MIKROELEKTRONIKA D.O.O, Batajnički drum 23, 11000 Belgrade, Serbia
VAT: SR105917343 Registration No. 20490918
Phone: + 381 11 78 57 600 Fax: + 381 11 63 09 644 E-mail: office@mikroe.com
www.mikroe.com

Thermostat 6 Click

PID: MIKROE-6313

Thermostat 6 Click is a compact add-on board designed for precise temperature monitoring and automated control of external devices. This board features the MCP6022 rail-to-rail operational amplifier and the AZ9403-1C-5DE SPDT relay, ensuring reliable temperature processing and powerful device control. It also features a connector for integrating an NTC thermistor or RTD probe, an onboard trimmer for setting temperature thresholds between 5°C and 30°C, and an MCP3221 A/D converter for digitizing temperature readings via I2C. The relay supports a 10A contact current, with operational status indicated by an LED, making it suitable for controlling robust external devices. Thermostat 6 Click is ideal for industrial automation, HVAC systems, and other temperature-sensitive environments requiring accurate monitoring and responsive control.

For more information about **Thermostat 6 Click** visit the official product page.

How does it work?

Thermostat 6 Click is an add-on board designed for precise temperature monitoring and control of external devices. At its core, it features a temperature probe connector for integrating an NTC thermistor or other RTD probe to measure temperature variations. The MCP6022 processes the probe's signal, a rail-to-rail input/output operational amplifier from Microchip, ensuring high precision and reliability in temperature monitoring. Besides accurate temperature measurement, this board also has an onboard trimmer for setting the desired operating temperature range between 5°C and 30°C. That's why this board is highly adaptable for various applications in industrial automation, HVAC systems, and other temperature-sensitive environments.

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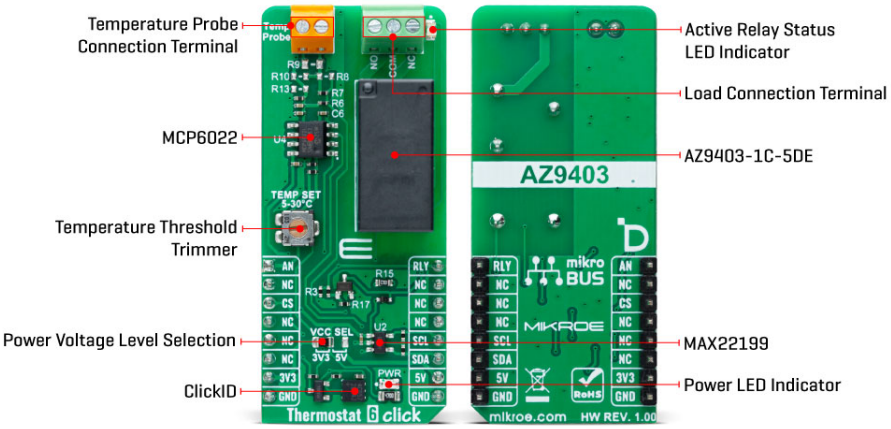

The probe detects real-time temperature changes, while the trimmer allows users to define a threshold temperature level. By comparing the probe's readings to the set threshold, the board activates or deactivates its relay, the AZ9403-1C-5DE SPDT from Zettler, enabling precise and automated control of external devices based on temperature conditions. The temperature limit set by the onboard trimmer can be monitored as an analog voltage output through the AN pin of the mikroBUS™ socket.

The AZ9403-1C-5DE SPDT relay has a nominal coil voltage of 5VDC and a contact current rating of 10A, enabling it to control more powerful external devices. The relay's SPDT configuration offers flexibility in switching between normally open (NO) and normally closed (NC) positions while its activation is controlled via the RLY pin of the mikroBUS™ socket. An orange LED indicates the relay's operational status visually, ensuring clear feedback and easy monitoring.

The analog temperature value processed by the operational amplifier is directly digitized by the MCP3221 A/D converter, enabling precise digital monitoring of the temperature. This 12-bit resolution converter communicates with the host MCU via an I2C-compatible interface, providing accurate and reliable temperature data for further processing.

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. Also, this 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	Relay,Temperature & humidity
Applications	Ideal for industrial automation, HVAC systems, and other temperature-sensitive environments requiring accurate monitoring and responsive control
On-board modules	MCP6022 - rail-to-rail operational amplifier from Microchip
Key Features	Easy integration of an NTC thermistor, rail-to-rail input/output amplifier for signal amplification, digital signal processing, high-

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	current relay for controlling external loads, orange LED for easy monitoring of relay activation state, and more
Interface	Analog,I2C
Feature	ClickID
Compatibility	mikroBUS™
Click board size	L (57.15 x 25.4 mm)
Input Voltage	3.3V or 5V

Pinout diagram

This table shows how the pinout on Thermostat 6 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS				Pin	Notes
Analog Output	**AN**	1	AN	PWM	16	**RLY**	Relay Control
	NC	2	RST	INT	15	NC	
ID COMM	**CS**	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
LD2	-	-	Active Relay Status LED Indicator
JP1	VCC SEL	Left	Power Voltage Level Selection 3V3/5V: Left position 3V3, Right position 5V

Thermostat 6 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
Relay Current Rating	-	-	10	A

Software Support

Thermostat 6 Click demo application is developed using the NECTO Studio, ensuring compatibility with mikroSDK's open-source libraries and tools. Designed for plug-and-play implementation and testing, the demo is fully compatible with all development, starter, and mikromedia boards featuring a mikroBUS™ socket.

Example Description

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This example demonstrates the use of Thermostat 6 Click board by reading the temperature level set using an on-board potentiometer and the temperature from the NTC Thermistor 10k Cylindrical Probe (B57500M0103A005) which is connected to the input, and also displaying the relay state. If the set temperature level is lower than the temperature read from NTC, then the relay switches ON.

Key Functions

- thermostat6_cfg_setup Config Object Initialization function.
- thermostat6_init Initialization function.
- thermostat6_get_adc_v_avg This function reads and averages the ADC voltage for a desired number of samples.
- thermostat6_get_an_pin_v_avg This function reads and averages the AN pin voltage for a desired number of samples.
- thermostat6_get_temperature This function calculates temperature in degrees Celsius based on a voltage input using the NTC Thermistor 10k Cylindrical Probe (B57500M0103A005) R/T characteristics map.

Application Init

Initializes the driver and logger.

Application Task

Reads the temperature level set using an on-board potentiometer and the temperature from the NTC Thermistor 10k Cylindrical Probe (B57500M0103A005) connected to the input, and displays the relay state. If the set temperature level is lower than the temperature read from NTC, then the relay switches ON.

Application Output

This Click board can be interfaced and monitored in two ways:

- Application Output - Use the "Application Output" window in Debug mode for real-time data monitoring. Set it up properly by following this tutorial.
- UART Terminal - Monitor data via the UART Terminal using a USB to UART converter. For detailed instructions, check out this tutorial.

Additional Notes and Information

The complete application code and a ready-to-use project are available through the NECTO Studio Package Manager for direct installation in the NECTO Studio. The application code can also be found on the MIKROE GitHub account.

Resources

mikroBUS™

mikroSDK

Click board™ Catalog

Click boards™

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Downloads

MCP6022 datasheet

MCP3221 datasheet

Thermostat 6 click 2D and 3D files v100

AZ9403 datasheet

Thermostat 6 click example package

Thermostat 6 click schematic v100