

Resistors

Last updated 1/10/24

Resistors

- Basics

- R

$$V = IR$$

- Circuit Symbols



fixed resistor



potentiometer



variable resistor

- Tolerance

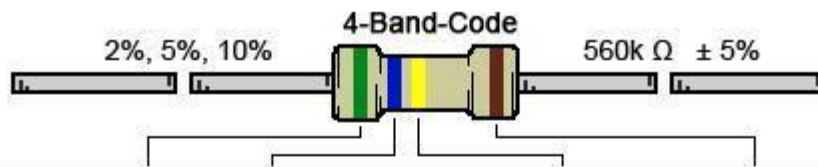
- .05% → 20%
- Most common: 5%, 10%
- Lower tolerance → more expensive

Common Values (5%)		
<u>value</u>		<u>range</u>
10	33	
11	36	
12	39	
13	43	10Ω
15	47	to
16	51	680KΩ
18	56	
20	62	
22	68	
24	75	
27	82	
30	91	

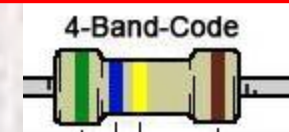
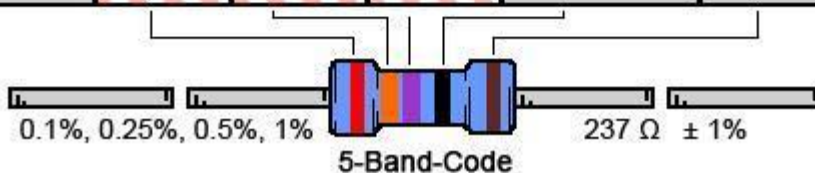
Resistors

- Leaded Resistor
 - Carbon Film, Metal Film, Metal Oxide

Count the number of bands on the resistor first



COLOR	1 ST BAND	2 ND BAND	3 RD BAND	MULTIPLIER	TOLERANCE
Black	0	0	0	1 Ω	
Brown	1	1	1	10 Ω	\pm 1% (F)
Red	2	2	2	100 Ω	\pm 2% (G)
Orange	3	3	3	1K Ω	
Yellow	4	4	4	10K Ω	
Green	5	5	5	100K Ω	\pm 0.5% (D)
Blue	6	6	6	1M Ω	\pm 0.25% (C)
Violet	7	7	7	10M Ω	\pm 0.10% (B)
Grey	8	8	8		\pm 0.05%
White	9	9	9		
Gold				0.1 Ω	\pm 5% (J)
Silver				0.01 Ω	\pm 10% (K)



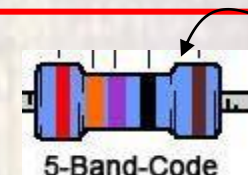
Green 5
Blue 6
Yellow 4

(5x10 + 6) x 10⁴ = 560,000 Ω = 560K Ω

Gold +/- 5%

560K Ω +/- 5%

Note – we use Engineering Notation

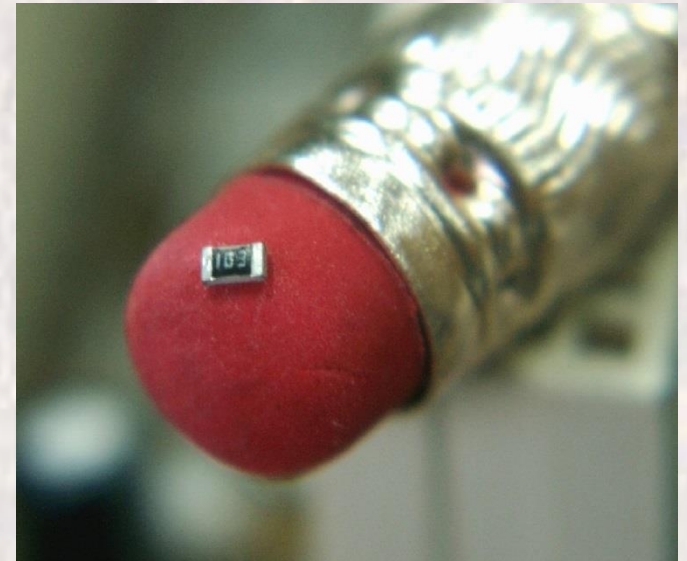
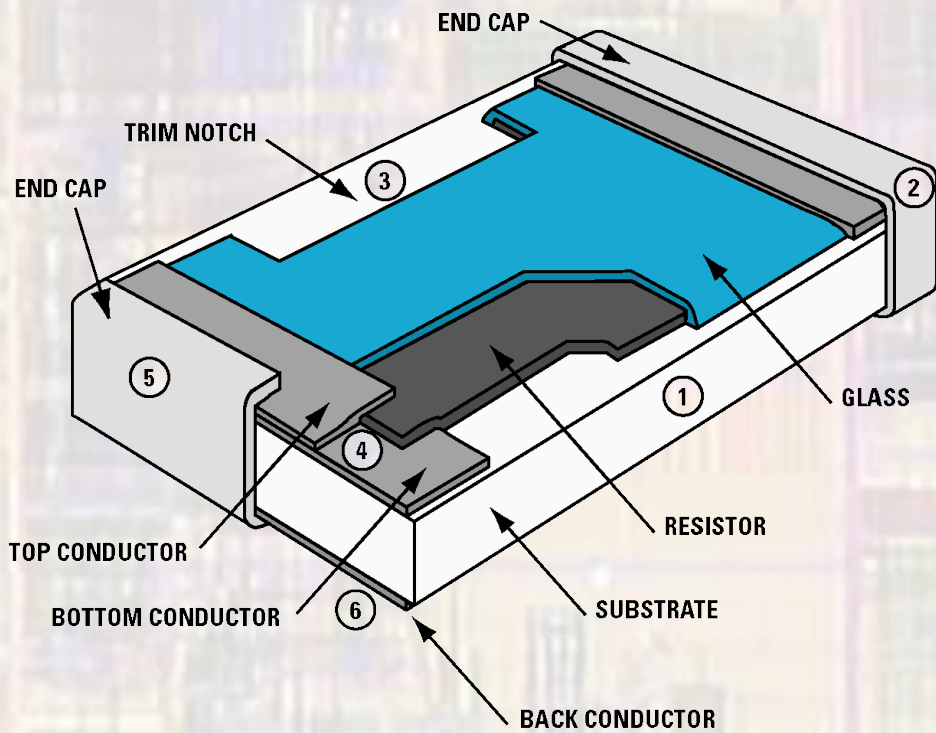


red – orange – violet – black – brown

(2x100 + 3x10 + 7) x 10⁰ = 237 Ω +/- 1%

Resistors

- Chip Resistor



ANATOMY OF A HIGH RELIABILITY THICK FILM CHIP RESISTOR

Resistors

- Chip Resistor
 - Also called Surface Mount Resistor



- Sizes – mm
 - L W
 - 0201, 0402, 0603, 0805, 1206, 1812
- Markings
 - If an R exists – indicates the decimal point
 - R100 \rightarrow 0.100 Ω 1R2 \rightarrow 1.2 Ω
 - Otherwise – just like leaded resistors
 - 123 \rightarrow 12x10³ Ω 1234 \rightarrow 123x10⁴ Ω