Senao Networks RM520N-GL Wireless Communication Module with Receive Instructions

Contents

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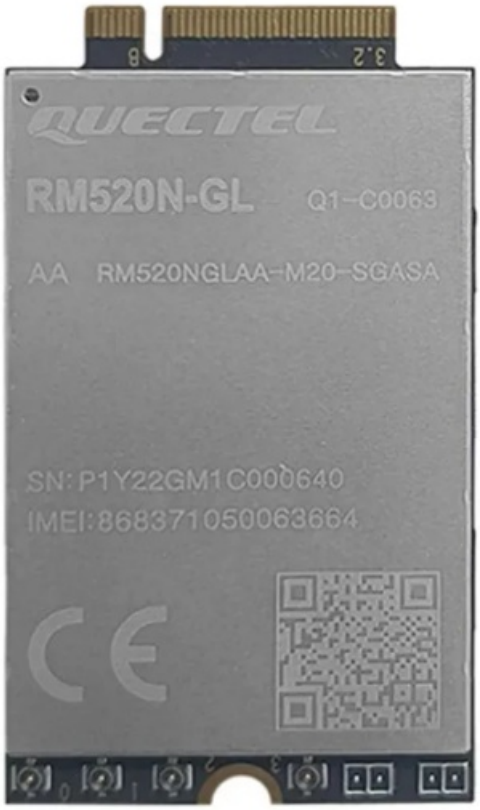

Product Information

Operation Description

RM520N-GL is a 5G NR/LTE-FDD/LTE-TDD/WCDMA wireless communication module with receive diversity. It provides data connectivity on 5G NR SA and NSA, LTE-FDD, LTE-TDD, DC-HSDPA, HSPA+, HSDPA, HSUPA, and WCDMA networks. RM520N-GL is a standard M.2 Key-B WWAN module. For more details, see PCI Express M.2 Specification Revision 4.0, Version 1.0.

RM520N-GL supports embedded operating systems such as Windows, Linux, and Android, and also provides GNSS and voice* functionality to meet specific application demands.

RM520N-GL is an industrial-grade module for industrial and commercial applications only.

Frequency Bands & MIMO & GNSS Systems

Mode	Frequency Bands	MIMO	GNSS Systems
5G NR SA	B1/B2/B4/B5/B8/B19		
5G NR NSA			
LTE-FDD			
WCDMA			
GNSS			GPS/GLONASS/BDS/Galileo/QZSS

The module can be applied to the following fields:

- Rugged tablet PC and laptop computer
- Remote monitor system

- Smart metering system
- Wireless CPE
- Smart TV
- Outdoor live devices
- Wireless router and switch
- Other wireless terminal devices

Key Features

Feature Function Interface Power Supply (U)SIM Interface
eSIM USB Interface PCIe Interface Transmitting Power

Details
PCI Express M.2 Interface
eSIM function is optional
Compliant with USB 3.1 Gen2 and USB 2.0 specifications
Maximum transmission rates: 5G NR Features, LTE Features, UMTS Features
Rx-diversity GNSS Features
Antenna Interfaces AT Commands Internet Protocol Features

1 HPUE is only for single carrier. 2 5G NR FDD bands only support 15 kHz SCS, and NR TDD bands only support 30 kHz SCS. 3 See CA & ENDC list for bandwidth supported by each frequency band in the NSA and SA modes. 4 The maximum rates are theoretical and the actual values refer to the network configuration. 5 525 Mbps is the typical value; while 550 Mbps is the theoretical data rate when the UL 256QAM of both LTE and 5G NR are enabled (LTEUL 256QAM in EN-DC is disabled by default and has not been deployed by operators, and it is not fully tested).

Firmware Upgrade

SMS

Physical Characteristics Temperature Range RoHS

All hardware components are fully compliant with EU RoHS directive

OEM Installation Guidance

For Senao 5G Sub-6 GHz M.2 Module

FCC ID: U2M-2022RM520NGL, IC: 3616C-022RM520NGL

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate this equipment.

The final host manual shall include the following regulatory statement:

Canada – Industry Canada (IC)

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Operation Description

General Description
RM520N-GL is a 5G NR/LTE-FDD/LTE-TDD/WCDMA wireless communication module with receive diversity. It provides data connectivity on 5G NR SA and NSA, LTE-FDD, LTE- TDD, DC-HSDPA, HSPA+, HSDPA, HSUPA and WCDMA networks. RM520N-GL is standard M.2 Key-B WWAN module. For more details, see PCI Express M.2 Specification Revision 4.0, Version 1.0

RM520N-GL supports embedded operating systems such as Windows, Linux and Android,and also provides GNSS and voice* functionality to meet specific application demands.
RM520N-GL is an industrial-grade module for industrial and commercial applications only.
The following table shows the frequency bands, MIMO and GNSS systems supported by the module.

Table 1: Frequency Bands & MIMO & GNSS Systems

Mode	Frequency Bands
5G NR SA	n1/n2/n3/n5/n7/n8/n12/n13/n14/n18/n20/n25/n26/n28/n29/n30/n38/n40/n41/ n48/n66/n70/n71/n75/n76/n77/n78/n79 DL 4 × 4 MIMO: n1/n2/n3/n7/n25/n30/n66/n38/n40/n41/n48/n70/n77/n78/n79 UL 2 × 2 MIMO: n38/n41/n48/n77/n78/n79
5G NR NSA	n1/n2/n3/n5/n7/n8/n12/n13/n14/n18/n20/n25/n26/n28/n29/n30/n38/n40/n41/n 48/ n66/n70/n71/n75/n76/n77/n78/n79 DL 4 × 4 MIMO: n1/n2/n3/n7/n25/n30/n66/n38/n40/n41/n48/n70/n77/n78/n79
LTE-FDD	FDD: B1/B2/B3/B4/B5/B7/B8/B12/B13/B14/B17/B18/B19/B20/B25/B26/B28/B29/ B30/B32/B66/B71 TDD: B34/B38/B39/B40/B41/B42/B43/B46(LAA)/B48 DL 4 × 4 MIMO: B1/B2/B3/B4/B7/B25/B30/B38/B40/B41/B42/B43/B48/B66
WCDMA	B1/B2/B4/B5/B8/B19
GNSS	GPS/GLONASS/BDS/Galileo/QZSS

The module can be applied to the following fields:

- Rugged tablet PC and laptop computer
- Remote monitor system
- Smart metering system
- Wireless CP
- Smart TV
- Outdoor live devices
- Wireless router and switch
- Other wireless terminal devices

Key Features

Feature	Details
Function Interface	PCI Express M.2 Interface
Power Supply	• Supply voltage: 3.135–4.4 V • Typical supply voltage: 3.7 V
(U)SIM Interface	• Compliant with *ISO/IEC 7816-3*, ETSI and IMT-2000 • Supported (U)SIM card: Class B (3.0 V) and Class C (1.8 V) • (U)SIM1 and (U)SIM2 interfaces • Dual SIM Single Standby
eSIM	eSIM function is optional
USB Interface	• Compliant with USB 3.1 Gen2 and USB 2.0 specifications • Maximum transmission rates: – USB 3.1 Gen2: 10 Gbps – USB 2.0: 480 Mbps • Used for AT command communication, data transmission, firmware upgrade (USB 2.0 only), software debugging, GNSS NMEA sentence output and voice over USB* • Supported USB serial drivers: – Windows 7/8/8.1/10, – Linux 2.6–5.15 – Android 4.x–12.x
PCIe Interface	• Complaint with PCIe Gen 4 • PCIe × 1 lane, supporting up to 16 Gbps • Used for AT command communication, data transmission, firmware upgrade, software debugging, GNSS NMEA sentence output
Transmitting Power	• 5G NR bands: Class 3 (23 dBm ±2 dB) • 5G NR n38/n40/n41/n77/n78/n79 bands HPUE: Class 2 (26 dBm +2/-3 dB)

	• LTE bands: Class 3 (23 dBm ±2 dB) • LTE B38/B41/B42/B43 bands HPUE [1]: Class 2 (26 dBm ±2 dB) • WCDMA bands: Class 3 (24 dBm +1/-3 dB)
5G NR Features	• Supports 3GPP Rel-16 • Supported modulations: - Uplink: π/2-BPSK, QPSK, 16QAM, 64QAM and 256QAM - Downlink: QPSK, 16QAM, 64QAM and 256QAM • Supports SCS 15 kHz [2] and 30 kHz [2] • Supports SA [3] and NSA [3] operation modes on all the 5G band • Supports Option 3x, 3a, 3 and Option 2 • Max. transmission data rates [4]: NSA: 3.2 Gbps (DL)/525/550 [5] Mbps (UL) SA: 2.4 Gbps (DL)/ 900 Mbps (UL)
LTE Features	• Supports 3GPP Rel-16 • LTE Category: DL Cat 19/ UL Cat 18 • Supported modulations: - Uplink: QPSK, 16QAM and 64QAM and 256QAM - Downlink: QPSK, 16QAM and 64QAM and 256QAM • Supports 1.4/3/5/10/15/20 MHz RF bandwidth • Max. transmission data rates [4]: LTE: 1.6 Gbps (DL)/ 200 Mbps (UL)
UMTS Features	• Supports 3GPP Rel-9 DC-HSDPA, HSPA +, HSDPA, HSUPA and WCDMA • Supports QPSK, 16QAM and 64QAM modulation • Max. transmission data rates [4]: - DC-HSDPA: 42 Mbps (DL) - HSUPA: 5.76 Mbps (UL) - WCDMA: 384 kbps (DL)/ 384 kbps (UL)
Rx-diversity	• Supports 5G NR/LTE/WCDMA Rx-diversity
GNSS Features	• Protocol: *NMEA 0183* • Data Update Rate: 1 Hz
Antenna Interfaces	• ANT0, ANT1, ANT2, and ANT3
AT Commands	• Compliant with *3GPP TS 27.007* and *3GPP TS 27.005* • Quectel enhanced AT commands
Internet Protocol Features	• Supports NITZ, PING and QMI protocols • Supports PAP and CHAP for PPP connections

1. HPUE is only for single carrier.
2. 5G NR FDD bands only support 15 kHz SCS, and NR TDD bands only support 30 kHz SCS.
3. See CA & ENDC list for bandwidth supported by each frequency band in the NSA and SA modes.
4. The maximum rates are theoretical and the actual values refer to the network configuration.
5. 525 Mbps is the typical value; while 550 Mbps is the theoretical data rate when the UL 256QAM of both LTE and 5G NR are enabled (LTEUL 256QAM in EN-DC is disabled by default and has not been deployed by operators, and it is not fully tested).

Firmware Upgrade	• USB 2.0 interface • PCIe interface • (D)FOTA (support A/B system)
SMS	• Text and PDU modes • Point-to-point MO and MT • SMS cell broadcast • SMS storage: ME by default
Physical Characteristics	• M.2 Key-B • Size: 30.0 mm × 52.0 mm × 2.3 mm • Weight: approx. 8.7 g
Temperature Range	• Operating temperature range: -30 °C to +75 °C [6] • Extended temperature range: -40 °C to +85 °C [7] • Storage temperature range: -40 °C to +90°C
RoHS	All hardware components are fully compliant with EU RoHS directive

CA & ENDC:

CA:

UL CA_1C; UL CA_3C; UL CA_5B; UL CA_7C; UL CA 38C; UL CA_40C

UL CA_41C; UL CA_42C; UL CA_1A-3A; UL CA_1A-5A; UL CA_1A-7A;UL CA_1A-8A

UL CA_1A-28A;UL CA_3A-5A;UL CA_3A-7A;UL CA_3A-8A;

UL CA_3A-20A; UL CA_7A-20A; UL CA_7A-28A;

DL CA_20A-32A;DL CA_1A-46A;DL CA_3A-46A;DL CA_7A-46A

ENDC:

•_3A_n7A;

DC_5A_n7A;DC_1A_n8A;DC_

DC_7A_n28A;DC_20A_n28A;DC_1A_n38A;DC_5A_n38A;DC_1A_n40;

DC_3A_n40A;DC_5A_n40A;DC_8A_n40A;DC_1A_n41A;DC_5A_n41A;

DC_1A_n77A;DC_

_3A_n77A;DC_5A_n77A;DC_7A_n77A;DC_8A_n77A;

DC_20A_n77A;DC_ 28A_n77A;DC_40A_n77A;DC_1A_n78A;DC_3A_n78A;

DC_5A_n78A;DC_7A_n78A;DC_8A_n78A;DC_20A_n78A;DC_28A_n78A;

DC_38A_178A;

6. To meet this operating temperature range, you need to ensure effective thermal dissipation, for example, by adding passive or active heatsinks, heat pipes, vapor chambers, etc. Within this range, the module can meet 3GPP specifications.
7. To meet this extended temperature range, you need to ensure effective thermal dissipation, for example,by adding passive or active heatsinks, heat pipes, vapor chambers, etc. Within this range, the module remains the ability to establish and maintain functions such as voice*, SMS, emergency call*, etc., without any unrecoverable malfunction. Radio spectrum and radio network are not influenced, while one or more specifications, such as Pout, may undergo a reduction in value, exceeding the specified tolerances of 3GPP. When the temperature returns to the normal operating temperature level, the module will meet 3GPP specifications again.

OEM Installation Guidance

For Senao 5G Sub-6 GHz M.2 Module

- OEM integrators must ensure that its product is electrically identical to Senao's reference designs.
  Any modifications to Senao's reference designs may invalidate regulatory approvals in relation to the product, or may necessitate notifications to the relevant regulatory authorities.
- OEM integrators are responsible for regression testing to accommodate changes to designs, new antennas, and host and submit for C2PC filings.
  Colocation with other transmitter modules will be addressed through filings for those co-located transmitters when necessary or that colocation of other transmitters will be according to applicable KDB guidelines including those for RF exposure
- The final system integrator must ensure there is no instruction provided in the user manual or customer documentation indicating how to install or remove the transmitter
- Appropriate labels must be affixed to the product that complies with applicable regulations in all respects. The regulatory label on the final system must include the statement: "Contains FCC ID: U2M-2022RM520NGL and/or IC: 3616C-022RM520NGL".
- A user's manual or instruction manual must be included with the product that contains the text as required by applicable law shall be provided to OEM integrators. They may include: 1. USA—Federal Communications Commission (FCC)

FCC COMPLIANCE STATEMENT

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

INFORMATION TO USER:
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instructions, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by tuning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the distance between the equipment and the receiver.
- Connect the equipment to outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

The final host manual shall include the following regulatory statement:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instructions, it may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by tuning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

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Canada - Industry Canada (IC)
This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Radiation Exposure Statement:
The product comply with the FCC/IC portable RF exposure limit set forth for an uncontrolled environment and are safe for intended operation as described in this manual. The further RF exposure reduction can be achieved if the product can be kept as far as possible from the user body or set the device to lower output power if such function is available.

Information on test modes and additional testing requirements
This transmitter is tested in a standalone mobile RF exposure condition and any co-located or simultaneous transmission with other transmitter(s) or portable use will require a separate class II permissive change re-evaluation or new certification.
Additional testing, Part 15 Subpart B disclaimer
This transmitter module is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to the final host. The final host will still need to be reassessed for compliance to this portion of rule requirements if applicable.
As long as all conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

IMPORTANT NOTE:
In the event that these conditions can not be met (for example certain laptop configurations or colocation with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

Manual Information to the End User
The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.
The end user manual shall include all required regulatory information/warning as show in this manual.

OEM/Host manufacturer responsibilities
OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market. This includes reassessing the transmitter module for compliance with the Radio and EMF essential requirements of the FCC rules. This module must not be incorporated into any other device or system without retesting for compliance as multiradio and combined equipment

FOR MOBILE DEVICE USAGE
Radiation Exposure Statement:
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

IMPORTANT NOTE:
In the event that these conditions can not be met (for example certain laptop configurations or colocation with another transmitter), then the Canada authorization is no longer considered valid and the IC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

End Product Labeling FOR MOBILE DEVICE USAGE
This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with greater than 20cm between the radiator & your body. The final end product must be labeled in a visible area with the following: “Contains IC: 3616C-022RM520NGL”.

Manual Information to the End User
The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user’s manual of the end product which integrates this module.
The end user manual shall include all required regulatory information/warning as show in this manual.

Documents / Resources

	Senao Networks RM520N-GL Wireless Communication Module with Receive [pdf] Instructions U2M-2022RM520NGL, U2M2022RM520NGL, 2022rm520ngl, RM520N-GL, RM520N-GL Wireless Communication Module with Receive, Wireless Communication Module with Receive, Communication Module with Receive, Module with Receive