FCM361R Hardware Design

Short-Range Module Series

Version: 1.0.0

Date: 2024-12-31

Status: Preliminary

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

Quectel Wireless Solutions Co., Ltd.
Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China
Tel: +86 21 5108 6236
Email: info@quectel.com

Or our local offices. For more information, please visit:
http://www.quectel.com/support/sales.htm.

For technical support, or to report documentation errors, please visit:
http://www.quectel.com/support/technical.htm.
Or email us at: support@quectel.com.

Legal Notices

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

Use and Disclosure Restrictions

License Agreements

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

Copyright

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

Trademarks

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

Third-Party Rights

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

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

Privacy Policy

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

Disclaimer

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

Safety Information

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

	Full attention must be paid to driving at all times in order to reduce the risk of an accident. Using a mobile while driving (even with a handsfree kit) causes distraction and can lead to an accident. Please comply with laws and regulations restricting the use of wireless devices while driving.
	Switch off the terminal or mobile before boarding an aircraft. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communication systems. If there is an Airplane Mode, it should be enabled prior to boarding an aircraft. Please consult the airline staff for more restrictions on the use of wireless devices on an aircraft.
	Wireless devices may cause interference on sensitive medical equipment, so please be aware of the restrictions on the use of wireless devices when in hospitals, clinics or other healthcare facilities.
	Terminals or mobiles operating over radio signal and cellular network cannot be guaranteed to connect in certain conditions, such as when the mobile bill is unpaid or the (U)SIM card is invalid. When emergency help is needed in such conditions, use emergency call if the device supports it. In order to make or receive a call, the terminal or mobile must be switched on in a service area with adequate cellular signal strength. In an emergency, the device with emergency call function cannot be used as the only contact method considering network connection cannot be guaranteed under all circumstances.
	The terminal or mobile contains a transceiver. When it is ON, it receives and transmits radio frequency signals. RF interference can occur if it is used close to TV sets, radios, computers or other electric equipment.
	In locations with explosive or potentially explosive atmospheres, obey all posted signs and turn off wireless devices such as mobile phone or other terminals. Areas with explosive or potentially explosive atmospheres include fueling areas, below decks on boats, fuel or chemical transfer or storage facilities, and areas where the air contains chemicals or particles such as grain, dust or metal powders.

About the Document

Revision History

Version	Date	Author	Description
-	2024-12-31	Joy DAI/Jay DONG	Creation of the document
1.0.0	2024-12-31	Joy DAI/Jay DONG	Preliminary

Contents

Table Index

Figure Index

1 Introduction

This document defines FCM361R and describes its hardware interfaces and air interface, 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
*	Unless otherwise specified, an asterisk (*) after a function, feature, interface, pin name, command, argument, and so on indicates that it is under development and currently not supported; and the asterisk (*) after a model indicates that the model sample is currently unavailable.

Hereby, Quectel Wireless Solutions Co., Ltd. declares that the radio equipment type FCM363R 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: XMR2025FCM361R
IC: 10224A- 2025FCM361R

2 Product Overview

FCM361R is a low-power and cost-effective MCU Wi-Fi and Bluetooth module compliant with IEEE 802.11b/g/n/ax and BLE 5.2 standard protocols. It supports interfaces such as UART, SPI*, I2C*, I2S*, PWM*, ADC* and SWD* for various applications.

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

- Embedded KM4 and KR4 dual-core processor with a single-core main frequency of up to 400 MHz
- 512 KB SRAM memory and 8/16 MB Flash
- Support for secondary development

Table 2: Basic Information

FCM361R	
Packaging type	LCC
Pin counts	47
Dimensions	(19.2 +0.3/-0.15) mm × (18 +0.3/-0.15) mm × (2.4 ±0.2) mm
Weight	Approx. 1.34 g

2.1. Key Features

Table 3: Key Features

Basic Information	
Protocols and Standard	- Wi-Fi Protocols: IEEE 802.11b/g/n/ax - Bluetooth protocol: BLE 5.2 - All hardware components are fully compliant with EU RoHS directive
Power Supply	**VBAT Power Supply:** 2.97–3.63 V - Typ.: 3.3 V
Temperature Ranges [1]	**Narrow-temperature Module** - Normal operating temperature: -40°C to +85°C - Storage temperature: -45°C to +95°C **Wide-temperature Module** - Operating temperature: -40°C to +105°C - Storage temperature: -40°C to +115°C
TE-B Kit	FCM361R-TE-B [2]
RF Antenna Interface	
Antenna Interface	1st generation RF coaxial connector 50 Ω characteristic impedance
Application Interface [3]	
Application Interfaces	UART, SPI*, I2C*, I2S*, PWM*, ADC*, SWD*

---

[1] Quectel supplies narrow-temperature and wide-temperature models. Within the operating temperature range, the module's indicators comply with IEEE and Bluetooth specification requirements.
[2] For more details about the TE-B, see **document [1]**.
[3] For more details about the interfaces, see **Chapter 3.4**.

3 Application Interfaces

3.1. Pin Assignment
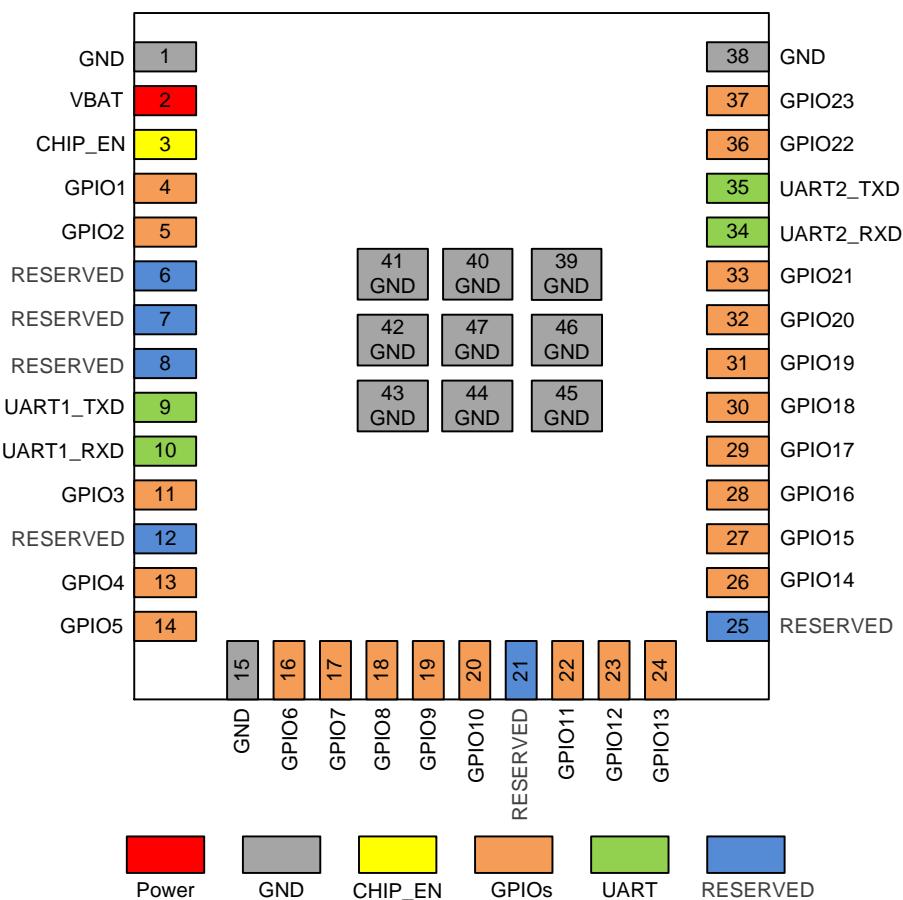
Figure 1: Pin Assignment (Top View)

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 provides 2 UARTs and 27 GPIO interfaces by default. In the case of multiplexing, it

---

supports interfaces including UART, SPI*, I2C*, I2S*, PWM*, ADC* and SWD*. For more details, see *Chapter 3.3* and *Chapter 3.4*.

3.2. Pin Definitions

Table 4: Parameter Definition

Parameter	Description
DI	Digital Input
DO	Digital Output
DIO	Digital Input/Output
PI	Power Input
Hi-Z	High Impedance

DC characteristics include voltage domain and rated current.

Table 5: Pin Description

Power Supply						
Pin Name	**Pin No.**	**I/O**	**Status After Reset**	**Description**	**DC Characteristics**	**Comment**
VBAT	2	PI	-	Main power supply for the module	Vmax = 3.63 V Vmin = 2.97 V Vnom = 3.3 V	It should be provided with sufficient current of at least 0.8 A.
GND	1, 15, 38–47					
Control Signal						
Pin Name	**Pin No.**	**I/O**	**Status After Reset**	**Description**	**DC Characteristics**	**Comment**
CHIP_EN	3	DI	-	Module enable	VBAT	Hardware enable. Internally pulled up to VBAT.

Active high.

UART Interfaces

Pin Name	Pin No.	I/O	Status After Reset	Description	DC Characteristics	Comment
UART1_RXD	10	DI	Hi-Z	UART1 receive	VBAT	
UART1_TXD	9	DO	Hi-Z	UART1 transmit		
UART2_RXD	34	DI	Hi-Z	UART2 receive		Test points must be reserved.
UART2_TXD	35	DO	Hi-Z	UART2 transmit		

GPIO Interfaces

Pin Name	Pin No.	I/O	Status After Reset	Description	DC Characteristics	Comment
GPIO1	4	DIO	Hi-Z	General-purpose input/output	VBAT	
GPIO2	5	DIO	Hi-Z	General-purpose input/output		
GPIO3	11	DIO	Hi-Z	General-purpose input/output		
GPIO4	13	DIO	Hi-Z	General-purpose input/output		
GPIO5	14	DIO	Hi-Z	General-purpose input/output		
GPIO6	16	DIO	Hi-Z	General-purpose input/output		
GPIO7	17	DIO	Hi-Z	General-purpose input/output		
GPIO8	18	DIO	Hi-Z	General-purpose input/output		
GPIO9	19	DIO	Hi-Z	General-purpose input/output		
GPIO10	20	DIO	Hi-Z	General-purpose input/output		
GPIO11	22	DIO	Hi-Z	General-purpose input/output		
GPIO12	23	DIO	Hi-Z	General-purpose input/output		

GPIO13	24	DIO	Hi-Z	General-purpose input/output	
GPIO14	26	DIO	Hi-Z	General-purpose input/output	
GPIO15	27	DIO	Hi-Z	General-purpose input/output	
GPIO16	28	DIO	Hi-Z	General-purpose input/output	
GPIO17	29	DIO	Hi-Z	General-purpose input/output	
GPIO18	30	DIO	Hi-Z	General-purpose input/output	
GPIO19	31	DIO	Hi-Z	General-purpose input/output	
GPIO20	32	DIO	Hi-Z	General-purpose input/output	
GPIO21	33	DIO	Hi-Z	General-purpose input/output	
GPIO22	36	DIO	Hi-Z	General-purpose input/output	
GPIO23	37	DIO	Hi-Z	General-purpose input/output	

RESERVED Pins

Pin Name	Pin No.	Comment
RESERVED	6–8, 12, 21, 25	Keep them unconnected.

3.3. GPIO Multiplexing

The module provides 2 UARTs and 23 GPIOs by default, and supports up to 27 GPIOs in the case of multiplexing. Pins are defined as follows:

Table 6: GPIO Multiplexing

Multiplexing Function	Multiplexing Function														
	GPIO1	GPIO2	GPIO3	GPIO4–GPIO6, GPIO12	GPIO7–GPIO11, GPIO13、GPIO17	GPIO14	GPIO15	GPIO16	GPIO18, GPIO19, GPIO21, GPIO22	GPIO20	GPIO23	UART1_TXD	UART1_RXD	UART2_RXD	UART2_TXD
ADC0	-	-	√	-	-	-	-	-	-	-	-	-	-	-	-
ADC1	-	-	-	-	-	-	-	-	-	-	-	-	√	-	-
ADC2	-	-	-	-	-	-	-	-	-	-	-	√	-	-	-
ADC3	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-
ADC4	-	√	-	-	-	-	-	-	-	-	-	-	-	-	-
ADC5	√	-	-	-	√	-	-	-	-	-	-	-	-	-	-
SWCLK	-	√	-	-	-	-	-	-	-	-	-	-	-	-	-
SWDIO	√	-	-	-	-	-	-	-	-	-	-	-	-	-	-
UART_LOG_RXD	-	-	-	-	-	-	-	-	-	-	-	-	-	√	-
UART_LOG_TXD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	√
UART0_TXD	√	√	√	√	√	-	√	-	√	√	√	√	√	-	-
UART0_RXD	√	√	√	√	√	-	√	-	√	√	√	√	√	-	-
UART0_CTS	√	√	√	√	√	-	√	-	√	√	√	√	√	-	-
UART0_RTS	√	√	√	√	√	-	√	-	√	√	√	√	√	-	-
UART1_TXD	√	√	√	√	√	√	√	-	√	√	√	√	√	-	-
UART1_RXD	√	√	√	√	√	-	√	√	√	√	√	√	√	-	-
UART2_TXD	√	√	√	√	√	-	√	-	√	√	√	√	√	-	-
UART2_RXD	√	√	√	√	√	-	√	-	√	√	√	√	√	-	-

UART3_TXD	√	√	√	√	√	-	√	-	√	√	√	√	√	-	-
UART3_RXD	√	√	√	√	√	-	√	-	√	√	√	√	√	-	-
UART3_CTS	√	√	√	√	√	-	√	-	√	√	√	√	√	-	-
UART3_RTS	√	√	√	√	√	-	√	-	√	√	√	√	√	-	-
SPI0_CLK	√	√	-	√	√	-	-	-	√	√	√	-	-	-	-
SPI0_MISO	√	√	-	√	√	-	-	-	√	√	√	-	-	-	-
SPI0_MOSI	√	√	-	√	√	-	-	-	√	√	√	-	-	-	-
SPI0_CS	√	√	-	√	√	-	-	-	√	√	√	-	-	-	-
SPI1_CLK	-	-	-	-	√	-	-	-	-	-	-	-	-	-	-
SPI1_MISO	-	-	-	-	√	-	-	-	-	-	-	-	-	-	-
SPI1_MOSI	-	-	-	-	√	-	-	-	-	-	-	-	-	-	-
SPI1_CS	-	-	-	-	√	-	-	-	-	-	-	-	-	-	-
I2S0_MCLK	√	√	√	√	√	-	√	√	-	-	-	√	√	-	-
I2S0_BCLK	√	√	√	√	√	-	√	-	-	-	-	√	√	-	-
I2S0_WS	√	√	√	√	√	-	√	-	-	-	-	√	√	-	-
I2S0_DIO0	√	√	√	√	√	-	√	-	-	-	-	√	√	-	-
I2S0_DIO1	√	√	√	√	√	-	√	-	-	-	-	√	√	-	-
I2S0_DIO2	√	√	√	√	√	-	√	-	-	-	-	√	√	-	-
I2S0_DIO3	√	√	√	√	√	-	√	-	-	-	-	√	√	-	-
I2S1_MCLK	-	-	-	-	√	√	-	-	√	√	√	-	-	-	-
I2S1_BCLK	-	-	-	-	√	-	-	-	√	√	√	-	-	-	-
I2S1_WS	-	-	-	-	√	-	-	-	√	√	√	-	-	-	-
I2S1_DIO0	-	-	-	-	√	-	-	-	√	√	√	-	-	-	-
I2S1_DIO1	-	-	-	-	√	-	-	-	√	√	√	-	-	-	-
I2S1_DIO2	-	-	-	-	√	-	-	-	√	√	√	-	-	-	-
I2S1_DIO3	-	-	-	-	√	-	-	-	√	√	√	-	-	-	-

I2C0_SCL	√	√	√	√	√	-	√	-	√	√	√	√	√	-	-
I2C0_SDA	√	√	√	√	√	-	√	-	√	√	√	√	√	-	-
I2C1_SCL	√	√	√	√	√	-	√	-	√	√	√	√	√	-	-
I2C1_SDA	√	√	√	√	√	-	√	-	√	√	√	√	√	-	-
PWM0	√	√	√	√	√	-	√	-	-	-	-	√	√	-	-
PWM1	√	√	√	√	√	-	√	-	-	-	-	√	√	-	-
PWM2	√	√	√	√	√	-	√	-	-	-	-	√	√	-	-
PWM3	√	√	√	√	√	-	√	-	-	-	-	√	√	-	-
PWM4	-	-	-	-	√	-	-	-	√	√	√	-	-	-	-
PWM5	-	-	-	-	√	-	-	-	√	√	√	-	-	-	-
PWM6	-	-	-	-	√	-	-	-	√	√	√	-	-	-	-
PWM7	-	-	-	-	√	-	-	-	√	√	√	-	-	-	-

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 Definitions

3.4.1. UART Interfaces

The module supports two UART interfaces by default. In the case of multiplexing, the module supports up to 5 UART interfaces. See *Table 6* for details. The pin definitions of main and debug UART interfaces are shown in the table below.

Table 7: Pin Description of UART interfaces

Pin Name	Pin No.	I/O	Description	Comment
UART1_RXD	10	DI	UART1 receive	
UART1_TXD	9	DO	UART1 transmit	
UART2_RXD	34	DI	UART2 receive	Test points must be reserved.
UART2_TXD	35	DO	UART2 transmit	

UART1 is mainly used for communication with MCU, supporting AT command application and data transmission. The baud rate can be configured, with a default of 115200 bps.
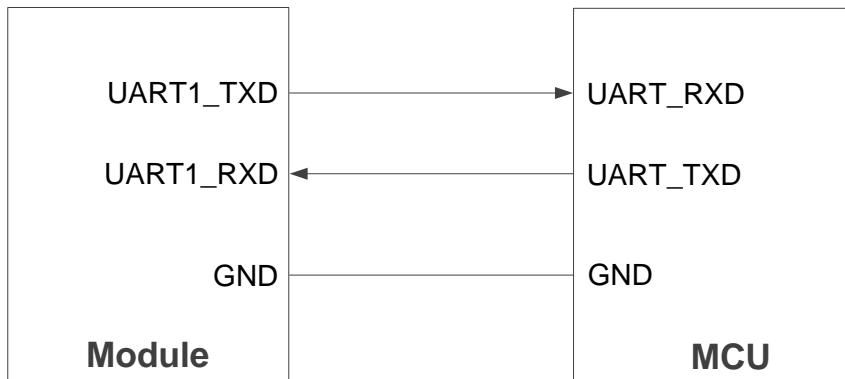

Figure 2: UART1 Connection Diagram

UART2 is mainly used for system debugging and testing and firmware local burning and upgrading. It supports chip manufacturer and some AT application debugging command input, as well as log printing output.
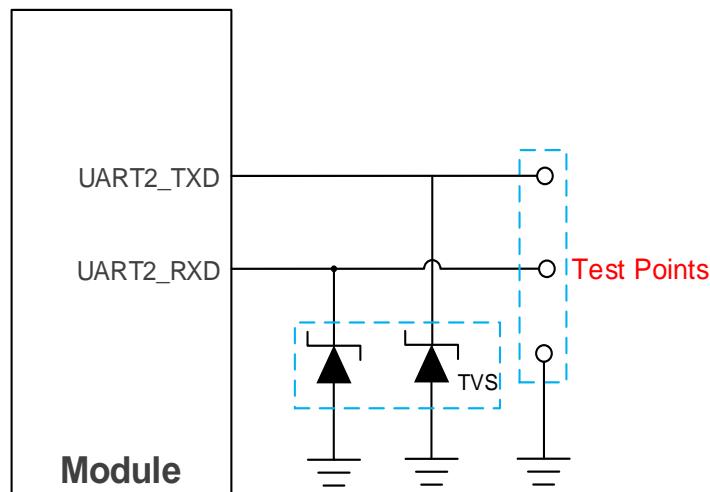
Figure 3: UART2 Connection Diagram

3.4.2. SPI Interfaces*

In the case of multiplexing, the module integrates 2 SPI interfaces (SPI0 and SPI1) that can operate in master mode with maximum clock frequency of 50 MHz or slave mode with maximum clock frequency of 25 MHz.

Table 8: Pin Description of SPI Interfaces

Pin Name	Pin No.	Multiplexing Function	I/O	Description	Comment
GPIO4	13	SPI0_CLK	DIO	SPI0 clock	In master mode, it is an output signal; In slave mode, it is an input signal. Other SPI configurations, see **Table 6**.
GPIO5	14	SPI0_MISO	DI	SPI0 master-in slave-out	Other SPI configurations, see **Table 6**.
GPIO6	16	SPI0_MOSI	DO	SPI0 master-out slave-in	
GPIO12	23	SPI0_CS	DIO	SPI0 chip select	In master mode, it is an input signal; In slave mode, it is an output signal. Other SPI configurations, see **Table 6**
GPIO7	17	SPI1_CLK	DIO	SPI1 clock	
GPIO8	18	SPI1_MISO	DI	SPI1 master-in slave-out	Other SPI configurations, see **Table 6**
GPIO9	19	SPI1_MOSI	DO	SPI1 master-out slave-in	
GPIO10	20	SPI1_CS	DIO	SPI1 chip select	In master mode, it is an input signal; In slave mode, it is an output signal.

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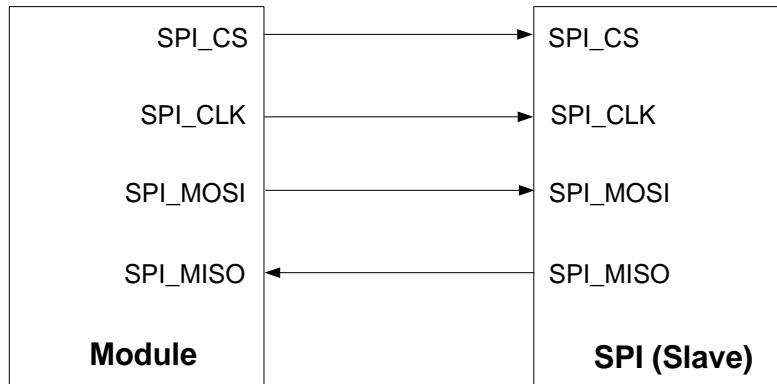

**Figure 4: SPI Interface Connection (Master Mode)**
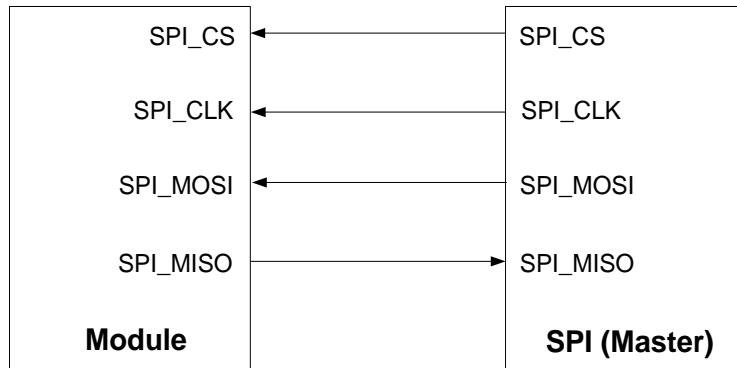
Figure 5: SPI Interface Connection (Slave Mode)

3.4.3. I2C Interfaces*

In the case of multiplexing, the module supports up to 2 I2C interfaces which can operate in master or slave mode. The I2C interface supports:

- Master or Slave I2C operation
- 7-bit or 10-bit addressing mode
- Multi-master ability including bus arbitration scheme
- Transmit and receive FIFOs with depth of 16 and width of 12-bit
- Clock stretch in master/slave mode
- Programmable SDA hold time and SCL duty cycle
- Interrupt mode

Table 9: Pin Description of I2C Interfaces

Pin Name	Pin No.	Multiplexing Function	I/O	Description	Comment
GPIO20	32	I2C0_SDA	OD	I2C0 serial data	
GPIO21	33	I2C0_SCL	OD	I2C0 serial clock	Other I2C configurations, see *Table 6*.
GPIO23	37	I2C1_SDA	OD	I2C1 serial data	
GPIO22	36	I2C1_SCL	OD	I2C1 serial clock	

3.4.4.   I2S Interfaces*

In the case of multiplexing, the module provides two I2S interfaces supporting master and slave modes. with sampling rate up to 384 kHz.

Table 10: Pin Description of I2S Interfaces

Pin Name	Pin No.	Multiplexing Function	I/O	Description	Comment
GPIO16	28	I2S0_MCLK	DO	I2S0 master clock	
GPIO7	17	I2S0_BCLK	DO	I2S0 bit clock	
GPIO8	18	I2S0_WS	DO	I2S0 word select	
GPIO1	4	I2S0_DIO0	DIO	I2S0 data input/output	
GPIO2	5	I2S0_DIO1	DIO	I2S0 data input/output	
GPIO3	11	I2S0_DIO2	DIO	I2S0 data input/output	
GPIO4	13	I2S0_DIO3	DIO	I2S0 data input/output	Other I2S configurations, see *Table 6*.
GPIO14	26	I2S1_MCLK	DO	I2S1 master clock	
GPIO9	19	I2S1_BCLK	DO	I2S1 bit clock	
GPIO10	20	I2S1_WS	DO	I2S1 word select	
GPIO11	22	I2S1_DIO0	DIO	I2S1 data in/out	
GPIO13	24	I2S1_DIO1	DIO	I2S1 data in/out	
GPIO17	29	I2S1_DIO2	DIO	I2S1 data in/out	

| GPIO18 | 30 | I2S1_DIO3 | DIO | I2S1 data in/out |

3.4.5. PWM Interfaces*

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

Table 11: Pin Description of PWM Interfaces

Pin Name	Pin No.	Multiplexing Function	I/O	Description	Comment
GPIO4	13	PWM0	DO	PWM0 output	
GPIO6	16	PWM1	DO	PWM1 output	
GPIO5	14	PWM2	DO	PWM2 output	
GPIO12	23	PWM3	DO	PWM3 output	Other PWM configurations, see **Table 6**.
GPIO7	17	PWM4	DO	PWM4 output	
GPIO8	18	PWM5	DO	PWM5 output	
GPIO9	19	PWM6	DO	PWM6 output	
GPIO10	20	PWM7	DO	PWM7 output	

3.4.6. ADC Interfaces*

In the case of multiplexing, the module supports up to 6 12-bit PWM interfaces, voltage input range is 0–3.3 V. Route the ADC signal traces with ground surrounded to improve the ADC voltage's accuracy. The pin definitions are shown in the table below.

Table 12: Pin Description of ADC Interfaces

Pin Name	Pin No.	Multiplexing Function	I/O	Description	Comment
GPIO3	11	ADC0	AI	General-purpose ADC interface	
UART1_RXD	10	ADC1	AI	General-purpose ADC interface	Other ADC configurations, see **Table 6**.
UART1_TXD	9	ADC2	AI	General-purpose ADC interface	

GPIO15	27	ADC3	AI	General-purpose ADC interface
GPIO2	5	ADC4	AI	General-purpose ADC interface
GPIO1	4	ADC5	AI	General-purpose ADC interface

Table 13: ADC Features

Parameter	Min.	Typ.	Max.	Unit
ADC Input Voltage Range	0	-	3.3	V
ADC Resolution	-	12	-	bit

3.4.7. SWD Interface*

In the case of multiplexing, the module supports one SWD interface supporting online program burning.

Table 14: Pin Description of SWD Interface

Pin Name	Pin No.	Multiplexing Function	I/O	Description
GPIO1	4	SWDIO	DIO	Serial data input/output
GPIO2	5	SWCLK	DI	Serial clock input

The following figure shows the connection of SWD interface:
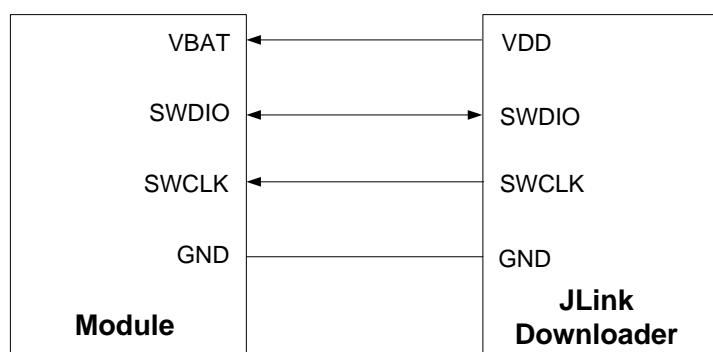
Figure 6: SWD Connection

4 Operating Characteristics

4.1. Power Supply

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	Main power supply for the module	2.97	3.3	3.63	V
GND	1, 15, 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 at least 0.8 A to ensure sufficient current. For better power supply performance, it is recommended to parallel a 22 µF decoupling capacitor, and two filter capacitors (1 µF 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:
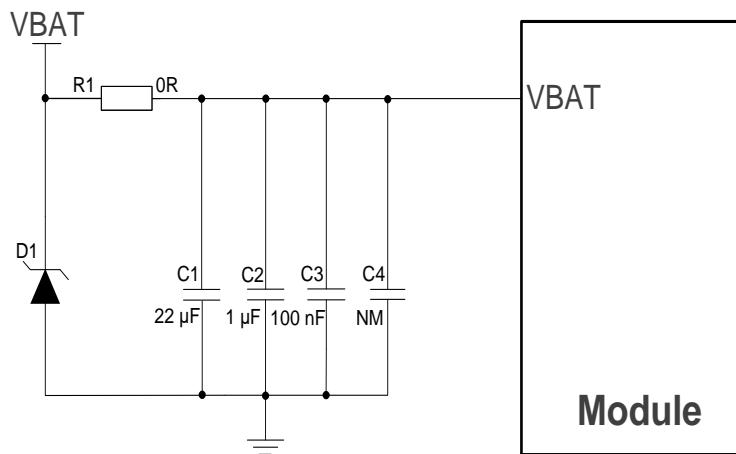
**Figure 7: VBAT Reference Circuit**

4.2. Turn On

The module can automatically start up after the VBAT is powered up and the power-up time is less than 1 ms. The power-up time for CHIP_EN is the same as that of VBAT due to the shared power source.

Table 16: Pin Description of CHIP_EN

Pin Name	Pin No.	I/O	Description	Comment
CHIP_EN	3	DI	Module enable	Hardware enable Internally pulled up to VBAT. Active high.

The turn-on timing is shown below:
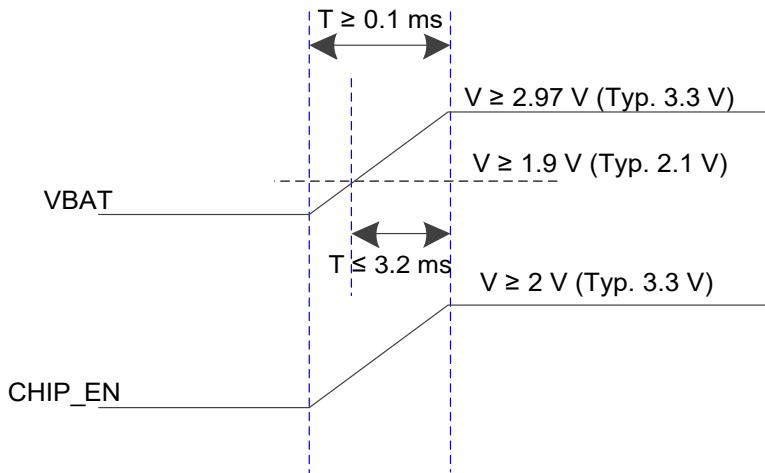
Figure 8: Turn-on Timing

4.3. Reset

Pull down the CHIP_EN pin voltage to less than 0.8 V and maintaining it for at least T1 + T2 ms can reset the module. T1 with time range of 0–16 ms is for avoiding false triggering. It can be set by software register.

Table 17: Pin Description of CHIP_EN

Pin Name	Pin No.	I/O	Description	Comment
CHIP_EN	3	DI	Module reset	Hardware reset. Active low.

The module reset timing is shown in the following figure:
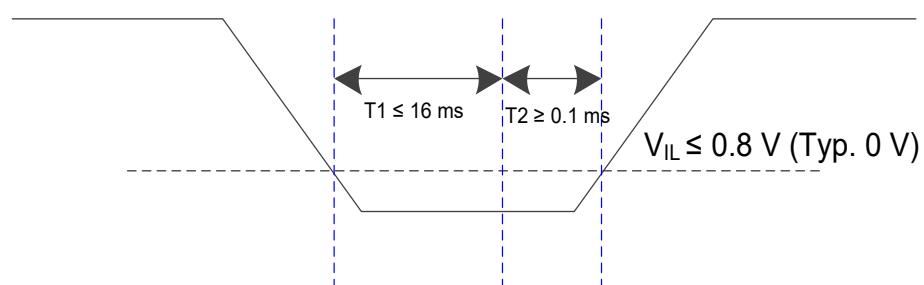
Figure 9: Reset Timing

The hardware reset reference circuit is shown in the following figure. It is recommended to use an open drain driver circuit to control CHIP_EN pin.
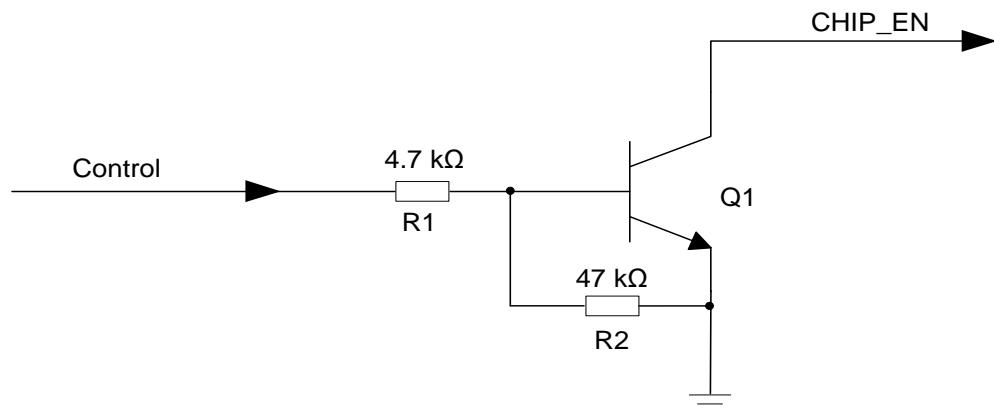

Figure 10: Reference Circuit of CHIP_EN by Using Driving Circuit

Another way to control the CHIP_EN pin is directly through a button switch. When pressing the button, static electricity may be generated, so a TVS should be placed near the button for ESD protection. The reference circuit is as follows:
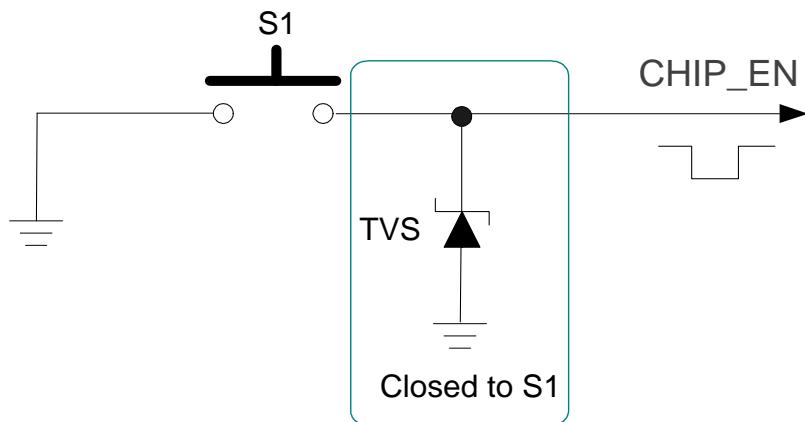

Figure 11: Reference Circuit of CHIP_EN by Using Button

4.4. Download Mode

After powering up the non-empty module, the firmware can be downloaded directly through debug UART (UART2).

After powering up the empty module, it is necessary to pull down the CHIP_EN and UART2_TXD low for

at least T1 + T2 ms, then release them in turn, and the module will enter download mode and download firmware through debug UART. T1 with time range of 0–16 ms is for avoiding false triggering. It can be set by software register.

The timing of the empty module entering download mode is shown in the following figure:
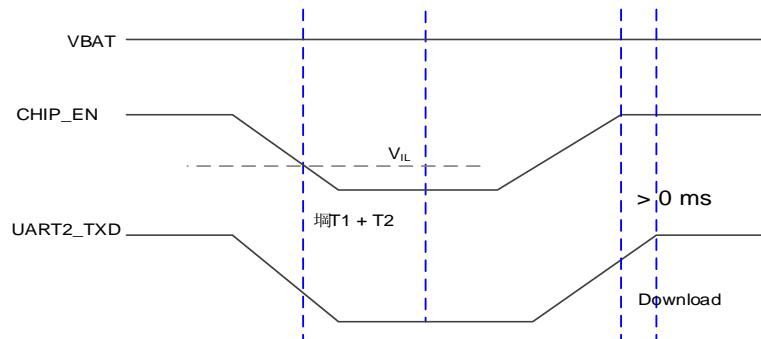
Figure 12: Timing for Empty Module Entering Download Mode

5 RF Performances

5.1. Wi-Fi Performances

Table 18: Wi-Fi Performances

Operating Frequency
2.4 GHz: 2.400–2.4835 GHz

Modulation
DBPSK, DQPSK, CCK, BPSK, QPSK, 16QAM, 64QAM, 256QAM

Encryption Mode
AES, DES, SHA

Operating Mode
● AP ● STA

Transmission Data Rate
● 802.11b: 1 Mbps, 2 Mbps, 5.5 Mbps, 11 Mbps ● 802.11g: 6 Mbps, 9 Mbps, 12 Mbps, 18 Mbps, 24 Mbps, 36 Mbps, 48 Mbps, 54 Mbps ● 802.11n: HT20 (MCS 0–MCS 7) ● 802.11ax: HE20 (MCS 0–MCS 9)

Condition (VBAT = 3.3 V; Temp. 25 °C)		EVM	Typ.; Unit: dBm; Tolerance: ±2 dB	
			Transmitting Power	**Receiver Sensitivity**
2.4 GHz	802.11b @ 1 Mbps	≤ 35 %	15	-98
	802.11b @ 11 Mbps		15	-91
	802.11g @ 6 Mbps	≤ -5 dB	17	-95
	802.11g @ 54 Mbps	≤ -25 dB	17	-78

802.11n, HT20 @ MCS 0	≤ -5 dB	17	-95
802.11n, HT20 @ MCS 7	≤ -27 dB	17	-76.5
802.11ax, HE20 @ MCS 0	≤ -5 dB	17	-95
802.11ax, HE20 @ MCS 9	≤ -32 dB	16	-70.5

5.1 Bluetooth Performances

Table 19: Bluetooth Performances

Operating Frequency		
2.400–2.4835 GHz		
Modulation		
GFSK		
Operating Mode		
BLE		
Condition (VBAT = 3.3 V; Temp. 25 °C)	**Typ.; Unit: dBm; Tolerance: ±2 dB**	
	Transmitting Power	**Receiver Sensitivity**
BLE (1 Mbps)	7 dBm	-98
BLE (2 Mbps)	7 dBm	-95
BLE (S=2)	7 dBm	-97
BLE (S=8)	7 dBm	-104

5.2 Antenna Interface

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.

5.3 Antenna Interface

5.3.1 RF Coaxial Connector

5.3.1.1   Antenna Connector Specifications

The mechanical dimensions of the receptacle supported by the module are as follows.
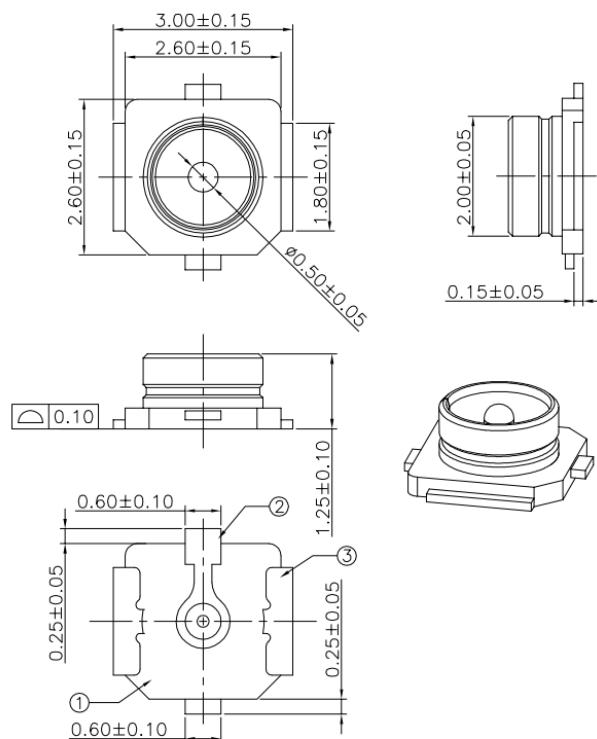
Figure 13: Dimensions of the Receptacle (Unit: mm)

Table 20: Major Specifications of the RF Connector

Item	Specification
Nominal Frequency Range	DC to 6 GHz
Nominal Impedance	50 Ω
Temperature Rating	-40 °C to +105 °C

Voltage Standing Wave Ratio (VSWR)	Meet the requirements of: Max. 1.3 (DC–3 GHz) Max. 1.45 (3–6 GHz)

5.3.1.2 Antenna Connector Installation

The two types of mated plugs that will meet a maximum height of 2.0 mm using a Ø 0.81 mm coaxial cable or a maximum height of 2.2 mm utilizing a Ø 1.13 mm coaxial cable are recommended to be matched with the receptacle mounted on the module.

The following figure shows the dimensions of mated plugs using Ø 0.81 mm coaxial cables.
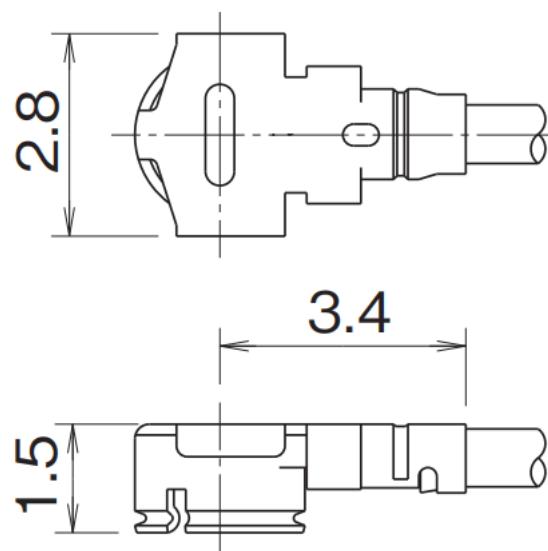
Figure 14: Dimensions of Mated Plugs (Ø 0.81 Coaxial Cables) (Unit: mm)

The following figure illustrates the connection between the receptacle on the module and the mated plug using a Ø 0.81 mm coaxial cable.
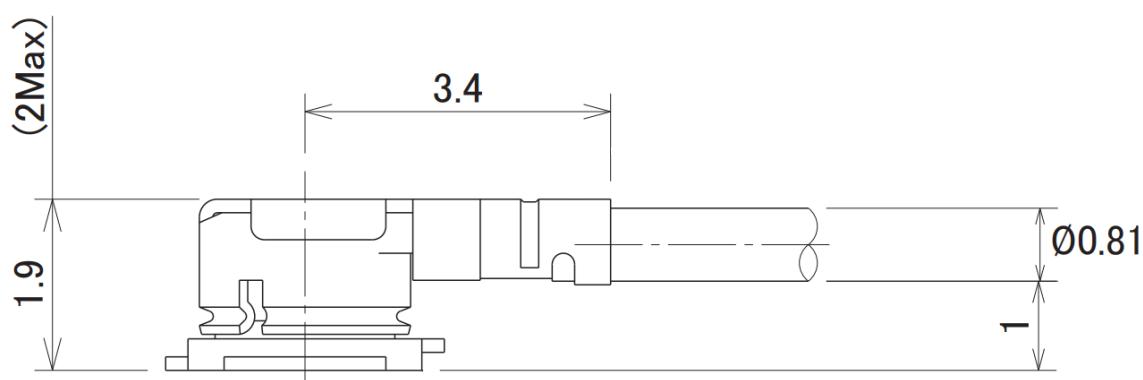
Figure 15: Space Factor of Mated Connectors (Ø 0.81 mm Coaxial Cables) (Unit: mm)

The following figure illustrates the connection between the receptacle mounted on the module and the mated plug using a Ø 1.13 mm coaxial cable.
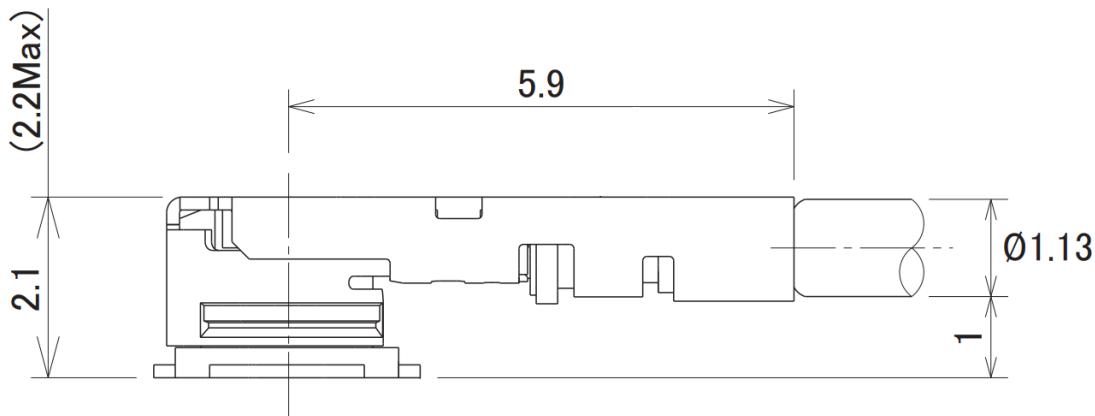
Figure 16: Space Factor of Mated Connectors (Ø 1.13 mm Coaxial Cables) (Unit: mm)

5.3.1.3   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.

6 Electrical Characteristics & Reliability

6.1 Absolute Maximum Ratings

Absolute maximum ratings for power supply and voltage on digital pins of the module are listed in the following table.

Table 21: Absolute Maximum Ratings (Unit: V)

Parameter	Min.	Max.
VBAT	-0.3	3.63
V_{IO} (Voltage at Digital Pins)	-0.3	3.63

6.2 Power Supply Ratings

Table 22: 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.	2.97	3.3	3.63

6.3 Power Consumption

6.3.1 Wi-Fi Power Consumption [4]

Table 23: Wi-Fi Power Consumption in Non-signaling Mode (Unit: mA)

Condition (VBAT = 3.3 V; Temp. 25 °C)			I_{VBAT} (Typ.)
2.4 GHz	802.11b	Tx 1 Mbps @ 15 dBm	280.5
		Tx 11 Mbps @ 15 dBm	266.4
	802.11g	Tx 6 Mbps @ 17 dBm	303.7
		Tx 54 Mbps @ 17 dBm	238.1
	802.11n	Tx HT20 MCS 0 @ 17 dBm	301.5
		Tx HT20 MCS 7 @ 17 dBm	229.2
	802.11ax	Tx HE20 MCS 0 @ 17 dBm	296.4
		Tx HE20 MCS 9 @ 16 dBm	209.5

NOTE

The above power consumption data is the typical value 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.

6.3.2 Bluetooth Power Consumption [5]

Table 24: Bluetooth Power Consumption in Non-signaling Mode (Unit: mA)

Condition (VBAT = 3.3 V; Temp. 25 °C)	I_{VBAT} (Typ.)
BLE (1 Mbps) @ Tx 7 dBm	112.5
BLE (2 Mbps) @ Tx 7 dBm	72.8
BLE (S=2) @ Tx 7 dBm	92

---

[4] The Bluetooth function is disabled when the Wi-Fi power consumption is tested.
[5] The Wi-Fi function is disabled when the Bluetooth power consumption is tested.

BLE (S=8) @ Tx 7 dBm	124

NOTE

The above power consumption data is the typical value 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	2.0	-
V_{IL}	Low-level input voltage	-0.3	0.8
V_{OH}	High-level output voltage	$0.85 \times V_{IO}$	-
V_{OL}	Low-level output voltage	-	$0.15 \times V_{IO}$

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)	±2	*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
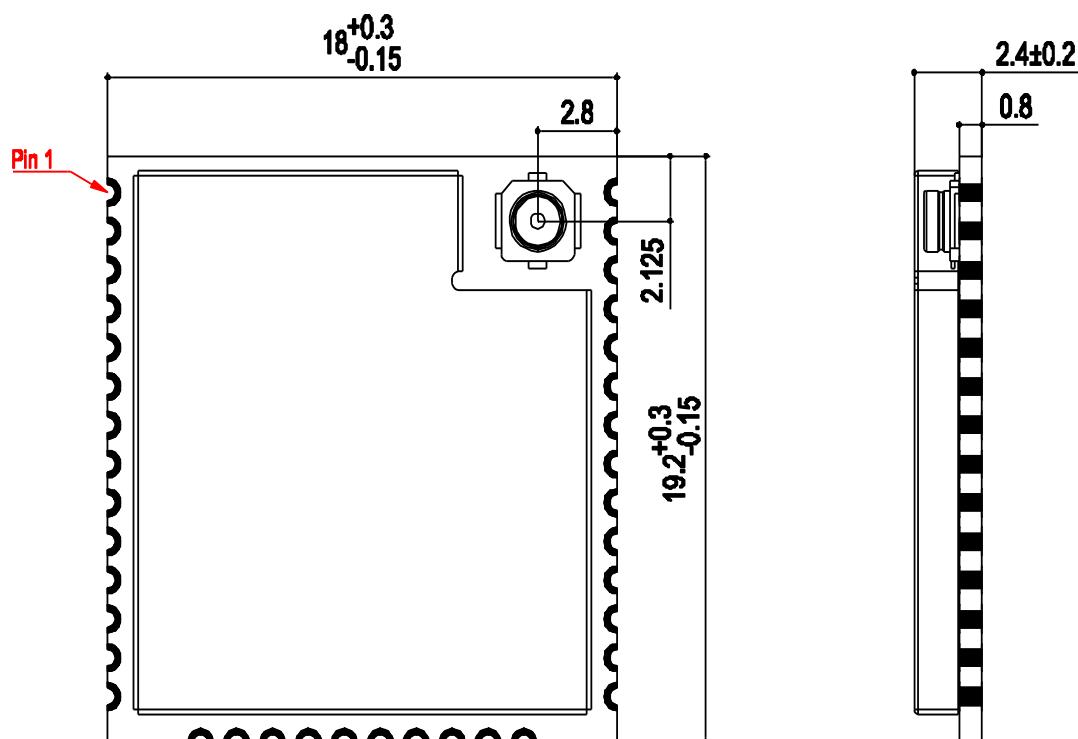

Figure 17: Module Top and Side Dimensions
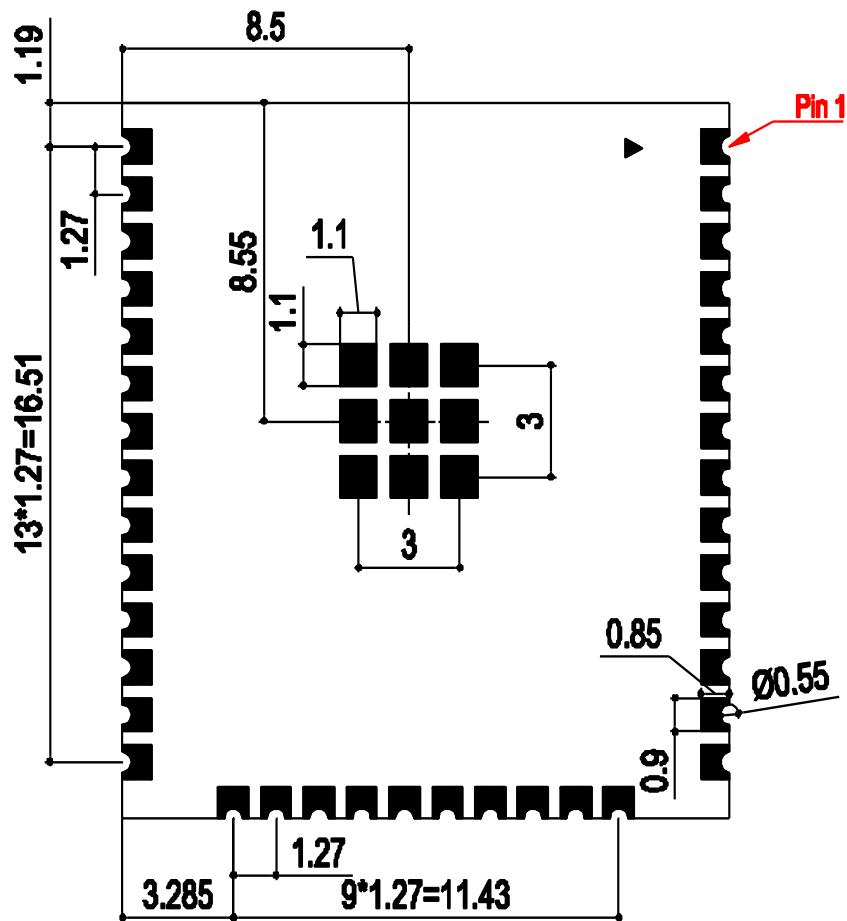
Figure 18: Module Bottom Dimensions

> **NOTE**
>
> The module's coplanarity standard: ≤ 0.13 mm.

7.2 Recommended Footprint
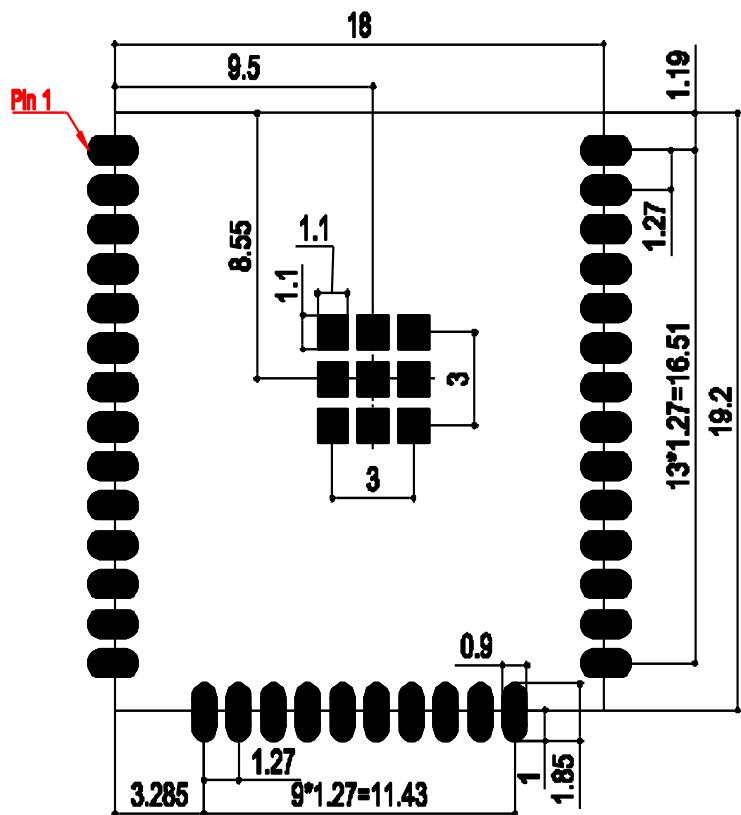
Figure 19: Recommended Footprint

> **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
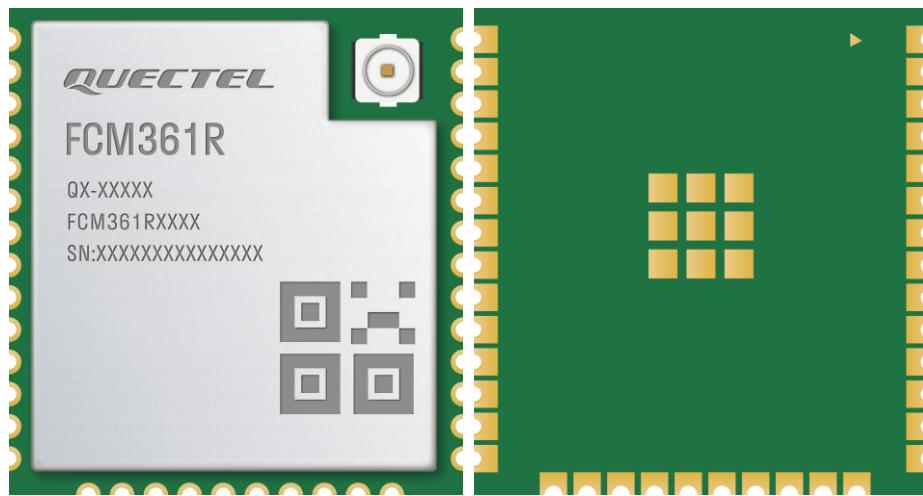
Figure 20: Module Top and Bottom Views

NOTE

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

---

8 Storage, Manufacturing & Packaging

8.1 Storage Conditions

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

1. Recommended Storage Condition: the temperature should be 23 ±5 °C and the relative humidity should be 35–60 %.

2. Shelf life (in a vacuum-sealed packaging): 12 months in Recommended Storage Condition.

3. Floor life: 168 hours [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*. And do not unpack the modules in large quantities until they are ready for soldering.

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 [2]**.

The recommended peak reflow temperature should be 235–246 ⁰C, with 246 ⁰C 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.
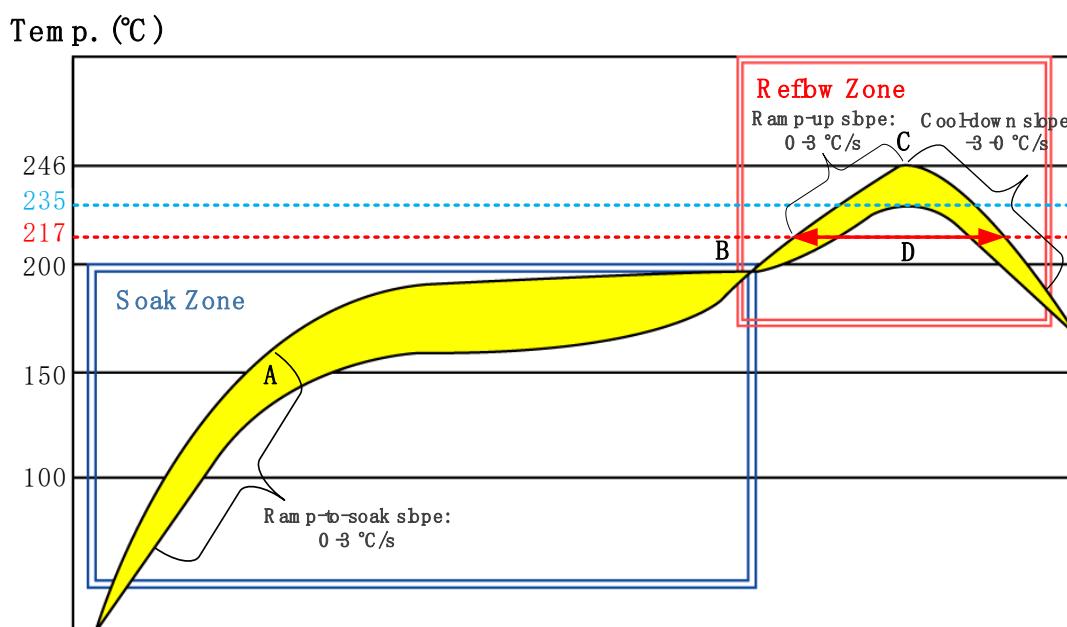

Figure 21: Recommended Reflow Soldering Thermal Profile

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 the solder joints. Both the hottest and coldest spots of solder joints on the PCB should meet the above requirements.
2. During manufacturing and soldering, or any other processes that may contact the module directly, NEVER wipe the module's shielding can with organic solvents, such as acetone, ethyl alcohol, isopropyl alcohol, trichloroethylene, 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. 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 [3]*.

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:
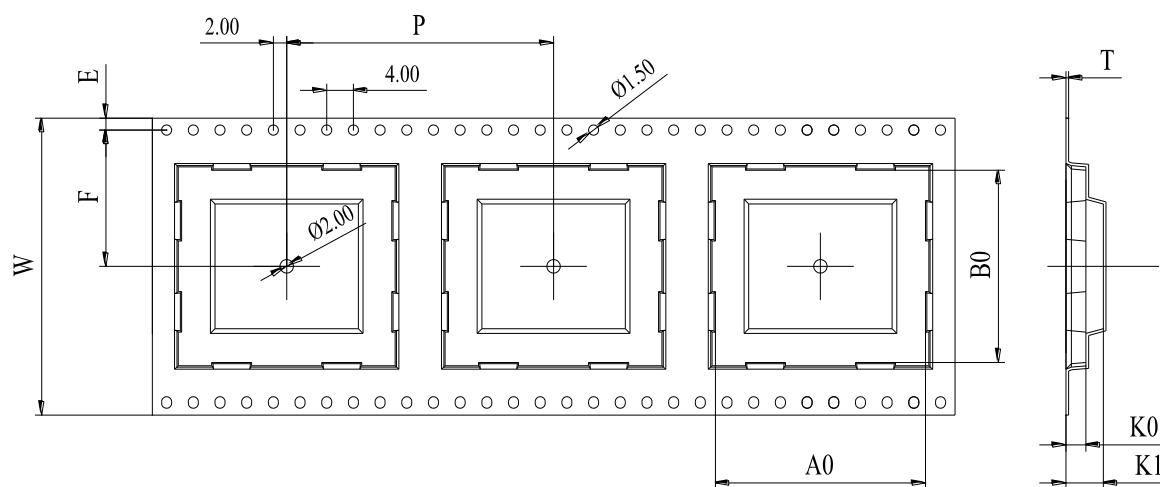
Figure 22: Carrier Tape Dimension Drawing (Unit: mm)

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

W	P	T	A0	B0	K0	K1	F	E
44	24	0.4	18.4	19.6	2.9	3.3	20.2	1.75

8.3.2 Plastic Reel

Plastic reel dimensions are illustrated in the following figure and table:
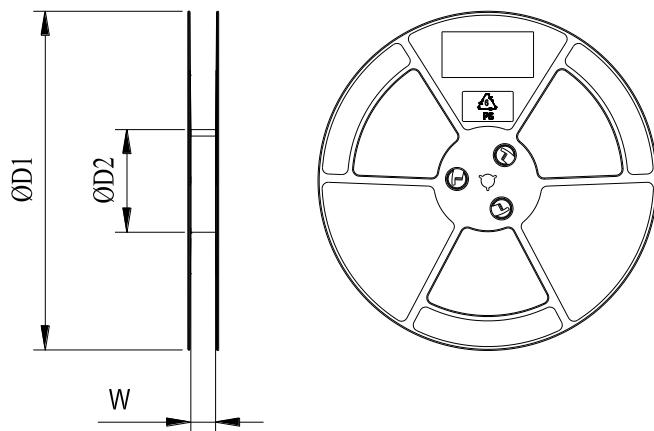
Figure 23: Plastic Reel Dimension Drawing

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

| øD1	øD2	W
380	100	44.5

8.3.3 Mounting Direction
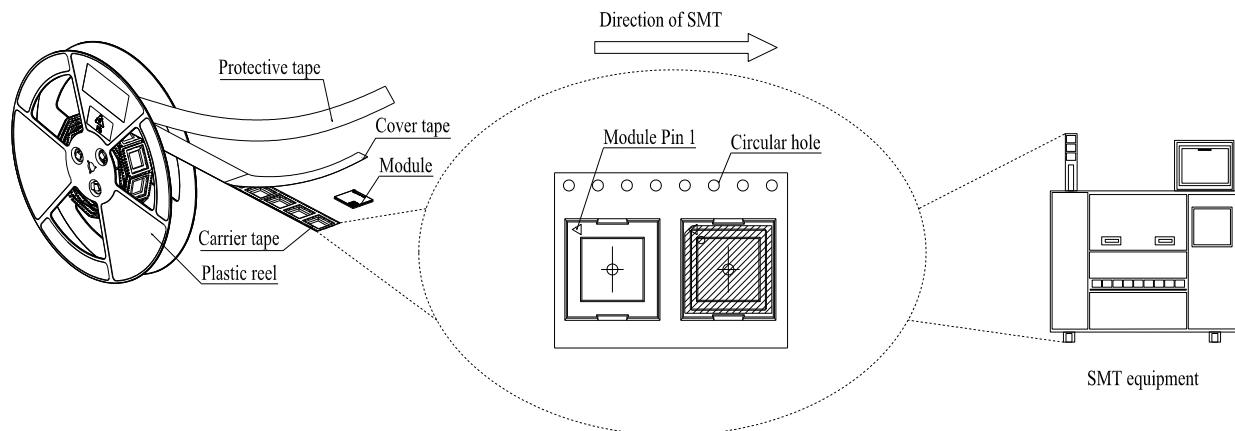
Figure 24: Mounting Direction

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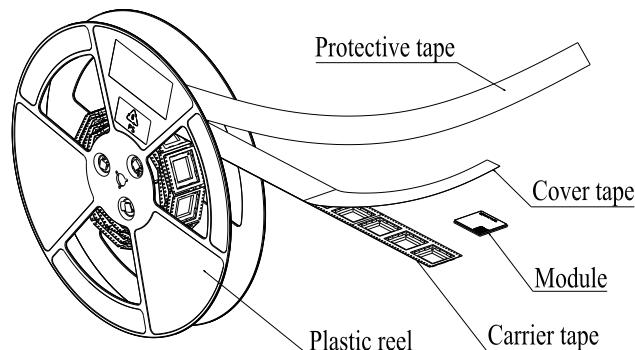
Place the modules onto the carrier tape cavity and cover them securely with cover tape. Wind the heat-sealed carrier tape onto a plastic reel and apply a protective tape for additional protection. 1 plastic reel can pack 1000 modules.

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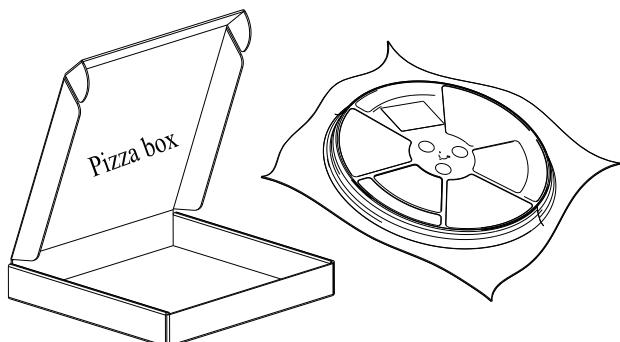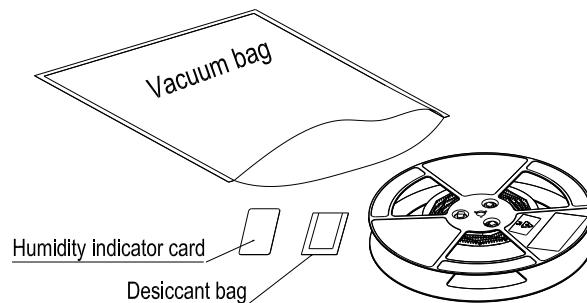
Place the vacuum-packed plastic reel into a pizza box.

Place the 4 packaged pizza boxes into 1 carton and seal it. 1 carton can pack 4000 modules.
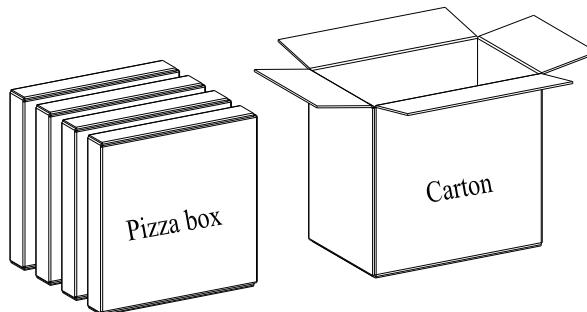
Figure 25: Packaging Process

9 **Appendix References**

Table 30: Related Documents

Document Name
[1] Quectel_FCM361R_TE-B_User_Guide
[2] Quectel_Module_Stencil_Design_Requirements
[3] 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
CDM	Charged Device Model
DAC	Digital-to-Analog Converter
DBPSK	Differential Binary Phase Shift Keying
DES	Data Encryption Standard
DQPSK	Differential Quadrature Phase Shift Keying
DSP	
ESD	Electrostatic Discharge

EVM	Error Vector Magnitude
FIFO	First Input First Output
GFSK	Gauss frequency Shift Keying
GND	Ground
GPIO	General-Purpose Input/Output
HBM	Human Body Mode
HE	High Efficiency
HT	High Throughput
I/O	Input/Output
I2C	Inter-Integrated Circuit
I2S	Inter-IC Sound
IEEE	Institute of Electrical and Electronics Engineers
LCC	Leadless Chip Carrier (package)
Mbps	Million Bits Per Second
MCS	Modulation and Coding Scheme
MCU	Microcontroller Unit
MSL	Moisture Sensitivity Levels
PCB	Printed Circuit Board
PWM	Pulse Width Modulation
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RoHS	Restriction of Hazardous Substances
SHA	Secure Hash Algorithm
SPI	Serial Peripheral Interface
SRAM	Static Random Access Memory

SMT	Surface Mounted Technology
STA	Station
SWD	Serial Wire Debug
TVS	Transient Voltage Suppressor
Tx	Transmit
UART	Universal Asynchronous Receiver/Transmitter
(U)SIM	(Universal) Subscriber Identity Module
V_{IH}	High-level Input Voltage
V_{IL}	Low-level Input Voltage
Vmax	Maximum Voltage
Vmin	Minimum Voltage
Vnom	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 -3.9dBi antenna. The host manufacturer installing this module into their product must ensure that the final compos it 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 show 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 hosts printed board micro strip trace antenna etc.

2.6 RF exposure considerations

The module must be installed in the host equipment such that at least 20cm is maintained between the antenna and users" body; and if RF exposure statement or module layout is changed, then the host product manufacturer 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: External Antenna

Gain: 0.3dBi

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: XMR2025FCM361R" 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, e.t.c 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 circuity), 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: XMR2025FCM361R**"

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 show 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.

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-2025FCM361R".

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.

Étiquetage du produit final

Ce module émetteur n'est autorisé que pour une utilisation dans un dispositif où l'antenne peut être installée de telle sorte que 20 cm puissent être maintenus entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans une zone visible avec la mention suivante: "contient IC:10224A-2025FCM361R".