Bluetooth Low Energy (BLE)

Data Transmission Module

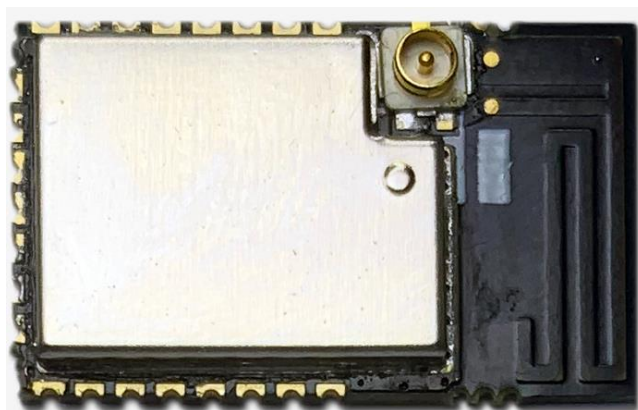# HM-BT210X

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1 Product Overview

HM-BT210X is a BLE data transmission module, based on a BLE 5.3 SoC chip (ARM Cortex-M33 32-bit processor, up to 80MHz working frequency), embedded with a 2.4GHz transceiver, equipped with an on-board PCB antenna and the external antenna is optional with connector. The module communicates with an external MCU via UART to quickly set up wireless connection and data transmission between BLE slave devices and BLE master devices (such as mobile phones and tablets). The external MCU has a low resource occupation and makes it easy for the developer to solve complex wireless communication challenges and accelerate time to market.

2 Module Features

- High-performance 32-bit ARM Cortex-M33® with DSP instruction and floating-point unit for efficient signal processing
- Supports BLE protocol 5.3 and Bluetooth Mesh;
- Up to 768KB of FLASH and 64KB of RAM;
- Support 20 general-purpose I/O ports, configurable mapping and flexible peripherals;
- Can be used as a BLE data transmission module or as an MCU alone;
- Support a universal serial interface UART communication;
- Support AT command to reset module, get MAC address;
- Support AT commands to adjust the BLE connection interval and control different forwarding rates (dynamic power consumption adjustment);
- Support AT commands to adjust the transmit power, modify the advertising interval, customize the advertising data, customize the device identification code, set the data delay (the preparation time for external MCU to receive data from serial port), modify the baud rate of serial port, modify the module name, and support data preservation when power is off;

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- The length of data packet from serial port is up to 240byte (the large packet will be segmented and assembled automatically);

- Support passkey setting, modification and recovery to prevent MITM (man-in-the-middle) attacks;

- Customize the advertising data including battery power, and custom device identification code (suitable for beacon applications);

- Support internal RTC real-time clock;

3 Electrical Characteristics

- Working Voltage: 1.71V-3.8V

- Working Temperature: -40℃～+85℃

- Modulation Mode: GFSK Gaussian Frequency Shift Keying

- Modulation Frequency: 2402MHz-2483.5MHz

- Maximum Transmit Power: +20dBm

- RX Current: 8.8mA @1Mbps GFSK

- TX Current:9.3mA@0dBm,33.8mA@10dBm,185mA@20dBm

- Low Power Consumption Mode Current: 50.9uA/MHz in Active Mode @80MHz

- Deep Sleep Mode Current: 5.0uA @EM2 Deep Sleep

- Receiving Sensitivity: -97.5dBm @1Mbps GFSK

4 Module Function Description

The module will start advertising automatically when it is powered. The mobile device running a specific APP can scan and connect to the module. When a connection has been established, the module can be operated through the BLE protocol. The external MCU can carry out wireless communication with the mobile device through the serial port of the module, and the external MCU can also send the

control commands to change the communication parameters through the serial port of the module.

The user's data package format is defined by the upper application. The mobile device can send data to the module through the APP, and then the data will be sent to the external MCU through the serial port of the module. After the module receives the data packet from the external MCU, it will automatically forward it to the connected mobile device. The user needs to complete the source code development of the external host MCU and APP running on the mobile device.
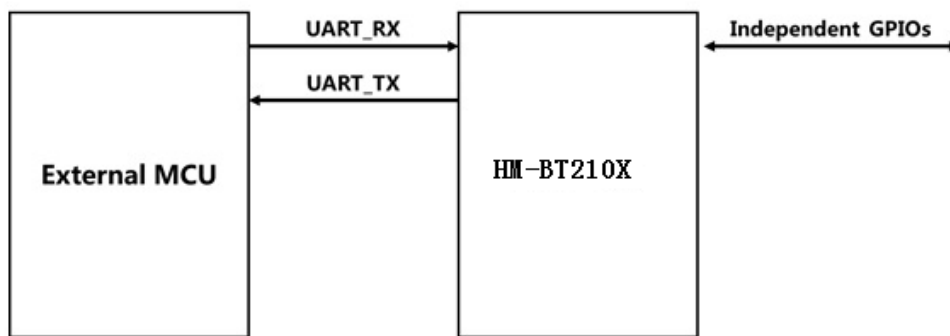
5   Application Diagram

Figure 5.1 Block diagram between HM-BT210X and External MCU
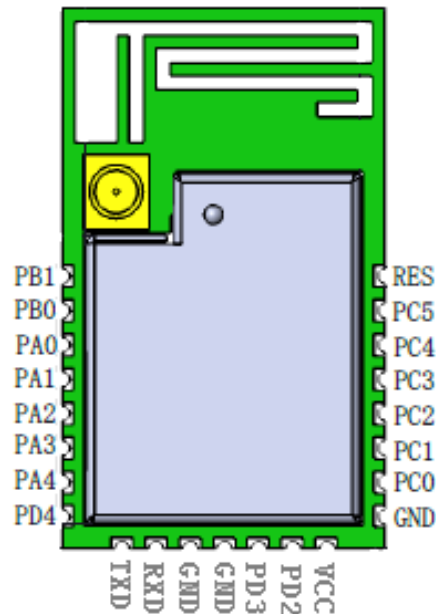
6 Module Pin

6.1 Module Pinout

Figure 6.1 Module Pinout (Top View)

6.2 Module Pin Definition

Pin No	Pin Name	Type	Description
1	PB1	I/O	General GPIO
2	PB0	I/O	General GPIO
3	PA0	I/O	General GPIO
4	PA1	I/O	SWCLK: Serial Clock for Debugging and Programming
5	PA2	I/O	SWDIO: Serial Data for Debugging and Programming
6	PA3	I/O	General GPIO
7	PA4	I/O	General GPIO

8	PD4	I/O	General GPIO
9	TXD	DO	PA5; UART TXD
10	RXD	DI	PA6; UART RXD
11	GND	DG	Power Ground
12	GND	DG	Power Ground
13	PD3	I/O	General GPIO
14	PD2	I/O	General GPIO
15	VCC	DV	Power Supply 3.3V
16	GND	DG	Power Ground
17	PC0	I/O	General GPIO
18	PC1	I/O	General GPIO
19	PC2	I/O	General GPIO
20	PC3	I/O	General GPIO
21	PC4	I/O	General GPIO
22	PC5	I/O	General GPIO
23	RES	I/O	Reset Pin; Active Low

Table 6-1 Module Pin Definition

7   Package Specifications
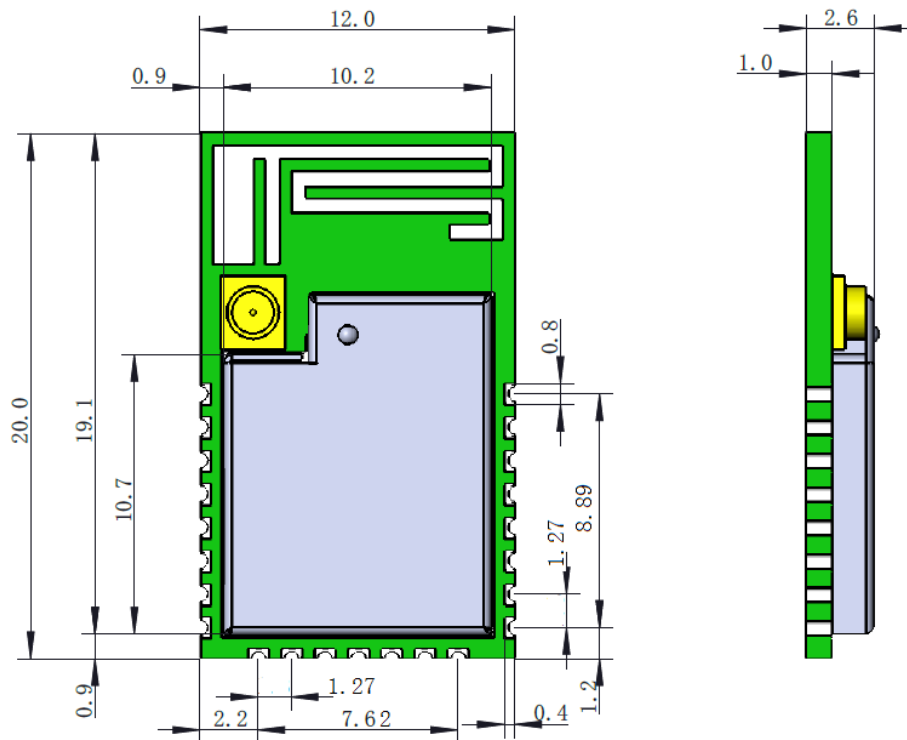
Figure 7.1 HM-BT210X Module Size (Unit: mm)

8   Ordering Information

Module	Feature List
HM-BT2101	CPU：80MHz FLASH：768KB RAM：64KB TX power：+10dBm
HM-BT2102	CPU：80MHz FLASH：768KB RAM：64KB TX power：+20dBm

9 Design Guidelines

9.1 Layout and Placement

For optimal performance of the HM-BT210X,

· Place the module aligned to the edge of the application PCB or leave the antenna area out of the application PCB, as illustrated in the figures below.

· Leave the antenna clearance area void of any traces, components, or copper on all layers of the application PCB if you are going to use the on-board chip antenna

· Connect all ground pads directly to a solid ground plane.

· Place the ground vias as close to the ground pads as possible.

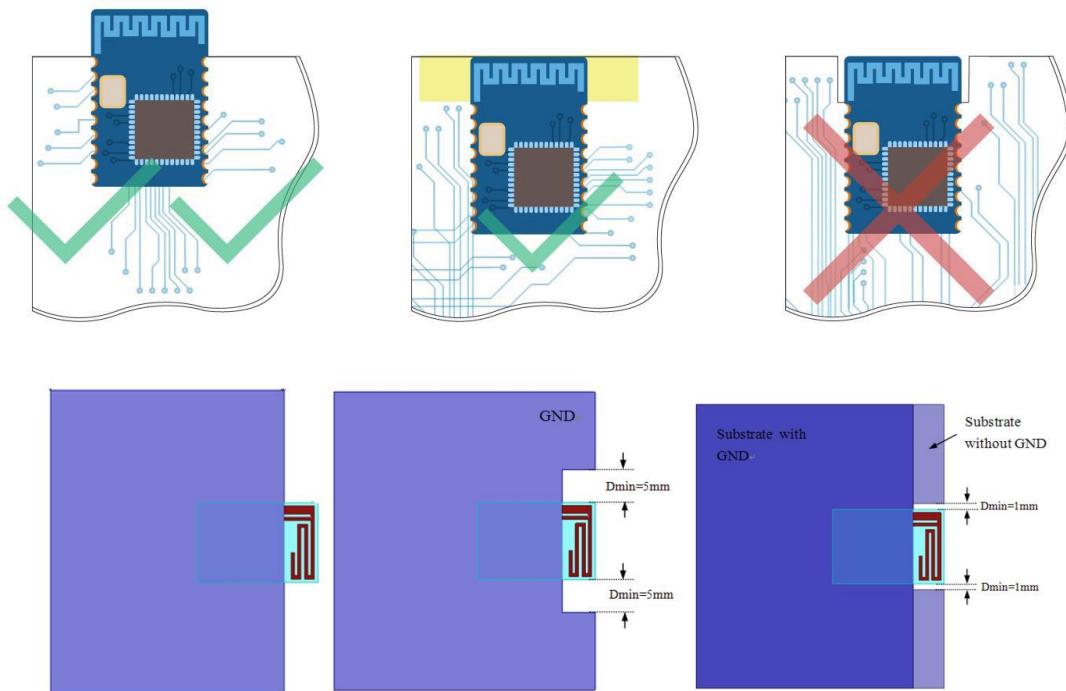· Do not place plastic or any other dielectric material in contact with the antenna.

Figure 9.1 Recommended Layout

10 Soldering Recommendations

It is recommended that final PCB assembly of the HM-BT210X follows the industry

standard as identified by the Institute for Printed Circuits (IPC). Sometimes a PCB must be reflowed multiple times based on the nature of the design and components used or limitations of the assembly line. During a single reflow cycle, every component is exposed to and stressed with high temperature. Exposing parts to high temperature for multiple times can damage the parts. It is always recommended to avoid more than two reflow cycles of the parts. The figure below illustrates the recommended reflow profile that follows IPC / JEDEC-020, and the peak temperature should not exceed 245℃.
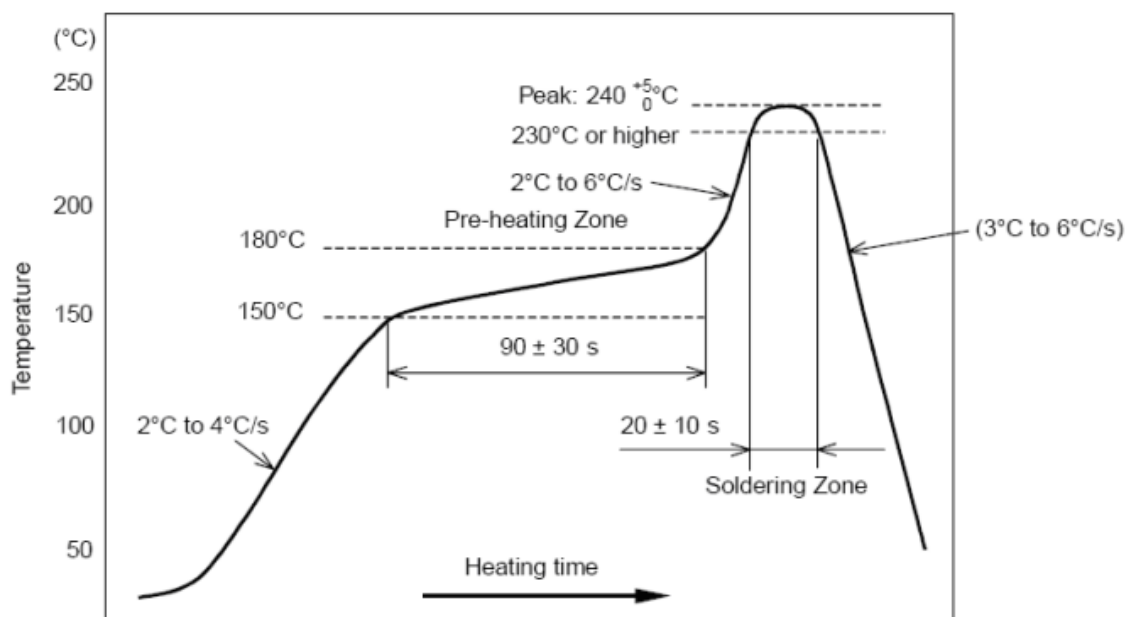

Figure 10.1 Classification Profile

11 Certifications

11.1 CE – EU

The HM-BT210X module have been tested against the relevant harmonized/designated standards and are in conformity with the essential requirements and other relevant requirements of the Radio Equipment Directive (RED) (2014/53/EU).

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12 Version History

Date	Version	Modification
2023/9/23	V1.0	Initial version

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Contact Information

Shenzhen Hope Microelectronics Co., Ltd.
Address: 30th floor of 8th Building, C Zone, Vanke Cloud City, Xili Sub-district, Nanshan, Shenzhen, GD, P.R. China
Tel: +86-755-82973805
Post Code: 518055
Email: sales@hoperf.com
Website: www.hoperf.com