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ISM 3 Click

PID: MIKROE-6066

ISM 3 Click is a compact add-on board designed for low-power wireless communication in the sub-1 GHz ISM and SRD frequency bands. This board features the S2-LP 433MHz RF transceiver from STMicroelectronics, known for its high performance and ultra-low power consumption. The S2-LP supports multiple modulation schemes with programmable data rates, offers excellent receiver sensitivity, adjustable RF output power, features such as automatic packet handling and support for SIGFOX™ and MONARCH networks. Communication with the host MCU is established via a 4-wire SPI interface, and additional flexibility is provided through three configurable GPIO pins. Ideal for a wide range of applications, ISM 3 Click is perfect for smart metering, home automation, industrial monitoring, wireless alarms, and other sensor-to-cloud solutions.

For more information about **ISM 3 Click** visit the official product page.

How does it work?

ISM 3 Click is based on the S2-LP, a high performance ultra-low power RF transceiver from STMicroelectronics. Created for sub-1 GHz wireless applications, this ultra-low power transceiver is ideal for use within license-free ISM and SRD bands, specifically operating in the 433MHz frequency range. Designed to support robust and flexible wireless connectivity, the S2-LP accommodates multiple modulation formats, including 2(G)FSK, 4(G)FSK, OOK, and ASK. These modulation types can be easily selected through the MOD_TYPE register, offering a customizable communication setup suited to various system requirements. Moreover, the device offers a programmable air data rate that spans from as low as 0.1kbps up to 500kbps, allowing developers to optimize for either speed or energy efficiency depending on the application. The ISM 3 Click is well-suited for a wide range of wireless applications including

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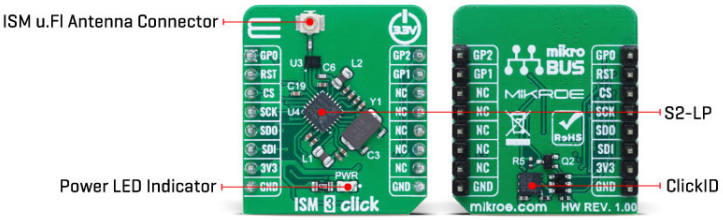
sensor-to-cloud systems, smart metering, home energy management, wireless alarm solutions, smart home environments, building automation systems, industrial monitoring and control setups, smart lighting infrastructure, and many others.



The S2-LP stands out for its exceptional receiver sensitivity, reaching values as low as -130dBm, ensuring reliable signal detection even in low-signal environments. It also features a programmable RF output power of up to +16dBm, making it capable of strong and stable transmission. To further enhance communication performance, the device integrates a digital RX filter and adjustable channel spacing. Rapid system responsiveness is supported by its fast startup time and quick frequency synthesizer settling. Smart integrated features such as automatic frequency offset compensation, automatic gain control (AGC), and symbol timing recovery contribute to consistent and accurate data reception.

This Click board™ establishes communication with the host MCU using a 4-wire SPI interface with maximum clock frequency of 10MHz, ensuring reliable and high-speed data transfer. Equipped with 128-byte FIFO buffers for both RX and TX, the S2-LP simplifies data handling and enables efficient packet-based communication. Built-in protocols support automatic packet acknowledgment and retransmission, and an embedded timeout engine ensures robust link management. Additionally, the S2-LP enables connectivity within SIGFOX™ and MONARCH networks, broadening its applicability to various low-power wide-area network (LPWAN) scenarios.

In addition to the interface pins, the ISM 3 Click also uses the RST pin, which serves as a shutdown control for the S2-LP, allowing the device to enter an ultra-low power state when not in use. Furthermore, it features three general-purpose I/O pins - GP0, GP1, and GP2 - which can be configured via SPI-accessible registers to perform a variety of functions. These GPIO pins are highly versatile and can be assigned roles such as interrupt generation or other control and monitoring tasks, providing additional flexibility. The board also features one u.Fl connector for the ISM antenna that MIKROE offers, like the Rubber 433MHz antenna combined with an IPEX-SMA cable for flexible and efficient connectivity options.

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. It also comes equipped with a library containing functions and example code that can be used as a reference for further development.

Specifications

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Type	Sub-1 GHz Transceievers
Applications	Ideal for smart metering, home automation, industrial monitoring, wireless alarms, and other sensor-to-cloud solutions
On-board modules	S2-LP - high performance ultra-low power RF transceiver from STMicroelectronics
Key Features	Ultra-low power sub-1 GHz RF transceiver, support for 2(G)FSK, 4(G)FSK, OOK, and ASK modulation schemes, programmable data rate, excellent receiver sensitivity, programmable RF output power, embedded protocol engine with automatic packet acknowledgment and retransmission, support for SIGFOX and MONARCH networks, and more
Interface	SPI
Feature	ClickID
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 ISM 3 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS				Pin	Notes
General-Purpose I/O	**GP0**	1	AN	PWM	16	**GP2**	General-Purpose I/O
Shutdown / ID SEL	**RST**	2	RST	INT	15	**GP1**	General-Purpose I/O
SPI Select / ID COMM	**CS**	3	CS	RX	14	NC	
SPI Clock	**SCK**	4	SCK	TX	13	NC	
SPI Data OUT	**SDO**	5	MISO	SCL	12	NC	
SPI Data IN	**SDI**	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

ISM 3 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V
Frequency Range	-	433	-	MHz
Sensitivity	-128	-	-100	dBm

Software Support

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ISM 3 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

This example demonstrates the use of an ISM 3 Click board by showing the communication between the two Click boards (Server and Client).

Key Functions

- ism3_cfg_setup Config Object Initialization function.
- ism3_init Initialization function.
- ism3_default_cfg Click Default Configuration function.
- ism3_transmit_packet This function transmits a desired data packet.
- ism3_receive_packet This function waits for a data packet to arrive and reads it.
- ism3_check_communication This function checks the communication by reading and verifying the device part number.

Application Init

Initializes the driver and performs the Click default configuration.

Application Task

There are two application modes: Server and Client.

- Server mode: Waits for a message from client device, reads the received packet and responds with an acknowledge message.
- Client mode: Initiates communication with the server device by sending a desired packet which contains the text message and a packet counter approximately every 500 milliseconds. After sending the packet it waits for an acknowledge response from server. The packet counter is incremented only after successfull acknowledgment for the last packet. All data is being displayed on the USB UART where you can track their changes.

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

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ISM 3 click example package

ISM 3 click 2D and 3D files v100

ISM 3 click schematic v100

S2-LP datasheet