

Design & Implement Infrared (IR) Controlled Home Appliances

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Abstract- Traditionally we saw that the electrical appliances in a home are controlled via switches that can operate the electronic devices. As the world gets advanced more and more technology has been introduced, we find new technology even at home. Home automation is becoming more popular around the globe. The process of home automation means that making everything in the house automatically or remotely controlled. Home automation leads us to drive the many AC application remotely.

The main objective of this project is that we can control any home appliances by using a simple circuit. This circuit consist of an IR module, IC4017, diode, relay and other components.

Key Words: TSOP1738, Voltage regulator 7805, 1N4007, IC CD 4017, Relay

1. INTRODUCTION

The main objective to design this system is to develop a cost effective solution that will control the home appliances remotely and enable home security in the absence of homeowner. The home appliances control system with an affordable cost was thought to be built that should be providing remote access to the appliances and allowing home security. Though devices connected at home and offices, consume electrical power. These devices should be controlled as well as turned ON/OFF if required. Most of the times it was done manually. Now it is a necessity to control devices more effectively and efficiently at anytime from anywhere within a defined range.

The circuit can be activated from up to some meters. It is very easy to build it and assembled it on a general-purpose PCB.

Many people have been using wireless technology via internet, GSM and Bluetooth protocol to control the home appliances, while others are using IR sensor to control, which detect the presence of people. But these all are not effective, if there is no internet or weak signal and if a person is still present in surroundings but no need of the appliances. Our proposed system is to reduce those kind of difficulty & short comes. It provides portability & stability to the system for general use. The old age people, disables and for the people who are unable to stand up or

face any difficulties, for them it is easy to use this kit to control home appliances.

2. METHODOLOGY

The main function of proposed system is to develop an electronic circuit which is used to control the home appliances with the help of remote in specified range with the help of a simple circuit which consist an IR module that receive a signal from a remote and then send the signal to the IC4017 that's used to show the status and control the operation. Output from the IC is transmitted to the transistor BC548 for amplify the strength of signal and then through a diode operate it on a relay which is connected to the AC home appliances.

This circuit consist of two parts:

- Transmitter
The product consist of a remote which is used for the transmission of IR radiation which is sense by TSOP.
- Receiver
It is the circuit which act on the response of transmitter, basically it's TSOP.

It is a capable little device that helps the people of all ages to explore the use of it. It is affordable to everyone, cheap and easy to install. We can save our time, energy to take actions on switch over the room appliances.

We use here basic transmission & reception protocol with the help of analog electric circuit.

3. SYSTEM REQUIREMENTS

The basic required analog components which are used in the circuit design are:

3.1 Transformer

In this analog circuit a step-down transformer is used to power up the circuit from AC supply, which consists of two winding's primary and secondary is used for converting the 220V to 9V ac because this system is directly connected to the power supply.

3.2 Voltage Regulator

The voltage regulator 7805 is used for providing the fix 5volts, DC to the circuit. In the absence of voltage regulator, the higher voltage may be damage the circuit. It is used to ensure that no more than 5V is delivered to the circuit & excess voltage is converted to heat dissipated through the regulator [1].

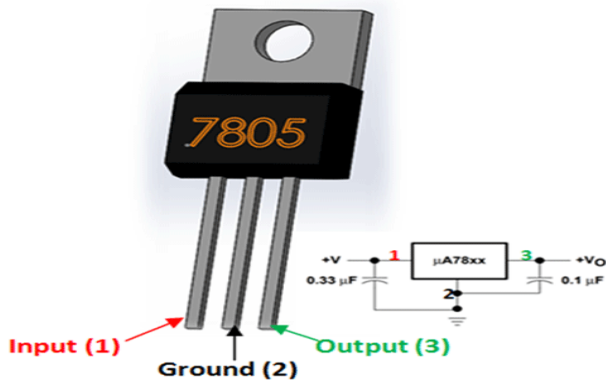


Fig-1: 7805 voltage regulator

3.3 IR Module (TSOP1738):

The TSOP 1738 modules are active low miniaturized receivers for infrared remote control system which are assembled on lead frame with TTL & CMOS compatibility. This sensor can be also used as a proximity sensor along with 38 KHz frequency [2].



Fig-2: TSOP1738

3.4 Diode 1N4007:

1N4007 is PN junction rectifier diode which rectifies the AC signal from the transformer, freewheeling diode etc. These type of diode allow the flow of electricity in one direction so it can be used for the conversion of AC to DC [3].

As per the naming convention 1N4007, 1N indicates single junction semiconductor whereas 4007 is the specific number to indicate the particular diode.

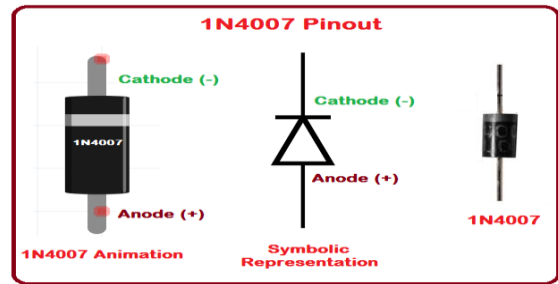


Fig-3: 1N4007

3.5 Relay

A relay is electrically operated switch. The appliance to be controlled is connected between the pole of the relay and neutral terminal of AC mains.

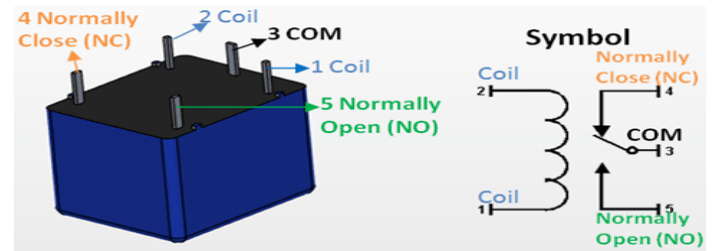


Fig-4: Relay

It has five terminals (1) Coil, (2) Coil, (3) Com, (4) Normally close, (5) Normally open. This relay is used to switch between two circuits. It can also use as an alternate operation on appliances. Whenever the current flows through the coil, it will create a magnetic field which in turn attracts the lever to change the switch contacts.

In short we can say that relay is like a switch which is used to control a circuit.

4. IC CD 4017 Decade Counter

The IC 4017 is a 16 pin decade counter. It is a CMOS decade counter cum decoder that can count our low range counting operations i.e. 0 to 10 and output are in decoded form. This IC is very useful and user friendly as it is low power consumption. This is also called a 10 stage Johnson decade counter. Mostly it is used for the save the space on board and also required time to design the circuit with the clock speed 5MHz [5].

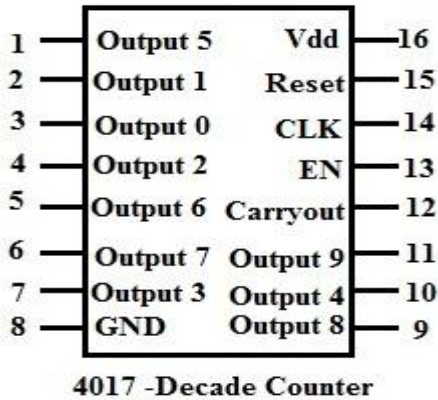


Fig-5: IC CD 4017

This IC has 16 I/O pins, output pins are Pins 1 to 7 & 9 to 11 and for each clock signal and each pin changes 'HIGH' one by one in sequence. Then Pin 13 is enable pin which enable the IC 4017 and this pin is active low means when it is connected with active high(Vdd), it ignore the clock signals. Pin 14 is clock pin which is responsible for sequential output. It can't be left unconnected as per the CMOS rules. Pin 15 is reset pin which is used to reset the output sequence to initial state. Pin 8 & 16 are ground & supply pins respectively. And in the last Pin 12 is carry out pin which is used to ripple the IC means delay the counting and it completes one cycle for every 10 clock cycles.

5. IMPLEMENTATION

To verify the existence of the circuit in real time, it is more important to implement it on the general purpose PCB board which is used to connect the electronic components using pathways and traces and soldered properly with more effort. As of now it is done with zero PCB and working model of circuit [6][7].

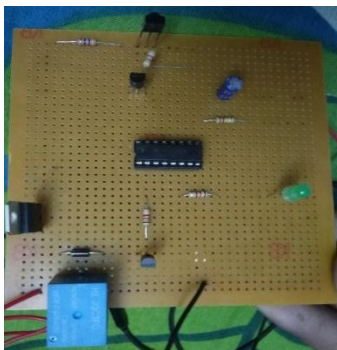


Fig-6: Zero PCB

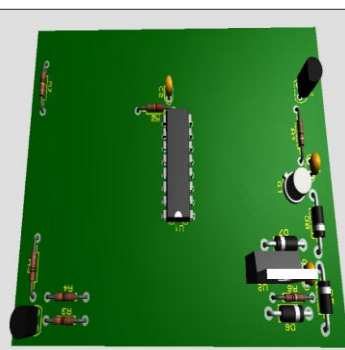


Fig-7: PCB Layout

6. Result

On the completion of the design & implementation of the circuit, observe that the transmitter and receiver circuit work properly in the range of approximately 9-10 meters with the operating frequency of 38 KHz and it is ready to use in physical existence [7].



Fig-7: Prototype Model

7. CONCLUSION

This simple circuit kit is used for simply ON-OFF functions of the AC operated home appliances. The IR remote sensor is enough to transmit the signal through TSOP. The power line devices which control by IR wave is a unique study to understand the flow and to implement in everyday life for every age group users. The most important advantage is that this circuit is free from any light interference and operates over specified control range without any special focusing lens.

REFERENCES

- [1.] Prashant Chakole, Dr. Pradip B. Dahikar, "RF Remote Control of Power Line Devices Using," International Journal of Engineering Science and Innovative Technology (IJESIT), 3, May 2013.
- [2.] Mohammad Shah, Alamgir And Sumit Dev, Design and Implementation of an Automatic Voltage Regulator with a Great Precision and Proper Hysteresis, International Journal of Advanced Science and Technology, Vol.7.5, 2015
- [3.] Prashant Chakole and Dr. Pradip B. Dahikar "RF Remote Control of Power Line Devices Using Embedded System" proceeding of International Journal of Engineering Science and Innovative Technology (IJESIT) Volume 2, Issue 3, May 2013
- [4.] Mardiana B., Hazura H., Fauziyah S., Zahariah M., Hanim A.R., Noor Shahida M.K., "Homes Appliances Controlled Using Speech Recognition in Wireless Network Environment," ICCTD, vol. 2, pp.285- 288, 2009

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