# 产品规格书 Specification

产品名称 Product name：蓝牙模块 Bluetooth module

产品型号 Product model：F-6988 V3.1

文件编号 Document No：XZX-SPEC-BT-RD-023

文件版本 Document Version：V2.5

生效日期 Availability date：2018-7-11

| 编制 Edit | 审核 Review | 批准 Approve |
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| | | |

| 变更履历 **Revision History** | | | | |
|---|---|---|---|---|
| 版本 Version | **变更内容 Change Information** | **页次 Page** | **时间变更 Date** | **修订人 Editor** |
| V2.0 | 首次制订 Initial issue | / | 2018-03-06 | 吴德龙 |
| V2.1 | GPIO_5 与 GPIO_15 对调<br>GPIO_5 is in tune with GPIO_15 | / | 2018-03-30 | 吴德龙 |
| V2.2 | GPIO_10 与 GPIO_14 对调<br>GPIO_10 is in tune with GPIO_14<br>GPIO_5 与 GPIO_9 对调<br>GPIO_5 is in tune with GPIO_9 | / | 2018-04-08 | 吴德龙 |
| V2.3 | 增加：模块的封装物料高度尺寸<br>Increase: Module packaging material height dimensions. | / | 2018-4-24 | 吴德龙 |
| V2.4 | 模块脚位图及引脚说明修改：模块第 40 脚由 GND 改为AGND | / | 2018-5-24 | 谢三顺 |
| V2.5 | 修改认证版本Bluetooth V5.0 | / | 2018-7-11 | 沈兴利 |
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# 目录(Content)

## 一、产品概述 Product overview：

F-6988 蓝牙模块为本公司自主开发的智能型无线音频数据传输产品，是低成本的高性价比的立体声无线传输方案，模块采用了 BEKEN 的 BK3266 芯片 QFN32 封装设计。F-6988 蓝牙模块采用免驱动方式，客户只需要把模块接入应用产品，就可以快捷地实现音乐的无线传输，享受无线音乐的乐趣，而且支持简单的数据传输功能。支持智能语音提示及报号功能；集成 TF 卡播放功能；集成移动 U 盘播放功能； 支持内部 LINE-IN；支持内部 MIC 通话.

F- 6988 is the Bluetooth module for intelligent wireless audio transmission products designed by our company . F- 6988 also is the low cost stereo audio Bluetooth solution with high performance. The main chip uses BEKEN BK3266 chip QFN 32 packaging design. Without any drive r, you can connect the module with your device to enjoy the high quality music easily and simple data transmission functions. It supports intelligent voice prompting and reporting number function, integrated TF card playback function and integrated mobile USB-disk playback function. It also supports internal LINE-IN

## 二、应用领域Application area：

该模块主要用于短距离的音乐传输，可以方便地和笔记本电脑，手机，PDA 等数码产品的蓝牙设备相连，实现音乐的无线传输。

F- 6988 is used for Bluetooth audio transmission and it is convenience to connect with mobile phone, personal computer, PDA and other digital products with Bluetooth hardware to enjoy the music wirelessly. The major application are included

※ 高档蓝牙音响 Bluetooth speaker

※ 蓝牙立体声耳机 Bluetooth stereo headset

※ 免提电话 Hands-free Phone

※ 蓝牙无线传输音频 Bluetooth speaker with data transmission

※ 蓝牙数传应用 Bluetooth data transmission application


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※ 支持移动互联周边设备 Support for mobile internet peripheral devices

※ 蓝牙智能音响 Bluetooth Smart Speaker

## 三、基本特性 Features:

Bluetooth Profiles

※Bluetooth V5.0 specification support
※9 mA average current for A2DP
※0.8 uA deep sleep current
※Bluetooth 5.0 classic and low energy
※A2DP v1.3, AVRCP v1.6, HFP v1.7, HID v1.1, AVCTP v1.4, AVDTP v1.3, and SPP v1.2
※True wireless stereo and two active link
※Two wires UART download interface
※16 bits stereo ADC and DAC
※Stereo line in and dual microphone
※Five bands digital hardware equalizer
※SPI, UART, I2C, SDIO and USB
※Interface for external PA and LNA
※Up to 220 mA battery charge controller

## 四、性能参数 performance parameter:

| | |
|---|---|
| 型号 Model | F-6988 |
| 蓝牙规格 Bluetooth specification | Bluetooth V5.0 |
| 供电电压 Service voltage | DC3.1-4.2V |
| 支持蓝牙协议 Bluetooth Profile | A2DP v1.3, AVRCP v1.6, HFP v1.7, HID v1.1, AVCTP v1.4, AVDTP v1.3, and SPP v1.2 |
| 工作电流 Supply voltage | ≤20mA |
| 待机电流 Standby current | <500uA |
| 温度范围 Temperature range | -40ºC to +80ºC |
| 无线传输范围 The wireless transmission range | >10 米(meter) |
| 传输功率 Transmission power | CLASS2，4dbm |
| 灵敏度 Sensitivity | -81dBm<0.1%BER |
| 频率范围 Frequency range | 2.402GHz-2.480GHz |
| 对外接口 The external interface | SPI, UART, I2C, GPIO,SDIO and USB |
| 音频性能 Audio performance | AAC,SBC 解码( decode) |
| 音频信噪比 The audio signal to noise ratio | ≥75dB |
| 模块尺寸 Module size | 25 X 13.5 X 2.2mm |



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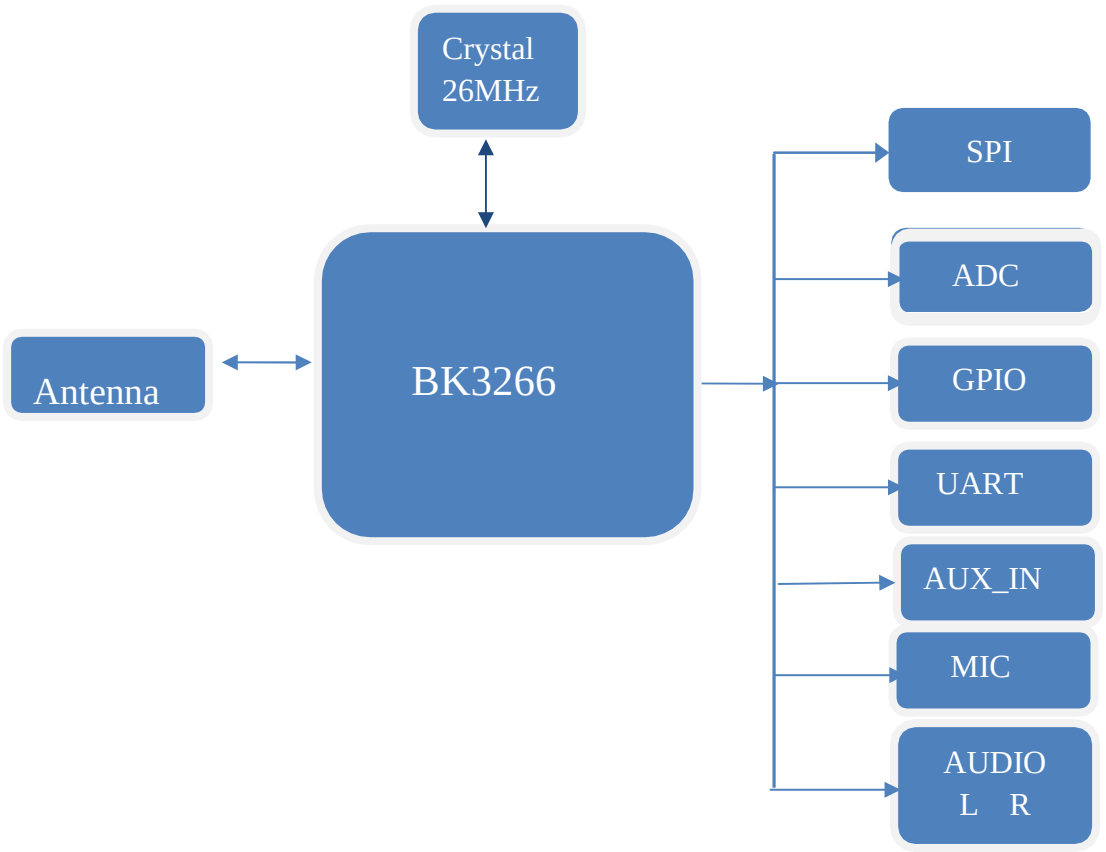
## 五、方框图 Module block diagram:





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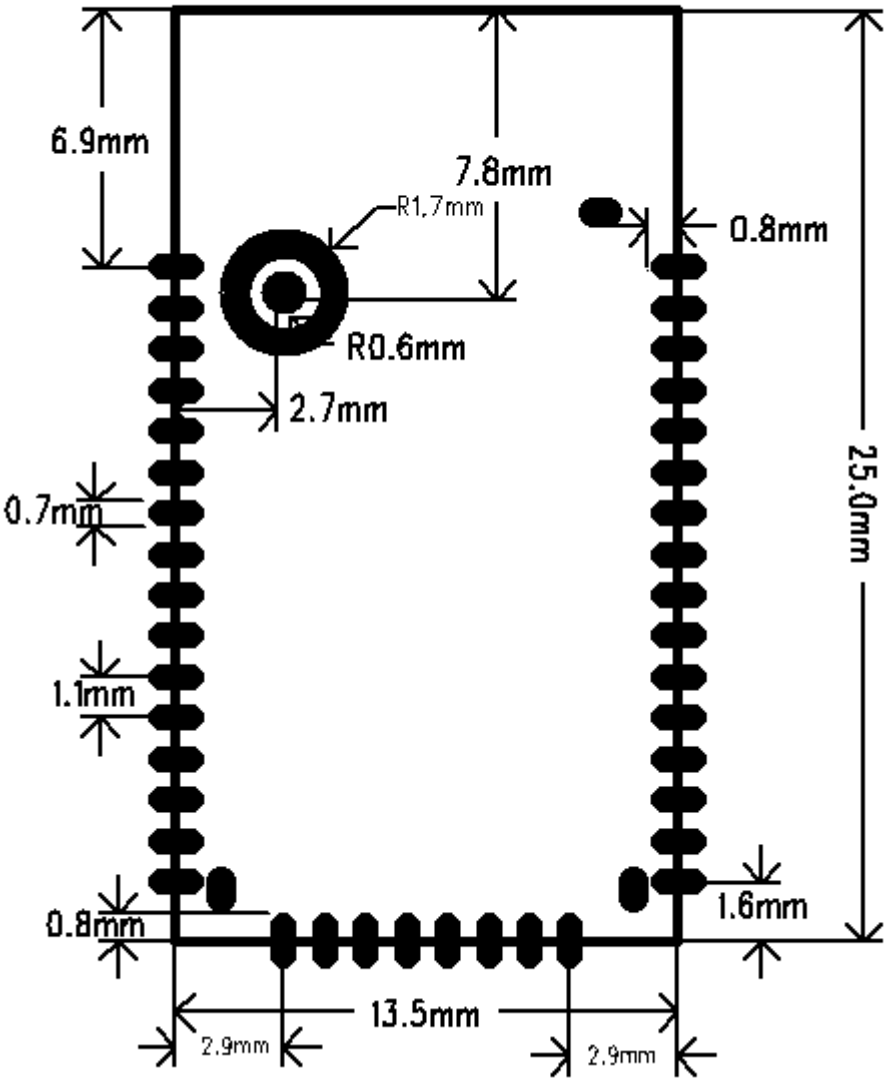
## 六、模块尺寸图 The size of the module graph：





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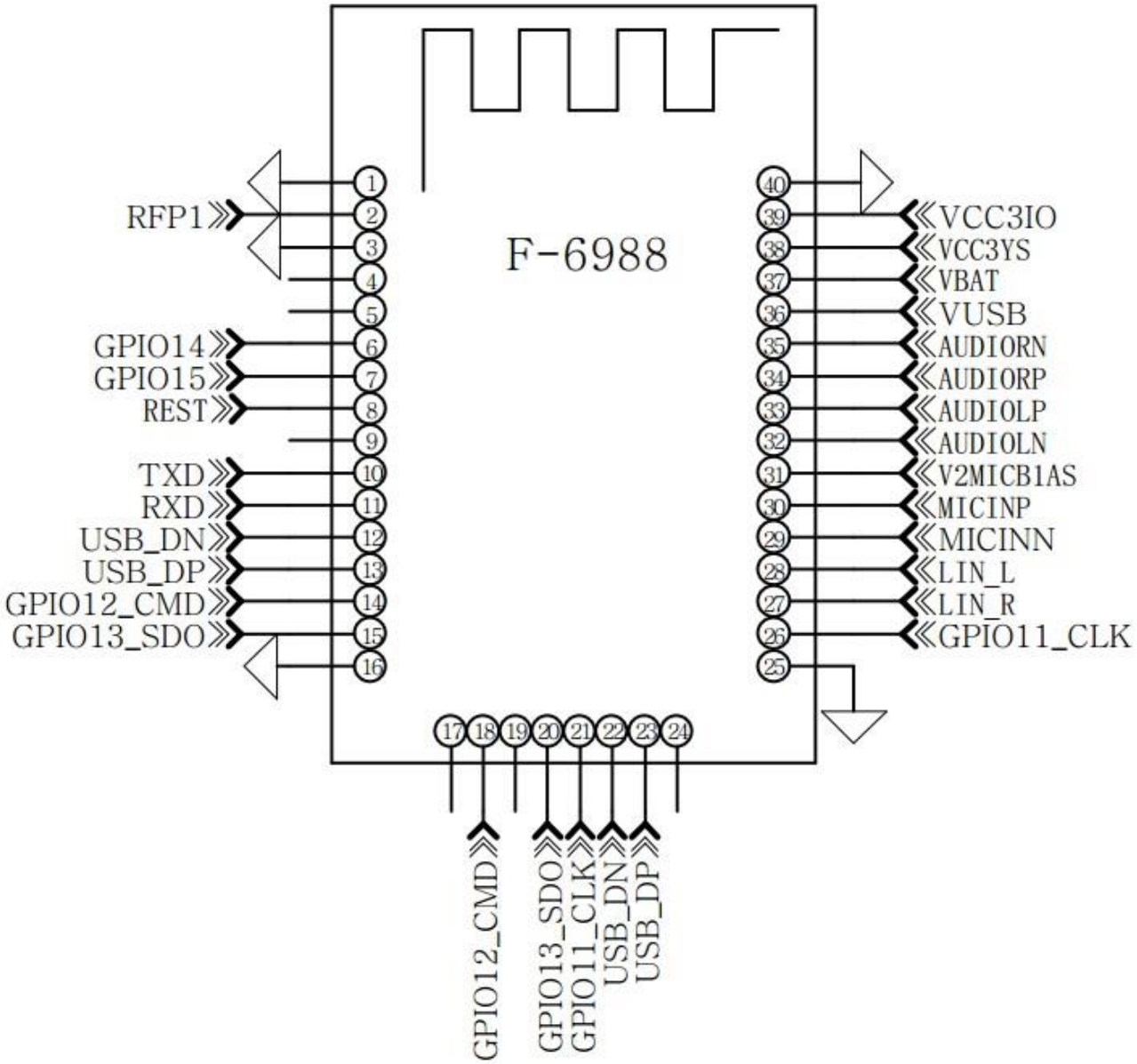
## 七、模块脚位定义图 Device pin out diagram：





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## 八、引脚功能说明Pin definition：

| Pin | Symb | I/O | Description |
|---|---|---|---|
| 1 | GND | GND | RF_GND |
| 2 | RF_OUT | RF | RF_OUT / NC |
| 3 | GND | GND | RF_GND |
| 4 | NC | NC | NC |
| 5 | NC | NC | NC |
| 6 | GPIO14 | ADC | GPIO14, JTAG_TDO/PWM5/ADC7/PCM_DOUT |
| 7 | GPIO15 | Digital I/O | GPIO15, Soft shut down and wake up (active high) |
| 8 | REST | REST | Reset pin, active low |
| 9 | NC | NC | NC |
| 10 | TX | Digital I/O | GPIO0, UART_TXD/I2C_SCL, Download port |
| 11 | RX | Digital I/O | GPIO1, UART_RXD/I2C_SDA, Download port |
| 12 | USB_DN/NC | Digital I/O | GPIO7, PWM1 / USBN./NC |
| 13 | USB_DP/NC | Digital I/O | GPIO6, PWM0 / USBP./NC |
| 14 | GPIO12_CMD/NC | Digital I/O | GPIO12,JTAG_TMS/PWM3/PCM_CLK/SD_CMD/ SPI2_MOSI/NC |
| 15 | GPIO13_SDO/NC | Digital I/O | GPIO13,JTAG_TDI/PWM4/ADC6/PCM_DIN/SD_DATA0/SPI2_MISO/NC |
| 16 | GND | GND | Ground connect battery negative |
| 17 | NC | NC | NC |
| 18 | GPIO12_CMD | Digital I/O | GPIO12,JTAG_TMS/PWM3/PCM_CLK/SD_CMD/ SPI2_MOSI |
| 19 | NC | NC | NC |
| 20 | GPIO13_SDO | Digital I/O | GPIO13,JTAG_TDI/PWM4/ADC6/PCM_DIN/SD_DATA0/SPI2_MISO/NC |
| 21 | GPIO11_CLK | Digital I/O | GPIO11,JTAG_TCK/PWM2/ADC4/PCM_SYNC/SD_CLK//SPI2_SCK |
| 22 | USB_DN | Digital I/O | GPIO7, PWM1 / USBN |
| 23 | USB_DP | Digital I/O | GPIO6, PWM0 / USBP |
| 24 | NC | NC | NC |
| 25 | GND | GND | GND |
| 26 | GPIO11_CLK | Digital I/O | GPIO11,JTAG_TCK/PWM2/ADC4/PCM_SYNC/SD_CLK//SPI2_SCK |
| 27 | LINR | AUX_INPUT | LINR |
| 28 | LINL | AUX_INPUT | LINL |
| 29 | MICINA/NC | MIC/NC | Microphone input negative,/NC |


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| | | | |
|---|---|---|---|
| 30 | MICINP | MIC+ | Microphone input positive |
| 31 | V2MICB1AS | VMIC | Microphone reference voltage |
| 32 | AUDIOLN | Audio output | Audio left channel negative |
| 33 | AUDIOLP | Audio output | Audio left channel positive |
| 34 | AUDIORP | Audio output | Audio right channel positive |
| 35 | AUDIORN | Audio output | Audio right channel negative |
| 36 | VUSB | Power | VUSB (4.7-5.2V) |
| 37 | VBAT | Power supply | Power supply(3.1V-4.2V) |
| 38 | VCC3YS | Power | 3.3V OUTPUT |
| 39 | VCC3IO | VCCSD | SD POWER |
| 40 | GND | GND | GND |
| | | | |

## 九、电路连接注意 Design notes：

F-6988 模块应用过程中，请注意避免功放、升压线路，DC/DC 电路等干扰源对模块的影响，避免模块供电回路同大功率电路单元形成串联回路，以此来提高整机 SNR；AGND 必须连接后级功放大地。

In order to better SNR, please pay attention to the hardware design of PA, DC booster, DC/DC circuit and the module power circuit to avoid influencing module.


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## 十、注意事项 Note：

A. 关于无线蓝牙的使用环境，无线信号包括蓝牙应用都受周围环境的影响很大，如树木、金属等障碍物会对无线信号有一定的吸收，从而在实际应用中，数据传输的距离受一定的影响。

The signal strength is depending on the environment of Bluetooth application, such as wood and metal will block the t ransmission signal to get the shortert ransmission distance.

B. 由于蓝牙模块都要配套现有的系统，放置在外壳中。由于金属外壳对无线射频信号是有屏蔽作用的。所以建议不要安装在金属外壳中。

Because of metal will block the signal transmission, it is recommend not to using the metal housing.

C. PCB 布板：蓝牙模块的天线部分的是 PCB 天线，由于金属会削弱天线的功能，在给模块布板的时候，模块天线下面严禁铺地和走线，若能挖空更好。

PCB layout guideline: no any copper existed in the antenna area of the module is the PCB antenna, the metal will weaken the function of the antenna when the antenna module to the module board, following prohibited paving and walk theline.

D. 如果模组天线旁边有电池，金属物，液晶屏，喇叭等，要求离天线距离至少 15mm

If the module antenna next to the battery、 metal, liquid crystal screen, loudspeaker, keep them away from antenna distance 15mm

E. layout 时供电线路建议使用星形走线，并确保蓝牙模组供电线性度要好，还有 BT 的地须与运放，功放，MCU 等的地分开，而且 BT 下侧不可有其他干扰地

When layout the power supply line recommended star line, and to ensure that the Bluetooth module Power supply lines is better , and BT should be with the amplifier, power amplifier, MCU, separately, and the underside of the BT has no other interference

F. 天线周围不可走控制线，电源线，音频线，MIC 等干扰线.

suggests the module antenna part floating on the floor, do not go around the antenna control line, power line, audio line, MIC interference lines;


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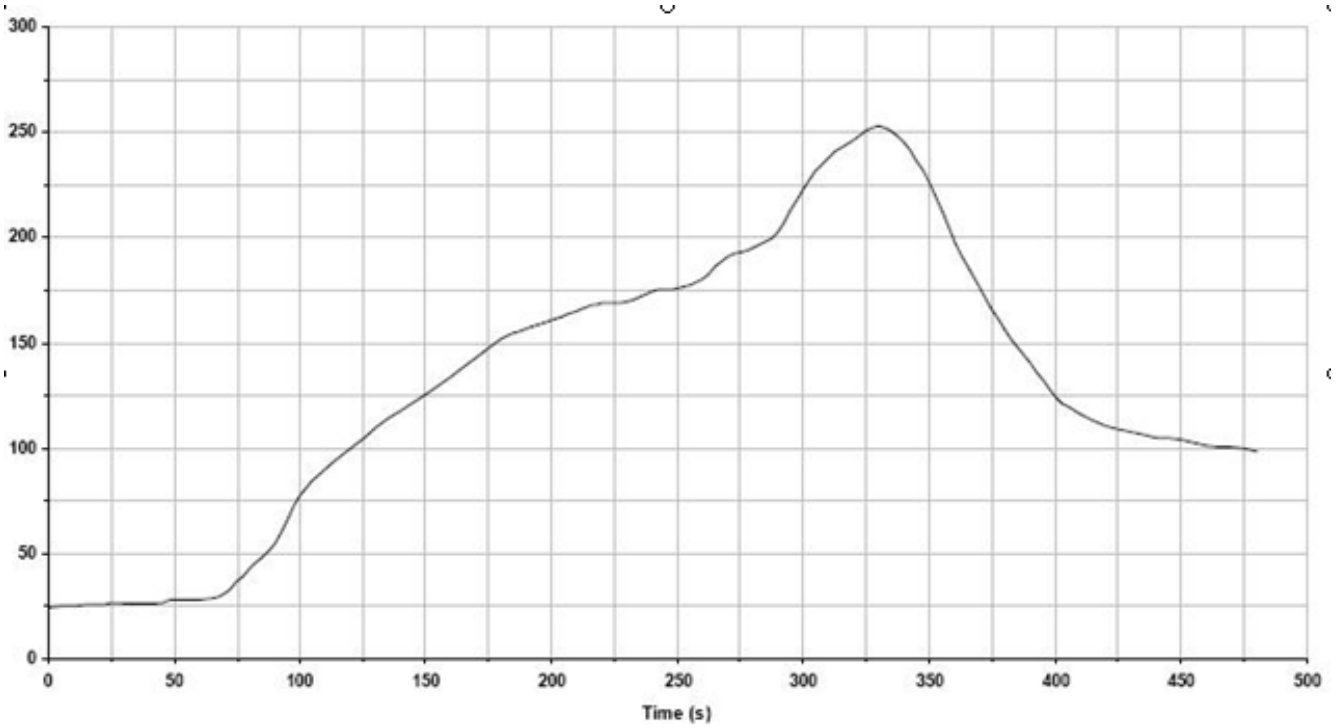
.

G. 如果模组天线附近有排座，外壳有金属铁网等对信号有影响的，建议选用专业的高增益天 线 .

If the module antenna near the row seats, Because of metal will block the signal transmission, it is recommended to use professional high-gain antenna.

## 十一、推荐回流温度 Recommended reflow temperature：




Key features of the profile:

-Initial Ramp=1-2.5℃/sec to 175℃ equilibrium
-Equilibrium time=60 to 80 seconds
-Ramp to Maximum temperature (250℃)=3℃/sec Max
-Time above liquidus temperature(217℃): 45 - 90 seconds
-Device absolute maximum reflow temperature: 250℃

## 十二、应用原理图Application schematic diagram：

参考原理图仅供参考应用！

Reference schematic diagram for reference purposes only!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FCC Statement
FCC standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247
PCB antenna , Antenna gain 0dBi

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: 2AB3N-F6988 Or Contains FCC ID: 2AB3N-F6988”

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 this 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.

## IC STATEMENT

This device contains licence-exempt transmitter(s)/receiver(s) that comply 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 interference.
(2) This device must accept any interference, including interference that may cause undesired operation of the device
Cet appareil contient des émetteurs / récepteurs exemptés de licence conformes aux RSS (RSS) d'Innovation, Sciences et Développement économique Canada. Le fonctionnement est soumis aux deux conditions suivantes :
(1) Cet appareil ne doit pas causer d'interférences.
(2) Cet appareil doit accepter toutes les interférences, y compris celles susceptibles de provoquer un fonctionnement indésirable de l'appareil.

IC Radiation Exposure Statement
This modular complies with IC 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 IC 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 IC: 10922A-F6988"

when the module is installed inside another device, the user manual of this device must contain below warning statements;
1. This device contains licence-exempt transmitter(s)/receiver(s) that comply 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 interference.
(2) This device must accept any interference, including interference that may cause undesired operation of the device.
2. Cet appareil contient des émetteurs / récepteurs exemptés de licence conformes aux RSS (RSS) d'Innovation, Sciences et Développement économique Canada. Le fonctionnement est soumis aux deux conditions suivantes :
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