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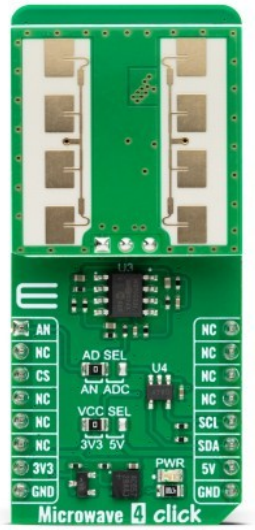
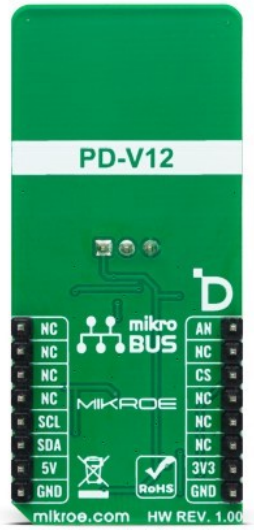
Microwave 4 Click





PID: MIKROE-5790

Microwave 4 Click is a compact add-on board that utilizes the Doppler Shift Phenomenon to sense motion. This board features the PD-V12, a miniature high-frequency microwave transceiver from Ningbo Pdlux Electronic Technology. The transmitter on this transceiver works on a 24.1GHz frequency over the flat Plane antenna. The strength of the sensor's output, in other words, the detection range, depends on the Signal-to-Noise ratio. This Click board™ makes the perfect solution for the development of intrusion alarms, automatic door openers, presence-sensing applications, and more.

How does it work?

Microwave 4 Click is based on the PD-V12, a miniature high-frequency microwave transceiver from Ningbo Pdlux Electronic Technology. This motion sensor is a K-band Bi-Static Doppler transceiver module. It is housed in a metal can and features a built-in resonator oscillator (CRO), providing a stable operation as it improves its front signal-receiving ability and reduces its flank blind area. The Microwave 4 Click detects the frequency shift between a transmitted and a received signal reflected from a moving object within the field of view of the transceiver.

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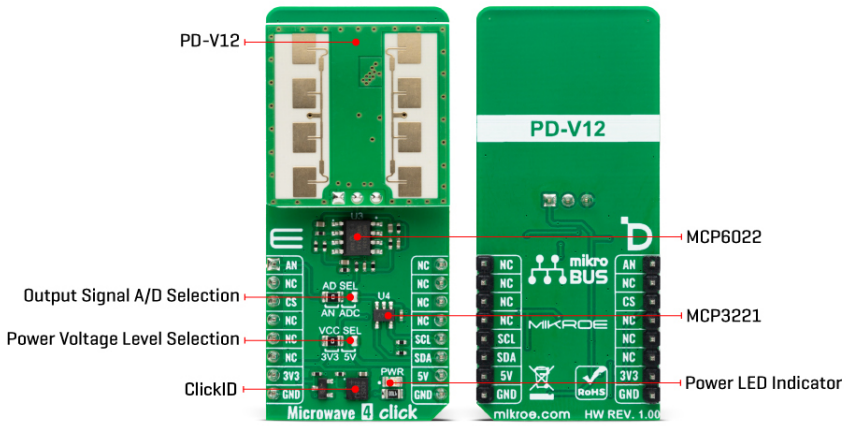

The radiated power (EIRP) emissions of <3mW at maximum meet the FCC and CE rules. The noise voltages at the output port inside an anechoic chamber are measured from 10Hz to 100Hz. The received signal strength (RSS) is measured at the total 1 Ways path loss of 70dB. The module uses two antennas (for RX and TX) with a maximum gain of 0dBi and is designed to be installed in such a way that allows it to operate at closer than 20cm to users or nearby persons.

The produced low-level output is amplified over the MCP6022, a rail-to-rail input/output 10MHz operational amplifier from Microchip. The amplified output goes to the ADC SEL jumper, which allows you to read the data over an analog pin of the mikroBUS™ socket or the MCP3221, a low-power 12-bit A/D converter from Microchip. The jumper is set to an analog pin by default. If the option is the ADC, you can count up to 22.3ksps in I2C fast mode.

As mentioned, the Microwave 4 Click uses an analog AN pin of the mikroBUS™ socket or a standard 2-Wire I2C interface of the MCP3221 to communicate with the host MCU. The I2C of the ADC supports standard (100KHz) and fast (400KHz) modes. Depending on the ADC of the host MCU, the onboard 12-bit ADC could be a better choice.

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	Motion
Applications	Can be used for the development of intrusion alarms, automatic door openers, presence-sensing applications, and more
On-board modules	PD-V12 - miniature high-frequency microwave transceiver from Ningbo Pdlux Electronic Technology
Key Features	Low power consumption, low cost, high sensitivity, plain antenna, additional 12-bit analog-to-digital converter, up to 22.3ksps, uses Doppler shift phenomenon to “sense”

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	motion, 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 Microwave 4 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS™				Pin	Notes
Analog Input	**AN**	1	AN	PWM	16	NC	
	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
JP1	VCC SEL	Left	Power/Logic Voltage Level Selection 3V3/5V: Left position 3V3, Right position 5V
JP2	ADC SEL	Right	Output Signal A/D Selection AN/ADC: Left position AN, Right position ADC

Microwave 4 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
Operating Frequency	24.075	24.1	24.175	GHz
Detection Range	-	-	20	cm

Software Support

We provide a library for the Microwave 4 Click as well as a demo application (example), developed using MIKROE compilers. The demo can run on all the main MIKROE development boards.

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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 Microwave 4 Click driver.

Key functions

- microwave4_read_raw_adc Microwave 4 read raw ADC value function.
- microwave4_read_voltage Microwave 4 read voltage level function.
- microwave4_set_vref Microwave 4 set vref function.

Example Description

This example demonstrates the use of the Microwave 4 Click board™ by reading and displaying the results of AD conversion and motion detection.

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:

- MikroSDK.Board
- MikroSDK.Log
- Click.Microwave4

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. 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

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Click Boards™

ClickID

Downloads

Microwave 4 click example on Libstock

Microwave 4 click 2D and 3D files

PD-V12 datasheet

MCP6022 datasheet

MCP3221 datasheet

Microwave 4 click schematic

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