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Automatic Counting

Automatic counting using CD4026IC and seven segment display

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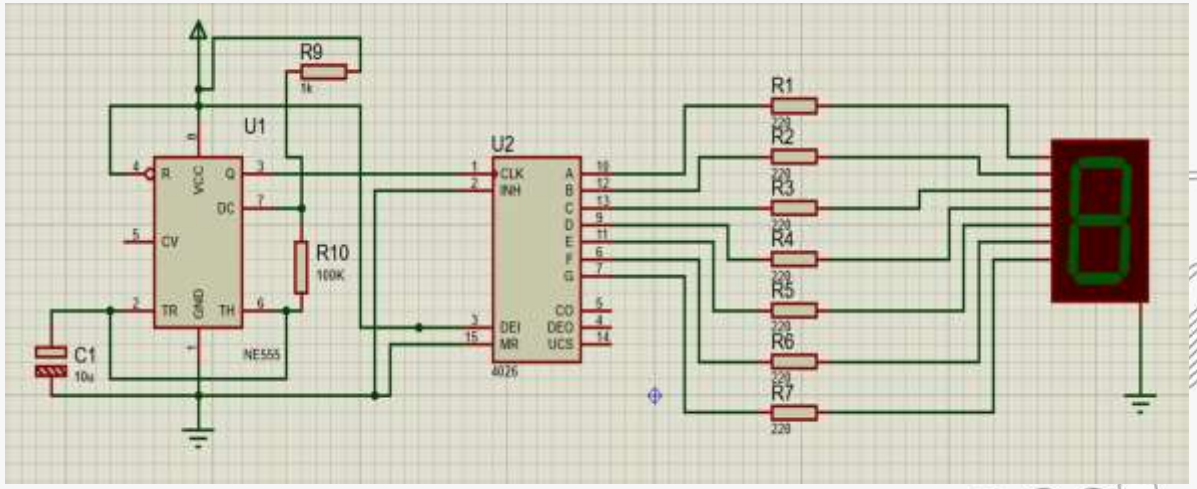
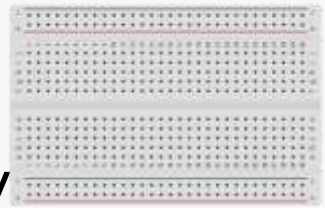
Introduction

Automatic counting



Required Components

- Breadboard
- 555 timer
- Seven Segment Display
- Resistor
- Snap Connector
- CD4026 IC
- LED
- Jumper Wires
- Battery 9v



Breadboard

555 Timer

Seven Segment Display

Resistor

Snap Connector

CD4026 IC

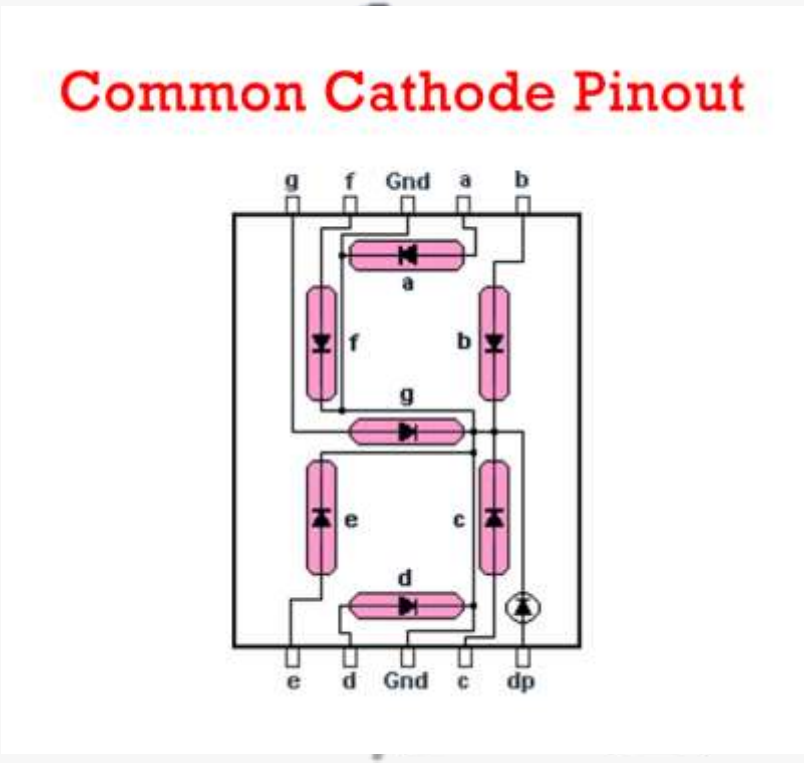
LED

Jumper Wires

Battery 9v

Seven Segment Display

- The seven segments displays are the oldest yet one of the efficient types of display used in embedded applications.
- This display has nothing more than 8 LED inside it. These 8 LEDs are separated into each segments which can be named as a, b, c, d, e, f, g, DP.
- These entire 7 segment LEDs have one end of their pins pulled out of the module and the other ends are connected together and pulled out as the common pin.



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Seven Segment Display Pin Configuration

PIN NUMBER	PIN NAME	DESCRIPTION
1	e	Controls the left bottom LED of the 7-segment display
2	d	Controls the bottom most LED of the 7-segment display
3	com	Connected to Ground/Vcc based on type of display
4	c	Controls the right bottom LED of the 7-segment display
5	Dp	Controls the decimal point LED of the 7-segment display
6	b	Controls the top right LED of the 7-segment display
7	a	Controls the top most LED of the 7-segment display
8	Com	Connected to Ground/Vcc based on type of display
9	f	Controls the top left LED of the 7-segment display
10	g	Controls the middle LED of the 7-segment display

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Procedure

Connection Steps

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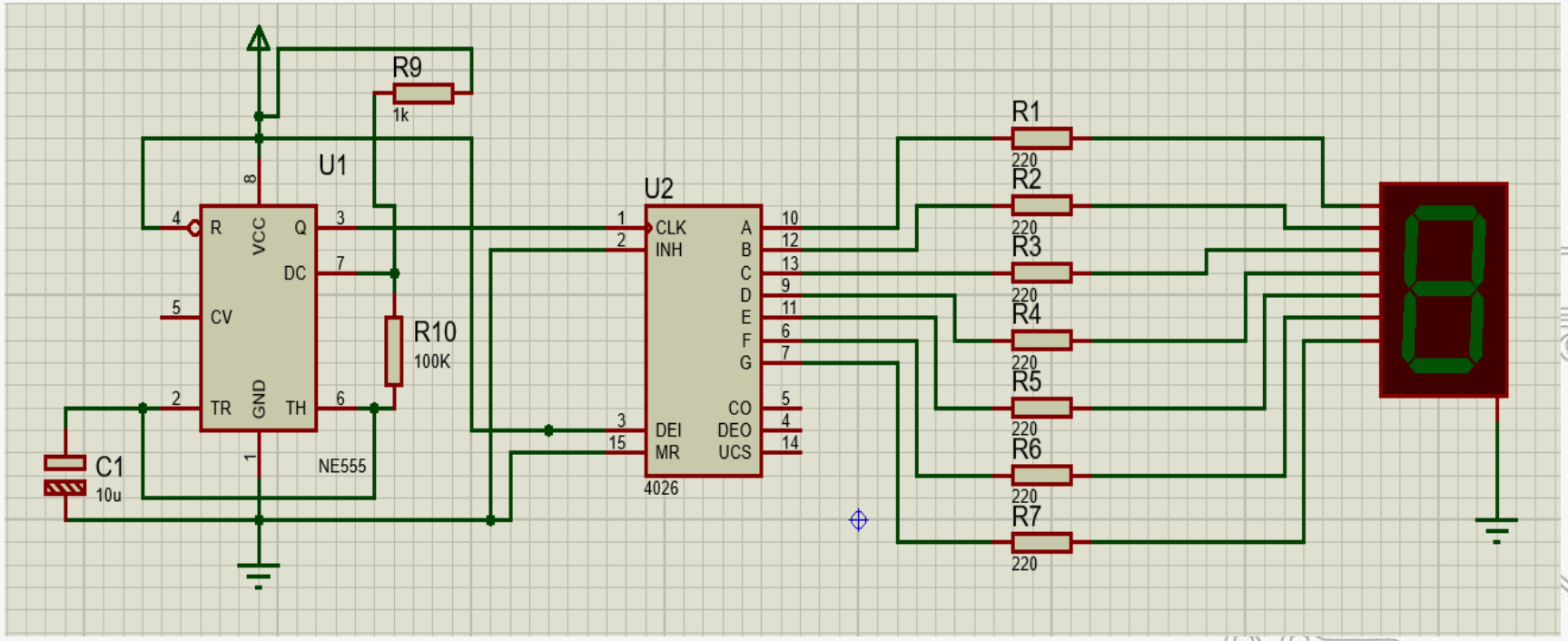
Circuit diagram



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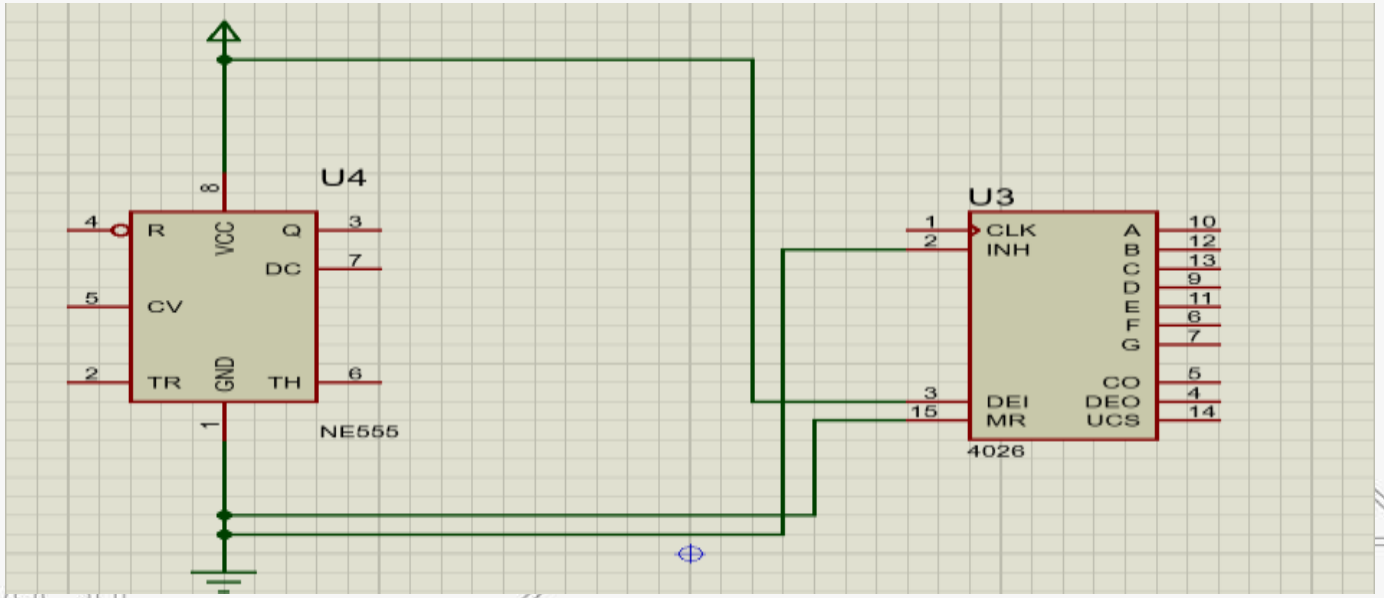
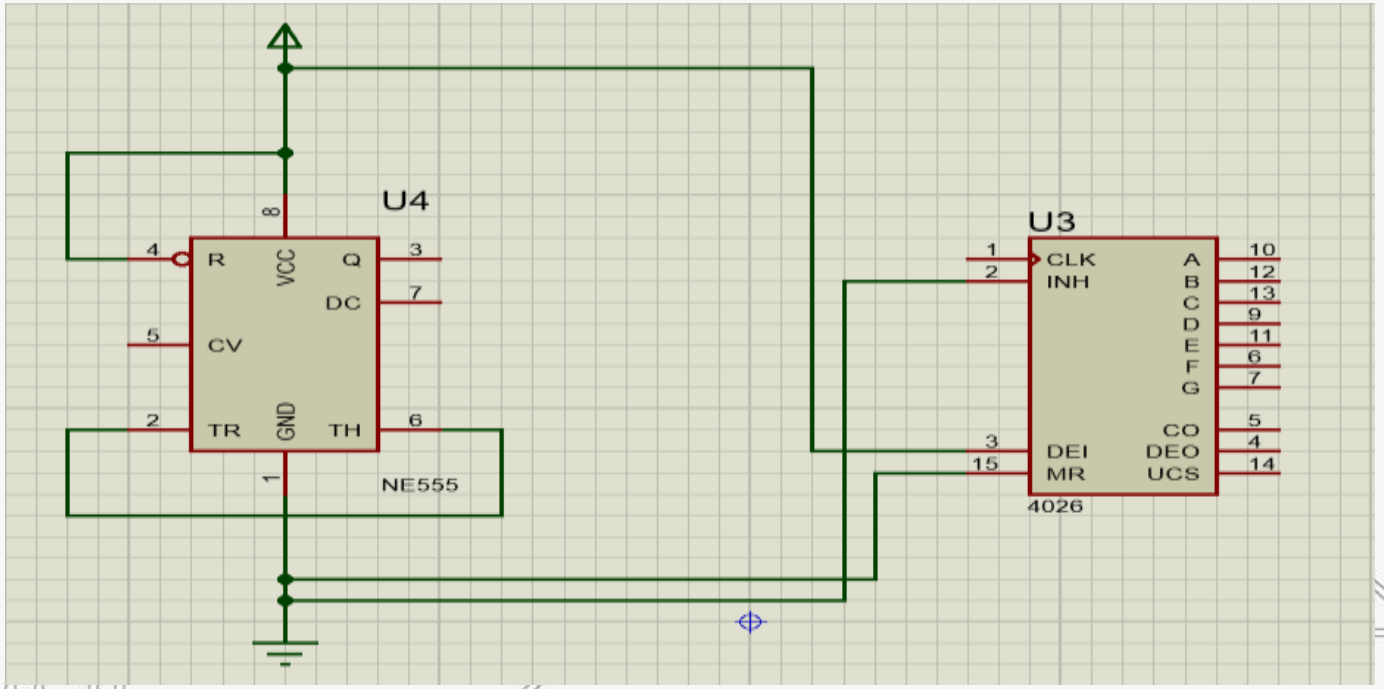
Connection Step 1

- Place 555 timer and 4026 IC into Bread Board and connect pin-8 of 555 timer And Pin-3, pin-16 of 4026 IC to positive row of Bread Board and pin-1 of 555 timer And pin-2, pin-8, pin-15 of 4026 IC to negative row of Breadboard as shown.



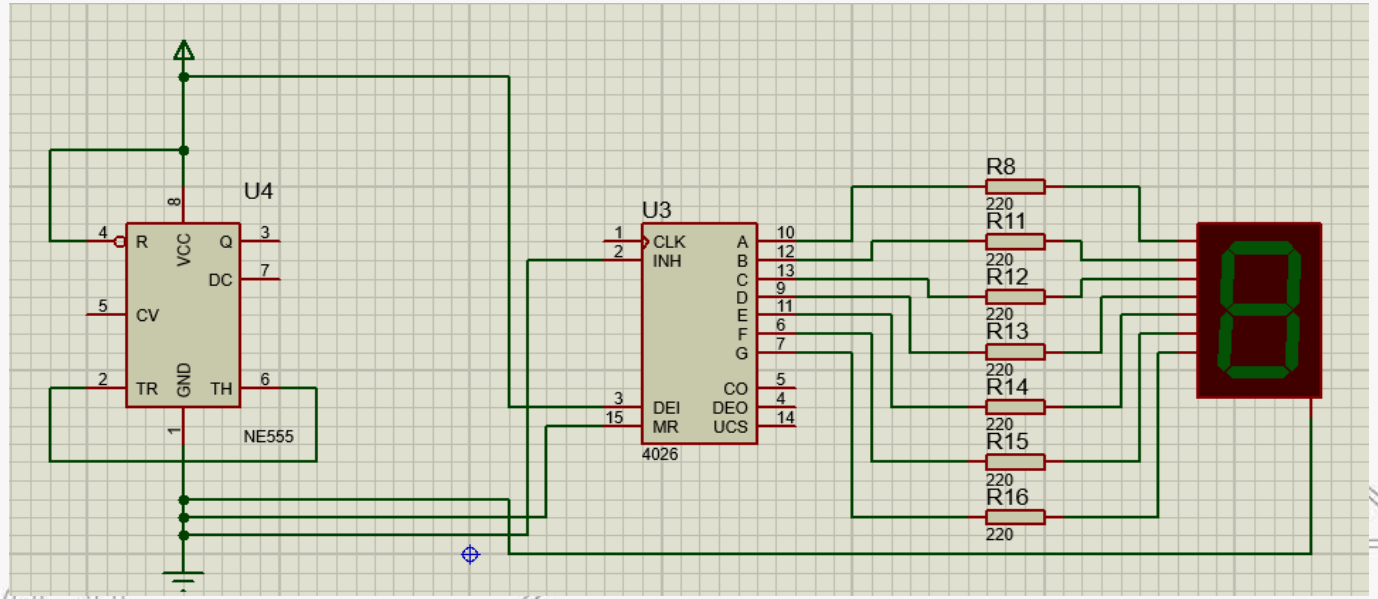
Series Connection Step 2

- Connect pin-2 to pin-6 and pin-4 to pin-8 of 555 timer as shown.



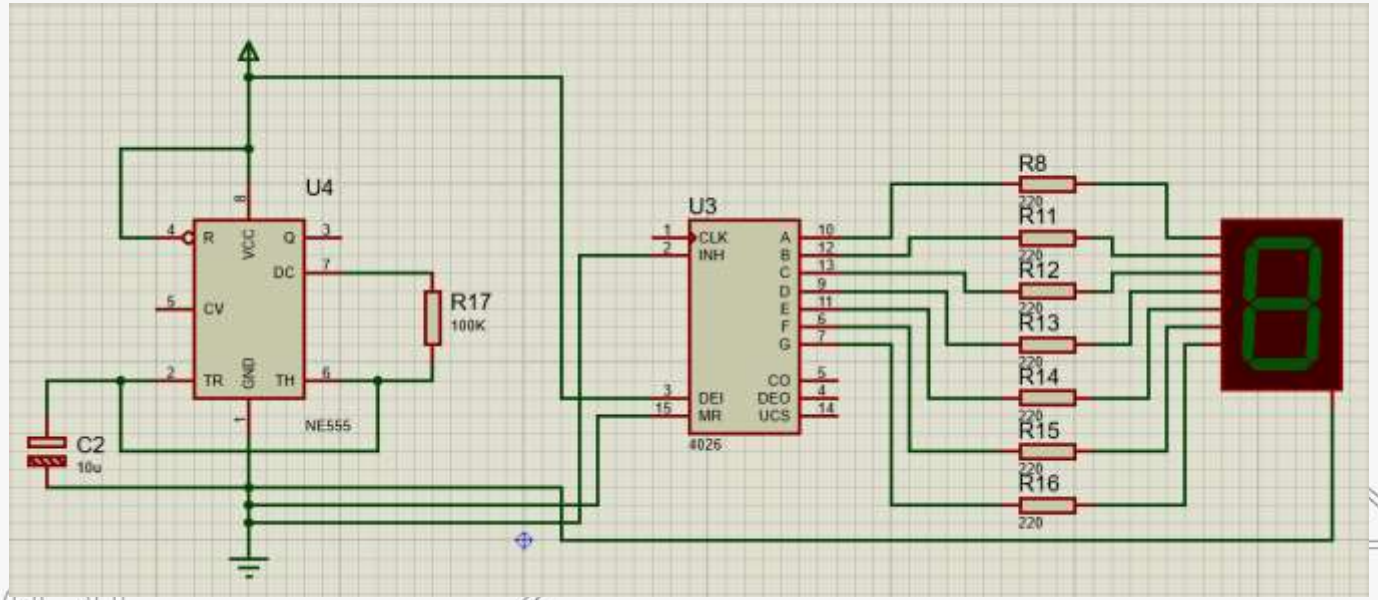
Series Connection Step 3

- Connect 7-segment display to the 4026 IC through 220 ohm resistor as shown.



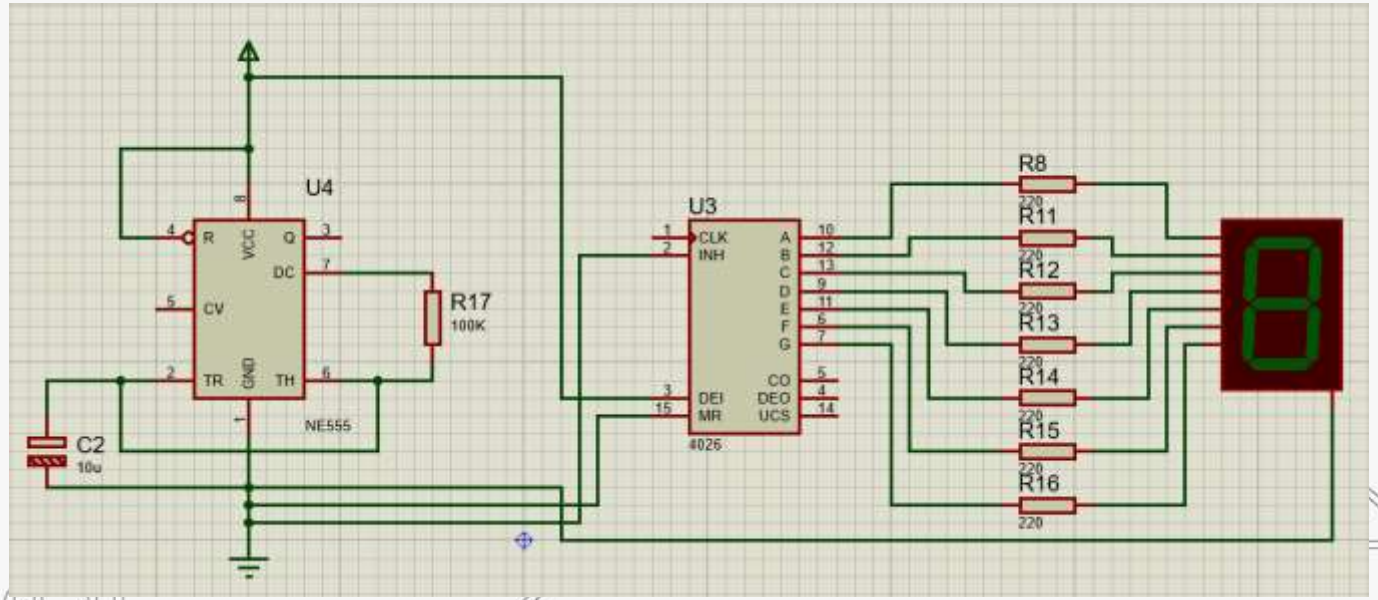
Series Connection Step 4

- Connect 10uf capacitor from pin-2 of 555 timer to negative row of bread board.



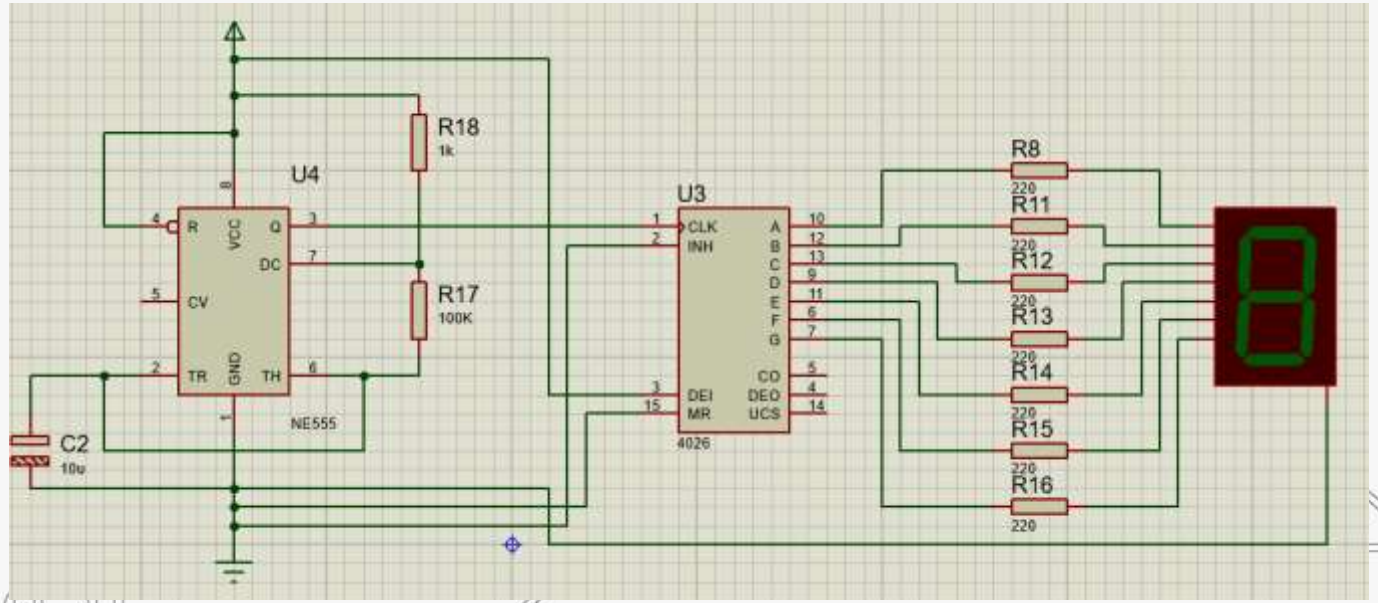
Series Connection Step 5

- Connect 100k resistor from pin-6 to pin-7 of 555 timer.



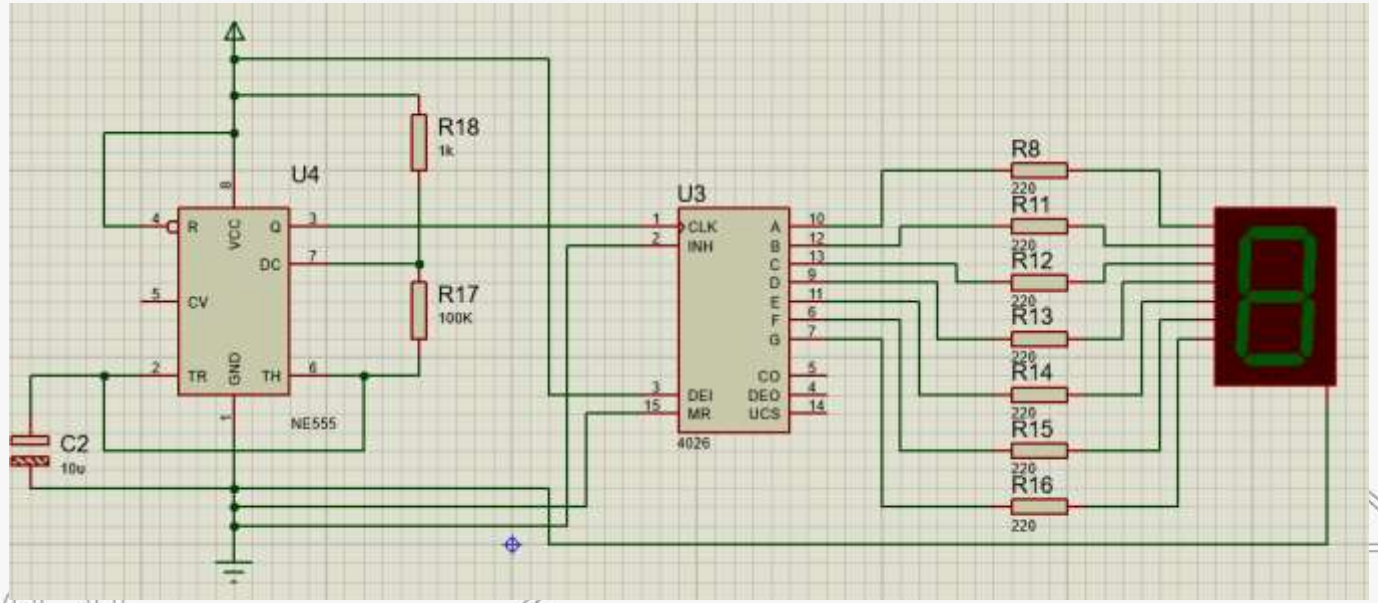
Series Connection Step 6

- Connect 1k resistor from pin-7 of 555 timer to positive row of Bread Board.



Series Connection Step 7

- Connect pin-3 of 555 timer to the pin-1 of 4026 IC and connect battery.



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Data & Outcomes

Learning from the activity

Data

- Which IC was used to drive seven segment display?
- Which IC used to drive CD4026?
- What range of values seven segment can display?

- CD4026
- 555 timer
- 0-F

Learning from the activity

- Use of CD4026
- Use of seven segment display
- Use of counter

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Assessment

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Thank you

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LED Chaser

Basic LED chaser circuit with 555 timer

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recap

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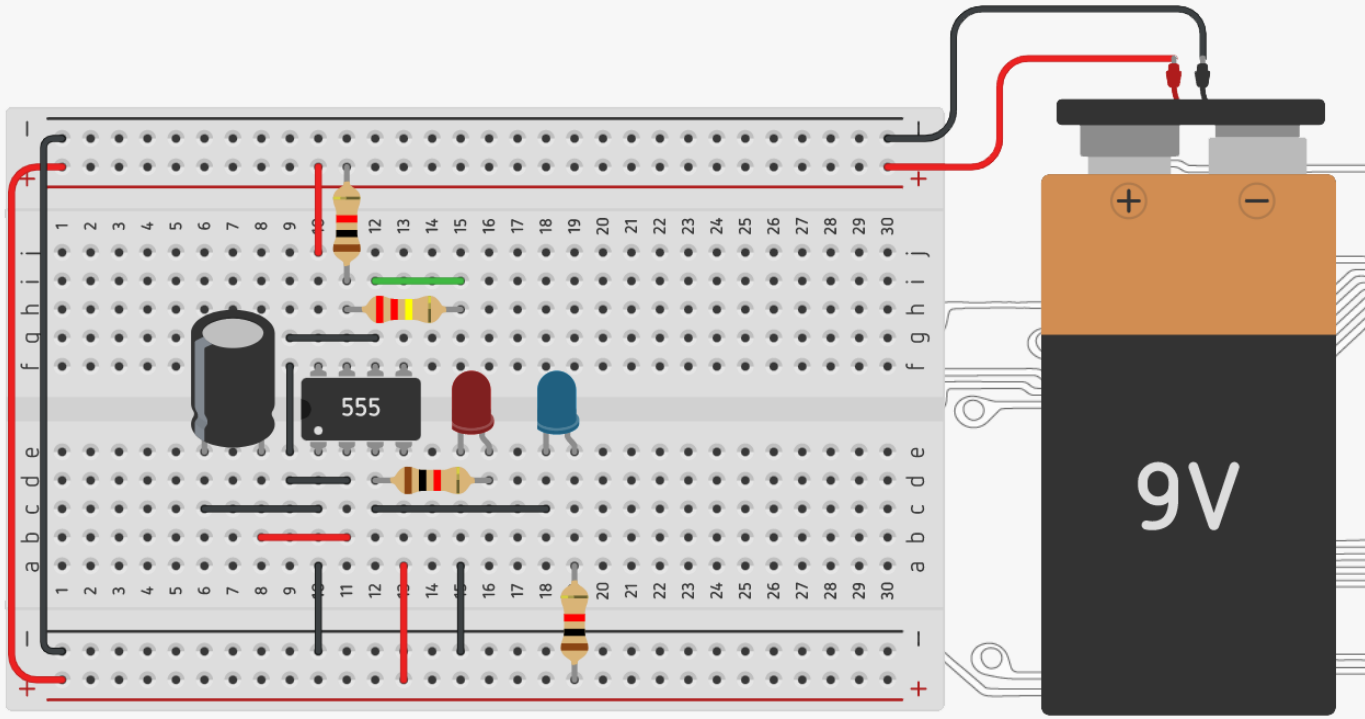
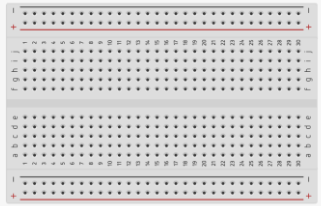
Introduction

LED chaser using 555 timer



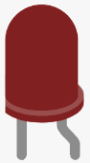
Required Components

- Breadboard
- 555 Timer
- LED
- Resistor
- Snap Connector
- Jumper Wires
- Battery 9v



Breadboard

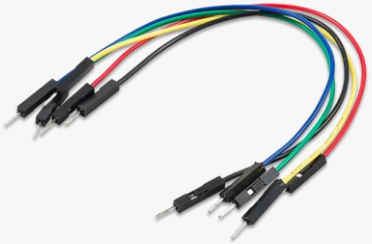
555 Timer



LED

Resistor

Snap Connector



Jumper Wires

Battery 9v

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Procedure

Connection Steps

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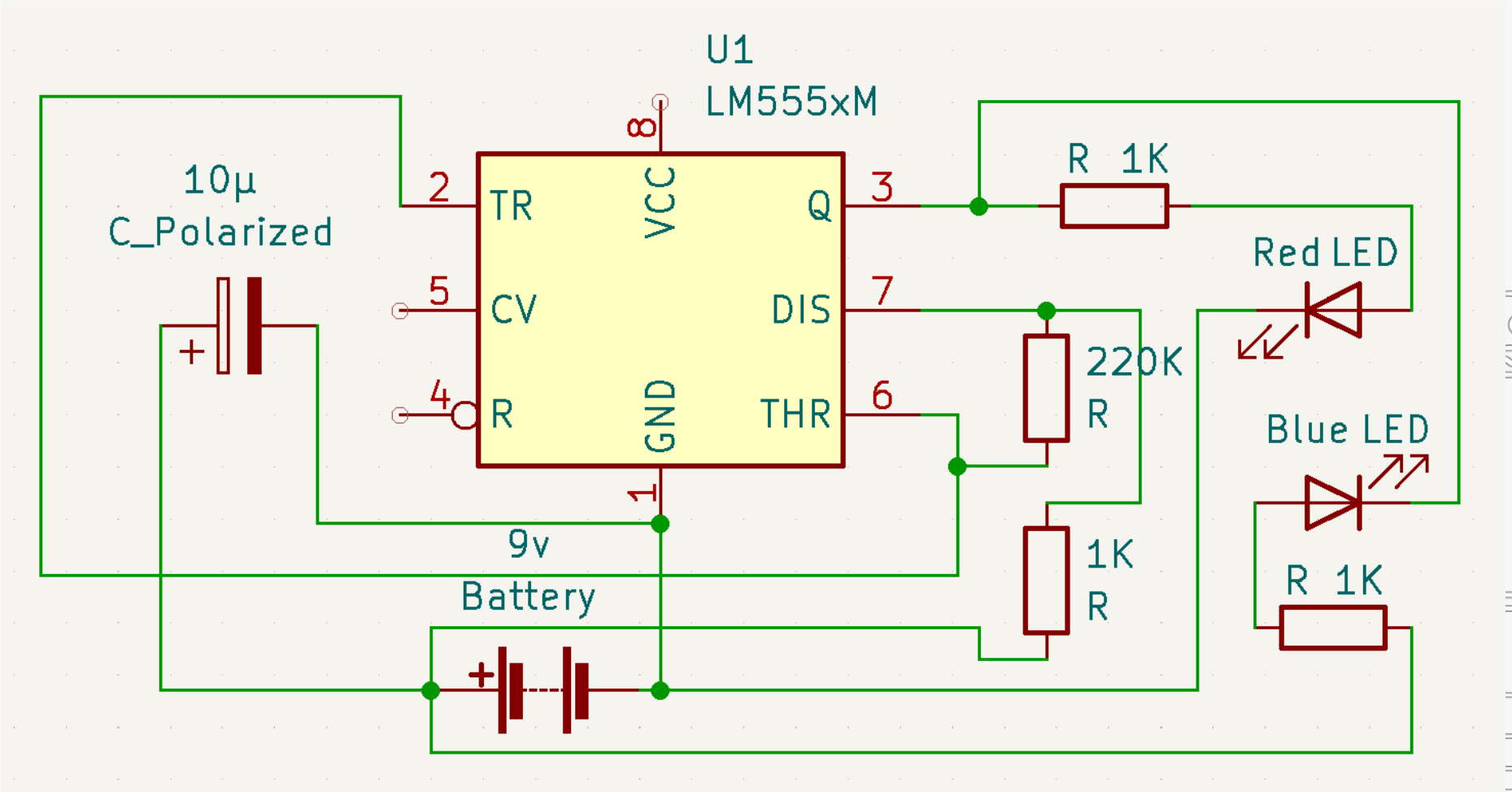
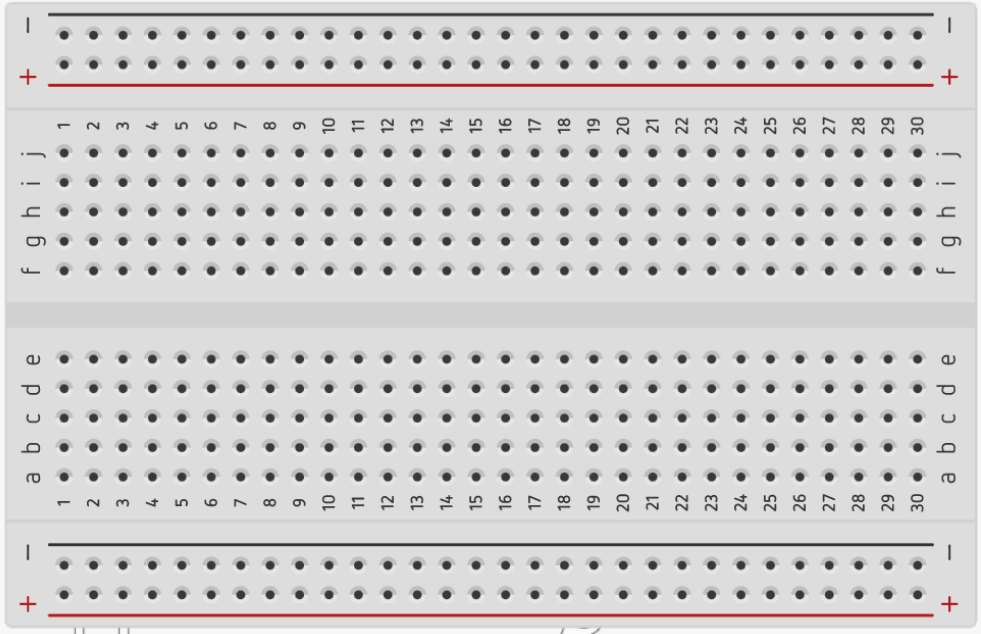
Circuit diagram



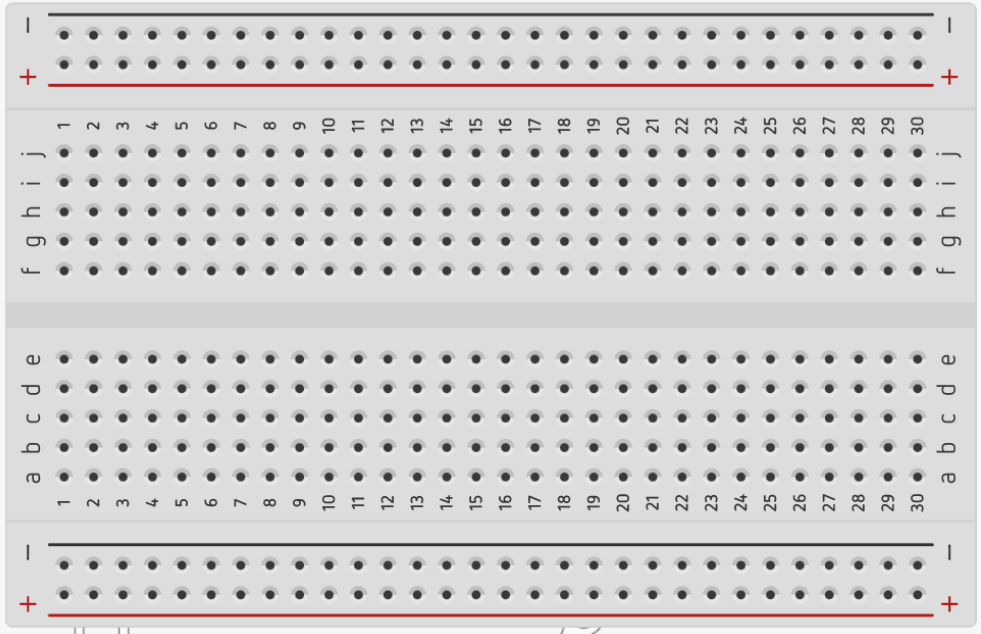
Connection Step 1

- Place breadboard



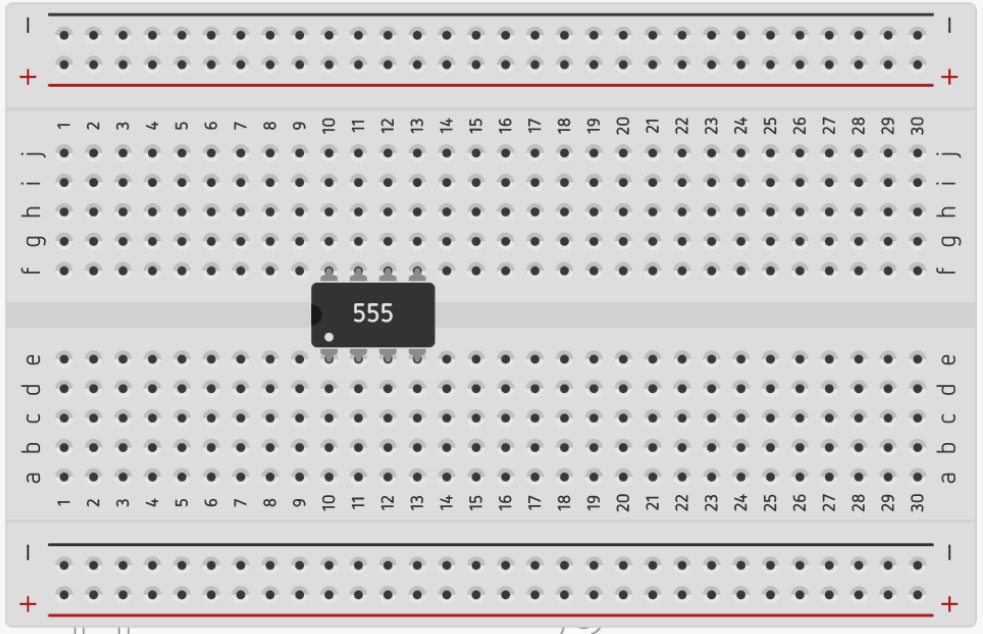
Connection Step 2

- Place battery



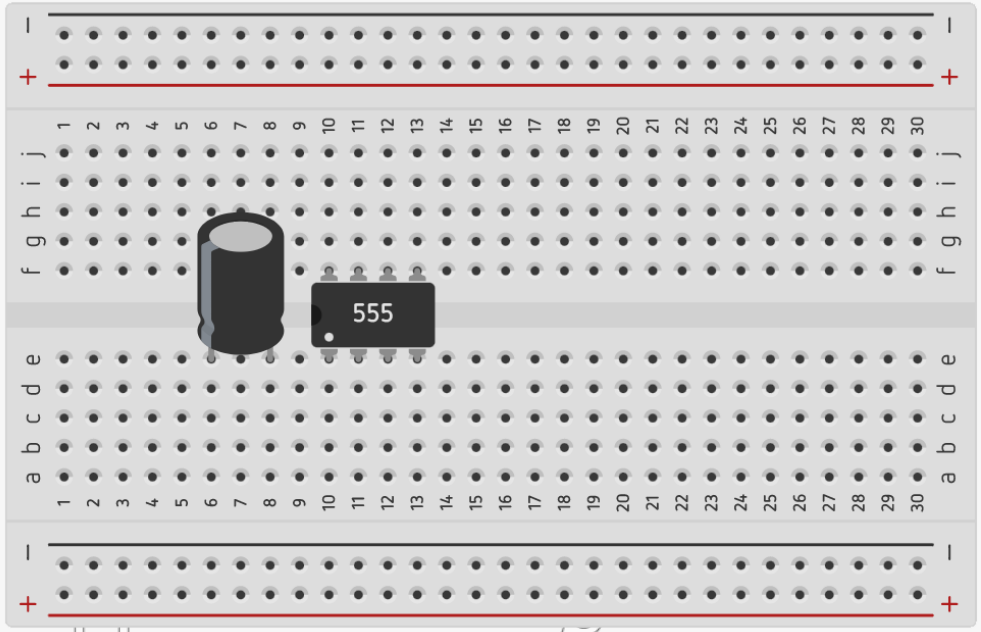
Connection Step 3

- Insert 555 timer in breadboard



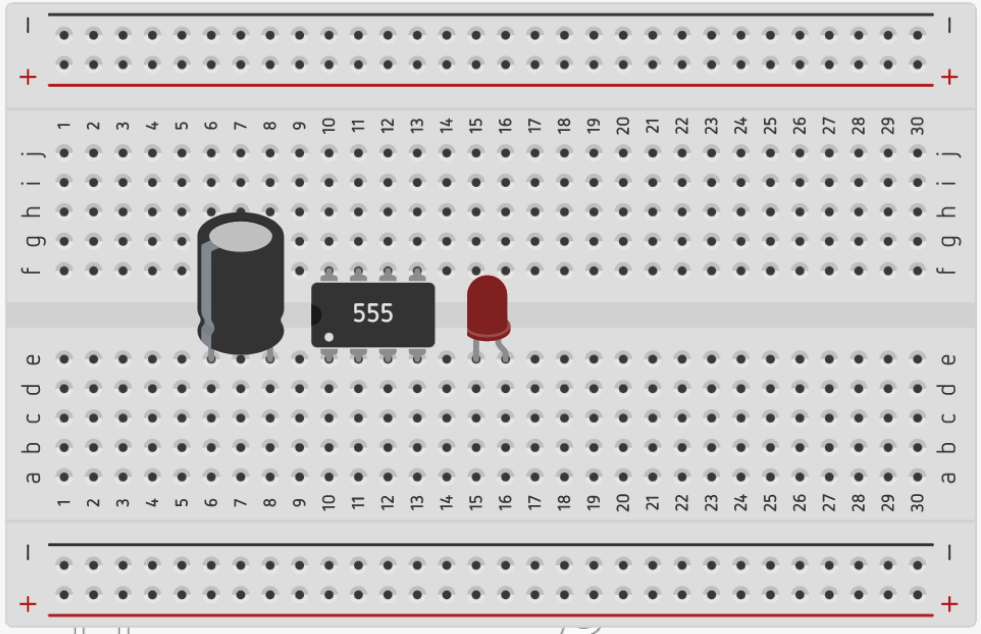
Connection Step 4

- Insert capacitor in breadboard



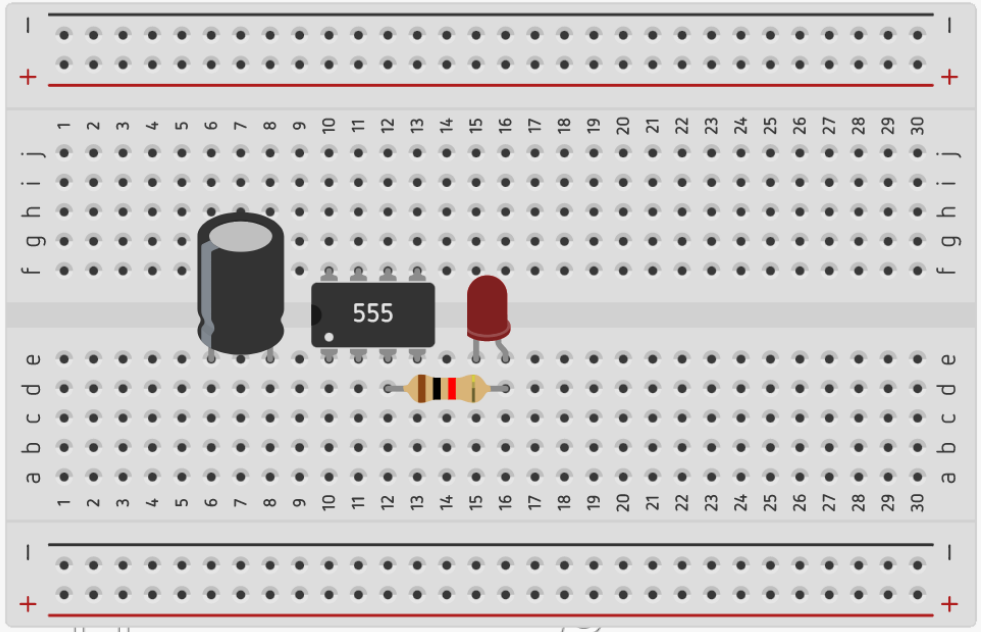
Connection Step 5

- Insert LED in breadboard



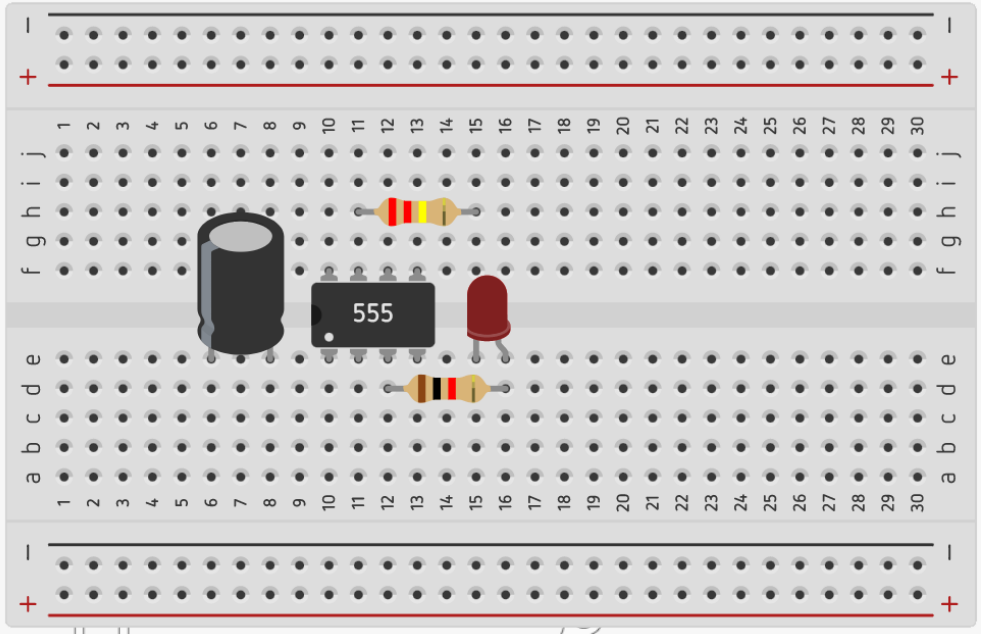
Connection Step 6

- Connect OUT (pin 3) of 555 timer to the anode terminal of LED using a resistor as shown in the diagram.



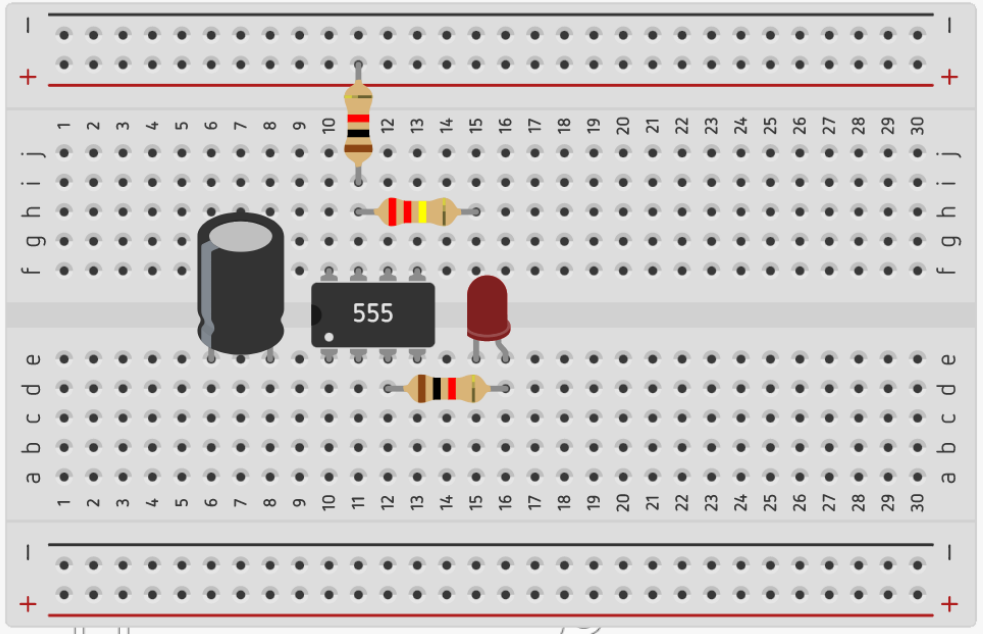
Connection Step 7

- Connect a resistor on DIS(pin 7) of 555 timer IC as shown in the diagram.



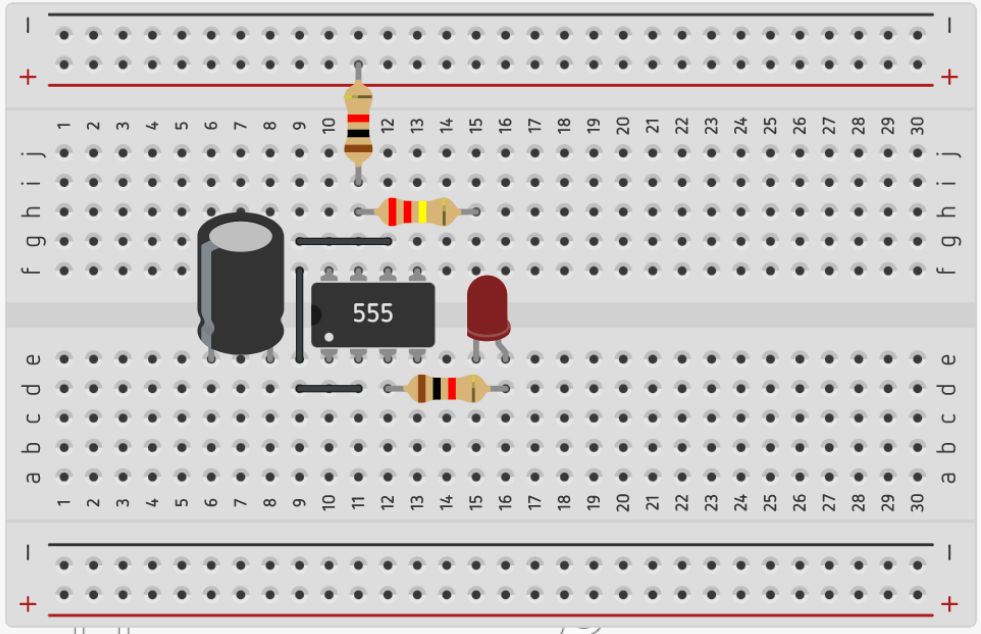
Connection Step 8

- Connect another resistor on DIS(pin 7) of 555 timer IC and other end of the resistor in the (+) power rail of breadboard as shown in the diagram.



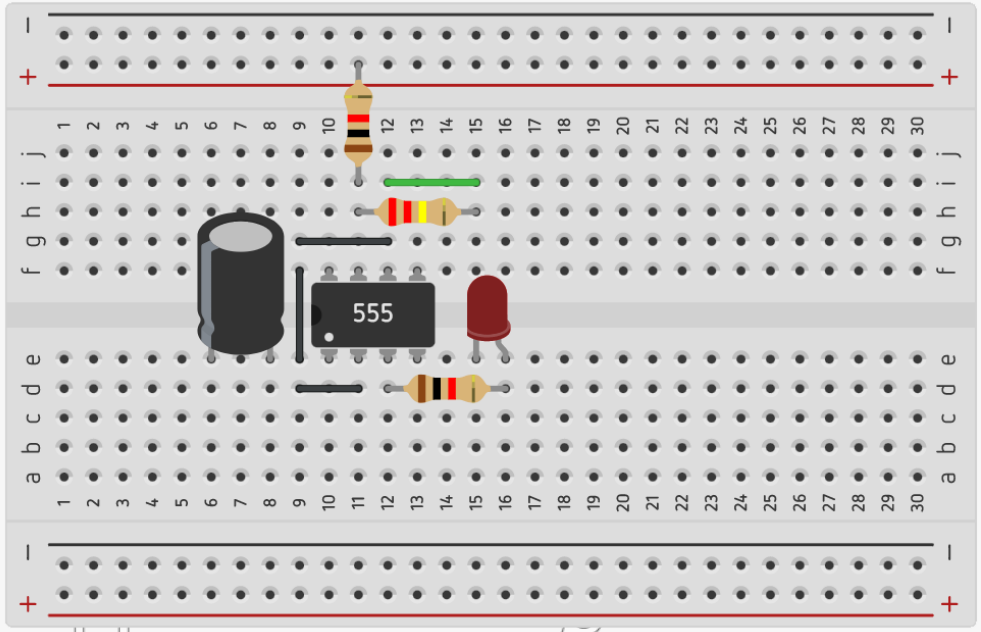
Connection Step 9

- Connect TRIG to THR pin of 555 timer as shown in the diagram.



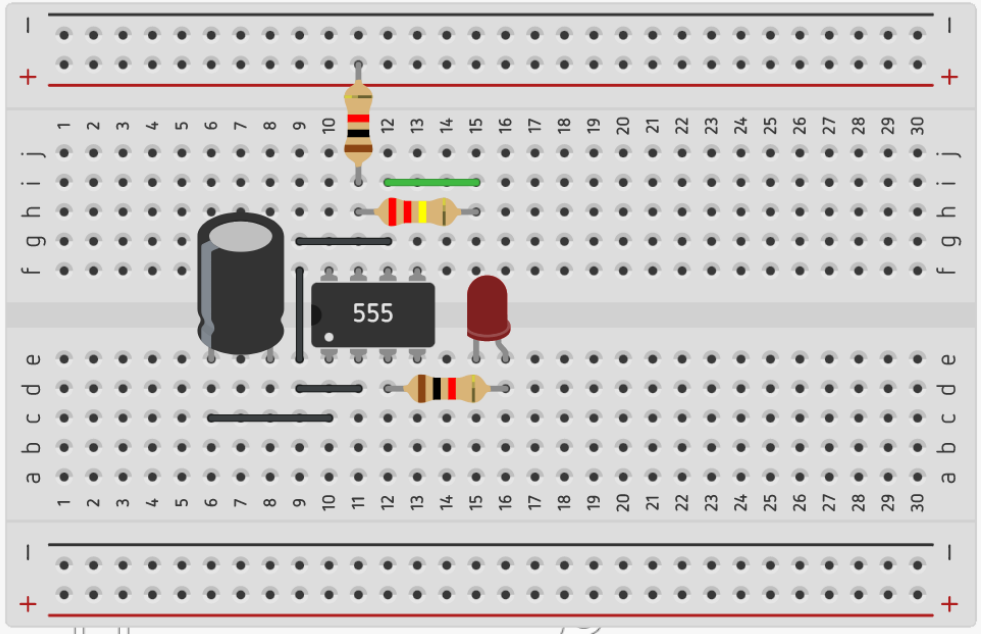
Connection Step 10

- Connect THR pin of 555 timer to the resistor open end as shown in the diagram.



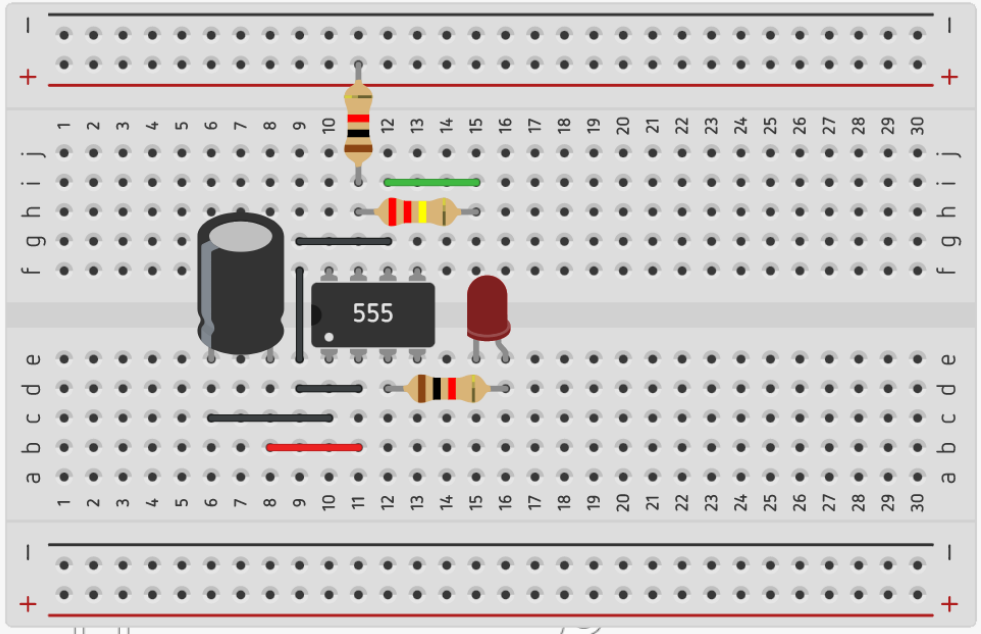
Connection Step 11

- Connect negative(-) terminal of capacitor to the GND pin of 555 timer as shown in the diagram.



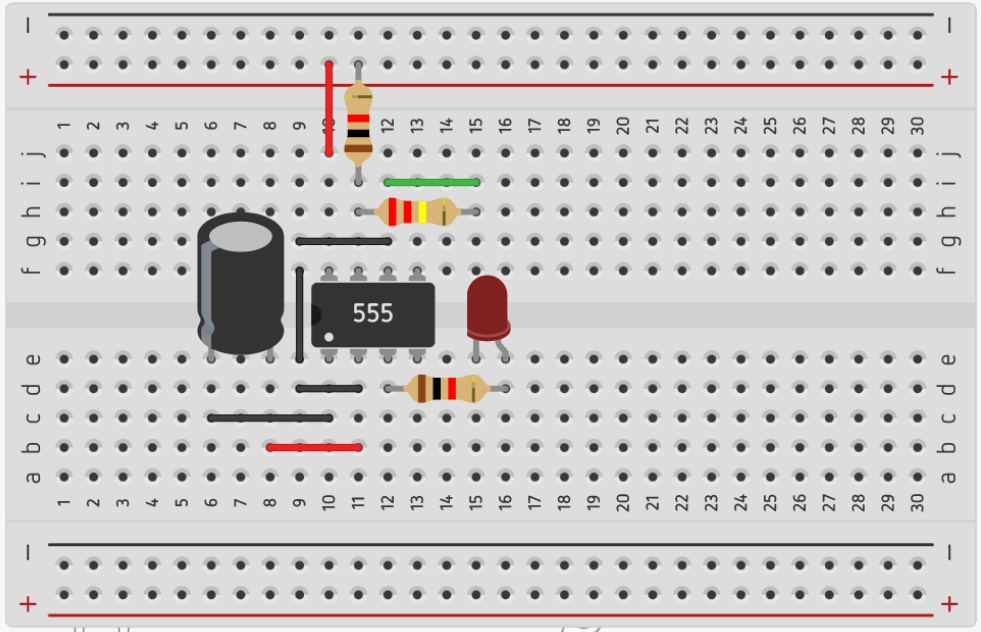
Connection Step 12

- Connect positive(+) terminal of the capacitor to the TRIG pin of the 555 timer as shown in the diagram.



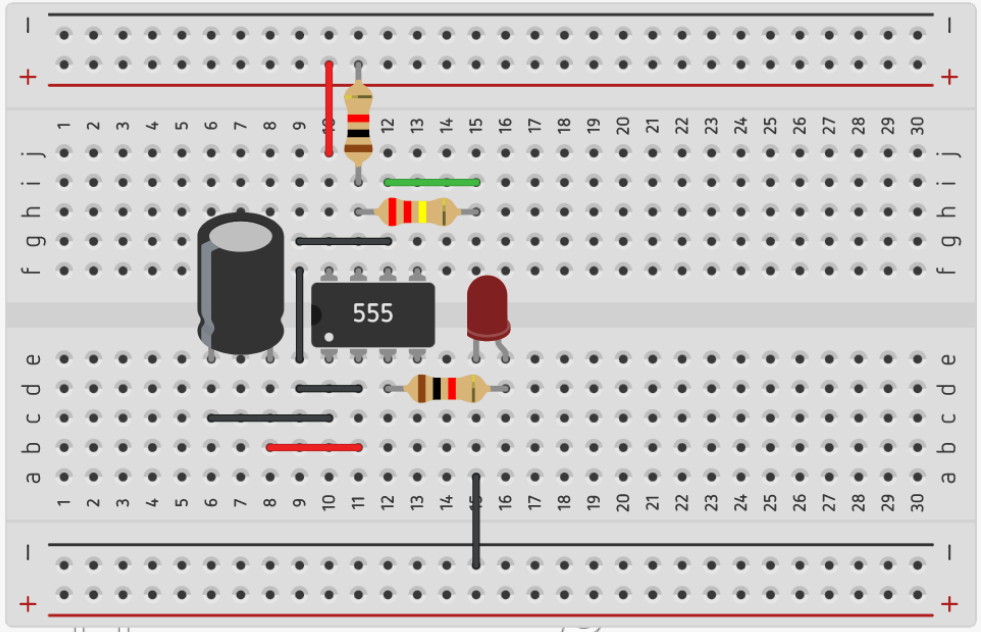
Connection Step 13

- Connect Vcc of 555 timer to the positive(+) power rail of the breadboard as shown in the diagram.



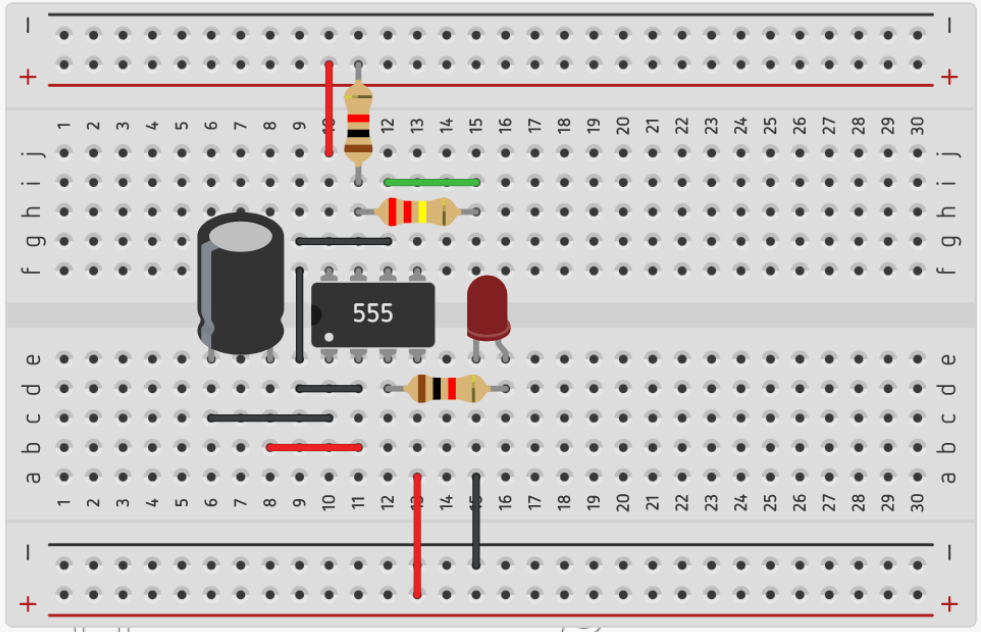
Connection Step 14

- Connect cathode(-) terminal of the LED to the negative(-) terminal of breadboard power rail as shown in the diagram.



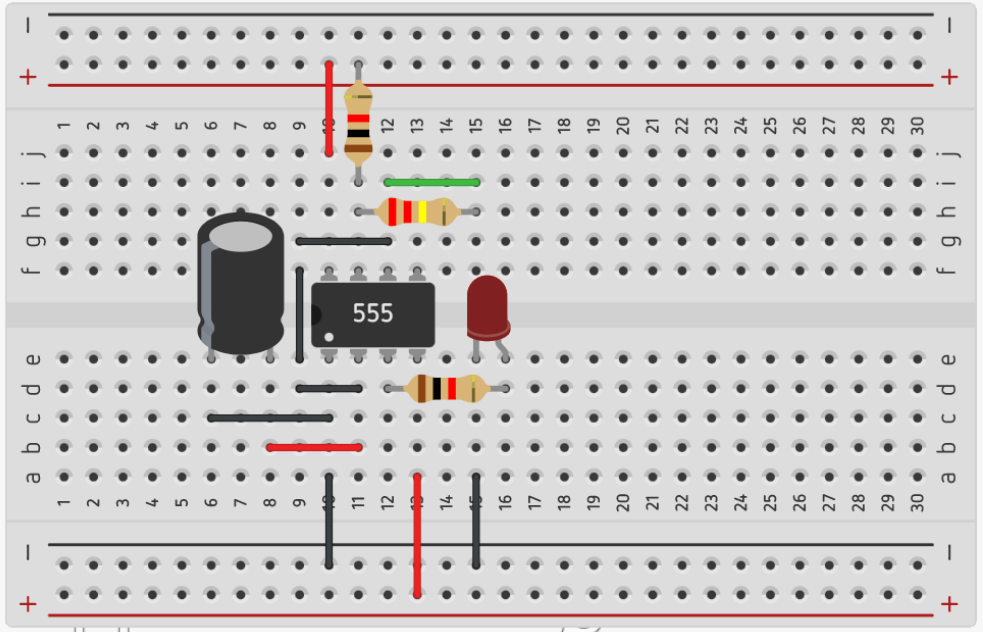
Connection Step 15

- Connect RESET(pin 4) of the 555 timer to the positive(+) power rail of the breadboard as shown in the diagram.



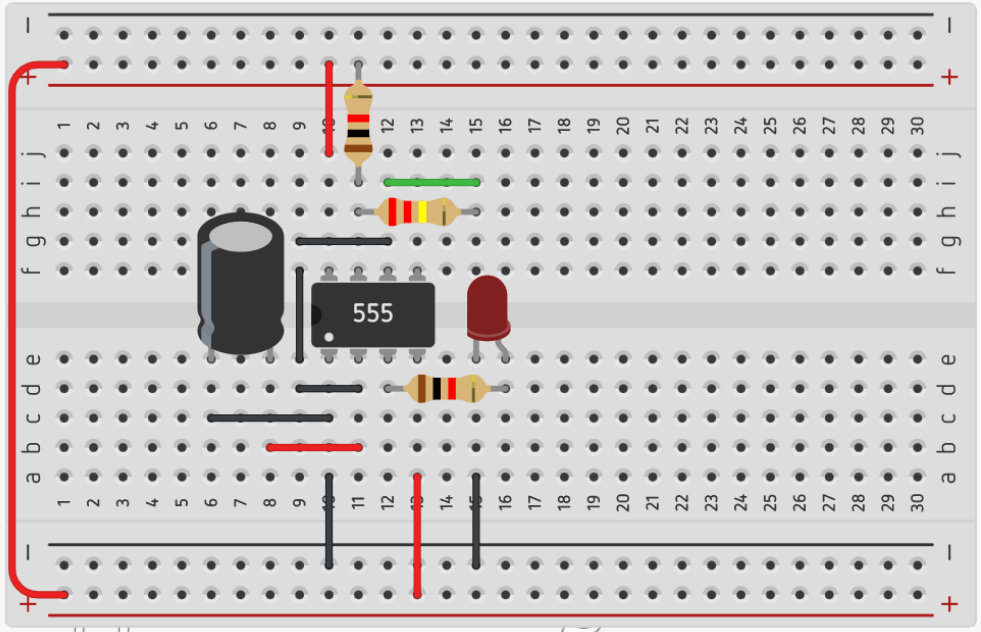
Connection Step 16

- Connect GND(pin 1) of the 555 timer to the negative(-) terminal of the breadboard power rail as shown in the figure.



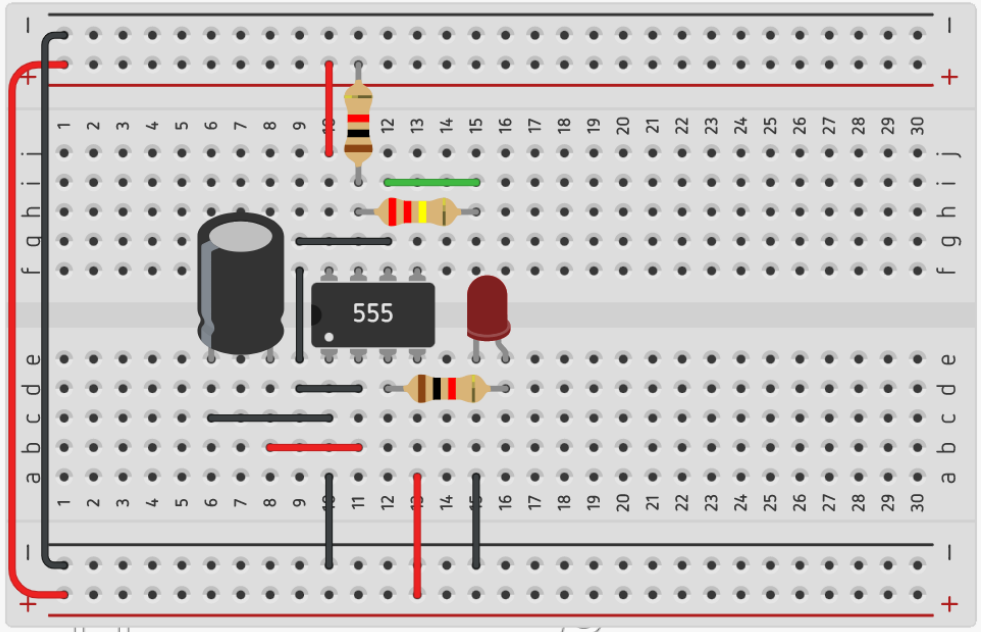
Connection Step 17

- Connect one side of positive(+) power rail to the another side of the power rail as shown in the figure.



Connection Step 18

- Connect one side of negative(-) power rail to the another side of the power rail as shown in the figure.



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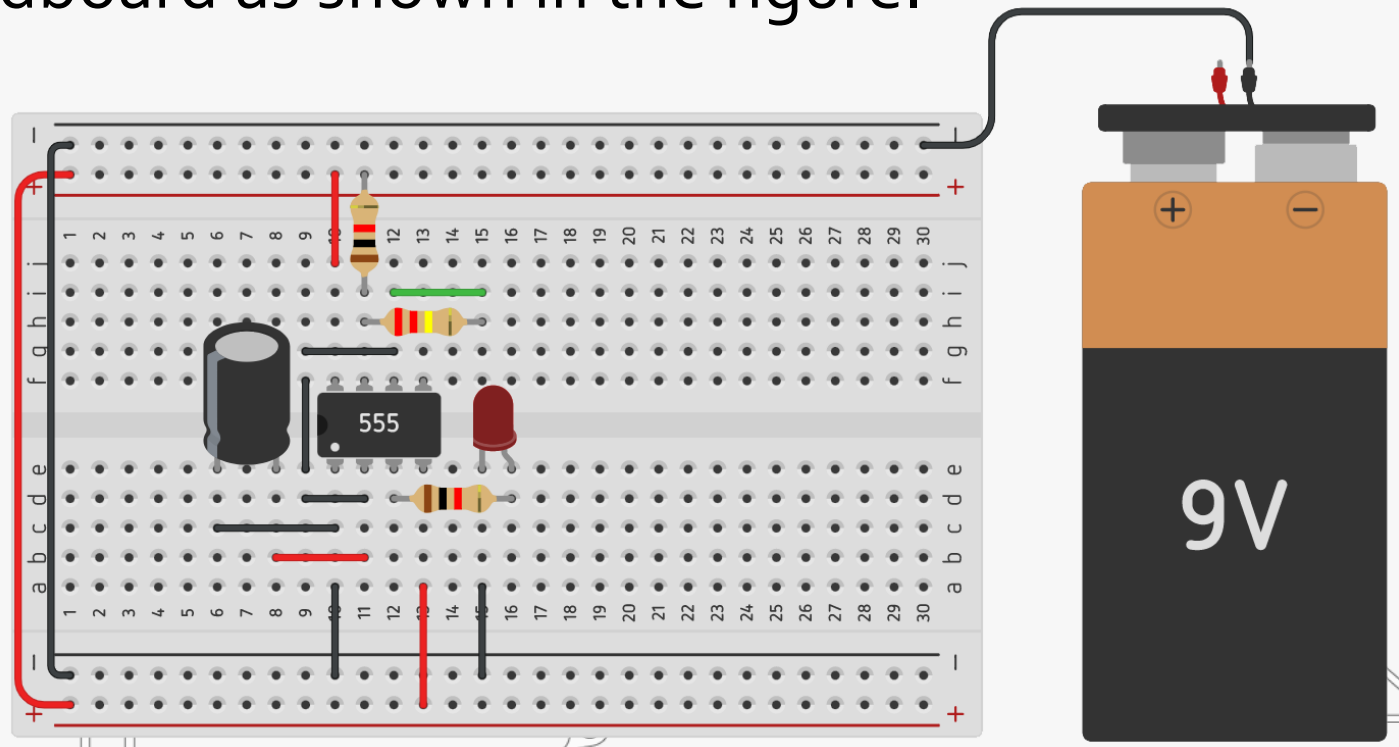
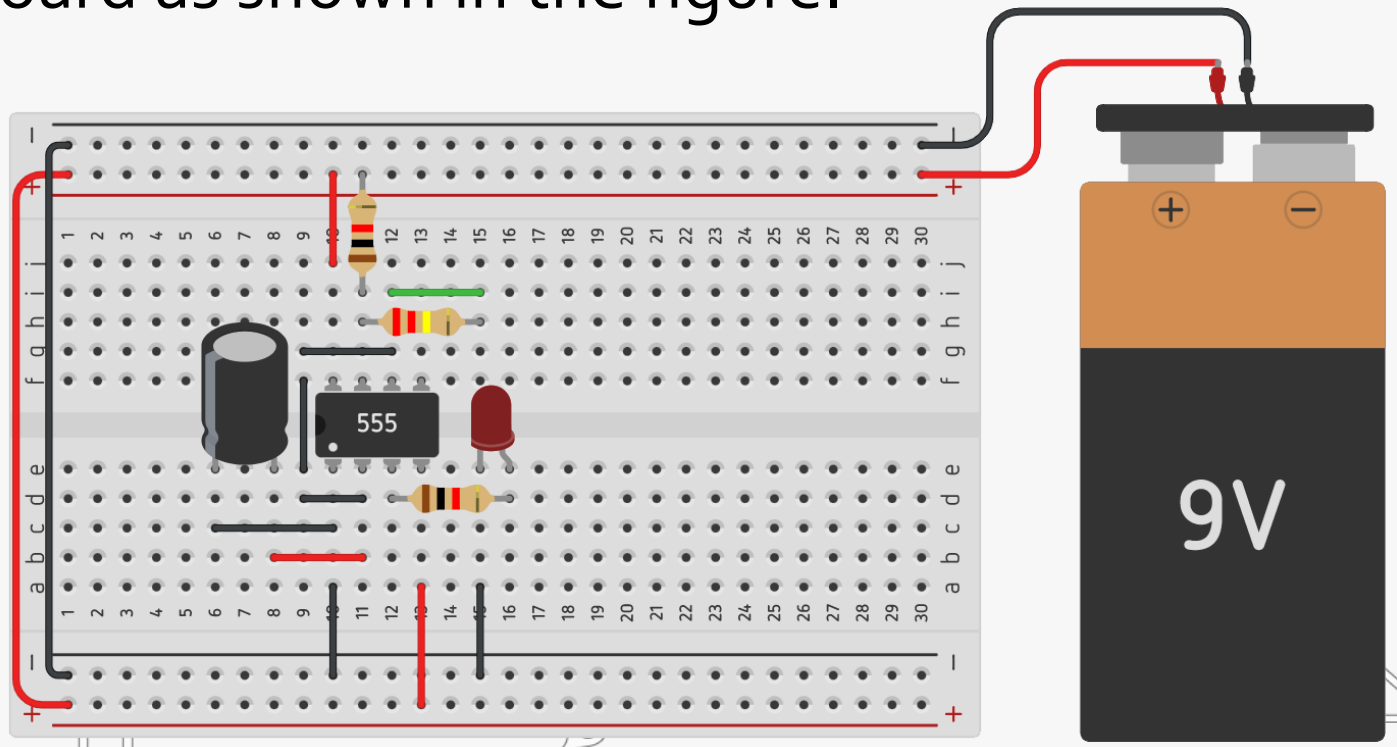
Connection Step 19

- Connect cathode(-) terminal of battery to the negative(-) power rail of the breadboard as shown in the figure.



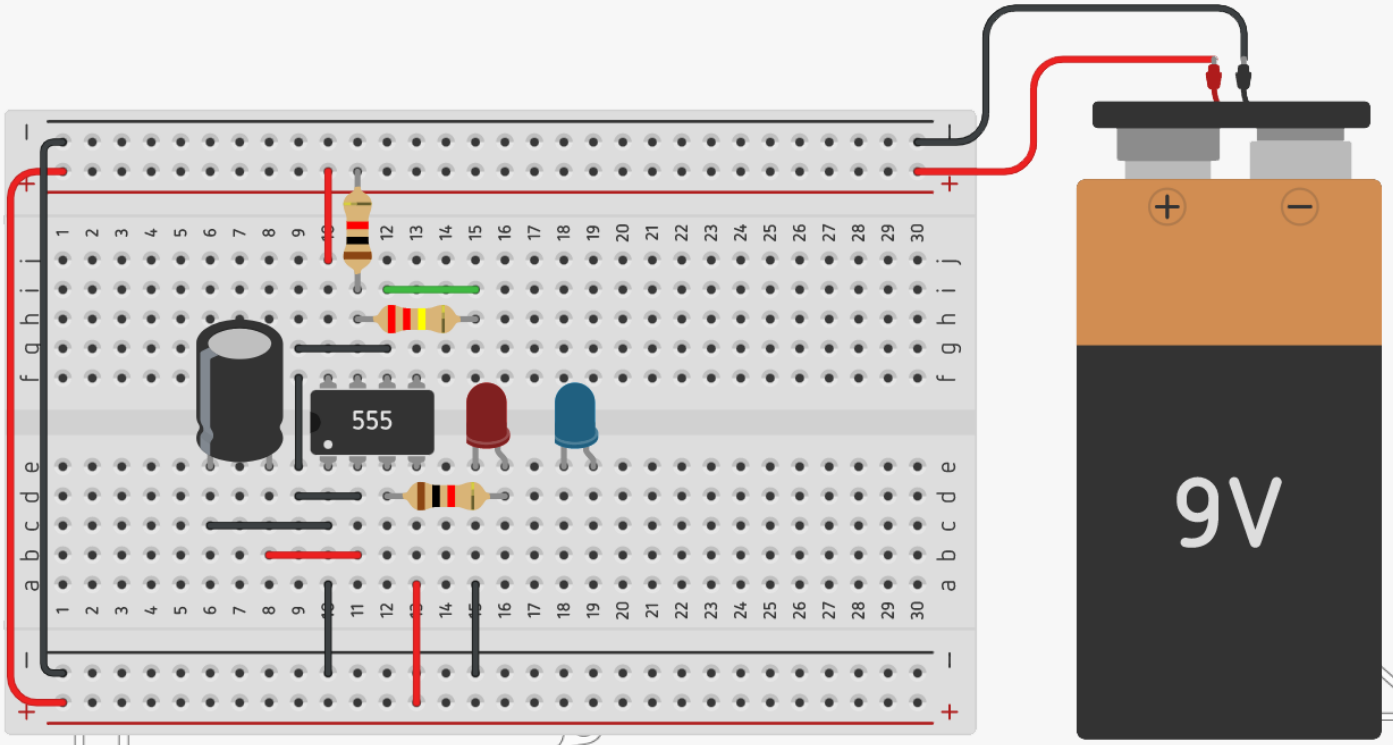
Connection Step 20

- Connect anode(+) terminal of battery to the positive(+) power rail of the breadboard as shown in the figure.



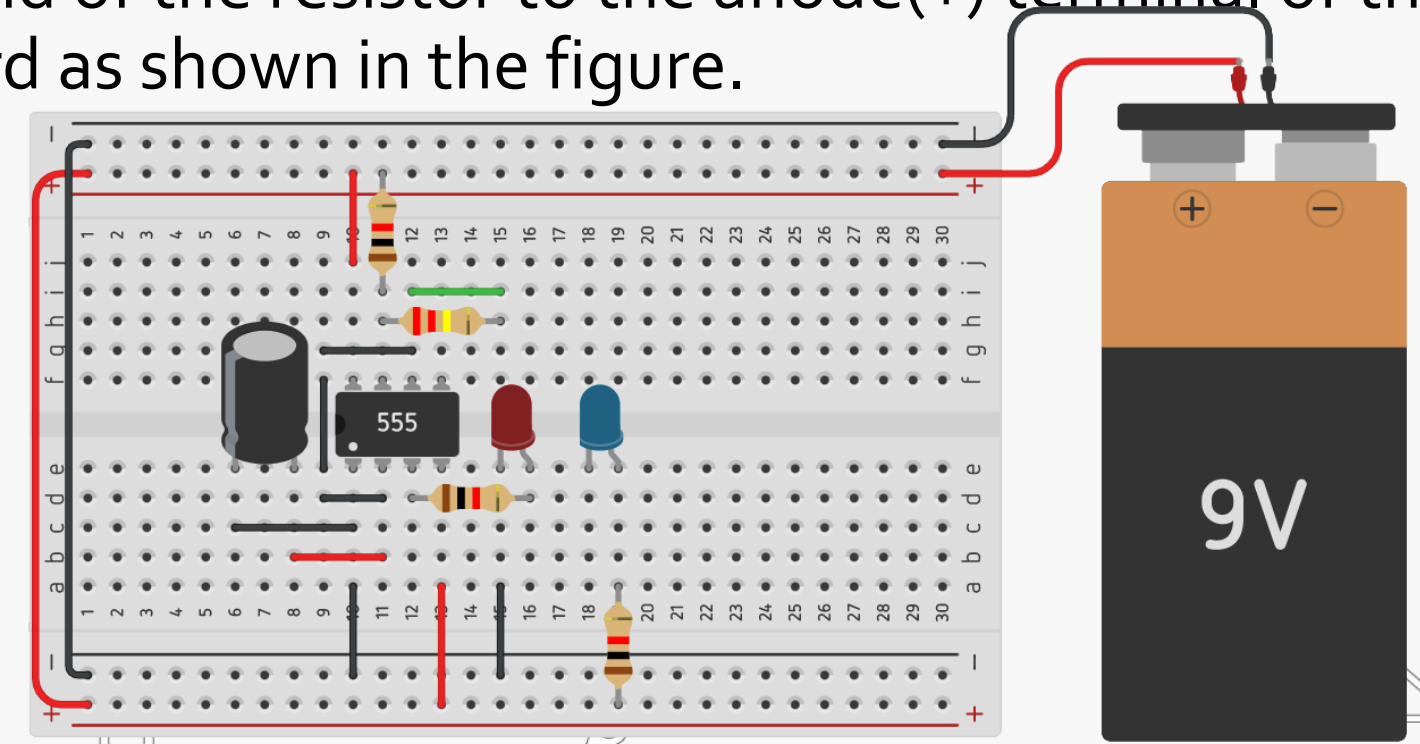
Connection Step 21

- Insert another LED in the breadboard as shown in the figure.



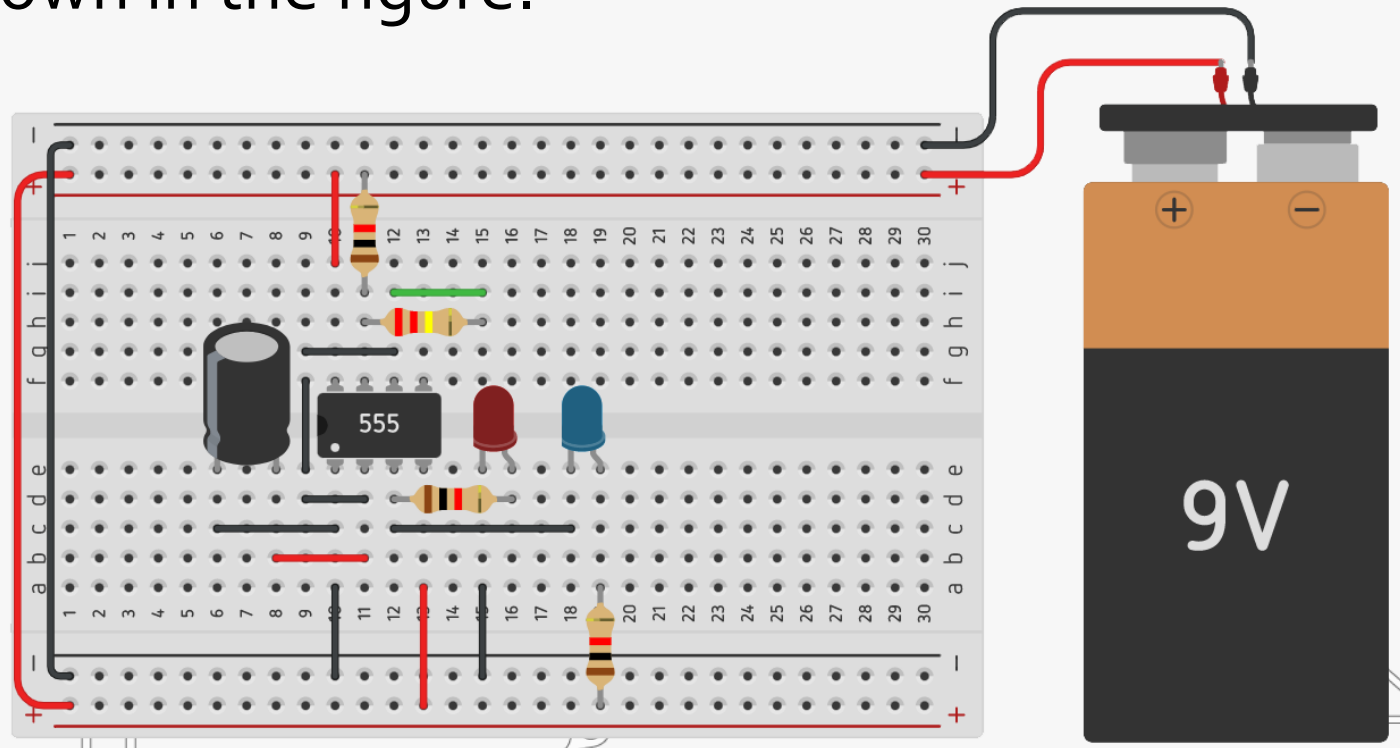
Connection Step 22

- Insert one resistor in the positive(+) power rail of breadboard and another end of the resistor to the anode(+) terminal of the LED in the breadboard as shown in the figure.



Connection Step 23

- Connect cathode(-) terminal of the LED to the OUT(pin 3) of the 555 timer as shown in the figure.



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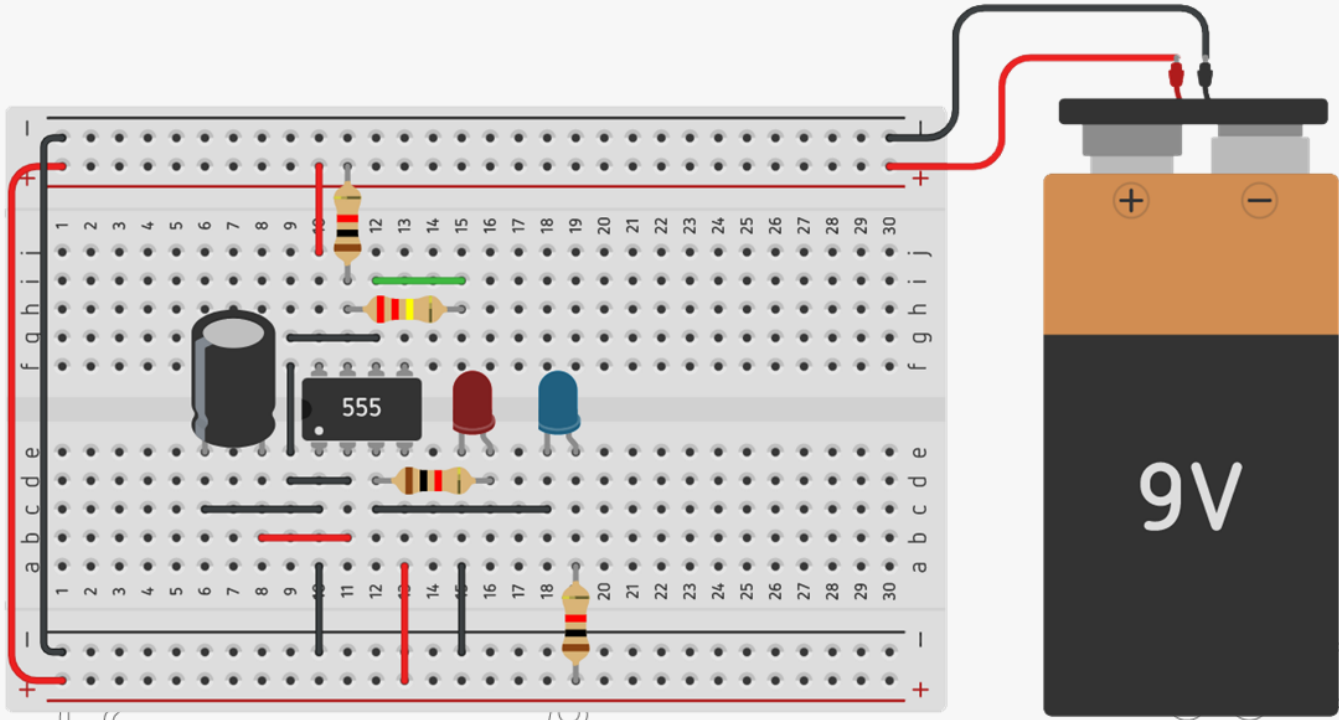
Connection Diagram

- Make sure your connections are made as per the diagram



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Data & Outcomes

Learning from the activity

Data

- Use of 555 timer
- How to make a chaser
- Generate pulse

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Learning from the activity

- How to use 555 timer
- How to make chaser using 555 timer

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Assessment

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Thank you

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Object Detector

Object detector using IR sensor

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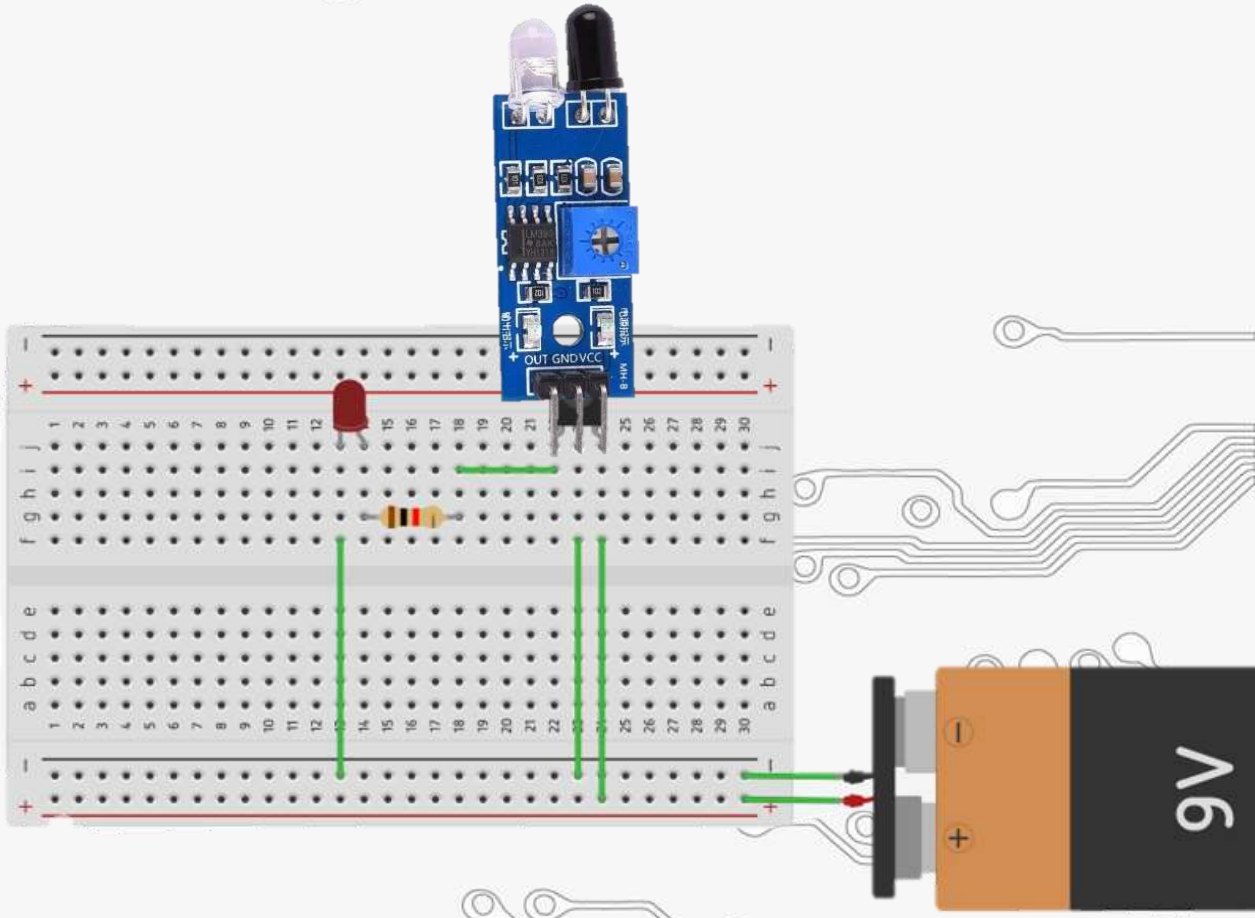
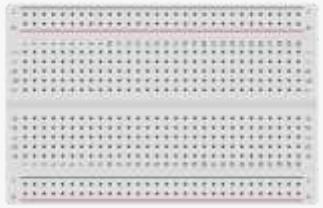
Introduction

Object detector



Required Components

- Breadboard
- IR Sensor
- LED
- Resistor
- Snap Connector
- Jumper Wires
- Battery 9v



Breadboard

IR Sensor

LED

Resistor

Snap Connector

Jumper Wires

Battery 9v

Infrared Transmitter-Receiver

- Infrared Transmitter is a light emitting diode (LED) which emits infrared radiations. Hence, they are called IR LED's. Even though an IR LED looks like a normal LED, the radiation emitted by it is invisible to the human eye.
- Infrared receivers are also called as infrared sensors as they detect the radiation from an IR transmitter. IR receivers come in the form of photodiodes and phototransistors. Infrared Photodiodes are different from normal photo diodes as they detect only infrared radiation.

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About Project

- An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion.
- These types of sensors measures only infrared radiation. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations.
- These types of radiations are invisible to our eyes that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED.
- The basic concept of an Infrared Sensor which is used as Object detector, is to transmit an infrared signal, this infrared signal bounces from the surface of an object and the signal is received at the infrared receiver.

Working of the Project

- In this project, the transmitter section includes an IR sensor, which transmits continuous IR rays to be received by an IR receiver module.
- An IR output terminal of the receiver varies depending upon its receiving of IR rays. Since this variation cannot be analyzed as such, therefore this output can be fed to a comparator circuit.
- Here an operational amplifier of LM358 is used as comparator circuit. When the IR receiver does not receive a signal, the potential at the inverting input goes higher than that non-inverting input of the comparator IC (LM358).
- Thus the output of the comparator goes low, but the LED does not glow. When the IR receiver module receives signal to the potential at the inverting input goes low. Thus the output of the comparator goes high and the LED starts glowing.

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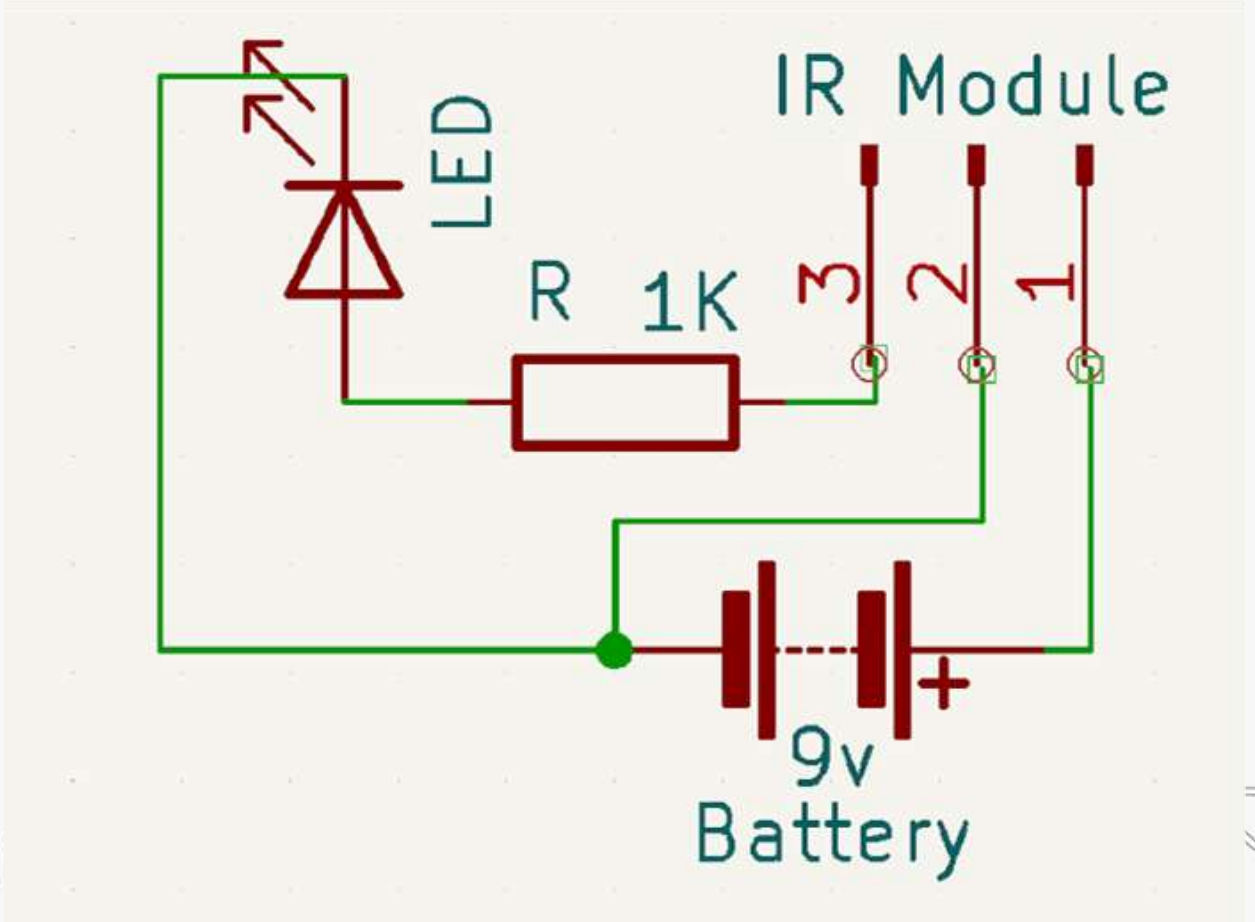
Procedure

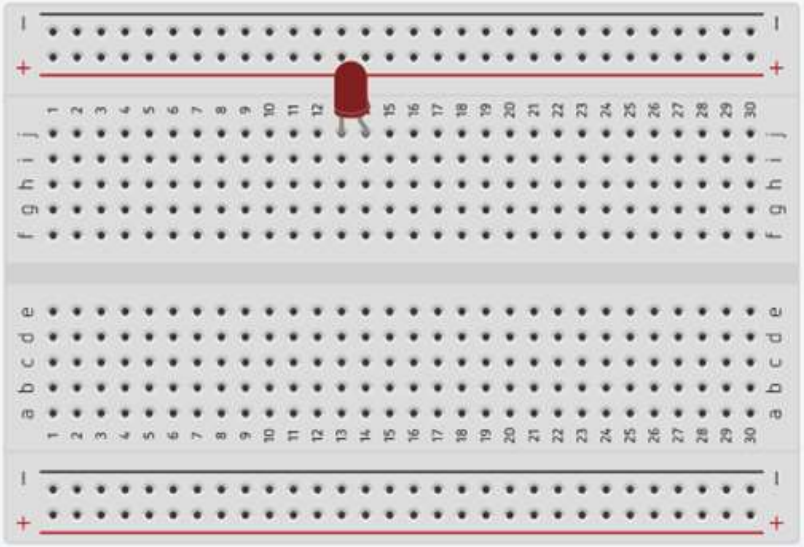
Connection Steps

Circuit diagram



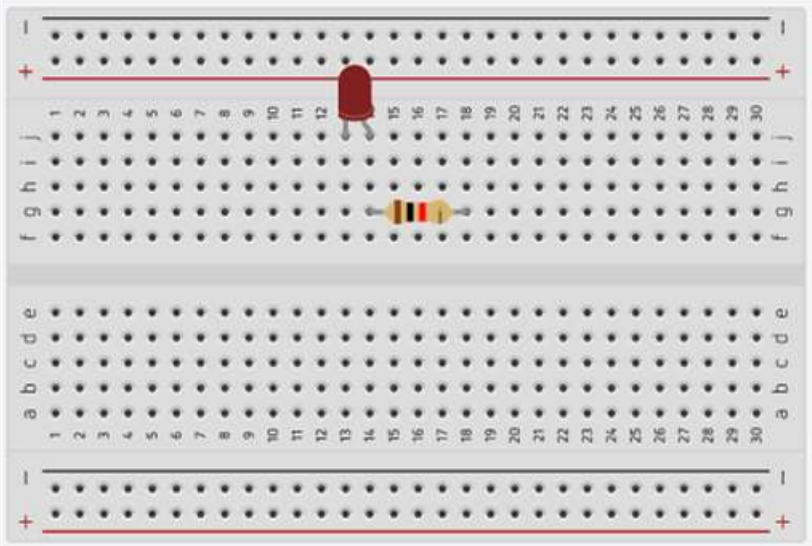
Connection Step 1

- Insert LED in bread board



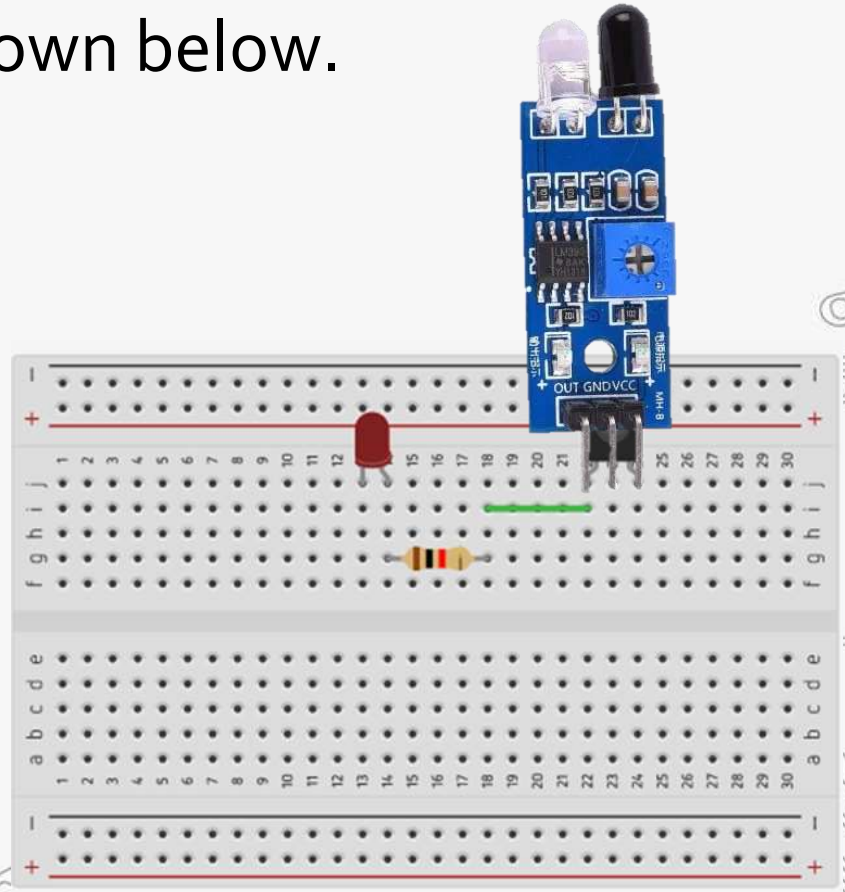
Connection Step 2

- Inter resistor in bread board and connect the anode (+) terminal of the LED to the resistor, as shown below.



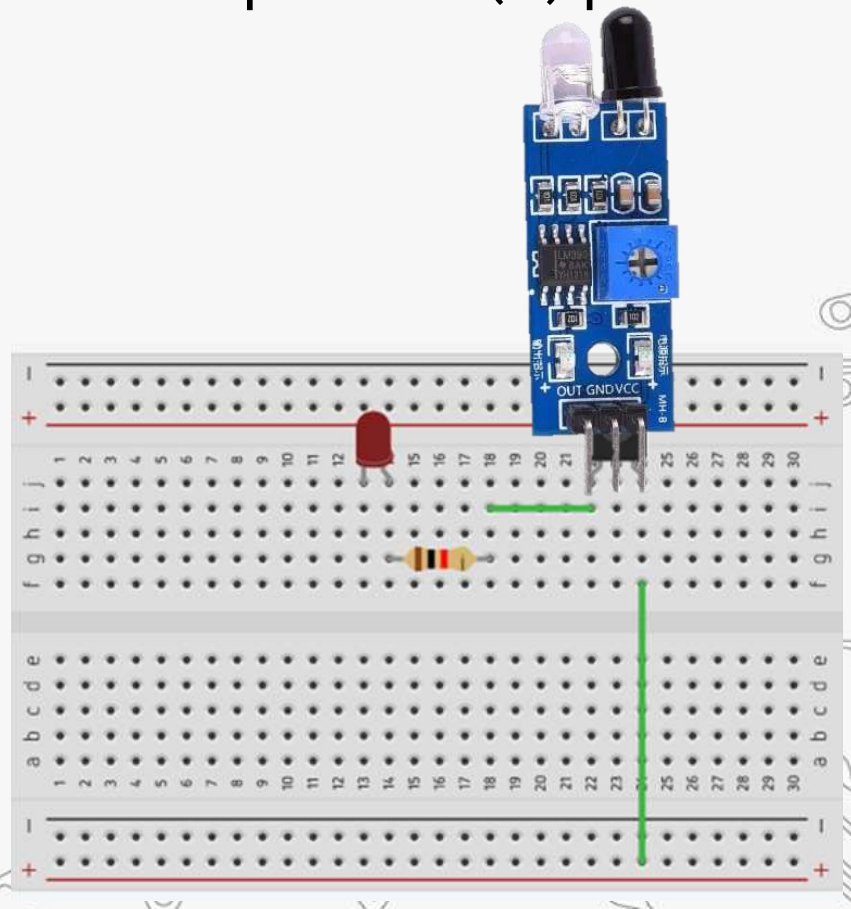
Connection Step 3

- Insert IR sensor in the bread board and connect the OUT terminal to the open end of the resistor as shown below.



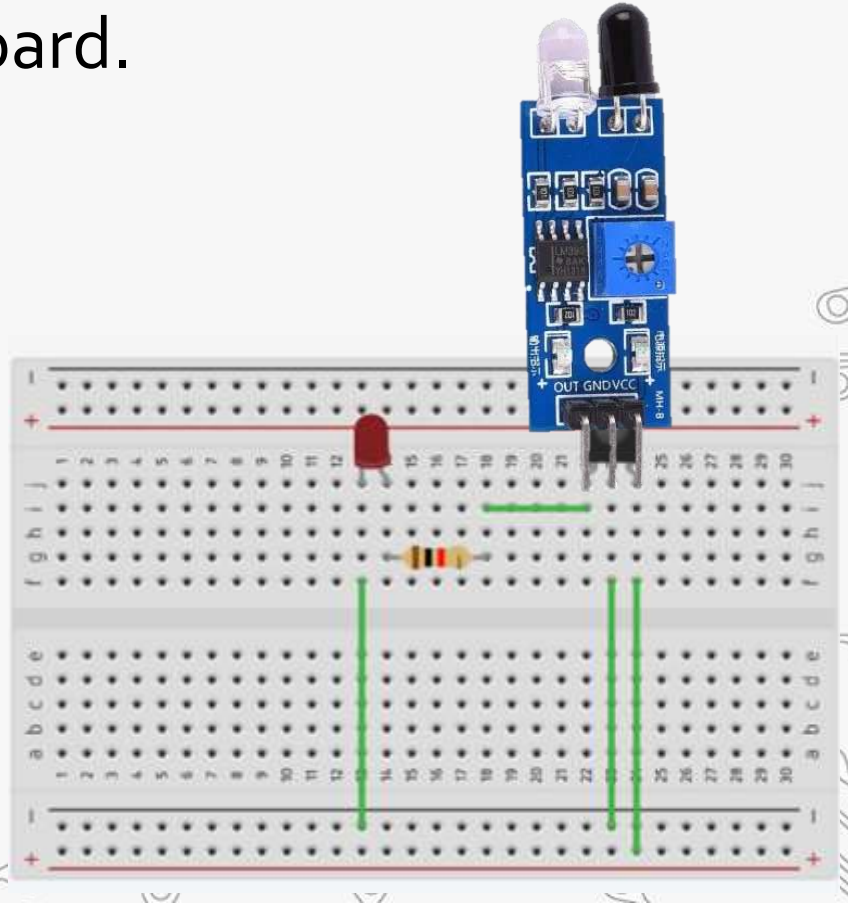
Connection Step 4

- Connect VCC terminal of IR sensor to the positive(+) power rail of bread board.



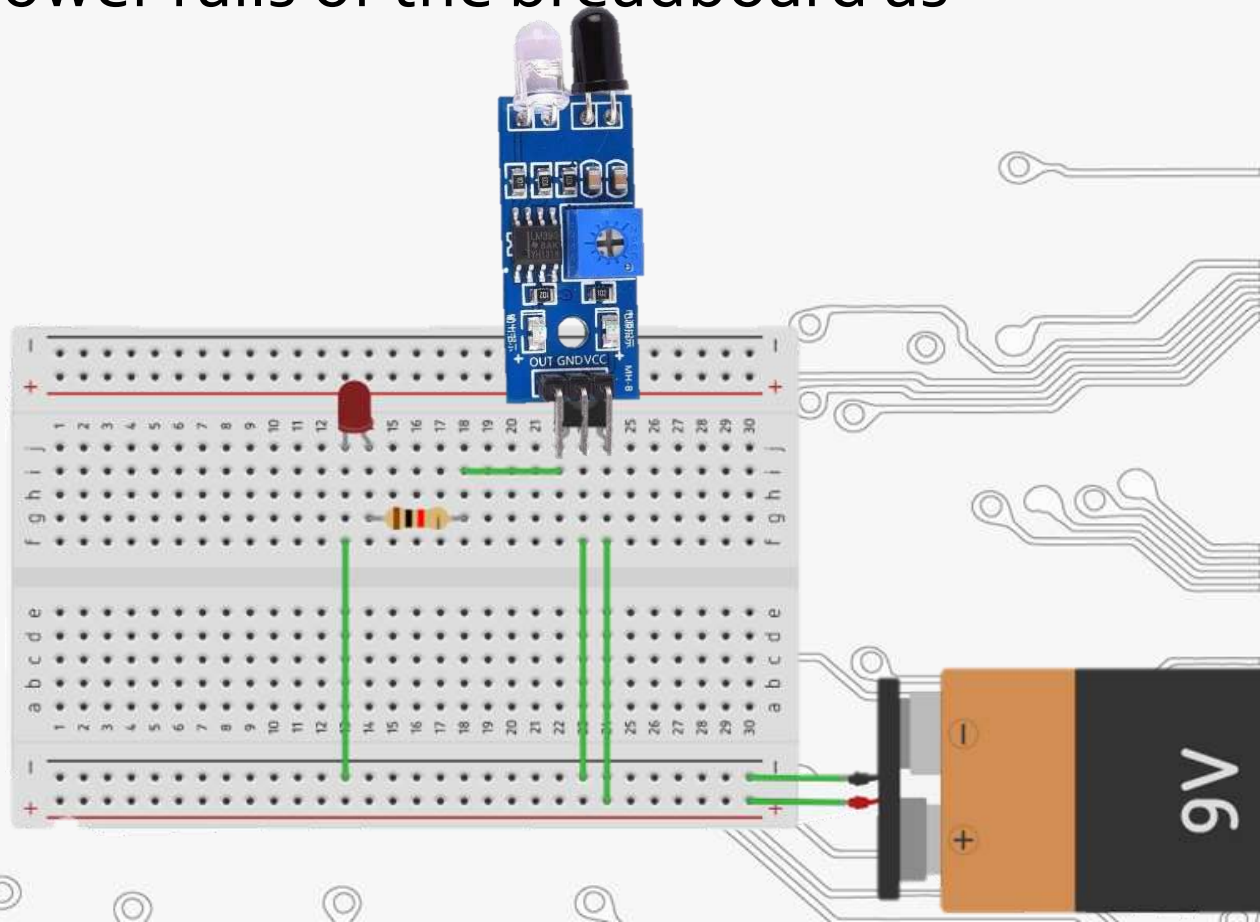
Connection Step 5

- Connect GND terminal and cathode (-) terminal of the LED to the negative (-) power rail of bread board.



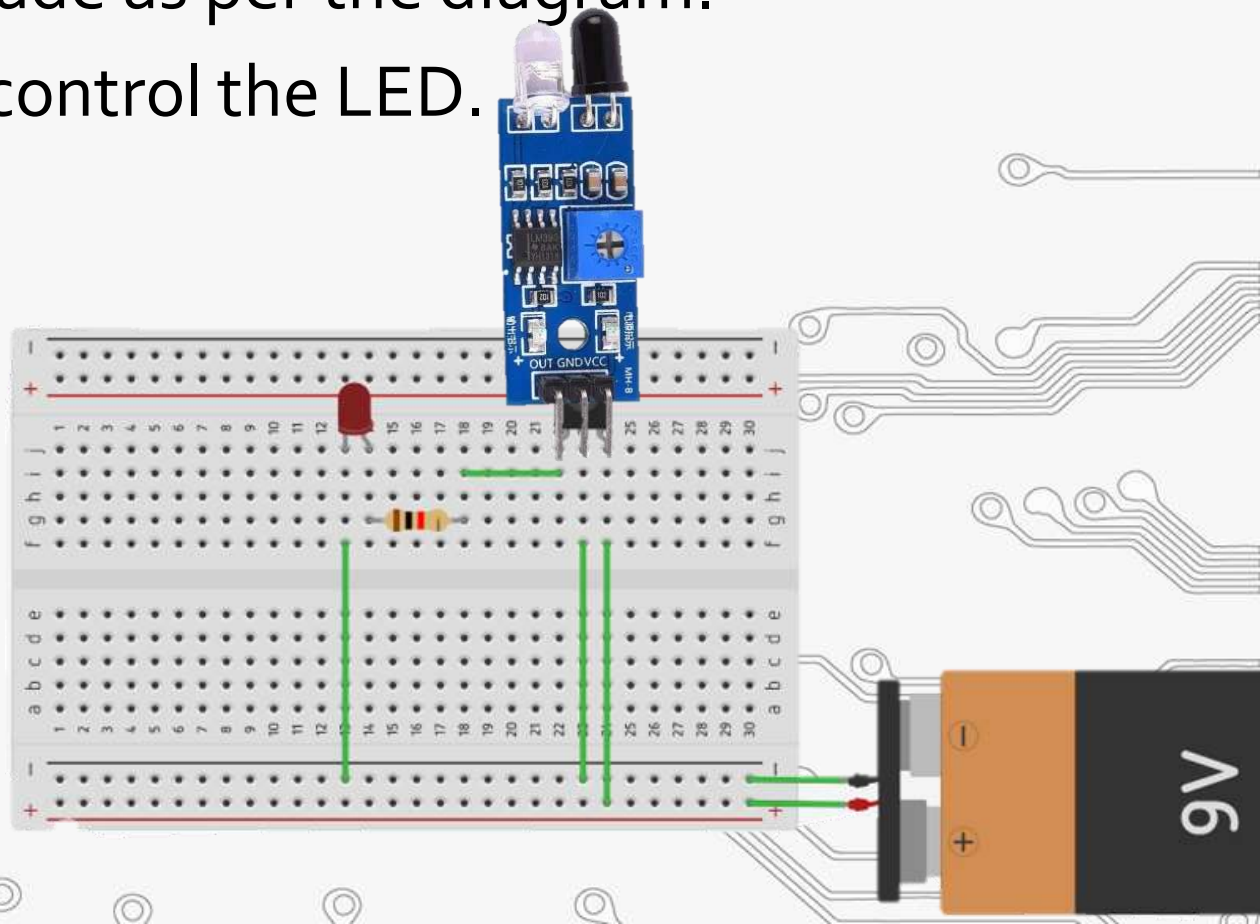
Connection Step 6

- Connect battery terminals to the power rails of the breadboard as shown below.



Connection Diagram

- Make sure your connections are made as per the diagram.
- Wave your hand over IR sensor to control the LED.



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Data & Outcomes

Learning from the activity

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Assessment

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Thank you

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Automatic Street Lamp

Automatic street lamp using LDR

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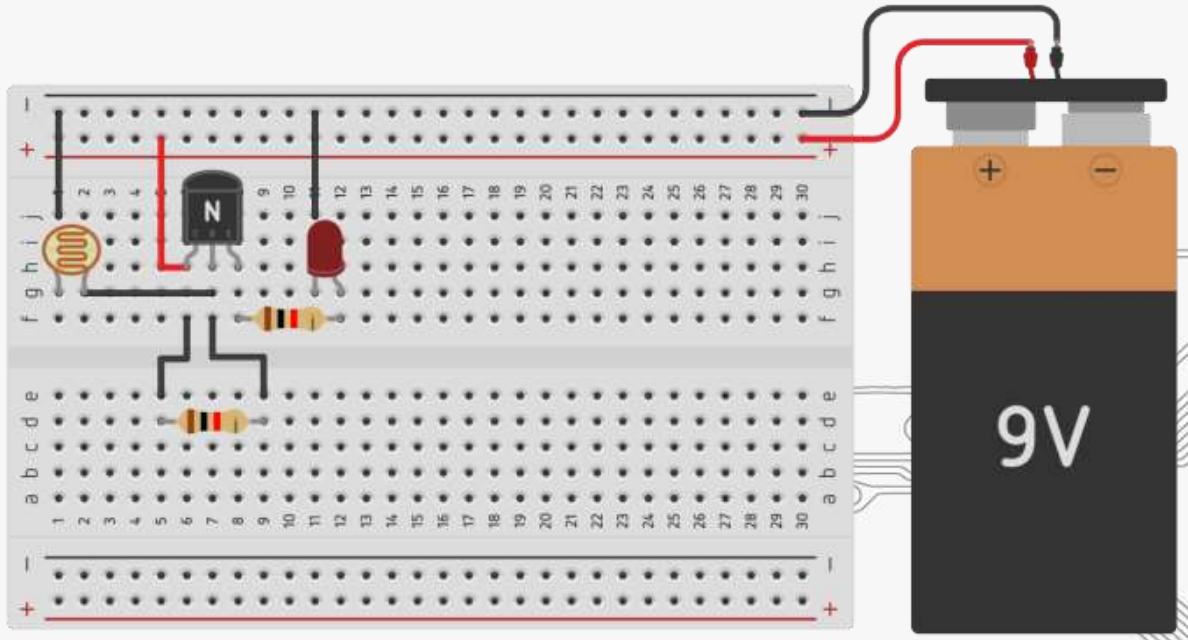
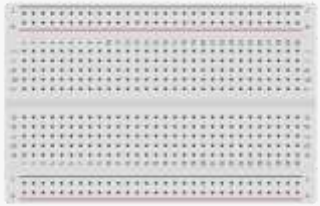
Introduction

Automatic street lamp



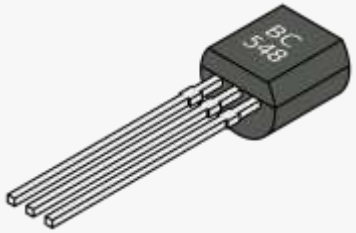
Required Components

- Breadboard
- LED
- BC548 transistor
- Resistor
- Snap Connector
- Light Dependent Resistor
- Jumper Wires
- Battery 9v



Breadboard

LED



BC548/547 Transistor

Resistor

Snap Connector

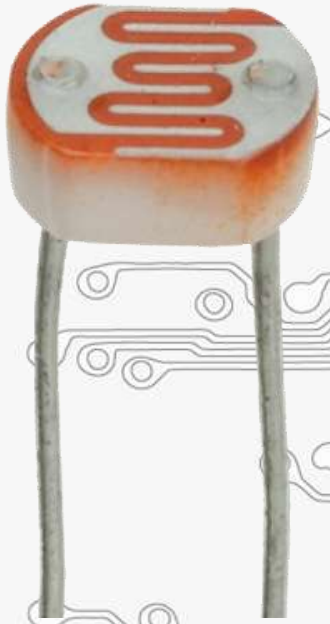
LDR

Jumper Wires

Battery 9v

Light Dependent Resistor (LDR)

- A photoresistor (also known as a Photocell, or light-dependent resistor, LDR, or photo-conductive cell) is a component that decreases resistance with respect to receiving luminosity (light) on the component's sensitive surface.
- It can be found in many consumer items such as:
  - Camera light meters
  - Clock radios
  - Alarm devices (as the detector for a light beam)
  - Nightlights
  - Solar street lamps



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Procedure

Connection Steps

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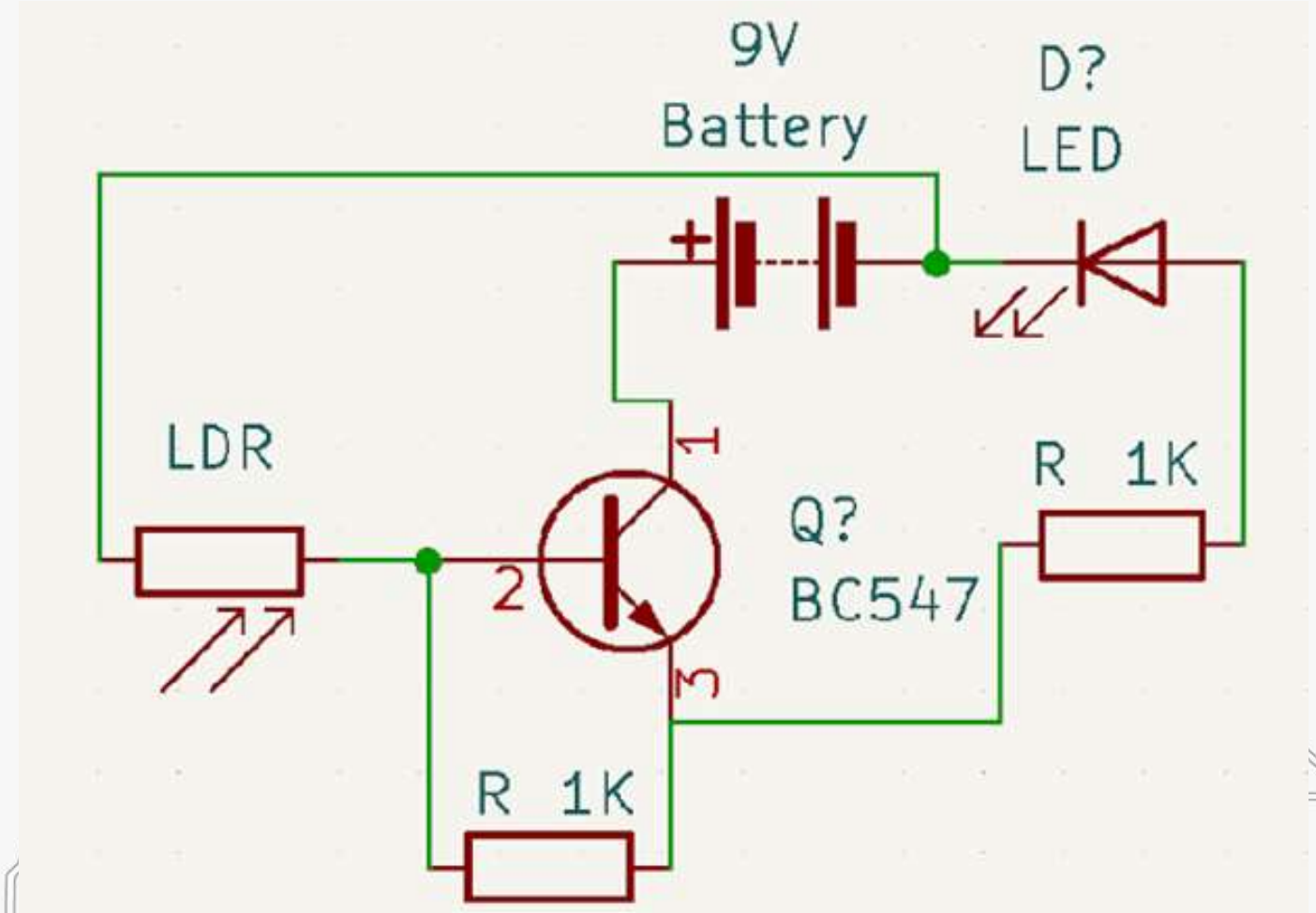
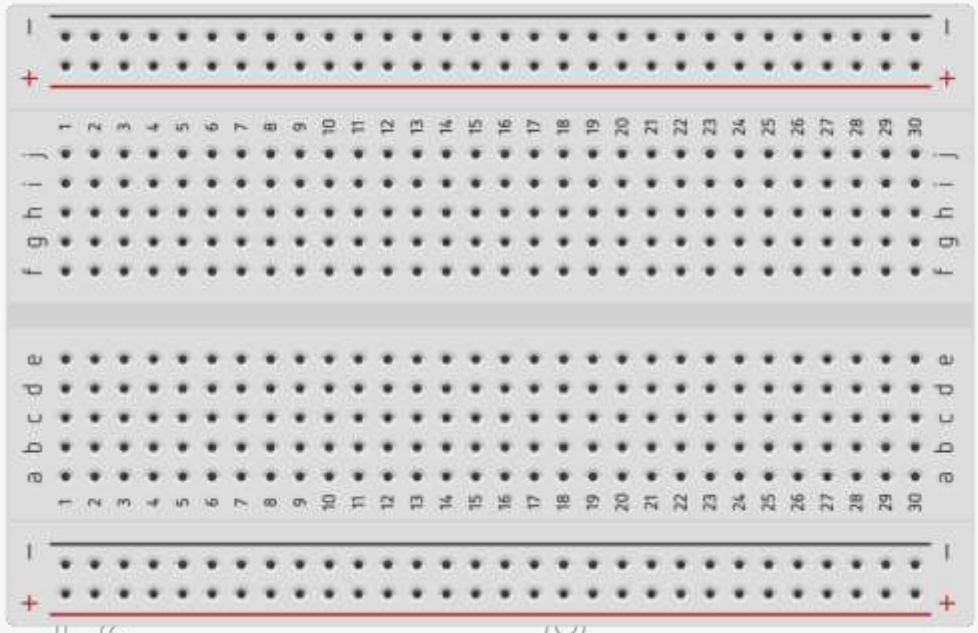
Circuit diagram



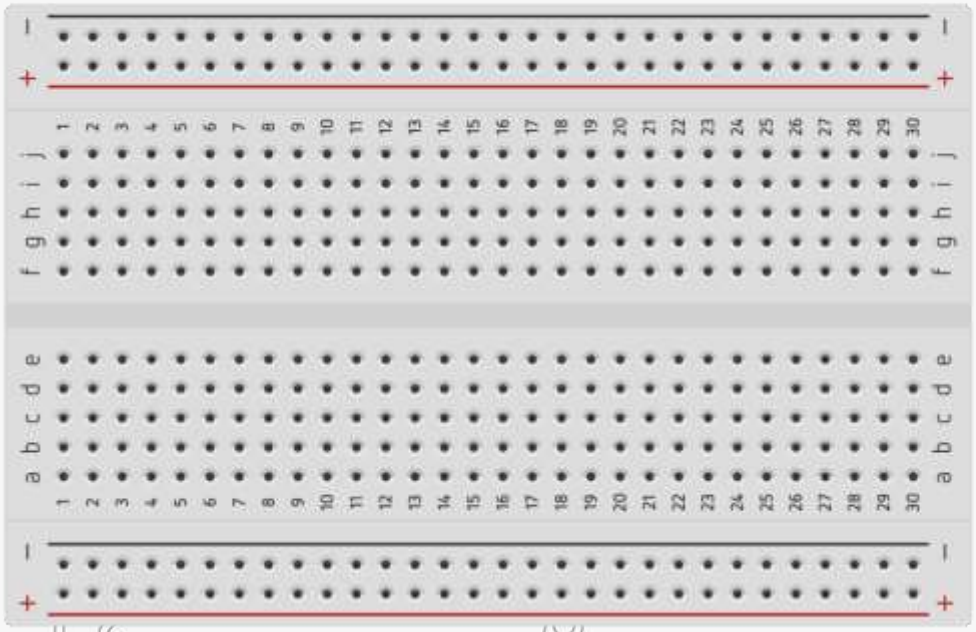
Connection Step 1

- Place breadboard



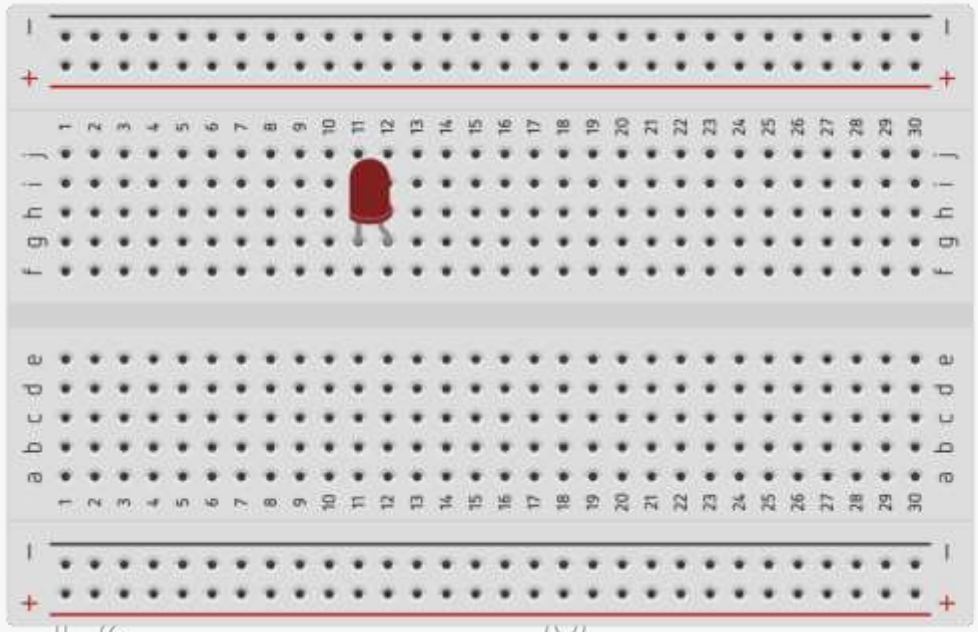
Series Connection Step 2

- Place 9v Battery



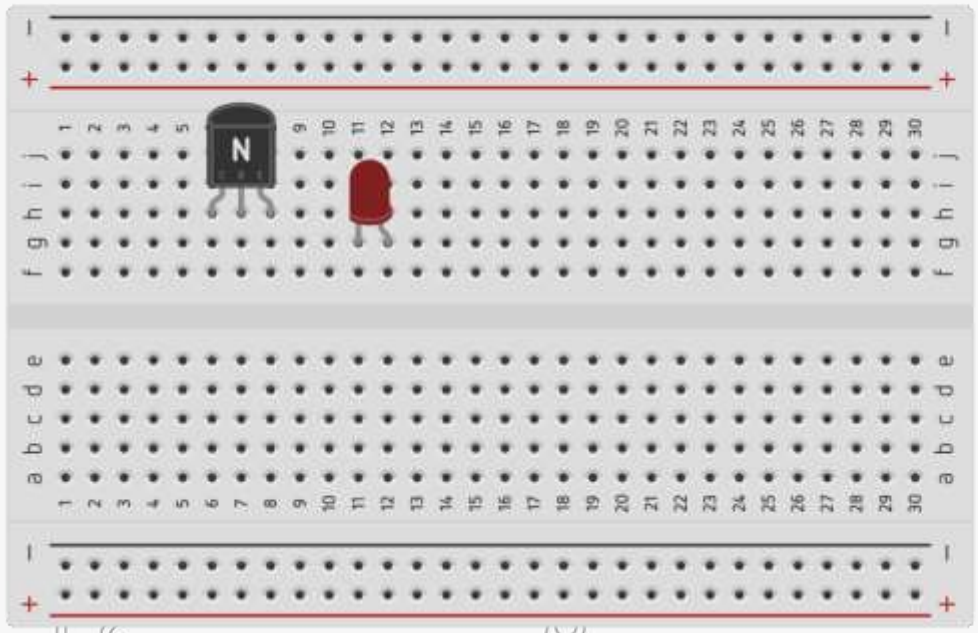
Series Connection Step 3

- Insert LED



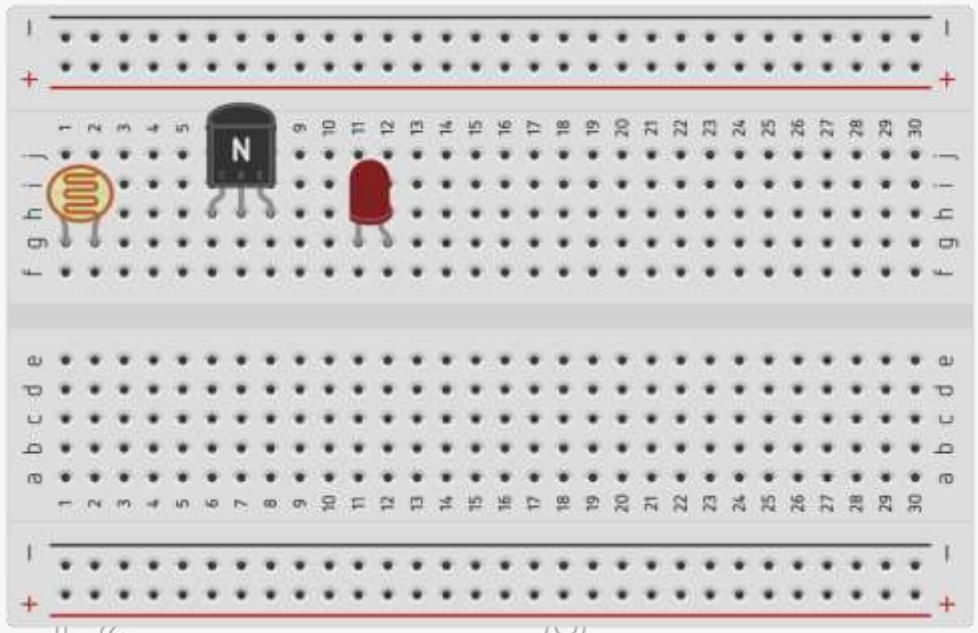
Series Connection Step 4

- Insert BC548 transistor in the breadboard.



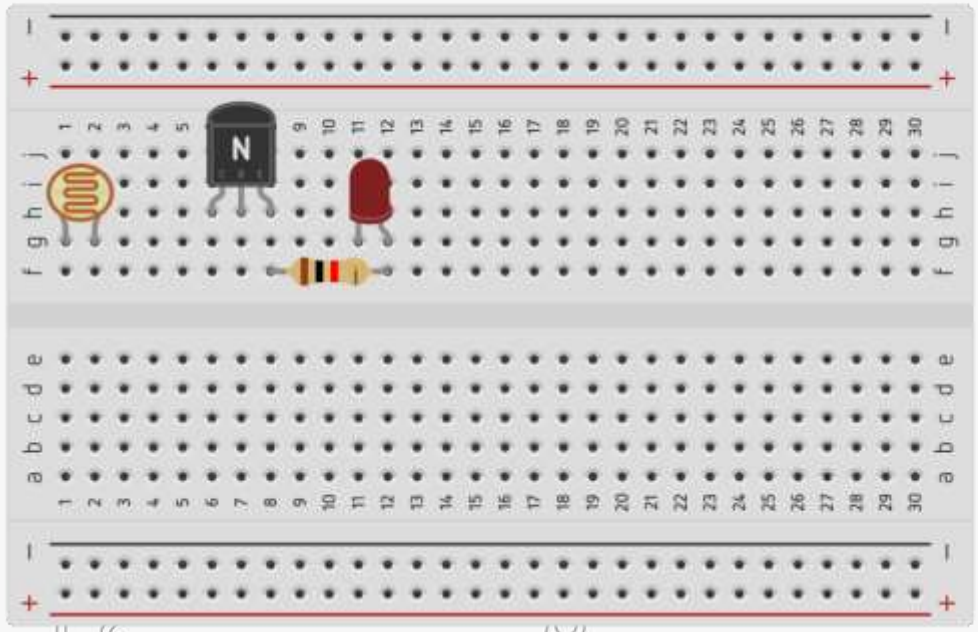
Series Connection Step 5

- Insert light dependent resistor in breadboard.



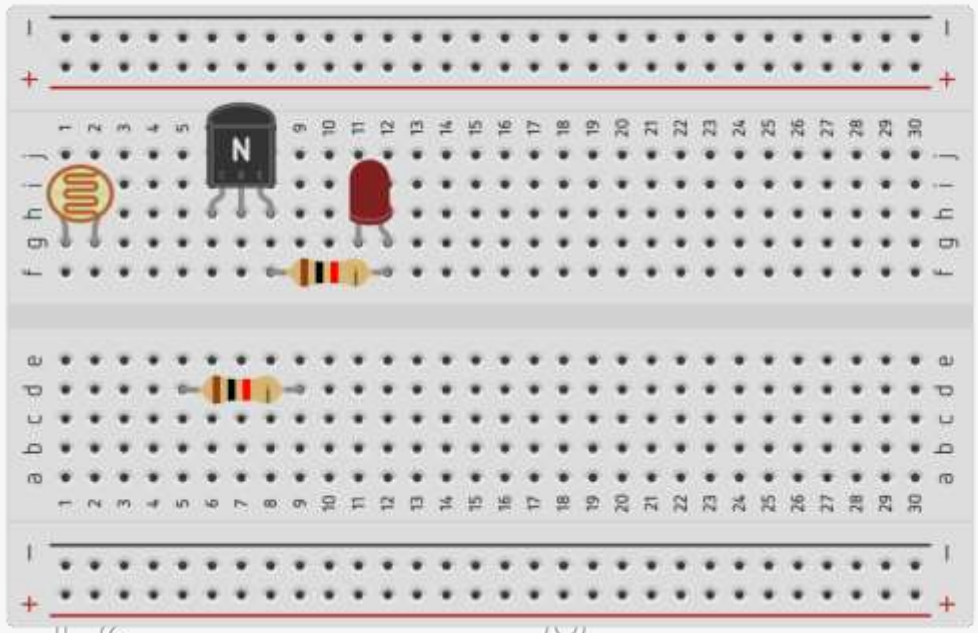
Series Connection Step 6

- Insert resistor in such a way that it connects to the anode(+) terminal of LED in breadboard as shown below.



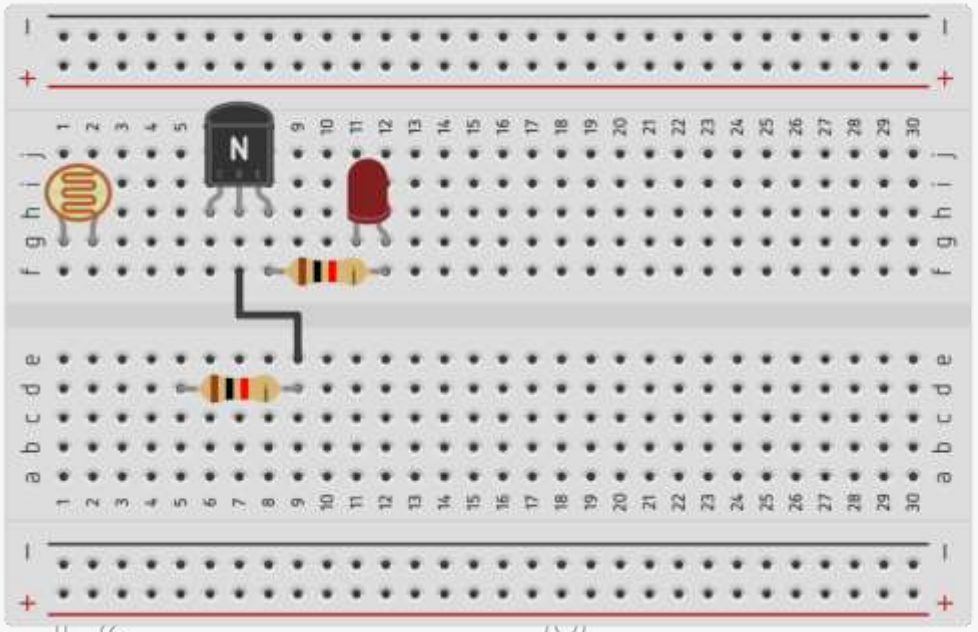
Series Connection Step 7

- Insert another resistor in the breadboard as shown below.



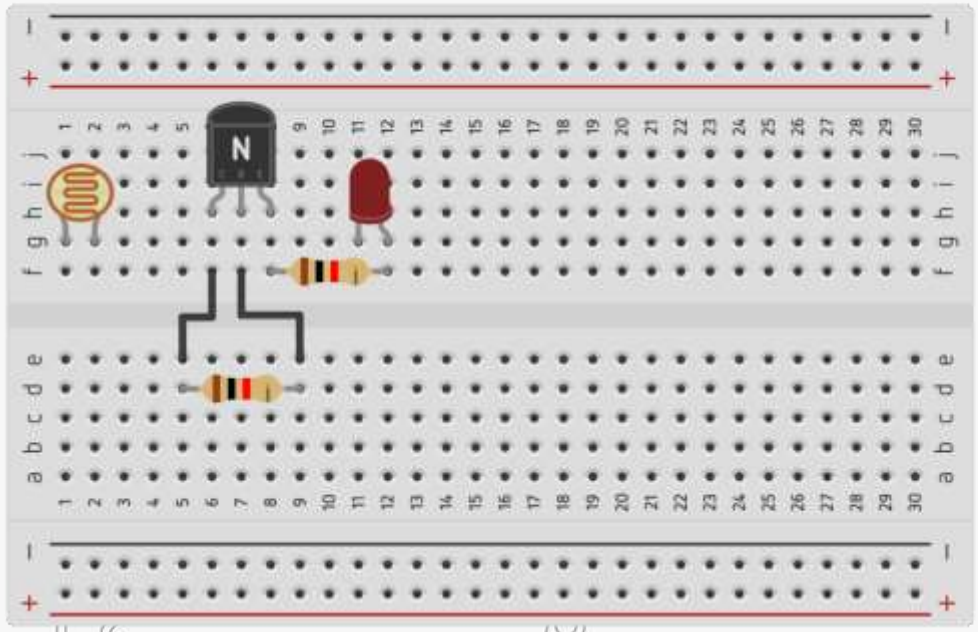
Series Connection Step 8

- Connect base terminal of transistor to the terminal of resistor as shown below.



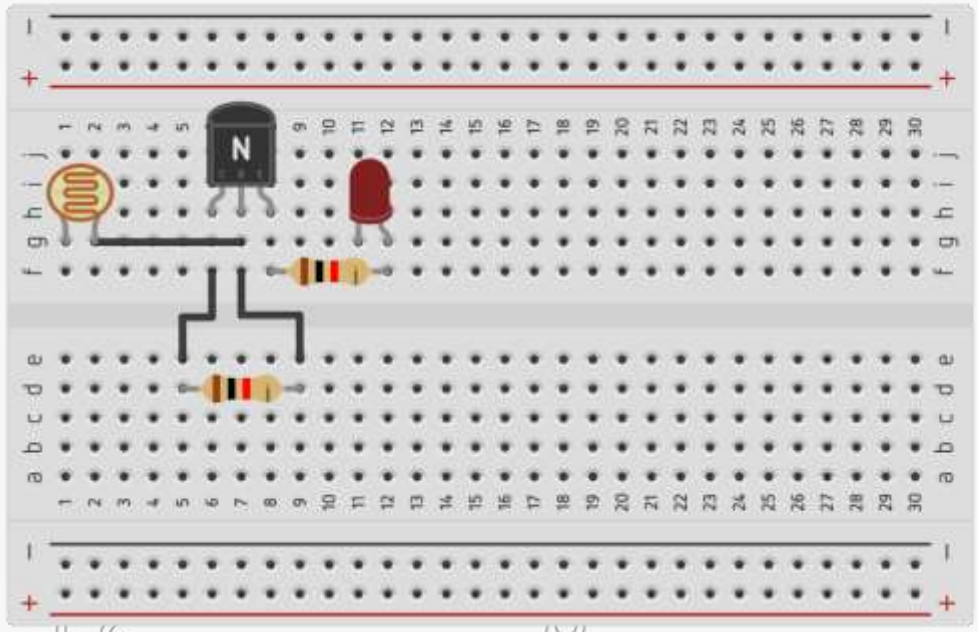
Series Connection Step 9

- Connect collector terminal of transistor to the another terminal of resistor as shown below.



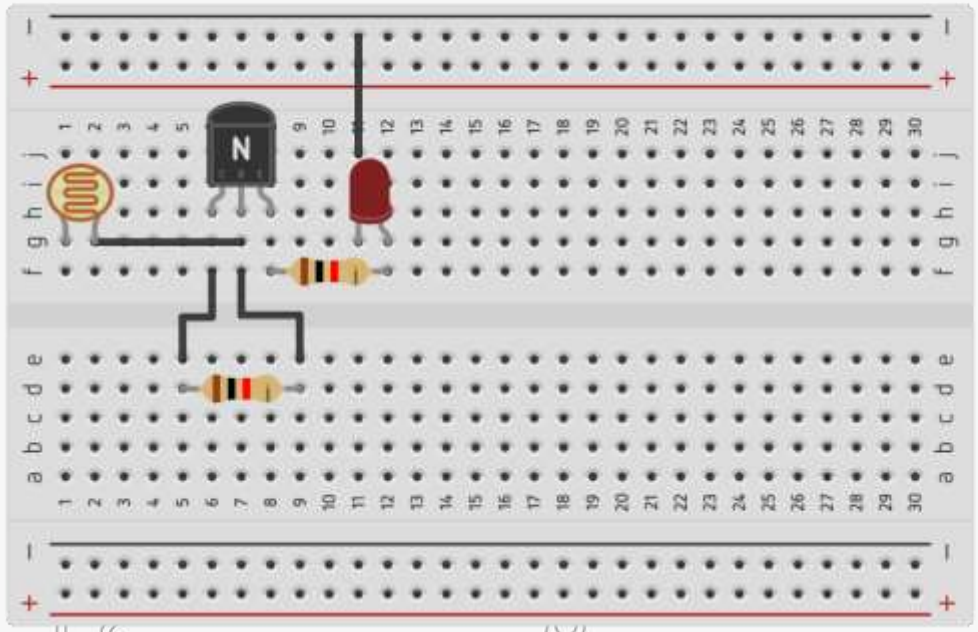
Series Connection Step 10

- Connect base terminal of transistor to the another terminal of LDR as shown below.



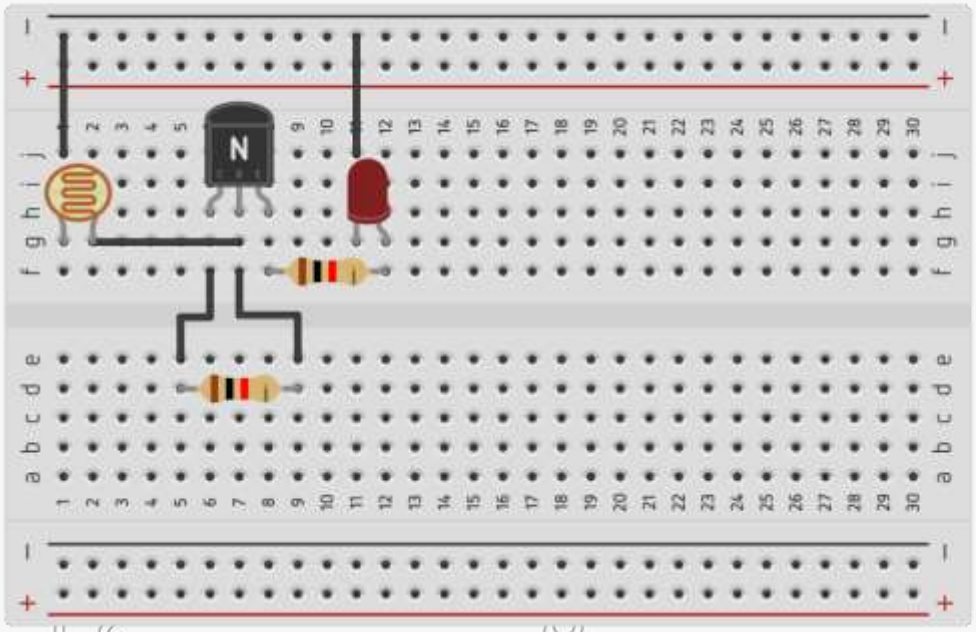
Series Connection Step 11

- Connect cathode(-) terminal of LED to the negative(-) power rail of breadboard as shown below.



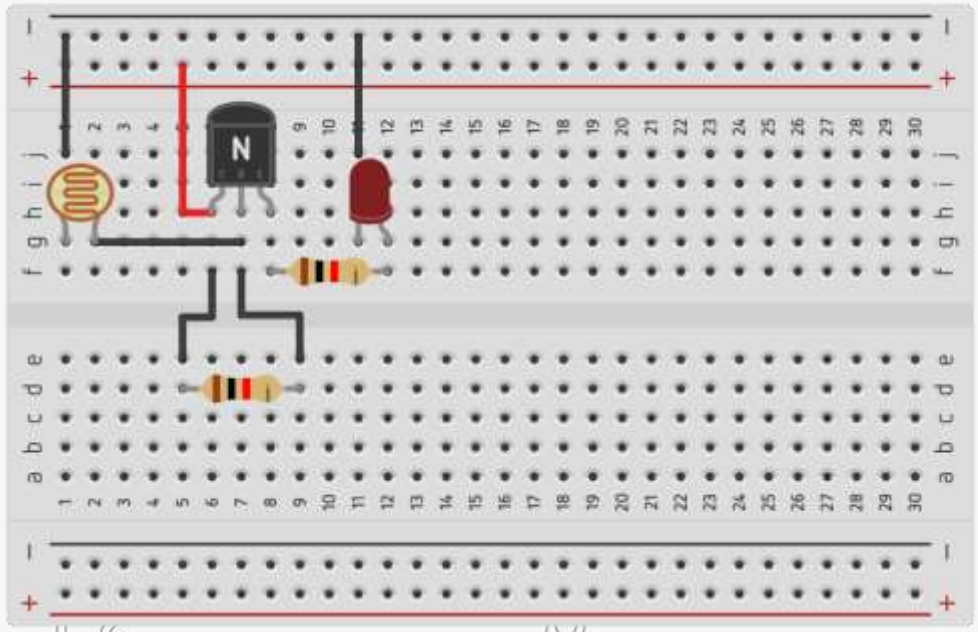
Series Connection Step 12

- Connect free end of the LDR to the negative(-) power rail of the breadboard as shown below.



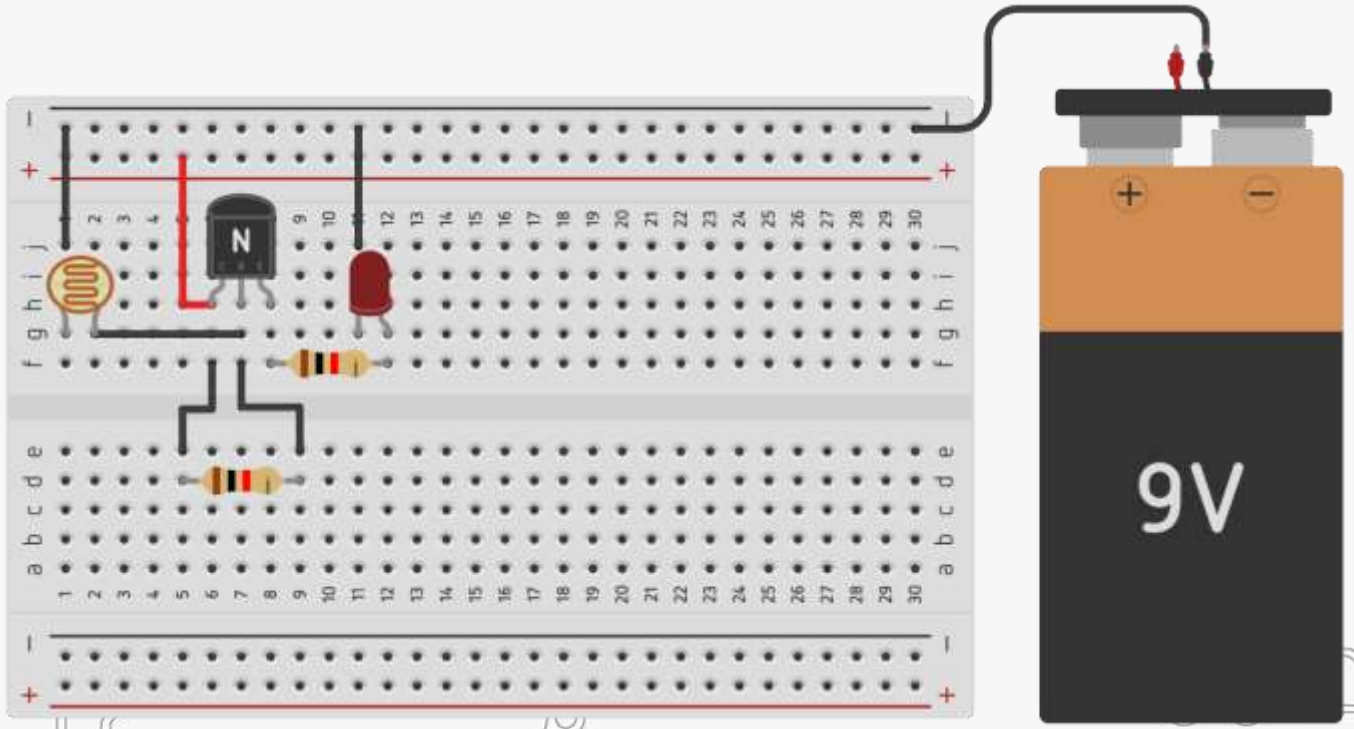
Series Connection Step 13

- Connect collector terminal of transistor to the positive(+) power rail of the breadboard as shown below.



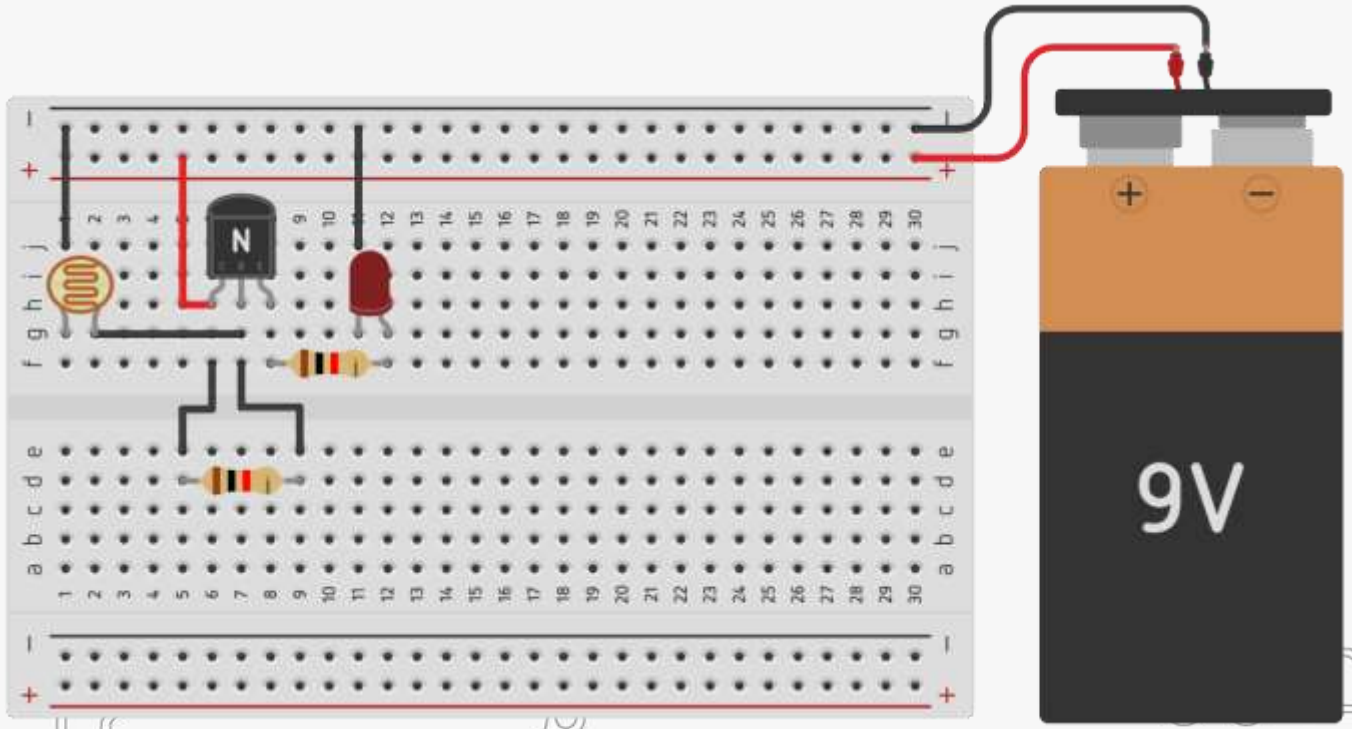
Series Connection Step 14

- Connect cathode(-) terminal of battery to the negative(-) power rail of the breadboard as shown below.



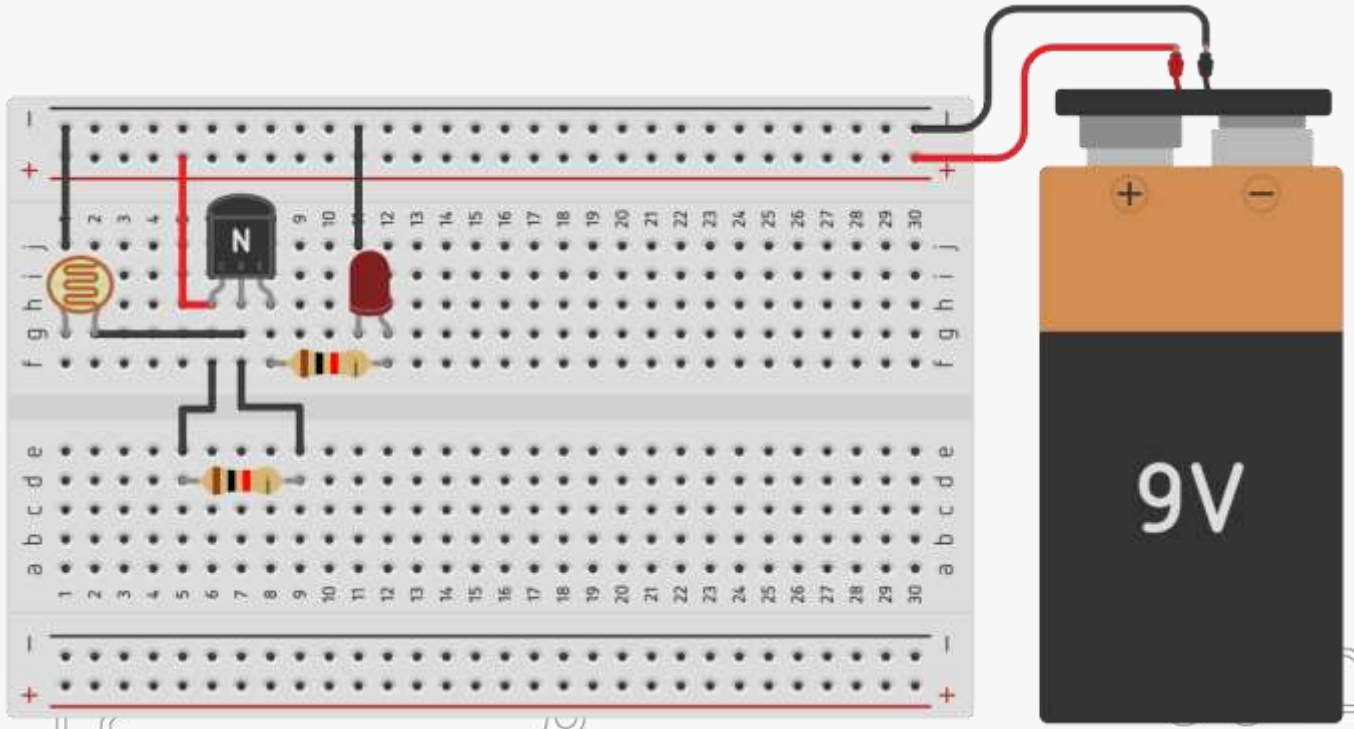
Series Connection Step 14

- Connect anode(+) terminal of battery to the positive(+) power rail of the breadboard as shown below.



Connection Diagram

- Make sure your connections are made as per the diagram.



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Data & Outcomes

Learning from the activity

Data

- What LDR stands for?

- Light Dependent Resistor

Learning from the activity

- Automatic control of lamp.

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Assessment

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Melody Generator

Melody generator using BT66 IC

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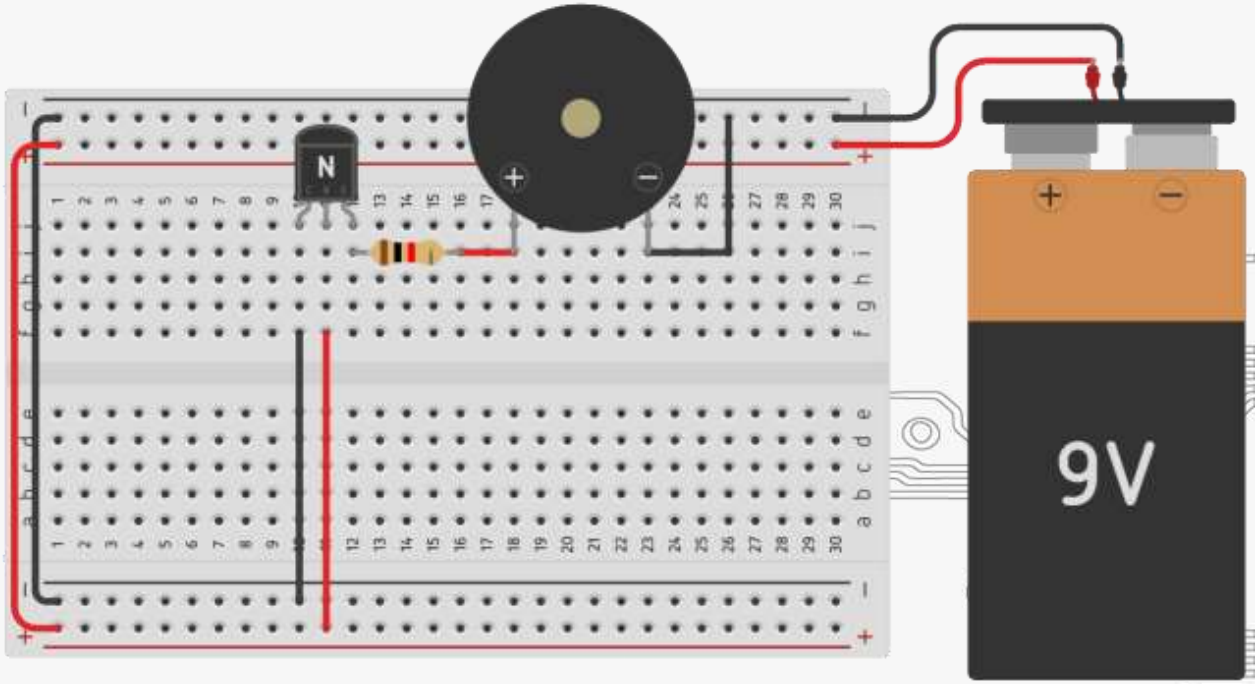
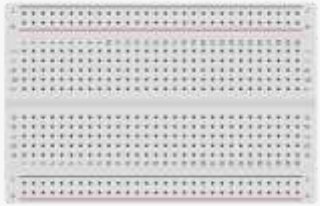
Introduction

Melody generator using BT66IC



Required Components

- Breadboard
- Buzzer
- BT66 IC
- Resistor
- Snap Connector
- Jumper Wires
- Battery 9v



Breadboard

Buzzer

BT66 IC

Resistor

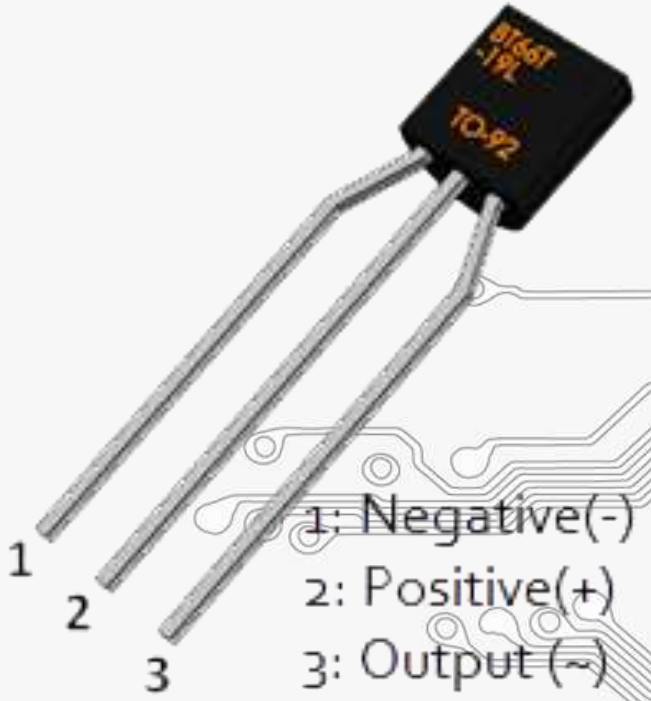
Snap Connector

Jumper Wires

Battery 9v

BT66 IC

- The BT66T is an easy to use 3 terminal Melody generator IC.
- This IC is easy to use because it can work on low voltage (0.3V to 3.5V) and consumes very little current (1uA) during operation.
- It's applications are:
  - Used to play melody
  - Make project more attractive using sound
  - Notify users through a melody
  - Used in Toys, Calling Bells, Alarms, etc.



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Procedure

Connection Steps

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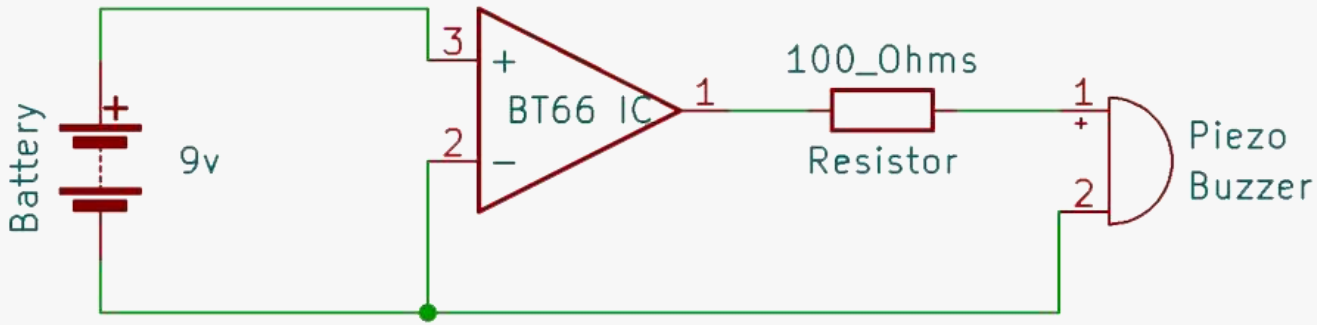
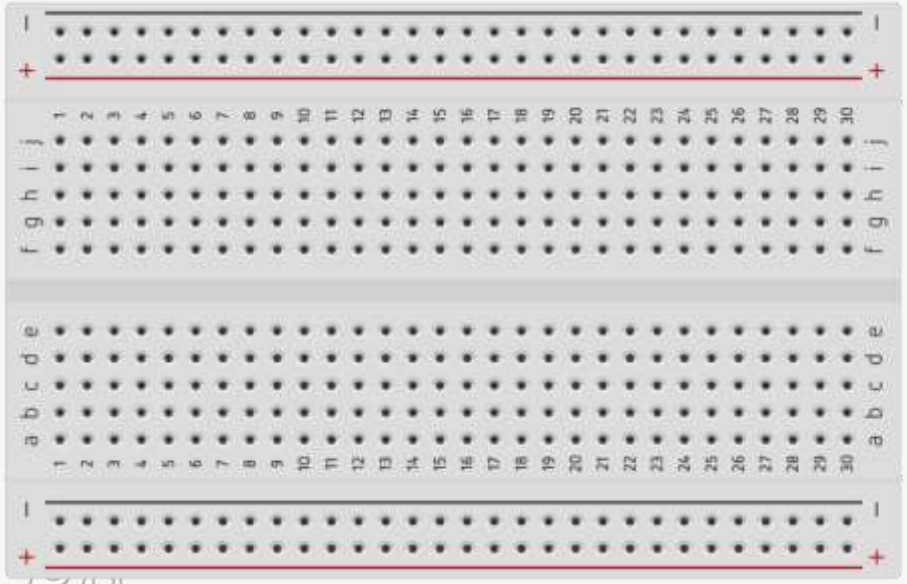
Circuit diagram



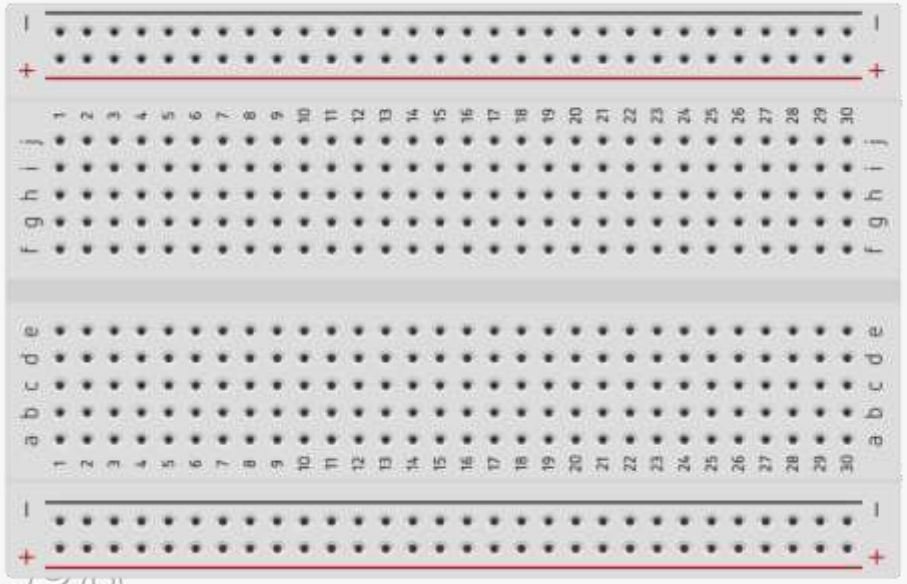
Connection Step 1

- Place breadboard



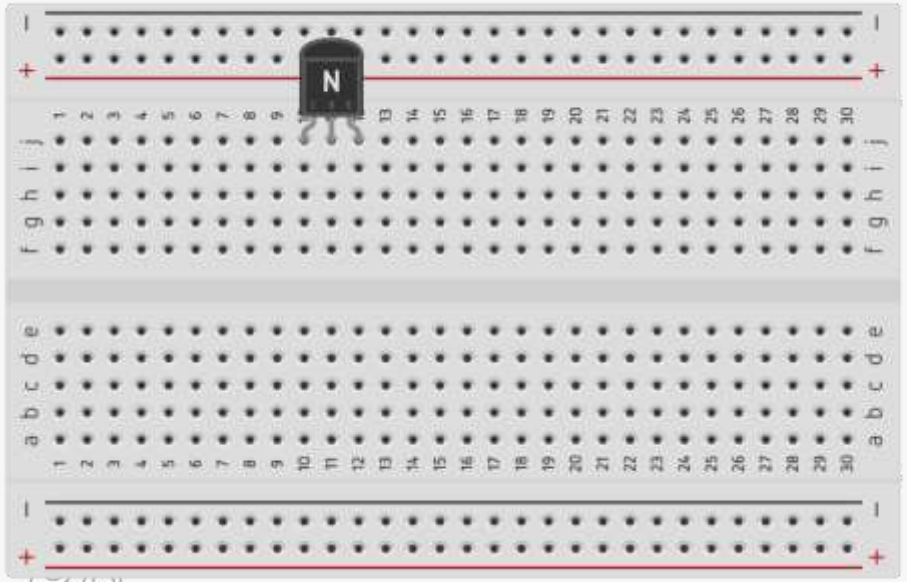
Connection Step 2

- Connect snap connector to 9v battery and keep it aside



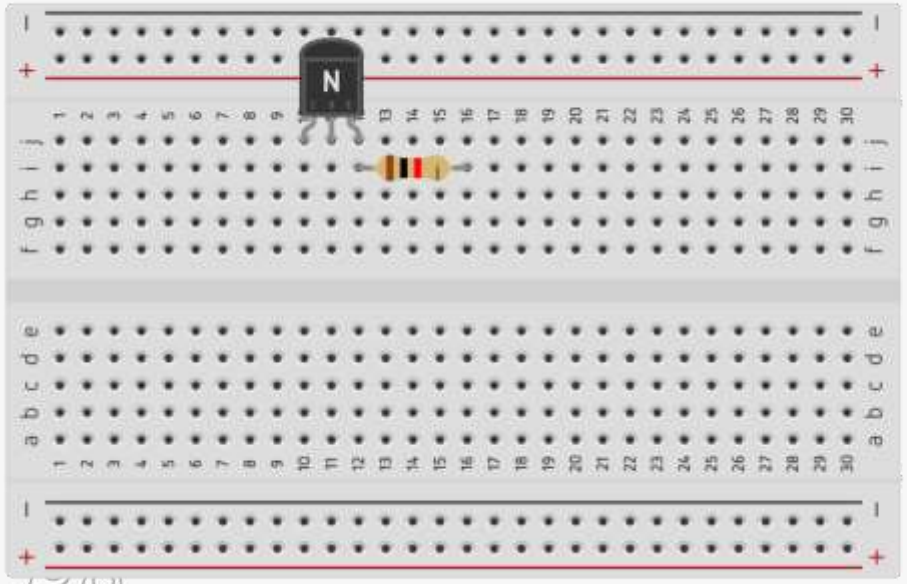
Connection Step 3

- Insert BT66 IC in breadboard



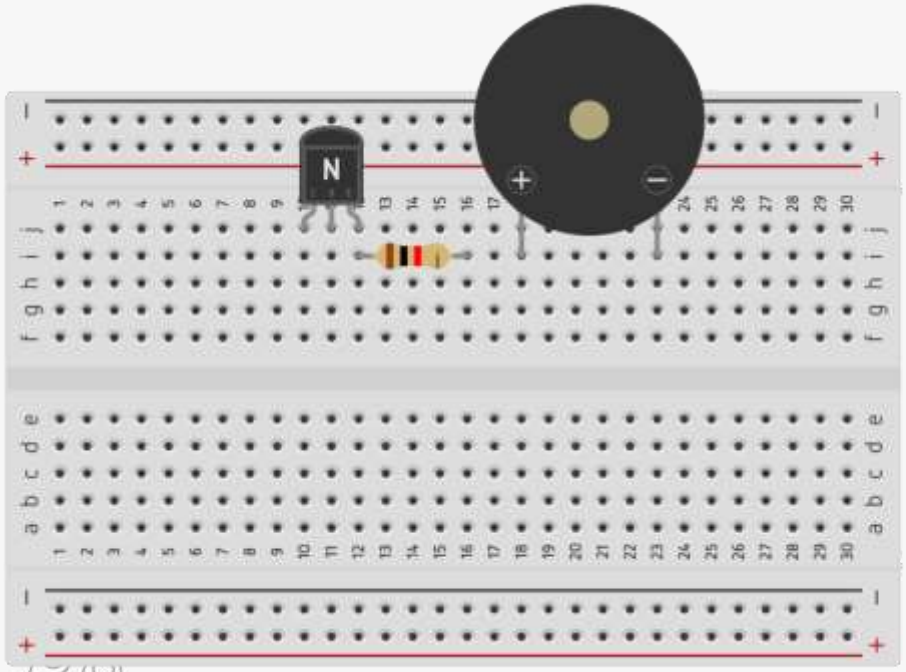
Connection Step 4

- Insert resistor to the output terminal of the IC as shown in the connection diagram.



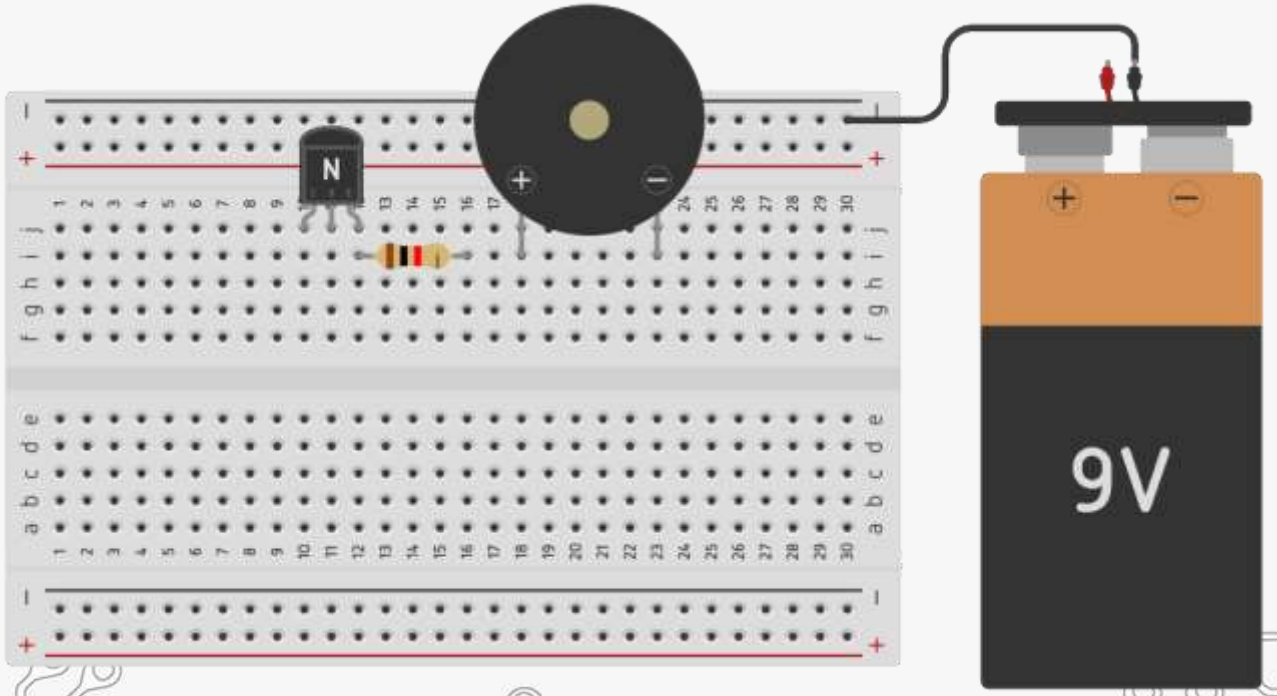
Connection Step 5

- Insert buzzer in the breadboard.



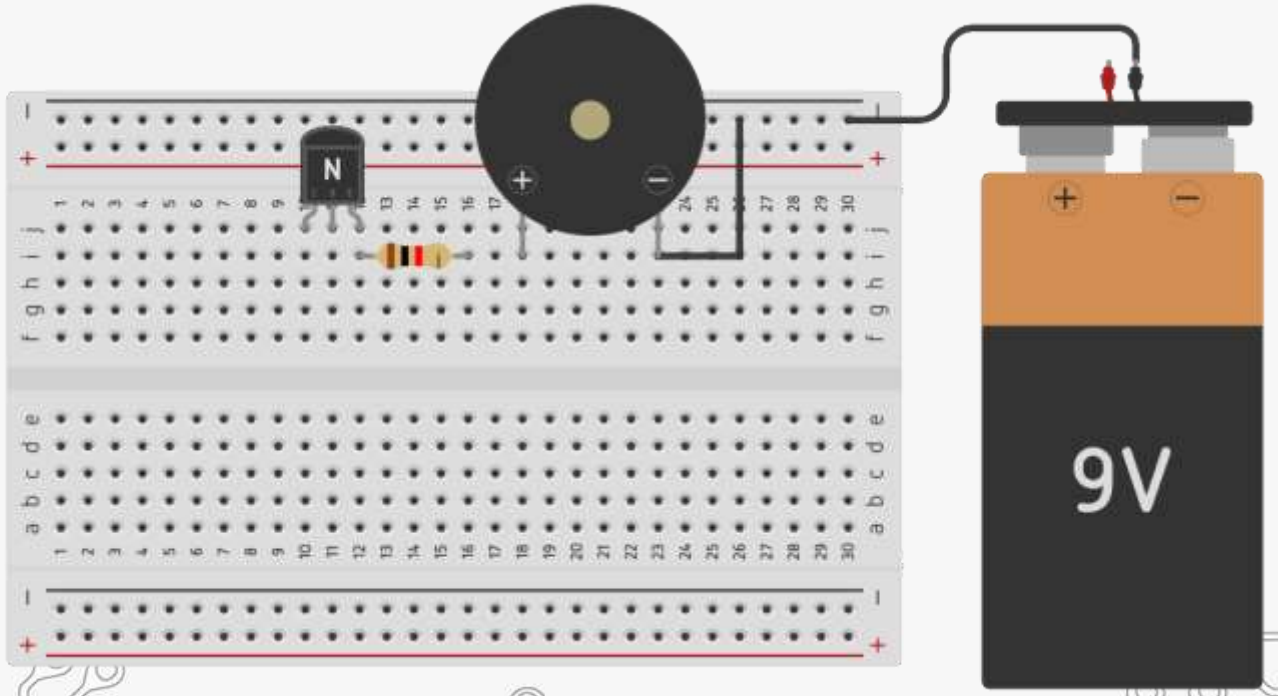
Connection Step 6

- Connect cathode(-) terminal of battery to (-) power rail of breadboard.



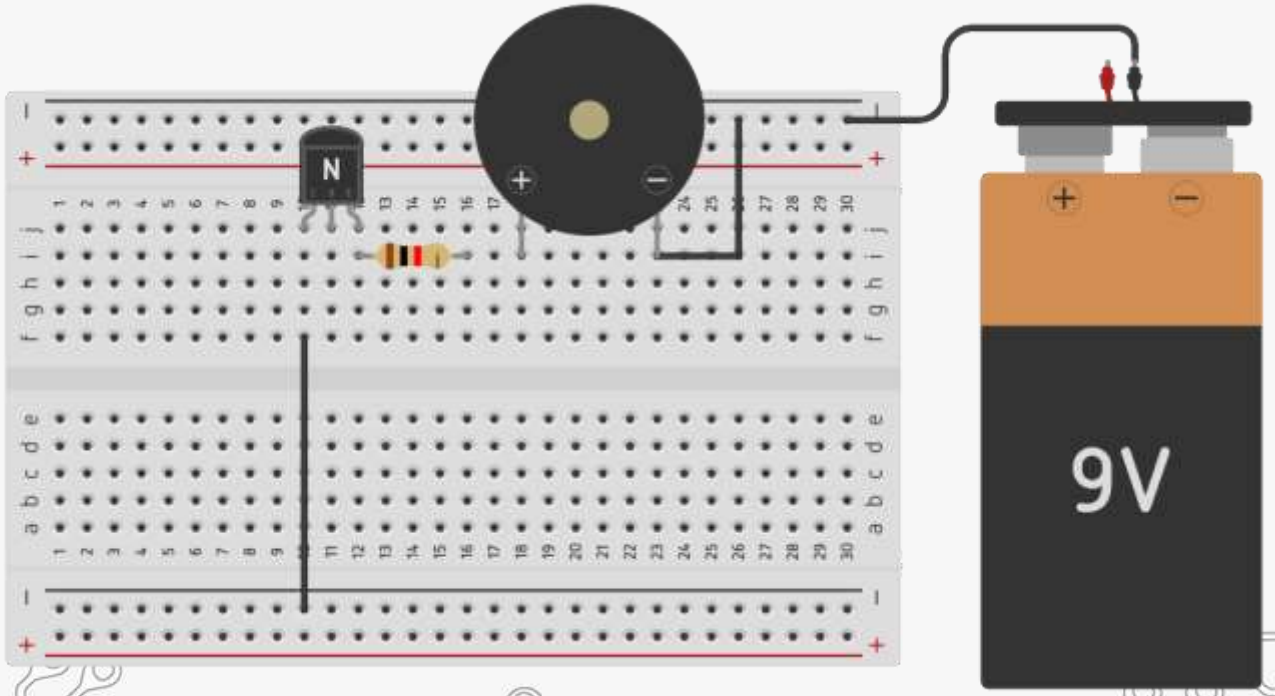
Connection Step 7

- Connect cathode(-) terminal of buzzer to the (-) power rail of breadboard.



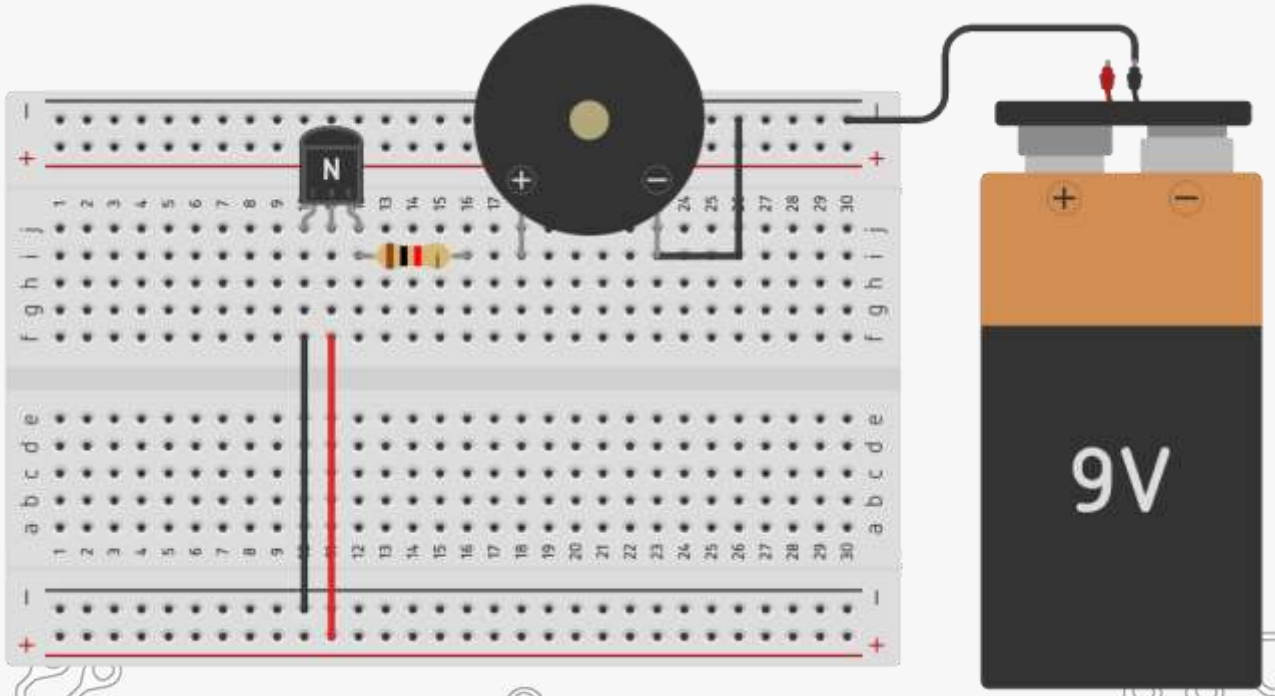
Connection Step 8

- Connect cathode(-) terminal of IC to (-) power rail of breadboard.



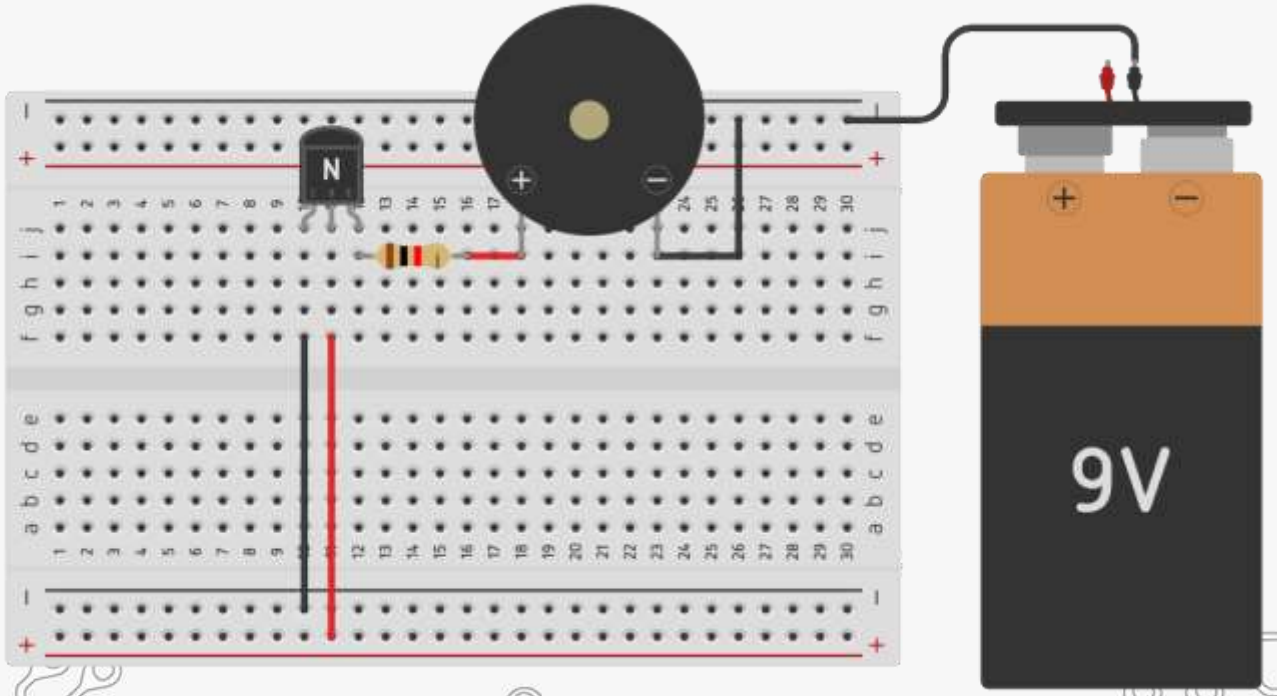
Connection Step 9

- Connect anode(+) terminal of IC to (+) power rail of breadboard.



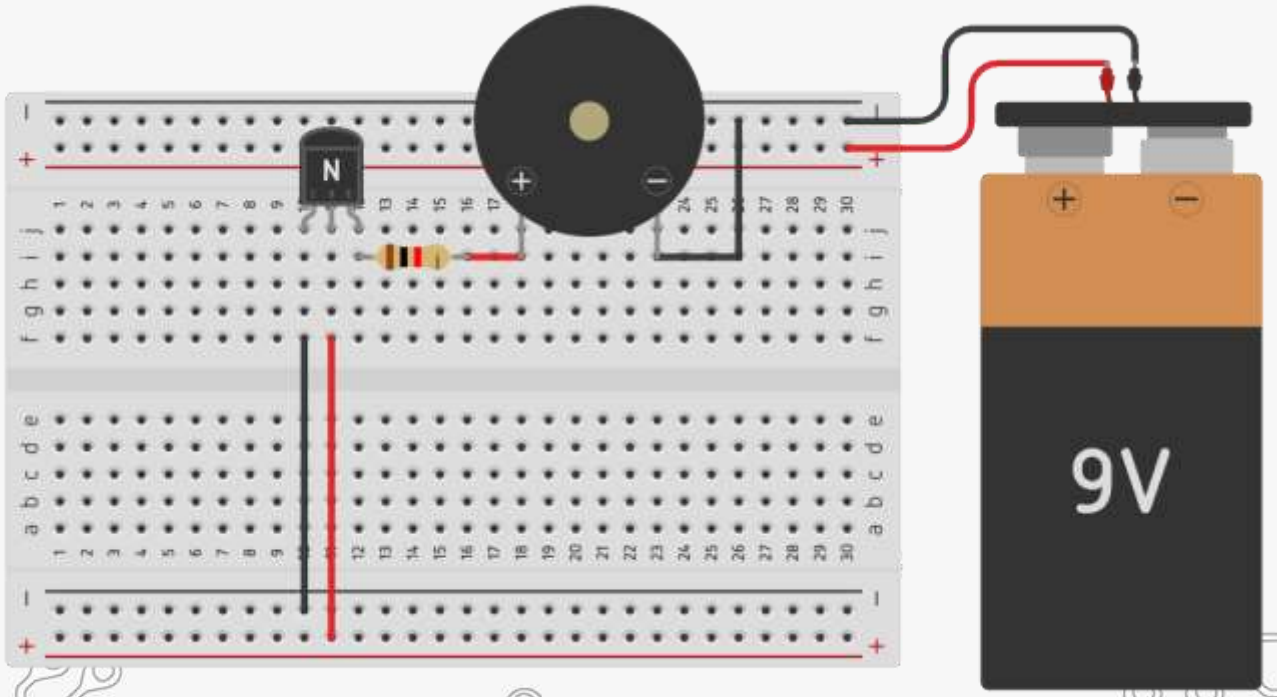
Connection Step 10

- Connect open terminal of resistor to anode (+) pin of buzzer.



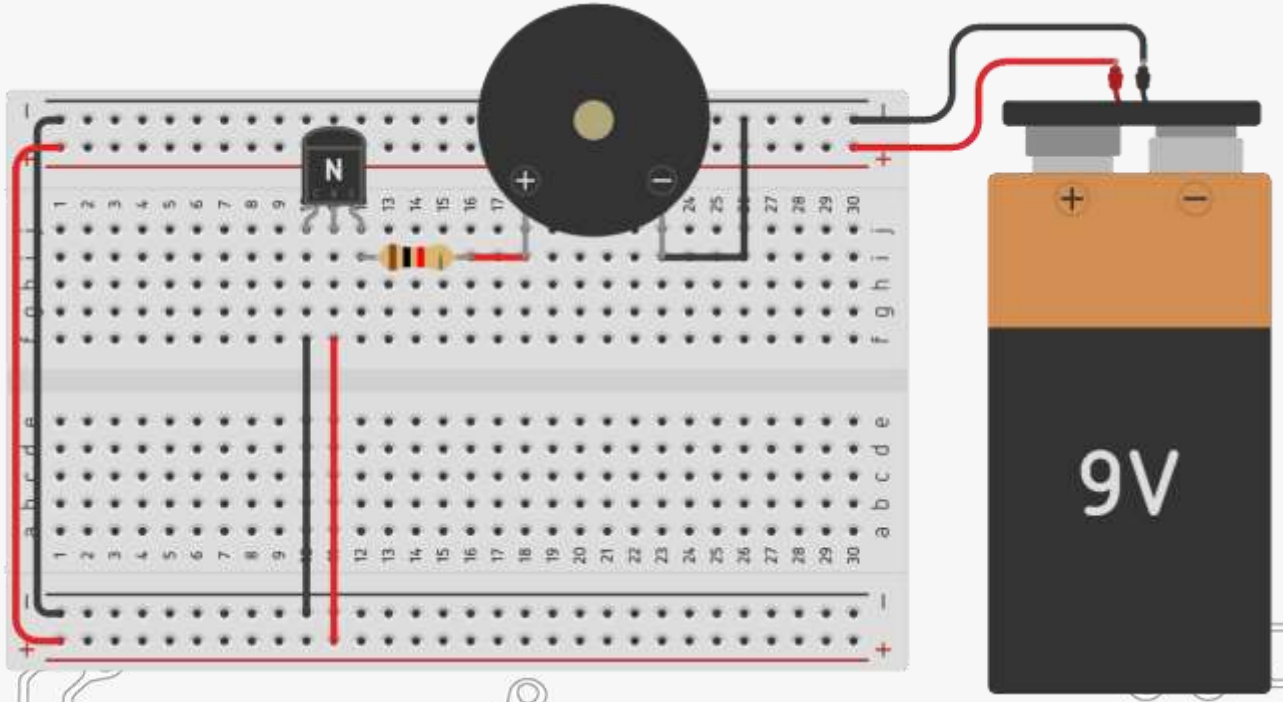
Connection Step 11

- Connect anode(+) terminal of battery to (+) power rail of breadboard.



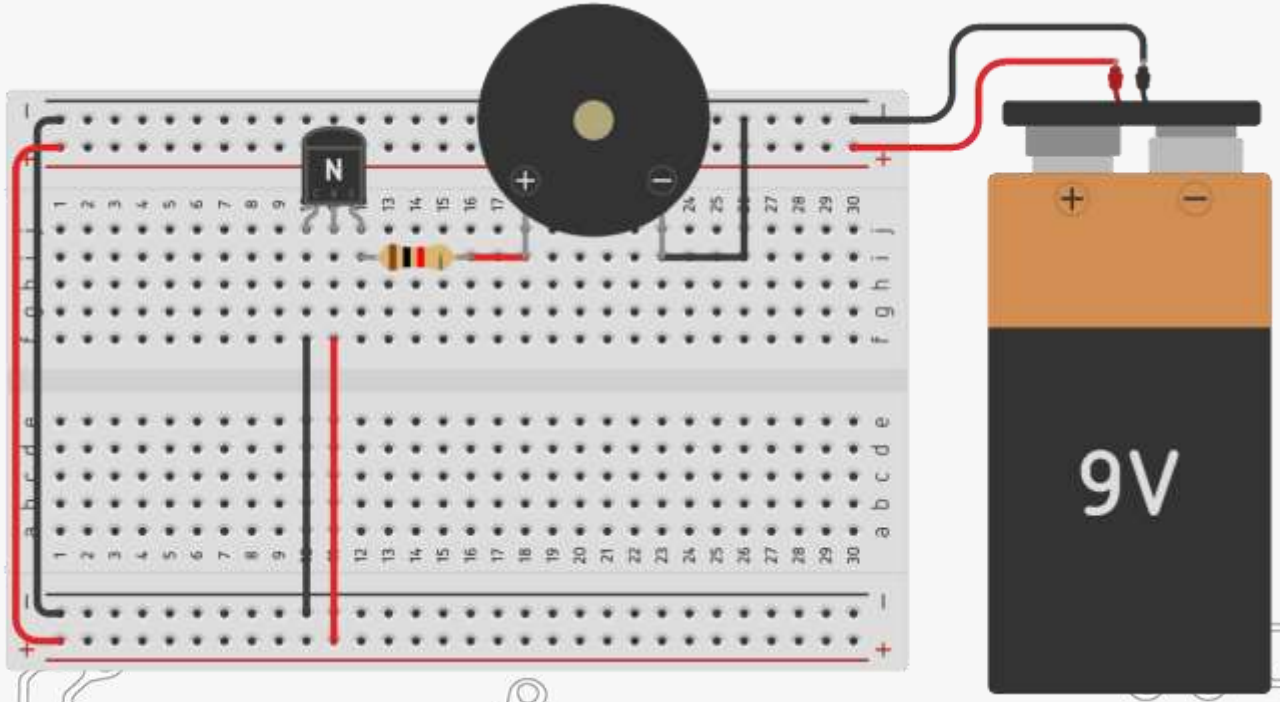
Connection Step 12

- Connect upper power rail of breadboard to lower power rail by connecting (+) to (+) and (-) to (-) rails as shown in the figure.



Connection Diagram

- Make sure your connections are made as per the diagram



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Data & Outcomes

Learning from the activity

Data

- Use BT66 IC
- Melody generation

Learning from the activity

- Using BT66 IC for melody generation.

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Assessment

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Temperature Controlled LED

Temperature Controlled LEDs using LM35

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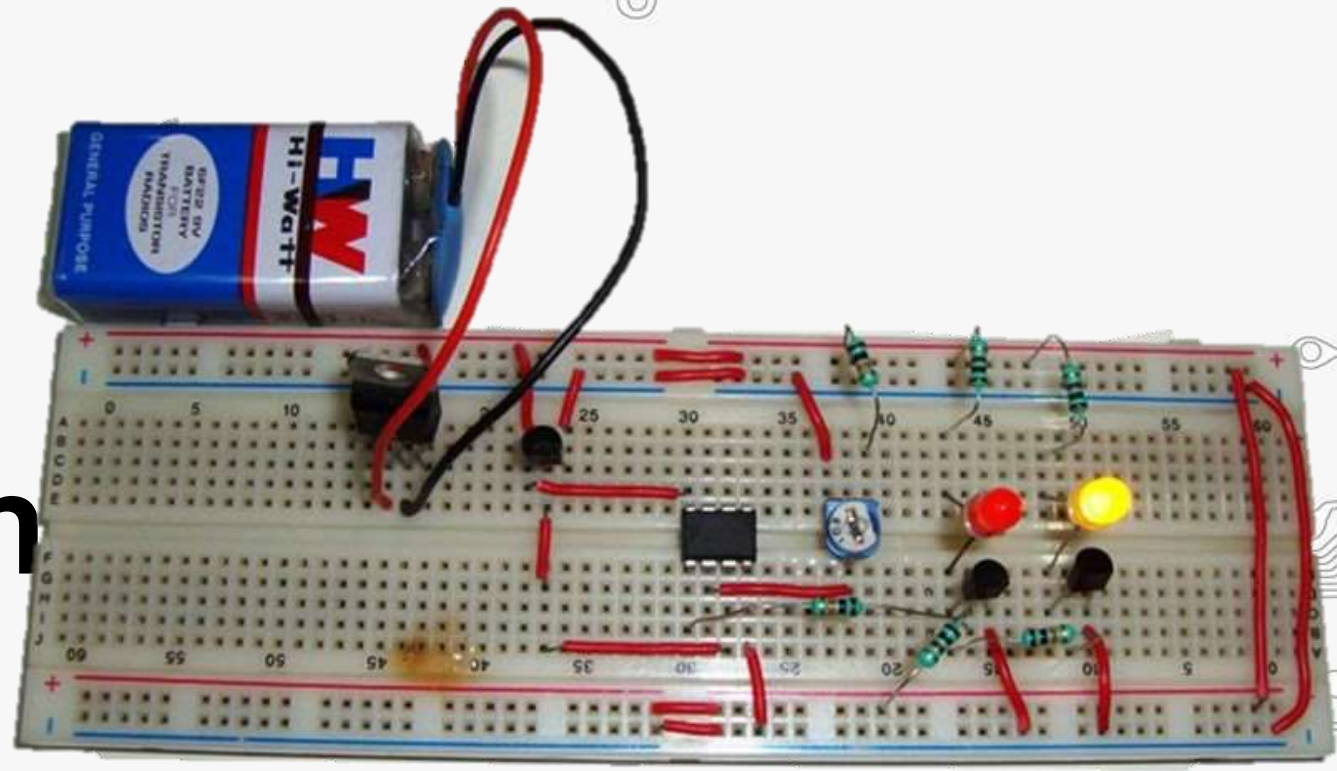
ACTIVITY BASED LEARNING

Introduction

Automatic counting



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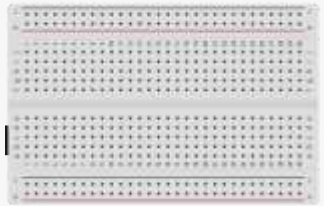
About Project

- In this project, we are going to control the LEDs according to temperature around.
- If temperature goes beyond a particular level (50 Degree in this circuit) then Red LED will glow automatically, otherwise yellow LED remains on below that particular temperature.
- This threshold temperature value can be set by adjusting the Variable resistor in the circuit, according to requirement.
- In this project you will also learn about how to use LM35 sensor in any circuit.
- LM35 is very popular and inexpensive temperature sensor generally used as digital thermometer or to measure temperature.

Required Components

- Breadboard
- Resistor
- Snap Connector
- LED
- LM35
- LM358 IC
- BC548/547 Transistor
- Jumper Wires
- Battery 9v
- 7805 IC
- 10k Potentiometer



Breadboard

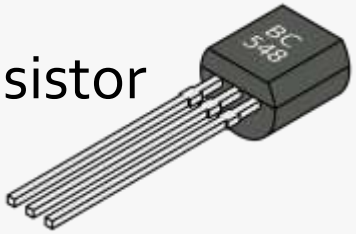
Resistor

Snap Connector

LED

LM35

LM358 IC



BC548/547 Transistor

Jumper Wires

Battery 9v

7805 IC

Potentiometer

Project Working

- In this circuit 9v general purpose battery is used to power up the whole circuit and IC7805 is used to provide the regulated 5v supply to the circuit. When temperature is below 50 degree then output of LM358 remains LOW and Q1 remains in OFF state and transistor Q2 remains in ON state.
- Now when surrounding's temperature goes beyond 50 Degree Celsius, output voltage of LM35 at pin 2 also goes higher than 0.5 volt or 500mV.
- Output of LM35 is connected to Pin 3 of Op-amp LM358 and as we have set the reference voltage (voltage at Pin 2 of LM358) to 0.5 volt, so now voltage at Pin 3 (non-inverting input) becomes higher than voltage at Pin 2 (inverting input) and output of op-amp LM358 (PIN 1) becomes HIGH.
- Output of LM358 connected to the base of NPN transistor Q1, so Q1 also becomes ON and Red LED starts glowing. At the same time, base of Transistor Q2 gets ground and Q2 becomes OFF and yellow LED also becomes OFF.

LM35 Temperature IC

- LM35 is an integrated analog temperature sensor whose electrical output is proportional to Degree Centigrade.
- LM35 Sensor does not require any external calibration or trimming to provide typical accuracies.
- The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy.

LM358

- The LM358 IC is a great, low power and easy to use dual channel op-amp IC.
- It is designed and introduced by national semiconductor. It consists of two internally frequency compensated, high gain, independent op-amps.
- This IC is designed for specially to operate from a single power supply over a wide range of voltages.

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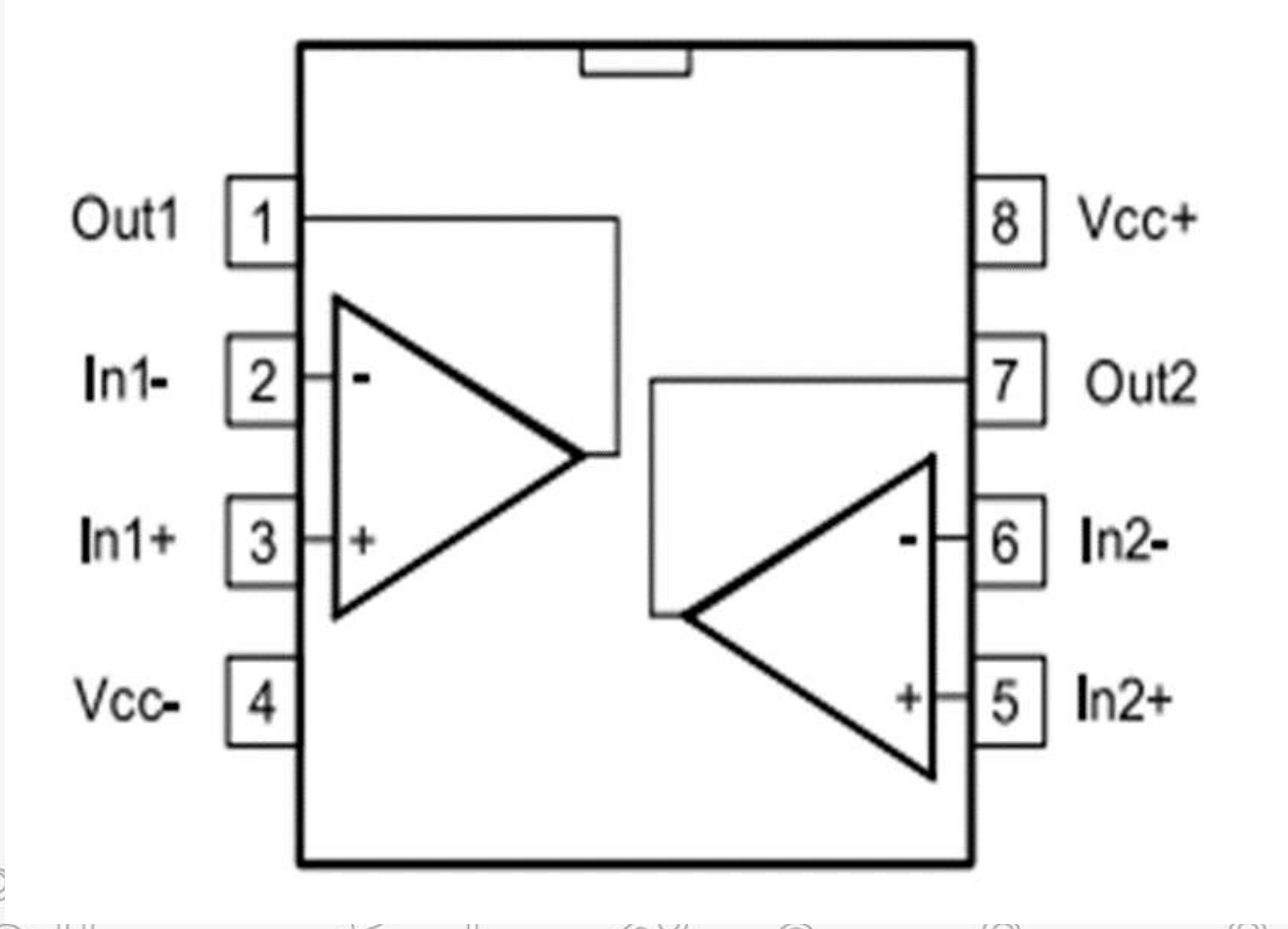
LM358 Pin Diagram



LM7805

- Voltage sources in a circuit may have fluctuations resulting in not providing fixed voltage outputs.
- A voltage regulator IC maintains the output voltage at a constant value.
- 7805 Voltage Regulator, a member of 78xx series of fixed linear voltage regulators used to maintain such fluctuations, is a popular voltage regulator integrated circuit (IC).
- The xx in 78xx indicates the output voltage it provides. 7805 IC provides +5 volts regulated power supply with provisions to add a heat sink.

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Procedure

Connection Steps

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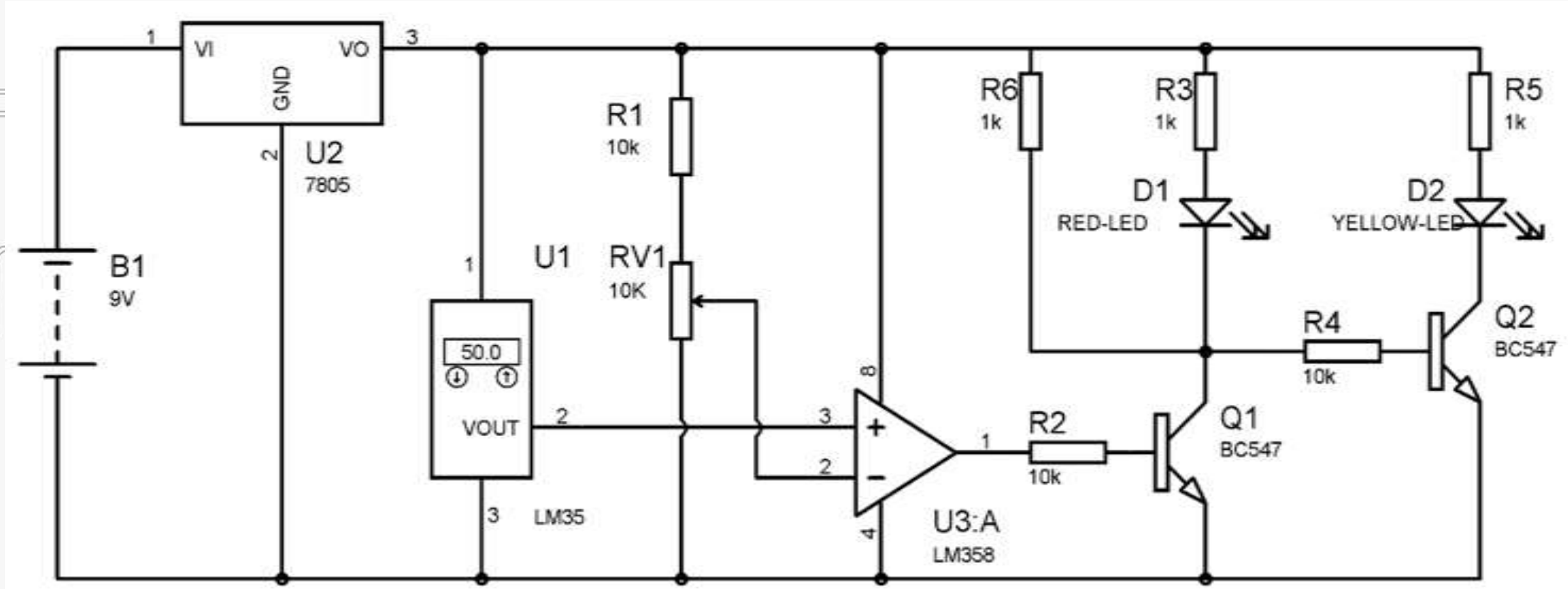
Circuit diagram



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Data & Outcomes

Learning from the activity

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Project Link :

https://youtu.be/3srRvZSlCHk

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Assessment

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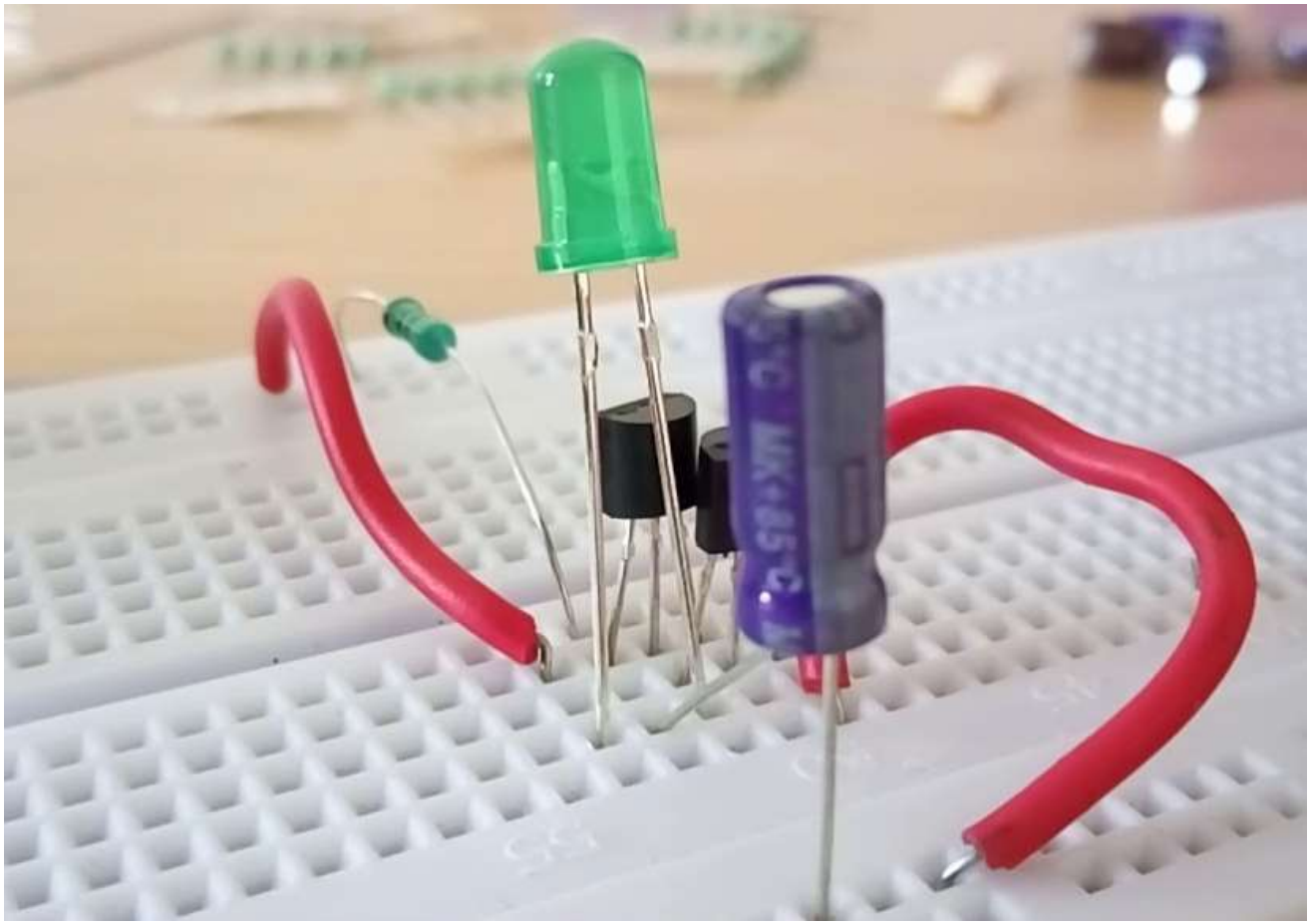
Thank you

LED blinking through Transistor

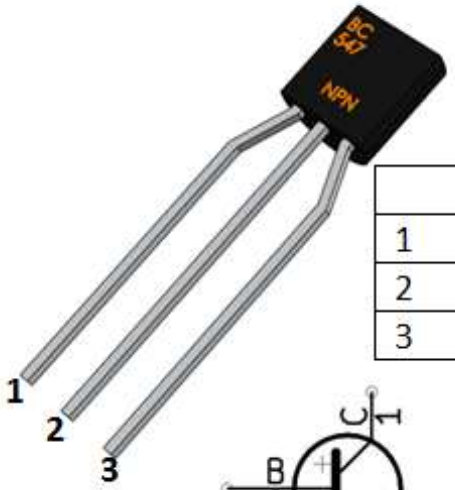


About project

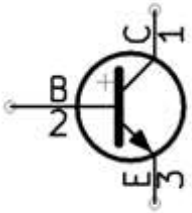
Blinking two LEDs using Transistors. This is a very simple project. It will flash an ordinary 3mm or 5mm (1/8" or 1/4") LED at high speed. The circuit for blinking an LED using transistors is called an Astable Multivibrator.

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.



BC-547	
1	Collector
2	Base
3	Emitter



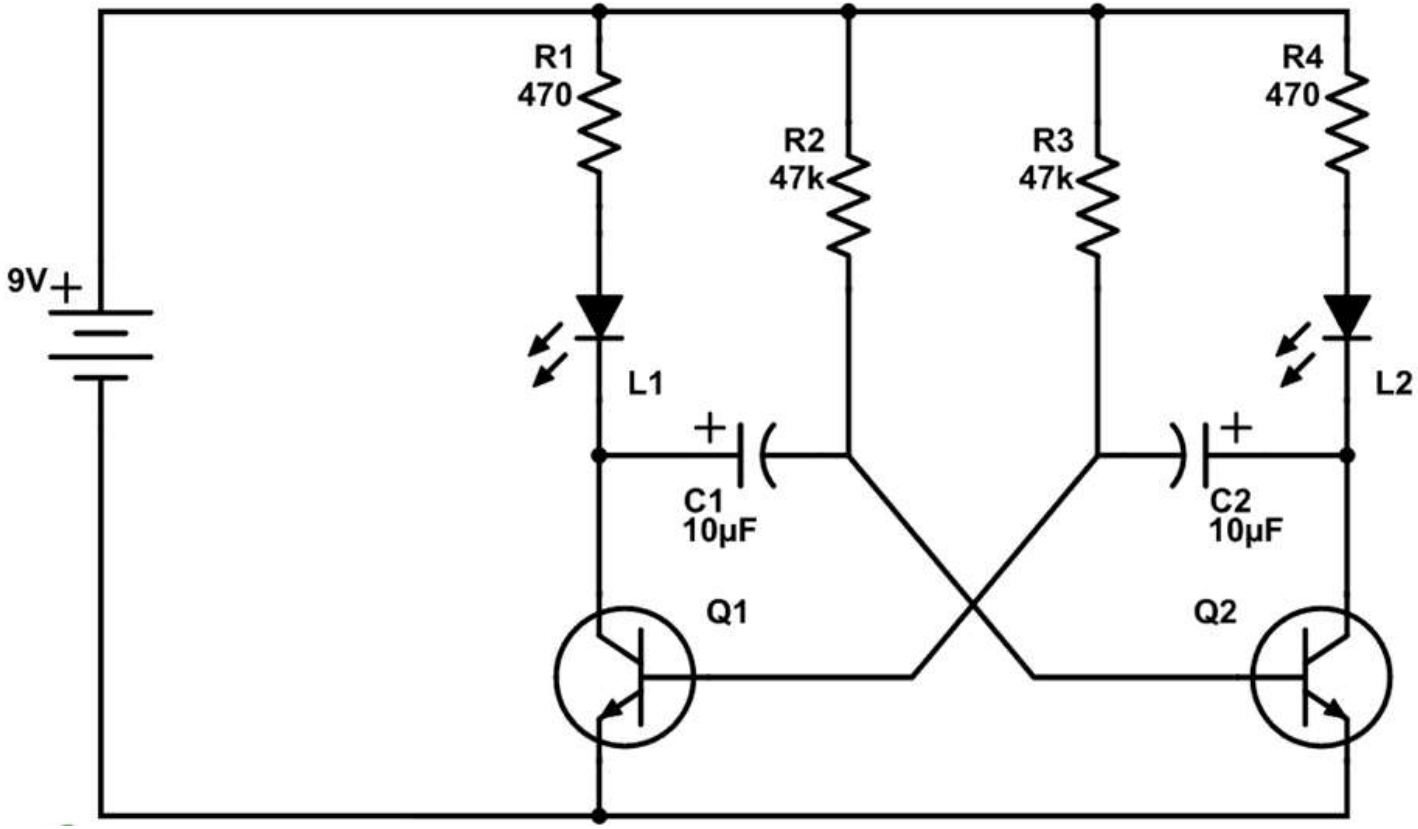
Working of project

- This project is on how to make a simple blinking LED circuit using transistors on a breadboard. Changing the blinking rate is also possible by changing the value of capacitor used(Use 100micro farad instead of 10 micro farad).
- Two capacitors C1 and C2 will alternate between being charged and discharged and thereby turning the transistors ON and OFF.
- When a transistor is ON, it allows current to flow through it so that the LED above it will light up.

Components Required

- Two BC547 Transistor
- Two 47k & Two 470 Ohm Resistors
- Two 10uF Capacitors
- Two LEDs
- One Breadboard
- One +9 Volt Battery
- One Battery Cap
- Connecting Wires

Connection Diagram



Project Link : https://youtu.be/aURlqamDJpE

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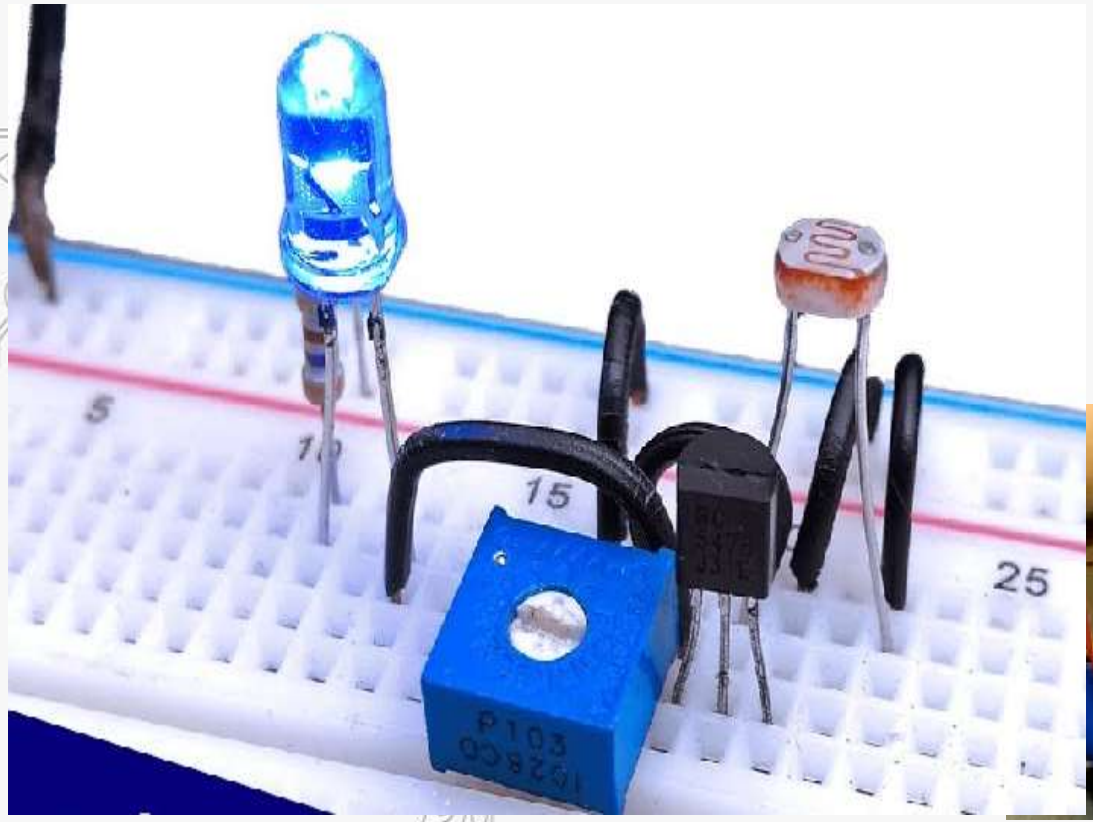
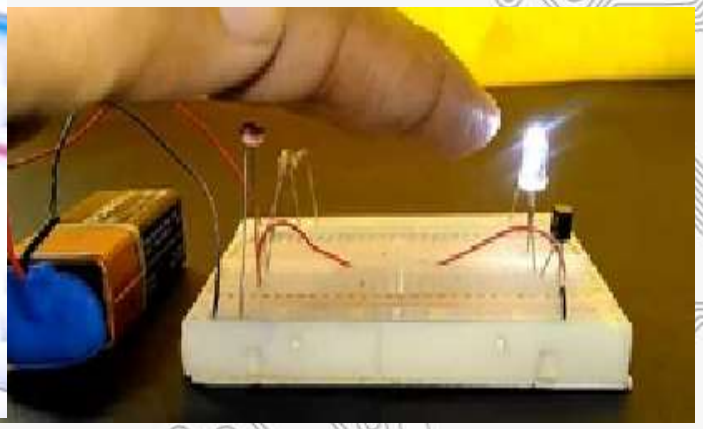
Automatic Street Light Controller





Light Dependent Resistor [LDR] Sensor

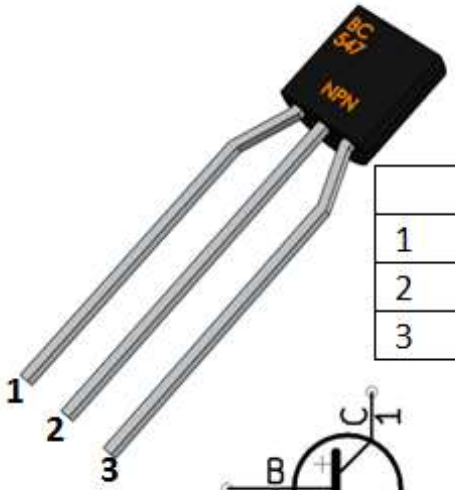
An **LDR** is a component that has a (variable) resistance that changes with the light intensity that falls upon it. This allows them to be used in light **sensing** circuits. A Light Dependent **Resistor** (**LDR**) or a photo **resistor** is a device whose resistivity is a **function** of the incident electromagnetic radiation. Hence, they are light sensitive devices. They are also called as photo conductors, photo conductive cells or simply photocells.

Working of LDR sensor

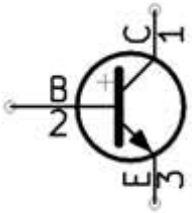
- We will use a LDR and a resistor together in series. An LDR is simply a device that changes resistance based on ambient light. The brighter the light, the lower the resistance, the dimmer the light, the higher the resistance.
- When there is no light , LDR will offer high resistance and less current flows through the resistor and voltage across resistor will be less near to GND.
- When light falls on LDR, its resistance decreases and current flow through it increases. Then voltage across the resistor increases and LED gets a HIGH signal.

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.



BC-547	
1	Collector
2	Base
3	Emitter



About project

- It is a simple and powerful project, which uses transistor (BC 547 NPN) as a switch to switch ON and OFF the street light system automatically.
- It automatically switches ON lights when the sunlight goes below the visible region of our eyes. (e.g. in evening after Sunset).
- It automatically switches OFF lights when Sunlight fall on it (i.e. on LDR) e.g. in morning, by using a sensor called LDR (Light Dependent Resistor) which senses the light just like our eyes.
- By using this Automatic system for street light controlling, we can reduce energy consumption because the manually operated street lights are not switched off properly even the sunlight comes and also not switched on earlier before sunset.

Components Required

- Light Dependent Resistor
- NPN Transistor- BC547
- Resistor [10k ,220ohms]
- LED
- Breadboard
- +9V Battery
- Battery Cap
- Connecting Wires

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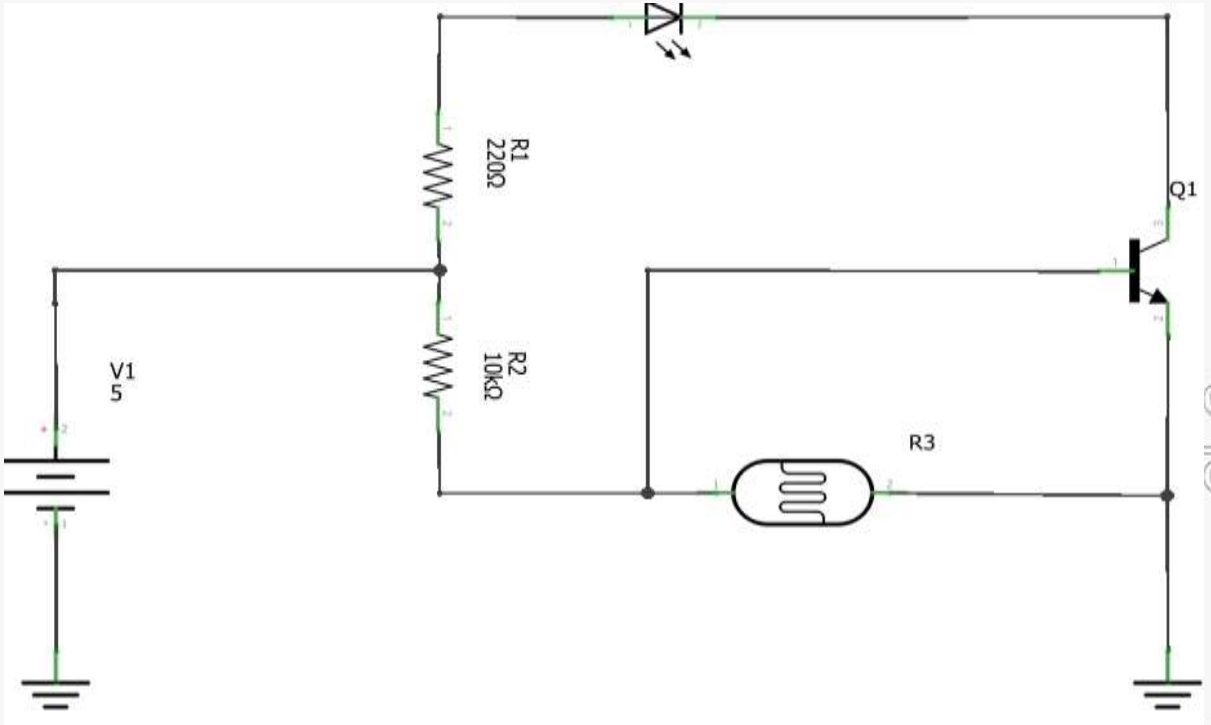
Connection Diagram



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Project Link : https://youtu.be/ovMK8RkB678

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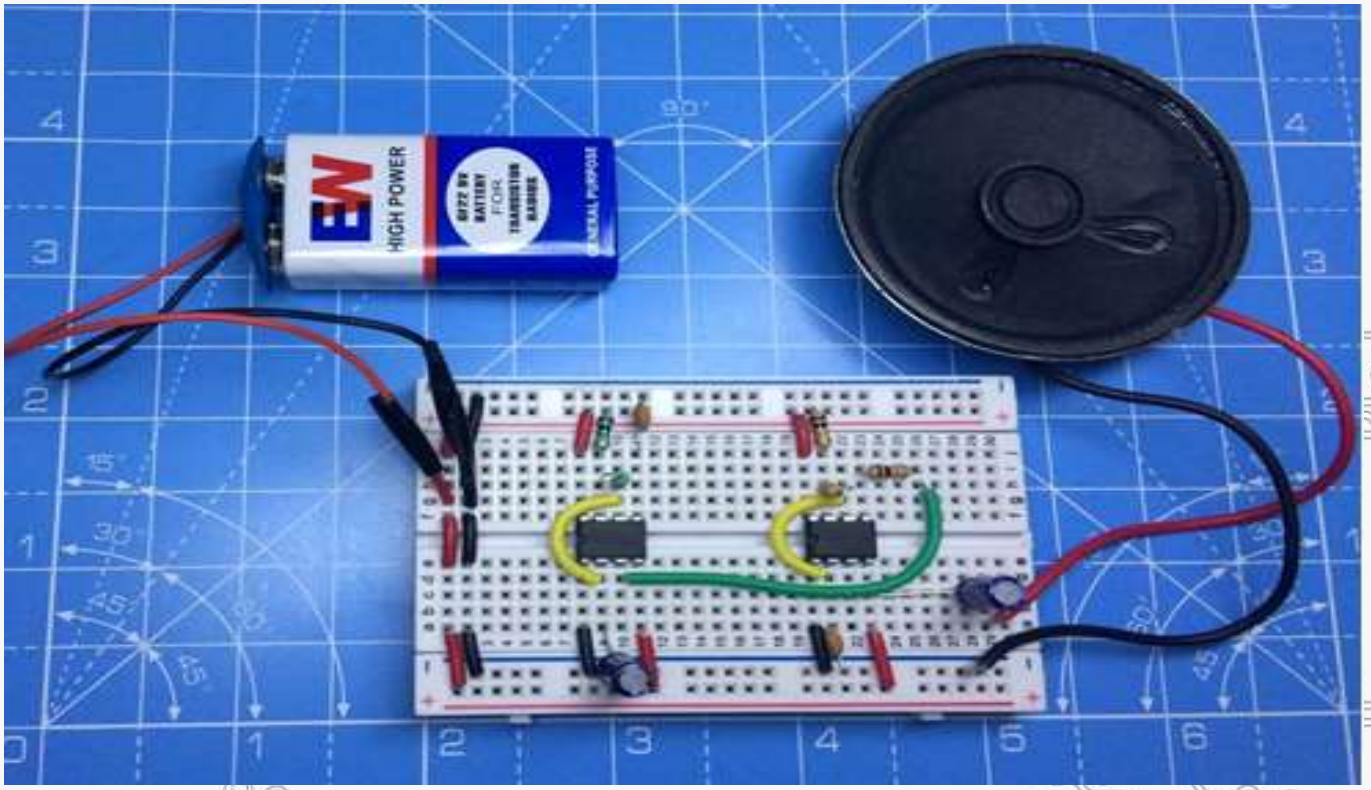
Police Siren using Timer IC 555



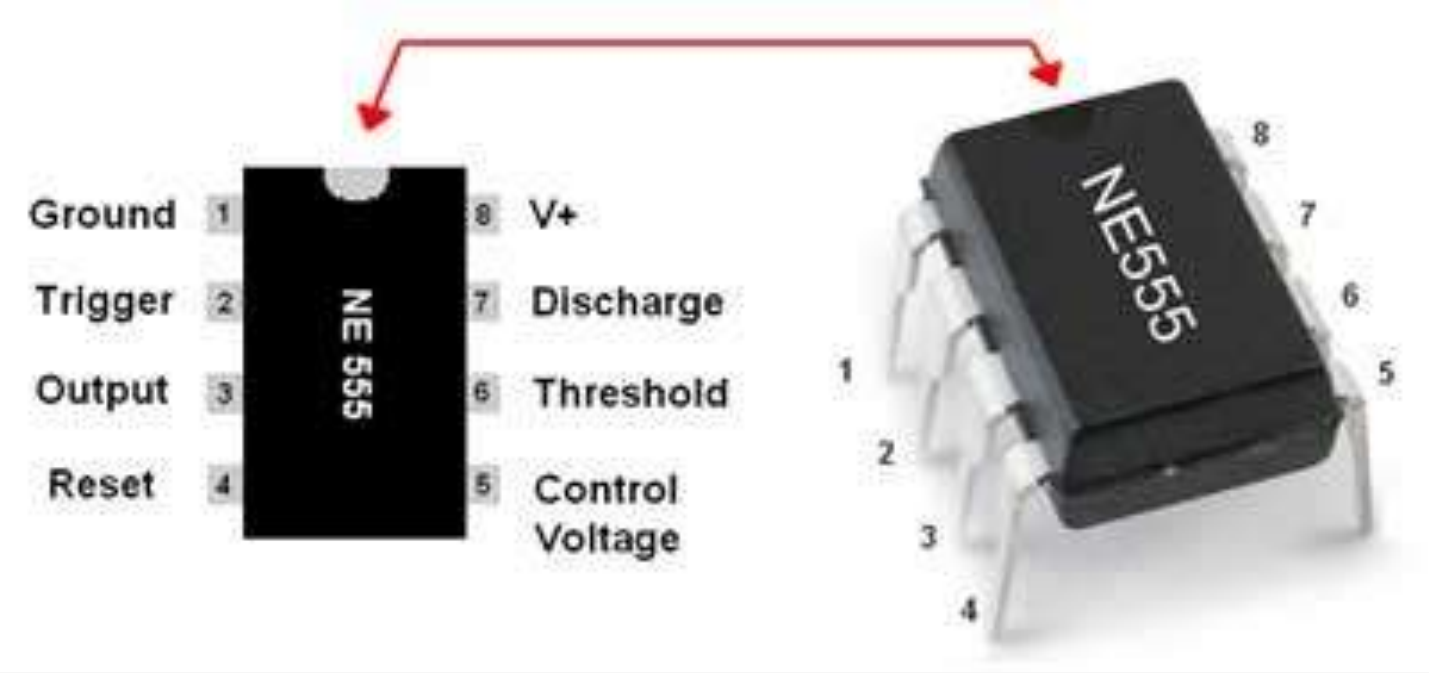
About project

The project of a police siren based on NE555 timer IC. The circuit uses two NE555 timers ICs and each of them are wired as Astable multivibrators. The circuit can be powered from anything between 6 to 15V DC. By connecting an additional power amplifier at the output you can further increase the loudness.

Timer IC 555

- Here is a pulse/frequency generator using the popular timer IC 555 which is wired as an Astable Multivibrator. The output pulses can be indicated visually by the LED. This circuit does not require any external trigger to change the state of the output, hence the name free-running. This circuit can be used in applications that require clock pulses.
- An Astable Multivibrator can be produced by adding resistors and a capacitor to the basic timer IC 555.The timing during which the output is either high or low is determined by the externally connected two resistors(R1&R2) and a capacitor(C1).

Pin Diagram


Ground 1
Trigger 2
Output 3
Reset 4
NE 555
8 V+
7 Discharge
6 Threshold
5 Control Voltage
NE555
1
2
3
4
5
6
7
8

IN4007 Diode

- **1N4007** is a PN junction rectifier **diode**. These types of **diodes** allow only the flow of electrical current in one direction only. So, it can be **used** for the conversion of AC power to DC.
- This diode is designed specifically for circuits that needs to convert alternating current into direct current. It can pass currents of up to 1 A, and have peak inverse voltage (PIV) rating of 1,000 V.

Working of project

- IC1 is wired as a slow Astable multivibrator operating at around 20Hz @ 50% duty cycle and IC2 is wired as fast Astable multivibrator operating at around 600Hz.
- The output of first Astable mutivibrator is connected to the control voltage input (pin5) of IC2. This makes the output of IC2 modulated by the output frequency of IC1, giving a siren effect.
- In simple words, the output frequency of IC2 is controlled by the output of IC1.

Components Required

- Two 555 Timer IC
- One 8 Ohm Speaker
- IN4007 Diode
- Two 68k and three 10k Resistors
- One 100uF, One 10uF, One 104nF and One 103nF Capacitors
- Breadboard
- One +9 Volt Battery
- One Battery Cap
- Connecting Wires

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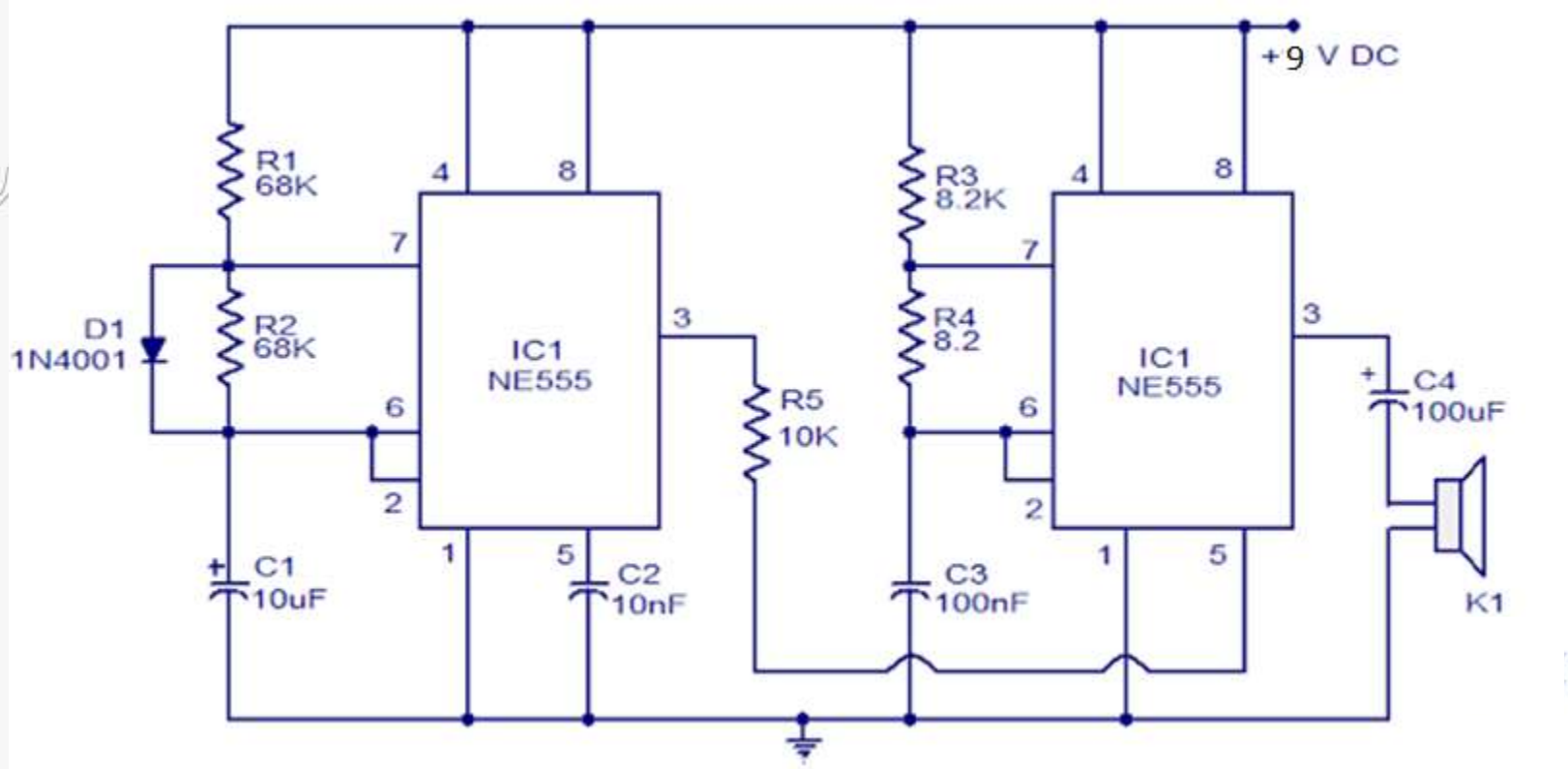
Connection Diagram



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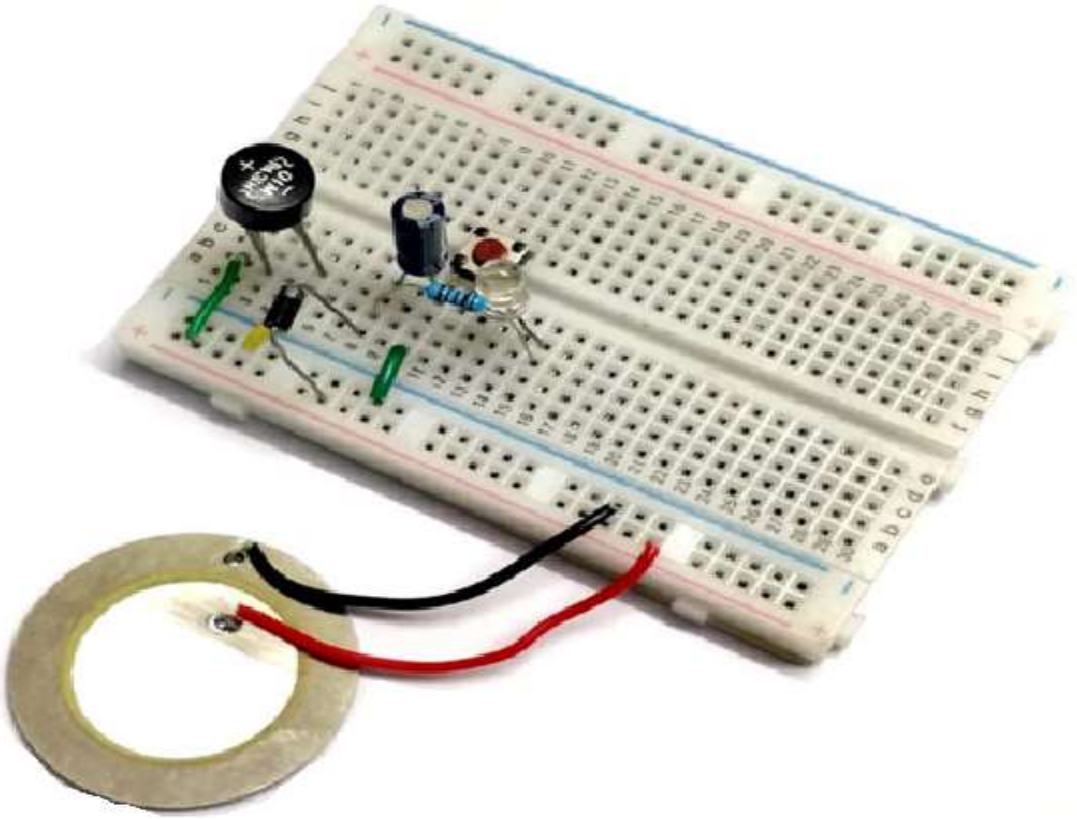
Project Link : https://youtu.be/ahCe5yUQR48

Controlling LED using Switch



About project

This project is developed by using 555 timer IC operated as a MONOSTABLE vibrator. Here the stable stage is LOW, so the timer outputs low after the trigger is removed. Basically in this circuit we will have a LED which turns ON when we touch a pin of timer. The LED will be ON for the time during which the trigger is present. Once the trigger is removed the LED turns OFF.

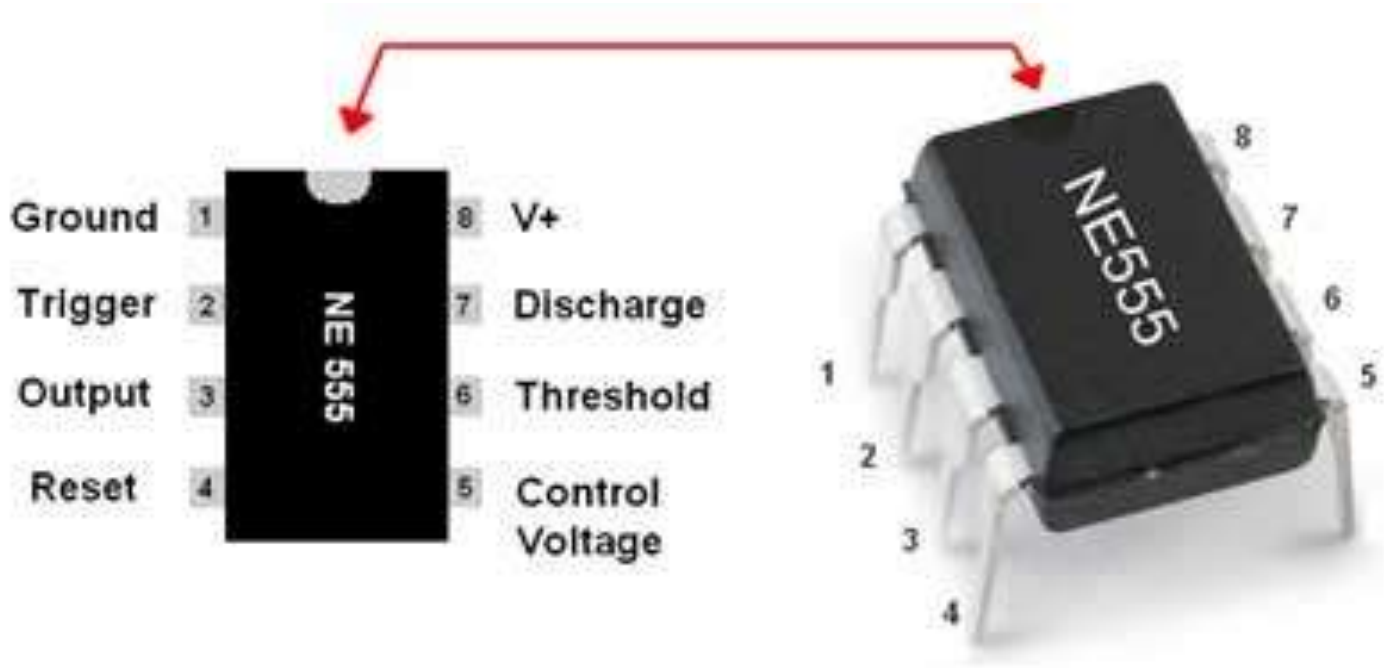
Piezoelectric Plate

A **piezoelectric plate** is a device that uses the **piezoelectric** effect to measure pressure, acceleration, strain or force by converting them to an electrical charge. The most common **piezoelectric** material is quartz. Certain ceramics, Rochelle salts, and various other solids also exhibit this effect.

Timer IC 555

- Here is a pulse/frequency generator using the popular timer IC 555 which is wired as an Astable Multivibrator. The output pulses can be indicated visually by the LED. This circuit does not require any external trigger to change the state of the output, hence the name free-running. This circuit can be used in applications that require clock pulses.
- An Astable Multivibrator can be produced by adding resistors and a capacitor to the basic timer IC 555.The timing during which the output is either high or low is determined by the externally connected two resistors(R1&R2) and a capacitor(C1).

Pin Diagram


Ground
1
Trigger
2
Output
3
Reset
4
NE 555
8
V+
7
Discharge
6
Threshold
5
Control Voltage
NE555
1
2
3
4
5
6
7
8

Working of project

- The capacitor between pin6 and pin1 determines the turn on time of LED once a trigger is passed. This circuit can be modified to turn ON for Two minutes for a single trigger by replacing the 10uF capacitance with a 1000uF one. So with the capacitance change one can get many turn on times and so can make the use of this circuit as a stair case lamp.
- The touch switch circuit is connected on the breadboard as per the circuit diagram, and power is turned ON. Now the LED will not turn on as the trigger is not given.
- This pin can be pulled high by human body potential. This trigger determines the output of 555. When this pin is high the output will be high and when this pin is low the output is low. So once the trigger is given the turn on time of the LED depends on the charging time of the capacitor.

Components Required

- One 555 Timer IC
- One Touch Plate
- One 100k and One 470 Ohm Resistors
- One 10µF Capacitor
- One 104nF Ceramic Capacitor
- One LED
- One Breadboard
- One +9 Volt Battery
- One Battery Cap
- Connecting Wires

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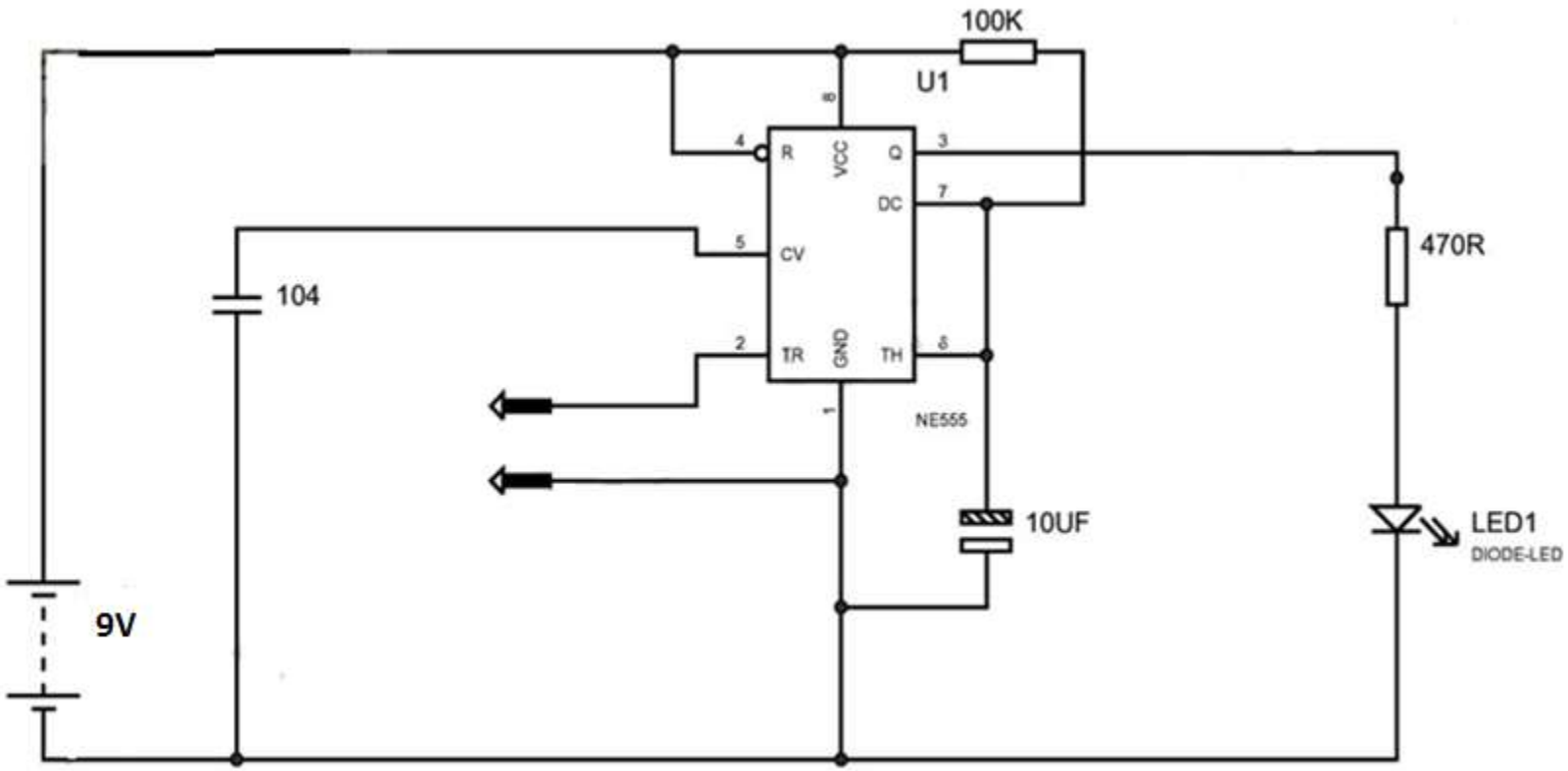
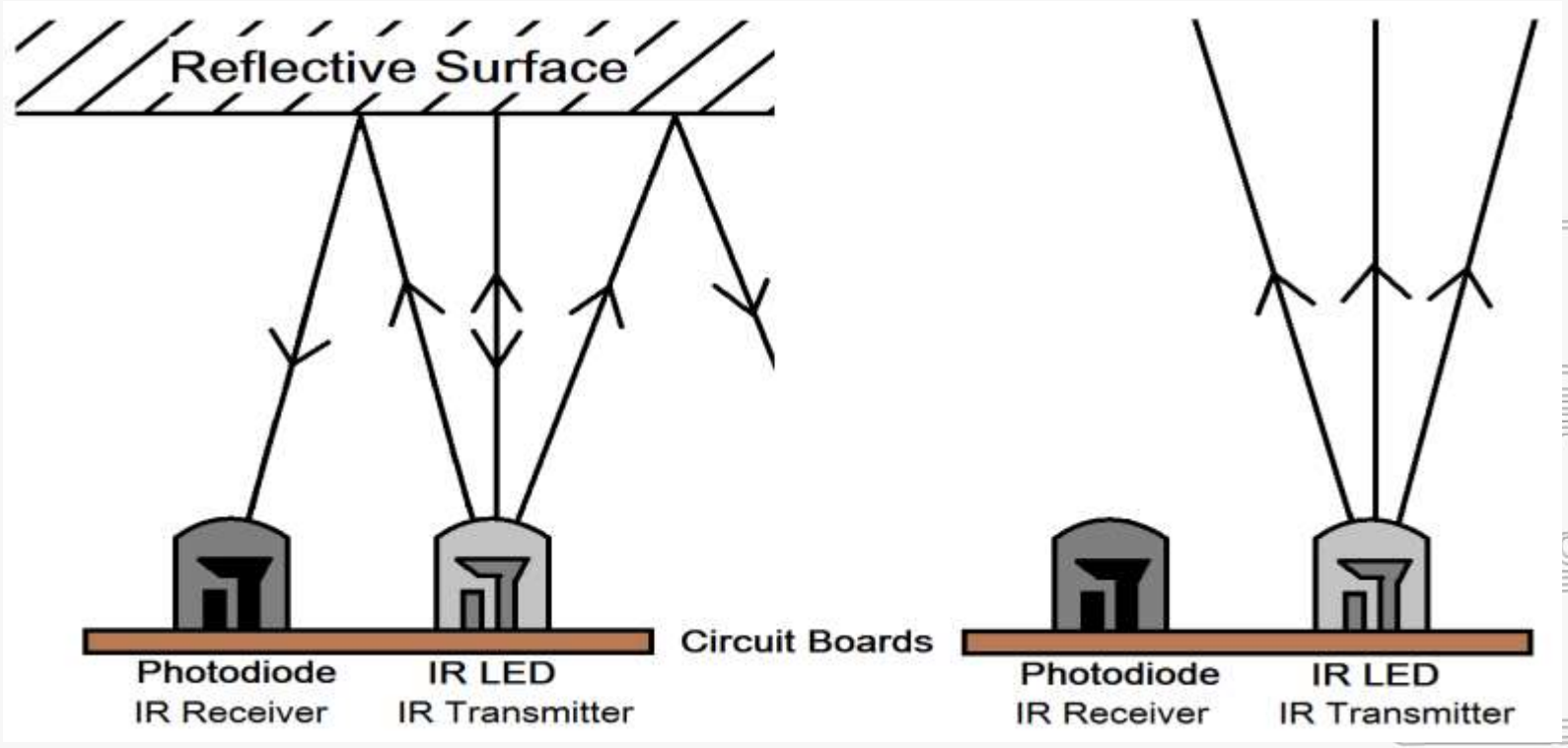
Connection Diagram



Project Link : https://youtu.be/Gp-VbPoGvw8

Object Detector using IR Sensor



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About project

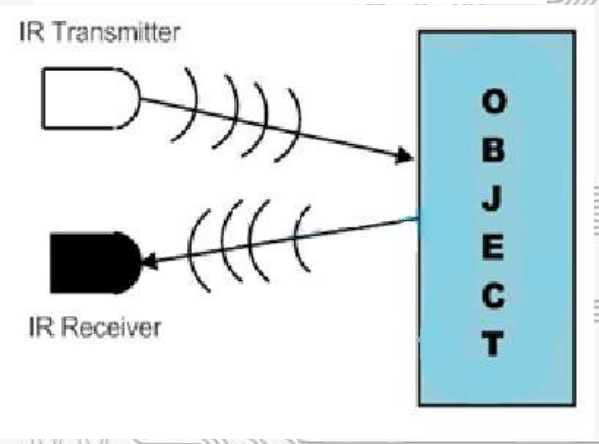
- An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion.
- These types of sensors measures only infrared radiation. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations.
- These types of radiations are invisible to our eyes that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED.
- The basic concept of an Infrared Sensor which is used as Object detector, is to transmit an infrared signal, this infrared signal bounces from the surface of an object and the signal is received at the infrared receiver.

IR Transmitter

Infrared Transmitter is a light emitting diode (LED) which emits infrared radiations. Hence, they are called IR LED's. Even though an IR LED looks like a normal LED, the radiation emitted by it is invisible to the human eye.

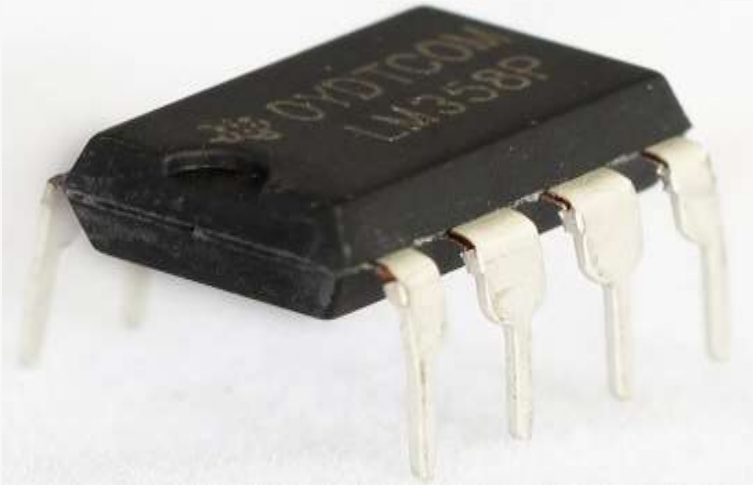
IR Receiver

Infrared receivers are also called as infrared sensors as they detect the radiation from an IR transmitter. IR receivers come in the form of photodiodes and phototransistors. Infrared Photodiodes are different from normal photo diodes as they detect only infrared radiation.

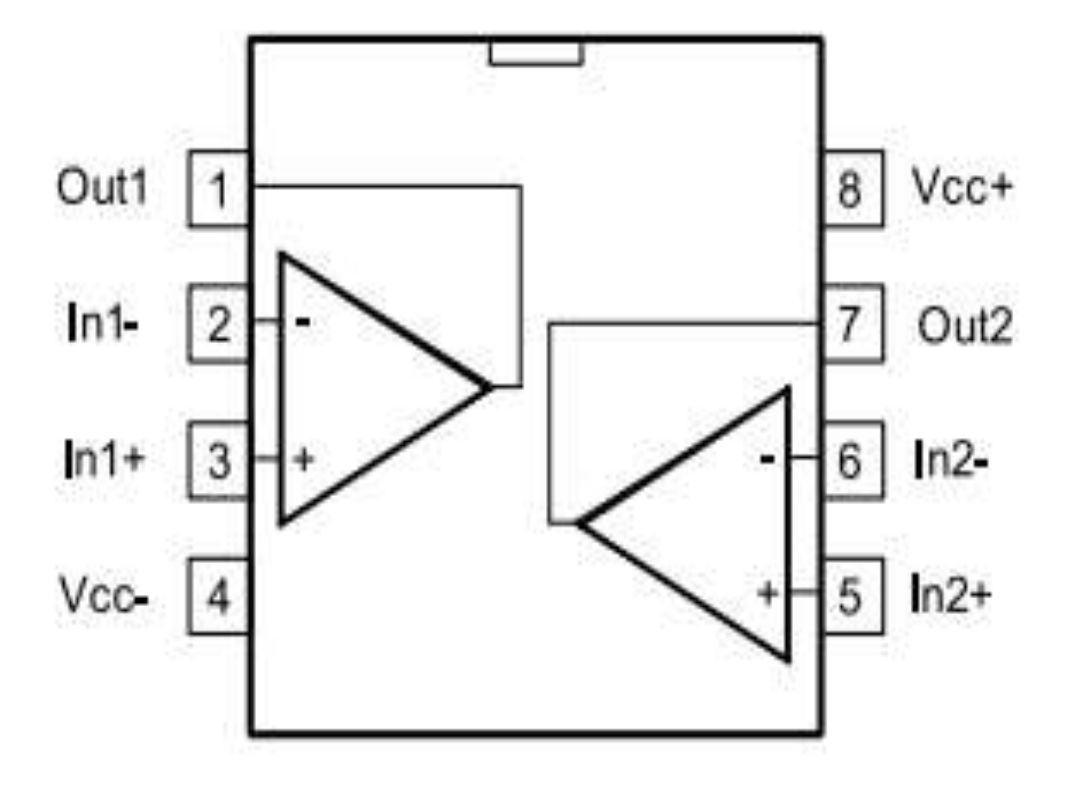


LM358 IC

The LM358 IC is a great, low power and easy to use dual channel op-amp IC. It is designed and introduced by national semiconductor. It consists of two internally frequency compensated, high gain, independent op-amps. This IC is designed for specially to operate from a single power supply over a wide range of voltages.



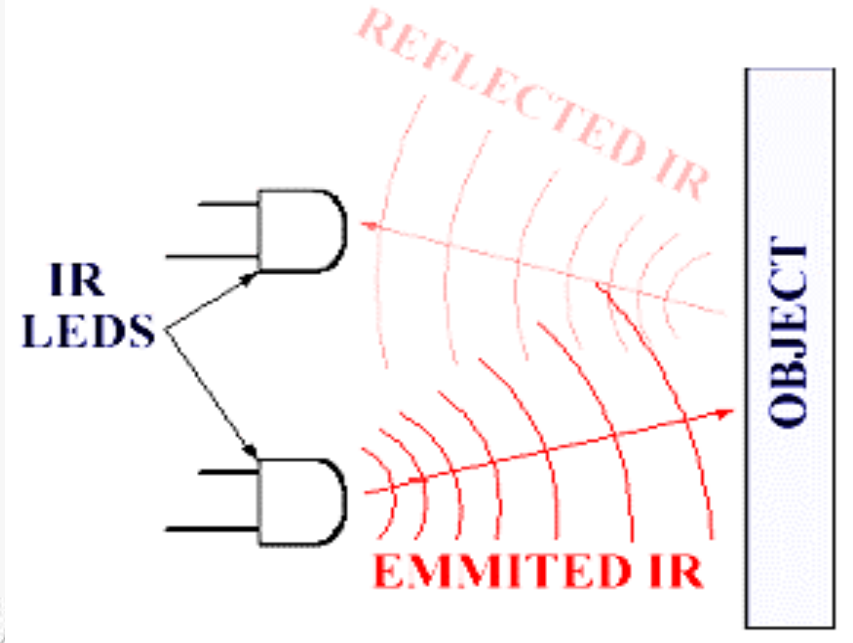
Pin configuration of LM358 IC



Working of project

- In this project, the transmitter section includes an IR sensor, which transmits continuous IR rays to be received by an IR receiver module.
- An IR output terminal of the receiver varies depending upon its receiving of IR rays. Since this variation cannot be analyzed as such, therefore this output can be fed to a comparator circuit.
- Here an operational amplifier of LM358 is used as comparator circuit. When the IR receiver does not receive a signal, the potential at the inverting input goes higher than that non-inverting input of the comparator IC (LM358).
- Thus the output of the comparator goes low, but the LED does not glow. When the IR receiver module receives signal to the potential at the inverting input goes low. Thus the output of the comparator goes high and the LED starts glowing.

- Resistor R1 (220ohms), R2 (10k) and R3 (330ohms) are used to ensure that minimum 10 mA current passes through the **IR LED** devices like **Photodiode** and normal LEDs respectively.
- Resistor VR1 (preset=10k) is used to set the sensitivity of the circuit diagram. The principle of an IR sensor working as an Object Detection Sensor.



Components Required

- One LM358 IC
- One IR Sensor Both Transmitter and Receiver
- One 10k Variable Resistor
- One 10k ,One 220 Ohm and One 330 Ohm Resistors
- One Led
- One Breadboard
- One 9 Volt Battery
- One Battery Cap
- Connecting Wires

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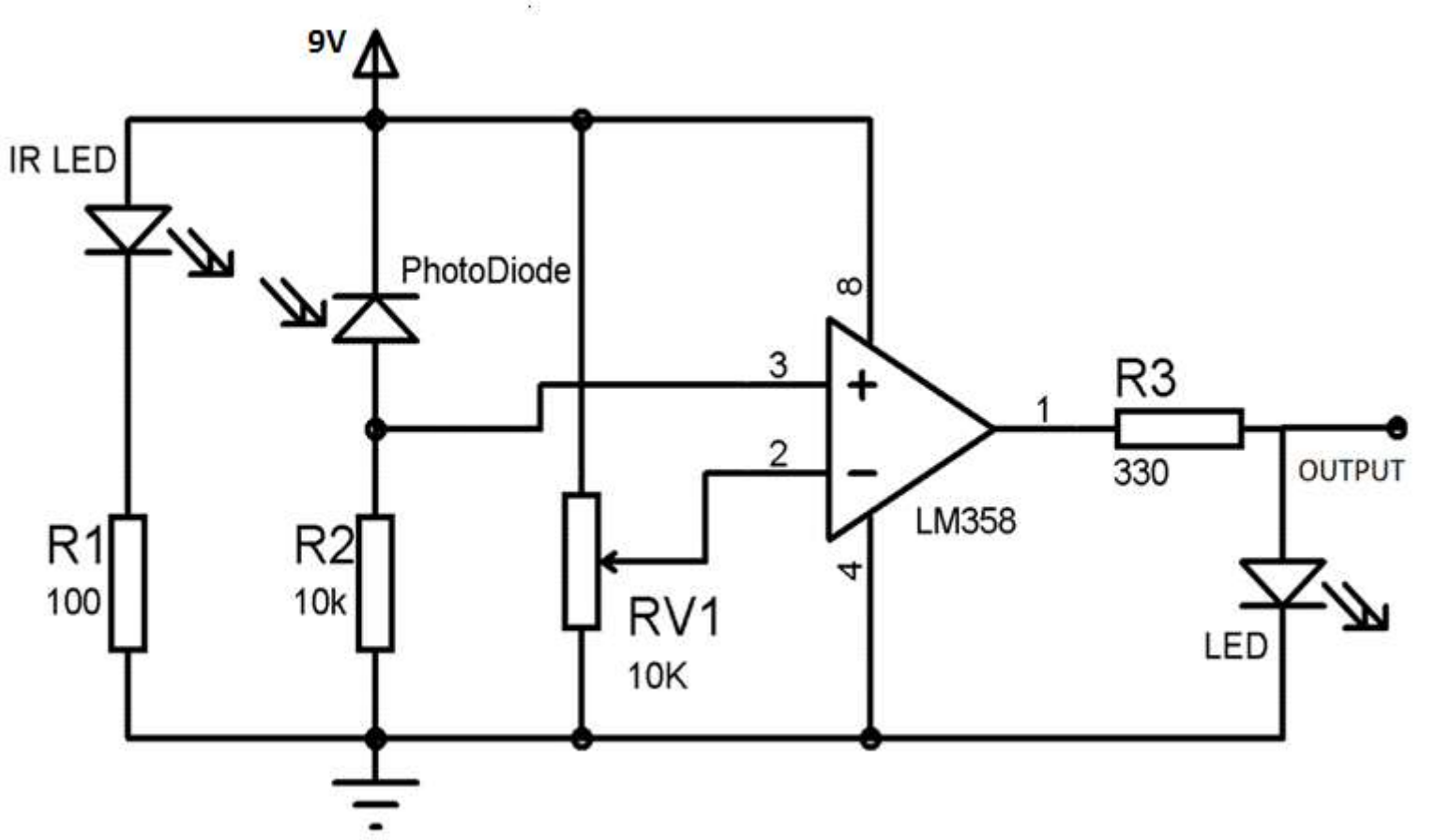
Connection Diagram



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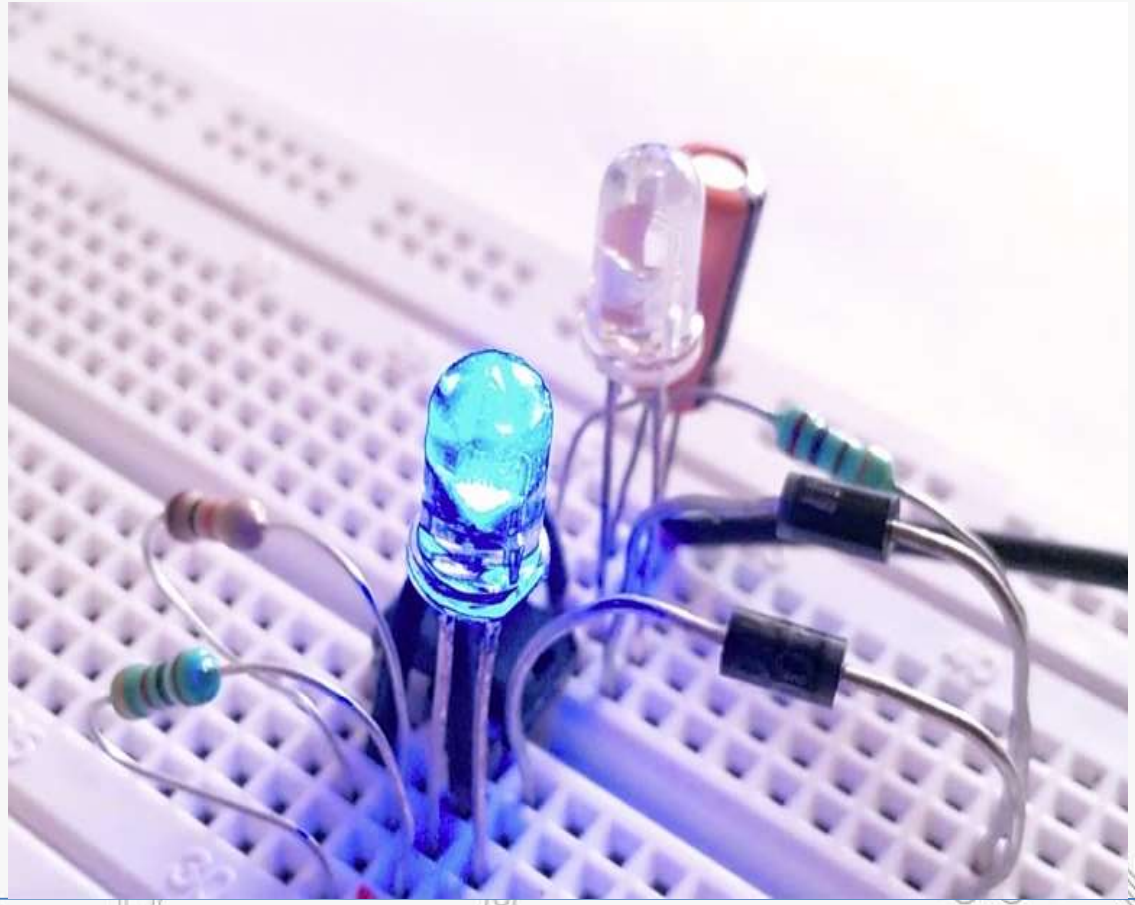
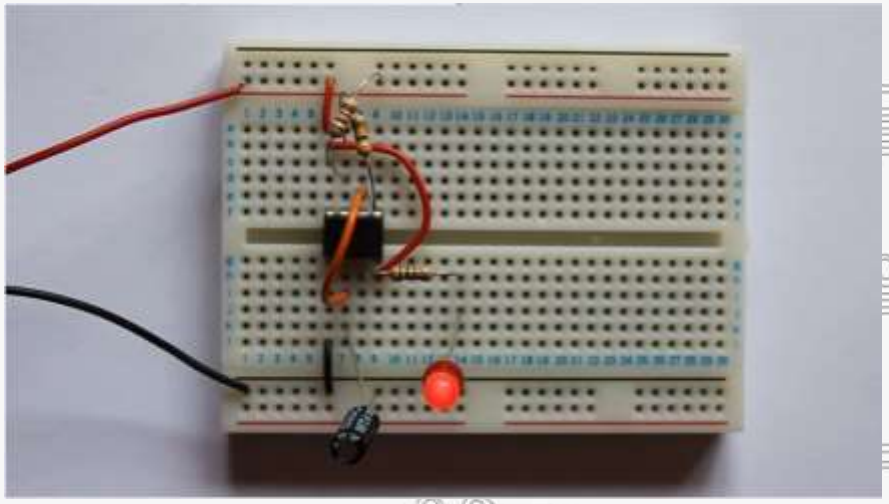
Project Link : https://youtu.be/6jsJPRb8Ug8

LED Flasher using Timer IC 555



About project

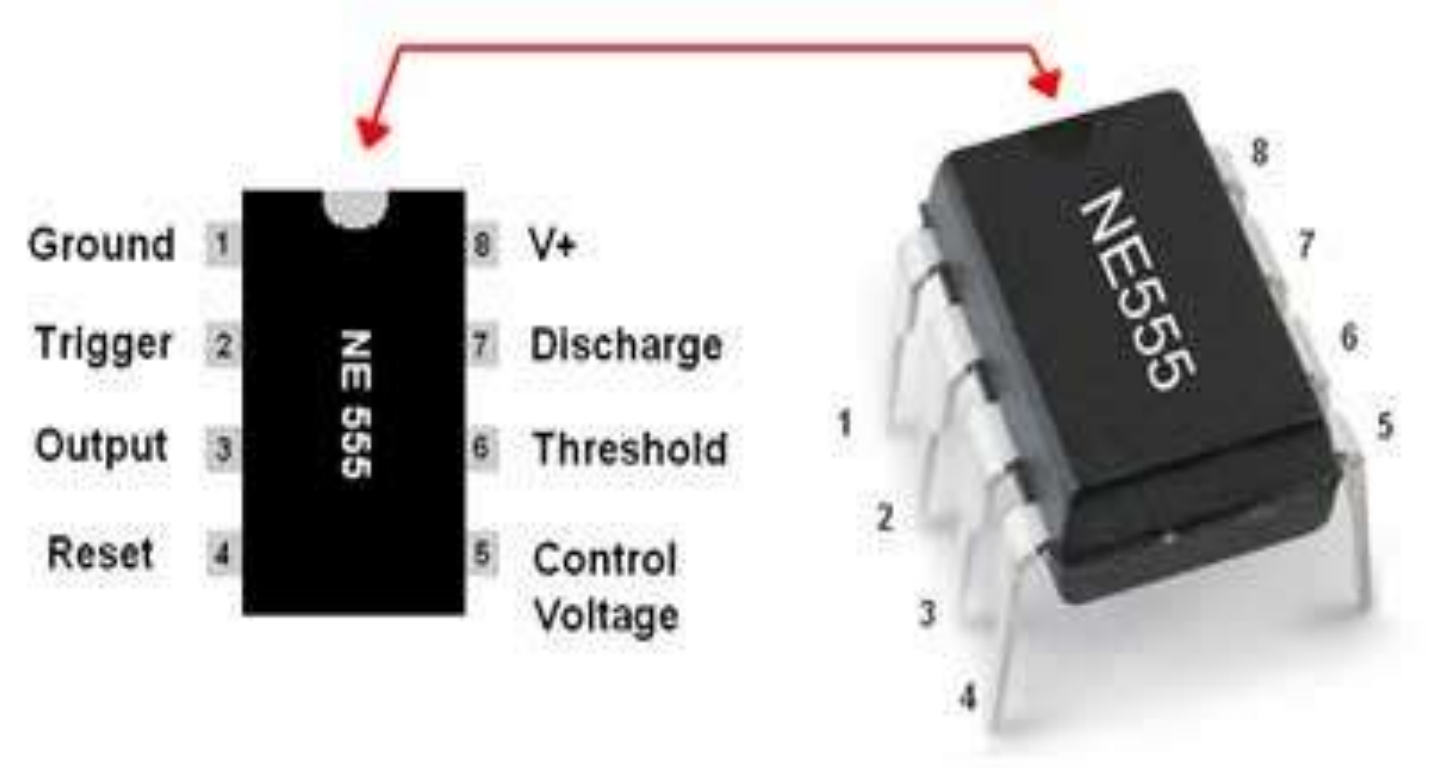
The circuit diagram of LED flasher based on NE555 timer IC. The circuit uses NE555 timer IC wired as Astable multivibrators. The circuit can be powered from anything between 6 to 15V DC. This project is to flash/blink LED at an interval of around 500ms.



Timer IC 555

- Here is a pulse/frequency generator using the popular timer IC 555 which is wired as an Astable Multivibrator. The output pulses can be indicated visually by the LED. This circuit does not require any external trigger to change the state of the output, hence the name free-running. This circuit can be used in applications that require clock pulses.
- An Astable Multivibrator can be produced by adding resistors and a capacitor to the basic timer IC 555.The timing during which the output is either high or low is determined by the externally connected two resistors(R1&R2) and a capacitor(C1).

Pin Diagram


Ground 1
Trigger 2
Output 3
Reset 4
NE 555
8 V+
7 Discharge
6 Threshold
5 Control Voltage
NE555
1
2
3
4
5
6
7
8

Components Required

- 555 Timer IC
- One 10k , One 1k and One 220 ohm Resistors
- 100uF capacitor
- LED
- Breadboard
- +9 Volt Battery
- Battery Cap
- Connecting Wires

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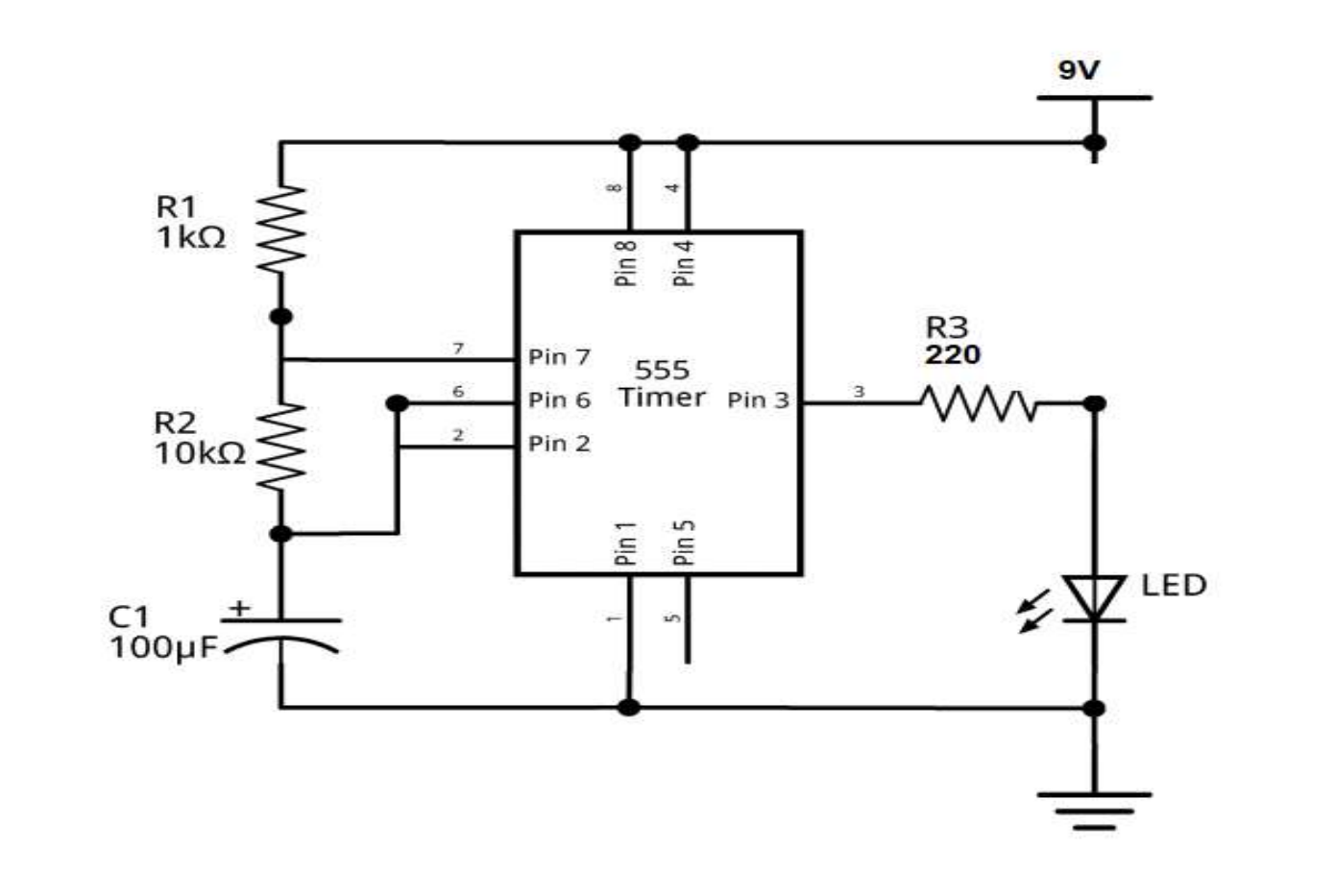
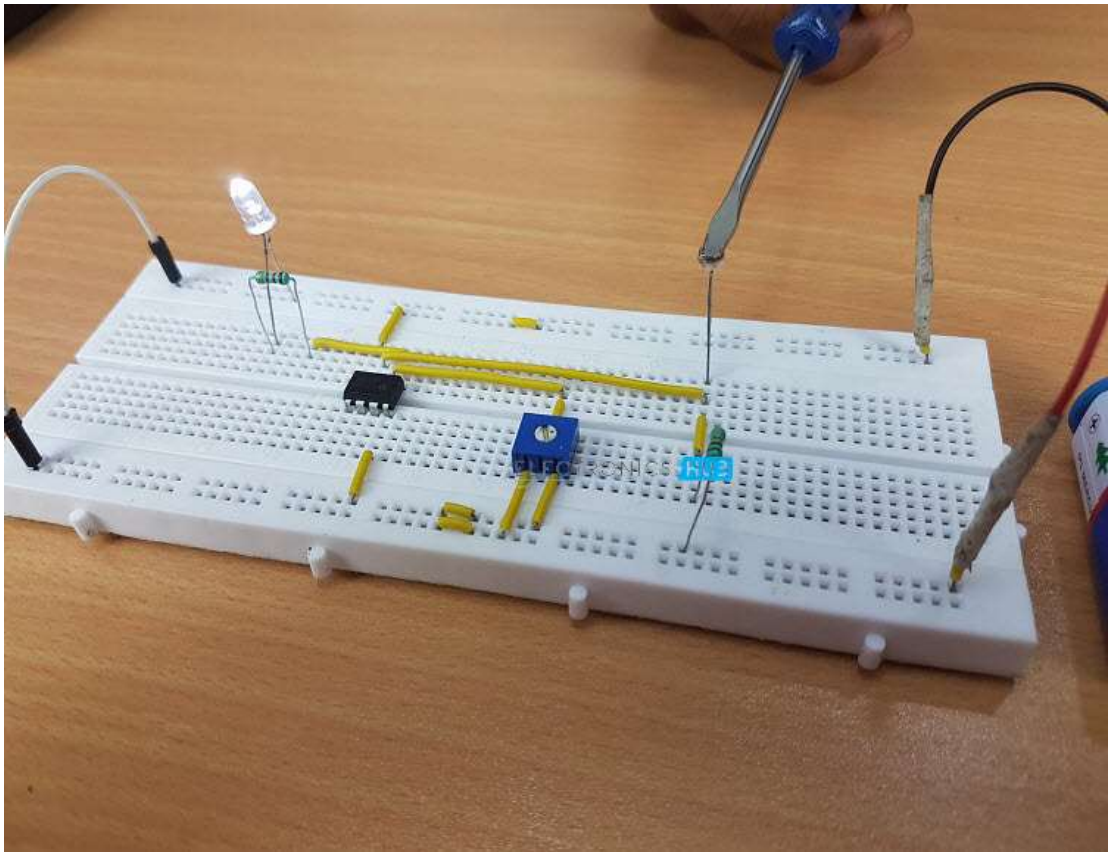
Connection Diagram



Project Link : https://youtu.be/ZKHbdxcLYic

Light Detector using LDR and LM358

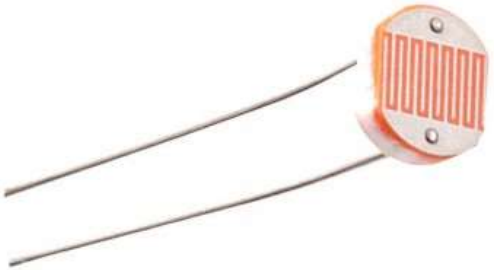


About project

- A Light Detector or a Light Sensor is a device or circuit that detects the intensity of the light incident on it. Different types of light detectors are LDRs (or Light Dependent Resistors), Photo Diodes, Photo Transistors, etc.
- In this project, we have designed a simple Light Detector using LDR and LM358 IC.
- We have connected the wiper terminal of the 10 KΩ Potentiometer to the inverting terminal of LM358. To the non – inverting terminal, we have connected the junction of a 10 KΩ Resistor and the LDR. These two will form a potential divider feeding its output to the LM358.

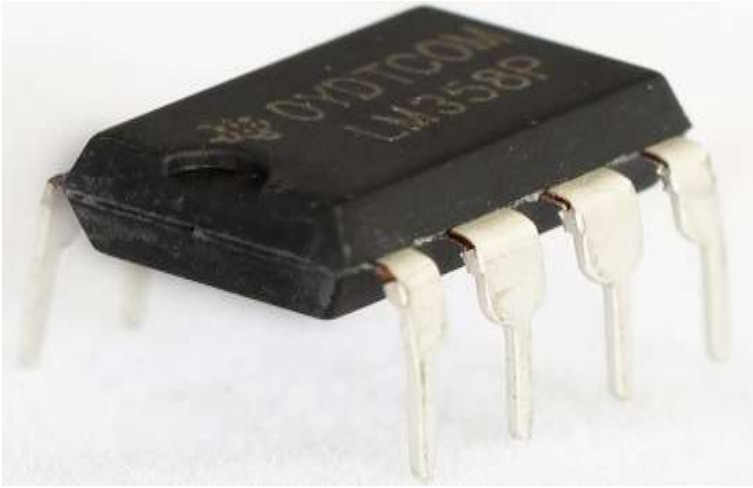
Light Dependent Resistor

An **LDR** is a component that has a (variable) resistance that changes with the light intensity that falls upon it. This allows them to be used in light **sensing** circuits. A Light Dependent **Resistor** (**LDR**) or a photo **resistor** is a device whose resistivity is a **function** of the incident electromagnetic radiation. Hence, they are light sensitive devices. They are also called as photo conductors, photo conductive cells or simply photocells.

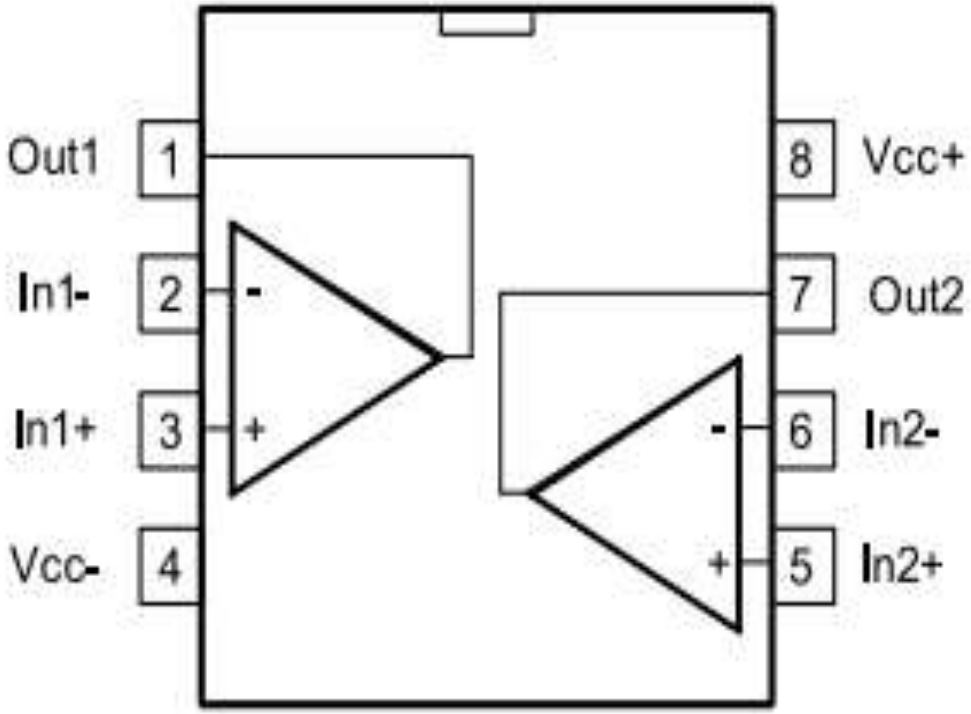


LM358 IC

The LM358 IC is a great, low power and easy to use dual channel op-amp IC. It is designed and introduced by national semiconductor. It consists of two internally frequency compensated, high gain, independent op-amps. This IC is designed for specially to operate from a single power supply over a wide range of voltages.



Pin configuration of LM358 IC



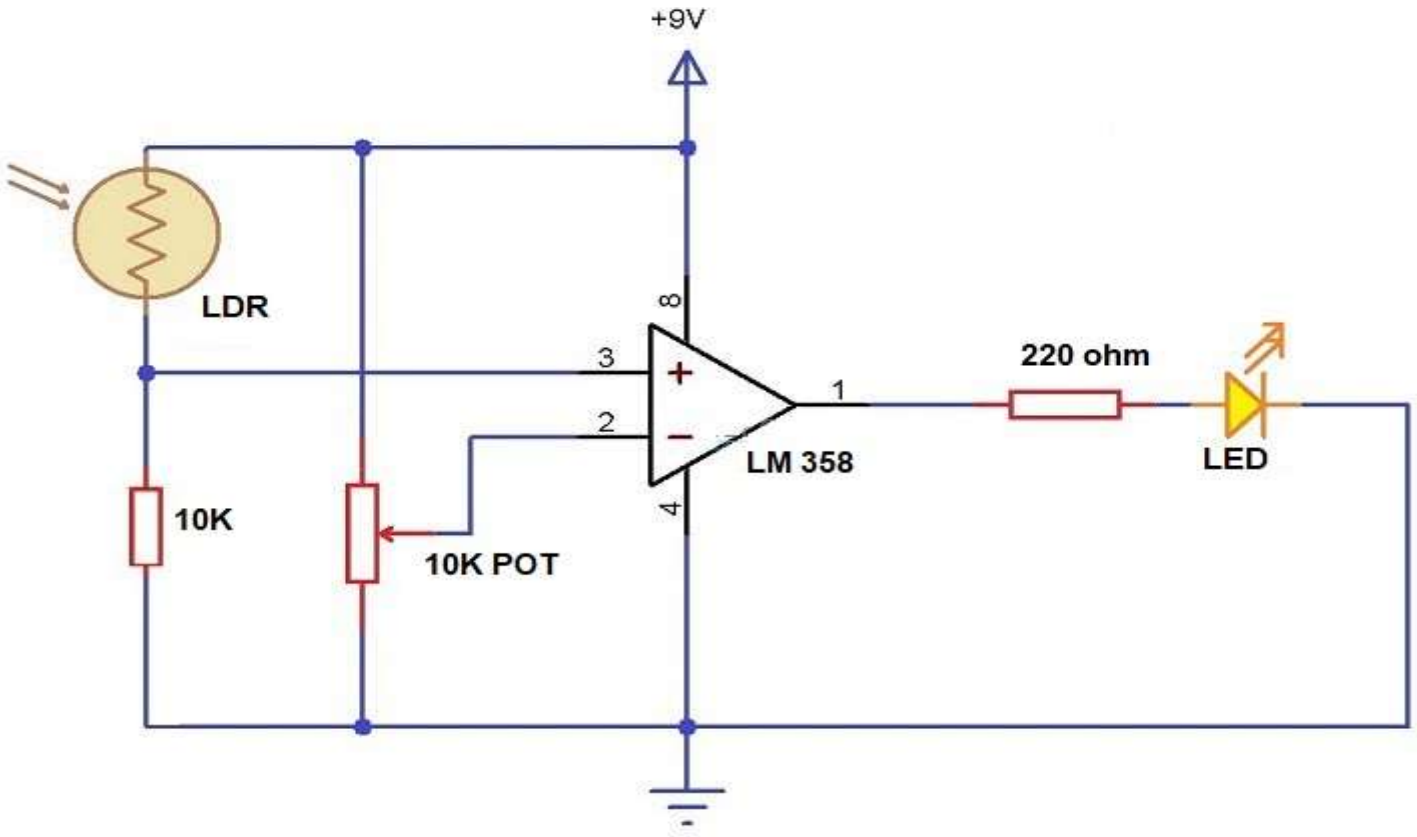
Working of project

- Typically, when light is incident directly on the LDR, its resistance will be very low and when there is no light i.e. in darker conditions, its resistance jumps to few mega Ohms.
- We will use this feature of the LDR is our project to detect light and turn on an LED. For this we have used an Operational Amplifier LM358. The Op – Amp is configured in comparator mode i.e. it will compare the voltages at inverting and non – inverting terminals and correspondingly generate a HIGH or LOW output.
- By adjusting 10k variable resistor, set the voltage at the pin 2 of LM358 which should be greater than the voltage at pin 3 of LM358.
- When there is no light on LDR, the voltage at the pin 3 is less than pin 2 and LED will be OFF. When light falls on LDR, the voltage at pin 3 becomes more than pin 2 and LED turns ON.

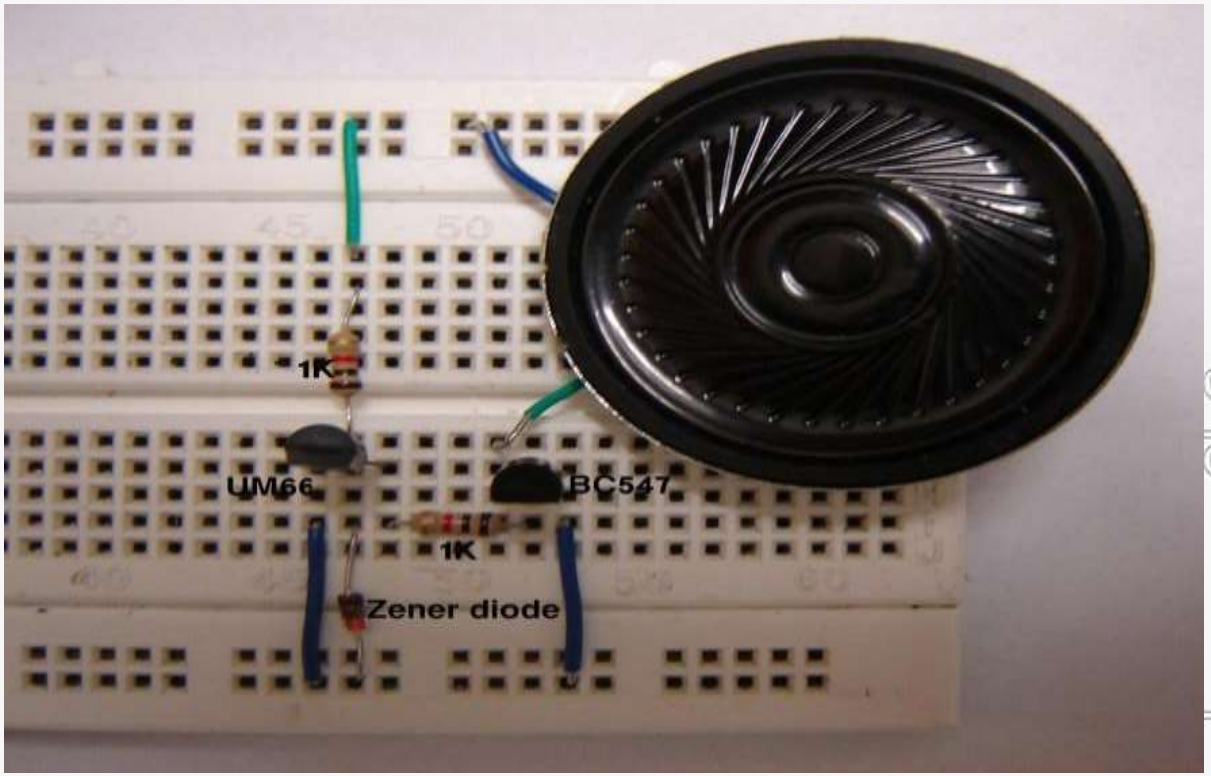
Components Required

- One LM358 IC
- One LDR
- One 10k Variable Resistor
- One 10k and One 220 ohm Resistors
- One Led
- One Breadboard
- One 9 Volt Battery
- One Battery Cap
- Connecting Wires

Connection Diagram



Project Link : https://youtu.be/nqCqjcOWd1E

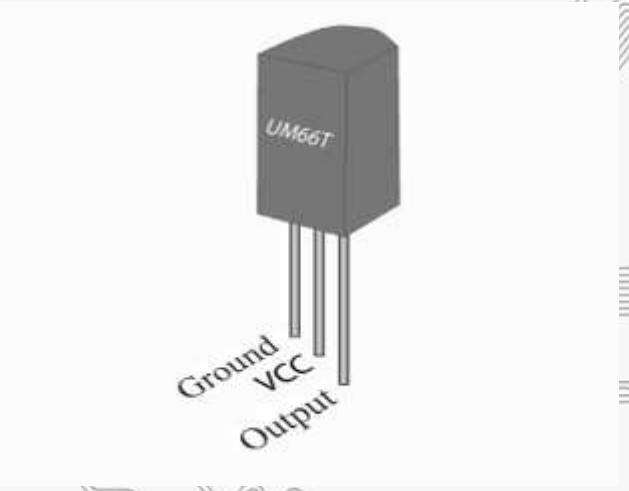

1K
UM66
BC547
1K
Zener diode

About project

This is a simple **melody generator** circuit which you can make by using an IC UM66. UM66 has an inbuilt beat and tone generator. This IC, with its three legs, looks like a transistor. This IC has many versions for playing different songs/beats. It has a built in ROM programmed for playing music.

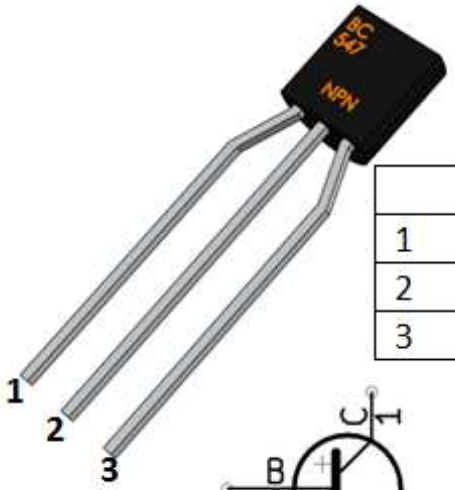
UM66 IC

- UM66 is a melody generating IC commonly used in calling bell, phone, toys, musical bell in doors, home security alarm systems, burglar alarms etc.
- It is a three pin IC looks like a transistor. Its first pin is ground, second is VCC and the third is the melody output.
- Supply voltage that can be given to the IC is in the range of 1.5V- 4.5V. These are CMOS ICs and have very small power consumption.



BC547 Transistor

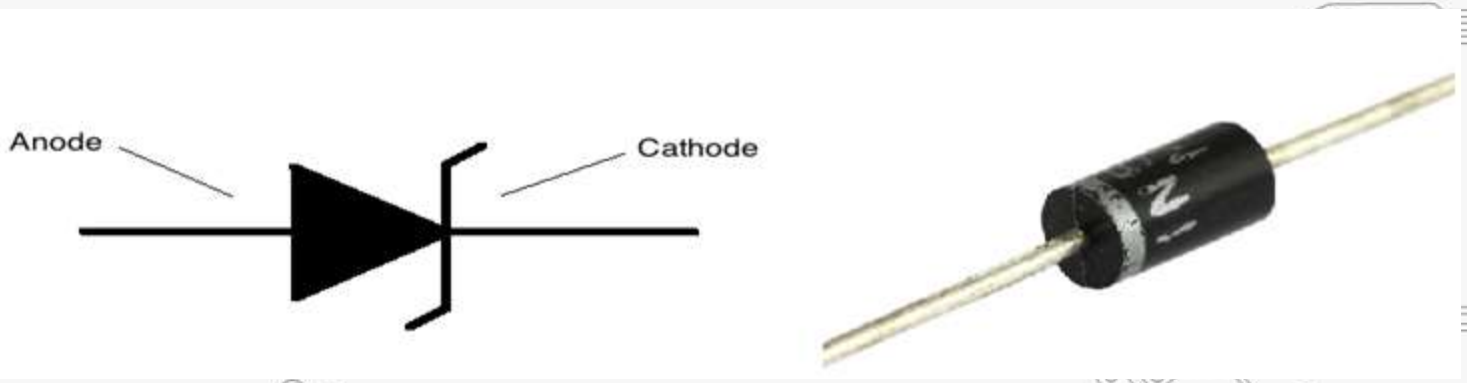
BC547 is a NPN transistor hence the collector and emitter will be left open (Reverse biased) when the base pin is held at ground and will be closed (Forward biased) when a signal is provided to base pin.



BC-547	
1	Collector
2	Base
3	Emitter

Zener Diode

A **Zener diode** is a type of diode that allows current to flow in the conventional manner - from its anode to its cathode i.e. when the anode is positive with respect to the cathode. When the voltage across the terminals is reversed and the potential reaches the *Zener voltage* (or "knee"), the junction will breakdown and current will flow in the reverse direction.



Working of project

- The melody will be available at pin 3 of UM66 and here it is amplified by using Q1 to drive the speaker. Resistor R2 limits the base current of Q1 within the safe values. R1 & R3 works as voltage divider and provides 4.5V at pin 2 of UM66.
- Speaker can be driven with external NPN transistor.
- Melody begins from the first note if power is reset.

Components Required

- One UM66/BT66 IC
- One BC547 Transistor
- Zener Diode
- Two 1K Resistors
- One 220 Ohm Resistor
- One Speaker
- One Breadboard
- One 9 Volt Battery
- One Battery Cap
- Connecting Wires

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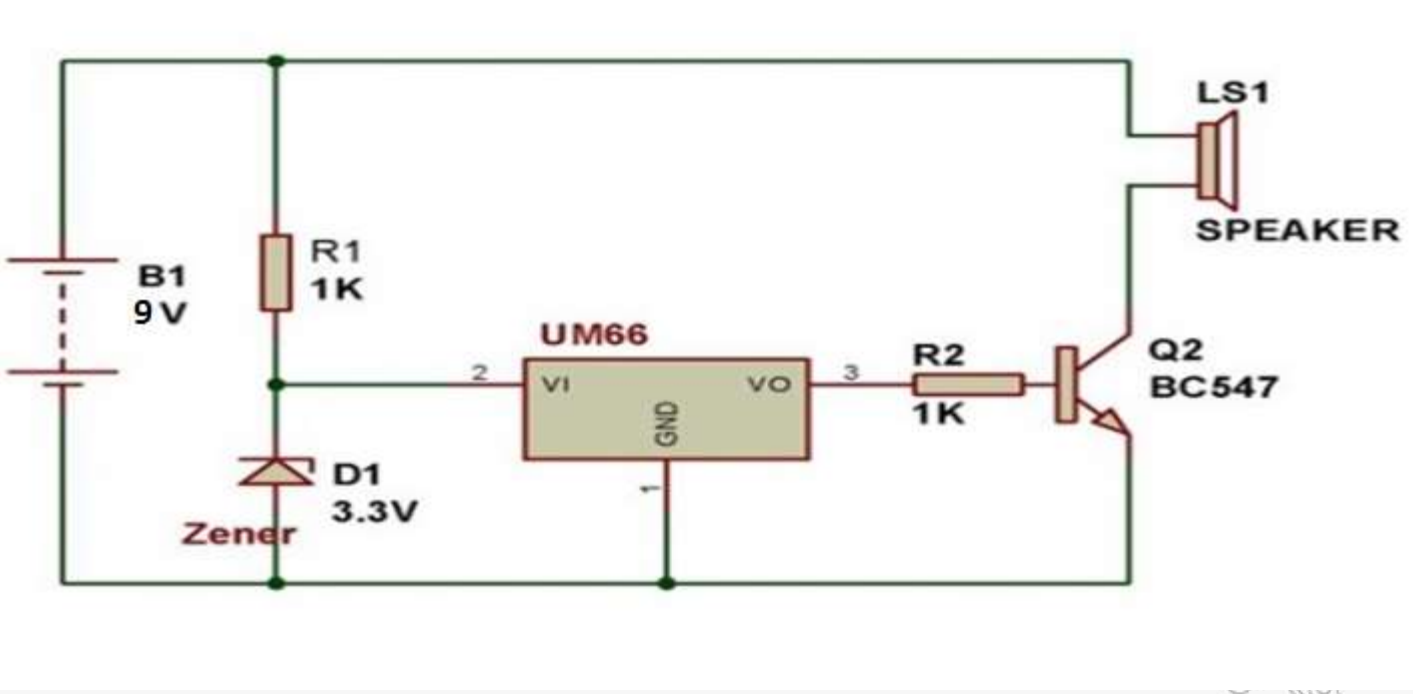
Connection Diagram



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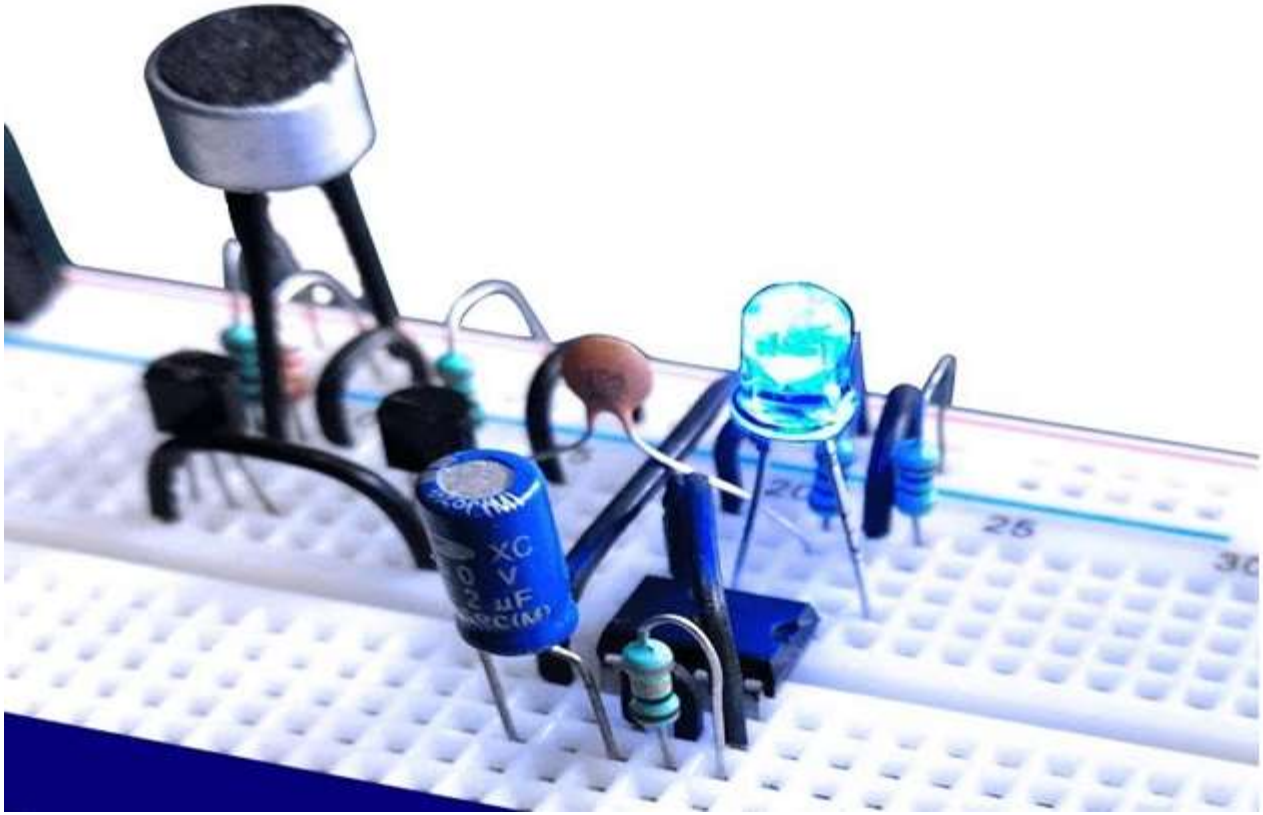
Project Link : https://youtu.be/cdzS-K_ajpc

Clap Switch Project

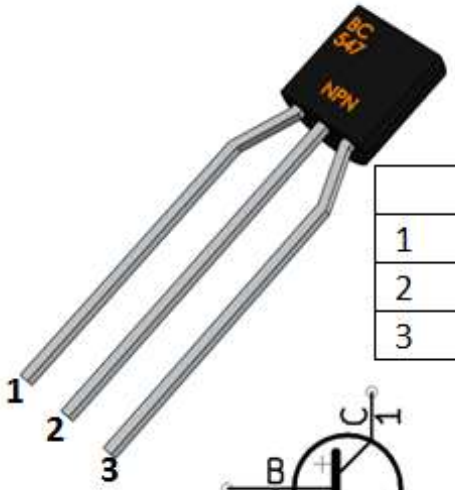


About project

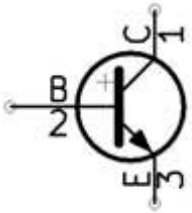
- Clap switch is an interesting hobby circuit which turns on the lights with a clap sound. Although its name is “Clap switch”, but it can be turned ON by any sound of approximately same pitch of Clap sound.
- The main component of this clap switch circuit is the Electric Condenser Mic, which has been used as a sound sensor. Condenser Mic basically converts sound energy into electrical energy that in turns used to trigger 555 timer IC through a Transistor.

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.



BC-547	
1	Collector
2	Base
3	Emitter



Microphone

• A **microphone** is a device that captures audio by converting sound waves into an electrical signal. This signal can be amplified as an analog signal or may be converted to a digital signal, which can be processed by a computer or other digital audio device.

• Vibration of the diaphragm causes surrounding components of the **microphone** to vibrate. Conversion of these vibrations is delivered as an audible signal.

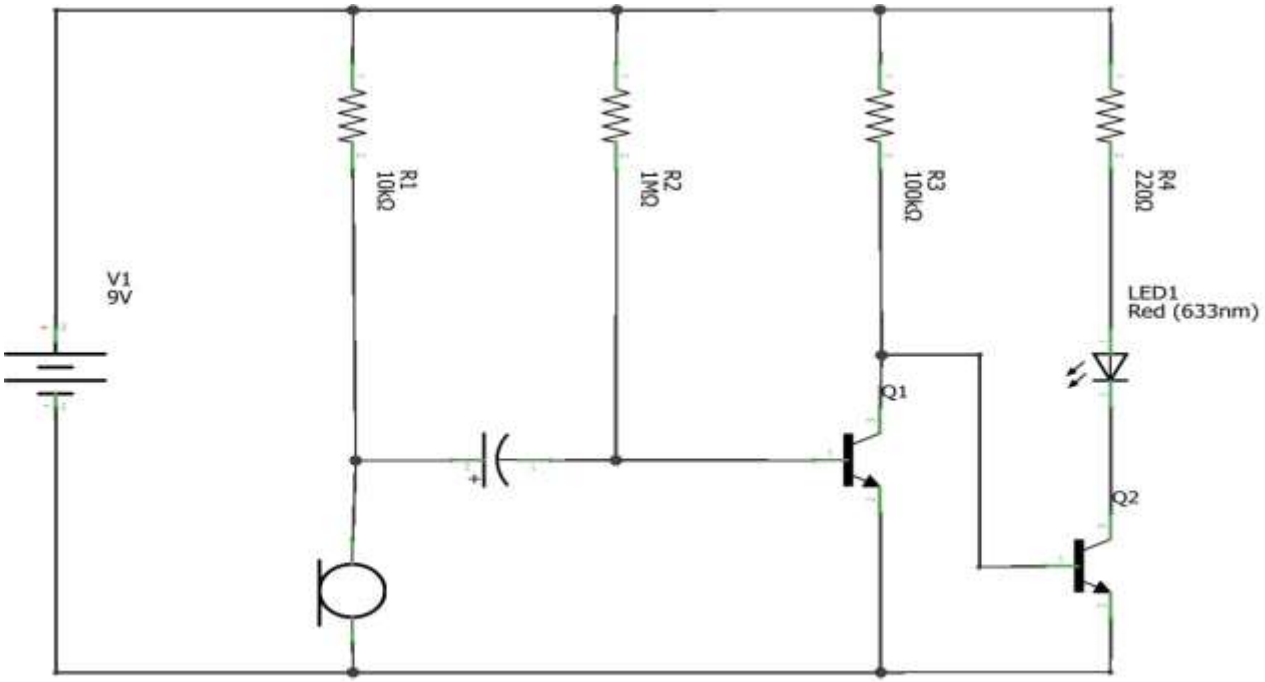
Working of project

- Initially the transistor is in OFF state, now when we produce some sound near condenser mic, this sound will be converted into electrical energy and it will raise the potential at the Base, which will turn the Transistor ON.
- As soon as the transistor becomes ON, LED will turn ON. We have connected the LED through a 220ohm resistor.
- After some time LED will be turned OFF automatically.

Components Required

- One Condenser Mic
- One BC547 Transistor
- One 100k, one 1M, one 10k and one 220 ohm Resistors
- One 100uF Capacitor
- One LED
- One Breadboard
- One 9V Battery
- One Battery Cap
- Connecting Wires

Connection Diagram



Project Link : https://youtu.be/LKSbp66waIA

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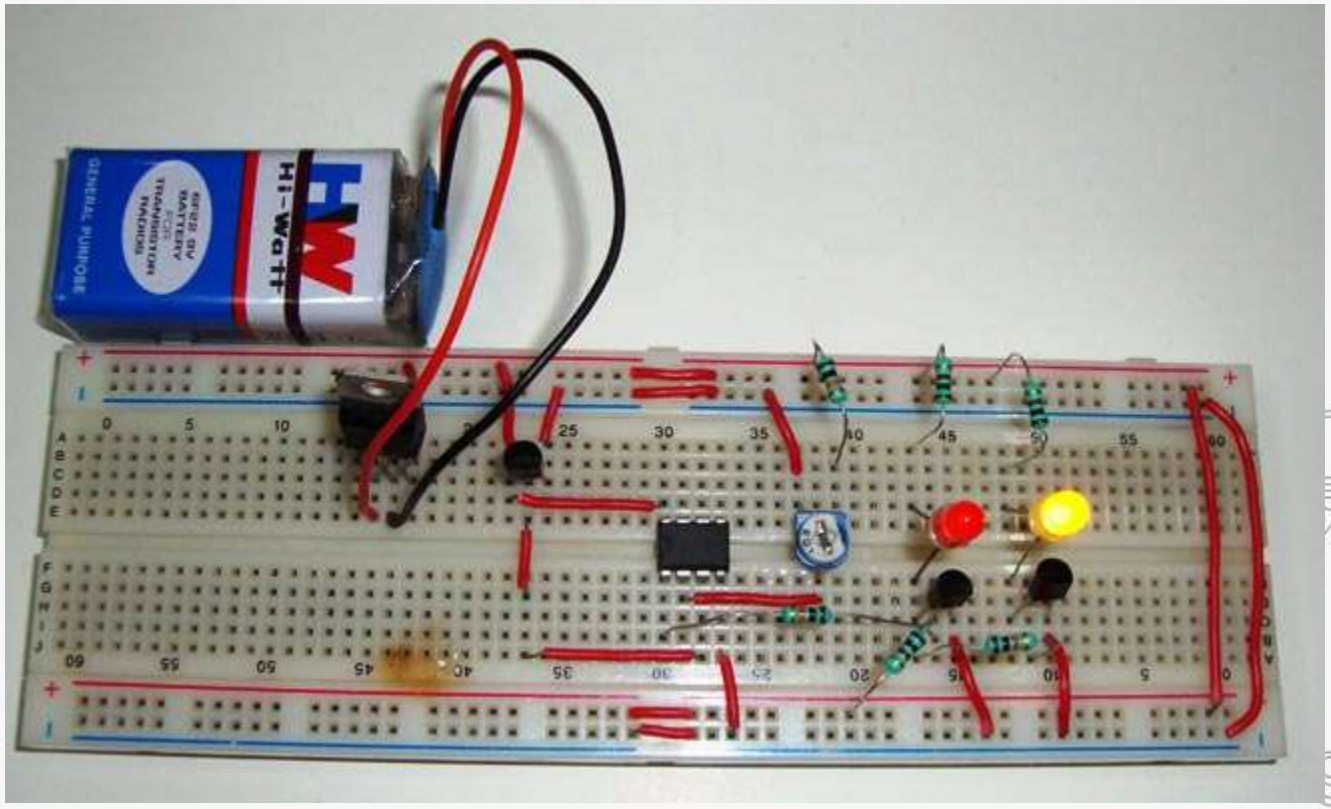
Temperature Controlled LEDs using LM35

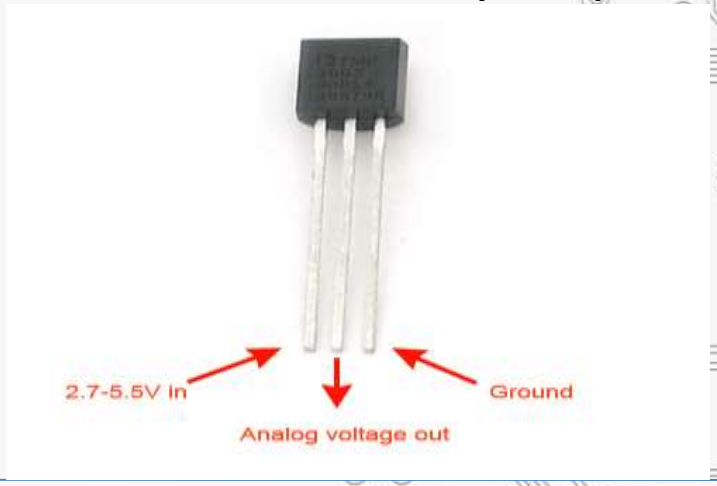


About project

- In this project, we are going to control the LEDs according to temperature around. If temperature goes beyond a particular level (50 Degree in this circuit) then Red LED will glow automatically, otherwise yellow LED remains on below that particular temperature. This threshold temperature value can be set by adjusting the Variable resistor in the circuit, according to requirement.
- In this project you will also learn about how to use LM35 sensor in any circuit. LM35 is very popular and inexpensive temperature sensor generally used as digital thermometer or to measure temperature.

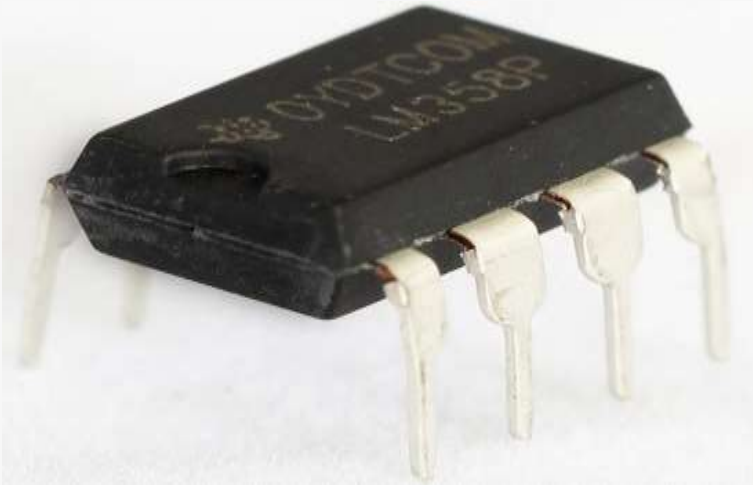
LM35 Temperature Sensor

LM35 is an integrated analog **temperature sensor** whose electrical output is proportional to Degree Centigrade. **LM35 Sensor** does not require any external calibration or trimming to provide typical accuracies. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy.

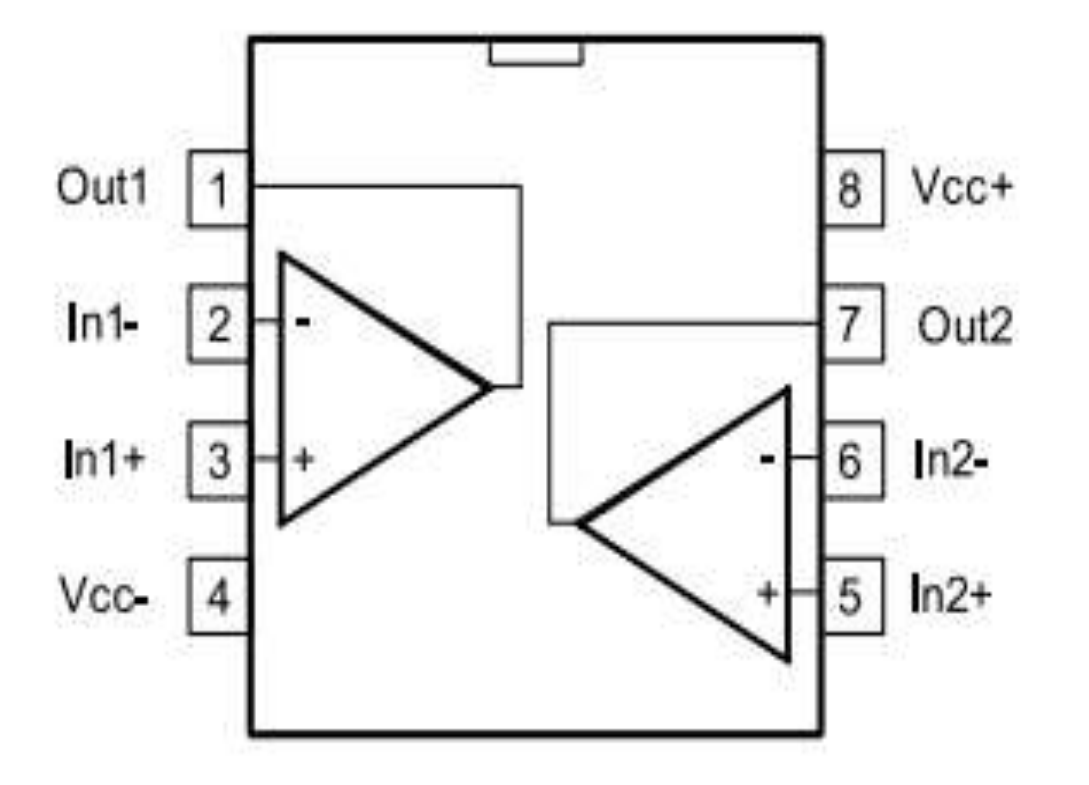


LM358 IC

The LM358 IC is a great, low power and easy to use dual channel op-amp IC. It is designed and introduced by national semiconductor. It consists of two internally frequency compensated, high gain, independent op-amps. This IC is designed for specially to operate from a single power supply over a wide range of voltages.

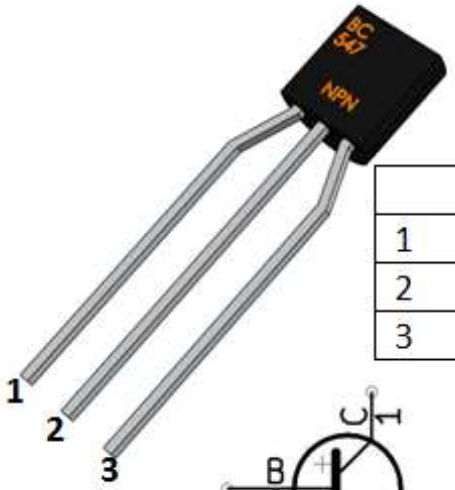


Pin configuration of LM358 IC

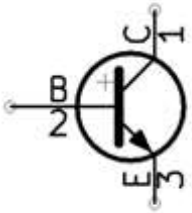


BC547

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.



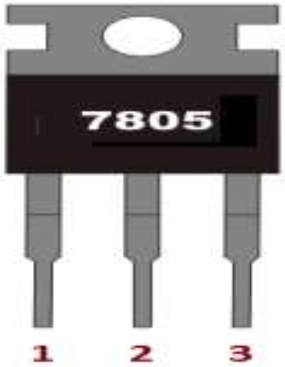
BC-547	
1	Collector
2	Base
3	Emitter



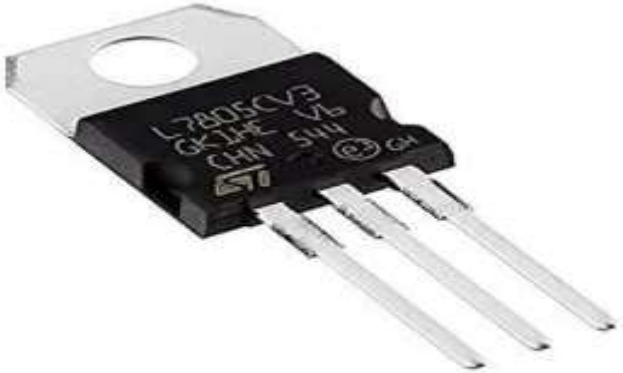
IC 7805

IC 7805 is a **5V Voltage Regulator** that restricts the output voltage to **5V output** for various ranges of input voltage. It acts as an excellent component against input voltage fluctuations for circuits, and adds an additional safety to your circuitry. It is inexpensive, easily available and very much commonly used. With few capacitors and this IC you can build pretty solid and reliable voltage regulator in no time.

IC 7805 Pinout



Pinout 7805



Typical 7805

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Working of project

- In this circuit 9v general purpose battery is used to power up the whole circuit and IC7805 is used to provide the regulated 5v supply to the circuit. When temperature is below 50 degree then output of LM358 remains LOW and Q1 remains in OFF state and transistor Q2 remains in ON state.
- Now when surrounding's temperature goes beyond 50 Degree Celsius, output voltage of LM35 at pin 2 also goes higher than 0.5 volt or 500mV.
- Output of LM35 is connected to Pin 3 of Op-amp LM358 and as we have set the reference voltage (voltage at Pin 2 of LM358) to 0.5 volt, so now voltage at Pin 3 (non-inverting input) becomes higher than voltage at Pin 2 (inverting input) and output of op-amp LM358 (PIN 1) becomes HIGH.
- Output of LM358 connected to the base of NPN transistor Q1, so Q1 also becomes ON and Red LED starts glowing. At the same time, base of Transistor Q2 gets ground and Q2 becomes OFF and yellow LED also becomes OFF.

Components Required

- One LM358 IC
- One 7805 IC
- One LM35 Temperature Sensor
- Two BC547 Transistors
- One 10k Variable Resistor
- Three 10k and Three 1k Resistors
- One Red Led and One Yellow Led
- One Breadboard
- One +9 Volt Battery
- One Battery Cap
- Connecting Wires

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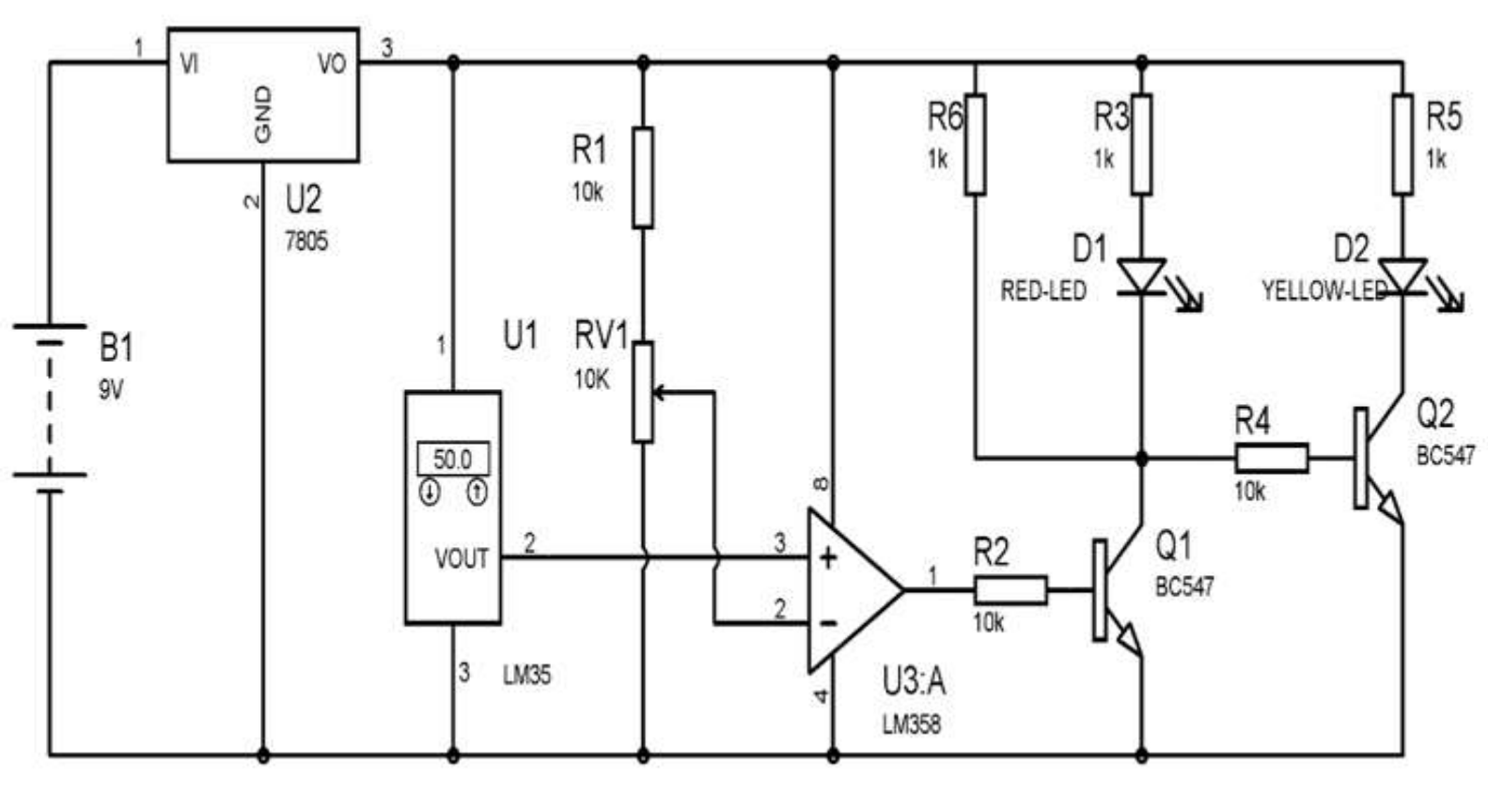
Connection Diagram



Project Link : https://youtu.be/3srRvZSlCHk

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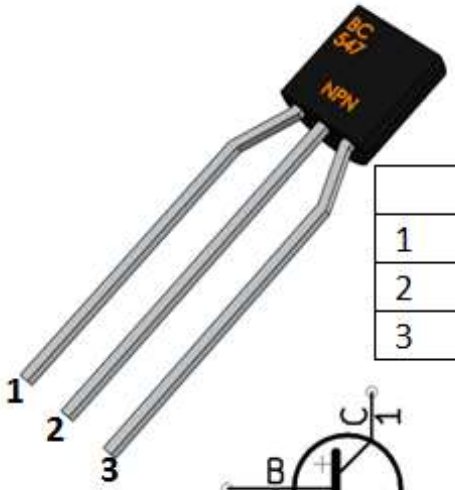
Rain detector using BC 547 Transistor

About project

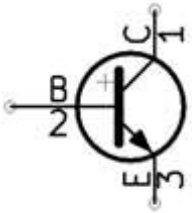
In this project basically, rain detector circuit detects rain . Main components in this circuit are BC547 & BC557 transistor. Circuit completes when rain make the sensing wires get wet. When ever the rain comes, **buzzer** will create alarm.

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.



BC-547	
1	Collector
2	Base
3	Emitter



Working of project

Circuit completes when rain make the sensing wires get wet. If there is no rain there will be no conduction between the wires in the sensor. So the circuit will not be active. If the sensor wires start conduction due to rain droplets, circuit gets activated. As a result transistor BC557 becomes ON and will drive transistor BC 547 to ON. The buzzer connected to collector of the BC 547 will be activated.

Components Required

- Two BC 547 Transistor
- Two 1k Resistors
- One Buzzer(One LED can also connected across Buzzer)
- Breadboard
- +9 Volt Battery
- Battery Cap
- Connecting Wires

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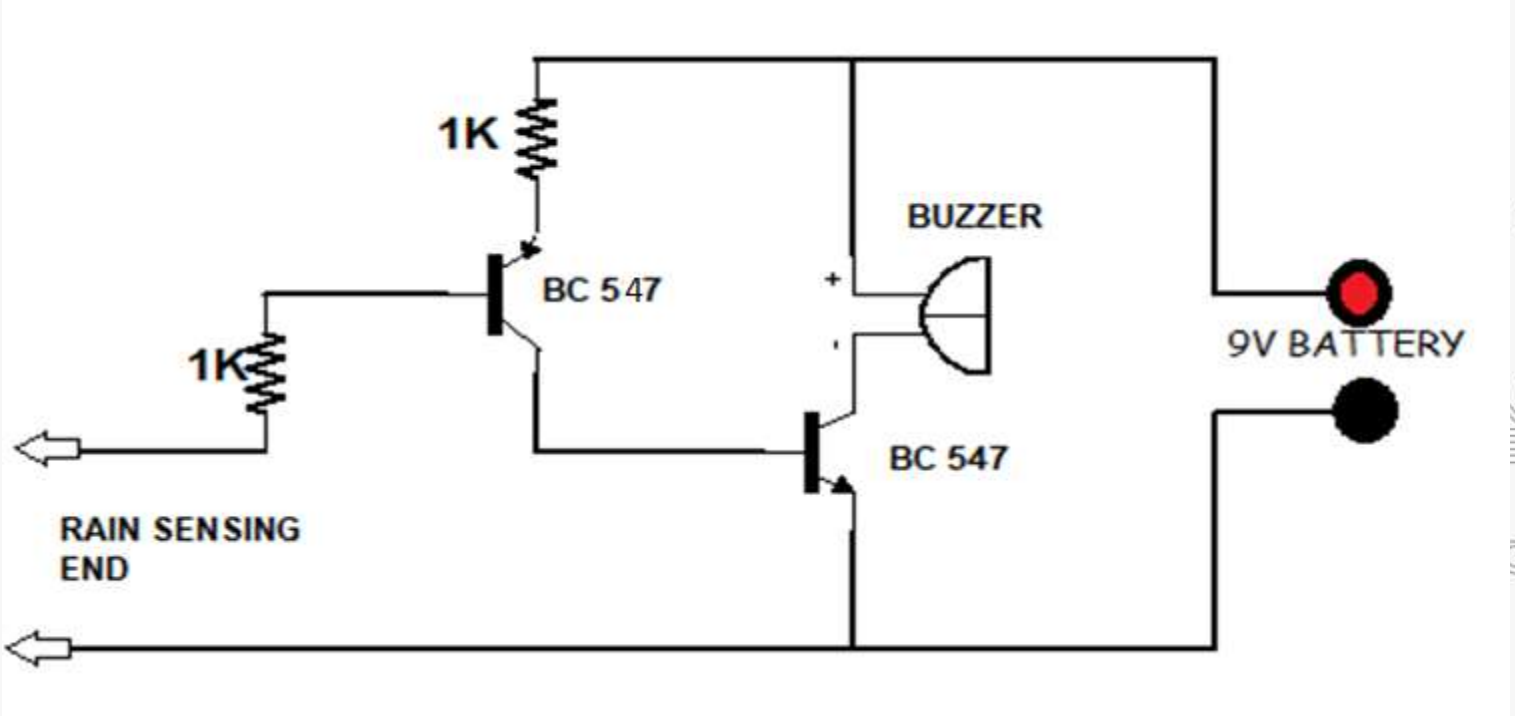
Connection Diagram



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Project Link : https://youtu.be/SesxYuAauwE

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Water Level Indicator

Water level indicator using bc548 transistor

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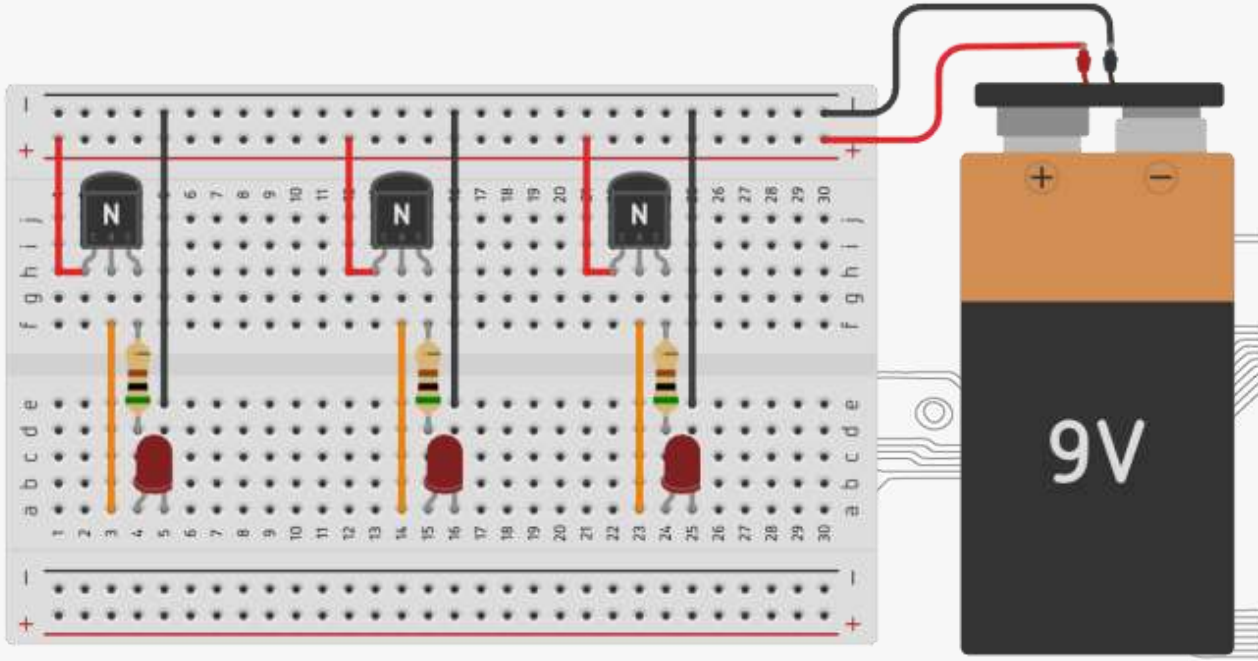
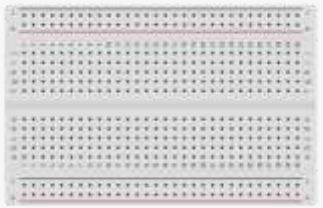
Introduction

Water Level Indicator



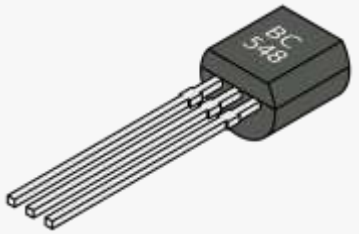
Required Components

- Breadboard
- LED
- BC548/547 Transistor
- Resistor
- Snap Connector
- Jumper Wires
- Battery 9v



Breadboard

LED



BC548/547 Transistor

Resistor

Snap Connector

Jumper Wires

Battery 9v

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Procedure

Connection Steps

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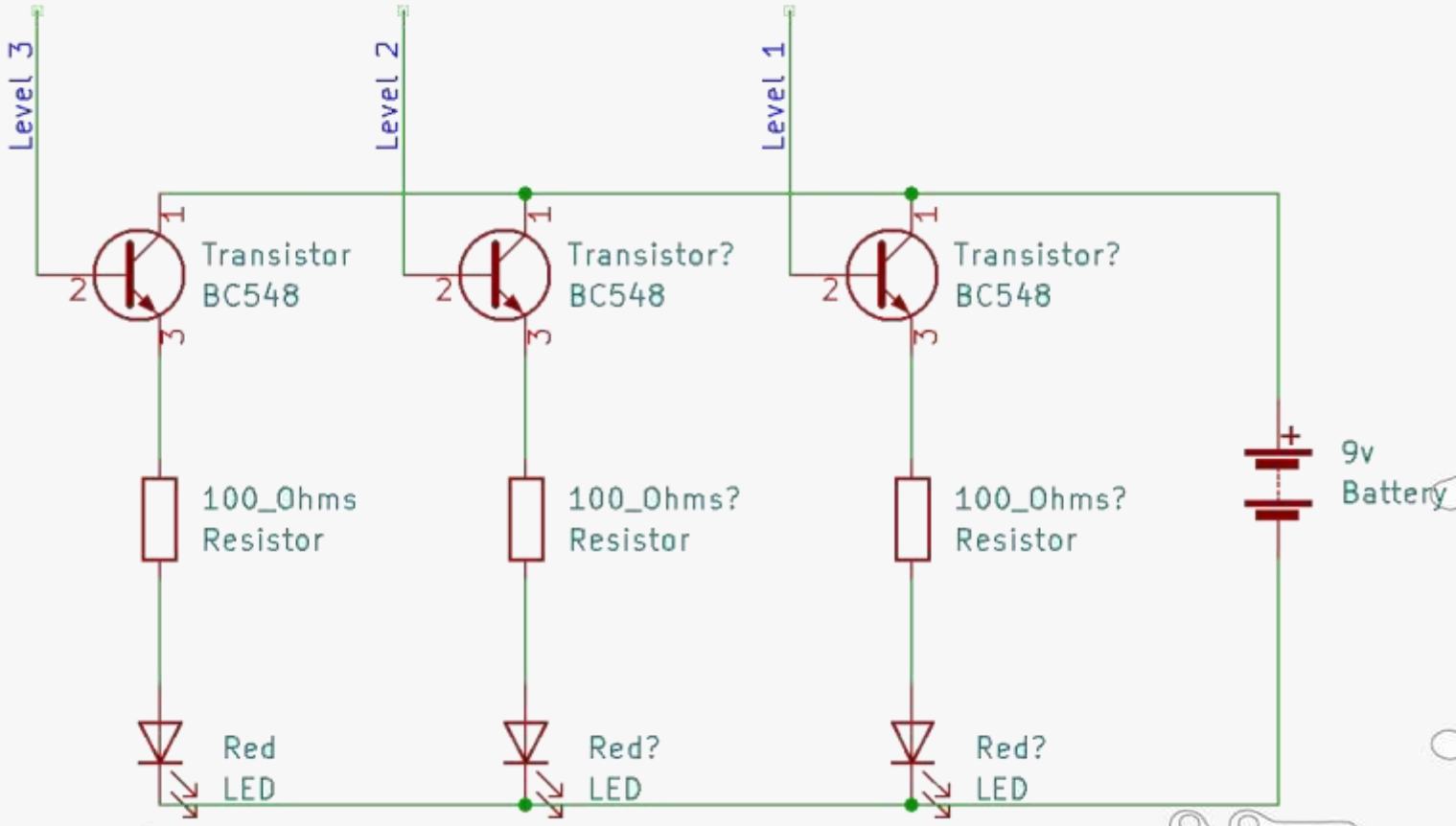
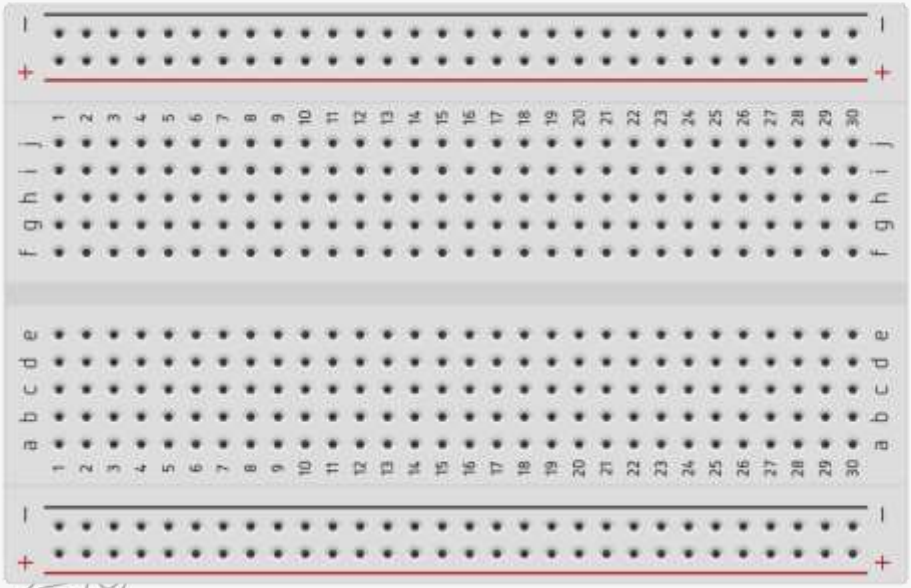
Circuit diagram



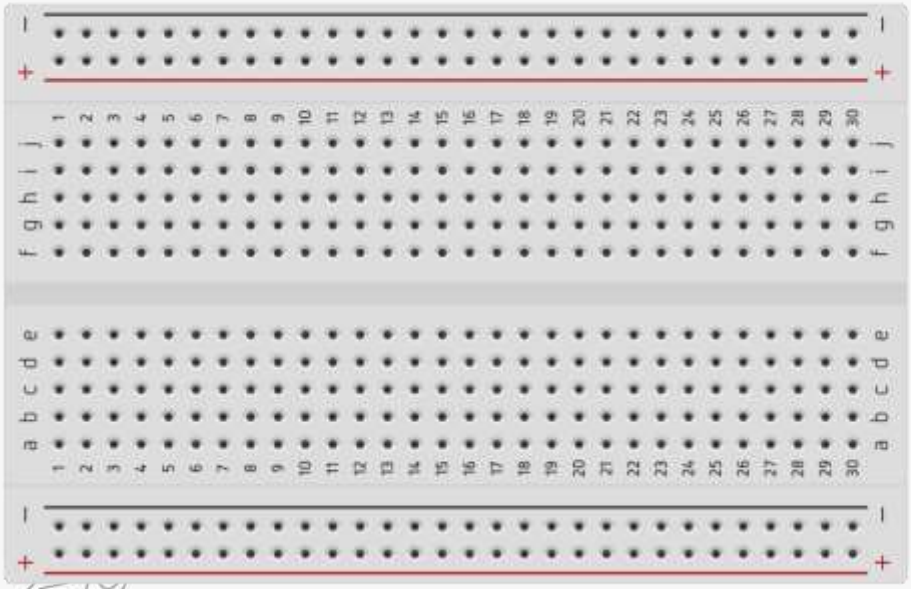
Connection Step 1

- Place breadboard



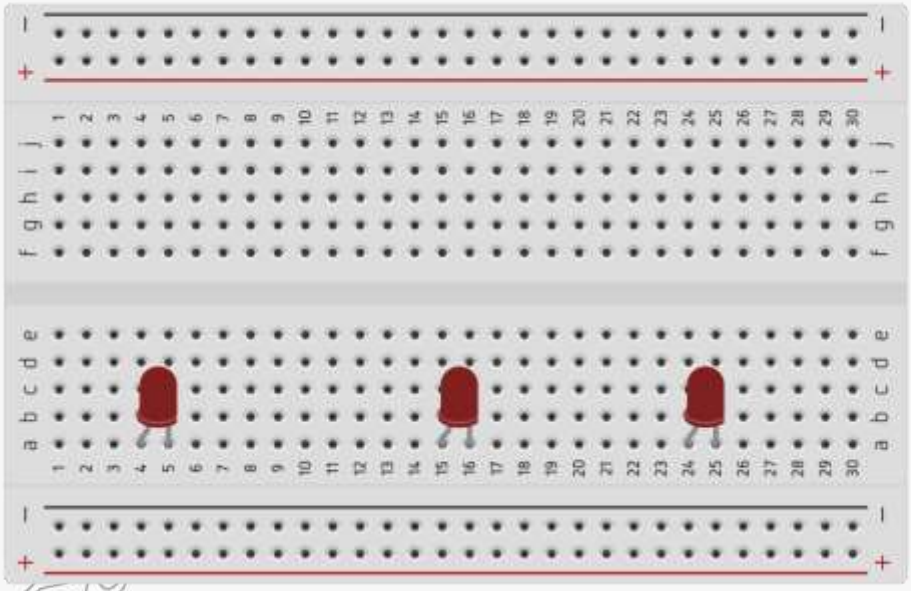
Connection Step 2

- Connect snap connector to the battery and keep it aside.



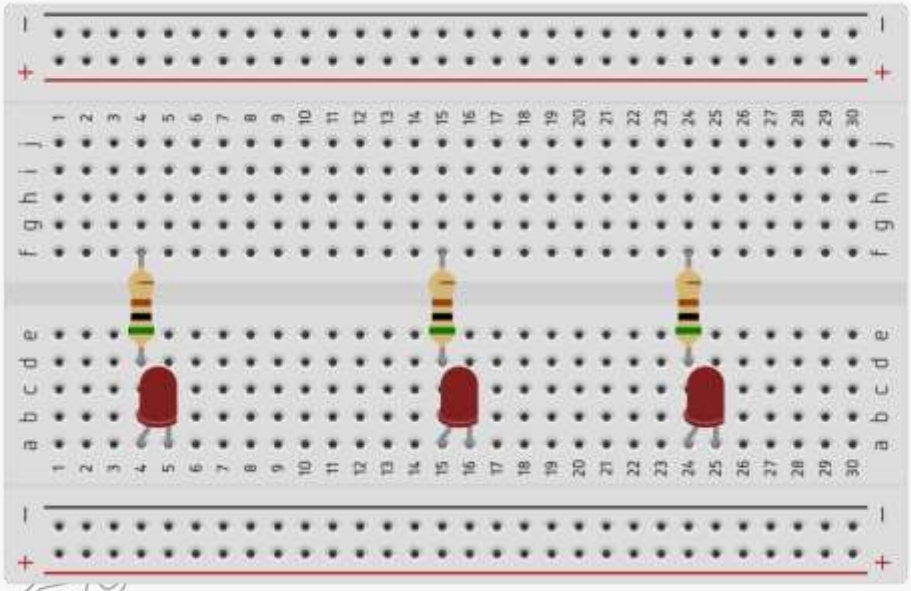
Connection Step 3

- Insert 3 LED in breadboard as shown in the diagram.



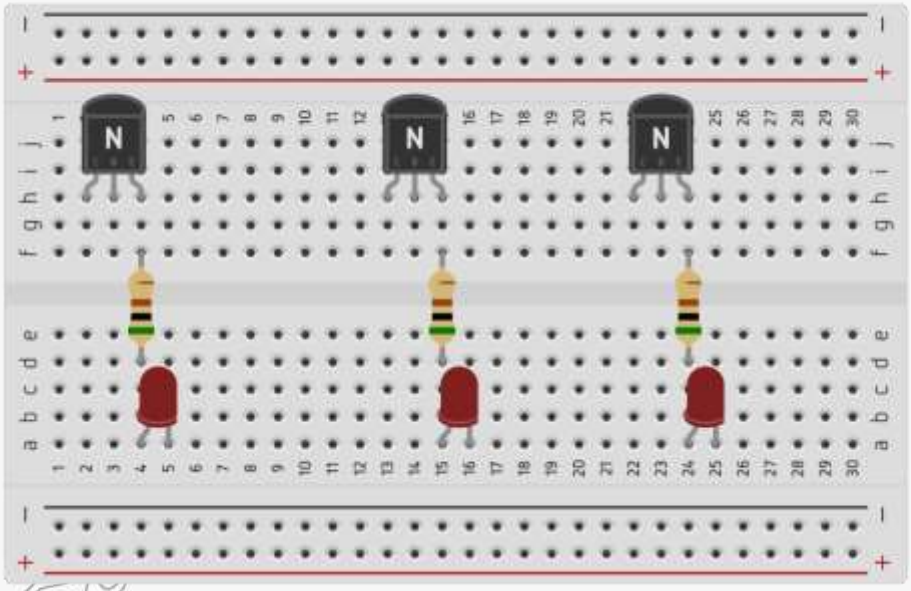
Connection Step 4

- Insert 3 resistor at anode(+) terminal of each LED as shown in the diagram.



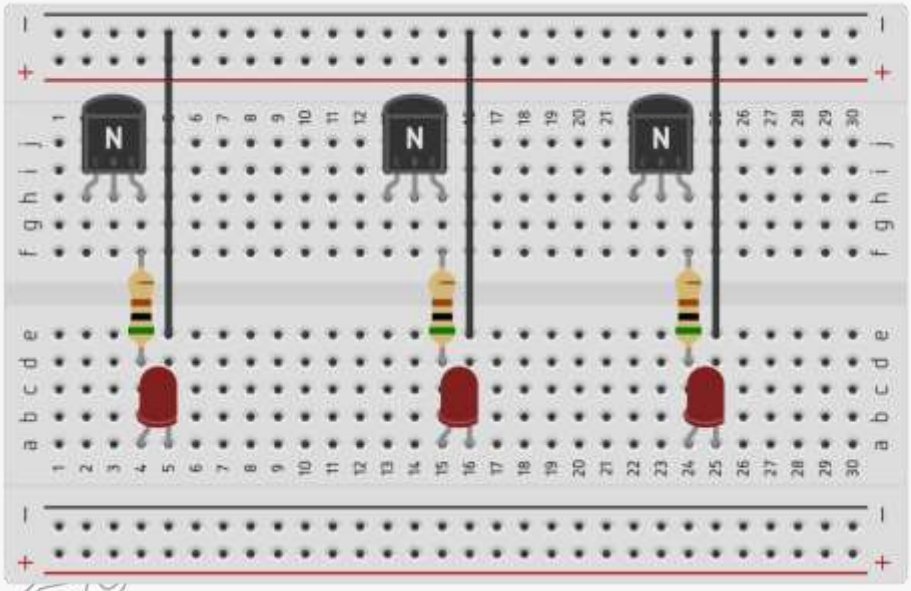
Connection Step 5

- Insert 3 BC548 transistor in breadboard and connect emitter pin to the each resistor as shown in the diagram.



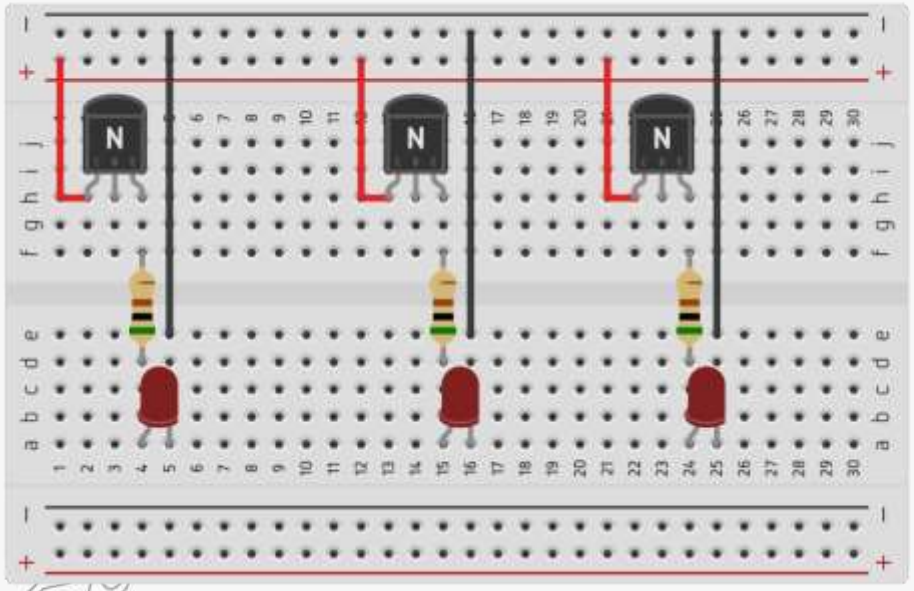
Connection Step 6

- Connect cathode(-) terminal of each LED to the (-) power rail of breadboard.



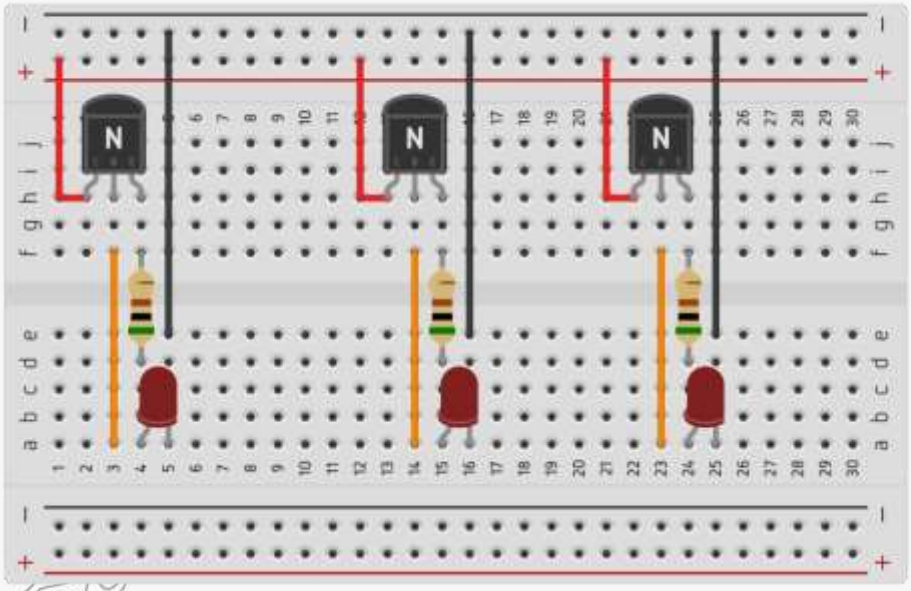
Connection Step 7

- Connect collector terminal of each transistor to the positive(+) power rail of breadboard.



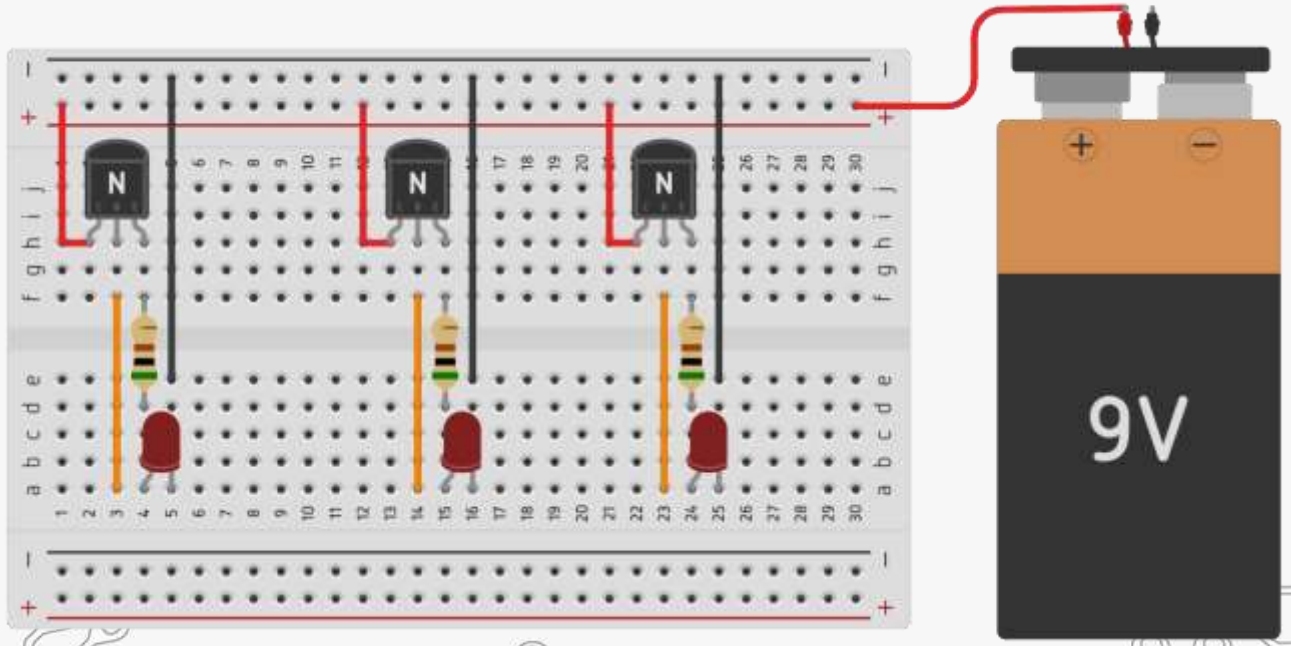
Connection Step 8

- Connect wires for level detection at base terminal of each transistor.



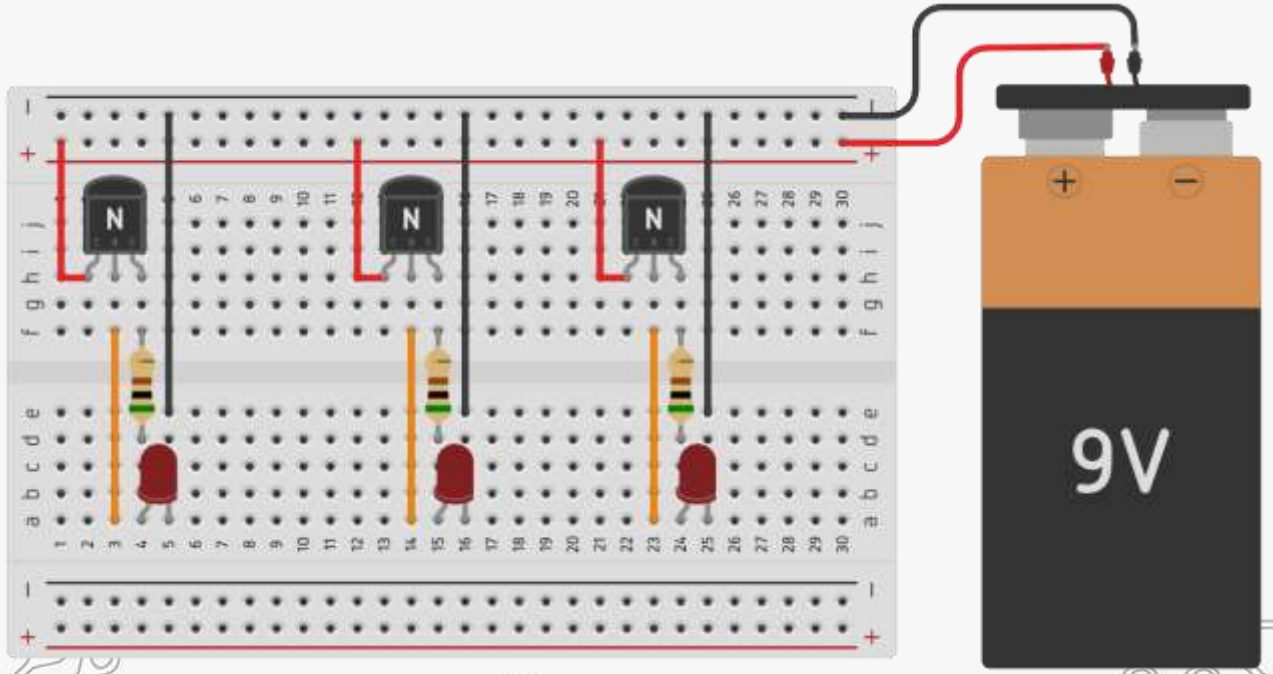
Connection Step 9

- Connect anode (+) terminal of battery to positive (+) power rail of breadboard.



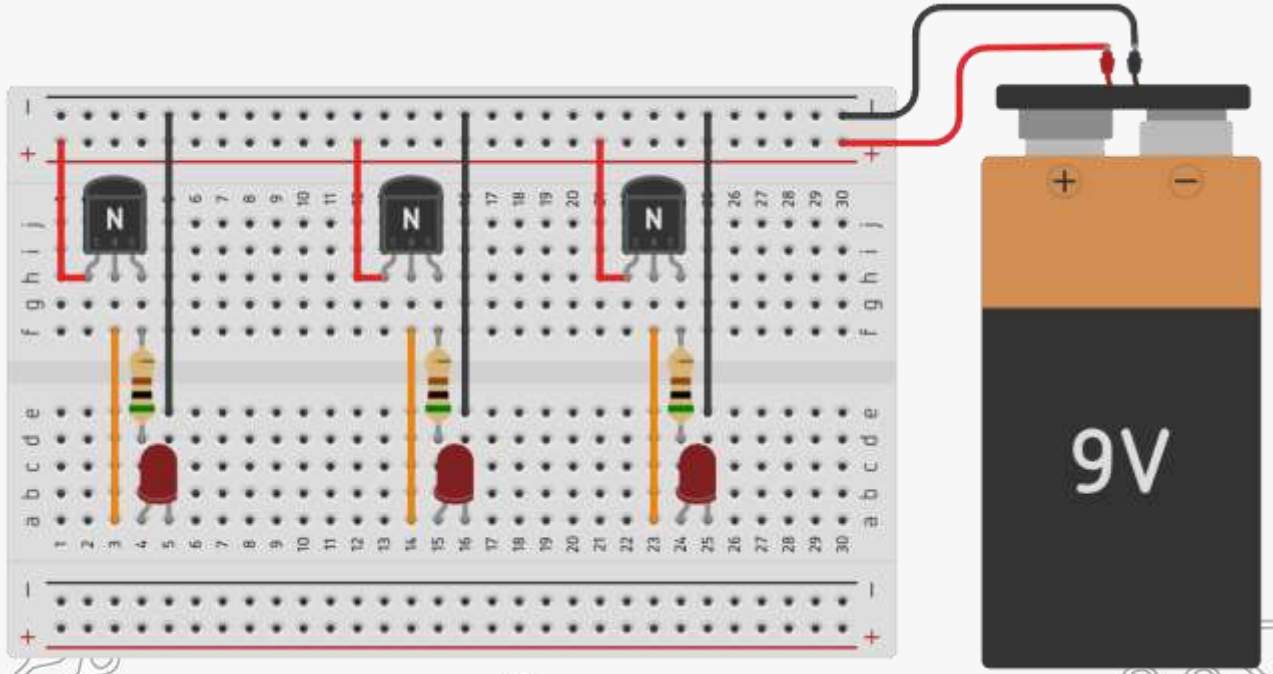
Connection Step 10

- Connect cathode (-) terminal of battery to negative (-) power rail of breadboard.



Connection Diagram

- Make sure your connections are made as per the diagram.



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Data & Outcomes

Learning from the activity

Data

- How many transistors used?
- 3

Learning from the activity

- Using multiple BC548 transistor for water level detection.

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Assessment

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Thank you