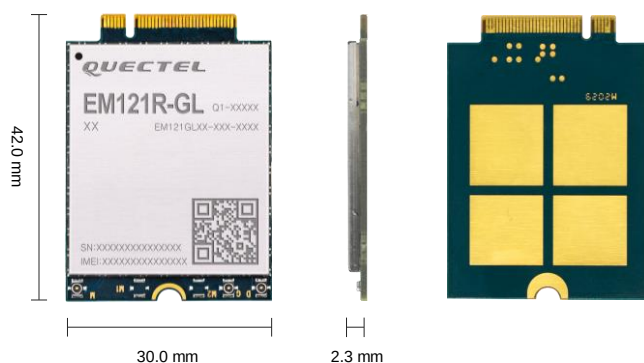




# Quectel EM121R-GL

## LTE-A Cat 12 M.2 Module



Quectel EM121R-GL is an LTE Advanced Category 12 module. Adopting the 3GPP Release 14 technology, it supports a theoretical downlink peak data rate of 600 Mbps and a theoretical uplink peak data rate of 150 Mbps. Designed in M.2 form factor, the module is compatible with Quectel LTE-A Cat 6 module EM06, Cat 12 modules EM12-G/EM120R-GL, which facilitates customers' migration between different modules.

EM121R-GL is designed for global market and nearly covers all the mainstream carriers worldwide. The module supports Qualcomm® IZat™ location technology Gen9-VT (GPS, GLONASS, BeiDou/Compass and Galileo) and supports active GNSS L1+L5 antennas. The integrated GNSS greatly simplifies product design, and provides quicker, more accurate and more dependable positioning capability.

A rich set of Internet protocols, industry-standard interfaces and abundant functionalities (PCIe interface/USB drivers for Windows, Linux, Android/optional Built-in eSIM) extend the applicability of the module to a wide range of applications such as industrial router, home gateway, STB, industrial laptop, consumer laptop, industrial PDA, rugged tablet PC, and digital signage, etc.



## Key Features

- ✓ LTE-A Cat 12 module with M.2 form factor
- ✓ Support DL 3 Carrier Aggregation and 256QAM
- ✓ Worldwide LTE-A and UMTS/HSPA+ coverage
- ✓ Support PCIe Gen2 interface for PC/Laptop application
- ✓ Built-in eSIM (optional), DSSA
- ✓ Low power mode
- ✓ Multi-constellation GNSS receiver available for applications requiring fast and accurate fixes in any environment
- ✓ MIMO technology meets demands for data rate and link reliability in modem wireless communication systems



DL: LTE Cat 12  
UL: LTE Cat 13



Max. 42 Mbps (DL)  
Max. 5.76 Mbps (UL)



M.2 Form Factor



Embedded Abundant  
Protocols



PCIe Gen2  
Interface



Multi-constellation  
GNSS



USB 2.0/3.0  
High Speed Interface



Quectel Enhanced  
AT Commands

Version: 1.0.0 | Status: Preliminary

# Quectel EM121R-GL

| LTE Cat 12                                 |           | EM121R-GL                                                                                                     |
|--------------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------|
| Region/Operator                            |           | Global                                                                                                        |
| Package                                    |           | M.2 Package, Key-B                                                                                            |
| Dimensions                                 |           | 42.0 mm × 30.0 mm × 2.3 mm                                                                                    |
| Weight                                     |           | 6.8 g                                                                                                         |
| Temperature Range                          |           |                                                                                                               |
| Operating Temperature                      |           | -25 °C to +75 °C                                                                                              |
| Extended Temperature                       |           | -40 °C to +85 °C                                                                                              |
| Frequency Bands                            |           |                                                                                                               |
| LTE                                        | LTE-FDD   | B1/B2/B3/B4/B5/B7/B8/B12/B13/B14/B17/B18/B19/B20/B25/B26/B28/B29 <sup>①</sup> /B30/B32 <sup>①</sup> /B66      |
|                                            | LTE-TDD   | B38/B39/B40/B41/B42/B43/B46 <sup>①</sup> (LAA)/B48 (CBRS)                                                     |
|                                            | DL 2CA    | Intra-band and Inter-band                                                                                     |
|                                            | DL 3CA    | Intra-band and Inter-band                                                                                     |
|                                            | DL 256QAM | Supported                                                                                                     |
|                                            | UL 2CA    | Intra-band                                                                                                    |
|                                            | UL 64QAM  | Supported                                                                                                     |
| UMTS                                       | WCDMA     | B1/B2/B3/B4/B5/B6/B8/B19                                                                                      |
| GNSS (L1+L5)                               |           | GPS/GLONASS/BeiDou (COMPASS)/Galileo                                                                          |
| Certifications                             |           |                                                                                                               |
| Regulatory                                 |           | Global: GCF<br>Europe: CE<br>North America: PTCRB<br>America: FCC<br>Canada: IC<br>Australia/New Zealand: RCM |
| Carrier                                    |           | America: Verizon/ AT&T*                                                                                       |
| Others*                                    |           | WHQL                                                                                                          |
| Data Rate (Max.)                           |           |                                                                                                               |
| LTE                                        |           | 600 Mbps (DL); 150 Mbps (UL)                                                                                  |
|                                            | DC-HSDPA  | 42 Mbps (DL)                                                                                                  |
| UMTS                                       | DC-HSUPA  | 5.76Mbps (UL)                                                                                                 |
|                                            | WCDMA     | 384 kbps (DL); 384 kbps (UL)                                                                                  |
| Enhanced Features                          |           |                                                                                                               |
| MIMO: DL 2 × 2                             |           | ●                                                                                                             |
| eCall: Emergency Service*                  |           | ●                                                                                                             |
| (U)SIM Card Detection                      |           | ●                                                                                                             |
| Built-in eSIM                              |           | ○                                                                                                             |
| DSSA: Dual SIM, Single Active              |           | ●                                                                                                             |
| DFOTA: Delta Firmware Upgrade Over-the-Air |           | ●                                                                                                             |
| Embedded GNSS                              |           | ●                                                                                                             |
| SMS                                        |           |                                                                                                               |
| Point-to-point MO and MT                   |           | ●                                                                                                             |
| SMS Cell Broadcast                         |           | ●                                                                                                             |
| Text and PDU Mode                          |           | ●                                                                                                             |
| 3GPP/3GPP2                                 |           | ●                                                                                                             |
| Windows OS SMS Push Feature                |           | ●                                                                                                             |

## Notes:

- ①: For secondary component carrier only.
- \*: Under development/In progress.
- : Supported; ○: Optional.

# Quectel EM121R-GL

| LTE Cat 12                         |                   | EM121R-GL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Software Features                  |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 3GPP                               |                   | 3GPP E-UTRA Release 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| AT Command                         |                   | 3GPP TS27.007<br>Quectel Enhanced AT Commands                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Protocols                          |                   | QMI/MBIM/NITZ/PING/HTTP/HTTPS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Drivers                            | MBIM Driver       | Windows 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                    | USB Serial Driver | Windows 7/8/8.1/10<br>Linux 2.6/3.x/4.x/5.x<br>Android 4.x/5.x/6.x/7.x/8.x/9.x/10.x                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                    | RIL Driver        | Android 4.x/5.x/6.x/7.x/8.x/9.x/10.x                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                    | NDIS Driver       | Windows 7/8/8.1/10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                    | ECM Driver*       | Linux 2.6/3.x/4.x/5.x                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                    | Gobinet Driver    | Linux 2.6/3.x/4.x/5.x                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                    | QMI_WWAN Driver   | 3.x (3.4 or later)/4.x/5.x                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                    | PCIE MHI Driver   | Windows 10<br>Linux 3.10–5.10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Interfaces                         |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| (U)SIM Interfaces (1.8/3.0 V)      |                   | × 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| USB 2.0/3.0, supporting Slave Mode |                   | × 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| PCIe Interface                     |                   | × 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| PCM*                               |                   | × 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Control and Indication Interfaces* |                   | × 7 (Airplane mode control, GNSS control, Wake-up control*, RF status indication, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Cellular/WLAN COEX UART Interface* |                   | × 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Antenna Tuner Control Interfaces*  |                   | × 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Configuration Pins                 |                   | × 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Antenna Interfaces                 |                   | × 3 (Main, Rx-diversity, GNSS)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Electrical Features                |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Supply Voltage Range               |                   | 3.135–4.4 V, typ. 3.7 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Transmitting Power                 |                   | <b>USB Mode</b> <ul style="list-style-type: none"> <li>LTE-FDD: Class 3 (23 dBm ±2 dB)</li> <li>LTE-TDD: <ul style="list-style-type: none"> <li>B41 HPUE: Class 2 (25.5 dBm +1/-2 dB)</li> <li>Other bands: Class 3 (23 dBm ±2 dB)</li> </ul> </li> <li>WCDMA: Class 3 (24 dBm +1/-3 dB)</li> </ul> <b>PCIe Only Mode</b> <ul style="list-style-type: none"> <li>LTE-FDD: <ul style="list-style-type: none"> <li>B30: 20 dBm ±2 dB</li> <li>Others bands: Class 3 (23 dBm ±2 dB)</li> </ul> </li> <li>LTE-TDD: <ul style="list-style-type: none"> <li>B41 HPUE: Class 2 (25.5 dBm +1/-2 dB)</li> <li>B48: 19 dBm ±2 dB</li> <li>Other bands: Class 3 (23 dBm ±2 dB)</li> </ul> </li> <li>WCDMA: Class 3 (24 dBm +1/-3 dB)</li> </ul> |
|                                    |                   | <b>USB Mode</b><br>66 µA @ Power down<br>1.84 mA @ Sleep (AT+CFUN=0, USB Suspend)<br>24.48 mA @ Idle (PF = 64, USB Active)<br><b>PCIe Only Mode</b><br>66 µA @ Power down<br>2.35 mA @ Sleep (AT+CFUN=0, Modern standby)<br>15.05 mA @ Idle (PF = 64, PCIe Active)                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Power Consumption                  |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

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