FC80A User Manual

Wi-Fi&Bluetooth Module Series

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Safety Information

The following safety precautions must be observed during all phases of operation, such as usage, service or repair of any cellular terminal or mobile incorporating the module. Manufacturers of the cellular 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 cellular 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.
	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. When emergent help is needed in such conditions, use emergency call if the device supports it. In order to make or receive a call, the cellular 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 cellular 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 cellular terminals. Areas with explosive or potentially explosive atmospheres include fuelling 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
-	2021-04-15	Elinor WANG/ Lucas HUANG	Creation of the document
1.0.0	2021-04-15	Elinor WANG/ Lucas HUANG	Preliminary
1.0.1	2021-08-13	Elinor WANG/ Lucas HUANG	Preliminary: 1. Updated the data in Chapter 4. 2. Updated the packaging information in Chapter 6.3.
1.0.2	2021-11-25	Elinor WANG	Preliminary: 1. Updated the data in Chapter 4.5 -4.7 2. Updated the packaging information in Chapter 6.3.
1.0.3	2021-12-31	Macky Xu	Preliminary: 1. Updated the data in Chapter 4.6

Contents

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1 Introduction

This document defines the FC80A and describes its air interfaces and hardware interfaces which are connected with your application.

This document can help you quickly understand module interface specifications, electrical and mechanical details, as well as other related information of the module. Associated with application notes and user guides, you can use FC80A to design and set up applications easily.

1.1. Special Mark

Table 1: Special Mark

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

2 Product Overview

2.1. General Description

FC80A is a Wi-Fi and Bluetooth module with low power consumption. It is a single-die WLAN (Wireless Local Area Network) and Bluetooth combo solution supporting IEEE 802.11a/b/g/n/ac 2.4/5 GHz WLAN standards and Bluetooth 5.0 standard, which enables seamless integration of WLAN and Bluetooth low energy technologies.

With a low-power SDIO 3.0 interface for WLAN, a UART and a PCM interface for Bluetooth. FC80A can provide WLAN and Bluetooth functions.

2.2. Key Features

The following table describes the key features of FC80A.

Table 2: Key Features

Features	Details
Power Supply	● **VBAT power supply:** Supply voltage range: 3.2–4.5 V Typical supply voltage: 3.3 V ● **VDDIO power supply:** Supply voltage range: 1.7–3.6 V Typical supply voltage: 1.8/3.3 V
Operating Frequency	● 2.4 GHz WLAN: 2.400–2.4835 GHz ● 5 GHz WLAN: 5.15–5.85 GHz ● Bluetooth: 2.402–2.480 GHz
Transmission Data Rates	● 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 (MCS0-7), HT40 (MCS0-7) ● 802.11ac: VHT20 (MCS0-8), VHT40 (MCS0-9), VHT80 (MCS0-9)

Transmitting Power	**2.4 GHz:** ● 802.11b/11 Mbps：18.0 ±2.5 dBm ● 802.11g/54 Mbps：16.5 ±2.5 dBm ● 802.11n/HT20 MCS7：15.5 ±2.5 dBm **5 GHz:** ● 802.11a/54 Mbps：12 ±2.5 dBm ● 802.11n/HT20 MCS7：12 ±2.5 dBm ● 802.11n/HT40 MCS7：11 ±2.5 dBm ● 802.11ac/VHT20 MCS8：11 ±2.5 dBm ● 802.11ac/VHT40 MCS9：10 ±2.5 dBm ● 802.11ac/VHT80 MCS9：10 ±2.5 dBm
Operation Mode	AP, STA
Modulation	CCK, BPSK, QPSK, 16QAM, 64QAM, 256QAM,
WLAN Application Interface	SDIO 3.0
Bluetooth Application Interface	UART and PCM
RF Antenna Interfaces	● ANT_WIFI0/BT ● ANT_WIFI1 ● ANT_BT（dedicated BT antenna) ● 50 Ω impedance
Physical Characteristics	● Size: (13 ±0.15) mm × (15 ±0.15) mm × (2.2 ±0.2) mm ● Package: LCC ● Weight: TBD
Temperature Range	● Operating temperature range: -30 °C to +75 °C ● Storage temperature range: -40 °C to +85 °C
RoHS	All hardware components are fully compliant with EU RoHS directive

2.3. Functional Diagram

The following figure shows a block diagram of FC80A.

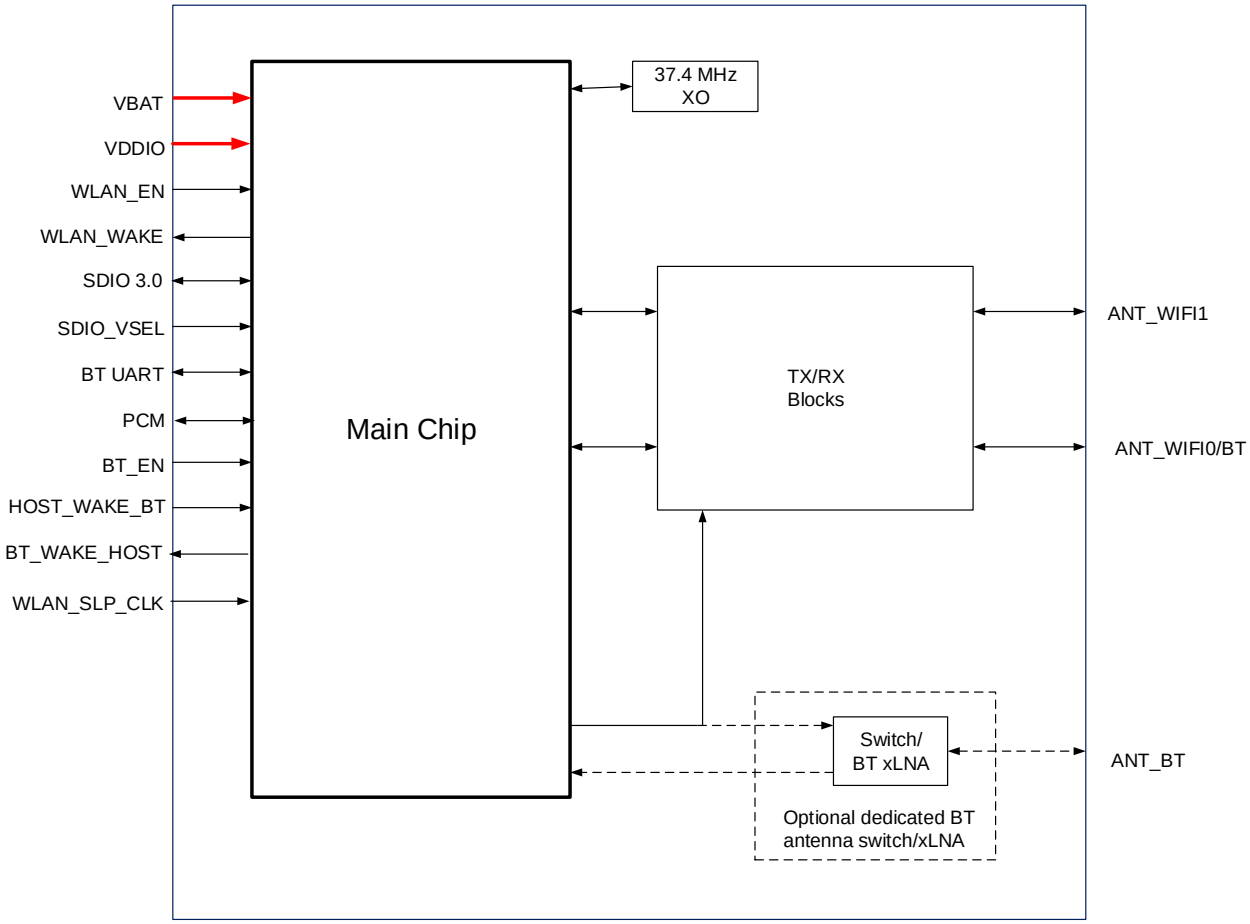


Figure 1: Functional Diagram of FC80A

NOTE

Dedicated Bluetooth antenna (ANT_BT) is optional according to the order code of the module.

2.4. Evaluation Board

To help customers to develop applications with FC80A, Quectel supplies an evaluation board (UMTS&LTE EVB), an RS-232 to USB converter cable, a USB data cable, a power adapter, antennas and other peripherals to control or test the module. For details, see ***document [1]***.

3 Application Interfaces

FC80A is equipped with 50 LCC pins. The subsequent chapters will provide a detailed introduction to the following interfaces and pins of the module:

- Power supply
- WLAN Application Interface
- Bluetooth Application Interface
- RF antenna interfaces
- Other interfaces

3.1. Pin Assignment

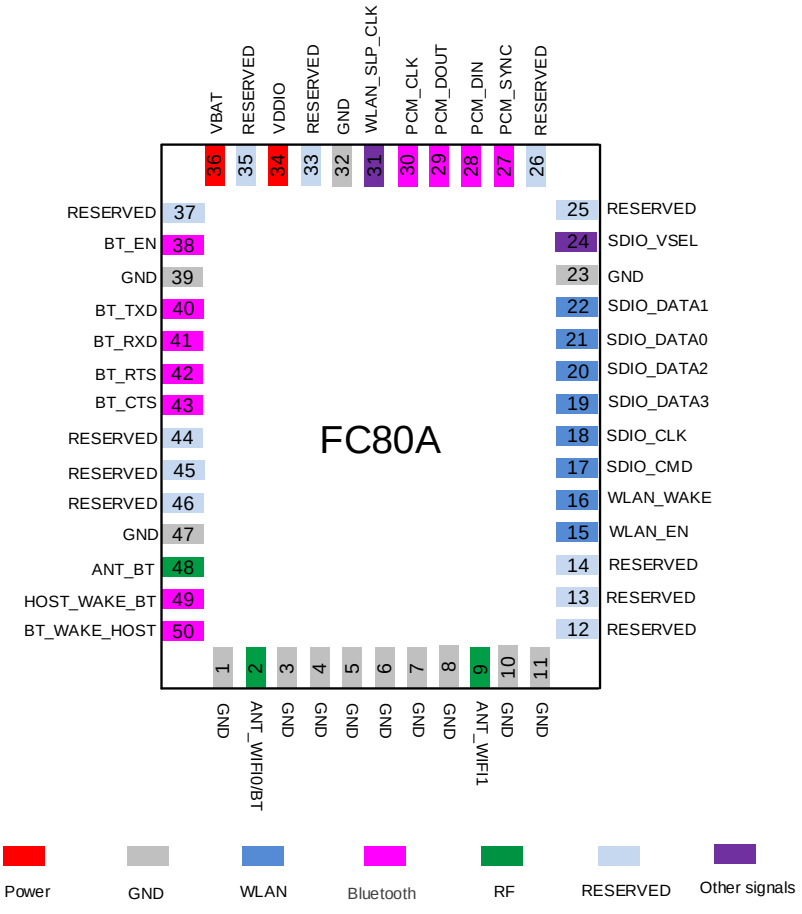


Figure 2: Pin Assignment (Top View)

NOTE

Keep all RESERVED pins open.

3.2. Pin Description

The following tables show the pin description of FC80A.

Table 3: I/O Parameters Definition

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

Table 4: Pin Description

Power Supply				
Pin Name	**Pin No.**	**I/O**	**Description**	**Comment**
VBAT	36	PI	Power supply for the module	It must be provided with sufficient current up to 1.2 A.
VDDIO	34	PI	Power supply for module's I/O pins	VDDIO support two voltage domains 1.8 V or 3.3 V.
GND	1, 3–8, 10–11, 23, 32, 39, 47			
WLAN Application Interface				

Pin Name	Pin No.	I/O	Description	Comment
WLAN_EN	15	DI	WLAN function enable control	Active high.
WLAN_WAKE	16	DO	Wake up the host by WLAN	VDDIO power domain
SDIO_CMD	17	DIO	SDIO command	
SDIO_CLK	18	DI	SDIO clock	
SDIO_DATA3	19	DIO	SDIO data bit 3	
SDIO_DATA2	20	DIO	SDIO data bit 2	
SDIO_DATA0	21	DIO	SDIO data bit 0	
SDIO_DATA1	22	DIO	SDIO data bit 1	
Bluetooth Application Interface				
Pin Name	**Pin No.**	**I/O**	**Description**	**Comment**
PCM_SYNC*	27	DI	PCM data frame sync	VDDIO power domain
PCM_DIN*	28	DI	PCM data input	
PCM_DOUT*	29	DO	PCM data output	
PCM_CLK*	30	DI	PCM clock	
BT_EN	38	DI	Bluetooth enable control	Active high. VDDIO power domain
BT_TXD	40	DO	Bluetooth UART transmit	VDDIO power domain
BT_RXD	41	DI	Bluetooth UART receive	
BT_RTS	42	DO	Bluetooth UART request to send	
BT_CTS	43	DI	Bluetooth UART clear to send	

HOST_WAKE_BT*	49	DI	Host wakes up Bluetooth	
BT_WAKE_HOST*	50	DO	Bluetooth wakes up host	
Other Interfaces				
Pin Name	**Pin No.**	**I/O**	**Description**	**Comment**
WLAN_SLP_CLK	31	DI	External 32.768 kHz low power clock input	VDDIO power domain
SDIO_VSEL	24	DI	SDIO voltage select: pull down: 3.3 V pull up:1.8 V	Pull up to VDDIO internally through a 200 kΩ resistor, high level by default. VDDIO power domain
RF Antenna Interfaces				
Pin Name	**Pin No.**	**I/O**	**Description**	**Comment**
ANT_WIFI0/BT	2	AIO	Wi-Fi0/Bluetooth antenna interface	50 Ω impedance.
ANT_WIFI1	9	AIO	Wi-Fi1 antenna interface	
ANT_BT	48	AIO	Dedicated Bluetooth antenna interface	50 Ω impedance. Please reserve this pin.
RESERVED Interfaces				
Pin Name	**Pin No.**	**I/O**	**Description**	**Comment**
RESERVED	12–14, 25–26, 33, 35, 37, 44–46			Keep these pins open.

3.3. Power Supply

The following table shows the power supply pins and ground pins of FC80A.

Table 5: Definition of Power Supply and GND Pins

Pin Name	Pin No.	Description	Min.	Typ.	Max.	Unit
VBAT	36	Power supply for the module	3.2	3.3	4.5	V
VDDIO	34	Power supply for module's I/O pins	1.7	1.8/3.3	3.6	V
GND	1, 3–8, 10–11, 23, 32, 39, 47					

FC80A is powered by VBAT and VDDIO, and it is recommended to use a power supply chip with maximum output current more than 1.2 A. The following figure shows the recommended turn up timing of FC80A.

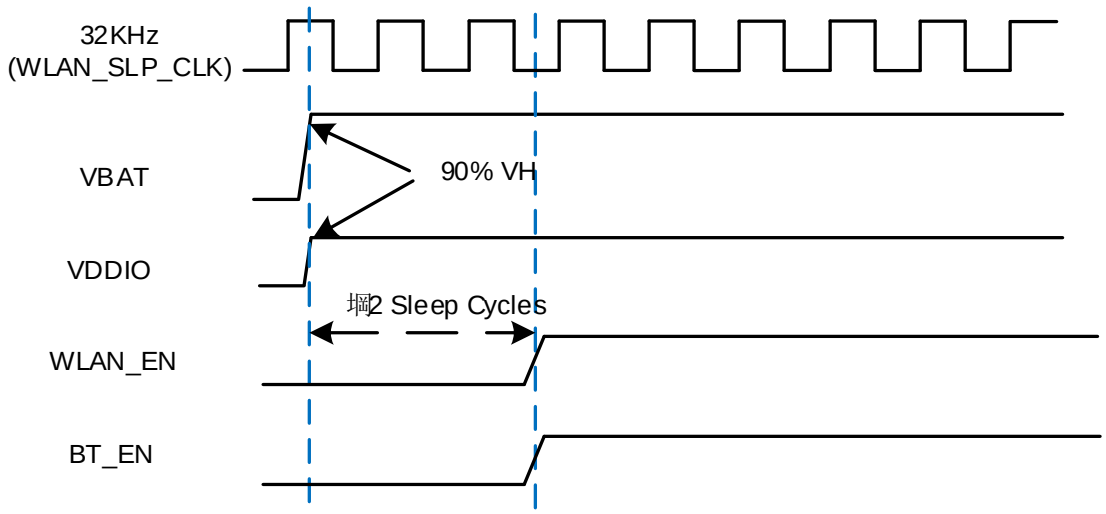


Figure 3: Turn Up Timing

NOTE

1. VBAT and VDDIO should not rise 10–90 % faster than 40 μs.
2. VBAT should be up before or at the same time as VDDIO. VDDIO should not be present first or be held high before VBAT is high.

3.4. WLAN Application Interface

The following figure shows the WLAN application interface connection between FC80A and the host.

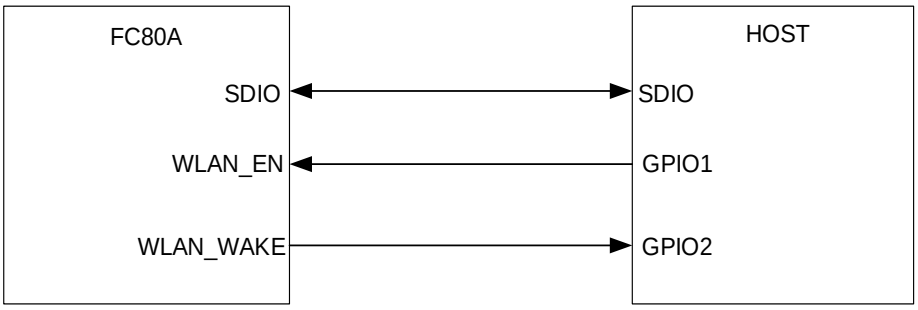


Figure 4: WLAN Application Interface Connection

3.4.1. WLAN_EN

WLAN_EN is used to control the WLAN function of the module. WLAN function will be enabled when WLAN_EN is at high level.

Table 6: Pin Definition of WLAN_EN

Pin Name	Pin No.	I/O	Description	Comment
WLAN_EN	15	DI	WLAN function enable control	Active high.

3.4.2. WLAN_WAKE

WLAN_WAKE is used to wake up the host.

Table 7: Pin Definition of WLAN_WAKE

Pin Name	Pin No.	I/O	Description	Comment
WLAN_WAKE	16	DO	Wake up the host by WLAN	

3.4.3. SDIO Interface

The following table shows the pin definition of SDIO interface.

Table 8: Pin Definition of SDIO Interface

Pin Name	Pin No.	I/O	Description	Comment
SDIO_CMD	17	DIO	SDIO command	VDDIO power domain
SDIO_CLK	18	DI	SDIO clock	
SDIO_DATA3	19	DIO	SDIO data bit 3	
SDIO_DATA2	20	DIO	SDIO data bit 2	
SDIO_DATA0	21	DIO	SDIO data bit 0	
SDIO_DATA1	22	DIO	SDIO data bit 1	

The following figure shows the SDIO interface connection between FC80A and host.

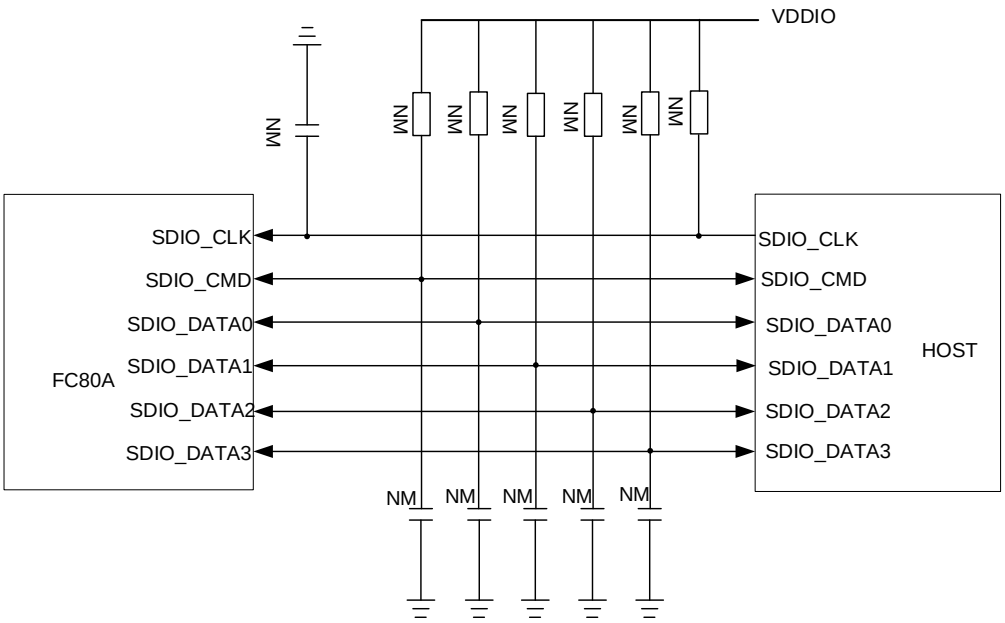


Figure 5: SDIO Interface Connection

To ensure that the interface design complies with the SDIO 3.0 specification, the following principles are recommended to be adopted:

- Route the SDIO differential traces in inner-layer of the PCB and the impedance is controlled at 50 Ω ±10 %;
- SDIO signals need to be keep away from sensitive signals, such as radio frequency, analog signals, clocks, and DC-DC noise signals;
- The distance between SDIO signals and other signals must be greater than 2 times the trace width, and the busload capacitance must be less than 15 pF.
- SDIO signal traces need to be treated with equal length (the distance between the traces is less than 1 mm). According to the transmission rate, the trace length has the following requirements:
  1) As for SDR104 mode, the recommended bus length is less than 50 mm, the internal trace length of the module is 11.36 mm.
  2) As for other modes, such as DDR50, SDR104, etc., the recommended bus length is less than 150 mm.

3.5. Bluetooth Application Interface

The following figure shows the block diagram of Bluetooth application interface connection between FC80A and a host.

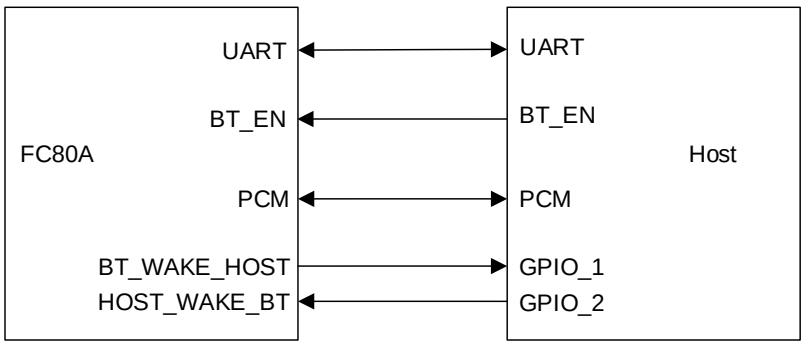


Figure 6: Block Diagram of Bluetooth Application Interface Connection

NOTE

GPIO_1 connected to BT_WAKE_HOST must be interruptible.

3.5.1. BT_EN

BT_EN is used to control the Bluetooth function of FC80A. Bluetooth function will be enabled when BT_EN is at high level.

Table 9: Pin Definition of BT_EN

Pin Name	Pin No.	I/O	Description	Comment
BT_EN	38	DI	Bluetooth enable control	Active high.

3.5.2. UART Interface

FC80A supports an HCI UART as defined in *Bluetooth Core Specification Version 5.0*. The UART supports hardware flow control, and it is used for data transmission with host. It supports up to 4.0 Mbps baud rates.

The following table shows the pin definition of UART interface.

Table 10: Pin Definition of UART Interface

Pin Name	Pin No.	I/O	Description	Comment
BT_TXD	40	DO	Bluetooth UART transmit	VDDIO power domain
BT_RXD	41	DI	Bluetooth UART receive	
BT_RTS	42	DO	Bluetooth UART request to send	
BT_CTS	43	DI	Bluetooth UART clear to send	

The voltage range of the Bluetooth UART interface of FC80A is determined by VDDIO. It is necessary to pay attention to whether the voltage range of host and FC80A Bluetooth UART interface is consistent. If necessary, voltage-level translator shall be added.

The following figure shows a reference design for UART interface connection between FC80A and host.

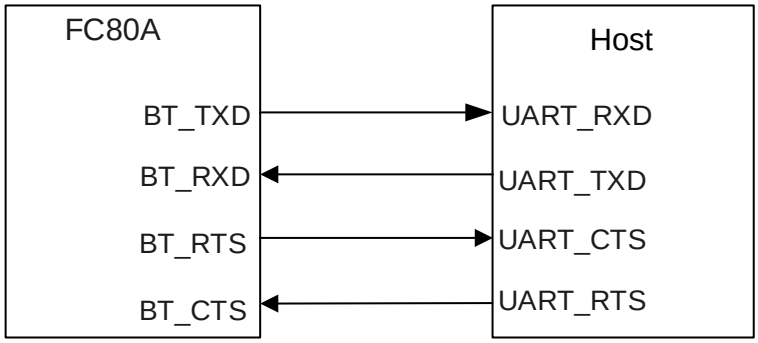


Figure 7: Reference Design for UART Interface Connection

3.5.3. BT_WAKE_HOST* and HOST_WAKE_BT*

Table 11: Pin Definition of BT_WAKEUP_HOST and HOST_WAKEUP_BT

Pin Name	Pin No.	I/O	Description	Comment
HOST_WAKE_BT	49	DI	Host wakes up Bluetooth	VDDIO power domain
BT_WAKE_HOST	50	DO	Bluetooth wakes up host	

3.5.4. PCM Interface*

PCM interface is used for audio over Bluetooth-supported phone. The following table shows the pin definition of PCM interface.

Table 12: Pin Definition of PCM Interface

Pin Name	Pin No.	I/O	Description	Comment
PCM_SYNC	27	DI	PCM data frame sync	VDDIO power domain
PCM_DIN	28	DI	PCM data input	
PCM_DOUT	29	DO	PCM data output	
PCM_CLK	30	DI	PCM clock	

The following figure shows the PCM interface connection between FC80A and the host.

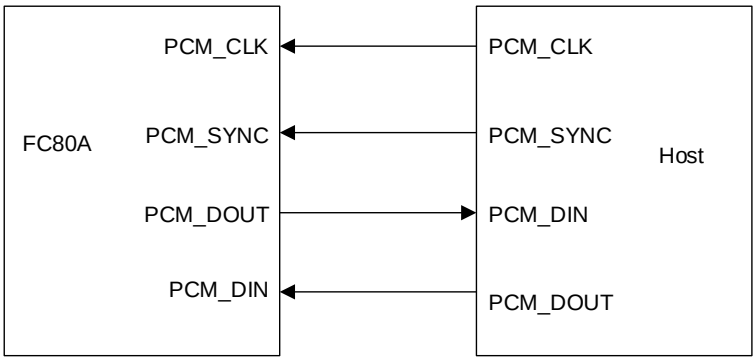


Figure 8: PCM Interface Connection

3.6. Other Interfaces

3.6.1. WLAN_SLP_CLK

The 32.768 kHz sleep clock is used in low power modes, such as power saving mode and sleep mode. It serves as a timer to determine when to wake up FC80A to receive signals in various power saving schemes, and to maintain basic logic operations when the module is in sleep mode.

Table 13: Pin Definition of WLAN_SLP_CLK Interface

Pin Name	Pin No.	I/O	Description	Comment
WLAN_SLP_CLK	31	DI	External 32.768 kHz low power clock input	

3.6.2. SDIO_VSEL

SDIO voltage domain can be selected through SDIO_VSEL. The following table shows the pin definition of SDIO_VSEL.

Table 14: Pin Definition of SDIO_VSEL

Pin Name	Pin No.	I/O	Description	Comment
SDIO_VSEL	24	DI	SDIO voltage select pull down: 3.3 V pull up: 1.8 V	1.8 V or 3.3 V power domain. Pull up to VDDIO internally through a 200 kΩ resistor, high level by default.

3.7. RF Antenna Interfaces

This information will be included in the future version of this document.

Table 15: Pin Definition of RF Antenna Interfaces

Pin Name	Pin No.	I/O	Description	Comment
ANT_WIFI0/BT	2	AIO	Wi-Fi0/Bluetooth antenna interface	50 Ω impedance.
ANT_WIFI1	9	AIO	Wi-Fi1 antenna interface	50 Ω impedance.
ANT_BT	48	AIO	Dedicated Bluetooth antenna interface	50 Ω impedance. Please reserve this pin.

4 Reliability, Radio and Electrical Characteristics

4.1. Electrical Characteristics

The following table shows the absolute maximum ratings.

Table 16: Absolute Maximum Ratings

Parameter	Min.	Max.	Unit
VBAT	-0.5	6.0	V
VDDIO	-0.5	3.9	V
Digital I/O Input Voltage	-0.5	3.9	V

The following table shows the recommended operating conditions of the module.

Table 17: Recommended Operating Conditions

Parameter	Min.	Typ.	Max.	Unit
VBAT	3.2	3.3	4.5	V
VDDIO	1.62	1.8/3.3	3.63	V

4.2. I/O Interface Characteristics

The following table shows the general DC electrical characteristics over recommended operating conditions (unless otherwise specified).

Table 18: General DC Electrical Characteristics for 1.8 V Domain

Symbol	Parameter	Min.	Max.	Unit
V_{IH}	High Level Input Voltage	0.65 × VDDIO	3.63	V
V_{IL}	Low Level Input Voltage	-	0.35 × VDDIO	V
V_{OH}	High Level Output Voltage	VDDIO - 0.45	-	V
V_{OL}	Low Level Output Voltage	-	0.45	V

Table 19: General DC Electrical Characteristics for 3.3 V Domain

Symbol	Parameter	Min.	Max.	Unit
V_{IH}	High Level Input Voltage	2.00	3.63	V
V_{IL}	Low Level Input Voltage	-	0.80	V
V_{OH}	High Level Output Voltage	VDDIO - 0.4	-	V
V_{OL}	Low Level Output Voltage	-	0.40	V

4.3. Operating and Storage Temperatures

Table 20: Operating and Storage Temperatures

Parameter	Min.	Typ.	Max.	Unit
Operating Temperature Range [1]	-30	-	+75	ºC
Storage Temperature Range	-40		+85	ºC

[1] Within operating temperature range, the module is IEEE compliant.

4.4. Power Consumption

The following tables show the power consumption of the module in different modes.

4.4.1. Power Consumption in Low Power Modes*

This chapter information will be included in the future version of this document.

4.4.2. Power Consumption

Table 21: Power Consumption in OFF State and Idle

Description	Conditions	$I_{WLAN3V3}$ (Typ.)	I_{VIO} (Typ.)	Unit
OFF State	**AT+QWIFI=0**	4	225	μA
Idle	**AT+QWIFI=1**	130	0.30	mA

Table 22: Power Consumption in ANT_WIFI0/BT（SISO Mode, Unit: mA)

Description	Conditions	VBAT (3.3 V)	VDDIO (1.8 V)
802.11b	TX (2.4 GHz) 1 Mbps	428	0.875
	TX (2.4 GHz) 11 Mbps	416	0.875
802.11g	TX (2.4 GHz) 6 Mbps	400	0.850
	TX (2.4 GHz) 54 Mbps	299	0.865
802.11n	TX (2.4 GHz) HT20 MCS0	409	0.864
	TX (2.4 GHz) HT20 MCS7	279	0.870
	TX (5 GHz) HT20 MCS0	376	0.840
	TX (5 GHz) HT20 MCS7	293	0.847
	TX (5 GHz) HT40 MCS0	383	0.841
	TX (5 GHz) HT40 MCS7	295	0.848
802.11a	TX (5 GHz) 6 Mbps	392	0.44

Description	Conditions	VBAT (3.3 V)	VDDIO (1.8 V)
	TX (5 GHz) 54 Mbps	291	0.40
802.11ac	TX (5 GHz) VHT20 MCS0	388	0.44
	TX (5 GHz) VHT20 MCS8	361	0.41
	TX (5 GHz) VHT40 MCS0	380	0.45
	TX (5 GHz) VHT40 MCS9	287	0.44
	TX (5 GHz) VHT80 MCS0	579	0.71
	TX (5 GHz) VHT80 MCS9	374	0.58

Table 23: Power consumption in ANT_WIFI1（SISO Mode，Unit: mA)

Description	Conditions	VBAT (3.3 V)	VDDIO (1.8 V)
802.11b	TX (2.4 GHz) 1 Mbps	513	0.88
	TX (2.4 GHz) 11 Mbps	482	0.88
802.11g	TX (2.4 GHz) 6 Mbps	473	0.89
	TX (2.4 GHz) 54 Mbps	310	0.90
802.11n	TX (2.4 GHz) HT20 MCS0	438	0.88
	TX (2.4 GHz) HT20 MCS7	292	0.88
	TX (5 GHz) HT20 MCS0	383	0.44
	TX (5 GHz) HT20 MCS7	294	0.41
	TX (5 GHz) HT40 MCS0	396	0.46
	TX (5 GHz) HT40 MCS7	294	0.44
802.11a	TX (5 GHz) 6 Mbps	383	0.43
	TX (5 GHz) 54 Mbps	298	0.41
802.11ac	TX (5 GHz) VHT20 MCS0	382	0.43
	TX (5 GHz) VHT20 MCS8	362	0.41

Description	Conditions	VBAT (3.3 V)	VDDIO (1.8 V)
	TX (5 GHz) VHT40 MCS0	395	0.46
	TX (5 GHz) VHT40 MCS9	284	0.43
	TX (5 GHz) VHT80 MCS0	422	0.51
	TX (5 GHz) VHT80 MCS9	333	0.47

Table 24: Power consumption in MIMO Mode (Unit: mA)

Description	Conditions	VBAT (3.3 V)	VDDIO (1.8 V)
802.11n	TX (2.4 GHz) HT20 MCS0	796	0.74
	TX (2.4 GHz) HT20 MCS7	417	0.75
	TX (5 GHz) HT20 MCS0	837	0.74
	TX (5 GHz) HT20 MCS7	603	0.74
	TX (5 GHz) HT40 MCS0	870	0.74
	TX (5 GHz) HT40 MCS7	464	0.74
802.11ac	TX (5 GHz) VHT20 MCS0	843	0.73
	TX (5 GHz) VHT20 MCS8	697	0.74
	TX (5 GHz) VHT40 MCS0	965	0.73
	TX (5 GHz) VHT40 MCS9	449	0.74
	TX (5 GHz) VHT80 MCS0	876	0.74
	TX (5 GHz) VHT80 MCS9	591	0.74

4.5. RF Performances

The following tables summarize the transmitting and receiving performances of FC80A.

4.5.1. Conducted RF Output Power

Table 25: Conducted RF Output Power at 2.4 GHz

Description	Rate	Typ.	Unit
802.11b	1 Mbps	18±2.5	dBm
802.11b	11 Mbps	18 ±2.5	dBm
802.11g	6 Mbps	18±2.5	dBm
802.11g	54 Mbps	16.5 ±2.5	dBm
802.11n (HT20)	MCS0	18 ±2.5	dBm
802.11n (HT20)	MCS7	15.5 ±2.5	dBm

Table 26: Conducted RF Output Power at 5 GHz

Description	Rate	Typ.	Unit
802.11a	6 Mbps	14±2.5	dBm
802.11a	54 Mbps	12±2.5	dBm
802.11n, HT20	MCS0	14±2.5	dBm
802.11n, HT20	MCS7	12±2.5	dBm
802.11n, HT40	MCS0	14±2.5	dBm
802.11n, HT40	MCS7	11±2.5	dBm
802.11ac, VHT20	MCS0	14±2.5	dBm
802.11ac, VHT20	MCS8	11±2.5	dBm
802.11ac, VHT40	MCS0	14±2.5	dBm
802.11ac, VHT40	MCS9	10±2.5	dBm
802.11ac, VHT80	MCS0	14±2.5	dBm
802.11ac, VHT80	MCS9	10±2.5	dBm

4.5.2. Conducted RF Receiving Sensitivity

Table 27: Conducted RF Receiving Sensitivity at 2.4 GHz

Description	Receiving Sensitivity (Typ.)	Unit
802.11b @ 1 Mbps	-98	dBm
802.11b @ 11 Mbps	-90	dBm
802.11g @ 6 Mbps	-94	dBm
802.11g @ 54 Mbps	-77	dBm
802.11n, HT20 @ MCS0	-93	dBm
802.11n, HT20 @ MCS7	-76	dBm

Table 28: Conducted RF Receiving Sensitivity at 5 GHz

Description	Receiving Sensitivity (Typ.)	Unit
802.11a @ 6 Mbps	-92	dBm
802.11a @ 54 Mbps	-76	dBm
802.11n, HT20 @ MCS0	-92	dBm
802.11n, HT20 @ MCS7	-74	dBm
802.11n, HT40 @ MCS0	-90	dBm
802.11n, HT40 @ MCS7	-71	dBm
802.11ac, VHT20 @ MCS0	-92	dBm
802.11ac, VHT20 @ MCS8	-69	dBm
802.11ac, VHT40 @ MCS0	-90	dBm
802.11ac, VHT40 @ MCS9	-65	dBm
802.11ac, VHT80 @ MCS0	-87	dBm
802.11ac, VHT80 @ MCS9	-62	dBm

4.6. Bluetooth Performance

The following table shows the Bluetooth transmitting and receiving performance of FC80A.

Table 29: Bluetooth Transmitting and Receiving Performance

Frequency	Transmit power	Receive sensitivity	Unit
BR	12	-89	dBm
EDR (π/4-DQPSK)	0	-93	dBm
EDR (8-DPSK)	0	-87	dBm
BLE (1M)	7.5	-96	dBm

4.7. ESD Protection

If the static electricity generated by various ways discharges to the module, the module maybe damaged to a certain extent. Thus, please take proper ESD countermeasures and handling methods. For example, wearing anti-static gloves during the development, production, assembly and testing of the module; adding ESD protective components to the ESD sensitive interfaces and points in the product design.

The following table shows the module's electrostatic discharge characteristics:

Table 30: Electrostatic Discharge Characteristics (25 ºC, 45 % Relative Humidity)

Tested Interfaces	Contact Discharge	Air Discharge	Unit
VBAT	±8	±12	kV
GND	±8	±12	kV
ANT_WIFI0	±8	±12	kV
ANT_WIFI1	±8	±12	kV

5 Mechanical Information

This chapter describes the mechanical dimensions of FC80A. All dimensions are measured in millimeter (mm), and the dimensional tolerances are ±0.2 mm unless otherwise specified.

5.1. Mechanical Dimensions

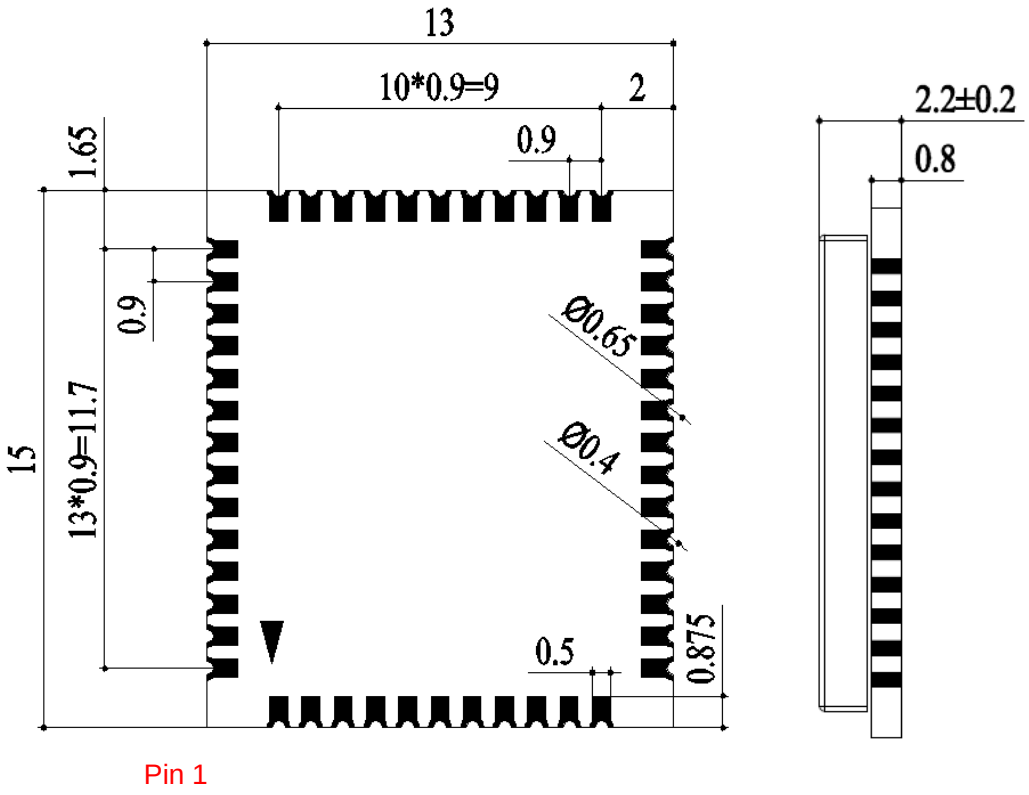


Figure 9: Top and Side Dimensions (Top and Side View)

NOTE

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

5.2. Recommended Footprint

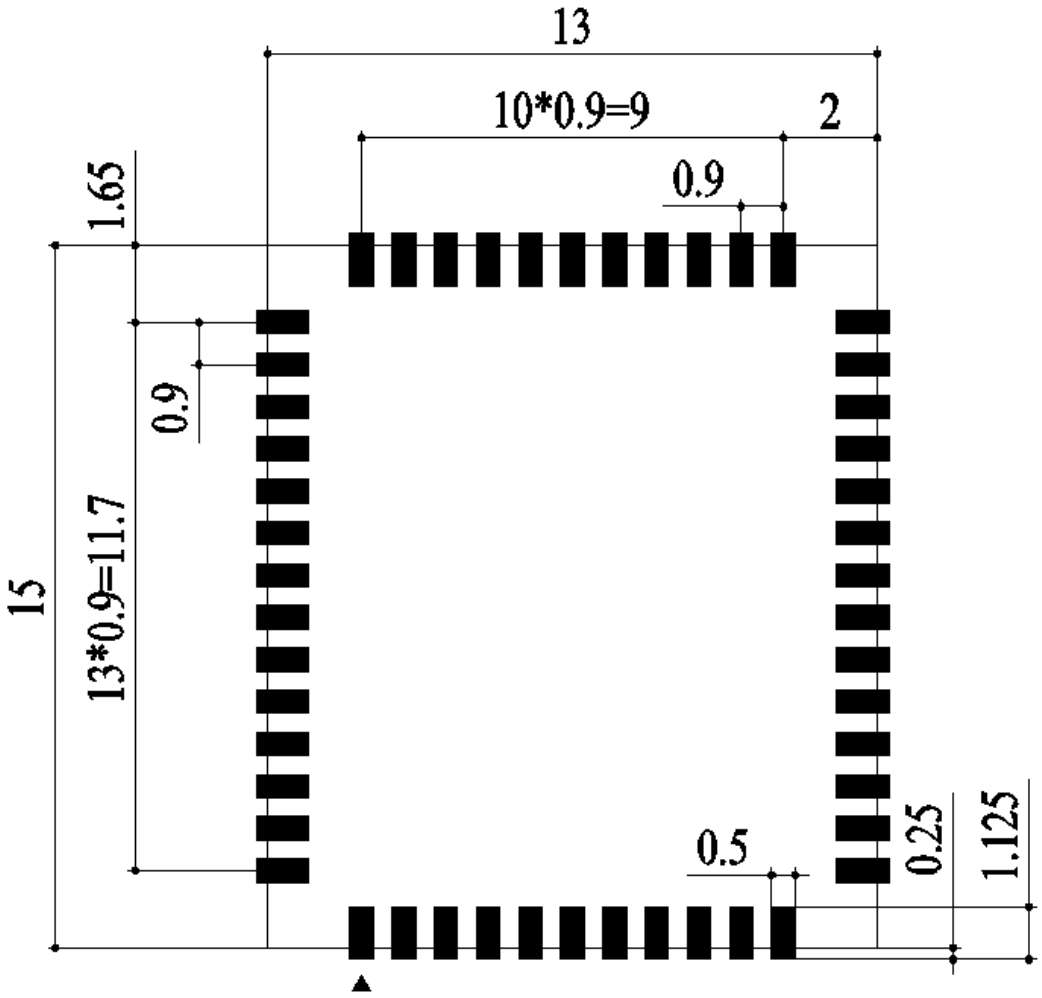


Figure 10: Recommended Footprint (Top View)

NOTE

1. For easy maintenance of this module, keep at least 3 mm between the module and other components on the motherboard.
2. Keep all RESERVED pins open.

5.3. Top and Bottom Views

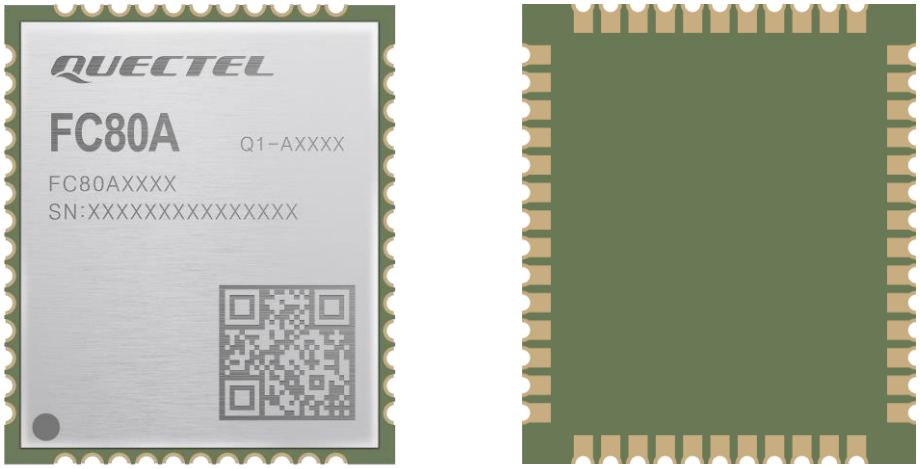


Figure 11: Top and Bottom Views of the Module

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.

6 Storage, Manufacturing and Packaging

6.1. 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. The storage life (in vacuum-sealed packaging) is 12 months in Recommended Storage Condition.

3. The floor life of the module is 168 hours [2] in a plant 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 drying 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 above occurs;
   - 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;
   - All modules must be soldered to PCB within 24 hours after the baking, otherwise they should be put in a dry environment such as in a drying oven.

[2] 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 remove the packages of tremendous modules if they are not 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. All modules must be soldered to PCB within 24 hours after the baking, otherwise put them in the drying oven. 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.

6.2. 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 0.13–0.15 mm. For more details, see ***document [2]***.

The peak reflow temperature should be 238–246 ºC, with 246 ºC as the absolute maximum reflow temperature. To avoid damage to the module caused by repeated heating, it is strongly 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.

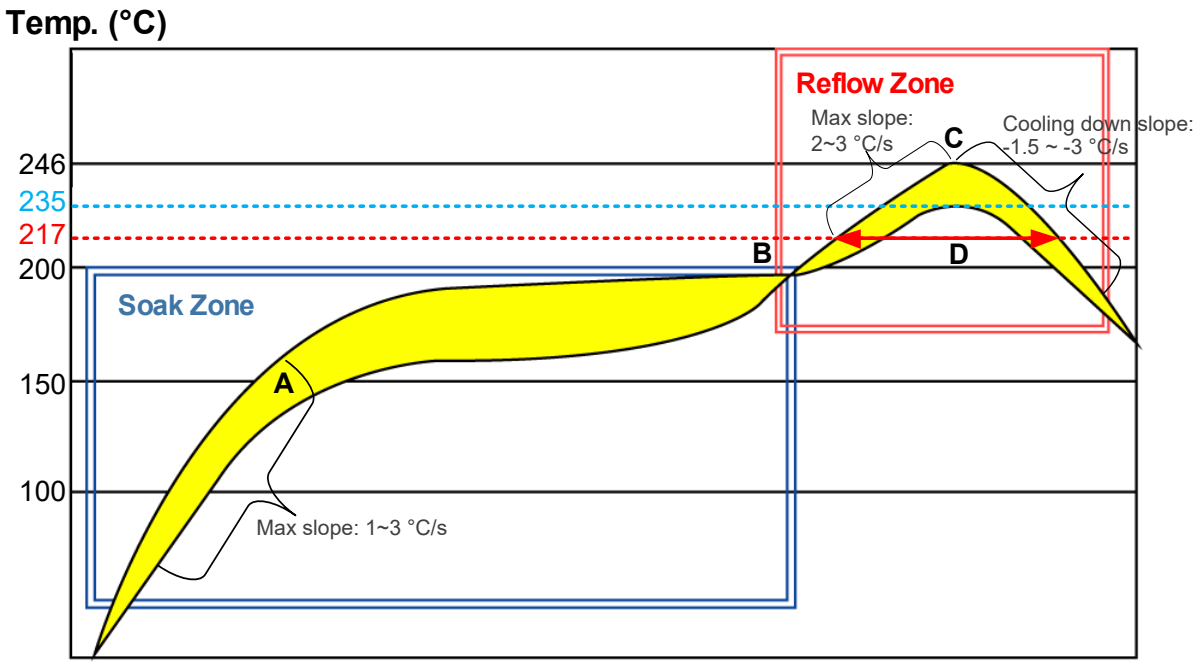


Figure 12: Recommended Reflow Soldering Thermal Profile

Table 31: Recommended Thermal Profile Parameters

Factor	Recommendation
Soak Zone	
Max slope	1–3 °C/s
Soak time (between A and B: 150 °C and 200 °C)	70–120 s
Reflow Zone	
Max slope	2–3 °C/s
Reflow time (D: over 217 °C)	40–70 s
Max temperature	235 °C to 246 °C
Cooling down slope	-1.5 to -3 °C/s
Reflow Cycle	
Max reflow cycle	1

NOTE

1. 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.
2. 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.
3. 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.

6.3. Packaging Specifications

The module adopts carrier tape packaging and details are as follow:

6.3.1. Carrier Tape

Dimension details are as follow:

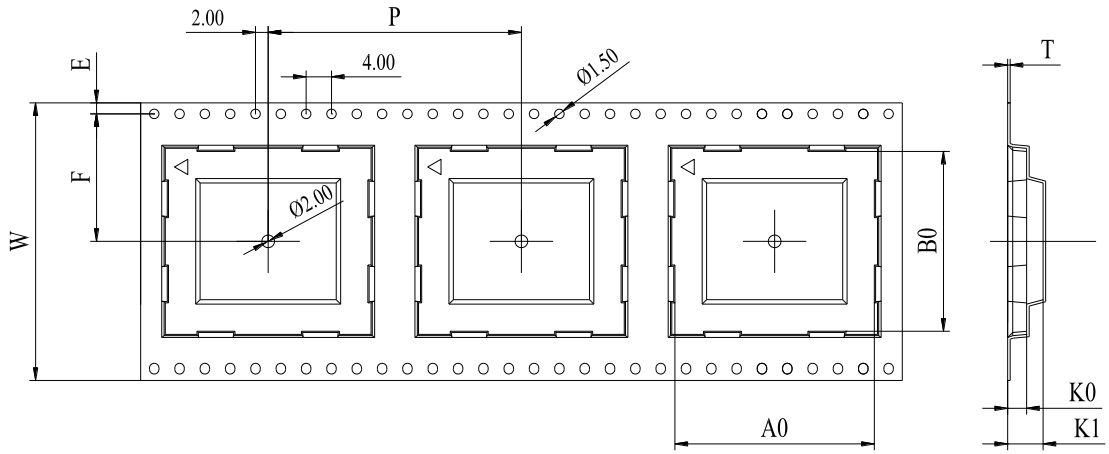


Figure 13: Carrier Tape Dimension Drawing

Table 32: Carrier Tape Dimension Table (Unit: mm)

W	P	T	A0	B0	K0	K1	F	E
32	20	0.4	13.4	15.4	2.7	5.4	14.2	1.75

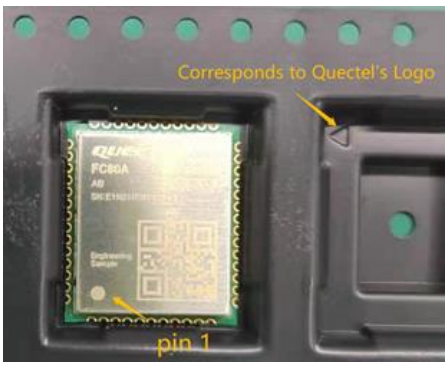


Figure 14: Package Sketch Map

Please note that pin 1 is located directly below the Logo (Quectel). The triangular in the figure above does not correspond to pin 1.

6.3.2. Plastic Reel

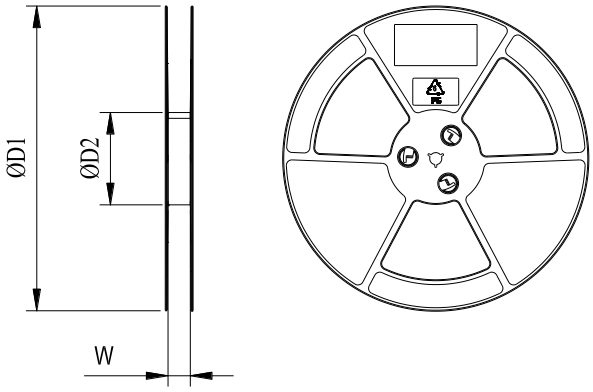
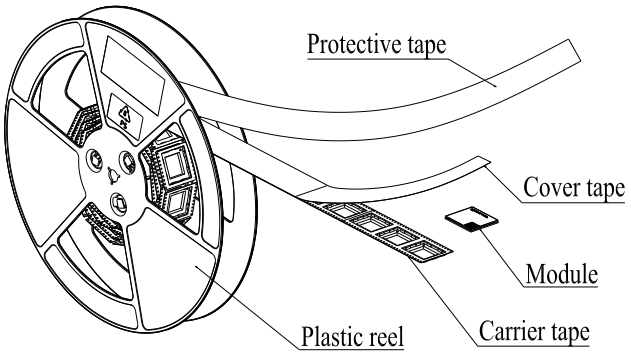


Figure 15: **Plastic Reel Dimension Drawing**

Table 33: Plastic Reel Dimension Table (Unit: mm)

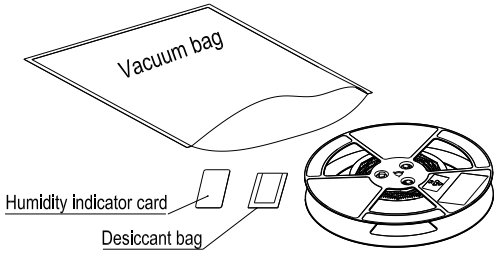
øD1	øD2	W
330	100	32.5

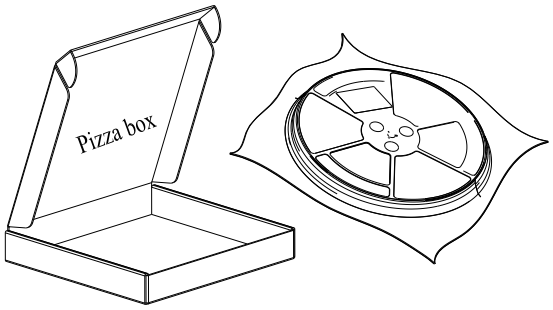
6.3.3. Packaging Process



Place the module into the carrier tape and use the cover tape to cover them; then wind the heat-sealed carrier tape to the plastic reel and use the protective tape for protection. One plastic reel can load 500 modules.

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





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

Put 4 pizza boxes into 1 carton and seal it. One carton can pack 2000 modules.

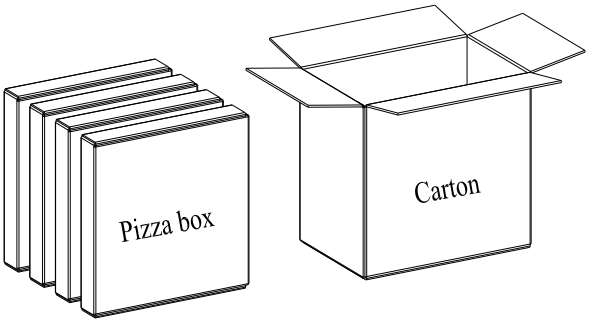


Figure 16: **Packaging Process**

7 Appendix Reference

Table 34: Related Documents

Document Name
[1] Quectel_UMTS&LTE_EVB_User_Guide
[2] Quectel_Module_Secondary_SMT_Application_Note

Table 35: Terms and Abbreviations

Abbreviation	Description
AP	Access Point
BPSK	Binary Phase Shift Keying
BT	Bluetooth
CCK	Complementary Code Keying
CTS	Clear to Send
GND	Ground
HCI	Host Controller Interface
IEEE	Institute of Electrical and Electronics Engineers
I_{IL}	Input Leakage Current
I/O	Input/Output
LNA	Low-Noise Amplifier
LTE	Long Term Evolution
Mbps	Megabits per second
MCS	Modulation and Coding Scheme

PA	Power Amplifier
PCB	Printed Circuit Board
PCM	Pulse Code Modulation
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
RoHS	Restriction of Hazardous Substances
RTS	Request to Send
RX	Receive
TBD	To Be Determined
TX	Transmit
UART	Universal Asynchronous Receiver/Transmitter
VHT	Very High Throughput
Wi-Fi	Wireless-Fidelity
WLAN	Wireless Local Area Network

8 Compliance Information

Declaration of Conformity
Hereby, [Quectel Wireless Solutions Co., Ltd] declares that the radio equipment type [Wi-Fi & BT Module] is in compliance with Directive 2014/53/EU.
The full text of the EU declaration of conformity is available at the following internet address:
https://www.quectel.com/shop

RF exposure statement
RF exposure information: The Maximum Permissible Exposure (MPE) level has been calculated based on a distance of d=20 cm between the device and the human body. To maintain compliance with RF exposure requirement, use product that maintain a 20cm distance between the device and human body.

OEM/Integrators Installation Manual
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:
In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID 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 FCC authorization.

End Product Labeling

The final end product must be labeled in a visible area with the following:Contains FCC ID: XMR202203FC80A ; IC: 10224A-202203FC80A.Le produit final doit être étiqueté dans une zone visible avec ce qui suit : Contient l'ID FCC : XMR202203FC80A ; CI : 10224A-202203FC80A.

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.

Federal Communication Commission Interference Statement

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.

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.

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 complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Industry Canada Statement

This device complies with Industry Canada RSS-210 and CAN ICES-3(B)/NMB-3(B). 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 RSS-210. 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.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
Cet émetteur ne doit pas être Co-placé ou ne fonctionnant en même temps qu'aucune autre antenne ou émetteur.

Caution Exposure:
This device meets the exemption from the routine evaluation limits in section 2.5 of RSS102 and users can obtain Canadian information on RF exposure and compliance.
Le dispositif répond à l'exemption des limites d'évaluation de routine dans la section 2.5 de RSS102
et les utilisateurs peuvent obtenir des renseignements canadiens sur l'exposition aux RF et le respect.

This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.
Cet équipement doit être installé et utilisé avec une distance minimale de 20 centimètres entre le radiateur et votre corps.

Requirement per KDB996369 D03

2.2 List of applicable FCC rules
List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required.3
Explanation: This module meets the requirements of FCC 47 CFR Part15 SubpartC FCC 47 CFR Part15 SubpartE
2.3 Summarize the specific operational use conditions
Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer’s instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.

Explanation: This module has been granted Single Modular Approval for mobile applications. OEM integrators for host products may use the module in their final products without additional FCC certifications if they meet the following conditions. Otherwise, additional FCC approvals must be obtained. The host product with the module installed must be evaluated for simultaneoustransmission requirements The user's manual for the host product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines. To comply with FCC regulations limiting both maximum RF ourput power and human exposure to RF radiation. A label must be affixed to the outside of the host product product with the following statement: This device contains FCC ID: YQD-QLM100 The final host/Module combinations may also need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorizaed for operation as a Part 15 digital device.

2.4 Limited module procedures

If a modular transmitter is approved as a “limited module,” then the module manufacturer is responsible for approving the host environment that the limited module is used with. The manufacturer of a limited module must describe, both in the filing and in the installation instructions, the alternative means that the limited module manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.

A limited module manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval. This limited module procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.

Explanation: The module is not a limited module.

2.5 Trace antenna designs

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects: layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna);

b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered);

c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;

d) Appropriate parts by manufacturer and specifications;

e) Test procedures for design verification; and
f) Production test procedures for ensuring compliance.
The module grantee shall provide a 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 the module grantee 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 grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.
Explanation: Yes, The module with trace antenna designs,refer to the RF Link schematic diagram and refer to PCB Layout.
2.6 RF exposure considerations
It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information:
(1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person's body); and (2) additional text needed for the host product manufacturer to provide to end users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).
Explanation: This module complies with FCC RF radiation exposure limits set forth for an uncontrolled environment, This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body." This module is designed to comply with the FCC statement, FCC ID is: XMR2022FC80A.
2.7 Antennas
A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an "omni-directional antenna" is not considered to be a specific "antenna type")).
For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product. The module manufacturers shall provide a list of acceptable unique connectors.
Explanation: The EUT has a Dipople Antenna.the customer can use the Dipople antenna,as list

Antenna Type	Frequency(MHz)	Gain (dBi)
Dipole Antenna	2.4–2.5 MHz, 5.15–5.85 MHz	1

2.8 Label and compliance information

Grantees are responsible for the continued compliance of their modules to the FCC rules. This includes advising host product manufacturers that they need to provide a physical or e-label stating “Contains FCC ID” with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.

Explanation:The host system using this module, should have label in a visible area indicated the following texts: “Contains FCC ID: XMR2022FC80A”

2.9 Information on test modes and additional testing requirements

Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product. The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host. Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer’s determination that a module as installed in a host complies with FCC requirements.

Explanation: Consider multi-transmission mode in the host.

2.10 Additional testing, Part 15 Subpart B disclaimer

The grantee should include a statement that 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 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.

Explanation: The host shoule be evaluated by the FCC Subpart B.

instruction to OEM if integrator install the module, and use the external antenna that are able to be detached.

1)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;
Explain：we claim use indoor for the band 5150–5250 MHz.
2)for devices with detachable antenna(s), the maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall be such that the equipment still complies with the e.i.r.p. limit;
Explain：we claim The list Antenna fullfill the e.i.r.p. limit.

The list Antenna fullfill the 6.2.2.3 Antenna Type	Frequency(MHz）	Gain（dBi）
Dipole Antenna	2.4–2.5 MHz, 5.15–5.85 MHz	1

3)for devices with detachable antenna(s), the maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits as appropriate; and
Explain：we claim The list Antenna fullfill the e.i.r.p. limit.

The list Antenna fullfill the 6.2.2.3 Antenna Type	Frequency(MHz）	Gain（dBi）
Dipole Antenna	2.4–2.5 MHz, 5.15–5.85 MHz	1

4)where applicable, antenna type(s), antenna models(s), and worst-case tilt angle(s) necessary to remain compliant with the e.i.r.p. elevation mask requirement set forth in section 6.2.2.3 shall be clearly indicated.

Explain：we claim The list Antenna fullfill the 6.2.2.3.

The list Antenna fullfill the 6.2.2.3 Antenna Type	Frequency(MHz）	Gain（dBi）
Dipole Antenna	2.4–2.5 MHz, 5.15–5.85 MHz	1

5)les dispositifs fonctionnant dans la bande de 5 150 à 5 250 MHz sont réservés uniquement pour une utilisation à l’intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux;
Expliquez : nous affirmons que la liste des antennes remplit la p.i.r.e. limite.
6)pour les dispositifs munis d’antennes amovibles, le gain maximal d’antenne permis pour les dispositifs utilisant les bandes de 5 250 à 5 350 MHz et de 5 470 à 5 725 MHz doit être conforme

à la limite de la p.i.r.e;
Expliquez : nous affirmons que la liste des antennes remplit la p.i.r.e. limite.

The list Antenna fullfill the 6.2.2.3 Antenna Type	Frequency(MHz）	Gain（dBi）
Dipole Antenna	2.4–2.5 MHz, 5.15–5.85 MHz	1

7)pour les dispositifs munis d'antennes amovibles, le gain maximal d'antenne permis (pour les dispositifs utilisant la bande de 5 725 à 5 850 MHz) doit être conforme à la limite de la p.i.r.e. spécifiée, selon le cas;
Expliquez : nous affirmons que la liste des antennes remplit la p.i.r.e. limite.

The list Antenna fullfill the 6.2.2.3 Antenna Type	Frequency(MHz）	Gain（dBi）
Dipole Antenna	2.4–2.5 MHz, 5.15–5.85 MHz	1

8)lorsqu'il y a lieu, les types d'antennes (s'il y en a plusieurs), les numéros de modèle de l'antenne et les pires angles d'inclinaison nécessaires pour rester conforme à l'exigence de la p.i.r.e. applicable au masque d'élévation, énoncée à la section 6.2.2.3, doivent être clairement indiqués.

Expliquez : nous affirmons que la liste des antennes remplit les conditions 6.2.2.3.

The list Antenna fullfill the 6.2.2.3 Antenna Type	Frequency(MHz）	Gain（dBi）
Dipole Antenna	2.4–2.5 MHz, 5.15–5.85 MHz	1