HEATER CLICK

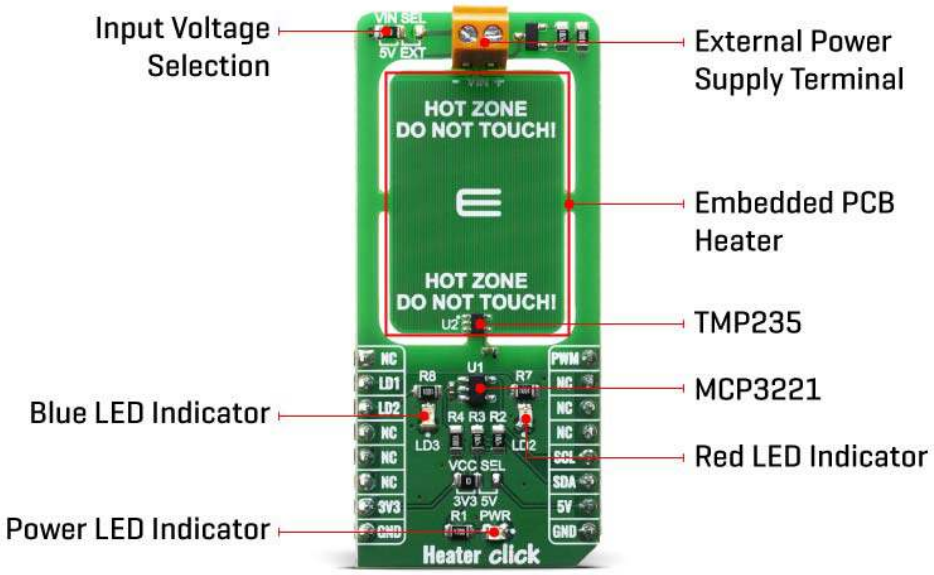
PID: MIKROE-3996 Weight: 19 g

Heater Click is designed with intention of PCB heater concept testing and useful tool for heating complete casing where staying in specified temperature range is crucial. Exact PCB temperature can be set and controlled using TMP235 on board temperature sensor from Texas Instruments. Heater Click is useful tool for some projects and products that require some kind of heating, whether to prevent electronics from becoming too cold, to help control humidity, to heat up a substance, or even to prevent one material from sticking to another.

Heater 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?

Heater Click works on a principle of Joule heating, also known as resistance heating (resistive heating), a process by which the passage of an electric current thrrough a conductor produces heat. Energy dissipated per unit time is equall to current passing through resistor times electric potential difference.



Heater Click allows PCB temperature ajusting and monitoring as it have embedded trace resistor on top layer of PCB. Resistor is made from copper 1oz thick and a pattern of 0.1mm wide track 1950mm long, this give us about 10 ohm resistance at 25 degrees Celsius.

With on bord VIN SEL jumper power supply can be selected as 5V from mikroBUS or any other voltage from external power supply at therminal block VIN. Using mikroBUS PWM pin power dissipation can be ajusted and therfore temperature controlled.

Heater Click minimize temperature spread from embedded resistor by having PCB gaps between it and rest of the click bord and components, by doing so hot zone is easier to warm up and keeping it at exact temperature without affecting rest of the commponents. LEDs are connected to LD1 and LD2 GPIO pins and can be used for example to signal user if temperature is ramping up or achieved, or any other user defined signaling.

Since the temperature rise in a heater is a function of its resistance and voltage, you don’t always need to design a heater from scratch. So long as you can apply a specific voltage, you should be able to achieve your desired temperature and monitoring it through I2C.

Temperature is monitored with TMP235 precision CMOS integrated-circuit linear analog temperature sensor with an output voltage proportional to temperature, The TMP235 device provides a positive slope output of 10 mV/°C over the full –40°C to +150°C temperature range.

Using MCP3221 a 12-bit ADC, output voltage from temperature sensor can be red through I2C. Communication to the MCP3221 is performed using a 2-wire, I2C compatible interface. Standard (100 kHz) and Fast (400 kHz) I2C modes are available with the device.

Specifications

Type	Temperature
Applications	Seed germination, 3D printer heated beds, humidity control, loads, heater reference
On-board modules	MCP3221, TMP235
Key Features	Stable temperature adjusting and monitoring
Interface	I2C,PWM
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 Heater 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	**PWM**	Pulse width modulation
Red Led	**LD1**	2	RST	INT	15	NC	
Blue Led	**LD2**	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
PWR	Green Led	-	Power LED Indicator
LD2	Red Led	-	Red LED Indicator
LD3	Blue Led	-	Blue LED Indicator

Software Support

We provide a library for the Heater 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 control over led pins and function for reading raw ADC data as well a fucntion for reading converted data in temperature.

Key functions:

- `uint16_t heater_read_data ( void );` - Function for reading raw ADC data
- `float heater_read_temp ( void );` - Function that raw data converts in temperature

Examples description

The application is composed of three sections :

- System Initialization - Initialization of I2C, UART modules and GPIO pins
- Application Initialization - Initialization of PWM module and start heating up
- Application Task - Durning the task device is heating up to 50 degree C and then cooling down to 40 degree C

```
void application_task ( )
{
    temp_read = heater_read_temp(  );

    if ( ( temp_read > HOT_TEMP ) && ( status_dev == HEATER_WAITING ) )
    {
```

```
        status_dev = HEATER_COOLING;
    }
    else if ( ( temp_read < COOL_TEMP ) && ( status_dev == HEATER_WAITING ) )
    {
        status_dev = HEATER_HEATING;
    }

    if ( status_dev == HEATER_HEATING )
    {
        heater_pwm_start(  );
        heater_set_led1_status( HEATER_LED_ON );
        heater_set_led2_status( HEATER_LED_OFF );
        status_dev = HEATER_WAITING;
    }
    else if ( status_dev == HEATER_COOLING )
    {
        heater_pwm_stop(  );
        heater_set_led1_status( HEATER_LED_OFF );
        heater_set_led2_status( HEATER_LED_ON );
        status_dev = HEATER_WAITING;
    }

    FloatToStr( temp_read, demo_txt );
    mikrobus_logWrite( " - Temperature: ", _LOG_TEXT );
    mikrobus_logWrite( demo_txt, _LOG_TEXT );
    mikrobus_logWrite( log_degree, _LOG_LINE );
    mikrobus_logWrite( "***************", _LOG_LINE );

    Delay_ms( 1000 );
}
```

Note:

- Device turns red led on when heating up device and blue when cooling down
- For this example you should supply device with additional 7V

The full application code, and ready to use projects can be found on our LibStock page.

Other mikroE Libraries used in the example:

- I2C
- PWM
- UART
- Conversion

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.