

Thermo K 3 Click



PID: MIKROE-5605

Thermo K 3 Click is a compact add-on board that provides accurate temperature measurements with a thermocouple probe. This board features the [MAX6675](#), a cold-junction-compensated K-thermocouple-to-digital converter from [Analog Devices](#). With the versatile type-K probe, this board enables precise temperature measurements of up to +700°C in 12-bit (0.25°C) resolution. This board can measure temperatures as high as +1024°C but with less precision. It features cold-junction compensation sensing and correction and open thermocouple detection. This Click board™ makes the perfect solution for the development of hand-held measurement equipment, industrial equipment thermal management, petrochemical thermal management, and more.

How does it work?

Thermo K 3 Click is based on the MAX6675, a cold-junction-compensated K-thermocouple-to-digital converter from Analog Devices. It includes signal-conditioning hardware to convert the thermocouple signal into a voltage compatible with the input channels of the ADC. The thermocouple circuit consists of two ends of the thermocouple wires, the hot junction, which is the thermocouple probe itself (0°C - 102.75°C), and the cold junction, which is the ambient temperature, usually the board itself (-20°C - 85°C). The MAX6675 senses the difference and corrects for the changes between those two ends by compensating cold junction. The MAX6675 measures the voltage from the thermocouple's output and the sensing diode and passes it to the internal conversion function stored in the ADC.

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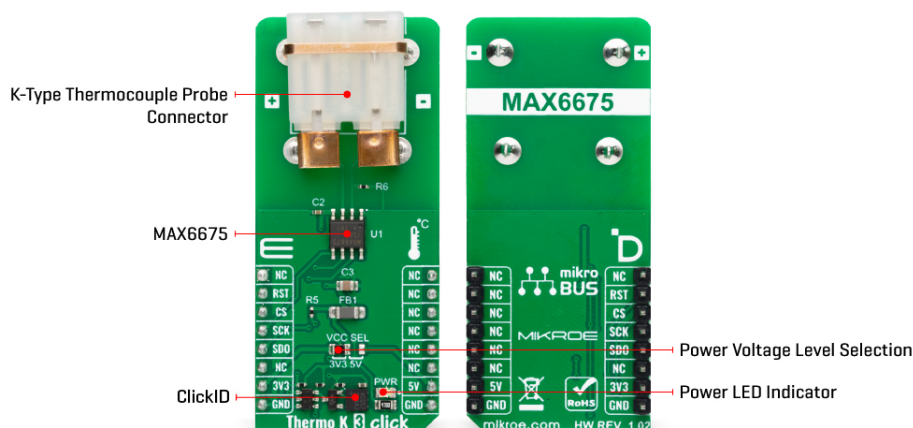
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The Thermo K 3 Click uses a 3-Wire (read-only) SPI serial interface to communicate with the host MCU with clock frequency up to 4.3MHz. Besides the temperature, you can get the data of the open thermocouple detection. For this feature, the T- of the PCC-SMP connector is grounded over the R6 0Ω resistor. You can desolder it if you do not need this feature or it does not suit your needs. This Click board™ does not come with the probe itself in the same package; however, a [Type-K thermocouple probe](#) with glass braid insulation is available in our store.

This Click board™ can operate with either 3.3V or 5V logic voltage levels selected via the VCC 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	MAX6675 - cold-junction-compensated K-thermocouple-to-digital converter from Analog Devices
Key Features	Direct digital conversion of Type-K thermocouple output, cold-junction compensation, open thermocouple detection, 12-bit (0.25 °C) resolution, PCC-SMP connector, and more
Interface	SPI
Feature	ClickID
Compatibility	mikroBUS™
Click board size	L (57.15 x 25.4 mm)
Input Voltage	3.3V or 5V

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Pinout diagram

This table shows how the pinout on Thermo K 3 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin					Pin	Notes
	NC	1	AN	PWM	16	NC	
ID SEL	RST	2	RST	INT	15	NC	
SPI Select / ID COMM	CS	3	CS	RX	14	NC	
SPI Clock	SCK	4	SCK	TX	13	NC	
SPI Data OUT	SDO	5	MISO	SCL	12	NC	
	NC	6	MOSI	SDA	11	NC	
Power Supply	3.3V	7	3.3V	5V	10	5V	Power Supply
Ground	GND	8	GND	GND	9	GND	Ground

Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
JP1	VCC SEL	Left	Power/Logic Level Voltage Selection 3V3/5V: Left position 3V3, Right position 5V

Thermo K 3 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
Thermocouple Operating Range	0	-	1024	°C
TDC Resolution	-	12	-	bit
TDC Resolution	-	0.25	-	°C

Software Support

We provide a library for the Thermo K 3 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 3 Click driver.

Key functions

- `thermok3_read_data` This function reads a raw data output by using the SPI serial interface.
- `thermok3_read_temperature` This function reads a raw data output and converts it to

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temperature in Celsius.

Example Description

This example demonstrates the use of Thermo K 3 Click board™ by reading and displaying the temperature measurements.

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.ThermoK3

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](#).

Resources

[mikroBUS™](#)

[mikroSDK](#)

[Click board™ Catalog](#)

[Click boards™](#)

[ClickID](#)

Downloads

[MAX6675 datasheet](#)

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

[Thermo K 3 click schematic](#)

[Thermo K 3 click example on Libstock](#)

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