

HCM320Z Hardware Design

Short-Range Module Series

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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

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-	2025-04-27	Joy DAI/Stephen LI	Creation of the document
1.0.0	2025-04-27	Joy DAI/Stephen LI	Preliminary

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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 price-performance ratio

This document defines HCM320Z in QuecOpen® solution and describes its air interfaces and hardware interfaces, which are connected with your applications. The document provides a quick insight into interface specifications, RF performance, electrical and mechanical specifications, as well as other related information of the module.

1.1. Special Mark

Table 1: Special Mark

Mark	Definition
[...]	Brackets ([...]) used after a pin enclosing a range of numbers indicate all pins of the same type. For example, SDIO_DATA[0:3] refers to all four SDIO pins: SDIO_DATA0, SDIO_DATA1, SDIO_DATA2, and SDIO_DATA3.

Hereby, Quectel Wireless Solutions Co., Ltd. declares that the radio equipment type HCM320Z is in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity is available at the following internet address:
<http://www.quectel.com/support/technical.htm>

Disposal of old electrical appliances

The European directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE), requires that old household electrical appliances must not be disposed of in the normal unsorted municipal waste stream. Old appliances must be collected separately in order to optimize the recovery and recycling of the materials they contain, and reduce the impact on human health and the environment.

The crossed out “wheeled bin” symbol on the product reminds you of your obligation, that when you dispose of the appliance, it must be separately collected.

Consumers should contact their local authority or retailer for information concerning the correct disposal of their old appliance.

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

FCC ID: XMR2025HCM320Z

IC: 10224A-2025HCM320Z



2 Product Overview

HCM320Z is a high-performance, low-power MCU Bluetooth module supporting Bluetooth 5.3 protocols. It provides multiple interfaces including UART, SPI, I2C, PWM, ADC, SWD* and USB* for various applications.

It is an SMD module with compact packaging. It includes:

- CortexM3 core processor with frequency from 12 MHz to 48 MHz
- Built-in 128 KB SRAM and 1 MB Flash
- Support for secondary development

Table 2: Basic Information

Item	Description
Packaging Type	LCC
Pin Counts	28
Dimensions	(16.5 +0.3/-0.15) mm × (13.3 +0.3/-0.15) mm × (2.5 ±0.2) mm
Weight	Pin antenna interface/PCB antenna: 0.75 g RF coaxial connector : 0.8 g

2.1. Key Features

Table 3: Key Features

Basic Information	
Protocols and Standard	- Bluetooth protocol: Bluetooth 5.3 - All hardware components are fully compliant with EU RoHS directive
Power Supply	VBAT Power Supply: 2.1–3.6 V - Typ.: 3.3 V
Temperature Ranges	- Normal operating temperature ¹: -40 to +85 °C - Storage temperature: -45 to +95 °C
TE-B Kit	HCM320Z-TE-B ²
RF Antenna/Antenna Interface ³	
Antenna/Antenna Interface	- Pin antenna interface (ANT_ BT) - RF coaxial connector - PCB antenna 50 Ω characteristic impedance
Application Interface ⁴	
Application Interfaces	UART, SPI, I2C, PWM, ADC, SWD*, USB*

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

² Quectel supplies a HCM320Z-TE-B with accessories to develop and test the module. For more details, see **document** 错误! 未找到引用源。.

³ The module provides three optional antenna or antenna interface designs. For more details, contact Quectel. Technical Support.

⁴ For more details about application interfaces, see **Chapter 0** and **Chapter 3.4**.

3 Application Interfaces

3.1. Pin Assignment

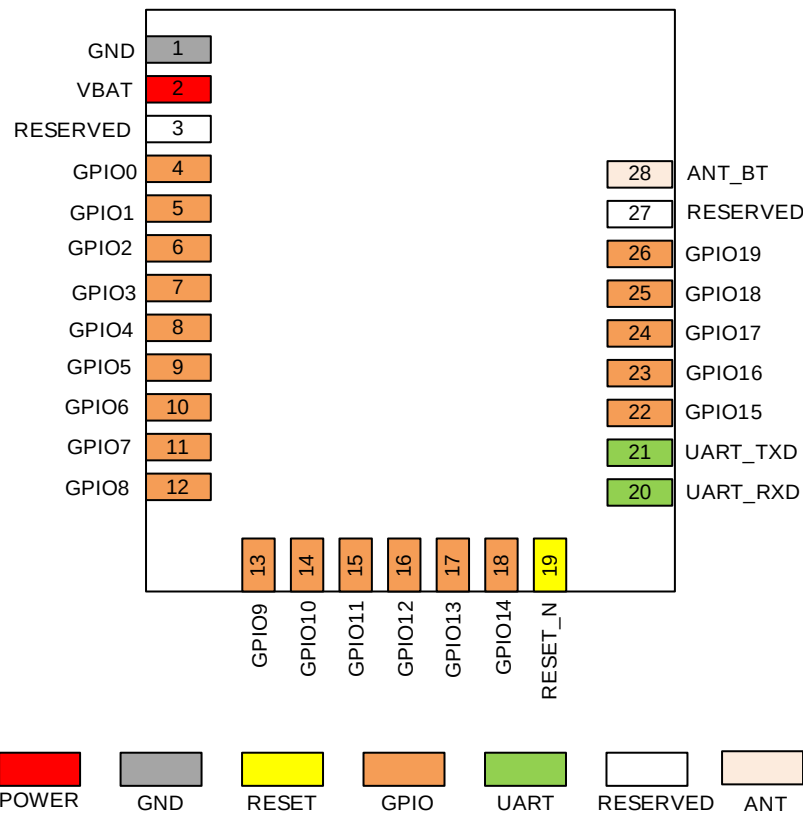


Figure 1: Pin Assignment (Top View)

NOTE

1. Keep all RESERVED and unused pins unconnected.
2. All GND pins should be connected to ground.
3. Ensure that there is no current sink on the module's pins before the module turns on.
4. The module has 20 GPIO interfaces by default. In the case of multiplexing, it supports interfaces including UART, SPI, I2C, PWM, ADC, SWD* and USB*. For more details, see **Chapter 3.3** and **3.4**.

3.2. Pin Definitions

Table 4: Parameter Definition

Parameter	Description
AIO	Analog Input/Output
DI	Digital Input
DO	Digital Output
DIO	Digital Input/Output
PI	Power Input
PU	Pull Up
Hi-Z	High Impedance

DC characteristics include power domain and rated current.

Table 5: Pin Description

Power Supply						
Pin Name	Pin No.	I/O	Description	Status After Reset	DC Characteristics	Comment
VBAT	2	PI	Power supply for the module	PU	V _{max} = 3.6 V V _{min} = 2.1 V V _{nom} = 3.3 V	It is recommended to be provided with sufficient current of at least 0.5 A.
GND	1					Connect it to ground.
Control Signal						
Pin Name	Pin No.	I/O	Description	Status After Reset	DC Characteristics	Comment
RESET_N	19	DI	Reset the module	PU	VBAT	Hardware enable. Internally pulled up to 3.3 V. Active low.

UART Interface						
Pin Name	Pin No.	I/O	Description	Status After Reset	DC Characteristics	Comment
UART_TXD	21	DO	UART transmit	-	VBAT	
UART_RXD	20	DI	UART receive	-		
GPIO Interfaces						
Pin Name	Pin No.	I/O	Description	Status After Reset	DC Characteristics	Comment
GPIO0	4	DIO	General-purpose input/output	Hi-Z	VBAT	Support Wakeup.
GPIO1	5	DIO	General-purpose input/output	Hi-Z		
GPIO2	6	DIO	General-purpose input/output	Hi-Z		
GPIO3	7	DIO	General-purpose input/output	Hi-Z		
GPIO4	8	DIO	General-purpose input/output	Hi-Z		
GPIO5	9	DIO	General-purpose input/output	Hi-Z		
GPIO6	10	DIO	General-purpose input/output	Hi-Z		
GPIO7	11	DIO	General-purpose input/output	Hi-Z		
GPIO8	12	DIO	General-purpose input/output	Hi-Z		
GPIO9	13	DIO	General-purpose input/output	Hi-Z		
GPIO10	14	DIO	General-purpose input/output	Hi-Z		
GPIO11	15	DIO	General-purpose input/output	Hi-Z		
GPIO12	16	DIO	General-purpose input/output	Hi-Z		
GPIO13	17	DIO	General-purpose input/output	Hi-Z		
GPIO14	18	DIO	General-purpose input/output	Hi-Z		

GPIO15	22	DIO	General-purpose input/output	Hi-Z
GPIO16	23	DIO	General-purpose input/output	Hi-Z
GPIO17	24	DIO	General-purpose input/output	Hi-Z
GPIO18	25	DIO	General-purpose input/output	Hi-Z
GPIO19	26	DIO	General-purpose input/output	Hi-Z

RF Antenna Interface

Pin Name	Pin No.	I/O	Description	Status After Reset	DC Characteristics	Comment
ANT_BT	28	AIO	Bluetooth antenna interface	-		50 Ω characteristic impedance.

RESERVED Pins

Pin Name	Pin No.	Comment
RESERVED	3, 27	Keep them open.

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 provides 20 GPIO interfaces by default, and can support up to 22 GPIO interfaces in the case of multiplexing. Pins are defined as follows:

Table 6: GPIO Multiplexing

Pin Name	Pin No.	Alternate Function 0 (GPIO No.)	Alternate Function 1	Alternate Function 2	Alternate Function 3	Alternate Function 4	Alternate Function 5
GPIO0	4	PB7	UART1_RTS	SPI1_MISO	USB_DM	PWM7	SWDIO
GPIO1	5	PB6	UART1_CTS	SPI1_MOSI	USB_DP	PWM6	SWCLK
GPIO2	6	PA4	UART1_RXD	SPI0_CLK	I2C0_SCK	PWM4	-
GPIO3	7	PA1	UART0_TXD	SPI0_CS	I2C0_SDA	PWM1	-
GPIO4	8	PA0	UART0_RXD	SPI0_CLK	I2C0_SCK	PWM0	-
GPIO5	9	PA3	UART0_RTS	SPI0_MISO	USB_DM	PWM3	-
GPIO6	10	PA2	UART0_CTS	SPI0_MOSI	USB_DP	PWM2	-
GPIO7	11	PA8	UART0_RXD	SPI0_CLK	I2C0_SCK	PWM0	-
GPIO8	12	PA9	UART0_TXD	SPI0_CS	I2C0_SDA	PWM1	-
GPIO9	13	PB10	UART0_CTS	SPI1_MOSI	I2C2_SCK	PWM2	-

GPIO10	14	PA5	UART1_TXD	SPI0_CS	I2C0_SDA	PWM5	-
GPIO11	15	PB11	UART0_RTS	SPI1_MISO	I2C2_SDA	PWM3	-
GPIO12	16	PA6	UART1_CTS	SPI0_MOSI	USB_DP	PWM6	-
GPIO13	17	PA7	UART1_RTS	SPI0_MISO	USB_DM	PWM7	-
GPIO14	18	PB4	UART1_RXD	SPI1_CLK	I2C1_SCK	PWM4	-
UART_RXD	20	PB8	UART0_RXD	SPI1_CLK	I2C1_SCK	PWM0	-
UART_TXD	21	PB9	UART0_TXD	SPI1_CS	I2C1_SDA	PWM1	-
GPIO15	22	PB15	UART1_RTS	SPI1_MISO	I2C2_SDA	PWM7	ADC0
GPIO16	23	PB14	UART1_CTS	SPI1_MOSI	I2C2_CLK	PWM6	ADC1
GPIO17	24	PB5	UART1_TXD	SPI1_CS	I2C1_SDA	PWM5	-
GPIO18	25	PB12	UART1_RXD	SPI1_CLK	USB_DP	PWM4	ADC3
GPIO19	26	PB13	UART1_TXD	SPI1_CS	USB_DM	PWM5	ADC4

NOTE

1. All GPIO supports wakeup.
2. After the module is powered off, all of its GPIOs must input low. Current leakage may make the module to be in an abnormal state.
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 Interface

The module has 1 UART interface by default. In the case of multiplexing, it supports up to 2 UART interfaces.

Table 7: Pin Description of UART Interface

Pin Name	Pin No.	I/O	Description	Comment
UART_TXD	21	DO	UART transmit	Other configurations for UART interface, see Table 6 .
UART_RXD	20	DI	UART receive	

The UART interface is used to communicate with the MCU, supports AT command application and data transmission, and can be used with debugging tools for downloading, debugging and AT command communication, and supports log printout. The baud rate is configurable, with a default of 115200 bps.

The UART interface connection between the module and the MCU is shown below.

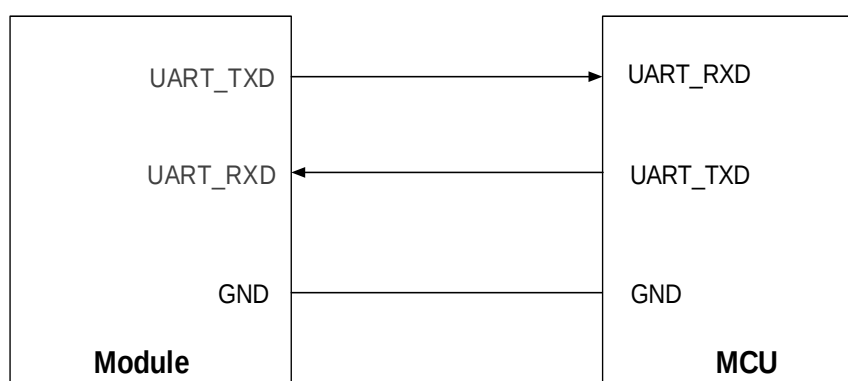


Figure 2: UART Interface Connection

3.4.2. SPI Interface

The module has 1 SPI interface by default. In the case of multiplexing, it supports up to 2 SPI interfaces that support master-slave mode.

Table 8: Pin Description of SPI Interface

Pin Name	Pin No.	Alternate Function	I/O	Description	Comment
GPIO3	7	SPI0_CS	DIO	SPI chip select	In master mode, it is an output signal.
GPIO4	8	SPI0_CLK	DIO	SPI clock	In slave mode, it is an input signal.
GPIO5	9	SPI0_MISO	DIO	SPI master-in slave-out	Other configurations for SPI interface, see Table 6 .
GPIO6	10	SPI0_MOSI	DIO	SPI master-out slave-in	Other configurations for SPI interface, see Table 6 .

The following figure shows the SPI connection between the host and the slave:

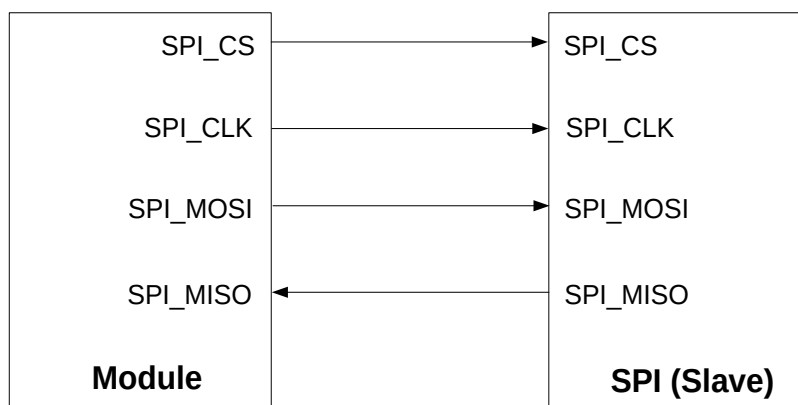


Figure 3: SPI Connection (Master Mode)

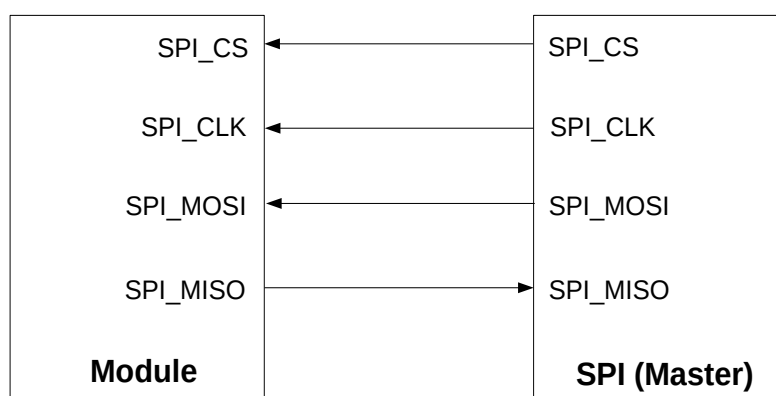


Figure 4: SPI Connection (Slave Mode)

3.4.3. I2C Interface

The module has 1 I2C interface by default. In the case of multiplexing, it supports up to 3 I2C interfaces. The interface supports master-slave mode and communication rate modes such as 100 kbps, 400 kbps, and 1 Mbps with 7-bit and 10 bit addressing.

Table 9: Pin Description of I2C Interface

Pin Name	Pin No.	Alternate Function	I/O	Description	Comment
GPIO7	11	I2C0_SCL	OD	I2C0 serial clock	Other configurations for I2C interface, see Table 6 .
GPIO8	12	I2C0_SDA	OD	I2C0 serial data	

NOTE

Reserve 1–10 kΩ pull-up resistors to VBAT when I2C interface is connected to an external equipment.

3.4.4. PWM Interfaces

In the case of multiplexing, the module supports up to 8 PWM interfaces.

Table 10: Pin Description of PWM Interfaces

Pin Name	Pin No.	Alternate Function	I/O	Description	Comment
GPIO4	8	PWM0	DO	PWM0 out	Other configurations for PWM interface, see Table 6 .
GPIO3	7	PWM1	DO	PWM1 out	
GPIO6	10	PWM2	DO	PWM2 out	
GPIO5	9	PWM3	DO	PWM3 out	
GPIO2	6	PWM4	DO	PWM4 out	
GPIO10	14	PWM5	DO	PWM5 out	
GPIO1	5	PWM6	DO	PWM6 out	
GPIO0	4	PWM7	DO	PWM7 out	

3.4.5. ADC Interfaces

The module has 2 ADC interfaces by default. In the case of multiplexing, it supports up to 4 ADC interfaces. To improve the voltage measurement accuracy, the trace of ADC interface should be surrounded by ground.

Table 11: Pin Description of ADC Interfaces

Pin Name	Pin No.	Alternate Function	I/O	Description	Comment
GPIO15	22	ADC0	AI	General-purpose ADC interface	Other configurations for ADC interface, see Table 6 .
GPIO16	23	ADC1	AI	General-purpose ADC interface	

Table 12: ADC Features

Parameter	Min.	Typ.	Max.	Unit
ADC Input Voltage Range	0	-	3.3	V
ADC Resolution	-	10	-	bit

NOTE

The input voltage of every ADC interface should not exceed its corresponding voltage range.

3.4.6. SWD Interface *

The module supports 1 SWD interface for module debugging and testing in the case of multiplexing. SWD is used as a serial download debugging port. When debugging, you only need to connect two pins to the serial debugger.

Table 13: Pin Description of SWD Interface

Pin Name	Pin No.	Alternate Function	I/O	Description
GPIO0	4	SWDIO	DIO	SWD data
GPIO1	5	SWCLK	DI	SWD clock

3.4.7. USB Interface*

In the case of multiplexing, the module supports 1 USB interface, which complies with USB 2.0 standard.

Table 14: Pin Description of USB Interface

Pin Name	Pin No.	Alternate Function	I/O	Description	Comment
GPIO0	4	USB_DM	DIO	USB differential data (-)	Other configurations for USB interface, see Table 6 .
GPIO1	5	USB_DP	DIO	USB differential data (+)	

The USB interface between the module and the host is connected as follows:

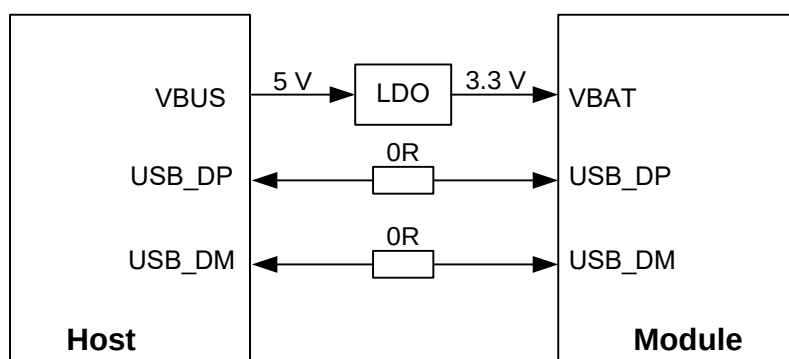


Figure 5: USB Interface Connection

When designing the USB interface, you should follow the following principles to meet USB 2.0 specifications.

- Route the USB signal traces as differential pairs with ground on the same layer and with ground planes above and below. The differential impedance of USB 2.0 is $90\ \Omega \pm 10\%$.
- Do not route signal traces under crystals, oscillators, magnetic devices, sensitive circuits/signals, such as RF circuits and analog signals, as well as noisy signals such as clock signals and DC-DC signals.
- Reserve a $0\ \Omega$ resistor on USB_DP and USB_DM lines respectively if possible.

For more details about the USB 2.0 specifications, visit <http://www.usb.org/home>.

4 Operating Characteristics

4.1. Power Supply Interface

Power supply pin and ground pins of the module are defined in the following table.

Table 15: Pin Description of Power Supply and GND Pins

Pin Name	Pin No.	I/O	Description	Min.	Typ.	Max.	Unit
VBAT	2	PI	Power supply for the module	2.1	3.3	3.6	V
GND	1						

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 provides at least 0.5 A to ensure sufficient current. For better power supply performance, it is recommended to parallel a 22 μ F decoupling capacitor, and two filter capacitors (1 μ F and 100 nF) 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 near the VBAT to improve the surge voltage bearing capacity of the module. In principle, the longer the VBAT trace is, the wider it should be.

VBAT reference circuit is shown below:

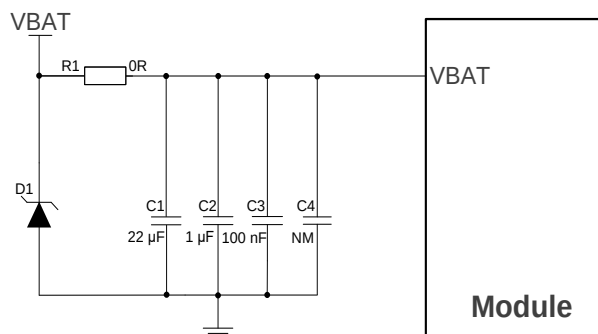


Figure 6: Reference Design of Power Supply

4.2. Turn-on

After the module VBAT is powered on, the power-on time is required to be greater than 50 μ s and less than 10 ms, and the module can automatically start up. The RESET_N pin voltage and VBAT are the same voltage source, and there is no difference in power-on time.

Table 16: Pin Description of RESET_N

Pin Name	Pin No.	I/O	Description	Comment
RESET_N	19	DI	Reset the module	Hardware enable. Internally pulled up to 3.3 V. Active low.

The turn-on timing is shown below:

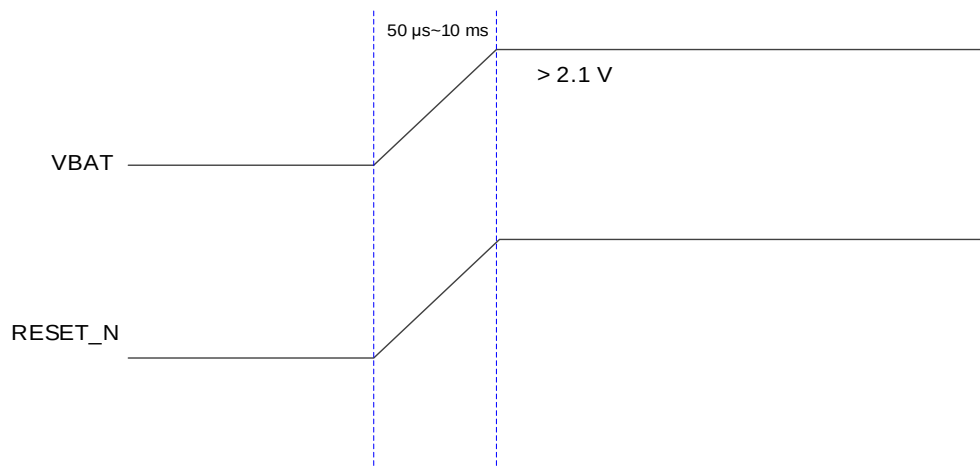


Figure 7: Turn-on Timing

4.3. Reset

Pulling RESET_N down to a voltage below 1.5 V for at least 20 ms will reset the module.

The way to control the RESET_N is by using a button. A TVS component should be placed near the button for ESD protection. The reference design is shown below:

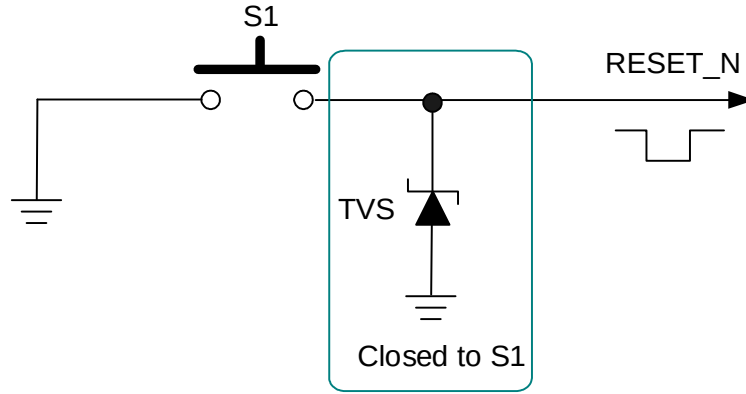


Figure 9: Reference Circuit of Reset with a Button

The module reset timing is illustrated in the following figure.

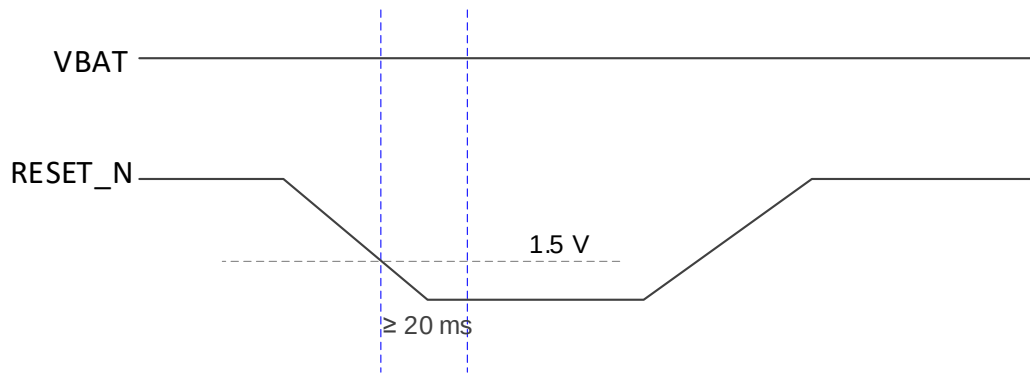


Figure 10: Reset Timing

NOTE

RESET_N is internally pulled up with a 1 kΩ resistor.

4.4. Download Mode

When the host computer opens the programming tool during resetting or power-up, and the module will enter download mode. In the download mode, the firmware can be download through the UART interface (pins 21 and 20).

5 RF Performances

5.1. Bluetooth Performances

Table 17: Bluetooth Performances

Operating Frequency		
2.400–2.4835 GHz		
Modulation		
GFSK, 8-DPSK, $\pi/4$ -DQPSK		
Operating Mode		
Bluetooth Classic (BR + EDR)		
Bluetooth Low Energy (BLE)		
Condition (VBAT = 3.3 V; Temp.: 25 °C)	Typ.; Unit: dBm; Tolerance: ± 3 dB	
	Transmitting Power	Receiver Sensitivity
BR (GFSK)	4	-90
EDR ($\pi/4$ -DQPSK)	1	-93
EDR (8-DPSK)	1	-85
BLE (1 Mbps)	8	-95
BLE (2 Mbps)	8	-92

5.2. Antenna/Antenna Interfaces ⁵

Appropriate antenna type and design should be used with matched antenna parameters according to specific application. It is required to perform 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 provides three antenna/antenna interface designs: pin antenna interface (ANT_ BT), PCB antenna or 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 .

5.2.1. Pin Antenna Interface (ANT_ BT)

Table 18: Pin Description of ANT_ BT

Pin Name	Pin No.	I/O	Description	Comment
ANT_ BT	28	AIO	Bluetooth antenna interface	50 Ω characteristic impedance.

5.2.1.1. Reference Design

The circuit of pin antenna interface is shown below. For better RF performance, it is necessary to reserve a dual L-type circuit and ESD protection components. Reserved components R1, C1, C2, and D1 should be placed as close to the antenna as possible and should be mounted or not based on the actual situation. By default, C1, C2, and D1 are not mounted, and only a 0 Ω resistor is mounted at R1. The parasitic capacitance of TVS should be less than 0.05 pF.

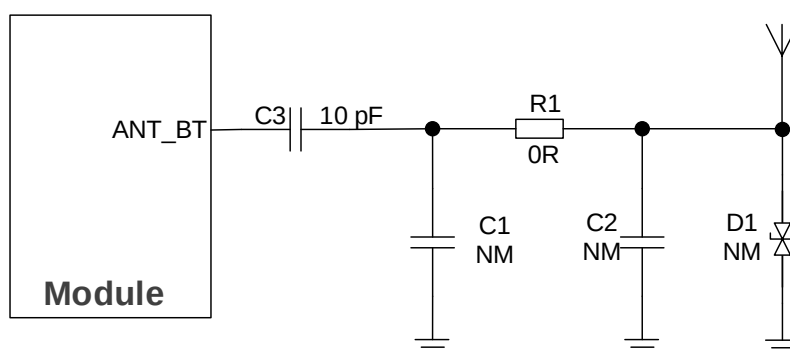


Figure 8: Reference Design of Pin Antenna Interface

⁵ The module provides three optional antenna or antenna interface designs. For more details, contact Quectel. Technical Support.

NOTE

Notes on C3:

- 1) If there is DC power at the antenna ports, place capacitors 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, they 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.

5.2.1.2. RF Routing Guidelines

For user's PCB, the characteristic impedance of all RF traces should be controlled as 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 the RF traces and the ground (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.

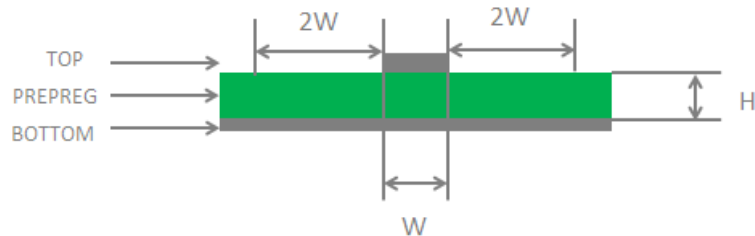


Figure 9: Microstrip Design on a 2-layer PCB

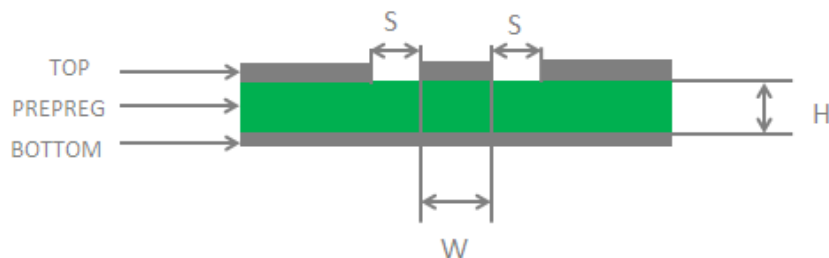


Figure 10: Coplanar Waveguide Design on a 2-layer PCB

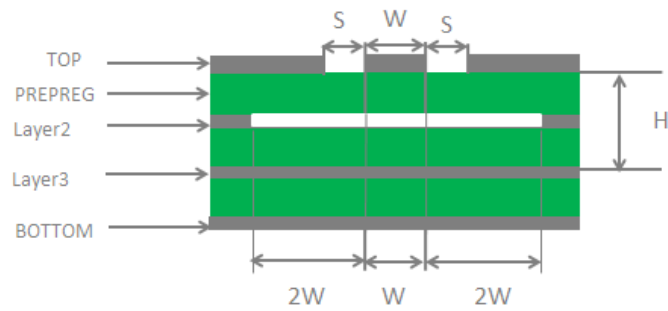


Figure 11: Coplanar Waveguide Design on a 4-layer PCB (Layer 3 as Reference Ground)

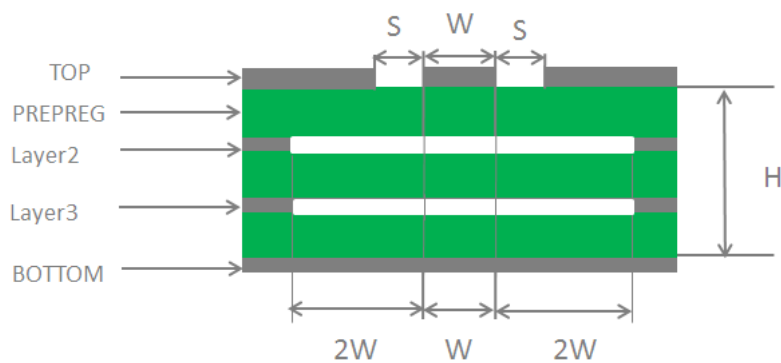


Figure 12: Coplanar Waveguide Design on a 4-layer PCB (Layer 4 as Reference Ground)

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]**.

5.2.1.3. RF Connector Recommendation

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

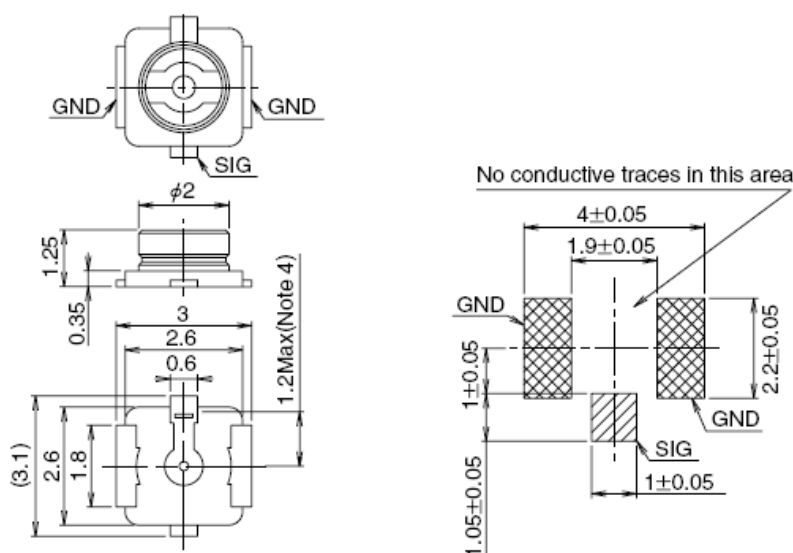


Figure 13: Dimensions of the Receptacle (Unit: mm)

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 14: Specifications of Mated Plugs

The following figure describes the space factor of mated connectors.

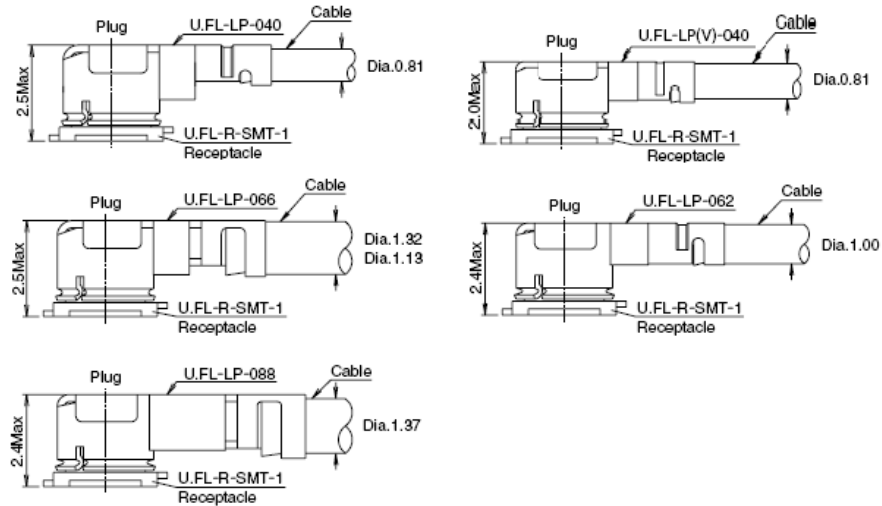


Figure 15: Space Factor of Mated Connectors (Unit: mm)

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

5.2.2. RF Coaxial Connector

5.2.2.1. Antenna Connector Specifications

The mechanical dimensions of the receptacle supported by the module are as follows.

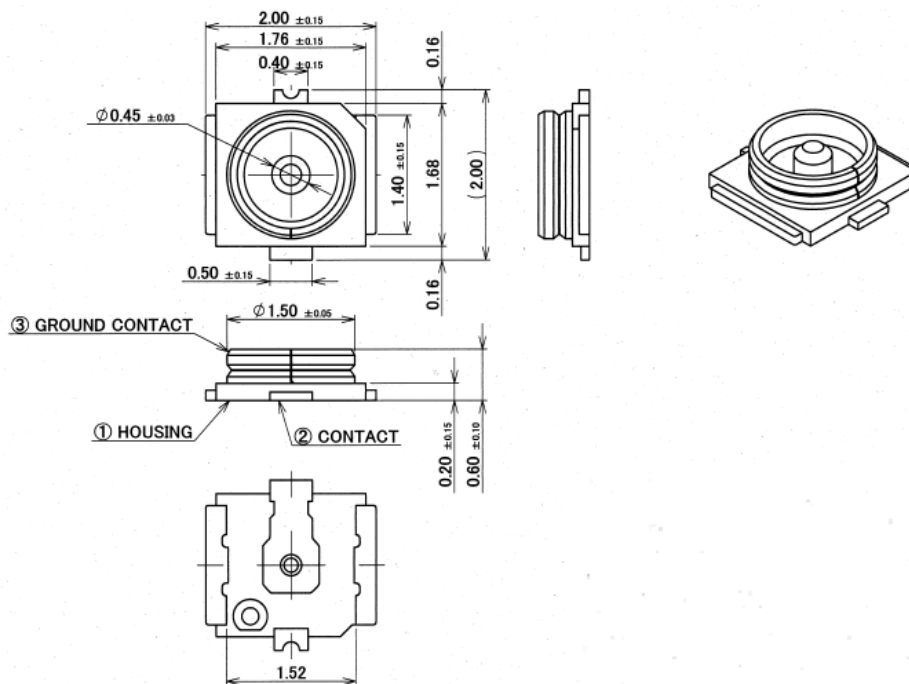


Figure 16: Dimensions of the Receptacle (Unit: mm)

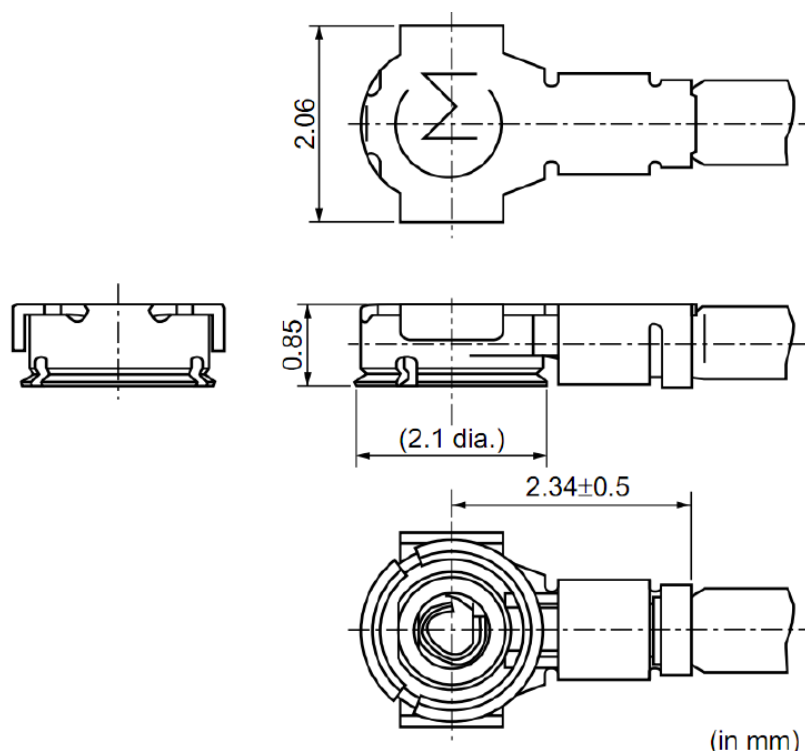
Table 19: Major Specifications of the RF Connector

Item	Specification
Nominal Frequency Range	DC to 6 GHz
Nominal Impedance	50 Ω
Temperature Rating	-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)

5.2.2.2. Antenna Connector Installation

The receptacle mounted on the module accepts two types of mated plugs that will meet a maximum height of 1.2 mm using a $\varnothing$ 0.81 mm coaxial cable or a maximum height of 1.45 mm utilizing a $\varnothing$ 1.13 mm coaxial cable.

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


Figure 17: Dimensions of Mated Plugs ($\varnothing$ 0.81 mm/ $\varnothing$ 1.13 mm Coaxial Cables) (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.

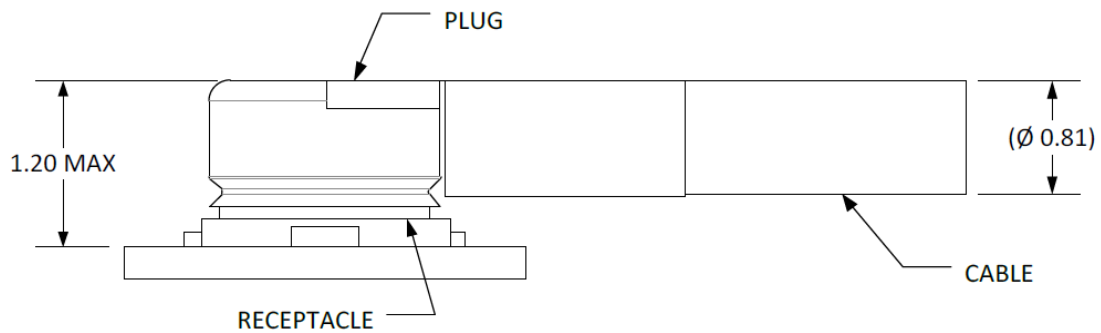


Figure 18: Space Factor of Mated Connectors ($\varnothing 0.81$ mm Coaxial Cables) (Unit: mm)

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

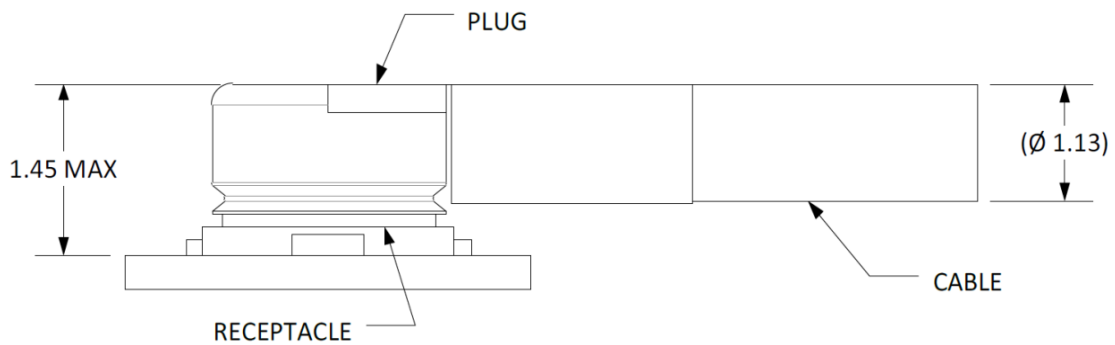


Figure 19: Space Factor of Mated Connectors ($\varnothing 1.13$ mm Coaxial Cables) (Unit: mm)

5.2.2.3. Recommended RF Connector Installation

The pictures for plugging in a coaxial cable plug is shown below, $\theta = 90^\circ$ is acceptable, while $\theta \neq 90^\circ$ is not.

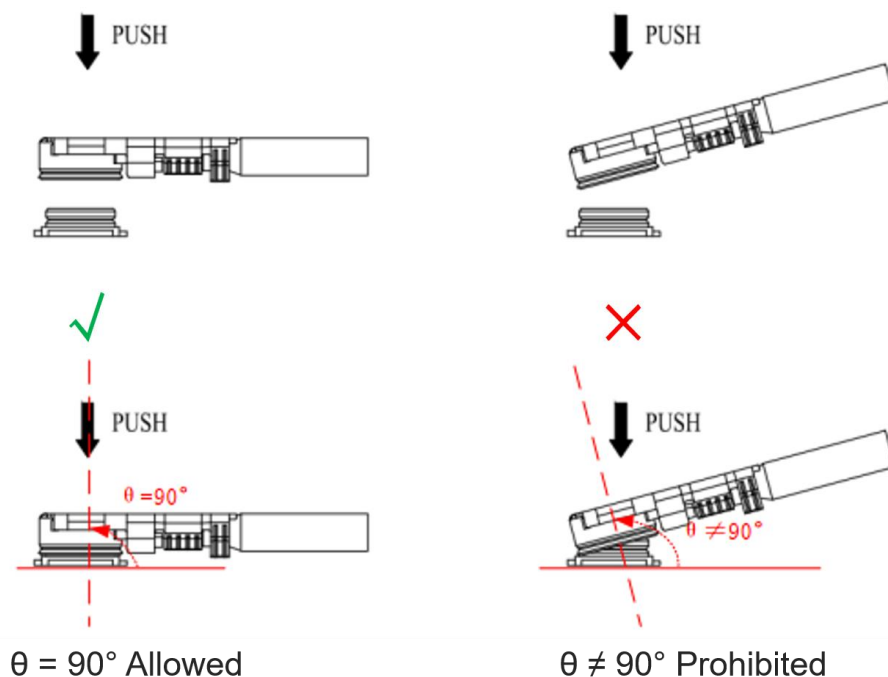


Figure 20 :Plug in a Coaxial Cable Plug

The pictures of pulling out the coaxial cable plug is shown below, $\theta = 90^\circ$ is acceptable, while $\theta \neq 90^\circ$ is not.

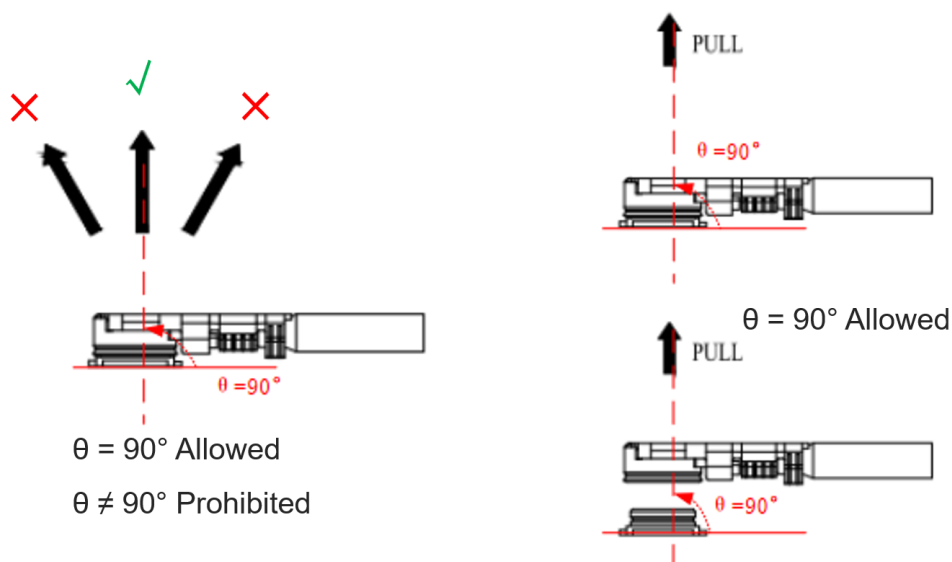


Figure 21: Pull out a Coaxial Cable Plug

The pictures of installing the coaxial cable plug with a jig is shown below, $\theta = 90^\circ$ is acceptable, while $\theta \neq 90^\circ$ is not.

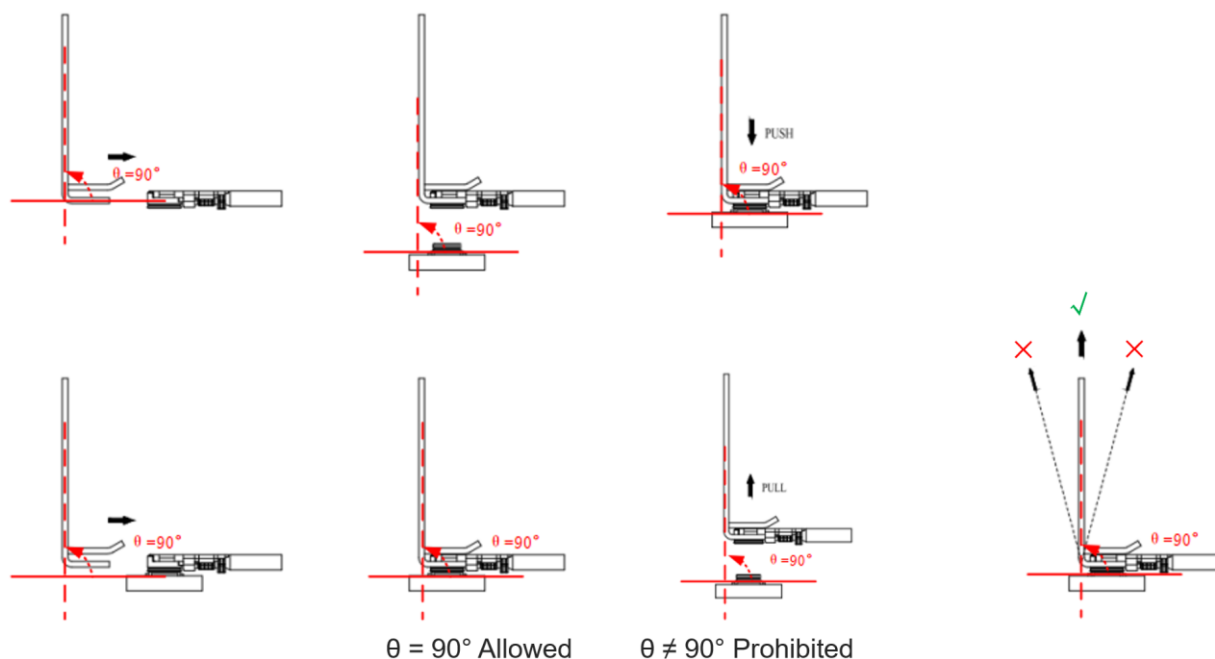


Figure 22: Install the Coaxial Cable Plug with Jig

5.2.2.4. 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>.

5.2.3. PCB Antenna

Table 20: Requirements for PCB Antenna

Parameter	Requirements
Frequency Range (GHz)	2.400–2.4835
Input Impedance (Ω)	50
VSWR	≤ 3
Gain (dBi)	-0.2 (Typ.)
Efficiency	35 % (AVG)

The performance of the PCB antenna depends on the entire product, including the motherboard, case, other RF signals, etc., 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 under the PCB antenna and within at least 10 mm to the left and right should be designed as keepout areas.
- On the motherboard, ensure a minimum clearance of 16 mm between the PCB antenna and power connectors, Ethernet ports, USB ports, and other large form-factor components (if any).
- 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.

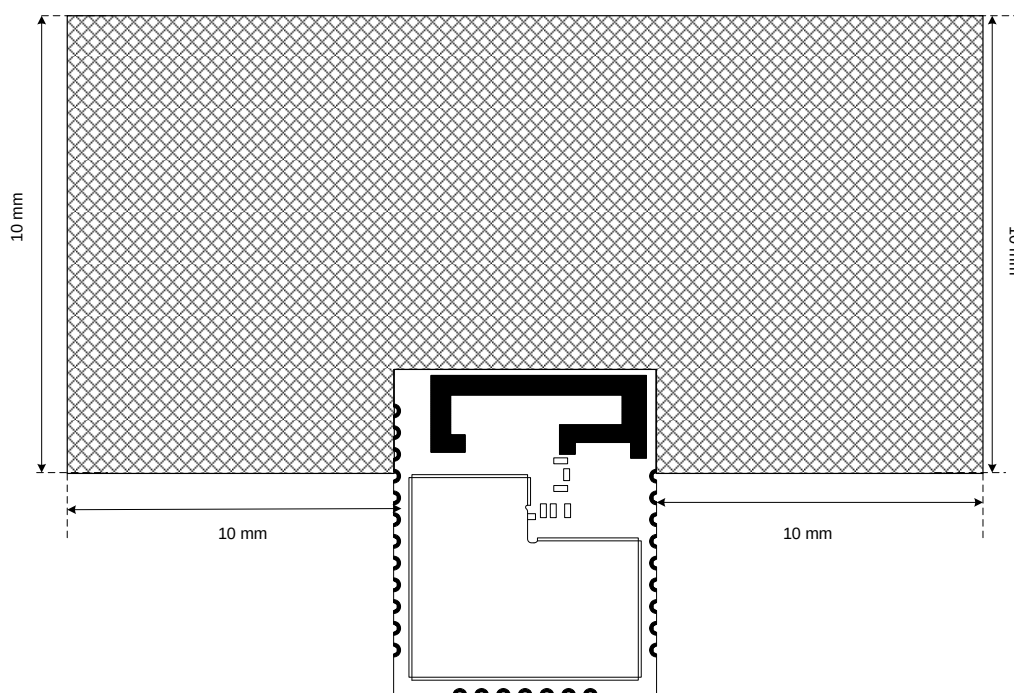


Figure 23: Keepout Area on Motherboard

To ensure module performance, do not route 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:

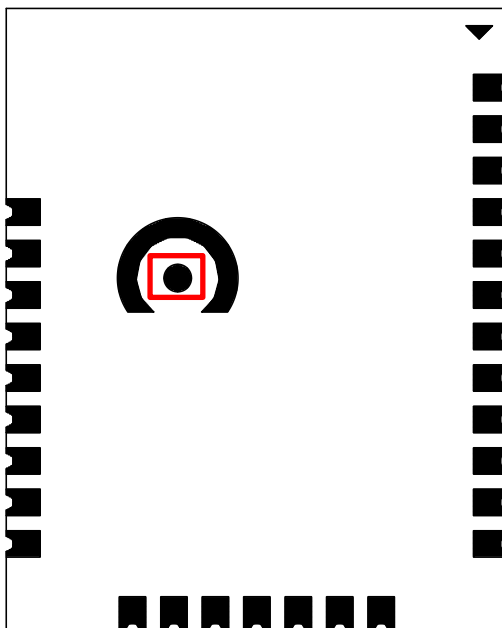


Figure 24: Prohibited Area During Routing (Bottom Side)

Table 21: Antenna Design Requirements

Parameter	Requirements
Frequency Ranges (GHz)	2.4 GHz: 2.400–2.4835
Pin 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

NOTE

1. Antenna isolation:
 - > 20 dB @ above 1000 MHz
 - > 15 dB @ 600~1000 MHz
 - > 10 dB @ 400~600 MHz
2. The isolation between each antenna traces on PCB is recommended to be over 75 dB.

6 Electrical Characteristics and Reliability

6.1. Absolute Maximum Ratings

Table 22: Absolute Maximum Ratings (Unit: V)

Parameter	Min.	Max.
VBAT	-0.3	3.6
Voltage at Digital Pins	-0.3	3.6
Voltage at ADC	0	3.6

NOTE

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

6.2. Power Supply Ratings

Table 23: Module 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.	2.1	3.3	3.6

6.3. Power Consumption

6.3.1. Bluetooth Power Consumption

Table 24: Bluetooth Power Consumption in Non-signaling Mode

Condition	I _{VBAT} (AVG)	Unit
Sleep mode	7.84	μA
Shutdown mode	3.0	μA
BR (GFSK) @ 4 dBm	22	mA
EDR (π/4-DQPSK) @ 1 dBm	20	mA
EDR (8-DPSK) @ 1 dBm	20	mA
BLE (1 Mbps) @ 8 dBm	20	mA
BLE (2 Mbps) @ 8 dBm	13	mA

NOTE

1. Test conditions: ambient temperature 25 °C, and typical power domain.
2. 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, please contact Quectel Technical Support.

6.4. Digital I/O Characteristics

Table 25: VBAT I/O Requirements (Unit: V)

Parameter	Description	Min.	Max.
V _{IH}	High-level input voltage	0.7 × VBAT	3.6
V _{IL}	Low-level input voltage	-0.3	0.3 × VBAT
V _{OH}	High-level output voltage	2.4	3.6

V_{OL}	Low-level output voltage	-	0.4
----------	--------------------------	---	-----

6.5. ESD Protection

Static electricity occurs naturally and 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 26: ESD Characteristics (Unit: kV)

Model	Test Result	Standard
Human Body Model (HBM)	± 4	ANSI/ESDA/JEDEC JS-001-2017
Charged Device Model (CDM)	± 0.5	ANSI/ESDA/JEDEC JS-002-2018

7 Mechanical Information

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

7.1. Mechanical Dimensions

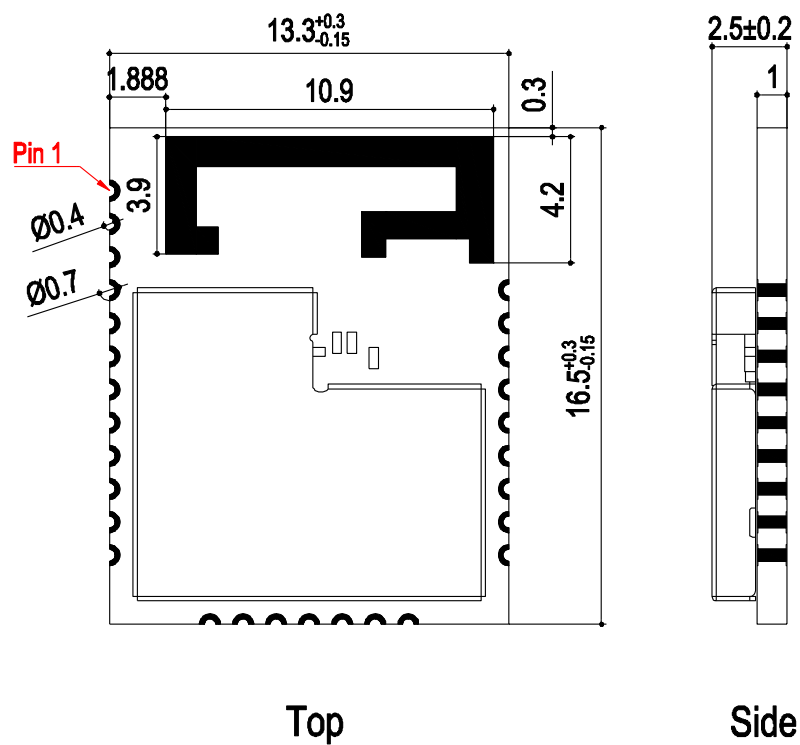


Figure 25: Top and Side Dimensions (Pin Antenna Interface)

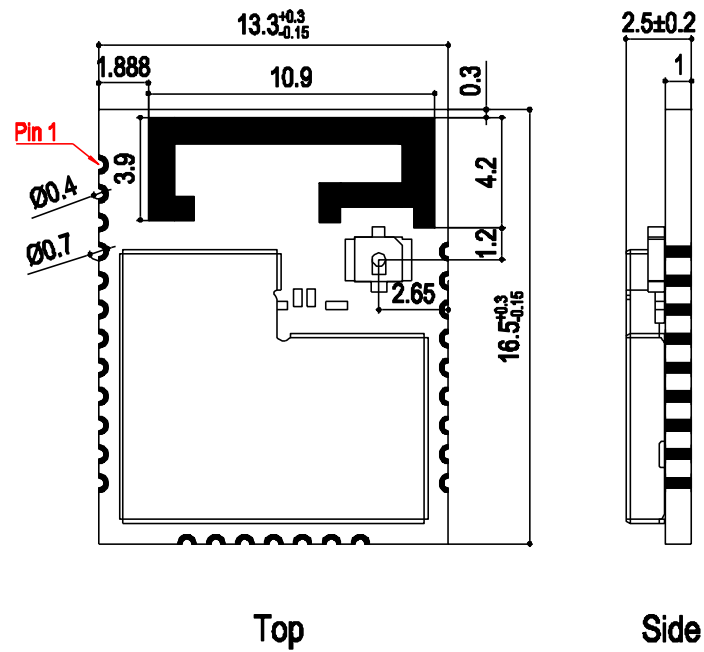


Figure 26: Top and Side Dimensions (RF Coaxial Connector)

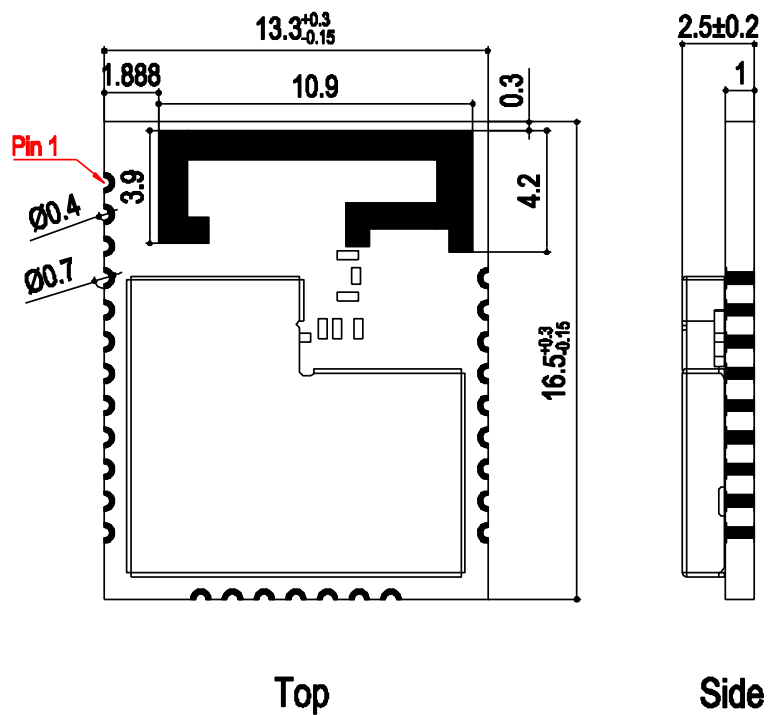


Figure 27: Top and Side Dimensions (PCB Antenna)

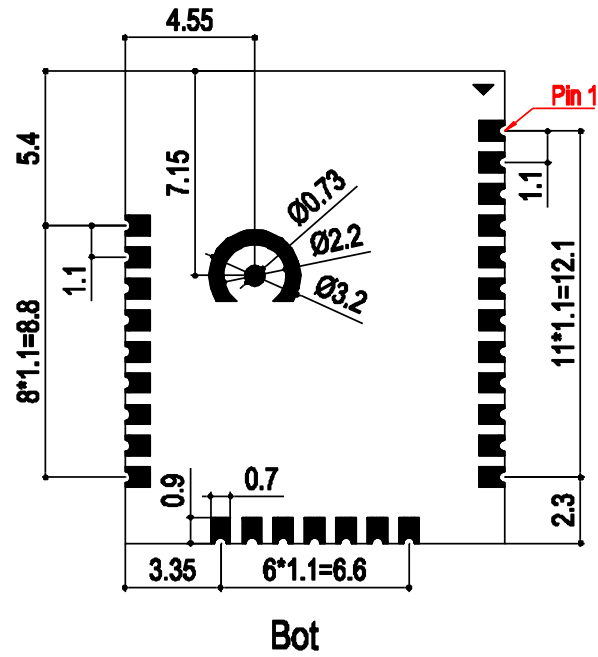


Figure 31: Bottom Dimensions (Bottom View)

NOTE

The module's coplanarity standard: ≤ 0.13 mm.

7.2. Recommended Footprint

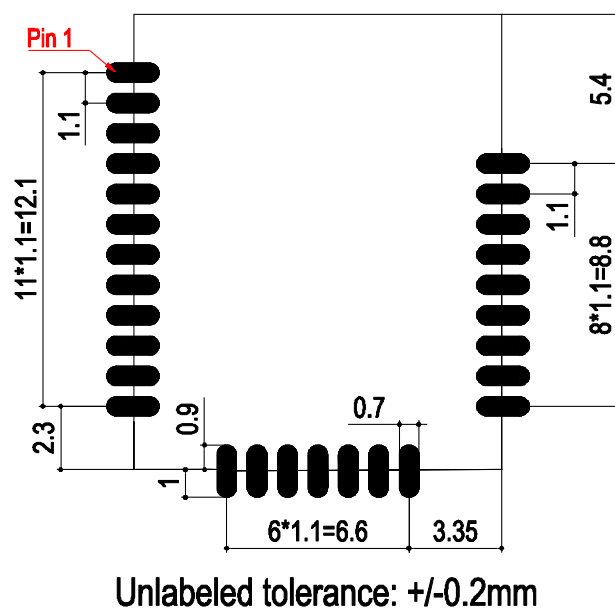


Figure 28: Recommended Footprint

NOTE

Keep at least 3 mm between the module and other components on the motherboard to improve soldering quality and maintenance convenience.

7.3. Top and Bottom Views

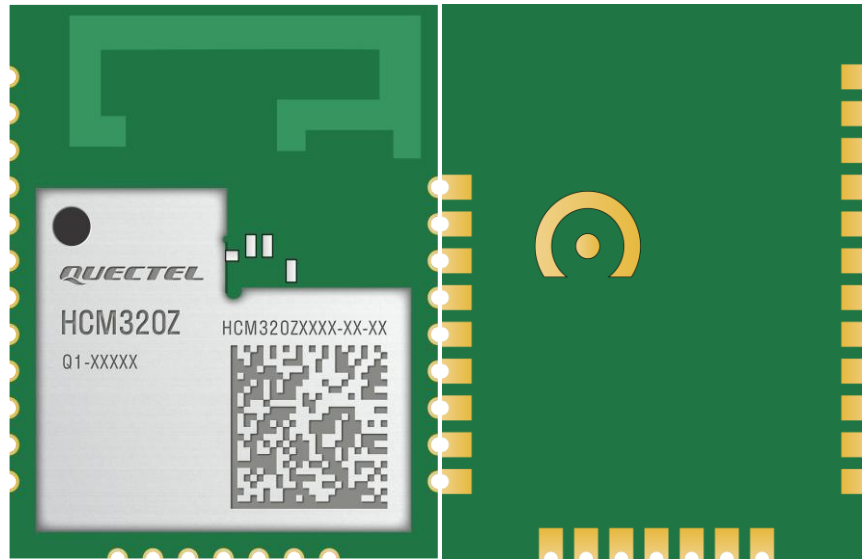


Figure 33: Top and Bottom Views (Pin Antenna Interface)

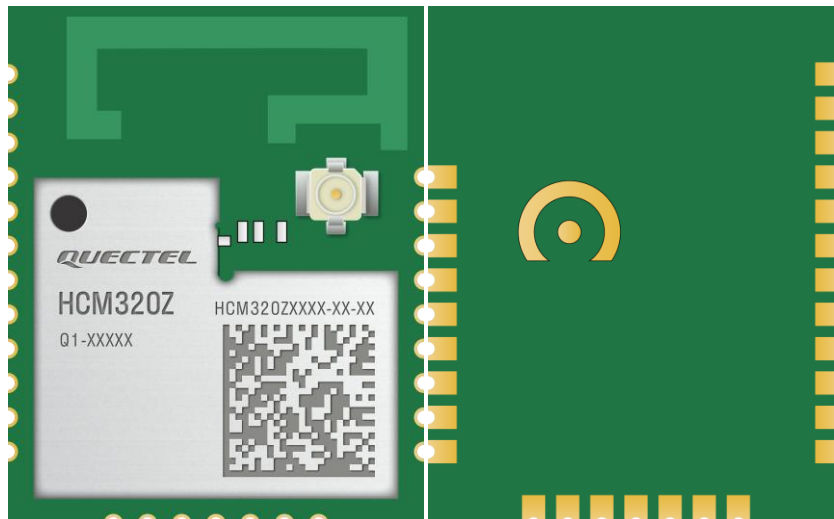


Figure 34: Top and Bottom Views (RF Coaxial Connector)

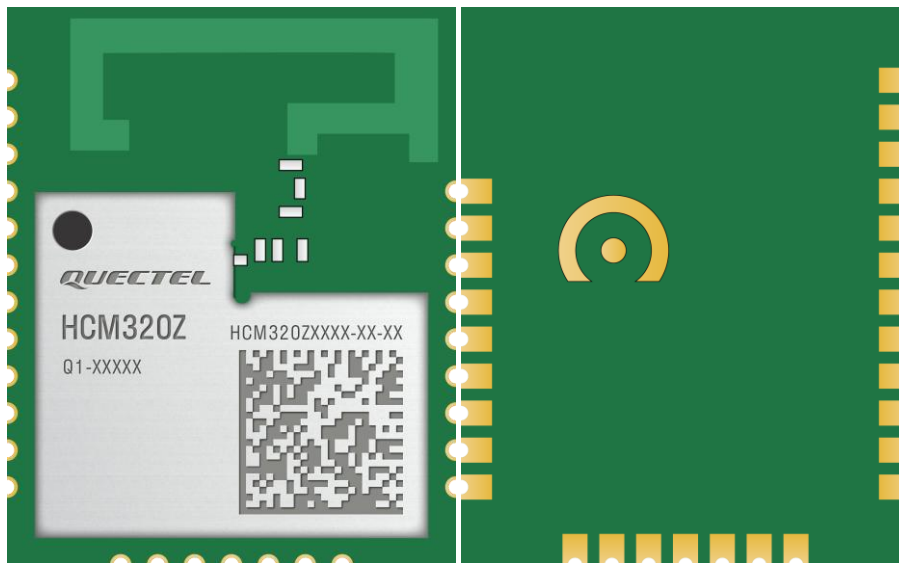


Figure 35: Top and Bottom Views (PCB Antenna)

NOTE

1. Images above are for illustrative purposes only and may differ from the actual module. For authentic appearance and label, please refer to the module received from Quectel.
2. The RF coaxial connector is not soldered when the module is designed with PCB antenna or pin antenna interface.

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 ⁶ 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.

⁶ 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*. 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 0.08–0.12 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.

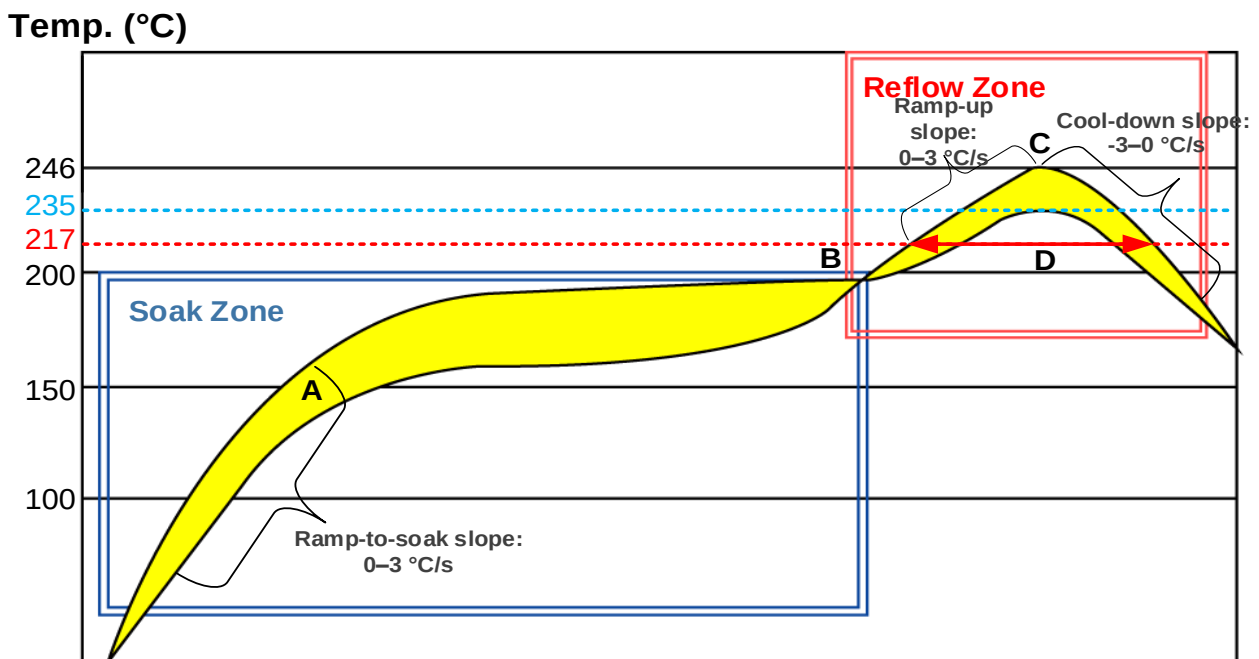


Figure 36: Recommended Reflow Soldering Thermal Profile

Table 27: Recommended Thermal Profile Parameters

Factor	Recommended Value
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-up 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 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. Otherwise, the shielding can may become rusted.
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 Specification

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:

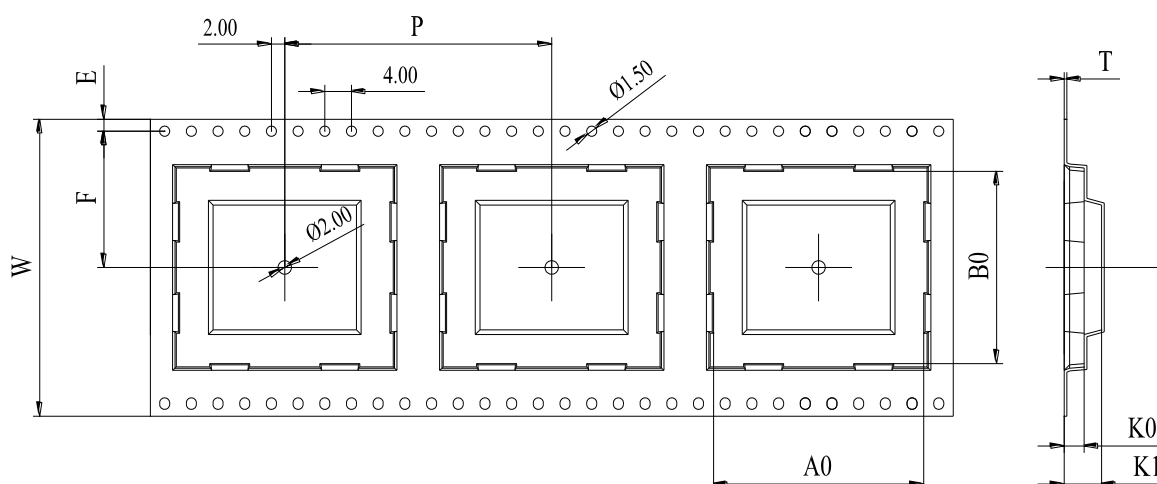


Figure 29: Carrier Tape Dimension Drawing (Unit: mm)

Table 28: Carrier Tape Dimension Table (Unit: mm)

W	P	T	A0	B0	K0	K1	F	E
32	24	0.4	13.6	17	2.3	3.2	14.2	1.75

8.3.2. Plastic Reel

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

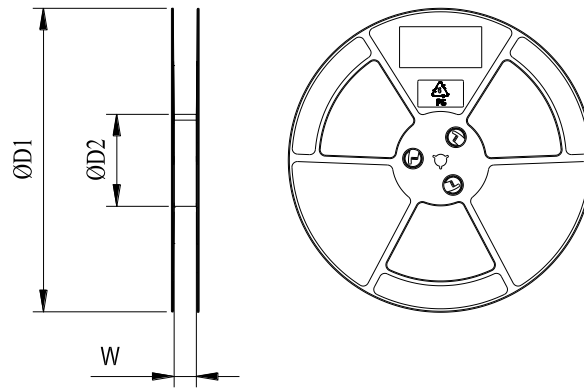


Figure 30: Plastic Reel Dimension Drawing

Table 29: Plastic Reel Dimension Table (Unit: mm)

ØD1	ØD2	W
380	100	32.5

8.3.3. Mounting Direction

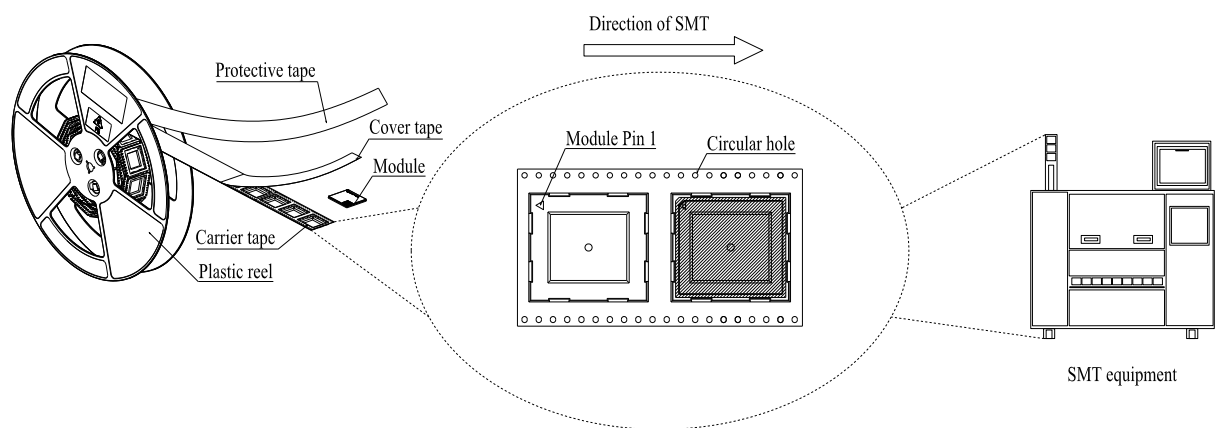
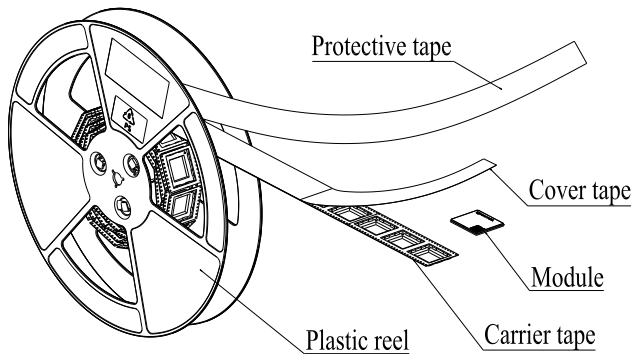


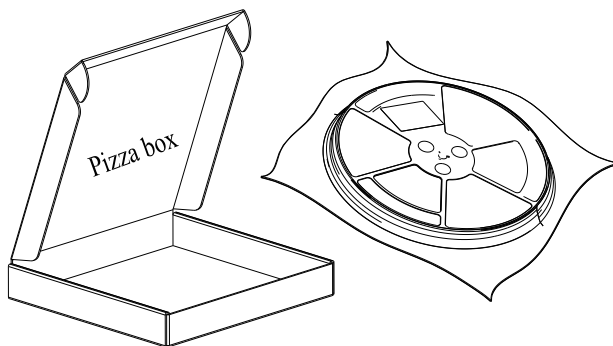
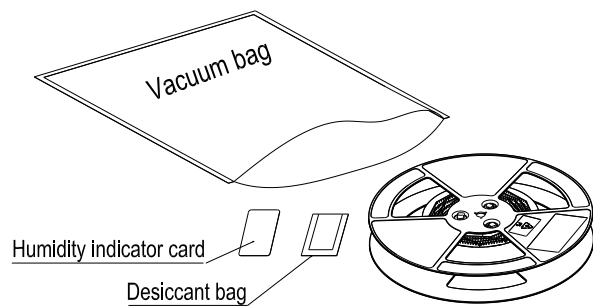
Figure 31: Mounting Direction

8.3.4. Packaging Process



Place the modules onto the carrier tape cavity and cover them securely with cover tape. Wind the heat-sealed carrier tape onto a plastic reel and apply a protective tape for additional protection. 1 plastic reel can pack 1000 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 4000 modules.

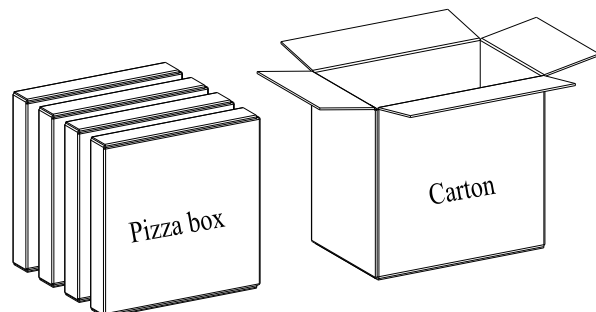


Figure 32: Packaging Process

9 Appendix References

Table 30: Reference Documents

Document Name
[1] Quectel_HCM320Z_TE-B_User_Guide
[2] Quectel_RF_Layout_Application_Note
[3] Quectel_Module_Stencil_Design_Requirements
[4] Quectel_Module_SMT_Application_Note

Table 31: Terms and Abbreviations

Abbreviation	Description
ADC	Analog-to-Digital Converter
AES	Advanced Encryption Standard
AP	Access Point
BLE	Bluetooth Low Energy
BPSK	Binary Phase Shift Keying
CCK	Complementary Code Keying
DBPSK	Differential Binary Phase Shift Keying
DES	Data Encryption Standard
DPSK	Differential Phase Shift Keying
DQPSK	Differential Quadrature Phase Shift Keying
ESD	Electrostatic Discharge
EVM	Error Vector Magnitude

GFSK	Gauss frequency Shift Keying
GND	Ground
GPIO	General-Purpose Input/Output
HT	High Throughput
I/O	Input/Output
I2C	Inter-Integrated Circuit
IEEE	Institute of Electrical and Electronics Engineers
LGA	Land Grid Array
Mbps	Million Bits Per Second
MCU	Microcontroller Unit
MISO	Master In Slave Out
MOSI	Master Out Slave In
PCB	Printed Circuit Board
PWM	Pulse Width Modulation
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
RoHS	Restriction of Hazardous Substances
SDIO	Secure Digital Input/Output
SHA	Secure Hash Algorithm
SMT	Surface Mount Technology
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
USB	Universal Serial Bus
(U)SIM	(Universal) Subscriber Identity Module
V_{IH}	High-level Input Voltage
V_{IL}	Low-level Input Voltage
V_{max}	Maximum Voltage
V_{min}	Minimum Voltage
V_{nom}	Nominal Voltage Value
V_{OH}	High-level Output Voltage
V_{OL}	Low-level Output Voltage
VSWR	Voltage Standing Wave Ratio

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 & 15.407.

2.3 Specific operational use conditions

The module can be used for mobile applications with a maximum -0.24dBi 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 user's 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: -0.24dBi;

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: XMR2025HCM320Z " 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 & 15.407 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, U S)

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: XMR2025HCM320Z**"

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.

IC Statement

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

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

The device is compliance with RF field strength limits, users can obtain Canadian information on RF exposure and compliance.

IC Radiation Exposure Statement

This equipment complies with IC 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.

Déclaration d' exposition aux radiations:

Cet équipement est conforme aux limites d' exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.