

EG915U Series

Hardware Design

LTE Standard Module Series

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Status: Released

1 Introduction

This document defines the EG915U series module and describes its air interfaces and hardware interfaces which are connected with relate to customers' applications.

It can help customers quickly understand interface specifications, electrical and mechanical details, as well as other related information of the module. Associated with application notes and user guides, customers can use this module to design and to set up mobile applications easily.

1.1. Special Mark

Table 1: Special Mark

Mark	Definition
*	Unless otherwise specified, when an asterisk (*) is used after a function, feature, interface, pin name, AT command, or argument, it indicates that the function, feature, interface, pin, AT command, or argument is under development and currently not supported; and the asterisk (*) after a model indicates that the sample of such model is currently unavailable.

2 Product Overview

EG915U series module is an LTE-FDD, LTE-TDD and GSM wireless communication module, which provides data connectivity on LTE-FDD, LTE-TDD and GPRS networks. It also provides voice functionality, Bluetooth and Wi-Fi Scan¹ to meet your specific application demands. Related information and details are listed in the table below:

Table 2: Brief Introduction of the Module

Categories	
Packaging and pins number	126-pin; LGA
Dimensions	(23.6 ±0.2) mm × (19.9 ±0.2) mm × (2.4 ± 0.2)mm
Weight	2.5 ±0.2 g
Wireless network functions	LTE/GSM/Bluetooth/Wi-Fi Scan ¹
Variants	EG915U-CN ² ; EG915U-EU; EG915U-LA

2.1. Frequency Bands and Functions

Table 2: Wireless Network Type

Wireless Network Type	EG915U-CN	EG915U-EU	EG915U-LA
LTE-FDD	B1/B3/B5/B8	B1/B3/B5/B7/B8/B20/B28	B2/B3/B4/B5/B7/B8/B28/B66
LTE-TDD	B34/B38/B39/B40/B41	-	-
GSM	900/1800 MHz	850/900/1800/1900 MHz	850/900/1800/1900 MHz
Bluetooth and Wi-Fi Scan ¹	2.4 GHz	2.4 GHz	2.4 GHz

¹ EG915U series support Bluetooth and Wi-Fi Scan functions. Due to the shared antenna interface, the two functions cannot be used simultaneously. Bluetooth and Wi-Fi Scan functions are optional (both supported or not), please contact Quectel Technical Support for details.

² Only EG915U-CN provides LTE-TDD, please consult Quectel Technical Support for details.

2.2. Key Features

The following table describes the detailed features of EG915U series module.

Table 4: Key Features of EG915U Series Module

Features	Description
Power Supply	<ul style="list-style-type: none">● Supply voltage: 3.3–4.3 V● Typical supply voltage: 3.8 V
Transmitting Power	<p>EG915U-CN:</p> <ul style="list-style-type: none">● EGSM900: Class 4 (33 dBm \pm2 dB)● DCS1800: Class 1 (30 dBm \pm2 dB)● LTE-FDD: Class 3 (23 dBm \pm2 dB)● LTE-TDD: Class 3 (23 dBm \pm2 dB) <p>EG915U-EU:</p> <ul style="list-style-type: none">● GSM850/EGSM900: Class 4 (33 dBm \pm2 dB)● DCS1800/PCS1900: Class 1 (30 dBm \pm2 dB)● LTE-FDD: Class 3 (23 dBm \pm2 dB) <p>EG915U-LA:</p> <ul style="list-style-type: none">● GSM850/EGSM900: Class 4 (33 dBm \pm2 dB)● DCS1800/PCS1900: Class 1 (30 dBm \pm2 dB)● LTE-FDD: Class 3 (23 dBm \pm2 dB)
LTE Features	<p>EG915U-CN:</p> <ul style="list-style-type: none">● Supports up to Cat 1 FDD/TDD.● Supports 1.4/3/5/10/15/20 MHz RF bandwidth.● Supports uplink QPSK, 16QAM.● Supports downlink QPSK, 16QAM and 64QAM.● FDD: Max 10 Mbps (DL)/5 Mbps (UL).● TDD: Max 8.96 Mbps (DL)/3.1 Mbps (UL). <p>EG915U-EU:</p> <ul style="list-style-type: none">● Supports up to Cat 1 FDD.● Supports 1.4/3/5/10/15/20 MHz RF bandwidth.● Supports uplink QPSK, 16QAM.● Supports downlink QPSK, 16QAM and 64QAM.● FDD: Max 10 Mbps (DL)/5 Mbps (UL). <p>EG915U-LA:</p> <ul style="list-style-type: none">● Supports up to Cat 1 FDD.● Supports 1.4/3/5/10/15/20 MHz RF bandwidth.● Supports uplink QPSK, 16QAM.● Supports downlink QPSK, 16QAM and 64QAM.

	<ul style="list-style-type: none"> ● FDD: Max 10 Mbps (DL)/5 Mbps (UL)
GSM Features	GPRS: <ul style="list-style-type: none"> ● Supports GPRS multi-slot class 12 ● Coding scheme: CS-1/CS-2/CS-3/CS-4 ● Max 85.6 Kbps (DL)/85.6 Kbps (UL)
Internet Protocol Features	<ul style="list-style-type: none"> ● Supports TCP/UDP/PPP/NT/NETZ/FTP/HTTP/PING/CMUX/HTTPS/FTPS/SSL/FILE/MQTT/MMS protocols ● Support PAP (Password Authentication Protocol) and CHAP (Challenge Handshake Authentication Protocol) protocols which are usually used for PPP connection
SMS	<ul style="list-style-type: none"> ● Text and PDU modes ● Point-to-point MO and MT ● SMS cell broadcast ● SMS storage: Stored in (U)SIM card and ME, stored in ME by default
(U)SIM Interface	<ul style="list-style-type: none"> ● Supports USIM/SIM card: 1.8/3.0 V
UART Interfaces	Main UART <ul style="list-style-type: none"> ● Used for AT command communication and data transmission ● Baud rates reach up to 921600 bps; 115200 bps by default ● Supports RTS and CTS hardware flow control Debug UART <ul style="list-style-type: none"> ● Used for the output of partial logs ● Baud rate: 921600 bps ● Only used for debug UART, cannot be used for universal UART Auxiliary UART
SPI Interface	<ul style="list-style-type: none"> ● Supports one SPI interface (master mode only)
I2C Interface	<ul style="list-style-type: none"> ● Supports one I2C interface
PCM Interface	<ul style="list-style-type: none"> ● Supports one PCM interface
Audio Features	<ul style="list-style-type: none"> ● Supports one analog audio input and one analog audio output ● GSM: HR/FR/EFR/AMR/AMR-WB ● Supports echo cancellation and noise suppression
ADC Interfaces	<ul style="list-style-type: none"> ● Supports two ADC interfaces
Network Indication	<ul style="list-style-type: none"> ● NET_STATUS used to indicate the network connectivity status
AT Commands	<ul style="list-style-type: none"> ● Compliant with 3G PP TS 27.007, 27.005 and Quectel enhanced AT commands
USB_BOOT Interface	<ul style="list-style-type: none"> ● Supports one download control interface
Antenna Interfaces	<ul style="list-style-type: none"> ● Main antenna interface (ANT_MAIN) ● Bluetooth and Wi-Fi Scan antenna interface (ANT_BT/WIFI_SCAN) ● 50 Ω impedance

Position Fixing	<ul style="list-style-type: none"> • Support Wi-Fi Scan
Temperature Range	<ul style="list-style-type: none"> • Operation temperature range: -35 to +75 °C ⁴ • Extended temperature range: -40 to +85 °C ⁵ • Storage temperature range: -40 to +90 °C
Firmware Upgrade	<ul style="list-style-type: none"> • USB interface and DFOTA
RoHS	<ul style="list-style-type: none"> • All hardware components are fully compliant with EU RoHS directive

2.3. Functional Diagram

The following figure shows a block diagram of the module and illustrates the major functional parts.

- Power management
- Baseband
- Flash
- Radio frequency
- Peripheral interfaces

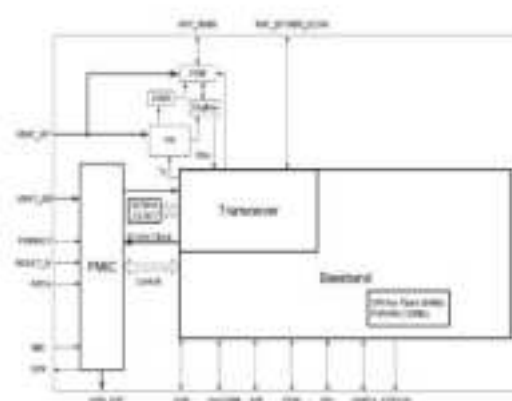


Figure 1: Functional Diagram

⁴ Within operating temperature range, the module meets 3GPP specifications.

⁵ Within extended temperature range, the module remains the ability to establish and maintain functions such as voice, SMS, data transmission, etc., without any unrecoverable malfunction. Radio spectrum and radio network are not influenced, while one or more specifications, such as P_{out} , may exceed the specified tolerances of 3GPP. When the temperature returns to the operating temperature range, the module meets 3GPP specifications again.

2.4. Pin Assignment

The following figure illustrates the pin assignment of the module.

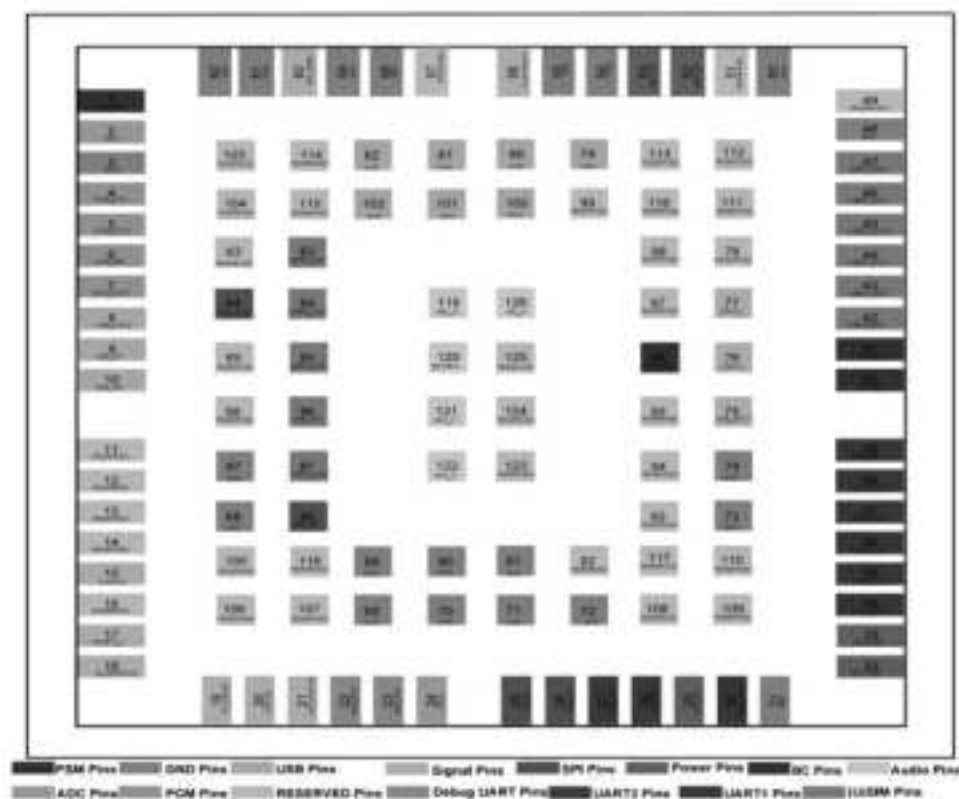


Figure 2: EG915U Series Module Pin Assignment (Top View)

NOTE

1. USB_BOOT cannot be pulled up before startup.
2. Keep NC and RESERVED pins unconnected, all GND pins shall be connected to the ground.
3. The function of PSM is under development and it is not recommended to use it right now.
4. The module supports dual-SIM single stand by. For details, please contact Quectel Technical Support.

2.5. Pin Description

The following tables show the pin definition of the module.

Table 3: I/O Parameters Definition

Type	Description
AI	Analog Input
AO	Analog Output
AIO	Analog Input/Output
DI	Digital Input
DO	Digital Output
DIO	Digital Input/Output
OD	Open Drain
PI	Power Input
PO	Power Output

Table 4: Pin Description

Power Supply					
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
VBAT_BB	32, 33	PI	Power supply for the module's baseband part	Vmax = 4.3 V Vmin = 3.3 V Vnom = 3.8 V	It must be provided with sufficient current up to 1 A
VBAT_RF	52, 53	PI	Power supply for the module's RF part		It must be provided with sufficient current up to 2.5 A
VDD_EXT	29	PO	Provide 1.8 V for external circuit	Vnom = 1.8 V Iomax = 50 mA	Power supply for external GPIO's pull-up circuits. Add 2.2 μ F bypass capacitor

						If unused, keep it open.
Power On/Off						
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment	
PWRKEY	15	DI	Turn on/off the module	$V_{b,max} = 0.5\text{ V}$	VBAT power domain.	
RESET_N	17	DI	Reset the module		VBAT power domain. If unused, keep it open.	
Indication Interfaces						
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment	
STATUS	20	DO	Indicate the module's operation status	$V_{O,min} = 1.35\text{ V}$ $V_{O,max} = 0.45\text{ V}$	1.8 V power domain. If unused, keep it open.	
NET_STATUS	21	DO	Indicate the module's network activity status	$V_{O,min} = 1.35\text{ V}$ $V_{O,max} = 0.45\text{ V}$	1.8 V power domain. If unused, keep it open.	
USB Interface						
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment	
USB_VBUS	8	AI	USB connection detect	$V_{max} = 5.25\text{ V}$ $V_{min} = 3.5\text{ V}$ $V_{nom} = 5.0\text{ V}$	Typical: 5.0 V If unused, keep it open.	
USB_DP	9	AIO	USB differential data (+)		USB 2.0 compliant. Require differential impedance of 90 Ω . If unused, keep it open.	
USB_DM	10	AIO	USB differential data (-)			
(U)SIM Interface						
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment	
USIM1_VDD	43	PO	(U)SIM1 card power supply	$I_{o,max} = 50\text{ mA}$ For 1.8 V (U)SIM: $V_{max} = 1.9\text{ V}$	Either 1.8 V or 3.0 V (U)SIM card is supported and	

				V _{min} = 1.7 V	can be identified automatically by the module.
				For 3.0 V (U)SIM: V _{max} = 3.05 V V _{min} = 2.7 V	
				For 1.8 V (U)SIM: V _{IL} max = 0.6 V V _{IH} min = 1.26 V V _{OL} max = 0.45 V V _{OH} min = 1.35 V	
USIM1_DATA	45	DIO	(U)SIM1 card data	For 3.0 V (U)SIM: V _{IL} max = 1.0 V V _{IH} min = 1.95 V V _{OL} max = 0.45 V V _{OH} min = 2.55 V	
				For 1.8 V (U)SIM: V _{OL} max = 0.45 V V _{OH} min = 1.35 V	
USIM1_CLK	46	DO	(U)SIM1 card clock	For 3.0 V (U)SIM: V _{OL} max = 0.45 V V _{OH} min = 2.55 V	
				For 1.8 V (U)SIM: V _{OL} max = 0.45 V V _{OH} min = 1.35 V	
USIM1_RST	44	DO	(U)SIM1 card reset	For 3.0 V (U)SIM: V _{OL} max = 0.45 V V _{OH} min = 2.55 V	
				V _{IL} min = -0.3 V V _{IL} max = 0.6 V V _{IH} min = 1.26 V V _{IH} max = 2.0 V	1.8 V power domain. If unused, keep this pin open
USIM1_DET	42	DI	(U)SIM1 card hot-plug detect		
USIM1_GND	47	-	Ground	-	Specified ground for (U)SIM1 card
				I _{omax} = 50 mA	
USIM2_VDD	87	PO	(U)SIM2 card power supply	1.8 V (U)SIM: V _{max} = 1.9 V V _{min} = 1.7 V 3.0 V (U)SIM: V _{max} = 3.05 V V _{min} = 2.7 V	Either 1.8 V or 3.0 V (U)SIM card is supported and can be identified automatically by the module.

USIM2_DATA	86	DIO	(U)SIM2 card data	1.8 V (U)SIM₁ $V_{ILmax} = 0.6\text{ V}$ $V_{IHmin} = 1.26\text{ V}$ $V_{OLmax} = 0.45\text{ V}$ $V_{OHmin} = 1.35\text{ V}$	
				3.0 V (U)SIM₁ $V_{ILmax} = 1.0\text{ V}$ $V_{IHmin} = 1.95\text{ V}$ $V_{OLmax} = 0.45\text{ V}$ $V_{OHmin} = 2.55\text{ V}$	
USIM2_CLK	84	DO	(U)SIM2 card clock	1.8 V (U)SIM₁ $V_{OLmax} = 0.45\text{ V}$ $V_{OHmin} = 1.35\text{ V}$	
				3.0 V (U)SIM₁ $V_{OLmax} = 0.45\text{ V}$ $V_{OHmin} = 2.55\text{ V}$	
USIM2_RST	85	DO	(U)SIM2 card reset	1.8 V (U)SIM₁ $V_{OLmax} = 0.45\text{ V}$ $V_{OHmin} = 1.35\text{ V}$	
				3.0 V (U)SIM₁ $V_{OLmax} = 0.45\text{ V}$ $V_{OHmin} = 2.55\text{ V}$	
USIM2_DET	83	DI	(U)SIM2 card hot-plug detect	$V_{ILmin} = -0.3\text{ V}$ $V_{ILmax} = 0.6\text{ V}$ $V_{IHmin} = 1.26\text{ V}$ $V_{IHmax} = 2.0\text{ V}$	1.8 V power domain. If unused, keep it open
Main UART Interface					
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
MAIN_CTS	36	DO	DTE clear to send signal to DCE (connect to DTE's CTS)	$V_{OLmax} = 0.45\text{ V}$ $V_{OHmin} = 1.35\text{ V}$	1.8 V power domain. If unused, keep it open.
MAIN_RTS	37	DI	DTE request to send signal to DCE (connect to DTE's RTS)	$V_{ILmin} = -0.3\text{ V}$ $V_{ILmax} = 0.6\text{ V}$ $V_{IHmin} = 1.26\text{ V}$ $V_{IHmax} = 2.0\text{ V}$	
MAIN_RXD	34	DI	Main UART receive	$V_{ILmin} = -0.3\text{ V}$ $V_{ILmax} = 0.6\text{ V}$ $V_{IHmin} = 1.26\text{ V}$ $V_{IHmax} = 2.0\text{ V}$	have a period of time when the module is powered on.

MAIN_DCD	38	DO	Main UART data carrier detect	$V_{OL,max} = 0.45\text{ V}$ $V_{OH,min} = 1.35\text{ V}$	
MAIN_TXD	35	DO	Main UART transmit	$V_{OL,max} = 0.45\text{ V}$ $V_{OH,min} = 1.35\text{ V}$	
MAIN_RI	39	DO	Main UART ring indication	$V_{OL,max} = 0.45\text{ V}$ $V_{OH,min} = 1.35\text{ V}$	
MAIN_DTR	30	DI	Main UART data terminal ready	$V_{IL,min} = -0.3\text{ V}$ $V_{IL,max} = 0.6\text{ V}$ $V_{IH,min} = 1.26\text{ V}$ $V_{IH,max} = 2.0\text{ V}$	
Auxiliary UART Interface					
Pin Name	Pin No.	I/O	Description	DC Characteristics	comment
AUX_TXD	27	DO	Auxiliary UART transmit	$V_{OL,max} = 0.45\text{ V}$ $V_{OH,min} = 1.35\text{ V}$	1.8 V power domain. If unused, keep it open.
AUX_RXD	28	DI	Auxiliary UART receive	$V_{IL,min} = -0.3\text{ V}$ $V_{IL,max} = 0.6\text{ V}$ $V_{IH,min} = 1.26\text{ V}$ $V_{IH,max} = 2.0\text{ V}$	1.8 V power domain. If unused, keep it open.
Debug UART Interface					
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
DBG_RXD	22	DI	Debug UART receive	$V_{IL,min} = -0.3\text{ V}$ $V_{IL,max} = 0.6\text{ V}$ $V_{IH,min} = 1.26\text{ V}$ $V_{IH,max} = 2.0\text{ V}$	1.8 V power domain. If unused, keep it open.
DBG_TXD	23	DO	Debug UART transmit	$V_{OL,max} = 0.45\text{ V}$ $V_{OH,min} = 1.35\text{ V}$	
I2C Interface					
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
I2C_SCL	40	OD	I2C serial clock		External pull-up resistor is required. 1.8 V only. If unused, keep it open.
I2C_SDA	41	OD	I2C serial data		The I2C interface supports

connection of multiple peripherals except for codec IC

PCM Interface					
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
PCM_SYNC	5	DI	PCM data frame sync	$V_{L,min} = -0.3\text{ V}$ $V_{L,max} = 0.6\text{ V}$ $V_{IH,min} = 1.26\text{ V}$ $V_{OH,max} = 2.0\text{ V}$	1.8 V power domain. If unused, keep it open. Support slave mode only.
PCM_CLK	4	DI	PCM clock	$V_{L,min} = -0.3\text{ V}$ $V_{L,max} = 0.6\text{ V}$ $V_{IH,min} = 1.26\text{ V}$ $V_{OH,max} = 2.0\text{ V}$	
PCM_DIN	6	DI	PCM data input	$V_{L,min} = -0.3\text{ V}$ $V_{L,max} = 0.6\text{ V}$ $V_{IH,min} = 1.26\text{ V}$ $V_{OH,max} = 2.0\text{ V}$	
PCM_DOUT	7	DO	PCM data output	$V_{OL,max} = 0.45\text{ V}$ $V_{OH,min} = 1.35\text{ V}$	
RF Antenna Interface					
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
ANT_MAIN	60	AIO	Main antenna interface		50 Ω impedance
ANT_BT/ WiFi_SCAN	56	AIO	The shared interface for Bluetooth and Wi-Fi Scan		50 Ω impedance. If unused, keep it open
GRFC Antenna Tuner Control Interface*					
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
GRFC1	76	DO	Generic RF Controller		If unused, keep it open.
GRFC2	77	DO			
SPI Interface					
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
SPI_CLK	26	DO	SPI clock	$V_{OL,max} = 0.45\text{ V}$ $V_{OH,min} = 1.35\text{ V}$	Master mode only.
SPI_CS	25	DO	SPI chip select	$V_{OL,max} = 0.45\text{ V}$ $V_{OH,min} = 1.35\text{ V}$	

SPI_DIN	88	DI	SPI master mode input	$V_{ILmin} = -0.3\text{ V}$ $V_{ILmax} = 0.6\text{ V}$ $V_{IHmin} = 1.26\text{ V}$ $V_{IHmax} = 2.0\text{ V}$	
SPI_DOUT	64	DO	SPI master mode output	$V_{OLmax} = 0.45\text{ V}$ $V_{OHmin} = 1.35\text{ V}$	
ADC Interface					
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
ADC0	24	AI	General-purpose ADC interface	Voltage range: 0.1 V to VBAT	If unused, keep it open.
ADC1	2	AI			
Analog Audio Interfaces					
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
MIC_N	119	AI	Microphone analog input (-)		
MICBIAS	120	PO	Bias voltage output for microphone	$V_O = 2.2\text{--}3.0\text{ V}$ $V_{nom} = 2.2\text{ V}$	
SPK_P	121	AO	Analog audio differential output (+)		
SPK_N	122	AO	Analog audio differential output (-)		
MIC_P	126	AI	Microphone analog input (+)		
USB_BOOT					
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
USB_BOOT	75	DI	Control pin for module to enter download mode	$V_{ILmin} = -0.3\text{ V}$ $V_{ILmax} = 0.6\text{ V}$ $V_{IHmin} = 1.26\text{ V}$ $V_{IHmax} = 2.0\text{ V}$	1.8 V power domain. Active high. A circuit that enables the module to enter the download mode must be reserved.
PSM Interface*					
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment

PSM_IND	1	DO	Indicate the module's power saving mode		
PSM_EINT	95	DI	External interrupt pin; wake up the module from PSM		
Other interfaces					
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
W_DISABLE#	18	DI	Airplane mode control	$V_L\min = -0.3\text{ V}$ $V_L\max = 0.6\text{ V}$ $V_H\min = 1.26\text{ V}$ $V_H\max = 2.0\text{ V}$	1.8 V power domain. Pulled up by default. When it is in low voltage level, the module can enter airplane mode. If unused, keep it open. When the pin is powered on, there will be a period of time when the level status is uncertain.
AP_READY	19	DI	Application processor ready	$V_L\min = -0.3\text{ V}$ $V_L\max = 0.6\text{ V}$ $V_H\min = 1.26\text{ V}$ $V_H\max = 2.0\text{ V}$	1.8 V power domain. If unused, keep it open. When the PIN pin is powered on, there will be a period of time when the level status is uncertain.
GND					
Pin Name	Pin No.				
GND	3, 31, 48, 50, 54, 55, 58, 59, 61, 62, 67, 68, 69, 70, 71, 72, 73, 74, 79, 80, 81, 82, 89, 90, 91, 100, 101, 102				
RESERVED					
Pin Name	Pin No.				

NOTE

11, 12, 13, 14, 16, 49, 51, 57, 65, 66, 78, 92, 93, 94, 95, 97, 98, 99, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 123, 124, 125

1. The functions of PSM and GRFC are under development and it is not recommended to use them right now, please consult Quectel Technical Support for details.
5. PIN18(MAIN_W_DISABLE)&PIN19(AP_READY)&PIN30(MAIN_DTR) &PIN38(MAIN_DCD)&PIN39(MAIN_RI) When the module is powered on, there will be a period of time when the power level is indeterminate. First, high level 3V_{cc} lasts for 2 seconds, then low power Pin₁₈ lasts for 1.2 seconds, and then it is configured as 1.8V_{cc} input/output. According to specific usage scenarios and circuit design, please evaluate whether the output stage that is indeterminate when the power is just turned on meets the customer's application design requirements.

2.6. EVB

In order to help customers develop applications with EG915U series module, Quectel provides an evaluation board (UMTS<E EVB), USB to RS-232 converter cable, earphone, antennas and other peripherals to control or test the module. For more details, please refer to **document [1]**.

FCC 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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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:

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

Important Note:

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 and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Country Code selection feature to be disabled for products marketed to the US/Canada.

This device is intended only for OEM integrators under the following conditions:

1. The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2. The transmitter module may not be co-located with any other transmitter or antenna,
3. For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change. (if modular only test Channel 1-11)

As long as the three conditions above are met, further transmitter testing 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 cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot 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.

End Product Labeling

The final end product must be labeled in a visible area with the following"

Contains FCC ID: 2AWBA-GS12"

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.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01r01

2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular transmitter

2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

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.

2.7 Antennas

This radio transmitter **FCC ID: 2AWBA-GS12** has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Antenna No.	Model No. of antenna:	Type of antenna:	Gain of the antenna (Max.)	Frequency range:
			Antenna	
Bluetooth	/	FPC Antenna	5.38	2402-2480MHz
GSM 850			3.04	824-849MHz
GSM PCS1900			4.33	1850~1910MHz
LTE Band2			4.33dBi	1850~1910MHz
LTE Band4			1.6dBi	1710~1755MHz
LTE Band5			1.03dBi	824~849MHz
LTE Band7			4.02dBi	2500~2570MHz
LTE Band66			2.63dBi	1710~1780MHz

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains **FCC ID: 2AWBA-GS12**".

2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to confirm compliance with FCC requirements for the transmitter when the module is installed in the host.

2.10 Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.

2.11 Note EMI Considerations

Host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties.

2.12 How to make changes

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system. According to the KDB 996369 D02 Q&A Q12, that a host manufacture only needs to do an evaluation (i.e., no C2PC required when no emission exceeds the limit of any individual device (including unintentional radiators) as a composite. The host manufacturer must fix any failure.