Lierda L-BTOWB99 module Hardware design manual

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Document revision history

Document version	Change date	Revised	auditor	Change the content
Rev1.0	24-12-28	ZXY	YB	The initial version

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Suitable for module selection

number	Module model	Support frequency band	size(mm)	Module profile
1	L-BTOWB99	2.4 GHz ISM Band	17.4×23.2×2mm	

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1 Foreword

The L-BTOWB99 Bluetooth module is a high-performance IOT Bluetooth transceiver developed based on the nRF52840 chip platform. The module is a stamp package with an onboard IPEX connector design. The product also has the characteristics of low power consumption, small volume, rich resources, and strong anti-interference ability

Figure 1.1 Product appearance diagram

2 Product review

2.1 Key features

Table 2-1 Key features

parameter	explain
Wireless standards	BLE 5.4
Frequency band	2400~2483.5MHZ(2.4GHz ISM Band)
antenna	On-board IPEX connector
Size	17.4×23.2×2mm
operating voltage	1.7V~5.5V
Emission current	4.8mA@0dBm，1M,Typ
Receive current	4.6mA@1M,Typ
Sleep current	0.4uA，Typ
Emission power	-20~+8dBm
Operating temperature	-40 ~＋85℃
Storage temperature	-40 ~ +125℃
Communication interface	UART

2.2 Application scenarios

- 2.4GHz low-power Bluetooth system;
- PC, tablet, mobile phone, handheld machine and other low-power peripheral devices (HID, remote control, etc.);
- Consumer electronics, such as sports and health care;
- Intelligent instrument, data acquisition and other wireless sensor network;
- Photovoltaic, charging pile, industrial instruments and other industries;
- Smart home, LAN, interactive devices, and beacon lights.

2.3 Hardware block diagram

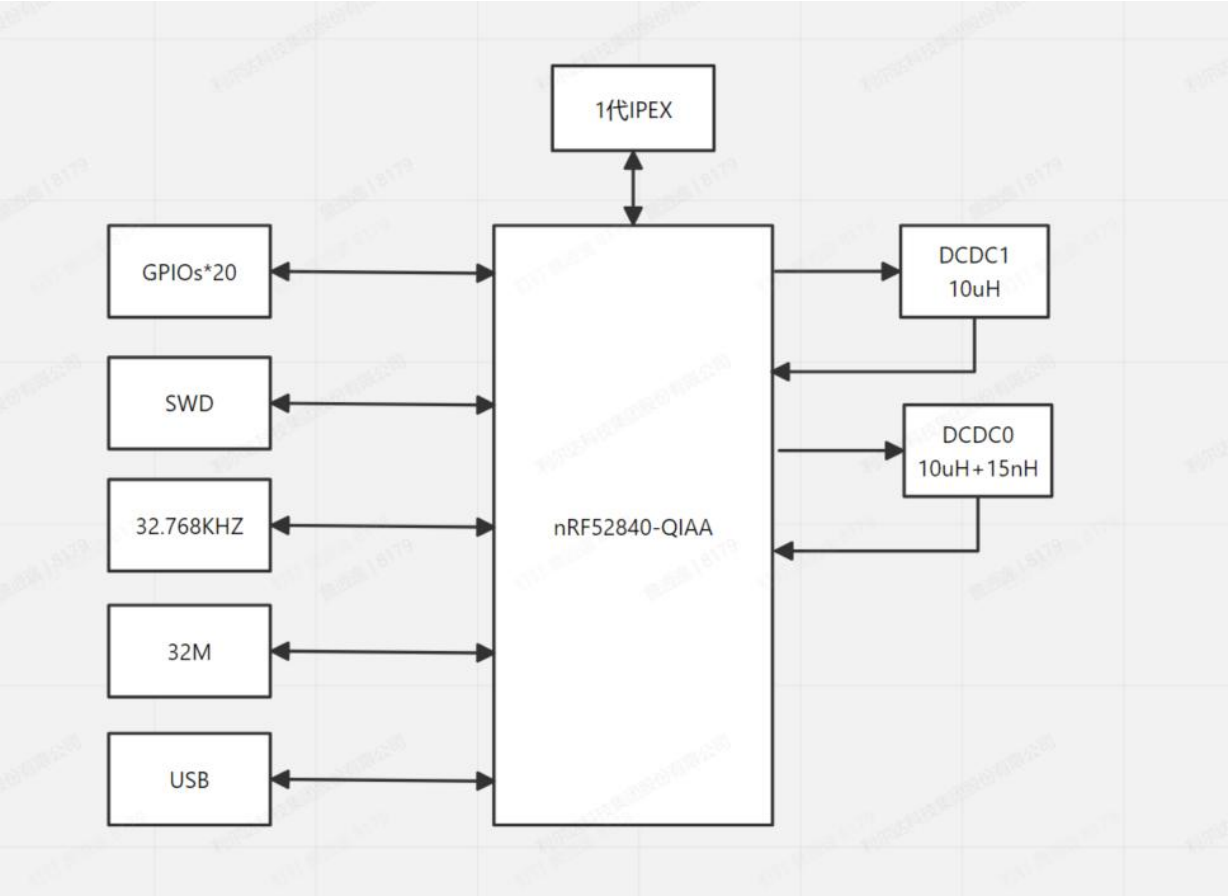

Figure 2.1, functional block diagram

2.4 pin definition

For a better understanding of the application, the following table is the type definition of I / O parameters.

Table 2-2 Description of the type definitions of the I / O parameters

I/O parameter type	characterization
IO	General Purpose Input/Output
DI	digital input
DO	numeric output
P	Power pin
G	GND
RFI/O	RF Input/Output

Table 2-2 pin definition

number	pin definition	I/O parameter type	characterization	remarks
1	GND	G	GND	
2	P1.13	IO	General Purpose Input/Output	
3	P1.15	IO	General Purpose Input/Output	
4	P0.02	IO	General Purpose Input/Output	
5	P0.29	IO	General Purpose Input/Output	
6	P0.31	IO	General Purpose Input/Output	
7	P0.26	IO	General Purpose Input/Output	
8	P0.04	IO	General Purpose Input/Output	
9	P0.06	IO	General Purpose Input/Output	
10	P0.08	IO	General Purpose Input/Output	
11	P1.09	IO	General Purpose Input/Output	
12	P0.12	IO	General Purpose Input/Output	
13	GND	G	GND	
14	VDD	P	Power Supply Voltage	Normal voltage (3.3V) power supply power supply
15	VDDH	P	Power Supply Voltage	High voltage (5V) power supply
16	D-	IO	USB	The USB function is not supported by default
17	D+	IO	USB	
18	P0.13	IO	General Purpose Input/Output	
19	P0.15	IO	General Purpose Input/Output	
20	P0.18	IO	General Purpose Input/Output	
21	P0.20	IO	General Purpose Input/Output	
22	P0.22	IO	General Purpose Input/Output	
23	P0.24	IO	General Purpose Input/Output	
24	P1.00	IO	General Purpose Input/Output	

25	SWDIO	IO	DEBUG	
26	SWCLK	IO	DEBUG	
27	P0.09	IO	General Purpose Input/Output	
28	P0.10	IO	General Purpose Input/Output	

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3 Performance characteristics

3.1 Power design

number	pin definition	I/O parameter type	characterization	remarks
14	VDD	P	Power Supply Voltage	Normal voltage (3.3V) power supply power supply
15	VDDH	P	Power Supply Voltage	High voltage (5V) power supply

The WB 99 external input power supply provides two mode inputs: normal voltage (3.3V) and high voltage (5V).3.3V power supply interface, connecting VDD with VDDH.5V power supply, only VDDH.

The WB 99 module supports normal voltage (3.3V) input by default, and does not support high voltage (5V) input and USB function. Please confirm the specific configuration required with the business personnel before placing an order.

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4 Radio frequency characteristics

4.1 BLE

Table 5-2 module BLE RF performance

Main parameters	Performance
Bluetooth standard	BLE 5.4
frequency range	2402MHz ~ 2480MHz
Work channel	LE：Ch0 ~ Ch39
modulation mode	GFSK
RF emission power	0dBm, typical
Gain control step	4dB, typical
The RF power control range	-20 ~ +8 dBm
receiving sensitivity@ PER=30.8%, LE(1Mbps)	-95dBm，typical
Maximum receiving signal @ PER=30.8%, LE(1Mbps)	0dBm
receiving sensitivity@ PER=30.8%, LE(2Mbps)	-92dBm，typical
Maximum receiving signal @ PER=30.8%, LE(2Mbps)	0dBm

remark

The test module is powered by 3.3V and tested in 25℃ environment.

5 Electrical performance and reliability

5.1 Absolute maximum ratings

Maximum ratings are the extreme limits to which the chip can be exposed for a limited amount of time without permanently damaging it.

Table 6 1 Maximum rating of pin voltage

Main parameters	describe	Min	Max	Unit
VDD	Power Supply	-0.3	3.9	V
VDDH	Power Supply	-0.3	5.8	V
T_S	Storage temperature	-40	+125	℃
Radio	RF input power	-	10	dBm
MSL	Moisture Sensitivity Level	MSL3		

5.2 Recommended condition rating parameters

The operating conditions are the physical parameters in which the chip can run inside it.

Table 6 1 Recommended condition rating parameters

Main parameters	describe	Min	Typ	Max	Unit
VDD	1.7	3.3	3.6	V	Normal voltage power supply voltage(1)
VDDH	2.5	3.7	5.5	V	High voltage power supply voltage(1)
I	100	-	-	mA	Supply current of the external power supply(2)
T_A	-40	+25	+85	℃	Normal working environment(3)

remark

(1) When the module operates in this voltage range, the relevant performance of the

module meets the requirements of IEEE 802.11 standard.

(2) The flow capacity of the power supply is required to be above 500 mA, otherwise individual parameters, such as transmitting power, EVM rate, may exceed the IEEE 802.11 standard range.

(3) When the module operates in this temperature range, the relevant performance of the module meets the requirements of IEEE 802.11 standard.

(4) WB 99 module default is atmospheric 3.3V input test module.

5.3 Consumption

Table 6-2 Module power consumption data

Main parameters	current	Remake
Emission current @0dBm，1M	4.8mA	
Receive current@1M	4.6mA	
Sleep current	0.4uA	

5.4 electrostatic protection

In the mode application of the module, due to the static electricity generated by the human body and the charged friction between the microelectronics, the discharge through various ways may cause certain damage to the module. Therefore, more attention should be paid to the ESD protection. ESD protection measures should be taken in research and development, production assembly and testing, especially in product design. For example, anti-static protection should be added at the interface of circuit design and the points vulnerable to damage or influence by electrostatic discharge; test equipment should be well grounded; antistatic gloves should be worn in production.

表 6-5 引脚静电防护等级

Test port type	Contact discharge	unit	testing standard
Power pin	±4	KV	IEC61000-4-2
RF pin	±2	KV	

6 operation instruction

6.1 Steel mesh opening design

In principle, the thickness selection of the steel network on the bottom plate is selected according to the comprehensive consideration of the packaging type of the devices in the plate, and the following requirements should be focused on:

The module pad position can be locally thickened to 0.15~0.20mm to avoid air welding;

6.2 Reflux welding operation instruction

Note: This operation instruction is only suitable for lead-free operations and is for reference only.

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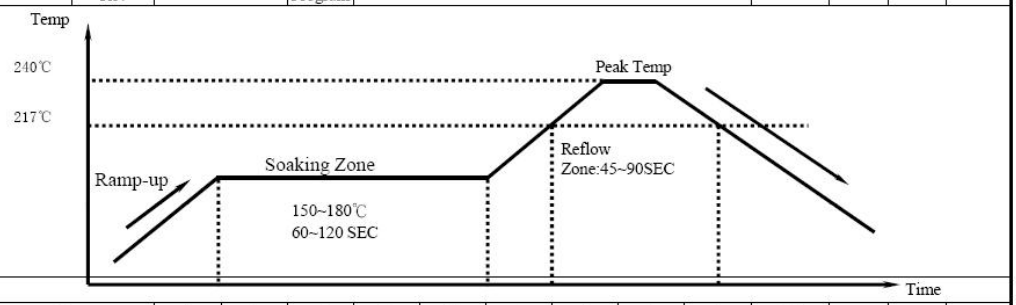
物联网接入式解决方案领导者	Standard Operation Procedure (SOP)													作成	作成日
生产工段 Station	SMT				工序名 Station	回流焊									
文件编号 Doc No.	MSOP-FL-RX1060N-G01	版本 Rev	A0		程序名 Program	003-RR-T-S606-S3									

作业项目

曲线图



温区参数

Zone	1	2	3	4	5	6	7	8	9	10
Top	150	150	180	180	180	195	210	240	250	240
Bottom	150	150	180	180	180	195	210	240	250	240
Conveyor speed	900	mm/min								

曲线参

	峰值温度	浸温	熔锡温度	上升斜率	回焊斜率	降温斜率
Temp Range	240±5	150--180	217	25-150		183
Time ,		60--120S	45—90S	1--3 ℃/s	1—3 ℃/s	≤4℃/s

	物料名称 Description	规格	料号 P/N	位号 Location	用量（PCS	工具/设备	用量（PCS	编号	日期	修改内容
1						测温仪	1			
2						测温板	1			
3						耐高温手套	1			

7 FCC WARNING

This device complies with Part 15 of the FCC Rules.Operation is subject tothe following two conditions:

(1)this device may not cause harmful interference, and

(2)this device must accept any interference received, including interferencethat may cause undesired operation.

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

NOTE: This equipment has been tested and found to comply with the limits fora Class B digital device, pursuant to Part 15 of the FCC Rules. These limitsare designed to provide reasonable protection against harmful interference in aresidential installation. This equipment generates,uses and can radiate radiofrequency energy and, if not installed and used in accordance with theinstructions,may cause harmful interference to radio communications.However,there is no guarantee that interference will not occur in a particularinstallation.

If this equipment does cause harmful interference to radio or televisionreception, which can be determined by turning the equipment off and on, theuser is encouraged to try to correct the interference by one or more of thefollowing 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 whichthe receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The device has been evaluated to meet general RF exposure requirement, The device can be used in portable exposure condition without restriction. Federal Communication Commission (FCC) Radiation Exposure Statement Power is so low that no RF exposure calculation is needed.

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.

ORIGINAL EQUIPMENT MANUFACTURER (OEM) NOTES

The OEM must certify the final end product to comply with unintentional radiators (FCC Sections 15.107 and 15.109) before declaring compliance of the final product to Part 15 of the FCC rules and regulations. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change.

The OEM must comply with the FCC labeling requirements. If the module's label is not visible when installed, then an additional permanent label must be applied on the outside of the finished product which states: "Contains transmitter module FCC ID: N8N-WB99. Additionally, the following statement should be included on the label and in

the final product's user manual: "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 interferences, and

(2) this device must accept any interference received, including interference that may cause undesired operation."

The module is allowed to be installed in mobile and portable applications A module or modules can only be used without additional authorizations if they have been tested and granted under the same intended end - use operational conditions, including simultaneous transmission operations. When they have not been tested and granted in this manner, additional testing and/or FCC application filing may be required. The most straightforward approach to address additional testing conditions is to have the grantee responsible for the certification of at least one of the modules submit a permissive change application. When having a module grantee file a permissive change is not practical or feasible, the following

guidance provides some additional options for host manufacturers. Integrations using modules where additional testing and/or FCCapplication filing(s) may be required are: (A) a module used in devices requiring additional RF exposure compliance information (e.g., MPE evaluation or SAR testing); (B) limited and/or split modules not meeting all of the module requirements; and (C) simultaneous transmissions for independent collocated transmitters not previously granted together.

This Module is full modular approval, it is limited to OEM installation ONLY. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change. (OEM) Integrator has to assure compliance of the entire end product include the integrated Module. Additional measurements (15B) and/or equipment authorizations(e.g. Verification) may need to be addressed depending on co-location or simultaneous transmission issues if applicable.(OEM) Integrator is reminded to assure that these installation instructions will not be made available to the end user.

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