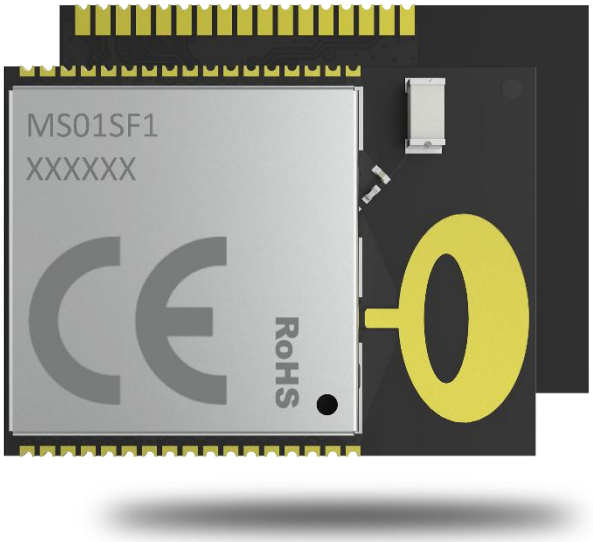
MINEWSEMI



MS01SF1

Bluetooth Low Energy 5.2
& UWB Combo Module

Specification V1.0

nRF52833+DW3120 Module MS01SF1 Specification

MS01SF1(26.12*19.13*3.2mm) uses Nordic Semiconductor nRF52833 Bluetooth chip as microcontroller, sets the parameters of the Qorvo high-precision ranging chip DW3120 over the air by Bluetooth, and controls the DW3120 to perform ranging operations, obtain the corresponding results, and then send back to smart phone app or other host devices.

Features

1. IEEE 802.15.4-2015 and IEEE 802.15.4z BPRF compliant&Bluetooth® connectivity
2. Fully aligned with FiRa™ PHY, MAC and certification
3. Supports UWB Channels 5 (6.5 GHz) and 9 (8 GHz)
4. The ranging accuracy is within 10-30cm
5. Point to point distance is 80m(line of sight)
6. UWB Data rates of 850 kbps, 6.8 Mbps
7. BLE 5 data rate: 2Mbps,1Mbps, 500 kbps,125kbps. IEEE 802.15.4 Thread and Zigbee data rate: 250kbps, Proprietary 2.4 GHz: 2 Mbps, 1 Mbps
8. 512 KB Flash/128 KB Ram
9. With 3-axis Accelerometer
10. Integrated PCB and Ceramic antenna
11. Supports ToF, DS:TWR, TDOA schemes

Application

1. Asset Tracking
2. Real Time Location System
3. Factory Automation
4. Access Control
5. Consumer Applications

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1 Product Introduction

MS01SF1 is an Ultra-Wideband(UWB) transceiver & Bluetooth low energy 5.2 module integrated with the latest Decawave DW3120 SoC for indoor positioning and the advanced Nordic Semiconductor nRF52833 SoC as the central processor with an acceleration sensor, which can meet the requirements of industrial intelligence, production safety, warehousing and logistics, smart cities, public procuratorate and law division. The nRF52833 supports 23 IO ports, which can be configured as UART, SPI, I2C, PWM and other interfaces, simplify the development for customers.

1.1 Product Characteristics

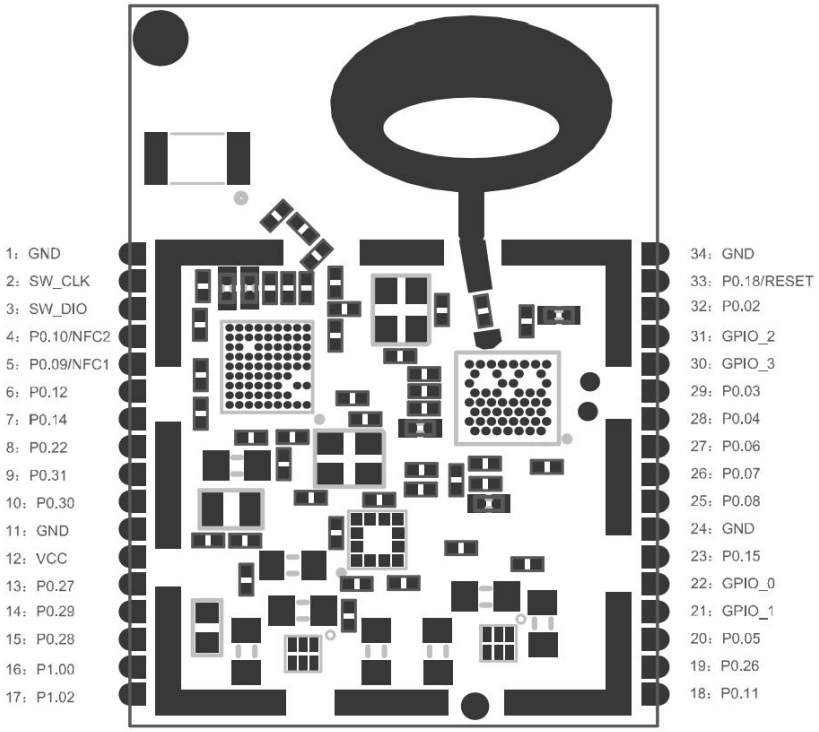
MS01SF1 Specification			
Model Series	MS01SF1	**Antenna**	Ceramic&PCB antenna
SoC	Nordic nRF52833& Decawave DW3120	**Size**	26.12*19.13*3.2mm
Flash	512kB	**RAM**	128kB
BLE RX Sensitivity	-96dBm	**BLE TX Power**	-40-+8dBm
BLE TX Peak Current	0dBm-4.6mA	**BLE RX Peak Current**	4.8mA
UWB TX Peak Current	140mA	**UWB RX Peak Current**	55mA
UWB RX Sensitivity	-94dBm	**GPIO**	BLE 23 + UWB 4

1.2 Ordering information

Ordering number	Description
MS01SF1-7Y33AIR	DW3120, nRF52833-QIAA BT 5.3 Module, PCB Antenna, Reel pack

2 Pin Description

2.1 Moudle pin diagram



2.2 Pin definition

No.	Symbol	Description
1	GND	Ground
2	SWDCLK	nRF52833 Burn the clock pin
3	SWDIO	nRF52833 Burn data pins
4	P0.10	nRF52833 General purpose I/O
5	P0.09	nRF52833 General purpose I/O
6	P0.12	nRF52833 General purpose I/O
7	P0.14	nRF52833 General purpose I/O
8	P0.22	nRF52833 General purpose I/O
9	P0.31	nRF52833 General purpose I/O/ADC pin
10	P0.30	nRF52833 General purpose I/O/ADC pin
11	GND	Ground
12	VCC	Power supply pin：2.8V~3.6V
13	P0.27	nRF52833 General purpose I/O
14	P0.29	nRF52833 General purpose I/O
15	P0.28	nRF52833 General purpose I/O
16	P1.00	nRF52833 General purpose I/O
17	P1.02	nRF52833 General purpose I/O
18	P0.11	nRF52833 General purpose I/O
19	P0.26	nRF52833 General purpose I/O
20	P0.05	nRF52833 General purpose I/O
21	GPIO_1	DW3120 General purpose I/O
22	GPIO_0	DW3120 General purpose I/O
23	P0.15	nRF52833 General purpose I/O
24	GND	Ground

25	P0.08	nRF52833 General purpose I/O
26	P0.07	nRF52833 General purpose I/O
27	P0.06	nRF52833 General purpose I/O
28	P0.04	nRF52833 General purpose I/O
29	P0.03	nRF52833 General purpose I/O
30	GPIO_3	DW3120 General purpose I/O
31	GPIO_2	DW3120 General purpose I/O
32	P0.02	nRF52833 General purpose I/O
33	P0.18	nRF52833 General purpose I/O/reset pin
34	GND	Ground
1	GND	Ground
2	SWDCLK	nRF52833 Burn the clock pin
3	SWDIO	nRF52833 Burn data pins
4	P0.10	nRF52833 General purpose I/O
5	P0.09	nRF52833 General purpose I/O
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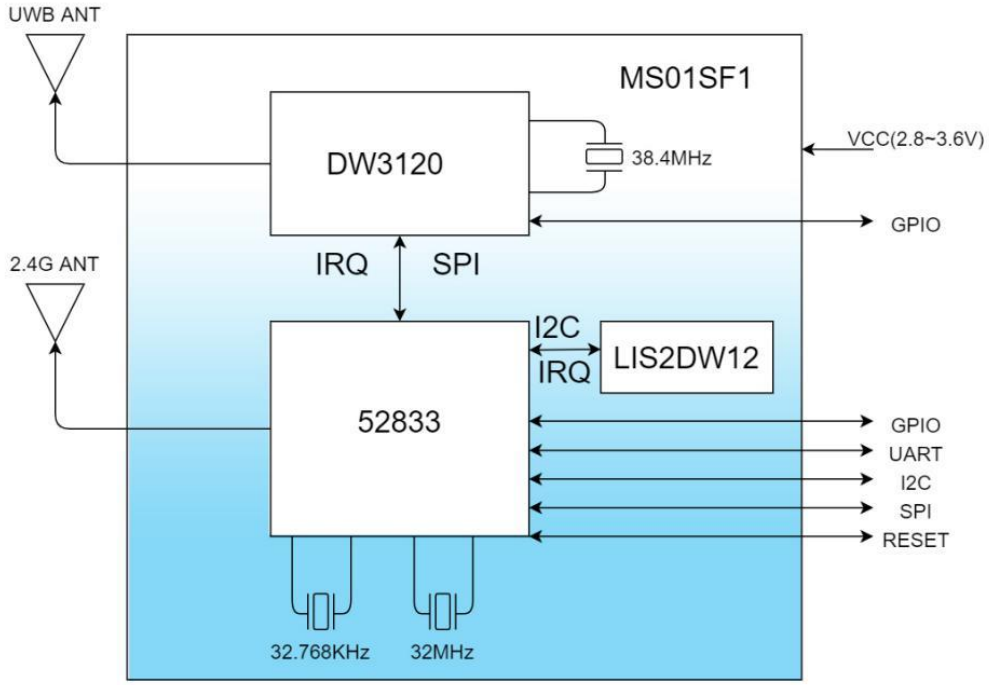
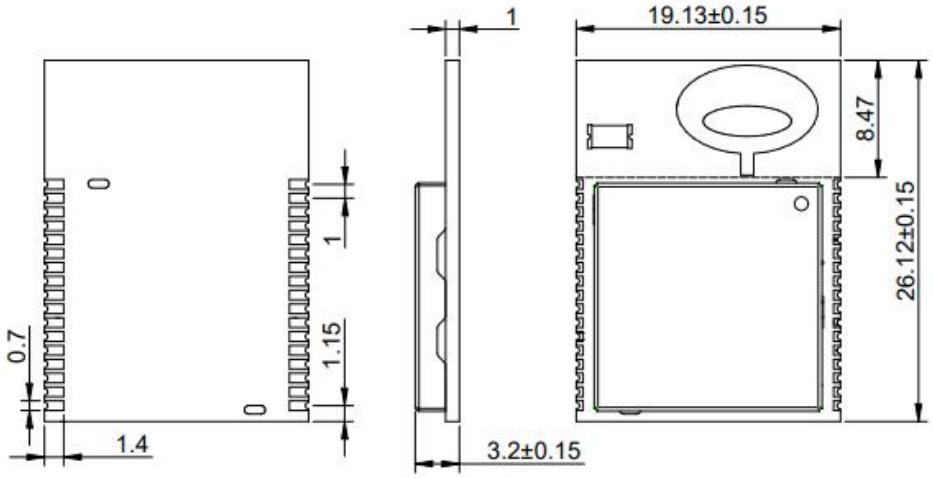
22	GPIO_0	DW3120 General purpose I/O
23	P0.15	nRF52833 General purpose I/O
24	GND	Ground
25	P0.08	nRF52833 General purpose I/O

2.3 Block diagram



2.4 Size Drawing

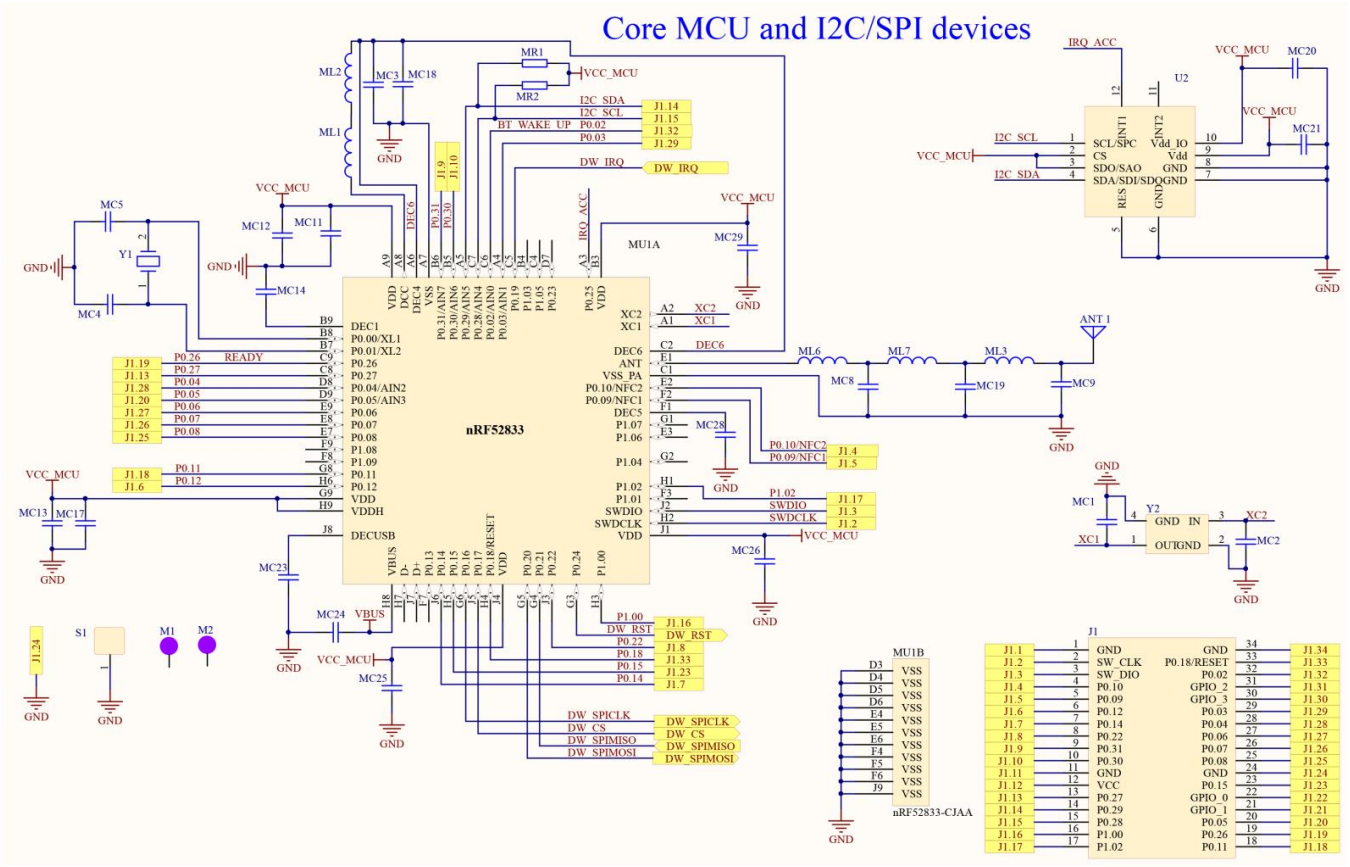


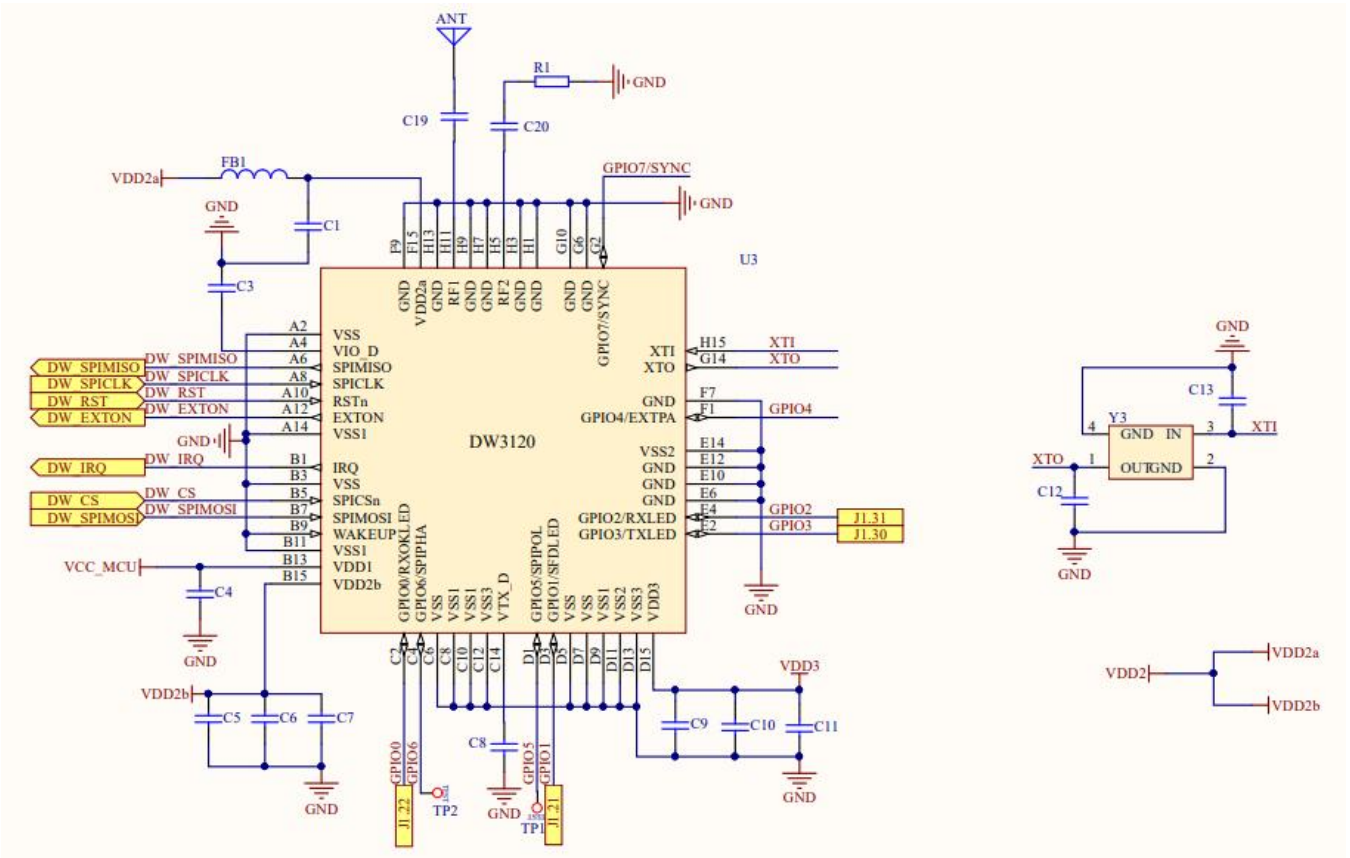
Important: Unit: mm Tolerance: +/- 0.1, default
Recommend solder pad size: 2.54*0.65mm, Center GND pad: 1mm.

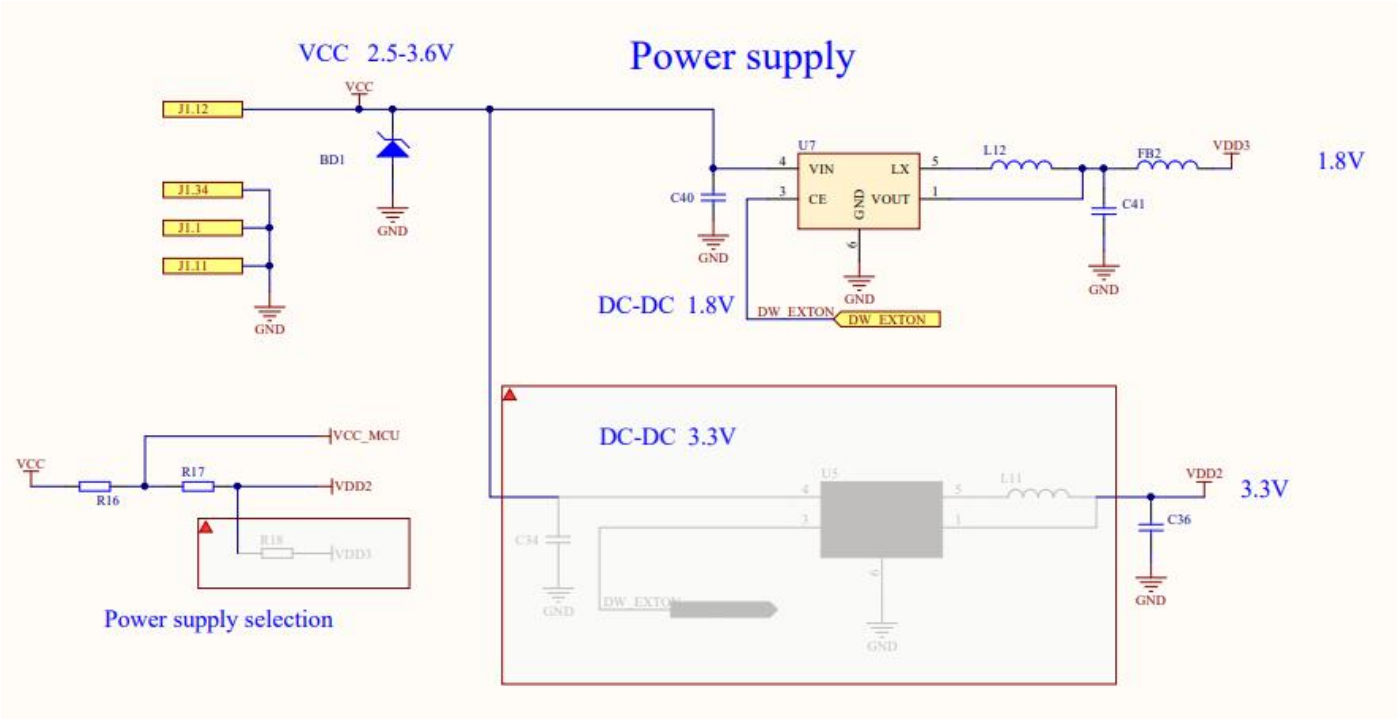
3 Electrical parameters

Parameter	Min.	Typical value	Max.	Unit	Notes
Operating temperature	-30		+85	° C	
Storage temperature	-40		+85	° C	
VCC	2.8		3.6	V	
Sleep current		0.05		mA	Deep sleep
UWB TX Current		140		mA	Channel 5
BlueTooth TX Current		14		mA	
UWB RX Current		55		mA	
Frequency Range	6240	6489.6	6739.2	MHz	Channel 5 Center Frequency
		7987.2		MHz	Channel 9 Center Frequency
Ranging distance	30		80	m	Transmission rate：6.8 Mbps

4 Module Schematic





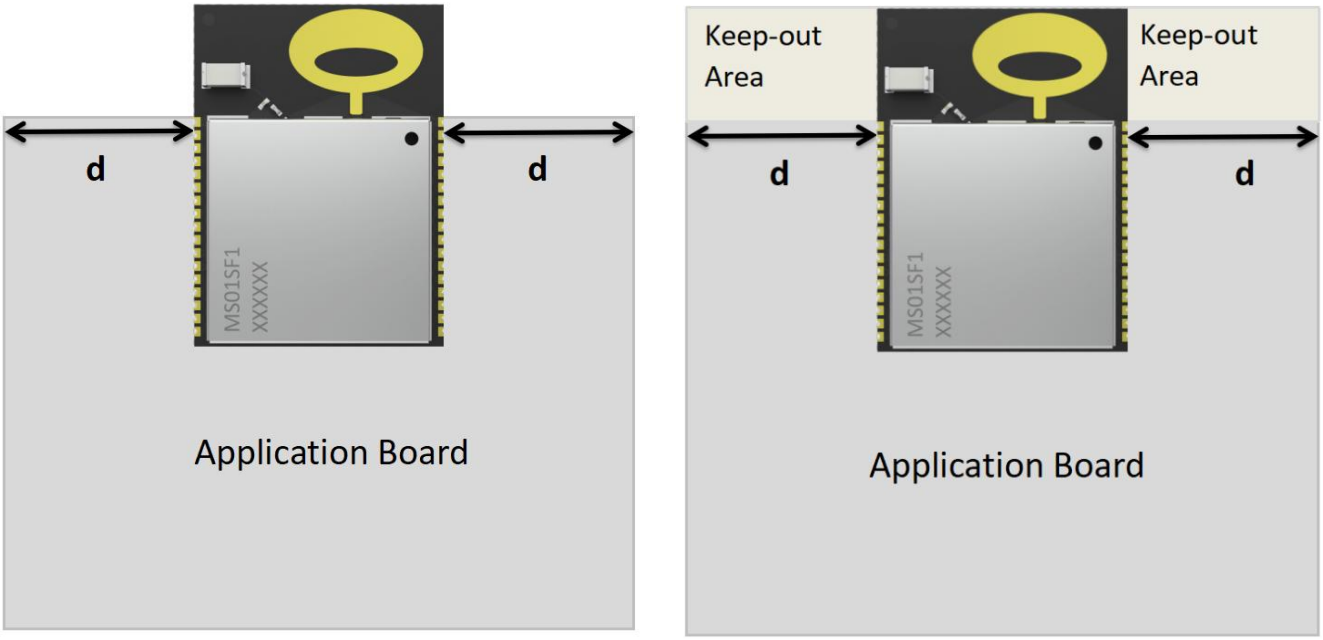


5 PCB Design

When design the PCB onto which MS01SF1 module will be installed,the proximity of the MS01SF1 on-board antenna to metal and other non-RF transparent materials needs to considered carefully .

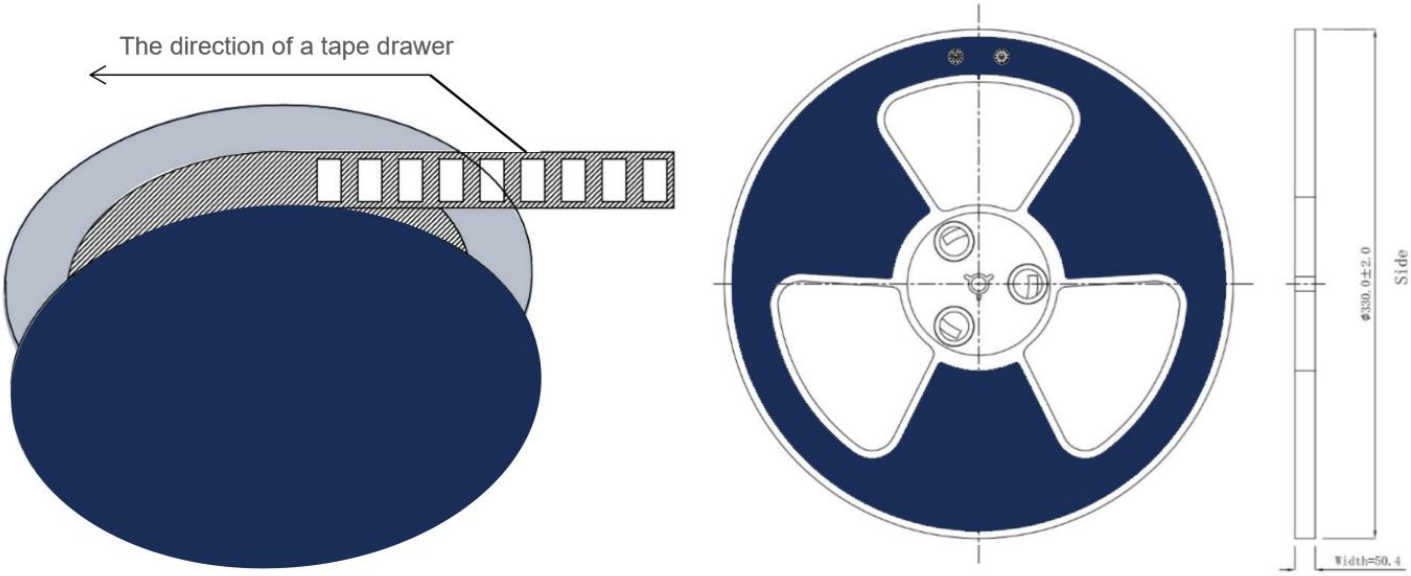
The recommended placement scheme of the UWB module, as shown in the figure. In order to obtain the best RF performance, ground copper should be flooded in all areas of the application board, except in the areas marked “Keep-Out Area”, where there should be no metal either side, above or below (e.g. do not place battery under antenna) .

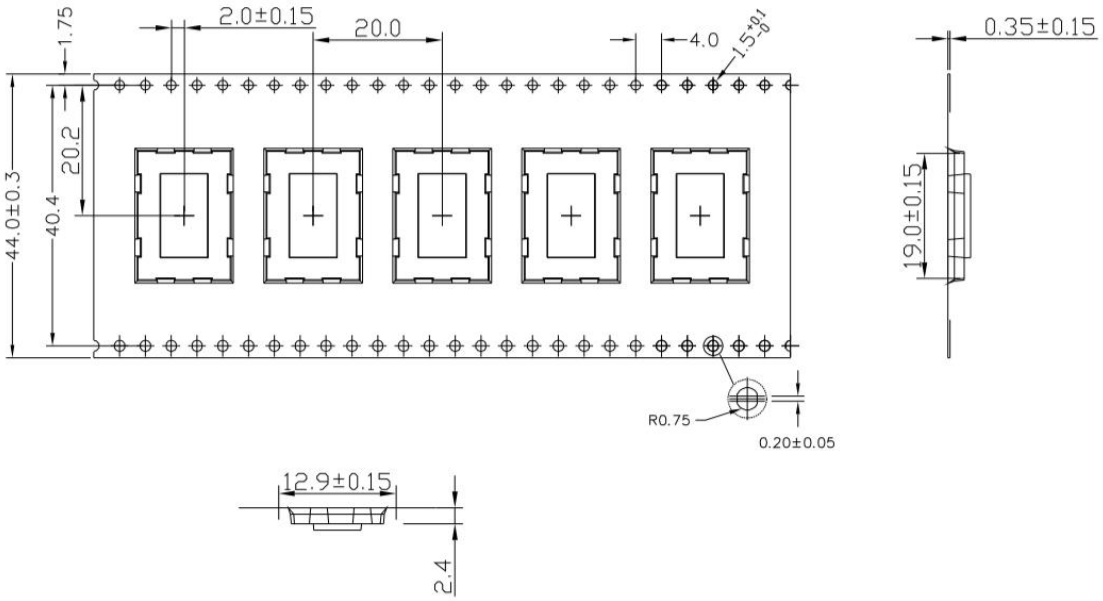
Two suggested placement schemes are shown below in the figure, the application board with no metallic material in the keep-out area. In the image on the left, an application board with the antenna projecting off of the board so that the keep out area is in free-space. In the picture on the right, an application board which does not have the module in free
space but has the PCB copper removed on either side (and behind) the module antenna. In addition, the ground area of the application board affects the radiation pattern of the module antenna. (It is recommended that there should be no metal within the minimum distance d=10mm on both sides of the module antenna)



6 Package Information

6.1 Package dimension



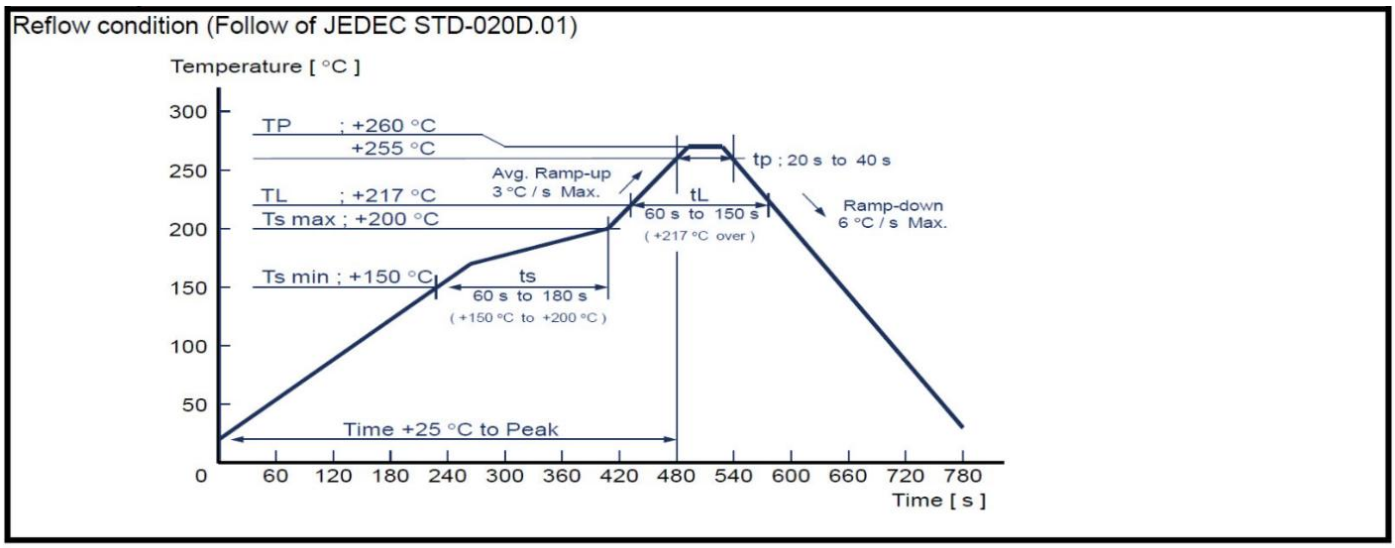


Details of Package Dimension:

Details	Reel-MS01SF1
Quantity(module)	550PCS
Tape Weight	1038g
Gross Weight	1508g
Dimension	W: 44mm T: 0.35mm

7 Production advice

1. Conduct SMT process according to below reflow oven temperature curve. The maximum temperature is 260℃;
Refer to IPC/JEDEC standard; Peak temperature: <260℃; Times: ≤2 times, when SMT involves double-sided SMT, it is recommended that the module surface to be reflowed only once, if you have special process, please contact our Minew for futher technical support.



1. It is recommended to make a partial stepped stencil with a thickness of 0.2mm, and the stencil hole should be extended by 0.8mm size.;
2. After opening the package, it should be stored in vacuum environment. Module should not be exposed to the air for a long time to prevent moisture and pad oxidation. If there is an interval of 7 to 30 days during SMT process, it is recommended to bake it with reel at 65-70 degrees for 24 hours before using for SMT again;
3. Before starting SMT, electrostatic discharge (ESD) protection measures should be taken.

8 Notes & Cautions

We cannot assure that the specification has no errors and omission even though this specification is under collate and check strictly.

This specification is under the protection of laws and regulations of copyright, please do not copy and duplicate at any form, or do not transmit part or full of this specification in any wire and wireless network in any form, or do not edit or translate to any other format, word, code, etc.

8.1 Design notes

- It is critical to following the recommendations of this document to ensure the module meets the specifications.
- The module should be placed at the edge of the circuit board as far as possible to keep away from other circuits.
- Antenna should be kept away from other circuits. It can prevent low radiation efficiency and the normal use of other circuits from being affected.
- The landing of components should be appropriate and that is better for reducing the parasitic inductance.
- Please refuse to supply voltage that is not within the range of specification.
- Please make sure the module or its surface may not suffer from the physical shock or extreme stress.

8.2 Installation and soldering

Please do not lay copper under the module antenna. It can prevent the influence of signal radiation and the transmission distance from being affected.

8.3 Handling and storage

a) Due to the fact that CMOS components are included in the module, it is better to eliminate static electricity at any methods when transporting or working with the module. Moreover, it is strongly recommended adding anti-ESD components to circuit design to hinder damage from real-life ESD events. Anti-ESD methods can be also used in mechanical design.

b) Please store the modules within -40℃ to +125℃ before and after installation and make sure the modules is away from the direct sunlight exposure for a long duration. Modules should be far away from humid and salty air conditions, and any corrosive gasses or substances.

c) Please not to wash the module. No-Clean Paste is used in production. The metal shield may be oxidized by the washing process and may lead to chemistry reaction with No-Clean Paste. If modules goes through the washing process, functions of the module may not guaranteed.

d) After opening the package, it should be stored in vacuum environment. Module should not be exposed to the air for a long time to prevent moisture and pad oxidation. If there is an in terval of 7 to 30 days during SMT process,

8.4 Life support applications

a) The module is not design for life support device or system and not allowed to be used in destructive devices or system in any direct, or indirect ways. Minewsemi is not responsible for compensation of any losses when applying modules under such application as described above.

b) Minewsemi shall not responsible for the customer's products or application.

9 Disclaimer

The factory has passed the ISO9001 quality management system, ISO14001 environmental management system and OAHS18001 occupational health and safety assessment . Each product has been rigorously tested (transmission power test, sensitivity test, power consumption test, stability test, aging test, etc.).

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- All other trademarks listed herein are owned by their respective owners.
- All specifications are subject to change without notice.
- Please do not use this specification for produce, sell or illegal purpose without MinewSemi's authorization.
- MinewSemi have right to interpret all the items above.

10 Revision History

Version	Date	Notes	Contributor(s)	Person of Approve
1.0	2022-06-14	First edition	IDA&Eddie	Coral

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