

产品说明书

PRODUCT USER GUIDE

1. 概述 Overview

BT-MC89-JK1是一款基于赛普拉斯CYW89072单芯片蓝牙模组，该芯片是个集成了2.4GHz收发器的独立基带处理器,为汽车无线电应用带来了最新的移动连接技术，提供了汽车3级的温度性能，芯片已过AEC-Q100认证测试。

BT-MC89-JK1 is a single-chip Bluetooth module based on CYW89072 of CYPRESS. The chip is a stand-alone baseband processor with an integrated 2.4GHz transceiver, It brings the latest mobile connectivity technology to automotive radio applications, Offering automotive Grade3 temperature performance, CYW89072 chip can met the AEC-Q100 certification.

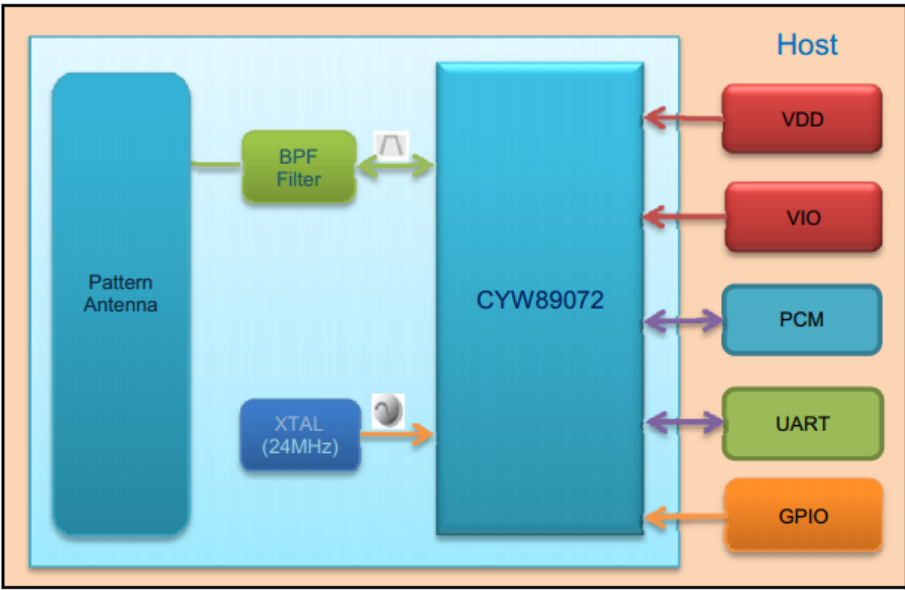
1.1 特征 Features

- ◆ 蓝牙 5.2
Bluetooth 5.2
- ◆ 支持蓝牙 Class1 或 Class2 功率等级
Support class1 or class2 Bluetooth power level.
- ◆ 支持高速 UART 通讯
Support high speed UART communication
- ◆ 支持标准 HCI 接口
Support standard HCI interface.
- ◆ 支持 PCM/I2S 数字音频接口
Support PCM/I2S digital audio interface
- ◆ 表面贴装类型 23*16*3.2mm
Surface mount type 23*16*3.2mm
- ◆ 模组内置 PCB 天线
Built-in pattern antenna on the module
- ◆ 符合 RoHS 2.0 环保
RoHS 2.0 compliant

1.2 应用 Applications

- ◆ 汽车无线免提
Automotive Hands-Free radios

1.3 框图 Block Diagram



2. 模组规格 Module Specification

2.1 通用规格 General Specification

1	产品名称 Product name	车载蓝牙模组 Car kit Bluetooth module
2	芯片类型 Chip set	CYW89072BRFB5GT, 49-ball rFCFBGA
3	频率范围 Frequency band	2402MHz~2480MHz
4	功率等级 Power class level	Class 2 (-6dBm < P _{AV} < 4dBm)
5	通讯接口 Communication interface	UART、PCM
6	波特率 Baud rate	115200bps(Default)
7	额定电压 Rated voltage	3.3V DC (<50mV _{p-p} 纹波电压)
8	工作电压范围 Operating voltage range	2.8V~3.6V DC
9	尺寸 Dimension	23*16*3.2mm (L*W*H)
10	抗静电 ESD	H1C(HBM)
11	湿敏等级 MSL	3
12	平整度 Co-planarity	≤0.1mm
13	测试和认证 Test & certification	BQB\FCC\CE\IC\MIC

2.2 绝对最大额定值 Absolute maximum rating

参数 Parameter		最小 Min.	最大 Max.	单位 Unit
储存温度 Storage temperature		-40	+90	°C
供电电压 Supply voltage <i>*Ripple voltage < 45mVp-p</i>	VDD	-	3.6	V
	VIO	-	3.6	V
输入输出脚最小电压 Minimum voltage on I/O pins		-0.3	-	V
输入输出脚最大电压 Maximum voltage on I/O pins			VIO+0.3	V

2.3 推荐工作环境 Recommended operating conditions

参数 Parameter		最小 Min.	典型 Typ.	最大 Max.	单位 Unit
工作温度 Operating temperature		-40	25	+85	°C
工作湿度 Operating humidity		10	-	+90	%
供电电压 Supply voltage <i>*Ripple voltage < 45mVp-p</i>	VDD	3.1	3.3	3.5	V
	VIO	3.1	3.3	3.5	V

2.4 数字 I/O 特性 Digital I/O characteristics

特性 Characteristics	符号 Sym.	最小 Min.	最大 Max.	单位 Unit
输入低电压 Input low voltage(VIO=3.3V)	V _{IL}	-	0.8	V
输入高电压 Input high voltage(VIO=3.3V)	V _{IH}	2.0	-	V
输出低电压 Output low voltage	V _{OL}	-	0.4	V
输出高电压 Output high voltage	V _{OH}	VIO-0.4	-	V
输入低电流 Input low current	I _{IL}	-	1.0	mA
输入高电流 Input high current	I _{IH}	-	1.0	mA
输出低电流 Output low current	I _{OL}	-	3.0	mA
输出高电流 Output high current	I _{OH}	-	3.0	mA

2.5 电源功耗 Power consumption

参数 Parameter		最小 Min.	典型 Typ.	最大 Max.	单位 Unit
供电电压 Supply voltage	VDD	-	-	41	mA
	VIO	-	-	10	mA

2.6 射频特性 RF characteristics

BDR

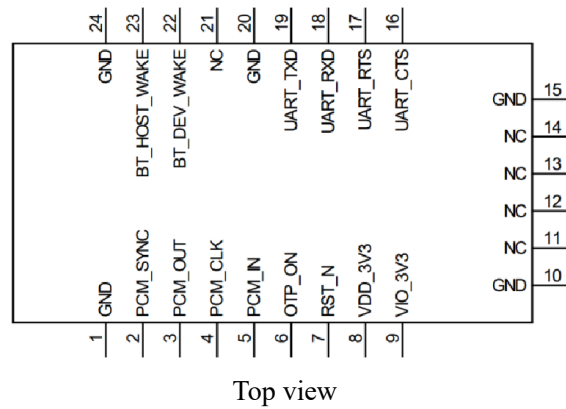
参数 Parameter		最小 Min.	典型 Typ.	最大 Max.	单位 Unit
发射 Transmitter					
输出功率 Output power		-6	0	4	dBm
初始载波容限 Initial carrier-frequency tolerance		-75	-	+75	kHz
调制特性 Modulation characteristics	Δf_{avg}	140	-	175	kHz
	Δf_{2max}	115		-	kHz
	$\Delta f_{2avg} / \Delta f_{1avg}$	0.8	-	-	-
载波频率漂移 Carrier frequency drift	1slot	-25	-	+25	kHz
	3slot / 5slot	-40	-	+40	kHz
	Max. drift rate	-20	-	+20	kHz/50us
接收 Receiver					
单/多时隙灵敏度 Single/Multiple sensitivity	P=-70dBm	-	-	<0.1	%
最大输入电平 Maximum input level	P=-20dBm	-	--	<0.1	%

BLE

参数 Parameter		最小 Min.	典型 Typ.	最大 Max.	单位 Unit
输出功率 Output power		-6	0	4	dBm
调制特性 Modulation characteristics	Δf_{avg}	225	-	275	kHz
	$\Delta f_{2max}(at\ 99.9\%)$	185		-	kHz
	Ratio	0.8	-	-	-
载波频率漂移 Carrier frequency drift	Frequency Offset	-	-	150	kHz
	Frequency Drift	-	-	50	kHz
	Drift Rate	-	-	20	kHz/50us
接收灵敏度 Receiver sensitivity (PER<30.8%)	GFSK, 1Mbps	-	-90	-	dBm

3. 设计应用 Design Application

3.1 管脚配置 Pin Assignment

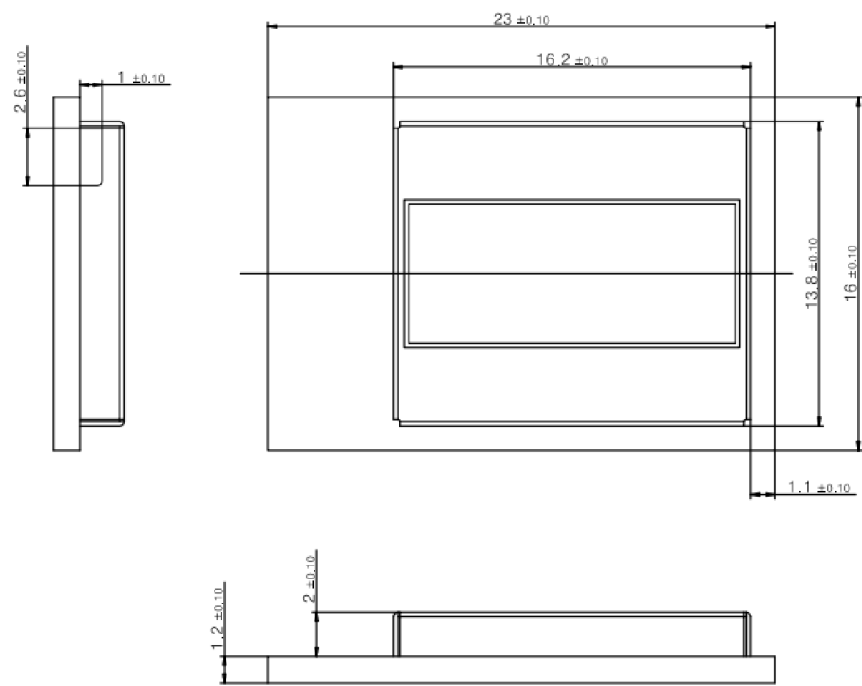


3.2 管脚描述 Pin Description

* All digital I/O has internal pull-up or pull-down values which are around 60Kohm.

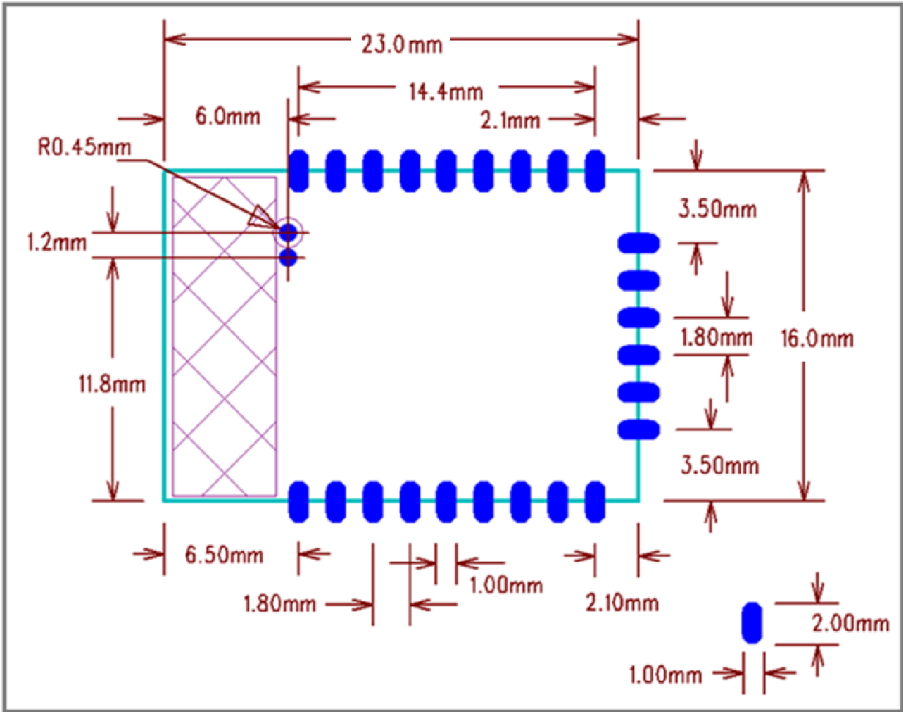
No.	Pin Name	Type	Description
1	GND	GND	Ground connection
2	PCM_SYNC	I/O	PCM sync signal
3	PCM_OUT	O	PCM data output
4	PCM_CLK	I/O	PCM clock
5	PCM_IN	I	PCM data input
6	OTP_ON	I	If OTP is used, pull this pin high. If OTP is not used, pull this pin low.
7	RST_N	I	Active-low reset input.
8	VDD_3V3	I	Main power voltage source input
9	VIO_3V3	I	I/O voltage supply input
10	GND	GND	Ground connection
11	NC	-	NC
12	NC	-	NC
13	NC	-	NC
14	NC	-	NC
15	GND	GND	Ground connection
16	UART_CTS	I	UART clear to send input
17	UART_RTS	O	UART request to send output
18	UART_RXD	I	UART receive data
19	UART_TXD	O	UART transmit data
20	GND	GND	Ground connection
21	NC	-	NC
22	BT_DEV_WAKE	I/O	DEV_WAKE of general -purpose I/O signal
23	BT_HOST_WAKE	I/O	HOST_WAKE of general -purpose I/O signal
24	GND	GND	Ground connection

3.3 外形尺寸图 Dimensional Outline Drawing



Weight: 1.73G ±0.1

3.4 封装尺寸图 Dimensional Package Drawing

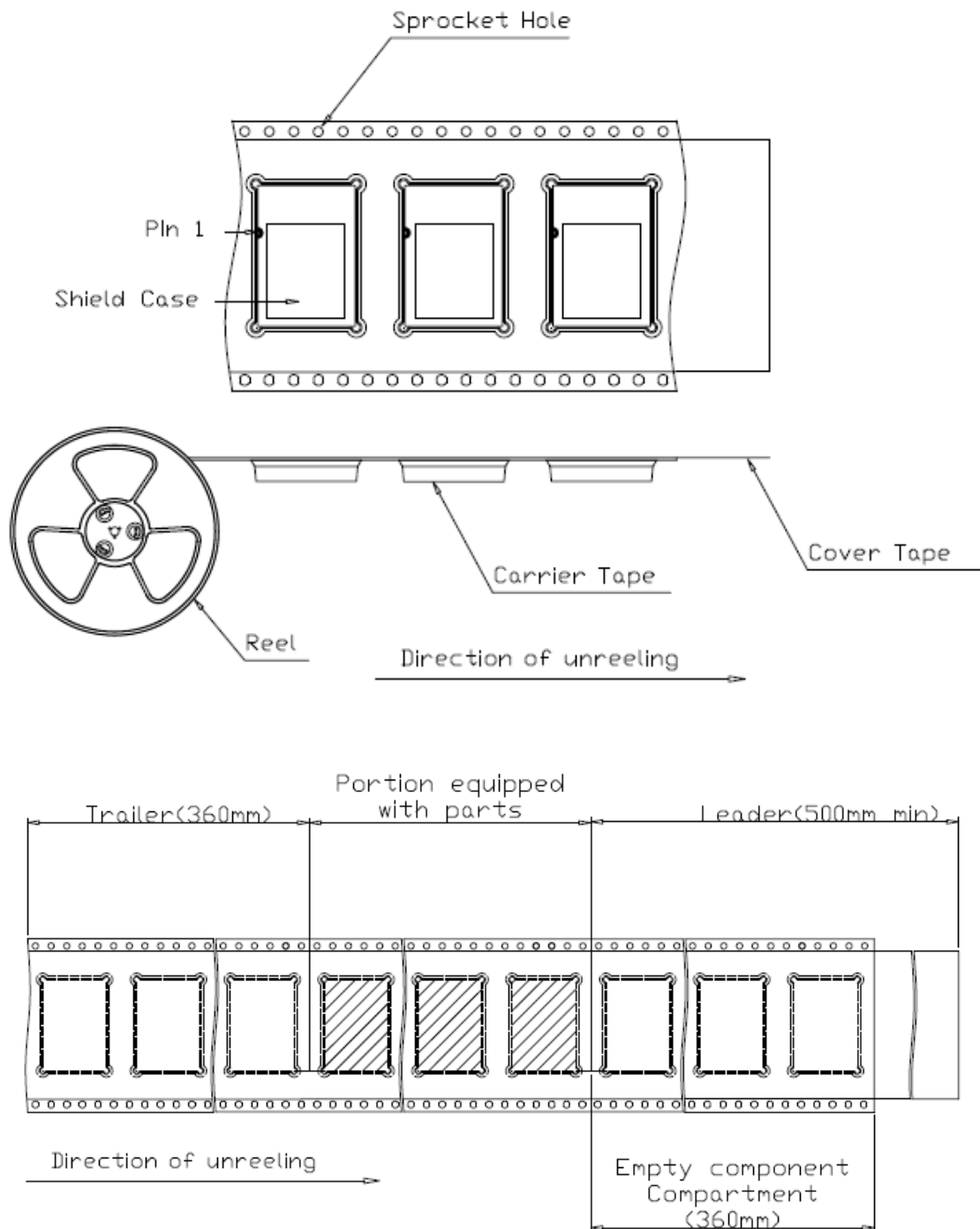


公差: ±0.1mm

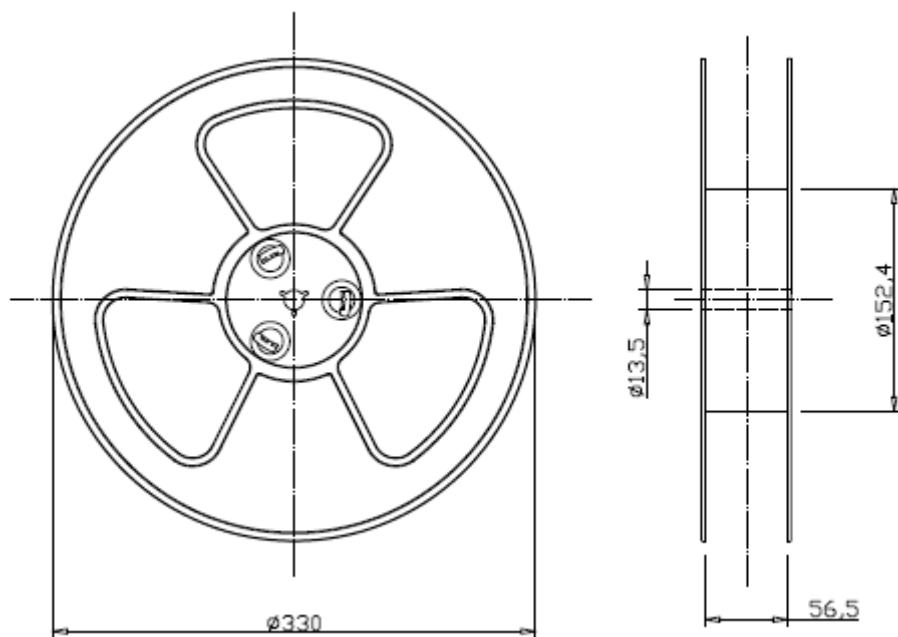
Tolerance: ±0.1mm

4.包装信息 Package Information

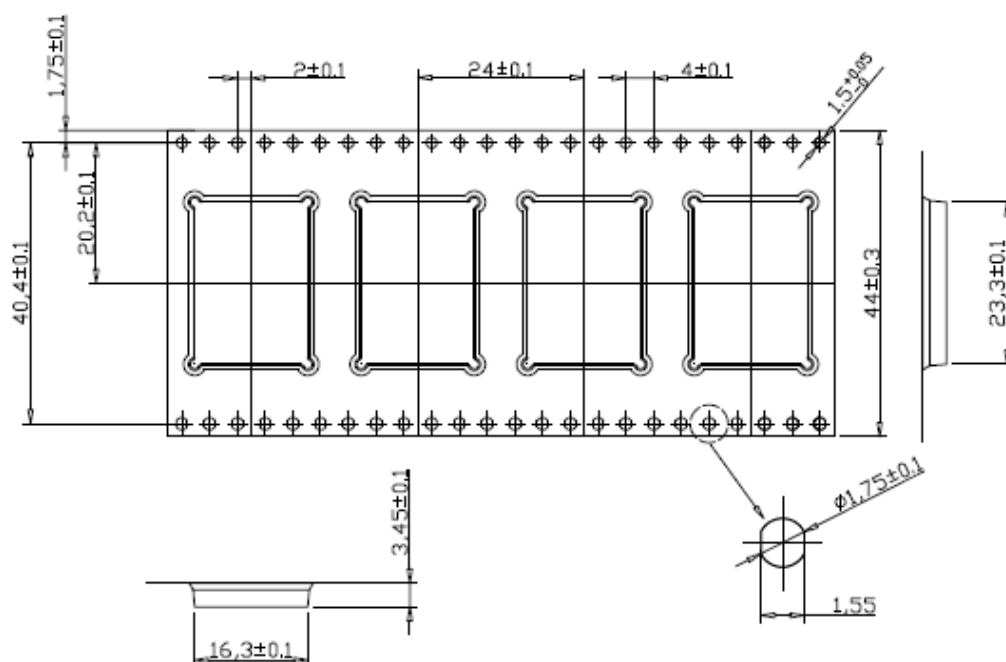
4.1 卷盘包装 Tape Package



4.2 卷盘尺寸 Reel Dimensions



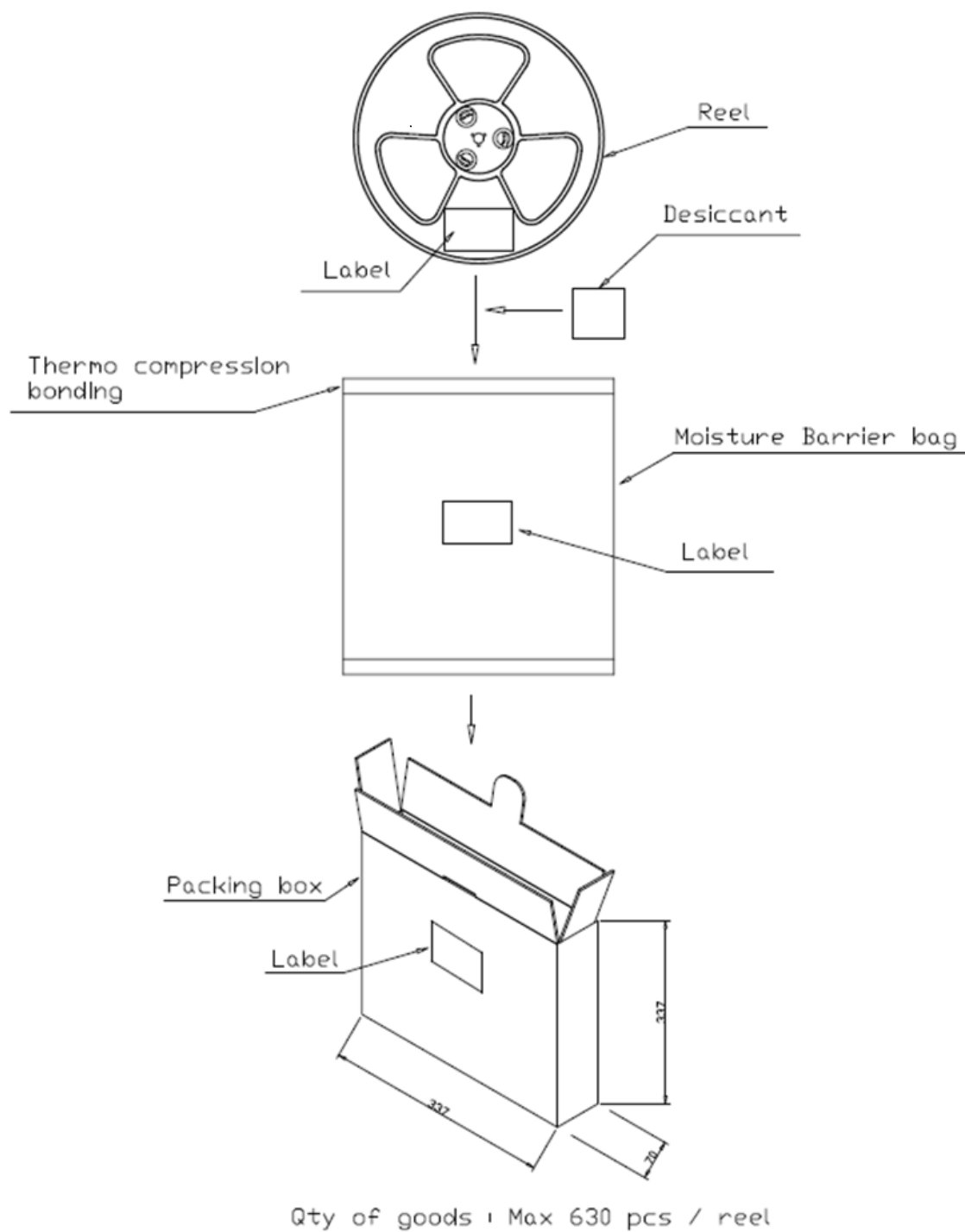
4.3 载带尺寸 Tape Dimensions



4.4 包装规格 Packing Specification

模块出货采用真空包装出货，包装示意图如下：

Module shipments by vacuum packaging, packing diagram as follows:



Note: 本产品基于 JEDEC 标准 J-STD-020 适用于温敏等级 MSL3
This product is applicable to moisture sensitivity level MSL3
(Based on JEDEC Standard J-STD-020)

FCC Statement

FCC standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

Integral antenna with antenna gain 0dBi

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.

Any Changes or modifications not expressly approved by the party responsible for compliance 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.

FCC Radiation Exposure Statement

This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: ZWY89072 Or Contains FCC ID: ZWY89072"

When the module is installed inside another device, the user manual of the host must contain below warning statements; 1. 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.
 - (2) This device must accept any interference received, including interference that may cause undesired operation.
2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

Any company of the host device which install this modular with modular approval should perform the test of radiated & conducted emission and spurious emission, etc. according to FCC part 15C : 15.247 and 15.209 & 15.207 , 15B Class B requirement, Only if the test result comply with FCC part 15C : 15.247 and 15.209 & 15.207 , 15B Class B requirement , then the host can be sold legally.

IC STATEMENT

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference.
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil contient des émetteurs / récepteurs exemptés de licence conformes aux RSS (RSS) d'Innovation, Sciences et Développement économique Canada. Le fonctionnement est soumis aux deux conditions suivantes :

- (1) Cet appareil ne doit pas causer d'interférences.
- (2) Cet appareil doit accepter toutes les interférences, y compris celles susceptibles de provoquer un fonctionnement indésirable de l'appareil.

IC Radiation Exposure Statement

This modular complies with IC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

If the IC number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following:

"Contains IC:12033A-89072"

when the module is installed inside another device, the user manual of this device must contain below warning statements;

1. This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference.
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

2. Cet appareil contient des émetteurs / récepteurs exemptés de licence conformes aux RSS (RSS) d'Innovation, Sciences et Développement économique Canada. Le fonctionnement est soumis aux deux conditions suivantes :

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