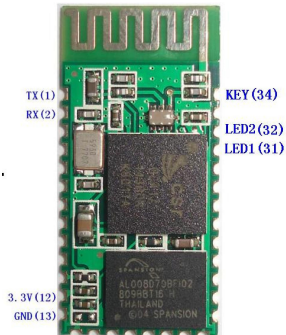


HC-05

1. Overview:

This module supports UART, USB, SPI, PCM, SPDIF and other interfaces, and supports SPP Bluetooth serial port protocol, which has the advantages of low cost, small size, low power consumption, high sensitivity of sending and receiving.



2. Feature

- Bluetooth V2.0+EDR
- Bluetooth Class 2
- Built-in PCB RF antenna
- Built-in 8Mbit Flash
- Support SPI programming interface
- Support UART, USB, SPI, PCM and other interfaces
- Support master and slave
- Support software control master-slave module
- 3.3V power supply
- Passed REACH, ROHS certification

3. Application areas:

- Bluetooth car handsfree
- Bluetooth GPS
- Bluetooth PCMCIA, USB Dongle
- Bluetooth wireless data transmission;
- Industrial remote control, telemetry;
- POS system, wireless keyboard, mouse;
- Traffic, underground positioning, alarm;
- Automated data acquisition system;
- Wireless data transmission; banking system;
- Wireless data collection;
- Building automation, security, wireless monitoring of equipment room, access control system;

Smart home, industrial control;
 Vehicle inspection equipment;
 Interactive program voting equipment for television stations;
 Government street lamp energy saving equipment
 Wireless LED display system
 Bluetooth joystick, Bluetooth gamepad
 Bluetooth printer
 Bluetooth remote control toy

4. Physical characteristics:

Operating Frequency Band	2.4GHz ISM band
Bluetooth Specification	V2.0+EDR
Output Power Class	Class 2
Operating Voltage	3.3V
Host Interface	USB 1.1/2.0 or UART
Audio Interface	PCM interface
Flash Memory Size	8Mbit
Dimension	27mm (L) x 13 (W) mm x 2mm (H)

5. Electrical characteristics:

Absolute Maximum Ratings		
Rating	Min	Max
Storage temperature	-40℃	+150℃
Supply voltage: VBAT	-0.4V	5.6V
Other terminal voltages	VSS-0.4V	VDD+0.4V

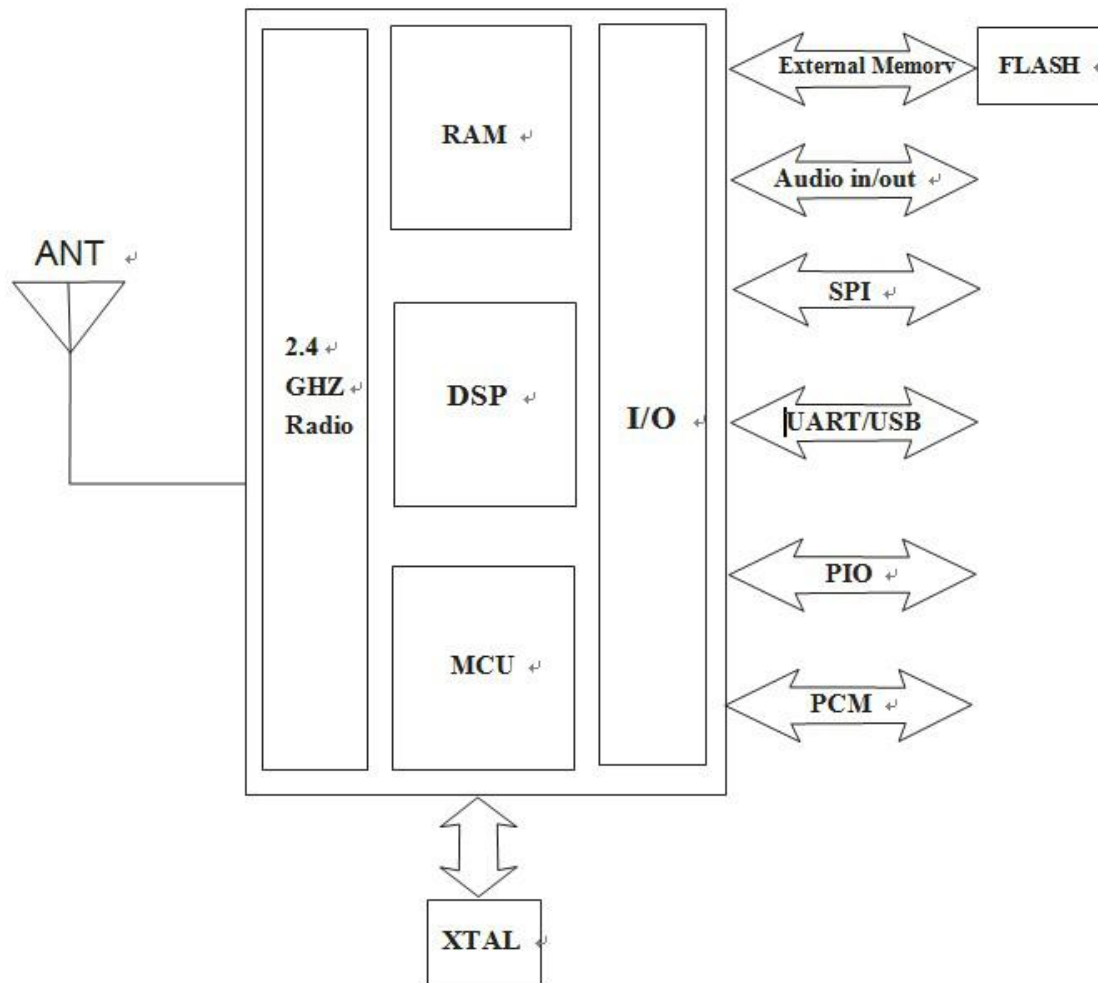
Recommended Operating Conditions		
Operating Condition	Min	Max
Operating temperature range	-40℃	+150℃
Guaranteed RF performance range ^(a)	-40℃	+150℃
Supply voltage: VBAT	2.2V	4.2V ^(b)

6. Power consumption:

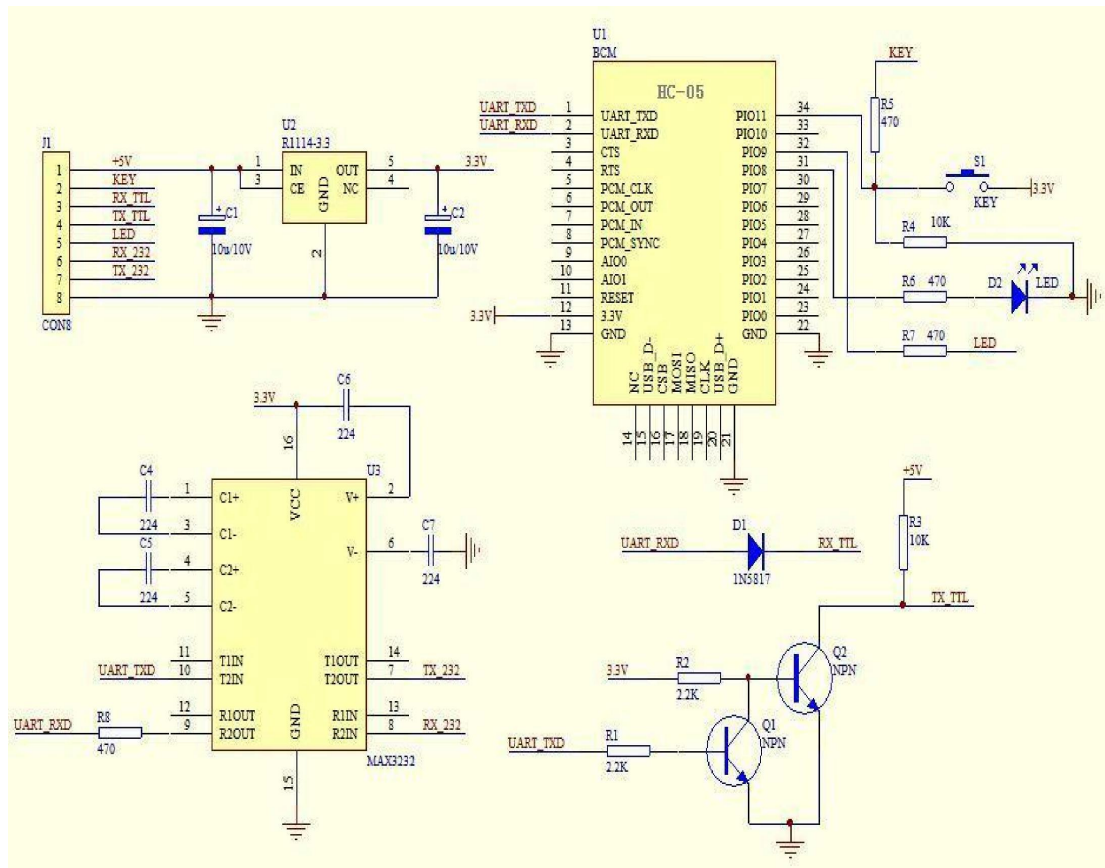
Operation Mode	Connection Type	UART Rate(kbps)	Average	Unit
Page scan	-	115.2	0.42	mA
ACL No traffic	Master	115.2	4.60	mA
ACL With file transfer	Master	115.2	10.3	mA

ACL 1.28s sniff	Master	38.4	0.37	mA
ACL 1.28s sniff	Slave	38.4	0.42	mA
SCO HV3 30ms sniff	Master	38.4	19.8	mA
SCO HV3 30ms sniff	Slave	38.4	19.0	mA
Standby Host connection	-	38.4	40	μA

7. Functional block diagram:



8. Application circuit diagram:

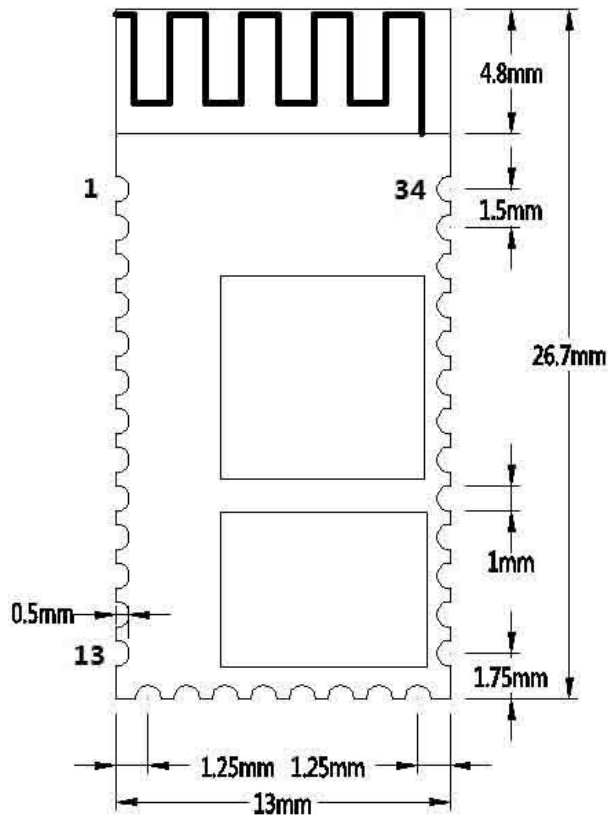


9. Pin function description:

PIN	NAME	TYPE	Function
1	UART-TX	CMOS output	Serial data output
2	UART-RX	CMOS input	Serial data input
3	UART-CTS	CMOS input	Serial port clear send
4	UART-RTS	CMOS output	Serial port request to send
5	PCM-CLK	Two way	PCM clock
6	PCM-OUT	CMOS output	PCM data output
7	PCM-IN	CMOS input	PCM data input
8	PCM-SYNC	Two way	PCM data synchronization
9	AIO(0)	Two way	Programmable analog input and output
10	AIO(1)	Two way	Programmable analog input and output
11	RESETB	CMOS input	Reset/reset button
12	3.3V	power input	+3.3V power supply
13	GND	Ground	Ground
14	NC	Output	NC (please hang)
15	USB-DN	Two way	USB data negative

16	SPI-CSB	CMOS input	SPI chip select
17	SPI-MOSI	CMOS input	SPI data input
18	SPI-MISO	CMOS output	SPI data output
19	SPI-CLK	CMOS input	SPI clock port
20	USB-DP	Two way	USB data is positive
21	GND	Ground	Ground
22	GND	Ground	Ground
23	PIO(0)	Two way	Programmable input/output port (0)
24	PIO(1)	Two way	Programmable input/output port (1)
25	PIO(2)	Two way	Programmable input/output port (2)
26	PIO(3)	Two way	Programmable input/output port (3)
27	PIO(4)	Two way	Programmable input/output port (4)
28	PIO(5)	Two way	Programmable input/output port (5)
29	PIO(6)	Two way	Programmable input/output port (6)
30	PIO(7)	Two way	Programmable input/output port (7)
31	PIO(8)	Output	Status indicator LED port 1
32	PIO(9)	Output	Status indicator LED port 2
33	PIO(10)	Two way	Programmable input/output port (10)
34	PIO(11)	Input	Module state switching pin, High level -> AT command responds to working status; Low level or floating -> Bluetooth normal working status.

10. Dimensions:



11. Serial port module pin definition:

1. PIO(8) connects to the LED to indicate the working status of the module. The module flashes after power-on, and the different states flash differently.
2. PIO (9) is connected to the LED to indicate that the module is successfully connected. After the Bluetooth serial port is successfully connected, the LED is on.
3. PIO (11) module state switching pin, high level --> AT command response working state, low level or floating --> Bluetooth normal working state.
4. The reset circuit is already on the module and reset when the power is turned back on.

12. Steps to set the master mode:

1. PIO (11) is set high.
2. Upon power-on, the module enters the AT command response state.
3. HyperTerminal or other serial port tool, set baud rate 38400, data bit 8 bits, stop bit 1 bit, no parity bit, No flow control.
4. The serial port sends the character "AT+ROLE=1\r\n" and successfully returns "OK\r\n", where \r\n is a carriage return line feed.
5. PIO (11) is de-asserted, re-powered, the module is the main module, and the slave module is automatically searched to establish a connection.

13. LAYOUT considerations

1. BLK-MD-HC-05 Bluetooth module serial port level needs 3.3V, if you connect with 5V level system, you need to add level conversion chip.
2. Bluetooth signals are greatly affected by the surrounding, such as trees, metal, walls and other obstacles will absorb or shield the Bluetooth signal, so it is not recommended to install in the metal casing.
3. Since the metal will weaken the antenna function, it is recommended that when the module is given to the Lay board, the ground under the module antenna should not be laid and routed. It is best to hollow out.

AT instruction set

The BLK-MD-HC-05 embedded Bluetooth serial communication module has two working modes: command response working mode and automatic connection working mode. In the automatic connection working mode, the module can be divided into master, slave and loopback three working roles.

When the module is in the automatic connection working mode, it will automatically transfer data according to the preset setting; when the module is in the command response working mode, it can execute all the AT commands described below, and the user can send various AT commands to the module as modules. Set control parameters or issue control commands. The dynamic conversion of the module's operating state can be achieved by controlling the input level of the module's external pin (PIO11).

The pin definition used by the serial port module:

1. PIO8 is connected to the LED to indicate the working status of the module. The module flashes after power-on, and the different states flash differently.
2. PIO9 is connected to the LED to indicate that the module is successfully connected. After the Bluetooth serial port is successfully connected, the LED is on.
3. PIO11 module status switching pin, high level --> AT command response working status, low level or floating --> Bluetooth routine State.
4. The reset circuit is already on the module and reset when the power is turned back on.

Steps to set up as the main module:

1. PIO11 is set high.
2. Upon power-on, the module enters the AT command response state.
3. HyperTerminal or other serial port tool, set baud rate 38400, data bit 8 bits, stop bit 1 bit, no parity bit, No flow control.
4. The serial port sends the character "AT+ROLE=1\r\n" and successfully returns "OK\r\n", where \r\n is a carriage return line feed.

5. PIO is set low, power is turned back on, the module is the main module, and the slave module is automatically searched to establish a connection.

Detailed instructions

(AT commands are not case sensitive and end with carriage return, newline characters: \r\n)

1. Test instructions:

Command	Response	Parameter
AT	OK	/

2. Module reset (restart):

Command	Response	Parameter
AT+RESET	OK	/

3. Obtain the software version number:

Command	Response	Parameter
AT+VERSION?	+VERSION:<Param> OK	Param: Software version number

for example:

At+version?\r\n

+VERSION:2.0-20100601

OK

4. Restore default state:

Command	Response	Parameter
AT+ORGL	OK	/

Factory default state:

1. Equipment class: 0

2. Search code: 0x009e8b33

3. Module Job Role: Slave Mode

4. Connection mode: Specify the dedicated Bluetooth device connection mode

5. Serial Port Parameter: Baud Rate - 38400bits/s; Stop Bit: 1 bit; Check Digit: /

6. Pairing code: "1234"

7. Equipment name: "H-C-2010-06-01"

... ..

5. Get module Bluetooth address:

Command	Response	Parameter
AT+ADDR?	+ADDR:<Param> OK	Param: Bluetooth address

Bluetooth address representation method: NAP: UAP: LAP (hexadecimal)

for example:

The module Bluetooth device address is: 12:34:56:ab:cd:ef

At+addr?\r\n

+ADDR:1234:56:abcdef

OK

6. Set/query device name:

Command	Response	Parameter
AT+NAME=<Param>	OK	Param:Bluetooth device name Default name:"HC-05"
AT+NAME?	1. +NAME:<Param> OK——Success 2. FAIL——Failure	

E.g:

AT+NAME=HC-05\r\n ——Set the module device name: "HC-05"

OK

AT+NAME="HC-05"\r\n - Set the module device name to "HC-05"

OK

At+name=Beijin\r\n ——Set the module device name: "Beijin"

OK

At+name="Beijin"\r\n - Set the module device name to "Beijin"

OK

At+name?\r\n

+NAME: Bei jin

OK

7. Get the remote Bluetooth device name:

Command	Response	Parameter
AT+RNAME? <Param1>	1. +NAME:<Param2> OK——Success 2. FAIL——Failure	Param1: Remote Bluetooth device address Param2: Remote Bluetooth device address

Bluetooth address representation method: NAP: UAP: LAP (hexadecimal)

E.g:

The module Bluetooth device address is: 00:02:72:od:22:24, the device name is: Bluetooth

At+rname? 0002,72,od2224\r\n

+RNAME: Bluetooth

OK

8. Setup / Query - Module Role:

Command	Response	Parameter
AT+ROLE=<Param>	OK	Param:Parameter takes the following values:
AT+ROLE?	+ROLE:<Param>	

	OK	0 - from the role (Slave) 1 - Master role (Master) 2 - Loopback role (Slave-Loop) Default: 0
--	----	---

Module role description:

Slave - passive connection;

Slave-Loop - passive connection, receiving remote Bluetooth master data and returning the data to the remote Bluetooth master as it is;

Master - Query the surrounding SPP Bluetooth slaves and initiate a connection to establish a transparent data transmission channel between the master and slave Bluetooth devices.

9. Settings / Query - Device Class:

Command	Response	Parameter
AT+CLASS=<Param>	OK	Param:Parameter takes the following values: Param: Equipment class The Bluetooth device class is actually a 32 bit Parameter, the Parameter is used to indicate the device class Type, and the type of service supported. Default: 0
AT+ CLASS?	1. + CLASS:<Param> OK——Success 2. FAIL——Failure	

In order to effectively filter the surrounding Bluetooth devices, quickly query or query the custom Bluetooth device, the user can set the module to a non-standard Bluetooth device class, such as: 0x1f1f (hexadecimal).

10. Device / Query - Query Access Code:

Command	Response	Parameter
AT+IAC=<Param>	1. OK——Success 2. FAIL——Failure	Param: Query access code Default: 9e8b33 See Appendix 2 for specific settings: Query Access Code Description
AT+ IAC?	+IAC:<Param> OK	

The access code is set to GIAC (General Inquire Access Code: 0x9e8b33) general query access code, which can be used

Discovered or found all Bluetooth devices around; in order to efficiently query or be queried in many Bluetooth devices around

Customize the Bluetooth device, the user can set the module query access code to a number other than GIAC and LIAC, such as: 9e8b3f.

Example:

AT+IAC=9e8b3f\r\n

OK

AT+IAC?\r\n

+IAC: 9e8b3f

OK

11. Settings / Query - Query Access Mode:

Command	Response	Parameter
AT+INQM=<Param>,<Param2>,<Param3>	1. OK——Success 2. FAIL——Failure	Param: Query mode 0— <code>inquiry_mode_standard</code> 1— <code>inquiry_mode_rssi</code> Param2: Maximum number of Bluetooth device Responses Param3: Maximum query timeout Timeout range: 1 to 48 (recombination time: 1.28 seconds to 61.44 seconds) Default: 1, 1, 48
AT+ INQM?	+INQM:<Param>,<Param2>,<Param3> OK	

Example:

AT+INQM=1,9,48\r\n——Query mode setting: with RSSI signal strength indication, more than 9 Bluetooth devices Response

To terminate the query, set the timeout to 48xl. 28=61.44 seconds.

OK

AT+INQM\r\n

+INQM: 1, 9, 9, 48

OK

12. Settings / Query - Pairing Code:

Command	Response	Parameter
AT+PSWD=<Param>	OK	Param: Pairing code Default name:"1234"
AT+ PSWD?	+ PSWD :<Param> OK	

13. Setup / Query - Serial Parameters:

Command	Response	Parameter
AT+UART=<Param>,<Param2>,<Param3>	OK	Param1: baud rate (bits/s) The values are as follows (decimal): 4800 9600 19200
AT+ UART?	+UART=<Param>,<Param2>,<Param3> OK	

		38400 57600 115200 23400 460800 921600 1382400 Param2: stop bit 0 - 1 bit 1 - 2 digits Param3: check digit 0—None 1 - Odd 2—Even Default setting: 9600, 0, 0
--	--	--

Example: Set the serial port baud rate: 115200, 2 stop bits, Even check

AT+UART=115200,1,2,\r\n

OK

AT+UART?

+UART: 115200, 1, 2

OK

14. Settings / Query - Connection Mode:

Command	Response	Parameter
AT+CMODE=<Param>	OK	Param:
AT+ CMODE?	+ CMODE:<Param> OK	0 - specify the Bluetooth address connection mode (Specify the Bluetooth address set by the binding Command) 1—any Bluetooth address connection mode (not bound by the address set by the bound Command) 2 - Loopback role (Slave-Loop) Default connection mode: 0

15. Set / Query - Bind Bluetooth Address:

Bluetooth address representation method: NAP: UAP: LAP (hexadecimal)

Command	Response	Parameter
AT+BIND=<Param>	OK	Param - Bind Bluetooth address
AT+ BIND?	+ BIND:<Param>	

	OK	Default binding Bluetooth address: 00:00:00:00:00:00
--	----	---

Bluetooth address representation method: NAP: UAP: LAP (hexadecimal)

Binding Command is only valid when the Bluetooth address connection mode is specified!

for example:

In the specified Bluetooth address connection mode, bind the Bluetooth device address: 12:34:56:ab:cd:ef

The command and Response are as follows:

AT+BIND=1234,56,abcdef\r\n

OK

AT+BIND?\r\n

+BIND:1234:56:abcdef

OK

16. Setup / Query - LED indicates drive and connection status output polarity:

Command	Response	Parameter
AT+POLAR=<Param1>, <Param1>	OK	Param1: The value is as follows 0——PI08 output low level LED 1——PI08 output high level LED
AT+ BIND?	+ POLAR=<Param1>, <Param1> OK	Param2: The value is as follows 0——PI09 output low level indicates connection Success 1——PI09 output high level indicates connection Success Default setting: 1,1

HC-05 Bluetooth module definition: PI08 output drive LED indicates working status; PI09 output indicates connection status.

for example:

PI08 output low level LED, PI09 output high level indicates connection Success.

The command and Response are as follows:

AT+POLAR=0,1\r\n

OK

AT+POLAR?\r\n

+POLAR=0,1

OK

17. Set PIO single port output:

Command	Response	Parameter
---------	----------	-----------

AT+PIO=<Param1>, <Param2>	OK	Param1: PIO port number (decimal number) Param2: PIO port output status 0——low level 1 - high level
------------------------------	----	---

The HC-05 Bluetooth module provides users with PIO port resources: PI00~PI07 and PI010, which users can use to expand the input.

Output port.

for example:

1. PI010 port output high level

AT+PIO=10,1\r\n

OK

2. PI010 port output high level

AT+PIO=10,0\r\n

OK

18. Set PIO multiport output:

Command	Response	Parameter
AT+MPIO=<Param>	OK	Param: PIO port serial number mask combination (decimal number)

The HC-05 Bluetooth module provides users with PIO port resources: PI00~PI07 and PI010, which can be used by the user to expand the input. Output port.

PIO port number mask = (1<< port number)

PIO port number mask combination = (PIO port number mask 1 | PIO port number mask 2 |)

Such as:

PI02 port mask = (1<<2) = 0x004

PI010 port mask = (1<<10) = 0x400

PI02 and PI010 port mask combination = (0x004 | 0x400) = 0x404

for example:

1. PI010 and PI02 port output high level

AT+MPIO=404\r\n

OK

2. PI04 port output high level

AT+PIO=004\r\n

OK

3. PI010 port output high level

AT+PIO=400\r\n

OK

4. All ports output low level

AT+MPIO=0\r\n

OK

19. Query PIO port input:

Command	Response	Parameter
AT+MPIO?	+MPIO:<Param> OK	Param - PIO port value (16bits) Param[0]=PI00 Param[1]=PI01 Param[2]=PI02 Param[10]=PI010 Param[11]=PI011

The HC-05 Bluetooth module provides users with PIO port resources: PI00~PI07 and PI010~PI011, which can be used by the user to expand the input and output ports.

20. Settings / Query - Page Scan, Query Scan Parameters:

Command	Response	Parameter
AT+IPSCAN=<Param1>, <Param2>, <Param3>, <Param4> AT+IPSCAN?	OK +IPSCAN: <Param1>, <Param2>, <Param3>, <Param4> OK	Param1: Query interval Param2: Query duration Param3: paging interval Param4: paging duration The above Parameters are all decimal numbers. Default: 1024, 512, 1024, 512

for example:

At+ipscan=1234,500,1200,250\r\n

OK

At+ipscan?

+IPSCAN: 1234, 500, 1200, 250

21. Settings / Query - SHIFF energy saving parameters:

Command	Response	Parameter
AT+SNIFF=<Param1>, <Param2>, <Param3>, <Param4>	OK	Param1: maximum time Param2: minimum time Param3: Try time Param4: Timeout
AT+IPSCAN?	+SNIFF: <Param1> , <Param2> , <Param3>, <Param4>	The above Parameters are all decimal numbers. Default: 0,0,0,0

22. Set/Query Security and Encryption Mode:

Command	Response	Parameter
AT+SENM=<Param>,<Param2>,	1. OK——Success 2. FAIL——Failure	Param: Safe mode, the values are as follows:

AT+ SENM?	+ SENM:<Param>,<Param2>, OK	0--sec_mode0+off 1--sec_mode1+non_secure 2--sec_mode2_service 3--sec_mode3_link 4--sec_mode_unknown Param2 encryption mode, the values are as follows: 0--hci_enc_mode_off 1--hci_enc_mode_pt_to_pt 2--hci_enc_mode_pt_to_pt_and_broadcast Default: 0,0
-----------	-----------------------------------	--

23. Remove the specified authentication device from the Bluetooth pairing list:

Command	Response	Parameter
AT+PMSAD=<Param>	OK	Param: Bluetooth device address

for example:

Remove the device with the Bluetooth address: 12:34:56:ab:cd:ef from the pairing list

At+rmsad=1234,56,abcdef\r\n

OK - delete Success

or

At+rmsad=1234,56,abcdef\r\n

FAIL - 12:34:56:ab:cd:ef Bluetooth device does not exist in the pairing list

24. Remove all Authenticated Devices from the Bluetooth pairing list:

Command	Response	Parameter
AT+RMAAD	OK	/

for example:

Remove all Bluetooth devices from the pairing list

At+rmaad\r\n

OK

25. Find the specified authentication device from the Bluetooth pairing list:

Command	Response	Parameter
AT+FSAD=<Param>	1. OK——Success 2. FAIL——Failure	Param: Bluetooth device address

for example:

Find Bluetooth devices from the pairing list: 12:34:56:ab:cd:ef

At+fsad=1234,56,abcdef\r\n

OK - There is a 12:34:56:ab:cd:ef Bluetooth device in the pairing list.

At+fsad=1234,56,abcde0\r\n

FAIL - There is no 12:34:56:ab:cd:e0 Bluetooth device in the pairing list.

26. Obtain the number of authenticated devices in the Bluetooth pairing list:

Command	Response	Parameter
AT+ADCN?	+ADCN:<Param> OK	Param: Number of Bluetooth devices in the pairing list

for example:

At+adcn?

+ADCN: 0 - no Bluetooth device in the pairing trust list

OK

27. Obtain the most recently used Authenticated Device:

Command	Response	Parameter
AT+MRAD?	+ MRAD :<Param> OK	Param: Recently used Bluetooth device address

for example:

At+mrads?

+MRAD: 0:0:0 - no trusted Bluetooth devices have been used recently

OK

28. Get the working status of the Bluetooth module:

Command	Response	Parameter
AT+STATE?	+ STATE:<Param> OK	Param: module working status The return value is as follows: "INITIALIZED"--initial state "READY" - ready state "PAIRABLE" - pairable status "PAIRED" - pairing status "INQUIRING" - query status "CONNECTING" - the connection status "CONNECTED" - connection status "DISCONNECTED" - disconnected state "NUKNOW" - unknown state

for example:

At+state?

+STATE:INITIALIZED - Initialization state

OK

29. Initialize the SPP specification library:

Command	Response	Parameter
AT+INIT	1. OK——Success 2. FAIL——Failure	/

30. Query Bluetooth devices:

Command	Response	Parameter
AT+INQ	+INQ: <Param1>, <Param2>, <Param3>, OK	Param1: Bluetooth address Param2: device class Param3: RSSI signal strength

Example 1:

At+init\r\n - Initialize the SPP library (cannot be initialized repeatedly)

OK

At+iac=9e8b33\r\n - Query the Bluetooth device of any access code

OK

At+class=0\r\n - query various Bluetooth device classes

At+inqm=1,9,48\r\n ——Query mode: with RSSI signal strength indication, more than 9 Bluetooth devices Response will terminate the query, set the super

The time is 48x1.28=61.44 seconds.

At+inq\r\n - Query peripheral Bluetooth devices

+INQ: 2:72:D2224,3E0104,FFBC

+INQ: 1234:56:0,1F1F,FFC1

+INQ:1234:56:0,1F1F,FFC0

+INQ: 1234:56:0,1F1F,FFC1

+INQ: 2:72:D2224,3F0104,FFAD

+INQ: 1234:56:0,1F1F, FFBE

+INQ: 1234:56:0,1F1F, FFC2

+INQ: 1234:56:0,1F1F, FFBE

+INQ: 2:72:D2224,3F0104,FFBC

OK

Example 2:

At+iac=9e8b33\r\n - Query the Bluetooth device of any access code

OK

At+class=1f1f\r\n - Query the Bluetooth device with device class 0x1f1f

OK

At+inqm=1,9,48\r\n ——Query mode: with RSSI signal strength indication, more than 9 Bluetooth devices Response will terminate the query, set the super

The time is 48x1.28=61.44 seconds.

At+inq\r\n - Filter. Query peripheral Bluetooth devices

+INQ: 1234:56:0,1F1F, FFC2

```

+INQ: 1234:56:0,1F1F,FFC1
+INQ: 1234:56:0,1F1F,FFC1
+INQ: 1234:56:0,1F1F,FFC1
+INQ: 1234:56:0,1F1F, FFC2
+INQ: 1234:56:0,1F1F,FFC1
+INQ: 1234:56:0,1F1F,FFC1
+INQ:1234:56:0,1F1F,FFC0
+INQ: 1234:56:0,1F1F, FFC2
OK

```

Example 3:

```

At+iac=9e8b3f\r\n ——Query the Bluetooth device with access code 0x9e8b3f
OK
At+class=1f1f\r\n - Query the Bluetooth device with device class 0x1f1f
OK
At+inqm=1,1,20\r\n ——Query mode: with RSSI signal strength indication, more than
1 Bluetooth device Response will terminate the query, set the super
The time is 20x1.28=25.6 seconds.
At+inq\r\n - Filter. Query peripheral Bluetooth devices
+INQ:1234:56:ABCDEF,1F1F,FFC2
OK

```

31. Cancel the inquiry of Bluetooth devices:

Command	Response	Parameter
AT+INQC	OK	/

32. Device pairing:

Command	Response	Parameter
AT+PAIR=<Param1>,<Param2>	1. OK——Success 2. FAIL——Failure	Param1: Remote device Bluetooth address Param2: Connection timeout (seconds)

for example:

Paired with a remote Bluetooth device: 12:34:56:ab:cd:ef, the maximum pairing timeout is 20 seconds.

```

At+pai=1234,56,abcdef,20\r\n
OK

```

33. Equipment connection:

Command	Response	Parameter
AT+LINK=<Param>	1. OK——Success 2. FAIL——Failure	Param: Remote device Bluetooth address

for example:

Establish a connection with the remote Bluetooth device: 12:34:56:ab:cd:ef

At+fsad=1234,56,abcdef\r\n—Query whether the Bluetooth device 12:34:56:ab:cd:ef is in the pairing list

OK

At+link=1234,56,abcdef\r\n—Query the Bluetooth device 12:34:56:ab:cd:ef in the pairing list, you can connect directly without query.

OK

34. Disconnect:

Command	Response	Parameter
AT+DISC	1. +DISC:SUCCESS - Disconnect Success OK 2. +DISC: LINK_LOSS - connection lost OK 3. +DISC: NO_SLC - no SLC connection OK 4. +DISC: TIMEOUT - disconnect timeout OK 5. +DISC:ERROR - disconnect error OK	/

35. Enter the energy saving mode:

Command	Response	Parameter
AT+ENSNIFF=<Param>	OK	Param: Device Bluetooth address

36. Exit the energy saving mode:

Command	Response	Parameter
AT+EXSNIFF=<Param>	OK	Param: Device Bluetooth address

Appendix 1: ATCommand Error Code Description

Error code return form - ERROR: (error_code)

error_code (hexadecimal number)	Comment
0	AT command error
1	Command result is the default value
2	PSKEY write error
3	Device name is too long (more than 32 bytes)
4	Device name length is zero
5	Bluetooth address: NAP is too long
6	Bluetooth address: UAP is too long
7	Bluetooth address: LAP is too long
8	PIO sequence number mask length is zero
9	Countless PIO serial numbers

A	Device class length is zero
B	Device class number is too long
C	Query access code length is zero
D	The query access code number is too long
E	Invalid query access code
F	Pairing code length is zero
10	Pairing code is too long (more than 16 bytes)
11	Module role is invalid
12	Invalid baud rate
13	Invalid stop bit
14	Check digit is invalid
15	No authentication device exists in the pairing list
16	SPP library is not initialized
17	SPP library repeated initialization
18	Invalid query mode
19	Query timeout too large
1A	Bluetooth address is zero
1B	Invalid security mode
1C	Invalid encryption mode

Appendix 2: Device Class Description

The Class of Device/Service(CoD) is a 32 bits number that of 3 fields specifies the service supported by the device. Another field specifies the minor device class, which describes the device type in more detail.

The Class of Device /Service (CoD) field has a variable format. The format is indicated using the 'within the CoD'. The length of the Format Type field is variable and ends with two bits different from '11'. The version field starts at the least significant bit of the CoD and may extend upwards. In the 'format#1' of the CoD (format Type field = 00), 11 bits are assigned as a bit-mask (multiple bits can be set) each bit corresponding to a high level generic category of service class. Currently 7 categories are defined. These are primarily of a 'public service' nature. The remaining 11 bits are used to indicate device type category and other device-specific characteristics. Any reserved but otherwise unassigned bits, such as in the Major Service Class field, should be to 0.

Figure 1.2: The Class of Device/Service field (format type). Please note the order in which the octets are sent on the air and stored in memory. Bit number 0 is sent first on the air.

1. MAJOR SERVICE CLASSES

Bit no Major Service Class

13 Limited Discoverable Mode [Ref #1]

14 (reserved)

15 (reserved)

16 Positioning (Location identification)

- 17 Networking (LAN, Ad hoc, ...)
- 18 Rendering (Printing, Speaker, ...)
- 19 Capturing (Scanner, Microphone, ...)
- 20 Object Transfer (v-Inbox, v-Folder, ...)
- 21 Audio (Speaker, Microphone, Headset service, ...)
- 22 Telephony (Cordless telephony, Modem, Headset service, ...)
- 23 Information (WEB-server, WAP-server, ...)

TABLE 1.2: MAJOR SERVICE CLASSES

[Ref #1 As defined in See Generic Access Profile, Bluetooth SIG]

2. MAJOR DEVICE CLASSES

The Major Class segment is the highest level of granularity for defining a Bluetooth Device. The main function of a device is used to determine the major Class grouping. There are 32 different possible major classes. The assignment of this Major Class field is defined in Table 1.3.

- 1 2 1 1 1 0 9 8 Major Device Class
- 0 0 0 0 0 Miscellaneous [Ref #2]
- 0 0 0 0 1 Computer (desktop, notebook, PDA, organizers, ...)
- 0 0 0 1 0 Phone (cellular, cordless, payphone, modem, ...)
- 0 0 0 1 1 LAN/Network Access point
- 0 0 1 0 0 Audio/Video (headset, speaker, stereo, video display, vcr ...)
- 0 0 1 0 1 Peripheral (mouse, joystick, keyboards, ...)
- 0 0 1 1 0 Imaging (printing, scanner, camera, display, ...)
- 1 1 1 1 1 Uncategorized, specific device code not specified
- X X X X All other values reserved

TABLE 1.3: MAJOR DEVICE CLASSES

[Ref #2: Used where a more specific Major Device Class is not suited (but only as specified as in this document). Devices that do not have a major class assigned can use the all-1 code until 'classified']

3. THE MINOR DEVICE CLASS FIELD

The 'Minor Device Class field' (bits 7 to 2 in the CoD), are to be interpreted only in the context of the Major Device Class (but interpreted of the Service Class field). Thus the meaning of the bits may change, depending on the value of the 'Major Device Class field'. When the Minor Device Class field indicates a device class, then the primary device class should be reported, e.g. a cellular phone that can work as a cordless handset should

4. MINOR DEVICE CLASS FIELD—COMPUTER MAJOR CLASS

Minor Device Class

7 6 5 4 3 2 bit no of CoD

- 0 0 0 0 0 Uncategorized, code for device not assigned
- 0 0 0 0 1 Desktop workstation
- 0 0 0 1 0 Server-class computer
- 0 0 0 1 1 Laptop
- 0 0 1 0 0 Handheld PC/PDA (clam shell)
- 0 0 1 0 1 Palm sized PC/PDA

0 0 0 1 1 0 Wearable computer (Watch sized)

X X X X X All other values reserved

TABLE 1.4: SUB DEVICE CLASS FIELD FOR THE 'COMPUTER' MAJOR CLASS

5. MINOR DEVICE CLASS FIELD – PHONE MAJOR CLASS

Minor Device Class

7 6 5 4 3 2 bit no of CoD

0 0 0 0 0 0 Uncategorized,code for device not assigned

000001 Cellular

0 0 0 0 1 0 Cordless

0 0 0 0 1 1 Smart phone

0 0 0 1 0 0 Wired modem or voice gateway

0 0 0 1 0 1 Common ISDN Access

0 0 0 1 1 0 Sim Card Reader

X X X X X All other values reserved

TABLE 1.5: SUB DEVICE CLASSES FOR THE 'PHONE' MAJOR CLASS

6. MINOR DEVICE CLASS FIELD – LAN/NETWORK ACCESS POINTE MAJOR CLASS

Minor Device Class

7 6 5 bit no of CoD

0 0 0 Fully available

0 0 1 1 – 17% utilized

0 1 0 1 7 - 33% utilized

0 1 1 3 3 – 50% utilized

1 0 0 5 0 – 67% utilized

1 0 1 6 7 – 83% utilized

1 1 0 8 3 – 99% utilized

1 1 1 No service available [REF #3]

XXX All other values reserved

TABLE 1.6: THE LAN/NETWORK ACCESS POINTE LOAD FACTOR FIELD

[Ref #3: "Device is fully utilized and cannot accept additional connections at this time, please retry later"]

The exact loading formula is not standardized. It is up to each LAN/Network Access Point implementation to determine what internal conditions to report as a utilization of communication requirement is that the box. As a recommendation, a client that locates multiple LAN/Network Access Points should attempt to connect to the one reporting the lowest load.

Minor Device Class

4 3 2 bit no of CoD

0 0 0 Uncategorized (use this value if no other apply)

XXX All other values reserved

TABLE 1.7: RESERVED SUB-FIELD FOR THE LAN/NETWORK ACCESS POINTE

7. MINOR DEVICE CLASS FIELD – AUDIO/VIDEO MAJOR CLASS

Minor Device Class

7 6 5 4 3 2 bit no of CoD

0 0 0 0 0 0 Uncategorized,code not assigned

0 0 0 0 0 1 Device conforms to the Headset profile

000010 Hands-free

0 0 0 0 1 1 (Reserved)

0 0 0 1 0 0 Microphone

0 0 0 1 0 1 Loudspeaker

0 0 0 1 1 0 Headphones

0 0 0 1 1 1 Portable Audio

0 0 1 0 0 0 Car audio

0 0 1 0 0 1 Set-top box

0 0 1 0 1 0 HiFi Audio Device

001011 VCR

0 0 1 1 0 1 Camcorder

0 0 1 1 1 0 Video Monitor

0 0 1 1 1 1 Video Display and Loudspeaker

0 1 0 0 0 0 Video Conferencing

0 1 0 0 0 1 (Reserved)

0 1 0 0 1 0 Gaming/Toy [Ref #4]

X X X X X All other values reserved

[Ret #4: Only to be used with a Gaming/Toy device that makes audio/video capabilities

available via Bluetooth]

TABLE 1.8: SUB DEVICES FOR THE 'AUDIO/VIOEO' MAJOR CLASS

8. MINOR DEVICE CLASS FIELD – PERIPHERAL MAJOR CLASS

Minor Device Class

7 6 bit no of CoD

0 1 Keyboard

1 0 Pointing device

1 1 Combo keyboard /pointing device

X X X All other values reserved

TABLE1.9: THE PERIPHERAL MAJOR CLASS KEYBOARD/POINTING DEVICE FIELD

Bits 6 and 7 independantly specify mouse, keyboard or combo mouse/keyboard devices.

These may be combined with the lower bits in a multifunctional decice.

Minor Device Class

5 4 3 2 bit no of CoD

0 0 0 0 Uncategorized device

0 0 0 1 Gamepd

0 0 1 1 Remote control

0 1 0 0 Sensing device

0 1 0 1 Digitizer tablet

X X X X All other values reserved

TABLE1.10: RESERVED SUB-FIELD FOR THE DEVICE TYPE

9. MINOR DEVICE CLASS FIELD – IMAGING MAJOR CLASS

Minor Device Class

7 6 5 4 bit no of CoD

X X X 1 Display

X X 1 X Camera

X 1 X X Scanner

1 X X X Printer

X X X X All other values reserved

TABLE 1.11: THE TMAGING MAJOR CLASS BITS 7 TO 7

Bits 4 to 7 independent ly specify bi splay, camera, scanner or printer. These may be combined in a multifunctional device.

Minor Device Class

3 2 bit no of CoD

0 0 Uncategorized, default

X X All other values reserved

TABLE 1. 12: THE IMAGING MAJOR CLASS BITS 2 AND 3

Bits 2 and 3 are reserved

Appendix 3: The Inquiry Access Codes

The General-and Device-Specific Inquiry Access Codes (DIACs)

The Inquiry Access Code is the first level of filtering when finding Bluetooth

The main purpose of defining multiple IACs is to limit the number of

Reply that are received when scanning devices within range.

0. 0x9E8B33 -- General/Unlimited Inquiry Access Code (GIAC)

1. 0x9E8B00 - Limited Dedicated Inquiry Access Code (LIAC)

2. 0x9E8B01 ~ 0x9E8B32 RESERVED FOR FUTURE USE

3. 0x9E8B34 ~ 0x9E8B3F RESERVED FOR FUTURE USE

The Limited Inquiry Access Code(LIAC)is only intended to be used for limited time Periods in scenarios where both are have been explicitly caused to enter this state, Usually by user action. For further explanation of the use of the LIAC, please refer To the Generic Access Profile.

In contrast it is allowed to be continuously scanning for the General Inquiry Access Code (GIAC) and respond whenever inquired.