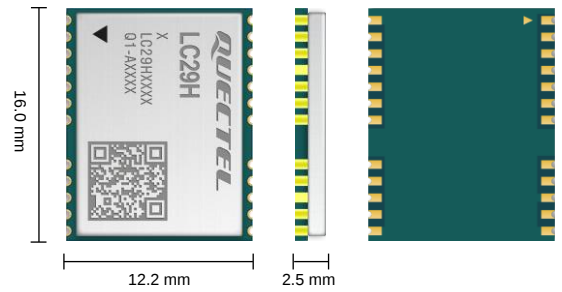


# Quectel LC29H Series

## Dual-Band Multi-Constellation GNSS Module with RTK and DR Functions



LC29H is a series of dual-band, multi-constellation GNSS modules that support the concurrent reception of GNSS constellations such as GPS, GLONASS, Galileo, BDS, QZSS, and NavIC (only supported by LC29H (AI)).

Compared to GNSS modules that track only L1 signals, the LC29H series can track a higher number of visible satellites in multi bands, thereby significantly mitigating the multipath effect in deep urban canyons and improving positioning accuracy. By having an internal LNA and diplexer, the module achieves improved sensitivity and anti-interference capability. Featuring dual frequency support, the module delivers enhanced accuracy values of 1 m in autonomous mode and centimeter levels in the RTK capable variants. The optional DR function ensures the module's superior positioning performance even in weak signal areas or when GNSS signals are not available.

Based on the receiver chip using 12 nm technology, the LC29H series provides advanced power management enabling low-power GNSS sensing and position fix, which makes the module an ideal solution for power-sensitive and battery-powered systems.

Featuring high-precision positioning and low power consumption makes the LC29H series perfectly suited for applications such as real time tracking and sharing economy related services.



## Key Features

- ✓ Multi-GNSS engine for GPS, GLONASS, Galileo, BDS, QZSS, and NavIC (only supported by LC29H (AI))
- ✓ Reception of L1 and L5 GNSS bands signals concurrently
- ✓ Integrated DR function (optional)
- ✓ RTK (optional) providing sub-meter accuracy with fast convergence time and outstanding performance
- ✓ Output GNSS and IMU raw data messages (optional)
- ✓ Integrated LNA for high sensitivity
- ✓ Integrated diplexer for noise cancellation
- ✓ UART, I2C and SPI interfaces
- ✓ Integrated AGNSS function
- ✓ Integrated AIC and jamming function



AGNSS Technology



Ultra Low Power  
Consumption



Ultra Compact Size



Tracking Sensitivity:  
-165 dBm



Operating Temperature  
Range: -40 to +85 °C



Anti-jamming



RoHS Compliant



Multi-constellation System

# Quectel LC29H Series

| GNSS Module                                                           | LC29H (AA)                                                                                                                                            | LC29H (BA)                                                                                                                                              | LC29H (CA)                                                                                                                                        |
|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Dimensions                                                            | 12.2 mm × 16.0 mm × 2.5 mm                                                                                                                            | 12.2 mm × 16.0 mm × 2.5 mm                                                                                                                              | 12.2 mm × 16.0 mm × 2.5 mm                                                                                                                        |
| Weight                                                                | Approx. 0.9 g                                                                                                                                         | Approx. 0.9 g                                                                                                                                           | Approx. 0.9 g                                                                                                                                     |
| Temperature Range                                                     |                                                                                                                                                       |                                                                                                                                                         |                                                                                                                                                   |
| Operating Temperature                                                 | -40 °C to +85 °C                                                                                                                                      | -40 °C to +85 °C                                                                                                                                        | -40 °C to +85 °C                                                                                                                                  |
| Storage Temperature                                                   | -40 °C to +90 °C                                                                                                                                      | -40 °C to +90 °C                                                                                                                                        | -40 °C to +90 °C                                                                                                                                  |
| GNSS Features                                                         |                                                                                                                                                       |                                                                                                                                                         |                                                                                                                                                   |
| Supported Bands                                                       | GPS/QZSS: L1 C/A, L5<br>GLONASS: L1<br>Galileo: E1, E5a<br>BDS: B1I, B2a                                                                              | GPS/QZSS: L1 C/A, L5<br>GLONASS: L1<br>Galileo: E1, E5a<br>BDS: B1I, B2a                                                                                | GPS/QZSS: L1 C/A, L5<br>GLONASS: L1<br>Galileo: E1, E5a<br>BDS: B1I, B2a                                                                          |
| Default GNSS Constellations                                           | GPS + GLONASS + Galileo + BDS + QZSS                                                                                                                  | GPS + GLONASS + Galileo + BDS + QZSS                                                                                                                    | GPS + GLONASS + Galileo + BDS + QZSS                                                                                                              |
| Number of Concurrent GNSS                                             | 4 + QZSS                                                                                                                                              | 4 + QZSS                                                                                                                                                | 4 + QZSS                                                                                                                                          |
| SBAS                                                                  | WAAS, EGNOS, MSAS and GAGAN                                                                                                                           | WAAS, EGNOS, MSAS and GAGAN                                                                                                                             | WAAS, EGNOS, MSAS and GAGAN                                                                                                                       |
| Function(s)                                                           | Standard                                                                                                                                              | RTK + DR (integrated IMU)                                                                                                                               | DR (integrated IMU)                                                                                                                               |
| Horizontal Position Accuracy                                          | Autonomous <sup>①</sup> : 1 m                                                                                                                         | Autonomous <sup>①</sup> : 1 m<br>RTK <sup>②</sup> : < 0.1 m + 1 ppm                                                                                     | Autonomous <sup>①</sup> : 1 m                                                                                                                     |
| DR Position Error (ADR)                                               | -                                                                                                                                                     | 4-wheeler: < 2 % of distance traveled without GNSS<br>2-wheeler: < 4 % of distance traveled without GNSS                                                | 4-wheeler: < 2 % of distance traveled without GNSS<br>2-wheeler: < 4 % of distance traveled without GNSS                                          |
| DR Position Error (UDR)                                               | -                                                                                                                                                     | 4-wheeler: < 3 % of distance traveled without GNSS<br>2-wheeler: < 6 % of distance traveled without GNSS                                                | 4-wheeler: < 3 % of distance traveled without GNSS<br>2-wheeler: < 6 % of distance traveled without GNSS                                          |
| Velocity Accuracy <sup>③</sup>                                        | 0.03 m/s                                                                                                                                              | 0.03 m/s                                                                                                                                                | 0.03 m/s                                                                                                                                          |
| Accuracy of 1PPS Signal (RMS) <sup>③</sup>                            | 20 ns                                                                                                                                                 | 20 ns                                                                                                                                                   | 20 ns                                                                                                                                             |
| RTK Convergence Time                                                  | -                                                                                                                                                     | RTK <sup>②</sup> : < 10 s                                                                                                                               | -                                                                                                                                                 |
| Heading Accuracy                                                      | -                                                                                                                                                     | -                                                                                                                                                       | -                                                                                                                                                 |
| TTFF (with AGNSS) <sup>④</sup>                                        | Full Cold Start: 5 s                                                                                                                                  | Full Cold Start: 5 s                                                                                                                                    | Full Cold Start: 5 s                                                                                                                              |
| TTFF (Without AGNSS) <sup>③</sup>                                     | Full Cold Start: 26 s<br>Warm Start: 16 s<br>Hot Start: 1 s                                                                                           | Full Cold Start: 26 s<br>Warm Start: 16 s<br>Hot Start: 1 s                                                                                             | Full Cold Start: 26 s<br>Warm Start: 16 s<br>Hot Start: 1 s                                                                                       |
| Sensitivity (@ Default GNSS Constellations)                           | Acquisition: -147 dBm<br>Tracking: -165 dBm<br>Reacquisition: -159 dBm                                                                                | Acquisition: -145 dBm<br>Tracking: -165 dBm<br>Reacquisition: -157 dBm                                                                                  | Acquisition: -145 dBm<br>Tracking: -165 dBm<br>Reacquisition: -157 dBm                                                                            |
| Dynamic Performance <sup>③</sup>                                      | Maximum Altitude: 10000 m<br>Maximum Velocity <sup>⑤</sup> : 500 m/s<br>Maximum Acceleration <sup>⑤</sup> : 4g                                        | Maximum Altitude: 10000 m<br>Maximum Velocity <sup>⑤</sup> : 500 m/s<br>Maximum Acceleration <sup>⑤</sup> : 4g                                          | Maximum Altitude: 10000 m<br>Maximum Velocity <sup>⑤</sup> : 500 m/s<br>Maximum Acceleration <sup>⑤</sup> : 4g                                    |
| PVT Update Rate                                                       | 1–10 Hz                                                                                                                                               | 1–10 Hz                                                                                                                                                 | 1–10 Hz                                                                                                                                           |
| Raw Data Update Rate                                                  | GNSS: 1 Hz                                                                                                                                            | GNSS: 1 Hz<br>IMU: 100 Hz (Max.)                                                                                                                        | GNSS: 1 Hz<br>IMU: 100 Hz (Max.)                                                                                                                  |
| Certifications                                                        |                                                                                                                                                       |                                                                                                                                                         |                                                                                                                                                   |
| Regulatory                                                            | Europe: CE                                                                                                                                            | Europe: CE                                                                                                                                              | Europe: CE                                                                                                                                        |
| Others                                                                | RoHS                                                                                                                                                  | RoHS                                                                                                                                                    | RoHS                                                                                                                                              |
| Interfaces                                                            |                                                                                                                                                       |                                                                                                                                                         |                                                                                                                                                   |
| I2C                                                                   | × 1<br>Up to 400 kbps                                                                                                                                 | × 1<br>Up to 400 kbps                                                                                                                                   | × 1<br>Up to 400 kbps                                                                                                                             |
| UART                                                                  | × 2<br>Adjustable: 4800–3000000 bps<br>Default: 115200 bps (UART1) or 3000000 bps (UART2)                                                             | × 2<br>Adjustable: 4800–3000000 bps<br>Default: 115200 bps (UART1) or 3000000 bps (UART2)                                                               | × 2<br>Adjustable: 4800–3000000 bps<br>Default: 115200 bps (UART1) or 3000000 bps (UART2)                                                         |
| SPI                                                                   | × 1 (Multiplexed from I2C and UART1)                                                                                                                  | × 1 (Multiplexed from I2C and UART1)                                                                                                                    | × 1 (Multiplexed from I2C and UART1)                                                                                                              |
| Protocols                                                             |                                                                                                                                                       |                                                                                                                                                         |                                                                                                                                                   |
| Protocols                                                             | NMEA 0183/RTCM 3.x                                                                                                                                    | NMEA 0183/RTCM 3.x                                                                                                                                      | NMEA 0183/RTCM 3.x                                                                                                                                |
| External Antenna Interface                                            |                                                                                                                                                       |                                                                                                                                                         |                                                                                                                                                   |
| Antenna Type                                                          | Active or Passive                                                                                                                                     | Active or Passive                                                                                                                                       | Active or Passive                                                                                                                                 |
| Antenna Power Supply                                                  | External or VDD_RF pin of module                                                                                                                      | External or VDD_RF pin of module                                                                                                                        | External or VDD_RF pin of module                                                                                                                  |
| Electrical Characteristics                                            |                                                                                                                                                       |                                                                                                                                                         |                                                                                                                                                   |
| Supply Voltage Range                                                  | 3.1–3.6 V, typ. 3.3 V                                                                                                                                 | 3.1–3.6 V, typ. 3.3 V                                                                                                                                   | 3.1–3.6 V, typ. 3.3 V                                                                                                                             |
| I/O Voltage <sup>⑥</sup>                                              | Typ. 2.8 V                                                                                                                                            | Typ. 2.8 V                                                                                                                                              | Typ. 2.8 V                                                                                                                                        |
| Power Consumption (@ Default GNSS Constellations, 3.3 V) <sup>③</sup> | <b>Normal Operation:</b><br>24 mA (79.2 mW) @ Acquisition<br>24 mA (79.2 mW) @ Tracking<br><b>Power Saving Mode:</b><br>25 µA (82.5 µW) @ Backup Mode | <b>Normal Operation:</b><br>32 mA (105.6 mW) @ Acquisition<br>32 mA (105.6 mW) @ Tracking<br><b>Power Saving Mode:</b><br>25 µA (82.5 µW) @ Backup Mode | <b>Normal Operation:</b><br>30 mA (99 mW) @ Acquisition<br>30 mA (99 mW) @ Tracking<br><b>Power Saving Mode:</b><br>25 µA (82.5 µW) @ Backup Mode |

NOTE:

1. ①: CEP, 50 %, 24 hours static, -130 dBm, more than 6 SVs.

2. ②: CEP, 50 %, with active high-precision antennas in an open-sky environment and within 1 km from the base station.

3. ③: Room temperature, all satellites at -130 dBm.
4. ④: Open-sky, active high-precision antenna.

5. ⑤: ITAR limits.

6. ⑥: The voltage domain is 1.8 V for certain interfaces or pins. See hardware design for details.

# Quectel LC29H Series

| GNSS Module                                                           | LC29H (DA)                                                                                                                                        | LC29H (EA)                                                                                                                                        | LC29H (AI)                                                                                                                                             |
|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dimensions                                                            | 12.2 mm × 16.0 mm × 2.5 mm                                                                                                                        | 12.2 mm × 16.0 mm × 2.5 mm                                                                                                                        | 12.2 mm × 16.0 mm × 2.5 mm                                                                                                                             |
| Weight                                                                | Approx. 0.9 g                                                                                                                                     | Approx. 0.9 g                                                                                                                                     | Approx. 0.9 g                                                                                                                                          |
| Temperature Range                                                     |                                                                                                                                                   |                                                                                                                                                   |                                                                                                                                                        |
| Operating Temperature                                                 | -40 °C to +85 °C                                                                                                                                  | -40 °C to +85 °C                                                                                                                                  | -40 °C to +85 °C                                                                                                                                       |
| Storage Temperature                                                   | -40 °C to +90 °C                                                                                                                                  | -40 °C to +90 °C                                                                                                                                  | -40 °C to +90 °C                                                                                                                                       |
| GNSS Features                                                         |                                                                                                                                                   |                                                                                                                                                   |                                                                                                                                                        |
| Supported Bands                                                       | GPS/QZSS: L1 C/A, L5<br>GLONASS: L1<br>Galileo: E1, E5a<br>BDS: B1I, B2a                                                                          | GPS/QZSS: L1 C/A, L5<br>GLONASS: L1<br>Galileo: E1, E5a<br>BDS: B1I, B2a                                                                          | GPS/QZSS: L1 C/A<br>GLONASS: L1<br>Galileo: E1<br>BDS: B1I<br>NavIC: L5                                                                                |
| Default GNSS Constellations                                           | GPS + GLONASS + Galileo + BDS + QZSS                                                                                                              | GPS + GLONASS + Galileo + BDS + QZSS                                                                                                              | GPS + GLONASS + Galileo + BDS + NavIC + QZSS                                                                                                           |
| Number of Concurrent GNSS                                             | 4 + QZSS                                                                                                                                          | 4 + QZSS                                                                                                                                          | 5 + QZSS                                                                                                                                               |
| SBAS                                                                  | WAAS, EGNOS, MSAS and GAGAN                                                                                                                       | WAAS*, EGNOS*, MSAS* and GAGAN*                                                                                                                   | WAAS, EGNOS, MSAS and GAGAN                                                                                                                            |
| Function(s)                                                           | RTK                                                                                                                                               | RTK + Heading <sup>①</sup>                                                                                                                        | Standard                                                                                                                                               |
| Horizontal Position Accuracy                                          | Autonomous <sup>②</sup> : 1 m<br>RTK <sup>③</sup> : 1 cm + 1 ppm                                                                                  | Autonomous <sup>②</sup> : 1 m<br>RTK <sup>③</sup> : 1 cm + 1 ppm                                                                                  | Autonomous <sup>②</sup> : 1.8 m                                                                                                                        |
| DR Position Error (ADR)                                               | -                                                                                                                                                 | -                                                                                                                                                 | -                                                                                                                                                      |
| DR Position Error (UDR)                                               | -                                                                                                                                                 | -                                                                                                                                                 | -                                                                                                                                                      |
| Velocity Accuracy <sup>④</sup>                                        | 0.03 m/s                                                                                                                                          | 0.03 m/s                                                                                                                                          | 0.1 m/s                                                                                                                                                |
| Accuracy of 1PPS Signal (RMS) <sup>④</sup>                            | 20 ns                                                                                                                                             | 20 ns                                                                                                                                             | 80 ns                                                                                                                                                  |
| RTK Convergence Time                                                  | RTK <sup>③</sup> : < 10 s                                                                                                                         | RTK <sup>③</sup> : < 10 s                                                                                                                         | -                                                                                                                                                      |
| Heading Accuracy <sup>⑤</sup>                                         | -                                                                                                                                                 | Heading: 0.2°                                                                                                                                     | -                                                                                                                                                      |
| TTFF (with AGNSS) <sup>⑥</sup>                                        | Full Cold Start: 5 s                                                                                                                              | Full Cold Start: 5 s                                                                                                                              | Full Cold Start: 5 s                                                                                                                                   |
| TTFF (Without AGNSS) <sup>④</sup>                                     | Full Cold Start: 26 s<br>Warm Start: 16 s<br>Hot Start: 1 s                                                                                       | Full Cold Start: 26 s<br>Warm Start: 16 s<br>Hot Start: 1 s                                                                                       | Full Cold Start: 29 s<br>Warm Start: 24 s<br>Hot Start: 1 s                                                                                            |
| Sensitivity (@ Default GNSS Constellations)                           | Acquisition: -145 dBm<br>Tracking: -165 dBm<br>Reacquisition: -157 dBm                                                                            | Acquisition <sup>⑦</sup> : -145 dBm<br>Tracking: -165 dBm<br>Reacquisition: -157 dBm                                                              | Acquisition <sup>⑦</sup> : -150 dBm<br>Tracking <sup>⑦</sup> : -165 dBm<br>Reacquisition <sup>⑦</sup> : -160 dBm                                       |
| Dynamic Performance <sup>④</sup>                                      | Maximum Altitude: 10000 m<br>Maximum Velocity <sup>⑧</sup> : 500 m/s<br>Maximum Acceleration <sup>⑧</sup> : 4g                                    | Maximum Altitude: 10000 m<br>Maximum Velocity <sup>⑧</sup> : 500 m/s<br>Maximum Acceleration <sup>⑧</sup> : 4g                                    | Maximum Altitude: 10000 m<br>Maximum Velocity <sup>⑧</sup> : 500 m/s<br>Maximum Acceleration <sup>⑧</sup> : 4g                                         |
| PVT Update Rate                                                       | RTK: 1 Hz                                                                                                                                         | RTK: 1–10 Hz                                                                                                                                      | 1–10 Hz                                                                                                                                                |
| Raw Data Update Rate                                                  | GNSS: 1 Hz                                                                                                                                        | GNSS: 1 Hz                                                                                                                                        | GNSS: 1 Hz                                                                                                                                             |
| Certifications                                                        |                                                                                                                                                   |                                                                                                                                                   |                                                                                                                                                        |
| Regulatory                                                            | Europe: CE                                                                                                                                        | Europe: CE                                                                                                                                        | Europe: CE                                                                                                                                             |
| Others                                                                | RoHS                                                                                                                                              | RoHS                                                                                                                                              | RoHS                                                                                                                                                   |
| Interfaces                                                            |                                                                                                                                                   |                                                                                                                                                   |                                                                                                                                                        |
| I2C                                                                   | × 1<br>Up to 400 kbps                                                                                                                             | -                                                                                                                                                 | × 1<br>Up to 400 kbps                                                                                                                                  |
| UART                                                                  | × 2<br>Adjustable: 4800–3000000 bps<br>Default: 115200 bps (UART1) or 3000000 bps (UART2)                                                         | × 1<br>Adjustable: 4800–3000000 bps<br>Default: 460800 bps                                                                                        | × 2<br>Adjustable: 9600–921600 bps (UART1) or 4800–3000000 bps (UART2)<br>Default: 115200 bps (UART1) or 3000000 bps (UART2)                           |
| SPI                                                                   | × 1 (Multiplexed from I2C and UART1)                                                                                                              | -                                                                                                                                                 | × 1 (Multiplexed from I2C and UART1)                                                                                                                   |
| Protocols                                                             |                                                                                                                                                   |                                                                                                                                                   |                                                                                                                                                        |
| Protocols                                                             | NMEA 0183/RTCM 3.x                                                                                                                                | NMEA 0183/RTCM 3.x                                                                                                                                | NMEA 0183/RTCM 3.x                                                                                                                                     |
| External Antenna Interface                                            |                                                                                                                                                   |                                                                                                                                                   |                                                                                                                                                        |
| Antenna Type                                                          | Active or Passive                                                                                                                                 | Active or Passive                                                                                                                                 | Active or Passive                                                                                                                                      |
| Antenna Power Supply                                                  | External or VDD_RF pin of module                                                                                                                  | External or VDD_RF pin of module                                                                                                                  | External or VDD_RF pin of module                                                                                                                       |
| Electrical Characteristics                                            |                                                                                                                                                   |                                                                                                                                                   |                                                                                                                                                        |
| Supply Voltage Range                                                  | 3.1–3.6 V, typ. 3.3 V                                                                                                                             | 3.1–3.6 V, typ. 3.3 V                                                                                                                             | 3.1–3.6 V, typ. 3.3 V                                                                                                                                  |
| I/O Voltage <sup>⑨</sup>                                              | Typ. 2.8 V                                                                                                                                        | Typ. 2.8 V                                                                                                                                        | Typ. 2.8 V                                                                                                                                             |
| Power Consumption (@ Default GNSS Constellations, 3.3 V) <sup>④</sup> | <b>Normal Operation:</b><br>30 mA (99 mW) @ Acquisition<br>30 mA (99 mW) @ Tracking<br><b>Power Saving Mode:</b><br>25 µA (82.5 µW) @ Backup Mode | <b>Normal Operation:</b><br>30 mA (99 mW) @ Acquisition<br>30 mA (99 mW) @ Tracking<br><b>Power Saving Mode:</b><br>25 µA (82.5 µW) @ Backup Mode | <b>Normal Operation:</b><br>16 mA (52.8 mW) @ Acquisition<br>16 mA (52.8 mW) @ Tracking<br><b>Power Saving Mode:</b><br>51 µA (168.3 µW) @ Backup Mode |

NOTE:

- ①: Heading function is implemented with two pieces of LC29H (EA) modules.
- ②: CEP, 50 %, 24 hours static, -130 dBm, more than 6 SVs.
- ③: CEP, 50 %, with active high-precision antennas in an open-sky environment and within 1 km from the base station.
- ④: Room temperature, all satellites at -130 dBm.
- ⑤: Standard deviation value, static, open-sky, 1 m baseline length.

- ⑥: Open-sky, active high-precision antenna.
- ⑦: Tested with an external LNA with 17 dB gain and 0.55 dB noise figure.
- ⑧: ITAR limits.
- ⑨: The voltage domain is 1.8 V for certain interfaces or pins (excluding LC29H (EA)). See hardware design for details.
- ⑩: Under development.