RF-BM-2652P2 / RF-BM-2652P2I CC2652P SimpleLink™ Multiprotocol 2.4 GHz Wireless Module with Integrated Power Amplifier

Version 1.0

Shenzhen RF-star Technology Co., Ltd.

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TI BLE Module List

Chipset	Core	Flash (KB)	RAM (KB)	TX Power (dBm)	Model	Antenna	Power Consumption (μA)	Dimension (mm)	Range (m)	Photo
CC2640 R2FRSM	M3	128	28	2	RF-BM-4044B2	PCB	808.64	16.6 × 11.2	BLE: 70 BLE Long Range: 85	
					RF-BM-4044B3	IPEX	808.64	15.2 × 11.2	BLE: 130 BLE Long Range: 165	
					RF-BM-4044B4	CHIP/Half-hole	808.64	8 × 8	BLE: 10 BLE Long Range:	
					RF-BM-4044B5	CHIP/Half-hole	808.64	8.5 × 10.5	BLE: 10 BLE Long Range:	
CC2640 R2FRGZ	M3	128	28	5	RF-BM-4077B1	PCB	842	23.5 × 17	BLE: BLE Long Range:	
CC2640 R2FRGZ – Q1					RF-BM-4077B2	PCB	842	23.5 × 17	BLE: BLE Long Range:	
CC2642R	M4F	352	80	5	RF-BM-2642B1	PCB	101.94	23.5 × 17	BLE: BLE Long Range:	
CC2652R	M4F	352	80	5	RF-BM-2652B1	PCB	101.94	23.5 × 17	BLE: 500 BLE Long Range:	

									2200	
									ZigBee: 300	
CC2652P	M4F	352	80	20	RF-BM-2652P1	Half-hole		25 × 16.4	BLE 1M: 350	
									BLE Long Range: 2200	
									ZigBee: 1100	
	M4F	352	80	20	RF-BM-2652P2	PCB Half-hole		30 × 16.4	BLE 1M: 350	
									BLE Long Range: 2200	
									ZigBee: 1100	
					RF-BM-2652P2I	IPEX/Half-hole		30 × 16.4	BLE 1M: 350	
									BLE Long Range: 2200	
									ZigBee: 1100	
CC1352R	M4F	352	80	5 / 14	RF-TI1352B1	IPEX		16.8 × 26.5	BLE: 500	
									ZigBee: 300	
									868 MHz: 1000	
CC1352P	M4F	352	80	20	RF-TI1352P1	Half-hole		16.4 × 25	BLE 1M: 350	
									BLE Long Range: 2200	
									ZigBee: 1100	
									868 MHz: 2500	

Note:

1. The power consumption is tested under 200 ms broadcast interval at 0 dBm TX power, with EN internal pullup.
2. The transmission range is the longest distance obtained by testing the module's maximum transmission power in an open and interference-free environment in sunny weather.
3. Click the picture to buy modules.

1 Device Overview

1.1 Description

RF-BM-2652P2(I) is an RF module based on TI lower-power CC2652P SoC, which is a multiprotocol 2.4 GHz wireless module supporting Thread, Zigbee®, Bluetooth® 5.1 Low Energy, IEEE 802.15.4, IPv6-enabled smart objects (6LoWPAN), proprietary systems, including the TI 15.4-Stack (2.4 GHz), and concurrent multiprotocol through a Dynamic Multiprotocol Manager (DMM) driver. It integrates a 48 MHz crystal and a 32.768 kHz crystal, 352 KB of in-system Programmable Flash, 256 KB ROM, 8 KB of Cache SRAM, and 80 KB of ultra-low leakage SRAM. Its ARM® Cortex®-M4F core application processor can operate at an extremely low current at flexible power modes. And the module enables long-range and low-power applications using an integrated +20 dBm high-power amplifier with best-in-class transmit current consumption at 85 mA. It features a small size, robust connection distance, and rigid reliability. Optional antenna output modes (PCB, IPEX connector, and half-hole interface) make the module more convenient for application and development.

1.2 Key Features

- RF Features
  - Bluetooth® 5.1 Low Energy
  - ZigBee®
  - Thread
  - Wi-SUN®
  - Proprietary
  - IEEE 802.15.4
  - IPv6-enabled smart objects (6LoWPAN)
  - TI15.4-Stack (2.4 GHz)
  - Dynamic Multiprotocol Manager (DDM) driver
- TX power: up to +20 dBm with temperature compensation
- Excellent receiver sensitivity
  - -100 dBm for 802.15.4 (2.4 GHz)
  - -105 dBm for Bluetooth 125 kbps (LE coded PHY)
- Wide Operation Range
  - 1.8 V to 3.8 V single power supply
  - Operating temperature: -40 °C to +85 °C
  - Storage temperature: -40 °C to +125 °C
- Microcontroller
  - Powerful 48 MHz ARM® Cortex®-M4F processor
  - EEBMC CoreMark® score: 148
  - 352 KB of in-system programmable flash
  - 256 KB of ROM for protocols and library functions
  - 8 KB of cache SRAM (Alternatively available as general-purpose RAM)
  - 80 KB of ultra-low leakage SRAM. The SRAM is protected by parity to ensure high reliability of operation.
  - 2-pin cJTAG and JTAG debugging
  - Support OTA upgrade
- Ultra-low power sensor controller with 4 KB of SRAM
  - Sample, store, and process sensor data
  - Operation independent from system CPU
  - Fast wake-up for low-power operation
- Rich Peripherals
  - Digital peripheral pins can be routed to 23 GPIOs
  - 4 × 32-bit or 8 × 16-bit general-purpose timers
  - 12-bit ADC, 200 ksamples/s, 8 channels
  - 2 × comparators with internal reference DAC (1 × continuous time, 1 × ultra-low power)

- Programmable current source
- 2 × UART
- 2 × SSI (SPI, Microwave, TI)
- I^2C
- I^2S
- Real-time clock (RTC)
- AES 128- and 256- bit Crypto accelerator
- ECC and RSA public key hardware accelerator
- SHA2 accelerator (full suite up to SHA-512)
- True random number generator (TRNG)
- Capacitive sensing, up to 8 channels
- Integrated temperature and battery monitor

- External system
  - On-chip buck DC/DC converter
- Transmission range:
  - RF-BM-2652P2: 70 m (@ PCB antenna)
  - RF-BM-2652P2I: 120 m (@ external PCB antenna)
- Dimension: 30.0 mm × 16.4 mm × 2.2 mm
- RF-BM-2652P2 and RF-BM-2652P2I Certificates:
  - FCC
  - CE

1.3 Applications

- 2400 to 2480 MH ISM and SRD systems with down to 4 kHz of receive bandwidth
- Home and building automation
- Building security system
- HVAC system
- Gateway
- IP network camera
- Fire safety system
- Smart grid
- Automatic meter reading
- Industrial transport
- Wireless sensor networks
- Factory automation and control
- Wireless healthcare applications
- Energy harvesting applications
- Asset tracking and management
- Electronic Shelf Label (ESL)
- Wired networking
- Small business router
- Portable electronics
- Set-top box
- Connected peripherals
- Keyboard and keypads
- Home theater & entertainment
- Electronic and robotic toys
- Wearables

1.4 Functional Block Diagram

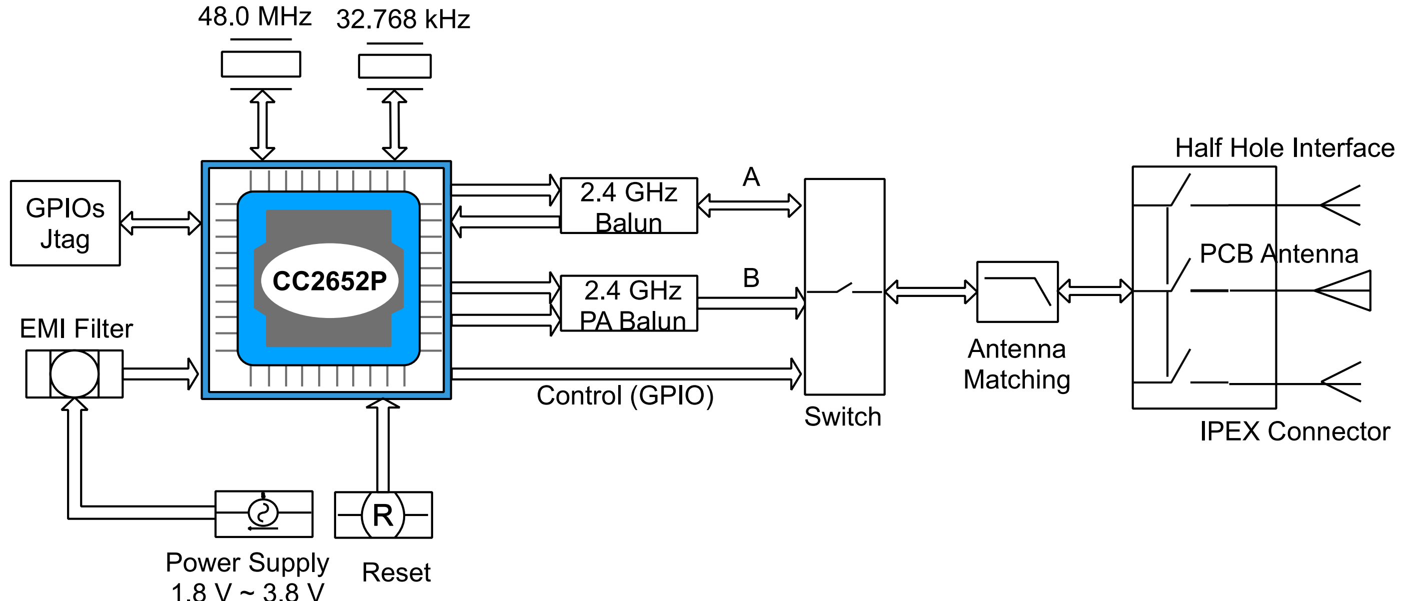


Figure 1. Functional Block Diagram of RF-BM-2652P2(I)

1.5 Part Number Conventions

The part numbers are of the form of RF-BM-2652P2(I) where the fields are defined as follows:

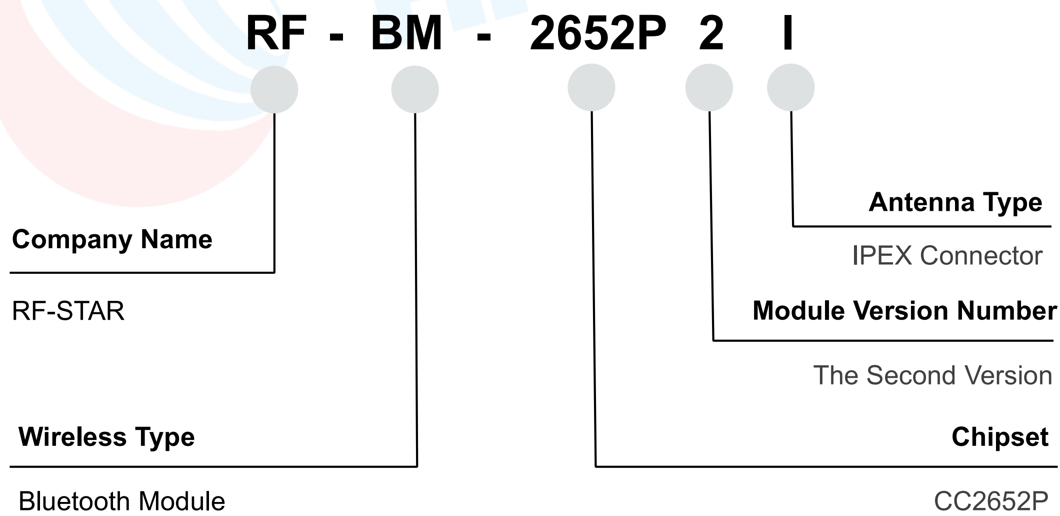


Figure 2. Part Number Conventions of RF-BM-2652P2(I)

Table of Contents

TI BLE Module List........ 2
1 Device Overview........ 4
1.1 Description........ 4
1.2 Key Features........ 4
1.3 Applications........ 5
1.4 Functional Block Diagram........ 6
1.5 Part Number Conventions........ 6
Table of Contents........ 7
Table of Figures........ 8
Table of Tables........ 9
2 Module Configuration and Functions........ 10
2.1 Module Parameters........ 10
2.2 Module Pin Diagram........ 11
2.3 Pin Functions........ 11
3 Specifications........ 13
3.1 Recommended Operating Conditions........ 13
3.2 Handling Ratings........ 13
3.3 Power Consumption........ 13
3.3.1 Power Mode........ 13
3.3.2 Radio Mode........ 15
4 Application, Implementation, and Layout........ 16
4.1 Module Photos........ 16
4.2 Recommended PCB Footprint........ 16
4.3 Schematic Diagram........ 17
4.4 Antenna........ 17
4.4.1 Antenna Design Recommendation........ 17
4.4.2 Antenna Output Mode Modification........ 18
4.4.3 External Antenna Design Recommendation of the Half-Hole ANT Pin........ 18
4.4.4 IPEX Connector Specification........ 20
4.5 Basic Operation of Hardware Design........ 21

4.6 Trouble Shooting 21
4.6.1 Unsatisfactory Transmission Distance 21
4.6.2 Vulnerable Module 22
4.6.3 High Bit Error Rate 22
4.7 Electrostatics Discharge Warnings 22
4.8 Soldering and Reflow Condition 22
4.9 Optional Package Specification 24
5 Certificate 26
5.1 FCC 26
5.2 CE 26
6 Revision History 27
7 Contact Us 28

Table of Figures

Figure 1. Functional Block Diagram of RF-BM-2652P2(I) 6
Figure 2. Part Number Conventions of RF-BM-2652P2(I) 6
Figure 3. Pin Diagram of RF-BM-2652P2(I) 11
Figure 4. Recommendation of Antenna Layout 18
Figure 5. Antenna Output Mode Modification of RF-BM-2652P2(I) 18
Figure 6. Reference Design of the External Antenna 19
Figure 7. Reference Design of the External Antenna Traces 19
Figure 8. SI9000 Impedance Calculation Diagram 19
Figure 9. Specification of Antenna Seat 20
Figure 10. Specification of IPEX Wire 20
Figure 11. Recommended Reflow for Lead-Free Solder 23
Figure 12. Default Package by Tray 24
Figure 13. Package by Tape & Reel 25
Figure 14. FCC certificate of RF-BM-2652P2(I) 26
Figure 15. CE certificate of RF-BM-2652P2(I) 26

Table of Tables

Table 1. Parameters of RF-BM-2652P2(I) 10
Table 2. Pin Diagram of RF-BM-2652P2(I) 11
Table 3. Recommended Operating Conditions of RF-BM-2652P2(I) 13
Table 4. Handling Ratings of RF-BM-2652P2(I) 13
Table 5. Table of Power Consumption on Power Mode 13
Table 6. Table of Power Consumption on Radio Mode 15
Table 7. Temperature Table of Soldering and Reflow 23

2 Module Configuration and Functions

2.1 Module Parameters

Table 1. Parameters of RF-BM-2652P2(I)

Chipset	CC2652P
Supply Power Voltage	1.8 V ~ 3.8 V, 3.3 V is recommended
Frequency	2402 MHz ～ 2480 MHz
Maximum Transmit Power	+20.0 dBm
Receiving Sensitivity	-100 dBm @ 802.15.4 (2.4 GHz) -105 dBm @ Bluetooth 125 kbps (LE Coded PHY)
GPIO	23
Flash	352 KB
ROM	256 KB
RAM	80 KB
Support Protocol	Bluetooth 5.1 Low Energy, ZigBee, Thread, IEEE 802.15.4, 6LoWPAN, Wi-SUN
Crystal	48 MHz, 32.768 kHz
Package	SMT packaging (1.27-mm half-hole pitch stamp stick)
Dimension	30.0 mm × 16.4 mm × 2.2 mm
Type of Antenna	RF-BM-2652P2: PCB antenna RF-BM-2652P2I: IPEX connector, ANT pin
Operating Temperature	-40 ℃ ～ +85 ℃
Storage Temperature	-40 ℃ ～ +125 ℃

2.2 Module Pin Diagram

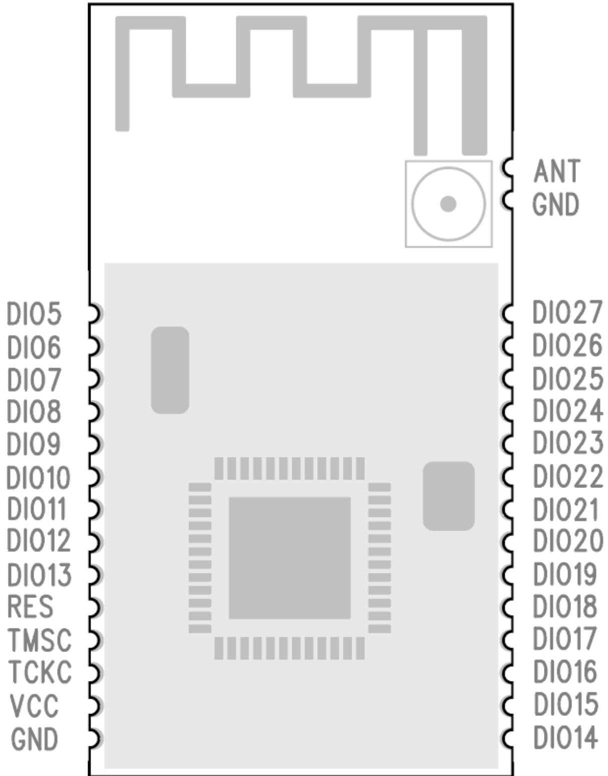


Figure 3. Pin Diagram of RF-BM-2652P2(I)

2.3 Pin Functions

Table 2. Pin Diagram of RF-BM-2652P2(I)

Pin	Name	Chip Pin	Function	Description
1	DIO5	DIO5	GPIO	GPIO, Sensor Controller, high-drive capability
2	DIO6	DIO6	GPIO	GPIO, Sensor Controller, high-drive capability
3	DIO7	DIO7	GPIO	GPIO, Sensor Controller, high-drive capability
4	DIO8	DIO8	GPIO	GPIO
5	DIO9	DIO9	GPIO	GPIO
6	DIO10	DIO10	GPIO	GPIO
7	DIO11	DIO11	GPIO	GPIO
8	DIO12	DIO12	GPIO	GPIO
9	DIO13	DIO13	GPIO	GPIO
10	RES	RESET_N	RES	Reset, active low.
11	JTAG_TMSC	TMSC	JTAG_TMSC	JTAG TMSC, high-drive capability
12	JTAG_TCKC	TCKC	JTAG_TCKC	JTAG TCKC

13	VCC	EXT_3V3	VCC	Power supply: 1.8 V ~ 3.8 V, recommended to 3.3 V.
14	GND	GND	GND	Ground
15	DIO14	DIO14	GPIO	GPIO
16	DIO15	DIO15	GPIO	GPIO
17	DIO16	DIO16	GPIO	GPIO, JTAG_TDO, high-drive capability
18	DIO17	DIO17	GPIO	GPIO, JTAG_TDI, high-drive capability
19	DIO18	DIO18	GPIO	GPIO
20	DIO19	DIO19	GPIO	GPIO
21	DIO20	DIO20	GPIO	GPIO
22	DIO21	DIO21	GPIO	GPIO
23	DIO22	DIO22	GPIO	GPIO
24	DIO23	DIO23	GPIO or Analog	GPIO, analog capability
25	DIO24	DIO24	GPIO or Analog	GPIO, analog capability
26	DIO25	DIO25	GPIO or Analog	GPIO, analog capability
27	DIO26	DIO26	GPIO or Analog	GPIO, analog capability
28	DIO27	DIO27	GPIO or Analog	GPIO, analog capability
29	GND	GND	-	Ground
30	ANT	-	ANT	Antenna

3 Specifications

3.1 Recommended Operating Conditions

Functional operation does not guarantee performance beyond the limits of the conditional parameter values in the table below. Long-term work beyond this limit will affect the reliability of the module more or less.

Table 3. Recommended Operating Conditions of RF-BM-2652P2(I)

Items	Condition	Min.	Typ.	Max.	Unit
Operating Supply Voltage	/	1.8	3.3	3.8	V
Operating Temperature	/	-40	+25	+85	℃

Notes: To ensure the RF performance, the ripple wave on the source must be less than ±300 mV.

3.2 Handling Ratings

Table 4. Handling Ratings of RF-BM-2652P2(I)

Items	Condition	Min.	Typ.	Max.	Unit
Storage Temperature	Tstg	-40	+25	+125	℃
Human Body Model	HBM		±2000		V
Moisture Sensitivity Level			2		
Charged Device Model			±500		V

3.3 Power Consumption

3.3.1 Power Mode

Table 5. Table of Power Consumption on Power Mode

Measured on the CC2652P with Tc = 25°C, VDDS = 3.0 V with internal DC/DC converter, unless otherwise noted. The data is quoted from the TI CC2652P data sheet.

Parameter		Test Conditions	Typ.	Unit
Core Current Consumption				
I_{core}	Reset and Shutdown	Reset. RESET_N pin asserted or VDDS below power-on-reset threshold	150	nA
		Shutdown. No clocks running, no retention	150	nA
	Standby without	RTC running, CPU, 80 KB RAM and (partial) register retention.	0.94	μA

	cache retention	RCOSC_LF		
		RTC running, CPU, 80 KB RAM and (partial) register retention. XOSC_LF	1.09	μA
	Standby with cache retention	RTC running, CPU, 80 KB RAM and (partial) register retention. RCOSC_LF	3.2	μA
		RTC running, CPU, 80 KB RAM and (partial) register retention. XOSC_LF	3.3	μA
	Idle	Supply Systems and RAM powered RCOSC_HF	675	μA
	Active	MCU running CoreMark at 48 MHz RCOSC_HF	3.39	mA
Peripheral Current Consumption				
I_{peri}	Peripheral power domain	Delta current with domain enabled	97.7	μA
	Serial power domain	Delta current with domain enabled	7.2	μA
	RF Core	Delta current with power domain enabled, clock enabled, RF core idle	210.9	μA
	μDMA	Delta current with clock enabled, module is idle.	63.9	μA
	Timer	Delta current with clock enabled, module is idle.(1)	81.0	μA
	I^2C	Delta current with clock enabled, module is idle.	10.1	μA
	I^2S	Delta current with clock enabled, module is idle.	26.3	μA
	SSI	Delta current with clock enabled, module is idle. (2)	82.9	μA
	UART	Delta current with clock enabled, module is idle. (3)	167.5	μA
	CRYPTO (AES)	Delta current with clock enabled, module is idle.	25.6	μA
	PKA	Delta current with clock enabled, module is idle.	84.7	μA
	TRNG	Delta current with clock enabled, module is idle.	35.6	μA
Sensor Controller Engine Consumption.				
I_{SCE}	Active mode	24 MHz, infinite loop	808.5	μA

	Low-power mode	2 MHz, infinite loop	30.1	μA

Note:

(1) Only one GPTimer running

(2) Only one SSI running

(3) Only one UART running

3.3.2 Radio Mode

Table 6. Table of Power Consumption on Radio Mode

Measured on the CC2652P with Tc = 25°C, VDDS = 3.0 V with internal DC/DC converter, unless otherwise noted. The data is quoted from the TI CC2652P data sheet.

Parameter	Test Conditions	Typ.	Unit
Radio Receive Current	2440 MHz	6.9	mA
Radio Transmit Current Regular PA	0 dBm output power setting 2440 MHz	7.3	mA
	+5 dBm output power setting 2440 MHz	9.6	mA
Radio Transmit Current High-power PA	+20 dBm output power setting 2440 MHz	85	mA
Radio Transmit Current Regular PA, 10 dBm configuration	+10 dBm output power setting 2440 MHz	22	mA

4 Application, Implementation, and Layout

4.1 Module Photos

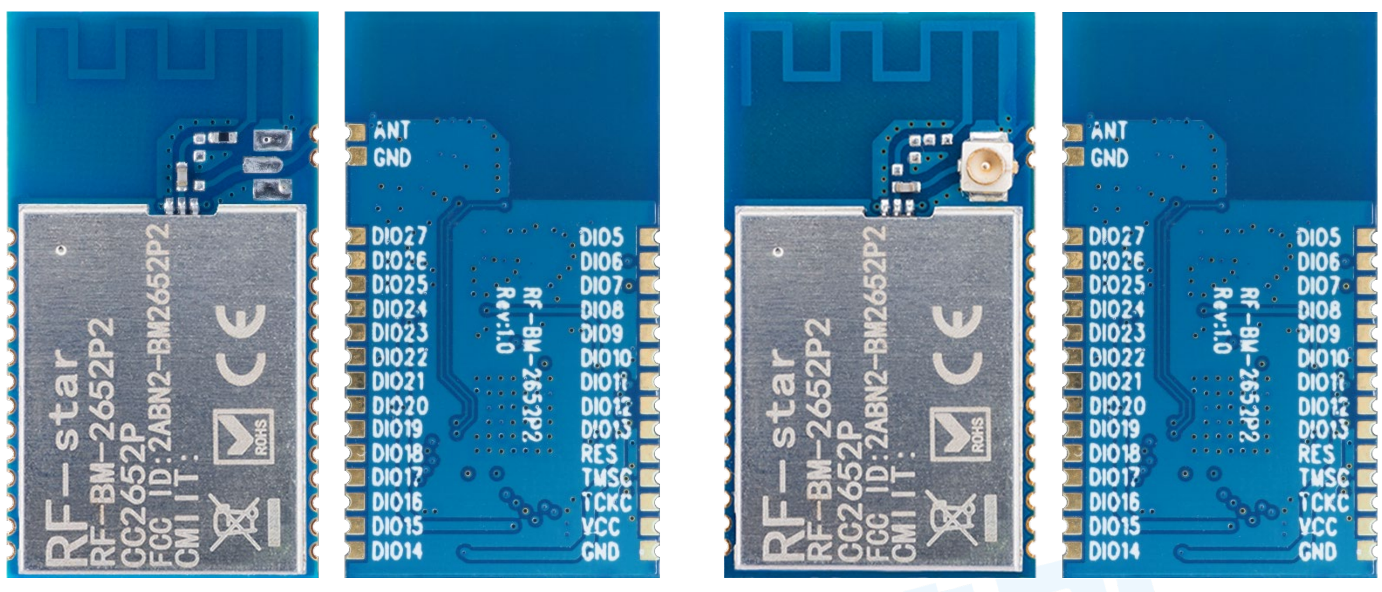


Figure 3. Photos of RF-BM-2652P2(I)

4.2 Recommended PCB Footprint

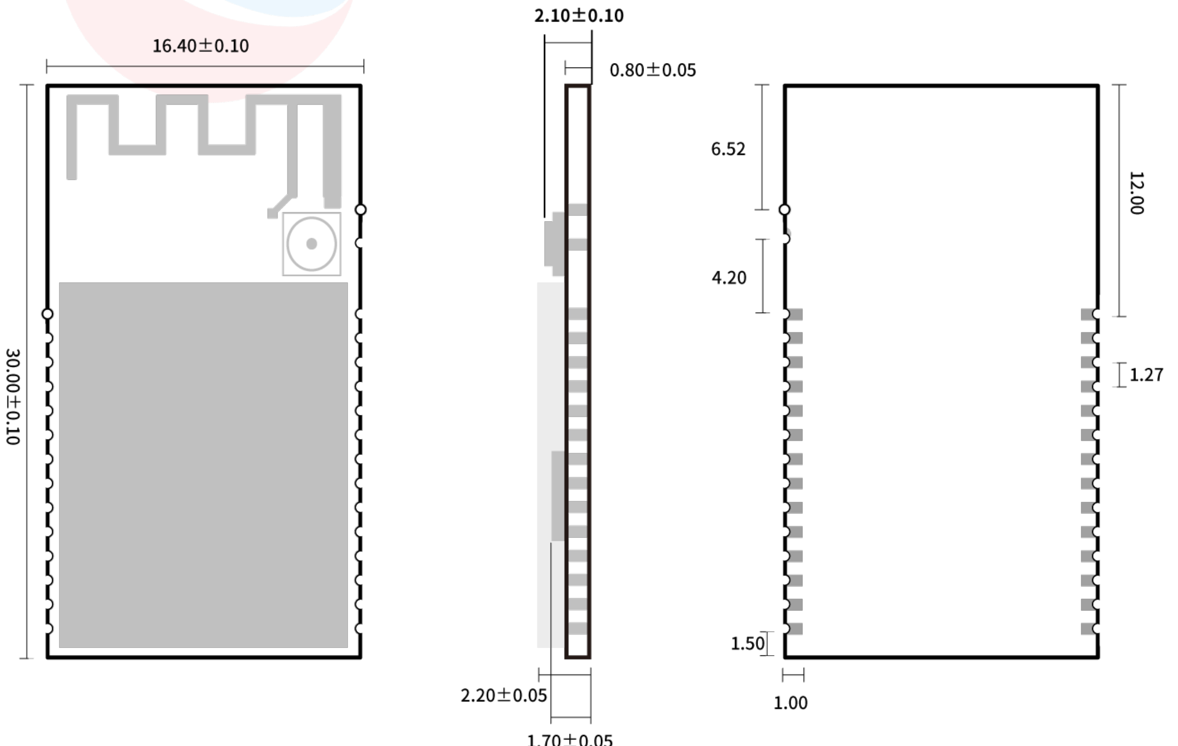


Figure 4. Recommended PCB Footprint of RF-BM-2652P2(I)

4.3 Schematic Diagram

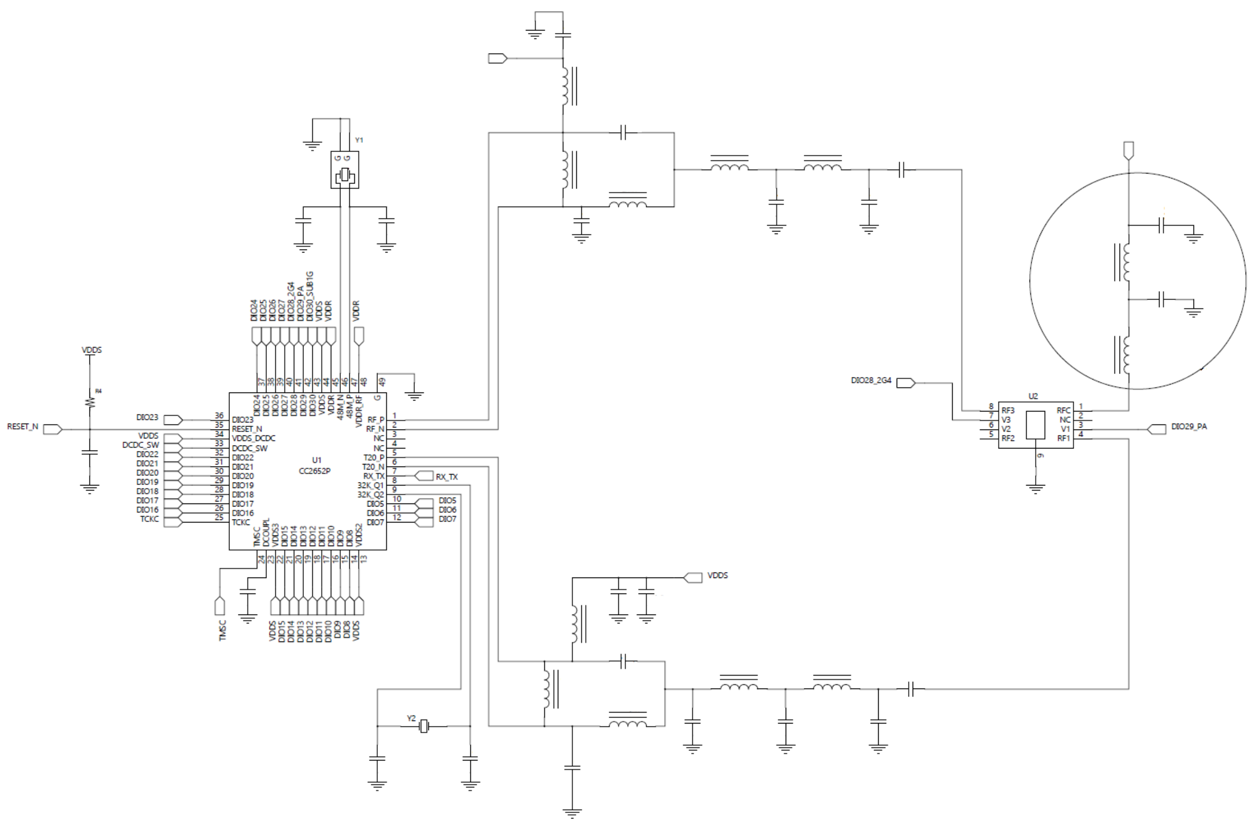


Figure 5. Schematic Diagram of RF-BM-2652P2(I)

4.4 Antenna

4.4.1 Antenna Design Recommendation

1. The antenna installation structure has a great influence on the module performance. It is necessary to ensure that the antenna is exposed and preferably vertically upward. When the module is installed inside of the case, a high-quality antenna extension wire can be used to extend the antenna to the outside of the case.
2. The antenna must not be installed inside the metal case, which will cause the transmission distance to be greatly weakened.
3. The recommendation of antenna layout.

   The inverted-F antenna position on PCB is free-space electromagnetic radiation. The location and layout of the antenna are key factors to increase the data rate and transmission range.

   Therefore, the layout of the module antenna location and routing is recommended as follows:

   (1) Place the antenna on the edge (corner) of the PCB.

   (2) Make sure that there is no signal line or copper foil in each layer below the antenna.

   (3) It is best to hollow out the antenna position in the following figure to ensure that the S11 of the module is minimally affected.

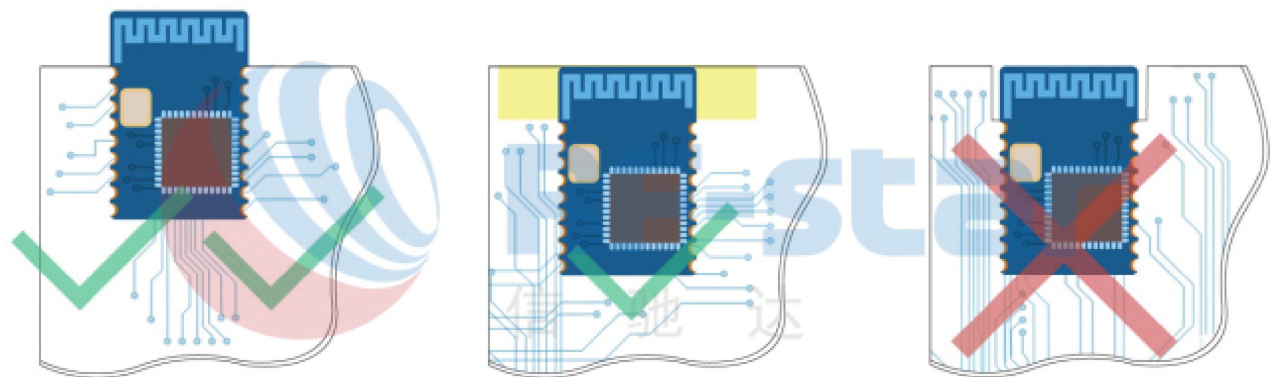


Figure 4. Recommendation of Antenna Layout

Note: The hollow-out position is based on the antenna used.

4.4.2 Antenna Output Mode Modification

1. The antenna output mode can be modified according to the following steps.
   One 10 pF Capacitance and one 0 R resistor are mounted on the RF-BM-2652P2 as shown in the red circles. If the user would like to change the antenna output mode to IPEX or ANT pin, the 10 pF Capacitance needs to be rotated 90 degrees clockwise as shown in the yellow circle, and the 0 R resistor is needed to be removed. If the IPEX or ANT pin needs to be changed to the PCB antenna, vice versa.

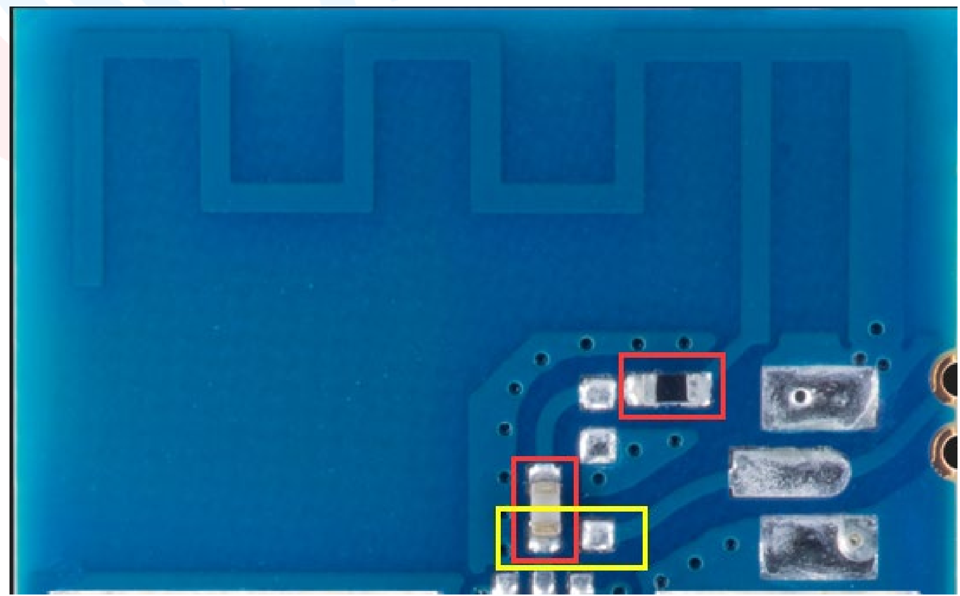


Figure 5. Antenna Output Mode Modification of RF-BM-2652P2(I)

4.4.3 External Antenna Design Recommendation of the Half-Hole ANT Pin

1. A Π-type matching circuit is reserved for the antenna, and 50 Ω impedance control is performed on the RF traces. The traces are as short as possible, and 135° or arc traces are used as much as possible. No vias are used to change layers. More GND vias are placed around the RF traces.

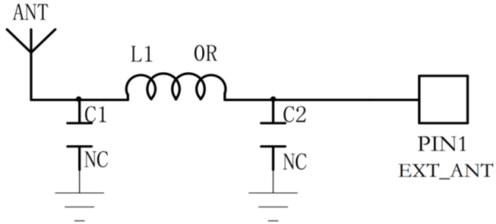


Figure 6. Reference Design of the External Antenna

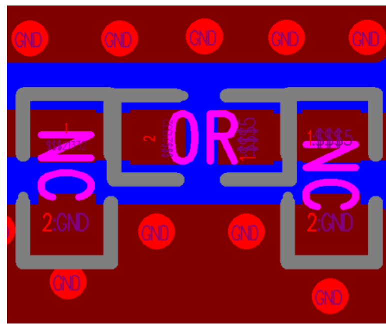


Figure 7. Reference Design of the External Antenna Traces

2. The RF trace width and copper-clad spacing can be calculated by SI9000 software, and the impedance is controlled to 50 Ω according to the actual board thickness, number of layers, plate, dielectric thickness, dielectric constant, copper thickness, line width, line spacing, and solder mask thickness.

   Example: FR4 is a double-layer board with a thickness of 1.0 mm. Through calculation, the width of the trace is 0.8254 mm, and the spacing between traces and copper is 0.22 mm.

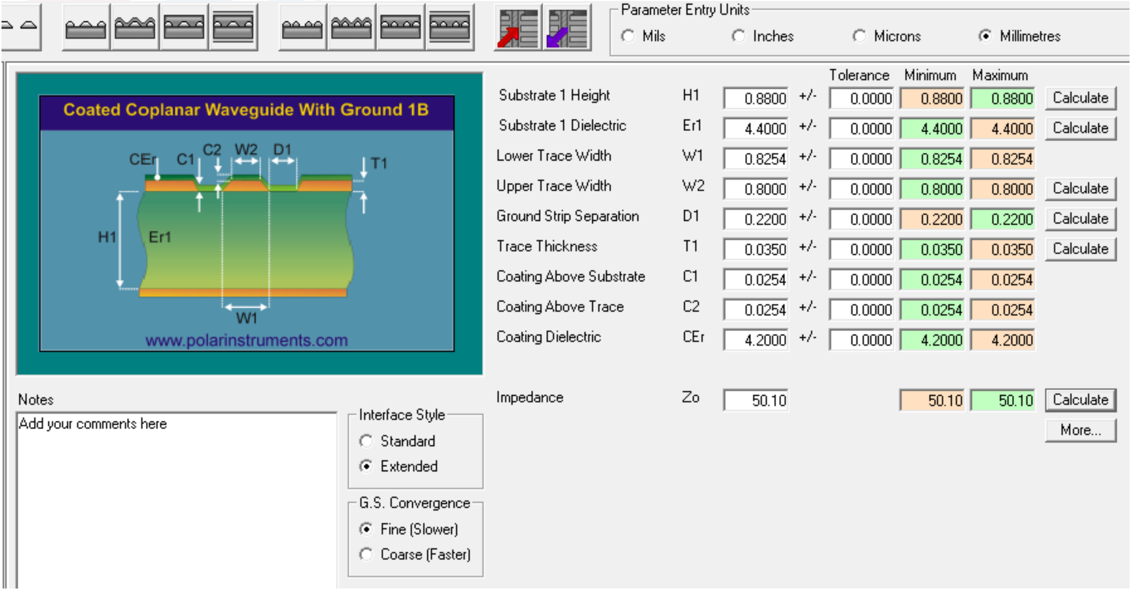


Figure 8. SI9000 Impedance Calculation Diagram

4.4.4 IPEX Connector Specification

RF-BM-2652P2(I) module is integrated the IPEX version 1 antenna seat, the specification of the antenna seat is as follows:

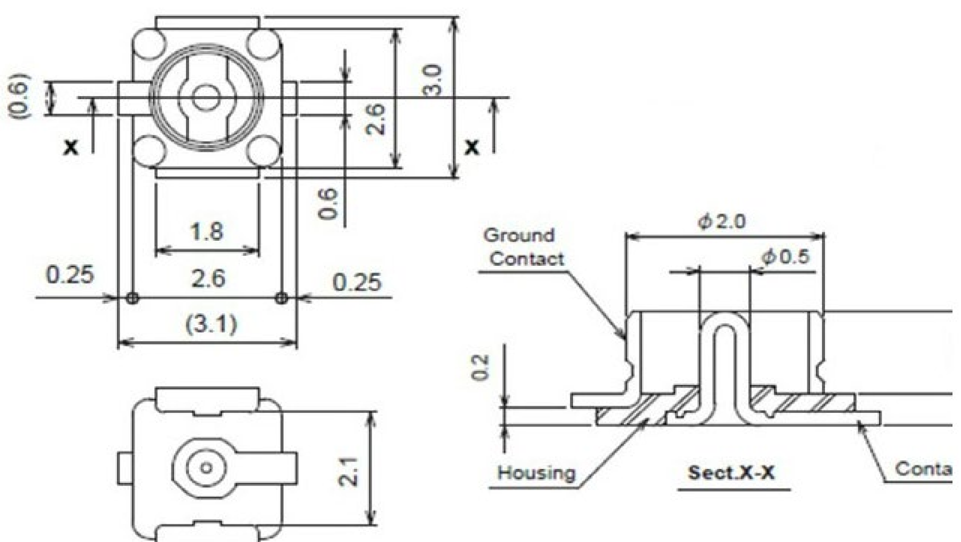


Figure 9. Specification of Antenna Seat

The specification of the IPEX wire end is as follows:

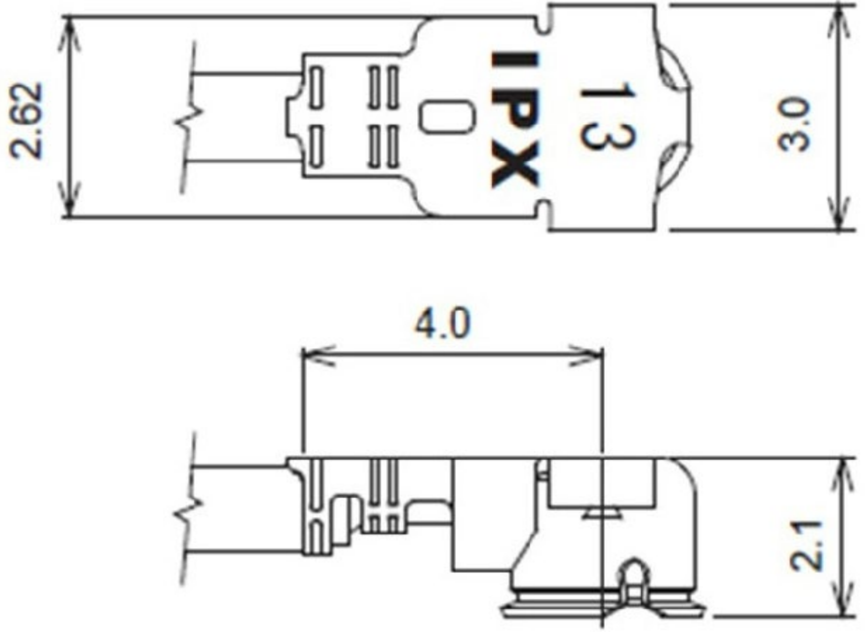


Figure 10. Specification of IPEX Wire

4.5 Basic Operation of Hardware Design

1. It is recommended to offer the module a DC stabilized power supply, a tiny power supply ripple coefficient, and reliable ground. Please pay attention to the correct connection between the positive and negative poles of the power supply. Otherwise, the reverse connection may cause permanent damage to the module;
2. Please ensure the supply voltage is between the recommended values. The module will be permanently damaged if the voltage exceeds the maximum value. Please ensure a stable power supply and no frequently fluctuating voltage.
3. When designing the power supply circuit for the module, it is recommended to reserve more than 30% of the margin, which is beneficial to the long-term stable operation of the whole machine. The module should be far away from the power electromagnetic, transformer, high-frequency wiring, and other parts with large electromagnetic interference.
4. The bottom of the module should avoid high-frequency digital routing, high-frequency analog routing, and power routing. If it has to route the wire on the bottom of the module, for example, it is assumed that the module is soldered to the Top Layer, the copper must be spread on the connection part of the top layer and the module, and be close to the digital part of the module and routed in the Bottom Layer (all copper is well-grounded).
5. Assuming that the module is soldered or placed in the Top Layer, it is also wrong to randomly route the Bottom Layer or other layers, which will affect the spurs and receiving sensitivity of the module to some degree;
6. Assuming that there are devices with large electromagnetic interference around the module, which will greatly affect the module performance. It is recommended to stay away from the module according to the strength of the interference. If circumstances permit, appropriate isolation and shielding can be done.
7. Assuming that there are routings of large electromagnetic interference around the module (high-frequency digital, high-frequency analog, power routings), which will also greatly affect the module performance. It is recommended to stay away from the module according to the strength of the interference. If circumstances permit, appropriate isolation and shielding can be done.
8. It is recommended to stay away from the devices whose TTL protocol is the same 2.4 GHz physical layer, for example, USB 3.0.

4.6 Trouble Shooting

4.6.1 Unsatisfactory Transmission Distance

1. When there is a linear communication obstacle, the communication distance will be correspondingly weakened. Temperature, humidity, and co-channel interference will lead to an increase in the communication packet loss rate. The performances of ground absorption and reflection of radio waves will be poor when the module is tested close to the ground.

2. Seawater has a strong ability to absorb radio waves, so the test results by the seaside are poor.
3. The signal attenuation will be very obvious if there is metal near the antenna or if the module is placed inside the metal shell.
4. The incorrect power register set or the high data rate in the open air may shorten the communication distance. The higher the data rate, the closer the distance.
5. The low voltage of the power supply is lower than the recommended value at ambient temperature, and the lower the voltage, the smaller the power is.
6. The unmatchable antennas and modules or the poor quality of antenna will affect the communication distance.

4.6.2 Vulnerable Module

1. Please ensure the supply voltage is between the recommended values. The module will be permanently damaged if the voltage exceeds the maximum value. Please ensure a stable power supply and no frequently fluctuating voltage.
2. Please ensure the anti-static installation and the electrostatic sensitivity of high-frequency devices.
3. Due to some humidity-sensitive components, please ensure the suitable humidity during installation and application. If there is no special demand, it is not recommended to use at too high or too low temperature.

4.6.3 High Bit Error Rate

1. There are co-channel signal interferences nearby. It is recommended to be away from the interference sources or modify the frequency and channel to avoid interferences.
2. The unsatisfactory power supply may also cause garbled. It is necessary to ensure the power supply's reliability.
3. If the extension wire or feeder wire is of poor quality or too long, the bit error rate will be high.

4.7 Electrostatics Discharge Warnings

The module will be damaged by the discharge of static. RF-star suggests that all modules should follow the 3 precautions below:

1. According to the anti-static measures, bare hands are not allowed to touch modules.
2. Modules must be placed in anti-static areas.
3. Take the anti-static circuitry (when inputting HV or VHF) into consideration in product design.

Static may result in the degradation in performance of the module, even causing failure.

4.8 Soldering and Reflow Condition

1. Heating method: Conventional Convection or IR/convection.
2. Solder paste composition: Sn96.5/Ag3.0/Cu0.5

3. Allowable reflow soldering times: 2 times based on the following reflow soldering profile.
4. Temperature profile: Reflow soldering shall be done according to the following temperature profile.
5. Peak temperature: 245 ℃.

Table 7. Temperature Table of Soldering and Reflow

Profile Feature	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Sn63 / Pb37	Sn96.5 / Ag3.0 / Cu0.5
Min. Preheating Temperature (T_{min})	100 ℃	150 ℃
Max. Preheating Temperature (T_{max})	150 ℃	200 ℃
Preheating Time (T_{min} to T_{max}) (t_1)	60 s ~ 120 s	60 s ~ 120 s
Average Ascend Rate (T_{max} to T_p)	Max. 3 ℃/s	Max. 3 ℃/s
Liquid Temperature (T_L)	183 ℃	217 ℃
Time above Liquidus (t_L)	60 s ~ 90 s	30 s ~ 90 s
Peak Temperature (T_p)	220 ℃ ~ 235 ℃	230 ℃ ~ 250 ℃
Average Descend Rate (T_p to T_{max})	Max. 6 ℃/s	Max. 6 ℃/s
Time from 25 ℃ to Peak Temperature (t_2)	Max. 6 minutes	Max. 8 minutes
Time of Soldering Zone (t_P)	20±10 s	20±10 s

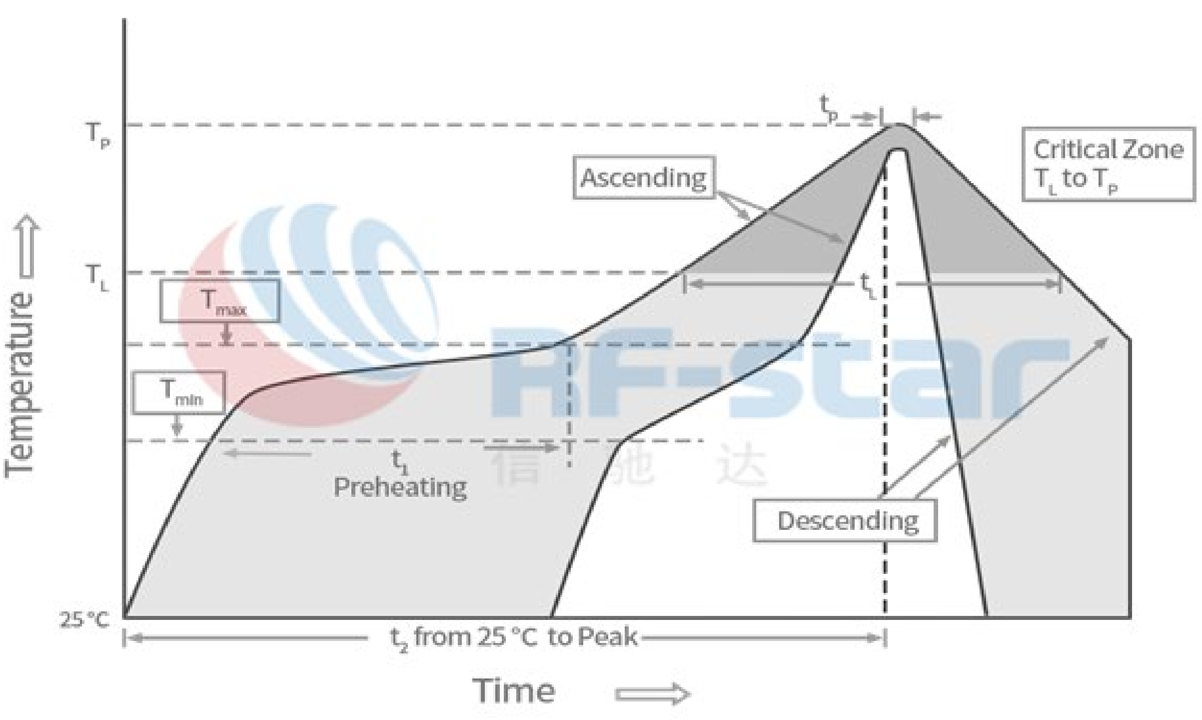


Figure 11. Recommended Reflow for Lead-Free Solder

4.9 Optional Package Specification

The default package method is ***by tray***. If you need the modules to be shipped by tape & reel, pls contact us in advance.

Humidity card

Desiccant

Max. 50 pieces/Tray

Aluminum moisture Barrier bag

Corrugated cardboard box (Inner)

Corrugated cardboard box (Inner)

Corrugated cardboard box (Outer)

Max. 2500 pieces/Box

Figure 12. Default Package by Tray

Tape and ReeL

Double protection:
Protective tape + Foam protection

Humidity card

Desiccant

Max. 500 pieces/Reel

Aluminum moisture
Barrier bag

Corrugated cardboard box
（Inner）

Corrugated cardboard box
（Inner）

Corrugated cardboard box
（Outer）

Max. 2500 pieces/Box

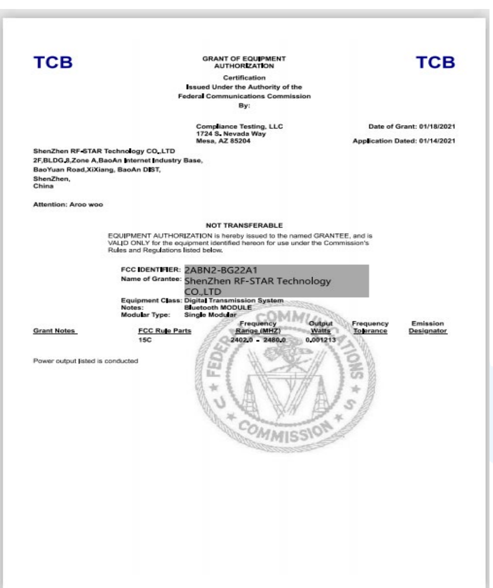
Figure 13. Package by Tape & Reel

5 Certificate

5.1 FCC

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.

FCC ID: 2ABN2-BG22A1



TCB — GRANT OF EQUIPMENT AUTHORIZATION — TCB

Certification
Issued Under the Authority of the
Federal Communications Commission
By:

Compliance Testing, LLC
1724 S. Nevada Way
Mesa, AZ 85204

Date of Grant: 01/18/2021
Application Dated: 01/14/2021

ShenZhen RF-STAR Technology CO.,LTD
2F,BLDG,8,Zone A,BaoAn Internet Industry Base,
BaoYuan Road,XiXiang, BaoAn DIST,
ShenZhen,
China

Attention: Aroo woo

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER: 2ABN2-BG22A1
Name of Grantee: ShenZhen RF-STAR Technology CO.,LTD
Equipment Class: Digital Transmission System
Notes: Bluetooth MODULE
Modular Type: Single Modular

Grant Notes	FCC Rule Parts	Frequency Range (MHZ)	Output Watts	Frequency Tolerance	Emission Designator
	15C	2402.0 - 2480.0	0.001213		

Power output listed is conducted

Figure 14. FCC certificate of RF-BM-2652P2(I)

5.2 CE

BLUE ASIA

Declaration of Conformity

The submitted sample of the following equipment has been tested for CE marking accordingto the following European Directive: the RED Directive 2014/53/EU.

Applicant name &address : Shenzhen Rfstar Technology Co.,Ltd
Room 601,Block C,Skyworth Building, NanShan,Shen Zhen 518057

Manufacturer name & Address : Shenzhen Rfstar Technology Co.,Ltd
Room 601,Block C,Skyworth Building, NanShan,Shen Zhen 518057

Product : Bluetooth MODULE
Model/Type reference : RF-BM-BG22A1
Trade mark : RF-STAR
Order No. : BLA-EMC-202012-A33

Essential Requirements		Applied Specification/Standards	Documentary Evidence
Art 3.1 (a)	Health	EN 62479:2010	Test Report BLA-EMC-202012-A3303
Art 3.1 (a)	Safety	EN IEC 62368-1:2020	Test Report BLA-S-202012-A06
Art 3.1 (b)	EMC	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-17 V3.2.4 (2020-09)	Test Report BLA-EMC-202012-A3301
Art 3.2	Radio	ETSI EN 300 328 V2.2.2 (2019-07)	Test Report BLA-EMC-202012-A3302

This verification has been granted to the applicant based on the results of the tests, performed by laboratory of BlueAsia of Technical Services(Shenzhen) Co., Ltd.on the sample of the above-mentioned product in accordance with the provisions of the relevant specific standards and the product is in conformity with the essential requirements of Article 3.1(a) (b) 3.2 of Directive 2014/53/EU. The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives.

CE

Emen_li
Lab manager
Date: 2021/1/16

BlueAsia of Technology Services(Shenzhen) Co.,Ltd
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Email: marketing@cblueasia.com
www.cblueasia.com

Figure 15. CE certificate of RF-BM-2652P2(I)

6 Revision History

Date	Version No.	Description
2020.07.09	V1.0	The initial version is released.
2022.07.11	V1.1	Add the antenna part. Add the certificates.

Note:

1. The document will be optimized and updated from time to time. Before using this document, please make sure it is the latest version.
2. To obtain the latest document, please download it from the official website: www.rfstariot.com and www.szrfstar.com.

7 Contact Us

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