

Rakstore MAX31865

Rakstore MAX31865 PT100 to PT1000 RTD-to-Digital Converter Board User Manual

Model: MAX31865

[Instructions](#) [Introduction](#) [Features](#) [Setup](#) [Operating](#)
[Maintenance](#) [Troubleshooting](#) [Specifications](#) [Warranty & Support](#)

1. INTRODUCTION

The Rakstore MAX31865 RTD-to-Digital Converter Board is designed to interface with Platinum Resistance Temperature Detectors (RTDs) such as PT100 and PT1000. This module converts the resistance of the RTD into a digital signal, providing accurate temperature measurements. It is optimized for use with microcontrollers like Arduino, offering a simple SPI-compatible interface for data acquisition.

2. KEY FEATURES

- Integrated MAX31865 chip for RTD-to-digital conversion.
- Supports PT100 and PT1000 RTDs.
- Capable of compensating 2, 3, or 4-wire RTDs for enhanced accuracy.
- 15-bit Analog-to-Digital Converter (ADC) resolution.
- Nominal temperature resolution of 0.03125°C (with non-linear variation).
- SPI compatible interface for easy integration with microcontrollers.
- Fast conversion time of 21ms (maximum).

3. SETUP INSTRUCTIONS

This section details the steps required to connect and power the MAX31865 converter board.

3.1. Component Overview

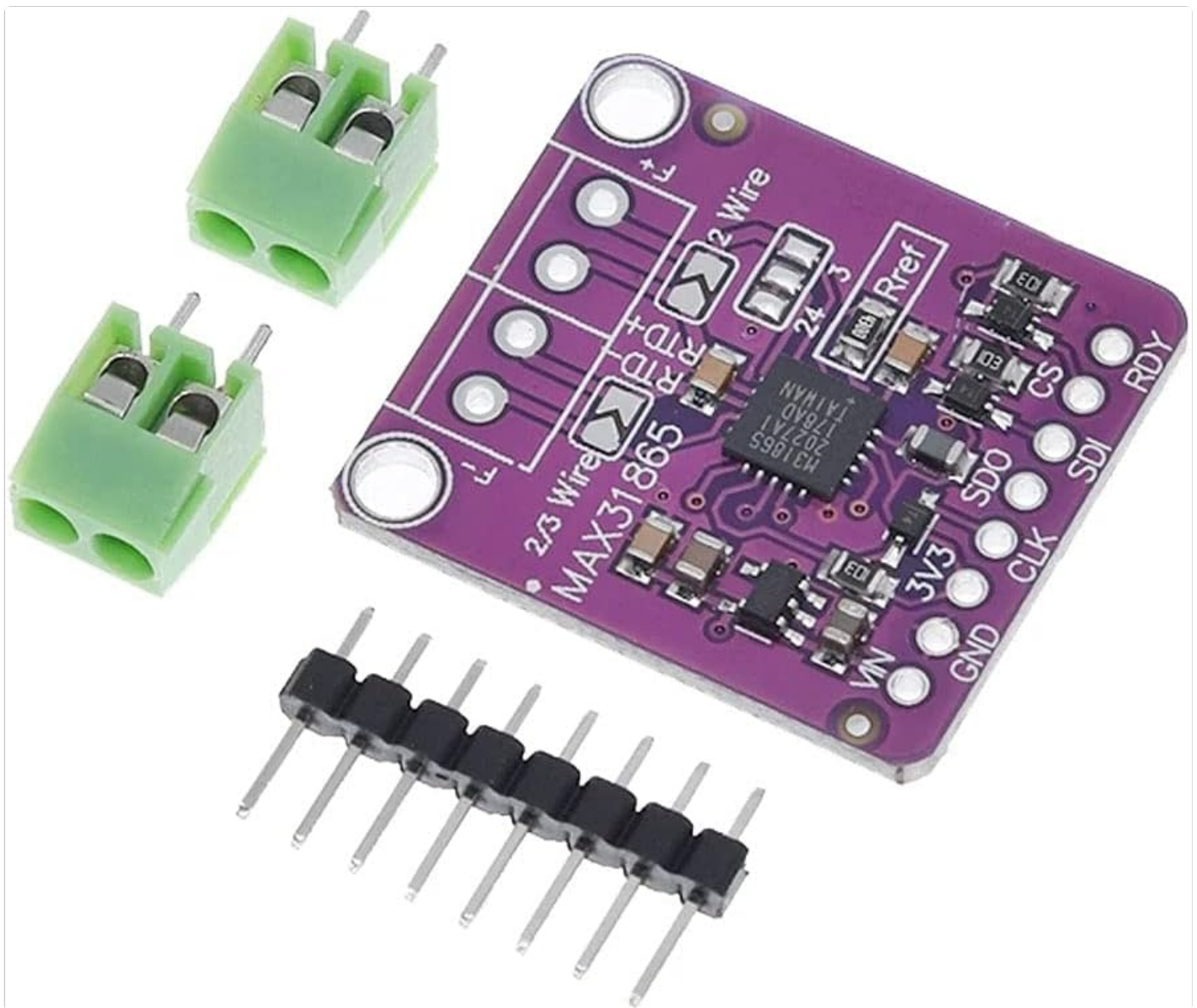


Figure 3.1: The MAX31865 converter board, showing the main chip, RTD input terminals, SPI pins, and power connections. Included are two green screw terminal blocks and a male header pin strip for connection flexibility.

3.2. Power Supply Connection

- **VIN:** Connect to a 3-5V DC power source. This supplies power to the board.
- **3V3:** This is a 3.3V output from the onboard regulator, typically used for logic level shifting or powering other low-power components if needed.
- **GND:** Connect to the ground of your power supply and microcontroller.

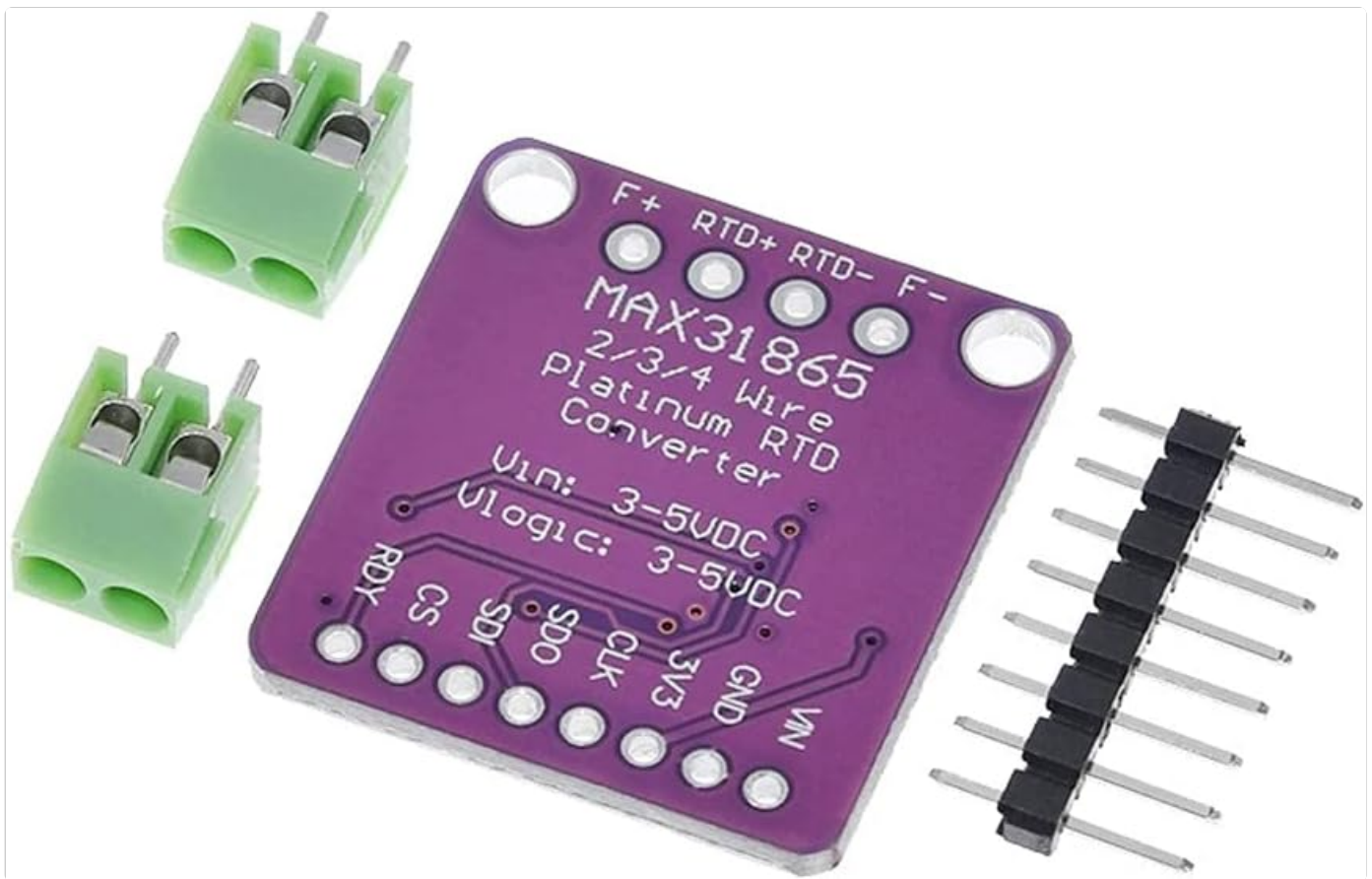


Figure 3.2: Rear view of the MAX31865 board, indicating the input voltage ranges for VIN (3-5VDC) and VLOGIC (3-5VDC). VLOGIC refers to the voltage level for the SPI communication pins.

3.3. RTD Sensor Connection

The MAX31865 supports 2, 3, and 4-wire RTD configurations. Ensure the correct jumpers on the board are set for your RTD type (refer to the board's silkscreen for jumper locations, typically labeled 2/3 wire and 4 wire).

- **2-Wire RTD:** Connect the two RTD wires to RTD+ and RTD-.
- **3-Wire RTD:** Connect one sense wire to RTD+, and the two current-carrying wires to RTD- and F-.
- **4-Wire RTD:** Connect the two sense wires to RTD+ and RTD-, and the two current-carrying wires to F+ and F-.

The board includes screw terminals for secure RTD connections.

3.4. SPI Interface Connection

Connect the MAX31865 to your microcontroller using the Serial Peripheral Interface (SPI) pins:

- **CS (Chip Select):** Connect to a digital output pin on your microcontroller.
- **SDI (Serial Data In):** Connect to the MOSI (Master Out Slave In) pin of your microcontroller.
- **SDO (Serial Data Out):** Connect to the MISO (Master In Slave Out) pin of your microcontroller.
- **CLK (Clock):** Connect to the SCK (Serial Clock) pin of your microcontroller.
- **RDY (Ready):** An optional output pin that indicates when a conversion is complete.

4. OPERATING INSTRUCTIONS

To operate the MAX31865, you will need to write code for your microcontroller to communicate via SPI. Libraries are commonly available for platforms like Arduino to simplify this process.

4.1. Basic Operation Sequence

1. **Initialization:** Configure the MAX31865 registers for your specific RTD type (PT100/PT1000), number of wires (2/3/4), and desired measurement settings. This typically involves setting the RTD bias, VBIAS, and conversion mode.
2. **Start Conversion:** Initiate a temperature conversion by writing to the configuration register.
3. **Wait for Conversion:** Wait for the conversion to complete. This can be done by polling the RDY pin (if connected) or by introducing a delay (minimum 21ms).
4. **Read Data:** Read the 15-bit ADC data from the MAX31865 registers via SPI. This data represents the RTD resistance.
5. **Calculate Temperature:** Use the read resistance value and the known characteristics of your RTD (e.g., PT100 or PT1000 curve) to calculate the actual temperature. Many libraries handle this calculation automatically.
6. **Error Checking:** Read the fault status register to check for open circuits, short circuits, or other errors.

Refer to the MAX31865 datasheet for detailed register configurations and communication protocols.

5. MAINTENANCE

The MAX31865 converter board is a low-maintenance device. Follow these guidelines to ensure its longevity and reliable operation:

- **Environmental Protection:** Keep the board in a dry environment, away from moisture, dust, and extreme temperatures.
- **Static Discharge:** Handle the board with care, especially in environments prone to static electricity. Use anti-static precautions when handling.
- **Cleaning:** If necessary, gently clean the board with a soft, dry brush or compressed air. Avoid using liquids or harsh chemicals.
- **Connections:** Periodically check all wiring connections to ensure they are secure and free from corrosion.

6. TROUBLESHOOTING

If you encounter issues with your MAX31865 converter board, consider the following troubleshooting steps:

- **No Power/LED Off:**
 - Verify that the VIN and GND connections are correct and that the power supply is providing 3-5V DC.
 - Check for any short circuits on the board.
- **Incorrect Temperature Readings:**
 - Ensure the RTD is correctly wired for its type (2, 3, or 4-wire) and that the board's jumpers are set accordingly.
 - Confirm that the correct RTD type (PT100 or PT1000) is configured in your software.
 - Check the RTD sensor itself for damage or incorrect calibration.
 - Verify the reference resistor (Rref) value on the board matches your RTD setup (e.g., 400Ω for PT100).
 - Check for noise on the SPI lines; ensure connections are short and shielded if necessary.
- **No Data from SPI:**
 - Double-check all SPI connections (CS, SDI, SDO, CLK) to your microcontroller.
 - Ensure your microcontroller's SPI library is correctly initialized and configured (e.g., SPI mode, clock speed).

- Verify that the CS pin is being correctly toggled by your software.

- **Fault Status Indication:**

- If the fault register indicates an open circuit, check the RTD wiring for breaks or loose connections.
- If it indicates a short circuit, check for unintended connections between RTD wires or to ground/power.

7. TECHNICAL SPECIFICATIONS

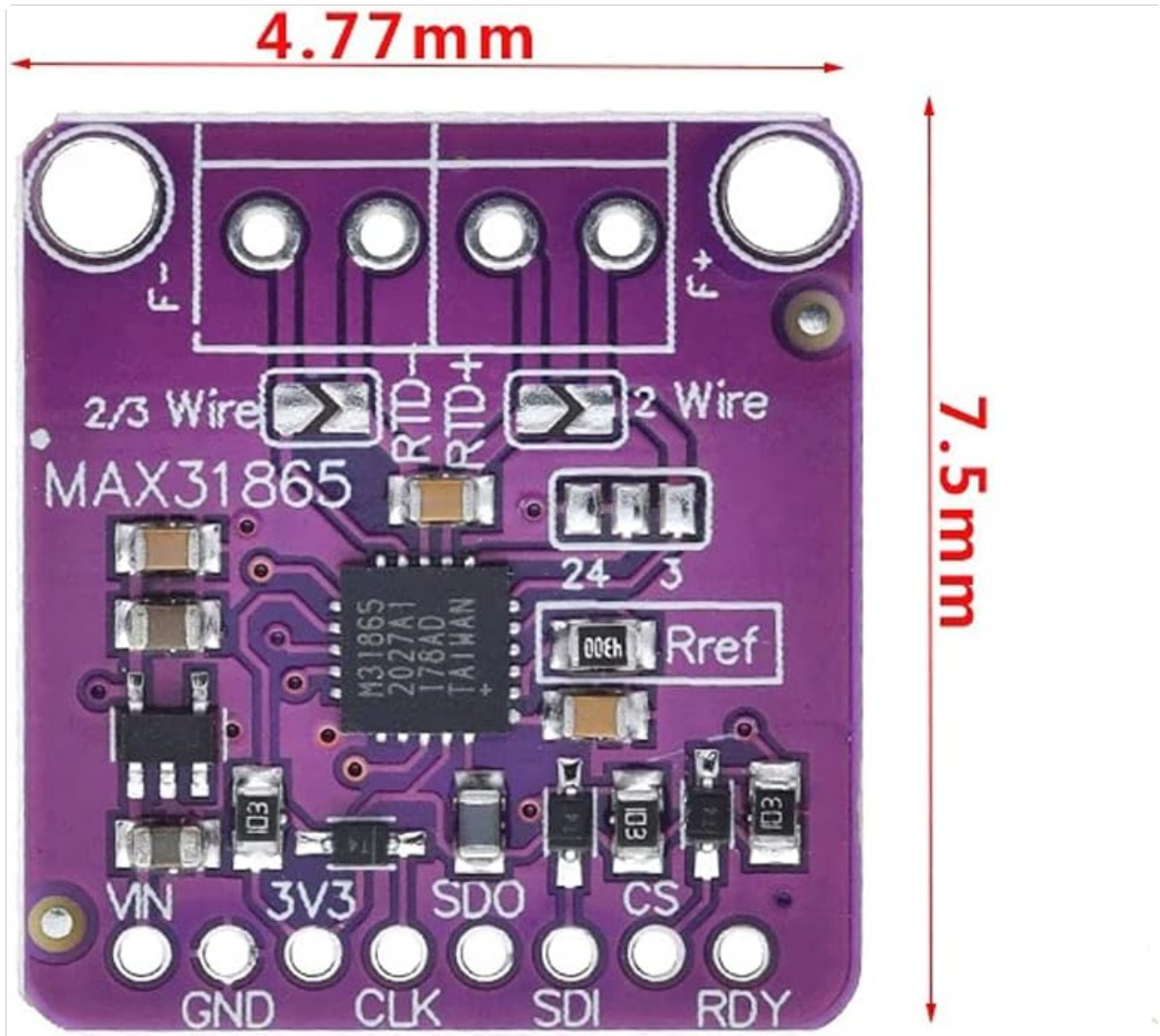


Figure 7.1: Dimensions of the MAX31865 converter board, showing approximate measurements for integration into projects.

Feature	Specification
Model Name	MAX31865
Supported RTD Types	PT100, PT1000
RTD Wire Configurations	2-wire, 3-wire, 4-wire (with compensation)
ADC Resolution	15-bit
Nominal Temperature Resolution	0.03125°C (nonlinear)
Interface	SPI compatible

Feature	Specification
Conversion Time	21ms (maximum)
Input Voltage (VIN)	3V - 5V DC
Logic Voltage (VLOGIC)	3V - 5V DC
Manufacturer	Rakstore
ASIN	B099QL3HNV
GTIN/UPC	763431916585

8. WARRANTY AND SUPPORT

This product is typically covered by the standard return policy of the retailer from which it was purchased. For specific warranty details, please refer to the purchase documentation or contact the retailer directly.

For technical support or further inquiries, please contact the manufacturer, Rakstore, through their official channels or the platform where the product was acquired. No specific support contact information is provided in this manual.



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