

WT8266-S2 WiFi Module

Extreme / Open / Small / Easy

Specification

Version 2.6

2020/6/1

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CE marking:

Use the WT8266 in the environment with the temperature between -40 °C and 85 °C. For the following equipment: WT8266RED (CE 0700) is in compliance with the essential requirements and other relevant provisions of Directive (RED) 2014/53/EU.

Hereby, WIRELESS-TAG TECHNOLOGY CO., LIMITED declares that this WiFi module is in compliance with essential requirements and other relevant provisions of Directive (RED) 2014/53/EU, A copy of the declaration of conformity can be found at www.wireless-tag.com.

Amendment record

Version	Changed by	Time	Reason	Details
V1.0	Lemme	2015.08.13	Original	
V2.0	Lemme	2015.10.12	Update	Flash size Available RAM size Power consumption on deep sleep mode Operating Temperature Model size on top view Schematic of WT8266-S2 FCC/CE/RoHs certification document Tech support email
V2.1	Lemme	2015.10.18	Update	Product picture Environment temperature
V2.2	Lemme	2015.12.29	Update	CE Caution
V2.3	Lemme	2016.1.21	Update	CE marking update
V2.4	Lemme	2016.1.22	Update	Certification update
V2.5	Wangleyu	2018.9.10	Update	Schematic of WT8266-S2 Layout of WT8266-S2 Size description CE marking update RED CE Certification update RoHs certification update
V2.6	Vans	2020.6.1	Update	Schematic of WT8266-S2 Layout of WT8266-S2

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1. Overview

WT8266-S2 Wi-Fi module is a low consumption, high performance Wi-Fi network control module designed by Wireless-Tag. It can meet the IoT application requirements in smart power grids, building automation, security and protection, smart home, remote health care etc.

The module's core processor ESP8266 integrates an enhanced version of Tensilica's L106 Diamond series 32-bit processor with smaller package size and 16 bit compact mode, main frequency support 80 MHz and 160 MHz, support RTOS, integrated Wi-Fi MAC / BB / RF / PA / LNA, on-board PCB antenna.

The module supports standard IEEE802.11 b / g / n protocol, a complete TCP / IP protocol stack. It can be used to host the application or to offload Wi-Fi networking functions from another application processor.

2. Main Features

- Operating Voltage: 3.3V
- Operating Temperature: -40-85°C
- CPU Tensilica L106
 - RAM 50KB (Available)
 - Flash 16Mbit/32Mbit (16Mbit default)
- System
 - 802.11 b/g/n
 - Integrated Tensilica L106 ultra-low power 32-bit micro MCU, with 16-bit RSIC. The CPU clock speed is 80MHz. It can also reach a maximum value of 160MHz.
 - WIFI 2.4 GHz, support WPA/WPA2
 - Ultra-Small 18.6mm*15.0mm
 - Integrated 10 bit high precision ADC
 - Integrated TCP/IP Stack
 - Integrated TR switch, balun, LNA, Power amplifier and matching network
 - Integrated PLL, Regulator and power source management components, +20 dBm output power in 802.11b mode
 - Supports antenna diversity
 - Deep sleep current < 20uA, Power down leakage current < 5uA
 - Rich interface on processor: SDIO 2.0, (H) SPI, UART, I2C, I2S, IRDA, PWM, GPIO
 - STBC, 1x1 MIMO, 2x1 MIMO, A-MPDU & A-MSDU aggregation & 0.4s guard interval
 - Wake up, build the connection and transmit packets in < 2ms
 - Standby power consumption < 1.0mW (DTIM3)
 - Support AT remote upgrades and cloud OTA upgrade
 - Support STA/AP/STA+AP operation modes
 - FCC/CE/RoHS

3. Hardware Specifications

3.1 System Diagram

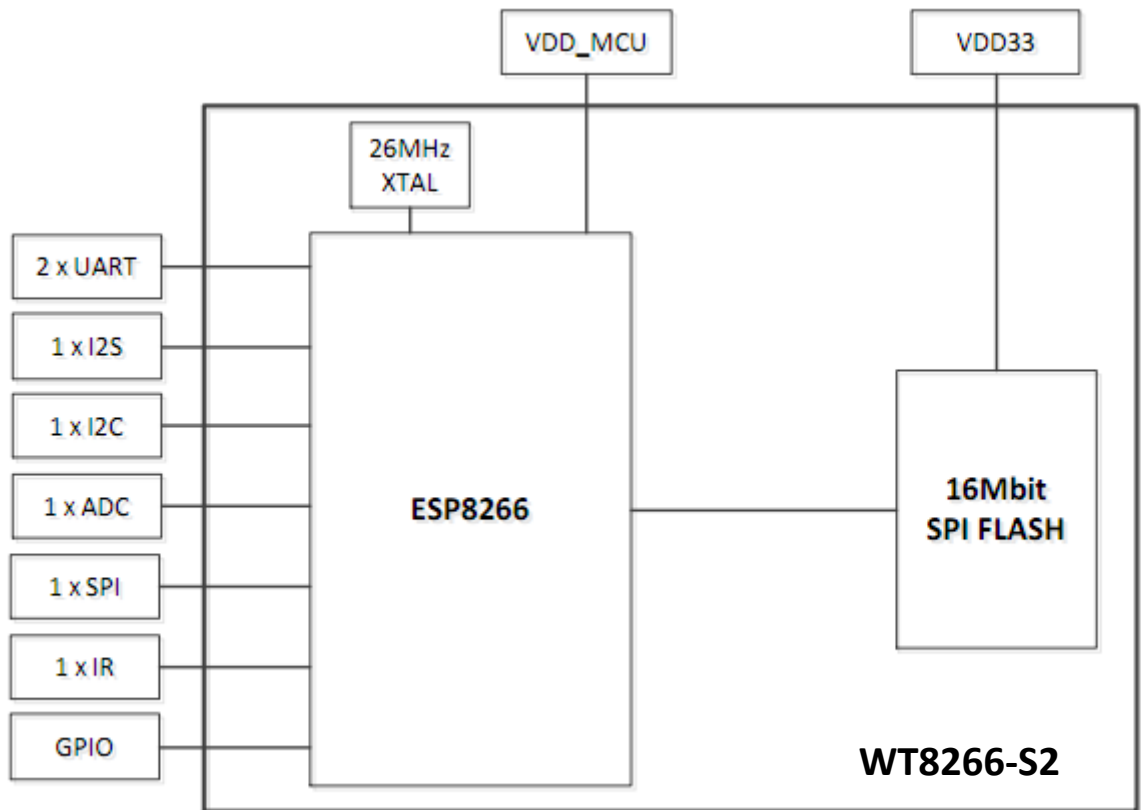


Figure-1 System Diagram

3.2 Pin Description

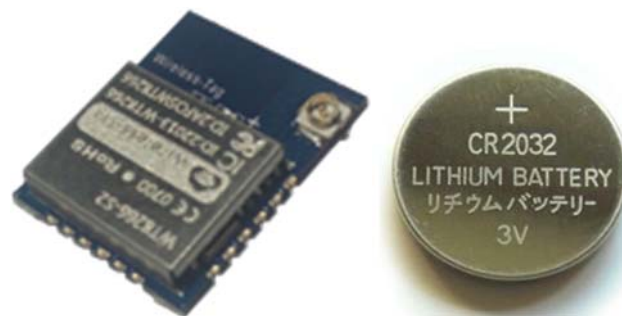


Figure-2 Physical Map (Top View)

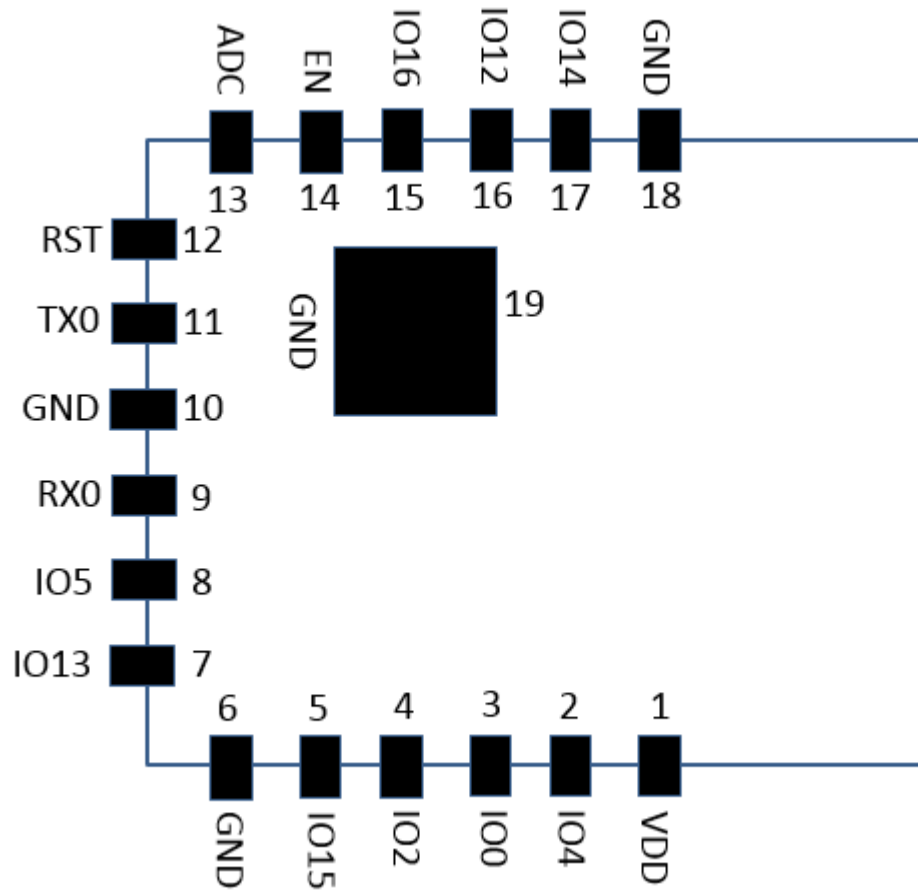


Figure-3 WT8266-S2 Pinout (Bottom View)

Table 1 Pin Definition and Description

Pin	Name	Description
1	VDD	3.3V supply (VDD)
2	IO4	GPIO4
3	IO0	GPIO0
4	IO2	GPIO2;UART1_TXD
5	IO15	GPIO15;MIDO; HSPICS;UART0_RTS
6	GND	GND
7	IO13	GPIO13; HSPI_MOSI;UART0_CTS
8	IO5	GPIO5
9	RX0	UART0_RXD;GPIO3
10	GND	GND
11	TX0	UART0_TXD;GPIO1
12	RST	Reset Module
13	ADC	Detecting chip VDD3P3 supply voltage or ADC pin input voltage (not available at the same time)
14	EN	Chip Enable. High: On, chip works properly; Low: Off, small current
15	IO16	GPIO16; Deep sleep wakeup, by connecting to RST pin

16	IO12	GPIO12;HSPI_MISO
17	IO14	GPIO14;HSPI_CLK
18	GND	GND
19	GND	GND PAD

Note:

Table-2 Pin Mode

Mode	IO15	IO0	IO2
UART Download Mode	Low	Low	High
Flash Boot Mode	Low	High	High

Table-3 Interface Description

Name	Pin	Function Description
HSPI Interface	IO12(MISO),IO13(MOSI),IO14(CLK),IO15(CS)	Can connect external SPI Flash, display and MCU etc.
PWM Interface	IO12(R),IO15(G),IO13(B)	The official demo provides 4-channel PWM (user can expand to 8-channel), can be used to control lights, buzzers, relays and motors, etc.
IR Interface	IO14(IR_T), IO5(IR_R)	The functionality of Infrared remote control interface can be implemented via software programming. NEC coding, modulation, and demodulation are used by this interface. The frequency of modulated carrier signal is 38KHz.
ADC Interface	ADC	ESP8266EX integrates a 10-bit precision SAR ADC. ADC_IN interface is used to test the power supply voltage of VDD3P3 (Pin 3 and Pin 4), as well as the input voltage of TOUT (Pin 6). It can be used in sensors application.
I2C Interface	IO14(SCL), IO2(SDA)	Can connect to external sensor and display, etc.
UART Interface	UART0: TX0(U0TXD),RX0(U0RXD), IO15(RTS),IO13(CTS) UART1: IO2(TX0)	Devices with UART interfaces can be connected Download: U0TXD+U0RXD or GPIO2+U0RXD Communication: (UART0):U0TXD,U0RXD,MTDO(U0RTS),MTCK(U0CTS) Debug: UART1_TXD(GPIO2) Can be used to print debugging information
		By default, UART0 will output some printed information when the device is powered on and is booting up. If this issue exerts influence on some specific applications, users can exchange the inner pins of UART when initializing, that is to say, exchange U0TXD, U0RXD with U0RTS, U0CTS.
I2S Interface	I2S input: IO12 (I2SI_DATA); IO13 (I2SI_BCK); IO14 (I2SI_WS);	Mainly used for audio capturing, processing and transmission.
	I2S output: IO15 (I2SO_BCK); IO3 (I2SO_DATA); IO2 (I2SO_WS);	

3.3 Electrical Characteristic

3.3.1 Maximum Ratings

Table- 4. Maximum Ratings

Ratings	Condition	Value	Unit
Storage Temperature	/	-45 to 125	°C
Maximum Soldering Temperature	/	260	°C
Supply Voltage	IPC/JEDEC J-STD-020	+3.0 to +3.6	V

3.3.2 Recommended Operating Environment

Table -5 Recommended Operating Environment

Working Environment	Name	Min Value	Typical Values	Max Value	Unit
Operating Temperature	/	-40	20	85	°C
Supply Voltage	VDD	3.0	3.3	3.6	V

3.3.3 Digital Port Characteristics

Table -6 Digital Port Characteristics

Port	Typical Values	Min Value	Max Value	Unit
Input low logic level	VIL	-0.3	0.25VDD	V
Input high logic level	VIH	0.75vdd	VDD+0.3	V
Output low logic level	VOL	N	0.1VDD	V
Output high logic level	VOL	0.8VDD	N	V

3.4 Power Consumption

3.4.1 Operating Power Consumption

Table -7 Operating Power Consumption

Mode	Standard	Speed Rate	Typical Value	Unit
Tx	11b	1	215	mA
		11	197	
	11g	6	197	
		54	145	
	11n	MCS7	120	
Rx	All rates		56	mA

Note: RX mode data packet length is 1024 bytes;

3.4.2 Standby Power Consumption

The following current consumption is based on 3.3V supply and 25°C ambient with internal regulators. Values are measured at antenna port without SAW filter. All the transmission measurements values are based on 90% duty cycle, continuous transmission mode.

Table -8 Standby Power Consumption

Mode	Status	Typical Value				
Standby	Modem Sleep	15mA				
	Light Sleep	0.9mA				
	Deep Sleep	20uA				
	Off	0.5uA				
Power Save Mode (2.4G) (Low Power Listen disabled) ¹	DTIM period	Current Cons. (mA)	T1 (ms)	T2 (ms)	Tbeacon (ms)	T3 (ms)
	DTIM 1	1.2	2.01	0.36	0.99	0.39
	DTIM 3	0.9	1.99	0.32	1.06	0.41

①: Modem-Sleep requires the CPU to be working, as in PWM or I2S applications. According to 802.11 standards (like U-APSD), it saves power to shut down the Wi-Fi Modem circuit while maintaining a Wi-Fi connection with no data transmission. E.g. in DTIM3, to maintain a sleep 300ms-wake 3ms cycle to receive AP's Beacon packages, the current is about 15mA.

②: During Light-Sleep, the CPU may be suspended in applications like Wi-Fi switch. Without data transmission, the Wi-Fi Modem circuit can be turned off and CPU suspended to save power according to the 802.11 standard (U-APSD). E.g. in DTIM3, to maintain a sleep 300ms-wake 3ms cycle to receive AP's Beacon packages, the current is about 0.9mA.

③: Deep-Sleep does not require Wi-Fi connection to be maintained. For application with long time lags between data transmission, e.g. a temperature sensor that checks the temperature every 100s, sleep 300s and waking up to connect to the AP (taking about 0.3~1s), the overall average current is less than 1mA.

3.5 RF Characteristics

3.5.1 RF Configuration and General Specifications of Wireless LAN

Table-9 RF Configuration and General Specifications of Wireless LAN

Items	Specifications		Unit
Country/Domain Code	Reserved		—
Center Frequency	11b	2.412-2.472	GHz
	11g	2.412-2.472	GHz
	11n HT20	2.412-2.472	GHz
Rate	11b	1, 2, 5.5, 11	Mbps
	11g	6, 9, 12, 18, 24, 36, 48, 54	Mbps
	11n 1stream	MCS0, 1, 2, 3, 4, 5, 6, 7	Mbps
Modulation type	11b	DSSS	—
	11g/n	OFDM	—

3.5.2 RF Tx Characteristics

Table-10 Emission Characteristics

Mark	Parameters	Condition	Min Value	Typical Value	Max Value	Unit
Ftx	Input Frequency	—	2.412	—	2.484	GHz
Pout	Output Power					
	11b	1Mbps	—	19.5	—	dBm
		11Mbps	—	18.5	—	dBm
		54Mbps	—	16	—	dBm
		MCS7	—	14	—	dBm

3.5.3 RF Rx Characteristics

Table-11 RF Receiving Characteristics

Mark	Parameters	Condition	Min Value	Typical Value	Max Value	Unit
Frx	Input Frequency	—	2.412	—	2.484	GHz
Srf	Sensitivity					
	DSSS	1 Mbps	—	-98	—	dBm
		11 Mbps	—	-91	—	dBm
	OFDM	6 Mbps	—	-93	—	dBm
		54 Mbps	—	-75	—	dBm
	HT20	MCS7	—	-71	—	dBm

4. Mechanical Dimensions

4.1 Module Size

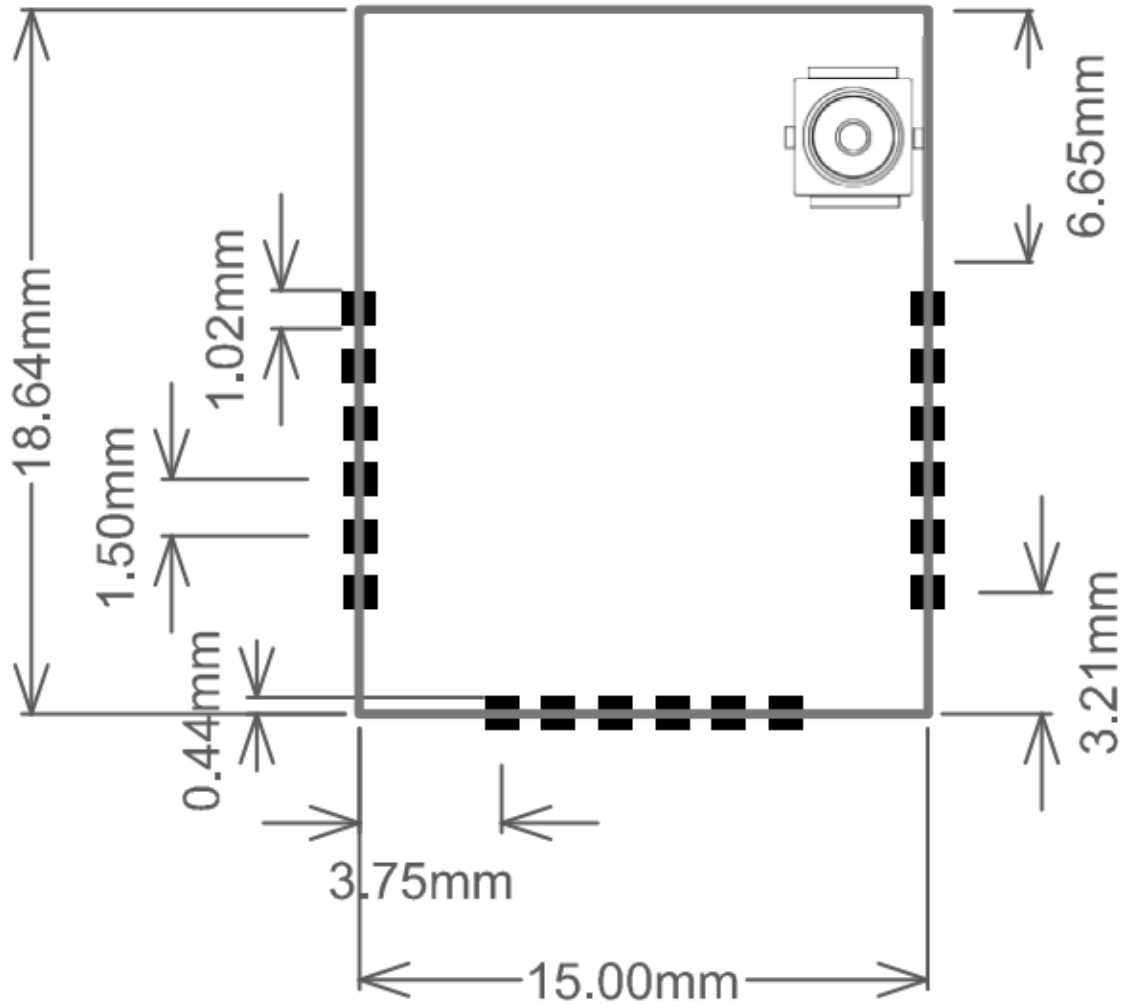


Figure -4 Module Size (Front View)

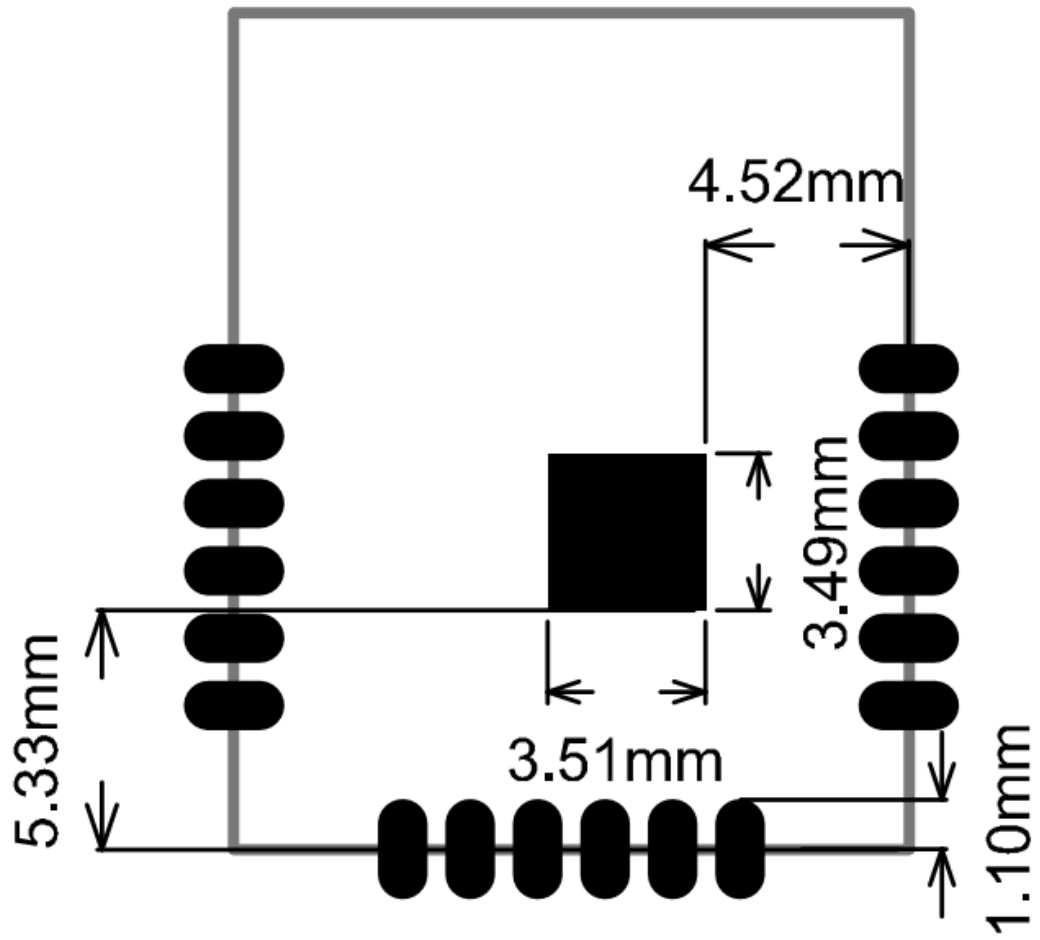


Figure -4-1 Module Size (reverse projection view)

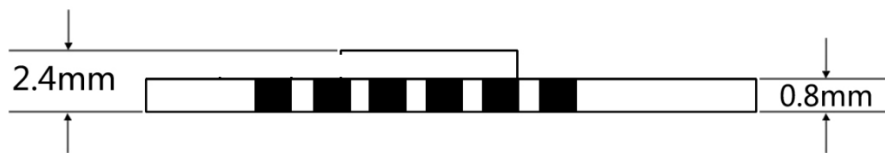


Figure -5 Module Size (Side View)

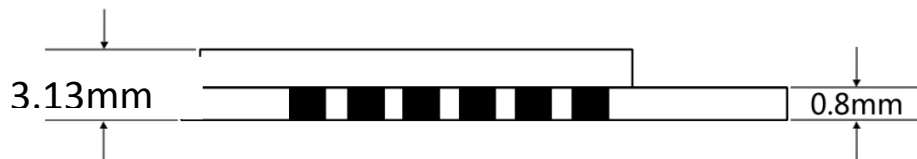


Figure -6 Module Size - shieldingcase (Side View)

4.2 Schematics

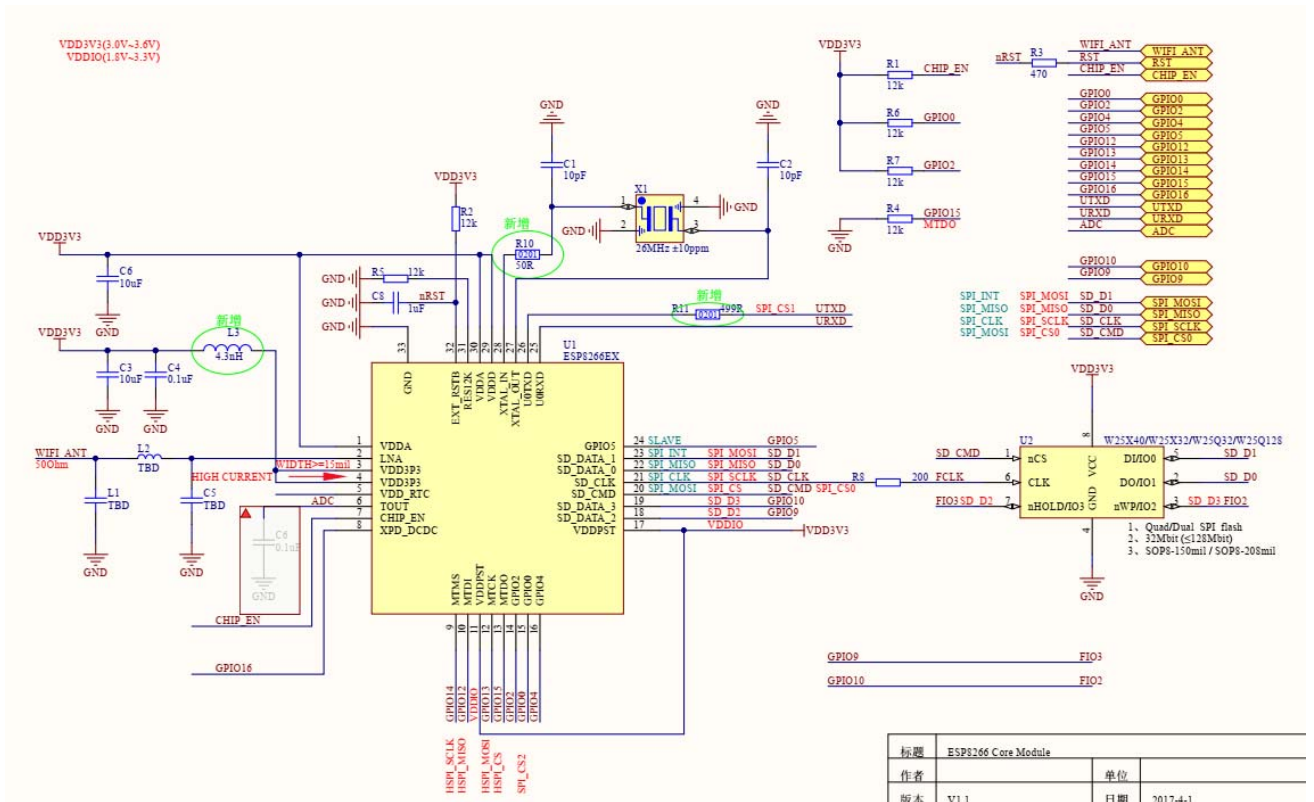


Figure -7 WT8266-S2 Schematics

5. Certification

Figure -8 RED (CE 0700) Certification

Figure -9 FCC Certification

Figure -10 RoHS Certification

6. Product Trial

- Forum: bbs.wireless-tag.com

Federal Communication Commission Statement (FCC, U.S.)

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 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.

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.

FCC Caution:

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

IMPORTANT NOTES

Co-location warning:

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

OEM integration instructions:

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

The transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the external antenna(s) that has been originally tested and certified with this module.

As long as the conditions above are met, further transmitter test 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 (for example, digital device emissions, PC peripheral requirements, etc.).

Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in

combination with the host equipment is no longer considered valid and the FCC ID of the module 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 Transmitter Module FCC ID: 2AFOS-WT8266-S2".

Information that must be placed in the end user manual:

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 v01

2.2 List of applicable FCC rules

FCC Part 15 Subpart C 15.247 & 15.207 & 15.209

2.3 Specific operational use conditions

The module is a WIFI module with WIFI 2.4G function.

Operation Frequency: 2412~2462MHz

Number of Channel: 11

Modulation: 802.11b CCK; 802.11g/n OFDM

Type: FPC Antenna

Gain: 3 dBi Max.

The module can be used for mobile or applications with a maximum 3dBi antenna. The host manufacturer installing this module into their product must ensure that the final composite product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation. The host manufacturer 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.

2.4 Limited module procedures

Not applicable. The module is a Single module and complies with the requirement of FCC Part 15.212.

2.5 Trace antenna designs

Not applicable. The module has its own antenna, and doesn't need a host's printed board microstrip trace antenna etc.

2.6 RF exposure considerations

The module must be installed in the host equipment such that at least 20cm is maintained between the antenna and users' body; and if RF exposure statement or module layout is changed, then the host product manufacturer required to take responsibility of the module through a change in FCC ID or new application. The FCC ID of the module cannot be used on the final product. In these circumstances, the host manufacturer will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization

2.7 Antennas

Antenna Specification are as follows: Type: FPC Antenna

Gain: 3 dBi

This device is intended only for host manufacturers under the following conditions: The transmitter module may not be co-located with any other transmitter or antenna;

The module shall be only used with the internal antenna(s) that has been originally tested and certified with this module. The antenna must be either permanently attached or employ a 'unique' antenna coupler.

As long as the conditions above are met, further transmitter test will not be required. However, the host manufacturer is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

2.8 Label and compliance information

Host product manufacturers need to provide a physical or e-label stating “Contains FCC ID: 2AFOS-WT8266-S2” with their finished product.

2.9 Information on test modes and additional testing requirements

Operation Frequency: 2412~2462MHz

Number of Channel: 11

Modulation: 802.11b CCK; 802.11g/n OFDM

Host manufacturer must perform test of radiated & conducted emission and spurious emission, etc according to the actual test modes for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

Only when all the test results of test modes comply with FCC requirements, then the end product can be sold legally.

2.10 Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for FCC Part 15 Subpart C 15.247 & 15.207 & 15.209 and that the 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. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

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.

Warning: 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.

FCC 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 & your body.