GY-BT7

BLE5.0 Bluetooth module

Version 1.4

Module Introduction

1.1 Introduction

The Guangyun IoT GY-BT7 Bluetooth module is the latest BLE 5.0 serial communication Bluetooth module launched by Guangyun IoT. It uses the Realtek RTL8762 chip and is equipped with Guangyun IoT mini programs, IoT apps, and IoT cloud platform development services, providing enterprises with fast, efficient and one-stop IoT solution services.

This module is designed based on years of experience in IoT industry solutions from Guangyun IoT, and has the following advantages:

Rapid development

Guangyun IoT has designed and simplified the hexadecimal serial communication protocol for IoT product applications, reducing the development workload of MCU engineers and reducing the demand for MCU resources.
Supporting WeChat mini programs, Android Apple APP, and cloud platform development services

Guangyun IoT provides customized development, maintenance, and online services for IoT WeChat mini programs (domestic), IoT Android/Apple apps (domestic and foreign), and IoT cloud platforms (domestic and foreign) based on this Bluetooth module.

1.1 Module performance parameters

Module performance parameters

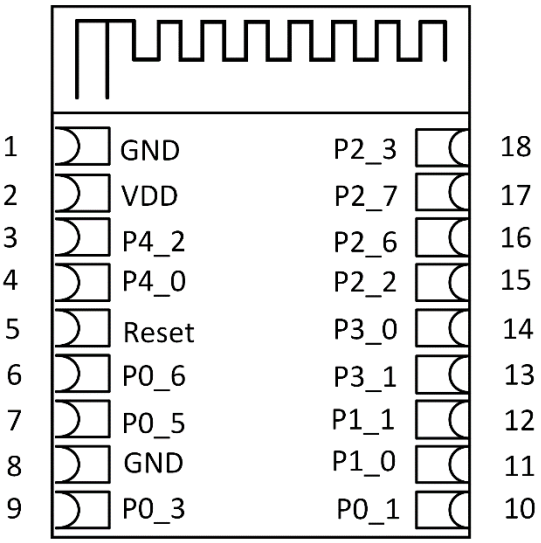
Section	GY-BT7
Module Size	15*11.2*2.2mm
Package	Patch
Antenna	Onboard /IPEX
Bluetooth version	Bluetooth 5.0
Frequency band	2400 MHz~2483.5MHz

Transmitting power	+8 dBm（MAX）
Working mode	UART
Hardware interface	PWM、UART、GPIO、ADC
Supply Voltage	3.3V
Supply Voltage Range	3.0V-3.6V
Reserved peak current	50mA 以上
Operating temperature range	-40-85℃
Storage Temperature Range	-40-105℃
Active TX mode	12mA
Standby (deep sleep)	0.6uA(Implemented through firmware)

2 Module Hardware Description

2.1 Pin Definition

2.1.1 GY-BT7 Pin Definition



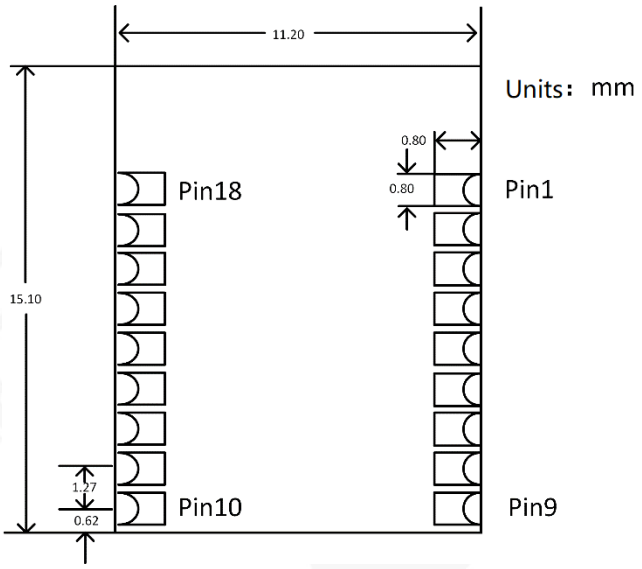
Pin Definition Diagram

Main Pin Definition Table

Number	Name	Function	Function Description
1,8	GND	GND	GND
2	VDD	VDD_BAT	3.3V
5	RESET	RESET	Reset, low level active
9	P0_3	LOG_TX	LOG output, pulled low when downloading firmware
13	P3_1	HCI UART RXD	HCI UART RXD Download Firmware Usage
14	P3_0	HCI UART TXD	HCI UART TXD Download Firmware Usage
16	P2_6	UART TXD	UART TXD user serial port TX
17	P2_7	UART RXD	UART RXD User Serial Port RX

1.1 Dimensional drawings

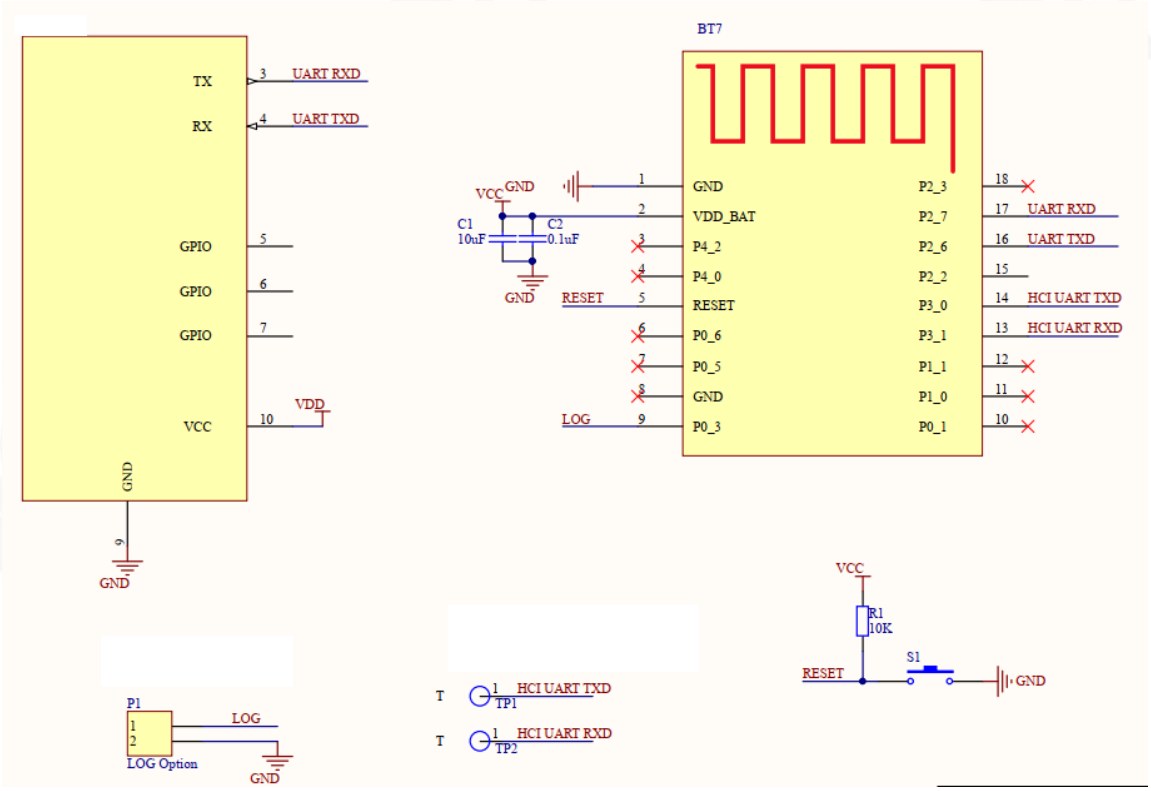
1.1.1 GY-BT7 Dimensional Drawing



Dimension

3 Product Design Description

3.1 Reference schematic diagram



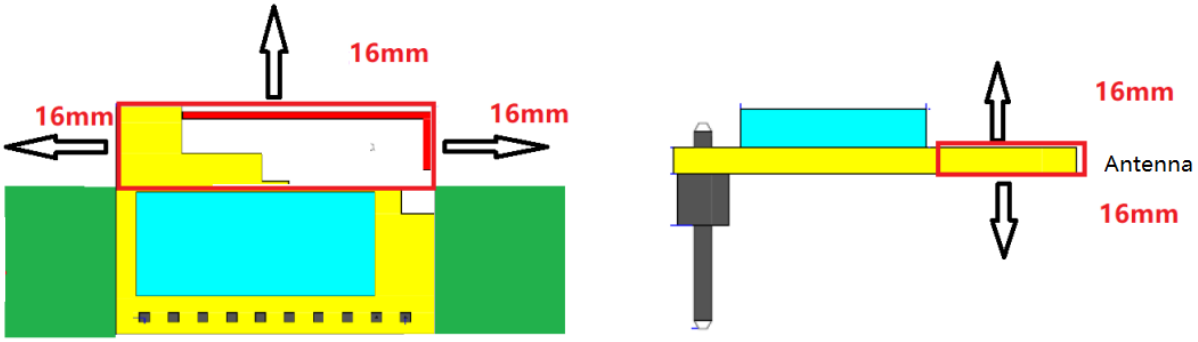
3.2 IoT Product Design Reference (UED Guidance)

IoT Product Design Reference Table

Functional section	UED requirements
Trigger method for device pairing status	1. When the device is unbound and powered on, it enters the pairing state (implemented by the module and does not require MCU processing) 2. The user triggers the mold product to enter the pairing state through a button (achieved by sending instructions through the MCU)
Device pairing status window time	30 minutes (implemented by the module, no MCU processing required)
Trigger pairing	Press and hold single or combination buttons for 7 seconds (implemented by MCU)
Pairing status	Indicator light flashing, on for 0.4s, off for 0.2s (achieved by MCU) (Please note that after receiving the module successfully entering the pairing command, perform the flash action. Do not press the key to trigger successfully and enter the flashing action. Otherwise, there may be a situation where the module has not entered the pairing state, but the product indicator light flashes, misleading the user. At the same time, there may be customer complaints due to the user's unsuccessful pairing.)
Connected status	Indicator light always on (implemented by MCU)
Unconnected state	Indicator light always off (implemented by MCU)

3.3 Antenna Design

When the module is an onboard PCB antenna, it is required to have complete clearance directly below the antenna, and the area around the antenna should avoid metal to avoid affecting the antenna radiation efficiency and communication distance.

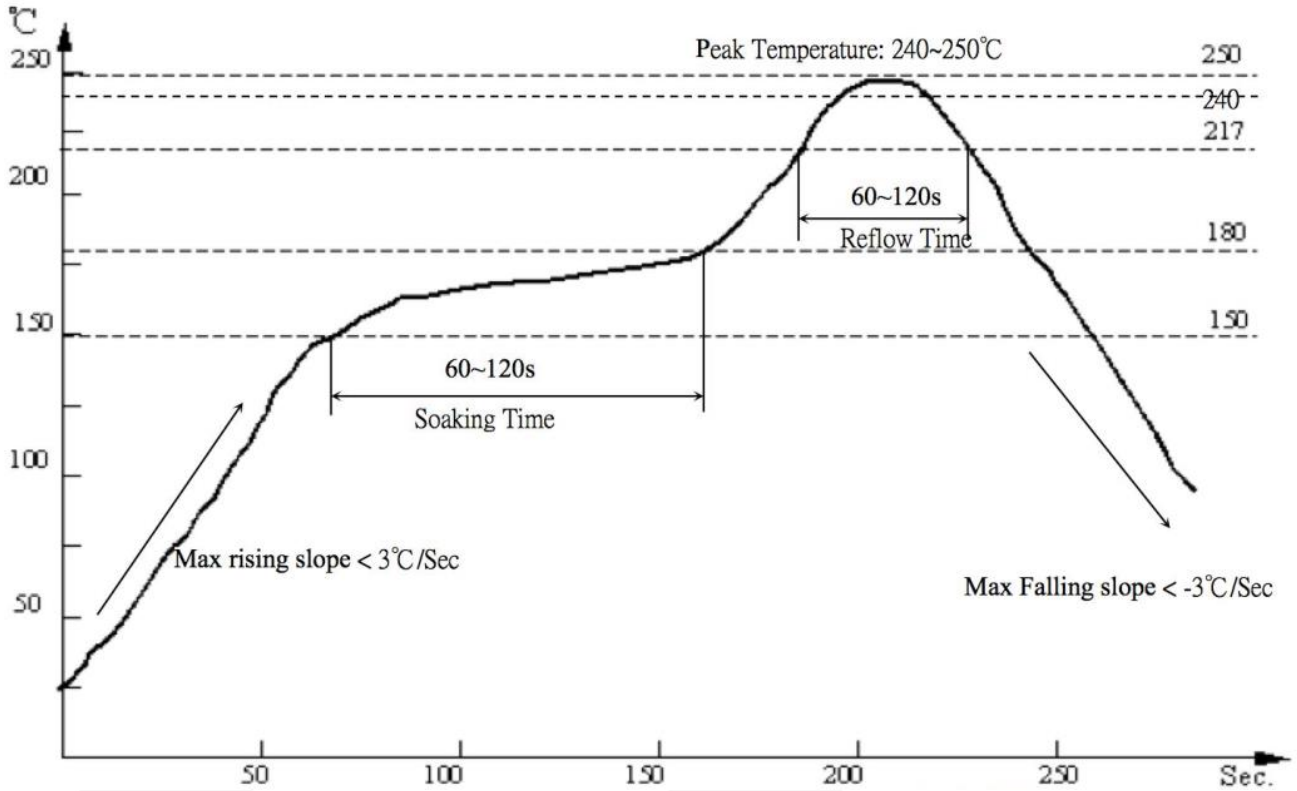


Suggested placement area for module

3.4 Reflow soldering temperature curve

Welding instructions: during double-sided SMT, after the first reflow of the top side components, the circuit board needs to be turned over for Reflow soldering on the other side. During the second reflow, the original soldered T side components will be fixed by the surface tension of the solder paste to prevent the components from falling under the action of gravity.

The design of the motherboard has been verified to be free of defects through furnace temperature testing (240-250°C). To ensure its stability, it is recommended to apply glue.



Reflow soldering temperature curve

FCC Statement

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

The modular can be installed or integrated in mobile or fix devices. This modular can be installed in any portable device.

FCC Radiation Exposure Statement
The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.
If the FCC 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 Transmitter Module FCC ID: 2A58X-GY-BT7 Or Contains FCC ID:2A58X-GY-BT7”

When the module is installed inside another device, the user manual of the host must contain below warning statements;

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.
(2) This device must accept any interference received, including interference that may cause undesired operation.

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

Any company of the host device which install this modular with Single modular approval should perform the test of radiated emissionand spurious emission according to FCC part 15C : 15.247 and 15.209 requirement,Only if the test result comply with FCC part 15C : 15.247 and 15.209 requirement, then the host can be sold legally.

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.

OEM INTEGRATION INSTRUCTIONS:

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

The module must be installed in the host equipment such that 0.5 cm is maintained between the antenna and users, and the transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the internal on-board antenna that has been originally tested and certified with this module. External antennas are not supported. As long as these 3 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.). The end-product may need Verification testing, Declaration of Conformity testing, a Permissive Class II Change or new Certification. Please involve a FCC certification specialist in order to determine what will be exactly applicable for the end-product.

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. In such cases, please involve a FCC certification specialist in order to determine if a Permissive Class II Change or new Certification is required.

Upgrade Firmware:

The software provided for firmware upgrade will not be capable to affect any RF parameters as certified for the FCC for this module, in order to prevent compliance issues.

End product labeling:

This transmitter module is authorized only for use in device where the antenna may be installed such that 0.5 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: “Contains FCC ID: 2A58X -GY-BT7”.

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.

2.2 List of applicable FCC rules

List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below

concerning the need to notify host manufacturers that further testing is required.3 Explanation: This module meets the requirements of FCC part 15C(15.247).

2.3 Summarize the specific operational use conditions

Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer’ s instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.

Explanation: The EUT has a Integral Antenna , and the antenna use a permanently attached antenna which is not replaceable.

2.4 Limited module procedures

If a modular transmitter is approved as a “limited module,” then the module manufacturer is responsible for approving the host environment that the limited module is used with. The manufacturer of a limited module must describe, both in the filing and in the installation instructions, the alternative means that the limited module manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.

A limited module manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.

This limited module procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific

host originally granted with a limited module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module. Explanation: The Module is not a limited module.

2.5 Trace antenna designs

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects: layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.

a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s),

dielectric constant, and impedance as applicable for each type of antenna);

b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered); c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;

d) Appropriate parts by manufacturer and specifications;

e) Test procedures for design verification; and

f) Production test procedures for ensuring compliance.

The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

Explanation: Yes, The module with Integral antenna designs, Please refer to the antenna specification book for antenna dimensions.

2.6 RF exposure considerations

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the application conditions

(mobile, portable – xx cm from a person’ s body); and (2) additional text needed for the host product manufacturer to provide to end users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).

Explanation: This module has been evaluated to meet general RF exposure requirement., This equipment should be installed and operated with a minimum distance of 0.5 centimeters between the radiator and your body." This module is designed to comply with the FCC statement, FCC ID is: 2A58X -GY-BT7.

2.7 Antennas

A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an “omni-directional antenna” is not considered to be a specific “antenna type”)).

For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product. The module manufacturers shall provide a list of acceptable unique connectors.

Explanation: The EUT has a Integral Antenna, and the antenna use a permanently attached antenna which is unique.

2.8 Label and compliance information

Grantees are responsible for the continued compliance of their modules to the FCC rules. This includes advising host product manufacturers that they need to provide a physical or e-label stating “Contains FCC ID” with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.

Explanation:The host system using this module, should have label in a visible area indicated the following texts: "Contains FCC ID: 2A58X -GY-BT7."

2.9 Information on test modes and additional testing requirements5

Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus

with multiple, simultaneously transmitting modules or other transmitters in a host.

Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer’ s determination that a module as installed in a host complies with FCC requirements.

Explanation: Top band can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

2.10 Additional testing, Part 15 Subpart B disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, 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 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.

Explanation: The module without unintentional-radiator digital circuity, so the module does not require an evaluation by FCC Part 15 Subpart B. The host shoule be evaluated by the FCC Subpart B.