

IOT PRACTICAL PRESENTATION

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4947
LDR
(LIGHT DEPENDENT RESISTOR)

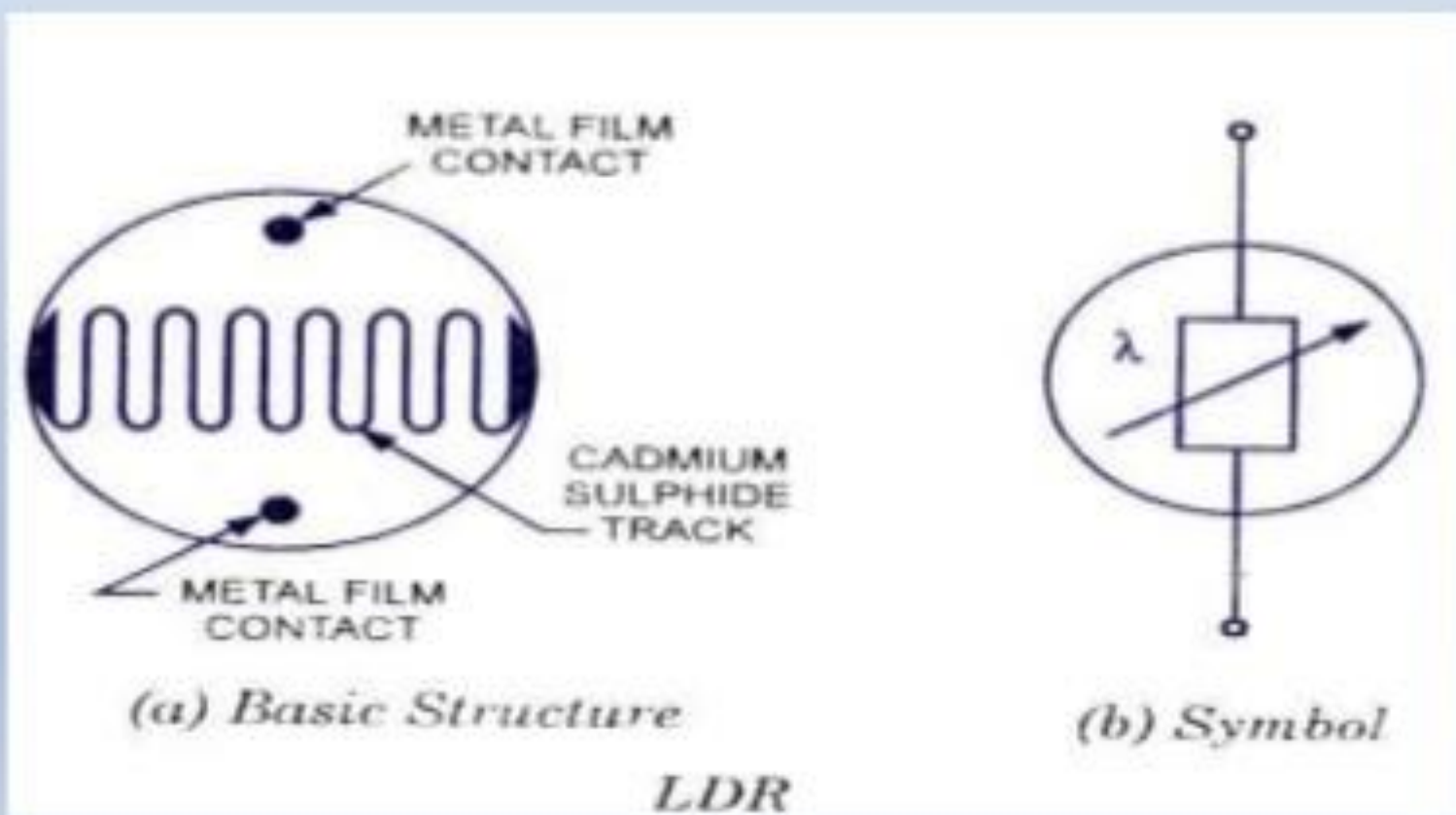
LDR(LIGHT DEPENDENT RESISTOR)

- A light dependent resistor (LDR) or a photo resistor or photocell is a light controlled variable resistor . Its resistance changes with Light intensity that falls on it.
- The resistance of a photo resistor decreases with increasing Incident light intensity . In other words , it exhibits photoconductivity.
- The resistance range and sensitivity of a photoresistor can substantially differ among dissimilar devices.

- They are made up of semiconductor materials having high resistance.

Photocells or LDRs are non linear devices. Their sensitivity varies with the wavelength of light incident on them.

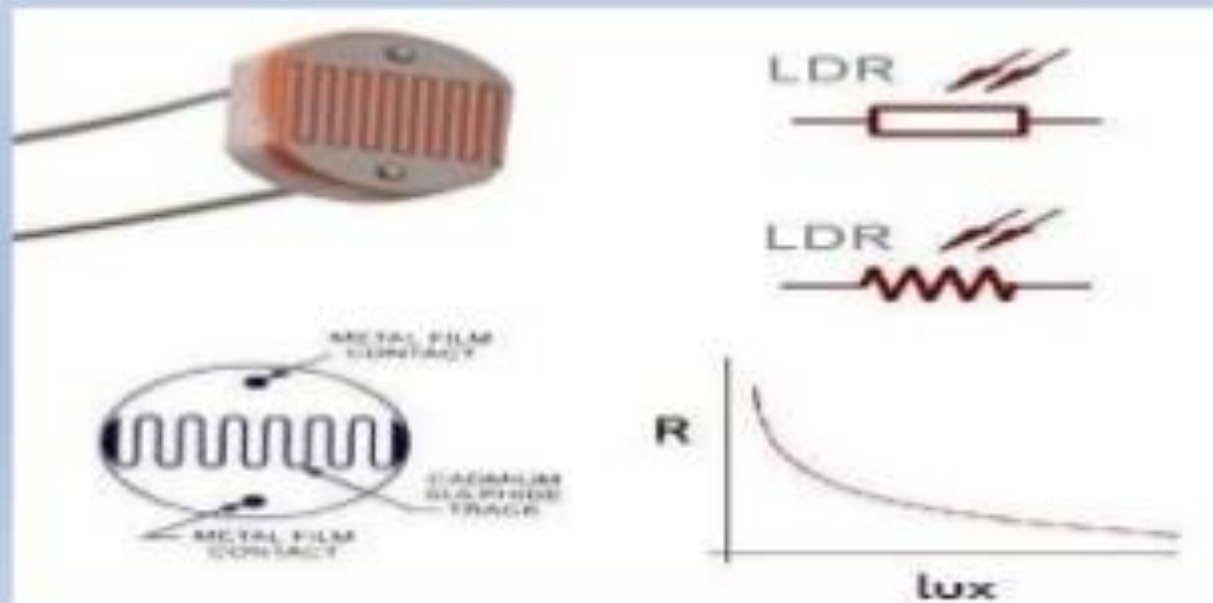
Some photocells might not at all respond to a certain range of wavelength.



WORKING OF LDR

- A LDR works on the principle of photoconductivity.
- Photo conductivity is an optical phenomenon in which the materials Conductivity reduces when light is absorbed by the materials.
- When light falls i.e, when the photons fall on the devices , the electrons in the valence band of the semiconductor material are excited to the conduction band.
- These photons in the incident light should have energy greater than the band gap of the semiconductor material to make the electron jump from the valence band to the conduction band.

- When light having enough energy is incident on the device, more and more electrons are excited to the conduction band which results in large number of charge carrier.
- It The result of this process is more and more current starts flowing and hence is said that the resistance of the devices has decreased.



TYPES OF LDR

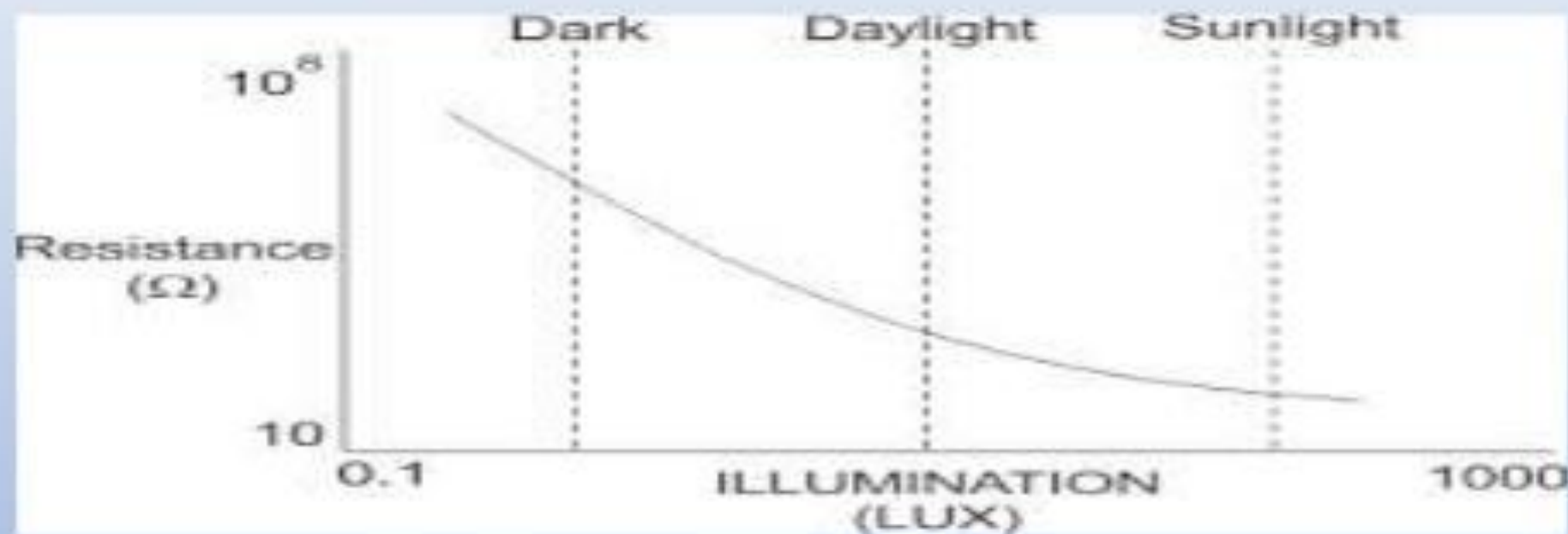
There are two types of photocells :-

- 1) **Intrinsic:** These are pure semiconductor materials such as silicon or germanium . Electrons get excited from valence band to conduction band . When photons of enough energy falls on it and number charge carriers increases.
- 2) **Extrinsic:** These are semiconductor materials doping with impurities which are called as dopants. These dopants create new energy bands above the valence band which are filled with electrons.
hence this reduces the band gap and less energy is required in exciting them .

CHARACTERISTICS OF LDR

- ❖ LDRs are light dependent device whose resistance decreases when light falls on them and increases in the dark.
- ❖ When a light dependent resistor is kept in dark , its resistance is very high . This resistance is called as **dark resistance**.
- ❖ It can be as high as $10^{12}\Omega$.
- ❖ If the device is allowed to absorb light its resistance will decreases drastically.

- ❖ If a constant voltage is applied to it and intensity of light is increased the current starts increasing.



- ❖ When light is incident on a photocell it usually takes about 8 to 12 ms for the change in resistance to take place, while it takes seconds for resistance to rise back again to its initial value after removal of light. This phenomenon is called **resistance recovery rate**.

- ❖ LDR are less sensitive than photo diodes and photo transistor
- ❖ A photo diode and a photocell (LDR) are not the same a photodiode is a pn - junction semiconductor device that converts light to electricity.
- ❖ where as a photocell is a passive device , there is no pn- junction nor it converts light to electricity.
- ❖ If the light intensity is kept constant , the resistance may still vary significantly due to temperature changes.
- ❖ extrinsic light dependent resistor are generally designed for longer wavelengths of light.

CONSTRUCTION OF LDR

- ❖ Modern light dependent resistor are made of lead sulphide , lead selenide indium antimonide and most commonly cadmium sulphide (Cds) and cadmium selenide.
- ❖ A light sensitive material is deposited on an insulating substrate such as ceramic.
- ❖ The material is deposited in zigzag pattern in order to obtain the desired resistance and power rating.
- ❖ This zigzag area separates the metal deposited area into two regions.

- ❖ The disk is then mounted in a glass envelope or encapsulated in transparent plastic to prevent surface contamination

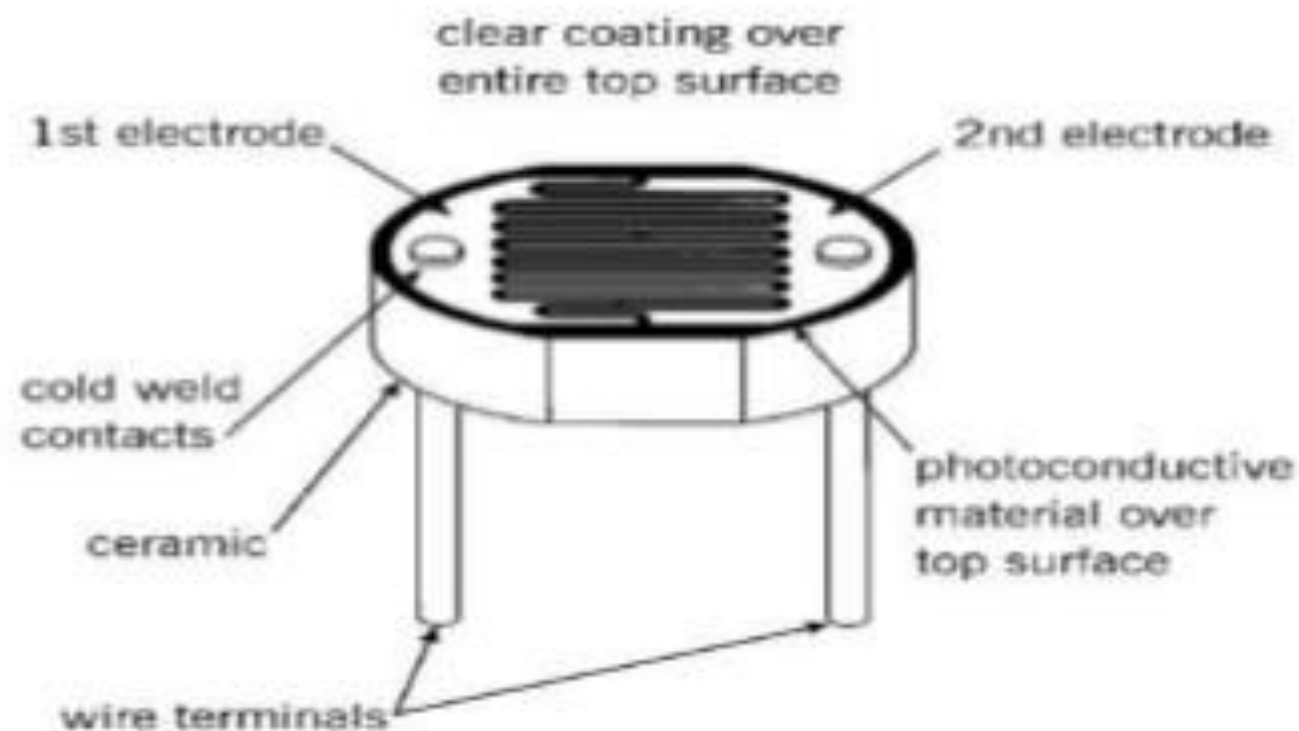


Figure 3
Typical Construction of a Plastic Coated Photocell

ADVANTAGES:

- LDRs are cheap and readily available in many sizes and shapes.
- Practical LDRs are available in a variety of sizes and packages styles, the most popular size having a face diameter of roughly 10 mm.
- They need very small power and voltage for its operation.

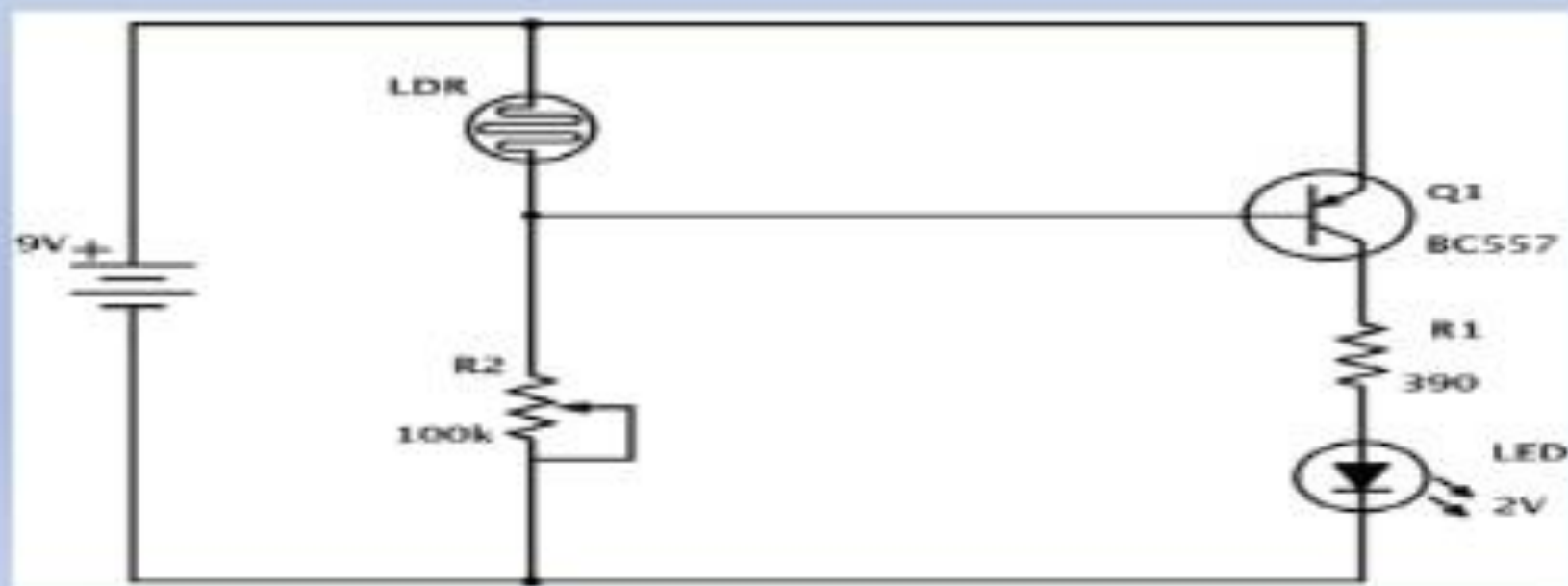
DISADVANTAGES:

- Highly inaccurate with a response time of about tens or hundreds of milliseconds.

APPLICATION OF LDR

1. **Light sensor** : The LED lights up when the intensity of the light reaching the LDR resistor is sufficient.

Example is **Automatic energy light** : It senses darkness/night and turns ON automatically similarly it senses day light and turns OFF automatically . Series of LEDs are connected .



- **Audio compressor** : Audio compressors are devices which reduce the gain of audio amplifier when the amplitude of the signal is above a set value . This is done to amplify soft sounds while preventing the loud sounds from clipping .
- **Fire Alarm** : the alarm works by sensing the smoke produced during fire . When there is no smoke the light from the bulb will be directly falling on the LDR .
- **Automatic street light**: It automatically switches ON when the night falls and turns OFF when the sun rises.

THANK YOU

