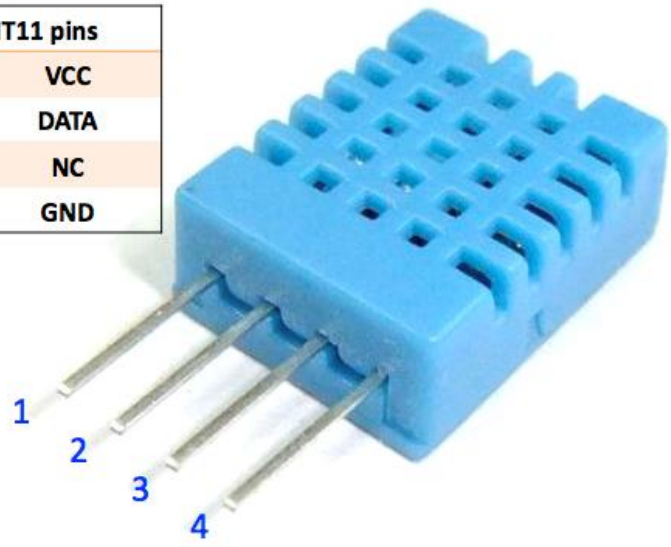
DHT11 Humidity-temperature Sensor

The digital temperature and humidity sensor DHT11 is a composite sensor that contains a calibrated digital signal output of temperature and humidity. The technology of a dedicated digital modules collection and the temperature and humidity sensing technology are applied to ensure that the product has high reliability and excellent long-term stability.

The sensor includes a resistive sense of wet component and an NTC temperature measurement device, and is connected with a high-performance 8-bit microcontroller.

Only three pins are available for use: VCC, GND, and DATA. The communication process begins with the DATA line sending start signals to DHT11, and DHT11 receives the signals and returns an answer signal. Then the host receives the answer signal and begins to receive 40-bit humiture data (8-bit humidity integer + 8-bit humidity decimal + 8-bit temperature integer + 8-bit temperature decimal + 8-bit checksum).

DHT11 pins	
1	VCC
2	DATA
3	NC
4	GND



Features

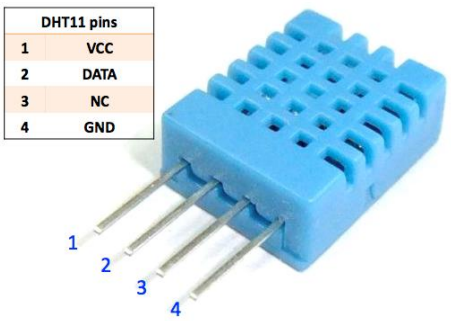
1. Humidity measurement range: 20 - 90%RH
2. Temperature measurement range: 0 - 60℃
3. Output digital signals indicating temperature and humidity
4. Working voltage:DC 5V; PCB size: 2.0 x 2.0 cm
5. Humidity measurement accuracy: ±5%RH
6. Temperature measurement accuracy: ±2℃

6.2 Temperature - Humidity

Humidity and temperature are closely related from the physical quantity itself to the actual people's life. The temperature and humidity of human environment will directly affect the thermoregulatory function and heat transfer effect of human body. It will further affect the thinking activity and mental state, thus affecting the efficiency of our study and work.

Temperature is one of the seven basic physical quantities in the International System of Units, which is used to measure the degree of hot and cold of an object. Celsius is one of the more widely used temperature scales in the world, expressed by the symbol "℃".

Humidity is the concentration of water vapor present in the air. The relative humidity of air is commonly used in life and is expressed in %RH. Relative humidity is closely related to temperature. For a certain volume of sealed gas, the higher the temperature, the lower the relative humidity, and the lower the temperature, the higher the relative humidity.

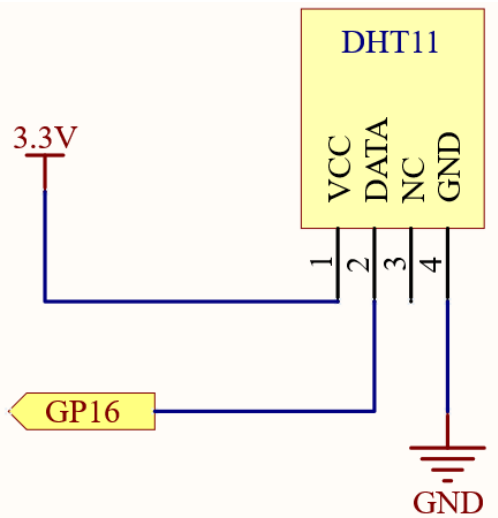


A basic digital temperature and humidity sensor, the **DHT11**, uses a capacitive humidity sensor and thermistor to measure the surrounding air and outputs a digital signal on the data pins (no analog input pins are required).

To measure tem and humidity following things are required.

S. No.	COMPONENT	QUANTITY
1	Raspberry Pi Pico W	1
2	Micro USB Cable	1
3	Breadboard	1
4	Jumper Wires	Several
5	DHT11 Humiture Sensor	1

Schematic



```
from machine import Pin, I2C
import utime as time
from dht import DHT11, InvalidPulseCount

pin = Pin(16, Pin.IN, Pin.PULL_UP)
sensor = DHT11(pin)
time.sleep(5)  # initial delay

while True:
    try:
        sensor.measure()
        string = "Temperature:{}\nHumidity: {}".format(sensor.temperature, sensor.humidity)
        print(string)
        time.sleep(4)

    except InvalidPulseCount as e:
        print('Bad pulse count - retrying ...')
```

After the code is run, you will see the Shell continuously print out the temperature and humidity, and as the program runs steadily, these two values will become more and more accurate.

How it works?

In the dht library, we have integrated the relevant functionality into the `DHT11` class.

```
from dht import DHT11, InvalidPulseCount
```

Initialize the `DHT11` object. This device only needs a digital input to be used.

```
pin = Pin(16, Pin.IN, Pin.PULL_UP)
sensor = DHT11(pin)
```

Use `sensor.measure()` to read the current temperature and humidity, which will be stored in `sensor.temperature`, `sensor.humidity`. They are then printed out. Finally the DHT11 sampling rate is 1HZ, a `time.sleep(1)` is needed in the loop.

```
while True:
    try:
        sensor.measure()
        string = "Temperature:{}\nHumidity: {}".format(sensor.temperature, sensor.humidity)
        print(string)
        time.sleep(4)

    except InvalidPulseCount as e:
        print('Bad pulse count - retrying ...')
```