

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: 1.2 | 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)				
	46.0 mm	46.0 mm	46.0 mm	46.0 mm
	53.0 mm	53.0 mm	53.0 mm	53.0 mm
	3.05 mm	3.05 mm	3.05 mm	3.05 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/ 67/ 71 ^② /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/ 71 ^② / 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/ 67/ 71 ^② / 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/ 71 ^② / 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/ 71 ^② /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/ 71 ^② / 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/ 71 ^②	B2/ 4/ 5/ 7/ 12/ 13/ 14/ 17/ 25/ 26/ 29/ 30/ 66/ 71	B1/ 3/ 5/ 7/ 8/ 20/ 28/ 32/ 71 ^②	B2/ 4/ 5/ 7/ 12/ 13/ 14/ 17/ 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/ 71 ^②	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/ 71 ^②	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*	FCC*/ IC*/ GCF*/ PTCRB*	CE/ RCM/ GCF	FCC/ IC/ GCF/ PTCRB
Carrier	TBD	AT&T*/ Verizon*/ T-Mobile*	TBD	AT&T/ Verizon/ T-Mobile/ EchoStar(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.

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	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 +1/ -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 +1/ -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

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