

**Ministry of high Education and Scientific Research
Middle Technical University
Electrical Engineering Technical College**

**Training package
in
Workshops
(Electronic components)**

**For
Students of first class
Department of Medical Instrumentation Techniques Engineering**



By

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Electronic components

11th & 12th

modular

**modular
units**

1/ Overview

1 / A –Target population :-

For students of first class

Department of Medical Instrumentation Eng. Techniques

1 / B –Rationale :-

This unit introduces principles of electronic components in the workshop

1 / C –Central Idea :-

The major topics discussed in this unit are included in the following outline.

- **Diode**
- **Transistor**
- **Voltage regulator**

2/ Performance Objectives :-

After studying the first modular unit, the student will be able to-

1. Know the different types of electronic components.
2. Utilities of electronic components.
3. Testing electronic components

3/ Pre test :-

Circle the correct answer:-

1. Has two terminal anode and cathode

- a- diode
- b- transistor
- c- voltage regulator
- d- all above

2. has three terminal base, collector, and emitter

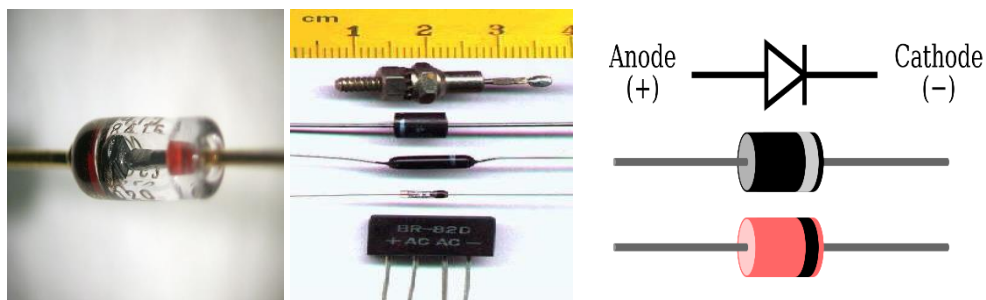
- a- diode
- b- voltage regulator
- c- Transistor
- d- all above

4/ the text :-

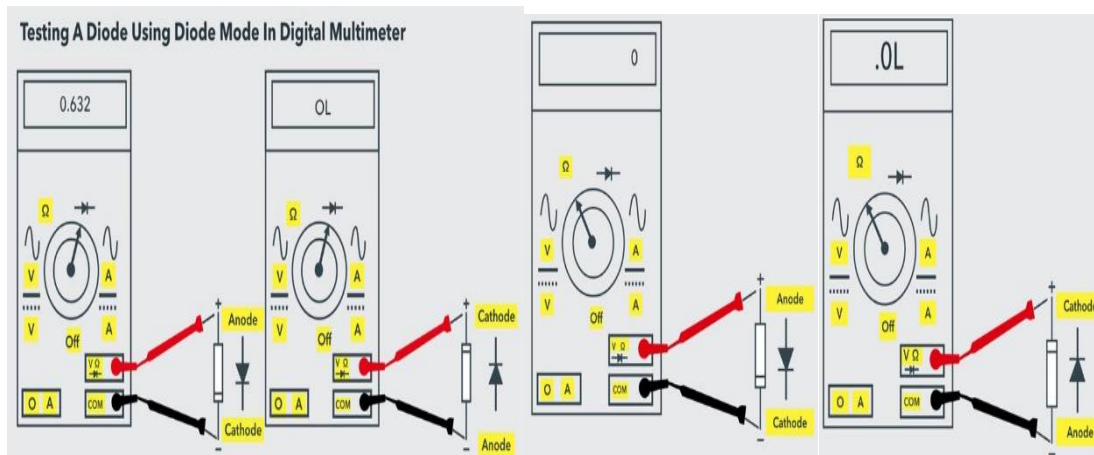
➤ Electronic components

1- Diode

A diode is a two-terminal electronic component that conducts current primarily in one direction (asymmetric conductance); it has low (ideally zero) resistance in one direction, and high (ideally infinite) resistance in the other. A diode vacuum tube or thermionic diode is a vacuum tube with two electrodes, a heated cathode and a plate, in which electrons can flow in only one direction, from cathode to plate. A semiconductor diode, the most commonly used type today, is a crystalline piece of semiconductor material with a p-n junction connected to two electrical terminals. Semiconductor diodes were the first semiconductor electronic devices. The diode is a two terminal semiconductor device that allows current to flow only in one direction. These are found in different applications like rectifiers, clampers, clippers and so on. When the anode terminal of the diode is made positive with respect to cathode, the diode is said to be forward-biased. The forward-biased diode voltage drop is typically 0.7V for Silicon diodes. This is the minimum potential difference between Anode and Cathode of the Diode to become forward biased.



Test diode has shown below

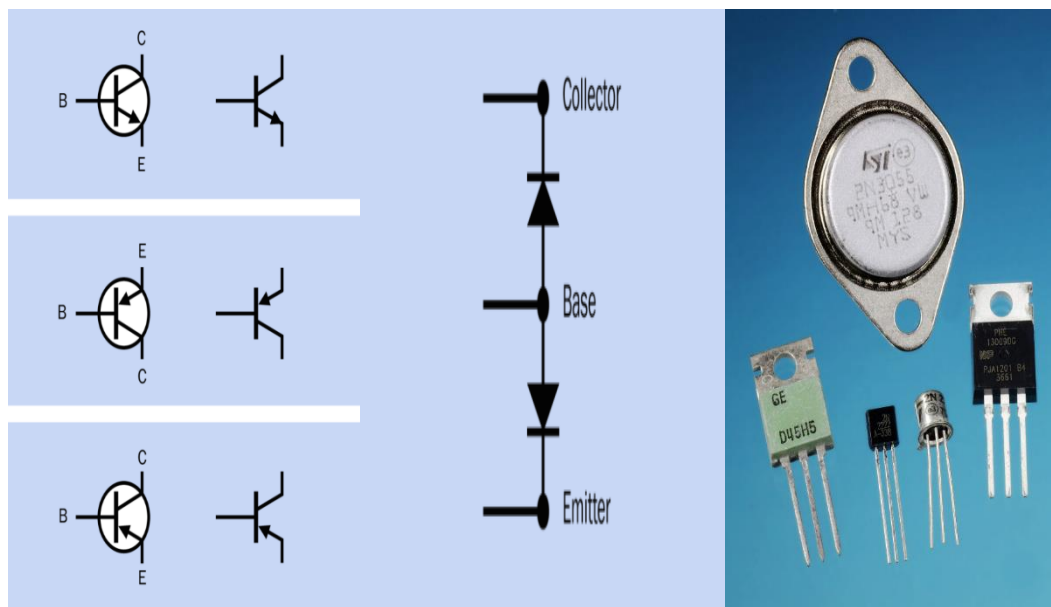


2- Transistor

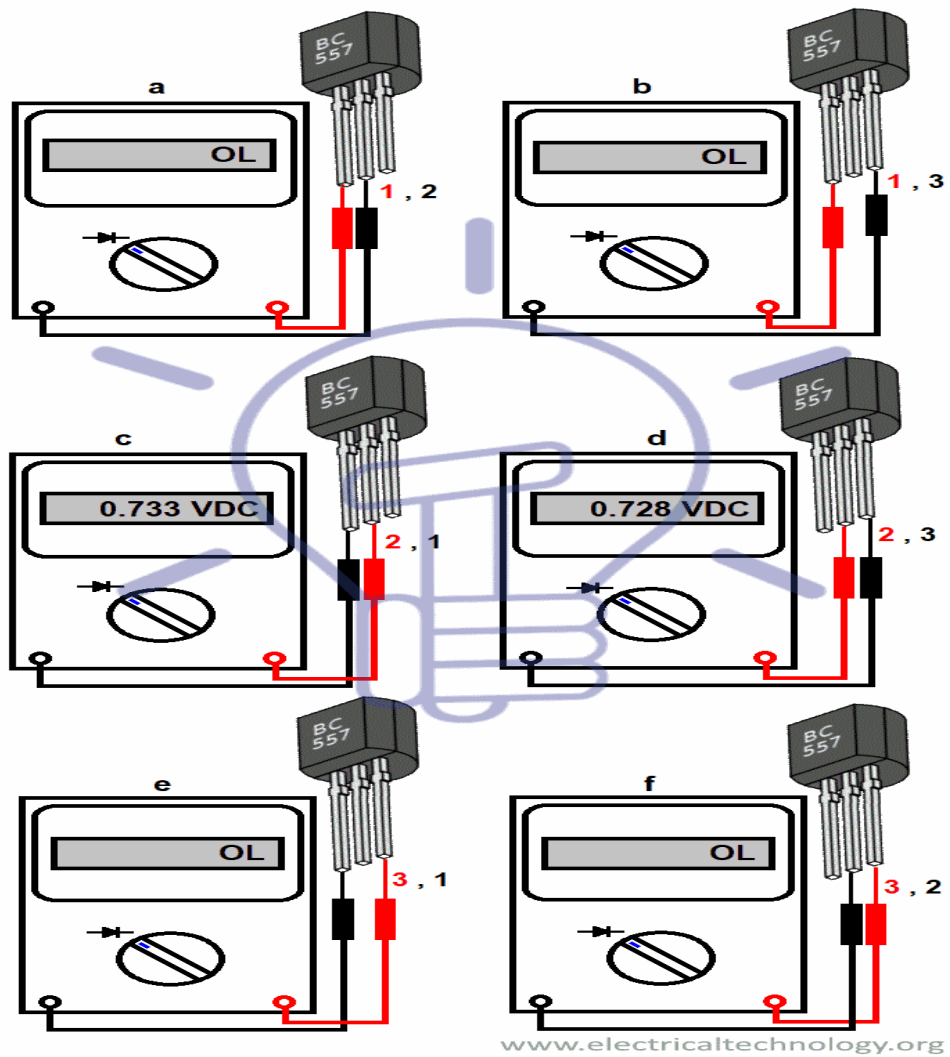
The earliest transistors were fabricated from germanium; silicon has become the most commonly used material. Silicon behaves like an insulator, in its pure state at room temperature, but can be “doped” (carefully contaminated) with impurities that introduce a surplus of electrons unbounded from individual atoms. The result is an N-type semiconductor that can be induced to allow the movement of electrons through it, if it is biased with an external voltage. Forward bias means the application of a positive voltage, while reverse bias means reversing that voltage. Other dopants can create a deficit of electrons, which can be thought of as a surplus of “holes” that can be filled by electrons. The result is a P-type semiconductor. A bipolar NPN transistor consists of a thin central P-type layer sandwiched between two thicker N-type layers. The three layers are referred to as collector, base, and emitter, with a wire or contact attached to each of them. When a negative charge is applied to the emitter, electrons are forced by mutual repulsion toward the central base layer. If a forward bias (positive potential) is applied to the base, electrons will tend to be attracted out through the base.

However, because the base layer is so thin, the electrons are now close to the collector. If the base voltage increases, the additional energy encourages the electrons to jump into the collector, from which they will make their way to the positive current source, which can be thought of as having an even greater deficit of electrons.

Symbols for an NPN transistor (top) and a PNP transistor (center and bottom). Depending on the schematic in which the symbol appears, it may be rotated or inverted. The circle may be omitted, but the function of the component remains the same.



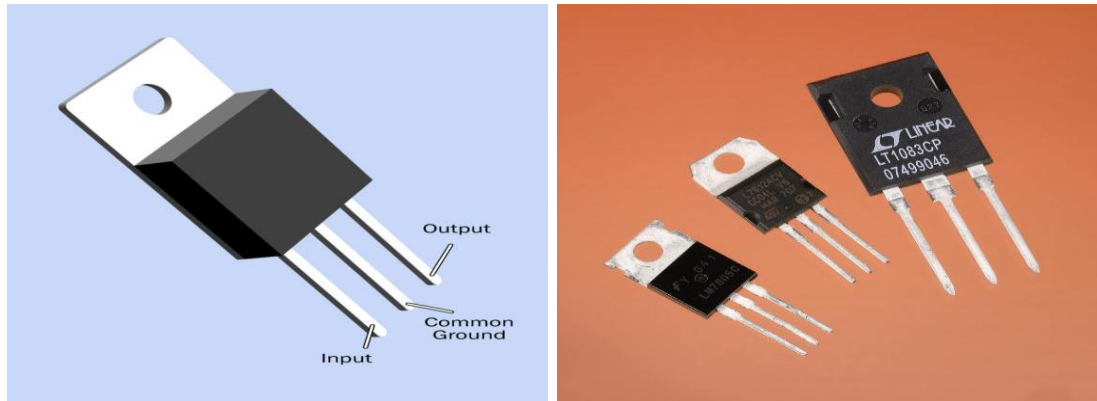
Test transistor has shown below



BC 557 PNP	Measuring Points		Result	BC 557 PNP	Measuring Points		Result
	1-2	1-3			2-1	2-3	
	1-2		OL		1-2		OL
	1-3		OL		1-3		OL
	2-1		0.733 VDC		2-1		0.733 VDC
	2-3		0.728 VDC		2-3		0.728 VDC
	3-1		OL		3-1		OL
	3-2		OL		3-2		OL

3- Voltage regulator

A linear voltage regulator provides a tightly controlled DC output, which it derives from an unregulated or poorly regulated DC input. The DC output remains constant regardless of the load on the regulator (within specified limits). It is a cheap, simple, and extremely robust component.



Test Voltage regulator has shown below



5/ Post test :-

Circle the correct answer:-

1- Used to regulate voltage

- a- Voltage regulator
- b- transistor
- c- diode
- d- all above

2- The bipolar transistor has two types:

- a- True.
- b- False.

3- The types of transistor are

- a- NPN
- b- PNP
- c- PPN
- d- NNP
- e- a and b .

6/ key answer :-

1- Pre test :-

1. a
2. c

2- Post test :-

1. a
2. a
3. e

7/References :-

1. Encyclopedia of Electronic Components Volume 1 (Charles Platt).
2. <https://www.electricaltechnology.org/2013/03/how-to-remember-direction-of-pnp-and.html>