black)
T=Silver (10%)
V=Green (500)



220pF ±20% 300V

D1, D2, M = 2, 2, x10 (Red, Red, Brown)
T=Black (20%)
V=Orange (300)

240pF 700V

D1, D2, D3, M = 2, 4, 0 (Red, Yellow, Brown)
V=Purple (700)

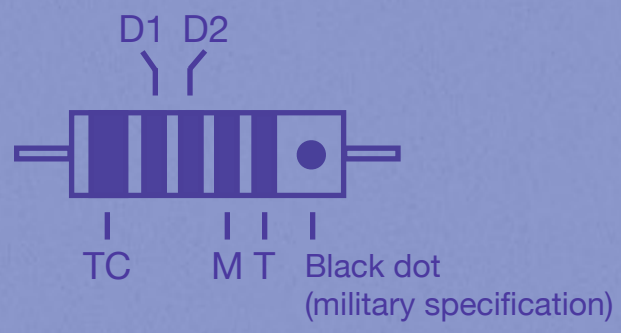
420pF ±5% Class A

D1, D2, M = 4, 2, x10 (Yellow, Red, Brown)
T=Gold (5%)
C=Black (A)

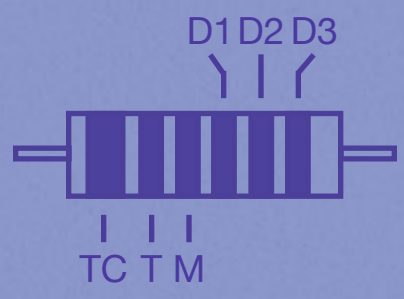
Axial Lead Ceramic Capacitors

Codification Chart

JAN Standard



RMA Standard



	D1	D2	D3	M	TC	T	
Black	0	0	0	x1	0	2pF	20%
Brown	1	1	1	x10	-30		1%
Red	2	2	2	x100	-80	0.25pF	2%
Orange	3	3	3	x1 000	-150		
Yellow	4	4	4	x10 000	-220		
Green	5	5	5		-330	0.5pF	5%
Blue	6	6	6		-470		
Purple	7	7	7		-750		
Grey	8	8	8	÷100	+30	0.25 pF	
White	9	9	9	÷10	+120 to -750 (EIA) +500 to -330 (JAN)	1 pF	10%
Gold					+100 (JAN)		
Silver					+100 (JAN)		
						<10pF	≥10pF

Examples (Axial Lead Ceramic Capacitors)

47pF ±20%
-80PPM/°C

TC=Red (-80)
D1=Yellow (4)
D2=Purple (7)
M=Black (x1)
T=Black (20%)

22nF ±10%
-220PPM/°C

TC=Yellow (-220)
D1=Red (2)
D2=Red (2)
M=Orange (x1000)
T=White (10%)

4.6nF ±5%
-330PPM/°C

TC=Green (-330)
T=Green (5%)
M=Brown (x10)
D1=Yellow (4)
D2=Blue (6)
D3=Black (0)

6.8pF ±0.5pF
-470PPM/°C

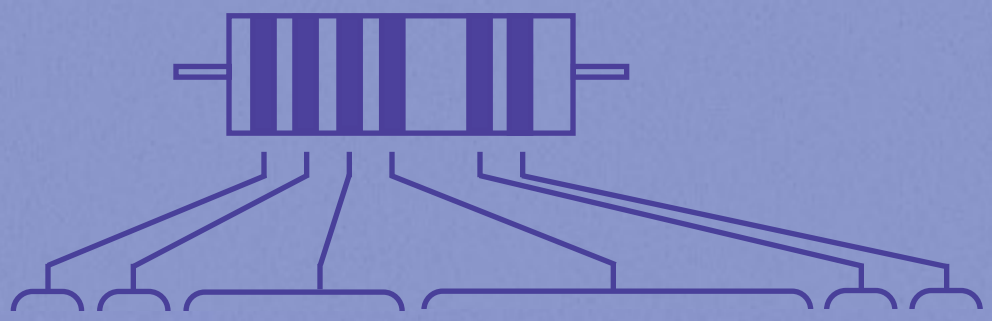
TC=Blue (-470)
T=Green (0.5pF)
M=Grey (÷100)
D1=Blue (6)
D2=Grey (8)
D3=Black (0)

More Info

JAN standard tubular ceramic capacitors are 500V working voltage, while RMA standard are 300V.

Axial Lead Molded Paper Capacitors

Codification Chart



Black	0	0	x1	2pF	20%	0	0
Brown	1	1	x10		1%	1	1
Red	2	2	x100	0.25pF	2%	2	2
Orange	3	3	x1 000			3	3
Yellow	4	4	x10 000			4	4
Green	5	5		0.5pF	5%	5	5
Blue	6	6				6	6
Purple	7	7				7	7
Grey	8	8	÷100	0.25 pF		8	8
White	9	9	÷10	1 pF	10%	9	9
				<10pF	≥10pF		

1° band: First digit
2° band: Second digit
3° band: Multiplier/divider
4° band: Tolerance
5° band: Working voltage first digit
6° band: Working voltage second digit

Examples

47pF ±20% 1000V

Yellow (4)
Purple (7)
Black (x1)
Black (20%)
Brown+Black (1000)

470pF ±10% 1200V

Yellow (4)
Purple (7)
Brown (x10)
White (10%)
Brown+Red (1200)

22nF ±20% 1500V

Red (2)
Red (2)
Orange (x1000)
Black (20%)
Brown+Green (1500)

2.4nF ±5% 1600V

Red (2)
Yellow (4)
Red (x100)
Green (5%)
Brown+Blue (1600)

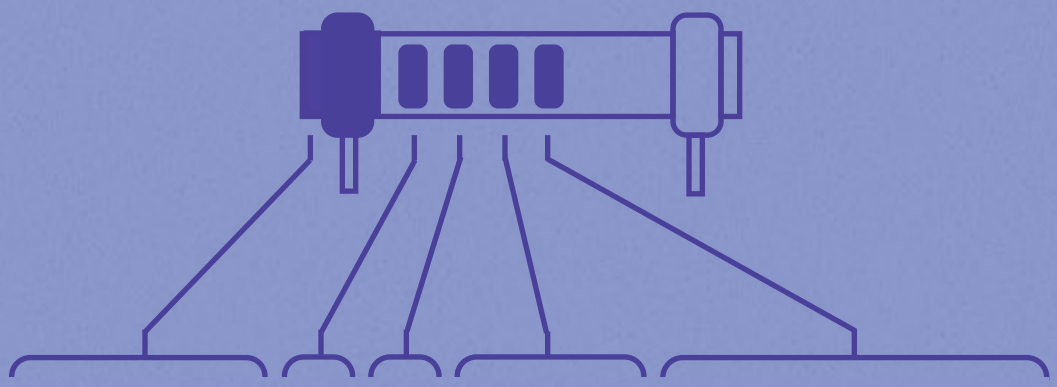
More Info

Working voltage with 2 bands: first digit + second digit + 2 zeros. Example: Digits 1 and 2 = 1200V.

This capacitor uses oil impregnated paper as dielectric. It is also known as “bumble bee capacitor” and large used in 60’s sound applications like the famous Gibson guitars. Later this capacitor was relanched, but with no color bands - they have the value written directlly in the body, and this new version is known as “the black beauty” and still used on some guitars.

Tubular Ceramic Capacitors

Codification Chart



Black	0	0	0	x1	2pF	20%
Brown	-30	1	1	x10		1%
Red	-80	2	2	x100		2%
Orange	-150	3	3	x1 000		
Yellow	-220	4	4	x10 000		
Green	-330	5	5		0.5pF	5%
Blue	-470	6	6			
Purple	-750	7	7			
Grey	+30	8	8	÷100	0.25 pF	
White	+120 to -750 (EIA) +500 to -330 (JAN)	9	9	÷10	1 pF	10%
Silver	+100 (JAN)					
None	By-Pass Coupling					
					<10pF	≥10pF

1° band: Temperature coefficient (in PPM/°C)
2° band: First digit
3° band: Second digit
4° band: Multiplier/divider
5° band: Tolerance

Examples

47pF ±20% -80PPM/°C

Red (-80)
Yellow (4)
Purple (7)
Black (x1)
Black (20%)

470pF ±10%

Yellow (4)
Purple (7)
Brown (x10)
White (10%)

22nF ±5%

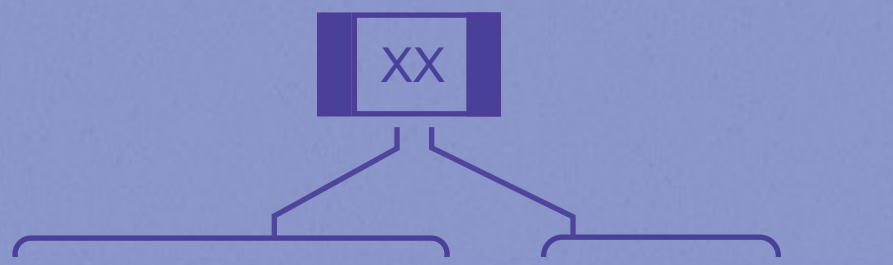
Red (2)
Red (2)
Orange (x1000)
Green (5%)

More Info

By-pass coupling ceramic capacitors does not have temperature coefficient marking.

2-Digit Alphanumeric Chip SMD Capacitors

Codification Chart



A	1.0	M	3.0	Y	8.2	0	x 1
B	1.1	N	3.3	Z	9.1	1	x 10
C	1.2	P	3.6	a	2.5	2	x 100
D	1.3	Q	3.9	b	3.5	3	x 1 000
E	1.5	R	4.3	d	4.0	4	x 10 000
F	1.6	S	4.7	e	4.5	5	x 100 000
G	1.8	T	5.1	f	5.0	6	x 1 000 000
H	2.0	U	5.6	m	6.0	7	x 10 000 000
J	2.2	V	6.2	n	7.0	9	÷ 10
K	2.4	W	6.8	t	8.0		
L	2.7	X	7.5	y	9.0		

Examples

0.47pF
4.7 (S=4.7 in table), ÷10 (9=÷10)

47pF
4.7 (S=4.7 in table), x10 (1=x10)

220pF
2.2 (J=2.2 in table), x100 (2=x100)

240nF
2.4 (K=2.4 in table), x100K (5=x100K)

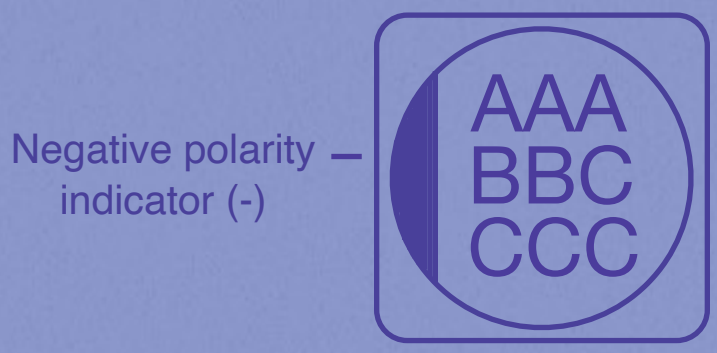
More Info

This component has no tolerance marking. If not declared by the manufacturer, it should be considered 20%.

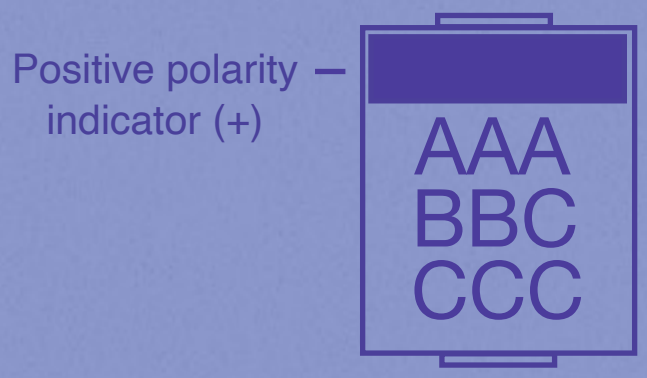
SMD Capacitors (Generic Coding)

Codification Chart

Electrolytic Capacitors



Tantalum and other chip capacitors

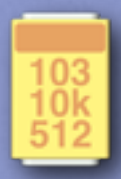


Legend:

Symbol	Meaning
AAA	Capacitance value (2 digits + multiplier)
BB	Working voltage.
C's	Manufacturer's informations

Examples

10nF 10V
10nF (103 = 10000 pF)
10=10V

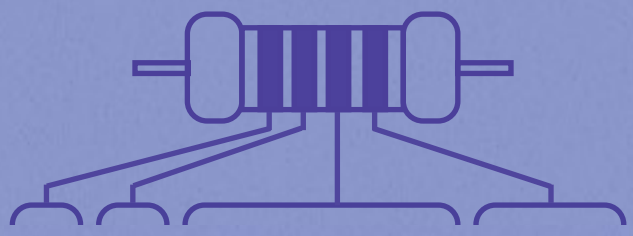


10nF 10V
10nF (103 = 10000 pF)
10=10V

Inductors

Axial Lead Inductors

Codification Chart



Black	0	0	x1	20%
Brown	1	1	x10	1%
Red	2	2	x100	2%
Orange	3	3	x1 000	3%
Yellow	4	4	x10 000	4%
Green	5	5	x100 000	0.5%
Blue	6	6	x1 000 000	0.25%
Purple	7	7	x10 000 000	0.1%
Grey	8	8		
White	9	9		
Gold			÷10	5%
Silver			÷100	10%

1° band: First digit
2° band: Second digit
3° band: Multiplier/divider, if present
4° band: Tolerance (+/-)
Values in μH (microhenries).

Examples

700µH ±2%
purple (7), black (0), brown (x10), red (2%)

2.4mH ±5%
red (2), yellow (4), red (x100), gold (5%)

4.7µH ±2%
yellow (4), purple (7), gold (÷10), red (2%)

80µH ±5%
grey (8), black (0), gold (5%)

27µH ±2%
red (2), purple (7), red (2%)

More Info

A double width sliver band may be used to signify military standard. In fact, until 90‘s, tolerances different from 5% and 10% where found only in military type inductors. Example:

2.7mH ±2% military

One gold band may also be used to specify decimal point. Example:

2.2µH ±5%

SMD Inductors

Codification Chart

Tolerance Table:

A	0.05%	H	3%
B	0.1%	J	5%
C	0.25%	K	10%
D	0.5%	L	15%
F	1%	M	20%
G	2%		None: Check manufacturer's data

Legend:

Symbol	Meaning
D	Digit
M	Multiplier
T	Tolerance , if present

It's possible to find "μ", "R" or "N" letters too, with the following meaning:

Letter	Meaning
μ	Decimal point
R	Decimal point
N	Decimal point, value in nH (nanohenries)

When these letters are present, there is no multiplier. All other symbols are digits.

Examples

22μH ±5%
22 (digits), x1 (no zeros), ±5% (J=5%)

2.2mH
22 (digits), x100 (2 zeros) (2200μH = 2.2mH)

4.7μH
4 (digit), R (decimal point), 7 (digit)

4.7nH
4 (digit), N (decimal point in nanohenries), 7 (digit)

0.47μH
μ (decimal point), 4 (digit), 7 (digit)

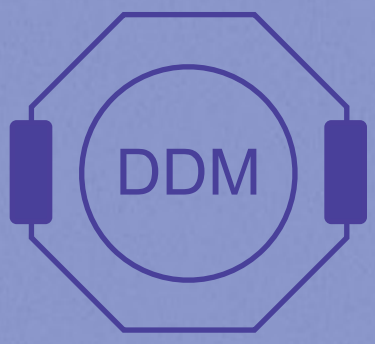
More Info

Some manufactures use two small boxes (colon symbol) to represent the number eight. Example:

280 μH

Numbered SMD Inductors

Codification Chart



Legend:

Symbol	Meaning
D	Digit
M	Multiplier (number of zeros)

It's possible the "R" symbol to indicate the decimal point. In this case, there is no multiplier. All the symbols are digits.

Examples

22µH
2 (digit), 2(digit), x1 (no zeros)

4.7µH
4 (digit), decimal point, 7 (digit)

2.2mH
2 (digit), 2(digit), x100 (2 zeros)

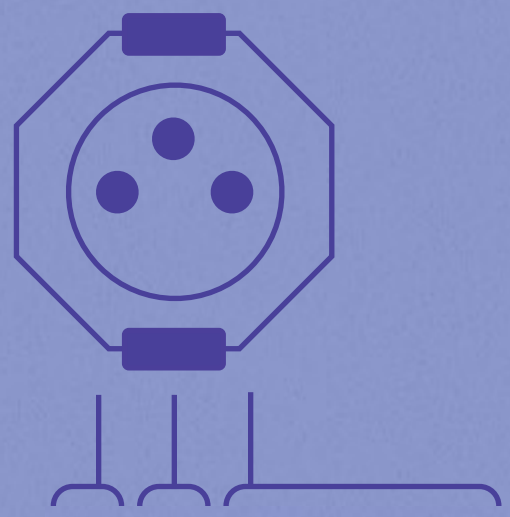
47µH
4 (digit), 7(digit), x1 (no zeros)

More Info

This component has no tolerance marking. If not declared by the manufacturer, it should be considered 20%.

Color Dots SMD Inductors

Codification Chart



Black	0	0	x1
Brown	1	1	x10
Red	2	2	x100
Orange	3	3	x1 000
Yellow	4	4	x10 000
Green	5	5	x100 000
Blue	6	6	x1 000 000
Purple	7	7	x10 000 000
Grey	8	8	
White	9	9	

Examples

470µH
4 (yellow), 7 (purple), x10000 (yellow)

15µH
1 (brown), 5 (green), x1000 (orange)

680nH
6 (blue), 8 (grey), x10 (brown)

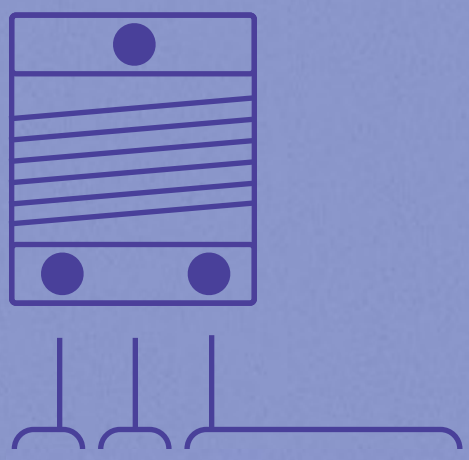
50nH
5 (green), 0 (black), x1 (black)

More Info

This component has no tolerance marking. If not declared by the manufacturer, it should be considered 20%.

Color Dots Chip SMD Inductors

Codification Chart



Black	0	0	x1
Brown	1	1	x10
Red	2	2	x100
Orange	3	3	x1 000
Yellow	4	4	x10 000
Green	5	5	x100 000
Blue	6	6	x1 000 000
Purple	7	7	x10 000 000
Grey	8	8	
White	9	9	

Examples

470µH
4 (yellow), 7 (purple), x10000 (yellow)

15µH
1 (brown), 5 (green), x1000 (orange)

680nH
6 (blue), 8 (grey), x10 (brown)

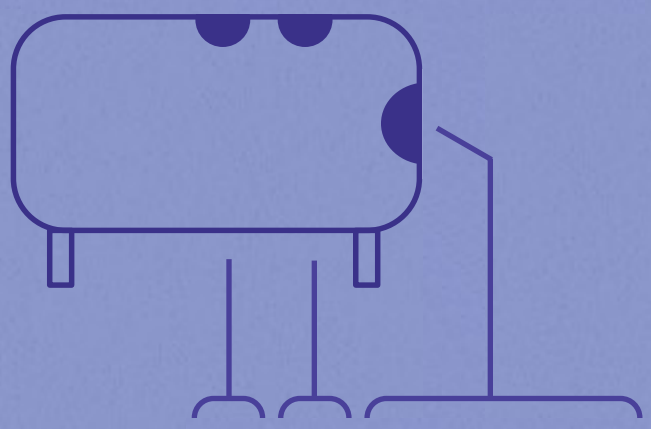
50nH
5 (green), 0 (black), x1 (black)

More Info

This component has no tolerance marking. If not declared by the manufacturer, it should be considered 20%.

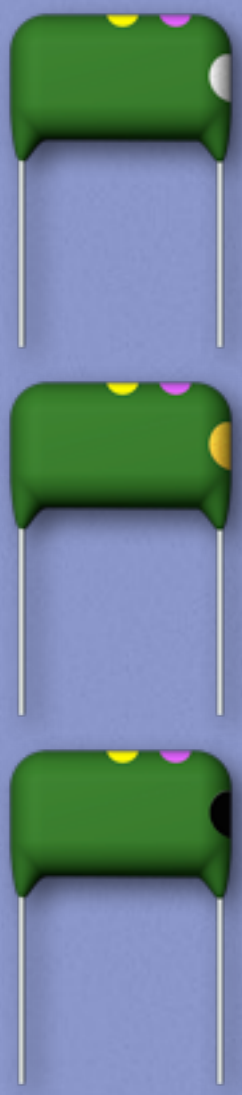
Side-Marked Epoxy Dipped Inductors

Codification Chart



Black	0	0	x1
Brown	1	1	x10
Red	2	2	x100
Orange	3	3	x1 000
Yellow	4	4	x10 000
Green	5	5	
Blue	6	6	
Purple	7	7	
Grey	8	8	
White	9	9	
Gold			÷10
Silver			÷100

Examples



0.47µH

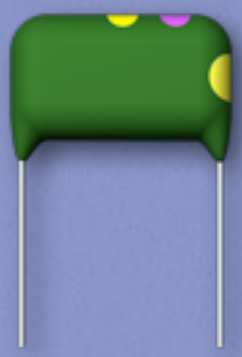
Yellow (4)
Purple (7)
Silver (÷100)

4.7µH

Yellow (4)
Purple (7)
Gold (÷10)

47µH

Yellow (4)
Purple (7)
Black (x1)



470mH

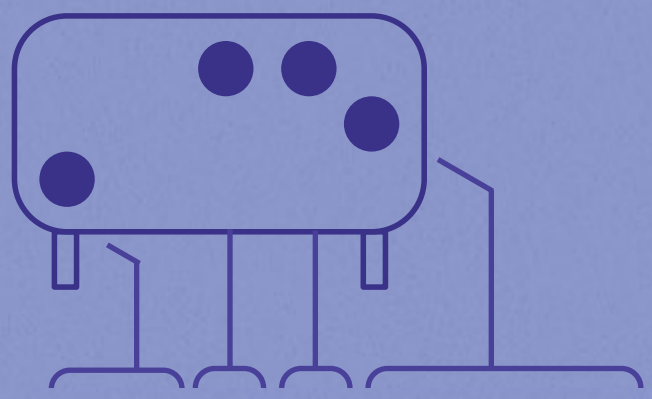
Yellow (4)
Purple (7)
Yellow (x10000)

More Info

This component has no tolerance marking. If not declared by the manufacturer, it should be considered 20%.

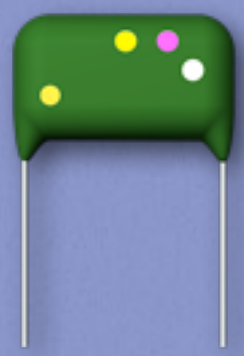
Front-Marked Epoxy Dipped Inductors

Codification Chart



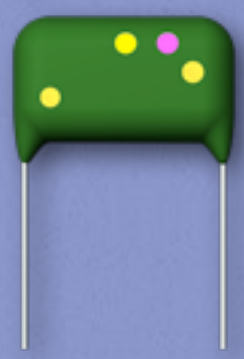
Black		0	0	x1
Brown		1	1	x10
Red		2	2	x100
Orange		3	3	x1 000
Yellow		4	4	x10 000
Green		5	5	
Blue		6	6	
Purple		7	7	
Grey		8	8	
White		9	9	
Gold	5%			÷10
Silver	10%			÷100

Examples



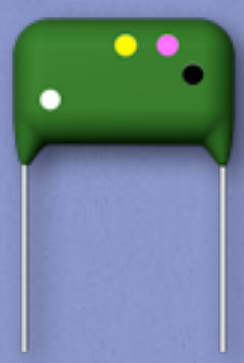
0.47µH

Yellow (4)
Purple (7)
Silver (÷100)
Gold (±5%)



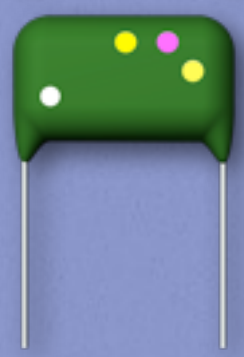
4.7µH

Yellow (4)
Purple (7)
Gold (÷10)
Gold (±5%)



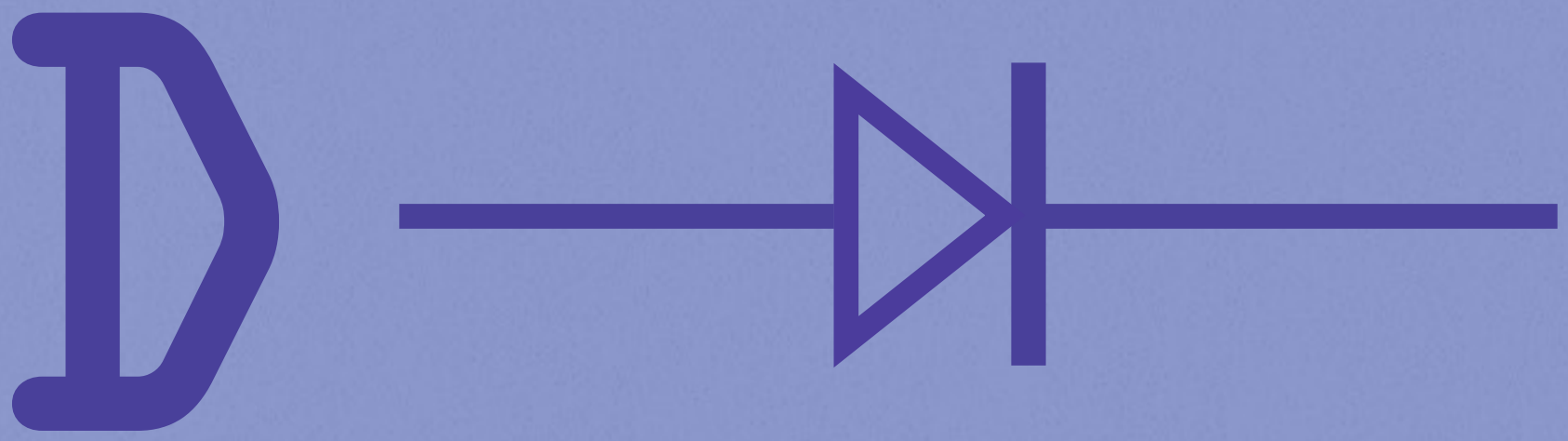
47µH

Yellow (4)
Purple (7)
Black (x1)
Silver (±10%)



470mH

Yellow (4)
Purple (7)
Yellow (x10000)
Silver (±10%)



Diodes

1N Color Bands Glass Diodes

Codification Chart

2 digits glass diode

3 digits glass diode

4 digits glass diode

Legend:

Symbol	Meaning
D	Digit
S	Suffix, if used

Color Table:

	Digit	Suffix
Black	0	-
Brown	1	A
Red	2	B
Orange	3	C
Yellow	4	D
Green	5	E
Blue	6	F
Purple	7	G
Grey	8	H
White	9	I

Examples

1N60
Black band (2 digits), blue (6), black (0)

1N139
brown (1), orange (3), white (9)

1N139A
brown (1), orange (3), white (9), brown (A)

1N4148
yellow (4), brown (1), yellow (4), grey (8), black (no suffix)

1N4148B
yellow (4), brown (1), yellow (4), grey (8), red (B)

More Info

Identifying this type of diode can be confusing when you don't know if the last band is a digit or a suffix, so here is the algorithm:

If the diode has a thick black band:

- If there is 2 color bands: DD
- If there is 3 color bands: DDS

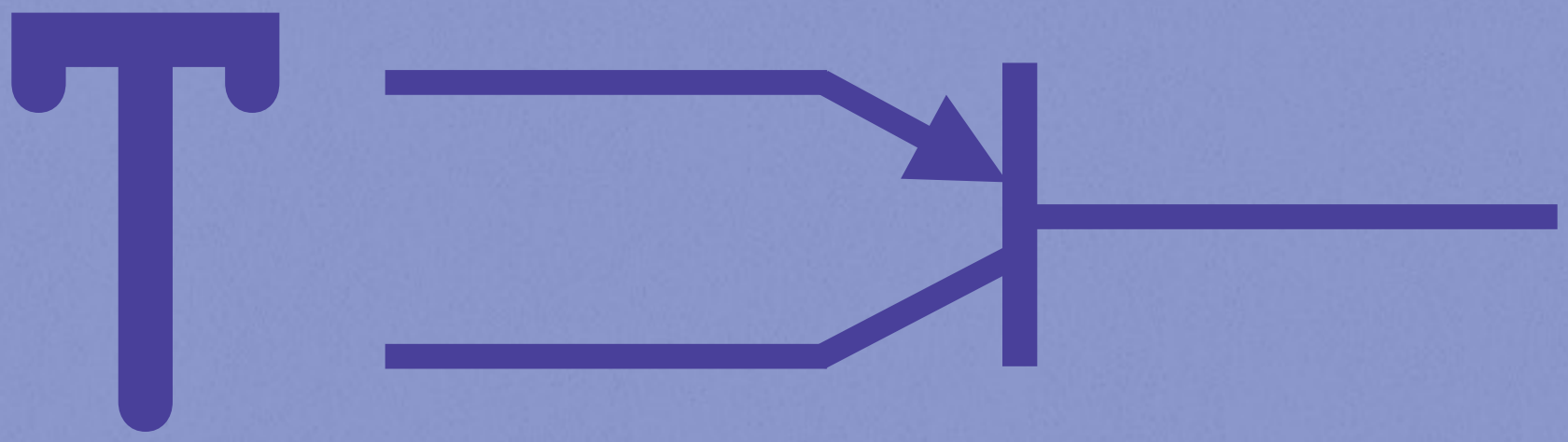
Else:

- If there is 3 color bands: DDD
- If there is 4 color bands: DDDS
- If there is 5 color bands: DDDDS

End.

Diodes with 5 bands always is 4-digits. If there is no suffix, the fifth band is black, else the fifth band has the corresponding color of the suffix.

The standard "1N" for diodes codification means "1 junction". This is why some transistors starts with "2N" (they have usually 2 junctions).



Transistors

4 Color Dots Russian Transistors

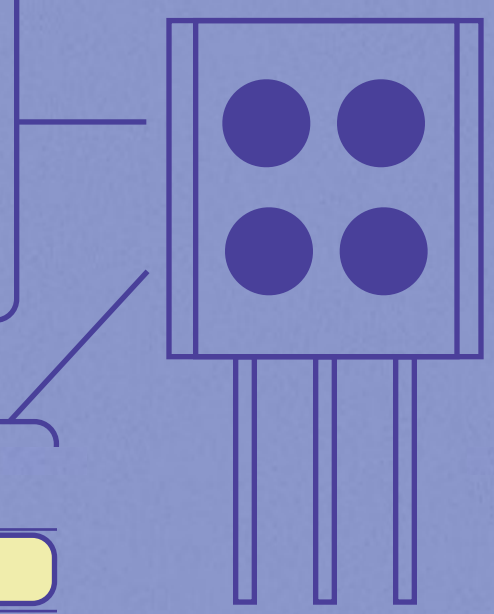
Codification Chart

Model:

Brown	KT326
Red	KT337
Light Yellow	KT345
Blue	KT349
Grey	KT350
Yellow	KT351
Green	KT352
Pink	KT363
White	KT645
Light Blue	KT310

Suffix:

Pink	А
Yellow	Б
Blue	В
Light Yellow	Г
Orange	Д
Cyan	Е
Olive Green	Ж
Green	И
Red	К
Grey	Л



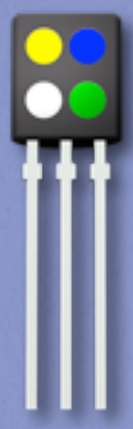
Manufacturing Month:

Light Yellow	January
Blue	February
Green	March
Red	April
Olive Green	May
Grey	June
Brown	July
Orange	August
Cyan	September
White	October
Yellow	November
Light Blue	December

Manufacturing Year:

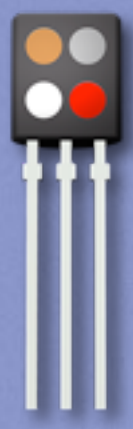
Light Yellow	1977
Olive Green	1978
Orange	1979
Cyan	1980
Light Cyan	1981
White	1982
Red	1983
Brown	1984
Green	1985
Light Blue	1986

Examples (4 color dots russian transistors)



КТ351В, october 1985

Top left: KT351 (yellow)
Top right: В (blue)
Bottom left: october (white)
Bottom right: 1985 (green)



КТ326Л, october 1983

Top left: KT326 (brown)
Top right: Л (grey)
Bottom left: october (white)
Bottom right: 1983 (red)

КТ337Б, august 1984

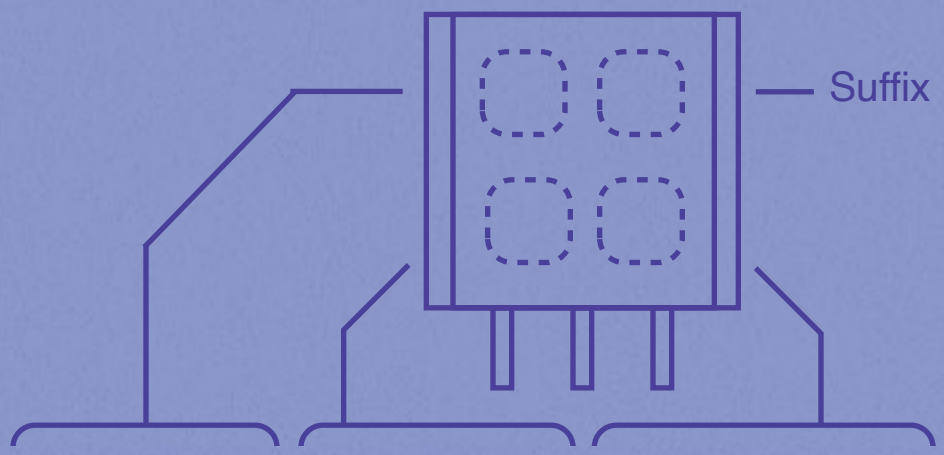
Top left: KT337 (red)
Top right: Б (yellow)
Bottom left: august (orange)
Bottom right: 1984 (brown)

КТ350И, july 1979

Top left: KT350 (grey)
Top right: И (green)
Bottom left: july (brown)
Bottom right: 1979 (orange)

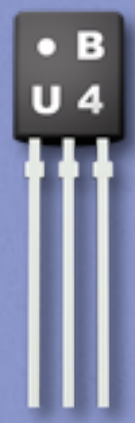
4 Symbols Russian Transistors

Codification Chart



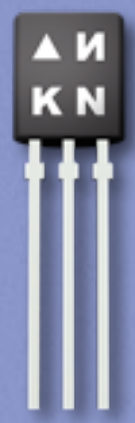
Model:	Manufacturing Year:	Manufacturing Month:
KT203	U 1986	1 January
KT208	V 1987	2 February
KT209	W 1988	3 March
KT209	X 1989	4 April
KT313	A 1990	5 May
KT326	B 1991	6 June
KT339	C 1992	7 July
KT342	D 1993	8 August
KT502	E 1994	9 September
KT503	F 1995	O October
KT3102	H 1996	N November
KT3107	I 1997	D December
KT3157	K 1998	
KT3166	L 1999	
KT6127	M 2000	
KT680		
KT681		
KT698		
КП103		

Examples



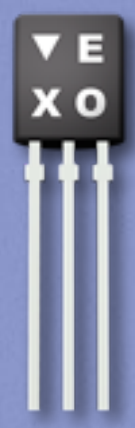
KT208B April/1986

KT208 (small circle)
B (suffix)
1986 (U)
April (4)



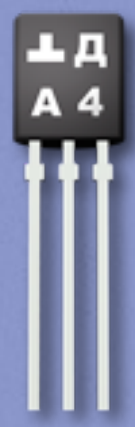
KT339И November/1998

KT339 (up arrow)
И (suffix)
1998 (K)
November (N)



KT326E October/1989

KT326 (down arrow)
E (suffix)
1989 (X)
October (O)



KT313Д April/1990

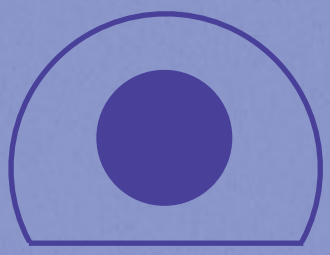
KT313 (upside-down T)
Д (suffix)
1990 (A)
April (4)

2 Color Dots Russian Transistors

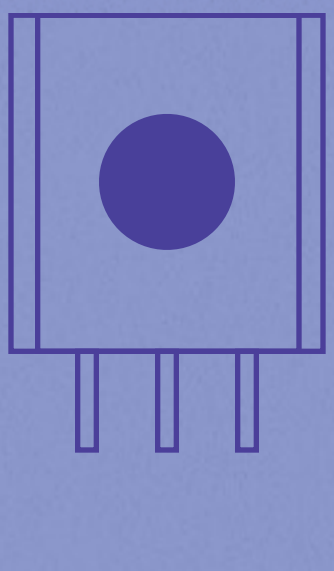
Codification Chart

Model:		Suffix:	
Dark Red	KT326	Dark Red	А
Grey	KT337	Yellow	Б
Orange	KT345	Dark Green	В
Brown	KT349	Light Blue	Г
Light Blue	KT350	Blue	Д
Blue	KT351	White	Е
Yellow	KT352	Dark Brown	Ж
White	KT363	Silver	И
Dark Green	KT645	Orange	К
Silver	KT310	Light Tobacco	Л
Tobacco	KT310	Grey	М

Top View:



Front View:



Examples

КТ352Д

Front: KT352 (yellow)
Top: Д (blue)

КТ351Б

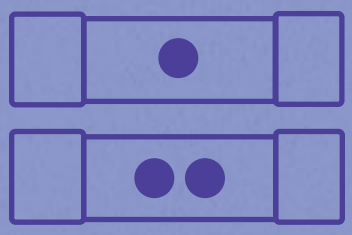
Front: KT351 (blue)
Top: Б (yellow)

F

Fuses

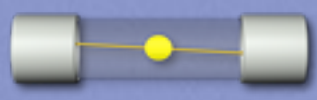
Color Dots Glass Fuses

Codification Chart



Salmon Pink		50 mA
Black		60 mA
Grey		100 mA
Red		150 mA
Brown		250 mA
Yellow		500 mA
Green		750 mA
Blue		1 A
Light Blue		1.5 A
Purple		2 A
White		3 A
Black	White	5 A
Orange		7 A
Orange	Black	10 A
Orange	Grey	12 A
Orange	Green	15 A
Orange	Purple	20 A
Orange	White	25 A

Examples



500 mA
(yellow)

2A
(purple)

5A
(black + white)

10A
(orange + black)

20A
(orange + purple)

Color Bands Glass Fuses

Codification Chart

Velocity + 1 Band

	Narrow	Wide
Red	1 A	10 A
Purple	1.25 A	12.5 A
Orange	1.6 A	16 A
Blue	2 A	20 A
Yellow	2.5 A	25 A
Black	3.15 A	
Brown	4 A	
White	5 A	
Green	6.3 A	

Velocity + 2 Bands

Red	Red	100 mA
Purple	Purple	125 mA
Orange	Orange	160 mA
Blue	Blue	200 mA
Yellow	Yellow	250 mA
Black	Black	315 mA
Brown	Brown	400 mA
White	White	500 mA
Green	Green	630 mA
Grey	Grey	800 mA

Velocity + 3 Bands

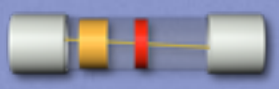
Black	Black	Black	32 mA
Brown	Brown	Brown	40 mA
White	White	White	50 mA
Green	Green	Green	63 mA
Grey	Grey	Grey	80 mA
Brown	Black	Brown	100 mA
Brown	Blue	Brown	160 mA
Red	Black	Brown	200 mA
Red	Green	Brown	250 mA
Orange	Brown	Brown	315 mA
Yellow	Black	Brown	400 mA
Green	Black	Brown	500 mA
Blue	Orange	Brown	630 mA
Grey	Black	Brown	800 mA
Brown	Black	Red	1A
Brown	Red	Red	1.25 A
Brown	Blue	Red	1.6 A
Red	Black	Red	2 A
Red	Green	Red	2.5 A
Yellow	Black	Red	4 A
Blue	Orange	Red	6.3 A

Velocity Band:

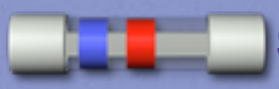
(valid for the three versions above)

Red	Very fast acting
Purple	Fast acting
Orange	Normal
Blue	Slow blow
Yellow	Very slow blow

Examples



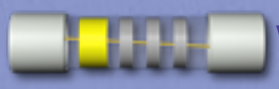
Normal blow 1A (orange + narrow red)



Slow blow 10A (blue +wide red)

Fast acting 500mA (Purple + white, white)

Very fast acting 200mA (red + red, black, brown)



Very slow blow 80mA (yellow + grey, grey, grey)

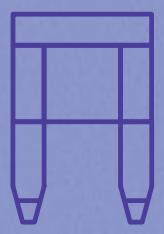
Blade Automotive Fuses

Codification Chart

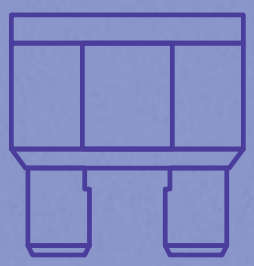
	Micro	Mini	Standard	Maxi
Black	-	-	1	-
Grey	-	2	2	25
Violet	-	3	3	-
Pink	-	4	4	-
Tan	5	5	5	70
Brown	7.5	7.5	7.5	35
Red	10	10	10	50
Blue	15	15	15	60
Yellow	20	20	20	20
Clear	25	25	25	80
Green	30	30	30	30
Cyan	-	-	35	-
Orange	-	-	40	40

Micro

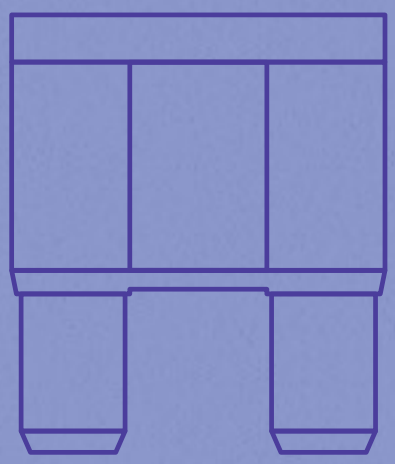
Mini



Standard



Maxi



Examples

10A (Mini, red)

25A (Micro, clear)

30A (Standard, green)

35A (Maxi, brown)

More Info

Micro is also known as Low Profile ATM, APS or ATT.

Mini is also known as ATM.

Standard is also known as ATC, APR or ATO.