

# WS8100-M2Ble5.0Module specification

Product model: WS8100-M2

Issue: Rev1.6

## Chapter One, module introduction

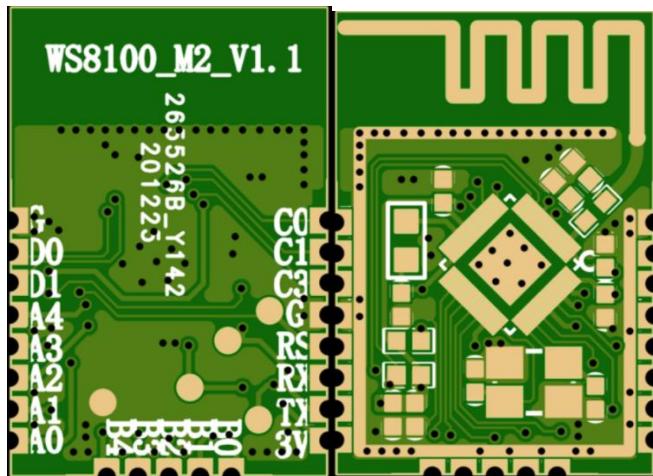
WS8100\_M2 is a transparent transmission module based on WS8100. It has the characteristics of low power consumption, high speed, long transmission distance and easy operation.

The module can be used for transparent transmission of AT instructions, and the user can interact with the module through the serial port. At the same time, the module supports the secondary development function, retains the module burning and debugging port, and users can re-develop the project according to their own needs.

AT instruction mode: The user can query or configure the parameters of the module through the corresponding instruction set.

Secondary development: perfect information introduction and software interface, all aspects to support user secondary development, easy upgrade, support on-chip flash read and write, standby ultra-low power consumption.

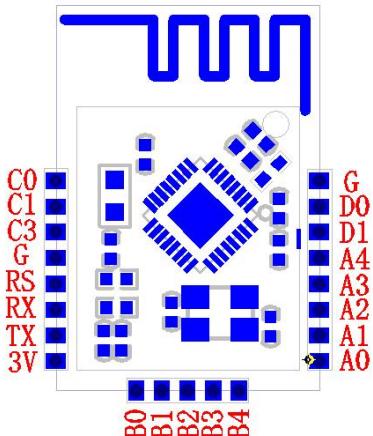
### 1. 1. 1 Demo board diagram



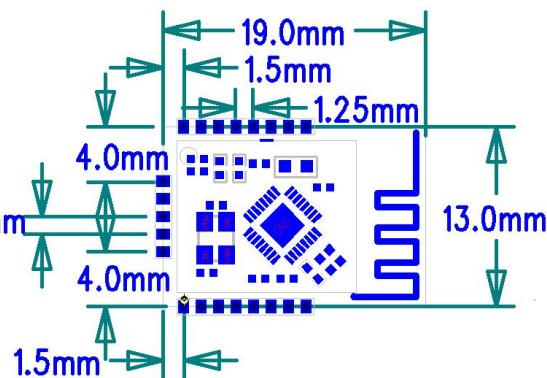
Top view

subface

### 1. 2 Module pin figure ZZ



PIN chart



Package drawing

### 1.3 Module Dimensions

Size: 19×13×1.0 unit mm

### 1.4 Performance Parameters

#### microcontroller

- 32-bit high performance RISC core
- 16MHz / 32MHz clock
- 512KB/1MB Flash
- 40KB Cache static RAM (SRAM)
- Operating temperature: -20°C ~ +85°C

#### Low power consumption

- Operating voltage range: 1.8 to 3.6V
- On-chip DC-DC converter
- MCU operating current: 1.4mA@16MHz
- MCU sleep current:
  - 0.6 uA (IO wake up)
  - 1.0uA (32Khz on, 8K RAM on)
  - 1.1uA (32Khz on, 24K RAM on)
- Receiving current: 8.5mA
- Sending current: 9.5mA@+0dbm
- 16mA@+7dbm

#### RF part

- 2.4GHz RF transceiver, Bluetooth compliant

#### Low Power (BLE) 5.0 specification

- -97dBm Receiving sensitivity
- -20dBm ~ +7dBm programmable output power
- Single-end RF port
- Frequency range: 2402MHz to 2480MHz
- Modulation mode: GFSK

### 1.5 Low Power Mode

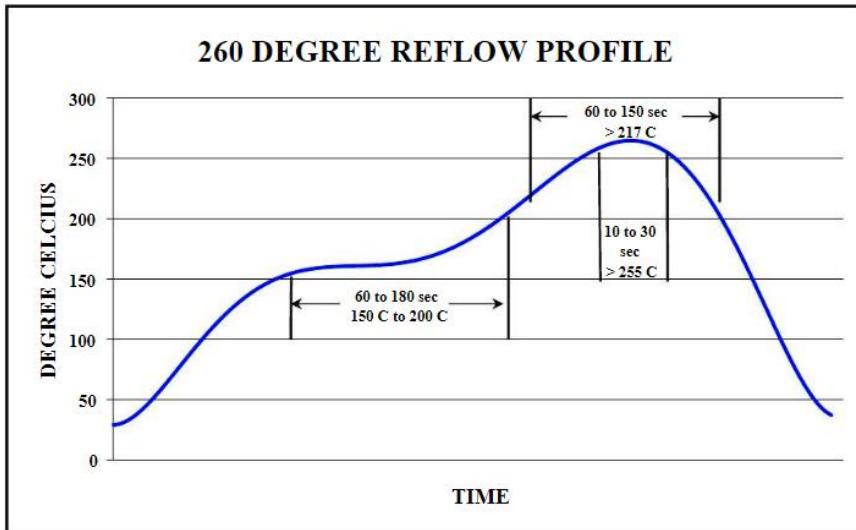
Power Domain	Peri	RAM	AON	FLASH
DeepSleep+	Off	Off	On	On
Sleep (HOSC Off)	On	On	On	On

### 1.6PIN function table

serial number	Pin definition	IO	Module screen printing	Pin type	describe
1	PC0	PC0	C0	I/O	Undefined, used for secondary development
2	PC1	PC1	C1	I/O	Undefined, used for secondary development
3	PC0	PC0	C3	I/O	Undefined, used for secondary development
4	GND	GND	G	P	modularly
5	RST	RST	RS	I	Module reset pin, after the reset, the control IO should be set to suspension input to reduce power consumption. 0: reset 1: works normally
6	UART_RX	PD2	RX	I	Serial port RX data receiver
7	UART_TX	PD3	TX	0	Serial port TX Data sender
8	VCC	V33	3V	P	Module power supply positive, range: 1.8V~3.6V, typical 3.3V
9	CONN_STAT0	PB1	B1	0	B1 and B0 are BIT1 and BIT0 respectively
10	CONN_STAT1	PB0	B0	0	00: Stop the broadcast 01: Broadcasting now 10: The connection is complete 11: The connection is down
11	DEBUG_TX	PB3	B3	I	Low level /DEBUG UART TX not defined
12	DEBUG_RX	PB2	B2	I	Low level /DEBUG UART RX not defined
13	WAKE_UP	PB4	B4	I	1: The module wakes up 0: Module standby, disconnect Bluetooth connection, standby current 0.8uA [Extremely low power requirements Note: After 2 seconds of high output, set IO to input drop-down, otherwise it will increase power consumption The operation with detection signal: PD1 is high after effective.
14	STANDBY	PA0	A0	I	1: Enter standby mode. 0: indicates the working mode. [Extremely low power requirements Note: After

					2 seconds of high output, set I0 to input drop-down, otherwise it will increase power consumption. The operation with detection signal: PD1 is low after effective.
15	MODE_CTRL	PA1	A1	I	Module signal input, serial port mode switch 1: The serial port is in command mode 0: indicates that the serial port is in transparent mode
16	UART_EN	PA2	A2	I	1: The serial port is ready to receive data 0: The serial port is idle, reducing power consumption
17	BT_EN	PA3	A3	I	Module signal input, module Bluetooth enabled 0: The module starts broadcasting until a device is connected to it 1: Turn off Bluetooth, if there is a connection, disconnect, and turn off the broadcast
18	PA4	PA4	A4	I/O	Undefined, used for secondary development
19	PD1	PD1	D1	I/O	Undefined, used for secondary development
20	PDO	PDO	D0	I/O	Undefined, used for secondary development
21	GND	GND	G	P	modularly

### 1.7 Reflow curve



### 2.1 Instruction Format

In command mode, module parameters can be queried or set through the serial port.

Query class instructions are sent to the module in the format of "AT+XXXX\CR\LF".

The setup class instructions are sent to the module in the format of "AT+XXXX:xxxx\CR\LF".

Where \CR\LF is "\r\n" and the hexadecimal is (0x0D,0x0A).

For example:

The query mode command is sent

asc: AT+ROLE\r\n

Corresponding hexadecimal number: 41 54 2B 56 45 52 53 0D 0A

Serial port transmission parameters are as follows: The default baud rate is 115200bps. 8 data bits; 1 bit stop bit; No check.

## Chapter 2 Software instruction set

### 2.1 Instruction Format

### 2.2 Querying the instruction Table

Instruction specification	instruct	respond	parameter specification
Example Query the primary/secondary mode	AT+ROLE\r\n	ROLE:SLAVE\r\n	
Querying the Firmware version	AT+VERS\r\n	VX.X\r\n	
Querying Bluetooth MAC addresses	AT+GADD\r\n	ADDR:XX XX\r\n	
Querying the device name	AT+GNAM\r\n	NAME:XX XX\r\n	
Query connection interval	AT+GCONA\r\n	CON:XXX X\r\n	unit 0.625ms
Example Query the maximum connection interval	AT+GCONX\r\n	CONMAX: XXXX\r\n	unit 0.625ms
Example Query the minimum connection interval	AT+GCONN\r\n	CONMIN: XXXX\r\n	unit 0.625ms
Query latency	AT+LATY+\r\n	LATY:XXX X+\r\n	
Query transmit power	AT+GPWR\r\n	PWR:XXX X\r\n	
Example Query the baud rate of a serial port	AT+GURT\r\n	UART:XX XX\r\n	
Get Bluetooth status	AT+GSTA\r\n	ADVERTISING_ON	Broadcast on
Query pairing password	AT+GPWD\r\n	Pair code:XXX X	
Query broadcast	AT+GADVA\r\n	ADV:XXX	unit

interval		X\r\n	: 1.25ms
Example Query the maximum broadcast interval	AT+GADVX\r\n	ADVMAX: XXXX\r\n	unit : 1.25ms
Query the minimum broadcast interval	AT+GADVN\r\n	ADVMIN: XXXX\r\n	unit : 1.25ms
Example Query broadcast packet content	AT+GAVD\r\n	AVD:XXX XXX\r\n	

### 2.3 Setting the command table

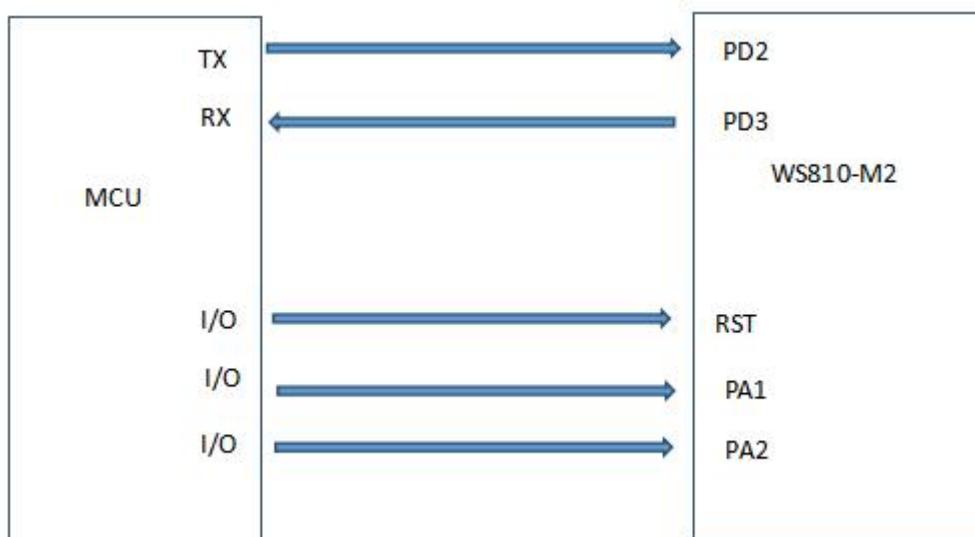
Instruction specification	instruct	respond	parameter specification
Set the baud rate of the serial port	AT+UART+Para\r\n	OK\r\n	Need input 2400、4800、9600、19200、38400、57600、115200 One of the numbers preset value: 115200
Setting the device name	AT+SNAM+Para\r\n	OK\r\n	Enter a string name with a maximum of 20 bytes Default value: WS8100_BLE5.0
Module reset	AT+REST\r\n	OK\r\n	Bluetooth module restart
Module parameter reset	AT+PDEF\r\n	OK\r\n	Bluetooth module parameters reset
Set connection interval 【 Maximum and minimum values are the same 】	AT+SCONA+Para\r\n	OK\r\n	Input 6~3200 (uint: 1.25ms) Default value: 64
Set the maximum connection interval	AT+SCONX+Para\r\n	OK\r\n	input 6~3200 (uint : 1.25ms) Default value: 64
Set the minimum connection interval	AT+SCONN+Para\r\n	OK\r\n	input 6~3200 (uint : 1.25ms) Default value: 64
Set transmit power	AT+SPWR+Para\r\n	OK\r\n	Enter -20, -15, -10, -5~4, 7 Default value: 0
Disconnect Bluetooth connection	AT+CONB\r\n	OK\r\n	
Start broadcasting	AT+ADVL\r\n	ADVERTISING_	

		ON\r\n	
Turn off the broadcast	AT+ADVB\r\n	ADVERTISING_OFF\r\n	
Set broadcast interval 【 Maximum and minimum values are the same 】	AT+SADVA+Para\r\n	OK\r\n	Enter 20~6399 (uint: 0.625ms) Default value: 160
Set the maximum broadcast interval	AT+SADVX+Para\r\n	OK\r\n	Enter 20~6399 (uint: 0.625ms) Default value: 160
Set the minimum broadcast interval	AT+SADVN+Para\r\n	OK\r\n	Enter 20~6399 (uint: 0.625ms) Default value: 160
Set the broadcast packet	AT+SAVD+Para\r\n	OK\r\n	The value can contain a maximum of 31 bytes
Set Bluetooth latency	AT+LATY+Para\r\n	OK\r\n	Set latency to the default value 0

Note: Setting latency reduces power consumption but data latency! latency can be enabled if there is no data. latency can be disabled if there is data transfer

## Chapter 3 Module application examples

### 3.1 Connection diagram between MCU and WS8100 modules



Instructions for use:

PA1 Command data switchover

PA2 Serial port is enabled

PD2 Rx

PD3 TX

VCC

GND

RST low pulse [duration 100ms] reset

### **FCC Statement**

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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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 important announcement

**Important Note:**

### **Radiation Exposure Statement**

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 and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Country Code selection feature to be disabled for products marketed to the US/Canada.

This device is intended only for OEM integrators under the following conditions:

1. The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2. The transmitter module may not be co-located with any other transmitter or antenna,

As long as the conditions above are met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

**Important Note:**

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

### **End Product Labeling**

The final end product must be labeled in a visible area with the following"

Contains FCC ID: **2BKUL-M2**"

### **Manual Information to the End User**

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

**Integration instructions for host product manufacturers according to KDB 996369 D03  
OEM Manual v01r01**

**2.2 List of applicable FCC rules**

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular transmitter

**2.3 Specific operational use conditions**

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

**2.4 Limited module procedures**

Not applicable

**2.5 Trace antenna designs**

Not applicable

**2.6 RF exposure considerations**

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.

**2.7 Antennas**

This radio transmitter **FCC ID: 2BKUL-M2** has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Antenna No.	Model No. of antenna:	Type of antenna:	Gain of the antenna (Max.)	Frequency range:
Bluetooth	/	PCB Antenna	1.68 dBi	2400-2500MHz

**2.8 Label and compliance information**

The final end product must be labeled in a visible area with the following " Contains **FCC ID: 2BKUL-M2**".

**2.9 Information on test modes and additional testing requirements**

Host manufacturer is strongly recommended to confirm compliance with FCC requirements for the transmitter when the module is installed in the host.

**2.10 Additional testing, Part 15 Subpart B disclaimer**

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.

**2.11 Note EMI Considerations**

Host manufacturer is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties.

**2.12 How to make changes**

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system. According to the KDB 996369 D02 Q&A Q12, that a host manufacturer only needs to do an evaluation (i.e., no C2PC required when no emission exceeds the limit of any individual device (including unintentional radiators) as a composite. The host manufacturer must fix any failure.