

AGRICULTURE SUPPORTIVE SYSTEM FOR FARMERS

Submitted in partial fulfillment of the requirements for the award of

**Bachelor of Engineering Degree in
Electrical and Electronics Engineering**

by

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**DEPARTMENT OF ELECTRICAL AND ELECTRONICS
ENGINEERING SCHOOL OF ELECTRICAL AND ELECTRONICS
ENGINEERING**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

Accredited with Grade "A" by NAAC

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SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **PRITHI K** (Reg. No. 39140043) **SINDHU V** (Reg. No. 39140052) **KEERTHANA M S** (Reg. No. 39140023) and **THARINI N P** (Reg. No. 39140061) who carried out the project entitled "**AGRICULTURE SUPPORTIVE SYSTEM FOR FARMERS**" under our supervision from November 2021 to May 2022.

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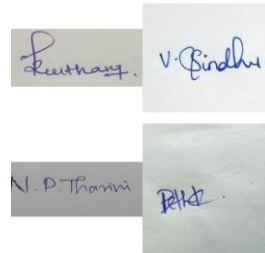
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DECLARATION

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DATE: 29.4.2022

PLACE: Chennai

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ABSTRACT

Modernization of the cultivating procedure is one of the critical strides for a nation like India, which needs to import enormous measure of grains and agro items from different nations to take care of the demand of 1.2 billion populaces. One of the real difficulties of the agribusiness is the correct checking of the dirt wellbeing, nature, and modifying the water system and in addition the plant clears as per this perception. Issues concerning horticulture, wide open and agriculturists have been continually preventing improvement. The main answer for these issues is rural modernization. Another situation is giving security from assaults of animals which destroy the agrilands.

In this project we are doing two things one is automatic irrigation system and second one is animal intrusion prevention system, we use arduino microcontroller as heart of this project soil moisture sensor was connected to detect the soil moisture and if the soil moisture is below the limit it will turn on the motor. And for animal intrusion prevention we use ultrasonic sensor and ir sensor to detect the animals if ultrasonic sensor detect the animal it will start buzzer the alarm and for ir sensor it will start pumping the water. By buzzing and pumping we can alert the animals and this methos will act as digital fence for the agricultural lands.

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LIST OF SYMBOLS AND ABBREVIATIONS

ω_0	-	Resonant Angular Frequency
C_r	-	Resonant Capacitor
C_s	-	Series Resonant Capacitor
L_r	-	Resonant Inductor
L_s	-	Series Resonant Inductor
I_r	-	Resistance Current
R	-	Resistor
V_C	-	Capacitor Voltage
V_{ds}	-	Drain to Source Voltage
V_{in}	-	Input Voltage
V_{out}	-	Output Voltage
X_c	-	Capacitive Reactance
X_l	-	Inductance Reactance
Z	-	Impedance
AC	-	Alternating Current
API	-	Application Program Interface
CCM	-	Continuous Conduction Mode
DCM	-	DisContinuous Conduction Mode
CISC	-	Complex Instruction Set Computer
CPU	-	Central Processing Unit
CTR	-	Current Transfer Ratio

DC	-	Direct Current
DCM	-	Discontinuous Current Mode
DIAC	-	Diode Alternating Current
DVM	-	Discontinuous Voltage Mode
ESR	-	Equivalent Series Resistance
ICSP	-	In Circuit Serial Programming
IGBT	-	Insulated Gate Bi-Polar Transistor
ILBC	-	Interleaved Boost Converter
MCLR	-	Master Clear
PFC	-	Power Factor Correction
PIC	-	Peripheral Interface Controller
SIM	-	Simulator
THD	-	Total Harmonic Distortion

CHAPTER 1

1.1 INTRODUCTION

Electric fences can be used to protect farmhouses, farmlands, forest bungalows, etc from animals. In a way, these simulate the job of a cowboy or forest guard. Already popular in countries where manpower is expensive, electric fences are slowly becoming popular in India as well.

Nowadays the use of electric fence for control and content livestock are having a large application in almost all countries of the world. Electric Fence was starting to use in the thirties and nowadays is used in all world in little and big farms. Brazil, like the major exporter of beef cattle is a great consumer of this technology. Big farms with large areas of control need electric fences energizers of large capacity to keep high voltage in all its extension. But not much information about safety use and project is presented in papers and available for consumers and manufacturers as well electric fences characteristics. There are in Brazil many manufacturers of this kind of equipment, but these manufacturers use empiric rules to design this kind of equipments. This work intends to be a starting point to change this reality involving the academic researchers in the study of this problem. The electric fence presents the following parts: Energizer, Wire, Isolation and Ground.

Agriculture in India is the broadest economic sector and plays a significant role in the overall socioeconomic factor of India. The increasing news articles in television and newspaper on wild animals raiding agricultural crops during harvest season shows that these animals can destroy a farmer's livelihood. In such

areas Electric fencing system can be employed in which the animals experience a high voltage low current shock for a very short time. Because of the small magnitude of current there is no threat to the animal's life at the same time the large magnitude voltage scares away the animals.

Usually, PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors. A photoelectric sensor, or photo eye, is a device used to detect the distance, absence, or presence of an object by using a light transmitter, often infrared, and a photoelectric receiver. They are used extensively in industrial manufacturing. There are three different functional types: opposed (through beam), retro-reflective, and proximity-sensing (diffused).

The practices employed by farmers to deter elephants are also wide ranging. These generally include active traditional deterrents such as shouting, drum beating, bursting firecrackers, torch lighting, and setting fire to raw jute or tires fixed at the end of bamboo sticks.

Usually, farmers guard their crops on their own, however during peak raiding season two to three neighboring farmers form groups to ride elephants back.

Additionally, forest department officials may aid in mitigating human elephant conflict by firing shots in the air as well as using domestic elephants to drive away crop raiders.

1.2 AIM OF THE PROJECT

The project "electric fencing for irrigation of animal-man conflict is designed such that it can be installed on any surface.

- ✚ It is much easy and cost effective than increasing the height of the wall.
- ✚ The project is easily expandable and can be used by farmer to increase the security of the land from animals, and compatible with all types of additional security gadgets

1.3 LITERATURE SURVEY

[1] An electric fence was first use in Texas in 1888. Electricity from a generator using an overshot wheel.

There is a possibility of electric fence posing the risk of fire when bushes or trees grow in close proximity.after that electric fence was based on GSM technology so the circuit cover certain distance,this circuit is more expensive for farmers.

[2] There have been numerous attempts to modify farming practices to prevent retaliatory killings that appear to have focused on different predators who may exhibit different hunting behaviors, across contrasting landscapes, with potentially different kinds of fences, and ultimately different outcomes. Hence, the objective is to eliminate predation of livestock and thus reduce provocations between humans and animals that often lead to retaliatory killing.

[3] Zarco-González et al. (2012) found that various aspects of the livestock farmland landscape and farming practices, in part, explained the high rate of livestock predation by pumas and the retaliatory killings carried out by farmers. Interviews were conducted with 52 livestock owners to assess levels of livestock predation and retaliatory killing of pumas, in addition to livestock management practices such as the degree of livestock supervision and nighttime shelter. Additionally, topographic data was collected on the areas surrounding livestock grazing sites such as distance to human settlements, roads, vegetation, and steep cliffs, and in-field verification of killings. By using a combination of analytical

techniques, including spatial modeling and parametric methods, livestock losses due to puma predation were found to cluster in space.

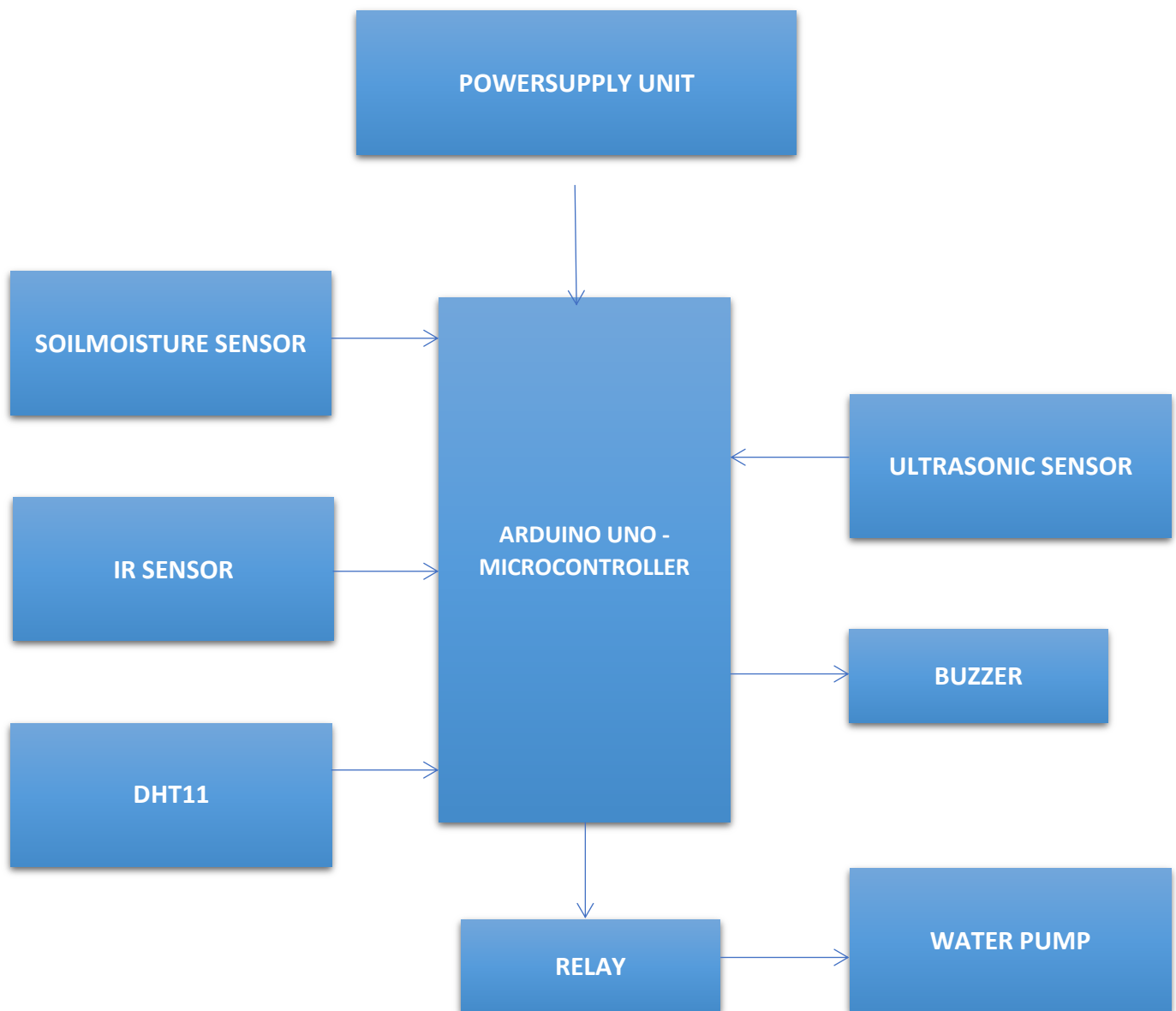
1.4 ADVANTAGES

- ✚ Safety independent of grid power
- ✚ Significantly reduces man-animal conflicts
- ✚ Eco-Friendly
- ✚ Effective wildlife management
- ✚ Durability
- ✚ Low maintenance
- ✚ Designed to work on solar energy and hence tool for park managers
- ✚ Cost effective and return on investment starts from day one

CHAPTER 2

PROJECT DESCRIPTION

2.1 BLOCK DIAGRAM:



2.2 HARDWARE AND SOFTWARE REQUIREMENTS:

HARDWARE REQUIRED:

-  ARDUINO UNO – MICRO CONTROLLER
-  SOIL MOISTURE SENSOR
-  ULTRASONIC SENSOR
-  IR SENSOR
-  DHT11 SENSOR
-  RELAY
-  WATER PUMP
-  BUZZER
-  POWER SUPPLY UNIT
-  SOLDERING KIT
-  CONNECTING WIRES

SOFTWARE USED:

-  ARDUINO IDE
-  EMBEDDED C

MODULES:

1. SENSOR INTERFACING
2. PREPARING POWER SUPPLY UNIT
3. MICRO-CONTROLLER PROGRAMMING
4. READING ANALOG DATA
5. TEST AND DEBUG
6. SUBMISSION

2.3 MODULE DESCRIPTION:

1. SENSOR INTERFACING

Sensor interfacing is a mix of amplification, filtering, and other signal conditioning as well as analog-to-digital conversion. The analog-to-digital converter (ADC) may be in your microcontroller, but you will still need to make the sensor compatible with the ADC input.

2. PREPARING POWER SUPPLY UNIT

A power supply unit (or PSU) converts mains AC to low-voltage regulated DC power for the internal components of a controller. A power supply is used to reduce the mains electricity at 240 volts AC down to something more useable, say 12 volts DC. There are two types of power supply, linear and switch mode. A linear power supply uses a transformer to reduce the voltage. The AC signal is rectified and regulated to produce a high DC voltage.

An AC adapter, AC/DC adapter, or AC/DC converter is a type of external power supply, often enclosed in a case similar to an AC plug. Adapters for battery-powered equipment may be described as chargers or rechargers (see also battery charger). AC adapters are used with electrical devices that require power but do not contain internal components to derive the required voltage and power from main power. The internal circuitry of an external power supply is very similar to the design that would be used for a built-in or internal supply.

3. MICRO-CONTROLLER PROGRAMMING

A microcontroller is a programmable IC, capable of multiple functions depending on how it's programmed. Many different kinds of microcontrollers exist that offer a wide range of functionality. The versatility of the microcontroller is what makes it one of the most powerful tools in modern design. This guide will explain the basics of microcontrollers and how they are programmed.

4. READING ANALOG DATA

The microcontroller of the board has a circuit inside called an analog-to-digital converter or ADC that reads this changing voltage and converts it to a number between 0 and 1023. When the shaft is turned all the way in one direction, there are 0 volts going to the pin, and the input value is 0. When the shaft is turned all the way in the opposite direction, there are 5 volts going to the pin and the input value is 1023. In between, `analog Read()` returns a number between 0 and 1023 that is proportional to the amount of voltage being applied to the pin.

5. TEST AND DEBUG

Testing means verifying correct behavior. Testing can be done at all stages of module development: requirements analysis, interface design, algorithm design, implementation, and integration with other modules. In the following, attention will be directed at implementation testing. Implementation testing is not restricted to execution testing. An implementation can also be tested using correctness proofs, code tracing, and peer reviews, as described below.

Debugging is a cyclic activity involving execution testing and code correction. The testing that is done during debugging has a different aim than final module testing. Final module testing aims to demonstrate correctness, whereas testing during debugging is primarily aimed at locating errors. This difference has a significant effect on the choice of testing strategies.

6. SUBMISSION

CHAPTER 3

3. HARDWARE DESCRIPTION:

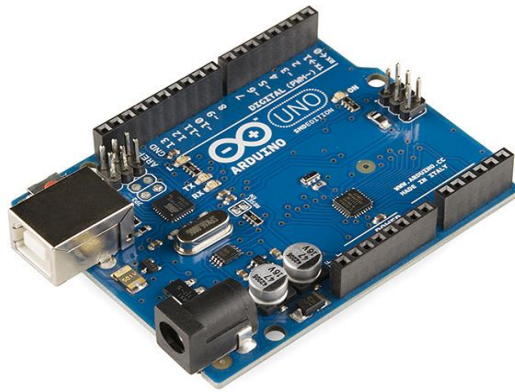
3.1 ARDUINO

3.1.1 DESCRIPTION

Arduino is an open source, computer hardware and software company, project, and user community that designs and manufactures Single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world.

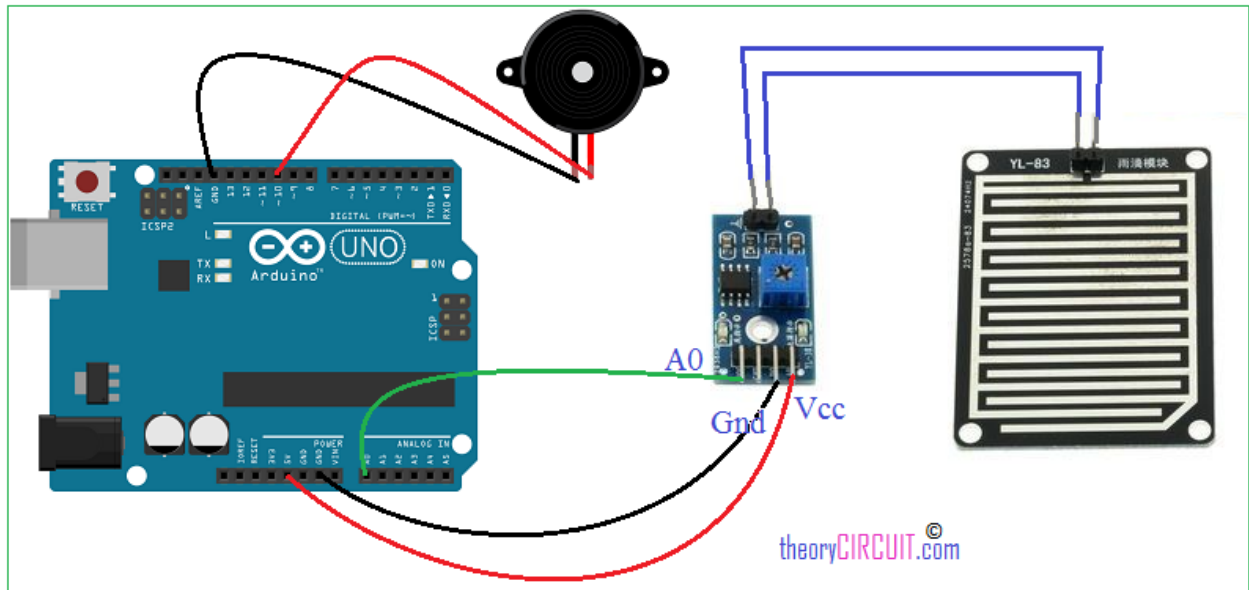
Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.



ARDUINO UNO

Arduino is an open-source project that created microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices. The project is based on microcontroller board designs, produced by several vendors, using various microcontrollers. These systems provide sets of digital and analog input/output (I/O) pins that can interface to various expansion boards (termed shields) and other circuits. The boards feature serial communication interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino project provides an integrated development environment (IDE) based on a programming language named Processing, which also supports the languages C and C++.



ARDUINO UNO INTERFACE WITH SENSOR & BUZZER

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter. Arduino Uno has a number of facilities for communicating with a computer, another Arduino board, or other microcontrollers.

3.1.2 FEATURES

- Microcontroller: ATmega328P
- Operating voltage: 5V
- Input voltage: 7-12V
- Flash memory: 32KB
- SRAM: 2KB
- EEPROM: 1KB

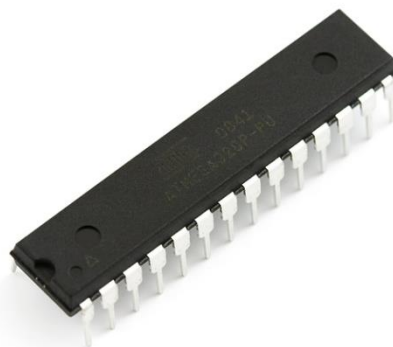
3.1.3 APPLICATIONS

- Real time biometrics
- Robotic applications
- Academic applications

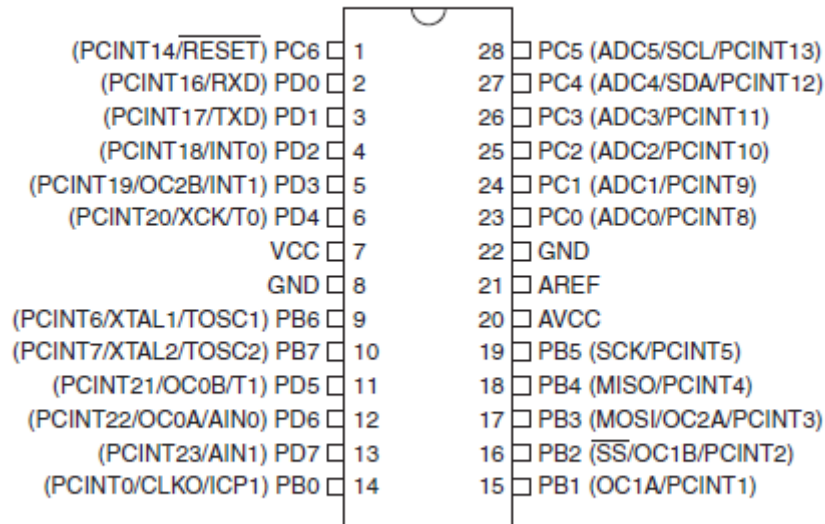
3.2 ATMEGA328 IC

3.2.1 DESCRIPTION

The ATmega328 is a single-chip microcontroller created by Atmel in the mega AVR family. The Atmel 8-bit AVR RISC-based microcontroller combines 32 kB ISP flash memory with read-while-write capabilities, 1 kB EEPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz.



ATmega328P IC

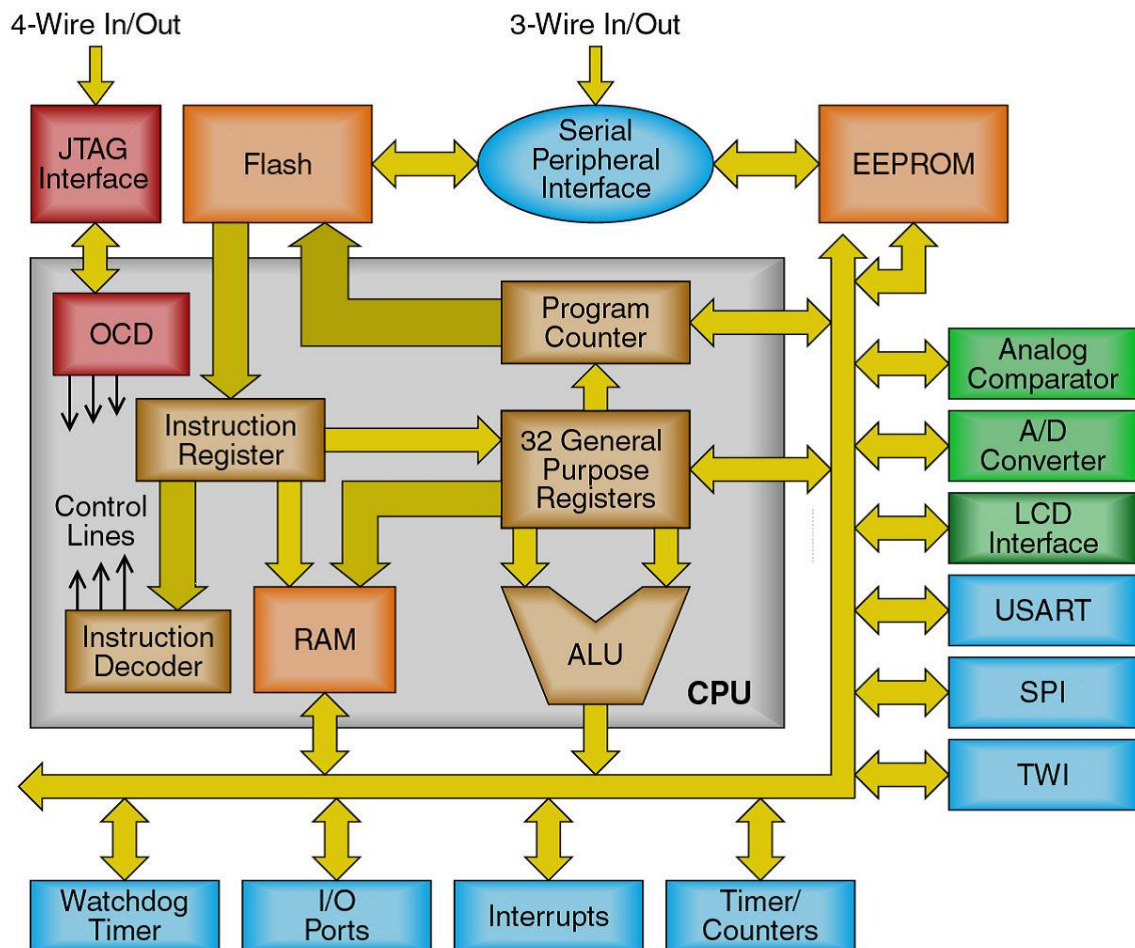


3.2.2 PIN DIAGRAM

- High Performance, Low Power Atmel®AVR® 8-Bit Microcontroller Family
- Advanced RISC Architecture
 - 131 Powerful Instructions
 - Most Single Clock Cycle Execution
 - 32 x 8 General Purpose Working Registers
 - Fully Static Operation
 - Up to 20 MIPS Throughput at 20MHz
 - On-chip 2-cycle Multiplier

- High Endurance Non-volatile Memory Segments
 - 4/8/16/32KBytes of In-System Self-Programmable Flash program memory
 - 256/512/512/1KBytes EEPROM
 - 512/1K/1K/2KBytes Internal SRAM
 - Write/Erase Cycles: 10,000 Flash/100,000 EEPROM
C(1)°C/100 years at 25°Data retention: 20 years at 85
 - Optional Boot Code Section with Independent Lock Bits In-System Programming by On-chip Boot Program
 - True Read-While-Write Operation
 - Programming Lock for Software Security Atmel® QTouch® library support
 - Capacitive touch buttons, sliders and wheels– QTouch and QMatrix® acquisition
 - Up to 64 sense channels
- Peripheral Features
 - Two 8-bit Timer/Counters with Separate Prescaler and Compare Mode
 - One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode
 - Real Time Counter with Separate Oscillator
 - Six PWM Channels
 - 8-channel 10-bit ADC in TQFP and QFN/MLF package
 - Temperature Measurement
 - 6-channel 10-bit ADC in PDIP Package
 - Temperature Measurement

- Programmable Serial USART– Master/Slave SPI Serial Interface
- Byte-oriented 2-wire Serial Interface (Philips I2 C compatible)
- Programmable Watchdog Timer with Separate On-chip Oscillator
- On-chip Analog Comparator
- Interrupt and Wake-up on Pin Change



3.2.3 ARCHITECTURE DIAGRAM

- Special Microcontroller Features

- Power-on Reset and Programmable Brown-out Detection
 - Internal Calibrated Oscillator
 - External and Internal Interrupt Sources
 - Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby, and Extended Standby
- I/O and Packages
 - 23 Programmable I/O Lines
 - 28-pin PDIP, 32-lead TQFP, 28-pad QFN/MLF and 32-pad QFN/MLF
- Operating Voltage: 1.8 - 5.5V
 - Temperature Range: -40 °C to 85°
 - Speed Grade: 0 - 4MHz@1.8 - 5.5V, 0 - 10MHz@2.7 - 5.5.V, 0 - 20MHz @ 4.5 - 5.5V C°
 - Power Consumption at 1MHz, 1.8V, 25
 - Active Mode: 0.2Ma
 - Power-down Mode: 0.1µA
 - Power-save Mode: 0.75µA (Including 32kHz RTC)

3.3 PIN DISCRIPTION

VCC Digital supply voltage

GND Ground.

3.3.1 Port B (PB7:0) XTAL1/XTAL2/TOSC1/TOSC2

Port B is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port B output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port B pins

that are externally pulled low will source current if the pull-up resistors are activated. The Port B pins are tri-stated when a reset condition becomes active, even if the clock is not running. Depending on the clock selection fuse settings, PB6 can be used as input to the inverting Oscillator amplifier and input to the internal clock operating circuit. Depending on the clock selection fuse settings, PB7 can be used as output from the inverting Oscillator amplifier. If the Internal Calibrated RC Oscillator is used as chip clock source, PB7..6 is used as TOSC2..1 input for the Asynchronous Timer/Counter2 if the AS2 bit in ASSR is set.

3.3.2 Port C (PC5:0)

Port C is a 7-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The PC5:0 output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port C pins that are externally pulled low will source current if the pull-up resistors are activated. The Port C pins are tri-stated when a reset condition becomes active, even if the clock is not running.

3.3.3 PC6/RESET

If the RSTDISBL Fuse is programmed, PC6 is used as an I/O pin. Note that the electrical characteristics of PC6 differ from those of the other pins of Port C. If the RSTDISBL Fuse is unprogrammed, PC6 is used as a Reset input. A low level on this pin for longer than the minimum pulse length will generate a Reset, even if the clock is not running. The minimum pulse length is given in Table 28-3 on page 308. Shorter pulses are not guaranteed to generate a Reset.

3.3.4 Port D (PD7:0)

Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port D output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port D pins that are externally pulled low will source current if the pull-up resistors are

activated. The Port D pins are tri-stated when a reset condition becomes active, even if the clock is not running.

3.3.5 AVCC

AVCC is the supply voltage pin for the A/D Converter, PC3:0, and ADC7:6. It should be externally connected to VCC, even if the ADC is not used. If the ADC is used, it should be connected to VCC through a low-pass filter. Note that PC6..4 use digital supply voltage, VCC

3.3.6 AREF

AREF is the analog reference pin for the A/D Converter

3.3.7 ADC7:6 (TQFP and QFN/MLF Package Only)

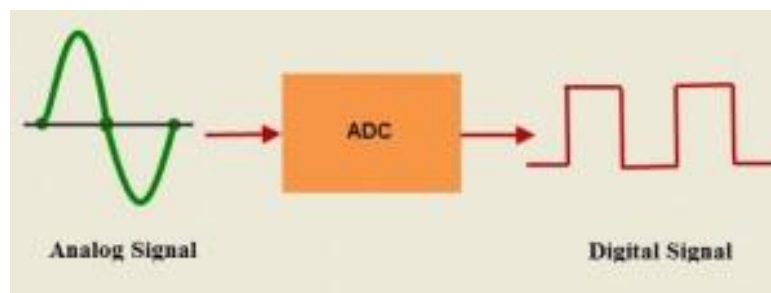
In the TQFP and QFN/MLF package, ADC7:6 serve as analog inputs to the A/D converter. These pins are powered from the analog supply and serve as 10-bit ADC channels.

3.4 ANALOG PORTS

3.4.1 DESCRIPTION

In electronics, an analog-to-digital converter (ADC, A/D, A–D, or A-to-D) is a system that converts an analog signal, such as a sound picked up by a microphone or light entering a digital camera, into a digital signal. An ADC may also provide an isolated measurement such as an electronic device that converts an input analog voltage or current to a digital number proportional to the magnitude of the voltage or current.

In an embedded system, A/D conversion is very important as embedded systems deal with digital values; their surroundings usually occupy various analog signals. Analog signals need to be altered into digital before being treated by the microcontroller. At present, we can observe how to read an external analog signal using PIC microcontroller and exhibit the digital o/p conversion on an LCD display. The i/p signal can be a varying voltage between 0 to 5v.

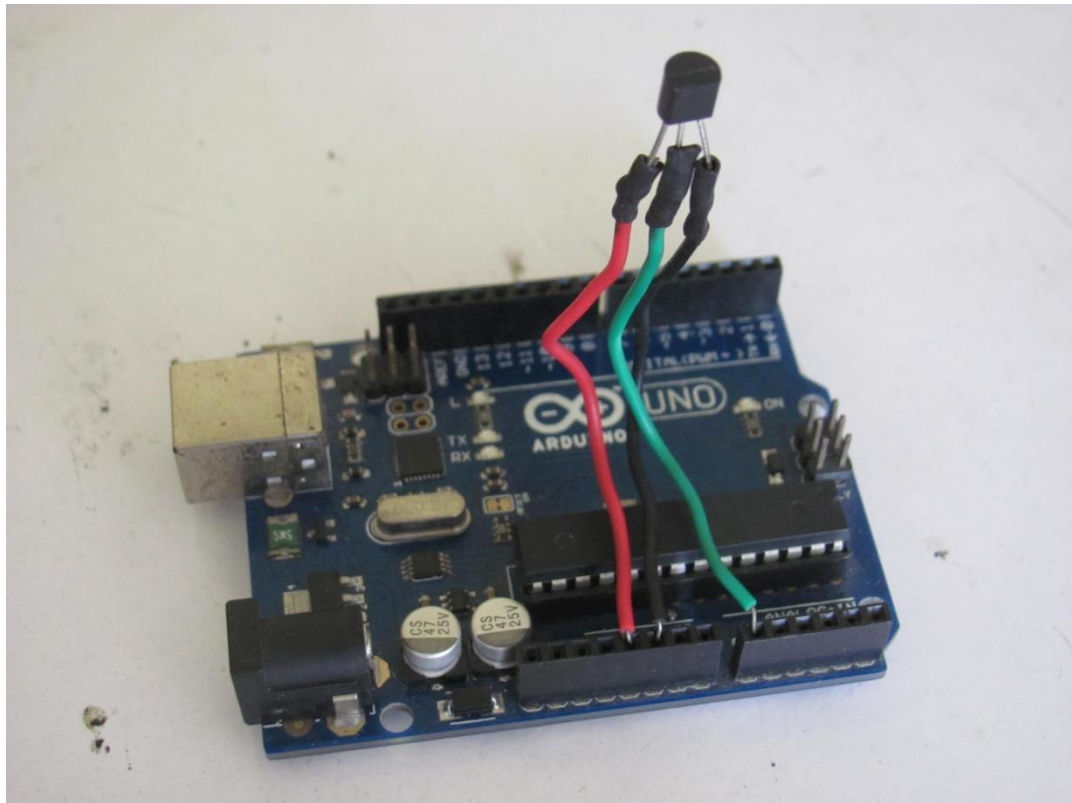


ADC Conversion

The Arduino UNO board has five analog input pins A0 through A5. These pins can read the signal from an analog sensor like the humidity sensor or temperature sensor and convert it into a digital value that can be read by the microprocessor.

In the world of Arduino an Analog signal is simply a signal that can be HIGH (on), LOW (off) or anything in between these two states. This means an Analog signal has a voltage value that can be anything between 0V and 5V (unless you mess with the Analog Reference pin). Analog allows you to send output or receive input about devices that run at percentages as well as on and off. The Arduino does this by sampling the voltage signal sent to these pins and comparing it to a voltage reference signal (5V). Depending on the voltage of the Analog signal when compared to the Analog Reference signal the Arduino then assigns a numerical value to the signal somewhere between 0 (0%) and 1023 (100%).

The digital system of the Arduino can then use this number in calculations and sketches.



TEMPERATURE SENSOR INTERFACE WITH ARDUINO

To receive Analog Input the Arduino uses Analog pins # 0 - # 5. These pins are designed for use with components that output Analog information and can be used for Analog Input. There is no setup necessary, and to read them use the command: `analogRead(pinNumber);` where `pinNumber` is the Analog In pin to which the the Analog component is connected. The `analogRead` command will return a number including or between 0 and 1023.

3.4.2 AREF PIN

DESCRIPTION

AREF means **A**nalogue **RE**ference. It allows us to feed the Arduino a reference voltage from an external power supply. For example, if we want to measure voltages with a maximum range of 3.3V, we would feed a nice smooth 3.3V into the AREF pin – perhaps from a voltage regulator IC. Then the each step of the ADC would represent 3.22 millivolts.



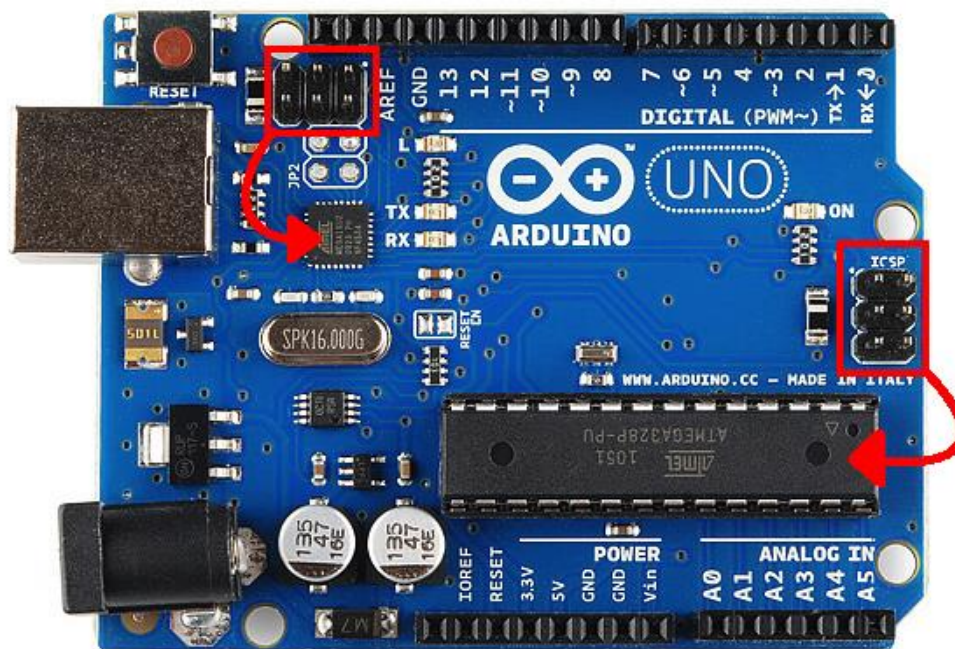
3.4.3 ANALOG REFERENCE PIN IN ARDUINO

- **DEFAULT:** the default analog reference are 5V or 3.3V;
- **INTERNAL:** an built-in reference, equal to 1.1 volts on the ATmega168 or ATmega328 and 2.56 volts on the ATmega8 and Atmega32u4;
- **INTERNAL1V1:** built-in 1.1V reference;
- **INTERNAL2V56:** built-in 2.56V reference;
- **EXTERNAL:** use as reference the voltage applied to AREF pin in the range 0-5V only.

3.4.4 ICSP PORTS

DESCRIPTION

In-system programming (ISP), also called In-Circuit Serial Programming (ICSP), is the ability of some programmable logic devices, microcontrollers, and other embedded devices to be programmed while installed in a complete system, rather than requiring the chip to be programmed prior to installing it into the system



ARDUINO ICSP PIN'S

The primary advantage of this feature is that it allows manufacturers of electronic devices to integrate programming and testing into a single production phase, and save money, rather than requiring a separate programming stage prior to assembling the system. This may allow manufacturers to program the chips in their own system's production line instead of buying preprogrammed chips from

a manufacturer or distributor, making it feasible to apply code or design changes in the middle of a production run.

Microcontrollers are typically soldered directly to a printed circuit board and usually do not have the circuitry or space for a large external programming cable to another computer.

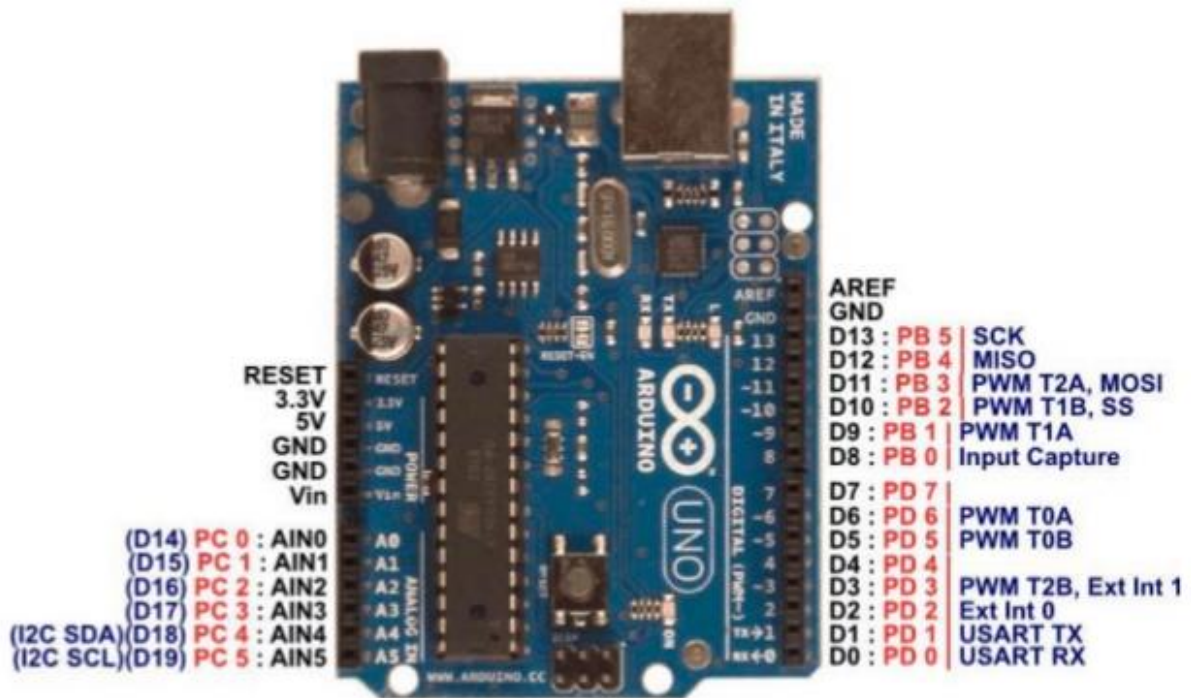
Typically, chips supporting ISP have internal circuitry to generate any necessary programming voltage from the system's normal supply voltage, and communicate with the programmer via a serial protocol. Most programmable logic devices use a variant of the JTAG protocol for ISP, in order to facilitate easier integration with automated testing procedures. Other devices usually use proprietary protocols or protocols defined by older standards. In systems complex enough to require moderately large glue logic, designers may implement a JTAG-controlled programming subsystem for non-JTAG devices such as flash memory and microcontrollers, allowing the entire programming and test procedure to be accomplished under the control of a single protocol.

3.4.5 I/O PORTS

DESCRIPTION

Input/output port. Alternatively referred to as I/O address, I/O ports, and I/O port address, the input/output port is what allows the software drivers to communicate with hardware devices on your computer. In your computer there are 65,535 ports that are numbered from 0000h to FFFFh

General-purpose input/output (GPIO) is a generic pin on an integrated circuit or computer board whose behavior including whether it is an input or output pin is controllable by the user at run time.



ANALOG PIN DETAILS

GPIO pins have no predefined purpose, and go unused by default.^{[1][2]} The idea is that sometimes a system integrator who is building a full system might need a handful of additional digital control lines and having these available from a chip avoids having to arrange additional circuitry to provide them. For example, the Realtek ALC260 chips (audio codec) have 8 GPIO pins, which go unused by default. Some system integrators (Acer Inc. laptops) use the first GPIO (GPIO0) on the ALC260 to turn on the amplifier for the laptop's internal speakers and external headphone jack.

GPIO capabilities may include

- GPIO pins can be configured to be input or output
- GPIO pins can be enabled/disabled
- Input values are readable (typically high or low)

- Output values are writable/readable
- Input values can often be used as IRQs (typically for wakeup events)

GPIO peripherals vary widely. In some cases, they are simply a group of pins that can switch as a group to either input or output. In others, each pin can be set up to accept or source different logic voltages, with configurable drive strengths and pull ups/downs. Input and output voltages are typically though not always limited to the supply voltage of the device with the GPIOs, and may be damaged by greater voltages.

A GPIO pin's state may be exposed to the software developer through one of a number of different interfaces, such as a memory mapped peripheral, or through dedicated IO port instructions. Some GPIOs have 5 V tolerant inputs: even when the device has a low supply voltage (such as 2 V), the device can accept 5 V without damage.

3.4.6 PWM PIN'S

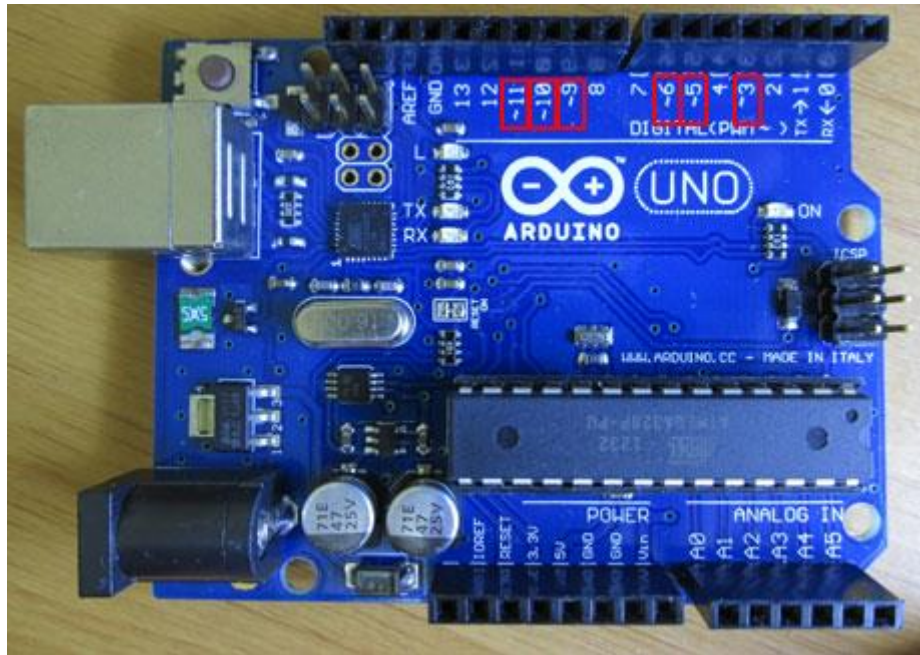
DESCRIPTION

PWM stands for Pulse Width Modulation, which in itself is not very useful if you don't know what modulation is. In the electronics world, modulation is the technique of superimposing information on a high speed signal or carrier.

average wattage. a number of APV's use pulse width to regulate power down below the battery's supplied voltage, since most lipo packs and all 18650 style batteries output 3.7 volts at a nominal charge level. ... DC-DC is a flat signal.



Pulse width modulation (PWM) is a fancy term for describing a type of digital signal. Pulse width modulation is used in a variety of applications including sophisticated control circuitry. A common way we use them here at SparkFun is to control dimming of RGB LEDs or to control the direction of a servo motor.



PWM PIN'S ARDUINO

Pulse Width Modulation, or PWM, is a technique for getting analog results with digital means. Digital control is used to create a square wave, a signal switched between on and off. This on-off pattern can simulate voltages in between full on (5 Volts) and off (0 Volts) by changing the portion of the time the signal spends on versus the time that the signal spends off. The duration of "on time" is called the pulse width. To get varying analog values, you change, or modulate, that pulse width. If you repeat this on-off pattern fast enough with an LED for example, the result is as if the signal is a steady voltage between 0 and 5v controlling the brightness of the LED.

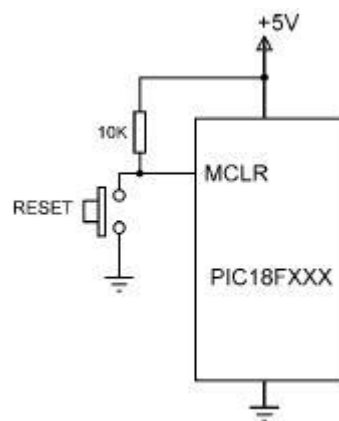
In the graphic below, the green lines represent a regular time period. This duration or period is the inverse of the PWM frequency. In other words, with Arduino's PWM frequency at about 500Hz, the green lines would measure 2 milliseconds each. A call to `analogWrite()` is on a scale of 0 - 255, such that `analogWrite(255)` requests a 100% duty cycle (always on), and `analogWrite(127)` is a 50% duty cycle (on half the time) for example.

3.4.7 RESET BUTTON

DESCRIPTION

The first circuit pulls the RESET pin low to enable the chip. The second circuit is the same, but with a reset button. If you press that, the chip will get reset. When the 5V power is switched on, the capacitor shorts to 5V, and then gradually the RC circuit discharges to bring the reset pin to 0.

A power-on reset (PoR) generator is a microcontroller or microprocessor peripheral that generates a reset signal when power is applied to the device. It ensures that the device starts operating in a known state.



CIRCUIT DIAGRAM FOR RESET BUTTON CONNECT WITH CONTROLLER

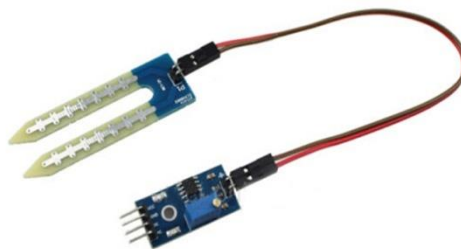
A power-on reset (PoR) is a circuit that provides a predictable, regulated voltage to a microprocessor or microcontroller with the initial application of power. A PoR system can be a peripheral, but in sophisticated processors or controllers the PoR is integrated on the main chip.

3.5 SOIL MOISTURE SENSOR

3.5.1 DESCRIPTION

The SparkFun Soil Moisture Sensor is a simple breakout for measuring the moisture in soil and similar materials. The soil moisture sensor is pretty straight forward to use. The two large exposed pads function as probes for the sensor, together acting as a variable resistor. The more water that is in the soil means the better the conductivity between the pads will be and will result in a lower resistance, and a higher SIG out.

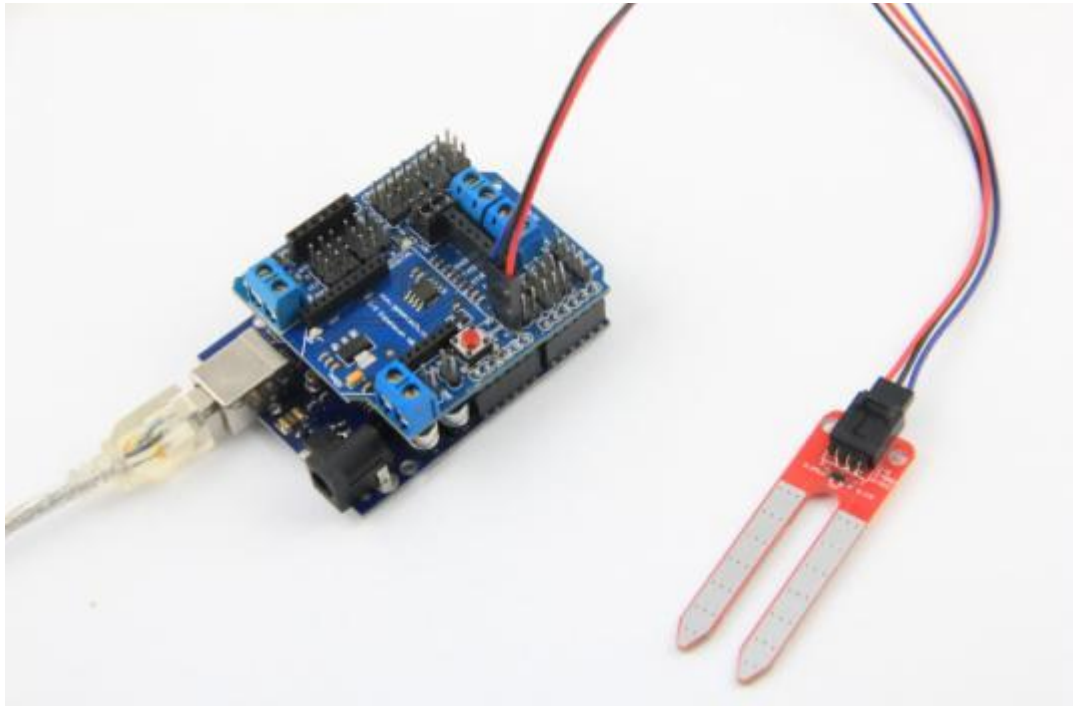
This sensor can be used to test the moisture of soil, when the soil is having water shortage, the module output is at high level, and else the output is at low level. By using this sensor one can automatically water the flower plant, or any other plants requiring automatic watering technique. Module dual output mode, digital output is simple, analog output more accurate.



SOIL MOISTURE SENSOR

Soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and

weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.



SOIL MOISTURE SENSOR INTERFACE WITH CONTROLLER

The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.

3.5.2 FEATURES

- Input voltage: 5v

- Output voltage:0-5v
- Output: Analog.
- Sensitivity adjustable.
- Threshold level can be configured.
- Module triple output mode, digital, analog, serial outputs.

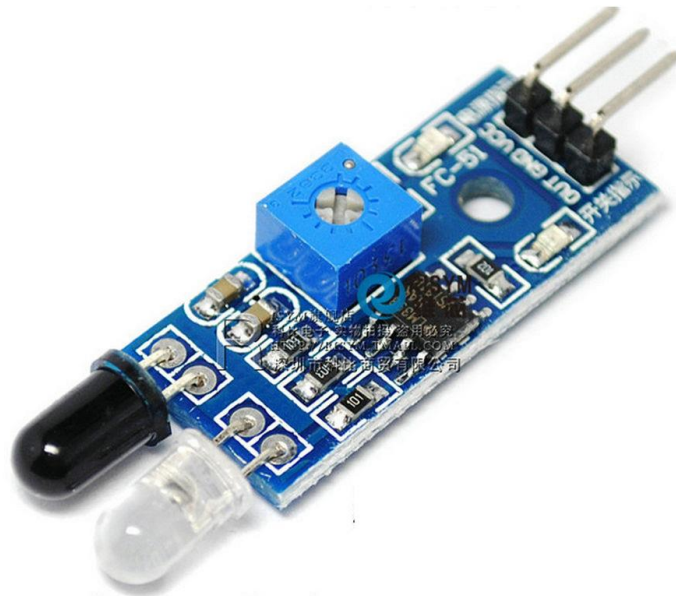
3.5.3 APPLICATIONS

- Agriculture
- Landscape irrigation.
- Research
- Simple sensor for Gardeners.

3.6 IR SENSOR

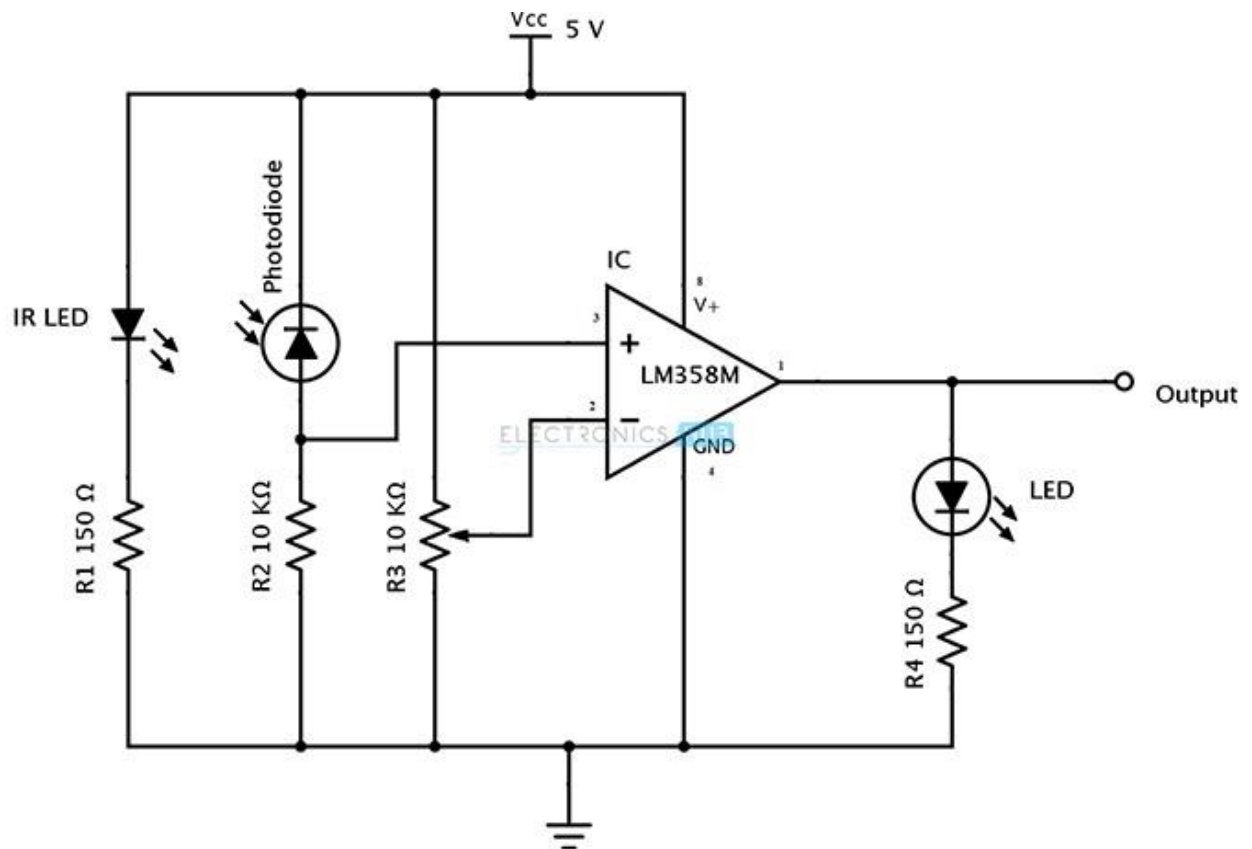
3.6.1 DESCRIPTION

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor.



IR SENSOR

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes, that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, The resistances and these output voltages, change in proportion to the magnitude of the IR light received.



3.6.2 CIRCUIT DIAGRAM

3.6.3 FEATURES

- Input voltage : 3.3v
- Output : analog

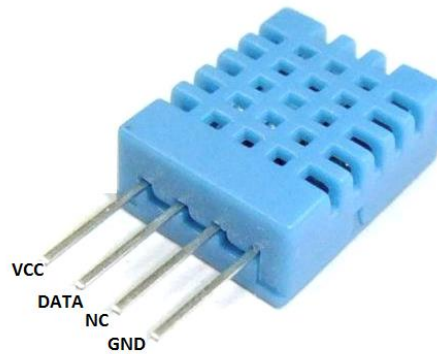
3.6.4 APPLICATION

- Radiation Thermometers
- Flame Monitor
- Moisture Analyzers
- Gas Analyzers

3.7 HUMIDITY SENSOR

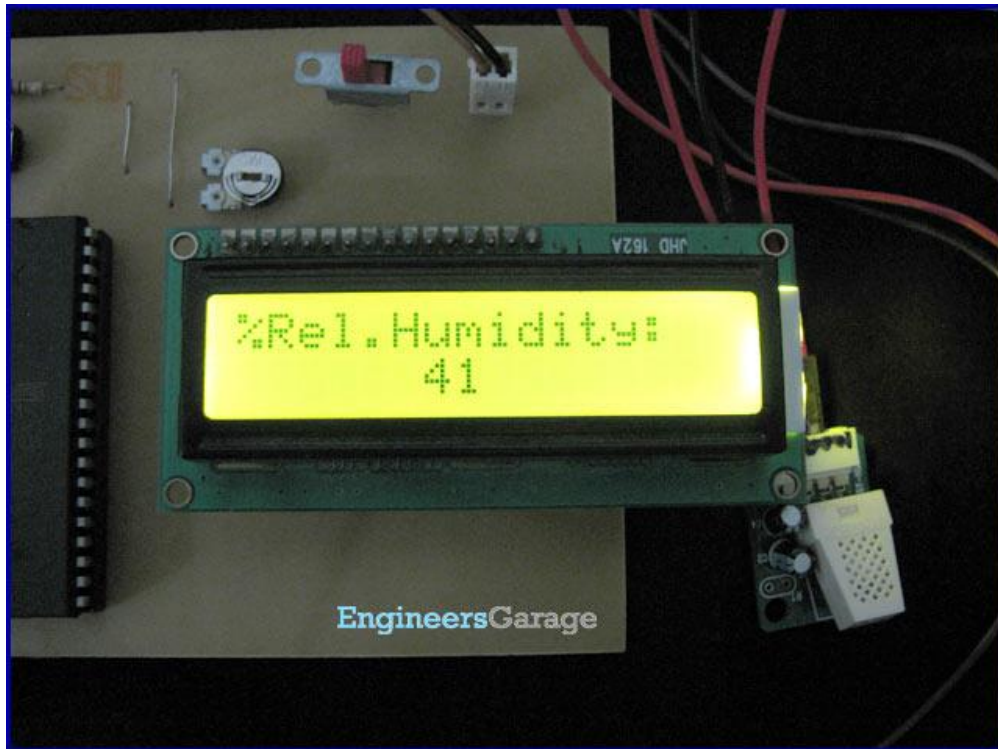
3.7.1 DESCRIPTION

A humidity sensor (or hygrometer) senses, measures and reports the relative humidity in the air. It therefore measures both moisture and air temperature. Relative humidity is the ratio of actual moisture in the air to the highest amount of moisture that can be held at that air temperature.



HUMIDITY SENSOR

A humidity sensor senses, measures both moisture and air temperature. The sensor is composed of two metal plates and contains a non-conductive polymer film between them. This film collects moisture from the air, which causes the voltage between the two plates to change. These voltage changes are converted into digital readings showing the level of moisture in the air.



HUMIDITY INTERFACING WITH MICROCONTROLLER

Humidity measurement can be done using electronic hygrometers. Electronic type hygrometers or humidity sensors can be broadly divided into two categories namely capacitive sensing effects and resistive sensing effects. Resistive type humidity sensors pick up changes in the resistance value of the sensor element in response to the change in the humidity. Thick film conductor of precious metals like gold, ruthenium oxide is printed and culminated in the shape of the comb to form an electrode. Then a polymeric film is applied on the electrode; the film acts as a humidity sensing film due to the existence of movable ions. Change in impedance occurs due to the change in the number of movable ions.

3.7.2 FEATURES

- Input Voltage: 5v

- Output: Analog (0-5v)
- High Performance
- Long Term Stability
- Close tolerances
- Low cost

3.7.3 APPLICATIONS

- Air conditioners
- Climate control for green houses
- Storage and warehouses
- Meteorological applications

3.8 ULTRASONIC SENSOR

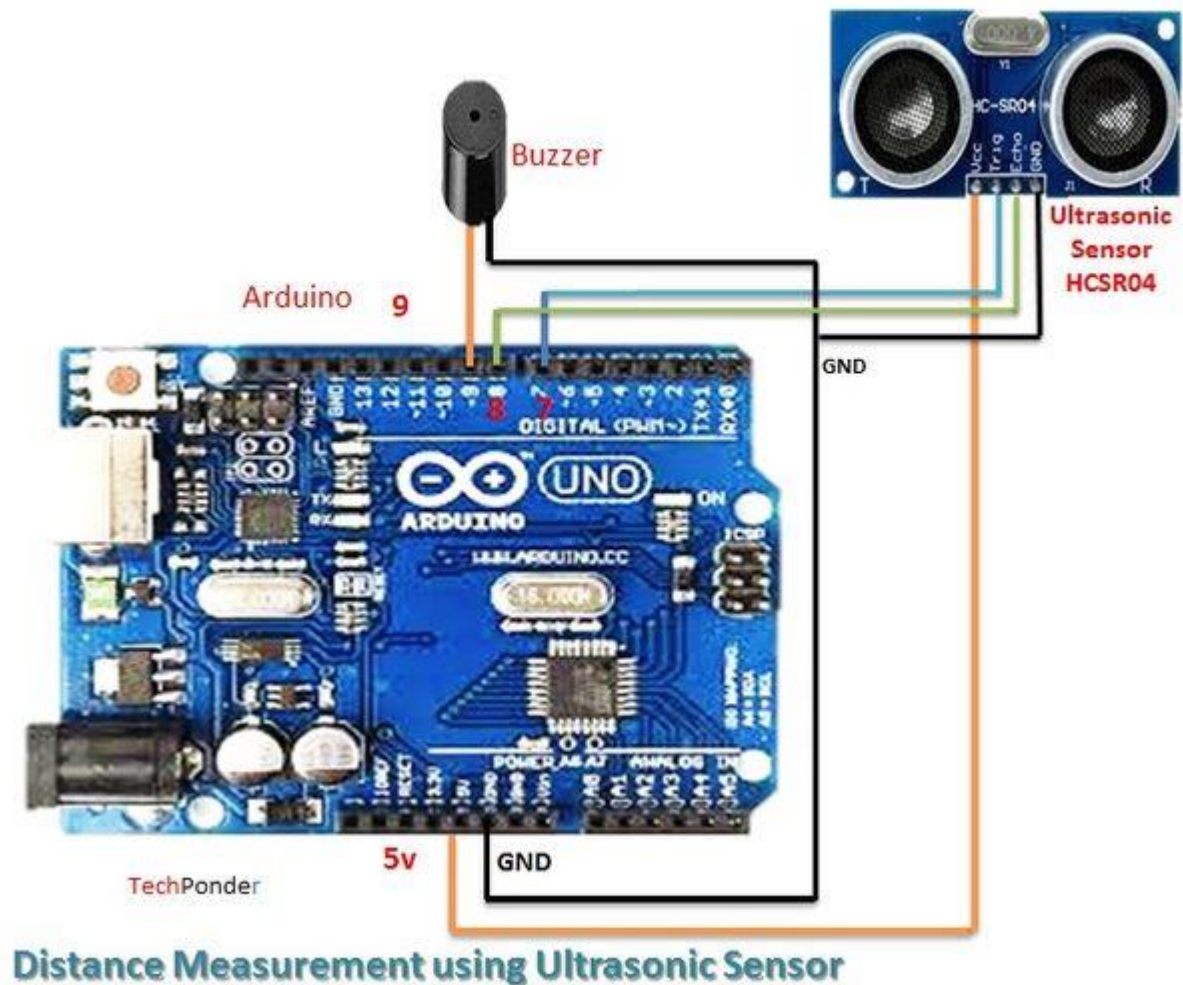
3.8.1 DESCRIPTION

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.



ULTRASONIC SENSOR

Ultrasonic sensor emit ultrasonic pulses, and by measuring the time of ultrasonic pulse reaches the object and back to the transducer. The sonic waves emitted by the transducer are reflected by an object and received back in the transducer. After having emitted the sound waves, the ultrasonic sensor will switch to receive mode. The time elapsed between emitting and receiving is proportional to the distance of the object from the sensor.



ULTRASONIC SENSOR INTERFACE WITH ARDUINO

Ultrasonic transmitter emitted an ultrasonic wave in one direction and started timing when it launched. Ultrasonic spread in the air and would return immediately when it encountered obstacles on the way. At last the ultrasonic receiver would stop timing when it receives the reflected wave. The distance of sensor from the target object is calculated. It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package. Its operation is not affected by sunlight or black material. The supply voltage to the sensor is 5VDC. The sensor has two pins namely trig and echo which is connected to the controller to give digital input.

3.8.2 FEATURES

- Working Voltage: 5VDC
- Quiescent Current : 2Ma
- Working Current: 15mA
- Detecting Range: 2cm - 4.5m
- Trigger Input Pulse width: 10uS

3.8.3 APPLICATIONS

- Robot navigation
- Obstacle avoidance
- Engineering measurement tools
- Industrial control system

3.9 BUZZER

3.9.1 DESCRIPTION

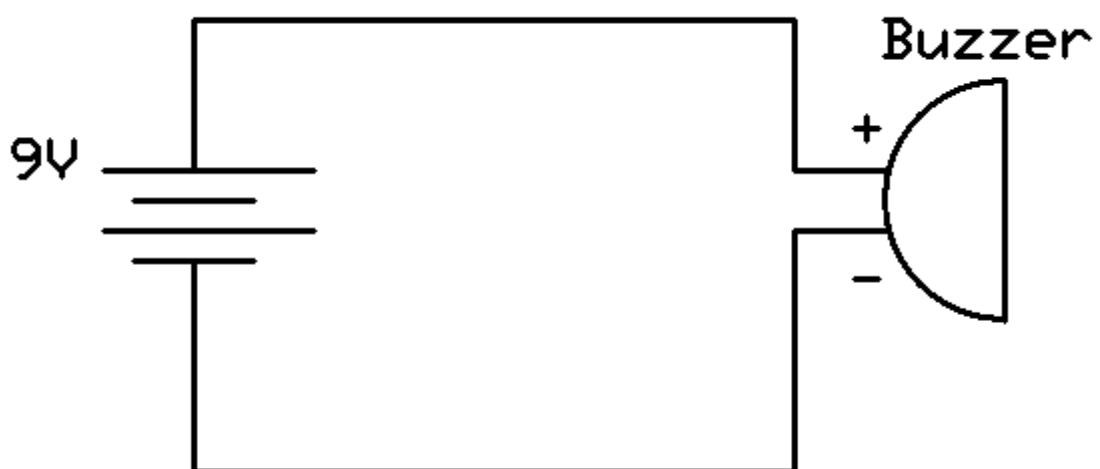
A buzzer or beeper is a signaling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows.

BUZZER

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or key stroke.



Buzzer is an integrated structure of electronic transducers, DC power supply, widely used in computers, printers, copiers, alarms, electronic toys, automotive electronic equipment, telephones, timers and other electronic products for sound devices. Active buzzer 5V Rated power can be directly connected to a continuous sound, this section dedicated sensor expansion module and the board in combination, can complete a simple circuit design, to "plug and play."



3.9.2 CIRCUIT DIAGRAM

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

It generates consistent single tone sound just by applying D.C voltage. Using a suitably designed resonant system, this type can be used where large sound volumes are needed. At Future Electronics we stock many of the most common types categorized by Type, Sound Level, Frequency, Rated Voltage, Dimension and Packaging Type.

3.9.3 FEATURES

- Input supply: 5 VDC
- Current consumption: 9.0 mA max.
- Oscillating frequency: 3.0 ± 0.5 KHz
- Sound Pressure Level: 85dB min

3.9.4 APPLICATIONS

- Confirmation of user input (ex: mouse click or keystroke)
- Electronic metronomes
- Sporting events
- Judging Panels
- Annunciator panels

3.10 SINGLE CHANEL RELAY

3.10.1 DESCRIPTION

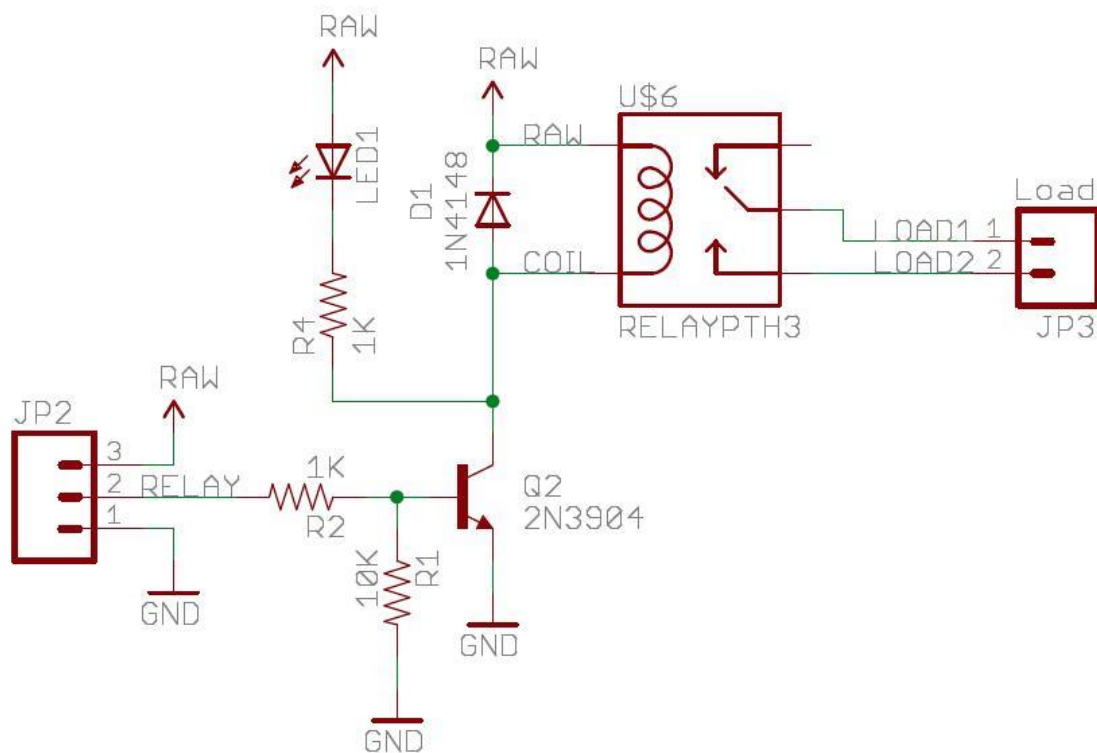
A relay is an electrically operated device. It has a control system and (also called input circuit or input contactor) and controlled system (also called output circuit or output contactor). It is frequently used in automatic control circuit.

Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. ... When a relay contact is Normally Closed (NC), there is a closed contact when the relay is not energized.



SINGLE CHANNEL RELAY

Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits. They were used to switch the signal coming from one source to another destination. The high end applications of relays require high power to be driven by electric motors and so on. Such relays are called contactors.



3.10.2 CIRCUIT DIAGRAM

A relay is an electromechanical switch which is activated by an electric current. A single relay board arrangement contains driver circuit, power supply circuit and isolation circuit. A relay is assembled with that circuit. The driver circuit contains transistors for switching operations. The transistor is use for switching the relay. An isolation circuit prevents reverse voltage from the relay which protects the controller and transistor from damage. The input pulse for switching the transistor is given from the microcontroller unit. It is used for switching of a single device.

3.10.3 FEATURES

- Input voltage: 12VDC

- Driver unit: ULN2003A
- Isolation unit: In4007
- Fast switching

3.10.4 APPLICATIONS

- Ac load Switching applications
- Dc load Switching applications
- Motor switching applications

3.11 WATER PUMP MOTOR

3.11.1 DESCRIPTION

The water pump, a container made of aluminum or iron, is part of the cooling system. It contains an impeller (looks like a fan) that circulates water and coolant throughout the cooling system, keeping the engine from overheating.

Jet pumps create suction in a rather novel way. The pump is powered by an electric motor that drives an impeller, or centrifugal pump. The impeller moves water, called drive water, from the well through a narrow orifice, or jet, mounted in the housing in front of the impeller.



WATER PUMP MOTOR

As the name implies, water pumps pump water. Whether that be in a vehicle, at a business, in the home, or in a well, shoppers can probably find a water pump to fit their vehicle or to help them draw water from the ground in a self-dug well to be used in pressure tanks within the location.

Vehicle water pumps help regulate the flow of water through a vehicle's cooling system; when the seal on these go bad, the whole pump must be replaced. Located within the home or business, pressure water pumps regulate the water pressure year round, controlling water flow to different areas of the location.

A pump motor is a DC motor device that moves fluids. A DC motor converts direct current electrical power into mechanical power. DC or direct current motor works on the principal, when a current carrying conductor is placed in a magnetic field, it experiences a torque and has a tendency to move. This is known as motoring action.

Pumps operate by some mechanism (typically reciprocating or rotary), and consume energy to perform mechanical work by moving the fluid. Pumps operate via many energy sources, including manual operation, electricity, engines, or

wind power, come in many sizes, from microscopic for use in medical applications to large industrial pumps

3.11.2 FEATURES

- Reduced noise
- Available in DC and AC
- Supply voltage: +12VDC
- Supply voltage: 230V AC

3.11.3 APPLICATIONS

- Priming a pump
- To pump water supply, including pneumatic systems and in places where no
- suction lift is required Pump motor as public water supply
- In domestic water supply system

CHAPTER 4

4. SOFTWARE DESCRIPTION:

4.1 ARDUINO IDE:

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

Programs written using Arduino Software (IDE) are called **sketches**. These sketches are written in the text editor and are saved with the file extension `.ino`. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom righthand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

Before uploading your sketch, you need to select the correct items from the **Tools** > **Board** and **Tools** > **Port** menus. The boards are described below. On the Mac, the serial port is probably something like `/dev/tty.usbmodem241` (for an Uno or Mega2560 or Leonardo) or `/dev/tty.usbserial-1B1` (for a Duemilanove or earlier USB board), or `/dev/tty.USA19QW1b1P1.1` (for a serial board connected with a Keyspan USB-to-Serial adapter). On Windows, it's probably COM1 or COM2 (for a serial board) or COM4, COM5, COM7, or higher (for a USB board) - to find out, you look for USB serial device in the ports section of the Windows Device Manager. On Linux, it should be `/dev/ttyACMx`, `/dev/ttyUSBx` or similar. Once you've selected the correct

serial port and board, press the upload button in the toolbar or select the **Upload** item from the **Sketch** menu. Current Arduino boards will reset automatically and begin the upload. With older boards (pre-Diecimila) that lack auto-reset, you'll need to press the reset button on the board just before starting the upload. On most boards, you'll see the RX and TX LEDs blink as the sketch is uploaded. The Arduino Software (IDE) will display a message when the upload is complete, or show an error.

When you upload a sketch, you're using the Arduino **bootloader**, a small program that has been loaded on to the microcontroller on your board. It allows you to upload code without using any additional hardware. The bootloader is active for a few seconds when the board resets; then it starts whichever sketch was most recently uploaded to the microcontroller. The bootloader will blink the on-board (pin 13) LED when it starts (i.e. when the board resets).

4.2 EMBEDDED C:

Embedded C is a set of language extensions for the C programming language by the C Standards Committee to address commonality issues that exist between C extensions for different embedded systems.

Embedded C is a set of language extensions for the C programming language by the C Standards Committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations

An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. It is embedded as part of a complete device often

including hardware and mechanical parts. Embedded systems control many devices in common use today. Ninety-eight percent of all microprocessors are manufactured as components of embedded systems.

Examples of properties of typical embedded computers when compared with general-purpose counterparts are low power consumption, small size, rugged operating ranges, and low per-unit cost. This comes at the price of limited processing resources, which make them significantly more difficult to program and to interact with. However, by building intelligence mechanisms on top of the hardware, taking advantage of possible existing sensors and the existence of a network of embedded units, one can both optimally manage available resources at the unit and network levels as well as provide augmented functions, well beyond those available. For example, intelligent techniques can be designed to manage power consumption of embedded systems.

Modern embedded systems are often based on microcontrollers (i.e. CPU's with integrated memory or peripheral interfaces), but ordinary microprocessors (using external chips for memory and peripheral interface circuits) are also common, especially in more-complex systems. In either case, the processor(s) used may be types ranging from general purpose to those specialized in certain class of computations, or even custom designed for the application at hand. A common standard class of dedicated processors is the digital signal processor (DSP).

Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

Embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, and largely complex systems like hybrid vehicles, MRI, and avionics. Complexity

varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

CHAPTER 5

5. CONCLUSION:

The Automated Irrigation and animal intrusion System based on microcontroller controls and monitors all the drip irrigation system and animal intrusion detection activities efficiently. The proposed System is a valuable tool for accurate soil moisture control in highly specialized greenhouse vegetable production and it is a precise simple method of irrigation. The proposed system helps in automatic adjusting of moisture levels; time saving that leads to good profit for farmers. The animal intrusion system provides the safety of the farm field.

The project “electric fencing for irrigation of animal-man conflict is designed such that it can be installed on any surface.

- ✚ It is much easy and cost effective than increasing the height of the wall.
- ✚ The project is easily expandable and can be used by farmer to increase the security of the land from animals, and compatible with all types of additional security gadgets

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