

R-Pi

Team Emertxe



Interfacing

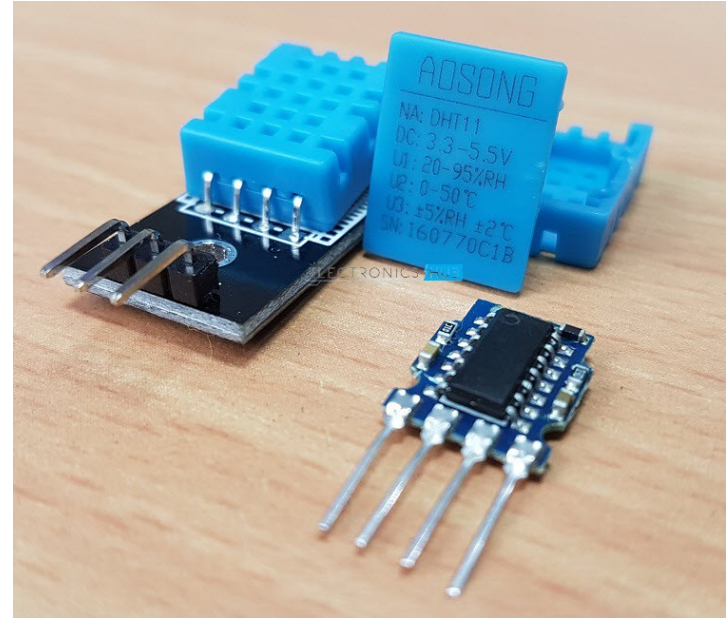
Sensors: DHT11 Introduction



Interfacing

Sensors: Introduction

- DHT11 Temperature and Humidity Sensor
 - Part of DHTXX series of Humidity sensors.
 - The other sensor in this series is DHT22.
 - Both these sensors are Relative Humidity (RH) Sensor.
 - They will measure both the humidity and temperature.
 - Cheap and slow, very popular among hobbyists and beginners.



Interfacing

Sensors: Introduction

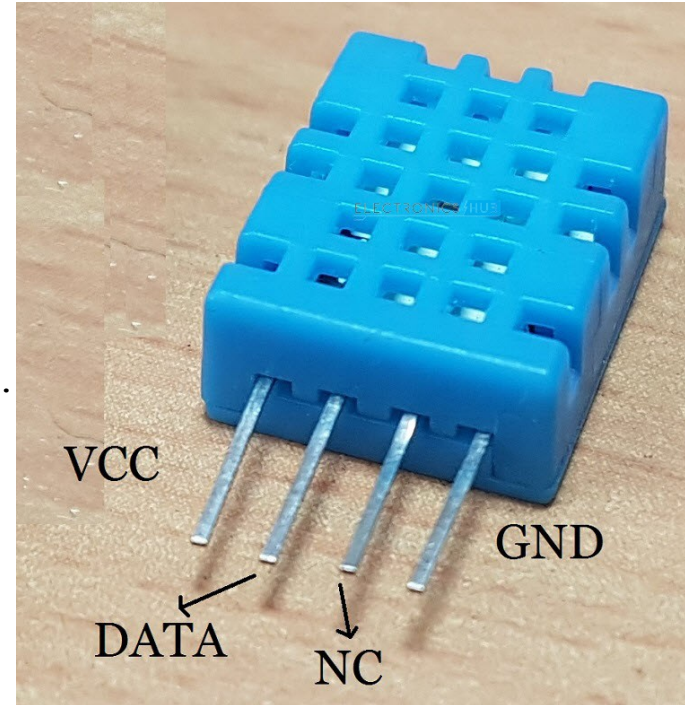


- Sensor consists of 3 main components.
 - A resistive type humidity sensor,
 - NTC (negative temperature coefficient) thermistor (to measure the temperature).
 - An 8-bit microcontroller, which converts the analog signals from both the sensors and sends out single digital signal.
- This digital signal can be read by any microcontroller or microprocessor for further analysis.

Interfacing

Sensors: Introduction

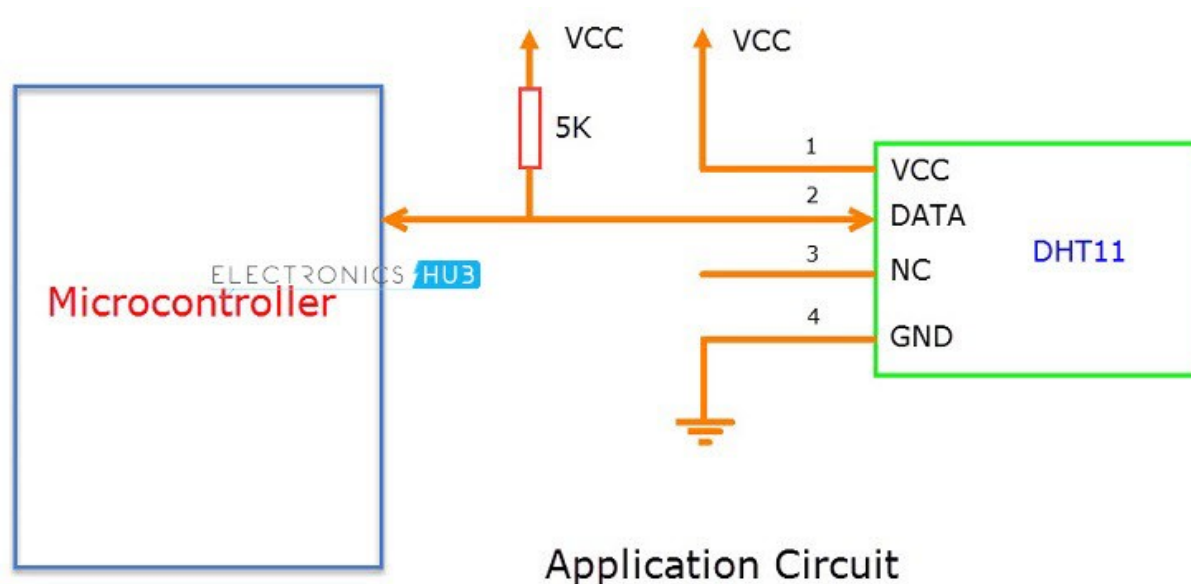
- DHT11 Humidity Sensor consists of 4 pins:
 - VCC, Data Out, Not Connected (NC) and GND.
 - The range of voltage for VCC pin is 3.5V to 5.5V.
 - A 5V supply would do fine.
 - The data from the Data Out pin is a serial digital data.



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Sensors: Introduction

- DHT11 Sensor can measure a humidity value in the range of 20 - 90% of Relative Humidity (RH)
- A temperature in the range of 0 - 50°C.
- The sampling period of the sensor is 1 second i.e.



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Sensors: Introduction



- The data from the DHT11 sensor consists of 40 - bits and the format is as follows:
 - 8 - Bit data for integral RH value,
 - 8 - Bit data for decimal RH value,
 - 8 - Bit data for integral Temperature value,
 - 8 - Bit data for integral Temperature value and
 - 8 - Bit data for checksum.

00100101

High Humidity

00000000

Low Humidity

00011001

High Temperature

00000000

Low Temperature

00111110

Checksum (Parity)

- RH = Decimal of 00100101 = 37%
- Temperature = Decimal of 00011001 = 250C

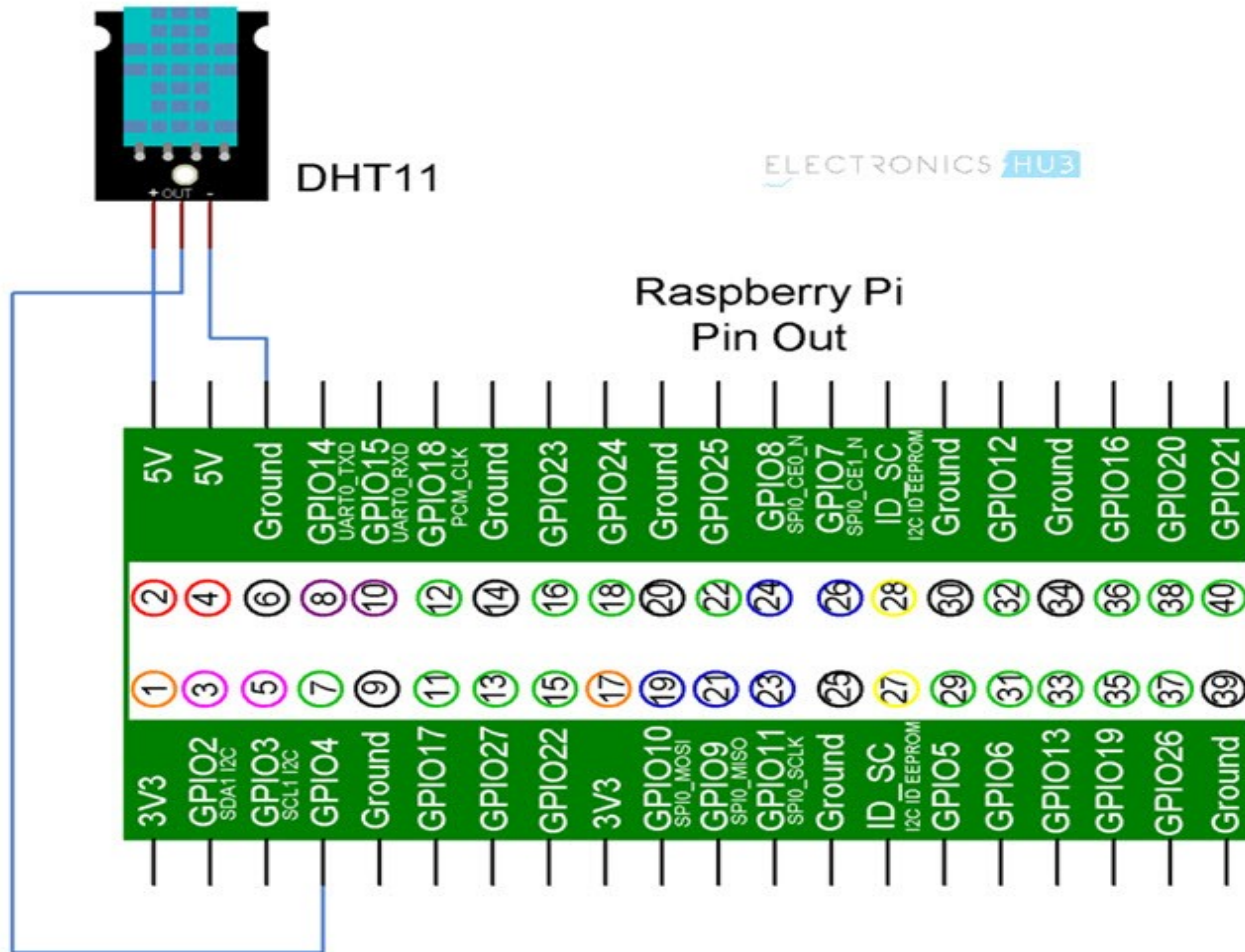
Interfacing

Sensors: Circuit Diagram



Interfacing

Sensors: Circuit Diagram



Note: If GPIO4 is not working, try connecting to some other GPIO and change the pin in code

Interfacing

Sensors: Installing DHT11 Library



Interfacing

Step-1: Installing DHT11 Library

- Clone Adafruit_DHT library

```
git clone https://github.com/adafruit/Adafruit_Python_DHT.git
```

```
[Satya@RPi]~  
git clone https://github.com/adafruit/Adafruit_Python_DHT.git  
Cloning into 'Adafruit_Python_DHT'...  
remote: Enumerating objects: 308, done.  
remote: Total 308 (delta 0), reused 0 (delta 0), pack-reused 308  
Receiving objects: 100% (308/308), 91.74 KiB | 0 bytes/s, done.  
Resolving deltas: 100% (168/168), done.  
[Satya@RPi]~
```

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Step-2: Installing DHT11 Library

- Change DIR to Adafruit_DHT library

```
cd Adafruit_Python_DHT/
```

```
[Satya@RPi]~  
cd Adafruit_Python_DHT/  
[Satya@RPi]~/Adafruit_Python_DHT  
ls  
Adafruit_DHT  examples  LICENSE  MANIFEST.in  README.md  setup.py  source  
[Satya@RPi]~/Adafruit_Python_DHT
```

Interfacing

Step-3: Installing DHT11 Library

- Upgrade

```
sudo apt-get upgrade
```

```
[Satya@RPi]~  
cd Adafruit_Python_DHT/  
[Satya@RPi]~/Adafruit_Python_DHT  
sudo apt-get upgrade  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
Calculating upgrade... Done  
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
```

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Step-4: Installing DHT11 Library

- Install

```
sudo apt-get install build-essential python-dev
```

```
[Satya@RPi]~  
cd Adafruit_Python_DHT/  
[Satya@RPi]~/Adafruit_Python_DHT  
sudo apt-get install build-essential python-dev  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
build-essential is already the newest version (12.3).  
python-dev is already the newest version (2.7.13-2).  
python-dev set to manually installed.  
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
```

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Step-5: Installing DHT11 Library

- Run setup.py

```
sudo python setup.py install
```

```
[Satya@RPi]~/Adafruit_Python_DHT
sudo python setup.py install
running install
running bdist_egg
running egg_info
creating Adafruit_DHT.egg-info
writing Adafruit_DHT.egg-info/PKG-INFO
writing top-level names to Adafruit_DHT.egg-info/top_level.txt
writing dependency_links to Adafruit_DHT.egg-info/dependency_links.txt
writing manifest file 'Adafruit_DHT.egg-info/SOURCES.txt'
reading manifest file 'Adafruit_DHT.egg-info/SOURCES.txt'
reading manifest template 'MANIFEST.in'
writing manifest file 'Adafruit_DHT.egg-info/SOURCES.txt'
installing library code to build/bdist.linux-armv7l/egg
running install_lib
running build_py
creating build
:
:
:
Installed /usr/local/lib/python2.7/dist-packages/Adafruit_DHT-1.4.0-py2.7-linux-armv7l.egg
Processing dependencies for Adafruit-DHT==1.4.0
Finished processing dependencies for Adafruit-DHT==1.4.0
```

Interfacing

Sensors: Coding



Interfacing

Step-1:

- Change DIR to examples

```
cd examples
```

```
[Satya@RPi]~/Adafruit_Python_DHT
ls
Adafruit_DHT  Adafruit_DHT.egg-info  build  dist  examples  LICENSE  MANIFEST.in  README.md  setup.py  source
[Satya@RPi]~/Adafruit_Python_DHT
cd examples/
[Satya@RPi]~/Adafruit_Python_DHT/examples
```

Interfacing

Step-2:

- Create file dht_11.py

```
import sys
import Adafruit_DHT
import time

while True:
    humidity, temperature = Adafruit_DHT.read_retry(11, 4)
    print 'Temp: {0:0.1f} C  Humidity: {1:0.1f} %'.format(temperature, humidity)
    time.sleep(1)
```

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Step-3:

- Run the file

```
[Satya@RPi]~/Adafruit_Python_DHT/examples
sudo python dht_11.py
Temp=25.0* Humidity=86.0%
Temp=26.0* Humidity=86.0%
Temp=25.0* Humidity=86.0%
Temp=26.0* Humidity=86.0%
Temp=25.0* Humidity=86.0%
Temp=26.0* Humidity=86.0%
Temp=25.0* Humidity=86.0%
Temp=26.0* Humidity=86.0%
Temp=25.0* Humidity=86.0%
Temp=26.0* Humidity=86.0%
Temp=25.0* Humidity=86.0%
Temp=26.0* Humidity=86.0%
```

THANK YOU