

Rayson

QS9322 Bluetooth 4.0 Low Energy Module

Datasheet

Version 2.0



VERSION HISTORY

| Version | Comment |
|---------|--|
| 1.0 | First release |
| 1.1 | Add the photo of QS9322 with shielding box |
| 1.2 | Change transparent transfer baud rate to 115200. Connect Pin19 to Vin in figure 1 and 7. |
| 1.3 | Add CE note |
| 1.4 | Add model definition, Layout Guide instruction and Soldering Recommendations |
| 1.8 | Add CE and FCC qualification information |
| 1.9 | Change the pin19 description. Power supply (2.4~3.6V) |
| 2.0 | Update CE and FCC qualification information |

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1 Key Features

◆ Bluetooth® 4.0 Low Energy wireless module

- Frequency bands: 2400MHz to 2483.5MHz
- 1Mbps on air data rate
- Slave and Master mode operation
- Support up to 8 simultaneous links in master mode
- 128-bit AES coprocessor
- Complete BLE protocol stack and application profiles

◆ Integrated 32-bit Cortex-M0 MCU with

- 64KB system memory
- 128KB flash

◆ Ultra Low Power Consumption

- 2uA deep sleep mode
- 3uA sleep mode (32kHz RC OSC on)
- DC-DC mode
 - 9.25mA RX current at 3V
 - 8.8mA TX current @0dBm Tx power at 3V
- Non DC-DC mode
 - 13.6mA RX current at 3V
 - 13.3mA TX current @0dBm Tx power at 3V
- Integrated DC-DC converter and LDO
- 3V DC power supply or DC 3V coin cell

◆ High Performance

- -95dBm RX sensitivity (Non DC-DC mode)
- -93dBm RX sensitivity (DC-DC mode)
- Tx power from -20dBm to 4dBm
- Excellent link budget up to 99dB

◆ Complete Protocol Stack and Profile

- Bluetooth® v4.0
- Bluetooth® v4.0 host stack including L2CAP , SMP, ATT, GATT, GAP
- Qualified application profiles and services
- Controller subsystem QDID: B021031
- Host stack subsystem QDID: B021098
- Profile subsystem QDID: B021946

◆ Certifications

- Bluetooth EPL
- RoHS qualified
- CE qualified
- Modular certification for FCC

◆ Ease of Design

- Small form factor: QS9322-PLCS, 9x13x2.2mm;
- Easy to use command set over UART/SPI to communicate with App MCU
- PCB antenna with impedance matching

◆ Application

- Sports & Fitness
- Healthcare & Wellness
- Remote Control
- PC Peripherals (mouse, keyboard)
- Mobile Phone Accessories
- Home/building Automation
- Industrial automation
- Wireless Sensor Networks

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2 Description

2.1 Model Definition

QS9322-PLCS

FCC ID: QWO-QS9322PLCS.

IC ID : 4460A-QS9322PLCS

2.2 Module description

QS9322 is a compact, surface mount Bluetooth 4.0 Low Energy (BLE) compliant wireless module. It integrates an advanced single-chip BLE SoC chip – QN9021 with RF circuit and PCB antenna in a compact module. Embedded 16 MHz and 32.678 kHz crystals are used for clock generation. Impedance matching provides optimal radio performance with extremely low spurious emissions. QS9322 can be used directly with a coin cell battery or 3V DC regulated DC power supply.

Small size gives good radiation efficiency with low price even when the module is used in layouts with very limited space and easy modular handling.

QS9322 offers all Bluetooth low energy features: radio, stack, profiles and application space for customer applications, so no external processor is needed. QS9322 can also be used to transfer raw data between each other through the factory built-in application.

The pre-qualified module enables users to add Bluetooth Low Energy to traditional products within the shortest time. QS9322 is leading the way for the new generation of Bluetooth low energy modules.

| | | | |
|-----------|-----------|-----------|--|
| 20 | P3.0/ADC- | Analog in | GPIO / ADC- |
| 21 | P3.1/ADC+ | Analog in | GPIO / ADC+ |
| 22 | GND | Ground | Should be connected to ground plane on application PCB |
| 23 | GND | Ground | Should be connected to ground plane on application PCB |
| 24 | GND | Ground | Should be connected to ground plane on application PCB |
| 25 | GND | Ground | Should be connected to ground plane on application PCB |

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4 Electrical Characteristics

Table 2 Recommended Operating Conditions

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNIT |
|--------|-----------------------|-----------------|-----|-----|-----|------|
| VCC | Power supply | Relative to GND | 2.4 | 3.0 | 3.6 | V |
| TA | Operating temperature | | -40 | +25 | +85 | °C |
| | | | | | | |

Table 3 Current Consumption

| SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|-----------------|------------------------------------|-----|------|-----|------|
| I _{cc} | Deep sleep mode | | 2 | | µA |
| | Sleep mode | | 3 | | µA |
| | Idle mode (w/o DC-DC) | | 0.84 | | mA |
| | MCU @8MHz (w/o DC-DC) | | 1.35 | | mA |
| | RX mode(w/o DC-DC) | | 13.6 | | mA |
| | RX mode (w/t DC-DC) | | 9.25 | | mA |
| | TX mode @0dBm Txpower (w/o DC-DC) | | 13.3 | | mA |
| | TX mode @0dBm Txpower (w/t DC-DC) | | 8.8 | | mA |

(Typical values are T_A = 25°C and VCC =3V)

Notes:

1. Current Consumption includes analog and digital.
2. Depend on IO conditions.
3. **Deep sleep mode:** digital regulator off, no clocks, POR, RAM/register content retained
4. **Sleep mode:** digital regulator off, 32k RC OSC on, POR, sleep timer on, and RAM/register content retained
5. **Idle:** 16MHz OSC on, no radio or peripherals, 8 MHz system clock and MCU idle (no code execution)
6. **MCU@8 MHz:** MCU running at 8 MkHz RC OSC clock, no radio or peripherals
7. **RX sensitivity** is -95dBm sensitivity when DC-DC is disabled.
8. **RX sensitivity** is -93dBm sensitivity when DC-DC is enabled.

5 Layout and Physical Dimensions

5.1 Physical dimensions

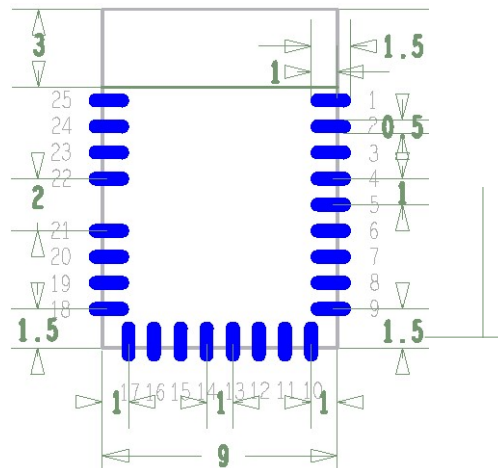


Figure 2 Physical dimensions and pinout (mm) – Top view

5.2 Layout guide

For optimal performance of the antenna place the module at the position of the PCB as shown in the following figures. Do not place any metal (traces, components, battery etc.) within the clearance area of the antenna. Connect all the GND pins directly to a solid GND plane. Place the GND vias as close to the GND pins as possible. Use good layout practices to avoid any excessive noise coupling to signal lines or supply voltage lines.

Place nothing around the antenna for the high antenna performance as shown in Figure 3. If can't layout as aforesaid, avoid placing GND plane closer than 5 mm as shown in Figure 4 and any other dielectric material closer than 1 mm from the antenna as shown in Figure 5. Anything closer than this distance from the antenna will detune the antenna to lower frequencies and reduce the RF power.

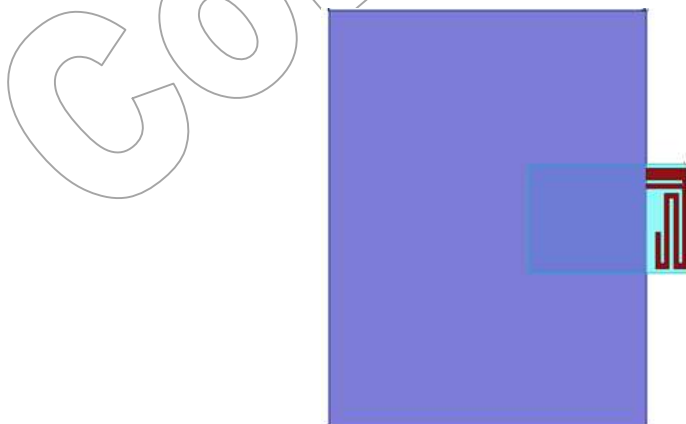


Figure 3 Layout for high performance

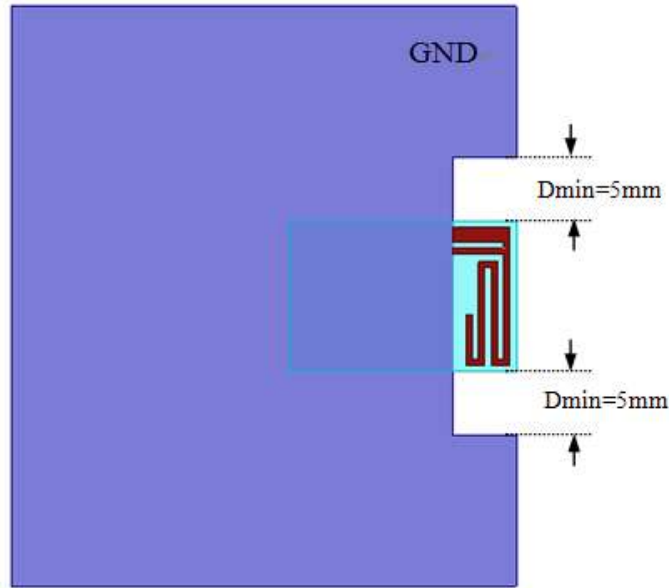


Figure 4 Layout when GND plane around antenna

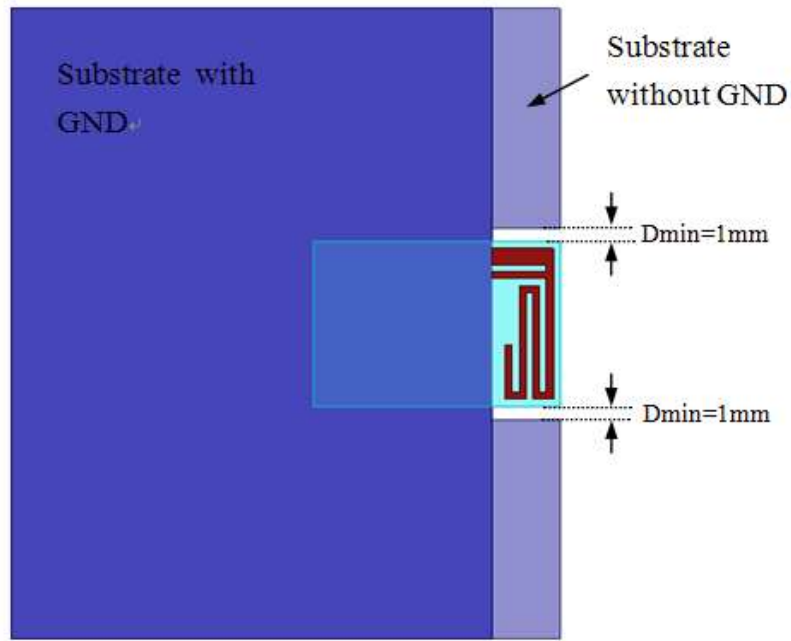


Figure 5 Layout when any dielectric material around antenna

6 Soldering Recommendations

QS9322 is compatible with industrial standard reflow profile for Pb-free solders. The reflow profile used is dependent on the thermal mass of the entire populated PCB, heat transfer efficiency of the oven and particular type of solder paste used. Consult the datasheet of particular solder paste for profile configurations.. Since the profile used is process and layout dependent, the optimum profile should be studied case by case. Thus following recommendation should be taken as a starting point guide.

- Refer to technical documentations of particular solder paste for profile configurations
- Avoid using more than one flow.
- Aperture size of the stencil should be 1:1 with the pad size.

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7 Application Reference

QS9322 integrates BLE SoC chip – QN9021 with RF circuit and PCB antenna in a compact module. It can be used directly with a coin cell battery or 3V DC regulated power supply.

QS9322 can be used as a MCU with BLE feature, and also be used as a RF module to transfer raw data between each other through the factory built-in application.

When QS9322 is used as a MCU with BLE feature, program flow can refer to the QN902x's user manual.

When QS9322 is used as only a RF module for transfer raw data, the reference circuit schematic and programming guide can refer to QS9322 BLE Module User Manual.

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Note1:

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.

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

Please notice that 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 FCC ID: QWO-QS9322PLCS " any similar wording that expresses the same meaning may be used.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 5mm between the radiator & your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Note2:

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Please notice that if the IC 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 IC: 4460A-QS9322PLCS" any similar wording that expresses the same meaning may be used.

L'étiquette d'homologation d'un module d'Innovation, Sciences et Développement économique Canada devra être posée sur le produit hôte à un endroit bien en vue, en tout temps. En l'absence d'étiquette, le produit hôte doit porter une étiquette sur laquelle figure le numéro d'homologation du module d'Innovation, Sciences et Développement économique Canada, précédé du mot « contient », ou d'une formulation similaire allant dans le même sens et qui va comme suit :

Contient IC : 4460A-QS9322PLCS est le numéro d'homologation du module.

Note3:

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.

The module is limited to installation in mobile application;

A separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and difference antenna configurations.

There is requirement that the grantee provide guidance to the host manufacturer for compliance with Part 15B requirements.

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