

MS11SF1

Wi-Fi&BLE Combo Module

Specification V1.0

ESPRSSIF ESP32-C3FN4

Wi-Fi&BLE Combo

Module MS11SF1



MS11SF1 is a compact size(16.6x 13.2 x 2.2 mm) 2.4 GHz Wi-Fi (802.11 b/g/n) and Bluetooth® 5 module. The module is built around ESP32-C3FN4 SoC, RISC-V single-core microprocessor, which can be widely used in smart home, consumer electronics, wearable devices and other fields.

Features

1. SoC : ESP32-C3FN4
2. Receiving sensitivity: -97dBm
3. 4M Flash/400 KB RAM
4. GPIO:22
5. SoC TX power: BLE: -27dBm to +18dBm;
Wi-Fi: 10 to 20dBm
6. Antenna: PCB
7. Operating temperature: -40°C to +85°C
8. Supply voltage: 3V to 3.6 V
9. Firmware: support AT command
10. Module size: 16.60mm×13.20mm×2.20mm
11. Support for 2.4G Wi-Fi4 (IEEE802.11 b/g/n), backward compatible.
12. Support for AP, STA, AP+STA modes.
13. BLE 5.0, BLE Mesh.
14. Support for AT, ESP-IDF development.
15. Support for AP mapping, Smart Config mapping, BluFi mapping.
16. Support for OTA upgrade.

Application

1. Smart Home
2. Consumer Electronics
3. Medical Device
4. Retail and Catering
5. Audio Equipment
6. Smart Agriculture
7. Industrial Automation

INDEX

1 Product Introduction	- 4 -
1.1 Ordering information	- 4 -
2 Block Diagram	- 5 -
3 Mechanical Drawing	- 6 -
4 Pin assignment	- 6 -
4.1 Pin definition	- 7 -
5 Module startup mode	- 9 -
6 Power consumption description	- 9 -
6.1 RF power consumption	- 9 -
6.2 Power management	- 10 -
7 Module schematic	- 11 -
8 Package Information	- 12 -
8.1 Package dimension	- 12 -
8.2 Details of Package Dimension:	- 13 -
9 Reflow and Soldering	- 14 -
10 Notes & Cautions	- 15 -
10.1 Design notes	- 15 -
10.2 Layout notes	- 15 -
10.3 Installation and soldering	- 16 -
10.4 Handling and storage	- 16 -
10.5 Life support applications	- 17 -
11 Disclaimer	- 18 -
12 Revision History	- 18 -
COPYRIGHT STATEMENT	- 19 -

1 Product Introduction

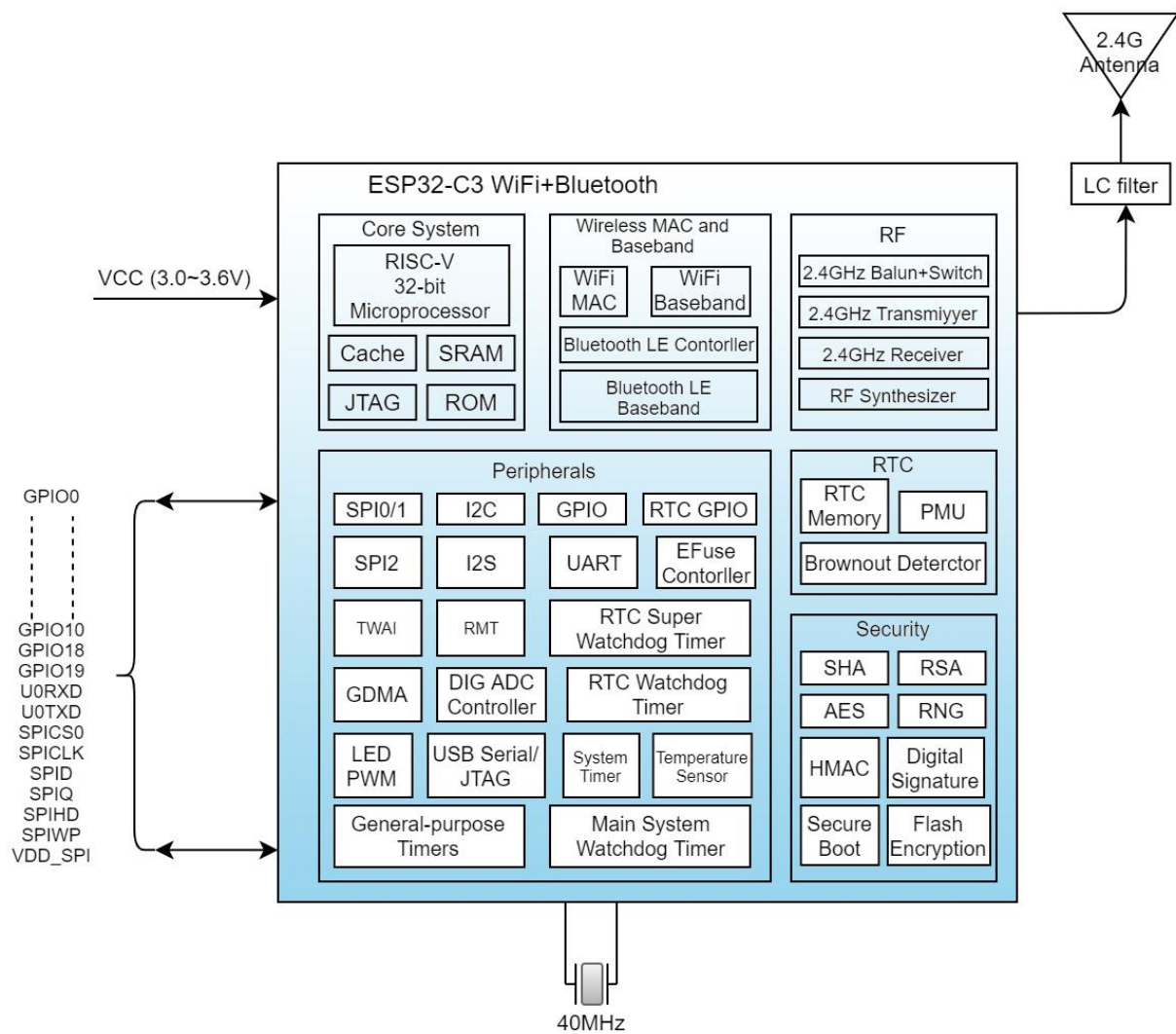
MS11SF1 module is an Wi-Fi 4 & BLE 5.0 Module based on ESP32-C3FN4. It features an RISC-V 32-bit single-core processor with an operating frequency of up to 160MHz. The MS11SF1 supports development using AT commands, sending AT commands through the serial port to configure Wi-Fi and BLE to achieve the pass-through function. Besides, you can develop your own firmware by using the ESP-IDF development framework.

The MS11SF1 comes with 22 GPIO pins and integrate a rich set of peripherals including UART, SPI, I2C, I2S, ADC, TWAI (compatible with ISO 11898-1 protocol), LED PWM controller, USB (compatible with 2.0 full speed standard), JTAG controller, temperature sensor, RMT (infrared remote control), and etc.

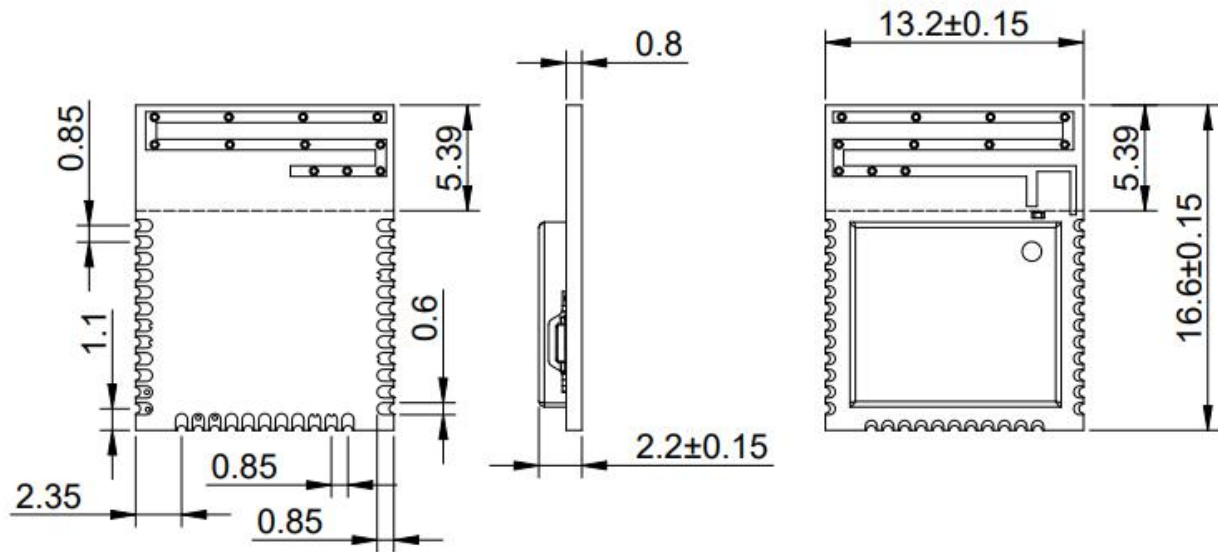
1.1 Ordering information

Ordering number	Description
MS11SF11-001	ESP32-C3FN4, QFN32, PCB Antenna, Reel pack

2 Block Diagram

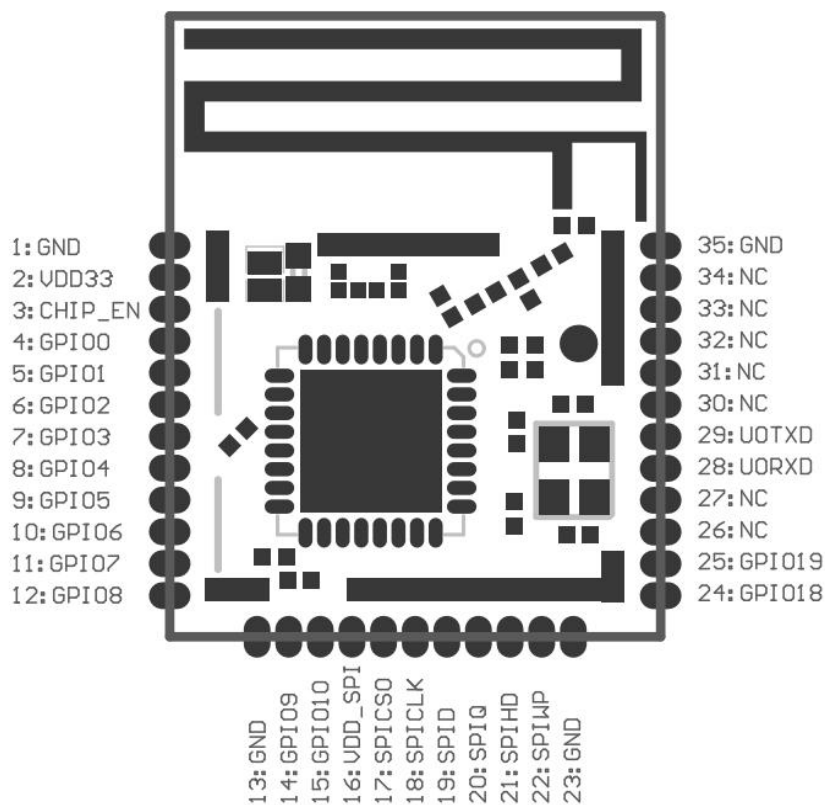


3 Mechanical Drawing



Important: Unit: mm Tolerance: +/- 0.1, default
Recommend solder pad size: 1.7*0.8mm
Recommend the pad extends out:0.5mm

4 Pin assignment



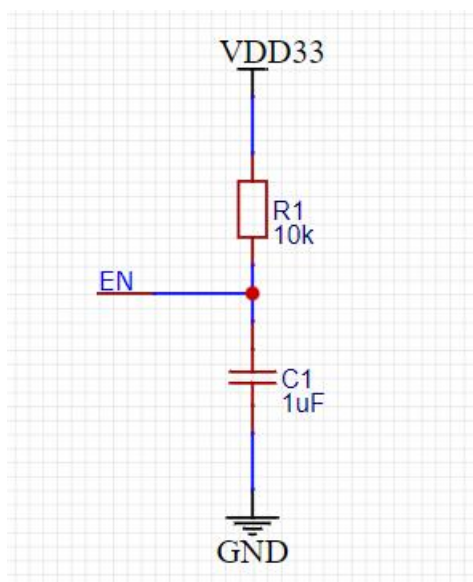
4.1 Pin definition

Symbol	Type	Description
GND	Ground	
VDD33	Power supply	
CHIP_EN	High: on, enables the chip Low: off, the chip powers off	Do not leave the EN pin floating
GPIO0	GPIO0, ADC1_CH0, XTAL_32K_P	External 32.768K crystal oscillator can be connected
GPIO1	GPIO1, ADC1_CH1, XTAL_32K_N	
GPIO2	GPIO2, ADC1_CH2, FSPIQ	
GPIO3	GPIO3, ADC1_CH3	
GPIO4	GPIO4, ADC1_CH4, FSPIHD, MTMS	
GPIO5	GPIO5, ADC2_CH0, FSPIWP, MTDI	
GPIO6	GPIO6, FSPICK, MTCK	UART1; After AT firmware preload, can be used for serial communication.
GPIO7	GPIO7, FSPID, MTDO	
GPIO8	GPIO8	
GND	Ground	
GPIO9	GPIO9	
GPIO10	GPIO10, FSPICS0	
VDD_SPI	GPIO11	VDD_SPI is used to supply power to the built-in or external flash of the chip by default. It can be used as GPIO11 only when an external flash is connected and an external flash power supply is connected.
SPICS0	GPIO14, SPICS0	
SPICK	GPIO15, SPICK	
SPID	GPIO16, SPID	
SPIQ	GPIO17, SPIQ	

SPIHD	GPIO12, SPIHD	
SPIWP	GPIO13, SPIWP	
GND	Ground	
GPIO18	GPIO18, USB_D-	Built-in USB to JTAG.
GPIO19	GPIO19, USB_D+	
NC	Empty	
U0TXD	GPIO21, U0TXD	Available for AT firmware programming.
U0RXD	GPIO20, U0RXD	
NC	Not available	
GND	Ground	

Notice:

1. The MS11SF1 has a total of 3 SPIs (SPI0, SPI1 and SPI2). SPI0 and SPI1 can be configured in SPI memory mode, and SPI2 can be configured in general SPI mode.
2. GPIO11-GPIO17 have been connected to the SPI Flash pins inside the module and are not recommended for other functions.
3. In order to ensure the regular power supply when the MS11SF1 module is used, an RC delay circuit needs to be added to the EN pin. The RC is usually recommended to be $R = 10\text{ k}\Omega$, $C = 1\text{ }\mu\text{F}$.



GPIO	Default state	SPI boot mode	Download Boot Mode
GPIO2	None	1	1
GPIO8	None	Don't care	1
GPIO9	Internal pull-up	1	0

5 Module startup mode

6 Power consumption description

6.1 RF power consumption

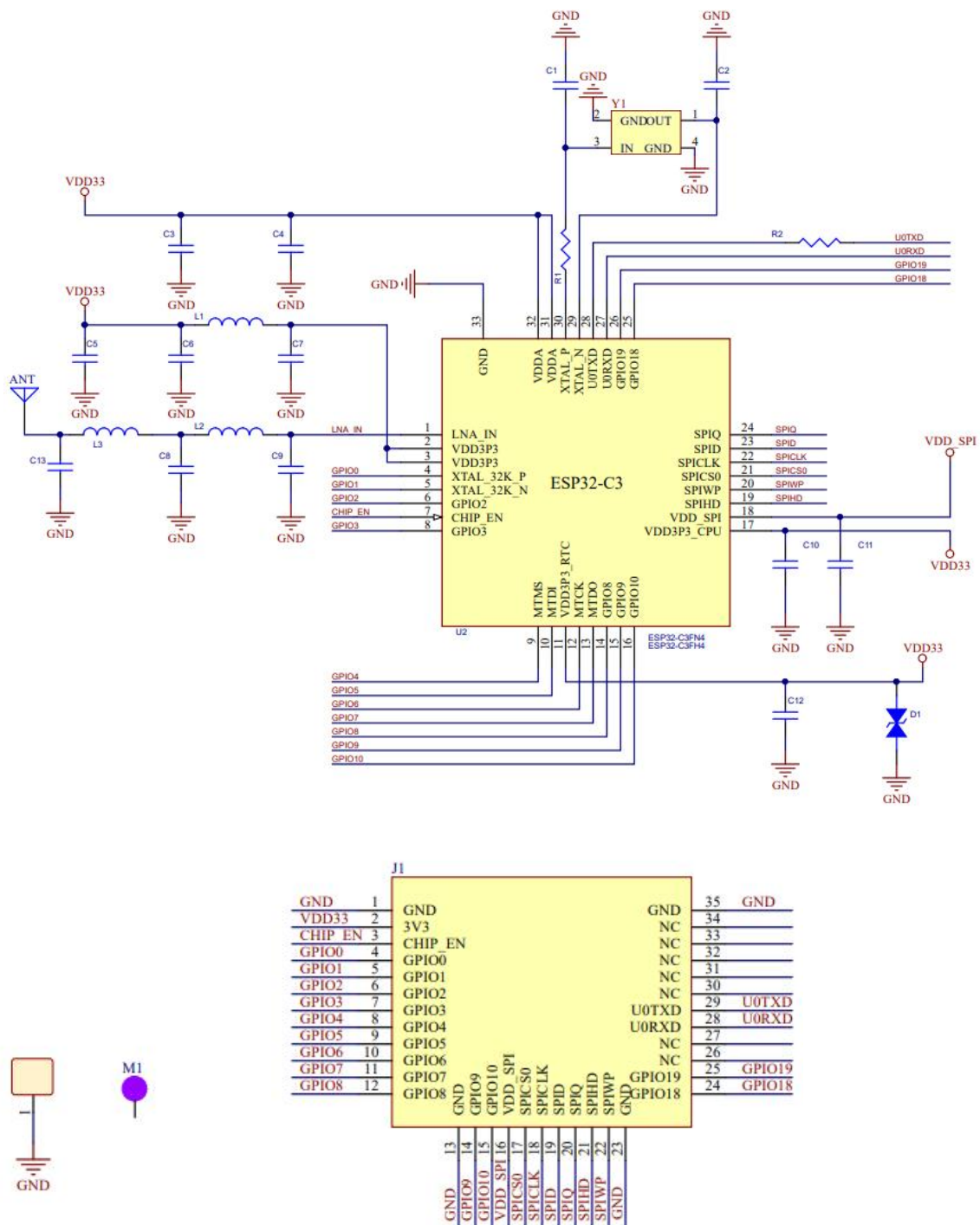
The following power consumption figures are based on 3.3 V power supply, 25 °C ambient temperature, and test results done at the RF interface.

Operating mode		Working status	Peak (mA)	Average value (mA)
RF work	TX	TX-802.11b, 1Mbps, @21dBm	371.18	354.53
		TX-802.11g, 54Mbps, @19dBm	289.38	263.59
		TX-802.11n, HT20-MCS7, @18.5dBm	273.81	251.22
		TX-802.11n, HT40-MCS7, @18.5dBm	249	220.4
	RX	RX-802.11n, HT20-MCS7	95.38	83.88
		RX-802.11n, HT40-MCS7	102.87	86.36

6.2 Power management

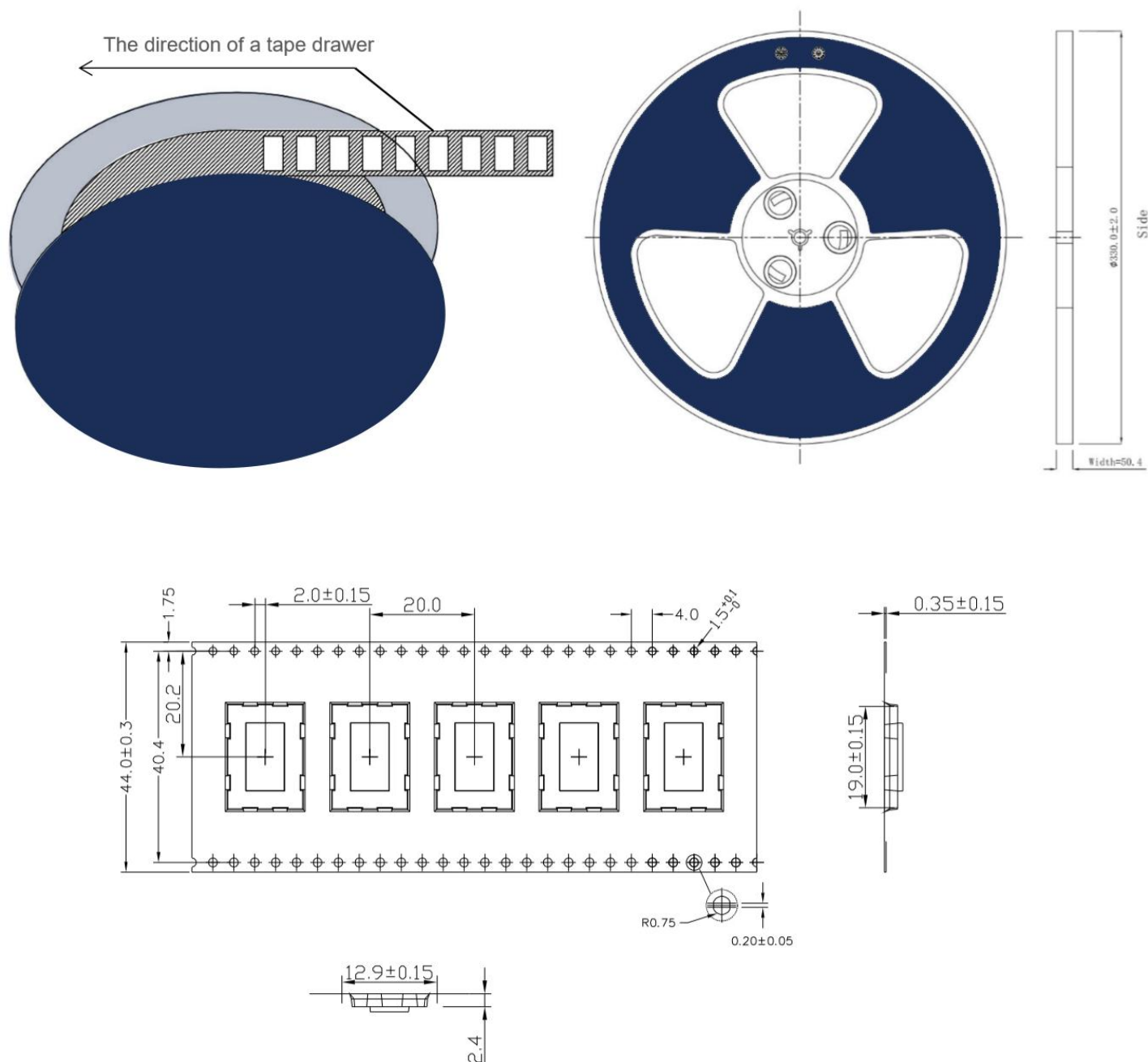
Operating mode	Working status	Average value
Modem-sleep	CPU is powered on and clock frequency configurable; Wi-Fi, BLE baseband and RF off; Wi-Fi or BLE to stay connected.	25.04mA
Light-sleep	CPU is powered off; Host, MAC, RTC timer, external interrupt can wake up the chip; Wi-Fi or BLE to stay connected.	153μA
Deep-sleep	The RTC memory is in working state; The RTC memory is in working state; The RTC clock timer or RTC GPIO can wake up the chip.	5.74μA
Power off	The CHIP_EN pin is pulled low and the chip is turned off.	0.31μA

7 Module schematic



8 Package Information

8.1 Package dimension

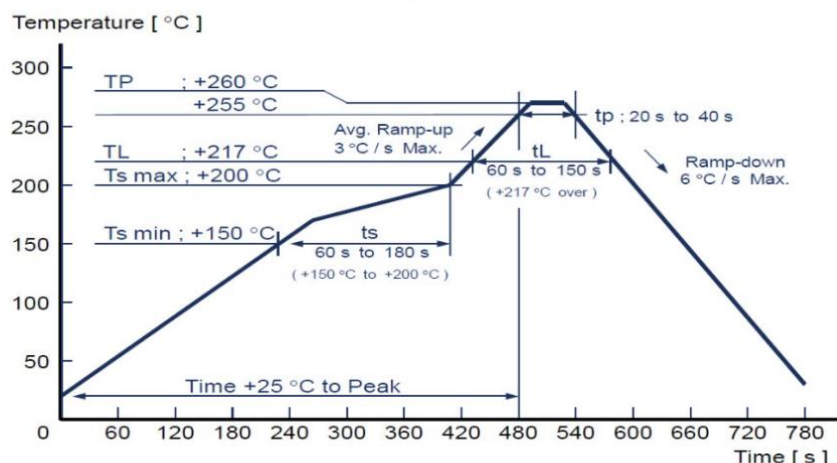


8.2 Details of Package Dimension:

Details	Reel-MS11SF1
Quantity(module)	850PCS
Net Weight	903.8g
Gross Weight	1172g
Dimension	W: 44mm T: 0.35mm

9 Reflow and Soldering

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 (T _{smin})	100°C	150°C
Preheat Temperature max (T _{smax})	150°C	200°C
Preheat Time (T _{smin} to T _{smax})(t _s)	60-120 sec	60-120 sec
Average ramp-up rate (T _{smax} to T _p)	3°C/second max	3°C/second max
Liquidous Temperature (T _L)	183°C	217°C
Time (t _L) Maintained Above (T _L)	60-90 sec	30-90 sec
Peak Temperature (T _p)	220-235°C	230-250°C
Average ramp-down rate (T _p to T _{smax})	6°C/second max	6°C/second max
Time 25°C to peak temperature	6 minutes max	8 minutes max

Important:

- When SMT involves double-sided patch, it is recommended that the module surface be reflowed only once.
- For module SMT, 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.
- 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.

10 Notes & Cautions

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

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10.1 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.

10.2 Layout notes

To make sure wireless performance is at its best condition, please layout the MS45SF1 module on the carrier board as below instructions and picture.

a) Placement of the antenna

The antenna area of module shall lay clearance completely and should not be blocked by the metal. Otherwise it will have effect on antenna performance (As the picture indicated below).

b) Placement of top-layer

The placement of top-layer in carrier board shall be lay copper completely to reduce the signal line in carrier board or other interference.

c) Clearance

The upper and below area of antenna (including the case) shall have 4mm or more than 4mm clearance to reduce the influences for antenna.



*The Grey area above is Carrier board.

10.3 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.

10.4 Handling and storage

- 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°C to $+125^{\circ}\text{C}$ 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 interval of 7 to 30 days during SMT process,

10.5 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.

11 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:

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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.

12 Revision History

Version	Date	Notes	Contributor(s)	Person of Approve
1.0	2022-06-27	First edition	Jason	Coral

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