

SC171-W

Hardware Guide

V1.0

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Applicable Model

No.	Applicable Model	Description
1	SC171-W	Support BT WIFI

Change History

V1.0 (2022-09-20) Initial version.

1 Foreword

1.1 Description

This document describes the electrical characteristics, RF performance, structure size, application environment, etc. of the SC171-W module. With the assistance of the document and other instructions, the developers can quickly understand the hardware functions of the module and develop products.

1.2 Reference Standards

This product is designed with reference to the following standards:

- IEEE 802.11n WLAN MAC and PHY, October 2009+ IEEE 802.11-2007 WLAN MAC and PHY, June 2007
- IEEE Std 802.11b, IEEE Std 802.11a, IEEE Std 802.11g, IEEE Std 802.11n, IEEE Std 802.11ac, IEEE Std 802.11ax
- IEEE 802.11-2007 WLAN MAC and PHY, June 2007
- Bluetooth Radio Frequency TSS and TP Specification
1.2/2.0/2.0+EDR/2.1/2.1+EDR/3.0/3.0+HS, August 6, 2009
- Bluetooth Low Energy RF PHY Test Specification, RF-PHY.TS/4.0.0, December 15, 2009
- Bluetooth Low Energy RF PHY Test Specification, RF-PHY.TS/4.2.0, November 7, 2014
- Bluetooth Low Energy RF PHY Test Specification, RF-PHY.TS/5.0.2, December 07, 2017
- Bluetooth Low Energy RF PHY Test Specification, RF-PHY.TS/5.1.1, August 07, 2019
- Bluetooth Low Energy RF PHY Test Specification, RF-PHY.TS/5.2

2 Overview

2.1 Product Introduction

The module integrates core components such as Baseband, Memory, PMU, Transceiver, PA; it supports long distance multi-mode communication wireless positioning technology. The module is embedded with Android operating system and support various interfaces such as MIPI/USB/UART/SPI/I2C. It is the optimal solution for the core system of wireless smart products. Its corresponding network modes and frequency bands are as follows:

Table 1. Supported bands

Mode	Band
WIFI802.11a/b/g/n/ac/ax	2402MHz~2482MHz
	5170MHz~5835MHz
	5925MHz~7125MHz
BT5.2	2402MHz~2480MHz

The SC171-W module can be embedded in various M2M product applications, and issuitable for developing intelligent devices such as intelligent POS, cash register, robot, unmanned aerial vehicle, intelligent home, security monitoring, multimedia terminal, vehicle terminal and other devices. The following table describes the detailed performance parameters of the SC171-W module.

Table 2. Key features

Feature	Description
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Power Supply	DC: 3.5–4.4 V, typical: 3.8 V
WLAN features	Support 2.4G , 5G and 6G WLAN wireless communication, support 802.11a, 802.11b, 802.11g, 802.11n, 802.11ac and 802.11ax, 2x2 MIMO.
Bluetooth features	BT5.2 (BR/EDR+BLE)

Physical characteristics	Dimensions: 56.5 mm x 42.5 mm x 2.85 mm
	Package: 636 LGA
	Weight: About 15.9g
Temperature range	Operating temperature ¹ : -30°C–75°C [®]
	Storage temperature: -40°C–85°C
Software update	USB/OTA/SD
RoHS	Comply with RoHS standard



When the module is operating within this temperature range, the functions of it are normal and the relevant performance meets the 3GPP standard.

2.2 Electrical Indicators

The following table lists the normal operating voltage range of the module. All performance indicators of the module are guaranteed to be within this range.

Table 10. Operating voltage

Parameter	Min	Normal	Max	Unit
VBAT	3.5	3.8	4.4	V
USB_VBUS	3.7	5.0	12.6	V
VRTC	2.0	3.0	3.25	V

The following table lists the absolute maximum rated parameters of a module. If the absolute maximum parameter range is exceeded, permanent damage may be caused to the device.

Table 11. Absolute maximum parameters

Parameter	Min	Max	Units
V _{BAT}	-0.3	6	V
USB_IN	-0.3	28	V

2.3 Operating and Storage Temperature

Table 12. Operating and storage temperature

Parameter	Min	Max	Unit
Operating ambient temperature	-30	75	°C
Storage temperature	-40	85	°C

2.4 ESD Indicators

In the application of the module, due to static electricity generated by human body and charged friction between micro-electronics, etc. discharging to the module through various channels that may cause damage, so ESD protection should be taken seriously attention. In the process of R&D, production assembly and testing, especially in product design, ESD protection measures should be taken. For example, anti-static protection should be added at the designed circuit interface and the points susceptible to electrostatic discharge or impact. Anti-static gloves should be worn during production.

ESD performance parameters are listed in the following table (Temperature: 25°C, humidity: 45%).

Table 13. ESD indicators

Test Point	Contact Discharge	Air Discharge	Unit
V _{BAT} , GND	±5	±10	kV
Antenna interface	±4	±8	kV

Other interface ± 0.5 ± 1 kV

3 RF Interface

3.1 WIFI

The SC171-W module supports 2.4G ,5G and 6G WLAN wireless communications and 802.11a, 802.11b, 802.11g, 802.11n, 802.11ac and 802.11ax standards, with a maximum throughput to 3600 Mbps (2x2+2x2 11ax DBS). Its characteristics are as follows:

- Support Wake-on-WLAN (WoWLAN)

- Support ad hoc mode
- Support WAPI
- Support AP mode
- Support Wi-Fi Direct
- 2.4G bands support CCK, OFDM, VHT20 and VHT40, and HE20 and HE40
- 5G bands support OFDM, VHT20, VHT40, VHT80, VHT160, HE20, HE40, HE80, and HE160

Test condition: 3.8V power supply, environment temperature 25°C.

Table 43. WIFI transmitting power

Frequency	Mode	Date Rate	Bandwidth (MHz)	TX Power (dBm)
2.4G	802.11b	1Mbps	20	18±3
		11Mbps	20	18±3
	802.11g	6Mbps	20	17±3
		54Mbps	20	15±3
	802.11n	MCS0	20	17±3
		MCS7	20	15±3
		MCS0	40	17±3
		MCS7	40	15±3
		MCS0	20	17±3
		MCS11	20	10±3
		MCS0	40	17±3
		MCS11	40	10±3
	802.11a	6Mbps	20	17±3
		54Mbps	20	15±3
5G	802.11n	MCS0	20	17±3
		MCS7	20	15±3
		MCS0	40	17±3

		MCS7	40	15±3
	802.11ac	MCS0	20	17±3
		MCS8	20	15±3

Frequency	Mode	Date Rate	Bandwidth (MHz)	TX Power (dBm)
	802.11ax	MCS0	40	17±3
		MCS9	40	14±3
		MCS0	80	17±3
		MCS9	80	13±3
		MCS0	160	17±3
		MCS9	160	10±3
		MCS0	20	15±3
		MCS2111	40	10±3
		MCS0	40	17±3
		MCS11	40	10±3
		MCS0	80	17±3
		MCS11	80	10±3
		MCS0	160	17±3
		MCS11	160	10±3

Frequency	RU	Mode	Band	TX Power (dBm)
6G	26	802.11a	U-NII-5	10±3
			U-NII-6	6±3
		802.11ax	U-NII-5	1.5±3
			U-NII-6	-5±3
			U-NII-7	-5±3
			U-NII-8	-5±3
	52	802.11a	U-NII-5	10±3
			U-NII-6	6±3
		802.11ax	U-NII-5	1.5±3
			U-NII-6	-5±3
			U-NII-7	-5±3
			U-NII-8	-5±3

106	802.11a	U-NII-5	10±3
		U-NII-6	6±3
	802.11ax	U-NII-5	1.5±3
		U-NII-6	-5±3
		U-NII-7	-5±3
		U-NII-8	-5±3

Microstrip lines are recommended for RF routing of WIFI antennas, with insertion loss controlled within 0.2dB and 5G frequency impedance controlled within 50Ω.

Table 45. WIFI operating frequency

Mode	Frequency	Unit
2.4G	2402-2482	MHz
5G	5170-5835	MHz
6G	5925-7125	MHz

3.2 BT

The SC171-W module supports BT5.2 (BR/EDR+BLE) standards. The modulation method supports GFSK, 8-DPSK and $\pi/4$ -DQPSK.BR/EDR. Channel bandwidth is 1MHz and can accommodate 79 channels. The BLE channel can accommodate40 channels. Its main features are as follows:

- BT 4.2 + BR/EDR + BLE
- Support for ANT protocol
- Support for BT-WLAN coexistence operation, including optional concurrent receiving
- Up to 3.5 piconets (master, slave, and page scanning)

Table 46. BT rate and version information

Version	Date Rate	Throughput	Note
BT1.2	1Mbit/s	> 80Kbit/s	- -
BT2.0+EDR	3Mbit/s	> 80Kbit/s	- -
BT3.0+HS	24Mbit/s	Refer to 3.0+HS	- -
BT4.2 LE	24Mbit/s	Refer to 4.2 LE	- -
BT5.2	24Mbit/s	Refer to 5.1 LE	- -

Test condition: 3.8V power supply, environment temperature 25°C.

Table 47. BT performance indicator

Type	DH-5	2-DH5	3-DH5	BLE	Unit
Transmitter	15.5±2.5	14±2.5	14±2.5	8±2.5	dBm
Sensitivity	-80	-80	-75	-89	dBm



The sensitivity here is a typical value. Microstrip lines are recommended for RF routing of Bluetooth antennas, with insertion loss controlled within 0.2dBm and impedance controlled within 50Ω.

Table 48. BT operating frequency

Mode	Frequency	Unit
Bluetooth	2402~2480	MHz

4. FCC Conformance information

Federal Communication Commission Interference 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.

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 and can radiate radio frequency energy and, if not installed and used in accordance with the 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 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.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This device is intended only for OEM integrators under the following conditions: (For module device use)

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
 - 2) The transmitter module may not be co-located with any other transmitter or antenna.
- As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Important Notice to OEM integrators

1. This module is limited to OEM installation ONLY.

2. This module is limited to installation in mobile applications, according to Part 2.1091(b).
3. The separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations
4. For FCC Part 15.31 (h) and (k): The host manufacturer is responsible for additional testing to verify compliance as a composite system. When testing the host device for compliance with Part 15 Subpart B, the host manufacturer is required to show compliance with Part 15 Subpart B while the transmitter module(s) are installed and operating. The modules should be transmitting and the evaluation should confirm that the module's intentional emissions are compliant (i.e. fundamental and out of band emissions). The host manufacturer must verify that there are no additional unintentional emissions other than what is permitted in Part 15 Subpart B or emissions are compliant with the transmitter(s) rule(s).

The Grantee will provide guidance to the host manufacturer for Part 15 B requirements if needed.

Important Note

notice that any deviation(s) from the defined parameters of the antenna trace, as described by the

instructions, require that the host product manufacturer must notify to Fibocom Wireless Inc. that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the USI, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

End Product Labeling

When the module is installed in the host device, the FCC label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text: "Contains FCC ID:ZMOSC171W"

The FCC ID can be used only when all FCC compliance requirements are met.

Antenna Installation

- (1) The antenna must be installed such that 20 cm is maintained between the antenna and users,
- (2) The transmitter module may not be co-located with any other transmitter or antenna.
- (3) Only antennas of the same type and with equal or less gains as shown below may be used with this module. Other types of antennas and/or higher gain antennas may require additional authorization for operation.

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

Antenna information

Band	Gain(dBi)	Type
BT	3.53	
2.4GHz WLAN	3.53	
5.2GHz WLAN	3.06	
5.3GHz WLAN	3.07	
5.6GHz WLAN	4.81	
5.8GHz WLAN	4.2	
5.9GHz WLAN	5.09	
6.2GHz WLAN	5.14	
6.5GHz WLAN	5.09	
6.7GHz WLAN	5.16	
7.0GHz WLAN	5.12	
Bluetooth	3.22	Monopole
2.4GHz WLAN	3.35	
5.2GHz WLAN	3.35	
5.3GHz WLAN	3.42	
5.6GHz WLAN	4.77	
5.8GHz WLAN	4.72	
5.9GHz WLAN	4.71	
6.2GHz WLAN	4.75	
6.5GHz WLAN	4.29	
6.7GHz WLAN	4.81	
7.0GHz WLAN	4.74	

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance **20** cm between the radiator & your body.

WIFI 6E Warning

Operation of transmitters in the 5.925-7.125 GHz band is prohibited for control of or communications with unmanned aircraft systems.

5. ISED Conformance information

Industry Canada Statement

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement."

Radiation Exposure Statement

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance **20** cm between the radiator & your body.

Déclaration d'exposition aux radiations:

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

This device is intended only for OEM integrators under the following conditions: (For module device use)

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
 - 2) The transmitter module may not be co-located with any other transmitter or antenna.
- As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes (Pour utilisation de dispositif module)

- 1) L'antenne doit être installée de telle sorte qu'une distance de 20 cm est respectée entre l'antenne et les utilisateurs, et
- 2) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les 2 conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

IMPORTANT NOTE:

In the event that these conditions can not be met (for example certain laptop configurations or colocation with another transmitter), then the Canada authorization is no longer considered valid and the IC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

NOTE IMPORTANTE:

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations

d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final.

Dans

ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur)

et l'obtention d'une autorisation distincte au Canada.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed

such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains IC:21374-SC171W".

Plaque signalétique du produit final

Ce module émetteur est autorisé uniquement pour une utilisation dans un dispositif où l'antenne peut être installée de telle sorte qu'une distance de 20cm peut être maintenue entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 21374-SC171W".

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

Manuel d'information à l'utilisateur final

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à

la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui

intègre ce module.

Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.