Component Identification

This presentation will…

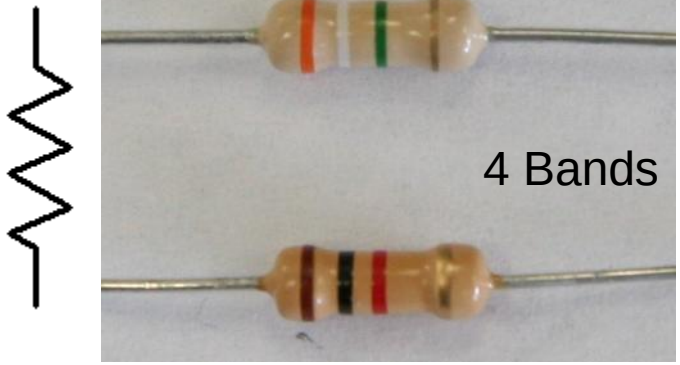
- Introduce common components used in electronics.
- Define a resistor and present various resistor types and package styles.
- Demonstrate how to read a resistor's nominal value and how to measure its actual value with a Digital Multi-Meter (DMM).
- Define a capacitor and present various capacitor types and package styles.
- Demonstrate how to read a capacitor's nominal value.

Resistors

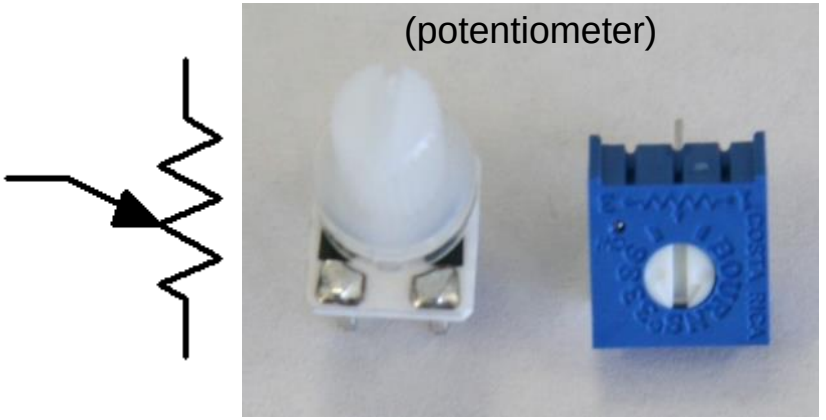
- A resistor is an electronic component that resists the flow of electrical current.
- A resistor is typically used to control the amount of current that is flowing in a circuit.
- Resistance is measured in units of ohms (Ω) and named after George Ohm, whose law (Ohm's Law) defines the fundamental relationship between voltage, current, and resistance.

Resistors: Types and Package Styles

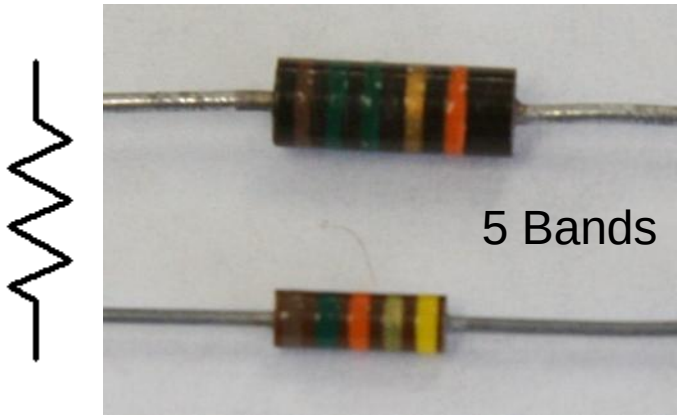
Carbon Film Resistors



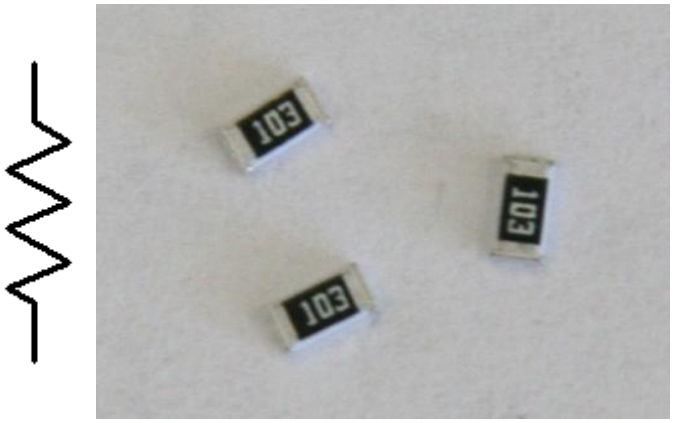
Variable Resistors



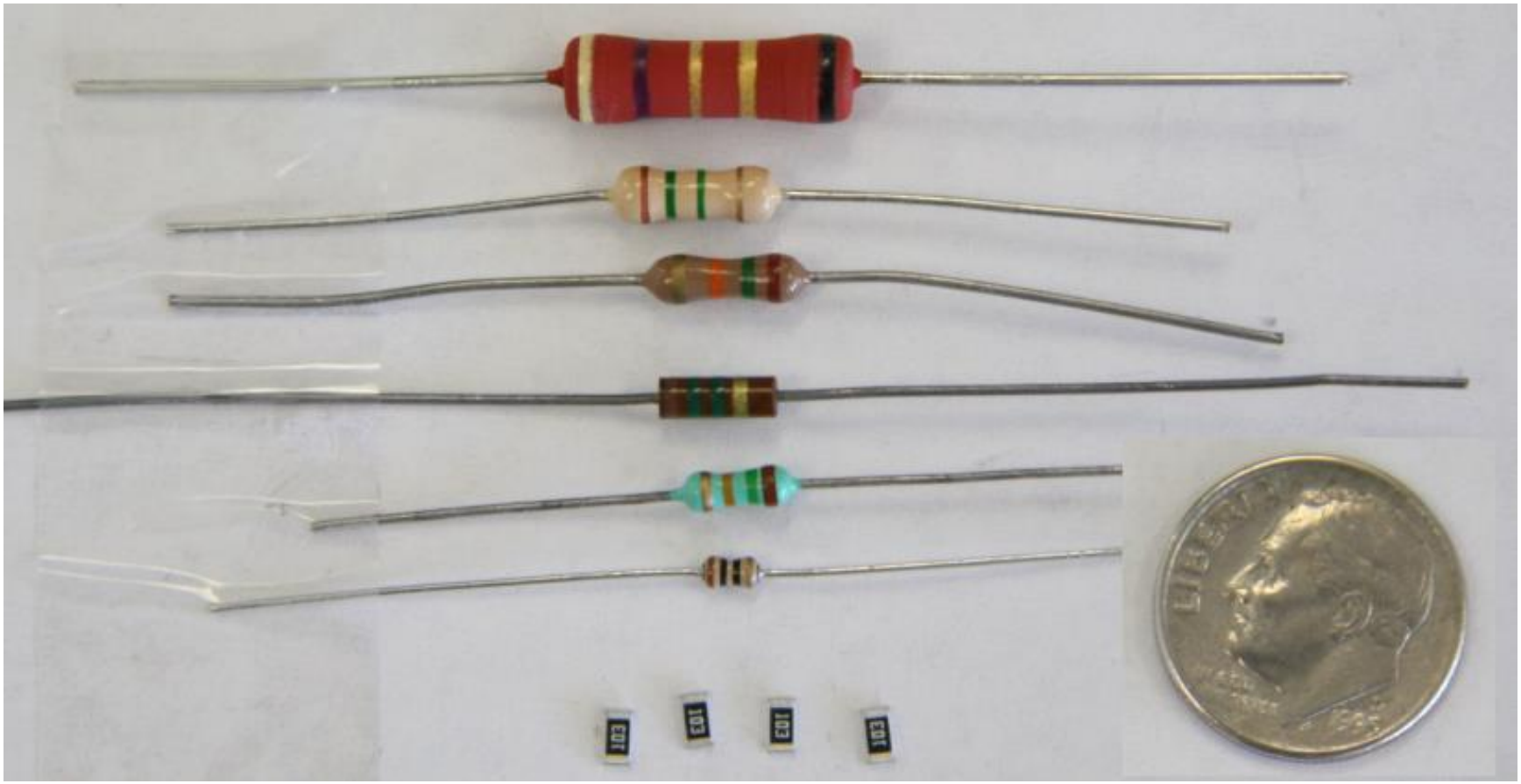
Carbon Film Resistors



Surface Mount Resistors



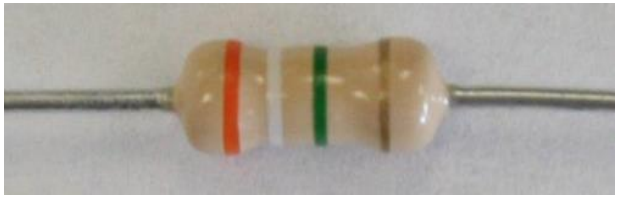
Resistors: Size Comparison



Determining A Resistor's Value

Color Code

- Resistors are labeled with color bands that specify the resistor's nominal value.
- The nominal value is the resistor's face value.

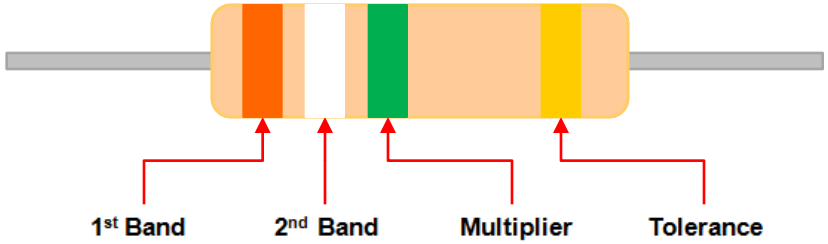


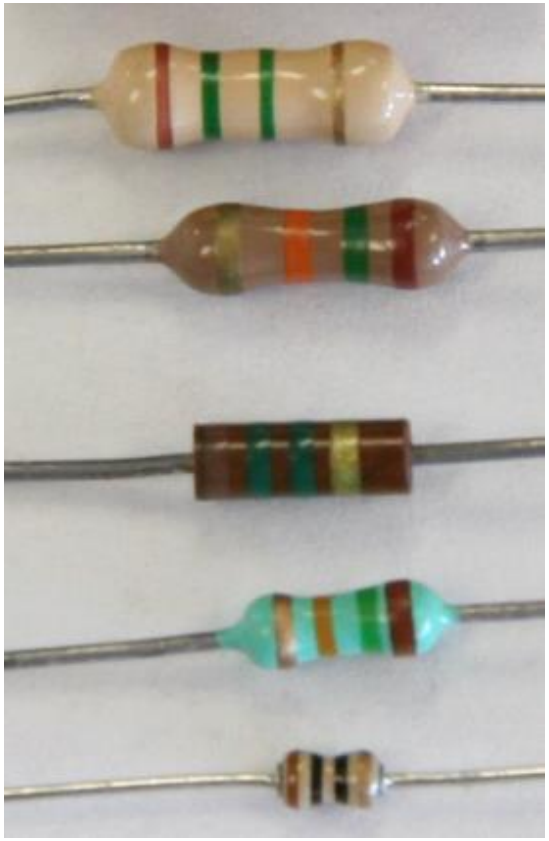
Measured Value

- A digital multi-meter can be used to measure the resistor's actual resistance value.

How To Read A Resistor's Value

Resistor Color Code



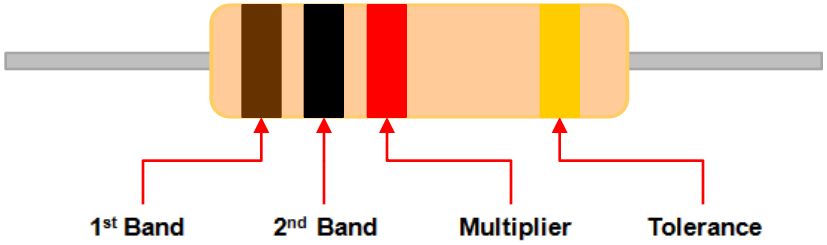


	1st Band	2nd Band	Multiplier	Tolerance
NONE				20%
Silver			0.01	10%
Gold			0.1	5%
Black	0	0	1	
Brown	1	1	10	
Red	2	2	100	
Orange	3	3	1K	
Yellow	4	4	10K	
Green	5	5	100K	
Blue	6	6	1M	
Violet	7	7	10M	
Gray	8	8	100M	
White	9	9	1000M	

Resistor Value: Example #1

Example:

Determine the nominal value for the resistor shown.

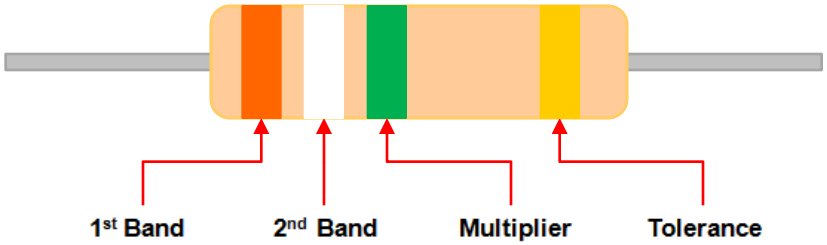


	1st Band	2nd Band	Multiplier	Tolerance
NONE				20%
Silver			0.01	10%
Gold			0.1	5%
Black	0	0	1	
Brown	1	1	10	
Red	2	2	100	
Orange	3	3	1K	
Yellow	4	4	10K	
Green	5	5	100K	
Blue	6	6	1M	
Violet	7	7	10M	
Gray	8	8	100M	
White	9	9	1000M	

Resistor Value: Example #2

Example:

Determine the nominal value for the resistor shown.

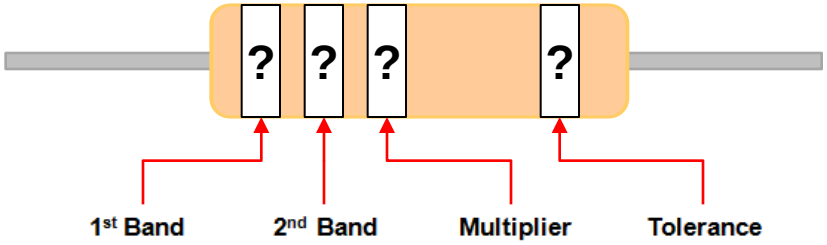


	1st Band	2nd Band	Multiplier	Tolerance
NONE				20%
Silver			0.01	10%
Gold			0.1	5%
Black	0	0	1	
Brown	1	1	10	
Red	2	2	100	
Orange	3	3	1K	
Yellow	4	4	10K	
Green	5	5	100K	
Blue	6	6	1M	
Violet	7	7	10M	
Gray	8	8	100M	
White	9	9	1000M	

Resistor Value: Example #3

Example:

Determine the color bands for a 1.5 K Ω ±5% resistor.



	1st Band	2nd Band	Multiplier	Tolerance
NONE				20%
Silver			0.01	10%
Gold			0.1	5%
Black	0	0	1	
Brown	1	1	10	
Red	2	2	100	
Orange	3	3	1K	
Yellow	4	4	10K	
Green	5	5	100K	
Blue	6	6	1M	
Violet	7	7	10M	
Gray	8	8	100M	
White	9	9	1000M	

Measured Value

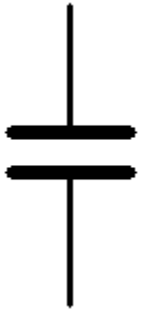
Using a Digital Multi-Meter (DMM) to measure resistance.

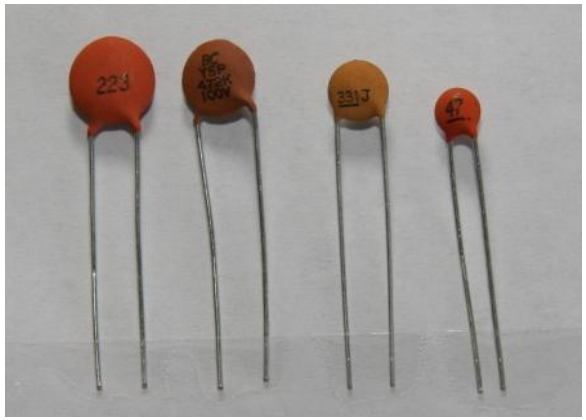
Capacitors

- A capacitor is an electronic component that can be used to store an electrical charge.
- Capacitors are often used in electronic circuits as temporary energy-storage devices.
- Capacitance is measured in units of farads (F) and named after Michael Faraday, a British chemist and physicist who contributed significantly to the study of electromagnetism.

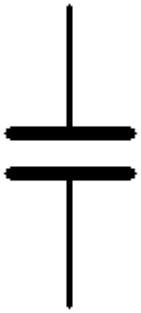
Capacitors: Types and Package Styles

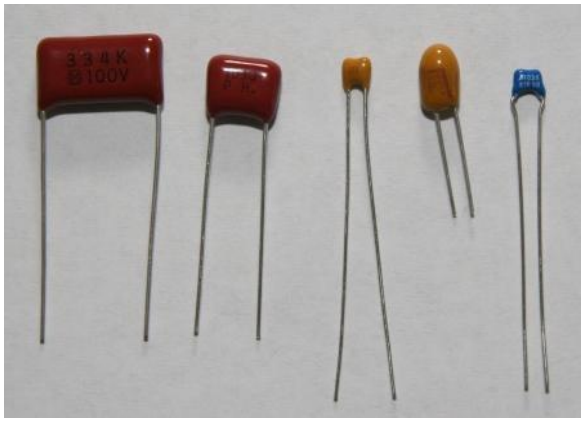
Ceramic Disc Capacitors



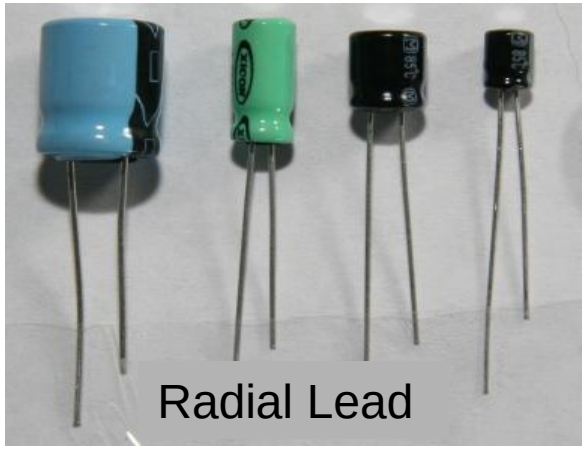


Mylar / Tantalum
Monolithic Ceramic

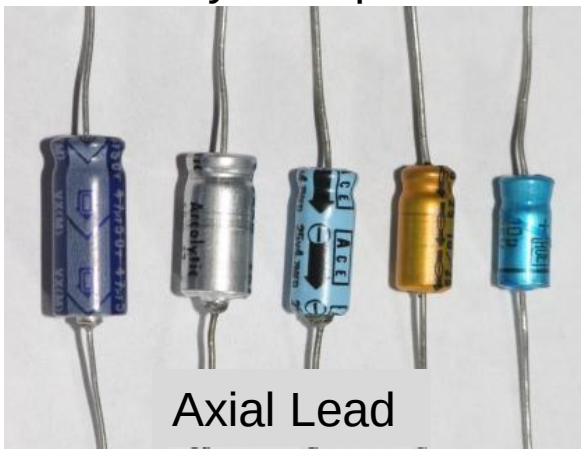




Electrolytic Capacitors

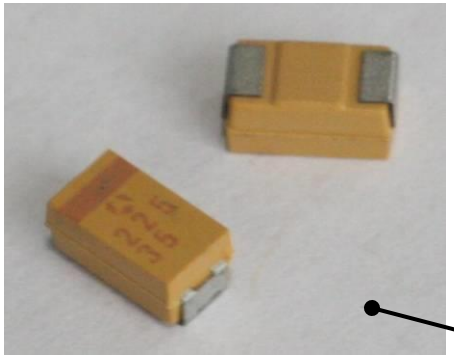


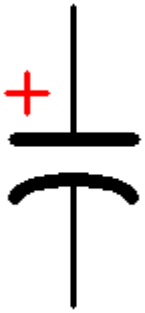
Electrolytic Capacitors



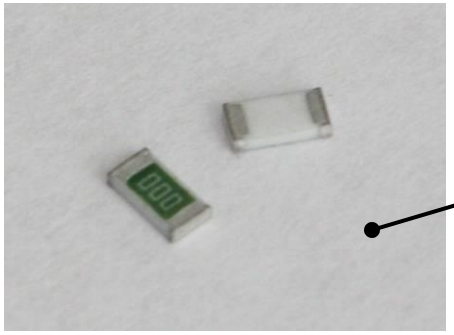
Capacitors: Types and Package Styles

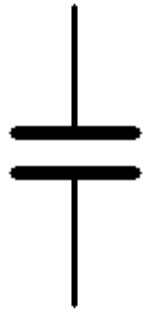
Surface Mount
Tantalum Capacitors



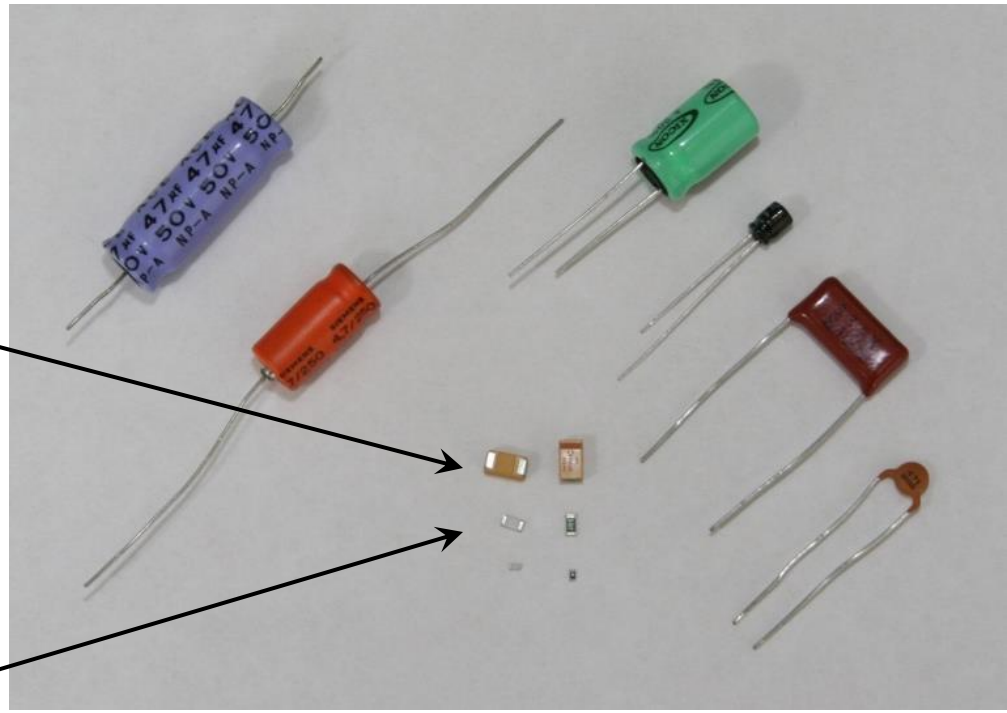


Surface Mount
Ceramic Capacitors





Size Comparison

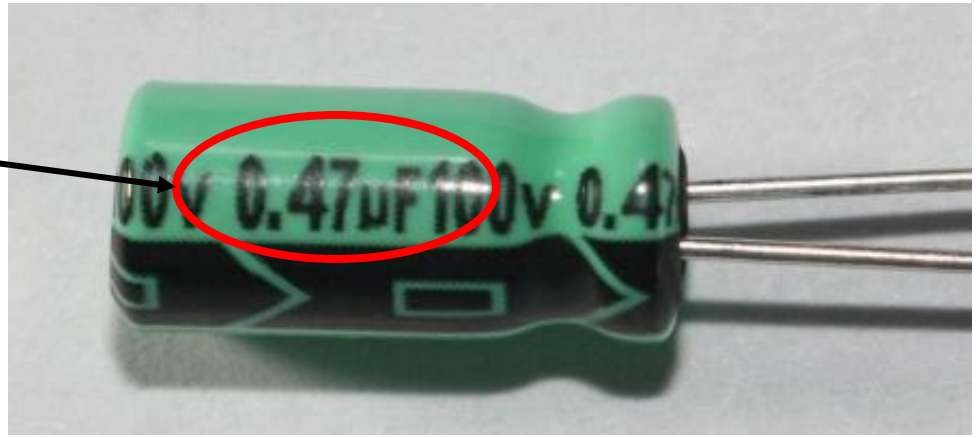


How To Read A Capacitor's Value

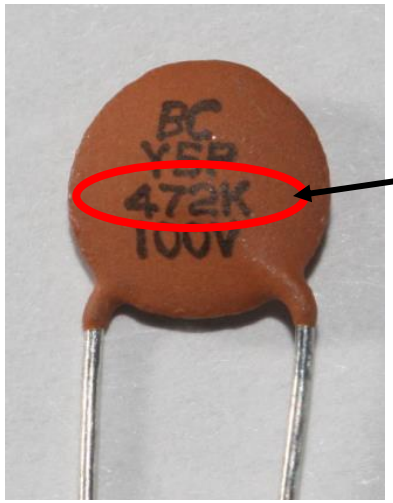
Electrolytic Capacitors

10 µF

0.47 µF



How To Read A Capacitor's Value



Disc Capacitors

4 7 2 K

First Digit	Second Digit	Third Digit	Fourth Digit
First Figure	Second Figure	# of Zeros	Tolerance
4	**7**	**00**	**K**

4700 pF ±10%

Code	Tolerance
A	±0.05%
B	±0.1%
C	±0.25%
D	±0.5%
F	±1%
G	±2%
J	±5%
K	±10%
M or NONE	±20%
N	±30%
Q	−10%, +30%
S	−20%, +50%
T	−10%, +50%
Z	−20%, +80%

Note: Units on Disc Capacitors are always in pico-farads

Capacitor: Example #1

Example:

Determine the nominal value for the capacitor shown.

Code	Tolerance
A	±0.05%
B	±0.1%
C	±0.25%
D	±0.5%
F	±1%
G	±2%
J	±5%
K	±10%
M or NONE	±20%
N	±30%
Q	−10%, +30%
S	−20%, +50%
T	−10%, +50%
Z	−20%, +80%

Capacitor: Example #2

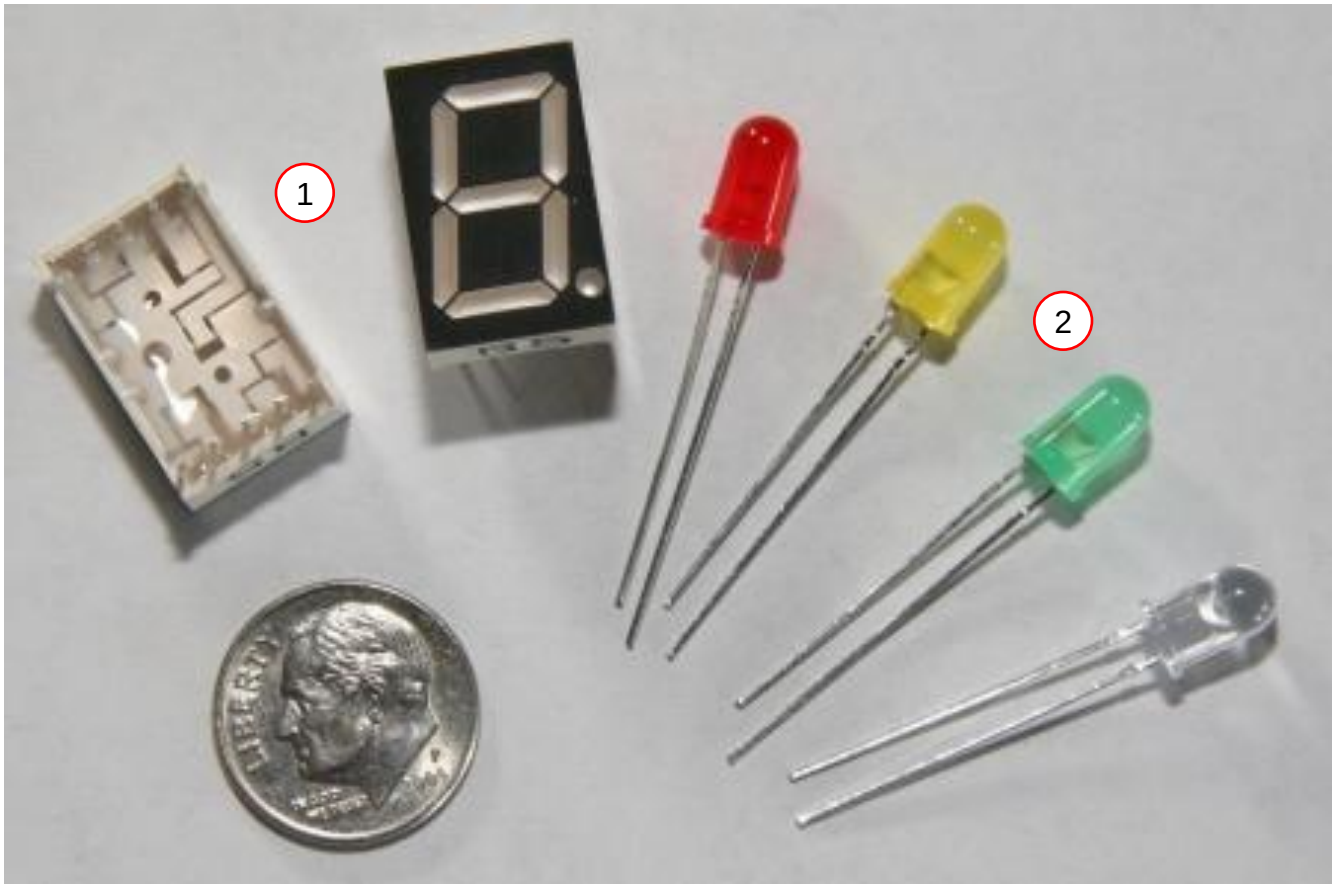
Example:

Determine the nominal value for the capacitor shown.

Code	Tolerance
A	±0.05%
B	±0.1%
C	±0.25%
D	±0.5%
F	±1%
G	±2%
J	±5%
K	±10%
M or NONE	±20%
N	±30%
Q	−10%, +30%
S	−20%, +50%
T	−10%, +50%
Z	−20%, +80%

Common Electronic Components

Displays

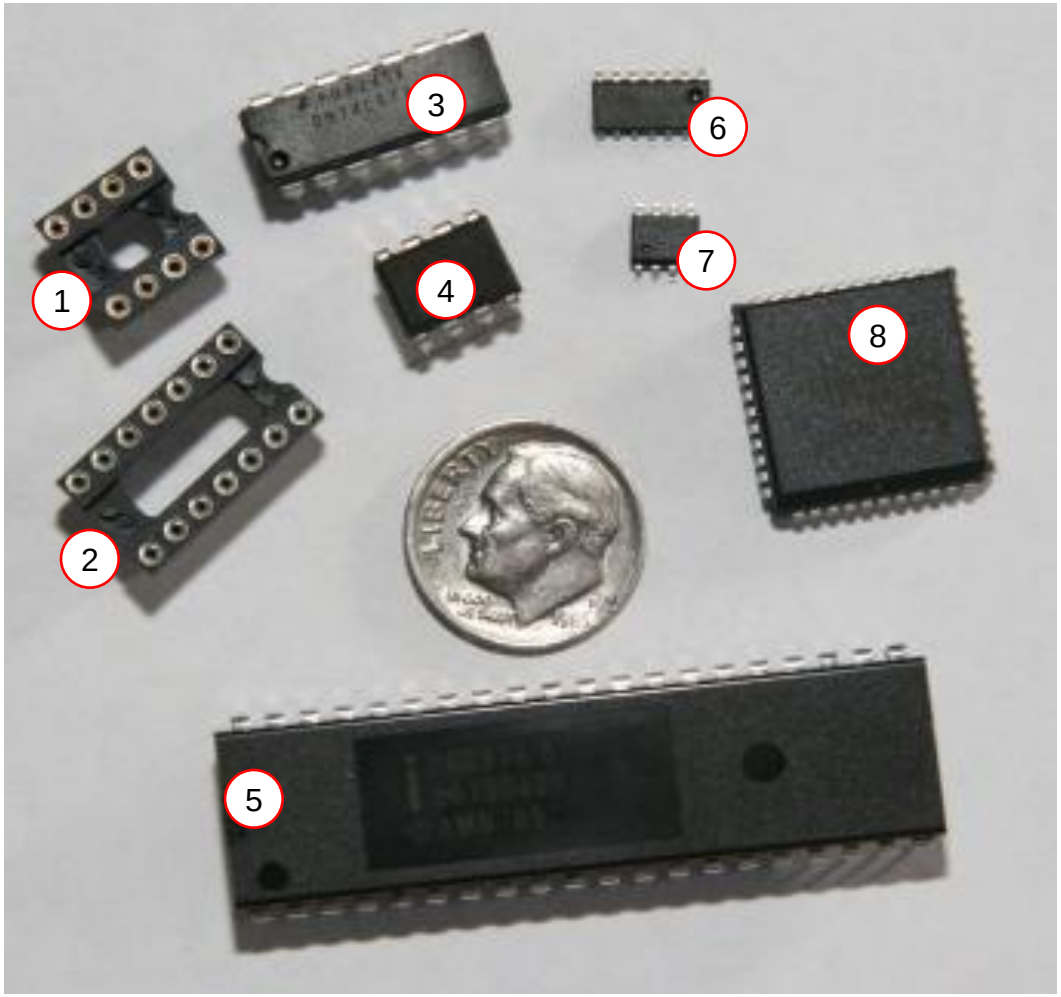


1) Seven Segment Display

2) Light Emitting Diodes (LED)

Common Electronic Components

Integrated Circuits (IC's) & Sockets

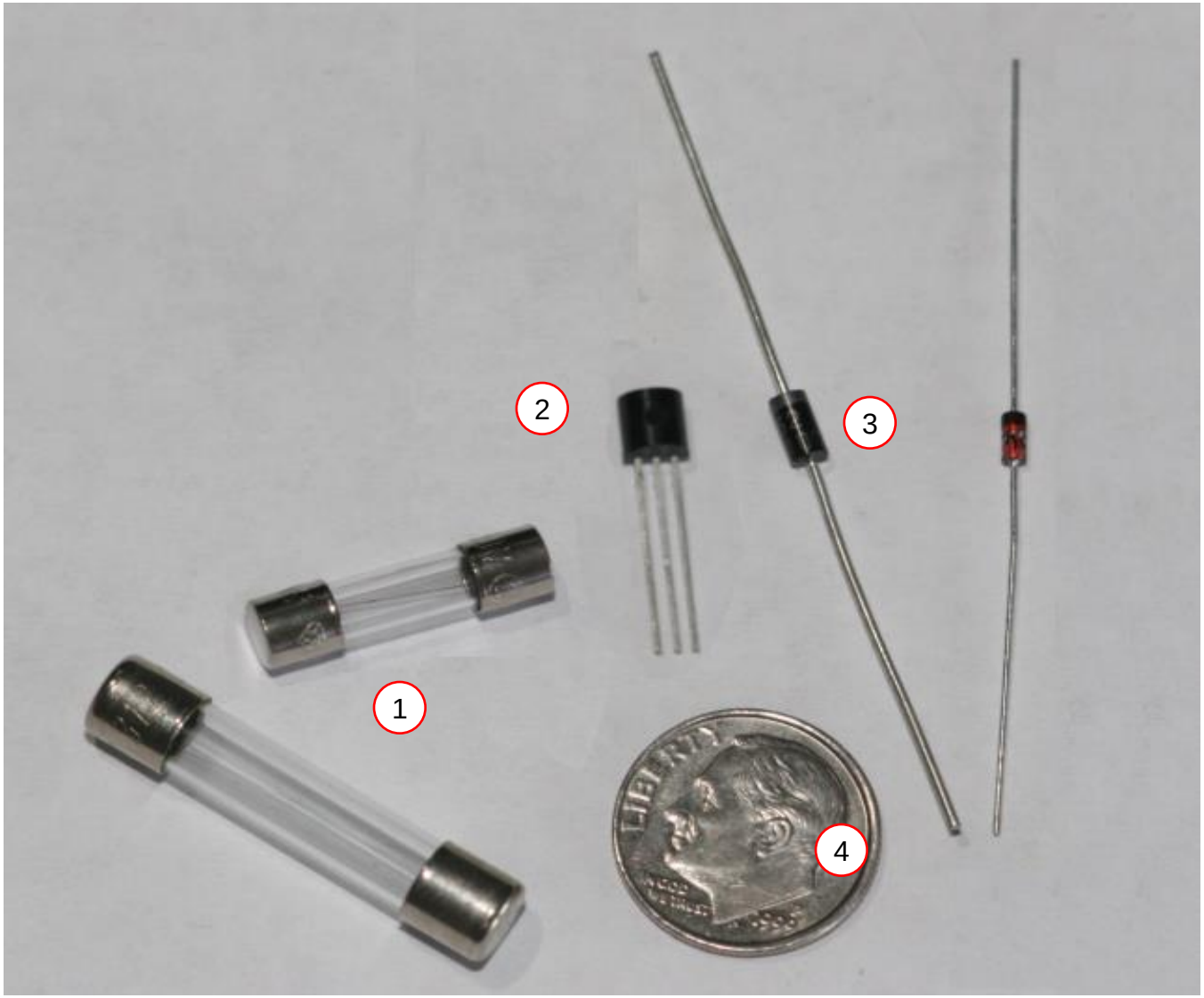


1) 8 Pin Solder Socket
2) 14 Pin Solder Socket
3) 14 Pin DIP IC
4) 8 Pin DIP IC
5) 40 Pin DIP
6) 14 PIN SOIC
7) 8 Pin SOIC
8) 44 Pin PLCC

DIP – Dual Inline Package
SOIC – Small Outline Integrated Circuit
PLCC - Plastic Leaded Chip Carrier

Common Electronic Components

Misc Components



1) Fuses
2) Transistor
3) Diodes
4) Dime ☺