

XLW-BLE003U

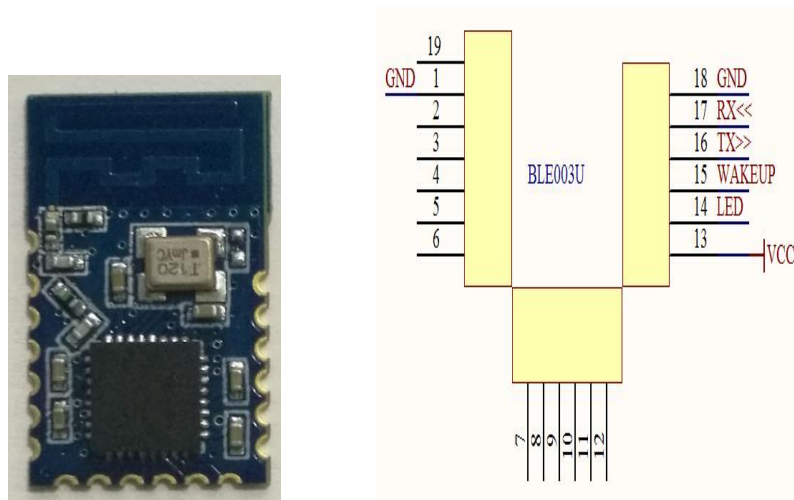
Bluetooth Module

Manual

XLW-BLE003U

Bluetooth Module Manual

The **BLE003U** is a Bluetooth module which is lower energy consuming, compact designed size, stronger signal, quick start reading, higher reliability, higher cost-efficiency. This module highly integrates Bluetooth Low Energy radio, stack, profile and applications in a SoC. The BLE003U Bluetooth module is equipped with a variety of standard interfaces, UART, I2C, PWM, GPIO, etc. and also provides a Command Line Interface configuration, AT Instruction Set etc. User could easily integrate into their products , accelerate product development, shorten time to market. It provides users a low-cost & reliable wireless solutions. The module also offers flexible hardware interfaces for the different application.



BLE003U Module

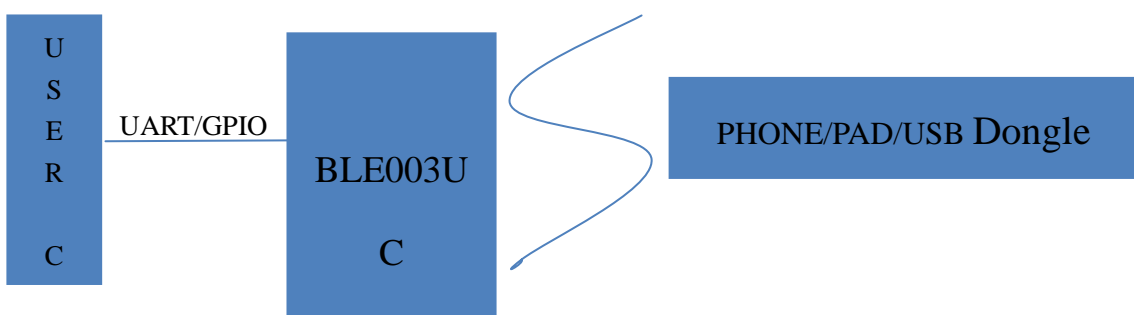
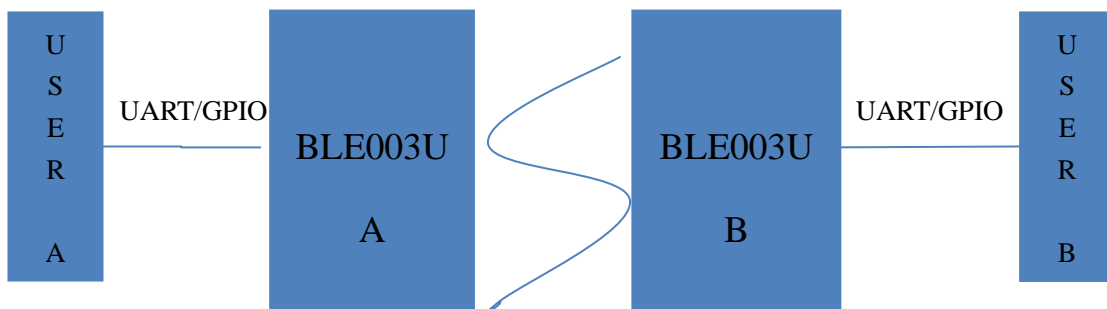
Product features:

- Bluetooth BLE4.0 single mode module
 - Low energy consumption, support Suspend and Deep Sleep mode, optionally powered by battery
 - Support UART/PWM/GPIO/I2C interfaces
 - Support PCB antenna
 - Support command line configuration interface, compatible with the AT instruction
 - BQB certification(SIG DID: **D032089**) , FCC, CE, RoHs compliant
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Applications:

- Intelligent home system, small appliances, intelligent home appliances, light.
- Wearable, handheld devices, health/medical care equipment.
- Toys, automotive electronics, all types of industrial control products.
- Electronic scale, Sports and fitness equipments

1. The bluetooth module application logic diagram



2. Pin definitions of BLE003U

Pin Number	Pin Name	Definitions	Remarks
1	GND	POWER GROUND	

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2	GPIO1	GPIO	
3	GPIO2/SDA	GPIO or SDA	
4	GPIO3	GPIO	
5	GPIO4/SCL	GPIO or SCL	
6	RST	RESET	Reset pin, active low
7	REVERSE	REVERSE	suspension if not in use
8	GPIO5/PWM	GPIO or PWM	
9	GPIO6/PWM	GPIO or PWM	
10	GPIO7/PWM	GPIO or PWM	
11	GPIO8	GPIO	
12	GPIO9	GPIO	
13	VCC	3.3V Power supply	2.5V-3.6V,suggest 3.3V
14	STATUS/PWM /GPIO	STATUS or PWM	The default is module LED status light, When the Bluetooth connection is low level.
15	WAKEUP/PWM/GPIO	Suspend Mode or PWM	the default is module Suspend status, active low into Suspend Mode.
16	TX	UART TXD (TTL)	
17	RX	UART RXD (TTL)	
18	GND	POWER GROUND	
19	RF output	Antenna output PIN	It already have PCB antenna on module board, suspension if not in use.

Note: PIN suspension if not in use.

3. Technical specification

Item	Specification
Antenna	PCB on-board antenna, gain -2db
Frequency	2.402 ~ 2.480 GHZ
Data Transfer Rate	1Mbps
RF Receiver sensitivity	-92dBm

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RF maximum output power		+8dBm
IO	UART	Baud rate up to 8M
	GPIO	Support up to 11 GPIO(Need to customize)
	PWM	Support up to 5 PWM(Need to customize)
Working Voltage	2.5 ~ 3.6V	
Working Temperature	-40° C ~ +85° C	

4. Communication Protocol

GAP、GATT、SPP、Bluetooth Serial Port Profile.

5. AT Instructions

AT instruction: “AT+command instruction+ \r\n” , AT instruction Success: return “OK\r\n” or “information”, Failed: return “ERROR\r\n” . AT instructions to change the parameters required can take effect after t restart the module.

AT instruction is valid when the module Bluetooth is not connected. The module Bluetooth connection automatically enters the serial transmission mode.

5.1 AT Insturcitons

Instructions		Description
NAME	query	“AT+NAME\r\n” , return: the module name(the default BLE003U)
	setting	“AT+NAME=USER NAME\r\n” , USER NAME is user’s module name, the default name is “BLE003U”
PIN	query	“AT+PIN\r\n” , return Bluetooth PIN password, the default is “NULL”.
	setting	AT+PIN=USER PIN\r\n” , USER PIN is user’s PIN password. If the Bluetooth module is not encrypted, “AT+PIN=NULL\r\n”
BAUD	query	“AT+BAUD\r\n” , return Serial baud rate. the default serial baud rate is 115200.
	setting	“AT+BAUD=USER BAUD\r\n” , USER BAUD is serial baud rate, module serial baud rate: 8000000, 4000000, 115200, 57600, 56000, 38400, 14400, 9600, 4800,2400

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DEFAULT		“AT+ DEFAULT \r\n” , Restore the default setting.
REBOOT		“AT+REBOOT \r\n” , Reboot the system of BLE003U module
MAC	query	“AT+MAC\r\n” , return the Bluetooth module MAC address, for example “12345678ABCD\r\n”。
ADVINT	query	“AT+ADVINT \r\n” , return the Bluetooth module Broadcast interval time, the default Broadcast interval time is 250ms.
	setting	“AT+ADVINT=500 r\n”,500ms is broadcast interval time.
CONNINT	query	“AT+CONNINT \r\n” , return the Bluetooth module connection interval time. the default Broadcast interval time is 250ms.
	setting	AT+ CONNINT =500 r\n。 500ms is connection interval time.
UIDSPP	query	“ AT+UIDSPP \r\n ” , return the Bluetooth module UUID parameter。 The default UUID 为 FFE0。
	setting	AT+UIDSPP=FFF0 \r\n。 FFF0 is UUID parameter。
UUIDREAD	Query	“AT+UUIDREAD \r\n” , query the read feature cod. APP read data from module by the UUID. The default UUID is FFE1.
	setting	“AT+UUIDREAD=FFF5 \r\n” . Setting UUID is FFF5. APP read data from module by the UUID.
UUIDWRITE	query	“AT+UUIDWRITE \r\n” 。 query the write feature cod. The module receive data from APP by the UUID.
	setting	“AT+UUIDWRITE =FFF1 \r\n” .Setting UUID is FFF1. The module receive data from APP by the UUID.
STATUS	query	“AT+STATUS \r\n”, return the connection status of the current Bluetooth module , CONNECTED or DISCONN。

5.2 Flash read and write instruction

(The instruction function may be modified, if need, please contact the sales, in order to avoid subsequent to the official version is not compatible with the instruction)

Flash read and write instruction:

Read flash instruction: AT+RF=addr,len\r\n

Addr: flash address, from 0 to 8192, 8K bytes

Len: the length of data to be read, effective data from 0 to 60, the maximum 60 bytes.

eg: AT+RF=999,10\r\n, In the flash 999 address consecutive reading of 10 bytes of data, after the module receives the instruction, it will read the 10 bytes of data through the serial port.

Write flash instructon: AT+WF=addr,len,data\r\n

Addr: flash address, from 0 to 8192, 8K bytes

Len: the length of data to be read, effective data from 0 to 60, the maximum 60 bytes.

eg: AT+WF=999,10,0123456789\r\n, In the flash 999 address consecutive writing of 10 bytes of data(0123456789), after writing successfully, it will return "OK!\r\n".

5.3 AT instruction mode and Data transmission mode

Module disconnected: serial data as AT instruction processing;

Module connected: through the 11 PIN to determine whether the AT instruction mode or data transmission mode, if the high level is the transmission data, as the low level is the AT instruction mode.

6. Low energy description

BLE003U based on the different current consumption have three work mode t:

6.1 Normal Working mode:

- 1) Usage: The WAKEUP PIN is suspension in the normal working mode.
- 2) Power consumption: the module is in broadcast mode or connected mode(including no data) , the current is about 15mA.

6.2 Suspend mode (Shallow sleep mode)

- 1) Usage: Customer's MCU I / O port need to connect with the module WAKEUP PIN. when MCU need send dates to the module by the serial port, MCU need pull the WAKEUP PIN high level module 5 seconds in advance. After sending the data the MCU immediately pull the WAKEUP PIN low level. Please keep WAKEUP PIN to low level if not in use .

- 2) Power consumption:

When broadcast interval time and connection interval time is 1000ms, the current is 78uA.

When broadcast interval time and connection interval time is 500ms, the current is 143uA.

When broadcast interval time and connection interval time is 200ms, the current is 338uA.

In addition, in the Suspend mode, if the MCU send 20 bytes of data to the Bluetooth module each 100ms , the average current of the different connection interval time are as follows:

Interval time (ms)	Average current (uA)
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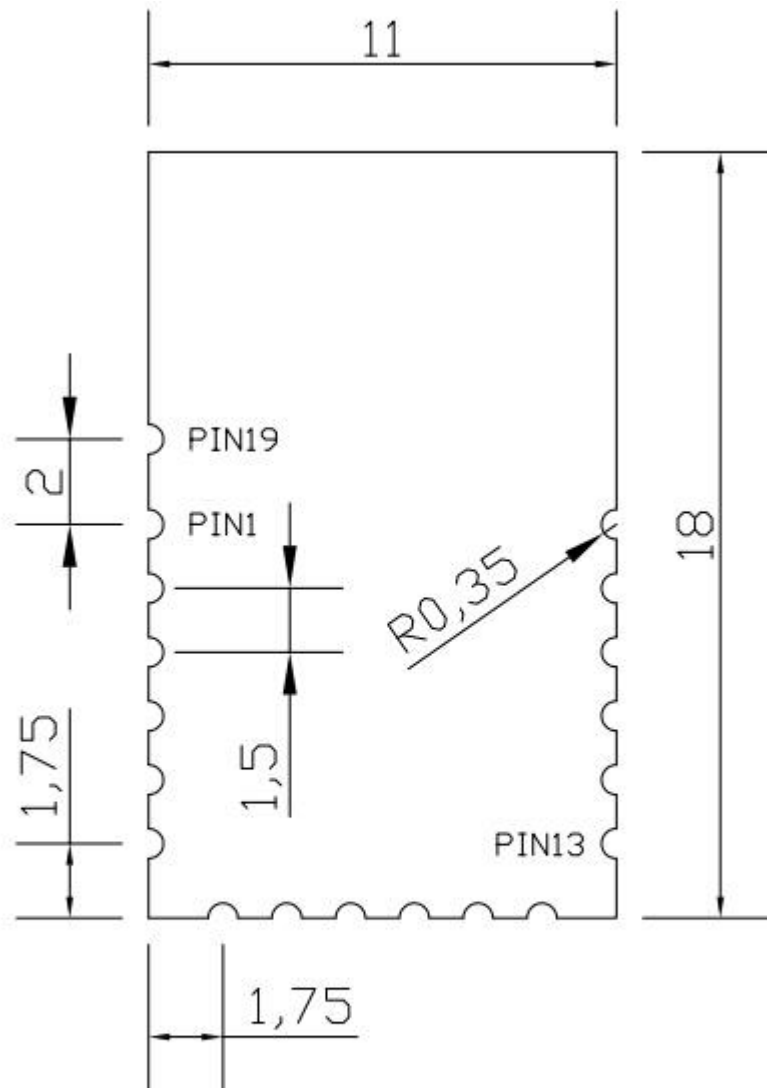
1000	152
250	567
100	1380

Note: The connection interval time does not represent the minimum interval APP or MCU data sending time, such as 1000ms connected interval time does not refer to APP can only write a data one time in 1000ms .Instead the app can write data many times in 1000ms, but APP can write no more than 20 bytes data to module every time. These data will send to the module together every 1000ms. The module send date to the app similarly, but data can be sent up to 75 one time.

6.3 Deep sleep mode

The current of the Deep sleep mode is only about 0.7uA. The Standard module does not support the Deep sleep mode. If necessary, please contact us.

7.The Module Dimension



Unit:mm

8. Power supply circuit

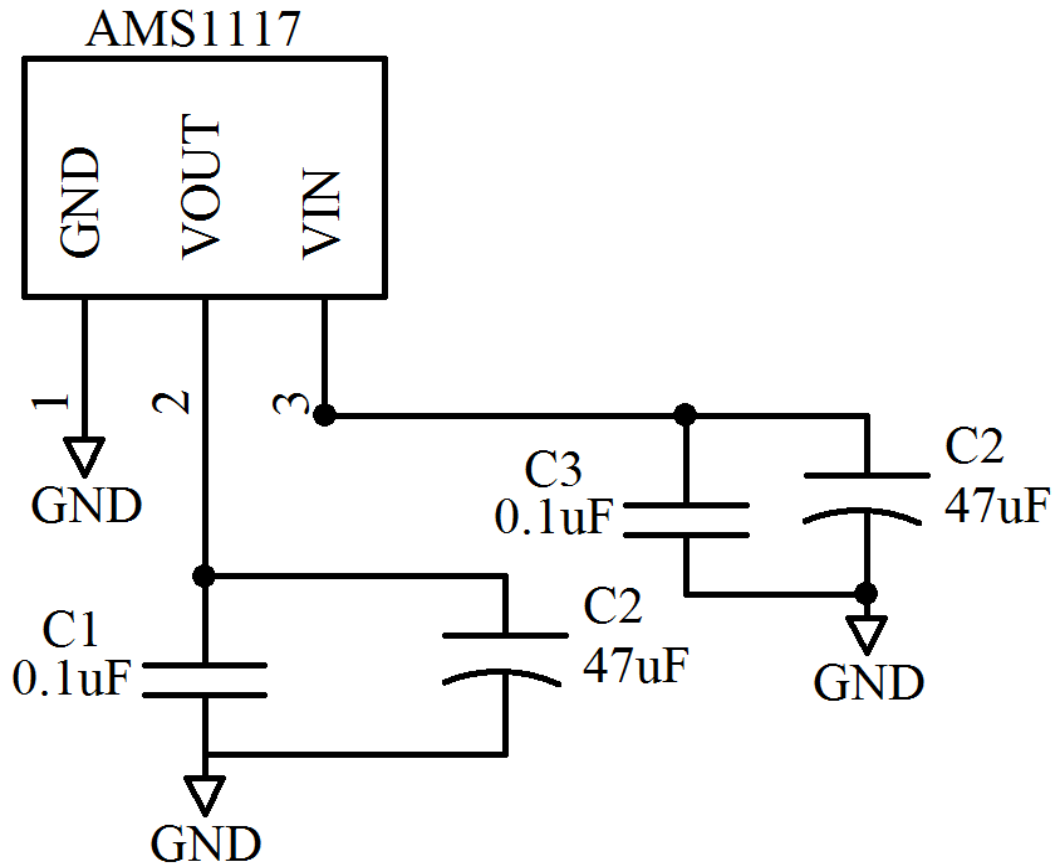


图 3-1 3.3V power supply circuit

Notes:

1、 BLE003U series of Bluetooth module of power supply circuit has certain requirements: a 3.3V supply voltage ripple coefficient to less than 200mV, the minimum output current to greater than 20mA (need to choose a 3.3V regulator, according to the actual circuit current to decide).

9. Module Usage

- 1) The module disconnected: serial data all as AT instruction processing; Module connected: Receive the data format by the serial port to determine whether the AT instruction or transmission data. If the data format is with the format of the AT instruction, as the AT instruction processing otherwise as data processing.
 - 2) The default UUID of the module is FFE0, the data transceiver features are FFE1. You can modify the module by UUIDSPP, UUIDREAD, and UUIDWRITE instructions.
 - 3) The LED indicates in 14 PIN of module, when the Bluetooth module is connected the LED
-

is light in lower level. When the Bluetooth module is disconnected, the LED is flash. The actual application will be connected in series with a resistor according to the specific parameters of the LED.

- 4) If the SLEEP function is not in use (the module is in normal working mode) , WAKEUP (15 PIN of the module) is suspension. If the sleep function is in use, let pull the wakeup PIN to low level into sleep mode. At this time, the user's MCU need an I / O port to connect the WAKEUP PIN of module. When module radio broadcast the MCU control WAKEUP PIN to be in low level, so APP can send data to the module, the data can be send through the serial port to MCU.
- 5) Bluetooth module products work in the 2.4G frequency band, should try to avoid the impact of various factors on the wireless transceiver data, pay attention to the following two points:
 - Bluetooth module products try to avoid the use of metal shell, when the use of part of the metal shell, as far as possible to make the module antenna away from the metal part.
 - Layout PCB board, antenna part around don't walk the line, not copper, away from interference components around as soon as possible.

FCC and IC Statement

This device complies with Part 15 of the FCC Rules [and with Industry Canada licence-exempt RSS standard].. 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.

Ce matériel est conforme à la partie 15 des règles FCC [et aux critères d'exemption des licences industrielles canadiennes (RSS)]. L'opération doit satisfaire aux deux conditions suivantes: 1) l'équipement ne doit pas causer d'interférences nuisibles; et 2) l'équipement doit accepter toute interférence reçue, y compris toute interférence pouvant conduire à des opérations indésirables

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.

This device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter.

Radiation Exposure Statement

The device has been evaluated to meet general RF exposure requirement in portable exposure condition without restriction.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

2.2 List of applicable FCC rules[and ISED Radio Standards Specifications]

CFR 47 FCC PART 15 SUBPART C[and RSS-247 Issue2] has been investigated. It is applicable to the modular.

2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

2.4 Limited module procedures

This module is Limited single modular without shielding, host manufacturer have to consult with module manufacturer for the module limiting conditions when integrate the module in the host. module manufacturer should reviews detailed test data or host designs prior to giving the host manufacturer approval.

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

The device has been evaluated to meet general RF exposure requirement in portable exposure condition without restriction.

L'appareil a été évalué pour répondre aux exigences générales d'exposition aux radiofréquences. L'appareil peut être utilisé en condition d'exposition portable sans restriction.

2.7 Antennas

This radio transmitter FCC ID: 2ATP5XLW-BLE003U[IC: 25175-XLWBLE003U] has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Antenna No.	Operate frequency band	Antenna Type	Maximum antenna gain
Antenna 1	2.4GHz – 2.5 GHz	PCB Antenna	-2.0 dBi

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains FCC ID: 2ATP5XLW-BLE003U" ["Contains IC: 25175-XLWBLE003U"]

2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to confirm compliance with FCC/ISED requirements for the transmitter when the module is installed in the host...

2.10 Additional testing, Part 15 Subpart B/ Canadian CAN ICES-003 (B) disclaimer

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Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B/ ICES-003 (B)...

