

STM32F103RCT6 (ARM Microcontroller) and BME688

environment sensor interfacing using Arduino IDE

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BME688 (<https://www.adafruit.com/product/5046>) is available with STEMMA QT interface, please see below Figure 1

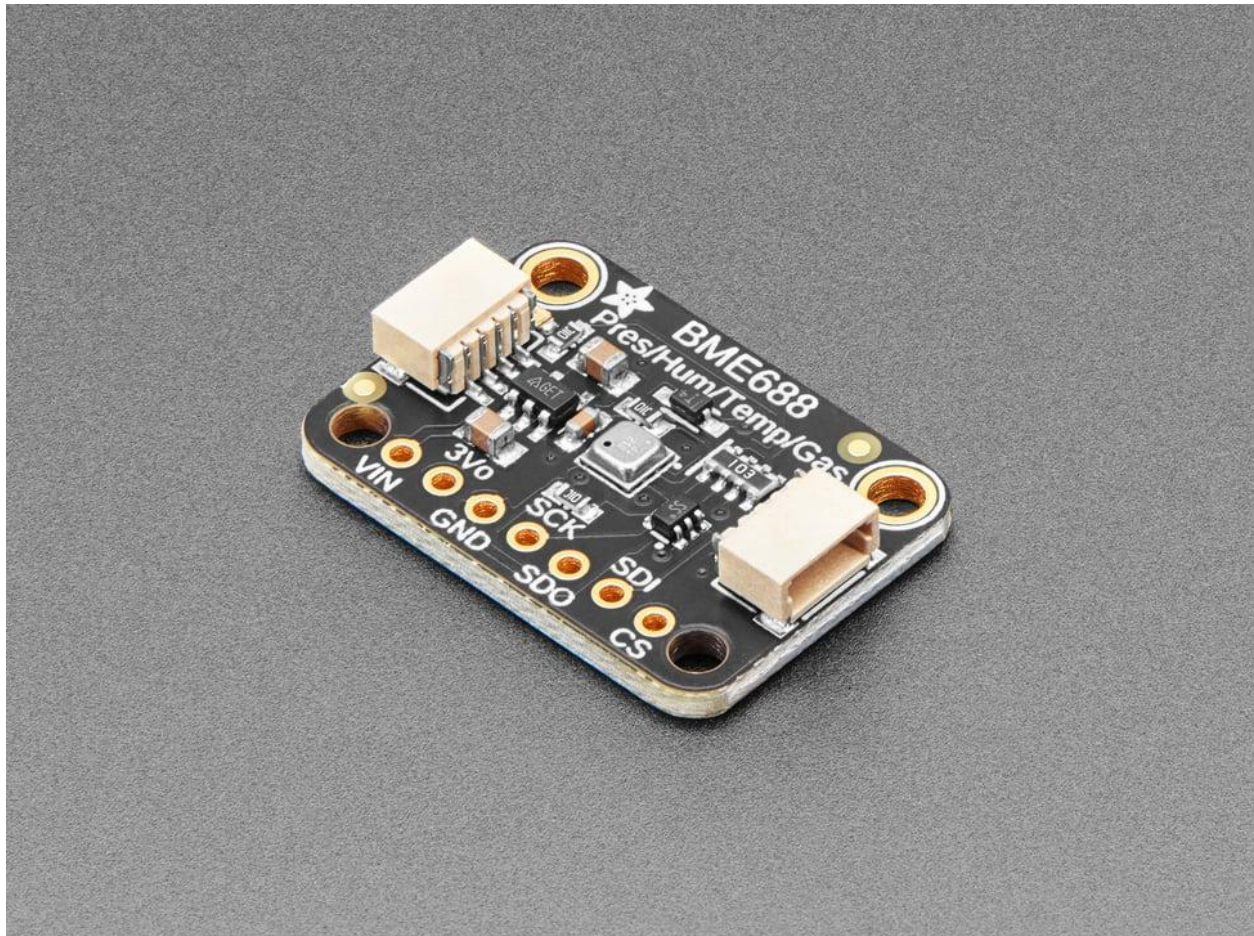


Figure 1 BME688 Pressure/Humidity/Temperature/Gas sensor with I2C interface

It is backward compatible with BME680, it has added functionality in area of Gas sensing, this sensor from Adafruit has default i2c address of 0x77

Libraries `Wire.h`, `SPI.h` (if using SPI bus), `Adafruit_Sensor`, `Adafruit_BME680` needs to be included in this sketch

Below is sketch to display environment data (Pressure, Humidity, Temperature Gas) on Arduino serial monitor

```

/*****
This is a library for the BME680 gas, humidity, temperature & pressure sensor

Designed specifically to work with the Adafruit BME680 Breakout
----> http://www.adafruit.com/products/3660

These sensors use I2C or SPI to communicate, 2 or 4 pins are required
to interface.

Adafruit invests time and resources providing this open source code,
please support Adafruit and open-source hardware by purchasing products
from Adafruit!

Written by Limor Fried & Kevin Townsend for Adafruit Industries.
BSD license, all text above must be included in any redistribution
This is same sketch as BME680 it has been modified for BME688
Modified by Alok Kumar Mishra (akmishra\_99@yahoo.com)
Date:- Wednesday Nov 12,2025
*****/

```

```

#include <Wire.h>
#include <SPI.h>
#include <Adafruit_Sensor.h>
#include "Adafruit_BME680.h"

#define BME_SCK 13
#define BME_MISO 12
#define BME_MOSI 11
#define BME_CS 10

#define SEALEVELPRESSURE_HPA (1013.25)
//I2C1: PB6 (SCL) and PB7 (SDA) on STM2F103RCT6
Adafruit_BME680 bme(&Wire); // I2C
//Adafruit_BME680 bme(&Wire1); // example of I2C on another bus
//Adafruit_BME680 bme(BME_CS); // hardware SPI
//Adafruit_BME680 bme(BME_CS, BME_MOSI, BME_MISO, BME_SCK);

void setup() {
  Serial.begin(115200);
  while (!Serial);
  Serial.println(F("BME688 test"));

  if (!bme.begin(0x77)) {
    Serial.println("Could not find a valid BME688 sensor, check wiring!");
    while (1);
  }
}

```

```

}

// Set up oversampling and filter initialization
bme.setTemperatureOversampling(BME680_OS_8X);
bme.setHumidityOversampling(BME680_OS_2X);
bme.setPressureOversampling(BME680_OS_4X);
bme.setIIRFilterSize(BME680_FILTER_SIZE_3);
bme.setGasHeater(320, 150); // 320*C for 150 ms
}

void loop() {
  if (! bme.performReading()) {
    Serial.println("Failed to perform reading :(");
    return;
  }
  Serial.print("Temperature = ");
  Serial.print(bme.temperature);
  Serial.println(" *C");

  Serial.print("Pressure = ");
  Serial.print(bme.pressure / 100.0);
  Serial.println(" hPa");

  Serial.print("Humidity = ");
  Serial.print(bme.humidity);
  Serial.println(" %");

  Serial.print("Gas = ");
  Serial.print(bme.gas_resistance / 1000.0);
  Serial.println(" KOhms");

  Serial.print("Approx. Altitude = ");
  Serial.print(bme.readAltitude(SEALEVELPRESSURE_HPA));
  Serial.println(" m");

  Serial.println();
  delay(2000);
}

```

The screenshot shows the Arduino IDE interface. The main editor displays a sketch named 'bme688test_alok_1.ino'. The code includes headers for the BME688 sensor and defines pins for I2C and SPI. The setup function initializes the serial port and prints a test message. The serial monitor shows the output of the sketch, displaying sensor data for three consecutive readings.

```
14 //written by Linor Fried & Kevin Townsend for Adafruit Industries.
15 //SD license, all text above must be included in any redistribution
16 //*****
17
18 #include <Wire.h>
19 #include <SPI.h>
20 #include <Adafruit_Sensor.h>
21 #include "Adafruit_BME688.h"
22
23 #define BME_SCK 13
24 #define BME_MISO 12
25 #define BME_MOSI 11
26 #define BME_CS 10
27
28 #define SEALEVELPRESSURE_HPA (1013.25)
29 //I2C: BME (SCL) and PPT (SDA) on STM32F103RCT6
30 Adafruit_BME688 bme(BME_CS); // I2C
31 //Adafruit_BME688 bme(BME_CS); // example of I2C on another bus
32 //Adafruit_BME688 bme(BME_CS); // hardware SPI
33 //Adafruit_BME688 bme(BME_CS, BME_MOSI, BME_MISO, BME_SCK);
34
35 void setup() {
36   Serial.begin(115200);
37   while (!Serial);
38   Serial.println(F("BME688 test"));
39 }
```

Output Serial Monitor X

Not connected. Select a board and a port to connect automatically. No Line Ending 9600 baud

```
BME688 test
Temperature = 24.17 °C
Pressure = 999.79 hPa
Humidity = 57.11 %
Gas = 5.68 uS/m³
Approx. Altitude = 107.62 m

Temperature = 24.10 °C
Pressure = 999.79 hPa
Humidity = 56.58 %
Gas = 5.68 uS/m³
Approx. Altitude = 107.28 m

Temperature = 23.66 °C
Pressure = 999.77 hPa
Humidity = 55.69 %
Gas = 5.68 uS/m³
Approx. Altitude = 107.28 m

Temperature = 23.42 °C
Pressure = 999.78 hPa
```

Figure 2 BME sketch BME688test_alok_1 for BME688 sensor in Arduino IDE

Connect QT cable and connect red wire to 3.3v power supply on STM32F103RCT6 microcontroller board, connect black wire to ground (GND) yellow wire (SCL) to PB6 and Blue wire to PB7 (SDA) of microcontroller STM32F103RCT6

If you want to use SPI interface then modify followings in sketch

```
#define BME_SCK 13
#define BME_MISO 12
#define BME_MOSI 11
#define BME_CS 10
```

To SPI interface on STM32F103RCT6

```
BME688 test
Temperature = 24.17 *C
Pressure = 989.72 hPa
Humidity = 57.11 %
Gas = 5.68 KOhms
Approx. Altitude = 197.60 m
```

```
Temperature = 24.10 *C
Pressure = 989.75 hPa
Humidity = 56.03 %
Gas = 5.68 KOhms
Approx. Altitude = 197.35 m
```

```
Temperature = 23.66 *C
Pressure = 989.77 hPa
Humidity = 55.69 %
Gas = 5.68 KOhms
Approx. Altitude = 197.26 m
```

Figure 3 output of running program on STM32F103RCT6 microcontroller in Arduino Serial monitor

Please copy/choose settings as shown in Figure 4 to tools menu and click compile and load (after connecting STlink to STM32F103RCT6 board)

After Arduino sketch is flashed to STM32F103RCT6 board press reset or power cycle board and output will appear as shown in Figure 3

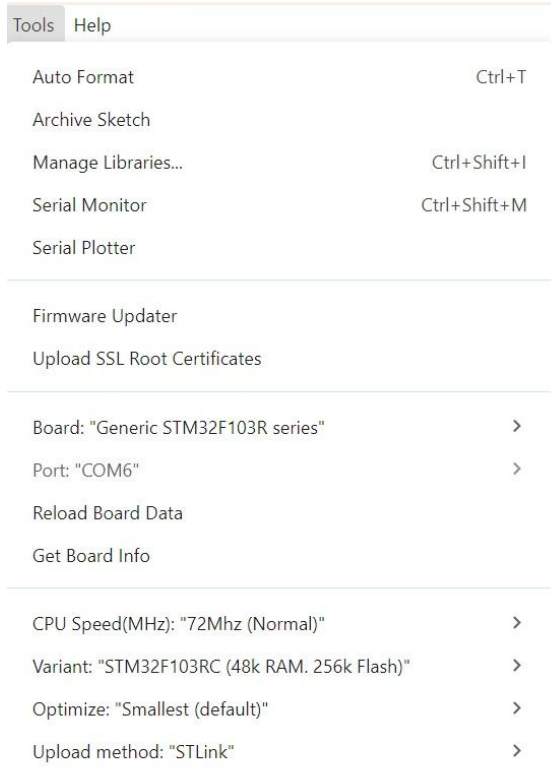


Figure 4 Tools menu settings in Arduino IDE

Here is photo/picture of complete setup (Figure 5) , showing complete setup in which BME688 environment sensor connected to STM32F103RCT6 ARM microcontroller, also ST Link is connected.

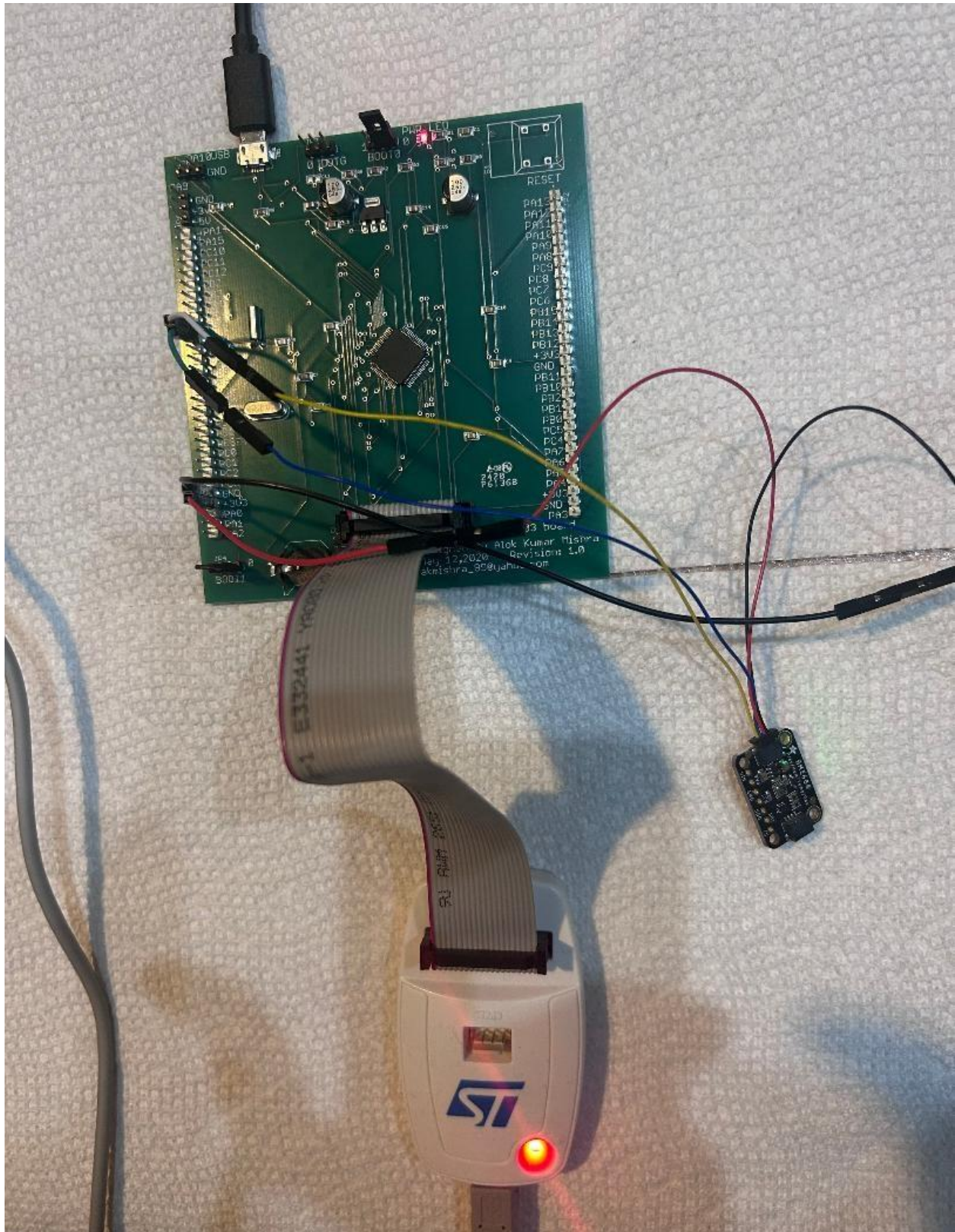


Figure 5 complete setup showing BME688 connected to STM32F103RCT6...