

Waveshare EM060K-GL

Waveshare Quectel EM060K-GL Module User Manual

Model: EM060K-GL | Brand: Waveshare

1. INTRODUCTION

The Waveshare Quectel EM060K-GL is an advanced LTE-A Cat 6 module designed with an M.2 form factor. It offers robust global multi-band GNSS positioning capabilities and supports DL 2 Carrier Aggregation and 64QAM for enhanced data rates. This module provides worldwide LTE-A and UMTS/HSPA+ coverage, featuring a low power mode for energy efficiency. Its integrated multi-constellation GNSS receiver ensures fast and accurate positioning in diverse environments, while MIMO technology enhances data rate and link reliability in modern wireless communication systems.

Quectel EM060K-GL Module

LTE-A Cat 6 M.2 Module

Industrial-Grade Module For Industrial And Commercial Applications



Figure 1: Overview of the Quectel EM060K-GL Module, highlighting its branding and model number.

2. KEY FEATURES

Features At A Glance

- LTE-A Cat 6 module with M.2 form factor
- Supports DL 2 Carrier Aggregation and 64QAM
- Worldwide LTE-A and UMTS/HSPA+ coverage
- Low power mode, more power saving
- Integrated multi-constellation GNSS receiver to meet the requirement of fast and accurate positioning in different environments
- MIMO technology meets demands for data rate and link reliability in modern wireless communication systems

M.2 Form Factor

EM060K-GL adopts the 3GPP Release 12 specification and M.2 form factor, compatible with Quectel's LTE-A Cat 6 module EM06, LTE-A Cat 12 modules EM12-G/EM121R-GL/EM120R-GL, LTE-A Cat 16 module EM160R-GL and 5G modules [RM50xQ](#) series, which facilitate the migration between different modules.



Worldwide Mainstream Carriers Coverage

The EM060K-GL nearly covers all the mainstream carriers worldwide. The integrated multi-constellation high-precision GNSS receiver (supports GPS, GLONASS, BDS and Galileo) greatly simplifies the product design and provides quicker, more accurate positioning capability.

Built-In Rich Network Protocols

Integrates multiple industry-standard interfaces and supports multiple drivers and software functions (USB drivers for Windows, Linux, and Android), which greatly expands the range of applications including Industrial Routers, Home Gateways, Set Top Box, industrial laptops, consumer laptops, Industrial PDAs, Rugged Industrial Tablet PCs and Digital Signage.

Figure 2: Visual representation of the EM060K-GL module's key features and capabilities.

- **LTE-A Cat 6 Module:** Utilizes an M.2 form factor for compact integration.
- **Carrier Aggregation:** Supports DL 2 Carrier Aggregation and 64QAM for improved data throughput.
- **Global Coverage:** Provides worldwide LTE-A and UMTS/HSPA+ network coverage.
- **Low Power Mode:** Designed for power efficiency, reducing energy consumption.
- **Integrated GNSS:** Features a multi-constellation GNSS receiver for precise and rapid positioning.
- **MIMO Technology:** Incorporates MIMO for enhanced data rates and link reliability in wireless communications.

3. SETUP AND INSTALLATION

This section outlines the general steps for installing the EM060K-GL M.2 module. Always refer to the host device's manual for specific installation instructions.

1. **Prepare the Host Device:** Ensure the host device (e.g., laptop, router, industrial PC) is powered off and disconnected from any power source.

2. **Locate M.2 Slot:** Identify the available M.2 slot on your host device's motherboard. The EM060K-GL module is compatible with M.2 Key B slots.
3. **Insert the Module:** Gently insert the EM060K-GL module into the M.2 slot at a 30-degree angle. Apply even pressure until the module is fully seated.
4. **Secure the Module:** Press the module down and secure it with the provided screw (usually included with the host device or module accessory kit) to hold it in place.
5. **Connect Antennas (if applicable):** If your host device and module require external antennas for LTE/GNSS, carefully connect them to the appropriate connectors on the module.
6. **Close the Device:** Reassemble your host device, ensuring all covers are properly secured.
7. **Power On and Install Drivers:** Power on the host device. You may need to install specific drivers for the Quectel EM060K-GL module. These drivers are typically available from the Waveshare or Quectel official websites.



Figure 3: Rear view of the EM060K-GL module, showing the M.2 connector pins and mounting notch.

4. OPERATING INSTRUCTIONS

Once the EM060K-GL module is installed and drivers are in place, follow these general steps for operation:

1. **Driver Verification:** Confirm that the necessary drivers are correctly installed and the module is recognized by the operating system. Check Device Manager on Windows or use `lsusb`/`lspci` commands on Linux.
2. **SIM Card Insertion:** If using cellular connectivity, ensure a valid and activated SIM card is inserted into the host device's SIM card slot (if available and connected to the module).
3. **Network Configuration:** Configure your network settings. This typically involves selecting the cellular network,

setting up an Access Point Name (APN), and enabling mobile data. Refer to your operating system's network settings or your router's interface.

4. **GNSS Functionality:** For GNSS positioning, ensure the module has a clear view of the sky (if external antenna is used) and that GNSS services are enabled in your application or operating system.
5. **Monitoring:** Use diagnostic tools or software provided by Quectel or your host device manufacturer to monitor signal strength, data usage, and GNSS status.

5. MAINTENANCE

Proper maintenance ensures the longevity and optimal performance of your EM060K-GL module.

- **Keep Dry:** Protect the module from moisture and liquids. Water damage can lead to malfunction.
- **Clean Gently:** If cleaning is necessary, use a soft, dry cloth. Avoid harsh chemicals or abrasive materials. Ensure the device is powered off before cleaning.
- **Avoid Static Discharge:** When handling the module outside of its host device, always use anti-static precautions (e.g., anti-static wrist strap) to prevent damage from electrostatic discharge.
- **Temperature Control:** Operate the module within its specified temperature ranges to prevent overheating or performance degradation.
- **Firmware Updates:** Periodically check the Waveshare or Quectel website for firmware updates. Applying updates can improve performance, add features, or fix bugs.

6. TROUBLESHOOTING

If you encounter issues with your EM060K-GL module, consider the following troubleshooting steps:

- **Module Not Detected:**
 - Ensure the module is correctly seated in the M.2 slot.
 - Verify that the host device's BIOS/UEFI settings recognize the M.2 slot.
 - Check if the necessary drivers are installed.
- **No Network Connection:**
 - Confirm the SIM card is properly inserted and activated.
 - Check APN settings and network configuration in your operating system or router.
 - Ensure antennas are securely connected (if applicable) and have a clear signal path.
 - Verify that your cellular plan is active and has data allowance.
- **Poor Signal Strength:**
 - Relocate the host device to an area with better cellular coverage.
 - Ensure external antennas (if used) are positioned optimally and are not obstructed.
 - Check antenna connections for looseness or damage.
- **GNSS Not Functioning:**
 - Ensure the device has a clear view of the sky for satellite reception.
 - Verify that GNSS services are enabled in your application or operating system.
 - Check for any physical obstructions or interference sources.
- **Module Overheating:**
 - Ensure adequate airflow around the module and host device.
 - Verify that the module is operating within its specified temperature range.

- Reduce workload if possible.

If these steps do not resolve the issue, please contact Waveshare technical support for further assistance.

7. SPECIFICATIONS

Detailed technical specifications for the Waveshare Quectel EM060K-GL module.

Specifications

LTE CAT 6	EM06-E	EM060K-GL
Region / Provider	EMEA/APAC①/Brazil	Global
Operating temperature	-30 °C ~ +70 °C	
Extension temperature	-40 °C ~ +85 °C	
Dimensions	42.0 × 30.0 × 2.3 (mm)	
Power supply	3.135~4.4 V, typical 3.7 V	
Power consumption	50 μA @ shutdown 4.1 mA @ hibernate, typical 22.1mA @ idle	62 μA @ shutdown 2.71 mA @ hibernate, typical 16.57mA @ idle
FREQUENCY BAND		
LTE-FDD	B1, B3, B5, B7, B8, B20, B28, B32②	B1, B2, B3, B4, B5, B7, B8, B12, B13, B14, B17, B18, B19, B20, B25, B26, B28, B29③, B30, B32③, B66, B71
LTE-TDD	B38, B40, B41	B34, B38, B39, B40, B41, B42, B43, B46③ (LAA), B48 (CBRS)
2xCA	B1+B1, B5, B8, B20, B28; B3+B3, B5, B7, B8, B20, B28; B7+B5, B7, B8, B20, B28; B20+B32②; B38+B38; B40+B40; B41+B41	Intra-band, Inter-band
WCDMA	B1, B3, B5, B8	B1, B2, B3, B4, B5, B6, B8, B19
GNSS	GPS/GLONASS/BeiDou (Compass)/Galileo/QZSS(optional)	GPS/GLONASS/BDS/Galileo
DATA RATE		
LTE-FDD	300Mbps (DL); 50Mbps (UL)	300Mbps (DL); 50Mbps (UL)
LTE-TDD	226Mbps (DL); 28Mbps (UL)	
DC-HSPA+	42Mbps (DL); 5.76Mbps (UL)	
WCDMA	384kbps (DL); 384kbps (UL)	
Note	① Japan and CMCC are NOT included. ② For EM06-E, B32 is only used for receiving in LTE-FDD, and is only for secondary component carrier in 2xCA. ③ For EM060K-GL, LTE-FDD B29/B32 and LTE-TDD B46 are used for receiving only, and are only for secondary component carrier.	

Figure 4: Comprehensive table detailing the technical specifications of the EM060K-GL module, including frequency bands and data rates.

EM060K-GL Module Specifications

Feature	Detail
Brand	Waveshare
Model Number	EM060K-GL
Form Factor	M.2

Feature	Detail
Connectivity Technology	USB
LTE Category	Cat 6 (LTE-A)
Carrier Aggregation	DL 2CA, 64QAM
GNSS Support	Integrated multi-constellation (GPS, GLONASS, BDS, Galileo)
Operating Temperature	-30 °C ~ +70 °C
Extension Temperature	-40 °C ~ +85 °C
Dimensions	42.0 x 30.0 x 2.3 mm
Power Supply	3.135V ~ 4.4V, typical 3.7V
Idle Power Consumption	16.57mA (typical)
Shutdown Power Consumption	62 μA (typical)
Compatible Devices	Laptop, Router

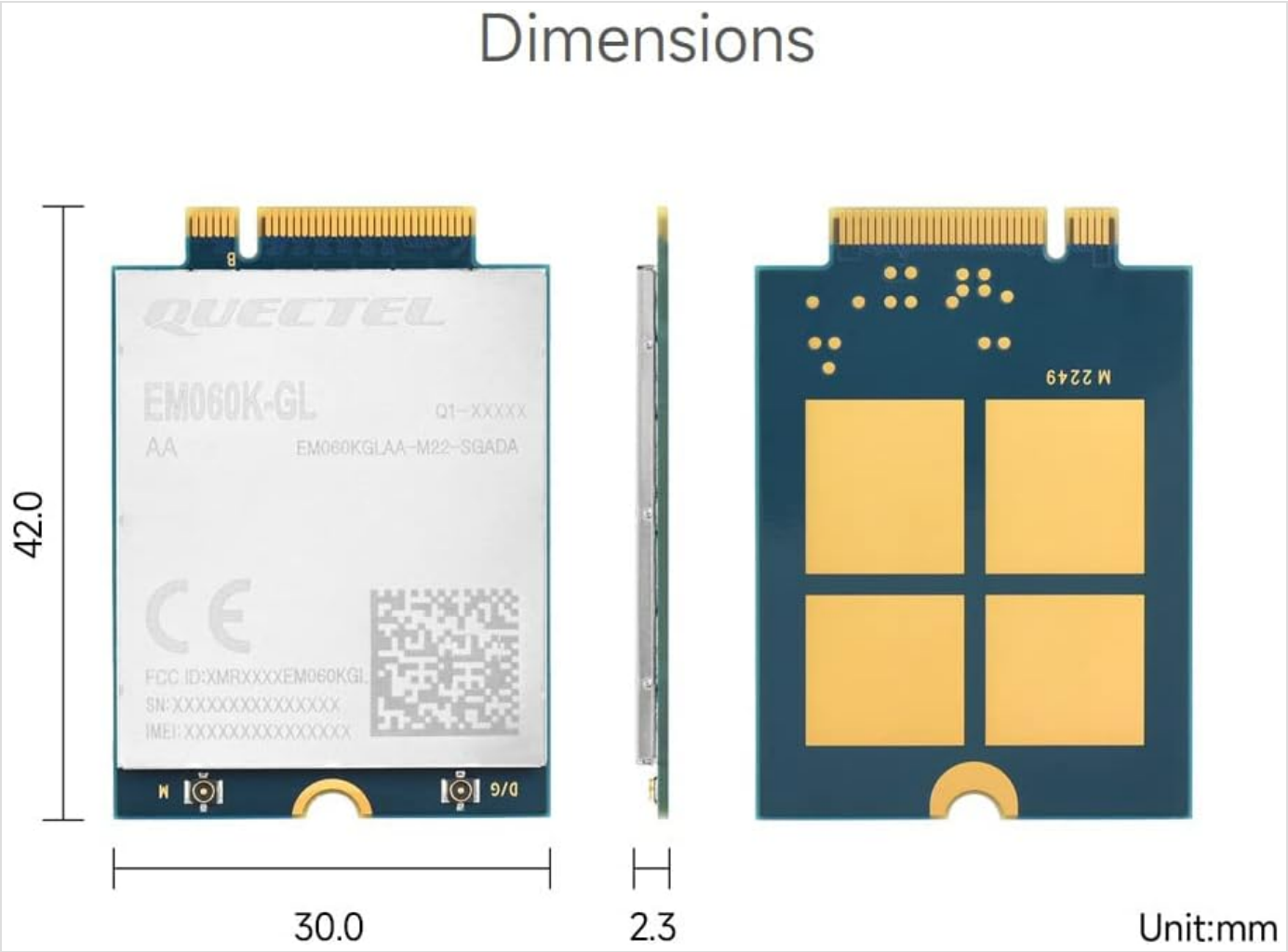


Figure 5: Physical dimensions of the EM060K-GL module in millimeters.

8. APPLICATION SCENARIOS

The EM060K-GL module is designed for a wide range of industrial and commercial applications requiring reliable LTE-A connectivity and GNSS positioning.

Application Scenarios

Industrial Routers, Home Gateways, Set Top Boxes, Industrial Laptops, Consumer Laptops, Industrial PDAs, Rugged Industrial Tablet PCs, And Digital Signage...



Figure 6: Examples of environments and devices where the EM060K-GL module can be utilized, including industrial routers, laptops, and digital signage.

- **Industrial Routers:** Providing robust cellular connectivity for remote monitoring and control.
- **Home Gateways:** Enabling high-speed internet access in residential settings.
- **Set Top Boxes:** Integrating cellular data for smart TV and media applications.
- **Industrial Laptops & PDAs:** Offering mobile connectivity for field operations and data collection.
- **Rugged Industrial Tablet PCs:** Ensuring reliable communication in harsh environments.
- **Digital Signage:** Providing remote content updates and management for advertising displays.

9. WARRANTY INFORMATION

Waveshare products typically come with a standard limited warranty against defects in materials and workmanship. The specific duration and terms of the warranty may vary by region and product. Please retain your proof of purchase for warranty claims.

For detailed warranty information, please refer to the official Waveshare website or contact their customer service directly. Unauthorized modifications or improper use of the module may void the warranty.

10. TECHNICAL SUPPORT

For technical assistance, driver downloads, firmware updates, or any inquiries regarding the EM060K-GL module, please visit the official Waveshare support resources:

- **Official Website:** www.waveshare.com
- **Product Wiki/Documentation:** Search for "EM060K-GL" on the Waveshare Wiki for detailed documentation and resources.
- **Contact Support:** Refer to the "Contact Us" section on the Waveshare website for email, phone, or forum support options.

When contacting support, please have your product model number (EM060K-GL) and a detailed description of your issue ready.