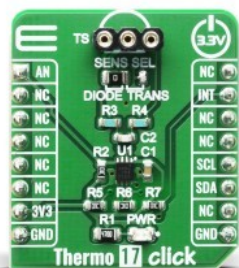


Thermo 17 Click



PID: MIKROE-3994

The **Thermo 17 Click** is a Click board™ based on the [TMP451-Q1](#), a high-accuracy, lowpower remote temperature sensor monitor with a built-in local temperature sensor from [Texas Instruments](#). Because of its main features, this Click is perfect for automotive infotainment systems, ECU processor temperature monitoring, TCM processor temperature monitoring, BCM processor temperature monitoring and LED headlight thermal control.

Thermo 17 Click board™ 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 17 click is a Click board™ equipped with the TMP451-Q1 sensor IC, which can measure temperature measurements between -40°C and +125°C so that the temperature measurement data can be processed by the host MCU. The remote temperature sensors are typically low-cost discrete NPN or PNP transistors, or substrate thermal transistors or diodes that are integral parts of microprocessors, microcontrollers, or FPGAs.

Mikroe produces entire development toolchains for all major microcontroller architectures.

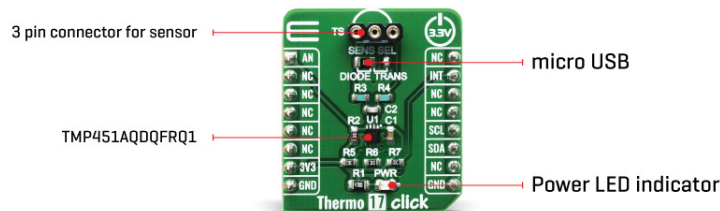
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ISO 27001: 2013 certification of informational security management system.
ISO 14001: 2015 certification of environmental management system.
OHSAS 18001: 2008 certification of occupational health and safety management system.



ISO 9001: 2015 certification of quality management system (QMS).



The temperature is represented as a 12-bit digital code for both the local and the remote sensors, giving a resolution of 0.0625°C. The temperature accuracy is $\pm 1^\circ\text{C}$ (maximum) in the typical operating range for the local and the remote temperature sensors. The two-wire serial interface accepts the SMBus communication protocol. Advanced features such as series resistance cancellation, programmable nonideality factor (η factor), programmable offset, programmable temperature limits, and a programmable digital filter are combined to provide a robust thermal monitoring solution with improved accuracy and noise immunity. The TMP451-Q1 device is ideal for multi-location, high-accuracy temperature measurements in a variety of automotive sub-systems. The device is specified for operation over a supply voltage range of 1.7 V to 3.6 V and a temperature range of -40°C to 125°C .

Because of its main features, this Click is perfect for automotive infotainment systems, ECU processor temperature monitoring, TCM processor temperature monitoring, BCM processor temperature monitoring and LED headlight thermal control.

The TMP451-Q1 device operates only as a slave device on either the two-wire bus or the SMBus. Connections to either bus are made using the open-drain I/O lines, SDA and SCL. The SDA and SCL pins feature integrated spike suppression filters and Schmitt triggers to minimize the effects of input spikes and bus noise.

This Click Board™ is designed to be operated only with 3.3V logic level. A proper logic voltage level conversion should be performed before the Click board™ is used with MCUs with logic levels of 5V.

Specifications

Type	Temperature & humidity
Applications	Automotive infotainment systems, ECU processor temperature monitoring, TCM processor temperature monitoring, BCM processor temperature monitoring and LED headlight thermal control
On-board modules	TMP451-Q1, a high-accuracy, lowpower remote temperature sensor monitor with a built-in local temperature sensor from Texas Instruments

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Key Features	Qualified for automotive applications, Series resistance cancellation, Programmable digital filter
Interface	GPIO,I2C
ClickID	No
Compatibility	mikroBUS™
Click board size	S (28.6 x 25.4 mm)
Input Voltage	3.3V

Pinout diagram

This table shows how the pinout on Thermo 17 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin					Pin	Notes
Thermal shutdown	AN	1	AN	PWM	16	NC	
	NC	2	RST	INT	15	INT	Interrupt output
	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	NC	
Ground	GND	8	GND	GND	9	GND	Ground

Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
JP1	SEN SEL	Left	Sensor selection: Left position DIODE, Right side TRANSISTOR

Software Support

We provide a library for the Thermo 17 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

Library provides functions for reading from and writing to device, and additional function for reading temperature value from sensor.

Key functions:

- void thermo17_generic_write (uint8_t reg_adr, uint8_t write_data) - Function for writing data
- uint8_t thermo17_generic_read (uint8_t reg_adr) - Function for reading data

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- float thermo17_read_temp (uint8_t temp_macro) - Function for reading temperature from device

Examples description

The application is composed of three sections :

- System Initialization - Initialization of I2C module and setting int and an pin to input
- Application Initialization - Check id status
- Application Task - Appliction measures temp value every 1000ms and logs it

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
- Convesions

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 17 click example on Libstock](#)

[Thermo 17 click 2D and 3D files](#)

[TMP451-Q1 datasheet](#)

[Thermo 17 click schematic](#)

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