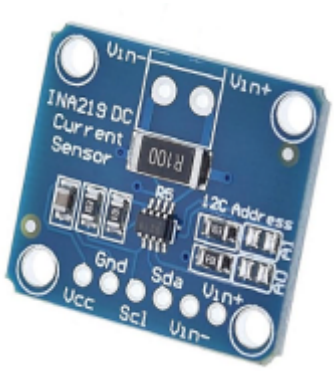
LamaPLC: CJMCU-219/INA-219 breakout board/IC with I²C communication

The **CJMCU-219** is a *breakout board* featuring the **INA219** *IC*, a zero-drift, bidirectional current and power monitor with an I²C interface.



Core Technical Specifications

- **Voltage Measurement:** Can detect bus voltages from **0V to +26V DC**.
- **Current Range:** Measures **up to ±3.2A** bidirectionally using its built-in 0.1 ohm shunt resistor.
- **Supply Voltage:** Operates on **+3.0V to +5.5V**.
- **Precision:** Features a 12-bit ADC with a maximum error accuracy of 1% over -40°C to +85°C.
- **Interface:** Uses I²C communication (standard 100kHz or high-speed 400kHz/3.4MHz) with a default address of **0x40**.

Key Features

- **High-Side Sensing:** Unlike many sensors, it can measure current on the high side (between the power source and the load), thereby avoiding ground-reference issues.
- **Multi-Function Reporting:** It calculates and reports bus voltage, shunt voltage drop, current, and total power (W) directly.
- **Programmability:** Supports software-programmable calibration, filtering (averaging up to 128 samples), and conversion times.
- **Daisy-Chaining:** Supports up to 16 programmable I²C addresses, allowing multiple modules to run on the same bus.

Safety & Limitations

- **Voltage Limit:** The chip may be damaged if bus voltage exceeds its absolute hardware limit of 26V.
- **Inductive Loads:** Users should be cautious with large motors, as *“flyback”* voltage spikes can exceed the 26V threshold and destroy the sensor.

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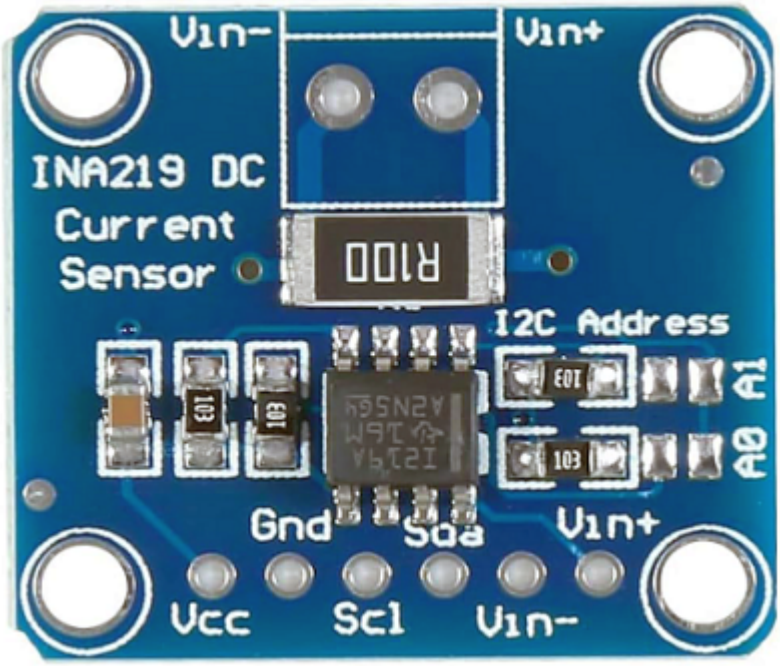
CJMCU-219 Pinout

Logic and Power Pins



These pins connect to your microcontroller (e.g., Arduino or Raspberry Pi) to power the sensor and transmit data.

- **VCC:** Supply voltage for the module (**3.0V to 5.5V**).
- **GND:** Common ground for both power and logic.
- **SCL:** I²C serial clock line.
- **SDA:** I²C serial data line.

Measurement (Load) Pins

These pins are placed in series with the positive side (high-side) of the circuit you want to monitor.

- **Vin+:** Connect to the positive terminal of your power source (e.g., battery).
- **Vin-:** Connect to the positive terminal of your load (the device being powered).

I²C addressing Pins (A0 & A1)

Some versions of the CJMCU-219 include solder pads labeled **A0** and **A1**. By default, these are connected to GND, setting the I2C address to **0x40**.

Bridging these pads to VCC allows you to set the address to any of 16 values (**0x4F**), enabling multiple sensors on the same I²C bus.

Caution: The maximum bus voltage the Vin pins can safely handle is 26V DC.

Arduino wiring

- VCC → Arduino 5V (o 3.3V).
- GND → Arduino GND.

- SCL → Arduino SCL (A5 on Uno/Nano).
- SDA → Arduino SDA (A4 on Uno/Nano).
- Vin+ → Positive side of your power supply.
- Vin- → Positive side of your load (the device being powered).

Arduino code

To begin using the CJMCU-219 with Arduino, the easiest approach is to use the **Adafruit INA219** library.

This example code sets up the sensor and outputs voltage, current, and power readings to the Serial Monitor at **115200 baud**.

A simple example with the Adafruit_INA219 library involves initializing the sensor and repeatedly reading and displaying bus voltage, shunt voltage, load voltage, current, and power. The complete code is available in the provided source document.

```
#include <Wire.h>
#include <Adafruit_INA219.h>

Adafruit_INA219 ina219;

void setup(void) {
  Serial.begin(115200);
  while (!Serial) { delay(1); } // Wait for serial port to connect

  // Initialize the INA219 (default address 0x40)
  if (!ina219.begin()) {
    Serial.println("Failed to find INA219 chip");
    while (1) { delay(10); }
  }

  // Optional: Set calibration for higher precision
  // Default is 32V, 2A. Alternatives:
  // ina219.setCalibration_32V_1A();
  // ina219.setCalibration_16V_400mA();

  Serial.println("Measuring voltage and current with INA219...");
}

void loop(void) {
  float shuntvoltage = 0;
  float busvoltage = 0;
  float current_mA = 0;
  float loadvoltage = 0;
  float power_mW = 0;

  // Read data from sensor
  shuntvoltage = ina219.getShuntVoltage_mV();
  busvoltage = ina219.getBusVoltage_V();
```

```
  current_mA = ina219.getCurrent_mA();
  power_mW = ina219.getPower_mW();
  loadvoltage = busvoltage + (shuntvoltage / 1000);

  // Print results
  Serial.print("Bus Voltage:   "); Serial.print(busvoltage);
Serial.println(" V");
  Serial.print("Shunt Voltage: "); Serial.print(shuntvoltage);
Serial.println(" mV");
  Serial.print("Load Voltage:  "); Serial.print(loadvoltage);
Serial.println(" V");
  Serial.print("Current:       "); Serial.print(current_mA);
Serial.println(" mA");
  Serial.print("Power:         "); Serial.print(power_mW); Serial.println("
mW");
  Serial.println("");

  delay(2000);
}
```

Key Functions Explained

- *begin():* Starts I2C communication. It uses address 0x40 by default.
- *getBusVoltage_V():* Returns the voltage between GND and the load (V-).
- *getShuntVoltage_mV():* Returns the voltage drop across the 0.1 ohm resistor.
- *getCurrent_mA():* Returns the current flowing through the sensor.
- *getPower_mW():* Calculates power based on the current and bus voltage.

Calibration for Accuracy

The library includes built-in calibration modes to improve precision for specific ranges:

- **Default:** 32V, 2A (Used if no other function is called).
- **setCalibration_32V_1A():** Increases precision for current measurements up to 1A.
- **setCalibration_16V_400mA():** Highest precision for low-voltage, low-current projects.

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 project: Sension SCD CO² measurement module	2026/04/15 19:34	scd30, scd40, scd41, iaq, ndir, sensor, i2c, arduino code
• 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: Arduino Modul: BME680	2026/05/12 18:40	code, c, 2026, arduino, bme680, sensor, i2c, comunication
• lamaPLC: AS5600 Magnetic Induction Angle Measurement Sensor Module	2026/05/13 00:06	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, bme688, bmp180, bmp280, hw-611, hw611, bosch, temperature, humidity, pressure, sensor, arduino, i2c, communication, ai, cjmcu, volatile organic compounds, vocs, volatile sulfur compounds, vscs, iaq
• 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)	2026/04/23 21:52	cjmcu-811, ccs811, gas, sensor, vocs, tvoc, eco2, co2, arduino, air quality metal oxide, mox, i2c, micropython, rp2040-eth
• 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, eco_2, tvoc, aqi, indoor air quality, iaq, co_2, 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	2026/04/23 21:52	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	2026/04/23 21:52	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: MLX90614 (GY-906) infrared non-contact thermometer	2026/05/08 00:03	communication, i2c, temperature, mlx90614, gy-906, modul, infrared, non-contact thermometer, dsp, pwm, smbus, hailege
• lamaPLC: PCF857x I/O Expander chip/modul with I²C communication	2026/05/15 01:03	communication, i2c, pcf857x, pcf8574, pcf8574a, pcf8575, i o expander, i o extension, nxp, texas instruments

• 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: RP2040_ETH_Modul: I²C scanner	2026/05/12 16:20	code, micropython, 2026, rp2040 eth, i2c, comunication
• lamaPLC: RP2040_ETH_Modul: MLX90614 simple	2026/05/12 17:06	code, micropython, 2026, rp2040 eth, i2c, communication, mlx90614
• lamaPLC: RP2040_ETH_Modul: Read BME 680/688 sensor data	2026/05/12 21:06	code, micropython, 2026, rp2040 eth, bme680, i2c, sensor, communication
• lamaPLC: RP2040_ETH_Modul: Read BME 680/688 sensor data and store in Modbus input registers	2026/05/12 18:58	code, micropython, 2026, rp2040 eth, bme680, i2c, sensor, communication
• 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: st756x display drivers	2026/05/20 16:17	display, driver, i2c, spi, lcd, cog, oled, st7565, st7567, gm12864, gm12864-59n, gm12864-03a, gm12864-01a, gme12864-41
• 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
• lamaPLC: XGZP68xx: Silicon Pressure Sensors/Module	2026/05/15 15:17	communication, i2c, sensor, modul, pressure, cfsensor, xgzp68xx, xgzp6810d, xgzp6857d, xgzp6859d, xgzp6887d, xgzp6897d, xgzp6899a, piezoresistive, capacitive

• 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-219, INA-219, INA219, breakout board, i2c, communication, sensor, voltage, current, arduino, code, CJMCU