TLS-01 BLE Module Manual

Version Information

Version	Date	Modified By	Introduction
1.1	01.2017	Kim	Release

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1.   Overview

TLS-01 BLE4.0 wireless module is designed with TLSR8266F512. TLSR8266F512 is bluetooth low energy chip which is compliant with bluetooth 4.0 single-mode. The module can be widely used in short distance wireless communication application, with low power consumption, small volume, strong anti-jamming capability. The basic function of TLS-01 is transmitting data between TLS-01 module and a smart phone as peripheral device. The Module integrates with the "AT" commands. You can set the name of the module, the baud rate, advertising interval value and the other parameters.

2. The detailed parameters of Module

2.1 PCB mechanical design
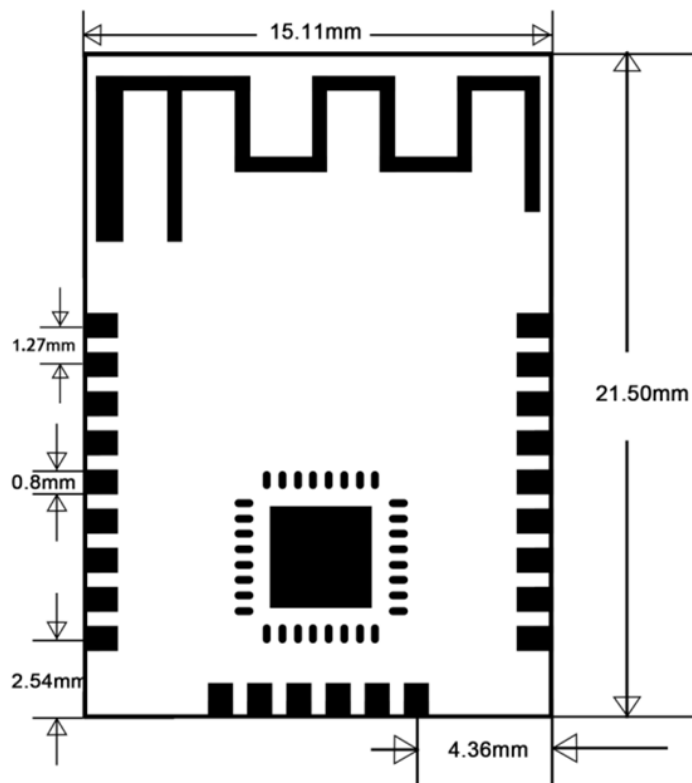
2.2 The parameters of module

TLS-01 BLE module's parameters in detail in the following table:

WeBee TLS-01 BLE Module parameters:	
PCB parameters	1. Layers : 2
	2. Size : 21.5*15.1 mm
	3. Interface : 1.27mm interval stamp-hole
	4. Material : Special materials for RF
The characteristics of the module	1. Receiver sensitivity:-93dBm
	2. Input DC voltage: 1.9V-3.6V （3.3V is recommend）
	3. Operating temperature : -40℃— 80℃
	4. Antenna：PCB on board
	5. Transmission distance: 50 m(open environment)
	6. Bluetooth version : BLE Core_V4.0
	7. Transmission rate : Maximum up to 2.0K Byte/s
	8. Power consumption : Receiving status <14mA; Emiting status <14mA;
The module's features in software	1. Supporting UART "AT" Command configuration
	2. Support Android 4.3 above system、iOS
	3. All settings can be saved after power-off

Electrical Characteristics:

Parameter		condition	Min	Typical	Max	Unit
Storage temperature			-40	-	80	℃
Maximum welding temperature		IPC/JEDEC J-STD-020	-	-	260	℃
Operating Voltage		-	1.9	3.3	3.6	V
All I/O	VIL/VIH	-	-0.3/0.75VIO	-	0.25VIO/3.6	V
	VOL/VOH	-	N/0.8VIO	-	0.1VIO/N	
	I MAX	-	-	-	12	mA
Electrostatic (Human Model)		TAMP=25℃	-	-	2	KV
Electrostatic (Machine Model)		TAMP=25℃	-	-	0.5	KV

Power consumption:

Condition	Min	Typical	Max	Unit
The interval of broadcast is100ms	-	500	-	uA
The interval of broadcast is 500ms	-	110	-	uA
The interval of broadcast is 1000ms	-	57	-	uA
The module connect with Android device	-	7	-	mA
The module connect with iOS device	-	2.9	-	mA
In normal mode(send or receive)	-	14	-	mA

2.3 The description about module-pin
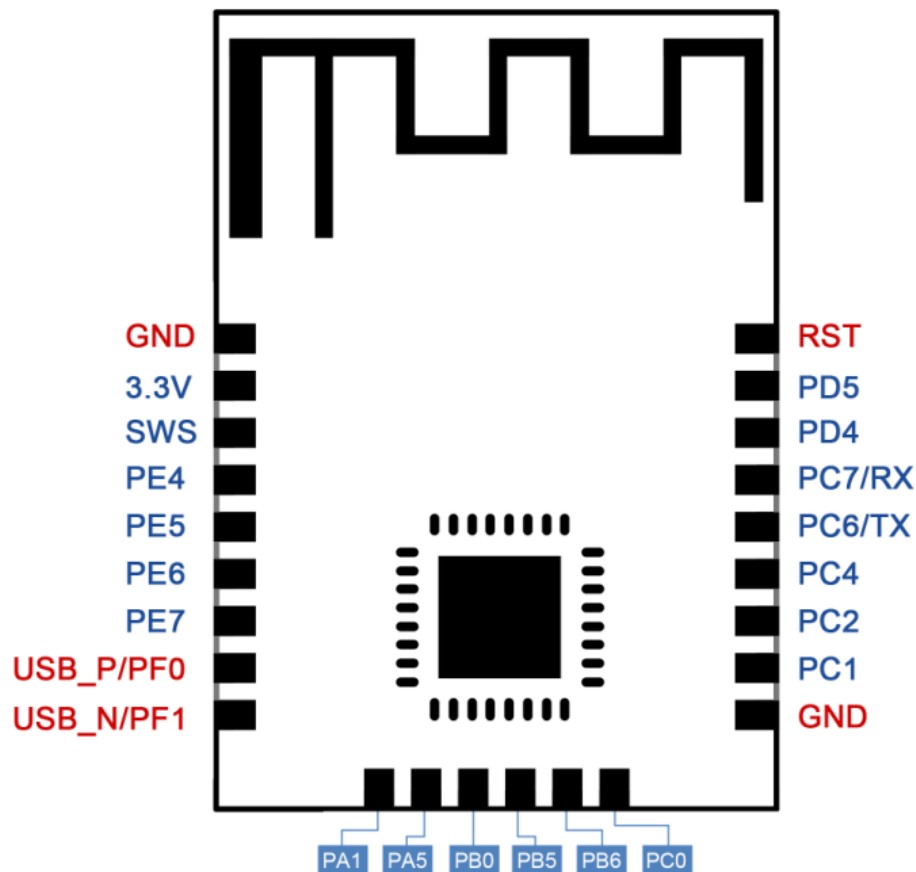
If you use TLS-01 BLE module，you need only to focus on the function of the following Pins, it can directly interact with external UART devices.

PIN	I/O	Description
GND		GND
VCC	I	Operating voltage DC 1.9V～3.6V（3.3V is recommended）
PC7	RX	The Module's UART-RX Pin
PC6	TX	The Module's UART-TX Pin
PC2	ADC	external voltage input, measuring voltage, input range: 0-3.3V
PA1	I/O	IO1，"AT"Command control I/O
PA5	I/O	IO2，"AT"Command control I/O
PB0	I	IO3，"AT"Command control input

PB5	I	IO4，"AT"Command control input	
PC0	O	The indication pin of broadcasting；when the BLE was connected，the module will stop broadcasting.	L：the module is broadcasting
			H：the module is not broadcasting
PB6	O	The indication pin of BLE connection	L：the BLE module has be connected
			H：the BLE module isn't connected
PD5	I	Enable UART , the default is low.	L：the module's UART is enable
			H：the module's UART is disable

Note:

1. When the module is power on (only VCC & GND is connected), the module start to broadcast, the UART is also enabled by default.

2.4 Factory settings

Item	Default parameters
Module mode	Peripheral mode
Module name	BLE SPP
Broadcast interval	100ms
The longest serial frame	72Byte
Module address	Unique MAC address
Module Baud Rate	9600bps，Data：8bit，stop bit：1bit，No odd-even check
Connection parameters	Connection interval min:6 Connection interval max:8 Latency:0 Timeout:100

2.5 Service UUID and Characteristic UUID

UUID	Parameters	Description
Service UUID	0xFEE0	Main service
Notify Characteristic UUID	0xFEE1	The UUID that module sends data to APP, The attribute is Notify.
Write Characteristic UUID	0xFEE1	The UUID that APP sends to module (Consistent with Notify), The attribute is Write with response
AT Characteristic UUID	0xFEE2	AT command channel, the smart-phone write AT commands to the UUID channel, the module receives AT commands then return the results through the channel. Properties is Write with response and Notify

3. Transparent transmission test between module and smart phone

H-2 Technik provides Bluetooth transparent transmission module testing mobile APP, users can quickly test transparent transmission between the phone and the module.
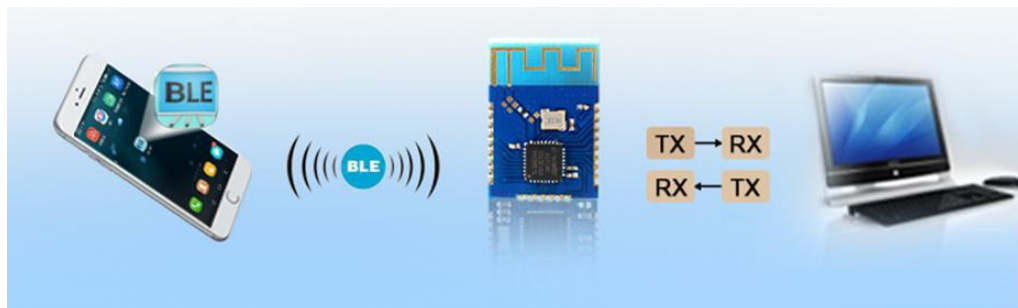
Step 1: download the test App for Android:
http://www.h-2technik.com/download/BLE_SPP.apk

Step 2: Open the APP and scan module for connection (if connection is successful, PB6 output changes to low level)

Serial port assistant

APP
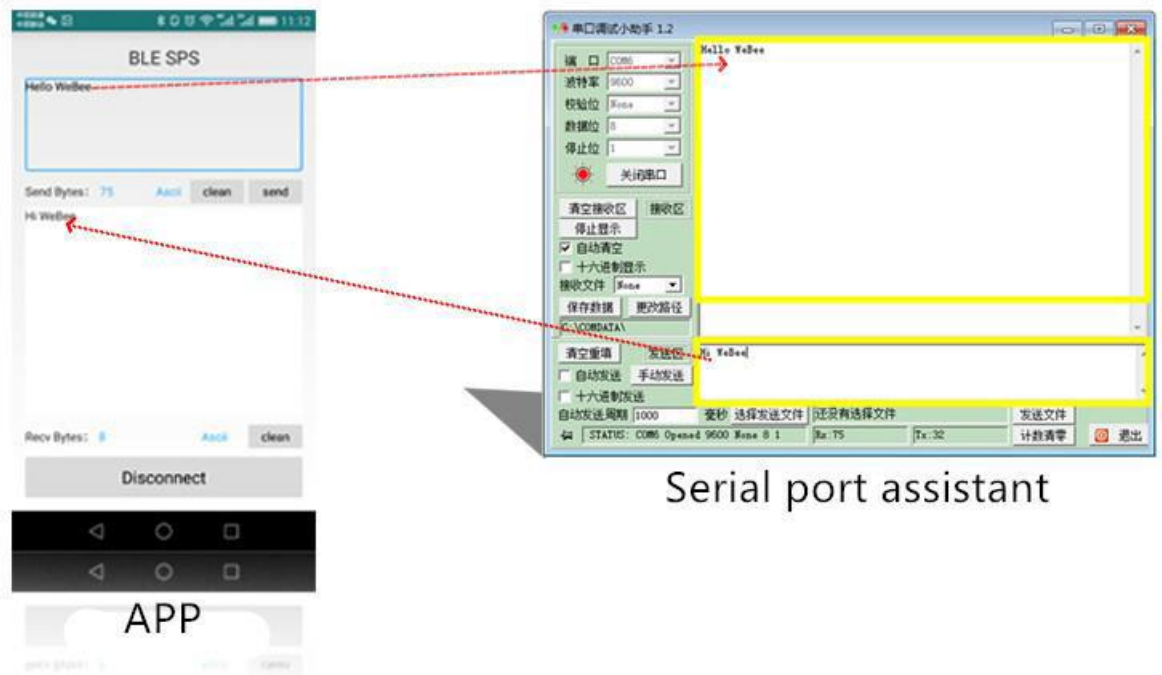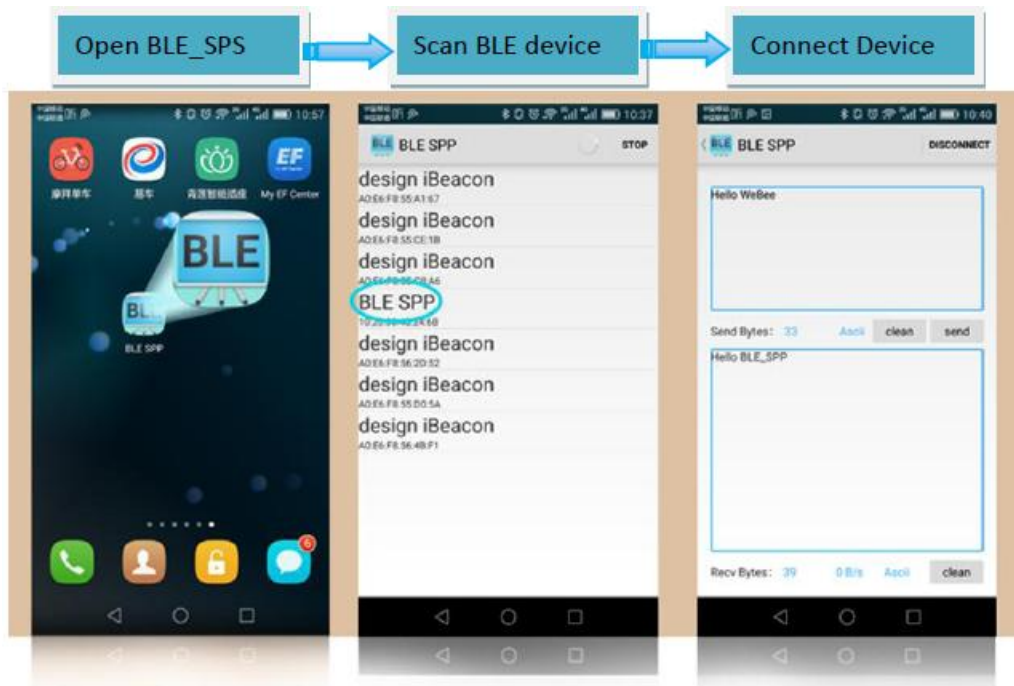
Step 3:
After a successful connection, the smart phone can send a message to BLE module,
BLE module prints information through the serial port on the PC serial port assistant;
PC serial port can also send a message to the smart phone.

4 The „AT" command of setting module

TLS-01 BLE transparent module supports AT command to configure. You need only to connect the module to the PC serial port or connected to the phone and send commands to the module, module returns the receiving data.
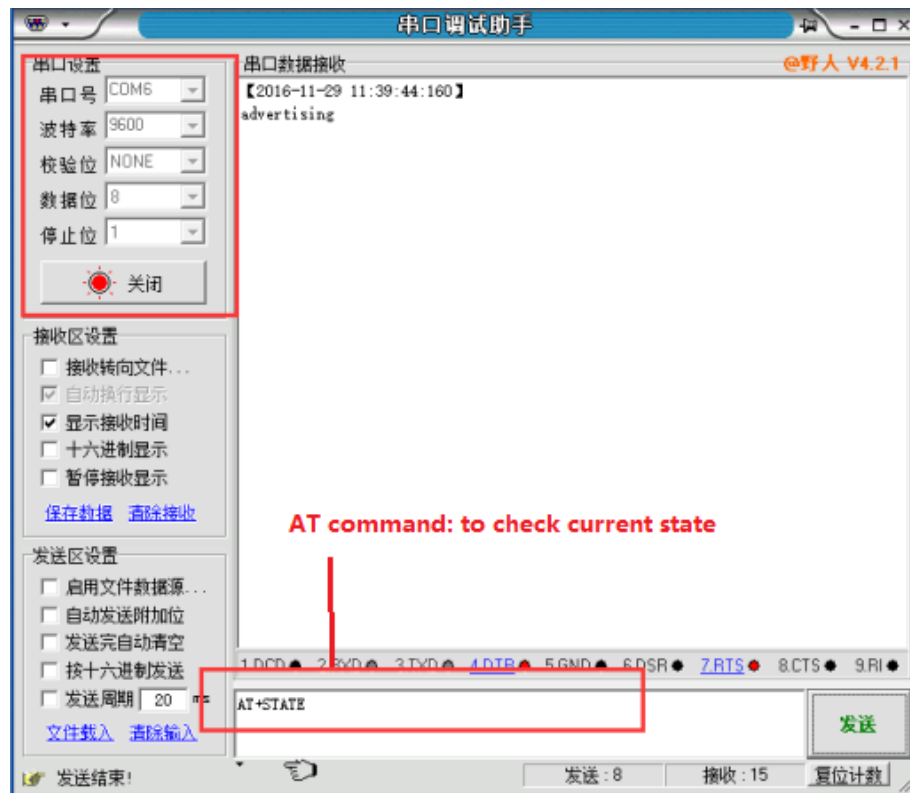
Note:

1. All AT commands do not need to add carriage return (\r), newline (\n);

2. Note that some AT commands need to reset the module to take effect.

4.1   Test AT Command

Command: AT	Param description: None
	Response: OK
	Example: AT
Note: Effective immediately	

4.2 Reboot module

Command:	Param description
AT+RST	
	Response:
	OK
	Example:
	AT+RST
Note: Effective immediately	

4.3 Restore factory-setting

Command:	Param description
AT+RESTORE	
	Response:
	OK
	Example:
	AT+RESTORE
Note: Effective immediately	

4.4 Setting the name of module

Command:	Param description
AT+NAME=	The module's name (20Byte or less)
	Response:
	OK
	Example:
	AT+NAME=LOCK
	Setting the name of module as:LOCK
Note: Effective immediately	

4.5 Setting the value of advertising interval

Command:	Param description
AT+ADV=	The parameter of broadcast interval
	Response:
	OK
	Example:
	AT+ADV=160
	It means that the broadcast interval is 160*0.625ms=100ms
Note: Effective immediately	

4.6   Setting enable module broadcast

Command:	Param description
AT+EN_ADV=	1: means enable broadcast; 0 :means disable broadcast.
	Response: On: BLE enable broadcast Off: BLE disable broadcast
	Example: AT+EN_ADV=1 1means enable broadcast
Note: Effective immediately	

4.7   Modify baud rate of UART Interface

Command:	Param description: bautdrate: 2400.4800 .9600.
AT+UART= <bautdrate>	19200,38400,57600,74880,115200
	Response: OK:means executed successful E4:means excuted fail
	Example: AT+UART=115200 Setting the module's baudrate :115200
	Note: The module default baud rate is 9600bps
Note：Effect after reboot	

The parameters that the module serial port can be set	
	2400 bps
	4800 bps
	9600 bps
	19200 bps
The baud rates	38400 bps
	57600 bps
	74800 bps
	115200 bps
Odd-Even check bit	None
Data bit	8
Stop bit	1

TLS-01 module serial port up to receive 72Byte, serial buffer is 255Byte, the module receives the data will be sent to the APP sub-package,The length of packet that the Bluetooth sent to the APP is 20Byte.

4.8 Setting transmit power

Command: AT+dBm=	Param description: The transmit power that can be setted.			
		Vaule	Power（dBm）	Vaule	Power（dBm）
		0	Max（+8dBm）	6	-18dBm
		1	+5dBm	7	-23dBm
		2	0 dBm	8	-27dBm
		3	-5 dBm	9	-30dBm
		4	-10dBm	10	-37dBm
		5	-13 dBm	100	Min
	Response: OK: means executed successful E5:means excuted fail			
	Example: AT+dBm=0 （The module's default transmit power is maximum.）			
Note：Effective immediately				

4.9 Setting connection parameters

Command: AT+CONN=Conn_min,Conn_max, Laytency,Timeout	Param description Conn_min:The Minimum parameters of connection (8-10000) Conn_max: The Minimum parameters of connection (8-10000) Laytency：Delay(0-4) Timeout: x ms
	Response: On: BLE enable broadcast Off: BLE disable broadcast
	Example: AT+CONN=20,40,0,2000 Setting the parameters ,Conn_min：20 Conn_max：40 Laytency：0 Timeout: 2000
Note：Effect after reboot	

The parameters of connection	The default parameters	description
Connection interval min	6	The parameters of connection will affect the response speed that the phone connect the BLE module, in general, the smaller parameters, the faster the connection response.
Connection interval max	8	
Latency	0	
Timeout	100	

4.10 Setting IO1 level

Command: AT+IO1=H/L	Param description Setting the level of the GPIO_PA1 Pin H:High level L:Low level
	Response: OK
	Example: AT+IO1=H
	Note: The default level is low
Note: Effective immediately	

4.11 Setting IO2 level

Command: AT+IO2=H/L	Param description : Setting the level of the GPIO_PA5 Pin H:High level L:Low level
	Response: OK
	Example: AT+IO2=H
	Note: The default level is low
Note: Effective immediately	

4.12   Getting value from ADC pin

Command: **AT+ADC**	Param description : **None**
	Response: **ADC value: if the return value is 512,it means the voltage :512/1024*3.3=1.65V**
	Example: **AT+ADC**
	Note：Reads the ADC pin's voltage, the referenced voltage is AVDD (3.3V) , the ADC range: 0-1023
Note：Effective immediately．Returns the ADC value	

4.13   Querying version of firmware

Command: **AT+VER**	Param description : **None**
	Response: **1.0.0**
	Example： **AT+VER**
Note：Effective immediately, returns the ver	

4.14   Querying MAC address

Command: **AT+MAC**	Param description : **None**
	Response: **18FE34D4XXXX**
	Example： **AT+MAC**
Note：Effective immediately, returns MAC	

4.15 Querying module status

Command: AT+STATE	Param description : None	
	Response:	
	Standby	Sleep status
	Advertising	Broadcast status
	Connected	Connected status
	Terminated	Terminate status
	Error	Error status
	Service discovery finished	Service discovery finished
	Example： AT+STATE	
Note：Effective immediately, returns the status of module		

4.16 Querying module name

Command: AT+NAME	Param description : None
	Response: BLE SPP
	Example： AT+NAME
Note：Effective immediately, returns the name of module	

4.17 Querying broadcast interval

Command: AT+ADV	Param description : None
	Response: 160 ,means interval is:160*0.625ms=100ms
	Example： AT+ADV
Note：Effective immediately	

4.18   Querying baud rate

Command: AT+UART	Param description : None
	Response: 115200 ,means module's baudrate is:115200
	Example: AT+UART
Note: Effective immediately	

4.19   Querying transmit power

Command: AT+dBm	Param description : None
	Response: max dBm、+5dBm、0dBm、-5dBm、-10dBm、-13dBm、-18dBm、-23dBm、-27dBm、-30dBm、-37dBm、min dBm E5:means that the read failed
	Example: AT+dBm
Note: Effective immediately	

4.20   Querying connection parameters

Command: AT+CONN	Param description : None
	Response: 20,40,0,200 Means the parameter: Conn_min: 20 Conn_max: 40 Laytency: 0 Timeout: 200
	Example: AT+CONN
Note: Effective immediately	

4.21   Querying current connection setting

Command:	Param description :
AT+CURRCONN	**None**
	Response:
	ble disconnected： means bluetooth is not connected
	6,8,0,200： means the current parameter of connection
	Conn_min： 6
	Conn_max： 8
	Laytency： 0
	Timeout： 200
	Example：
	AT+CURRCONN
	Note: Querying the actual parameters of connection, need to connect the BLE module, please send the instructions when the bluttooth had connected 5 seconds.
	The connection parameters set by the module may not be suitable for APP. During the APP connection process, the module connection parameters will be automatically adjusted to the best. This instruction can only be executed when the module is connected with the device.
Note： Effective immediately	

4.22　Read output status of IO1

Command:	Param description :
AT+IO1	Reads the level of the PA1 pin
	Response: H: the current IO level output is high L: the current IO level output is low
	Example: AT+IO1
Note: Effective immediately	

4.23　Read output status of IO2

Command:	Param description :
AT+IO2	Reads the level of the PA5 pin
	Response: H: the current IO level output is high L: the current IO level output is low
	Example: AT+IO2
Note: Effective immediately	

4.24　Read input status of IO3

| Command:	Param description :
AT+IO3	Reads the level of the PB0 pin
	Response: H: the current IO level input is high L: the current IO level input is low
	Example: AT+IO3
Note: Effective immediately	

4.25 Read input status of IO4

Command:	Param description :
AT+IO4	Reads the level of the PB5 pin
	Response:
	H: the current IO level input is high
	L: the current IO level input is low
	Example:
	AT+IO4
Note: Effective immediately	

## 5 The guide about programming

TSL-01 module is supplied with firmware. You can use it as an ordinary common serial device. It is very each to construct circuit for using BLE function.

5.1 Most simple connection circuit diagram

If the power of the Bluetooth module is subject to external control or does not take into account power issues and does not require connection status indication and IO control, the following simple circuit diagram connection can be used to connect the external MCU to the Bluetooth module (only VCC, GND, TXD, RXD 4 Pins): If the user's MCU is 3.3V, the serial port can be directly connected to the MCU, as shown below:
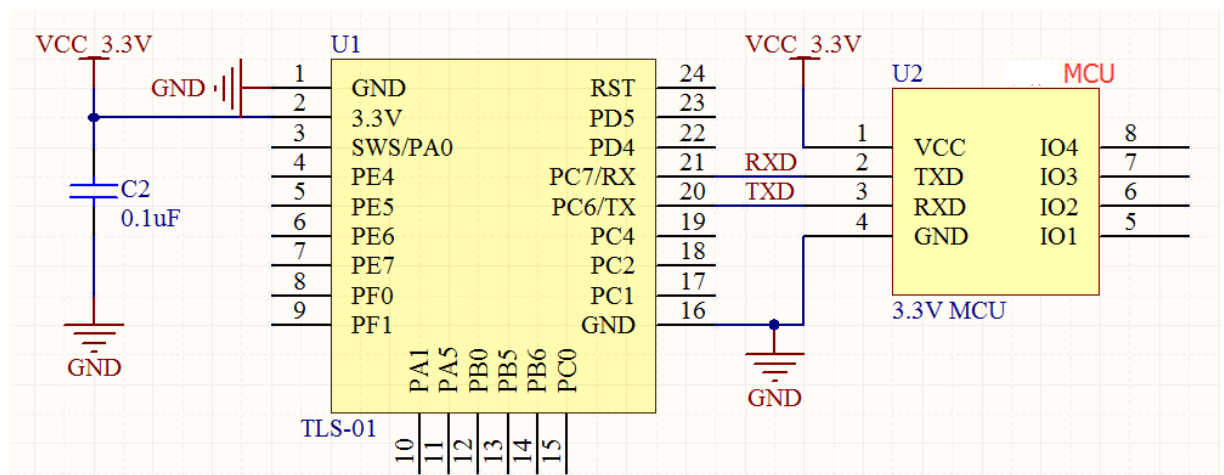

If the user's MCU is 5V, the level of communication between the serial partner is not symmetrical, communicate is not possible. 1K resistor have to be connected between MCU serial port and modules , as shown below:
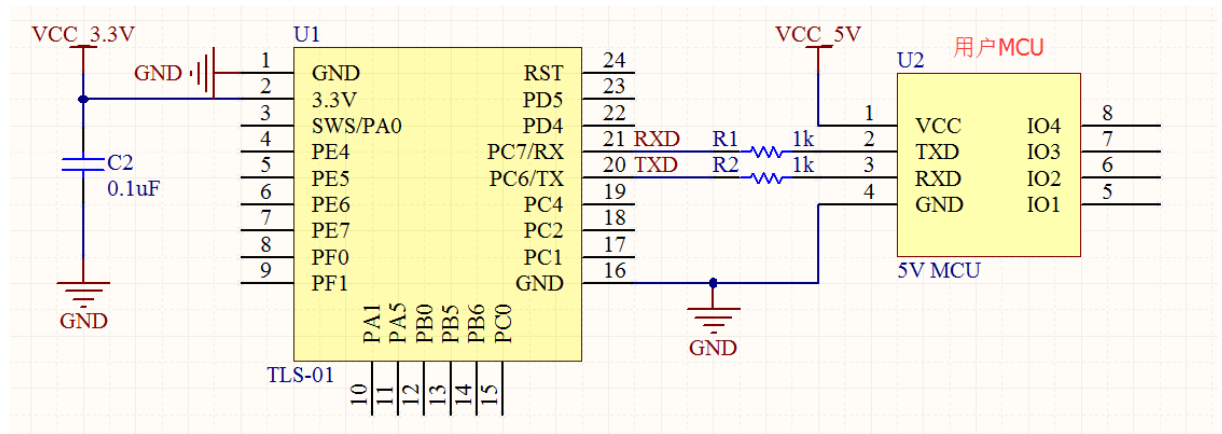
5.2　Typical application circuit of TSL-01 Module

The module broadcast and connection have corresponding indication pin, the typical application is connected as follows:
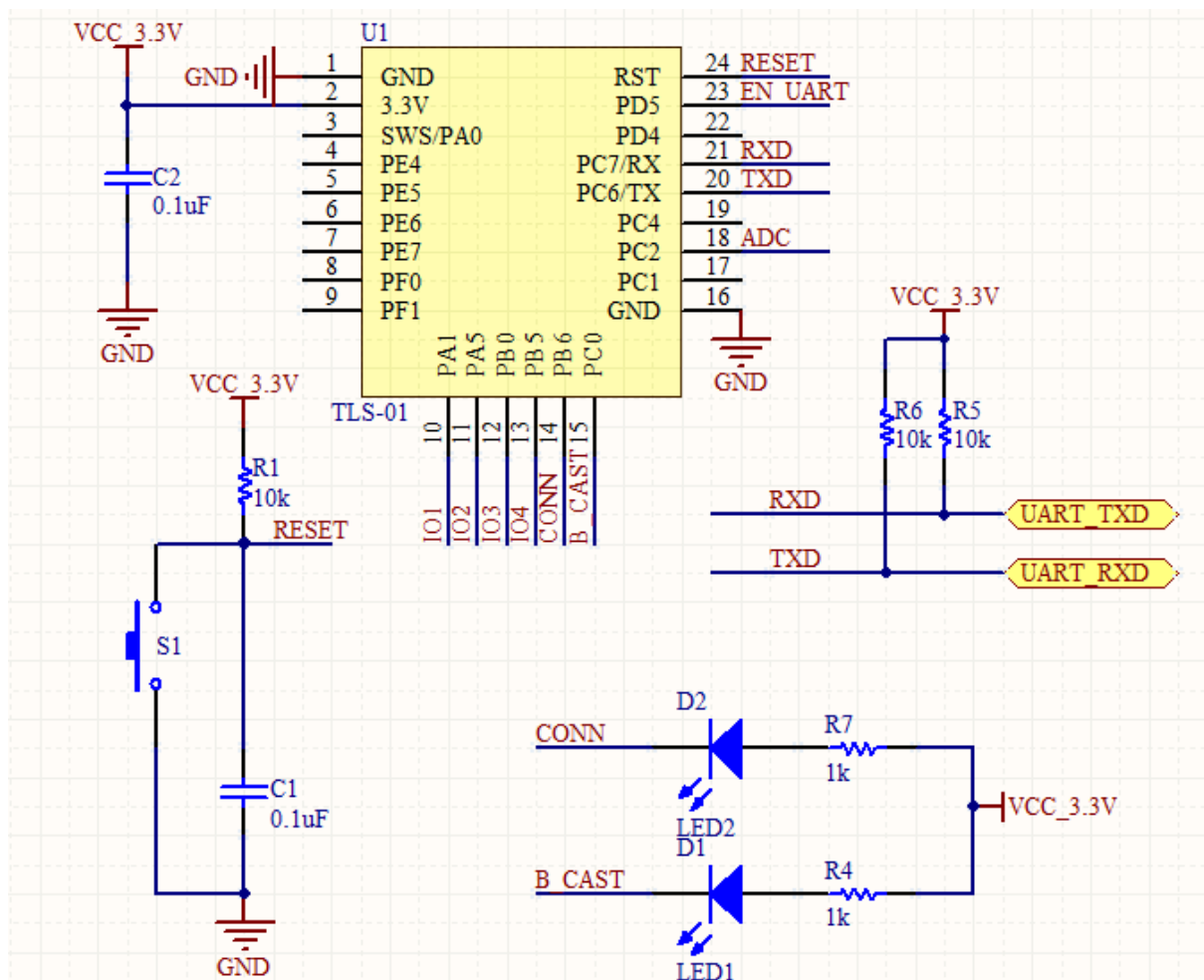
PC0	The indication pin of broadcasting; when the BLE was connected, it will stop broadcasting.	L：the module is broadcasting
		H：the module is not broadcasting
PB6	The indication pin of BLE connection	L：the BLE module has be connected
		H：the BLE module isn't connected
PD5	Enable UART , the default is low.	L：the module's UART is enable
		H：the module's UART is disable