

FCM266D

Hardware Design

Short-Range Products

Version: 1.0.0

Date: 2025-09-01

Status: Preliminary



At Quectel, our aim is to provide timely and comprehensive services to our customers. If you require any assistance, please contact our headquarters:

Quectel Wireless Solutions Co., Ltd.

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

Tel: +86 21 5108 6236

Email: info@quectel.com

Or our local offices. For more information, please visit:

<http://www.quectel.com/support/sales.htm>.

For technical support, or to report documentation errors, please visit:

<http://www.quectel.com/support/technical.htm>.

Or email us at: support@quectel.com.

Legal Notices

We offer information as a service to you. The provided information is based on your requirements and we make every effort to ensure its quality. You agree that you are responsible for using independent analysis and evaluation in designing intended products, and we provide reference designs for illustrative purposes only. Before using any hardware, software or service guided by this document, please read this notice carefully. Even though we employ commercially reasonable efforts to provide the best possible experience, you hereby acknowledge and agree that this document and related services hereunder are provided to you on an “as available” basis. We may revise or restate this document from time to time at our sole discretion without any prior notice to you.

Use and Disclosure Restrictions

License Agreements

Documents and information provided by us shall be kept confidential, unless specific permission is granted. They shall not be accessed or used for any purpose except as expressly provided herein.

Copyright

Our and third-party products hereunder may contain copyrighted material. Such copyrighted material shall not be copied, reproduced, distributed, merged, published, translated, or modified without prior written consent. We and the third party have exclusive rights over copyrighted material. No license shall be granted or conveyed under any patents, copyrights, trademarks, or service mark rights. To avoid ambiguities, purchasing in any form cannot be deemed as granting a license other than the normal non-exclusive, royalty-free license to use the material. We reserve the right to take legal action for noncompliance with abovementioned requirements, unauthorized use, or other illegal or malicious use of the material.

Trademarks

Except as otherwise set forth herein, nothing in this document shall be construed as conferring any rights to use any trademark, trade name or name, abbreviation, or counterfeit product thereof owned by Quectel or any third party in advertising, publicity, or other aspects.

Third-Party Rights

This document may refer to hardware, software and/or documentation owned by one or more third parties ("third-party materials"). Use of such third-party materials shall be governed by all restrictions and obligations applicable thereto.

We make no warranty or representation, either express or implied, regarding the third-party materials, including but not limited to any implied or statutory, warranties of merchantability or fitness for a particular purpose, quiet enjoyment, system integration, information accuracy, and non-infringement of any third-party intellectual property rights with regard to the licensed technology or use thereof. Nothing herein constitutes a representation or warranty by us to either develop, enhance, modify, distribute, market, sell, offer for sale, or otherwise maintain production of any our products or any other hardware, software, device, tool, information, or product. We moreover disclaim any and all warranties arising from the course of dealing or usage of trade.

Privacy Policy

To implement module functionality, certain device data are uploaded to Quectel's or third-party's servers, including carriers, chipset suppliers or customer-designated servers. Quectel, strictly abiding by the relevant laws and regulations, shall retain, use, disclose or otherwise process relevant data for the purpose of performing the service only or as permitted by applicable laws. Before data interaction with third parties, please be informed of their privacy and data security policy.

Disclaimer

- a) We acknowledge no liability for any injury or damage arising from the reliance upon the information.
- b) We shall bear no liability resulting from any inaccuracies or omissions, or from the use of the information contained herein.
- c) While we have made every effort to ensure that the functions and features under development are free from errors, it is possible that they could contain errors, inaccuracies, and omissions. Unless otherwise provided by valid agreement, we make no warranties of any kind, either implied or express, and exclude all liability for any loss or damage suffered in connection with the use of features and functions under development, to the maximum extent permitted by law, regardless of whether such loss or damage may have been foreseeable.
- d) We are not responsible for the accessibility, safety, accuracy, availability, legality, or completeness of information, advertising, commercial offers, products, services, and materials on third-party websites and third-party resources.

Copyright © Quectel Wireless Solutions Co., Ltd. 2025. All rights reserved.

Safety Information

The following safety precautions must be observed during all phases of operation, such as usage, service or repair of any terminal or mobile incorporating the module. Manufacturers of the terminal should notify users and operating personnel of the following safety information by incorporating these guidelines into all manuals of the product. Otherwise, Quectel assumes no liability for customers' failure to comply with these precautions.



Full attention must be paid to driving at all times in order to reduce the risk of an accident. Using a mobile while driving (even with a handsfree kit) causes distraction and can lead to an accident. Please comply with laws and regulations restricting the use of wireless devices while driving.



Switch off the terminal or mobile before boarding an aircraft. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communication systems. If there is an Airplane Mode, it should be enabled prior to boarding an aircraft. Please consult the airline staff for more restrictions on the use of wireless devices on an aircraft.



Wireless devices may cause interference on sensitive medical equipment, so please be aware of the restrictions on the use of wireless devices when in hospitals, clinics or other healthcare facilities.



Terminals or mobiles operating over radio signal and cellular network cannot be guaranteed to connect in certain conditions, such as when the mobile bill is unpaid or the (U)SIM card is invalid. When emergency help is needed in such conditions, use emergency call if the device supports it. In order to make or receive a call, the terminal or mobile must be switched on in a service area with adequate cellular signal strength. In an emergency, the device with emergency call function cannot be used as the only contact method considering network connection cannot be guaranteed under all circumstances.



The terminal or mobile contains a transceiver. When it is ON, it receives and transmits radio frequency signals. RF interference can occur if it is used close to TV sets, radios, computers or other electric equipment.



In locations with explosive or potentially explosive atmospheres, obey all posted signs and turn off wireless devices such as mobile phone or other terminals. Areas with explosive or potentially explosive atmospheres include fueling areas, below decks on boats, fuel or chemical transfer or storage facilities, and areas where the air contains chemicals or particles such as grain, dust or metal powders.

About the Document

Revision History

Version	Date	Author	Description
-	2025-09-01	Allen Ke/Neil Cheng	Creation of the document
1.0.0	2025-09-01	Allen Ke/Neil Cheng	Preliminary

Contents

Safety Information.....	3
About the Document.....	4
Contents.....	5
Table Index.....	7
Figure Index.....	8
1 Introduction	9
2 Product Overview.....	10
2.1. Key Features.....	11
3 Application Interfaces	13
3.1. Pin Assignment	13
3.2. Pin Definitions	14
3.3. GPIO Multiplexing	18
3.4. Interface Definition	18
3.4.1. UART.....	18
3.4.1.1. UART.....	19
3.4.1.2. Debug UART	19
3.4.2. SPI.....	20
3.4.3. I2C Interface.....	22
3.4.4. PWM Interface.....	22
3.4.5. ADC Interface.....	22
3.4.6. WAKEUP Interface.....	23
3.4.7. Indication Interface	24
4 Operating Characteristics	25
4.1. Power Supply	25
4.1.1. Reference Design for Power Supply.....	25
4.2. Reset.....	26
5 RF Specifications.....	28
5.1. Wi-Fi Performances	28
5.2. Bluetooth Performances	29
5.3. Antenna/Antenna Interfaces	30
5.3.1. Antenna interface (ANT_WIFI/BT).....	30
5.3.1.1. Reference Design.....	30
5.3.1.2. RF Routing Guidelines	31
5.3.1.3. RF Connector Recommendation	33
5.3.2. PCB Antenna.....	35
5.3.3. RF Coaxial Connector.....	37
5.3.3.1. Antenna Connector Specifications.....	37

5.3.3.2.	Antenna Connector Installation.....	38
5.3.3.3.	Recommended Manufacturers of RF Connector and Cable	39
5.3.4.	Requirements for Antenna Design.....	39
6	Electrical Characteristics and Reliability	40
6.1.	Absolute Maximum Ratings	40
6.2.	Power Supply Ratings.....	40
6.3.	Power Consumption.....	41
6.3.1.	Wi-Fi Power Consumption	41
6.3.2.	Bluetooth Power Consumption	42
6.4.	Digital I/O Characteristics	42
6.5.	ESD Protection.....	43
7	Mechanical Information.....	44
7.1.	Mechanical Dimensions	44
7.2.	Recommended Footprint	46
7.3.	Top and Bottom Views.....	47
8	Storage, Manufacturing & Packaging.....	49
8.1.	Storage Conditions.....	49
8.2.	Manufacturing and Soldering.....	50
8.3.	Packaging Specifications	52
8.3.1.	Carrier Tape	52
8.3.2.	Plastic Reel	53
8.3.3.	Mounting Direction	53
8.3.4.	Packaging Process	54
9	Appendix References	55

Table Index

Table 1: Basic Information	10
Table 2: Key Features	11
Table 3: Parameter Definition	14
Table 4: Pin Description	14
Table 5: GPIO Multiplexing	18
Table 6: Pin Description of UART	18
Table 7: Pin Description of SPI	20
Table 8: SPI Timing Parameters (Unit: ns)	21
Table 9: Pin Description of I2C Interface	22
Table 10: Pin Description of PWM Interface	22
Table 11: Pin Description of ADC Interface	22
Table 12: ADC Features	23
Table 13: Pin Description of WAKEUP Interface	23
Table 14: Pin Description of Network Status Indication Interface	24
Table 15: Pin Description of Power Supply and GND Pins	25
Table 16: Pin Description of CHIP_EN	26
Table 17: Wi-Fi Performances	28
Table 18: Bluetooth Performances	29
Table 19: Pin Description of ANT_WIFI/BT	30
Table 20: Requirements for PCB Antenna.....	35
Table 21: Major Specifications of the RF Connector	37
Table 22: Requirements for Antenna Design.....	39
Table 23: Absolute Maximum Ratings (Unit: V)	40
Table 24: Module's Power Supply Ratings (Unit: V).....	40
Table 25: Wi-Fi Power Consumption in Non-signaling Mode (Unit: mA).....	41
Table 26: Bluetooth Power Consumption in Non-signaling Mode (Unit: mA).....	42
Table 27: I/O Characteristics (Unit: V)	42
Table 28: Electrostatic Discharge Characteristics (Unit: kV)	43
Table 29: Recommended Thermal Profile Parameters	51
Table 30: Carrier Tape Dimension Table (Unit: mm).....	52
Table 31: Plastic Reel Dimension Table (Unit: mm).....	53
Table 32: Related Documents.....	55
Table 33: Terms and Abbreviations	55

Figure Index

Figure 2: Pin Assignment (Top View)	13
Figure 3: Main UART Connection	19
Figure 4: Debug UART Connection	20
Figure 5: Reference Circuit of Debug UART.....	20
Figure 6: SPI Timing.....	21
Figure 7: Reference Design of Network Status Indication	24
Figure 8: Reference Design of Power Supply.....	25
Figure 9: Reference Circuit of Reset with Driving Circuit	26
Figure 10: Reference Circuit of Reset with a Button.....	27
Figure 11: Reset Timing	27
Figure 12: Reference Design of Antenna Interface (ANT_WIFI/BT)	31
Figure 13: Microstrip Design on a 2-layer PCB	32
Figure 14: Coplanar Waveguide Design on a 2-layer PCB	32
Figure 15: Coplanar Waveguide Design on a 4-layer PCB (Layer 3 as Reference Ground).....	32
Figure 16: Coplanar Waveguide Design on a 4-layer PCB (Layer 4 as Reference Ground).....	32
Figure 17: Dimensions of the Receptacle (Unit: mm).....	33
Figure 18: Specifications of Mated Plugs (Unit: mm).....	34
Figure 19: Space Factor of the Mated Connectors (Unit: mm).....	34
Figure 20: Keepout Area on Motherboard	36
Figure 21: Prohibited Area During Routing (Bottom Side).....	36
Figure 22: Dimensions of the Receptacle (Unit: mm).....	37
Figure 23: Dimensions of the Receptacle (Unit: mm).....	38
Figure 24: Space Factor of Mated Connectors (Ø 0.81 mm Coaxial Cables) (Unit: mm).....	38
Figure 25: Space Factor of Mated Connectors (Ø 1.13 mm Coaxial Cables) (Unit: mm).....	39
Figure 26: Top and Side Dimensions.....	44
Figure 27: Bottom Dimension.....	45
Figure 28: Recommended Footprint	46
Figure 29: Top and Bottom Views (Antenna Interface)	47
Figure 30: Top and Bottom Views (PCB Antenna)	47
Figure 31: Top and Bottom Views (RF Coaxial Connector)	48
Figure 32: Recommended Reflow Soldering Thermal Profile	50
Figure 33: Carrier Tape Dimension Drawing (Unit: mm)	52
Figure 34: Plastic Reel Dimension Drawing.....	53
Figure 35: Mounting Direction	53
Figure 36: Packaging Process	54

1 Introduction

QuecOpen® is a solution where the module acts as the main processor. Constant transition and evolution of both the communication technology and the market highlight its merits. It can help you to:

- Realize embedded applications' quick development and shorten product R&D cycle
- Simplify circuit and hardware structure design to reduce engineering costs
- Miniaturize products
- Reduce product power consumption
- Apply OTA technology
- Enhance product competitiveness and cost-effectiveness

The document defines FCM266D in QuecOpen® solution and describes its hardware interfaces and air interfaces connected to your applications, which can help you quickly understand the hardware interface characteristics, RF characteristics, electrical characteristics, mechanical specifications and other relevant information of the module.

2 Product Overview

FCM266D is a low-power, cost-effective Wi-Fi and Bluetooth module supporting IEEE 802.11b/g/n/ax and BLE 5.4 protocols. It features built-in power management unit, power amplifier, low noise amplifier and RF transceiver switch. The module has multiple interfaces such as UART, SPI, I2C, PWM and ADC for various applications.

The module is an SMD module with compact packaging. The general features of the module are as follow:

- ARM core based on the Armv8-M architecture with a main frequency of up to 320 MHz
- 640 KB SRAM, 64 KB ROM
- Built-in 8 MB Flash memory and external 16 MB Flash
- Comply with BLE 5.4 and IEEE 802.11b/g/n/ax
- Flash programming via UART

Table 1: Basic Information

Item	Description
Packaging Type	LCC
Pin Counts	28 pins
Dimensions	(20 +0.3/-0.15) mm × (18 +0.3/-0.15) mm × (2.4 ±0.2) mm
Weight	Approx. 1.23 g

2.1. Key Features

Table 2: Key Features

Basic Information	
Protocols and Standard	● Wi-Fi protocol: IEEE 802.11b/g/n/ax ● Bluetooth protocol: BLE 5.4 ● All hardware components fully comply with EU RoHS directive
Supply Voltage	VBAT Power Supply: ● 2.0–4.35 V ● Typ. 3.3 V
Temperature Ranges	● Normal operating temperature ¹: -40 °C to +85 °C ● Storage temperature: -45 °C to +95 °C
TE-B Kit	FCM266D-TE-B ²
RF Antenna/Antenna Interface ³	
Antenna/Antenna Interfaces	● Antenna interface (ANT_WIFI/BT) ● PCB Antenna ● RF Coaxial Connector ● 50 Ω impedance
Application Interfaces ⁴	
Application Interfaces	UART, SPI, I2C, PWM, ADC

¹ Within this range, the module's indicators comply with IEEE and Bluetooth specification requirements.

² Quectel supplies a FCM266D-TE-B with accessories to develop and test the module. For more details, see **document [1]**.

³ The module is provided with one of the three antenna/antenna interface designs. For more details, please contact Quectel Technical Support.

⁴ For more details about the interfaces, see **Chapter 3.3** and **Chapter 3.4**.

3 Application Interfaces

3.1. Pin Assignment

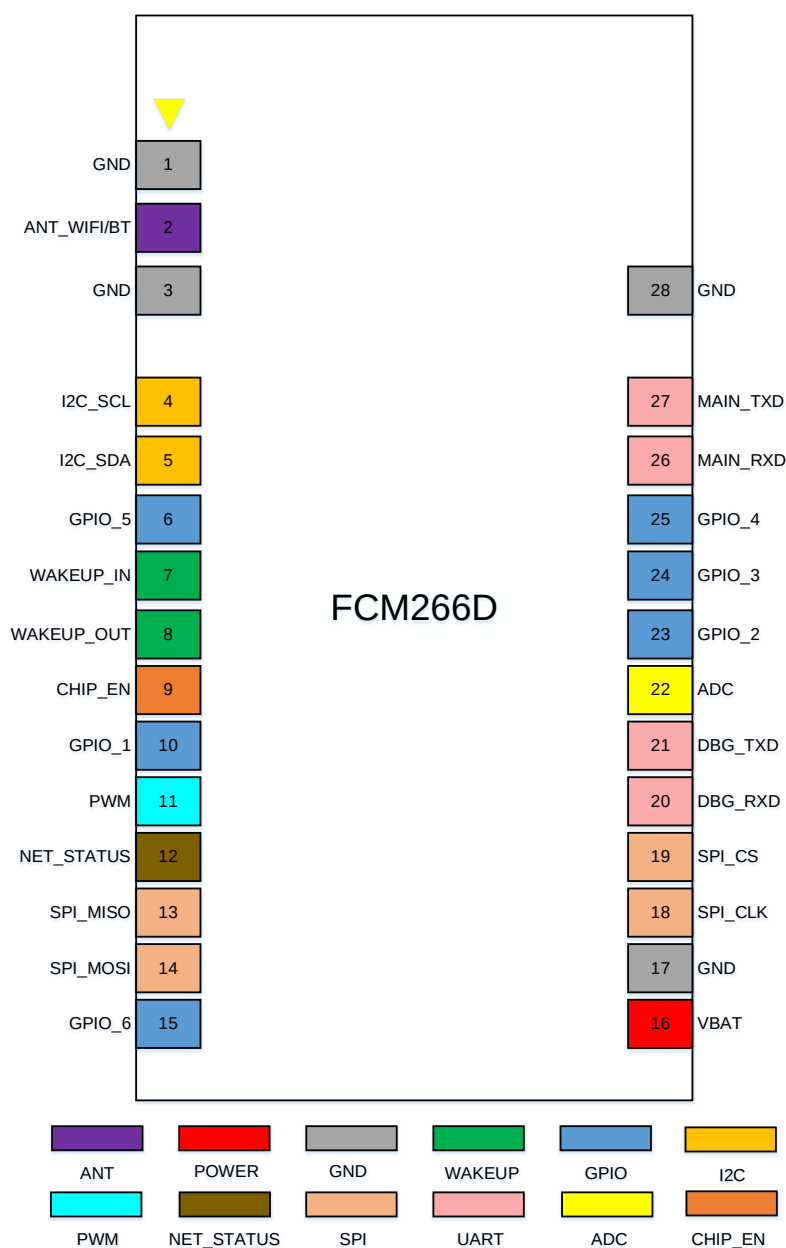


Figure 1: Pin Assignment (Top View)

NOTE

1. All GND pins should be connected to ground.
2. Ensure that there is no sink current on the pins before turning on the module.
3. The module has 6 GPIO interfaces by default. In the case of multiplexing, it supports interfaces including UART, SPI, I2C, PWM and ADC. For more details, see **Chapter 3.3** and **Chapter 3.4**.

3.2. Pin Definitions

Table 3: Parameter Definition

Parameter	Description
AI	Analog Input
AIO	Analog Input/Output
DI	Digital Input
DO	Digital Output
DIO	Digital Input/Output
OD	Open Drain
PI	Power Input
H	High Level
L	Low Level

DC characteristics include power domain and rated current.

Table 4: Pin Description

Power Supply and GND Pins						
Pin Name	Pin No.	I/O	Status after Reset	Description	DC Characteristics	Comment
VBAT	16	PI	-	Power supply for the module	Vmax = 4.35 V Vmin = 2.0 V Vnom = 3.3 V	It is recommended to provide a current

						of at least 20 mA.
GND	1, 3, 17, 28		Connect them to the ground.			
Reset						
Pin Name	Pin No.	I/O	Status after Reset	Description	DC Characteristics	Comment
CHIP_EN	9	DI	H	Reset the module	V _{IH} max = 3.6 V V _{IH} min = 2.0 V	Hardware reset. Active low. When VBAT is powered up, keep CHIP_EN at a high level, and the module will start automatically.
UART						
Pin Name	Pin No.	I/O	Status after Reset	Description	DC Characteristics	Comment
DBG_TXD	21	DO	H	Debug UART transmit	VBAT	Debug UART.
DBG_RXD	20	DI	H	Debug UART receive		
MAIN_TXD	27	DO	H	Main UART transmit		
MAIN_RXD	26	DI	H	Main UART receive		
SPI						
Pin Name	Pin No.	I/O	Status after Reset	Description	DC Characteristics	Comment
SPI_MISO	13	DIO	L	SPI master-in slave-out	VBAT	It inputs signals when the module serves as a master device. It outputs signals when the module serves as a slave

						device.
SPI_MOSI	14	DIO	L	SPI master-out slave-in	VBAT	It outputs signals when the module serves as a master device.
SPI_CLK	18	DIO	L	SPI clock		It inputs signals when the module serves as a slave device.
SPI_CS	19	DIO	L	SPI chip select		
I2C Interface						
Pin Name	Pin No.	I/O	Status after Reset	Description	DC Characteristics	Comment
I2C_SCL	4	OD	-	I2C serial clock	VBAT	Pull it up to 3.3 V externally.
I2C_SDA	5	OD	-	I2C serial data		
WAKEUP Interface						
Pin Name	Pin No.	I/O	Status after Reset	Description	DC Characteristics	Comment
WAKEUP_IN	7	DI	-	Wake up the module	VBAT	Wake up at the rising edge.
WAKEUP_OUT	8	DO	-	Wakeup signal from the module		Active high.
Indication Interface						
Pin Name	Pin No.	I/O	Status after Reset	Description	DC Characteristics	Comment
NET_STATUS	12	DO	-	Indicate the module's network registration status	VBAT	In STA mode, it outputs high level when Wi-Fi is connected.
PWM Interface						
Pin Name	Pin No.	I/O	Status after Reset	Description	DC Characteristics	Comment
PWM	11	DO	-	PWM output	VBAT	

ADC Interface

Pin Name	Pin No.	I/O	Status after Reset	Description	DC Characteristics	Comment
ADC	22	AI	L	General ADC interface	$V_{IHmax} = 4\text{ V}$ $V_{ILmin} = 0\text{ V}$	

RF Antenna Interface

Pin Name	Pin No.	I/O	Status after Reset	Description	DC Characteristics	Comment
ANT_WIFI/BT	2	AIO	-	Wi-Fi/Bluetooth antenna interface		50 Ω impedance.

GPIOs

Pin Name	Pin No.	I/O	Status after Reset	Description	DC Characteristics	Comment
GPIO_1	10	DIO	-	General-purpose input/output	VBAT	Support wakeup interrupt.
GPIO_2	23	DIO	-	General-purpose input/output		
GPIO_3	24	DIO	-	General-purpose input/output		
GPIO_4	25	DIO	-	General-purpose input/output		
GPIO_5	6	DIO	-	General-purpose input/output		
GPIO_6	15	DIO	-	General-purpose input/output		

NOTE

To reduce the probability of module damage and extend module service life, do not power up and down frequently.

3.3. GPIO Multiplexing

The module has 6 GPIOs by default. The pin definitions are shown in the table below.

Table 5: GPIO Multiplexing

Pin Name	Pin No.	Alternate Function 0 (GPIO No.)	Alternate Function 1	Alternate Function 2
GPIO_1	10	P24	PWMG0_PWM4	-
GPIO_2	23	P34	PWMG1_PWM2	-
GPIO_3	24	P36	PWMG1_PWM4	-
GPIO_4	25	P19	-	PWMG0_PWM1
GPIO_5	6	P48	-	-
GPIO_6	15	P18	-	PWMG0_PWM0

NOTE

1. All GPIOs support wakeup.
2. After the module is powered down, all of its GPIOs must be driven low. Otherwise, the current leakage may make the module enter an abnormal status.
3. The maximum number of each application interface multiplexed with GPIOs is not available simultaneously. For more details, see **Chapter 3.4**.

3.4. Interface Definition

3.4.1. UART

The module has two UART: main UART and debug UART.

Table 6: Pin Description of UART

Pin Name	Pin No.	I/O	Description	Comment
DBG_TXD	21	DO	Debug UART transmit	Debug UART.

DBG_RXD	20	DI	Debug UART receive
MAIN_TXD	27	DO	Main UART transmit
MAIN_RXD	26	DI	Main UART receive

3.4.1.1. UART

The main UART is used for program programming and module debugging, the baud rate is 921600 bps.

The main UART connection between the module and the MCU is shown below:

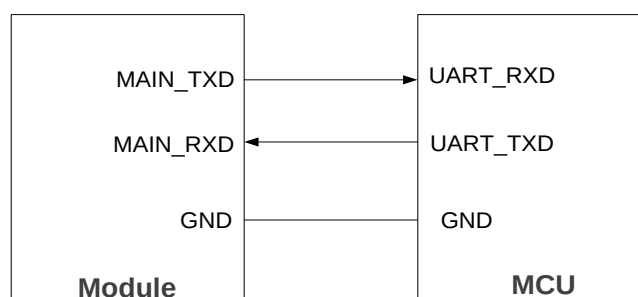


Figure 2: Main UART Connection

NOTE

To increase the stability of UART communication, it is recommended to add UART hardware flow control design.

3.4.1.2. Debug UART

The debug UART is used for partial log output, the baud rate is 115200 bps.

The debug UART connection between the module and the MCU is shown below:

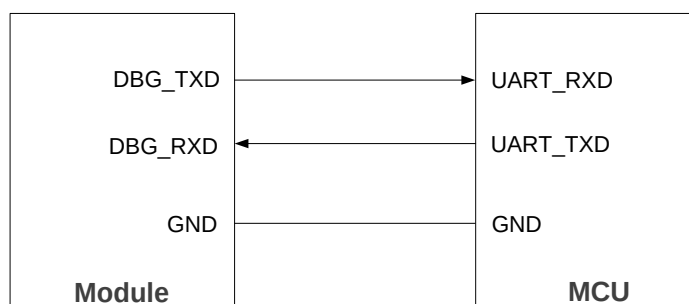


Figure 3: Debug UART Connection

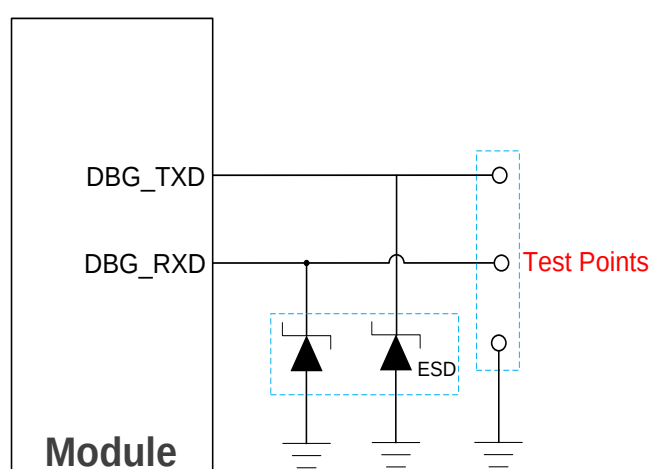


Figure 4: Reference Circuit of Debug UART

3.4.2. SPI

The module has one SPI, which supports both master and slave modes. In slave mode, the maximum clock frequency is 50 MHz. In master mode, the maximum clock frequency is 8 MHz.

Table 7: Pin Description of SPI

Pin Name	Pin No.	I/O	Description	Comment
SPI_MISO	13	DIO	SPI master-in slave-out	It inputs signals when the module serves as a master device. It outputs signals when the module serves as a slave device.

SPI_MOSI	14	DIO	SPI master-out slave-in	It outputs signals when the module serves as a master device.
SPI_CLK	18	DIO	SPI clock	
SPI_CS	19	DIO	SPI chip select	It inputs signals when the module serves as a slave device.

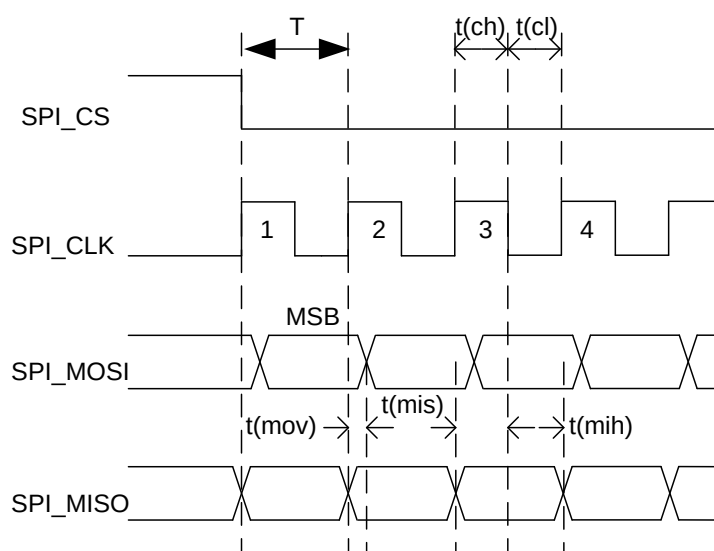


Figure 5: SPI Timing

Table 8: SPI Timing Parameters (Unit: ns)

Parameters	Description	Min.	Max.
T	SPI clock cycle	-	20
t (ch)	SPI clock high-level period	$45\% \times T$	-
t (cl)	SPI clock low-level period	$45\% \times T$	-
t (mov)	Valid period of SPI master data output	1.5	-
t (mis)	Setup period of SPI master data input	1	-
t (mih)	Holding period of SPI master data input	2	-

3.4.3. I2C Interface

The module has one I2C interface by default, which supports master mode only. The maximum clock frequency is 400 kHz and it adopts 7-bit addressing. It is connected to peripherals such as EEPROM by default.

Table 9: Pin Description of I2C Interface

Pin Name	Pin No.	I/O	Description	Comment
I2C_SCL	4	DO	I2C serial clock	Pull it up to 3.3 V externally.
I2C_SDA	5	DO	I2C serial data	

3.4.4. PWM Interface

The module supports 1 PWM interface, the pin description is as shown in the **Table 10**: Pin Description of PWM Interface.

Table 10: Pin Description of PWM Interface

Pin Name	Pin No.	I/O	Description
PWM	11	DO	PWM output

3.4.5. ADC Interface

The module supports one ADC interface by default, the voltage range is as shown in . To improve the voltage measurement accuracy, the trace of ADC interface should be surrounded by ground.

Table 11: Pin Description of ADC Interface

Pin Name	Pin No.	I/O	Description
ADC	21	AI	General ADC interface

Table 12: ADC Features

Parameter	Min.	Typ.	Max.	Unit
ADC Input Voltage	0	-	$V_{REF} \times N$	V
VREF	-	1.1	-	V
ADC Resolution	-	12	-	bits

N is the reciprocal of the internal voltage division ratio, which is configurable. Typically, N can be 1, 2, 3 or 4.

NOTE

1. The input voltage of every ADC interface should not exceed its corresponding voltage range.
2. It is prohibited to supply any voltage to ADC interface when the module is not powered by the VBAT.

3.4.6. WAKEUP Interface

WAKEUP_IN is used to wake up the module from deep sleep mode or standby mode. WAKEUP_OUT pin can be used to wake up the host.

Table 13: Pin Description of WAKEUP Interface

Pin Name	Pin No.	I/O	Description	Comment
WAKEUP_IN	7	DI	Wake up the module	Wake up at the rising edge.
WAKEUP_OUT	8	DO	Wakeup signal from the module	Active high.

3.4.7. Indication Interface

NET_STATUS is the module's network status indication pin, which can drive corresponding LEDs. The reference design is shown below.

Table 14: Pin Description of Network Status Indication Interface

Pin Name	Pin No.	I/O	Description	Comment
NET_STATUS	12	DO	Indicate the module's network activity status	In STA mode, it outputs high level when Wi-Fi is connected.

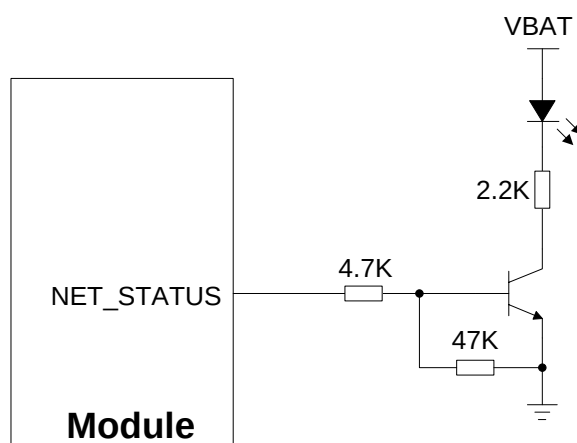


Figure 6: Reference Design of Network Status Indication

4 Operating Characteristics

4.1. Power Supply

Table 15: Pin Description of Power Supply and GND Pins

Pin Name	Pin No.	I/O	Description	Min.	Typ.	Max.	Unit
VBAT	16	PI	Power supply for the module	2.0	3.3	4.35	V
GND	1, 3, 17, 28						

4.1.1. Reference Design for Power Supply

The module is powered by VBAT, and it is recommended to use a power supply chip that can provide sufficient current of at least 20 mA. For better power supply performance, it is recommended to parallel 22 μ F, 1 μ F and 100 nF filter capacitors near the module's VBAT pin. C4 is reserved for debugging and not mounted by default. In addition, it is recommended to add a TVS diode near the VBAT to improve the surge voltage bearing capacity of the module. As per design rules, the longer the VBAT trace is, the wider it should be.

The reference design for the VBAT is shown below:

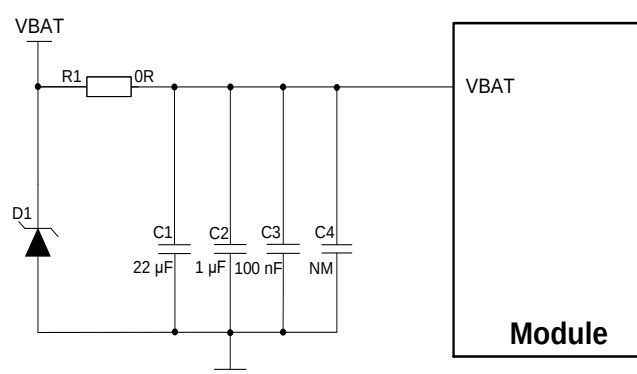


Figure 7: Reference Design of Power Supply

4.2. Reset

Drive CHIP_EN down for at least 100 ms and then release it to reset the module. In order to avoid module restart due to abnormal interference, it is recommended to route the trace as short as possible and surround it with ground.

Table 16: Pin Description of CHIP_EN

Pin Name	Pin No.	I/O	Description	Comment
CHIP_EN	9	DI	Reset the module	Hardware reset. Active low. When VBAT is powered up, keep CHIP_EN at a high level, and the module will start automatically.

The reference design for resetting the module is shown below. You can use an open collector driver to control CHIP_EN.

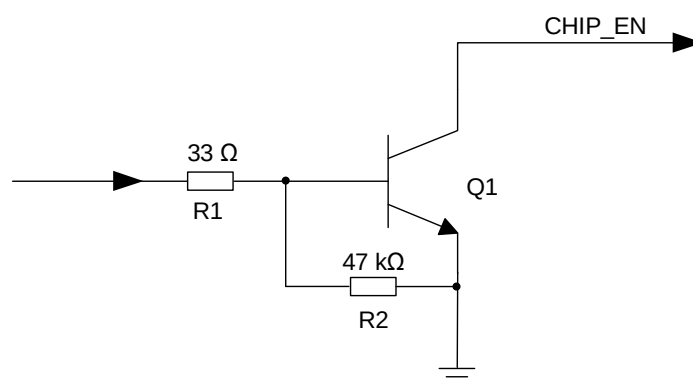


Figure 8: Reference Circuit of Reset with Driving Circuit

Another way to control the CHIP_EN is by using a button. A TVS component should be placed near the button for ESD protection, and a 100 nF capacitor should be added in parallel for hardware debouncing.

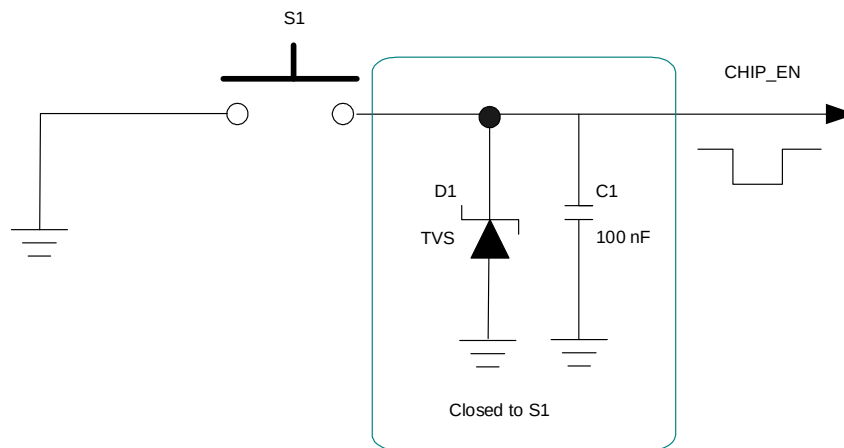


Figure 9: Reference Circuit of Reset with a Button

The module reset timing is shown below:

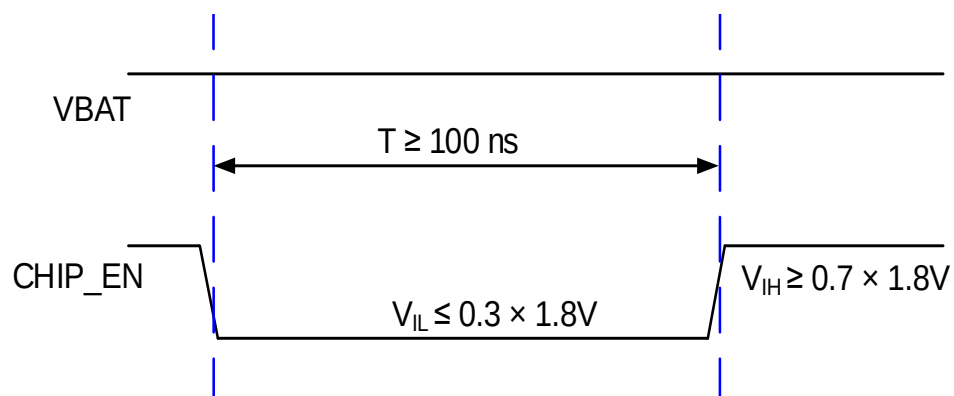


Figure 10: Reset Timing

5 RF Specifications

5.1. Wi-Fi Performances

Table 17: Wi-Fi Performances

Operating Frequency			
2.4 GHz: 2.400–2.4835 GHz			
Modulation			
OFDMA			
Encryption Mode			
WP, WPA2, WPA3			
Operating Mode			
- AP - STA			
Transmission Data Rate			
802.11b: 1 Mbps, 2 Mbps, 5.5 Mbps, 11 Mbps 802.11g: 6 Mbps, 9 Mbps, 12 Mbps, 18 Mbps, 24 Mbps, 36 Mbps, 48 Mbps, 54 Mbps 802.11n: HT20 (MCS 0–7), HT40 (MCS 0–7) 802.11ax: HE20 (MCS 0–11), HE40 (MCS 0–11)			
Condition (VBAT = 3.3 V; Temp.: 25 °C)	EVM	Typ.; Unit: dBm; Tolerance: ±2 dB	
		Transmit Power	Receiver Sensitivity
2.4 GHz	802.11b @ 1 Mbps ≤ 35 %	19	-97
		19	-88
	802.11g @ 6 Mbps ≤ -5 dB	16	-93
	802.11g @ 54 Mbps ≤ -25 dB	16	-75

802.11n, HT20 @ MCS 0, BPSK	≤ -5 dB	15	-92
802.11n, HT20 @ MCS 7, 64QAM	≤ -27 dB	14	-73
802.11n, HT40 @ MCS 0, BPSK	≤ -5 dB	14	-89
802.11n, HT40 @ MCS 7, 64QAM	≤ -27 dB	14	-71
802.11ax, HE20 @ MCS 0, BPSK	≤ -5 dB	15	-93
802.11ax, HE20 @ MCS 7, 1024QAM	≤ -35 dB	14	-75
802.11ax, HE40 @ MCS 0, BPSK	≤ -5 dB	14	-90
802.11ax, HE40 @ MCS 7, 1024QAM	≤ -35 dB	14	-72

NOTE

The module supports the above frequency bands in hardware, but actual applications may be subject to local regulations.

5.2. Bluetooth Performances

Table 18: Bluetooth Performances

Operating Frequency		
2.400–2.4835 GHz		
Modulation		
GFSK		
Operating Mode		
BLE		
Condition (VBAT = 3.3 V; Temp. 25°C)	Typ.; Unit: dBm; Tolerance: ± 2 dB	
	Transmit Power	Receiving Sensitivity

BLE (1 Mbps)	6	-96
BLE (2 Mbps)	6	-94
BLE (S = 2)	6	-97
BLE (S = 8)	6	-99

5.3. Antenna/Antenna Interfaces ⁵

Appropriate antenna type and design should be used with matched antenna parameters according to specific application. It is required to conduct a comprehensive functional test for the RF design before mass production of terminal products. The entire content of this chapter is provided for illustration only. Analysis, evaluation and determination are still necessary when designing target products.

The module is provided with one of the three antenna/antenna interface designs: pin antenna interface (ANT_WIFI/BT), PCB antenna and RF coaxial connector. The RF coaxial connector is not soldered when the module is designed with PCB antenna or pin antenna interface. The impedance of antenna port is 50 Ω .

5.3.1. Antenna interface (ANT_WIFI/BT)

Table 19: Pin Description of ANT_WIFI/BT

Pin Name	Pin No.	I/O	Description	Comment
ANT_WIFI/BT	2	AIO	Wi-Fi/Bluetooth Antenna Interfaces	50 Ω impedance.

5.3.1.1. Reference Design

The circuit of pin antenna interface is shown below. For better RF performance, it is recommended to reserve a dual-L type circuit and ESD protection components. The reserved matching components should be placed as close to the antenna as possible and mounted or not based on the actual situation. C1, C2 are not mounted by default and a 0 Ω resistor is mounted on R1.

⁵ The module is provided with one of the three antenna/antenna interface designs. For more details, please contact Quectel Technical Support.

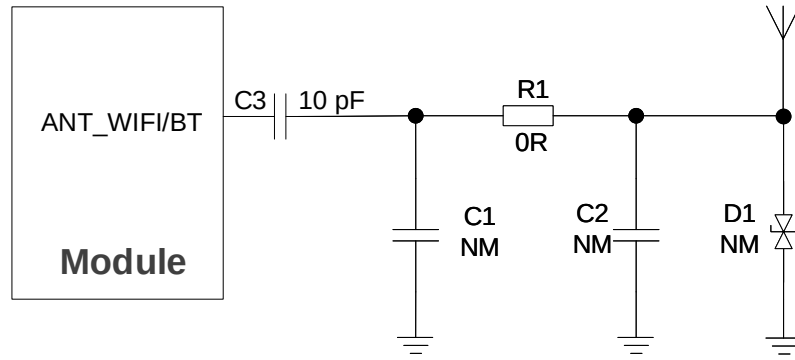


Figure 11: Reference Design of Antenna Interface (ANT_WIFI/BT)

NOTE

1. It is recommended to reserve ESD protection components for the antenna interfaces and the junction capacitance should not exceed 0.05 pF.
2. Notes on C3:
 - 1) If there is DC power at the antenna ports, place a capacitor on C3 to prevent short circuit to ground. The capacitance value is recommended to be 10 pF, which can be adjusted according to the debugging results.
 - 2) If there is no DC power in the peripheral design:
 - a) Do not reserve C3.
 - b) If C3 has already been reserved, it should be mounted with components, and it is recommended to use 0 Ω resistors. You can also match the components according to the debugging results.

5.3.1.2. RF Routing Guidelines

For user's PCB, the characteristic impedance of all RF traces should be controlled to 50 Ω . The impedance of the RF traces is usually determined by the trace width (W), the materials' dielectric constant, the height from the reference ground to the signal layer (H), and the spacing between RF traces and grounds (S). Microstrip or coplanar waveguide is typically used in RF layout to control characteristic impedance. The following are reference designs of microstrip or coplanar waveguide with different PCB structures.

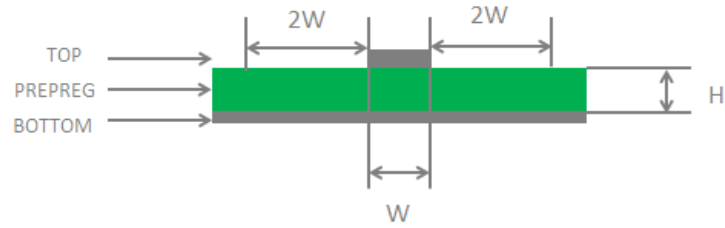


Figure 12: Microstrip Design on a 2-layer PCB

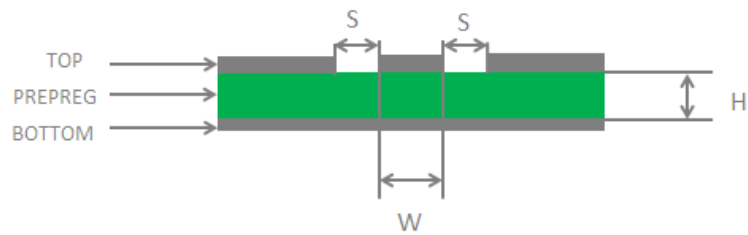


Figure 13: Coplanar Waveguide Design on a 2-layer PCB

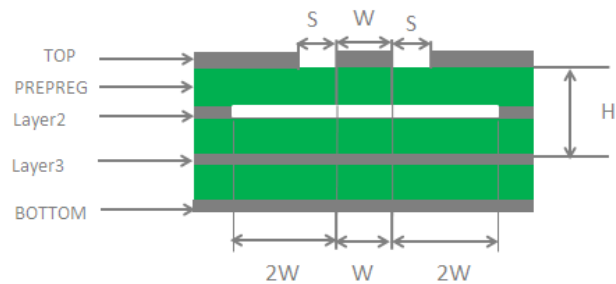


Figure 14: Coplanar Waveguide Design on a 4-layer PCB (Layer 3 as Reference Ground)

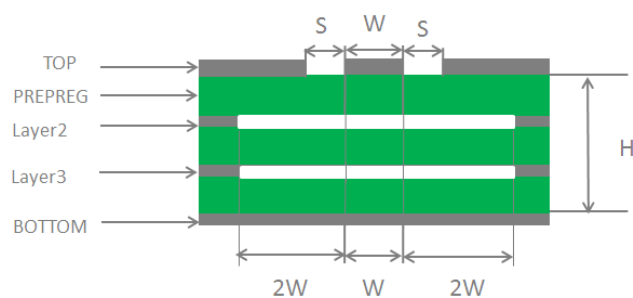


Figure 15: Coplanar Waveguide Design on a 4-layer PCB (Layer 4 as Reference Ground)

To ensure RF performance and reliability, follow the principles below in RF layout design:

- Use an impedance simulation tool to accurately control the characteristic impedance of RF traces to 50 Ω .
- The GND pins adjacent to RF pins should not be designed as thermal relief pads, and should be fully connected to ground.
- The distance between the RF pins and the RF connector should be as short as possible and all the right-angle traces should be changed to curved ones. The recommended trace angle is 135°.
- There should be clearance under the signal pin of the antenna connector or solder joint.
- The reference ground of RF traces should be complete. Meanwhile, adding some ground vias around RF traces and the reference ground could help to improve RF performance. The distance between the ground vias and RF traces should be at least twice the width of RF signal traces ($2 \times W$).
- Keep RF traces away from interference sources (such as DC-DC, (U)SIM/USB/SDIO high frequency digital signals, display signals, and clock signals), and avoid intersection and paralleling between traces on adjacent layers.

For more details about RF layout, see **document [2]**.

5.3.1.3. RF Connector Recommendation

If the RF connector is used for antenna connection, it is recommended to use U.FL-R-SMT connector provided by Hirose.

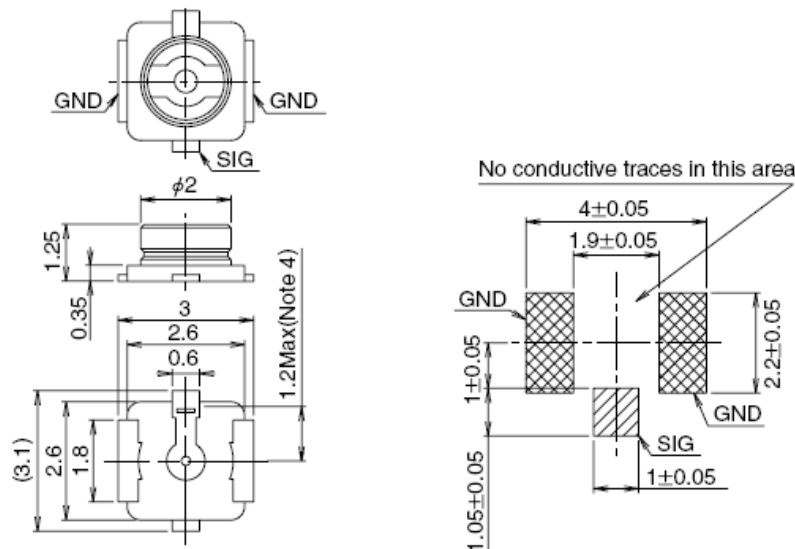


Figure 16: Dimensions of the Receptacle (Unit: mm)

U.FL-LP series mated plugs listed in the following figure can be used to match the U.FL-R-SMT.

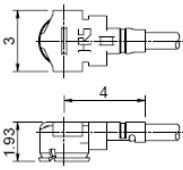
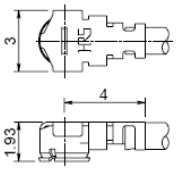
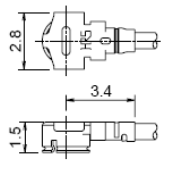
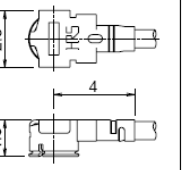
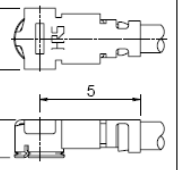
Part No.	U.FL-LP-040	U.FL-LP-066	U.FL-LP(V)-040	U.FL-LP-062	U.FL-LP-088
					
Mated Height	2.5mm Max. (2.4mm Nom.)	2.5mm Max. (2.4mm Nom.)	2.0mm Max. (1.9mm Nom.)	2.4mm Max. (2.3mm Nom.)	2.4mm Max. (2.3mm Nom.)
Applicable cable	Dia. 0.81mm Coaxial cable	Dia. 1.13mm and Dia. 1.32mm Coaxial cable	Dia. 0.81mm Coaxial cable	Dia. 1mm Coaxial cable	Dia. 1.37mm Coaxial cable
Weight (mg)	53.7	59.1	34.8	45.5	71.7
RoHS	YES				

Figure 17: Specifications of Mated Plugs (Unit: mm)

The following figure describes the space factor of mated connectors.

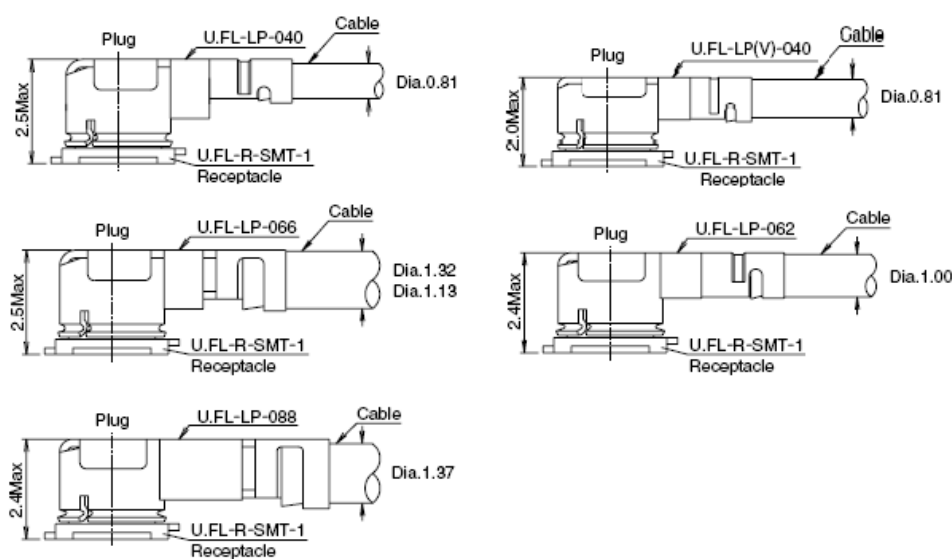


Figure 18: Space Factor of the Mated Connectors (Unit: mm)

For more details, visit <http://www.hirose.com>.

5.3.2. PCB Antenna

Table 20: Requirements for PCB Antenna

Parameter	Requirements
Frequency Range (GHz)	2.4 GHz: 2.400–2.4835 GHz
Input Impedance (Ω)	50
VSWR	≤ 2.4
Gain (dBi)	2.1
Efficiency	$\geq 38.5\%$

The performance of the PCB antenna depends on the entire product, including the motherboard, case, and other RF signals, and it is recommended to verify it at the early stage of design. To ensure the performance and reliability when designed with PCB antenna, follow the basic principles below for module's placement and layout:

- The module should be placed on the edge of the motherboard.
- On the motherboard, all PCB layers within at least 10 mm below and on both sides of the PCB antenna should be designed as keepout areas.
- On the motherboard, ensure a minimum clearance of 16 millimeters between the PCB antenna and power supply connectors, Ethernet ports, USB port and any large components on the motherboard.
- If using a plastic case, ensure a minimum clearance of 10 mm between the PCB antenna and the plastic case. If using a metal case, it is recommended to use an external antenna.

NOTE

If any of the above principles cannot be guaranteed, it is advisable to explore alternative antenna solutions for the module or seek assistance from the Quectel Antenna Team, who can offer design assistance and recommend suitable external antennas. Please feel free to contact Quectel Technical Support if necessary.

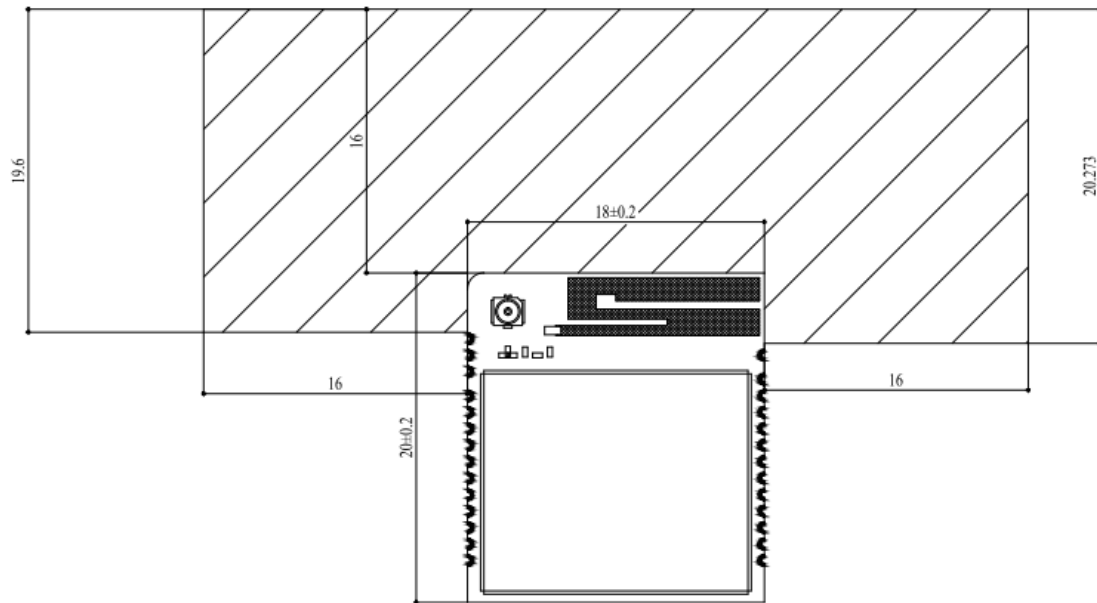


Figure 19: Keepout Area on Motherboard

To ensure module performance, do not route traces at the RF test point at the bottom of the module during PCB design. The prohibited area during routing is shown in the red box below:

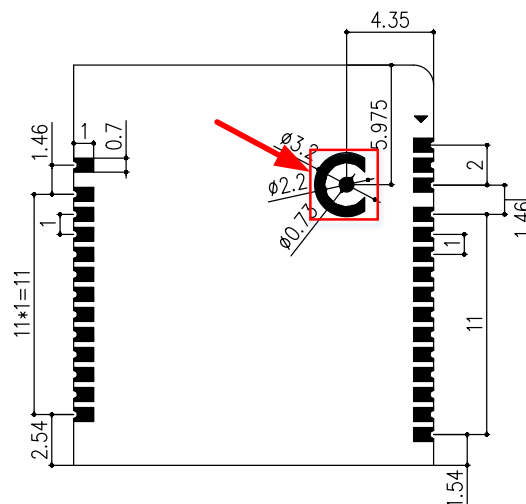


Figure 20: Prohibited Area During Routing (Bottom Side)

5.3.3. RF Coaxial Connector

5.3.3.1. Antenna Connector Specifications

The mechanical dimensions of the receptacle are as follows.

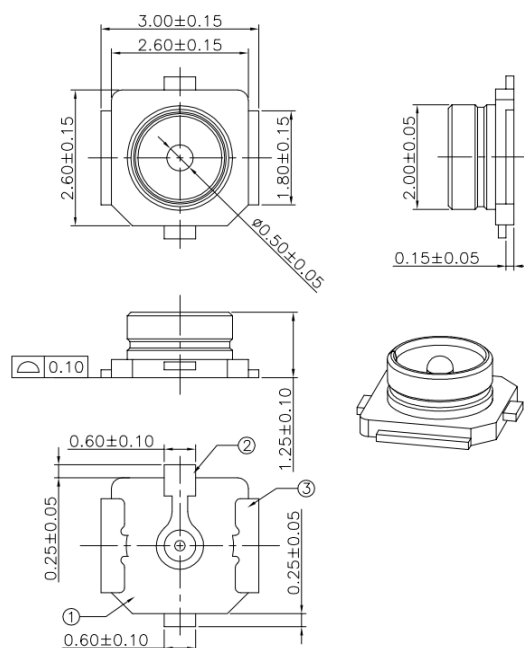


Figure 21: Dimensions of the Receptacle (Unit: mm)

Table 21: Major Specifications of the RF Connector

Parameter	Specification
Nominal Frequency Range	DC to 6 GHz
Nominal Impedance	50 Ω
Temperature Ranges	-40 °C to +85 °C
Voltage Standing Wave Ratio (VSWR)	Meet the requirements of: Max. 1.3 (DC–3 GHz) Max. 1.45 (3–6 GHz)

5.3.3.2. Antenna Connector Installation

The receptacle used in conjunction with the module will accept two types of mated plugs that will meet a maximum height of 2.0 mm using a $\varnothing$ 0.81 mm coaxial cable or a maximum height of 2.2 mm utilizing a $\varnothing$ 1.13 mm coaxial cable.

The following figure shows the dimensions of mated plugs using a $\varnothing$ 0.81 mm/ $\varnothing$ 1.13 mm coaxial cable.

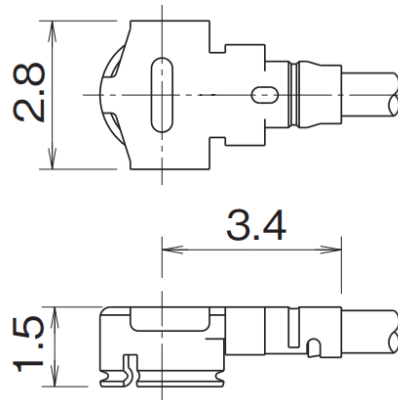


Figure 22: Dimensions of the Receptacle (Unit: mm)

The following figure illustrates the connection between the receptacle on the module and the mated plug using a $\varnothing$ 0.81 mm coaxial cable.

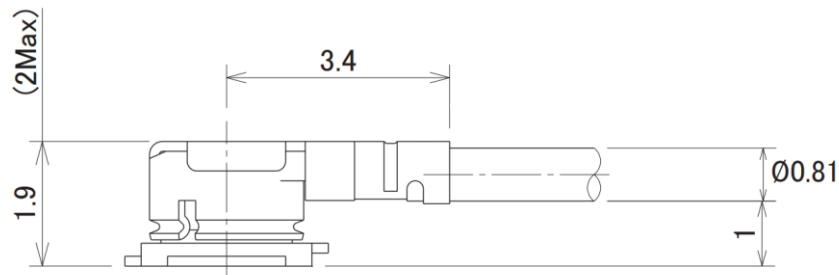


Figure 23: Space Factor of Mated Connectors ($\varnothing$ 0.81 mm Coaxial Cables) (Unit: mm)

The following figure illustrates the connection between the receptacle on the module and the mated plug using a $\varnothing$ 1.13 mm coaxial cable.

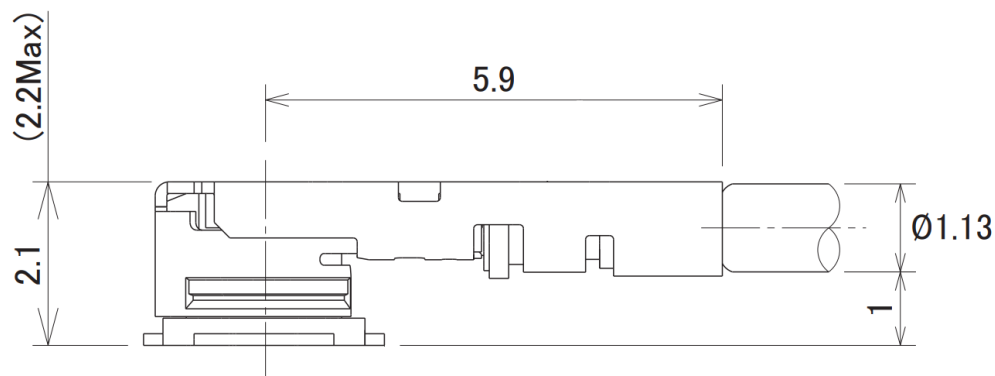


Figure 24: Space Factor of Mated Connectors (Ø 1.13 mm Coaxial Cables) (Unit: mm)

5.3.3.3. Recommended Manufacturers of RF Connector and Cable

RF connectors and cables by I-PEX are recommended. For more details, visit <https://www.i-pex.com>.

5.3.4. Requirements for Antenna Design

Table 22: Requirements for Antenna Design

Parameter	Requirements
Frequency Range (GHz)	2.4 GHz: 2.400–2.4835 GHz
RF Antenna Interface, RF Coaxial Connector	● VSWR: ≤ 2 (Typ.) ● Gain: 1 dBi (Typ.) ● Max input power: 50 W ● Input impedance: 50 Ω ● Vertical polarization ● Cable insertion loss: < 1 dB

6 Electrical Characteristics and Reliability

6.1. Absolute Maximum Ratings

Table 23: Absolute Maximum Ratings (Unit: V)

Parameters	Min.	Max.
VBAT	-0.3	4.5

NOTE

Exceeding the conditions of use as shown above may cause permanent damage to the module.

6.2. Power Supply Ratings

Table 24: Module's Power Supply Ratings (Unit: V)

Parameter	Description	Condition	Min.	Typ.	Max.
VBAT	Power supply for the module	The actual input voltages must be kept between the minimum and maximum values	2	3.3	4.35

6.3. Power Consumption

Test conditions for module power consumption are as follows:

- Ambient temperature 25 °C
- Typical power domain
- 50 Ω impedance

The above power consumption data are the typical values for your reference only. Actual values may vary among different modules due to differences in internal components, software versions and test ambient temperatures. For more details, contact Quectel Technical Support.

6.3.1. Wi-Fi Power Consumption ⁶

Table 25: Wi-Fi Power Consumption in Non-signaling Mode (Unit: mA)

Condition (Duty Cycle: 90%)			I _{VBAT} (AVG)	I _{VBAT} (MAX)
2.4 GHz	802.11b	Tx @ 1 Mbps	237.96	247.36
		Tx @ 11 Mbps	237.59	247.30
	802.11g	Tx @ 6 Mbps	191.95	200.53
		Tx @ 54 Mbps	191.26	201.75
	802.11n	Tx HT20 @ MCS 0	195.17	203.24
		Tx HT20 @ MCS 7	180.49	190.15
		Tx HT40 @ MCS 0	198.02	206.56
		Tx HT40 @ MCS 7	181.61	189.67
	802.11ax	Tx HE20 @ MCS 0	192.08	204.40
		Tx HE20 @ MCS 7	175.00	189.67
		Tx HE40 @ MCS 0	189.16	206.49
		Tx HE40 @ MCS 7	171.30	192.34

⁶ The Bluetooth function is disabled when the Wi-Fi power consumption is tested.

6.3.2. Bluetooth Power Consumption ⁷

Table 26: Bluetooth Power Consumption in Non-signaling Mode (Unit: mA)

Condition	I _{VBAT} (AVG)	I _{VBAT} (MAX)
BLE (1 Mbps) @ 6 dBm	77.47	106.12
BLE (2 Mbps) @ 6 dBm	55.51	106.51
BLE (S = 2) @ 6 dBm	70.58	106.83
BLE (S = 8) @ 6 dBm	89.03	108.44

6.4. Digital I/O Characteristics

Table 27: I/O Characteristics (Unit: V)

Parameters	Description	Min.	Max.
V _{IH}	High-level input voltage	0.7 × V _{IO}	V _{IO} + 0.3
V _{IL}	Low-level input voltage	-0.3	0.3 × V _{IO}
V _{OH}	High-level output voltage	0.9 × V _{IO}	-
V _{OL}	Low-level output voltage	-	0.1 × V _{IO}

NOTE

For more details about V_{IO}, contact Quectel Technical Support.

⁷ The Wi-Fi function is disabled when the Bluetooth power consumption is tested.

6.5. ESD Protection

Static electricity occurs naturally and it may damage the module. Therefore, applying proper ESD countermeasures and handling methods is imperative. For example, wear anti-static gloves during the development, production, assembly and testing of the module; add ESD protection components to the ESD sensitive interfaces and points in the product design.

Table 28: Electrostatic Discharge Characteristics (Unit: kV)

Model	Test Result	Reference Standard
Human Body Model	± 4	ANSI/ESDA/JEDEC JS-001
Charge Device Model	± 0.5	ANSI/ESDA/JEDEC JS-002

7 Mechanical Information

This chapter describes the mechanical dimensions of the module. All dimensions are measured in millimeter (mm), and the dimensional tolerances are ± 0.2 mm unless otherwise specified.

7.1. Mechanical Dimensions

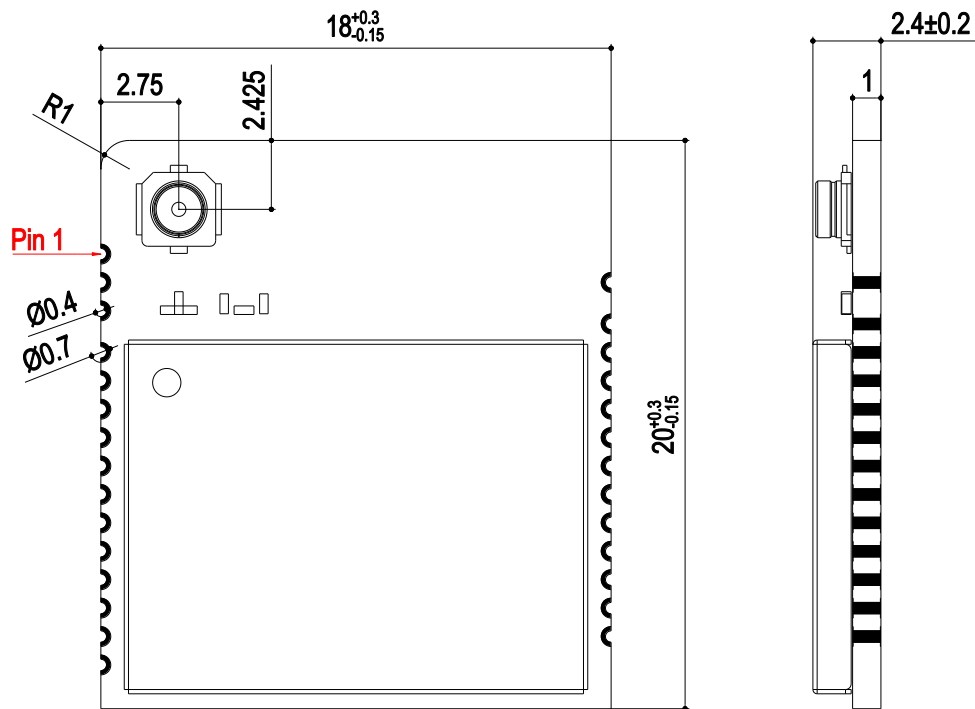


Figure 25: Top and Side Dimensions

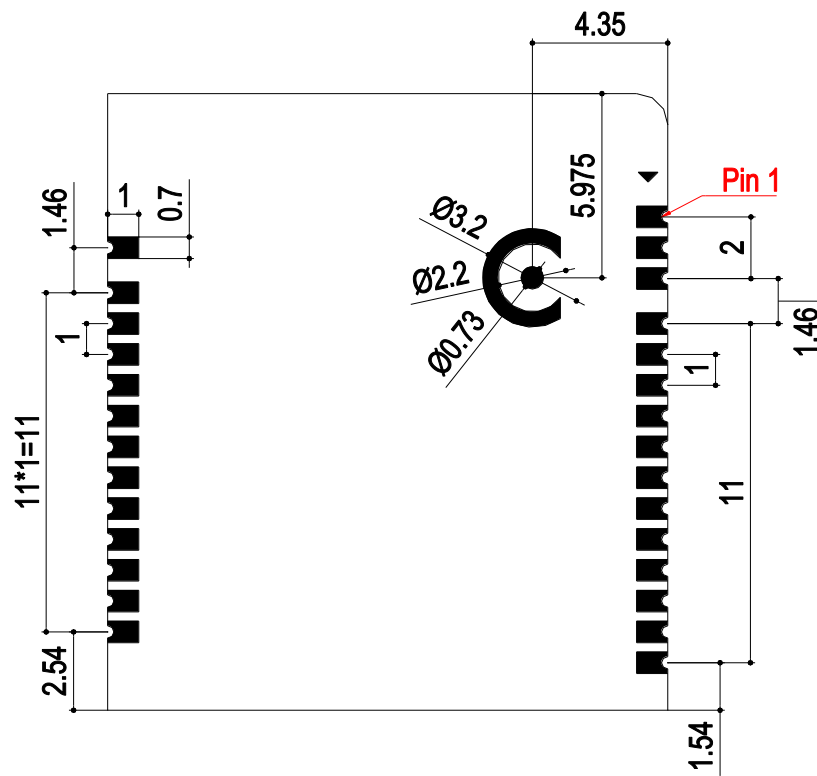


Figure 26: Bottom Dimension

NOTE

The module's coplanarity standard: ≤ 0.13 mm.

7.3. Top and Bottom Views

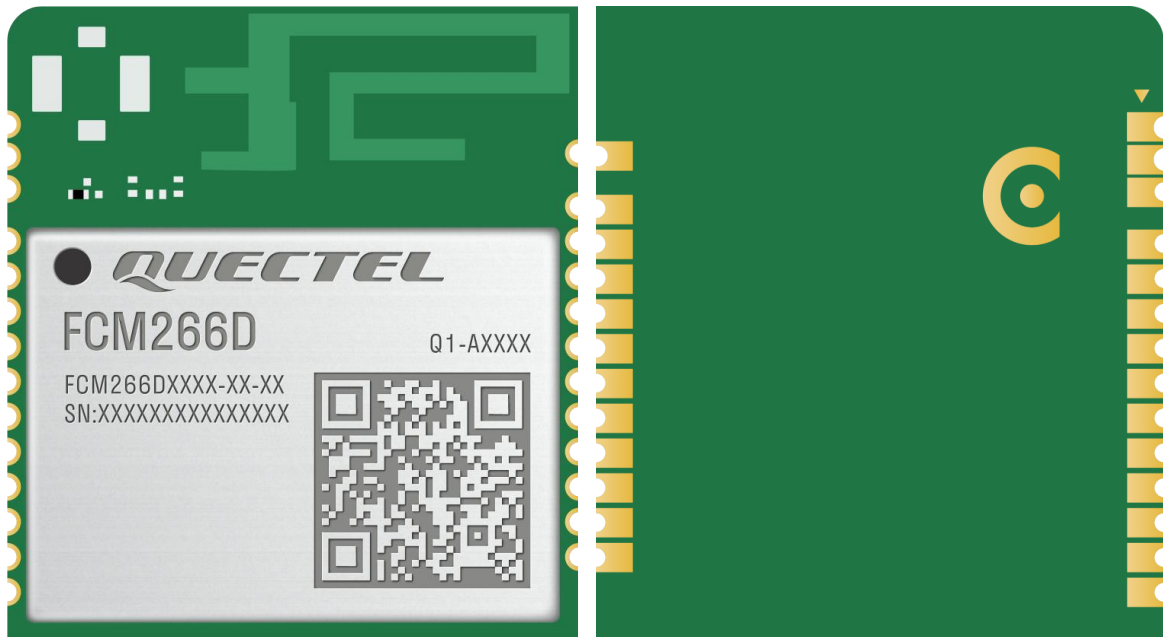


Figure 28: Top and Bottom Views (Antenna Interface)

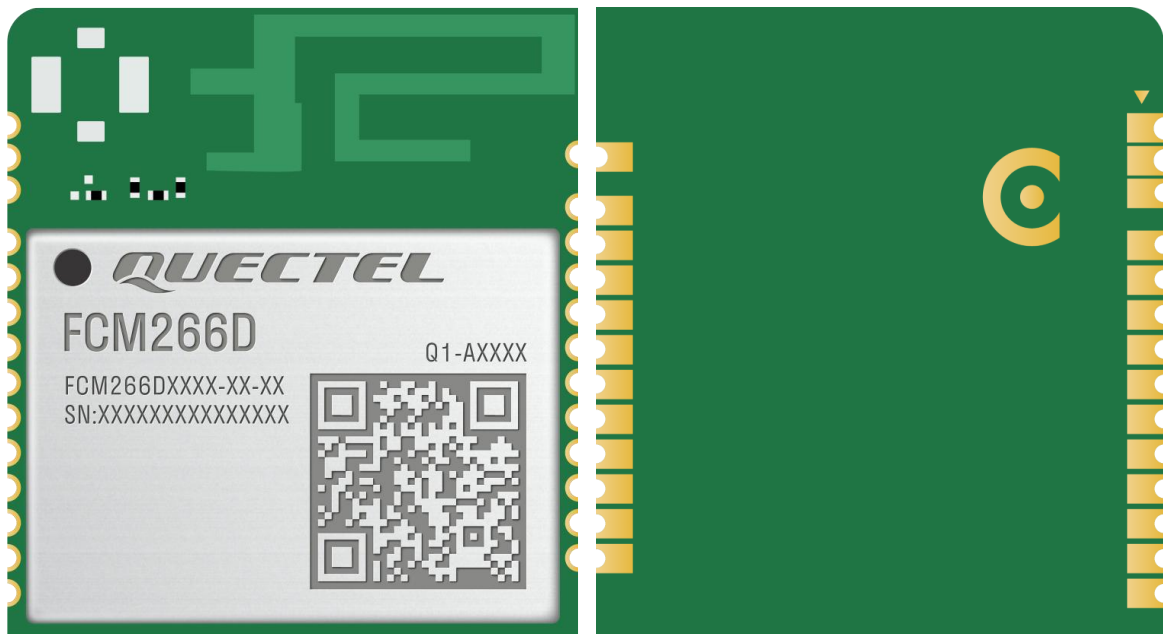


Figure 29: Top and Bottom Views (PCB Antenna)

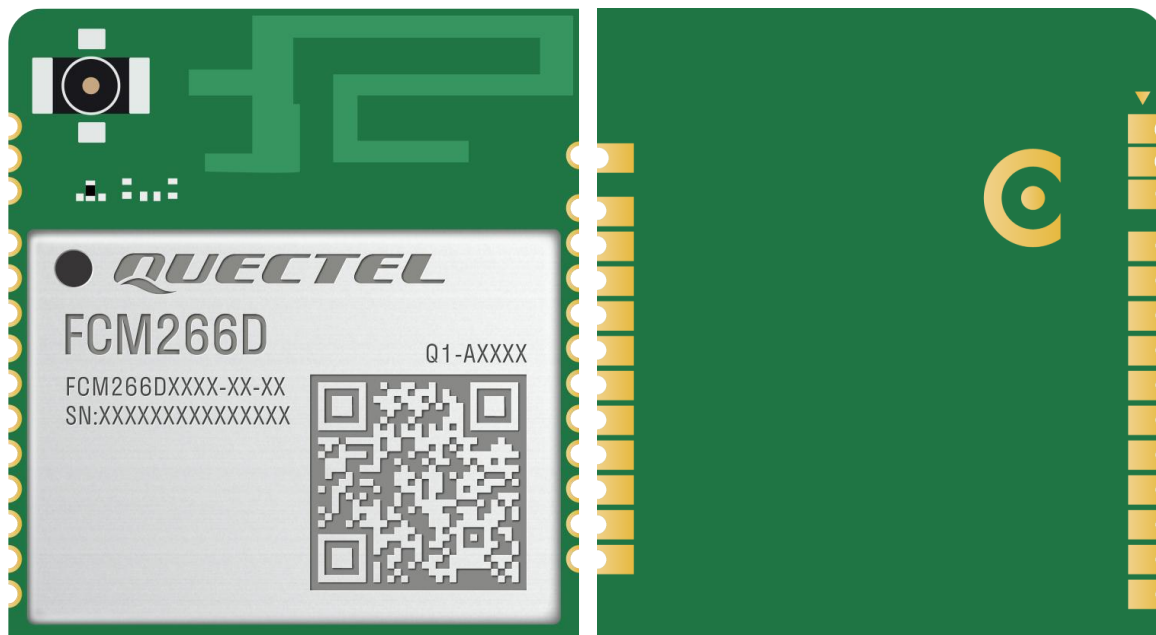


Figure 30: Top and Bottom Views (RF Coaxial Connector)

NOTE

Images above are for illustration purpose only and may differ from the actual module. For authentic appearance and label, please refer to the module received from Quectel.

8 Storage, Manufacturing & Packaging

8.1. Storage Conditions

The module is provided with vacuum-sealed packaging. MSL of the module is rated as 3. The storage requirements are shown below.

1. Recommended storage condition: the temperature should be 23 ± 5 °C and the relative humidity should be 35–60 %.
2. Shelf life (in a vacuum-sealed packaging): 12 months in recommended storage condition.
3. Floor life: 168 hours ⁸ in a factory where the temperature is 23 ± 5 °C and relative humidity is below 60 %. After the vacuum-sealed packaging is removed, the module must be processed in reflow soldering or other high-temperature operations within 168 hours. Otherwise, the module should be stored in an environment where the relative humidity is less than 10 % (e.g., a dry cabinet).
4. The module should be pre-baked to avoid blistering, cracks and inner-layer separation in PCB under the following circumstances:
 - The module is not stored in Recommended Storage Condition;
 - Violation of the third requirement mentioned above;
 - Vacuum-sealed packaging is broken, or the packaging has been removed for over 24 hours;
 - Before module repairing.
5. If needed, the pre-baking should follow the requirements below:
 - The module should be baked for 24 hours at 120 ± 5 °C;
 - The module must be soldered to PCB within 24 hours after the baking, otherwise it should be put in a dry environment such as in a dry cabinet.

⁸ This floor life is only applicable when the environment conforms to *IPC/JEDEC J-STD-033*. It is recommended to start the solder reflow process within 24 hours after the package is removed if the temperature and moisture do not conform to, or are not sure to conform to *IPC/JEDEC J-STD-033*. And do not unpack the modules in large quantities until they are ready for soldering.

NOTE

1. To avoid blistering, layer separation and other soldering issues, extended exposure of the module to the air is forbidden.
2. Take out the module from the package and put it on high-temperature-resistant fixtures before baking. If shorter baking time is desired, see *IPC/JEDEC J-STD-033* for the baking procedure.
3. Pay attention to ESD protection, such as wearing anti-static gloves, when touching the modules.

8.2. Manufacturing and Soldering

Push the squeegee to apply the solder paste on the surface of stencil, thus making the paste fill the stencil openings and then penetrate to the PCB. Apply proper force on the squeegee to produce a clean stencil surface on a single pass. To guarantee module soldering quality, the thickness of stencil for the module is recommended to be 0.12–0.15 mm. For more details, see **document [3]**.

The recommended peak reflow temperature should be 235–246 °C, with 246 °C as the absolute maximum reflow temperature. To avoid damage to the module caused by repeated heating, it is recommended that the module should be mounted only after reflow soldering for the other side of PCB has been completed. The recommended reflow soldering thermal profile (lead-free reflow soldering) and related parameters are shown below.

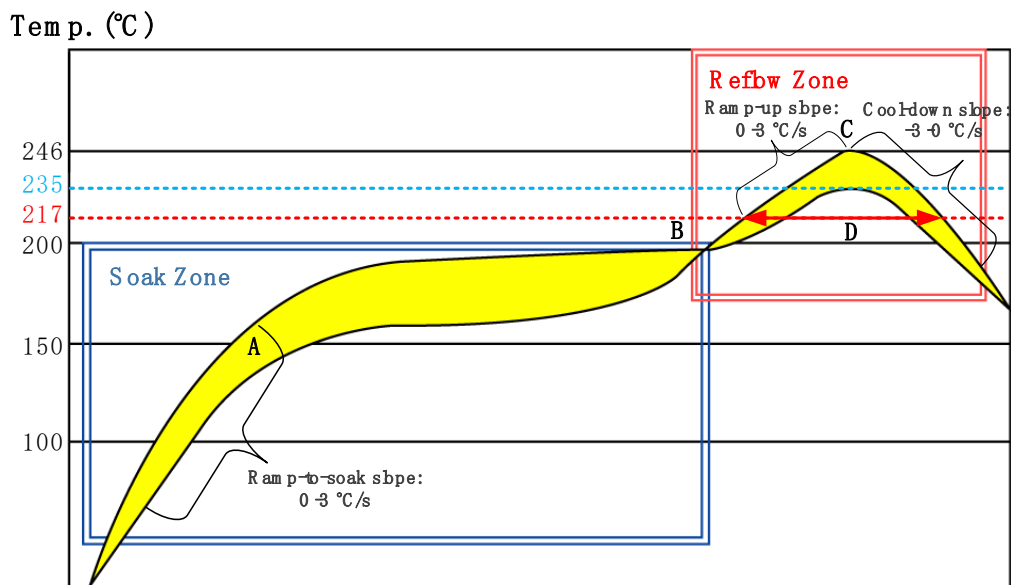


Figure 31: Recommended Reflow Soldering Thermal Profile

Table 29: Recommended Thermal Profile Parameters

Factor	Requirements
Soak Zone	
Ramp-to-soak Slope	0–3 °C/s
Soak Time (between A and B: 150 °C and 200 °C)	70–120 s
Reflow Zone	
Ramp-to-soak Slope	0–3 °C/s
Reflow Time (D: over 217°C)	40–70 s
Max Temperature	235–246 °C
Cool-down Slope	-3–0 °C/s
Reflow Cycle	
Max Reflow Cycle	1

NOTE

1. The above profile parameter requirements are for the measured temperature of the solder joints. Both the hottest and coldest spots of solder joints on the PCB should meet the above requirements.
2. During manufacturing and soldering, or any other processes that may contact the module directly, NEVER wipe the module's shielding can with organic solvents, such as acetone, ethyl alcohol, isopropyl alcohol, trichloroethylene.
3. The shielding can for the module is made of Cupro-Nickel base material. It is tested that after 12 hours' Neutral Salt Spray test, the laser engraved label information on the shielding can is still clearly identifiable and the QR code is still readable, although white rust may be found.
4. If a conformal coating is necessary for the module, do not use any coating material that may chemically react with the PCB or shielding cover, and prevent the coating material from flowing into the module.
5. Avoid using ultrasonic technology for module cleaning since it can damage crystals inside the module.
6. Avoid using materials that contain mercury (Hg), such as adhesives, for module processing, even if the materials are RoHS compliant and their mercury content is below 1000 ppm (0.1 %).
7. Corrosive gases may corrode the electronic components inside the module, affecting their reliability and performance, and potentially leading to a shortened service life that fails to meet the designed lifespan. Therefore, do not store or use unprotected modules in environments containing corrosive gases such as hydrogen sulfide, sulfur dioxide, chlorine, and ammonia.
8. Due to the complexity of the SMT process, please contact Quectel Technical Support in advance

for any situation that you are not sure about, or any process (e.g., selective soldering, ultrasonic soldering) that is not mentioned in **document [4]**.

8.3. Packaging Specifications

This chapter outlines the key packaging parameters and processes. All figures below are for reference purposes only, as the actual appearance and structure of packaging materials may vary in delivery.

The modules are packed in a tape and reel packaging as specified in the sub-chapters below.

8.3.1. Carrier Tape

Carrier tape dimensions are illustrated in the following figure and table:

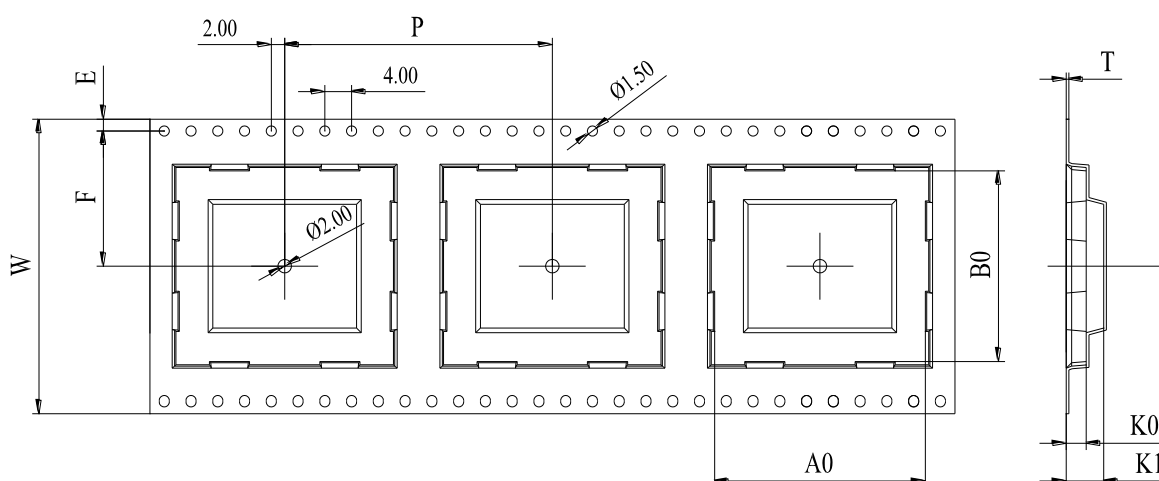


Figure 32: Carrier Tape Dimension Drawing (Unit: mm)

Table 30: Carrier Tape Dimension Table (Unit: mm)

W	P	T	A0	B0	K0	K1	F	E
44	32	0.4	18.4	20.4	3.1	4.4	20.2	1.75

8.3.2. Plastic Reel

Plastic reel dimensions are illustrated in the following figure and table:

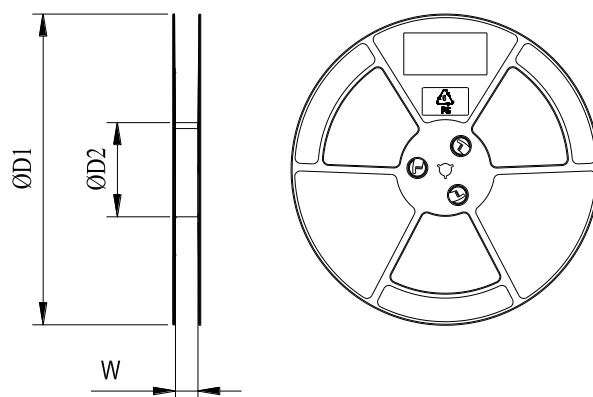


Figure 33: Plastic Reel Dimension Drawing

Table 31: Plastic Reel Dimension Table (Unit: mm)

ØD1	ØD2	W
380	100	44.5

8.3.3. Mounting Direction

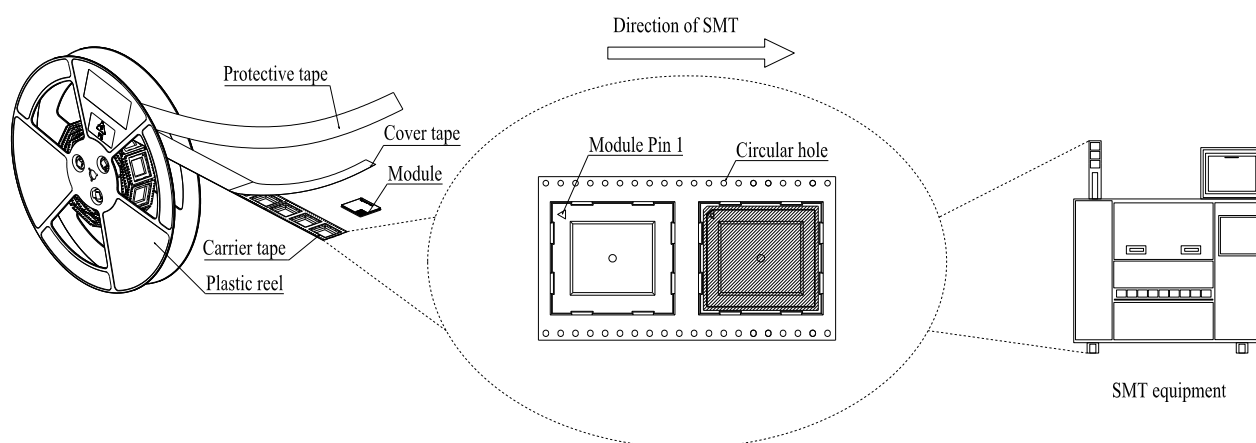
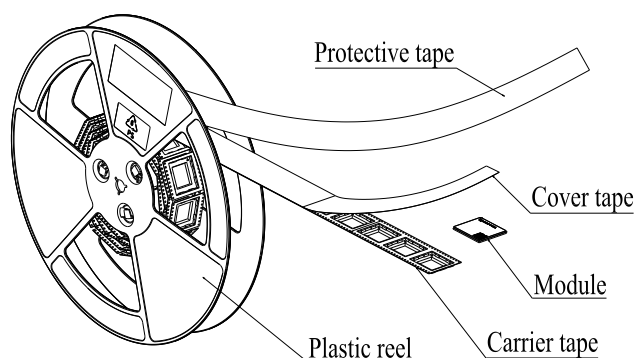


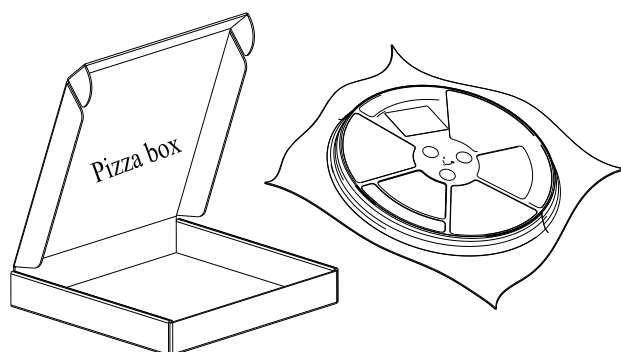
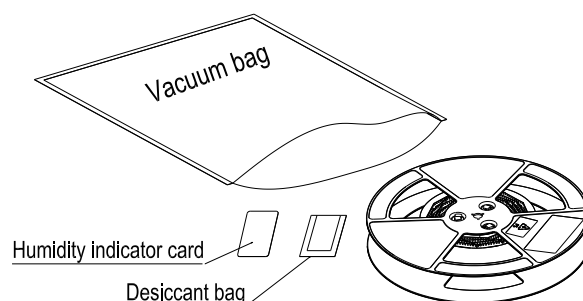
Figure 34: Mounting Direction

8.3.4. Packaging Process



Wind the heat-sealed carrier tape onto a plastic reel and apply a protective tape for additional protection. 1 plastic reel can pack 500 modules.

Place the packaged plastic reel, humidity indicator card and desiccant bag into a vacuum bag, and vacuumize it.



Place the vacuum-packed plastic reel into a pizza box.

Place the 4 packaged pizza boxes into 1 carton and seal it. 1 carton can pack 2000 modules.

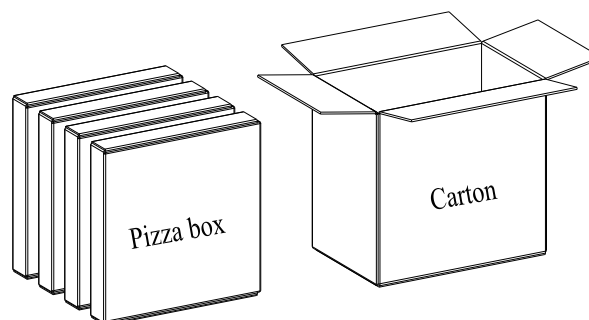


Figure 35: Packaging Process

9 Appendix References

Table 32: Related Documents

Document Name
[1] Quectel_FCM266D_TE-B_User_Guide
[2] Quectel_RF_Layout_Application_Note
[3] Quectel_Module_Stencil_Design_Requirements
[4] Quectel_Module_SMT_Application_Note

Table 33: Terms and Abbreviations

Abbreviation	Description
ADC	Analog-to-Digital Converter
AP	Access Point
ARM	Advanced RISC Machine
BLE	Bluetooth Low Energy
BPSK	Binary Phase Shift Keying
DC	Direct Current
EEPROM	Electrically Erasable Programmable Read-Only Memory
ESD	Electrostatic Discharge
GFSK	Gauss Frequency Shift Keying
GND	Ground
GPIO	General-Purpose Input/Output

HE	High Efficiency
HT	High Throughput
High Frequency Crystal OscillatorI2C	Inter-Integrated Circuit
I/O	Input/Output
LCC	Leadless Chip Carrier (package)
Mbps	Million Bits Per Second
MCS	Modulation and Coding Scheme
MCU	Microcontroller Unit
MISO	Master In Slave Out
MOSI	Master Out Slave In
OFDMA	Orthogonal Frequency-Division Multiple Access
PCB	Printed Circuit Board
PWM	Pulse Width Modulation
QAM	Quadrature Amplitude Modulation
RF	Radio Frequency
RoHS	Restriction of Hazardous Substances
SPI	Serial Peripheral Interface
SRAM	Static Random-Access Memory
STA	Station
TBD	To Be Determined
TVS	Transient Voltage Suppressor
Tx	Transmit
UART	Universal Asynchronous Receiver/Transmitter
(U)SIM	(Universal) Subscriber Identity Module
VHT	Very High Throughput

V_{IH}	High-level input voltage
V_{IL}	Low-level input voltage
V_{max}	Maximum Voltage
V_{min}	Minimum Voltage
V_{nom}	Nominal Voltage
V_{OH}	High-level Output voltage
V_{OL}	Low-level Output voltage
V_{REF}	Voltage Reference
VSWR	Voltage Standing Wave Ratio
WPA	Wi-Fi Protected Access
XO	Crystal Oscillator

FCC Statement

Warning: Changes or modifications to this unit 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

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

FCC Radiation Exposure Statement

This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Does not comply with the use restrictions of the product:

Portable devices used close with human's body (within 20cm), Like Cell phone, Notebook etc.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

2.2 List of applicable FCC rules

FCC Part 15 Subpart C 15.247 & 15.209.

2.3 Specific operational use conditions

The module can be used for mobile applications with a maximum 2.1dBi antenna. The host manufacturer installing this module into their product must ensure that the final product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules,

including the transmitter operation. The host manufacturer 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 shown in this manual.

2.4 Limited module procedures

Not applicable. The module is a Single module and complies with the requirement of FCC Part 15 212.

2.5 Trace antenna designs

Not applicable. The module has its own antenna, and doesn't need a host's printed board micro strip trace antenna etc.

2.6 RF exposure considerations

The module must be installed in the host equipment such that at least 20cm is maintained between the antenna and users' body; and if RF exposure statement or module layout is changed, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID or new application. The FCC ID of the module cannot be used on the final product. In these circumstances, the host manufacturer will be responsible for reevaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

2.7 Antennas

Antenna Specification are as follows:

Type: PCB Antenna

Gain: 2.1dBi

This device is intended only for host manufacturers under the following conditions: The transmitter module may not be co-located with any other transmitter or antenna; The module shall be only used with the internal antenna(s) that has been originally tested and certified with this module. The antenna must be either permanently attached or employ a "unique" antenna coupler.

As long as the conditions above are met, further transmitter test will not be required. However, the host manufacturer is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc).

2.8 Label and compliance information

Host product manufacturers need to provide a physical or e-label stating "Contains FCC ID: XMR2025FCM266D" with their finished product.

2.9 Information on test modes and additional testing requirements

Host manufacturer must perform test of radiated & conducted emission and spurious emission, etc according to the actual test modes for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product. Only when all the test results of test modes comply with FCC requirements, then the end product can be sold legally.

2.10 Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for FCC Part 15 Subpart C 15.247 & 15.209 and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Federal Communication Commission Statement (FCC, US)

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 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

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.

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.

IMPORTANT NOTES**Co-location warning:**

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

OEM integration instructions:

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

The transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the external antenna(s) that has been originally tested and certified with this module.

As long as the 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 (for example, digital device emissions, PC peripheral requirements, etc.).

Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module 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 Transmitter Module **FCC ID: XMR2025FCM266D**"

Information that must be placed in the end user manual:

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 shown in this manual.