

# Rabbit-S User Guide

**Project:Rabbit/Bluetooth 5 BLE module**

**Module name:Rabbit-S**

**Designed:Suzhou Pairlink Network Technology Ltd.**

Version	Note	Date
V1.0	Create	2021/06/30
V2.0	Modify Confidential Information	2021/09/01

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## 1.Main Application Domain

- 1: MCU data pass-through.
- 2: Bluetooth Printer / Scanner / Digital price tag etc.
- 3: Remote control / Keyboard and Mouse / Toys / Smart phone self timer etc.
- 4: Industrial remote control / Industrial telemetry / Industrial data collection.
- 5: Smart home / Intelligent lighting / Intelligent access control system.

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## 2. Electrical Specifications

### 2.1. Absolute Ratings

Parameter	Specification		Unit
	Min.	Max.	
Power Supply(V)	-0.3V	+3.6V	Burn the module permanently if it exceeds +3.6V
Storage temperature(°C)	-55	+125	
Working temperature (°C)	-40	+85	
ESD HBM	-3.5KV	+3.5KV	Human Body Model
ESD CDM	-500V	+500V	Charged Device Model

### 2.2. Recommended Operating Conditions

Parameter	Specification			Note
	Min.	Typical	Max.	
Power Supply(V)	1.8	3.3	3.6	
Communication level(V)		3.3		Can't communicate with 5V TTL level directly
Working temperature(°C)	-40	20	+85	Industry Standard
Consume	TX Current (mA)		10.2	TX Power=+4dBm
			12.7	TX Power=+8dBm
	RX Current (mA)		6.8	VBAT=3V3,1Mbps
	Sleep Current (uA)		3.8	Deep-sleep ,Supports GPIO wake-up and timer wake-up
TX Power(dBm)			+8	
Receive Sensitivity(dBm)			-97	1Mbps

## Digital I/O Characteristic

Characteristics	Condition	Symbol	Specification			Unit
			Min.	Typical	Max.	
Input Low Voltage	VBAT=3V3	VIL	-	0	0.9	V
Input High Voltage		VIH	2.0	3.3	3.6	V
Output Low Voltage		VOL	0	-	0.33	V
Output High Voltage		VOH	2.97	-	3.3	V

## 2.3.Physical Parameters

Parameter	Performance	Note
Communication Distance	50M	Data Transfer (BLE) Environment: Sunny and open Airspeed: 1Mbps
Crystal	40MHz	Industry Standard
Protocol	BLE 5	Supported data rates: 1Mbps,2Mbps
Package	Patch	Refer to section 3.3
IC	RTL8762CMF	Packaging:QFN-40
Core	ARM Cortex-M4	
RAM	160KByte	
Flash	4Mbits	Embedded SOC memory
Dimensions	17.8mm*12.0mm*1.9mm	L*W*H
RF Interface	PCB Antenna	

## 3. Hardware Design and PCB layout

### 3.1. Pin assignment and Pin description

Rabbit-S Pin definition can refer to Figure 1.

**Table 1: Module Pin Description**

<i>Pin Number</i>	<i>Pin Name</i>	<i>I/O</i>	<i>Alternate Function Description</i>
10	VBAT	P	Power Supply(DC1.8V~3.6V).
1,2,16,22,25	GND	P	Connect to Ground.
11	RESET	DI	Reset signal (active high).
13	LOG_OUT	DIO	Log_out,not intended for customer use.
18	P3_1	DIO	GPIO/UART_RX
19	P3_0	DIO	GPIO/UART_TX
23	32K_XI	A	
24	32K_XO	A	
3	P0_4	DIO	
4	P0_2	DIO	
5	P0_1	DIO	
6	P4_0	DIO	INPUT/OUTPUT with selectable pull up/down resistor.
7	P4_1	DIO	General purpose I/O port bit or alternate function nodes. Contain state retention mechanism during power down.
8	P4_2	DIO	
9	P4_3	DIO	
12	P5_0	DIO	
14	P1_0	DIO	
15	P1_1	DIO	
17	P2_3	DIO/AIN	GPIO/ADCIN3
20	P2_4	DIO/AIN	GPIO/ADCIN4
21	P2_5	DIO/AIN	GPIO/ADCIN5

Note: GPIO has integrated pull-up and pull-down resistors.

Support GPIO super multiplexing function, WAKE\_UP / UART / SPI / IIC / PWM / and other functions can be arbitrarily configured on GPIO.

For more GPIO function configuration questions, contact to Pairlink.

As shown in the following table: GPIO Pin detailed Information.

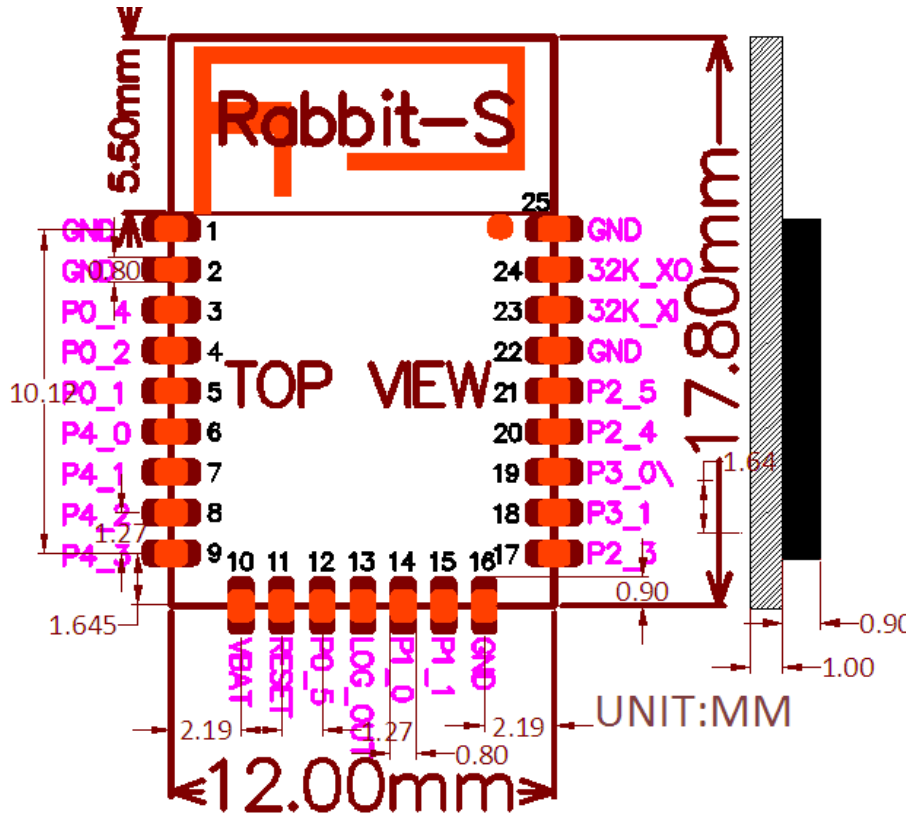
Rabbit-B Rabbit-C Rabbit-S	GPIO Index	ADC	Hardware Default Pull setting(100K) Reset state	Rom Code Setting	Pull resistor	Bootcode Default	Wakeup Function	Drv ier current
P0_0	GPIO_0		Pull Down	Pull Down	10K/100K		Yes	8mA
P0_1	GPIO_1		Pull Down	Pull Down	10K/100K		Yes	8mA
P0_2	GPIO_2		Pull Down	Pull Down	10K/100K		Yes	8mA
P0_3	GPIO_3		Pull Up	Output High	10K/100K	LOG_UART_TX	Yes	8mA
P0_4	GPIO_4		Pull Down	Pull Down	10K/100K		Yes	8mA
P0_5	GPIO_5		Pull Down	Pull Down	10K/100K		Yes	8mA
P0_6	GPIO_6		Pull Down	Pull Down	10K/100K		Yes	8mA
P1_0	GPIO_8		Pull Up	Pull Up	10K/100K	SWDIO	Yes	8mA
P1_1	GPIO_9		Pull Up	Pull Up	10K/100K	SWDCLK	Yes	8mA
P5_0	GPIO_25		Pull Down	Pull Down	5K/50K		Yes	8mA
32k_XI	GPIO_26		Pull Down	Pull Down	10K/100K		Yes	8mA
32k_XO	GPIO_27		Pull Down	Output Low	10K/100K		Yes	8mA
P2_2	GPIO_18	ADC/LPC(channel 2) Differetial1+	Pull Down	Pull Down	5K/50K		Yes	8mA
P2_3	GPIO_19	ADC/LPC(channel 3) Differetial1-	Pull Down	Pull Down	5K/50K		Yes	8mA
P2_4	GPIO_20	ADC/LPC(channel 4) Differetial2+	Pull Down	Pull Down	5K/50K		Yes	8mA
P2_5	GPIO_21	ADC/LPC(channel 5) Differetial2-	Pull Down	Pull Down	5K/50K		Yes	8mA
P2_6	GPIO_22	ADC(channel 6) Differetial3+	Pull Down	Pull Down	5K/50K		Yes	8mA
P2_7	GPIO_23	ADC(channel 7) Differetial3-	Pull Down	Pull Down	5K/50K		Yes	8mA
P3_0	GPIO_24		Pull Up	Pull Up	10K/100K	UART_TX	Yes	8mA
P3_1	GPIO_25		Pull Up	Pull Up	10K/100K	UART_RX	Yes	8mA
P3_2	GPIO_26		Pull Down	Pull Down	10K/100K		Yes	8mA
P3_3	GPIO_27		Pull Down	Pull Down	10K/100K		Yes	8mA
P4_0	GPIO_28		Pull Down	Pull Down	10K/100K		Yes	8mA
P4_1	GPIO_29		Pull Down	Pull Down	10K/100K		Yes	8mA
P4_2	GPIO_30		Pull Down	Pull Down	10K/100K		Yes	8mA
P4_3	GPIO_31		Pull Up	Pull Up	10K/100K		Yes	8mA

### 3.2.Appearance and Dimensions

Figure 1 shows the size of the module. The components and prominent structure are not allowed put in this size range(17.8mm\*12.0mm\*1.9mm).

The following land pattern size is recommended for user board design. However, user can modify it according PCB soldering conditions. Sufficient examination is necessary if use the modified land pattern.

Figure 1: Mechanical Information

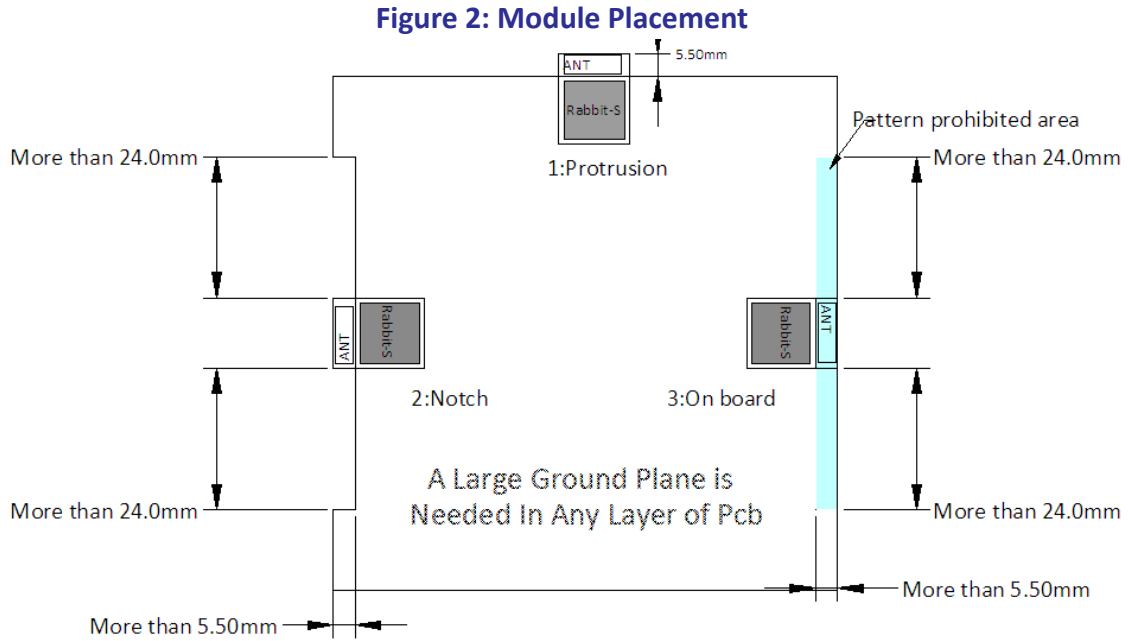




### 3.3.Module Layout Guideline

The layout on user PCB should be designed according to the following guideline.

When the module is placed on the PCB, it must be ensured that the RF antenna area (2 times the width of the module) is hollow or suspended, and there must be no traces, vias or copper.



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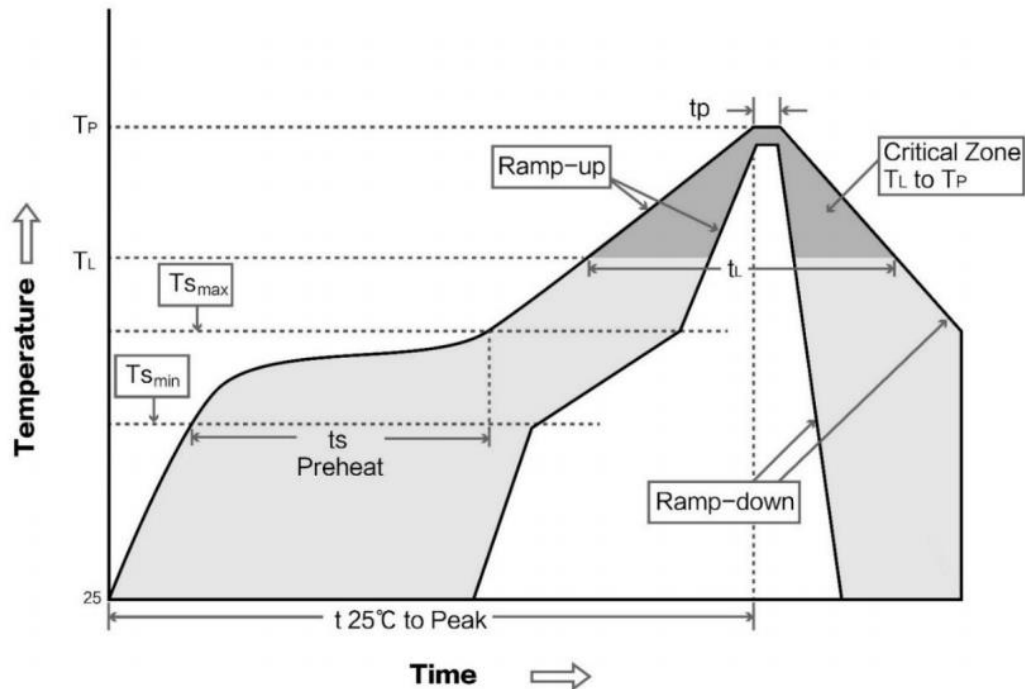
## 4. Welding Declaration

The Rabbit-S module only supports one reflow soldering. Our company is not responsible for the module failure caused by multiple reflow soldering.

**Figure 3: Reflow Soldering Temperature**

Profile Feature	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Sn63/Pb37	Sn96.5/Ag3/Cu0.5
Preheat Temperature min ( $T_{smin}$ )	100°C	150°C
Preheat temperature max ( $T_{smax}$ )	150°C	200°C
Preheat Time ( $T_{smin}$ to $T_{smax}$ )( $t_s$ )	60-120 sec	60-120 sec
Average ramp-up rate ( $T_{smax}$ to $T_p$ )	3°C/second max	3°C/second max
Liquidous Temperature ( $T_L$ )	183°C	217°C
Time ( $t_L$ ) Maintained Above ( $T_L$ )	60-90 sec	30-90 sec
Peak temperature ( $T_p$ )	220-235°C	230-250°C
Average ramp-down rate ( $T_p$ to $T_{smax}$ )	6°C/second max	6°C/second max
Time 25°C to peak temperature	6 minutes max	8 minutes max

**Figure 4: Reflow Soldering Curve**



## 5. Federal Communications Commission (FCC) Interference Statement

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 generate, 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 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.

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

**RF exposure warning**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

This product may not be collocated or operated in conjunction with any other antenna or transmitter.

**Industry Canada (IC)**

CAN ICES-003 (B)/NMB-003(B)

This device complies with Industry Canada's licence-exempt RSSs. 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.

Cet appareil est conforme à la norme RSS d'Industrie Canada. Son fonctionnement est sujet aux deux conditions suivantes:

- (1) le dispositif ne doit pas produire de brouillage préjudiciable, et
- (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

**IMPORTANT NOTE:**

Radiation Exposure Statement:

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Déclaration d'exposition aux radiations:

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20cm de distance entre la source de rayonnement et votre corps.

#### **OEM Integration Instructions:**

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

The module can be used to installation in other host. The transmitter module may not be co-located with any other transmit or antenna. The module shall be only used with the integral antenna(s) that has been originally tested and certified with this module. As long as 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 requirement with this module installed (for example, digital device emission, PC peripheral requirements, etc.). OEM integrator is responsible for ensuring the end-user has no manual instruction to remove or install module.

#### **IMPORTANT NOTE:**

In the event that these conditions cannot be met (for example certain laptop configuration 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 and circumstance, the OEM integrator will be responsible for re-evaluating. The end product (including the transmitter) and obtaining a separate FCC authorization. The final end product must be labeled in a visible area with the following: **“Contains Transmitter Module FCC ID: 2AQV6RABBIT-S”**.

Antenna Specification:

Antenna Type	Manufacturer	Frequency Range (MHz)	Maximum Peak Antenna Gain(dBi)
PCB Antenna	N/A	2402 - 2480	-0.41

**IMPORTANT NOTE:**

This Module (IC: 24210-RABBITS, PMN: Rabbit Bluetooth 5 BLE module) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Ce Module sans fil (IC: 24210-RABBITS, PMN: Rabbit Bluetooth 5 BLE module) a été approuvé par industrie Canada pour fonctionner avec les types d'antennes énumérés ci-dessous avec le gain maximal autorisé indiqué. Les types d'antenne non inclus dans cette liste, ayant un gain supérieur au gain maximum indiqué pour ce type, sont strictement interdits pour l'utilisation avec ce dispositif.

The Host Marketing Name (HMN) must be displayed (according to e-labelling requirements) or indicated at any location on the exterior of the host product or product packaging or product literature, which shall be available with the host product or online.

Le nom de commercialisation de l'hôte (HMN) doit être affiché (conformément aux exigences d'étiquetage électronique) ou indiqué à tout endroit à l'extérieur du produit hôte ou de l'emballage du produit ou de la documentation de produit, qui doit être disponible avec le produit hôte ou en ligne.

The host product shall be properly labelled to identify the modules within the host product. The Innovation, Science and Economic Development Canada certification label of a module shall be clearly visible at all times when installed in the host product; otherwise, the host product must be labelled to display the Innovation, Science and Economic Development Canada certification number for the module, preceded by the word "Contains" or similar wording expressing the same meaning, as follows: Contains IC: 24210-RABBITS. Le produit hôte doit être correctement étiqueté pour identifier les modules du produit hôte. Le label de certification Innovation, Science et développement économique Canada

d'un module doit être clairement visible à tout moment lorsqu'il est installé dans le produit hôte; Dans le cas contraire, le produit hôte doit porter le numéro de certification Innovation, Science et développement économique Canada pour le module, précédé du mot "contient" ou d'une formulation similaire exprimant la même signification, Contient IC: 24210-RABBITS.

Antenna Specification:

Antenna Type	Manufacturer	Frequency Range (MHz)	Maximum Peak Antenna Gain(dBi)
PCB Antenna	N/A	2402 - 2480	-0.41