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DEPARTMENT OF ELECTRONICS ENGINEERING

A Skill Based Mini Project Report

On

HARDWARE MODEL FOR NIGHT SENSING LIGHT

Submitted By

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Under the Mentorship of

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CERTIFICATE

Department Of Electronics Engineering

This is to certified this Project by

AYUSH AGRAWAL (0901EC221023)

of 3rd semester ELECTRONIS ENGINEERING have successfully completed the skill based mini project "**MODEL FOR NIGHT SENSING LIGHT**" which is a record of my work carried out under the mentorship of Dr.R. Jenkin Suji and Dr. R.P Narwaria. To the best of my knowledge the matter present in this project is an original work and has not been submitted for the award of any other diploma or degree certificate.

Under the guidance of

Dr.R. Jenkin Suji

Dr. R.P Narwaria

ACKNOWLEDGEMENT

I take great pleasure in extending my gratitude to our institute, Madhav Institute Of Technology and Science, to provide us with the golden opportunity to perform my project. This helped me to understand the concepts through their practical implementation.

I would also like to extend my acknowledgement to our subject teachers Dr.R Jenkin Suji and Dr.R.P Narwaria. Their valuable guidance helped me know the project aim. In addition to this, their constructive feedback helped me turn this into a success.

The active and productive guidance of Dr. Vandana Vikas Thakare (Head, Department of Electronics Engineering) contributed greatly in the completion of the project.

I also acknowledge with gratitude to our director Dr. R.K. Pandit for providing the facilities needed for the accomplishment of this project.

The environment at MITS has been a valuable experience for us. It has provided an opportunity to learn at our own pace in our discipline of interest. The present project is an ample testimonial of the face. Lastly, I would like to thank all those who helped I during different stages of completion of this project as without them it would not have been possible.

Students' Signature

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1. INTRODUCTION

A nightlight is a small light fixture, usually electrical, placed for comfort or convenience in dark areas or areas that may become dark at certain times, such as at night or during an emergency. Small long-burning candles serving a similar function are referred to as "tea lights". An automatic night light is a device that turns on light when there is darkness in the surrounding area. It's a portable version of automatic street lights. In this we use a **LDR (Light Dependent Resistor) which varies resistance with respect to light intensity.**

Fig. 1: Light Dependent Resistor

1.1. Light Dependent Resistor (LDR)

LDR (Light Dependent Resistor) as the name states is a special type of resistor that **works on the photoconductivity principle** that means that resistance changes according to the intensity of light. Its **resistance decreases with an increase in the intensity of light**. It is often used as a light sensor, light meter, anutomatic street lights, and in areas where we needto have light sensitivity. It is also called a Light Sensor. LDR are usuallyavailable in 5mm, 8mm, 12mm and 25mm dimensions. The LDRs made with photosensitive semiconductor materials like Cadmium Sulfides (CdS), lead sulfide, lead selenide, indium antimonide or cadmium selenide and they are placed in Zigzag shape, and two metal contacts are placed on both ends of the Zigzag shape; these metal contacts help in creating a connection with the LDRs. Now, a transparent coating is applied on the top so that the zig-zag-shaped photosensitive material gets protected and as the coating is transparent the LDR will be able to capture light from the outer environment for its working.

1.2. Working of LDR

Whenever the light falls on its photoconductive material, it absorbs its energy and the electrons of that photoconductive material that is in the valence band get excited and go to the conduction band and thus increasing the conductivity as per the increased in light intensity. Also, the energy in incident light should be greater than the band gap energy so that the electrons from the valence

band got excited and go to the conduction band. The LDR has the highest resistance in dark around 1012 Ohm and this resistance decreases with the increase in Light.

1.3. Difference between LDR and photodiodes

Photodiodes give quick response and are used where needed to detect quick response on and off like in optical communication, and optoisolators. The photodiodes are semiconductor devices and work on PN junctions. The photodiode works on the principle of converting the light energy into electric energy while the LDR is resistance and its resistance decreases with the increase in light intensity. They are generally used in automatic security lights. Whereas the Photocell, a photoelectric, photovoltaic effect or photoconductivity is used to generate a current or a voltage when exposed to light or other electromagnetic radiation. They are generally used in burglar alarms.

1.4. Limitations of LDR

- LDRs require a few milliseconds or more to respond fully to the changes in light intensity, i.e. they require few seconds to return to their normal resistance once the light source is removed.
- The sensitivity of an LDR varies with the light wavelength. If the wavelength is outside a certain range, it will not affect the resistance at all.
- Light-dependent resistors have lower sensitivity than photodiodes and phototransistors.

2. COMPONENTS REQUIRED

1. BC 547 Transistor
2. Carbon Resistor (10KOhm)
3. Light Dependent Resistor (LDR)
4. Light Emitting Diode (LED)
5. Battery
6. Breadboard
7. Wires

1. Transistor (BC547)

A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power. It is composed of semiconductor material with three terminals for connectionto an external circuit.
Emitter (E): It is the left hand side thick layer of the transistor which is heavily doped;Base (B): It is a central thin layer of transistor which is lightly doped;
Collector (C): It is the right hand side thick layer of the transistor which is moderately doped;

A p-n-p junction transistor is obtained by growing a thin layer of thin layer of n-type semi-conductor in between two relatively thick layers of p-type semi-conductor.

An n-p-n junction transistor is obtained by growing a thin layer p-type semi-conductor inbetween two relatively thick layers of n-type semi-conductor.

In the project, n-p-n transistor (BC-547) is used.

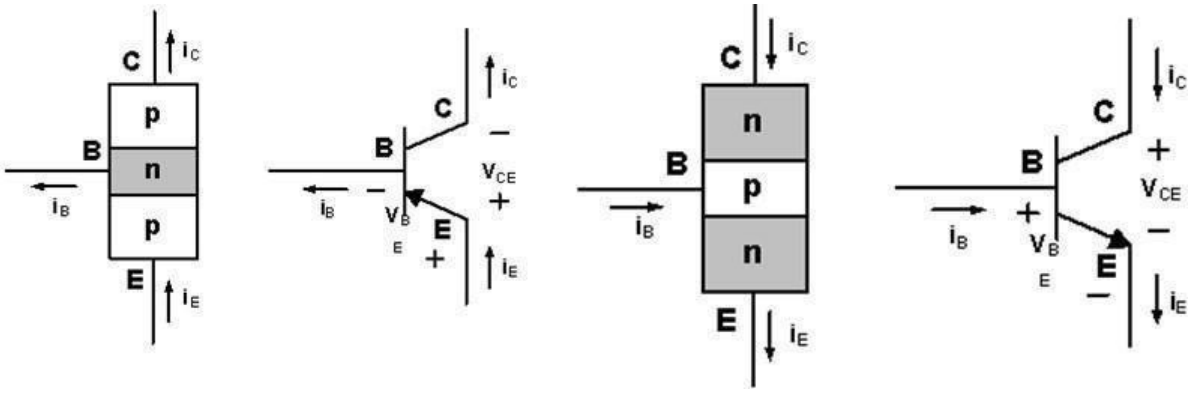
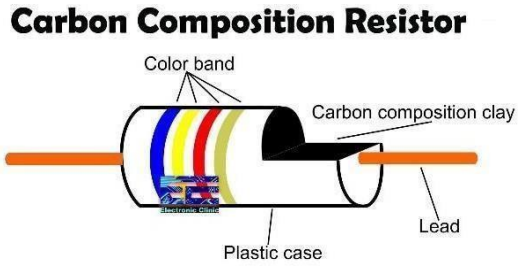


Fig. 2: p-n-p and n-p-n transistor

2. Carbon Resistor (10KOhm)

A carbon resistor has generally four rings or bands A, B, C and D of different colors corresponding to the value of resistance. It is an electrical component that reduces the electriccurrent. The resistors ability to reduce the current is called resistance and is measured in unitsof ohms. If we make an analogy to water flow through pipes. The resistor is a thin pipe that reduces the water flow.

Fig. 3: Carbon Resistor



3. Light Dependent Resistance (LDR)

LDRS or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance ofan LDR is very high sometimes as high as 1000000 ohms, but whenthey are illuminated with light resistance drops dramatically. Electronic onto sensors are the devices that alter their electrical characteristics in the presences of visible or invisible light. The best-known devices of this type are the light dependent resistor (LDR), the photo diode and the phototransistors.

Light dependent resistor as the name suggests depends on light for the variation of resistance.

• LDR are made by depositing a film of cadmium sulphide or cadmium selenide on a substrateof ceramic containing no or very few free electrons when not illuminated. The longer the stripthe more the value of resistance.

•Then light falls on the strip. The resistance decreases. In the absence of light the resistance canbe in the order of 10K ohm to 15K ohm and is called the dark resistance.

The device consists of a pair of metal film contacts separated by a snakelike track of cadmiumsulphide film. Designed to provide the maximum possible contact area with the two metal films.The structure is housed in a clear plastic or resin case, to provide free access to external light. Practical L7DRs are available in variety of sizes and packages styles, the most popular size having a face diameter of roughly 10mm, practical LDR is shown in figure below.

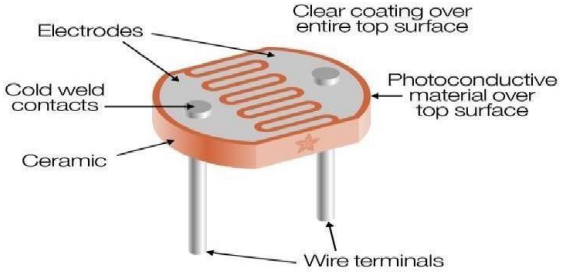


Fig. 4: Practical LDR

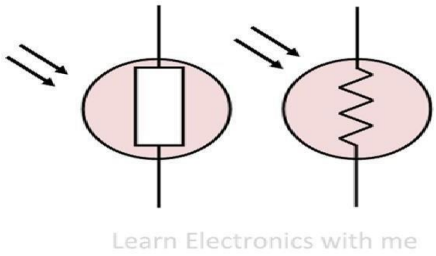


Fig. 5: Symbol of LDR

4. Light Emitting Diode (LED)

A light-emitting diode (LED) is a two-lead semiconductor light source that resembles a basic p-n junction diode, except that an LED also emits light. When an LED's anode lead has a voltage that is more positive than its cathode lead by at least the LED's forward voltage drop, current flows. Electrons are able to recombine with holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor. In this project, we use led of white color.

5. Battery (9V)

A battery is a source of electric power consisting of one or more electrochemical cells with external connections for powering electrical devices.

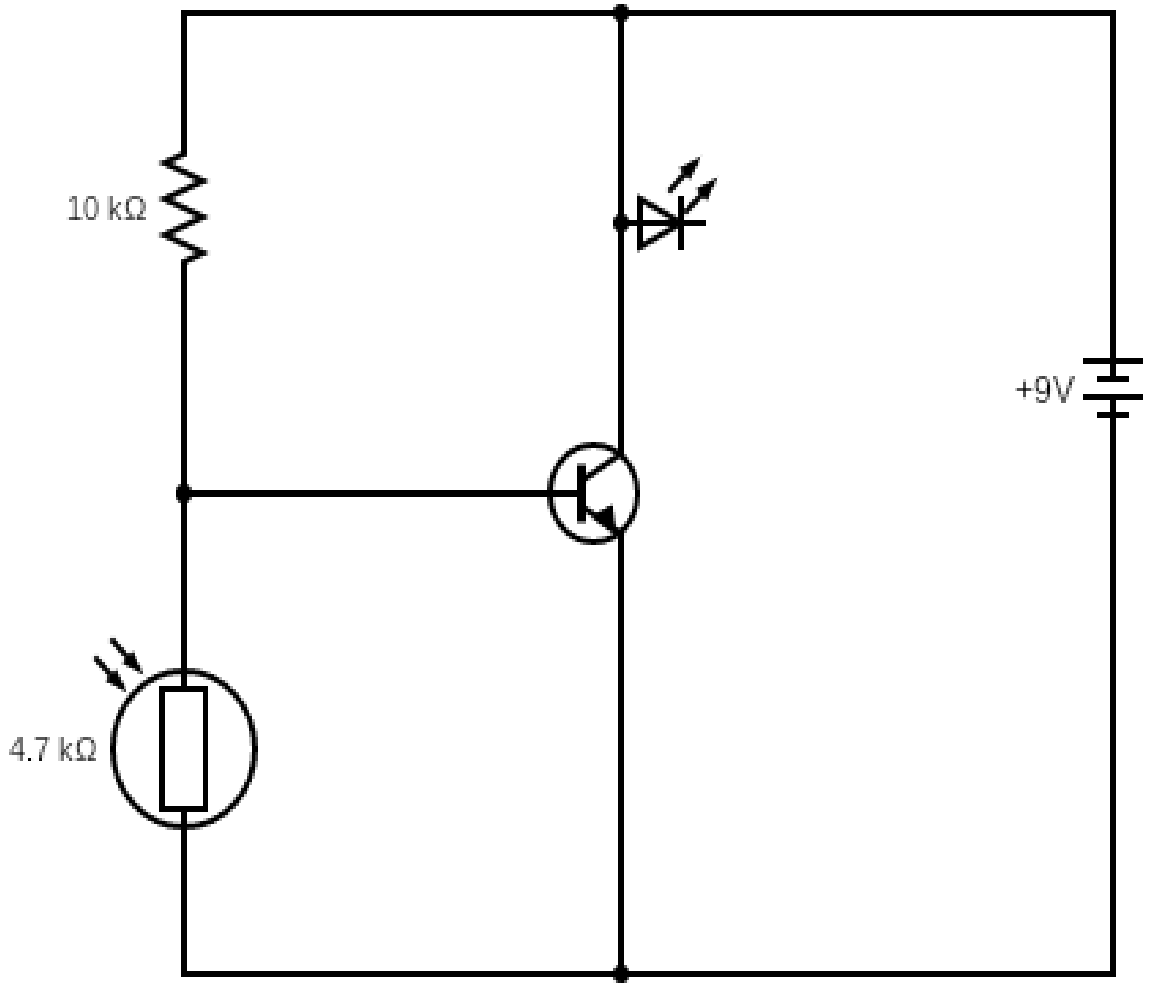
6. Breadboard

A breadboard, solder less breadboard, or protoboard is a construction base used to build semi- permanent prototypes of electronic circuits. Breadboards do not require soldering or destruction of tracks and are hence reusable.

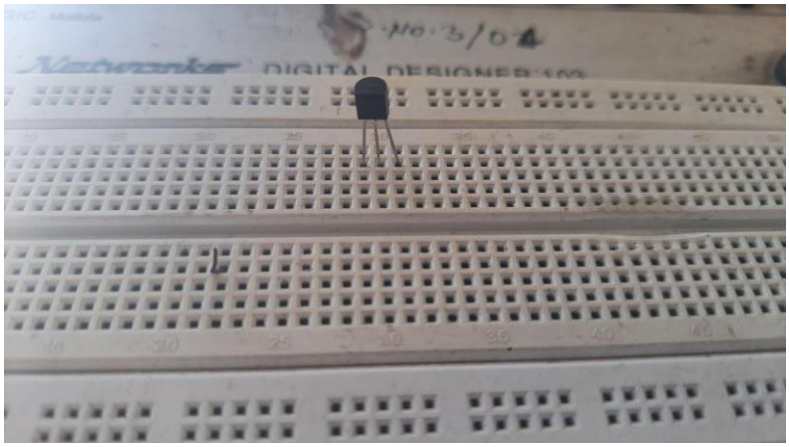
7. Wires

A wire is a single, usually cylindrical, flexible strand or rodof metal. These are used to connectcomponents.

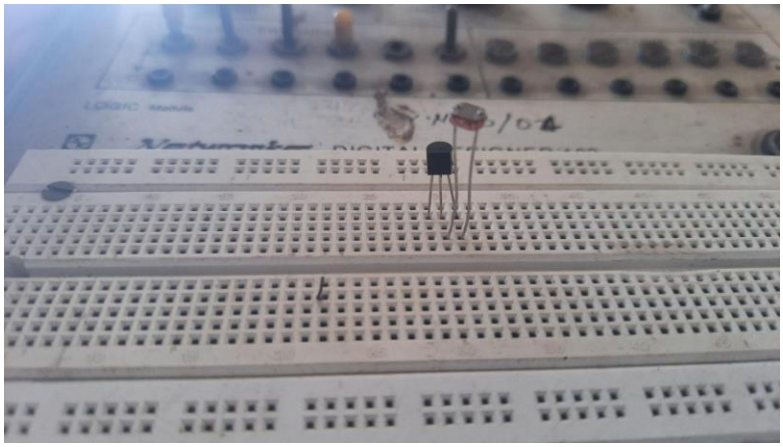
3. CIRCUIT DIAGRAM



4. DEVICE FABRICATION

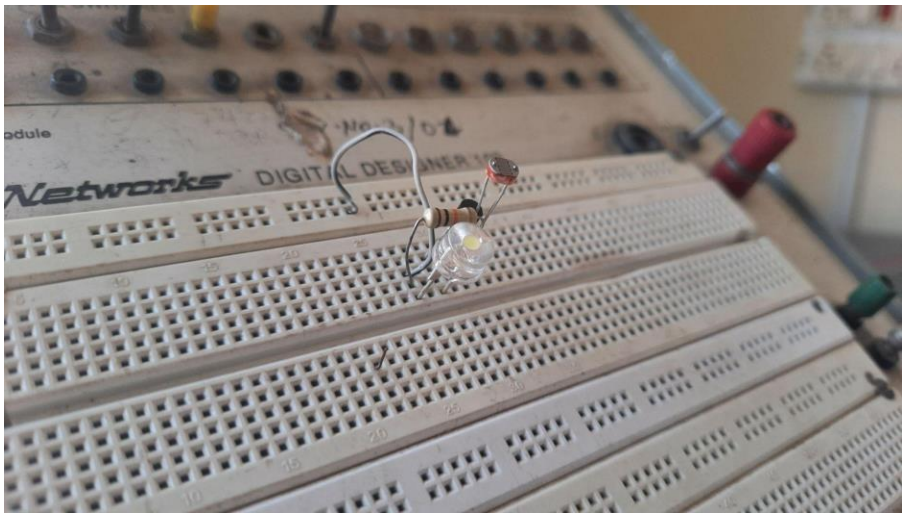


1. Connect the transistor to the breadboard.

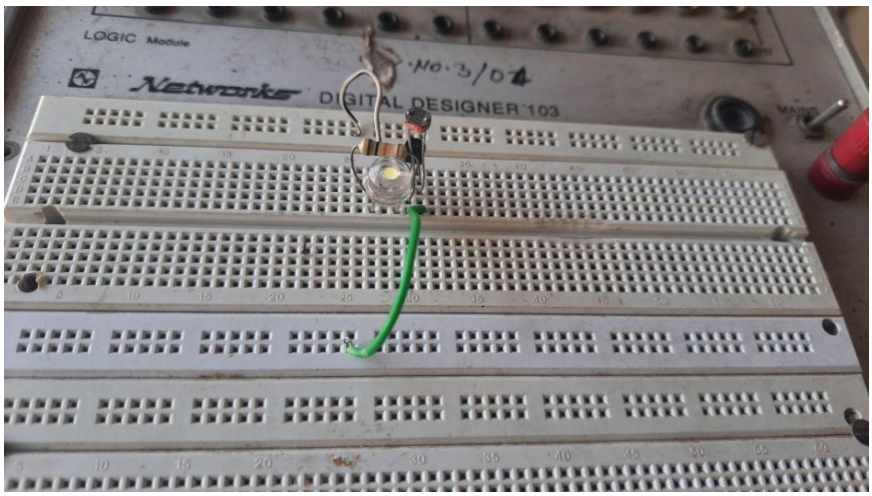


2. Connect the LDR with the base and emitter of the transistor.

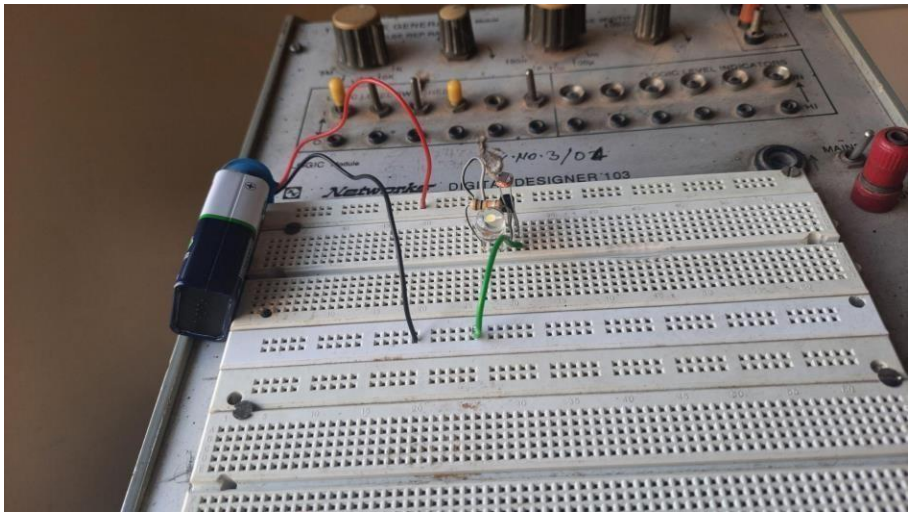
3. Next, connect the resistor with the base and collector of the transistor.



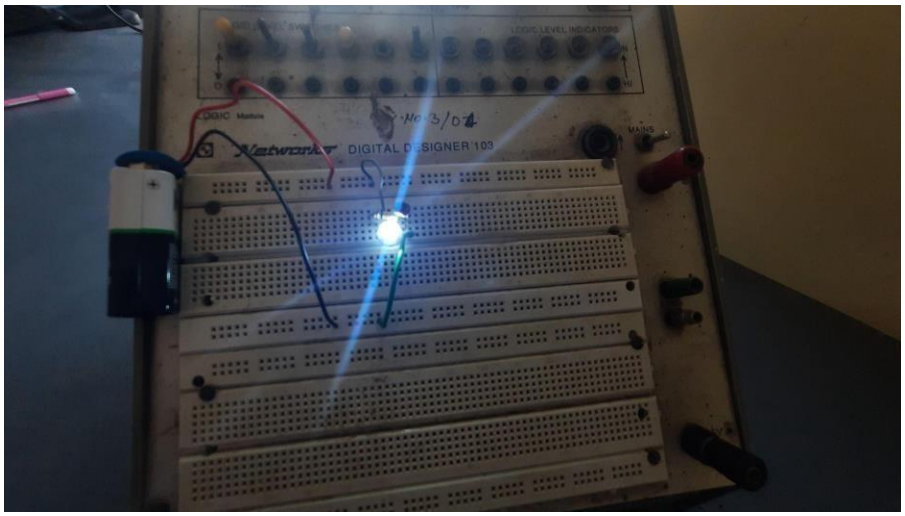
4. Now, connect the bulb with the collector and base of the transistor.



5. Connect the other terminals of the transistor to the breadboard.



6. Lastly, connect the battery.



7. On turning off the light, the bulb glows.

5. WORKING

During the day, when the light intensity is high on the LDR, its resistance decreases. Whereas when the light intensity is low, the resistance through LDR is very low. Thus thecurrent flows thorough it during night. Therefore, it glows.

Whenever the light falls on its photoconductive material, it absorbs its energy and the electrons of that photoconductive material that is in the valence band get excited and go to the conduction band and thus increasing the conductivity as per the increased in light intensity. Also, the energy in incident light should be greater than the band gap energyso that the electrons from the valence band got excited and go to the conduction band. The LDR has the highest resistancein dark around 1012 Ohm and this resistance decreases with the increase in Light.

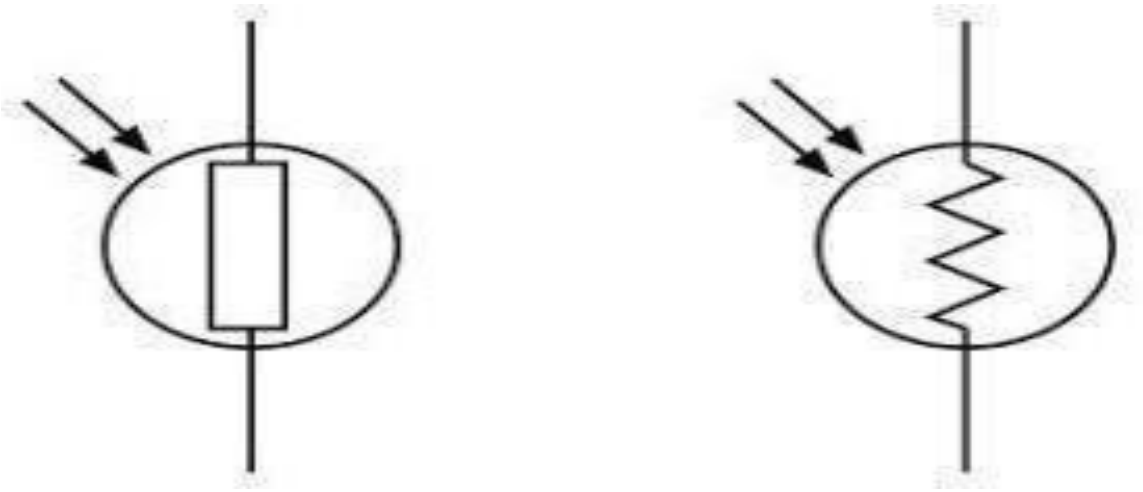


Fig. 6: LDR working

6. APPLICATIONS

- APPLICATION 1:

The circuit of **Automatic Night Light** can be powered from a battery, which can be charged during day time by harvesting thesolar energy through solar cell as shown below**.**

Fig. 7: Solar cell

Fig. 8: Battery

- APPLICATION 2:

The solar energy harvested from sunlight can be stored, inverted from DC voltage to AC voltage using sun tie converted. The AC voltage can be stepped up and given to THE ELECTRIC GRID. The AC voltage from THE ELECTRIC GRID can be stepped down,rectified and used for powering the circuit. Meanwhile, the street canalso be powered by the AC voltage, which is controlled by a relay switch connected to the switching part of the circuit. The below mentioned strategy will be enabling us to harvest solar energy in an effective way for the operation of the circuit and for powering the street light also.

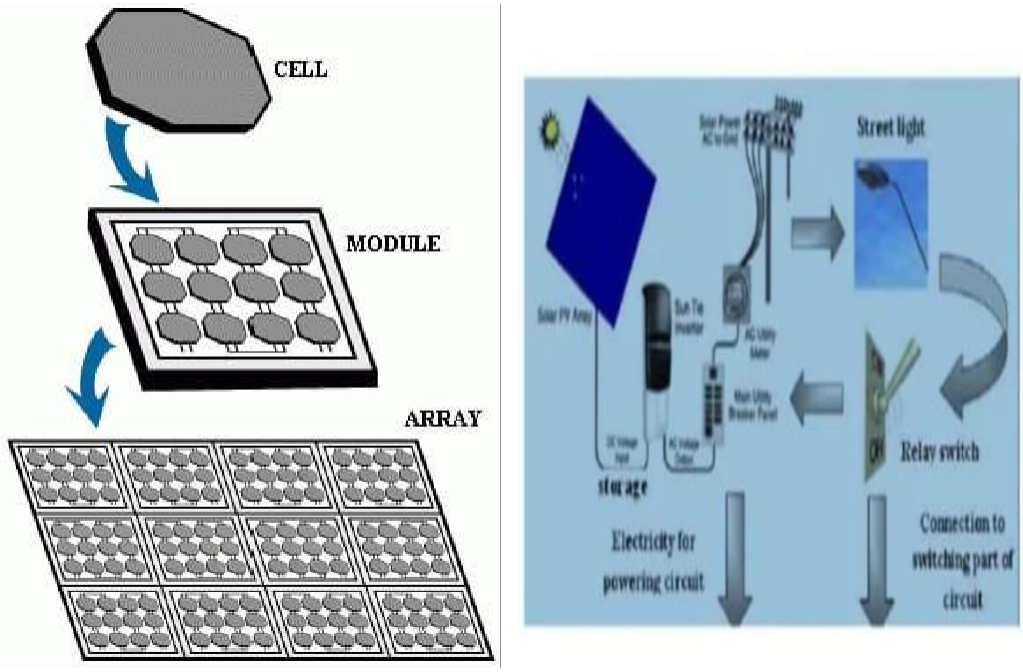


Fig. 9: Solar cell

7. CONCLUSION

Automatic Night Light as the name suggests is for turning ON and OFF the light automatically without the need of human interventions. It seems that the light intensity from surroundings and find whether its day or night. And it automatically turns ON when the surrounding is dark andit turns OFF when it receives light from surroundings. A sensor called LDR is used to detect the light intensity. Thisproject finds wide outdoor applications in streets, gardensand public places where it finds difficult to appoint a person to operate the light.

8. REFERENCES

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