



Sunway UWB Module Datasheet

SWM1000SR150 Series

Date	Version	Update Content	Approval
2020.12.02	V1.0	Preliminary version	UWB team
2021.01.07	V1.1	Update part numbering and reference schematics	UWB team
2021.02.03	V1.2	Delete '-' in part numbering	UWB team

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1. Introduction

Based on the NXP chip, Sunway UWB module integrates the clock circuit, RF circuit, power management and so on, which conforms to the IEEE 802.15.4z HRP UWB standard. PHY and MAC conform to the FiRa Consortium specification.

SWM1000SR150 series module can be used for single-side two ways ranging (TWR) or double-side two-ways ranging by means of an External Antennas (designed by Sunway). It can also be used for 2D/3D real time location system (RTLS).

1.1. Key Features

Name	SWM1000SR150
Antenna Port	JSC
Size	13mm * 18mm * 2.2mm
Communication Interface	SPI
Main Chip	SR150
Channel	5 & 9
Frequency range	6.24GHz~8.24GHz
Supply Voltage	2.2V ~5.5V(with DC-DC)
	1.71V~1.98V(without DC-DC)
Max Output Power	11.5dBm
Ranging Mode	1D/2D/3D Ranging

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1.2. Applications

High Precision RTLS, Real-Time Location System (TDOA or AoA):

Industry, Medical Treatment, Automotive, IoT etc.

Secured location and payment system.

2. Electrical characteristics

2.1. Recommended operating conditions

When the input voltage of the module is lower than the rated operating voltage, the operation will be unstable. Input voltage higher than the maximum rating will cause permanent damage to the module. At the same time, working under the maximum rating for a long time also affects the stability of the module.

Parameter	Min	Typ	Max	Unit	Conditions/Notes
Operating Temperature	-30		+85	°C	
Supply Voltage	2.2	3.3	5.5	V	With DC-DC
	1.71	1.8	1.98	V	Without DC-DC
HIGH level input voltage (V_{IH})	1.26	1.8	2.3	V	
LOW level input voltage (V_{IL})	-0.6	-	0.54	V	
HIGH level output voltage (V_{OH})	1.4	-	1.8	V	
LOW level output voltage (V_{OL})	-	-	0.2	V	

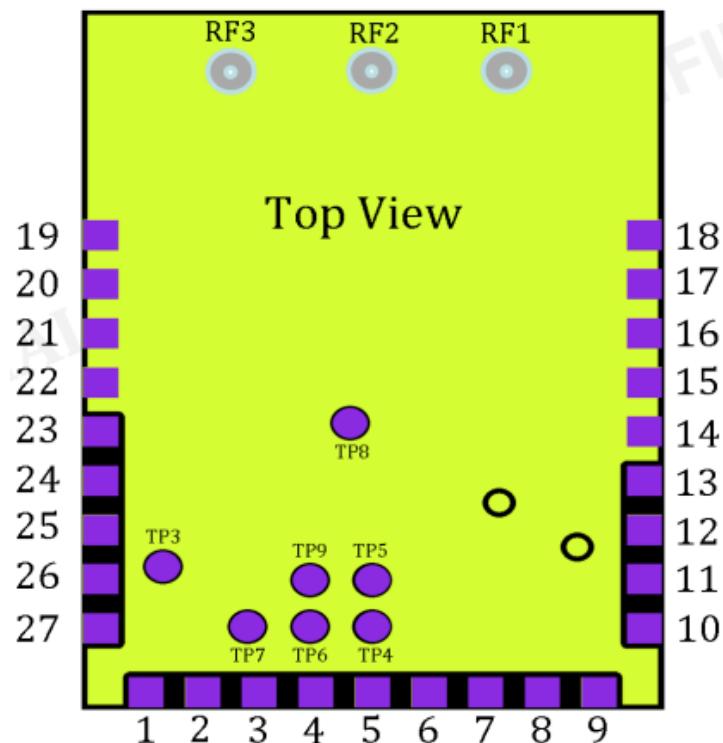
2.2. RF characteristics

Parameter	Min	Typ	Max	Unit	Conditions/Notes
Frequency range	6240		8240	MHz	Channel 5 and 9
Channel bandwidth		500		MHz	
Output power spectral density (programmable)	Channel 5		-41.3	-31.6	dBm/MHz
	Channel 9		-41.3	-32	dBm/MHz
Power level range		32		dB	
Power level step		0.25		dB	
Rx Sensitivity ($\pm 10\text{ppm}$ carrier Offset)	Channel 5		-91.9	dBm	64 preamble, 6.8Mbps data rate
	Channel 9		-90	dBm	64 preamble, 6.8Mbps data rate



3. Module Package

3.1. Pinout Description



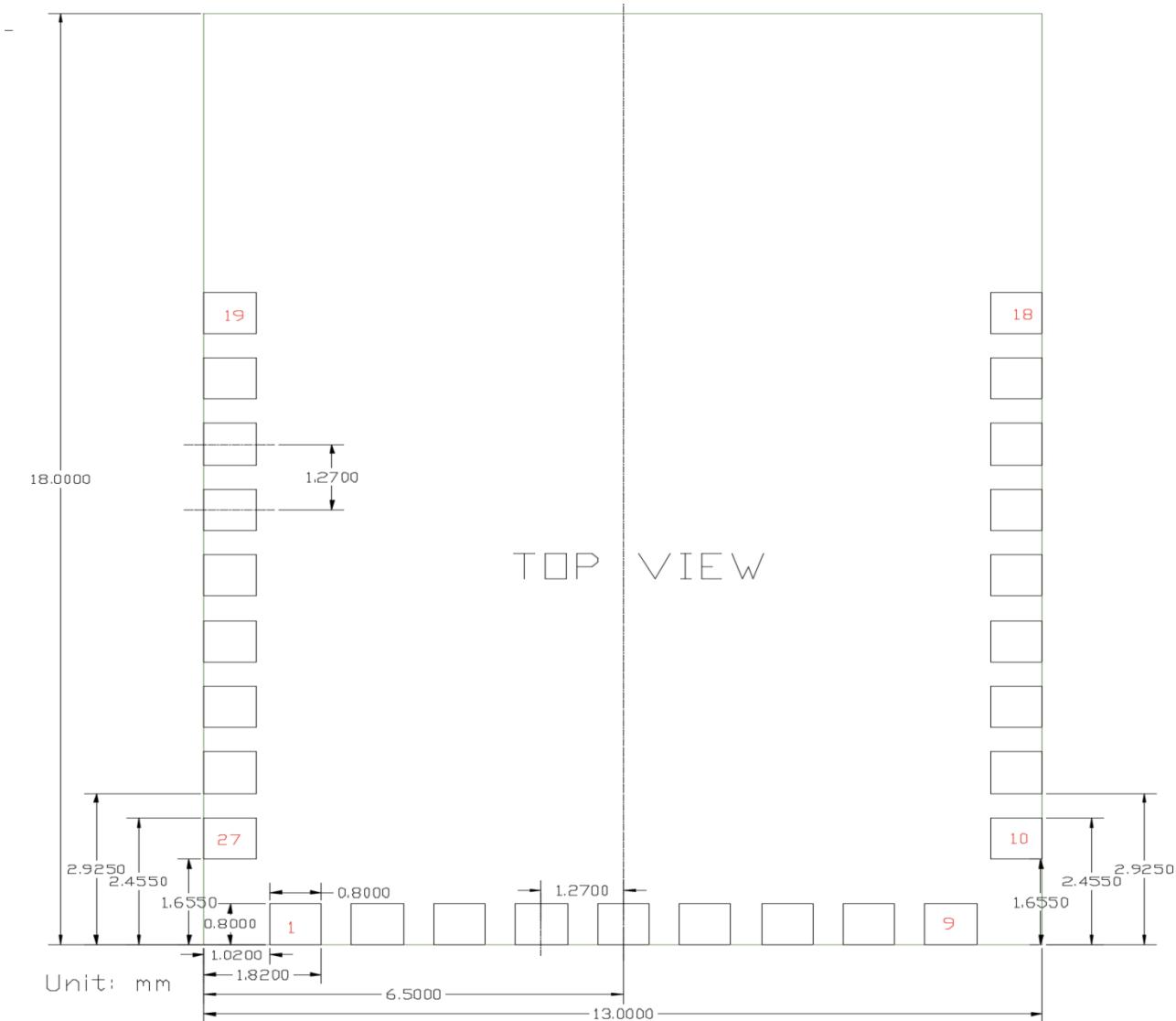


3.2. Pin Description Box

Pin	Pin Name	Pin Type	Description
1	CHIP_ENABLE	I	connection for disabling/enabling the chip
2	RTC_SYNC	I	NA. Kept Open.
3	SENSOR_INT	O	IRQ to host for indicating data ready
4	SWDO	I	NA. Kept Open.
5	SWDIO	O	Serial Wire Debug interface data input/output
6	SWDCLK	I/O	Serial Wire Debug interface clock input
7	SE_IRQ	I	NA. Kept Open.
8	SE_I2C_SDA	I/O	NA. Kept Open.
9	SE_I2C_SCL	I/O	NA. Kept Open.
10	UART_TXD	O	NA. Kept Open.
11	UART_RXD	I	NA. Kept Open.
12	POWER_EN	I	DC/DC Enable control (for built-in DC/DC module only)
13	VCC		Power supply
14	GND		Ground supply
15	GND		Ground supply
16	GND		Ground supply
17	GND		Ground supply
18	GND		Ground supply
19	GND		Ground supply
20	GND		Ground supply
21	EE_I2C_SCL	I/	EEPROM I2C clock (for built-in EEPROM module only)
22	EE_I2C_SDA	I/O	EEPROM I2C data (for built-in EEPROM module only)
23	SPI_MISO	O	MISO connection for the SPI host interface
24	SPI_SCK	I	clock for the SPI host interface
25	SPI_CS	I	Slave select connection for the SPI host interface
26	SPI_MOSI	I	MOSI connection for the SPI host interface
27	SYNC	I	SPI Rx handshake from the Host to the chip
RF1	TX/RX		RF port, used for Tx & Rx
RF2	RX		RF port, used for elevation
RF3	RX		RF port, used for azimuth

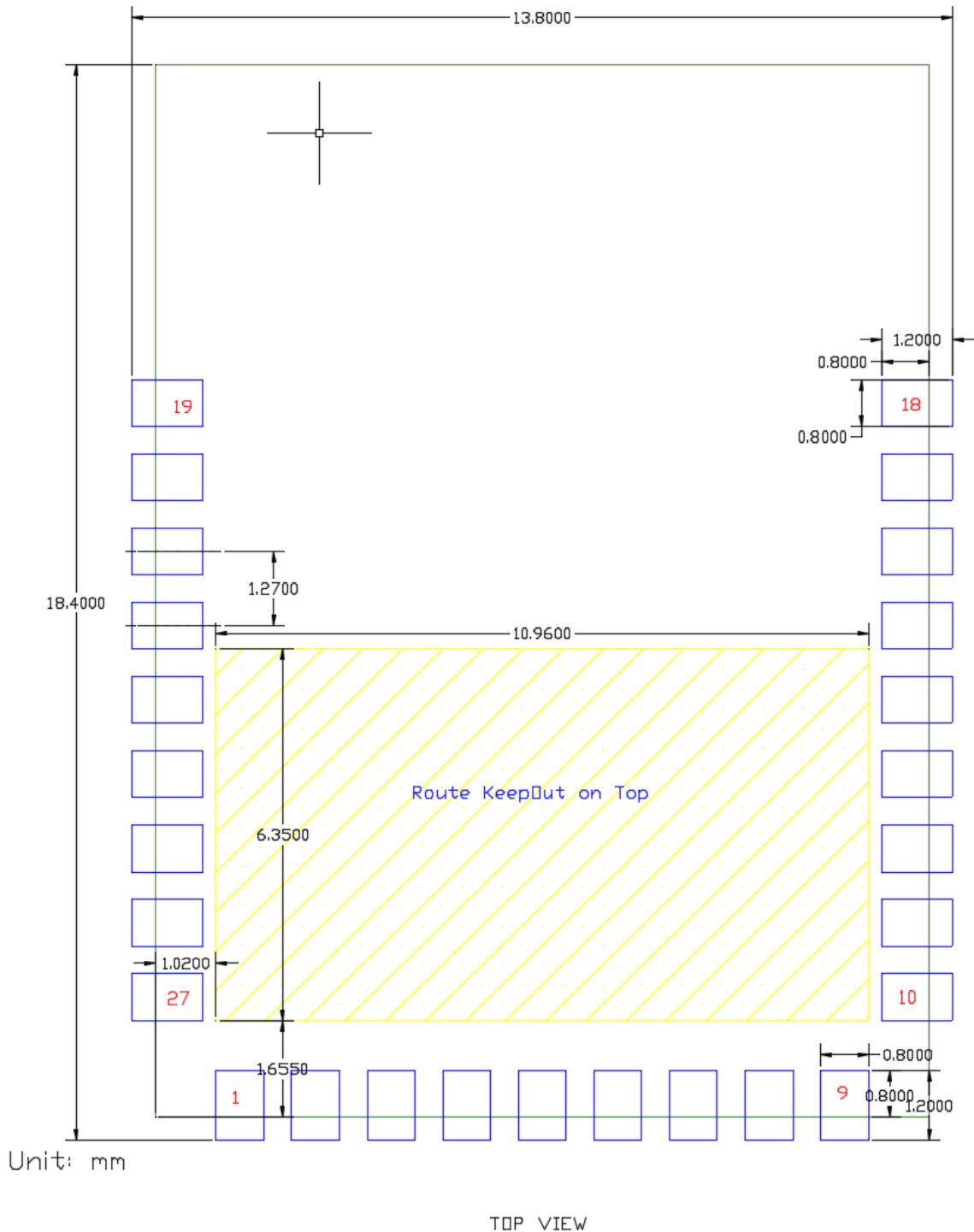


3.3. Package outline





3.4. Recommended PCB Footprint



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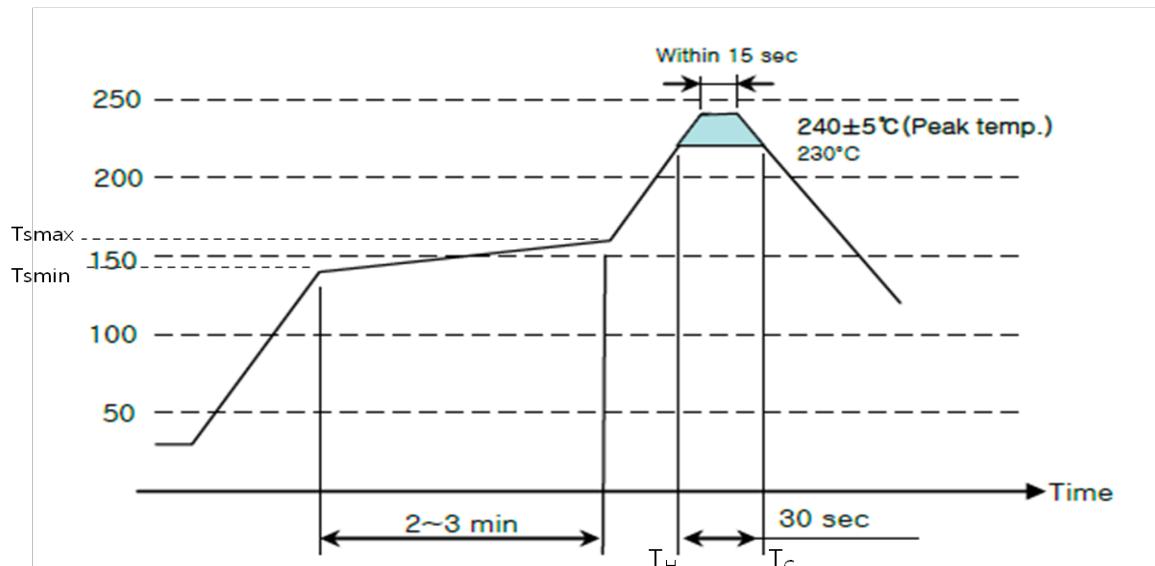


4. Soldering Condition

4.1. Manual Soldering – Pb Free

Soldering Temperature: $360^{\circ}\text{C} \pm 5^{\circ}\text{C}$, 5sec max.

4.2. Recommended Reflow Condition – Pb Free



Profile Feature	Pb-Free Assembly
Preheat	
-Temperature Min (Tsmin)	140°C
-Temperature Typical (Tstypical)	150°C
-Temperature Max (Tsmax)	160°C
-Time Tsmin to Tsmax	2 ~ 3 min
Peak Temperature	240±5°C
Time of actual peak temperature	Max. 15 seconds
Heating to Cool	
-Temperature Heating (TH)	230°C
-Temperature Cool (TC)	230°C
-Time TH to TC	30 seconds

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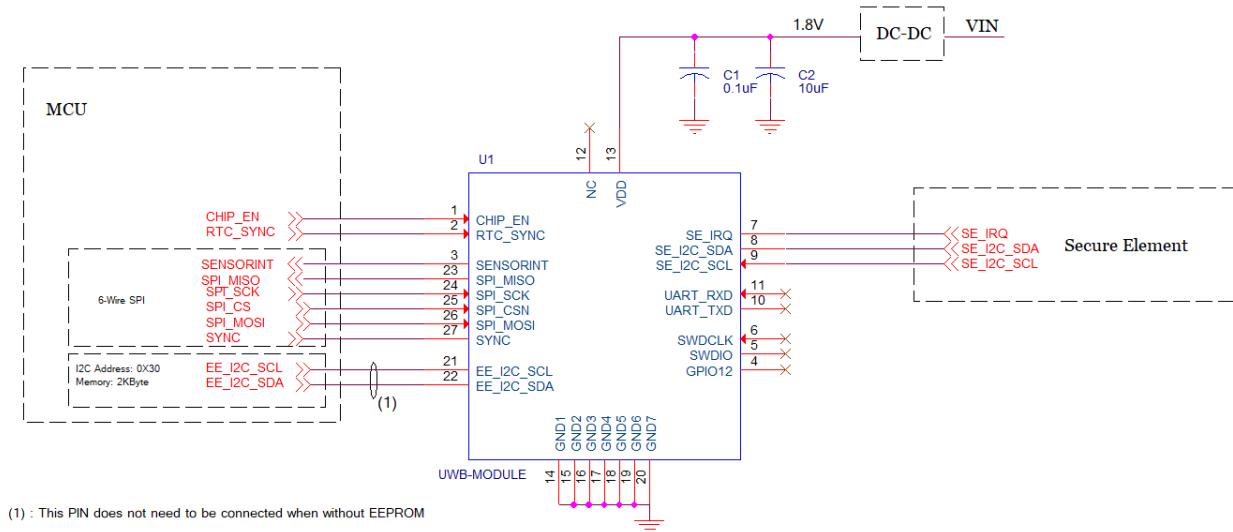
5. Part Numbering

	<u>SW</u>	<u>M</u>	<u>1000</u>	<u>SR150</u>	<u>3</u>	<u>DFE</u>	<u>1</u>
Company name							
SW =Sunway							
Device type							
M =Module, T =Tag+QN9090							
Type							
1000=UWB Only							
1001=UWB+QN9090							
Chipset							
NXP UWB Part Number							
Antenna number							
1=1antenna,2=2antenna, 3=3antenna,4=4antenna							
Optional Part number							
D/X=(with DCDC/without X),F/X=(with Filter/without X)							
E/X=(with EEPROM/without X)							
Version							



6. Application design-in information

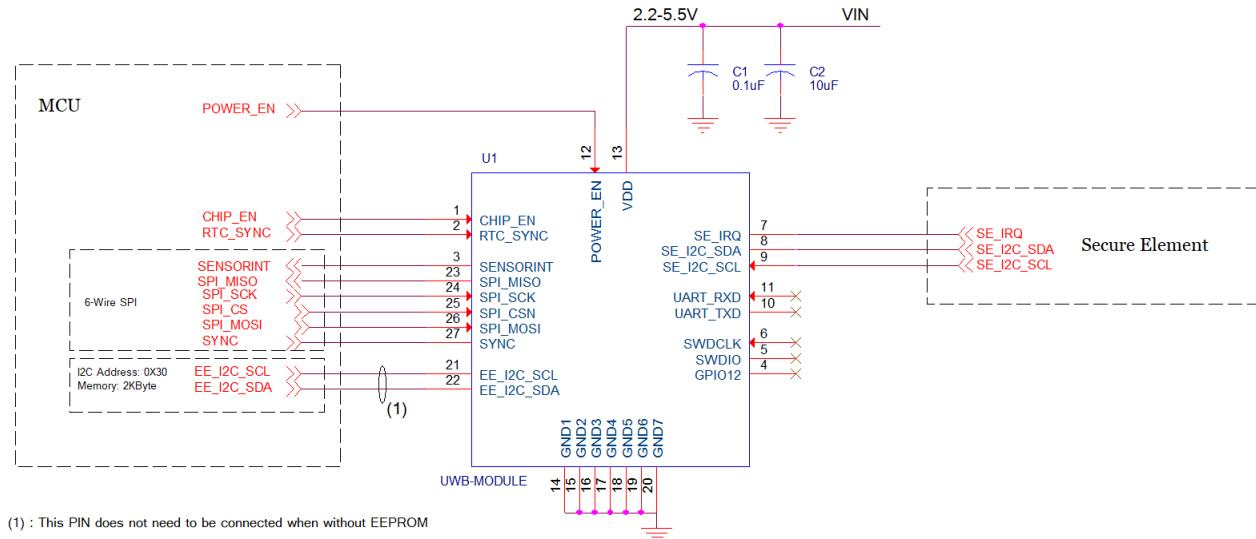
6.1. Reference schematics for SWM1000SR1503XFE



Reference schematics for SWM1000SR1503XFE



6.2. Reference schematics for SWM1000SR1503DFE



Reference schematics for SWM1000SR1503DFE



7. Antenna information

Antenna type: Circular polarization patch

Number of patch: 2

Working Channel: CH5&CH9

Gain: CH5:5.3dBi,CH9:5.8dBi

S11: -12dB

RF Connector: JSC

8. Test mode and additional testing requirement

There are two working modes of this module as follows:

BPRF mode, PRF=62.4MHz

HPRF mode, PRF=124.8MHz

If the terminal manufacturer uses other types of antennas, re-certification testing is required in accordance with FCC Part 15.519, 15.521(g) and 15.209.

9. Regulatory approval

US FCC ID: 2A2WQ-SR150

This equipment has been tested and found to comply with the following directive (s) and standard(s):

Radio equipment directive (RED) 2014/53/EU. Standards applied: EN 301 489-1 V2.1.1, EN 301 489-33 V2.2.1, EN 302 065 V2.1.1, EN 62479:2010

FCC 47 CFR Part 15F(15.519 UWB). FCC Integration instructions according to KDB996369 D03 OEM V01 manual section.

The latest datasheet version can be downloaded from www.sz-sunway.com.

9.1. European Union requirements

9.1.1 Radio Equipment Directive

The SWM1000SR150 Module has been certified for use in European Union countries. A copy of the EU Declaration of Conformity is available for download on our website.

If these modules are incorporated into a product, the manufacturer must ensure continuing compliance of the final product to the Radio Equipment Directive 2014/53/EU.



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The manufacturer must then draw up a new written EU Declaration of Conformity as per RED Article 18.

Furthermore, the manufacturer must ensure the final product does not exceed the specified power ratings, antenna specifications, and/or installation requirements as specified in this document. If any of these specifications are exceeded in the final product, the manufacturer must assess whether additional compliance testing is required.

IMPORTANT: The “CE” marking must be in compliance with the RED Article 19. It must be affixed to a visible location on the OEM product. The CE mark shall have a height of at least 5mm except where this is not possible on account of the nature of the apparatus. The CE marking must be affixed visibly, legibly, and indelibly.





9.2. Regulatory Module Integration Instructions

This module has been granted modular approval for portable applications. OEM integrators for host products may use the module in their final products without additional FCC certification if they meet the following conditions. Otherwise, additional FCC approvals must be obtained.

- The host product with the module installed must be evaluated for simultaneous transmission requirements
- The user's manual for the host product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.
- A label must be affixed to the outside of the host product with the following statements:

This device contains FCC ID: 2A2WQ-SR150

This equipment contains equipment certified under IC: SR150

The final host / module combination may also need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.

If the final host / module combination is intended for use as a portable device, the host manufacturer is responsible for separate evaluations/approvals for the SAR requirements from FCC Part 2.1093 and RSS-102.

9.3. FCC Operating Requirements and conditions

The design of SWM1000SR150 complies with U.S. Federal Communications Commission (FCC) guidelines respecting safety levels of radio frequency (RF) exposure for Portable devices.

FCC ID: This product contains FCC ID: 2A2WQ-SR150

CFR §15.19 Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CFR §15.21 Information to user

Warning: changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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RF Exposure compliance statement

This Module complies with FCC radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Labelling Instruction for Host Product Integrator

Please notice that if the FCC identification number is not visible when the module is installed inside another device. Then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as following:

“Contains FCC ID: 2A2WQ-SR150” any similar wording that expresses the same meaning may be used.

CFR § 15.19 labelling requirements shall be complied on end user device. Labelling rules for special device, please refer to CFR §2.925, CFR §15.19(a)(5) and relevant KDB publications. For E-label, please refer to CFR §2.935.

Installation Notice to Host Product Manufacturer

The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module. This module has been evaluated stand alone to meet portable use without restriction, however, if a host product also contains other transmitter(s) and antenna(s), necessary test or evaluation needs to be performed in order to meet the requirement.

Antenna Change Notice to Host manufacturer

If you desire to increase antenna gain and either change antenna type or use same antenna type certified, a Class II permissive change application is required to be filed by us, or you (host manufacturer) can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

FCC other Parts, Part 15B Compliance Requirements for Host product manufacturer

This modular transmitter is only FCC authorized for the specific rule parts listed on our grant, host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification.

Host manufacturer in any case shall ensure host product which is installed and operating with the module is in compliant with Part 15B requirements.

Please note that For a Class B or Class A digital device or peripheral, the instructions furnished the user manual of the end-user product shall include statement set out in CFR § 15.105 information to the user or such similar statement and place it in a prominent location in the text of host product manual. Original texts as following:



For Class B

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For Class A

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant of part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.