

SKU610 Ultra Wideband Module Datasheet

Document Information

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This document applicable to the following products :

Product name	Type number	Product status
SKU610	SKU610-GMP (09364)	OUT of stock
SKU610	SKU610-G (0936401)	Mass Production

Note: G stands for 6-axis accelerometer sensor, M for Magnetometer, and P for barometer Pressure sensor

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1 General Description

The SKU610 module is based on Decawave's DW1000 Ultra Wideband (UWB) transceiver IC, which is an IEEE 802.15.4-2011 UWB implementation. It chose a external antenna connector, which can help user to match the different UWB antennas. Our module integrates all RF circuitry of NRF52832 and a 2.4G Ceramic antenna, User can use the BLE function easily.

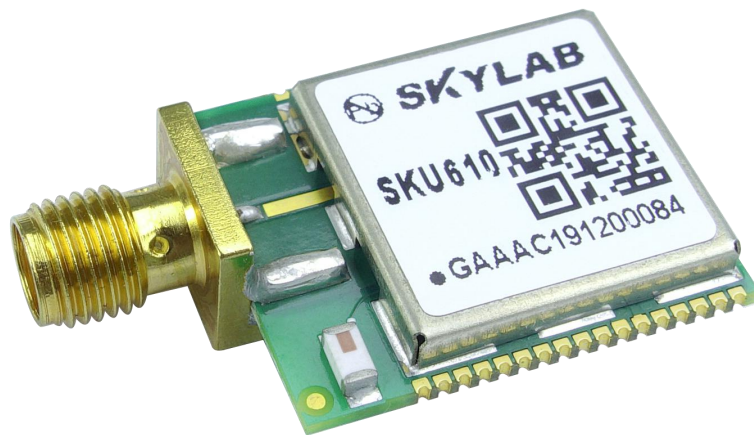


Figure 1-1: SKU610 Top View

2 Applications

- ◆ Healthcare (locate assets, patients & staff)
- ◆ Industrial (asset-tracking, factory automation).
- ◆ Retail (security, navigation, customer analytics).
- ◆ Consumer (connected home, sports analytics).

3 Features

- ◆ Ranging accuracy to within 10cm.
- ◆ 6.8 Mbps data rate.
- ◆ IEEE 802.15.4-2011 UWB compliant.
- ◆ Nordic Semiconductor nRF52832.
- ◆ Bluetooth® connectivity.
- ◆ Bluetooth® chip antenna.
- ◆ Motion sensor: 3-axis accelerometer.
- ◆ Current consumption optimised for low power sleep mode: <math><15\mu\text{A}</math>.

- ◆ Supply voltage: 2.8 V to 3.6 V.
- ◆ Size: 19.0 mm x 23.0 mm x 3.2 mm.

3 Key Benefits

- ◆ Enables anchors, tags & gateways to quickly get an entire RTLS system up-and-running
- ◆ Accelerates product designs for faster Time-to-Market & reduced development costs
- ◆ Over-the-air updates
- ◆ User API to SKU610 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 SKU610 firmware from an external device
- ◆ Low-power hardware design and software architecture for longer battery life

4 Applications Block Diagram

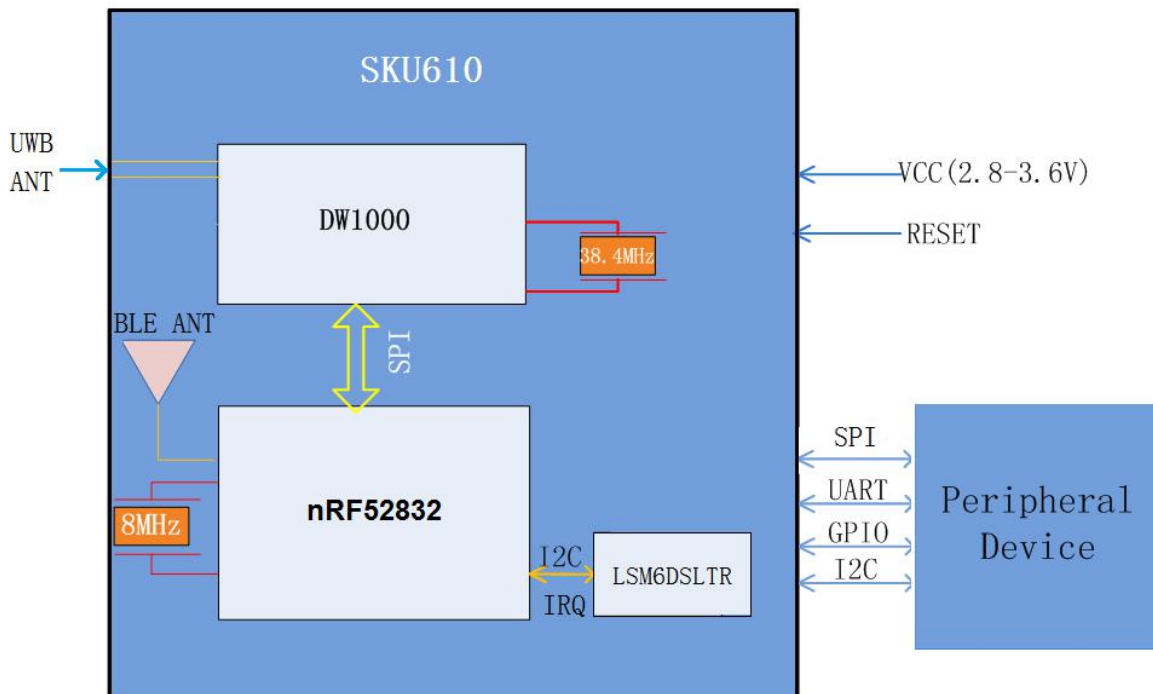


Figure 4-1: SKU610 Block Diagram

5. Electrical Specification

The following tables give detailed specifications for the SKU610 module. Tamb = 25 °C for all specifications given.

5.1 Nominal Operating Conditions

Table 5-1: SKU610 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
Voltage on VDDIO for programming OTP	3.7	3.8	3.9	V	Supply is connected to the OTP in the SKU610 this supply is connected to the VDDIO test point which is underneath the PCB

5.2 DC Characteristics

Table5-2: SKU610 Receiver 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	
Current in Bluetooth® discovery mode		6		mA	
Digital input voltage high	0.7 x VCC		VCC	V	
Digital input voltage low	GND		0.3 x VCC	V	
Digital output voltage high	0.7 x VCC		VCC	V	
Digital output voltage low	GND		0.3 x VCC	V	

5.3 Receiver AC Characteristic

Table 5-3: SKU610 Receiver AC Characteristic

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

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 SKU610.

Table 5-4: SKU610 Typical Receiver Sensitivity Characteristics

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		

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

5.5 Transmitter AC Characteristics

Table 5-5: SKU610 Transmitter AC Characteristics

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

* If using the pre-loaded embedded firmware of the SKU610 module

5.6 Absolute Maximum Ratings

Table 5-6: SKU610 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
SKU610 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

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

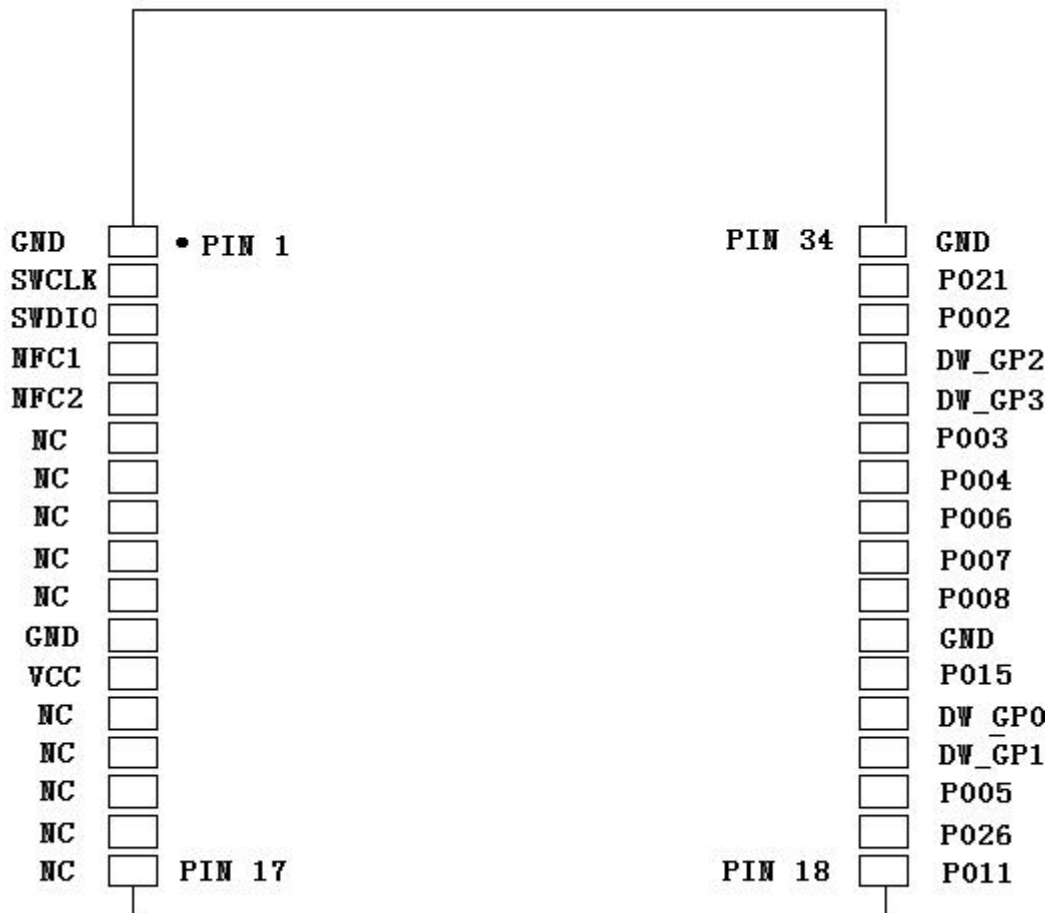


Figure 6-1: SKU610 Module Pinout (TOP View)

6.2 Pin Description

Table 6-1: SKU610 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	NFC1	DIO	NFC antenna connection
5	NFC2	DIO	NFC antenna connection
6	NC	DIO	Don't connect anything
7	NC	DIO	Don't connect anything
8	NC	DIO	Don't connect anything
9	NC	DIO	Don't connect anything
10	NC	DIO	Don't connect anything
11	GND	G	Common ground
12	VCC	P	External supply for the module. 2.8V - 3.6V
13	NC	G	Don't connect anything
14	NC	DIO	Don't connect anything
15	NC	DO	Don't connect anything
16	NC	DIO	Don't connect anything
17	NC	DIO	Don't connect anything
18	P011	DIO	General purpose I/O Pin of NRF52832
19	P026	DIO	General purpose I/O Pin of NRF52832
20	P005	DIO	General purpose I/O Pin of NRF52832
21	DW_GP1	DIO	General purpose I/O pin of DW1000
22	DW_GP0	DIO	General purpose I/O pin of DW1000
23	GPIO_15	DIO	General purpose I/O Pin of NRF52832
24	GND	G	Common GND
25	GPIO_8	DIO	General purpose I/O Pin of NRF52832

26	GPIO_7	DIO	General purpose I/O Pin of NRF52832
27	GPIO_6	DIO	General purpose I/O Pin of NRF52832
28	GPIO_4	DIO	General purpose I/O Pin of NRF52832
29	GPIO_3	DIO	General purpose I/O Pin of NRF52832
30	DW_GP3	DIO	General purpose I/O pin of DW1000
31	DW_GP2	DIO	General purpose I/O pin of DW1000
32	P002	DIO	General purpose I/O Pin of NRF52832
33	P021	DIO	General purpose I/O Pin of NRF52832
34	GND	G	Common ground.

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

Table 6-2: Internal nRF52832 pins used and their function

nRF52832 Pin	DW1000
PO.19	DW_IRQ
PO.16	DW_SCK
PO.20	DW_MOSI
PO.18	DW_MISO
PO.17	DW_SPI_CS
PO.24	DW_RST
nRF52832 Pin	LSM6DSLTR
PO.23	ACC_IRQ
PO.29	I2C_SDA
PO.28	I2C_SCL

DW1000's GPIOs 5,6 control the DW1000 SPI mode configuration. Within the DWM1001 module, those GPIOs are unconnected and will be internally pulled down. Consequently, SPI will be set to mode 0

Table6-3: I2C slave devices address I2C

I2C slave device	Address
LIS2DH12	0X6B

7 Reference Circuit

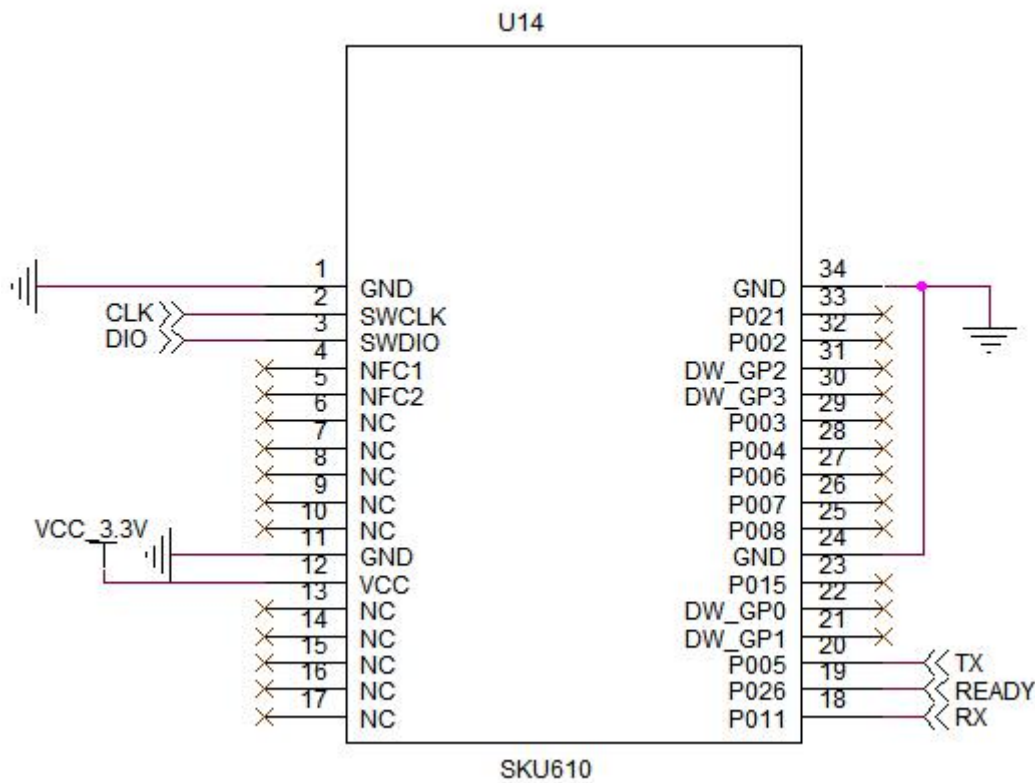


Figure7-1: SKU610 reference circuit

In general ,user just need to power on the module wit the VCC and GND pin in a TDOA system,For TWR application,user need to connect the UART to their CPU to get data.However ,we recommend that user should add test points for SWD port to update the firmware.

8 PCB Footprint and Dimensions

8.1 Module Drawings

All measurements are given in millimeter.

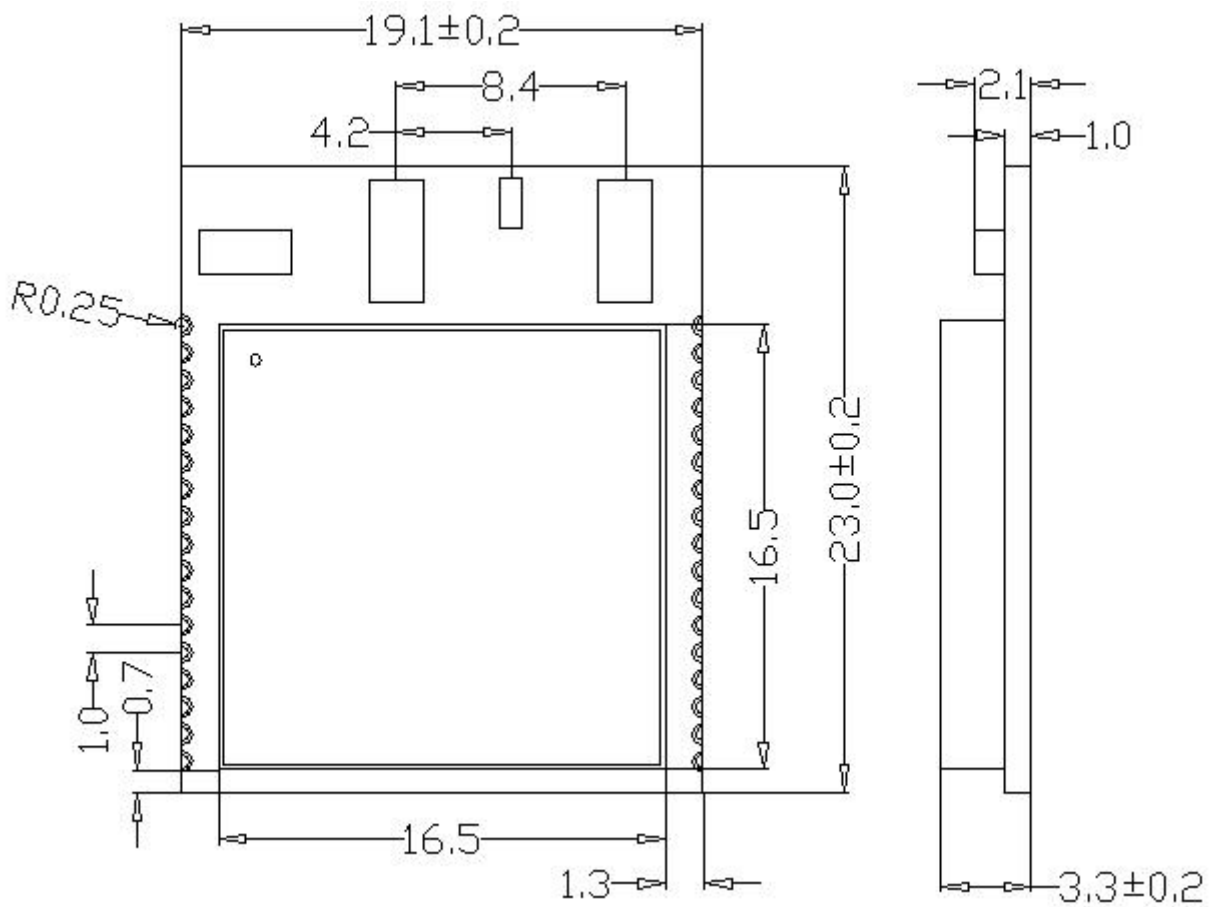


Figure 8-1: SKU610 PCB Footprint and Dimensions(units: mm)

8.2 Module Footprint

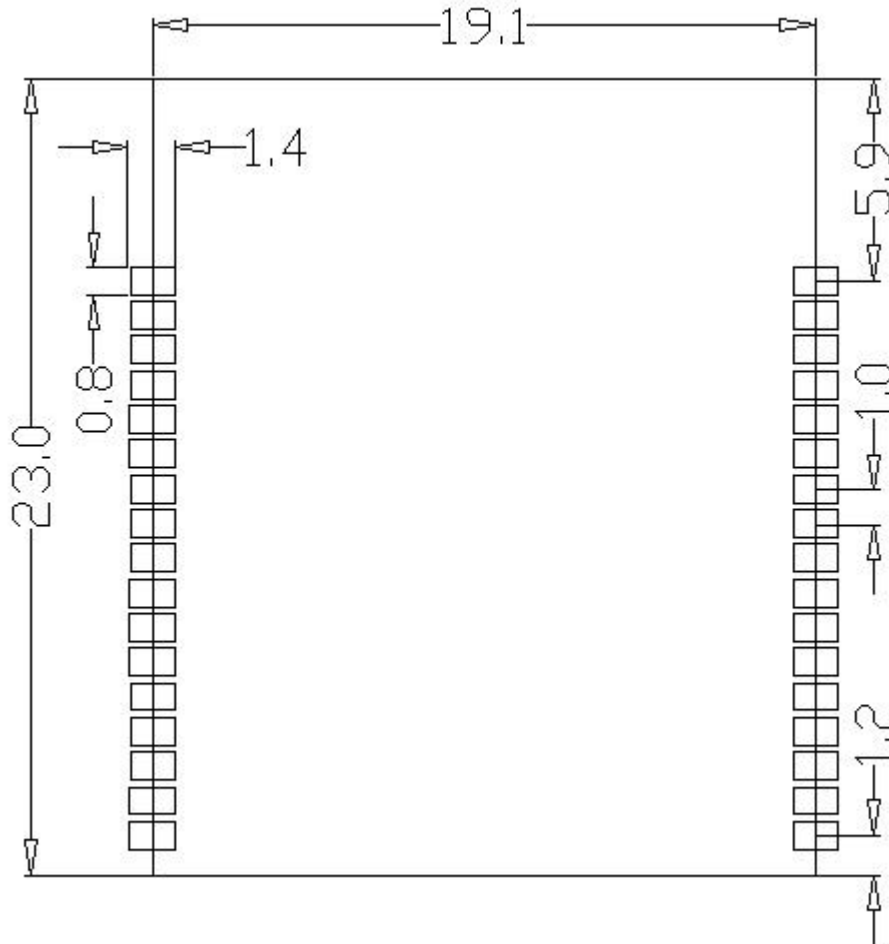


Figure 8-2: SKU610 Module Land Pattern (units: mm)

9 Manufacturing Process Recommendations

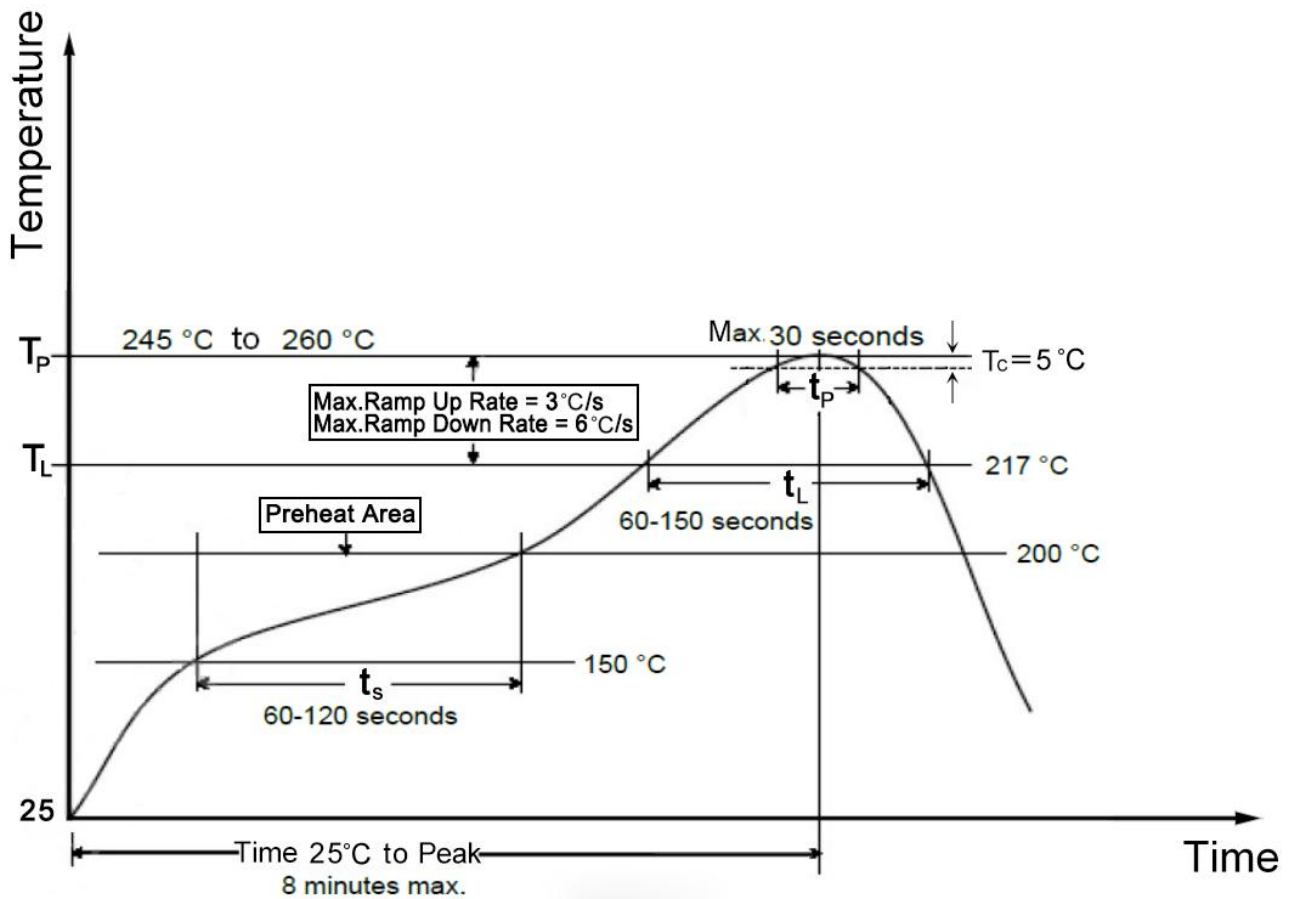


Figure 9-1: SKU610 Typical Lead-free Soldering Profile

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 Packaging Specification

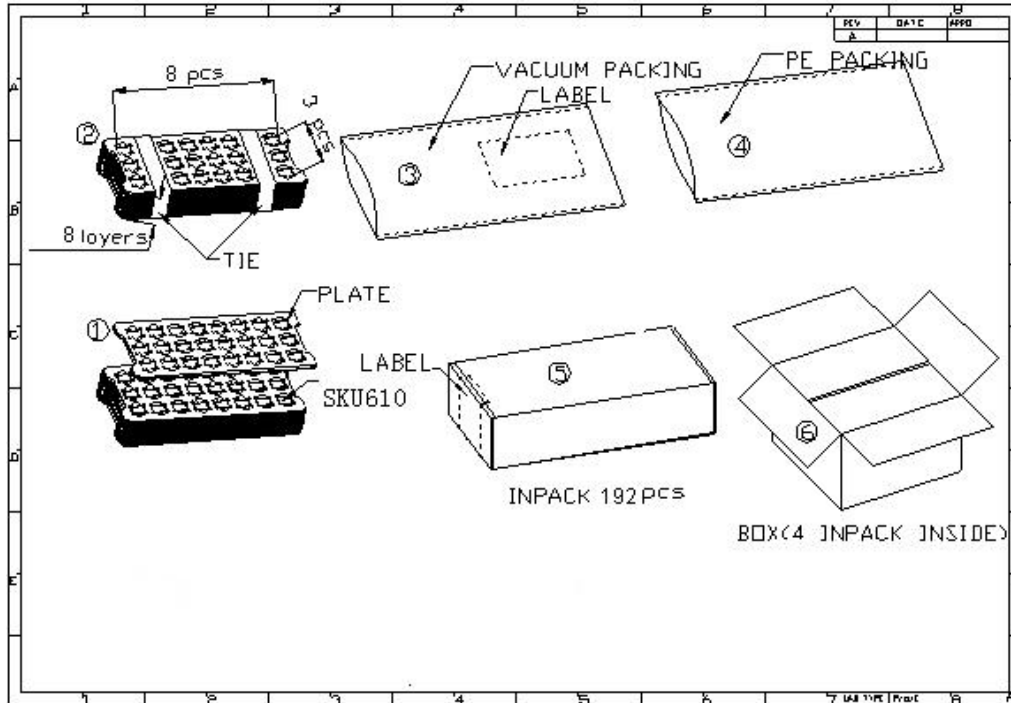


Figure10-1: SKU610 Packaging

SKU610 modules are put into tray and 528 units per tray. Each tray is 'dry' and vacuum packaging.



SKU610 series modules are Electrostatic Sensitive Devices and require special precautions while handling.

ESD precautions

The SKU610 modules contain highly sensitive electronic circuitry and are Electrostatic Sensitive Devices (ESD). Handling the SKU610 modules without proper ESD protection may destroy or damage them permanently.

The SKU610 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 SKU610 module. Don't touch the module by hand or solder with non-anti-static soldering iron to avoid damage to the module.

11 Contact Information

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