

How the Circuit Works

For this circuit the transistor acts as a switch for the LED, turning it on and off corresponding with the light falling upon the LDR (light dependent resistor). Consider the LDR of a very high resistance (in it's dark state), the current flows from the positive supply of both the 33k and 10k resistors and into the base lead of the transistor, therefore turning the transistor on and the LED lights on. When the LDR has bright light shining upon it, the resistance falls to a very low level allowing the current that would have otherwise flown to the base of the transistor, to flow through the LDR and around the outside of the circuit, not flowing through the transistor and not turning the LED light on. This is because electricity likes to find the easier path between two points, so when the LDR is in it's dark state the easiest point is through the transistor then around the circuit and when the LDR is light, around the circuit is the easier path.

Resistors

Resistors are used to control the amount of current that flows through a circuit. They are measured in Ohms (Ω), Kilohms (k Ω) or Megohms (M Ω). The most common resistors are 10k, 100k, 1k, 10M, 100M and 1G. Resistors are also used to protect components from too much current. A resistor with a value of 10k will allow 10mA of current to flow through it. A resistor with a value of 100k will allow 1mA of current to flow through it. A resistor with a value of 1k will allow 100mA of current to flow through it. A resistor with a value of 10M will allow 100 μ A of current to flow through it. A resistor with a value of 100M will allow 10 μ A of current to flow through it. A resistor with a value of 1G will allow 1 μ A of current to flow through it.

Fixed Value Resistor

A fixed value resistor is a resistor whose resistance is constant and does not change with temperature, voltage, or current. They are used to control the amount of current that flows through a circuit. They are measured in Ohms (Ω), Kilohms (k Ω) or Megohms (M Ω). The most common fixed value resistors are 10k, 100k, 1k, 10M, 100M and 1G.

Light Dependent Resistor

A light dependent resistor (LDR) is a resistor whose resistance varies with the amount of light falling upon it. In the dark, the resistance is very high, and in the light, the resistance is very low. LDRs are used in light sensitive circuits, such as automatic street lighting and burglar alarms.

Power Rating

The power rating of a resistor is the maximum amount of power that it can dissipate without becoming too hot to handle. It is measured in Watts (W). The most common power ratings are 1/4W, 1/2W, 1W, 2W, 5W, 10W, 20W, 50W, 100W, and 200W.

Light Emitting Diode

A light emitting diode (LED) is a diode that emits light when it is forward biased. They are used in a wide range of applications, from indicator lights to high power lighting. LEDs are measured in milliwatts (mW) or Watts (W). The most common LED power ratings are 5mW, 10mW, 20mW, 50mW, 100mW, 200mW, 500mW, 1W, 2W, 5W, 10W, 20W, 50W, 100W, and 200W.

LED Transistor

An LED transistor is a transistor that has an LED attached to its base. It is used in light sensitive circuits, such as automatic street lighting and burglar alarms. The most common LED transistor power ratings are 5mW, 10mW, 20mW, 50mW, 100mW, 200mW, 500mW, 1W, 2W, 5W, 10W, 20W, 50W, 100W, and 200W.

Diodes

There are many different types of diodes but they all have two terminals and allow current to flow in one direction only. They are used in a wide range of applications, from rectifiers to signal diodes. Diodes are measured in Volts (V) or Kilovolts (kV). The most common diode forward voltages are 0.7V, 1.0V, 1.5V, 2.0V, 3.0V, 4.0V, 5.0V, 6.0V, 7.0V, 8.0V, 9.0V, 10.0V, 15.0V, 20.0V, 30.0V, 40.0V, 50.0V, 60.0V, 70.0V, 80.0V, 90.0V, and 100.0V.

Power Rating

The power rating of a diode is the maximum amount of power that it can dissipate without becoming too hot to handle. It is measured in Watts (W). The most common diode power ratings are 100mW, 200mW, 500mW, 1W, 2W, 5W, 10W, 20W, 50W, 100W, and 200W.

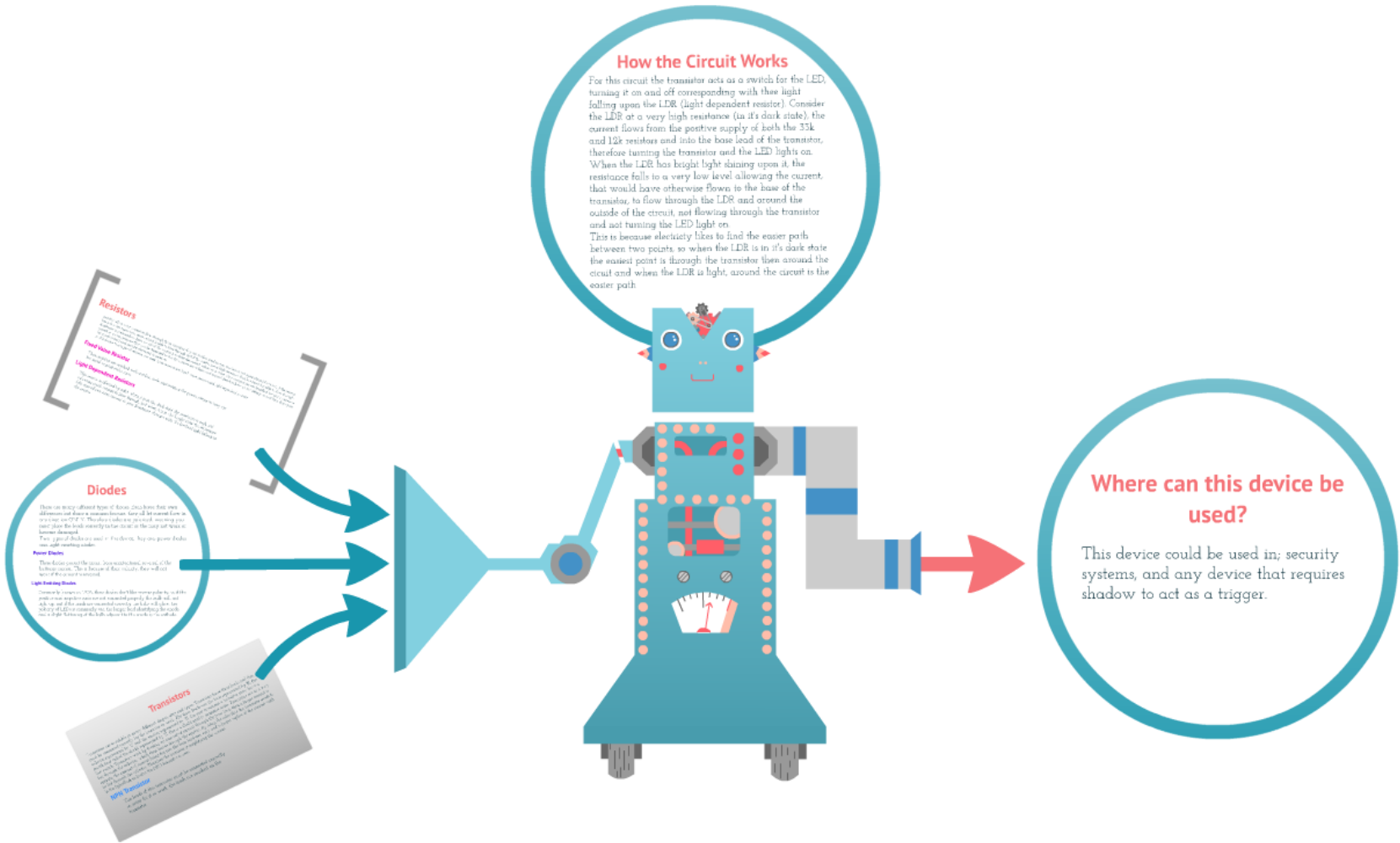
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Where can this device be used?

This device could be used in; security systems, and any device that requires shadow to act as a trigger.

Light/Dark Indicator



Light/Dark Indicator

Resistors

Resistors allow some current to flow through them, meaning they are neither insulators or conductors, but somewhere inbetween. If the resistor has a low resistance then more current is able to flow through and if the resistor has a high resistance then less current is able to flow through. Resistance is measured in ohms. the job of the resistor is to limit the current values to a value other components can handle. If too much current is passed to the components they can be damaged so it is the resistors job to limit that current. Resistors have power ratings so that they don't pass too much current and become damaged themselves.

In this device two types of resistors are used, these resistors are; fixed value resistors and light dependent resistors.

Fixed Value Resistor

These resistors are marked with a colour code, representing the power rating as they are too small to print codes upon.

Light Dependent Resistors

This resistor is effected by light. when it is in the 'dark state' the resistance is high, not allowing much current to flow through, but when it is in the 'bright state' the resistance falls and allows more current to pass. Resistance changes with the levels of light falling on the resistor.

Diodes

There are many different types of diodes. Each have their own differences but share a common feature, they all let current flow in one direction ONLY. Therefore diodes are polarised, meaning you must place the leads correctly in the circuit or they may not work or become damaged.

Two types of diodes are used in this device, they are; power diodes and light emitting diodes.

Power Diodes

These diodes protect the circuit from unintentional reversal of the batteries current. This is because of their polarity, they will not work if the current is reversed.

Light Emitting Diodes

Commonly known as LED's, these diodes don't like reverse polarity, so if the positive and negative ends are not connected properly the bulb will not light up, but if the leads are connected correctly the bulb will glow. the polarity of LED's is commonly via the longer lead identifying the anode and a slight flattening of the bulb adjacent to the anode is the cathode.

Transistors

Transistors are available in many different shapes, sizes and types. Transistors have three leads and they must be connected correctly for the transistor to work. The three leads are; the base represented by 'B', the collector represented by 'C' and the emitter represented by 'E'. On rare occasions a transistor may have a fourth lead called the shield, represented by 'S', this is a shield used to minimise noise. Transistors act as a very fast switch. Transistors work by feeding an amount of current through the base lead, then a larger current is fed through the collector, which then leaves through the emitter. By using the rules that the transistor needs to operate, the amount of current being fed into the base lead can vary and a larger replica of the current will be fed through the collector. Therefore the transistor is amplifying the current. In the light/dark indicator the NPN transistor is used.

NPN Transistor

The leads of this transistor must be connected correctly in order for it to work, the leads are marked on the transistor.

Resistors

Resistors allow water to flow through them, however they are made of materials that are hard to get through. If the resistor has a low resistance then water flows through it easily. If the resistor has a high resistance then the water has to find the easiest way to get through. In this sense two types of resistor are used. These resistors are fixed value resistors and light dependent resistors.

Fixed Value Resistor

These resistors are marked with a colour code representing the power rating as they are too small to print codes upon.

Light Dependent Resistors

This resistor is affected by light when it is in the dark state the resistance is high and allowing small current to flow through. But when it is in the light state the resistance falls and allows more current to pass. Resistance changes with the levels of light falling on the resistor.

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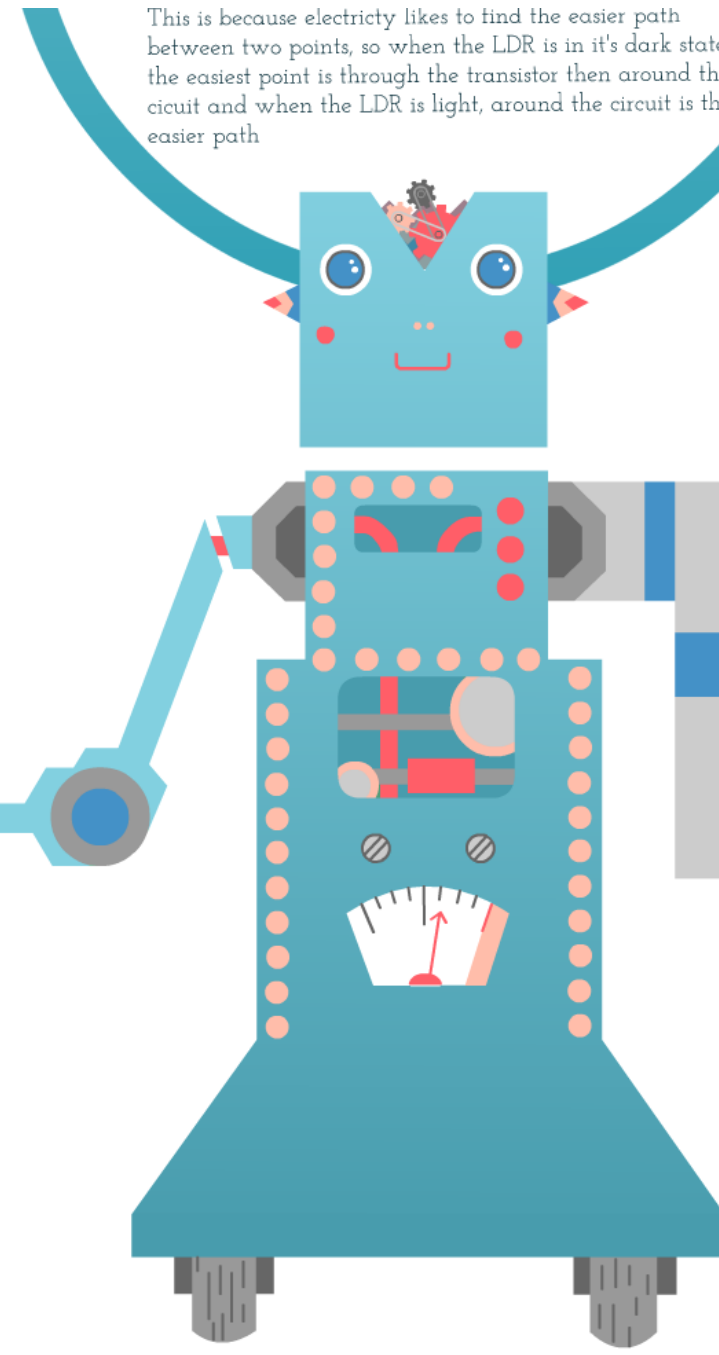
Transistors

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NPN Transistor

The leads of this transistor must be connected correctly in order for it to work, the leads are marked on the transistor.

This is because electricity likes to find the easier path between two points, so when the LDR is in its dark state the easiest point is through the transistor then around the circuit and when the LDR is light, around the circuit is the easier path.




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