

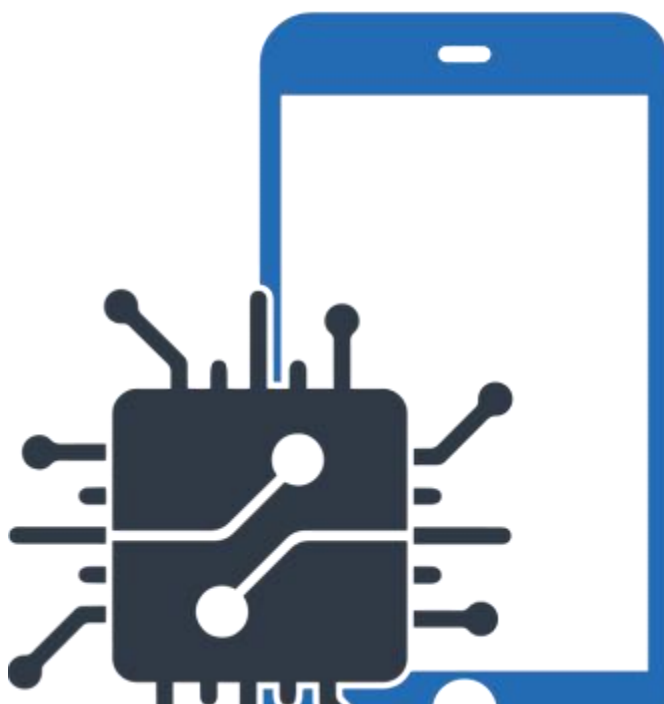


GQ-BT2G

Bluetooth module

Version 1.0

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Modify Record

Version	Date	Modified By	REVISION
1.0	2024/06/02	Darren Zhuang	Create documents

1 Scheme Introduction

1.1 Scheme Introduction

The GQ-BT2G Bluetooth module of Guangcai IoT is a hexadecimal serial communication Bluetooth module solution launched by Guangcai IoT. It is equipped with Guangcai IoT mini programs, IoT apps, and IoT cloud platform development services, providing enterprises with fast and efficient one-stop IoT solution services.

This module is designed based on years of experience in widely embedded IoT industry solutions and has the following advantages

Small size

The widely embedded IoT uses small and highly integrated chips as the module solution, which can compress the volume of the Bluetooth module to 16 * 10 * 2.8mm

Complete certification

To adapt to both domestic and international IoT modules, this module has been certified by SRRC, FCC, CE, RoSH, and supports BQB attachment. At present, we are gradually improving the certification of overseas countries.

Rapid development

Guangqian IoT is designed to simplify the hexadecimal serial communication protocol for IoT product applications, reducing the workload of MCU engineers and lowering MCU resource requirements.

Supporting WeChat mini programs, Android and Apple apps, and cloud platform development services

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

1.2 Module performance parameters

Table 1 Module performance parameters

Name	Bluetooth module
Model	GQ-BT2G
Size	16*10*2.8mm
package	Patch
antenna	Onboard
Wireless Authentication	SRRC FCC ID (RF) CE RED (DOC)
EMC radiation	FCC SDOC (EMC)
certificates	EU RoHS
Wireless communication mode	BLE 5.4 , Beacon
Working mode	UART
hardware interface	UART , I/O
Supply Voltage	5V OR 3.3V
Working current	TX @0dB : 8.6mA
Reserve peak current	50mA
Working temperature range	-40-85°C
Storage Temperature Range	-40-125°C
Frequency range	2400-2483.5MHz
Occupied bandwidth	≤3MHz
Transmission power	≤20dBm(EIRP)

2 Module Hardware Description

2.1 Hardware image



Figure 1 Front of module



Figure 2 Module reverse side

2.2 Pin Definition

2.2.1 GQ-BT2G Hardware images and pin definitions



Figure 3 Pin Definition Diagram

Table 2 Pin Definition Table

Pin number	Pin Name	Pin function	Function Description
1	3.3V	Power Supply 3.3V	3.3V input (choose one of 5V pin)
2	GND	Grounding	GND input
3	TX	GPIO/UART TX	UART TX
4	RX	GPIO/UART RX	UART RX
5	5V	Power Supply 5V	5V input (choose one from 3.3V pin)

2.3 Dimension

2.3.1 Dimension

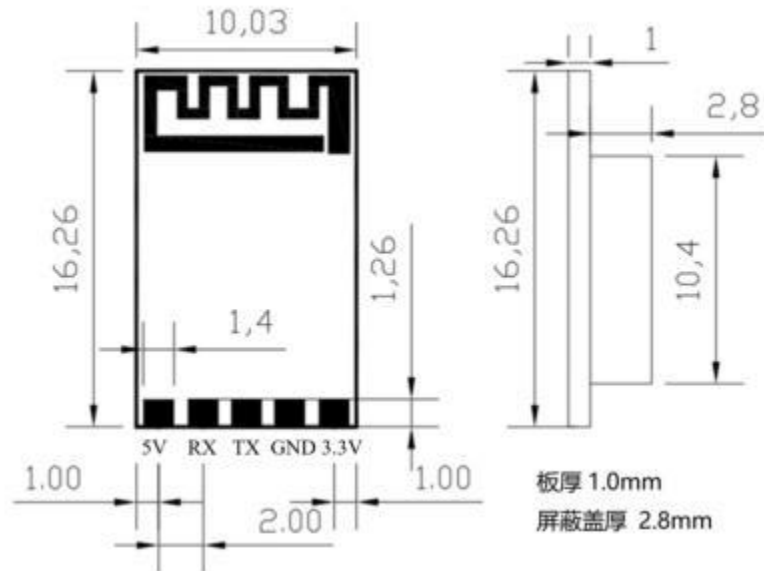


Figure 4 Front dimension diagram

3 Product Design Description

3.1 Refer to the schematic diagram

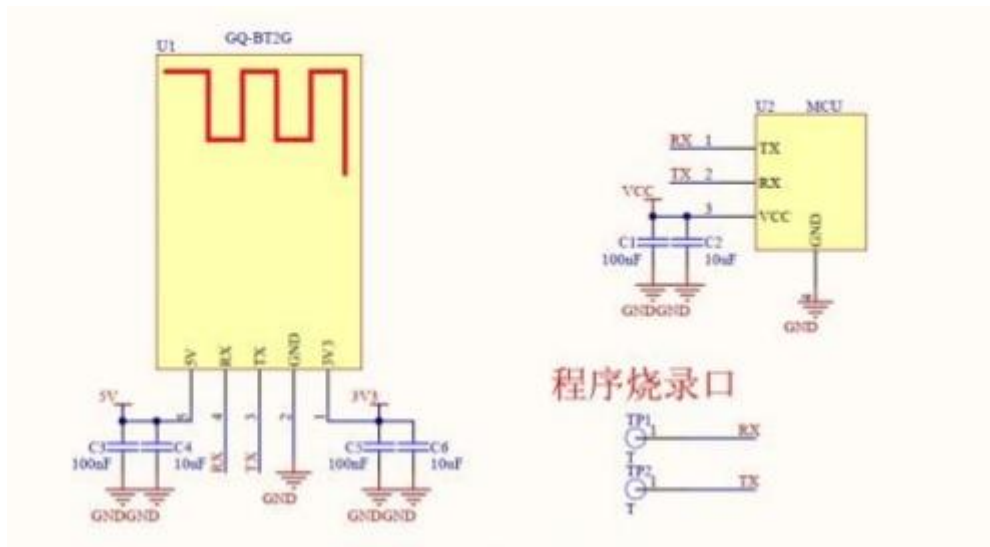


Figure 5 GQ-BT2G module peripheral design schematic

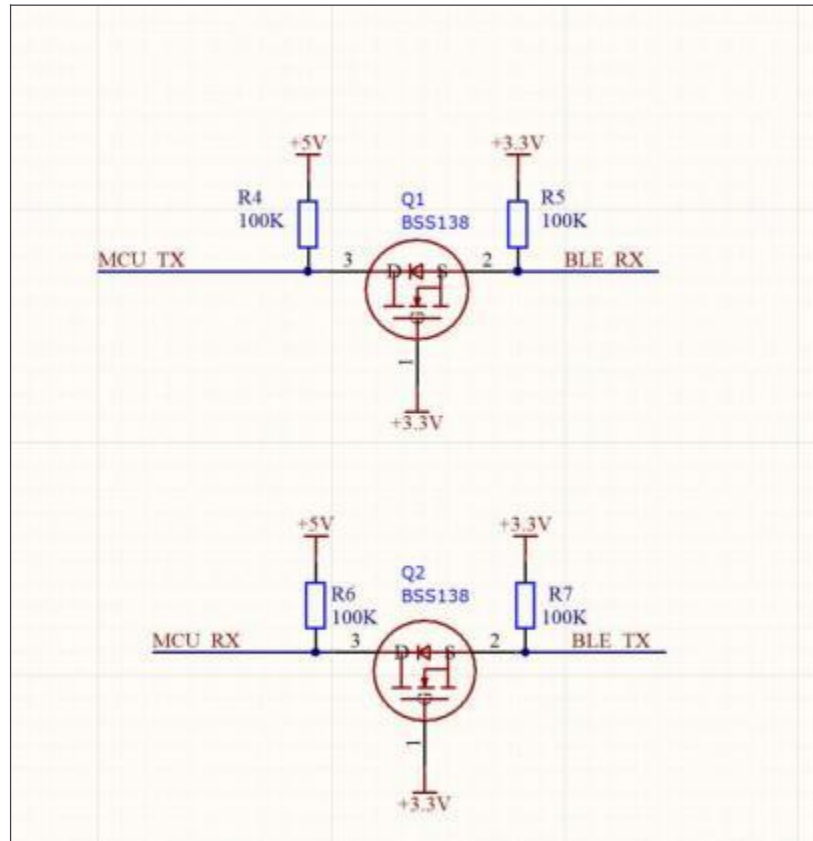


Figure 7 3.3V and 5V conversion reference circuit

3.2 Antenna Design

When the module is an onboard PCB antenna, it is required to have complete clearance directly below the antenna, and the surrounding area of the antenna should avoid metal to prevent the radiation efficiency of the antenna from being affected, which may affect the communication distance.

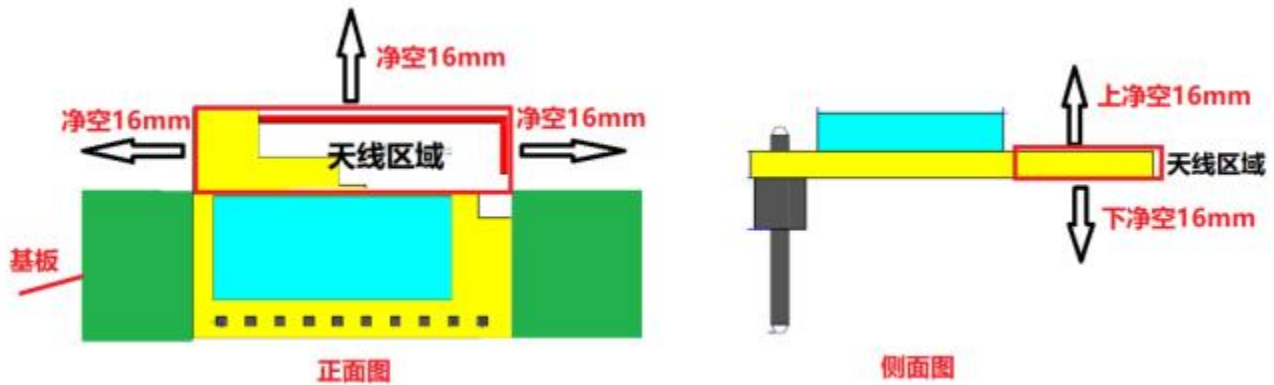


Figure 8 Suggested placement area for modules

3.3 Reflow profile

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

The design of the motherboard is verified to have no defects after passing through the furnace (furnace temperature 240-260 °C) for the assembly of yin and yang boards. To ensure its stability, it is recommended to apply glue.

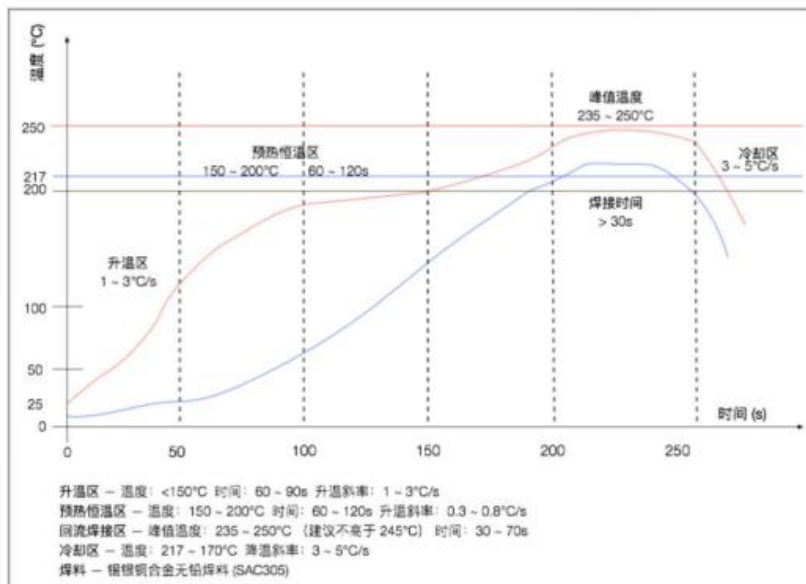


Figure 9 Reflow soldering temperature curve char

FCC Caution

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.

Any 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.

OEM INTEGRATION INSTRUCTIONS:

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

The module must be installed in the host equipment. 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:

The final end product must be labeled in a visible area with the following: "Contains FCC ID: 2BLD4-GQBT2G".

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.

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 PCB 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 PCB 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 complies with FCC RF radiation exposure limits set forth for an uncontrolled environment, This module is designed to comply with the FCC statement, FCC ID is: 2BLD4-GQBT2G.

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 PCB 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: 2BLD4-GQBT2G."

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 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.

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