SMART BOTTLE

4-Week Summer Internship Program

SVECW-AICTE IDEA LAB

Submitted by

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VISHNU
UNIVERSAL LEARNING

SHRI VISHNU ENGINEERING COLLEGE FOR WOMEN

(Approved by AICTE, New Delhi, Affiliated to JNTUK)

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CERTIFICATE

This is to certify that the thesis entitled, **"SMART BOTTLE"** is being submitted by **Y.L.SOWMYA (22B01A45C6), K.ANUSHA (22B01A0443), B.J.NANDINI(22B05A1201)** during 4-Week Summer Internship Program offered by SVECW-AICTE Idea Lab, Shri Vishnu Engineering College for Women (Autonomous), Bhimavaram is a record of Bonafide work done by them under our guidance and supervision.

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DECLARATION

We are the students of Shri Vishnu Engineering College for Women hereby declare that this project work entitled "**SMART BOTTLE PROJECT**" being submitted to the SVECW(A) affiliated to JNTU, Kakinada during 4-Week Summer Internship Program offered by SVECW-AICTE Idea Lab, Shri Vishnu Engineering College for Women (Autonomous), Bhimavaram. It is a record of bonafide work done by us and it has not been submitted to any other Institute or University for the award of any other degree or prize.

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SMART BOTTLE PROJECT REPORT

Project Title: SMART BOTTLE

Team Members: Y. Lakshmi Sowmya, K. Anusha,

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Date Of Submission: 6th June 2024

ABSTRACT

Effective management of fluid and electrolyte levels in hospitals is crucial for optimal patient care and operational efficiency. Current practices often rely on manual monitoring by nursing staff, making them susceptible to human error and delays. Such inefficiencies can lead to critical shortages or wastage, posing significant risks to patient health. The complexity and demands of healthcare environments necessitate a more reliable, automated solution to manage these vital resources accurately.

This project proposes an IoT-based system utilizing smart sensors to continuously monitor fluid and electrolyte levels in real-time. Data is transmitted and alerts when levels fall below predefined thresholds. This ensures timely interventions and accurate data management, enhancing patient safety and reducing the burden of manual checks on medical staff. The system aims to improve hospital efficiency and mitigate risks associated with manual monitoring, ultimately enhancing the quality of patient care.

INDEX

INTRODUCTION

Hospitals are complex environments where the timely and efficient management of resources is crucial for patient care and operational efficiency. Among the many critical resources that require constant monitoring are fluids and electrolytes. These are essential for patient treatments, including IV drips, dialysis, and other therapeutic procedures

1.Water Level Monitoring Using Water Level Sensor:

Utilizing a water level sensor, our system accurately monitors fluid levels in real-time within healthcare facilities. The sensor employs a simple yet effective mechanism to detect the presence or absence of fluid, ensuring precise measurements. As fluid levels decrease, the sensor promptly detects the change, signaling potential shortages. This real-time monitoring capability enables proactive interventions, preventing critical fluid deficits and optimizing patient care. By integrating this sensor into our IoT-based system, we can enhance the accuracy and efficiency of fluid management processes, ultimately improving healthcare outcomes.

2. Response to Fluid Level:

By continuously monitoring fluid levels through water level sensors, our system promptly reacts to fluctuations.

i.Low Fluid Level:

When the fluid level drops below a predefined threshold, indicating a potential shortage, our system triggers a series of immediate alerts. A red LED illuminates, providing a clear visual indication of the low level. Simultaneously, the system sends SMS notifications and initiates calls to notify nursing staff. Additionally, a buzzer emits an audible alarm, ensuring that the low fluid level is promptly addressed, minimizing the risk to patient safety.

ii. Medium Fluid Level:

In the case of medium fluid levels, the system employs a different response mechanism to signify an adequate but not optimal level. A yellow LED lights up, offering a visual cue that the fluid level is within an acceptable range. This visual indication alerts healthcare providers to monitor the situation closely, enabling proactive measures to prevent potential shortages.

iii. High Fluid Level:

When the fluid level reaches a high threshold, indicating an abundance of fluid, the system responds accordingly. A green LED activates to visually signify the high fluid level, indicating that additional monitoring may not be required. By promptly identifying high fluid levels, our system promotes efficient time management.

BASIC PRINCIPLE

This project integrates various components, including water sensors, GSM modules, LEDs, and buzzers, with an Arduino Uno microcontroller to monitor fluid levels and provide timely alerts. The water sensor operates on the principle of conductivity, detecting changes caused by the presence or absence of fluid. By connecting the sensor's VCC, GND, and OUT pins to the Arduino's power source, ground, and a digital input pin respectively, the Arduino can interpret the sensor's output signals to determine fluid levels.

The GSM module enhances communication by sending SMS notifications and making calls to alert healthcare personnel about fluid level changes. It is connected to the Arduino through its VCC and GND pins for power and ground, and the RX and TX pins for data transmission, ensuring seamless integration and effective communication. Additionally, LEDs connected to specific digital pins on the Arduino provide visual alerts, indicating different states or events, such as low fluid levels or successful communication through the GSM module.

To provide audible alerts, a buzzer is connected to the Arduino, with its positive leg linked to a digital pin and its negative leg to the ground. This setup allows the Arduino to control the buzzer's activation, offering additional sensory feedback alongside the visual indicators. By combining these components and programming them to interact with the Arduino Uno microcontroller, the system ensures effective monitoring of fluid levels and timely alerts, optimizing resource management and response times in healthcare facilities.

OBJECTIVES

The goal is to develop an IoT-based system that provides real-time monitoring of fluid and electrolyte levels in hospitals.

1.Continuous Monitoring: Real-time data on fluid and electrolyte levels are continuously monitored.

2.Reduced Risk: Minimizes the risk of errors associated with manual monitoring, enhancing patient safety and healthcare efficiency.

3.Cost-effectiveness: Offers a cost-effective solution for fluid level monitoring compared to more complex automated systems, making it accessible for healthcare facilities with limited resources.

4.Remote Monitoring: Provides remote monitoring capabilities, allowing healthcare providers to receive alerts via SMS and take action from anywhere.

5.Automated Alerts: Automated alerts are sent to the medical staff when levels are low, prompting timely interventions.

6.Operational Efficiency: Freeing up medical staff from routine checks, allowing them to focus more on direct patient care.

PROBLEM STATEMENT

Develop an IOT based system to monitor fluid and electrolyte levels in hospitals. The system alerts staff when levels are low, ensuring timely interventions for patient care.

CONTEXT:

In hospitals, the timely and efficient management of fluid and electrolyte levels is critical for patient care. Current methods often rely on manual checks, leading to potential delays and human errors. An IoT-based monitoring system can revolutionize this process by providing real-time data and automated alerts.

This system will employ smart sensors to continuously track fluid levels, sending notifications to medical staff when supplies are low. By ensuring timely interventions, this technology enhances patient safety and allows healthcare professionals to focus more on direct patient care, improving overall hospital efficiency.

BLOCK DIAGRAM
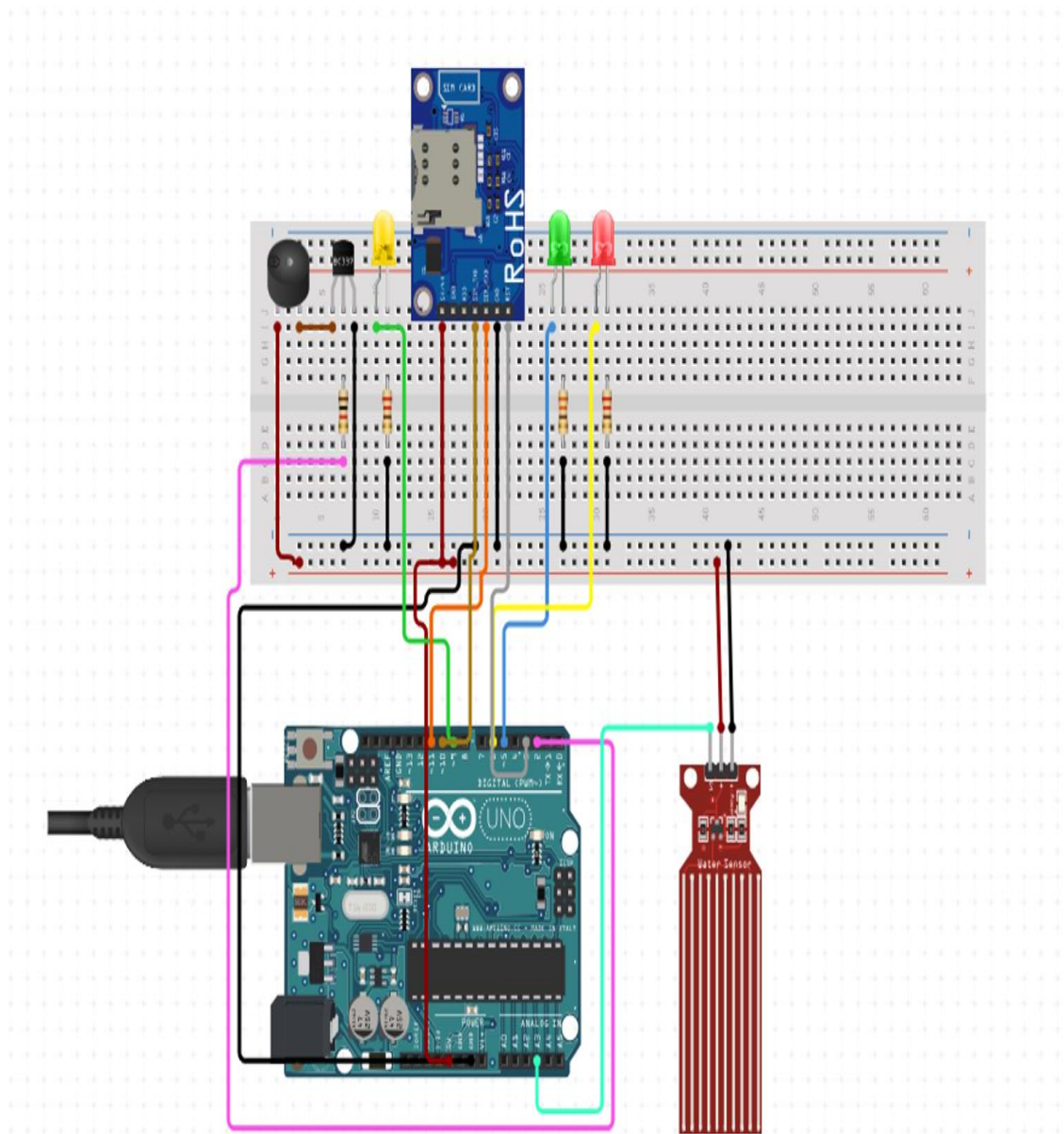
Figure – Circuit diagram of Smart Bottle

LIST OF COMPONENTS

S.NO	PARTS	QUANTITY
1	Arduino	1
2	Breadboard	1
3	Water Level Sensor	1
4	Led light	3
5	Jump Wires	10-15
6	Buzzer	1
7	GSM Module	1
8	SIM Card	1
9	Adapter	1
10	USB Cable	1

BUDGET

S.NO	PARTS	COST
1	Arduino	₹600 -₹700
2	Breadboard	₹50 - ₹60
3	Water Level Sensor	₹50 - ₹100
4	Led light	₹5- ₹10
5	Jump Wires	₹5- ₹10
6	Buzzer	₹20-₹30
7	GSM Module	₹300- ₹500
8	SIM Card	₹50
9	Adapter	₹140- ₹200
10	USB Cable	₹140- ₹200

Total Estimated Cost: Around ₹1000- ₹2000

SPECIFICATION OF COMPONENTS

ARDUINO - UNO:

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.

Pin Description:

- **Vin**: This is the input voltage pin of the Arduino board used to provide input supply from an external power source.

- **5V**: This pin of the Arduino board is used as a regulated power supply voltage and it is used to give supply to the board as well as onboard components.

- **3.3V:** This pin of the board is used to provide a supply of 3.3V which is generated from a voltage regulator on the board

- **GND:** This pin of the board is used to ground the Arduino board.

- **Reset:** This pin of the board is used to reset the microcontroller. It is used to Resets the microcontroller.

- **Analog Pins:** The pins AO to A5 are used as an analog input and it is in the range of 0-5V.

- **Digital Pins**: The pins 0 to 13 are used as a digital input or output for the Arduino board.

- **Serial Pins:** These pins are also known as a UART pin.It is used for communication between the Arduino board and a

computer or other devices. The transmitter pin number 1 and receiver pin number 0 is used to transmit and receive the data resp.

- **External Interrupt Pins**: This pin of the Arduino board is used to produce the External interrupt and it is done by pin numbers 2 and 3.

- **PWM Pins**: This pins of the board is used to convert the digital signal into an analog by varying the width of the Pulse. The pin numbers 3,5,6,9,10 and 11 are used as a PWM pin.
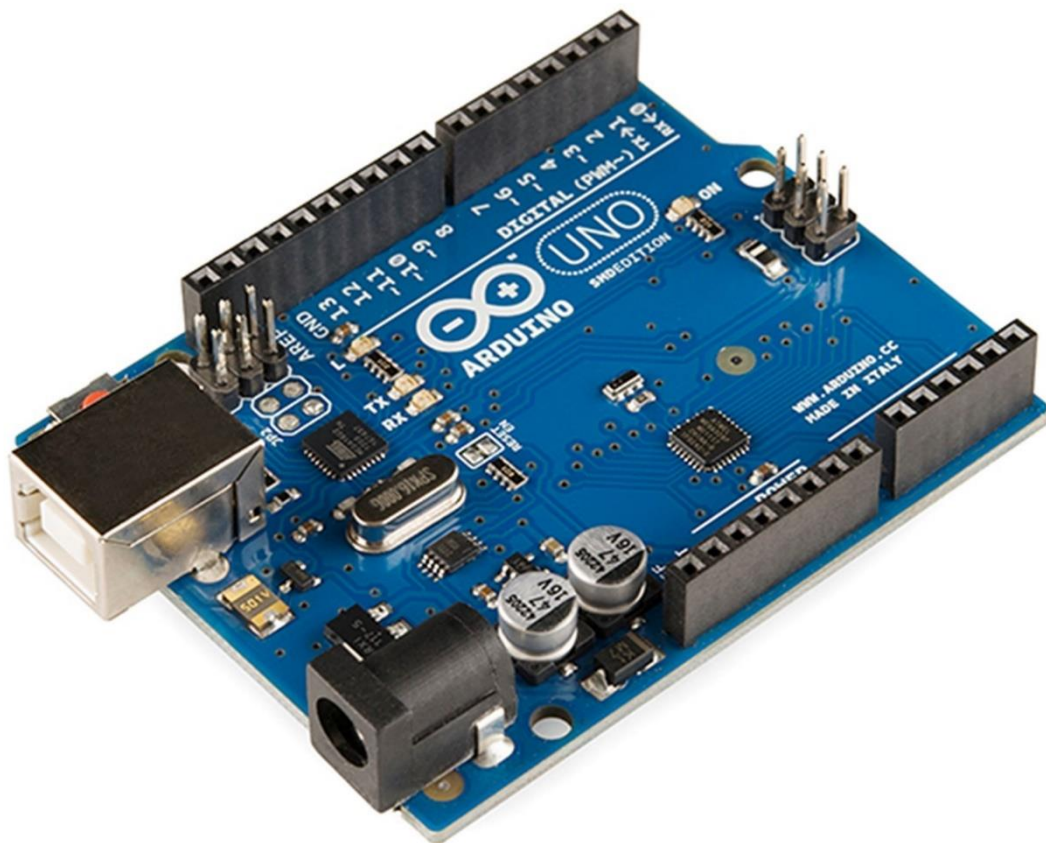

Figure – Arduino-uno

WATER LEVEL SENSOR:

The water level sensor is extremely simple to use and only requires three pins to connect.

- **S (signal)**: It is an analog output pin that will be connected to one of your Arduino's analog inputs.

- **+(Vcc) pin:** It provides power to the sensor. It is recommended that the sensor be powered from 3.3V to 5V. Please keep in mind that the analog output will vary depending on the voltage supplied to the sensor.

- **– (GND)** : It is the ground pin.
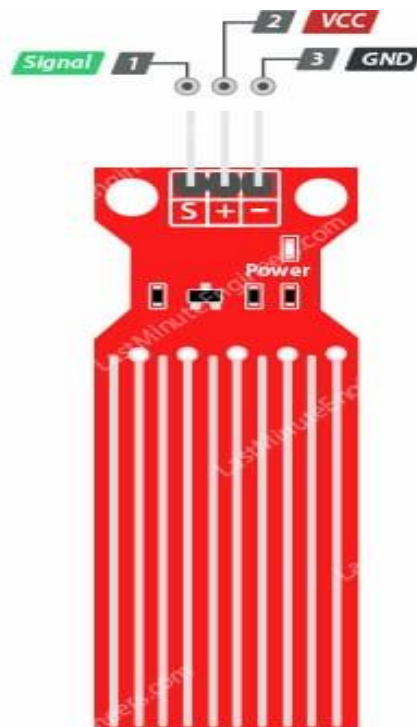
FIGURE – WATER LEVEL SENSOR

GSM MODULE:

GSM 900 module allows devices to communicate over the GSM network, enabling functionalities like voice calls, SMS, and data transmission.

- **AT Commands:** The module is controlled using AT commands, which are simple text-based instructions sent from a microcontroller or computer.

- **Versatile Applications:** It is widely used in various applications including remote monitoring, SMS-based alert systems, and wireless data transfer.

- **Power and Antenna:** The module typically requires a stable power supply and an external antenna to ensure reliable network connectivity and performance.
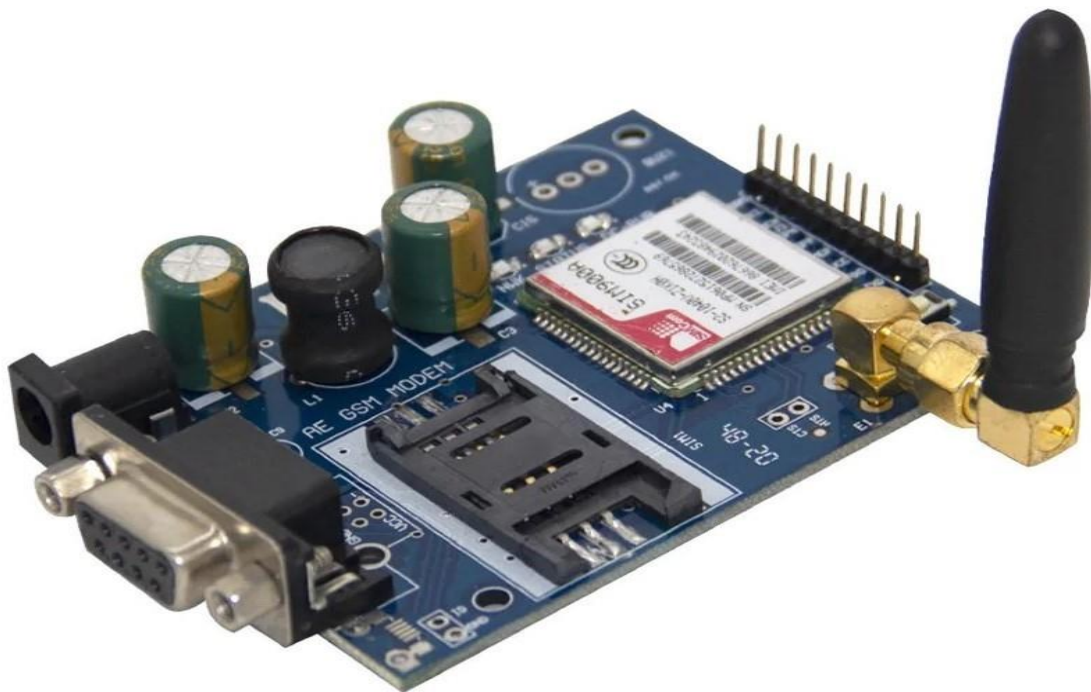
Figure – GSM MODULE 900A

BREADBOARD

A breadboard is a handy tool used in electronics for building and testing circuits without the need for soldering.

- It's like a temporary platform where you can plug in electronic components and wires to quickly prototype your ideas.
- With rows and columns of interconnected metal strips beneath the surface, it provides a convenient way to create circuits by simply inserting components and making connections using jumper wires.
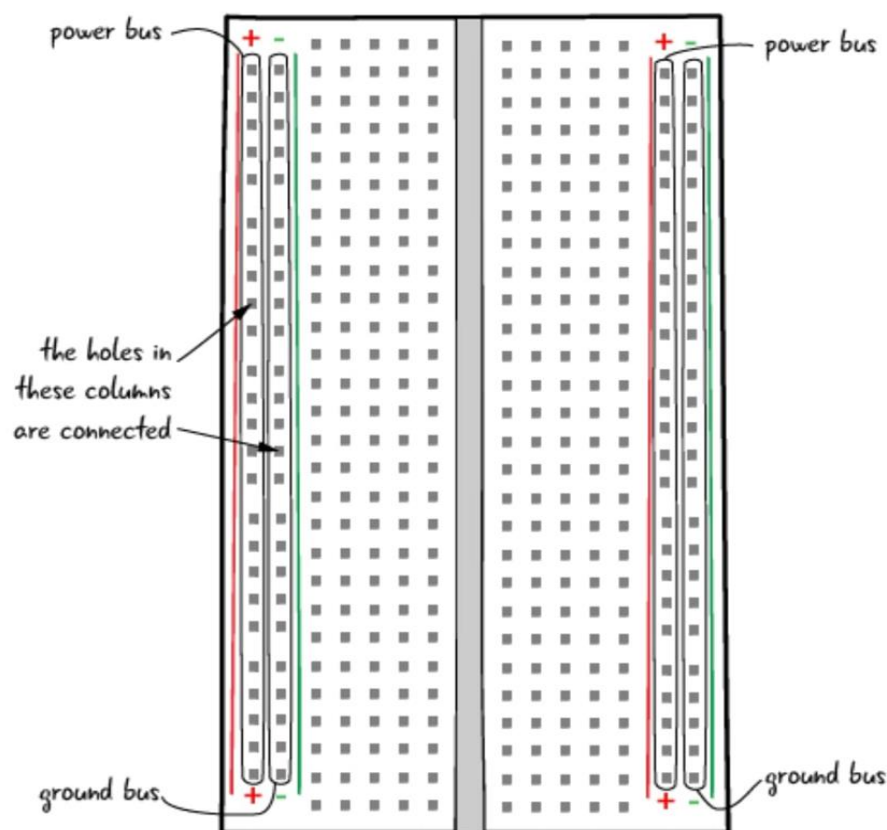

Figure – BREADBOARD

LED(Light-Emitting Diode):

LEDs are semiconductor devices that emit light when an electric current passes through them in the forward direction, converting electrical energy into light energy.

- **Energy Efficiency**: LEDs are highly efficient light sources, converting a large portion of electrical energy into visible light, resulting in reduced energy consumption and lower electricity bills.

- **Long Lifespan:** With lifespans ranging from tens of thousands to hundreds of thousands of hours, LEDs offer long-lasting illumination, reducing the need for frequent replacement and maintenance.
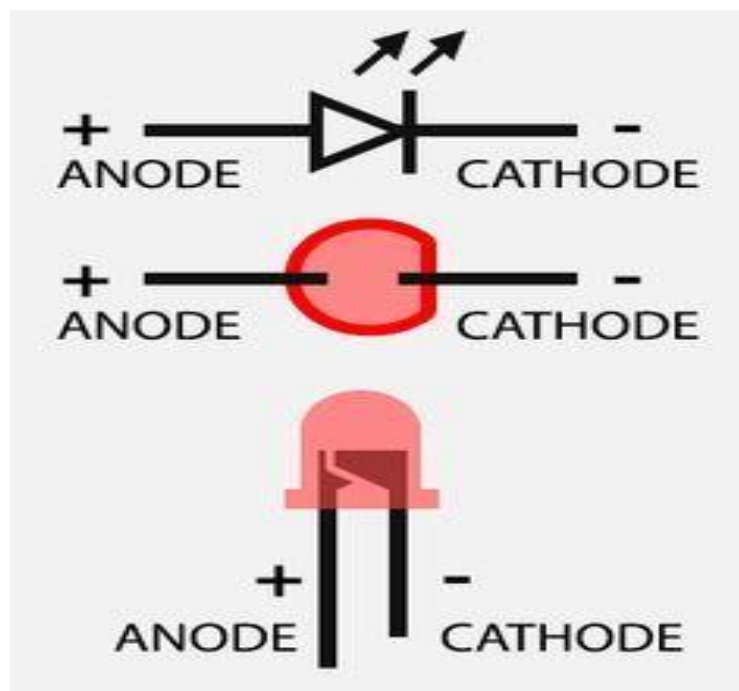
Figure – LED

BUZZER:

A buzzer is an electronic sound-producing device that generates audible tones or alerts when an electric current is passed through it, causing a metal or plastic diaphragm to vibrate and produce sound waves.

Buzzer integration in IoT projects offers a versatile audio notification solution, enhancing the system's ability to communicate with users in real-time.

Pin Description:

Pin1: It is a VCC pin. It is used to connect 5V to the piezo buzzer.

Pin2: It is a GND pin. It is used to connect GND

Alerts and Notification: Buzzers serve as audible indicators to alert users about critical events, such as security breaches, environmental changes, or system malfunctions. For instance, in smart home applications, buzzers can notify occupants of intrusions, fire alarms, or gas leaks.

Figure – Buzzer

ARDUINO IDE

The Arduino Integrated Development Environment (IDE) is a software platform used for programming and developing applications for Arduino microcontroller boards.

- It provides a user-friendly interface for writing, compiling, and uploading code to Arduino boards

- **Code Editor** : The editor includes syntax highlighting, code folding, and auto-completion to enhance coding efficiency.

- **Compiler and Uploader** : Translate code into machine language and upload it to the Arduino board.
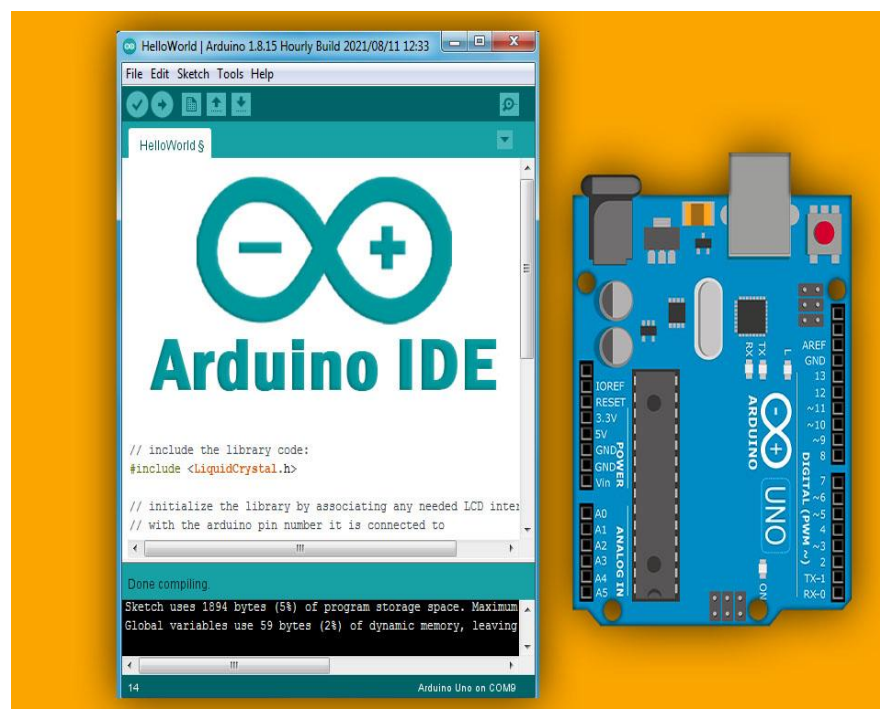
Figure – Arduino-IDE

WORKING:

The project operates by utilizing the Arduino Uno microcontroller as the central hub to coordinate the functionalities of the interconnected components. Initially, upon system startup, the Arduino initializes its digital pins and establishes communication channels with the water sensor, GSM module, buzzer, and LEDs. This initialization phase ensures that all components are ready to receive and transmit data effectively.

Subsequently, the water sensor continuously monitors the fluid level in the designated area, detecting any changes in conductivity indicative of water presence. When water is detected, the sensor sends a corresponding signal to the Arduino Uno through its OUT pin, triggering the alert sequence. The buzzer emits an audible alarm to notify nearby personnel, while LEDs may provide visual indications to attract attention and convey the urgency of the situation.

Concurrently, the Arduino utilizes the GSM module to send out SMS notifications or make calls to predefined contacts, alerting them about the water detection event. The GSM module leverages the cellular network for communication, ensuring reliable transmission of alerts irrespective of the geographical location. This dual-alert mechanism ensures that stakeholders are promptly informed about the detected water presence, facilitating timely intervention and mitigating potential risks or damages.

PROCEDURE

1.Gather Components:

- Arduino
- Water Level Sensor
- Led light, Buzzer
- GSM Module
- SIM Card, Adapter, USB Cable

2.Circuit Setup:

Here are pins for connecting a water sensor to an Arduino Uno:

- VCC: Connect the VCC pin of the water sensor to the 3.3V or 5V pin on the Arduino Uno.

- GND: Connect the GND pin of the water sensor to one of the GND pins on the Arduino Uno.

- OUT: Connect the OUT pin of the water sensor to a digital input pin on the Arduino Uno. You can choose any available digital input pin, such as pin 2, 3, 4, etc.

To connect a GSM module to an Arduino Uno board:

- VCC pin of the GSM module to the 5V pin on the Arduino Uno

- GND pin of the GSM module to the GND pin on the Arduino Uno

- RX pin of the GSM module to digital pin 0 on the Arduino Uno

- TX pin of the GSM module to digital pin 1 on the Arduino Uno

How to connect a buzzer to a breadboard and an Arduino Uno:

➢ Positive leg of the buzzer to digital pin 13 on the Arduino Uno.

➢ Negative leg of the buzzer to a GND pin on the breadboard.

3.ARDIUNO CODE:

○ Write the code to read the water level for water level sensor.

○ Set a threshold value for the water level sensor to determine the low, medium, high levels of fluid.

○ Write logic to turn on the LED's in their respective cases i.e., low, medium, high levels of fluid.

○ Write logic to a send a sms and call to the nursing staff when the level of fluid is low.

○ Upload the code to the Arduino.

ADVANTAGES:

1.Timely Alerting: The project provides real-time alerts upon detecting water presence, enabling swift response and mitigation of potential damages.

2.Remote Monitoring: With GSM module integration, the system allows for remote monitoring and alerting, ensuring stakeholders are informed regardless of their location.

3.Cost-effective Solution: Utilizing readily available components and open-source platforms like Arduino, the project offers a cost-effective solution for water level monitoring and alerting.

4.**Enhanced Safety**: By promptly notifying users of water presence, the project enhances safety measures, reducing the risk of accidents or property damage associated with water-related incidents.

APPLICATIONS:

➢ A sensor that detects fluid levels and sends notifications to a user's phone.
➢ This application has variety of applications across different fields.

Here are some examples:

- Home Automation

- Agriculture

- Industrial Applications

- Healthcare

- Environmental Monitoring

PROTOTYPE

➤ The project demonstrates the effective integration of smart sensors, LEDs, and a buzzer to monitor and alert fluid levels in real-time.
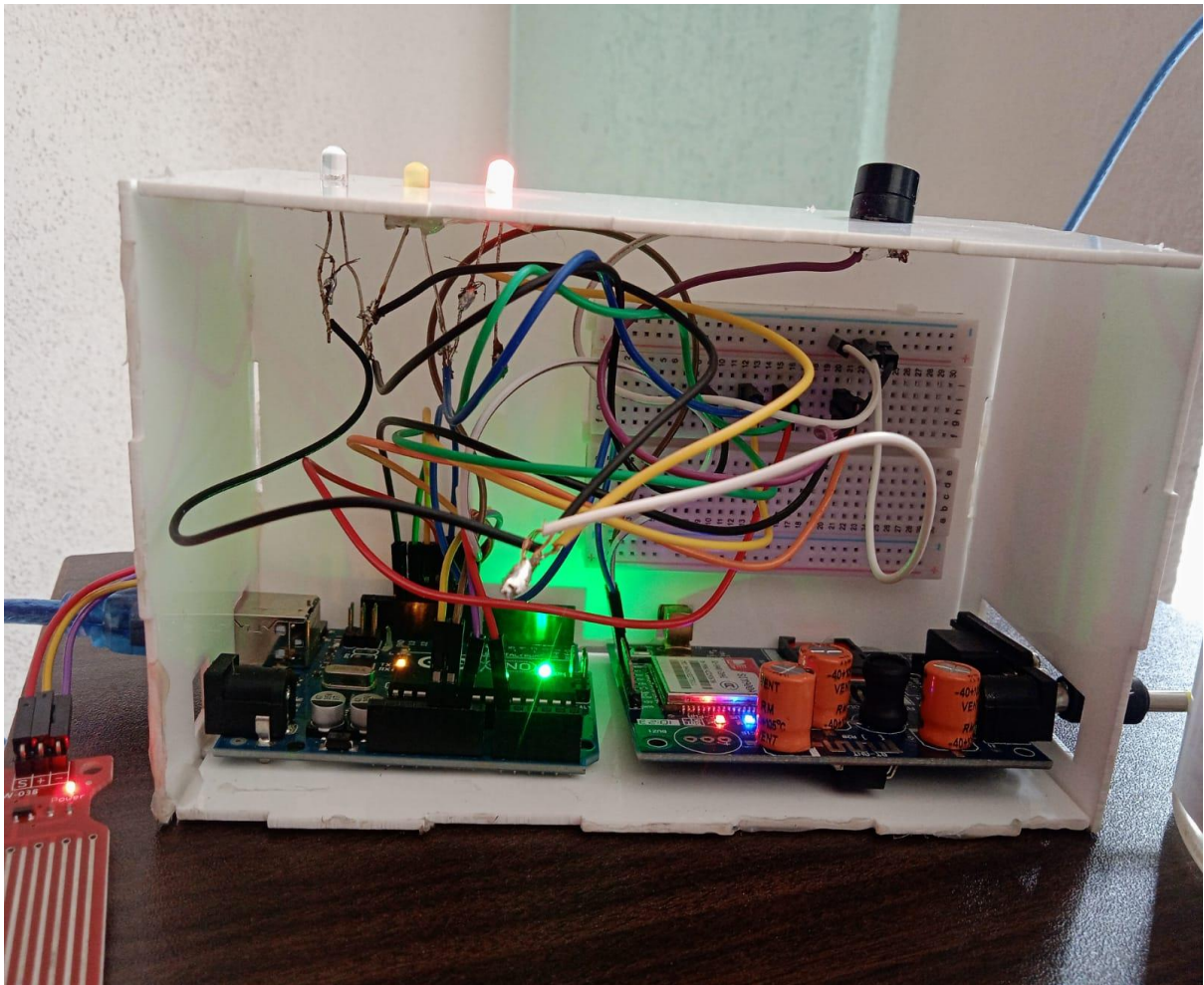
OUTPUT:

1. **Real-time Monitoring Data:**

   Continuous monitoring and accurate measurement of fluid and electrolyte levels.

2. **Alerts and Notifications:**

   Immediate alerts for low levels and critical conditions, with customizable thresholds.

3. **Data Transmission and Storage:**

   Secure wireless transmission and compliant storage of real-time and historical data.

4. **Integration and Compatibility:**

   Seamless integration with hospital systems and role-based access control.

CONCLUSION

In conclusion, the proposed IoT-based system provides a groundbreaking solution for managing fluid and electrolyte levels in hospitals. By employing smart sensors for continuous real-time monitoring, the system effectively addresses the limitations of manual monitoring, minimizing the risks of human error and delays. The automation of data transmission and the use of threshold-based alerts ensure that interventions are timely, thereby enhancing patient safety and ensuring efficient resource management.

This innovative approach significantly reduces the workload on medical staff, allowing them to focus more on direct patient care rather than routine monitoring tasks. Additionally, by improving the accuracy and timeliness of fluid and electrolyte management, the system enhances overall hospital efficiency. This leads to better resource utilization and ultimately improves the quality of patient care, making the healthcare environment safer and more effective.

FINAL RESULT

The outcome of this project is an IoT-based system that effectively monitors fluid and electrolyte levels in hospitals, providing clear and immediate alerts to healthcare personnel. The system operates as follows.

*Low Fluid Levels:

When fluid levels fall below predefined thresholds, the system activates a notification sequence where the LED indicator lights up red and the buzzer sounds, providing both visual and audible alerts to prompt immediate intervention.

*Medium Fluid Levels: If the fluid levels are at a medium level, the system turns on a yellow LED, indicating a cautionary status, with the buzzer remaining off to prevent unnecessary alarm.

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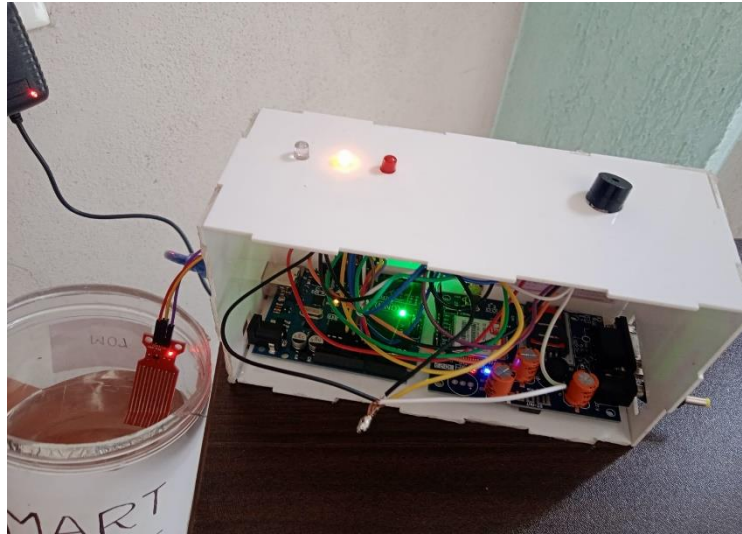
*High Fluid Levels:

When the fluid levels are high, the system activates a white LED, signals that the levels are within the safe range, with the buzzer remaining off.

Finally, this multi-tiered alert system ensures healthcare personnel receive precise and timely information about fluid levels, enhancing patient safety, reducing manual monitoring efforts, and improving overall hospital

ACKNOWLEGMENT

We would like to thank everyone who helped make the Smart Bottle project a success.

First, a big thank you to **Dr. T. Sudheer Kumar, Associate Professor**, for his expert guidance and support throughout the project. His advice and feedback were crucial in improving the Smart Bottle system.

We also appreciate our institution for providing the necessary resources and facilities. Special thanks to the technical staff for their help with hardware and software issues.

We are grateful to our peers and colleagues for their constructive criticism and encouragement during the project.

Finally, we thank our families and friends for their support and motivation.

Thank you all for believing in this project and helping us achieve our goals.

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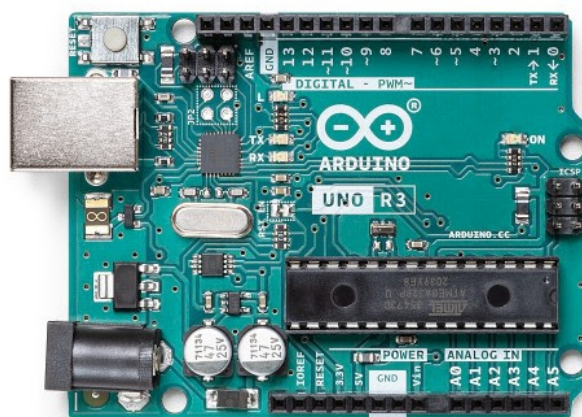
Description

The Arduino UNO R3 is the perfect board to get familiar with electronics and coding. This versatile development board is equipped with the well-known ATmega328P and the ATMega 16U2 Processor.
This board will give you a great first experience within the world of Arduino.

Target areas:

Maker, introduction, industries

Features

- **ATMega328P** Processor

  - **Memory**

    - AVR CPU at up to 16 MHz
    - 32KB Flash
    - 2KB SRAM
    - 1KB EEPROM

  - **Security**

    - Power On Reset (POR)
    - Brown Out Detection (BOD)

  - **Peripherals**

    - 2x 8-bit Timer/Counter with a dedicated period register and compare channels
    - 1x 16-bit Timer/Counter with a dedicated period register, input capture and compare channels
    - 1x USART with fractional baud rate generator and start-of-frame detection
    - 1x controller/peripheral Serial Peripheral Interface (SPI)
    - 1x Dual mode controller/peripheral I2C
    - 1x Analog Comparator (AC) with a scalable reference input
    - Watchdog Timer with separate on-chip oscillator
    - Six PWM channels
    - Interrupt and wake-up on pin change

  - **ATMega16U2 Processor**

    - 8-bit AVR® RISC-based microcontroller

  - **Memory**

    - 16 KB ISP Flash
    - 512B EEPROM
    - 512B SRAM
    - debugWIRE interface for on-chip debugging and programming

  - **Power**

    - 2.7-5.5 volts

CONTENTS

1 The Board

1.1 Application Examples

The UNO board is the flagship product of Arduino. Regardless if you are new to the world of electronics or will use the UNO as a tool for education purposes or industry-related tasks, the UNO is likely to meet your needs.

First entry to electronics: If this is your first project within coding and electronics, get started with our most used and documented board; Arduino UNO. It is equipped with the well-known ATmega328P processor, 14 digital input/output pins, 6 analog inputs, USB connections, ICSP header and reset button. This board includes everything you will need for a great first experience with Arduino.

Industry-standard development board: Using the Arduino UNO R3 board in industries, there are a range of companies using the UNO board as the brain for their PLC's.

Education purposes: Although the UNO R3 board has been with us for about ten years, it is still widely used for various education purposes and scientific projects. The board's high standard and top quality performance makes it a great resource to capture real time from sensors and to trigger complex laboratory equipment to mention a few examples.

1.2 Related Products

- Starter Kit
- Arduino UNO R4 Minima
- Arduino UNO R4 WiFi
- Tinkerkit Braccio Robot

2 Ratings

2.1 Recommended Operating Conditions

Symbol	Description	Min	Max
	Conservative thermal limits for the whole board:	-40 °C (-40°F)	85 °C (185°F)

NOTE: In extreme temperatures, EEPROM, voltage regulator, and the crystal oscillator, might not work as expected.
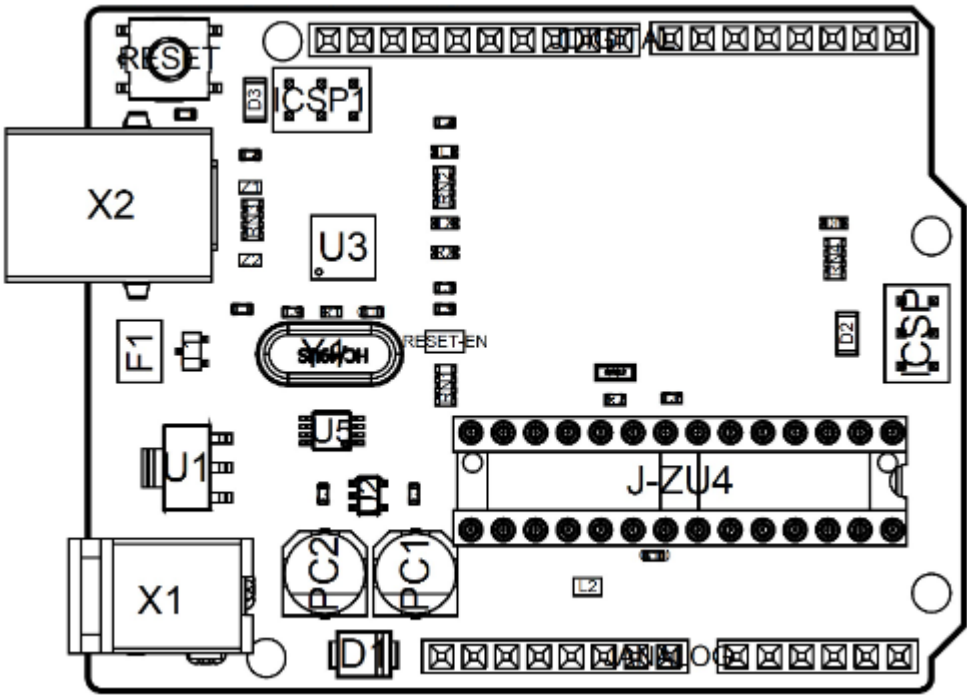
2.2 Power Consumption

Symbol	Description	Min	Typ	Max	Unit
VINMax	Maximum input voltage from VIN pad	6	-	20	V
VUSBMax	Maximum input voltage from USB connector		-	5.5	V
PMax	Maximum Power Consumption	-	-	xx	mA

3 Functional Overview

3.1 Board Topology

Top view

Board topology

Ref.	Description	Ref.	Description
X1	Power jack 2.1x5.5mm	U1	SPX1117M3-L-5 Regulator
X2	USB B Connector	U3	ATMEGA16U2 Module
PC1	EEE-1EA470WP 25V SMD Capacitor	U5	LMV358LIST-A.9 IC
PC2	EEE-1EA470WP 25V SMD Capacitor	F1	Chip Capacitor, High Density
D1	CGRA4007-G Rectifier	ICSP	Pin header connector (through hole 6)
J-ZU4	ATMEGA328P Module	ICSP1	Pin header connector (through hole 6)
Y1	ECS-160-20-4X-DU Oscillator		

3.2 Processor

The Main Processor is a ATmega328P running at up to 20 MHz. Most of its pins are connected to the external headers, however some are reserved for internal communication with the USB Bridge coprocessor.

3.3 Power Tree


```
VIN ──LDO──┐
           ├──> +5V ──┬──> ATMEGA16U2-MU(R)   261mA
USBVCC ──OPAMP──┘      │
                       ├──> ATMEGA328P-PU      410mA
                       │
                       ├──> KPT-2012SGC (Green LED)   5.6mA
                       │
                       ├──> 4xKPT-2012YC (Yellow LED)  8.7mA
                       │
                       └──LDO──> +3V3
```
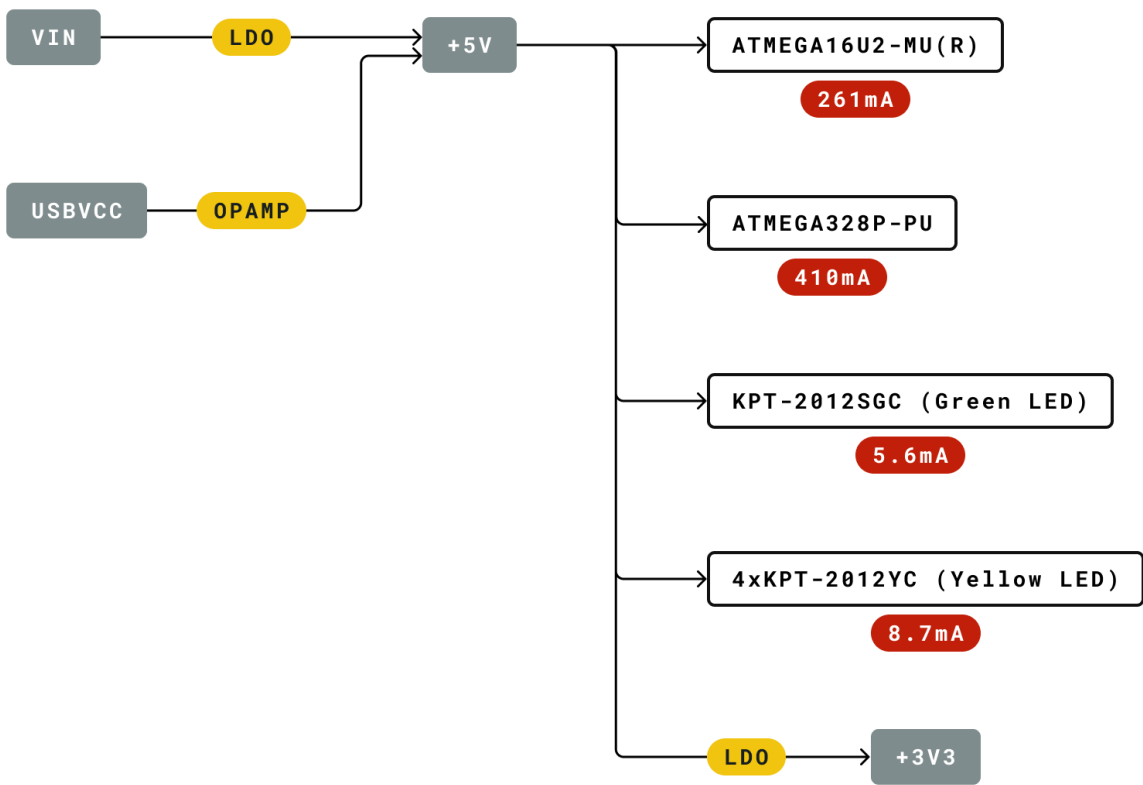
Legend:

▢ Component   ● Power I/O   ● Conversion Type

● Max Current   ● Voltage Range

Power tree

4 Board Operation

4.1 Getting Started - IDE

If you want to program your Arduino UNO R3 while offline you need to install the Arduino Desktop IDE [1] To connect the Arduino UNO to your computer, you'll need a USB-B cable. This also provides power to the board, as indicated by the LED.

4.2 Getting Started - Arduino Web Editor

All Arduino boards, including this one, work out-of-the-box on the Arduino Web Editor [2], by just installing a simple plugin.

The Arduino Web Editor is hosted online, therefore it will always be up-to-date with the latest features and support for all boards. Follow **[3]** to start coding on the browser and upload your sketches onto your board.

4.3 Sample Sketches

Sample sketches for the Arduino UNO R3 can be found either in the "Examples" menu in the Arduino IDE or in the "Documentation" section of the Arduino website [4]

4.4 Online Resources

Now that you have gone through the basics of what you can do with the board you can explore the endless possibilities it provides by checking exciting projects on Arduino Project Hub **[5]**, the Arduino Library Reference **[6]** and the online Arduino store **[7]** where you will be able to complement your board with sensors, actuators and more.

5 Connector Pinouts
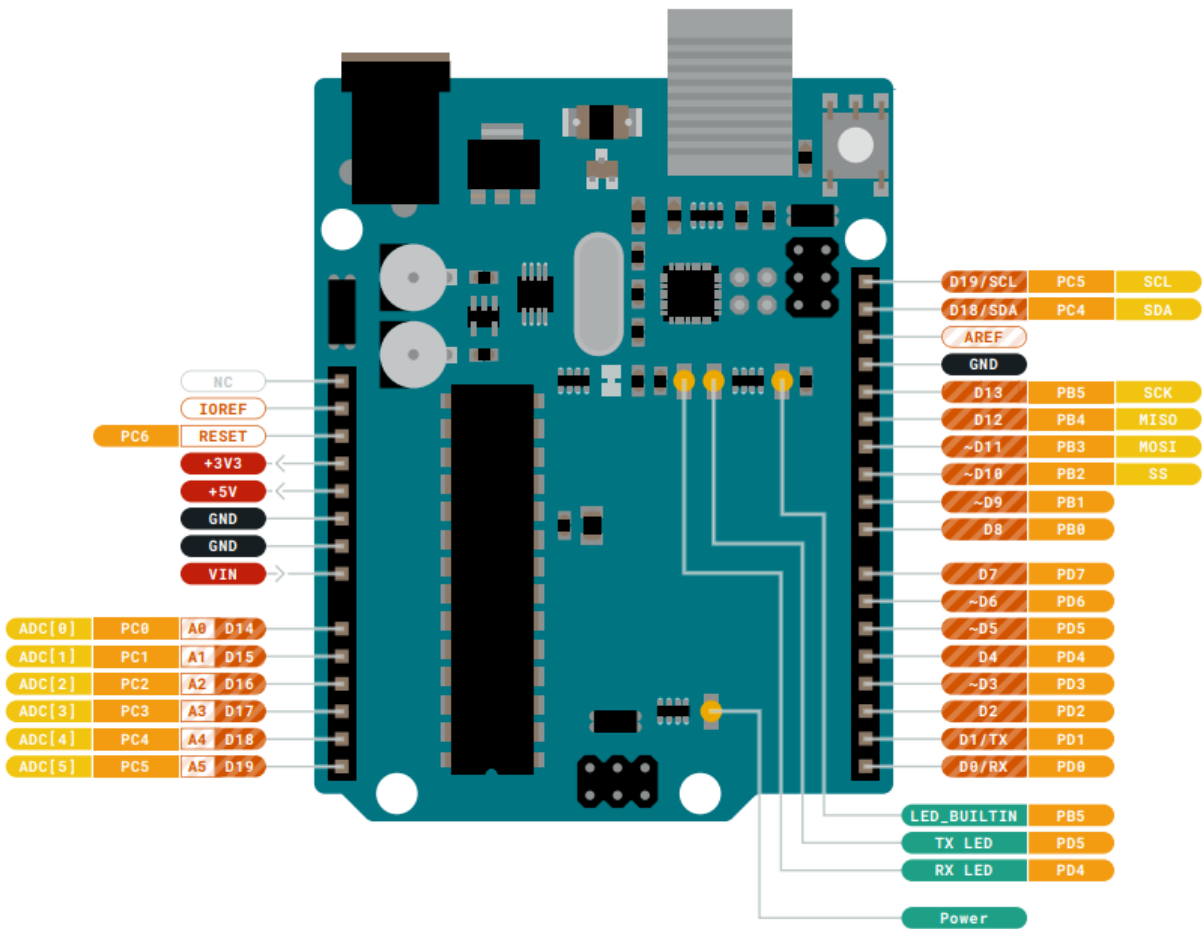
Pinout

5.1 JANALOG

Pin	Function	Type	Description
1	NC	NC	Not connected
2	IOREF	IOREF	Reference for digital logic V - connected to 5V
3	Reset	Reset	Reset
4	+3V3	Power	+3V3 Power Rail
5	+5V	Power	+5V Power Rail
6	GND	Power	Ground
7	GND	Power	Ground
8	VIN	Power	Voltage Input
9	A0	Analog/GPIO	Analog input 0 /GPIO
10	A1	Analog/GPIO	Analog input 1 /GPIO
11	A2	Analog/GPIO	Analog input 2 /GPIO
12	A3	Analog/GPIO	Analog input 3 /GPIO
13	A4/SDA	Analog input/I2C	Analog input 4/I2C Data line
14	A5/SCL	Analog input/I2C	Analog input 5/I2C Clock line

5.2 JDIGITAL

Pin	Function	Type	Description
1	D0	Digital/GPIO	Digital pin 0/GPIO
2	D1	Digital/GPIO	Digital pin 1/GPIO
3	D2	Digital/GPIO	Digital pin 2/GPIO
4	D3	Digital/GPIO	Digital pin 3/GPIO
5	D4	Digital/GPIO	Digital pin 4/GPIO
6	D5	Digital/GPIO	Digital pin 5/GPIO
7	D6	Digital/GPIO	Digital pin 6/GPIO
8	D7	Digital/GPIO	Digital pin 7/GPIO
9	D8	Digital/GPIO	Digital pin 8/GPIO
10	D9	Digital/GPIO	Digital pin 9/GPIO
11	SS	Digital	SPI Chip Select
12	MOSI	Digital	SPI1 Main Out Secondary In
13	MISO	Digital	SPI Main In Secondary Out
14	SCK	Digital	SPI serial clock output
15	GND	Power	Ground
16	AREF	Digital	Analog reference voltage
17	A4/SD4	Digital	Analog input 4/I2C Data line (duplicated)
18	A5/SD5	Digital	Analog input 5/I2C Clock line (duplicated)

5.3 Mechanical Information

5.4 Board Outline & Mounting Holes

Board outline
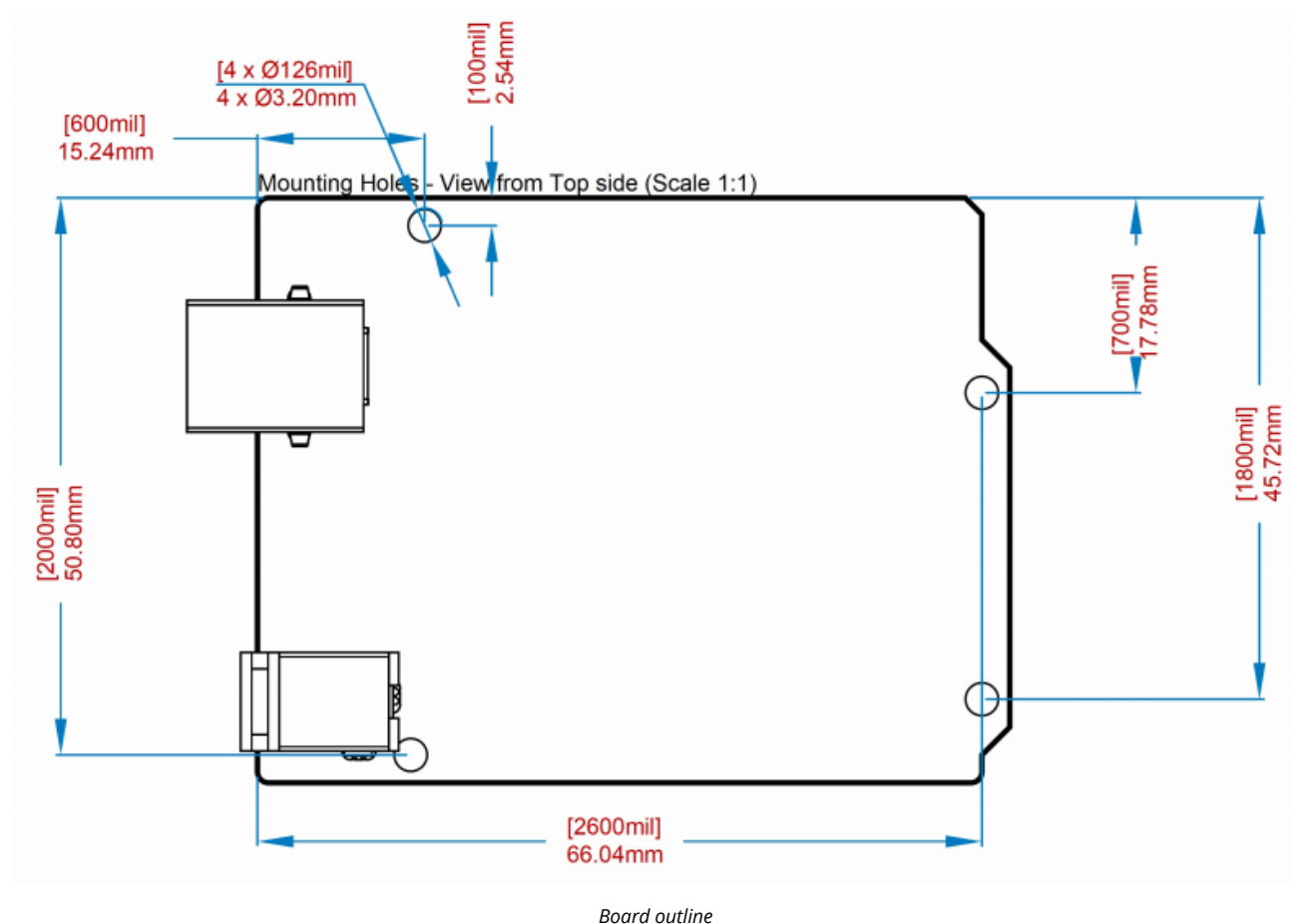
6 Certifications

6.1 Declaration of Conformity CE DoC (EU)

We declare under our sole responsibility that the products above are in conformity with the essential requirements of the following EU Directives and therefore qualify for free movement within markets comprising the European Union (EU) and European Economic Area (EEA).

ROHS 2 Directive 2011/65/EU	
Conforms to:	EN50581:2012
Directive 2014/35/EU. (LVD)	
Conforms to:	EN 60950-1:2006/A11:2009/A1:2010/A12:2011/AC:2011
Directive 2004/40/EC & 2008/46/EC & 2013/35/EU, EMF	
Conforms to:	EN 62311:2008

6.2 Declaration of Conformity to EU RoHS & REACH 211 01/19/2021

Arduino boards are in compliance with RoHS 2 Directive 2011/65/EU of the European Parliament and RoHS 3 Directive 2015/863/EU of the Council of 4 June 2015 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Substance	Maximum limit (ppm)
Lead (Pb)	1000
Cadmium (Cd)	100
Mercury (Hg)	1000
Hexavalent Chromium (Cr6+)	1000
Poly Brominated Biphenyls (PBB)	1000
Poly Brominated Diphenyl ethers (PBDE)	1000
Bis(2-Ethylhexyl} phthalate (DEHP)	1000
Benzyl butyl phthalate (BBP)	1000
Dibutyl phthalate (DBP)	1000
Diisobutyl phthalate (DIBP)	1000

Exemptions: No exemptions are claimed.

Arduino Boards are fully compliant with the related requirements of European Union Regulation (EC) 1907 /2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH). We declare none of the SVHCs (https://echa.europa.eu/web/guest/candidate-list-table), the Candidate List of Substances of Very High Concern for authorization currently released by ECHA, is present in all products (and also package) in quantities totaling in a concentration equal or above 0.1%. To the best of our knowledge, we also declare that our products do not contain any of the substances listed on the "Authorization List" (Annex XIV of the REACH regulations) and Substances of Very High Concern (SVHC) in any significant amounts as specified by the Annex XVII of Candidate list published by ECHA (European Chemical Agency) 1907 /2006/EC.

6.3 Conflict Minerals Declaration

As a global supplier of electronic and electrical components, Arduino is aware of our obligations with regards to laws and regulations regarding Conflict Minerals, specifically the Dodd-Frank Wall Street Reform and Consumer Protection Act, Section 1502. Arduino does not directly source or process conflict minerals such as Tin, Tantalum, Tungsten, or Gold. Conflict minerals are contained in our products in the form of solder, or as a component in metal alloys. As part of our reasonable due diligence Arduino has contacted component suppliers within our supply chain to verify their continued compliance with the regulations. Based on the information received thus far we declare that our products contain Conflict Minerals sourced from conflict-free areas.

7 FCC Caution

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference

(2) this device must accept any interference received, including interference that may cause undesired operation.

FCC RF Radiation Exposure Statement:

1. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

2. This equipment complies with RF radiation exposure limits set forth for an uncontrolled environment.

3. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

English: User manuals for license-exempt radio apparatus shall contain the following or equivalent notice in a conspicuous location in the user manual or alternatively on the device or both. This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) this device may not cause interference

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

French: Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l' appareil nedoit pas produire de brouillage

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

IC SAR Warning:

English This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body.

French: Lors de l' installation et de l' exploitation de ce dispositif, la distance entre le radiateur et le corps est d 'au moins 20 cm.

Important: The operating temperature of the EUT can't exceed 85°C and shouldn't be lower than -40°C.

Hereby, Arduino S.r.l. declares that this product is in compliance with essential requirements and other relevant provisions of Directive 2014/53/EU. This product is allowed to be used in all EU member states.

8 Company Information

Company name	Arduino S.r.l
Company Address	Via Andrea Appiani 25 20900 MONZA Italy

9 Reference Documentation

Reference	Link
Arduino IDE (Desktop)	https://www.arduino.cc/en/Main/Software
Arduino IDE (Cloud)	https://create.arduino.cc/editor
Cloud IDE Getting Started	https://create.arduino.cc/projecthub/Arduino_Genuino/getting-started-with-arduino-web-editor-4b3e4a
Arduino Website	https://www.arduino.cc/
Project Hub	https://create.arduino.cc/projecthub?by=part&part_id=11332&sort=trending
Library Reference	https://www.arduino.cc/reference/en/
Online Store	https://store.arduino.cc/

10 Revision History

Date	Revision	Changes
26/07/2023	2	General Update
06/2021	1	Datasheet release

High Sensitivity Water Sensor
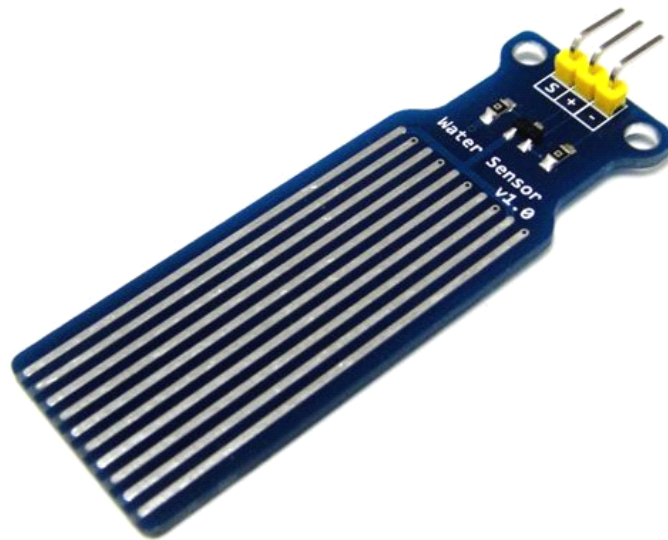
Description:

Water sensor brick is designed for water detection, which can be widely used in sensing the rainfall, water level, even the liquate leakage. The brick is mainly comprised of three parts: An Electronic brick connector, a 1 MΩ resistor, and several lines of bare conducting wires.

This sensor works by having a series of exposed traces connected to ground and interlaced between the grounded traces are the sens traces. The sensor traces have a weak pull-up resistor of 1 MΩ. The resistor will pull the sensor trace value high until a drop of water shorts the sensor trace to the grounded trace. Believe it or not this circuit will work with the digital I/O pins of your Arduino or you can use it with the analog pins

to detect the amount of water induced contact between the grounded and sensor traces.

This item can judge the water level through with a series of exposed parallel wires stitch to measure the water droplet/water size .

This item can easily change the water size to analog signal, and output analog value can directly be used in the program function, then to achieve the function of water level alarm.

This item have low power consumption, and high sensitivity, which are the biggest characteristics of this mdoule.

This item can be compatible with Arduino UNO、Arduino mega2560、Arduino ADK etc.

Features:

1、 Working voltage: 5V

2、 Working Current: <20ma

3、 Interface: Analog

4、 Width of detection: 40mm×16mm

5、 Working Temperature: 10℃~30℃

6、 Weight: 3g

7、 Size: 65mm×20mm×8mm

8、 Arduino compatible interface

9、 Low power consumption

10、 High sensitivity

11、 Output voltage signal: 0~4.2V
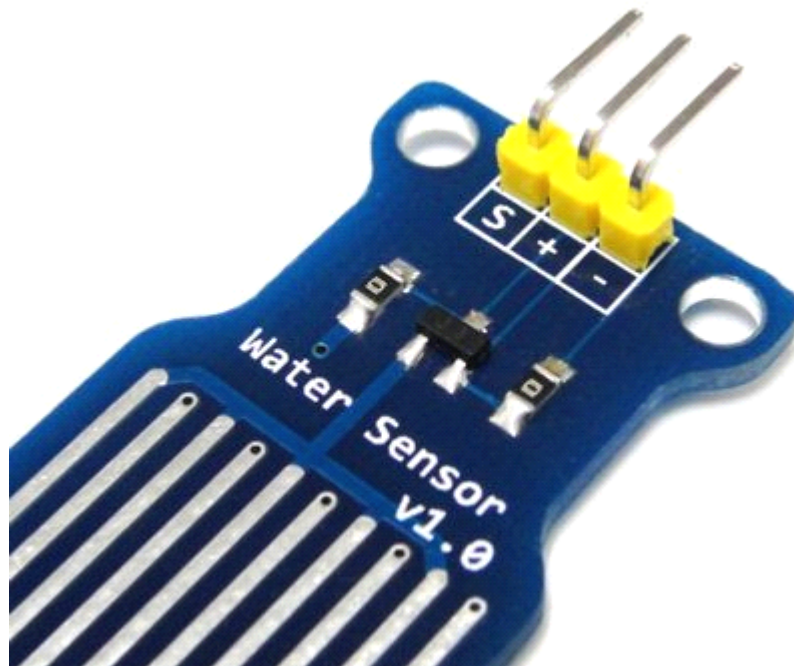
Pin definition:

"S" stand for signal input

"+" stand for power supply

"-" stand for GND

Applications:

1、Rainfall detecting

2、Liquid leakage

3、Tank overflow detector

Connecting Diagram:
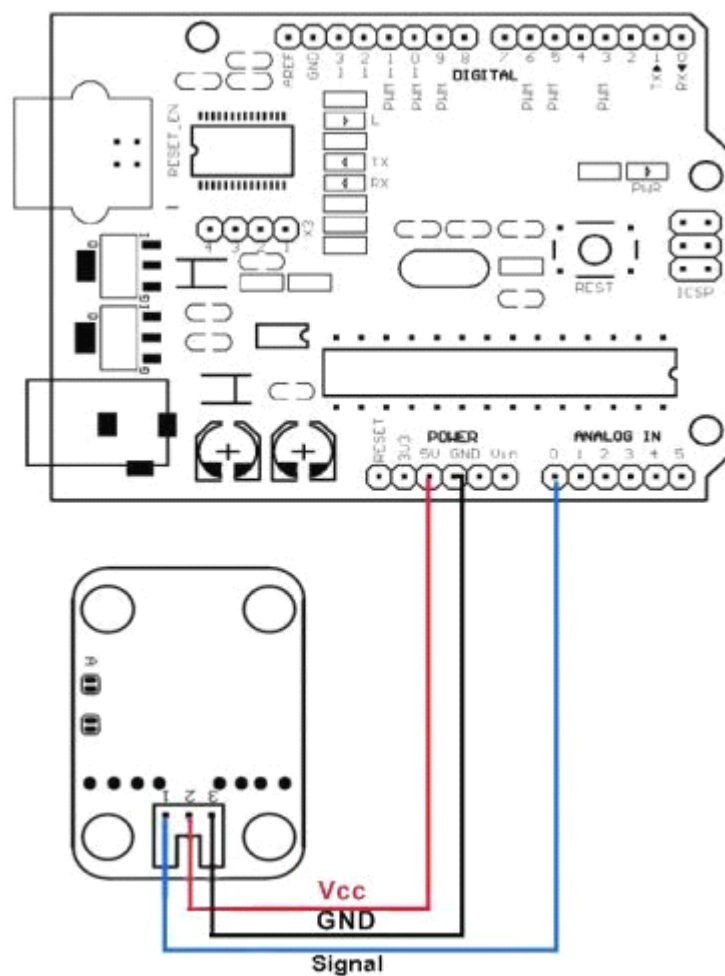
This sensor module come with 3 Pin Dual-female Jumper Wire length 300mm as below:

Example:

Please use the cable to connect the Water sensor with A1 interface of Arduino Sensor shied.

Please use the cable to connect the LED module with D8 interface of Arduino Sensor shied.

After hardware connection, please download the test code to Arduino after being compiled code, and the Arduino test code such as below:

```
Int analogPin = 1; // water sensor connected to the analog port 1
Int led = 12; // LEd connected to the digital mouth 12
Int val = 0; // definition variable val initial value as 0
Int data = 0; // definition variable data initial value as 0
Void setup ()
{
PinMode (led, OUTPUT); // definition led as output pin
Serial. Begin (9600); // set the baud rate as 9600
}
Void loop ()
{
Val = analogRead (analogPin); // read the simulation value and send to variable val
If (val > 700) {// judgment variable val is whether more than 700 or not
DigitalWrite (LED, HIGH); // variable val greater than 700, LED on
}
Else {
DigitalWrite (led, LOW); // variable val less than 700, LED off
}
Data = val; // variable val assignment to variable data
Serial. Println (data); // serial print variable data
Delay (100);
}
```

The come out the result as below:

Water level has not reached alarming value, the system will not alarm, LED will not light up.

Water level beyond warning value, the system will alarm, LED will lights up.

Standard LED

Red Emitting Colour

Features:

- High intensity
- Standard T-1 3/4 diameter package
- General purpose leads
- Reliable and rugged

Package Dimensions:

Dimensions : Millimetres (Inches)

Specification Table

Chip Material	Lens Colour	Source Colour	Part Number
AlGaAs	Diffused	Red	MV5754A

Notes:

1. Tolerance is ±0.25 mm (0.01") unless otherwise noted
2. Protruded resin under flange is 1 mm (0.04") maximum
3. Lead spacing is measured where the leads emerge from the package

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Page <1>   18/10/11 V1.1

Standard LED

Red Emitting Colour

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Absolute Maximum Ratings at T_a = 25°C

Parameter	Maximum	Unit
Power Dissipation	80	mW
Peak Forward Current (1/10 Duty Cycle, 0.1 ms Pulse Width)	100	mA
Continuous Forward Current	20	
Derating Linear From 50°C	0.4	mA / °C
Reverse Voltage	5	V
Operating Temperature Range	-25°C to +80°C	
Storage Temperature Range	-40°C to +100°C	
Lead Soldering Temperature (4 mm (0.157) Inches from Body)	260°C for 5 s	

Electrical Optical Characteristics at T_a = 25°C

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Test Condition
Luminous Intensity	I_v		40		mcd	I_f = 20 mA (Note 1)
Viewing Angle	$2\theta_{1/2}$		25		Deg	(Note 2)
Peak Emission Wavelength	λp		640		nm	I_f = 20 mA
Dominant Wavelength	λd		635		nm	I_f = 20 mA (Note 3)
Spectral Line Half-Width	$\Delta\lambda$		25		nm	I_f = 20 mA
Forward Voltage	V_f		2	2.5	V	I_f = 20 mA
Reverse Current	I_R	-	-	100	µA	V_R = 5 V

Notes:

1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE eye-response curve
2. $\theta_{1/2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity
3. The dominant wavelength (λd) is derived from the CIE chromaticity diagram and represents the single wavelength which defines the colour of the device

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Page <2>   18/10/11 V1.1

Standard LED

Red Emitting Colour

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Typical Characteristics

$I_F - V_F$ ($T_a = 25°C$)

Forward Current I_F (mA) vs Forward Voltage V_F (V)
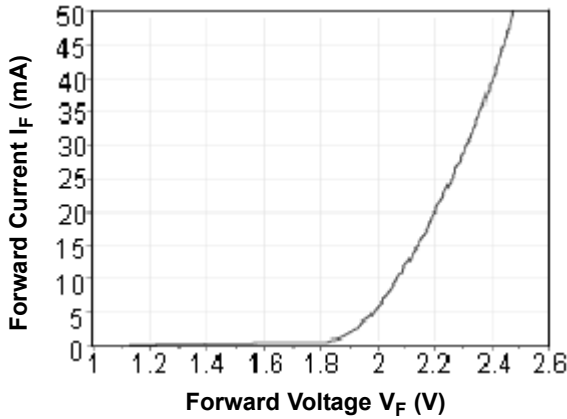
Relative Luminous Intensity - I_F ($T_a = 25°C$)

Relative Luminous Intensity vs Forward Current I_F (mA)
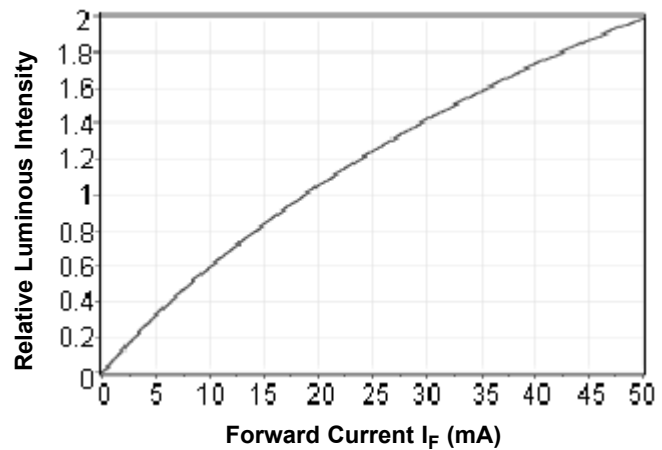
Wavelength Characteristics ($T_a = 25°C$)

Relative Luminous Intensity vs Wavelength λ (nm)

Relative Luminous Intensity - T_a

Relative Luminous Intensity vs Ambient Temperature T_a (°C)

$I_F - T_a$

Forward Current I_F (mA) vs Ambient Temperature T_a (°C)
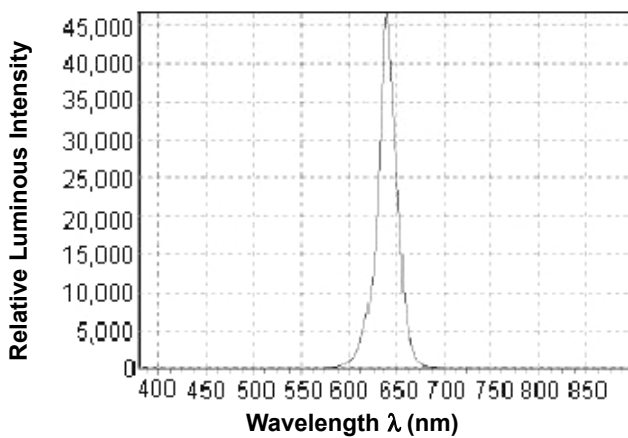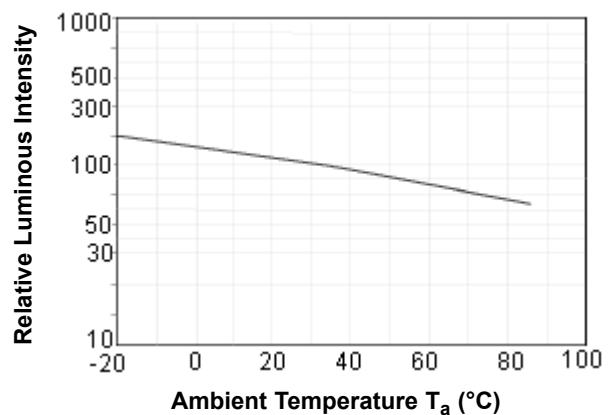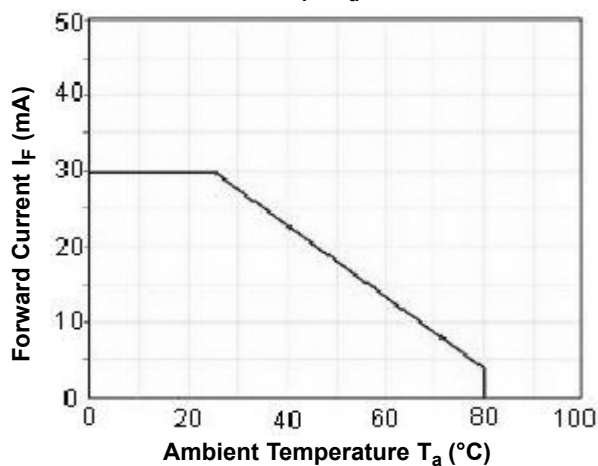
Directive Characteristics ($T_a = 25°C$)

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Farnell AN AVNET COMPANY **Newark** AN AVNET COMPANY **element14**

EN - For pricing and availability in your local country please visit one of the below links:

DE - Informationen zu Preisen und Verfügbarkeit in Ihrem Land erhalten Sie über die unten aufgeführten Links:

FR - Pour connaître les tarifs et la disponibilité dans votre pays, cliquez sur l'un des liens suivants:

[MV5754A](MV5754A)

EN
This Datasheet is presented by
the manufacturer

DE
Dieses Datenblatt wird vom
Hersteller bereitgestellt

FR
Cette fiche technique est
présentée par le fabricant

Buzzer

pro-SIGNAL

Features

- Black in colour
- With internal drive circuit
- Sealed structure
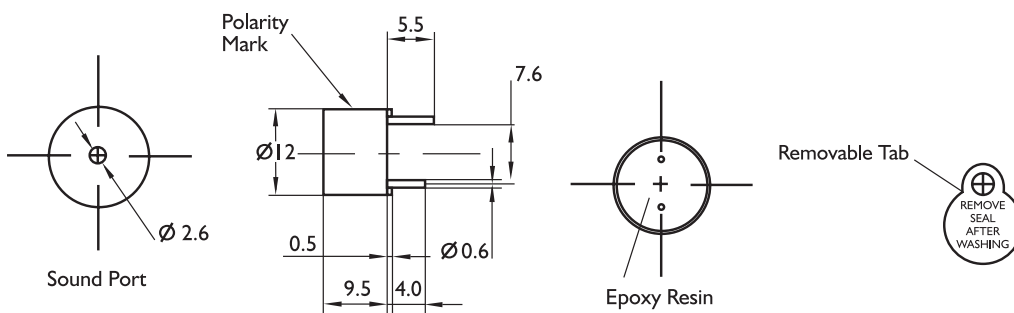- Wave solderable and washable
- Housing material: Noryl

Applications

- Computer and peripherals
- Communications equipment
- Portable equipment
- Automobile electronics
- POS system
- Electronic cash register

RoHS Compliant

Specifications:

Rated Voltage	: 6V DC
Operating Voltage	: 4 to 8V DC
Rated Current*	: ≤30mA
Sound Output at 10cm*	: ≥85dB
Resonant Frequency	: 2300 ±300Hz
Tone	: Continuous
Operating Temperature	: -25°C to +80°C
Storage Temperature	: -30°C to +85°C
Weight	: 2g

*Value applying at rated voltage (DC)

Diagram

Polarity Mark

5.5
7.6
Ø12
Ø 2.6
Sound Port
0.5
Ø 0.6
9.5 4.0

Epoxy Resin

Removable Tab
REMOVE SEAL AFTER WASHING

Dimensions : Millimetres
Tolerance : ±0.5mm

Part Number Table

Description	Part Number
Buzzer, Electromech, 6V DC	ABI-009-RC

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Page <1>

02/11/16   V1.0

DATASHEET GSM

Datasheet DW-SOHO-M-1GSM
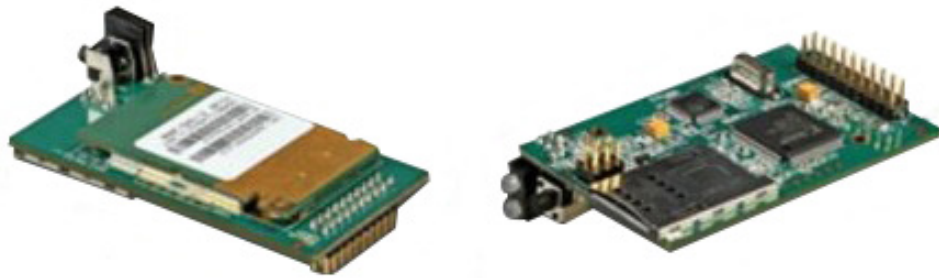
Designed with DW-SOHO-M-1GSM for global market. DW-SOHO-M-1GSM compatible with DW-SOHO-H-2O, is a quad-band GSM engine that works on frequencies GSM 850MHz, EGSM 900 MHz, DCS 1800 MHz and PCS 1900MHz. The DW-SOHO-M-1GSM can search the 4 frequency bands automatically, and is compliant to GSM OpenBTS Phase 2/2+.

DW-SH-GSM FEATURES

Feature	Reference
Power supply	Single supply voltage 3.8V - 4.5V
External power supply required	NO
Power saving	Power consumption in SLEEP mode is 1.5mA
GSM class	SIM Card v3
Frequency Bands	850MHz, 900 MHz, 1800 MHz and 1900MHz.
Supported protocols	Voice (2G)
Temperature range	Normal operation: -25-+70 degrees Centigrade
External antenna	Connected via 50antenna connector
Audio features	Speech codec modes: Half Rate (ETS 06.20) Full Rate (ETS 06.10) Enhanced Full Rate (ETS 06.50 / 06.60 / 06.80) AMR Echo Cancellation Noise reduction
Certifications	CE FCC RoHS ISO 9001

MODULE RF INDICATORS

RF output power of DW-SOHO-M-1GSM

Frequency	Max	Frequency
GSM850/900	33dBm ±2dB	5dBm±5dB
DCS1800/ PCS1900	30dBm ±2dB	0dBm±5dB

RF receive sensitivity of DW-SOHO-M-1GSM

Frequency	Frequency
GSM850/900	< -105dBm
DCS1800/PCS1900	< -105dBm

Module receive/transmit frequency

Frequency	Receive	Transmit
GSM 850 MHz	869 ~ 894 MHz	824 ~ 849 MHz
GSM 900 MHz	925 ~ 960 MHz	880 ~ 915MHz
DCS 1800 MHz	1805 ~ 1880 MHz	1710 ~ 1785MHz
PCS 1900 MHz	1930 ~ 1990 MHz	1850 ~ 1910MHz

Connection for system GSM

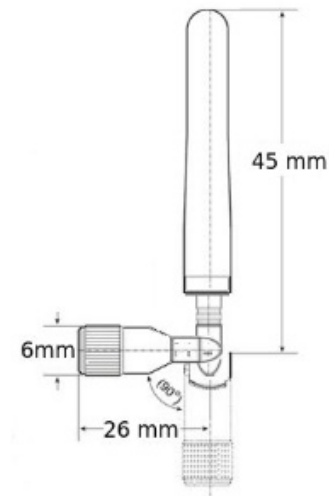Each module has two LED(Light-Emitting Diodes), which is integrated on the module.
The Red LED indicates port status:
SYNC= Module sincronign with the operator
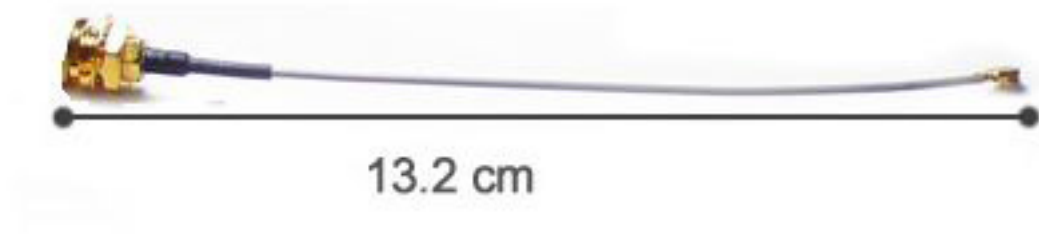STA= Channel Ringing
Each module has one button "ONKEY" to restart the module without restart the SOHO

Antenna

Feature	Reference
Frecuenty	824-880/890-960/1850-1990/1710-2170/2400-2483
VSWR	2
Gain	3 dBi
Impedance ()	50
Polarization	Linear polarization
Connector	SMA plug
Length	5 mm
Color	Black
Temperature range	- 45° c a +75° c

13.2 cm

Designed to be mounted separately between the module and Antenna, the antenna coaxial wire offers a respectable 2.2 dBi gain at 900 MHz and 3.8 dBi at 2000 MHz

Normative

Directive 1999/5/CE

Directives 2002/95/CE and 2002/96/CE

ETSI EN 301511 (System GSM)

ETSI EN 301489-1/-7 (Compatibility electromagnetic and radio spectrum)

EN 60950-1, EN 60215 (Security)