FN-LINK 欧智通

PRODUCT SPECIFICATION

6220N-RRM

Wi-Fi Single-band 1x1 802.11b/g/n + BLE v4.2

IOT Combo Module

Version:v1.0

6220N-RRM Module Datasheet

Ordering Information	Part NO.	Description
	FG6220NRRM-00	RTL8720CM-VA2-CG/802.11 b/g/n/,1T1R+BT4.2/20*24mm,

Customer: _____

Customer P/N:_____

Signature:_____

Date:_____

Office: 14th floor, Block B, phoenix zhigu, Xixiang Street, Baoan District, Shenzhen

Factory: NO.8, Litong RD., Liuyang Economic & Technical Development Zone, Changsha, CHINA

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CONTENTS

Revision History

Version	Date	Contents of Revision Change	Draft	Checked	Approved
V1.0	2022/07/15	Initial release	FC	ZZQ	QJP

1. General Description

1.1 Introduction

6220N-RRM combo module is a highly integrated IoT module with low power 802.11b/g/n Wireless LAN (WLAN) network controller. It combines a KM4 MCU, WLAN MAC, a 1T1R capable WLAN baseband, RF, and Bluetooth. It also provides a bunch of configurable GPIOs which are configured as digital peripherals for different applications and control usage.

6220N-IN integrates internal memories for complete Wi-Fi protocol functions. The embedded memory configuration also provides simple application developments.

1.2 Description

Model Name	6220N-RRM
Product Description	Support Wi-Fi/Bluetooth functionalities
Dimension	L x W x H: 20mm*24mm*3.1mm
Interface	UART, GPIO, SDIO device, SPI, PWM, I2C
BT Interface	UART
Operating temperature	-20°C to +85°C
Storage temperature	-40°C to +125°C
Operating Voltage	3.3±10% Vdc

2. Features

General Features

- 802.11b/g/n compatible WLAN
- 65Mbps transmit and receive PHY rate using 20MHz bandwidth
- 802.11e QoS Enhancement (WMM)
- 802.11i (WPA, WPA2，WPA3). Open, shared key, and pair-wise key authentication services
- Wi-Fi Direct support
- Internal 4MB pSRAM
- external 2MB FLASH

Interface

- UART
- SPI
- I2C
- GPIO
- PWM
- SDIO2.0 device

Bluetooth Features

- Bluetooth 4.2 Low Energy (BLE)

3. Block Diagram
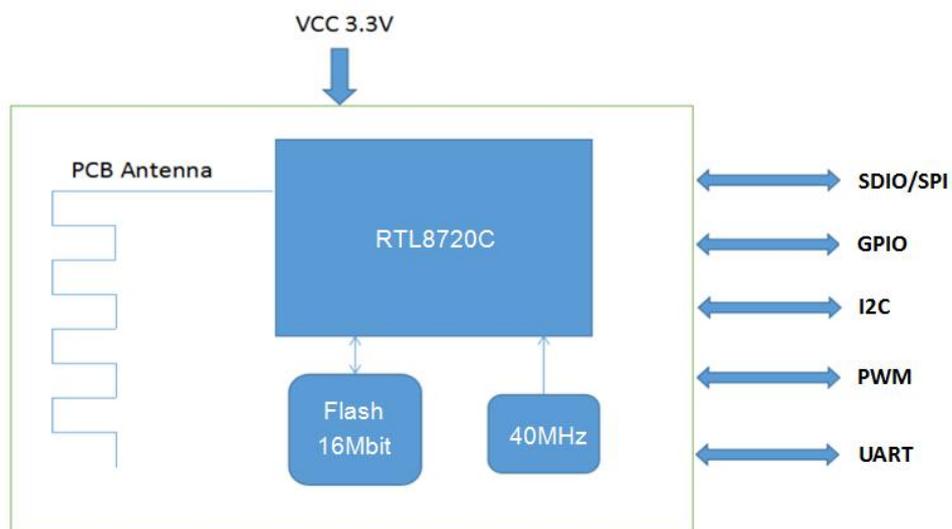
4. General Specification

4.1 WI-FI Specification

Feature	Description	
WLAN Standard	IEEE 802.11 b/g/n Wi-Fi compliant	
Frequency Range	2.400 GHz ~ 2.4835 GHz (2.4 GHz ISM Band)	
Number of Channels	2.4GHz：Ch1 ~ Ch14	
Test Items	**Typical Value**	**EVM**
Output Power	802.11b /11Mbps : 17dBm ± 2 dB	EVM ≤ -10dB
	802.11g /54Mbps : 15dBm ± 2 dB	EVM ≤ -25dB
	802.11n /MCS7 : 14dBm ± 2 dB	EVM ≤ -28dB
Spectrum Mask	Meet with IEEE standard	
Freq. Tolerance	±20ppm	
Test Items	**TYP Test Value**	**Standard Value**
Receive Sensitivity (11b,20MHz) @8% PER	- 1Mbps PER @ -92 dBm	≤-83
	- 11Mbps PER @ -84 dBm	≤-76
Receive Sensitivity (11g,20MHz) @10% PER	- 6Mbps PER @ -88 dBm	≤-85
	- 54Mbps PER @ -71 dBm	≤-68
SISO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -87 dBm	≤-85
	- MCS=7 PER @ -68 dBm	≤-67
Maximum Input Level	802.11b : -10 dBm	
	802.11g/n : -20 dBm	
Antenna Reference	Small antenna with 3.25 dBi peak gain	

4.2 Bluetooth Specification

Feature	Description
General Specification	
Bluetooth Standard	BLE V4.2.
Host Interface	UART
Antenna Reference	Small antennas with 0~2 dBi peak gain
Frequency Band	2400 MHz ~ 2483.5 MHz
Number of Channels	40 channels

Modulation	GFSK		
RF Specification			
	Min(dBm)	**Typical**(dBm)	**Max**(dBm)
Output Power	2	6	10
Sensitivity @ BER=0.1%		-88	
Maximum Input Level	GFSK (1Mbps):-20dBm		

5. Pin Definition

5.1 Pin Outline

< TOP VIEW >

RF1	1		20	GND
GND	2		19	GPIOA_23
CHIP_EN	3		18	GPIOA_20
GPIOA_0	4		17	GPIOA_19
GPIOA_1	5		16	GPIOA_18
GPIOA_2	6		15	GPIOA_17
GPIOA_3	7		14	GPIOA_16
GPIOA_4	8		13	GPIOA_15
VD33	9		12	GPIOA_14
GND	10		11	GPIOA_13
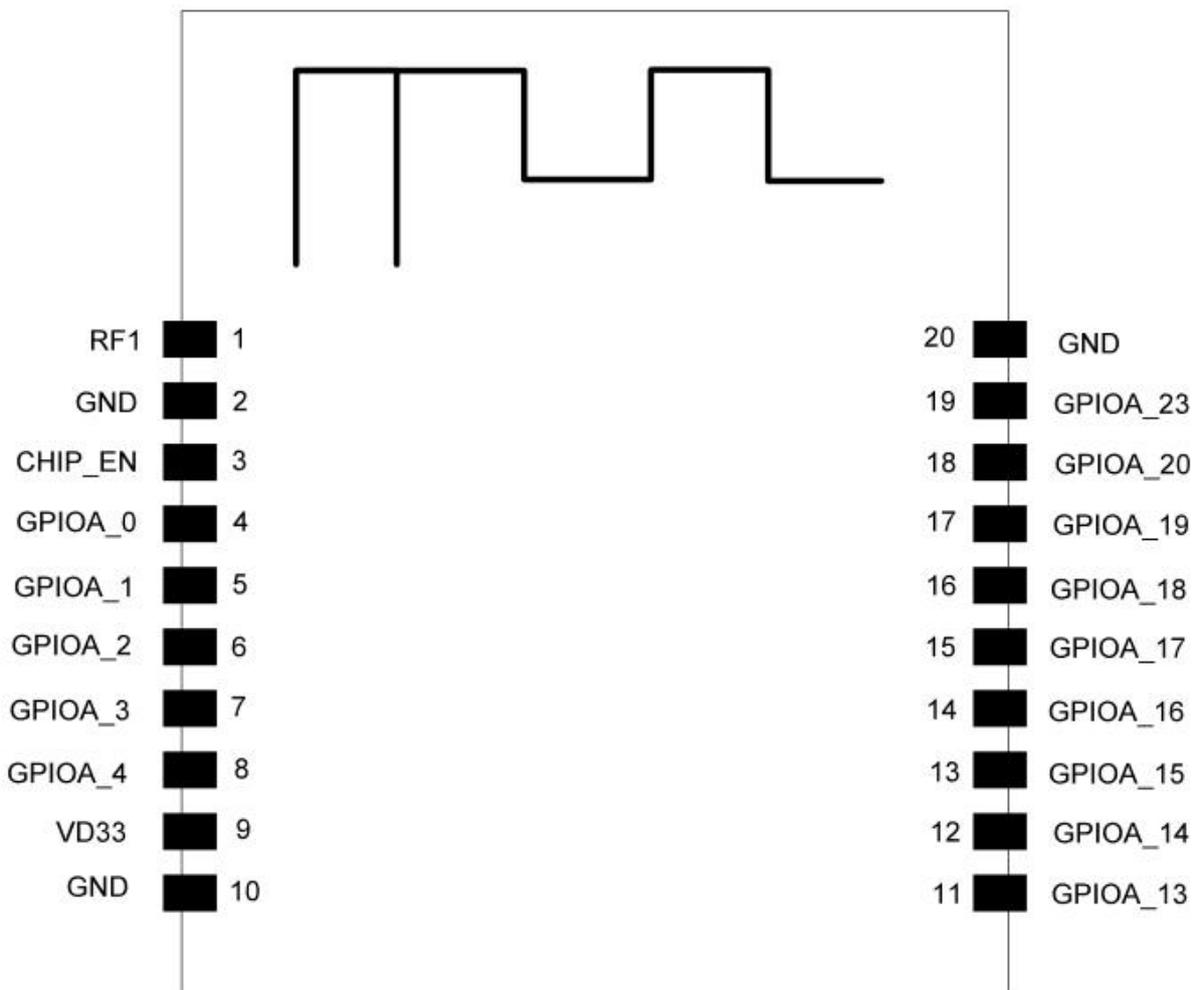
5.2 Pin Definition details

NO.	Name	TypeNote1	Description	Voltage
1	RF1		WL RF signal; NC by default (use printing antenna on module)	
2	GND	P	Ground connections	
3	CHIP_EN	I	Enable Chip (1: enable; 0: shutdown)	
4	GPIOA_0	I/O	Ground connections	
5	GPIOA_1	I/O	Enable Chip (1: enable; 0: shutdown)	3.3V
6	GPIOA_2	I/O	GPIO pin, refer to Pin Function Table	3.3V
7	GPIOA_3	I/O	GPIO pin, refer to Pin Function Table	3.3V
8	GPIOA_4	I/O	GPIO pin, refer to Pin Function Table e	3.3V
9	VD33	P	NC, internally connected to VBAT_IN for 3.3V power supply	3.3V
10	GND	P	Ground connections	3.3V
11	GPIOA_13	I/O	GPIO pin, refer to Pin Function Table	
12	GPIOA_14	I/O	GPIO pin, refer to Pin Function Table	
13	GPIOA_15	I/O	GPIO pin, refer to Pin Function Table	
14	GPIOA_16	I/O	GPIO pin, refer to Pin Function Table	
15	GPIOA_17	P	GPIO pin, refer to Pin Function Table	3.3V
16	GPIOA_18	P	GPIO pin, refer to Pin Function Table	3.3V
17	GPIOA_19	I/O	GPIO pin, refer to Pin Function Table	
18	GPIOA_20	I/O	GPIO pin, refer to Pin Function Table	3.3V
19	GPIOA_23	I/O	GPIO pin, refer to Pin Function Table	3.3V
20	GND	P	Ground connections	

Note1: P for POWER, I for INPUT, O for OUTPUT

Note2: Make sure GPIOA_0 and GPIOA_13 won't be both pulled up when power-on.

Note3: GPIOA_0, GPIOA_1 and GPIOA_23 are power on trap pins with internal 10Kohm pull-low. We suggest keep them not connected, please contact us for support if customer really have to use them.

Note4: GPIOA_15 and GPIO1A_16 The default is download serial port

5.3 Pin Function Table

Module Pin#	IC Pin Name	SDIO	JTAG	UART	SPI/WL_LED /EXT_32K	I2C	PWM
4	GPIOA_0		JTAG_CLK	UART1_IN	EXT_32K		PWM[0]
5	GPIOA_1		JTAG_TMS	UART1_OUT	BT_LED		PWM[1]
6	GPIOA_2		JTAG_TDO	UART1_IN	SPI_CSn	I2C_SCL	PWM[2]
7	GPIOA_3		JTAG_TDI	UART1_OUT	SPI_SCL	I2C_SDA	PWM[3]
8	GPIOA_4		JTAG_TRST	UART1_CTS	SPI_MOSI		PWM[4]
11	GPIOA_13			UART0_IN			PWM[7]
12	GPIOA_14			UART0_OUT			PWM[2]
13	GPIOA_15	SD_D2		UART2_IN	SPI_CSn	I2C_SCL	PWM[3]
14	GPIOA_16	SD_D3		UART2_OUT	SPI_SCL	I2C_SDA	PWM[4]
15	GPIOA_17	SD_CMD					PWM[5]
16	GPIOA_18	SD_CLK					PWM[6]
17	GPIOA_19	SD_D0		UART2_CTS	SPI_MOSI	I2C_SCL	PWM[7]
18	GPIOA_20	SD_D1		UART2_RTS	SPI_MISO	I2C_SDA	PWM[0]
19	GPIOA_23				LED_0		PWM[7]

Note: Please contact Fn-Link for SW feasibility once you confirm GPIO configuration.

6. Electrical Specifications

6.1 Power Supply DC Characteristics

	MIN	TYP	MAX	Unit
Operating Temperature	-20	25	85	deg.C
VCC33	3.0	3.3	3.6	V

6.2 Interface Circuit time series

6.2.1 Power On Sequence
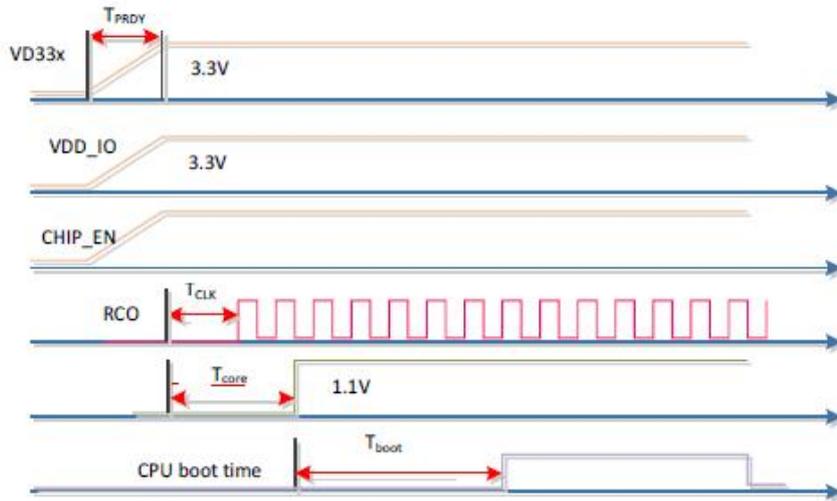
Symbol	Parameter	Minimu	Typica	Maxi	Unit
TPRDY	3.3V ready time	0.6	0.6	1	ms
T_{CLK}	Internal ring clock stable time after 3.3V ready	1			ms
T_{core}	Core power ready time	1.5	1.5		ms
T_{boot}	Application ready time				ms
V_{RST}	Shutdown occurs after CHIP_EN lower than this voltage	0	0	1.65	V
T_{RST}	The require time that CHIP_EN lower than V_{RST}	--	10	--	us

6.2.2 Bus Timing Specification
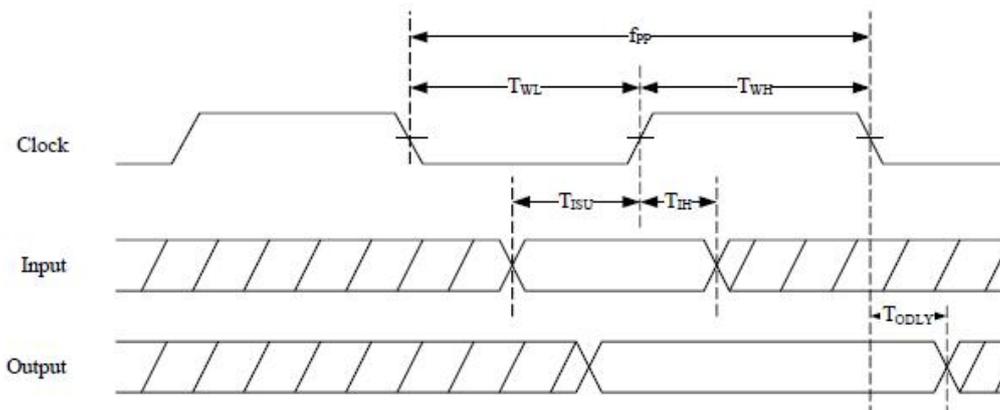
NO	Parameter	Mode	MIN	MAX	Unit
f_{PP}	Clock Frequency	Default	0	25	MHz
		HS	0	50	MHz
T_{WL}	Clock Low Time	DEF	10	-	ns
		HS	7	-	ns
T_{WH}	Clock High Time	DEF	10	-	ns
		HS	7	-	ns
T_{ISU}	Input Setup Time	DEF	5	-	ns
		HS	6	-	ns
T_{IH}	Input Hold Time	DEF	5	-	ns
		HS	2	-	ns
T_{ODLY}	Output Delay Time	DEF	-	14	ns
		HS	-	14	ns

6.2.3 Resume from Standby
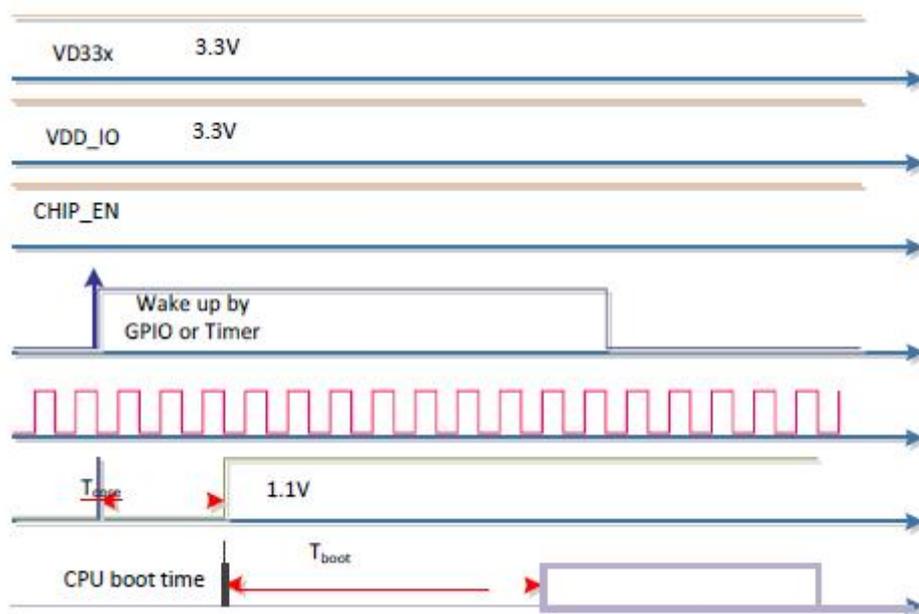
6.2.4 Shutdown Sequence
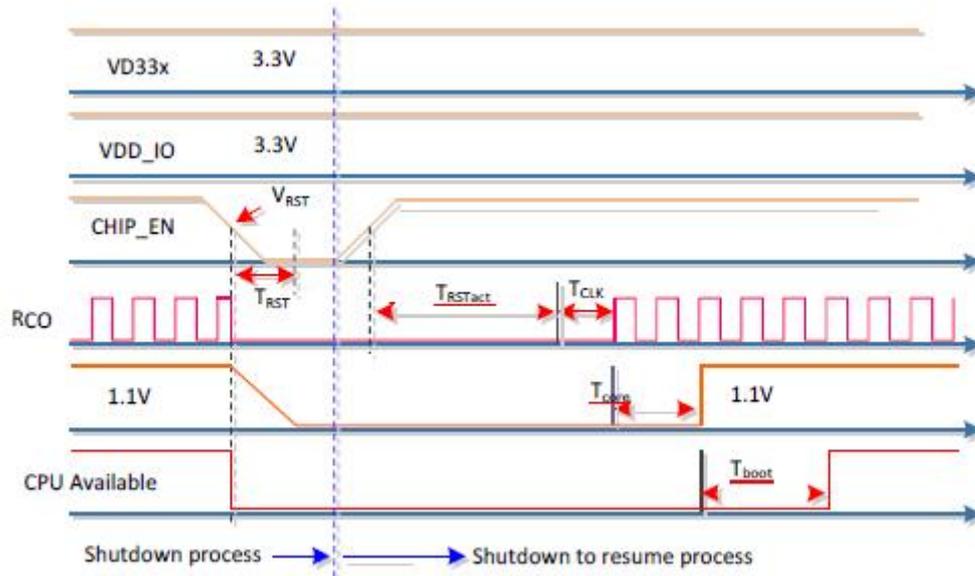
7. Size reference

7.1 Module Picture

L x W : 24 x 20 (+0.3/-0.1) mm Refer to section 4.2 for detailed marking info.	
H: 3.1 (±0.1) mm	
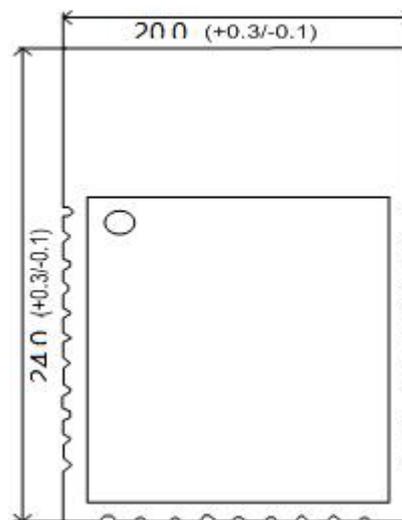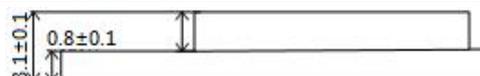
Weight	2.56g

7.2 Marking Description

< TOP VIEW >

公司Logo ----- Fn-Link
产品型号 ----- 6220N-RRM
生产批次 ----- CXXXXX
00代表机型 ----- 220300
生产周期 ----- Pin 1 标记
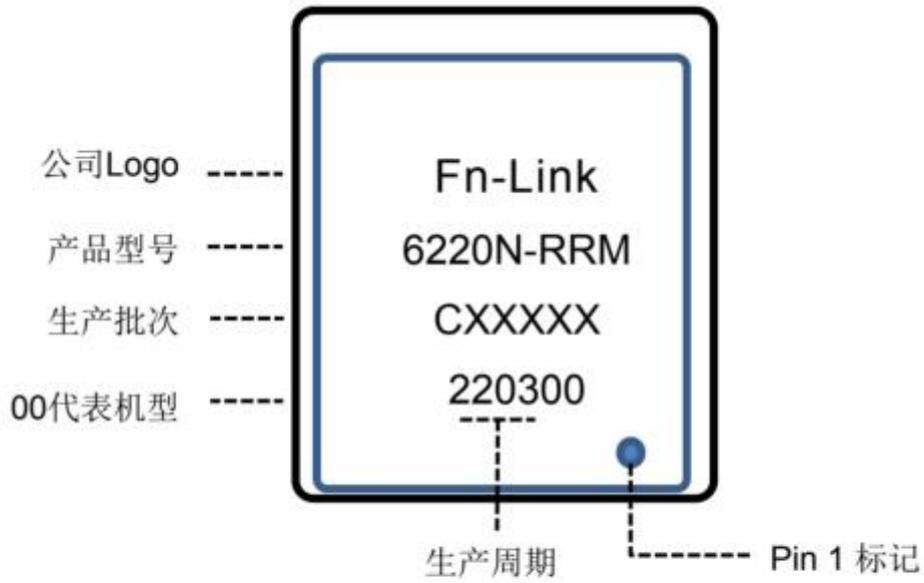
模组尺寸：20x24mm
屏蔽盖尺寸：17.47x18.23mm

7.3 Physical Dimensions

<TOP View>
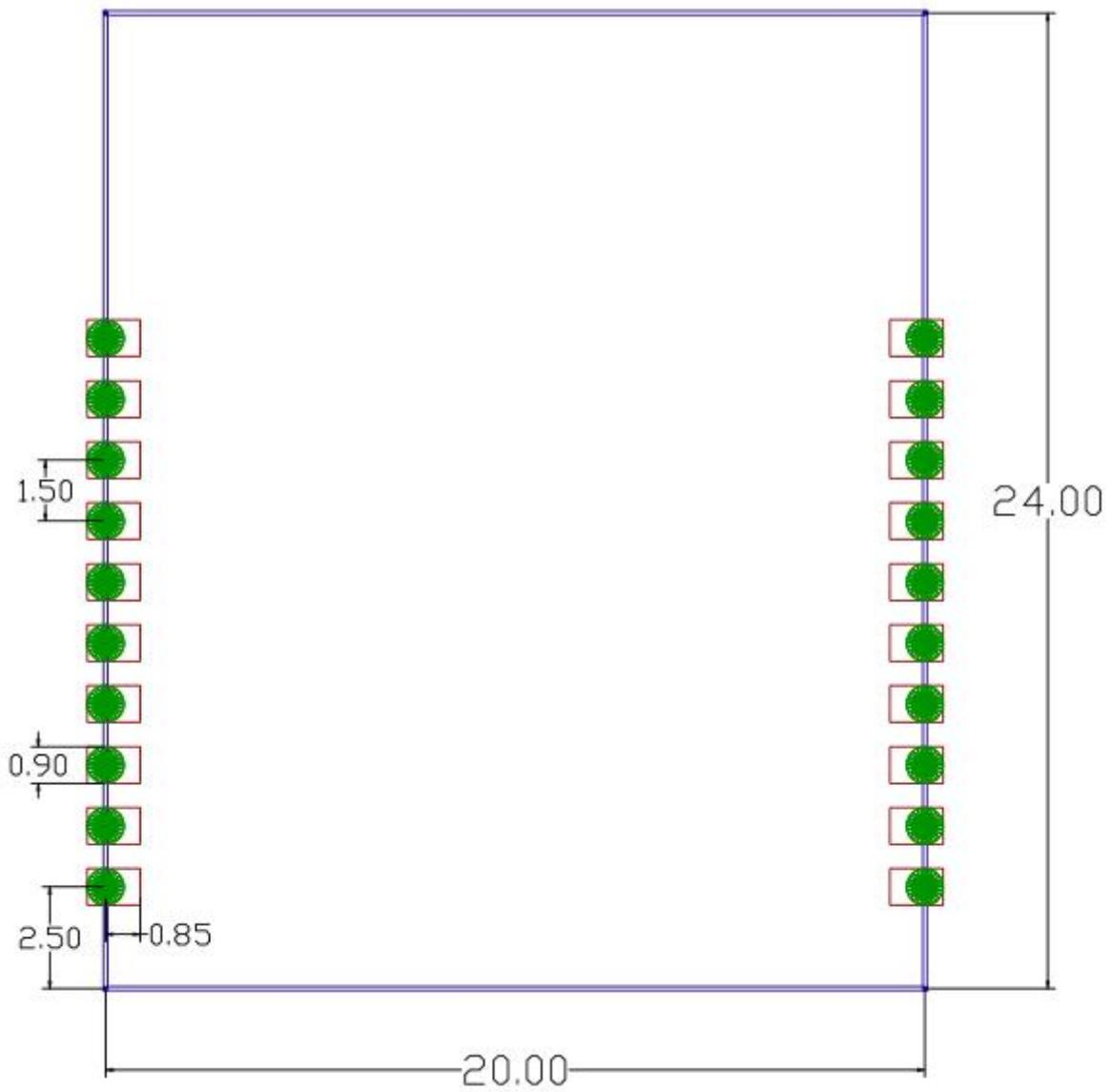
7.4 Layout Recommendation
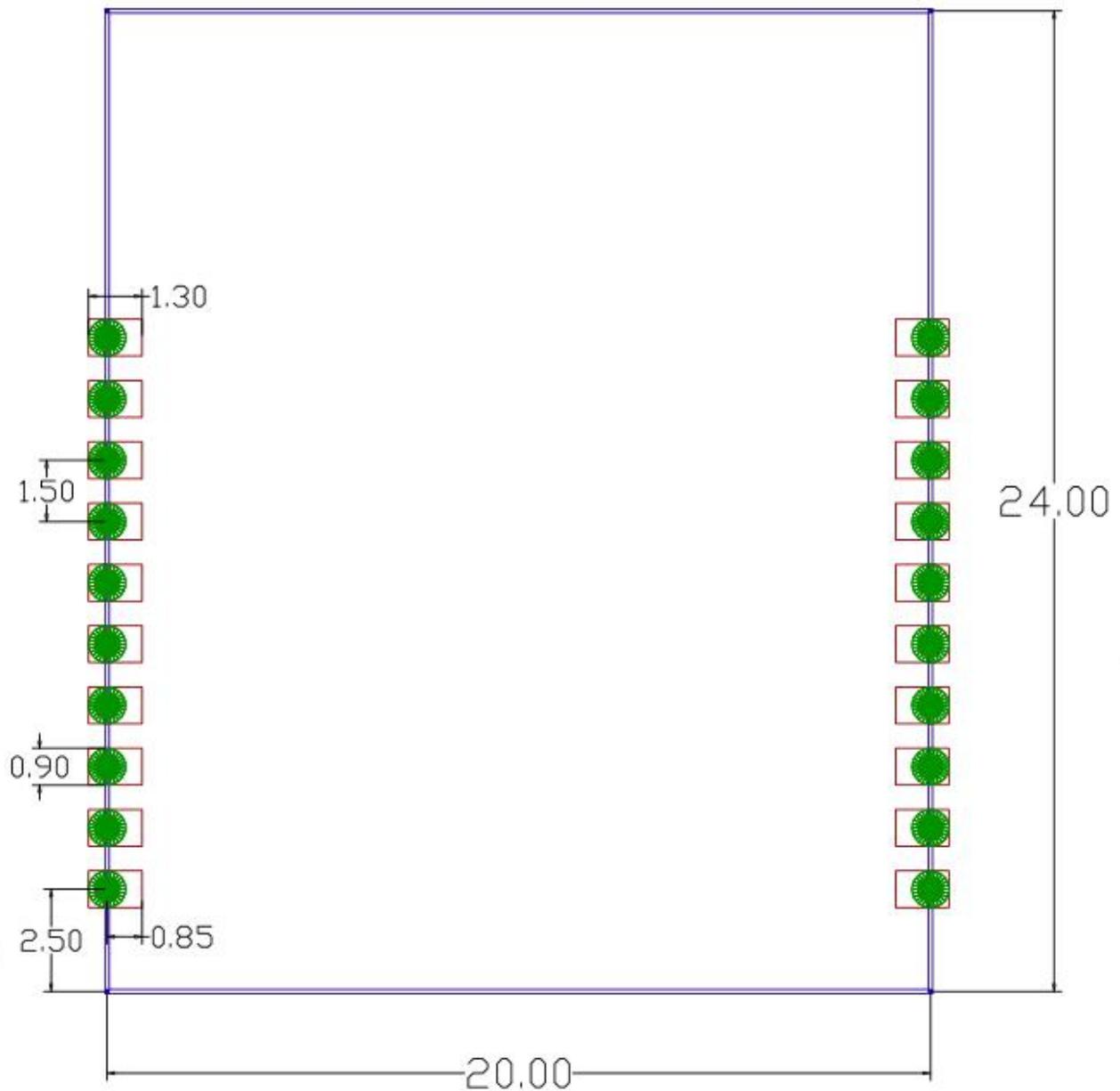
8. The Key Material List

Item	Part Name	Description	Manufacturer
1	PCB	6220N-RRM-V1.0 深绿色,FR4,2 层通孔,有卤 TG150,化金,24 连片,20X24X0.8mm (翔宇)	XY-PCB, GDKX, Sunlord, SLPCB
2	Crystal	3225　40MHz, ±10ppm, 12pF	ECEC, Hosonic, TKD, JWT
3	Chipset	RTL8720CM-VA2, QFN40	Realtek

| 4 | Shielding | 6220N-RRM   Shielding | 信太，精力通 |
| 5 | Flash | MX25L1606EM1I-12G   SOP8-150MIL | MXIC,GigaDevice |

9. Reference Design
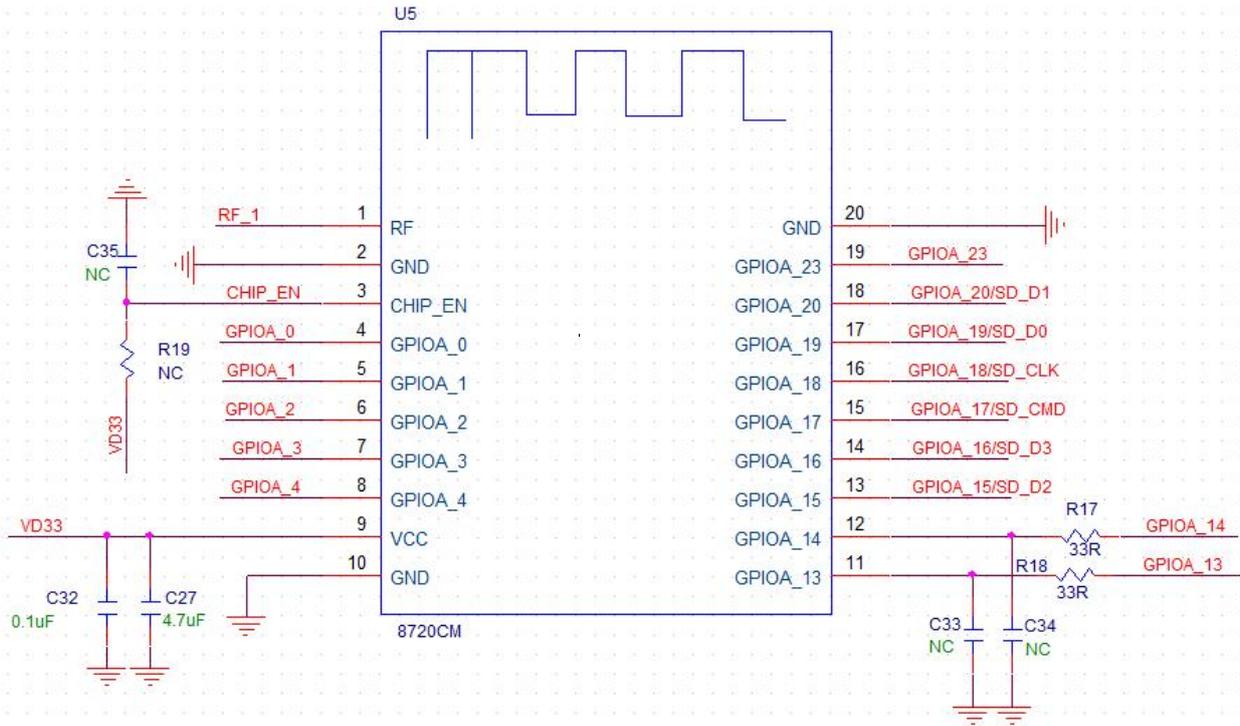
Note 1: Use on-board printing antenna by default. Contact Fn-Link for technical support if you want to use reserved pin1 or U.FL connector for external antenna design.

10.Antenna clearance area requirements

When using PCB antenna on Wi-Fi module, make sure the distance between PCB on motherboard and other metal devices is at least 16mm.The shaded areas in the figure below need to be marked away from metal devices, sensors, interference sources, and other materials that may interfere with the signal.
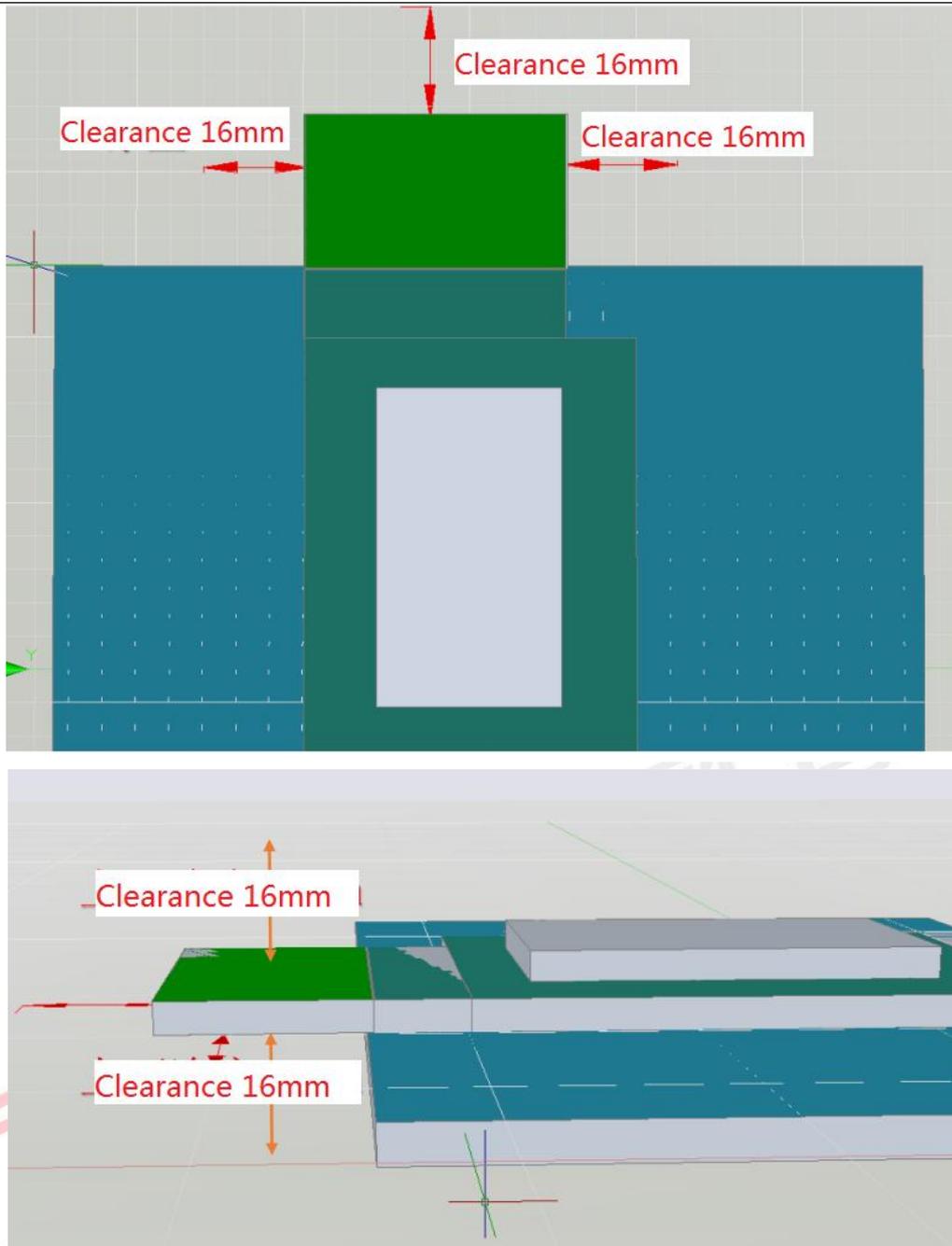
Antenna clearance reference

11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <250°C

Number of Times : ≤2 times

Slope: 1~2S℃/sec max.
(217℃ to peak)

peak : 250℃

Ramp down rate :
Max , 2,5℃/sec.

217℃

Preheat : 150~200℃

60~120 sec

40~70 sec

25℃

Ramp up rate :
Max , 2,5℃/sec.

Time (sec)
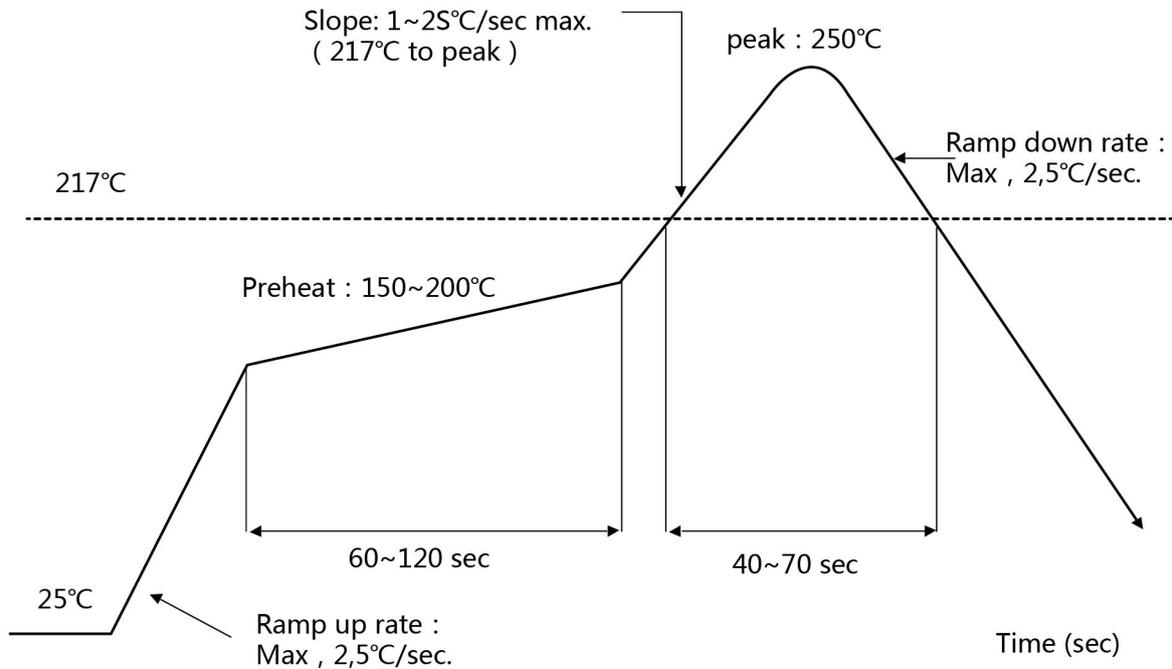
12. RoHS compliance

All hardware components are fully compliant with EU RoHS directive

13. Package

13.1 Reel
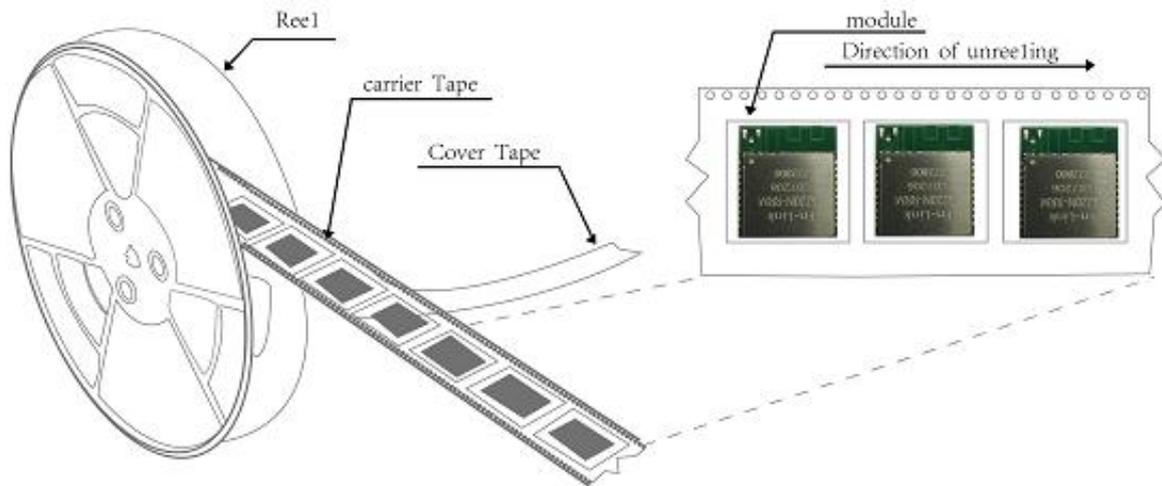
13.2 Packaging Detail

the take-up package

Using self-adhesive tape
Size of black tape: 44mm   the cover tape   :37.5mm

Color of plastic disc: blue

NY bag size:500mm*420mm   size ： 335*335*55mm

The packing case size:360*210*370mmg

14. Moisture sensitivity

The Modules is a Moisture Sensitive Device level 3, in according with standard IPC/JEDEC J-STD-020, take care

all the relatives requirements for using this kind of components.

Moreover, the customer has to take care of the following conditions:

a) Calculated shelf life in sealed bag: 12 months at <40°C and <90% relative humidity (RH)

b) Environmental condition during the production: 30°C / 60% RH according to IPC/JEDEC J-STD-033A paragraph 5

c) The maximum time between the opening of the sealed bag and the reflow process must be 168 hours if condition

d) "IPC/JEDEC J-STD-033A paragraph 5.2" is respected

e) Baking is required if conditions b) or c) are not respected

f) Baking is required if the humidity indicator inside the bag indicates 10% RH or more

FCC Statement

 This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1)This device may not cause harmful interference.
(2)This device must accept any interference received, including interference that may cause undesired operation.
2.   Changes or modifications 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 frequence 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 equipmemt 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 autlet 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 has been evaluated to meet general RF exposure requirement. The devicecan be used in portable exposure condition without restriction.

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

ISED Statement

 This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:
1.This device may not cause interference.
2.This device must accept any interference, including interference that may cause undesired operation of the device.

The device has been evaluated to meet general RF exposure requirement. The devicecan be used in portable exposure condition without restriction.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables auxappareils 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 toutbrouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre lefonctionnement.

L'appareil a été évalué pour répondre aux exigences générales d'exposition aux RF. L'appareil peut être utilisé dans des conditions d'exposition portable sans restriction.

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

Conditions on using FN-LINK TECHNOLOGY LIMITED regulatory approvals:
A. Customer must ensure that its product (The "CUSTOMER Product") is electrically identical to FN-LINK TECHNOLOGY LIMITED reference designs. Customer acknowledges that any modifications to FN-LINK TECHNOLOGY LIMITED reference designs may invalidate regulatory approvals in relation to the CUSTOMER Product, or may necessitate notifications to the relevant regulatory authorities.
B. Customer is responsible for ensuring that antennas used with the product are of the same type, with same or lower gains as approved and providing antenna reports to FN-LINK TECHNOLOGY LIMITED.
C. Customer is responsible for regression testing to accommodate changes to FN-LINK TECHNOLOGY LIMITED reference designs, new antennas, and portable RF exposure safety testing/approvals.
D. Appropriate labels must be affixed to the CUSTOMER Product that comply with applicable regulations in all respects.
E. A user's manual or instruction manual must be included with the customer product that contains the text as required by applicable law. Without limitation of the foregoing, an example (for illustration purposes only) of possible text to include is set forth below:

2.2 List of applicable FCC rules
FCC Part 15 Subpart C 15.247

2.3 Specific operational use conditions
Radio Technology: Bluetooth BLE
Operation frequency : 2402MHz -2480MHz
Number of channels : 40
Modulation : GFSK
Data Rate : 1Mpbs
Channel spacing : 2MHz
Antenna Type : PCB antenna, Maximum Gain is 3.25dBi.

Radio Technology: 2.4G WiFi
Operation frequency : 2412MHz-2462MHz for IEEE 802.11 b, g. n/HT20
Channel No. : 802.11b/802.11g /802.11n(HT20): 11
Modulation : IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK)
IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK)
IEEE 802.11n :OFDM(64QAM, 16QAM, QPSK, BPSK)
Antenna Type : PCB antenna, Maximum Gain is 3.25dBi.
The module can be used for mobile or portable applications with a maximum 3.25dBi antenna. The host manufacturer installing this module into their product must ensure that the final composit 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 informationto 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
The antenna used is the PCB antenna on the module.

2.6 RF exposure considerations

The device can be used in portable exposure condition without restriction 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 newapplication. The FCC ID of the module cannot be used on the final product. In these circumstances, the host manufacturer will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

2.7 Antennas

Antenna Specification are as follows:

Antenna Type: PCB antenna

Antenna Gain(Peak):3.25 dBi (Provided by customer)

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;

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 peripheralrequirements, etc.).

2.8 Label and compliance information

Host product manufacturers need to provide a physical or e-label stating "Contains FCC ID: 2AATL-6220N-RRM" With their finished product.

2.9 Information on test modes and additional testing requirements

Radio Technology: Bluetooth BLE

Operation frequency : 2402MHz -2480MHz

Number of channels : 40

Modulation : GFSK

Data Rate : 1Mpbs

Channel spacing : 2MHz

Antenna Type : PCB antenna, Maximum Gain is 3.25dBi.

Radio Technology: 2.4G WiFi

Operation frequency : 2412MHz-2462MHz for IEEE 802.11 b, g. n/HT20

Channel No. : 802.11b/802.11g /802.11n(HT20): 11

Modulation : IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK)

IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK)

IEEE 802.11n :OFDM(64QAM, 16QAM, QPSK, BPSK)

Antenna Type : PCB antenna, Maximum Gain is 3.25dBi.

Host manufacturer must perfom test of radiated & conducted emission and spurious emission, etcaccording 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 canbe 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 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.