NRF51822 BLE Module

Hardware specification

RF-star technology co.,LTD.

Updata：2015/11/10

FCC/IC NOTICE

NRF51822 BLE Module

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.

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

This device complies with Industry Canada licence-exempt RSS standard(s).
Operation is subject to the following two conditions:
   (1) this device may not cause interference, and
   (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditionssuivantes :
(1) l'appareil ne doit pas produire de brouillage, et
(2) l'utilisateur de l'appareil doit accepter tout brouillage
   radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Comprehensive integration instructions:
   • The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.
   • This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.
   • The OEM integrator is responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).
   • In the event that the grant conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product. In these circumstances, the OEM integrator will be responsible

for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

- The final end product must be labeled in a visible area with the following: Contains FCC ID: 2AGD6-RAMDBT001
Information that must be placed in the end user manual: The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

Catalog

● Overview

Shenzhen RF-star bluetooth module is based on low power bluetooth rf module (BLE) , can be widely used in short distance wireless communication field. With low power consumption, small volume, long transmission distance, strong anti-jamming capability, etc. Module is equipped with high-performance inverted F antenna.

The module can be used to develop based on bluetooth 4.0 (bluetooth) BLE, low power consumption of consumer electronics products, mobile phone peripheral products, products for customers with intelligent mobile communication to provide rapid BLE solution.

● Version update records

Version number	File date	Update content
V1.0	2015/10/15	✓ The first release
V1.1	2015/11/10	✓ Modify the module naming rules
V1.2	2016/02/22	✓ Modify the PCB packaging size of module

● Module parameters

·working voltage: 1.8V to 3.8V is recommended for 3.3V

·working frequency band: 2400～2483.5MHz

·Max launch power: +5 dBm（normal 0 dBm output）

·Receiving sensitivity：   -97 dBm

·Frequency error：   ±20 kHz

·Working temperature：   -20℃ ～ +85℃

·Storage temperature：   -50℃ ～ +125℃

● **Module type**

As shown in figure 1 shows the Module pin diagram, table 1 for each pin definition.
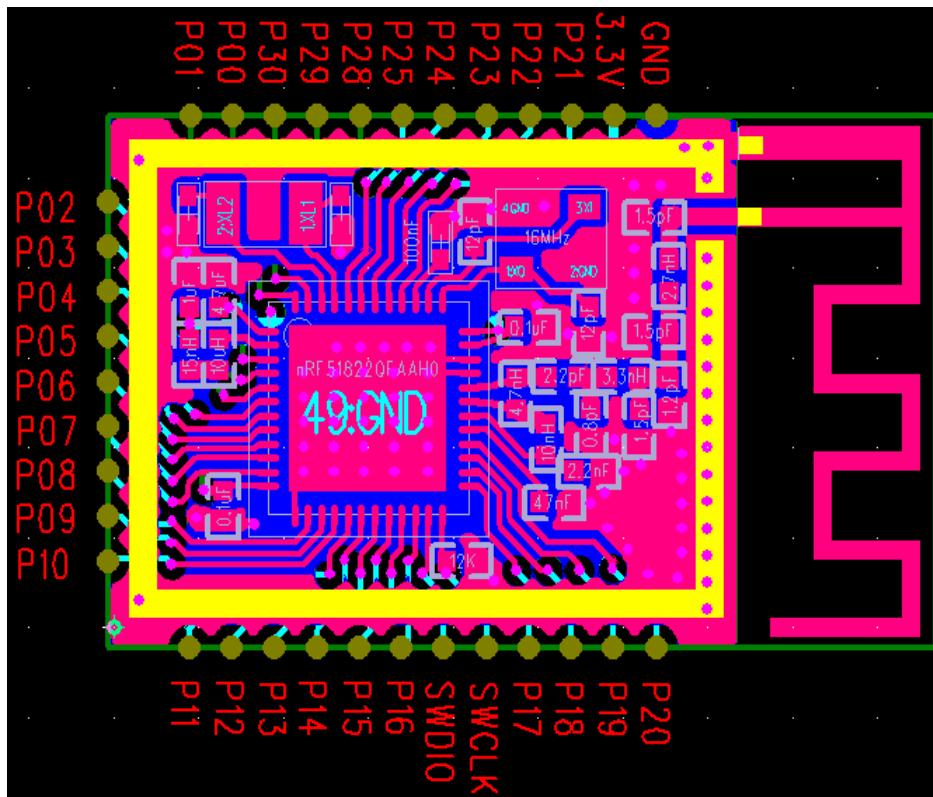
Figure 1 pin diagram

Table 1 pin definition

pin	Name	Function	Note
Pin1	GND	GND	GND
Pin2	VCC	Power supply positive input	Power supply，3.3V
Pin3	P21	I/O	
Pin4	P22	I/O	
Pin5	P23	I/O	
Pin6	P24	I/O	
Pin7	P25	I/O	
Pin8	P28	I/O	
Pin9	P29	I/O	
Pin10	P30	I/O	
Pin11	P00	I/O	
Pin12	P01	I/O	
Pin13	P02	I/O	
Pin14	P03	I/O	
Pin15	P04	I/O	
Pin16	P05	I/O	
Pin17	P06	I/O	
Pin18	P07	I/O	
Pin19	P08	I/O	
Pin20	P09	I/O	
Pin21	P10	I/O	
Pin22	P11	I/O	
Pin23	P12	I/O	
Pin24	P13	I/O	
Pin25	P14	I/O	
Pin26	P15	I/O	
Pin27	P16	I/O	
Pin28	SWDIO	I/O	
Pin29	SWCLK	I/O	
Pin30	P17	I/O	
Pin31	P18	I/O	
Pin32	P19	I/O	
Pin33	P20	I/O	

● Mechanical drawing and PCB packaging size

Figure 2 is module Mechanical drawing and PCB packaging size. Module thickness is .9±0.2 mm.
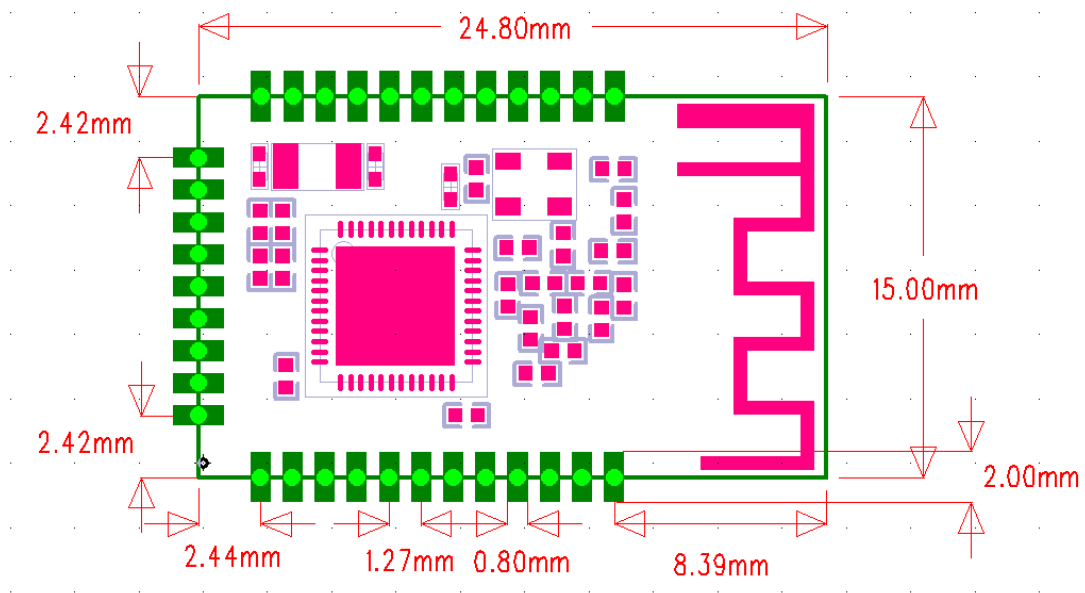

Figure 2　Module mechanical drawing

● Module naming rules

In the Specified phase of the product development , the RF STAR specified the name and number of naming module of each part. The RFSTAR RF51822 series module naming rules as shown in figure 3:
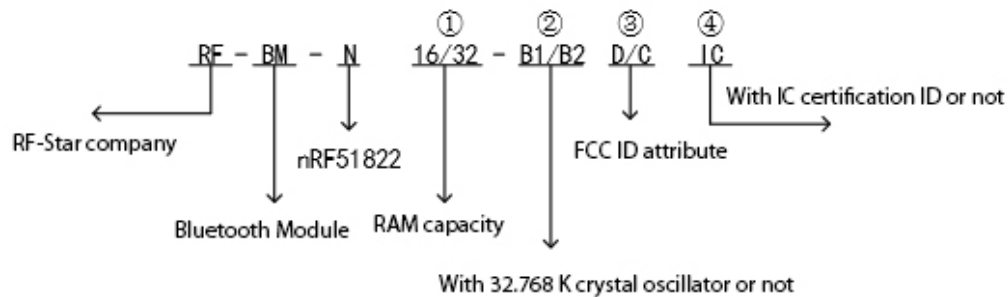

Figure 3 Module Naming Rules

Note:
Label① figures show the capacity of RAM, 16 said 16 KB RAM, 32, said 32 KB of RAM;
Label② the letters and Numbers show whether or not with 32.768 K crystal oscillator, B1 said with, B2 said without;
Label③ the letters show FCC ID attribute, D says the FCC ID of Defond, C is the FCC ID of end customer;
Label④ the letter said with IC certification ID or not, letter IC said with IC certification ID, without IC certification ID if no IC.

Such as RF-BM-N16-B1DIC naming rules as shown in figure 4, including the module of RAM capacity 16 KB, with 32.768 KHz crystal oscillator, the FCC ID belongs to Defond, and with IC certification ID.
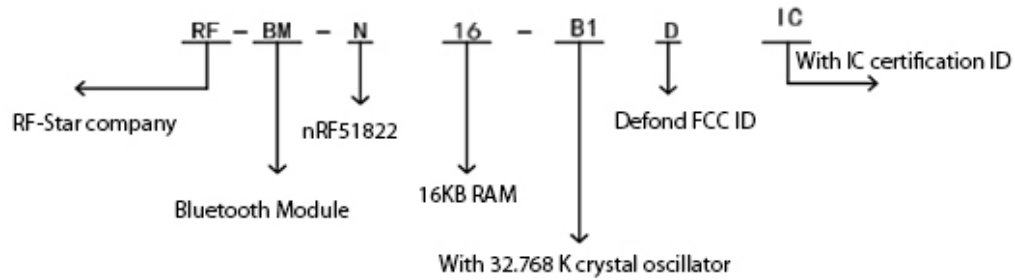
Figure 4 module naming rules, for example

The following table lists the all the names of the module and the corresponding description of nRF51822 series.

RF-BM-N16B1CIC	16k RAM, with 32.768 KHz crystal vibration, the FCC ID to end customer, with IC ID
RF-BM-N16B1C	16k RAM, with 32.768 KHz crystal vibration, the FCC ID to end customer, without IC ID
RF-BM-N16B1DIC	16k RAM, with 32.768 KHz crystal vibration, the FCC ID to Defond, with IC ID
RF-BM-N16B1D	16k RAM, with 32.768 KHz crystal vibration, the FCC ID to Defond, without IC ID
RF-BM-N16B2CIC	16k RAM, without 32.768 KHz crystal vibration, the FCC ID to end customer, with IC ID
RF-BM-N16B2C	16k RAM, without 32.768 KHz crystal vibration, the FCC ID to end customer, without IC ID
RF-BM-N16B2DIC	16k RAM, without 32.768 KHz crystal vibration, the FCC ID to Defond, with IC ID
RF-BM-N16B2D	16k RAM, without 32.768 KHz crystal vibration, the FCC ID to Defond, without IC ID
RF-BM-N32B1CIC	32k RAM, with 32.768 KHz crystal vibration, the FCC ID to end customer, with IC ID
RF-BM-N32B1C	32k RAM, with 32.768 KHz crystal vibration, the FCC ID to end customer, without IC ID
RF-BM-N32B1DIC	32k RAM, with 32.768 KHz crystal vibration, the FCC ID to Defond, with IC ID
RF-BM-N32B1D	32k RAM, with 32.768 KHz crystal vibration, the FCC ID to Defond, without IC ID
RF-BM-N32B2CIC	32k RAM, without 32.768 KHz crystal vibration, the FCC ID to end customer, with IC ID
RF-BM-N32B2C	32k RAM, without 32.768 KHz crystal vibration, the FCC

	ID to end customer, without IC ID
RF-BM-N32B2DIC	32k RAM, without 32.768 KHz crystal vibration, the FCC ID to Defond, with IC ID
RF-BM-N32B2D	32k RAM, without 32.768 KHz crystal vibration, the FCC ID to Defond, without IC ID

● Current power consumption

Testing environment：T A = +25°C,   V BAT = 3. 3 V。

Parameters		Testing conditions	Mini value	Type	Max value	Unit
MCU work	TX	0dbm		17		mA
	RX	High gain mode		9		
MCU sleep	TX					
	RX					
MCU LPDS	TX					
	RX					
MCU dorment	TX					
	RX			0.7		uA
The peak current calibration	TX	Voltage =3. 3V，Power=4 dBm		9.1		mA
	RX	Voltage =3. 3V，Power =4 dBm		5.9		

● RF testing report

T A = +25°C, V BAT = 3.3V，in the 39th channel（2442MHz) the measurement results shown in the table below:

Test item	Parameters	Test value	unit
Transmitter	Power	-1	dBm
	Frequency shift	±20	khz
	Radiation （30M -1G）	-36	dBm
	Radiation（1G -12.75G）	-30	
Receiver	Sensitivity （8% PER）	-93	

● Layout proposal（antenna location and routing）

Antenna is inverted F antenna on the PCB for free space electromagnetic radiation. Position of the antenna and the scope of the layout is the key to increase data rate and firing range.

Hence, about the layout proposal of antenna location and routing is as follows:
1、Place the antenna at the edge of the PCB board or on the corner.
2、To ensure that each layer under the antenna without signal wire or copper foil.
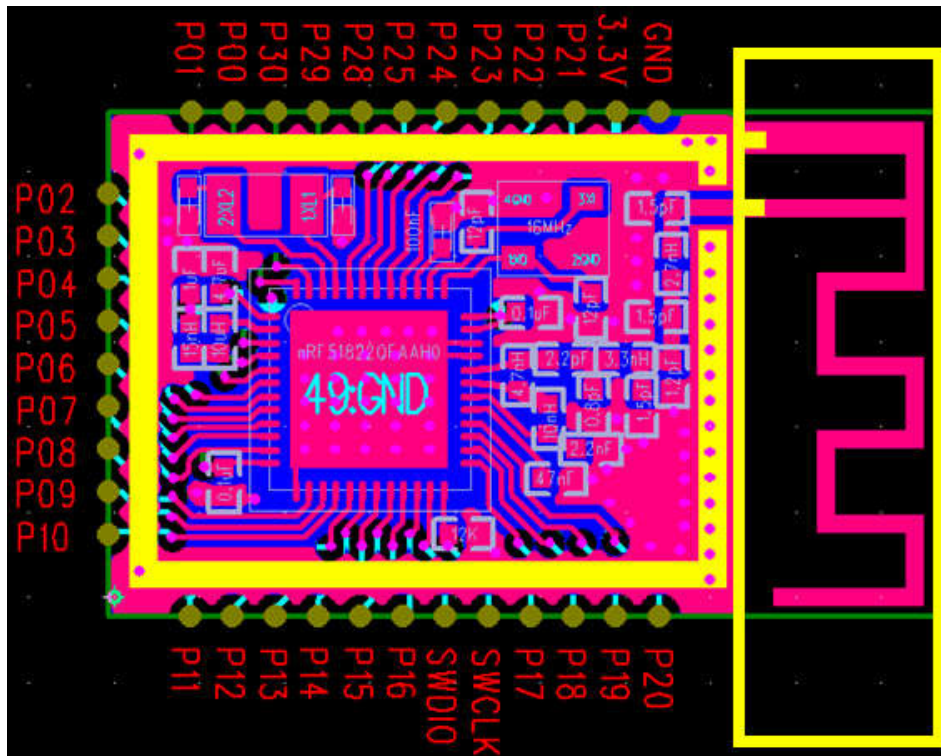3、It is best to hollow out the green boxes position in figure 4, to ensure its S11 affects is very small.

Figure 4

● Recommended operating conditions

Function in operation conditions outside the limits of the parameter value in the following form does not guarantee its performance, beyond the limit of operation for a long time more or less affect the long-term reliability of the module.

Note ：
(1) Operating temperature is restricted by the change of the crystal frequency；
(2) To ensure the wireless RF performance, ripple of the power supply must be less than ±300mV

Identification	Conditions	Mini value	Typical value	Max value	unit
Power supply and IO	Battery mode	1.8	3.3	3.8	V
Operation temperation	/	-40	25	85	℃
Environment hot place		-20		20	℃/分钟

✧ Soldering and Reflow Condition

1. Heating method: Conventional Convection or IR/convection;

2. Allowable reflow soldering times: 2 times based on the following reflow soldering profile（see figure 5）;

3 Temperature profile: Reflow soldering shall be done according to the following temperature profile （see figure 5）;
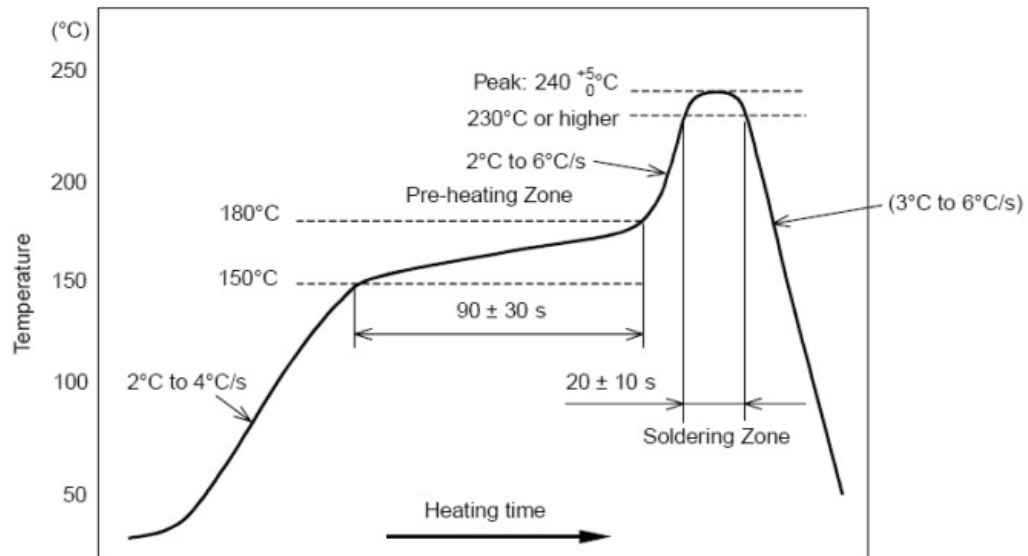
4. Peak temp: 245℃.

Figure 5 welding heat resistance temperature curve (point of welding)

● **Electrostatic discharge caution**

Module will be damaged by electrostatic discharge, RFSTAR recommends that all the module should be dealt with under the following three preventive measure:

1、Must follow the anti-static measures, cannot barely hand module.

2、Module must be placed in the storage area to prevent electrostatic.

3、Anti-static circuit of high voltage input or high frequency input should be considered during the product design.

To the result of the static electricity may result in minor performance degradation to the failure of the entire equipment. Due to the parameters of the very small changes can lead to the value of the equipment does not meet the certification requirements, thereby module will be more vulnerable to damage.

Contact us

深圳市信驰达科技有限公司

SHENZHEN RF STAR TECHNOLOGY CO.,LTD.

Tel：0755–8632 9829   Web: www.szrfstar.com

Fax：0755-86329413   E-mail：sales@szrfstar.com

地址：深圳市宝安区宝源路互联网产业基地 A 区 8 栋 2 楼

Add：2F,Block8,Dist.A,Internet Industry Base,Baoyuan Road ,Baoan Dist,Shenzhen