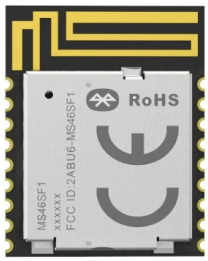


MINEW MS46SF11 Low Energy Bluetooth Module User Manual

MS46SF11 Low Energy Bluetooth Module
User Manual

nRF52805 module specification

Small-sized nRF52805
Module MS46SF11
OEM/ Integrators Installation Manual

MS46SF11 is a compact size (15.8 x 12.0 x 2.0 mm), highly flexible, ultra-low-power wireless BLE 5.0 Module based on nRF52805 SoCs; Its powerful 32-bit ARM Cortex® M4 CPU, a 192kB flash memory, a 24kB RAM and integrating a 2.4 GHz transceiver can offer the perfect solution for Bluetooth connectivity.

Contents

1 Features
2 Application
3 Product introduction
4 Pin description
5 Electrical specification
6 Electrical schematic
7 Package information
8 Reflow and soldering
9 Certification
10 Notes & cautions
11 Disclaimer
12 Contact information
13 Documents / Resources
13.1 References
14 Related Posts

Features

Frequency: 2400 to 2483 MHz Max.
Output power: +4dBm
Single power supply: 1.7 3.6V
Range: up to 60 meters in open space
Chip: nRF52805 (Nordic)
GPIO Quantity: 6
192KB Flash and 24KB RAM (nRF52805)
Module size: 15.8 x 12.0 x 2.0 mm
ARM Cortex-M4 processor
Metal shielding with marking
UART communication protocol (Slave optional)
AntennaPCB
Operating Temperature range: -40 to 80 degree Celsius
Certification
FCC is coming soon
CE is coming soon

Application

Medical devices
Heart rate monitor
Blood pressure monitor
Blood glucose meter
Thermometer
Sport facilities
Weighing machine
Sports and fitness sensors

Accessories 3D glasses and gaming controller
Mobile accessories
Remote controllers /Toys
Electronic devices
Cycle computer

Product introduction

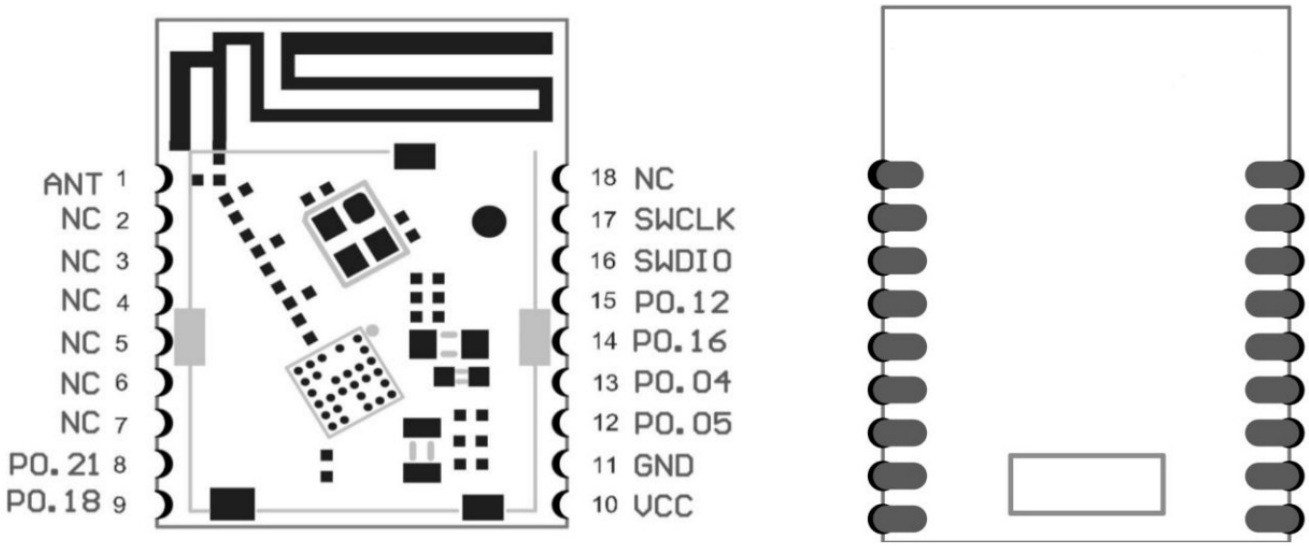
MS46SF11 is an ultra-small size (15.8 x 12.0 x 2.0 mm), highly flexible, ultra-low-power wireless BLE 5.0 Module based on nRF52805 SoCs; Its powerful 32-bit ARM CortexTM M4 CPU, a 192KB flash memory, a 24KB RAM and integrating a 2.4 GHz transceiver can offer the perfect solution for Bluetooth connectivity.
MS46SF11 can meet the most demanding applications, it allows faster time to market with high performance, low power management, and reduced development cost. Also, its range is estimated up to 60 meters in open space.

1.1 Ordering information

Ordering number	Description
MS46SF11-001	306030112, nRF52805-CAAA BT 5.0 Module, PCB Antenna, Reel pack

Pin description

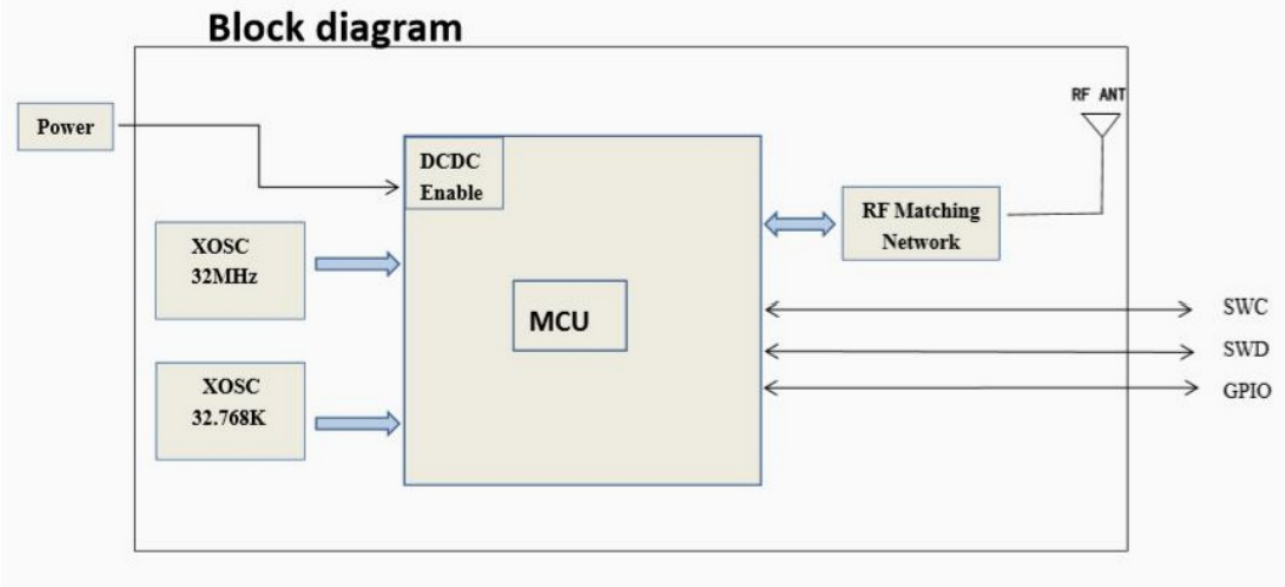
2.1 Pin assignment
2.1.1 MS46SF11 PCB Antenna



2.2 Pin definition

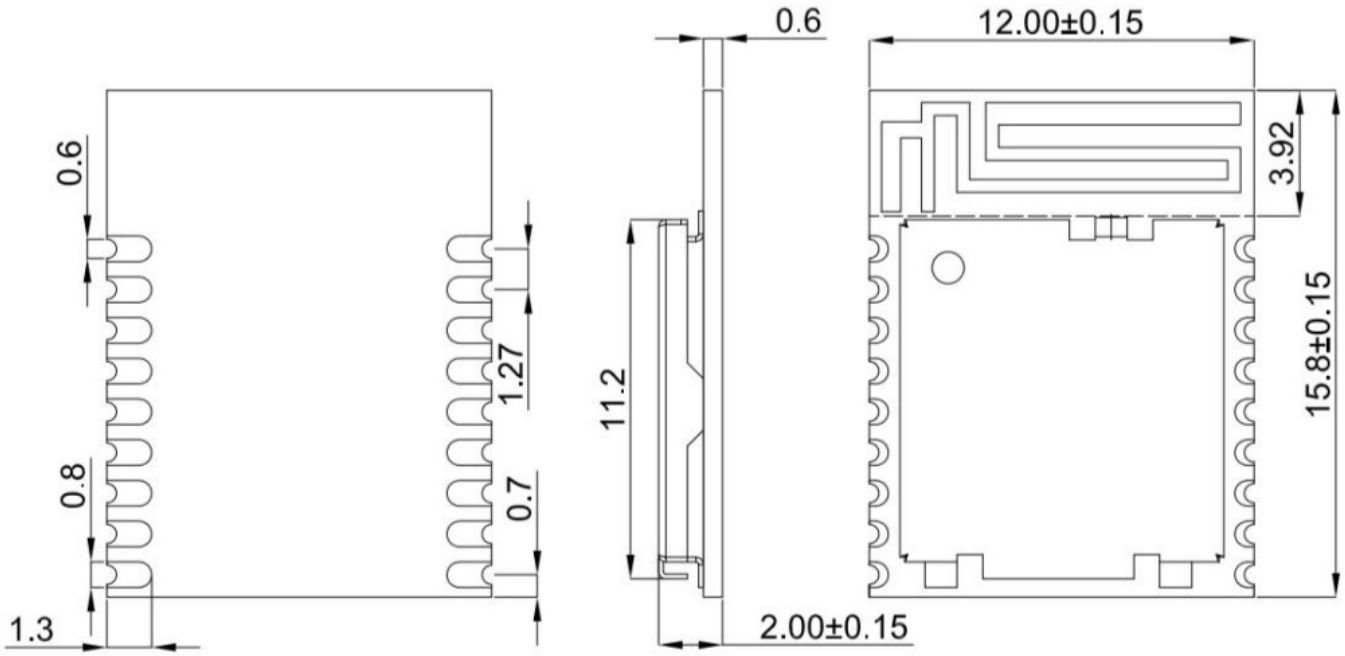
Symbol	Definition	Description
Pin 1	ANT	Connect pin for external antenna
Pin 2 to Pin 7	NC	
Pin 8	P0.21	UART TX
Pin 9	P0.18	UART RX
Pin 10	VCC	VCC
Pin 11	GND	GND
Pin 12	P0.05	CON_IND
Pin 13	P0.04	FIFO_FULL
Pin 14	P0.16	SLP
Pin 15	P0.12	BTDATA
Pin 16	SWDIO	Serial wire debug clock input for debugging and prog ramming
Pin 17	SWCLK	Serial wire debug I/O for debugging and programmin g
Pin 18	NC	

2.3 Block diagram



2.4 Mechanical drawing

2.4.1 MS46SF11 PCB Antenna



Unit: mm
Tolerance: +/- 0.1, default

Electrical specification

The electrical specifications of the module are directly related to the Nordic semiconductor Specifications for the nRF52805 chipset. The below information is only the extract from the nRF52805 specification. For more detailed information, please refer to the up-to-date specification of the chipset available on the Nordic semiconductor website

3.1 Absolute maximum ratings

Note	Min.	Max.	Unit
Supply voltages			
VDD	-0.3	+3.9	V
VSS		0	V
I/O pin voltage			
VI/O, VDD≤3.6 V	-0.3	VDD+0.3 V	V
VI/O, VDD>3.6 V	-0.3	3.9V	V
Environmental WLCSP package			
Storage temperature	-40	+125	°C
MSL(moisture sensitivity level)		1	
ESD HBM(Human Body Model)		3	kV
ESD HBM Class(Human Body Model Class)		2	
ESD CDM(Charged Device Model)		1	kV
Flash Memory			
Endurance	10 000		write/erase cycles
Retention at 85 °C	10		years

Important: Maximum ratings are the extreme limits to which the chip can be exposed for a limited amount of time without permanently damaging it. Exposure to absolute maximum ratings for prolonged periods of time may affect the reliability of the device.35

3.2 Recommended operating conditions

The operating conditions are the physical parameters that the chip can operate within.

Symbol	Parameter	Notes	Min.	Nom.	Max.	Units
VDD	Supply voltage, independent of DCDC enable		1.7	3.0	3.6	V
TR_VDD	Supply rise time (0 V to 1.7 V)				60	ms
TA	Operating temperature		-40	25	85	°C

Important: The on-chip power-on reset circuitry may not function properly for rise times longer than the specified maximum.

3.3 Electronic characteristic

3.3.1 General radio characteristics

Symbol	Description	Min.	Typ.	Max.	Units
fOP	Operating frequencies	2360		2500	MHz
fPLL,CH,SP	PLL channel spacing		1		MHz
fDELTA,1M	Frequency deviation @ 1 Msps		±170		kHz
fDELTA,BLE,1M	Frequency deviation @ BLE 1 Msps		±250		kHz
fDELTA,2M	Frequency deviation @ 2 Msps		±320		kHz
fDELTA,BLE,2M	Frequency deviation @ BLE 2 Msps		±500		kHz
FskBPS	On-the-air data rate	1000		2000	ksps

3.3.2 Radio current consumption (Transmitter)

Symbol	Description	Min.	Typ.	Max.	Units
ITX,PLUS4dBM,DCDC	TX only run current(DCDC,3V)PRF=+4 dBm		7.0		mA
ITX,PLUS4dBM	TX only run current PRF=+4 dBm		15.4		mA
ITX,0dBM,DCDC	TX only run current(DCDC,3V)PRF=0 dBm		4.6		mA

ITX,0dBM	TX only run current PRF=0 dBm		10.1		mA
ITX,MINUS4dBM, DCDC	TX only run current DCDC,3V PRF=-4 dBm		3.6		mA
ITX,MINUS4dBM	TX only run current PRF=-4 dBm		7.8		mA
ITX,MINUS8dBM, DCDC	TX only run current DCDC,3V PRF=-8 dBm		3.2		mA
ITX,MINUS8dBM	TX only run current PRF=-8 dBm		6.8		mA
ITX,MINUS12dBM ,DCDC	TX only run current DCDC,3V PRF=-12 dBm		2.9		mA
ITX,MINUS12dBM	TX only run current PRF=-12 dBm		6.2		mA
ITX,MINUS16dBM ,DCDC	TX only rncurrent DCDC,3V PRF=-16 dBm		2.7		mA
ITX,MINUS16dBM	TX only run current PRF=-16 dBm		5.7		mA
ITX,MINUS20dBM ,DCDC	TX only run current DCDC,3V PRF=-20 dBm		2.5		mA
ITX,MINUS20dBM	TX only run current PRF=-20 dBm		5.4		mA
ITX,MINUS40dBM ,DCDC	TX only run current DCDC,3V PRF=-40 dBm		2.1		mA
ITX,MINUS40dBM	TX only run current PRF=-40 dBm		4.3		mA
ISTART,TX,DCDC	TX start-up current DCDC,3V PRF=4 dBm	..	..	..	mA
ISTART,TX	TX start-up current PRF=4 dBm	..	..	..	mA

3.3.3 Radio current consumption (Receiver)

Symbol	Description	Min.	Typ.	Max.	Units
IRX,1M,DCDC	RX only run current (DCDC, 3V) 1Mbps / 1Mbps BLE		4.6		mA
IRX,1M	RX only run current (LDO, 3 V) 1Mbps / 1Mbps BLE		10.0		mA
IRX,2M,DCDC	RX only run current (DCDC, 3V) 2Mbps / 2Mbps BLE		5.2		mA
IRX,2M	RX only run current (LDO, 3 V) 2Mbps / 2Mbps BLE		11.2		mA
ISTART,RX,1M, DCDC	RX start-up current (DCDC 3V) 1Mbps/1Mbps BLE		3.5		mA
ISTART,RX,1M	RX start-up current 1Mbps/1Mbps BLE		6.7		mA

3.3.4 Transmitter specification

Symbol	Description	Min.	Typ.	Max.	Units
PRF	Maximum output power		4.0		dBm

PRFC	RF power control range		24		dB
PRFCR	RF power accuracy			±4	dB
PRF1,1	1st Adjacent Channel Transmit Power 1 MHz (1 M bps)		-25		dBc
PRF2,1	2nd Adjacent Channel Transmit Power 2 MHz (1 M bps)		-50		dBc
PRF1,2	1st Adjacent Channel Transmit Power 2 MHz (2 M bps)		-25		dBc
PRF2,2	2nd Adjacent Channel Transmit Power 4 MHz (2 M bps)		-50		dBc

3.3.5 Receiver operation

Symbol	Description	Min.	Typ.	Max.	Units
PRX, MAX	Maximum received signal strength at < 0.1% BE R		0		dBm
PSENS,IT,1M	Sensitivity, 1Msps nRF mode ideal transmitter[14]		-94		dBm
PSENS,IT,2M	Sensitivity, 2 Mbps nRF mode ideal transmitter[14]		-91		dBm
PSENS,IT,SP,1 M,BLE	Sensitivity, 1 Mbps BLE ideal transmitter, packet l ength ≤ 37 bytes BER=1E-3[15]		-97		dBm
PSENS,IT,LP,1 M,BLE	Sensitivity, 1 Mbps BLE ideal transmitter, packet l ength ≥ 128 bytes BER=1E-416		-96		dBm
PSENS,IT,SP,2 M,BLE	Sensitivity, 2 Mbps BLE ideal transmitter, packet l ength ≤ 37 bytes		-94		dBm

1. Typical sensitivity applies when ADDR0 is used for receiver address correlation. When ADDR[1…7] are used <=37bytesproprietary mode) for receiver address correlation, the typical sensitivity for this mode is degraded by 3dB.
2. As defined in the Bluetooth Core Specification v4.0 Volume 6: Core System Package (Low Energy Controller Volume)
3. Equivalent BER limit < 10E-04
4. Desired signal level at PIN = -67 dBm. One interferer is used, having equal modulation as the desired signal. The input power of the interferer where the sensitivity equals BER = 0.1% is presented.

3.3.6 RX selectivity

Symbol	Description	Min.	Typ.	Max.	Units
C/I1M,co-channel	1Msps mode, Co-Channel interference		9		dBm
C/I1M,-1MHz	1 Msps mode, Adjacent (-1 MHz) interference		-2		dBm
C/I1M,+1MHz	1 Msps mode, Adjacent (+1 MHz) interference		-10		dBm
C/I1M,-2MHz	1 Msps mode, Adjacent (-2 MHz) interference		-19		dBm
C/I1M,+2MHz	1 Msps mode, Adjacent (+2 MHz) interference		-42		dBm
C/I1M,-3MHz	1 Msps mode, Adjacent (-3 MHz) interference		-38		dBm
C/I1M,+3MHz	1 Msps mode, Adjacent (+3 MHz) interference		-48		dB
C/I1M,±6MHz	1 Msps mode, Adjacent (≥6 MHz) interference		-50		dB
C/I1MBLE,co-channel	1 Msps BLE mode, Co-Channel interference		6		dB
C/I1MBLE,-1MHz	1 Msps BLE mode, Adjacent (-1 MHz) interference		-2		dB
C/I1MBLE,+1MHz	1Msps BLE mode, Adjacent (+1 MHz) interference		-9		dB
C/I1MBLE,-2MHz	1Msps BLE mode, Adjacent (-2 MHz) interference		-22		dB
C/I1MBLE,+2MHz	1Msps BLE mode, Adjacent (+2 MHz) interference		-46		dB
C/I1MBLE,>3MHz	1Msps BLE mode, Adjacent (≥3 MHz) interference		-50		dB
C/I1MBLE,image	Image frequency Interference -22 dB		-22		dB
C/I1MBLE,image,1MHz	Adjacent (1 MHz) interference to in-band image frequency		-35		dB
C/I2M,co-channel	2 Msps mode, Co-Channel interference		10		dB
C/I2M,-2MHz	2 Msps mode, Adjacent (-2 MHz) interference		6		dB
C/I2M,+2MHz	2 Msps mode, Adjacent (+2 MHz) interference		-14		dB
C/I2M,-4MHz	2 Msps mode, Adjacent (-4 MHz) interference		-20		dB
C/I2M,+4MHz	2 Msps mode, Adjacent (+4 MHz) interference		-44		dB
C/I2M,-6MHz	2 Msps mode, Adjacent (-6 MHz) interference		-42		dB
C/I2M,+6MHz	2 Msps mode, Adjacent (+6 MHz) interference		-47		dB
C/I2M,≥12MHz	2 Msps mode, Adjacent (≥12 MHz) interference		-52		dB

C/I2MBLE,co-channel	2 Msps BLE mode, Co-Channel interference		6		dB
C/I2MBLE,-2MHz	2 Mbps BLE mode, Adjacent (-2 MHz) interference		-2		dB
C/I2MBLE,+2MHz	2 Mbps BLE mode, Adjacent (+2 MHz) interference		-12		dB
C/I2MBLE,-4MHz	2 Mbps BLE mode, Adjacent (-4 MHz) interference		-22		dB
C/I2MBLE,+4MHz	2 Msps BLE mode, Adjacent (+4 MHz) interference		-46		dB
C/I2MBLE,≥6MHz	2 Msps BLE mode, Adjacent (≥6 MHz) interference		-50		dB
C/I2MBLE,image	Image frequency Interference		-29		dB
C/I2MBLE,image,2MHz	Adjacent (2 MHz) interference to in-band image frequency		-44		dB

3.3.7 RX intermodulation

Symbol	Description	Min.	Typ.	Max.	Units
PIMD,5TH,1M	IMD performance, 1 Mbps, 5th offset channel, packet length ≤ 37 bytes		-33		dBm
PIMD,5TH,1M,BLE	IMD performance, BLE 1 Mbps, 5th offset channel, packet length ≤ 37 bytes		-30		dBm
PIMD,5TH,2M	IMD performance, 2 Mbps, 5th offset channel, packet length ≤ 37 bytes		-33		dBm
PIMD,5TH,2M,BLE	IMD performance, BLE 2 Mbps, 5th offset channel, packet length ≤ 37 bytes		-31		dBm

3.3.8 Radio timing

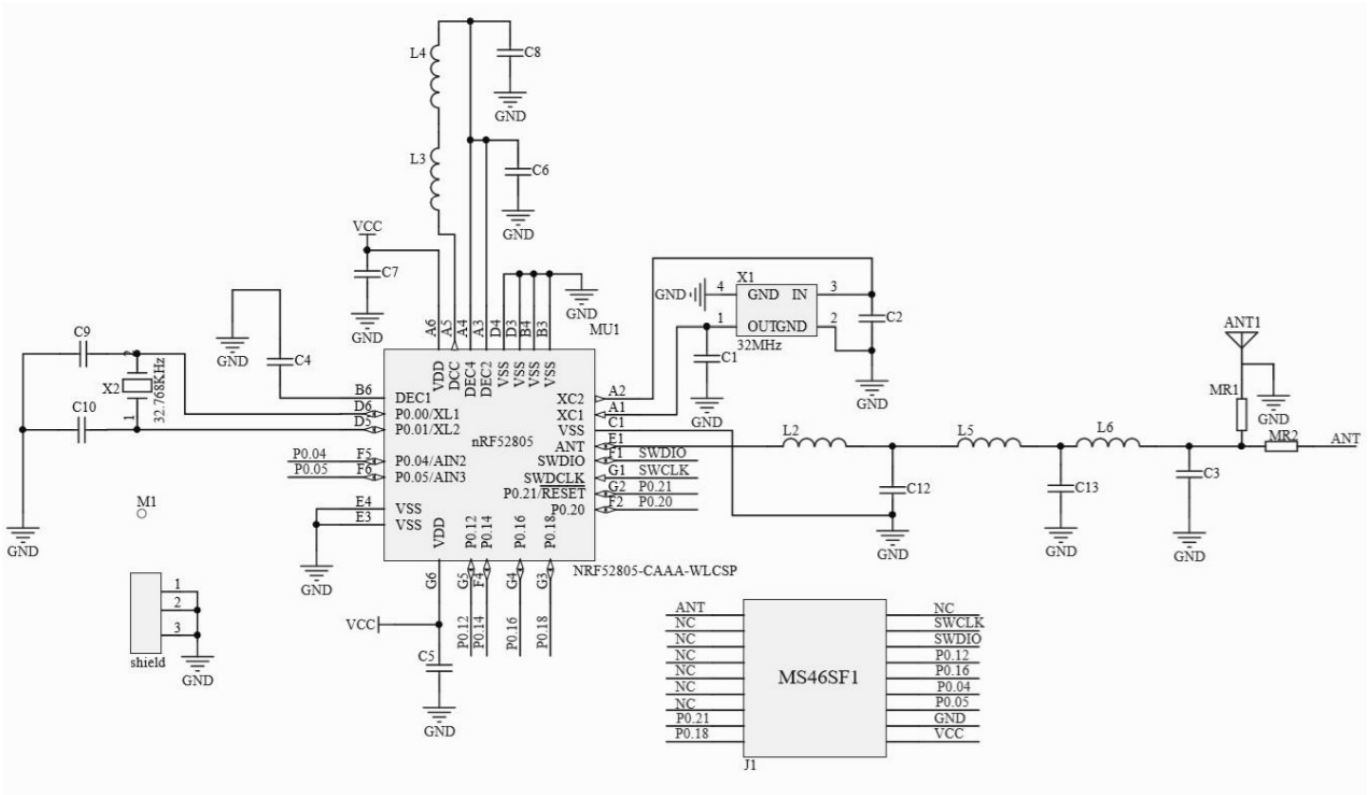
Symbol	Description	Min.	Typ.	Max.	Units
TTXEN, BLE,1M	The time between TXEN task and READY event after channel frequency is configured (1 Mbps BLE and 150 µs TIFS)		140		µs

tTXEN,FAST,BLE,1M	The time between TXEN task and READY event after channel FREQUENCY configured (1 Mbps BLE with fast ramp-up and 150 µs TIFS)FREQUENCY configured (Fast Mode)		40		µs
tTXDIS,BLE,1M	When in TX, the delay between DISABLE task and DISABLED event for MODE = Nrf_1Mbit and MODE = Ble_1Mbit		6		µs
tRXEN,BLE,1M	The time between the RXEN task and READY event after channel FREQUENCY is configured (1 Mbps BLE)		140		µs
tRXEN,FAST,BLE,1M	**The time** between the RXEN task and READY event after channel FREQUENCY is configured (1 Mbps BLE with fast ramp-up)		40		µs
tRXDIS,BLE,1M	When in RX, the delay between DISABLE task and DISABLED event for MODE = Nrf_1Mbit and MODE = Ble_1Mbit		0		µs
tTXDIS,BLE,2M	When in TX, delay between DISABLE task and DISABLED event for MODE = Nrf_2Mbit and MODE = Ble_2Mbit		4		µs
tRXDIS,BLE,2M	When in RX, the delay between DISABLE task and DISABLED event for MODE = Nrf_2Mbit and MODE = Ble_2Mbit		0		µs

3.3.9 Received signal strength indicator (RSSI) specifications

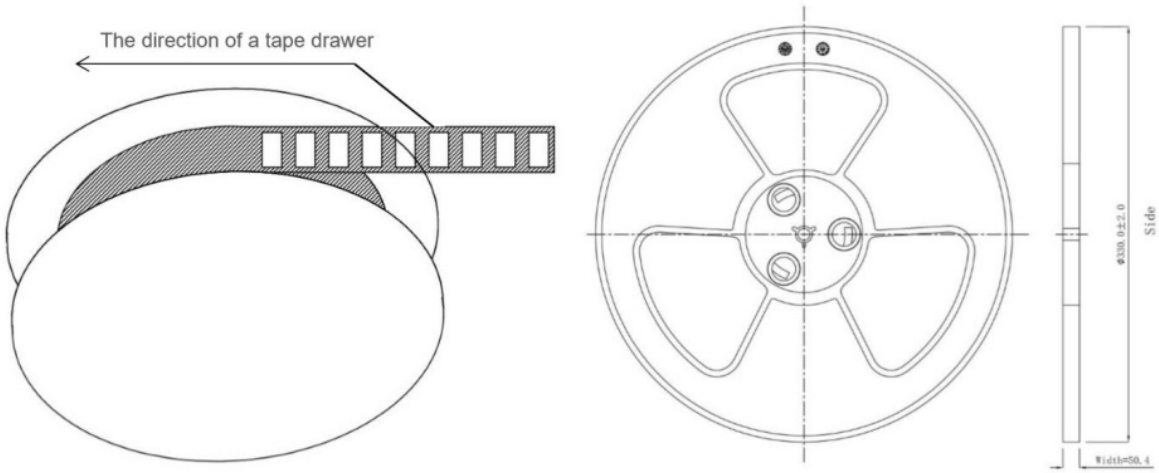
Symbol	Description	Min.	Typ.	Max.	Units
RSSIACC	RSSI Accuracy[18]		±2		dB
RSSIRESOLUTION	RSSI resolution		1		dB
RSSIPERIOD	RSSI sampling time from RSSI_START task		0.25		µs
RSSISETTLE	RSSI settling time after signal level change		15		µs

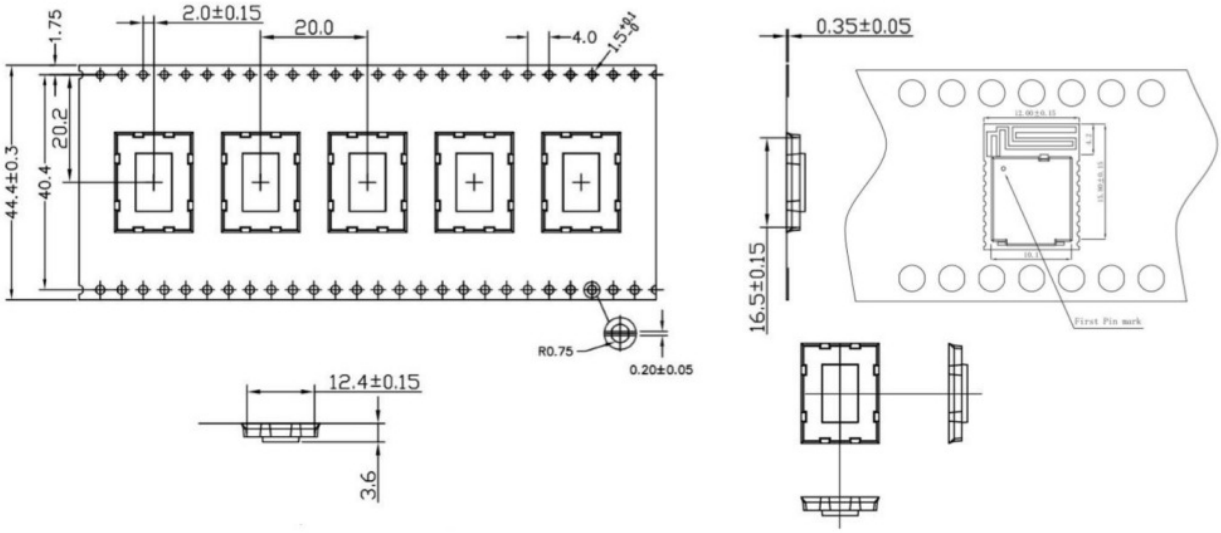
Electrical schematic



Package information

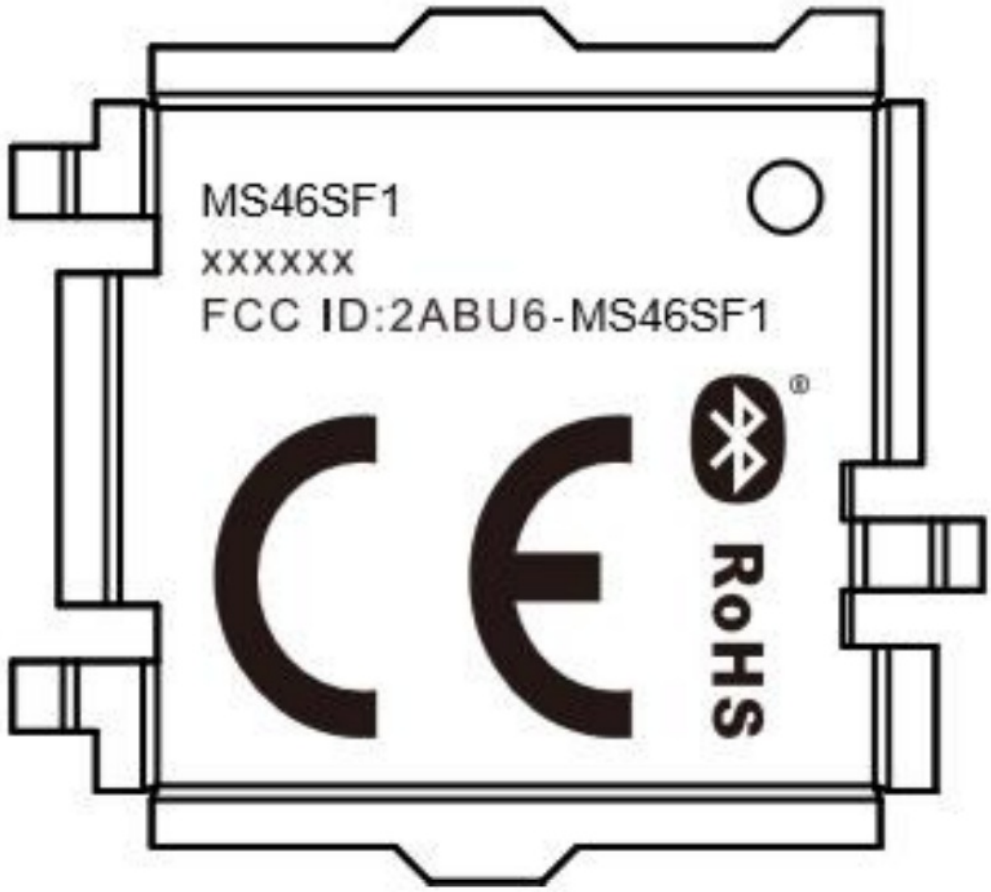
5.1 Package dimension





Details	Reel-MS46SF11
Quantity(module)	850PCS
Tape Weight	720g
Single module Weight	0.66g
Gross Weight	1021g
Dimension	W 330mm T 50.4mm

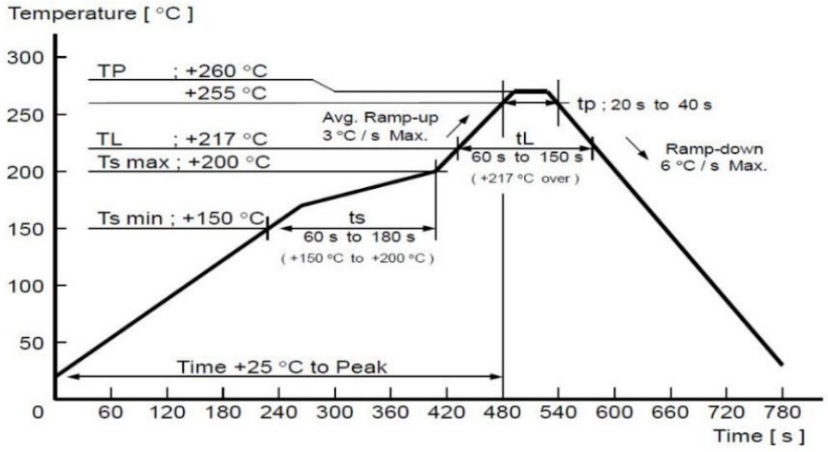
5.2 Mark on metal shield



Reflow and soldering

6.Reflow profile

Reflow condition (Follow of JEDEC STD-020D.01)



Profile Feature	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Sn63/Pb37	Sn96.5/Ag3/Cu0.5
Preheat Temperature min (Tsmin)	100°C	150°C
Preheat Temperature max (Tsmax)	150°C	200°C
Preheat Time (Tsmin to Tsmax)(ts)	60-120 sec	60-120 sec
Average ramp-up rate (Tsmax to T p)	3°C/second max	3°C/second max
Liquidous Temperature (TL)	183°C	217°C
Time (tL)Maintained Above (TL)	60-90 sec	30-90 sec
Peak Temperature (Tp)	220-235°C	230-250°C
Average ramp-down rate (Tp to Ts max)	6°C/second max	6°C/second max
Time 25°C to peak temperature	6 minutes max	8 minutes max

Certification

7.1 CE Certification

MS46SF11 module is being tested and is expected to be compliant with the EU-Radio Equipment standards. OEM integrators should consult with qualified test houses to verify all regulatory requirements have been met for their complete device.

7.2 FCC Certification

MS46SF11 module is being tested and is expected to be compliant with the Federal Communications Commission standards.

7.3 Environmental

7.3.1 RoHs

MS46SF11 modules are in compliance with Directive 2011/65/EU, 2015/863/EU of the European Parliament and the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

7.3.2 Reach

MS46SF11 modules listed below do not contain the 191 SVHC (Substance of Very High Concern), as defined by Directive EC/1907/2006 Article according to REACHAnnex XVII.

As for the OEM integration:
Only OEM integrators have the right to integrate this device under the following conditions: Any other transmitter or antenna must not be co-located with the antenna and transmitter. The module shall be only used with the integral antenna(s)that has been originally tested and certified with this module.
As long as the two conditions below are met, further transmitter testing will not be required. (1)This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
However, the OEM integrator shall test their end-product for any additional compliance requirements with this module installed (for example, digital device emission, PC peripheral requirements, etc.). If these conditions cannot be met (for example certain laptop configuration or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the final product shall not use the FCC ID of the module.
In these circumstances, the OEM integrator shall be re-evaluating the end product(including the transmitter) and obtaining a separate FCC authorization. The OEM shall be verifying end product compliance with FCC Part 15, sub-part B limits for unintentional radiators through an accredited test facility.

Notes & cautions

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

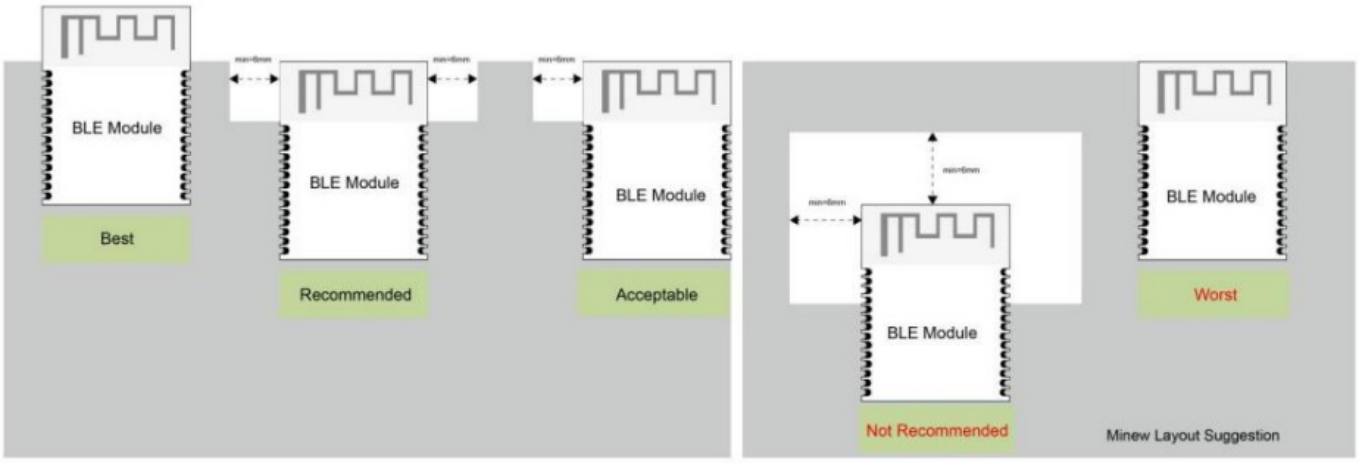
8.1 Design notes

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

8.2 Layout notes

To make sure wireless performance is in its best condition, please layout the MS46SF11 module on the carrier board as below in the instructions and pictures.

1. Placement of the antenna area of the module shall lay clearance completely and should not be blocked by the metal. Otherwise, it will have an effect on antenna performance (As the picture indicated below).
2. Placement of top layer The placement of the top layer in the carrier board shall be laid copper completely to reduce the signal line in the carrier board or other interference.
3. Clearance The upper and below the area of the antenna (including the case) shall have 4mm or more than 4mm clearance to reduce the influences on the antenna.



*The Grey area above is the Carrier board.

8.3 Installation and soldering

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

8.4 Handling and storage

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

2. Please store the modules within -40 to +125 before and after installation and make sure the modules is away from direct sunlight exposure for a long duration. Modules should be far away from humid and salty air conditions, and any corrosive gasses or substances.
3. Please not wash the module. No-Clean Paste is used in production. The metal shield may be oxidized by the washing process and may lead to a chemical reaction with No-Clean Paste. If modules go through the washing process, the functions of the module may not be guaranteed.

8.5 Life support applications

1. The module is not designed for life support devices or systems and is not allowed to be used in destructive devices or systems in any direct, or indirect ways. Mine is not responsible for a compensation of any losses when applying modules under such application as described above.
2. Mine shall not responsible for the customer’s products or applications.

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.).
*** NOTICES:**

1. The Bluetooth trademark is owned by the Bluetooth SIG Inc. USA.
2. All other trademarks listed herein are owned by their respective owners.
3. All specifications are subject to change without notice.
4. Please do not use this specification for produce, sale, or illegal purpose without Minew's authorization.
5. Mine has the right to interpret all the items above.

Contact information

Manufacturer: Shenzhen Minew Technologies Co., Ltd.
Tel: 0086-755-2103 8160
Email: **info@Minew.com**
URL: **https://www.minew.com/**
Address: 3rd Floor, Building I,
Gangzhilong Science Park, Qinglong Road, Longhua District,
Shenzhen 518109,
China

FCC Statement
FCC standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247 Integral PCB antenna with antenna gain 2.07dBi 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. Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
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, 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 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. If any hardware modifies or RF control software modifications will be made by the host manufacturer, a C2PC or new certificate should be applied to get approval, if those changes and modifications made by the host manufacturer are not expressly approved by the party responsible for the compliance, then it is illegal. FCC Radiation Exposure Statement This modular complies with FCC RF 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. 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 the following: "Contains Transmitter Module FCC ID: 2ABU6-MS46SF1 Or Contains FCC ID: 2ABU6-MS46SF1" When the module is installed inside another device, the user manual of the host must contain the below warning statements;
1. 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. (2) This device must accept any interference received, including interference that may cause undesired operation.
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, 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 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.
2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

Documents / Resources

	MINEW MS46SF11 Low Energy Bluetooth Module [pdf] User Manual MS46SF1, 2ABU6-MS46SF1, 2ABU6MS46SF1, MS46SF11 Low Energy Bluetooth Module, Low Energy Bluetooth Module, Bluetooth Module

References

- Minew | A Leading Professional Bluetooth Beacon Manufacturer & Brand