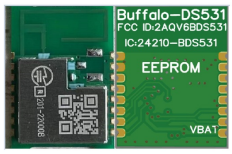

Suzhou Pairlink Network Technology Buffalo-DS531 Bluetooth 5.1 BLE Module User Guide

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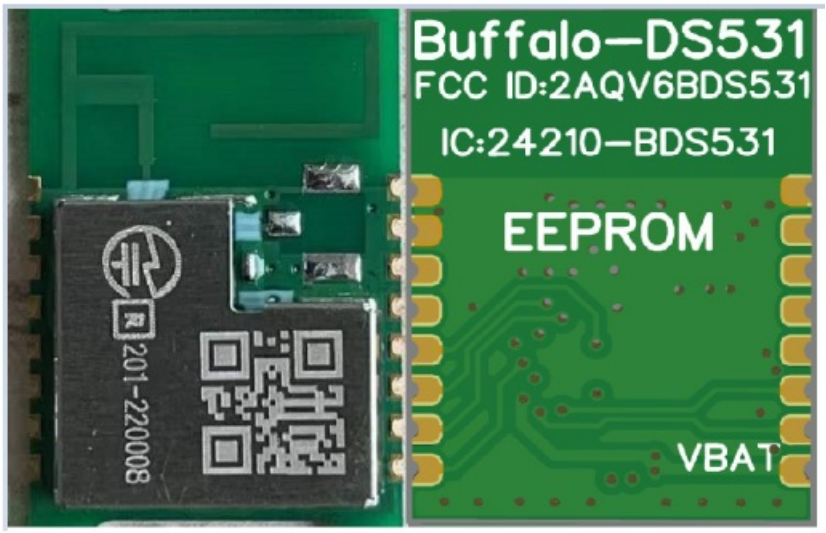


Electrical Specifications

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(℃)	-40	+125	
Working temperature(℃)	-40	+85	
ESD HBM	-4KV	+4KV	Human Body Model
ESD CDM	-500V	+500V	Charged-Device Model

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(℃)		-40	20	+85	Industry Standard
	TX Current (mA)			3.5	TX Power=+2.5dBm
Consume	RX Current (mA)			2.2	1Mbps
	Sleep Current (uA)		2		Software off period
TX Power(dBm)		-19.5		+2.5	
Receive Sensitivity(dBm)				-94	1Mbps

Physical Parameters

Parameter	***Performance***		***Note***
Distance	Buffalo-DS531-B	30m	Data Transfer (BLE) Environment: Sunny and open Airs peed: 1Mbps Buffalo-DS531-B with PCB antenna
Crystal	32MHz		Industry Standard
Protocol	Bluetooth 5.1		Supported data rates: 1 Mbps
Package	Patch		Refer to section 4.3
IC	DA14531-00000FX2		Package FCGQFN24
Core	ARM Cortex-M0		
OTP	32KB		One-Time-Programmable
RAM	48KB		
ROM	144KB		
EEPROM	Buffalo-DS531-B:2Kbit		Type:P24C02A
Dimensions(mm)	16.3*12.0*2.4		L*W*H
Antenna Type	Buffalo-DS531-B		On-board PCB antenna
Antenna Gain	+0dbi		On-board PCB antenna

Peripheral Interface

- 2 x UARTs (one with flow control)
- 1 x SPI interface with master configurable
- 1 x I2Cs interface
- 12 x GPIOs
- 4 x 10-bit ADC input
- 8 x PWMs interface
- 2 x general-purpose timer

Hardware Design and PCB layout

Pin assignment and Pin description: Buffalo DS 531 B Pin definition can refer to Figure 1

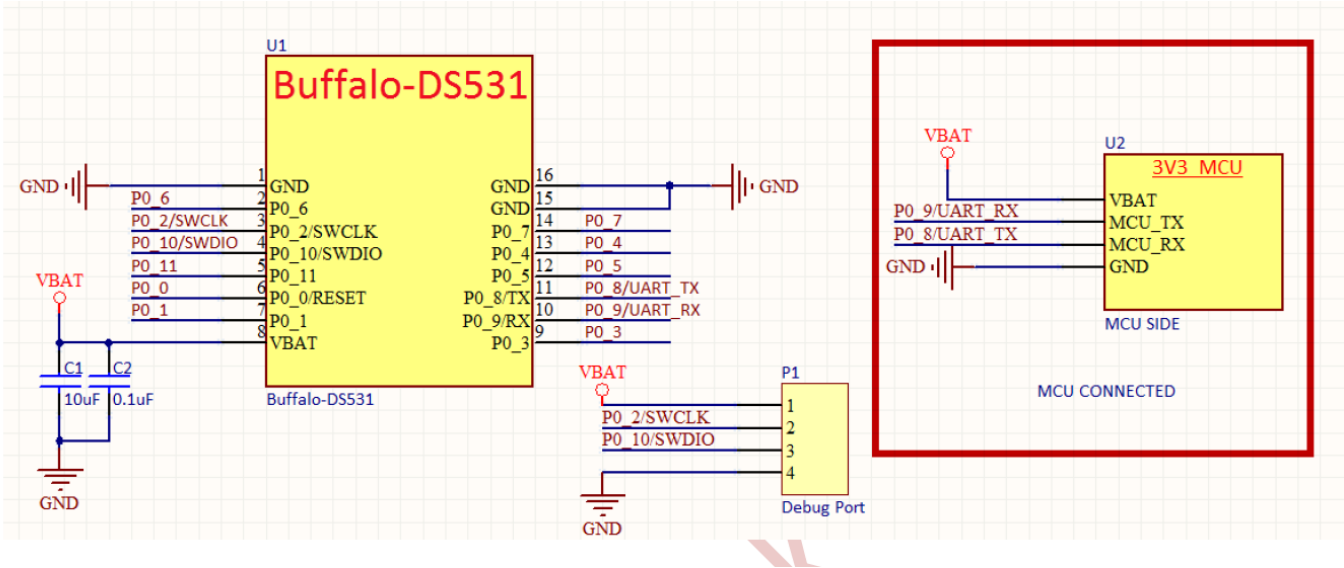
Table 1: Module Pin Description

Pin Number	*Pin Name*	*I/O*	*RESET STATE*	*Alternate Function Description*
8	VBAT	P		Power Supply
1,15,16	GND	P		Connect to Ground
	P0_0	DIO	I-PD	GPIO:P0_0
6 Reset		DI	I-PD	Reset signal (active high).
P0_6		DIO		
2	ADC2	AI	I-PD	
P0_2		DIO		
3 SWCLK		DIO	I-PD	
	ADC1	AI		

INPUT/OUTPUT with selectable pulls up/down resistor. General purpose I/O port bit or alternate function nodes. Contain state retention mechanism during power down.

Reference Design
The latest schematic and design examples, bill of material, and layout file are available from the original developer Contact us for details.

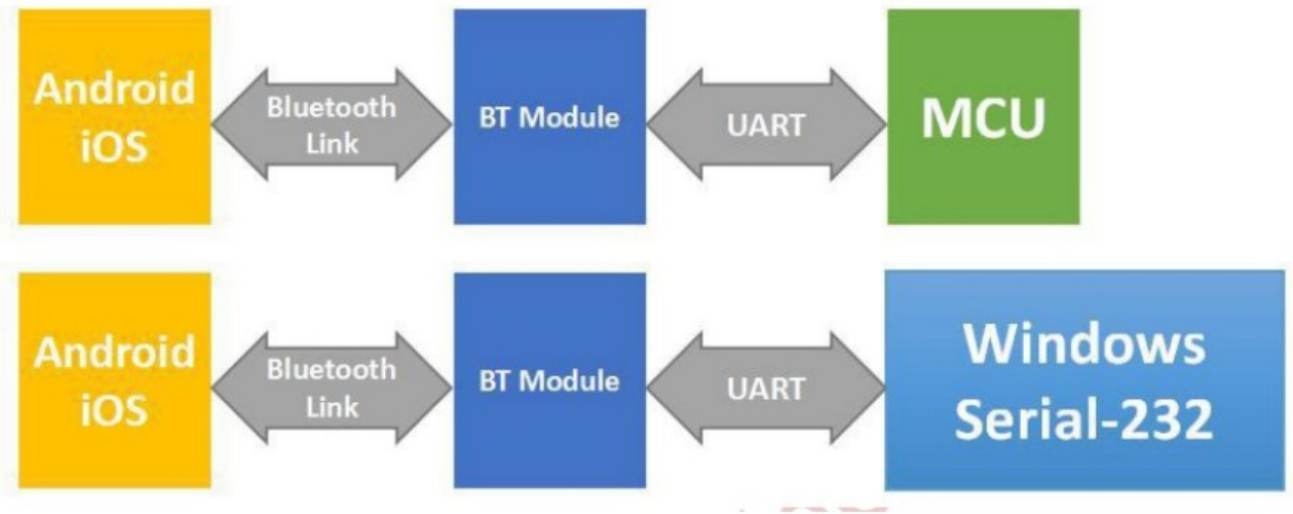
Figure 1: Module Reference Design



Circuit Description

1. VBAT supply voltage value is 1.80V 3.60V.
2. PIN10 (P0_9 / UART_RX), and PIN11(P0.8 / UART_TX) are configured as the module's UART interface by default.
3. PIN 6 (0 /RESET) multiple xing module RESET, the software can be configured as RESET function, int ernal pull down by default. If need to configure the RESET function must consult the Pair link for recommendations.

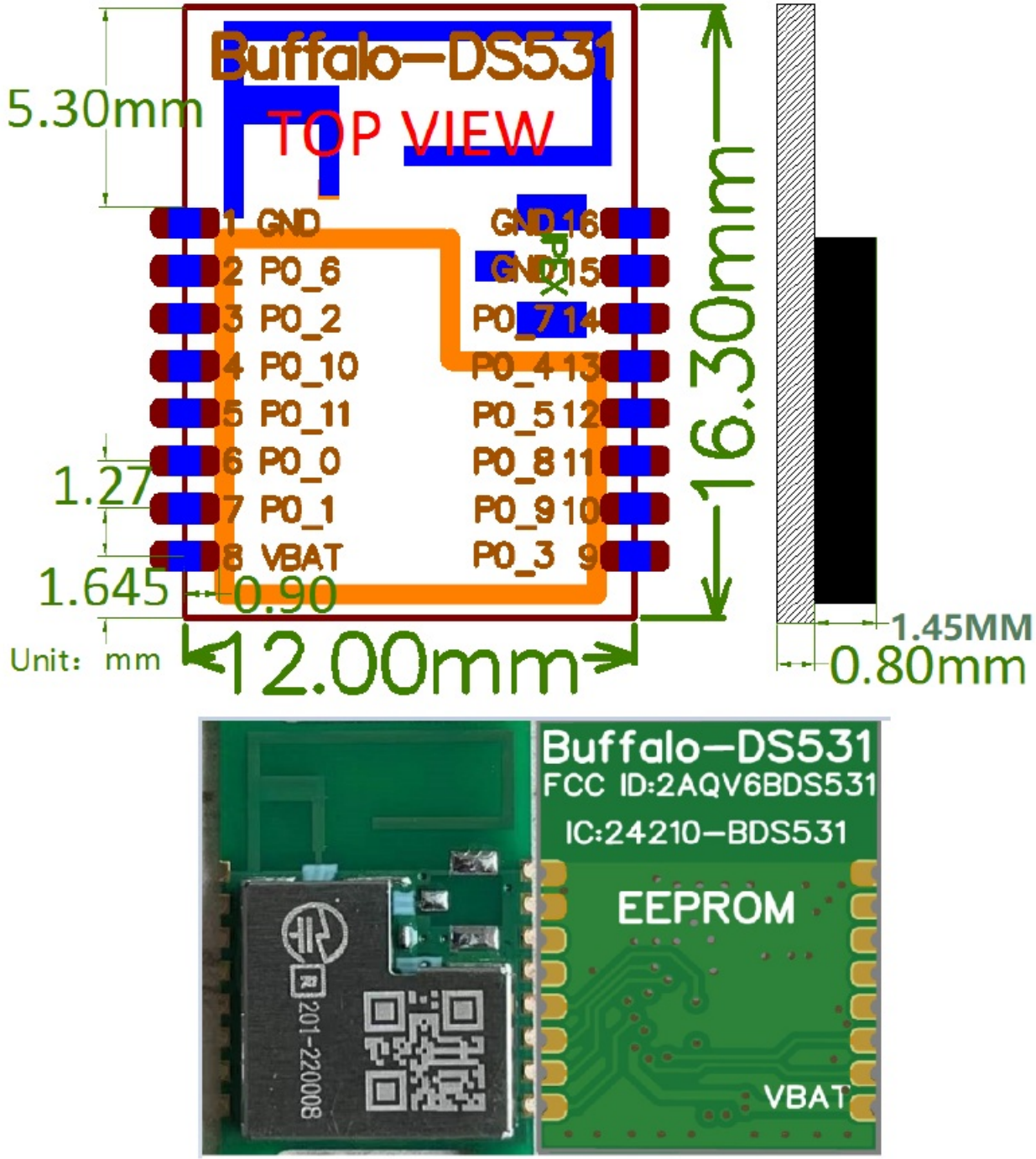
4. The Buffalo DS531 B is TTL level, and the UART port can communicate directly with the 3.3V MCU.
5. Support GPIO super multiplexing function, WAKE_ UP / UART / SPI / IIC / PWM /, and other functions can be arbitrarily configured on GPIO.
6. Reserve P1 burning interface if the PCB board has enough space.
7. The application diagram is shown below.



Appearance and Dimensions

Figure 2 shows the size of the module. The components and prominent structure are not allowed put in this size range(16.3mm*12.0mm*2.4mm). The following land pattern size is recommended for user board design. However, the user can modify it according PC B soldering conditions. Sufficient examination is necessary if using the modified land pattern.

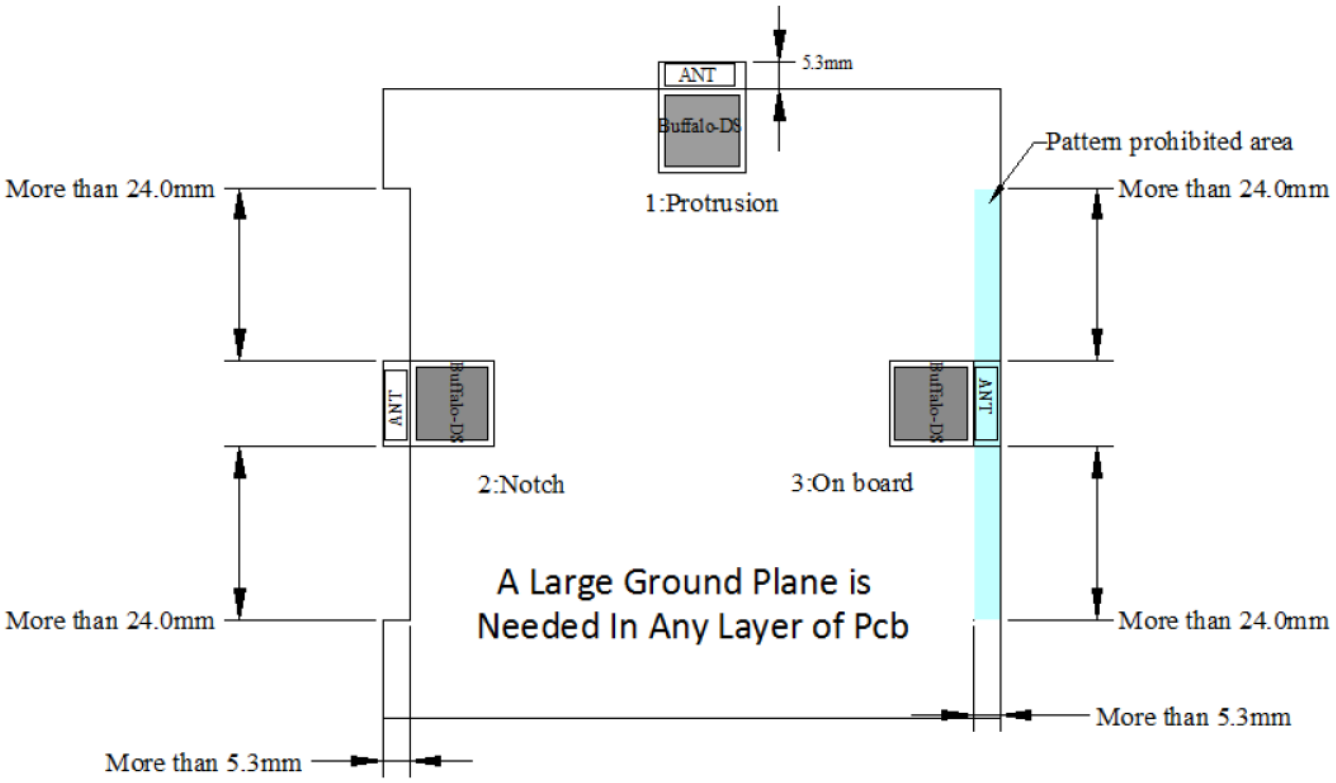
Figure 2: Mechanical Information



Module Layout Guideline

The layout on the 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.

Figure 3: Module Placement



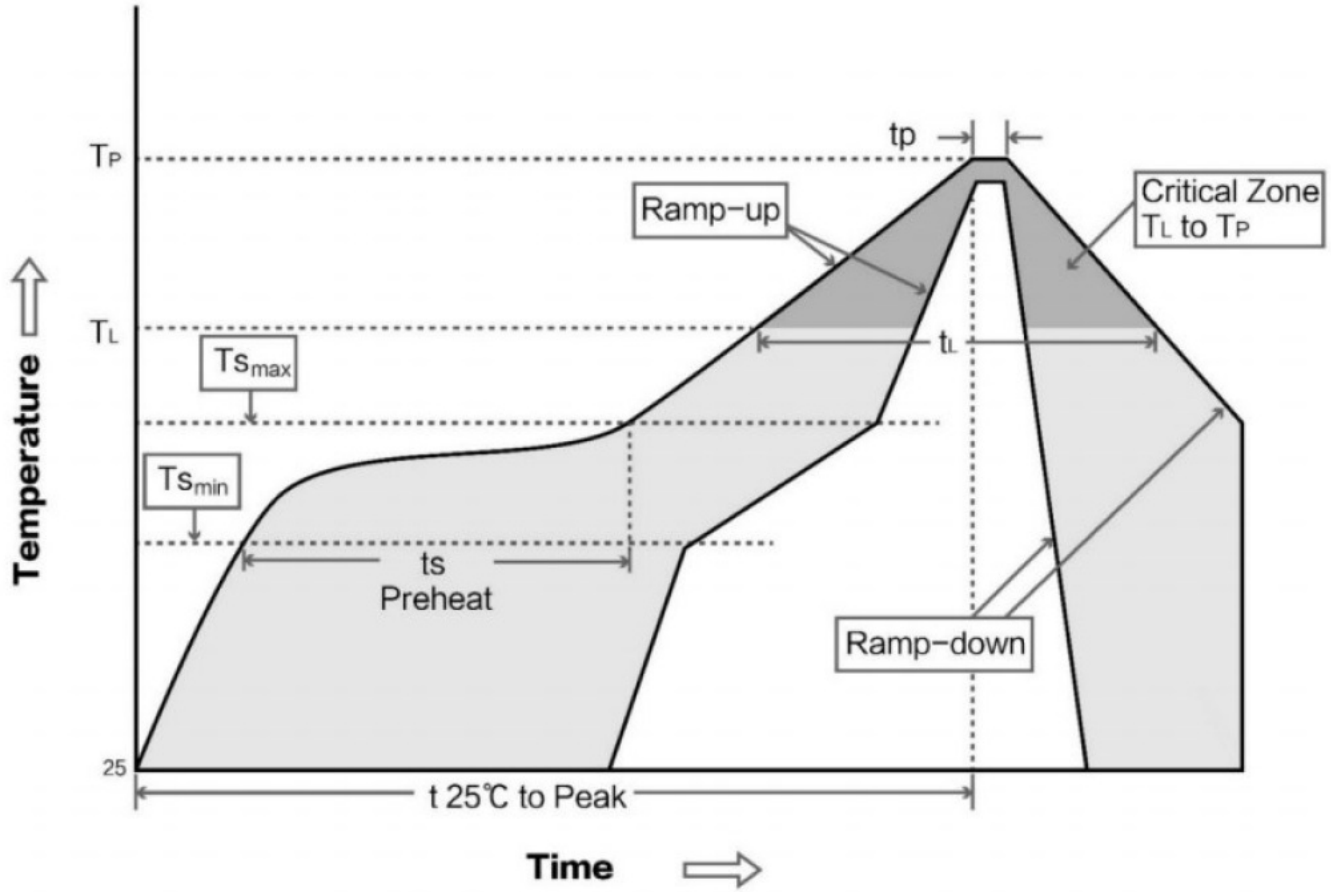
Welding Declaration

The Buffalo-DS531-B module only supports one reflow soldering. Our company is not responsible for the module failure caused by multiple reflow soldering.

Figure 4:Reflow Soldering Temperature

Profile Feature	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Sn63/Pb37	Sn96.5/Ag3/Cu0.5
Preheat Temperature min （Tsmin）	100℃	150℃
Preheat temperature max (Tsmax)	150℃	200℃
Preheat Time (Tsmin to Tsmax)(ts)	60-120 sec	60-120 sec
Average ramp-up rate(Tsmax to Tp)	3℃/second max	3℃/second max
Liquidous Temperature (TL)	183℃	217℃
Time（tL）Maintained Above（TL）	60-90 sec	30-90 sec
Peak temperature（Tp）	220-235℃	230-250℃
Aveage ramp-down rate（Tp to Tsmax）	6℃/second max	6℃/second max
Time 25℃ to peak temperature	6 minutes max	8 minutes max

Figure 5 Reflow Soldering Curve



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 Part15 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 of the following measures:

- Reorient or relocate the receiving
- Increase the separation between the equipment and
- Connect the equipment into an outlet on a circuit different from that to which the receiver is
- Consult the dealer or an experienced radio/TV technician for 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.

The module is limited to OEM installation only This product is mounted inside of the end product only by professional installers OEM. They use this module with changing the power and control signal setting by software

of end product within the scope of this application. End-user cannot change this setting. The OEM integrator has to be aware no to provide information to the end-user regarding how to install or remove this RF module in the user manual of the end product with integrates this module. The end-user manual shall include all required regulatory information/warning as shown in this manual. That separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations.

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 This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be collocated or oper ating in conjunction with any other antenna or transmitter.

Industry Canada

(IC) CAN ICES 3 (B)/NMB 3(B)
This device complies with Industry Canada's license-exempt RSS. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and this device must accept any interference received, including interference that may cause undesired operation.

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 a minimum distance of 20cm between the radiator and your body.

OEM Integration Instructions
This device is intended only for OEM integrators under the fol lowing conditions The module can be used to install in another host, and the transmitter module may not be co-located with any other transmitter 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 transmitter tests 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.)

IMPORTANT NOTE

In the event that these conditions cannot be met (for example certain laptop configuration or c o 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 this 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: 2AQV6BDS531

Antenna Specification

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

IMPORTANT NOTE

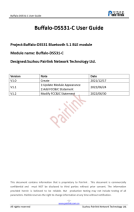
This Wireless Module IC: 24210 BDS531) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device. The Host Marketing Name (HMN) must be displayed (according to e-labeling 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. The host product shall be properly labeled 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 labeled 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: 2421 0 BDS531

Antenna Specification

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

Documents / Resources

	Suzhou Pairlink Network Technology Buffalo-DS531 Bluetooth 5.1 BLE Module [pdf] User Guide BDS531, 2AQV6BDS531, Buffalo-DS531 Bluetooth 5.1 BLE Module, Buffalo-DS531, Bluetooth 5.1 BLE Module
	Suzhou Pairlink Network Technology Buffalo-DS531 Bluetooth 5.1 BLE Module [pdf] User Guide BDS531, 2AQV6BDS531, Buffalo-DS531 Bluetooth 5.1 BLE Module, Buffalo-DS531, Bluetooth 5.1 BLE Module

References

- pairlink.com.cn
- pairlink.com.cn/