# TGW206-16

## Wi-Fi 802.11b/g/n+ Bluetooth LE 5.0 Module

Table of contents

# 1. Product Features1.

## 1 Describe

TGW206-16 is a smart new generation highly integrated Wi-Fi and Bluetooth LE combination chip. The wireless subsystem includes 2.4G radio, Wi-Fi 802.11b/g/n and BLE baseband/MAC design. The microcontroller subsystem contains a low-power 32-bit RISC CPU, cache and memory. The power management unit provides flexible settings to implement low-power modes and supports a variety of security features.

### 1.2 Product Features

**802.11b/g/n, Wi-Fi+Bluetooth LE5.0 Combo, support STA, Soft AP and Sniffer**

**Adopt open source self-controllable RISC-V CPU, 1～160MHz adjustable, 276KB SRAM**

**Ultra-low power consumption: sleep power consumption is only 0.5uA, network standby power consumption is only 40uA (DTIM10)**

**Ultra-fast connection: cold start fast connection is only 70ms**

**Ultra-long distance: maximum transmit power 21dBm, sensitivity -98dBm, penetrating one more wall**

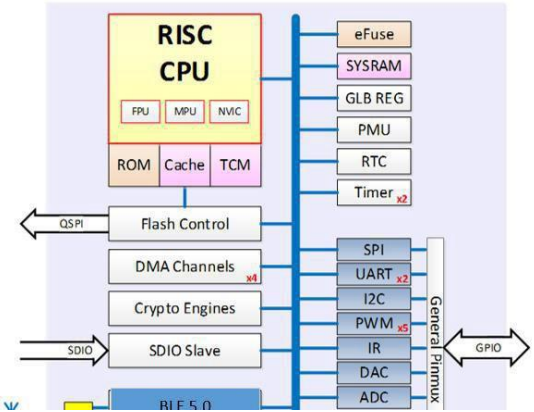
**High security: support secure boot, secure debugging, AES 128/192/256 encryption engine, WPA3, MD5, SHA-1/224/256, PKA (RSA/ECC) encryption engin**

Support Wi-Fi and Bluetooth LE coexistence

### 1.3 Application scenarios

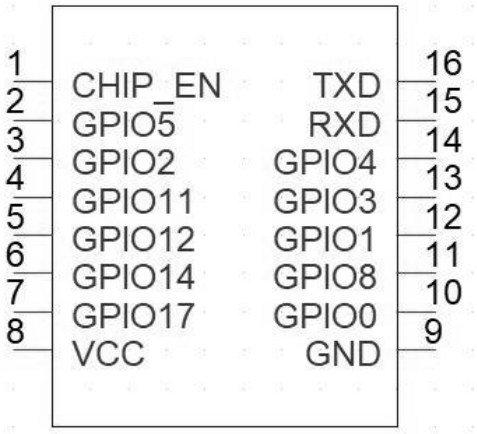
- Smart Lighting
- Smart switch
- Smart socket
- Smart home appliances
- Monitoring remote control

### 1.4 System Block Diagram



## 2. PIN foot definition

### 2.1 Module PIN interface diagram




### 2.2 Pin Function

| NO | Name | IO Type | Description | Configurable Functions |
|---|---|---|---|---|
| 1 | CHIP_EN | I/O | Chip enable pin (active high) | |
| 2 | GPIO5 | I/O | GPIO5 | SDIO,SPI, I2C, UART, PWM0, ADC,ACOMP |
| 3 | GPIO2 | I/O | GPIO2 | SDIO, SFLASH, SPI, I2C, UART, PWM2 |
| 4 | GPIO11 | I/O | GPIO11 | SPI, I2C, UART, PWM1, ADC, |
| 5 | GPIO12 | I/O | GPIO12 | SPI, I2C, UART, PWM2, ADC, ACOMP |
| 6 | GPIO14 | I/O | GPIO14 | SPI, I2C, UART, PWM4, ADC, ACOMP, DAC |
| 7 | GPIO17 | I/O | GPIO17 | SPI, I2C, UART, PWM2, |
| 8 | VCC | P | Power supply. 3.3V is required | |
| 9 | GND | P | Ground connections | |
| 10 | GPIO0 | I/O | GPIO0 | SDIO, SFLASH, SPI, I2C, UART, PWM0 |
| 11 | GPIO8 | I/O | GPIO8 (Boot option). | SPI, I2C, UART, PWM3 |
| 12 | GPIO1 | I/O | GPIO1 | SDIO, SFLASH, SPI, I2C, UART, PWM1 |
| 13 | GPIO3 | I/O | GPIO3 | SDIO, SPI, I2C,PWM3, 用户通讯串口 RXD |

| | | | | |
|---|---|---|---|---|
| 14 | GPIO4 | I/O | GPIO4 | SDIO, SPI, I2C, PWM4, ADC, ACOMP,用户通讯串口 TXD |
| 15 | RXD | I/O | UART RX | 该串口只能作为烧录及日志输出串口 |
| 16 | TXD | I/O | UART TX | |

**Note: 1. The standard transparent transmission firmware uses GPIO3 (user communication serial port RXD) and GPIO4 (user communication serial port TXD) as the serial port for communication with the MCU.**
**2. The module supports up to five PWM outputs, and the PWM in the same group can only set one of the GPIO ports.**

## 3. Module Feature Specifications

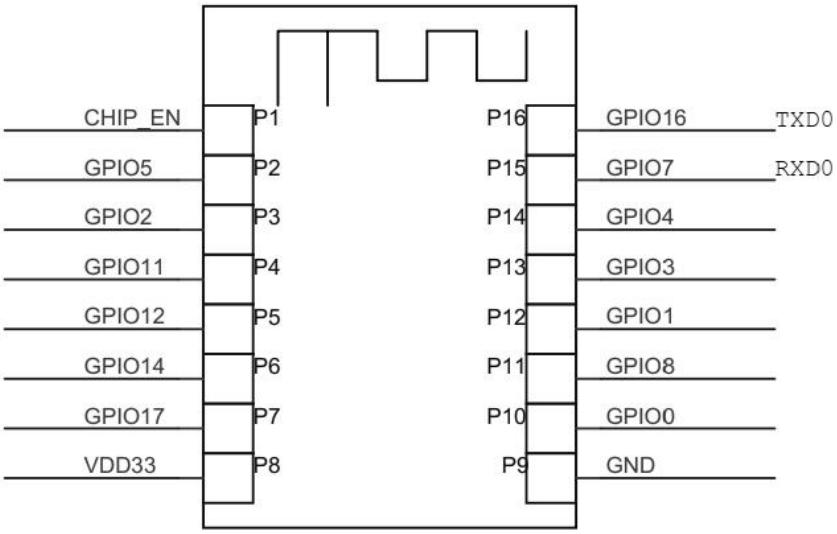
### 3.1 Electrical Characteristics

| | |
|---|---|
| Product Name | TGW206-16 Module |
| Standard | IEEE 802.11b/g/n |
| Frequency Band | 2.4~2.4835GHz ISM Band |
| Modulation Type | 802.11b: CCK, DQPSK, DBPSK |
| | 802.11g: 64-QAM,16-QAM, QPSK, BPSK |
| | 802.11n: 64-QAM,16-QAM, QPSK, BPSK |
| Data Transfer Rate | 1,2,5.5,6,11,12,18,22,24,30,36,48,54,65,72.2Mbps |
| Spread Spectrum | IEEE 802.11b: DSSS (Direct Sequence Spread Spectrum) |
| | IEEE802.11g/n: OFDM (Orthogonal Frequency Division Multiplexing) |
| RX Sensitivity | 11b-1Mbps: -98dBm |
| | 11b-11Mbps: -91dBm |
| | 11g-54Mbps: -77dBm |
| | 11n HT20-MCS0: -92dBm |
| | 11n HT20-MCS7: -73dBm |
| Maximum Input Level | 11b: 5dBm |
| | MCS0: -4dBm |
| | MCS7: -13dBm |
| Output Power | 11b: 21dBm |
| | 11g: 18dBm |
| | 11n: 17dBm |
| Interface | UART |
| Power Supply | DC3.3V |
| Operating Temperature | -30℃ to +85℃ |

| | |
|---|---|
| Size: | 24mm×16mm×2.75mm |

## 4. Reference application andPCB Layout

### 4.1 Application Schematic Reference




**4.2** PCB Layout reference

4.2.1 Keep the headroom at the module antenna

4.2.2 The module is far away from strong interference sources

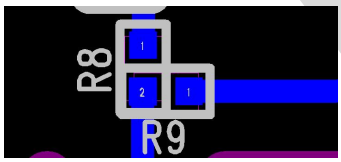
4.2.3 The capacitor should be increased at the power supply, and the trace should be short and thick

**4.2.4 he module can be attached to the PCB board, or it can be soldered on the PCB board with 2.0 pin headers**

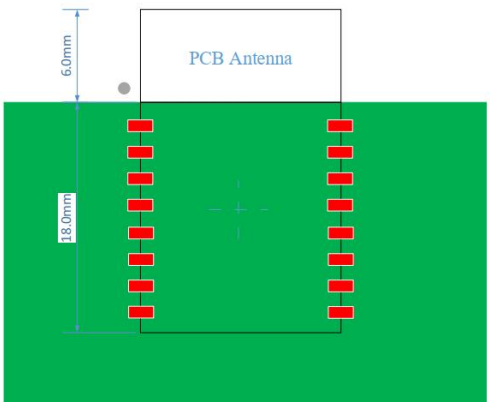
4.2.5 The PCB can use the on-board antenna, or use the IPEX socket to connect the external antenna (as follows), this version is the on-board antenna

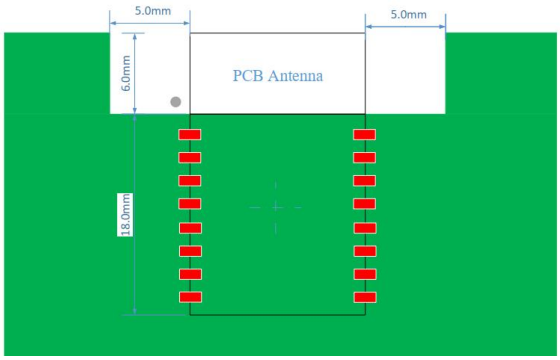
Onboard Antenna: R8(0R) / R9(NC)

- PEXThe socket is connected to the external antenna:R8(NC) / R9（0R）



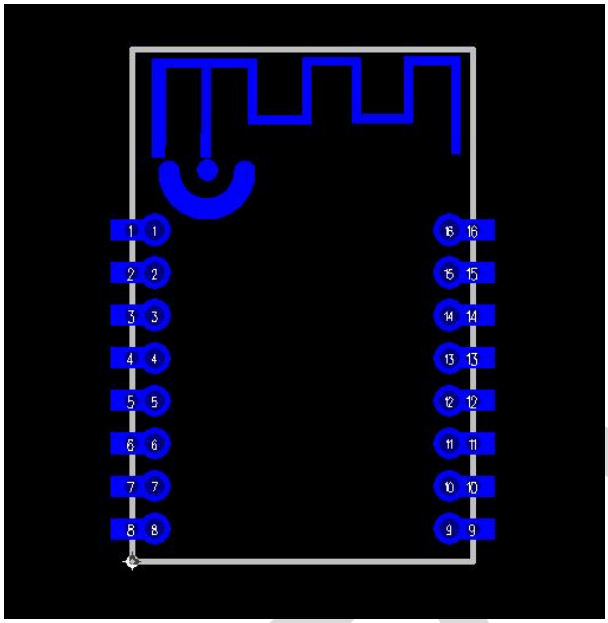

4.2.6 Module layout suggestions are as follows



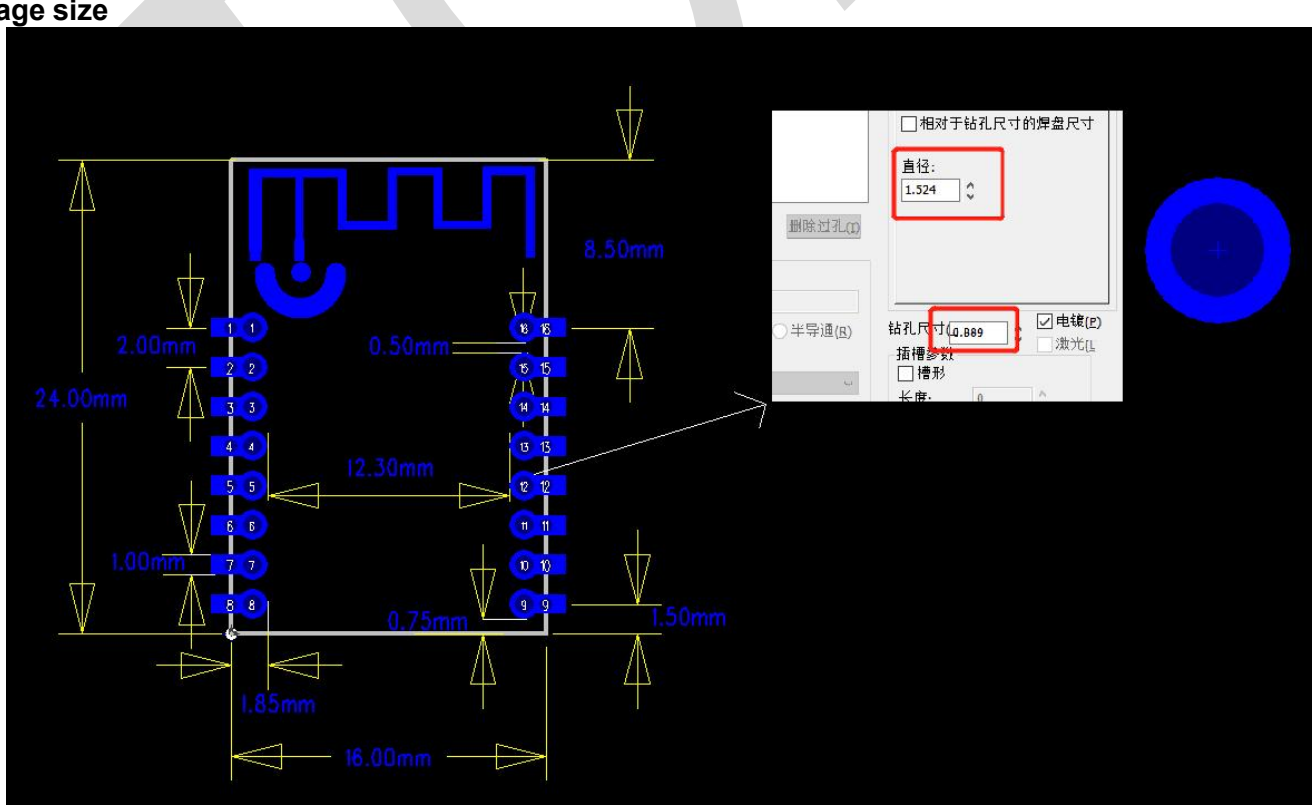



# 5. Reference PCB Package

## 5.1 Recommended pad



## 5.2 Package size



## 6. Revise history

| Version | Modify the content | Modified by | Date |
|---|---|---|---|
| V0.1 | first edition | Yongwu zhong | 2020.08.09 |
| V0.2 | Update series naming | Yongwu zhong | 2020.10.27 |
| V0.3 | Update GPIO function description | MJ | 2022.01.13 |

FCC STATEMENT

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
This device may not cause harmful interference, and
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 20mm between the radiator & your body.

**Integration instructions for host product manufacturers according to KDB 996369 D03 OEMManual 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**
Operation Mode : BT BLE
Support Rate : 1Mbps 2Mbps
Operation Frequency : 2402~2480MHz
Number of Channel : 40 Channels
Modulation Type : GFSK
Operation Mode : 802.11b 802.11g 802.11n(HT20)
Operation Frequency : 2412~2462MHz
Number of Channel : 11 Channel for 20MHz bandwidth (2412~2462MHz)
Modulation Type : 802.11b: DSSS (CCK, DQPSK, DBPSK)
802.11g: OFDM (BPSK, QPSK, 16QAM, 64QAM)
802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM)
Antenna Type : PCBl antenna
Antenna Gain(Peak) : 2.05 dBi (Provided by customer)
The module can be used for mobile or portable applications with a maximum 2.05dBi antenna. The host manufacturer installing this module into their product must ensure that the final composit product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operaition. The host manufacturer has to be aware not to provide informationto 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 microstriptrace antenna etc.


**2.6 RF exposure considerations**

The module must be installed in the host equipment such that at least 20mm 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 newapplication. 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:

Antenna Type:PCB antenna

Antenna Gain(Peak):2.05 dBi (Provided by customer)

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 External 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 peripheralrequirements, etc

**2.8 Label and compliance information**

Host product manufacturers need to provide a physical or e-label stating "Contains FCC ID VYV-TGW206-16 With their finished product.

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

Operation Mode : BT BLE
Support Rate : 1Mbps 2Mbps
Operation Frequency : 2402~2480MHz
Number of Channel : 40 Channels
Modulation Type : GFSK
Operation Mode : 802.11b 802.11g 802.11n(HT20)
Operation Frequency : 2412~2462MHz
Number of Channel : 11 Channel for 20MHz bandwidth (2412~2462MHz)
Modulation Type : 802.11b: DSSS (CCK, DQPSK, DBPSK)
802.11g: OFDM (BPSK, QPSK, 16QAM, 64QAM)
802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM)

Antenna Type : PCBI antenna
Antenna Gain(Peak) : 2.05 dBi (Provided by customer)
Host manufacturer must perfom 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 canbe 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 & 15.209and that the host product manufacturer is responsible for compliance to any other FCC rules that applyto 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 circuity), 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.