I2C-TC9600KP, I2C-TC9600JP, I2C-TC9600TP, I2C-TC9600NP,
I2C-TC9600SP, I2C-TC9600EP, I2C-TC9600BP, I2C-TC9600RP

Panel-Mounted I2C Bus Thermocouple EMF-to-Temperature Converter

1 Features

The I2C-TC9600XP temperature measurement board is engineered with a range of advanced features that ensure precise and reliable temperature monitoring. Below is a detailed overview of its key characteristics:

- **Single-Chip Solution:** The board utilizes the MCP9600 chip, providing an integrated approach to temperature measurement.
- **Thermocouple EMF Conversion:** It transforms the electromotive force (EMF) generated by a thermocouple into a temperature reading in degrees Celsius.
- **Cold-Junction Compensation:** The MCP9600 chip includes integrated cold-junction compensation, which helps maintain measurement accuracy regardless of ambient temperature variations.
- **Error Detection:** The board is equipped to detect both open-circuit and short-circuit conditions in the thermocouple sensor, enhancing safety and reliability.
- **Wide Thermocouple Compatibility:** It supports multiple thermocouple types, including K, J, T, N, S, E, B, and R, ensuring versatility across various applications.
- **High Accuracy:** The board offers a typical measurement accuracy of ±0.5°C, making it suitable for applications that require precise temperature control.
- **Fine Resolution:** With a resolution of 0.0625°C, the board enables highly detailed monitoring and regulation of temperature.
- **Easy Sensor Connection:** The board includes a thermocouple plug connector, simplifying the process of attaching the sensor.
- **I2C Bus Communication:** It communicates with microcontrollers via the I2C bus, supporting a bus speed of 100kHz for efficient data transfer.
- **Selectable I2C Addresses:** The board features eight selectable addresses, which can be set using jumpers, allowing multiple devices to operate on a single bus without address conflicts.
- **Wide Operating Voltage:** It operates within a voltage range from 2.7V to 5.5V, providing flexibility for various system requirements.
- **Power Polarity Protection:** The board includes a polarity protection circuit for the power supply, guarding against accidental incorrect connections.
- **Panel Installation:** Designed for easy installation on panels, the board is suitable for integration into instrument enclosures or industrial systems.
- **Compact Size:** The board features a small footprint, measuring just 42.00 x 44.00 mm, making it ideal for applications where space is limited.

2 Overview of the I2C-TC9600XP Temperature Measurement Board

The I2C-TC9600XP is a specialized electronics board designed for precise temperature measurement by converting the electromotive force (EMF) generated by a thermocouple into a temperature value in degrees Celsius. At its core, the board utilizes the MCP9600 chip from Microchip, which features an integrated cold-junction compensation unit to ensure accurate readings.

One of the notable capabilities of the I2C-TC9600XP is its ability to detect potential errors in the thermocouple sensor, including both open-circuit and short-circuit conditions. This improves reliability and safety during temperature monitoring operations.

Each model within the I2C-TC9600XP family is tailored for compatibility with specific thermocouple types, ensuring optimal performance and accuracy. The board itself offers high measurement accuracy, with a typical error margin of only ±0.5 degrees Celsius. Additionally, the measurement results are provided with a fine resolution of 0.0625 degrees Celsius, allowing for precise monitoring and control.

For ease of use, the board is equipped with a thermocouple plug connector, making it straightforward to connect the sensor. Communication with a microcontroller is established via the I2C bus, operating at a bus speed of 100 kHz. The board supports a wide operating voltage range from 2.7V to 5.5V, providing flexibility in various system configurations. Finally, the I2C-TC9600XP is designed for convenient mounting on electronic case panels, making it suitable for integration into a variety of instrument enclosures and industrial applications.

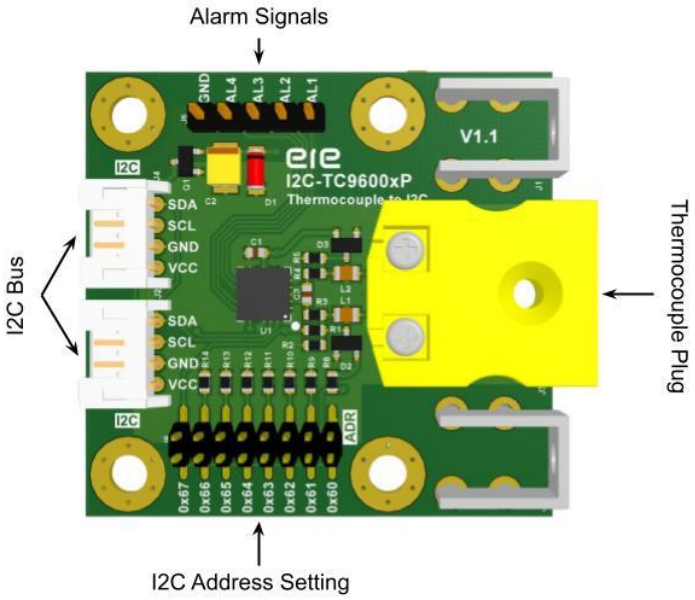


Figure 1: Board Diagram

3 I2C Bus Pull-Up Resistor Requirement

The I2C-TC9600XP board does not include built-in pull-up resistors for its SDA (Serial Data) and SCL (Serial Clock) lines. For proper operation of the I2C communication, it is necessary to add external pull-up resistors (typically 4.7kΩ to 10kΩ) to the I2C bus. These pull-up resistors are essential because they ensure that the SDA and SCL lines return to a logic high state when not actively driven low, which is necessary for reliable data transmission and reception between the board and the connected microcontroller or other devices. When setting up the I2C-TC9600XP in your system, make sure to connect suitable pull-up resistors externally to both the SDA and SCL lines.

4 I2C Bus Address Configuration

The I2C-TC9600XP connects to a microcontroller using the I2C bus, which enables communication between multiple devices on the same bus. Each device on the I2C bus needs a unique address to avoid conflicts and ensure proper operation. The I2C-TC9600XP supports eight selectable I2C addresses, allowing users to configure the board's address as needed. This flexibility is achieved through the use of jumpers on the board. By adjusting these jumpers, you can assign one of eight possible addresses to the I2C-TC9600XP, making it straightforward to integrate multiple boards into a single system without address conflicts.

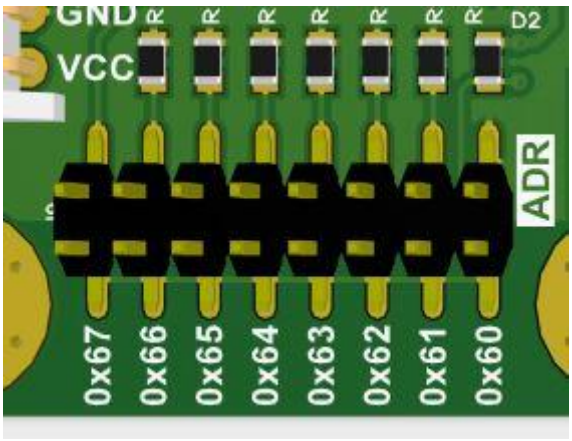
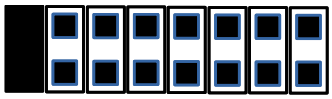
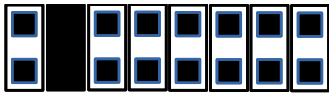


Figure 2: Jumpers of I2C address

Jumper Setting	I2C Addresses
	0x67
	0x66
	0x65
	0x64

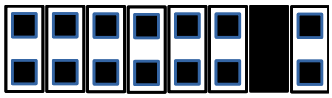
	0x63
	0x62
	0x61
	0x60

Table 1: Address jumper setting

5 Flexible Mounting Options

The I2C-TC9600XP is engineered to accommodate a variety of installation requirements. It can be securely mounted on the base of an enclosure, ensuring stability and ease of access for internal connections. Alternatively, the device can be attached directly to a panel, providing convenient access and integration with external interfaces. These mounting options enable the I2C-TC9600XP to be installed in different configurations to suit the needs of diverse applications.

5.1 Attach the board to the panel

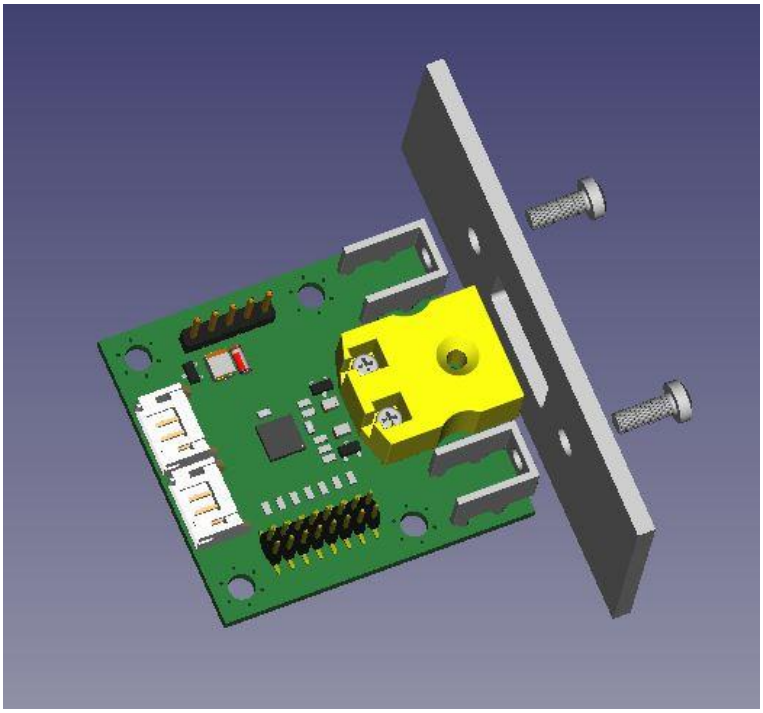


Figure 3: Bolt the I2C-TC9600XP to the panel.

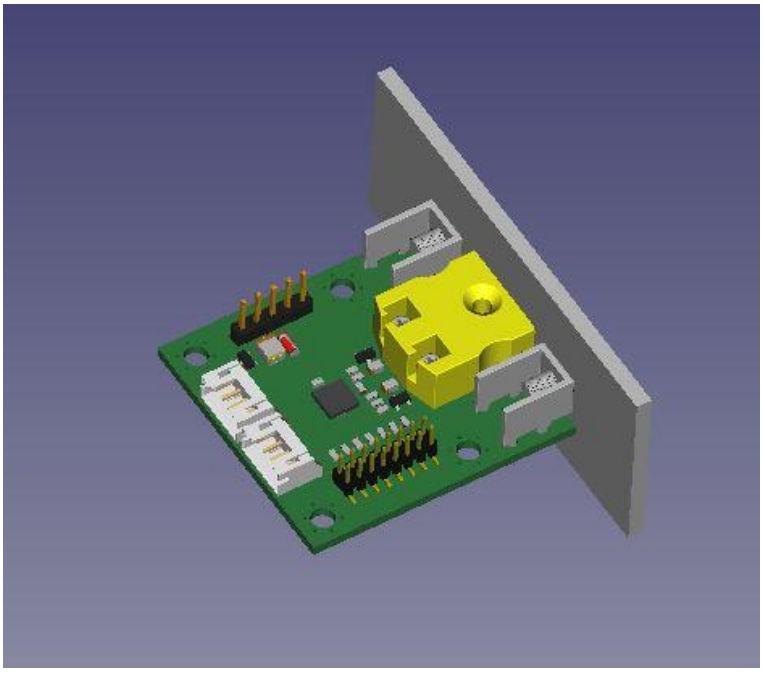


Figure 4: Secure the I2C-TC9600XP module to the panel.

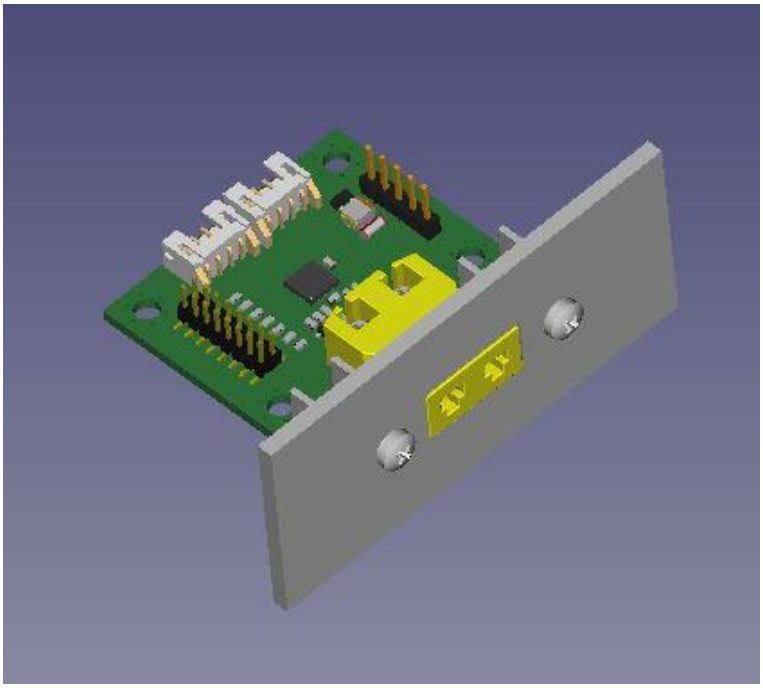


Figure 5: TC-9600XP front panel.

5.2 Mount the on the base of an enclosure

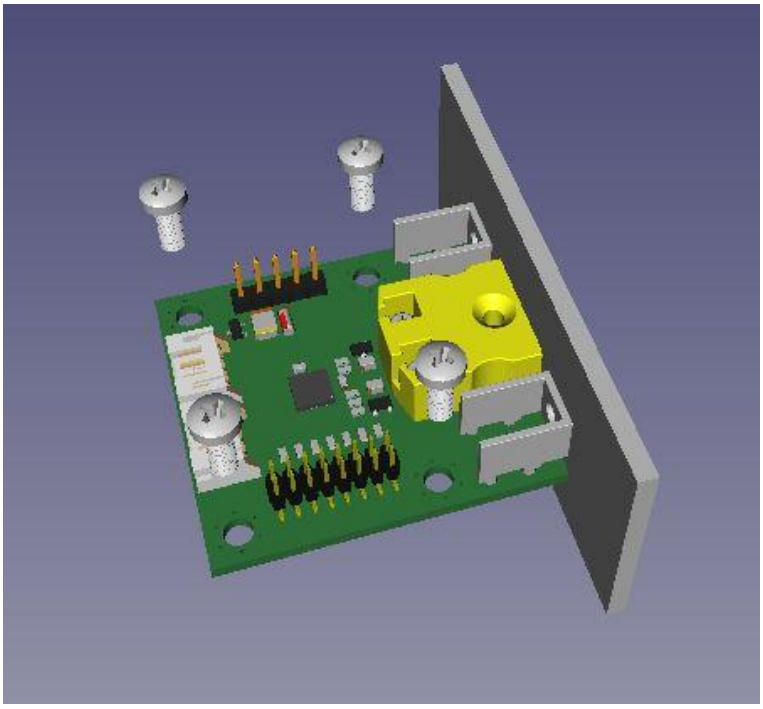


Figure 6: Attach the I2C-TC9600XP PCB to the bottom of the enclosure.

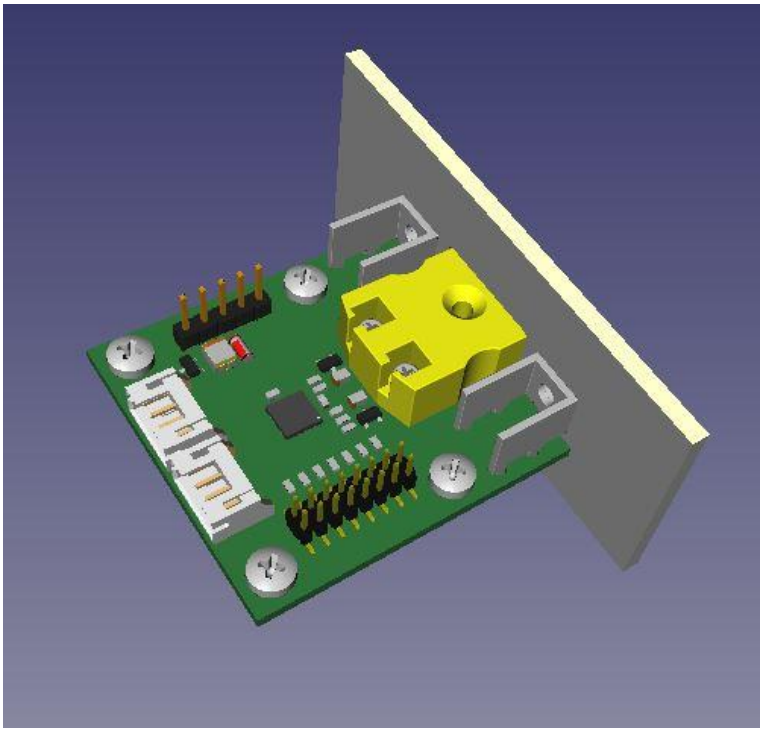


Figure 7: The PCB mounts to the base; the connector attaches to the panel.

6 Specifications

Parameters	Values
Operating voltage (VCC)	2.7V – 5.5V
I2C Bus frequency (Maximum)	100kHz
I2C bus pull-up resistance	No. *External installation is required for these resistors.*
I2C bus connectors	Pin-count: 4-pin Pin-pitch: 2.00mm
Alarm connector	Pin-count: 5-pin Pin-pitch: 2.54mm
Board Models	**Thermocouple Types**
I2C-TC9600KP	Thermocouple Type: K
I2C-TC9600JP	Thermocouple Type: J
I2C-TC9600TP	Thermocouple Type: T
I2C-TC9600NP	Thermocouple Type: N
I2C-TC9600SP	Thermocouple Type: S
I2C-TC9600EP	Thermocouple Type: E
I2C-TC9600BP	Thermocouple Type: B
I2C-TC9600RP	Thermocouple Type: R

Table 2: Specifications

7 Dimensions

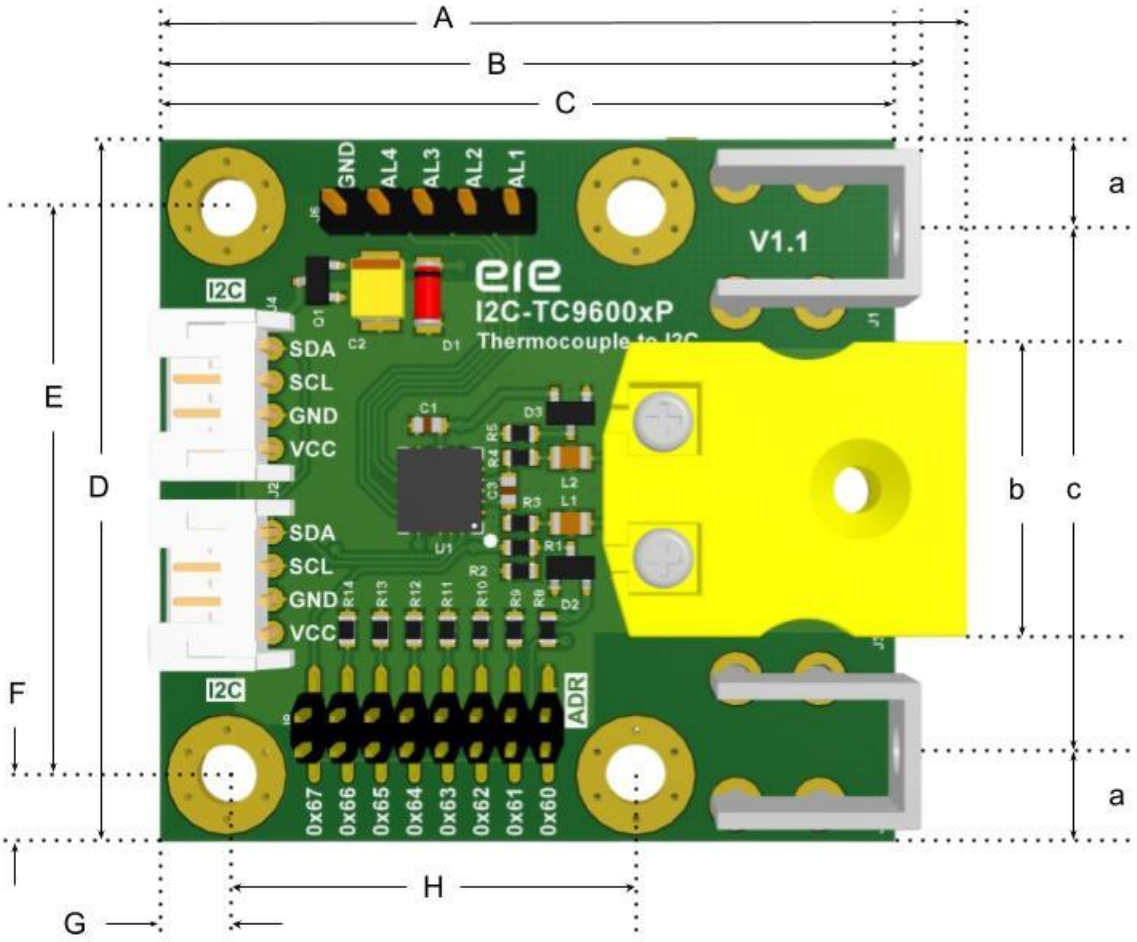


Figure 3: Dimensions

	Inch	mm
A	1.8503	47.00
B	1.7519	44.50
C	1.7322	44.00
D	1.6535	42.00
E	1.3385	34.00
F	0.1574	4.00
G	0.1574	4.00
H	0.9645	24.50
a	0.2362	6.00
b	0.6496	16.50
c	1.1811	30.00

Table 3: Dimensions

Declaration
ERE Company Limited is committed to continuously improving its products. Therefore, we reserve the right to change specifications at any time without prior notice.