ELECTRICAL · CHEAT SHEET

Resistor *color codes*.

Color band decoder for **4-band**, **5-band**, and **6-band** resistors — digits, multipliers, tolerances, and temperature coefficients. Per IEC 60062.

The color code table

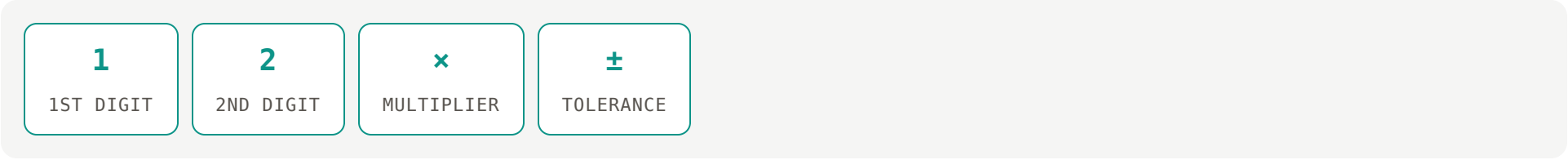
COLOR	DIGIT	MULTIPLIER	TOLERANCE	TEMP COEF
Black	0	×1	—	—
Brown	1	×10	±1.0%	100 ppm/°C
Red	2	×100	±2.0%	50 ppm/°C
Orange	3	×1K	—	15 ppm/°C
Yellow	4	×10K	—	25 ppm/°C
Green	5	×100K	±0.5%	—
Blue	6	×1M	±0.25%	10 ppm/°C
Violet	7	×10M	±0.1%	5 ppm/°C
Grey	8	×100M	±0.05%	—
White	9	×1G	—	—
Gold	—	×0.1	±5.0%	—
Silver	—	×0.01	±10.0%	—

COLOR	DIGIT	MULTIPLIER	TOLERANCE	TEMP COEF
None	–	–	±20.0%	–

How to read each band system

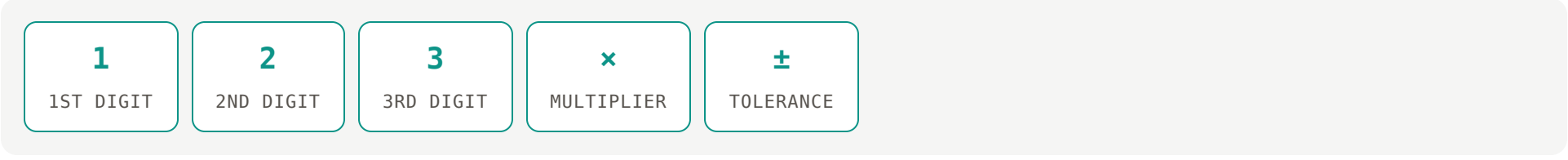
4-band (most common, ±5% or ±10%)

Read from the side *opposite* the wider/different-colored tolerance band:



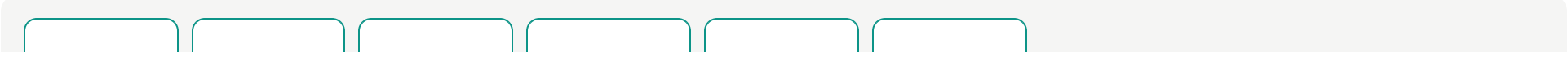
Example: Brown–Black–Red–Gold = `1 0 ×100 ±5%` = **1.0 kΩ ±5%**

5-band (precision, ±1% or ±2%)



Example: Brown–Black–Black–Brown–Brown = `1 0 0 ×10 ±1%` = **1.00 kΩ ±1%**

6-band (precision + temperature coefficient)



1	2	3	×	±	°
1ST DIGIT	2ND DIGIT	3RD DIGIT	MULTIPLIER	TOLERANCE	TEMP COEF

Same as 5-band, with one extra band for ppm/°C drift over temperature. Used where stability matters (precision references, calibration).

> **Reading direction.** Resistors don't have an arrow saying "this end first." Conventions: the tolerance band is usually *wider*, *set apart* from the others by a gap, or in a less common color (gold/silver/brown). If you can't tell which end, use a multimeter to confirm — color-blind eyes and faded resistors are why ohmmeters exist.

Common pitfalls

- **Brown and red are easy to confuse** on small surface-mount or old through-hole parts, and the resulting resistance can be 10× off. When in doubt, measure.
- **Orange and yellow** can blur on heat-discolored parts. Again — measure.
- **The "preferred values" sequence** (E12 series for 5%, E24 for some, E96 for 1%) means not every theoretical value exists as a real part. 1 kΩ exists; 1.034 kΩ doesn't.
- **SMD resistors don't use color codes.** They use 3-digit (e.g. "103" = 10 × 10^3 = 10 kΩ), 4-digit (precision), or EIA-96 (a 3-character coded scheme). Different cheat sheet.

Common questions

How do I tell which end of a resistor to start reading?

The tolerance band (usually gold or silver) is on the right end with a slight gap from the others. Start from the opposite end. For 5-band precision resistors, the 4th band (multiplier) is sometimes a different color from band 5 (tolerance) — that gap helps. When in doubt, measure with a multimeter.

What do gold and silver bands mean?

As tolerance bands: gold = ±5%, silver = ±10%. As multiplier bands: gold = ×0.1, silver = ×0.01 (so a green-blue-gold 4-band is 56 × 0.1 = 5.6 Ω, not 56 × 10^0). Position determines meaning — they always read as tolerance when they're the last band.

Why are 4-band and 5-band resistors different?

4-band is the standard ±5% E12 series with 2 significant figures + multiplier + tolerance. 5-band adds a third significant figure for precision (±1% E96 series, where values like 4.99 kΩ exist). 6-band adds a temperature coefficient band. Higher precision = more bands.

What's the 'preferred value' I should buy?

E12 series (±10% spacing) covers most needs: 10, 12, 15, 18, 22, 27, 33, 39, 47, 56, 68, 82 — each multiplied by 10^n. For precision work, E24 (±5%) doubles these values, E48 (±2%) doubles again, E96 (±1%) doubles again. Stock E12 for general use plus a few specific E96 values you need often.

Why can't I see the colors on a small SMD resistor?

SMD resistors don't use color codes at all — they use numeric markings (3-digit, 4-digit, or EIA-96). 'White' SMD packages are too small for legible printing — below 0603 size you typically can't read markings without magnification. See the SMD resistor codes page for decoding 472 = 4.7 kΩ, etc.

Sources

- **Color code standard:** IEC 60062 — Marking codes for resistors and capacitors.
- **Preferred values:** IEC 60063 — Preferred number series for resistors and capacitors (E6, E12, E24, E48, E96, E192).
