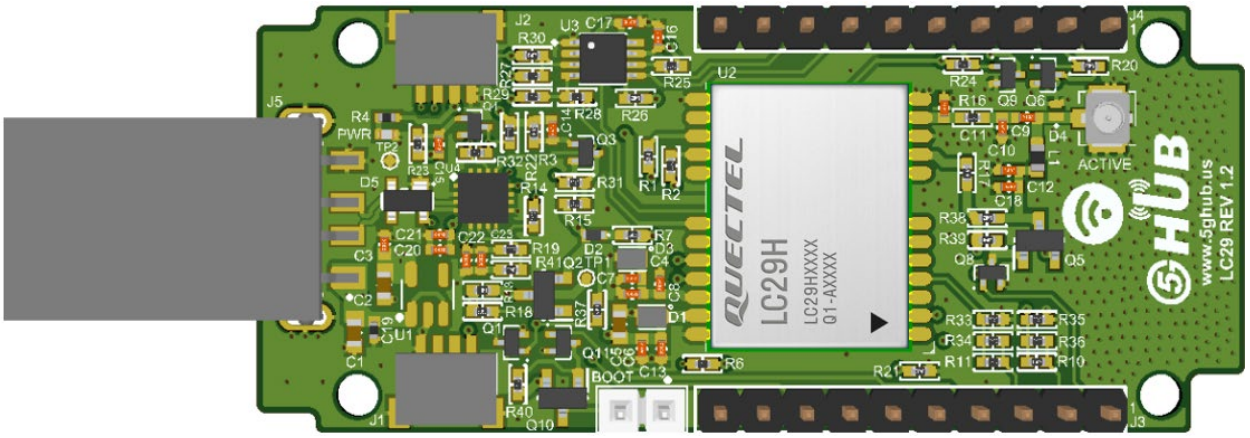
# New Product Highlight

**Image:** (72dpi, 640x640 or larger preferred)



**Main Title (short):**
GNSS USB Modem

**Sub-Title (more descriptive and includes supplier name):**
GNSS with Dead-Reckoning and Real-Time Kinetics USB Modem

**Description paragraphs:**

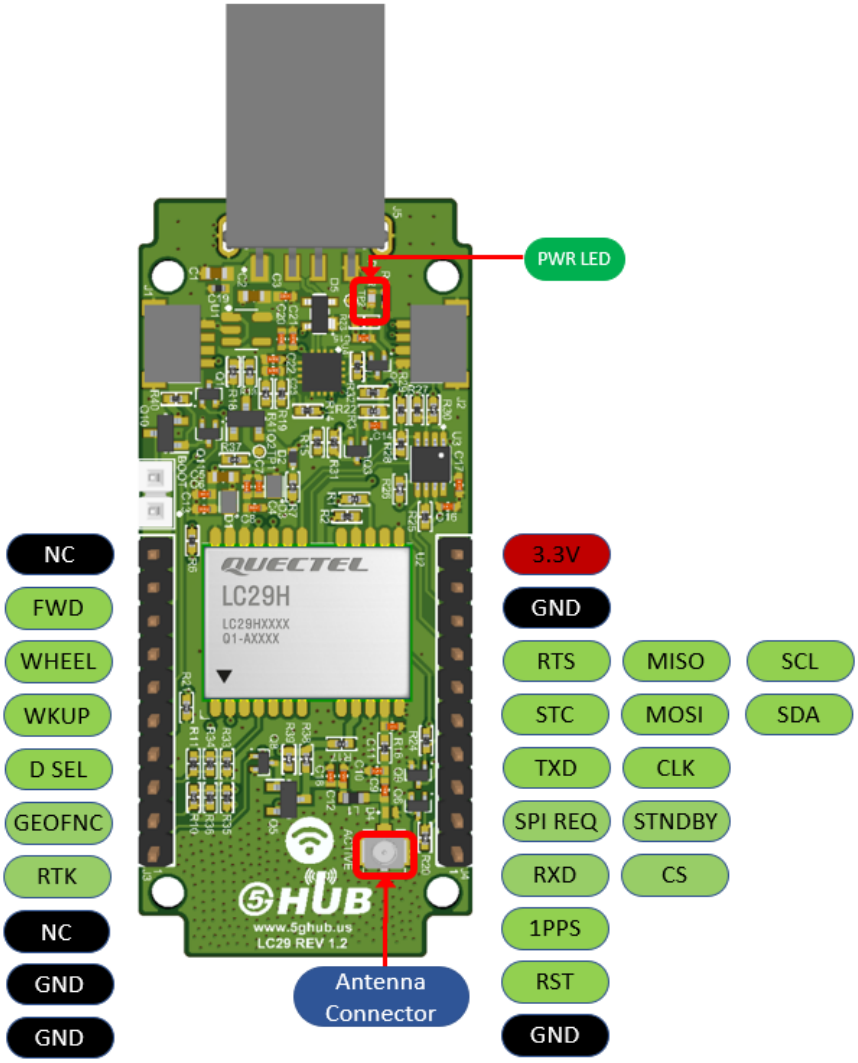
This GNSS USB modem is a GNSS with Dead-Reckoning (DR) and Real-Time Kinetics (RTK). It is a dual-band and multi-constellation GNSS module supporting multiple global positioning constellations, GPS, GLONASS, Galileo, BDS and QZSS. It includes an integrated 6-axis Inertia Measurement Unit (IMU) and support sophisticated dead-reckoning algorithms, fusing the IMU data with the GNSS data to provide continuous tracking solution in GNSS impaired environments. It also includes an RTK position engine in order to provide cm-level positioning accuracy.

The GNSS USB supports two DR modes: ADR (Automotive Dead Reckoning) and UDR (Untethered Dead Reckoning). In ADR mode, the module relies on speed data from the vehicle and the on-board 6-axis sensor for enhanced accuracy in environments with no GNSS coverage. The UDR mode does not require speed data. The firmware automatically switches to UDR mode if no speed data is injected upon module power-up. In ADR mode, it obtains vehicle speed data through wheel-ticks or direct vehicle speed data output (m/s). There are two wheel-tick injection methods: 1) injection through the WHEELTICK pin, with a maximum distance increment of 0.05 m per pulse; 2) cumulative wheel-tick injection through the UART interface, with a minimum injection frequency of 10 Hz, and a maximum distance increment of 0.05 m per pulse. The direct vehicle speed output can only be injected through the UART interface, with the minimum injection frequency of 20 Hz, and the maximum error of 0.1 m/s between the injected speed and actual speed.

The GNSS USB modem support the DR technology. By combining satellite navigation data with wheel speed, gyroscope and accelerometer data, the module obtains continuous and high accuracy positioning in weak signal environments such as tunnels and urban canyons when the vehicle state (e.g., speed, forward direction or vertical displacement) changes, or even when the satellite signal is partially or completely blocked.

**GNSS USB Modem Features:**

- Supports dual-band in the following GNSS bands: L1, L5, L1/L5, E1/E5a, B1I/B2a
- Supports multi-constellation GNSS and features a high-performance, high reliability positioning engine, which facilitates fast and precise GNSS positioning capability.
- Include an integrated 6-axis IMU and support sophisticated dead-reckoning algorithms, fusing the IMU data with the GNSS data to provide continuous tracking solution in GNSS impaired environments.
- Includes an RTK position engine to provide cm-level positioning accuracy.
- Can be used as a base station to generate RTK differential correction data that can be transmitted over radio or over cellular connectivity to become a part of a NTRIP network.
- Support AGNSS feature that significantly reduces the modules' TTFF, especially under lower signal conditions.
- Embedded flash memory provides the capacity for storing not only user-specific configurations, but also future firmware updates.
- Supports UART, I2C, SPI, 1PPS hardware interfaces.
- Can be embedded in your application.
- GNSS
    - GPS/GLONASS/BeiDou/Galileo/QZSS
    - Cold start < 16s, Warm start <2s Hot start < 1 s
    - Horizontal accuracy < 0.1 m
    - Velocity accuracy < 0.03m/s
    - GNSS Band: 1176 MHz to 1609 MHz



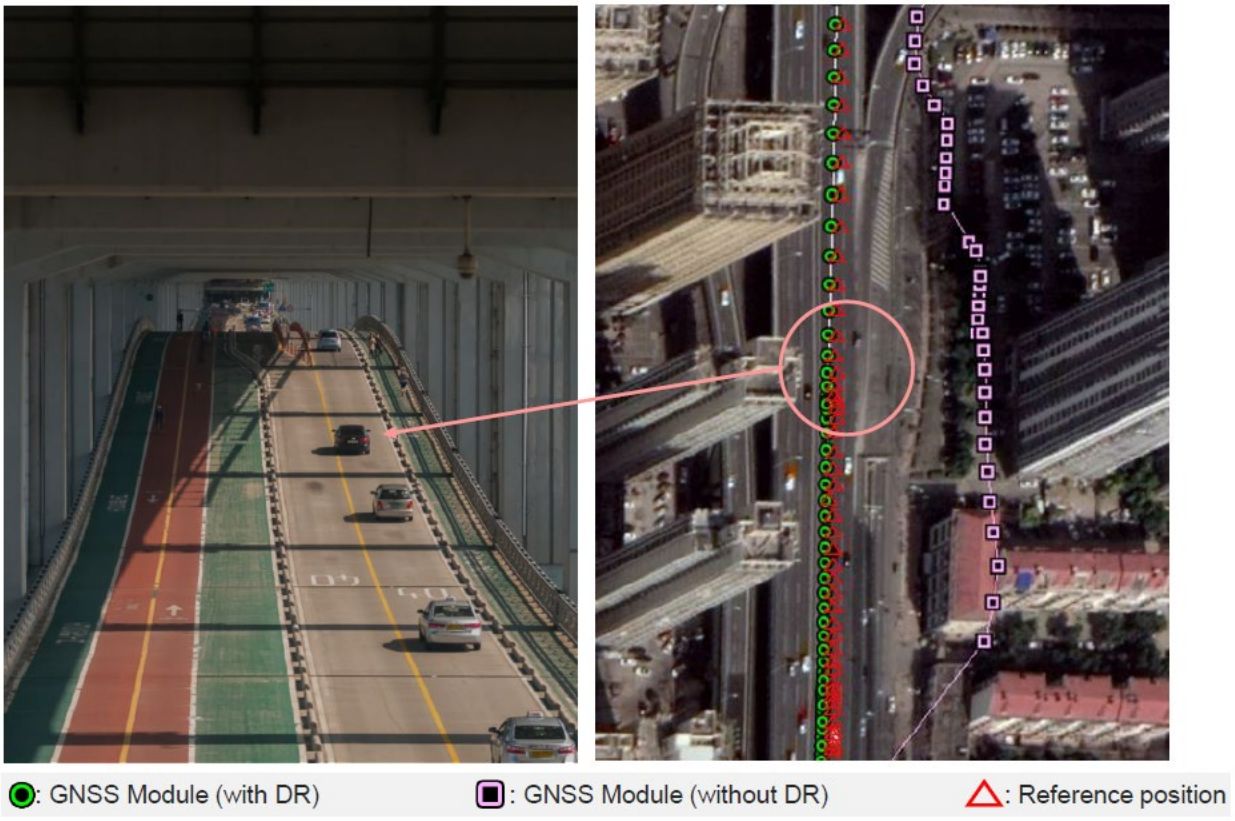

**Applications:**

- GNSS for data applications
- GPS, asset, vehicle, and location tracking
- Shared scooter
- Smart home, smart city, smart transportation, smart metering, smart farming, smart waste management, navigation, mapping, and timing applications.
- Internet of Things (IoT)

**How does GNSS DR Algorithm work?**

DR uses GNSS and INS (Internal Navigation System) in a fused solution to provide continuous high accuracy positioning. If the GNSS visibility drops due to obstructions, the INS will provide the information until the satellite visibility improves. Based on this technology, the device can get full coverage positioning or navigation even in parking garages, tunnels and urban canyons.

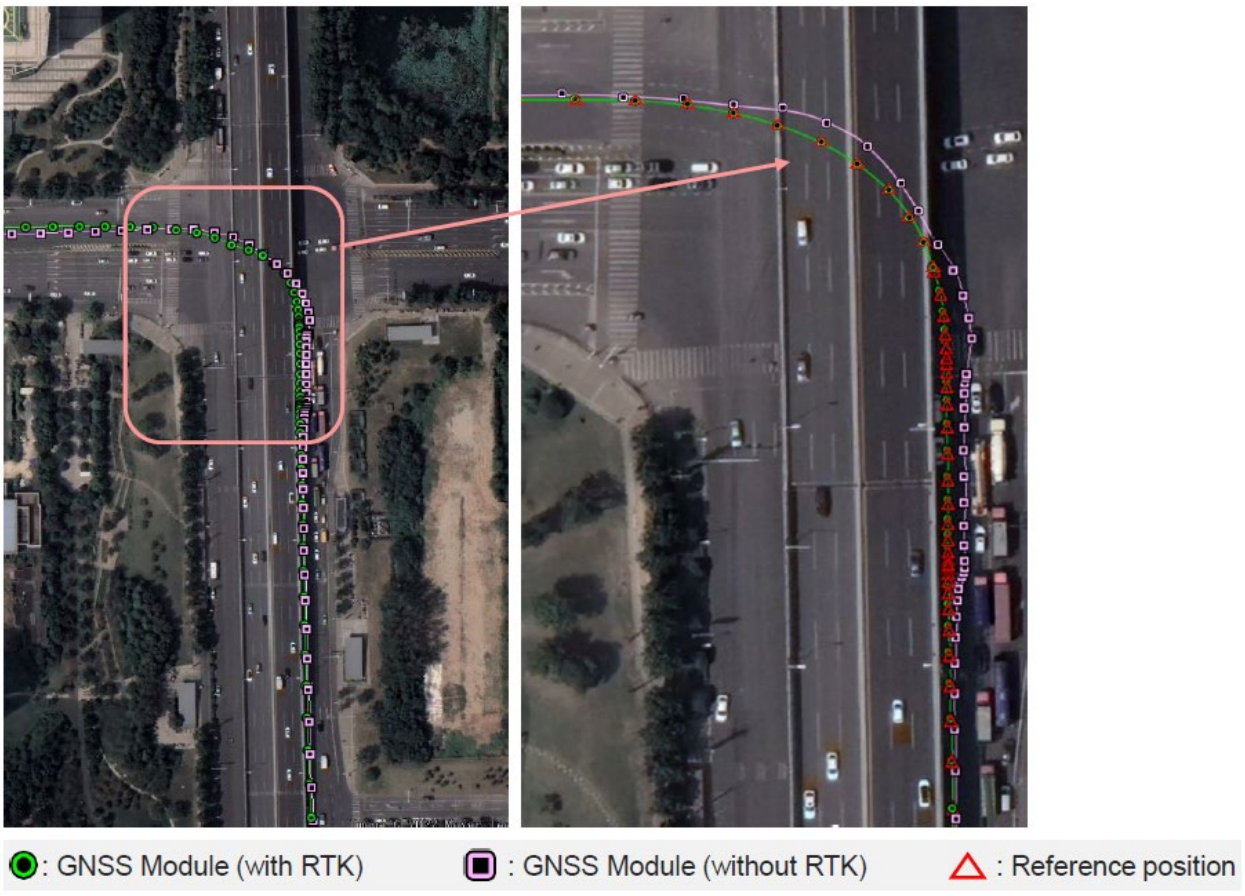
The following diagram shows how GNSS with DR works when a car is driving under an elevated road. The GNSS signal is cut-off because of the elevated road. The car position is accurate when using the GNSS with DR while it is off when the GNSS is used without DR.



**How does GNSS RTK Algorithm work?**

RTK is a differential GNSS technique that uses real-time corrections from a nearby base station or reference network to achieve centimeter-level accuracy. It corrects for errors such as satellite orbit and clock errors, atmospheric delays, and multipath effects. RTK depends on the spatial correlation of these errors between the base station and the rover receiver. RTK typically achieves high accuracy in centimeter-level accuracy.

The following diagram shows how GNSS with RTK works when a car is driving in an open-sky environment. The car position is highly accurate when using the GNSS with RTK while it is less accurate off when the GNSS is used without RTK.



**Focus Part(s):**

GNSSLC29H10

GNSS with Dead-Reckoning (DR) and Real-Time Kinetics (RTK) USB (LC29H) - 5G HUB TECHNOLOGIES, INC

**Associated parts:**