

MP280B

User's Guide

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WARNINGS

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.

Caution: 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.

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.

Information for the OEM Integrators

This device is intended for OEM integrators only. Please see the full grant of equipment document for restrictions.

Label Information to the End User by the OEM Integrators

If this certified module is installed inside the host device, then the outside of the host must be labeled with "Contains FCC ID: 2AUXFMP280B" .

The requirement for KDB 996369 D03:

1 List of applicable FCC rules

FCC Part 15. 247.

2 Summarize the specific operational use conditions

None

3 Limited module procedures

The module is a single module, so this requirement is not applicable to the product.

4 Trace antenna designs

The module uses the permanent PCB antenna, so this requirement is not applicable to the product.

5 RF exposure considerations

After evaluation, the SAR requirement is deemed to be satisfied without test. Please check the report for detail information.

6 Antennas

PCB antenna, 3dBi.

7 Label and compliance information

If this certified module is installed inside the host device, then the outside of the host must be labeled with "Contains FCC ID: 2AUXFMP280B".

8 Information on test modes and additional testing requirements

The host manufacturer can use the software of SmartRF Studio 7 to make the Bluetooth transmit continuously.

9 Additional testing, Part 15 Subpart B disclaimer

The module only complies with the FCC Part 15.247. If the module is installed in the host device, the host manufacturer is responsible for the compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. For example, if the host manufacturer markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the host manufacturer shall provide a notice stating that the final

1. General Information

The MP280B module works in transparent transmission mode. After the module is powered on, it will be broadcast automatically. The mobile phone that has opened a specific APP will scan and dock it. After successful, it can be monitored by the BLE protocol. In the transparent transmission mode, the user CPU can perform two-way communication through the module's universal serial port and mobile device, and the user can also manage and control certain communication parameters through a specific serial port AT command. The specific meaning of user data is defined by the upper application. The mobile device can write to the module through the APP, and the written data will be sent to the user's CPU through the serial port. After the module receives the data packet from the user CPU serial port, it will automatically forward it to the mobile device. For development in this mode, the user must be responsible for the code design of the main CPU and the smart mobile device side APP code design.

1.1 Main Features

- Easy to use, without any Bluetooth protocol stack application experience;
- The user interface uses a universal serial port design, full-duplex two-way communication, the minimum baud rate supports 4800bps;
- The default 30ms connection interval, fast connection, enhance the compatibility stability of Android phones;
- Support the AT command software reset module to obtain the MAC address;
- Support AT command to adjust the Bluetooth connection interval and control different forwarding rates (dynamic power consumption adjustment);
- The serial port packet length, can be any length below 200byte (including 200) (large package automatic distribution);
- High-speed transparent transmission, up to 4K / S, stable operation in 2.5K / S ~ 2.8K / S;
- Support the mobile device APP to modify the module name, save power, save the serial port baud rate, product identification code, custom broadcast content, broadcast cycle, and save power;

2. User Interface

The MP280B module uses a 6-pin header for the user interface, or it can be used for patching.

pin	function	description
1	3V3	Power
2	GND	Ground
3	RXD	Serial port reception
4	TXD	Serial port transmission
5	IO0	Reset pin,active low
6	IO1	Status pin

2.1 Antenna interface

MP280B module uses IPEX carrier, please use IPEX antenna to connect module.

Commented [y1]: 这个图怎么改?

3. Transparent protocol

The transparent transmission mode of the module means that the universal serial port is connected to the user CPU to establish two-way communication between the user CPU and the mobile device. The module will have different data throughput capabilities for different serial port baud rates and BLE connection intervals, as well as different packet delivery intervals. In order to coordinate the use of low-speed CPU, the default baud rate is 9600bps. In applications with large data volume transmission or high real-time requirements, it is recommended to set the high-speed serial port baud rate to 115200bps.

When the module BLE connection interval is 20 ms and the serial port baud rate is 115200 bps, the module has the highest theoretical forwarding capability (4K/S).

The module can transmit up to 200 bytes of data packets from the serial port at one time. The module will automatically send packets according to the packet size. The maximum payload of each wireless packet is 20 bytes. Packets sent by the mobile device to the module must be sent by themselves (1-20 bytes/packet). After receiving the wireless packet, the module will forward it to the serial port receiving end of the host.

4. AT Command

The string starting with "TTM" will be parsed and executed as an AT command, and will be returned from the serial port as it is, and then the output execution result will be added, "TTM:OK\r\n\0" or "TTM:ERP\r\n\0" and so on. Serial data packets that do not begin with "TTM" will be considered transparent data.

4.1 Connection interval setting

Enter the following string into the serial port RX to set the BLE connection interval:
"TTM: CIT-Xms"

Where X="20", "30", "50", "100", "200", "300", "400", "500", "1000", "1500", "2000", unit ms (The above data formats are all ASCII code). For example, "TTM: CIT-30ms" means that the connection interval is set to 30ms. After executing this command, the following confirmation will be obtained from the serial port TX:

"TTM:TIMEOUT\r\n\0" indicates that the change timed out and the modification failed.
"TTM:OK\r\n\0" indicates that the change was successful and is running at the new connection interval;

The success of this connection interval setting depends on the mobile device's limit on the connection interval. Different IOS versions have different maximum connection intervals. In addition, due to the internal mechanism of the BLE protocol, this instruction will have different execution efficiency under different connection intervals.

Note: This connection interval is not saved when it is powered off, and the change command is valid only after the connection is successful.

4.2 Get the module name

Enter the following string into the serial port RX:

"TTM:NAM-?"

Will receive from TX:

" TTM:NAM-xxxxxxxxxxxx\r\n\0"

The "xxxxxxxxxxxx" after the string is the Bluetooth module name.

4.3 Module rename

Input the following string to the serial port RX, where "Name" is the module name, the length is within 16 bytes, and the ASCII code format.

" TTM:REN-" + Name

For example, "TTM: REN-ABC123" means to rename the module to "ABC123".

If the modification is successful, it will receive "TTM:OK\r\n\0" from TX. If the command format is incorrect, it will return:

"TTM:ERP\r\n\0"

This name is saved after power down.

4.4 Get baud rate

Enter the following string into the serial port RX to set the baud rate:

"TTM: BPS-?"

Will receive from TX:

"TTM: BPS-X"

Where X="4800", "9600", "19200", "38400", "57600", "115200", (the above data formats are all ASCII).

4.5 Baud rate setting

Enter the following string into the serial port RX to set the baud rate:

"TTM: BPS-X"

Where X="4800", "9600", "19200", "38400", "57600", "115200", (the above data formats are all ASCII). For example, "TTM: BPS-115200" means that the set baud rate is 115200 bps. After executing this command, the following confirmation will be obtained from the serial port TX:

"TTM:BPS SET AFTER 2S...", if the set value is not in the option, or the command format is incorrect, then return:

"TTM:ERP\r\n\0"

4.6 Get the physical address MAC

Enter the following string into the serial port RX:

"TTM:MAC-?"

Will receive from TX:

" TTM:MAC-xxxxxxxxxxx\r\n\0"

The "xxxxxxxxxxx" after the string is the 6-byte module Bluetooth address.

4.7 Set MAC address

Enter the following string into the serial port RX:

"TTM:MAC-xxxxxxxxxxx", where "xxxxxxxxxxx" is the 6-byte module Bluetooth address to be set.

It will receive "TTM:OK\r\n\0" confirmation from the TX pin. If the command format is incorrect, it will return:

"TTM:ERP\r\n\0"

After the module is restarted, the module will work according to the new MAC address.

4.8 Module reset

Enter the following string into the serial port RX:

"TTM: RST-SYSTEMRESET"

This will force the module to soft reset once.

4.9 Broadcast cycle setting

Enter the following string into the serial port RX to set the module's broadcast period,
 $T = X * 100\text{ms}$:

"TTM:ADP-(X)"

Where X = "2", "5", "10", "15", "20", "25", "30", "40", "50" (all data formats are ASCII).

For example, "TTM:ADP-(2)" indicates that the broadcast period is set to 200 ms. If the setting is successful, it will receive "TTM:OK\r\n\0" confirmation from the TX pin. If the command format is incorrect, it will return:

"TTM:ERP\r\n\0"

After the module is restarted, the module will broadcast according to the new broadcast cycle.

4.10 Add custom broadcast content

Enter the following string into the serial port RX to customize the broadcast content.

"TTM:ADD-"+ Data

Data is the data for preparing additional broadcasts. The length is in the range of 0~16 and is input in ASCII format. For example, if you input

"TTM:ADD-Advertisement!" to the serial port RX, you will receive "TTM:OK\r\n\0" from the TX pin. If the command format is incorrect, it will return:

"TTM:ERP\r\n\0"

This command takes effect immediately after it is set up, and you can use this function to broadcast some custom content. If set to 16 all 0 data, the custom broadcast data is considered not to be used, but the default broadcast content is used instead.

4.11 Define product identification code

Enter the following string into the serial port RX to customize the product identifier;

"TTM:PID-"+ Data

Data is a two-byte product identification code, ranging from 0x0000 to 0xFFFF (L = 2), and each character is input to the serial port RX in ASCII format. For example, if you input "TTM:PID-RS" to the serial port RX (the hexadecimal number corresponding to RS is 0x5253), you will receive "TTM:OK\r\n\0" from the TX pin. If the command format is incorrect, then Will return:

"TTM:ERP\r\n\0"

This ID will appear on the broadcast to filter the device or determine if it is a specific product.

4.12 Transmit power setting

Input the following string to the serial port RX and set the corresponding transmit power in dBm.

"TTM:TPL-(X)"

Where X=" +4", "0", "-6", "-23" (the above data formats are all ASCII codes). For example, "TTM:TPL-(+4)" means that the set transmission power is +4 dBm. After that, it will receive the "TTM:OK\r\n\0" confirmation from the TX pin, and the module will

immediately communicate with the new transmit power. If the command format is incorrect, it will return:

"TTM:ERP\r\n\0"

Note: This parameter is not saved when it is powered down.

4.13 RSSI signal strength output

Input the following string to the serial port RX to enable the RSSI signal strength output with an interval of 1 second.

"TTM: RSI-ON"

Enter the following string into the serial port RX to turn off the RSSI signal strength output.

"TTM: RSI-OFF"

After the setting is successful, the TX pin receives "TTM:OK\r\n\0" to confirm. If the command format is incorrect, it will return:

"TTM:ERP\r\n\0"

If the RSSI output function is turned on, the RSSI signal strength string is printed once every 1 second.

"TTM: RSI-xx\r\n\0" (for example, if the RSSI is -63dBm, the printed character is "TTM:RSI-63\r\n\0")

Note: This parameter is not saved when power is off, and the RSSI output is automatically turned off after the connection is disconnected.

4.14 RTC settings and acquisition

Enter the following string into the serial port RX to set the RTC time. The format is 4 digits for the year, and 2 digits for each month, day, hour, minute, and second.

"TTM:RTC-xxxxxxxxxxxx"

For example, if you set the character to be entered at 3:4:5 on January 2, 2017,

"TTM:RTC-20170102030405"

After the setting is successful, the TX pin receives "TTM:OK\r\n\0" to confirm. If the command format is incorrect, it will return:

"TTM:ERP\r\n\0"

Enter the following string into the serial port RX to get the current system time.

"TTM:RTC-?\r\n\0"

After the setting is successful, the TX pin receives "TTM:RTC-xxxxxxxxxxxx\r\n\0", and the format is the same as the setting RTC format;

If the instruction format is incorrect, it will return: "TTM:ERP\r\n\0"

Note: This parameter is not saved when power is off, and the RTC needs to be reset after the module is powered up again.

5. Broadcast data setting

5.1 Default broadcast data

After the module is powered on, a default interval of 200ms will be broadcast. The default is 9 bytes of data:

```
{
  0x00, 0x00, //custom device type code, default is 00 00, can be set by AT
  command;
  0x00, 0x00, 0x00, 0x00, //four-way PWM current output status (default), or the
  acquired value of two ADCs;
  0x00, //module power supply percentage, 2.0V = 0%;
  0x00, 0x00, //IO configuration, IO output input status, this byte changes in real
  time with the current state of IO;
}
```

5.2 Custom broadcast data

If you use the AT command to customize the broadcast content, the maximum length is 16 bytes, the specific format is

```
{
  0x00, 0x00, //custom device type code, default is 00 00, can be set by AT
  command;
  Data [n], //custom broadcast data, n <= 16 ;
}
```

Note: The total length is 2+n bytes, and the custom broadcast data can be modified by the AT command and saved after power down. If the custom broadcast data is all 0 (16 bytes), then the custom broadcast is considered not to be used, but the system default broadcast content is used. To avoid excessive power consumption caused by excessive broadcast data, you can also set the custom broadcast data to any value of 1 byte.

6. System reset and recovery

There are three ways to reset a module, and a third method can restore system parameters:

1. Reset the module using the AT command;
2. Use the service channel interface to remotely reset the module with APP.
3. Use the hardware RESTORE pin (see the pin definition table). After powering up for 30 seconds, the system parameters of the module will be restored to the user level parameters (shallow recovery, reset immediately after releasing this pin), if the system continues to pull down for 20 seconds, all system parameters of the module will be restored to the factory settings (depth recovery) and reset immediately. This pin has an internal pull-up and will not enter this mode by default.

7 Technical Support and mPower Contacts

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