Alinket ALX850B WiFi Controller Module User Manual

ALX850B manual

Contents

Introduction

1.1 overview

Blanket ALX85X Controller 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. ALX85X supports either an onboard ceramic antenna or a U.FL connector which provides the flexibility for customers to pick up its own proper external antenna. Here then, the ALX85Xproduct family has mainly two types in terms of the antenna configuration.

Table 1ALX85XProduct Family

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

1.2 Hardware Architecture

ALX85X integrates an ARM® 32-bit Cortex®-M4 micro-controller, a Wi-Fi BB/MAC/RF SoC, a RF front end, and an On-Board SPI Flash into the small factor module.

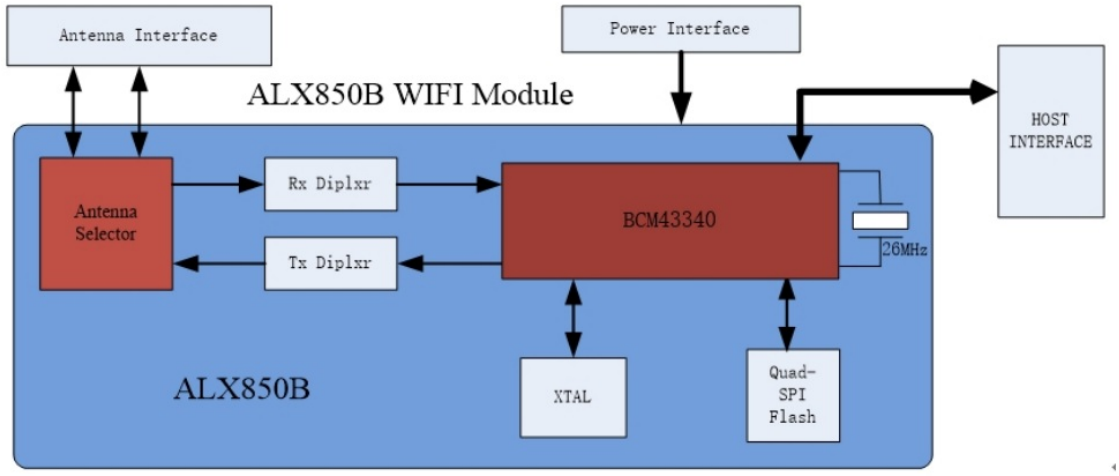

Figure 1 Block Diagram

1.3 Interface and Peripherals

The controller family includes various different host interfaces to communicate with the Host CPU.
The below table lists the basic descriptions of the MCU, Wi-Fi SoC, and interfaces.
Table 2 MCU 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 and USB interfaces are for customized projects only, not for standard products, please contact your local Blanket sales office or distributors for more information.

1.4 PIN Assignment

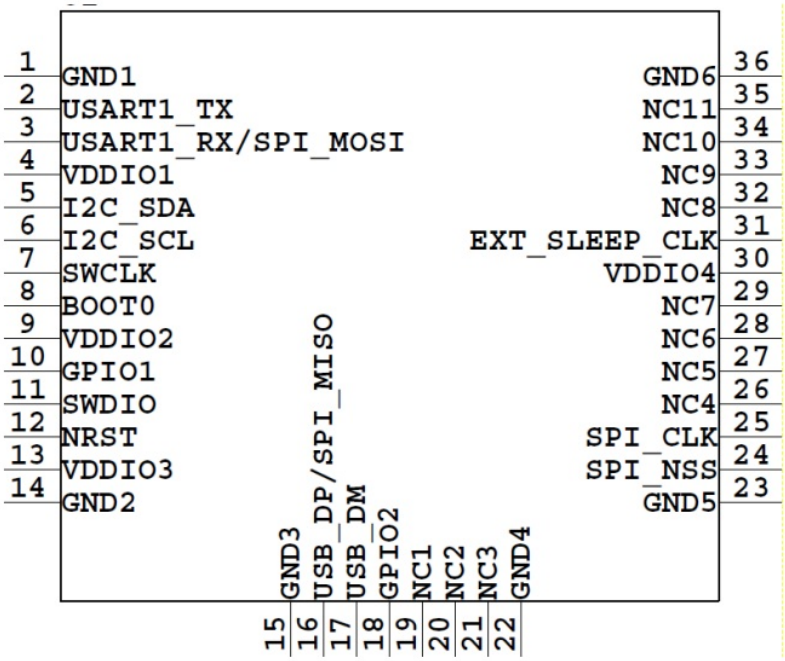

Figure 2 Ball Maps

1.5 PIN Description

Table 3 Pin Descriptions

Pins;	Type	Main function	Alternate functions	PIN connection (when not using)
	S	GND		
	1/0	USART1_ TX	GPIO	floating
	1/0	USART1_ WSPI_MOSI	GPIO	floating
	S	VDDIO	3.3V	
	1/0	I2C SDA_	GPIO	floating
	1/0	I2C_SCL	GPIO	floating
–	1/0	SWCLK	JTCK-SWCLK	floating
	I	BOOM		floating
3	V	VBAT	3.3V	
10	I/O	GPIO1	GPIO	floating
11	VO	SW1310	JTCK-SWDIO	floating
12	I	NFtST	Active-low reset input	coating
13	V	VDDIO	3.3V	
14	S	GND		
15	S	GND		
16	I/O	USB_DP/SP1_MISO	GPIO/USART1_RTS/USART2_RX	floating
17	I/O	USB_DM	GPIO/USARTI_CTS/USART2_TX	floating

18	I/O	GP102	GPIO	floating
19				floating
20				floating
21				coating
22	S	GND		
23	S	GND		
24	I/O	SPI NSS _	GPIO/ADC	coating
25	I/O	SP!CU(_	GPIO/ADC	floating
26				floating
27				coating
28				oating
29				floating
30	V	VIDEO	3.3V	
31	I/O	EXT_sleep_cik	Input pin for 32.768kHz or GND	
32				floating
33				floating
34				floating
35				floating
36	S	GND		

Feature Highlights

2.1 MCU

ALX85X family has a dedicated microcontroller to enhance the Wi-Fi function or applications. The MCU has an ARM® 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 MIPS/MHz(Dhrystone2.1), and DSP instructions.

2.2 Memories

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

2.3 Wi-Fi

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

2.4 Security

➢ AES and TKIP in hardware for faster data encryption
➢ WEP, WPA and WPA2support for powerful encryption and authentication
➢ Enterprise security: IEEE802.1X authentication includes EAP-TLS, PEAP-GTC, and PEAPMSCHAPV2.

2.5 SoftAP

➢ SoftAP and STA can be implemented on the same hardware by switching with specified commands.
➢ Fast SoftAP and STA switch, time <3s, no reset required.
➢ Parameters of both SoftAP and STA can be set/read by Alinket unique ACM command.

2.6 Network Connection Indication

➢ Indications include:
o AP connecting
o AP connected
o AP disconnected
o Server connecting(no indication because only 67ms, too short to indicate)
o Server connected
o Server disconnected
➢ Support below two methods
o In transparent mode, through GPIO to connect LEDs, LED On –connected, LED Off disconnected, LED Flashing –connecting.
o, Report the connection status to the customer Host through the Alinket ACM command.

2.7 Multi-Socket of TCP/UDP

Max.4 TCP sockets + 4 UDP sockets supported to connect to different networks. Those connections can be used for either of below two types of services or mixed circumstances.
➢ To connect to different servers for various cloud services.
➢ To connect to the same server or cloud for different services such as system, event, control, and service.
The figure below describes the use of multi-socket TCP or UDP connections.

Figure 3 Multi-Socket Connections for TCP/UDP

2.8 Low Power Mode

ALX85X family supports low power mode to meet various industries and applications. The typical implementation is to use two GPIOs.
➢ 1st GPIO for entering/quit low power mode
➢ 2nd GPIO to indicate the status, normal or low power mode.

2.9 Fast Network Configuration –Flashlink

Flash link is a fast network configuration tool, especially for those ALX85Xcustomer devices without a UI display. It is an APP software that can be installed on a mobile phone or PAD. Flash link can help customer to configure the below network parameters.

➢ AP
o Wi-Fi SSID
o Wi-Fi Password

o Wi-Fi Security
➢ Server
o Server URL
o Server Username
o Server Password

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

2.10 Fast Roaming
ALX85X family supports fast roaming between two APs managed by the same AC. A typical Wi-Fi roaming environments are as follows.
➢ An AC (AP Controller) to manage the APs connected to it. The AC manages its network DHCP and equalizer.
➢ All APs connected to the above AC have the same 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 ALX85X is a true roaming, with its latest technology, ALX85X roams from original AP to destination AP only takes less than 0.5s period.
ALX85X roaming technology is managed by Alinket unique ACM system. ALX85X controller scans the available AP RSSI, calculates the delta, and triggers the roaming activity. The below figure describes the roaming mechanism of ALX85X.

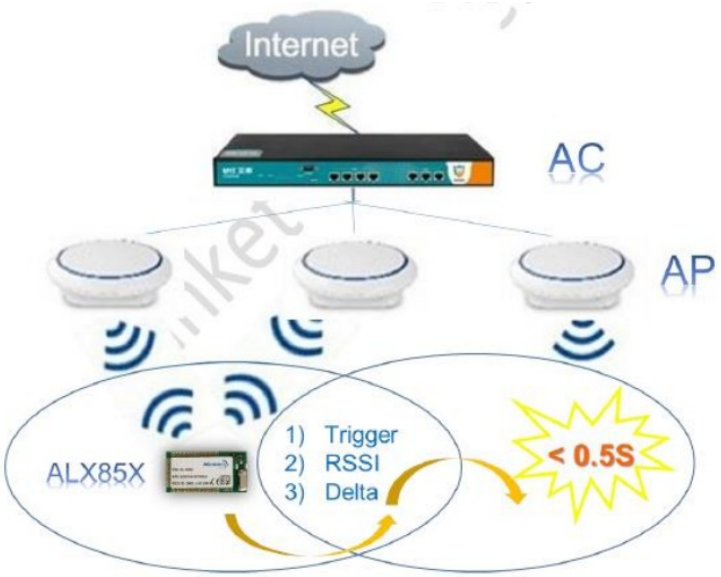

Figure 4 Fast Roaming < 0.5s

2.11 ACM

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

ACM system works with the host control interfaces between customer host MCU and Blanket controllers.

2.11.1 Host Control Interface

The host control interfaces are used for transferring ACM messages, Flow Control signal, and Power Save signal between customer host MCU and Alinket IoT controllers.

The below figure shows the connections between the customer host and ALX85Xfamily.

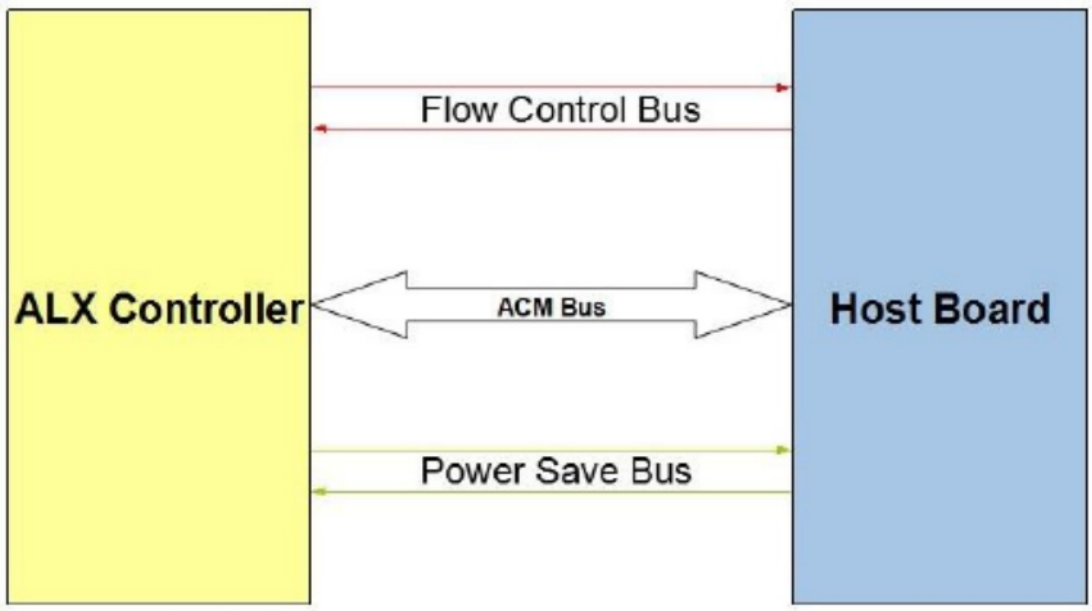

Figure 5 Host Control Interface

2.11.2 ACM Bus

ACM Bus is the interface to exchange the message between customer host MCU and Alinket controller. It can be a UART or SPI interface from a hardware point of view.

The messages include host control commands, controller command responses, and alarm events from the Blanket controller as well.

Detailed message definition, and the implementation of massage Flow Control and Power Save functions can be found in documents of Alinket Controller Message Specification and Alinket Host Control Interface Guide. (Note:

Please contact your local Alinket sales office or distributors to get the related documents.)

Wi-Fi Specification

3.1 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 FC C: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	5.17011z-5.31GHz,5.490-5.835GHz ETSI: 5180Mhz-5240Mhz FCC:5180Mhz-5240Mhz,5260Mhz-5320Mhz, 5500Mhz-5700Mhz, 574 5Mhz-5825Mhz
Modulation	OFDM, BPSK, QPSK, QAM
Support data rates	802.11a: 6, 9,12, 18,24,36,48,54(Mbps) 802.11 n: 6.5, 13,19.5,26,39,52,58.5,65(Mbps)

3.2 Tx Power

Table 6 2.4GHz TX Power

RF Characteristics	TYP.	Unit
RF TX Power@11b, 1Mbps	19.5	dBm
RF TX Power@11g,54 Mbps	21.9	dBm
RF TX Power@11n,65 Mbps	21.8	dBm

Table 7 5GHz TX Power

RF Characteristics	TYP.	Unit
RF TX Power@11a,6Mbps	14.1	dBm
RF TX Power@11n,65 Mbps	14.2	dBm

3.3 Rx Sensitivity
Table 8 2.4GHz Rx Sensitivity

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 9 5GHz Rx Sensitivity

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

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

2.2 List of applicable FCC rules
FCC Part 15 Subpart C 15.247 & 15.209 &15.407.
2.3 Specific operational use conditions
The module can be used for mobile applications with a maximum 4.84dBi antenna. The host manufacturer installing this module into their product must ensure that the final compos it product complies with the FCC requirements by a technical assessment or evaluation of the FCC rules, including the transmitter operation. The host manufacturer has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warnings as shown in this manual.

2.4 Limited module procedures
Not applicable. The module is a Single module and complies with the requirement of FCC Part 15.212.
2.5 Trace antenna designs
Not applicable. The module has its own antenna, and does.t need a host. sprinted board microstrip trace antenna etc.
2.6 RF exposure considerations
The module must be installed in the host equipment such that at least 20cm is maintained between the antenna and the users‟ body; and if the RF exposure statement or module layout is changed, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID or new application. The

FCC ID of the module cannot be used on the final product. In these circumstances, the host manufacturer will be responsible for reevaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

2.7 Antennas

Antenna Specification is as follows:
Type: FPC Antenna
Gain: 4.84dBi Max.
This device is intended only for host manufacturers under the following conditions:
The transmitter module may not be co-located with any other transmitter or antenna;
The module shall be only used with the internal antenna(s) that has been originally tested and certified with this module. The antenna must be either permanently attached or employ a „unique" antenna coupler.
As long as the conditions above are met, further transmitter tests will not be required. However, the host manufacturer is still responsible for testing their end-product for any
additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

2.8 Label and compliance information

Host product manufacturers need to provide a physical or e-label stating “Contains FCC ID: SMQALX850B” with their finished product

2.9 Information on test modes and additional testing requirements

Host manufacturer must perform tests of radiated & conducted emission and spurious emission, e.t.c according to the actual test modes for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.
Only when all the test results of test modes comply with FCC requirements, then the end product can be sold legally.

2.10 Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for FCC Part 15 Subpart C 15.247 & 15.209 &15.407 and the host product manufacturer is responsible for compliance with any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Federal Communication Commission Statement (FCC, U.S.)

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 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 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.

FCC Caution:
Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

IMPORTANT NOTES

Co-location warning:
This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
OEM integration instructions:
This device is intended only for OEM integrators under the following conditions:
The transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the external antenna(s) that has been originally tested
and certified with this module.
As long as the conditions above are met, further transmitter tests will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

Validity of using the module certification:
In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End product labeling:
The final end product must be labeled in a visible area with the following: "Contains Transmitter Module FCC ID: SMQALX850B".
Information that must be placed in the end user manual:
The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warnings as shown in this manual.

Documents / Resources

	Alinket ALX850B WiFi Controller Module [pdf] User Manual ALX850B, SMQALX850B, ALX850B WiFi Controller Module, WiFi Controller Module