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Resistor Color Code Chart

Colour bands, multipliers, tolerance and tempco, E-series values, SMD and capacitor codes

For: Electronics students, makers, technicians and repair engineers

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KEY RELATIONSHIP	FORMULA	REVERSE	WORKED EXAMPLE
Digits, then a power-of-ten multiplier, then tolerance (IEC 60062)	R = (digit bands as a number) × 10^(multiplier)	Write the value with 2 or 3 significant digits; the exponent is the multiplier colour	Yellow–violet–red–gold = 47 × 10^2 Ω = 4.7 kΩ ±5%

Read from the end nearest a band; the tolerance band is usually set apart. Colours as IEC 60062:2016.

Resistor colour code

Colour	Digit	Multiplier	Tolerance (letter)	Temp. coefficient (letter)
Pink	—	× 0.001	—	—
Silver	—	× 0.01	±10% (K)	—
Gold	—	× 0.1	±5% (J)	—
Black	0	× 1	—	250 ppm/K (U)
Brown	1	× 10	±1% (F)	100 ppm/K (S)
Red	2	× 100	±2% (G)	50 ppm/K (R)
Orange	3	× 1 k	±0.05% (W)	15 ppm/K (P)
Yellow	4	× 10 k	±0.02% (P)	25 ppm/K (Q)
Green	5	× 100 k	±0.5% (D)	20 ppm/K (Z)
Blue	6	× 1 M	±0.25% (C)	10 ppm/K (Z)
Violet	7	× 10 M	±0.1% (B)	5 ppm/K (M)
Grey	8	× 100 M	±0.01% (L)	1 ppm/K (K)
White	9	× 1 G	—	—
None	—	—	±20% (M)	—

Reading 4, 5 and 6 band resistors

A 3-band resistor has no tolerance band and is ±20%. On 6-band parts the last band can also be a reliability band.

Bands	Band 1	Band 2	Band 3	Band 4	Band 5	Band 6
3 bands	1st digit	2nd digit	Multiplier	—	—	—
4 bands	1st digit	2nd digit	Multiplier	Tolerance	—	—
5 bands	1st digit	2nd digit	3rd digit	Multiplier	Tolerance	—
6 bands	1st digit	2nd digit	3rd digit	Multiplier	Tolerance	Temp. coefficient

Worked examples

Bands	Resistance	Tolerance
Brown – Black – Black – Gold	10 Ω	±5%
Brown – Black – Red – Gold	1 kΩ	±5%
Red – Red – Brown – Gold	220 Ω	±5%
Yellow – Violet – Red – Gold	4.7 kΩ	±5%
Brown – Black – Orange – Gold	10 kΩ	±5%
Brown – Black – Yellow – Silver	100 kΩ	±10%
Green – Blue – Gold – Gold	5.6 Ω	±5%
Brown – Black – Black – Brown – Brown	1 kΩ	±1%
Yellow – Violet – Black – Brown – Brown	4.7 kΩ	±1%
Orange – Orange – Black – Red – Brown	33 kΩ	±1%

E-series preferred values (one decade)

Multiply by 1, 10, 100, 1 k, 10 k … to get every standard value, e.g. E12 4.7 → 4.7 Ω, 47 Ω, 470 Ω, 4.7 kΩ.

Series	Tolerance	Values
E6	±20%	1.0 1.5 2.2 3.3 4.7 6.8
E12	±10%	1.0 1.2 1.5 1.8 2.2 2.7 3.3 3.9 4.7 5.6 6.8 8.2
E24	±5%	1.0 1.1 1.2 1.3 1.5 1.6 1.8 2.0 2.2 2.4 2.7 3.0 3.3 3.6 3.9 4.3 4.7 5.1 5.6 6.2 6.8 7.5 8.2 9.1

E96 values (±1%) and EIA-96 SMD codes

The EIA-96 code is the position of the value in this list (01–96) followed by a multiplier letter.

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

EIA-96 multiplier letters

Letter	Multiplier	Example	Resistance
Z	× 0.001	01Z	100 mΩ
Y or R	× 0.01	68Y	4.99 Ω
X or S	× 0.1	30X	20 Ω
A	× 1	01A	100 Ω
B or H	× 10	01B	1 kΩ
C	× 100	01C	10 kΩ
D	× 1,000	01D	100 kΩ
E	× 10,000	01E	1 MΩ
F	× 100,000	01F	10 MΩ

SMD resistor 3- and 4-digit codes

Code	Rule	Resistance
103	10×10^{3}	10 kΩ
472	47×10^{2}	4.7 kΩ

Code	Rule	Resistance
100	10×10^0	10 Ω
4R7	R marks the decimal point	4.7 Ω
R47	R marks the decimal point	470 mΩ
000 or 0	Zero-ohm link (jumper)	0 Ω
1002	100×10^2 (1% parts)	10 kΩ
4701	470×10^1	4.7 kΩ
2490	249×10^0	249 Ω

Capacitor codes (value in pF)

Two digits and a multiplier, in picofarads: 104 = 10×10^4 pF = 100 nF. A third digit of 8 or 9 means × 0.01 or × 0.1.

Code	Capacitance	Code	Capacitance
101	100 pF	471	470 pF
102	1 nF	222	2.2 nF
103	10 nF	472	4.7 nF
104	100 nF	224	220 nF
105	1 µF	474	470 nF
106	10 µF	109	1 pF

Capacitor tolerance letters

Letter	Tolerance	Typical use
B	±0.1 pF	Small capacitors, below 10 pF
C	±0.25 pF	Small capacitors, below 10 pF
D	±0.5 pF (or ±0.5% above 10 pF)	Small capacitors and precision parts
F	±1%	Precision film and C0G/NP0 ceramic
G	±2%	Precision film and C0G/NP0 ceramic
J	±5%	Film, C0G/NP0 ceramic
K	±10%	Film, X7R ceramic
M	±20%	Electrolytic, X7R and Y5V ceramic
Z	+80% / −20%	Y5V and Z5U ceramic (decoupling)

Sources and method

- **IEC 60062:2016** — Marking codes for resistors and capacitors (colour code, letter and digit codes)
- **IEC 60063:2015** — Preferred number series for resistors and capacitors (E series)
- **EIA-96 marking code** — Three-character code for 1% surface-mount resistors (E96 index + multiplier letter)

Colour, tolerance and temperature-coefficient codes are transcribed from IEC 60062:2016 and cross-checked against a second published table; preferred values are from IEC 60063; every worked example and code table is calculated from those definitions. Interactive version, corrections and more charts: **allunitconversions.com/resistor-color-code-chart**