



**M.V.P.Samaj's**

**Arts, Science & Commerce College, UttamNa-  
garCIDCO, Nashik-08**

**SAVITRIBAIPHULEPUNEUNIVERSITY,PUNE**

**B.VocEAMR**

**Electrical Appliances Maintenance and Repairing Project  
Report**

**“Soil Moisture Detector”**

**Submitted:**

**Vishal Tejrav Damodar**

**Harshal Gorakshanath Ugale**

**Guided by**

**As-  
si . Prof . J . G . Wagh**

**.Department of B.Voc**

**EAMR**

---

Academic Year 2021-2022

**M.V.P.Samaj's**


**Arts, science & Commerce Collage  
UttamNagar CidcoNashik**

**Affiliated TO SAVITRIBAI PHULE UNIVERCITY, PUNE**

**CERTIFICATE**

Certificated that the project Reportentitled "**Soil Moisture Detector**" Has, been successfully completed by: **Vishal Tejrav Damodar, Harshal Gorakshanath Ugale** As partial fulfilment of Degree course in B.voc EAMR under Maharastra state board of Technical Education, pune during the acadmic year 2021-2022.

Thesaid workhas been assessed byus and wearesatisfiedthat the same is upto the standard envisaged for the level of the ource. And that the said work may bepresented to the external examiner.

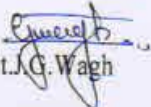
  
Smt. J.G. Wagh

GUIDE

  
EXAMINOR  
PRINCIPAL


Internal examiner

S. D. Pagaree.

  
smt. J.G. Wagh

**CoOrdinator**

B.Voc. Electrical Appliances:  
Maintenance & Repairing  
Arts, Science & Commerce  
CIDCO, Nashik  
Dr. J.D. Sonkhaskar

  
PRINCIPAL  
K.S.K.W. Arts, Sci. & Com. College  
CIDCO, Nashik-8.

## **DECLARATION**

I'am hereby declare that this report is record authentic

work carried out by us during the VIth semester and has not been submitted to any other university or institute.

Student Name  
Vishal Tejrav Damodar  
Harshal Gorkshanath Ugale

**BONAFIDE CERTIFICATE**



MARATHA VIDYA PRASARAK SAMAJ'S  
**K.S.K.W. Arts, Science & Commerce College, Cidco**  
 Cidco, Nashik 422008

Establish Year : 1993

**\* BONAFIDE CERTIFICATE \***

This is to certify that Mr. Ugale Harshal Gorakshnath is/was a Bonafide Student of this Institute, studying in the TYB.Voc Electrical Appliances Maint. & Repairing class during the Academic Year 2022 - 2023.

To the best of my knowledge, He bears a good moral character. His Date of Birth as per the Register is 20-August-1999 .



Place :Nashik, Nashik  
 Date :23-Jul-2022

Clerk

for  
 Principal

Water is more precious than Gold



MARATHA VIDYA PRASARAK SAMAJ'S  
**K.S.K.W. Arts, Science & Commerce College, Cidco**  
 Cidco, Nashik 422008

Establish Year : 1993

**\* BONAFIDE CERTIFICATE \***

This is to certify that Mr. Damodhar Vishal Tejrav is/was a Bonafide Student of this Institute, studying in the TYB.Voc Electrical Appliances Maint. & Repairing class during the Academic Year 2021 - 2022.

To the best of my knowledge, He bears a good moral character. His Date of Birth as per the Register is 08-October-2000 .



Place :Nashik, Nashik  
 Date :16-Jul-2022

Clerk

for  
 Principal

Water is more precious than Gold

## ACKNOWLEDGEMENT

We would like to take this opportunity to express our sincere and Whole hearted thanks to my guide Assi. Prof. J.G. Wagh for his most valuable Advice, timely guidance and inspiration during each step of this Project Work.

We are thankful to Assi. Prof. J.G. Wagh HOD, B.voc(EAMR) Department for his most valuable advice, timely guidance and inspiration during each step of this project work.

We are very much thankful to Dr. J.D. Sonkhaskar, Principal as Well as Co-ordinator of Arts, Commerce And Science College Cidco Nashik, Without their support and encouragement; we would not have achieved the desired goal of completion of the project.

Also we would like to thank staff members, technical staff Members, of B.Voc Electrical Department, our colleagues and Friends who helped us directly and indirectly to complete this work.

1. Vishal Tejrao Damodar
2. Harshal Gorkshanath Ugale

## INDEX

### Soil Moisture Detector.

<b>Sr. No.</b>	<b>Topic</b>	<b>Page No.</b>
<b>1</b>	<b>Abstract</b>	<b>7</b>
<b>2</b>	<b>Introduction</b>	<b>8</b>
<b>3</b>	<b>Working Principle</b>	<b>9</b>
<b>4</b>	<b>Circuit Diagram</b>	<b>12</b>
<b>5</b>	<b>Project Model</b>	<b>13</b>
<b>6</b>	<b>Component List</b>	<b>14</b>
<b>7</b>	<b>Advantage</b>	<b>26</b>
<b>8</b>	<b>Disadvantage</b>	<b>27</b>
<b>9</b>	<b>Application</b>	<b>28</b>
<b>10</b>	<b>Future Scope</b>	<b>29</b>

---



## ABSTRACT

Because water is an important resource and not all communities around the world can afford to be liberal with their water needs; it has become important to use available water as efficiently as possible, especially in agriculture. For the purpose of reducing the overwatering of crops, an unattended ground moisture sensor can be implemented to measure the current moisture level in the soil surrounding the plants. This will allow a farmer to know when to water/stop watering his crop. For convenience, the moisture data information should be transmitted wirelessly to the user.

The design of an unattended ground moisture sensor and wireless communication/user interface system is discussed. The sensor design consists of a Wheatstone bridge for determining the resistance of the soil, followed by a differential amplifier for converting the measured resistance into a voltage. This is done because there exists a correlation between moisture and resistance. This voltage is interpreted by a microcontroller as moisture data and sent wirelessly to a Lora communication receiving node by a Lora communication transmitting node. The receiving node then relays that information to a PC host for access by the user. The system has a power circuit that consists of a battery and a linear regulator.

## INTRODUCTION

Soil moisture sensors measure the water content in the soil and can be used to estimate the amount of stored water in the soil horizon. Soil moisture sensors do not measure water in the soil directly. Instead, they measure changes in some other soil property that is related to water content in a predictable way.

Soil moisture sensor consist of two conducting plates which function as a probe and acting as a variable resistor together. When the sensor is inserted into the water, the resistance will decrease and get better conductivity between plates. The above figure shows the working principle of the soil moisture sensor. Soil moisture sensor has two conducting plates. First plate is connected to the +5Volt supply through series resistance of 10K ohm and second plate is connected directly to the ground. It simply acts as a voltage divider bias network, and output is taken directly from the first terminal of the sensor pin, which is shown in figure above. The output will change in the range of 0 – 5 Volt, in proportion with change in content of water in the soil. Ideally, when there is zero moisture in soil, the sensor acts as open circuit i.e. infinite resistance. For this condition, we get 5V at the output.

This sensor mainly utilizes capacitance to gauge the water content of the soil (dielectric permittivity). The working of this sensor can be done by inserting this sensor into the earth and the status of the water content in the soil can be reported in the form of a percent. This sensor makes it perfect to execute experiments within science courses like environmental science, agricultural science, biology, soil science, botany, and horticulture.

## WORKING PRINCIPLE

The Soil Moisture Sensor uses capacitance to measure dielectric permittivity of the surrounding medium. In soil, dielectric permittivity is a function of the water content. The sensor creates a voltage proportional to the dielectric permittivity, and therefore the water content of the soil.

### Working principle of soil moisture sensor

Soil moisture sensor, also known as: soil moisture sensor, soil moisture sensor, soil moisture sensor, is mainly used to measure soil volumetric water content. For soil moisture monitoring and agricultural irrigation and forestry protection, the commonly used soil moisture sensors are FDR type and TDR type, that is, frequency domain type and time domain type. The FDR type is currently more popular. The FDR frequency domain reflectometer is an instrument used to measure soil moisture. It has the advantages of simplicity and safety, fast and accurate, continuous fixed point, automation, wide range, and less calibration.

At present, there are many soil moisture measurement methods at home and abroad, and there are different soil moisture sensors. For example: Time Domain Reflectometry (TDR), Plaster Method, Infrared Remote Sensing Method, Frequency Domain Reflectance Method/Frequency Domain Method (FDR/FD Method), Titration Method, Capacitance Method, Resistance Method, Microwave Method, Neutron Method, Karl Fischer Method, Y-ray method and nuclear magnetic resonance method. Below we introduce the working principle of each sensor. The TDR method is a soil moisture measurement method developed in the 1980s. The Chinese is a time domain reflectometer. This method is widely used in foreign countries, and it has just begun to be introduced in China, and all departments have paid great attention to it.

TDR is a system similar to a radar system, with strong independence, and its results are basically independent of soil type, density, and temperature. And it is also very important that TDR can measure soil moisture under icy conditions, which is unmatched by other methods. In addition, TDR can monitor the soil water and salt content at the same time, and there is almost no difference between the results of the two measurements. The degree of this measurement method is evident. Because the TDR method equipment is expensive, in the late 1980s, many companies (such as Aqua SPY, Sentek, Delta-T, Decagon) began to use simpler than TDR Methods to measure the dielectric constant of the soil. The FDR and FD methods are not only cheaper than TDR, but also have a shorter measurement time. After a specific soil calibration, the measurement accuracy is high, and the shape of the probe is not limited, and it can be measured at multiple depths at the same time. Data collection is easier to implement.

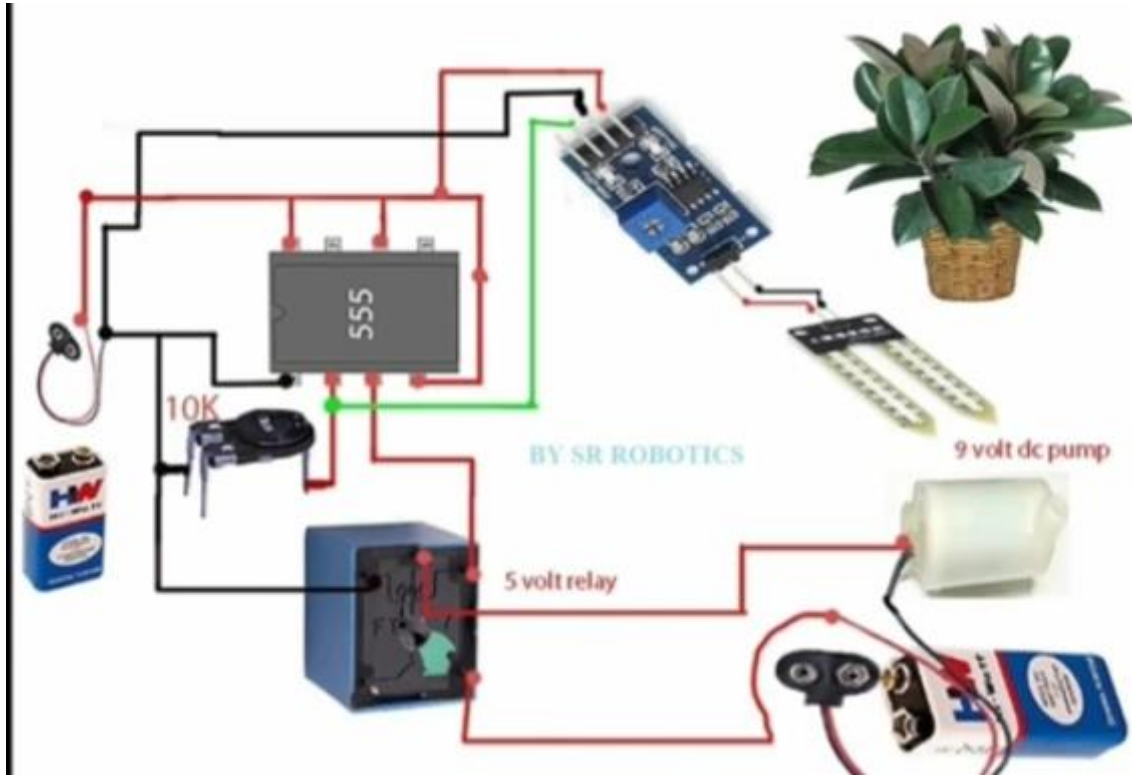
The resistance method uses the resistance of gypsum, nylon, glass fiber, etc. and their moisture content. When these intermediates plus electrodes are placed in moist soil, and then after a period of time, the water content of these things reaches equilibrium. Due to the relationship between resistance and moisture content, we have previously calibrated a certain correspondence between resistance and percentage, and then we can use these components to obtain moisture readings within the suction range of 1 to 15 atmospheres. The neutron method is suitable for measuring soil moisture in the field. It is based on the principle that hydrogen drastically reduces the speed of fast neutrons and scatters them away. Now there are neutron moisture meters for measuring soil moisture on the market. The neutron moisture meter has many advantages, but it has considerable restrictions on organic soil, and it is not suitable for measuring the soil moisture content of 0-15 cm. Similar to the neutron instrument, the ray transmission method uses the radioactive source  $^{137}\text{Cs}$  to emit a line, and the probe receives the energy of the ray through the soil, and the soil moisture The content is converted.

At a time when technology is essential for sensor solution, ensuring that it works in a symbiotic way with your human employees is key.

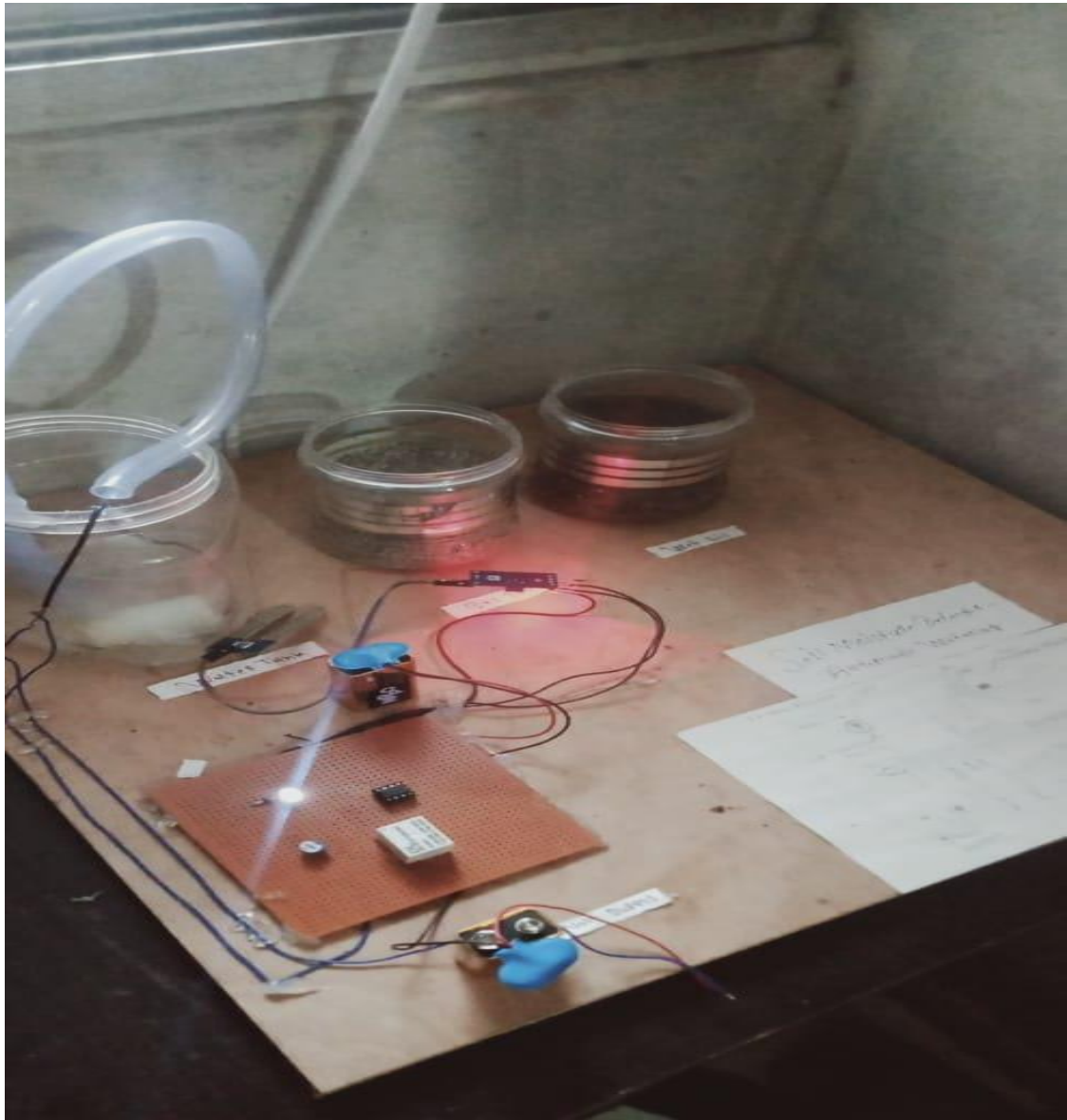
No, this isn't a wonder product and it won't be likely to change your life but it will give your environmental monitoring systems a kick and bring the extraordinary to the every day. give it a shot at Rika Sensors.

Rika Sensors is one of the top brands in their class when it comes to sensor solution and OEM sensor. If you check online, Rika Sensors is often rated high and reviewed with much praise. we would be very pleased to receive your inquiry.

# CIRCUITDIAGRAM



# PROJECTMODEL

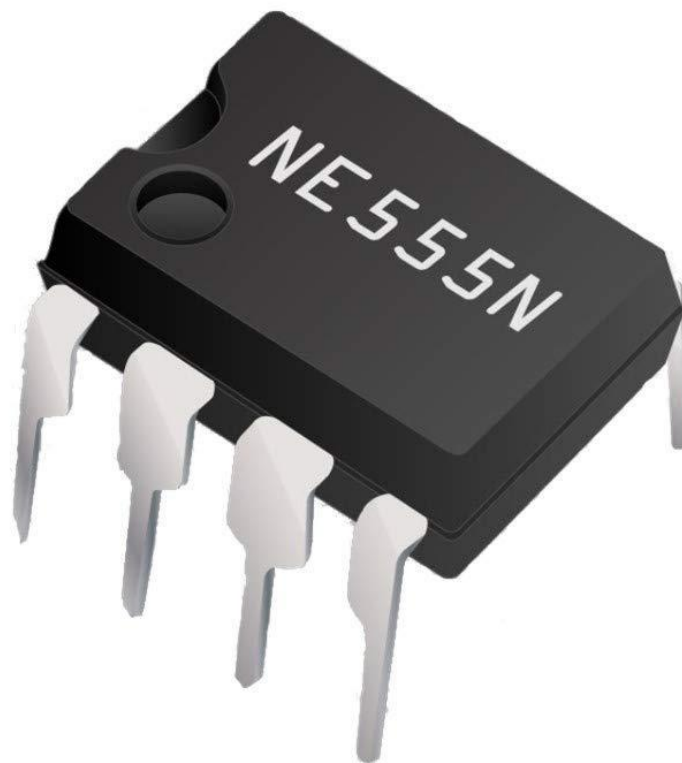


**COMPONENT LIST**

<b>Sr.</b>	<b>Components</b>	<b>Qty.</b>	<b>Price</b>
<b>1</b>	<b>IC 555</b>	<b>1</b>	<b>15</b>
<b>2</b>	<b>Soil Sensor</b>	<b>1</b>	<b>90</b>
<b>3</b>	<b>9 Volt Battery &amp; Connector</b>	<b>1</b>	<b>5</b>
<b>4</b>	<b>LED</b>	<b>1</b>	<b>30</b>
<b>5</b>	<b>5 Volt Relay</b>	<b>1</b>	<b>30</b>
<b>6</b>	<b>9 Volt DC Motor (Water Pump)</b>	<b>2</b>	<b>90</b>
<b>7</b>	<b>1K Resistors</b>	<b>1</b>	<b>5</b>
<b>8</b>	<b>10K Variable Resistors</b>	<b>1</b>	<b>30</b>
<b>9</b>	<b>0 PCB Bord</b>	<b>1</b>	<b>60</b>

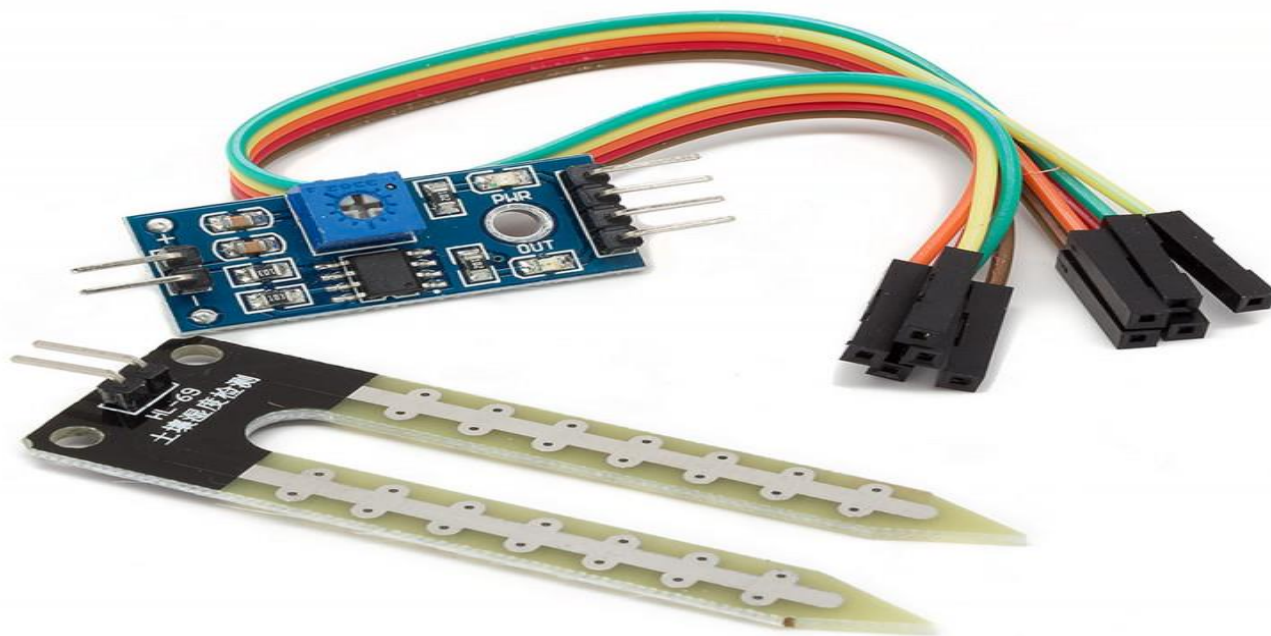


## ➤ IC 555



The 555 timer IC is an integral part of electronics projects. Be it a simple project involving a single 8-bit micro-controller and some peripherals or a complex one involving system on chips (SoCs), 555 timer working is involved. These provide time delays, as an oscillator and as a flip-flop element among other applications.

## ➤ Soil Sensor



Soil moisture sensors pH meters, soil N.P.K sensors and other soil detection instruments. Soil tester based on the IOT, wireless transmission, high accuracy and fast response. Manufacturer. 24-Hour Service. Factory Direct Sales. Support Customization

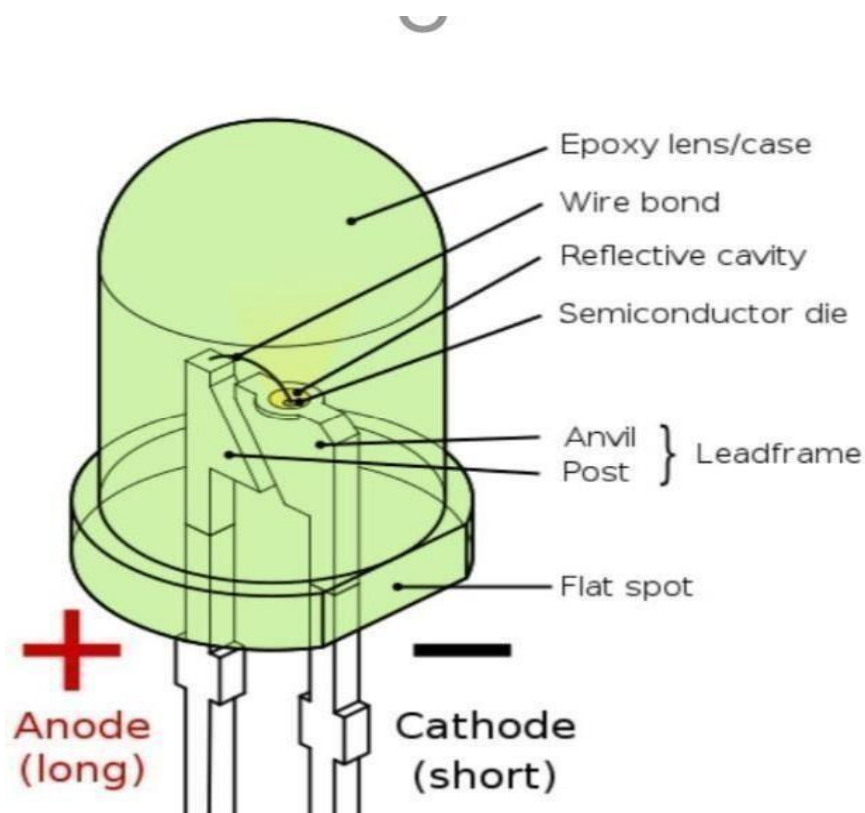
## ➤ 9V BATTERY & CONNECTOR



The nine-volt battery, or 9-volt battery, is a common size of battery that was introduced for early transistor radios. It has an octagonal prism shape with rounded ends and a snap connector at the top. This type is commonly used in smoke detectors, gas detectors, clocks, walkie-talkies, electric guitar and effects units.

**Connector-** The battery has both terminals in a snap connector on one end. The smaller circular (male) terminal is positive, and the larger hexagonal or octagonal (female) terminal is the negative contact. The connectors on the battery are the same as on the load device.

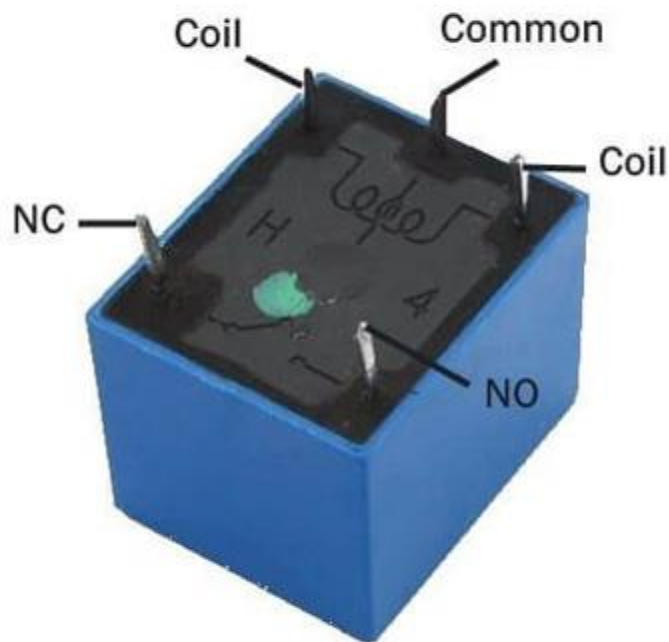
## ➤ LED (LIGHT EMITTING DIODE)



A light-emitting diode is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons.

## ➤ 5 Volt Relay

# 5v Relay Pinout



A 5v relay is an automatic switch that is commonly used in an automatic control circuit and to control a high-current using a low-current signal. The input voltage of the relay signal ranges from 0 to 5V.

➤ **9 Volt DC Motor (Water Pump)**



The working principle of a water pump mainly depends upon the positive displacement principle as well as kinetic energy to push the water. These pumps use AC power otherwise DC power for energizing the motor of the water pump whereas others can be energized other kinds of drivers like gasoline engines otherwise diesel

## ➤ 1K Resistors



A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses. High-power resistors that can dissipate many watts of electrical power as heat may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

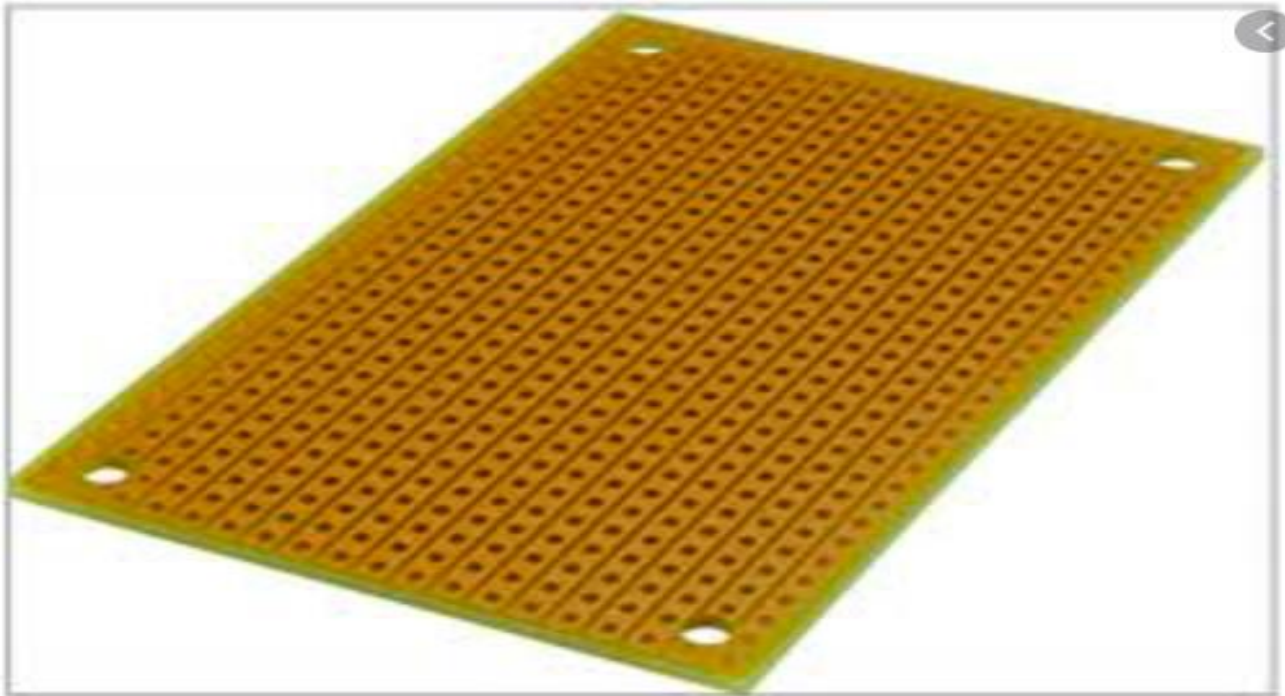
## ➤ 10K Variable Resistors



Variable resistors find its application in most of the electronic circuits used today. We have been getting a lot of comments with questions on how a variable resistor works and so on. Here are the details.



## ➤ 0 PCB BOARD



Zero Printed Circuit Board refers to an all-purpose & conventional PCB that embeds the circuits arbitrarily to ensure the continuous functioning of the hardware. The layers of general purpose circuit board are coated with copper as to allow appropriate soldering of the components of PCB. Thus, it reduces the chances of any short circuit.

➤ **ADVANTAGES:**

- Simple method of measurement.
- It delivers the results immediately.
- Watermark sensors and tensiometers are very low in cost.
- Offers accurate results.
- Watermark sensors offer larger moisture reading range from 0 to 200 cb or kpa.

**➤ DISADVANTAGES:**

- It requires initial evaluation of site specific conditions before selection of appropriate moisture sensor.
- It requires probe to be inserted in the soil. It requires labor to collect the data and maintain the measurement processes.

## ➤ APPLICATIONS:

- ▶ Soil moisture sensors are used in numerous research applications, e.g. in agricultural science and horticulture including irrigation planning, climate research, or environmental science including solute transport studies and as auxiliary sensors for soil respiration measurements.

- **FUTURE SCOPE**

- High quality and low price, soil NPK sensor manufacturer, support customization. Soil nutrient monitoring, high accuracy, wireless transmission. 24-Hour Service. Factory Direct Sales. Manufacturer. Types: Soil NPK Sensor, Soil Moisture Sensor, Soil PH Sensor