

LoRa Module

MS24SF1

Datasheet

V 1.0.0

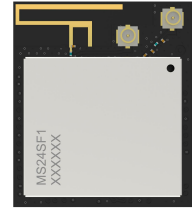
Applicable Product Model
MS24SF1

Version Note

Version	Details	Contributor(s)	Date	Notes
1.0.0	First edit	Vinle	2023.06.16	

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.

■ Application

- Security and early warning equipment
- Smart metering
- Agricultural sensors
- Retail Store Sensor street

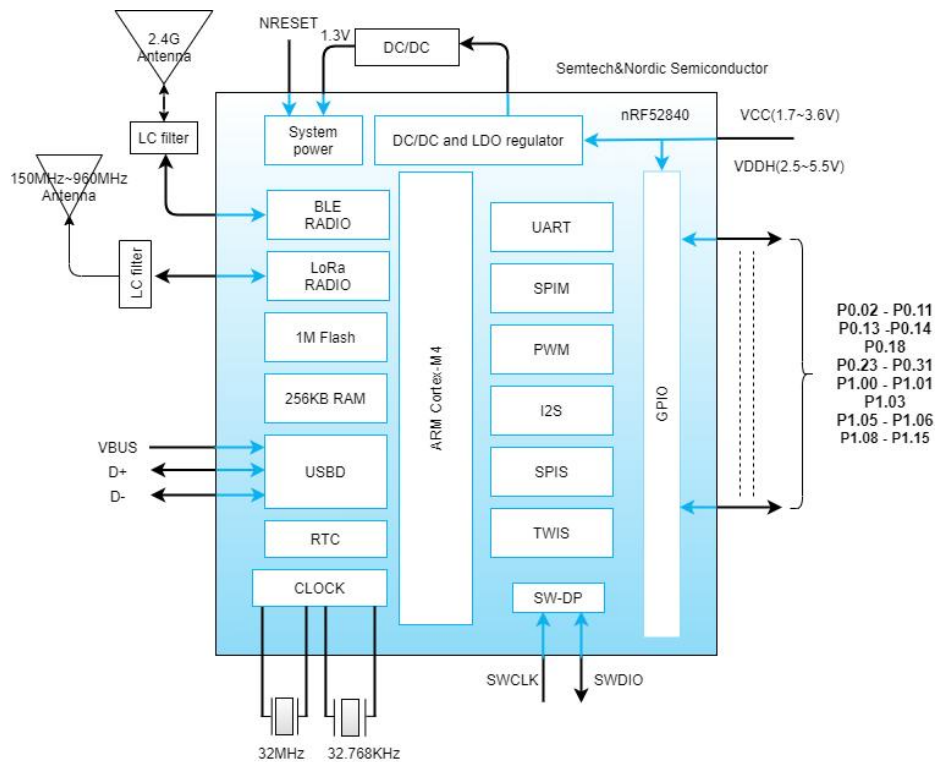
■ Key parameter

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

INDEX

1 Block Diagram	5
2 Electrical Specification	5
3 Pin Description	6
4 Pin Definition	7
5 Mechanical Drawing	8
6 Module Connection Description	8
6.1 Connection diagram	8
6.2 Power supply	9
6.3 SPI Interface character	9
6.3.1 Internal DIO with IRQ control	10
6.3.2 Module TX, RX Mode controls	11
7 Electrical Schematic	11
8 PCB Layout	12
9 Reflow and Soldering	13
10 Package Information	14
Quality	15
Contact Us	15
Copyright Statement	16

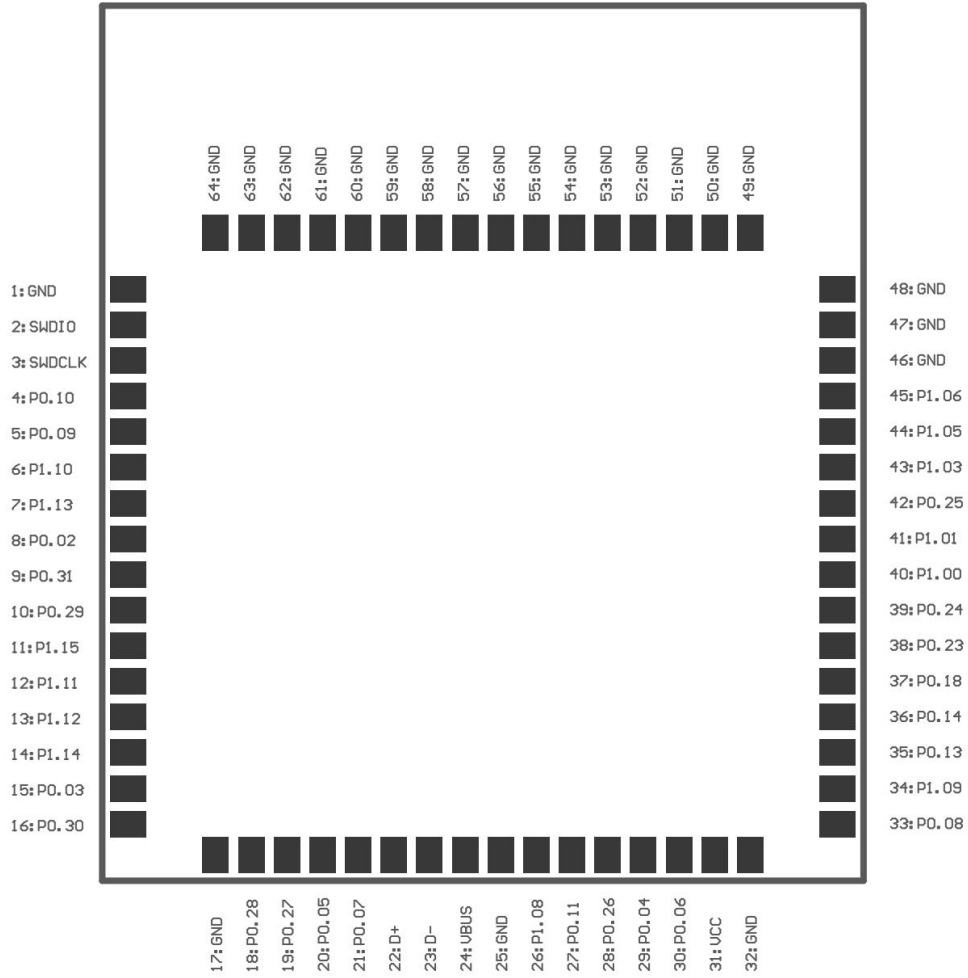
1 Block Diagram



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°C~+85°C	
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

3 Pin Description

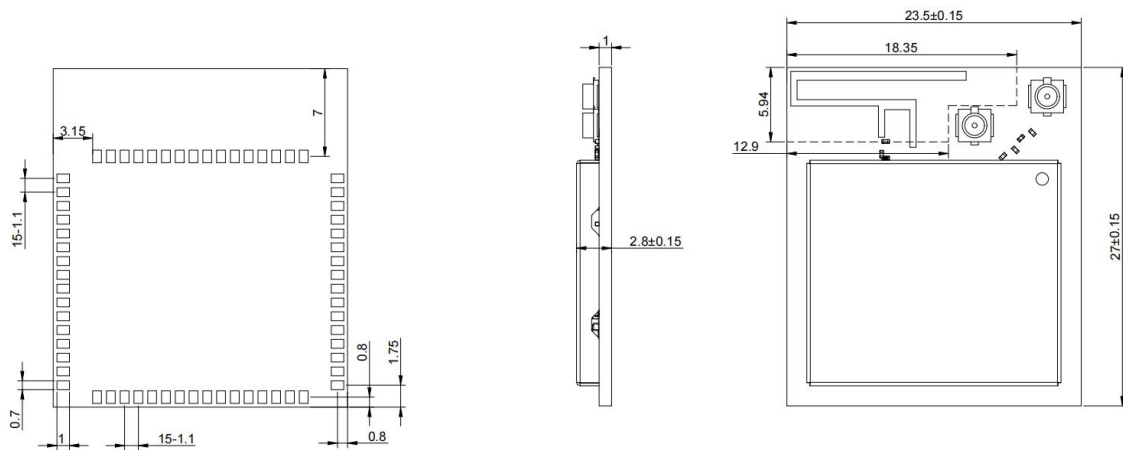


(Top View)

4 Pin Definition

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

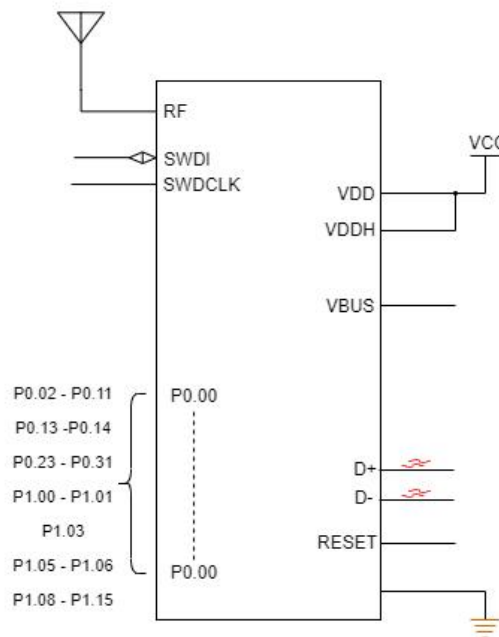
5 Mechanical Drawing



* (Default unit: mm Default tolerance: ±0.1)

6 Module Connection Description

6.1 Connection diagram



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

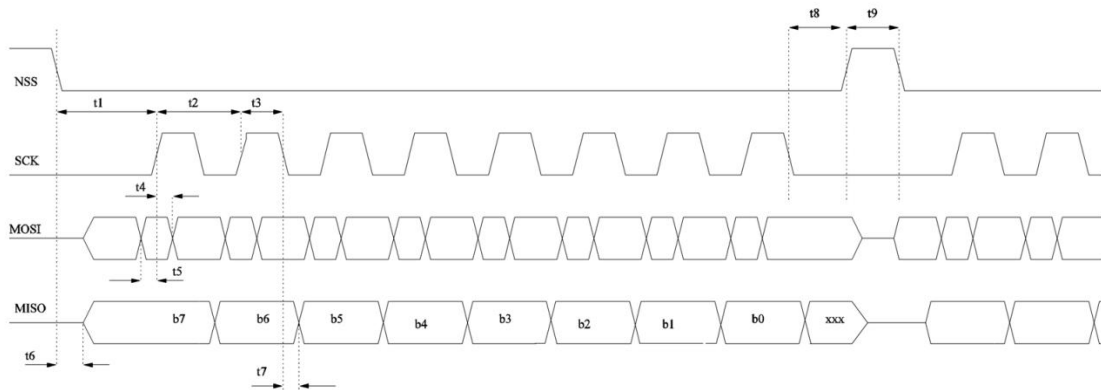
The SPI runs on an external SCK clock, allowing it to reach 16MHz.

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



6.3.1 Internal 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

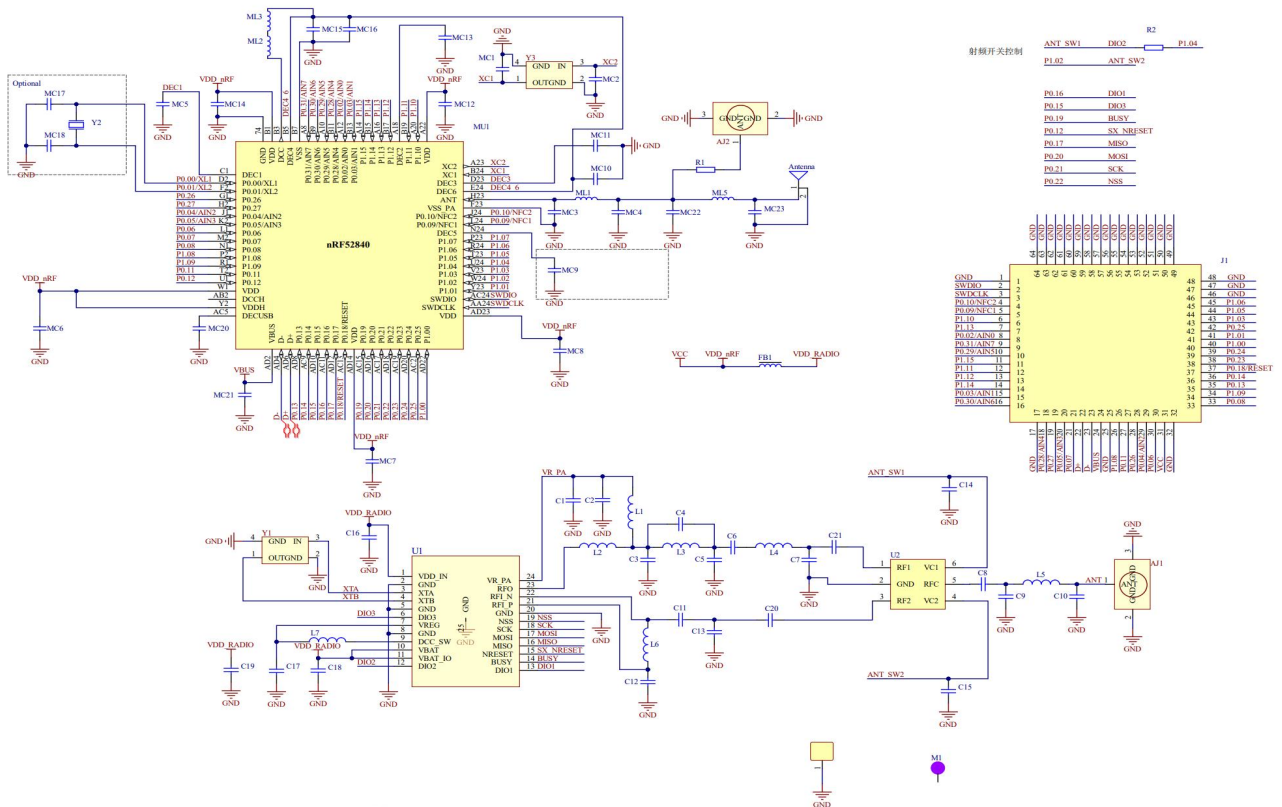
6.3.2 Module TX, RX Mode controls

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



Note: Before placing an order, please confirm the specific configuration required

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.

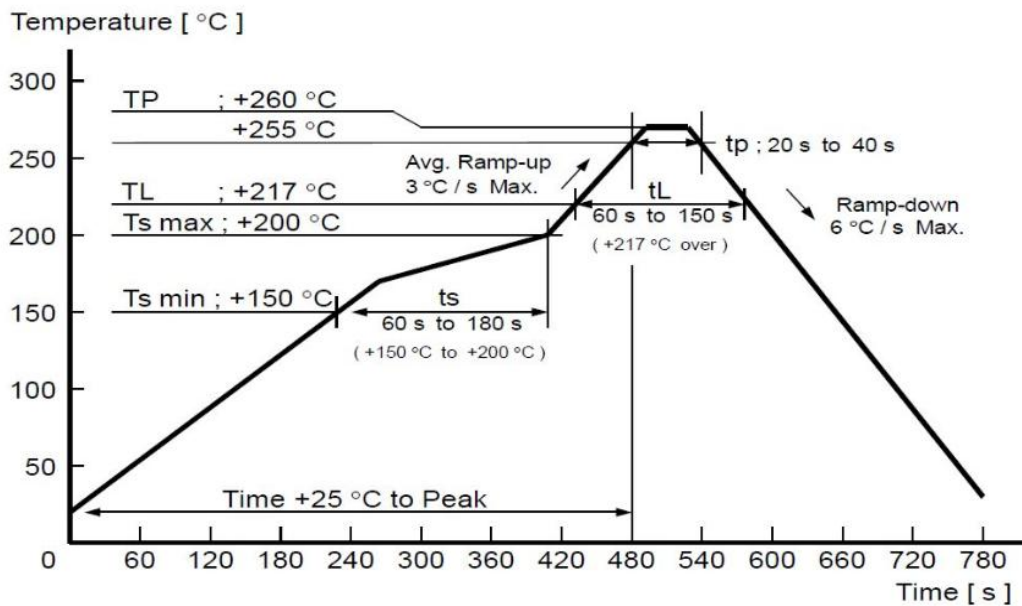
Layout notes:

- 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

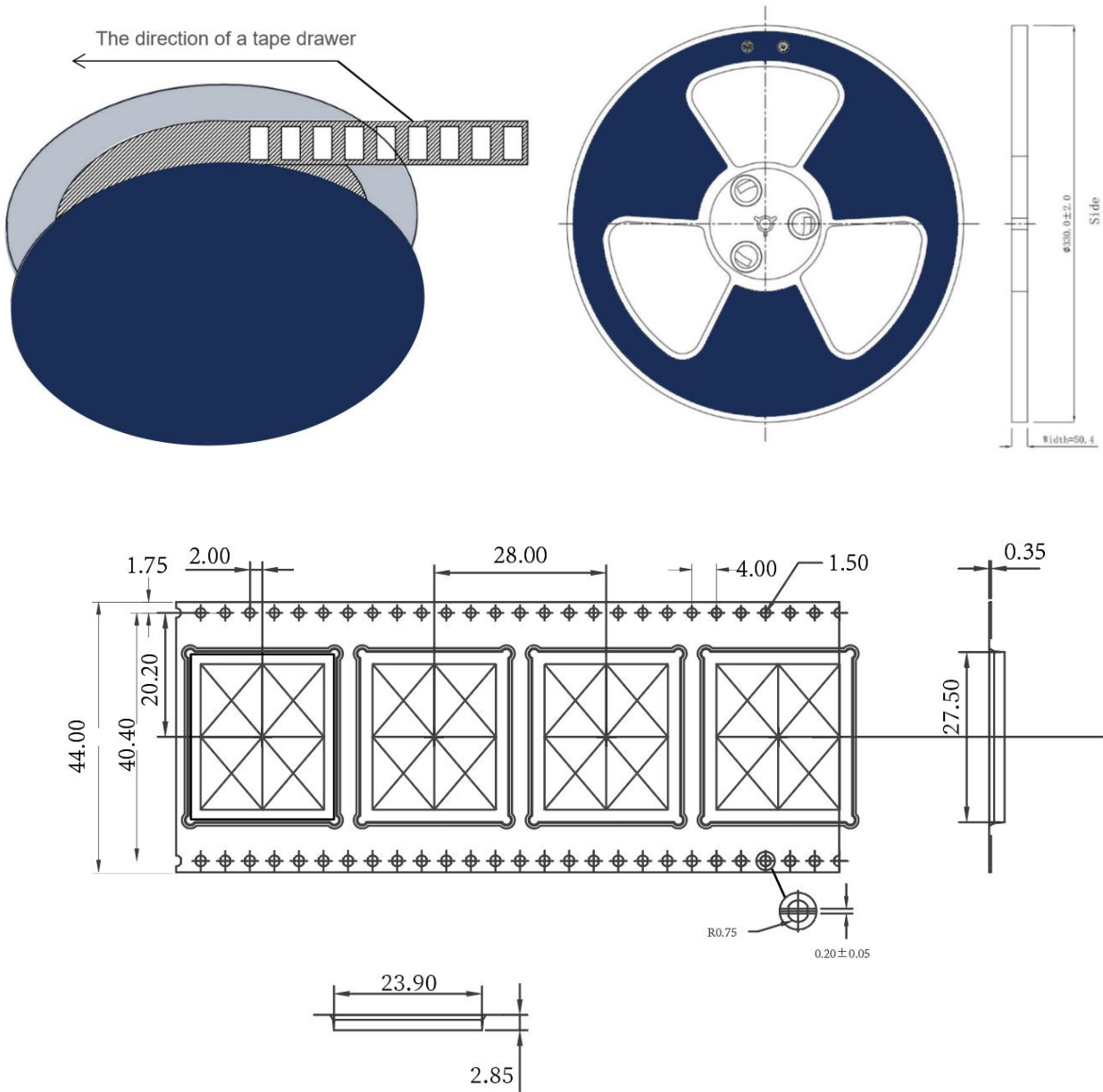
1) Do SMT according to above reflow oven temperature deal curve. Max. Temperature is 260°C;

Refer to IPC/JEDEC standard; Peak TEMP<260°C; 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 °C for 24 hours without disassembling the tape.
- 4) Before using SMT, please adopt ESD protection measure.

10 Package Information



* (Default unit: mm Default tolerance: ± 0.1)

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

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

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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.

● Contact Us

Shenzhen Minewsemi Co., Ltd. is committed to swiftly delivering top-quality connectivity modules to our customers. For assistance and support, please feel free to contact our relevant personnel, or contact us as follows:

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