

LSD4BT-E66 Series

User Manual



Lierda Science & Technology Group

Product Name: E66 Standard Module (PCB Antenna)

Product Model: LSD4BT-E66

File Version: Rev04

Revision History

Serial No.	Revision Log	Revised by	Reviewed by	File Version	Revision Date
1	Initial version	Wang Hongyang	Sun Xiangtao	Rev01	May 31, 2018
2	Update the communication distance of the module, and add the power consumption data under different connection and broadcast intervals	Wang Hongyang	Sun Xiangtao	Rev02	October 11, 2018
3	Correct the working parameters of the module, the transmittance state and the basic frequency of CPU, distinguish the different TRX current of the module in the ACTIVE mode and in the SLEEP mode, and add the power consumption data under more time intervals	Wang Hongyang	Sun Xiangtao	Rev03	December 11, 2018
4	Add Module Authentication information	Wang Hongyang	Sun Xiangtao	Rev04	March 1, 2019

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Chapter 1 Overview

E66 series of Bluetooth module is a low-energy and high-performance Bluetooth module which is researched and developed based on the low-energy and high-performance Bluetooth SOC chip. The module adopts the stamp hole-type interface, and is pre-reserved with two optional interfaces: PCB antenna and external antenna; the module is in small size, is led out by full port, is convenient to use, and can help you reduce the investment in software and hardware, and easily realize the development of Bluetooth application.

Table 1-1 Model Description

Model	Description
LSD4BT-E66	PCB antenna. This model does not include software. For the product with software, please communicate with the salesman over the specific model, MPQ and other information

1.1 Functional Characteristics of Module

- Working voltage: 1.6~3.6V
- Designed frequency: 2402MHz~2480MHz
- Transmittance power: Max 7dBm
- Ultra-high receiving sensitivity: -93±1dBm
- Ultra-far effective communication distance: 30m@0dBm

1.2 Application Occasions

- Smartphone and tablet peripherals
- Wireless wearable Bluetooth equipment
- Intelligent light control, smart home, smart city

Chapter 2 Specification & Parameters

Table 2-1 Limit Parameters of the Product

Main Parameters	Performance	Remarks
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	Minimum Value	Maximum Value	
Power supply voltage (V)	1.6	3.6	
Working temperature (°C)	-40	+85	
ESD (KV)	3	/	All PINS, HBM MADE

Table 2-2 Working Parameters of the Module @ 25°C

Main Parameters		Performance			Remarks
		Minimum Value	Typical Value	Maximum Value	
Working voltage (V)		1.6	3.3	3.6	The ripple of the power supply requires the peak value to be within 30mV
Working temperature (°C)		-40	/	+85	Normal communication
Working frequency band (MHz)		2402	/	2480	ISM frequency band
Number of channels		/	40	/	Standard number of channels under BLE Agreement
Power Consumption	Transmittance state (mA) ACTIVE	/	10.5	/	2402MHz, 0dBm@16M The whole CPU works
	Transmittance state (mA) SLEEP	/	6.58	/	2402MHz, 0dBm@16M Only the RF part of the CPU works
	Receiving state (mA) ACTIVE	/	10.3	/	2402MHz@16M The whole CPU works

	Receiving state (mA)	/	6.09	/	2402MHz@16M Only the RF part of the CPU works	
	SLEEP					
	SLEEP (μA)	/	2	/		
Transmittance power (dBm)	-15	/		7		Software configurable
Receiving sensitivity (dBm)	/	-93		/		PER<30.8% (BER<0.1%)
Communication protocol	BLE4.0/4.2					
Interface Type	1.27mm of spacing, 3-sided stamp hole					
Communication distance ¹	30m@0dBm					Chip configuration@0dBm

1. “Communication distance” is affected by the measuring environment, air humidity and other factors around. The distance is measured via the communication between the mobile phone and the module, and is only for reference.

Table 2-3 Power Consumption of the Module under Different Broadcast Intervals

Mode	Average Power Consumption (μA)	Broadcast Interval (ms)
0dBm Broadcast mode	122.3	100
	60.8	200
	29.4	500
	22.2	700
	19.6	1000
	12.1	2000
	8.1	3000
	6.7	5000
	5.3	7000
	4.4	10000

Table 2-4 Power Consumption of the Module under Different Connection Intervals

Mode	Average Power Consumption (μ A)	Connection Interval (ms)
0dBm Connection mode	61.1	100
	31.1	200
	16.3	500
	14.7	700
	12.1	1000
	8.9	2000
	7.2	3000
	6.6	4000

Note: The power consumption data tested in the connection mode is tested via the non-data communication between the mobile phone and the module.

Chapter 3 Hardware Layout and Interface Description

3.1 Dimensions

The physical view of LSD4BT-E66 is as shown in the following Fig. 3-1:

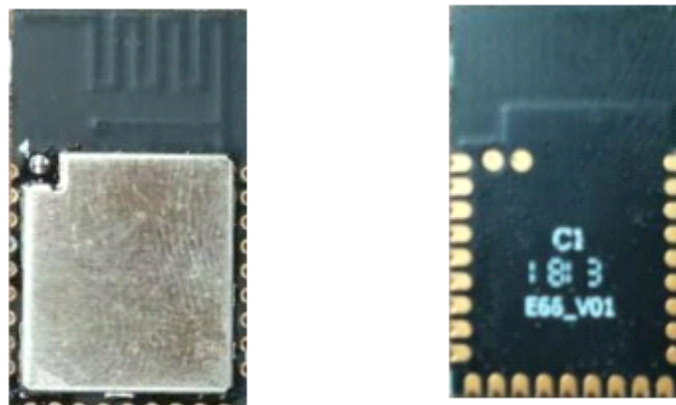


Fig. 3-1 Physical View of LSD4BT-E66 Series of Module

When this product is designed, the tantalum capacitors and PCBs have optional material models. On

the premise that the performance requirements are met, the appearance color may be different, and the actual product shall prevail. The main materials (main chips, crystal oscillators, etc.) do not have any substitutional models. Any change will be notified in advance.

The dimensions of the module LSD4BT-E66 are as shown in the following Fig. 3-2:

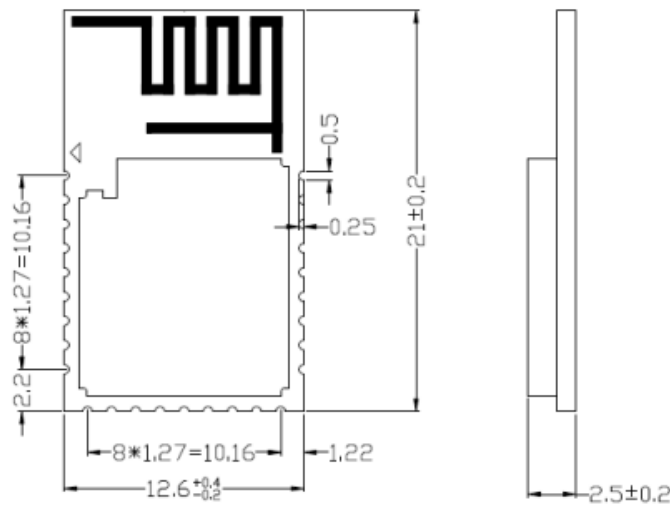


Fig. 3-2 Dimension Diagram of LSD4BT-E66 Series of Module

The dimensional tolerance which is not marked in the figure is subject to the standard GB/T1804-m.

3.2 Interface Description

The following figure shows the serial number of the pins of the module and describes the corresponding pins:

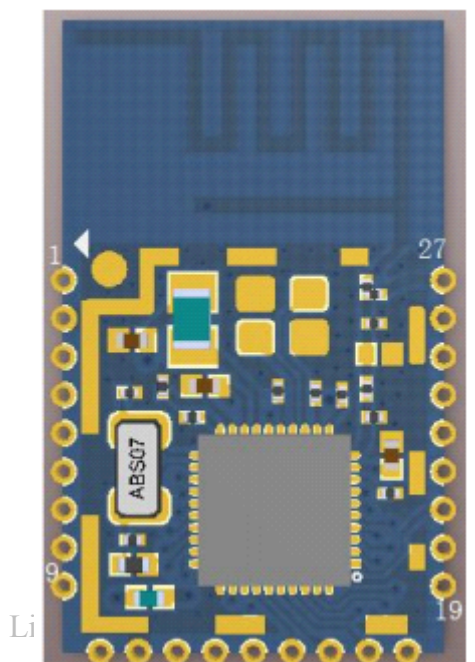


Table 3-1 Functional Description of Pins of LSD4BT-E66 Series of Module

Module Pin	Chip Pin	Name	Function	Remarks
1	/	NC	Not connected	
2	41	GND	Grounded	
3	23	P3/PADC	GPIO	
4	24	P4/PADC	GPIO	
5	25	P5/PADC	GPIO	
6	26	P6/PADC	GPIO	
7	27	P9	GPIO	
8	28	P10	GPIO	
9	29	P11	GPIO	
10	18	VBAT	Power supply	

11	41	GND	Grounded	
12	32	RSTN	Reset	
13	6	SWCLK	Programmed	
14	7	SWD	Programmed	
15	34	P15	GPIO	
16	35	P16	GPIO	
17	36	P17	GPIO	
18	37	P18	GPIO	
19	38	P19	GPIO	
20	39	P20	GPIO	
21	1	P24	GPIO	
22	2	P25	GPIO	
23	3	P26	GPIO	
24	4	P27	GPIO	
25	5	P28	GPIO	
26	41	GND	Grounded	
27	10	ANT	External antenna	

3.3 Module Authentication

This module has been certified by SRRC (China) and FCC (United States). CMIIT ID number is xxxxxxxx, and FCC ID number is 2AOFDLS4BT-E66A.

Three display modes of CMIIT ID and FCC ID are provided. The first shield laser scheme is defaulted.

1. Shield shield laser: display module product serial number, CMIIT ID, FCC ID, RoHS logo, lierda

registered trademark, CE certification logo, etc., with shield as the specific criterion;

2.Back label: display module product serial number, CMIIT ID, FCC ID, module P/N, lierda registered trademark, etc, specific to the manufactured product;



Fig. 3-3 Back label

3.Display by the terminal device : The SRRC ID, FCC ID, etc, can be referenced by the terminal device according to relevant standards.

Chapter 4 Application Instructions

4.1 Notices to Typical Application

1. Power Supply

It is suggested supplying power to the module with the DC regulated power supply. The ripple coefficient of the power supply shall be smaller as possible, and the module shall be grounded reliably. Please pay attention to the correct connection of the positive and negative poles of the power supply, because reverse connection may lead to the permanent damage of the module;

2. Antenna Selection

2.1 PCB Antenna

The module is an on-board PCB antenna. During the layout of the board, please make sure the area right below the antenna is completely clear, as shown in the following figure. The red part is the user's backplane area or the copper-clad area, the grey part is the clear area of the antenna of the user's backplane, and the boundary point of the clear area is the upper edge of the shielding cover. Make sure there is no any

metal in 360 degrees around the antenna; otherwise, the radiation efficiency of the antenna will be affected, and the communication distance will be greatly affected.



Fig. 4-1 Description of Clear Area of Antenna

2.2 External Antenna

The module is connected with the external antenna through the stamp hole. It is suggested pre-reserving π matched network on the backplane. The external interface can be SMA or IPEX. As shown in the following figure 4-2, for the RF wiring of the highlight part, it needs to lay the 50ohm impedance line; the relationship between the width of the 50ohm impedance line, wiring and the copper-clad spacing, board thickness is as shown in Figure 4-3.

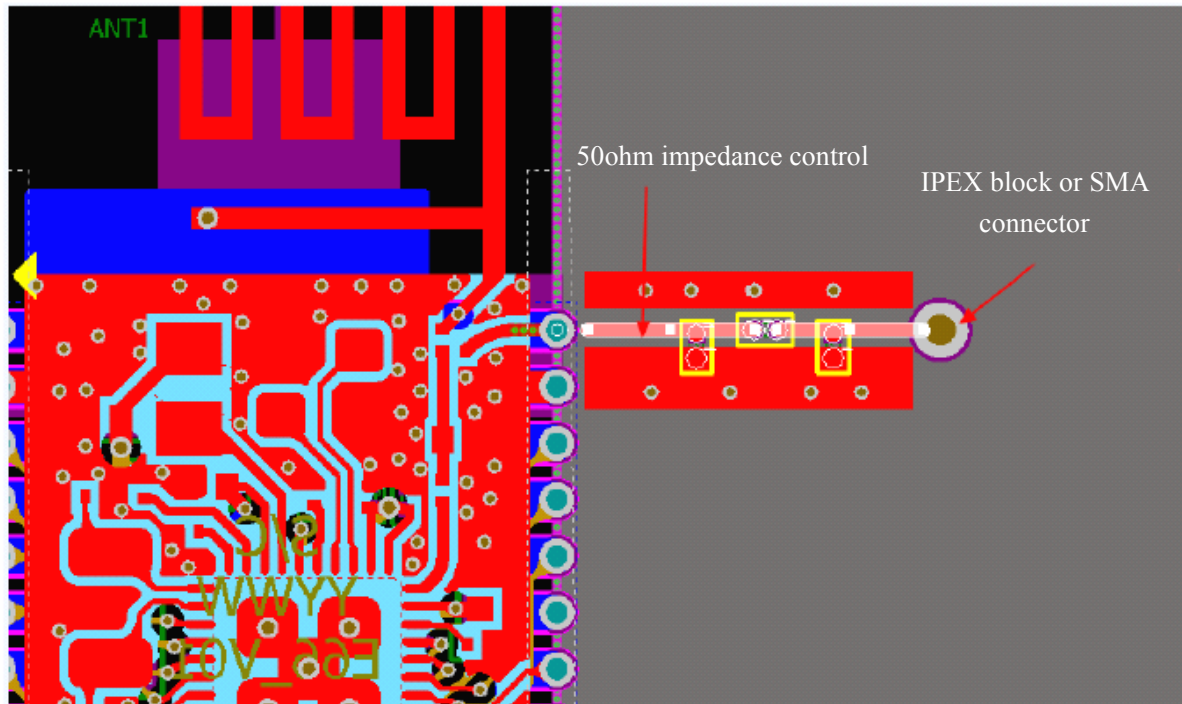


Fig. 4-2 Recommended Circuit of External Antenna

Recommended values of FR4 dual panel

(H=Board thickness, W=Line width, D=Spacing between wiring and copper-clad):

H=1.0mm, W=0.8mm, D=0.2mm

H=1.0mm, W=1.0mm, D=0.254mm (Recommended)

H=1.2mm, W=1.0mm, D=0.2mm (Recommended)

H=1.6mm, W=1.0mm, D=0.2mm (Recommended)

Fig. 4-3 Recommended Wiring of 50ohm Impedance Line

3. Electrostatic Notices

The user shall pay attention to the electrostatic requirements (as shown in Table 2-1) of the product when in design, and add the electrostatic prevention measures when designing the end products.

Chapter 5 Production Guidance

5.1 Production Guide

It is suggested the stamp hole packaging module mounted by an SMT machine, and the mounting shall be finished within 24 hours after unpacking. Otherwise, its need to repackage by vacuumizing, so as to prevent poor mounting effect due to damp.

If the package includes a humidity indicator card, it is suggested judging if the module needs to be baked according to the indication of the humidity indicator card. The baking conditions are as follows:

Baking temperature: $125^{\circ}\text{C}\pm 5^{\circ}\text{C}$;

The alarm temperature is set to be 130°C ;

SMT mounting can be carried out after the temperature cools down to be $<36^{\circ}\text{C}$ under natural conditions;

If the product is unpacked for over 3 months, please pay special attention if the product is affected with damp, because the PCB gold immersion process may lead to the oxidation of the land after more than 3 months, and may lead to such problems as false welding and missing welding during the mounting process.

In order to ensure the pass rate of reflow, it is suggested picking 10% of products for visual inspection and AOI detection in the first time of mounting, so as to ensure the reasonableness of the furnace temperature, device absorption method and placement method;

Operators at all stations must wear the anti-electrostatic gloves during the whole production process;

5.2 Requirements on Positions of Module on Backplane

It is suggested the green oil thickness at the module position of the backplane be less than 0.02mm, so as to prevent the phenomenon that the green oil is too thick, the module is blocked up and cannot be effectively contacted with solder paste, and the welding quality is affected.

In addition, please do not place other devices within 2mm around the module position on the interface board, so as to ensure the convenience for repairing the module.

5.3 Opening Design of Steel Mesh

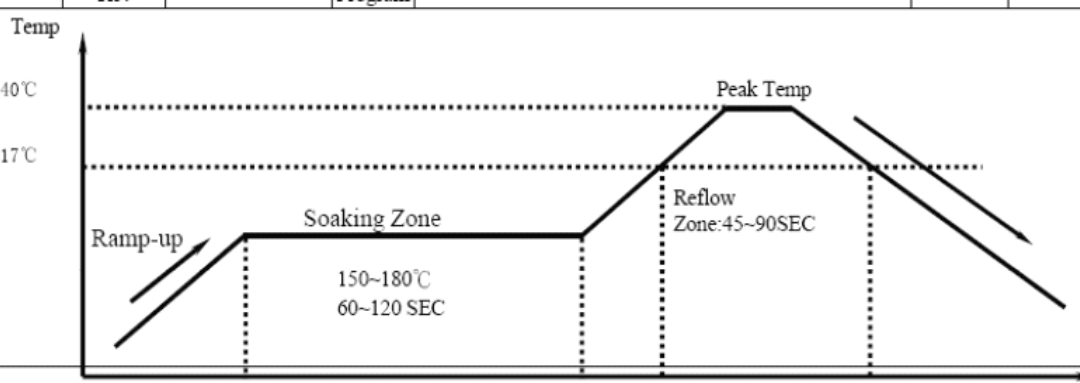
The thickness of the steel mesh on the backplane shall be selected by comprehensively considering the packaging type of the devices in the board, and special attention shall be paid to the following

requirements:

The land position of the module can be locally thickened to 0.15~0.20mm, so as to prevent void solder;

5.4 Standard Operation Procedure (SOP) for Reflow

Note: This SOP is only applicable to lead-free operation, and only for reference.

 作业指导书 Standard Operation Procedure (SOP)												Approved by	Revised by	Generated by	Generation Date
生产工段 Station	SMT				工序名 Station	Reflow									
文件编号 Doc No.	MSOP-FL-RX1060N-G01	版本 Rev	A0		程序名 Program	003-RR-T-S606-S3									
Operation Items	Curve Chart	 The graph shows a temperature profile over time. Key points include: Ramp-up, Soaking Zone (150~180°C, 60~120 SEC), Peak Temp (240°C), Reflow Zone (45~90 SEC), and a final cooling phase. The temperature ranges from 217°C to 240°C.													
	Temperature Zone Parameters	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												
Curve Parameters		Peak temperature		Soaking temperature		Tin fusion temperature		Slope of increase		Slope of reflow		Slope of cooling			
Temp Range	240±5		150--180		217		25-150				183				
Time			60--120S		45--90S		1--3 °C/s		1--3 °C/s		≤4°C/s				
物料名称 Description	Specification	Material No.	P/N	位号 Location	Used Amount (PCS)	Tool/Equipment		Used Amount (PCS)	No	Date	Revision Contents				
1						Thermometer		1							
2						Thermometric plate		1							
3						High temperature-resistant gloves		1							

Chapter 6 Product Package

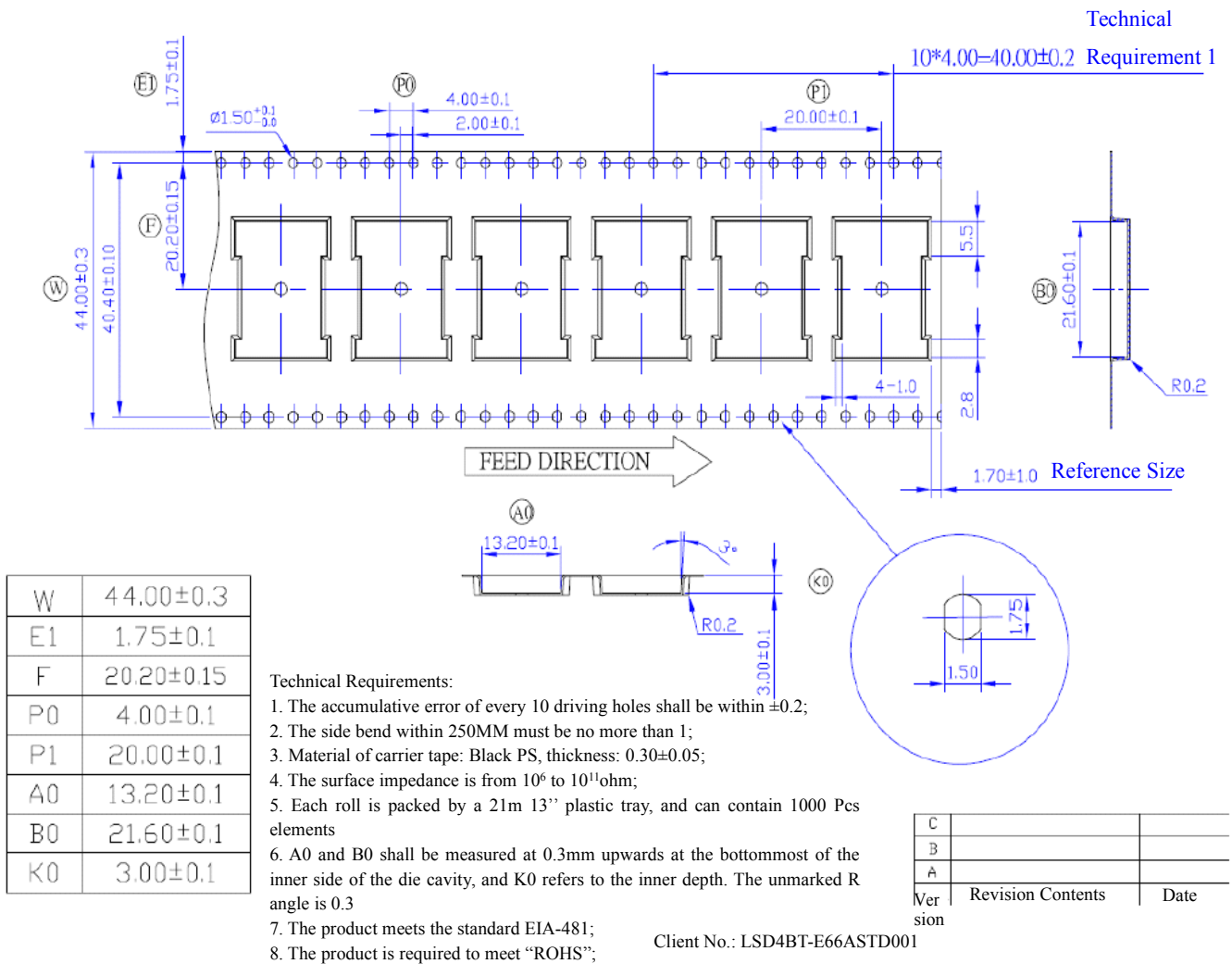
6.1 Packaging Method

■ Tape

□ Foam

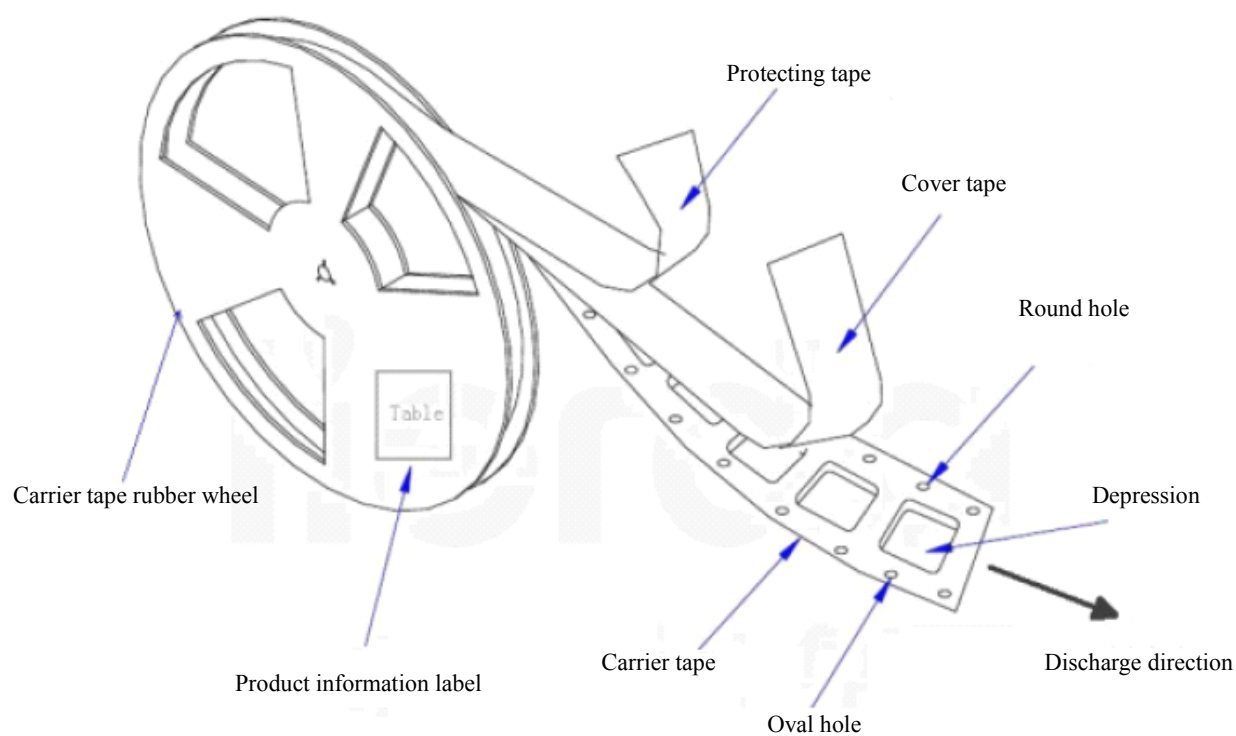
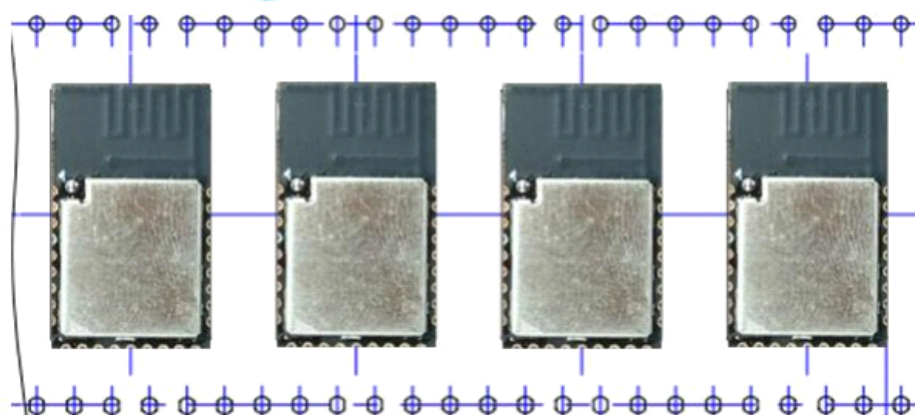
□ Electrostatic bag

6.2 Strip Size



6.3 Product Direction

The placement direction of the tape packaging module is as shown in the following figure:



Reminder

Welcome to use the products of Lierda Science & Technology Group Co., Ltd.. Prior to the use of our products, please first read this reminder; if you have started to use the Instructions, you will be considered as having read and accepted the reminder.

Lierda Science & Technology Group Co., Ltd. reserves the final interpretation and revision rights

over all attached materials, and any modification of them will not be further notified.

**FCC Statement:**

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.

NOTE: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

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
- This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

RF Exposure Information and Statement :

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter

Instructions to the OEM/Integrator:

This module has been granted modular approval for mobile applications. OEM integrators for host products may use the module in their final products without additional FCC certification if they meet the following conditions. Otherwise, Additional FCC approvals must be obtained.

- 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:2AOFDLSD4BT-E66A, 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 user's manual for the host product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.
- The final host / module combination may also need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.
- This Module is full modular approval, it is limited to OEM installation ONLY.
- The module is limited to installation in mobile application.
- A separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and difference antenna configurations.
- The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.
- The Grantee will provide guidance to the Host Manufacturer for compliance with the Part 15B requirements if requested.