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

LR 9 Click

PID: MIKROE-6038

LR 9 Click is a compact add-on board designed for ultra-long-range spread spectrum communication tasks within the LPWAN domain. This board is based on the RA-08, a LoRaWAN module from Ai-Thinker Technology, featuring the ASR6601 system-on-chip (SoC) that combines RF transceivers, modems, and a 32-bit RISC microcontroller (MCU). This module excels with its support for LoRa and (G)FSK modulation, a frequency range of 410MHz to 525MHz, and embedded storage of 128KB FLASH and 16KB SRAM, ensuring robust and versatile communication capabilities. Moreover, it's equipped with UART and I2C interfaces for easy programming and integration and an SMA antenna connector for enhanced connectivity. This Click board™ is ideal for applications in smart metering, supply chain and logistics, home automation, and security systems, offering long-distance, ultra-low power connectivity solutions for various sectors.

LR 9 Click is fully compatible with the mikroBUS™ socket and can be used on any host system supporting the mikroBUS™ standard. It comes with the mikroSDK open-source libraries, offering unparalleled flexibility for evaluation and customization. What sets this Click board™ apart is the groundbreaking ClickID feature, enabling your host system to seamlessly and automatically detect and identify this add-on board.

How does it work?

LR 9 Click is based on the RA-08, a LoRaWAN module from Ai-Thinker Technology. This module is made for ultra-long-range spread spectrum communication tasks powered by the ASR6601. The ASR6601, an LPWAN wireless communication system-on-chip (SoC), combines RF transceivers, modems, and a 32-bit RISC microcontroller (MCU). The embedded MCU,

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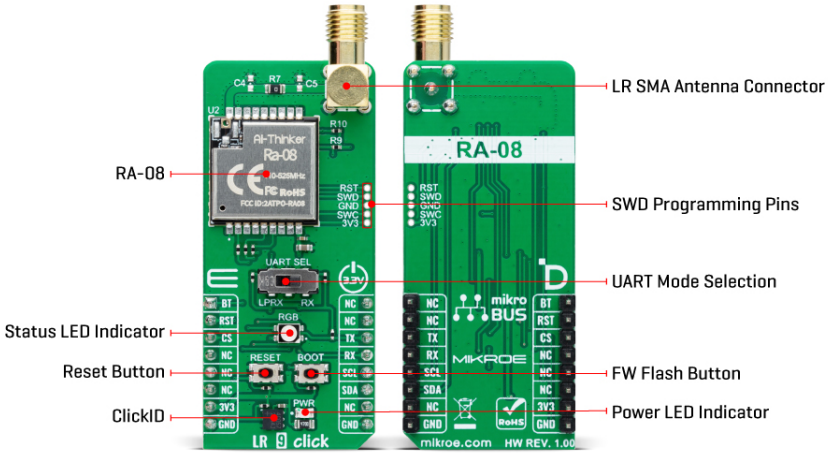
leveraging an ARM core, operates at a frequency of 48MHz. The RA-08 is designed to work with LoRa modulation and the conventional (G)FSK modulation within the LPWAN domain. Furthermore, it supports BPSK and (G)MSK modulation for transmission, with the receiver accommodating (G)MSK modulation.



Designed for LPWAN applications, the RA-08 module delivers long-distance, ultra-low power connectivity. It finds its applications in various sectors, including smart metering, supply chain and logistics management, building automation for homes, security systems, and remote-controlled irrigation systems. Diving deeper into the specifics, the module supports a frequency range from 410MHz to 525MHz and can transmit at a maximum power of +22dBm. It boasts embedded storage with 128KB of FLASH and 16KB of SRAM, alongside support for several sleep modes, with a deep sleep current as low as 0.9uA.

Additional functionalities of the LR 9 Click include communication capabilities with the host MCU via a UART interface, set by default to a baud rate of 115200bps. A switch on the board allows the selection of the UART interface's function—either as the main serial communication port for exchanging AT commands (in the LPRX position) or as a serial port for firmware flashing (in the RX position). Moreover, for developers looking to build their software from scratch, the module also includes I2C communication capabilities.

The board does not limit itself to UART and I2C interface pins; it also features pins like the RST pin for module resetting (which can also be achieved through a RESET button) and a BT pin for firmware flashing (accessible through a BOOT button). This makes programming and software development a breeze through the SWD interface pins on the board's right side. Also, an RGB LED serves as a module status indicator and is configurable by the user.

LR 9 Click also features the SMA antenna connector with an impedance of 50Ω, compatible with various antennas available from MIKROE, like the Rubber Antenna 433MHz, to enhance its connectivity.

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. Also, it comes equipped with a library containing functions and an example code that can be used as a reference for further development.

Specifications

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Type	LoRa,Sub-1 GHz Transceievers
Applications	Ideal for smart metering, supply chain and logistics, home automation, and security systems
On-board modules	RA-08 - LoRaWAN module from Ai-Thinker Technology
Key Features	Based on LPWAN wireless communication SoC, integrated 32-bit RISC MCU, supported modulations including LoRa, (G)FSK, BPSK, (G)MSK, high sensitivity, embedded flash i SRAM memory, external antenna support, UART/I2C interface, AT commands, and more
Interface	I2C,UART
Feature	ClickID
Compatibility	mikroBUS™
Click board size	L (57.15 x 25.4 mm)
Input Voltage	3.3V

Pinout diagram

This table shows how the pinout on LR 9 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS™				Pin	Notes
FW Flash	**BT**	1	AN	PWM	16	NC	
Reset	**RST**	2	RST	INT	15	NC	
ID COMM	**CS**	3	CS	RX	14	**TX**	UART TX
	NC	4	SCK	TX	13	**RX**	UART RX
	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	NC	
Ground	**GND**	8	GND	GND	9	**GND**	Ground

Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
LD2	RGB	-	Status LED Indicator
SW1	UART SEL	Left	UART Interface Mode Selection LPRX/RX: Left position LPRX, Right position RX
T1	RESET	-	Reset Button
T2	BOOT	-	FW Flash Button

LR 9 Click electrical specifications

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Description	Min	Typ	Max	Unit
Receiver inputs voltage range	3.3	-	5	V
Frequency Range	410	-	525	MHz
Output Power	-	-	+22	dBm

Software Support

We provide a library for the LR 9 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 LR 9 Click driver.

Key functions

- lr9_send_data_frame This function sends the desired data frame by using the UART serial interface.
- lr9_inquire_command Using the UART serial interface, this function writes the desired query command with or without the included equals symbol.
- lr9_write_command This function writes a desired command and parameter by using the UART serial interface.

Example Description

This example demonstrates the use of LR 9 click board by processing the incoming data and displaying them on the USB UART.

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.LR9

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

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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

Click Boards™

Downloads

LR 9 click example on Libstock

LR 9 click 2D and 3D files v100

RA-08 AT Commands

RA-08 datasheet

LR 9 click schematic v100