

SKU622超宽带测距模组规格书

SKU622 UWB Ranging Module Datasheet

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1. 产品介绍/Product information



Figure 1.1 SKU622 with IPEX-III (UFL) RF connector

SKU622 是一款基于 UWB 的高精度测距模组。模组基于 Qorvo DW3210 超宽带芯片，支持 IEEE802.15.4-2022 UWB 协议，并对射频链路增加了 FEM 提升其收发性能，让 SKU622 测距范围更广，远距离精度更高。

SKU622 is an UWB high precision ranging module. It use Qorvo's DW3210 transceiver IC, which support IEEE 802.15.4-2011 UWB protocol. The module support PA and LNA in its RF chain in order to enhance its TX and RX performance. And it will result in larger coverage and higher precision.

SKU622 模块主控 IC 采用 nordic 蓝牙 4.2 芯片 nRF52833。模块采用 3 边半孔设计，开放了较多 IO 口，可以被配置成 UART、SPI、I2C、PWM 等接口，方便客户二次开发。

SKU622 module use nordic BLE 5.1 nRF52833 as MCU. And the module's 3-side-half-hole footprint support many GPIO pin out which can be configured into UART, SPI, I2C, PWM interface, which is convenient for secondary development of customers.

2 模块应用 Applications

- ◆ UWB 一维测距基站/UWB 1-dimension ranging anchor.
- ◆ UWB TWR 定位基站/UWB TWR positioning anchor
- ◆ UWB TWR ranging or TWR positioning Tags
- ◆ 无线数据传输/Wireless data transferring

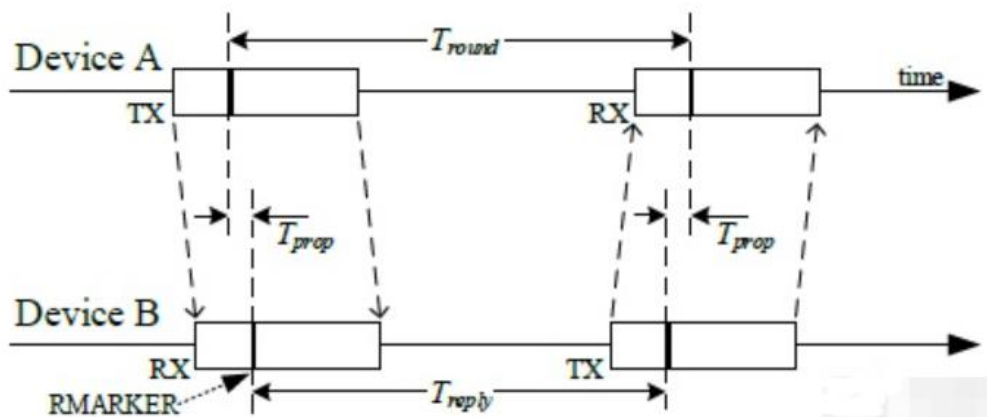


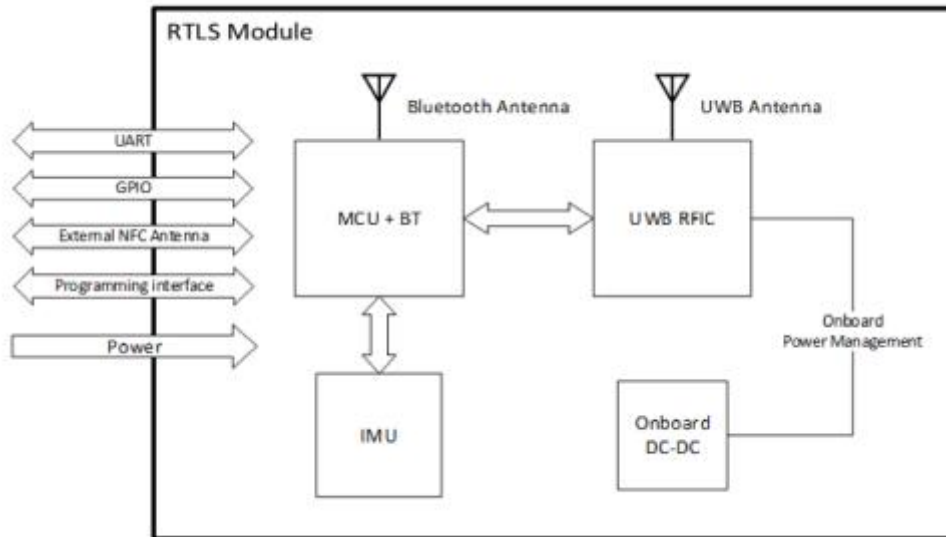
Figure 2.1 TWR ranging Process

3 特点 Features

- ◆ 静态测距精度 10cm / Static ranging accuracy up to 10cm.
- ◆ 最大 6.8Mbps 数据传输速率 / 6.8 Mbps Max data rate.
- ◆ 可视范围 200m 以上测距距离 / 200 m+ line-of-sight range typical.
- ◆ IEEE 802.15.4-2022 UWB compliant.
- ◆ 蓝牙 5.1 芯片 nRF52833 / BLE 5.1 chip nRF52833.
- ◆ 尺寸 Size:22.5x19x2.5mm (不含屏蔽盖 No shield cover, 不含 UFL 射频头 No UFL connector) .

4.应用框图 Application Diagram

SKU622 由主芯片 nRF52833+UWB 射频芯片 DW3210 组成，SKU622 use nRF52833 as main control chip, and DW3210 as UWB transiver chip.



SKU622

5.电气参数 Electrical Specification

下述表格给出来 SKU622 的电气参数默认条件是室温 25℃，除非特别标出温度范围。

The following tables give detailed specifications for the SKU622module. Tamb = 25 °C for all specifications given.

5.1 正常工作条件 Nominal Operating Conditions

Parameter	Min.	Typ.	MAX.	Units	Condition/Note
工作温度 Operating temperature	-40		+85	°C	
电源电压 Supply voltage VCC	2.6	3.3	3.6	V	
IO 口电压 Voltage on VDDIO	2.6	3.3	3.6	V	

Table 5-1: SKU622 Operating Conditions

5.2 直流参数 DC Characteristics

Parameter	Min.	Typ.	Max.	Units	Condition/Note
休眠电流 Sleep current		TBD		μA	
发射封装电流 TX peak current		TBD		mA	
接收电流 RX peak current		TBD		mA	
TDOA 定位功耗		TBD		mA	
IO 电压高电平 IO voltage high	0.7VCC		VCC+0.3	V	
IO 电压低电平 IO voltage low	-0.3		0.3VCC	V	

Table5-2: SKU622 Receiver DC Characteristics

注：TBD 项可能因固件配置不同而不同，如发射电流受到增益的影响比较大。

Note: TBD item may differ from firmware configuration, for example, TX peak current depend mostly on TX gain.

5.3 信道频率参数 Channel Characteristic

UWB Channel Number	Centre Frequency (MHz)	Bandwidth (MHz)
5	6489.6	499.2
9	7987.2	499.2

Table 5-3: SKU622 Channel Frequency Characteristic

5.4 接收灵敏度 Receiver Sensitivity Characteristics

测试条件 25°C, 20 字节 payload 长度。

Tamb = 25 °C, 20 byte payload.

丢包率 Packet Error Rate	数据速率 Data Rate	接收灵敏度 Receiver Sensitivity	单位 Units	测试条件备注 Condition/Note		
1%	6.8 Mbps	TBD	dBm/500 MHz	Preamble 128	Carrier frequency offset ±10 ppm	所以测试基于通道 5, PRF64MHz All measurements performed on Channel 5, PRF 64 MHz
10%	6.8 Mbps	TBD	dBm/500 MHz	Preamble 128		

Table 5-4: SKU622 Typical Receiver Sensitivity Characteristics

*智能发射增益使能后的等效灵敏度. 标准固件默认打开.

*equivalent sensitivity with Smart TX Power enabled. This is enabled in the onboard firmware.

5.5 发射射频参数 Transmitter RF Characteristics

参数 Parameter	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Units	备注/Note
Output power spectral density		-41*	-10	dBm/MHz	默认软件采用典型功率 Typical power is used as default
Output Channel Power		-14	13	dBm/500MHz	

Table 5-5: SKU622Transmitter AC Characteristics

*如果使用预先集成到模块中的软件 If using the pre-loaded embedded firmware of the SKU622 module

5.6 极限条件 Absolute Maximum Ratings

参数 Parameter	Min.	Max.	Units
接收电平 Receiver power		TBD	dBm
存储温度 Temperature - Storage temperature	-40	+125	°C
使用温度 Temperature – Operating temperature	-40	+85	°C
人体静电模型 ESD (Human Body Model)	-2000	2000	V

Table 5-6: SKU622 Absolute Maximum Ratings

超出上述电压、功率、温度范围时，可能会导致模块永久失效。上述仅仅是极限参数，正常工作范围外极限范围内的操作条件本规格书不提供保证。长时间暴露在这些条件下可能影响到设备的可靠性。

Stresses beyond those listed in this table may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions beyond those indicated in the operating conditions of the specification is not implied. Exposure to the absolute maximum rating conditions for extended periods may affect device reliability.

6 模块引脚介绍 Module Pinout and Pin Description

6.1 引脚分布 Module Pinout

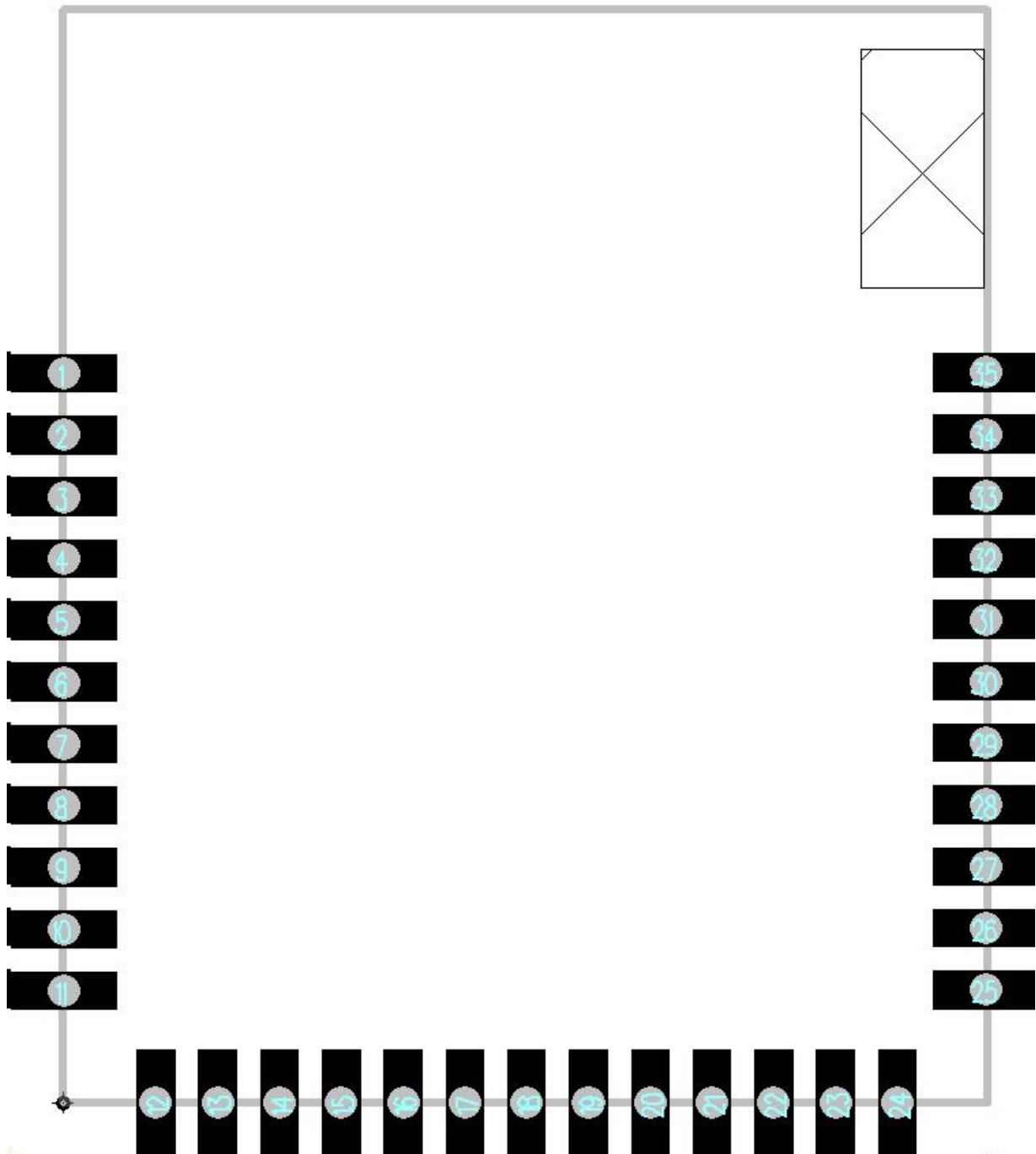


Figure 6-1: SKU622Module Pinout (TOP View)

6.2 引脚描述 Pin Description

Pin No.	Pin Name	I/O	Description
1	GND	G	地 Ground
2	GND	G	地 Ground
3	P0.04	DI	通用 IO,默认串口 RX; General purpose I/O pin; Uart RX by default
4	SWDCLK	DI	Jlink 烧录脚 SWDCLK; Serial wire debug clock input for J-link debug and programming of Nordic Processor.
5	SWDIO	DIO	Jlink 烧录脚 SWDIO; Serial wire debug I/O for J-link debug and programming of Nordic Processor
6	RESERVED	DIO	悬空不接 NC pin, don' t connect to any net
7	P0.05	DO	通用 IO,默认串口 TX; General purpose I/O pin; Uart TX by default
8	DW_VCC	PI	UWB 芯片供电脚(3.3V) UWB power input (3.3V)
9	DW_VCC	PI	
10	GND	G	地 Ground
11	GND	G	地 Ground
12	RESERVED	DIO	悬空不接 NC pin, don' t connect to any net
13	RESERVED	DIO	悬空不接 NC pin, don' t connect to any net
14	RESERVED	DIO	悬空不接 NC pin, don' t connect to any net
15	RESERVED	DIO	悬空不接 NC pin, don' t connect to any net
16	RESERVED	DIO	悬空不接 NC pin, don' t connect to any net
17	P0.09	DIO	通用 IO, General purpose I/O pin.
18	P0.10	DIO	通用 IO, General purpose I/O pin.
19	GND	G	地 Ground
20	GND	G	地 Ground
21	RESERVED	DIO	悬空不接 NC pin, don' t connect to any net
22	VCC	PI	主芯片电源供电脚(3V3),和 8&9 脚用磁珠隔离开 MCU power input(3V3), divided away from pin 8&9 with ferrite bead
23	VBUS	DI	USB 参考电源 (4.5~5.5V),不能给 MCU 供电 USB Reference power supply (4.5-5.5V), unable to power MCU
24	GND	G	地 Ground
25	D-	DIO	USB D- (Slave only)
26	D+	DIO	USB D+ (Slave only)
27	RESERVED	DIO	悬空不接 NC pin, don' t connect to any net
28	RESERVED	DIO	悬空不接 NC pin, don' t connect to any net
29	RESERVED	DIO	悬空不接 NC pin, don' t connect to any net
30	P0.29	DIO	I2C SDA
31	P0.28	DO	I2C SCL
32	RESERVED	DIO	悬空不接 NC pin, don' t connect to any net
33	P0.11	DIO	通用 IO, General purpose I/O pin.
34	GND	G	地 Ground
35	GND	G	地 Ground

Table 6-1: SKU622Pin Description

缩略词简介 Short Expression:

- (1) PI:Power supply input 电源输入;
- (2) PO:Power supply output 电源输出
- (3) DI:Digital Input 数字输入;
- (4) DO:Digital Output 数字输出;
- (5) AI: Analog Input 模拟输入;
- (6) AO: Analog Output 模拟输出
- (7) DIO:Digital Input/Output 数字输入/输出;
- (8) AIO: Analog Input / Output 模拟输入/输出
- (9) G:Ground 接地

DW3210 的与 nRF52833 相连如下:

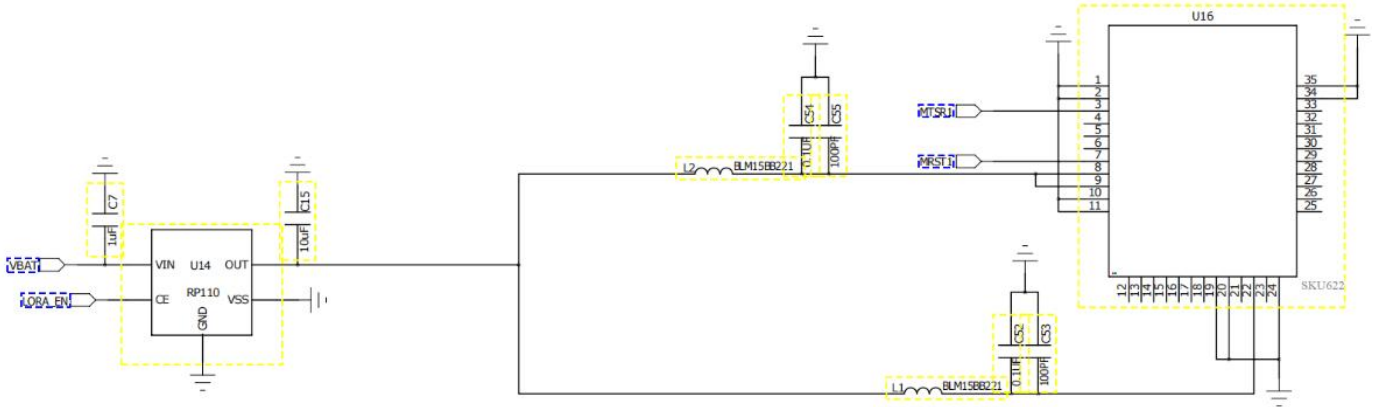
DW3210's SPI is connected to nRF52833 GPIO like below:

nRF52833 Pin	DW3210
P0.01	DW_IRQ
P0.20	DW_SCK
P0.15	DW_MOSI
P0.17	DW_MISO
P1.09	DW_SPI_CS
P0.18	DW_RST
P0.00	WAKEUP

Table 6-2: Internal nRF52833 pins used and their function

7 参考设计原理图 Reference schematic design

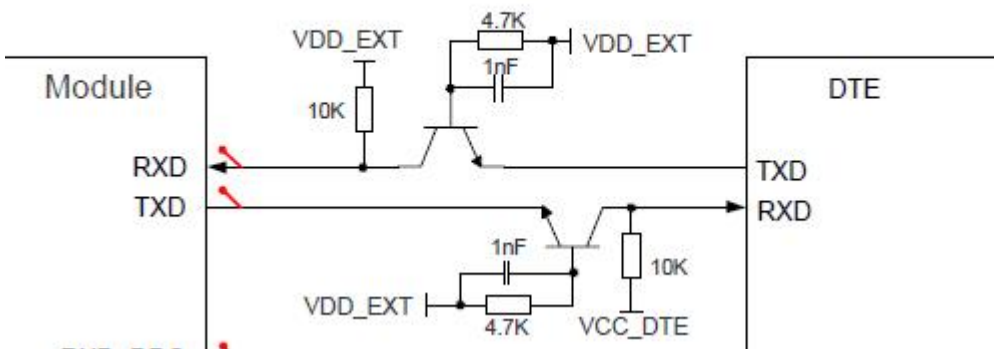
我司针对如下参考设计原理图（我司 DEMO 板的最小系统）可以提供 demo 软件，含数据协议。如果自行更改 IO 口功能需要走定制软件流程，不推荐。



备注:

1. UWB_TXD, UWB_RXD 为 3.3V TTL 电平,如需电平转换可以参考如下电平转换电路:

UWB_TXD,UWB_RXD is 3.3V TTL voltage level. If you need voltage shift please refer to the circuit below:



2. 为防止静电对模块造成损害，请把使用到的有可能外露的 IO 口增加 ESD 保护器件；

Please reserve ESD protect circuit to all pins you might used or exposed.

3. 为方便调试，请把 Jlink 下载口接出 4pin 2.54 排针，方便烧录软件。

Please reserve a 2.54mm pitch 4 pin needle holes for downloading firmware using Jlink.

8 PCB 封装和 Layout 指导 PCB Footprint and Layout notice

我司提供 PADS VX2.4, CAD 格式的封装，如有需要，请联系技术支持。建议 Layout 时，发给技术支持 Review 下。

We can supply footprint in PADS VX2.4, Auto CAD2010 format. And we can help review your design when you finish SKU622 layout. Please contact tech-support team for further information.

PCB 封装参考如下：

PCB footprint is as follows:

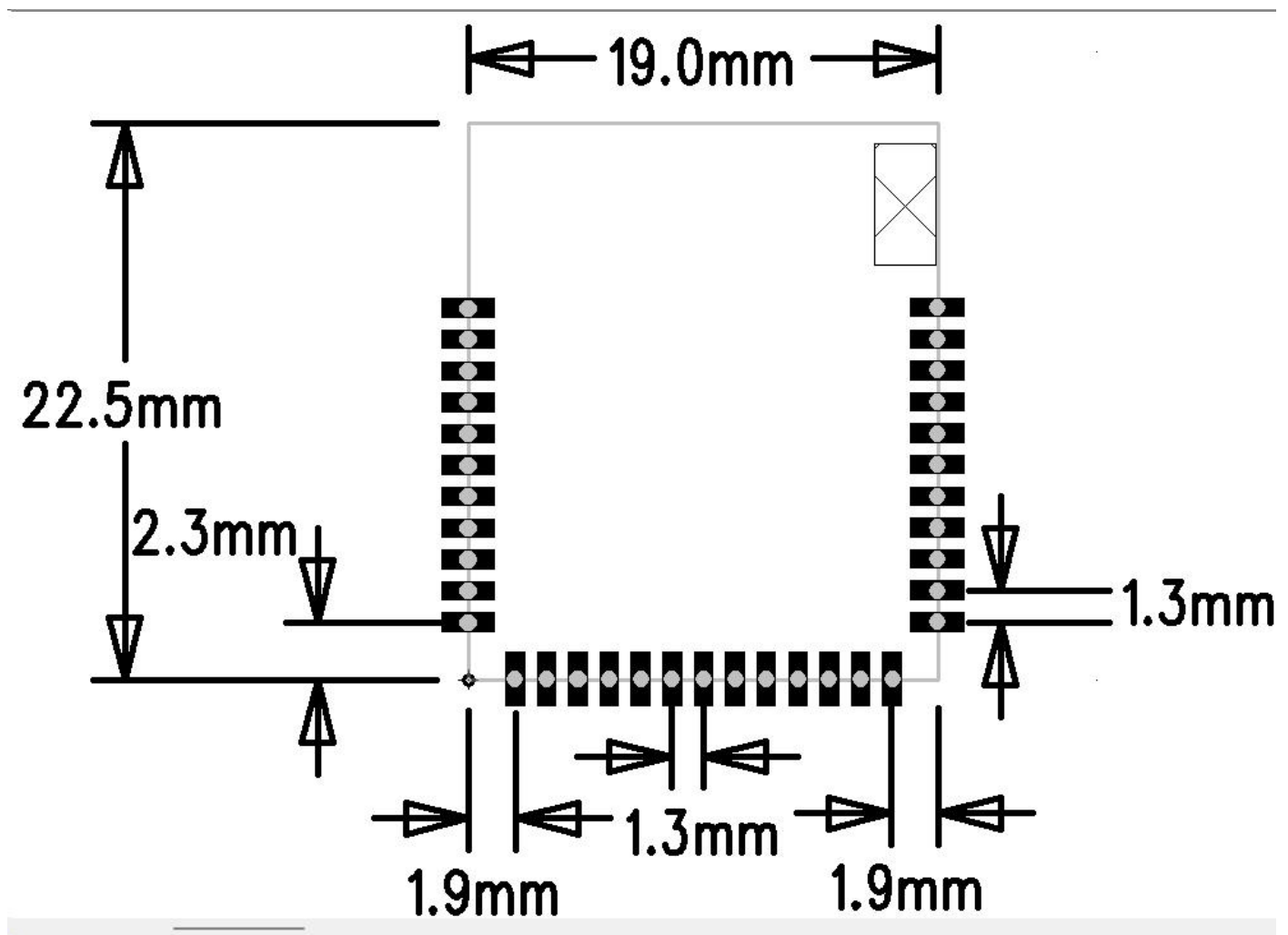


Figure 8-1: SKU622 PCB Footprint and Dimensions(units: mm)

注 Notice:

1. 上方等腰梯形区域为焊接式 PCB 片状天线，当使用片状天线时，其对应区域及左右两侧不得有地平面或者其他起屏蔽效应的结构件。

The isosceles trapezoid PCB antenna area is copper forbidden, when using the soldering PCB antenna(SKU622-P). And the nearing left and right and up area of the antenna cannot have ground component like shield cover.

2. 使用 SMA 外接天线时，SMA 对应下方 PCB 板应镂空，或者把模块 SMA 头伸出 PCB 板外。

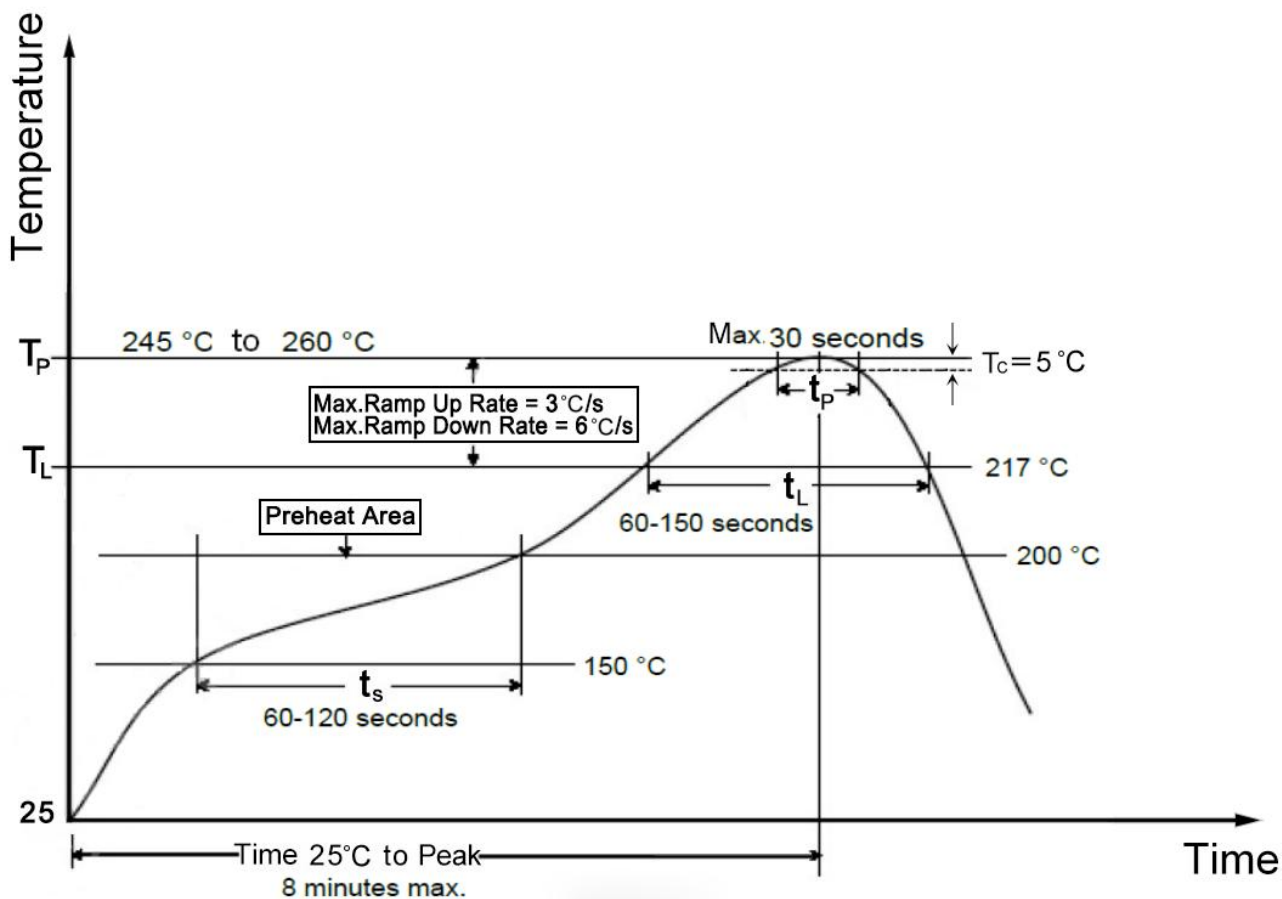
When using SMA to connect external antenna(SKU622-E), the PCB below SMA should be cut or put the SMA side out of your PCB.

3. Pin 间距默认 2.3mm，除非下图特殊标出；焊盘为标准跑道型结构（两个直径 1.4mm 半圆被长 1.4，宽 0.9mm 矩形隔开）。

The pin pitch is default 2.3mm unless remarked on the next figure; The pin is standard racetrack shape (two half circle whose diameter is 1.4mm, isolated by a 1.4mm*0.9mm rectangle).

9 生产流程建议 Manufacturing Process Recommendations

Figure 9-1: SKU622 Typical Lead-free Soldering Profile 无铅回流焊接炉温曲线



注：在工厂选择的最终回流焊接温度图取决于其他外部因素，例如焊接膏的选择、模块基板的尺寸、厚度和性能等。超过推荐焊接曲线中的最高焊接温度可能会永久损坏模块。

Note: The final re-flow soldering temperature map chosen at the factory depends on additional external factors, for example, choice of soldering paste, size, thickness and properties of the module's baseboard etc. Exceeding the maximum soldering temperature in the recommended soldering profile may permanently damage the module.

10 包装信息 Packaging Specification

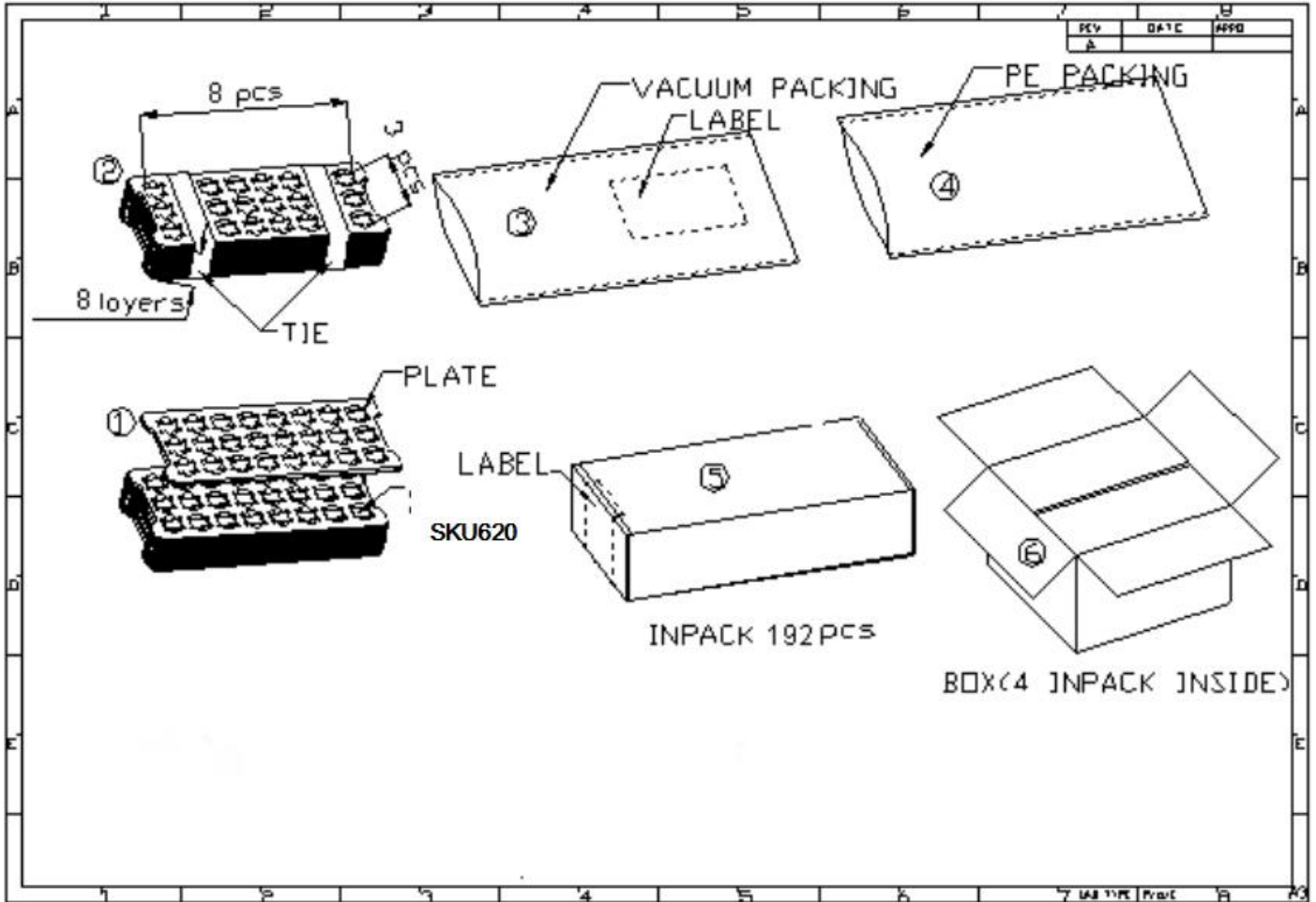


Figure10-1: SKU622 Packaging

SKU622-E 模组被放入托盘，每个托盘 528 个单元。每个托盘都是“干燥”和真空包装的。

SKU622 modules are put into tray and 528 units per tray. Each tray is ‘dry’ and vacuum packaging.

静电防护 ESD precautions



SKU622 模块包含高度敏感的电子电路，属于静电敏感器件(ESD)。在没有适当的静电放电保护的情况下使用 SKU622 模块可能会永久的破坏或损坏它们。

SKU622 模块是静电敏感器件，需要适用于静电敏感元件特殊的静电防护措施，正确的 ESD 处理和包装流程必须应用在使用 SKU622 模块的过程中，包括处理、运输和操作包含 SKU622 模块的任何应用程序。不可裸手触摸模块或用不防静电烙铁焊接，以免损坏模块。

SKU622 series modules are Electrostatic Sensitive Devices and require special precautions while handling. The SKU622 modules contain highly sensitive electronic circuitry and are Electrostatic Sensitive Devices (ESD). Handling the SKU622 modules without proper ESD protection may destroy or damage them permanently.

The SKU622 modules are electrostatic sensitive devices (ESD) and require special ESD precautions typically applied to ESD sensitive components. Proper ESD handling and packaging procedures must be applied throughout the processing, handling, transportation and operation of any application that incorporates the SKU622 module. Don't touch the module by hand or solder with non-anti-static soldering iron to avoid damage to the module.

11 联系方式 Contact Information

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