

**AFFILIATED TO GUJARAT TECHNOLOGY UNIVERSITY**





# A PROJECT REPORT

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## *Certificate*

*This is to certify that*

*Kale Darshan A. from SSASIT College having Enrolment No: 1110760109030 has completed Report on the workshop project having title Clap Switch in a group consisting of 4 persons under the guidance of the Faculty Guide MR KEYUR S DENPIYA*

*The mentor from the industry for the project:*

*Name:*

*Industry:*

*Contact Details:*

*Head of Department*

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## **ACKNOWLEDGEMENT**

The satisfaction and euphoria that accompany the successful completion of any task would be incomplete without the mentioning of the people whose constant guidance and encouragement made it possible. We take pleasure in presenting before you, our project, which is result of studied blend of both research and knowledge.

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## **INDEXS**

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<b>Topic</b>	<b>Page No</b>
<b>I. Introductions</b>	<b>07</b>
<b>II. How It Works</b>	<b>08</b>
<b>III. Circuit Diagram</b>	<b>09</b>
<b>IV. Technical Specifications-Characteristics</b>	<b>09</b>
<b>V. Component List And Price</b>	<b>10</b>
<b>VI. Construction</b>	<b>11</b>
<b>VII. Component Description</b>	<b>12</b>
<b>VIII. Advantage</b>	<b>20</b>
<b>IX. Disadvantages</b>	<b>20</b>
<b>X. Application</b>	<b>21</b>
<b>XI. Future scope</b>	<b>21</b>
<b>XII. Attachment</b>	<b>22</b>
<b>XIII. Reference</b>	<b>22</b>



## INTRODUCTION:

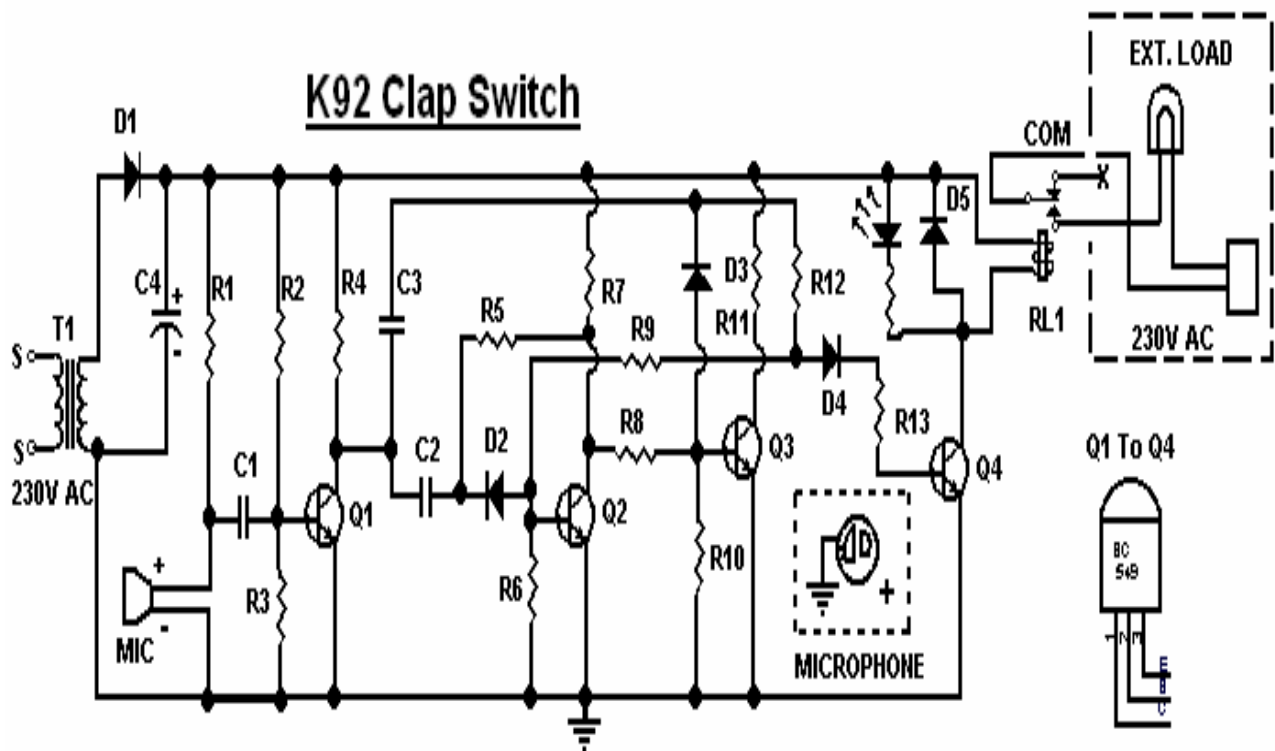
This is a circuit that can be used to turn a device on and off by sound only, hand clapping, whistling etc. Can be used to turn the light on and off, in When triggered the circuit will stay in the on or off condition till it is triggered again. **CLAP SWITCH** is a switch which can switch on/off any electrical circuit by the sound of the clap. The basic idea of clap switch is that the electric microphone picks up the sound of your claps, coughs, and the sound of that book knocked off the table. It produces a small electrical signal which is amplified by the succeeding transistor stage. Two transistors cross connected as a bi-stable multi-vibrator change state at each signal. One of these transistors drives a heavier transistor which controls a lamp. This circuit is constructed using basic electronic components like resistors, transistors, relay, transformer, capacitors. This circuit turns „ON“ light for the first clap. The light turns ON till the next clap. For the next clap the light turns OFF. This circuit works with 12V voltage .Therefore a step-down transformer 12V/300mA is employed . The primary application involves an elderly or mobility-impaired person . It is generally used for a light, television, radio, or similar electronic device that the person will want to turn on/off from bed. The major disadvantage is that, it is generally cumbersome to have to clap one's hands to turn something ON or OFF. and it's generally seen as simpler for most use cases to use a traditional light switch.

### **How It Works:**

The circuit contains two stages first of which is a preamplifier using transistor Q1 for greater amplification of the microphone signals. The second circuit contains 2 transistor Q2 & Q3 connected as a Flip-Flop. The flip-flop is triggered by the preamplifier's output and it trigger in turn the output transistor Q4 which controls the relay. As you can easily see with each change of state of the Flip-Flop the output transistor will also be forces to change state being either on or off and this consequently turns the relay on or off. The relay is of the changeover type and its contacts are rated for 220V/3A/6A as purchased. The microphone used in this project is of the condenser type for greater sensitivity. The supply voltage required for the correct operator of the clap switch is 12 VDC and is provided by the transformer supplied in the kit.



## Circuit Diagram:



### Technical Specifications-Characteristics:

Working Voltage: 230V AC

Current : 60mA

Contact Rating : 3A/6A as per the kit selected

### Component List And Price:

Component	Specification	Comment	Price (Rs)
R1	15K $\Omega$	Brown,Green,Orange	1
R2,R5,R12	2M2 $\Omega$	Red,Red,Green	3
R3	270K $\Omega$	Red,Violet,Yellow	1
R4	3K3 $\Omega$	Orange,Orange,Red	1
R6,R10	27K $\Omega$	Red,Violet,Orange	2
R7,R11	1K5 $\Omega$	Brown,Green,Red	2
R8,R9	10K $\Omega$	Brown,Black,Orange	2
R13	2k2 $\Omega$	Red,Red,Red	1
R14	1K $\Omega$	Brown,Black,Red	1
C1	10Kpf	0.01 $\mu$ F/103	2-3
C2,C3	47KPF	0.047 $\mu$ F/473	4
C4	1000 $\mu$ f/16V	Electrolytic Cap	2
Q1,Q2,Q3,Q4	BC549C	Transistor	10
D1	1N4007	Rectifier Diode	10
D2,D3,D4,D5	1N4148	Fast Switching Diode	10
MIC	CON.MIC	Condenser MIC	50
RLY	12V/1c/o	RELAY	25-40
Led	Red	3mm Led	5-10

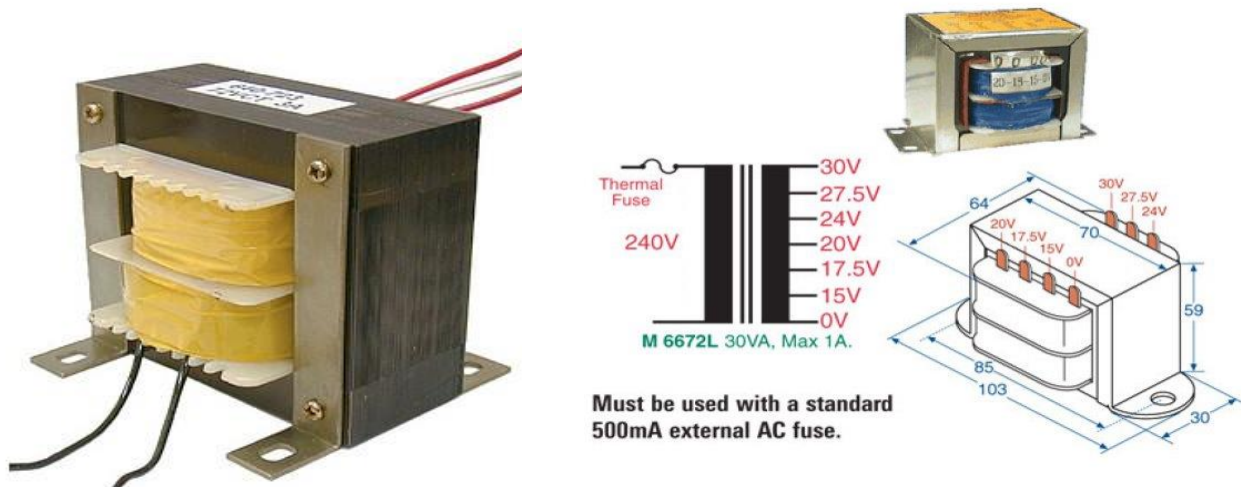
<b>X1</b>	<b>0- 12V/250mA</b>	<b>Transformer</b>	<b>25-30</b>
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### **Construction:**

First of all you should place on the board the resistor, the capacitor, the transistors & make sure that the electrolytic capacitor & diode are connected the right way round because they are polarized. Make a careful visual inspection for mistakes, shorts across adjacent tracks etc and if everything seems to be all right the transformer must be connected at point “12~0” and the relay contact are marked as “RLY”. Connect the power to the circuit and clap your hands in front of the microphone the relay should click.

## Component Description:

### TRANSFORMER:



This transformer is used in circuit to control the voltage and current. Also used for the convert the voltage from 230V to 12V.

These open-style transformers have a primary voltage of 230VAC/60Hz and can be used for small electronic projects and designs. With a center-tapped secondary they are ideal where the output needs to be rectified to DC.

## RESISTOR:



**Resistors** are electrical components that oppose the flow of either direct or alternating current. They are used to protect, operate, or control circuits. Resistors limit or reduce the current passed across them.

Most of the circuits are found in components that do specific work such as bulbs or heating elements and in devices is call resistor. In this circuit use on resistor to provide specific resistivity to limit and to control voltage in circuit.

The behavior of an ideal resistor is dictated by the relationship specified by Ohm's law which is states that the current (I) is proportional to the voltage (V) and inversely proportional to the resistance (R). This is directly used in practical computations.

### Resistor Color Code:

4-Band-Code

2%, 5%, 10%

560k  $\Omega$   $\pm$  5%

COLOR	1st BAND	2nd BAND	3rd BAND	MULTIPLIER	TOLERANCE
Black	0	0	0	1 $\Omega$	
Brown	1	1	1	10 $\Omega$	$\pm$ 1% (F)
Red	2	2	2	100 $\Omega$	$\pm$ 2% (G)
Orange	3	3	3	1K $\Omega$	
Yellow	4	4	4	10K $\Omega$	
Green	5	5	5	100K $\Omega$	$\pm$ 0.5% (D)
Blue	6	6	6	1M $\Omega$	$\pm$ 0.25% (C)
Violet	7	7	7	10M $\Omega$	$\pm$ 0.10% (B)
Grey	8	8	8		$\pm$ 0.05%
White	9	9	9		
Gold				0.1	$\pm$ 5% (J)
Silver				0.01	$\pm$ 10% (K)

0.1%, 0.25%, 0.5%, 1%

5-Band-Code

237 $\Omega$   $\pm$  1%

Electronix Express / RSR  
<http://www.elexp.com>

1-800-972-2225  
In NJ 732-381-8020

## CAPACITOR:



Capacitor is one of those fascinating devices which are horrible when they go wrong and absolute brilliance when they do their work. Let us go in detail and understand what are capacitors and their applications.

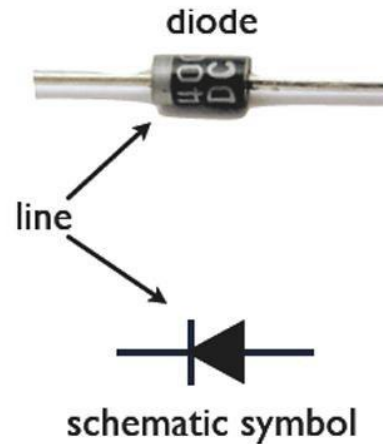
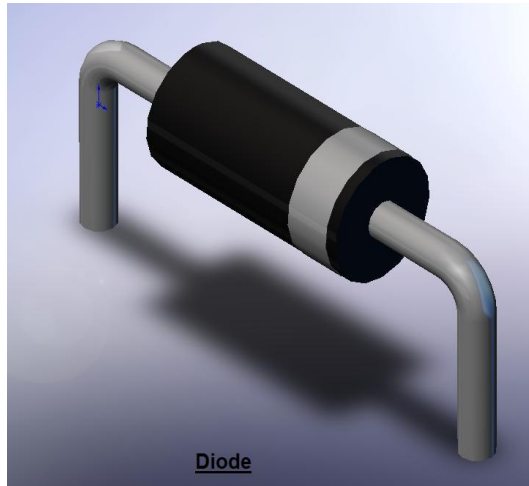
Capacitors are components which store electric charge or energy when voltage is applied across them.

A simplest form of capacitor contains two parallel conducting plates separated by an insulating material, which is usually ceramic, mica, tantalum, air, paper, or even vacuum. This insulating material is known as dielectric.

### Capacitor color code:

Colour	Digit A	Digit B	Multiplier D	Tolerance (T) > 10pf	Tolerance (T) < 10pf	Temperature Coefficient (TC)
Black	0	0	x1	± 20%	± 2.0pF	
Brown	1	1	x10	± 1%	± 0.1pF	-33x10 <sup>-6</sup>
Red	2	2	x100	± 2%	± 0.25pF	-75x10 <sup>-6</sup>
Orange	3	3	x1,000	± 3%		-150x10 <sup>-6</sup>
Yellow	4	4	x10,000	± 4%		-220x10 <sup>-6</sup>
Green	5	5	x100,000	± 5%	± 0.5pF	-330x10 <sup>-6</sup>
Blue	6	6	x1,000,000			-470x10 <sup>-6</sup>
Violet	7	7				-750x10 <sup>-6</sup>
Grey	8	8	x0.01	+80%, -20%		
White	9	9	x0.1	± 10%	± 1.0pF	
Gold			x0.1	± 5%		
Silver			x0.01	± 10%		

## DIODE:



A diode is a type of two-terminal electronic component with a nonlinear current–voltage characteristic. The most common function of a diode is to allow an electric current to pass in one direction, while blocking current in the opposite direction.

Diode is used to convert alternating current to direct current, and to extract modulation from radio signals in radio receivers.

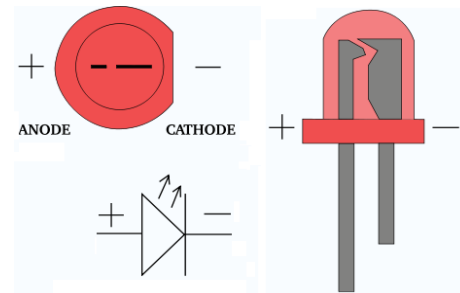
Semiconductor diode is made of a crystal of semiconductor like silicon that has impurities added to it to create a region on one side that contains negative charge carriers (electrons), called n-type semiconductor, and a region on the other side that contains positive charge carriers (holes), called p-type semiconductor.

### Types of Diode:

1. P-N Diode
2. Light Emitting Diode
3. Photodiode
4. Tunnel diode
5. Zener Diode



## LED:





### Function

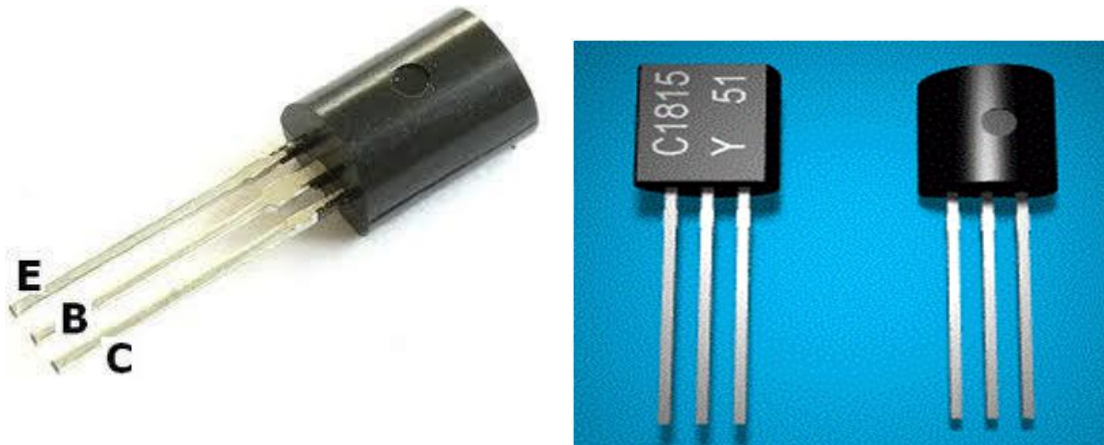
Led's emit light when an electric current passes through them.

The main use of LED (light emitting diode) is that when cut the power supply anywhere the red color led indicates the alert light.

Never connect an LED directly to a battery or power supply, It will be destroyed almost instantly because too much current will pass through and burn it out.

	Color	Wavelength range (nm)	Typical efficacy (lm/W)
	<a href="#">Red</a>	$620 < \lambda < 645$	72
	<a href="#">Red-orange</a>	$610 < \lambda < 620$	98
	<a href="#">Green</a>	$520 < \lambda < 550$	93
	<a href="#">Cyan</a>	$490 < \lambda < 520$	75
	<a href="#">Blue</a>	$460 < \lambda < 490$	37

## TRANSISTOR:



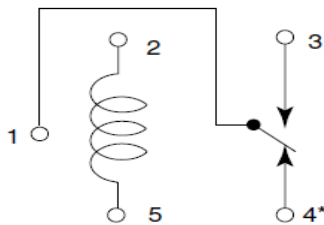
A transistor is comprised of three parts a base, a collector and an emitter. The base is used as a controller for the electrical supply.

A transistor is a semiconductor device used to amplify and switch electronics signals and power. It is composed of a semiconductor material with at least three terminals for connection to an external circuit.

A transistor can amplify Silicon transistors when amplifying near the saturation point typically fail and create distortion. It is used in general purpose, audio, high voltage, super- beta, matched pair ect.

## RELAY:

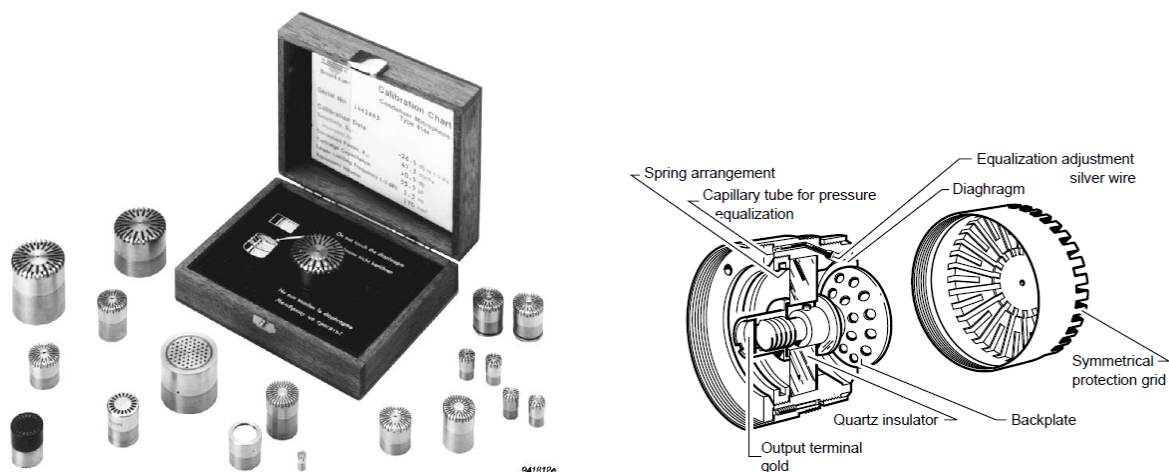
WIRING DIAGRAM



A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. Relays are used where it is necessary to control a circuit by a low-power signal, or where several circuits must be controlled by one signal. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays".

## MICROPHONE:



Sound energy received by microphone is converted to electrical signals. Microphones are types of transducers, they convert acoustic energy i.e. sound signal. Basically, a microphone is made up of a diaphragm, which is a thin piece of material that vibrates when it is struck by sound wave. This causes other components in the microphone to vibrate leading to variations in some electrical quantities thereby causing electrical current to be generated.

The current generated in the microphone is the electrical pulse. The current generated by a microphone is very small and this current is referred to as mic level and typically measured in milli-volts. Before it is usable, the signal must be amplified, usually to line level, with typical value within (0.5–2) volts, which is stronger. So the signal produced by microphone is amplified by transistor **Q1**. The basic action of this transistor **Q1** is to receive an input signal from the input transducer (microphone), control the amount of power that the amplifier takes from power source (Vs) and converts it into power needed to energize the load.

## **ADVANTAGES:**

1. The primary application involves an elderly or mobility-impaired person.
2. We can turn something (e.g. a lamp) on and off from any location in the room (e.g. while lying in the bed) simply by clapping our hands.
3. Low cost and reliable circuit.
4. Complete elimination of man power.
5. Energy efficient.

## **DISADVANTAGES:**

1. It is generally cumbersome to have to clap one's hands to turn something on or off and it is generally seen as simpler for most use cases to use a traditional light switch.
2. Unless we use a filter in the circuit, it is not that advantageous. So that circuit activates only for clap of particular frequencies and then it becomes accurate.

## APPLICATIONS:

1. Clap activated switch device will serve well in different **phone-controlled** Applications.
2. Clap switch is generally used for a **light, television, radio** or similar electronic device that the person will want to turn on/off from bed.
3. This circuit functions on using the sound energy provided by the clap which is converted into electrical energy by condenser microphone . Using this converted electrical energy which is used to turn on relay (an electronic switch).
4. The primary application involves an **elderly or mobility-impaired person**.
5. The major advantage of a clap switch is that you can turn something (e.g. a lamp) on and off from any location in the room (e.g. while lying in bed) simply by clapping your hands.
6. The major disadvantage is that it's generally cumbersome to have to clap one's hands to turn something on or off and it's generally seen as simpler for most use cases to use a traditional light switch

## CONCLUSION:

The clap activated switching device function properly by responding to both hand claps at about three to four meter away and finger tap sound at very close range, since both are low frequency sounds and produce the same pulse wave features. The resulting device is realizable, has good reliability and it's relatively inexpensive. Assemble the circuit on a general-purpose PCB and enclose it in a suitable box. This circuit is very useful in field of electronic circuits. By using some modification it area of application can be extended in various fields. It can be used to raised alarm in security system with a noise ,and also used at the place where silence needed.

## FUTURE SCOPE:

1. We can increase the range of this equipment by using better Mic.
2. We can use this as Remote Controller.

**Attachment:**

1. Datasheet of Relay
2. BC549C Datasheet
3. 1N4007 Datasheet
4. 1N4148 Datasheet
5. Condenser MIC

**Reference:**

1. [www.vishaworld.com](http://www.vishaworld.com)
2. [www.scribd.com](http://www.scribd.com)
3. [www.electronicsschematics.in](http://www.electronicsschematics.in)
4. [www.circuiteasy.com](http://www.circuiteasy.com)
5. [www.kpsec.com](http://www.kpsec.com)
6. [www.buildcircuit.com](http://www.buildcircuit.com)
7. [www.electronicsforu.com](http://www.electronicsforu.com)

Marks:.....

Sign:.....



