

HooRii

TECHNOLOGY

HooRii
HRN71-BSNS

Product Specification

Version Ver1.0

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1、简介

1. Introduction

HRN71 系列是和众基于 nRF52840 芯片设计的近场通信模组，本模组旨在将高度集成、超低功耗，高质量无线物联网设备所需的特性和功能集成到单个 SoC 中。支持 Thread、BLE 通讯和 Matter 应用层的标准和行业联盟规范。

The HRN71 series is a near field communication module designed by HooRii based on the nRF52840 chip. This module is designed to integrate the features and functions required for highly integrated, ultra-low power, high quality wireless IoT devices into a single SoC. Standards and industry consortium specifications for Thread, BLE Communications and Matter application layers are supported.

1.1 特性

1.1 Features

- 内置低功耗 32 位 CPU，可以兼作应用处理器

Built-in low-power 32-bit CPU that can double as an application processor

- 主频支持 64MHz

Main frequency support 64 MHz

- 2MB FLASH, 256 kB RAM

2MB FLASH, 256 kB RAM

- 工作电压：1.7V~3.6V

Operating voltage: 1.7V~3.6V

- 丰富外设资源：

Extensive peripheral resources:

- 最多 11×GPIOs;

Up to 11 x GPIOs;

- USB 2.0 全速 (12 Mbps) 控制器;

USB 2.0 full speed (12 Mbps) controller;

- 最多 8×12 位 ADC, 200 ksps;

Up to 8 x 12-bit ADCs, 200 ksps;

- 最多 4 个四通道脉冲宽度调制器 (PWM) 单元，带 EasyDMA ；

Up to 4 x quad pulse width modulator (PWM) units with EasyDMA;

- 多达 2 个 I2C 兼容的两线制主站/从站 ；

Up to 2 I2C-compatible 2-wire master/slave units;

- 多达 4 个 SPI 主站/3 个 SPI 从站，带 EasyDMA ；

Up to 4 SPI masters/3 SPI slaves with EasyDMA;

- 2 个 UART (CTS/RTS) ，带 EasyDMA ；

2 UARTs (CTS/RTS) with EasyDMA;

- QSPI 32 MHz 接口

QSPI 32 MHz interface

1.2 应用领域

1.2 Applications

- 智能楼宇

Intelligent Buildings

- 智慧家居/家电

Smart Home / Home Appliances

- 智能插座

Smart plug

- 工业无线控制

Industrial Wireless Control

1.3 模组规格

1.3 Module specifications

芯片型号 Chip type	nRF52840
支持标准 Support Standards	6LowPAN, Thread, BLE, Matter
天线接口 Antenna interface	天线焊盘 antenna pads
模组尺寸 Module size	L*W*H: 10*10*2.6 mm External antenna (antenna pad): L*W*H: 10*10*2.6 mm
工作温度 Operating temperature	-40°C ~ 85°C
储存温度 Storage temperature	-40°C ~ 125°C

1.4 方案框图

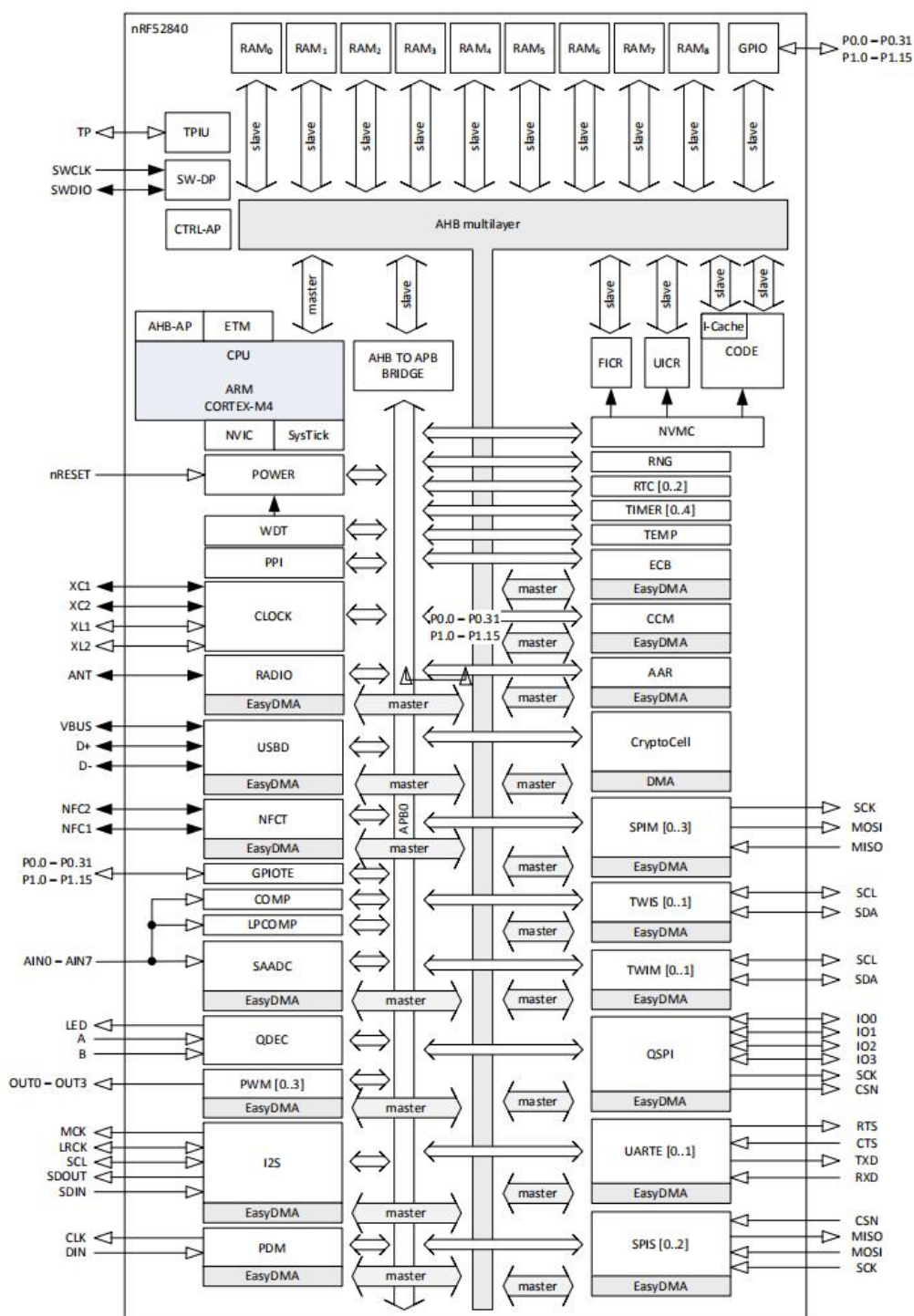
1.4 Block diagram of the solution

这个框图说明 nRF52840 的整个系统。带白头的箭头表示与其他信号共享物理引脚的信号。

任意 GPIO 可配置为 SPI、I2C、UART、PWM 等外设引脚：

This block diagram illustrates the entire system of the nRF52840. The arrows with white headers indicate signals that share physical pins with other signals.

Any GPIO can be configured as a peripheral pin for SPI, I2C, UART, PWM, etc:



2、电气特性

2. Electrical Characteristics

2.1 推荐的操作条件

2.1 Recommended operating conditions

参数项 Item	描述 Descriptive	最小值 Min	典型值 Typ	最大值 Max	单位 Unit
VBAT	工作电压 operating voltage	1.7	3.0	3.6	V
VIH	I/O 高电平输入 I/O high level input	0.7VDD	—	VDD	V
VIL	I/O 低电平输入 I/O low level input	VSS	—	0.3VDD	V
VOH	I/O 高电平输出 I/O high level output	0.9VDD	—	VDD	V
VOL	I/O 低电平输出 I/O low level output	VSS	—	0.1VDD	V
T _{opr}	工作温度 operating temperatures	−40	—	85	°C

2.2 DC 特性

2.2 DC Characteristics

参数项 Item	工作状态 Working State T _{opr} =25°C	平均值 Average Value	峰值 (典型值) Peak (Typ)	单位 Unit	条件 Condition
接收电流 Receiving Current	连续接收 Receive continuously	6.77	9.66	mA	@ 250 kbit/s, DC/DC
发射电流 Emitting Current	连续发射, 0dBm 输出功率 Continuous transmit, 0dBm output power	6.87	9.84	mA	@ 250 kbit/s, DC/DC
	连续发射, +8dBm 输出功率 Continuous transmit, +8dBm output power	16.7	20.14	mA	@ 250 kbit/s, DC/DC
睡眠电流 Sleep Current	系统关闭, 无 RAM 保留, 重置时唤醒 System shutdown, no RAM retention, wake on reset	—	9	uA	@DC/DC, 外置 Flash 低功耗待机模式 @DC/DC, external flash low power standby mode

2.3 AC 特性

2.3 AC Characteristics

2.3.1 基本射频特性

2.3.1 Basic RF Characteristics

工作频率 Operating frequency	2.400GHz-2.4835GHz
无线传输速率 Wireless transmission rate	IEEE802.15.4 250Kbps, $\pm 500\text{KHz}$ deviation; BLE/2.4GHz Proprietary 1Mbps, $\pm 250\text{KHz}$ deviation
通信距离 (IEEE802.15.4 250Kbps) Communication distance (IEEE802.15.4 250Kbps)	200M @+8dBm, 外置天线 (增益 0.5dBi) 200M @ +8dBm, external antenna (gain 2dBi)

2.3.2 发射性能 (IEEE802.15.4 250Kbps)

2.3.2 Transmit performance (IEEE802.15.4 250Kbps)

参数项 Parameter	最小值 Min	典型值 Typ	最大值 Max	单位 Unit
输出功率 Output power	-20	-	8	dBm
输出功率可调节步进 Output power adjustable step	-	4	-	dB
频率偏移 Frequency offset	-13	-	13	ppm
EVM	-	1	-	%rms

2.3.3 接收性能 (IEEE802.15.4 250Kbps)

2.3.3 Receive performance (IEEE802.15.4 250Kbps)

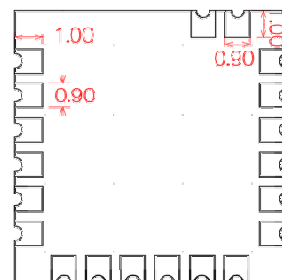
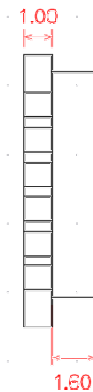
参数项 Item	最小值 Min	典型值 Typ	最大值 Max	单位 Unit
PER $\leq 1\%$, 接收灵敏度 (250Kbps) PER $\leq 1\%$, receive sensitivity (250Kbps)	-	-98	-	dBm

2.4 驱动特性

2.4 Driver characteristics

参数项 Item	描述 Descriptive	最小值 Min	典型值 Typ	最大值 Max	单位 Unit
I _{OL,HDH}	Current at VSS+0.4 V, output set low, high drive, VDD =3.3V	6	10	15	mA
I _{OH,HDH}	Current at VDD-0.4 V, output set high, high drive, VDD=3.3V	6	9	14	mA

3.1 模組尺寸 (Units: mm)



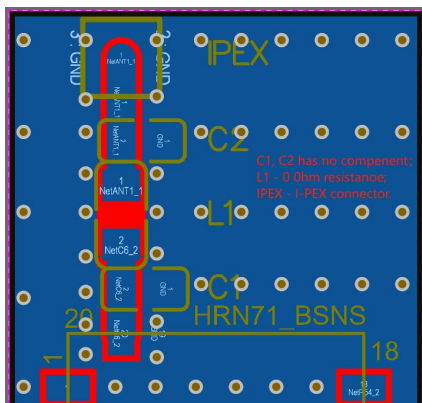
Bottom View

3.2.1 电路原理图设计

元件 Component	位号 Place	规格 Parameter	数量 Quantities
贴片电容 Chip capacitor	C1	NC	1
贴片电容 Chip capacitor	C2	NC	1
贴片电阻 Chip resistors	L1	0Ω	1

3.2.2 布局建议

3.2.2 Layout recommendations:



射频走线长度 RF traces Length	射频走线宽度 RF traces Width	地敷铜与走线间距 Ground Copper and tracesl Spacing
9.3MM	1MM	0.2MM

L1 为 $0\ \Omega$ 电阻器, C1、C2 为调谐专用, 不含任何元件。射频测试连接器用于传导射频性能测试, 应尽可能靠近模块的 ANT 引脚。HRN71_BSNS 与天线之间的迹线阻抗必须控制在 $50\ \Omega$ 。

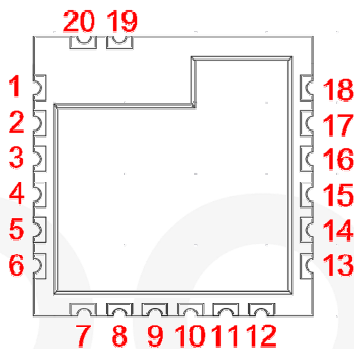
The L1 are 0Ω resistors, and the C1, C2 are reserved for tuning and have no components. The RF test connector is used for the conducted RF performance test, and should be placed as close as to the module's ANT pin. The traces impedance between HRN71 BSNS and antenna must be controlled in 50 Ω.

1. 外置天线版本通过模块的天线邮票孔焊盘，在客户的底板将射频信号通过 RP-SMA 转接头或 IPEX 座连接到外置天线；
2. 将天线邮票孔焊盘在底板上引出时，需在底板上预留 π 匹配网络，将射频信号引出到 RP-SMA 头或者 IPEX 座，再连接外置天线；
3. 客户在底板上的射频走线需要做 50Ω 阻抗控制。

1. The external antenna version connects the RF signal to the external antenna via the antenna stamp hole pads of the module, at the customer's base plate, via RP-SMA adapters or IPEX holders.
2. When leading the antenna stamp hole pads on the base plate, a π -matching network needs to be reserved on the base plate to lead the RF signal out to the RP-SMA header or IPEX holder and then connect the external antenna.
3. The customer needs to do 50Ω impedance control for the RF alignment on the base board.

3.3 模组引脚定义

3.3 Module Pinout Definitions



引脚号 Pin Number	类型 Type	引脚功能 Pin Functions	备注 Remarks
1	Debug	Serial wire debug I/O for debug and programming	D
2	Debug	Serial wire debug I/O for debug and programming	C
3	Digital I/O nRESET	General purpose I/O Configurable as pin RESET	
4	USB	USB D-	
5	USB	USB D+	
6	VBUS	5 V input for USB 3.3 V regulator	
7	VDD	Power supply	Typ. 3.3V,纹波<30mV,电流>250mA Typ. 3.3V, ripple <30mV, current >250mA
8	GND	Negative power supply for module	
9	Digital I/O	General purpose I/O	
10	Digital I/O Analog input	General purpose I/O Analog input	
11	Digital I/O Analog input	General purpose I/O Connection for 32.768 kHz crystal	
12	Digital I/O Analog input	General purpose I/O Connection for 32.768 kHz crystal	
13	Digital I/O	General purpose I/O	

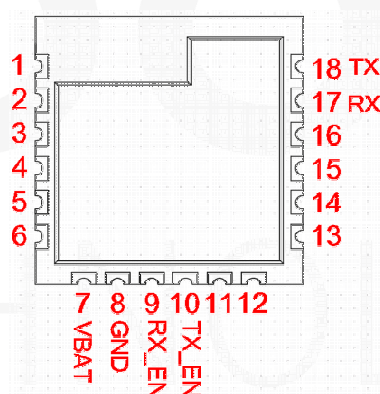
	Analog input	Connection for 32.768 kHz crystal	
14	Digital I/O Analog input	General purpose I/O Analog input	
15	Digital I/O Analog input	General purpose I/O Analog input	
16	Digital I/O Analog input	General purpose I/O Analog input	
17	Digital I/O Analog input	General purpose I/O Analog input	
18	Digital I/O	General purpose I/O	
19	GND	Negative power supply for module	
20	ANT	RF output port	

4、应用方案

4. Application Solutions

4.1 AT 应用

4.1 AT Applications



引脚号 Pin number	功能 Function	功能介绍 Features	说明 Description	备注 Remarks
8	GND	电源地 Power supply ground	—	四引脚 4 Pin
7	VBAT	电源供应引脚 Power supply pin	Type. 3.3V。	
17	RX	UART 串口通信 UART serial communication	用于模块与 MCU 的 UART 通信。	
18	TX		For UART communication between the module and the MCU.	
9	RX_EN	UART 的 RX 接收使能引脚 RX receive enable pin of the UART	高电平，UART 的 RX 打开，接收来自 MCU 的数据；低电平，UART_RX 关闭。 High, the RX of the UART is turned on to receive data from the MCU; low, the UART_RX is turned off.	六引脚，可选功能 ^① 6pin, optional function ^①

10	TX_NTF	UART 消息通知引脚 UART message notification pin	当模块有数据发送给 MCU 时，该引脚会触发输出高电平，发送完成后，该引脚进入低电平。 This pin is triggered to output high when the module has data to send to the MCU, and goes low when the sending is complete.	
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① 可选功能为六引脚模式与四引脚模式，

①Optional functions are available in six-pin mode and four-pin mode.

- 六引脚模式：GPIO 唤醒模式，使用 RX_EN 和 TX_NTF 引脚作为通信唤醒源；

Six-pin mode: GPIO wake-up mode, using the RX_EN and TX_NTF pins as communication wake-up sources;

- 四引脚模式：RX 唤醒模式，使用 RX 引脚作为通信唤醒源，该模式下 MCU 与模组之间发送的报文头部都需加上前导码。因此，当无法支持六引脚模式时，可选择该模式。

Four-pin mode: RX wake-up mode, which uses the RX pin as the communication wake-up source. In this mode, the header of all messages sent between the MCU and the module need to be prefixed with a leading code. Therefore, this mode can be selected when the six-pin mode cannot be supported.

5、订购信息

5. Ordering information

5.1 订购代码

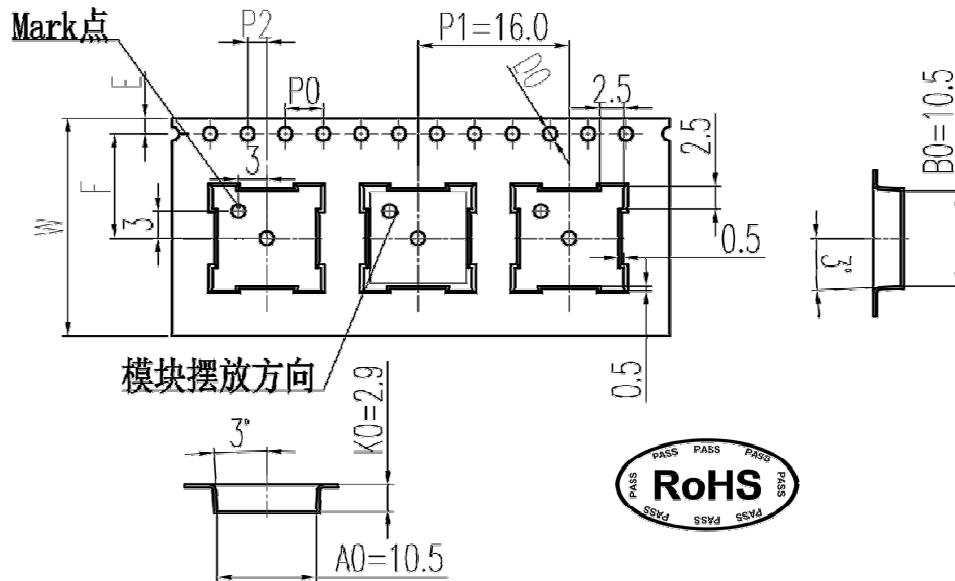
5.1 Ordering codes

模组型号 Module type	规格描述 Specification description
HRN71-BSNS	天线焊盘，有屏蔽罩，2MB Flash Antenna Pad, Shielded, 2MB Flash

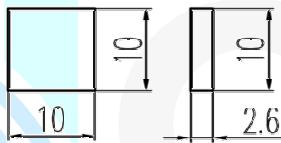
5.2 包装卷带信息

5.2 Packaging Tape and Reel Information

产品型号 Product Model	出货方式 Shipping method	模组数量 Module Number
HRN71-BSNS	载带卷盘 Tape Reel	1300pcs/卷 1300pcs/roll



颗粒尺寸参考



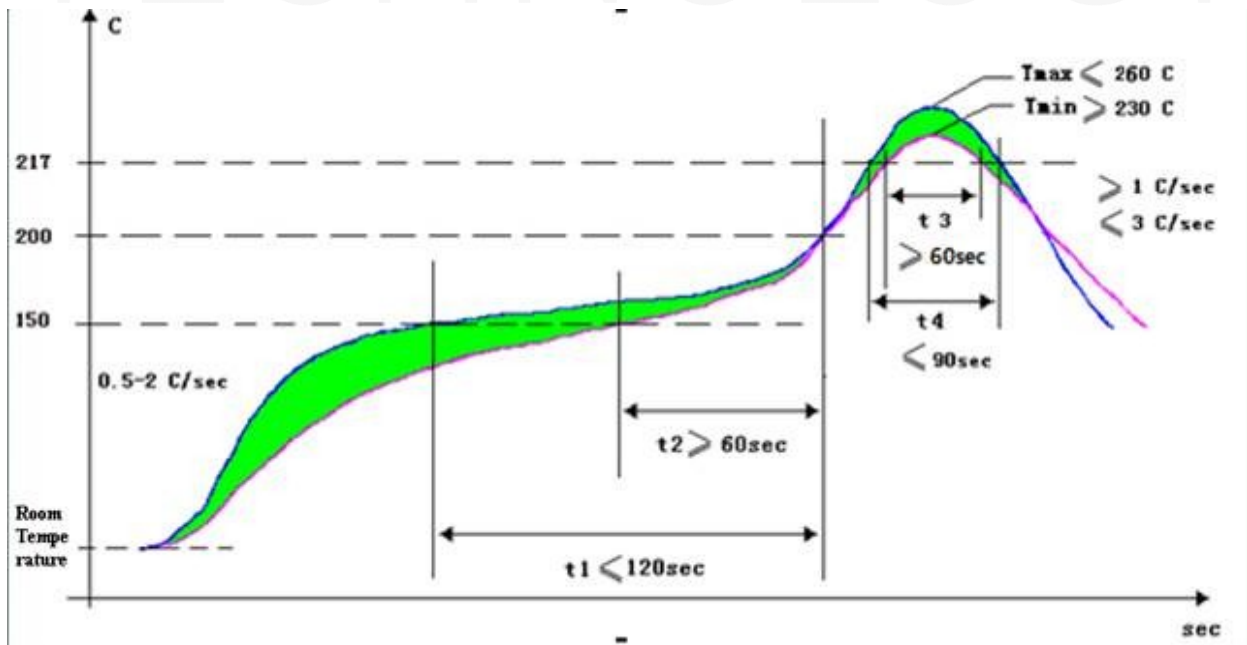
ITEM	W	F	E1	D0	D1	P0	P2	T
DIM	24	11.5	1.75	φ1.5	φ1.5	4.00	2.00	0.30
TOLE	+0.30 -0.30	+0.10 -0.10	+0.10 -0.10	+0.10 -0.00	+0.20 -0.20	+0.10 -0.10	+0.10 -0.10	+0.05 -0.05

6、无铅回流焊工艺参数要求

6.Requirements for lead-free reflow soldering process parameters

- 无铅回流焊接工艺温度曲线如下图所示。

The lead-free reflow soldering process profile is shown in the diagram below.



- 无铅回流焊工艺参数如下表所示。

The parameters of the lead-free reflow soldering process are shown in the table below.

区域 Region	时间 Time	升温速率 Heating rate	峰值温度 Peak temperature	降温速率 Cooling rate
预热区 (40~150°C) Preheating zone (40 to 150° C)	60~150s	$\leq 2.0^{\circ}\text{C/s}$	-	-
均温区 (150~200°C) Homogenising zone (150 to 200° C)	60~120s	$< 1.0^{\circ}\text{C/s}$	-	-
回流区 (>217°C) Reflow zone (>217° C)	60~90s	-	230-260°C	-
冷却区 (Tmax~180°C) Cooling zone (Tmax ~ 180° C)	-	-	-	$1.0^{\circ}\text{C/s} \leq \text{Slope} \leq 4.0^{\circ}\text{C/s}$

说明:

Description:

- 预热区：温度由40°C~150°C，温度上升速率控制在2°C/s左右，该温区时间为60~150s。

Pre-heating zone: temperature from 40° C ~ 150° C , the temperature rise rate is controlled at about 2 ° C / s , and the time of this temperature zone is 60 ~ 150 s .

- 均温区：温度由150°C~200°C，稳定缓慢升温，温度上升速率小于1°C/s，且该区域时间控制在60~120s（注意：该区域一定缓慢受热，否则易导致焊接不良）。

Even temperature zone: temperature from 150° C to 200° C , stable and slow heating, temperature rise rate less than 1° C / s , and the region time control in 60 ~ 120s (Note: the region must be slowly heated, otherwise easy to lead to poor welding).

- 回流区：温度由217°C~Tmax~217°C，整个区间时间控制在60~90s。

Reflux zone: temperature from 217° C ~ Tmax ~ 217° C , with the entire zone time controlled at 60-90s.

- 冷却区：温度由Tmax~180°C，温度下降速率最大不能超过4°C/s。

Cooling zone: temperature from Tmax to 180° C , the maximum rate of temperature drop cannot exceed 4° C/s.

- 温度从室温25°C升温到250°C时间不应该超过6分钟。

The temperature increase from room temperature 25° C to 250° C should take no more than 6 minutes.

- 该回流焊曲线仅为推荐值，客户端需根据实际生产情况做相应调整。

This reflow profile is only a recommendation and the client will need to adjust it accordingly to the actual production situation.

- 回流时间以60~90s为目标，对于一些热容较大无法满足时间要求的单板可将回流时间放宽至120s。

The reflow time is targeted at 60-90s, and can be relaxed to 120s for some veneers with a large heat capacity that cannot meet the time requirement.

封装体耐温标准参考IPC/JEDEC J-STD-020D标准，封装体测温方法参考JEP 140标准。

The temperature resistance of the package is based on the IPC/JEDEC J-STD-020D standard and the temperature measurement

of the package is based on the JEP 140 standard.

IPC/JEDEC J-STD-020D 标准，封装体测温方法按照 JEP 140 标准要求：

IPC/JEDEC J-STD-020D standard, encapsulated body temperature measurement method as required by JEP 140:

IPC/JEDEC 020D 中的无铅器件封装体耐温标准如下表所示。

The temperature resistance standards for lead-free device packages in IPC/JEDEC 020D are shown in the table below.

表IPC/JEDEC 020D 中的无铅器件封装体耐温标准

Temperature resistance standards for lead-free devices in IPC/JEDEC 020D in table

Package Thickness	Volume mm3 <350	Volume mm3 350~2000	Volume mm3 >2000
<1.6mm	260℃	260℃	260℃
1.6mm~2.5mm	260℃	250℃	245℃
>2.5mm	250℃	245℃	245℃

体积计算中不计入器件焊端（焊球，引脚）和外部散热片。

The volume calculation does not take into account the solder ends of the device (solder balls, pins) and the external heat sink.

回流焊接工艺曲线测量方法：

Reflow soldering process curve measurement method.

JEP140 推荐：对于厚度较小的器件，测量封装体温度时，直接将热电偶贴放在器件表面，对于厚度较大的器件，在器件表面钻孔埋入热电偶进行测量。由于量化器件厚度的要求，推荐全部采用在封装体表面钻孔埋入热电偶的方式（特别薄器件，无法钻孔除外）。

JEP140 recommends: for small devices, the thermocouple is placed directly on the surface of the device when measuring the temperature of the package, for thicker devices, the thermocouple is drilled into the surface of the device for measurement. Due to the requirement to quantify the thickness of the device, it is recommended that all thermocouples are drilled into the surface of the package (except for particularly thin devices, where drilling is not possible).

7、FCC& IC Statement:

This device complies with Part 15 of the FCC Rules and with Innovation, Science and Economic Development Canada's licence-exempt RSS(s).

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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (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.

Changes or modifications made to this equipment not expressly approved by (HooRii Technology Co., Ltd.) may void the FCC authorization to operate this equipment.

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.

Radiofrequency radiation exposure Information:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

End-users and installers must be provided with antenna installation

Radiation Exposure Statement:

This equipment complies with IC 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.

Déclaration d'exposition aux radiations: Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20cm de distance entre la source de rayonnement et votre corps.

OEM/Integrators Installation Manual

This module has been granted modular approval for mobile applications. OEM integrators for host products may use the module in their final products without additional IC (Industry Canada) certification if they meet the following conditions. Otherwise, additional IC approvals must be obtained.

- The host product with the module installed must be evaluated for simultaneous transmission requirements.
- The users manual for the host product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current IC RF exposure guidelines.
- To comply with IC regulations limiting both maximum RF output power and human exposure to RF radiation, the maximum antenna gain including cable loss in a mobile only exposure condition must not exceed, it include one omni antenna with Max antenna gain 0.5 dBi;
- A label must be affixed to the outside of the host product with the following statements:

This device contains FCC ID: 2BC2T-HRN71

This equipment contains equipment certified under IC: 31630-HRN71

The final host / module combination may also need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.

If the final host / module combination is intended for use as a portable device (see classifications below) the host manufacturer is responsible for separate approvals for the SAR requirements from FCC Part 2.1093 and RSS-102.

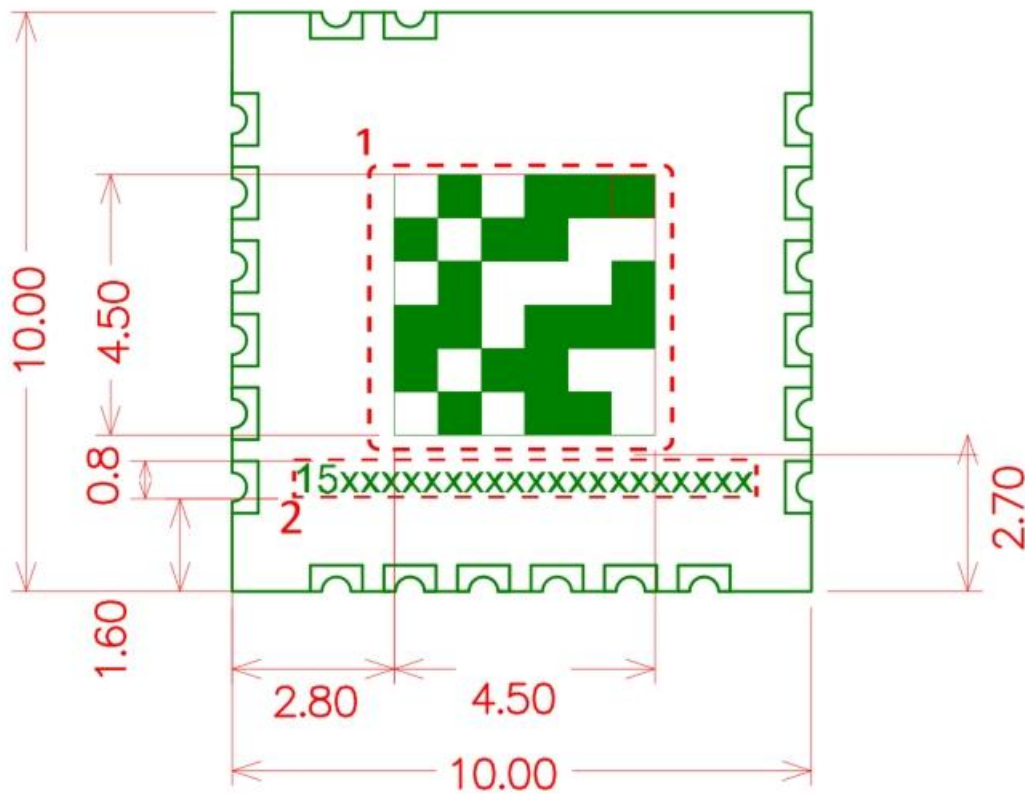
Trace antenna designs

Not applicable. The module has its own antenna, and doesn't need a host's printed board microstrip trace antenna etc.

This radio transmitter [31630-HRN71], has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Antenna Type	Frequency Band (MHz)	Antenna Gain (dBi)
Omni Antenna	2400 ~ 2500	0.5

HRN71_BSNS - Label Design



FCC ID: 2BC2T-HRN71

IC: 31630-HRN71

Model Name: HRN71_BSNS



: 2D code

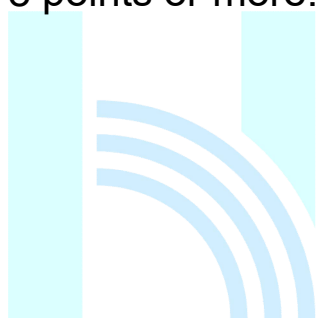
Since the product is too small to put the FCC and IC IDs even with the font size 4 point, we have to put the related information on the user manual.

HRN71_BSNS - Label Design

FCC ID:2BC2T-HRN71 IC: 31630-HRN71 HVIN: HRN71_BSNS
This device complies with part 15 of FCC Rules and Industry Canada's licence-exempt RSSs. 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.
Le présent appareil est conforme à la partie 15 des règles de la FCC et aux normes des CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'appareil doit accepter tout brouillage subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

The character size is
8 points or more.

Notation requirement areas
of other countries.



TECHNOLOGY