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# THERMO K click

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## THERMO K click

	
<b>THERMO K click</b>	
<b>IC/Module</b>	MCP9600 datasheet <sup>[1]</sup>
<b>Interface</b>	I2C
<b>Power supply</b>	3.3V or 5V
<b>Product page</b>	<a href="http://shop.mikroe.com/click/sensors/thermo-k">shop.mikroe.com/click/sensors/thermo-k</a> <sup>[2]</sup>
<b>Schematic</b>	THERMO K click schematic <sup>[3]</sup>

**THERMO K click** carries the **MCP9600 IC from Microchip** and depending on the type of probe it uses, the click can measure temperatures from  $-200\text{ }^{\circ}\text{C}$  to  $+1372\text{ }^{\circ}\text{C}$ . THERMO K click is designed to run either on 3.3V or 5V power supply. It communicates with the target MCU through I2C interface.

## Features and usage notes

### Temperature range

With the type-K probe, available in our store <sup>[4]</sup>, this click can measure temperature up to  $+480\text{ }^{\circ}\text{C}$ .

### MCP9600 from Microchip

The MCP9600 IC converts thermocouple EMF to degree Celsius with integrated Cold-Junction compensation. It corrects the thermocouple nonlinear error characteristics of eight thermocouple types and outputs  $\pm 1.5^{\circ}\text{C}$  accurate temperature data.

### 4 alert outputs

THERMO K click has 4 alert outputs onboard that can be used to detect multiple temperature zones. You can define on which specific temperature the THERMO K click will send an alarm.

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## Low power modes

Low-Power modes are available for battery-powered applications. In shut-down mode the module uses only 2  $\mu\text{A}$ .

## Thermocouple probe

In order to use THERMO K click you need to connect the appropriate K-type thermocouple probe (not included in the package) into the PCC-SMP connector.

## Key features

- MCP9600 IC from Microchip
  - Four Programmable Temperature Alert Outputs
  - Operating Current: 300  $\mu\text{A}$  (typical)
  - Shutdown Current: 2  $\mu\text{A}$  (typical)
- Interface: I2C
- 3.3V or 5V power supply

## Jumpers and settings


Designator	Name	Default Position	Default Option	Description: describe the use + list all options with respective descriptions
JP1	PWR.SEL.	Left	3V3	Power Supply Voltage Selection 3V3/5V, left position 3v3, right position 5V
JP2	ADDR.SEL.	Right	GND	I2C address Selection. Left position (VDD) is 1100111x and right position (GND) is 1100000x .

## Additional information

Our store <sup>[5]</sup> offers Thermocouple Type-K Glass Braid Insulated probes.

## 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	 mikroBUS™				Pin	Notes
Alert 4 output	<b>ALERT4</b>	1	AN	PWM	16	<b>ALERT2</b>	Alert 2 output
Alert 3 output	<b>ALERT3</b>	2	RST	INT	15	<b>ALERT1</b>	Alert 1 output
Not connected	NC	3	CS	TX	14	NC	Not connected
Not connected	NC	4	SCK	RX	13	NC	Not connected
Not connected	NC	5	MISO	SCL	12	<b>SCL</b>	I2C Clock
Not connected	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

## Programming

The demo shows the temperature on the TFT or LCD display.

It measures every half a second.

We have examples for PIC, dsPIC, PIC32, ARM, AVR and FT90x compilers.

The code snippet is from the Example folder of the PIC compiler and P18F87K22 MCU.

This example is a temperature reading routine.

First, we are reading the “Thermocouple Temperature Register” and then we are converting the value to a temperature in the Celsius scale.

```
float Read_Temperature()
{
    float Temperature;

    tmp_data[0] = MCP9600_TH;

    I2C1_Start();
    I2C1_Wr( MCP9600_I2C_ADDR );
    I2C1_Wr( tmp_data[ 0 ] );
    I2C1_Stop();
    Delay_us( 50 );
    I2C1_Start();
    I2C1_Wr( MCP9600_I2C_ADDR | 1 );
    tmp_data[ 0 ] = I2C1_Rd( 1 );
    tmp_data[ 1 ] = I2C1_Rd( 0 );
    I2C1_Stop();

    if( (tmp_data[0] & 0x80) == 0x80)
    {
        tmp_data[0] = tmp_data[0] & 0x7F;

        Temperature = 1024 - (tmp_data[0]*16 + tmp_data[1] / 16);
    }
    else
    {
        Temperature = (tmp_data[0] * 16 + (float)tmp_data[1] / 16);
    }

    return Temperature;
}
```

## Resources

- THERMO K schematic <sup>[3]</sup>
- MCP9600 datasheet <sup>[1]</sup>
- Libstock Library <sup>[6]</sup>
- mikroBUS™ standard specifications <sup>[7]</sup>

## References

- [1] <http://ww1.microchip.com/downloads/en/DeviceDoc/20005426B.pdf>
  - [2] <https://shop.mikroe.com/click/sensors/thermo-k>
  - [3] [http://cdn-docs.mikroe.com/images/3/3e/THERMO\\_K\\_click\\_schematic.pdf](http://cdn-docs.mikroe.com/images/3/3e/THERMO_K_click_schematic.pdf)
  - [4] <https://shop.mikroe.com/accessories/sensors/thermocouple-type-k-glass-braid-insulated>
  - [5] [https://shop.mikroe.com/accessories/sensors/thermocouple-type-k-glass-braid-insulated?search\\_query=thermocouple&results=2](https://shop.mikroe.com/accessories/sensors/thermocouple-type-k-glass-braid-insulated?search_query=thermocouple&results=2)
  - [6] <http://libstock.mikroe.com/projects/view/1976/thermo-k-click>
  - [7] <http://download.mikroe.com/documents/standards/mikrobus/mikrobus-standard-specification-v200.pdf>
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