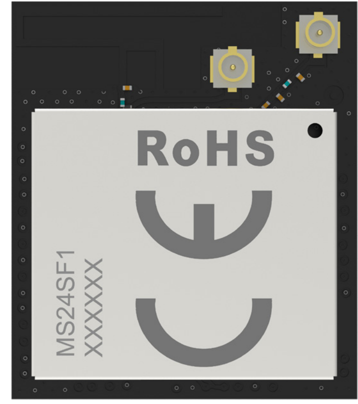
MINEWSEMI

LoRa Module
MS24SF1



Datasheet

V 1.0.0

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Version Note

Version	Details	Contributor(s)	Date	Notes
1.0.0	First edit	Vincle, Leo	2024.06.06	

Part Number

Model	Hardware Code
MS24SF18-001	8Y40AI
MS24SF13-001	3Y40AI

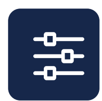
MS24SF1-nRF52840+SX1262

Ultra-long-range,IPEX+PCB design,high-sensitivity,BLE5.3, Dual-low-power-chip-combo

MS24SF1 module is integrates both BLE and LoRa wireless connectivity modes, supporting FSK, GFSK, and LoRa modulation modes. It enables point-to-point communication and supports data transmission via BLE. The device is initially shipped as a blank module with demo firmware for testing purposes. It offers long-range communication capabilities, extremely low power consumption. LoRa™ modulation technology resolves the challenge of simultaneously achieving long-distance communication, interference resistance, and low power consumption, which traditional design approaches struggle with.

FEATURES

Available with ARM Cortex-M4 core



Low power and dual low-power chip combo

Long range transmission, City environment 5KM

Exclusive dual IPEX+PCB design, flexible antenna optional

BLE antenna support PCB and IPEX optional

BLE5.3, support BLE long-range

More IO port support, UART, SPI, I2C, etc.

KEY PARAMETER

MS24SF1			
Chip Model	nRF52840+SX1262	**Antenna**	PCB+IPEX
Module size	27x23.5x2.8mm	**GPIO**	35
Receiving Sensitivity	LoRa: -146dBm BLE: -96dBm, 1Mbps -103dBm, 125Kbps	**Transmission Power**	LoRa: +22dBm BLE: -40 ~ +8dBm
Current(TX)	122.8mA	**Current(RX)**	9.3mA

APPLICATION

Smart city

smart medical care

Cold chain transport

Security warning equipment

Environmental sensor

Instrument and meter Smart meter

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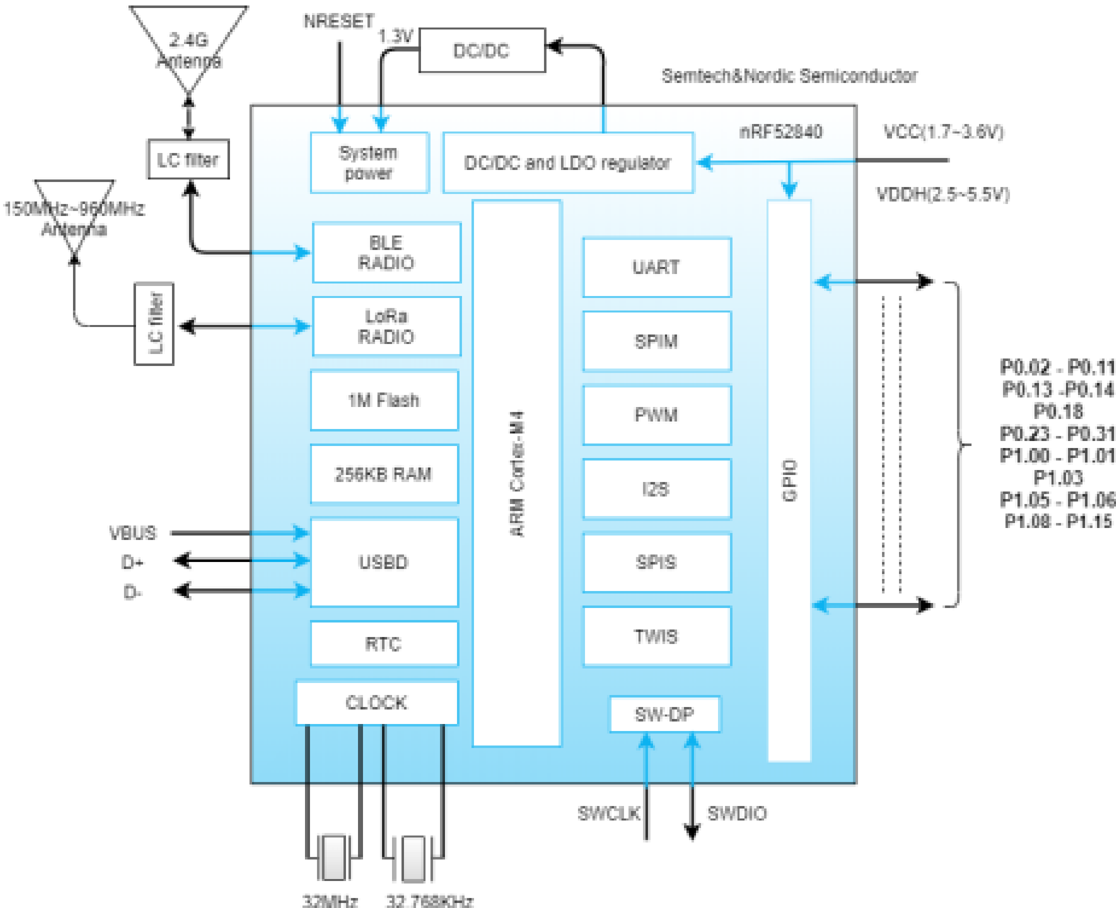
1 BLOCK DIAGRAM



2 ELECTRICAL SPECIFICATION

Parameter	Values	Notes
Operation Voltage	1.7V-3.7V	To ensure RF work, supply voltage suggest not lower than 3.3V
Operation Temperature	-40℃~+85℃	
Transmission Power	LoRa：+22dBm BLE：+8dBm	Configurable
ISM Frequency	LoRa:150~960MHz BLE:2.4GHz	Optional， default 868MHZ
Current(RX)	9.3mA	RX mode
Current(TX)	122.8mA	TX mode
Module Dimension	27x23.5x2.8mm	
Quantity of IO Port	35	GPIOs、I2C、I2S、PWM、UART

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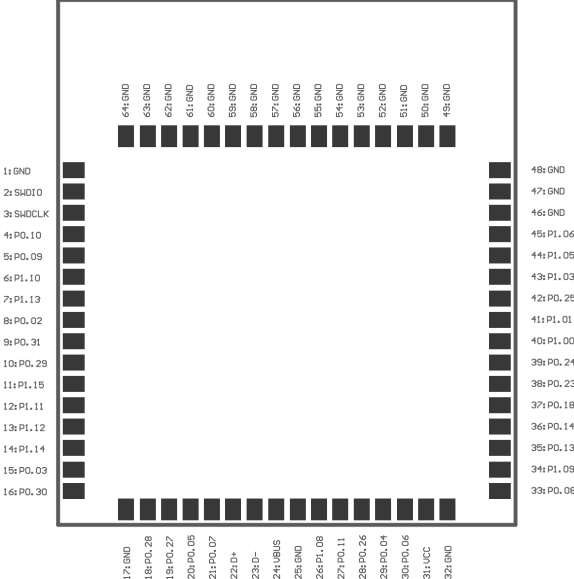
3 PIN DESCRIPTION



4 PIN DEFINITION

Number	Symbol	Type	Function description	Notes
	VCC		Power supply positive	Power supply,1.7V~3.6V,
	VBUS		Power supply	standard 3.3V
	GND		Power supply negative pole	Power conversion access needed for USB port
	SWDCLK/SWDIO		Used to burn firmware	Ground
	P0.02 - P0.11		GPIO	General Purpose IO Port
	P0.13 -P0.14		GPIO	General Purpose IO Port
	P0.23 - P0.31		GPIO	General Purpose IO Port
	P1.00 - P1.01		GPIO	General Purpose IO Port
	P1.03		GPIO	General Purpose IO Port
	P1.05 - P1.06		GPIO	General Purpose IO Port
	P1.08 - P1.15		GPIO	General Purpose IO Port
	D+		USB port	USB D+
	D-		USB port	USB D-
	P0.18		RESET	Reset pin

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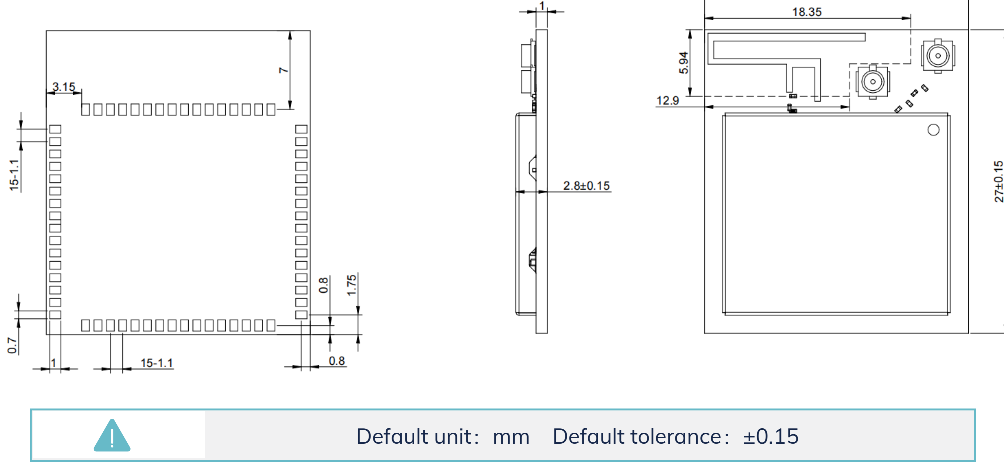
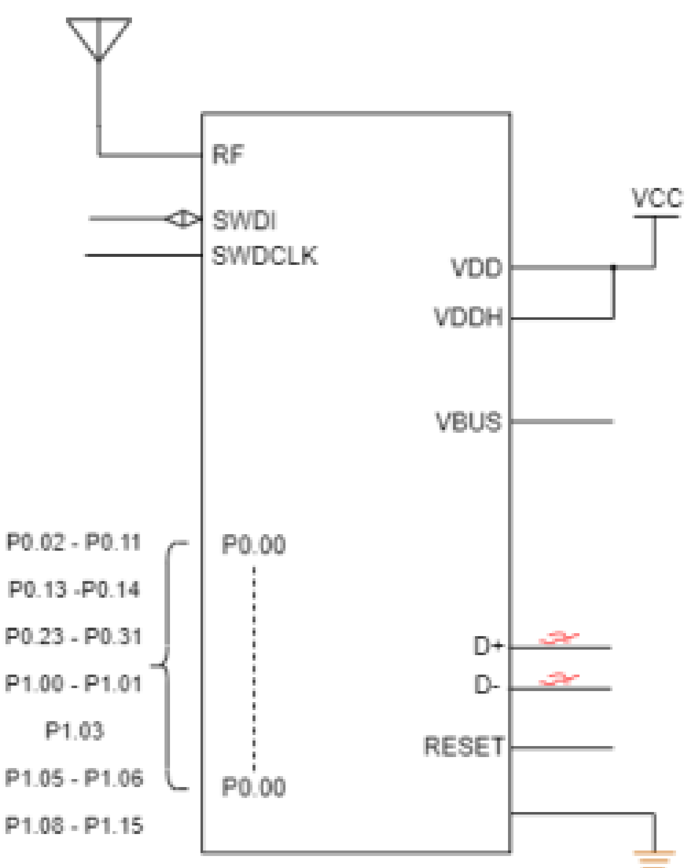
5 MECHANICAL DRAWING



Default unit：mm Default tolerance：±0.15

6 MODULE CONNECTION DESCRIPTION

6.1 Connection diagram



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6.2 Power supply

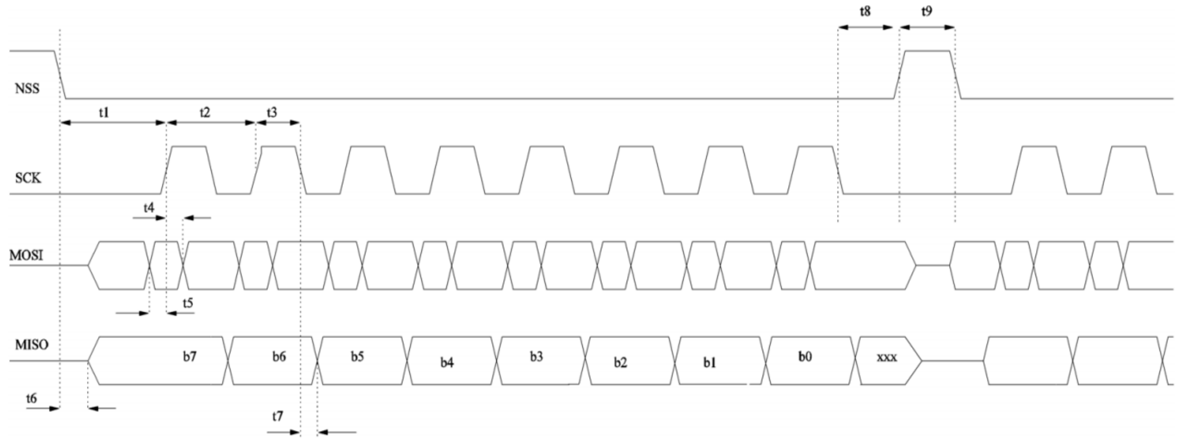
The chip-sets operating voltage range is 1.8V-3.6V, to ensure normal use, the power supply voltage shall be 3.3V as far as possible.

6.3 SPI Interface character

The SPI runs on an external SCK clock, allowing it to reach 16MHz.
Transmission is initiated when the NSS pin level goes low. When NSS is high, MISO is in a high impedance state.
SPI Timing Requirements (The chip implements only the Slave side function.)

Symbol	Description	Minimum	Typical	Maximum	unit
t1	NSS falling edge to SCK setup time	32	-	-	ns
t2	SCK period	62.5	-	-	ns
t3	SCK high time	31.25	-	-	ns
t4	MOSI to SCK hold time	5	-	-	ns
t5	MOSI to SCK setup time	5	-	-	ns
t6	MOSI to SCK setup time	0	-	15	ns
t7	SCK falling to MISO delay	0	-	15	ns
t8	SCK to NSS rising edge hold time	31.25	-	-	ns
t9	NSS high time	125	-	-	ns
t10	NSS falling edge to SCK setup time when switching from SLEEP to STDBY_RC mode	100	-	-	s
t11	NSS falling to MISO delay when switching from SLEEP to STDBY_RC mode	0	-	150	s

Active Timing



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6.3.1 DIO with IRQ control

Commands Controlling the Radio IRQs and DIOs(At least one DIO is required for IRQ, and BUSY cable is also required to be used compulsorily）.

Command	Operate code	Parameters	Description
SetDioIrqParams	0x08	IrqMask[15:0], Dio1Mask[15:0], Dio2Mask[15:0], Dio3Mask[15:0],	Configure the IRQ and the DIOs attached to each IRQ
GetIrqStatus	0x12	-	Get the values of the triggered IRQs
ClearIrqStatus	0x02	-	Clear one or several of the IRQs
SetDIO2AsRfSwitchCtrl	0x9D	Enable	Configure radio to control an RF switch from DIO2
SetDIO3AsTcxoCtrl	0x97	tcxoVoltage, timeout[23:0]	Configure the radio to use a TCXO controlled by DIO3

6.3.2 Module TX,RX Mode controls

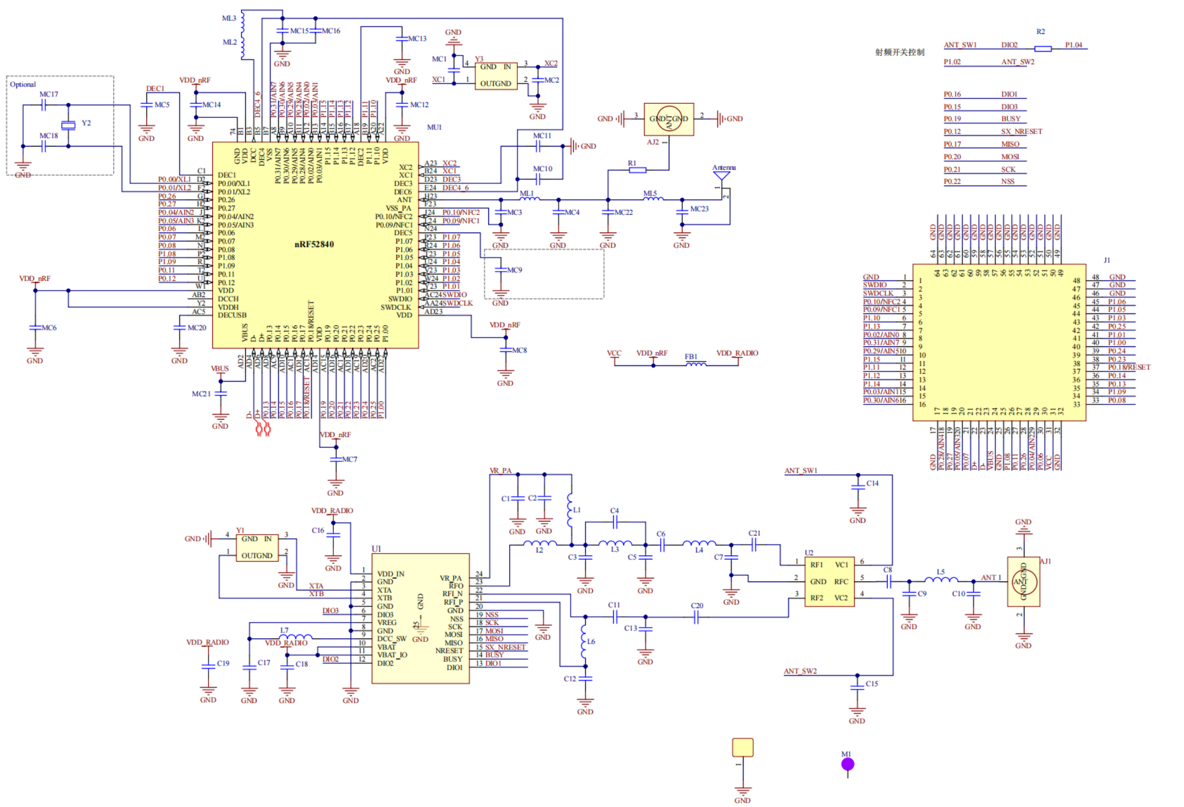
P1.04 detection of TX and RX level pins, P1.02 is Synchronous control pin:

1)When P1.04 detects a high level, pin P1.02 sets the level to low, the mode is TX mode.

2)When P1.04 detects a low level, pin P1.02 sets the level to high, the mode is RX mode.

Mode	P1.04	P1.02
TX	1	0
RX	0	1

7 ELECTRICAL SCHEMATIC



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8 PCB LAYOUT

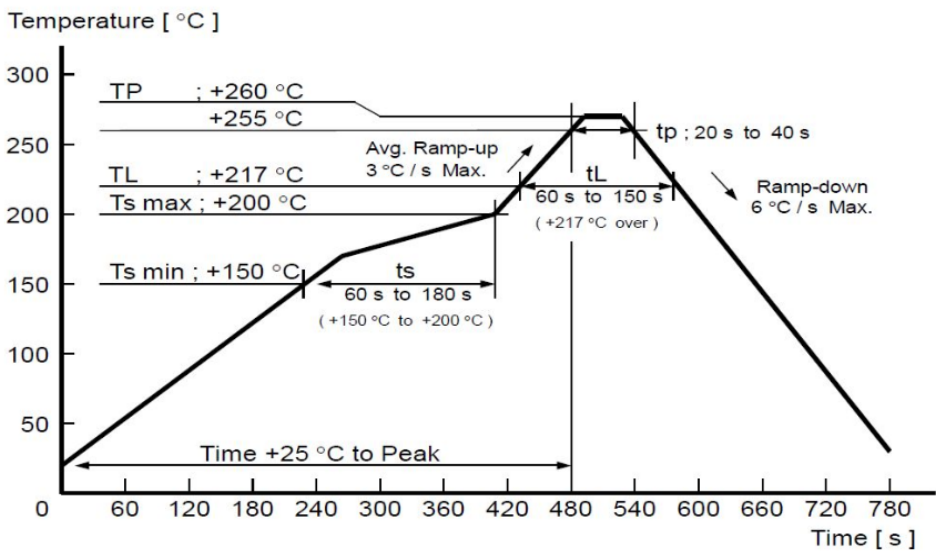
Module antenna area couldn't have GND plane or metal cross line, couldn't place components nearby. It is better to make hollow out or clearance treatment or place it on the edge of PCB board.

Layout Notes:

1) Preferred Module antenna area completely clearance and not be prevented by metals, otherwise it will influence antenna's effect (as above DWG. indication).
2) Cover the external part of module antenna area with copper as far as possible to reduce the main board's signal cable and other disturbing.
3) It is preferred to have a clearance area of 4 square meter or more area around the module antenna (including the shell) to reduce the influence to antenna.
4) Device should be grounded well to reduce the parasitic inductance.
5) Do not cover copper under module's antenna in order to avoid affect signal radiation or lead to transmission distance affected.
6) Antenna should keep far from other circuits to prevent radiation efficiency reduction or affects the normal operation of other lines.
7) Module should be placed on edge of circuit board and keep a distance away from other circuits.
8) Suggesting to use magnetic beads to insulate module's access power supply.

9 REFLOW AND SOLDERING

1) Do SMT according to above reflow oven temperature deal curve. Max. Temperature is 260℃;
Refer to IPC/JEDEC standard; Peak TEMP<260℃; Times: ≤2 times, suggest only do once reflow soldering on module surface in case of SMT double pad involved. Contact us if special crafts involved.



2) Suggesting to make 0.2mm thickness of module SMT for partial ladder steel mesh, then make the opening extend 0.8mm
3) After unsealing, it cannot be used up at one time, should be vacuumed for storage, couldn't be exposed in the air for long time. Please avoid getting damp and soldering-pan oxidizing. If there are 7 to 30 days interval before using online SMT, suggest to bake at 65-70 ℃ for 24 hours without disassembling the tape.
4) Before using SMT, please adopt ESD protection measure.

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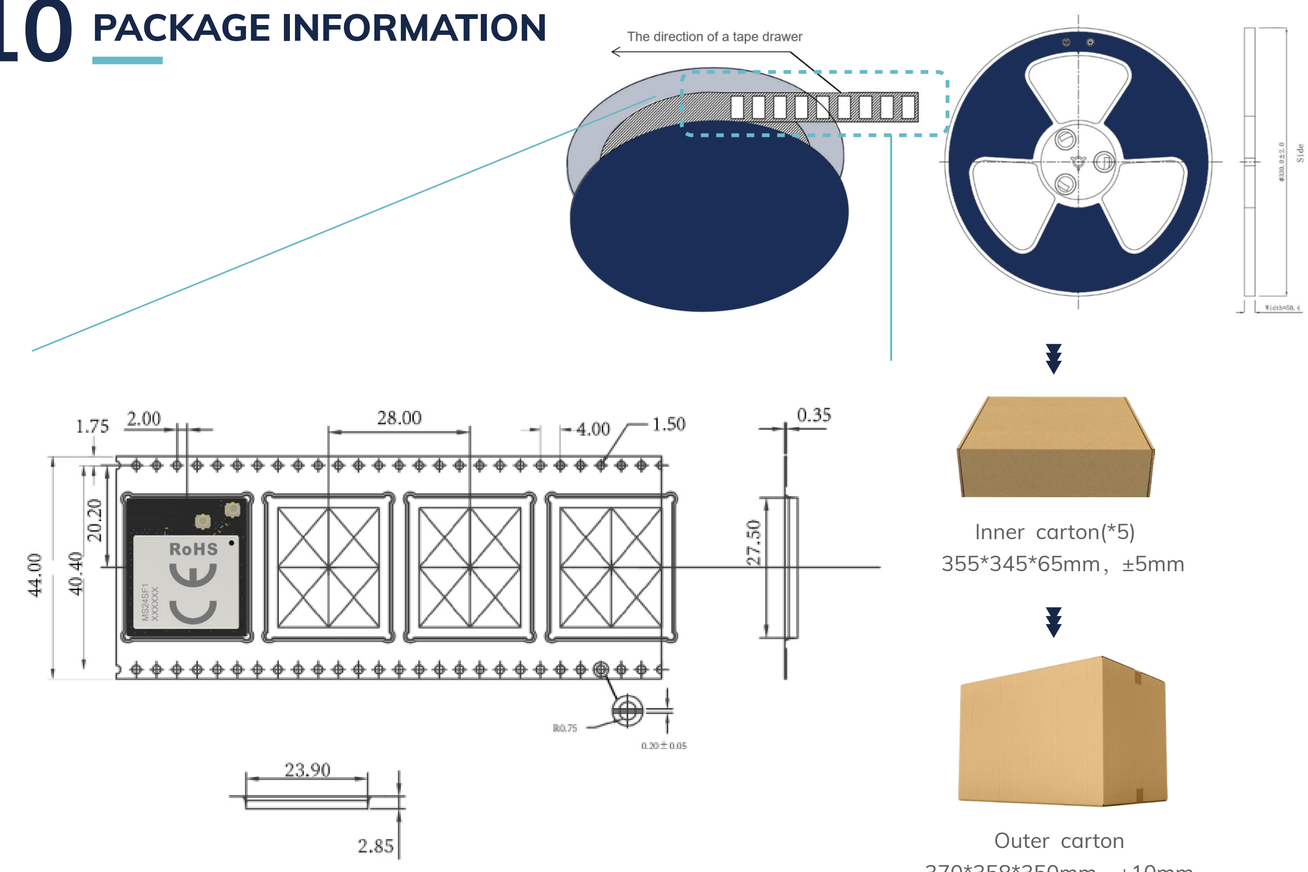
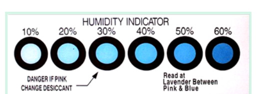
10 PACKAGE INFORMATION



Remarks

General material list for FCL packaging:

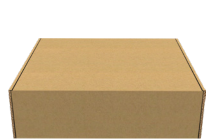
Carrier tape packaging tray



Humidity Indicator
(1 pcs/bag)

Desiccant
(placed in a vacuum bag)

Vacuum bag



Inner carton(*5)
355*345*65mm，±5mm

Outer carton
370*358*350mm，±10mm

Other:

Moisture-proof label (attached to the vacuum bag)

Certification label (attached to the vacuum bag)

Outer box label

Default unit：mm Default tolerance：±0.1

Packing detail	Specification	Net weight	Gross weight	Dimension
MS24SF1	850PCS	-	-	W=44mm，T=0.35mm

Note: Default weight tolerance all are within 10g（except the special notes）

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11 STORAGE CONDITIONS

- **Please use this product within 6 months after signing the receipt.**
  - This product should be stored without opening the package at an ambient temperature of 5~35°C and a humidity of 20~70%RH.
  - This product should be left for more than 6 months after receipt and should be confirmed before use.
  - The product must be stored in a non-corrosive gas (Cl2, NH3, SO2, NOx, etc.).
  - To avoid damaging the packaging material, do not apply any excessive mechanical shocks, including but not limited to sharp objects adhering to the packaging material and product dropping.

- **This product is suitable for MSL2 (based on JEDEC standard J-STD-020).**
  - After opening the package, the product must be stored at ≤30°C/<60%RH. It is recommended to use the product within 3-6 months after opening the package.
  - When the color of the indicator in the package changes, the product should be baked before welding.

- **Baking is not required for one year if exposure is limited to <30°C and 60%RH. Refer to MSL2 for exposure criteria for moisture sensitivity level. If exposed to (≥168h@85°C/60%RH) conditions or stored for more than one year, recommended baking conditions.**

  1. 120 +5/-5°C, 8 hours, 1 time

  Products must be baked individually on heat-resistant trays because the materials (base tape, reel tape, and cover tape) are not heat-resistant, and the packaging material may be deformed at temperatures of 120℃;

  2、90℃ +8/-0℃， 24hours，1times

  The base tape can be baked together with the product at this temperature. Please pay attention to the uniformity of heat.

12 HANDLING CONDITIONS

• Be careful in handling or transporting products because excessive stress or mechanical shock may break products.

• Handle with care if products may have cracks or damages on their terminals. If there is any such damage, the characteristics of products may change. Do not touch products with bare hands that may result in poor solder ability and destroy by static electrical charge.

13 QUALITY

Cognizant of our commitment to quality, we operate our own factory equipped with state-of-the-art production facilities and a meticulous quality management system. We hold certifications for ISO9001, ISO14001, ISO27001, OHSA18001, BSCI.

Every product undergoes stringent testing, including transmit power, sensitivity, power consumption, stability, and aging tests. Our fully automated module production line is now in full operation, boasting a production capacity in the millions, capable of meeting high-volume production demands.

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14 COPYRIGHT STATEMENT

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15 RELATED DOCUMENTS

- SX1261-2_Chip_Datasheet
  https://en.minewsemi.com/file/SX1261-2_Chip_Datasheet_EN.pdf
- nRF52840_Chip_Datasheet
  https://en.minewsemi.com/file/nRF52840_Chip_Datasheet_EN.pdf
- MinewSemi_Product_Naming_Reference_Manual_V1.0
  https://en.minewsemi.com/file/MinewSemi_Product_Naming_Reference_Manual_EN.pdf
- MinewSemi_Connectivity_Module_Catalogue_V2.0
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