

WY100 Datasheet

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WANYEE WY100 DATASHEET

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General Description

The WY100 is a fully integrated Wi-Fi® module with ultra-low power consumption, best RF performance and easy development environment. Such low power operation can extend the battery life as long as a year or more depending on the application.

The WY100 is included Wi-Fi SoC, 40MHz crystal oscillator, 32.768KHz RTC clock, RF Lumped RF filter, flash memory and chip antenna or u.FL connector.

The Wi-Fi SoC is a highly integrated ultra-low power Wi-Fi system on a chip (SoC), which contains an 802.11b/g/n radio (PHY), a baseband processor, a media access controller (MAC), on- chip memory, and a host networking application processor, all on a single silicon die.

The SoC is built from the ground up for the "Internet of Things" and is ideal for wearables, door locks, home appliances, sprinkler systems, thermostats, connected lighting, drop-in video cameras, and other devices that comprise the "Connected Home".

Key Features

- Highly integrated ultra-low power Wi-Fi® system on chip
 - Sleep current: 2.9uA, VBAT=3.3V
- RF Performance
 - Tx Power: +13.62dBm, 1Mbps DSSS
 - Rx Sensitivity: -98.5dBm, 1Mbps DSSS
- Full offload: SoC runs full networking OS and TCP/IP stack
- Wi-Fi processor
 - IEEE 802.11b/g/n, 20MHz channel bandwidth, 2.4GHz
 - IEEE 802.11s Wi-Fi mesh
 - Wi-Fi security: WPA/WPA2-Enterprise/Personal, WPA2 SI, WPA3 SAE, and OWE
 - Vendor EAP types: EAP-TTLS/MSCHAPv2, PEAPv0/EAP-MSCHAPv2, PEAPv1, EAP-FAST, and EAP-TLS
 - Operating modes: Station, SoftAP, and Wi-Fi Direct® Modes (GO, GC, GOfixed)
 - WPS-PIN/PBC for easy Wi-Fi provisioning
 - Bluetooth coexistence
 - Antenna switching diversity
- CPU core subsystem
 - ARM Cortex-M4F core w/ clock frequency of 30~160 MHz
 - Embedded Memory
 - ROM: 256KB
 - SRAM: 512KB
 - OTP: 8KB
- Hardware accelerators
 - General HW CRC engine
 - HW zeroing function for fast booting
 - Pseudo random number generator (PRNG)
- Complete software stack
 - Comprehensive networking software stack
 - Provides TCP/IP stack: in the form of network socket APIs
- Advanced security
 - Secure booting
 - Secure debugging about JTAG/SWD and UART ports
 - Secure asset storage
- Built-in hardware crypto engines for advanced security
 - TLS/DTLS security protocol functions
 - Crypto engine for key deliberate generic security functions: AES (128,192,256), DES/3DES, SHA1/224/256, RSA, DH, ECC, CHACHA, and TRNG
- Built-in 4-channel auxiliary ADC for sensor interfaces
 - 12-bit SAR ADC: single-ended four channels
 - Provides dynamic auto switching function
- Supports various interfaces
 - eMMC/SD expanded memory
 - SDIO Host/Slave function
 - QSPI for external flash control
 - Three UARTs
 - SPI Master/Slave interface
 - I2C Master/Slave interface
 - I2S for digital audio streaming
 - 4-channel PWM
 - Individually programmable, multiplexed GPIO pins
 - JTAG and SWD
- Power management unit
 - On-Chip RTC
 - Wake-up control of fast booting or full booting with minimal initialization time
 - Supports three ultra-low power sleep modes
- Supply
 - Operating voltage: 2.1V to 3.6V (typical: 3.3V)
 - 2 Digital I/O Supply Voltage: 1.8V / 3.3V
 - Black-out and brown-out detector
- Dimensions
 - 13.5mm × 21.5mm x 3.2mm, 37-Pins,
- Operating temperature range
 - -40°C to 85°

Applications

WY100 is a full offload Wi-Fi module for IoT application, such as:

- Security systems
- Door locks
- Thermostats
- Garage door openers
- Blinds
- Lighting control
- Sprinkler systems
- Video camera security systems
- Smart appliances
- Video door bell

System Diagram

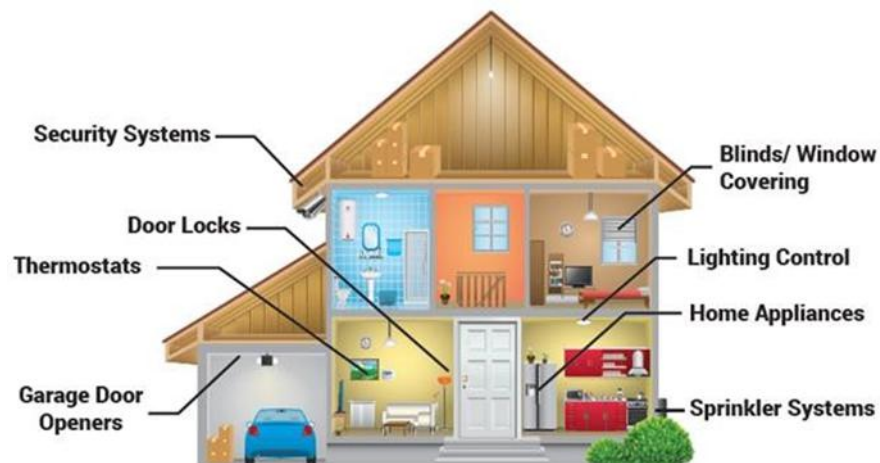


Figure 1: System Diagram

2 Block Diagram

Figure 2 shows the hardware (HW) block diagram.

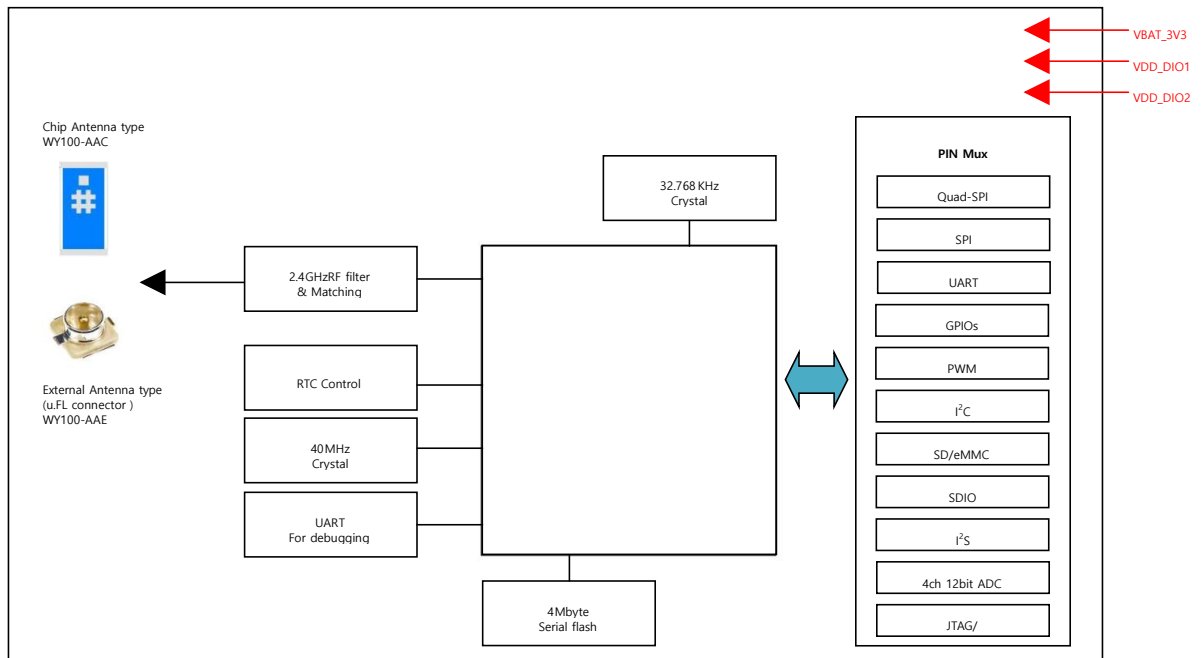


Figure 2: Hardware Block Diagram

Figure 3 shows the software (SW) block diagram.

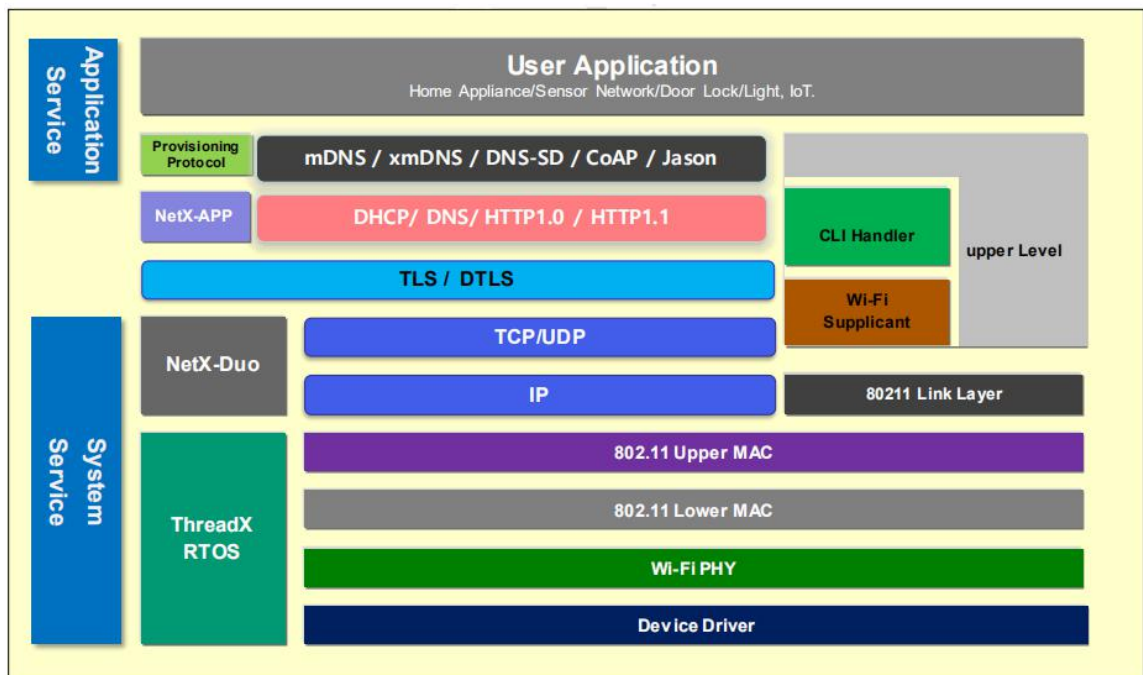


Figure 3: Software Block Diagram

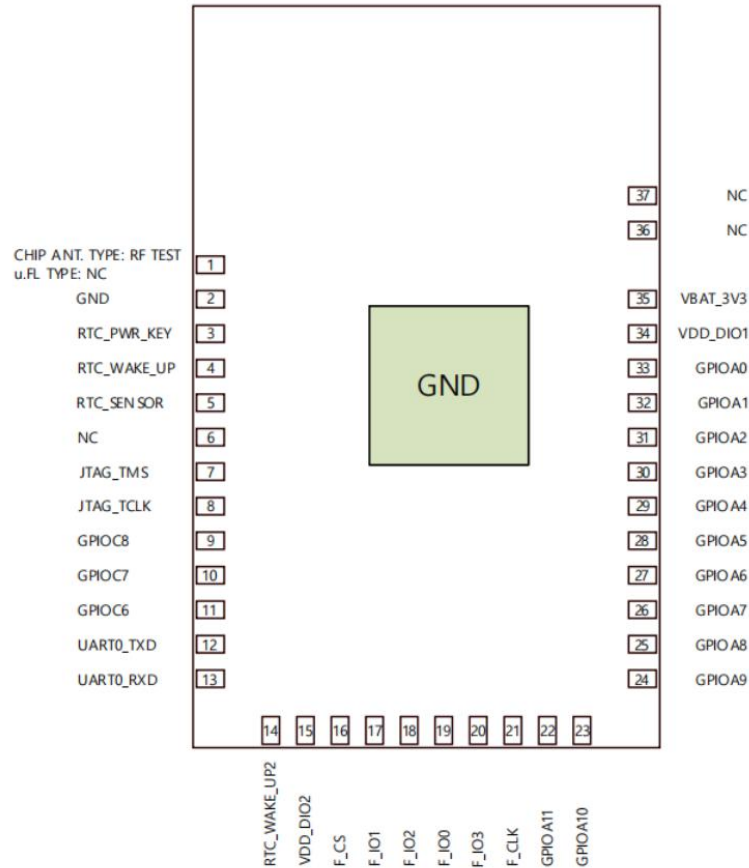
The following descriptions are about the SW block diagrams.

- Kernel layer
 - Real Time Operating System
- The Wi-Fi layer is divided into four layers:
 - Lower MAC
 - SW module to control/handle HW Wi-Fi MAC/PHY and interfaces with Upper MAC layer
 - Upper MAC
 - SW module to control/handle Wi-Fi control/handle to interface with supplicant

- Wi-Fi Link Layer: Interface layer between Upper MAC and supplicant
 - Supplicant: SW module to control/management to operate Wi-Fi operation
- Network stack layer
 - Used to control/handle network operation
 - Main protocols are IP, TCP, and UDP
 - Other necessary protocols are supported
- Security Layer
 - Crypto operation engine is ported to use crypto HW engine
- TLS/TCP and DTLS/UDP APIs are supported to handle security operation:
 - User application layer
 - Variable sample codes are supported in SDK – sample codes use supported APIs
 - TCP Client/Server, UDP Client/Server, TLS Client/Server
 - HTTP/HTTPs download, OTA Update usage, and MQTT usage
 - Applications from other customers can be implemented easily in SDK

3 Pinout

3.1 Pin-out Description (37-pins)



3.2 Pin Multiplexing

This device provides various interfaces to support many kinds of applications. It is possible to control each pin according to the required application in reference to the pin multiplexing illustrated in Table 2. Pin control can be realized through register setting. This device can use a maximum of 16 GPIO pins and each of the GPIO pins multiplexes signals of various functions. In particular, four pins from GPIOA0 to GPIOA3 multiplex analog signals, which also can be realized through register setting.

Table 2. Pin Multiplexing

| Pin | JTAG | Analog | SPI slave | SPI Master | I2C master | I2C slave | SDIO slave | SDeMMC | BT coex | I2S | I2S_Clock | UART0 | UART1 | UART2 | Muxed w/Analog | Pin State (nRESET=0) | Driving Strength |
|------------------|-------|----------|-----------|-----------------|------------|-----------|------------|--------|---------|------|-----------|-------|---------|-------|----------------|----------------------|------------------|
| GPIOA0 | | channel0 | SPI_MISO | | I2C_SDA | I2C_SDA | | | | BCLK | | | TXD | | O | I-PD | 2/4/8/12mA |
| GPIOA1 | | channel1 | SPI_MOSI | | I2C_CLK | I2C_CLK | | WRP | | MCLK | | | RXD | | O | I-PD | 2/4/8/12mA |
| GPIOA2 | | channel2 | SPI_CSB | | I2C_SDA | I2C_SDA | | | | SDO | | RTS | TXD | | O | I-PD | 2/4/8/12mA |
| GPIOA3 | | channel3 | SPI_CLK | | I2C_CLK | I2C_CLK | | | | LRCK | Clock_In | CTS | RXD | | O | I-PD | 2/4/8/12mA |
| GPIOA4 | | | | | I2C_SDA | I2C_SDA | cmd | cmd | | BCLK | | RTC | TXD/RTS | | X | I-PD | 2/4/8/12mA |
| GPIOA5 | | | | | I2C_CLK | I2C_CLK | CLK | CLK | | MCLK | | CTS | RXD/CTS | | X | I-PD | 2/4/8/12mA |
| GPIOA6 | | | SPI_CSB | SPI_CSB | I2C_SDA | I2C_SDA | D3 | D3 | | SDO | | RTS | TXD | | X | I-PD | 2/4/8/12mA |
| GPIOA7 | | | SPI_CLK | SPI_CLK | I2C_CLK | I2C_CLK | D2 | D2 | | LRCK | | CTS | RXD | | X | I-PD | 2/4/8/12mA |
| GPIOA8 | | | SPI_MISO | SPI_DIO0 (MOSI) | I2C_SDA | | D1 | D1 | BT_sig0 | BCLK | | | | | X | I-PD | 2/4/8/12mA |
| GPIOA9 | | | SPI_MOSI | SPI_DIO1 (MISO) | I2C_CLK | | D0 | D0 | BT_sig1 | MCLK | | | | | X | I-PD | 2/4/8/12mA |
| GPIOA10 | | | SPI_MISO | SPI_DIO2 | | | | WRP | BT_sig2 | | Clock_In | | | TXD | X | I-PD | 2/4/8/12mA |
| GPIOA11 | | | SPI_MOSI | SPI_DIO3 | | | | | | | | | | RXD | X | I-PD | 2/4/8/12mA |
| TCLK/ GPIOA15 | TCLK | | | | | | | | | | | | | | X | I-PD | 2/4/8/12mA |
| TMS | TMS | | | | | | | | | | | | | | X | I-PU | 2/4/8/12mA |
| UART_TXD | | | | | | | | | | | | | | | X | O | 2/4/8/12mA |
| UART_RXD | | | | | | | | | | | | | | | X | I | 2/4/8/12mA |
| GPIOC6 | TDI | | | | | | | | | | | | | | X | I-PD | 2/4/8/12mA |
| GPIOC7 | TDO | | | | | | | | | | | | | RXD | X | I-PD | 2/4/8/12mA |
| GPIOC8 | NTRST | | | | | | | | | | | | | TXD | X | I-PD | 2/4/8/12mA |
| F_IO1 | | | SPI_MOSI | | | | D0 | | | LRCK | | | | | X | | 2/4/8/12mA |
| F_IO2 | | | SPI_MISO | | | | D1 | | | SDO | | | | RXD | X | | 2/4/8/12mA |
| F_IO3 | | | | | | | D2 | | | | | | | TXD | X | | 2/4/8/12mA |
| F_IO4 | | | | | | | D3 | | | | | | | | X | | 2/4/8/12mA |
| F_CS | | | SPI_CSB | | | | cmd | | | BCLK | | | | | X | | 2/4/8/12mA |
| F_CLK | | | SPI_CLK | | | | CLK | | | MCLK | | | | | X | | 2/4/8/12mA |

4 Electrical Specification

4.1 Absolute Maximum Ratings

Table 3: Absolute Maximum Ratings

| Parameter | #Pins | Min | Max | Units |
|----------------------------------|-------|-----|-----|-------|
| VBAT_3V3 | 35 | VSS | 3.9 | V |
| VDD_DIO1 | 34 | VSS | 3.9 | V |
| VDD_DIO2 | 15 | VSS | 3.9 | V |
| Operating temperature range (TA) | | -40 | +85 | °C |

4.2 Recommended Operating Conditions

Table 4: Recommended Operating Conditions

| Parameter | QFN Pins | Min | Typ | Max | Units |
|----------------------------------|----------|------|-----|-----|-------|
| VBAT_3V3 | 35 | 2.1 | | 3.6 | V |
| VDD_DIO1 | 34 | 1.62 | | 3.6 | V |
| VDD_DIO2 | 15 | 1.62 | | 3.6 | V |
| Operating temperature range (TA) | | -40 | | +85 | °C |

4.3 Electrical Characteristics

4.3.1 DC Parameters, 1.8V IO

Table 5: DC Parameters, 1.8V IO

| Parameter | Symbol | Condition | Min | Typ | Max | Units |
|---------------------|-----------------|--|------------|-----|------------|-------|
| Input Low Voltage | V _{IL} | Guaranteed logic Low level | VSS | | 0.3 × DVDD | V |
| Input High Voltage | V _{IH} | Guaranteed logic High level | 0.7 × DVDD | | DVDD | V |
| Output Low Voltage | V _{OL} | DVDD=Min. | VSS | | 0.2 × DVDD | V |
| Output High Voltage | V _{OH} | DVDD=Min. | 0.8 × DVDD | | DVDD | V |
| Pull-up Resistor | R _{PU} | V _{PAD} =V _{IH} , DIO=Min. | | | 32.4 | kΩ |
| Pull-down Resistor | R _{PD} | V _{PAD} =V _{IL} , DIO=Min. | | | 32.4 | |

Note 1 DVDD = 1.8V, VDD_DIO1, VDD_DIO2 Logic Level

4.3.2 DC Parameters, 3.3V IO

Table 6: DC Parameters, 3.3V IO

| Parameter | Symbol | Condition | Min | Typ | Max | Units |
|---------------------|-----------------|--|-----|-----|------|-------|
| Input Low Voltage | V _{IL} | Guaranteed logic Low level | VSS | | 0.8 | V |
| Input High Voltage | V _{IH} | Guaranteed logic High level | 2.0 | | DVDD | V |
| Output Low Voltage | V _{OL} | DVDD=Min. | VSS | | 0.4 | V |
| Output High Voltage | V _{OH} | DVDD=Min. | 2.4 | | DVDD | V |
| Pull-up Resistor | R _{PU} | V _{PAD} =V _{IH} , DIO=Min. | | | 19.4 | kΩ |
| Pull-down Resistor | R _{PD} | V _{PAD} =V _{IL} , DIO=Min. | | | 16.0 | |

Note 1 DVDD = 3.3V, VDD_DIO1, VDD_DIO2 Logic Level

4.4 Current Consumption

TA = +25°C, VBAT = 3.3V

Table 10: Current Consumption in Low Power Operation

| Parameter | Condition | Min | Typ | Max | Units |
|---------------------|-----------|-----|-----|-----|-------|
| Low Power Operation | Sleep 1 | | 0.2 | | μA |
| | Sleep 2 | | 1.8 | | |
| | Sleep 3 | | 2.9 | | |

5 Package Information

5.1 Dimension: WY100-AAE

Unit: mm

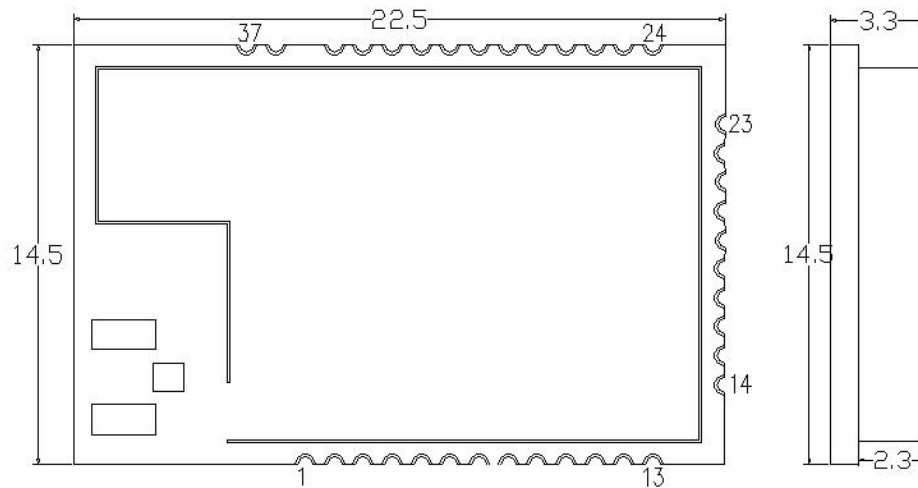


Figure 4: Module Top

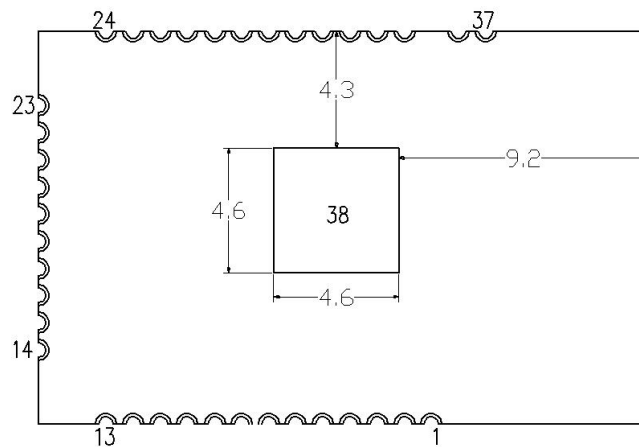


Figure 5: Module Bot

5.2 PCB Land Pattern

Unit: mm

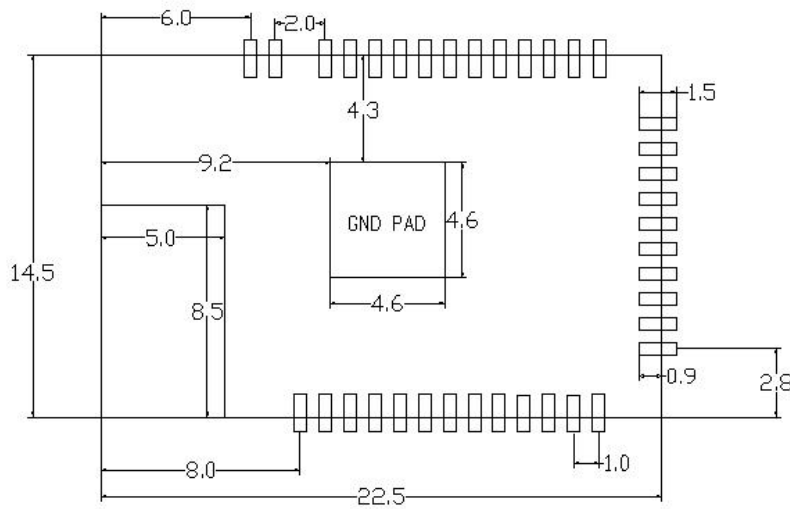


Figure 6: PCB Land Pattern (Top View)

Please take attention that changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

(1) Operational use conditions

***if your module has professional users use condition limitations, please keep below sentence here Module has professional users use condition limitations, Host product manufacturer please ensure giving such warning like "Product is limited to professional users use" in your product's instruction.

(2) Antenna used

| Antenna Type | Brand/ manufacturer | Model No. | Max. Antenna Gain |
|--------------|------------------------------------|-----------|-------------------|
| FPC | Beijing Wanyee Technology CO.,LTD. | / | 3.3dBi |

(3) Notice to Host Product Manufacturer

Any deviation(s) from the defined parameters of the antenna trace, as described by this instruction, host product manufacturer must notify us that you wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by us, or you (host manufacturer) can take responsibility through the change in FCC ID and IC ID (new application) procedure followed by a Class II permissive change application.

(4) Labelling Instruction for Host Product Integrator

Please notice that if the FCC and IC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following:

"Contains FCC ID: 2A38OWY100" any similar wording that expresses the same meaning may be used.

§ 15.19 and RSS-Gen Labelling requirements shall be complied on end user device. Labelling rules for special device, please refer to §2.925, § 15.19 (a)(5) and relevant KDB publications. For E-label, please refer to §2.935.

(5) Installation Notice to Host Product Manufacturer

The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.

The module is limited to installation in mobile application, a separate approval is required for all other operating configurations, including portable configurations with respect to §2.1093 and difference antenna configurations.

(6) Antenna Change Notice to Host manufacturer

If you desire to increase antenna gain and either change antenna type or use same antenna type certified, a Class II permissive change application is required to be filed by us, or you (host manufacturer) can take responsibility through the change in FCC ID and IC ID (new application) procedure followed by a Class II permissive change application.

(7) FCC other Parts, Part 15B Compliance Requirements for Host product manufacturer

This modular transmitter is only FCC authorized for the specific rule parts listed on our grant, host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification.

Host manufacturer in any case shall ensure host product which is installed and operating with the module is in compliant with Part 15B requirements.

Please note that For a Class B or Class A digital device or peripheral, the instructions furnished the user manual of the end-user product shall include statement set out in §15.105

Information to the user or such similar statement and place it in a prominent location in the text of host product manual. Original texts as following:

For Class B

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.*
- Increase the separation between the equipment and receiver.*
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- Consult the dealer or an experienced radio/TV technician for help.*

For Class A

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.