SKU611 规格书
超宽带模块

SKU611 Datasheet
Ultra Wideband Module

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This document applicable to the following products：

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SKU611	SKU611（09401）	Mass Production

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目录Contents

1 概述/ General Description

　　　　SKU611模块是为UWB PDOA应用程序设计的，它集成了两个DW1000 IC和一个NRF52840 BLE IC。专门设计的UWB型天线使其在TDOA系统中实现了完美的性能。

The SKU611 module is design for UWB PDOA application, It integrates two DW1000 IC and a

NRF52840 BLE IC. The specially designed of UWB antenna mad it achieve a perfect performance in a

TDOA system.

Figure 1-1: SKU611 Top View

2 应用/ Applications

- ◆　无人机，机器人，AGV/ Drones, Robots, AGV　　.

- ◆　室内导航和定位/ Indoor navigation and location.

- ◆　运动，跟踪/ Sports, tracking

3 特性/ Features

- ◆　兼容IEEE 802.15.4-2011 UWB/ IEEE 802.15.4-2011 UWB compliant.

- ◆　Nordic Semiconductor nRF52840.

- ◆　蓝牙®连接/ Bluetooth® connectivity.

- ◆　蓝牙®芯片天线/ Bluetooth® chip antenna.

- ◆　10 DoF Sensors‑Accel, Gyro, MAG, BAR.

- ◆　电源电压/ Supply voltage: 2.8 V to 3.6 V.

- ◆　尺寸/ Size: 57.0 mm x 41.0 mm x 3.8 mm.

3 主要优势/ Key Benefits

◆ 10 DoF Sensors – Accel, Gyro, MAG, BAR.

◆ 户对SKU611固件的API（可作为一个库），用于用户代码定制/ User API to SKU611 firmware (available as a library) for user code customisation.

◆ 车载蓝牙®智能设备，用于连接手机/平板电脑/个人电脑/ On-board Bluetooth® SMART for connectivity to phones/tablets/PCs

◆ 使用SPI、UART和蓝牙®API，可从外部设备访问SKU611固件/ SPI, UART and Bluetooth® APIs to access SKU611 firmware from an external device

◆ 低功耗硬件设计和软件架构，以延长电池寿命/ Low-power hardware design and software architecture for longer battery life

4 应用框图/ Applications Block Diagram

Figure 4-1: SKU611 Block Diagram

5 电器特性/ Electrical Specification

下表给出了SKU611模块的详细规格说明。Tamb = 25℃，适用于所有规格。

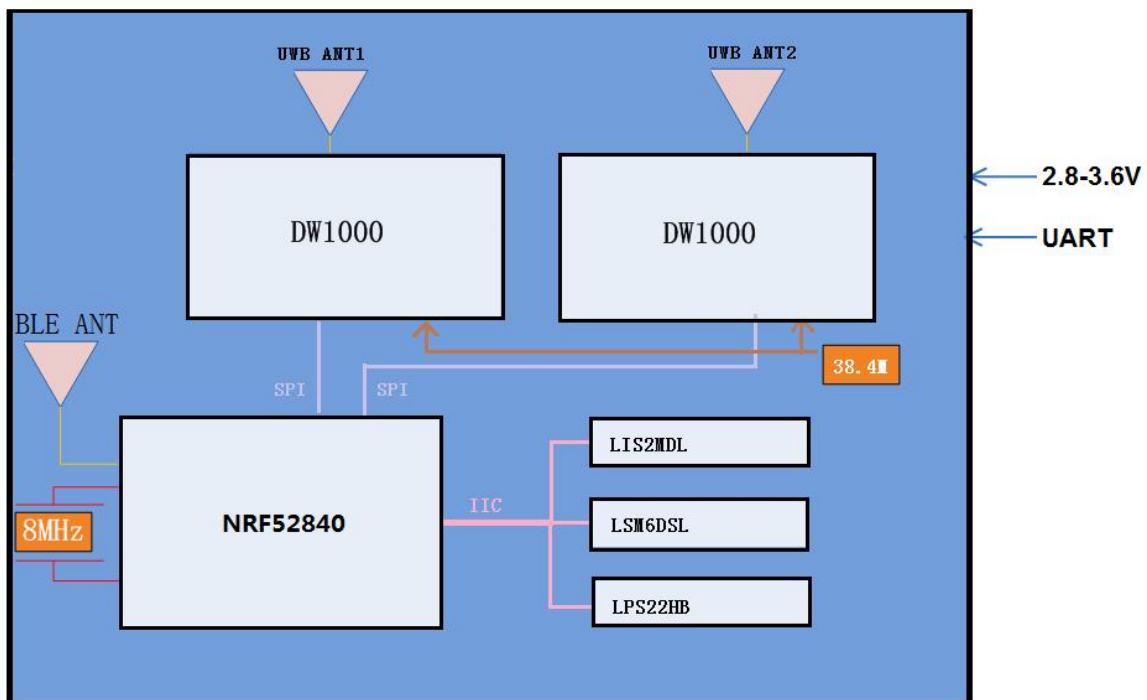The following tables give detailed specifications for the SKU611 module. Tamb = 25 ˚C for all specifications given.

5.1 工作条件/ Nominal Operating Conditions

Table 5-1: SKU611 Operating Conditions

参数/Parameter	Min.	Type	MAX.	Units	条件和注意事项/Condition/Note
Operating temperature	-40		+85	˚C	
Supply voltage VCC	2.8	3.3	3.6	V	常规操作/ Normal operation

5.2 直流特性/ DC Characteristics

Table5-2: SKU611 Receiver DC Characteristics

参数/Parameter	Min.	Type	Max.	Units	条件和注意事项/Condition/Note
Supply current in DEEPSLEEP mode		4		µA	所有外设在最低功耗模式可实现,RTC和加速计被禁用与自定义固件。/ All peripherals in lowest power consumption mode Achievable where RTC and accelerometer are disabled with custom firmware.
Supply current in DEEP SLEEP mode		12		µA	RTC和加速度计运行,所有其他外设在最低功耗模式/ RTC and accelerometer operational, all other peripherals in lowest power consumption mode
Supply current in IDLE mode		13		mA	MCU和DW1000唤醒/ MCU and DW1000 awake
TX peak current		111		mA	
TX mean current		82		mA	
RX peak current		154		mA	
RX mean current		134		mA	

5.3 接收机交流特性/ Receiver AC Characteristic

Table 5-3: SKU611 Receiver AC Characteristic

参数/Parameter	Min.	Type	Max.	Units	条件和注意事项/Condition/Note
Frequency range	6240		6739.2	MHz	Centre Frequency 6489.6 MHz

5.4 接收机灵敏度特性/ Receiver Sensitivity Characteristics

测试条件25℃，20字节payload长度。天线增益0dBi，方向应根据天线方向性调整到SKU610合适的位置。

Tamb = 25 ˚C, 20 byte payload. These sensitivity figures assume an antenna gain of 0 dBi and should be modified by the antenna characteristics, depending on the orientation of the SKU611.

Table 5-4: SKU611 Typical Receiver Sensitivity Characteristics

Packet Error Rate	Data Rate	Receiver Sensitivity	Units	Condition/Note		
1%	6.8Mbps	-98*(-92)	dBm/500MHz	Preamble 128	Carrier frequency offset ±10 ppm	All measurements performed on Channel 5, PRF 64MHz
10%	6.8Mbps	-99*(-93)	dBm/500MHz	Preamble 128		

*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 发射机交流特性/ Transmitter AC Characteristics

Table 5-5: SKU611 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			-41.3*	dBm/MHz	
Output Channel Power		-17		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 SKU611 module

5.6 绝对最大额定参数/ Absolute Maximum Ratings

Table 5-6: SKU611 Absolute Maximum Ratings

Parameter	Min.	Max.	Units
供电电压/ Supply voltage	2.8	3.9	V
接收电平/Receiver power		0	dBm
存储温度/ Storage temperature	-40	+85	˚C
工作温度/ Operating temperature	-40	+85	˚C
ESD (Human Body Model)		2000	V
除VBAT，3V3_OUT，GND外其他脚的电平/ SKU611 pins other than VCC, VDDIO and GND		3.6	Note that 3.6 V is the max voltage that may be applied to these pins

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.

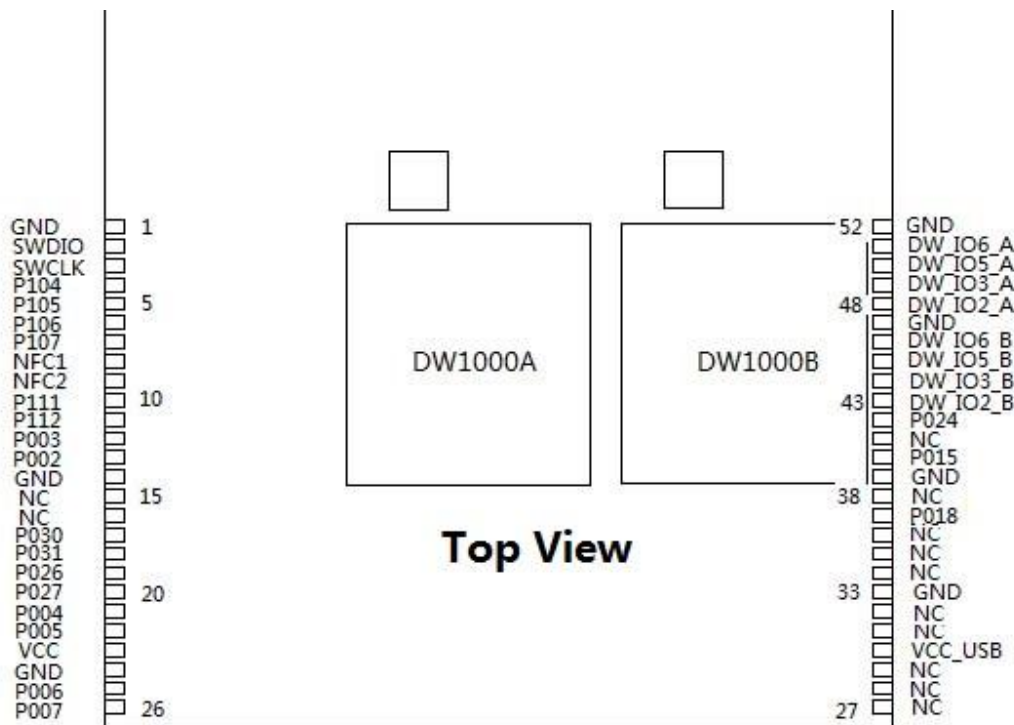# 6 模块引脚介绍/ Module Pinout and Pin Description

6.1 引脚分布/ Module Pinout

Figure 6-1: SKU611 Module Pinout (TOP View)

6.2 引脚描述/ Pin Description

Table 6-1: SKU611 Pin Description

Pin No.	Pin Name	I/O	Description
1	GND	G	接地/ Common ground.
2	SWD_CLK	P	处理器调试和编程的串行线调试时钟输入。/ Serial wire debug clock input for debug and programming of Nordic Processor.
3	SWD_DIO	DIO	处理器调试和编程的串行线调试I/O / Serial wire debug I/O for debug and programming of Nordic Processor
4	P104	DIO	NRF52840的通用I/O引脚/ General purpose I/O Pin of NRF52840
5	P105	DIO	NRF52840的通用I/O引脚/ General purpose I/O Pin of NRF52840
6	P106	DIO	NRF52840的通用I/O引脚/ General purpose I/O Pin of NRF52840
7	P107	DIO	NRF52840的通用I/O引脚/ General purpose I/O Pin of NRF52840

8	NFC1	DIO	NFC天线连接/ NFC antenna connection
9	NFC2	DIO	NFC天线连接/ NFC antenna connection
10	P111	DIO	NRF52840的通用I/O引脚/ General purpose I/O Pin of NRF52840
11	P112	DIO	NRF52840的通用I/O引脚/ General purpose I/O Pin of NRF52840
12	P003	DIO	NRF52840的通用I/O引脚/ General purpose I/O Pin of NRF52840
13	P002	DIO	NRF52840的通用I/O引脚/ General purpose I/O Pin of NRF52840
14	GND	G	接地/ Common ground.
15	NC	NC	悬空/ Don't connect anything
16	NC	NC	悬空/ Don't connect anything
17	P030	DIO	NRF52840的通用I/O引脚/ General purpose I/O Pin of NRF52840
18	P031	DIO	NRF52840的通用I/O引脚/ General purpose I/O Pin of NRF52840
19	P026	DIO	NRF52840的通用I/O引脚/ General purpose I/O Pin of NRF52840
20	P027	DIO	NRF52840的通用I/O引脚/ General purpose I/O Pin of NRF52840
21	P004	DIO	NRF52840的通用I/O引脚/ General purpose I/O Pin of NRF52840
22	P005	DIO	NRF52840的通用I/O引脚/ General purpose I/O Pin of NRF52840
23	VCC	P	
24	GND	G	接地/ Common ground.
25	P006	DIO	NRF52840的通用I/O引脚/ General purpose I/O Pin of NRF52840
26	P007	DIO	NRF52840的通用I/O引脚/ General purpose I/O Pin of NRF52840
27	NC	NC	NRF52840的通用I/O引脚/ General purpose I/O Pin of NRF52840
28	NC	NC	NRF52840的通用I/O引脚/ General purpose I/O Pin of NRF52840
29	NC	NC	NRF52840的通用I/O引脚/ General purpose I/O Pin of NRF52840
30	VCC_USB	DIO	General purpose I/O pin of DW1000
31	NC	NC	General purpose I/O pin of DW1000
32	NC	NC	NRF52832的通用I/O引脚/ General purpose I/O Pin of NRF52832
33	GND	G	NRF52832的通用I/O引脚/ General purpose I/O Pin of NRF52832
34	NC	NC	悬空/ Don't connect anything
35	NC	NC	悬空/ Don't connect anything
36	NC	NC	悬空/ Don't connect anything
37	P018	DIO	NRF52832的通用I/O引脚/ General purpose I/O Pin of NRF52832

38	NC	NC	悬空/ Don't connect anything
39	GND	G	NRF52832的通用I/O引脚/ General purpose I/O Pin of NRF52832
40	P015	DIO	NRF52832的通用I/O引脚/ General purpose I/O Pin of NRF52832
41	NC	NC	悬空/ Don't connect anything
42	P024	DIO	NRF52832的通用I/O引脚/ General purpose I/O Pin of NRF52832
43	DW_IO2_B	DIO	DW1000（B）的I/O引脚，如果不使用，请悬空/ I/O pin of DW1000(B),If it not be used,don't connect anything
44	DW_IO3_B	DIO	DW1000（B）的I/O引脚，如果不使用，请悬空/ I/O pin of DW1000(B),If it not be used,don't connect anything
45	DW_IO5_B	DIO	DW1000（B）的I/O引脚，如果不使用，请悬空/ I/O pin of DW1000(B),If it not be used,don't connect anything
46	DW_IO6_B	DIO	DW1000（B）的I/O引脚，如果不使用，请悬空/ I/O pin of DW1000(B),If it not be used,don't connect anything
47	GND	G	接地/ Common ground.
48	DW_IO2_A	DIO	DW1000（A）I/O引脚/ I/O pin of DW1000(A)
49	DW_IO3_A	DIO	DW1000（A）I/O出引脚/ I/O pin of DW1000(A)
50	DW_IO5_A	DIO	DW1000（A）I/O引脚/ I/O pin of DW1000(A)
51	DW_IO6_A	DIO	DW1000（A）I/O引脚/ I/O pin of DW1000(A)
52	GND		接地/ Common ground.

(1) P: 电源/ Power supply

(2) DI: 默认输入/ Default Input

(3) DO: 默认输出/ Default Output

(4) DIO: 默认输入/输出/ Default Input/Output

(5) G: 接地/ Ground

7 PCB设计指南/ PCB Design Guide

在设计将焊接SKU611的PCB时，需要仔细考虑SKU611板载陶瓷单极子天线与金属和其他非射频透明材料的接近程度。下面是两种建议的安置方案。在"隔离区域"标记区域，两侧上方或下方不得应有金属（例如不要将电池放置在天线下方）。图7-1中的放置方案显示了一个在隔离区域没有非射频透明材料的应用板，或一个天线突出离开隔离板的应用板，使隔离区域处于自由空间。在这第二种方案中，在系统实现中，不要将金属组件放置在天线的上方或下方仍然是很重要的。

When designing the PCB onto which SKU611 will be soldered, the proximity of the SKU611 on-board ceramic monopole antenna to metal and other non-RF transparent materials needs to considered carefully. Two suggested placement schemes are shown below. In the areas marked "Keep-Out Area" there should be no metal either side, above or below (e.g. do not place battery under antenna).The placement schemes in Figure 7-1 show an application board with no non-RF transparent material in the keep-out area, or an application board with the antenna projecting off of the board so that the keep out area is in free-space. In this second scheme it is still important not to place metal components above or below the antenna in a system implementation.
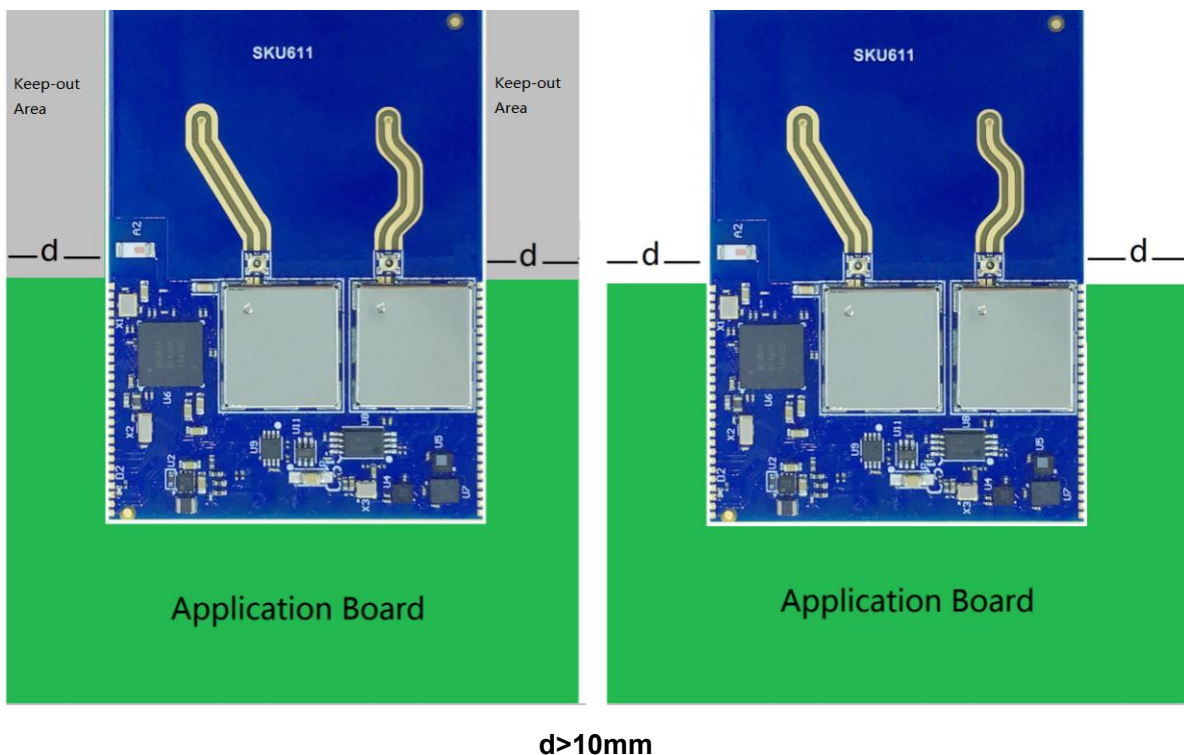

d>10mm

Figure 7-1: SKU611 Typical Lead-free Soldering Profile

8 PCB封装和尺寸/ PCB Footprint and Dimensions

8.1 模块尺寸图/ Module Drawings

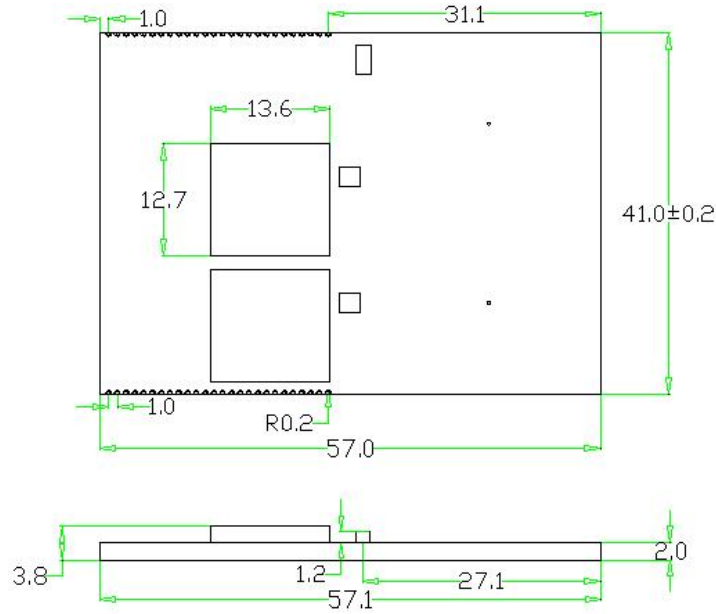所有的测量值都以毫米为单位。/ All measurements are given in millimeter.

Figure 8-1: SKU611 PCB Dimensions(units: mm)
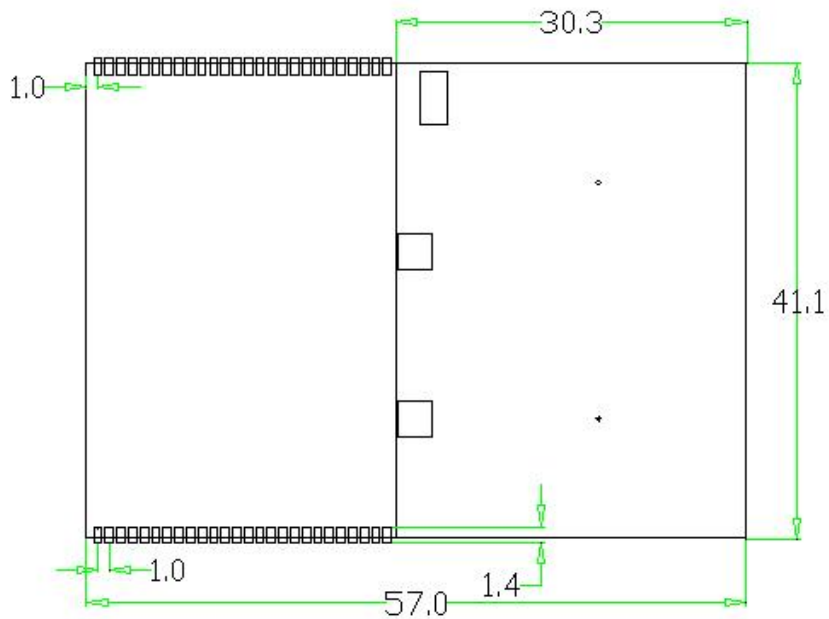
8.2 模块封装图/ Module Footprint

Figure 8-2: SKU611 Module Land Pattern (units: mm)

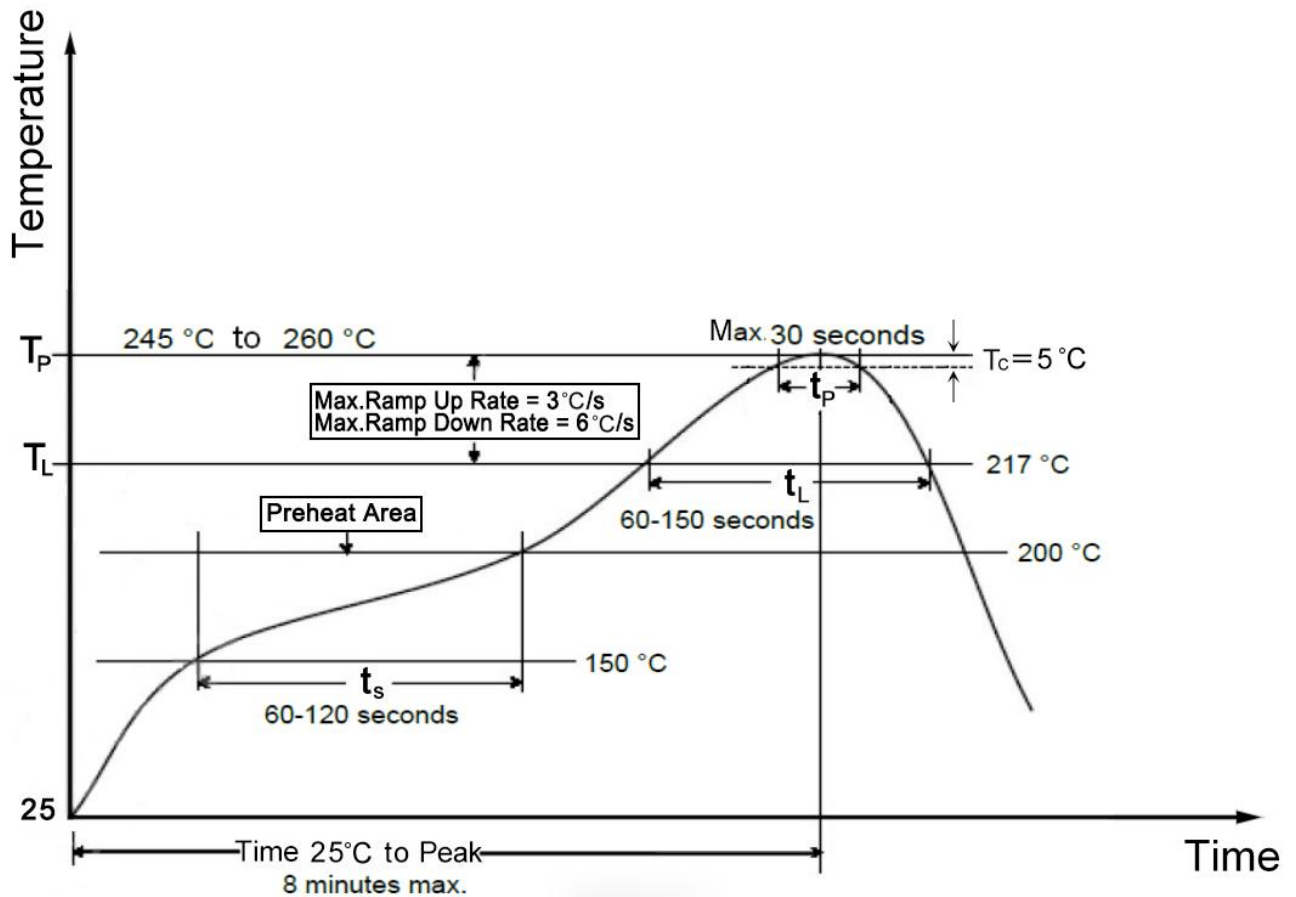# 9 制造工艺的建议/ Manufacturing Process Recommendations

Figure 9-1: SKU611 Typical Lead-free Soldering Profile

注：在工厂选择的最终再流焊接温度图取决于其他外部因素，例如，焊膏的选择、尺寸、厚度和模块底板的性能等。超过推荐焊接轮廓线中的最大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 包装规范/ Contact Information

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