Bluetooth Low Energy (BLE)

Data Transmission Module

HM-BT220X

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1 Product Overview

HM-BT220X is a BLE data transmission module, based on a BLE 5.2 SoC chip (ARM Cortex-M33 32-bit processor, up to 76.8MHz working frequency), embedded with a 2.4GHz transceiver, equipped with an on-board PCB antenna. The module communicates with an external MCU 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 the development process is very easy.

2 Module Features

- Based on ARM Cortex-M33 32-bit processor;

- Support BLE 2.4GHz multi-protocol;

- Supports BLE protocol stack from 4.x to 5.2;

- Up to 512KB of FLASH and 32KB of RAM;

- Support 14 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;

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- 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 broadcast interval, customize the broadcast 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;

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

- Support APP to modify the module name and save the data when power is off, modify the baud rate of serial port and product identification code, customize the broadcast content and broadcast cycle;

- Support APP to reset the module and set the transmit power;

- Support APP to adjust the BLE connection interval, but the data will not be saved after power is off (dynamic power consumption adjustment);

- Support anti-hijacking password setting, modification and recovery to prevent malicious third-party connection;

- The broadcast content can feedback the real-time status of the

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module, including battery power, and custom device identification

code (suitable for broadcast 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: +6dBm

- Receive Current: 3.6mA @1Mbps GFSK

- Emission Current:4.1mA@0dBm

- Emission Current:8.2mA@6dBm

- Low Power Consumption Mode Current: 27uA/MHz in Active

  Mode @76.8MHz

- Deep Sleep Mode Current: 1.4uA @EM2 Deep Sleep

- Receiving Sensitivity: -98.9dBm @1Mbps GFSK

4   Module Function Description

After the module is started, it will automatically broadcast. The mobile device that has opened a specific APP will scan and connect with the module. After successful connection, 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 module.

The user's data 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 send to the external MCU through the serial port of 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 code design of the external MCU and APP running on the mobile device.
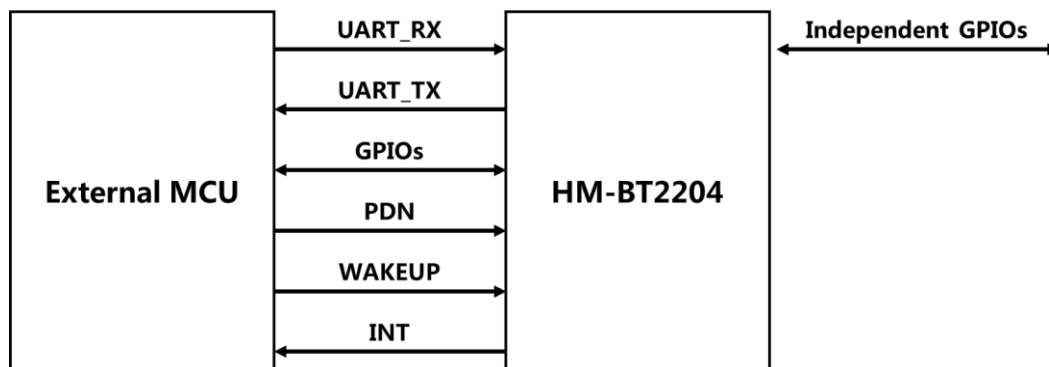
5 Application Diagram

Figure 1 Schematic between HM-BT220X and External MCU
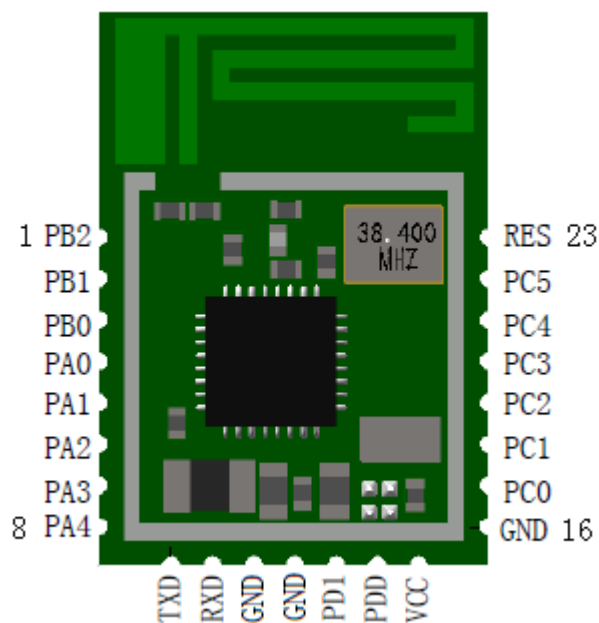
6 Module Pin

6.1 Module Pinout

Figure 2 Module Pinout (Top View)

6.2 Module Pin Definition

PinNo	PinName	Type	Description
1	PB2	I/O	General GPIO
2	PB1	I/O	General GPIO
3	PB0	I/O	General GPIO
4	PA0	I/O	General GPIO
5	PA1	I/O	SWCLK; Serial Clock for Debugging and Programming
6	PA2	I/O	SWDIO; Serial Data for Debugging and Programming
7	PA3	I/O	General GPIO
8	PA4	I/O	General GPIO
9	TXD	DO	PA5;UARTTXD
10	RXD	DI	PA6;UARTRXD
11	GND	DG	Power Ground
12	GND	DG	Power Ground
13	PD1	I/O	General GPIO ; 32.768KHz Crystal Pin
14	PD0	I/O	General GPIO ; 32.768KHz Crystal Pin
15	VCC	DV	Power Supply 3.3V
16	GND	DG	Power Ground
17	PC0	I/O	General GPIO

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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 1 Module Pin Definition

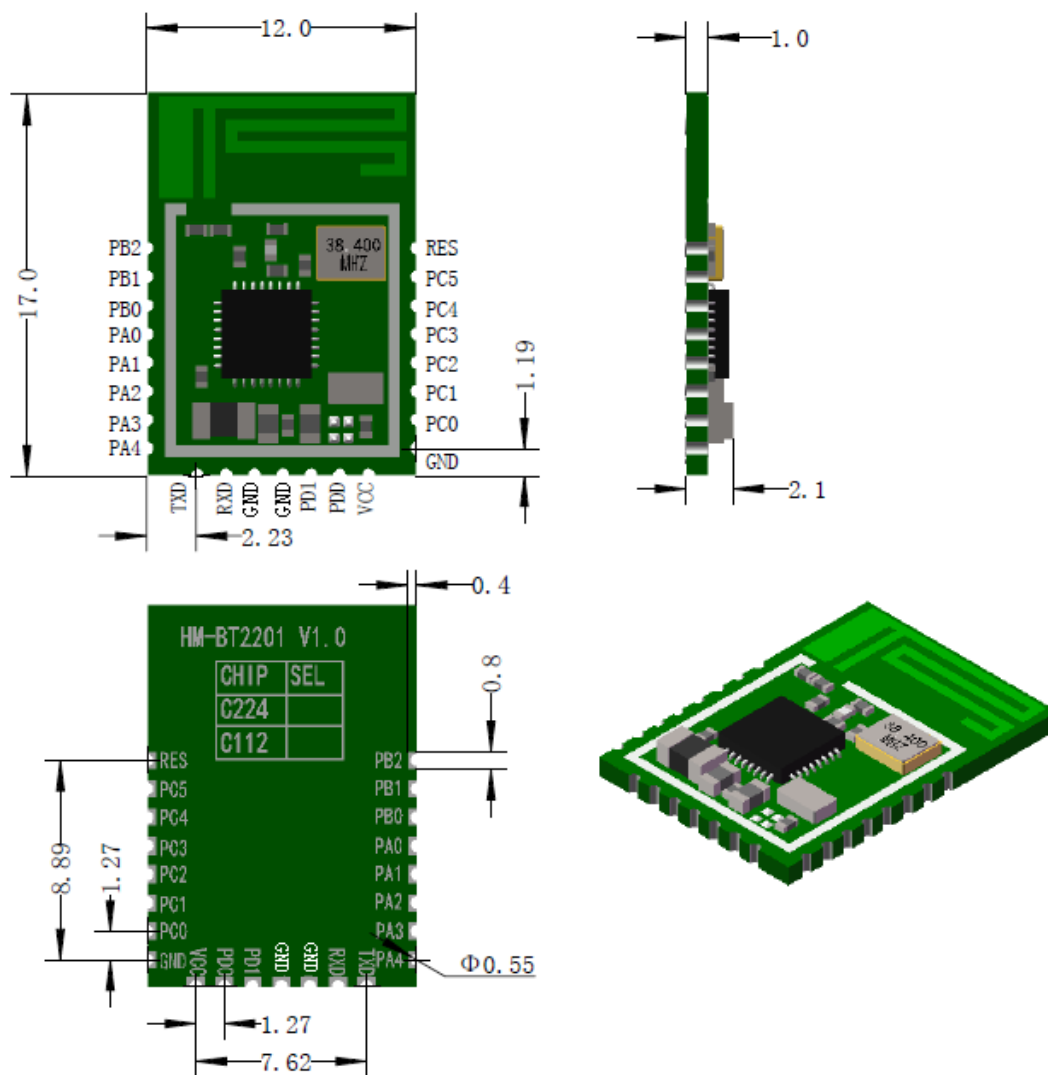**www.hoperf.com**

7 Module Size

Figure 3 HM-BT220X Module Size (without Shielding Cover)
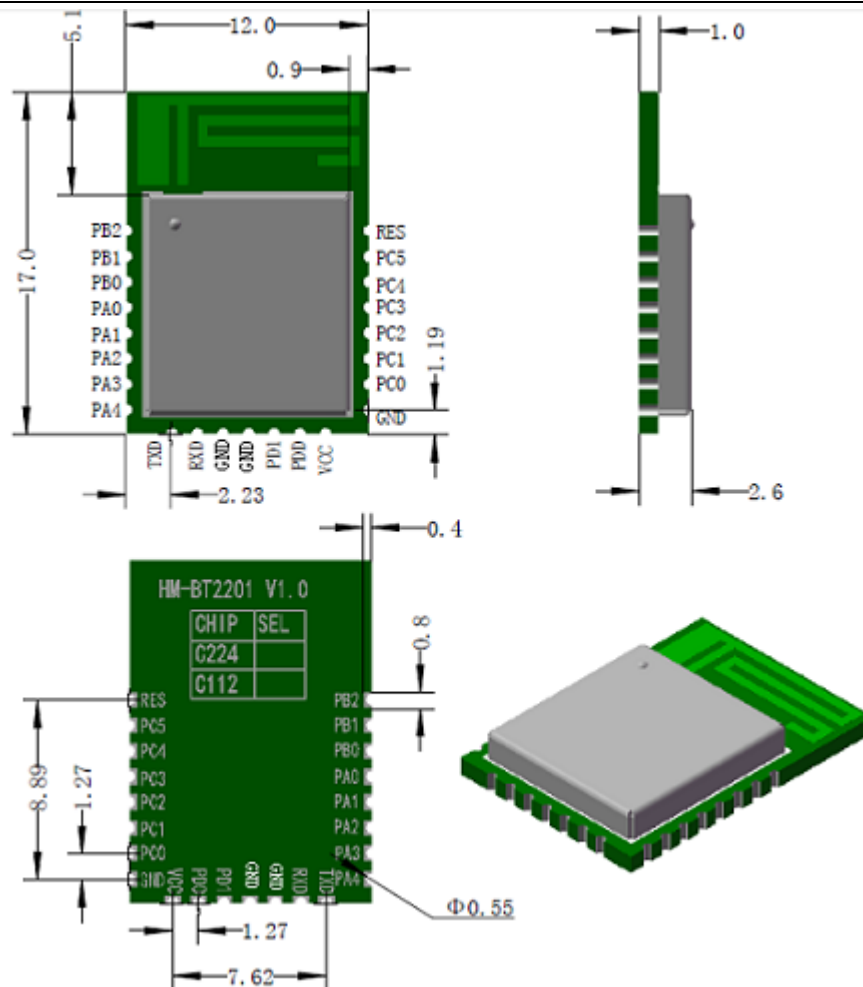
Figure 4 HM-BT220X Module Size (with Shielding Cover)

8   Ordering Information

Module	Feature List
HM-BT2201	CPU: 38.4MHz Flash: 352KB Tx Power: 0 dBm
HM-BT2202	CPU: 76.8MHz Flash: 352KB Tx Power: +6 dBm (+8 dBm)
HM-BT2204	CPU: 76.8MHz Flash: 512KB Tx Power: +6 dBm (+8 dBm)

(OEM) Integrator has to assure compliance of the entire end-product incl. the integrated RF Module. For 15 B (§15.107 and if applicable §15.107) compliance, the host manufacturer is required to show compliance with 15 while the module is installed and operating.

Furthermore the module should be transmitting and the evaluation should confirm that the module's intentional emissions (15C) are compliant (fundamental / out-of-band). Finally the integrator has to apply the appropriate equipment authorization (e.g. Verification) for the new host device per definition in §15.101.

Integrator is reminded to assure that these installation instructions will not be made available to the end-user of the final host device.

The final host device, into which this RF Module is integrated" has to be labelled with an auxilliary lable stating the FCC ID of the RF Module, such as "Contains FCC ID:

"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."

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.

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the

equipment.

Module statement

The single-modular transmitter is a self-contained, physically delineated, component for which compliance can be demonstrated independent of the host operating conditions, and which complies with all eight requirements of § 15.212(a)(1) as summarized below.

1) The radio elements have the radio frequency circuitry shielded.

2) The module has buffered modulation/data inputs to ensure that the device will comply with Part 15 requirements with any type of input signal.

3) The module contains power supply regulation on the module.

4) The module contains a permanently attached antenna.

5) The module demonstrates compliance in a stand-alone configuration.

6) The module is labeled with its permanently affixed FCC ID label

7) The module complies with all specific rules applicable to the transmitter, including all the conditions provided in the integration instructions by the grantee.

8) The module complies with RF exposure requirements.

This transmitter/module must not be collocated or operating in conjunction with any other antenna or transmitter.

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NOTE:

This device complies with Innovation, Science and Economic Development Canada's (ISED)'s licence-exempt RSSs. Operation is subject to the following two conditions:

(1) This device may not cause interference; and

(2) This device must accept any interference, including interference that may cause undesired operation of the device.

The equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment.

NOTE:

Cet appareil est conforme aux CNR exemptes de licence d'Industrie Canada . Son fonctionnement est soumis aux deux conditions suivantes :

(1) Ce dispositif ne peut causer d'interférences ; et

(2) Ce dispositif doit accepter toute interférence , y compris les interférences qui peuvent causer un mauvais fonctionnement de l'appareil.

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