Datasheet

SN:2022-0909A V1.0

BoBinfo 好上好信息

BB820

Ultra Low-Power Bluetooth 5.0 module

Introduction

BB820 is a high-performance,industrial,ultra low-power BLE 5.0 module,which based on Nordic SoC nRF52820.It provides rich interfaces such as UART, SPI, I2C, PWM. At the same time,it adopts a small stamp package and convenient for engineers to develop.

Key features

- **Frequency band**
  BLE: 2402～2480MHz
  Proprietary: 2360～2500MHz

- **Ultra low-power consumption**
  1.7 to 3.6 V supply voltage range
  < 4.9 mA peak current in TX @0dBm
  < 4.7 mA peak current in RX
  0.3 µA at 3V in System OFF mode,
  no RAM retention
  1.2 µA at 3V in System ON mode,
  no RAM retention, wake on RTC

- **High sensitivity**
  -95dBm sensitivity(1Mbps,BLE)
  -92dBm sensitivity(2Mbps,BLE)
  -103dBm sensitivity(125kbps,Long range)
  -98dBm sensitivity(500kbps,Long range)
  -20 to +8dBm TX power, configurable in 4 dB steps

- **Protocol**
  BLE4.0 / 4.1 / 4.2 / 5.0 / 5.1
  BLE5.0: 2Mbps/ 1Mbps
  Proprietary 2.4 GHz: 2 Mbps / 1 Mbps
  Multi-master and multi-slave
  BLE long range mode

- **Microprocessor & Memory**
  ARM®Cortex®-M4 32-bit processor
  256kB Flash and 32kB RAM

- **Interface**
  18*General purpose I/O pins
  1* UART / 2*SPI / 2*I2C
  1*USB(12Mbps)
  64 level comparator(8 channel)
  4*32-bit timer

- **Dimension**
  13.52mm×19.41mm×1.75mm

Applications

- Advanced computer peripherals and I/O devices
  Mouse / keyboard / Multi-touch trackpad
- Interactive entertainment devices
  Gaming controllers
  Remote controls
- Internet of things (IoT)
  Smart home sensors and controllers
  Industrial IoT sensors and controllers

Ordering information

Part No.	Temperature	Package	MOQ	Antenna
BB820-QI4A	-40°C ~ +85°C	SMD	1000	PCB on Board
BB820-QI4A-HT	-40°C ~ +105°C	SMD	1000	PCB on Board

Contents

1. Introduction

1.1 Description

BB820 is a high-performance,industrial,ultra low-power BLE 5.0 module,which based on Nordic SoC nRF52820.It provides rich interfaces such as USB,UART, I2C,SPI,DMA. At the same time,it adopts a small stamp package and convenient for engineers to develop.

1.2 Specifications

Specifications are shown in the following Table 1.1.

Table 1.1 Specifications of BB820

Function	Description
Flash	256kB
RAM	32kB
Microprocessor	64MHz ARM®Cortex-M4
Protocol support	BLE4.0/4.1/4.2/5.0/5.1
Frequency Band	2400MHz ~ 2480MHz (BLE) / 2360MHz ~ 2500MHz(nRF proprietary mode)
On-air data rate	1Mbps,2Mbps BLE mode 1Mbps, 2Mbps Nordic nRF proprietary mode 125kbps，500kbps Long range
TX power	-20～+8dBm
Sensitivity	-95dBm(1Mbps,BLE mode) -92dBm(2Mbps,BLE mode) -103dBm(125kbps,Long range mode) -98dBm (500kbps,Long range mode)
Power consumption	TX peak current: 4.9mA (0dBm) RX peak current: 4.7mA Sleep current: 0.3 μA at 3V in System OFF mode, no RAM retention Sleep current:1.2 μA at 3V in System ON mode, no RAM retention, wake on RTC
Digital interfaces	2*SPI / 2*I2C / 1*UART / 1*QDEC / 1*USB2.0(12Mbps)
Analog interfaces	64 level comparator(8 channel)
Timer	4*32-bit timer / 2*RTC / 1*WDT
Peripherals	AES/RNG/PPI
GPIO	18
Operation temperature	-40°C～85°C(QI4A)/ -40°C～105°C(QI4A-HT)
Package	SMD (25 pins)
Dimension	13.52mm*19.41mm*1.75mm

2. Pin assignments

2.1 Top view

Top view of BB820 is shown in Figure 2.1.

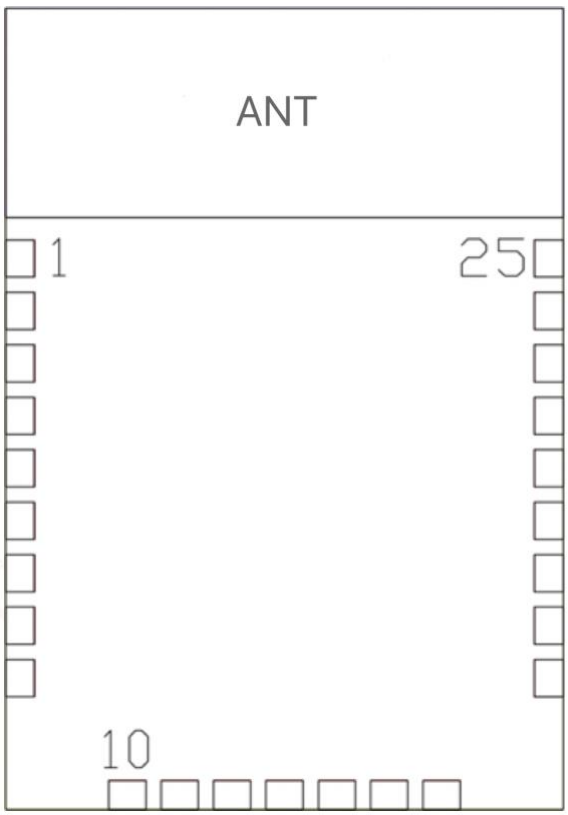

Figure 2.1 BB820 pin assignments,top view

2.2 Pin assignments

The BB820 pin assignment is shown in Table 2.1.

Table 2.1 Pin assignment description

Pin No.	Pin name	Description
1	P0.08	Digital I/O(Standard drive, <4mA & low frequency,<10KHz)
2	P0.29	Digital I/O(Standard drive, <4mA & low frequency,<10KHz)
3	P0.30	Digital I/O(Standard drive, <4mA & low frequency,<10KHz)
4	P0.28	Digital I/O(Standard drive, <4mA & low frequency,<10KHz)
5	P0.03	Analog input / Digital I/O(Standard drive, <4mA & low frequency,<10KHz)
6	P0.02	Analog input / Digital I/O
7	P0.04	Analog input / Digital I/O
8	GND	Power ground
9	VCC	Power input, 1.7 ~ 3.6V (recommended voltage range)
10	P0.00	Options for External 32.768KHz Crystal / Digital I/O

11	P0.01	Options for External 32.768KHz Crystal / Digital I/O
12	P0.05	Analog input / Digital I/O
13	P0.16	Digital I/O(Standard drive, <4mA & low frequency,<10KHz)
14	D-	USB D-
15	D+	USB D+
16	VBUS	USB VBUS input，4.35-5.5V
17	P0.06	Digital I/O
18	P0.07	Digital I/O
19	P0.14	Digital I/O
20	P0.17	Digital I/O(Standard drive, <4mA & low frequency,<10KHz)
21	P0.15	Digital I/O
22	P0.20	Digital I/O
23	P0.18/nRESET	Reset mode default(soft reset,active low) [Note]① Digital I/O
24	SWCLK	Serial wire debug clock input for debug and programming
25	SWDIO	Serial wire debug I/O for debug and programming

① The nRESET pin of BB820 can be used according to the product requirements.

3. Specifications and parameters

3.1 Absolute maximum ratings

Table 3.1 Absolute maximum ratings

Item	Parameter		Description
	Min	Max	
VDD (V)	-0.3	3.9	Exposure to absolute maximum ratings for prolonged periods of time may affect the reliability of the device.
I/O pin voltage (V)	-0.3	VDD+0.3	VDD voltage ≤ 3.6V
VBUS(V)	-0.3	+5.8	
RF input level (dBm)	-	10	
Reference transmission distance (m)	40	100	Module to module, @0dBm[Note]②
Operating temperature (℃)	-40	+85	BB820-QI4A
Operating temperature (℃)	-40	+105	BB820-QI4A-HT
Storage temperature (℃)	-40	+125	Normal temperature storage is recommended

3.2 ESD parameters

Table 3.2 ESD parameters

Item		Minimum	Maximum
ESD	Human Body Model	-	3000V
	Human Body Model Class	-	2
	Charged Device Model	-	1000V

② The reference communication distance is closely related to hardware construction, test site environment, etc, which is for reference only.

3.3 Operating conditions

Table 3.3 Recommended operating conditions

Item	Min	Typical	Max	Remark
Operating temperature (℃)	-40	+25	+85	BB820-QI4A
Operating temperature (℃)	-40	+25	+105	BB820-QI4A-HT
VDD（V）	1.7	3.3	3.6	
VBUS（V）	4.35	5.0	5.5	
$t_{POR,10us}$（ms）[Note]③	-	1	10	
$t_{POR,10ms}$（ms）	-	9	-	
$t_{POR,60ms}$（ms）	-	23	110	
t_{POR}（ms）@0→1.7V	-	-	60	

3.4 Power consumption

Table 3.4 Reference power consumption

Item	Typical	Unit	Description	Conditions
$I_{tx,peak}$	14	mA	TX only run current (DC/DC),@ +8dBm	VDD=3V, temperature=25℃ [Note]④
$I_{tx,peak}$	9.4	mA	TX only run current (DC/DC),@ +4dBm	
$I_{tx,peak}$	4.9	mA	TX only run current (DC/DC),@0 dBm	
$I_{Rx,peak}$	4.7	mA	RX only run current (DC/DC) 1 Mbps BLE	
$I_{Rx,peak}$	5.2	mA	RX only run current (DC/DC) 2 Mbps BLE	
I_{Sleep}	1.2	μA	System ON,no RAM retention,wake on RTC	
$I_{Power-down}$	0.3	μA	System OFF, no RAM retention, wake on reset	

③ $t_{POR,10us}$ means the module power supply VDD to rise from 0V to 1.7V, the power-on reset active at 1ms. The module power-on reset circuitry may not function properly for rise times longer than the specified maximum.

④ The dynamic power consumption of BB820 may be affected by the software operating mode, sleeping mode and RF activity interval,etc. Users can use the official simulation tool (Online Power Profiler) to calculate the current caused by software modification or configuration for special requirements. （https://devzone.nordicsemi.com/nordic/power）

3.5 RF parameters

The RF parameters of BB820 is shown in Table 3.5. **Error! Reference source not found.**

Table 3.5 RF parameters of BB820

Item	Typical	Unit	Conditions
Frequency band	2402～2480	MHz	BLE mode
Frequency band	2360～2500	MHz	nRF proprietary mode
TX Power	-20～+8	dBm	Configurable in 4 dB steps
Receiving sensitivity	-95	dBm	BLE mode, 1Mbps
Receiving sensitivity	-92	dBm	BLE mode, 2Mbps
Receiving sensitivity	-105	dBm	Long range mode, 125kbps
Receiving sensitivity	-98	dBm	Long range mode, 500kbps
Maximum RF input level	10	dBm	Exposure to absolute maximum ratings for prolonged periods of time may damaging it permanently

4. Typical application

The typical application circuit of BB820 is shown in Figure 4.1.

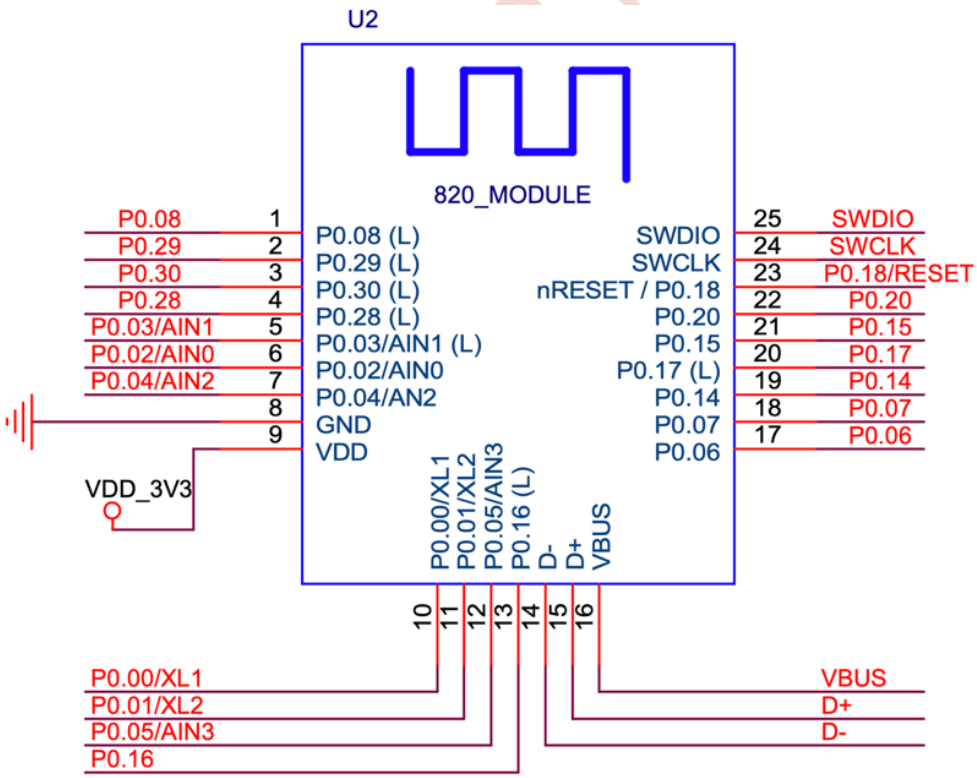

Figure 4.1 Typical application circuit

5. Mechanical specifications

5.1 Dimensions

The dimensions of BB820 is shown in the Figure 5.1.

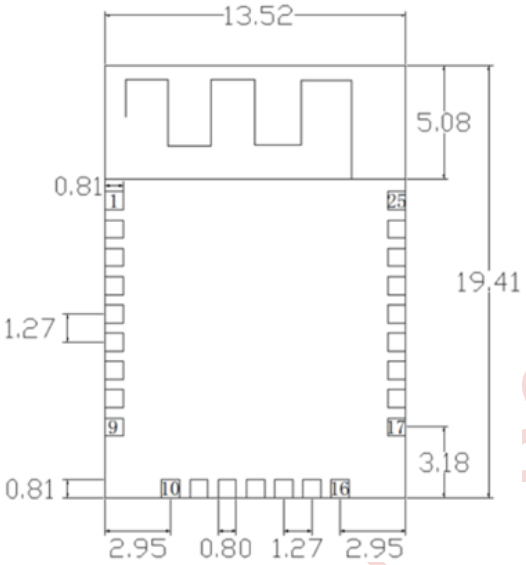

Figure 5.1 Dimensions of BB820(top view)

Table 5.1 Dimensions of BB820

Length	Width	Height	PCB Thickness	PAD Size	PIN Spacing
19.41mm	13.52mm	1.75mm	0.8mm	0.81mm×0.8mm	1.27mm

5.2 PCB footprint

The recommended PCB footprint of BB820 is shown in Figure 5.2

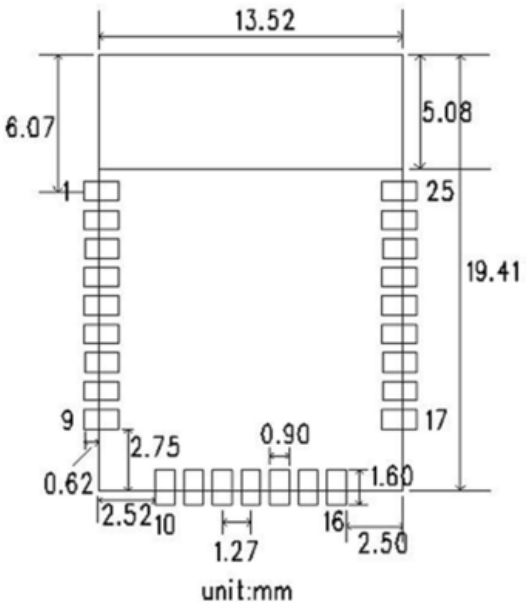

Figure 5.2 Recommended PCB footprint

6. Welding instructions

6.1 Recommended temperature reflow profile

The recommended SMT temperature reflow profile of BB820 is shown in Figure 6.1.

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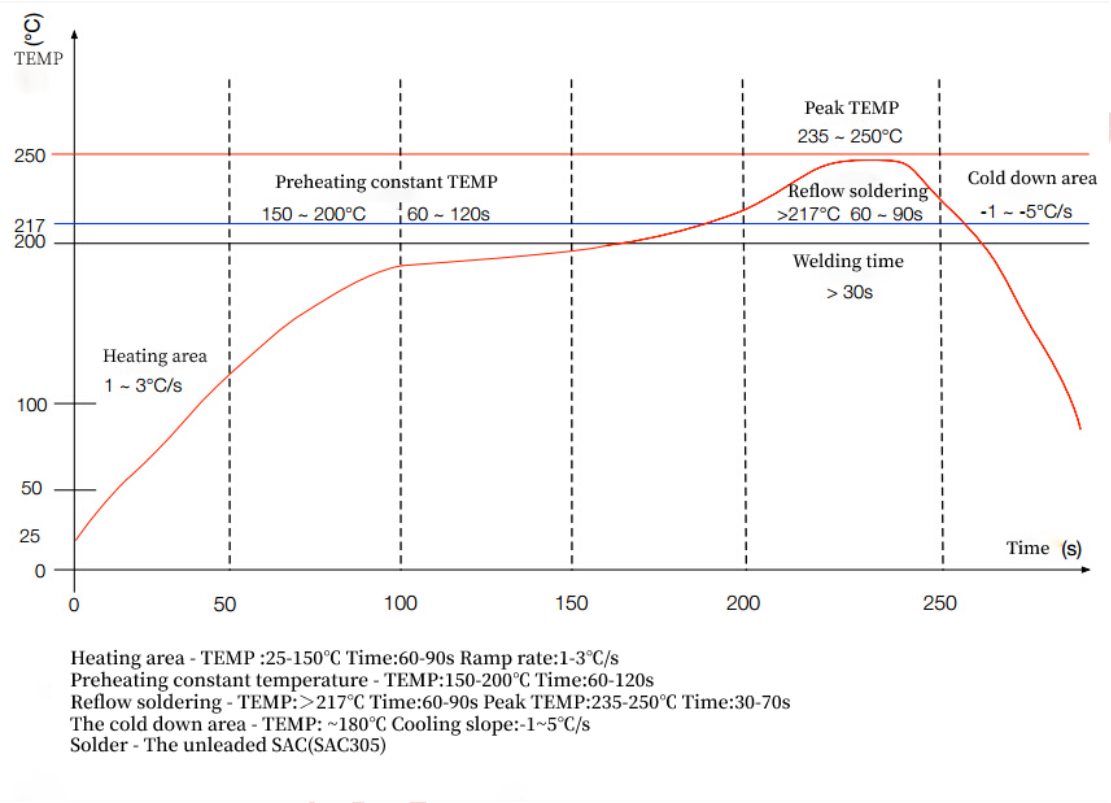

Figure 6.1 Temperature reflow profile

7. Part number & Selections

The selection list related to BB820 is shown in Table 7.1.

Part No.	SoC	Frequency band	Transmission power	Bluetooth protocol	Dimensions	Antenna type	Operating temperature
BB820-QI4A	nRF52820	2.4GHz	+8dBm	5.0	13.52 ×19.41×1.75mm	PCB	-40-+85℃
BB820-QI4A-HT	nRF52820	2.4GHz	+8dBm	5.0	13.52 ×19.41×1.75mm	PCB	-40-+105℃

Table 7.1 List of selections

8. Sales channel & Service

Shenzhen Best of Best Holdings Co., Ltd.

Add：Rm.1501A,East Tower,FIYTA Tech. Bldg.,Southern District of High-tech Industrial Park,Nanshan District,Shenzhen 518057,P.R.China

Tel：86-755-86018818

Fax：86-755-86018808

Web：www.bobholdings.com

Beijing office

Add：Room 1006 Quantum Plaza，No.23 Zhi Chun Road，Hai Dian District，Beijing

Tel：86-10-82358601/2/3/4

Fax：86-10-82358605

Shanghai office

Add：Room 2003-2004, Mingshen Center Bldg., No. 3131 Kaixuan Rd.,Xuhui District, Shanghai, P.R.C.

Tel：86-21-54071701

Fax：86-21-54071702

Chengdu office

Add：Room 1402, Bldg#2, Shudu Center, No.138, Tianfu No.2 Street, Mid Section, Tianfu Avenue, High-Tech District, Chengdu City, Sichuan Province, China

Tel：86-28-85355251

Fax：86-28-85350890

Guangzhou office

Add：Room 620 6 floor,ao yuan city plaza,hanxi avenueGuangzhou,China.

Tel：86-20-34481649

Fax：86-20-34481649

9. Revision history

Version	Date	Description	Reviser
V1.0	2022/09/09	Initial version	Damon

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.

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment.

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.

The device has been evaluated to meet general RF exposure requirement. This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.