VISVESVARAYA TECHNOLOGICAL UNIVERSITY

MINI PROJECT REPORT ON

"POWER FALURE AND RESUMPTON ALARAM"

SUBMITTED BY:

C KEERTHI (1NH18EC708)

B KAVYASHREE (1NH18EC725)

AKHIL KUMAR (1NH18ME049)

SOURABH SRIKUMAR (1NH18EC749)

INDRAJA CHIRUGUDU (1NH18EC716)

Under the guidance of

DR.MOHAN KUMAR NAIK

Professor

Dept. of ECE, NHCE, Bengaluru

NEW HORIZON COLLEGE OF ENGINEERING

(ISO-9001:2000 certified, Accredited by NAAC 'A', Autonomous college permanently affiliated to VTU)Outer Ring Road, Panathur Post, Near Marathalli, Bengaluru-560103

NEW HORIZON COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CERTIFICATE

Certified that the mini project work entitled "**POWER FAILURE AND RESUMPTION ALARM**" carried out by **C KEERTHI(1NH18EC708),B KAVYASHREE (1NH18EC725),AKHIL KUMAR (1NH18ME049),SOURABH SRIKUMAR (1NH18EC749),INDRAJA CHIRUGUDU (1NH18EC716) ,** bonafide students of Electronics and Communication Department, New Horizon College of Engineering, Bangalore.

The mini project report has been approved as it satisfies the academic requirements in respect of mini project work prescribed for the said degree.

Project Guide HOD ECE

DR MOHAN KUMAR NAIK DR SANJEEV SHARMA

External Viva

Name of Examiner Signature with Date

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ACKNOWLEDGEMENT

The satisfaction that accompany the successful completion of any task would be, but impossible without the mention of the people who made it possible, whose constant guidance and encouragement helped us succeed.

We thank **Dr. Mohan Manghnani**, Chairman of **New Horizon Educational Institution**, for providing necessary infrastructure and creating good environment.

We also record here the constant encouragement and facilities extended to us by **Dr.Manjunatha**, Principal, NHCE and **Dr. Sanjeev Sharma**, head of the department of Electronics and Communication Engineering. We extend sincere gratitude to them.

We sincerely acknowledge the encouragement, timely help and guidance to us by our beloved guide **Dr. Mohan Kumar Naik** to complete the project within stipulated time successfully.

Finally, a note of thanks to the teaching and non-teaching staff of electronics and communication department for their co-operation extended to us, who helped us directly or indirectly in this successful completion of mini project.

C KEERTHI (1NH18EC708)

B KAVYASHREE (1NH18EC725)

AKHIL KUMAR (1NH18ME049)

SOURABH SRIKUMAR (1NH18EC749)

INDRAJA CHIRUGUDU (1NH18EC716)

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ABSTRACT

Power fluctuation circuit using only few resistors , two transistors , two LED’s and a battery . We have made it easy to understand and build. This circuit being very simple still gets your work done.The green led glows when there is power and the red one glows when it fails. When power is there, transistor 1 will work keeping the transistor 2 on off state. The green LED glows. As soon as the power goes transistor 2 starts to work and the beeper , red LED will start to work indicating the power failure.

The circuit is built with a new **AUDIO VISUAL INDICATOR**. For audio buzzer is used and for visual LEDs are used. In the previous circuits they only used LEDs but now we have improvised using a buzzer which gives beep sound. In this way beep sound can be heard and know that there is a failure and take safety measures pre handed. This is just a basic circuit which only indicates about the threat , but in higher levels fuse can be used which will break down the circuit and prevent the damaging of components automatically.

CHAPTER 1

INTRODUCTION

Here is a simple power resumption alarm circuit that can be fixed inside the switch box itself. It gives beeps when the power resumes after a power failure. This circuit is ideal to monitor battery chargers, since the long duration power failure may sometimes remain unnoticed.

What Is Power Failure?

A **power outage** (also called a **power cut**, a **power out**, a **power blackout**, **power failure** or a **blackout**) is the loss of the electrical power network supply to an end user.There are many causes for power outages in the grid. Examples of such causes include electrical station failures, power line failures, substations or other parts of the distribution system, short circuits, cascade failures, safety or circuit breaker activity .Power outages are particularly important in areas where the environment and public safety are at risk. Facilities such as hospitals and wastewater treatment facilities usually have a backup power source such as a standby generator, which automatically begins to lose power. Other critical systems such as telecommunications also require emergency power. In the telephone exchange battery room, there is usually a lead-acid battery chart for backup and an outlet for connecting the generator during a long power outage. Power outages are categorized into three different phenomena, relating to the duration and effect of the outage:

• Permanent failure is a large power loss usually caused by power line failure. When the fault is cleared, the power will automatically recover. Voltage drop is the drop in power supply voltage. The term voltage drop comes from the dimming that the light receives when the voltage drops. Voltage drops can degrade device performance and cause malfunctions.

• Power outage is the total loss of power to an area and is the most serious power outage that can occur. Power outages due to or due to power plant trips are particularly difficult to recover

PROCTECTING THE POWER SYSTEM FROM OUTAGES

In power supply network, the power generation and the electrical load (demand) must be very close to equal every second to avoid overloading of network components, which can severely damage them. Protective relays and fuses are used to automatically detect overloads and to disconnect circuits at risk of damage.

Under certain conditions, a network component shutting down can cause current fluctuations in neighboring segments of the network leading to a cascading failure of a larger section of the network. This may range from a building, to a block, to an entire city, to an entire electrical grid. Modern power systems are designed to be resistant to this sort of cascading failure, but it may be unavoidable (see below). Moreover, since there is no short-term economic benefit to preventing rare large-scale failures, researchers have expressed concern that there is a tendency to erode the resilience of the network over time, which is only corrected after a major failure occurs.

In a 2003 publication, Carreras and co-authors claimed that reducing the likelihood of small outages only increases the likelihood of larger ones. In that case, the short-term economic benefit of keeping the individual customer happy increases the likelihood of large-scale blackouts.

The Senate Committee on Energy and Natural Resources held a hearing in October 2018 to examine "black start", the process of restoring electricity after a system-wide power loss. The hearing's purpose was for Congress to learn about what the backup plans are in the electric utility industry in the case that the electric grid is damaged. Threats to the electrical grid include cyber-attacks, solar storms, and severe weather, among others. For example, the "Northeast Blackout of 2003" was caused when overgrown trees touched high-voltage power lines. Around 55 million people in the U.S. and Canada lost power, and restoring it cost around $6 billion.

LITERATURE SURVEY

TITLE: Mains Failure

NAME OF THE AUTHOR: V David

DESCRIPTION: This mains indicator sounds an alarm whenever AC mains fails and resumes. It is very useful in industrial installations, cinema halls, hospitals,etc.

TITLE: Power failure and resumption alarm

NAME OF THE AUTHOR: Seemant Singh

DESCRIPTION: This circuit gives audio visual indication of the failure and resumption of mains power. The circuit is built around dual timer IC556. When mains is present the bi colour LED glows in green colour and when mains fails it turns red.

TITLE: Power resumption alarm circuit

NAME OF THE AUTHOR: D Mohan Kumar

DESCRIPTION: Here is a simple power resumption alarm circuit that can be fixed inside the switch box itself. It gives beeps when the power resumes after a power failure. This circuit is ideal to monitor battery chargers, since the long duration power failure may sometimes remain unnoticed.

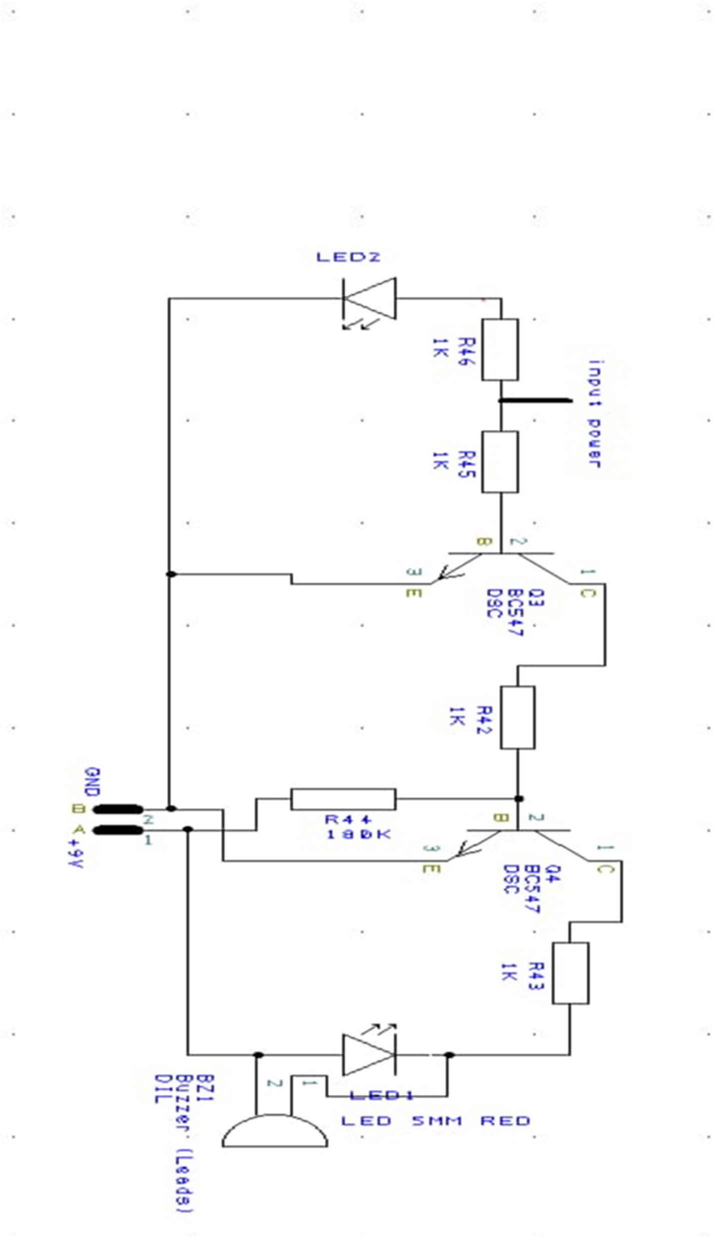
PROPOSED METHODOLOGY

Mini project topics were suited for considerations. Mini project topic was finalized as power failure and resumption alarm. The components for making the working model were purchased, that includes:

- resistors
- transistors
- jumper wires
- motherboard
- buzzer
- 9v batter
- 5v adapter

working model preparation was commenced. 50% of the working model was completed. working on presentation was commenced. report making commenced. 50% report was completed. 90% of the working model was completed on motherboard. 100% of the project working model along with project report is done.

PROJECT DESCRIPTION



This circuit consists of

- 5 Resistors
- 2 Transistors
- 2LED
- 1 Buzzer
- 9v battery
- Jumper wires
- Breadboard
- 5v adapter

RESISTORS

A **resistor** is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses. High-power resistors that can dissipate many watts of electrical power as heat may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented in the integrated circuit.

The electrical function of the resistor is specified by the resistor. Typical commercial resistors are manufactured with more than 9 digits. The nominal value of the resistance is within the manufacturing tolerances indicated on the component.

OHM'S LAW

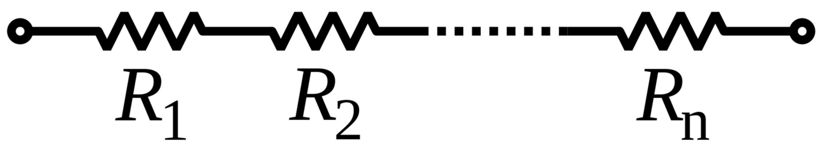
The behavior of an ideal resistor is dictated by the relationship specified by Ohm's law:

> Ohm's law states that the voltage (V) across a resistor is proportional to the current (I), where the constant of proportionality is the resistance (R). For example, if a 300 ohm resistor is attached across the terminals of a 12 volt battery, then a current of 12 / 300 = 0.04 amperes flows through that resistor.

Practical resistors also have some inductance and capacitance which affect the relation between voltage and current in alternating current circuits.

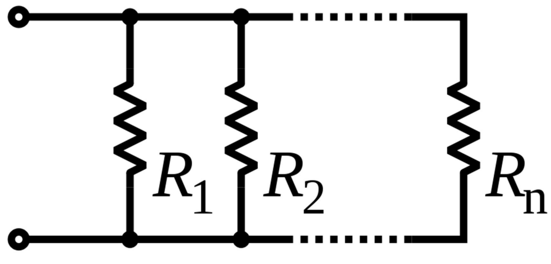
The ohm (symbol: Ω) is the SI unit of electrical resistance, named after Georg Simon Ohm. An ohm is equivalent to a volt per ampere. Since resistors are specified and manufactured over a very large range of values, the derived units of milliohm ($1\text{m}\Omega = 10^{-3}\ \Omega$), kilohm ($1\text{k}\Omega = 10^{3}\ \Omega$), and megohm ($1\ \text{M}\Omega = 10^{6}\ \Omega$) are also in common usage.

SERIES RESISTANCE



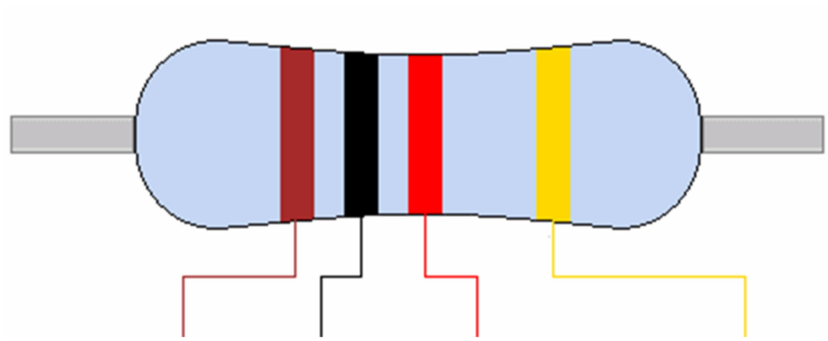
The total resistance of resistors connected in series is the sum of their individual resistance values.

PARALLEL RESISTANCE



The total resistance of resistors connected in parallel is the reciprocal of the sum of the reciprocals of the individual resistors.

1K RESISTOR



Black	0	0	0	1	-
Brown	1	1	1	10	±1%
Red	2	2	2	100	±2%
Orange	3	3	3	1000	-
Yellow	4	4	4	10 000	-
Green	5	5	5	100 000	±0.5%
Blue	6	6	6	1 000 000	±0.25%
Violet	7	7	7	10 000 000	±0.1%
Gray	8	8	8	100 000 000	±0.05%
White	9	9	9	1000 000 000	-
Gold				0.1	±5%
Silver				0.01	±10%
None					±20%

Coding a 1k Ohm Resistor

Count out loud from 0 up to 9. How many unique digits did you say? Right, there are 10 digits. If we agree on a unique color for each of the 10 digits, we can encode numbers of any size using sequences of colors, which brings us to the resistor color code. A **resistor** reduces (or resists) the flow of current. The value of the resistance is expressed as a number of ohms (the symbol Ω is used for "ohm"). The number of ohms is coded with a color and appears as a band on the device itself. Three color bands are used to represent the value because we only encode the first significant figure, the second significant figure and the number of zeros. In this lesson, we work this out for a 1k Ω resistor where "k" is the abbreviation for the prefix "kilo", meaning 1,000. So, a 1k Ω resistor has a value of 1,000 ohms and the number we will code is 1,000.

The main function of **resistors** in a circuit is to control the flow of current to other components. Take an LED (light) for example. If too much current flows through an LED it is destroyed. So a resistor is used to limit the current.

<u>180K RESISTOR</u>

Value	180 Ω
Type	4 Band Colour Code System
Colour Code	Brown, Grey, Brown, Gold
Multiplier	Brown, 10
Tolerance	Gold Band ±5%

TRANSISTOR

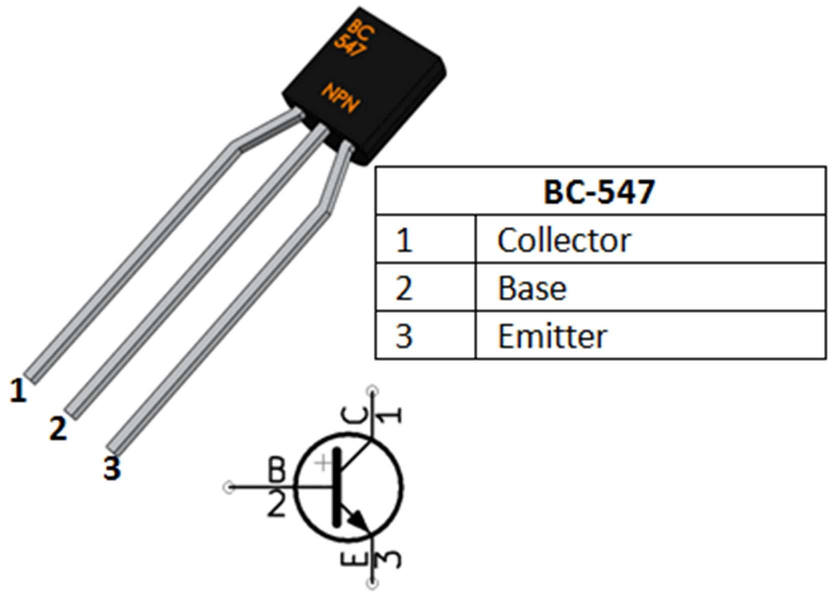
A **transistor** is a semiconductor device used to amplify or switch electronic signals and power. It is composed of semiconductor material usually with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals controls the current through another pair of terminals.

Because the controlled (output) power can be higher than the controlling (input) power, a transistor can amplify a signal. Today, some transistors are packaged individually, but many more are found embedded in integrated circuits.

Austro-Hungarian physicist Julius Edgar Lilienfeld proposed the concept of a field-effect transistor in 1926, but it was not possible to actually construct a working device at that time. The first working device to be built was a point-contact transistor invented in 1947 by American physicists John Bardeen and Walter Brattain while working under William Shockley at Bell Labs. They shared the 1956 Nobel Prize in Physics for their achievement.

The most widely used transistor is the MOSFET (metal–oxide–semiconductor field-effect transistor), also known as the MOS transistor, which was invented by Egyptian engineer Mohamed Atalla with Korean engineer Dawon Kahng at Bell Labs in 1959. The MOSFET was the first truly compact transistor that could be miniaturized and mass-produced for a wide range of uses. Transistors revolutionized the field of electronics, and paved the way for smaller and cheaper radios, calculators, and computers, among other things. The first transistor and the MOSFET are on the list of IEEE milestones in electronics. The MOSFET is the fundamental building block of modern electronic devices, and is ubiquitous in modern electronic systems. An estimated total of 13 sextillion MOSFETs have been manufactured between 1960 and 2018 (at least 99.9% of all transistors), making the MOSFET the most widely manufactured device in history. Most transistors are made from very pure silicon, and some from germanium, but certain other semiconductor materials can also be used. A transistor may have only one kind of charge carrier, in a field-effect transistor, or may have two kinds of charge carriers in bipolar junction transistor devices. Compared with the vacuum tube, transistors are generally smaller, and require less power to operate. Certain vacuum tubes have advantages over transistors at very high operating frequencies or high operating voltages.

BC-547



Pin Configuration

Pin Number	Pin Name	Description
1	Collector	Current flows in through collector
2	Base	Controls the biasing of transistor
3	Emitter	Current Drains out through emitter

BC547 Transistor Features

- Bi-Polar NPN Transistor
- DC Current Gain (h_{FE}) is 800 maximum
- Continuous Collector current (I_C) is 100mA
- Emitter Base Voltage (V_{BE}) is 6V
- Base Current(I_B) is 5mA maximum
- Available in To-92 Package

Brief Description on BC547

BC547 is a NPN transistor hence the collector and emitter will be left open (Reverse biased) when the base pin is held at ground and will be closed (Forward biased) when a signal is provided to base pin. BC547 has a gain value of 110 to 800, this value determines the amplification capacity of the transistor. The maximum amount of current that could flow through the Collector pin is 100mA, hence we cannot connect loads that consume more than 100mA using this transistor. To bias a transistor we have to supply current to base pin, this current (I_B) should be limited to 5mA.

When this transistor is fully biased then it can allow a maximum of 100mA to flow across the collector and emitter. This stage is called **Saturation Region** and the typical voltage allowed across the Collector-Emitter (V_{CE}) or Base-Emitter (V_{BE}) could be 200 and 900 mV respectively. When base current is removed the transistor becomes fully off, this stage is called as the **Cut-off Region** and the Base Emitter voltage could be around 660 mV.

BC547 as Switch

When a transistor is used as a switch it is operated in the **Saturation and Cut-Off Region** as explained above. As discussed a transistor will act as an Open switch during Forward Bias and as a Closed switch during Reverse Bias, this biasing can be achieved by supplying the required amount of current to the base pin. As mentioned the biasing current should maximum of 5mA. Anything more than 5mA will kill the Transistor; Therefore, a resistor is always added in series with the base pin. The value of this resistor (RB) can be calculated using the following formula:

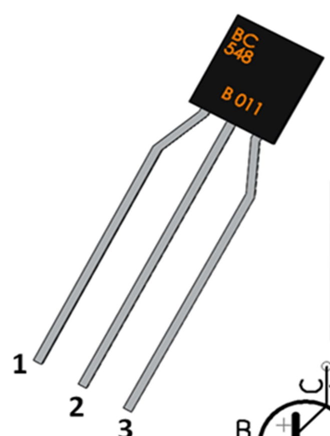
$\mathbf{R_B = V_{BE} / I_B}$

Where, the value of V_{BE} should be 5V for BC547 and the Base current (I_B depends on the Collector current (I_C). The value of I_B should not exceed mA.

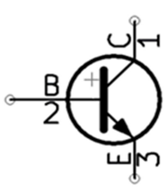
Applications

- Driver Modules like Relay Driver, LED driver etc..
- Amplifier modules like Audio amplifiers, signal Amplifier etc..
- Darlington pair

BC-548



BC-548	
1	Collector
2	Base
3	Emitter



BC548 Pin Configuration

Pin Number	Pin Name	Description
1	Collector	Current flows in through collector
2	Base	Controls the biasing of transistor
3	Emitter	Current Drains out through emitter

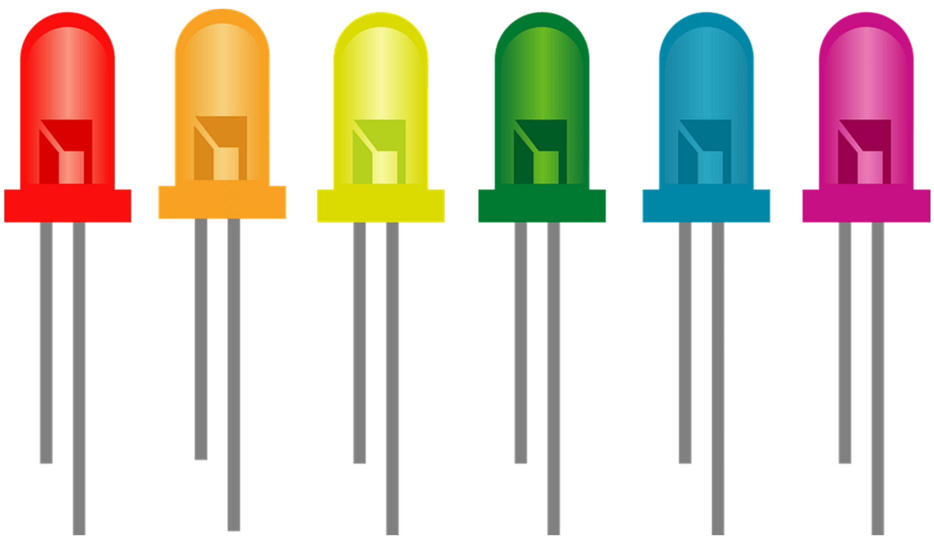
BC548 Transistor Features

- Bi-Polar NPN Transistor
- DC Current Gain (hFE) is 800 maximum
- Continuous Collector current (IC) is 500mA
- Emitter Base Voltage (VBE) is 5V
- Base Current(IB) is 5mA maximum
- Available in To-92 Package

LIGHT EMITTING DIODE

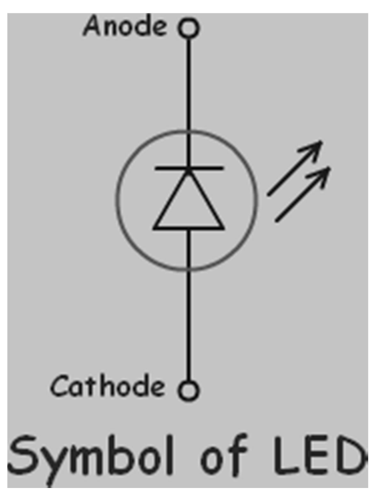
What is Light Emitting Diode

A light releasing diode is an electric component that emits light when the electric current flows through it. It is a light source based on semiconductors. When current passes through the LED, the electrons recombine with holes emitting light in the process. This is a specific type of diode with characteristics similar to a p-n junction diode. In other words, the LED allows forward current flow and blocks reverse flow.. Light-emitting diodes are built using a weak layer of heavily doped semiconductor material. Based on the semiconductor material used and the amount of doping, an LED will emit a coloured light at a particular spectral wavelength when forward biased.



LED Symbol

Below is the demonstration of the LED symbol. The symbol is similar to that of the p-n junction diode. The difference between these two symbols is that the two arrows indicate that the diode is emitting the light.

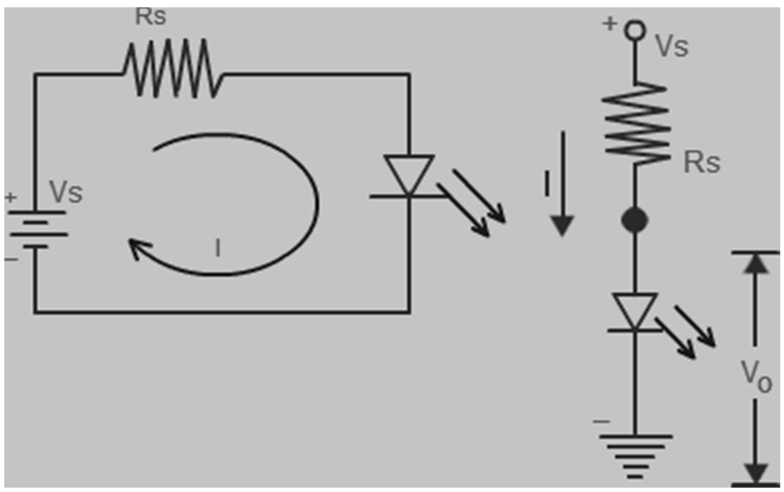


Given in the table below are the links related to LED:

- Differences Between LCD and LED
- Semiconductors and Insulators

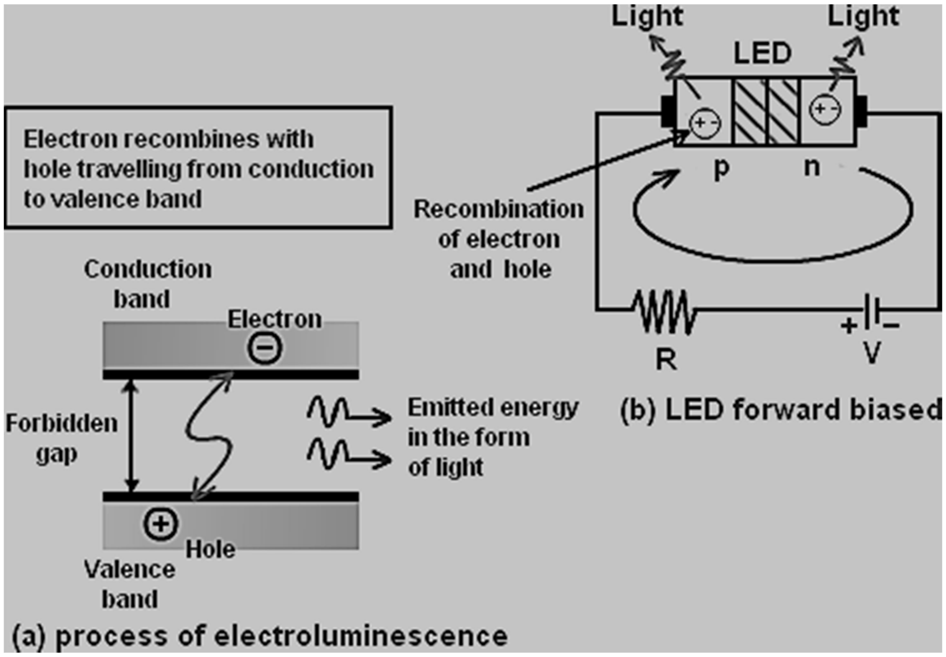
Light Emitting Diode Circuit

The LEDs also have a specific drop in voltage forward in cases where it is used typical circuits like a conventional diode. The drop in voltage depends on the current of LED, the colour of the produced light, etc. There are different values in the drop of voltage that would vary from 1.5V to 2.5 V current for 10 to 50 mA current.



Working Principle of LED

The holes lie in the valence band, while the free electrons are in the conduction band. When there is a forward bias in the p-n junction, the electron which is a part of the n-type semiconductor material would overrun the p-n junction and join with the holes in the p-type semiconductor material. Therefore regarding the holes, the free electrons would be at the higher energy bands.



The figure demonstrates the elementary process principle.

When this movement of free electron and hole takes place, there is a change in the energy level as the voltage drops from the conduction band to the valance band. There is a release of energy due to the motion of the electron.In standard diodes, the release of energy in the manner of heat. But in LED the release of energy in the form of photons that would emit the light energy. The entire process is known as electroluminescence, and the diodes are known as a light-emitting diode.

In LED, energy discharged in light form hinges on the forbidden energy gap. One could manipulate the wavelength of the light produced. Therefore, from its wavelength, the light colour and its visibility or cannot be controlled.The colour and wavelength of the light emitted can be determined by doping it with several impurities.

Uses of LED

LEDs find application in various fields, including optical communication, alarm and security systems, remote-controlled operations, robotics etc. It finds usage in many such areas because of its long-lasting capability, low power requirements, swift response time and fast switching capabilities. Below are a few standard LED uses:

- Used for tv backlighting

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- Uses in displays
- Used in automotive
- LEDs used in the dimming of lights

Types of LED

Below is the list of different types of LED that are designed using semiconductors:

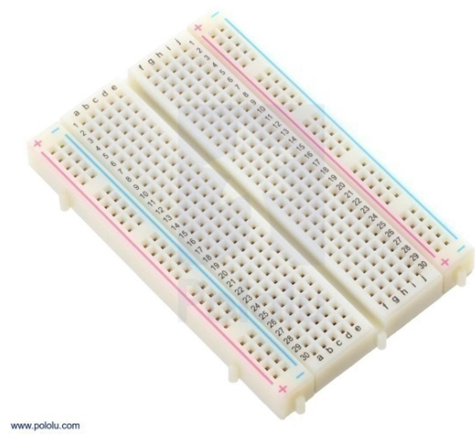
- Miniature LEDs
- High-Power LEDs
- Flash LED
- Bi and Tri-Colour
- Red Green Blue LEDs
- Alphanumeric LED
- Lighting LED

BUZZER

A **buzzer** or **beeper** is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

BREADBOARD

A **breadboard** is a solder less device for temporary prototype with electronics and test circuit designs. Most electronic components in an electronic circuit can be interconnected by inserting leads or terminals into the holes and connecting them with wires as needed.



JUMPER WIRES

A jumper cable is a simple cable with a connection pin on both ends and can be used to connect two points together without soldering. Jumpers are generally used on breadboards and other prototyping tools to facilitate circuit editing as needed.

9V BATTERY

The **nine-volt battery**, or **9-volt battery**, is a common size of battery that was introduced for the early transistor radios. It has a rectangular prism shape with rounded edges and a polarized snap connector at the top. This type is commonly used in walkie-talkies, clocks and smoke detectors.

The nine-volt battery format is commonly available in primary carbon-zinc and alkaline chemistry, in primary lithium iron disulfide, and in rechargeable form in nickel-cadmium, nickel-metal hydride and lithium-ion. Mercury-oxide batteries of this format, once common, have not been manufactured in many years due to their mercury content. Designations for this format include *NEDA 1604* and *IEC 6F22* (for zinc-carbon) or *MN1604 6LR61* (for alkaline). The size, regardless of chemistry, is commonly designated **PP3**—a designation originally reserved solely for carbon-zinc, or in some countries, *E* or *E-block*.

Most nine-volt alkaline batteries are constructed of six individual 1.5 V LR61 cells enclosed in a wrapper. These cells are slightly smaller than LR8D425 AAAA cells and can be used in their place for some devices, even though they are 3.5 mm shorter. Carbon-zinc types are made with six flat cells in a stack, enclosed in a moisture-resistant wrapper to prevent drying. Primary lithium types are made with three cells in series.

9-volt batteries accounted for 4% of alkaline primary battery sales in the United States in 2007, and 2% of primary battery sales and 2% of secondary battery sales in Switzerland in 2008

WORKING

The circuits shown in journals and online sites are quite complicated and hard to understand because they used timers and other IC's in that. Here we simplified it and got an easy to understand and simple circuit.

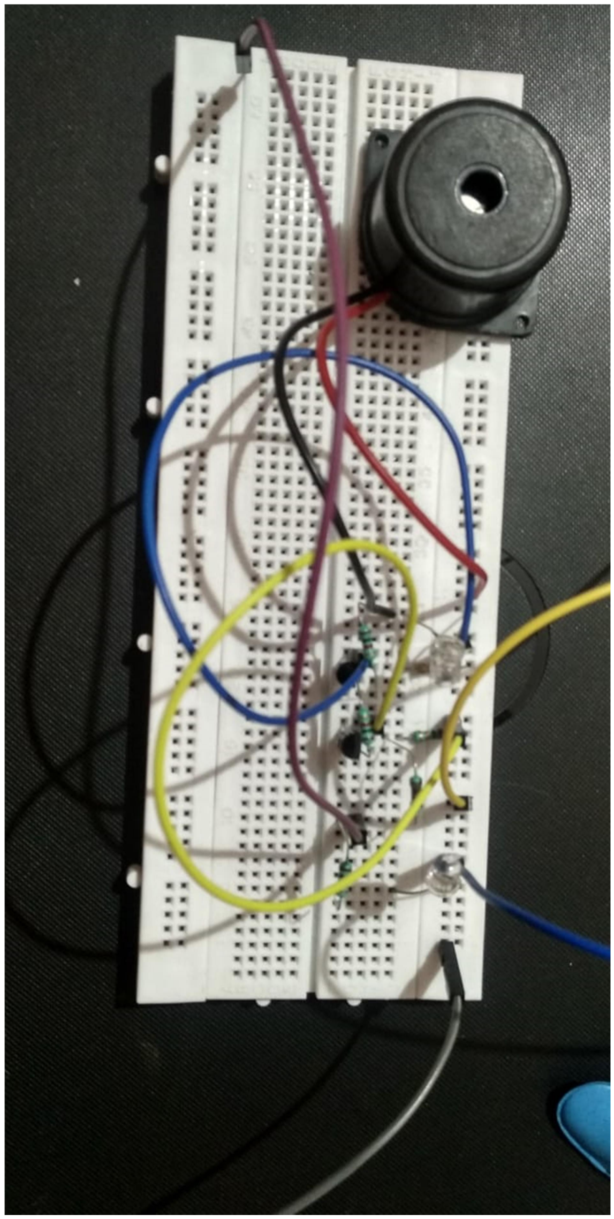
This project we have done helps in knowing if we have power or not. The audio visual indication helps us in knowing if we have power or not. When we have power the LED 1 glows and indicates the presence of power. When power fails the LED 1stops glowing and LED 2 starts glowing in red color along with the buzzer buzzing and indicates that the power has failed.

The circuit is first given an input power through the adaptor. This adaptor converts AC to DC. Then this DC is passed through the resistors R45 and R46 which creates a voltage divider bias. On one side the LED 2 glows indicating the presence of power and on the other it keeps the transistor T1 in ON state or 1 state. This transistor T1 enforces the transistor T2 to 0 state or off state . When T2 is in off state or 0 state the LED 1 and buzzer BZ1 won't work as there is no supply of current for them.

When the power fails then the transistor T1 switches off or goes to 0 state and transistor T2 goes to 1 state due to the power from 9V battery this keeps it turned on . As the transistor T2 is turned on , the transistor T2 supplies power to LED2 and buzzer BZ1 and makes it glow and buzz respectively.

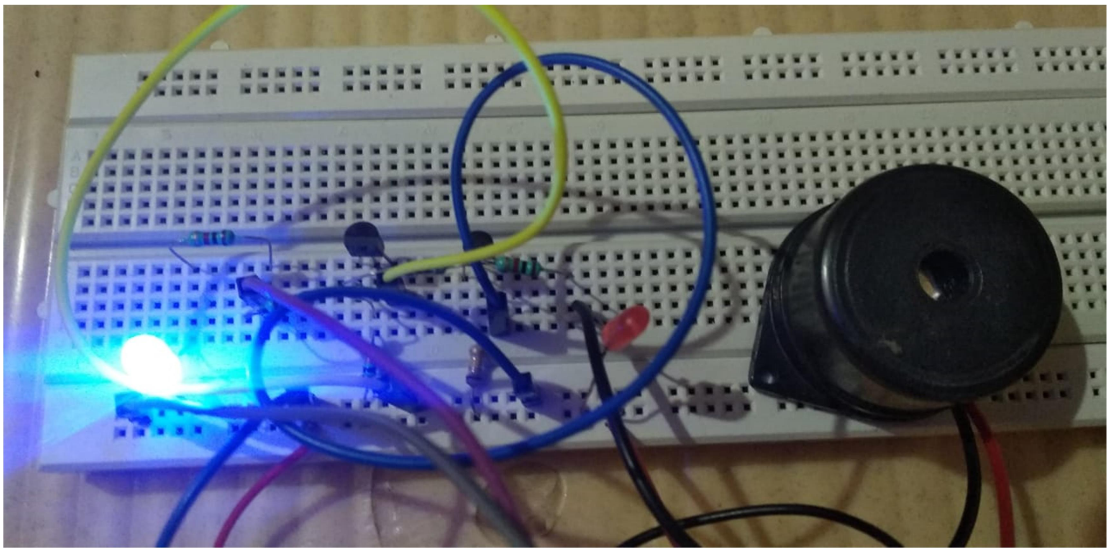
- Later when power resumes transistor T1 switches on and it enforces transistor T2 to switch off. The LED 1 and buzzer BZ1 stop working. The LED2 will start to glow again.
- Here are some biasing values of both transistors recorded during operation

	Transistor T1	Transistor T2
When 5V adaptor is on	**0.7V (on)**	**0.16V (off)**
When 9V battery is on	**0.06V (on)**	**0.65V (off)**

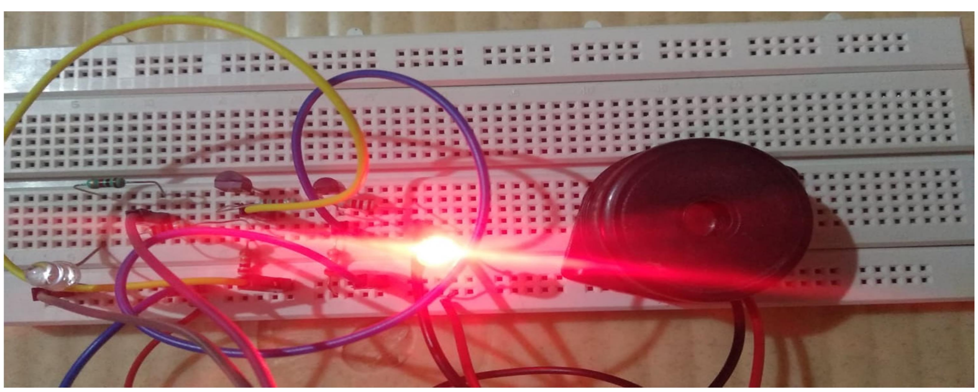


RESULT AND DISCUSSION

- The main goal of the project was to know the status of the power.
- It gives audio-visual indication.
- The circuit was built and was successful.



WHEN POWER RESUMES



WHEN POWER FAILS

CONCLUSION AND FUTURE SCOPE

The aim of our project has been achieved successfully.

It's cost effective and the circuit is very simple, we can use connect this type circuits even to ups and other alternative sources to give power when the power is off.

This circuit can also be designed by replacing 9v battery to capacitor where it can charge and discharge across resistors and make the transistor in on state.

<u>REFRENCES AND APPENDIX</u>

Online website's link used :

https://electronicsforu.com/electronics-projects/power-failure-and-resumption-alarm

JOURNAL PAPERS:

Mains failure and resumption alarm

-V David