

CB1730-Q31P

Bluetooth v5.1 Module



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1 Device Overview

1.1 Features

- Hardware implementation of programmable matrix scanning circuit
- Triaxial quadrature signal decoder
- 3D glasses shutter control
- Infrared signal modulation
- Adaptive frequency hopping
- Excellent sensitivity
- Enhanced control
- Bluetooth HID v1.0 and Bluetooth HID v1.1 Profiles
- Device ID Profile v1.3
- 10-bit ADC

1.2 Applications

- Bluetooth mouse
- Remote control
- Game Controller
- 3D glasses

1.3 Description

The CB1730-Q31P module is built around CYW20730 A2 chipset and was newly certified with the Bluetooth v5.1 specification. It used to be compliant with Bluetooth v3.0 specification when using BCM20730 or CYW20730 A1 chipset.

This module is highly suitable in terms of performance and cost effectiveness for Bluetooth mice and other Bluetooth human-computer interaction applications. The key features include low power consumption, high stability, the best-in-class interoperability, and fast connection and re-connection.

The main components of this module include the CYW20730 BT SoC, a 24 MHz crystal, and an EEPROM. The module connects an external antenna via an RF pin. CYW20730 has integrated an ARM® Cortex™-M3 core with up to 48 MHz main frequency, a separate baseband processor, and a 2.4 GHz radio transceiver.

1.4 Functional Block Diagram

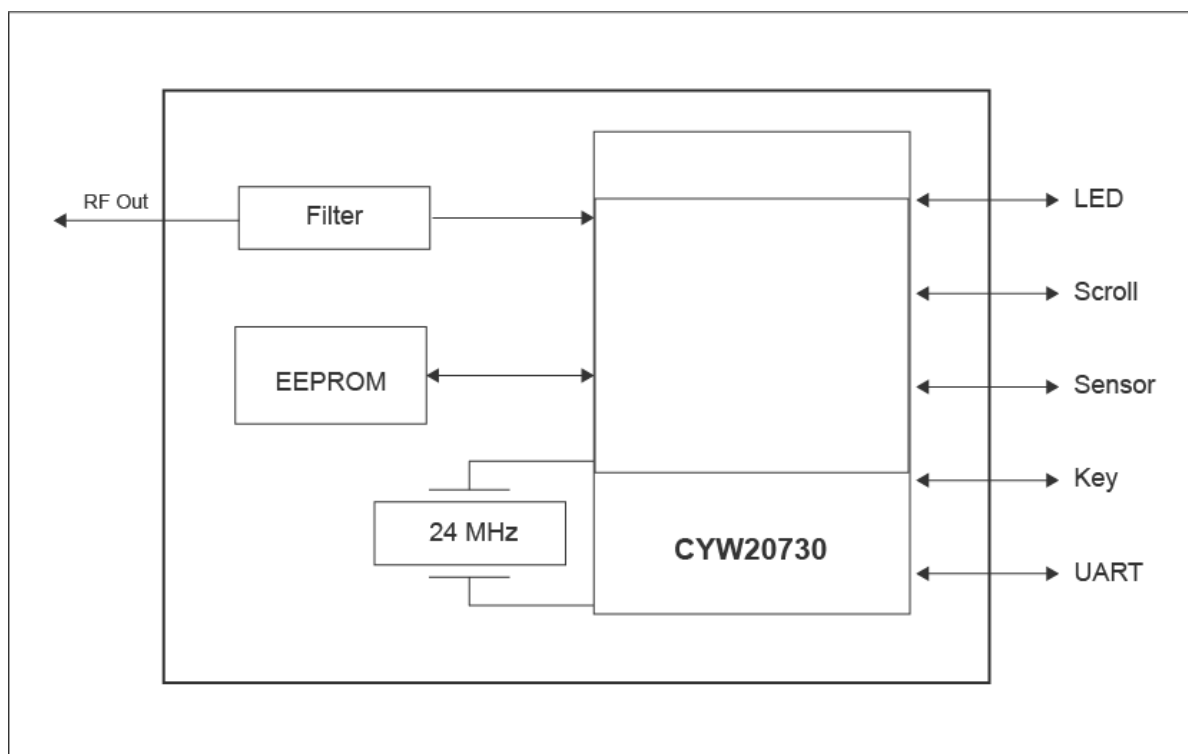


Figure 1. Block Diagram of CB1730-Q31P

The CB1730-Q31P module runs the application code above the HCI layer with a rich set of peripheral interfaces including SPI, I2C, UART and the circuitry for programmable matrix scanning.

The integrated on-chip button scanner automatically scans for button press and pop-up without the need for micro-processing intervention and stores it in the cache register. 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 signal decoder for automatically sampling two orthogonal signals generated by the raster mechanical mouse device, and the decoder can also work with an external analog quadrature signal IC to process a scroll wheel's sampling.

The CB1730-Q31P module provides a 2-wire BSC (Broadcom Serial Communications) interface that can be used to retrieve configuration information from an external EEPROM or to communicate with peripherals such as a trackball, a touchpad, or a motion tracking IC for cursor control. The BSC interface is compatible with I2C slave devices and supports 400 kHz clock. The BSC does not support multi-host devices and does not support access to the master or slave in the wait state.

The CB1730-Q31P module has two independent SPI interfaces. One of them is the host interface, and the other can be the master or the slave. Each interface has a 16-byte transmit buffer and a 16-byte receive buffer. As a host, it supports 1.8 V or 3.3 V SPI slaves; as a slave, it supports 1.8V and 3.3V SPI masters.

The module has built-in processing logic for supporting 3D glasses, which can synchronize 3D signals on image devices such like TVs, and drive the charge pump and shutter lenses on and off. This logic runs with the rest of the chip in sleep mode, which greatly reduces power consumption.

2 Pin Configuration and Functions

2.1 Module Pin Diagram

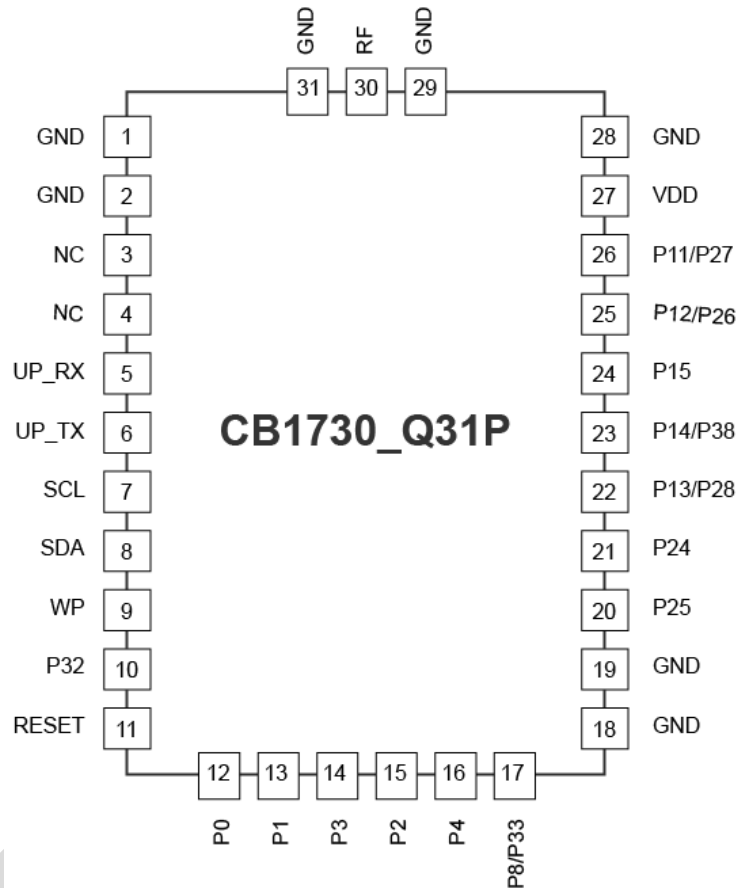


Figure 2. Pin Diagram of CB1730-Q31P

2.2 Pin Functions

Table 1. Pin Attributes of CB1730_Q31P

| Pin | Name | Default Direction | POR State | Description |
|--------------------|-------|-------------------|-----------|--|
| 1,2,18,19,28,29,31 | GND | | | Ground |
| 3,4 | NC | | | Not Connected |
| 5 | UP_RX | Input | | UART serial input: Serial data input for the HCI UART interface. |
| 6 | UP_TX | Output | PU | UART serial output: Serial data output for the HCI UART interface. |
| 7 | SCL | Output | PU | Clock signal for an external I2C device |
| 8 | SDA | Input/Output | PU | Data signal for an external I2C device |
| 9 | WP | Input | PU | EEPROM write protect |
| 10 | P32 | Input | Floating | GPIO: P32, primary use for EEPROM write protect control |

| | | | | |
|----|---------|-------|----------|--|
| 11 | RESET | Input | PU | Active-low system reset with open-drain output and internal pull-up resistor. |
| 12 | P0 | Input | Floating | GPIO: P0, Keyboard scan input (row): KSI0 |
| 13 | P1 | Input | Floating | GPIO: P1, Keyboard scan input (row): KSI1 |
| 14 | P3 | Input | Floating | GPIO: P3, Quadrature: QDX1 |
| 15 | P2 | Input | Floating | GPIO: P2, Quadrature: QDX0 |
| 16 | P4 | Input | Floating | GPIO: P4, SPI_2: MOSI (master and slave) |
| 17 | P8/P33 | Input | Floating | GPIO: P8, Keyboard scan output(column):KSO0 GPIO: P33, A/D converter input |
| 20 | P25 | Input | Floating | GPIO: P25, SPI MISO |
| 21 | P24 | Input | Floating | GPIO: P24, SPI clock |
| 22 | P13/P28 | Input | Floating | GPIO: P13, Keyboard scan output(column):KSO5 GPIO: P28, Quadrature signal control output QOC0 |
| 23 | P14/P38 | Input | Floating | GPIO: P14/P38, A/D converter input |
| 24 | P15 | Input | Floating | GPIO: P15, Motion |
| 25 | P12/P26 | Input | Floating | GPIO: P12, Keyboard scan output(column):KSO4 GPIO: P26, Current: 16mA |
| 26 | P11/P27 | Input | Floating | GPIO: P11, Keyboard scan output(column):KSO3 GPIO: P27, Current: 16mA |
| 27 | VDD | | | Power supply |
| 30 | RF | | | RF antenna port |
| 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

Caution: This module contains static-sensitive components that can be easily damaged if not handled properly. Precautions need to be taken to prevent potential damages.

Table 2. Absolute Maximum Rating

| Parameter | Specification | | | Unit |
|-------------------------------|---------------|------|-----------|------|
| | Min. | Typ. | Max. | |
| VDD | -0.3 | 3 | 3.8 | V |
| VIO | -0.3 | 3 | VDD + 0.3 | V |
| Storage Temperature | -40 | 25 | 85 | °C |
| Operating Ambient Temperature | -20 | 25 | 70 | °C |

Table 3. Electrostatic (ESD) Withstand Capability

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

3.2 Recommended Operating Conditions

Table 4. Power and Digital Levels

| 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 × VDD | - | | °C |
| Output Low Voltage | V _{OL} | | | 0.4 | |
| Output High Voltage | V _{OH} | VDDO-0.4 | | | |
| Temperature | | | | | |
| Operating Temperature | | -20 | | 70 | °C |
| Storage Temperature | | -40 | | 85 | °C |

3.3 RF Characteristics

Table 5. RF Parameters

| Parameters | Mode and Condition | Min. | Typ. | Max. | Unit |
|------------|--------------------|------|------|------|------|
|------------|--------------------|------|------|------|------|

| | | | | | |
|------------------------------|---|------|-----|------|-----|
| Frequency Range | - | 2402 | - | 2480 | dBm |
| 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 | kHz |
| Power Variation | - | - | 2 | - | kHz |

3.4 Power Consumption Summary

Table 6. Current Consumption Table

| Operation Mode | Conditions | Min. | Typ. | Max. | Unit |
|---------------------|--|------|--------------------------|------|------|
| Receiving | Receiver and baseband are both operating, 100% ON. | - | 26.6 | - | mA |
| Transmitting | 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

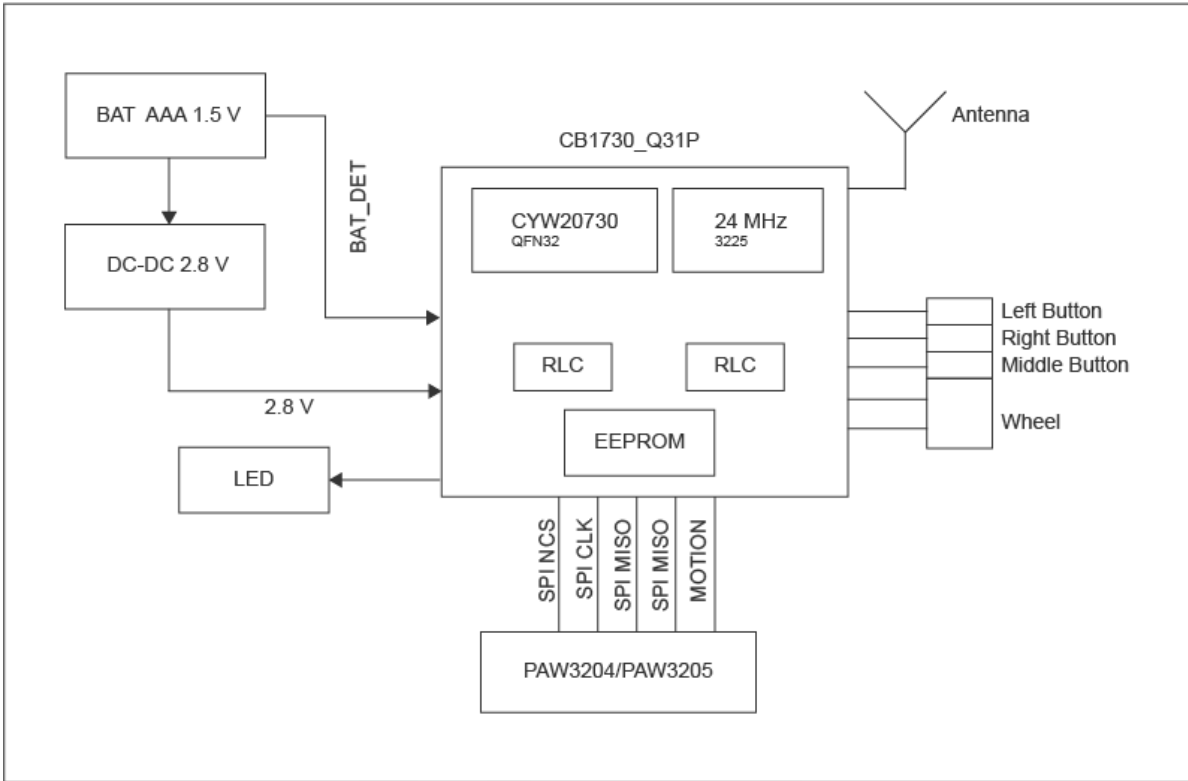


Figure 3. Module Application Block Diagram

4.2 Typical Application Circuit

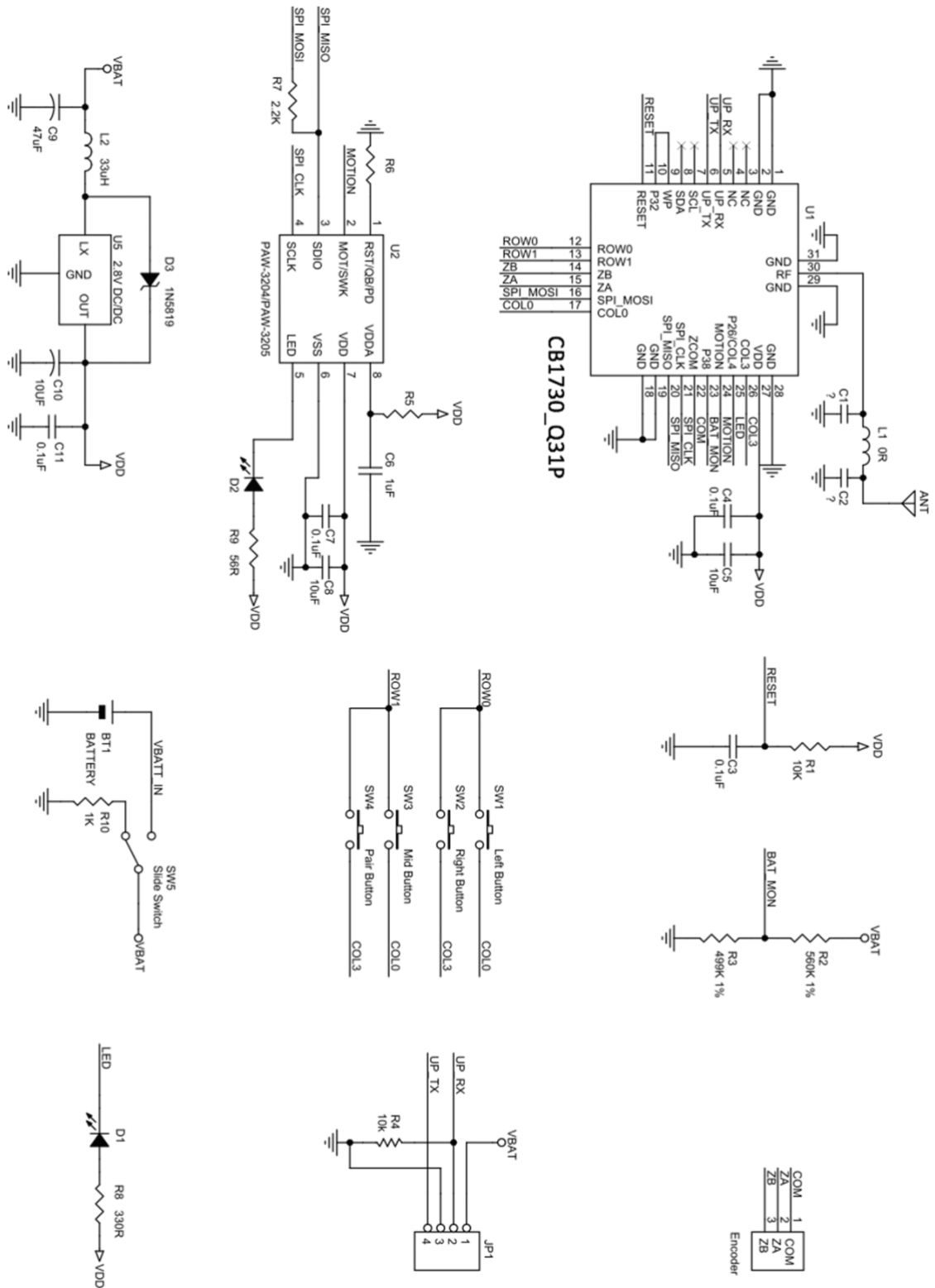


Figure 4. Bluetooth 3.0 Mouse Schematic Using the Original PAW3204/PAW3205 Optical Sensor

5 Mechanical and Package

5.1 Recommended PCB Footprint

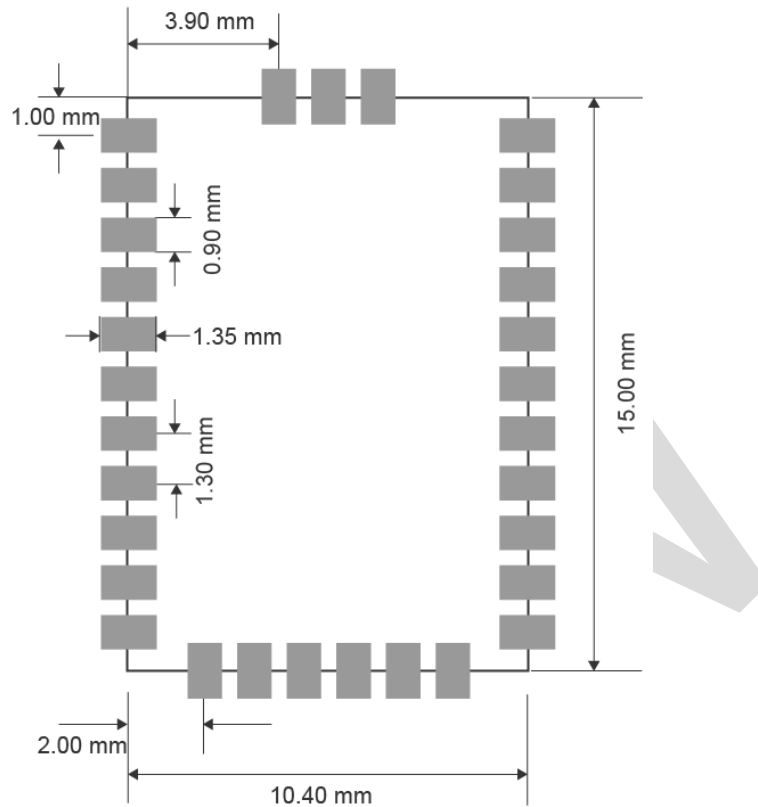


Figure 5. Recommended PCB Footprint of CB1730-Q31P

5.2 Package Information

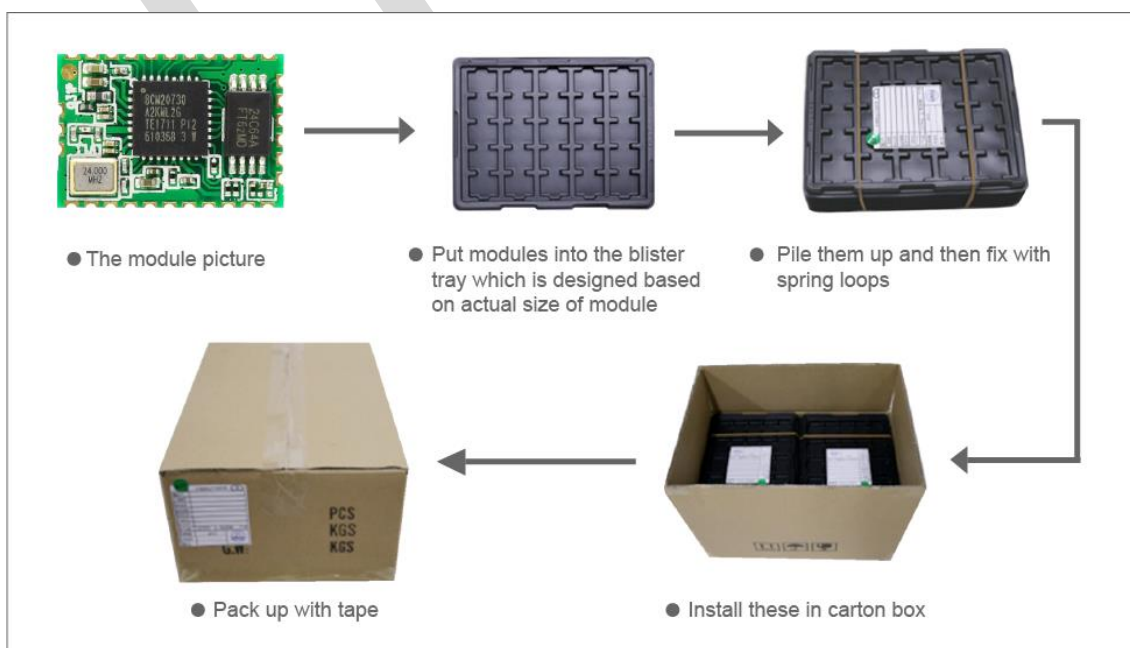


Figure 6. Packaging Information of CB1730-Q31P

6 Thermal Reflow

Referred to IPC/JEDEC standard.

Peak temperature: <250°C

Number of times: ≤2

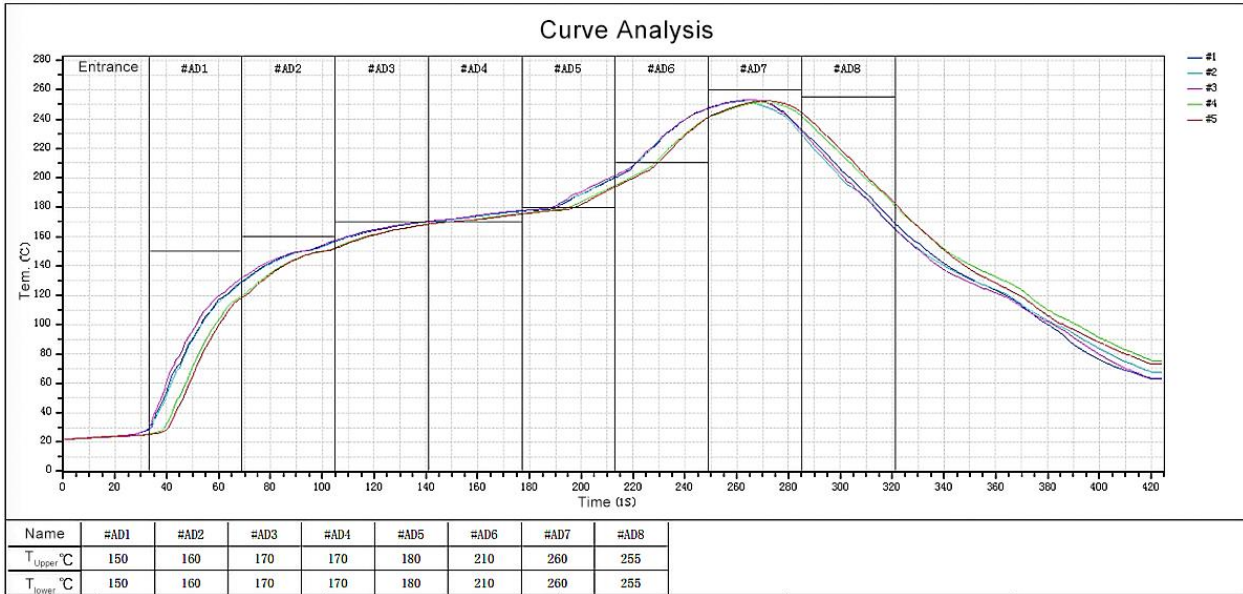


Figure 7. Recommended Reflow for Lead Free Solder

Note: Suggest the module can't be go through the reflow furnace again.

7 Revision History

| Date | Version No. | Description | Author |
|------------|-------------|---|--------|
| 2017.07.05 | V1.0 | The draft version | ZYW |
| 2018.08.01 | V1.1 | Modified the chip model from BCM20730 to CYW20730 | ZYW |
| 2019.07.09 | V1.2 | English version rewritten. | |