

PRODUCT SPECIFICATION & Manual

6233E-UUB

WiFi/bt module

Version:v2.1



6233E-UUB Module Datasheet

Ordering Information	Part NO.	Description
	FG6233EUUB-01	RTL8733BU-CG/802.11a/b/g/n/ WiFi+BT, 1T1R, USB, 12.2X12.9mm

Customer: _____

Customer P/N: _____

Signature: _____

Date: _____

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Revision History

[illegible]

1. General Description

1.1 Introduction

6233E-UUB is a highly integrated module with Realtek 8733BU-CG single-chip 802.11a/b/g/n 1T1R WLAN, and an integrated Bluetooth combo chip with USB 2.0 multi-function. The highly integrated module makes the possibilities of web browsing, VoIP, video stream applications. With seamless roaming capabilities and advanced security, also could interact with different vendors' 802.11a/b/g/n 1x1 Access Points in the wireless LAN.

The wireless module complies with IEEE 802.11 a/b/g/n standard and it can achieve up to a speed of 150Mbps when using 40MHz bandwidth. The integrated module provides USB2.0 interface for Wi-Fi.

1.2 Description

Model Name	6233E-UUB
Product Description	Support Wi-Fi/Bluetooth functionalities
Dimension	L x W x H: 12.2 x 12.9 x 2.37 mm
Wi-Fi Interface	Support USB 2.0
BT Interface	USB
Operating temperature	-20°C to 70°C
Storage temperature	-40°C to 85°C

2. Features

General Features

- 802.11a/b/g/n 1T1R WLAN and Bluetooth combo chip
- Complete 802.11n solution for both 2.4GHz and 5GHz band
- 72.2Mbps receive PHY rate and 72.2Mbps transmit PHY rate using 20MHz bandwidth
- 150Mbps receive PHY rate and 150Mbps transmit PHY rate using 40MHz bandwidth
- Maximum data rate 54Mbps in 802.11g; and 150Mbps in 802.11n

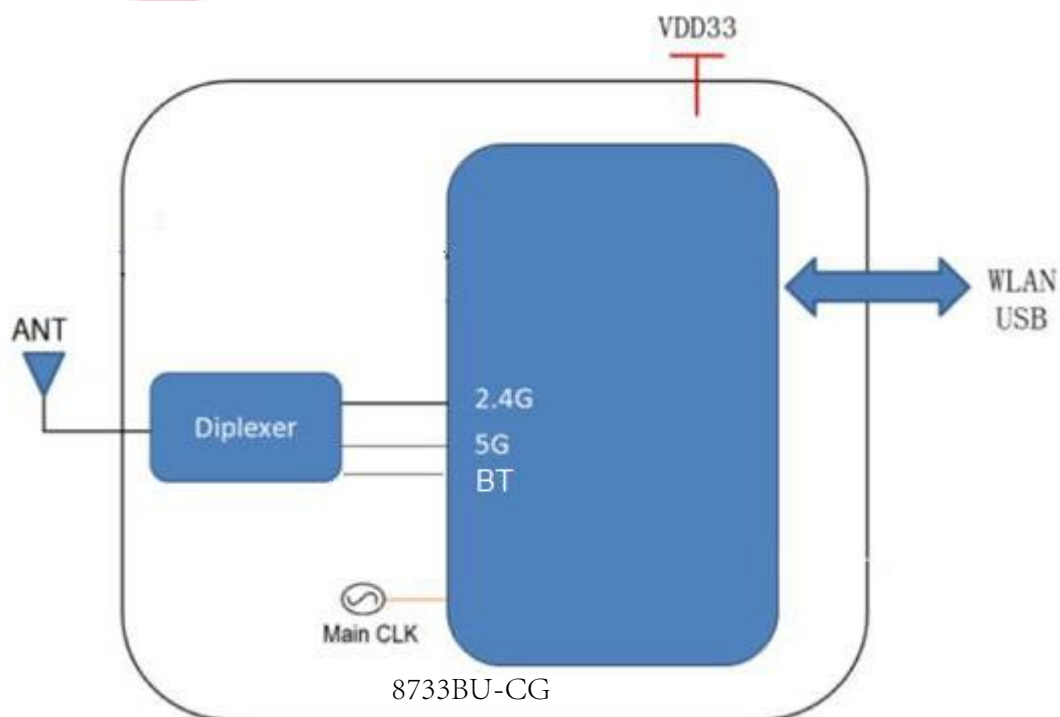
WLAN Interface

- USB Multi-Function for both BT (USB function 0) and WLAN (USB function 1)

Bluetooth Features

- Supports Bluetooth multiple Low Energy states
- Bluetooth Dual Mode support: Simultaneous LE and BR/EDR
- Small SMT package

3. Block Diagram



4. General Specification

4.1 WI-FI 2.4GHz RF Specification

Feature	Description	
WLAN Standard	IEEE 802.11 b/g/n Wi-Fi compliant	
Frequency Range	2412-2462 MHz(2.4 GHz ISM Band)	
Number of Channels	2.4GHz: Ch1 ~ Ch11	
Test Items	Typical Value	EVM
Output Power	802.11b /11Mbps : 17dBm $\pm$ 2 dB	EVM $\leq$ -9dB
	802.11g /54Mbps : 15dBm $\pm$ 2 dB	EVM $\leq$ -25dB
	802.11n /MCS7 : 14dBm $\pm$ 2 dB	EVM $\leq$ -28dB
Spectrum Mask	Meet with IEEE standard	
Freq. Tolerance	$\pm$ 20ppm	
Test Items	TYP Test Value	Standard Value
SISO Receive Sensitivity (11b,20MHz) @8% PER	- 11Mbps PER @ -85 dBm	$\leq$ -81
SISO Receive Sensitivity (11g,20MHz) @10% PER	- 54Mbps PER @ -71 dBm	$\leq$ -67
SISO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=7 PER @ -68 dBm	$\leq$ -65
SISO Receive Sensitivity (11n,40MHz) @10% PER	- MCS=7, PER @ -65 dBm	$\leq$ -62
Maximum Input Level	802.11b : -10 dBm	
	802.11g/n : -20 dBm	

Note: Other data rates transmit power are controlled by Power-by-Rate function of the driver.

4.2 WI-FI 5GHz RF Specification

Feature	Description	
WLAN Standard	IEEE 802.11 a/n Wi-Fi compliant	
Frequency Range	5150-5850 MHz(5.0 GHz Band)	
Number of Channels	5.0GHz: Please see the following table1	
Test Items	Typical Value	EVM
Output Power	802.11a /54Mbps : 16dBm $\pm$ 2 dB	EVM $\leq$ -25dB
	802.11n /MCS7 : 14dBm $\pm$ 2 dB	EVM $\leq$ -28dB

Spectrum Mask	Meet with IEEE standard	
Freq. Tolerance	$\pm 20\text{ppm}$	
Test Items	TYP Test Value	Standard Value
SISO Receive Sensitivity (11a,20MHz) @10% PER	- 54Mbps PER @ -71 dBm	≤ -68
SISO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=7 PER @ -68 dBm	≤ -65
SISO Receive Sensitivity (11n,40MHz) @10% PER	- MCS=7, PER @ -65 dBm	≤ -62
Maximum Input Level	802.11a/n : -10 dBm	
Antenna Reference	Small antennas with 0~2 dBi peak gain	

Note: Other data rates transmit power are controlled by Power-by-Rate function of the driver.

15GHz(20MHz) Channel table

Band range	Operating Channel Numbers	Channel center frequencies(MHz)
5180MHz~5240MHz	36	5180
	40	5200
	44	5220
	48	5240
5260MHz~5320MHz	52	5260
	56	5280
	60	5300
	64	5320
5550MHz~5700MHz	100	5500
	104	5520
	108	5540
	112	5560
	116	5580
	120	5600
	124	5620
	128	5640
	132	5660
	136	5680
	140	5700
5745MHz~5825MHz	149	5745
	153	5765

	157	5785
	161	5805
	165	5825

4.3 Bluetooth Specification

Feature	Description		
General Specification			
Bluetooth Standard	Bluetooth		
Host Interface	USB		
Antenna Reference	Small antennas with 0~2 dBi peak gain		
Frequency Band	2402 MHz ~ 2480 MHz		
Number of Channels	79 channels		
Modulation	GFSK, $\pi/4$ -DQPSK, 8-DPSK		
RF Specification			
	Min(dBm)	Typical(dBm)	Max(dBm)
Output Power (Class 1)	2	4	10
Sensitivity @ BER=0.1% for GFSK (1Mbps)			-70
Sensitivity @ BER=0.01% for $\pi/4$ -DQPSK (2Mbps)			-70
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)			-70
Maximum Input Level	GFSK (1Mbps):-20dBm		
	$\pi/4$ -DQPSK (2Mbps) :-20dBm		
	8DPSK (3Mbps) :-20dBm		

5. ID setting information

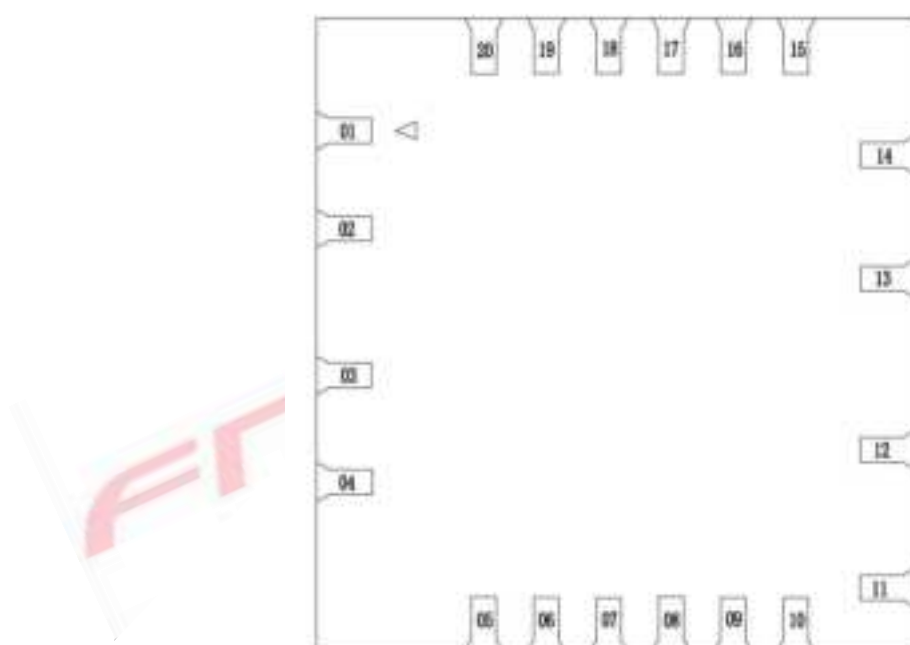
WI-FI

Vendor ID	-
Product ID	-

6. Pin Definition

6.1 Pin Outline

< TOP VIEW >



6.2 Pin Definition details

NO.	Name	Type	Description	Voltage
1	GND		Ground connections	
2	RF_0	I/O	RF I/O, Wi-Fi 2.4G/5G/BT	
3	NC		Floating(NC)	

4	GND		Ground connections	
5	BT_PCM_IN	I	PCM data input	3.3V
6	BT_PCM_OUT	O	PCM Data output	3.3V
7	BT_PCM_SYNC	I/O	PCM sync signal	3.3V
8	BT_PCM_CLK	I/O	PCM clock	3.3V
9	BT_WAKE_HST	O	Bluetooth device wake-up HOST	3.3V
10	HST_WAKE_BT	I	HOST wake-up Bluetooth device	3.3V
11	VD33	P	Main power source input	3.3V
12	DM	I/O	USB2.0 differential pair D-	
13	DP	I/O	USB2.0 differential pair D+	
14	GND		Ground connections	
15	NC		Floating(NC)	
16	NC		Floating(NC)	
17	NC		Floating(NC)	
18	CHIP_EN	I	Enable pin for module ON: pull high ; OFF: pull low (Default:pull high)	3.3V
19	HST_WAKE_WL	I	HOST wake-up WL device	3.3V
20	WL_WAKE_HST	O	WL device wake-up HOST	3.3V

P:POWER I:INPUT O:OUTPUT

7. Electrical Specifications

7.1 Power Supply DC Characteristics

	MIN	TYP	MAX	Unit
Operating Temperature	-20	25	70	deg.C
VDD33	3.0	3.3	3.6	V

7.2 Interface Circuit time series

7.2.1 USB Bus Timing during Power On Sequence



T_{on}: The main power ramp up duration

T_{en}: Interval between the rising point of 3.3V and chip_en

T_{gate}: Interval of 3.3V to be gated when chip_en voltage level < 2V

T_{attach}: USB attach state. The duration from resistor attached to USB host starting card detection procedure

T_{xtal}: XTAL starts

The power on flow Description:

The power on flow description : After main 3.3V ramp up, the internal power on reset is released by power ready detection circuit and the power management unit will be enabled. The power management unit enables the internal regulator and clock circuits.

The power management unit also enables the USB circuits.

USB analog circuits attach resisters to indicate the insertion of the USB device.

	Unit	Min	Typical	Max
T_{on}	ms	0.2	1.5	5
T_{por}	ms	--	2	10
T_{xtal}	ms	--	1.5	8
T_{attach}	ms	100	250	-
T_{1v25}	ms	0	0	5

7.2.2 Power off by 3.3V power sequence

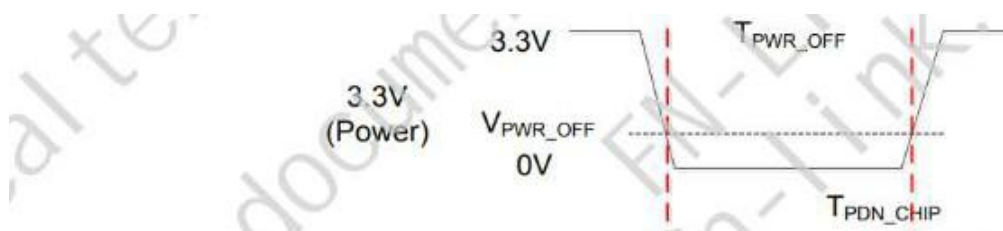


Figure 6. RTL8731BU-CG Power Off by 3.3V power Sequence

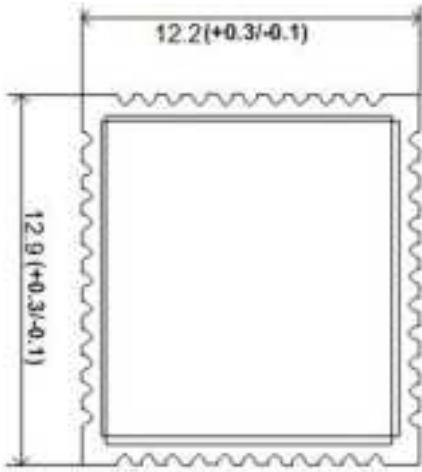
Table 14. RTL8731BU-CG Power Off by 3.3V power Timing Parameters

	Min	Typical	Max	Unit	Description
T_{PWR_OFF}	100	200	--	ms	3.3V power off time
V_{PWR_OFF}	--	--	0.7	V	3.3V power off voltage

When 3.3V power off and on afterward, the voltage of 3.3V power must keep lower than V_{PWR_OFF} , and the 3.3V power keeping off duration must be more than T_{PWR_OFF}

8. Size reference

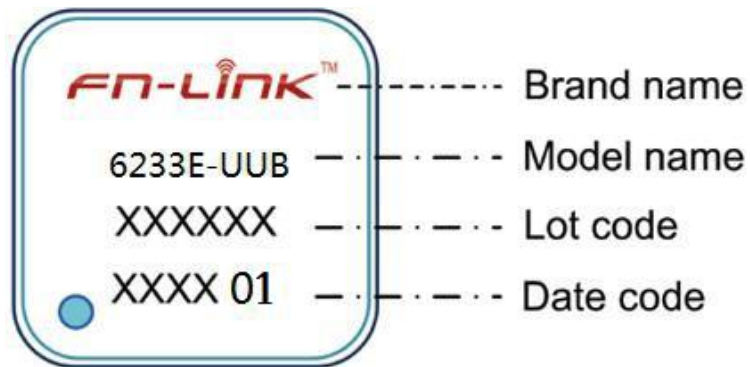
8.1 Module Picture

 L x W : 12.2 x 12.9 (+0.3/-0.1) mm	
H: 2.37 (±0.2) mm	
Weight	0.65g

Note: The module diagram will be updated in a future version

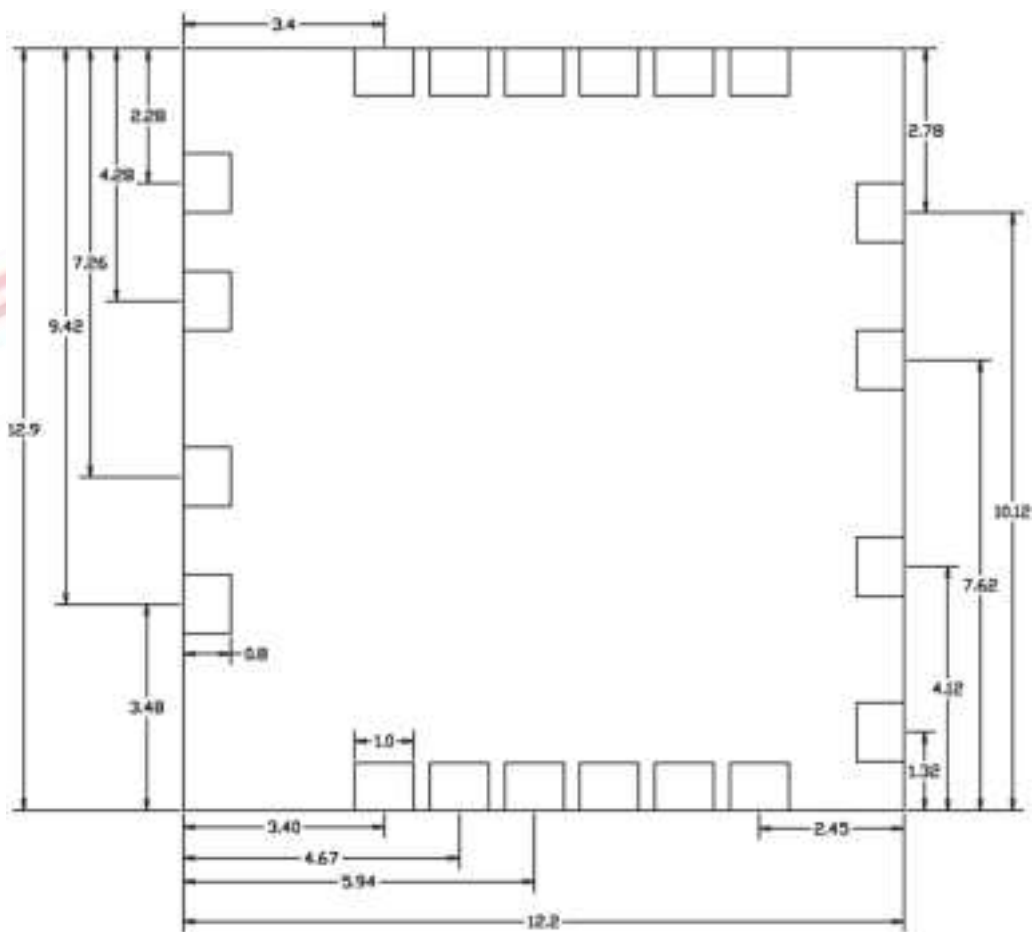
8.2 Marking Description

< TOP VIEW >

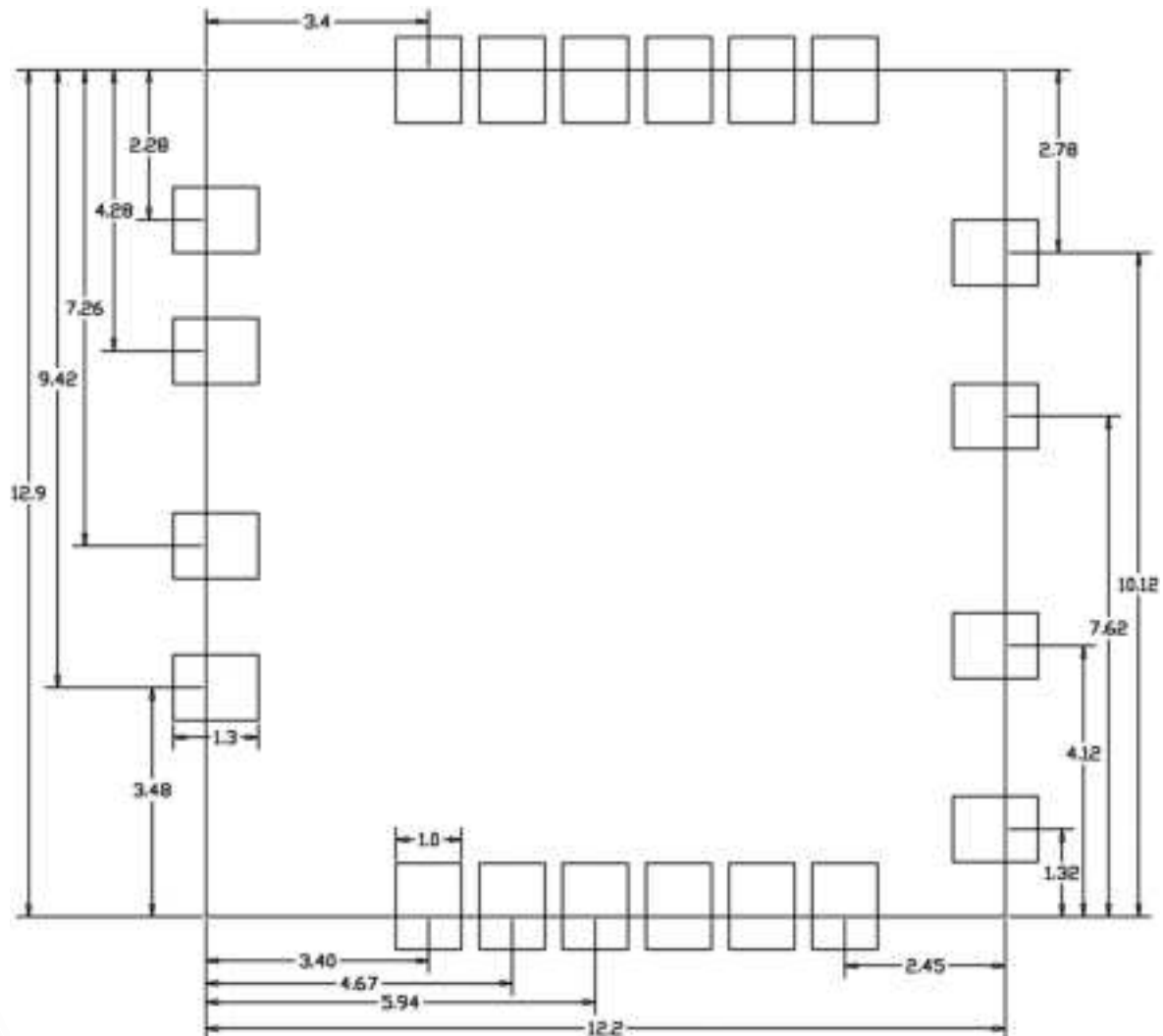


8.3 Physical Dimensions

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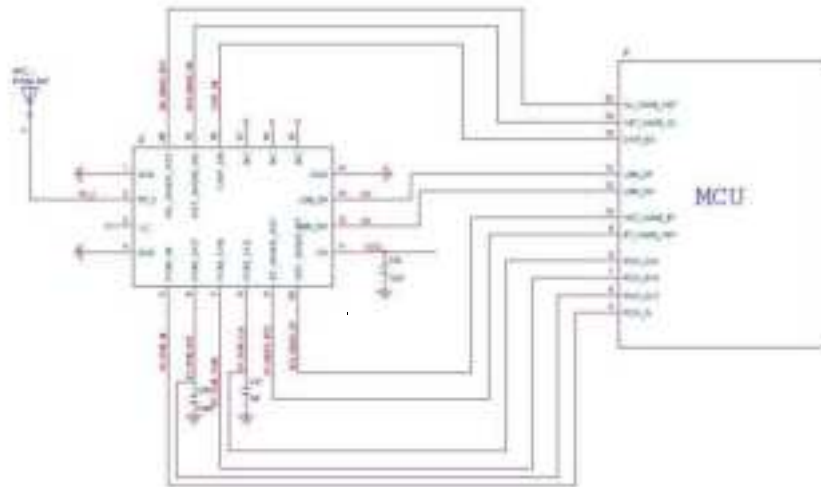
8.4 Layout Recommendation



9. The Key Material List

Item	Part Name	Description	Manufacturer
1	PCB	6233E-UUB,4L,FR4,12.2X12.9X0.8mm	XY-PCB, GDKX, Sunlord, SLPCB
2	Crystal	2520 40MHz 10ppm 12PF	ECEC, Hosonic, TKD, JWT
3	Chipset	RTL8733BU-CG,QFN40	Realtek
4	Shielding	6233E-UUB Shielding	信太, 精力通
5	Diplexer	RFDIP1607L898D1T	Glead, Walsin, ACX, Murata, MAG.LAYERS,ftgroup
6	Inductor	2016 2.2UH,±20%	MURATA,microgate,cenke,ceaiya

10. Reference Design



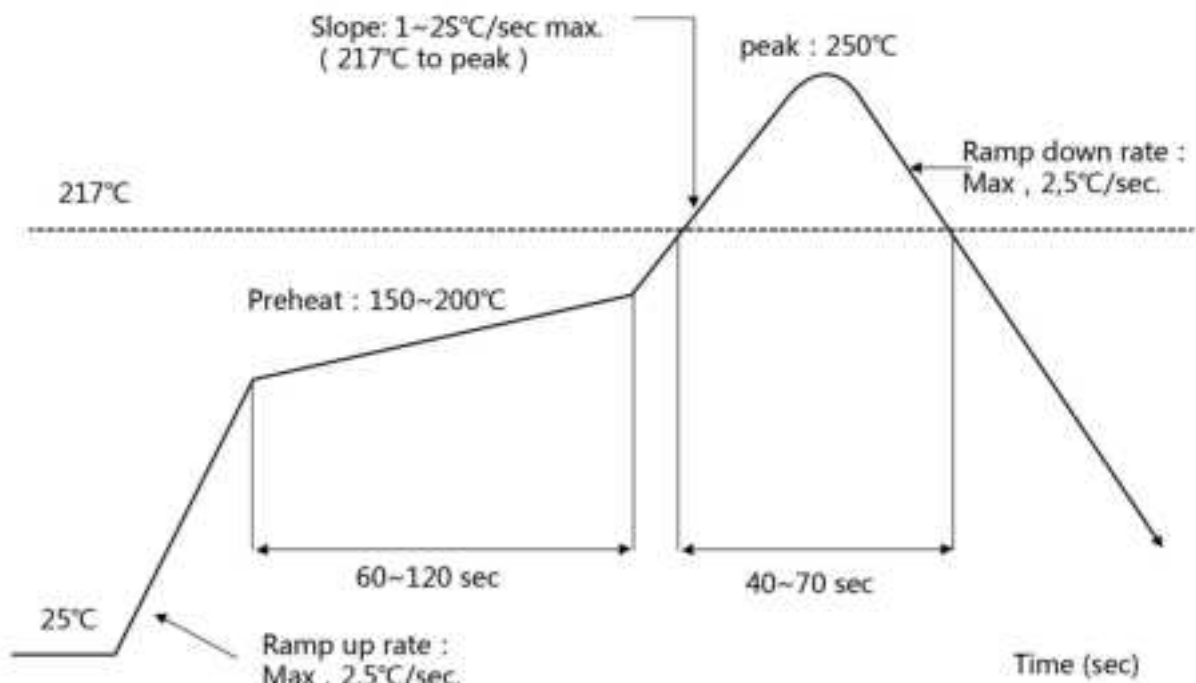
Note: Module requires independent power supply , supply capacity $\geq 1200\text{mA}$ and ripple less than 100mV ; Do not share power with amplifier, infrared device, camera, etc. USB differential trace, please keep $90\ \Omega$.

11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : $<250^{\circ}\text{C}$

Number of Times : ≤ 2 times



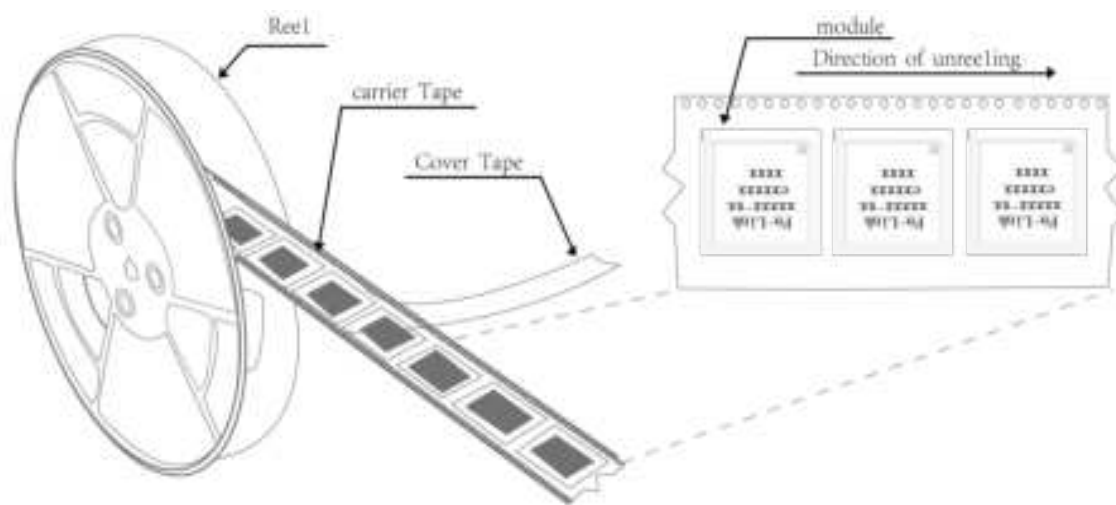
12. RoHS compliance

All hardware components are fully compliant with EU RoHS directive

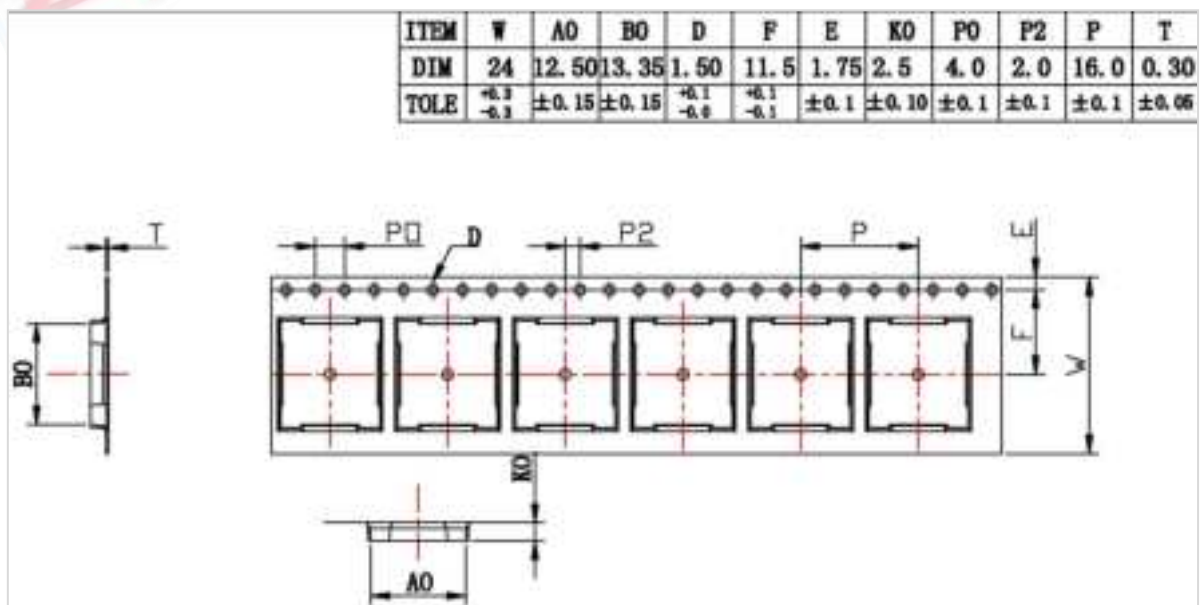
13. Package

13.1 Reel

A roll of 1500pcs

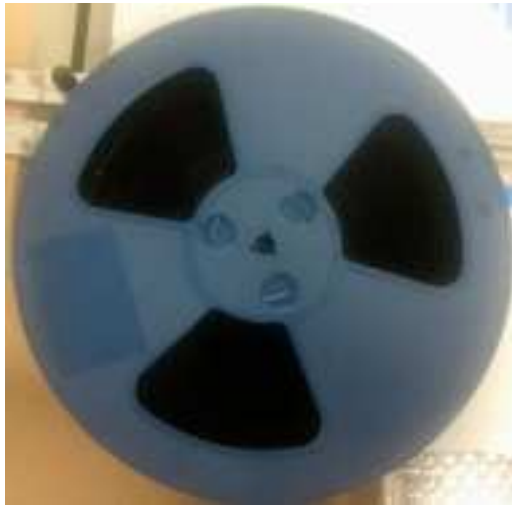


13.2 Carrier Tape Detail



13.3 Packaging Detail

the take-up package



Using self-adhesive tape

Size of black tape: 24mm*24.4m the cover tape :21.3mm*32.6m

Color of plastic disc: blue



NY bag size:450mm*415mm



size : 350*350*35mm



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

取得審驗證明之低功率射頻器材，非經核准，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

低功率射頻器材之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

前述合法通信，指依電信管理法規規定作業之無線電通信。

低功率射頻器材須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

應避免影響附近雷達系統之操作

1.1 List of applicable FCC rules:

The module complies with FCC Part 15.247.and FCC Part 15.407

1.2 Summarize the specific operational use conditions:

The module has been certified for Fix, Mobile applications.

This transmitter must not be co - located or operating in conjunction with any other antenna or transmitter.

1.3 Module procedures:

The module has its own RF shielding, which belong to signal module Standard requires:

Clear and specific instructions describing the conditions, limitations and procedures for third - parties to use and/or integrate the module into a host device (see Comprehensive integration instructions below).

Resolve: Supply example as follows:

Installation Notes:

- 1) 6233E-UUB Module Power supply range is DC 3.3V~3.6V, when you use 6233E-UUB Module design product, the power supply cannot exceed this range.
- 2) When connect 6233E-UUB Module to the host device, the host device must be power off.
- 3) Make sure the module pins correctly installed.
- 4) Make sure that the module does not allow users to replace or demolition.

1.4 Trace antenna designs:

Not applicable.

1.5 RF exposure considerations:

This equipment complies with FCC RF radiation exposure limits set forth for an

uncontrolled environment. The antenna(s) used for this transmitter must not be collocated or operating in conjunction with any other antenna or transmitter.

Note: the host product manuals must include a statement in order to alert the users of FCC RF exposure compliance.

Brand	Model	Antenna Net Gain(dBi)	Frequency range	Antenna Type
ABRACON	AFB4714A	BT: 2.76 dBi 2.4G WiFi: 2.76 dBi 5G band1: 3.16 dBi band2a: 3.07 dBi band2e: 2.30 dBi band3: 2.30 dBi	2400-2483.5 MHz 5150-5850 MHz	FPC Antenna
PSA	RFPCA381425IMLB301	BT: 2.21 dBi 2.4G WiFi: 2.21dBi 5G: 3.94 dBi	2400-2483.5 MHz 5150-5850 MHz	PCB Antenna
laird	EMN2449A25-25UFL	BT: 3.50 dBi 2.4G WiFi: 3.50 dBi 5G band1: 5.75 dBi band2a: 6.26 dBi band2e: 6.24 dBi band3: 5.18 dBi	2400-2483.5 MHz 5150-5851 MHz	PCB Antenna
iRobot	4802062	BT: 3.44 dBi 2.4G WiFi: 3.44 dBi 5G band1: 3.71 dBi band2a: 4.12 dBi band2e: 3.29 dBi band3: 2.49 dBi	2400-2483.5 MHz 5150-5852 MHz	PCB Antenna

1.7 Label and compliance information

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.

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 system integrator must place an exterior label on the outside of the final product housing the B100 Modules. Below is the content that must be included on this label.

The host product Labeling Requirements:

NOTICE: The host product must make sure that FCC labeling requirements are met. This includes

clearly visible exterior label on the outside of the final product housing that displays the contents shown in below:

FCC ID: 2AATL-6233E-UUB

1.8 Information on test modes and additional testing requirements:

When testing host product, the host manufacture should follow FCC KDB Publication 996369 D04 Module Integration Guide for testing the host products. The host manufacturer may operate their product during the measurements. In setting up the configurations, if the pairing and call box options

for testing does not work, then the host product manufacturer should coordinate with the module manufacturer for access to test mode software.

1.9 Additional testing, Part 15 Subpart B disclaimer:

The modular transmitter is only FCC authorized for the specific rule parts (FCC Part 15.247) list 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. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed when contains digital circuitry.

1.10 Information on test modes and additional testing requirements:

When testing host product, the host manufacture should follow FCC KDB Publication 996369 D04 Module Integration Guide for testing the host products. The host manufacturer may operate their product during the measurements.

FCC warning:

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.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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 antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter, End-Users must be provided with transmitter operation conditions for satisfying RF exposure compliance.

Canada warning:

- English:

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:

This device may not cause interference.

This device must accept any interference, including interference that may cause undesired operation of the device.

- French:

Cet appareil contient des émetteurs/récepteurs exemptés de licence qui sont conformes aux flux RSS exemptés de licence de Innovation, Science et développement économique Canada. L'exploitation est soumise aux deux conditions suivantes:

Cet appareil ne doit pas causer d'interférences.

Ce dispositif doit accepter toute interférence, y compris toute interférence pouvant causer un fonctionnement indésirable du dispositif

Les antennes utilisées pour cet émetteur doivent être installées pour assurer une distance de séparation d'au moins 20 cm par rapport à toutes les personnes et ne doivent pas être localisées ou fonctionner conjointement avec d'autres antennes ou émetteurs. Les utilisateurs doivent avoir des conditions de fonctionnement de l'émetteur pour satisfaire à la conformité à l'exposition RF.