

Quectel RG650E & RG650V Series

IoT/ eMBB-Optimized 5G Sub-6 GHz LGA Module

Quectel RG650E and RG650V are 5G LGA modules optimized specially for IoT and eMBB applications. Adopting the 3GPP Rel-17 technology, they support both 5G NSA and SA modes with Option 3x/ 3a/ 3 and Option 2 network architectures, and are backward compatible with the 4G/ 3G networks. The module can meet customers' different application demands for high speed, large capacity, low latency, high reliability, etc.

RG650E series and RG650V series are industrial-grade modules for industrial and commercial applications only.

RG650E series and RG650V series support Qualcomm® IZat™ location technology Gen9C Lite (GPS, GLONASS, BDS, Galileo and QZSS). The integrated GNSS receiver greatly simplifies product design and provides quicker, more accurate and more dependable positioning capability.

A rich set of Internet protocols, industry-standard interfaces (USB 2.0/ 3.0/ 3.1, PCIe 3.0, PCM, UART, etc.) and abundant functionalities (USB drivers for Windows, Linux and Android) extend the applicability of the module to a wide range of IoT and eMBB applications such as business routers, home gateway, STB, industrial laptops, consumer laptops, industrial PDA, rugged tablet PCs and video transmission.



Key Features

- ✓ 5G/ 4G/ 3G multi-mode module with LGA package, optimized for IoT and eMBB applications
- ✓ Worldwide 5G, LTE-A and 3G coverage
- ✓ 5G NSA and SA modes
- ✓ Multi-constellation GNSS receiver (optional) available for applications requiring fast and accurate fixes in any environment
- ✓ Feature refinements: FOTA and VoNR / VoLTE (optional)



5G NR Sub-6 GHz



LTE Cat 20 (DL)
LTE Cat 18 (UL)



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



Embedded Abundant
Protocols



LGA Package



Multi-constellation
GNSS (optional)



USB 3.1
High Speed Interface



PCIe 3.0
Interface



Quectel Enhanced
AT Commands



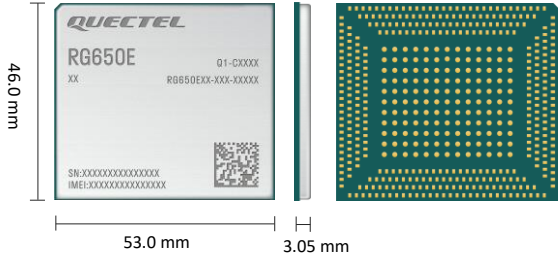
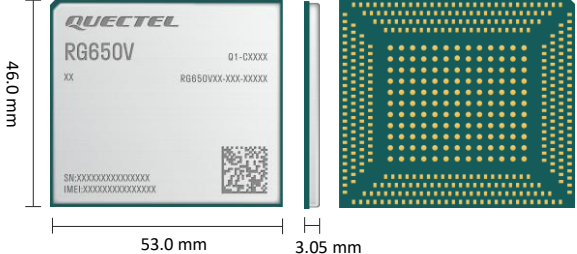
RoHS Compliant



VoNR /VoLTE
(optional)

Version: 1.1 | Status: Released

Quectel RG650E & RG650V Series

	RG650E-EU*	RG650E-NA	RG650V-EU	RG650V-NA
Region/ Operator	EMEA/ Oceania/ Brazil	North America	EMEA/ Oceania/ Brazil	North America
Dimensions (mm)				
Weight	Approx. 17.8 g	Approx. 17.8 g	Approx. 17.8 g	Approx. 17.8 g
Temperature Range				
Operating Temperature	-30 °C to +75 °C	-30 °C to +75 °C	-30 °C to +75 °C	-30 °C to +75 °C
Extended Temperature	-40 °C to +85 °C	-40 °C to +85 °C	-40 °C to +85 °C	-40 °C to +85 °C
Frequency Bands				
5G NR	3GPP Rel-17 NSA/ SA operation, Sub-6 GHz	3GPP Rel-17 NSA/ SA operation, Sub-6 GHz	3GPP Rel-17 NSA/ SA operation, Sub-6 GHz	3GPP Rel-17 NSA/ SA operation, Sub-6 GHz
5G NR NSA	n1/ 3/ 5/ 7/ 8/ 20/ 26/ 28/ 38/ 40/ 41/ 75/ 76*/ 77/ 78	n2/ 5/ 7/ 12/ 13*/ 14/ 25/ 26/ 29*/ 30/ 38/ 41/ 48*/ 66/ 70*/ 71/ 77/ 78	n1/ 3/ 5/ 7/ 8/ 20/ 26/ 28/ 38/ 40/ 41/ 71②/ 75/ 76*/ 77/ 78	n2/ 5/ 7/ 12/ 13*/ 14/ 25/ 26/ 29*/ 30/ 38/ 41/ 48*/ 66/ 70*/ 71/ 77/ 78
5G NR SA	n1/ 3/ 5/ 7/ 8/ 20/ 26/ 28/ 38/ 40/ 41/ 75/ 76*/ 77/ 78	n2/ 5/ 7/ 12/ 13/ 14/ 25/ 26/ 29/ 30/ 38/ 41/ 48/ 66/ 70/ 71/ 77/ 78	n1/ 3/ 5/ 7/ 8/ 20/ 26/ 28/ 38/ 40/ 41/ 71②/ 75/ 76*/ 77/ 78	n2/ 5/ 7/ 12/ 13/ 14/ 25/ 26/ 29/ 30/ 38/ 41/ 48/ 66/ 70/ 71/ 77/ 78
DL 4 × 4 MIMO	n1/ 3/ 5/ 7/ 8/ 20/ 26/ 28/ 38/ 40/ 41/ 75/ 76/ 77/ 78	n2/ 5/ 7/ 12/ 13/ 14/ 25/ 26/ 29/ 30/ 38/ 41/ 48/ 66/ 70/ 71/ 77/ 78	n1/ 3/ 5/ 7/ 8/ 20/ 26/ 28/ 38/ 40/ 41/ 71②/ 75/ 76/ 77/ 78	n2/ 5/ 7/ 12/ 13/ 14/ 25/ 26/ 29/ 30/ 38/ 41/ 48/ 66/ 70/ 71/ 77/ 78
8RX (optional)	n7/ 38/ 40/ 41/ 77/ 78	n38/ 41/ 48/ 77/ 78	n38/ 40/ 41/ 77/ 78	n38/ 41/ 48/ 77/ 78
LTE Category	Cat 20 (DL)/ Cat 18 (UL)	Cat 20 (DL)/ Cat 18 (UL)	Cat 20 (DL)/ Cat 18 (UL)	Cat 20 (DL)/ Cat 18 (UL)
LTE-FDD	B1/ 3/ 5/ 7/ 8/ 20/ 28/ 32	B2/ 4/ 5/ 7/ 12 (17)/ 13/ 14/ 25/ 26/ 29/ 30/ 66/ 71	B1/ 3/ 5/ 7/ 8/ 20/ 28/ 32/ 71②	B2/ 4/ 5/ 7/ 12 (17)/ 13/ 14/ 25/ 26/ 29/ 30/ 66/ 71
LTE-TDD	B38/ 40/ 41/ 42/ 43	B38/ 41/ 42/ 43/ 48	B38/ 40/ 41/ 42/ 43	B38/ 41/ 42/ 43/ 48
DL 4 × 4 MIMO	B1/ 3/ 5/ 7/ 8/ 20/ 28/ 32/ 38/ 40/ 41/ 42/ 43	B2/ 4/ 5/ 7/ 12/ 13/ 14/ 17/ 25/ 26/ 29/ 30/ 38/ 41/ 42/ 43/ 48/ 66/ 71	B1/ 3/ 5/ 7/ 8/ 20/ 28/ 32/ 38/ 40/ 41/ 42/ 43/ 71②	B2/ 4/ 5/ 7/ 12/ 13/ 14/ 17/ 25/ 26/ 29/ 30/ 38/ 41/ 42/ 43/ 48/ 66/ 71
WCDMA	B1/ 5/ 8	-	B1/ 5/ 8	-
GNSS (optional)	GPS/ GLONASS/ BDS/ Galileo/ QZSS	GPS/ GLONASS/ BDS/ Galileo/ QZSS	GPS/ GLONASS/ BDS/ Galileo/ QZSS	GPS/ GLONASS/ BDS/ Galileo/ QZSS
Certifications				
Regulatory	CE*/ RCM*/ GCF*	FCC*/ IC*/ GCF*/ PTCRB*	CE/ RCM/ GCF*	FCC*/ IC*/ GCF*/ PTCRB*
Carrier	TBD	AT&T*/ Verizon*/ T-Mobile*	TBD	AT&T*/ Verizon*/ T-Mobile*/ Dish*
Others	RoHS	RoHS	RoHS	RoHS
Data Rates (Max.) ①				
5G SA Sub-6	7.01 Gbps (DL)/ 1.25 Gbps (UL)	7.01 Gbps (DL)/ 1.25 Gbps (UL)	4.67 Gbps (DL)/ 1.25 Gbps (UL)	4.67 Gbps (DL)/ 1.25 Gbps (UL)
5G NSA Sub-6	5.47 Gbps (DL)/ 730 Mbps (UL)	5.47 Gbps (DL)/ 730 Mbps (UL)	4.52 Gbps (DL)/ 730 Mbps (UL)	4.52 Gbps (DL)/ 730 Mbps (UL)
LTE	2.0 Gbps (DL)/ 211 Mbps (UL)	2.0 Gbps (DL)/ 211 Mbps (UL)	2.0 Gbps (DL)/ 211 Mbps (UL)	2.0 Gbps (DL)/ 211 Mbps (UL)
WCDMA	42 Mbps (DL)/ 5.76 Mbps (UL)	-	42 Mbps (DL)/ 5.76 Mbps (UL)	-
Interfaces				
(U)SIM	1.8/ 3.0 V × 1; 1.8 V × 1 (eSIM external)	1.8/ 3.0 V × 1; 1.8 V × 1 (eSIM external)	1.8/ 3.0 V × 1; 1.8 V × 1 (eSIM external)	1.8/ 3.0 V × 1; 1.8 V × 1 (eSIM external)
UART	× 3	× 3	× 3	× 3
USB 2.0/ 3.0/ 3.1	× 1	× 1	× 1	× 1
PCIe 3.0	2-Lane × 2, 1-Lane × 1	2-Lane × 2, 1-Lane × 1	2-Lane × 2, 1-Lane × 1	2-Lane × 2, 1-Lane × 1
PCM	× 2	× 2	× 2	× 2
I2C	× 2	× 2	× 2	× 2
SPI	× 2	× 2	× 2	× 2
ADC	●	●	●	●
RESET_N	●	●	●	●
GPIO (QuecOpen®)	●	●	●	●
Antenna	Sub-6 GHz: × 8 ; GNSS: × 1	Sub-6 GHz: × 8 ; GNSS: × 1	Sub-6 GHz: × 8 ; GNSS: × 1	Sub-6 GHz: × 8 ; GNSS: × 1

NOTE:

1. ①: The presented data rates are theoretical only, and actual values depend on network conditions.

2. ②: Optional.

3. *: Under development/In progress.

4. ●: Supported.

5. TBD: To Be Determined.

Quectel RG650E & RG650V Series

	RG650E-EU *	RG650E-NA	RG650V-EU	RG650V-NA
Audio				
Audio	Digital Audio VoLTE/ VoNR (optional)	Digital Audio VoLTE/ VoNR (optional)	Digital Audio VoLTE/ VoNR (optional)	Digital Audio VoLTE/ VoNR (optional)
Enhanced Features				
DTMF	●	●	●	●
FOTA	●	●	●	●
(U)SIM Card Detection	●	●	●	●
Drivers				
USB Serial Driver	Windows 8.1/10/ 11; Linux 2.6–6.7; Android 4.x–13.x	Windows 8.1/10/ 11; Linux 2.6–6.7; Android 4.x–13.x	Windows 8.1/10/ 11; Linux 2.6–6.7; Android 4.x–13.x	Windows 8.1/10/ 11; Linux 2.6–6.7; Android 4.x–13.x
GNSS Driver	Android 4.x–13.x	Android 4.x–13.x	Android 4.x–13.x	Android 4.x–13.x
RIL Driver	Android 4.x–13.x	Android 4.x–13.x	Android 4.x–13.x	Android 4.x–13.x
USB NDIS Driver*	Windows 8.1/10/ 11	Windows 8.1/10/ 11	Windows 8.1/10/ 11	Windows 8.1/10/ 11
USB MBIM Driver	Windows 8.1/10/ 11; Linux 3.18–6.7	Windows 8.1/10/ 11; Linux 3.18–6.7	Windows 8.1/10/ 11; Linux 3.18–6.7	Windows 8.1/10/ 11; Linux 3.18–6.7
USB GobiNet Driver	Linux 2.6–6.7	Linux 2.6–6.7	Linux 2.6–6.7	Linux 2.6–6.7
USB QMI_WWAN Driver	Linux 2.6–6.7	Linux 2.6–6.7	Linux 2.6–6.7	Linux 2.6–6.7
USB RNDIS Driver	Windows 10/11; Linux 2.6–6.7	Windows 10/11; Linux 2.6–6.7	Windows 10/11; Linux 2.6–6.7	Windows 10/11; Linux 2.6–6.7
PCIe MHI Driver	Linux 3.10–6.7	Linux 3.10–6.7	Linux 3.10–6.7	Linux 3.10–6.7
Electrical Features				
Supply Voltage Range	3.3–4.4 V, typ. 3.8 V	3.3–4.4 V, typ. 3.8 V	3.3–4.4 V, typ. 3.8 V	3.3–4.4 V, typ. 3.8 V
Output Power	5G NR: - Class 1.5 (29 dBm +2/ -3 dB) for n38/ 41/ 77/ 78 - Class 2 (26 dBm +2/ -3 dB) for n1/ 3/ 5/ 7/ 28/ 38/ 40/ 41/ 77/ 78 - Class 3 (23 dBm ±2 dB) for Other Sub-6 GHz bands LTE: - Class 2 (26 dBm +2/ -3 dB) for B38/ 41/ 42/ 43 - Class 3 (23 dBm ±2 dB) for Other LTE bands WCDMA: - Class 3 (23 dBm ±2 dB)	5G NR: - Class 1.5 (29 dBm +2/ -3 dB) for n38/ 41/ 77/ 78 - Class 2 (26 dBm +2/ -3 dB) for n2/ 5/ 7/ 25/ 38/ 41/ 66/ 71/ 77/ 78 - Class 3 (23 dBm ±2 dB) for Other Sub-6 GHz bands LTE: - Class 2 (26 dBm +2/ -3 dB) for B38/ 41/ 42/ 43 - Class 3 (23 dBm ±2 dB) for Other LTE bands	5G NR: - Class 1.5 (29 dBm +2/ -3 dB) for n38/ 41/ 77/ 78 - Class 2 (26 dBm +2/ -3 dB) for n1/ 3/ 5/ 7/ 28/ 38/ 40/ 41/ 77/ 78 - Class 3 (23 dBm ±2 dB) for Other Sub-6 GHz bands LTE: - Class 2 (26 dBm +2/ -3 dB) for B38/ 41/ 42/ 43 - Class 3 (23 dBm ±2 dB) for Other LTE bands WCDMA: - Class 3 (23 dBm ±2 dB)	5G NR: - Class 1.5 (29 dBm +2/ -3 dB) for n38/ 41/ 77/ 78 - Class 2 (26 dBm +2/ -3 dB) for n2/ 5/ 7/ 25/ 38/ 41/ 66/ 71/ 77/ 78 - Class 3 (23 dBm ±2 dB) for Other Sub-6 GHz bands LTE: - Class 2 (26 dBm +2/ -3 dB) for B38/ 41/ 42/ 43 - Class 3 (23 dBm ±2 dB) for Other LTE bands
Power Consumption	TBD	TBD	0.22 mA @ power off 2.7 mA @ sleep mode	0.22 mA @ power off 2.7 mA @ sleep mode

NOTE:
1. *: Under development/In progress.
2. ●: Supported.
3. TBD: To Be Determined.

