

SKU625 超宽带测距 模组规格书

SKU625 UWB Ranging Module Datasheet

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SKU625	TBD	Sample

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1. 产品介绍/Product information

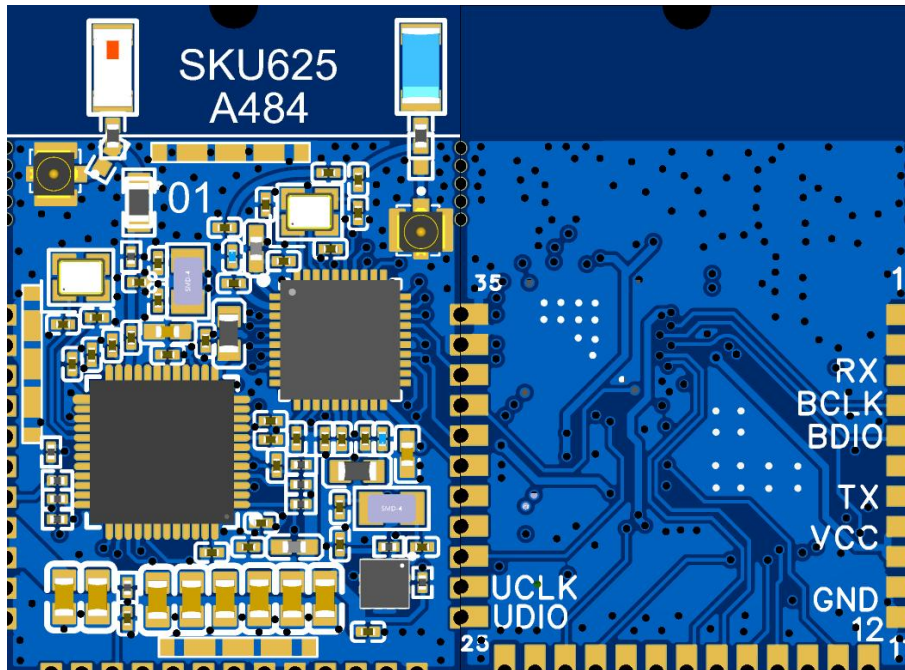


Figure 1-1: SKU625 with IPEX-III (UFL) RF connector

SKU625 是一款集成了蓝牙与 UWB 芯片的高精度测距模组，该模组兼容 IEEE 802.15.4z UWB 协议标准，并搭载了 BLE 5.1 技术。它采用了三边半孔布局，开放了丰富的 I/O 接口，支持灵活配置为 UART、SPI、I2C、PWM 等多种通信协议，方便二次开发。

SKU625 is a high-precision ranging module that integrates Bluetooth and UWB chips. This module is compatible with the IEEE 802.15.4z UWB protocol standard and incorporates BLE 5.1 technology. It features a three-sided half-hole layout, offering a plethora of I/O interfaces that can be flexibly configured to support various communication protocols such as UART, SPI, I2C, PWM, and more, facilitating secondary development.

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 测距或 TWR 定位标签 / UWB ranging or TWR positioning Tags.
- ◆ 无线数据传输 / Wireless data transferring.
- ◆ AirTag 追踪器 / AirTag Tracker.

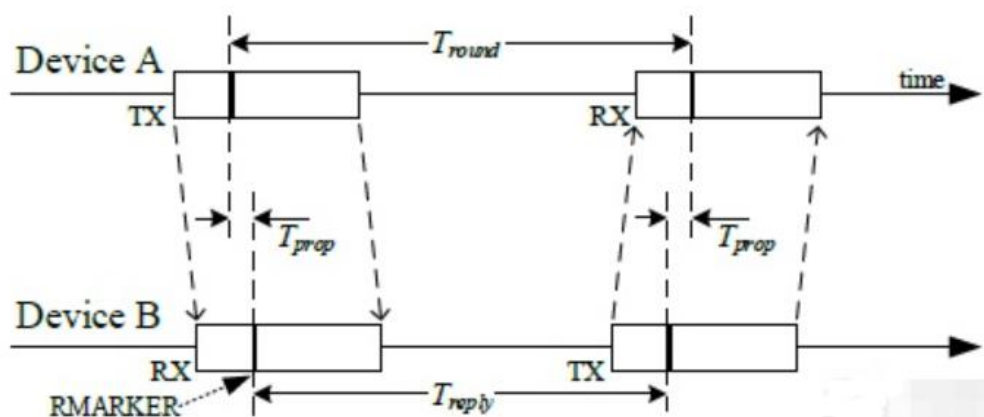


Figure 2-1: TWR ranging Process

3 特点 Features

- ◆ IEEE 802.15.4z UWB compliant.
- ◆ UWB 测距精度小于 $\pm 5\text{cm}$ / Ranging accuracy less than $\pm 5\text{cm}$.
- ◆ UWB 数据传输速率 / Data rates: 850Kbps, 6.8Mbps, 27.2Mbps and 54.4Mbps.
- ◆ UWB 可编程发射功率可达 10dBm / Data rates: 850Kbps, 6.8Mbps, 27.2Mbps and 54.4Mbps.
- ◆ BLE 5.1.
- ◆ BLE 数据传输速率 / Supported Data rates: 1 Mbps, 2 Mbps, and Long Range (500 kbps, 125kbps).
- ◆ BLE 发射功率 / TX power: -20 dBm to +7 dBm.
- ◆ 尺寸 Size: 28x19x2.5mm (不含屏蔽盖/No shield cover) .

4 应用框图 Application Diagram

SKU625 由 BLE 和 UWB 两颗芯片组成。

SKU625 is composed of two chips: BLE and UWB.

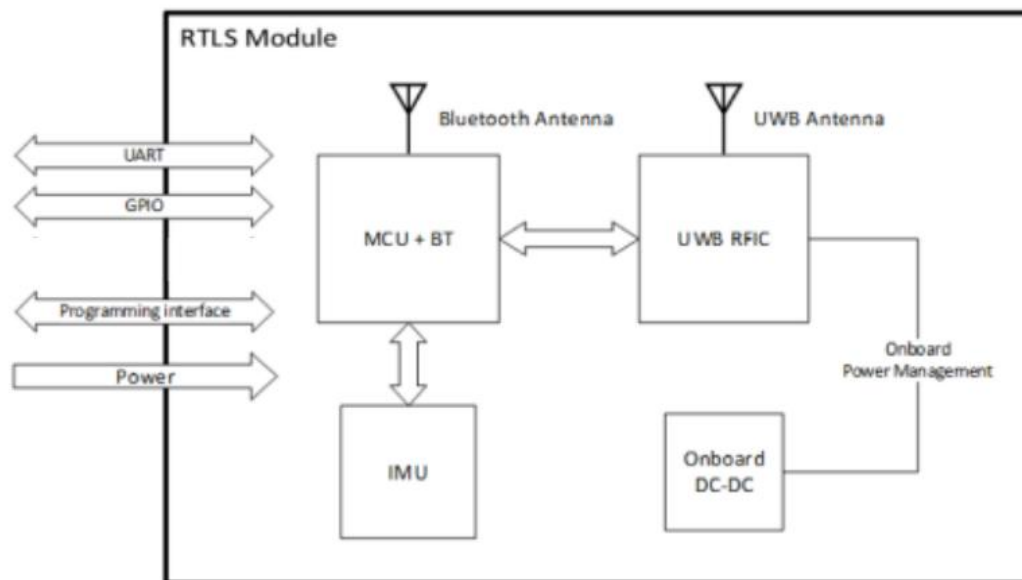


Figure 4-1

5 电气参数 Electrical Specification

下述表格给出来 SKU625 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 SKU625 module. Tamb = 25 °C for all specifications given.

5.1 正常工作条件 Nominal Operating Conditions

Table 5-1: SKU625 Operating Conditions

Parameter	Min.	Typ.	MAX.	Units	Condition/Note
工作温度 Operating temperature	-40	25	+85	°C	
电源电压 Supply voltage VCC	2.2	3.3	3.6	V	
IO 口电压 Voltage on VDDIO	1.8	3.3	3.3	V	

5.2 直流参数 DC Characteristics

Table5-2: SKU625 Receiver 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	
蓝牙扫描模式电流 Current in Bluetooth® discovery mode		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	

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 支持信道 5 和信道 9。

Channel 5 & 9 (6489.6MHz & 7987.2 MHz).

Table 5-3: SKU625 Channel Frequency Characteristic

Band group ^a (decimal)	Channel number (decimal)	Center frequency, f_c (MHz)	Band width (MHz)	Mandatory/Optional
2	5	6489.6	499.2	Optional
	6	6988.8	499.2	Optional
	7	6489.6	1081.6	Optional
	8	7488.0	499.2	Optional
	9	7987.2	499.2	Mandatory in high band
	10	8486.4	499.2	Optional
	11	7987.2	1331.2	Optional
	12	8985.6	499.2	Optional
	13	9484.8	499.2	Optional
	14	9984.0	499.2	Optional
	15	9484.8	1354.97	Optional

5.4 接收灵敏度 Receiver Sensitivity Characteristics

测试条件 25℃，20 字节 payload 长度。

Tamb = 25 °C, 20 byte payload.

Table 5-4: SKU625 Typical Receiver Sensitivity Characteristics

信道 Channel	数据速率 Data Rate	接收灵敏度 Receiver Sensitivity	单位 Units	测试条件备注 Condition/Note	
CH5	6.8 Mbps	-94	dBm/500 MHz	Preamble 128	Carrier frequency
CH9	6.8 Mbps	-93	dBm/500 MHz	Preamble 128	offset ±10 ppm

*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 发射交流参数 Transmitter AC Characteristics

Table 5-5: SKU625 Transmitter AC 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	-31	dBm/MHz	默认软件采用 典型功率 Typical power is used as default
Output Channel Power		-14	-4	dBm/500MHz	

*如果使用预先集成到模块中的软件 If using the pre-loaded embedded firmware of the SKU625 module

5.6 极限条件 Absolute Maximum Ratings

Table 5-6: SKU625 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

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

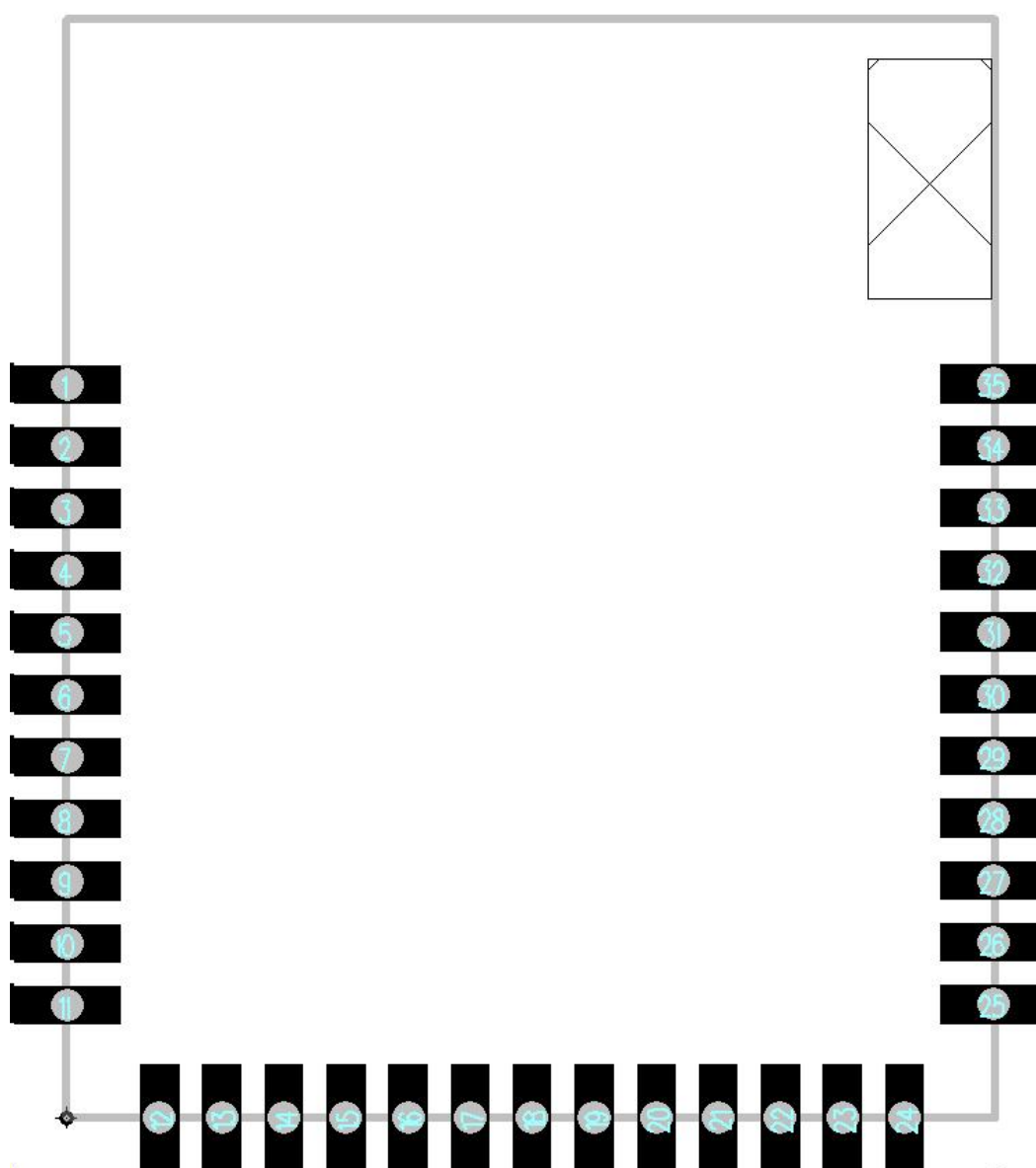


Figure 6-1: SKU625 Module Pinout (TOP View)

6.2 引脚描述 Pin Description

Table 6-1: SKU625 Pin Description

Pin No	Pin Name	I/O	Description
1	GND	G	地; Ground
2	GND	G	地; Ground
3	UART_RX	DI	串口 RX; UART RX
4	BLE_SWDCCLK	DI	BLE Jlink 烧录脚 SWDCCLK; BLE Serial wire debug clock input for J-link debug
5	BLE_SWDIO	DIO	BLE Jlink 烧录脚 SWDIO; BLE Serial wire debug I/O for J-link debug
6	SPI_CSN	DI	SPI 片选; SPI Chip Select
7	UART_TX	DO	串口 TX; UART TX
8	VDD	PI	供电脚(3.3V); power input (3.3V)
9	VDD	PI	
10	GND	G	地 Ground
11	GND	G	地 Ground
12	GPIO2	DIO	通用 I/O; General purpose I/O Pin
13	UWB_RSTN	DI	UWB 复位; UWB Reset
14	BLE_CHIP_EN	DI	BLE 芯片使能; BLE Chip Enable
15	SPI_MOSI	DIO	SPI 主机输出从机输入; SPI Master Output Slave Input
16	SPI_MISO	DIO	SPI 主机输入从机输出; SPI Master Input Slave Output
17	GPIO3	DIO	通用 I/O; General purpose I/O
18	GPIO4	DIO	通用 I/O; General purpose I/O
19	GND	G	地 Ground
20	GND	G	地 Ground
21	SPI_CLK	DIO	SPI 时钟; SPI Clock
22	UWB_BOOT0	PI	UWB 启动模式选择, 上电后内部上拉; UWB boot mode selection, Internal pull-up after power-on
23	RESERVED	DIO	悬空不接; Don't connect to any net
24	GND	G	地 Ground
25	UWB_SWDIO	DIO	UWB Jlink 烧录脚 SWDIO; UWB Serial wire debug I/O for J-link debug
26	UWB_SWDCCLK	DI	UWB Jlink 烧录脚 SWDCCLK; UWB Serial wire debug clock input for J-link debug
27	GPIO10	DIO	通用 I/O; General purpose I/O
28	PWM	DIO	蜂鸣器; Buzzer
29	AON_GPIO3	DIO	常开通用 I/O; Always-on General purpose I/O
30	IIC_SDA	DIO	IIC 数据; IIC Data
31	IIC_SCL	DIO	IIC 时钟; IIC Clock
32	CLK_TRIM	DI	烧录测试校准; Down load test calibration
33	KEY	DI	按键输入; Key input
34	GND	G	地 Ground
35	GND	G	地 Ground

缩略词简介 Short Expression:

PI:Power supply input 电源输入;

DI:Digital Input 数字输入;

DO:Digital Output 数字输出;

DIO:Digital Input/Output 数字输入/输出;

A/DIO:Analog/Digital Input/Output 模拟/数字 输入/输出;

G:Ground 接地。

BLE 芯片引脚与 UWB 芯片引脚相连关系如下:

UWB's SPI is connected to BLE GPIO like below:

Table 6-2: Internal Pins used and their connection

BLE Pin	UWB Pin
GPIO17	SPI0_CSN
GPIO31	RSTN
GPIO25	SPI0_MOSI
GPIO15	SPI0_MISO
GPIO24	SPI0_CLK

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，支持按键唤醒和蓝牙 findmy 查找，APP 上可以控制蜂鸣器。如果自行更改 IO 口功能需要走定制软件流程，不推荐。

Our company can provide demo software for the following reference design schematic diagram (the minimum system of our company's DEMO board), which supports key wake-up and Bluetooth findmy search. The buzzer can be controlled on the APP. If you change the function of the IO port by yourself, you need to go through the customized software process, which is not recommended.

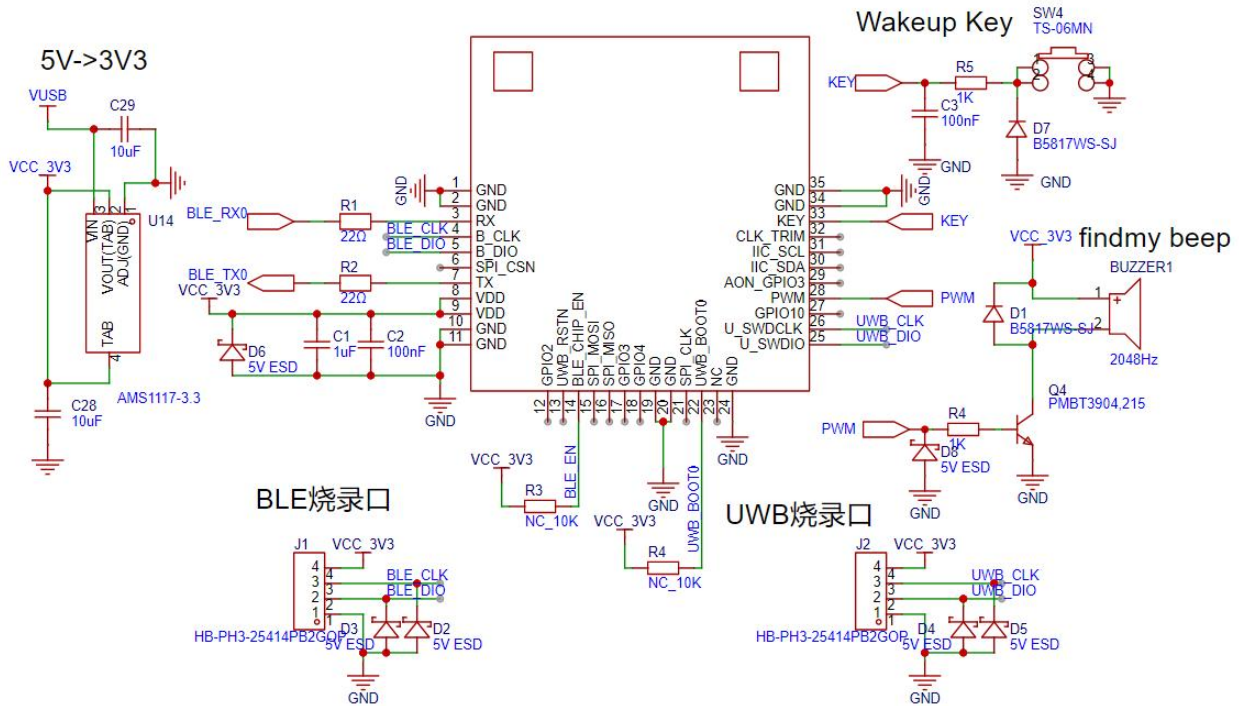


Figure 7-2

备注:

1. BLE_TX0, BLE_RX0 为 3.3V TTL 电平, 如需电平转换可以参考如下电平转换电路:

BLE_TX0, BLE_RX0 is 3.3V TTL voltage level. If you need voltage shift please refer to the circuit below:

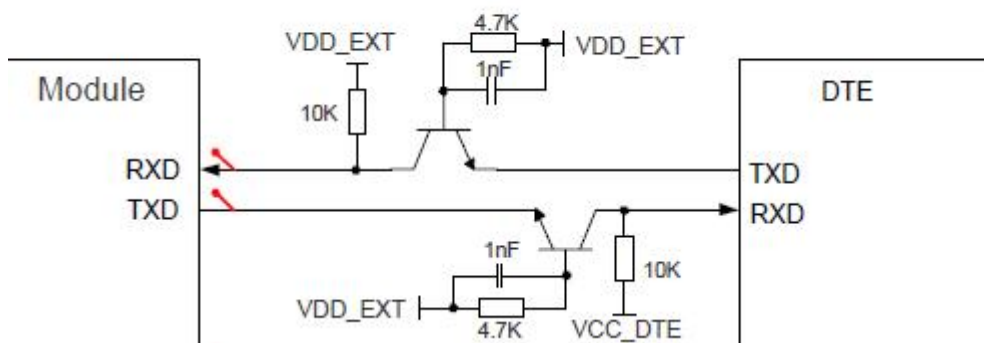


Figure 7-2

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 SKU625 layout. Please contact tech-support team for further information.

PCB 封装参考如下：

PCB footprint is as follows:

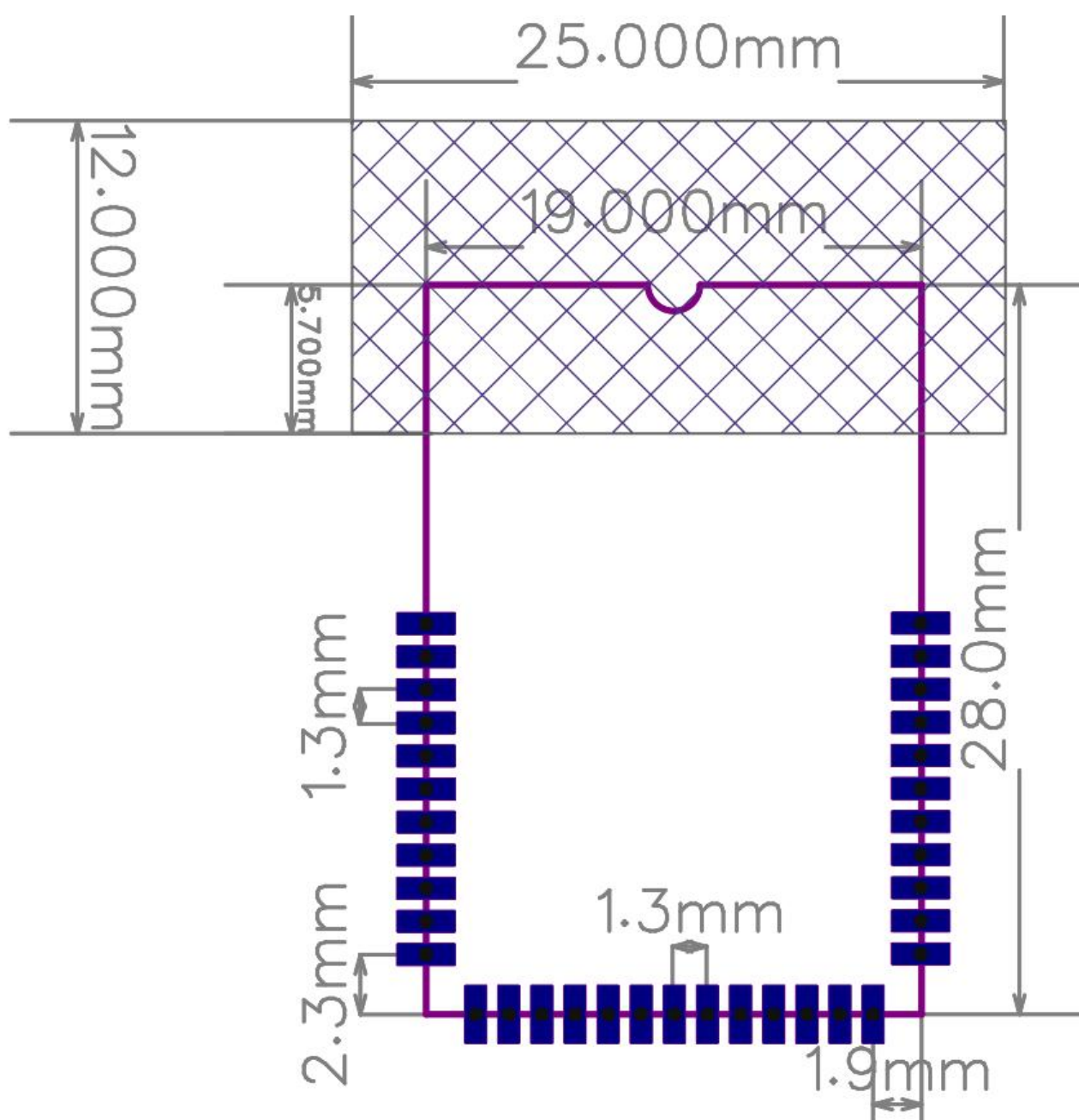


Figure 8-1: SKU625 PCB Footprint and Dimensions(units: mm)

注 Notice:

1. 为确保模块上方天线区域避免干扰，其对应的底板区域应保持净空，或允许天线区域略微超出底板边缘。

To ensure that the antenna area above the module is free from interference, there must be no wires in the corresponding base plate area, or the antenna area may slightly extend beyond the edge of the base plate.

2. Pin 间距默认 1.3mm，除非下图特殊标出；焊盘为矩形 2.2*0.8mm。

The Pin pitch is default 1.3mm unless remarked on the next figure; The Pin is in rectangle shape, 2.2*0.8mm.

9 生产流程建议 Manufacturing Process Recommendations

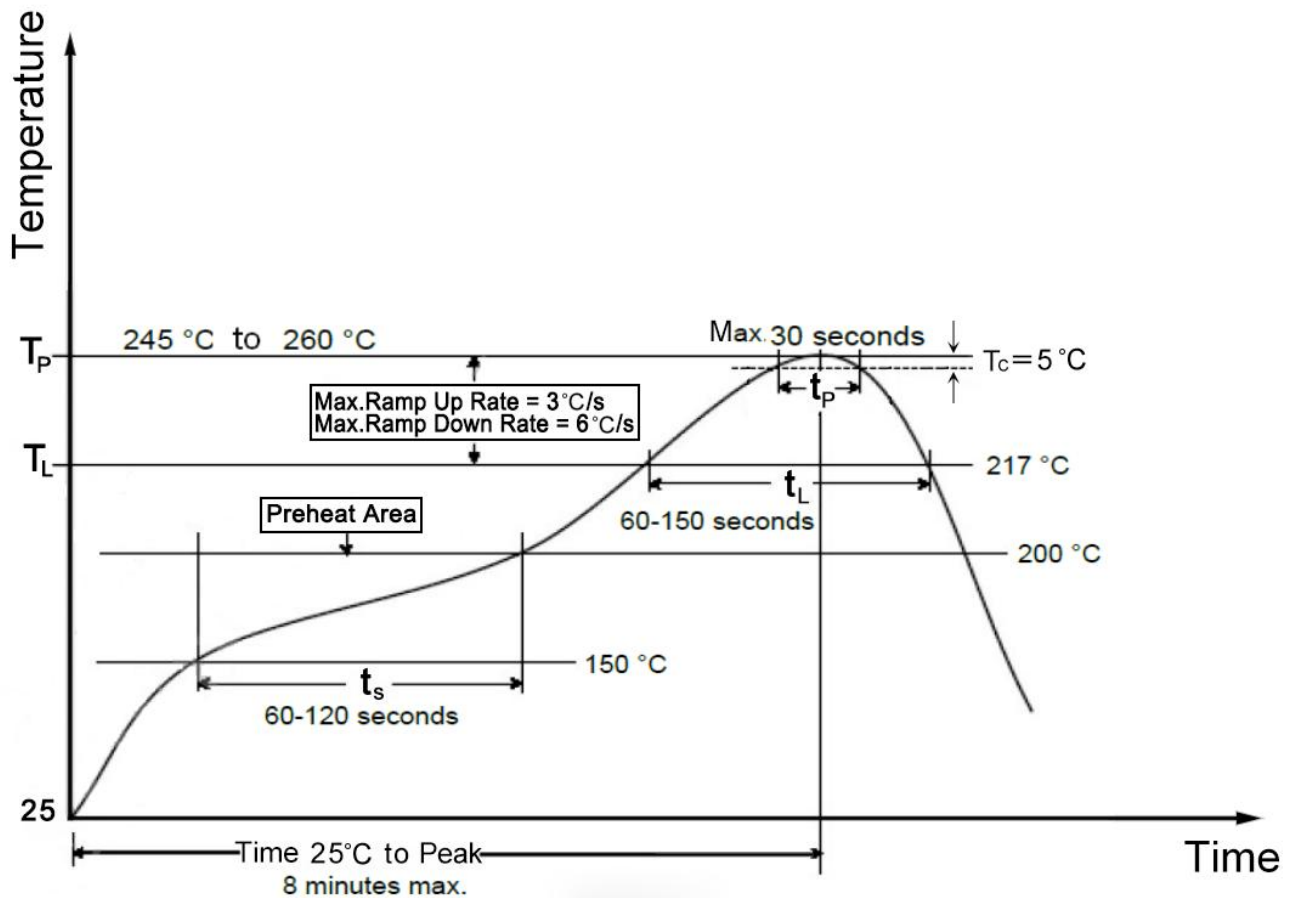


Figure 9-1: SKU625 Typical Lead-free Soldering Profile 无铅回流焊接炉温曲线

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

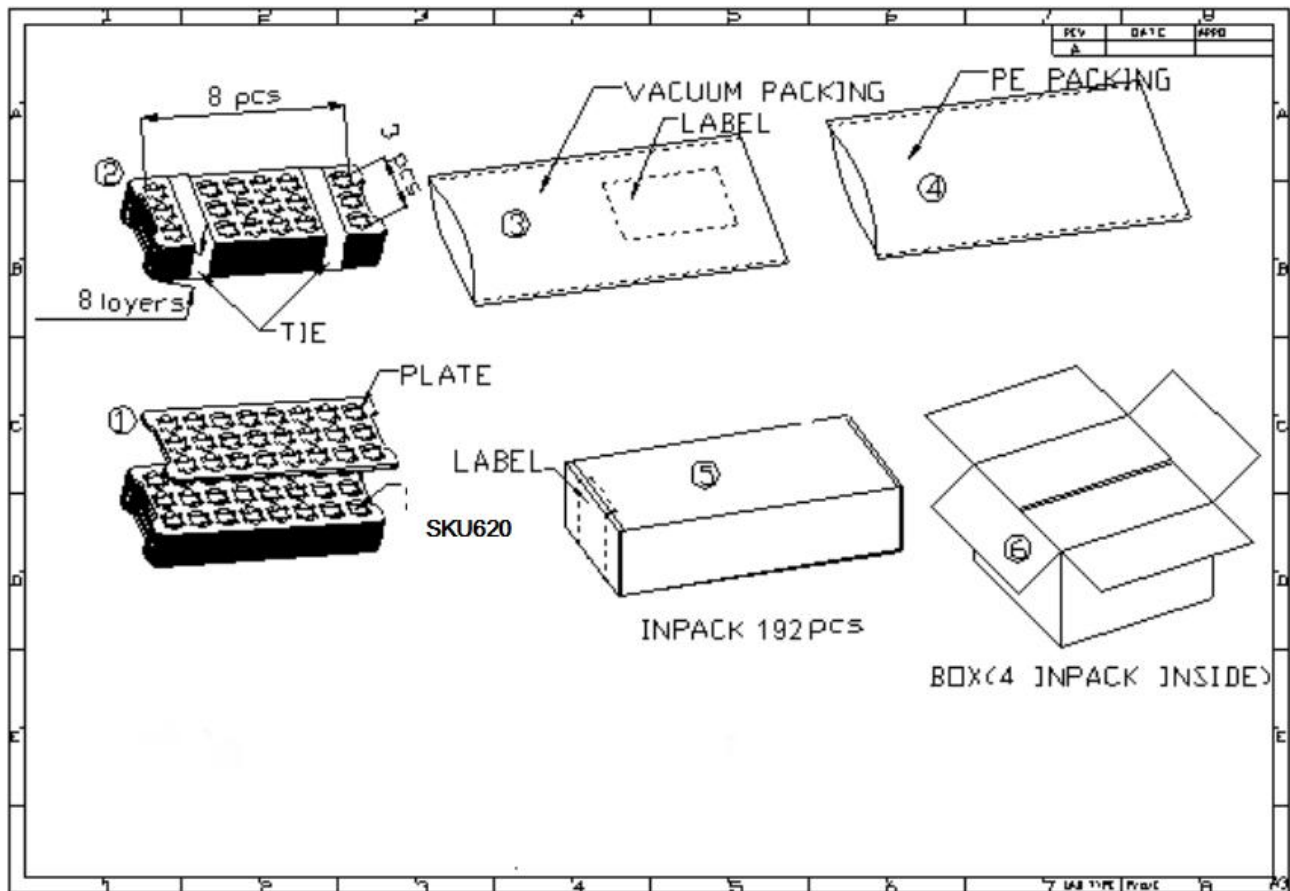


Figure10-1: SKU625 Packaging

SKU625 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。

SKU625 modules are put into tray and 528 units per tray. Each tray is 'dry' and vacuum packaging.

11 静电防护 ESD precautions

SKU625 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 SKU625 模块可能会永久的破坏或损坏它们。

SKU625 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 SKU625 模块的过程中，包括处理、运输和操作包含 SKU625 模块的任何应用程序。不可裸手触摸模块或用防静电烙铁焊接，以免损坏模块。



SKU625 series modules are Electrostatic Sensitive Devices and require special precautions while handling.

The SKU625 modules contain highly sensitive electronic circuitry and are Electrostatic Sensitive Devices (ESD). Handling the SKU625 modules without proper ESD protection may destroy or damage them permanently.

The SKU625 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 SKU625 module. Don't touch the module by hand or solder with non-anti-static soldering iron to avoid damage to the module.

12 联系方式 Contact Information

Skylab M&C Technology Co., Ltd.

深圳市天工测控技术有限公司

地址: 深圳市龙华区福城街道鸿创科技中心6栋11楼

Address: 11th Floor, Building 6, Hongchuang Science and Technology Center, Fucheng Street, Longhua District, Shenzhen, Guangdong, China.

电话/**Phone:** 86-0755 8340 8210 (Sales Support)

电话/**Phone:** 86-0755 8340 8510 (Technical Support)

传真/**Fax:** 86-0755-8340 8560

邮箱/**E-Mail:** sales1@skylab.com.cn

网站/**Website:** www.skylab.com.cn www.skylabmodule.com