

Introduction

The Gravity: STCC4 Carbon Dioxide (CO₂) Sensor is a highly cost-effective, multi-functional air quality monitoring module designed for rapid hardware integration and scalable deployments. Utilizing the Sensirion STCC4 high-performance gas sensing chip based on the Thermal Conductivity (TC) measurement principle, this sensor delivers stable and reliable CO₂ concentration readings. Its standout feature is the combination of extreme affordability with 3-in-1 measurement capabilities, integrating an onboard SHT40 sensor to provide simultaneous CO₂ (with a measurement range of 400 to 5,000 ppm and an accuracy of $\pm[100 \text{ ppm} + 10\%]$), ambient temperature, and humidity data.

Operating on a wide 3.3V to 5V voltage range and communicating via a standard I2C interface, it eliminates complex wiring and soldering. This makes the module highly suitable for deploying multi-node indoor air quality monitoring networks, building automation systems, smart home setups, and educational STEM projects where budget constraints, compact size, and ease of use are primary considerations.

True CO₂ Measurement

 Gravity STCC4 True CO₂. Real Accuracy  Traditional eCO₂ Sensors		
Product	Gravity STCC4 (True CO ₂)	Traditional eCO ₂ Sensors
 Measurement Method	 Direct Physical Measurement (Thermal Conductivity)	 Estimation (Based on TVOCs algorithms)
 Cross-Sensitivity	 High Immunity. Not affected by everyday odors.	 Highly Vulnerable. Easily triggered by perfumes, alcohol, and cooking.
 Data Reliability	 Absolute & Accurate (Ideal for HVAC control indoor air quality monitoring)	 Relative & Unstable (Prone to false alarms)
 Long-Term Stability	 Excellent. Maintained by Automatic Self-Calibration (ASC).	 Poor. Requires frequent baseline resets.

The Gravity STCC4 CO₂ sensor powered by Sensirion’s advanced Thermal Conductivity (TC) technology, it directly measures the physical thermal properties of the surrounding air to calculate absolute CO₂ concentration (400–5000 ppm). Supported by a built-in Automatic Self-Calibration (ASC) algorithm, it ensures long-term stability and pin-point accuracy. Say goodbye

to inaccurate estimations and build your HVAC automations, air quality alarms, and smart home systems on data you can actually trust.

Unmatched Cost-Effectiveness for Scalable IoT Networks

By leveraging Thermal Conductivity technology, the manufacturing and operational costs are significantly reduced compared to traditional NDIR or PAS sensors. This high accessibility allows developers, engineers, and educators to build multi-room air quality networks or large-scale distributed IoT deployments without exceeding hardware budgets. It provides a highly viable alternative when deploying dozens of high-cost professional sensors is financially impractical.

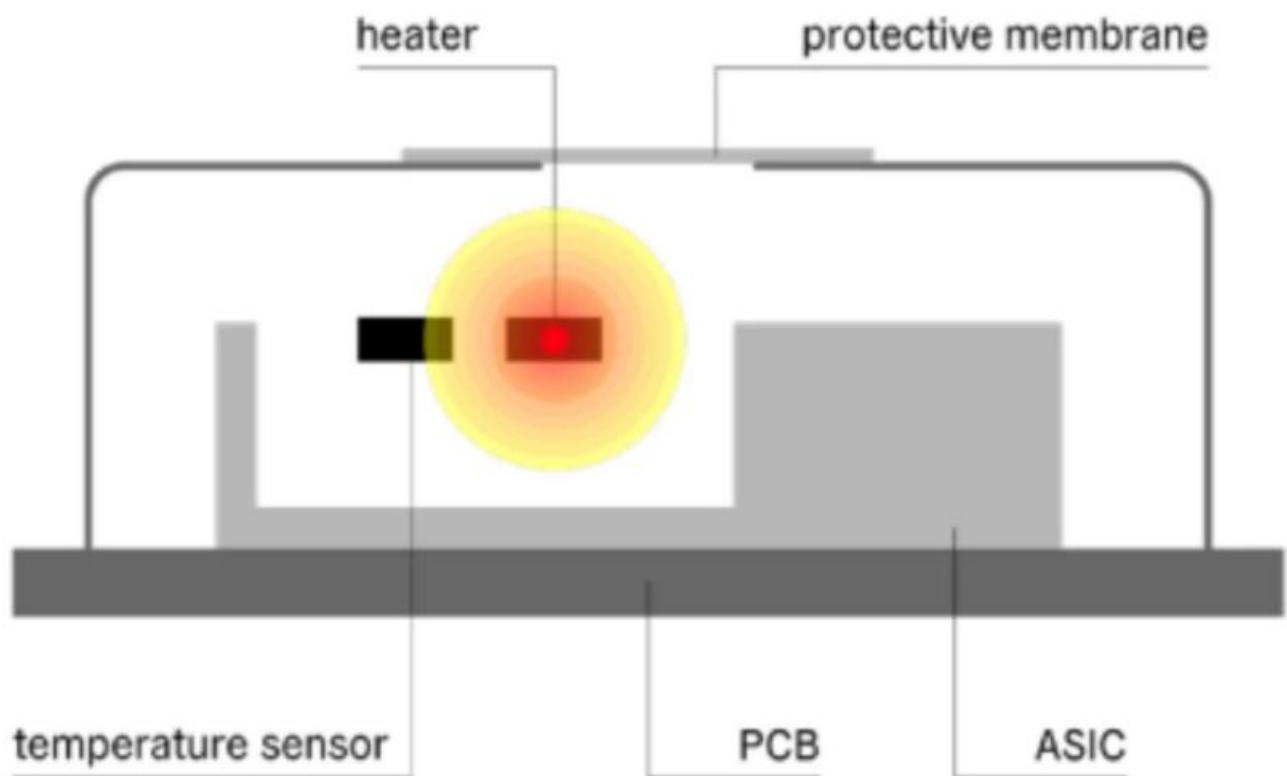


Figure: Internal structural diagram illustrating the Thermal Conductivity (TC) measurement principle utilized by the STCC4 chip.

3-in-1 Sensing with Automatic Compensation

The inclusion of the **onboard SHT40 sensor** transforms the module from a single-purpose gas detector into a comprehensive environmental node. It continuously monitors ambient temperature and humidity, actively utilizing this data to automatically compensate the CO₂ readings. This ensures reliable accuracy in fluctuating indoor climates, outputs three critical environmental metrics from a single device, and simplifies the overall system architecture.

Seamless Integration and Plug-and-Play Design

Hardware development is streamlined through the **standard Gravity I2C interface**. The wide **3.3V to 5V** operating voltage ensures native compatibility with popular microcontrollers such as [Arduino](#), [ESP32](#), and [Raspberry Pi](#). The plug-and-play nature eliminates the need for breadboards, soldering, or complex level-shifting circuitry, significantly reducing development time and accelerating the transition from prototype to final product.

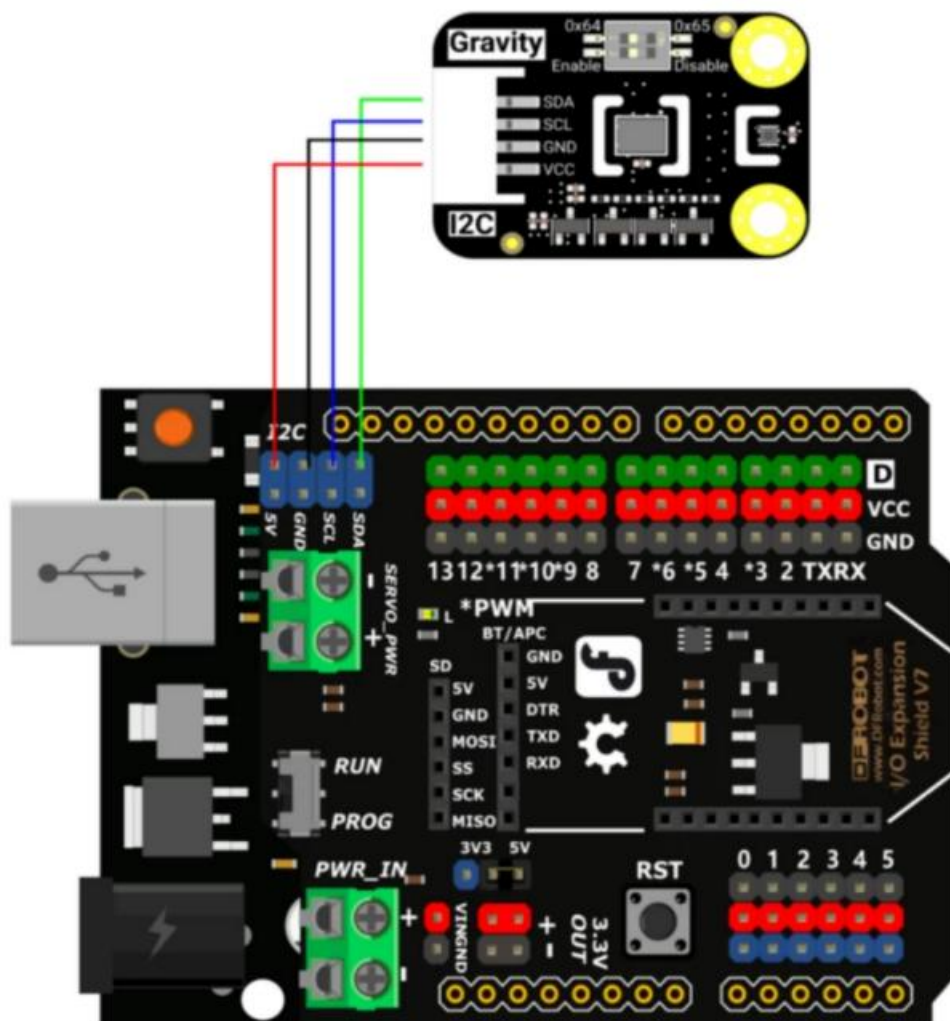
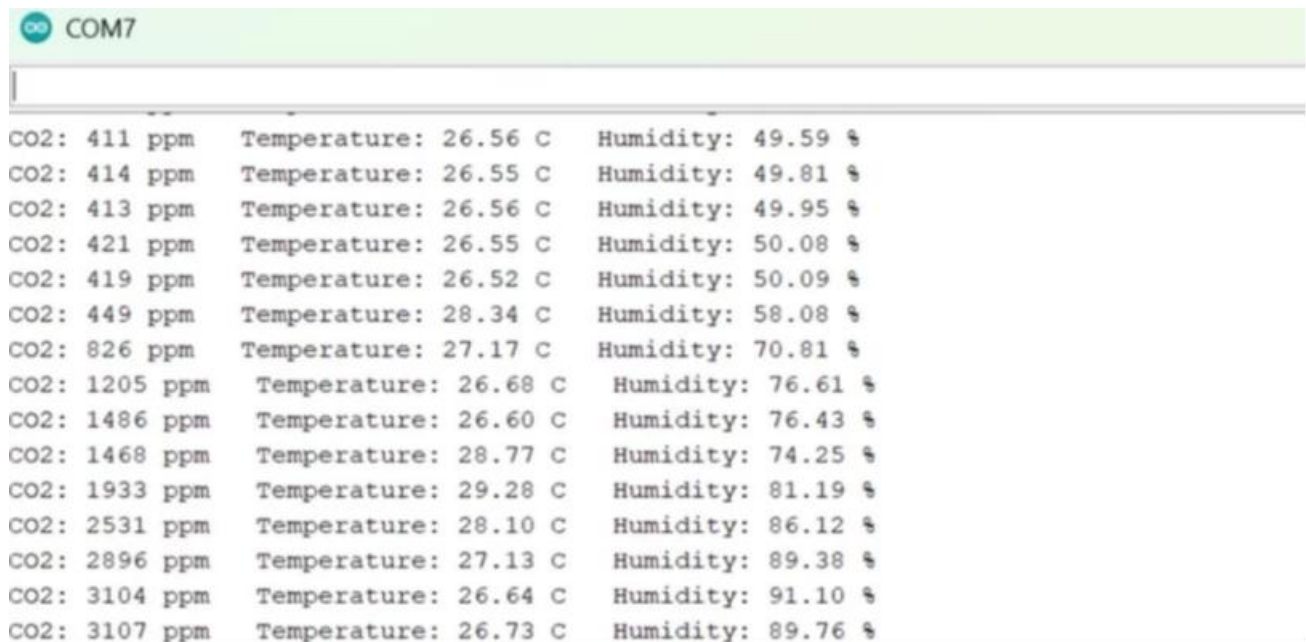


Figure: Plug-and-play hardware integration of the Gravity STCC4 CO2 Sensor with an Arduino microcontroller via a standard I2C interface.

Low Power Consumption for Continuous Monitoring

Designed for modern, energy-conscious applications, the module supports a highly efficient power profile. With a continuous measurement current of just 950 μA and a deep sleep mode drawing merely 1 μA , it is optimized for battery-powered smart home nodes and remote environmental monitoring stations requiring long-term, uninterrupted operation.



CO2	Temperature	Humidity
411 ppm	26.56 C	49.59 %
414 ppm	26.55 C	49.81 %
413 ppm	26.56 C	49.95 %
421 ppm	26.55 C	50.08 %
419 ppm	26.52 C	50.09 %
449 ppm	28.34 C	58.08 %
826 ppm	27.17 C	70.81 %
1205 ppm	26.68 C	76.61 %
1486 ppm	26.60 C	76.43 %
1468 ppm	28.77 C	74.25 %
1933 ppm	29.28 C	81.19 %
2531 ppm	28.10 C	86.12 %
2896 ppm	27.13 C	89.38 %
3104 ppm	26.64 C	91.10 %
3107 ppm	26.73 C	89.76 %

Figure: Real-time serial monitor data demonstrating simultaneous CO2, temperature, and humidity readings output directly from the sensor.

Selection Guide

CO2 Sensor Selection Guide					
Product Name	Gravity: STCC4 Carbon Dioxide (CO2) Sensor (3-in-1 Air Quality Monitoring, 400 ~ 5000ppm)	Gravity: Analog Electrochemical Carbon Dioxide / CO2 Sensor (0-10000 ppm)	Gravity: UART Infrared Carbon Dioxide / CO2 Sensor (0-50000 ppm)	Gravity: PWM Infrared Carbon Dioxide / CO2 Sensor (400-5000 ppm)	Gravity: I2C SCD41 Infrared Carbon Dioxide / CO2 Sensor (400 ~ 5000 ppm)
Figure					
SKU	SEN0678	SEN0159	SEN0220	SEN0219	SEN0536
Operation Voltage	3.3 ~ 5V	3.7~5V	4.5~5.5V	4.5~5.5V	3.3V~5V
Output	Gravity: I2C	Gravity: Analog (Analog2.7~4.1V) + 3P Header Digital Output(Alarm):0~VCC Level	Gravity: Analog (Analog Output 0.4~2v)	Gravity: UART (0~3.3V Level)	Gravity: I2C
Measurement Principle	Thermal Conductivity (TC)	Electrochemistry (solid electrolyte battery principle)	NDIR (non-dispersive infrared)	NDIR (non-dispersive infrared)	photoacoustic NDIR
Measurement Range	400 ~ 5000 ppm	0~10000 ppm	0-50000 ppm	400-5000 ppm	400~5000 ppm
Accuracy	±(100 ppm + 10% of reading)	±100ppm@400ppm	±(100ppm + 6% readings)	±(100ppm + 6% readings)	±(40 ppm + 5% MV)
Response Time	<20s	<20s	<90s	<30s	60s
Average Power	<4.8mW@5V (950μA continuous)	<1W	<430mW@5V	<430mW@5V	<30mW@5V
Operation Temperature	10°C ~ 40°C	-20°C~50°C	0°C~50°C	0°C~50°C	-10°C~60°C
Operation Humidity	20 ~ 80% RH (non-condensing)	0~95% RH (No condensation)	0~95% RH (No condensation)	0~95% RH (No condensation)	0~95% RH (No condensation)
Dimension (PCB)	32*22 mm	32*42 mm	37*69 mm	21*27.1 mm	32*27*8mm
Features	1. 3-in-1 (CO2, Temp, Humidity) 2. High cost-effectiveness 3. Low power (1μA sleep) 4. Auto compensation 5. I2C Plug and play	1. Large Range 2. Adjustable Alarm Threshold 3. Fast Response 4. Analog Output	1. High Accuracy 2. Long Lifespan 3. Auto Temperature Compensation 4. Water Vapor Interference Resistance 5. Analog Output	1. High Accuracy 2. Large Range 3. Long Lifespan 4. Auto Temperature Compensation 5. Water Vapor Interference Resistance 6. 3.3V UART Output	1.CO2, temperature, and humidity, three in one 2. Small size of 32*27*8mm 3. Low power, average current <4mA

Features

- High measurement accuracy: Based on the TC principle for stable and reliable data • Low power consumption: suitable for battery-powered or always-on systems
- Compact size: Easy to integrate into space-constrained and modular design
- Digital output: I2c interface with strong anti-interference capability
- Plug and play: Standard Gravity interface, no soldering required

Applications

- Indoor air quality monitoring: Real-time CO₂ detection to improve comfort in homes and offices
- Smart home systems: Works with ventilation, air conditioning, and windows for automated airflow control
- Building and classroom monitoring: Ensures air safety in high-occupancy environments
- Environmental monitoring & IoT: Suitable for various IoT air quality nodes
- Educational & experimental projects: Intuitive demonstration of CO₂ concentration changes for STEM education



Specification

- Supply Voltage: 3.3–5.0 V DC
- Operating Temperature: 10°C ~ 40°C
- Operating Humidity: 20% ~ 80% RH (non-condensing)
- Operating Current:
 - Peak: 4.2 mA
 - Continuous Measurement: 950 μ A
 - Single-shot Mode: 100 μ A (10s sampling interval)
 - Deep Sleep: 1 μ A
- CO₂ Measurement Range: 400–5000 ppm
- CO₂ Accuracy: $\pm(100 \text{ ppm} + 10\% \text{ of reading})$
- Response Time: 20 s
- Interface: Gravity I2C

Shipping List

- Gravity STCC4 CO2 Sensor x1
- Gravity 4Pin Cable x1

Documents

- [Product Wiki](#)