

FCM362K

Hardware Design

Wi-Fi&Bluetooth Module Series

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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

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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 cellular or mobile terminal incorporating the module. Manufacturers of the cellular terminal should notify users and operating personnel of the following safety precautions by incorporating them into all product manuals. Otherwise, Quectel assumes no liability for customers' failure to comply with these precautions.



Full attention must be paid to driving at all times to reduce the risk of an accident. Using a mobile phone 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 cellular or mobile terminal 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.



Cellular 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. If emergency assistance is needed, use emergency call if the device supports it. To make or receive a call, the cellular or mobile terminal 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 since network connection cannot be guaranteed under all circumstances.



The cellular or mobile terminal contains a transceiver. When it is ON, it receives and transmits radio 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 phones or other cellular 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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-	2023-10-18	Tara Kong	Creation of the document
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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 FCM362K in QuecOpen® solution and describes its air interfaces and hardware interfaces, which are connected with your applications.

With this document, you can quickly understand module interface specifications, electrical and mechanical details, as well as other related information of the module.

Hereby, Quectel Wireless Solutions Co., Ltd. declares that the radio equipment type FCM362K 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.

The device is restricted to indoor use only when operating in the 5150 to 5350 MHz frequency range.

	AT	BE	BG	HR	CY	CZ	DK
	EE	FI	FR	DE	EL	HU	IE
	IT	LV	LT	LU	MT	NL	PL
	PT	RO	SK	SI	ES	SE	UK(NI)

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

1.1. Special Marks

Table 1: Special Marks

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

2 Product Overview

FCM362K is a high-performance and low-power Wi-Fi and Bluetooth 5.2 Combo module supporting IEEE 802.11 a/b/g/n/ac/ax and Bluetooth 5.2 standards. The module, featuring built-in PMU, PA, LNA and T/R switch, provides multiple interfaces including UART, SPI*, SDIO, I2C*, I2S*, PCM*, PWM*, ADC*, and USB* for various applications.

It is an SMD module with compact packaging which includes:

- 240 MHz Cortex-M4F processor
- Built-in 896 KB ROM, 992 KB SRAM and 4 MB flash
- Support secondary development

Table 2: Basic Information

FCM362K	
Packaging type	LCC
Pin counts	47
Dimensions	(25.5 ±0.15) mm × (18 ±0.15) mm × (3.15 ±0.2) mm
Weight	Approx. 1.4 g

2.1. Key Features

Table 3: Key Features

Basic Information	
Protocols and Standards	● Wi-Fi Protocols: IEEE 802.11a/b/g/n/ac/ax ● Bluetooth protocol: Bluetooth 5.2 ● All hardware components are fully compliant with EU RoHS directive
Power Supply	VBAT Power Supply: ● 3.0–3.6 V ● Typ.: 3.3 V
Temperature Ranges	● Operating temperature ¹: -40 to +85 °C ● Storage temperature: -45 to +95 °C
EVB Kit	FCM362K TE-B ²
Antenna/Antenna Interface	
Antenna/Antenna Interfaces ³	● ANT_WIFI/BT antenna interface ● PCB antenna ● Coaxial RF connector ● 50 Ω characteristic impedance
Application Interface ⁴	
Application Interfaces	UART, SPI*, SDIO, I2C*, I2S*, PCM*, PWM*, ADC*, USB*

¹ Within the operating temperature range, the module's related performance meets IEEE and Bluetooth specifications.

² For more details about the EVB

³ The module is provided in one of the three antenna/antenna interface designs. For more details, 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

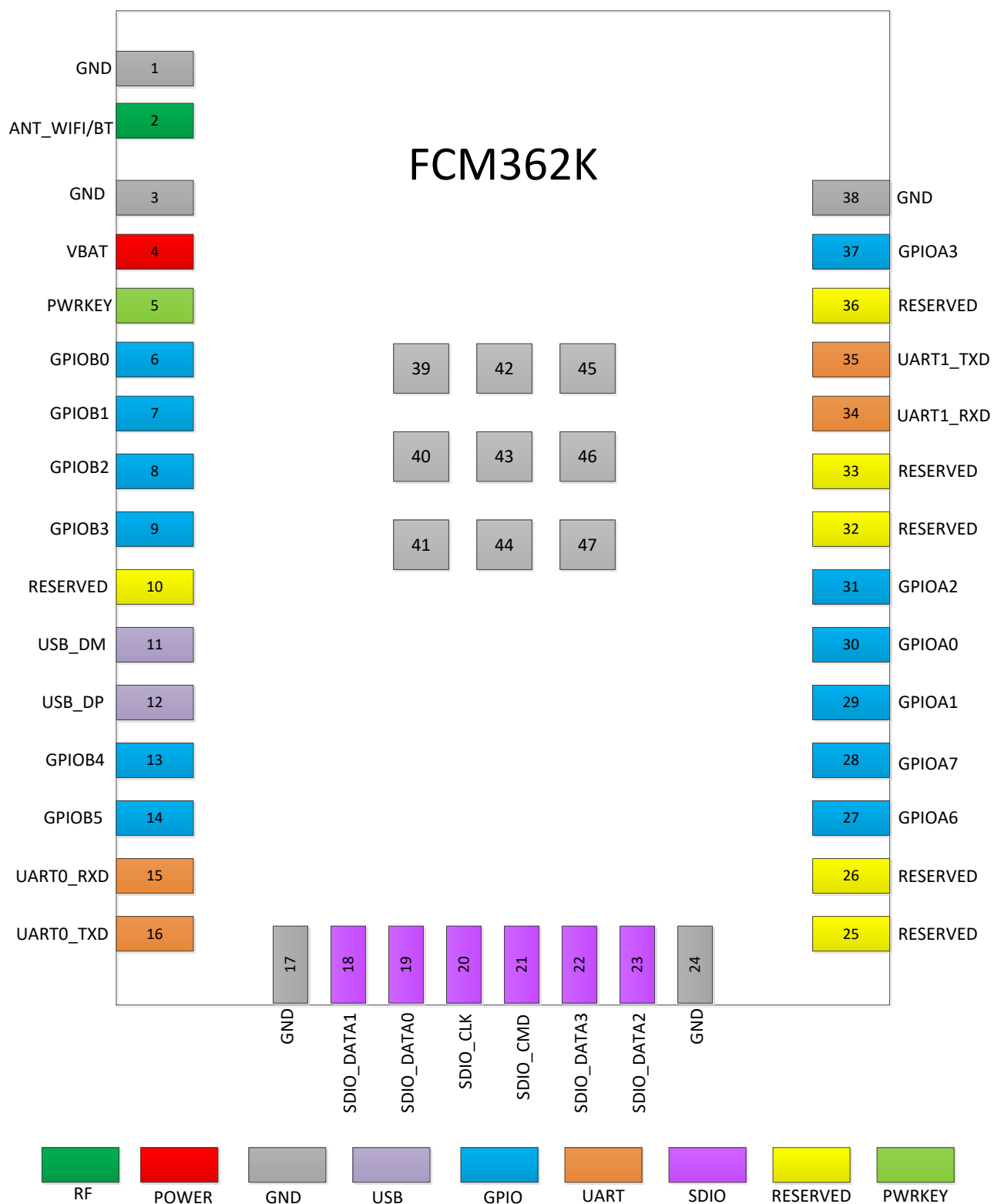


Figure 1: Pin Assignment (Top View)

NOTE

1. Keep all RESERVED and unused pins unconnected.
2. All GND pins should be connected to ground.
3. The module provides 23 GPIO interfaces. In the case of multiplexing, it supports up to 3 UARTs, 1 SPI*, 1 SDIO interface, 4 I2C* interfaces, 1 I2S* interface, 1 PCM* interface, 6 PWM* interfaces, 2 ADC* interfaces and 1 USB* interface. For more details, see **Chapter 3.3** and **Chapter 3.4**

3.2. Pin Description

Table 4: I/O Parameter Description

Type	Description
AIO	Analog Input/Output
DI	Digital Input
DO	Digital Output
DIO	Digital Input/Output
PI	Power Input

DC characteristics include power domain and rated current, etc.

Table 5: Pin Description

Power Supply					
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
VBAT	4	PI	Power supply for the module	Vmax = 3.6 V Vmin = 3.0 V Vnom = 3.3 V	It must be provided with sufficient current of at least 0.5 A.
GND	1, 3, 17, 24, 38–47				
Turn on/off					
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
PWEKEY	5	DI	Turn on/off the module	VBAT	Internally pulled down with a 200 kΩ resistor. Active high.

UARTs					
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
UART0_TXD	16	DO	UART0 transmit	VBAT	
UART0_RXD	15	DI	UART0 receive		
UART1_TXD	35	DO	UART1 transmit		
UART1_RXD	34	DI	UART1 receive		
USB Interface					
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
USB_DP	12	AIO	USB differential data (+)		Requires differential impedance of 90 Ω. USB 2.0 compliant.
USB_DM	11	AIO	USB differential data (-)		
GPIO Interfaces					
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
GPIOA0	30	DIO	General-purpose input/output	VBAT	
GPIOA1	29	DIO			
GPIOA2	31	DIO			
GPIOA3	37	DIO			
GPIOA6	9	DIO			
GPIOA7	10	DIO			
GPIOB0	6	DIO			
GPIOB1	7	DIO			
GPIOB2	8	DIO			
GPIOB3	9	DIO			
GPIOB4	13	DIO			
GPIOB5	14	DIO			
SDIO Interfaces					

Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
SDIO_DATA0	19	DIO	SDIO data bit 0	VBAT	
SDIO_DATA1	18	DIO	SDIO data bit 1		
SDIO_DATA2	23	DIO	SDIO data bit 2		
SDIO_DATA3	22	DIO	SDIO data bit 3		
SDIO_CLK	20	DI	SDIO clock		
SDIO_CMD	21	DIO	SDIO command		
RF Antenna Interface					
Pin Name	Pin No.	I/O	Description	DC Characteristics	Comment
ANT_WIFI/BT	2	AIO	Wi-Fi/Bluetooth antenna interface		50 Ω characteristic impedance.
RESERVED Pins					
Pin Name	Pin No.				Comment
RESERVED	10, 13, 25, 26, 32, 33, 36				Keep them open.

3.3. GPIO Multiplexing

The module provides up to 22 GPIO interfaces. 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	Alternate Function 6	Alternate Function 7	Alternate Function 8	Alternate Function 9
GPIOA0	30	GPIOA0	I2CM_SCL	I2S0_LRCK	PCM_FSYNC	SPI_SCK	PWM0	PCM_DOUT	PCM_CLK	BT_UART_CTS	
GPIOA1	29	GPIOA1	I2CM_SDA	I2S0_BCK	PCM_CLK	SPI_CSN0	PWM1	PCM_DIN	PCM_DOUT	BT_UART_RTS	
GPIOA2	31	GPIOA2	URAT0_RXD	I2S0_DIN	PCM_DIN	SPI_MISO	PWM2	PCM_FSYNC	PCM_DIN	BT_UART_RXD	UART1_RXD
GPIOA3	37	GPIOA3	UART0_TXD	I2S0_DOUT	PCM_DOUT	SPI_MOSI	-	PCM_CLK	PCM_FSYNC	BT_UART_TXD	UART1_TXD
UART1_RXD	34	GPIOA4	UART0_CTS	I2S0_BCK	PCM_FSYNC	SPI_CD				BT_UART_RXD	UART1_CTS
UART1_TXD	35	GPIOA5	UART0_RTS	I2S0_LRCK	PCM_DIN	SPI_FMARK				BT_UART_TXD	UART1_RTS
GPIOA6	27	GPIOA6	I2CM_SCL	UART1_CTS	PCM_DOUT	SPI_CSN1			UART2_RXD	BT_UART_CTS	BT_UART_RXD
GPIOA7	28	GPIOA7	I2CM_SDA	UART1_RTS	PCM_CLK	SPI_CSN2	AON_PWM0		UART2_TXD	BT_UART_RTS	BT_UART_TXD
URAT0_RXD	15	GPIOA8							UART2_CTS		BT_UART_CTS
UART0_TXD	16	GPIOA9				SPI_CSN3	AON_PWM1		UART2_RTS		BT_UART_RTS
SDIO_DATA1	18	GPIOA10	UART1_RXD	I2S1_BCK	UART2_RXD	SPI_CLK	BT_UART_CTS			BT_UART_CTS	
SDIO_DATA0	19	GPIOA11	UART1_TXD	I2S1_LRCK	UART2_TXD	SPI_CSN0	BT_UART_RTS			BT_UART_RTS	
SDIO_CLK	20	GPIOA12	UART1_CTS	I2S1_DIN	UART2_CTS	SPI_MISO	AON_PWM2		PCM_FSYNC	BT_UART_RXD	
SDIO_CMD	21	GPIOA13	UART1_RTS	CODEC_MCLK	UART2_RTS	SPI_MOSI	PWM0		PCM_CLK	BT_UART_TXD	
SDIO_DATA3	22	GPIOA14	I2CM_SCL	I2S1_DOUT		SPI_CD	PWM1	UART0_RXD	PCM_DIN		
SDIO_DATA2	23	GPIOA15	I2CM_SDA	I2S0_DIN		SPI_FMARK	PWM2	UART0_TXD	PCM_DOUT		
GPIOB0	6	GPIOB0	SPI_CLK				AON_PWM0	PCM_FSYNC			
GPIOB1	7	GPIOB1	SPI_CSN0				AON_PWM1	PCM_CLK			
GPIOB2	8	GPIOB2	SPI_MISO				AON_PWM2	PCM_DIN			

GPIOB3	9	GPIOB3	SPI_MOSI	PCM_DOUT
GPIOB4	14	GPIOB4	PWM0	
USB_DP	12	GPIOA20		
USB_DM	11	GPIOA21		

3.4. Application Interfaces

3.4.1. UARTs

The module provides up to 2 UARTs: UART0, UART1.

Table 7: Pin Definition of UARTs

Pin Name	Pin No.	I/O	Description	Comment
UART0_TXD	16	DO	UART0 transmit	
UART0_RXD	15	DI	UART0 receive	
UART1_TXD	35	DO	UART1 transmit	Pin 37,19 (alternative).
UART1_RXD	34	DI	UART1 receive	Pin 31,18 (alternative).
GPIOA7	28	DO	UART2 transmit	Pin 19 (alternative).
GPIOA6	27	DI	UART2receive	Pin 18 (alternative).

UART1 and UART2 can be used for data transmission. The default baud rate is 115200 bps, and the maximum baud rate can reach 6 Mbps.

The main UART connection between the module and the peripheral is illustrated below.

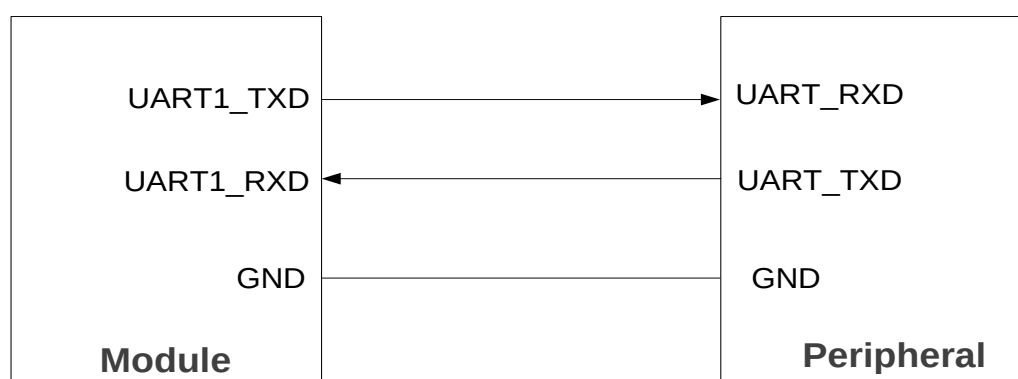


Figure 2: UART1 Connection

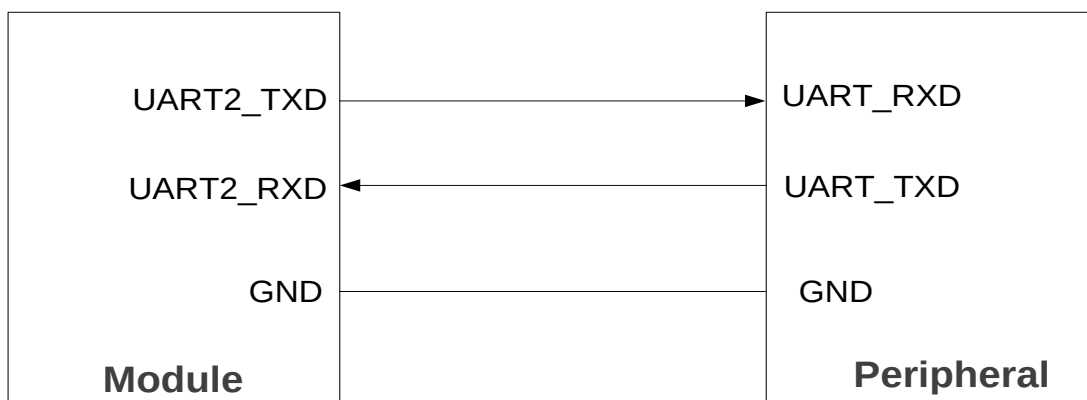


Figure 4: UART2 Connection

The debug UART0 supports 921600 bps baud rate by default, and is used for outputting partial logs with debugging tools. The following is a reference design of debug UART0. UART0 is also available for firmware upgrade and supports a default baud rate of 921600 bps.

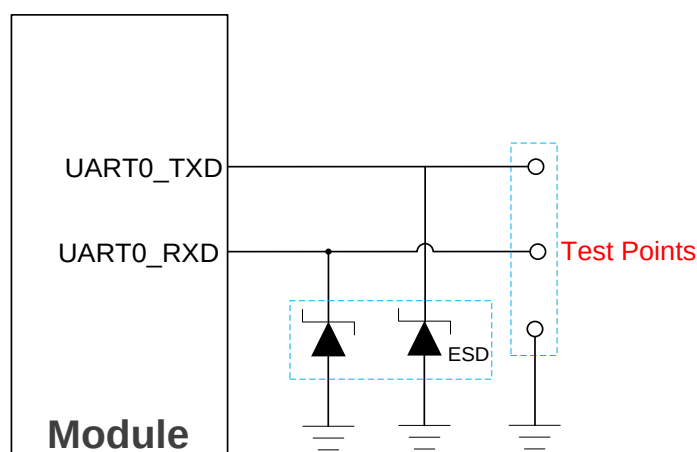


Figure 3: UART0 Reference Design

3.4.2. SPI*

The module provides a SPI which only supports master mode with a maximum clock frequency of up to 20 MHz.

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

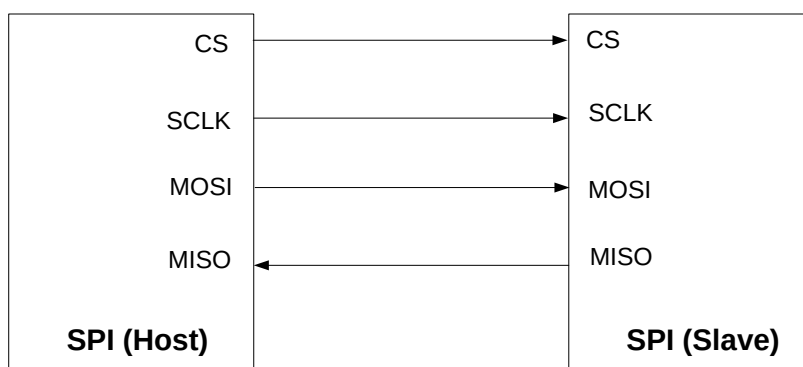


Figure 4: SPI Connection

Table 8: Pin Definition of SPI

Pin Name	Pin No.	Multiplexing Function	I/O	Description	Comment
GPIOA1	29	SPI_CS	DO	SPI chip select	Pin 7,19 (alternative).
GPIOA0	30	SPI_CLK	DO	SPI clock	Pin 6,18 (alternative).
GPIOA2	31	SPI_DIN	DI	SPI data input	Pin 8,20 (alternative).
GPIOA3	37	SPI_DOUT	DO	SPI data output	Pin 9,21 (alternative).

3.4.3. SDIO Interface

The module provides an SDIO interface which complies with SDIO 3.0 specification. The interface supports both master and slave modes with maximum clock rate of up to 208 MHz and 1-bit (by default) and 4-bit data bus modes. It can read external SD card data in master mode and communicates with host in slave mode.

Table 9: Pin Definition of SDIO Interface

Pin Name	Pin No.	I/O	Description	Comment
SDIO_DATA0	19	DIO	SDIO data bit 0	
SDIO_DATA1	18	DIO	SDIO data bit 1	
SDIO_DATA2	23	DIO	SDIO data bit 2	
SDIO_DATA3	22	DIO	SDIO data bit 3	

SDIO_CLK	20	DI	SDIO clock
SDIO_CMD	21	DIO	SDIO command

The following figure shows the SDIO connection between the module and the host:

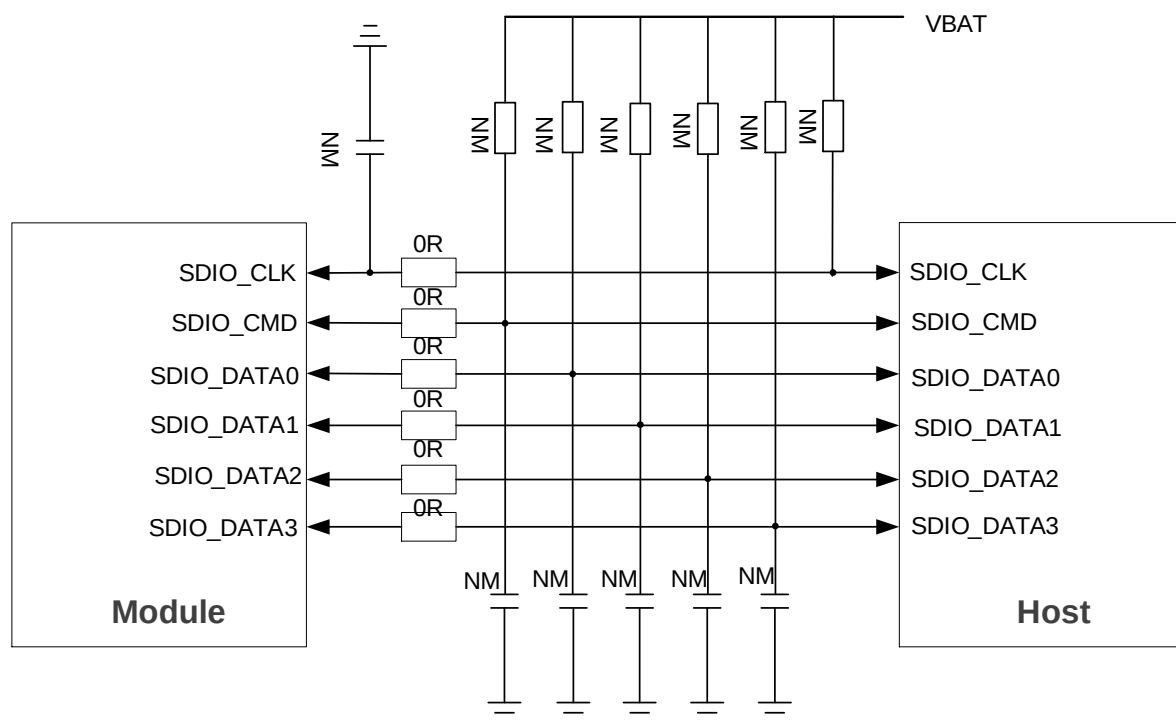


Figure 5: SDIO Connection

3.4.4. I2C* Interfaces

The module provides 4 I2C interfaces that support master mode only. It supports:

- AMBA 2.0 APB bus
- Standard-mode (100 Kbps) and fast-mode (400 Kbps) protocols
- Programmable master and slave modes
- 7-bit and 10-bit addressing modes
- Automatic clock stretching
- Programmable clock and data timing
- DMA
- Universal call address

Table 10: Pin Definition of I2C Interfaces

Pin Name	Pin No.	Multiplexing Function	I/O	Description
GPIOA0	30	I2C1_SCL	OD	I2C1 serial clock
GPIOA1	29	I2C1_SDA	OD	I2C1 serial data
GPIOA6	27	I2C3_SCL	OD	I2C2 serial clock
GPIOA7	28	I2C3_SDA	OD	I2C2 serial data
SDIO_DATA3	22	I2C3_SCL	OD	I2C3 serial clock
SDIO_DATA2	23	I2C3_SDA	OD	I2C3 serial data
GPIOB0	6	I2C4_SCL	OD	I2C4 serial clock
GPIOB1	7	I2C4_SDA	OD	I2C4 serial data

3.4.5. I2S* Interface

The module provides an I2S interface which supports both master and slave modes with sampling rates from 8 kHz to 384 kHz.

Pin Name	Pin No.	Multiplexing Function	I/O	Description	Comment
GPIOA0	30	I2S0_LRCK	DO	I2S0 channel select	Pin 14,35 (alternative).
GPIOA1	29	I2S0_SCLK	DO	I2S0 bit clock	Pin 34 (alternative).
GPIOA2	31	I2S0_DIN	DI	I2S0 data input	Pin 23 (alternative).
GPIOA3	37	I2S0_DOUT	DO	I2S0 data output	Pin 16 (alternative).
SDIO_DATA0	19	I2S1_LRCK	DO	I2S0 bit clock	
SDIO_DATA1	18	I2S1_SCLK	DO	I2S0 channel select	
SDIO_CLK	20	I2S1_DIN	DI	I2S0 data input	
SDIO_DATA3	22	I2S1_DOUT	DO	I2S0 data output	

Table 11: Pin Definition of I2S Interface

3.4.6. PCM* Interface

The module supports 1 PCM channel.

Table 12: Pin Definition of PCM Interfaces

Pin Name	Pin No.	Multiplexing Function	I/O	Description	Comment
GPIOB0	6	PCM_SYNC	DIO	PCM data frame sync	Pin 20、30、31、34、37 (alternative).
GPIOB1	7	PCM_CLK	DI	PCM clock	Pin 21、28、29、30、37 (alternative).
GPIOB2	8	PCM_DIN	DI	PCM data input	Pin 22、29、31、35 (alternative).
GPIOB3	9	PCM_DOUT	DO	PCM data output	Pin 23、27、29、30、37 (alternative).
SDIO_CMD	21	MCLK	DO	Clock output for codec	Pin 34 (alternative).

3.4.7. PWM* Interfaces

The module supports up to 3 PWM channels.

Table 13: Pin Definition of PWM Interfaces

Pin Name	Pin No.	Multiplexing Function	I/O	Description	Comment
GPIOA0	30	PWM0	DO	PWM out	Pin 21 (alternative).
GPIOA1	29	PWM1	DO	PWM out	Pin 22 (alternative).
GPIOA2	31	PWM2	DO	PWM out	Pin 23 (alternative).
GPIOA7	28	AON_PWM0	DO	PWM out	Pin 6 (alternative).
UART0_TXD	16	AON_PWM1	DO	PWM out	Pin 7 (alternative).
SDIO_CLK	20	AON_PWM2	DO	PWM out	Pin 8 (alternative).

3.4.8. ADC* Interfaces

The module supports 2ADC interfaces, whose voltage range is 0–1.2 V. To improve ADC accuracy, surround ADC trace with ground.

Table 14: Pin Definition of ADC Interfaces

Pin Name	Pin No.	Multiplexing Function	I/O	Description
GPIOB2	8	ADC0	AI	General-purpose ADC interface
GPIOB3	9	ADC1	AI	General-purpose ADC interface

Table 15: ADC Features

Parameter	Min.	Typ.	Max.	Unit
ADC Voltage Range	0	-	1.2	V
ADC Resolution Rate	-	TBD	-	bit

3.4.9. USB Interface

The module provides an integrated Universal Serial Bus (USB) interface as device which complies with the USB 2.0 specification and supports high-speed (480 Mbps) mode and is backward-compatible with full-speed (12 Mbps) mode.

Table 16: Pin Definition of USB Interface

Pin Name	Pin No.	Multiplexing Function	I/O	Description	Comment
USB_DP	12	AIO	DIO	USB differential data (+)	Requires differential impedance of 90 Ω. USB 2.0 compliant.
USB_DM	11	AIO	DIO	USB differential data (-)	

3.5. Antenna/ Antenna Interfaces

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 is provided in one of the three antenna/antenna interface designs: ANT_WIFI/BT antenna interface (stamp hole), PCB antenna and coaxial RF connector. The coaxial RF connector is not available when the module is designed with a PCB antenna or ANT_WIFI/BT antenna interface.

3.5.1. Operating Frequencies

Table 17: Operating Frequencies (Unit: GHz)

Feature	Frequency
2.4 GHz Wi-Fi	2.400–2.4835
5 GHz Wi-Fi	5.250~5.850
Bluetooth	2.400–2.4835

3.5.2. ANT_WIFI/BT Antenna Interface ⁵

Table 18: ANT_WIFI/BT Pin Definition

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

3.5.2.1. Reference Design

For better RF performance, it is necessary to reserve a π matching circuit and add an ESD protection component. Matching components such as R1, C1, C2, and D1 should be placed as close to the antenna as possible. C1, C2, and D1 are not mounted by default. The parasitic capacitance of TVS should be less than 0.05 pF and R1 is recommended to be 0 Ω .

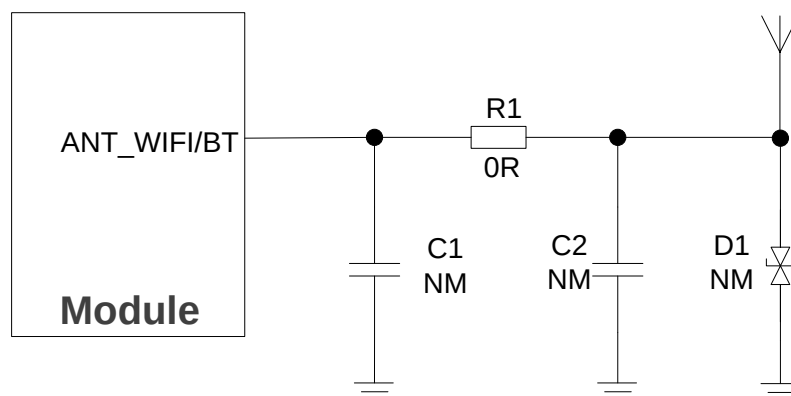


Figure 6: RF Antenna Reference Design

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

3.5.2.2. Antenna Design Requirements

Table 19: Antenna Design Requirements

Parameter	Requirement
Frequency Range (GHz)	2.4 GHz: 2.400~2.4835
Cable Insertion Loss (dB)	< 1
VSWR	≤ 2 (Typ.)
Gain (dBi)	1 (Typ.)
Max. input power (W)	50
Input impedance (Ω)	50
Polarization type	Vertical

3.5.2.3. 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.

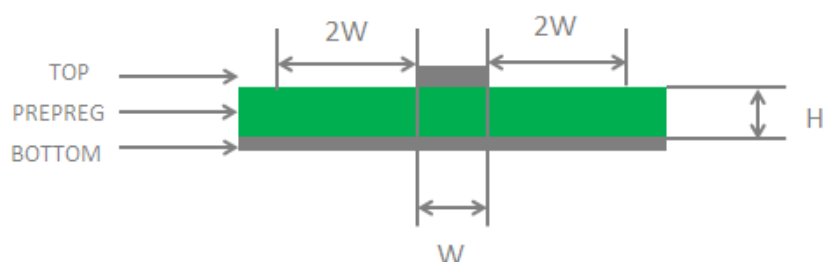


Figure 7: Microstrip Design on a 2-layer PCB

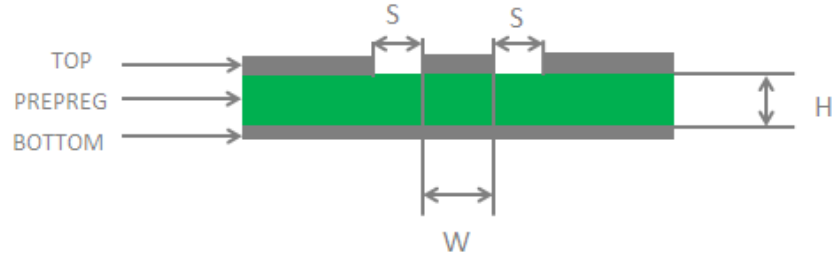


Figure 8: Coplanar Waveguide Design on a 2-layer PCB

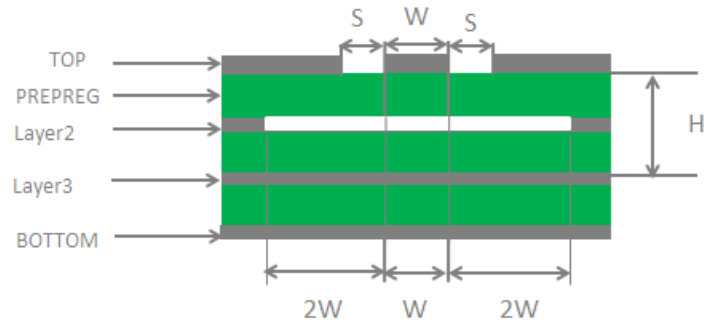


Figure 9: Coplanar Waveguide Design on a 4-layer PCB (Layer 3 as Reference Ground)

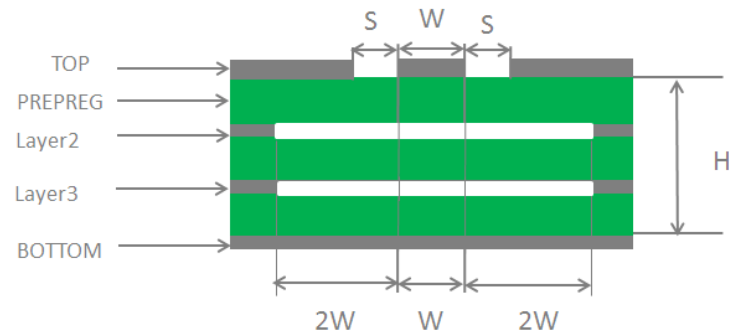


Figure 10: Coplanar Waveguide Design on a 4-layer PCB (Layer 4 as Reference Ground)

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 not less than twice the width of RF signal traces ($2 \times W$).
- Keep RF traces away from interference sources, and avoid intersection and paralleling between traces on adjacent layers.

3.5.2.4. RF Connector Recommendation

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

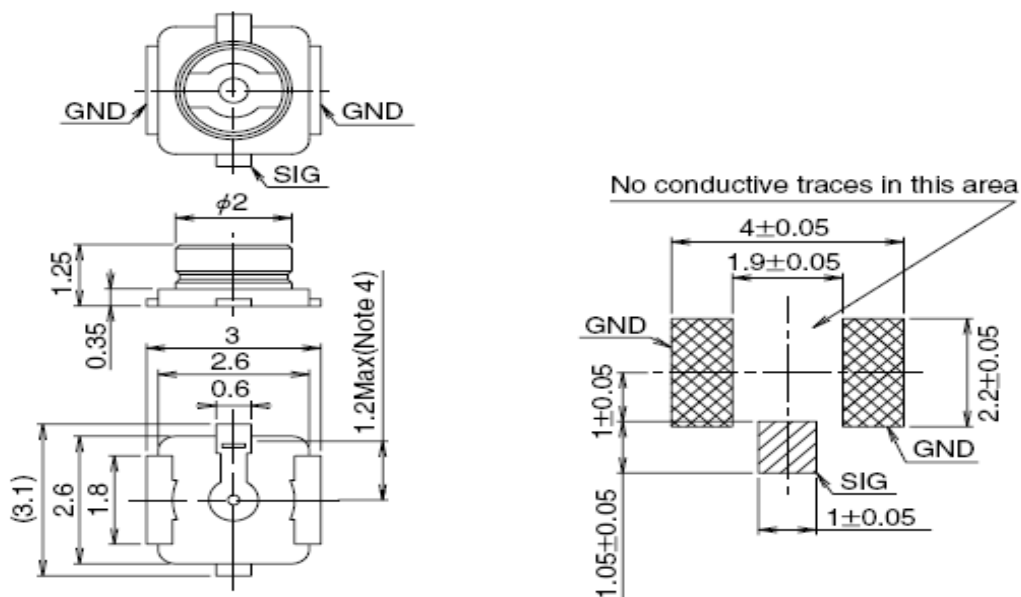


Figure 11: Dimensions of the Receptacle (Unit: mm)

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

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 12: Specifications of Mated Plugs

The following figure describes the space factor of mated connectors.

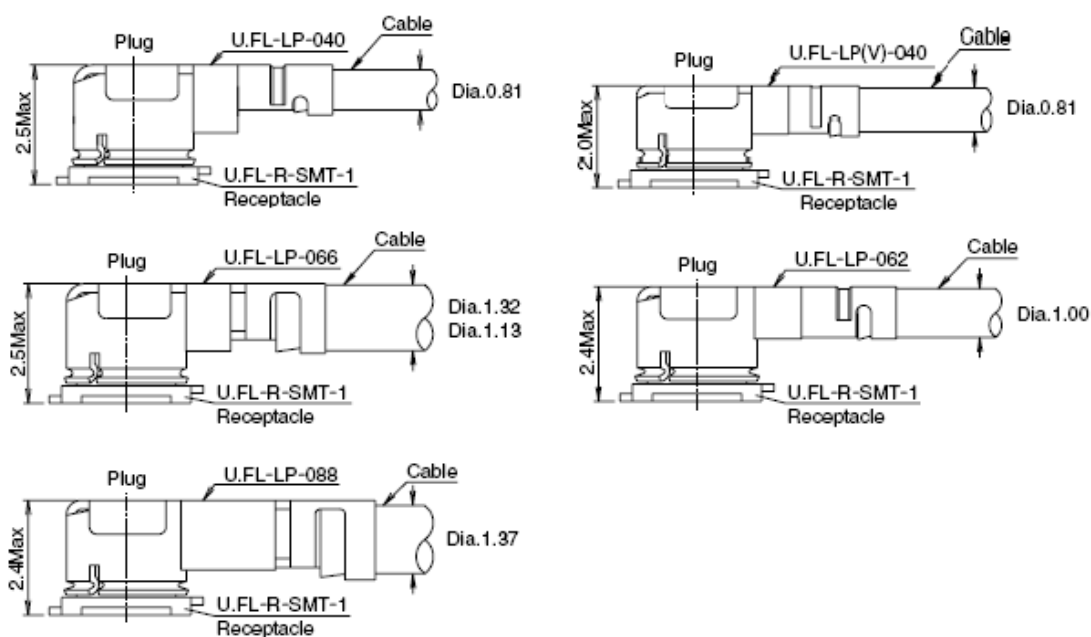


Figure 13: Space Factor of Mated Connectors (Unit: mm)

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

3.5.3. PCB Antenna ⁶

Table 20: PCB Antenna Specifications

Parameter	Requirement
Frequency Range (GHz)	2.400–2.500
Input Impedance (Ω)	50
VSWR	≤ 3
Gain (dBi)	1 (Typ.)
Efficiency	30 %

When designed with PCB antenna, the module should be placed on the edge of the motherboard. The PCB antenna should be at least 16 mm away from the metal components, connectors, vias, traces, and copper pour area on the motherboard. All layers in the PCB of the motherboard under the PCB antenna should be designed as a keepout area.

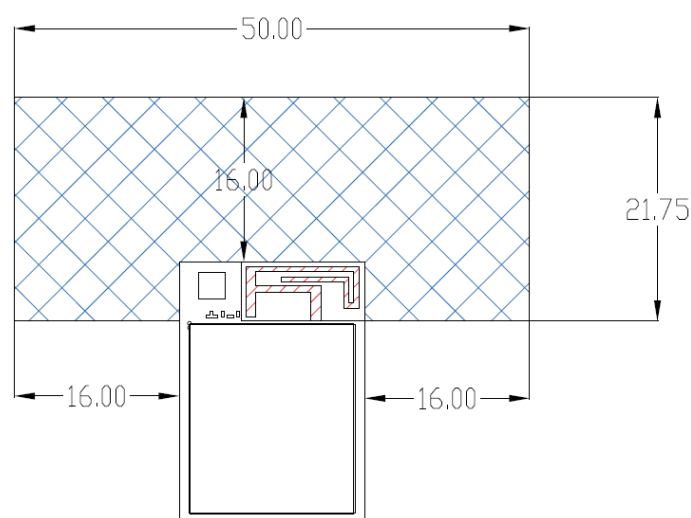


Figure 14: Keepout Area on Motherboard

During PCB design, do not route traces across the RF test point at the bottom of the module to ensure the module performance.

⁶ The module is provided in one of the three antenna/antenna interface designs. For more details, contact Quectel Technical Support.

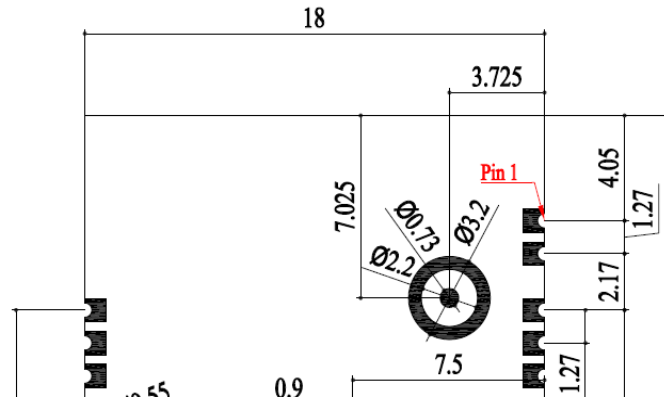


Figure 15: Prohibited Area for Routing

3.5.4. Coaxial RF Connector ⁷

3.5.4.1. Receptacle Specifications

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

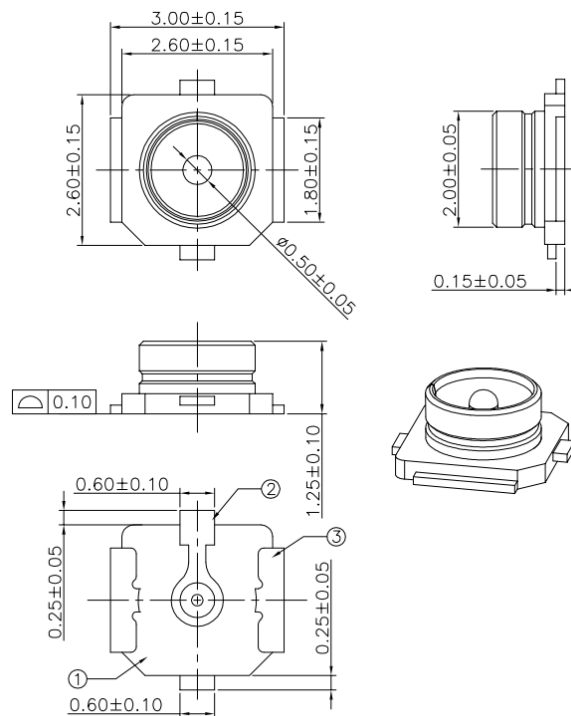


Figure 16: Dimensions of the Receptacle (Unit: mm)

⁷ The module is provided in one of the three antenna/antenna interface designs. For more details, contact Quectel Technical Support.

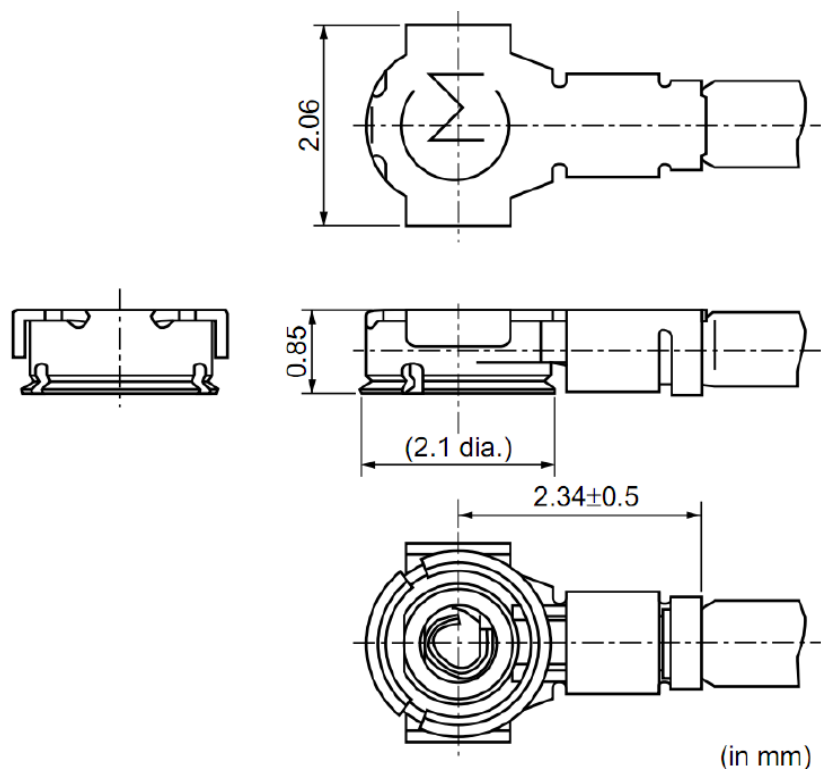
Table 21: Major Specifications of the RF Connector

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)

3.5.4.2. 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 coaxial cables.


Figure 17: Dimensions of Mated Plugs ($\varnothing$ 0.81 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.

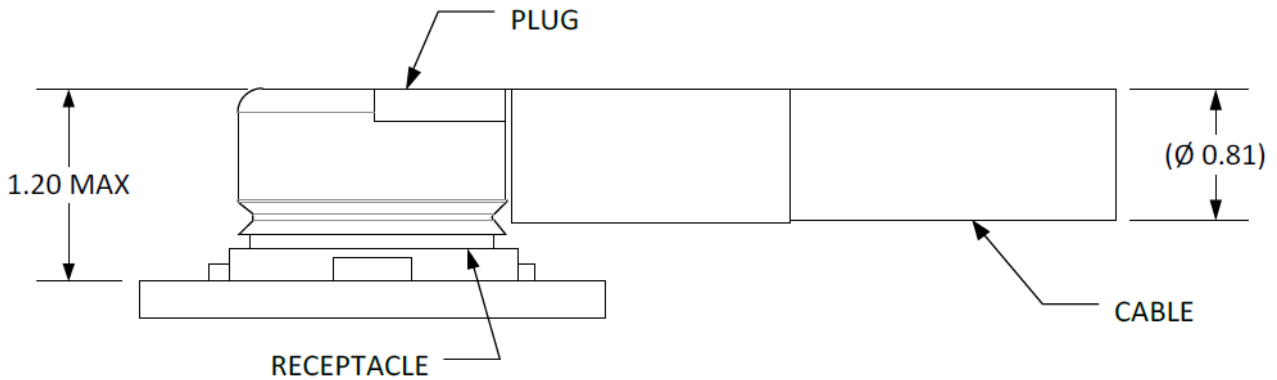


Figure 18: Space Factor of Mated Connectors ($\varnothing 0.81$ mm Coaxial Cables) (Unit: mm)

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.

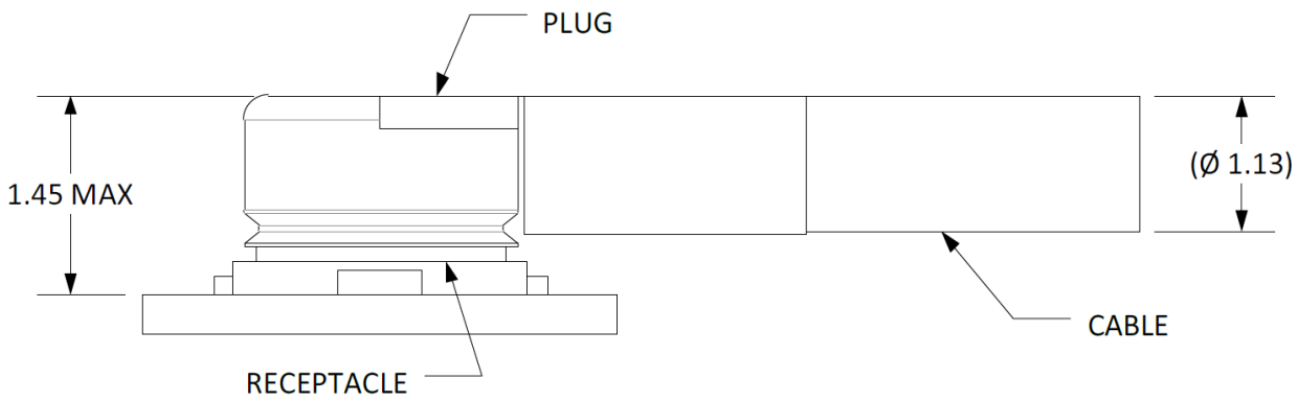


Figure 19: Space Factor of Mated Connectors ($\varnothing 1.13$ mm Coaxial Cables) (Unit: mm)

3.5.4.2.1. Assemble Coaxial Cable Plug Manually

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

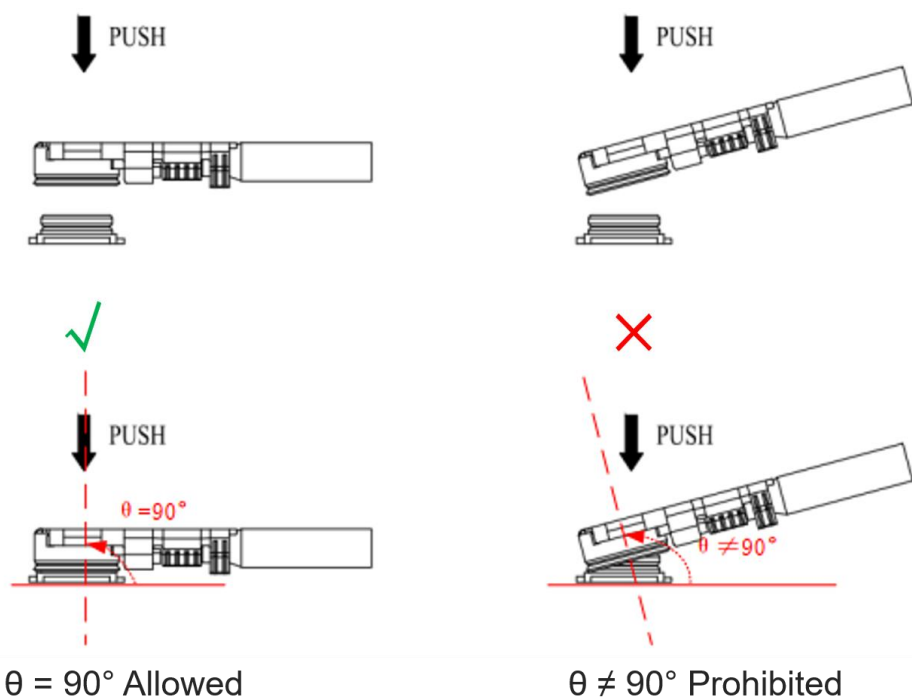


Figure 20: Plug in a Coaxial Cable Plug

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

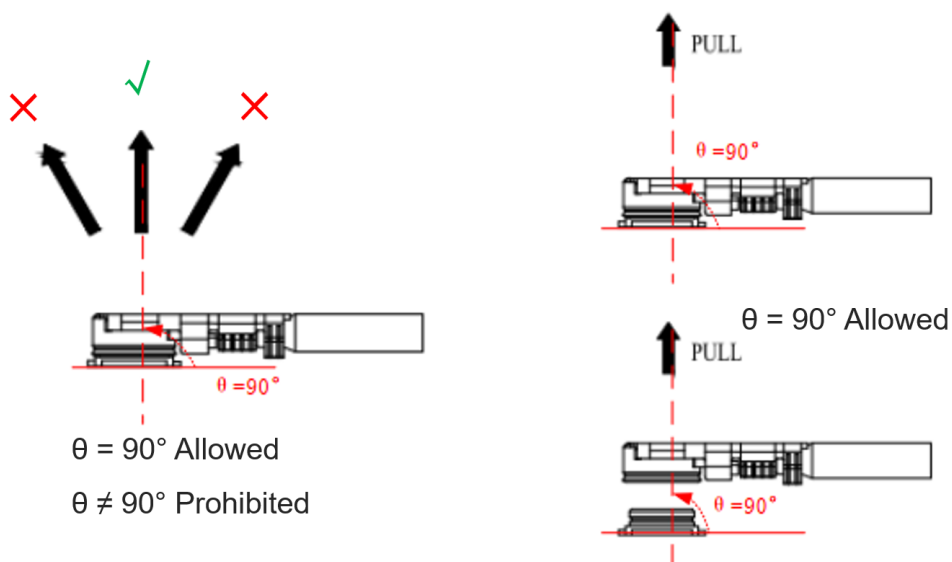


Figure 21: Pull out a Coaxial Cable Plug

3.5.4.2.2. Assemble Coaxial Cable Plug with Jig

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.

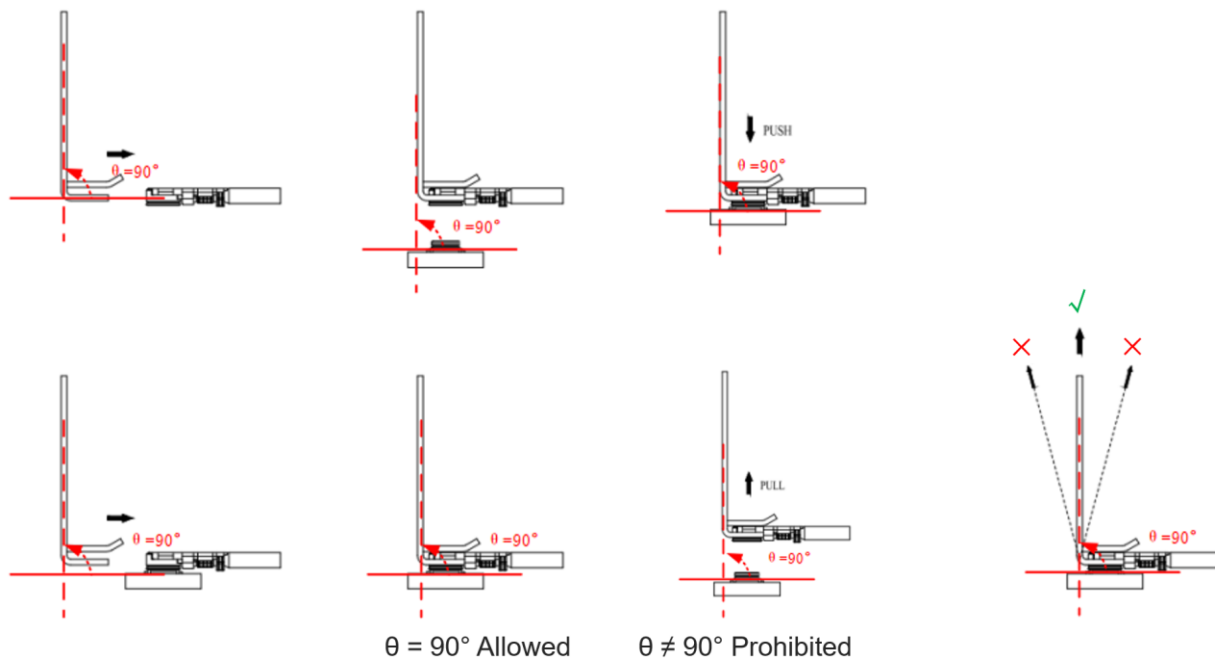


Figure 22: Install the Coaxial Cable Plug with Jig

3.5.4.3. 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>.

4 Operating Characteristics

4.1. Power Supply

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

Table 22: Pin Definition of Power Supply and GND Pins

Pin Name	Pin No.	I/O	Description	Min.	Typ.	Max.	Unit
VBAT	4	PI	Power supply for the module	3.0	3.3	3.6	V
GND	1, 3, 17, 24, 38–47						

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 with sufficient current of at least 0.5 A. 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. 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:

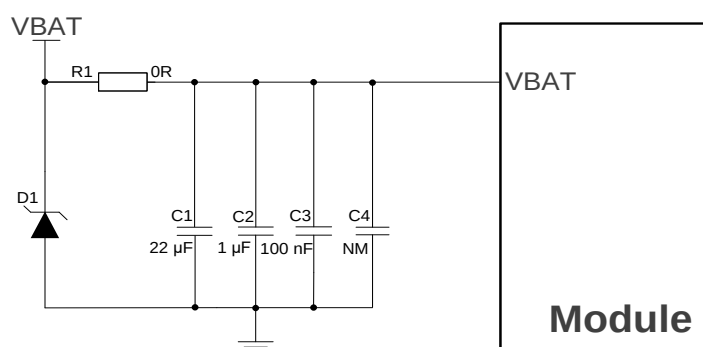


Figure 23: VBAT Reference Circuit

4.2. Turn On

After the VBAT is powered up, pull the PWRKEY up for 6 ms when turn on the module for the first time. After the module is turned on, the pin PWRKEY monitors the real-time level changes to realize turn-on/off of the module. When the module is completely powered off, the PWEKEY must be pulled up for 6 ms to start the module again.

Table 23: Pin Definition of PWRKEY

Pin Name	Pin No.	I/O	Description	Comment
PWRKEY	5	DI	Turn on/off the module	Internally pulled down with a 200 kΩ resistor. Active high.

The turn-on timing is shown below:

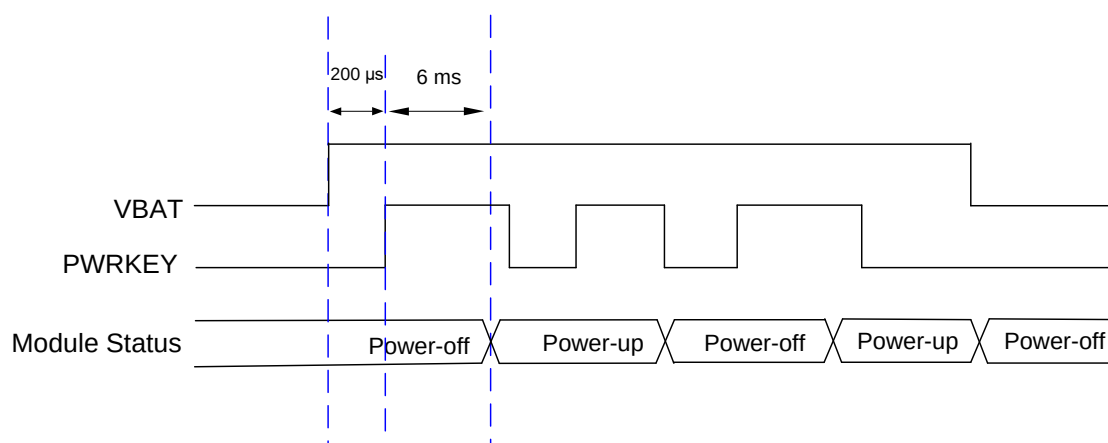


Figure 24: Turn-on Timing

4.3. Download Mode

After the module is powered on, keep the pin input of GPIOB0 and GPIOB1 at low level and press PWRKEY to start the module, and the module will enter the download mode. Firmware can be downloaded through UART0 in download mode.

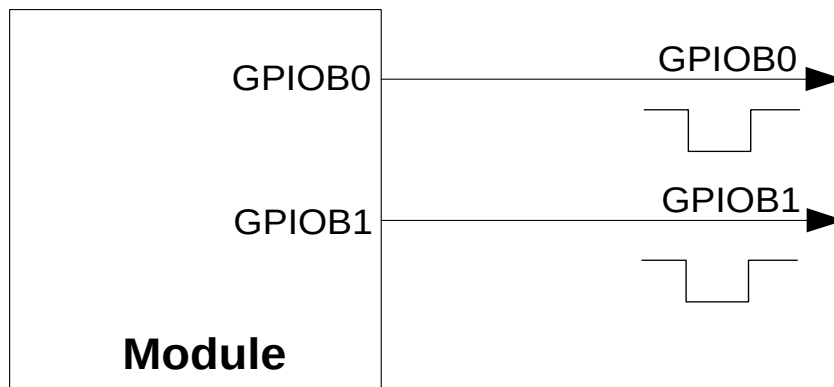


Figure 25: Reference Design for Download Mode

5 RF Performances

5.1. Wi-Fi Performances

Table 24: Wi-Fi Performances

Operating Frequency
2.4 GHz: 2.400~2.4835 GHz 5 GHz: 5.150~5.850 GHz
Modulation
BPSK, QPSK, CCK, 16QAM, 64QAM, 256QAM, 1024QAM
Operating Mode
STA
Transmission Data Rate
802.11b: 1 Mbps、2 Mbps、5.5 Mbps、11 Mbps 802.11a/g: 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) 802.11ac: VHT20 (MCS 0~8)、VHT40 (MCS 0~9) 802.11ax: HE20 (MCS 0~11)、HE40 (MCS 0~11)

5.2. Bluetooth Performances

Table 25: Bluetooth Performances

Operating Frequency
2.400~2.4835 GHz
Modulation
GFSK, $\pi/4$ -DQPSK, 8-DPSK

Operating Mode

- Classic Bluetooth (BR + EDR)
- Bluetooth Low Energy (BLE)

Condition	Unit: dBm, Tolerance: ± 3 dB	
	Transmitting Power @ Typ.	Receiving Sensitivity @ Typ.
BR	3.59	-90
EDR ($\pi/4$ -DQPSK)	0.14	-91
EDR (8-DPSK)	0.10	-85.5
BLE (1 Mbps)	3.55	-90

6 Electrical Characteristics & Reliability

6.1. Absolute Maximum Ratings

Table 26: Absolute Maximum Ratings (Unit: V)

Parameter	Min.	Max.
VBAT	-0.3	3.6
Voltage at Digital Pins	-0.3	3.6
Voltage at ADC[0:1]	0	1.2

6.2. Power Supply Ratings

Table 27: 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.	3.0	3.3	3.6

6.3. Wi-Fi Power Consumption

Table 28: Power Consumption in Low Power Modes

Mode	Typ.	Unit
Light sleep	TBD	μA
Deep sleep	TBD	μA
DTIM1	1.11	mA
DTIM3	0.48	mA
OFF	TBD	μA

Table 29: Power Consumption in Non-signaling Modes

Condition	Typ.	Unit
2.4 GHz	802.11b, Tx 1 Mbps @ 18 dBm	305.69 mA
	802.11b, Tx 11 Mbps @ 18 dBm	162.33 mA
	802.11g, Tx 6 Mbps @ 18 dBm	307.33 mA
	802.11g, Tx 54 Mbps @ 15 dBm	86.23 mA
	802.11n, HT20 Tx MCS 0 @ 18 dBm	310.85 mA
	802.11n, HT20 Tx MCS 7 @ 15 dBm	126.62 mA
	802.11n, HT40 Tx MCS 0 @ 18 dBm	314.48 mA
	802.11n, HT40 Tx MCS 7 @ 15 dBm	128.53 mA
	802.11ax, HE20 Tx MCS 0 @18 dBm	309.74 mA
	802.11ax, HE20 Tx MCS 11 @ 13 dBm	94.83 mA
	802.11ax, HE40 Tx MCS 0 @ 18 dBm	314.55 mA
	802.11ax, HE40 Tx MCS 11 @ 13 dBm	97.10 mA
5 GHz	802.11a, Tx 6 Mbps @ 18 dBm	380.57 mA
	802.11a, Tx 54 Mbps @ 15 dBm	109.65 mA
	802.11n, HT20 Tx MCS 0 @ 18 dBm	394.82 mA

802.11n, HT20 Tx MCS 7 @ 15 dBm	163.34	mA
802.11n, HT40 Tx MCS 0 @ 18 dBm	406.76	mA
802.11n, HT40 Tx MCS 7 @ 15 dBm	165.96	mA
802.11ac, VHT20 Tx MCS 0 @ 18 dBm	398.58	mA
802.11ac, VHT20 Tx MCS 8 @ 14 dBm	140.62	mA
802.11ac, VHT40 Tx MCS 0 @ 18 dBm	402.03	mA
802.11ac, VHT40 Tx MCS 9 @ 14 dBm	138.83	mA
802.11ax, HE20 Tx MCS 0 @ 18 dBm	395.49	mA
802.11ax, HE20 Tx MCS 11 @ 12 dBm	114.56	mA
802.11ax, HE40 Tx MCS 0 @ 18 dBm	402.48	mA
802.11ax, HE40 Tx MCS 11 @ 12 dBm	117.75	mA

6.4. Digital I/O Characteristics

Table 30: VBAT I/O Characteristics (Unit: V)

Parameter	Description	Min.	Max.
V_{IH}	High-level Input Voltage	$0.7 \times V_{BAT}$	V_{BAT}
V_{IL}	Low-level Input Voltage	0	$0.3 \times V_{BAT}$
V_{OH}	High-level Output Voltage	$0.9 \times V_{BAT}$	V_{BAT}
V_{OL}	Low-level Output Voltage	-0	$0.1 \times V_{BAT}$

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 31: ESD Characteristics (Unit: kV)

Model	Test Result	Standard
Human Body Model (HBM)	± 3	<i>ANSI/ESDA/JEDEC JS-001-2017</i>
Charged Device Model (CDM)	± 0.35	<i>ANSI/ESDA/JEDEC JS-002-2018</i>

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

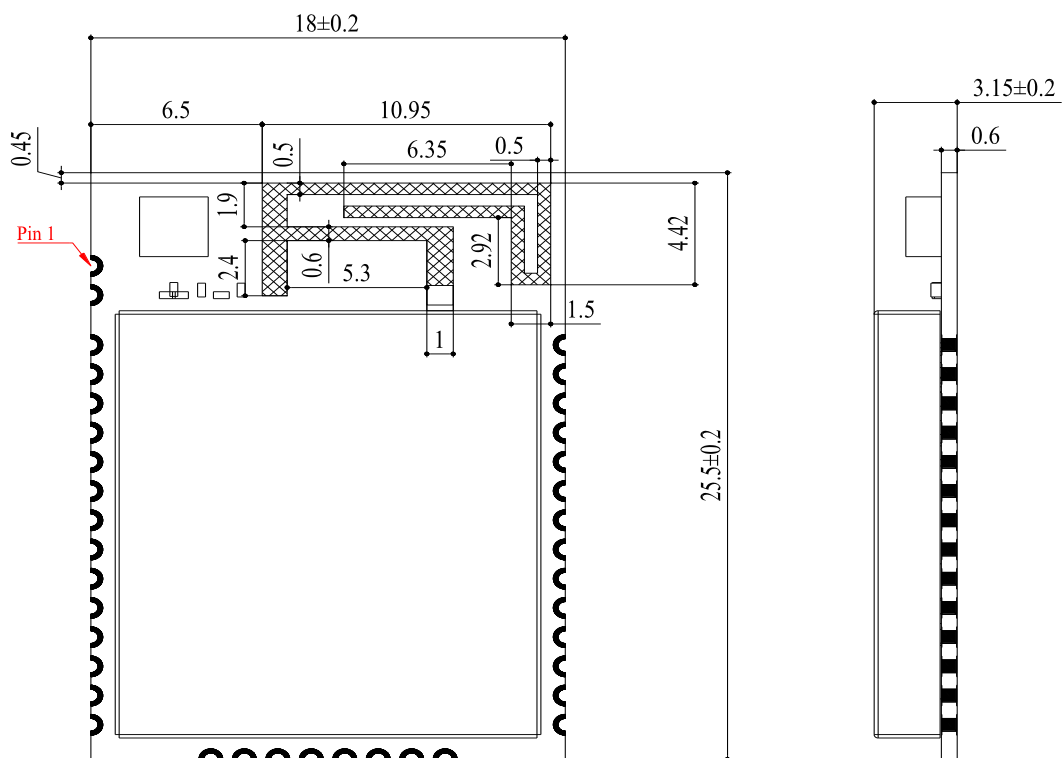


Figure 26: Top and Side Dimensions

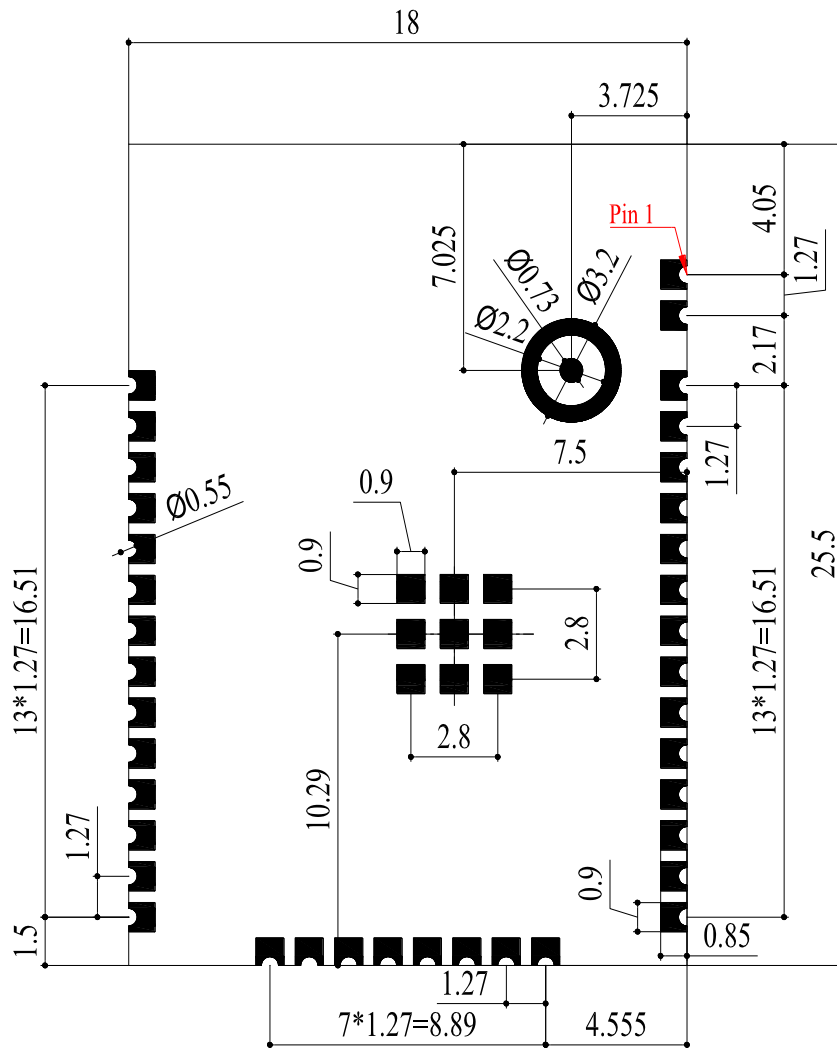


Figure 27: Bottom Dimensions (Bottom View)

NOTE

The package warpage level of the module conforms to the JEITA ED-7306 standard.

7.2. Recommended Footprint

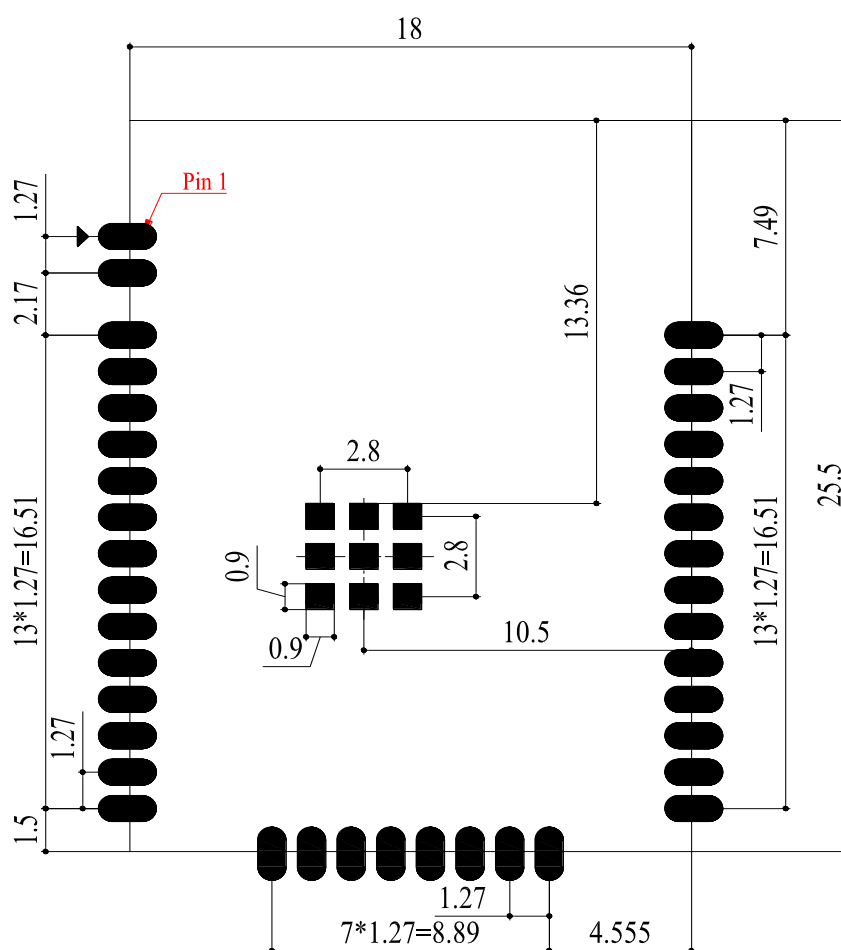


Figure 28: Recommended Footprint

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

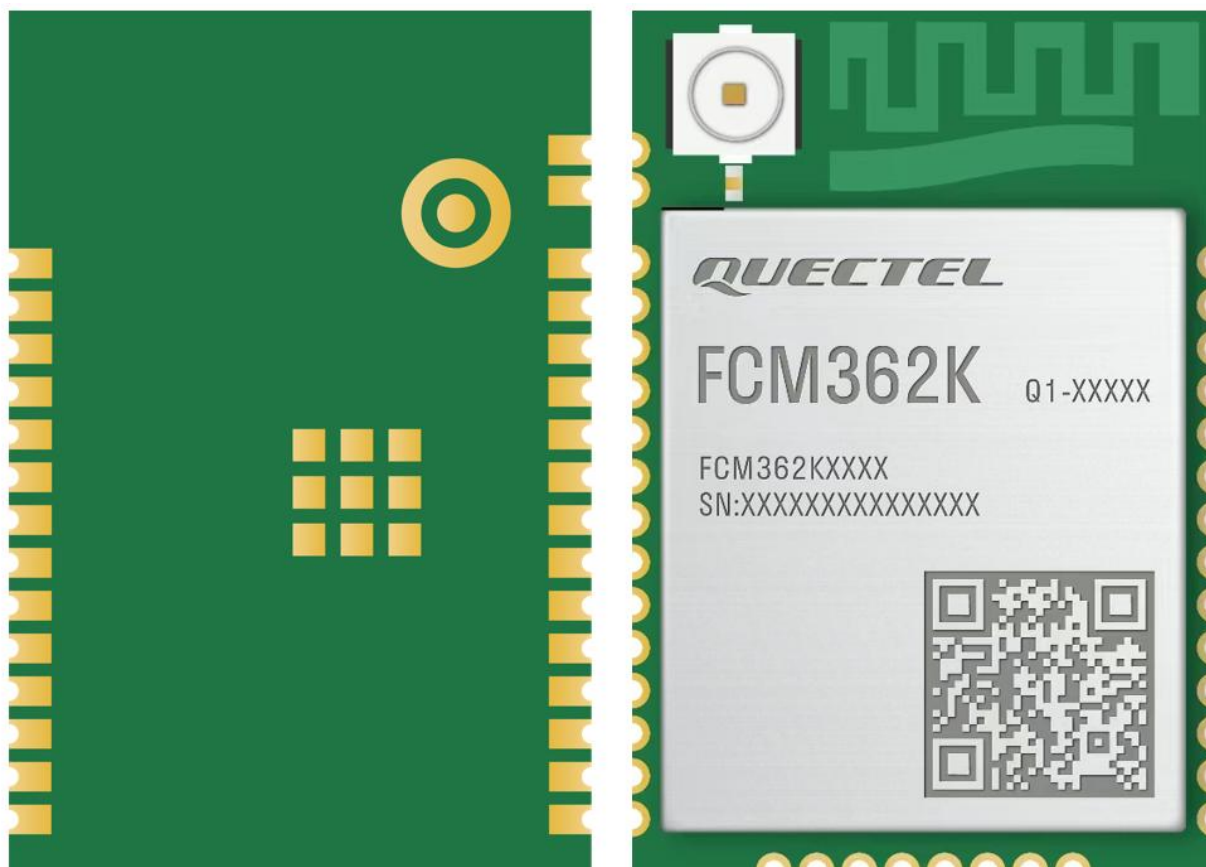


Figure 31: Top and Bottom Views

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 coaxial RF connector is not available when the module is designed with a PCB antenna or ANT_WIFI/BT 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 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 8 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 0.15–0.18 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.

Temp. (°C)

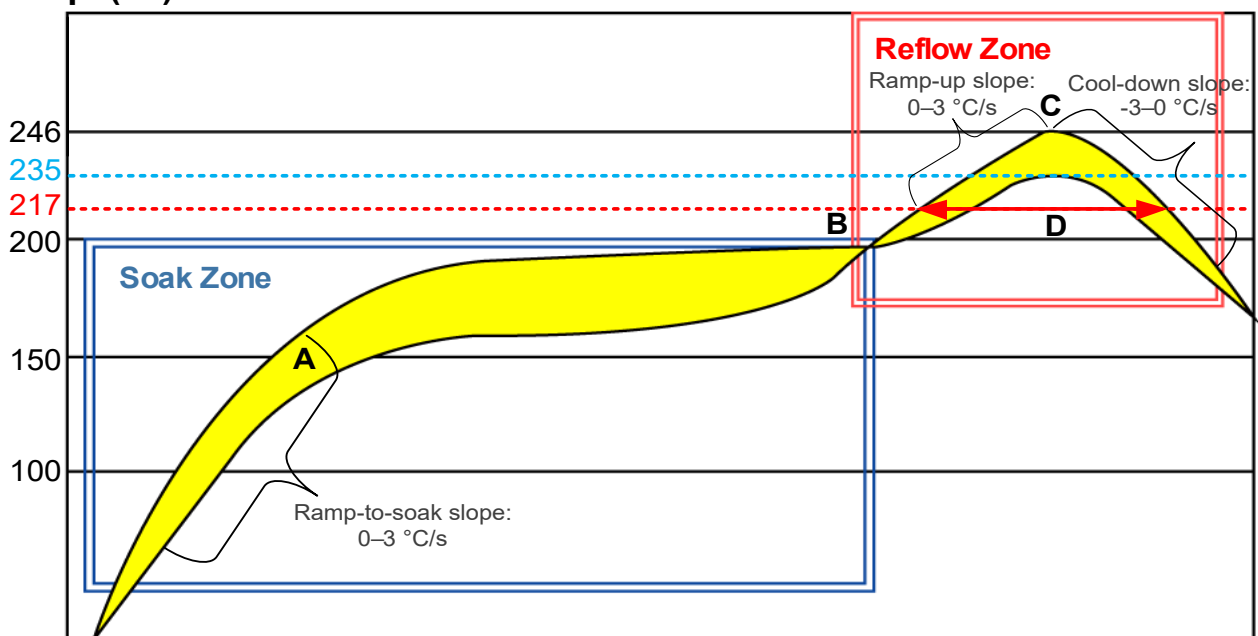


Figure 29: Recommended Reflow Soldering Thermal Profile

Table 32: 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, etc. 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. 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 [3]**.

8.3. Packaging Specifications

This chapter describes only the key parameters and process of packaging. All figures below are for

reference only. The appearance and structure of the packaging materials are subject to the actual delivery.

8.3.1. Carrier Tape

Carrier tape dimensions are detailed below:

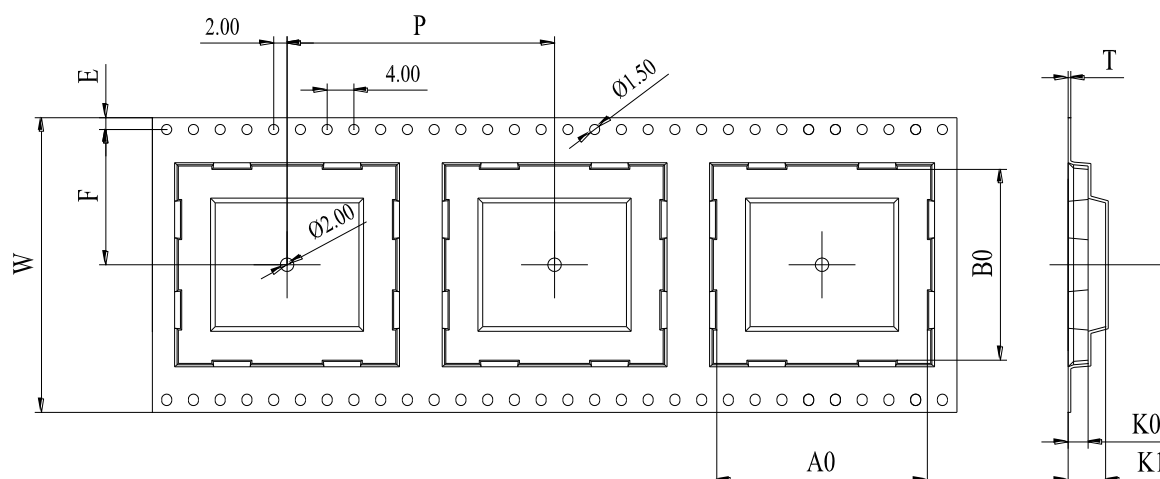


Figure 33: Tape Specifications

Table 33: Carrier Tape Dimension Table (Unit: mm)

W	P	T	A0	B0	K0	K1	F	E
44	32	0.4	18.4	25.9	3.7	6.8	20.2	1.75

8.3.2. Plastic Reel

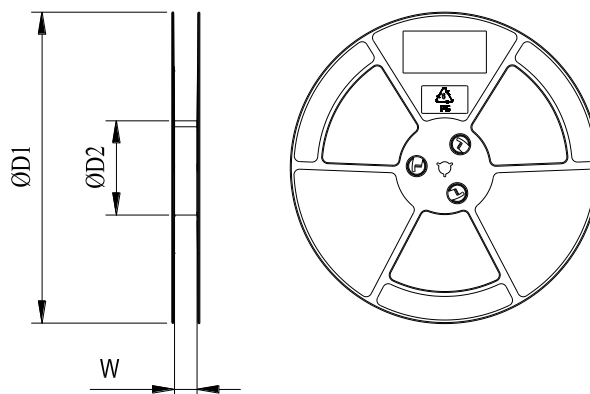


Figure 34: Reel Specifications

Table 34: Reel Dimensions (Unit: mm)

ØD1	ØD2	W
330	100	44.5

8.3.3. Mounting Direction

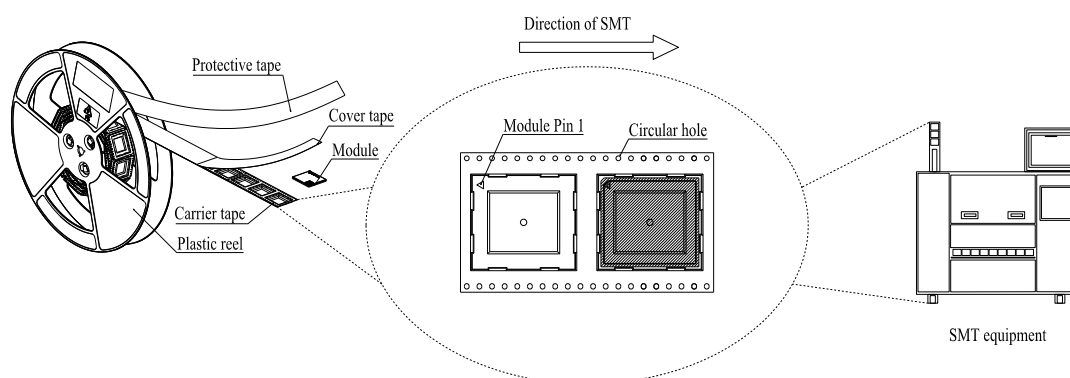
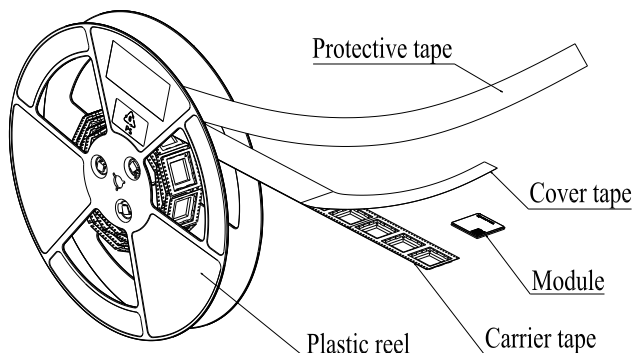


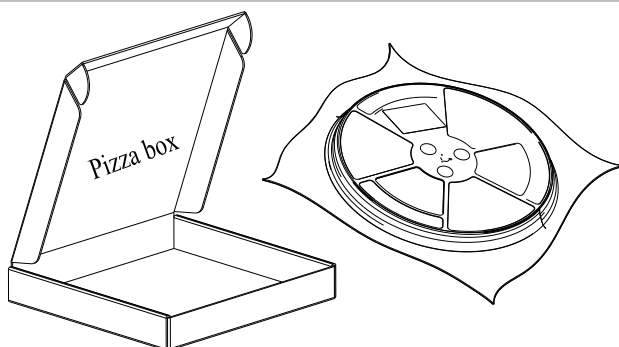
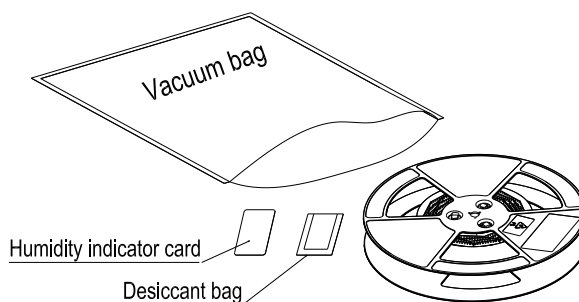
Figure 30: Mounting Direction

8.3.4. Packaging Process



Place the modules into the carrier tape and use the cover tape to cover them; then wind the heat-sealed carrier tape on the plastic reel and use the protective tape for protection. 1 plastic reel can load 250 modules.

Place the packaged plastic reel, 1 humidity indicator card and 1 desiccant bag into a vacuum bag, then vacuumize it.



Place the vacuum-packed plastic reel inside the pizza box.

Place 4 packaged pizza boxes inside 1 carton box and seal it. 1 carton box can pack 1000 modules.

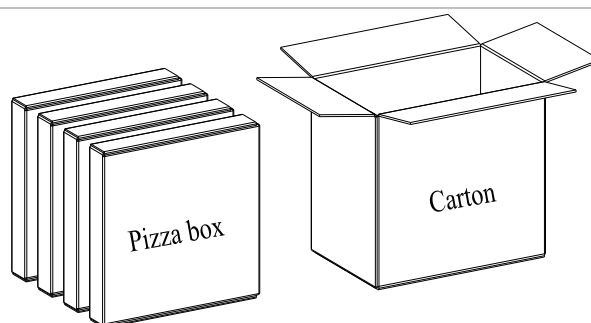


Figure 35: Packaging Process

9 Appendix References

Table 35: Reference Documents

Document Name
[1] Quectel_FCM362K_TE-B_User_Guide
[2] Quectel_RF_Layout_Application_Note
[3] Quectel_Module_SMT_Application_Note

Table 36: Terms and Abbreviations

Abbreviation	Description
ADC	Analog-to-Digital Converter
AMBA	Advanced Microcontroller Bus Architecture
AP	Access Point
APB	Advanced Peripheral Bus
BLE	Bluetooth Low Energy
BPSK	Binary Phase Shift Keying
CCK	Complementary Code Keying
CDM	Charged Device Model
DMA	Direct Memory Access
DPSK	Differential Phase Shift Keying
DTIM	Delivery Traffic Indication Message
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
I2S	Inter-IC Sound
HBM	Human Body Model
IEEE	Institute of Electrical and Electronics Engineers
LCC	Leadless Chip Carrier (package)
Mbps	Million Bits Per Second
MCU	Microcontroller Unit
OTA	Over The Air
PCB	Printed Circuit Board
PCM	Pulse Code Modulation
PWM	Pulse Width Modulation
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
RTC	Real Time Clock
RoHS	Restriction of Hazardous Substances
ROM	Read Only Memory
SCLK	Serial Clock
SD	Secure Digital
SDIO	Secure Digital Input/Output
SPI	Serial Peripheral Interface
SRAM	Static Random Access Memory

STA	Station
TBD	To Be Determined
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus
V_{IH}	High-level Input Voltage
V_{IL}	Low-level Input Voltage
V_{max}	Maximum Voltage
V_{min}	Minimum Voltage
V_{nom}	Normal Voltage Value
V_{OH}	High-level Output Voltage
V_{OL}	Low-level Output Voltage
VSWR	Voltage Standing Wave Ratio
Wi-Fi	Wireless Fidelity

Important Notice to OEM integrators

1. This module is limited to OEM installation ONLY.
2. This module is limited to installation in mobile or fixed applications, according to Part 2.1091(b).
3. The separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations
4. For FCC Part 15.31 (h) and (k): The host manufacturer is responsible for additional testing to verify compliance as a composite system. When testing the host device for compliance with Part 15 Subpart B, the host manufacturer is required to show compliance with Part 15 Subpart B while the transmitter module(s) are installed and operating. The modules should be transmitting and the evaluation should confirm that the module's intentional emissions are compliant (i.e. fundamental and out of band emissions). The host manufacturer must verify that there are no additional unintentional emissions other than what is permitted in Part 15 Subpart B or emissions are complaint with the transmitter(s) rule(s). The Grantee will provide guidance to the host manufacturer for Part 15 B requirements if needed.

Important Note

notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify to XXXX that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the USI, or the host manufacturer can take responsibility through the change in FCC ID (XMR2023FCM362K) procedure followed by a Class II permissive change application.

End Product Labeling

When the module is installed in the host device, the FCC/IC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text: "Contains FCC ID: XMR2023FCM362K"

"Contains IC: 10224A-2023FCM362K"

The FCC ID/IC ID can be used only when all FCC/IC compliance requirements are met.

Antenna Installation

- (1) The antenna must be installed such that 20 cm is maintained between the antenna and users,
- (2) The transmitter module may not be co-located with any other transmitter or antenna.
- (3) Only antennas of the same type and with equal or less gains as shown below may be used with this module. Other types of antennas and/or higher gain antennas may require additional authorization for operation.

Antenna type	2.4GHz band Peak Gain (dBi)	5.2GHz band Peak Gain (dBi)	5.3GHz band Peak Gain (dBi)	5.5GHz band Peak Gain (dBi)	5.8GHz band Peak Gain (dBi)
PCB	1.1	-1.5	-0.2	1	-2.4

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

Manual Information to the End User

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

Federal Communication Commission Interference Statement

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

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.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

List of applicable FCC rules

This module has been tested and found to comply with 15.247 and 15.407 requirements for Modular Approval.

The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, 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.

This device is intended only for OEM integrators under the following conditions: (For module device use)

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 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.

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

IC

Industry Canada Statement

This device complies with Industry Canada's licence-exempt RSSs. 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."

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 20 cm between the radiator & your body.

Déclaration d'exposition aux radiations:

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED 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.

RSS-247 Section 6.4 (5) (6) (for local area network devices, 5GHz)

The device could automatically discontinue transmission in case of absence of information to transmit, or operational failure. Note that this is not intended to prohibit transmission of control or signaling information or the use of repetitive codes where required by the technology.

The device for operation in the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;

The maximum antenna gain permitted for devices in the bands 5250–5350 MHz and 5470–5725 MHz shall comply with the e.i.r.p. limit; and

The maximum antenna gain permitted for devices in the band 5725–5825 MHz shall comply with the e.i.r.p. limits specified for point-to-point and non point-to-point operation as appropriate.

L'appareil peut interrompre automatiquement la transmission en cas d'absence d'informations à transmettre ou de panne opérationnelle. Notez que ceci n'est pas destiné à interdire la transmission d'informations de contrôle ou de signalisation ou l'utilisation de codes répétitifs lorsque cela est requis

par la technologie.

Le dispositif utilisé dans la bande 5150-5250 MHz est réservé à une utilisation en intérieur afin de réduire le risque de brouillage préjudiciable aux systèmes mobiles par satellite dans le même canal;

Le gain d'antenne maximal autorisé pour les dispositifs dans les bandes 5250-5350 MHz et 5470-5725 MHz doit être conforme à la norme e.r.p. limite; et

Le gain d'antenne maximal autorisé pour les appareils de la bande 5725-5825 MHz doit être conforme à la norme e.i.r.p. les limites spécifiées pour un fonctionnement point à point et non point à point, selon le cas.

This device is intended only for OEM integrators under the following conditions: (For module device use)

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 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.

Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif module)

- 1) L'antenne doit être installée de telle sorte qu'une distance de 20 cm est respectée entre l'antenne et les utilisateurs, et
- 2) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les 2 conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

IMPORTANT NOTE:

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

NOTE IMPORTANTE:

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du

Canada n'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains IC:10224A-2023FCM362K".

Plaque signalétique du produit final

Ce module émetteur est autorisé uniquement pour une utilisation dans un dispositif où l'antenne peut être installée de telle sorte qu'une distance de 20cm peut être maintenue entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 10224A-2023FCM362K".

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

Manuel d'information à l'utilisateur final

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.

Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.