



RFN-SMART915T-4NQ-xyz
RFN-SMART433T-4NQ-xyz
RFN-SMART915T-3GQ-xyz
RFN-Gate433T-4GQ-xyz

User Manual

Rev. 1.1 – 12/11/2019



Front View



Back View



1. Overview

The RF-Gate is a complete RF Terminal solution for RF 433/915 Mhz applications.
Based on Quectel Cellular modems and CC1310 radio.

2. Hardware Interface Description

2.1 Main features of the RF-Gate

Feature	Implementation
Incorporates combination of Short Range and CELLULAR modems, as well as GPS and WiFi	The SMART Linux module handles all RF CELLULAR GPS processing
Product Modem	<ul style="list-style-type: none"> • Quectel 3/4G Cellular Modems • CC1310 Short Range Radio • Mediatec Mips processor + WiFi core + LAN • GPS modem (on request)
Power supply	Single supply voltage 8V DC to 55V DC connector 4 pin micro-fit 3mm
GPIO	1x Open collector drive 100ma 1x RELAY 1A 30V 2x Inputs opto couplers, 0-55v 2 analog inputs 0-30V
Communication	1x RS232, connector D-Type 9pin (DB-9) 1x RJ45 ETHERNET PORT 1x micro USB (HOST)
Antennas	RF, CELLULAR, WiFi and GPS via SMA connectors
Processor	MT7688 (in smart versions) <ul style="list-style-type: none"> • 580 MHz MIPS CPU.
Memory	<ul style="list-style-type: none"> • 32MB flash and 128MB DDR2 RAM. • Micro SD slot.
Programming	<ul style="list-style-type: none"> • Linux • Python • C



2.1.1 Product Family

Product -> Modems	P/N	RF	GPS	Cellular	LAN	WiFi	Linux
		CC1310	L70	xG91	Linkit 7688		
4G+GPS+WiFi+LAN 915 Radio	RFN-SMART915T-4NQ-xyz	915Mhz	option "y"	EG95-NA	V	V	V
4G+GPS+WiFi+LAN 433 Radio	RFN-SMART433T-4NQ-xyz	433Mhz			V	V	V
3G+GPS+WiFi+LAN 915 Radio	RFN-SMART915T-3GQ-xyz	915Mhz		UG	V	V	V
4G+GPS+ 433 Radio	RFN-Gate433T-4GQ-xyz	433Mhz	V	BG96	-	-	-

Naming convention

NNN Radio frequency 433 or 915

abc Modem type

- 4: 4G,
- GN: Global Narrow band LTE,
- NA: North America, etc.
- 3G: 3G global

xyz

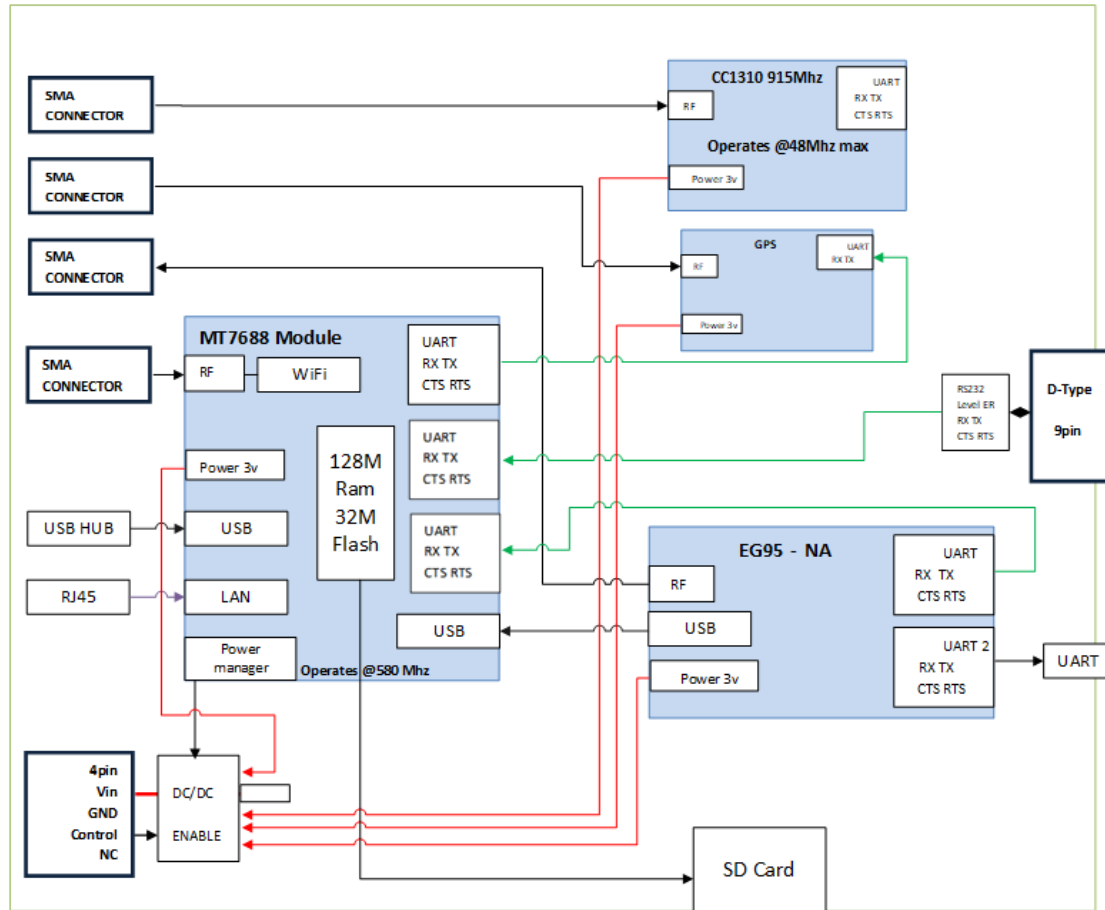
x: B for battery installed, 0 no

y: G:GPS, 0 GPS not present

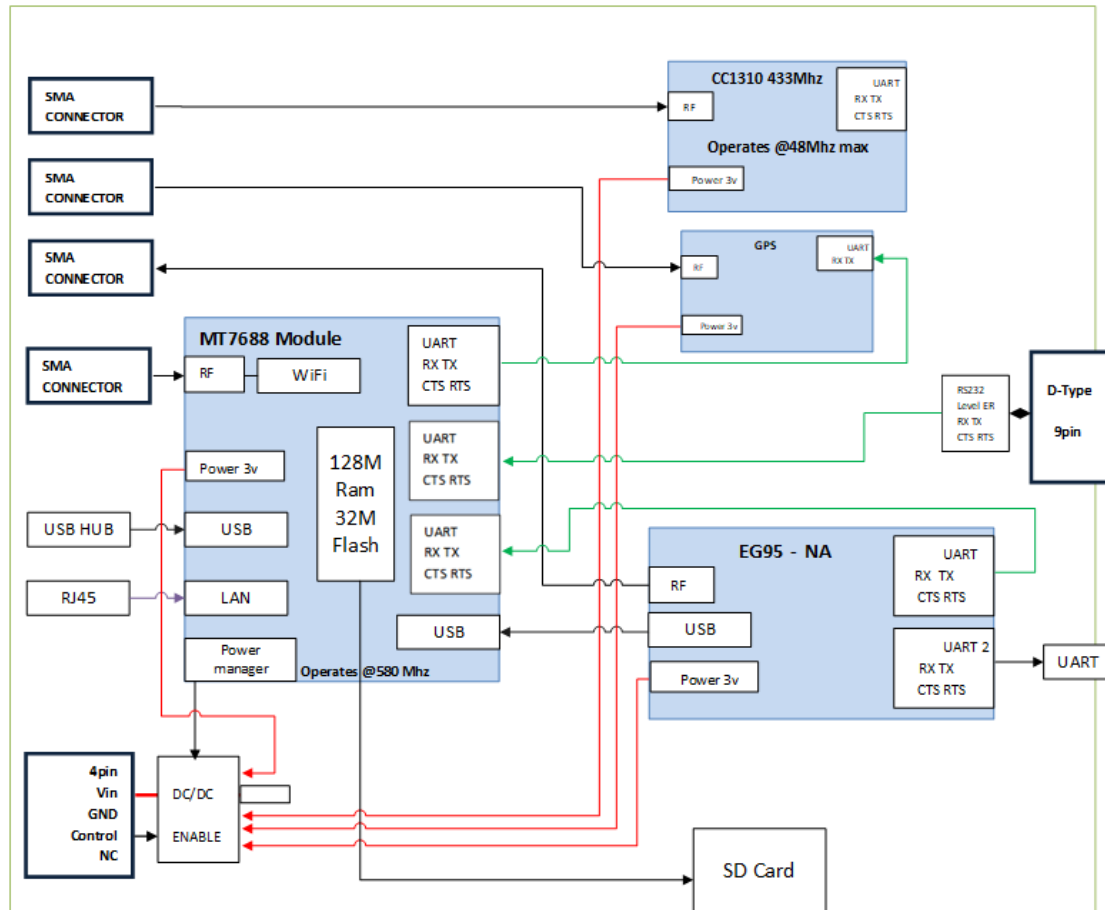
z: SW related

2.2 Hardware block diagram

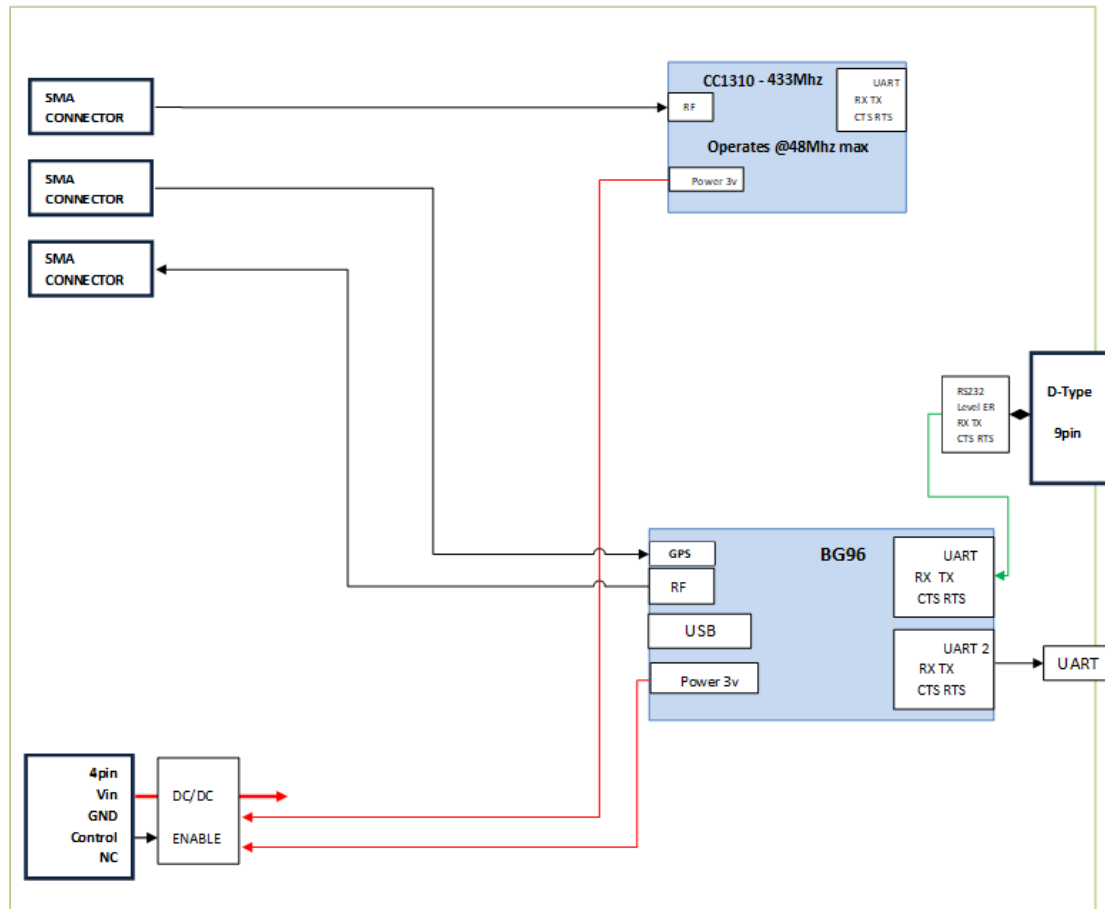
2.2.1 Option: RFN-SMART915T-4NQ-xyz



2.2.2 Option: RFN-SMART433T-4NQ-xyz



2.2.3 Option: RFN-GATE433T-4GQ-xyz



3. Interface description

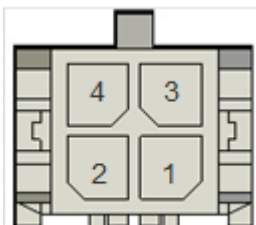
3.1 Molex 4 pin connector – Power connector

3.1.1 Power Supply

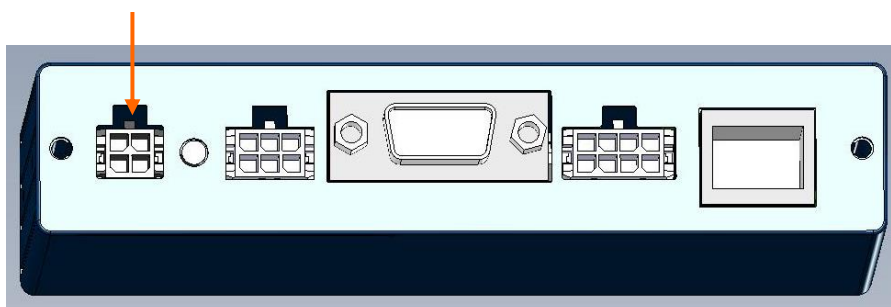
The power supply of the RF-Gate Terminal requires a single voltage source of POWER 6V-55V capable of providing a peak during an active transmission. The RF-Gate Terminal is protected against supply voltage reversal. An internal fuse 1.1A 60V ensures an electrical safety according to EN60950-1. This fuse is not removable. A fast blow fuse of 0.8A is necessary for 24V power supply system (for vehicles). The power supply recommended being any safety approved power supply certified IEC 60950-1 or EN 60950-1 or UL 60950-1 with limited output current up to 2A. The type of the receptacle assembled on the RF-Gate Terminal is 4 pin Micro Mate-N-LOK 3mm (0.11 inch) from MOLEX.

Pin	Signal name	Use
1	POWER	Input Power supply range 6-55V
2	Power Enable	Control pin to turn ON/OFF Terminal power. When putting this pin to voltage >6V the unit will be turn OFF. When putting this pin OPEN or GND the unit will be turn ON.
3	GND	Ground
4	Analog	Analog Input 0-30V or current measurement 4-20mA

Pin assignment of the power plug including power supply and Power Enable



Male 4-pole plug for power supply
To use with MOLEX MICRO FIT 3mm
PART NUMBER 43025-0400



3.1.2 Supply voltage requirements

The DC power supply must be connected to the POWER input:

- Input voltage range 6 - 55V DC
- Nominal Voltage 12V DC

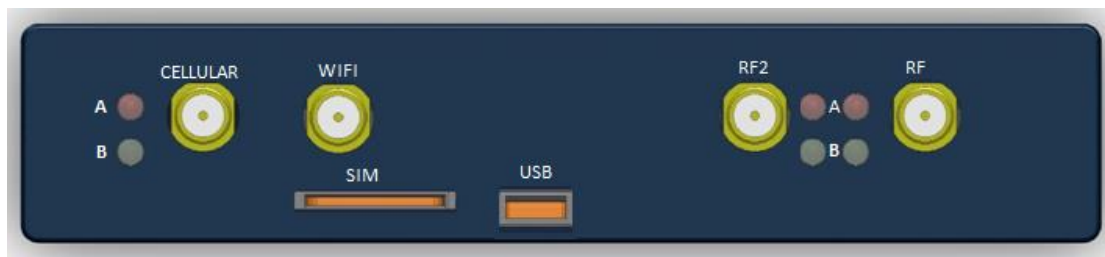
- Power Supply current rating: max. 2A @12V (if USB is used, use 3A Power supply)
- Power Supply ripple: max. 120mV
- Input current in idle mode: 20mA @ 12V
- Input average current in communication mode: 100mA @ 12V

3.3 SMA CONNECTORS AND LEDs

3.3.1 SMA Antennas connection

The RF-Gate Terminal uses SMA CONNECTORS for ANTENNAS.

RF Antenna:	In RF 433Mhz use the 433Mhz ANTENNA with 2dB gain or more. In RF 2.4Ghz use the 2.4Ghz ANTENNA with 2dB gain or more.
CELLULAR Antenna	4 band 3G ANTENNA with 2.5dB gain.
GPS/RF2 Antenna	ACTIVE GPS ANTENNA with 25-28dB gain. (in RFN-SMART915-4NQ-x0z, RFN-SMART433-4NQ-x0z is used for cellular Antenna diversity)



3.3.2 LED indications

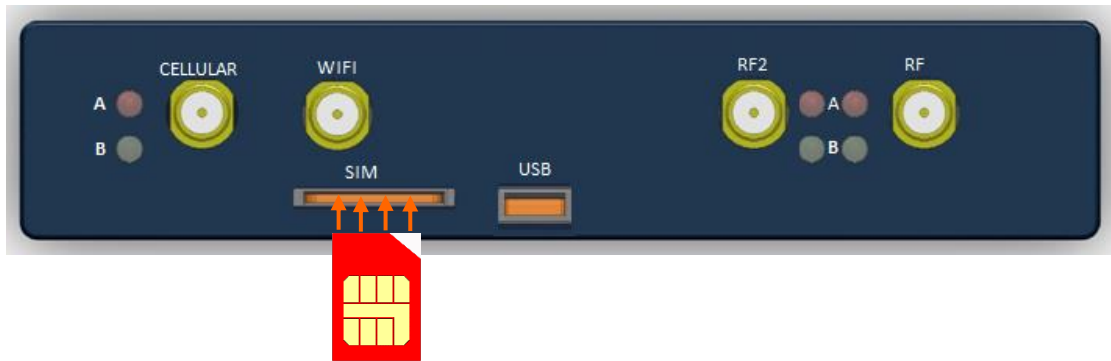
Upon power on, the designated LEDs should act as follows

- CELLULAR_B LED Modem Status, when On the Cellular Modem is ON
 - Fast blinks (around 2 per second) - search for cellular network
 - Slow blink (every 2 sec) - connected to a cellular network
- CELLULAR_A LED turns on when it is connected to the communication server
 - 2 seconds Slow Blink (200ms ON/1800ms OFF) Low Network Search
 - 2 seconds Slow Blink (1800ms ON/200ms OFF) modem in IDLE
 - Fast blink 4 per second, Data Transfer is Ongoing
 - Always High, Voice calling (not in USE)
- RF LED
 - In STAR versions
 - RF_B LED blinks on RF activity
 - RF_A LED blinks when moving the data between the RF and the Smart or 3G Module
 - In Receiver versions
 - RF_B LED blinks when receiving an RF tag data transmission
 - RF_A LED blinks when moving the data to the Smart or 3G Module
 - In Coordinator Versions
 - RF_B LED blinks means the RF is not configured
 - RF_B LED steady ON coordinator is on
 - RF_B LED steady ON coordinator is in Boot Loader
 - RF_A LED always off

- RF2_B (GPS) LED SMART TBD, USED SW dependent
- RF2_A (GPS) LED GPS blinks one per seconds if GPS present

3.4 SIM DRAWER OPTION CELLULAR COORDINATOR

Please insert the SIM card on the following direction into the SIM push-push.



3.4 USB connector

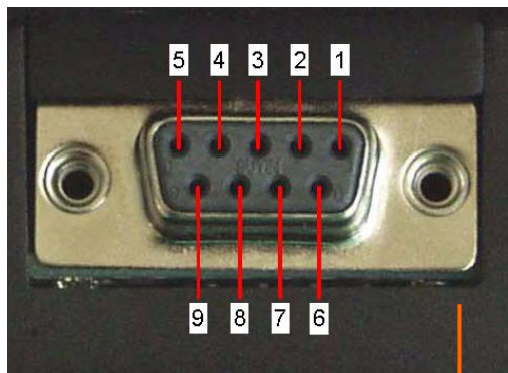
In 3G versions, for programming and debugging the Telit GSM module

In Smart Version the USB is connected to a USB Hub managed by the Linux, any standard USB2 device can be connected to this port (max current supply 500mA fuse protected)

(Managed by Linux, required user SW and device drivers to operate it)

3.5 RS-232 Interface

The serial interface of the RF-Gate is intended for the communication between the RF module and the host application. This RS-232 interface is a data and control interface for transmitting data. It accepts, AT commands and provides multiplexed channels. EMC immunity complies with the vehicular environment requirements according to EN 301 489-7. The user interface of the RF-Gate is accessible from a Data Terminal Equipment DTE connected to the RS232 interface and it is managed by AT commands according to the specification. The supported commands are listed in the AT Commands Reference Guide.



Pin assignment RS-232

Pin no.	Signal name	I/O	Function of application
1		O	NC
2	RXD	O	Receive Data
3	TXD	I	Transmit Data
4		I	NC
5	GND	-	Ground
6			NC
7	RTS	I	Request To Send
8	CTS	O	Clear To Send
9			NC

D-Type 9 pin female RS232



Connector type on the terminal is:

- RS-232 through D-Type 9-pin female
- Baud rate from 300 to 230,400 bit/s
- Short circuit (to Ground) protection on all outputs.
- Input voltage range: -12V to +12V

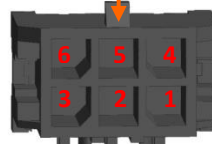
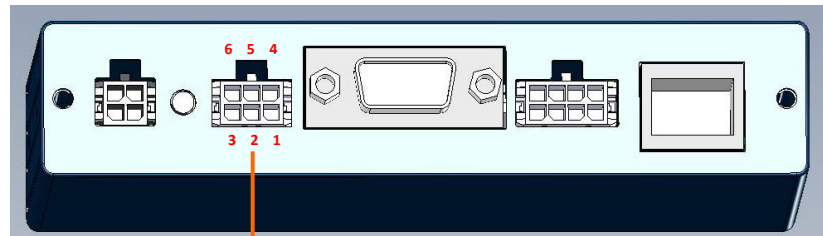
3.6 AUX A Interface

The AUX interface provides via Male 6-pole plug connector, the following options:

- Power control pin – To be use with internal PMW for 125khz transmitter
- GPS PPS – direct output of PPS for Time stamp
- TX AUX and RX AUX of the Modem
- Ground pin, VIN pin to supply to external board (after input diode and spick suppressor)

Pin assignment

1. POWER CONTROL / GPO
2. GPS PPS/Analog Input
3. VIN
4. RX AUX MODEM/I2C
5. TX AUX MODEM/I2C
6. GND



Male 6-pole plug.
To use with MOLEX MICRO FIT
PART NUMBER 43025-0600.

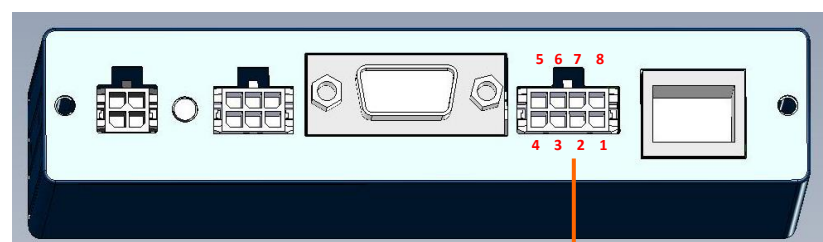
3.6 AUX B Interface

The AUX interface provides via Male 6-pole plug connector, the following options:

- 2 digital inputs opto couplers, input 0-55vdc.
- 2 outputs opto couplers, drive up to 100ma, external diode needed when driving a relay.
- 1 ADC (10 bit) input 0-55v.
- 1 Ground pin.

Pin assignment

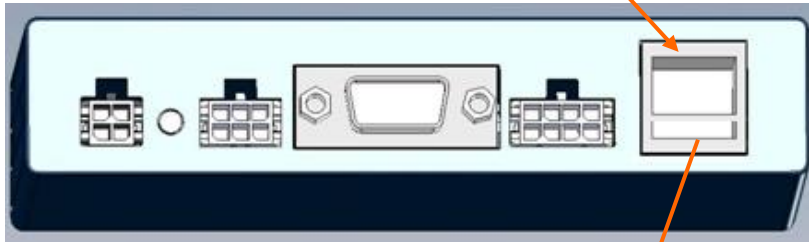
1. POWER 4V
2. RELAY A
3. RELAY B
4. GND MAIN
5. INPUT A OPTOCOUPLER
6. INPUT B OPTOCOUPLER
7. OPEN COLLECTOR
8. GND OPTOCOUPLER



Male 8-pole plug.
To use with MOLEX MICRO FIT
PART NUMBER 43025-0800.

3.7 ETHERNET Interface

The ETHERNET interface provides via RJ45 connector.



3.7 USB Type A Interface

General propose Type A USB connector (max current supply 500mA fuse protected)
 (Managed by Linux, required user SW and device drivers to operate it)

4. Mechanical Characteristics

4.1 General mechanical description

Weight	180g
Dimensions (max) L x W x H	147mm x 71.5mm x 34mm
Case material	Aluminum

Operating temperature range	-20°C to +55°C -4°F to 131°F ambient temperature	The module is fully functional (*) in all the temperature range and it fully meets the ETSI specifications.
	-30°C to +70°C -22°F to 158°F	The module is fully functional (*) in all the temperature range. Temperatures outside of the range -20°C to +55°C (-4°F to 131°F) might slightly deviate from ETSI specifications.
Humidity	5% - 85%	



1) Short Range

- a. **433 MHZ** FSK modulation up to 10 dbm (emitted power) using an external 3dbm antenna)
- b. **915 MHZ** FSK modulation up to 14 dbm (emitted power) using an external 3dbm antenna)

2) Cellular (From Quectel Datasheets)

EG95-NA

LTE FDD	B2/B4/B5/B12/B13	
WCDMA	B2/B4/B5	
Carrier	Verizon/ AT&T/ T-Mobile/ Telus/ U.S. Cellular/ Rogers/ Telus	
Regulatory	GCF/ FCC/ PTCRB/ IC WHQL	
Output Power	Class 3 (23dBm \pm 2dB) for LTE FDD Class 3 (24dBm+1/-3dB) for WCDMA Class 4 (33dBm \pm 2dB) for EGSM900 Class 1 (30dBm \pm 2dB) for DCS1800 Class E2 (27dBm \pm 3dB) for EGSM900 8-PSK Class E2 (26dBm \pm 3dB) for DCS1800 8-PSK	
Data	LTE FDD	Max 150Mbps (DL)/Max 50Mbps (UL)
	UMTS	DC-HSDPA: Max 42Mbps (DL) HSUPA: Max 5.76Mbps (UL) WCDMA: Max 384Kbps (DL)/Max 384Kbps (UL)
	GSM	EDGE: Max 296Kbps (DL)/Max 236.8Kbps (UL) GPRS: Max 107Kbps (DL)/Max 85.6Kbps (UL)

UG96

UMTS	800/850/900/1900/2100MHz	
GSM	850/900/1800/1900MHz	
Output Power	Class 3 (24dBm +1.7/-3.7dB) for UMTS bands Class E2 (27dBm \pm 3dB) for GSM850 and EGSM900 Class E2 (26dBm \pm 3dB) for DCS1800 and PCS1900 Class 4 (33dBm \pm 2dB) for GSM 850/900 Class 1 (30dBm \pm 2dB) for GSM 1800/1900	
Approvals	CE/FCC/GCF/PTCRB	
Data	HSUPA	Max.5.76Mbps
	HSDPA	Max 7.2Mbps
	UMTS	Max.384Kbps (DL)/Max.384Kbps (UL)
	EDGE	Max.296Kbps (DL)/Max 236.8kbps (UL)
	GPRS	Max.107Kbps (DL)/Max.85.6Kbps (UL)
	CSD	14.4Kbps

BG96

LTE FDD	Cat M1/Cat NB1 B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B26/B28	
LTE TDD	B39 (For Cat M1 Only)	
EGPRS	850/900/1800/1900MHz	
Output Power	23dBm	
Approvals	GCF/Deutsche Telekom (Europe) FCC/PTCRB/Verizon/AT&T/T-Mobile*/Sprint* (North America) RCM/Telstra (Australia) Telefonica* (Spain) IFETEL (Mexico) IC/BELL*/Telus (Canada) JATE/TELEC/KDDI/SoftBank* (Japan) KC*/SKT* (Korea) IMDA (Singapore) CCC (China)	
Data	Cat M1: Max. Cat NB1: EDGE: GPRS:	375Kbps (DL), Max. 375Kbps (UL) Max. 32Kbps (DL), Max. 70Kbps (UL) Max. 296Kbps (DL), Max. 236.8Kbps (UL) Max. 107Kbps (DL), Max. 85.6Kbps (UL)
GPS	GPS, GLONASS, BeiDou/Compass, Galileo, QZSS	



Class B information

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the 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 and, if not installed and used in accordance with the instructions, 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 turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- a) Reorient or relocate the receiving antenna.*
- b) Increase the separation between the equipment and receiver.*
- c) Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.*
- d) Consult the dealer or an experienced radio/TV technician.*

RF-Networks has not approved any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

Interference 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 interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Wireless notice

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

RF Exposure Warnings



1. **Mobile Device RF Exposure Statement (If Applicable):**

a. **Mobile Device definition:**

(§2.1091) (b)

A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.

§2.1091d(d)(4)

In some cases (for example, modular or desktop transmitters), the potential conditions of use of a device may not allow easy classification of that device as either Mobile or Portable. In these cases, applicants are responsible for determining minimum distances for compliance for the intended use and installation of the device based on evaluation of either specific absorption rate (SAR), field strength, or power density, whichever is most appropriate.

b. **Statement in UM:**

RF Exposure - This device is only authorized for use in a mobile application. At least 20 cm of separation distance between the (Product Name) device and the user's body must be maintained at all times.