

SKU611 Ultra Wideband Module Datasheet

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Contents

1 General Description.....	4
2 Applications	5
3 Features.....	5
3 Key Benefits.....	5
4 Applications Block Diagram.....	6
5.Electrical Specification.....	6
5.1 Nominal Operating Conditions	6
5.2 DC Characteristics.....	7
5.3 Receiver AC Characteristic	7
5.4 Receiver Sensitivity Characteristics	8
5.5 Transmitter AC Characteristics	8
5.6 Absolute Maximum Ratings	8
6 Module Pinout and Pin Description	9
6.1 Module Pinout	9
6.2 Pin Description	10
7 PCB Design Guide	13
8 PCB Footprint and Dimensions	14
8.1 Module Drawings	14
8.2 Module Footprint	15
9 Manufacturing Process Recommendations	16
10 Contact Information	17

1 General Description

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.

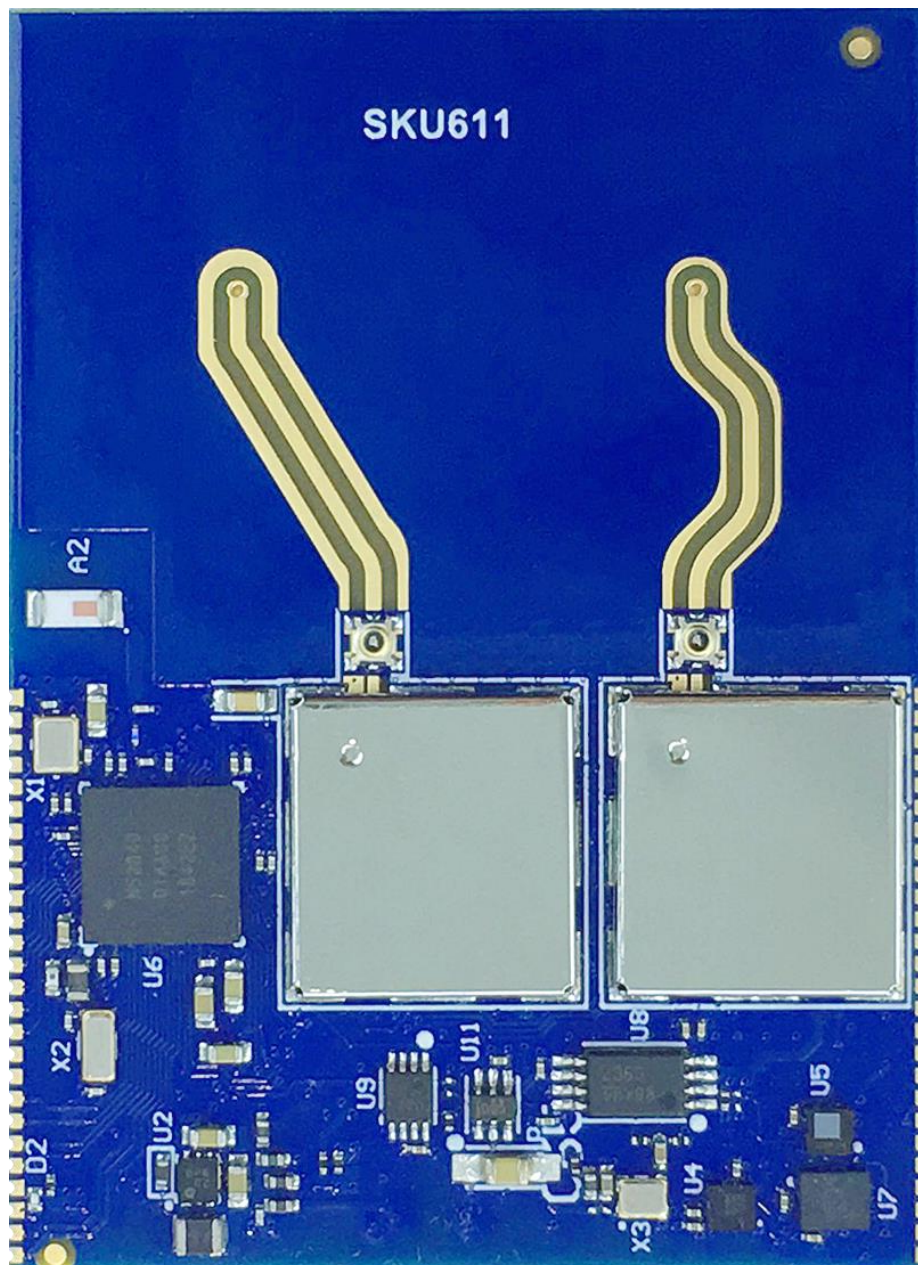


Figure 1-1: SKU611 Top View

2 Applications

- ◆ Follow me applications, Drones, Robots, AGV .
- ◆ Indoor navigation and location.
- ◆ Robotics, sports, tracking

3 Features

- ◆ IEEE 802.15.4-2011 UWB compliant.
- ◆ Nordic Semiconductor nRF52840.
- ◆ Bluetooth® connectivity.
- ◆ Bluetooth® chip antenna.
- ◆ 10 DoF Sensors – Accel, Gyro, MAG, BAR.
- ◆ Supply voltage: 2.8 V to 3.6 V.
- ◆ Size: 57.0 mm x 41.0 mm x 3.8 mm.

3 Key Benefits

- ◆ 10 DoF Sensors – Accel, Gyro, MAG, BAR.
- ◆ User API to SKU611 firmware (available as a library) for user code customisation.
- ◆ On-board Bluetooth® SMART for connectivity to phones/tablets/PCs
- ◆ SPI, UART and Bluetooth® APIs to access SKU611 firmware from an external device
- ◆ Low-power hardware design and software architecture for longer battery life

4 Applications Block Diagram

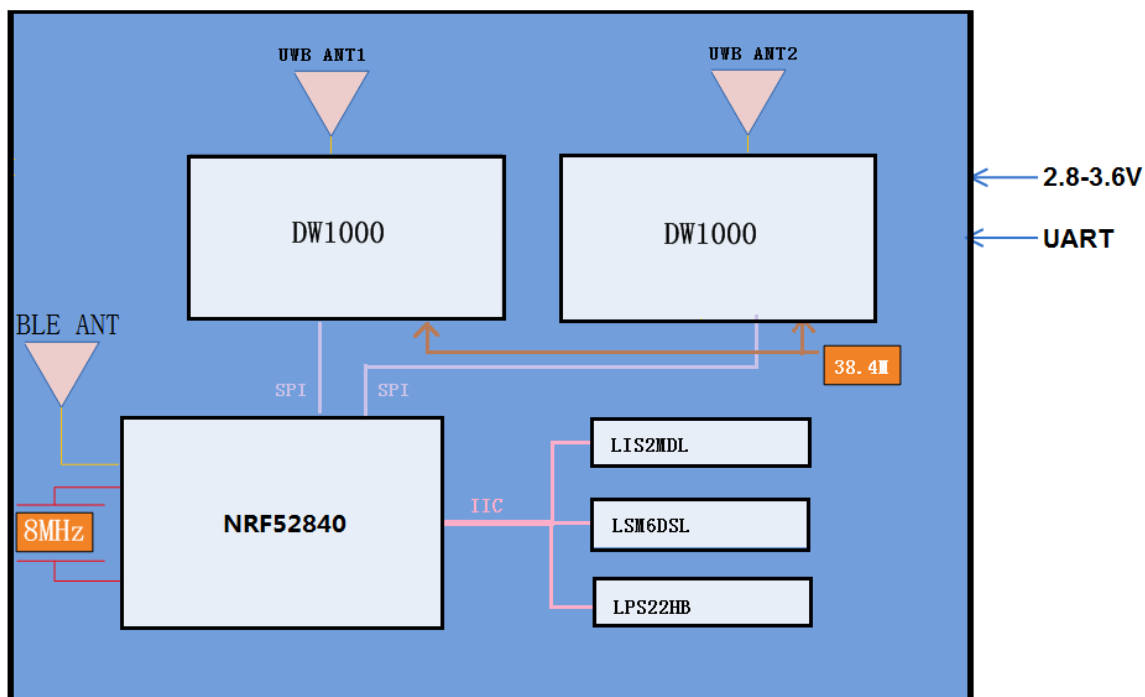


Figure 4-1: SKU611 Block Diagram

5. Electrical Specification

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

5.1 Nominal Operating Conditions

Parameter	Min.	Typ.	MAX.	Units	Condition/Note
Operating temperature	-40		+85	°C	
Supply voltage VCC	2.8	3.3	3.6	V	Normal operation

Table 5-1: SKU611 Operating Conditions

5.2 DC Characteristics

Parameter	Min.	Typ.	Max.	Units	Condition/Note
Supply current in DEEPSLEEP mode		4		μA	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 and accelerometer operational, all other peripherals in lowest power consumption mode
Supply current in IDLE mode		13		mA	MCU and DW1000 awake
TX peak current		111		mA	
TX mean current		82		mA	
RX peak current		154		mA	
RX mean current		134		mA	

Table5-2: SKU611 Receiver DC Characteristics

5.3 Receiver AC Characteristic

Parameter	Min.	Typ.	Max.	Units	Condition/Note
Frequency range	6240		6739.2	MHz	Centre Frequency 6489.6 MHz

Table 5-3: SKU611 Receiver AC Characteristic

5.4 Receiver Sensitivity Characteristics

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.

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

Table 5-4: SKU611 Typical Receiver Sensitivity Characteristics

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

5.5 Transmitter AC Characteristics

Parameter	Min.	Typ.	Max.	Units	Condition/Note
Output power spectral density			-41.3*	dBm/MHz	
Output Channel Power		-17		dBm/500MHz	

Table 5-5: SKU611 Transmitter AC Characteristics

* If using the pre-loaded embedded firmware of the SKU611 module

5.6 Absolute Maximum Ratings

Parameter	Min.	Max.	Units
Supply voltage	2.8	3.9	V
Receiver power		0	dBm

Temperature - Storage temperature	-40	+85	°C
Temperature – Operating temperature	-40	+85	°C
ESD (Human Body Model)		2000	V
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

Table 5-6: SKU611 Absolute Maximum Ratings

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 Module Pinout and Pin Description

6.1 Module Pinout

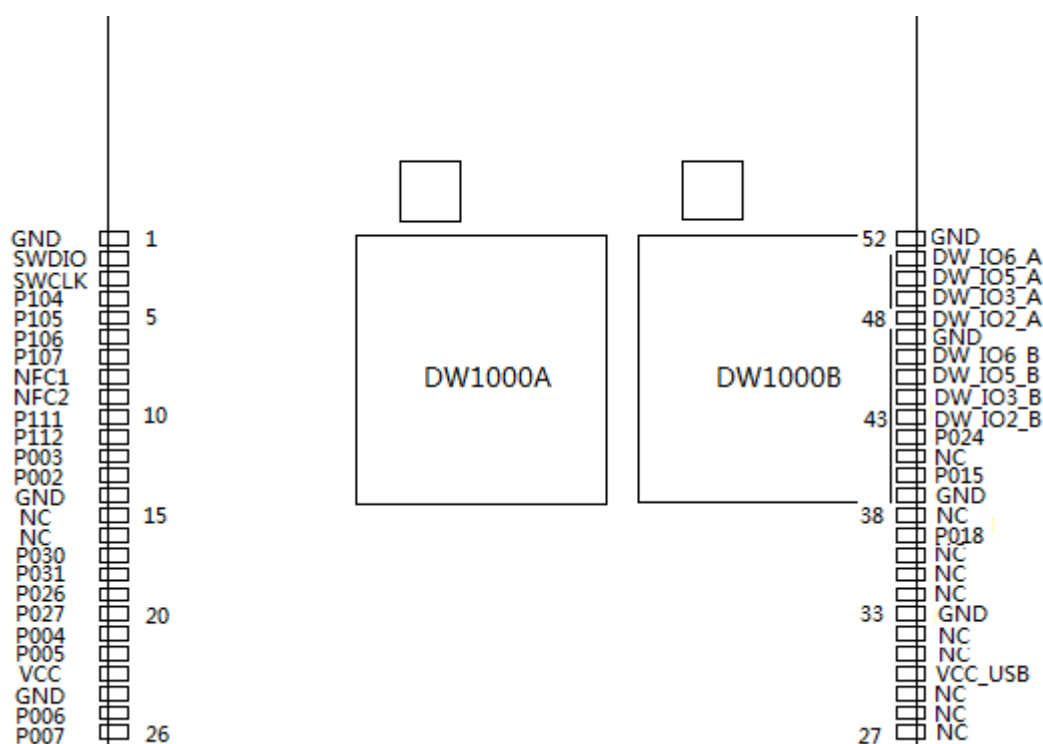


Figure 6-1: SKU611 Module Pinout (TOP View)

6.2 Pin Description

Pin No.	Pin Name	I/O	Description
1	GND	G	Common ground.
2	SWD_CLK	P	Serial wire debug clock input for debug and programming of Nordic Processor.
3	SWD_DIO	DIO	Serial wire debug I/O for debug and programming of Nordic Processor
4	P104	DIO	General purpose I/O Pin of NRF52840
5	P105	DIO	General purpose I/O Pin of NRF52840
6	P106	DIO	General purpose I/O Pin of NRF52840
7	P107	DIO	General purpose I/O Pin of NRF52840
8	NFC1	DIO	NFC antenna connection
9	NFC2	DIO	NFC antenna connection
10	P111	DIO	General purpose I/O Pin of NRF52840
11	P112	DIO	General purpose I/O Pin of NRF52840
12	P003	DIO	General purpose I/O Pin of NRF52840
13	P002	DIO	General purpose I/O Pin of NRF52840
14	GND	G	Common ground.

15	NC	NC	Don't connect anything
16	NC	NC	Don't connect anything
17	P030	DIO	General purpose I/O Pin of NRF52840
18	P031	DIO	General purpose I/O Pin of NRF52840
19	P026	DIO	General purpose I/O Pin of NRF52840
20	P027	DIO	General purpose I/O Pin of NRF52840
21	P004	DIO	General purpose I/O Pin of NRF52840
22	P005	DIO	General purpose I/O Pin of NRF52840
23	VCC	P	
24	GND	G	Common ground.
25	P006	DIO	General purpose I/O Pin of NRF52840
26	P007	DIO	General purpose I/O Pin of NRF52840
27	NC	NC	General purpose I/O Pin of NRF52840
28	NC	NC	General purpose I/O Pin of NRF52840
29	NC	NC	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	General purpose I/O Pin of NRF52832
33	GND	G	General purpose I/O Pin of NRF52832
34	NC	NC	Don't connect anything
35	NC	NC	Don't connect anything
36	NC	NC	Don't connect anything
37	P018	DIO	General purpose I/O Pin of NRF52832

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

Table 6-1: SKU611 Pin Description

- (1) P:Power supply
- (2) DI:Default Input
- (3) DO:Default Output
- (4) DIO:Default Input/Output
- (5) G:Ground

7 PCB Design Guide

When designing the PCB onto which SKU609 will be soldered, the proximity of the SKU611 on-board ceramic monopole antenna to metal and other non-RF transparent materials needs to be 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.

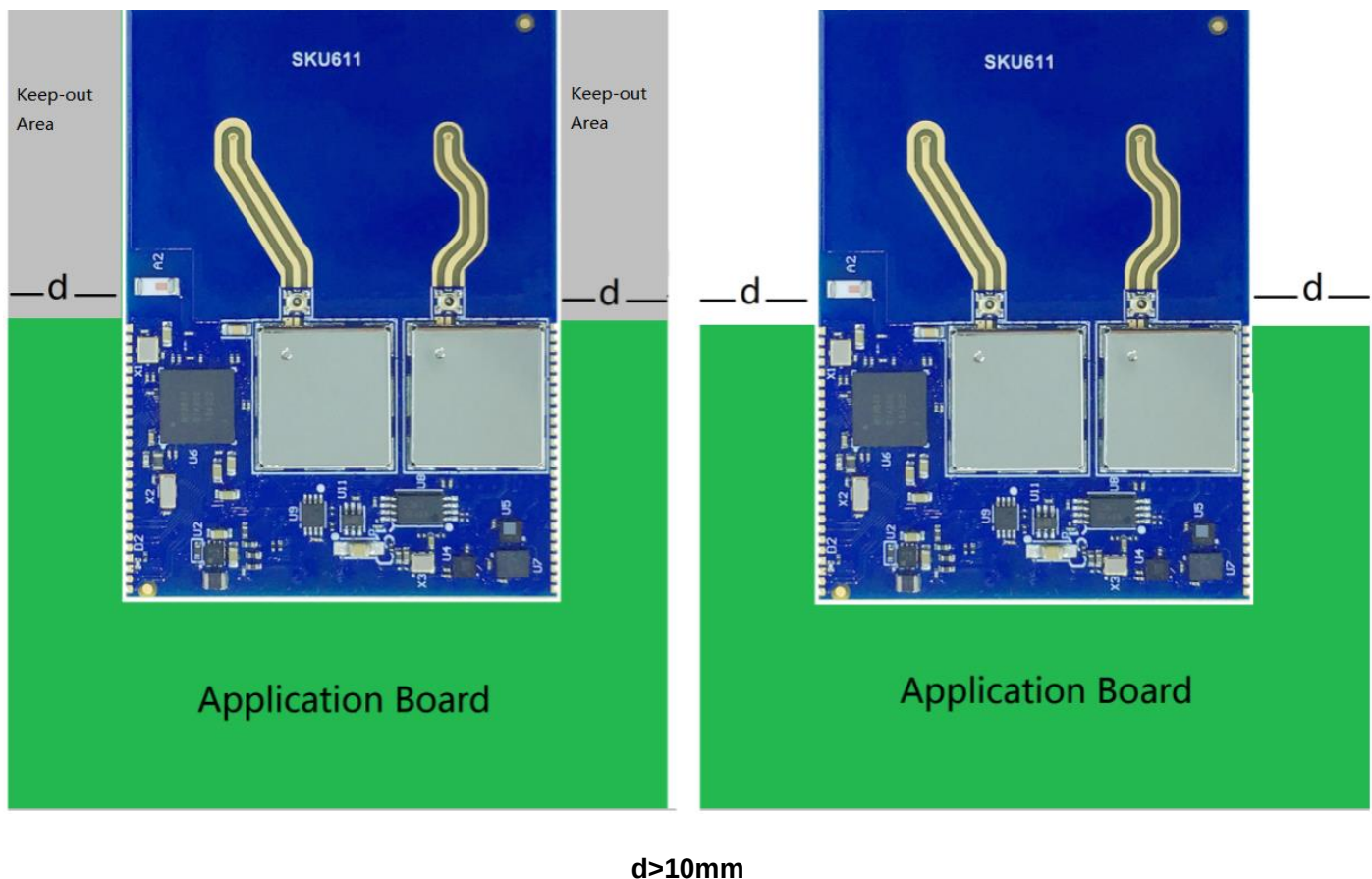


Figure 7-1: SKU611 Typical Lead-free Soldering Profile

8.2 Module Footprint

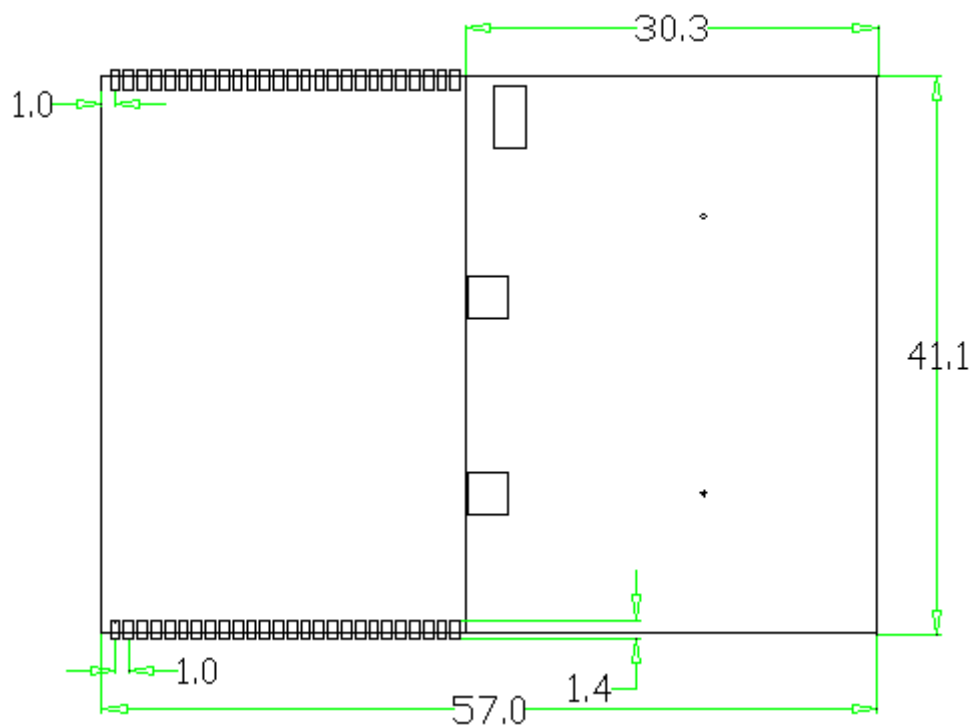


Figure 8-2: SKU611 Module Land Pattern (units: mm)

9 Manufacturing Process Recommendations

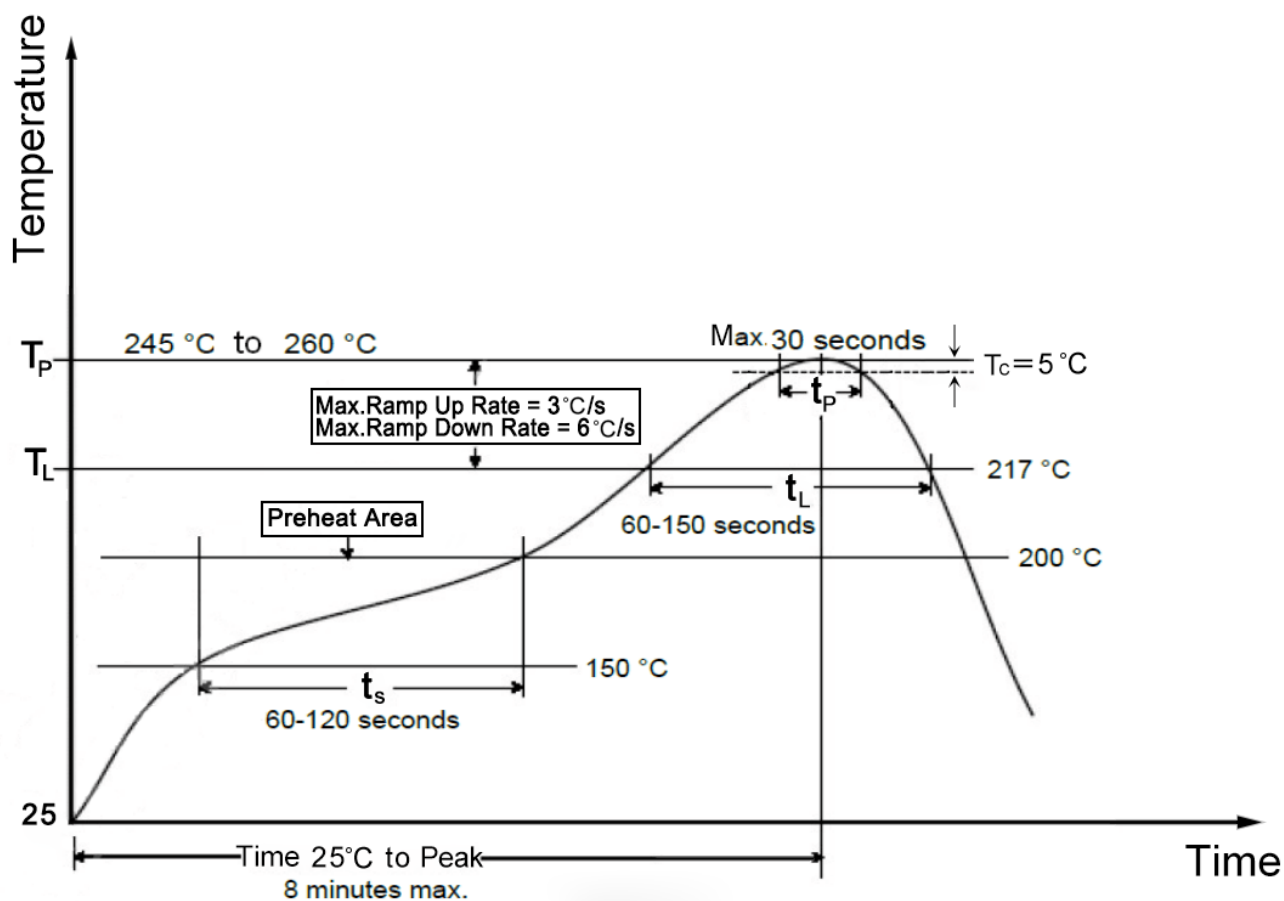


Figure 9-1: SKU611 Typical Lead-free Soldering Profile

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 Contact Information

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