Reading Voltage, Current, and Power Data from INA219 Sensor Using Raspberry Pi

Introduction:

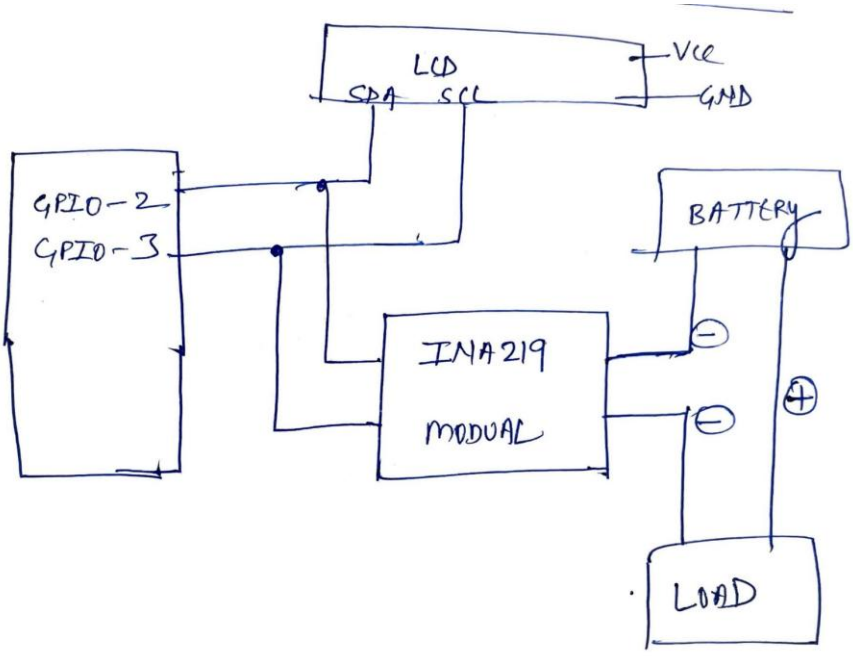
The INA219 sensor is a powerful current and power monitoring module that allows precise readings of voltage, current, and power consumption in electronic circuits. It is widely used in power management applications, including battery monitoring and energy-efficient systems. This manual provides a step-by-step guide on how to interface the INA219 sensor with a Raspberry Pi to read voltage, current, and power data.

Components Required:

- Raspberry Pi (any model with I2C support)
- INA219 Current Sensor Module
- Jumper Wires (Male-to-Female)
- A Load (Battery or a small DC device)
- Breadboard (optional for easy connections)

Circuit Connection:

1. Power Connections: Connect the VCC pin of the INA219 to the 5V pin of the Raspberry Pi and GND to GND.
2. I2C Communication: Connect the SDA pin of INA219 to the SDA pin of the Raspberry Pi and SCL to the SCL pin of the Raspberry Pi.
3. Load Connection: Connect the positive terminal of the load to the VIN+ pin of INA219 and the negative terminal to the VIN- pin.
4. Ensure all connections are secure before powering the system.



(INA219)

Applications:

- Battery monitoring for IoT devices
- Power consumption measurement in electronic circuits
- Monitoring energy usage in solar power systems
- Overcurrent protection in embedded systems

Learnings:

- Understanding of I2C communication protocol
- Hands-on experience in interfacing sensors with Raspberry Pi
- Knowledge of voltage, current, and power measurement techniques
- Practical skills in circuit design and implementation

Conclusion:

The INA219 sensor provides an efficient way to measure voltage, current, and power in real time. By integrating it with a Raspberry Pi, you can easily monitor power consumption for various applications. This knowledge is valuable for projects involving energy efficiency, battery management, and embedded system development.

Outcome:

Program:

```
import time
import board
import busio
from adafruit_ina219 import INA219
from RPLCD.i2c import CharLCD

# Initialize I2C Bus
i2c_bus = busio.I2C(board.SCL, board.SDA)
# Initialize INA219 Sensor
ina = INA219(i2c_bus)
# Initialize LCD
lcd = CharLCD('PCF8574', 0x27)

def update_display(voltage, current, power):
    """Update the LCD with Voltage, Current, and Power readings."""
    lcd.clear()
    lcd.cursor_pos = (0, 0)
    lcd.write_string("INA219 Readings")
    lcd.cursor_pos = (1, 0)
    lcd.write_string(f"V: {voltage:.2f} V")
    lcd.cursor_pos = (2, 0)
    lcd.write_string(f"I: {current/1000:.2f} A")
```

```
    lcd.cursor_pos = (3, 0)
    lcd.write_string(f"P: {power/1000:.2f} W")

try:
    while True:
        voltage = ina.bus_voltage  # Read Voltage (V)
        current = ina.current  # Read Current (mA)
        power = ina.power  # Read Power (mW)
        update_display(voltage, current, power)  # Update LCD
        #update_display(3.7, 1900, (3.7*1900))  # Update LCD
        time.sleep(1)  # Update every second

except KeyboardInterrupt:
    lcd.clear()
    print("Program Stopped")
```