

GNSS RTK 2 Click



PID: MIKROE-5430

GNSS RTK 2 Click is a compact add-on board used to enhance the precision of position data derived from satellite-based positioning systems. This board features the ZED-F9R, a multi-band professional-grade GNSS module with integrated multi-band Real Time Kinematics (RTK) technology offering centimeter-level accuracy from u-blox. This module concurrently uses GNSS signals from all four GNSS constellations (GPS/QZSS, GLONASS, Galileo, and BeiDou) and provides a reliable multi-band RTK turnkey solution with up to 30Hz real-time position update rate and full GNSS carrier raw data. This Click board™ is suitable for high-precision positioning for demanding industrial applications like machine control, ground robotic vehicles, and unmanned aerial vehicles (UAV).

GNSS RTK 2 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?

GNSS RTK 2 Click is based on the ZED-F9R, a multi-band professional-grade GNSS positioning module featuring the u-blox F9 receiver platform, providing a reliable multi-band GNSS sensor fusion solution for industrial applications. Thanks to the multi-band RF front-end architecture, all four major GNSS constellations (GPS, GLONASS, Galileo, and BeiDou) plus SBAS and QZSS satellites can be received concurrently. The ZED-F9R high-performance sensor fusion module also has an integrated inertial measurement unit (IMU) for centimeter-level accuracy RTK positioning (RTK rover feature).

Mikroe produces entire development toolchains for all major microcontroller architectures.

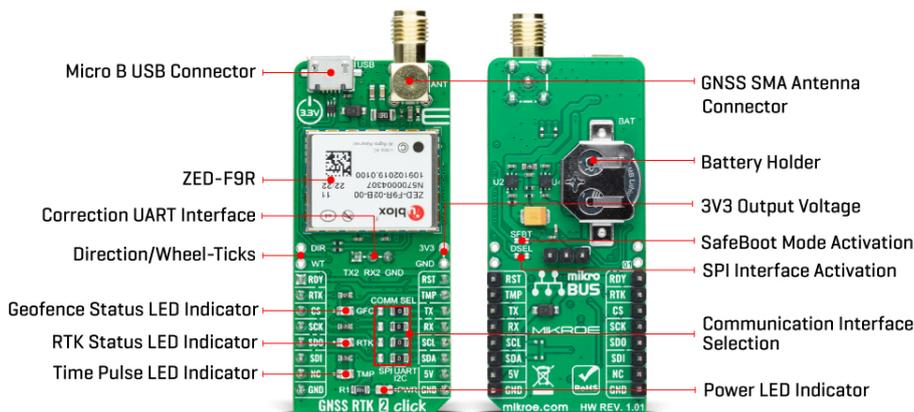
Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.



ISO 27001: 2013 certification of informational security management system.
 ISO 14001: 2015 certification of environmental management system.
 OHSAS 18001: 2008 certification of occupational health and safety management system.



ISO 9001: 2015 certification of quality management system (QMS).



The ZED-F9R's built-in algorithms fuse the IMU data, GNSS measurements, wheel ticks, correction data, and a vehicle dynamics model to provide optimal positioning accuracy where GNSS alone would fail. The module operates in the open sky, in the wooded countryside, in demanding multipath environments, and even in challenging environments such as cities. Designed for industrial applications, ZED-F9R is the ultimate solution for a data-driven economy where control and position availability are crucial.

This module represents a turnkey self-contained solution, eliminating the technical risk and effort of selecting and integrating RF components and third-party libraries such as precise positioning engines. It also offers support for a range of correction services, RTCM or SPARTN-formatted corrections, enabling high precision navigation using internet or satellite data through an unpopulated UART header in the middle of the board. This interface allows each application to optimize performance according to the application's unique needs.

GNSS RTK 2 Click communicates with a MCU using the UART interface at 115200bps as its default communication protocol with the option for users to use other interfaces, such as SPI and I2C, if they want to configure the module and write the library themselves. The interface is selected by positioning SMD jumpers labeled COMM SEL in an appropriate position. When choosing the SPI communication, with the correct selection of the COMM SEL jumpers, it is also necessary to populate the DSEL jumper to configure the interface pins as SPI. In the default state, the jumper labeled as DSEL is unpopulated. The receiver also can enter a Safe-Boot mode. When the jumper labeled SFBT is populated, the receiver starts in Safe-Boot mode, and the GNSS operation is disabled.

The USB interface, compatible with USB version 2.0 (Full Speed, 12 Mbit/s), can be used for communication as an alternative to the UART. The USB port can be used as an additional power supply if you the Click board™ is required to be a standalone device. In case of a mains supply failure, the module can use a backup supply voltage from a connected battery. Backup voltage supplies the real-time clock and battery-backed RAM and enables all relevant data to be saved in the backup RAM to allow a hot or warm start later.

In addition to these features, this board also uses several mikroBUS™ socket pins. RDY pin routed to the AN pin of the mikroBUS™ socket is used as a communication indicator when bytes are ready to be transmitted. The RST pin routed on the PWM pin of the mikroBUS™ socket provides the general reset ability, and the TMP pin, alongside its LED indicator, routed on the INT pin of the mikroBUS™ socket provides one pulse per second time pulse with configurable duration and frequency.

Mikroe produces entire development toolchains for all major microcontroller architectures.

Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.



ISO 27001: 2013 certification of informational security management system.
 ISO 14001: 2015 certification of environmental management system.
 OHSAS 18001: 2008 certification of occupational health and safety management system.



ISO 9001: 2015 certification of quality management system (QMS).

The RTK pin routed on the RST pin of the mikroBUS™ socket, alongside an LED indicator labeled RTK, indicates the RTK positioning status. When LED blinks, a valid stream of RTCM messages is received, but no RTK fixed mode has been achieved. When the LED is constantly lit, the LED indicates that RTK mode has been achieved. It also has another LED indicator labeled as GDC that shows the current geofence status as to whether the receiver is inside any active areas. For example, this feature can be used to wake up a sleeping host when a defined geofence condition is reached.

GNSS RTK 2 Click has an SMA antenna connector for connecting an appropriate antenna, also offered by Mikroe, such as [GPS Active External Antenna](#). This antenna is an excellent choice for all GSM/GPRS applications supporting L1 and L2 band frequencies. This Click board™ can be operated only with a 5V logic voltage level. The board must perform appropriate logic voltage level conversion before using MCUs with different logic levels. However, the Click board™ comes equipped with a library containing functions and an example code that can be used as a reference for further development.

Specifications

Type	GPS/GNSS,RTK
Applications	Can be used for high-precision positioning for demanding industrial applications
On-board modules	ZED-F9R - sensor fusion module with 3D sensors and a multi-band GNSS receiver from u-blox
Key Features	High precision, high performance, multi-band GNSS RX, centimeter-level accuracy, professional-grade, integrated IMU for RTK, selectable interface, support for RTCM soccections, geofence/RTK/time pulse indication, and more
Interface	GPIO,I2C,SPI,UART,USB
Feature	No ClickID,Skylark® Service
Compatibility	mikroBUS™,Skylark®
Click board size	L (57.15 x 25.4 mm)
Input Voltage	5V

Pinout diagram

This table shows how the pinout on GNSS RTK 2 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin					Pin	Notes
Transmission Ready Indicators	RDY	1	AN	PWM	16	RST	Reset
RTK Positioning Status	RTK	2	RST	INT	15	TMP	Time Pulse
SPI Chip Select	CS	3	CS	RX	14	TX	UART TX

Mikroe produces entire development toolchains for all major microcontroller architectures.

Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.



ISO 27001: 2013 certification of informational security management system.
 ISO 14001: 2015 certification of environmental management system.
 OHSAS 18001: 2008 certification of occupational health and safety management system.



ISO 9001: 2015 certification of quality management system (QMS).

SPI Clock	SCK	4	SCK	TX	13	RX	UART RX
SPI Data OUT	SDO	5	MISO	SCL	12	SCL	I2C Clock
SPI Data IN	SDI	6	MOSI	SDA	11	SDA	I2C Data
	NC	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
LD2	TMP	-	Time Pulse LED Indicator
LD3	RTK	-	RTK Status LED Indicator
LD4	CFG	-	Geofence Status LED Indicator
JP1-JP4	COMM SEL	Right	Communication Interface Selection SPI/UART: Left position SPI, Right position UART
J1	-	Unpopulated	Correction UART Interface Header
J2	-	Unpopulated	Direction/Wheel Ticks Header
J3	-	Unpopulated	3V3 Output Voltage Header
DSEL	DSEL	Unpopulated	SPI Interface Activation
SFBT	SFBT	Unpopulated	Safe-Boot Mode Activation

GNSS RTK 2 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	5	-	V
Operating Frequency	1.2	-	1.6	GHz
Sensitivity	-	-160	-	dBm
Altitude	-	-	80	km

Software Support

We provide a library for the GNSS RTK 2 Click as well as a demo application (example), developed using Mikroe [compilers](#). The demo can run on all 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 GNSS RTK 2 Click driver.

Key functions

Mikroe produces entire development toolchains for all major microcontroller architectures.

Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.



ISO 27001: 2013 certification of informational security management system.
 ISO 14001: 2015 certification of environmental management system.
 OHSAS 18001: 2008 certification of occupational health and safety management system.



ISO 9001: 2015 certification of quality management system (QMS).

- `gnsrkt2_reset_device` This function resets the device by toggling the RST pin.
- `gnsrkt2_generic_read` This function reads a desired number of data bytes from the module.
- `gnsrkt2_parse_gngga` This function parses the GNGGA data from the read response buffer.

Example Description

This example demonstrates the use of GNSS RTK 2 click by reading and displaying the GNSS coordinates.

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.GNSSRTK2

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, if no UART to USB interface available on the board. A 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](#)

[Click boards™](#)

Downloads

[GNSS RTK 2 click example on Libstock](#)

[GNSS RTK 2 click 2D and 3D files](#)

Mikroe produces entire development toolchains for all major microcontroller architectures.

Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.



ISO 27001: 2013 certification of informational security management system.
 ISO 14001: 2015 certification of environmental management system.
 OHSAS 18001: 2008 certification of occupational health and safety management system.



ISO 9001: 2015 certification of quality management system (QMS).

[ZED-F9R-02B datasheet](#)

[GNSS RTK 2 click schematic](#)

[Skylark® Precise Positioning Service Quick Start Guide](#)

Mikroe produces entire development toolchains for all major microcontroller architectures.

Committed to excellency, we are dedicated to helping engineers bring the project development up to speed and achieve outstanding results.



ISO 27001: 2013 certification of informational security management system.
ISO 14001: 2015 certification of environmental management system.
OHSAS 18001: 2008 certification of occupational health and safety management system.



ISO 9001: 2015 certification of quality management system (QMS).