

IoT tutorial

This tutorial explains how to make IoT projects

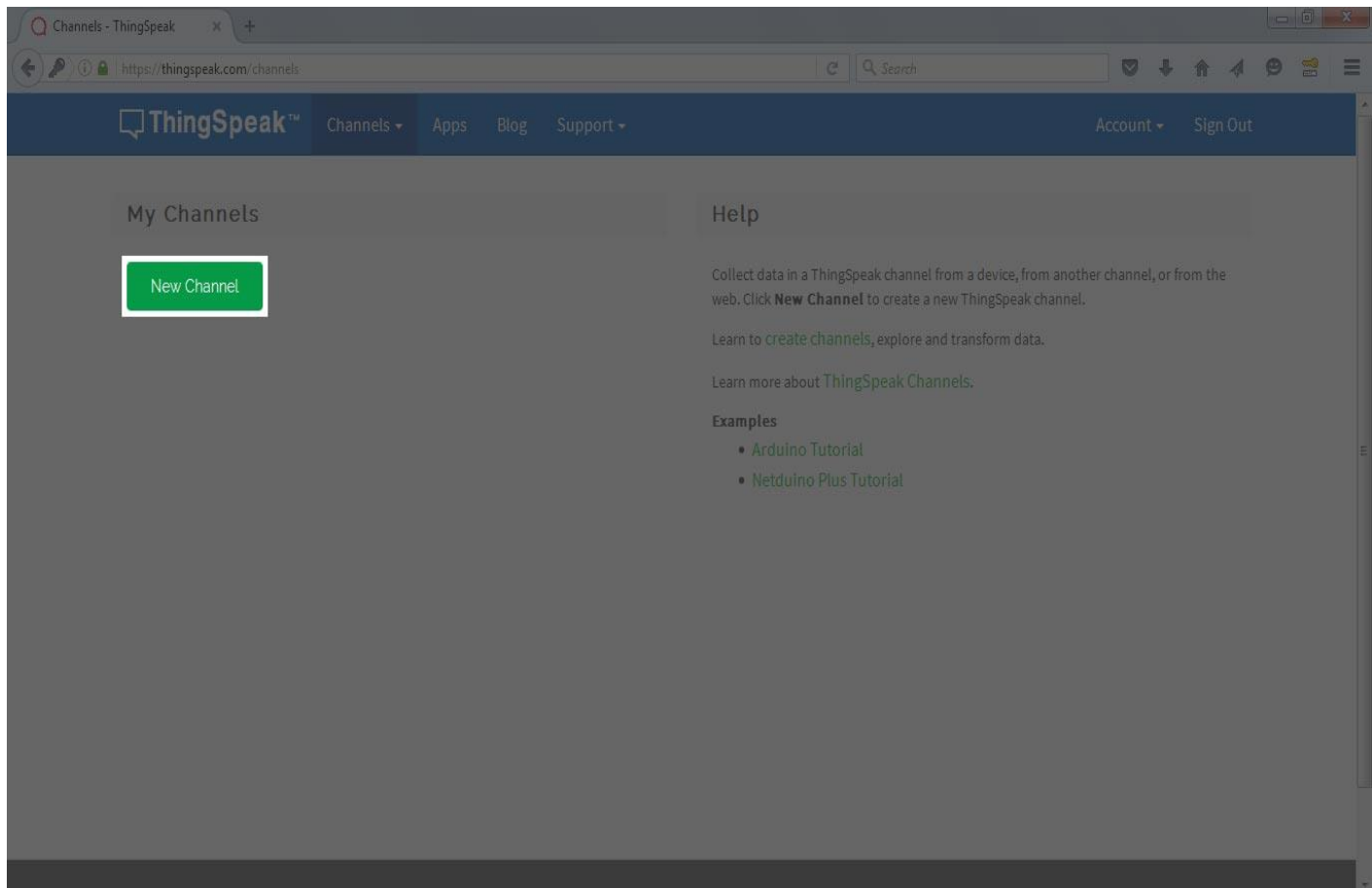
1. ThingSpeak Basics and account setup

ThingSpeak is an open cloud data platform where you can store and retrieve data.

URL : <https://thingspeak.com/>

If you do not have a ThingSpeak account create one. Once you have a ThingSpeak account login to your account.

Create a new channel by clicking on the button as shown in below image - A channel is the source for your data. Where you can store and retrieve data. A channel can have maximum 8 fields. It means you can store 8 different data to a channel.



2. Enter basic details of the channel

here we are creating channel to store data from LM35 temperature and humidity sensor so we need two fields.

ThingSpeak™

Channels ▾ Apps Community Support ▾

How to Buy Account ▾ Sign Out

Private View Public View

Channel Settings API Keys Data Import / Export

Channel Settings

Percentage complete 50%

Channel ID 264765

Name

SRISHTI ROBOTICS DATA CENTRE

Description

To show sensor datas

Field 1

temperature

☒

Field 2

humidity

☒

Field 3

☐

Help

Channels store all the data that a ThingSpeak application collects. Each channel includes eight fields that can hold any type of data, plus three fields for location data and one for status data. Once you collect data in a channel, you can use ThingSpeak apps to analyze and visualize it.

Channel Settings

- **Channel Name:** Enter a unique name for the ThingSpeak channel.
- **Description:** Enter a description of the ThingSpeak channel.
- **Field#:** Check the box to enable the field, and enter a field name. Each ThingSpeak channel can have up to 8 fields.
- **Metadata:** Enter information about channel data, including JSON, XML, or CSV data.
- **Tags:** Enter keywords that identify the channel. Separate tags with commas.
- **Latitude:** Specify the position of the sensor or thing that collects data in decimal degrees. For example, the latitude of the city of London is 51.5072.

3. Scroll down and save the channel

Channels - ThingSpeak

https://thingspeak.com/channels/new

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Latitude 0.0

Longitude 0.0

Show Video ☐ YouTube ☐ Vimeo

Video ID

Show Status ☐

Save Channel

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4.Channel ID

Channel Id is the identity of your channel. Note down this.

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SRISHTI ROBOTICS DATA CENTRE

Channel ID: **264765** | To show sensor datas

Author: vipinsrishti

Access: Private

Private View Public View Channel Settings API Keys Data Import / Export

+ Add Visualizations Data Export

MATLAB Analysis MATLAB Visualization

Channel Stats

Created: 29 minutes ago

Updated: about a minute ago

Entries: 0

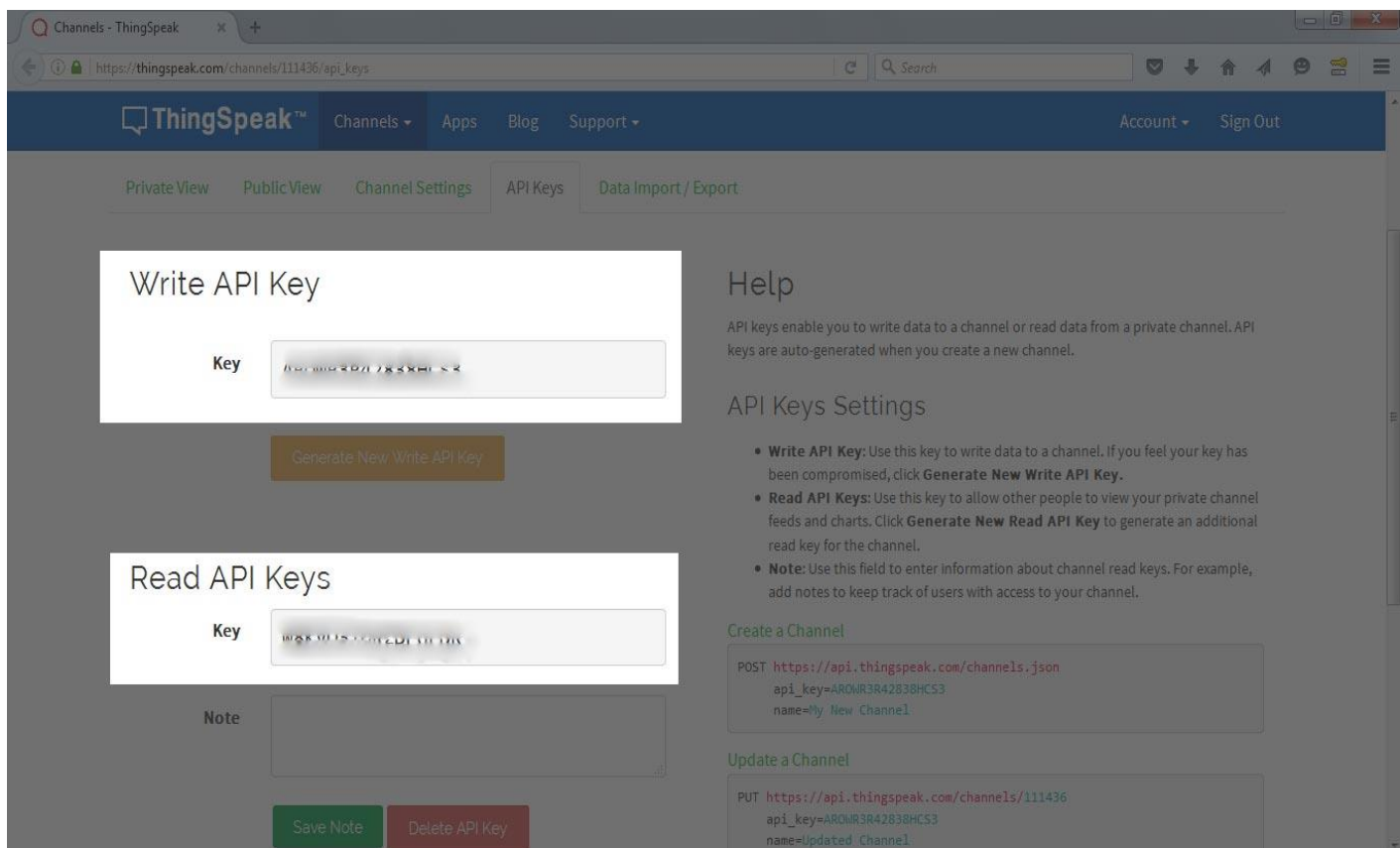
5.API Keys

API (Application Programming Interface) keys are the keys to access to your channel. In simple language you can understand that these are password to access your channel. You can access your channel in two ways-

1. To update channel / data logging : API Write Key will be used to access in this mode.

2. To retrieve data : API Read Key will be used to access in this mode.

Click on the API tab to know your API keys. We have blurred our API Keys for security reasons.



The screenshot shows the ThingSpeak web interface for managing API keys. The browser address bar shows the URL `https://thingspeak.com/channels/111436/api_keys`. The page has a dark blue header with the ThingSpeak logo and navigation links: Channels, Apps, Blog, Support, Account, and Sign Out. Below the header, there are tabs for Private View, Public View, Channel Settings, API Keys (which is selected), and Data Import / Export. The main content area is divided into two sections: 'Write API Key' and 'Read API Keys'. The 'Write API Key' section has a text input field labeled 'Key' containing a blurred key, a 'Generate New / Write API Key' button, and a 'Help' section explaining that API keys enable writing data to a channel or reading data from a private channel. The 'Read API Keys' section has a text input field labeled 'Key' containing a blurred key, a 'Note' text area, and 'Save Note' and 'Delete API Key' buttons. On the right side, there is a 'Help' section and 'API Keys Settings' with three bullet points: 'Write API Key', 'Read API Keys', and 'Note'. Below these, there are two code blocks: 'Create a Channel' showing a POST request to `https://api.thingspeak.com/channels.json` with `api_key=ARQWR3R42838HC53` and `name=My New Channel`, and 'Update a Channel' showing a PUT request to `https://api.thingspeak.com/channels/111436` with the same `api_key` and `name=Updated Channel`.

6.Accessing Channel:

You may use following URLs to access your channel -

To Update channel / data uploading / data logging

URL: http://api.thingspeak.com/update?api_key=YOUR-API&field1=VAR-1&field2=VAR-2

make the following replacements in the above mentioned URL-

1. YOUR-API : Your API Write Key

2. VAR-1 : Temperature Data

3. VAR-2 : Humidity Data

Response : If you get a positive number that means the data has been uploaded to your channel. The number is index of the last entry you have made.

Retrieve channel / data reading

URL: http://api.thingspeak.com/channels/YOUR-CHANNEL-ID/fields/FIELD.json?results=NOS-OF-RESULTS&api_key=YOUR-API

make the following replacements in the above mentioned URL-

1. YOUR-CHANNEL-ID - Your channel ID

2. FIELD - Field you want to retrieve. Write 1 for Field1, 2 for Field2

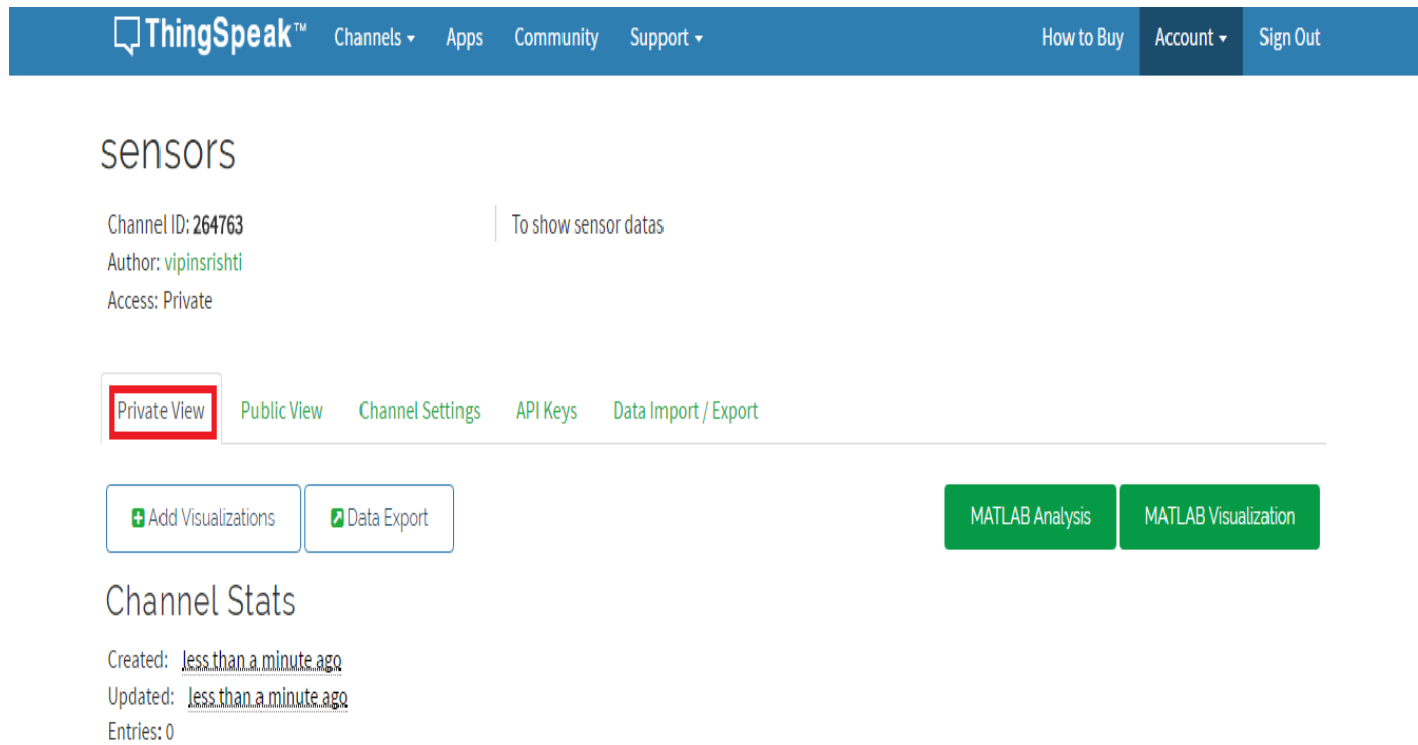
3. NOS-OF-RESULTS = The number of rows you want to retrieve.

4. YOUR-API : Your API Read Key

Response : You will get data as per your specifications in JSON format.

7. Reading data through ThingSpeak website.

Login to your account. Select your channel and click on the view as shown in the following image.



The screenshot shows the ThingSpeak website interface. At the top is a blue navigation bar with the ThingSpeak logo and links for Channels, Apps, Community, Support, How to Buy, Account, and Sign Out. Below the navigation bar, the page title 'sensors' is displayed. The channel information section shows 'Channel ID: 264763', 'Author: vipinsrishti', and 'Access: Private'. A message 'To show sensor datas' is visible. Below this, there is a row of tabs: 'Private View' (highlighted with a red box), 'Public View', 'Channel Settings', 'API Keys', and 'Data Import / Export'. Under the 'Private View' tab, there are two buttons: 'Add Visualizations' and 'Data Export'. To the right of these buttons are two green buttons: 'MATLAB Analysis' and 'MATLAB Visualization'. Below the buttons, the 'Channel Stats' section shows 'Created: less than a minute ago', 'Updated: less than a minute ago', and 'Entries: 0'.

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sensors

Channel ID: 264763
Author: vipinsrishti
Access: Private

To show sensor datas

Private View Public View Channel Settings API Keys Data Import / Export

+ Add Visualizations Data Export

MATLAB Analysis MATLAB Visualization

Channel Stats

Created: less than a minute ago
Updated: less than a minute ago
Entries: 0

PROJECT 1: DAM LEVEL INDICATOR

Hardware

1x Ultrasonic sensor

1x NodeMCU

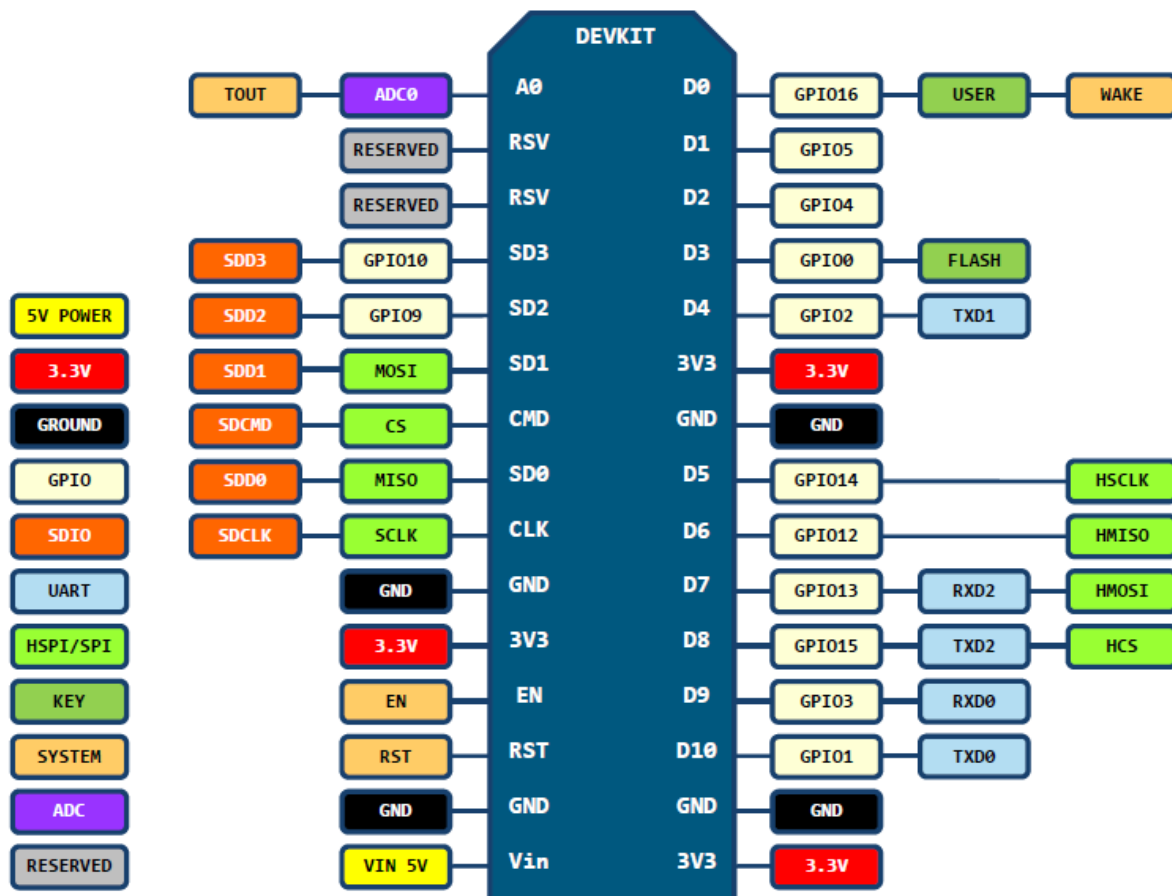
1x Access Point Connected to Internet(Wi-Fi)

Software:

Arduino IDE

The physical pins on NodeMCU v1.0 does not correspond to pins in Arduino IDE. Check out figure for pin mapping

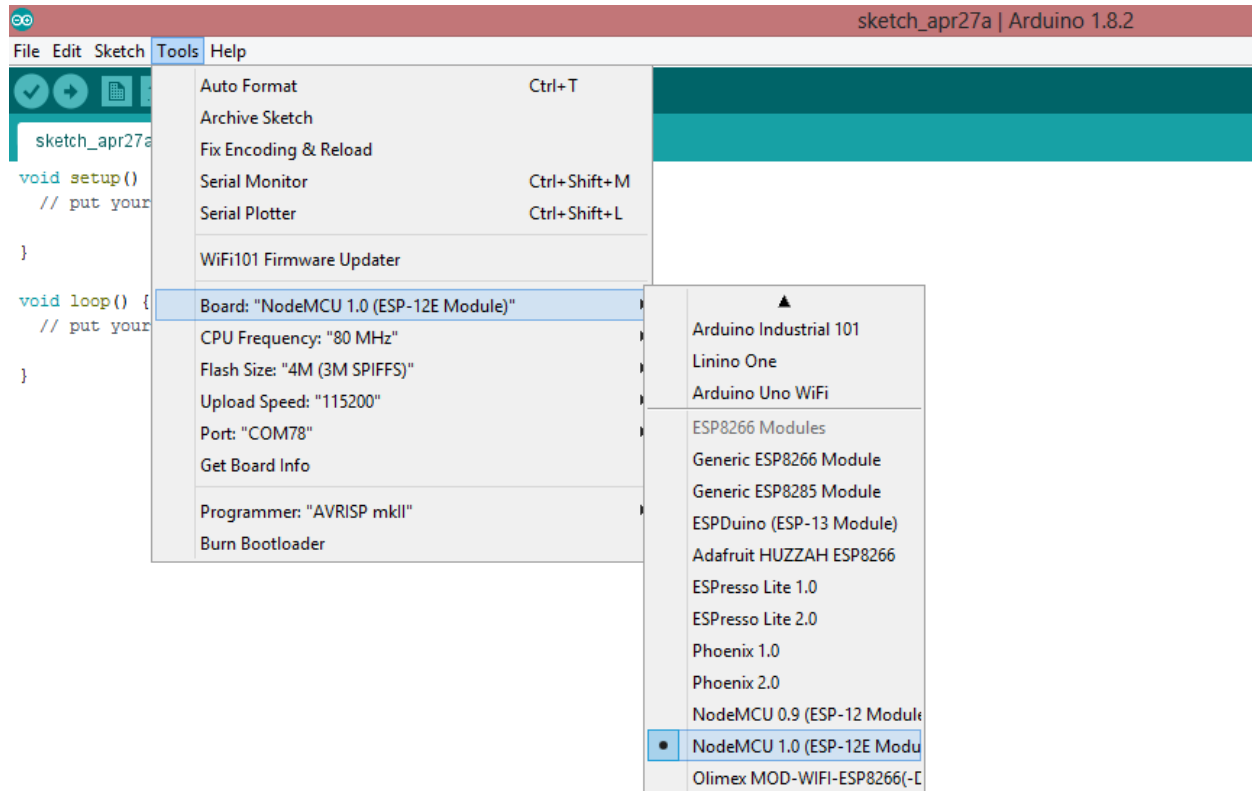
PIN DEFINITION



D0(GPIO16) can only be used as gpio read/write, no interrupt supported, no pwm/i2c/ow supported.

1. Connect 3.3v and gnd from NodeMCU v1.0 to Ultrasonic sensor respectively.
2. Connect echo and trigger pins from Ultrasonic sensor to NodeMCU v1.0

Connect microUSB to NodeMCU v1.0



Launch ESP8266 Arduino IDE, Select Tools -> Board -> NodeMCU v1.0; and ensure parameters are correct. Refer to screenshot.

Program the source code to read Ultrasonic sensor and the acquired data to be sent to thingspeak.



```
sketch_apr27b $  
  
#include "ThingSpeak.h"  
#include <ESP8266WiFi.h>  
  
char ssid[] = "SRISHTI ROBOTICS";          // your network SSID (name)  
char pass[] = "srishtirobotics123";        // your network password  
  
int status = WL_IDLE_STATUS;  
WiFiClient client;  
  
unsigned long myChannelNumber = 234946; // modify this with your own Channel Number  
const char * myWriteAPIKey = "G294VC763KY2LBLJ"; // modify this with your own API  
  
void setup() {  
    Serial.begin(9600); // for debugging reasons  
    WiFi.begin(ssid, pass);  
    ThingSpeak.begin(client);  
}  
  
void loop() {  
    int sensorValue = analogRead(A0);  
    Serial.println(sensorValue);  
    ThingSpeak.writeField(myChannelNumber, 1, sensorValue, myWriteAPIKey);  
    delay(20000);  
}
```

Now observe water level on thingspeak.