



北京万羿科技有限公司
BEIJING WANYEE TECHNOLOGY CO., LTD.

WY100 Datasheet

Version: v1.0

Initial Version	Sep., 2019
Current Version	Sep., 2019



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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, GO fixed)
 - 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 x 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

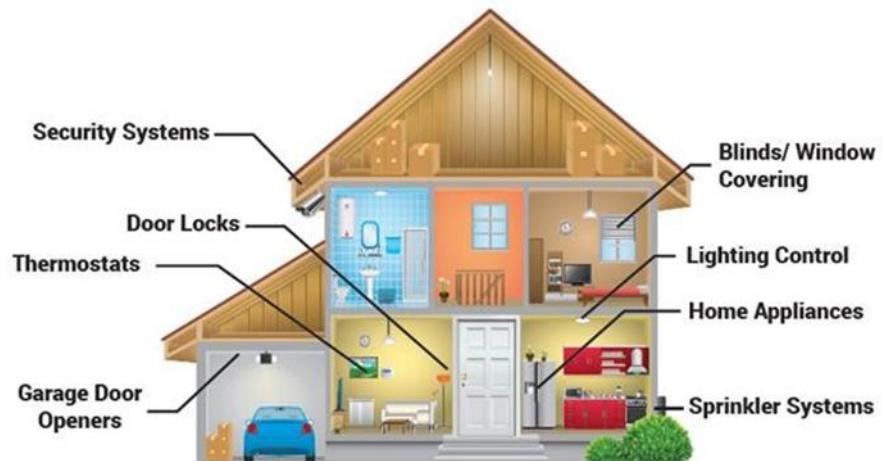


Figure 1: System Diagram

2 Block Diagram

Figure 2 shows the hardware (HW) block diagram.

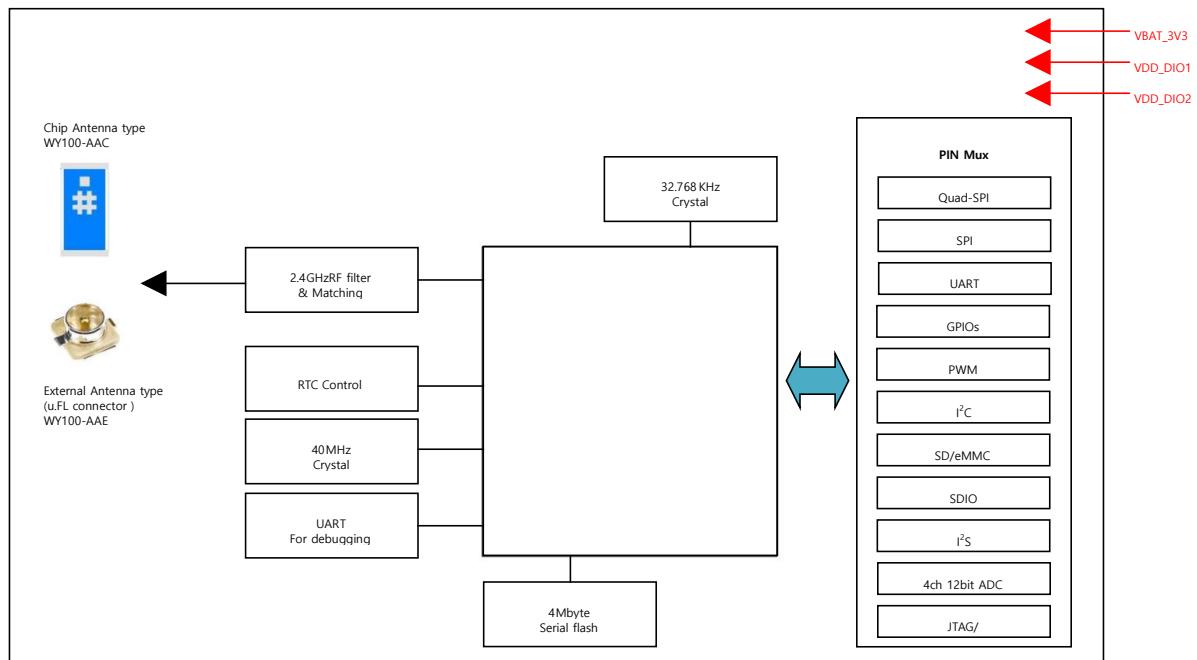


Figure 2: Hardware Block Diagram

Figure 3 shows the software (SW) block diagram.

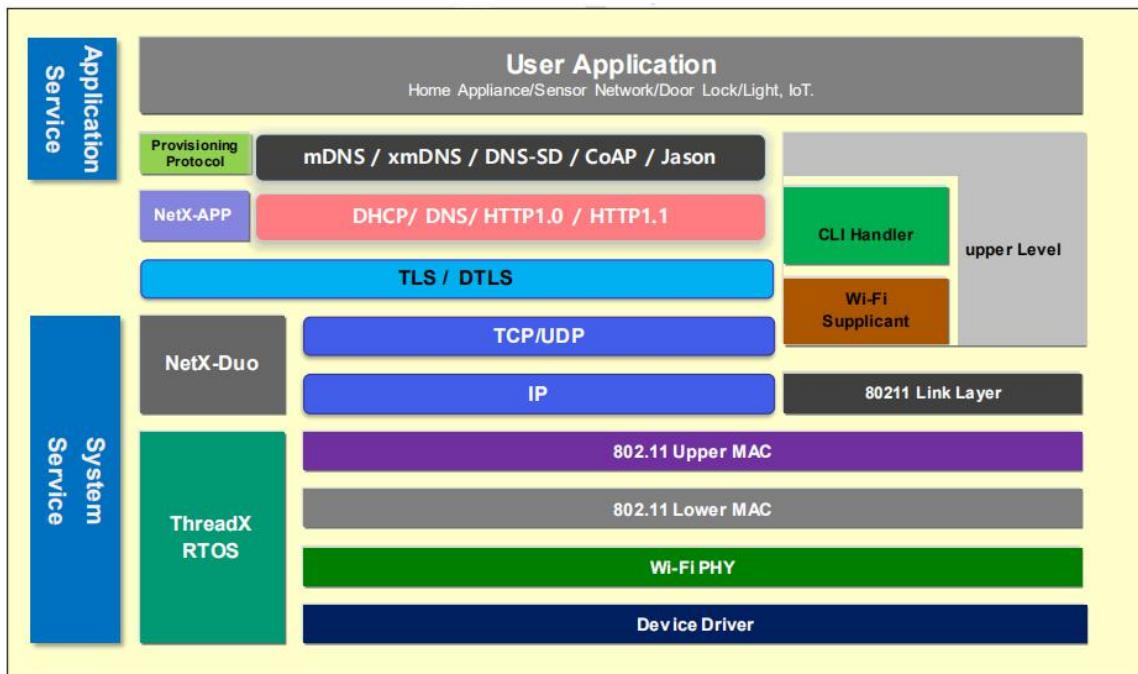


Figure 3: Software Block Diagram

The following descriptions are about the SW block diagrams.

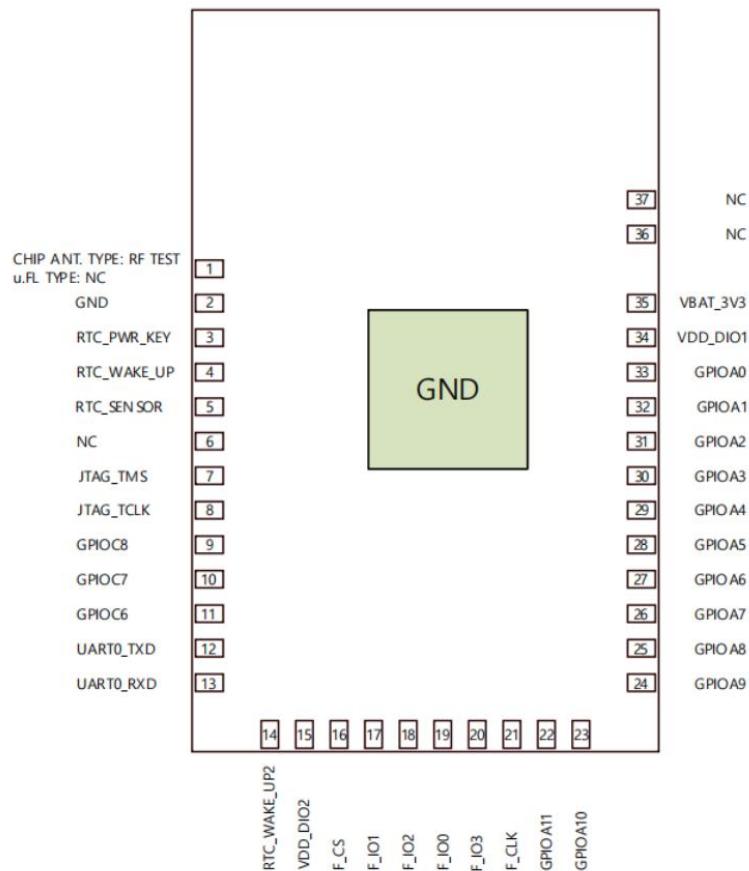
- Kernel layer
 - Real Time Operating System
- The Wi-Fi layer is divided into four layers:
 - Lower MAC
 - SW module to control/handle HW Wi-Fi MAC/PHY and interfaces with Upper MAC layer
 - Upper MAC
 - SW module to control/handle Wi-Fi control/handle to interface with supplicant



- 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 Table2. 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				SDO		RTS	TXD			O	I-PD	2/4/8/12mA
GPIOA3		channel3	SPI_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	D3	D3	SDO		RTS	TXD			X	I-PD	2/4/8/12mA
GPIOA7			SPI_CLK	SPI_CLK		I2C_CLK	D2	D2	LRCK		CTS	RXD			X	I-PD	2/4/8/12mA
GPIOA8			SPI_MISO	SPI_MISO (MOSI)	I2C_SDA		D1	D1	BT_sig0	BCLK					X	I-PD	2/4/8/12mA
GPIOA9			SPI_MOSI	SPI_MOSI (MISO)	I2C_CLK		D0	D0	BT_sig1	MCLK					X	I-PD	2/4/8/12mA
GPIOA10			SPI_MISO	SPI_MISO	I2C_DIO0			WRP	BT_sig2	Clock_In		TXD	X	I-PD	2/4/8/12mA		
GPIOA11			SPI_MOSI	SPI_MOSI	I2C_DIO1							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_RXD															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
GPIOC8	NTRST														TXD	X	I-PD
F_I01			SPI_MOSI			D0			LRCK						X		2/4/8/12mA
F_I02			SPI_MISO			D1			SDO			RXD	X				2/4/8/12mA
F_I03						D2						TXD	X				2/4/8/12mA
F_I04						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		$0.3 \times DVDD$	V
Input High Voltage	V_{IH}	Guaranteed logic High level	$0.7 \times DVDD$		DVDD	V
Output Low Voltage	V_{OL}	$DVDD = \text{Min.}$	VSS		$0.2 \times DVDD$	V
Output High Voltage	V_{OH}	$DVDD = \text{Min.}$	$0.8 \times DVDD$		DVDD	V
Pull-up Resistor	R_{PU}	$V_{PAD} = V_{IH}$, DIO=Min.			32.4	$k\Omega$
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}	$DVDD = \text{Min.}$	VSS		0.4	V
Output High Voltage	V_{OH}	$DVDD = \text{Min.}$	2.4		DVDD	V
Pull-up Resistor	R_{PU}	$V_{PAD} = V_{IH}$, $DIO = \text{Min.}$			19.4	$k\Omega$
Pull-down Resistor	R_{PD}	$V_{PAD} = V_{IL}$, $DIO = \text{Min.}$			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

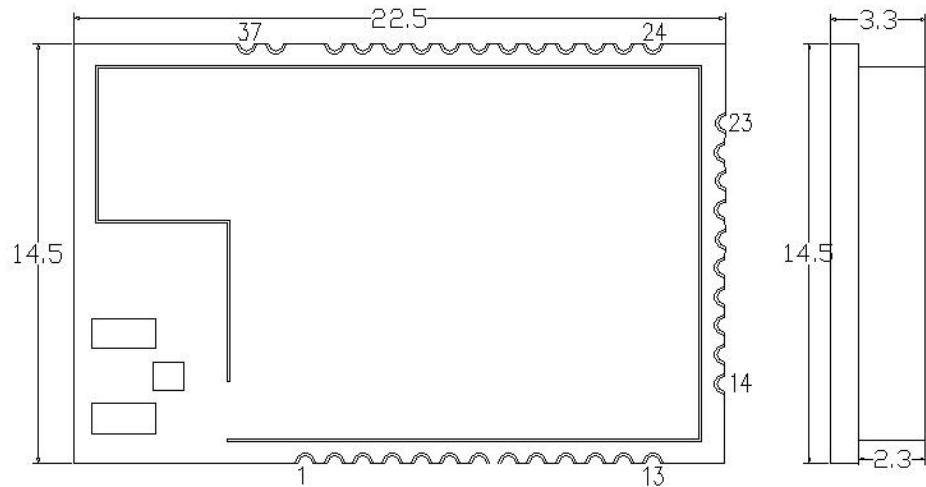


Figure 4: Module Top

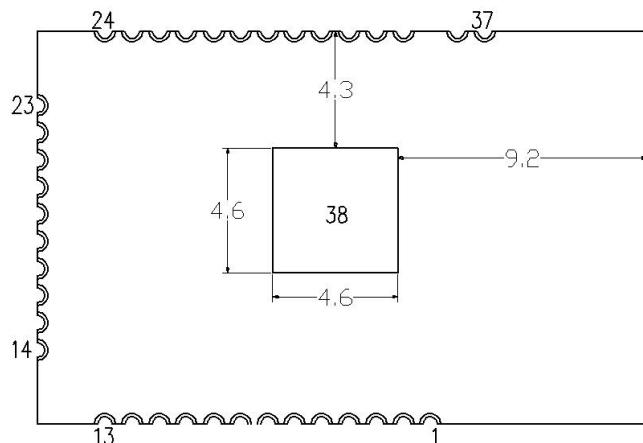


Figure 5: Module Bot

5.2 PCB Land Pattern

Unit: mm

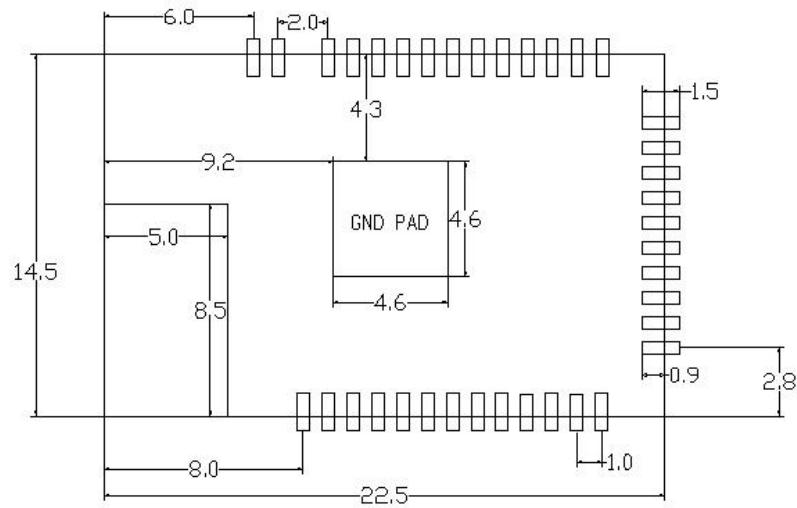


Figure 6: PCB Land Pattern (Top View)

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.