
LAB - 15

Interfacing Soil Moisture Sensor with Node



When you hear the term ‘smart garden’, one of the things that comes to your mind is a system that measures soil moisture and irrigates your plants automatically.

With this type of system, you can water your plants only when needed and avoid over-watering or under-watering.

How Does Soil Moisture Sensor Work?

The working of the soil moisture sensor is pretty straightforward.

The fork-shaped probe with two exposed conductors, acts as a variable resistor (just like a potentiometer) whose resistance varies according to the water content in the soil.

This resistance is inversely proportional to the soil moisture:

- The more water in the soil means better conductivity and will result in a lower resistance.

- The less water in the soil means poor conductivity and will result in a higher resistance

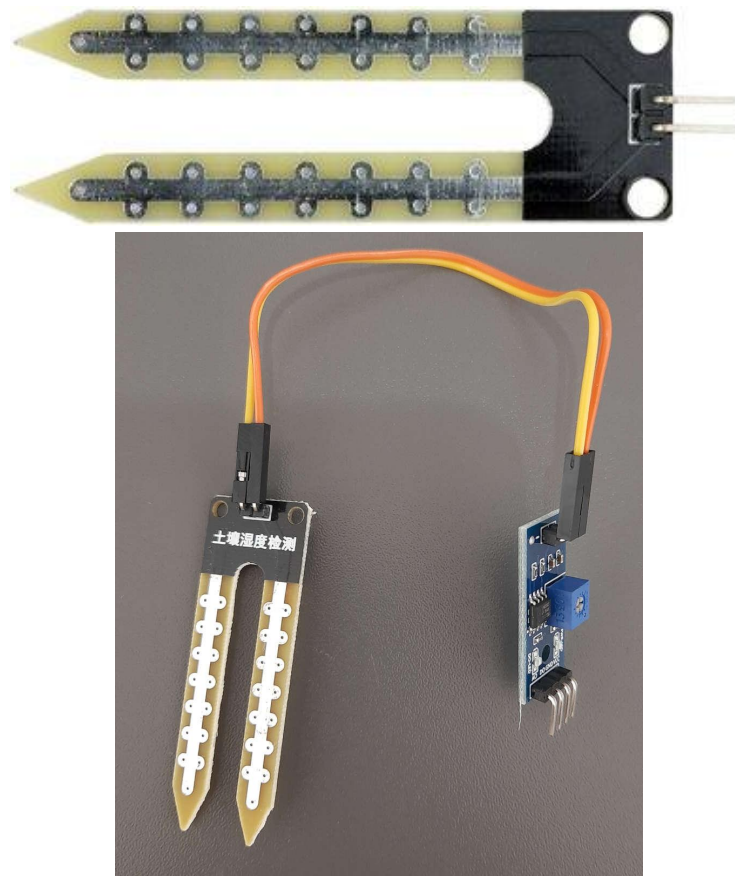
The sensor produces an output voltage according to the resistance, which by measuring we can determine the moisture level.

Hardware Overview

The sensor contains a fork-shaped probe with two exposed conductors that goes into the soil or anywhere else where the water content is to be measured.

Like said before, it acts as a variable resistor whose resistance varies according to the soil moisture.

The Probe



The Module

The sensor also contains an electronic module that connects the probe to the Arduino.

The module produces an output voltage according to the resistance of the probe and is made available at an Analog Output (AO) pin.

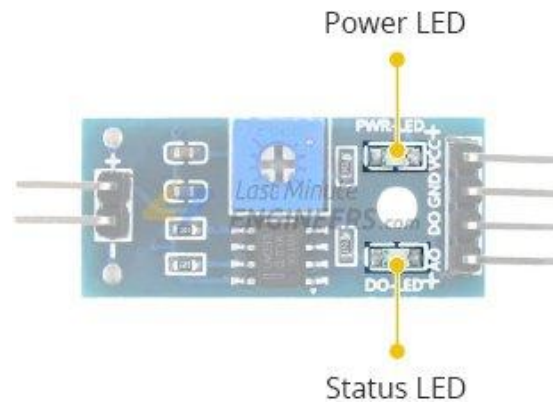
The same signal is fed to a LM393 High Precision Comparator to digitize it and is made available at an Digital Output (DO) pin.



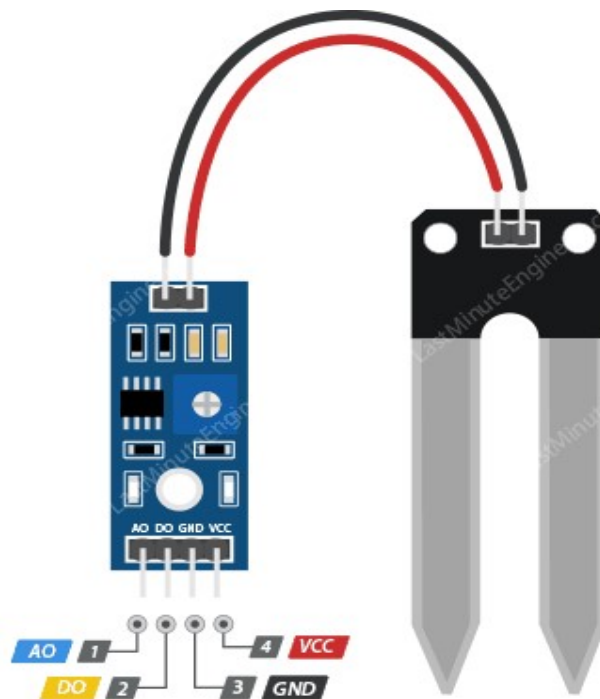
The module has a built-in potentiometer for sensitivity adjustment of the digital output (DO).

You can set a threshold by using a potentiometer; So that when the moisture level exceeds the threshold value, the module will output LOW otherwise HIGH.

This setup is very useful when you want to trigger an action when a certain threshold is reached. For example, when the moisture level in the soil crosses a threshold, you can activate a relay to start pumping water. You got the idea!



Soil Moisture Sensor Pinout



AO (Analog Output) pin gives us an analog signal between the supply value to 0V and will be connected to one of the analog inputs on your Arduino.

DO (Digital Output) pin gives Digital output of internal comparator circuit. You can connect it to any digital pin on an Arduino or directly to a 5V relay or similar device.

VCC pin supplies power for the sensor. It is recommended to power the sensor with between 3.3V – 5V. Please note that the analog output will vary depending on what voltage is provided for the sensor.

GND is a ground connection.

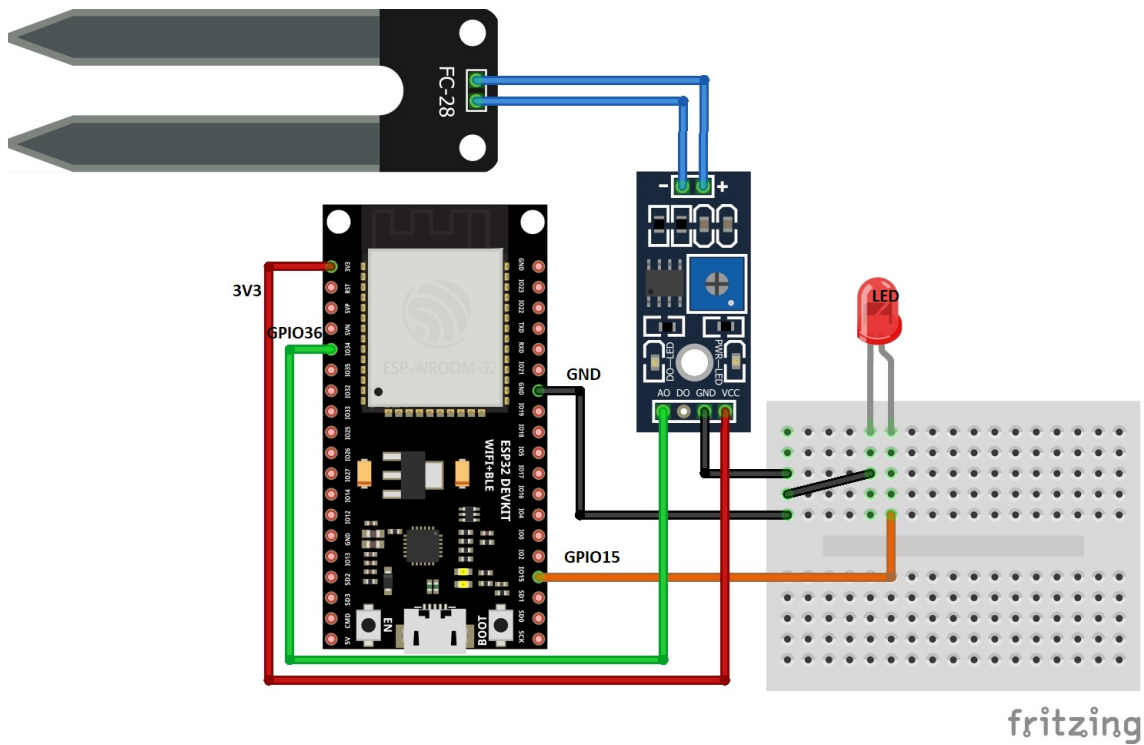
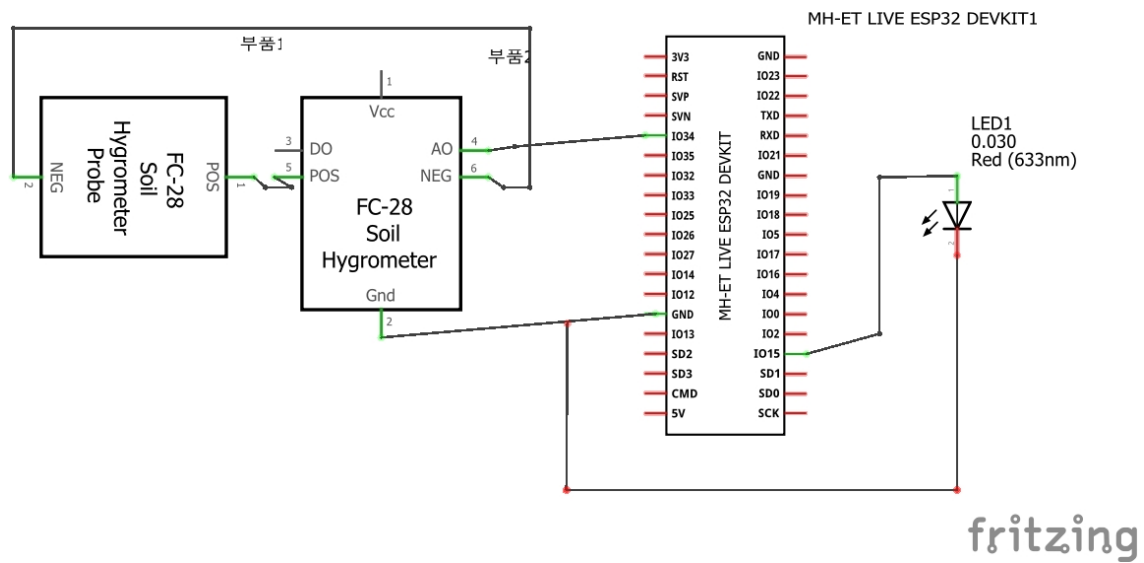
Input Voltage: 3.3 – 5V

Output Voltage: 0 – 4.2V

Input Current: 35mA

Output Signal: Both Analog and Digital

Connections and circuit diagram.



The soil moisture sensor has four pins:

VCC: Power
A0: Analog Output
D0: Digital Output
GND: Ground

The connections for the soil moisture sensor to the ESP32 are as follows:

VCC of the sensor to 5V or 3.3V
GND of the sensor to GND
A0 of the sensor to pin 36

Algorithm:

1. Define GPIO15 as ledPin and GPIO36 as sensorPin.
2. In setup, define LED pin as output pin(by default pin 36 (svp) pin is an input pin.
3. Define the trigger value.
4. begin the serial communication with a certain baudrate.
5. In loop, read the value from the sensor pin and print it on the serial monitor.
6. If the read value is above the trigger value, pass high value to LEDpin, if not Low value, so that the LED switches on and off respectively.

Code:

```
const int sensor_pin = A1; /* Soil moisture sensor O/P pin */

void setup() {
  Serial.begin(9600); /* Define baud rate for serial communication */
}

void loop() {
  float moisture_percentage;
```

```
int sensor_analog;  
sensor_analog = analogRead(sensor_pin);  
moisture_percentage = ( 100 - ( (sensor_analog/1023.00) * 100 ) );  
Serial.print("Moisture Percentage = ");  
Serial.print(moisture_percentage);  
Serial.print("%\n\n");  
delay(1000);  
}
```

Output:

543

567

432

456

Result:

Thus the soil moisture is measured using Soil Capacitive Sensor successfully.