

PAMEENCOS INA3221

PAMEENCOS INA3221 Triple-Channel Current and Voltage Monitor Module

Model: INA3221 | Brand: PAMEENCOS

1. INTRODUCTION

The PAMEENCOS INA3221 is a versatile triple-channel, high-side current and bus voltage monitor designed for various applications requiring precise power measurement. It features an I2C and SMBUS compatible interface, allowing for easy integration into existing systems. This module not only monitors shunt voltage drop and bus supply voltage but also offers programmable conversion times and averaging modes for enhanced signal accuracy. Critical and warning alarms can be configured for each channel to detect out-of-range conditions.

2. PRODUCT OVERVIEW

The INA3221 module provides comprehensive monitoring capabilities for up to three independent channels. Each channel can measure current and voltage, making it ideal for power management, battery monitoring, and system diagnostics. Key features include:

- Triple-channel monitoring with independent bus voltages.
- Integrated 0.1 Ohm, 1% 2W current sense resistors.
- Bus voltage measurement up to +26V with $\pm 8\text{mV}$ resolution.
- Current measurement up to $\pm 1.638\text{A}$ with $\pm 0.4\text{mA}$ resolution.
- I2C/SMBUS compatible interface with four programmable addresses.
- Wide operating temperature range: -40°C to $+125^{\circ}\text{C}$.
- Single supply operation: 2.7V to 5.5V.

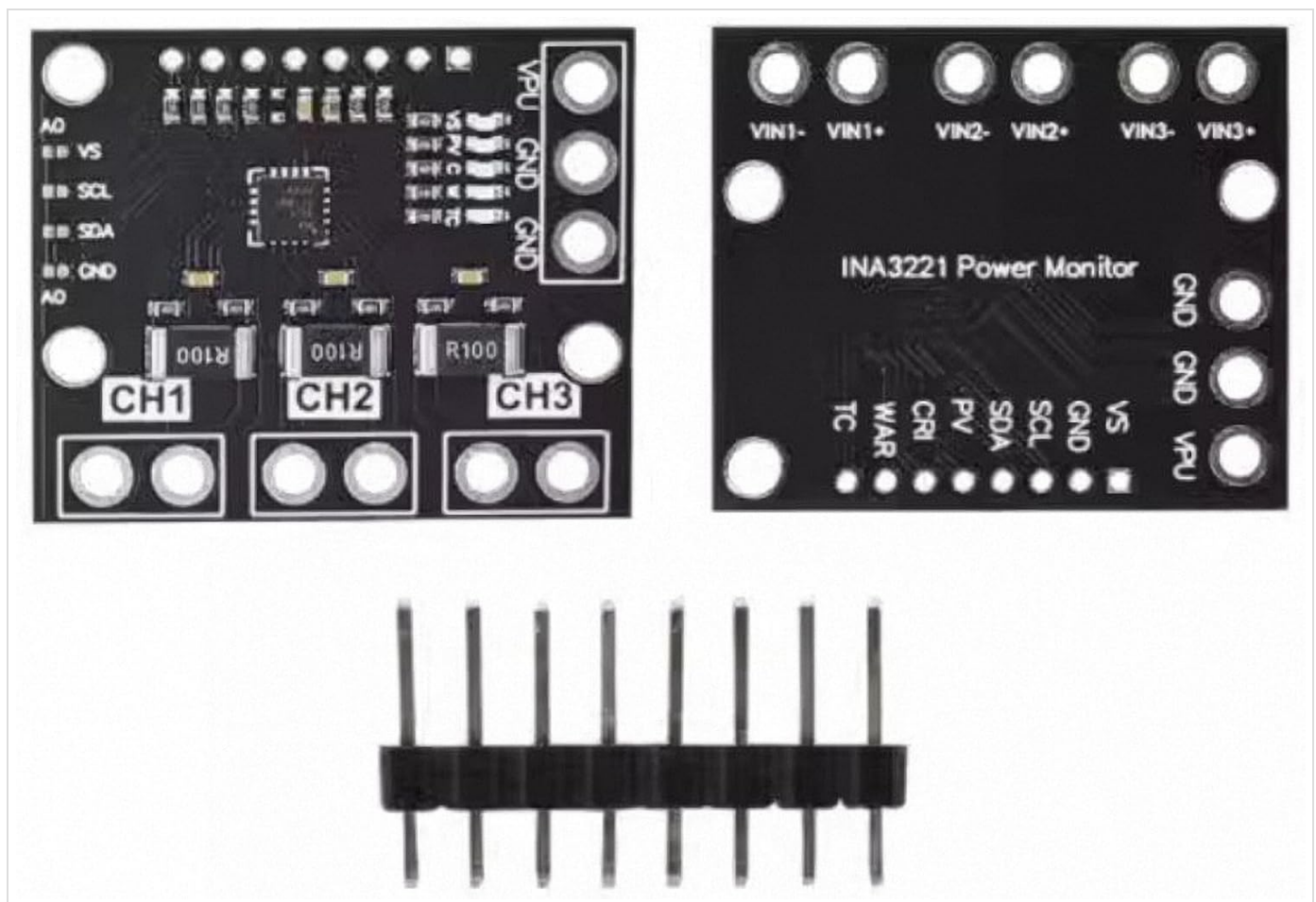


Figure 1: Front view of the PAMEENCOS INA3221 module, showing the three current sensing channels (CH1, CH2, CH3) and various pins for power and communication.

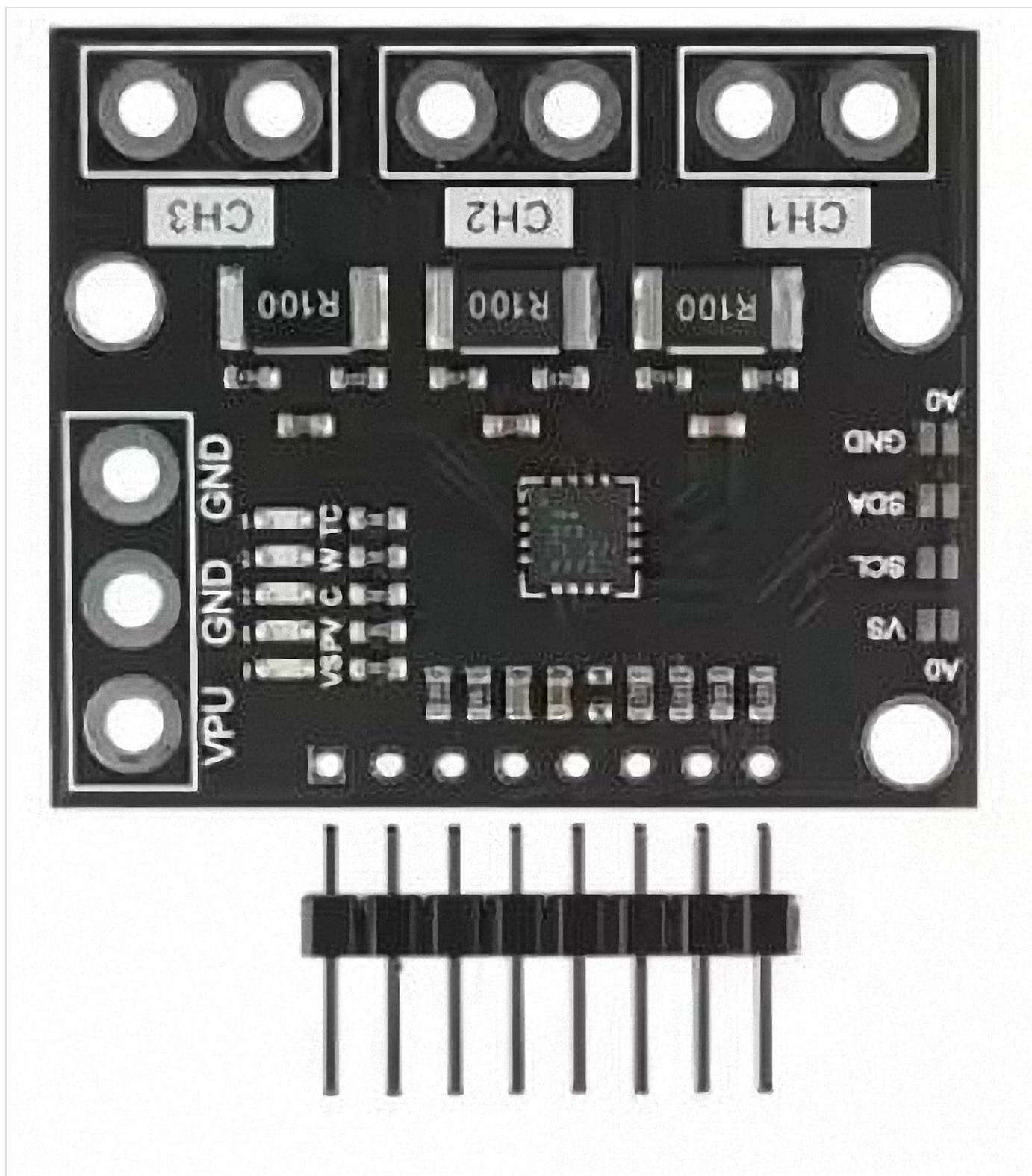


Figure 2: Back view of the PAMEENCOS INA3221 module, clearly labeled "INA3221 Power Monitor" and showing additional pin descriptions.

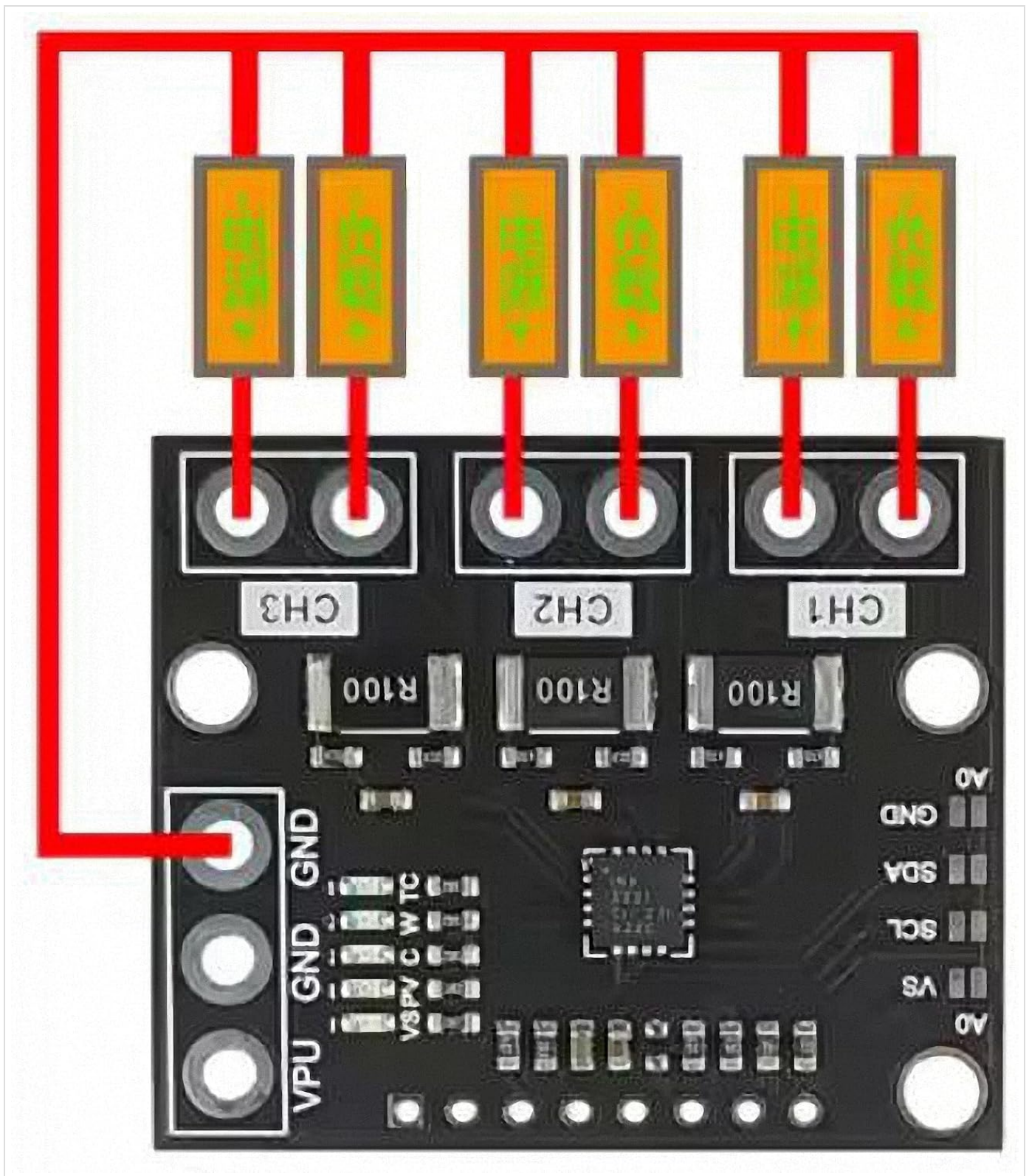


Figure 3: Top view of the PAMEENCOS INA3221 module with an attached header pin strip, illustrating the compact design and connection points.

3. SETUP

3.1 Pinout Description

The INA3221 module features several pins for power, communication, and measurement. Understanding the pinout is crucial for proper integration:

Pin	Description
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Pin	Description
VS	Module Supply Voltage (2.7V to 5.5V)
SDA	I2C Serial Data Line
SCL	I2C Serial Clock Line
A0	I2C Address Select Pin (used with jumpers)
VPU	Voltage Pull-Up (for I2C lines, typically connected to VS)
GND	Ground
CH1+, CH1-	Channel 1 Current Sense Input
CH2+, CH2-	Channel 2 Current Sense Input
CH3+, CH3-	Channel 3 Current Sense Input

3.2 I2C Address Configuration

The INA3221 module supports four programmable 7-bit I2C addresses: 0x40, 0x41, 0x44, 0x45. These addresses are selected using solder jumpers on the PCB, typically labeled A0. By connecting the A0 pin to different states (GND, VS, SDA, SCL), you can set the desired address. Refer to the image below for jumper locations and typical configurations.

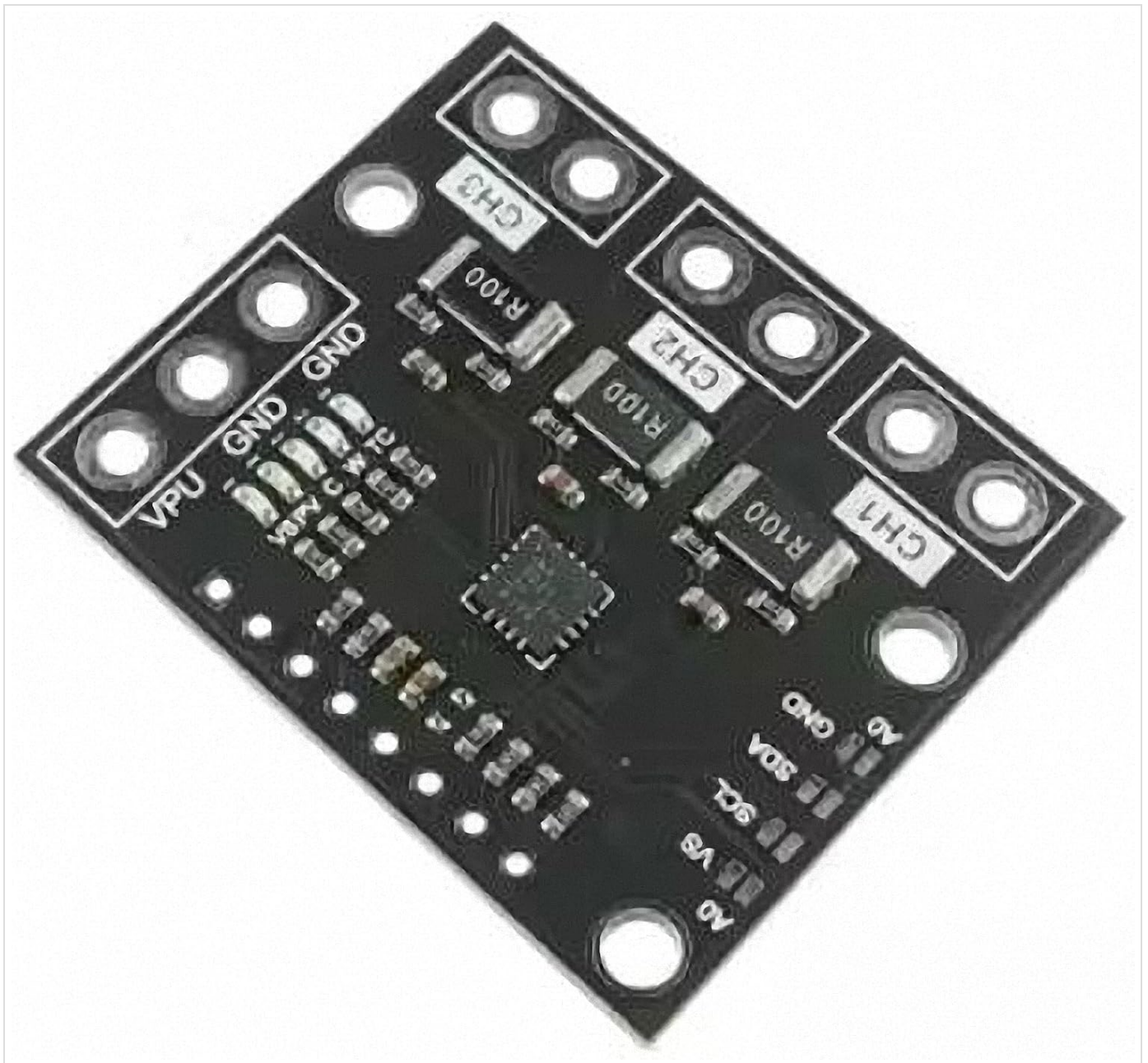


Figure 4: INA3221 module highlighting the solder jumper area for I2C address configuration. Consult the INA3221 datasheet for specific jumper settings corresponding to each address.

4. OPERATING INSTRUCTIONS

4.1 Basic Operation

The INA3221 performs high-side current sensing, meaning it measures the voltage drop across a shunt resistor placed in the positive supply line of the load. It can monitor bus voltages from 0V to +26V. For each channel, connect the positive side of the shunt resistor to the 'CHx+' input and the negative side to the 'CHx-' input. The module's VS pin should be connected to your system's power supply (2.7V to 5.5V).

4.2 Data Acquisition via I2C/SMBUS

To acquire data, connect the module to your microcontroller or system using the I2C interface (SDA and SCL pins). Ensure appropriate pull-up resistors are used on the I2C lines if not already present on your host board. Use the configured I2C address to communicate with the module. The INA3221 provides various registers for reading shunt voltage, bus voltage, and calculated current. Consult the INA3221 datasheet for a complete register map and programming guide.

4.3 Alarm Configuration

The module allows for setting critical and warning alarm thresholds for each channel. These alarms can be configured to trigger when measured values exceed or fall below predefined limits, providing immediate notification of abnormal conditions. The alarm status can be read from specific registers, and the module may also have dedicated alarm output pins (check datasheet for details).

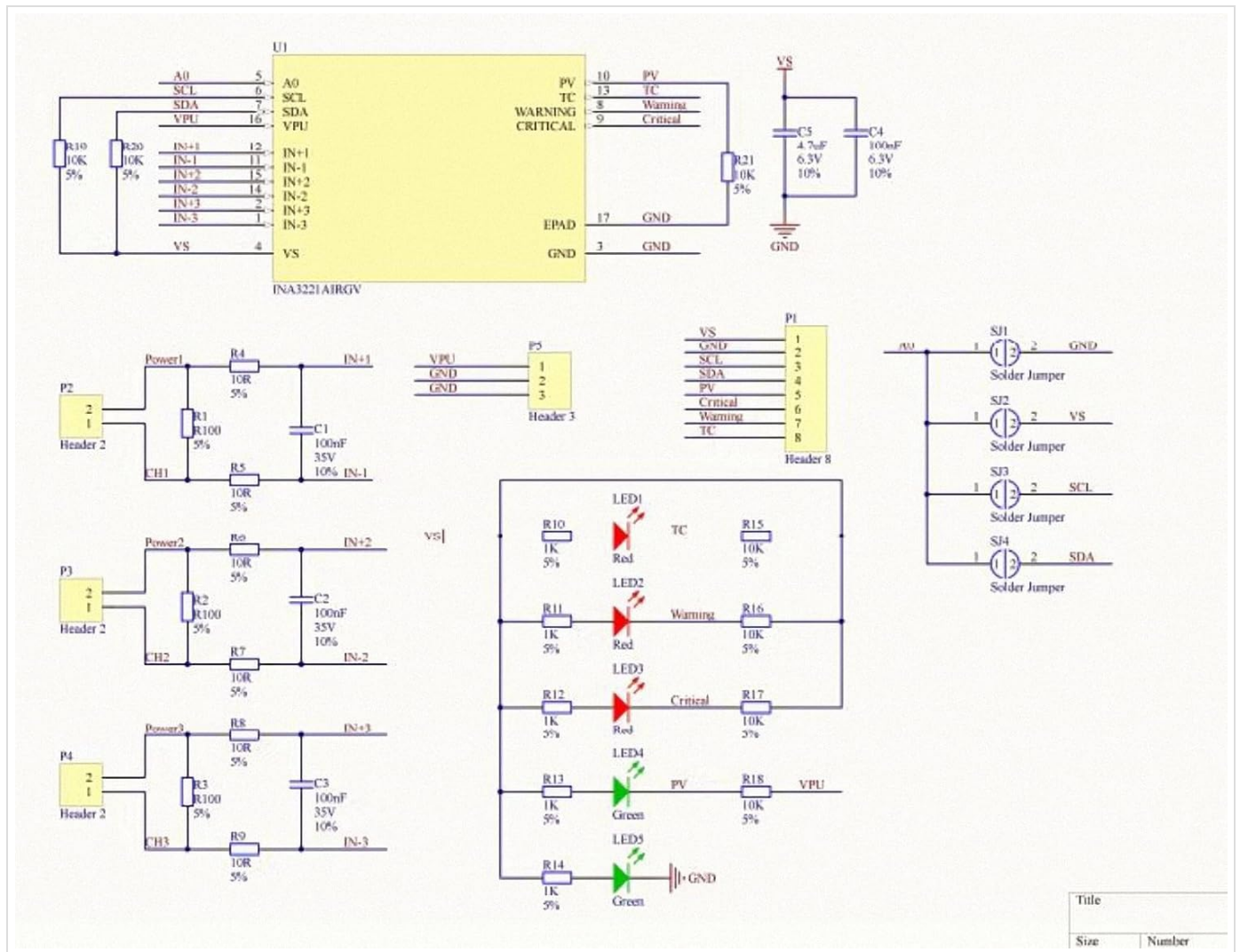


Figure 5: Example wiring diagram illustrating how to connect the INA3221 module to external components for current and voltage measurement across three channels.

5. MAINTENANCE

The INA3221 module is designed for robust operation and generally requires minimal maintenance. Follow these guidelines for optimal performance and longevity:

- **Cleaning:** Use a dry, soft cloth to gently clean the module. Avoid using liquids, solvents, or abrasive materials, as these can damage the components or PCB.
- **Storage:** When not in use, store the module in a dry, anti-static environment to prevent damage from electrostatic discharge (ESD) and moisture.
- **Environmental Conditions:** Operate the module within its specified temperature range of -40°C to +125°C. Avoid exposure to excessive moisture, corrosive environments, or extreme temperatures outside this range.

6. TROUBLESHOOTING

If you encounter issues with your INA3221 module, consider the following troubleshooting steps:

- **No I2C Communication:**

- Verify correct wiring of SDA, SCL, and GND connections between the module and your host microcontroller.
- Check the I2C address configuration via the solder jumpers on the module. Ensure it matches the address used in your software.
- Confirm that the host microcontroller's I2C bus is properly initialized and pull-up resistors are correctly applied to SDA and SCL lines.

- **Incorrect Readings:**

- Confirm the shunt resistor value (0.1 Ohm) and its connection in the current path.
- Check the module's power supply voltage (VS pin) to ensure it is within the 2.7V to 5.5V range.
- Ensure proper grounding of both the module and the system it is monitoring.
- Review your software's register read/write operations and any calculations performed on the raw data.

- **Alarms Not Triggering:**

- Verify that the alarm threshold settings in the module's registers are correctly configured to your desired limits.
- Ensure that the alarm flags are being read correctly from the module's status registers.

7. SPECIFICATIONS

Detailed technical specifications for the PAMEENCOS INA3221 module:

Parameter	Value
Channels	Triple
Current Sense Resistor	0.1 Ohm, 1% 2W (integrated)
Bus Voltage Range	0V to +26V
Bus Voltage Resolution	±8mV
Current Measurement Range	Up to ±1.638A
Current Measurement Resolution	±0.4mA
Supply Voltage (VS)	2.7V to 5.5V
Supply Current	350 µA (typical)
Operating Temperature	-40°C to +125°C
I2C/SMBUS Addresses	0x40, 0x41, 0x44, 0x45 (selectable)
Dimensions (PCB)	38 x 32 mm
Weight (PCB)	4.4g

8. WARRANTY AND SUPPORT

PAMEENCOS products are designed for reliability and performance. For specific warranty information regarding your INA3221 module, please refer to the product packaging or contact your retailer directly.

For technical assistance, support, or inquiries, please contact PAMEENCOS customer service through the official website or your point of purchase. When contacting support, please have your product model (INA3221) and any relevant

purchase information ready.

ASK A QUESTION ABOUT THIS MANUAL

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Example: How do I reset this device or fix this error?

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