ALXC2X

Wireless IoT Controller User Manual

Version 2.0

2015.01.28

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Revision History

Date(Y/M/D)	Revision Content	Revision By	Version
2015/9/11	Initialization Version	Alinket	1.0
2015/12/31	Delete sensitive word	Shi Qi	1.1
2016/01/28	Change to the new template, modify the hardware figures	Huanli Wang	2.0

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1. Product Overview

ALXC2X module is a low-cost and ultra-low power consumption wireless IoT controller, with integrated IEEE 802.11a/b/g/n functionalities, dual band 5 GHz/2.4 GHz, and Bluetooth 4.0.

The ALXC2X Module series is a family of low-power, self-contained, embedded wireless module solution that addresses the connectivity demands of machine to machine applications. An RF front end and two clocks embeds into a small factor modules.

The ALXC2X module includes 5 different interfaces to communicate with the Host. The modules can also be purchased with an U.FL connector for external antennas.

1. 1 Hardware Introduction

1.1.1 Ball Maps

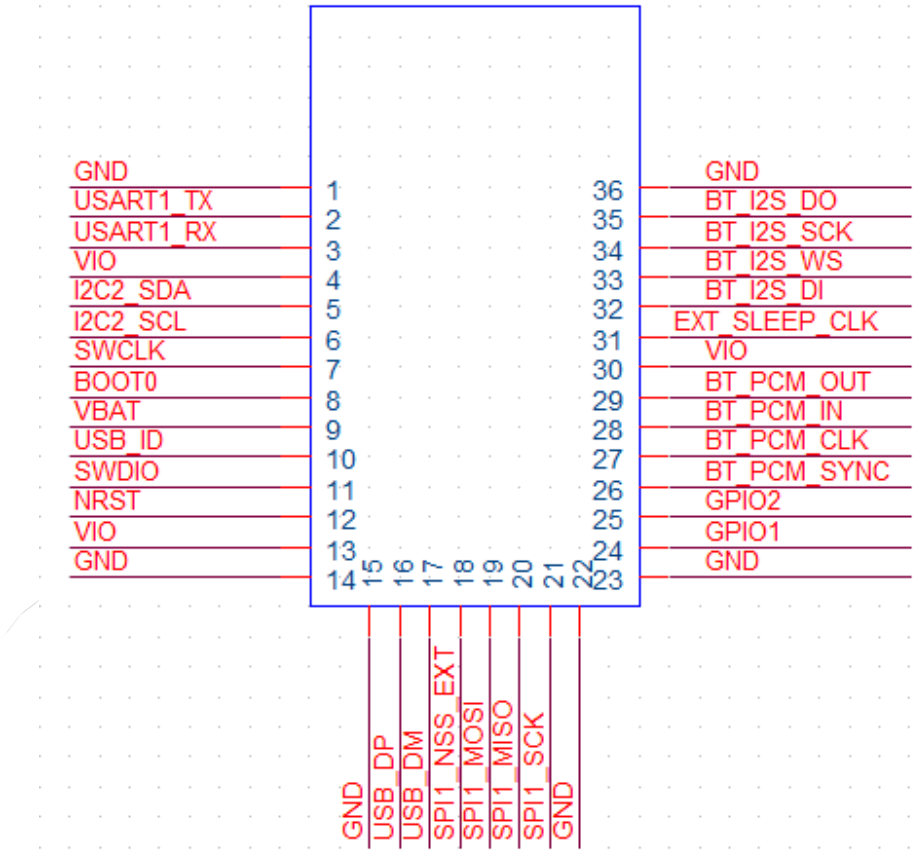


Figure 1 Ball Maps

1.1.2 PIN Description

Table 1 Pins Description

Pin#	Type	Name（Main function）	Alternate functions	PIN connection(when not using)
1	S	GND		
2	I/O	USART1_ TX	PB6	floating
3	I/O	USART1_ RX	PA10, USB_ID	floating
4	S	VIO		
5	I/O	I2C2_SDA	PB3, SPI1_SCK, USART1_RX	floating
6	I/O	I2C2_SCL	PB10	floating
7	I/O	SWCLK	PA14	floating
8	I	BOOT0		floating
9	S	VBAT		floating
10	I/O	USB_ID	PB13	floating
11	I/O	SWDIO	PA13	floating
12	I	NRST		floating
13	S	VIO		
14	S	GND		
15	S	GND		
16	I/O	USB_DP	PA12, USART1_RTS, USART6_RX	floating
17	I/O	USB_DM	PA11, USART1_CTS, USART6_TX	floating
18	I/O	SPI1_NSS_EXT	PB12, I2C2_SMBA	floating
19	I/O	SPI1_MOSI	PA7, ADC1_7	floating
20	I/O	SPI1_MISO	PB4	floating
21	I/O	SPI1_SCK	PA5, ADC1_5	floating
22	S	GND		
23	S	GND		
24	I/O	GPIO1(PB1)	ADC1_9	floating
25	I/O	GPIO2(PB0)	ADC1_8	floating
26	NC	NC	BT_PCM_SYNC	floating
27	NC	NC	BT_PCM_CLK	floating
28	NC	NC	BT_PCM_IN	floating
29	NC	NC	BT_PCM_OUT	floating
30	S	VIO		
31	I/O	EXT_SLEEP_CLK	External 32.768K Clock	floating
32	NC	NC	BT_I2S_DI	floating
33	NC	NC	BT_I2S_WS	floating
34	NC	NC	BT_I2S_SCK	floating
35	NC	NC	BT_I2S_DO	floating
36	S	GND		

1.1.3 Mechanical Size

1.1.3.1 Physical Dimensions

Table 2 Controller Dimensions

Parameter	Typical	Units
Dimensions (L x W x H)	28 x 14.3 x 2.2	mm
Dimensions tolerances (L x W x H)	±0.2	mm

1.1.3.2 Top View

Figure 2 ALXC2X (External Antenna, U.FL Connector) Top View

1.1.3.3 PCB Footprint (Top View)

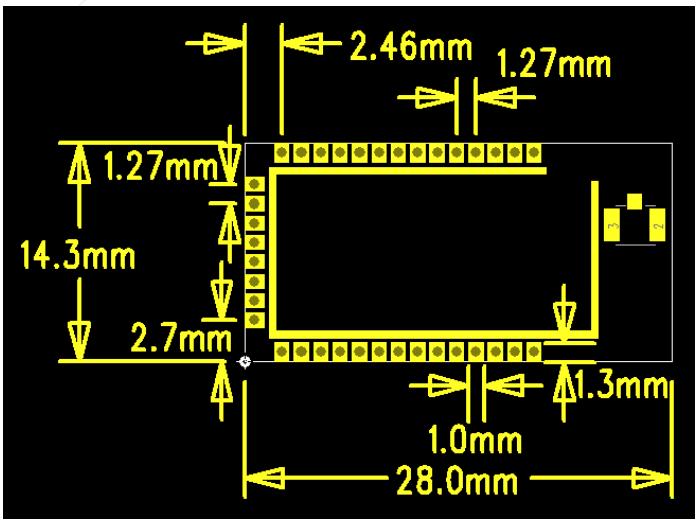


Figure 3 ALXC2XB Detailed Pad Dimensions (Top view)

1.1.4 Evaluation Kit

The ALXC2X EVK provides the hardware platform for the AWIC application development. Some major components of the EVK are shown in Figure 4.

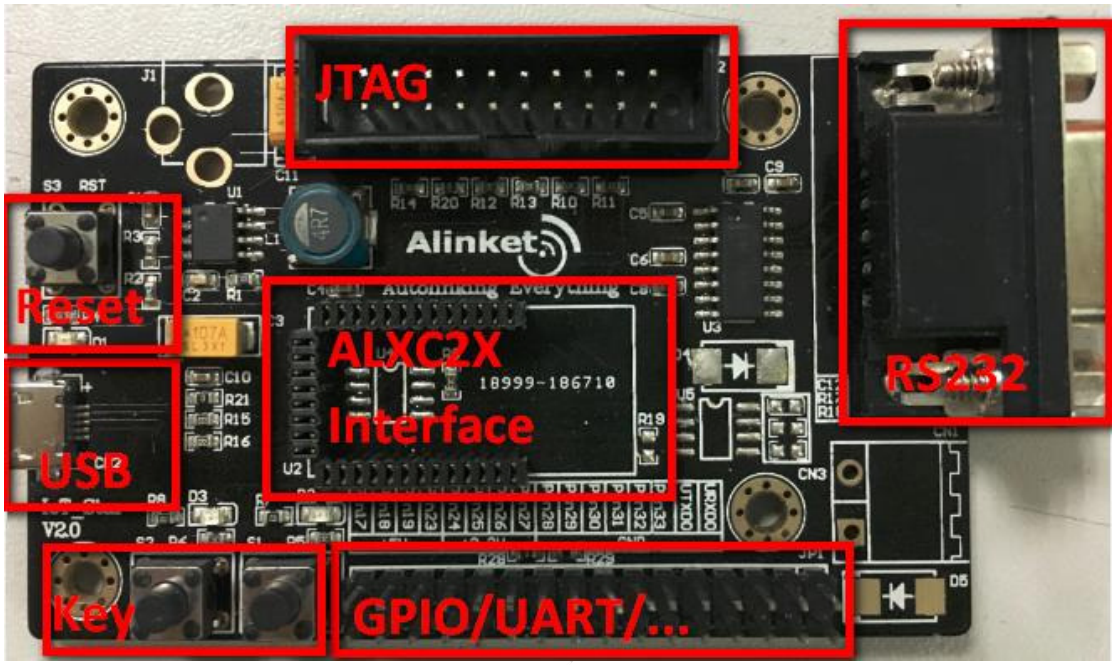


Figure 4 ALXC2X EVK

- Mini-USB connector supporting USB-Device, USB-serial interfaces and USB power supply
- Auto-Select power supply sources between Vusb and Vext
- Serial Flash (8M bits) and interface connectors
- Power indicator LED for availability of onboard 3.6V regulated output
- Two LEDs to indicate two GPO status
- A RST button to reset EVK
- Two Key button to test GPIO function
- A RS232 interface connector
- An ALXC2X interface connector
- A JTAG debug interface connector
- Pads for headers to access the I/O Pins of ALXC2X

1. 2 Range of operation

Table 3 Range of Operation-General Specification

Symbol	Description	Min	Max	Unit
Tg	General Operating temperature	-30	85	°C
To	Operating temperature	-40	85	°C
Ts	Storage temperature	-40	85	°C
VDDIO	IO Power supply	1.7	3.6	V
VDDBAT	Power supply	1.65	3.6	V
RFi	RF input power		0	dBm
MSL	Moisture Sensitivity Level	3		
RoHS	Restriction of Hazardous Substances	Compliant		

Table 4 Range of Operation-Voltages

Supply Power	Max +3.6 Volt	
Non-Operating Temperature	- 30° to 85° Celsius	
Voltage ripple	+/- 2%	Max. Values not exceeding operating voltage

Power supply for the ALXC2X Controller will be provided by the host via the power pins.

2. Hardware Reference Design

2. 1 Smallest System

ALXC2X module built-in Cortex-M4 microprocessor, SPI FLASH and an antenna, as long as power on the module can run. Shown as Figure 5.

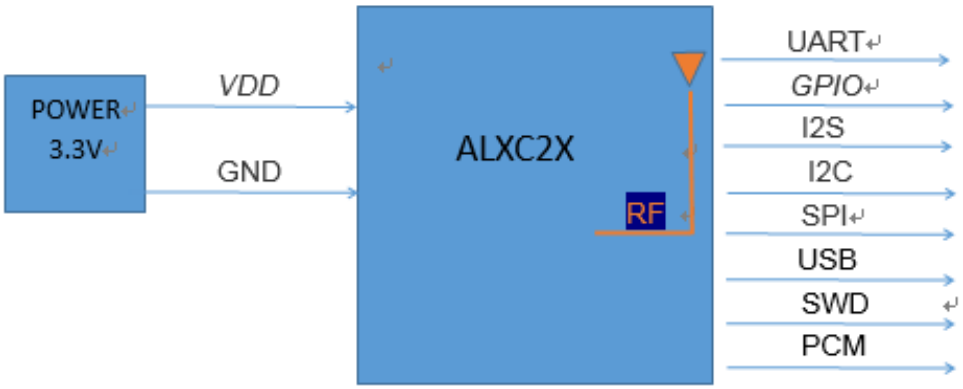


Figure 5 Smallest System

2. 2 Typical Application

The ALXC2X module communicates with other equipment by WiFi. Shown as Figure 6.
ALXC2X also provide peripheral interface options: I2S, I2C, SWD, PCM, UART, A/D, SPI, GPIOs.

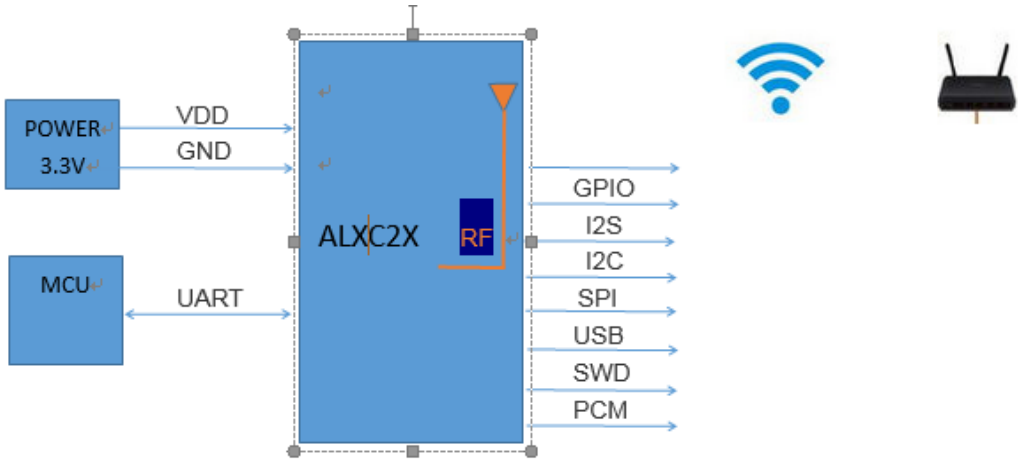


Figure 6 Typical Application

2. 3 Design Considerations

- ALXC2X module's default power is 3.3V, and the power ripple should be controlled within 50mV.
- The input of EXT_SLEEP_CLK pin must be 32.768KHz square wave, if not please ground directly.
- The power access to the VDDIO pin after filtering circuit.
- The external antenna must has 50 ohm impedance of shielded wire, and nearby can't have metal components.

3. Configuration with ACM

The host control interface are used for transferring the Alinket Controller Message (ACM), Flow Control signal and Power Save signal between Host Board and ALX module.

3. 1 Hardware Reference Model

The Host Control Interfaces are used to connect Host Board and ALX Controller. It includes ACM Bus, Flow Control Bus (Hardware Flow Control mode) and Power Save Bus (Power Save feature enabled).

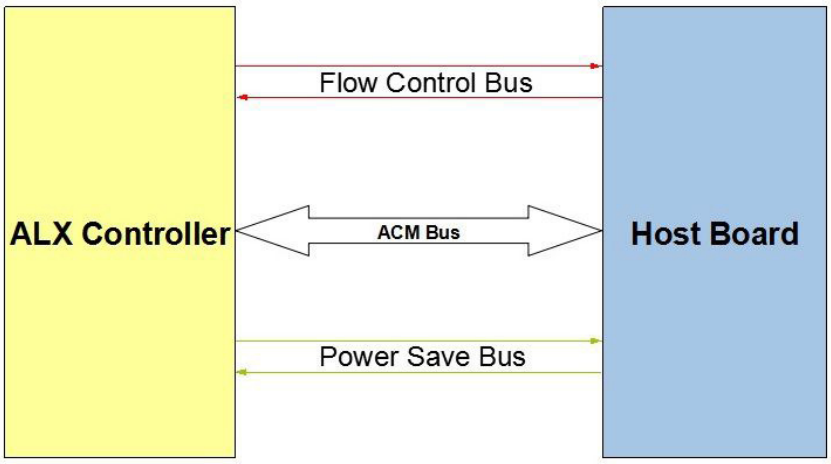


Figure 7 Hardware Reference Model

3. 2 ACM Bus

ACM Bus is the interface for exchanging the message between Host Board and ALX Controller. It could be the UART interface and SPI interface.
The messages are the control commands from Host Board, the response of commands from ALX Controller and alarm event from ALX Controller.

Input and output are UART interface with TTL level signals.

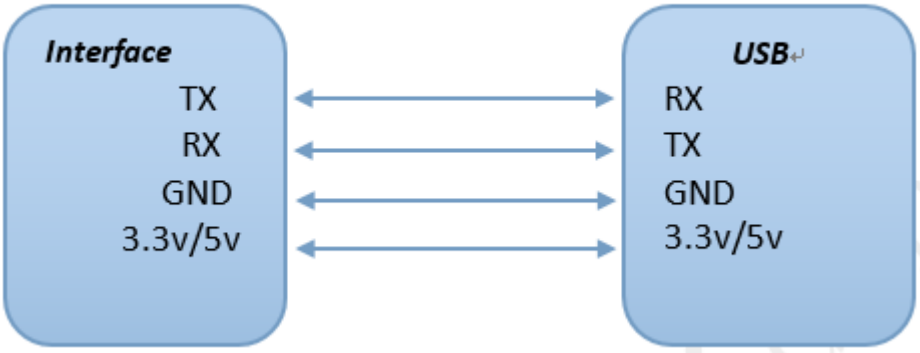


Figure 8 Connection Diagram

3. 3 Tools Introduction

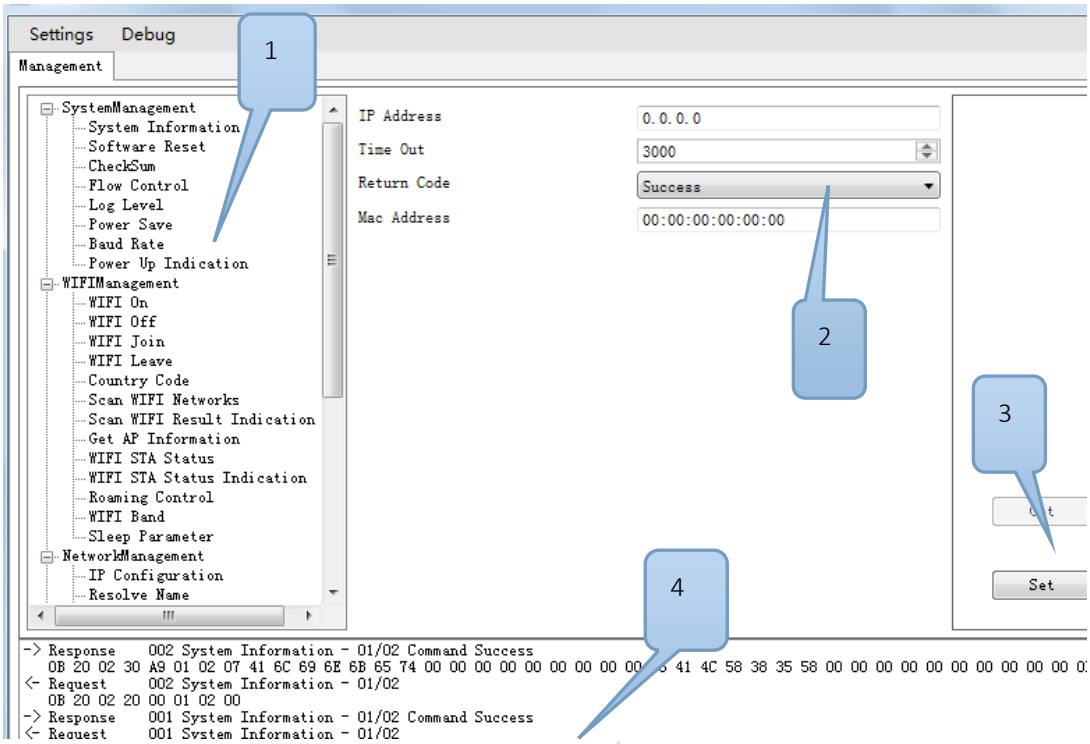


Figure 9 ACM Tool

Part 1: Show different function which can set module in different status.

Part 2: Each function in part1 have child configuration.

Part 3: Execute the current setting or get message from module.

Part 4: Show the send and receive message.

3. 4 Tool Configuration

✧ Notice: Detail operate please refer to AN_ACM_User Manual.doc

3.4.1 Join In AP

An AP must be successfully joined before using any TCP or UDP mode.

1. Open COM port and select right baud rate from menu->setting.

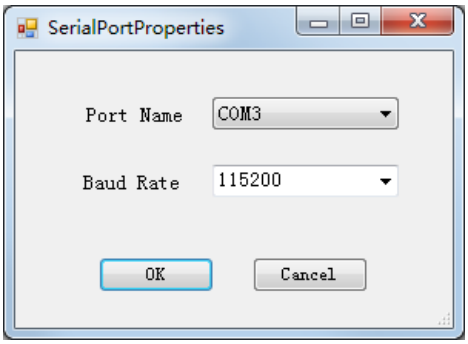


Figure 10 Open COM Port

2. Select “WiFi ON” in part 1, then click button “set”. If command is successful, the response is “Command Success”.

3. Select “WiFi Join” in part 1, fill in the blank in part 2, then click “set”. If command is successful, information will displayed in the console.

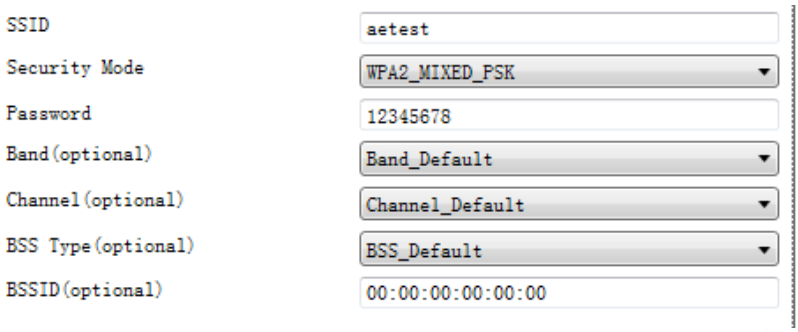


Figure 11 Configuration about Join AP

4. Select “IP Configuration”, enable “DHCP Status”, “set” into module. Then click “Get” to obtain a new IP address.

3.4.2 TCP Mode

3.4.2.1 Module Works on Client

1. Open COM port and choice right baud rate form menu->setting.

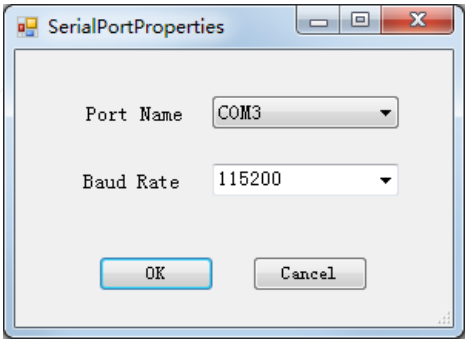


Figure 12 Open COM Port

2. Choice “WiFi ON” in part 1, then click button “set”. If “WiFi ON” is ok, the response is “Command Success”.

3. Choice “WiFi Join” in part 1, fill in the blank in part 2, then click “set”. If join is ok, success information will read from part 4.

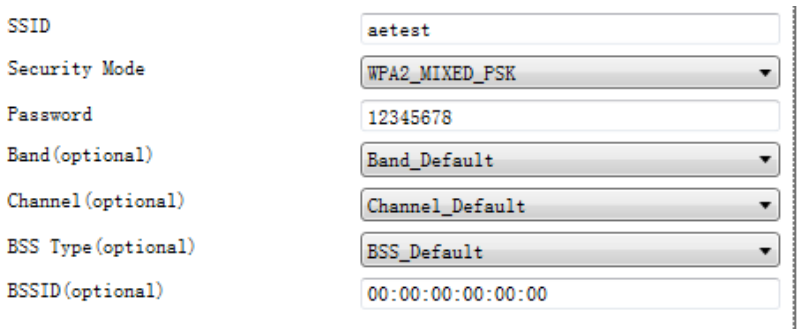


Figure 13 Configuration about Join AP

4. "IP Configuration", choice "DHCP Status" enable, "set" into module. Then click "Get" can get IP address

5. Choice "Create TCP Client Socket", default value is ok, except "Port Number", this number should be same with TCP&UDP test tool.

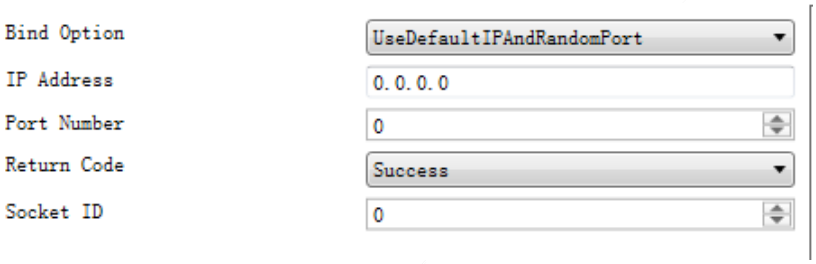


Figure 14 Create TCP Client Socket

6. Open "Alinket Socket Runner". Create server and fill in the port number. Shown as Figure 15.

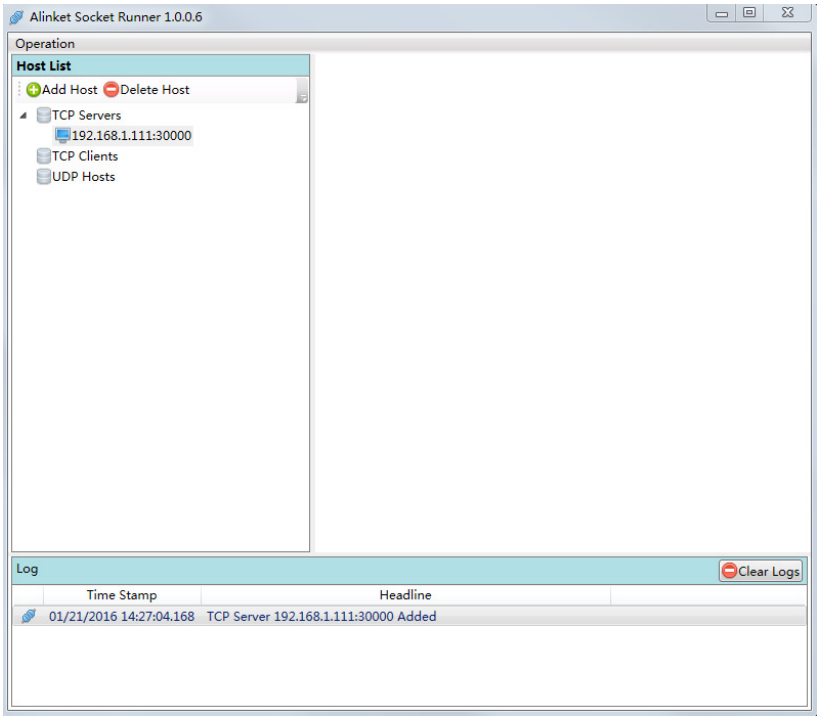


Figure 15 TCP/UDP Tool (Server)

7. Go back to ACM tool, choice “Connect TCP Server”, and fill in right information. After above action, click “set” to connect TCP server.

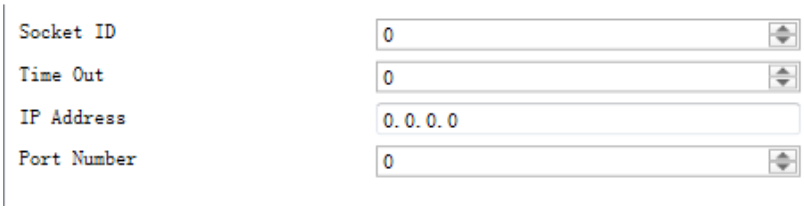


Figure 16 Connect to TCP Server

8. If connection is ok, you can send and receive message between ALXC2X and TCP server.

3.4.2.2 Module Works on Server

1. Repeat step1 ~4 in 2.4.2 chapter.

2. Choice “Create TCP Server”, then fill the table in part 2, after that click “Set” button.

3. Open Alinket Socket Runner, set client like below:

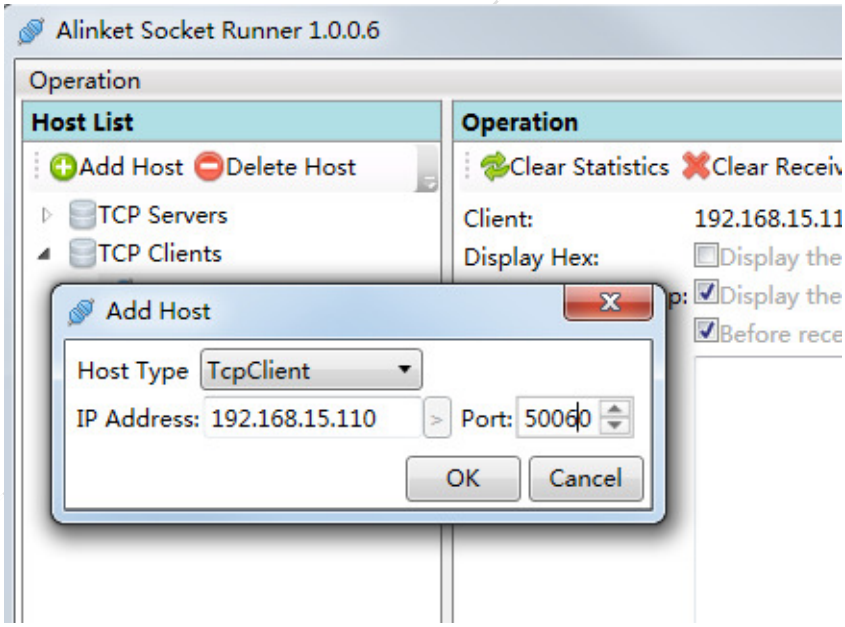


Figure 17 Add TCP Client

4. Click “OK” button.

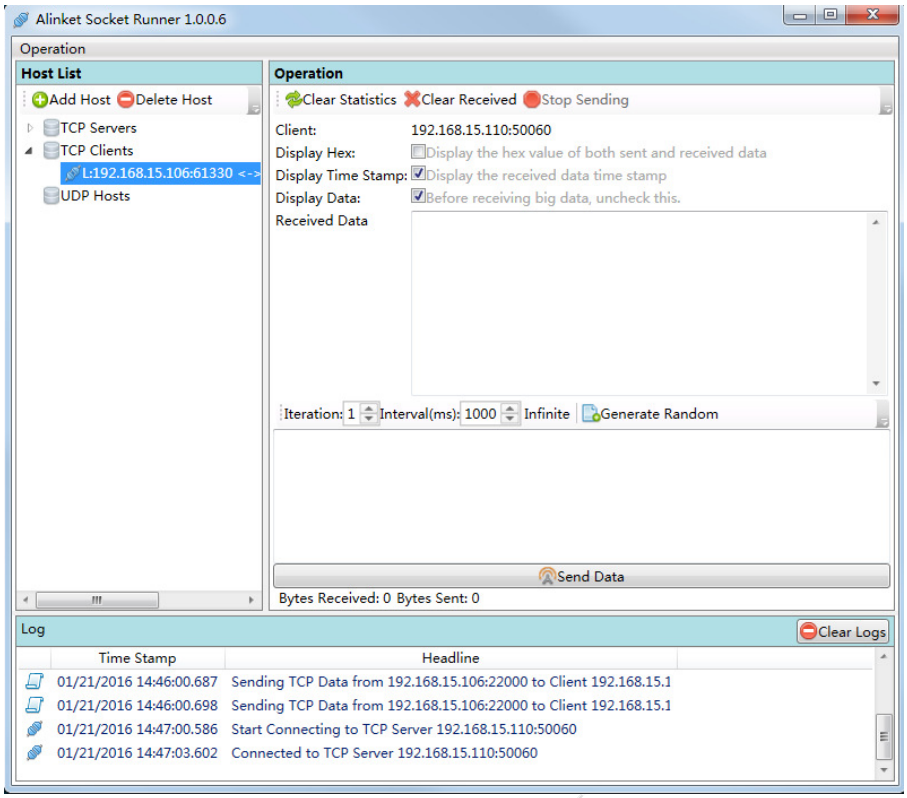


Figure 18 TCP/UDP Tool (Client)

3.4.3 UDP mode

1. Choice “Create UDP Socket” to create client mode on module with ACM

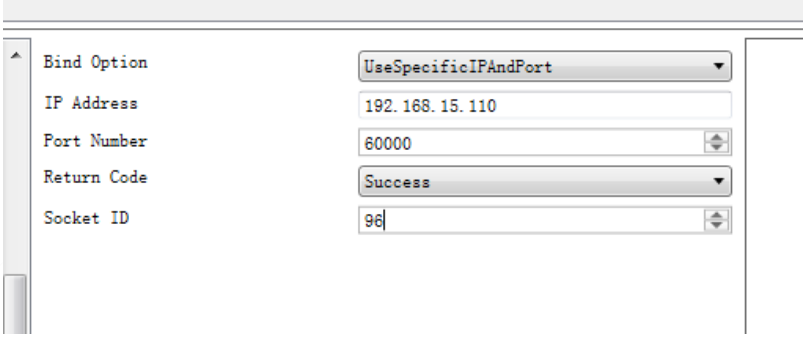


Figure 19 Configure the UDP Connection

2. Configure client mode on PC with Alinket Socket Runner.

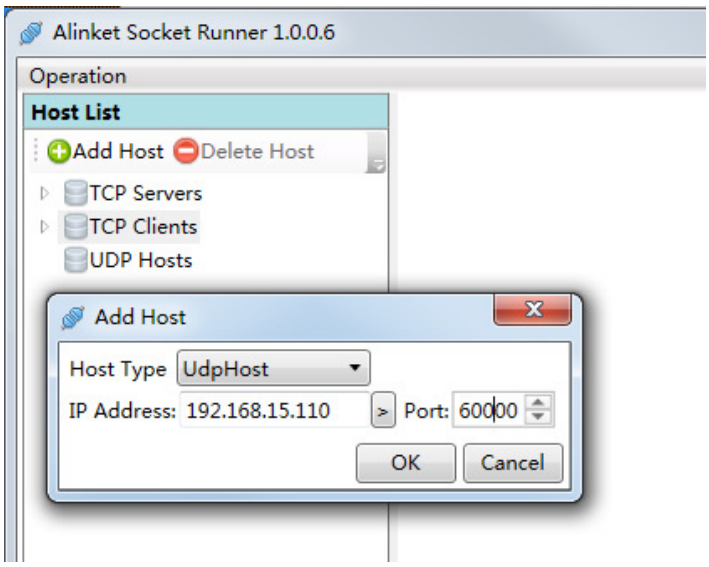


Figure 20 Create the UDP Connection

3. Click "OK" to create UDP in PC side, then it would connect to the module automatically.

4. If connection is ok, module and PC can send message to each other.

3. 5 BT Tool Configuration

Table 5 BT Information Available From ACM

ID	Name	Description
1	Power Up Indication	Reports the power up reason
2	Software Reset	Let the module reset itself
3	Get System Information	Includes manufacture, product name, SN, hardware version, boot loader version, firmware version, Bluetooth firmware version and produce date
4	Get UART Baud Rate	Show the UART baud rate
5	Set UART Baud Rate	After receiving the response restart the ASCS
6	BT On	Initialize its stack
7	BT Off	Shut down the BT function
8	Get BT Address	Return the MAC address
9	BT Send Data	Send message to specific MAC address
10	BT Receive Indication Data	Receive message from connected device

4. UART Transparent

4. 1 Hardware Connection

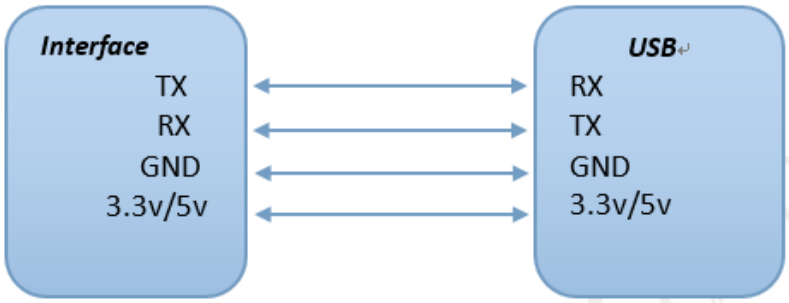


Figure 21 Hardware Detail Diagram

4. 2 WIFI Connection

4.2.1 TCP mode

1. Set up a server on PC.
2. Install Alinket flash link software on cell phone, which can join the same AP with PC.
3. Configure the flash link software like below.

Figure 22 Alinket flash link software

4. WiFi SSID is the name of the AP that the computer attached to.

5. Server URL is the server IP and port number.

6. Stop/Start button will launch the “flash link” function.

7. When configuration is finished, click “Start” button, if flash link is successful, the module will automatically configured.

8. After the module connects to the server successfully, message can be exchanged between the computer and the module as shown in below figure.

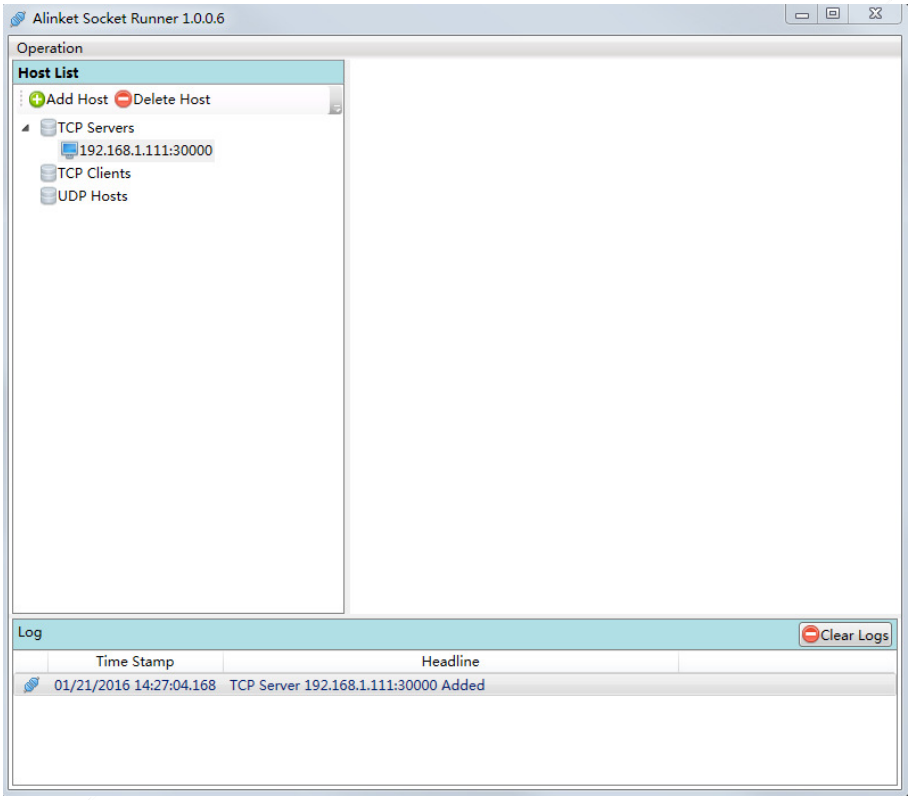


Figure 23 Connect to Server Success

4.2.2 UDP mode

1. Set up a client on PC, configure the UDP setting.

2. Repeat step 2~7 in chapter 4.2. But server URL in step 3 should be udp://XXX.XXX.X.X:port number.

4. 3 BT Connection

1. Find Bluetooth connection icon

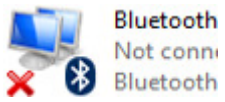


Figure 24 Bluetooth Connection

2. Right click and select property, make sure the configuration is set as below:

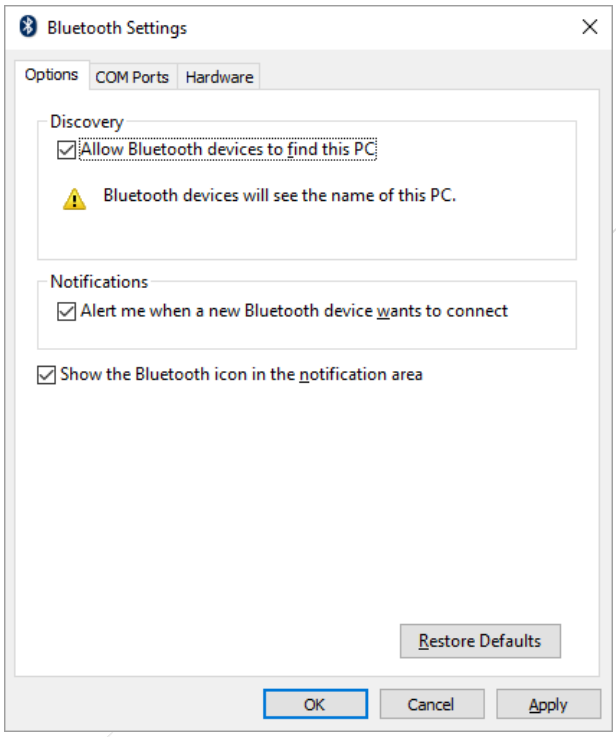


Figure 25 Bluetooth Connection Configuration

3. Add a Bluetooth device

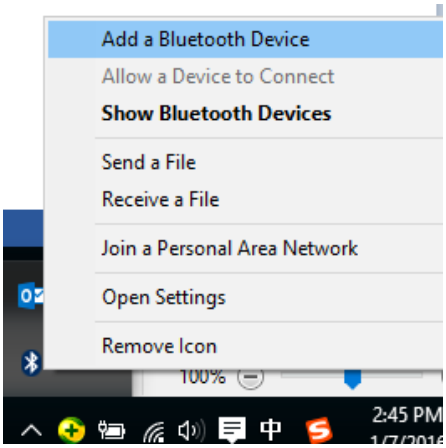


Figure 26 Add Bluetooth Device

4. Double click corresponding device in the list

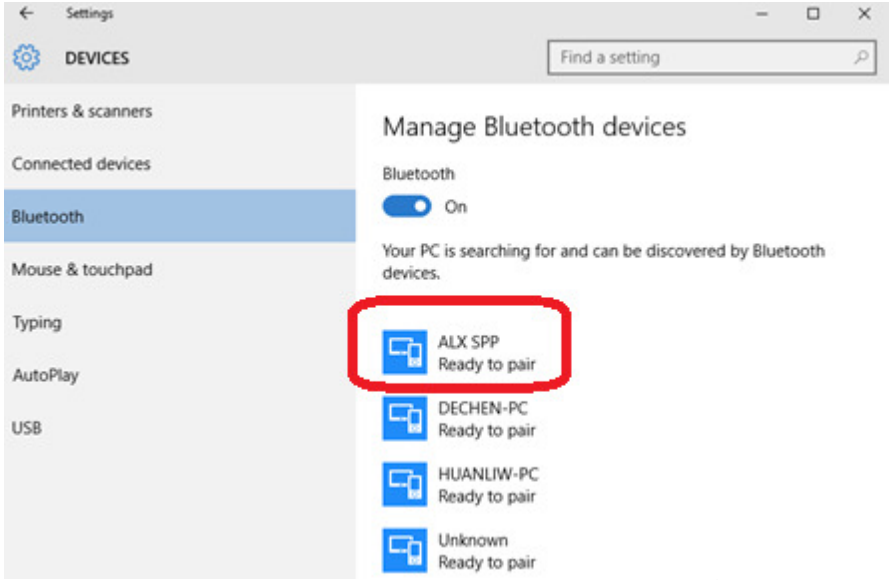


Figure 27 Connect Bluetooth Device

5. Wait for Connection success

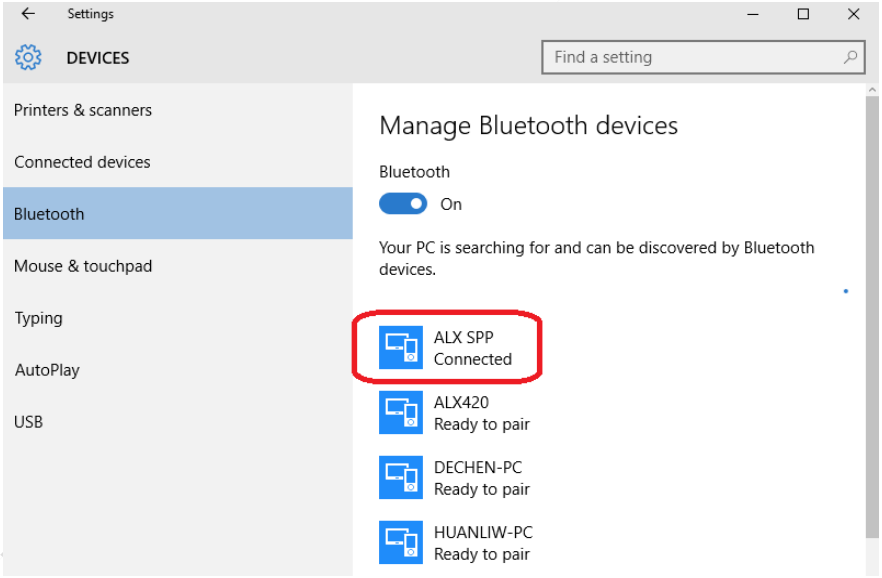


Figure 28 Connection Success

6. COM port status, we will find the connection between computer and ALXC2X is successful.

7. Try to send message between computer and ALXC2X. Open two instances of the COM port tool. Baud rate depends on which software you have download.

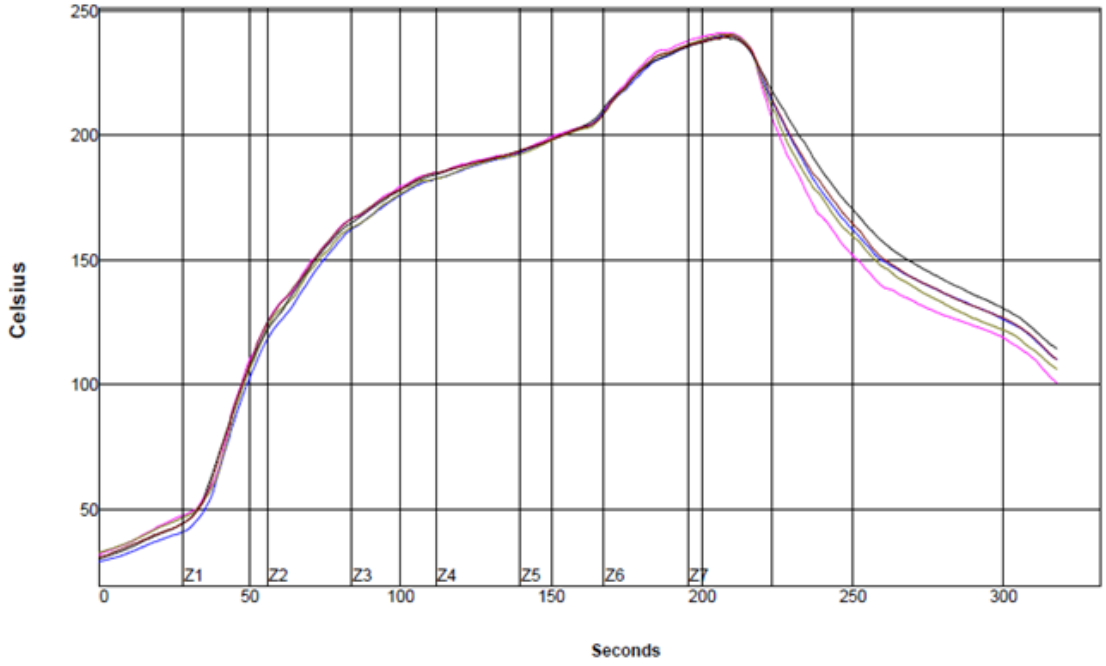
Now, COM port tool software can communicate with each other. It means Bluetooth connection between the computer and the ALXC2X module established.

5. Recommended Reflow Profile

Referred to IPC/JEDEC Standard

Peak Temperature < 250 ℃

Number of Times <= 2Times



Statistic Name	Low Limit	High Limit	Units
Max Rising Slope (Target=1.5) (Calculate Slope over 40 Seconds)	0.0	3.0	Degrees/Second
Max Falling Slope (Calculate Slope over 40 Seconds)	-4.0	-1.0	Degrees/Second
Soak Time 150-200C	60	90	Seconds
Time Above Reflow - 220C	40	50	Seconds
Peak Temperature	235	245	Degrees Celsius

Figure 29 Reflow Profile

6. Reference

[1] ALXC2X_DS.pdf, Alinket

[2] AN_ACM_User Manual.doc, Alinket

[3] Alinket Controller Message Specification VerX.X.pdf, Alinket

7. Technical Support Contact

For technical support, please mail support@alinket.com, or call 021-61048128.
Alinket Electronic Technology (Shanghai) Co., Ltd.
Floor 4, No.10, Lane 198, Zhangheng Road, Shanghai, 201204 P. R. China

8. Acronyms and Abbreviations

The following list of acronyms and abbreviations may appear in this document.

- ADC Analog-to-Digital Converter
- AP/STA Access Point/Station
- ART Adaptive Real-Time Memory
- BT Bluetooth
- CE Conformite Europeenne
- CMOS Complementary Metal Oxide Semiconductor
- EVB Evaluation Board
- EVK Evaluation Kit
- EVM Error Vector Magnitude
- FPU Float Point Unit
- GPIO General-Purpose Input-Output
- I2C Inter-Integrated Circuit
- I2S Inter-IC Sound
- IC Integrated Circuit
- IEEE Institute of Electrical and Electronics Engineers
- IP Internet Protocol
- JTAG Joint Test Action Group
- LQFP Low-profile Quad Flat Package

- MAC	Medium Access Control
- MSL	Moisture Sensitivity Level
- OFDM	Orthogonal Frequency Division Multiplexing
- PBB	Poly Brominated Biphenyl
- PBDE	Poly Brominated Biphenyl Ether
- PER	Packet Error Rate
- RC	Real Clock
- RF	Radio Frequency
- ROHS	Restriction of Hazardous Substances
- SPI	Serial Peripheral Interface
- SRAM	Static Random Access Memory
- TCP	Transmission Control Protocol
- TKIP	Temporal Key Integrity Protocol
- USBH	Universal Serial Bus Host Mode
- USBD	Universal Serial Bus Device Mode
- UDP	User Datagram Protocol
- UART	universal asynchronous receiver/transmitter
- WiFi	Wireless Fidelity

Notice:

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.

To satisfy FCC RF Exposure requirements for this transmission devices, a separation distance of 20cm or more should be maintained between the antenna of this device and persons during operation. To ensure compliance, operation at closer than this distance is not recommended. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
The modular transmitter must be equipped with either a permanently affixed label or must be capable of electronically displaying its FCC identification number:

(A) If using a permanently affixed label, the modular transmitter must be labeled with its own FCC identification number, and, if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: “Contains Transmitter Module FCC ID:2AELJ-ALXCOMBO.” Any similar wording that expresses the same meaning may be used. The Grantee may either provide such a label, an example of which must be included in the application for equipment authorization, or, must provide adequate instructions along with the module which explain this requirement. In the latter case, a copy of these instructions must be included in the application for equipment authorization.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.