ABLUE TECHNOLOGY

PTR 5518

AT Command Module Specification V1.0

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Revision

VERSION	DATE	RELEASE NOTE
V1.0	2023-2-22	First release

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CONTENT

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1. Overview

1.1. Product Introduction

PTR5518 is a BLE module with a slave feature. The module is based on nRF51822 with an ARM Cortex-M0 processor from Nordic Semiconductor.Therefore the module support the Bluetooth 4.0,high performance and ultra-low power(ULP).

The user's MCU is connected to the module through a serial port (UART), so that it enables bidirectional communication of data with the mobile device. After receiving the data from the serial port of the user MCU, the module will automatically send it to the mobile device; The mobile device can write data to the module by the APP, and then the module sends the data it received to the user's MCU through the serial port.

Module features (such as serial port baud rate, broadcast interval, etc.) support both local and air configuration modes. Various parameters of the module can be configured by "AT Command", and parts of the "AT Command" can be stored in flash to ensure the configuration dose not lost when the module is power-off.

1.2. Feature

- Support Bluetooth 4.x protocol.

- Support a wide range of supply voltage from 1.8V to 3.6V.

- Support information encryption to improve transmission security;

- Support low power advertising mode.

- Support to modify the 128-bit UUID.

- Support local configuration to adapt to different needs.

- Maximum rate 4KBytes/s.

- Two PWM interface.

1.3. Notice

1. The default serial port of the module is configured as 9600bps baud rate, 8 bits data, 1 stop bit, and none parity.

2. All the "AT Commands" must be used when the module is in "NONE CONNECTED MODE".

3. All the "AT Commands" are filled in ASCII format. When the inputted command is wrong or exceeds its range, the module will return ERROR.

4. Most of "AT Commands" take effect immediately while some of them take effect after the module has been reset.

5. In an environment where the amount of data is very large or the signal is not good, the original data cannot be sent to the peer device in time, which will cause the serial port buffer overflow problem. In this case, you can consider managing the data transmission by reading the module DIN pin state to avoid data loss. .

6. When some pins of the module are not in use, it is recommended that it is flowed.

1.4. Typical Application Frame

Figure 1 Application Diagram

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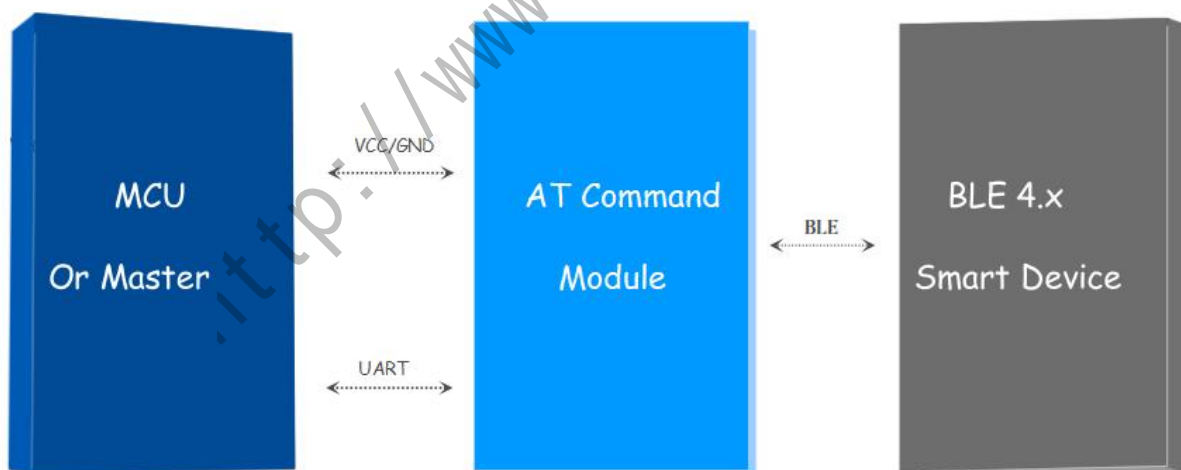
2. Hardware Specification

2.1. Package

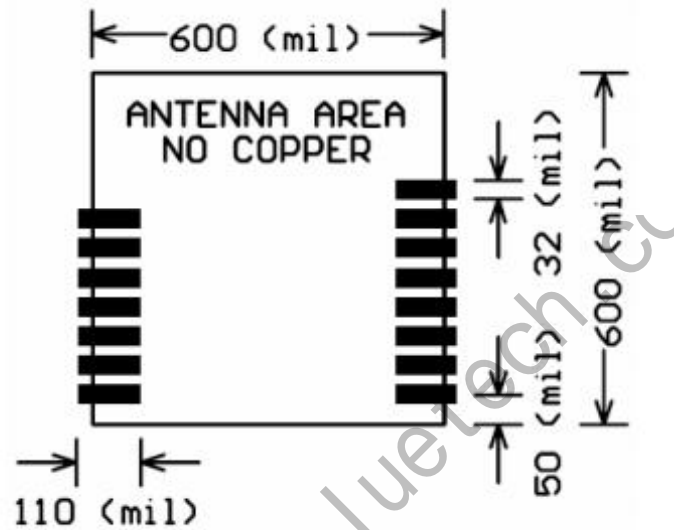The module package is shown in Figure 2(TOP VIEW).

Figure 2 Package diagram

2.2. Pin Assignment

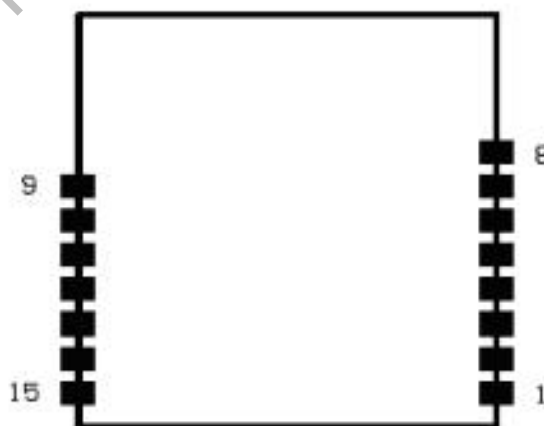The module pin assignments are shown in Figure 3 (TOP VIEW).

Figure 3 Pin Distribution

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Serial num	Abbreviation	Input/output	Explanation
1	EN	I	Falling edge: the module is awakened, and the specific state depends on the setting.Broadcast is default state. Rising edge: Enter the deep sleep mode immediately regardless of the current status.
2	TX	O	TX pin of the serial port.
3	RX	I	RX pin of the serial port.
4	SWDIO	/	/
5	SWCLK	/	/
6	CTS	O	Indicative signal of data output. Used to wake up the host. Low level: No data is sent by the module. The signal is pulled down to low level after the data sending is complete. High level: When there is a stream of data must be sent from the module to MCU,the pin become high level to notify MCU to prepare receiving.
7	RTS	I	Indicative signal of data input (optional): Low level: Data can be sent from MCU to the module. High level: When there is no data from the MCU,the pin become high level after the MCU data sent over.
8	NTF	I	Indicative signal of Connection State Low level: the module is not connected High level: the module is connected
9	GND	/	Module ground pin
10	VCC	/	Module power supply positive 1.8 ~ 3.6 V
11	RESET	O	Module reset pin，keep low in normal Rising edge: A signal of rising edge on this pin will cause the module to reset.
12	ADC0	I/O	Analog quantity acquisition, channel 0
13	FLOW	O	Serial port flow control: Low level: The serial port can send data to the module High level: The module is in a busy state, and the serial port cannot send data to the module
14	PMW0	I/O	PWM output ,channel 0
15	PMW1	I/O	PWM output ,channel 1

Table 1   Pin Assignment

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2.3. Layout Considerations

Bluetooth pass-through module works in the 2.4g wireless frequency band, but for wireless communication, it is relatively easy to be interfered by the external environment. So when laying out the module, there are a few points to note:

1. The wireless 2.4G signals can be shielded easily by metal materials, it is necessary to avoid metal materials around the module. If the shell of the product is made of metal materials, it may also have greater absorption of wireless signals.

2. Do not rout below the module as far as possible.

3. The antenna of the module should be placed as close as possible to the edge of the PCB of a main board, and the antenna direction should not be toward the center of the PCB, and ensure the underside of the antenna plate is hollowed out, and parallel to the direction of the antenna is not allowed to be copper or traced.

3. Function Description

3.1. Drive mode description

Role	Fuction	UUID	Attribute
Service	Data transmission	0001	/
Characteristic	RX	0002	Write
Characteristic	TX	0003	Notify
Service	Driver	0004	/
Characteristic	ADC	0005	Notify /Write
Characteristic	PWM	0006	Write

3.2. UUID of services and features

Data transmission service UUID：6940-**0001**-b5a3-f393-e0a9-e50e-24dc-ca99
RX characteristic UUID：6940-**0002**-b5a3-f393-e0a9-e50e-24dc-ca99
TX characteristic UUID：6940-**0003**-b5a3-f393-e0a9-e50e-24dc-ca99

Driver service UUID：7f51-**0004**-b5a3-f393-e0a9-e50e-24dc-ca9e
ADC characteristic UUID：7f51-**0005**-b5a3-f393-e0a9-e50e-24dc-ca9e
PWM characteristic UUID：7f51-**0006**-b5a3-f393-e0a9-e50e-24dc-ca9e

Note: The default UUID of the service and feature is as shown above in defaule when power on.
The red part can be changed by AT command.

3.3. Driver

3.3.1. ADC driver

This module provides 8-bit ADC acquisition and a channel of module battery power acquisition.
Write to the channel by the API to operate the corresponding ADC channel.

The number of characters entered is 2 bytes, in which the first byte is the check byte 0xAD, and
the second byte is the strobe byte, in which 1-2 represents the battery power acquisition and
ADC0 channel acquisition respectively. After entering the command, the module will send the
collected result to the host terminal, the collected voltage value will be obtained. The input
format is shown in the following example:

1. VCC voltage: 0xAD, 0x01; The returned value is 0x03/0x0A, which means the returned value is 3.10V.

2. ADC channel 0: 0xAD, 0x02;The returned value is 0x03/0x0A, which means the returned value is 3.10V.

3.3.2. PWM driver

This module provides two channels of PWM output waveform. The maximum frequency provided is 160kHz, of which the frequency of level 20 is adjustable and the duty cycle of level 100 is adjustable. Through the interface of API, write to the channel to control the corresponding PWM channel.Frequency selection:

If two PWM channels are opened at the same time, the same frequency setting must be maintained. If the frequency given in the setting is different, the frequency of PWM0 channel will be taken as the standard. The number of characters entered is 6 bytes, of which the first byte is the check byte 0x97, and the second byte is used for PWM channel selection; Among them, all open channels are 0x00, all closed channels are 0x01, channel 0 is 0x02, and channel 1 is 0x03; The third and fourth bytes control the frequency and duty cycle of PWM0 channel respectively, and the fifth and sixth bytes control the frequency and duty cycle of PWM1 channel respectively.

Ex:
1. PWM0 output frequency is 10kHz, duty cycle is 10%: 0x97,0x02,0x0C, 0x0A, 0x00,0x00;

2. The output frequency of PWM0/PWM1 is 100kHz, and the duty cycle is 10% and 40% respectively:0x97,0x00,0x11,0x0A,0x11,0x28；

3. Close all: 0x97,0x01,0x00,0x00,0x00,0x00;

Frequency	Command
50Hz	1
100Hz	2
200Hz	3
400Hz	4
600Hz	5
800Hz	6
1kHz	7

2kHz	8
4kHz	9
6 kHz	10
8kHz	11
10kHz	12
20kHz	13
40kHz	14
60kHz	15
80kHz	16
100kHz	17
120kHz	18
140kHz	19
160kHz	20

3.4. Init Param

Funtion	Param
Advertisement Type	Connectable advertisement
Advertise interval	200ms
Advertise name	XT-(6 bytes of MAC Address)
Baud rate	9600bps
Connect inerval	20ms
Transmit power	0dBm
Custom Data	6 bytes of MAC Address
DATA Service UUID	0001
RX Characteristic UUID	0002
TX Characteristic UUID	0003
Driver Service UUID	0004
ADC Characteristic UUID	0005
PWM Characteristic UUID	0006
RSSI mode	close
RTS check	close

4. AT Command

4.1.1. Software Reset

Command	ACK	Instruction
AT+STRS	OK+STRS	NO

Description:The module will restart after 100ms,and all configuration restored to factory settings.

*The command takes effect immediately.

4.1.2. Advertisement Type

Command	ACK	Instruction
AT+ADST-[Param]	AT+ADST-[Param]	[Param] 0: stop advertising 1: start connectable advertisement 2: start non-connect advertisement Default:1
AT+ADST-?	AT+ADST-[Param]	NO

Description:Set or check the advertisement type,the default setting is connectable advertisement.

*This parameter is keeped after power off.

4.1.3. Advertise Interval

Command	ACK	Instruction
AT+ADIT-[Param]	OK+ADIT-[Param]	[Param] 0：20　　（ms） 1：50　　（ms） 2：100　　（ms） 3：200　　（ms） 4：300　　（ms） 5：500　　（ms） 6：1000　（ms） 7：2000　（ms） Default: 3

| AT+ADIT-？ | OK+ADIT-[Param] | NO |

Description:Set or check the advertise interval.

*This parameter is keeped after power off.

4.1.4. Advertise Name

Command	ACK	Instruction
AT+NAME-[Index]	OK+NAME	NO

Description:Set or check the advertise name,the length of the name is 10 bytes max,the excess will be discarded.The default name is "XT_"＋"6-bytes MAC address of the Bluetooth chip"

Notice: The advertise name can only be constituted by numbers, characters, or underscores.

*This parameter is keeped after power off.

4.1.5. Baud Rate

Command	ACK	Instruction
AT+BAUD-[Param]	OK+BAUD-[Param]	[Param] 0：9600 (bps) 1：19200 (bps)s 2：38400 (bps) 3：57600 (bps) 4：115200 (bps) Default: 0
AT+BAUD-？	OK+BAUD-[Param]	NO

Description:Set or check the baud rate of the module's uart port.The default setting is 9600bps,8 data bit,1 stop bit,none parity.

*This parameter is keeped after power off.

4.1.6. Connect Interval

Command	ACK	Instruction
设置：AT+CNIT-[Param]	OK+CNIT-[Param]	[Param] 0：20 (ms) 1：30 (ms)

		2：50 (ms)
		3：100 (ms)
		4：200 (ms)
		5：300 (ms)
		6：500 (ms)
		7：1000 (ms)
		8：2000 (ms)
		Default：0
查询：AT+CNIT-？	OK+CNIT-[Param]	NO

Description:Set or check the connect interval.
*This parameter is keeped after power off.

4.1.7. Transmit Power

Command	ACK	Instruction
AT+TXPW-[Param]	OK+TXPW-[Param]	[Param] 0：+4 (dbM) 1：0 (dbM) 2：-4 (dbM) 3：-8 (dbM) 4：-12 (dbM) 5：-16 (dbM) 6：-20 (dbM) 7：-30 (dbM) Default：1
AT+TXPW-？	OK+TXPW-[Param]	NO

Description:Set or check the module's transmit power.The default setting is 0 dbm.
*This parameter is keeped after power off.

4.1.8. MAC Address

Command	ACK	Instruction
AT+GMAC	MAC Address	6 bytes MAC address

Description:Check the module's MAC.The returned data format is hexadecimal.

4.1.9. Custom Data

Command	ACK	Instruction
AT+MAFD –[Index]	OK+MAFD	NO
AT+MAFD –？	Custom data	NO

Description:User can defined advertise name,the length of the name is 6 bytes max,the excess will be discarded. The length of the name is less than 6 bytes ,the rest is filled with zero.The default name is 6-bytes MAC address of the Bluetooth chip.

*Note：When send the inquery command，the returned data format is hexadecimal.
*This parameter is keeped after power off.

4.1.10. Data service UUID

Command	ACK	Instruction
AT+SERN –[Index]	OK+SERN	NO
AT+SERN –？	OK+SERN-[Index]	NO

Description:User can defined BASE UUID of data service，the data length is 2 bytes.
*This parameter is keeped after power off.

4.1.11. Data driver UUID

Command	ACK	Instruction
AT+SERD –[Index]	OK+SERD	NO
AT+SERD –？	OK+SERD-[Index]	NO

Description:User can defined BASE UUID of data driver service，the data length is 2 bytes.
*This parameter is keeped after power off.

4.1.12.TX Characteristic UUID

Command	ACK	Instruction
AT+CHAT-[Index]	OK+CHAT	NO
AT+CHAT-？	OK+CHAT-[Index]	NO

Description:User can defined BASE UUID of data TX Characteristic，the data length is 2 bytes.

*This parameter is keeped after power off.

4.1.13.RX Characteristic UUID

Command	ACK	Instruction
AT+CHAR-[Index]	OK+CHAR	NO
AT+CHAR-？	OK+CHAR-[Index]	NO

Description:User can defined BASE UUID of data RX Characteristic，the data length is 2 bytes.

*This parameter is keeped after power off.

4.1.14.ADC Characteristic UUID

Command	ACK	Instruction
AT+CHAD-[Index]	OK+CHAD	NO
AT+CHAD-？	OK+CHAD-[Index]	NO

Description:User can defined BASE UUID of AD acquisition Characteristic，the data length is 2 bytes.

*This parameter is keeped after power off.

4.1.15.PWM Characteristic UUID

Command	ACK	Instruction
设置：AT+CHAP-[Index]	OK+CHAP	NO
查询：AT+CHAP-？	OK+CHAP-[Index]	NO

Description:User can defined BASE UUID of PWM Characteristic，the data length is 2 bytes.
*This parameter is keeped after power off.

4.1.16.Firmware Version

Command	ACK	Instruction
AT+CODV	OK+CODV-[Index]	NO

Description:Check the firmware version of the module.

4.1.17.RSSI Mode

Command	ACK	Instruction
AT+RSSI-[Param]	OK+RSSI-[Param]	0：exit RSSI mode 1：enter RSSI mode 2：get RSSI value
AT+RSSI-[Param]	OK+RSSI-[Param]	NO

Description:If need to get the RSSI value, you need to enter the RSSI mode and connect with the Bluetooth module, to input the corresponding command. It should be noted that after entering RSSI mode, data cannot be transmitted through at this time, unless exiting RSSI mode.

4.1.18.RTS check Enable

Command	ACK	Instruction
AT+CRTS-[Param]	OK+ CRTS -[Param]	0：disable RTS check 1：enable RTS check Default: 0
AT+ CRTS –?	OK+ CRTS -[Param]	NO

Description:Set the RTS enable attribute. By default, the PTR5518 RTS data line is closed, and the master MCU can send data to the transparent module at any time. If the modification parameter is set to 1, the master MCU needs to give a falling edge to the RTS before sending data to the transparent module each time, and the transparent module will accept the data transmitted by the master MCU. Note that if the RTS detection line transmission module is turned off, the power consumption will increase.
*This parameter is keeped after power off.

5. Appendix

5.1. Troubleshooting

◆ **Q**: Can not scan the advertise.
 A: Check whether the status of the device is not in the advertise state by using AT command "AT+ADST=?"

◆ Q: The module cannot be connected.
 A: Check whether the status of the device is in the non-connect state by using AT command "AT+ADST=?"

◆ Q: No reaction when the AT command is sent.
 A: Check whether the AT Command is end with a "\r",if there is a "\r",please remove it.

◆ Q: The module cannot communicate with the host(the command or data cannot be sent through uart port) .
 A: Make sure the module and the host(MCU) are in a common GND.

6. Important Notice

Reserves the right to make corrections, modifications, and/or improvements to the product and/or its specifications at any time without notice.
Assumes no liability for the user's product and/or applications.
Products are not authorized for use in safety-critical applications, including but not limited to life-support applications.