neardi

FD7352U WIFI Module

Datasheet

V1.0
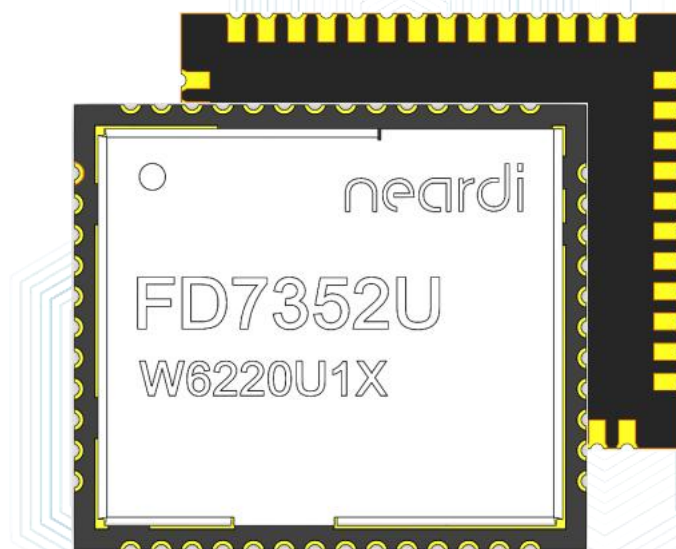
Shanghai Neardi Technology Co., Ltd.
www.neardi.com

Shanghai Neardi Technology Co., Ltd. (referred to as "Neardi Technology") always adheres to the customer-first service tenet and provides customers with fast and efficient support services. If you have any needs, please feel free to contact our company, the contact information is as follows:

Shanghai Neardi Technology Co., Ltd.
www.neardi.com
Tel: +86 21 20952021
Email: sales@neardi.com

Introduction

Neardi Technology provides this document for customers to use as a reference for product design and terminal applications. It is recommended that customers confirm the specifications and parameters provided in the document in detail, and confirm whether it can meet the design or application of the required products. At the same time, it is strongly recommended that customers do detailed tests in actual application scenarios based on the samples provided by our company to ensure that they meet the end use requirements. Neardi Technology is not responsible for any damages suffered due to the use of documents, materials and product functions.
The relevant parameters or design charts in this document are only examples, and customers should base their own independent analysis, evaluation and judgment when designing or using terminal products. Before customers use any design or service guided by this document, please read this statement carefully, understand and agree that although Neardi Technology has taken reasonable commercial efforts to provide the best possible experience, this document and its contents are PROVIDED TO YOU ON AN "AS AVAILABLE" BASIS. The information in this document is subject to change without notice.

Agreement

Unless specifically authorized by Neardi Technology, the recipient of the product documentation, hardware reference drawings, software descriptions and other materials provided by our company must keep the received content confidential and shall not use it for any other purpose other than the implementation and development of this project.

Copyright Statement

Version History

Version	Date	Illustrate
V1.0	2024/07/15	Initial Version

Contents

1 Product Overview

1.1 Product Introduction

FD7352U is a highly integrated, low-cost combo module with high-performance and low-power. It supports Wi-Fi 6 and Bluetooth 5.4 protocol, supports Wi-Fi MAC of the final version of Wi-Fi 6 Wave2 protocol, Wi-Fi Baseband of 2T2R, and high-performance RF. It also supports USB3.0, HS-UART and PCM interfaces for connection with the Host. This module also supports BT and Wi-Fi to work in coexistence mode. It is suitable for consumer electronics such as IPC, tablet and IOT, and can also be used in fields with high reliability requirements such as industrial interconnection.
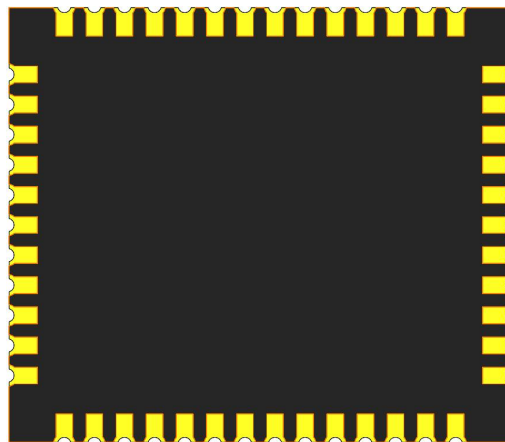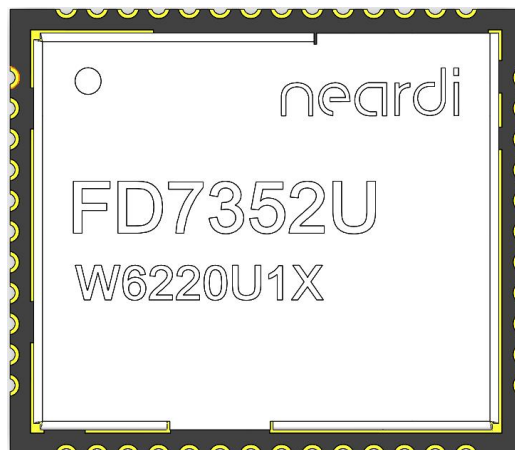
1.2 Wi-Fi Characteristics

✓ IEEE 802.11a/b/g/n/ac/ax (supports wave-2) wireless LAN communication protocol

✓ IEEE 802.11 d/e/h/i/k/mc/r/v/w

✓ 2.4G Phy rate up to 572.4Mbps, 5G Phy rate up to 1.2Gbps, Throughput 900Mbps

✓ Multiple modes such as Wi-Fi STA, AP, and P2P

✓ Support DBDC、DBSC

✓ 2.4G 40MHZ, 5G 80MHz bandwidth, 2T/2R

✓ Up to 1024QAM modulation, supports LDPC and STBC

✓ UL/DL OFDMA, UL/DL MU-MIMO

✓ QoS, WFA WMM, WMM PS

✓ RSSI and CSI Reporting

✓ Beamformee and 4*2 Tx Beamforming、2*2/2*1 Tx Beamforming

✓ WPA, WPA2, WPA3 encryption and decryption, WAPI and WPS2.0

✓ ER, DCM to improve transceiver gain

✓ 20in40/80/160, 80in160 HE PPDU, Partial band MU MIMO to improve air interface utilization

✓ BSS Color, Spatial Reuse to improve air interface utilization

✓ TWT, to optimize dynamic power consumption in multi-BSS environment

1.3 Bluetooth Characteristics

✓ Support Bluetooth (Classic BT+BLE) v2.1, v3.0, v4.2, v5.4 features

✓ USB interface for BT data transmission

✓ PCM/IIS interface for audio transmission

✓ BR/EDR/LE 1M/LE 2M/LE LR

✓ Support sco and esco link

✓ SSP/Secure Connection

✓ Low power mode (sniff, sniff sub-rating)

✓ Support BT/Wi-Fi coexistence

1.4 Block Diagram
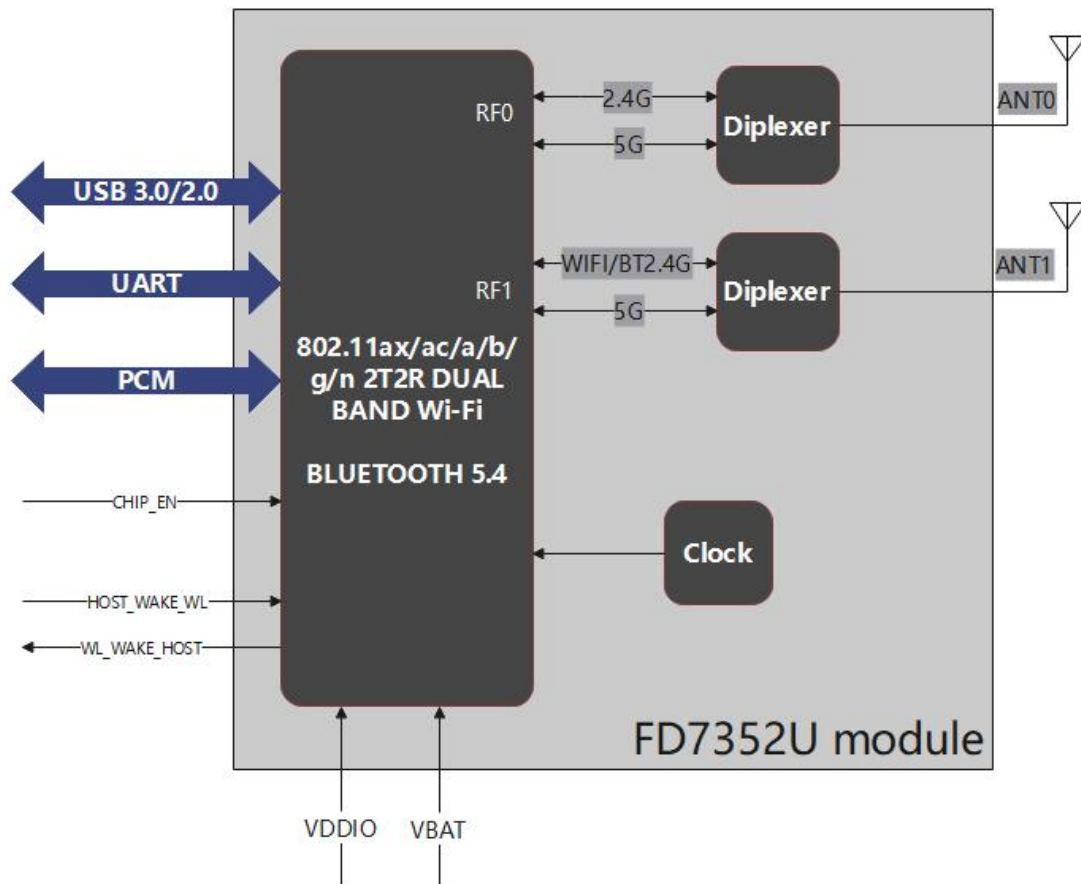
1.5 Parameters

Product Name	FD7352U
Product description	802.11ax/ac/a/b/g/n 2T2R dual band Wi-Fi and Bluetooth 5.4 comb module
Dimension	15.0(±0.1) mm*13.0(±0.1) mm*1.65(±0.2) mm
Power supply	VBAT: 3.0~3.6V; VDDIO: 1.62V~1.92V/3.0V~3.6V
Host interface	USB3.0 + UART + PCM
Footprint	LCC 50pin
Operating temperature	-30°C to 70°C
Operating humidity	10% to 90% (Non-Condensing)
Storage temperature	- 40°C to 85°C

2 Pin Definition

2.1 Pin Number
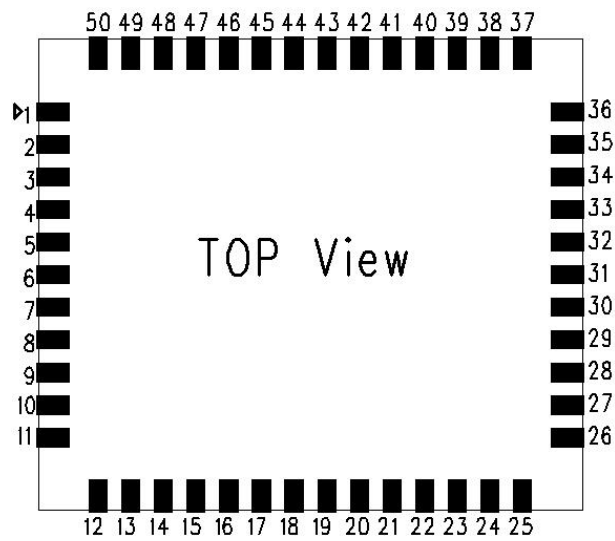
2.2 Pin   Description

Pin Number	Pin Name	Pin Type	Pin Description
1	GND	G	Ground connections
2	WL_S1/BT	RF	Wi-Fi & BT antenna I/O port
3	GND	G	Ground connections
4	GND	G	Ground connections
5	GND	G	Ground connections
6	GND	G	Ground connections
7	GND	G	Ground connections
8	GND	G	Ground connections
9	WL_S0	RF	Wi-Fi antenna I/O port
10	GND	G	Ground connections
11	GND	G	Ground connections
12	NC	-	Floating (Don't connected to ground)
13	NC	-	Floating (Don't connected to ground)
14	NC	-	Floating (Don't connected to ground)
15	CHIP_EN	I	Module enable signal
16	NC	-	Floating (Don't connected to ground)

17	NC/U1TXD	-	Floating (Don't connected to ground)
18	NC/ U1RXD	-	Floating (Don't connected to ground)
19	PCM_OUT	O	PCM Data output
20	PCM_IN	I	PCM data input
21	PCM_SYNC	I/O	PCM sync signal
22	PCM_CLK	I/O	PCM clock
23	GND	G	Ground connections
24	NC	-	Floating (Don't connected to ground)
25	Boot_USB3.0	I	Boot select pin,pull low boot from usb3.0 (default boot from usb2.0) If not used,keep it floating
26	NC	-	Floating (Don't connected to ground)
27	GND	G	Ground connections
28	DP	I/O	USB Transmitter/Receiver Differential Pair
29	DM	I/O	USB Transmitter/Receiver Differential Pair
30	GND	G	Ground connections
31	NC	-	Floating (Don't connected to ground)
32	GND	G	Ground connections
33	NC	-	Floating (Don't connected to ground)
34	VDDIO	P	I/O Voltage supply input
35	NC	-	Floating (Don't connected to ground)
36	VBAT	P	Main power voltage source input
37	NC	-	Floating (Don't connected to ground)
38	NC	-	Floating (Don't connected to ground)
39	GND	G	Ground connections
40	UART_TXD	I/O	UART TX signal
41	UART_RXD	I/O	UART RX signal
42	UART_RTS	I/O	UART DCE request to send signal
43	UART_CTS	I/O	UART DEC clear to send signal
44	SSRX-	I	USB3.0 receive data-Negative
45	SSRX+	I	USB3.0 receive data-Positive
46	SSTX-	O	USB3.0 transmit data-Negative
47	SSTX+	O	USB3.0 transmit data-Postive
48	BT_WAKE_HOST	I/O	Reserved/BT_WAKE_HOST
49	HOST_WAKE_WL	I/O	HOST wake-up WLAN
50	WL_WAKE_HOST	I/O	WLAN wake-up HOST

3 Mechanical Specifications

3.1 Mechanical Dimensions
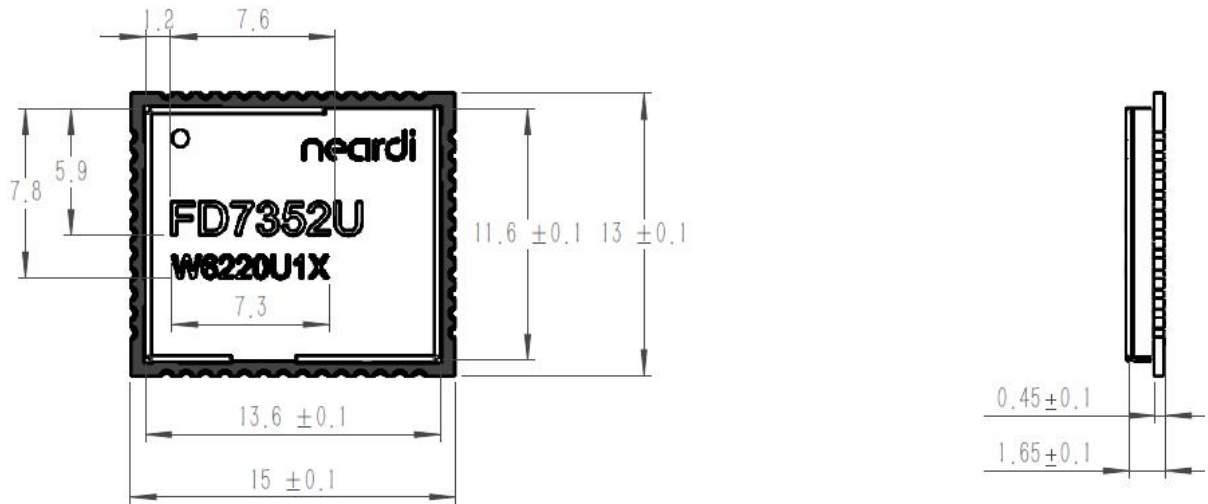
3.2 Recommended PCB Layout Footprint
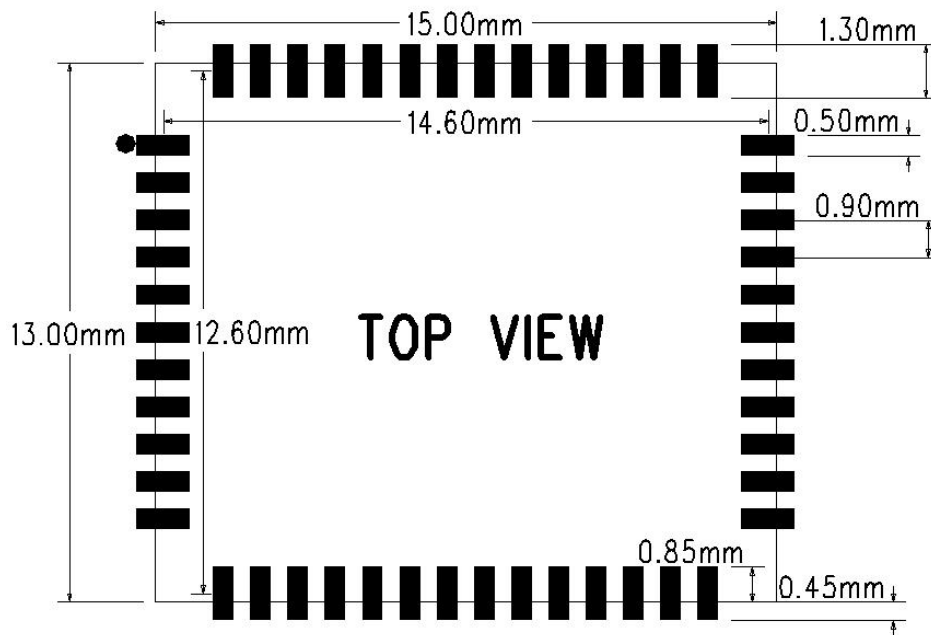
4 Electrical Performance and Reliability

4.1 Absolute Maximum Voltage Range

Symbol	Description	Min	Max	Unit
VBAT	Power Supply Voltage	-0.5	5.25 *	V
VDDIO	Digital/Bluetooth/SDIO/ I/O Voltage	-0.5	5.25	V

* If the voltage exceeds this value, the chip will be irreversibly damaged.

4.2 Recommended Operation Conditions

Symbol	Description	Min	Type	Max	Unit
Ta	Ambient Operating Temperature	-30	25	70	℃
Antenna	External Antenna VSWR		1.92:1	2:01	
VBAT	Power Supply Voltage	3	3.3	3.6	V
	Power Supply Current	-	-	2	A
VDDIO	Digital I/O Voltage	1.62	1.8	1.92	V
		3	3.3	3.6	V
		3	3.3	3.6	V
	Supply Current	-	-	150	mA

4.3 Power On/Off Sequence

Symbol	Description	Min	Type	Max	Unit
1	VBAT Ramp up time	0.2	0.5	-	mS
2	VDDIO should be powered on after VBAT is powered on	0	-	-	mS
3	CHIP_EN should be powered on after VDDIO is powered on	0	-	-	mS
4	CHIP_EN reset time	50	-	-	mS

4.4 Reliability

Item	Test Model	Class	Level	Criteria
ESD	HBM	2	2000V	ANSI/ESDA/JEDEC JS-001-2017
	CDM	C2a	500V	ANSI/ESDA/JEDEC JS-002-2018
Latch-up	Current	II A	200mA	JEDEC STANDARD NO.78F JANUARY 2022
	Voltage	II A	1.5xVmax	JEDEC STANDARD NO.78F JANUARY 2022

5   Interface Timing Parameters

5.1 PCM Interface Timing
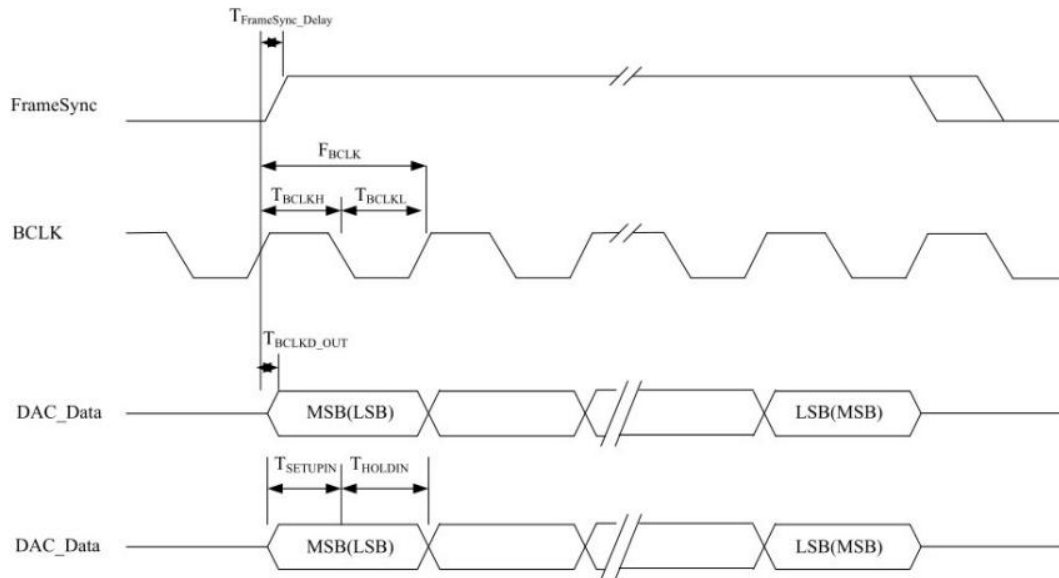
PCM Bus Timing

6 RF Characteristics

6.1 2.4GHZ Wi-Fi Radio Frequency (RF) Characteristics

Conditions: VBAT=3.3V; VDDIO=1.8V; Ta:25℃	
Features	Description
Wi-Fi Standard	IEEE 802.11b/g/n/ac/ax
Frequency Range	2.4~2.4835GHz(2.4GHz ISM Band)
Channels	Ch1~Ch13
Modulation	802.11b (DSSS): CCK, DQPSK, DBPSK;
	802.11g (OFDM): BPSK, QPSK, QAM16, QAM64;
	802.11n (OFDM): BPSK, QPSK, QAM16, QAM64;
	802.11ac (OFDM): BPSK, QPSK, QAM16, QAM64, QAM256;
	802.11ax (OFDMA): BPSK, BPSK_DCM, QPSK, QPSK_DCM, QAM16, QAM16_DCM, QAM64, QAM256, QAM1024;
Date Rate	802.11b: 1, 2, 5.5, 11Mbps;
	802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps;
	802.11n (HT20): MCS0~MCS7 6.5~72.2Mbps;
	802.11n (HT40): MCS0~MCS7 13.5~150Mbps;
	802.11ac(VHT20): MCS0~MCS8 6.5~86.7Mbps;
	802.11ac(VHT40): MCS0~MCS9 13.5~200Mbps;
	802.11ax (HE20): MCS0~MCS11 8~143.4Mbps;
	802.11ax (HE40): MCS0~MCS11 16~286.8Mbps;
Frequency Tolerance	≤±5ppm

2.4G Transmitter Specifications

Modulation	TX Rate	TX Power (±2dBm)	TX EVM (dB)	TX Mask	VBAT current (mA)
802.11b	1Mbps	22	≤35%	PASS	-
802.11b	11Mbps	22	≤35%	PASS	-
802.11g	6Mbps	20	≤-5	PASS	-
802.11g	54Mbps	18	≤-25	PASS	-
802.11n	HT20 MCS0	20	≤-5	PASS	-
802.11n	HT20 MCS7	18	≤-27	PASS	-
802.11n	HT40 MCS0	20	≤-5	PASS	-
802.11n	HT40 MCS7	14	≤-27	PASS	-
802.11ac	VHT20 MCS0	20	≤-5	PASS	-
802.11ac	VHT20 MCS8	15	≤-30	PASS	-
802.11ac	VHT40 MCS0	20	≤-5	PASS	-

802.11ac	VHT40 MCS9	15	≤-32	PASS	-
802.11ax	HE20 MCS0	20	≤-5	PASS	-
802.11ax	HE20 MCS11	14	≤-35	PASS	-
802.11ax	HE40 MCS0	20	≤-5	PASS	-
802.11ax	HE40 MCS11	14	≤-35	PASS	-

2.4G Receiver Specifications

Modulation	RX Rate	Min Input Level (dBm)	Max Input Level (dBm)	PER	VBAT current (mA)
802.11b	1Mbps	≤-96	-20	8%	-
802.11b	11Mbps	≤-87	-20	8%	-
802.11g	6Mbps	≤-92	-20	10%	-
802.11g	54Mbps	≤-75	-20	10%	-
802.11n	HT20 MCS0	≤-92	-20	10%	-
802.11n	HT20 MCS7	≤-72	-20	10%	-
802.11n	HT40 MCS0	≤-89	-20	10%	-
802.11n	HT40 MCS7	≤-70	-20	10%	-
802.11ac	VHT20 MCS0	≤-91	-20	10%	-
802.11ac	VHT20 MCS8	≤-68	-20	10%	-
802.11ac	VHT40 MCS0	≤-89	-20	10%	-
802.11ac	VHT40 MCS9	≤-63	-20	10%	-
802.11ax	HE20 MCS0	≤-92	-20	10%	-
802.11ax	HE20 MCS11	≤-60	-20	10%	-
802.11ax	HE40 MCS0	≤-89	-20	10%	-
802.11ax	HE40 MCS11	≤-58	-20	10%	-

6.2 5GHZ Wi-Fi RF Characteristics

Conditions: VBAT=3.3V; VDDIO=1.8V; Ta:25℃	
Features	Description
Wi-Fi Standard	IEEE 802.11a/n/ac/ax
Frequency Range	5.15~5.25GHz; 5.25~5.35GHz; 5.47~5.73GHz; 5.735~5.835GHz (5GHz ISM Band)
Channels	Ch36,Ch40, Ch44, Ch48; Ch52~Ch64; Ch100~Ch140; Ch149~Ch165
Modulation	802.11a (OFDM): BPSK, QPSK, QAM16, QAM64;
	802.11n (OFDM): BPSK, QPSK, QAM16, QAM64;
	802.11ac (OFDM): BPSK, QPSK, QAM16, QAM64, QAM256;
	802.11ax (OFDMA): BPSK, BPSK_DCM, QPSK, QPSK_DCM, QAM16, QAM16_DCM, QAM64, QAM256, QAM1024;
Date Rate	802.11a: 6, 9, 12, 18, 24, 36, 48, 54Mbps;

802.11n (HT20): MCS0~MCS7: 6.5~72.2Mbps;

802.11n (HT40): MCS0~MCS7: 13.5~150Mbps;

802.11ac (VHT20): MCS0~MCS8: 6.5~86.7Mbps;

802.11ac (VHT40): MCS0~MCS9: 13.5~200Mbps;

802.11ac (VHT80): MCS0~MCS9: 29.3~433.3Mbps;

802.11ax (HE20): MCS0~MCS11: 8~143.4Mbps;

802.11ax (HE40): MCS0~MCS11: 16~286.8Mbps;

802.11ax (HE80): MCS0~MCS11: 34~600.5Mbps;

Frequency Tolerance	≤±5ppm

5G Transmitter Specifications

Modulation	TX Rate	TX Power（±2dBm）	TX EVM（dB）	TX Mask	VBAT current (mA)
802.11a	6Mbps	19	≤-5	PASS	-
802.11a	54Mbps	17	≤-25	PASS	-
802.11n	HT20 MCS0	19	≤-5	PASS	-
802.11n	HT20 MCS7	17	≤-27	PASS	-
802.11n	HT40 MCS0	19	≤-5	PASS	-
802.11n	HT40 MCS7	17	≤-27	PASS	-
802.11ac	VHT20 MCS0	19	≤-5	PASS	-
802.11ac	VHT20 MCS8	14	≤-30	PASS	-
802.11ac	VHT40 MCS0	19	≤-5	PASS	-
802.11ac	VHT40 MCS9	14	≤-32	PASS	-
802.11ac	VHT80 MCS0	18	≤-5	PASS	-
802.11ac	VHT80 MCS9	13	≤-32	PASS	-
802.11ax	HE20 MCS0	19	≤-5	PASS	-
802.11ax	HE20 MCS11	12	≤-35	PASS	-
802.11ax	HE40 MCS0	19	≤-5	PASS	-
802.11ax	HE40 MCS11	12	≤-35	PASS	-
802.11ax	HE80 MCS0	18	≤-5	PASS	-
802.11ax	HE80 MCS11	11	≤-35	PASS	-

5G Receiver Specifications

Modulation	RX Rate	Min Input Level(dBm)	Max Input Level (dBm)	PER	VBAT current (mA)
802.11a	6Mbps	-91	-20	10%	-
802.11a	54Mbps	-74	-20	10%	-
802.11n	HT20 MCS0	-91	-20	10%	-
802.11n	HT20 MCS7	-71	-20	10%	-
802.11n	HT40 MCS0	-88	-20	10%	-
802.11n	HT40 MCS7	-69	-20	10%	-
802.11ac	VHT20 MCS0	-91	-20	10%	-
802.11ac	VHT20 MCS8	-67	-20	10%	-
802.11ac	VHT40 MCS0	-88	-20	10%	-

802.11ac	VHT40 MCS9	-63	-20	10%	-
802.11ac	VHT80 MCS0	-85	-20	10%	-
802.11ac	VHT80 MCS9	-59	-20	10%	-
802.11ax	HE20 MCS0	-91	-20	10%	-
802.11ax	HE20 MCS11	-60	-20	10%	-
802.11ax	HE40 MCS0	-89	-20	10%	-
802.11ax	HE40 MCS11	-58	-20	10%	-
802.11ax	HE80 MCS0	-86	-20	10%	-
802.11ax	HE80 MCS11	-53	-20	10%	-

6.3 Bluetooth Radio Frequency (RF) Characteristics

Conditions: VBAT=3.3V; VDDIO=1.8V; Ta:25℃

Features	Description
Bluetooth Standard	Bluetooth v2.1+EDR/3.0+HS/4.2/5. 4
Frequency Range	2.4~2.4835GHz
Channels	Bluetooth Classic: Ch0~Ch78 (For 1MHz Channels);
	Bluetooth Low Energy: Ch0~Ch39 (For 2MHz Channels);
Power class	Bluetooth Classic: Class1;
	Bluetooth Low Energy: Class1.5;
Modulation	BR_1Mbps: GFSK;
	EDR_2Mbps: π/4-DQPSK;
	EDR_3Mbps: 8DPSK;
	LE_125Kbps: GFSK (Coded_S=8);
	LE_500Kbps: GFSK (Coded_S=2);
	LE_1Mbps: GFSK (Uncoded);
	LE_2Mbps: GFSK (Uncoded);

Bluetooth Transmitter Specifications

Item	TX Power (dBm)			VBAT current(mA)
	Min	Type	Max	
BR_1M	6	8	10	-
EDR_2M /3M	6	8	10	-
LE_125/500K	6	8	10	-
LE_1M	6	8	10	-
LE_2M	6	8	10	-

Bluetooth Receiver Specifications

Item	Sensitivity (dBm)		Max Input Level (dBm)		VBAT current (mA)
	Input Level (Typ)	BER	Input	BER	

|			Level (Typ)		
BR_1Mbps	< -88	0.10%	> -20	-	-
EDR_2Mbps	< -86	0.01%	> -20	-	-
EDR_3Mbps	< -83	0.01%	> -20	-	-
BLE	< -88	30.80%	> -20	-	-

7 Hardware Design Guide

7.1 Power Design Notice

7.1.1 Voltage Requirement

The main power supply (VBAT) input range of the module is 3.3V+/-10%, and the interface VDDIO supports two level ranges, 1.8V+/-10% or 3.3V+/-10%. Due to the ripple of the main power can affect the RF performance of Wi-Fi and Bluetooth, therefore the power supply ripple VPP is required to be less than 50mV.

7.1.2 Current/Power Supply Reference Requirement

Under different standards, when Wi-Fi transmits continuously, The 3.3V power converter must be able to provide 1.8A current and fast transient response (when the transient current change rate is 80mA/us, the voltage drop is less than 100mV).
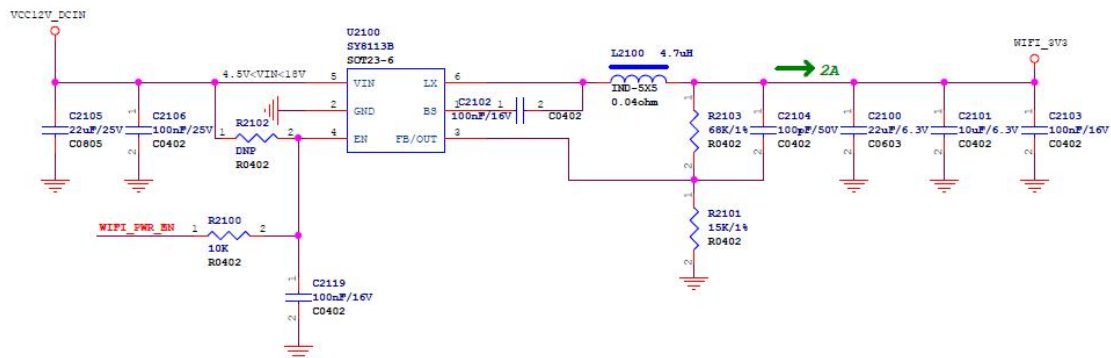
For the power on/off sequence of the module, please refer to the requirements in the "4.3 Power On/Off Sequence" chapter.

7.2 Interface Design Notice

7.2.1 Wake-up Signals

This module require two GPIOs as handshake signals with the host controller. As default, for example, WL_ WAKE_ HOST is the output signal "CP wakes up the Host", and HOST_ WAKE_ WL is the input signal "Host wakes up CP". Wi-Fi and Bluetooth use the same handshake signal. The working mechanism is as follows.
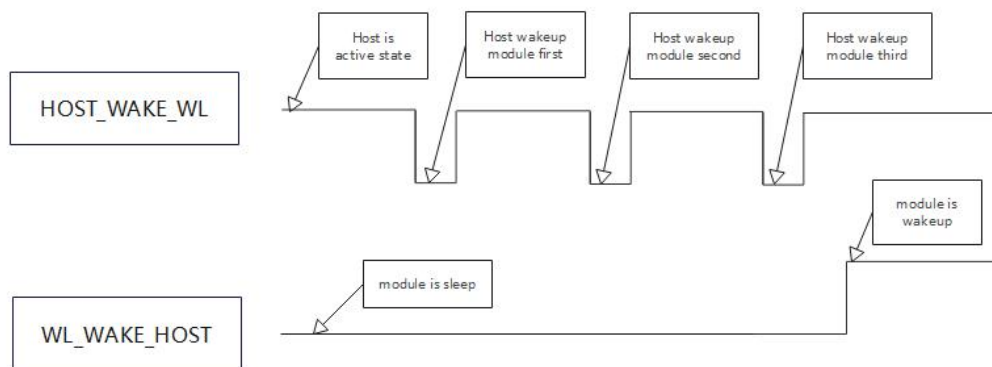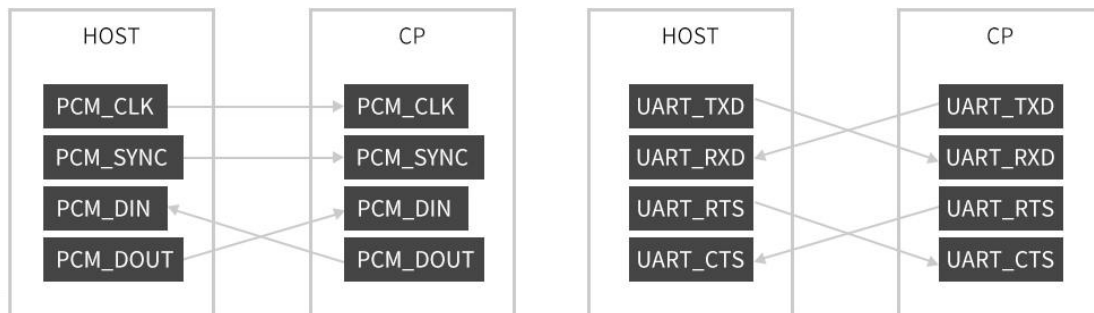

7.2.2 HCI Commend Interface

The Bluetooth supports USB and HS-UART (4Mbps) as HCI (Host Controller Interface). USB is used as HCI by default, which means the HS-UART port does not need in the HOST controller.
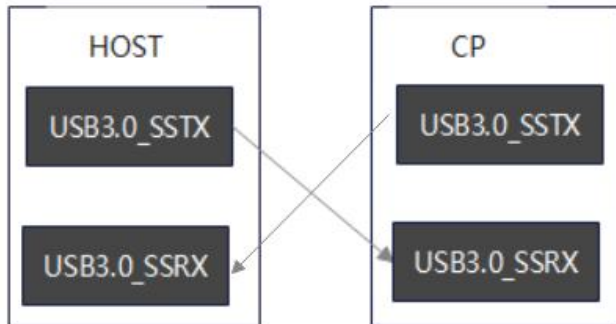
7.2.3 PCM and UART Interface

As shown in the figure below, the PCM bus and UART bus and data lines between the Host and the module need to be cross-connected.

7.2.4 USB3.0 Interface

USB3.0 data lines need to be cross-connected between HOST and CP.

8 Storage,Production and Packaging

8.1 Storage Conditions

❖   FD7352U module is 3 (MSL3) and packed in a vacuum-sealed bag when shipped, the recommended storage temperature is 25±5°C, and the relative humidity is 35%~60%. Under this condition, the module can be stored for 12 months.

❖   The Module shall be stored without opening the packing. After the packing opened, the module shall be completed the patch soldering within 24 hours.

❖   FD7352U module can be stored for no more than 168 hours in a workshop environment with a temperature of 25±5°C, a relative humidity below 60% and in compliance with IPC/JEDEC J-STD-033. It is not recommended to expose the module unpacked to the air for a long time. If not immediately patch soldering, it is recommended to store the module in a moisture-proof cabinet with a relative humidity of less than 10% to keep the module dry.

❖   If the module is not stored according to the above recommended method, it needs to be baked at high temperature (120±5°C) for 8 hours. The re-baked module shall be patched within 24 hours.

❖   Please pay attention to ESD protection when unpacking and handling modules.

8.2 Production Welding

During the production welding process, please do not use any organic solvents (such as alcohol, isopropanol, acetone, trichloroethylene, etc.) to wipe the shield of the FD7352U module, otherwise it may cause the shield to rust. Please do not ultrasonically clean the module, it may cause damage to the crystal inside the module. Please make sure that the spray material used will not chemically react with the module shield or PCB and will not flow into the module when spraying modules.

In order to ensure the welding quality and reliability of the FD7352U module, the thickness of the printed stencil is recommended to be 0.15~0.18mm; the recommended reflow curve is as follows:
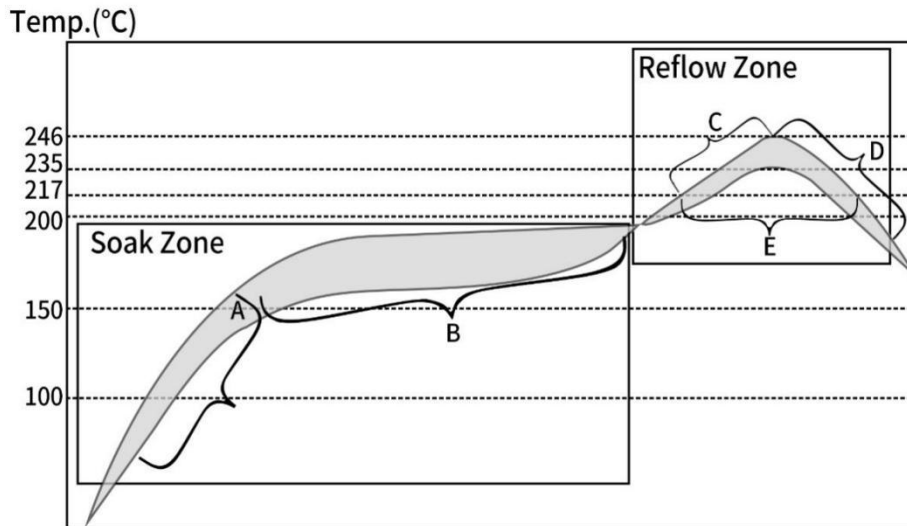
Recommended reflow curve

Item	Description	Value
Endothermic Zone Heating Rate	Interval A	≤3℃/s
Soak time	From the end of interval A to the beginning of interval B	60~120s
Reflow Zone Heating Rate	Interval C	≤3 ℃/s
Maximum Temperature	Highest point of the curve	246℃(+5/-0℃)
Cooling Rate	Interval D	<6 ℃/s
Reflow Time	Interval E	60~150 seconds

8.3 Packing Specifications

The key parameters and packaging processes described in this chapter are for reference only. The appearance and structure of the specific packaging materials are subject to actual delivery.
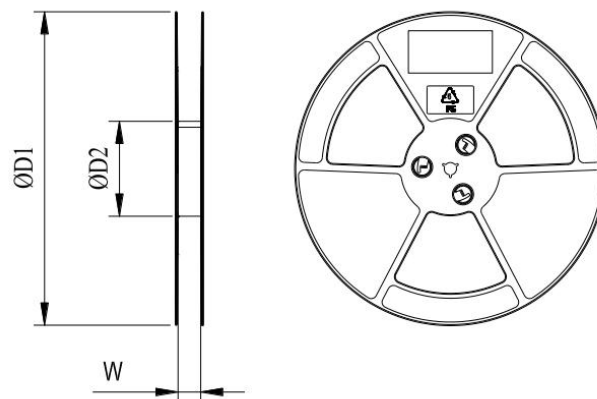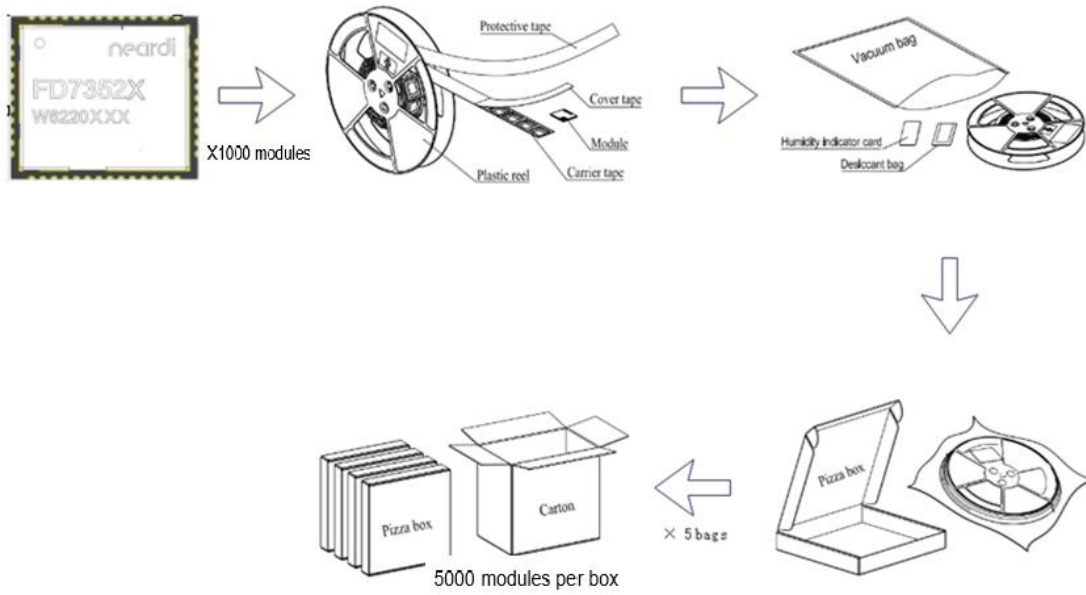
8.3.1 Tape Dimensions
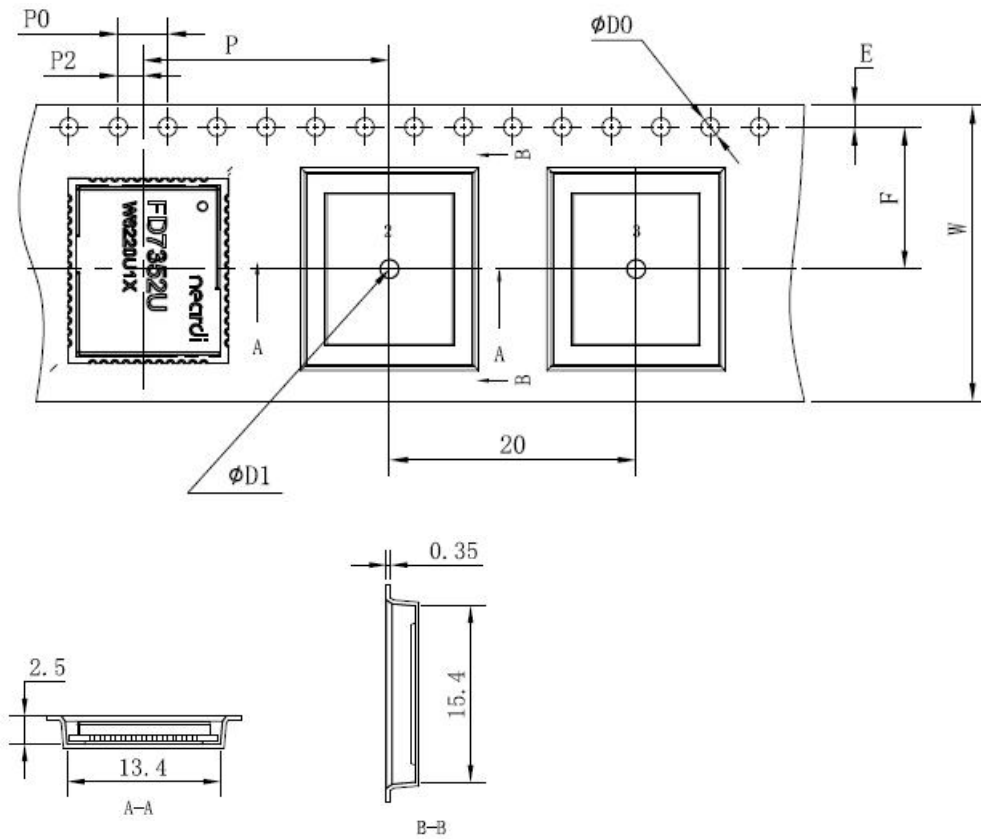
Tape dimensions

W	P	P0	P2	D0	D1	F	E.	Unit
24	20	4.0	2.0	1.5	1.5	11.5	1.75	mm

8.3.2 Plastic Reel Dimensions

ΦD1	φD2	W	unit
330	100	24	mm

8.3.3 Packaging Process

Package specification