IEEE 802.11 b/g/n 2.4GHz 1T1R WiFi with Bluetooth v2.1+EDR/Bluetooth 3.0/4.0 Specification

Project Name	WIFI+BT Module
Model NO.	F23BDSM23-W2

Approved: William Tan	Checked: Jim Hu	Drafted: Neal Yu

CONTENTS

0. Revision History

REV NO	Date	Modifications	Draft	Approved
Rev0.1	2014-12-10	First Released	Neal Yu	Symen Song
Rev0.2	2014-12-24	Update the Outline Drawing	Neal Yu	William Tan
Rev0.3	2015-04-03	Modify the description of Pin24	Neal Yu	William Tan

0.1. Model No Definition

Example: F23BDSM23-W2

F 23B D S M 2 3-W 2

Control NO:0,1,2…

Antenna: W External, B Print ANT

Voltage: 3 3.3Vdc, 5 5Vdc

Product NO: 1, 2, 3….

Product Type: M Module, D Dongle

Interface: S SDIO, U USB, E PCI-E

IC Version: VD

IC Part NO: RTL8723BS

Manufacturer: FN-LINK
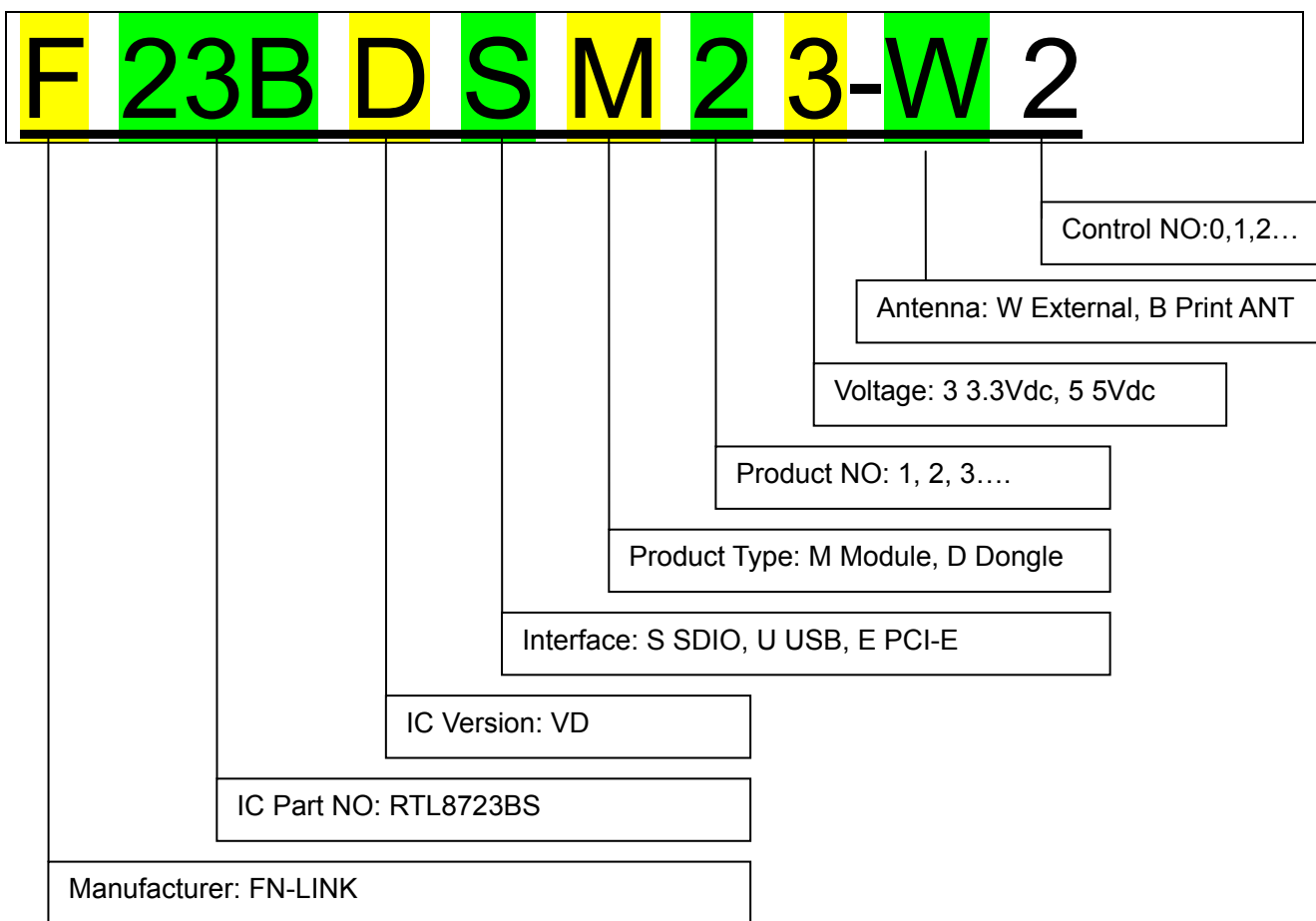
1. Introduction

1.1 Over view

F23BDSM23-W2 is a small size and low profile of WiFi + BT Combo module with LGA (Land-Grid Array) footprint, board size is 12mm*12mm with module thickness of 2mm. It can be easily manufactured on SMT process and highly suitable for tablet PC, ultra book, mobile device and consumer products. It provides SDIO interface for WiFi to connect with host processor and high speed UART interface for BT. It also has a PCM interface for audio data transmission with direct link to external audio codec via BT controller. The WiFi throughput can go up to 150Mbps in theory by using 1x1 802.11n b/g/n MIMO technology and Bluetooth can support BT2.1+EDR/BT3.0 and BT4.0.

F23BDSM23-W2 uses Realtek RTL8723BS, a highly integrated WiFi/BT single chip based on advanced COMS process. RTL8723BS integrates whole WiFi/BT function blocks into a chip, such as SDIO/UART, MAC, BB, AFE, RFE, PA, EEPROM and LDO/SWR, except fewer passive components remained on PCB. The general block diagram for the module is shown in Figure 1
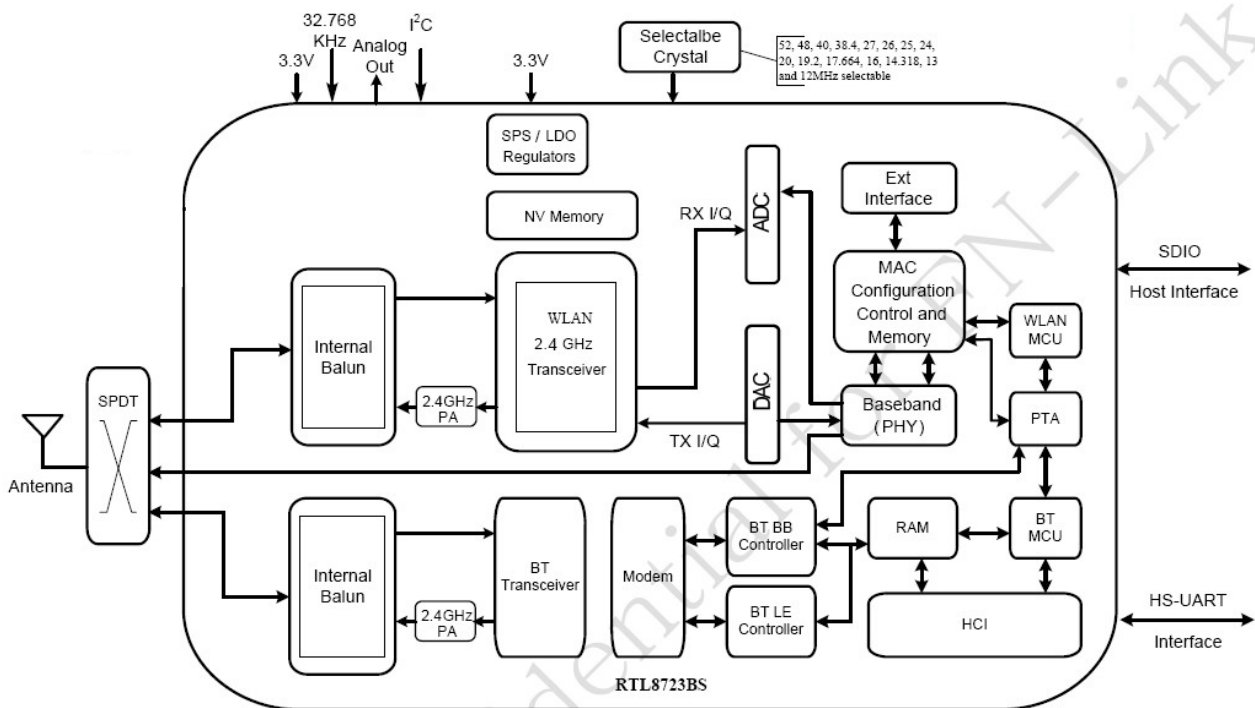

Figure 1

1.2 Product Features

● Operate at ISM frequency bands (2.4GHz)
● SDIO for WiFi and UART for Bluetooth
● IEEE standards support: IEEE 802.11b, IEEE 802.11g, IEEE 802.11n, IEEE 802.11d, IEEE 802.11e, IEEE 802.11h, IEEE 802.11i
● Fully Qualified for Bluetooth 2.1+EDR specification including both 2Mbps and 3Mbps modulation mode
● Fully qualified for Bluetooth 3.0
● Fully qualified for Bluetooth 4.0 Dual mode
● Full–speed Bluetooth operation with Piconet and Scatternet support
● Enterprise level security which can apply WPA/WPA2 certification for WiFi.
● WiFi 1 transmitter and 1 receiver allow data rates supporting up to 150 Mbps downstream and 150 Mbps upstream PHY rates

Note: The EUT does not support the technology MIMO .

2. GENERAL SPECIFICATION
2.1 RF Specifications

|	
Main Chipset	Realtek RTL8723BS-VD
Operating Frequency	2.400~2.4835GHz

Standards	**WiFi:**
	  IEEE 802.11b, IEEE 802.11g, IEEE 802.11n, IEEE 802.11d, IEEE 802.11e, IEEE 802.11h, IEEE 802.11i
	BT:
	  V2.1+EDR/BT v3.0/BT v4.0

Modulation	**WiFi:**
	  802.11b: CCK(11, 5.5Mbps), QPSK(2Mbps), BPSK(1Mbps),
	  802.11 g/n: OFDM
	BT:
	  8DPSK, π/4 DQPSK, GFSK

PHY Data rates	**WiFi:**
	  802.11b: 11,5.5,2,1 Mbps
	  802.11g: 54,48,36,24,18,12,9,6 Mbps
	  802.11n: up to 150Mbps
	BT:
	  1 Mbps for Basic Rate
	  2,3 Mbps for Enhanced Data Rate
	  6,9,12,18,24,36,48,54 Mbps for High Speed

Transmit Output Power	**WiFi:**
	  802.11b@11Mbps <10dBm
	  802.11g@6Mbps <10dBm
	  802.11g@54Mbps <10dBm
	  802.11n@65Mbps <10dBm (MCS 0_HT20)
	                        <10dBm (MCS 7_HT20)
	                        <10dBm (MCS 0_HT40)
	                        <10dBm (MCS 7_HT40)
	BT:
	  <5dBm

EVM	802.11b /11Mbps : EVM≦-9dB 802.11g /54Mbps : EVM≦-25dB 802.11n /65Mbps : EVM≦-28dB
Receiver Sensitivity (WiFi)	**802.11b@8% PER** 1Mbps -88dBm 2Mbps -87dBm 5.5Mbps -85dBm 11Mbps -82dBm **802.11g@10% PER** 6Mbps -86dBm 9Mbps -85dBm 12Mbps -84dBm 18Mbps -82dBm 24Mbps -80dBm 36Mbps -77dBm 48Mbps -73dBm 54Mbps -71dBm **802.11n@10% PER** MCS 0 -83dBm MCS 1 -82dBm MCS 2 -80dBm MCS 3 -78dBm MCS 4 -75dBm MCS 5 -71dBm MCS 6 -69dBm MCS 7 -67dBm
Receiver Sensitivity (BT)	-89dBm @ 1Mbps -86dBm @ 2Mbps -83dBm @ 3Mbps

| Operating Channel	**WiFi 2.4GHz:** 　　　　　　11: (Ch. 1-11) – United States 　　　　　　13: (Ch. 1-13) – Europe 　　　　　　14: (Ch. 1-14) – Japan **BT 2.4GHz:** Ch. 0 ~78
Media Access Control	**WiFi:**　CSMA/CA with ACK **BT:**　AFH, Time Division
Antenna	External Antenna
Antenna Gain	3.9dBi Max
Network Architecture	**WiFi:** Ad-hoc mode (Peer-to-Peer) 　　　　Infrastructure mode 　　　　Software AP 　　　　WiFi Direct **BT:**　Pico Net, Scatter Net
Security	**WiFi:** WPA, WPA-PSK, WPA2, WPA2-PSK, WEP 64bit & 128bit, IEEE 　　　802.11x, IEEE 802.11i **BT:**　　Simple Paring
OS Supported	Android /Linux/ Win CE /iOS /XP/WIN7
Host Interface	**WiFi:** SDIO **BT:** UART
Operating Voltage	**3.3±10% Vdc　I/O supply voltage**
Dimension	Typical　L12.0*W12.0*H1.6mm

2.2 Power Consumption

| Power Consumption (Typical by using SWR)	**WiFi only:** 　　　　TX Mode: (Throughput mode) 170mA　(MCS7/BW40/13dBm) 　　　　RX Mode: (Throughput mode) 130mA　(MCS7/BW40/-60dBm) 　　　　Associated Idle power saving with DTIM=3　2.1mA 　　　　Unassociated Idle:　0.1mA 　　　　RF disable Mode:　　0.1mA **BT:** Inquiry & Page Scan:　0.9 mA 　　ACL no traffic:　　　　7.5mA 　　SCO HV3:　　　　　　15.0mA

3. Mechanical Specification

3.1 Outline Drawing (Unit: ±0.15mm)
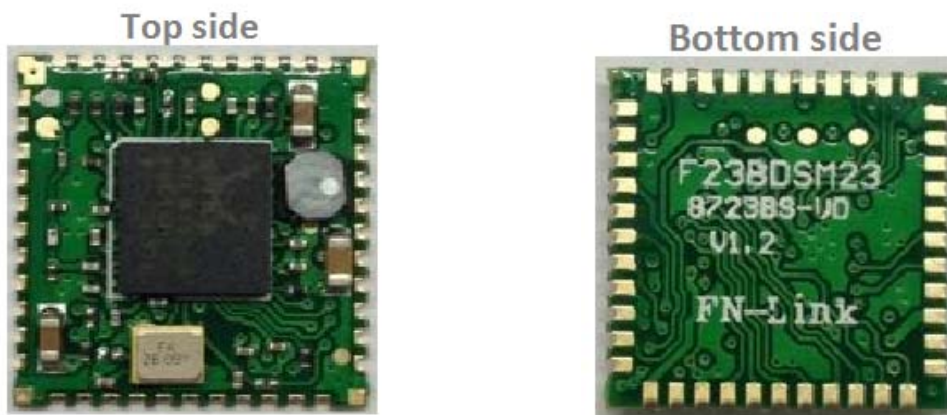
3.2 PCB LAYOUT Reference
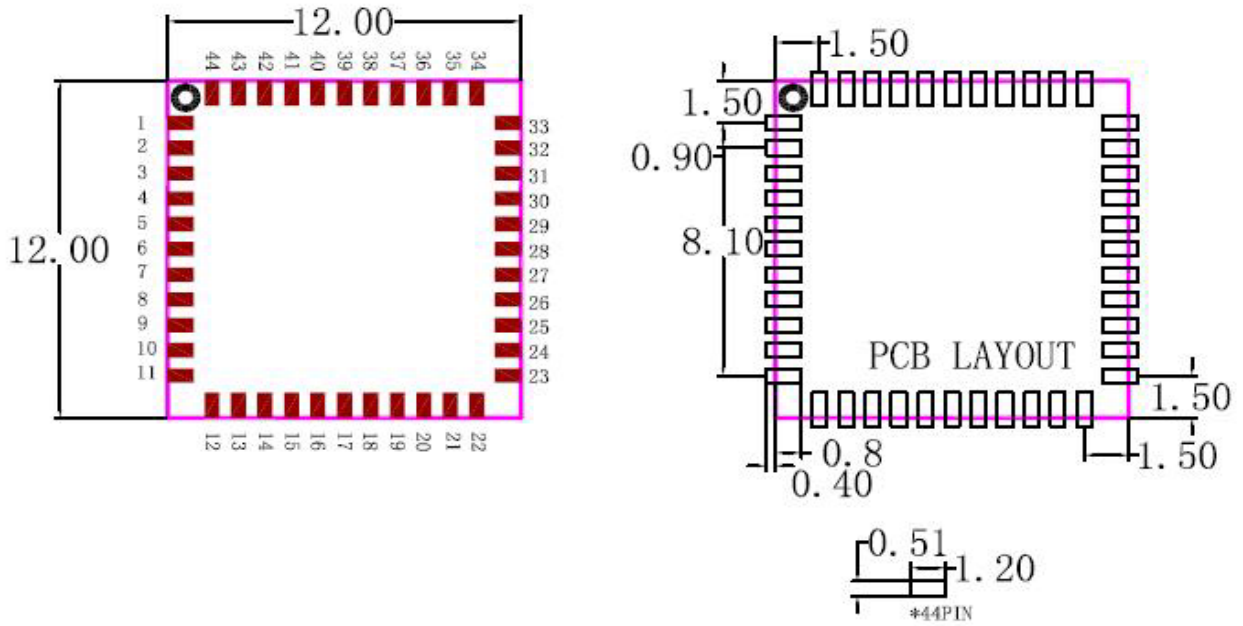

3.3 Pin Definition
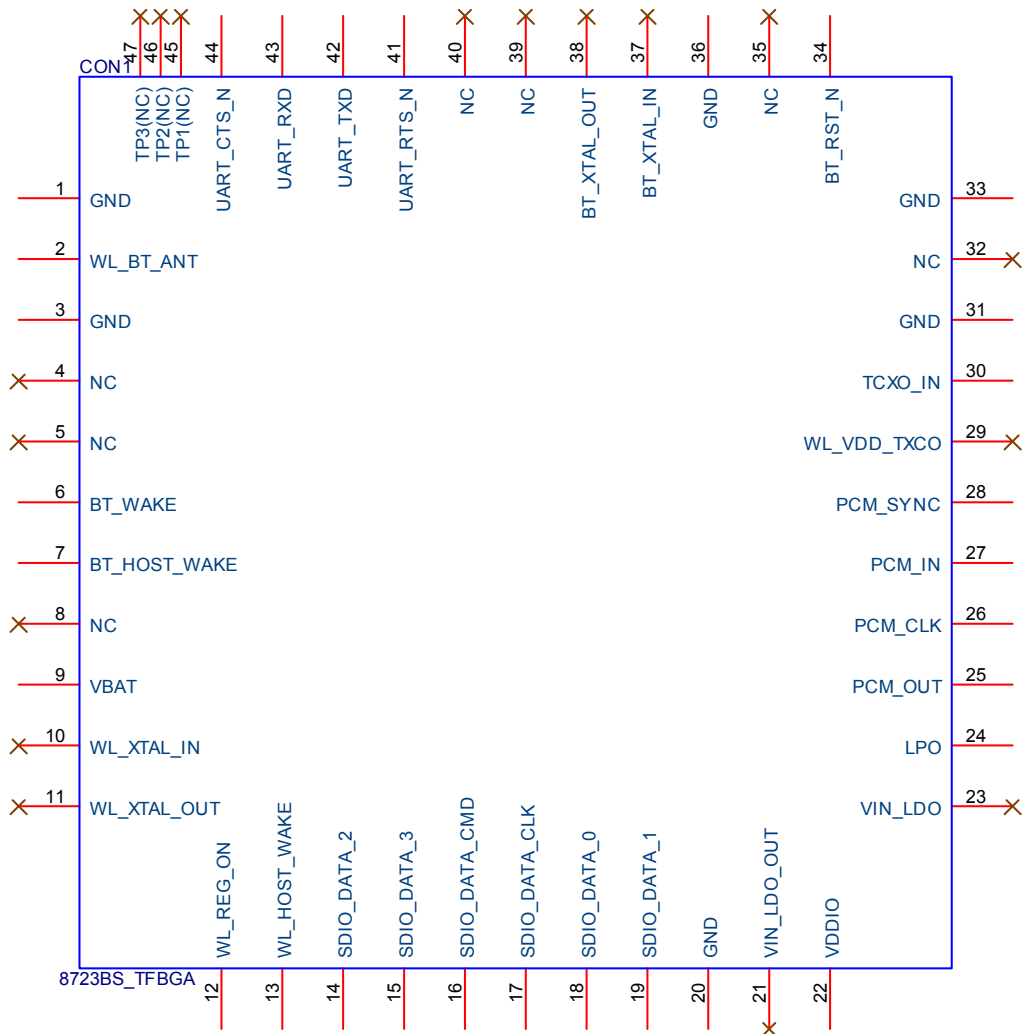
PIN Assignment

Pin #	Name	Description
1	GND	Ground connection
2	WL_BT_ANT	RF I/O port
3	GND	Ground connection
4	NC	Floating (NC)
5	NC	Floating (NC)
6	BT_WAKE	Wake-up BT
7	BT_HOST_WAKE	BT wake-up BT
8	NC	Floating (NC)
9	VBAT	**3.3±10%** V Main power voltage source input
10	WL_XTAL_IN	Floating (NC)
11	WL_XTAL_OUT	Floating (NC)
12	WL_REG_ON	Internal regulators power enable/disable
13	WL_HOST_WAKE	WLAN wake-up HOST
14	SDIO_DATA_2	SDIO data line 2
15	SDIO_DATA_3	SDIO data line 3
16	SDIO_DATA_CMD	SDIO command line
17	SDIO_DATA_CLK	SDIO clock line
18	SDIO_DATA_0	SDIO data line 0
19	SDIO_DATA_1	SDIO data line 1
20	GND	Ground
21	VIN_LDO_OUT	Floating(NC)
22	VDDIO	I/O Voltage supply input
23	VIN_LDO	Floating (NC)
24	LPO	External Clock input(32.768kHz), need to be reserved
25	PCM_OUT	PCM Output
26	PCM_CLK	PCM Clock
27	PCM_IN	PCM Input
28	PCM_SYNC	PCM Sync
29	WL_VDD_TXCO	Floating (NC)
30	TCXO_IN	Floating (NC)
31	GND	Ground
32	NC	Floating (NC)
33	GND	Ground
34	BT_RST_N	BT Reset IN
35	NC	Floating (NC)
36	GND	Ground
37	BT_XTAL_IN	Floating (NC)
38	BT_XTAL_OUT	Floating (NC)
39	NC	Floating (NC)
40	NC	Floating (NC)
41	UART_RTS_N	UART RTS
42	UART_TXD	UART Output

43	UART_RXD	UART Input
44	UART_CTS_N	UART CTS
45~47	TP1~TP3	Test point1~3　Floating (NC)
Total	47PINS	12.0*12.0*1.8mm LGA Package

3.4 SMD
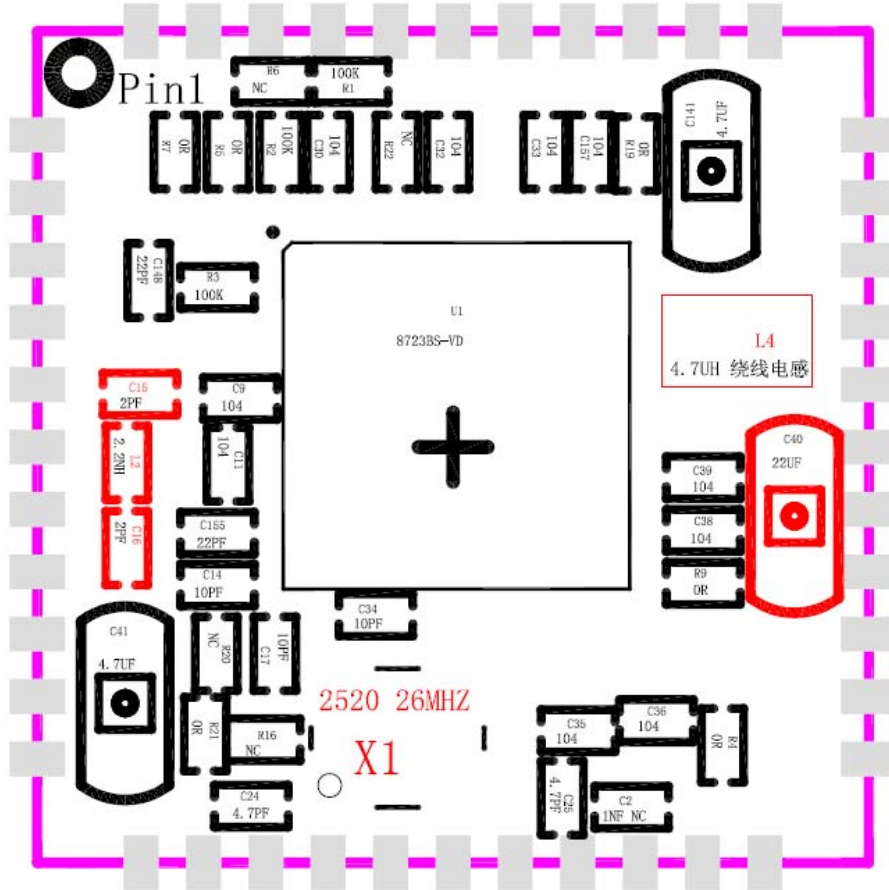
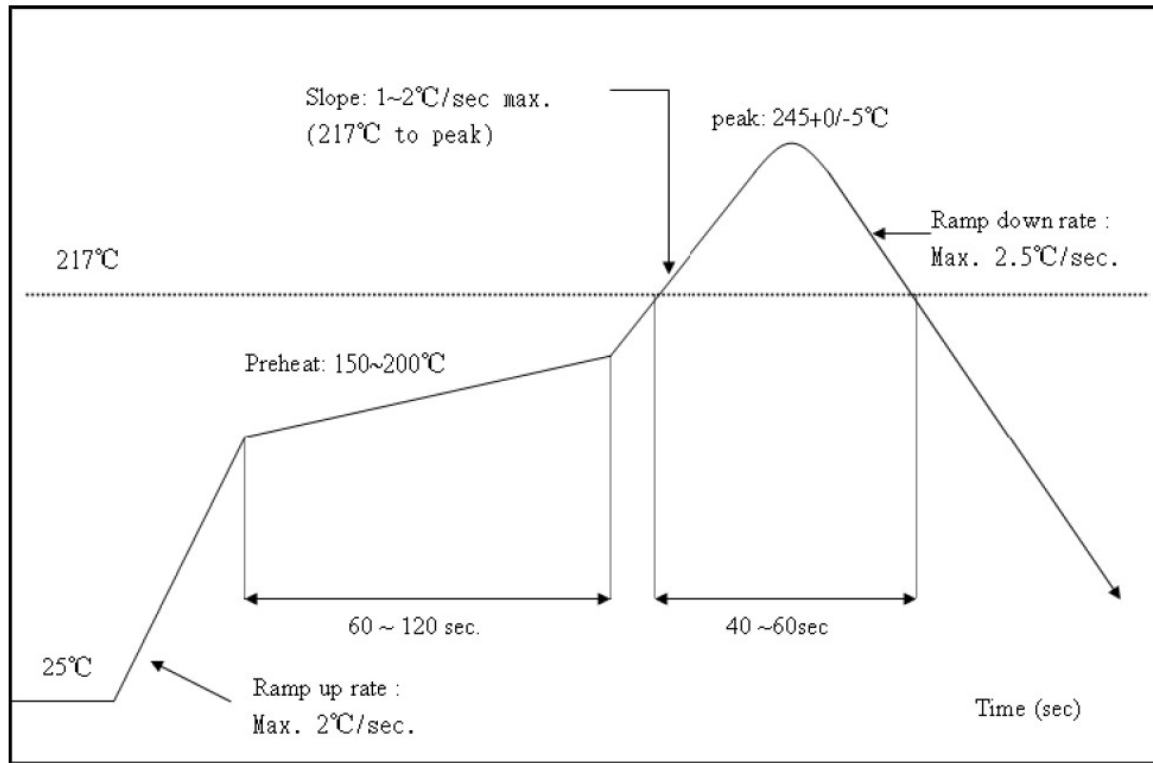## 4. Environmental Requirements

4.1 Conditions

Operating	Temperature:0°C to +70°C
	Relative Humidity: 10-90% (non-condensing)
Storage	Temperature: -40°C to +80°C (non-operating)
	Relative Humidity: 5-90% (non-condensing)
MTBF (Mean Time Between Failures)	Over 150,000hours

4.2 Recommended Reflow Profile
Referred to IPC/JEDEC standard.
Peak Temperature : <250°C
Number of Times : ≤2 times

### 4.3 Patch WIFI modules installed before the notice:

WIFI module installed note:
1. Please press 1 : 1 and then expand outward proportion to 0.7 mm, 0.12 mm thickness When open a stencil
2. Take and use the WIFI module, please insure the electrostatic protective measures.
3. Reflow soldering temperature should be according to the customer the main size of the products, such as the temperature set at 250 + 5 ℃ for the MID motherboard.

About the module packaging, storage and use of matters needing attention are as follows:
1. The module of the reel and storage life of vacuum packing: 1). Shelf life: 8 months, storage environment conditions: temperature in: < 40 ℃, relative humidity: < 90% r.h.
2. The module vacuum packing once opened, time limit of the assembly:
Card: 1) check the humidity display value should be less than 30% (in blue), such as: 30% ~ 40% (pink), or greater than 40% (red) the module have been moisture absorption.
2.) factory environmental temperature humidity control: ≦ 30% ℃, ≦ 60% r.h..
3). Once opened, the workshop the preservation of life for 168 hours.
3. Once opened, such as when not used up within 168 hours:
1). The module must be again to remove the module moisture absorption.
2). The baking temperature: 125 ℃, 8 hours.
3.) After baking, put the right amount of desiccant to seal packages.

5. Package
the take-up package
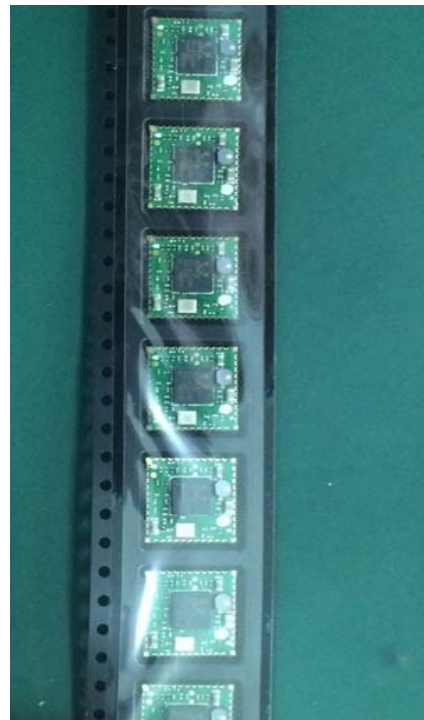
Size of black tape:24mm*32.6m
Color of plastic disc:blue
A roll of 2000pcs

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.

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.

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

LABEL OF THE END PRODUCT:

The final end product must be labelled in a visible area with the following "Contains TX FCC ID:

2AATL-F23BDSM23". If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual: 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.

RF Exposure

This device has been evaluated and shown compliant with the FCC RF Exposure limits under fixed exposure conditions (antennas are greater than 20cm from a person's body) when installed in certain specific OEM configurations.

This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. Due to missing shielding the module is strictly limited to integration by the Grantee himself or his dedicated OEM integrator under control of the Grantee. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

IMPORTANT NOTE:

This device is intended only for OEM integrators under the following conditions:

(1) According to FCC Part 15 Subpart C Section 15.212, the radio elements of the modular transmitter must have their own shielding. However, due to there is no shielding for this WIFI/BT module, this module is granted as a Limited Modular Approval.

(2) This module has been designed to operate with External antenna（I-PEX connector） having a maximum gain of 3.9dBi. The module is only certified with the installed antenna. Any change of the antenna will void the certification.

(3) Integration is typically strictly restricted to Grantee himself or dedicated OEM integrators under control of the Grantee.

The module Integrator will be responsible to satisfy SAR/RF exposure requirements, when the module integrated into any (portable, mobile, fixed) host device.

This module is intended for OEM integrator only and the OEM integrators and instructed to ensure that the end user has no manual instructions to remove or install the device. The OEM integrator is still responsible for the FCC compliance requirement of the end product, which integrates this module.

The module has no shielding and tested stand alone. This module is tested and approved as Limited modular approval with stand alone configuration, any OEM incorporated this radio module into any system are require additional testing and FCC Certification.

EU Regulatory Conformance

Hereby, we (FN-Link Technology Limited) declared that this device is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

CE0681

NCC 警語

本模組設計之目的僅用於系統廠商組裝，不針對公眾出售。
本模組之外接發射天線(I-PEX 連接頭)最大增值增益值不可超過 3.9dBi, 任何對產品或天線的修改都會造成產品認證的影響。
系統廠家安裝本模組後，需重新對系統作附加測試或認證評估。

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