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Thermo 23 Click





PID: MIKROE-4979

Thermo 23 Click is a compact add-on board that provides an accurate temperature measurement. This board features the TMP144, a high-precision digital temperature sensor from Texas Instruments. The temperature sensor in the TMP144 is the chip itself, that houses temperature sensor circuitry, 12-bit analog-to-digital converter (ADC), a control logic, and a serial interface block in one package. Characterized by its high accuracy (up to ±0.5°C typical) and high resolution of 0.0625°C, this temperature sensor provides temperature data to the host controller with a configurable interface which can be seen as both UART or SMAART Wire™ interface. This Click board™ is appropriate for thermal management of various consumer, industrial, and environmental applications with many temperature measurement zones that need to be monitored.

Thermo 23 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 23 Click as its foundation uses the TMP144, a digital temperature sensor optimal for thermal management and thermal profiling applications from Texas Instruments. This temperature sensor is characterized by high accuracy; a temperature range of -10°C to +100°C provides typical ±0.5°C accuracy. The temperature sensing device for the TMP144 is the chip itself. A bipolar junction transistor inside the chip is used in a band-gap configuration to produce a voltage proportional to the chip temperature. The voltage is digitized and converted to a 12-bit temperature result in degrees Celsius, with a resolution of 0.0625°C.

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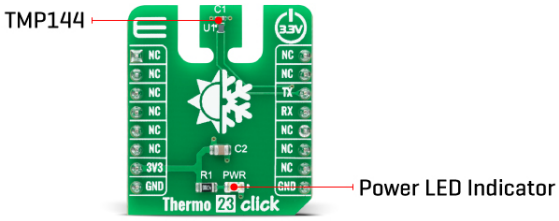

The TMP144 possesses several operational modes: Continuous-Conversion mode (CC), Shutdown, One-shot mode, and Extended Temperature mode, which increases the temperature-measurement range from -40°C to +120°C. In the CC mode, ADC performs continuous temperature conversions and stores each result to the temperature register, overwriting the result from the previous conversion, while Shutdown modes reduce power consumption in the TMP75C when continuous temperature monitoring is not required, typically less than 0.5µA. Also, while the TMP144 is in Shutdown mode, it can perform a one-shot temperature measurement and return to the Shutdown state after the single conversion.

Thermo 23 Click communicates with MCU using the UART interface with commonly used UART RX and TX pins as its communication protocol operating at 115200bps by default configuration to transmit and exchange data with the host MCU. This interface can also be seen as both UART and SMAART Wire™ interface, supporting daisy-chain configurations. Besides, the interface also supports Multiple Device Access (MDA) commands that let the host communicate with multiple devices on the bus simultaneously.

This sensor's special and equally important feature is its software interrupt, a temperature alert function that monitors the device temperature and compares the result to the values stored in the temperature limit registers to determine if the device temperature is within these set limits. The TMP144 does not issue future interrupts until the user writes sets the interrupt enable bit in the configuration register to re-enable future interrupts.

This Click board™ can be operated only with a 3.3V logic voltage level. The board must perform appropriate logic voltage level conversion before using MCUs with different logic levels. However, the Click board™ comes equipped with a library containing functions and an example code that can be used, as a reference, for further development.

Specifications

Type	Temperature & humidity
Applications	Can be used for thermal management of various consumer, industrial, and environmental applications with many temperature measurement zones that need to be monitored
On-board modules	TMP144 - high-precision digital temperature

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	sensor from Texas Instruments
Key Features	Low power consumption, high precision, UART interface, temperature sensor in the TMP144 is the chip itself, resolution of 0.0625°C, shutdown and one-shot mode, high accuracy, and more
Interface	UART
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 23 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS				Pin	Notes
	NC	1	AN	PWM	16	NC	
	NC	2	RST	INT	15	NC	
	NC	3	CS	RX	14	**TX**	UART TX
	NC	4	SCK	TX	13	**RX**	UART RX
	NC	5	MISO	SCL	12	NC	
	NC	6	MOSI	SDA	11	NC	
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

Thermo 23 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V
Temperature Accuracy	-	±0.5	±1	°C
Temperature Resolution	-	0.0625	-	°C
Operating Temperature Range	-40	+25	+120	°C

Software Support

We provide a library for the Thermo 23 Click as well as a demo application (example), developed using MikroElektronika compilers. The demo can run on all the main MikroElektronika development boards.

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

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Library Description

This library contains API for Thermo 23 Click driver.

Key functions

- thermo23_set_config This function sets the configuration register.
- thermo23_read_temperature This function reads the temperature value in Celsius.
- thermo23_read_command This function reads data from the selected command by using UART serial interface.

Example Description

This example demonstrates the use of Thermo 23 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 way), downloaded from our LibStock™ or found on Mikroe github account.

Other Mikroe Libraries used in the example:

- MikroSDK.Board
- MikroSDK.Log
- Click.Thermo23

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 MikroElektronika compilers.

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™

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Downloads

Thermo 23 click example on Libstock

Thermo 23 click 2D and 3D files

TMP144 datasheet

Thermo 23 click schematic

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