" Automatic Plant Irrigation System"

A MINI PROJECT REPORT

Submitted by

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CERTIFICATE

Certified that the mini project work entitled "**Automatic Plant irrigation system**" carried out by **G Sai Sandeep (1NH18EC033), P ChandraMohan (1NH18EC024), Govindraj CS (1NH18EC040), ANVS Manideep (1NH18EC012),** bonafide students of Electronics and Communication Department, New Horizon College of Engineering, Bangalore.

The mini project report has been approved as it satisfies the academic requirements in respect of mini project work prescribed for the said degree.

Project Guide   HOD ECE
(Dr. Dhivya)   (Dr. Sanjeev Sharma)

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ACKNOWLEDGEMENT

The satisfaction that accompany the successful completion of any task would be, but impossible without the mention of the people who made it possible, whose constant guidance and encouragement helped us succeed.

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Finally, a note of thanks to the teaching and non-teaching staff of electronics and communication department for their co-operation extended to us, who helped us directly or indirectly in this successful completion of mini project.

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ABSTRACT

In current era, food and water shortages occur due to increasing population. To avoid this problem, we must promote the agricultural sector. However, water waste is more present in this sector in the form of water saturation when irrigating agricultural fields with irrigation. Therefore, an automatic plant irrigation system should be designed for an adequate supply of water in the fields. This document discusses an automatic plant irrigation system that automatically detects the moisture content of the soil and decides if irrigation is needed and how much water is needed for the soil. It is used to detect the moisture content of the soil over a period of time. The component port left and the hex inverter is used to detect whether the soil is wet or dry. When the humidity is below the preset limit, it will start supplying the desired amount of water until it reaches the limit. When the soil is dry, the pump automatically sprays the fields, and when the soil is wet, the pump stops automatically, eliminating the need for labor and saving time

The aim of our project is to minimise the manual intervention by the farmer. Automated irrigation system will serve the following purpose:

1. As there is no un-planed usage of water, a lot of water is saved from being wasted.

2. The irrigation is the only when there is not enough moisture in the soil and the sensors

3. decides when should the pump be tuned on/off, saves a lot time for the farmers. This also gives much needed rest to farmers, as they don't have to go and turn the pump on/off manually.

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CHAPTER 1

INTRODUCTION

Today, in the field of agriculture, farmers face great problems in watering their crops. This is because they do not have a clear idea of food availability. Even if it's available, they need to pump water and wait until the field is well watered, forcing them to stop doing other activities, which are also important to them, so they waste valuable time and effort. But there is a solution: "An automatic plant irrigation system" helps not only farmers but others to water their gardens. This automatic irrigation system detects the moisture content of the soil and automatically changes the pump when the device is on. Proper use of the irrigation system is very important because the main reason is the shortage of water reserved for the land due to lack of rain, the unexpected use of water as a result of wasting large amounts of water. For this reason, we use this automatic plant irrigation system, and this system is very useful in all weather conditions. We all know that plants are very beneficial to all human beings in many ways. Plants help maintain healthy environment by naturally cleaning the air and producing oxygen Many people like to have plants in their garden. But due to civilization and insufficient space, many people grew plants in a mold or soil, on the windowsill.

CHAPTER 2
LITERATURE SURVEY

Muhammad et al (2010):

A simplified approach to Artificial Irrigation control problems. Neural network controller. System The proposal is compared with the ON / OFF controller. It shows that the Based on The ON / OFF system of the controller fails miserably through the di e therefore limitation. Sur the other hand ANN based approach has discussed a possible better implementation and more efficient control. Controllers These are not needed at a previous system meeting. Inherent ability to adapt to changing conditions as opposed to conventional methods. It is note that ANN based systems can save a lot of resources (energy and water) and can It provides optimized results to all types of agricultural areas.

Kalyan et al (2011):

The need for systems that make farming easier and more sustainable   has increased in recent years. The ability to retain two of the most important a farmer's resources, water and time, was the last challenge. A system that provides this capability - through the use of efficient and reliable methods such as the wireless sensor networking, sprinkler irrigation, GSM, SMS and easily accessible mobile technologies - is sure to help farmers get better yields and, on a larger scale, to help farmers.

3 Prisilla et al (2012):

Water is one of nature's most important gifts to humanity,the food requirements of the population for the human being also increases. In the past in a few decades, the use of water for irrigation has increased hysterically. The water is polluted due to waste and contaminants in industries. Saving water is more important. The objective can be achieved using the outgoing ANN control system. It will provide a way to save flooding of fields for future irrigation.

Sanjukumar et. al. (2013) :

The irrigation system based on the moisture content of the soil in the summer successfully developed and implemented with flow sensor. Characteristic highlights system are: Automatic closed loop irrigation system, temperature and water usage surveillance. The user can easily preset humidity levels and is regularly updated on LCD. To know the pH of the sun, the electrical conductivity of the sun will be incorporated into the system.
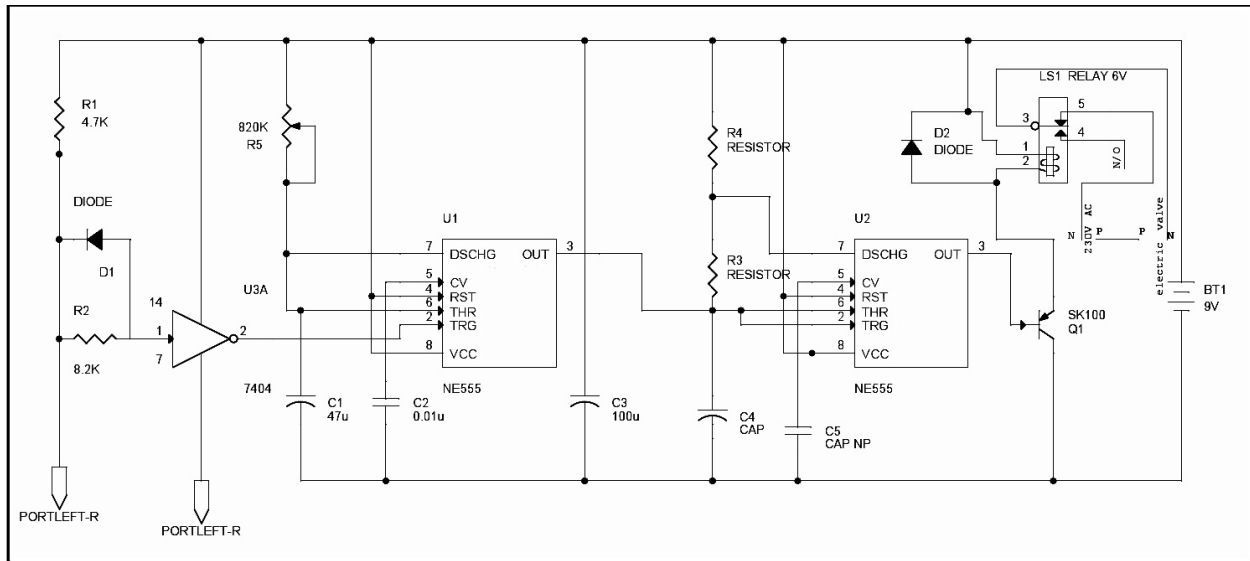
CHAPTER 3

PROPOSED METHODOLOGY

Fig 3.1 Circuit diagram

➢ Initially, we analyzed the circuit diagram in order to proceed forward.

➢ Then, we bought the components and placed all the components on the bread board.

➢ Later, we checked whether each component is functioning properly or not.

➢ Then, we checked each and every section of the model to find if it is functioning properly or not.

➢ Later, we tested the complete circuit at once by placing it in different types of soil.

➢ At last, we obtained the expected and the required output.

CHAPTER 04

PROJECT DESCRIPTION

This project is mainly based on 3 components like, hex inverter, NE555 timer IC and port left.
The output of the hex inverter is given as the input to the 1st NE555 timer. Then the output of this
NE555 timer is given as a input to the 2nd NE555 timer. The output of this 2nd timer is given to
to the base of the PNP transistor. Next, the emitter is connected to the Relay which is used in the
project. A diode is used to control the voltage levels in the circuit. A 9V battery is connected to
the cathode terminal of the diode as shown in the circuit diagram. The Portleft is placed inside the
soil to check the condition of the soil that is whether the soil is wet or dry. Depending upon this
condition the water is sprayed into the soil for certain time.

Fig 4.1 Block Diagram

COMPONENTS USED: -

Table 1.1. Components used in the project

COMPONENT	VALUE (OR) SPECIFICATION	REMARKS
HEX INVERTER	High Voltage	Operational amplifier
IC NE555-TIMER	Supply voltage - +16V	Timer
RELAY	LS1	
TRANSISTOR	SK100	Amplifies the circuit
CAPACITOR	47u	Electrolytic
CAPACITOR	0.01u	Ceramic
RESISTORS	8.2k, 1.1k, 82k,	Reduces the current flow
ZENER DIODE	3.3V	Used as a voltage regulator

HARDWARE DESCRIPTION

1. Resistors

A resistor is an electrical component that is used to limit / regulate the flow of an electrical current in the electronic circuit . Resistors can also be used to provide voltage to the active devices such as transistors.
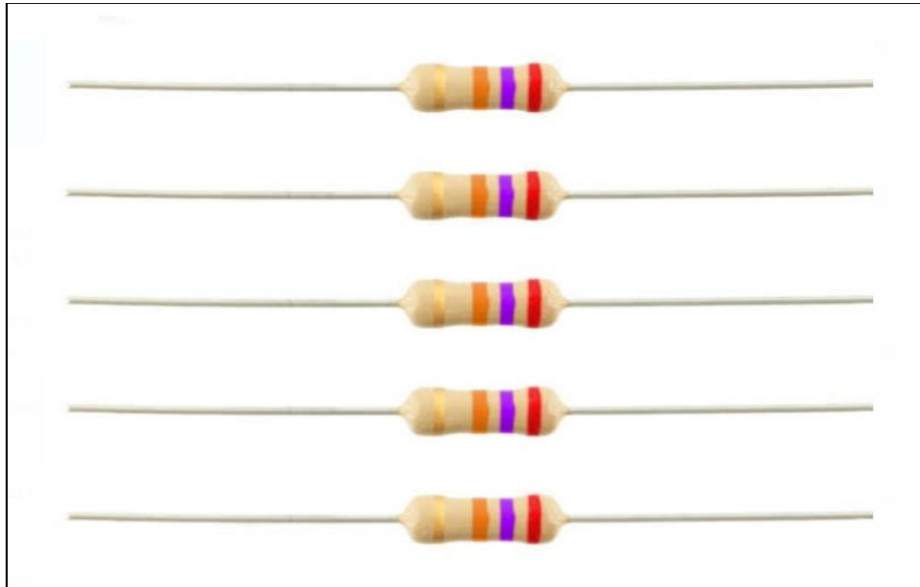

Fig 4.2 Resistor

2. Capacitors

A capacitor is an electronic component that is used to store electric charges. The capacitor is made up of 2 close conductors (usually plates) that are separated by a dielectric material. One plate accumulates positive charges and the other plate accumulates negative charges.

Fig 4.3 Capacitor

3. NE555 Timer IC:

NE555 Timer is a commonly used IC designed to produce a variety of outputs waveforms with the addition of an external RC network.
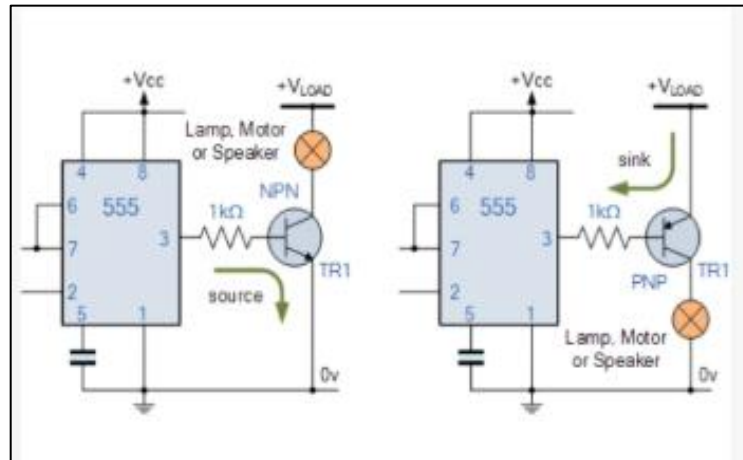

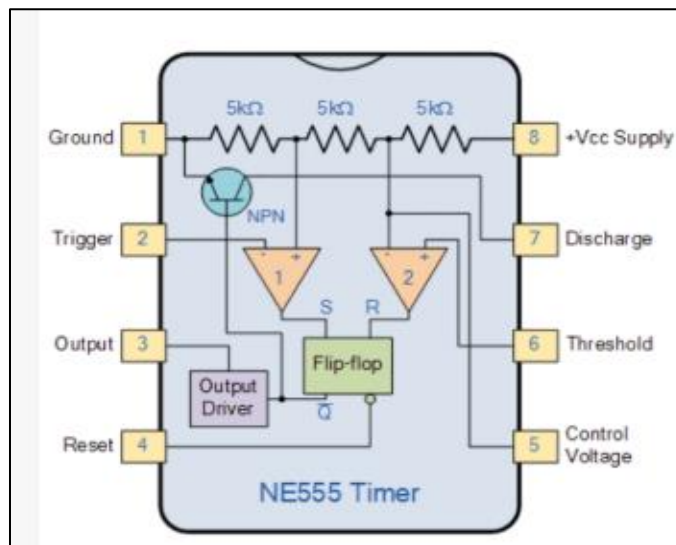**Fig 4.4** NE555 Timer IC

Pin Diagram:

Fig 4.5 PIN configuration

Pin Configuration:

Pin 1: Ground, the ground pin connects the 555 timer to the negative supply.

Pin 2: Trigger, the negative input to the comparator No 1.A negative pulse on this pin "sets" the internal Flip-flop when the voltage drops below 1/3 Vcc causing the output to switch from a "LOW" to a "HIGH" state.

Pin 3: Output, The output pin can drive any TTL circuit and is capable of sourcing or sinking up to 200mA of current at an output

Pin 4: Reset, This pin is used to "reset" the internal Flip-flop controlling the state to the output, pin 3. This is an active-low input and is generally connected to a logic "1" level when not used to prevent any unwanted resetting of the output

Pin 5: Control Voltage, This pin controls the timing of the 555 by overriding the 2/3Vcc level of the voltage divider network. By applying a voltage to this pin the width of the output signal can be varied independently of the RC timing network. When not used it is connected to the ground via a 10nF capacitor to eliminate any noise

Pin 6: Threshold, The positive input to comparator No 2. This pin is used to reset the Flip-flop when the voltage applied to it exceeds 2/3Vcc causing the output to switch from "HIGH" to "LOW" state. This pin connects directly to the RC timing circuit.

Pin 7: Discharge, The discharge pin is connected directly to the collectors to an internal NPN transistor which is used to "discharge" the timing capacitor to ground when the output at pin 3 switch "LOW"

Pin 8: Supply, This is the power supply pin and for general purpose TTL 555 timers is between 4.5V and 15V.
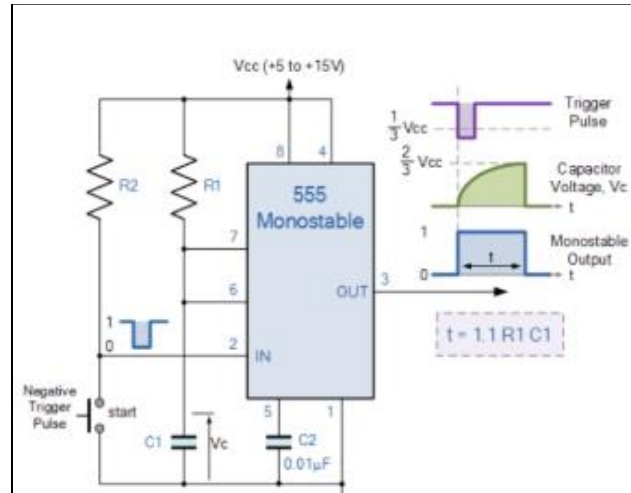
Monostable 555 timer
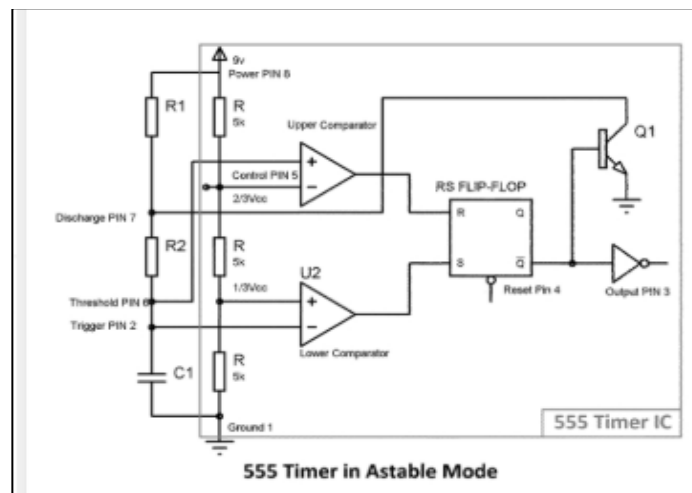

Fig 4.6 Monostable 555 Timer

Astable Multivibrator

Fig 4.7 Astable Multivibrator

Time high(seconds) = 0.693*(R1+R3)*C1

Time low(seconds) = 0.693*R2*C1

Time period(T) = (Time High + Time Low) = 0.693 + (R1 + 2*R2)*C1

Frequency = 1/Time period = 1/(0.693*(R1 + 2*R2)*C1)

Duty cycle = Duty cycle is the ratio of time for which for which output is HIGH to the total time.

Duty cycle% = (Time HIGH/Total time)*100

(T1/T)*100 = (R1+R2)/(R1+2*R2)*100

4.Relay

Dictionary says that relay means the act of passing something from one thing to another. The same meaning can be applied to this device because the signal received from one side of the device controls the switching operation on the device controls the switching operation on the other side. So relay is a switch which controls (open and close) circuits electrochemically. The main operation of this device is to make or break contact with the help of a signal without any human involvement in order to switch it ON of OFF.
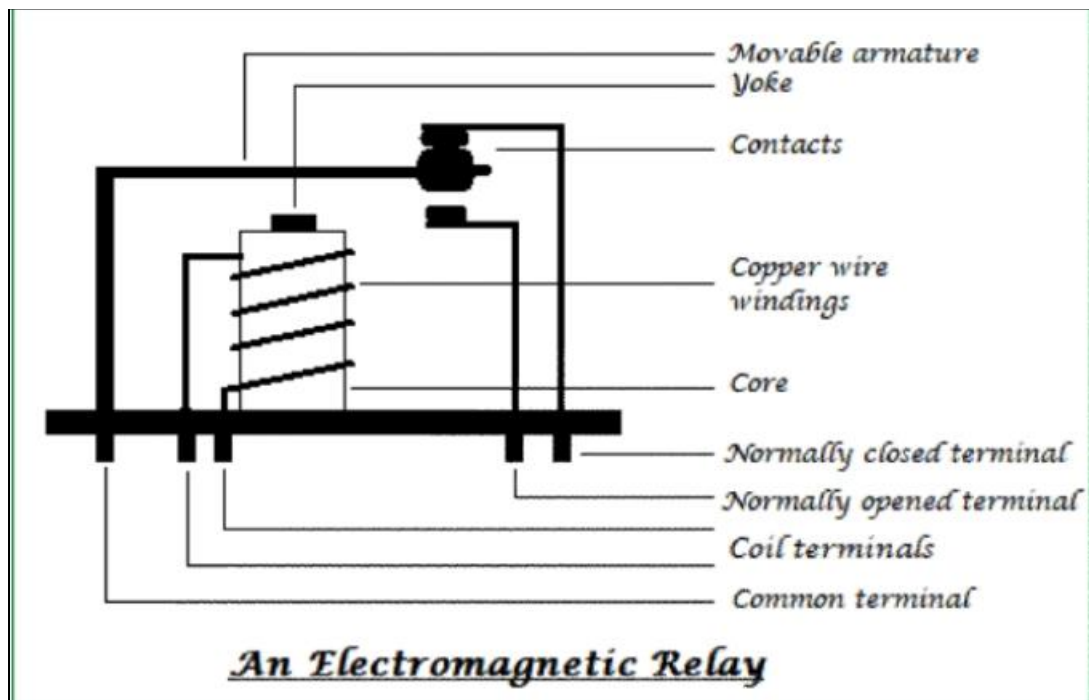
Internal diagram of a Relay.

Fig 4.8 Relay

5.7404 Hex Inverter

Pin diagram of the inverter is given below
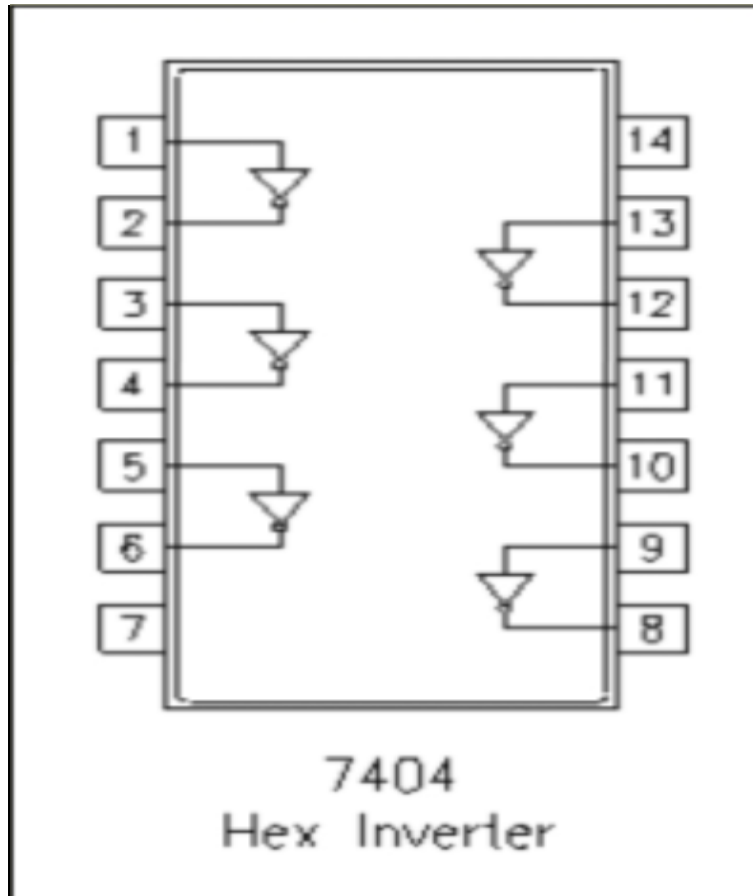

Fig 4.9 7470 HEX Inverter

Pin description

- o Pin 1 – A Input Gate 1
- o Pin 2 – Y Output Gate 1
- o Pin 3 – A Input Gate 2
- o Pin 4 – Y output Gate 2
- o Pin 5 – A Input Gate 3
- o Pin 6 – Y Input Gate 3
- o Pin 7 – Ground
- o Pin 8 – Y Output Gate 4
- o Pin 9 – A Input Gate 4
- o Pin 10 – Y Output Gate 5

- o Pin 11 – A Input Gate 5
- o Pin 12 – Y Output Gate 6
- o Pin 13 – A Input Gate 6
- o Pin 14 – Vcc positive Supply

Features of 7404 Hex Inverter

- o Has six hex inverters
- o Outputs can be directly interfaced to CMOS, NMOS and TTL
- o It has large operating voltage range
- o It has wide operating conditions

6.SK100 Transistor

SK100 is a general purpose, medium power PNP transistor. The basic application of a transistor are switching, amplification and regulation and regulation. Its DC current gain ranges from 100 to maximum of 300.

The transistor terminals require a fixed DC voltage to operate in the desired region of its characteristics curves. This is known as the biasing. For amplification applications, the transistor is based such that it is partly on for all input conditions. The input signal at base is amplified and taken at emitter. BC548 is used in common emitter configuration for amplifiers. The voltage divider is the commonly used biasing mode. For switching applications, transistor is based so that it remains fully on if there is a signal at its base. In the absence of base signal, it gets completely off.

7.1N4148 Diode

Fig 4.10 1N4148 Diode

Pin Configuration
- o Anode – Current always enters through anode
- o Cathode – Current always exists through cathode

Characteristics of 1N4148 Diode

- o Fast switching diode
- o Peak repetitive reverse voltage is 100V
- o RMS reverse voltage is 75V
- o Peak forward surge current is 2A
- o Forward continuous current is 300mA
- o Reverse recovery time is 8ns
- o Available in DO-35 Package

Description

A diode is a device which allows current flow through only one direction. That is the current Should always flow from the anode to cathode. The cathode terminal can be identified by using a grey bar as shown in the picture above.

For 1N4148 Diode, the maximum current carrying capacity is 300mA it can withstand peak up to 2A. The speciality of this diode is its fast recovery time of 8ns at a forward current of 10mA, hence this diode is used in place where fast switching are involved.

WORKING

To operate the circuit and water the pants, we use this simple logic: when the soil is dry it has high resistance and when the soil is wet it has low resistance. This circuit consists of two probes that are placed on the ground. These probes work only when the ground resistance is low and cannot work when the ground resistance is high. To drive the probes, the voltage supply is supplied by a battery, which is connected to the circuit. When the soil dries, it produces a strong voltage drop due to high resistance, which is detected by the hex inverter and creates the first NE555 timer. This timer is arranged as a monostable multivibrator that uses an electrical signal.

When the first timer 555 is activated on pin 2, it generates the output on pin 3; and, this output is given to the input of the second timer. This second NE555 timer is configured with an astable multivibrator and generates the output to make the relay connect to the value electrically driven through the SK100 transistor. The output of the second timer activates the transistor that controls the relay. This relay is connected to the input of an electrical value and the pipeline outputs the electrical value to the plants. When the relay is activated, the valve opens and water through the pipes rushes into the crops. As the water content in the soil increases, the resistance of the soil decreases and the transmission of the probes begins to cause the inverter to stop activating the first timer. Finally, the valve that is connected to the relay stops

ADVANTAGES

- Automatic system eliminates all the physical operation of ON/OFF valves.
- Possibilities to change frequency of the irrigation and the irrigation process and to optimize all the process.
- With these new technologies and adoption of advanced crop system, that are complex and difficult to operate physically.
- Availability of water from various and increased in efficiency of water management and fertilizers.
- System can also be operated at mid night, without water loss from evaporation, therefore minimized.
- Automatic Irrigation system start and stops when required, by optimizing energy usability.

DISADVANTAGES

- The irrigation process can be very sensitive.
- Self-help compatibility is low with big-scale systems, which is very much complex.
- Electricity is very much necessary for most of the systems.
- For crops like rpaddy we cannot use this project because of excess need of water.
- We use DTMF technique in the field where large amount of water is required.

APPLICATIONS

- It can be used in lawn, agriculture fields, drip irrigation systems etc.
- It can be used for cultivation purpose.
- It can be used to provide water in nurseries.
- It can be used for wide range of crops as one can customize reference required for different kind of crops.
- Water transfer and pond water management.

RESULT AND DISCUSSION

After successful Hardware Implementation of the circuit diagram in bread board following outputs will be obtained: -

1) When the value of soil moisture is minimum (zero) there will be no contact between the electrodes and an infinite impedance which occur between the two electrodes. This will make relay in ON state. The circuit sends output to the motor circuit. Thus, it will result ON state of the motor.

2) When there is sufficient moisture is present between the electrodes of the circuit. Then it makes a complete connection between the electrodes. The relay will switch OFF. This will result in turning OFF the motor.

CHAPTER 6

CONCLUSION

From the past days, the farmer have to visit his horticultural lands and manually check the wetness of the soil. It allows the client to filter and keep at a distance whatever the weather condition is. It is really a viable and financial approach to reduce human effort and reduce water loss in agricultural areas. The flow and return systems in agriculture have reduced the level of groundwater and the accessibility of human resources. This irrigation control framework can help the farmer in many courses.

The part of the agriculture fields, this frame can be used as part of cricket stadiums or openly cultivated golf stadiums. You are here presented an immense interest and a future extension of the project.

It allows a ton of improvement within it and increases the standard and valuable framework that can be used generally differ as being part of the rural realm.

FUTURE SCOPE

➢ Highly demanded for irrigation In Fields.

➢ Can be used in garden for irrigation In Garden Parks.

➢ It is very much Efficient for Paddy Fields.

➢ Used in Pisciculture.

➢ Can be connected and communicated through internet in future.

➢ It can be used by connecting it to mobile using GSM technology.

➢ Can be used by means of wireless applications.

➢ The maintenance of crops based on different seasons can be stored in a database.

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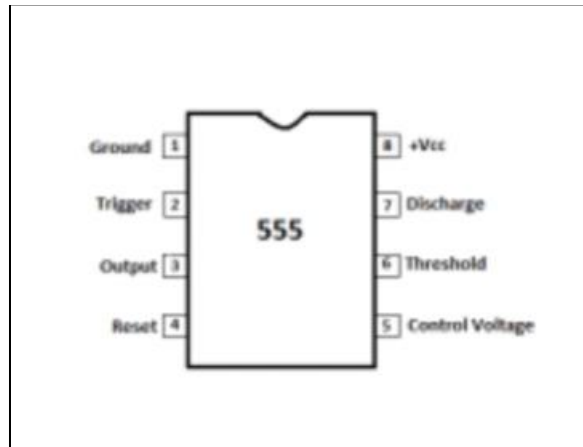
APPENDIX

NE555 IC

Fig 6.1 NE555 IC

Data Sheet :-

Parameters	Symbol	Typical Values
Supply voltage	Vcc	16
Power dissipation	Pd	600
Temperature range	Tamb	0 to 70
Storage temperature change	Tstg	-65 to +150
Lead soldering temperature	Tsold	230

Features: -

- ❖ Turn-off time less than 2μs.
- ❖ Maximum operating frequency greater than 500KHz.
- ❖ Timing from microseconds to hours.
- ❖ Operates in both astable and monostable modes.
- ❖ High output current.
- ❖ Adjust duty cycles.
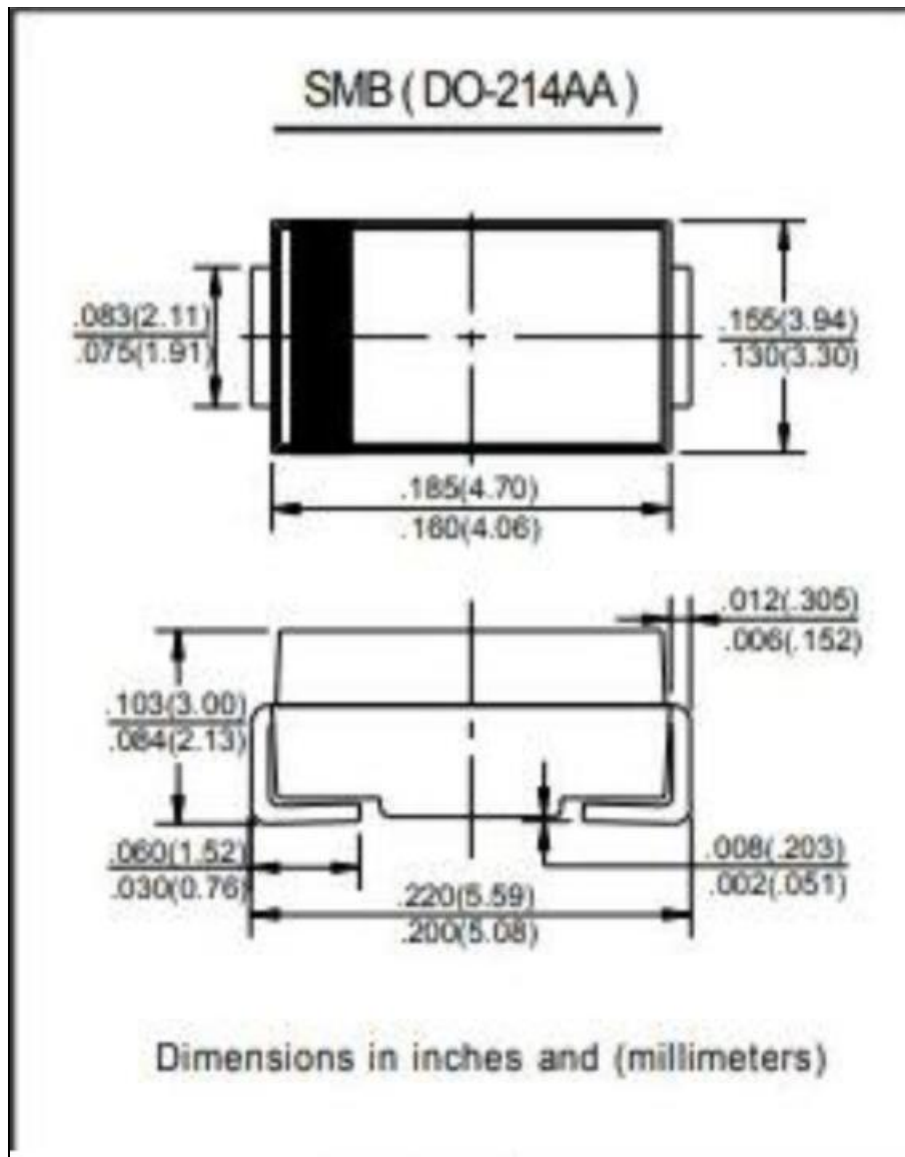- ❖ TTL compatibility.

Transistor SK100

Fig 6.2 SK100 Transistor

Features: -

❖ The plastic package carries Underwriters Laboratory Flammability Classification 940V-0.
❖ For surface mounted application.
❖ Metal silicon junction, majority carrier conduction.
❖ Built in strain relief, ideal for automated placement.
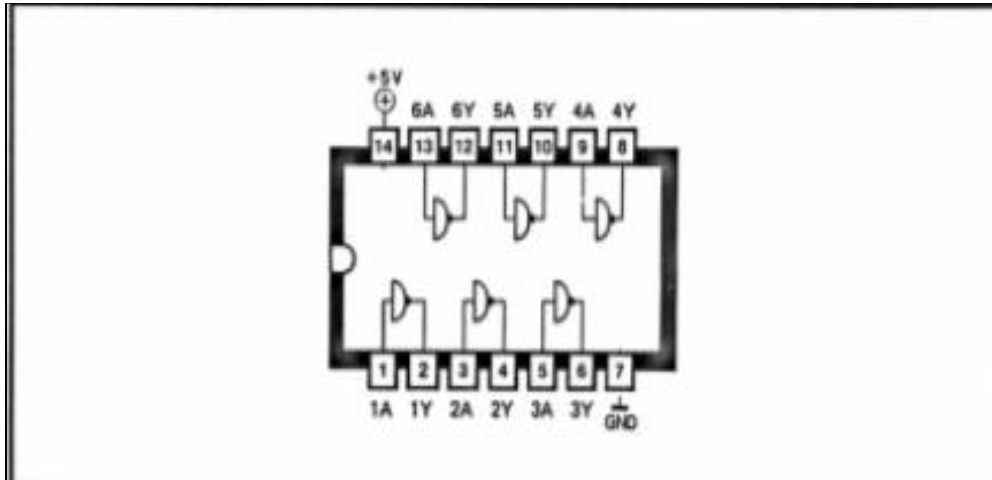❖ High forward surge current capability.

HEX INVERTER 7404

Fig 6.3 HEX Inverter

Description: -

This package contains six inverter.

Mode of operation: -

The six inverters can be used separately from each other.

For each inverter, a low input gives a high output and vice versa.

The 7414 contains six wavelengths with Schmitt trigger inputs and a single pinout.

Application: -

Logical Inversion, pulse shaping, oscillators.