

# Thermo K Click



PID: MIKROE-2501

**Thermo K Click** is a compact add-on board that serves as a thermocouple type-K probe interface for temperature measurement. This board features the MCP9600, a thermocouple EMF to temperature converter from Microchip. With the versatile type-K probe, this board enables precise temperature measurements of up to +480 °C. However, the capabilities don't stop there. This board can theoretically measure temperatures as high as +1372 °C by simply swapping to a different probe. This Click board™ makes the perfect solution for the development of hand-held measurement equipment, industrial equipment thermal management, petrochemical thermal management, and more.

Thermo K Click is supported by a [mikroSDK](#) compliant library, which includes functions that simplify software development. This [Click board™](#) comes as a fully tested product, ready to be used on a system equipped with the [mikroBUS™](#) socket.

## How does it work?

Thermo K Click is based on the MCP9600, a thermocouple EMF to temperature converter from Microchip. This converter typically has an accuracy of  $\pm 0.5^{\circ}\text{C}$  for thermocouple hot-junction with very good hot and cold-junctions resolution of  $+0.0625^{\circ}\text{C}$ . It features four programmable temperature alert outputs that monitor hot or cold-junction temperature, detects rising or falling temperature, and has up to  $255^{\circ}\text{C}$  of programmable hysteresis. In addition, it comes with integrated cold-junction compensation, and the correction coefficients are derived from the NIST Institute database. The Delta-Sigma ADC converter can work in 12/14/16/18-bit selectable resolutions, which is useful for detecting fast temperature transients.

The MCP9600 provides integrated thermocouple open-circuit and short-circuit detection, with

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an alert signal when the thermocouple wire is broken or disconnected, a feature that comes in handy. In the same way, the alert signal is asserted if the thermocouple wire is shorted to the ground or power. Regarding the alert, the MCP9600 will also notify the wrong polarity either in Comparator or Interrupt modes. The Comparator mode is helpful for thermostat-type applications to switch fan controllers, LEDs, and more, while the Interrupt mode is more convenient for microprocessor-based systems. The low-power segment comes in Shutdown mode and Burst mode with 1 up to 128 temperature samples.

The Thermo K Click uses a standard 2-Wire I2C interface to communicate with the host MCU, supporting standard 100KHz frequency. The four alert outputs from the MCP9600 can be observed over the AL1, AL2, AL3, and AL4 pins of the mikroBUS™ socket. These are programmable push-pull outputs. The Thermo K Click comes with a PCC-SMP connector for connecting an appropriate probe that MIKROE offers, the K-type Glass Braid Insulated probe.




This Click board™ can operate with either 3.3V or 5V logic voltage levels selected via the PWR SEL jumper. This way, both 3.3V and 5V capable MCUs can use the communication lines properly. However, the Click board™ comes equipped with a library containing easy-to-use functions and an example code that can be used, as a reference, for further development.


## Specifications

Type	Temperature & humidity
Applications	Can be used for the development of hand-held measurement equipment, industrial equipment thermal management, petrochemical thermal management, and more
On-board modules	MCP9600 - thermocouple EMF to temperature converter from Microchip
Key Features	Integrated cold-junction compensation, integrated thermocouple open-circuit, and short-circuit detection, support all K-type probes, good measurement resolution and accuracy, programmable temperature alerts, programmable digital filter for temperatures, and more
Interface	GPIO,I2C
Feature	No ClickID
Compatibility	mikroBUS™
Click board size	M (42.9 x 25.4 mm)
Input Voltage	3.3V or 5V

## Pinout diagram

This table shows how the pinout on THERMO K click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	Pin	Notes
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 ISOQAR REGISTERED	 UKAS MANAGEMENT SYSTEMS	 TUV SUD ISO 9001	<p>ISO 27001: 2013 certification of informational security management system. ISO 14001: 2015 certification of environmental management system. OHSAS 18001: 2008 certification of occupational health and safety management system.</p> <p>ISO 9001: 2015 certification of quality management system (QMS).</p>

							
Alert Signal 4	<b>AL4</b>	1	AN	PWM	16	<b>AL2</b>	Alert Signal 2
Alert Signal 3	<b>AL3</b>	2	RST	INT	15	<b>AL1</b>	Alert Signal 1
	NC	3	CS	TX	14	NC	
	NC	4	SCK	RX	13	NC	
	NC	5	MISO	SCL	12	<b>SCL</b>	I2C Clock
	NC	6	MOSI	SDA	11	<b>SDA</b>	I2C Data
Power supply	<b>+3.3V</b>	7	+3.3V	+5V	10	<b>+5V</b>	Power supply
Ground	<b>GND</b>	8	GND	GND	9	<b>GND</b>	Ground

## Onboard settings and indicators

Label	Name	Default	Description
-	PWR	-	Power LED Indicator
-	PWR SEL	Left	Power/Logic Voltage Level Selection 3V3/5V: Left position 3V3, Right position 5V
-	ADDR SEL	Left	I2C Address Selection 0/1: Left position 0, Right position 1

## Thermo K Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
K-type Probe Temperature Measure Range	-	-	+480	°C
Accuracy	-	±0.5	-	°C
Resolution	-	-	18	bit

## Software Support

We provide a library for the Thermo K Click as well as a demo application (example), developed using MIKROE [compilers](#). The demo can run on all the main MIKROE [development boards](#).

Package can be downloaded/installed directly from NECTO Studio Package Manager (recommended), downloaded from our [LibStock™](#) or found on [Mikroe github account](#).

## Library Description

This library contains API for Thermo K Click driver.

### Key functions

- Temperature data
- Get status
- Functions for read device info

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## Example Description

Demo application shows basic temperature reading using Thermo K click.

The full application code, and ready to use projects can be installed directly from NECTO Studio Package Manager (recommended), downloaded from our [LibStock™](#) or found on [Mikroe github account](#).

Other Mikroe Libraries used in the example:

- MikroSDK.Board
- MikroSDK.Log
- Click.ThermoK

## Additional notes and informations

Depending on the development board you are using, you may need [USB UART click](#), [USB UART 2 Click](#) or [RS232 Click](#) to connect to your PC, for development systems with no UART to USB interface available on the board. UART terminal is available in all MIKROE [compilers](#).

## mikroSDK

This Click board™ is supported with [mikroSDK](#) - MIKROE Software Development Kit. To ensure proper operation of mikroSDK compliant Click board™ demo applications, mikroSDK should be downloaded from the [LibStock](#) and installed for the compiler you are using.

For more information about mikroSDK, visit the [official page](#).

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## Resources

[mikroBUS™](#)

[Click board™ Catalog](#)

[Click Boards™](#)

## Downloads

[Thermo K click example on Libstock](#)

[Thermo K click schematic](#)

[THERMO K click 2D and 3D files](#)

[MCP9600 datasheet](#)

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