AUTOMATIC NIGHT LIGHT

BY

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A proposal project submitted in fulfillment of the requirement for award of the diploma of Electrical Engineering (Communication) Department of Electrical Engineering Polytechnic Seberang Perai (PSP)

DECLARATION

We hereby declare that this is the result of our own investigations, except where otherwise stated. We also declare that is has not been previously or concurrently submitted as a whole for any other projects at Seberang Perai Polytechnic.

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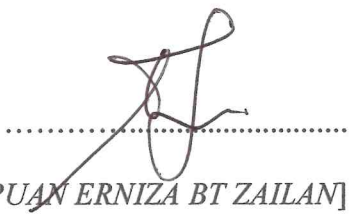
APPROVAL PAGE

I certify that I have supervised and read this study and that in my opinion, it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as Final Year Project report as partial fulfillment for a diploma of Electronic Engineering (Communication).



[*PUAN ERNIZA BT ZAILAN*]

Supervisor

ABSTRACT

Is seems today, people are so busy chasing time to do their daily lifestyles such as man and woman who got to work, students who go to the college and many more. Due to the era of modernization, peoples sometime neglect a little thing that can bring pain in the future. One of those things is the problem of letting the light on without switching off from day to night. Without realize, the electric bills are increasing from day to day. Yet it's too late to be regret. So based on our experienced and observation among the citizen in our hometown, comes the idea to make something that can help to reduce the wastage of electrical energy and time at the same time. The idea is to make an automatic night light that will switched on during dusk till all the night and will switch off during the dawn till all the day depend on the intensity of light from the surrounding. This will help the busiest people to lowest their electrical bills due to wastage of neglecting to switch off the light as it will off by itself. By supply of housing plug, even disable people will be effortlessly turn on the light. There is no need from external disturbance to on nor off the light. This will ensure the safety of kids or child from playing with the switches. Moreover, people on holidays doesn't need to worry of their house electrical use as its function by itself like normal day without them. This if not much, a little bit help to secure house from any thievery or any housebreaking. . Science and technology always try to make human life easier. So the main purpose of this paper is based on abating the weakness of normal human beings which is forgetful by constructing a sensor based device that can cooperate with human being in decreasing worries, stress and electrical wastage from undeniable weaknesses of forgetful. The hardware build on consist of component such as capacitors, transistors, resistors, optocoupler, triac, LDR, bridge diodes, zener diodes, fuse and fuse holder, rheostat, T-block, Light source, and adapter.

ACKNOWLEDGEMENT

'In the name of Allah, Most Gracious, Most Merciful'

First of all, all praises be to Allah SWT for giving us the opportunity to learn new things in completing this project entitled 'Automatic Night Light '

The completion and success of this project are not possible without the assistance, guidance and encouragement from many individuals. On the very outset of this project report, we would like to extend our sincere and heartfelt obligation towards all the personas who have helped us in this endeavour. We would like to express our heartiest gratitude and extremely thankful to our supervisor, Mrs Erniza Binti Zailan for his conscientious guidance, supervision, and encouragement which has helps us in completing this project. Next, to Politeknik Seberang Perai especially to the department of electrical engineering, we would like to extend our gratitude for giving us the opportunity to make this project.

Last but not least, we would like to acknowledge with a deep sense of reverence, our gratitude towards our parent and friends, for their constant supports morally and financially. Any omission from this acknowledgment does not mean lack of gratitude from me. May Allah bless everyone that contributed to our project, Insha'Allah.

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INTRODUCTION

1.1 Background

About 80% of people in the world have access to electricity. But despite the fact that more and more people are getting access to electricity we use very different amounts of it. The consumption of electricity in Malaysia rises rapidly every year, with an average of 2,533 GWh per year. The electricity consumption, for instance, in 1971 was 3,464 GWh and 94,278 GWh in 2008. By 2020, Malaysia's electricity consumption is expected to increase by about 30% from its present value to 124,677 GWh .

The main purpose of our project is to reduce if not much, a slightly change to our electricity consumption. By theory, our project can help residents to avoid wastage of electricity from neglecting to turn off the light in outside the house, garden or parking lot. As today's people were barely switch off their light whenever their leaves their house. We got evidences to prove this incidences happen among our residential. Its take time to roam around your house just to find and turn off the switches, and what make this task harder is if the switch are not at the place where people easy to see and reach. So we take responsible act to make an automatic appliance that can help people to not waste their time and electricity wastage by automatically turn on and off with the scheduled of the day and night.

Moreover, this project also ensure and increase the safety of the kids as they don't have to do the task of switch off the light. Some of children does not aware of the danger with switches which might exposed them to electric shock if not handle carefully. By this project, kids doesn't need to act anything to turn off the light.

1.2 Objective

This project has objectives which it's be a guide line in process to develop this project. The objectives are:

- To reduce the cost of electrical usage
- To reduce time waste on turning light switch on and off
- To make a light source that light on in the night and light off in the day
- To make a reliable light source
- To make an electrical appliance that can be used safely

1.3 Problem Statement

In our home we usually have a light bulb that illuminates the entrance, the courtyard garden clothes or suede. As a light that is on the outside of the house, who has not been forgotten to turn it off? We left it turned on for hours and hours in the day and sometimes for weeks, causing unnecessary power consumption. Turning off these switches might be a difficult task as we need to rush during our busiest hours doing all our everyday preparation!

As a student or worker which always scheduled on 8 a.m. in the morning, we don't have much time to waste on tasking like turn off the switches of all our house. And most of the time we are forgetful and neglect the light turn on throughout the day, week or might be a month! Those resulting in increasing of electric bills, wasting energy and causing unnecessary power consumption.

1.4 Problem Solution

Thinking about a solution to this problem, we have designed an electronic device that handles light a bulb, when the sun goes down and automatically shuts off when the sun returns to appear at dawn, like lamps lighting Street lighting.

Another of our motivations for doing this circuit is to present some components such as optocouplers and triacs, teaching basic operation.

1.5 Project Description

This project is created to help student like me or other to solve the problem of neglecting to turn off the light switches at our home. Which can help us reduce the time wasted in the early morning and also reduce the electrical bills. This light can automatically turn off during the daytime and turn on when the sun goes down.

1.6 Project Scope

This project can be used by all types of people and can be used at place where there exposed to light sources like the sun. Some example of the places:

- Parking lot
- Street Vendor
- Sidewalk
- Courtyard

CHAPTER 2:

LITERATURE REVIEW

2.1 Introduction

In this section, we will discuss about and share about all the information that we obtain from the study and research which is vital for us to get the project done. From the research, we also obtain some knowledge theory base and practically base which can be used for us to successfully complete this project and attaint's our objective. Majority materials are article, e-e-books, internet websites and previous work related to the project. The materials will be compiled and used as guidance for us to complete our projects. . We're expecting that this project could be useful to the citizens of housing area, and any other people who faced problems like we already mention earlier. The research is carried out on the components of devices such as transistors, resistors, capacitors, optocoupler, triac, LDR(Light dependent resistor), diodes, zener diodes, fuse holder's and fuse, rheostat and aluminium sink. . From the research, it help us to determine the suitable components to be used as a parts of our projects. Since the components has a wide range of selection, the study will help us choose the best to make our project run smoothly.

2.2 Component

2.2.1 Capacitors

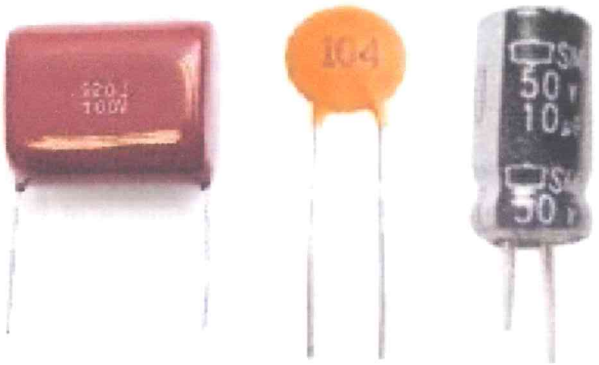

Figure 2.0: Capacitors

A capacitor originally known as a condenser is a passive two-terminal electrical component used to temporarily store electrical energy in an electric field. The forms of practical capacitors vary widely, but most contain at least two electrical conductors plates separated by a dielectric i.e. an insulator that can store energy by becoming polarized. The conductors can be thin films, foils or sintered beads of metal or conductive electrolyte, etc. The non conducting dielectric acts to increase the capacitor's charge capacity. Materials commonly used as dielectrics include glass, ceramic, plastic film, paper, mica, and oxide layers. Capacitors are widely used as parts of electrical circuits in many common electrical devices. Unlike a resistor, an ideal capacitor does not dissipate energy. Instead, a capacitor stores energy in the form of an electrostatic field between its plates.

When there is a potential difference across the conductors e.g., when a capacitor is attached across a battery, an electric field develops across the dielectric, causing positive charge +Q to collect on one plate and negative charge −Q to collect on the other plate. If a battery has been attached to a capacitor for a sufficient amount of time, no current can flow through the capacitor. However, if a time-varying voltage is applied across the leads of the capacitor, a displacement current can flow.

An ideal capacitor is characterized by a single constant value, its capacitance. Capacitance is defined as the ratio of the electric charge Q on each conductor to the potential difference V between them. The SI unit of capacitance is the farad (F), which is equal to one coulomb per volt (1 C/V). Typical capacitance values range from about 1 pF (10−12 F) to about 1 mF (10−3 F).

The larger the surface area of the "plates" conductors and the narrower the gap between them, the greater the capacitance is. In practice, the dielectric between the plates passes a small amount of leakage current and also has an electric field strength limit, known as the breakdown voltage. The conductors and leads introduce an undesired inductance and resistance.

Capacitors are widely used in electronic circuits for blocking direct current while allowing alternating current to pass. In analog filter networks, they smooth the output of power supplies. In resonant circuits they tune radios to particular frequencies. In electric power transmission systems, they stabilize voltage and power flow.

Energy storage is the primary function of a capacitor. Capacitors store electric energy when they are connected to a battery or some other charging circuit. They are commonly placed in electronic components and are used to maintain a power supply while the device is unplugged and without a battery for a short time. The capacitors used in this project are:

- C1= 2.2uF capacitor (225) polyester 250 volt or more
- C2= 22uF to 47uF 350 volt
- C3= 47uF capacitor at 25 volt
- C4= 0.1uF capacitor (104) ceramic or polyester

2.2.2 Transistors

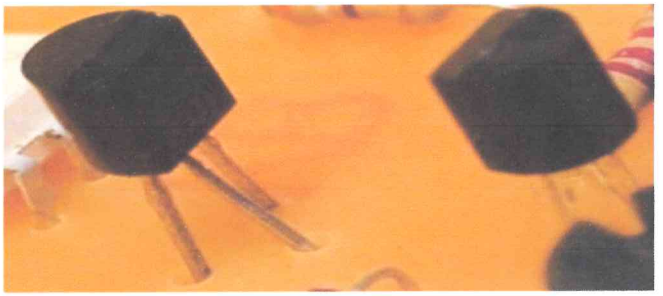

Figure 2.1: Transistors

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. A voltage or current applied to one pair of the transistor's terminals changes 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.

Transistors function as current amplifiers or binary switches. With amplification, a small current controls a gate for a greater current. When functioning as a binary switch, the identical control-gate/output process is used. The difference is that for the gate to be open binary digit one, it cannot figuratively be ajar as within the amplification function, for example a 5-volt threshold is required. Anything less than 5 volts received from the base means the gate is closed binary digit zero. The transistor used in this project are:

- Transistor 2N3904
- Transistor 2N2907

2.2.3 Resistors

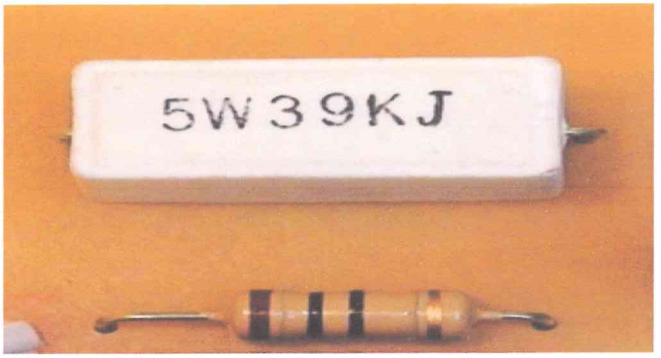

Figure 2.2: Resistors

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 within integrated circuits.

Resistor is a specialized electrical component that provides resistance as a circuit element. Resistors are passive, which means they are not affected by the current they carry. Resistors have two primary functions within a circuit which is reduce current flow and lower voltage. The resistor used in this project are:

- R1= 330K ohm to 1/4W (100K,470K up)
- R2= 10 ohm 1 W
- R3= 39K ohm to 47K ohm 5 W
- R4= 10K ohm 1/4W
- R5= 1K ohm 1/4W
- R6= 2.2K ohm 1/4W
- R7= 390 ohm 1/4W
- R8= 100 ohm 1/4W for 120 V

2.2.4 Optocoupler

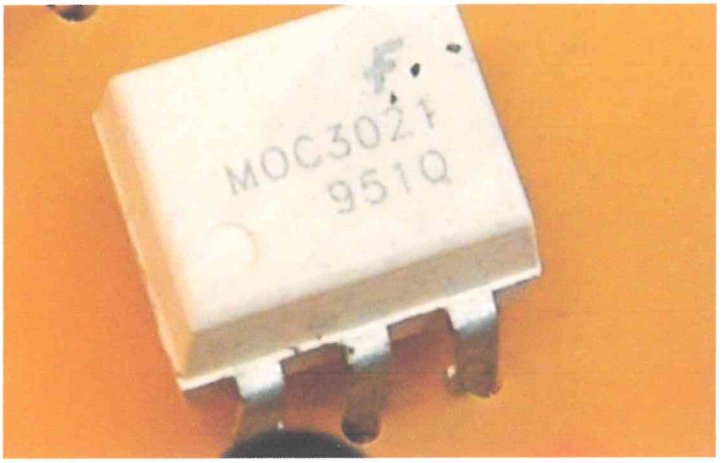

Figure 2.3: Optocoupler

Optocoupler contains a source emitter of light, almost always a near infrared light-emitting diode LED, that converts electrical input signal into light, a closed optical channel also called dielectrical channel, and a photosensor, which detects incoming light and either generates electric energy directly, or modulates electric current flowing from an external power supply. The sensor can be a photoresistor, a photodiode, a phototransistor, a silicon-controlled rectifier SCR or a triac. Because LEDs can sense light in addition to emitting it, construction of symmetrical, bidirectional opto-isolators is possible. An optocoupled solid state relay contains a photodiode opto-isolator which drives a power switch, usually a complementary pair of MOSFETs. A slotted optical switch contains a source of light and a sensor, but its optical channel is open, allowing modulation of light by external objects obstructing the path of light or reflecting light into the sensor.

Optocoupler is a passive optical component that can combine or split transmission data from optical fibers. It is an electronic device which is designed to transfer electrical signals by using light waves in order to provide coupling with electrical isolation between its input and output. The main purpose of an optocoupler is to prevent rapidly changing voltages or high voltages on one side of a circuit from distorting transmissions or damaging components on the other side of the circuit. An optocoupler contains a light source often near an LED which converts electrical input signal into light, a closed optical channel and a photosensor, which detects incoming light and either modulates electric current flowing from an external power supply or generates electric energy directly. The optocoupler used is:

- Optocoupler MOC3021

2.2.5 Triac

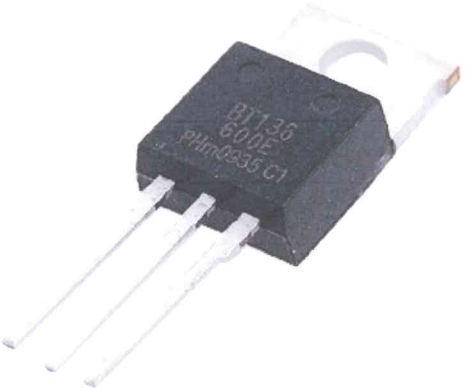

Figure 2.4: Triac

A Triac is a three terminal bidirectional semiconductor switching device which can control alternating current in a load.

Triac word made from two words: 'Tri' and 'ac'. Where Tri means three and 'ac' means alternating current. Thus triac is a three terminal device which can control alternating current in a load.It is an abbreviation for a triode ac switch. It is a bidirectional device, that means it can conduct in both directions for a specific time period. That is why sometimes, it is also known as bidirectional semiconductor triode switch.

TRIAC, from triode for alternating current, is a generic trademark for a three terminal electronic component that conducts current in either direction when triggered. Its formal name is bidirectional triode thyristor or bilateral triode thyristor. A thyristor is analogous to a relay in that a small voltage and current can control a much larger voltage and current. Triac used is:

- Triac BT136 or BTA08600

Construction of Triac:

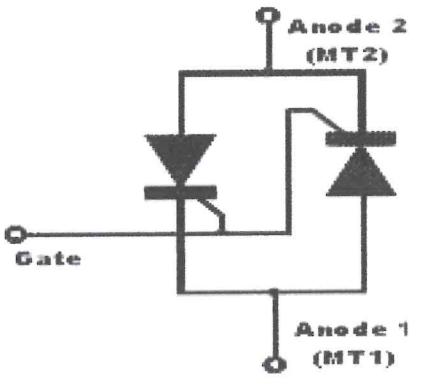

Figure 2.4.1: Construction of Triac

This figure shows the basic construction of triac that a Triac is basically made by connecting two Silicon Controlled Rectifiers in inverse parallel combination with common gate. A triac is almost similar to an SCR , but Triac is a bidirectional device whereas SCR is a unidirectional device like Diode. The internal layers and doping is done in such a way that the current can flow in both directions. The figure shows the equivalent circuit. It clearly shows that a Triac is made by connecting two SCRs in inverse parallel combination and by making gate common.

2.2.6 LDR (light dependent resistor)

Figure 2.5: LDR (light dependent resistor)

Figure 2.5.1: The symbol for a photoresistor

A photoresistor or light-dependent resistor, LDR, or photocell is a light-controlled variable resistor. The resistance of a photoresistor decreases with increasing incident light intensity; in other words, it exhibits photoconductivity. A photoresistor can be applied in light-sensitive detector circuits, and light- and dark-activated switching circuits.

A photoresistor is made of a high resistance semiconductor. In the dark, a photoresistor can have a resistance as high as several megohms while in the light, a photoresistor can have a resistance as low as a few hundred ohms. If incident light on a photoresistor exceeds a certain frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electrons conduct electricity, thereby lowering resistance. The resistance range and sensitivity of a photoresistor can substantially differ among dissimilar devices. Moreover, unique photoresistors may react substantially differently to photons within certain wavelength bands.

A photoelectric device can be either intrinsic or extrinsic. An intrinsic semiconductor has its own charge carriers and is not an efficient semiconductor, for example, silicon. In intrinsic devices the only available electrons are in the valence band, and hence the photon must have enough energy to excite the electron across the entire bandgap. Extrinsic devices have impurities, also called dopants, added whose ground state energy is closer to the conduction band; since the electrons do not have as far to jump, lower energy photons are sufficient to trigger the device. If a sample of silicon has some of its atoms replaced by phosphorus atoms , there will be extra electrons available for conduction.

A light dependent resistor, or LDR, varies resistance in a circuit based on how much light shines on it. When fully illuminated, the LDR has no resistance and current flows freely, but with darkness the resistance increases and current flow stops. In most circuit designs, the LDR acts like an on/off switch based on how much light shines on it. LDR is used 2ith 1 photo resistance.

2.2.7 Diodes Bridge

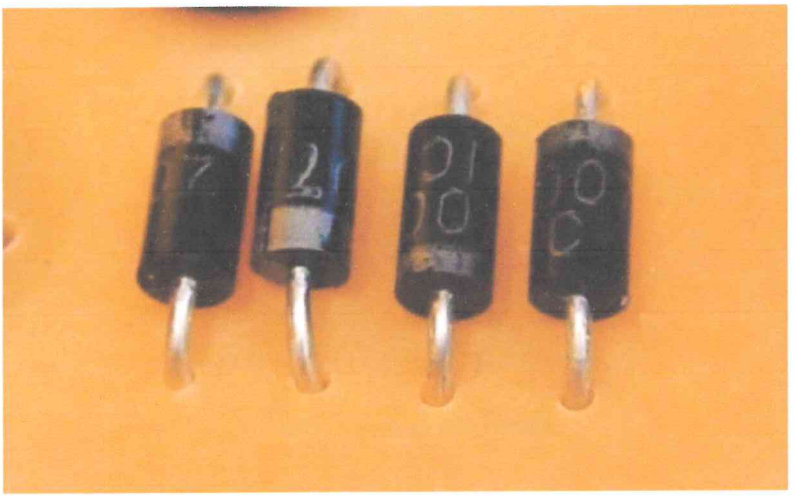

Figure 2.6: Diodes Bridge

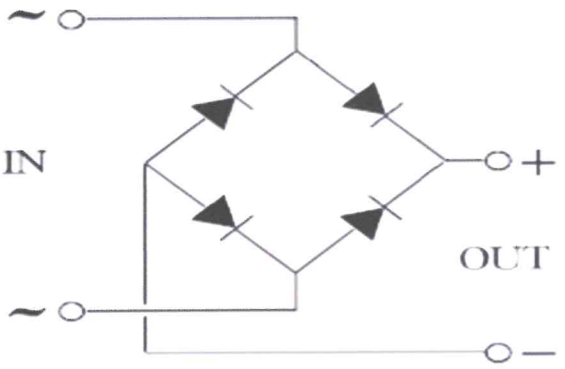

Figure 2.6.1: Symbol of Bridge

A diode bridge is an arrangement of four diodes in a bridge circuit configuration that provides the same polarity of output for either polarity of input.

When used in its most common application, for conversion of an alternating current (AC) input into a direct current (DC) output, it is known as a bridge rectifier. A bridge rectifier provides full-wave rectification from a two-wire AC input, resulting in lower cost and weight as compared to a rectifier with a 3-wire input from a transformer with a center-tapped secondary winding.

A diode is a two-terminal electronic component that conducts primarily in one direction, it has low resistance to the flow of current in one direction, and high resistance in the other. The diode use are 4 diodes 1N4007.

2.2.8 Zener diode

Figure 2.7: Zener Diode

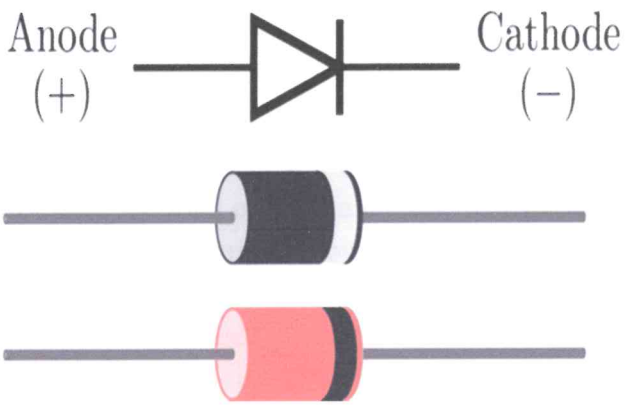

Figure 2.7.1: Symbol of Zener Diode

A Zener diode allows current to flow from its anode to its cathode like a normal semiconductor diode, but it also permits current to flow in the reverse direction when its "Zener voltage" is reached. Zener diodes have a highly doped p-n junction. Normal diodes will also break down with a reverse voltage but the voltage and sharpness of the knee are not as well defined as for a Zener diode. Also normal diodes are not designed to operate in the breakdown region, but Zener diodes can reliably operate in this region.

2.2.9 Fuse and fuse holder

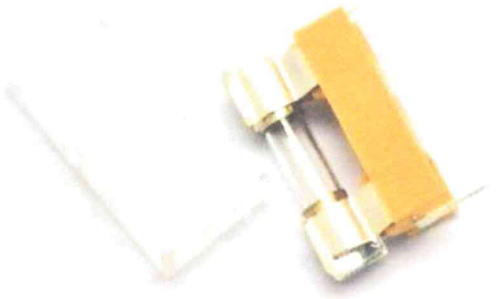

Figure 2.8: Fuse and Fuse Holder

A fuse is a type of low resistance resistor that acts as a sacrificial device to provide overcurrent protection, of either the load or source circuit. Its essential component is a metal wire or strip that melts when too much current flows through it, interrupting the circuit that it connects. Short circuits, overloading, mismatched loads, or device failure are the prime reasons for excessive current. Fuses can be used as alternatives to circuit breakers.

A fuse interrupts an excessive voltage so that further damage by overheating or fire is prevented. Wiring regulations often define a maximum fuse current rating for particular circuits. Overcurrent protection devices are essential in electrical systems to limit threats to human life and property damage. The time and current operating characteristics of fuses are chosen to provide adequate protection without needless interruption. Slow blow fuses are designed to allow harmless short term currents over their rating while still interrupting a sustained overload. Fuses are manufactured in a wide range of current and voltage ratings to protect wiring systems and electrical equipment. Self-resetting fuses automatically restore the circuit after the overload has cleared, and are useful in environments where a human replacing a blown fuse would be difficult or impossible, for example in aerospace or nuclear applications

A fuse prevents an electrical object from receiving too much current. In the event too much electricity is received by an electrical component, the fuse is designed to melt and separate. The fuse holder are the place to hold the fuse. We use fuse 2 Amp.

2.2.10 Rheostat/ Potentiometers

Figure 2.9: Rheostat

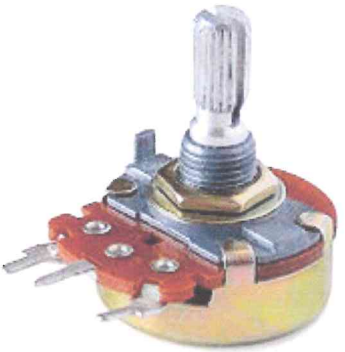

Figure 2.9.1: Potentiometers

Potentiometers or Rheostat are commonly used to control electrical devices such as volume controls on audio equipment. Potentiometers operated by a mechanism can be used as position transducers, for example, in a joystick. Potentiometers are rarely used to directly control significant power more than a watt, since the power dissipated in the potentiometer would be comparable to the power in the controlled load.

A rheostat is a variable resistor that is used to alter the amount of voltage or current in a circuit. Rheostats make possible functions of electronics such as light dimmers. The rheostat used are 20K ohm.