Datasheet

NW-B50C3 Industrial WIFI Bluetooth Module

Based on ESP32-C3 Series

Industrial Grade WIFI Bluetooth Chip

1 Module Introduction

1.1 General Description

NW-B50C3 is a wireless communication module developed based on ESP32-C3 industrial-grade Bluetooth WIFI module, integrating WiFi 2.4 GHz WLAN and BLE 5.0 communication module, equipped with a RISC-V 32-bit single-core processor, with powerful functions and rich peripheral interfaces, which can be used in smart home, industrial automation, healthcare, consumer electronics, and other fields.

1.2 Key Features

- 32-bit RISC-V single-core processor up to 120 MHz
- Support 2.4GHz and BLE 5.0
- Support IEEE802.11b/g/n protocols
- Support Station mode, SoftAP mode, Station + SoftAP mode and mixed mode simultaneously
- Rate support 125kbps, 500kbps, 1Mbps, 2Mbps
- Operating voltage/supply voltage: 3.0~3.6V
- Wi-Fi and Bluetooth coexist and share the same antenna

1.3 Applications

- Smart Home
- Industrial Automation
- Consumer Electronics Products
- Health Care
- Intelligent Agriculture
- Retail Catering

1.4 Key Parameter

Parameters	NW-B50C3
Product Description	WiFi 2.4GHz + BLE 5.0
Antenna	PCB on board antenna + IPEX jack
Frequency Range	2.402 ~ 2.480 GHZ
Max. TX Power	+20 dBm
RX Sensitivity	1Mbps：-98dBm 2Mbps：-95dBm 125Kbps：-106dBm 500Kbps：-102dBm
Flash	2M
Supply Voltage	3.0 ~ 3.6 V
Operating Temperature	-20~+85 ℃
Package (mm)	24 *16*0.8mm

Contents

2 Product Features

2.1 System Block Diagram

NW-B50C3 is a wireless communication module developed based on ESP32-C3 industrial-grade Bluetooth WIFI module, integrating WiFi 2.4 GHz WLAN and BLE 5.0 communication module, equipped with a RISC-V 32-bit single-core processor, with powerful functions and rich peripheral interfaces, which can be used in smart home, industrial automation, healthcare, consumer electronics, and other fields.

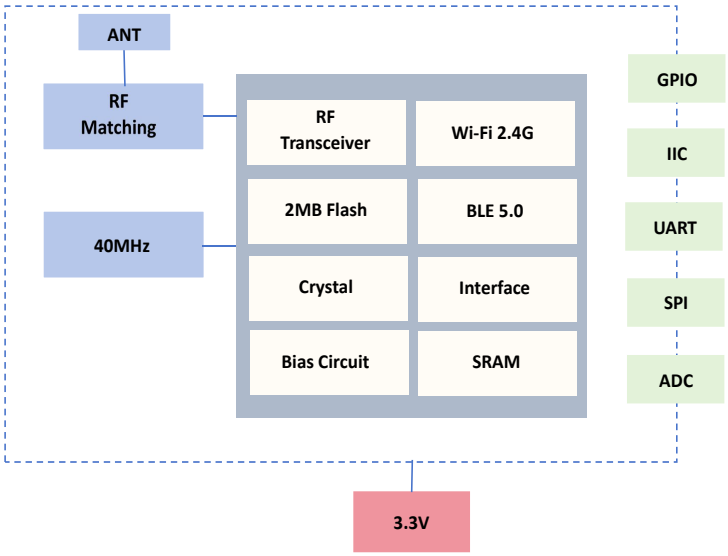

Figure 1 Functional Block Diagram

2.2 Pin Characteristics

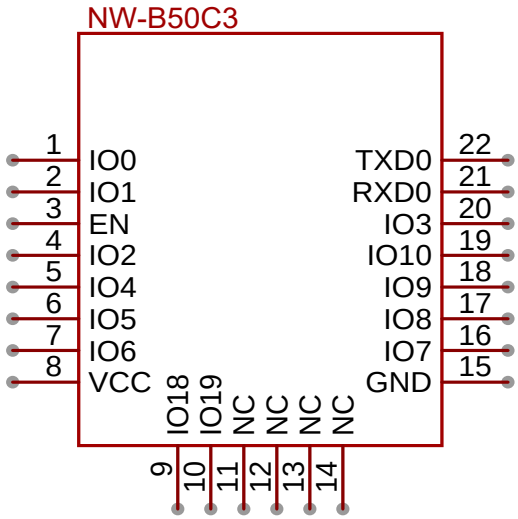

Figure 2 Bluetooth Module Pinouts

Pin	Name	Type	Description
1	IO0	I/O	General Purpose I/O
2	IO1	I/O	General Purpose I/O
3	EN	I/O	Enable Port
4	IO2	I/O	General Purpose I/O
5	IO4	I/O	General Purpose I/O
6	IO5	I/O	General Purpose I/O
7	IO6	I/O	General Purpose I/O
8	VCC	P	Power Input Pin: 3~3.6V
9	IO18	I/O	General Purpose I/O
10	IO19	I/O	General Purpose I/O
11	NC	-	NC
12	NC	-	NC
13	NC	-	NC
14	NC	-	NC
15	GND	P	Power Ground
16	IO7	I/O	General Purpose I/O
17	IO8	I/O	General Purpose I/O
18	IO9	I/O	General Purpose I/O
19	IO10	I/O	General Purpose I/O
20	IO3	I/O	General Purpose I/O
21	RXD0	I/O	UART Data Input
22	TXD0	I/O	UART Data Output

Table 1 Pin definition

3 Electrical Characteristics

3.1 Maximum Operation Rating

Parameters	Symbol	Min.	Typical	Max.	Unit
VDD Voltage	VDD	-0.3	3.3	3.6	V
Operating Temperature	Tstg	-40	-	105	°C

Table 2 Absolute maximum operating ratings

Note:

1. At room temperature.
2. Maximum Ratings are those values beyond which damage to the device may occur.
3. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability.
4. Functional operation under absolute maximum-rated conditions is not implied and should be restricted to the Recommended Operating Conditions.

3.2 Recommended Operating Conditions

Parameters	Symbol	Min.	Typical	Max.	Unit
VDD Voltage	VDD	3.0	3.3	3.6	V
External supply current	IVDD	0.5	-	-	A
Operating Temperature	Tstg	-20	-	85	°C

Table 3 Recommended Operating Conditions

Note: It does not guarantee the performance if the operating temperature is beyond the specified limit.

3.3 Power Consumption

Operation Mode	RF Mode	Description	Peak (mA)
RF	TX	802.11b, 1 Mbps, DSSS @ 20.5 dBm	373
		802.11g, 54 Mbps, OFDM @ 18.5 dBm	321
	RX	802.11n, HT20, MCS7 @ 17.5 dBm	300
		802.11b/g/n, HT20	66

Table 4 Power Consumption Characteristics

3.4 RF

WiFi TX Characteristics

Rate	Min. (dBm)	Typical. (dBm)	Max. (dBm)
802.11b, 1Mbps, DSSS	-	20.5	-
802.11b, 11Mbps, CCK	-	20.5	-
802.11g, 6Mbps, OFDM	-	20.5	-
802.11g, 54Mbps, OFDM	-	18.5	-
802.11n, HT20, MCS0	-	18.5	-
802.11n, HT20, MCS7	-	17.5	-

Table 5 WiFi TX Characteristics

WiFi RX Characteristics

Rate	Min. (dBm)	Typical. (dBm)	Max. (dBm)
802.11b, 1Mbps, DSSS	-	-99.0	-
802.11b, 11Mbps, CCK	-	-89.0	-
802.11g, 6Mbps, OFDM	-	-93.6	-
802.11g, 54Mbps, OFDM	-	-76.0	-
802.11n, HT20, MCS0	-	-93.0	-
802.11n, HT20, MCS7	-	-73.4	-

Table 6 WiFi RX Characteristics

Bluetooth RX Characteristics

Parameters	**Min.**	**Typical**	**Max.**	**Unit**
Sensitivity @30.8% PER	-	-98.0	-	dBm
Max. Received Signal @30.8% PER	-	8	-	dBm

Table 7 Bluetooth RX Characteristics

4 Hardware Design

Do not place metal objects or route around the antenna 2mm, it is recommended to hollow out the underside of the antenna. As metal has a shielding effect on electromagnetic signals, try to avoid using metal enclosures.

4.1 Reference Schematics

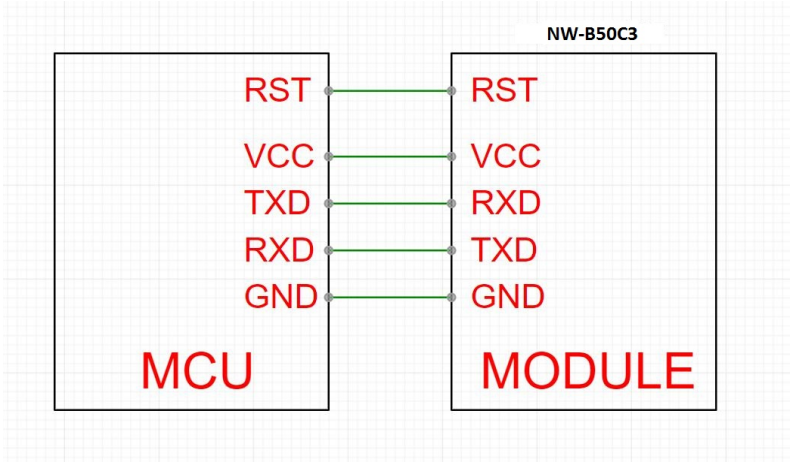

Figure 3 Reference Schematics

4.2 Power Supply Design

Note: NW-B50C3 Bluetooth module has certain requirements for the power supply circuit.
The ripple coefficient of the 3.3V supply voltage should be less than 200mV, the minimum output current should be greater than 50mA (the choice of the 3.3V regulator needs to be determined by the actual circuit current).

4.3 Layout Guidelines

It is strongly recommended to use good layout practices to ensure proper module operation, placing copper or any metal close to the antenna will affect antenna performance and thus deteriorate antenna efficiency.
The metal shielding around the antenna will stop the signal from radiating, therefore metal enclosures should not be used with the module, please use more ground over holes at the edge of the grounded area, the following recommendations will help to avoid EMC problems in the design.
Please note that each design is unique, the following descriptions do not take into account all basic design rules, such as avoiding capacitive coupling between signal lines; the following descriptions are intended to avoid EMC problems caused by the RF part of the module and should be considered with care, to avoid problems with the digital signals in the design. Ensure that the loops of the signal lines are as short as possible.

E.g.: If the signal enters the inner layer via the through-holes, always use ground through-holes around the pads. And place them closely and symmetrically around the signal through-holes. Any sensitive signal routing and loops should be done on the inner layer of the PCB as far as possible. Sensitive signal lines should have a ground surround above and below them.

4.4 **Mechanical Details**

Nominal Size: 24mm(L) x 16mm(W) x 0.8mm(H) Tolerance：±0.2mm

Pad radius R: 0.6mm

Pad pitch: 2mm

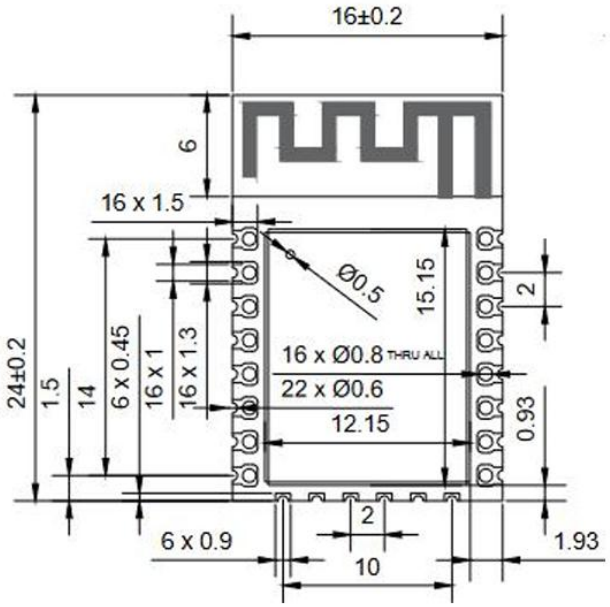

Figure 4 Mechanical Details

5 **Products Treatment**

5.1 **Storage Conditions**

Products sealed in moisture-proof bags (MBB) should be stored in a non-condensing atmosphere at < 40 °C/90% RH. The module has a moisture sensitivity class MSL of 3. After unpacking the vacuum bag, it must be used within 168 hours at 25±5 °C and 60% RH, otherwise it needs to be baked before it can be put on line a second time.

5.2 **Baking Conditions**

Modules must be baked at 120+5°C for 8 hours, the second-baked module must be soldered within 24 hours after baking, otherwise they must still be stored in the drying oven.

5.3 **Reflow Soldering**

Before any reflow soldering is carried out, it is important to ensure the modules are packaged in moisture-proof package. The package contains a desiccant (to absorb moisture) and a humidity indicator card to show the

level of dryness to be maintained during storage and shipment. If it is necessary to bake the module, please check the table below and follow the instructions specified in IPC / JEDEC J-STD-033.

Note: The tray must not be heated above 65°C. If the high temperature baking method (above 65°C) in the table below is used, the module must be removed from the tray.

Any module that has been unpacked and not surface mounted within a specified time should be repackaged. Effective desiccants and humidity indicator cards should be placed inside the package. MSL (moisture sensitivity level) 3 modules should be stored in the air for less than 168 hours at an ambient temperature of 30°C / 60% RH. The recommended baking time and temperature are as follows:
The design of surface mount modules is easy to manufacture, including reflow soldering to the PCB main board. Ultimately, it is the responsibility of the customer to choose the appropriate solder paste and ensure that the furnace temperature during reflow meets the requirements of the solder paste. Surface mount modules conform to the J-STD-020D1 standard for reflow soldering temperatures. The soldering configuration file depends on the various parameters that need to be set for each application. The data here is only used for reflow soldering guidance.

5.4 **Package Specifications**

Tray package: Min. package 3000PCS

Tray size: 50pcs / tray