DEMONSTRATION

on

ELCTRONICS DEVICES AND CIRCUITS LAB

By

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Topics to be discussed

- Vision, Mission, POs, PSOs & PEOs
- Syllabus & Course Outcomes (COs)
- Over view of EDC
- Major Equipment List
- Lab Physical View
- Dos & Don’t

Vision, Mission, POs, PSOs & PEOs

Vision of the institute

To be a premier institute for professional education producing dynamic and vibrant force of technocrat with competent skills, innovative ideas and leadership qualities to serve the society with ethical and benevolent approach.

Mission of the institute

Mission_1: To create a learning environment with state-of-the art infrastructure, well equipped laboratories, research facilities and qualified senior faculty to impart high quality technical education.

Mission_2: To facilitate the learners to foster innovative ideas, inculcate competent research and consultancy skills through Industry-Institute Interaction.

Mission_3: To develop hard work, honesty, leadership qualities and sense of direction in rural youth by providing value based education.

Vision of the Department

To become a centre of excellence in the field of Electronics and Communication Engineering and produce graduates with Technical Skills, Research & Consultancy Competencies, Life-long Learning and Professional Ethics to meet the challenges of the Industry and evolving Society.

Mission of the Department

Mission_1: To enrich Technical Skills of students through Effective Teaching and Learning practices for exchange of ideas and dissemination of knowledge.

Mission_2: To enable the students with research and consultancy skill sets through state-of-the art laboratories, industry interaction and training on core & multidisciplinary technologies.

Mission_3: To develop and instill creative thinking, Life-long learning, leadership qualities, Professional Ethics and social responsibilities among students by providing value based education.

Programme Educational Objectives (PEOs)

PEO_1: To prepare the graduates to be able to plan, analyze and provide innovative ideas to investigate complex engineering problems of industry in the field of Electronics and Communication Engineering using contemporary design and simulation tools.

PEO_2: To provide students with solid fundamentals in core and multidisciplinary domain for successful implementation of engineering products and also to pursue higher studies.

PEO_3: To inculcate learners with professional and ethical attitude, effective communication skills, teamwork skills, and an ability to relate engineering issues to broader social context at work place.

Programme Outcome (POs)

PO_1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO_2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO_3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO_4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO_5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO_6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO_7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO_8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO_9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO_10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO_11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO_12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcome (PSOs)

PSO_1: Higher Education: Qualify in competitive examinations for pursuing higher education by applying the fundamental concepts of Electronics and Communication Engineering domains such as Analog & Digital Electronics, Signal Processing, Communication & Networking, Embedded Systems, VLSI Design and Control Systems etc..

PSO_2: Employment: Get employed in allied industries through their proficiency in program specific domain knowledge, specialized software packages and Computer programming or become an entrepreneur.

Syllabus & Course Outcomes (COs)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

II B.Tech. I-Sem (ECE)

(15A04305) ELECTRONIC DEVICES AND CIRCUITS LAB

- **Course Outcomes (Cos)**
- **C217.1**
- Plot the V-I characteristics of PN junction and Zener diode and find the static & dynamic resistances
- **C217.2**
- Demonstrate the rectifiers with and without filters.
- **C217.3**
- Plot VI characteristics of BJT and FET in different configurations and find input impendence, output admittance, voltage and current gain.
- **C217.4**
- Illustrate the characteristics of SCR and UJT.
- **C217.5**
- Design the amplifier circuits using BJT and FET
- **PART A: Electronic Workshop Practice**
- Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
- Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
- Soldering Practice- Simple circuits using active and passive components.
- Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.

- **PART B: List of Experiments**
- **(For Laboratory Examination-Minimum of Ten Experiments)**
  - **P-N Junction Diode Characteristics**
- Part A: Germanium Diode (Forward bias & Reverse bias)
- Part B: Silicon Diode (Forward bias only)
- **Zener Diode Characteristics**
- Part A: V-I Characteristics
- Part B: Zener Diode act as a Voltage Regulator
- **Rectifiers (without and with c-filter)**
- Part A: Half-wave Rectifier
- Part B: Full-wave Rectifier
- **BJT Characteristics(CE Configuration)**
- Part A: Input Characteristics
- Part B: Output Characteristics
- **FET Characteristics(CS Configuration)**
- Part A: Drain (Output) Characteristics
- Part B: Transfer Characteristics
- **SCR Characteristics**
- **UJT Characteristics**
- **Transistor Biasing**
- **CRO Operation and its Measurements**
- **BJT-CE Amplifier**
- **Emitter Follower-CC Amplifier**
- **FET-CS Amplifier**

VEMU INSTITUTE OF TECHNOLOGY::P.KOTHAKOTA
NEAR PAKALA, CHITTOOR-517112
(Approved by AICTE, New Delhi & Affiliated to JNTUA, Anantapuramu)
Department of Electronics &Communication Engineering

LIST OF EXPERIMENTS TO BE CONDUCTED

- **P-N Junction Diode Characteristics**

- Part A: Germanium Diode (Forward bias & Reverse bias)
- Part B: Silicon Diode (Forward bias only)
- **Zener Diode Characteristics**
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- **Transistor Biasing**
- **CRO Operation and its Measurements**
- **BJT-CE Amplifier**
- **Emitter Follower-CC Amplifier**
- **FET-CS Amplifier**
- **ADDITIONAL EXPERIMENTS:-**
- **CLIPPERS AND CLAMPERS**
- **TRANSISTOR ACT AS ASWITCH**

WHAT IS EDC

- The word electronics is derived from electron mechanics, which means to study the behavior of an electron under different conditions of applied electric field.

- The branch of engineering in which the flow and control of electrons in vacuum or semiconductor are studied is called electronics. Electronics can also be defined as the branch of engineering in which the electronic devices and their utilization are studied.

- The motion of electrons through a conductor gives us electric current. This electric current can be produced with the help of batteries and generators.

- The device which controls the flow of electrons is called electronic device. These devices are the main building blocks of electronic circuits.

- Electronics have various branches include, digital electronics, analog electronics, micro electronics, nanoelectronics, optoelectronics, integrated circuit and semiconductor device.

ACTIVE COMPONENTS

- DIODES
- TRANSISTORS
- INTEGRATED CIRCUITS (ICs)

DIODES

- A **diode** is a two-terminal electronic component that conducts current primarily in one direction; it has low resistance in one direction, and high 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.

TYPES OF DIODES

- P-N JUNCTION DIODE
- ZENER DIODE
- SCHOTTY DIODE
- TUNNELDIODE
- VARACTOR DIODE
- LASER DIODE etc…

APPLICATIONS OF P-N JUNCTION DIODE

- SWITCH - ON SWITCH
  - OFF SWITCH

RECTIFIER – CONVERTS AC TO DC

TRANSITORS

- A **transistor** is a semiconductor device used to amplify or switch electronic signals and electrical power. It is composed of semiconductor material usually with at least three terminals for connection to an external circuit.

TYPES OF TRANSISTORS

- BI-POLAR JUNCTION TRANSISTORS (BJT)

  N-P-N TRANSISTOR &

  P-N-P TRANSISTOR

- UNI-POLAR JUNCTION TRANSISTORS (UJT)

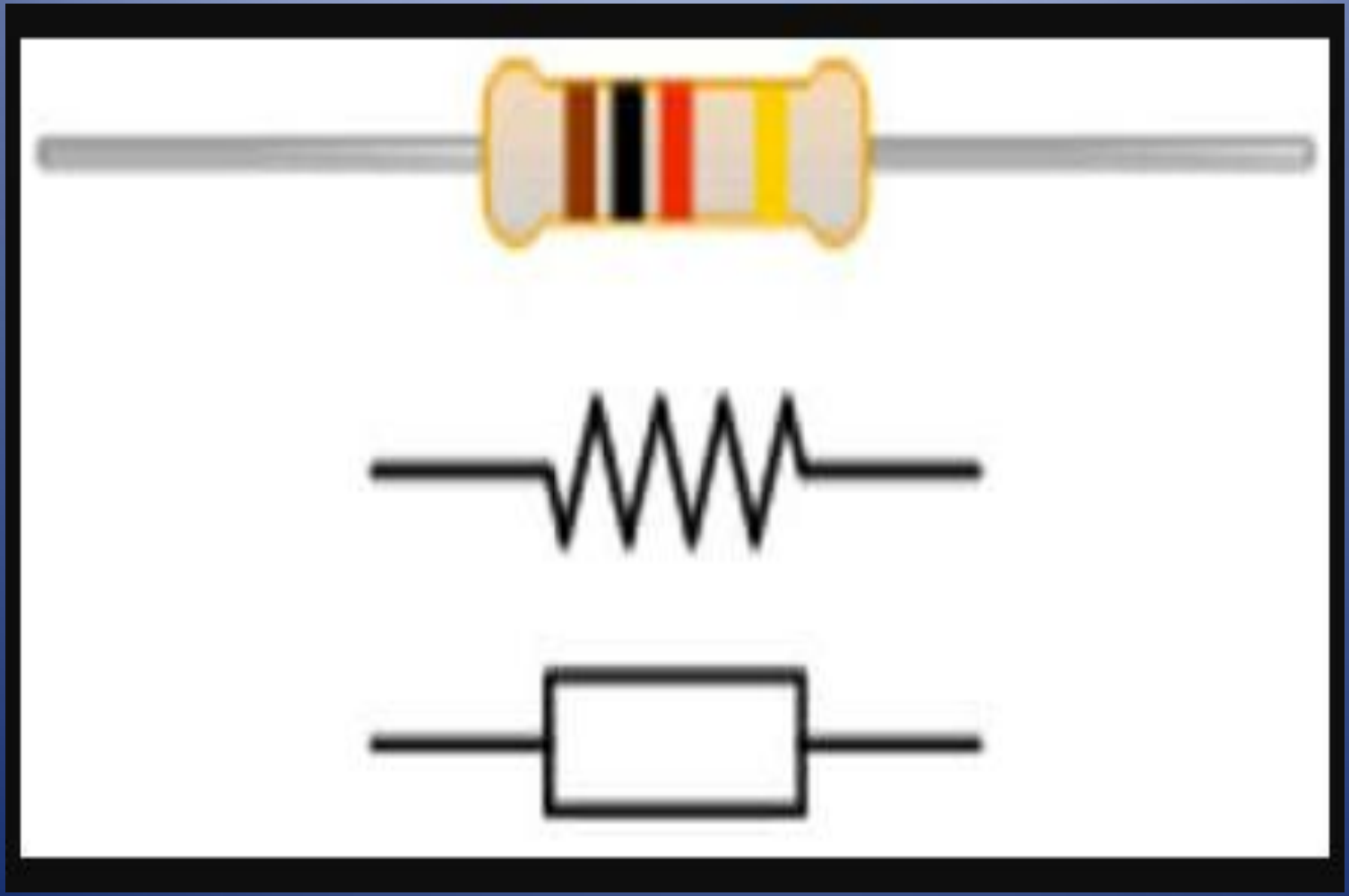
Ex: FIELD EFFECT TRANSISTOR(FET)

JFET & MOSFET

PASSIVE COMPONENTS

- RESISTORS
- INDUCTORS
- CAPACITORS

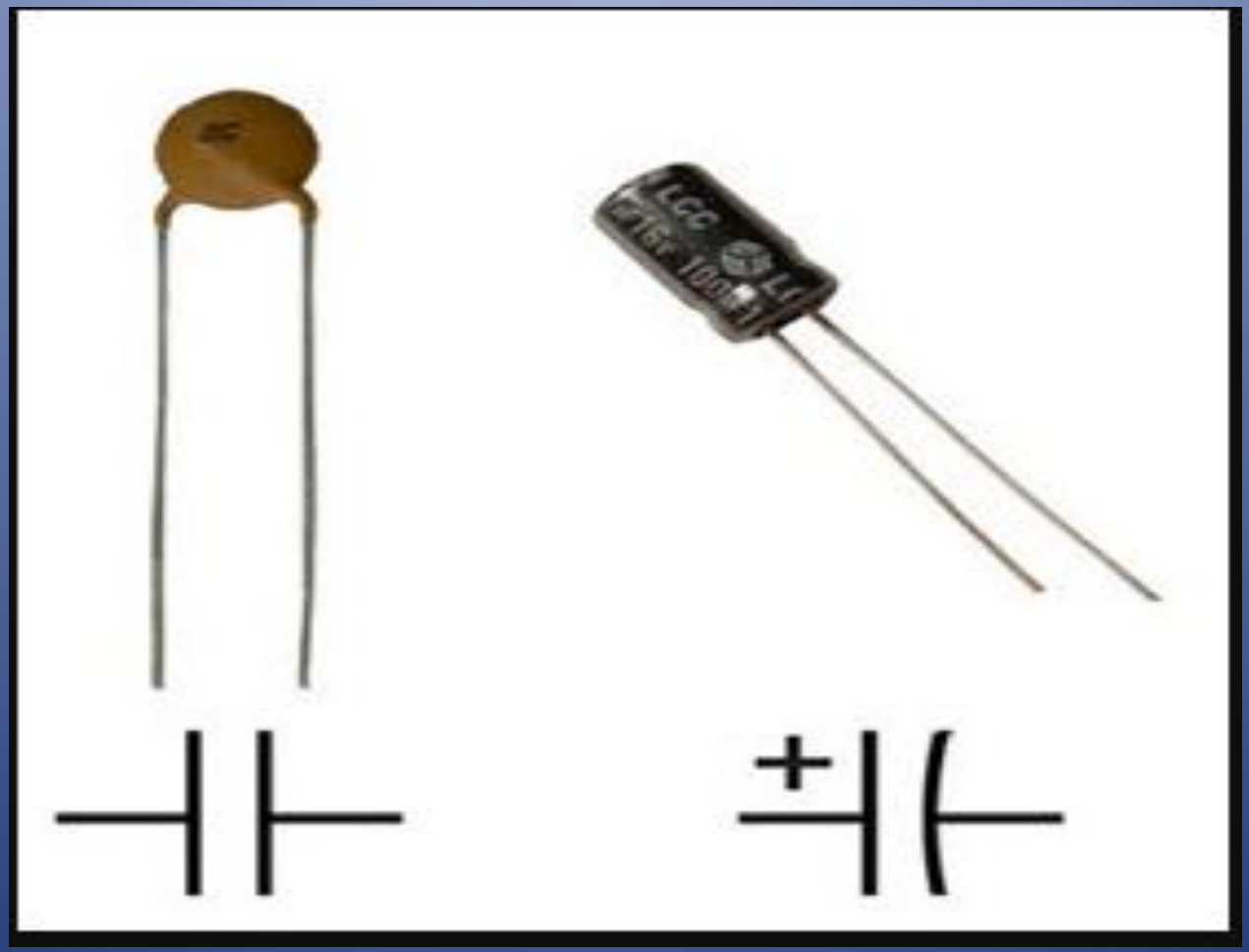
RESISTOR



RESISTOR

- **<u>Resistor:</u>**
- Resistors are the most commonly used components in electronic circuits and devices. The main purpose of a resistor is to maintain specified values of voltage and current in an electronic circuit. A Resistor works on the principle of Ohm's law and the law states that the voltage across the terminals of a resistor is directly proportional to the current flowing through it.
- $$V = I R$$
- Where V is the potential difference between two points which include a **resistance** R. I is the current flowing through the resistance.

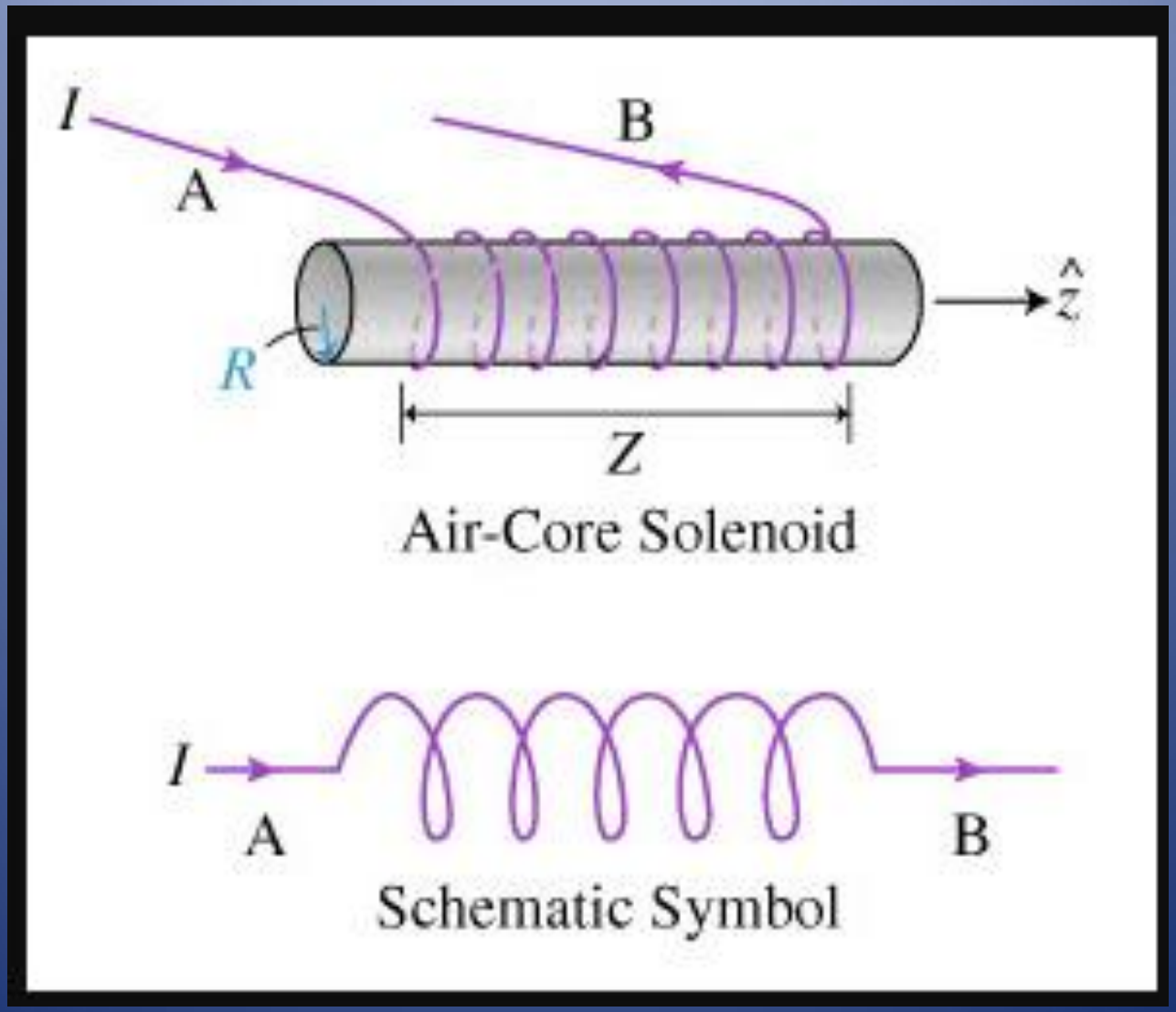
CAPACITOR



CAPACITOR

- **Capacitors:**
- A capacitor made from two conductive plates with an insulator between them and it stores electrical energy in the form of an electric field. A capacitor blocks the DC signals and allows the AC signals and also used with a resistor in a timing circuit.
- The stored charge is $Q=CV$
- Where
  C is the capacitance of a capacitor and V is the applied voltage.

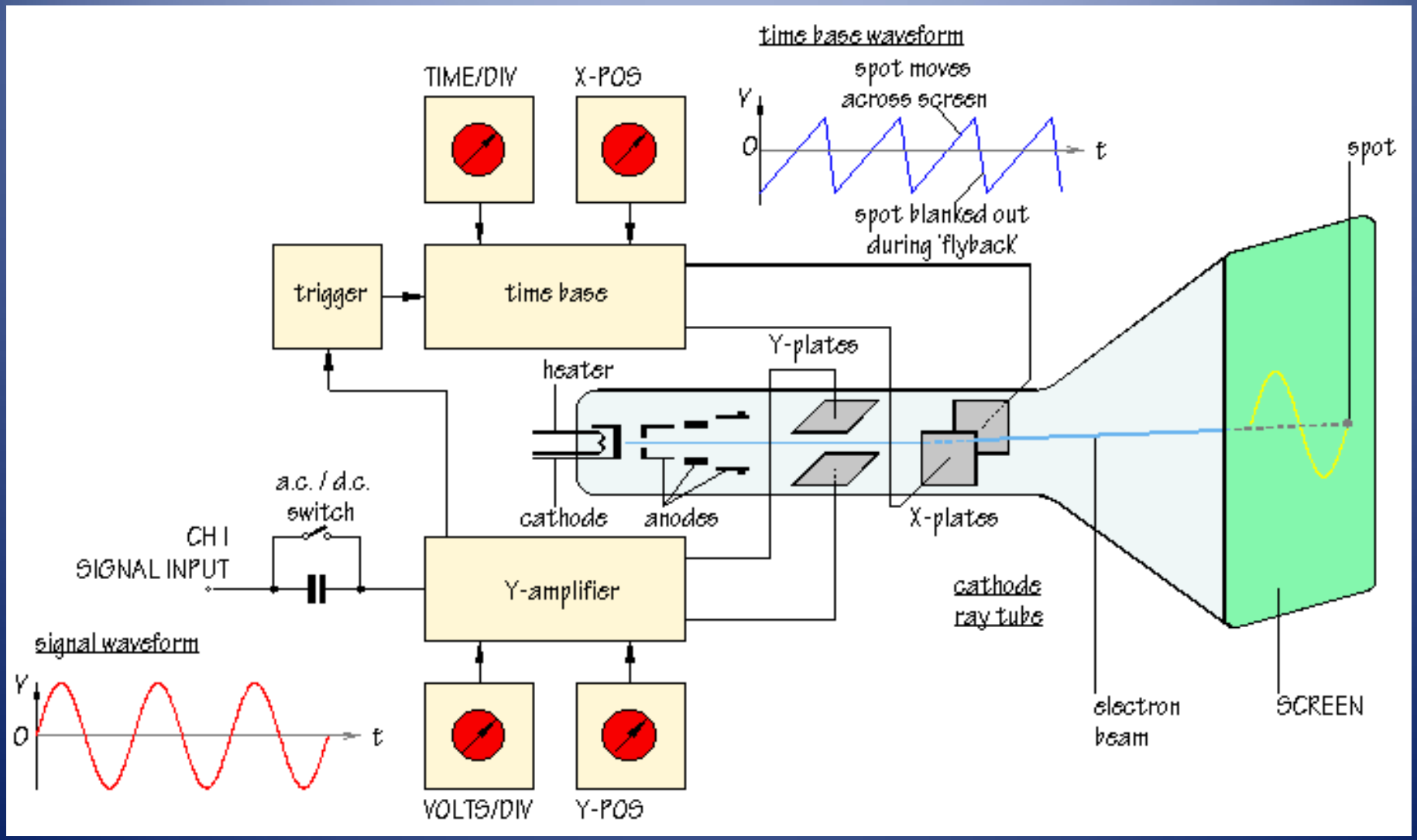
INDUCTOR



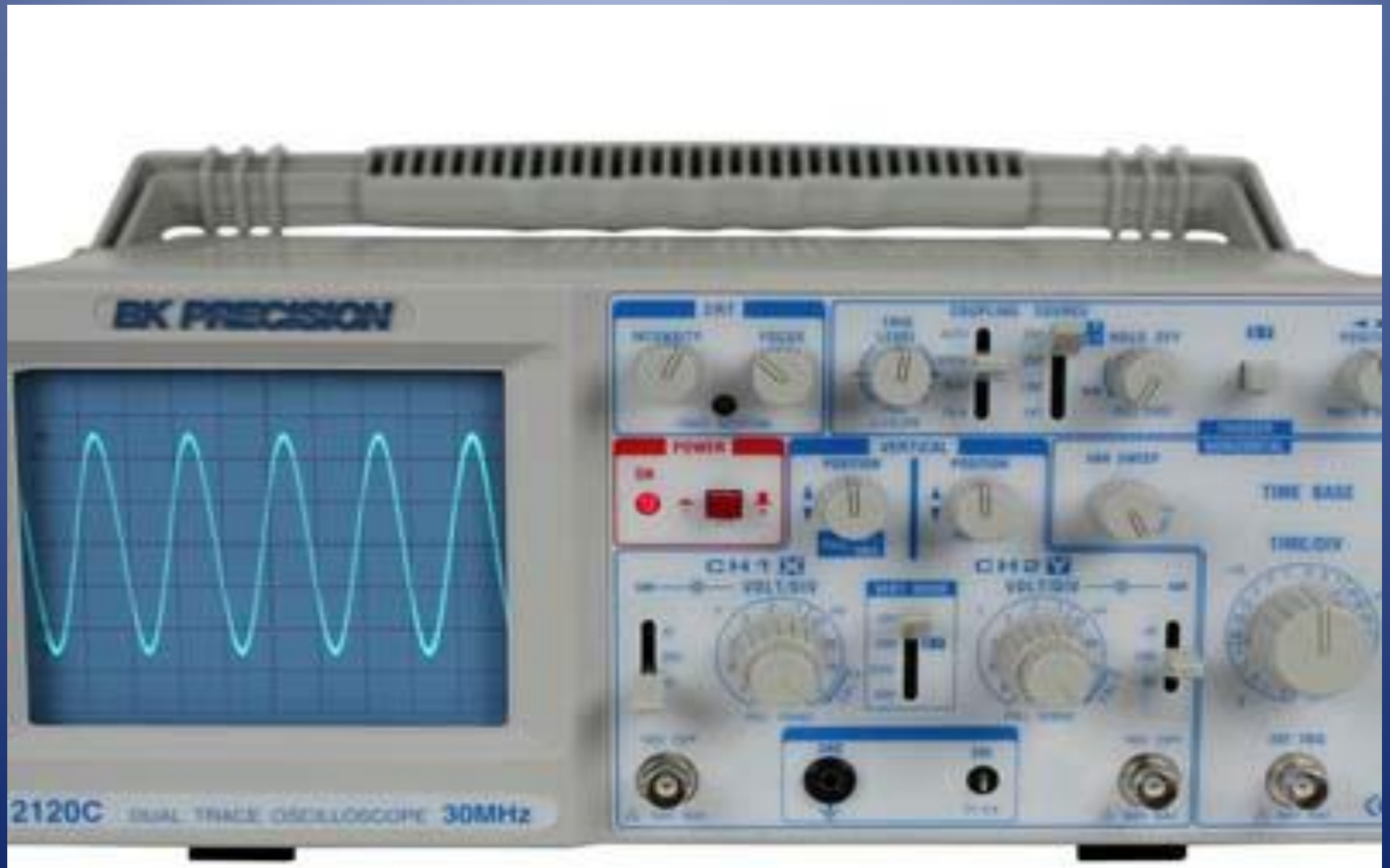
INDUCTOR

- **Inductors:**
- An inductor is also referred as AC resistor which stores electrical energy in the form of magnetic energy. It resists the changes in the current and the standard unit of inductance is Henry. Capability of producing magnetic lines is referred as inductance.
- The inductance of the inductor is given as $L= (\mu.K.N2.S)/l$.
- Where,
- L is inductance,
  μ is Magnetic permeability,
  K is magnetic coefficient,
  S is the Cross section area of the coil,
  N is the Number of turns of the coils,
  And l is the Length of the coil in axial direction.

Cathode ray Oscilloscope



ANALOG CATHODE RAY OSCILLOSCOPE



ANALOG CRO

- **Oscilloscope (CRO):**
- An oscilloscope displays time-varying signals like voltage waveform patterns on a screen which help in visualizing the circuit functions. While the basic models

FUNCTION GENERATOR

FUNCTION GENERATOR

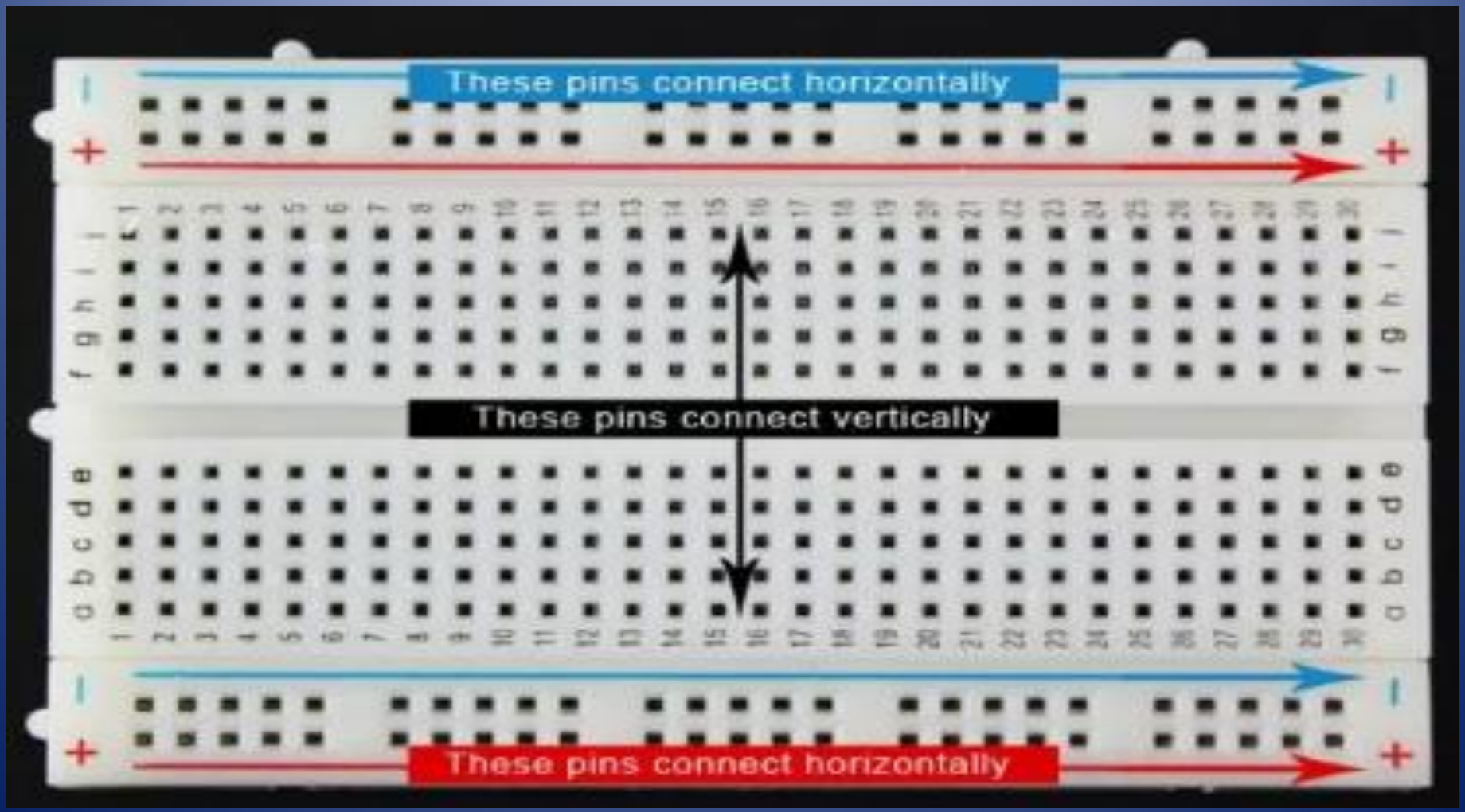
- **Function generator :**
- A function generator is usually a piece of electronic test equipment or soft ware used to generate different types of electrical waveforms over a wide range of frequencies. Some of the most common waveforms produced by the function generator are the sine wave , square wave, triangular wave and sawtooth shapes. These waveforms can be either repetitive or single-shot

REGULATED POWER SUPPLY

REGULATED POWER SUPPLY

- **Power supplies:**
- A power supply is an electrical device that supplies electric power to an electrical load. The primary function of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. As a result, power supplies are sometimes referred to as electric power converters

BREAD BOARD

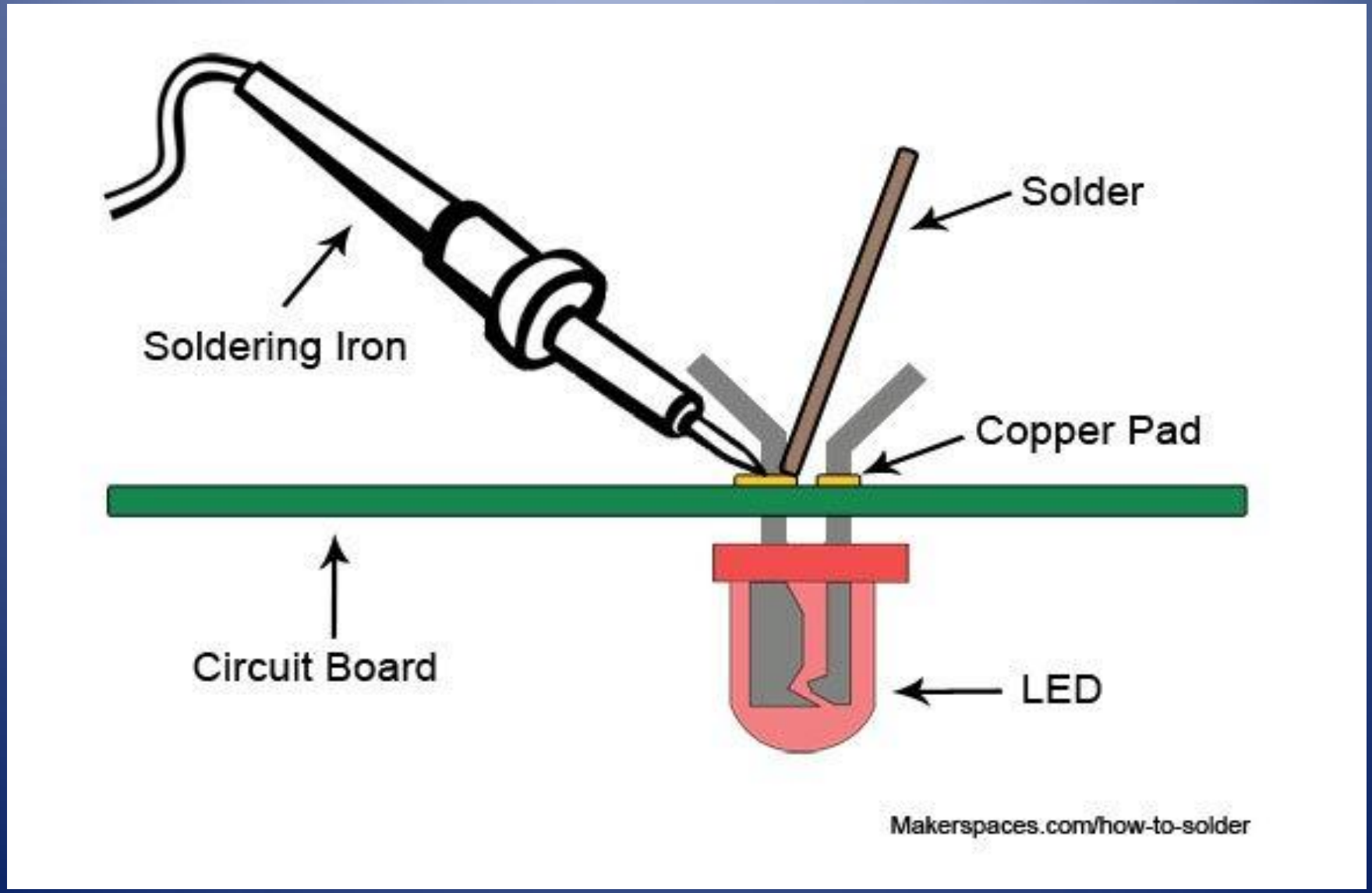

These pins connect horizontally
These pins connect vertically
These pins connect horizontally

BREAD BOARD

Breadboards:

- In order to temporarily construct a circuit without damaging the components used to build it, we must have some sort of a platform that will both hold the components in place and provide the needed electrical connections. In the early days of electronics, most experimenters were amateur radio operators. They constructed their radio circuits on wooden
- breadboards. Although more sophisticated techniques and devices have been developed to make the assembly and testing of electronic circuits easier, the concept of the breadboard still remains in assembling components on a temporary platform.

SOLDERING PRACTICE



SOLDERING

Solder:

- Soldering is the process of joining two or more electronic parts together by melting solder around the connection. Solder is a metal alloy and when it cools it creates a strong electrical bond between the parts. Even though soldering can create a permanent connection, it can also be reversed using a desoldering tool as described below.

DE SOLDERING

DE SOLDERING

- These tools are used to remove the soldered wires and components on printed circuit boards for repair and troubleshooting usually when there is a fault in the connections. These include pumps and copper braid wicks. A de-soldering pump draws solder away with a quick vacuum action.

AMMETER

AMMETER

- An ammeter (from Ampere Meter) is a measuringinstrument used to measure the current in a circuit. Electric currents are measured in amperes (A), hence the name. Instruments used to measure smaller currents, in the milliampere or microampere range, are designated as milliammeters or microammeters

VOLT METER

VOLT METER

- A voltmeter is an instrument used for measuring electrical potential difference between two points in an electric circuit. Analog voltmeters move a pointer across a scale in proportion to the voltage of the circuit; digital voltmeters give a numerical display of voltage by use of an analog to digital converter.

DIGITAL MULTI METER

DIGITAL MULTI METER

- A multimeter is quite important as it measures voltage, current, resistance, and other aspects of electricity and circuits. Usually, these are small in size, run on batteries, and carry large digital displays. There is also a knob to select the measurement function and a pair of test leads for connecting the device to the circuit.

L C R METER

L C R METER

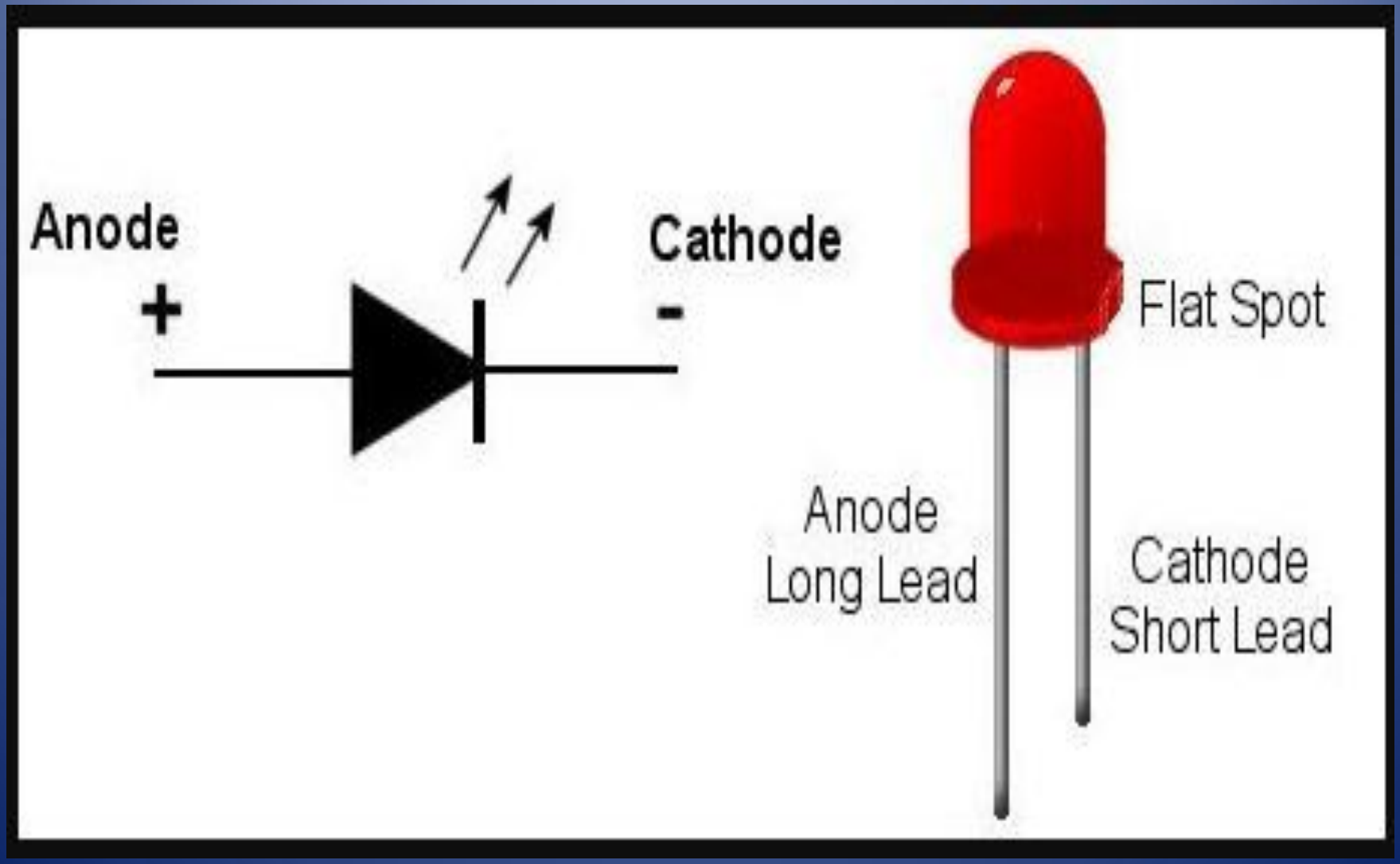
- LCR meters are used for measuring inductance, capacitance, and resistance involved in an electronic setup. These are available in two variants- a low-cost version and a high-cost version. The former one measures the total impedance of a component while the latter measures all the impedance of the components, equivalent series resistance (ESR) and the Quality (Q) factor of the component.

BREAD BOARD TRAINER KIT

WHAT IS SEMICONDUCTOR

- A **semiconductor device** is an electronic component that relies on the electronic properties of a semiconductor material (primarily silicon, germanium, and gallium arsenide, as well as organic semiconductors) for its function. Semiconductor devices have replaced vacuum tubes in most applications. They use electrical conduction in the solid state rather than the gaseous state or thermionic emission in a vacuum.
- Semiconductor devices are manufactured both as single discrete devices and as integrated circuit (IC) chips, which consist of two or more devices—which can number from the hundreds to the billions—manufactured and interconnected on a single semiconductor wafer (also called a substrate).

Diode



DIODES:

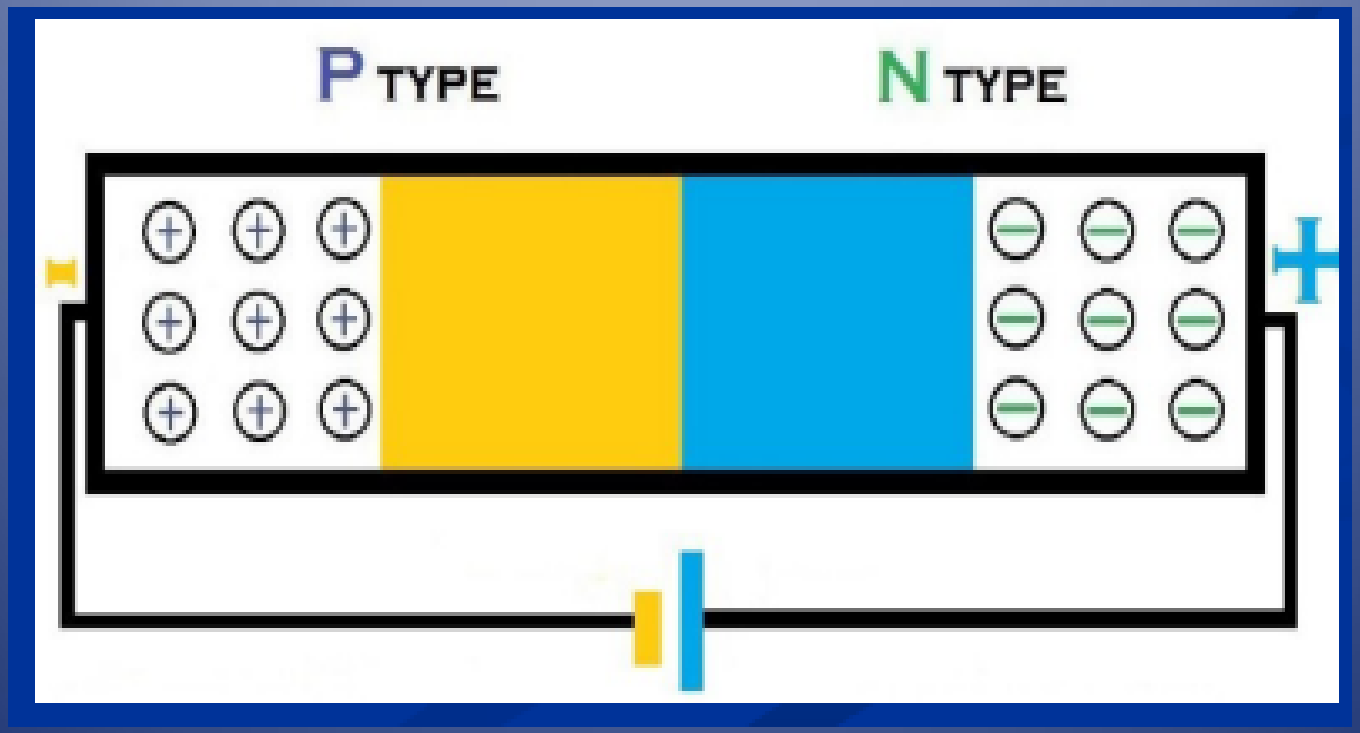
- A diode is a device that allows current to flow in one direction and usually made with semiconductor material. A Diode is an electronic component with two terminals that are anode and cathode. It allows electron current flow from cathode to anode but it blocks another direction. The diode will have low resistance in one direction and high resistance in another direction.. These are mostly used in converting circuits like AC to DC circuits.
- A Diode is an electronic component with two terminals that are anode and cathode. It allows electron current flow from cathode to anode but it blocks another direction. The diode will have low resistance in one direction and high resistance in another direction
- These are of different types like PN diodes, Zener diodes, LEDs, photo diodes, etc.

PN junction diode

- P type and N type semiconductors, taken separately are of very limited use.
- If we join a piece of P type material to a piece of N type material such that the crystal structure remains continuous at the boundary,, ….. A PN JUNCTION is formed.
- It can function as ….

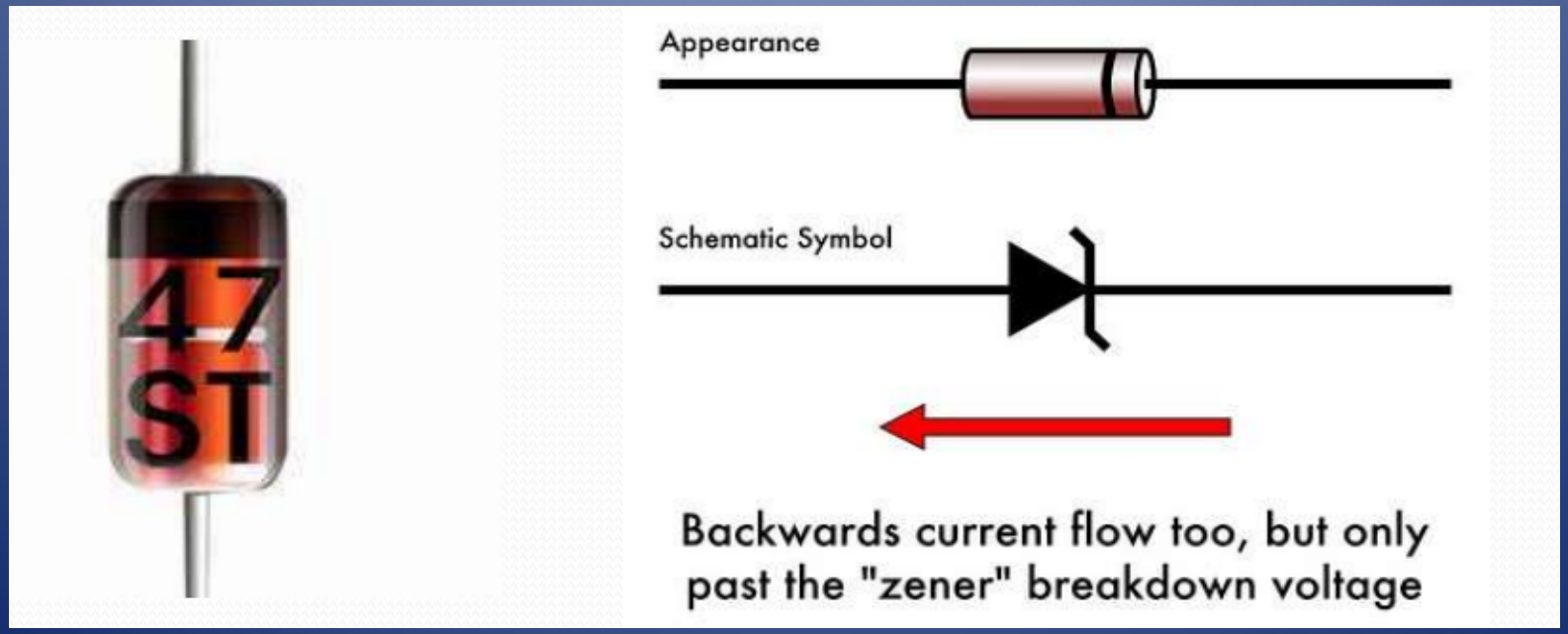
Rectifier
Amplifier
Switching
And other operations in electronic circuits.

- PN-junction : When P-type semiconductor is suitably joined to N- type semiconductor the contact surface is called PN-junction.

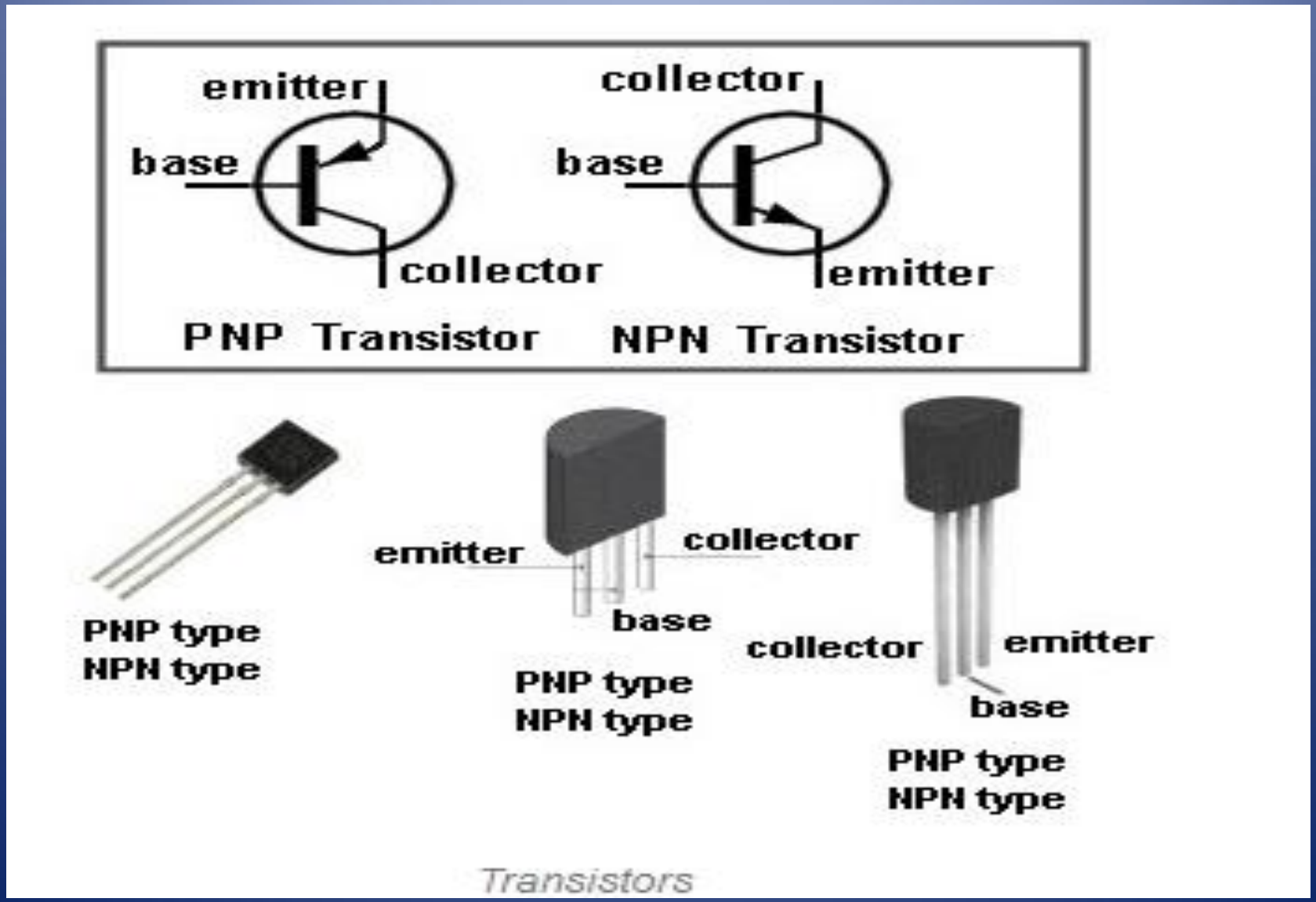


Zener Diode

- A Zener diode is a type of diode that permits current not only in the forward direction like a normal diode, but also in the reverse direction .If the voltage is larger than the breakdown voltage known as “Zener knee voltage” or “Zener voltage”



TRANSISTORS



TRANSISTOR

- **TRANSISTORS:**
- A transistor is a three terminal semiconductor device. Mostly it is used as switching device and also as an amplifier. This switching device can be a voltage or current controlled.By controlling the voltage applied to the one terminal controls the current flow through the other two terminals. Transistors are of two types, namely bipolar junction transistor (BJT) and field effect transistors (FET). And further these can be PNP and NPN transistors.

Transistor Configurations

- Common-Base Configuration
- Common-Emitter Configuration
- Common-Collector Configuration

Amplifier

- Amplifier:- An Amplifier, is an electronic device that increase the power of a signal.

- It does this by taking energy from a power supply and controlling the output to match the input signal shape but with a larger amplitude.
- In this sense, an amplifier modulates the output of the power supply to make the output signal stronger than the input signal.

TYPES OF AMPLIFIER

- There are Basically Four Types of Amplifier.

1. Voltage Amplifier
2. Current Amplifier
3. Transconductance
4. Transresistance

- Common Base, Common Emitter and Common Collector are the Configurations of the Amplifier.

Common Emitter Amplifier

- a common emitter amplifier is typically used as a voltage amplifier
- Input is applied to base ,output is taken across collector and the emitter is grounded
- Features:

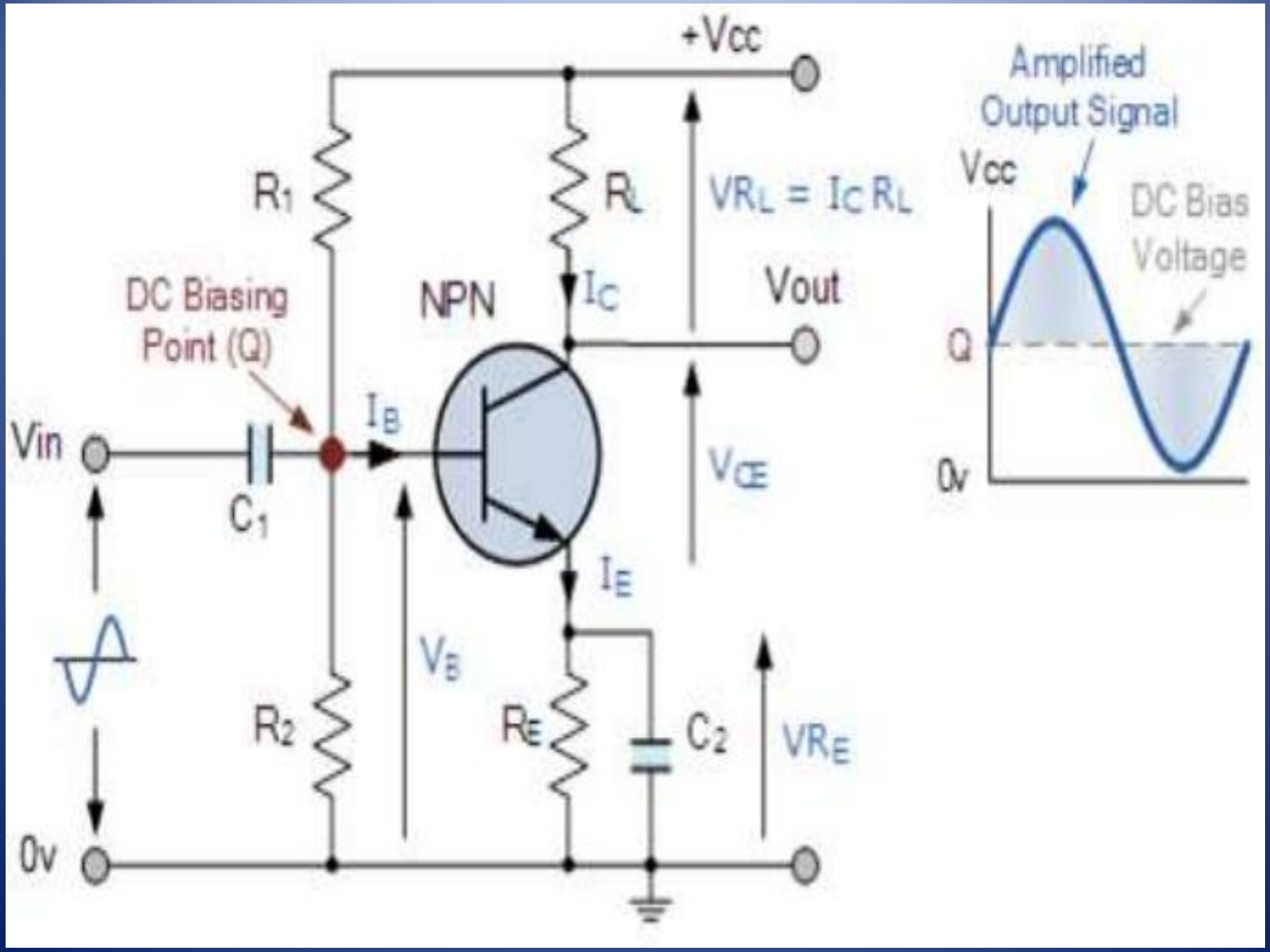
  Moderate /high input impedance.

  Moderate output impedance.

  High Voltage Gain

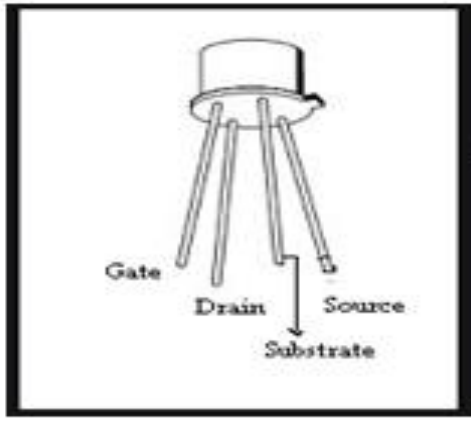
  High Current Gain.

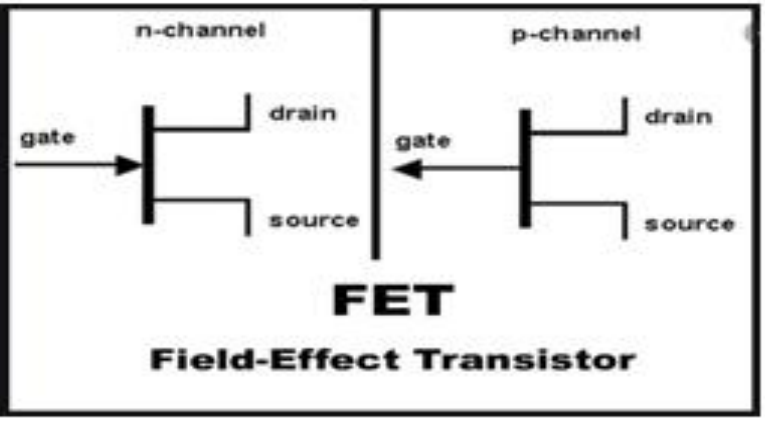
  Output is Inverted

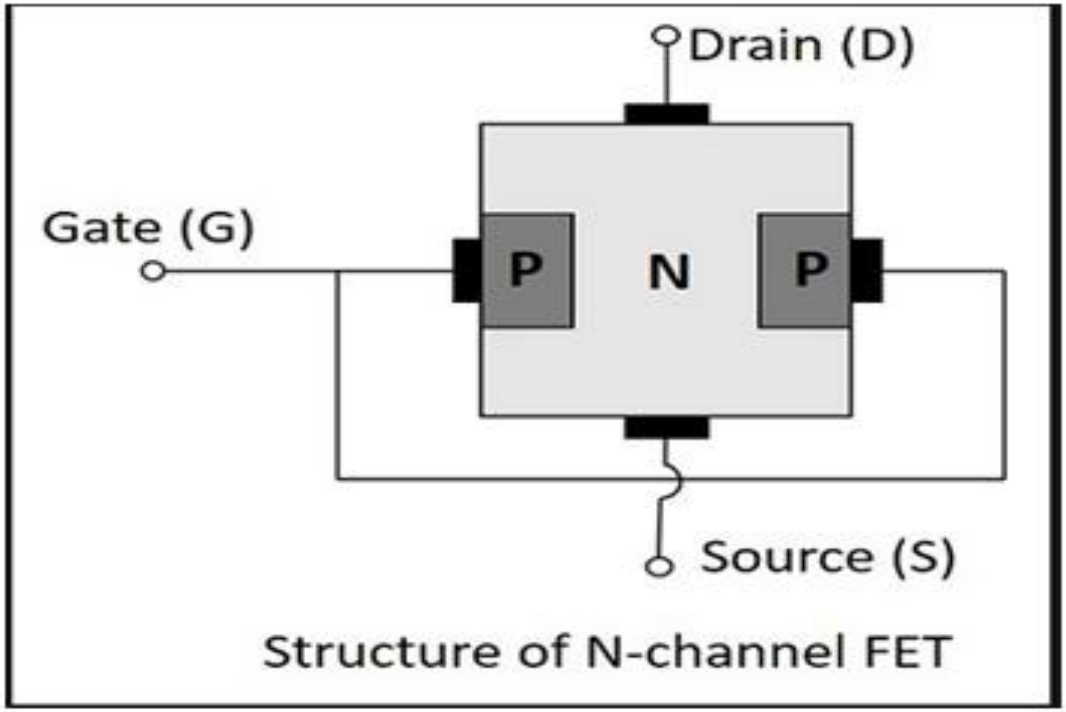

+Vcc
R1
RL
VRL = IC RL
DC Biasing
Point (Q)
NPN
IC
Vout
IB
Vin
C1
VCE
IE
VB
R2
RE
C2
VRE
0v
Amplified
Output Signal
Vcc
DC Bias
Voltage
Q
0v

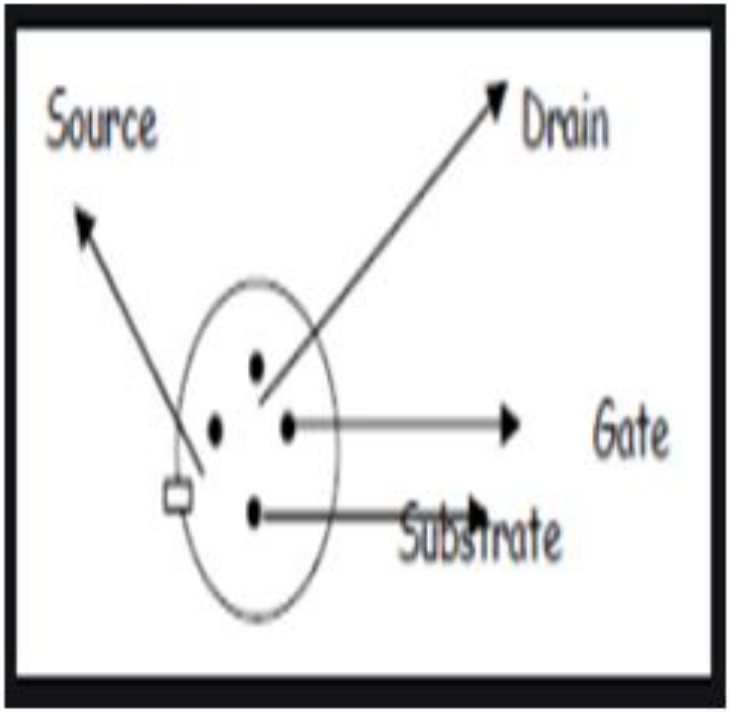
Experimental Output of CE

FET (Field Effect Transistor)



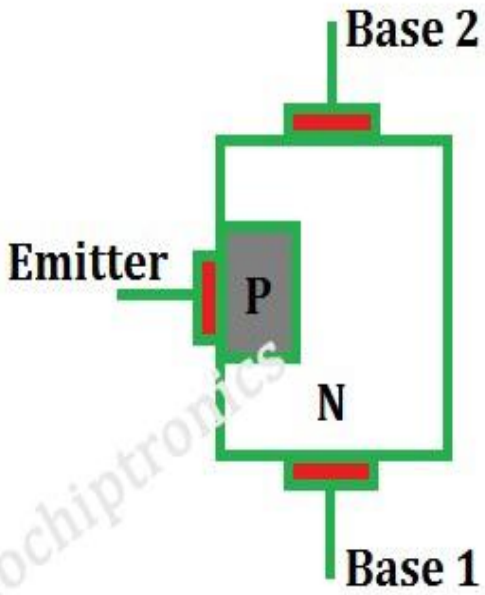




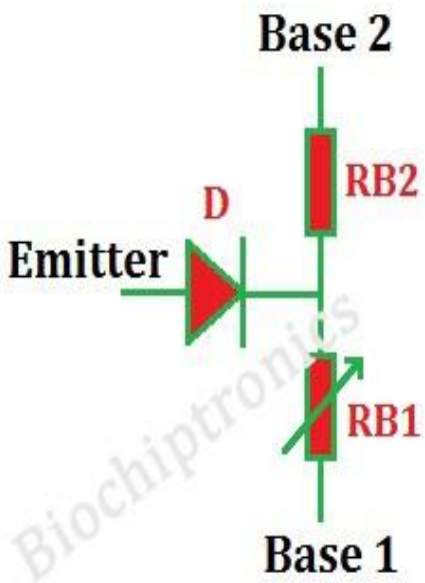


Bipolar transistors are so **named** because they conduct by using both majority and minority carriers. The **field-effect transistor** (**FET**), sometimes **called** a unipolar transistor, uses either electrons (in N-channel **FET**) or holes (in P-channel **FET**) for conduction. ... There are fields inside of a BJT

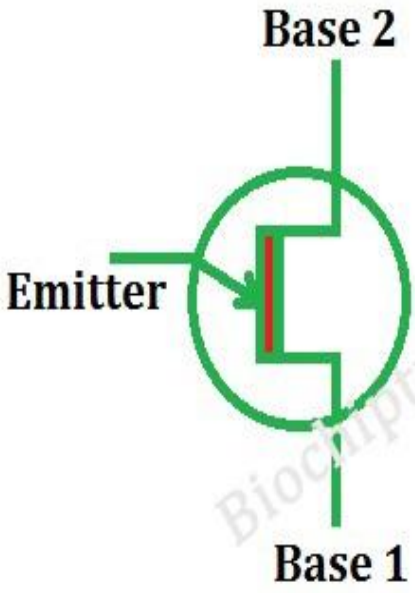
Unijunction transistor (UJT)



Construction

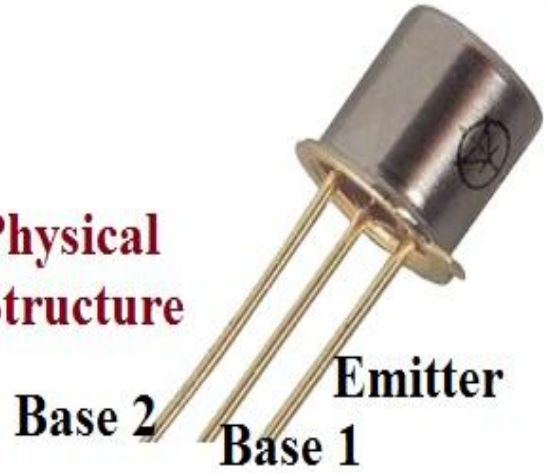


Equivalent Circuit



Symbol

Physical Structure



Biochiptronics

BIOCHIPTRONICS TECHNOLOGIES

Unijunction transistor

- The UJT as the name implies, is characterized by a single pn junction.
- It exhibits negative resistance characteristic that makes it useful in oscillator circuits.

SCR

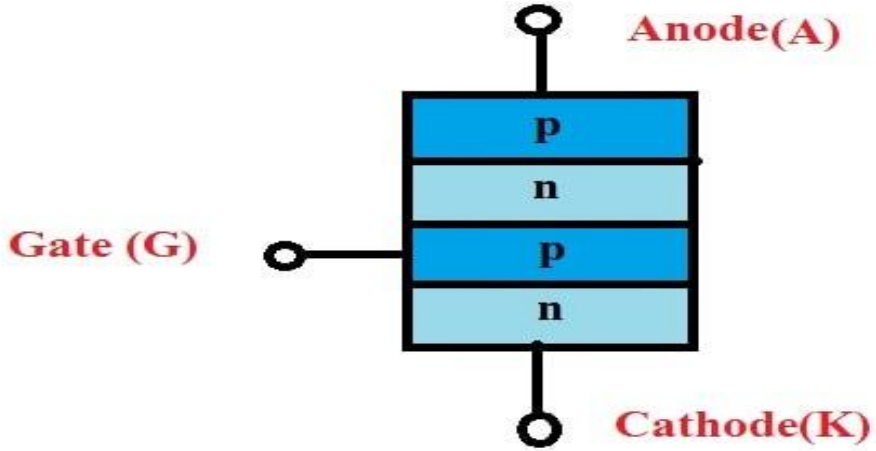


Fig. SCR Diagram

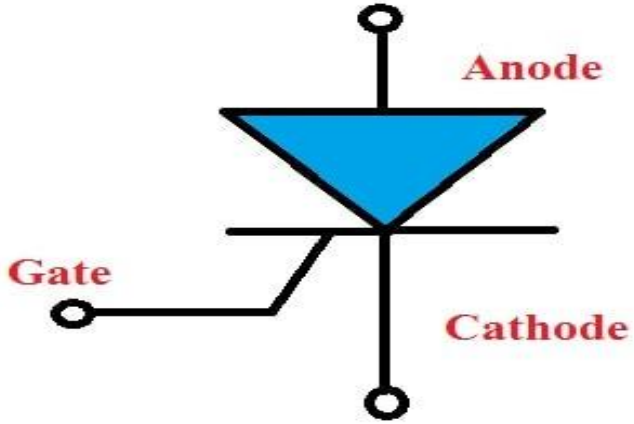


Fig. SCR Symbol

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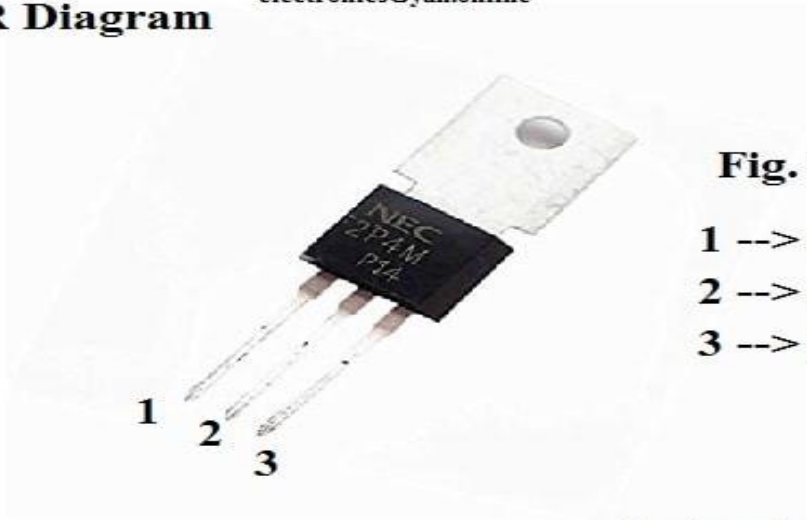

Fig. SCR Pinout

1 --> Cathode
2 --> Anode
3 --> Gate

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- SCR:SILICON CONTROLLED RECTIFIER
- It is a modified semiconductor diode.
- Also called Thyristor.
- It is a diode having ‘gate’
- The SCR is the power-handling electronic device in an SCR heater control.
- An SCR conducts current in only one direction, two SCRs are connected in an inverse parallel, or "back-to-back,"configuration when used as the power control.

Major Equipment Details

S.No	Name of the Equipment	Quantity		Amount (Rs.)
1.	Regulated Power Supply Digital-Dual (0-30V)	10		85,120/-
2.	Function Generators (3 MHz)	05	15	1,13,718/-
	Function Generators (5 MHz)	10		
3.	Multimeters (Digital)	10		21,025/-
4.	Cathode Ray Oscilloscopes (20 MHz)	10		1,62,250/-
5.	Decade Resistance Box (DRBs)	10		18,075/-
6.	Decade Inductance Box (DIBs)	05		12,500/-
7.	Decade Resistance Box (DCBs)	05		12,500/-
8.	LCR Meter	01		7,021/-
9.	Stabilizer (5 KVA)	01		12,564/-
10.	DC Ammeters - (Analog)	24		24,780/-
11.	DC Voltmeters - (Analog)	24		24,780/-
12.	Bread Board Trainer Kits	10		26,432/-
		Total		**5, 20,765/-**

Lab Physical View

Do's & Don't's

- While entering the Laboratory, the students should follow the dress code (Wear shoes, White Apron & Female students should tie their hair back).
- The students should bring their observation note book, practical manual, record note book, calculator, necessary stationary items and graph sheets if any for the lab classes without which the students will not be allowed for doing the practical.
- All the equipments and components should be handled with utmost care. Any breakage/damage will be charged.
- If any damage/breakage is noticed, it should be reported to the instructor immediately.
- If a student notices any short circuits, improper wiring and unusual smells immediately the same thing is to be brought to the notice of technician/lab in charge.
- At the end of practical class the apparatus should be returned to the lab technician and take back the indent slip.
- Each experiment after completion should be written in the observation note book and should be corrected by the lab in charge on the same day of the practical class.
- Each experiment should be written in the record note book only after getting signature from the lab in charge in the observation note book.
- Record should be submitted in the successive lab session after completion of the experiment.
- 100% attendance should be maintained for the practical classes.

Fire Extinguishers	First Aid Box
Miniature Circuit Breaker's (MCB's).	CC Camera surveillance

Table 6.4.2 Safety Measures in the Laboratories

THANK YOU