THE MINOR PROJECTS

TRP ELECTRONICS OFFICIAL

TOPIC :- Wireless & Remote Control Circuit for ON/OFF Electronics & Electrical Appliances

This Circuit is design and implement for a wireless remote-controlled circuit to switch appliances ON/OFF using IR Remote without any microcontroller. This circuit uses IR technology with NE555 Timer, CD4017 Decade Counter, TSOP1738 IR Receiver, and Relay.

INTRODUCTION: -

This project demonstrates a basic wireless switch using infrared technology. It eliminates the need for complex microcontroller programming and uses simple ICs to achieve toggle operation for home appliances.

ADVANTAGES:-

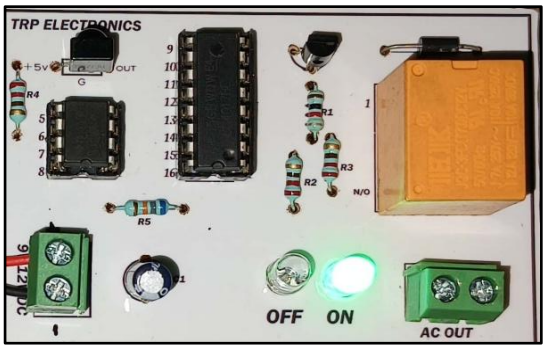
-No Programming Required –Microcontroller Free Design.

-Low cost & Easy To build.

-Works with any IR Remote.

-Can Control any AC or DC appliances (depending on relay rating).

- **PCB VIEW OF CIRCUIT**



APPLICATIONS:-

- *Remote-controlled lights and fan*
- *Smart DIY home automation*
- *Toy or model control systems*
- *Remote learning kits for electronics students*

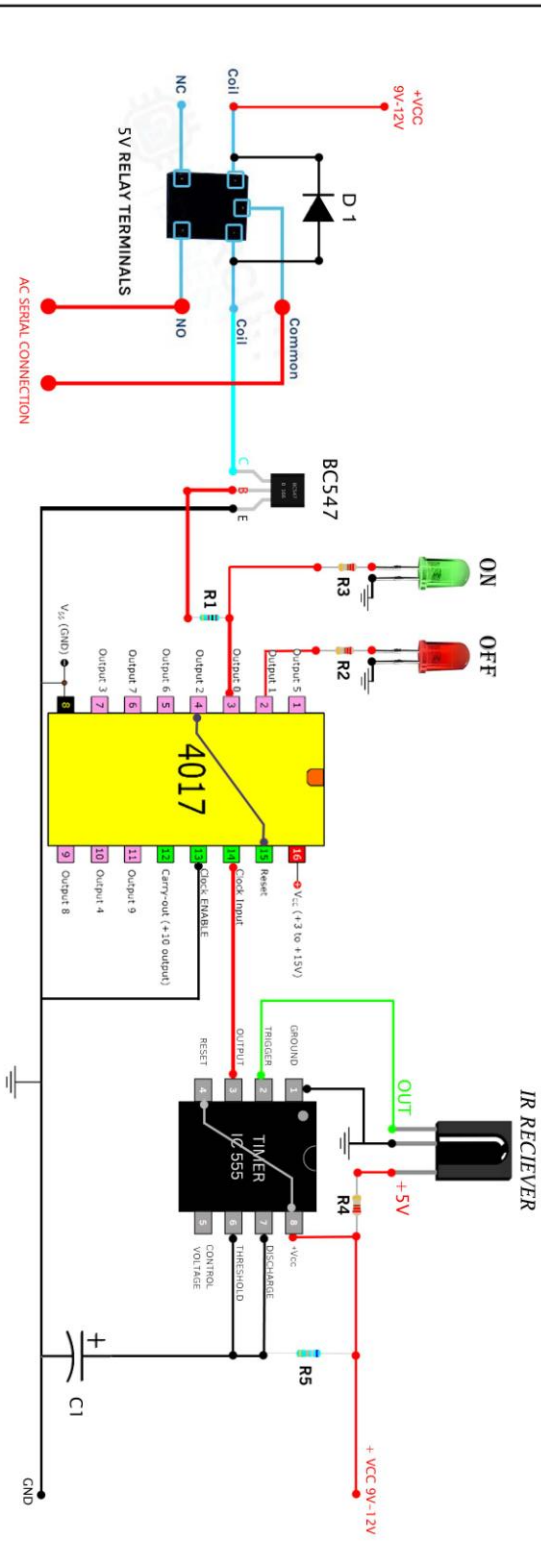
Circuit Description:-

- *IR Sensor detects signals from any remote control.*
- *NE555 generates a pulse from the IR signal.*
- *CD4017 toggles the output for each received pulse.*
- *A transistor switches the relay to turn the load ON or OFF.*

Working Principle:-

Every time you press the remote, the TSOP1738 sends a signal to the NE555 timer. The timer generates a short pulse, which is fed into the CD4017 IC. CD4017 changes its output state with every pulse. This output activates or deactivates the relay through a transistor.

{ WIRELESS & REMOTE CONTROL CIRCUIT FOR ON/OFF ELECTRONICS & ELECTRICAL APPLIANCES }



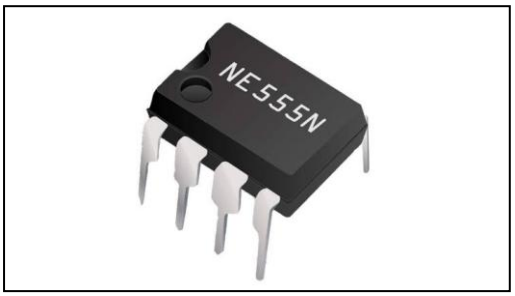
DETAILS ABOUT ABOVE CIRCUIT :-

- *(IC CD4017)*
- *(NE 555)*
- *(IR RECIEVER)*
- *(BC 547)*
- *(RELAY 5V)*
- *(IN4007 DIODE - D1)*
- *(IK RESISTOR - R1)*
- *(220 OHM - R2,R3,R4)*
- *(68K RESISTOR - R5)*
- *(10UF / 25V CAPACITOR - C1)*
- *(GREEN,RED LED)*

✓Components Used (with Ratings):

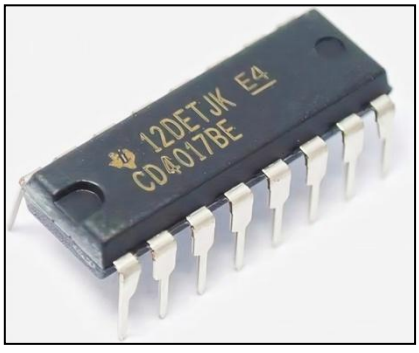
1. NE555 Timer IC - Monostable pulse generation, 4.5V to 15V.

Working - The 555 timer IC is a versatile integrated circuit used for various timing, pulse generation, and oscillator applications. It works by internally comparing a voltage on the trigger pin (2) with a specific portion of the supply voltage (1/3 Vcc) and another on the threshold pin (6) with another portion (2/3 Vcc). External components, like resistors and capacitors, are used to control the timing of its operations.



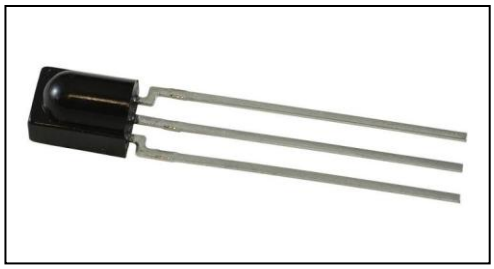
2. CD4017 Decade Counter - CMOS logic, 3V to 15V.

Working - The CD4017 IC is a versatile decade counter that operates as a Johnson counter, providing 10 decoded outputs. It's known for its ability to count pulses of variable duration and can be used in various applications like sequencing LEDs and frequency division.



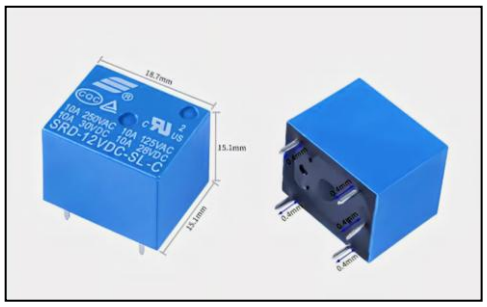
3. TSOP1738 - IR sensor, 38kHz frequency, 2.7V to 5.5V.

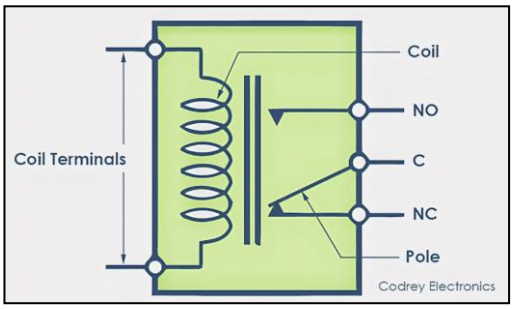
Working - The TSOP1738 is a universal infrared receiver designed to work with most infrared remotes, particularly those using a 38 kHz carrier frequency. It's commonly used in applications like remote testers, proximity sensors, and as part of remote control systems.



4. Relay Module - 5V SPDT, 10A/250VAC or 10A/30VDC.

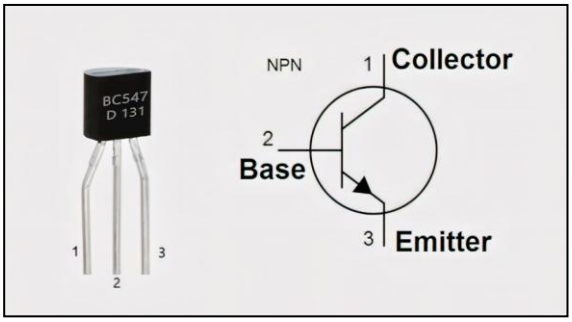
Working - A 5V relay is an electronically operated switch that uses a 5V signal to control a higher voltage or current load. It works by using an electromagnetic coil that, when energized by the 5V signal, creates a magnetic field that pulls a mechanical switch, either closing or opening a circuit. This allows a low-power control signal (like from a microcontroller) to switch a higher-power load, isolating the control circuit from the load circuit.





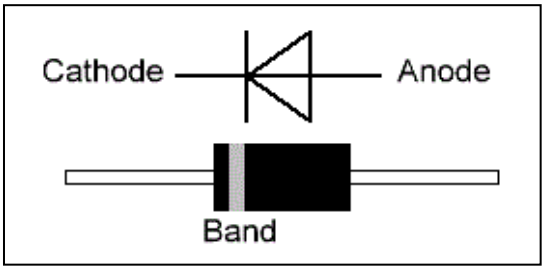
5. Transistor (BC547) - NPN, 100mA collector current.

Working - The BC547 transistor, a bipolar junction transistor (BJT), works on the principle of current amplification. It amplifies a small input current at the base, allowing a larger current to flow between the collector and emitter. It can also be used as an electronic switch, switching between on and off states.



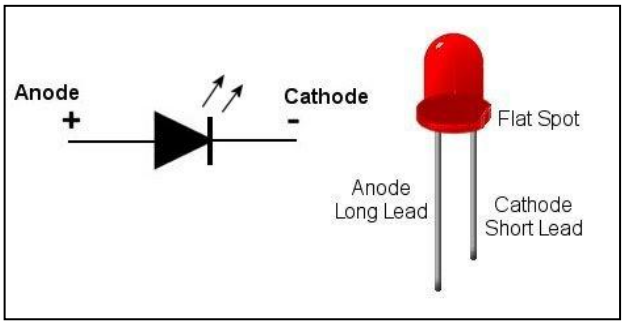
6. Diode (1N4007) - Reverse voltage: 1000V, current: 1A.

Working - The 1N4007 diode acts as a one-way valve, allowing current to flow in only one direction, a process called rectification. It's a common rectifier diode used to convert alternating current (AC) to direct current (DC). It can handle up to 1A of current and withstand a peak reverse voltage of 1000V. In this Circuit we are using this Diode as a Reverse Polarity Protection of Relay.



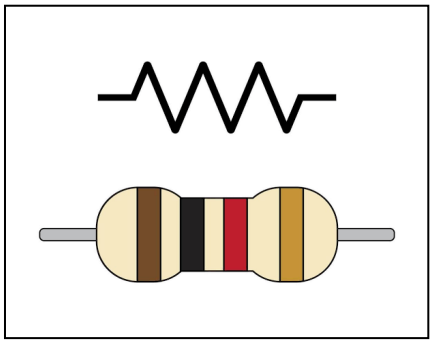
7. LED - 5mm, 20mA, 2V typical.

Working - LED allow the current to flow in the forward direction and blocks the current in the reverse direction. Light-emitting diodes are heavily doped p-n junctions. Based on the semiconductor material used and the amount of doping, an LED will emit coloured light at a particular spectral wavelength when forward biased.



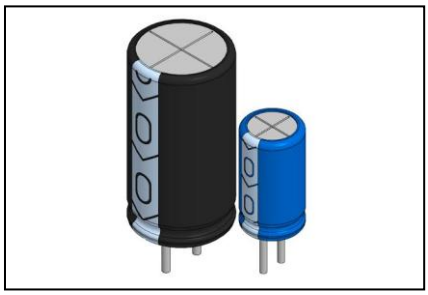
8. Resistors - 1k, 68k, 220 Ohm (1/4W).

Working - A resistor limits the flow of current in a circuit, converting electrical energy into heat. It achieves this by offering resistance, which is measured in ohms (Ω). This resistance hinders the movement of electrons, slowing down the current and dissipating the energy as heat.



9. Capacitors - 10uF (Electrolytic), 100nF (Ceramic).

Working - A capacitor stores electrical energy by accumulating charges on its plates when a voltage is applied, forming an electric field. It charges when connected to a voltage source and discharges through a load when the source is removed. In a DC circuit, a capacitor initially allows current flow but eventually blocks it, while in an AC circuit, it continuously charges and discharges.



10.Power Supply - 5V,9V,12V DC (Battery or Adapter).

Working – Power supply is most important device for Electronics devices & circuits. That's transforms electricity from a source, like an electrical outlet, into a suitable voltage and current for powering electronic devices. It's essentially a converter, ensuring the device receives the right type and amount of electricity to operate safely and efficiently.

NOTE:- This circuit will be needed a Pure & Stable DC voltage because we are using in this circuit IR SENSOR , IC555 , CD4017 Semiconductor Components . This is a very Sensitive Components . We are Highly Recommended Stable Voltage Adapter & Battery.

CIRCUIT CONNECTIONS :-

TSOP1738 IR Sensor –

- PIN 1 (OUT) is Connected to The Input of NE555 With Pin 2 (TriggerSignal).
- PIN 2 (GND) is Connected Ground.
- PIN 3 (VCC +5) is Connected with +5V throw a 220 OHM Resistor.

NE555 Timer –

- PIN 1 – GND
- PIN 2 – Trigger from IR Sensor OUTPUT
- PIN 3 – OUTPUT – Connected to CD4017 IC (PIN 14)
- PIN 4 – Direct +5V
- PIN 6 (Threshold) & PIN 7 (Discharge) – Connected With Each together.
- 10uf Capacitor + is Connect With PIN 6&7 And Capacitor – is GND.
- 68K Resistor Connect With PIN 6&7 And +5V.
- PIN 8 – Direct +5V.

CD 4017 (Decade Counter) –

- PIN 16 - VCC +5V.
- PIN 8 & PIN 13 – GND.
- PIN 14 – Clock INPUT from IC555 PIN 3 OUTPUT.
- PIN 15 (RESET) – Connected With Q2 (PIN 4).
- PIN 2 – Connected With Red LED + Throw a 220 OHM Resistor.
- PIN 3 – Connected to the Base of Transistor BC547 Throw a 1k Resistor.
- PIN 3 – Connected With Green LED + Throw a 220 OHM Resistor.

BC547 TRANSISTOR –

- Base – Connected to CD4017 PIN 3 With 1K Resistor.
- Emitter – Connected to GND.
- Collector – Connected to Relay PIN 2

5V RELAY –

- PIN 1 – Connected to VCC +5V
- PIN 2 – Connected to transistor Collector Pin.
- Diode 1N4007 + Connected to PIN 2 & - Connected to PIN 1

WORKING OF COMPONENTS :-

- **NE555 Timer IC**:

- Works in monostable mode to produce a one-shot pulse.

- Triggered by the falling edge from the IR sensor.

- Output stays HIGH for a duration based on R and C.

- **CD4017 Decade Counter:**

- Advances one output HIGH on each clock pulse.

- Used here to toggle between ON and OFF states.

- Resets automatically after 10 steps.

- **TSOP1738 IR Receiver:**

- Detects 38kHz IR signals from standard remotes.

- Filters noise and sends clean digital output.

- **Relay:**

- Electromagnetic switch to control high-power load.

- Gets activated by transistor when CD4017 output is HIGH.

- Can switch AC or DC devices like lights, motors.

- **Transistor (BC547):**

- Acts as a switch for the relay.

- Amplifies current from CD4017 output to drive relay coil.

- **Diode (1N4007):**

- Protects the transistor from reverse voltage when relay turns OFF.

- Essential for relay safety and stability.

❖ Conclusion:

This wireless IR-based ON/OFF switching system is efficient and easy to build without programming. It provides a foundation for home automation projects and teaches the use of basic ICs in real-world electronics. This system is economical, reliable, and expandable.

Recommended Improvements:

- Add more outputs using multiple CD4017s.

- Add IR decoding for multiple device control.

- Upgrade to RF module for long-distance control.