

Thermo 20 Click



PID: MIKROE-4316

Thermo 20 Click is a compact add-on board that provides an accurate temperature measurement. This board features the [TSYS03](#), a miniature digital temperature sensor that comes up with factory calibrated, highly accurate temperature data from [TE Connectivity](#). This temperature sensor characterized by its accuracy and high resolution offers digital output with a configurable I2C interface, ensures lower conversion time with precise temperature sensing, and provides a low power consumption sensor suitable for battery-driven applications. This Click board™ is appropriate for industrial control, as a replacement of precision RTDs, thermistors, and NTCs, or in any other temperature measurement applications.

Thermo 20 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 20 Click is based on the TSYS03, an ultra-compact digital temperature sensor with precise digital output and low power consumption from TE Connectivity. The TSYS03 is factory calibrated and provides accurate temperature measurements through several I2C configurable addresses. Operating from a supply voltage ranging between 2.4V and 5.5V and drawing just 5 μ A Thermo 20 Click board™ is well suited for battery-powered and automotive applications. With an extended operating range from -40°C to +125°C, the TSYS03 provides digital temperature measurements which offer accuracy of $\pm 0.5^\circ\text{C}$ when operating at ambient temperatures between 0°C and 60°C.

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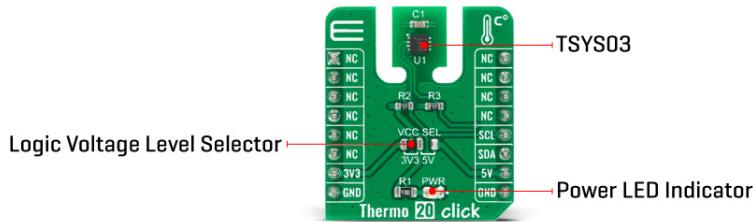
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The TSYS03 consists of a semiconductor diode as a measuring element, which was integrated into an ASIC. The temperature is obtained from the voltage that drops across the diode, and through an A/D converter with a 16-bit resolution, the output is obtained as a digital value via a configurable I2C interface. The TSYS03 impresses with its high accuracy, the current consumption lower than 5 μ A, and low self-heating of max. 0.1 $^{\circ}$ C.

Thermo 20 Click communicates with MCU using the standard I2C 2-Wire interface with a maximum clock frequency of 1MHz. The standard I2C address is 0x40, but the sensor can also react to a second, alternative I2C address. It is possible to do one-time subsequent writing of an alternative static I2C address. This leads to a wrong memory CRC, but the sensor is still functional. It is also possible to write an alternative I2C address to the sensor during operation. This address is temporally and is overwritten during a software reset or a hardware restart function.

This Click board™ is designed to be operated with both 3.3V and 5V logic voltage levels that can be selected via VCC SEL jumper. This allows for both 3.3V and 5V capable MCUs to use the I2C communication lines properly. However, the Click board™ comes equipped with a library that contains 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 industrial control, as a replacement of precision RTDs, thermistors, and NTCs, or in any other temperature measurement applications.
On-board modules	Thermo 20 Click is based on the TSYS03, an ultra-compact digital temperature sensor with precise digital output and low power consumption from.
Key Features	Low power consumption, high accuracy, high resolution, low conversion time with precise temperature sensing, and more.
Interface	I2C

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ClickID	No				
Compatibility	mikroBUS™				
Click board size	S (28.6 x 25.4 mm)				
Input Voltage	3.3V or 5V				

Pinout diagram

This table shows how the pinout on Thermo 20 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikro™ BUS				Pin	Notes
	NC	1	AN	PWM	16	NC	
	NC	2	RST	INT	15	NC	
	NC	3	CS	RX	14	NC	
	NC	4	SCK	TX	13	NC	
	NC	5	MISO	SCL	12	SCL	I2C Clock
	NC	6	MOSI	SDA	11	SDA	I2C Data
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 Supply Voltage Selection 3V3/5V: Left position 3V3, Right position 5V

Thermo 20 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-0.3	-	5.5	V
Supply Current	-	5	-	µA
Accuracy	-0.5	-	+0.5	°C
Resolution	-	16	-	bit
Operating Temperature Range	-40	-	+125	°C

Software Support

We provide a library for the Thermo 20 Click on our [LibStock](#) page, as well as a demo application (example), developed using MikroElektronika [compilers](#). The demo can run on all the main MikroElektronika [development boards](#).

Library Description

The library covers all the necessary functions to control Thermo 20 Click board™. Library performs a standard I2C interface communication.

Key functions:

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- float thermo20_get_temperature (void) - Get temperature data function.
- void thermo20_soft_reset (void) - Soft reset function.
- void thermo20_start_conversion (void) - Start conversion function.

Examples description

The application is composed of three sections :

- System Initialization - Initializes I2C and start to write log.
- Application Initialization - Initialization driver enables - I2C, software reset the device and read the serial number, also write log.
- Application Task - (code snippet) This is an example that demonstrates the use of the Thermo 20 Click board™. Thermo 20 Click board™ can be used to measure temperature. All data logs write on USB UART changes every 3 sec.

The full application code, and ready to use projects can be found on our [LibStock](#) page.

Other mikroE Libraries used in the example:

- I2C
- UART
- Conversions

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. The terminal available in all MikroElektronika [compilers](#), or any other terminal application of your choice, can be used to read the message.

mikroSDK

This Click board™ is supported with [mikroSDK](#) - MikroElektronika 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™](#)

Downloads

[Thermo 20 click 2D and 3D files](#)

[Thermo 20 click example on Libstock](#)

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[Thermo 20 click schematic](#)[TSYS03 datasheet](#)

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