产　品　规　格　书

PRODUCT SPECIFICATION

产品名称：　　　蓝牙 BLE 模块
APPELLATION:　　Bluetooth Low Energy Module
产品型号：　　　BT-MN10-1
MODEL:　　　　BT-MN10-1
客户名称：
CUSTOMER:
版　　本：　　　V1.0
VERSION:　　　V1.0

客户承认 **CUSTOMER APPROVED**
签名： Signature: 职务： Duty: 日期： Date:

<table>
<tr><td colspan="5">shinwa 信华精机有限公司
Shinwa Industries(China)Ltd.</td></tr>
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变更履历表

Revision History

序号 No	版本 Version	变更日期 Date	变更内容 Change Description	备注 Remark	制作 Executed by	审核 Checked by
1	V1.0	2023/11/28	首次发行. First Issue.	\	黄文轩 Huang wenxuan	

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1. 介绍 Introduction

1.1 简要 Overview

★ BT-MN10-1 模块是采用蓝牙v5.0低功耗芯片设计。
BT-MN10-1 module is designed with BT v5.0 BLE chip.

★ BT-MN10-1模组集成有高性能射频收发器、基带及32位Cortex-M4处理器；最大 24kB Data SRAM 存储，最大 192kB Data Flash 存储
BT-MN10-1 module integrates a high-performance RF transceiver, bansband and 32bit Cortex-M4 microprocessor; 24kB Data SRAM Max, 192kB Data Flash Max.

1.2 特征 Features

★ 蓝牙 MESH，支持 Bluetooth SIG Mesh
Bluetooth SIG Mesh

★ 支持蓝牙主/从模式。
Support Bluetooth Master/Slave.

★ 支持带中断功能输入输出端口。
Support GPIO with interrupt function.

★ 外置高速晶体振荡器: 32MHz和预留外置低速 RC 振荡器: 32.768KHz
32MHZ Crystal oscillator and reserve low speed RC 32.768KHZ Crystal oscillator outside

★ 可支持UART(CTS/RTS)串口端口在DMA。
UART (CTS/RTS) with EasyDMA.

★ I2C 接口支持主从关系
I 2 C compatible master/slave

★ 模组尺寸20 X 12mm,邮票孔,41个脚位。
Module size: 20 X 12mm, Stamp-41pin.

★ 模组内置PCB天线
Antenna inside the module.

★ 电压供电范围：1.8V ~ 3.6V
Supply voltage range: 1.8V~3.6V

★ 满足ROHS2.0环保
Satisfy the ROHS2.0 environmental care

1.3 应用 Applications

★ 汽车无钥匙进入及启动系统。
Passive keyless entry and passive start system.

★ 远程控制人机交互及讯息传输。
Remote control human-computer interaction and message transmission.

★ 生产和制造自动化。
Production and manufacturing automation

★ IOT多节点BLE MESH联网。
Iot BLE mesh

★ 物流标签。
Logistics label

★ 运动穿戴式
Sports wearable

★ 消费类产品
Consumer products

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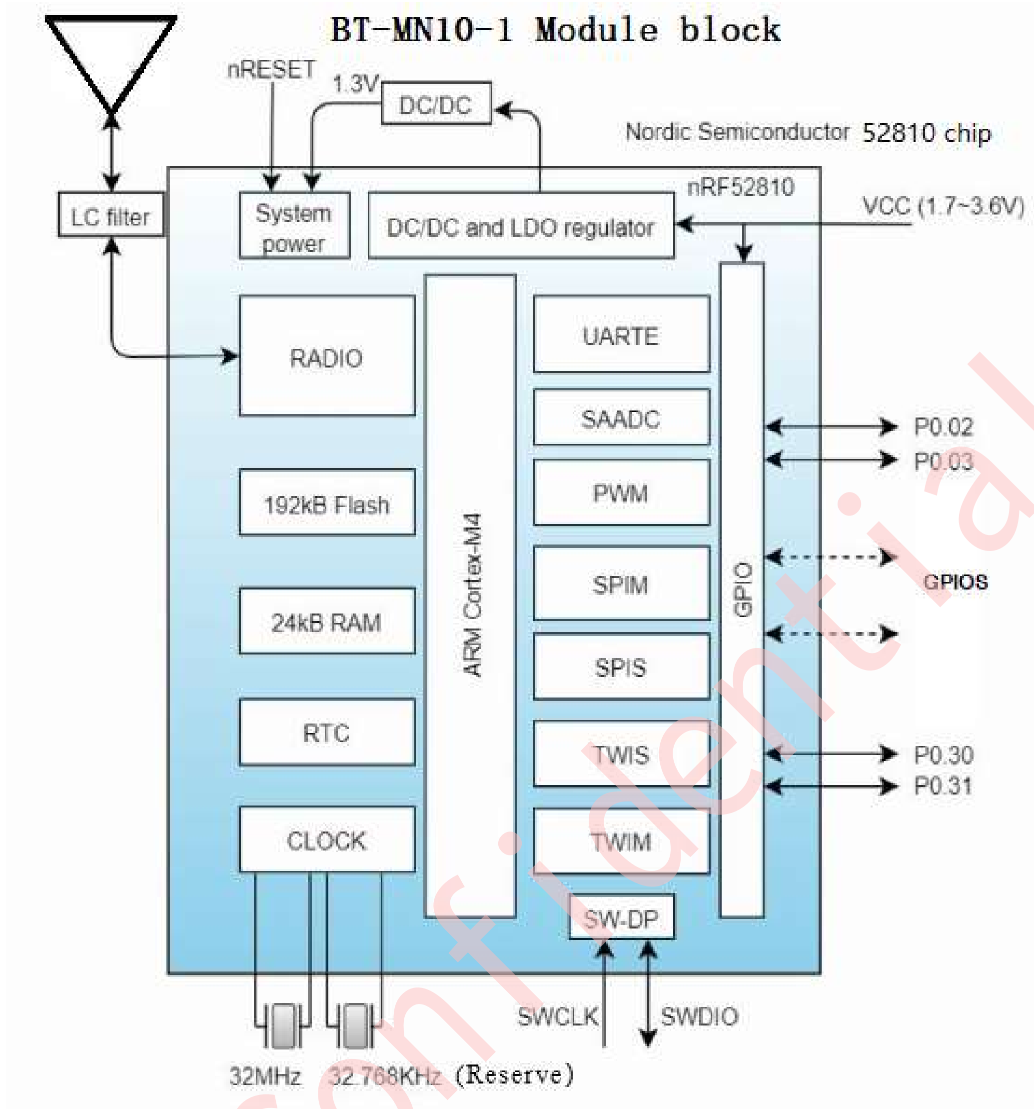
1.4 框图 Block Diagram



2. 规格 Specification

2.1 通用规格 General Specification

1	产品名称 Product Name	蓝牙低功耗模组 Bluetooth low energe module
2	额定电压 Rated Voltage	3.3V DC（<50mVp-p 纹波电压）
3	工作电压范围 Operation Voltage range	1.8V～3.6V (DC)
4	最大发射功率 Max. Transmission Power	4 dBm
5	最大传输距离 Max. Transmission Distance	80 米
6	尺寸 Dimension	20 X 12 X 0.6mm(L*W*H)
7	抗静电 ESD	Class2(HBM)
8	潮敏等级 MSL Level	3

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2.2 温度和湿度规格 Temperature and Humidity specification

工作温度范围 Operation Temperature range	−40～85℃
储存温度范围 Storage Temperature range	−40～125℃
湿度范围 Humidity range	10% ～90%

2.3 BLE 射频规格和电器性能规格

BLE Radio Specification and Electrical performance specifications

项目 Items	条件 Conditions	最小 Min.	典型 Typ.	最大 Max.	单位 Unit
TX output power	N/A	-40	-2	4	dBm
Mod Char: F1 average	N/A	225	264	275	KHz
Mod Char: F2 Max.	N/A	185	210	-	KHz
Mod Char: Ratio	N/A	0.8		-	-
RXsensitivity(PER)	1500packets@1Mbps	-	-90	-95	dBm
RXsensitivity(PER)	1500packets@2Mbps	-	-90	-95	dBm
RXsensitivity(PER)	1500packets@125kbp	-	-90	-95	dBm
RX mode	N/A.		4.6		mA
TX mode@0DB	N/A		4.6		mA

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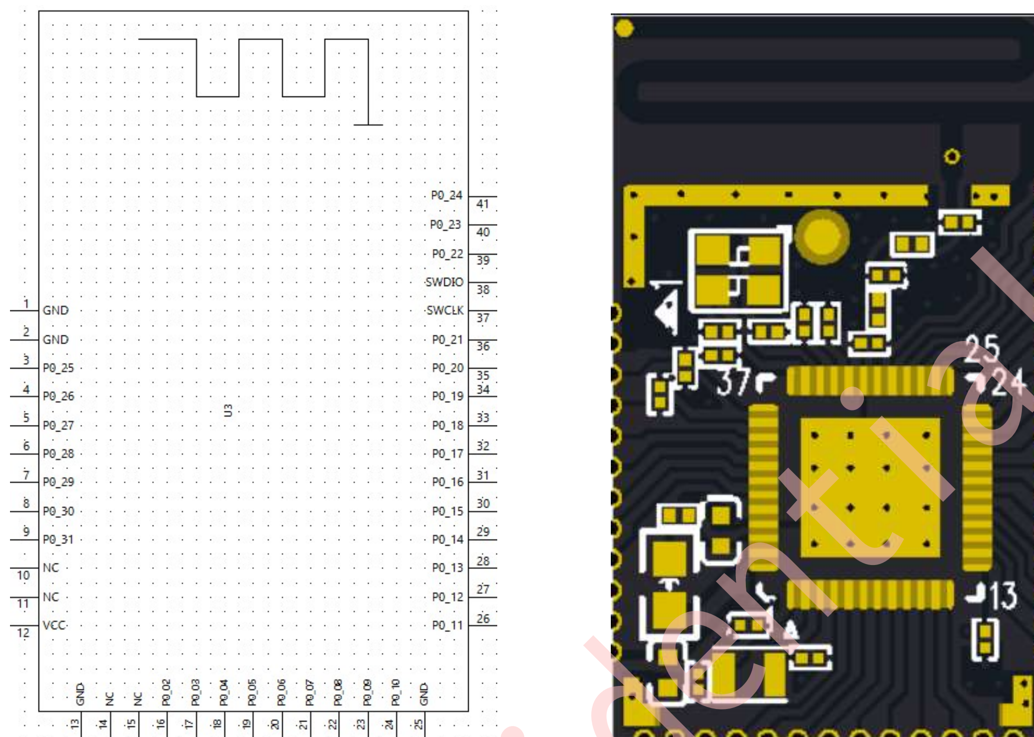
3. 设计应用 Design Application

3.1 管脚配置 Pin Assignment



3.2 管脚描述 Pin Description

Pin	Name	Type	Description
1	GND	GND	Ground
2	GND	GND	Ground
3	P0_25	Digital I/O	General purpose I/O
4	P0_26	Digital I/O	General purpose I/O
5	P0_27	Digital I/O	General purpose I/O
6	P0_28	Digital I/O	General purpose I/O
7	P0_29	Digital I/O	General purpose I/O
8	P0_30	Digital I/O	General purpose I/O
9	P0_31	Digital I/O	General purpose I/O
10	NC	NC	No Connector
11	NC	NC	No Connector
12	VCC	Power	Power supply
13	GND	Power	Ground
14	NC	NC	No Connector
15	NC	NC	No Connector
16	P0_02	Digital I/O	General purpose I/O
17	P0_03	Digital I/O	General purpose I/O
18	P0_04	Digital I/O	General purpose I/O

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19	P0_05	Digital I/O	General purpose I/O
20	P0_06	Digital I/O	General purpose I/O
21	P0_07	Digital I/O	General purpose I/O
22	P0_08	Digital I/O	General purpose I/O
23	P0_09	Digital I/O	General purpose I/O
24	P0_10	Digital I/O	General purpose I/O
25	GND	Power	Ground
26	P0_11	Digital I/O	General purpose I/O
27	P0_12	Digital I/O	General purpose I/O
28	P0_13	Digital I/O	General purpose I/O
29	P0_14	Digital I/O	General purpose I/O
30	P0_15	Digital I/O	General purpose I/O
31	P0_16	Digital I/O	General purpose I/O
32	P0_17	Digital I/O	General purpose I/O
33	P0_18	Digital I/O	General purpose I/O
34	P0_19	Digital I/O	General purpose I/O
35	P0_20	Digital I/O	General purpose I/O
36	P0_21	Digital I/O	General purpose I/O
37	SWCLK	Digital I/O	Serial wire debug clock input for debug and programming
38	SWDIO	Digital I/O	Serial wire debug I/O for debug and programming
39	P0_22	Digital I/O	General purpose I/O
40	P0_23	Digital I/O	General purpose I/O
41	P0_24	Digital I/O	General purpose I/O

3.3 模块片烧录方式，具体如下chip has burning software as follows :

Jlink烧录接口：芯片烧录时使用SWCLK 和 SWDIO 是默认的Jlink烧录口；
Jlink burning Port: used during chip batch production SWCLK and SWDIO are the default serial port burning ports

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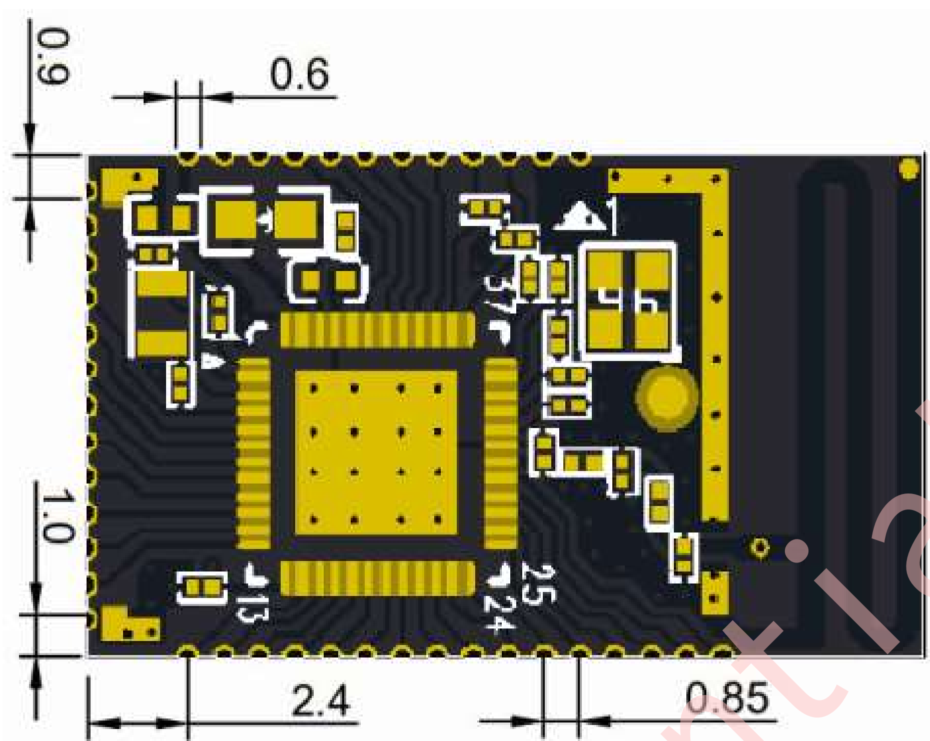
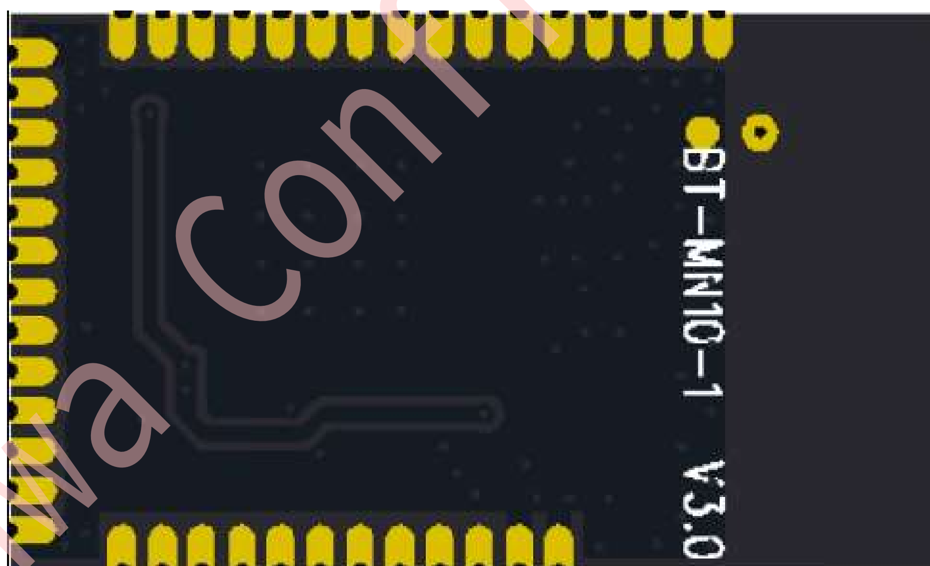
3.4 推荐模块封装 **Recommended Module Mounting Pattern**





模块尺寸：20 X 12mm(长 X 宽),公差:±0.3mm

Module Size: 20 X 12mm(L X W), Tolerance: ±0.3mm

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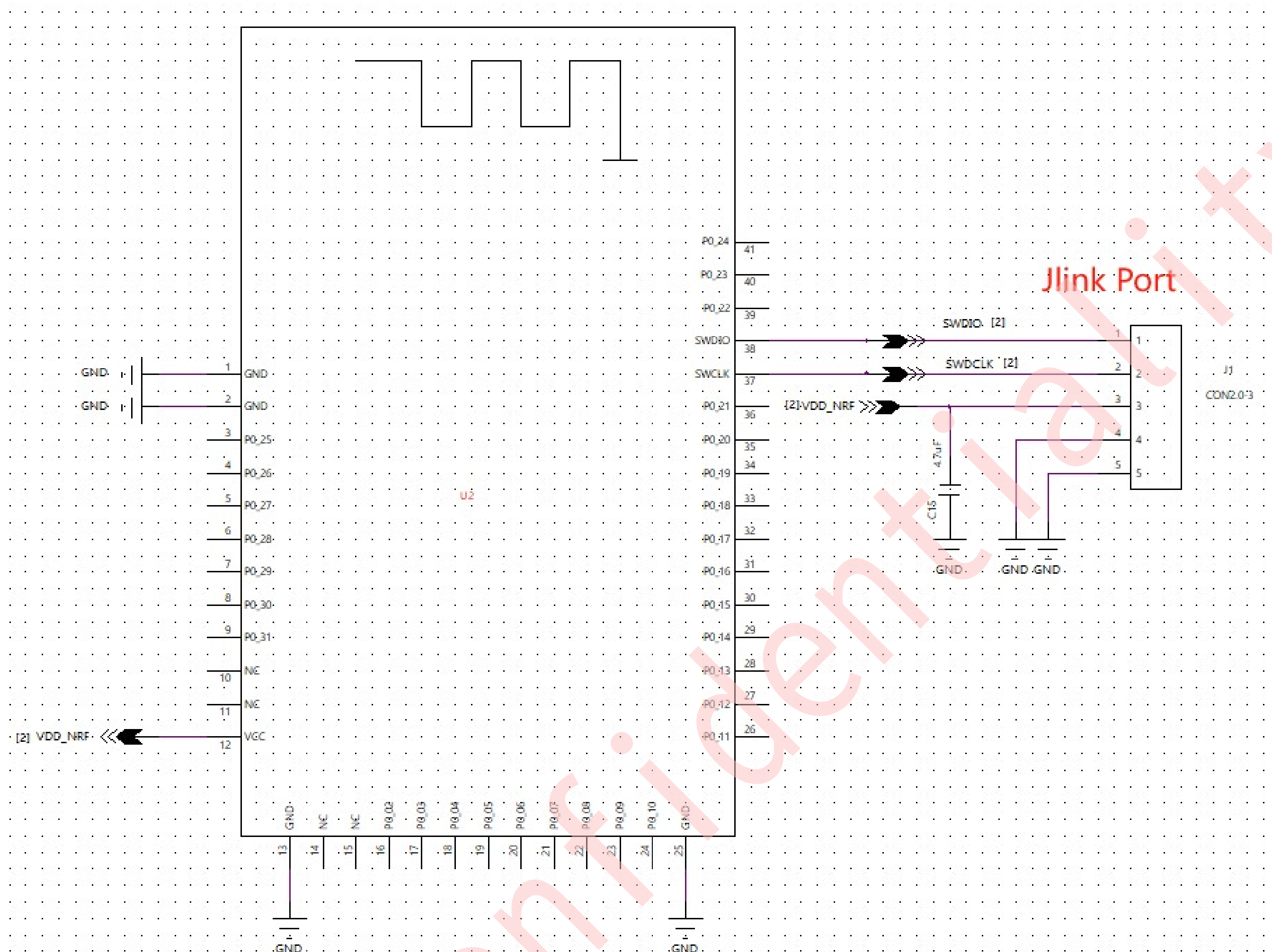
3.5 参考应用原理图 Reference Application Schematic



备注：以上电路仅供参考。

Remark：The above circuit is for reference only.

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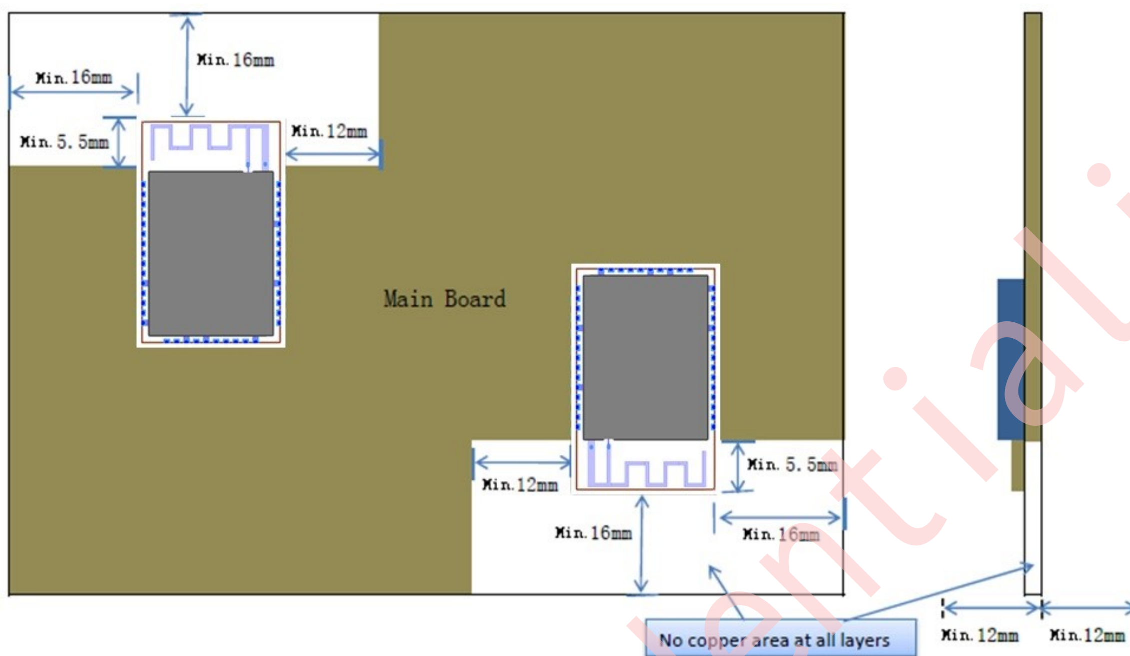
3.6 模块放置指引 Module Placement Guidelines

模块放置时需要考虑 RF 天线的禁空区面积，请参考以下模块放置方式

Please consider the RF antenna restricted area and place the module according to the photo showed as below:



4. 可靠性测试 Reliability Test

4.1 可靠性测试规格 Reliability Test Specification

序号 No.	测试项目 Test Item	测试条件 Test Conditions
1	前置测试 Precondition Test	测试前先以 100℃烘烤 5 小时，以无铅工艺温度曲线对模块过回流焊 3 次， +100℃, 5hours, Bake the module before test, perform 3 times lead-free profile reflow,
2	温湿度试验 Temp-Humidity Resistance	+40±3℃，90±5%RH，存储 48 小时。 +40±3℃, 90±5%RH, Storage for 48hours.
3	高温存储 High Temp.Storage	+85℃，存储 96 小时。 +85℃, Storage for 96 hours.
4	低温存储 LowTemp.Storage	-40℃，存储 96 小时。 -40℃, Storagefor 96 hours.
5	高温工作 High Temp.Operating	+85℃，工作 48 小时。 +85℃, Operating for 48 hours.
6	低温工作 LowTemp.Operating	-40℃，工作 48 小时。 -40℃, Operating for 48 hours.
7	温度循环 Temp.Cycling	+80℃，1 小时→-30℃，1 小时，温度转换时间 2 小时内，循环 50 次。 +80℃, 1 hour,→-30℃, 1hour, Temperature shift time within 2 hours,50 cycles.
8	热冲击 Thermal Shock	+85℃，0.5 小时→-40±3℃，0.5 小时，温度转换时间 5 分钟内，循环 50 次， +85℃, 0.5hour,→-40±3℃, 0.5hour, Temperature shift time within 5mins,5cycles,

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9	振动试验 Vibration Resistance	振动频率：10～55Hz，扫频速率：0.1 Oct/min，最大加速度：4Grms, X ,Y,Z 三个方向各 2 个小时， Freq: 10~55Hz, 0.1Oct/min, max acceleration: 4Grms, Test time: X,Y, Z axis for 2hours,
10	机械冲击 Impact Resistance	冲击加速度：50G(m/sec2)，冲击时间：11 毫秒，冲击频率和方向：6 个方向各 10 次。 Impact acceleration: 50G(m/sec2), Impact time: 11ms, Impact frequency and direction: 10times each in 6 directions,
11	静电试验 Electrostatic Resistance	人体模型，等效电容=100pF，放电电阻=1. 5kΩ，±2kV，3 次，间隔 0. 5 秒。 Human body model, C=100pF,R=1.5kΩ,±2kV, INT=1Sec./3times,
12	包装跌落测试 Package Drop Test	将标准包装箱从 0.8 米的高度跌落到钢板面或混泥土上，跌落 6 个面和 1 个角及 3 个棱各 1 次， Drop the component in standard package from the height of 0.8m onto steel surface or concrete, The test shall be conducted 1 time for each surface, one of the corner and each edage of drop corner(3 edages) of the packaging,
13	焊锡性测试 Solderability Test	熔锡槽内熔入一定量的锡，温度在 260℃±5℃，将产品置入约 10S 后取出，观察其状况，模块焊盘的上锡情况与 OK 样品对比无明显差异。 Melt certain of solder in the soldering pot, set the temperature at 260℃±5℃ and place the module in for 10s, then observe the soldering of the module PAD, It should not have the obvious difference compare with the OK sample.

4. 2 可靠性测试标准 Reliability Test Standard

项目 Items	条件 Conditions	最小 Min.	典型 Typ.	最大 Max.	单位 Unit
TX output power	N/A	-40	-2	4	dBm
Mod Char: F1 average	N/A	225	264	275	KHz
Mod Char: F2 Max.	N/A	185	210	-	KHz
Mod Char: Ratio	N/A	0.8		-	-
RXsensitivity(PER)	1500packets,1Mbps	-	-90	-95	dBm

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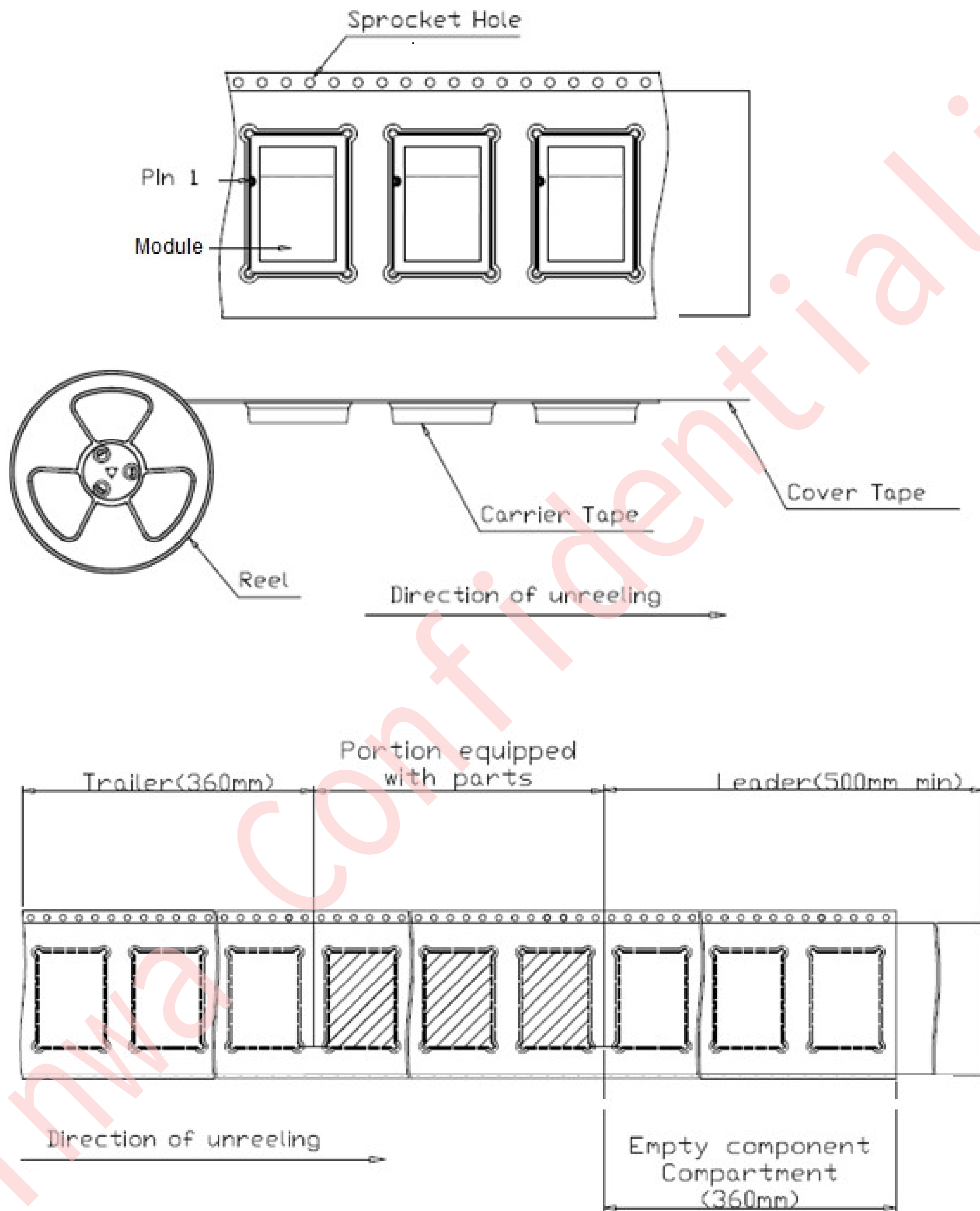
5. 包装信息 Package Information

模块出货采用真空包装出货，包装示意图如下：

Module shipments by vacuum packaging, packing diagram as follows:

5. 1 卷带包装 TapingPackage



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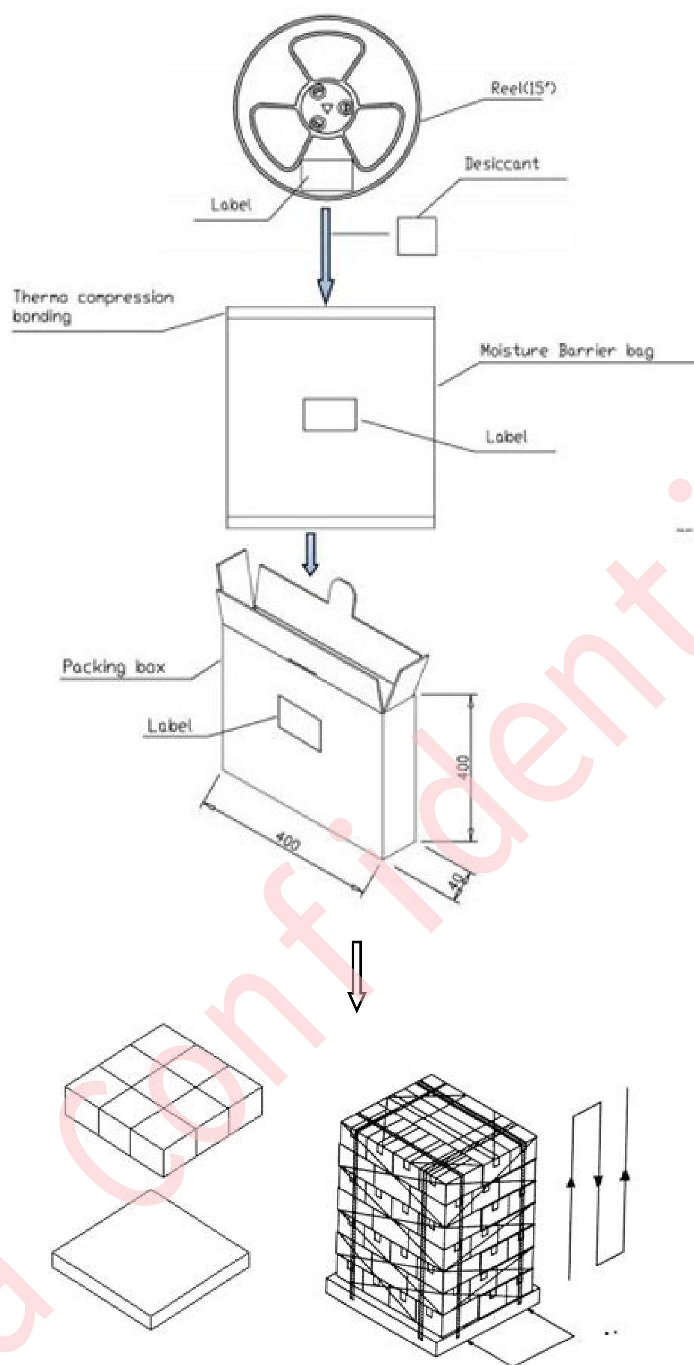
5.2 包装规格 Packing Specifications



Note: *本产品基于 JEDEC 标准 J-STD-020 适用于温敏等级 MSL3*
This product is applicable to moisture sensitivity levelMSL3
(Based on JEDEC Standard J-STD-020)

5.3 外箱标签 Labelof the outer box

此标签会依照客户的要求进行打印，否则将按照信华 BT 模块通用标签规格打印。
This label will be printed according to the customer's requirements,
otherwise it will be printed according to general label specification of Shinwa BT module。

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6. 回流焊温度参考曲线 Recommended Reflow Temperature Profile

无铅工艺器件温度曲线:

For Pb-Free parts heat resist temperature profile:

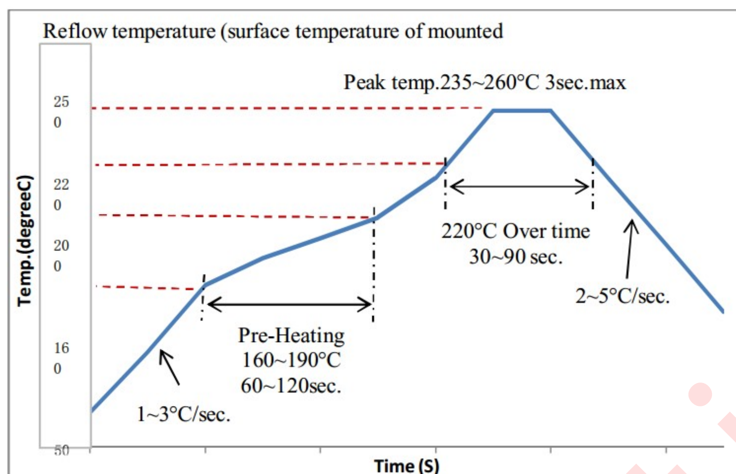

Figure 18: Recommended reflow temperature profile

Process Step	Lead-Free Solder
预热 Pre-heat	160~190˚C/within60~120 sec.
回炉 Reflow	235~260˚C Max. (220˚C up/within 30~90s,235~260˚Cwithin 3s)
温升 Ramp-up Rate	1~3˚C/sec.
斜降 Ramp-down Rate	2~5˚C/sec.

注意 Note:

1.推荐模块最多 2 次过回炉。

Recommend the reflow soldering is 2 times maximum

2.为保证焊接良好，需要在过回炉过程中增加氮气。

In order to have better SMT solder performance, please add Nitrogen during reflow process

3.此模块不适用于波峰焊。

This part is not adapted to flow soldering.

4. 模块翘曲度≤0. 11mm。

The warpage of the module is ≤0.11mm.

5.模组贴片时建议用 0. 16mm～0. 20mm 厚度的阶梯钢网，用户可根据主板的适应性进行相应调整。

Recommended to use step stencil with 0.16~0.20mm when the module is mounted and user can adjust

7. 模块的手工焊接事项 The Hand-soldering Information

模块的手工焊接参考以下要求：

The HCI module can withstand the following hand soldering specification:

1.烙铁头温度需设置在 360±10℃

The soldering iron tip temperature should be set to 360±10℃

2.模块的手工焊接时间需在 3 秒以内

The manual soldering time should be within 3 seconds

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8. 储存条件 Storage Condition

为了满足模块的焊接和存储要求，需要保持以下条件：

The following conditions should be kept for soldering and keeping in storage for this module:

1. 在干燥的袋子中保存期限：在低于 40˚C,90% RH 条件下保存 12 个月

   Shelf life in dry bag: 12months at <40˚C and 90% RH

2. 包装袋开封后，模块必须进行回流焊接或者同等条件的处理：

   After bag is opened, module shall be subjected to soldering reflow or equivalent processing must be:

   a) 在低于 30˚C/60% RH 工厂条件下，168 小时内进行焊接

   Mounted within 168 hours at factory condition of<30˚C/60% RH

   b) 在低于 10% RH 环境中存储

   Stored at <10% RH

3. 模块在焊接前需要烘烤,如果：

   Modules will be required baking before mounting if:

   a) 当室温为 23˚C±5˚C，湿度指示卡显示大于 10%

   Humidity indicator shows >10% when read at room temperature 23˚C±5˚C

   b) 不能满足上面 2.a 或 2.b 条件

   Above item 2.a) or 2.b) are not met

4. 如果需要烘烤，模块需放置在温箱中，在 40˚C+5˚C/-0˚C，<5%RH 条件下烘烤 192 小时

   If baking is required, device may be baked for 192hours at 40˚C+5˚C/-0˚C and <5%RH for temperature device containers.

5. 烘烤过后，放置在室温下一个小时，然后使用.

   After baking, leave it for 1 hour at room temperature then use it.

9. 备注 Remark

◆本规格书中的规格、性能是采用信华精机有限公司提供的控制电路来测试定义。

The standard and performance in specification are defined using the control circuit of Shinwa industries (China) ltd.

◆在满足规格书的范围内，为了改良、提高性能，有时会进行相应的设计变更，请理解。

The parts are subject to change with any improvement within the range of the specifications withoutprior notice.

◆规格书的承认：

Recognition of this specification.

从发行之日起 1 个月以内，须将已承认的规格书返还，超过 1 个月未返还的，敝司将作为已承认处理，请理解。

Please return the recognized specifications within a month from the issued date. It is over a month fromthe issued date, We will think that specification is recognized.

◆信华精机有限公司对规格书内容的保留最终解释权。

Shinwa industries (China) ltd. reserves the right to the interpretation of this specification.

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10.附录 Appendix

附录 1：生产工厂名称和地址

Appendix 1: The factory name and address.

No	Factory Name	Factory Address
1	信华精机有限公司(中国) Shinwa industries(china) ltd.	广东省惠州市仲恺高新区惠风西四路 1 号 No.1, Huifeng West 4 Road, Zhongkai High-tech Zone, Huizhou City, Guandong Province, China.

FCC Statement
FCC standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247
Device is equipped with PCB antenna , Antenna gain 0.25dBi

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.

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

Note: 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.

FCC Radiation Exposure Statement
This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: ZWY52810 Or Contains FCC ID: ZWY52810"

When the module is installed inside another device, the user manual of the host must contain below warning statements;
1. 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;
(2) This device must accept any interference received, including interference that may cause undesired operation.

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

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.

Any company of the host device which install the modular with modular approval should perform the test of radiated & conducted emission and spurious emission, etc. according to FCC part 15C : 15.247 and 15.209 & 15.207 ,15B Class B requirement, Only if the test result comply with FCC part 15C : 15.247 and 15.209 & 15.207 ,15B Class B requirement then the host can be sold legally.

Shinwa confidentiality

The device has been evaluated to meet general RF exposure requirement. The devic e can be used in portable exposure condition without restriction.

The OEM must certify the final end product to comply with unintentional radiators (FCC Sections 15.107 and 15.109) before declaring compliance of the final product to Part 15 of the FCC rules and regulations. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change.
The OEM must comply with the FCC labeling requirements. If the module's label is not visible when installed, then an additional permanent label must be applied on the outside of the finished product which states: "Contains transmitter module FCC ID:ZWY52810 ".
Additionally, the following statement should be included on the label and in the final product's user manual:
"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 interferences, and
(2) this device must accept any interference received, including interference that may cause undesired operation." The module is limited to installation in applications. Separate approval is required for all other operating configurations, including portable configuration with respect to Part 2.1093 and different antenna configurations. A module or modules can only be used without additional authorizations if they have been tested and granted under the same intended end - use operational conditions, including simultaneous transmission operations. When they have not been tested and granted in this manner, additional testing and/or FCC application filing may be required. The most straightforward approach to address additional testing conditions is to have the grantee responsible for the certification of at least one of the modules submit a permissive change application. When having a module grantee file a permissive change is not practical or feasible, the following guidance provides some additional options for host manufacturers. Integrations using modules where additional testing and/or FCC application filing(s) may be required are: (A) a module used in devices requiring additional RF exposure compliance information (e.g., MPE evaluation or SAR testing); (B) limited and/or split modules not meeting all of the module requirements; and (C) simultaneous transmissions for independent collocated transmitters not previously granted together. This Module is full modular approval, it is limited to OEM installation ONLY. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change. (OEM) Integrator has to assure compliance of the entire end product include the integrated Module.
Additional measurements (15B) and/or equipment authorizations (e.g. Verification) may need to be addressed depending on co-location or simultaneous transmission issues if applicable. (OEM) Integrator is reminded to assure that these installation instructions will not be made available to the end user