AW-CU639-ZC2

Wireless MCU with Integrated Wi-Fi 6 + Bluetooth Low Energy 5.4

Datasheet

Rev. A

DF

(For Standard)

Features

WLAN

- Support 1x1 dual-band 2.4 GHz Wi-Fi b/g/n/ax radio
- 20 MHz channel operation
- Wi-Fi 6 Target Wake Time(TWT) support
- Wi-Fi 6 Extended Range (ER) and Dual Carrier Modulation (DCM)
- Support low-power Wi-Fi idle, standby, and sleep modes
- WPA2/WPA3 security
- Support for Matter over Wi-Fi

Bluetooth

- Supports Bluetooth LE 5.4(Class 2) certified and Bluetooth LE 5.2 features supported
- Wi-Fi/Bluetooth coexistence protocol support
- Intelligent Adaptive Frequency Hopping (AFH)
- Support Bluetooth LE 1/2Mbps high speed mode and Long Range operation (125/500kbps)
- I2S and PCM audio interface

Revision History

Document NO: R2-2639-DST-02

Version	Revision Date	DCN NO.	Description	Initials	Approved
A	2024/10/16	DCN032927	● Draft version	Roger Liu	N.C Chen

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1. Introduction

1.1 Product Overview

AzureWave **AW-CU639-ZC2** is a highly integrated, low-power tri-radio Wireless RW610 MCU with an integrated MCU and Wi-Fi 6 + Bluetooth Low Energy (LE) 5.4 radios designed for a broad array of applications. Applications include connected smart home devices, enterprise and industrial automation, smart accessories, and smart energy.

AW-CU639-ZC2 includes a 260 MHz Arm Cortex-M33 core with TrustZone-M, 1.2 MB on-chip SRAM and a Quad SPI interface with high bandwidth

AW-CU639-ZC2 includes a full-featured 1x1 dual-band (2.4 GHz) 20 MHz Wi-Fi 6 (802.11ax) subsystem bringing higher throughput, better network efficiency, lower latency, and improved range over previous generation Wi-Fi standards. The Bluetooth LE radio supports 1/2 Mbit/s high-speed data rate, long range and extended advertising as well as LE Audio for a better overall audio experience.

The advanced design of the **AW-CU639-ZC2** delivers tight integration, low power, and highly secure operation in a space- and cost-efficient wireless MCU requiring only a single 3.3 V power supply

1.2 Block Diagram

TBD

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1.3 Specifications Table

1.3.1 General

Features	Description
Product Description	IEEE 802.11 b/g/n/ax Wi-Fi 6 with Bluetooth 5.4 Zcore2 Module
Major Chipset	NXP RW610 TFBGA(145 pins)
Host Interface	UART
Dimension	50 mm x 26.5 mm x 3.7 mm(Max)
Package	Stamp module, 45 pins
Weight	0.01kg

1.3.2 WLAN

Features	Description
WLAN Standard	IEEE 802.11 b/g/n/ax 1T1R
WLAN VID/PID	NA
WLAN SVID/SPID	NA
Frequency Rage	2.4 GHz ISM Bands 2.412-2.462 GHz
Modulation	BPSK, QPSK,16-QAM, 64-QAM, 256-QAM
Number of Channels	2.4GHz: ■ USA, NORTH AMERICA, Canada and Taiwan - 1 ~ 11 ■ China, Australia, Most European Countries - 1 ~ 13 ■ Japan, 1 ~ 13

<table>
<tr><td>Output Power
(Board Level Limit)*</td><td>
2.4G
<table>
<tr><td></td><td>Min</td><td>Typ</td><td>Max</td><td>Unit</td></tr>
<tr><td>11b (11Mbps)
@EVM<35%</td><td>-</td><td>-</td><td>-</td><td>dBm</td></tr>
<tr><td>11g (54Mbps)
@EVM≦-25 dB</td><td>-</td><td>-</td><td>-</td><td>dBm</td></tr>
<tr><td>11n (HT20 MCS7)
@EVM≦-27 dB</td><td>-</td><td>-</td><td>-</td><td>dBm</td></tr>
<tr><td>11ax(HE20 MCS9)
@EVM≦-32 dB</td><td>-</td><td>-</td><td>-</td><td>dBm</td></tr>
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</td></tr>
<tr><td>Receiver Sensitivity</td><td>
2.4G
<table>
<tr><td></td><td>Min</td><td>Typ</td><td>Max</td><td>Unit</td></tr>
<tr><td>11b (11Mbps)</td><td>-</td><td>-86</td><td>-83</td><td>dBm</td></tr>
<tr><td>11g (54Mbps)</td><td>-</td><td>-72</td><td>-69</td><td>dBm</td></tr>
<tr><td>11n (HT20 MCS7)</td><td>-</td><td>-69</td><td>-66</td><td>dBm</td></tr>
<tr><td>11ax (HE20 MCS9)</td><td>-</td><td>-63</td><td>-60</td><td>dBm</td></tr>
</table>
</td></tr>
<tr><td>Data Rate</td><td>WLAN:
802.11b : 1, 2, 5.5, 11Mbps
802.11g : 6, 9, 12, 18, 24, 36, 48, 54Mbps
802.11n : Maximum data rates up to 72 Mbps (20 MHz channel)
802.11ax: Maximum data rates up to 115 Mbps (20 MHz channel)</td></tr>
<tr><td>Security</td><td>■ WiFi: WPA/WPA2/WPA3 personal and enterprise and AES/CCMP/CMAC/GCMP
■ BT: AES</td></tr>
</table>

1.3.3 Bluetooth

<table>
<tr><th>Features</th><th>Description</th></tr>
<tr><td>Bluetooth Standard</td><td>Full Bluetooth 5.4 features</td></tr>
<tr><td>Frequency Rage</td><td>2402MHz~2480MHz</td></tr>
<tr><td>Modulation</td><td>GFSK</td></tr>
<tr><td>Output Power</td><td>
<table>
<tr><td></td><td>Min</td><td>Typ</td><td>Max</td><td>Unit</td></tr>
<tr><td>Low Energy 1M/2M</td><td>-</td><td>-</td><td>-</td><td>dBm</td></tr>
</table>
</td></tr>
<tr><td>Receiver Sensitivity</td><td>BT Sensitivity (PER<30.8%)
<table>
<tr><td></td><td>Min</td><td>Typ</td><td>Max</td><td>Unit</td></tr>
<tr><td>Low Energy 1M/2M</td><td>-</td><td>-</td><td>-</td><td>dBm</td></tr>
</table>
</td></tr>
</table>

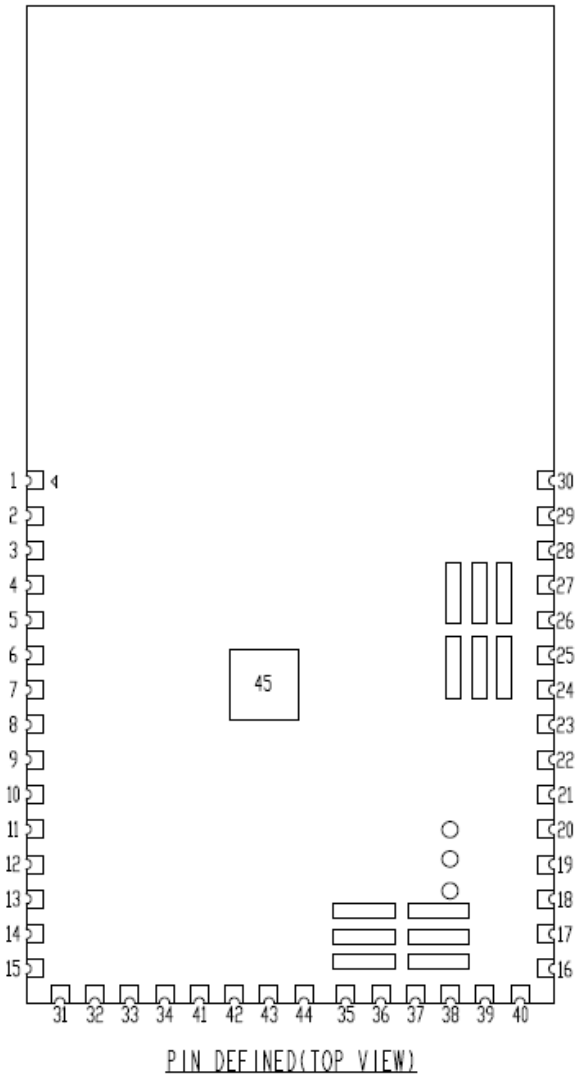
* If you have any certification questions about output power please contact FAE directly.

1.3.4 Operating Conditions

Features	Description
Operating Conditions	
Voltage	3.3V +-5%
Operating Temperature	-30℃ ~ 85℃
Operating Humidity	Less than 85% R.H.
Storage Temperature	-40℃ to +85℃
Storage Humidity	Less than 60% R.H.

2. Pin Definition

2.1 Pin Map



AW-CU639-ZC2 Pin Map (Top View)

2.2 Pin Table

2.2.1 Pin Define

Pin No	Definition	Basic Description	Voltage	Type
1	GND	Ground.		GND
2	VDD33	3.3V	3.3V	Power
3	WKUP_WIN	GPIO[18]	3.3V	I/O
4	WKUP_IN_SOC	GPIO[19]	3.3V	I/O
5	WKUP_OUT_SOC	GPIO[20]	3.3V	I/O
6	M_TMS / SWDIO	GPIO[14]	3.3V	I/O
7	M_TDI	GPIO[8]_Reserve for JTAG_TDI	3.3V	I/O
8	M_TCK / SWCLK	GPIO[13]	3.3V	I/O
9	M_TDO	GPIO[9] _Reserve for JTAG_TDO	3.3V	I/O
10	I2S_DATA_OUT (SPK)	GPIO[2]	3.3V	I/O
11	I2S_CLK	GPIO[4]	3.3V	I/O
12	I2S_SEL	GPIO[3]	3.3V	I/O
13	UART2_RX	GPIO[13]_Reserve for UART2_RX function	3.3V	I/O
14	UART2_TX	GPIO[14]_Reserve for UART2_TX function	3.3V	I/O
15	GND	Ground.		GND
16	DP_CTRL	GPIO[55]	3.3V	I/O
17	DP_MISO	GPIO[46]	3.3V	I/O
18	DP_MOSI	GPIO[46]	3.3V	I/O
19	DP_CLK	GPIO[48]	3.3V	I/O
20	DP_CS	GPIO[49]	3.3V	I/O
21	DP_TE	GPIO[45]	3.3V	I/O
22	DP_CD	GPIO[47]	3.3V	I/O
23	DP_RST	GPIO[44]	3.3V	I/O
24	WIN_TX	GPIO[56]	3.3V	I/O
25	WIN_RX	GPIO[57]	3.3V	I/O
26	Boot	EXT_REQ/ Request from external radio	1.8V	I
27	UART3_RX	GPIO[24]	3.3V	I/O
28	UART3_TX	GPIO[26]	3.3V	I/O
29	EN	Full Power-down (input) (active low) 0 = full power-down mode 1 = normal mode	3.3V	I
30	GND	Ground.		GND
31	VDD33	3.3V	3.3V	Power
32	GND	Ground.		GND
33	GPIO[15]	Reserve for GPIO[15]	3.3V	I/O
34	GPIO[10]	Reserve for GPIO[10]	3.3V	I/O
35	USB_DM	USB bus data-	3.3V	I/O
36	USB_DP	USB bus data+	3.3V	I/O
37	DP_TOUCH_INT	GPIO[5]	3.3V	I/O
38	DP_TOUCH_I2C_D	GPIO[9]	3.3V	I/O

	ATA			
39	DP_TOUCH_I2C_CLK	GPIO[8]	3.3V	I/O
40	GND	Ground.		GND
41	DP_TOUCH_RST	GPIO[11]	3.3V	
42	PDM_CLK	GPIO[53]	3.3V	I/O
43	PDM_DATA	GPIO[51]	3.3V	I/O
44	USB_VBUS_5V	VBUS selection, 5 V analog power supply	5V	Power
45	EPAD	Ground.		GND

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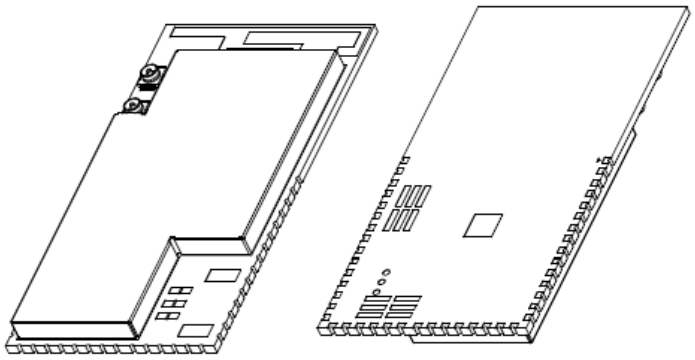
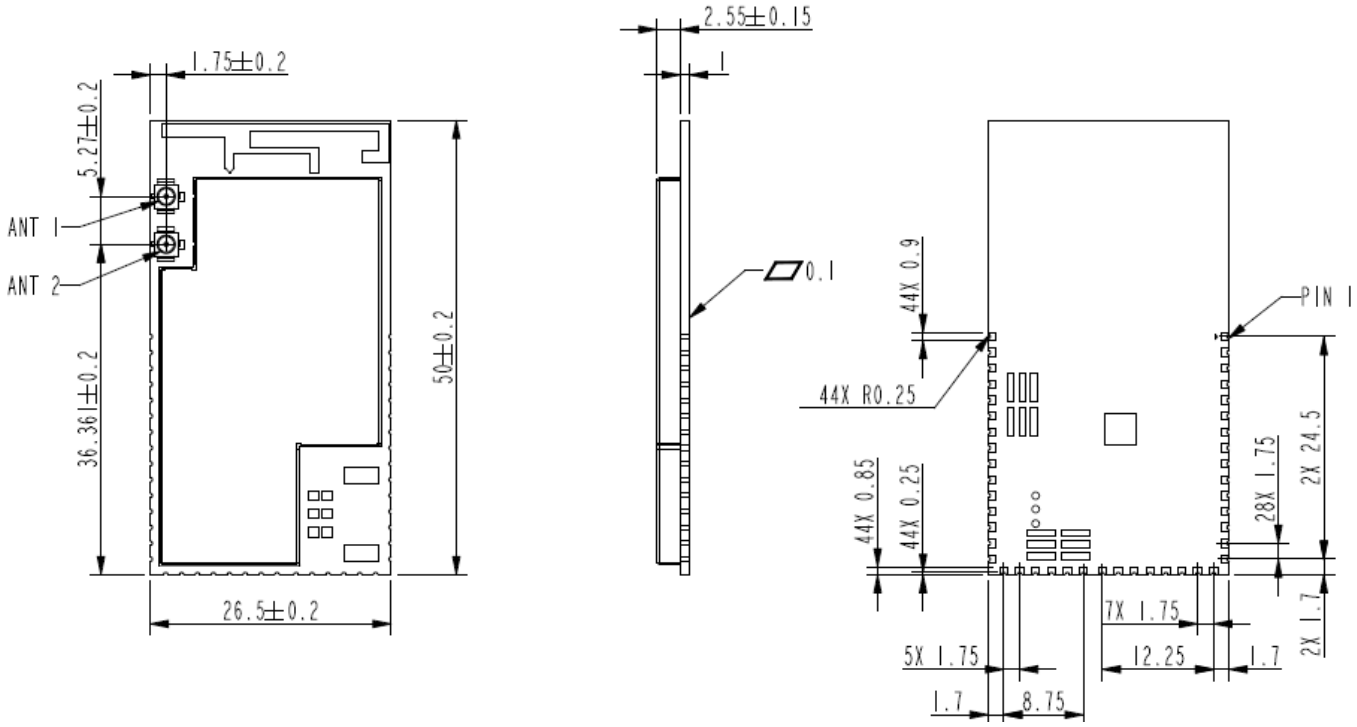
3. Mechanical Information

3.1 Mechanical Drawing





FCC:

Federal Communication Commission Interference Statement

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.

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.

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.

IMPORTANT NOTE:
This module is intended for OEM integrator. This module is only FCC authorized for the specific rule parts listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.
Additional testing and certification may be necessary when multiple modules are used.
OEM integrators that they must use the equivalent antennas or C2PC will be required.

This equipment complies with FCC mobile 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 & your body. If the module is installed in a portable host, a separate SAR evaluation is required to confirm compliance with relevant FCC portable RF exposure rules.

The host manufacturer should reference KDB Publication 996369 D04 Module Integration Guide.
USERS MANUAL OF THE END PRODUCT:
In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied.
The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

This device complies with Part 15 of 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.

LABEL OF THE END PRODUCT:
The final end product must be labeled in a visible area with the following " Contains TX FCC ID: TLZ-CU639".

This device complies with Part 15 of 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.

Ant list

Ant.	Port	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	1	AzureWave	2639AN	PCB	N/A	2.5
2	1	TE	2108792-2	Dipole	I-Pex	4.9
3	1	TAOGLAS	FXP831.07.0100C	Dipole	I-Pex	3
4	1	TAOGLAS	FXP830.07.0100C	Dipole	I-Pex	2.5

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference.

(2) This device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil contient des émetteurs / récepteurs exempts de licence qui sont conformes au (x) RSS (s) exemptés de licence d'Innovation, Sciences et Développement économique Canada. L'opération est soumise aux deux conditions suivantes:

(1) Cet appareil ne doit pas provoquer d'interférences.

(2) Cet appareil doit accepter toute interférence, y compris les interférences susceptibles de provoquer un fonctionnement indésirable de l'appareil.

This radio transmitter [6100A- CU639] has been approved by Innovation, Science and Economic Development Canada 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.

Le présent émetteur radio (6100A-CU639) a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal d'antenne. Les types d'antennes non inclus dans cette liste qui ont un gain supérieur au gain maximal indiqué pour tout type listé sont strictement interdits pour une utilisation avec cet appareil.

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IMPORTANT NOTE:

IC Radiation Exposure Statement:

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

IMPORTANT NOTE:

This module is intended for OEM integrator. The OEM integrator is responsible for the compliance to all the rules that apply to the product into which this certified RF module is integrated.
Additional testing and certification may be necessary when multiple modules are used.
OEM integrators that they must use the equivalent antennas or C2PC will be required.
Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the IC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied.

The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. Operation is subject to the following two conditions: (1) this device may not cause harmful interference (2) this device must accept any interference received, including interference that may cause undesired operation.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains IC: 6100A-CU639 ".
The Host Model Number (HMN) must be indicated at any location on the exterior of the end product or product packaging or product literature which shall be available with the end product or online.

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