低功耗蓝牙模块

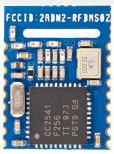
RF-BM-S02A 硬件规格书

深圳市信驰达科技有限公司

更新日期：2020 年01月18日

目录

● 模块选型表

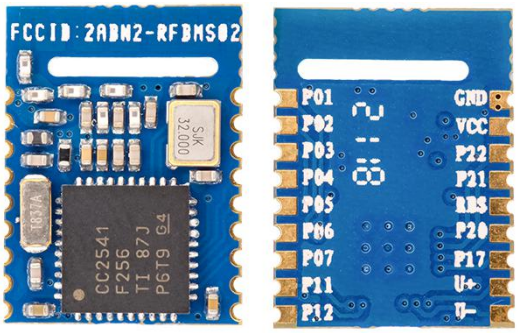
芯片型号	内核	FLASH (KB)	RAM (KB)	发射功率 (dBm)	模块型号	天线形式	模块尺寸 (mm)	通信距离 (M)	模块照片 (点击可访问)
CC2540	8051	256	8	+4	RF-BM-S01	PCB	13.7 * 17.4	100	
					RF-BM-S02	PCB	11.2 * 15.2	100	
					RF-BM-S02I	IPEX	11.2 * 15.2	150	
					RF-CC2540A1	PCB	15.2 * 24.1	100	
CC2541	8051	256	8	0	RF-BM-S01A	PCB	13.7 * 17.4	70	
					RF-BM-S02A	PCB	11.2 * 15.2	70	
					RF-BMPA-2541B1	PCB/IPEX	13.7 * 31.4	300	

注：

1、通信距离为以模块最大发射功率在晴朗天气下空旷无干扰环境下测试所得最远距离。

2、点击图片可跳转至购买链接。

● 概述



RF-BM-S02A 蓝牙模块是基于 TI 公司 CC2541 芯片研发的低功耗蓝牙(BLE)射频模块，可广泛应用于短距离无线通信领域。具有功耗低、体积小、传输距离远、抗干扰能力强等特点。模块配备高性能蛇形天线，采用半孔形式硬件接口设计。

该模块可用于开发基于蓝牙4.0(BLE，低功耗蓝牙)的消费类电子产品，手机外设产品等，能提高操作的可靠性；提高信号的传输距离和抗干扰性；还能实现解决不同电子产品间的互操作问题，电池寿命也可显著延长。为客户产品与智能移动设备通讯提供快速的 BLE 解决方案。软件开发可参考基于 TI 提供的标准 BLE 协议栈，LIB 底层库以及 API 调用接口。源码级 profile，APP Demo 等资料可有效缩短开发投入时间。

此模块的设计目的是迅速桥接电子产品和智能移动设备，可广泛应用于有此需求的各种电子设备，如仪器仪表，物流跟踪，健康医疗，智能家居，运动计量，汽车电子，休闲玩具等。用户可借此模块，以最短的开发周期整合现有方案或产品，以最快的速度占领市场，同时为企业的发展注入崭新的技术力量。

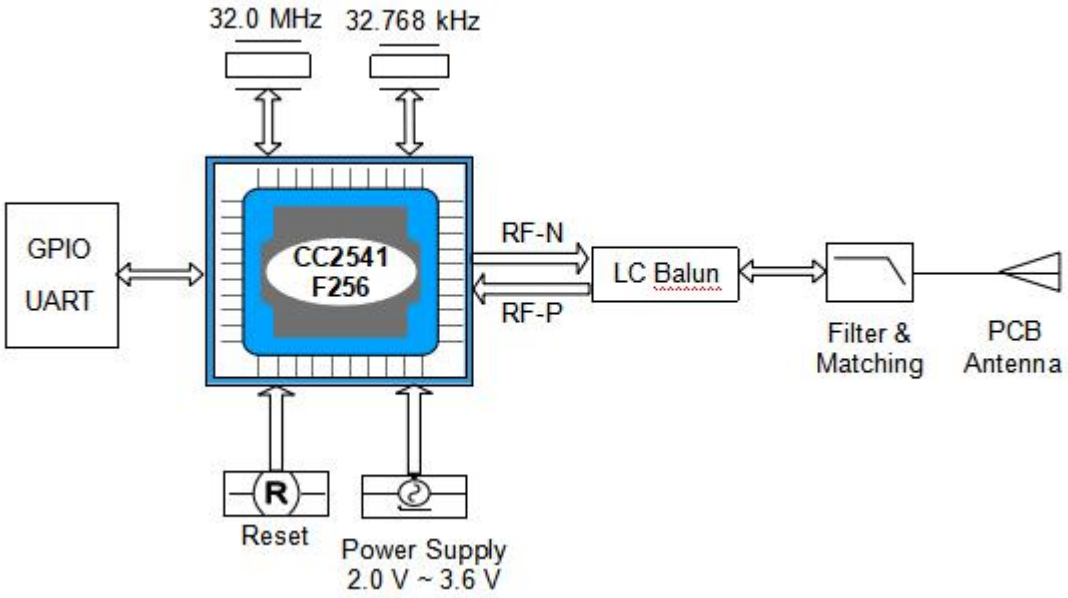


图 1. RF-BM-S02A 原理框图

● 模块参数

表 1. RF-BM-S02A 参数

芯片型号	CC2541
工作电压	2.0 ~ 3.6 V，推荐为 3. 3 V
工作频段	2402 MHz ～ 2480 MHz
发射功率	-23 ~ +0 dBm (正常0dBm输出)
接收灵敏度	-87 dBm（低增益模式） -93 dBm（高增益模式）
SRAM	8 KB
FLASH	256 KB
GPIO数量	13 个
晶振频率	32 MHz，32.768KHz
封装方式	SMT（邮票半孔）
工作温度	- 40 ℃ ～ + 85 ℃
储存温度	- 40 ℃ ～ + 125 ℃

● 模块尺寸与引脚定义

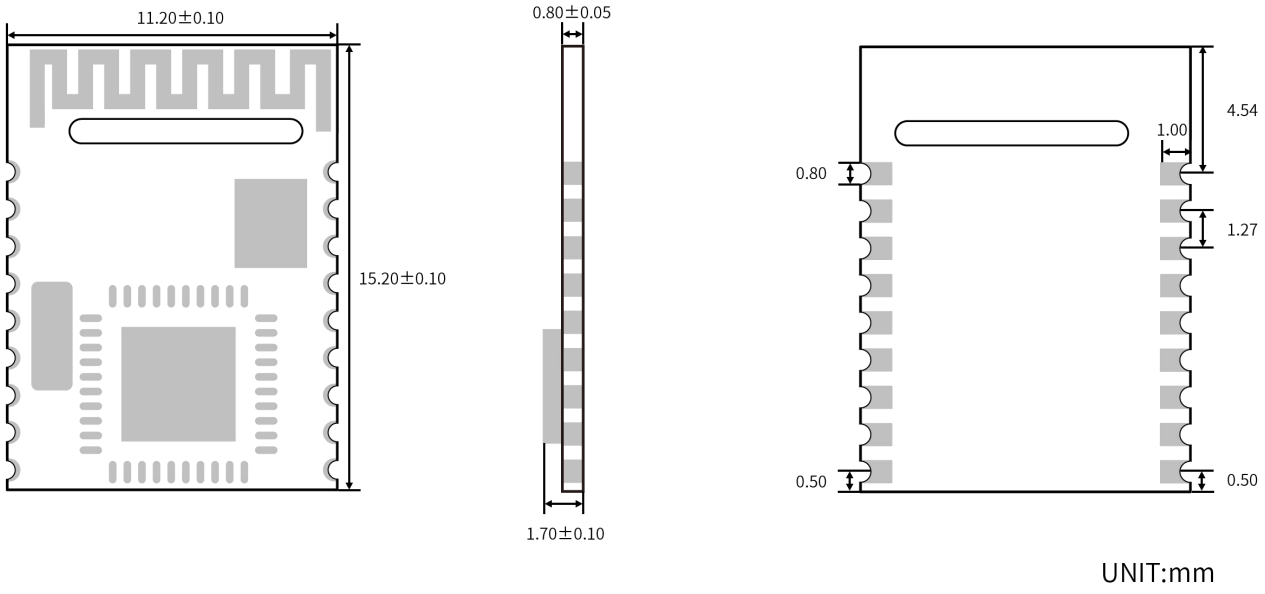


图 2. RF-BM-S02A尺寸图

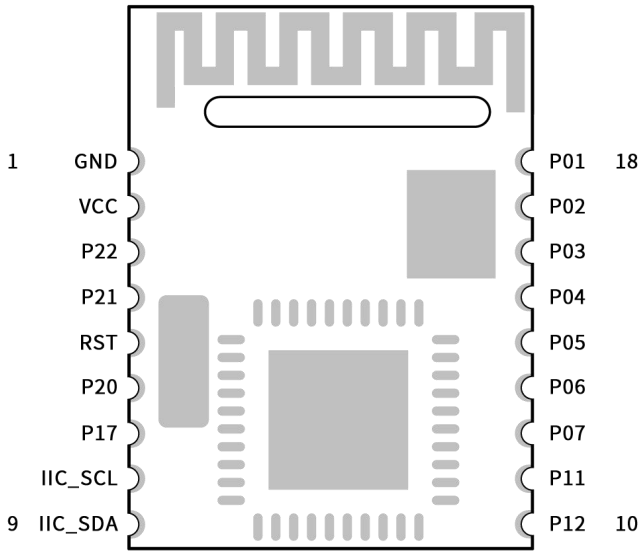


图 3. RF-BM-S02A引脚图

表 2. RF-BM-S02A模块引脚定义

引脚序号	名称	功能	备注
1	GND	—	
2	VCC	—	模块电源，2.0 ~ 3.6 V，推荐 3.3 V
3	P22	I/O	
4	P21	I/O	
5	RESET	复位脚	低电平有效
6	P20	I/O	
7	P17	I/O	
8	I2C_SCL	I2C 时钟线	CC2541 芯片支持 I2C_SCL
9	I2C_SDA	I2C 数据线	CC2541 芯片支持 I2C_SDA
10	P12	I/O	
11	P11	I/O	
12	P07	I/O	
13	P06	I/O	
14	P05	I/O	
15	P04	I/O	
16	P03	I/O	
17	P02	I/O	
18	P01	I/O	

● 硬件设计注意事项

1、推荐使用直流稳压电源对模块进行供电，电源纹波系数尽量小，模块需可靠接地；请注意电源正负极的正确连接，如反接可能会导致模块永久性损坏；

2、请检查供电电源，确保在推荐供电电压之间，如超过最大值会造成模块永久性损坏；请检查电源稳定性，电压不能大幅频繁波动；

3、在针对模块设计供电电路时，往往推荐保留 30% 以上余量，有利于整机长期稳定地工作；模块应尽量远离电源、变压器、高频走线等电磁干扰较大的部分；

4、高频数字走线、高频模拟走线、电源走线必须避开模块下方，若实在不得已需要经过模块下方，假设模块焊接在 Top Layer，在模块接触部分的 Top Layer 铺地铜（全部铺铜并良好接地），必须靠近模块数字部分并走线在 Bottom Layer；

5、假设模块焊接或放置在 Top Layer，在 Bottom Layer 或者其他层随意走线也是错误的， 会在不同程度影响模块的杂散以及接收灵敏度；

6、假设模块周围有存在较大电磁干扰的器件也会极大影响模块的性能，跟据干扰的强度建议适当远离模块，若情况允许可以做适当的隔离与屏蔽；

7、假设模块周围有存在较大电磁干扰的走线（高频数字、高频模拟、电源走线）也会极大影响模块的性能，跟据干扰的强度建议适当远离模块，若情况允许可以做适当的隔离与屏蔽；

8、通信线若使用5V电平， 必须使用电平转换电路；

9、尽量远离部分物理层亦为 2.4 GHz 频段的TTL 协议，例如：USB3.0。

10、模块天线布局请参考下图：

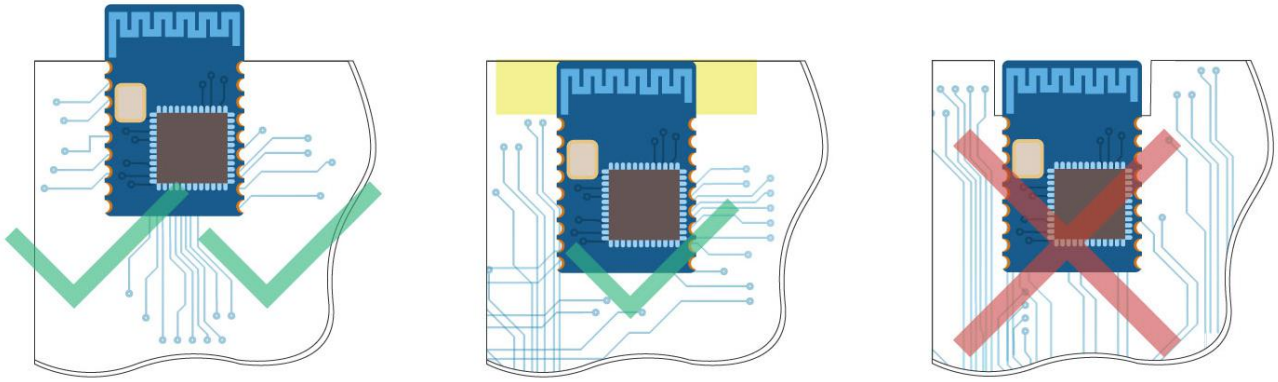


图 4. 布局建议

● 常见问题

➢ 传输距离不理想

1、当存在直线通信障碍时，通信距离会相应的衰减；温度、湿度，同频干扰，会导致通信丢包率提高；地面吸收、反射无线电波，靠近地面测试效果较差；
2、海水具有极强的吸收无线电波能力，故海边测试效果差；
3、天线附近有金属物体，或放置于金属壳内，信号衰减会非常严重；
4、功率寄存器设置错误、空中速率设置过高（空中速率越高，距离越近）；
5、室温下电源低压低于推荐值，电压越低发功率越小；
6、使用天线与模块匹配程度较差或天线本身品质问题。

➢ 易损坏——异常损坏

1、请检查供电电源，确保在推荐供电电压之间，如超过最大值会造成模块永久性损坏；请检查电源稳定性，电压不能大幅频繁波动；
2、请确保安装使用过程防静电操作，高频器件静电敏感性；
3、请确保安装使用过程湿度不宜过高，部分元件为湿度敏感器件；如果没有特殊需求不建议在过高、过低温度下使用。

➢ 误码率太高

1、附近有同频信号干扰，远离干扰源或者修改频率、信道避开干扰；
2、电源不理想也可能造成乱码，务必保证电源的可靠性；
3、延长线、馈线品质差或太长，也会造成误码率偏高。

● 回流焊条件

1、加热方法：常规对流或 IR 对流；
2、允许回流焊次数：2 次，基于以下回流焊(条件)(见图 5)；
3、温度曲线：回流焊应按照下列温度曲线(见图 5)；
4、最高温度：245°C。

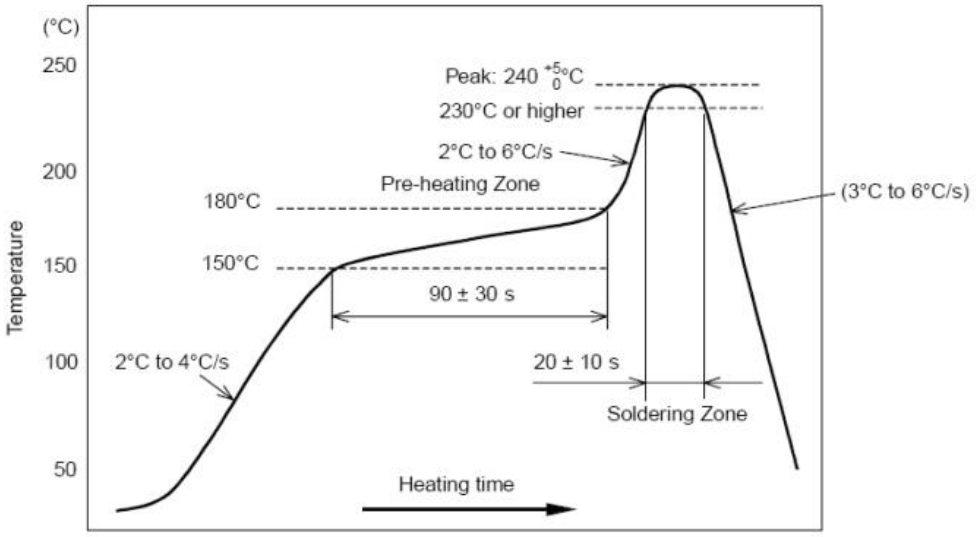


图 5. 部件的焊接耐热性温度曲线(焊接点)

● 静电放电警示

模块会因静电释放而被损坏，RF-star 建议所有模块应在以下 3 个预防措施下处理：

1、必须遵循防静电措施，不可以裸手拿模块。

2、模块必须放置在能够预防静电的放置区。

3、在产品设计时应该考虑高电压输入或者高频输入处的防静电电路。

静电可能导致的结果为细微的性能下降到整个设备的故障。由于非常小的参数变化都可能导致设备不符合其认证要求的值限，从而模块会更容易受到损害。

● 版本更新记录

版本号	文档日期	更新内容
V1.0	2018/02/07	更新模块实物图 更新模块工作与存储温度范围
V1.0	2018/02/26	更正模块工作与存储维度范围 新增附录 C：CE 认证 更新附录 D：ROHS 认证
V1.0	2018/08/02	更新公司地址
V1.0	2020/01/18	更换模块尺寸、引脚图 添加模块选型表

● 联系我们

深圳市信驰达科技有限公司

Shenzhen RF-star Technology Co., Ltd.

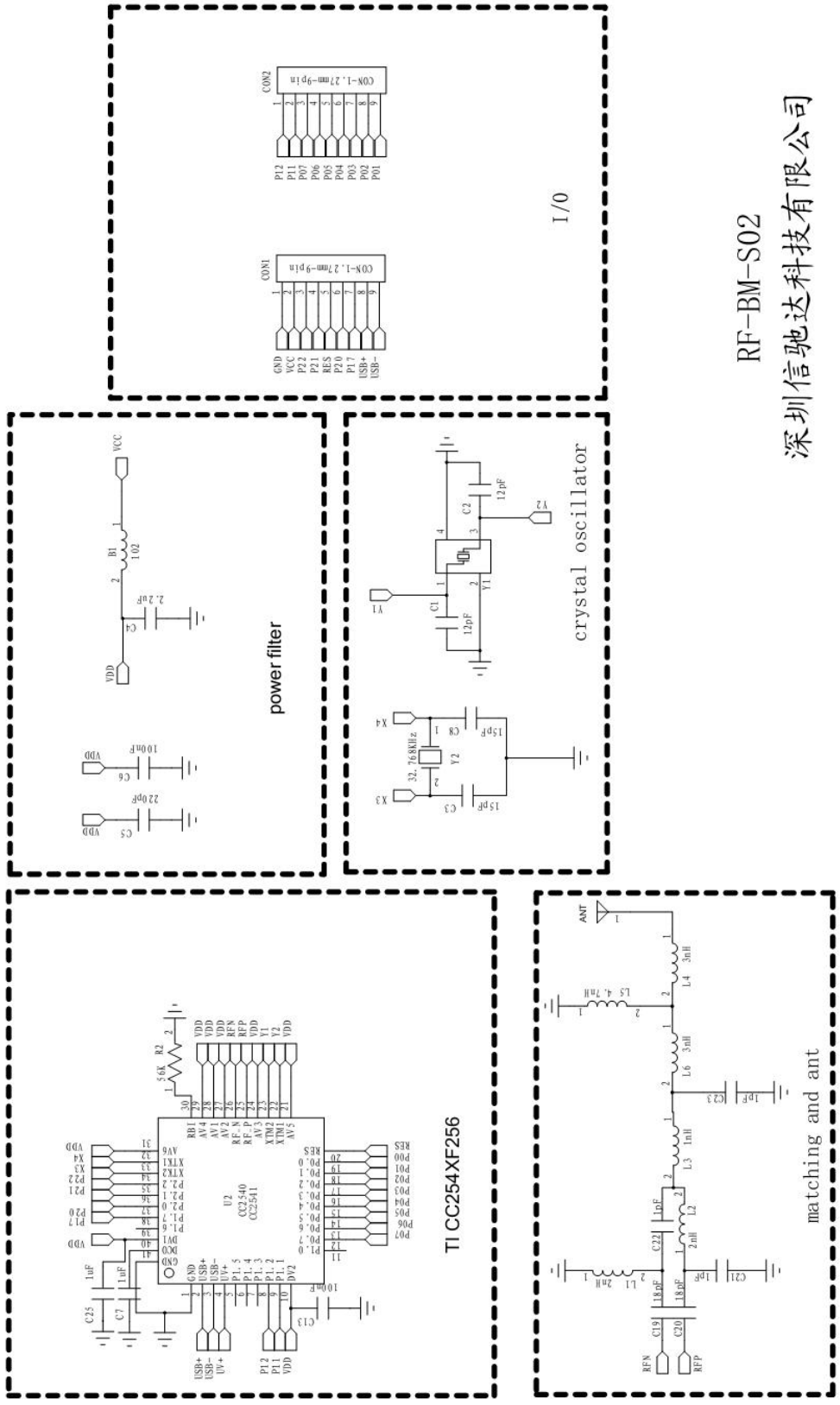
Tel(Sales)：0755–8632 9829　　Tel(FAE)：0755-3695 3756

E-mail：sales@szrfstar.com　　Web： www.szrfstar.com

地址：深圳市南山区高新园科技南一道创维大厦 C 座 601 室

Add：Room 601,Block C,Skyworth Building,Nanshan High-Tech Park,Shenzhen.

附录A：模块原理图


I/O
power filter
crystal oscillator
matching and ant
TI CC254XF256
RF-BM-S02
深圳信驰达科技有限公司

附录 B：FCC 认证

TCB

GRANT OF EQUIPMENT AUTHORIZATION

Certification

Issued Under the Authority of the

Federal Communications Commission

By:

TCB

Nemko Canada Inc.
303 River Road
Ottawa, Ontario, K1V 1H2
Canada

Date of Grant: 01/07/2016

Application Dated: 01/05/2016

ShenZhen RF-STAR Technology CO.,LTD
2F,BLDG.8,Zone A,BaoAn Internet Industry Base,
BaoYuan Road,XiXiang, BaoAn DIST,
ShenZhen,
China

Attention: Aroo woo

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER: 2ABN2-RFBMS02A
Name of Grantee: ShenZhen RF-STAR Technology CO.,LTD
Equipment Class: Digital Transmission System
Notes: Bluetooth Module
Modular Type: Limited Single Modular

Grant Notes	FCC Rule Parts	Frequency Range (MHZ)	Output Watts	Frequency Tolerance	Emission Designator
	15C	2402.0 - 2480.0	0.000731		

Limited Single Modular Approval. Power output listed is conducted. Approval is limited to OEM installation only. Compliance of this device in all final host configurations is the responsibility of the Grantee. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other transmitter. OEM integrators must be provided with antenna installation instructions and labeling requirements for finished products. OEM integrators and End-users must be provided with transmitter operation conditions for satisfying RF exposure compliance. This grant is valid only when the device is sold to OEM integrators and the OEM integrators are instructed to ensure that the end user has no manual instructions to remove or install the device. Separate approval is required for all other operating configurations, including portable configurations with respect to 2.1093 and different antenna configurations.

附录 C：CE 认证

CCIS Shenzhen Zhongjian Nanfang Testing Co., Ltd.

VERIFICATION OF CONFORMITY

Verification No:	CCISE170703301V
Applicant:	SHENZHEN RF STAR TECHNOLOGY CO., LTD.
Address of Applicant:	2F, Block8, Dist.A, Internet Industry Base, Baoyuan Road, Baoan Dist, Shenzhen, China
Product Name:	Bluetooth Module
Model No.:	RF-BM-S02, RF-BM-S02A
Trade Mark:	RF-star

Sufficient samples of the product have been tested and found to be in conformity with

Applicable standards:	Draft ETSI EN 301 489-1 V2.2.0 (2017-03), Draft ETSI EN 301 489-17 V3.2.0 (2017-03), ETSI EN 300 328 V2.1.1 (2016-11), EN 62479:2010, EN 60950-1: 2006+ A11:2009 + A1:2010+ A12:2011+A2:2013
As shown in the Test report number(s):	CCISE170703301, CCISE170703302, CCISE170703303, CCISS170704001

Based on a review of the test report detailed above, this apparatus has met the requirements of the above standards and hence has been properly demonstrated that the requirement of the directive have been fulfilled. The product is in conformity with the article 3.1(a) the requirements of safety and article 3.1(b) the requirements of EMC and article 3.2 requirements of radio equipment in Directive 2014/53/EU.

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives. The affixing of the CE marking presumes in addition that the conditions in all relative Directives are fulfilled.

ZHONGJIAN NANFANG TESTING CCIS SHENZHEN CO., LTD.

CE

Bruce Zhang
Laboratory Manager **02 Aug., 2017**

Address: No. B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road, Bao'an District, Shenzhen, Guangdong, China
Telephone: +86 (0) 755 2311 8282, Fax: +86 (0) 755 2311 6366, Website: www.ccis-cb.com

附录D：RoHS认证

DTi

TEST REPORT

ilac-MRA CNAS
TESTING
CNAS L8083

REPORT No.: DTI201801253515 Date: 2018-01-30 Page 1 of 7

Applicant Company Name：SHENZHEN RF STAR TECHNOLOGY CO.,LTD.

Applicant Company Address：2F, Block8, Dist.A, Internet Industry Base, Baoyuan Road, Baoan Dist, Shenzhen, China

Report on the submitted samples said to be:

Sample Name	:	Bluetooth Module
Model No.	:	RF-BM-S02A, RF-BM-S02
Sample Receiving Date	:	Jan.25, 2018
Testing Period	:	From Jan.25, 2018 to Jan.30, 2018
Results	:	Please refer to next page(s).

Summary of Test Results:

TEST REQUEST		CONCLUSION
A	EU RoHS Directive 2011/65/EU and its amendment directives	Pass

Signed for and on behalf of
DTI

Approved by: Li Ping

Deesev Testing International Co.,Ltd. DTI 德泽威检测

DTI Deesev Testing International Corp. (Shenzhen)
德泽威技术检测(深圳)有限公司
5/F,1st Tower of Gaoxinqi High-tech Zone, 67th Zone ,Liuxian 1st Road,Bao'an,Shenzhen, Guangdong, China
中国广东省深圳市宝安区留仙一路67区高新奇战略新兴产业园二期1号楼5楼
Tel: +86-755-66683068 Fax: +86-755-66683099

附录E：End Product Listing

EPL Bluetooth® End Product Listing

The Bluetooth SIG Hereby Recognizes

ShenZhen RF STAR Technology CO.,LTD.
Member Company

RF-BM-S01_v1.1
Qualified Design Name

Qualified Design ID(s): B016552

Contact Person: Aroo Wong

Series: V1.1

Publish Date: 13 November 2013

EPL Type: Other

This certificate acknowledges the *Bluetooth*® Specifications declared by the member were achieved in accordance with the *Bluetooth* Qualification Process as specified within the *Bluetooth* Specifications and as required within the current PRD

Bluetooth® SPECIAL INTEREST GROUP

附录F：REACH认证

Verification of Conformity

Applicant Name:	SHENZHEN RFSTAR TECHNOLOGY CO.,LTD
Address:	2F,BLOCK8,DIST.A,INTERNET INDUSTRY BASE,BAOYUAN ROAD ,BAOAN DIST.,SHENZHEN,CHINA

hereby declares that the product

Product Tested:	BLE BLUETOOTH MODULE ZIGBEE MODULE WIFI MODULE
Model Number:	RF-BM-S01;RF-BM-S02;RF-BM-S02A;RF-BM-S03;RF-BM-S02D; RF-BM-S03S; RF-BM-S02I;RF-BM-26405X5B1;RF-WM-3200B1;RF-WM-7681B1;RF-WM-7681B2;RF-DG-2540B1;RF-ZM-2530B1;RF-ZMPA-2530B1;RF-BMPA-2540B1;RF-BM-51822B1
Ratings and principal characteristics:	The mixed test result is PASS,Conform to the requirements of the regulations

Conforms to the following specifications

Relevant Standards/ Specifications/ Directives	Article 33 of Regulation (EC) No 1907/2006 requires supplier of an article containing a substance meeting the criteria in Article 57 and identified in accordance with Article 59(1) in a concentration above 0.1% weight (w/w) shall provide the recipient of the article with sufficient information, available to the supplier, to allow safe use of the article including, as a minimum, he name of that substance.
Verification Issuing Office Name & Address	Eurones Consumer Products Testing Service Co.,Ltd 3F,Huafeng Building,No.77, Hetian Avenue Houjie Town, Dongguan City, Guangdong Province,China
Date of tests	Sep 22, 2015
Report no.	C150918025001

CONSUMER PRODUCTS CPST TESTING

Signature: Will Pan

Name: Will Pan
Position: CPST
Date: 2015-9-22

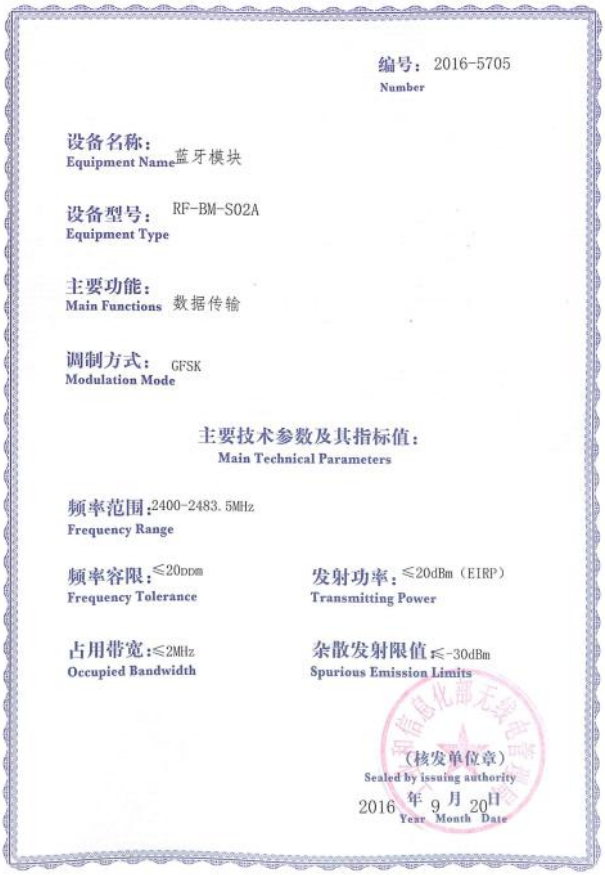
附录G：SRRC认证

无线电发射设备
Radio Transmission Equipment
型号核准证
Type Approval Certificate

深圳市信驰达科技有限公司：
根据《中华人民共和国无线电管理
In accordance with the provisions on the Radio
条例》，经审查，下列无线电发射设备
Regulations of the People's Republic of China , the following
符合中华人民共和国无线电管理规定和
radio transmission equipment , after examination , conforms
技术标准，其核准代码为：CMIIT ID: 2016DP5705
to the provisions with its CMIIT ID:

有效期：
Validity 五年

（发证机关）
Sealed by issuing authority
2016年 9 月 20日
Year Month Date



编号：2016-5705
Number

设备名称：蓝牙模块
Equipment Name

设备型号：RF-BM-S02A
Equipment Type

主要功能：数据传输
Main Functions

调制方式：GFSK
Modulation Mode

主要技术参数及其指标值：
Main Technical Parameters

频率范围：2400-2483.5MHz
Frequency Range

频率容限：≤20ppm
Frequency Tolerance

发射功率：≤20dBm（EIRP）
Transmitting Power

占用带宽：≤2MHz
Occupied Bandwidth

杂散发射限值：≤-30dBm
Spurious Emission Limits

（核发单位章）
Sealed by issuing authority
2016年 9 月 20日
Year Month Date