SKU1000 Datasheet
Ultra Wideband Module

Document Information		
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Revision history

Revision	Description	Approved	Date
V1.01	Initial Release	George He	20231101

This document applicable to the following products：

Product name	Type number	Product status
SKU1000	SKU1000	Mass Production

Contents

1 General Description

The SKU1000 module is based on Decawave's DW1000 Ultra Wideband (UWB) transceiver IC, which is an IEEE 802.15.4-2011 UWB implementation. It integrates UWB and Bluetooth® antenna, all RF circuitry, Nordic Semiconductor nRF52832 and a motion sensor.

Figure 1-1: SKU1000 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.
- 6.8Mbps data rate.
- 60 m line-of-sight range typical.
- IEEE 802.15.4-2011 UWB compliant.

  Supports 6 RF bands from 3.5 GHz to 6.5 GHz

  Data rates of 110kbps, 850kbps, 6.8Mbps

  Supports 2-way ranging and TDOA
- Supply voltage: 2.8 V to 3.6 V.
- Size: 10.0 mm x 92 mm x 1.9 mm.

4 Applications Block Diagram

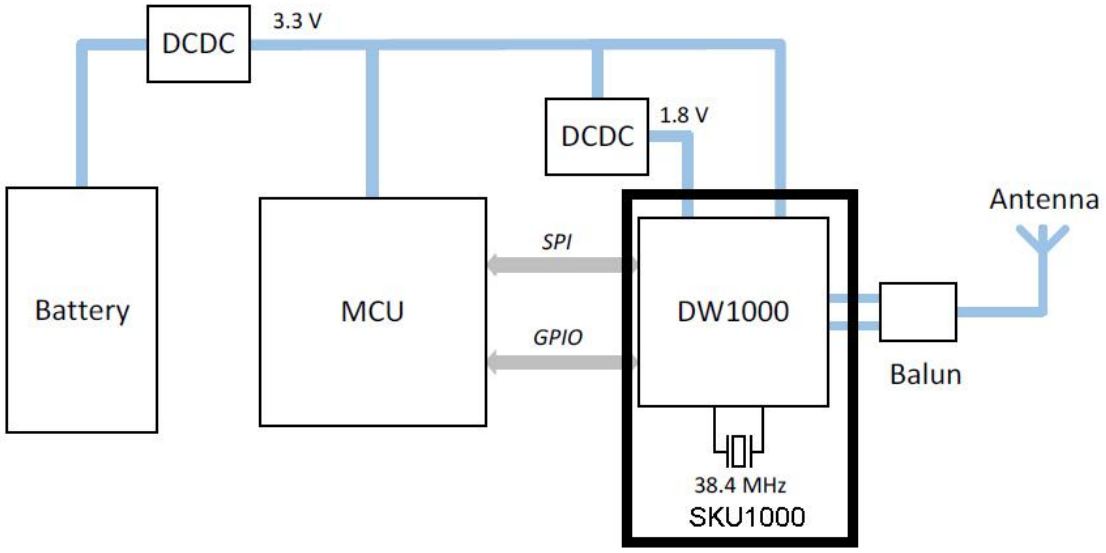

Figure 4-1: SKU1000 Block Diagram

5 Electrical Specification

The following tables give detailed specifications for the SKU1000 module.

Tamb = 25 ˚C for all specifications given.

5.1 Nominal Operating Conditions

Table 5-1: SKU1000 Operating Conditions

Parameter	Min.	Typ.	MAX.	Units	Condition/Note
Operating temperature	-40		+85	˚C	
Supply voltage VCC_3V3	2.8	3.3	3.6	V	Normal operation
Supply voltage VCC_1V8	1.6	1.8	3.6	V	Normal operation

5.2 Receiver AC Characteristic

Table 5-2: SKU1000 Receiver AC Characteristic

Parameter	Min.	Typ.	Max.	Units	Condition/Note
Frequency range	6240		6739.2	MHz	Centre Frequency 6489.6 MHz
Frequency range	3774		4243.2	MHz	Centre Frequency 3993.6 MHz (only in china）

5.3 Receiver Sensitivity Characteristics

Tamb = 25 ˚C, 20 byte payload. These sensitivity figures assume an antenna gain of 0dBi and should be modified by the antenna characteristics, depending on the orientation of the SKU1000.

Table 5-3: SKU1000 Typical Receiver Sensitivity Characteristics

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

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

5.4 Transmitter AC Characteristics

Table 5-4: SKU1000 Transmitter AC Characteristics

Parameter	Min.	Typ.	Max.	Units	Condition/Note
Output power spectral density			-41.3*	dBm/MHz	
Output Channel Power		-17		dBm/500MHz	
Output power variation with temperature*	-1		+1	dB	Using on board compensation.

* If using the pre-loaded embedded firmware of the SKU1000 module

5.5 Absolute Maximum Ratings

Table 5-6: SKU1000 Absolute Maximum Ratings

Parameter	Min.	Max.	Units
Supply voltage VCC_3V3	2.8	3.9	V
Receiver power		0	dBm
Temperature - Storage temperature	-40	+125	˚C
Temperature – Operating temperature	-40	+85	˚C

ESD (Human Body Model)		2000	V
SKU1000 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

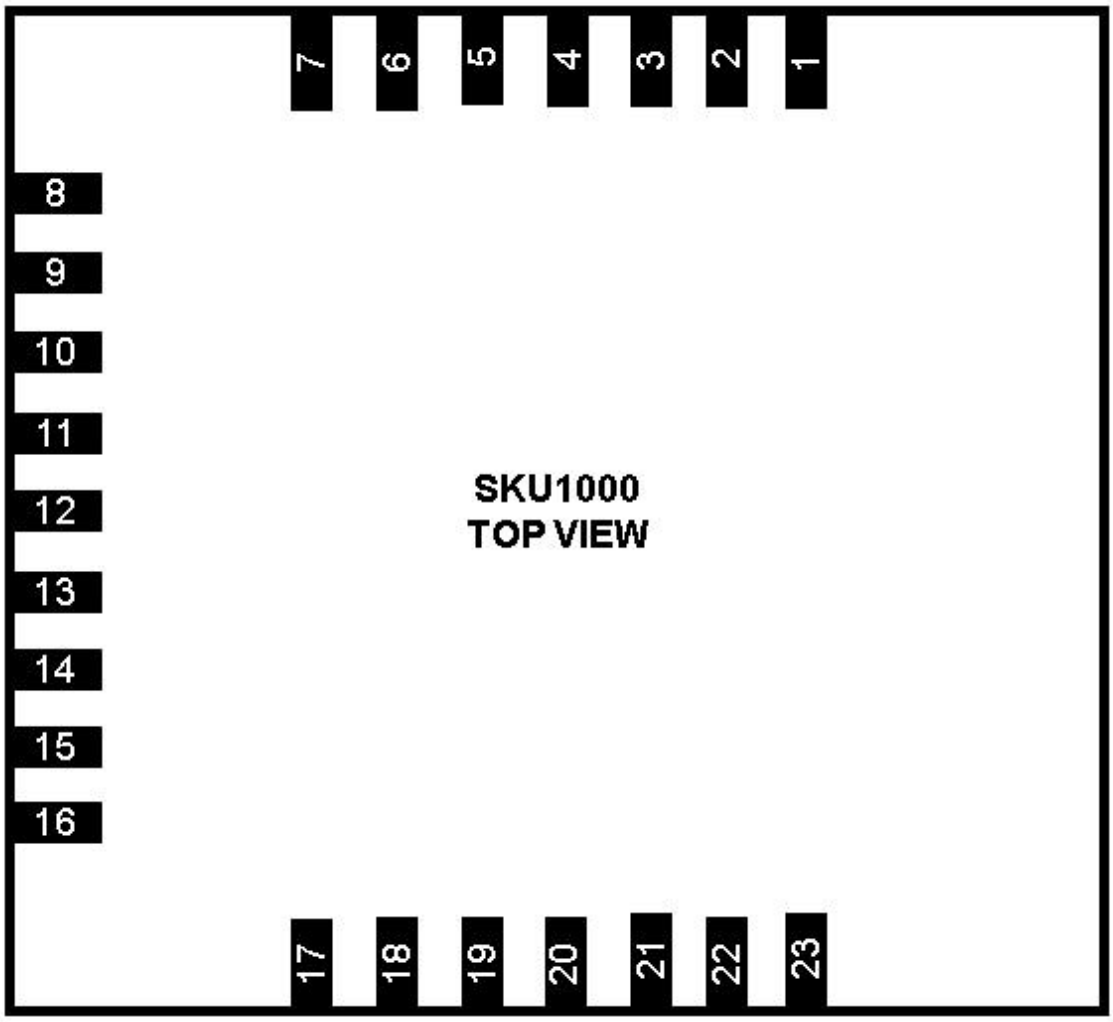

Figure 6-1: SKU1000 Module Pinout (TOP View)

6.2 Pin Description

Table 6-1: SKU1000 Pin Description

Pin No.	Pin Name	I/O	Description
1	GND	G	Ground.
2	RF_P	AIO	Positive pin of the 100 Ω differential RF pair. Should be AC coupled.
3	RF_N	AIO	Negative pin of the 100 Ω differential RF pair. Should be AC coupled.
4	GND	G	Ground
5	VDD_PA1	P	External supply to the transmitter power amplifier.
6	VDD_PA2	P	External supply to the transmitter power amplifier.
7	EXTON	DO	External device enable. Asserted during wake up process and held active until device enters sleep mode.
8	WAKUP	DI	When asserted into its active high state
9	SPIS_CS	DI	Configured as a SPI slave this pin is the SPI chip select. This is an active low enable input. The high-to-low transition on SPICSn signals the start of a new SPI transaction. This is also the ADC function of the nRF52and DEEPSLEEP states and may cause spurious interrupts unless pulled low.
10	VCC_3V3	P	External supply for the module. 2.8V - 3.6V
11	GND	G	Ground
12	DW_RST	DIO	Reset pin. Active Low Input. May be pulled low by external open drain driver to reset the DW1000. Must not be pulled high by external source.
13	DW_SYNC	DIO	The SYNC input pin is used for external synchronization
14	GPIO6	DIO	After power-up, the pin will default to a General Purpose I/O pin. It may be configured for use as EXTRXE (External Receiver Enable). This pin goes high when the DW1000 is in receive mode.
15	GPIO5	DIO	After power-up, the pin will default to a General Purpose I/O pin. It may be configured for use as EXTTXE (External Transmit Enable). This pin goes high when the DW1000 is in transmit mode.
16	GND	G	Ground

17	GPIO1	DIO	General purpose I/O pin.
18	SPIS_MOSI	DI	Configured as a SPI slave this pin is the SPI data input
19	SPIS_MISO	DO	Configured as a SPI slave this pin is the SPI data output
20	SPIS_CLK	DI	Configured as a SPI slave this pin is the SPI clock. This is also the ADC function of the nRF52
21	DW_IRQ	DIO	General purpose I/O pin of the DW1000.It may be configured for use as a SFDLED driving pin that can be used to light a LED when SFD (Start Frame Delimiter) is found by the receiver.
22	GND	G	Ground
23	VDD_1.8V	P	External supply for the module. 1.6V - 3.6V

(1) P：Power supply

(2) DI：Default Input

(3) DO：Default Output

(4) DIO：Default Input/Output

(5) G：Ground

7 PCB Footprint and Dimensions

7.1 Module Recommend Layout

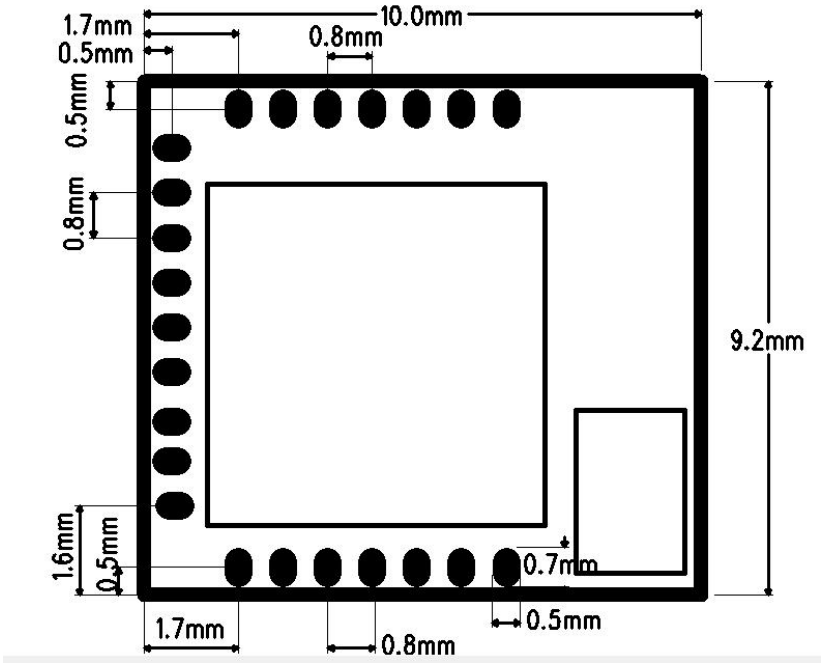

Figure 8-2: SKU1000 Module Footprint

8 Manufacturing Process Recommendations

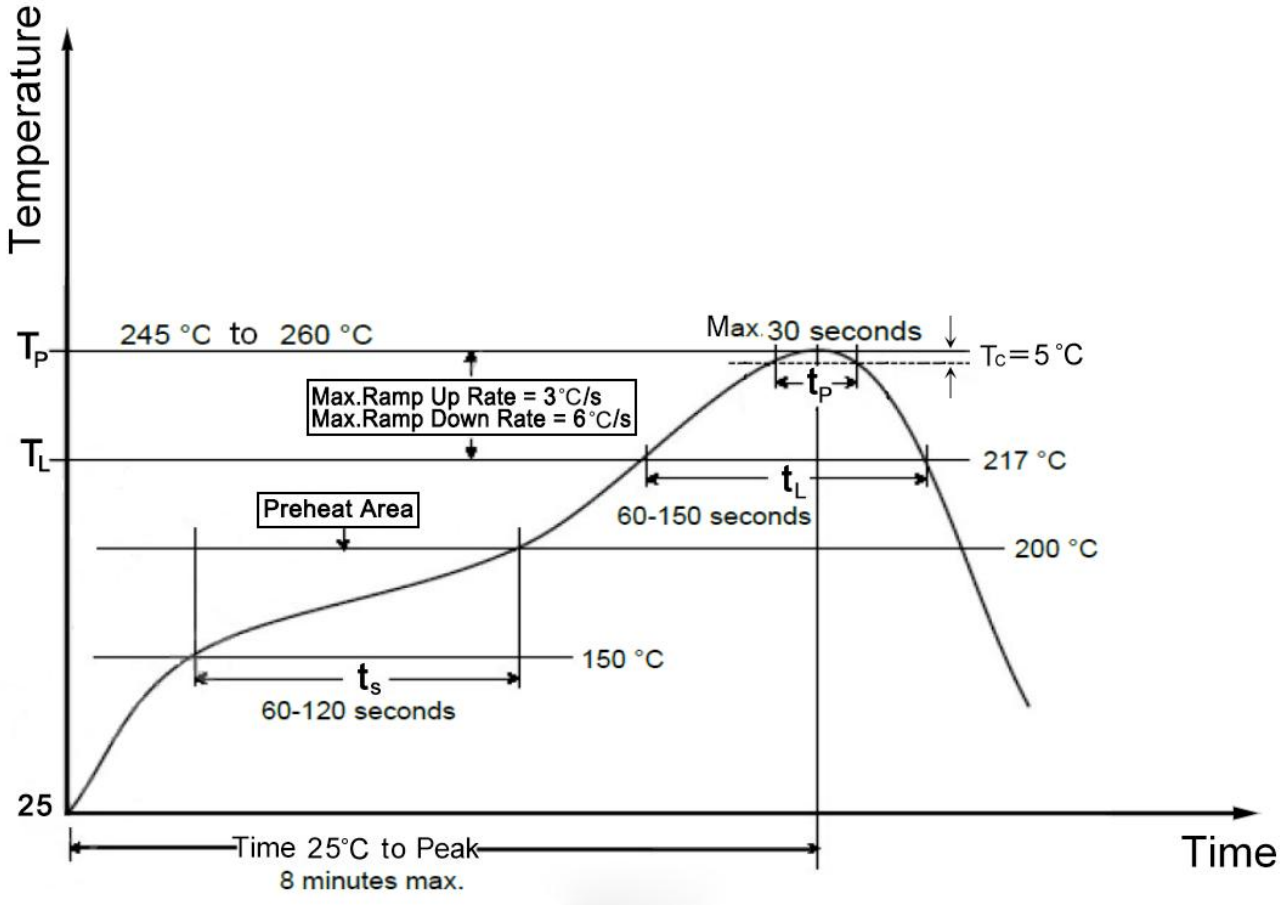

Figure 9-1: SKU1000 Typical Lead-free Soldering Profile

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.

9 Packaging Specification

SKU1000 modules are shipped in reel and with 2000 units per reel. Each tray is ‘dry’ package ，PIN1 for the module packaging direction

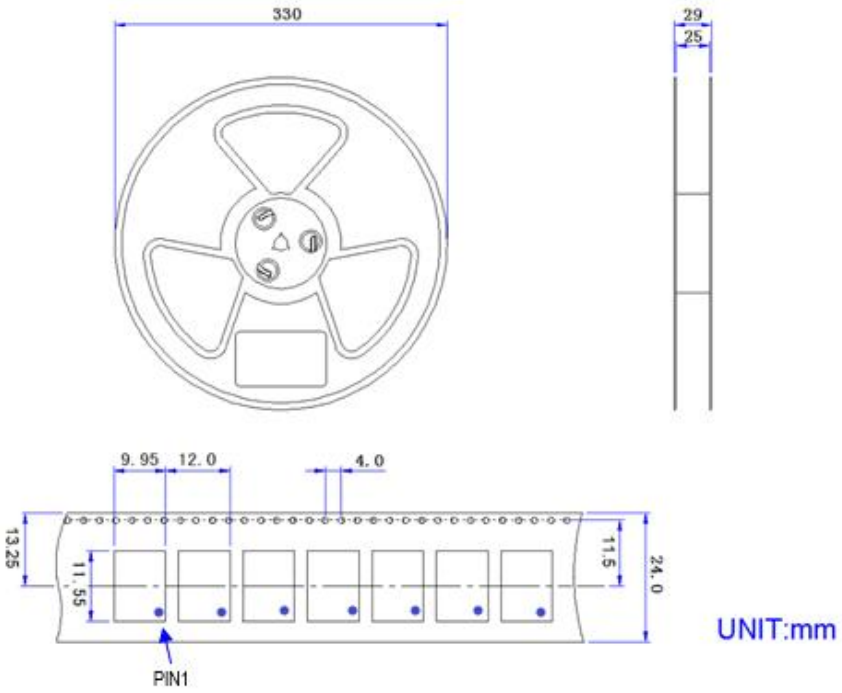

Figure10-1: SKU1000 Packaging

SKU1000 modules are put into tray and 500 units per tray. Each tray is ‘dry’ and vacuum packaging. SKU1000 series modules are Electrostatic Sensitive Devices and require special precautions while handling.

ESD precautions

The SKU1000 modules contain highly sensitive electronic circuitry and are Electrostatic Sensitive Devices (ESD). Handling the SKU1000 modules without proper ESD protection may destroy or damage them permanently.

The SKU1000 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 SKU1000 module. Don't touch the module by hand or solder with non-anti-static soldering iron to avoid damage to the module.

10 Contact Information

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