

6223B-UUD

**Wi-Fi Single-band 1X1 + Bluetooth 4.2
Combo Module Datasheet**



6223B-UUD Module Datasheet

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Revision History

Version	Date	Revision Content	Draft	Approved
1.0	2019/07/04	Initial release	Lsp	Stone
1.1	2019/09/12	Refine section 1.	Lsp	Stone
1.2	2019/09/18	Add power consumption; Refine section 2.	Lsp	Stone
1.3	2020/04/29	Add thermal pad. Refine section 4, 5, 9 and 11.	Lsp	Stone
1.4	2020/11/09	Add module photo; correct package info.	Lsp	Stone

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1 Overview

1.1 Introduction

The 6223B-UUD is a low-cost and low-power consumption module which has all of the Wi-Fi and Bluetooth functionalities. The module is based on Realtek RTL8723DU chipset that highly integrated single-chip 802.11b/g/n 1T1R WLAN, and an integrated Bluetooth 2.1/4.2 single chip with USB 2.0 multi-function.

The wireless module complies with IEEE 802.11 b/g/n 1x1 standard and it can achieve up to a speed of 150Mbps to connect the wireless LAN. The integrated module provides USB interface for Wi-Fi and Bluetooth.

This compact module is a total solution for a combination of Wi-Fi and Bluetooth V4.2 technologies.

1.2 Features

- Complies with USB2.0 for WLAN and BT controller.
- Compatible with IEEE 802.11b standard to provide wireless 11Mbps data rate.
- Compatible with IEEE 802.11g standard to provide wireless 54Mbps data rate.
- Compatible with IEEE 802.11n standard to provide wireless 150Mbps data rate.
- CMOS MAC, Baseband PHY, and RF in a single chip for IEEE 802.11b/g/n compatible WLAN.
- Complete 802.11n solution for 2.4GHz band.
- 20MHz and 40MHz bandwidth transmission.
- DSSS with DPSK and DQPSK, CCK modulation with long and short preamble.
- Compatible with Bluetooth v2.1, V4.2 Systems
- Supports Bluetooth 4.0 Low Energy (BLE)
- Bluetooth 4.0 Dual Mode support: Simultaneous LE and BR/EDR
- Supports multiple Low Energy states

Block Diagram:

1.3 General Specification

Model Name	6223B-UUD
Product Description	Support Wi-Fi/Bluetooth functionalities
Dimension	L x W x H: 15 x 13 x 2.3 (typical) mm
Wi-Fi Interface	USB
BT Interface	USB
Operating temperature	0°C to 70°C
Storage temperature	-55°C to 125°C
RoHS	All hardware components are fully compliant with EU RoHS directive

1.4 Recommended Operating Rating

		Min.	Typ.	Max.	Unit
Operating Temperature		0	25	70	deg.C
VCC33		3.15	3.3	3.45	V
Current Consumption (VCC=3.3V)	Non-Associated	-	78	-	mA
	BT Associated Idle(WLAN off)	-	50	-	mA
	WLAN & BT Associated Idle	-	75	-	mA
	Rx Throughput (802.11b 11Mbps)	-	113	-	mA
	Rx Throughput (802.11g 54Mbps)	-	94	-	mA
	Tx Throughput (802.11b 11Mbps)	-	227	-	mA
	Tx Throughput (802.11g 54Mbps)	-	198	-	mA

※1.5 EEPROM Information

Wi-Fi

Reg Domain	
Vendor ID	
Device ID	

BT

Vendor ID	
Product ID	

2 Wi-Fi RF Specification

2.1 2.4GHz Wi-Fi Specification

Feature	Detailed Description
Standard	IEEE 802.11b/g/n
Modulation	DQPSK, DBPSK and CCK with DSSS QPSK , BPSK , 16QAM ,64QAM with OFDM
Operating Frequency	2400 ~ 2483.5MHz ISM band
Channel Numbers	13 channels for Worldwide
PHY Data Rate	802.11b: up to 11Mbps 802.11g: up to 54Mbps 802.11n: up to 150Mbps
Tx Output Power	802.11b: 17±2dBm at 11Mbps 802.11g: 15±2dBm at 54Mbps 802.11n HT20&HT40: 14±2dBm at MCS7,
EVM	802.11b: EVM ≤ -10dB at 11Mbps 802.11g: EVM ≤ -25dB at OFDM54 802.11n HT20&HT40: EVM ≤ -28dB at MCS7
MASK	IEEE compliant
Frequency Error	± 20 ppm
Rx Sensitivity	802.11b@8% PER: -83dBm at 11Mbps -92dBm at 1Mbps 802.11g@10% PER: -71dBm at 54Mbps -88dBm at 6Mbps 802.11n HT20@10% PER: -68dBm at MCS7 -87dBm at MCS0 802.11n HT40@10% PER: -66dBm at MCS7 -84dBm at MCS0
Antenna	External antenna

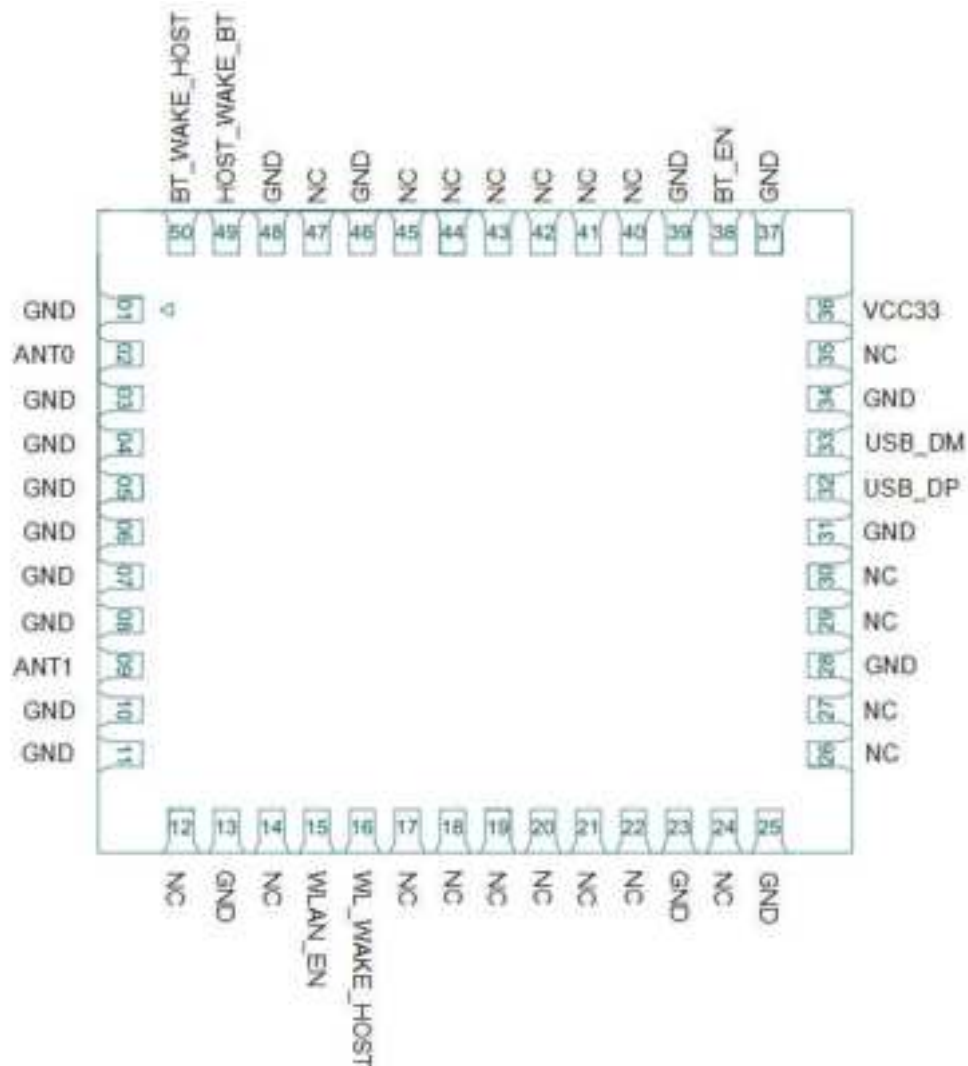
3 Bluetooth Specification

Feature	Description		
General Specification			
Bluetooth Standard	Bluetooth V4.2, V2.1		
Host Interface	USB		
Frequency Band	2402 MHz ~ 2480 MHz		
Number of Channels	79 channels for BDR+EDR, 40 channels for BLE		
Modulation	GFSK, $\pi/4$ -DQPSK and 8DPSK		
RF Specification			
	Min.	Typical.	Max.
Output Power (Class 1.5)		6dBm	
Output Power (Class 2)		2dBm	
Sensitivity @ BER=0.1% for GFSK (1Mbps)		-86dBm	
Sensitivity @ BER=0.01% for $\pi/4$ -DQPSK (2Mbps)		-86dBm	
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)		-80dBm	
Maximum Input Level	GFSK (1Mbps): -20dBm		
	$\pi/4$ -DQPSK (2Mbps) : -20dBm		
	8DPSK (3Mbps) : -20dBm		
Sensitive @PER=30.8% FOR BLE		-90dBm	

4 Pin Assignments

4.1 Pin Outline

< TOP VIEW >



4.2 Pin Definition

PIN	Name	Type	Description	Voltage
1	GND	—	Ground connections	
2	ANT0	I/O	RF I/O port chain0, for BT	
3~8	GND	—	Ground connections	

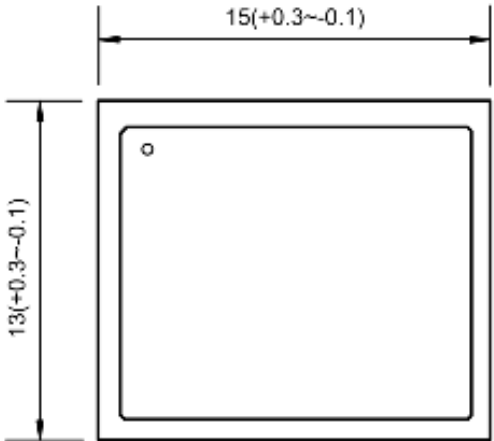
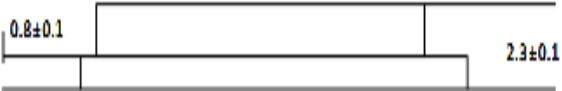
9	ANT1	I/O	RF I/O port chain1, for Wi-Fi 2.4GHz	
10~11	GND	—	Ground connections	
12	NC	—	No connect	
13	GND	—	Ground connections	
14	NC	—	No connect	
15	WLAN_EN	I	Enable pin for WLAN device ON: pull high ; OFF: pull low (Internal 100Kohm pull-up to 3.3V)	3.3V
16	WL_WAKE_HOST	O	WLAN to wake-up HOST (Internal 100Kohm pull-up to 3.3V)	3.3V
17~22	NC	—	No connect	
23	GND	—	Ground connections	
24	NC	—	No connect	
25	GND	—	Ground connections	
26~27	NC	—	No connect	
28	GND	—	Ground connections	
29~30	NC	—	No connect	
31	GND	—	Ground connections	
32	USB_DP	I/O	USB2.0 differential pair D+	
33	USB_DM	I/O	USB2.0 differential pair D-	
34	GND	—	Ground connections	
35	NC	—	No connect	
36	VCC33	P	Main power input 3.3V	3.3V
37	GND	—	Ground connections	
38	BT_EN	I	Enable pin for Bluetooth device ON: pull high ; OFF: pull low (Internal 100Kohm pull-up to 3.3V)	3.3V
39	GND	—	Ground connections	
40~45	NC	—	No connect	
46	GND	—	Ground connections	
47	NC	I	No connect (IC GPIO8)	3.3V
48	GND	—	Ground connections	
49	HOST_WAKE_BT	I	HOST wake-up Bluetooth device	3.3V
50	BT_WAKE_HOST	O	Bluetooth device to wake-up HOST (SoC internally pull-down, avoid external pull-high)	3.3V

P: POWER I: INPUT O: OUTPUT

5 Dimensions

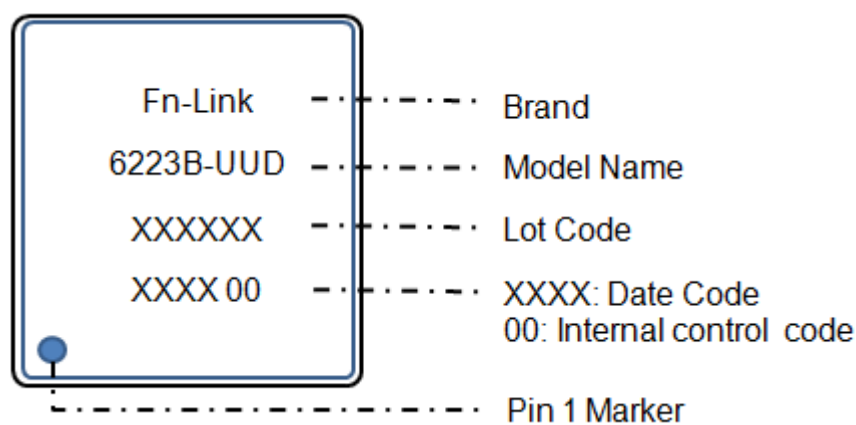
5.1 Physical Dimensions and Module Photo

(Unit: mm)

L x W: 15 x 13mm 	
H: 2.3mm	
Weight (typical)	0.85g

5.2 Marking Description

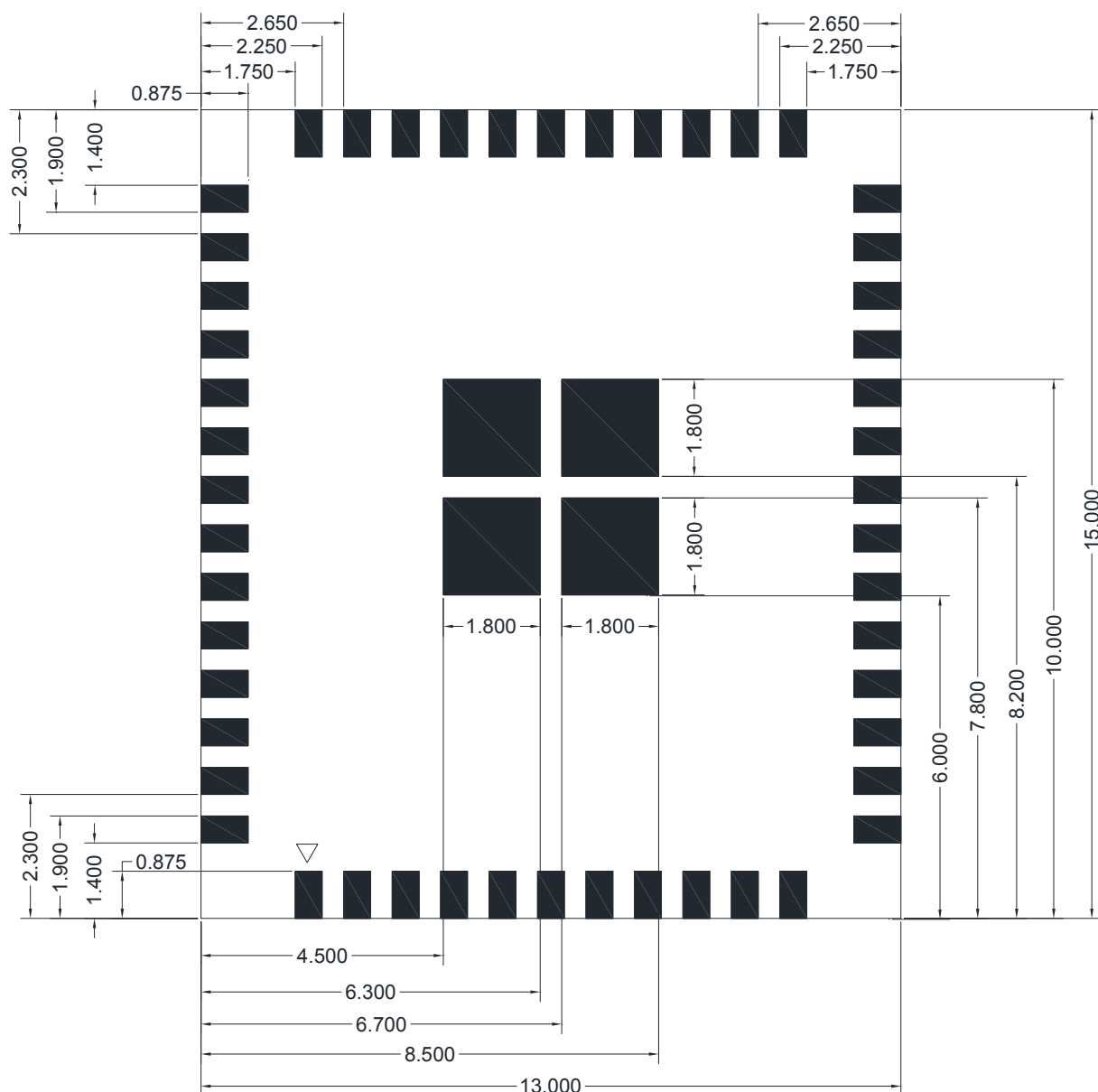
< TOP VIEW >



Note: Internal control code 00 for dual-ant version.

5.3 Physical Outline

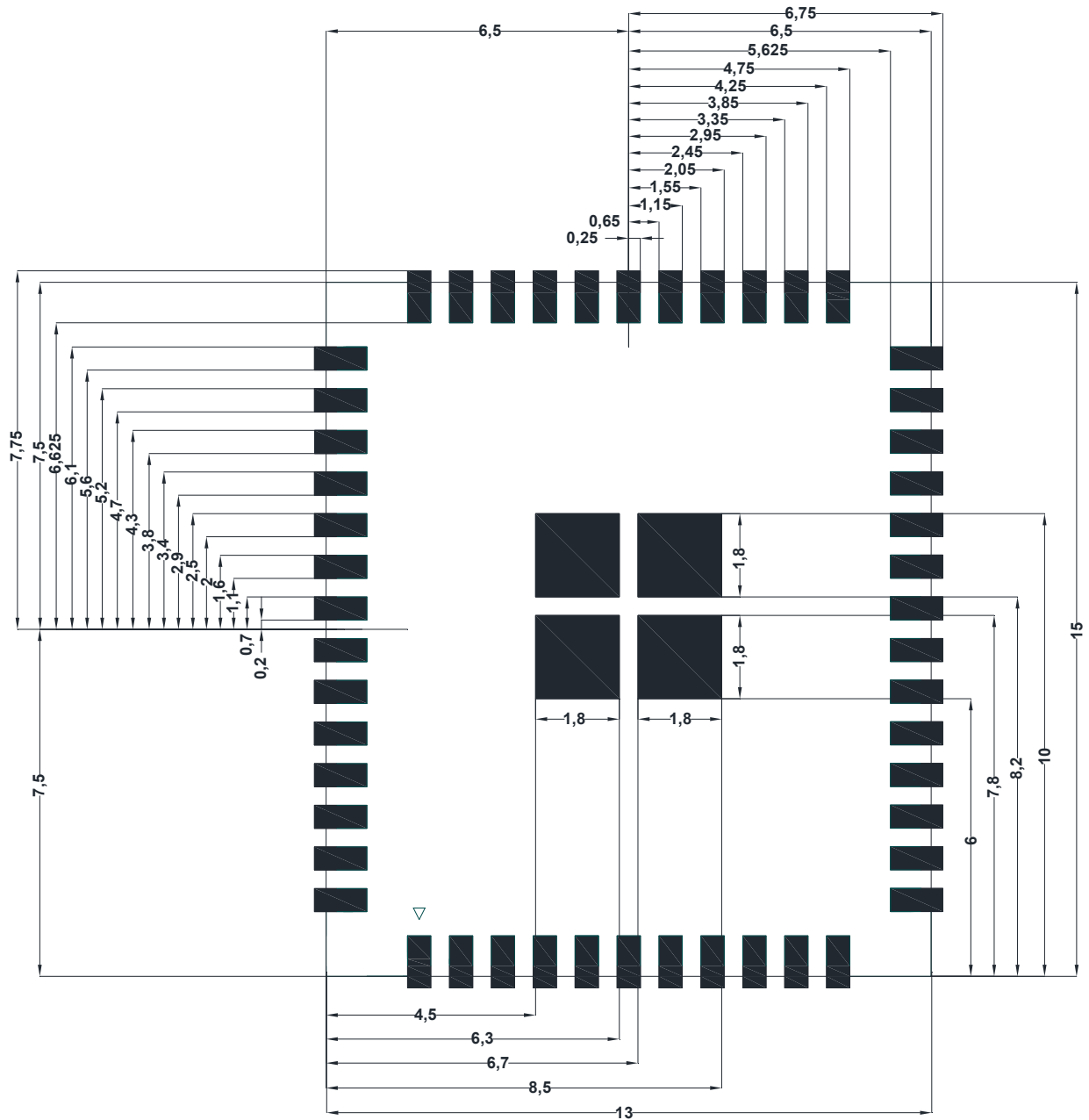
(Unit: mm)
< TOP VIEW >



5.4 Layout Recommendation

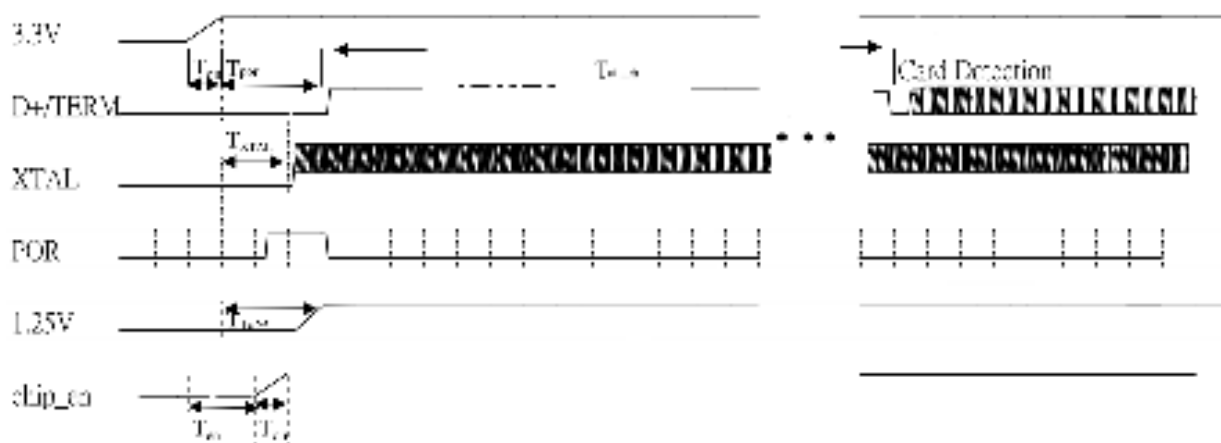
(Unit: mm)

<Top View>



6 Interface Timing Specification

6.1 Power On Sequence



T_{on} : the main power ramp on duration

T_{por} : the power on reset releases and power management unit executes power on tasks

T_{attach} : USB attach state

$T_{k-state}$: the duration from resistor attached to USB host starting card detection procedure

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.

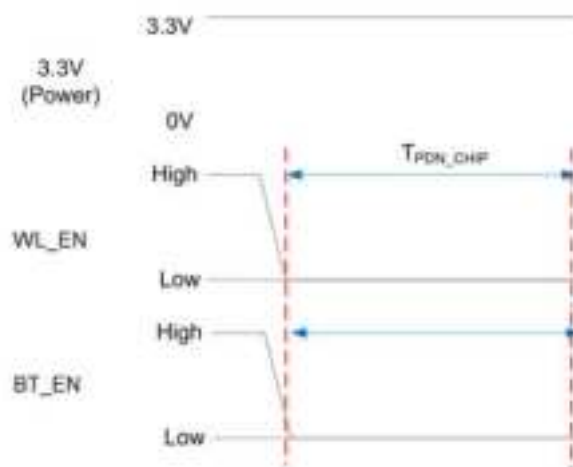
The power management unit also enables the USB circuits.

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

The typical timing range:

	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	--	2	5
T_{en}	ms	0	0	5

6.2 Power Off by WL_EN and BT_EN sequence

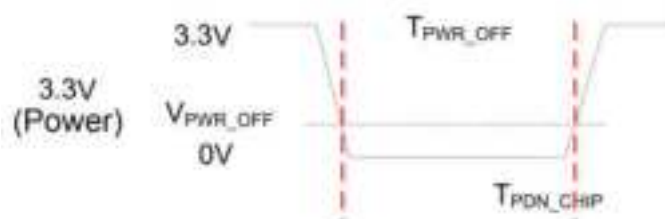


Power off by WL_EN and BT_EN timing parameters:

	Min	Typical	Max	Unit	Description
T_{PDN_CHIP}	100	200	--	ms	WL_EN, BT_EN keep low duration

WL_EN and BT_EN can externally shutdown the chipset when both WL_EN and BT_EN are pulled low. The keeping low duration must be more than T_{PDN_CHIP} .

6.3 Power Off by 3.3V power sequence



Power off by WL_EN and BT_EN 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} .

7 Reference Design

8 Ordering Information

Part No.	Description
FG6223BUUD-00	RTL8723DU, b/g/n, Wi-Fi+BLE4.2, 1T1R, 15X13mm, USB, Dual ANT

9 The Key Material List

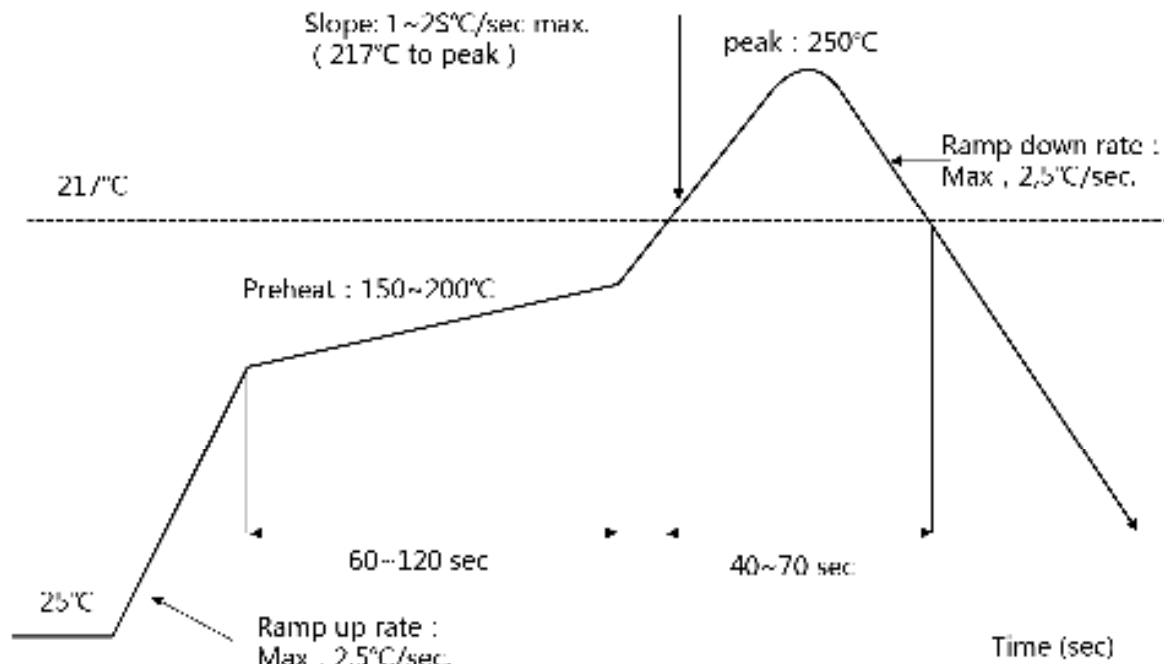
Main	Chipset	RTL8723DU-CG (Realtek)
Main	Crystal	2520, 40MHZ, 15pF, 10ppm, SX25Y040000BF1T-C (TKD)
Alternative	Crystal	2520, 40MHz, 15pF, 10ppm, E2SB40E00001AE (HOSONIC)
Alternative	Crystal	2520, 40MHz, 15pF, 10ppm (ECEC)
Alternative	Crystal	2520, 40MHz, 15pF, 10ppm (JWT)

10 Recommended Reflow Profile

Refer to IPC/JEDEC standard.

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

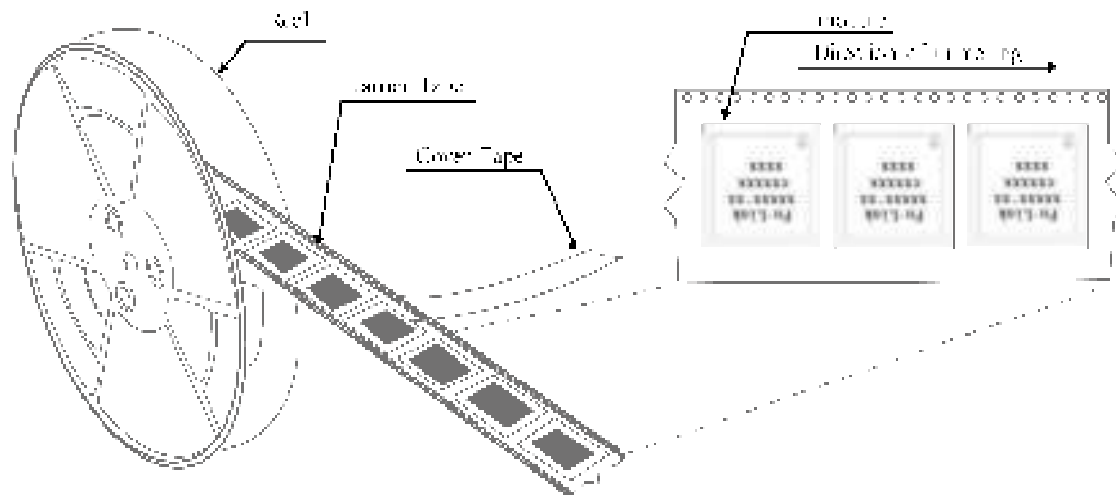
Number of Times: ≤ 2 times



11 Package Information

11.1 Reel

A roll of 1500pcs



11.2 Packaging Detail

The take-up package



Using self-adhesive tape

Size of carrier tape: 24mm*24.4m. The cover tape: 21.3mm*24.4m

Color of plastic disc: blue

A roll of 1500pcs



NY bag size: 450x415mm



Internal box size: 350x350x35mm



Carton size: 370x360x210mm

11.3 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