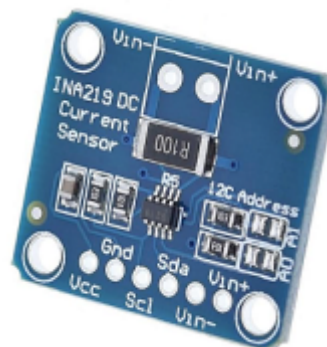


LamaPLC: CJMCU-219/INA-219 breakout board/IC with I²C communication

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.

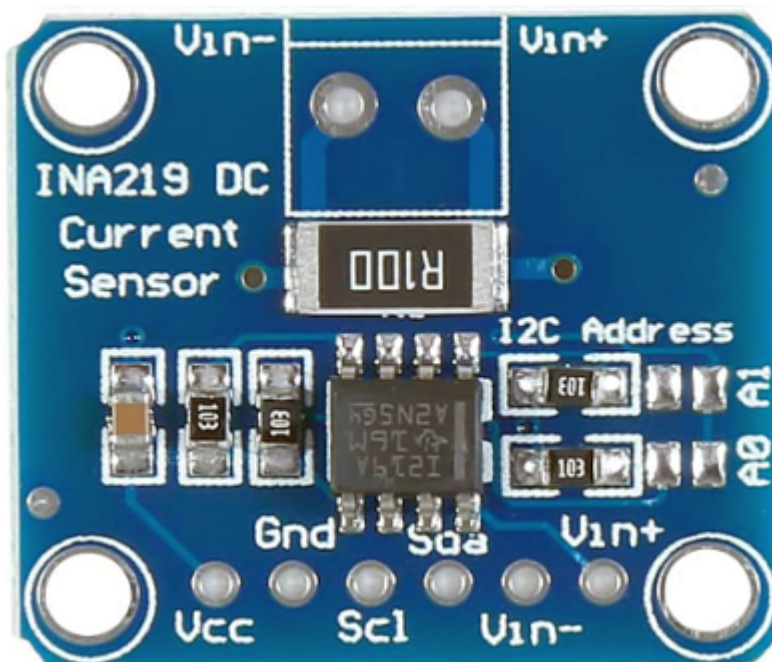


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CJMCU-219 Pinout

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

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