TGW202-6

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

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1.Product Features and Specifications

1.1Describe

The TGW202-6 module is designed based on a new generation of intelligent and highly integrated Wi-Fi and Bluetooth LE combination chip TG7100C. The wireless subsystem includes 2.4G radio, Wi-Fi 802.11b/g/n and LE 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. TGW202-6 module DIP pin welding method is designed, which is especially convenient for small-sized lamps and lanterns. The module leads out the antenna pad, which is convenient for structural design; it supports I2C control or supports up to three PWM outputs at the same time, which can realize simple and fast access to the Tmall Genie ecosystem.

1.2Product Features

- 802.11b/g/n，Wi-Fi+ Bluetooth LE5.0 Combo，support STA，Soft AP 和 Sniffer
- Supports the use of open source self-controllable RISC-V CPU, adjustable from 1 to 160MHz, 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: transmit power up to 21dBm, sensitivity -90dBm, 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 engine
- support Wi-Fi 和 Bluetooth LE

1.3Module block diagram

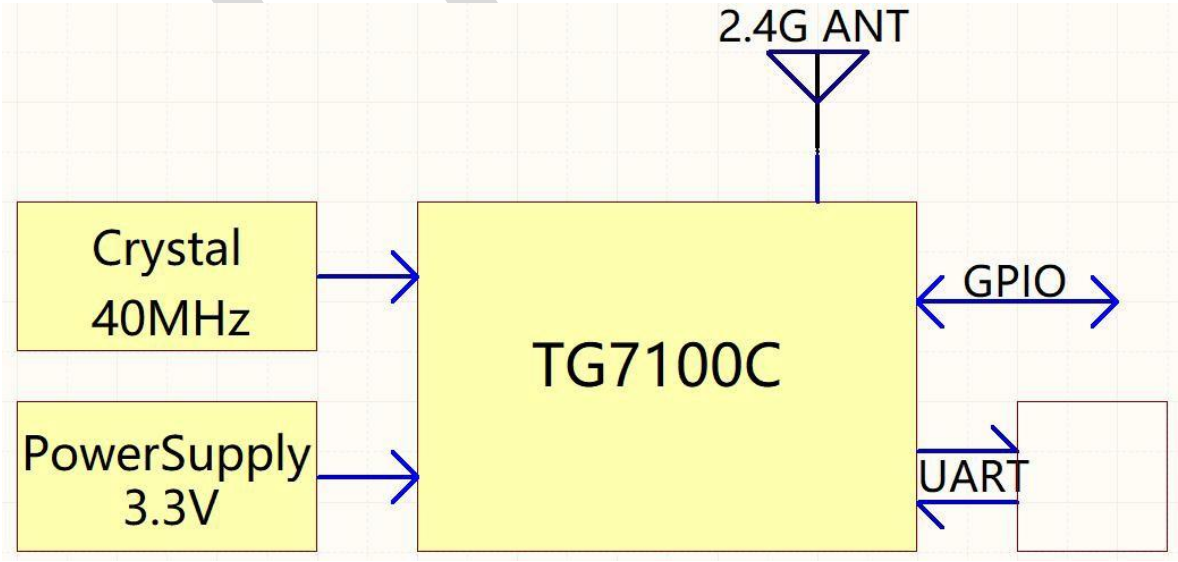


Figure 1 TGW202-6 module block diagram

1.4Application scenarios

Smart Lighting

2.Module pin definition

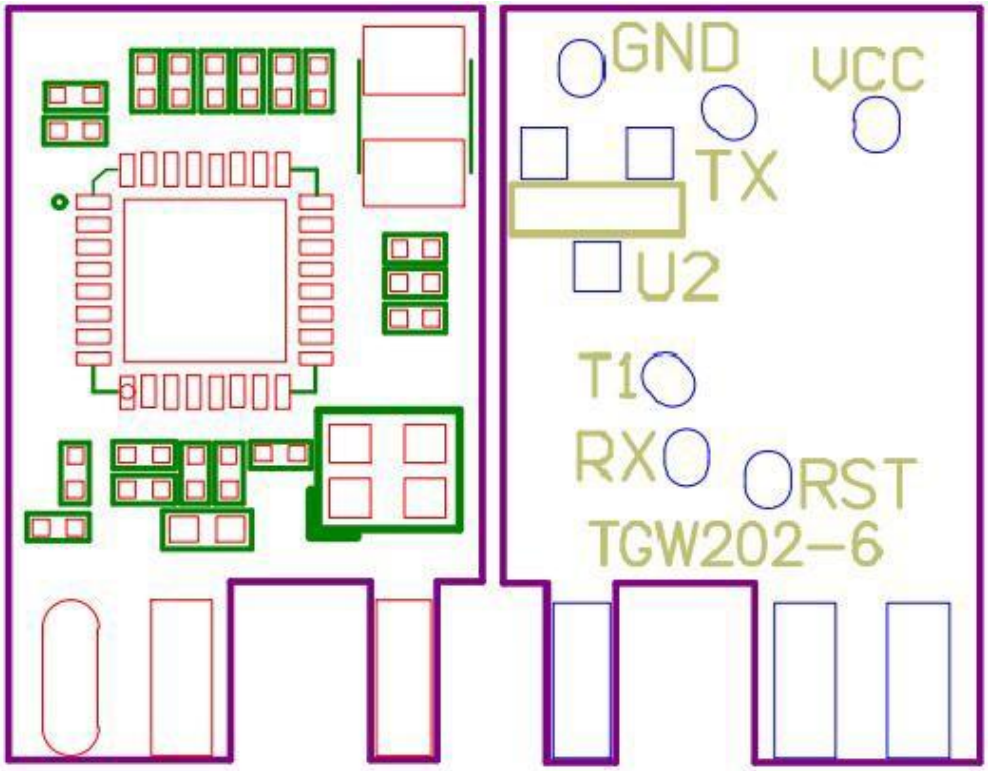


Figure 2 Module pins

Module pin definition

pin Numbering	Module pin name	illustrate
1	ANT1	External antenna
2	PWM2	GPIO22
3	PWM0	GPIO20
4	VDD33	PowerSupply
5	PWM1	GPIO21
6	GND	Ground

Note: This module can be configured with up to 3 independent PWM channels.

3.Electrical Characteristics Specifications

3.1WiFi RF Specifications

Product Name	TGW202-6 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: -90dBm
	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	DC 3.3V
Operating Temperature	-30℃ to +105℃
Size:	13.5mm×8.5mm×2.1mm

3.2BLE RF Specifications

Parameter	Conditions	Minimum	Typical	Maximum	Unit
Frequency range		2402		2480	MHz
RX sensitivity	1 Mbps	-	-93	-	dBm
Initial carrier frequency offset		-24	5	24	KHz
Output power	BLE 1M	-	9	-	dBm

3.3Recommended working environment

parameter	describe	Min	TYP	MAX	UNIT
VDD	Module supply voltage	2.7	3.3	3.6	V
TA	operating ambient temperature	-30	25	105	℃
Ts	Storage ambient temperature	-40	25	125	℃

3.4Module electrical parameters

parameter	Min	TYP	MAX	UNIT
VDD	2.7	3.3	3.6	V
Distribution current	-	120	-	mA
working current	-	55	-	mA
standby current	-	23	-	mA

4.Refer to application

4.1Application schematic reference

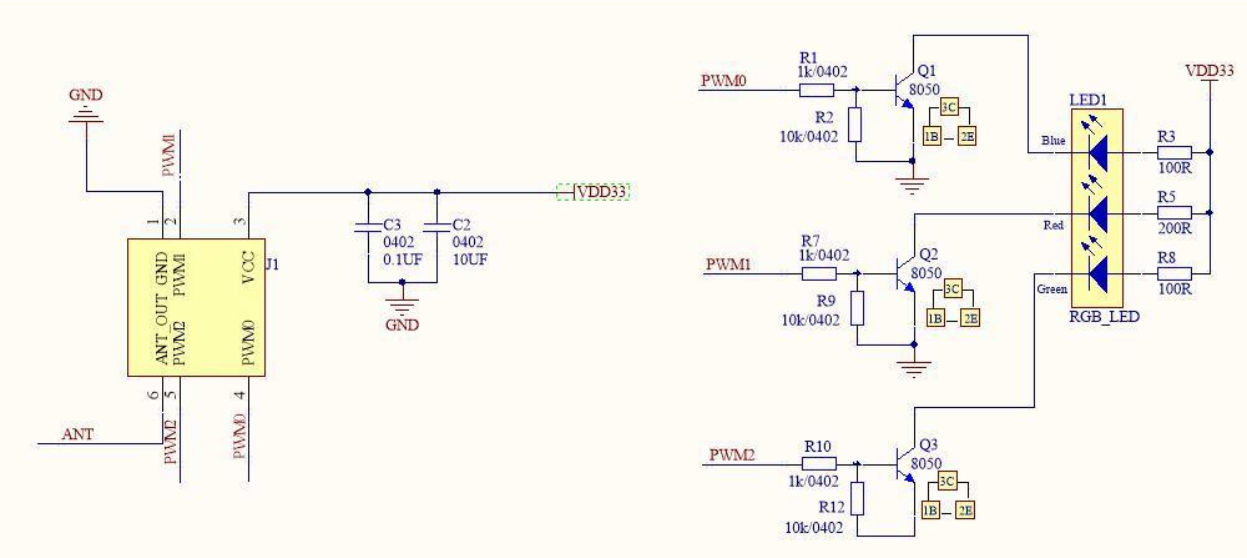
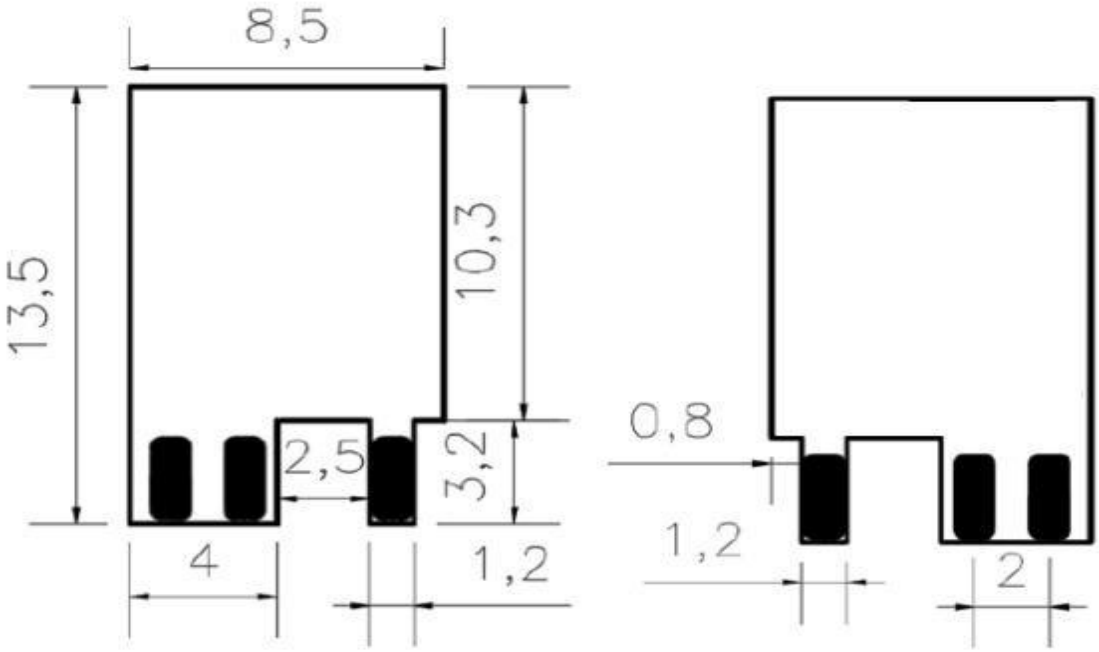


Figure 3. TGW202-6 application circuit diagram

5.Module Mechanical Dimensions

5.1 Module Mechanical Dimensions（tolerance±0.15mm）



A side B side

5.2 Reference Layout package size（tolerance±0.15m）

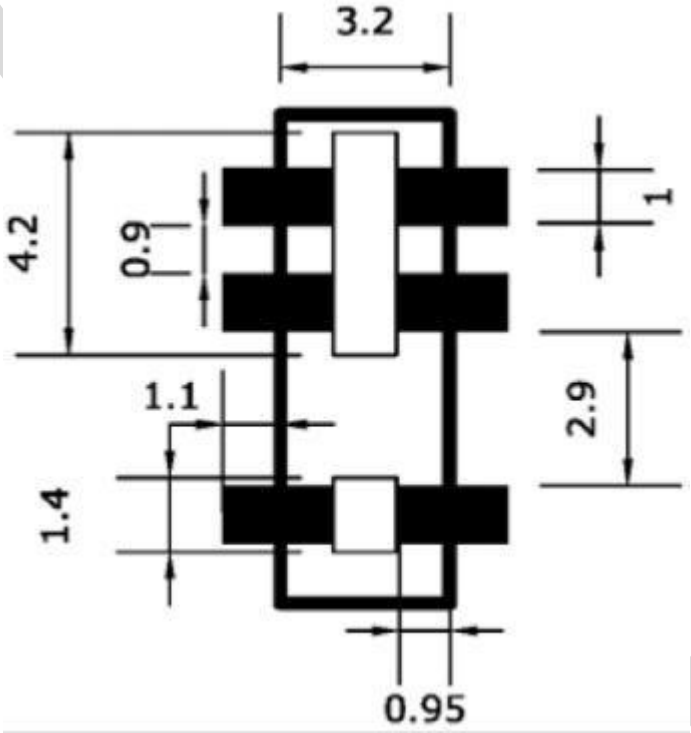


Figure 4 Reference layout package size diagram

6.Layout Precautions

This module is an external antenna, so the antenna should be designed with excellent performance in the 2.4-2.5GHz frequency band

The module power supply filter capacitor should be as close as possible to the module VDD signal Interface

7.Packaging information

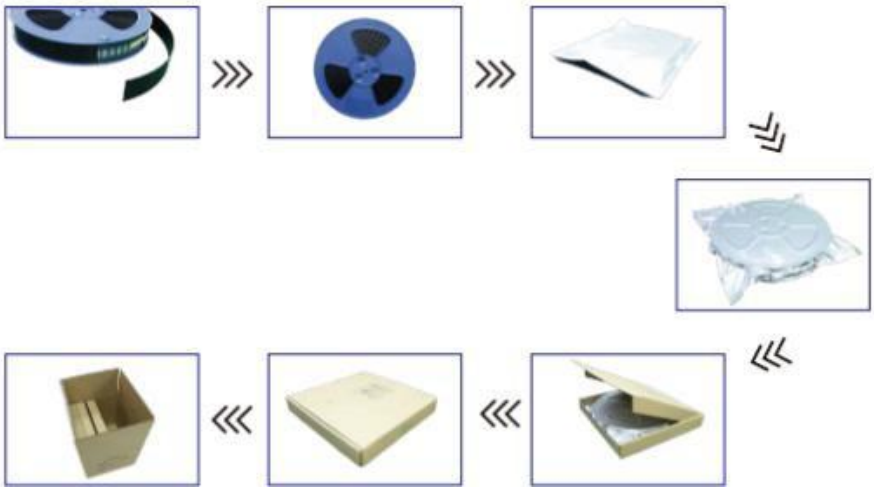


Figure 5. TGW202-6 module packaging process overview

8.Wave soldering reference curve

TGW202-6 is an in-line module. A wave soldering device is recommended for welding. Only when no wave soldering equipment is available, it is recommended to use wave soldering equipment for welding. Manual welding is recommended within 24 hours after unpacking. Otherwise, the solder should be placed in a drying cabinet with a humidity of less than 10%RH, or re-vacuumed, and the exposure time recorded. The total exposure time must not exceed 168 hours.

Please refer to the recommended temperature of the wave welding furnace to set the furnace temperature. The wave welding temperature is 260℃±5℃, and the wave welding temperature curve is shown below:

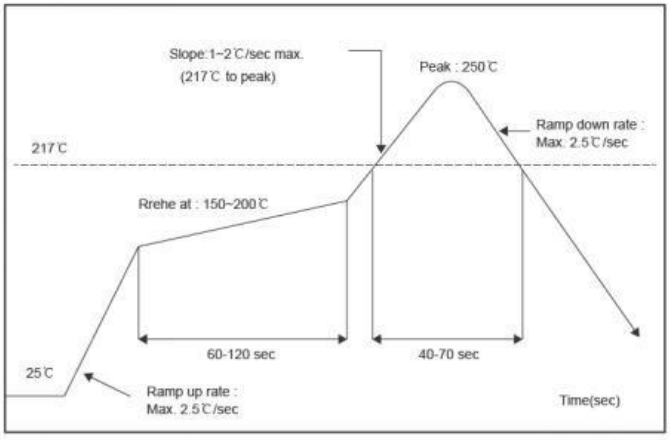


Figure 6. Recommended for wave soldering with lead-free solders

Note: When welding modules, it is recommended not to perform double wave soldering.

Recommended welding temperature			
Recommendations for temperature curves of wave soldering furnac		Recommended temperature for manual welding	
preheating temperature	80-130℃	Welding temperature	360℃±20℃
preheating time	75-100S	weld time	It's less than 3S per dot
Crest contact time	3-5S	N/A	N/A
Tin cylinder temperature	260±5℃	N/A	N/A
Temperature rise slope	≤2℃/S	N/A	N/A
ramp rate	≤6℃/S	N/A	N/A

9. FCC Certification Requirements

According to the definition of mobile and fixed device is described in Part 2.1091(b), this device is a fixed device.
And the following conditions must be met:
1. This Modular Approval is limited to OEM installation for fixed applications only. The antenna installation and operating configurations of this transmitter, including any applicable source-based timeaveraging duty factor, antenna gain, and cable loss must satisfy MPE categorical Exclusion Requirements of 2.1091.
2. The EUT is a fixed device; maintain at least a 20 cm separation between the EUT and the user’s body and must not transmit simultaneously with any other antenna or transmitter.
3. A label with the following statements must be attached to the host end product: This device contains FCC ID:VYV-TGW202-6 . This module must not transmit simultaneously with any other antenna or transmitter
5. The host end product must include a user manual that clearly defines operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.
For portable devices, in addition to the conditions 3 through 6 described above, a separate approval is required to satisfy the SAR requirements of FCC Part 2.1093 If the device is used for other equipment that separate approval is required for all other operating configurations, including portable configurations with respect to 2.1093 and different antenna configurations. For this device, OEM integrators must be provided with labeling instructions of finished products.
Please refer to KDB784748 D01 v07, section 8. Page 6/7 last two paragraphs: A certified modular has the option to use a permanently affixed label, or an electronic label. For a permanently affixed label, the module must be labeled with an FCC ID - Section 2.926 (see 2.2 Certification (labeling requirements) above). The OEM manual must provide clear instructions explaining to the OEM the labeling requirements, options and OEM user manual instructions that are required (see next paragraph).
For a host using a certified modular with a standard fixed label, if (1) the module’s FCC ID is not visible when installed in the host, or (2) if the host is marketed so that end users do not have straightforward commonly used methods for access to remove the module so that the FCC ID of the module is visible; then an additional permanent label referring to the enclosed module: VYV-TGW202-6: “Contains Transmitter Module FCC ID: VYV-TGW202-6” The host OEM user manual must also contain clear instructions on how end users can find and/or access the module and the FCC ID.

9.1 Radiation Exposure Statement:

This module support BT(2402-2480MHz) ,WIFI(2412~2462 MHz)which compliance with part 15.249,15.247 and apply for limited module approval . The module is limited to OEM installation only. The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.
OEM integrator shall equipped the antenna to compliance with antenna requirement part 15.203& 15.204 and must not be co-located or operating in conjunction with any other antenna or transmitters. And OEM host shall implement a Class II Permissive Change (C2PC) or a new FCC ID to demonstrate complied with FCC standard. The OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.
The final end product must be labelled in a visible area with the following: “Contains FCC ID:VYV-TGW202-6” The final host / module combination may also need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device. The user’s manual or instruction manual for an intentional or unintentional radiator shall caution the user

that changes, or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.
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 manufacturer could void the user’s authority to operate the equipment.
To ensure compliance with all non-transmitter functions the host manufacturer is responsible for ensuring compliance with the module(s) installed and fully operational. For example, if a host was previously authorized as an unintentional radiator under the Supplier’s Declaration of Conformity procedure without a transmitter certified module and a module is added, the host manufacturer is responsible for ensuring that the after the module is installed and operational the host continues to be compliant with the Part 15B unintentional radiator requirements.

9.2 Class B digital device

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.

9.3 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.

9.4 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.

9.5 Summarize the specific operational use conditions:

The TGW202-6 radio module is designed specifically for control applications in the host product intelligent lighting series, model: TGW202-6. The radio module is not intended to be sold as a standalone product. TGW202-6 is only suitable for indoor lighting fixtures. The TGW202-6 radio module must not coexist or work together with any other antenna or transmitter.

10.Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

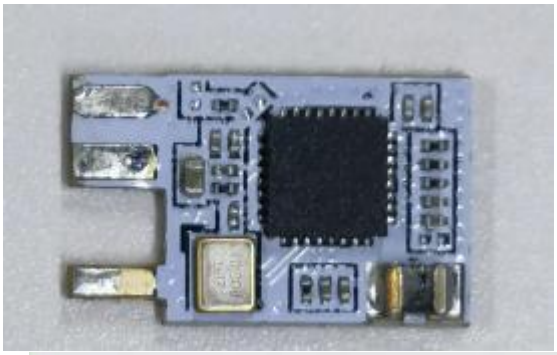
10.1 List of applicable FCC rules
CFR 47 FCC PART 15 SUBPART C 15.247 & 15.207 & 15.209

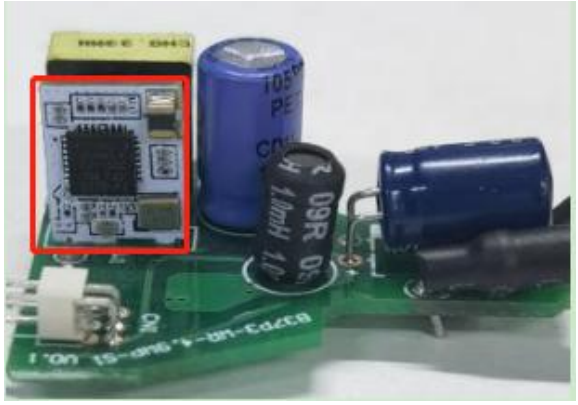
10.2 Specific operational use conditions
The radio module is installed in smart lighting fixtures, and can be remotely controlled by the app in home, office, and commercial environments.

10.3 Limited module procedures

The TGW202-6 radio module does not include its own RF shielding. The radio module has been tested in a standalone configuration and complies with FCC Part 15.247. The RF module has also been tested in the host product series, and each host product model has been verified for AC power line conducted emission, stray radiation emission, and conducted output power. The results of the host product testing indicate that the radio module meets the requirements when installed in the host product. Any installation or operation that does not follow this manual will require further evaluation.Host installation instructions：Plug the signal port of the module into the corresponding port on the main boardof the host. See the figure below, marked in the red box.

The module is installed inside the host





Note: See Appendix 1 at the end for detailed instructions on how to install.

10.4 Trace antenna designs

The module itself does not come with an antenna, and the rod antenna provided by the laboratory is used for testing.any changes or modifications by the OEM integrator will require additional testing and evaluation.

10.5 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.

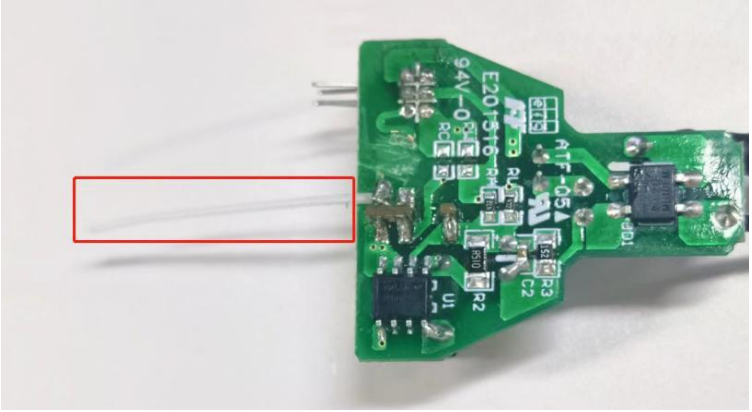
The module has been evaluated and shown compliant with the FCC RF Exposure limits under Mobile exposure conditions. OEM integrator shall equipped the antenna to compliance with antenna requirement part 15.203 &15.204 and must not be co-located or operating in conjunction with any other antenna or transmitters,otherwise, a Class II Permissive Change (C2PC) must be filed with the FCC and/or a new FCC authorization must be applied.

10.6 Antennas

Please perform the Trace antenna design that followed the specifications of the antenna.
The concrete contents of a check are the following three points.
1) It is the same type as the antenna type of antenna specifications.
2) An antenna gain is lower than a gain given in antenna specifications.
Measure the gain, and confirm the peak gain is less than the application value.
3) The emission level is not getting worse.

Measure the spurious, and confirm degradation of less than 3dB than spurious value of worst of report used for the application.

Antenna Specification are as follows:
Antenna Type:Monopole antenna
Antenna Gain(Peak):2 dBi



This radio transmitter FCC ID: VYV-TGW202-6 has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. This device does not use antenna types whose gain is greater than the maximum gain of any of the listed types not included below. The antenna is External antenna, It's permanently fixed. the antenna gain is 2.4GHz 2dBi),This antenna is permanently paired with a product to sell.
The final installation of the radio module in the host must include an antenna.
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.)
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.Please refer to Section 9.1 for details.

10.7 Label and compliance information

The final end product must be labelled in a visible area with the following :
“Contains FCC ID: VYV-TGW202-6”
If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users' manual: 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.

A user's manual for the finished product should include one of the following statements: For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:
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.

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:
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.

The User's Manual for The finished product should include the following statements:
Any changes or modifications to this equipment not expressly approved by the OEM/Integrator may cause harmful interference and void the user's authority to operate this equipment.

RF Exposure
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.

10.8 Information on test modes and additional testing requirements
Data transfer module demo board can control the EUT work in RF test mode at specified conditions. This radio module must not be installed to co-locate and operating simultaneously with other radios in the host system except in accordance with FCC multi-transmitter product procedures. Additional testing and equipment authorization may be required operate simultaneously with other radio.

10.9 Additional testing, Part 15 Subpart B disclaimer

The host product manufacturer is responsible for compliance with any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

General Statements

The module is intended only for OEM integrators.
The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.
The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and 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.
The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed. Note EMI Considerations: Note that a host manufacture is recommended to use KDB 996369 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.
For standalone mode, reference the guidance in D04 Module Integration Guide and for simultaneous mode7; see D02 Module Q&A Question 12, which permits the host manufacturer to confirm compliance.
How to make changes:
When changing from the conditions of approval, please present technical documentation that it is equivalent to a Class I change.
For example, when adding or changing an antenna, the following technical documents are required.
1) The document indicating the same type as the original antenna
2) Technical document showing that the gain is the same with the gain at the time of the original approval. If the antenna gain is lower than the antenna gain value compared with the original approval, a class II permissive change should be followed.
3) Technical document showing that the radiated emissions level is no more than the worse value than when it was originally certified.

Appendix 1-Quick Installation Guide

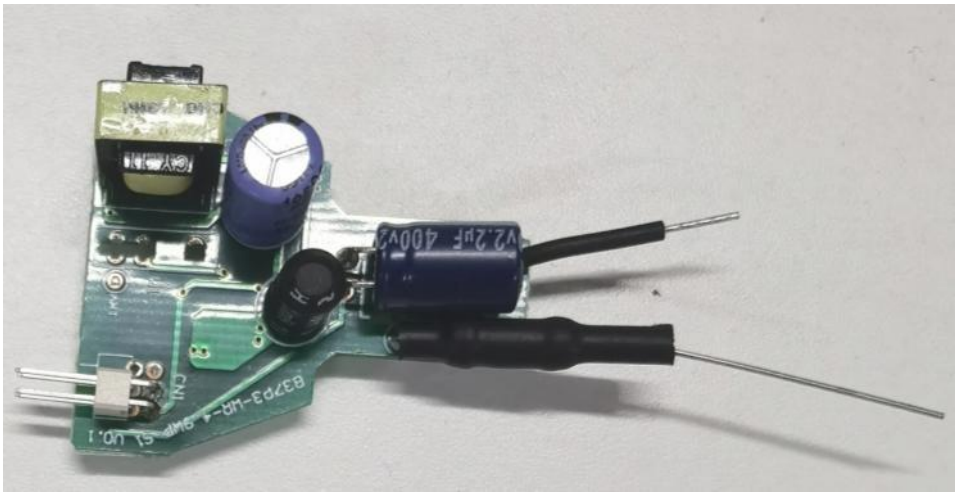
The wireless module is installed into the host by the certificate applicant, and other users cannot change it without permission.

1. Connect to a luminaire

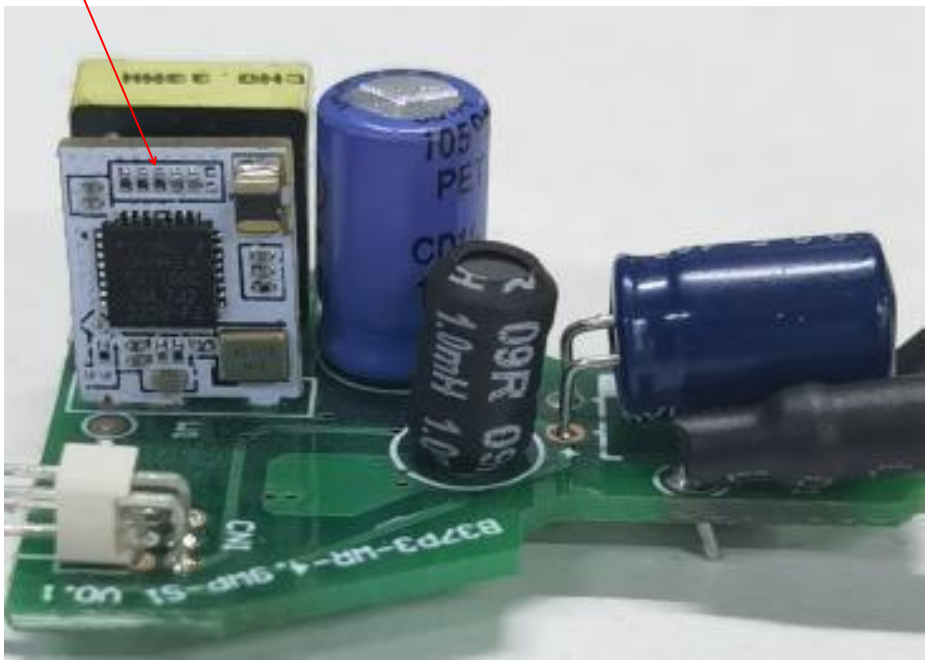
（This chapter introduces how to connect the adapter to your luminaire. Please note that images are for demonstration only）

2. Follow the steps below to insert the adapter into your Luminaire

Get a new lamp controller PCB board



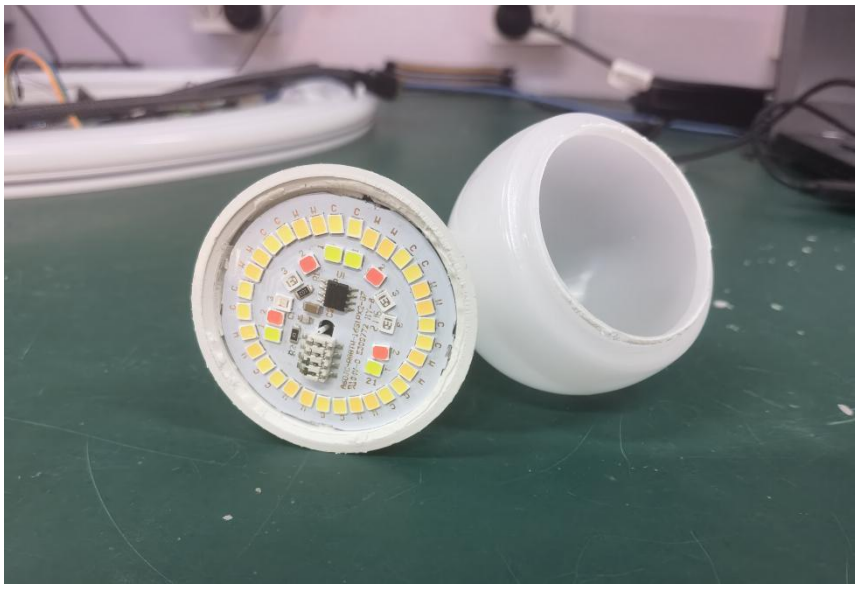
Insert wireless module



Prepare complete lamp components, lamp body, lampshade, lamp board, PCB board

Insert the PCB board into the lamp

Install the lamp body



Install the lampshade

Introduction to Typical Installation and Usage Environment

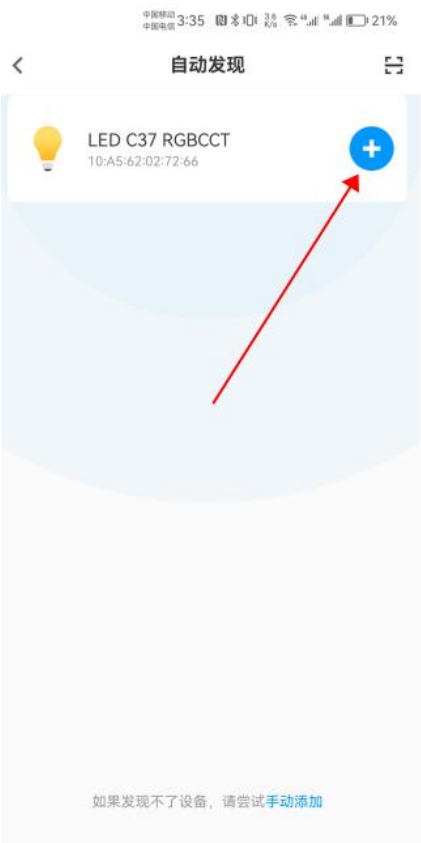
Appendix 2-APP Distribution Network Description

1. Connect the bulb to 100-230V AC power and turn on the distribution mode (open close 5 times within 10 seconds)

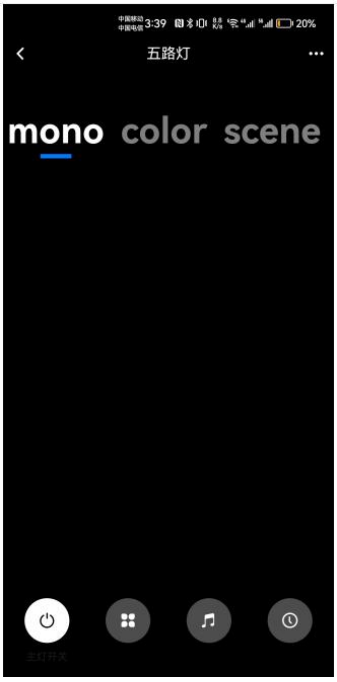
2.1 Open the "Cloud Intelligence APP"

2.2 Click on the "+" button in the upper right corner to search for devices

2.3 Click on the "+" button on the searched device to add a device



2.4. Select 2.4G WiFi, enter the WiFi password, and click Next

2.5 Waiting for the completion of equipment network distribution

2.6. After completing the distribution network, click the corresponding button to control the bulb light