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GNSS 9 Click





PID: MIKROE-6073

GNSS 9 Click is a compact add-on board designed for accurate and reliable positioning applications. This board features the TESEO-LIV4F, a dual-band GNSS module from STMicroelectronics, known for its low-power operation and multi-constellation tracking capabilities. This module ensures submeter positioning accuracy with its integrated TCXO and RTC oscillator, supports Real-Time Assisted GNSS (RT-AGNSS), and reduces Time To First Fix (TTFF). It features dual communication interfaces (UART and I2C), an SMA antenna connector with flexible power control via the AON pin, and backup battery support for standalone operation. GNSS 9 Click is ideal for various applications, including vehicle and fleet tracking, goods logistics, drones, anti-theft systems, and public transportation.

How does it work?

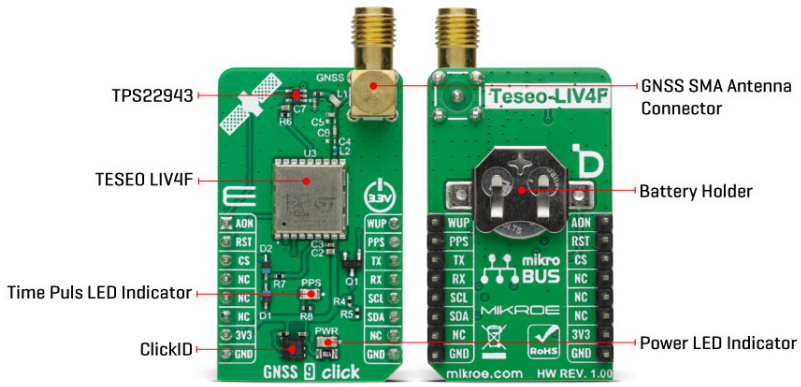
GNSS 9 Click is based on the TESEO-LIV4F, a dual-band GNSS module from STMicroelectronics designed for low-power positioning operation. This module integrates the Teseo IV single-die GNSS receiver, capable of simultaneously tracking multiple satellite constellations, including GPS, Galileo, GLONASS, BeiDou, and QZSS, and is IRNSS constellation-ready. The result is reliable, real-time positioning data across various challenging environments. Despite its compact size, the TESEO-LIV4F delivers exceptional submeter-level positioning accuracy thanks to its integrated Temperature Compensated Crystal Oscillator (TCXO) and Real-Time Clock (RTC) oscillator, ensuring reduced Time To First Fix (TTFF). The module also supports Real-Time Assisted GNSS (RT-AGNSS), which predicts satellite data based on past observations, enhancing its efficiency and accuracy. It is CE-certified, ensuring compliance with industry standards and broad applicability.

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The GNSS receiver supports multiple frequency bands, including GPS/QZSS L1C/A at 1575.42 MHz and L5C at 1176.45 MHz, GLONASS L1OF within the range of 1592.9525 to 1610.485 MHz, BeiDou B1i at 1561.098 MHz and B2a at 1207.14 MHz, Galileo E1 at 1575.42 MHz and E5a at 1176.45 MHz, as well as SBAS L1C/A. The TESEO-LIV4F module brings the advanced accuracy and robust performance of Teseo IV technology to a wide range of applications. Its embedded firmware and evaluation environment simplify development and make it suitable for diverse use cases, including vehicle tracking and fleet management, goods tracking and logistics, drones and tolling systems, anti-theft and emergency call systems, public transportation, and vehicle diagnostics, as well as people and pet location solutions, insurance platforms, and vehicle sharing systems.

The GNSS 9 Click communicates with the host MCU through a UART interface using the standard UART RX and TX pins. The default communication speed is set at 115200bps, ensuring efficient data exchange. It also provides an I2C interface for communication with a host MCU in the I2C Fast speed mode (400kHz). Still, it must be noted that the I2C interface can only be operated in the peripheral mode.

Besides interface pins, this Click board™ also incorporates a reset pin (RST) for direct module resetting and an external interrupt signal (WUP) that can be programmed for various functions, such as waking up the module. Furthermore, GNSS 9 Click includes a blue PPS LED indicator, which, in combination with the PPS pin, detects a synchronized pulse signal from the TESEO-LIV4F once per second. The PPS function is enabled by default, and the module will output the PPS signal once a 3D fix is achieved.

This Click board™ also features the SMA antenna connector with an impedance of 50Ω, compatible with various antennas available from MIKROE, like the Active GPS Antenna, to enhance its connectivity. The external antenna supply is not always activated by default but can be controlled via the AON pin. This pin activates the TPS22943 load switch, which enables the module to provide the necessary power supply for the antenna's operation. This design allows for flexible control of the external antenna's power, ensuring it is only supplied when needed. Also, in the case of the primary supply failure, the module can use a backup supply voltage from a connected battery on the back of the board if it is needed for the Click board™ to work as a standalone device.

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

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used as a reference for further development.

Specifications

Type	GPS/GNSS
Applications	Ideal for applications like vehicle and fleet tracking, goods logistics, drones, anti-theft systems, and public transportation
On-board modules	TESEO-LIV4F - dual-band GNSS module from STMicroelectronics
Key Features	Supported GPS, Galileo, GLONASS, BeiDou, QZSS constellations, IRNSS-ready, GPS/QZSS (L1C/A, L5C), GLONASS (L1OF), BeiDou (B1i, B2a), Galileo (E1, E5a), SBAS (L1C/A) frequency bands, submeter accuracy, real-Time Assisted GNSS (RT-AGNSS) for satellite data prediction, UART and I2C interfaces, battery for backup power, and more
Interface	I2C,UART
Feature	ClickID
Compatibility	mikroBUS™
Click board size	M (42.9 x 25.4 mm)
Input Voltage	3.3V,External

Pinout diagram

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

Notes	Pin	mikroBUS				Pin	Notes
Antenna Supply Control	**AON**	1	AN	PWM	16	**WUP**	Module Wake-Up Interrupt
Reset	**RST**	2	RST	INT	15	**PPS**	Time Pulse
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	PPS	-	Time Pulse LED Indicator

GNSS 9 Click electrical specifications

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Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V
Frequency Range	1176.45 / 1207.14 / 1561.098 / 1575.42 / 1593-1610			MHz
Horizontal Position Accuracy	-	0.8	-	m
Time to First Fix (Cold Start)	-	28.5	-	s
Tracking Sensitivity	-	-162	-	dBm

Software Support

GNSS 9 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 GNSS 9 Click by reading and displaying the GNSS coordinates.

Key Functions

- gnss9_cfg_setup Config Object Initialization function.
- gnss9_init Initialization function.
- gnss9_get_pps_pin This function returns the PPS pin logic state.
- gnss9_reset_device This function resets the device by toggling the RST pin.
- gnss9_parse_gpgga This function parses the GPGGA data from the read response buffer.

Application Init

Initializes the driver and resets the Click board.

Application Task

Reads the received data, parses the GPGGA info from it, and once it receives the position fix it will start displaying the coordinates on the USB UART.

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

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also be found on the MIKROE GitHub account.

Resources

mikroBUS™

mikroSDK

Click board™ Catalog

Click boards™

ClickID

Downloads

TPS22943 datasheet

GNSS 9 click 2D and 3D files v100

TESEO-LIV4F datasheet

GNSS 9 click schematic v100

GNSS 9 click example package

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