

# HET-BC1024 User Manual

## Summary

HET-BC1024 is a Bluetooth Low energy module, using CSR1024 as the main chip, which is a built-in high efficiency and low-power processor. CSR1024 is able to run independently Bluetooth 5.0 protocol stack and application profile. HET-BC1024 has 80KB RAM and 192KB ROM with 256KB FLASH, also it has rich peripheral interfaces to meet different applications.

HET-BC1024 is an open development platform, users can design their own applications based on the Bluetooth protocol stack, it also support a MESH network application and other typical application-UART relay. Users can use the SDK of the module to shorten the development time

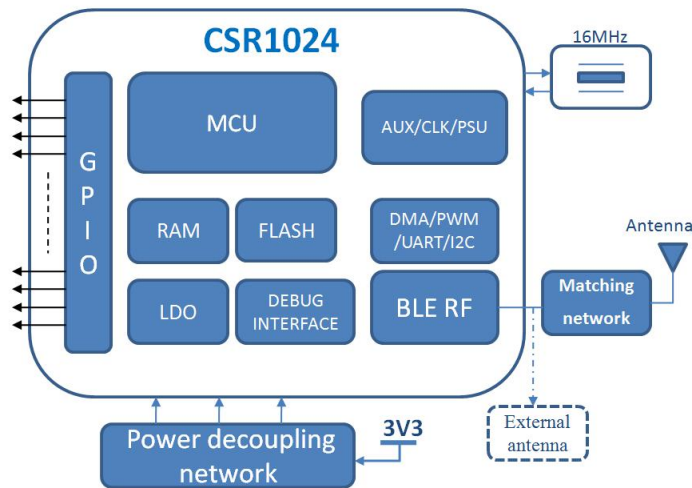
## Applications

- Health Care
- Smart Home Application
- Motion Measurement
- Auto Electronics
- Leisure Toys

## 1. Brief Introduction

HET-BC1024 Bluetooth low energy module, using CSR1024 as the core processor. This module is compatible with Bluetooth 5.0 specification, Runs in **2.4 GHz** ISM band, **GFSK modulation**, 40 channel 2 MHz channel gap, three fixed radio channel, 37 automatic adaptive frequency hopping data channel, 2 MHz gap better prevent adjacent channel interference. The internal PA can deliver a maximum of 4dBm output, Receive sensitivity is typically -90.5dBm. The module integrates a 50ohm **inverted F type PCB antenna** which has **0.5dBi gain**.

This module is designed to let electronic products connect with smart mobile devices through Bluetooth, it can be widely used in various electronic devices, such as instrumentation, logistics tracking, healthcare, smart home, motion measurement, automotive electronics, toys and other leisure. Below is the module hardware block diagram.



## 2. Product Features

■ Power supply: 3.3V

■ Power Dissipation

- Transmit Mode      5mA      (0dBm Transmit Power)
- Receive Mode      5mA      (-90.5dBm Sensitivity)
- Sleeping Mode      1.6uA

■ XAP Core

■ Peripherals:

- 15 x GPIOs
- 1 x AIOs
- 1 x UARTs
- 10bit ADC
- 1 x I2C
- 5 x PWM modules
- Debug- SPI interface

■ Emission Power : -60~4dBm

■ Receiver Sensitivity : -90.5dBm

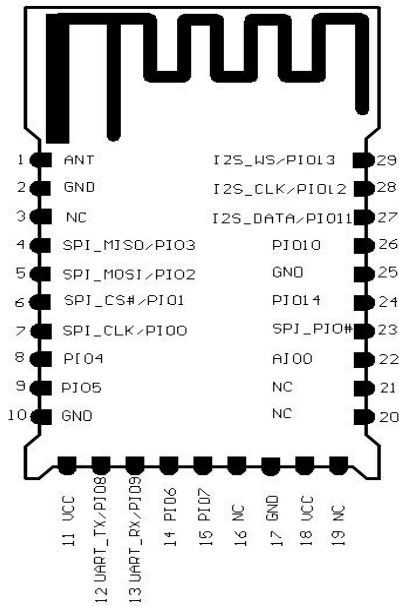
■ Working Frequency: 2400~2483.5MHz

■ Working Environment Temperature : -20~70°C

■ Transmission Distance : > 50m

### 3. Interface Definition

#### 3.1 Pin Assignments



#### 3.2 Pin Description

PIN No.	PIN NAME	PIN TYPE	DESCRIPTION
1	ANT	External antenna	Antenna port for Bluetooth transmitter / receiver.(can't be used)
2	GND	Ground	Connect to GND
3	NC	Unused pins	Not connected
4	SPI_MISO/PIO3	Digital: Bidirectional with programmable strength internal pull-up / pull-down and LCD glass driving capability	General programmable I/O line 3
5	SPI_MOSI/PIO2		General programmable I/O line 2
6	SPI_CS#/PIO1		General programmable I/O line 1
7	SPI_CLK/PIO0		General programmable I/O line 0
8	PIO4		General programmable I/O line 4
9	PIO5		General programmable I/O line 5
10	GND	Ground	Connect to GND

11	VCC	3V3	power-supply connection
12	UART_TX/PIO8	Digital: Bidirectional with	General programmable I/O line 8
13	UART_RX/PIO9	programmable strength internal	General programmable I/O line 9
14	PIO6	pull-up / pull-down and LCD glass	General programmable I/O line 6
15	PIO7	driving capability	General programmable I/O line 7
16	NC	Unused pins	Not connected
17	GND	Ground	Connect to GND
18	VCC	3V3	power-supply connection
19	NC	Unused pins	Not connected
20	NC	Unused pins	Not connected
21	NC	Unused pins	Not connected
22	AIO0	Unidirectional analogue	Analogue programmable input line
23	SPI_PIO#	Input with strong internal Pull-down	Selects Debug SPI on PIO[3:0]
24	PIO14	Digital: Bidirectional with programmable strength internal pull-up / pull-down and LCD glass driving capability	General programmable I/O line 14
25	GND	Ground	Connect to GND
26	PIO10	Digital: Bidirectional with	General programmable I/O line 10
27	I2S_DATA/PIO11	programmable strength internal	General programmable I/O line 11
28	I2S_CLK/PIO12	pull-up / pull-down and	General programmable I/O line 12
29	I2S_WS/PIO13	LCD glass driving capability	General programmable I/O line 13

## 4. Electrical Parameters

### 4.1 Maximum Rating Parameter

Pressure beyond the "maximum evaluation value" data will cause permanent damage to the device unrecoverable. The following assessment is limited to the pressure, to go beyond the operations specifications paragraph indicated functional operation will not apply to the following data. Under absolute maximum evaluation value status will have an impact on long - term use of equipment performance reliability.

Item	Min	Type	Max	Unit
Storage temperature	-40	-	85	°C
Battery (VDD_BAT and VDD_PADS)	0	-	3.6	V
I/O supply voltage	0	-	3.6	V
VDD_AUX, VDD_DIG, AIOs	0	-	1.26	V
VDD_RAD, VDD_RF_IN, VDD_RF	0	-	2.2	V
ESD	Human Body Model Contact Discharge per JEDEC EIA /JS-001-2014		2	KV
	Charged Device Model Contact Discharge per JEDEC EIA /JS002-2014		500	V

### 4.2 Recommended Operation Conditions.

Item	Min	Type	Max	Unit
Operating temperature range	-30	20	85	°C
Battery (VDD_BAT) operation	1.4	3.0	3.6	V
I/O supply voltage (VDD_PADS)	1.4	3.0	3.6	V

### 4.3 Electronic Characteristics

Mode	Description	Total Typical Current at 3 V
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Deep Sleep: No RAM Retention and External Interrupts Enabled	All functions are shut down. To wake the chip, toggle a pre-configured PIO			1.6μA
Deep Sleep: No RAM Retention with External Interrupts and Timer Enabled	VDD_PADS = ON			5.5μA
	VDD_BAT = ON			
Deep Sleep: 16 KB Data RAM Retention	VDD_PADS = ON	VDD_BAT = ON	RAM = ON	10.5μA
	Digital Circuits = ON	SMPS = ON		
Deep Sleep: 16 KB Data RAM and 64 KB RAM Retention	VDD_PADS = ON	VDD_BAT = ON	RAM = ON	12μA
	Digital Circuits = ON	SMPS = ON		
Idle: Shallow Sleep	<1 :s Wake up Time	VDD_BAT = ON	RAM = ON	0.75 mA
	Digital Circuits = ON	MCU = IDLE	VDD_PADS= ON	
Idle: Active	<1 :s Wake up Time	VDD_BAT = ON	RAM = ON	1.3mA(Execution from Cache)
	Digital Circuits = ON	MCU = IDLE	VDD_PADS= ON	13.5 mA (Active SMEM Execution)
TX Active	4dBm Transmit Power			5 mA Average
RX Active	-90.5dBm Sensitivity			5 mA Average

#### 4.4 Input/Output Terminal Characteristics

Switch-mode Regulator	Min	Typ	Max	Unit
Output voltage (VDD_AUX)	-	1.2	-	V
Output voltage (VDD_DIG)	-	1.1	-	V
Output voltage (VDD_RAD)	-	1.8	-	V
Output voltage (VDD_MEM)	-	3.3	-	V

NOTE : These are internal regulators and should have no additional load connected.

#### Digital I/O Terminals

Input Voltage Levels	Min	Typ	Max	Unit
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VIL input logic level low	-	-	25%xVDD_PADS	V
VIH input logic level high	75%xVDD_PADS	-	-	V
Output Voltage Levels				
VOL output logic level low, IOL = 8.0 mA (Max Drive Strength)	-	-	20%xVDD_PADS	V
VOH output logic level high, IOL = -8.0 mA (Max Drive Strength)	80%xVDD_PADS	-	-	V
Tr/Tf (for 30 pF load)	-	-	2	ns
Input and Tristate				
With strong pull-up	3.5	4.7	6.0	kΩ
With strong pull-down	3.5	4.7	6.0	kΩ
With weak pull-up	8	40	50	uA
With weak pull-down	10	40	50	uA
CI input capacitance	-	5	-	pF

NOTE Range applicable for VDD\_PADS between 1.8 V and 3.3 V when measured as a short circuit.

#### AIO

Input/Output Voltage Levels	Min	Typ	Max	Unit
Input voltage	0	-	VDD_AUX	V

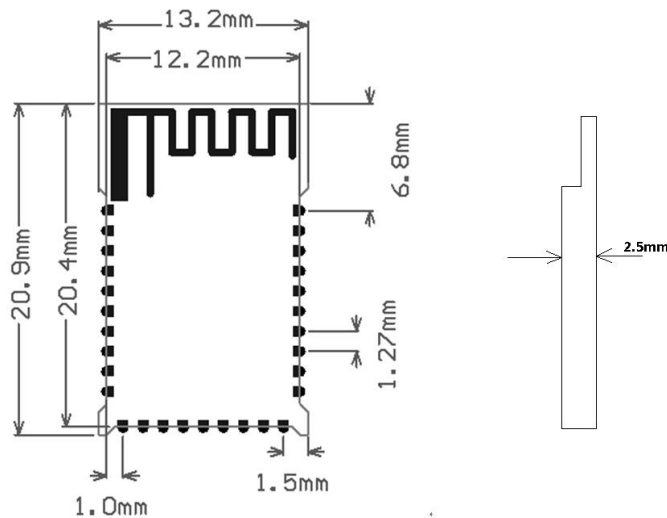
#### 10-bit Aux ADC

10-bit Aux ADC	Min	Typ	Max	Unit
Resolution	-	-	10	Bits
Input voltage range(1)	0	-	VDD_AUX	V
Input bandwidth	-	100	-	kHz
Conversion time	1.38	1.68	4.14	us
Sample rate(2)	-	-	700	Samples/s

NOTE :1. LSB size = VDD\_AUX/1023.

2. The 10-bit Aux ADC is accessed through the firmware API. The sample rate given is achieved as part of this function.

## 4. Module Mechanical Dimension



## 5. HET UART pass through Firmware functions Operating Instructions

### 5.1 Transparent Mode and Command Mode

Module can operate in transparent mode and command mode.

**Transparent mode:** In this mode, users don't need to think about the complex Bluetooth protocol application, you can complete the development of products quickly. In this mode the module will automatically transmit the received UART data to the bonding mobile device through Bluetooth. also it will automatically transmit the received Bluetooth data to the MCU through UART. For product development, the user is responsible for the main MCU firmware design and intelligent mobile device APP design.

**Command Mode:** In this mode, the module can be controlled through specific serial AT commands, for details please refer “**H&T BLE Modules Programming Guide**”

### 5.2 Switch between two modes

The module can be switched between 2 modes through PIO7, when PIO7 is low, Command Mode is enabled, when PIO7 is high, Transparent Mode is enabled.

### 5.3 Sleep and Wake

Before sending serial data to the module through UART, the PIO1 need to be pulled down to

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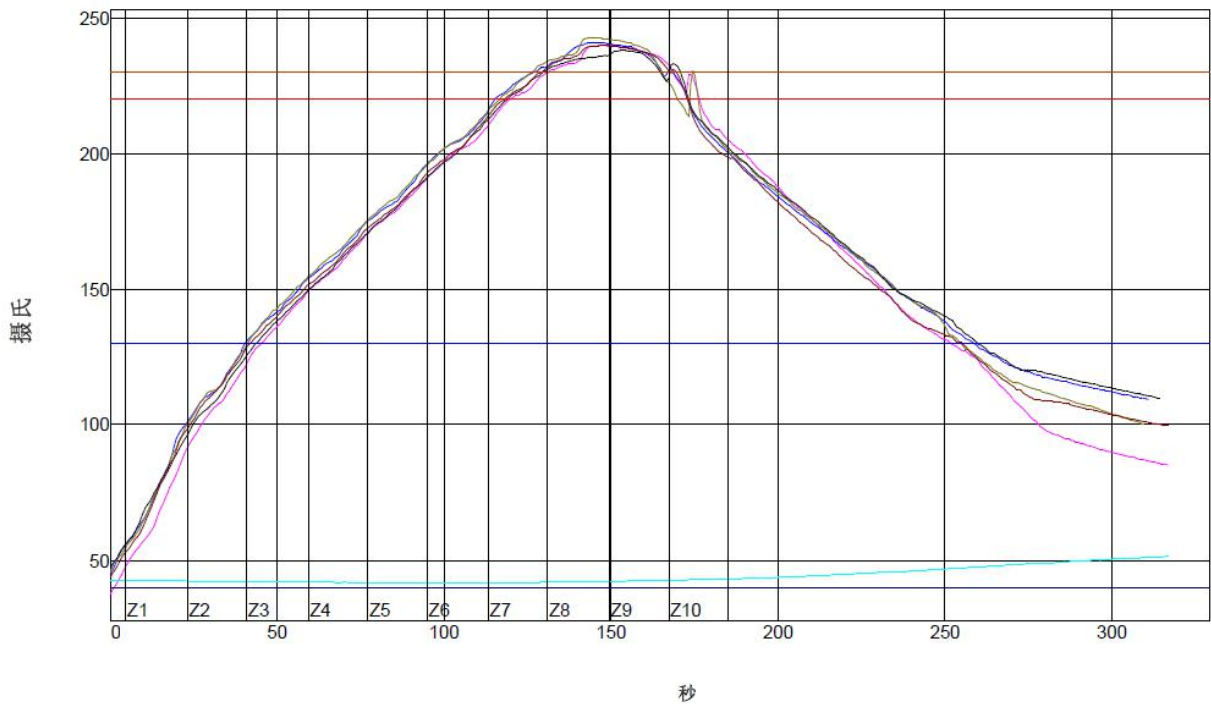


wake up the module. When the user’s MCU monitors the module PIO12 has been pulled down, this means module has been successfully woken up, then the data can be sent at this time. during data transmission, PIO1 must remain low, after data transmission is completed, the PIO1 pin need to be pulled up, then the module goes to sleep again to reduce power consumption.

Once the module receives data from another end BLE device, the data will be automatically forwarded to the MCU, also the PIO10 pin will be pulled low to inform the MCU to receive data. During data transmission PIO10 pin will remain low. After all serial data transmission is completed, PIO10 pin will be pulled up.

## 6. Temperature Profile of Reflow Soldering Process

Setpoints (摄氏)										
温区	1	2	3	4	5	6	7	8	9	10
上温区	140	160	180	190	210	235	265	270	245	140
下温区	140	160	180	190	210	235	265	270	245	
Conveyor Speed (公分/分): 85.00										



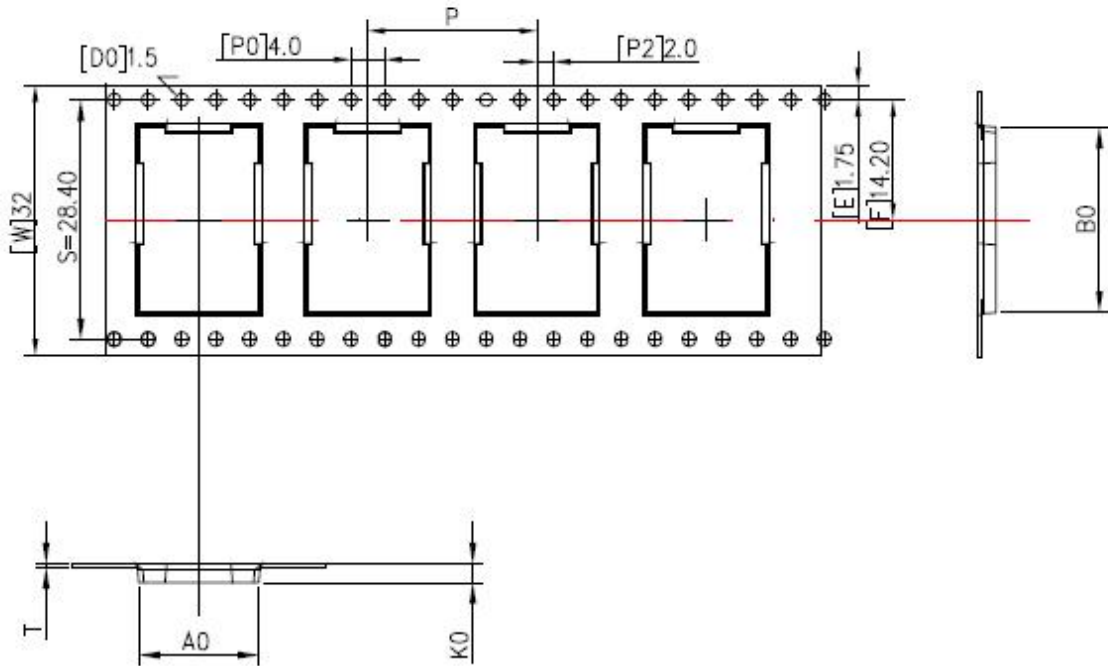
## 7. Module Package Information

This module can be packaged with tape or tray after production, since this is ESD sensitive device, precautions should be used when handling the device in order to prevent permanent damage.

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damage.

Below is the dimension of the packaging tape and reel:



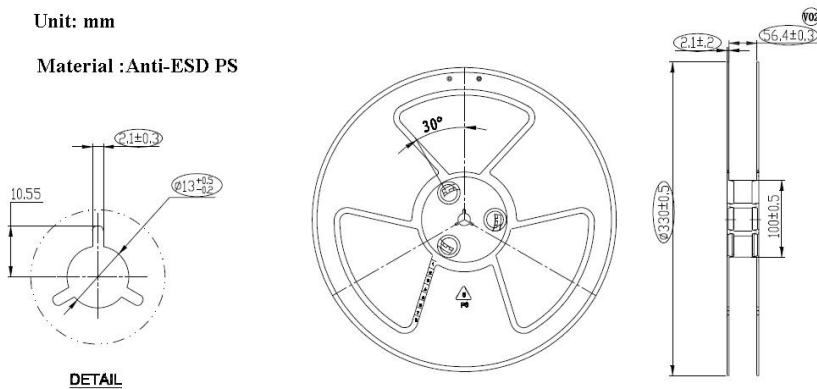
**Remayk:**

1. 10 sprocket hole pitch cumulative tolerance +/-0.2mm
2. Carrier camber is within 100 in 100mm
3. All Dimensions meet EIA-481-B requirements
4. Material: Conductive Black PS, Thickness: 0.30+/-0.05mm
5. Reel: 13" Meter: 24.6M Racking Qty: 1200PCS, Voidance 30PCS

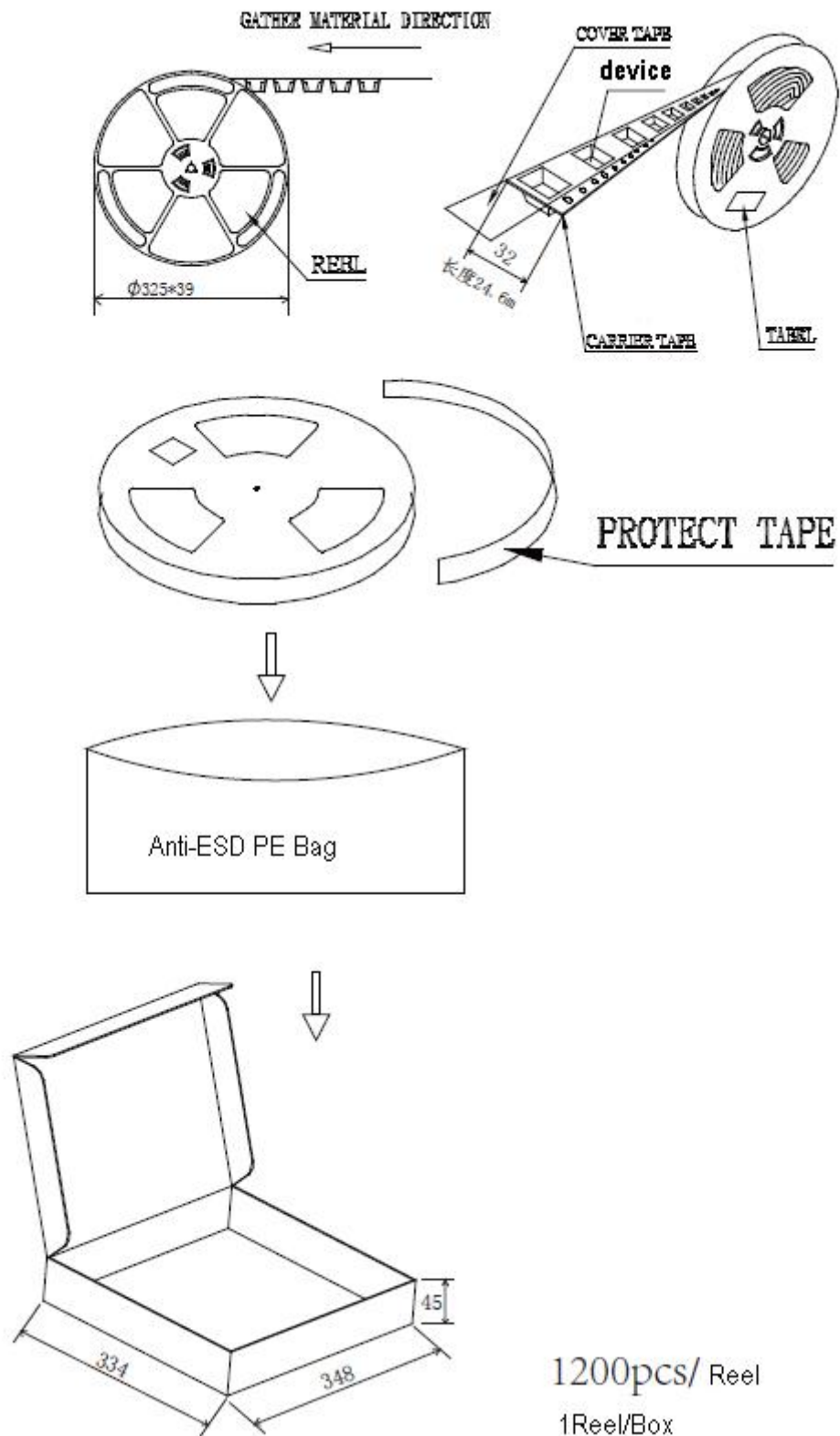
W	32.00 <sup>+0.30</sup> / <sub>-0.30</sub>	T	0.30±0.05	P <sub>0</sub>	4.00±0.10	A <sub>0</sub>	13.80±0.10	A1	
		F	14.2±0.10	Ø2	2.00±0.10	B <sub>0</sub>	21.50±0.10	B1	
E	1.75±0.10	P	20.00±0.10	D <sub>0</sub>	Ø1.50 <sup>+0.10</sup> / <sub>0</sub>	K <sub>0</sub>	2.30±0.10	K1	

Unit: mm

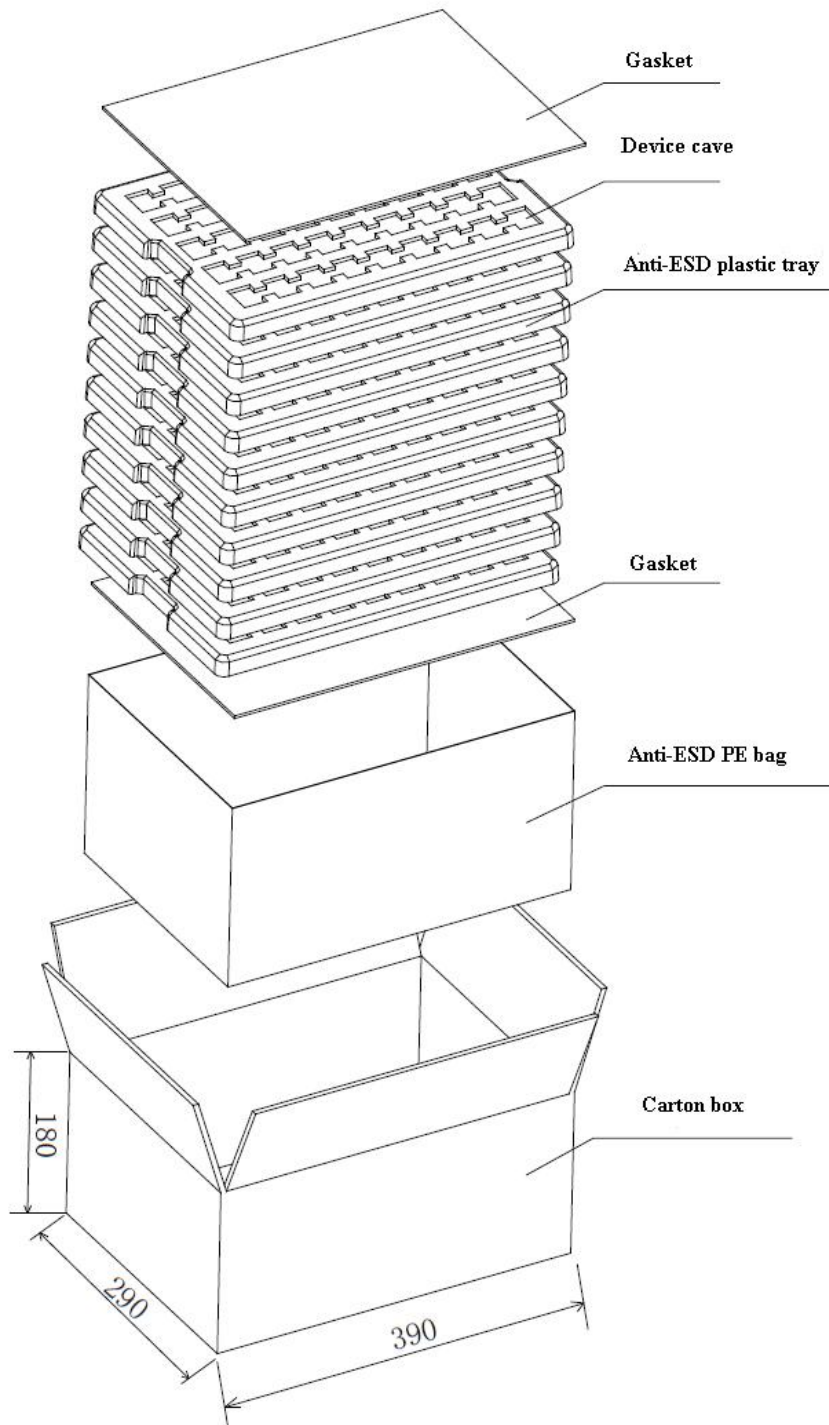
Material : Anti-ESD PS



Below is the tape packaging process:



Below is the tray packaging process:



**NOTE: 80PCS/Tray  
10 Trays/Box**

Below is the carton label drawing.

 	
<b>Customer:</b>	XXXXXXXXXX
<b>Customer P/N:</b>	XXXXXXXXXX
<b>Product Name:</b>	BLE Module
<b>Model:</b>	HET-BC1024
<b>FCC ID:</b>	2ANR8-HET-BC1024
<b>PO Number:</b>	XXXXXXXXXX
<b>Quantity:</b>	XXX PCS
<b>Carton Number :</b>	XX
<b>Production date:</b>	XXXX/XX/XX
<b>Shenzhen H&amp;T Intelligent Control Co.,Ltd</b>	

## **FCC Statement**

15.19

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.

15.21

Note: The grantee is not responsible for any changes or modifications not expressly approved by the party responsible for compliance. Such modifications could void the user's authority to operate the equipment.

15.105(b)

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

## **RF Exposure Statement**

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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 5 mm between the radiator and your body.

#### 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: 2ANR8-HET-BC1024" . 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."

This Module is full modular approval, it is limited to OEM installation ONLY.