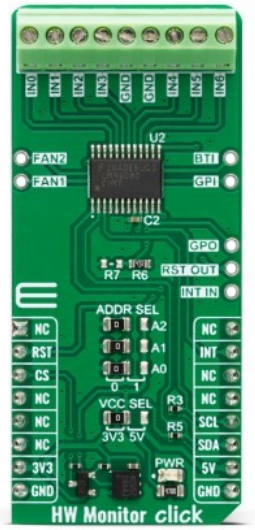
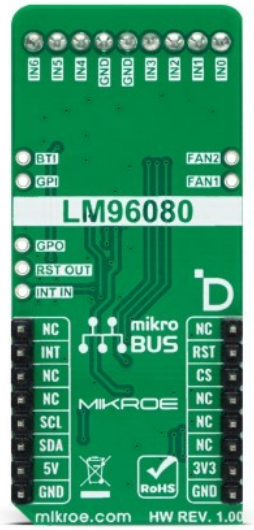
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HW Monitor Click





PID: MIKROE-5684

HW Monitor Click is a compact add-on board used to monitor and regulate the performance of various hardware components within an embedded system. This board features the LM96080, an I2C-configurable system hardware monitor from Texas Instruments that contains a 10-bit delta-sigma ADC capable of measuring seven positive voltages and local temperature. The LM96080 also has two programmable fan speed monitoring inputs besides other hardware monitoring functions like chassis intrusion detection, additional external interrupt input, master reset for external purposes, as well as a sequencer that performs watchdog window comparisons of all measured values. This Click board™ is suitable for system thermal and hardware monitoring for various servers, electronic test equipment and instrumentation, communications infrastructure, consumer electronics, and more.

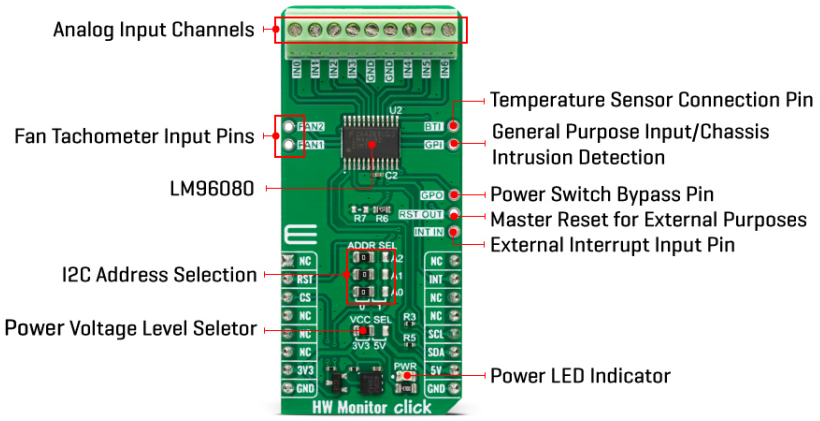
HW Monitor Click is supported by a mikroSDK compliant library, which includes functions that simplify software development. This Click board™ comes as a fully tested product, ready to be used on a system equipped with the mikroBUS™ socket.

How does it work?

HW Monitor Click is based on the LM96080, a system hardware monitor from Texas Instruments that performs power supply, temperature, and fan monitoring for various embedded systems. The LM96080 provides seven analog inputs spread across the terminals on the top of the board labeled from IN0 to IN6, a temperature sensor, a delta-sigma ADC, two fan speed counters, watchdog registers, and a variety of inputs and outputs on a single chip. It continuously converts analog inputs to 10-bit resolution with a 2.5mV LSB, yielding input ranges of 0 to 2.56V. The analog inputs are intended to be connected to the several power supplies present in a typical communications infrastructure system.

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This Click board™ communicates with MCU using the standard I2C 2-Wire interface to read data and configure settings with a maximum frequency of 400kHz. The LM96080 includes an analog filter on the I2C lines that improves noise immunity and supports the timeout reset function on SDA and SCL pins, preventing I2C bus lockup. Also, the LM96080 allows choosing the least significant bits (LSB) of its I2C slave address using the SMD jumpers labeled ADDR SEL.

The LM96080 is especially suited to interface with linear and digital temperature sensors such as LM73, LM75, LM56, LM57, LM26, LM27, LM26LV, or other LM96080 via the BTI pin on one of the unpopulated headers. Temperature can be converted to a 9-bit or 12-bit two's complement word with resolutions of 0.5°C or 0.0625°C LSB, respectively. On the same header, in addition to the BTI pin, there is also a GPI pin, which, in addition to its function as a general-purpose input pin, can also serve as a chassis intrusion detection input. The chassis intrusion input is designed to accept an active high signal from an external circuit that latches, such as when the cover is removed from the computer.

Next in this board's series of additional features are the fan inputs, labeled FAN1 and FAN2, that can be programmed to accept either fan failure indicator programmed to be active high or active low or tachometer signals. Fan inputs measure the period of tachometer pulses from the fans, providing a higher count for lower fan speeds. The full-scale fan counts are 255 (8-bit counter), representing a stopped or slow fan. Based on a count of 153, nominal speeds are programmable from 1100 to 8800 RPM. Signal conditioning circuitry is also included to accommodate the slow rise and fall times.

The last header contains functions such as an external interrupt input INT IN, a master reset for external purposes RST OUT, and a single power switch pin GPO. The INT IN active low interrupt provides a way to chain the interrupts from other devices through the LM96080 to the host, the RST_OUT is intended to provide a master reset to devices connected to this line, while the GPO pin is an active low NMOS open drain output intended to drive an external power PMOS for software power control or can be utilized to control power to a cooling fan. The LM96080 also possesses a general reset signal routed on the RST pin of the mikroBUS™ socket to reset the LM96080, and an additional interrupt signal, routed on the INT pin of the mikroBUS™ socket whenever some of the external interrupts like INT_OUT, interrupt from the temperature sensor, or when a chassis detection event occurs.

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

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properly. However, the 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	ADC
Applications	Can be used for system thermal and hardware monitoring for various servers, electronic test equipment and instrumentation, communications infrastructure, consumer electronics, and more
On-board modules	LM96080 - system hardware monitor from Texas Instruments
Key Features	Seven positive voltage inputs with 10-bit resolution, local temperature sensing, two programmable fan speed monitoring inputs, chassis intrusion detection, watchdog comparison of all monitored values, power switch bypass, external interrupt and master reset, and more
Interface	I2C
ClickID	Yes
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 HW Monitor 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	
Reset	**RST**	2	RST	INT	15	**INT**	Interrupt
	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 Voltage Level Selection 3V3/5V: Left position 3V3, Right

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			position 5V
JP2-JP4	ADDR SEL	Left	I2C Address Selection 0/1: Left position 0, Right position 1
J1	-	Unpopulated	Temperature Sensor Connection/Chassis Intrusion Detection
J2	-	Unpopulated	External Interrupt/Master Reset/Power Switch Bypass
J3	-	Unpopulated	Fan Tachometer Input

HW Monitor Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
Analog Input Voltage Range	0	-	2.56	V
ADC Resolution	-	10	-	bit

Software Support

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

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

Library Description

This library contains API for HW Monitor Click driver.

Key functions

- hwmonitor_get_analog_inputs HW Monitor gets analog inputs voltage function.
- hwmonitor_get_temperature HW Monitor gets temperature function.
- hwmonitor_set_config HW Monitor set the configuration function.

Example Description

This example demonstrates the use of the HW Monitor Click board™. The demo application monitors analog voltage inputs and local temperature data.

The full application code, and ready to use projects can be installed directly from NECTO Studio Package Manager (recommended), downloaded from our LibStock™ or found on Mikroe github account.

Other Mikroe Libraries used in the example:

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- MikroSDK.Board
- MikroSDK.Log
- Click.HWMonitor

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 Mikroe compilers.

mikroSDK

This Click board™ is supported with mikroSDK - Mikroe Software Development Kit, that needs to be downloaded from the LibStock and installed for the compiler you are using to ensure proper operation of mikroSDK compliant Click board™ demo applications.

For more information about mikroSDK, visit the official page.

Resources

mikroBUS™

mikroSDK

Click board™ Catalog

Click boards™

ClickID

Downloads

HW Monitor click example on Libstock

HW Monitor click 2D and 3D files

LM96080 datasheet

HW Monitor click schematic

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