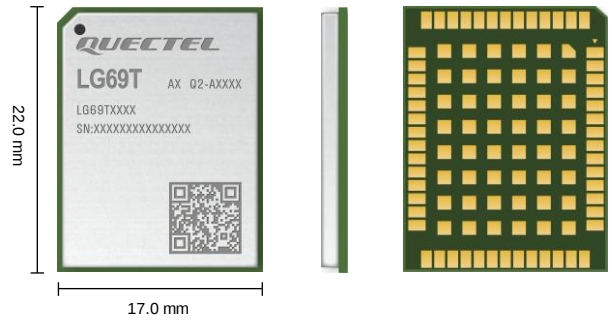


Quectel LG69T Series

Automotive Grade Dual-Band Multi-Constellation GNSS Module Integrating DR/RTK



Quectel LG69T series features the fifth generation of STMicroelectronics® positioning receiver platform with 80 tracking channels and 4 fast acquisition channels. Its dual band (L1 + L5 or L1 + L2) variants support up to 4 concurrent global constellations (GPS, GLONASS, Galileo and BDS), as well as QZSS, and optionally integrate RTK and Dead Reckoning technology enabling the best performance in various applications.

LG69T (AA) includes an integrated IMU and provides GNSS raw data as well as IMU raw data to use with external positioning engines. LG69T (AB) is an ASIL-B GNSS raw data module used with an external positioning engine and external IMU for functional safety autonomous driving applications. Integrating an internal IMU and fusion engine, LG69T (AF) provides PVT (DR) output as well as high update rate IMU raw data.

LG69T (AI) supporting L1 + L2 bands and LG69T (AJ, AR) supporting L1 + L5 bands are extended temperature GNSS raw data modules. LG69T (AJ) also incorporates an IMU and provides IMU raw data suitable to use with external positioning engines.

LG69T (AM) excludes the IMU and is suitable as a stand alone RTK Rover capable of centimeter-level precision. LG69T (AP) has a built-in automotive grade IMU whereas LG69T (AQ) contains an industrial grade internal IMU, both of which provide DR + RTK centimeter-level performance. LG69T (AS) is suitable as a stand alone or networked RTK base station and provides RTCM output to be used across radio or cellular links.

Navigation rate up to 10 Hz makes the LG69T series suitable for applications such as delivery robots, precision agriculture, mining and marine, automotive telematics as well as ADAS and DMS.



Key Features

- ✓ Concurrent reception of up to 4 constellations (GPS, GLONASS (optional), Galileo and BDS), as well as QZSS (optional)
- ✓ RTK (optional) provides centimeter-level accuracy with fast convergence time and outstanding performance
- ✓ No need for external co-processor (optional)
- ✓ Up to 10 Hz GNSS raw data output (optional)
- ✓ Integrated LNA for improved sensitivity (optional)
- ✓ DR algorithms (optional)
- ✓ Compact size and light weight suitable for mass market applications
- ✓ Designed and manufactured according to the Quality Management System based on IATF 16949:2016 Standard



L1 + L5 or L1 + L2
Dual Bands



Multi-Constellation
System



Low Power Consumption



DR



RTK



Operating Temperature
Range: -40 °C to +85 °C/105 °C



RoHS Compliant

Quectel LG69T Series

GNSS Module	LG69T (AP)	LG69T (AM)	LG69T (AQ)	LG69T (AB)
Dimensions (mm)	22.0 × 17.0 × 3.3	22.0 × 17.0 × 3.3	22.0 × 17.0 × 3.3	22.0 × 17.0 × 3.3
Weight (g)	Approx. 2.7	Approx. 2.6	Approx. 2.7	Approx. 2.7
Temperature Range				
Operating Temperature	-40 °C to +85 °C	-40 °C to +85 °C	-40 °C to +85 °C	-40 °C to +105 °C
Storage Temperature	-40 °C to +95 °C	-40 °C to +95 °C	-40 °C to +95 °C	-40 °C to +105 °C
GNSS Features				
Supported Bands	GPS: L1 C/A; L5 Galileo: E1; E5a BDS: B1I; B2a QZSS: L1 C/A; L5	GPS: L1 C/A; L5 Galileo: E1; E5a BDS: B1I; B2a QZSS: L1 C/A; L5	GPS: L1 C/A; L5 Galileo: E1; E5a BDS: B1I; B2a	GPS: L1 C/A; L2C or L5 Galileo: E1; E5b or E5a BDS: B1I; B2I or B2a GLONASS: L1 QZSS: L1 C/A; L2C or L5
Functions	PVT ^① (DR + RTK + Heading ^②)	PVT ^① (RTK + Heading ^②)	PVT ^① (DR + RTK)	GNSS raw data
Integrated IMU	Supported	-	Supported	-
Default GNSS Constellations	GPS + Galileo + BDS + QZSS	GPS + Galileo + BDS + QZSS	GPS + Galileo + BDS	GPS + GLONASS + Galileo + BDS + QZSS
Channels	80 Tracking Channels 4 Fast Acquisition Channels	80 Tracking Channels 4 Fast Acquisition Channels	80 Tracking Channels 4 Fast Acquisition Channels	80 Tracking Channels 4 Fast Acquisition Channels
SBAS	-	-	-	-
Horizontal Position Accuracy	Autonomous ^③ : 1.0 m RTK ^④ : 0.01 m + 1 ppm	Autonomous ^③ : 1.0 m RTK ^④ : 0.01 m + 1 ppm	Autonomous ^③ : 1.0 m RTK ^④ : 0.01 m + 1 ppm	Autonomous ^③ : 1.0 m RTK ^④ : Centimeter-level (Depending on external precision positioning engine)
Vertical Accuracy	RTK ^④ : 0.02 m + 1 ppm	RTK ^④ : 0.02 m + 1 ppm	-	-
Velocity Accuracy ^⑤	Without Aid: 0.1 m/s	Without Aid: 0.1 m/s	Without Aid: 0.1 m/s	Without Aid: 0.1 m/s
Acceleration Accuracy ^⑤	Without Aid: 0.1 m/s ²	Without Aid: 0.1 m/s ²	Without Aid: 0.1 m/s ²	Without Aid: 0.1 m/s ²
Convergence Time	RTK ^④ : 10 s	RTK ^④ : 10 s	RTK ^④ : TBD	-
Accuracy of 1PPS Signal ^⑤	50 ns	50 ns	50 ns	50 ns
Heading Accuracy	Heading (measured with 1 m baseline): 0.2° DR (measured without signal, 1 km): 1°	-	-	-
TTFF (with AGNSS)	Cold Start: 10 s	Cold Start: 10 s	-	-
TTFF (without AGNSS) ^⑥	Cold Start: 36 s Warm Start: 30 s Hot Start: 3 s	Cold Start: 36 s Warm Start: 30 s Hot Start: 3 s	Cold Start: TBD Warm Start: TBD Hot Start: TBD	Cold Start: 36 s Warm Start: 30 s Hot Start: 3 s
Sensitivity (@ Default Constellations) ^⑥	Acquisition: -145 dBm Tracking: -160 dBm Reacquisition: -153 dBm	Acquisition: -145 dBm Tracking: -160 dBm Reacquisition: -153 dBm	Acquisition: TBD Tracking: TBD Reacquisition: TBD	Acquisition: -144 dBm Tracking: -159 dBm Reacquisition: -153 dBm
Dynamic Performance ^⑤	Maximum Altitude: 18000 m Maximum Velocity ^⑦ : 515 m/s Maximum Acceleration ^⑦ : 4g	Maximum Altitude: 18000 m Maximum Velocity ^⑦ : 515 m/s Maximum Acceleration ^⑦ : 4g	Maximum Altitude: 18000 m Maximum Velocity ^⑦ : 515 m/s Maximum Acceleration ^⑦ : 4g	Maximum Altitude: 18000 m Maximum Velocity ^⑦ : 515 m/s Maximum Acceleration ^⑦ : 4g
Update Rate (Max.)	PVT ^① : 10 Hz (DR) IMU raw data: 100 Hz	PVT ^① : 10 Hz	PVT ^① : 10 Hz (DR) IMU raw data: 20 Hz [*]	GNSS raw data: 10 Hz
Interfaces				
UART	× 2 UART1/UART2: 115200–921600 bps (Adjustable) 460800 bps (Default)	× 2 UART1/UART2: 115200–921600 bps (Adjustable) 460800 bps (Default)	× 2 UART1/UART2: 115200–921600 bps (Adjustable) 460800 bps (Default)	× 2 UART1: 115200–921600 bps (Adjustable) 460800 bps (Default) UART2*: TBD
CAN	× 1	-	-	-
SPI	-	-	-	Internal JTAG port
Protocols				
Protocols	NMEA 0183/RTCM 3.x	NMEA 0183/RTCM 3.x	NMEA 0183/RTCM 3.x	RTCM 3.x
External Antenna Interface				
Antenna Type	Active	Active	Active	Active
Antenna Power Supply	External or Internal (through VDD_RF)	External or Internal (through VDD_RF)	External or Internal (through VDD_RF)	External or Internal (through VDD_RF)
Electrical Characteristics				
Supply Voltage Range	3.0–3.6 V, typ. 3.3 V	3.0–3.6 V, typ. 3.3 V	3.0–3.6 V, typ. 3.3 V	3.0–3.6 V, typ. 3.3 V @ VCC 1.14–1.3 V, typ. 1.25 V @ VCC_CORE
I/O Voltage	Same as VCC	Same as VCC	Same as VCC	Same as VCC
Current Consumption (@ Default Constellations, 3.3 V) ^⑤	Normal Operation: Acquisition: 360 mA Tracking: 360 mA Power Saving Mode: Backup mode: 55 µA	Normal Operation: Acquisition: 330 mA Tracking: 335 mA Power Saving Mode: Backup mode: 55 µA	Normal Operation: Acquisition: TBD Tracking: TBD Power Saving Mode: Backup mode: TBD	Normal Operation: Acquisition: 65 mA @ VCC Acquisition: 210 mA @ VCC_CORE Tracking: 65 mA @ VCC Tracking: 210 mA @ VCC_CORE Power Saving Mode: Backup mode: 55 µA
Certifications				
Regulatory	Europe: CE*	Europe: CE	Europe: CE*	Europe: CE*
Others	RoHS	RoHS	RoHS	RoHS, ASIL-B*
Quality & Reliability				
Quality & Reliability	Manufactured and fully tested in ISO/TS 16949 certified production sites	Manufactured and fully tested in ISO/TS 16949 certified production sites	-	Manufactured and fully tested in ISO/TS 16949 certified production sites

NOTE:

1. ^①: PVT stands for Position, Velocity and Time.

2. ^②: To achieve the Heading function, LG69T (AP) needs to be used in combination with LG69T (AM).

3. ^③: CEP, 50 %, 24 hours static, -130 dBm and more than 6 SVs.

4. ^④: CEP, 50 %, with active high-precision antennas in an open-sky environment and within 1 km from the base station.
5. ^⑤: All satellites at -130 dBm.

6. ^⑥: Demonstrated with a low noise external LNA.

7. ^⑦: ITAR limits.

8. *: Preliminary data.

9. *: Under development/in progress.

10. All measurements are conducted at room temperature.



Quectel LG69T Series

GNSS Module	LG69T (AA)	LG69T (AD)	LG69T (AI)	LG69T (AJ)
Dimensions (mm)	22.0 × 17.0 × 3.1	22.0 × 17.0 × 3.1	22.0 × 17.0 × 3.3	22.0 × 17.0 × 3.3
Weight (g)	Approx. 1.9	Approx. 1.9	Approx. 2.7	Approx. 2.5
Temperature Range				
Operating Temperature	-40 °C to +85 °C	-40 °C to +85 °C	-40 °C to +105 °C	-40 °C to +105 °C
Storage Temperature	-40 °C to +95 °C	-40 °C to +95 °C	-40 °C to +105 °C	-40 °C to +105 °C
GNSS Features				
Supported Bands	GPS: L1 C/A; L5 Galileo: E1; E5a BDS: B11; B2a QZSS: L1 C/A; L5	GPS: L1 C/A; L5 Galileo: E1; E5a BDS: B11; B2a QZSS: L1 C/A; L5	GPS: L1 C/A; L2C or L5 GLONASS: L1; L2 Galileo: E1; E5b or E5a BDS: B11; B2I or B2a QZSS: L1 C/A; L2C or L5	GPS: L1 C/A; L5 Galileo: E1; E5a BDS: B11; B2a QZSS: L1 C/A; L5
Functions	IMU raw data + GNSS raw data	PVT ^① /GNSS raw data ^②	GNSS raw data	GNSS raw data + IMU raw data
Integrated IMU	Supported	-	-	Supported
Default GNSS Constellations	GPS + Galileo + BDS + QZSS	GPS + Galileo + BDS + QZSS	GPS + GLONASS + Galileo + BDS + QZSS	GPS + Galileo + BDS + QZSS
Channels	80 Tracking Channels 4 Fast Acquisition Channels	80 Tracking Channels 4 Fast Acquisition Channels	80 Tracking Channels 4 Fast Acquisition Channels	80 Tracking Channels 4 Fast Acquisition Channels
SBAS	WAAS, EGNOS*, MSAS and GAGAN	WAAS, EGNOS*, MSAS and GAGAN	-	-
Horizontal Position Accuracy	Autonomous ^③ : 1.0 m RTK ^④ : Centimeter-level (Depending on external precision positioning engine)	Autonomous ^③ : 1.0 m RTK ^④ : Centimeter-level (Depending on external precision positioning engine)	Autonomous ^③ : 1.0 m RTK ^④ : Centimeter-level (Depending on external precision positioning engine)	Autonomous ^③ : 1.0 m RTK ^④ : Centimeter-level (Depending on external precision positioning engine)
Vertical Accuracy	-	-	-	-
Velocity Accuracy ^⑤	Without Aid: 0.1 m/s	Without Aid: 0.1 m/s	Without Aid: 0.1 m/s	Without Aid: 0.1 m/s
Acceleration Accuracy ^⑤	Without Aid: 0.1 m/s ²	Without Aid: 0.1 m/s ²	Without Aid: 0.1 m/s ²	Without Aid: 0.1 m/s ²
Convergence Time	-	-	-	-
Accuracy of 1PPS Signal ^⑤	50 ns	50 ns	50 ns	50 ns
Heading Accuracy	-	-	-	-
TTFF (with AGNSS)	Cold Start: TBD	Cold Start: TBD	Cold Start: TBD	Cold Start: TBD
TTFF (without AGNSS) ^⑥	Cold Start: 36 s Warm Start: 30 s Hot Start: 3 s	Cold Start: 36 s Warm Start: 30 s Hot Start: 3 s	Cold Start: 36 s Warm Start: 30 s Hot Start: 3 s	Cold Start: 36 s Warm Start: 30 s Hot Start: 3 s
Sensitivity (@ Default Constellations) ^⑥	Acquisition: -145 dBm Tracking: -160 dBm Reacquisition: -153 dBm	Acquisition: -145 dBm Tracking: -160 dBm Reacquisition: -153 dBm	Acquisition: -145 dBm Tracking: -160 dBm Reacquisition: -153 dBm	Acquisition: -145 dBm Tracking: -160 dBm Reacquisition: -153 dBm
Dynamic Performance ^⑥	Maximum Altitude: 18000 m Maximum Velocity ^⑦ : 515 m/s Maximum Acceleration ^⑦ : 4g	Maximum Altitude: 18000 m Maximum Velocity ^⑦ : 515 m/s Maximum Acceleration ^⑦ : 4g	Maximum Altitude: 18000 m Maximum Velocity ^⑦ : 515 m/s Maximum Acceleration ^⑦ : 4g	Maximum Altitude: 18000 m Maximum Velocity ^⑦ : 515 m/s Maximum Acceleration ^⑦ : 4g
Update Rate (Max.)	GNSS raw data: 10 Hz IMU raw data: 100 Hz	PVT ^① : 1 Hz GNSS raw data: 10 Hz	GNSS raw data: 10 Hz	GNSS raw data: 10 Hz IMU raw data: 100 Hz
Interfaces				
UART	× 2 UART1: 115200–921600 bps (Adjustable) 460800 bps (Default) UART2: 460800 bps	× 2 UART1: 115200–921600 bps (Adjustable) 460800 bps (Default) UART2: 460800 bps	× 2 UART1: 115200–921600 bps (Adjustable) 460800 bps (Default) UART2: 460800 bps	× 2 UART1: 115200–921600 bps (Adjustable) 460800 bps (Default) UART2: 460800 bps
Protocols				
Protocols	RTCM 3.x	NMEA 0183/RTCM 3.x	RTCM 3.x	RTCM 3.x
External Antenna Interface				
Antenna Type	Active	Active	Active	Active
Antenna Power Supply	External or Internal (through VDD_RF)	External or Internal (through VDD_RF)	External or Internal (through VDD_RF)	External or Internal (through VDD_RF)
Electrical Characteristics				
Supply Voltage Range	3.0–3.6 V, Typ. 3.3 V	3.0–3.6 V, Typ. 3.3 V	3.0–3.6 V, Typ. 3.3 V	3.0–3.6 V, Typ. 3.3 V
I/O Voltage	Same as VCC	Same as VCC	Same as VCC	Same as VCC
Power Consumption (@Default Constellations, 3.3 V) ^⑤	Normal Operation: Acquisition: 242 mA Tracking: 237 mA Power Saving Mode: Backup mode: 55 µA	Normal Operation: Acquisition: 235 mA Tracking: 232 mA Power Saving Mode: Backup mode: 55 µA	Normal Operation: Acquisition: 295 mA Tracking: 295 mA Power Saving Mode: Backup mode: 55 µA	Normal Operation: Acquisition: 245 mA Tracking: 245 mA Power Saving Mode: Backup mode: 55 µA
Certifications				
Regulatory	Europe: CE	Europe: CE	-	-
Others	RoHS	RoHS	RoHS	RoHS
Quality & Reliability				
Quality & Reliability	Manufactured and fully tested in ISO/TS 16949 certified production sites	Manufactured and fully tested in ISO/TS 16949 certified production sites	Manufactured and fully tested in ISO/TS 16949 certified production sites	Manufactured and fully tested in ISO/TS 16949 certified production sites

NOTE:

1. ①: PVT stands for Position, Velocity and Time.

2. ②: PVT and GNSS raw data are supported by different firmware versions.

3. ③: CEP, 50 %, 24 hours static, -130 dBm, more than 6 SVs.

4. ④: CEP, 50 %, with active high-precision antennas in an open-sky environment and within 1 km from the base station.

5. ⑤: All satellites at -130 dBm.
6. ⑥: Demonstrated with a low noise external LNA.

7. ⑦: ITAR limits.

8. *: Under development.

9. All measurements are conducted at room temperature.



Quectel LG69T Series

GNSS Module	LG69T (AF)	LG69T (AR)	LG69T (AS)
Dimensions (mm)	22.0 × 17.0 × 3.3	22.0 × 17.0 × 3.3	22.0 × 17.0 × 3.3
Weight (g)	Approx. 2.7	Approx. 2.5	Approx. 2.7
Temperature Range			
Operating Temperature	-40 °C to +85 °C	-40 °C to +105 °C	-40 °C to +85 °C
Storage Temperature	-40 °C to +95 °C	-40 °C to +105 °C	-40 °C to +95 °C
GNSS Features			
Supported Bands	GPS: L1 C/A; L5 Galileo: E1; E5a BDS: B1I; B2a QZSS: L1 C/A; L5	GPS: L1 C/A; L5 Galileo: E1; E5a BDS: B1I; B2a QZSS: L1 C/A; L5	GPS: L1 C/A; L5 Galileo: E1; E5a BDS: B1I; B2a QZSS: L1 C/A; L5
Functions	DR + IMU raw data	GNSS raw data	Base station
Integrated IMU	Supported	-	-
Default GNSS Constellations	GPS + Galileo + BDS + QZSS	GPS + Galileo + BDS + QZSS	GPS + Galileo + BDS + QZSS
Channels	80 Tracking Channels 4 Fast Acquisition Channels	80 Tracking Channels 4 Fast Acquisition Channels	80 Tracking Channels 4 Fast Acquisition Channels
SBAS	WAAS, EGNOS, MSAS and GAGAN	-	-
Horizontal Position Accuracy	Autonomous ^① : 1.0 m	Autonomous ^① : 1.0 m RTK ^② : Centimeter-level (Depending on external precision positioning engine)	-
Vertical Accuracy	-	-	-
Velocity Accuracy ^③	Without Aid: 0.1 m/s	Without Aid: 0.1 m/s	-
Acceleration Accuracy ^③	Without Aid: 0.1 m/s ²	Without Aid: 0.1 m/s ²	-
Convergence Time	-	-	-
Accuracy of 1PPS Signal ^③	50 ns	50 ns	50 ns
TTFF (with AGNSS)	Cold Start: 10 s Cold Start: 36 s Warm Start: 30 s Hot Start: 3 s	Cold Start: TBD Cold Start: 36 s Warm Start: 30 s Hot Start: 3 s	-
TTFF (without AGNSS) ^③			-
Sensitivity (@ Default Constellations) ^④	Acquisition: -145 dBm Tracking: -160 dBm Reacquisition: -153 dBm	Acquisition: -145 dBm Tracking: -160 dBm Reacquisition: -153 dBm	Acquisition: -145 dBm Tracking: -161 dBm Reacquisition: -153 dBm
Dynamic Performance ^③	Maximum Altitude: 18000 m Maximum Velocity ^⑤ : 515 m/s Maximum Acceleration ^⑤ : 4g	Maximum Altitude: 18000 m Maximum Velocity ^⑤ : 515 m/s Maximum Acceleration ^⑤ : 4g	Maximum Altitude: 18000 m Maximum Velocity ^⑤ : 515 m/s Maximum Acceleration ^⑤ : 4g
Update Rate (Max.)	PVT ^⑥ (DR): 1 Hz IMU raw data: 100 Hz	GNSS raw data: 10 Hz	GNSS raw data: 1 Hz
Interfaces			
UART	× 2 UART1: 115200–921600 bps (Adjustable) 460800 bps (Default) UART2: 460800 bps	× 2 UART1: 115200–921600 bps (Adjustable) 460800 bps (Default) UART2: 460800 bps	× 2 UART1/UART2: 115200–921600 bps (Adjustable) 460800 bps (Default)
Protocols			
Protocols	NMEA 0183	RTCM 3.x	NMEA 0183 ^⑦ /RTCM 3.x
External Antenna Interface			
Antenna Type	Active	Active	Active
Antenna Power Supply	External or Internal (through VDD_RF)	External or Internal (through VDD_RF)	External or Internal (through VDD_RF)
Electrical Characteristics			
Supply Voltage Range	3.0–3.6 V, Typ. 3.3 V	3.0–3.6 V, Typ. 3.3 V	3.0–3.6 V, Typ. 3.3 V
I/O Voltage	Same as VCC	Same as VCC	Same as VCC
Current Consumption (@Default Constellations, 3.3 V) ^③	Normal Operation: Acquisition: 275 mA Tracking: 274 mA Power Saving Mode: Backup mode: 55 µA	Normal Operation: Acquisition: 245 mA Tracking: 245 mA Power Saving Mode: Backup mode: 55 µA	Normal Operation: Acquisition: 360 mA Tracking: 360 mA Power Saving Mode: Backup mode: 55 µA
Certifications			
Regulatory	Europe: CE*	Europe: CE*	Europe: CE
Others	RoHS	RoHS	RoHS
Quality & Reliability			
Quality & Reliability	Manufactured and fully tested in ISO/TS 16949 certified production sites	Manufactured and fully tested in ISO/TS 16949 certified production sites	Manufactured and fully tested in ISO/TS 16949 certified production sites

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: All satellites at -130 dBm.

4. ④: Demonstrated with a low noise external LNA.

5. ⑤: ITAR limits.
6. ⑥: PVT stands for Position, Velocity and Time.

7. ⑦: LG69T (AS) only supports proprietary NMEA message.

8. *: In progress.

9. All measurements are conducted at room temperature.