



# 7SEMI

## **SHT40 Digital Humidity and Temperature Sensor Nano Breakout 2.54mm Pitch**

Version 1.0

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# 1.Introduction



The **7Semi SHT40 Digital Humidity and Temperature Sensor Nano Breakout 2.54mm Pitch** integrates Sensirion's latest 4th-generation SHT4x sensor technology. This compact and high-accuracy sensor is ideal for precise humidity and temperature measurements. Designed for reliability and efficiency, the SHT40 supports I<sup>2</sup>C communication and operates across a wide voltage range, making it suitable for various embedded and IoT applications.

## 1.1 Features

- High accuracy:  $\pm 1.8\%$  RH,  $\pm 0.2\text{ }^{\circ}\text{C}$  (typical)
- Operating range: 0% to 100% RH, -40 to 125  $^{\circ}\text{C}$
- Fully calibrated and linearized output
- I<sup>2</sup>C digital interface (0x44 default address)
- Ultra-low power consumption: 0.4  $\mu\text{A}$  average
- Optional PTFE membrane for IP67 protection
- Compatible with Arduino, ESP32, Raspberry Pi, STM32

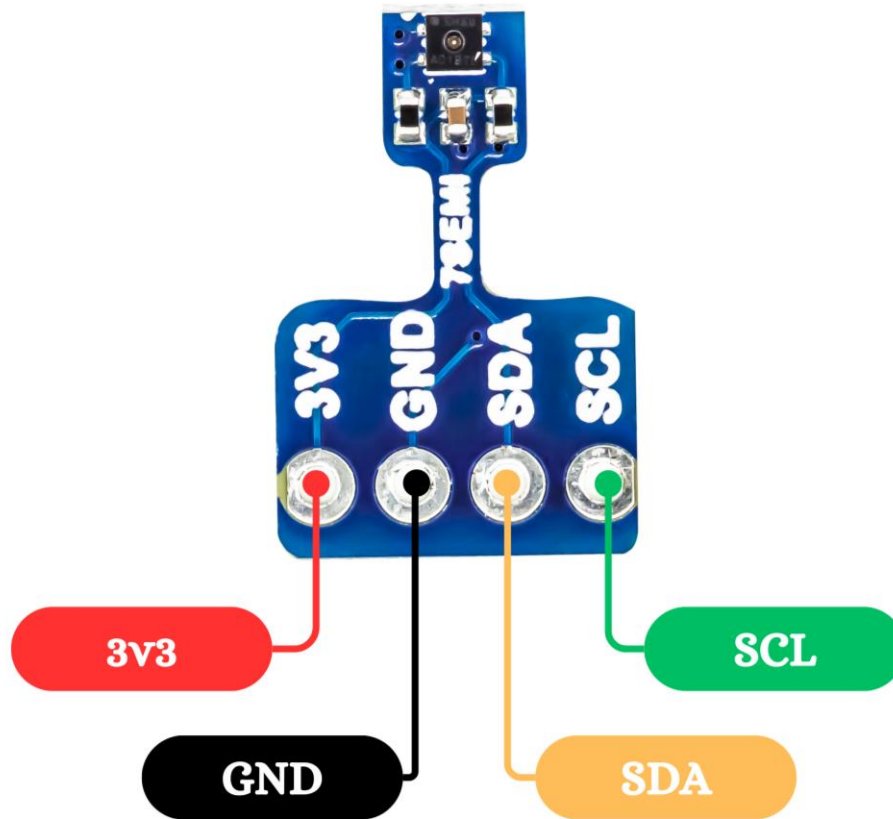
## 2. Technical Specification

The **Technical Specification** table provides detailed information about **7Semi SHT40 Digital Humidity and Temperature Sensor Nano Breakout 2.54mm Pitch**, including its operating voltage, current consumption, and electrical characteristics. This data helps users understand the power requirements, communication parameters, and performance capabilities of the sensor. It ensures compatibility with different microcontrollers and embedded systems while providing guidelines for efficient integration into various applications.

### SHT40 Specifications

- Relative Humidity Accuracy:  $\pm 1.8$  %RH (typ.)
- Temperature Accuracy:  $\pm 0.2$  °C (typ.)
- Supply Voltage: 1.08 V to 3.6 V
- Idle Current: 80 nA
- Average Current: 0.4  $\mu$ A (low repeatability)
- Interface: I<sup>2</sup>C, 16-bit resolution
- Connector: 2.54mm pitch header
- Breakout Dimensions: 14.82 x 9.75 mm

## 3.Pinouts

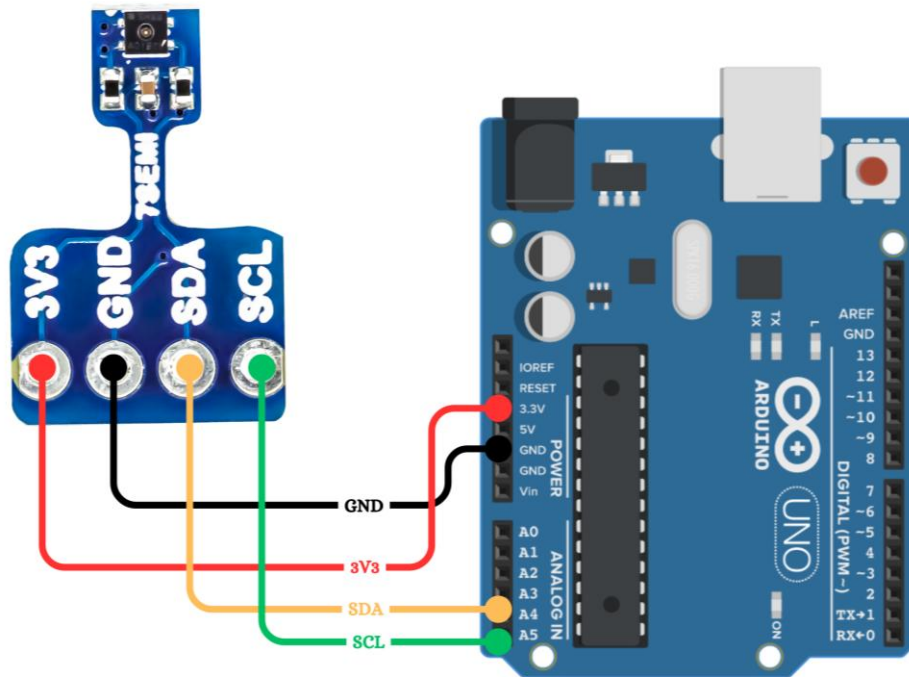


Pin	Name	Description
1	VCC	Power Input (3.3V DC)
2	SCL	I <sup>2</sup> C Clock Line
3	SDA	I <sup>2</sup> C Data Line
4	GND	Ground Connection

### Connection Guidelines

- Ensure a stable 3.3V DC power source.
- Connect SCL to SCL and SDA to SDA for proper communication.

## 4. Hardware Interface



### Connection Explanation :

- The VCC pin of the sensor is connected to **3.3V** on the Arduino UNO.
- The GND pin of the sensor is connected to the GND pin of the Arduino UNO to The **SCL (Clock Line)** of the sensor is connected to **A5 (SCL)** on the Arduino UNO.
- The **SDA (Data Line)** of the sensor is connected to **A4 (SDA)** on the Arduino UNO.
- These connections allow the **Arduino UNO** to communicate with the **SHT40 sensor** using the I<sup>2</sup>C protocol.

## 5. Example code link

We provide example codes to help you get started with the **7Semi SHT40 Digital Humidity and Temperature Sensor Nano Breakout 2.54mm Pitch**. These examples demonstrate how to communicate with the sensor and retrieve temperature and humidity data using the I<sup>2</sup>C protocol. The code is available for two popular platforms: Arduino and ESP32.

### Code Explanation

```
#include <Arduino.h>
#include <SensirionI2cSht4x.h>
#include <Wire.h>

// macro definitions
// make sure that we use the proper definition of NO_ERROR
#ifndef NO_ERROR
#undef NO_ERROR
#endif
#define NO_ERROR 0

SensirionI2cSht4x sensor;

static char errorMessage[64];
static int16_t error;

void setup() {

    Serial.begin(115200);
    while (!Serial) {
        delay(100);
    }
    Wire.begin();
    sensor.begin(Wire, SHT40_I2C_ADDR_44);

    sensor.softReset();
    delay(10);
    uint32_t serialNumber = 0;
    error = sensor.serialNumber(serialNumber);
    if (error != NO_ERROR) {
        Serial.print("Error trying to execute serialNumber(): ");
        errorToString(error, errorMessage, sizeof errorMessage);
        Serial.println(errorMessage);
        return;
    }
    Serial.print("serialNumber: ");
    Serial.print(serialNumber);
    Serial.println();
}
```

```
    }

    void loop() {

        float aTemperature = 0.0;
        float aHumidity = 0.0;
        delay(20);
        error = sensor.measureLowestPrecision(aTemperature, aHumidity);
        if (error != NO_ERROR) {
            Serial.print("Error trying to execute measureLowestPrecision():
");
            errorToString(error, errorMessage, sizeof errorMessage);
            Serial.println(errorMessage);
            return;
        }
        Serial.print("aTemperature: ");
        Serial.print(aTemperature);
        Serial.print("\t");
        Serial.print("aHumidity: ");
        Serial.print(aHumidity);
        Serial.println();
    }
}
```

## 1. Library Inclusions

- `#include <Arduino.h>` → Core Arduino functions.
- `#include <SensirionI2cSht4x.h>` → Sensirion's official driver library for SHT40.
- `#include <Wire.h>` → Enables I<sup>2</sup>C communication.

## 2. Sensor Object and Error Handling

- `SensirionI2cSht4x sensor;` → Creates a sensor object to access SHT40 functions.
- `static int16_t error;` → Stores error codes from sensor function calls.
- `static char errorMessage[64];` → Buffer to store error messages.
- `#define NO_ERROR 0` → Represents a successful operation with no errors.

## 3. Sensor Initialization (setup())

- Starts Serial communication at 115200 baud.
- Waits for Serial Monitor to open (important for some boards).
- Initializes I<sup>2</sup>C communication using `Wire.begin()`.
- Begins SHT40 communication with `sensor.begin(Wire, SHT40_I2C_ADDR_44)`.
- Issues a soft reset using `sensor.softReset()` to ensure a clean start.
- Reads the sensor's unique 32-bit serial number.
- If successful, prints the serial number; otherwise, displays an error message.

## 4. Measuring Temperature and Humidity (loop())

- Declares `aTemperature` and `aHumidity` as float variables.
- Waits 20ms before each measurement to ensure stability.
- Uses `sensor.measureLowestPrecision()` for a fast, low-power measurement mode.



- If successful, prints both temperature (°C) and relative humidity (%RH) to Serial Monitor.
- If an error occurs, the corresponding message is displayed.

### 5. Low Precision Mode

- `measureLowestPrecision()` → Provides fast results with lower resolution.
- Ideal for energy-efficient, battery-powered applications where speed matters more than ultra-high accuracy.

### 6. Error Handling

- After each sensor call, `if (error != NO_ERROR)` checks for issues.
- Uses `errorToString()` to convert numeric errors into readable messages.
- Ensures clear debugging feedback during development

### 7. Arduino Example Code

This example is designed for Arduino-compatible boards and demonstrates:

- Initializing the I<sup>2</sup>C communication with the SHT40 sensor board.
- Reading temperature and Humidity data from the sensor.
- Printing the sensor data to the Serial Monitor.

### 8. ESP32 Example Code

This example targets ESP32 boards and showcases:

- Configuring the ESP32 I<sup>2</sup>C interface to communicate with the SHT40 sensor board.
- Reading temperature and Humidity data from the sensor.
- Printing the sensor data to the Serial Monitor.

### How to Access the Code

- **Download Link for Arduino and ESP32 Example:** [Click Here](#)

## 5.1 Sample Serial Output Arduino

Sample output Image of Arduino:

```
serialNumber: 261384716  
aTemperature: 25.46 aHumidity: 47.23  
aTemperature: 25.47 aHumidity: 47.21  
aTemperature: 25.47 aHumidity: 47.20  
aTemperature: 25.48 aHumidity: 47.18  
aTemperature: 25.48 aHumidity: 47.16  
aTemperature: 25.49 aHumidity: 47.15  
aTemperature: 25.50 aHumidity: 47.14  
aTemperature: 25.51 aHumidity: 47.12  
aTemperature: 25.51 aHumidity: 47.10  
aTemperature: 25.52 aHumidity: 47.08
```

## 6. Mechanical Specification

