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# EDAN INSTRUMENTS ALXC28 WIFI Module User Manual

**ALXC28 User manual**

**Contents**

## Introduction

**1.1 overview**
ALXC28 is a small size, low power consumption, dual band IEEE802.11 a/b/g/n WLAN module. It can provide network connection through SDIO, UART, SPI, PCM and other interfaces.
The ALXC28 ,highly integrates MAC, Base band, RF, RF front end.

Figure 1 ALXC28 wifi module

## 1.2 Hardware Block Diagram

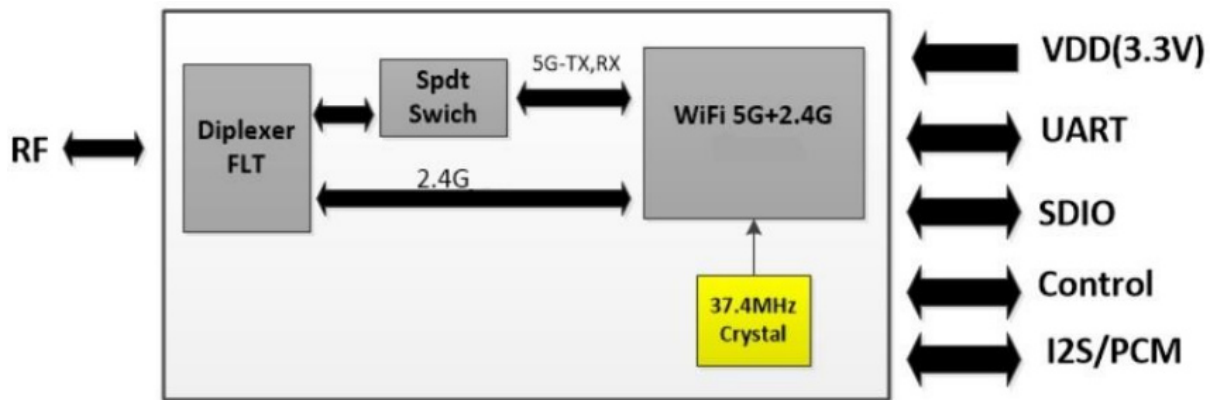ALXC28 wifi module integrates a Wi-Fi BB/MAC/RF SoC and RF front end.



Figure 2 Block Diagram

## 1.3 Interface

The module includes various different host interfaces to communicate with Host CPU. Below table lists the basic descriptions of the Wi-Fi SoC and the interfaces.

Table 1 MCU and Interfaces

| Model | | ALXC28 |
|---|---|---|
| Wi-Fi Technology | | IEEE802.11 a/b/g/n |
| Frequency Band | | 2.4GHz & 5GHz, Dual Band |
| Host Interfaces | UART x 1 | Max 4Mbps |
| | SDIO x 1 | SDIO 2.0, 25MHz & 50MHz, 1bit & 4bit mode |
| | I2S/PCM | 16bit, 16KHz (256 kbps ) |

## 1.4 Package Info
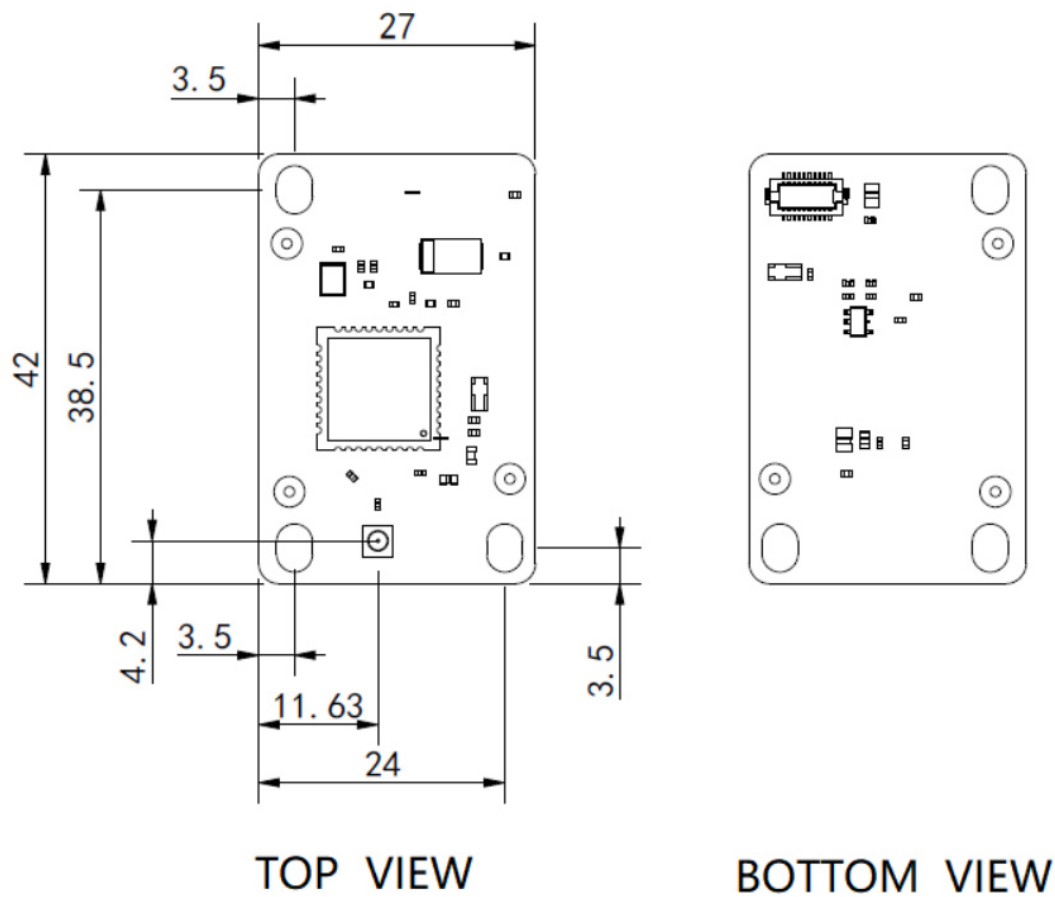
TOP VIEW        BOTTOM VIEW

Table 2 Package info

## 1.5 PIN Description
**Table 3 Pin Descriptions**

| No | Type | Name (main function) | Description | PIN connection (not use) |
|----|------|---------------------|-------------|--------------------------|
| 1  | I/O  | SDIO_CMD     | SDIO command          |           |
| 2  | I    | SDIO_CLK     | SDIO clock input      |           |
| 3  | I/O  | SDIO_DATA°   | SDIO data0            |           |
| 4  | I/O  | SDIO_DATA1   | SDIO data 1           |           |
| 5  | I/O  | SDIO_DATA2   | SDIO data 2           |           |
| 6  | I/O  | SDIO_DATA3   | SDIO data 3           |           |
| 7  | I    | WL_DIV_WAKE  | WLAN device wakeup    | Suspended |
| 8  | O    | WL_HOST_WAKE | WLAN host wakeup      | Suspended |
| 9  | S    | GND          | Ground                |           |
| 10 | O    | BT_UART_RTS_N | UART request send    | Suspended |
| 11 | I    | BT_UART_CTS_N | UART clear send      | Suspended |
| 12 | I    | BT_UART_RXD  | UART serial receiving | Suspended |

| 13 | O | BT_UART_TXD | UART serial transmitting | Suspended |
|----|---|---|---|---|
| 14 | I | EXT_SLEEP_CLK | External sleep clock ( 32.768kHz) or Ground | |
| 15 | O | BT_HOST_WAKE | Host wakeup | Suspended |
| 16 | I | BT_DEV_WAKE | Device wakeup | Suspended |
| 17 | S | GND | Ground | |
| 18 | I | BT_PCM_IN | PCM data in | Suspended |
| 19 | O | BT_PCM_OUT | PCM data out | Suspended |
| 20 | I/O | BT_PCM_CLK | PCM clock | Suspended |
| 21 | 1/0 | BT_PCM_SYNC | PCM sync | Suspended |
| 22 | I | BT_12S_DI | 12C data in | Suspended |
| 23 | I/O | BT_PCM_WS | 12S WS | Suspended |
| 24 | I/O | BT_PCM_SCK | 12S clock | Suspended |
| 25 | O | BT_PCM_DO | I2S data out | Suspended |
| 26 | S | GND | Ground | |
| 27 | S | GND | Ground | |
| 28 | S | GND | Ground | |
| 29 | I/O | RFOUT | WLAN 5G,2.4GHz and Bluetooth RF input /output | |
| 30 | S | GND | Ground | |
| 31 | S | GND | Ground | |
| 32 | I | BT_REG_ON | 6T power on/off | |
| 33 | I | WL_REG_ON | WLAN power onfoff | |
| 34 | I | VBAT | SR VBAT and PAPMU VBAT power input | |
| 35 | I | VIO | 1.8V-3.3V VDDIO input | |
| 36 | S | GND | Ground | |
| 37 | S | GND | Ground | |
| 38 | S | GND | Ground | |
| 39 | S | GND | Ground | |
| 40 | S | GND | Ground | |

## Feature Highlights

### 2.1 Wi-Fi

1. Dual–band 2.4 GHz and 5 GHz IEEE 802.11 a/b/g/n.
2. Single–stream IEEE 802.11n support for 20 MHz and 40 MHz channels provides PHY layer rates up to 150 Mbps for typical upper–layer throughput in excess of 90 Mbps.
3. Supports the IEEE 802.11n STBC (space–time block coding) RX and LDPC (low–density parity check) TX options for improved range and power efficiency.
4. Supports IEEE 802.15.2 external coexistence interface to optimize bandwidth utilization with other co–located wireless technologies such as GPS, WiMAX, or UWB
5. Alternative host interface supports HSIC v1.0 (short–distance USB device)

## 2.2 Security

1. WPA™ and WPA2™ (Personal) support for powerful encryption and authentication
2. AES in WLAN hardware for faster data encryption and IEEE 802.11i compatibility
3. Reference WLAN subsystem provides Cisco® Compatible Extensions (CCX, CCX 2.0, CCX 3.0, CCX 4.0, CCX 5.0)
4. Reference WLAN subsystem provides Wi–Fi Protected Setup(WPS)

## 2.3 Network Connection Indication
## Indications include:

- AP connecting
- AP connected
- AP disconnected
- Server connecting
- Server connected
- Server disconnected

# Wi-Fi Specification

### 3.1 Wireless Specification
Table 4 2.4GHz Wireless Specification

| Features | | Specification |
|---|---|---|
| WLAN Standards | | IEEE802.11 b/g/n |
| Antenna Port | | 1T/R |
| Frequency Band | 11b | 2412-2472 MHz |
| | 11g/n 20MHz | 2412-2472 MHz |
| | 11n 40MHz | 2422-2462 MHz |
| Modulation | | DSSS(DBPSK,DQPSK,CCK), OFDM(BPSK,QPSK,16-QAM,64-QAM) |
| Link Data Rate | 11b | 1,2,5.5L,5.5S,11L,11S |
| | 11g | 6,9,12,18,24,36,48,54 |
| | 11n | MCS 0,1,2,3,4,5,6,7 |

**Table 5 5GHz Wireless Specification**

| Features | | Specification |
|---|---|---|
| WLAN Standards | | IEEE802.11 a/n |
| Antenna Port | | 1T/R |
| Frequency Band | 11a/n 20MHz | 5180-5825 MHz |
| | 11n 40MHz | 5190-5795 MHz |
| Modulation | | DSSS(DBPSK,DQPSK,CCK), OFDM(BPSK,QPSK,16-QAM,64-QAM) |
| Support data rates | 11a | 6,9,12,18,24,36,48,54 |
| | 11n | MCS 0,1,2,3,4,5,6,7 |

## 3.2 Rx Sensitivity
**Table 6 2.4GHz Rx Sensitivity**

| Receiver Characteristics | TYP. | Unit |
|---|---|---|
| 1 Mbps DSSS | -99 | dBm |
| 11 Mbps CCK | -89 | dBm |
| 54 Mbps OFDM | -77 | dBm |
| MCS0 (20 MHz) | -92 | dBm |
| MCS7 (20 MHz) | -73 | dBm |
| MCS0 (40 MHz) | -89 | dBm |
| MCS7 (40 MHz) | -69 | dBm |

**Table 7 5GHz Rx Sensitivity**

| Receiver Characteristics | TYP. | Unit |
|---|---|---|
| 6 Mbps DSSS | -90.5 | dBm |
| 54 Mbps OFDM | -73.5 | dBm |
| MCS0 (20 MHz) | -90.5 | dBm |
| MCS7 (20 MHz) | -70.5 | dBm |
| MCS0 (40 MHz) | -87.5 | dBm |
| MCS7 (40 MHz) | -68.5 | dBm |

**Federal Communications Commission (FCC) Statement**

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.

**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.

**Warning:** Changes or modifications made to this device not expressly approved by Edan Instruments, Inc. may void the FCC authorization to operate this device.

**Note:** The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

**RF exposure statement:**

The transmitter must not be co-located or operated in conjunction with any other antenna or transmitter. This equipment complies with the FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a Minimum distance of 20cm between the radiator and any part of your body.

**Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01r01**

**2.2 List of applicable FCC rules**

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular transmitter.

**2.3 Specific operational use conditions**

This Modular Approval is limited to OEM installation for mobile and fixed applications only. The antenna installation and operating configurations of this transmitter, including any applicable source-based time averaging duty factor, antenna gain, and cable loss must satisfy MPE categorical Exclusion Requirements of 2.1091.

**2.4 Limited module procedures**

Not applicable.

**2.5 Trace antenna designs**

Not applicable

## 2.6 RF exposure considerations

The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device if without further certify such as C2PC with SAR. This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

## 2.7 Antennas

This radio transmitter 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 if without further certify such as C2PC.

| Type | Antenna type | Frequency Range | Antenna Gain |
|------|-------------|-----------------|--------------|
| LBS-037A | PIFA Antenna | 2.4GHz – 2.5 GHz<br>5.15GHz – 5.85 GHz | 4.08 dBi<br>3.47 dBi |

## 2.8 Label and compliance information

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: SMQALXC28" Or "Contains FCC ID:SMQALXC28"

## 2.9 Information on test modes and additional testing requirements

Host manufacturer which install this modular with limit modular approval should perform the test of radiated emission and spurious emission according to FCC part 15C:15.247 and 15.209 requirement, only if the test result comply with the requirement, then the host can be sold legally.

## 2.10 Additional testing, Part 15 Subpart B disclaimer

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.

## 2.11 Note EMI Considerations

Host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties.

## 2.12 How to make changes

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. According to the KDB 996369 D02 Q&A Q12, that a host manufacture only needs to do an evaluation (i.e., no C2PC required when no emission exceeds the limit of any individual device (including unintentional radiators) as a composite. The host manufacturer must fix any failure.

## Documents / Resources

**EDAN INSTRUMENTS ALXC28 WIFI Module** [pdf] User Manual
SMQALXC28, SMQALXC28, ALXC28, ALXC28 WIFI Module, WIFI Module, Module

## References

- **User Manual**