# WiFi6 + BLE5.3 Combo Module

# MS12SF1

# MS12SF1-nRF7002+nRF5340

## Dual-Core,High-performance,ultra-low-power,Support AP/STA Mode,-Support WiFi6 Dual-band that 2.4G and 5G ,1T1R

MS12SF1 WiFi6+BLE Combo Module adopts integrated nRF7002 and nRF5340 chip, supports BLE mode, at the same time supports WiFi6 dual-band connection, 2.4G and 5G function adopts WiFi and BLE independent antenna design, have no crosstalk between functions. One device can support two wireless connection mode of WiFi and BLE. output Maximum power up to 21dBm, receiving current in 2.4G frequency region is 56mA, while in 5G frequency region is 58mA, meanwhile supports BLE master/slave mode and passthrough mode, adopts WiFi and BLE independent design, no crosstalk.

## FEATURES

Bluetooth 5.3

Dual-Core

Ultra-low-power

High-performance

Support WiFi6
Dual-band that 2.4G and 5G ,1T1R

## KEY PARAMETER

| MS12SF1 | | | |
|---|---|---|---|
| **Chip Model** | nRF7002+nRF5340 | **Antenna** | PCB/IPEX |
| **Module size** | 27×23.5×2.4mm | **GPIO** | 29 |
| **Flash** | 1MB+256KB | **RAM** | 512KB+64KB |
| **Receiving Sensitivity** | -98dBm | **Transmission Power** | BLE:-40 ~ +3dBm WiFi:+21dBm |
| **Current(TX)** | 2.4G-191mA 5G-260mA | **Current(RX)** | 2.4G-56mA 5G-58mA |
| **Firmware** | / | | |

## APPLICATION

Smart Buildings

Consumer Electronics

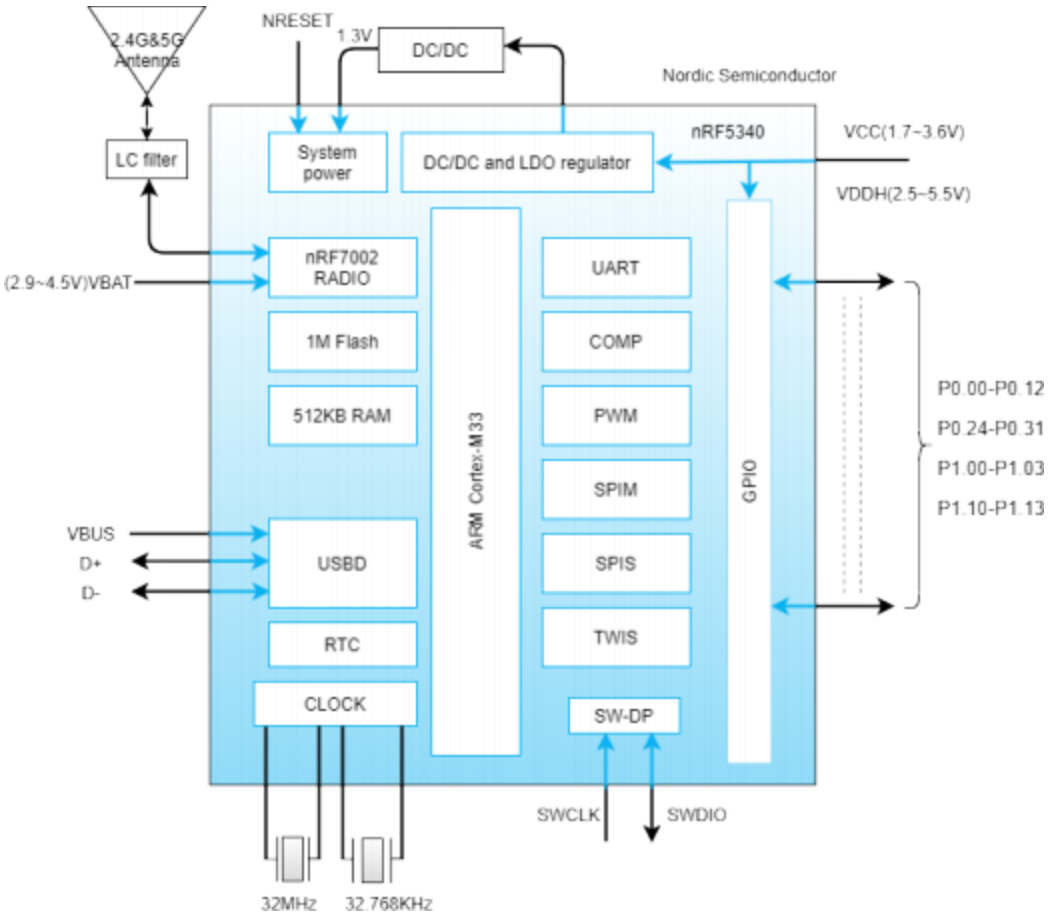
Smart Agriculture

Security Equipment

Intelligent wearable device

Automotive Devices

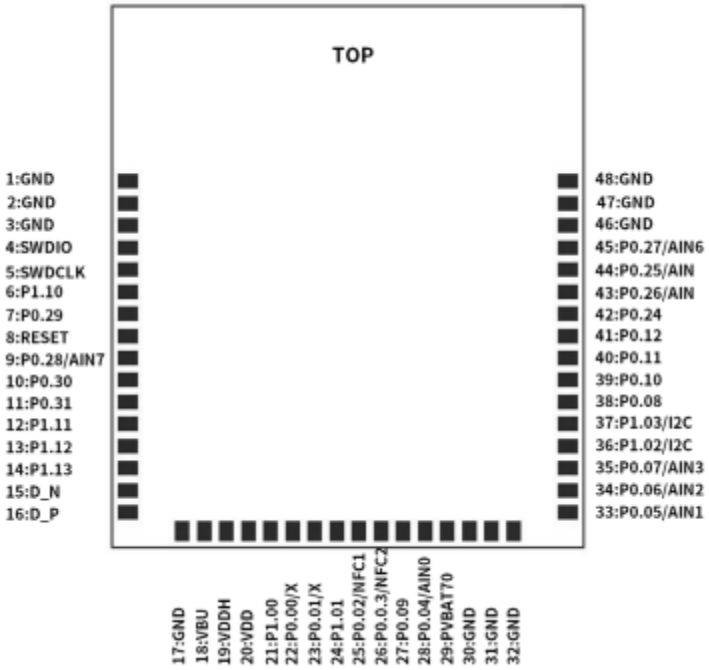
# 1 BLOCK DIAGRAM




# 2 ELECTRICAL SPECIFICATION

| Parameter | Values | Notes |
|---|---|---|
| Operation Voltage | 1.7V-5.5V | To ensure RF operation · suggest BLE supply voltage not lower than 3.3V<br>suggest WiFi supply voltage not lower than 3.6V |
| Working Temperature | -40℃~+85℃ | |
| Transmission Power | BLE:-40 ~ +3dBm WiFi: +5 ~+21dBm | Configurable |
| Current(RX) | 2.4G-56mA/5G-58mA | |
| Current(TX) | 2.4G-191mA/5G-260mA | BLE 2Mbps transmission |
| Module Dimension | 27×23.5×2.4mm | |
| Quantity of IO Port | 29 | General purpose IO interface |

# 3 PIN DESCRIPTION

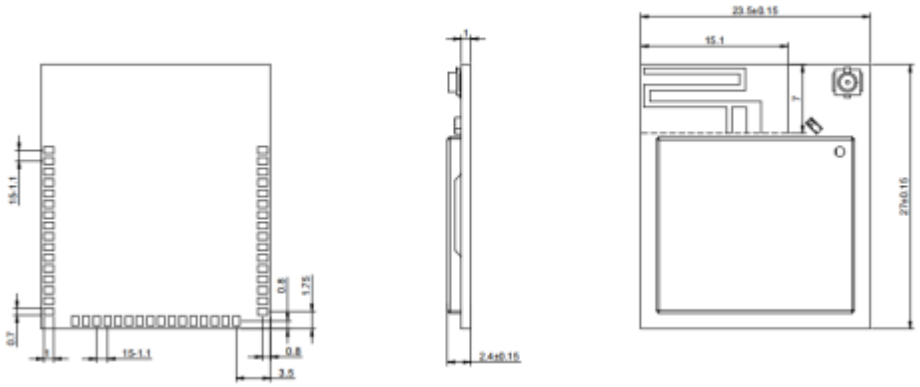



# 4 PIN DEFINITION

| Pin Number | Symbol | Definition |
|---|---|---|
| VDD | Power positive pole | Supply electricity: 1.7V~3.6V |
| VDDH | GPIO | Supply electricity: 2.5V~5.5V |
| VBUS | Power source | USB interface acquired power input after conversion |
| VBAT70 | Power source | WiFi power supply, 2.9V~4.5V, 3.6V standard |
| GND | Negative power supply | Grounded |
| SWDCLK/SWDIO | I/O, SWCLK/SWDIO | For burning firmware |
| P0.00-P0.12 | GPIOs | General purpose IO interface |
| P0.24-P0.31 | GPIOs | General purpose IO interface |
| P1.00-P1.03 | GPIOs | General purpose IO interface |
| P1.10-P1.13 | GPIOs | General purpose IO interface |
| D_P | USB port | USB D+ |

| | | |
|---|---|---|
| D_N | USB port | USB D- |
| RESET | Reset | Pull up the resistor internally to reset |

# 5 MECHANICAL DRAWING



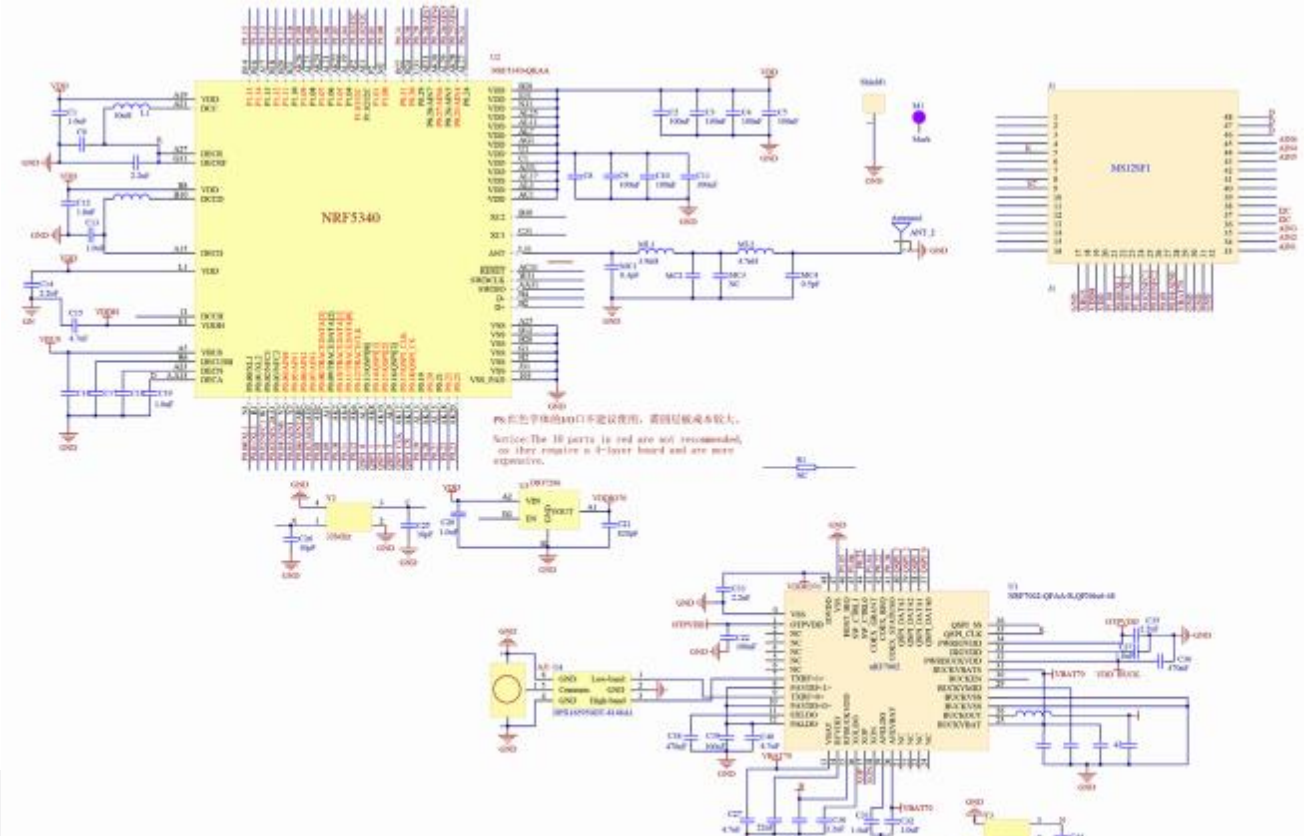

Default unit： mm Default tolerance： ±0.15

# 6 POWER SUPPLY MODULE

BLE Chip operation voltage range is 2.7V to 3.6V, to ensure normal use, supply voltage range should be 3.0V to 3.6V as far as possible.

WiFi Chip operation voltage range is 2.9V to 4.5V, to ensure normal use, supply voltage range should be 3.3V to 4.5V as far as possible.

# 7 ELECTRICAL SCHEMATIC

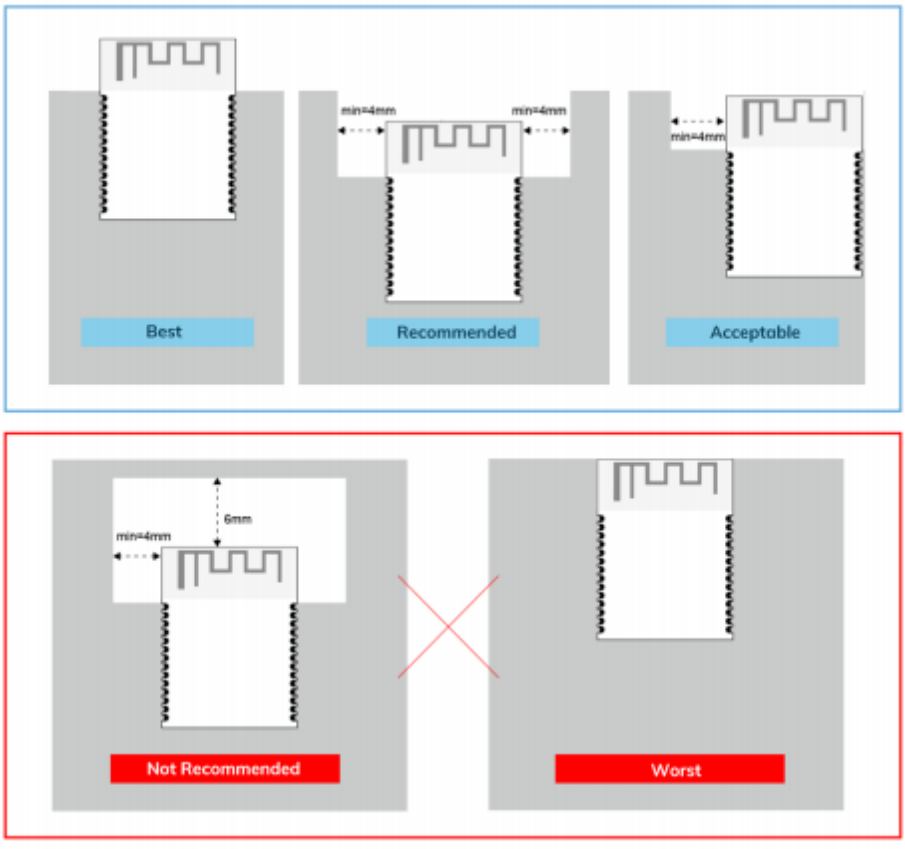


Before placing an order, please confirm the specific configuration required with the salesperson.

# 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.

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.

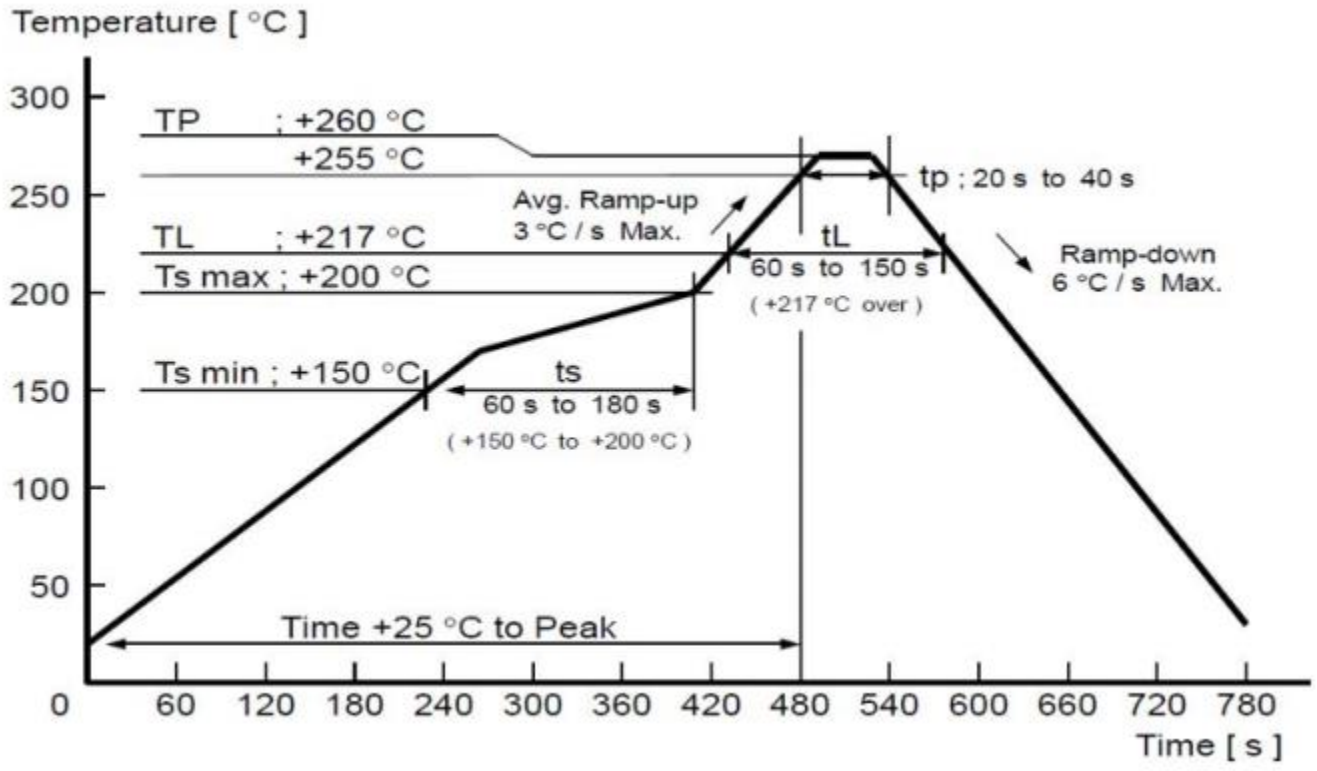
7) Module should be placed on edge of circuit board and keep a distance away from other circuits.

8) Suggesting to use magnetic beads to insulate module's access power supply.

# 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.

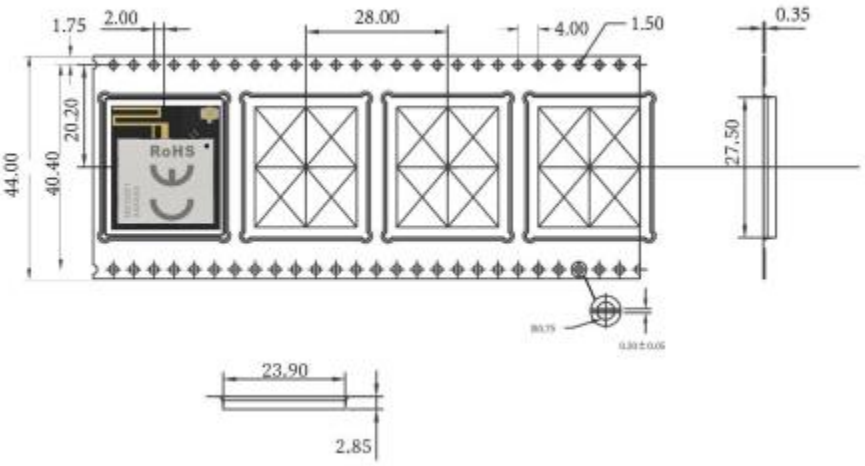



2) Suggesting to make 0.2mm thickness of module SMT for partial ladder steel mesh, then make the opening extend 0.8mm

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.

# 10 PACKAGE INFORMATION




Inner carton(*5)
355*345*65mm · ±5mm

Outer carton
370*358*350mm · ±10mm

## 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 |
|---|---|---|---|---|
| MS12SF1 | 700PCS | 1820g | 2350g | W=44mm · T=0.35mm |

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

# 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 (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.

# 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.

# 14 COPYRIGHT STATEMENT