MINEWSEMI

Bluetooth LE Module

ME54BS02

Datasheet

V 0.6.0

Version Note

Version	Details	Contributor(s)	Date	Notes
0.6.0	First edit	Michelle, Leo	2024.08.06	

Part Number

Model	Hardware Code
ME54BS02	1Y20TI

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https://en.minewsemi.com/file/ME54BS02-nRF54H20_Datasheet_K_EN.pdf

ME54BS02-nRF54H20

Best-in-class, ultra-low power consumption, Bluetooth module supporting BLE5.4

ME54BS02 is a highly integrated, ultra-high performance, ultra-low power Bluetooth module based on nRF54H20. nRF54H20 integrates multiple Arm Cortex-M33 processors and RISC-V coprocessors with clock frequencies up to 320 MHz, and each processor is optimized for a specific type of workload. In addition, it also comes with 2 MB non-volatile MRAM and 1 MB static RAM, and is designed for PSA Level 3 certification with high security protection. The hardware is equipped with an onboard antenna, and the integrated design highlights the higher performance of the nRF54 series and provides more GPIO development and use. At the same time, the ultra-low system power consumption and excellent RF performance as well as other powerful supporting resources are very suitable for Bluetooth low-power applications and Bluetooth high-end applications.

FEATURES

- Bluetooth 5.4
- Ultra-high performance
- Ultra-low Power
- Hardware support for 802.15.4, Bluetooth mesh, LE Audio, Thread, Matter, ANT and other protocol development

KEY PARAMETER

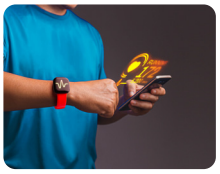
ME54BS02-nRF54H20			
Chip Model	nRF54H20	**Antenna**	PCB
Module Size	16.5×12.0×2mm	**GPIO**	64
Flash	2MB MRAM	**RAM**	1MB RAM
Receiving Sensitivity	-100dBm	**Transmission Power**	~ +10dBm
Current(TX)	2.5mA	**Current(RX)**	5.6mA

*Note: Considering that MRAM is a magnetic memory, there may be strong magnetic interference in a strong magnetic field scene causing abnormal module operation or chip damage. Specific to the actual use of the situation shall prevail.

APPLICATION

Smart Home

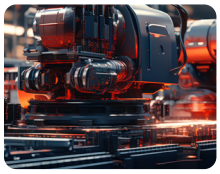
Virtual Reality and Augmented Reality



Advanced Wearables

Electric Vehicles

Medical Devices



Industrial IoT

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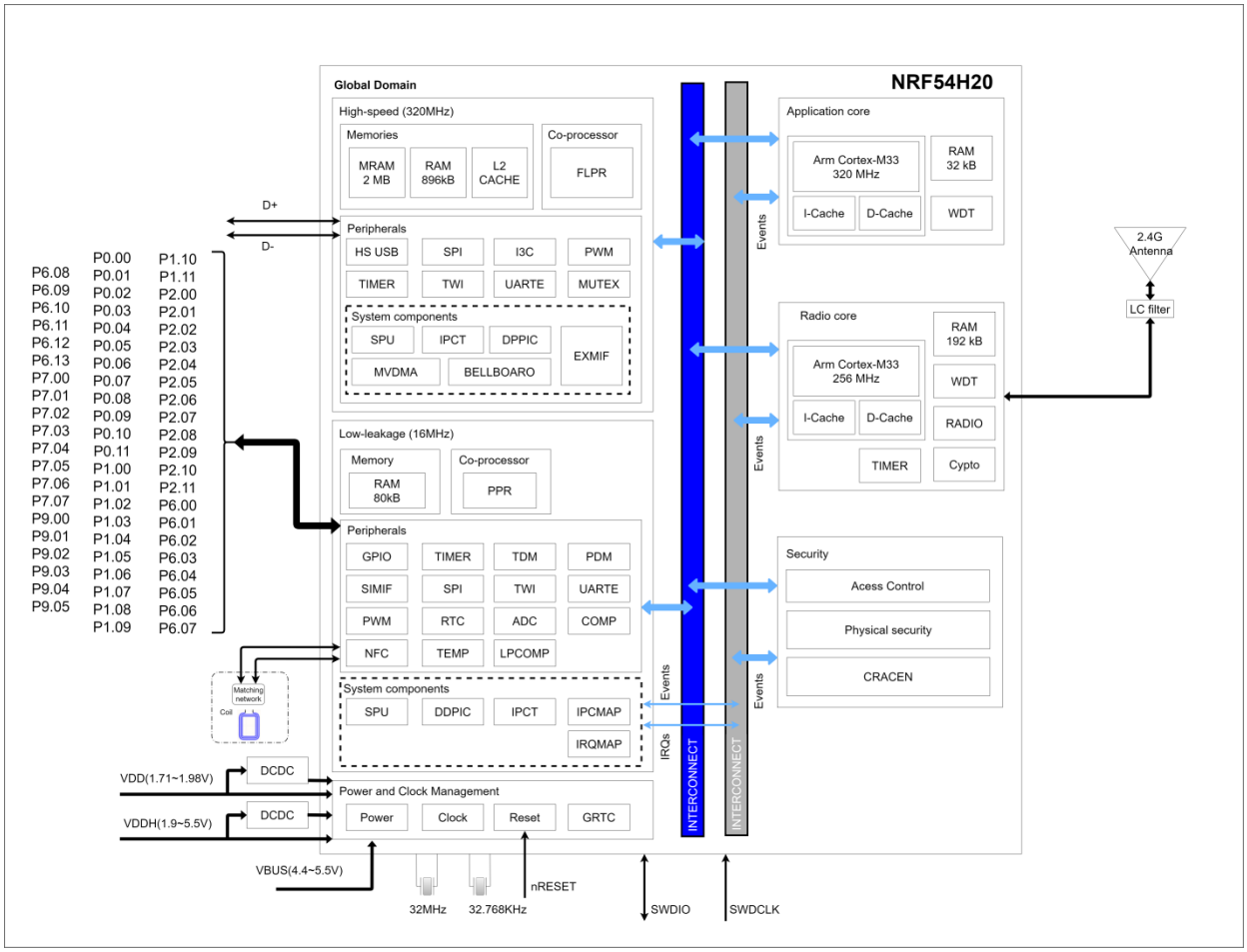
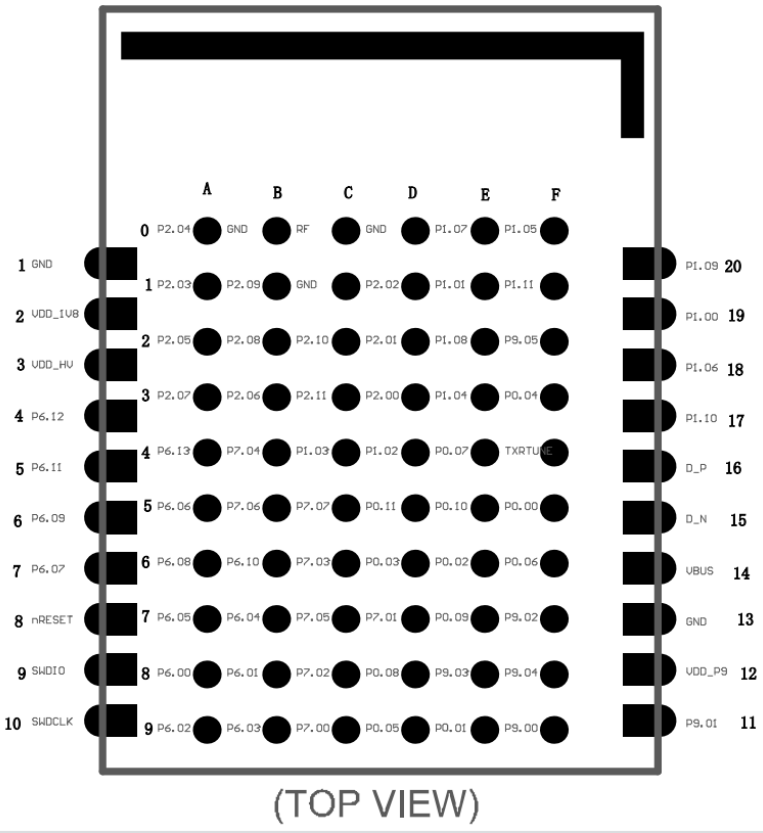
1 BLOCK DIAGRAM



2 ELECTRICAL SPECIFICATION

Parameter	Values	Notes
Working Voltage	1.71~1.98V/ 1.8-5.5V	Both types of power supply can be used, in order to ensure that the RF work, the use of 1.8-5.5V power supply voltage is recommended not less than 3V
Working Temperature	-40℃~+85℃/ -40℃~+105℃	85/105°C optional, storage temperature is -40℃~+105℃
Transmitting Power	~ +10dBm	Configurable
Current(RX)	5.6mA	3V RF receiving current in 1Mbps mode
Current(TX)	2.5mA	3V RF transmitting current in 0dB mode
Module Dimension	16.5*12.0*2mm	
Quantity of IO Port	64	

3 PIN DESCRIPTION



4 PIN DEFINITION

The following table summarizes the available GPIO ports and the number of pins per port.

Pin Number	Available pins	Pad type	Definition
P0	[11:0]	1V8 - Slow	Always-on port
P1	[11:0]	1V8 - Slow	Analog peripherals
P2	[11:0]	1V8 - Slow	Slow peripherals
P6	[13:0]	1V8 - Fast	EXMIF + Fast peripherals
P7	[7:0]	1V8 - Fast	Fast peripherals
P9	[5:0]	3V3 - Slow	Analog peripherals

*Note: P0-P7 is powered by 1.8V, 1.71~1.98V, which is different from the standard 3.3V power supply of other modules. When using standard 3.3V output devices, the hardware design needs to consider level conversion.

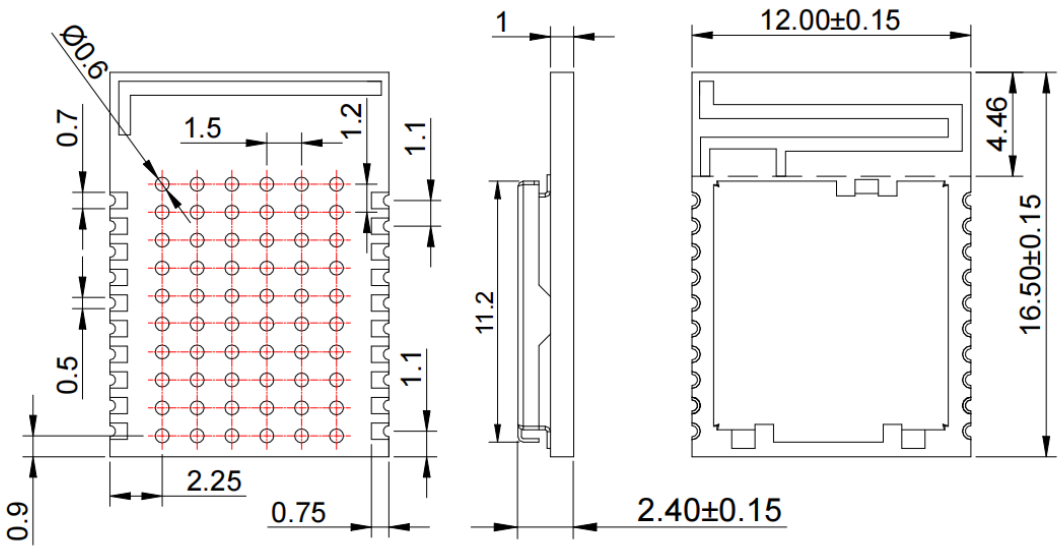
Module specific pin definitions are shown in the table:

Pin Number	Symbol	Type	Definition
1/13	GND	GND	GND
2	VDD_1V8	Power	Power supply, 1.71~1.98V, power supply with this pin, then VDD_HV suspended
3	VDD_HV	Power	Power supply, 1.8-5.5V, with this pin power supply, then VDD_1V8 suspended, the power supply has been converted to 1.71~1.98V by the internal circuitry to supply power to the P0/P1/P2/P6/P7 pins.
4	P6.12	I/O;RESETN	General purpose I/O；EXMIF RESETN
5	P6.11	I/O;DQ4	General purpose I/O；EXMIF DQ4
6	P6.09	I/O;DQ3	General purpose I/O；EXMIF DQ3
7	P6.07	I/O;DQ0	General purpose I/O；EXMIF DQ0
8	nRESET	Reset pin	Reset
9/10	SWDIO/SWDCLK	Burn Pins	Burn pins, burn only need to connect the power supply pin, ground, and these two pins
11	P9.01	I/O	General purpose I/O
12	VDD_P9	Power	P9.00-P9.05 power supply pins,VDD_P9 power supply range: 1.62-3.6V, standard 3.3V
14	VBUS	Power	Power input to VREGUSB
15	D_N	USB	USB D-
16	D_P	USB	USB D+
17	P1.10	I/O	General purpose I/O
18	P1.06	I/O	General purpose I/O
19	P1.00	I/O	General purpose I/O
20	P1.09	I/O	General purpose I/O
A0	P2.04	I/O	General purpose I/O
A1	P2.03	I/O	General purpose I/O
A2	P2.05	I/O	General purpose I/O
A3	P2.07	I/O	General purpose I/O
A4	P6.13	I/O；CS1	General purpose I/O； Dedicated pin for Quad SPI
A5	P6.06	I/O；DQ6	General purpose I/O；EXMIF DQ6
A6	P6.08	I/O；DQ5	General purpose I/O；EXMIF DQ5
A7	P6.05	I/O；DQ1	General purpose I/O；EXMIF DQ1

Pin Number	Symbol	Type	Definition
A8	P6.00	I/O；CK	General purpose I/O；EXMIF CK
A9	P6.02	I/O；RWDS	General purpose I/O；EXMIF RWDS
B0	GND	GND	GND
B1	P2.09	I/O	General purpose I/O
B2	P2.08	I/O	General purpose I/O
B3	P2.06	I/O	General purpose I/O
B4	P7.04	I/O	General purpose I/O
B5	P7.06	I/O	General purpose I/O
B6	P6.10	I/O；DQ2	General purpose I/O；EXMIF DQ2
B7	P6.04	I/O；DQ7	General purpose I/O；EXMIF DQ7
B8	P6.01	I/O；CKN	General purpose I/O；EXMIF CKN
B9	P6.03	I/O；CS0	General purpose I/O；EXMIF CS0
C0	RF	External Antenna Pin	By default, the module comes with an antenna, this pin is directly suspended. If you don't use the module antenna, you can connect an external antenna through this pin, when connecting an external antenna, the module needs to connect the resistor with the antenna to this pin; you need to explain the configuration requirements with the salesperson.
C1	GND	GND	GND
C2	P2.10	I/O；NFC_N	General purpose I/O；NFC antenna connection
C3	P2.11	I/O；NFC_P	General purpose I/O；NFC antenna connection
C4	P1.03	I/O	General purpose I/O with analog functionality
C5	P7.07	I/O	General purpose I/O
C6	P7.03	I/O	General purpose I/O
C7	P7.05	I/O	General purpose I/O
C8	P7.02	I/O	General purpose I/O
C9	P7.00	I/O	General purpose I/O
D0	GND	GND	GND
D1	P2.02	I/O	General purpose I/O
D2	P2.01	I/O	General purpose I/O
D3	P2.00	I/O	General purpose I/O

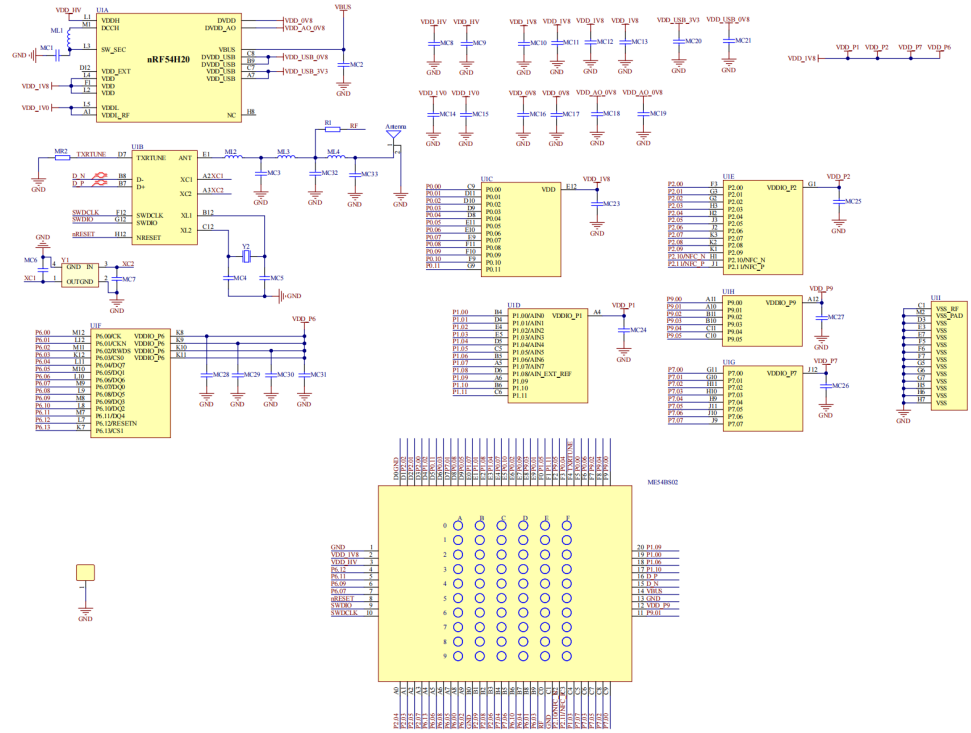
Pin Number	Symbol	Type	Definition
D4	P1.02	I/O	General purpose I/O with analog functionality
D5	P0.11	I/O	General purpose I/O
D6	P0.03	I/O	General purpose I/O
D7	P7.01	I/O	General purpose I/O
D8	P0.08	I/O	General purpose I/O
D9	P0.05	I/O	General purpose I/O
E0	P1.07	I/O	General purpose I/O with analog functionality
E1	P1.01	I/O	General purpose I/O with analog functionality
E2	P1.08	I/O	General purpose I/O with analog functionality
E3	P1.04	I/O	General purpose I/O with analog functionality
E4	P0.07	I/O	General purpose I/O
E5	P0.10	I/O	General purpose I/O
E6	P0.02	I/O	General purpose I/O
E7	P0.09	I/O	General purpose I/O
E8	P9.03	I/O	General purpose I/O
E9	P0.01	I/O	General purpose I/O
F0	P1.06	I/O	General purpose I/O
F1	P1.11	I/O	General purpose I/O
F2	P9.05	I/O	General purpose I/O
F3	P0.04	I/O	General purpose I/O
F4	TXRTU	USB Tune Pin	USB Transmitter Resistor Tune Pin
F5	P0.00	I/O	General purpose I/O
F6	P0.06	I/O	General purpose I/O
F7	P9.02	I/O	General purpose I/O
F8	P9.04	I/O	General purpose I/O
F9	P9.00	I/O	General purpose I/O

5 MECHANICAL DRAWING



Default unit: mm Default tolerance: ±0.15

6 ELECTRICAL SCHEMATIC



Notice: Before placing an order, please confirm the specific configuration required with the salesperson.

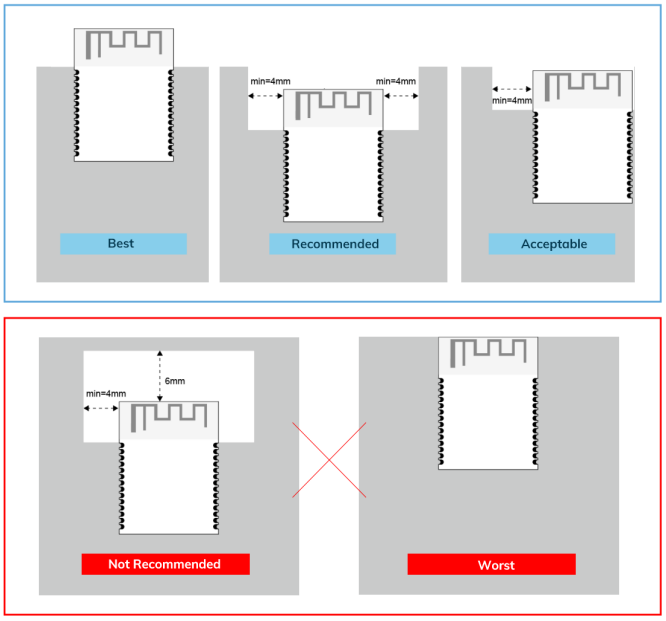
7 PCB LAYOUT

There should be no GND plane or metal cross wiring in the module antenna area, and components should not be placed nearby. It is best to make a hollow or clear area, or place it on the edge of the PCB board.

Notice: Refer to examples as below, and highly suggest to use the first design and the adjustment of modules antenna design according to the first wiring.

Layout Notes:

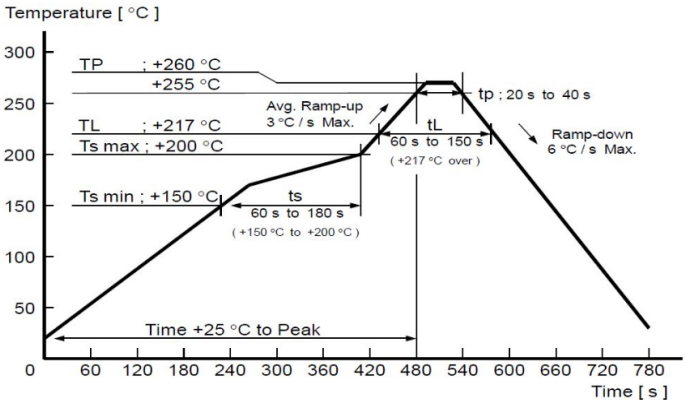
1) Preferred Module antenna area completely clearance and not be prevented by metals, otherwise it will influence antenna's effect (as above DWG. indication).
2) Cover the external part of module antenna area with copper as far as possible to reduce the main board's signal cable and other disturbing.
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.



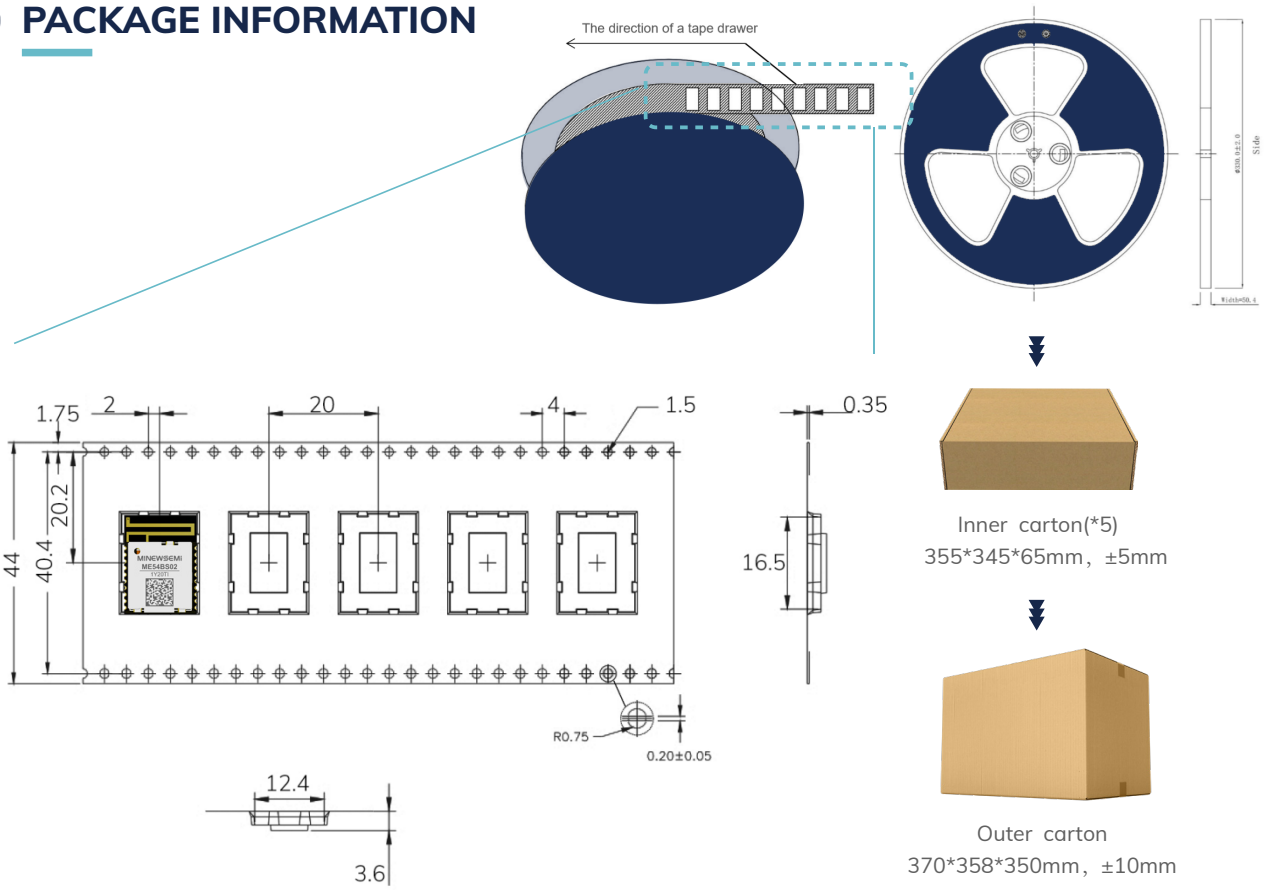
8 REFLOW AND SOLDERING

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.



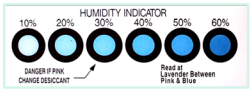
9 PACKAGE INFORMATION



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
ME54BS02	-	-	-	W=44mm，T=0.35mm

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

10 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 (CI2, 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.

11 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.

12 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 RELATED DOCUMENTS

- 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
  https://en.minewsemi.com/file/MinewSemi_Connectivity_Module_Catalogue_EN.pdf

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MINEWSEMI

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