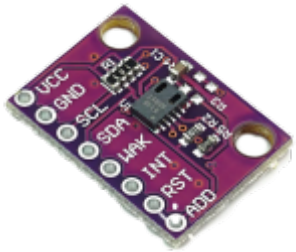
lamaPLC: CJMCU-811 CCS811 Gas Sensor (VOCs TVOC CO2)

The CJMCU-811 is a small, ultra-low-power digital gas sensor module designed to monitor indoor air quality. It is built around the CCS811 sensor from AMS, which uses a metal oxide (MOX) multi-gas sensor to detect a broad range of Volatile Organic Compounds (VOCs).



- This type of digital sensor is used to measure changes in volatile organic compounds, especially carbon dioxide (CO^2). The module features a CJMCU-811 CCS811 CO^2 Air Quality Metal Oxide Gas Sensor.
- The sensor is known for its low power consumption, making it suitable for use in battery-powered devices.
- This device is primarily used to monitor indoor air quality and can be read by microcontrollers through the I^2C interface.
- Because of its complex design, the module is highly sensitive and can accurately measure the share of eCO^2.

- **ETVOC** measurement range: 0 ~ 32768 ppb
- **ECO2** measurement range: 400 ~ 32768 ppm

Key Capabilities

The sensor measures atmospheric conditions and outputs digitized values via an I^2C interface:

- **eCO^2 (Equivalent CO^2):** Calculates carbon dioxide levels based on volatile organic compounds, usually ranging from 400 to 8,192 ppm.
- **TVOC (Total Volatile Organic Compounds):** Detects a wide array of gases, including alcohols, aldehydes, ketones, organic acids, and amines.
- **On-board Processing:** Incorporates an integrated 8-bit microcontroller that runs intelligent algorithms to turn raw sensor data into air quality readings, decreasing the processing load on your main controller.

Technical Specifications

Feature	Details
Operating Voltage	1.8V to **3.3V** DC (Note: *Some modules include a regulator for 5V compatibility*)
Power Consumption	~30mA average; extremely low power in idle modes (< 6µW)
Interface	I2C (standard address is often 0x5A or 0x5B)
Dimensions	Roughly 15mm x 21mm
Environment	Operating temperature from -40°C to 125°C

Usage Considerations

- **“Equivalent” Readings:** It's important to understand that this isn't a genuine CO2 sensor.

Instead, it estimates eCO2 levels from VOC concentrations, which can sometimes lead to inaccuracies compared to industrial-grade NDIR (non-dispersive infrared) sensors.
- **Burn-in & Run-in:** New sensors need a 48-hour burn-in period to achieve stability. Moreover, after turning on the device, the sensor typically requires about 20 minutes of run-in time to produce accurate readings.
- **Baseline Calibration:** The sensor automatically adjusts its *"clean air"* baseline gradually. However, for optimal performance, it should regularly be exposed to fresh outdoor air.

Pin Descriptions

The CJMCU-811 (featuring the CCS811 sensor) is typically an 8-pin breakout board. For basic operation, you must connect VCC, GND, SDA, SCL, and WAKE.

Pin Name	Function	
VCC	Power Supply	**1.8V to 3.6V** (*Some boards include a 5V regulator*).
GND	Ground	Common ground for power and logic.
SCL	I²C Clock	Serial clock line for communication.
SDA	I²C Data	Serial data line for communication.
WAKE	Wake (Active Low)	Crucial: Must be pulled to GND to enable I²C communication.
INT	Interrupt (Active Low)	Optional; indicates when new data is ready, or thresholds are crossed.
RST	Reset (Active Low)	Optional; pulling this low resets the sensor.
ADDR	I²C Address Select	Connect to GND for 0x5A (default) or VCC for 0x5B.

Connection Tips

- **WAKE Pin:** On many CJMCU-811 modules, the sensor will not respond to I2C commands if the WAKE pin is left floating. Connect it directly to a GND pin for continuous operation.
- **Voltage Logic:** While the sensor chip runs at 3.3V, many breakout boards, such as those from Adafruit or standard CJMCU versions, include level shifters, making them safe for use with 5V microcontrollers like the Arduino Uno.
- **I²C Speed:** If using a Raspberry Pi, you may need to lower the I²C baud rate to 10kHz because the Pi's hardware sometimes struggles with the *"clock stretching"* required by the CCS811.

Arduino example code

To use the CJMCU-811 with an Arduino, the most common approach is to use the **Adafruit CCS811** Library.

Arduino Wiring

Connect your CJMCU-811 breakout to the Arduino as follows:

- **VCC → 3.3V** (or 5V if your board has a regulator)
- **GND → GND**
- **SDA → A4** (on Uno/Nano) or Pin 20 (Mega)
- **SCL → A5** (on Uno/Nano) or Pin 21 (Mega)
- **WAKE → GND** (Required to keep the sensor active)

This basic sketch initializes the sensor and prints eCO2 and TVOC levels to the Serial Monitor.

```
#include "Adafruit_CCS811.h"

Adafruit_CCS811 ccs;

void setup() {
  Serial.begin(115200); // Set Serial Monitor to 115200 baud
  Serial.println("CCS811 test");

  // Initialize the sensor
  if(!ccs.begin()){
    Serial.println("Failed to start sensor! Check wiring and WAKE pin.");
    while(1);
  }

  // Wait for the sensor to be ready
  while(!ccs.available());
}

void loop() {
  if(ccs.available()){
    // readData returns false if there is no error
    if(!ccs.readData()){
      Serial.print("CO2: ");
      Serial.print(ccs.geteCO2());
      Serial.print("ppm, TVOC: ");
      Serial.print(ccs.getTVOC());
      Serial.println("ppb");
    } else {
      Serial.println("ERROR reading sensor!");
      while(1);
    }
  }
  delay(1000); // Wait 1 second between readings
}
```

Common Troubleshooting

- **I²C Address:** If the code fails to start, your board might use address 0x5B instead of the default 0x5A. You can try *ccs.begin(0x5B)*; in the setup.
- **Serial Monitor Speed:** Ensure the baud rate in your Serial Monitor matches *Serial.begin(115200)*;.
- **Accuracy:** Remember that this sensor requires a 20-minute warm-up for stable readings and a 48-hour burn-in period when first used.

I²C topics on lamaPLC

Page	Date	Tags
• lamaPLC Communication: 1-Wire	2026/04/23 21:51	1-wire, communication, bus, microlan, i2c, uart, usart, ds18b20
• lamaPLC Communication: I²C	2025/09/23 21:25	i2c, i c, smbus, philips, bus, communication, arduino
• LamaPLC: AHT10 Modul	2026/03/22 03:14	communication, i2c, temperature, humidity, sensor, aht, aht 10, modul
• LamaPLC: AHT20 / BMP280 Modul	2026/04/23 21:52	bmp280, aht20, adafruit, temperature, humidity, pressure, sensor, arduino, code, i2c
• LamaPLC: APDS - Avago ALS and proximity detection sensors with I²C communication	2026/04/23 21:52	avago, apds-9900, apds-9930, apds-9960, als, proximity, detection, gesture recognition, gesture, i2c, communication, sensor, arduino, code
• lamaPLC: AS5600 Magnetic Induction Angle Measurement Sensor Module	2026/03/28 23:50	communication, i2c, as5600, as-5600, magnetic, induction, angle, sensor
• lamaPLC: Bi-Directional Logic Level Converter 3.3V ↔ 5V	2026/04/12 00:34	bi-directional, logic level converter, i2c, uart, spi
• LamaPLC: BMP/BME Bosch Temperature/Humidity/Pressure sensors with I²C communication	2026/04/23 21:52	bme280, bme680, bmp180, bmp280, hw-611, hw611, bosch, temperature, humidity, pressure, sensor, arduino, i2c, communication, cjmcu
• LamaPLC: CJMCU-219/INA-219 breakout board/IC with I²C communication	2026/04/23 21:52	cjmcu-219, ina-219, ina219, breakout board, i2c, communication, sensor, voltage, current, arduino, code, cjmcu
• LamaPLC: CJMCU-3216 / AP-3216 integrated digital ambient light and proximity sensor module/IC with I²C communication	2026/04/23 21:52	cjmcu-3216, cjmcu, ap-3216, ap3216, ambient light, proximity, sensor, arduino, code, i2c, communication
• lamaPLC: CJMCU-811 CCS811 Gas Sensor (VOCs TVOC CO2)	2026/03/22 00:08	cjmcu-811, ccs811, gas, sensor, vocs, tvoc, eco2, co2, arduino, air quality metal oxide, mox, i2c
• LamaPLC: D6T Omron Non-Contact Thermal Sensors with I²C communication	2026/04/23 21:52	d6t, d6t-32l, d6t-44l, d6t-8l, d6t-1a, omron, non-contact, thermal, sensor, i2c, arduino, code
• LamaPLC: DPS Infineon Temperature/Pressure sensors with I2C communication	2026/04/23 21:52	dps310, infineon, temperature, pressure, sensor, arduino, i2c, communication, code
• lamaPLC: Energy, power, current, and voltage	2025/05/31 23:32	i2c, i c, communication, arduino, energy, power, current, sensor, ina226
• LamaPLC: ENS ScioSense Multi-gas sensors with I²C communication	2026/04/23 21:52	ens160, sciosense, gas-quality, i2c, communication, sensor, arduino, code, eco₂, tvoc, aqi, indoor air quality, iaq, co₂, voc

• lamaPLC: ESP32 / ESP8266	2025/11/22 00:07	esp8266, esp32, esp32-c2, esp32-c3, esp32-c5, esp32-c6, esp32-c61, esp32-h2, esp32-s2, esp32-s3, esp32-p4, espressif systems, communication, ethernet, ip, wi-fi, thread, zigbee, matter, homekit, bluetooth, mqtt, adc, spi, uart, i2c, i2s, rmt, pwm, usb, usb otg, twai
• LamaPLC: Gas sensors	2023/07/01 17:29	gas, sensor, i2c, onewire, communication, mq-3, mq-4, mq-5, mq-6, mq-7, mq-8, mq-9, mq-135, gm-102b, gm-302b, gm-502b, gm-702b, alcohol, ch4, natural gas, smoke, lng, co, co2, lpg, h2, iso-butane, nox, nh3, benzene, town gas, formaldehyde, propane, humidity, temperature, voc, grv gas sens v2
• lamaPLC: GY-511 6DOF sensor module	2026/03/22 01:44	stmicroelectronics, lsm303dlhc, i2c, lsm303, sensor, gy-511, 6dof, pololu, module, arduino
• LamaPLC: GY-9250 MPU-9250/6500 9-axis Attitude Sensor Board	2026/04/23 21:52	ak8963, gy-9250, mpu-9250, 9-axis, motion detection, magnetometer, communication, i c, i2c, spi
• LamaPLC: HDC Texas Instruments Temperature/humidity sensors with I²C communication	2026/04/23 21:52	sht21, htu21, si7021, gy-21, gy-213v, hdc1080, gy-213v-hdc1080, cjmcu, cjmcu-1080, texas instruments, temperature, humidity, sensor, i2c, communication, arduino, code
• lamaPLC: HT16K33 display controller	2026/04/23 21:51	i2c, 7-segment display, display, ht16k33, arduino
• LamaPLC: HTU TE Connectivity temperature/humidity sensors with I²C communication	2026/04/23 21:52	htu, htu31d, htu21d, htu20d, sht20, htu20, sht21, htu21, si7021, gy-21, gy-213v, hdc1080, si702, gy-20, sht31, htu31, si7031, gy-31, te connectivity, temperature, humidity, i2c, communication, sensor, arduino, code
• lamaPLC: INA modules with Arduino libraries	2026/04/11 19:54	i2c, i c, communication, arduino, energy, power, current, monitor, sensor, ina219, gy-219, ina226, gy-216, ina228, gy-228, ina237, ina238, ina260, ina3221, ina
• lamaPLC: INA226 - current/voltage/power monitor with I²C communication	2026/04/23 21:52	i2c, i c, communication, arduino, energy, power, current, monitor, sensor, ina226, ina219, ina
• lamaPLC: LCD 1602/2004 with I²C communication	2026/02/14 18:27	communication, i2c, display, lcd, 1602, 2004, hd44780, pcf8574, pcf8574t, pcf8574at, arduino
• LamaPLC: MAX30100/MAX30102 Heart Rate Click Sensor Module	2026/04/23 21:52	max30102, max30100, heart rate click, sensor, communication, i2c, arduino, code
• lamaPLC: MCP23017 / MCP23S17 16-Bit I/O Expander with Serial Interface I²C / SPI	2026/04/23 21:52	communication, i2c, mcp23017, mcp23s17, spi, i o expander, serial, cjmcu-2317, cjmcu

• LamaPLC: Pixart PAJ7620U2 Gesture recognition sensors/module with I²C communication	2026/04/23 21:52	paj7620u2, gy-paj7620, pixart, gesture recognition, i2c, communication, sensor, arduino, code
• LamaPLC: SC16IS750 / SC16IS752: One or two serial (UART) ports from microcontroller via I²C or SPI communication	2026/04/23 21:52	cjmcu-750, cjmcu-752, cjmcu, nxp, sc16is750, sc16is752, uart, serial, i2c, spi, modul, converter, arduino, code
• LamaPLC: SGP Sensirion TVOC/VOC sensors with I²C communication	2026/04/15 19:41	sgp30, sgp40, sgp41, sensirion, gas-sensor, i2c, communication, sensor, arduino, code, eco₂, voc, tvoc, indoor air quality, iaq, nox, hydrogen
• LamaPLC: SHT Sensirion Temperature/humidity sensor with I²C communication	2026/04/23 21:52	sht20, sht21, sht25, sht30, sht31, sht35, sht40, gy21, temperature, humidity, i2c, communication, sensor, arduino, code
• lamaPLC: Signal level converters	2026/02/14 23:47	pca9306, i2c, voltage, level, converter
• lamaPLC: TCA9548A (HW617); Low-Voltage 8-Channel I²C Switch Module	2026/02/14 23:51	tca9548a, hw617, i2c, switch, communication, expansion board, arduino
• lamaPLC: TM1637 7-segment display	2026/02/14 18:26	i2c, 7-segment display, display, tm1637, arduino
• LamaPLC: TOFnnnC STMicroelectronics Time-of-Flight (ToF) sensors with I²C communication	2026/04/23 21:52	tof050c, vl6180, tof200c, vl53l0x, tof400c, vl53l1x, stmicroelectronics, time-of-flight, tof, i2c, communication, sensor, arduino, code
• LamaPLC: VL53Lnn STMicroelectronics time-of-flight (ToF) laser-ranging sensors with I²C communication	2026/04/23 21:52	vl53l0x, vl53l1x, vl53l0 1xv2, gy-530, time-of-flight, tof, laser-ranging, i2c, communication, sensor, arduino, code
• LamaPLC: VL6180X STMicroelectronics Time-of-Flight (ToF) sensor with I²C communication	2026/04/23 21:52	vl6180x, stmicroelectronics, time-of-flight, tof, i2c, communication, sensor, arduino, code
• Magnetic angle sensors	2026/03/05 21:19	magnetic angle sensor, magnetic flux, sensor, spi, i2c, pwm, communication, modul, as5047p, as5600, mt6701, mt6816, mt6835, tle5012b, amr, gmr, tmr, anisotropic magnetoresistive
• SSH1106/SSD1306 OLED Display with I²C communication	2026/02/14 18:27	i2c, oled, display, ssd1306, sh1106, ssh1106, arduino, cmos

CJMCU-811, CCS811, Gas, Sensor, VOCs, TVOC, eCO2, CO2, Arduino, Air Quality Metal Oxide, MOX, I2C

This page has been accessed for: Today: 2, Until now: 4