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GNSS RTK 3 Click - LC29HEA

PID: MIKROE-5933

GNSS RTK 3 Click is a compact add-on board that enhances the precision of position data derived from satellite-based positioning systems. This board features the LC29HEA, a dual-band, multi-castellation GNSS module from Quectel. This module supports the concurrent reception of all five global GNSS constellations: GPS, BDS, Galileo, GZSS, and GLONASS. It can receive and track many visible satellites in multi-bands, significantly mitigating the multipath effect in deep urban canyons and improving positioning accuracy. This Click board™ makes the perfect solution for the development of high-precision positioning for demanding industrial applications like machine control, ground robotic vehicles, and unmanned aerial vehicles (UAV).

GNSS RTK 3 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.

NOTE: To ensure the best performance of your GNSS RTK 3 Click, we recommend using the GNSS L1/L5 Active External Antenna available from MIKROE.

How does it work?

GNSS RTK 3 Click is based on the LC29HEA, a dual-band, multi-castellation GNSS module from Quectel. With internal LNA and SAW filters, the module achieves better sensitivity and anti-interference capability. Dual frequency support helps the module deliver CEP accuracy values of 1m in autonomous mode and centimeter levels while using the RTK functionality. Integrated RTK (Real-Time Kinetic) position engine provides a sub-meter accuracy with fast convergence

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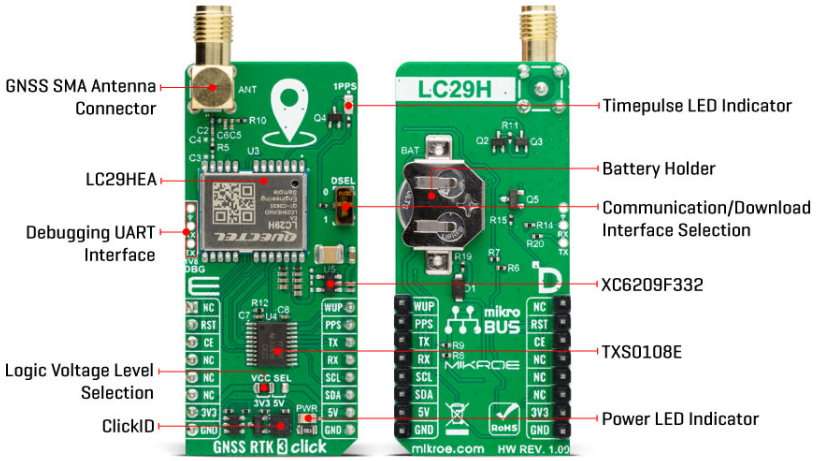
time and outstanding performance. This module supports the RTK Rover technique. Before implementing the RTK navigation technique, the module must receive the RTK differential data via its UART port. After validating the differential correction data, the module will enter differential or RTK float mode. The expected accuracy at RTK fixed mode is lower than 20cm.



The LC29HEA module features an integrated AGNSS function, integrated AIC, and jamming function and is capable of reception of L1 and L5 GNSS band signals concurrently. The receiver chip is built using 12nm technology and provides advanced power management, which enables low-power GNSS sensing and position fix, which in turn makes the module ideal for power-sensitive and battery-powered systems. There is a DSEL switch with 0 and 1 positions. By setting it to a 0 position, the UART interface can be used for communication and downloading, while the I2C can only be used for communication. The 1 position sets UART for downloading only, while the I2C interface can be used for communication and downloading.

The GNSS RTK 3 Module has an SMA antenna connector for connecting an appropriate antenna, also offered by MIKROE, such as a GNSS L1/L5 Active External Antenna. This antenna is an excellent choice for all GNSS applications supporting L1 and L5 band frequencies. You can also control the antenna by deactivating it in power-saving mode, lowering power consumption.

To interface different voltage levels of the host MCU, GNSS RTK 3 Click is equipped with the TXS0108E, an 8-bit bi-directional level-shifting voltage translator from Texas Instruments. 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. If no battery is present, the backup is powered over the 3.3V rail of the mikroBUS™ socket.

As mentioned, the GNSS RTK 3 Click uses a standard 2-Wire UART interface to communicate with the host MCU with commonly used UART RX and TX pins. The UART 2 interface pins are exposed on a 1.8V DBG header for debugging purposes. The module supports baud rates 9600 up to 3Mbps, while the 115200bps is the default. Besides the UART interface, you can also use a standard 2-Wire I2C interface to communicate with the host MCU with a data rate of up to 400kbps. The module will use the NMEA 0183/RTCM 3.x protocols in both cases. You can update the LC29HEA firmware using any of those interfaces. Using the RST pin, you can reset the module or wake it up using the WUP pin. Besides the 1PPS LED, the one pulse per second can also be monitored over the PPS pin.

This Click board™ can operate with either 3.3V or 5V logic voltage levels selected via the VCC

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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	GPS/GNSS
Applications	Can be used for the development of high-precision positioning for demanding industrial applications like machine control, ground robotic vehicles, and unmanned aerial vehicles (UAV)
On-board modules	LC29HEA - dual-band, multi-castellation GNSS module from Quectel
Key Features	Multi-GNSS engine for GPS, GLONASS, BDS, Galileo, and QZSS, reception of L1 and L5 GNSS bands signals concurrently, RTK providing sub-meter accuracy width fast convergence time and outstanding performance, integrated LNA for high sensitivity, integrated SAW filter for noise cancellation, and more.
Interface	I2C,UART
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 GNSS RTK 3 Click - LC29HEA 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	**WUP**	Wake-up
Reset / ID SEL	**RST**	2	RST	INT	15	**PPS**	Timepulse Output
Device Enable / ID COMM	**CE**	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	**5V**	Power Supply
Ground	**GND**	8	GND	GND	9	**GND**	Ground

Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator

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LD2	1PPS	-	1PPS LED Indicator
JP1	VCC SEL	Left	Logic Level Voltage Selection 3V3/5V: Left position 3V3, Right position 5V
SW1	DSEL	Upper	Communication and Downloading Interface Selection 0/1: Upper position 0, Lower position 1

GNSS RTK 3 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	3.3	-	5	V
Operating Frequency Range	1164	-	1606	MHz
Acquisition Sensitivity	-	-147	-	dBm
Tracking Sensitivity	-	-165	-	dBm
TTFF Cold Start	-	26	-	sec
Position Accuracy (RTK)	1cm + 1ppm			

Software Support

We provide a library for the GNSS RTK 3 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 GNSS RTK 3 Click driver.

Key functions

- gnssrtk3_enable_device This function enables the device by setting the CEN pin to high logic state.
- gnssrtk3_generic_read This function reads a desired number of data bytes by using UART or I2C serial interface.
- gnssrtk3_parse_gga This function parses the GGA data from the read response buffer.

Example Description

This example demonstrates the use of GNSS RTK 3 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.

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Other Mikroe Libraries used in the example:

- MikroSDK.Board
- MikroSDK.Log
- Click.GNSSRTK3

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

Click boards™

ClickID

Downloads

GNSS RTK 3 Click - LC29HEA example on Libstock

GNSS RTK 3 Click - LC29HEA schematic v100

GNSS RTK 3 Click - LC29HEA 2D and 3D files v100

LC29HEA datasheet