BASIC COMPONENTS AND SYMBOLS

Lesson 2

EET 150

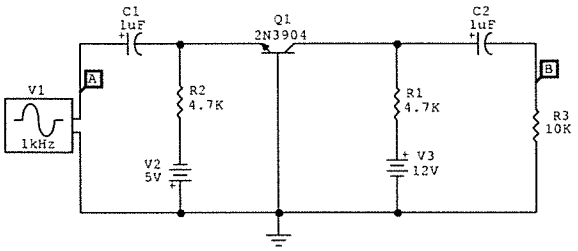
Components and Symbols Learning Objectives

- In this lesson you will:
- learn how schematic diagrams represent electric circuits
- study the different types components found in electric/electronic circuits.
- see the actual components and their schematic symbols
- learn how to read component values from color codes

Fundamental Components

Schematic Diagrams and Components

- **Symbols representing actual devices**
- **Show connections and give component values**
- **Differ from physical layout**



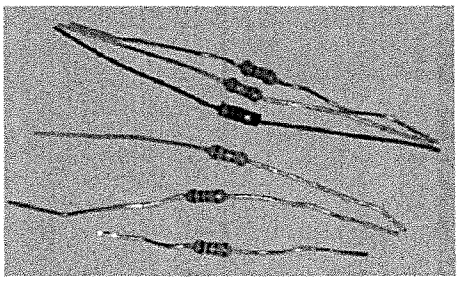
Example Schematic circuit

Fundamental Components Resistors

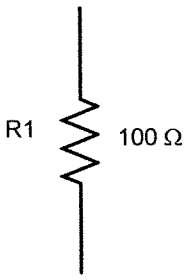
Resistors limit currents and dissipate active power (Heat)

Symbol: R

Units: ohms (Ω) also kΩ (x1000) and MΩ (x1,000,000)



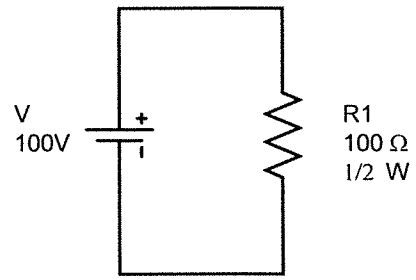
Actual Resistors ¼ Watt various values



Schematic Symbol

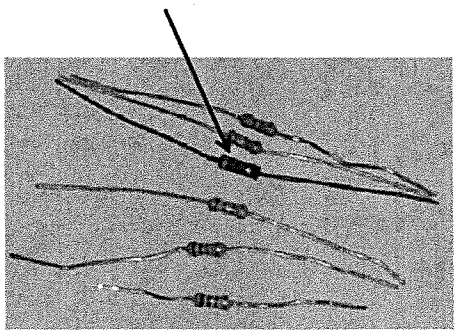
Fundamental Components
Resistors

Simple Schematic Circuit



Finding Resistor Values
Resistor Color Codes

Resistor values determined by colored bands on resistor body

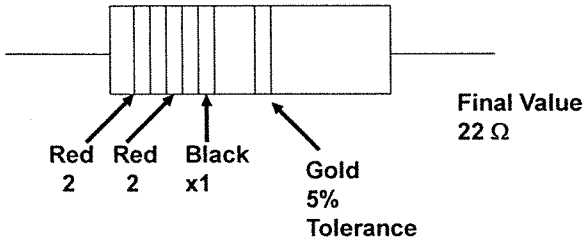


Two bands determine value
One band the multiplier
One band tolerance (accuracy)

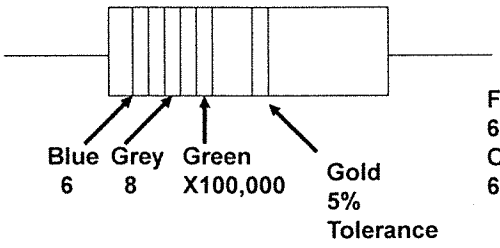
Resistor Color Code

Colors	Digit	Multiplier	Add This Number of Zeros
Black	0	1	0
Brown	1	10	1 (0)
Red	2	100	2 (00)
Orange	3	1,000	3 (000)
Yellow	4	10,000	4 (0,000)
Green	5	100,000	5 (00,000)
Blue	6	1,000,000	6 (000,000)
Violet	7	10,000,000	7 (0,000,000)
Gray	8	100,000,000	8 (00,000,000)
White	9	1,000,000,000	9 (000,000,000)
Gold		0.1	5% Tolerance
Silver		0.01	10% Tolerance

Resistor Color Code Examples

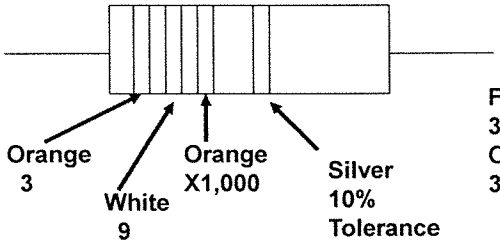


Resistor Color Code Examples



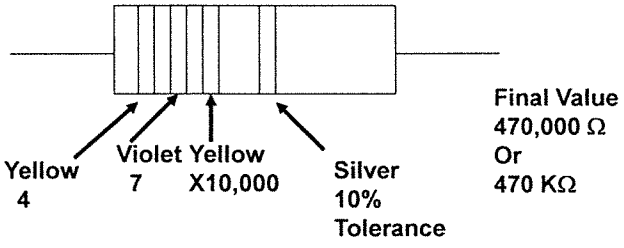
Final Value
6,800,000 Ω
Or
6.8 MΩ

Resistor Color Code Examples



Final Value
39,000 Ω
Or
39 KΩ

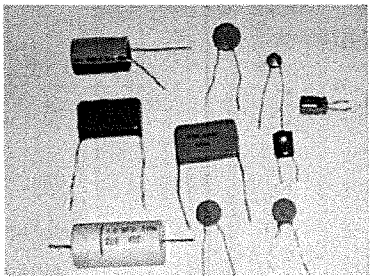
Resistor Color Code Examples

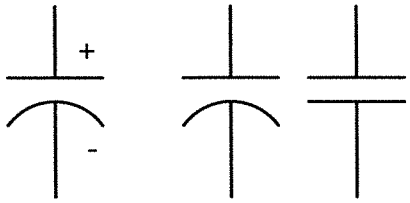


Fundamental Components
Capacitors

Capacitors stores charges (electrons) on plates separated By insulators. Block dc current, oppose voltage changes
Symbol: C

Units: Farads (F) also μF (1/1,000,000)
and pF (1/1,000,000,000,000)



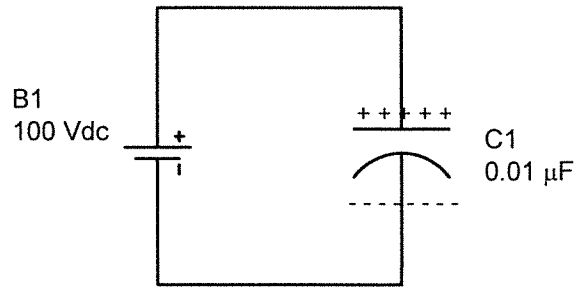


Polarized Non-Polarized

Schematic Symbols

Fundamental Components Capacitors

Simple Schematic Circuit

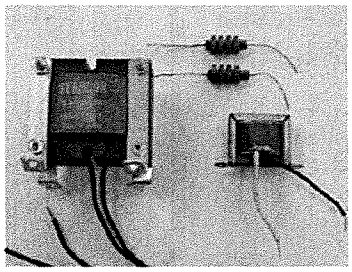


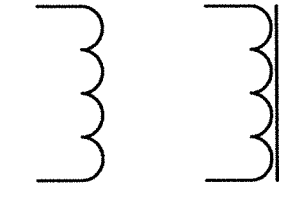
Fundamental Components Inductors

Inductors stores energy in magnetic field. Constructed of wire coiled around form (air) or iron core. Opposes current changes

Symbol: L

Units: Henrys (H) also μH (1/1,000,000) and mH (1/1,000)



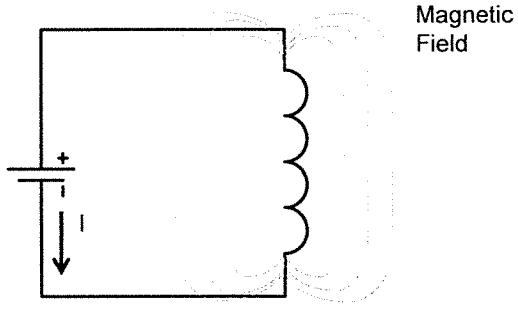


Air core Iron core

Schematic symbols

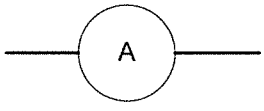
Fundamental Components Inductors

Simple Schematic Circuit

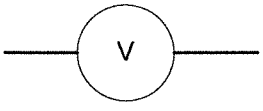


Fundamental Components Measurement Symbols

Schematic Symbols that indicate measurement devices

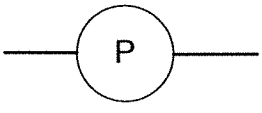


Ammeter
Measures Current



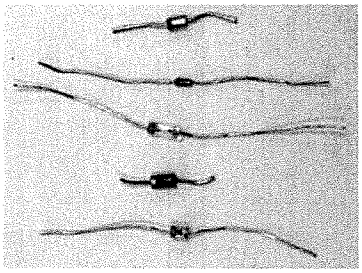
Voltmeter
Measures Voltage

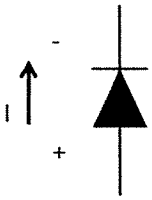
Wattmeter
Measures Power



Semiconductor Devices

Devices used to switch, direct, and amplify electric/electronic signals





Only allows current to flow in one direction

Diode Symbol

Special Types of Diodes

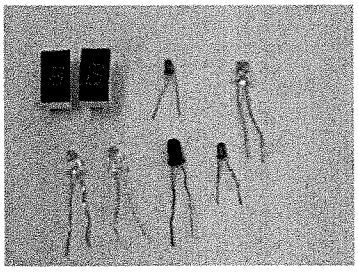
Zener Diodes - regulate voltage
Photo Diodes - conduct based on light intensity
Light Emitting Diodes (LED) – light up when connected to power

Semicoductor Devices
Special Diodes

Zener Diode

LED

Photo Diode

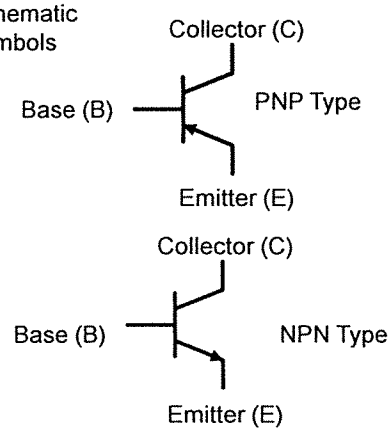


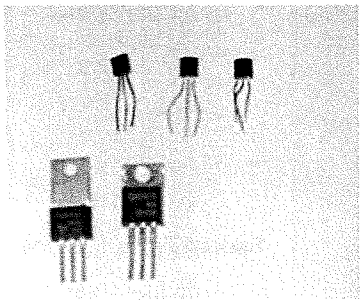
Types of LED's

Semiconductor Devices
Transistors

Transistors Amplify and Switch Currents in Electronic Circuits

Schematic Symbols



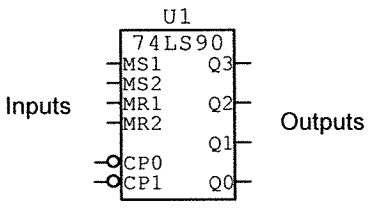


Actual Devices

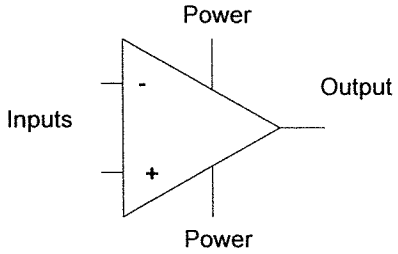
Semiconductor Devices
Integrated Circuits (ICs)

Integrated Circuits (ICs or Chips) encase many transistors and perform thousands of functions.

Functional Classes
Digital (Computer chips)
Analog (Amplifiers)

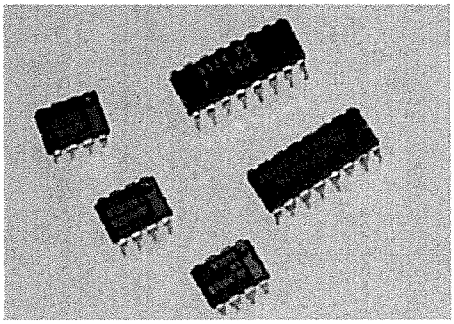


Digital Component Symbol
Decade Counter



Amplifier Symbol

Integrate Circuit Packages



ICs come in may package sizes and types.

Dual Inline Package (DIP)

Pin Counts of 8, 14, 16 20, 24.

Good for experimenting

Surface mount: Very small size

Basic Components and Symbols

End Lesson 2 EET 150

Coming Next: Fundamentals of Electricity