ALX850B manual

1. Introduction

overview

Alinket ALX85XController Family,which has Wi-Fi 802.11a/b/g/n functionalities,is a portfolio of low-powered, self-contained, embedded wireless module solutions that address the connectivity demands of machine to machine applications.

ALX85Xsupportseither an on-board ceramicantenna or a U.FL connector which provides the flexibility for customer to pick up its own proper external antenna.

Here then, ALX85Xproduct family hasmainly two types in terms of antenna configuration.

Table 1ALX85XProduct Family

ALX850A	Wi-Fi 2.4GHz& 5GHz,Dual BandIoT Controller, On-Board Antenna
ALX850B	Wi-Fi 2.4GHz& 5GHz, Dual BandIoT Controller, External Antenna, Support U.FL

Hardware Architecture

ALX85XintegratesanARM® 32-bit Cortex®-M4micro-controller, a Wi-Fi BB/MAC/RF SoC, a RF front end, and an On-Board SPI Flashintothe small factor module.

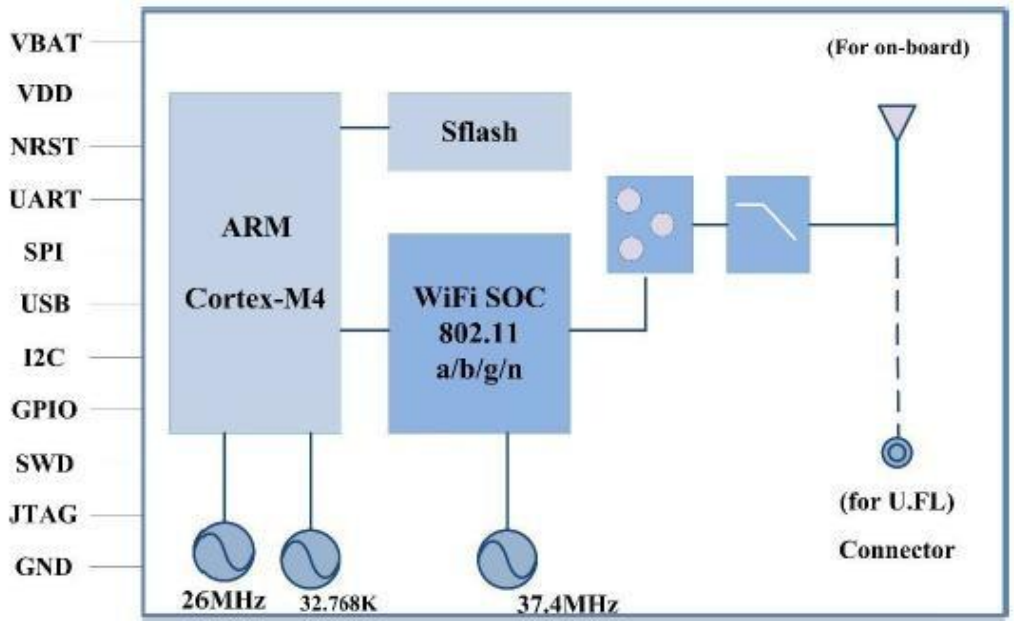

Figure 2 Block Diagram

Interface and Peripherals

The controller family includes variousdifferent host interfaces to communicate with Host CPU. Below table lists the basic descriptions of the MCU, Wi-Fi SoC and the interfaces.

Table 2MCU and Interfaces

Model		ALX85X
Wi-Fi Technology		IEEE802.11 a/b/g/n
Frequency Band		2.4GHz & 5GHz, Dual Band
MCU	Core	ARM® Cortex®- M4 @100MHz
	RAM	128KB
	ROM	512KB
Flash (On-Board)		1MB
Host Interfaces	UART x 2	Up to 6.25Mbps
	SPI x 1	50MHz, multiplexing with USB & UART1
	USB x 1	UAB 2.0, Full Speed - 12Mbps
Peripherals	I2C x 1	Support 100KHz, 400KHz & 1MHz
	ADC x 2	12 bit, 16 channel, multiplexing with GPIO
	GPIO x 10	Max., multiplexing with interface & peripherals

Note: SPI,USBinterfacesarefor customized projects only, not for standard product, please contact your local Alinket sales office or distributors for more information.

PIN Assignment

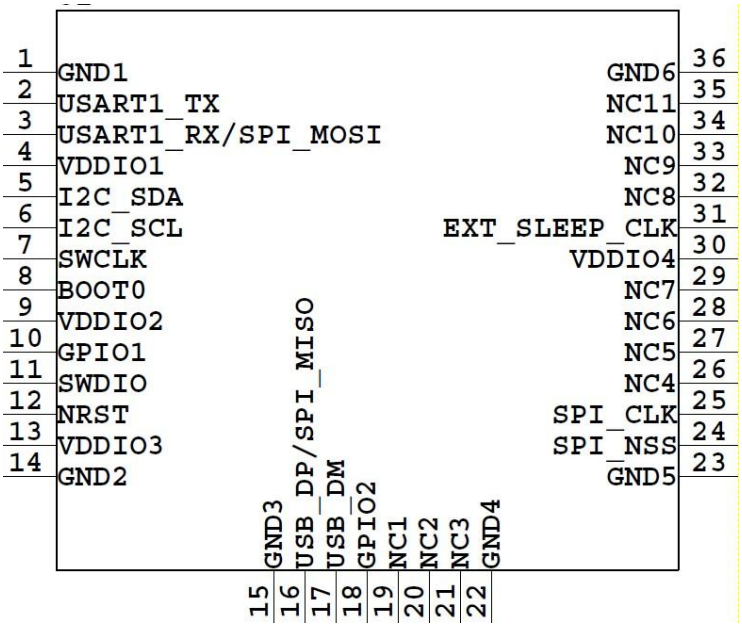

Figure 3 Ball Maps

PIN Description

Table 3 PinDescriptions

Pins	Type	Main function	Alternate functions	PIN connection (when not using)
1	S	GND		
2	I/O	USART1_ TX	GPIO	floating
3	I/O	USART1_ RX/SPI_MOSI	GPIO	floating
4	S	VDDIO	3.3V	
5	I/O	I2C_SDA	GPIO	floating
6	I/O	I2C_SCL	GPIO	floating
7	I/O	SWCLK	JTCK-SWCLK	floating
8	I	BOOT0		floating
9	V	VBAT	3.3V	
10	I/O	GPIO1	GPIO	floating
11	I/O	SWDIO	JTCK-SWDIO	floating
12	I	NRST	Active-low reset input	floating
13	V	VDDIO	3.3V	
14	S	GND		
15	S	GND		
16	I/O	USB_DP/SPI_MISO	GPIO/USART1_RTS/USART2_RX	floating
17	I/O	USB_DM	GPIO/USART1_CTS/USART2_TX	floating
18	I/O	GPIO2	GPIO	floating
19				floating
20				floating
21				floating
22	S	GND		
23	S	GND		
24	I/O	SPI_NSS	GPIO/ADC	floating
25	I/O	SPI_CLK	GPIO/ADC	floating
26				floating
27				floating
28				floating
29				floating
30	V	VDDIO	3.3V	
31	I/O	EXT_sleep_clk	Input pin for 32.768kHz or GND	
32				floating
33				floating
34				floating
35				floating
36	S	GND		

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2. FeatureHighlights

MCU

ALX85Xfamily has a dedicated microcontroller to enhance the Wi-Fi function or applications.The MCU has anARM® 32-bit Cortex®-M4 core with FPU, adaptive real-time accelerator (ART

Accelerator™) allowing 0-wait state execution from Flash memory, frequency 100MHz, memory protection unit, 125 DMIPS/1.25 DMIPS/MHz(Dhrystone2.1), and DSP instructions.

Memories

- 512 Kbytes of Flash memory
- 128 Kbytes of SRAM
- 1M Bytes of Built-in Serial Flash

Wi-Fi

- WLAN IEEE802.11a/b/g/n,2.4GHz & 5GHz dual band.
- Flexible country code and channelconfiguration for worldwide market.
- Integrated WLAN CMOS power amplifier with internal power detector and closed-loop power control, ensures the high performance on RF sensitivity and stability.
- Supports per packet RX Antenna diversity

Security

- AES and TKIP in hardware for faster data encryption
- WEP, WPA and WPA2support for powerful encryption and authentication
- Enterprise security: IEEE802.1X authentication includesEAP-TLS, PEAP-GTC, PEAP-MSCHAPV2.

SoftAP

- SoftAP and STA can be implemented on same hardware by switching with specified command.
- Fast SoftAP and STA switch, time <3s, noreset required.
- Parametersof both SoftAP and STA can be set/read by Alinket unique ACM command.

Network Connection Indication

- Indications include:
  - AP connecting
  - AP connected
  - AP disconnected

- Server connecting(no indication because only 67ms, too short to indicate)
- Server connected
- Server disconnected

➢ Support below two methods
- In transparent mode, through GPIO to connect LEDs, LED On –connected, LED Off disconnected, LED Flashing –connecting.
- Report the connection status to customer Host through Alinket ACM command.

Multi-Socket of TCP/UDP

Max.4 TCP sockets + 4 UDP sockets supported to connect to differentnetworks. Those connections can be used for either of below two types of services or mixed circumstances.

➢ To connect to differentservers for various cloud services.

➢ To connect to same server or cloud for differentservices such as system, event, control and service.

The figure below describes the use of the multi-socket TCP or UDP connections.

Figure 5 Multi-Socket Connections for TCP/UDP

Low Power Mode

ALX85Xfamily supports low power mode to meet various industry and applications. The typical implementation is to use two GPIOs.

➢ 1st GPIOfor enter/quit low power mode

➢ 2nd GPIO to indicate the status, normal or low power mode.

Fast Network Configuration –Flashlink

Flashlink is a fast network configuration tool especially for those ALX85Xcustomer devices which without an UI display. It is an APP software which can be installed on mobile phone or PAD.

Flashlink can help customer to configure below network parameters.

➢ AP

- Wi-Fi SSID
- Wi-Fi Password
- Wi-Fi Security

➢ Server

- Server URL
- Server Username
- Server Password

There will be a configuration notification status in the bottom field of the configuration page. Flashlink is the industry only Wi-Fi fast network configuration tool support AP and Server one time configuration.It supports both Android and IOS.

Fast Roaming

ALX85Xfamily supports fast roaming between two APs which managed by the same AC. A typical Wi-Fi roaming environment are as follows.

➢ An AC (AP Controller) to manage the APs connected to it. The AC manages its network DHCP and equalizer.

➢ AllAPsconnected to above AC havesame SSID, Password and Security (WEP, WPA or WPA2 etc.).

➢ The IP address assigned to ALX85Xcontroller is managed by AC, not AP.

Unlike network disconnection and reconnection from one AP to another AP (usually taking 5s ~ 10s), Alinket ALX85Xis a true roaming, with its latest technology, ALX85Xroams from original AP to destination AP only take less than 0.5s period.

ALX85Xroaming technology is managed by Alinket unique ACM system. ALX85Xcontroller scans the available AP RSSI, calculates the delta and triggers the roaming activity. Below figure describes the roaming mechanism of ALX85X.

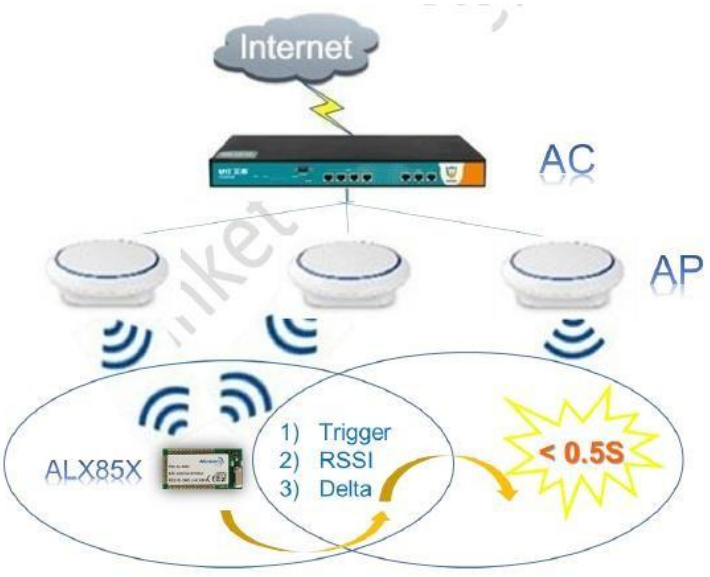

Figure 6 Fast Roaming < 0.5s

ACM

ACM (Alinket Controller Message) is a message system and protocol for the communications between customer host MCU and Alinket IoT controllers. It is developed by Alinket itself and is applicable to all Alinket controllers including ALX85Xfamily.
ACM system works with the host control interfaces between customer host MCU and Alinket controllers.

Host Control Interface

The host control interfaces are used for transferring ACMmessages, Flow Control signal and Power Save signal between customer host MCU and Alinket IoT controllers.
Below figure shows the connections between customer host and ALX85Xfamily.

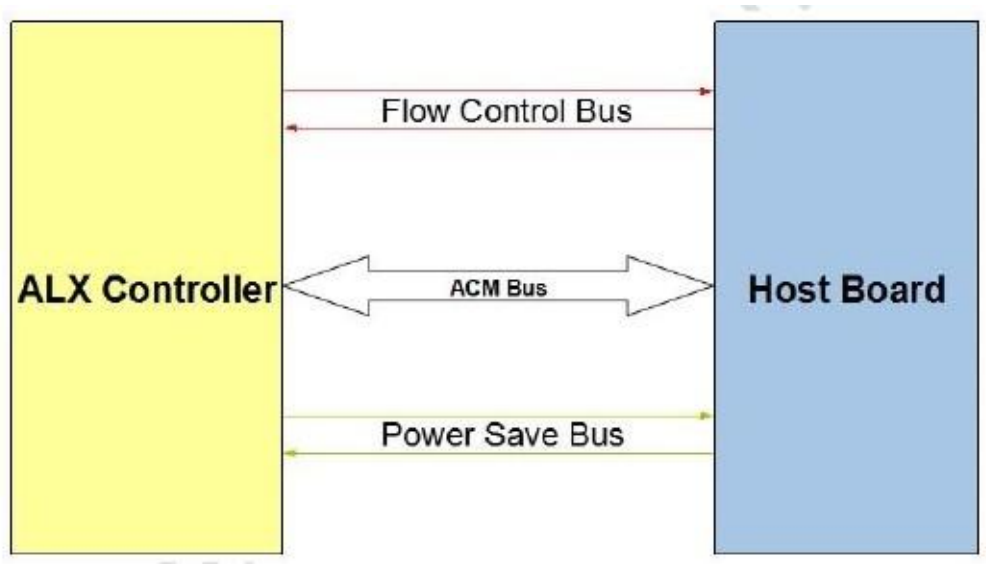

Figure 7 Host Control Interface

ACM Bus

ACM Bus is the interface toexchangethe message between customer host MCUand Alinket controller. It can be UART, SPIinterface from hardware point of view.
The messages include host control commands, controller command response, and alarm eventsfrom Alinket controller as well.
Detailed message definition, the implementation of massage Flow Control and Power Save functions can be found in documents of *AlinketController Message Specification*and *Alinket Host Control Interface Guide*. (Note: Please contact your local Alinket sales office or distributors to get the related documents.)

3. Wi-Fi Specification

Wireless Specification

Table 4 2.4GHz Wireless Specification

Features	Specification
WLAN Standards	IEEE802.11 b/g/n
Antenna Port	Single Antenna
Frequency Band	2.412GHz –2.484 GHz ETSI: 2412Mhz-2472Mhz FCC:2412Mhz-2462Mhz
Modulation	DSSS, CCK, OFDM, BPSK, QPSK, QAM
Support data rates	802.11b: 1, 2, 5.5, 11(Mbps) 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 (Mbps) 802.11n: 6.5,13,19.5,26,39,52,58.5,65(Mbps)

Table 5 5GHz Wireless Specification

Features	Specification
WLAN Standards	IEEE802.11 a/n
Antenna Port	Single Antenna
Frequency Band	5.17GHz–5.31GHz,5.490-5.835GHz ETSI: 5180Mhz-5240Mhz FCC:5180Mhz-5240Mhz,5745Mhz-5825Mhz
Modulation	OFDM, BPSK, QPSK, QAM
Support data rates	802.11a: 6, 9,12, 18,24,36,48,54(Mbps) 802.11n: 6.5,13,19.5,26,39,52,58.5,65(Mbps)

Tx Power

Table 6 2.4GHz TX Power

RF Characteristics	TYP.	Unit
RF TX Power@11b, 1Mbps	23.0	dBm
RF TX Power@11g,54 Mbps	25.0	dBm
RF TX Power@11n,65 Mbps	25.0	dBm

Table 7 5GHz TX Power

RF Characteristics	TYP.	Unit
RF TX Power@11a,6Mbps	13.0	dBm
RF TX Power@11n,65 Mbps	13.0	dBm

Rx Sensitivity

Table 8 2.4GHz RxSensitivity

Receiver Characteristics	TYP.	Unit
PER <8%, Rx Sensitivity @ 1Mbps DSSS	-95	dBm
PER < 8%, Rx Sensitivity @ 11 Mbps CCK	-89	dBm
PER < 10%, Rx Sensitivity @ 6 Mbps OFDM	-92	dBm
PER < 10%, Rx Sensitivity @ 54 Mbps OFDM	-77	dBm
PER < 10%, Rx Sensitivity @ MCS0	-92	dBm
PER < 10%, Rx Sensitivity @ MCS7	-73	dBm

Table 95GHz RxSensitivity

Receiver Characteristics	TYP.	Unit
PER <10%, Rx Sensitivity @ 6Mbps OFDM	-90.5	dBm
PER < 10%, Rx Sensitivity @ 54 Mbps OFDM	-73.5	dBm
PER < 10%, Rx Sensitivity @ MCS0	-90.5	dBm
PER < 10%, Rx Sensitivity @ MCS7	-70.5	dBm

Modular Usage Statement

Note 1: This module certified complies with RF exposure requirements under mobile or fixed condition; this module is to be installed only in mobile or fixed applications.

A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20 centimeter separation requirement.

A fixed device is defined as a device is physically secured at one location and is not able to be easily moved to another location.

Note 2: Host product manufacturers must provide in their user manual the required RF exposure information for mobile & fixed usage of this module. Host product manufacturers must use the following RF exposure statement in their user manual “This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and all persons. This transmitter must not be co-location or operating in conjunction with any other antenna or transmitter.”

Note 3: Any modifications made to the module will void the Grant of Certification, this module is limited to OEM installation only and must not be sold to end-users, end-user shall have no manual instructions to remove or install the device, only software or operating procedure shall be placed in the end-user operating manual of final products.

Note 4: Additional testing and certification may be necessary when multiple modules are used.

Note 5: The module may be operated only with the PIFA Antenna with which it is authorized.

Note 6: To ensure compliance with all non-transmitter functions the host manufacturer is responsible for ensuring compliance with the module(s) installed and fully operational. For example, if a host was previously authorized as an unintentional radiator under the Supplier’s Declaration of Conformity procedure without a transmitter certified module and a module is added, the host manufacturer is responsible for ensuring that the after the module is installed and operational the host continues to be compliant with the part 15B unintentional radiator requirements. Since this may depend on the details of how the module is integrated with the host, the manufacturer shall provide guidance to the host manufacturer for compliance with the part 15B requirements.

Note 7: When the FCC ID certification 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 the wording ”Contains transmitter module FCC ID: SMQALX850BEDAN” or “Contains FCC ID: SMQALX850BEDAN”.

Note 8: The FCC rule/s for this module are CFR 47 Part 15 Subpart C.

Note 9: This modular transmitter is only FCC authorized for the specific rule parts listed on its grant. The host product manufacturer is responsible to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product will require Part 15 Subpart B compliance when the modular transmitter is installe.

FCC Warning

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 inte rference received, including interference that may cause undesired operation.

Changes or modifications 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 interferenceto 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.

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.