



ROOT_BLE_62 Datasheet V0.7

2025-07-24

Revision History

Version	Description	Date	Author
V0.1		2025-05-21	Lei. Yang
V0.2	The following content has been updated: 2.2 Definition of pins	2025-06-12	Lei. Yang
V0.3	The following content has been updated:2.1 Appearance Dimensions	2025-06-16	Lei. Yang
V0.4	The following content has been updated:4. Radio Transceiver	2025-06-20	Lei. Yang
V0.5	The following content has been added:8. FCC warning	2025-07-03	Lei. Yang
V0.6	The following content has been updated:2.1 Appearance Dimensions	2025-07-14	Lei. Yang
V0.7	Change the datasheet to English The following content has been added:7. Module Peripheral Circuit & Placement Guidelines	2025-07-18	Lei. Yang

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1. Introduction

ROOT_BLE_62 is a low-power, highly integrated AIoT module featuring an MCU PHY+6222 chip with integrated Bluetooth Low Energy (Bluetooth LE 5.4) wireless communication. It includes 512KB Flash and 64KB RAM, with an ultra-compact footprint of 11mm × 13.61mm × 1.8mm. Ideal for space-constrained devices.

1.1 Key Features

- Integrated low-power PHY+6222 MCU (dual-role application processor)
- Bluetooth
 - Bluetooth LE:Bluetooth 5.4、Bluetooth SIG mesh
 - 125Kbps、500Kbps、1Mbps、2Mbps
 - TX Max Power 5dBm
 - Receiver sensitivity -93dBm@1Mbps
-90dBm@2Mbps
 - Antenna gain
- Supply Voltage: 3V - 3.6V
- Operating Temperature:-20℃ - 85℃
- PCB Onboard Antenna
- peripheral device: 3 x GPIO、1 x UART 3 x PWM and 1 x ADC

1.2 Applications

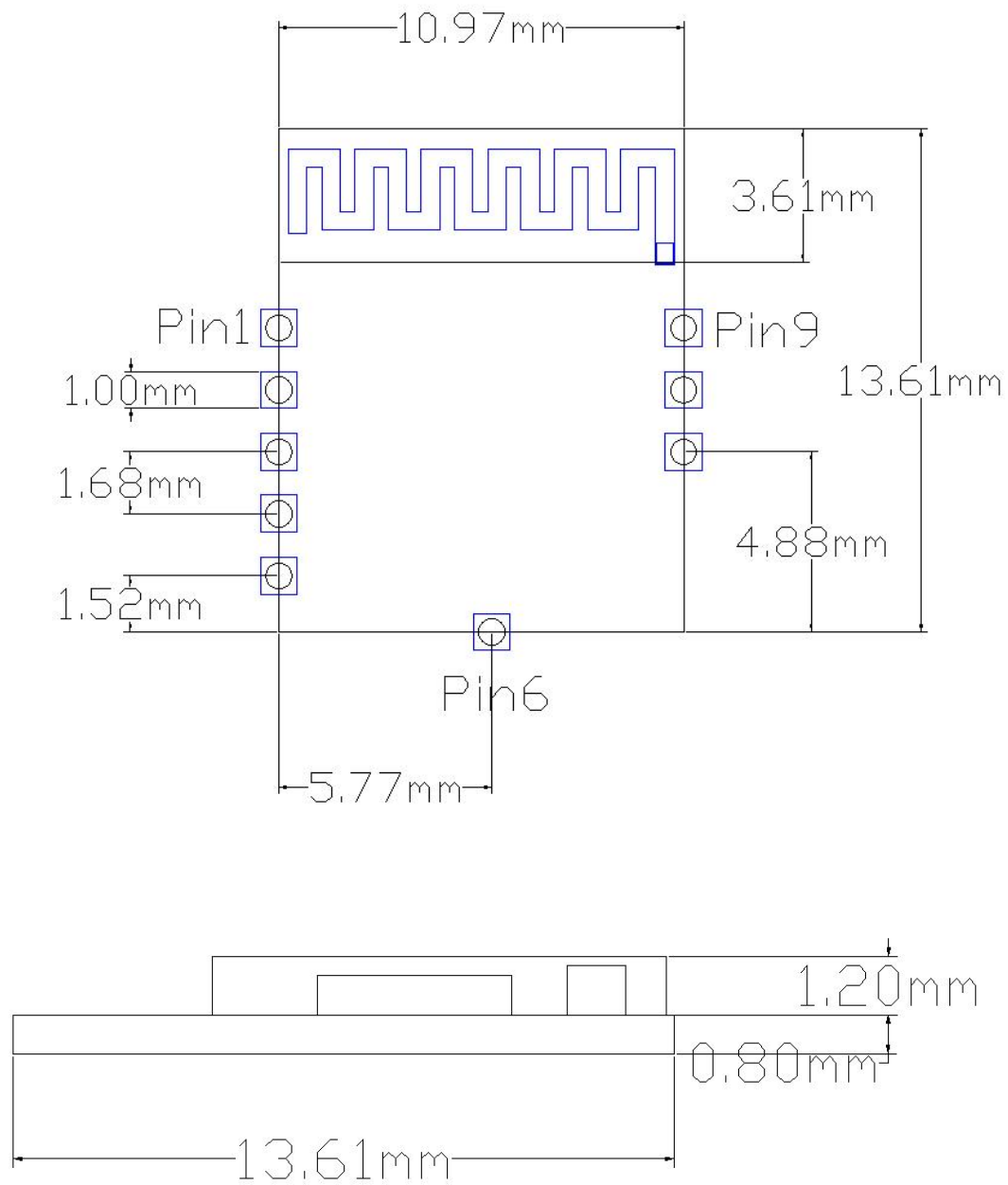
- Smart LED systems
- Smart home devices
- Smart low-power sensors

2. Module interface

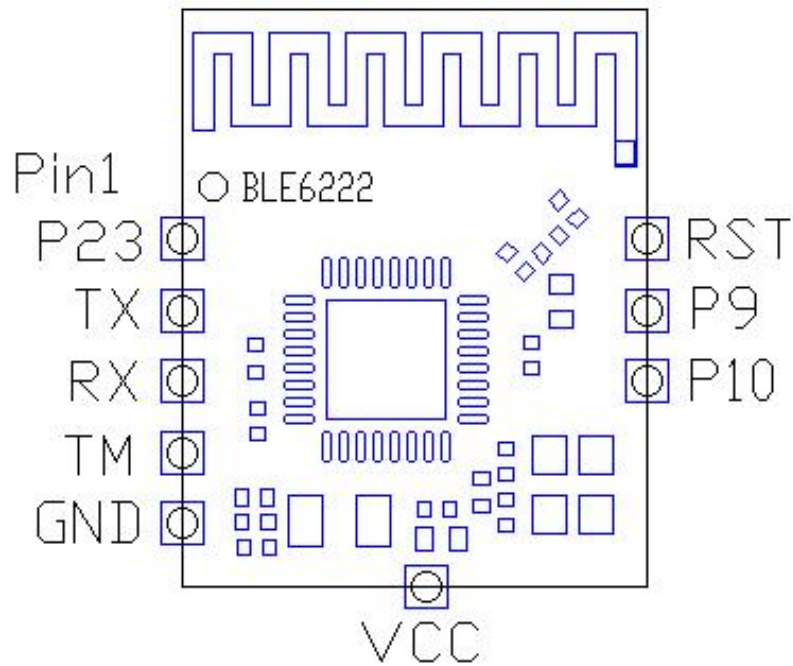
2.1 Appearance Dimensions

ROOT_BLE_62 has a total of 9 interfaces. The pin width is 1mm, and the vertical pin spacing is 1.68mm.

ROOT_BLE_62 Dimensions: 10.97±0.3mm(W)x13.61±0.3mm(L)x2.0±0.15mm(H)。



2.2 Definition of pins



No.	Name	I/O	Functional Description
1	P23	I/O	GPIO/ADC/PWM
2	UART_TX	I/O	UART_TX
3	UART_RX	I/O	UART_RX
4	TM	I	TM
5	GND	GND	GND
6	VCC_3.3V	Power	3.3V Power supply
7	P10_RX	I/O	GPIO/PWM
8	P9_TX	I/O	GPIO/PWM
9	RST_N	I	Reset pin

Note: I is input ,O is output.

3. Electrical parameters

3.1 Absolute Maximum Ratings

Symbol	Parameter	Min.	Max.	Unit
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Ts (Storage temperature)	-40	105	°C
VDD (Power supply)	-0.3	3.6	V
ESD HBM	TAMB-25°C	2	KV
ESD CDMQF	TAMB-25°C	0.5	KV

3.2 Operating Conditions (3.3V 25°C)

Symbol	Description	Min.	Typ.	Max.	Unit
Ta	Operating temperature	-20		85	°C
VDD	Supply voltage normal mode	3.0	3.3	3.6	V

3.3 Radio Current Consumption

Parameter	Description	Tx_Power (dBm)	Typ (mA)
TX	with internal DC-DC @3V	0	4.6
RX Only			4

4. Radio Transceiver

4.1 Transceiver characteristics

Parameter	Description
BLE Frequency range	2402MHz~2483.45MHz
Bluetooth LE	Bluetooth 5.4、Bluetooth SIG mesh
Antenna	PCB Onboard Antenna, Gain dBi

4.2 Transmitter Specification

Parameter	Min.	Typ.	Max.	Unit
1Mbps RF Output Power	-20	0	5	dBm
2Mbps RF Output Power	-20	0	5	dBm

125Kbps RF Output Power	-20	0	5	dBm
500Kbps RF Output Power	-20	0	5	dBm
Gain step		3		dB

4.5 Receiver Specification

Parameter	Min.	Typ.	Max.	Unit
1Mbpsx Sensitivity@30.8% PER		-93		dBm
2Mbps Sensitivity@30.8% PER		-90		dBm
125Kbps Sensitivity@30.8% PER		-99		dBm
500Kbps Sensitivity@30.8% PER		-94		dBm

5. Antenna characteristics

5.1 Antenna Type

PCB Onboard Antenna, Gain -0.489dBi

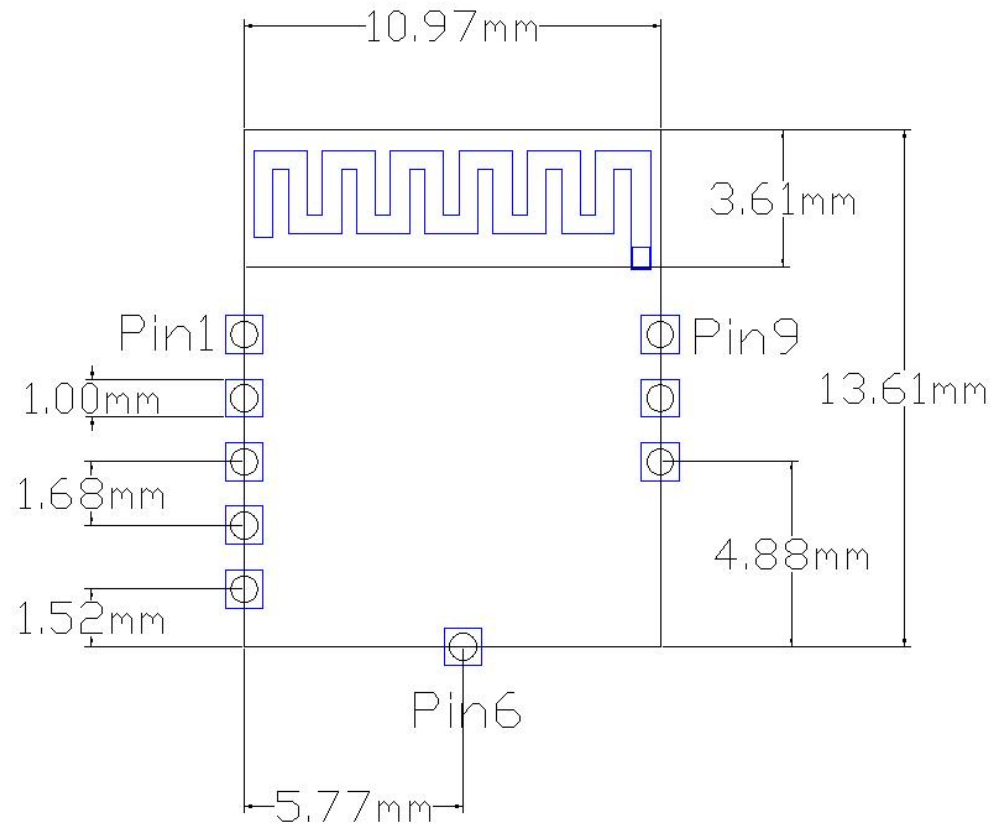
5.2 Reduce antenna interference

Due to the use of PCB Onboard antennas in AIoT module, it is recommended that the distance between the module antenna and other metal components be at least 15mm to ensure optimal BLE performance.

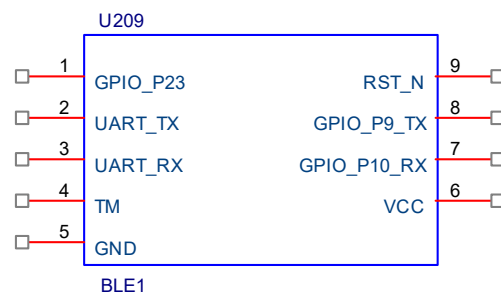
6. Package information and production guidance

6.1 PCB Size

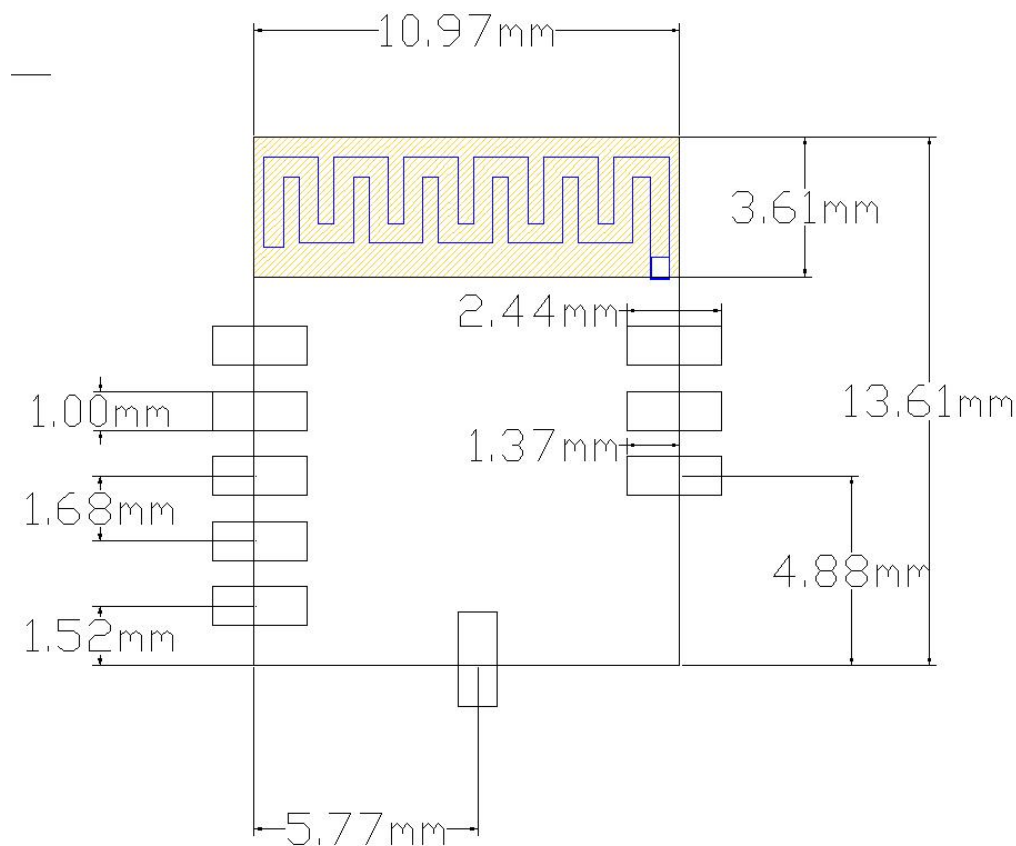
ROOT_BLE_62 PCB Size: $10.97 \pm 0.3\text{mm}$ (W) x $13.61 \pm 0.3\text{mm}$ (L) x $0.8 \pm 0.15\text{mm}$ (H)。



6.2 Schematic Symbol



6.3 Recommended module package design dimensions



Copper paving is prohibited in the yellow area of the above picture

6.4 Production Guide & Storage Conditions

1. Modules should be mounted using SMT equipment. After opening the packaging, complete soldering within 24 hours.

Unused modules must be stored in a dry cabinet with $\leq 10\%$ RH or resealed in vacuum packaging with exposure time recorded. Total exposure time must not exceed 168 hours.

Required SMT Equipment:

- Pick-and-place machine
- SPI
- Reflow oven
- Profile thermometer
- AOI

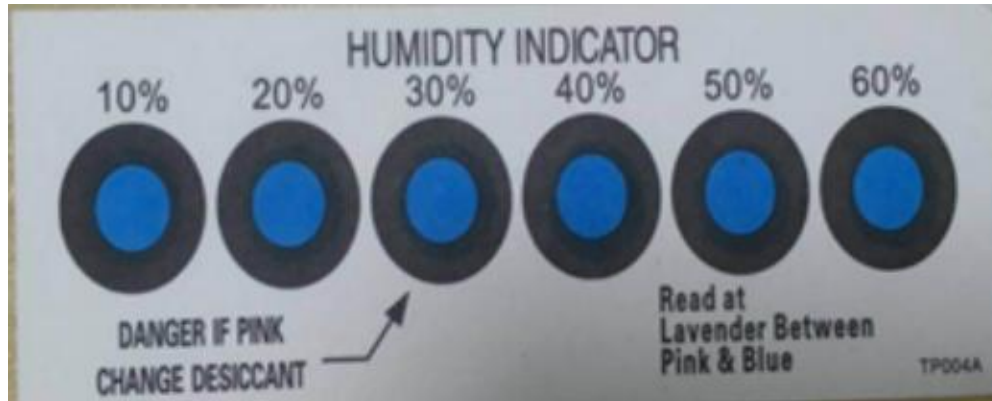
Baking Equipment:

- Cabinet oven
- ESD-safe high-temperature trays
- ESD-safe high-temperature gloves

2. Module Storage Conditions:

- Module MSL: 3

- Moisture barrier bags must be stored at $<40^{\circ}\text{C}$ and $<90\%\text{RH}$.
- Shelf life of dry-packed products: 12 months from sealing date.
- Each sealed package contains a humidity indicator card.



3. Baking Requirements for Moisture Exposure

Baking is required if:

- Vacuum packaging is damaged before opening.
- No humidity indicator card is found inside.
- Humidity indicator card shows $\geq 10\%$ (pink zone).
- Total exposure time exceeds 168 hours $\leq 30^{\circ}\text{C}/60\%\text{RH}$.
- Exceeds 12 months from initial sealing date.
- Not store according to J-STD-033

4. Baking parameters:

- Baking Temperature:
 - Reel packaging: 40°C , $\leq 5\%\text{RH}$
 - Tray packaging: 125°C , $\leq 5\%\text{RH}$ (Use high-temperature trays, not blister trays)
- Baking Duration:
 - Reel packaging: 168 hours
 - Tray packaging: 12 hours
- Over-Temperature Alarm Setting:
 - Reel packaging: 50°C
 - Tray packaging: 135°C
- Cool naturally to $\leq 36^{\circ}\text{C}$ before production.
- Rebake if re-exposed for >168 hours after initial baking.
- Wave soldering is not recommended for modules exposed >168 hours without baking. As MSL-3 moisture-sensitive devices, prolonged exposure likely causes moisture absorption. High-temperature soldering may lead to device failure or poor solder joints.

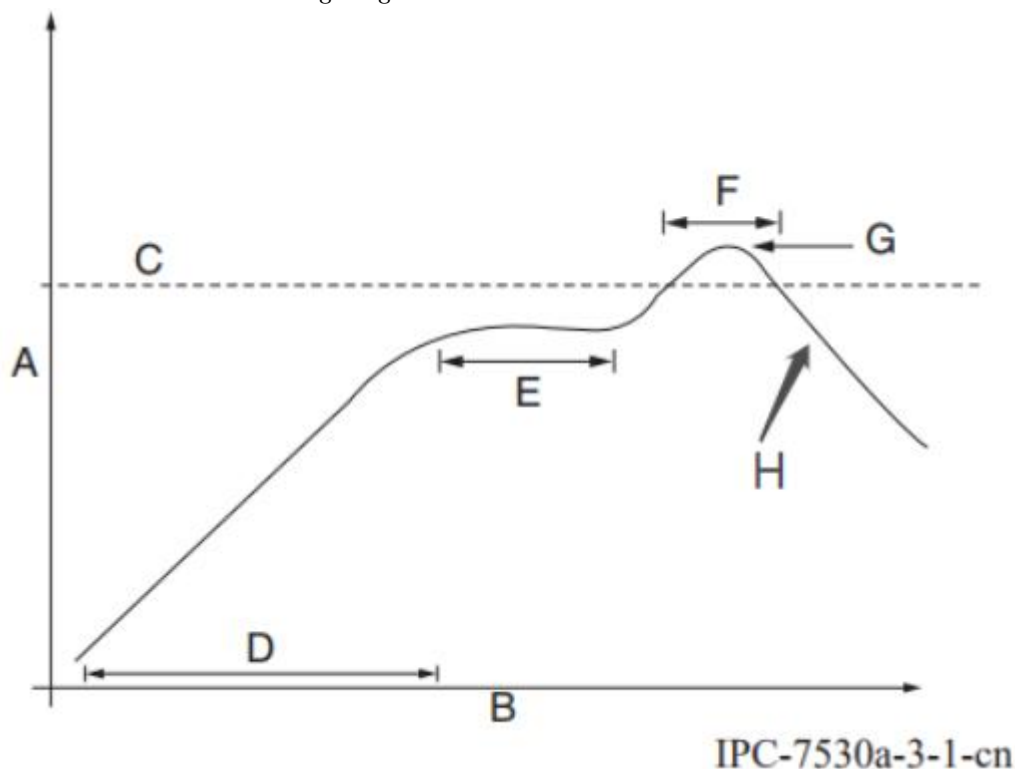
5. ESD safeguards must be implemented throughout production

6. Quality Assurance Recommendations

Use SPI and AOI to monitor solder paste printing and component placement

6.5 Recommended furnace temperature curve

Please set the temperature according to the reflow soldering curve, with a peak temperature of 245 °C. The reflow soldering temperature curve is shown in the following figure:



A: Temperature axis

B: Time axis

C: Alloy liquidus: 217 - 220° C

D: Ramp-up rate: 1 - 3° C/s

E: Soak zone: 60 - 120s at 150 - 200° C

F: Time above liquidus: 50 - 70s

G: Peak temperature: 235 - 245° C

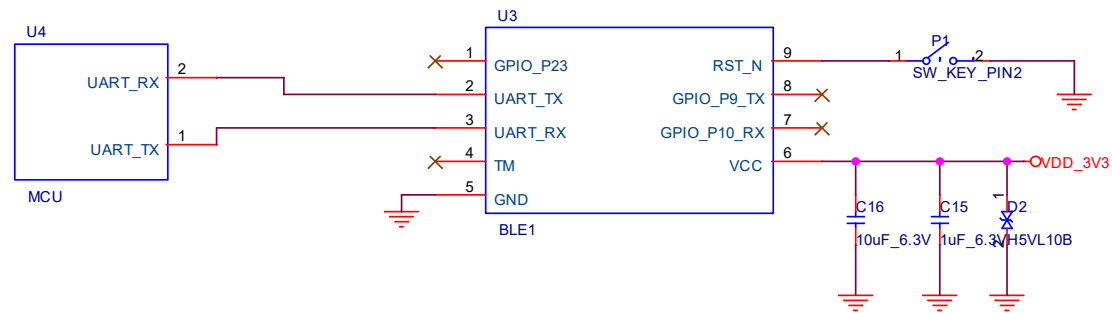
H: Ramp-down rate: 1 - 4° C/s

Note: The recommended curve above is based on SAC305 alloy solder paste as an example. For other alloy solder pastes, please follow the recommended furnace temperature curve settings in the solder paste specification book.

7. Module Peripheral Circuit & Placement

Guidelines

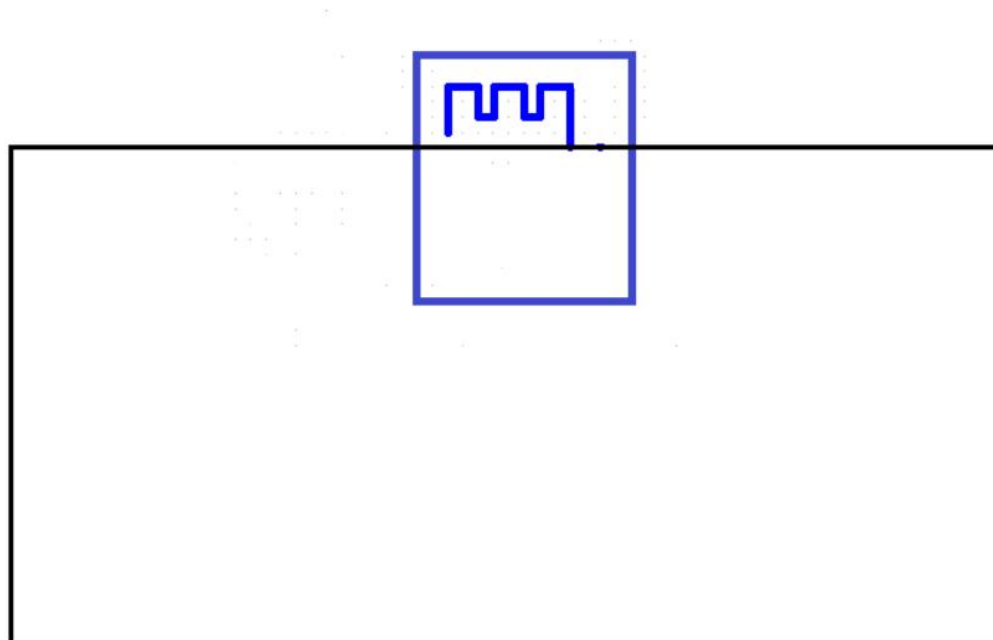
7.1 Peripheral Circuit Recommendations



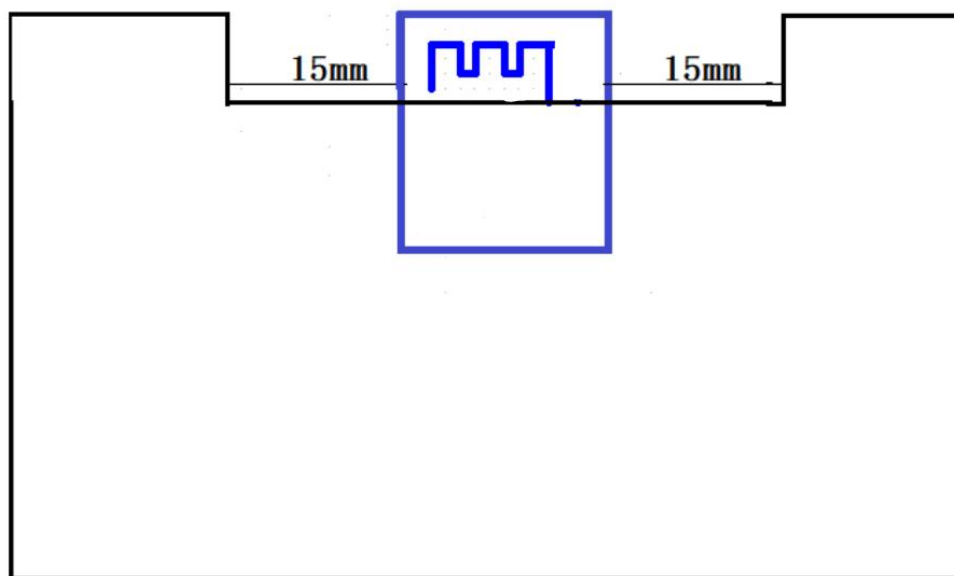
1. Place 10uF+ 1uF capacitors + ESD on power supply pins.

7.2 Module Placement Guidelines

Extend antenna section beyond PCB edge to minimize ground plane interference.



If antenna cannot extend beyond board: Maintain $\geq 15\text{mm}$ keepout area (no copper pours, traces, or components). Remove ground planes under antenna area on opposite PCB layers.



8. Packaging information

FCC Warning

Integration instructions for host product manufacturers according to KDB 996369 D03

OEM Manual v01r01

2.2 List of applicable FCC rules

FCC Part 15.247

2.3 Specific operational use conditions

This transmitter/module and its antenna(s) must not be co-located or operating in conjunction with any transmitter. This information also extends to the host manufacturer's instruction manual.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

It is "not applicable" as trace antenna which is not used on the module.

2.6 RF exposure considerations

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment shall be installed and operated with minimum distance 20cm between the radiator & body. The host product manufacturer would provide the above information to end users in their end-product manuals.

2.7 Antennas

PCB antenna; -0.489dBi; 2400-2500MHz



2.8 Label and compliance information

The end product must carry a physical label or shall use e-labeling followed KDB784748D01 and KDB 784748 stating “Contains Transmitter Module FCC ID: 2BENK-BLE62” .

2.9 Information on test modes and additional testing requirements

For more information on testing, please contact the manufacturer.

2.10 Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for the specific rule parts (FCC Part 15.247) 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. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed when contains digital circuitry.

FCC Statements

(OEM) Integrator has to assure compliance of the entire end-product incl. the integrated RF Module. For 15 B (§ 15.107 and if applicable § 15.109) compliance, the host manufacturer is required to show compliance with 15 while the module is installed and operating.

Furthermore the module should be transmitting and the evaluation should confirm that the module’s intentional emissions (15C) are compliant (fundamental / out-of-band). Finally the integrator has to apply the appropriate equipment authorization (e.g. Verification) for the new host device per definition in § 15.101.

Integrator is reminded to assure that these installation instructions will not be made available to the end-user of the final host device.

The final host device, into which this RF Module is integrated has to be labeled with an auxiliary label stating the FCC ID of the RF Module, such as "Contains FCC ID: 2BENK-BLE62".

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 to this unit not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

The Integrator will be responsible to satisfy SAR/ RF Exposure requirements, when the module integrated into the host device.

Module statement

The single-modular transmitter is a self-contained, physically delineated, component for which compliance can be demonstrated independent of the host operating conditions, and which complies with all eight requirements of § 15.212(a)(1) as summarized below.

- 1) The radio elements have the radio frequency circuitry shielded.
- 2) The module has buffered modulation/data inputs to ensure that the device will comply with Part 15 requirements with any type of input signal.
- 3) The module contains power supply regulation on the module.
- 4) The module contains a permanently attached antenna.
- 5) The module demonstrates compliance in a stand-alone configuration.
- 6) The module is labeled with its permanently affixed FCC ID label.
- 7) The module complies with all specific rules applicable to the transmitter, including all the conditions provided in the integration instructions by the grantee.
- 8) The module complies with RF exposure requirements.

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

IC Statements

The final host device, into which this RF Module is integrated" has to be labeled with an auxiliary label stating the IC of the RF Module, such as" Contains transmitter module IC: 31919-BLE62".

Le périphérique hôte final, dans lequel ce module RF est intégré, doit être étiqueté avec une étiquette auxiliaire indiquant le CI du module RF, telle que "Contient le module émetteur IC: 31919-BLE62".

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference.
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique 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;
- (2) L' appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d' en compromettre le fonctionnement.

ISED Radio Frequency Exposure Statement:

This equipment complies with ISED exposure limits set forth for an uncontrolled environment. This equipment shall be installed and operated with minimum distance 20cm between the radiator & body.

Déclaration d'ISDE sur l'exposition aux radiofréquences :

Cet équipement est conforme aux limites d'exposition d'ISDE établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé à une distance minimale de 20 cm entre le radiateur et le corps.