

BT5GMD-B47P

BT5.1 Compliant Module



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1. Device Overview

1.1 Features

- Programmable key-scanning interface, up to 8 x 20 matrix
- Triaxial quadrature signal decoder
- Shutter control for 3D glasses
- Infrared modulator
- Adaptive frequency hopping
- Fast connect or re-connect
- Excellent receiver sensitivity
- Support Bluetooth HID profile V1.0 and V1.1
- Support Device ID Profile V1.3
- Firmware over-the-air (OTA) upgrade
- Bluetooth specification V5.1 compliant

1.2 Applications

- Wireless keyboard
- Wireless mouse
- Joystick
- 3D glasses

1.3 Descriptions

The BT5GMD-B47P module is built around Cypress® CYW20730A2, a Cortex™ M3 core, Bluetooth V5.1 compliant SoC. It carries the broadly adopted Bluetooth stack inherited from Broadcom (Cypress acquired Broadcom IoT business in July 2016). This module's outstanding features include low power consumption, robust reliability, and the best interoperability with different iOS, Android, and Windows devices. The BT5GMD-B47P is a market proven solution for the Bluetooth keyboard, mouse and other HID for PC, tablet, and smartphones.

This module has a 2.4 GHz PCB antenna built in, which makes it simple to implement on a product board. This module can be pre-certified with Bluetooth SIG to ease customers' effort to certify their products.

CYW20730 runs Bluetooth stack in its 320KB ROM, and the application code in its 60KB RAM. The BT5GMD-B47P provides a rich set of peripheral interfaces including SPI, I2C, UART, infrared transmitting and receiving, GPIOs for matrix scanning.

The internal button scanner of the module automatically scans the button press and pop up actions and stores them in the cache register without the need for micro-processing intervention. The button scanning unit is controlled by the state machine and includes three states, namely, idle, scan, and scan end.

The module also includes a mouse quadrature signal decoder for automatically sampling the two orthogonal signals generated by a raster mechanical mouse device. The decoder can also work with an external analog quadrature signal IC and a scroll wheel sampling.

The BT5GMD-B47P module provides a 2-wire BSC (Broadcom Serial Communications) interface that can be used to obtain configuration information from an external EEPROM, or connects peripherals for cursor control such as a trackball, a touchpad, or a motion tracking IC. The BSC interface is compatible with I2C slave devices and can support clock speed up to 400 kHz. The BSC does not support multi-host devices. Neither does it support accessing the master or slave in the wait state.

This module has two independent SPI interfaces. One of them is the host interface, and the other can be either the master or the slave. Each interface has a 16-byte transmitter buffer and a 16-byte receiver buffer. As a host, it supports 1.8V or 3.3V IO voltage slave, and vice versa.

The module has built-in processing logics for supporting 3D glasses. It can synchronize 3D signals on TV, PC and other image devices, and drive the charging pump and shutter lens on and off. These logics can run while keeping the rest of the chip in sleep mode, so as to greatly reduce power consumption.

1.4 Functional Block Diagram

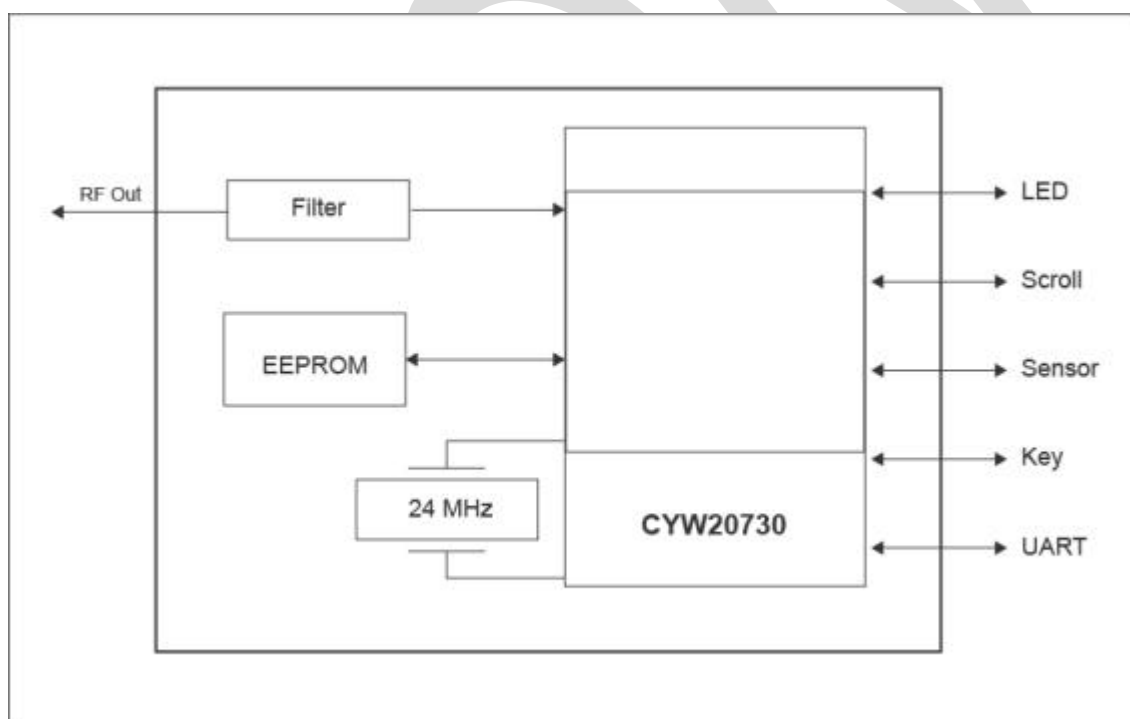


Figure 1. Block Diagram of BT5GMD-B47P

2. Pin Configuration and Functions

2.1 Module Pin Diagram

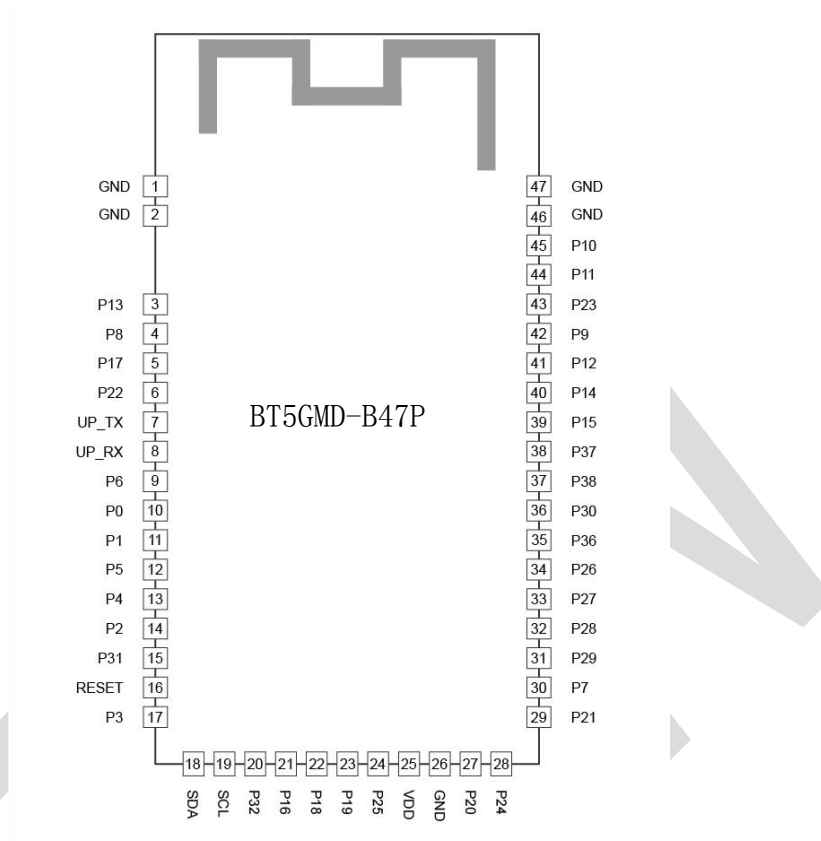


Figure 2. Pin Diagram of BT5GMD-B47P

2.2 Pin Functions

Pin	Name	Default Direction	POR State	Description
1, 2, 26 46, 47	GND	Input	N/A	Ground
25	VDD	Input	N/A	Power supply
16	RESET	Input	PU	Active-low system reset with open-drain output & internal pull up
18	SDA	I/O	PU	Data signal for an extern I2C device
19	SCL	I/O	PU	Clock signal for an external I2C device
7	UP_TX	Output	PU	UART serial output-serial data output for the HCI UART interface
8	UP_RX	Input	PD	UART serial input-serial data output for the HCI UART interface
10	P0	Input	Floating	GPIO:P0, keyboard scan input(row):KSI0

11	P1	Input	Floating	GPIO:P1, keyboard scan input(row):KSI1
14	P2	Input	Floating	GPIO:P2, keyboard scan input(row):KSI2
17	P3	Input	Floating	GPIO:P3, keyboard scan input(row):KSI3
13	P4	Input	Floating	GPIO:P4, keyboard scan input(row):KSI4
12	P5	Input	Floating	GPIO:P5, keyboard scan input(row):KSI5
9	P6	Input	Floating	GPIO:P6, keyboard scan input(row):KSI6
30	P7	Input	Floating	GPIO:P7, keyboard scan input(row):KSI7
4	P8	Input	Floating	GPIO:P8, keyboard scan output(column):KSO0
42	P9	Input	Floating	GPIO:P9, keyboard scan output(column):KSO1
45	P10	Input	Floating	GPIO:P10, keyboard scan output(column):KSO2
44	P11	Input	Floating	GPIO:P11, keyboard scan output(column):KSO3
41	P12	Input	Floating	GPIO:P12, keyboard scan output(column):KSO4
3	P13	Input	Floating	GPIO:P13, keyboard scan output(column):KSO5
40	P14	Input	Floating	GPIO:P14, keyboard scan output(column):KSO6
39	P15	Input	Floating	GPIO:P15, keyboard scan output(column):KSO7
21	P16	Input	Floating	GPIO:P16, keyboard scan output(column):KSO8
5	P17	Input	Floating	GPIO:P17, keyboard scan output(column):KSO9
22	P18	Input	Floating	GPIO:P18, keyboard scan output(column):KSO10
23	P19	Input	Floating	GPIO:P19, keyboard scan output(column):KSO11
27	P20	Input	Floating	GPIO:P20, keyboard scan output(column):KSO12
29	P21	Input	Floating	GPIO:P21, keyboard scan output(column):KSO13
6	P22	Input	Floating	GPIO:P22, keyboard scan output(column):KSO14
43	P23	Input	Floating	GPIO:P23, keyboard scan output(column):KSO15
28	P24	Input	Floating	GPIO:P24, keyboard scan output(column):KSO16
24	P25	Input	Floating	GPIO:P25, keyboard scan output(column):KSO17
34	P26	Input	Floating	GPIO:P26, Current 16 mA @3.3 V
33	P27	Input	Floating	GPIO:P27, Current 16 mA @3.3 V
32	P28	Input	Floating	GPIO:P28, Current 16 mA @3.3 V
31	P29	Input	Floating	GPIO:P29, Current 16 mA @3.3 V
36	P30	Input	Floating	GPIO:P30, A/D converter input, default as the battery capacity detection
15	P31	Input	Floating	GPIO:P31, A/D converter input
20	P32	Input	PU	GPIO:P32, Default as the EEPROM write protect pin
35	P36	Input	Floating	GPIO:P36, SPI CLK (Master mode)
38	P37	Input	Floating	GPIO:P37, SPI CS (Master mode)
37	P38	Input	Floating	GPIO:P38, SPI MOSI (Master mode)

3. Specifications

3.1 Absolute Maximum Rating

Warning: This module contains static-sensitive components that can be easily damaged if not handled.

The following are suggestions for preventing damage to the module caused by electrostatic discharge:

- Wear protective gloves.
- Assemble and test in the ESD protected working area.
- Pack in an ESD shielded boxes.
- Maintain all ESD protection devices in good status.

Model	Tolerance
Human Body Mode (HBM)	2000 V
Charged Device Mode (CDM)	400 V
Machine Mode (MM)	150 V

3.2 Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	V
Power Section					
DC Supply Voltage		1.75	-	3.6	V
Digital Level					
Input Low Voltage	V_{IL}	-	-	0.4	A
Input High Voltage	V_{IH}	$0.75 \times V_{DD}$	-		°C
Output Low Voltage	V_{OL}			0.4	
Output High Voltage	V_{OH}	$V_{DDO}-0.4$			
Temperature					
Operating Temperature		0	25	70	°C
Storage Temperature		-40	25	85	°C

3.3 RF Characteristics

Parameters	Mode and Condition	Min.	Typ.	Max.	Unit
Frequency Range	-	2402	-	2480	MHz
RX Sensitivity (Standard)	GFSK, 0.1%BER, 1 Mbps	-	-88	-	dBm
RX Sensitivity (Low Current)	Average current when the device is in the receive state, 100% utilization of available slots.	-	-84	-	dBm
Output Power	-	-6	-	4	dBm
Power Variation	-	-	2	-	dB

3.4 Power Consumption Summary

Operation Mode	Conditions	Min.	Typ.	Max.	Unit
Receive	Receiver and baseband are both operating, 100% ON.	-	26.6	-	mA
Transmit	Transmitter and baseband are both operating, 100% On.	-	24 @ 2 dBm 19 @ 0 dBm	-	mA
DM1	Average current when the device is in the transmit state, 100% utilization of available slots.	-	15.2	-	mA
DH1	Average current when the device is in the receiver state, 100% utilization of available slots.	-	16.67	-	mA
Sleep	Internal LPO is in use.	-	28.4	-	μA
HIDOFF	-	-	1.5	-	μA
Sniff Mode 11.25 ms	Slave	-	2.8	-	mA
Sniff Mode 22.5 ms	Slave	-	1.27	-	mA
Sniff Mode 60 ms	Slave	-	750	-	μA
Sniff Mode 100 ms	Slave	-	500	-	μA
Sniff Mode 495 ms	Slave	-	230	-	μA

4. Application, Implementation, and Layout

4.1 Application Diagram

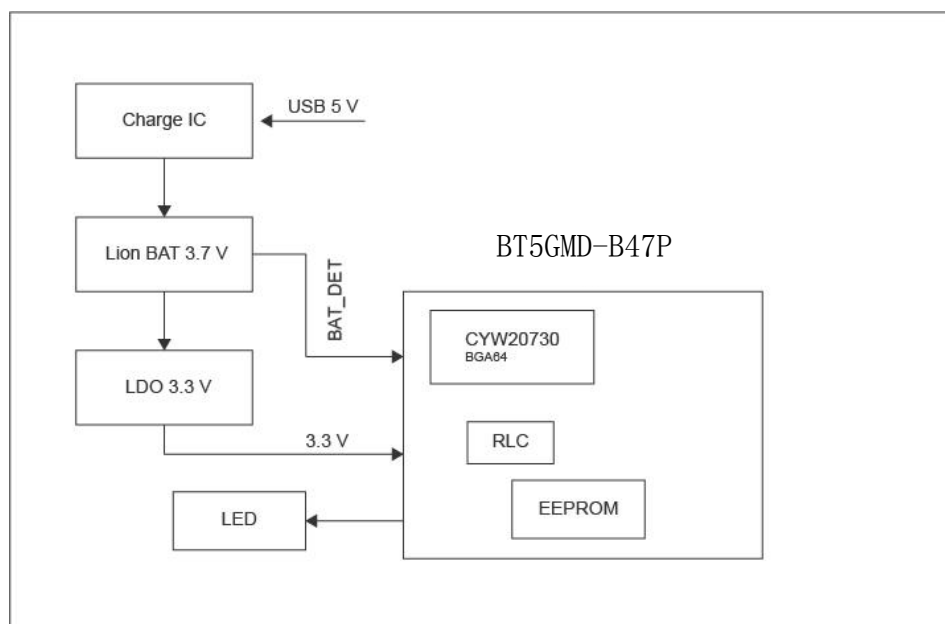


Figure 3. Application Block Diagram of BT5GMD-B47P

4.2 Typical Application Circuit

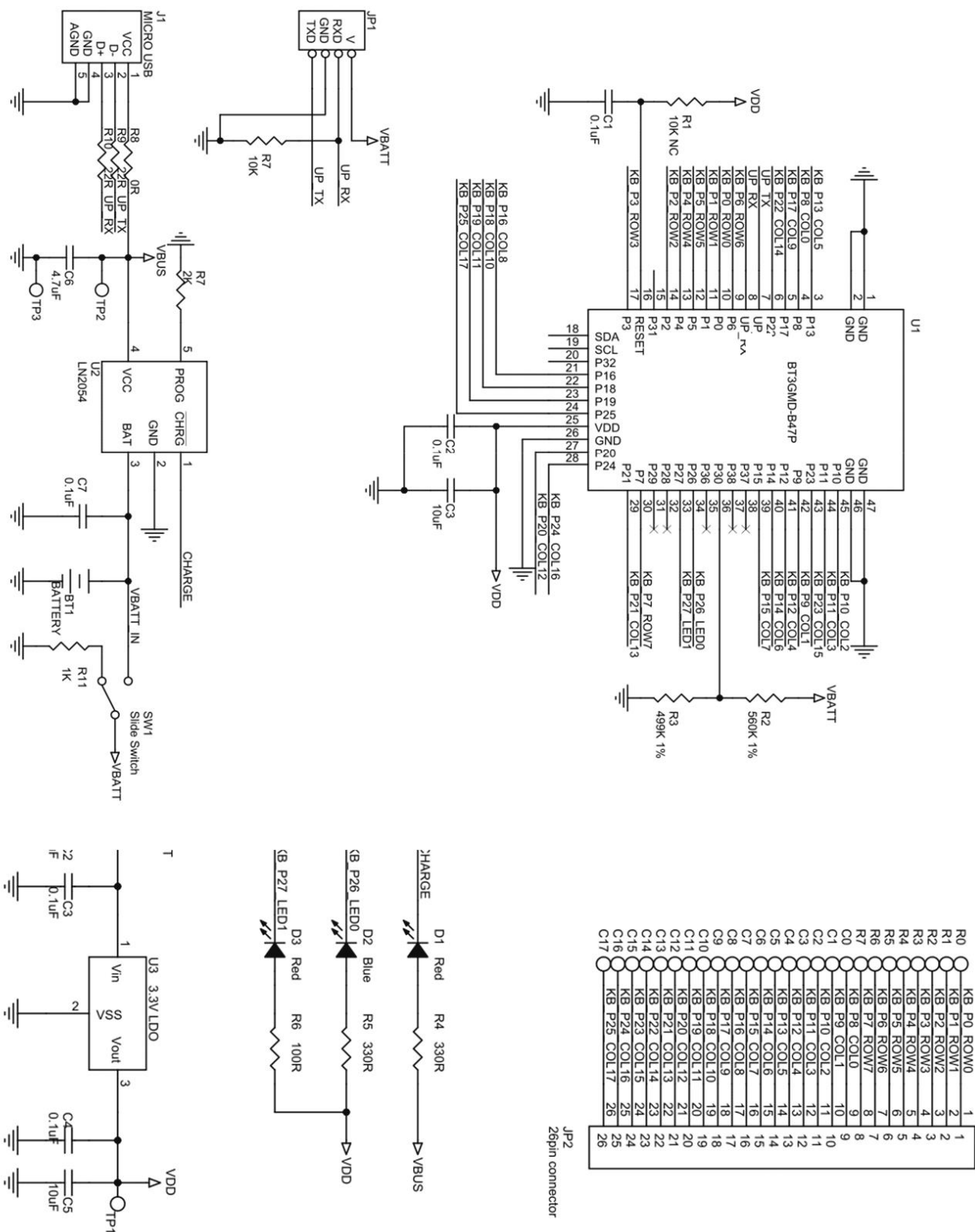


Figure 4. Typical Application Circuit of BT5GMD-B47P

4.3 Layout Guideline

- (1) Keep RF traces with 50 Ohm impedance.
- (2) Ensure enough clearance area underneath the antenna.

5. Mechanical and Package

5.1 Recommended PCB Packaging

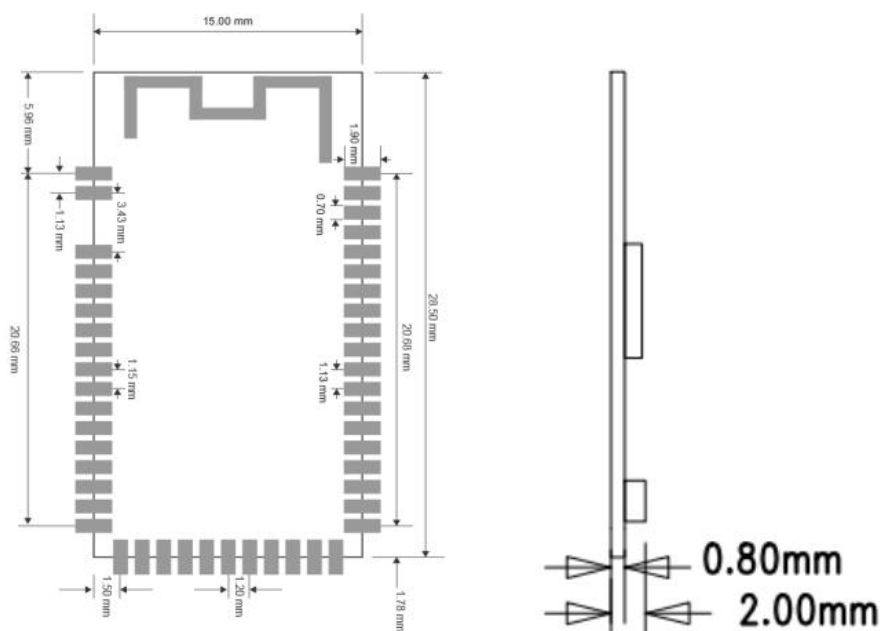


Figure 5. Recommended PCB Packaging of BT5GMD-B47P

5.2 Package Information

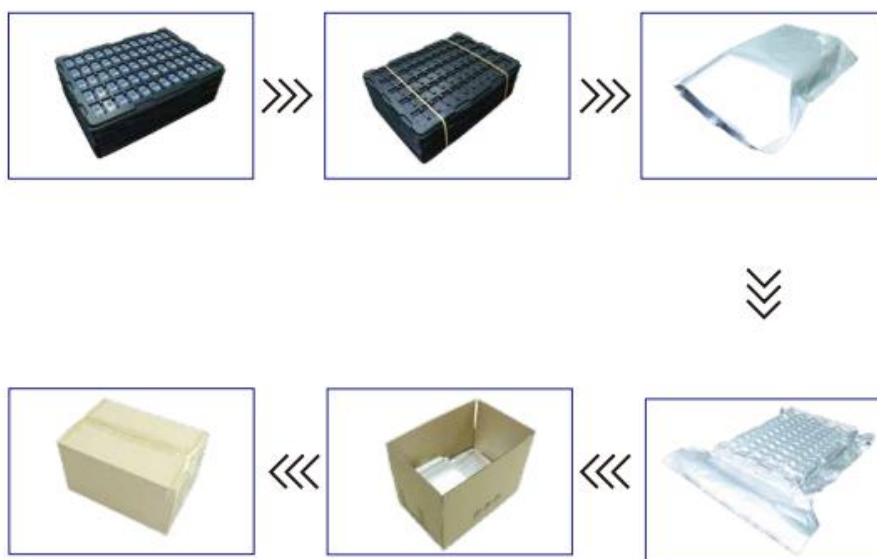


Figure 6. Brief Packaging Process of BT5GMD-B47P Modules

6. Thermal Reflow

Referred to IPC/JEDEC standard.

Peak temperature: <250°C

Number of times: ≤2

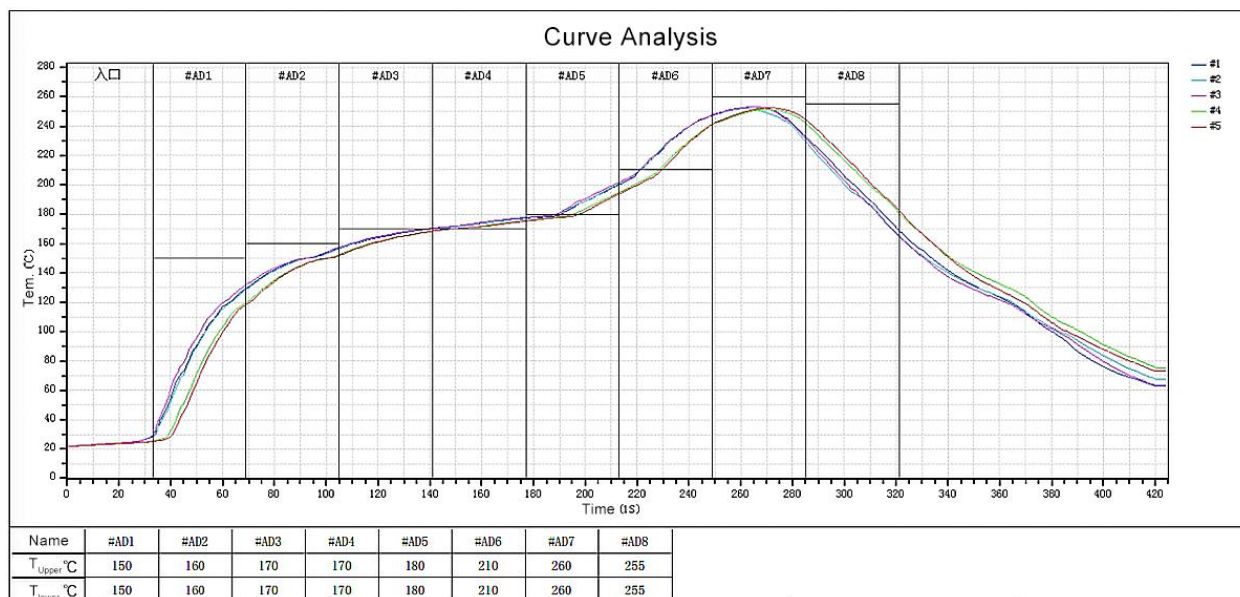


Figure 7. Recommended Reflow for Lead Free Solder

Note: The module is recommended not to go through reflow oven twice;

7. Ordering Information

TBD

8. Revision History

Version	Change Content	Reviser	Date
V0.1	Initial version	Bob Li	2019.07.09
V2.0	Edited the English Version	Bob Li	2020.03.30
V2.1	Modified some parameter	Bob Li	2020.06.15