AzureWave AW-CM358MA Wireless MCU with Integrated Wi-Fi 6 Microcontroller Module User Manual

Contents

AzureWave Technologies, Inc.

AzureWave AW-CM358MA Wireless MCU with Integrated Wi-Fi 6 Microcontroller Module

Product Usage Instructions

Installation
Ensure the AW-CU603 module is properly aligned with the corresponding connectors on your device.

Power Supply
Connect a single 3.3 V power supply to the AW-CU603 module.

Connectivity
Utilize the UART, I2C, or USB interface for establishing connectivity with the AW-CU603 module.

Network Setup
Configure the Wi-Fi settings on your device to connect to the AW-CU603 module.

Features

WLAN

- 1×1 dual-band 2.4 GHz/5 GHz Wi-Fi 6 radio
- 20 MHz channel operation
- Wi-Fi 6 Target Wake Time(TWT) support
- Wi-Fi 6 Extended Range (ER) and Dual Carrier Modulation (DCM)
- Low-power Wi-Fi idle, standby, and sleep modes
- WPA/WPA2/WPA3 personal and enterprise
- Support for Matter over Wi-Fi

Revision History
Document NO: R2-2603-DST-01

Version	Revision Date	DCN NO.	Description	Initials	Approved
A	2024/05/07	DCN031572	I Draft version	Roger Liu	N.C Chen

Introduction

Product Overview
AzureWave AW-CU603 is a highly integrated, low-power Wireless RW610 MCU with an integrated MCU and Wi-Fi 6 designed for a broad array of applications. Applications include connected smart home devices, enterprise and industrial automation, smart accessories, and smart energy. AW-CU603 includes a 260 MHz Arm Cortex-M33 core with Trust Zone-M, 1.2 MB on-chip SRAM and a Quad SPI interface with high bandwidth, and an on-the-fly decryption engine for securely accessing off-chip XIP flash. AW-CU603 includes a full-featured 1×1 dual-band (2.4 GHz / 5 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 advanced design of the AW-CU603 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.

Block Diagram

TBD

Specifications Table

General

Features	Description
Product Description	Wi-Fi 6 1×1 Microcontroller Module
Major Chipset	NXP RW610 HVQFN (116 pins)
Host Interface	UART / I2C / USB
Dimension	22 mm x 30 mm x 2.45 mm
Package	M.2 2230
Antenna	I-PEX MHF4 Connector Receptacle (20449) 1×1 diversity on MAIN ANT and AUX ANT
Weight	2.64g

WLAN

<table>
<tr><th>Features</th><th>Description</th></tr>
<tr><td>WLAN Standard</td><td>IEEE 802.11 a/b/g/n/ac/ax 1T1R</td></tr>
<tr><td>WLAN VID/PID</td><td>NA</td></tr>
<tr><td>WLAN SVID/SPID</td><td>NA</td></tr>
<tr><td>Frequency Rage</td><td>• 2.4 GHz ISM Bands 2.412-2.472 GHz
• 5.15-5.25 GHz (FCC UNII-low band) for US/Canada and Europe
• 5.25-5.35 GHz (FCC UNII-middle band) for US/Canada and Europe
• 5.47-5.725 GHz for Europe
• 5.725-5.825 GHz (FCC UNII-high band) for US/Canada
• 5.825-5.885 GHz (FCC UNII-4) for US/Canada</td></tr>
<tr><td>Modulation</td><td>DSSS, OFDM, DBPSK, DQPSK, CCK,16-QAM, 64-QAM, 256-QAM,</td></tr>
<tr><td>Number of Channels</td><td>2.4GHz:
• USA, NORTH AMERICA, Canada and Taiwan – 1 ~ 11
• China, Australia, Most European Countries – 1 ~ 13
• Japan, 1 ~ 13
5GHz:
• USA, Canada, Most European Countries -36, 40, 44, 48, 52, 56,60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 144,
149, 153, 157, 161, 165, 169, 173, 177
• Japan – 36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140
• China – 36, 40, 44, 48, 52, 56, 60, 64, 149, 153, 157, 161, 165</td></tr>
<tr><td>Output Power (Board Level Limit)*</td><td>2.4G
<table>
<tr><th></th><th>Min</th><th>Typ</th><th>Max</th><th>Unit</th></tr>
<tr><td>11b (11Mbps) @EVM<35 %</td><td>16</td><td>18</td><td>20</td><td>dBm</td></tr>
<tr><td>11g (54Mbps) @EVM≦-25 dB</td><td>14.5</td><td>16</td><td>17.5</td><td>dBm</td></tr>
<tr><td>11n (HT20 MCS7) @EVM≦-27 dB</td><td>13.5</td><td>15</td><td>16.5</td><td>dBm</td></tr>
<tr><td>11ax(HE20 MCS9) @EVM≦-32 dB</td><td>12.5</td><td>14</td><td>15.5</td><td>dBm</td></tr>
</table>
5G</td></tr>
</table>

		Min	Typ	Max	Unit
	11a (54Mbps) @EVM≦ -25 dB	14	16	18	dBm
	11n (HT20 MCS7) @EVM≦-27 dB	13	15	17	dBm
	11ac(VHT20 MCS8) @ EVM≦-30 dB	12	14	16	dBm
	11ax(HE20 MCS9) @E VM≦-32 dB	11	13	15	dBm

Receiver Sensitivity

2.4G

	Min	Typ	Max	Unit
11b (11Mbps)	–	-87	-84	dBm
11g (54Mbps)	–	-73	-70	dBm
11n (HT20 MCS7)	–	-70	-67	dBm
11ax (HE20 MCS9)	–	-64	-61	dBm

5G

	Min	Typ	Max	Unit
11a (54Mbps)		-73	-70	dBm
11n (HT20 MCS7)		-70	-67	dBm
11ac(VHT20 MCS8)		-66	-63	dBm
11ax(HE20 MCS9)		-64	-61	dBm

Data Rate	WLAN: 802.11b : 1, 2, 5.5, 11Mbps 802.11a/g : 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n : Maximum data rates up to 72 Mbps (20 MHz channel) 802.11ac: Maximum data rates up to 87 Mbps (20 MHz channel) 802.11ax: Maximum data rates up to 115 Mbps (20 MHz channel)
Security	n Wi-Fi: WPA2/WPA3 personal and enterprise and AES/CCMP/CMAC/GCMP

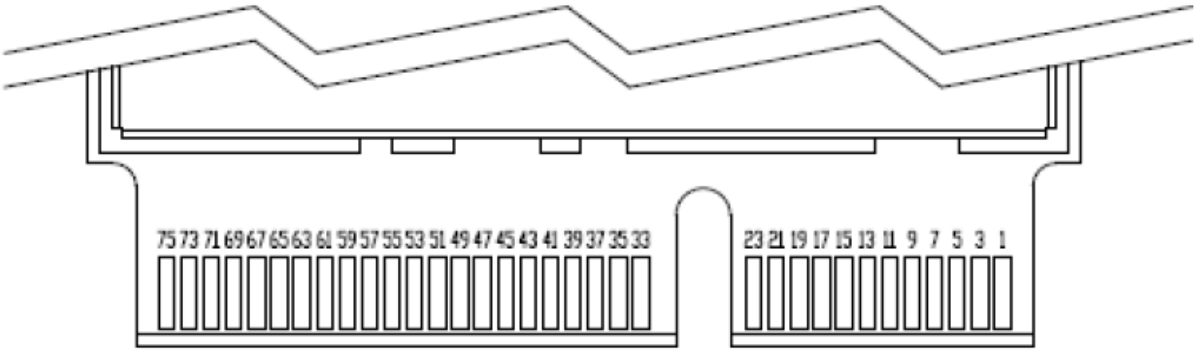
- * If you have any certification questions about output power please contact FAE directly.

Operating Conditions

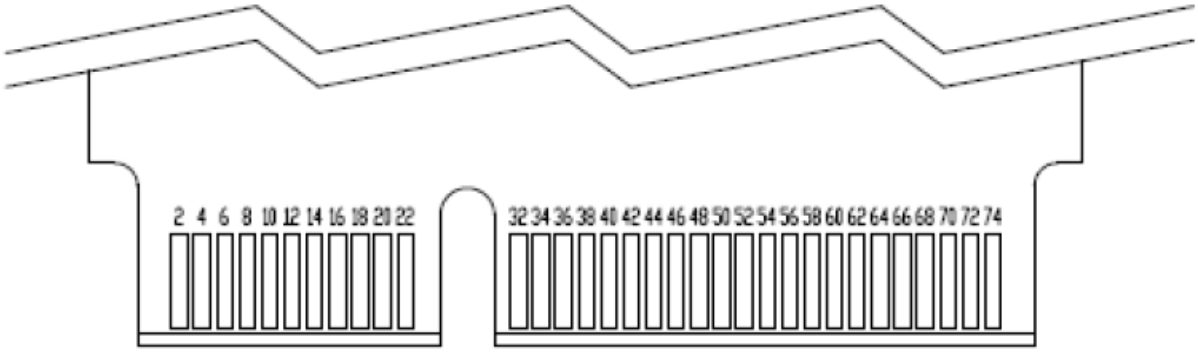
Features	Description
Operating Conditions	
Voltage	3.3V +-5%
Operating Temperature	-40℃ to +85℃
Operating Humidity	Less than 85% R.H.
Storage Temperature	-40℃ to +85℃
Storage Humidity	Less than 60% R.H.
ESD Protection	
Human Body Model	TBD
Changed Device Model	TBD

Pin Definition

Pin Map



PIN DEFINED (TOP VIEW)



PIN DEFINED (BOTTOM VIEW)

Pin Table

Pin No	Definition	Basic Description	Voltage	Type
1	GND	Ground		GND
2	+3.3V	3.3V power supply.	3.3V	Power
3	USB_D+	USB bus data+	3.3V	I/O
4	+3.3V	3.3V power supply	3.3V	Power
5	USB_D-	USB bus data-	3.3V	I/O
6	LED1#	GPIO[11], PWM output	3.3V	I/O
7	GND	Ground		GND
8	NC	No connect to anything		Floating
9	NC	No connect to anything		Floating
10	NC	No connect to anything		Floating
11	NC	No connect to anything		Floating
12	NC	No connect to anything		Floating
13	NC	No connect to anything		Floating
14	NC	No connect to anything		Floating
15	NC	No connect to anything		Floating
16	LED2#	GPIO[42], ADC0 channel 0	3.3V	I/O
17	NC	No connect to anything		Floating
18	GND	Ground.		GND
19	GND	Ground.		GND
20	UART WAKE#	UART Host Wake	3.3V	O
21	NC	No connect to anything		Floating
22	UART TxD	UART_SOUT	3.3V	O
23	NC	No connect to anything		Floating
32	UART RxD	UART_SIN	3.3V	I
33	GND	Ground.		GND
34	UART RTS	UART_RTS	3.3V	O
35	NC	No connect to anything		Floating
36	UART CTS	UART_CTS	3.3V	I
37	NC	No connect to anything		Floating
38	Board ID	GPIO[43]	3.3V	I/O
39	GND	Ground		GND
40	CONFIG_HOST_BOOT[0]	Host configuration options **HW Strap pin for ISP boot mode or for programing Flash**	1.8V	I/O

		1= Boot from Flex SPI Flash (Default) 0= ISP boot from UART to programing flash		
41	NC	No connect to anything		Floating
42	Vendor defined	Reserve No connect to anything		Floating
43	NC	No connect to anything		Floating
44	Alert# _EC	GPIO[22]	3.3V	O
45	GND	Ground		GND
46	I2C1_DATA	GPIO[9] FC1_RXD_SDA_MOSI_DATA_I2C:Flexcomm1 I2C data in/out	3.3V	I/O
47	NC	No connect to anything		Floating
48	I2C1_CLK	GPIO[8] FC1_TXD_SCL_MISO_WS_I2C:Flexcomm1 I2C clock	3.3V	I/O
49	NC	No connect to anything		Floating
50	NC	No connect to anything		Floating
51	GND	Ground		GND
52	NC	No connect to anything		Floating
53	NC	No connect to anything		Floating
54	NC	No connect to anything		Floating
55	NC	No connect to anything		Floating
56	W_DISABLE1#	Full Power-down (input) (active low)0 = full power-down mode1 = normal mode This pin has internal pull high 51k resistor to 3.3V	3.3V	I
57	GND	Ground		GND
58	I2C0_DATA	GPIO[2] FC0_RXD_SDA_MOSI_DATA_I2C:Flexcomm0 I2C data in/out	3.3V	I/O
59	NC	No connect to anything		Floating
60	I2C0_CLK	GPIO[3] FC0_TXD_SCL_MISO_WS_I2C:Flexcomm0 I2C clock	3.3V	I/O
61	NC	No connect to anything		Floating
62	ALERT#	GPIO[27]	3.3V	O
63	GND	Ground		GND
64	NC	No connect to anything		Floating
65	NC	No connect to anything		Floating
66	NC	No connect to anything		Floating

67	NC	No connect to anything		Floating
68	NC	No connect to anything		Floating
69	GND	Ground		GND
70	NC	No connect to anything		Floating
71	NC	No connect to anything		Floating
72	+3.3V	3.3V power supply	3.3V	Power
73	NC	No connect to anything		Floating
74	+3.3V	3.3V power supply	3.3V	Power
75	GND	Ground		GND

Electrical Characteristics

Absolute Maximum Ratings

Symbol	Parameter	Minimum	Typical	Maximum	Unit
VBAT	DC supply for the 3.3V input	–	3.3	3.96	V
VIO	1.8 V/3.3 V digital I/O power supply	–	1.8	2.16	V
			3.3	3.96	V

Recommended Operating Conditions

Symbol	Parameter	Minimum	Typical	Maximum	Unit
VBAT	DC supply for the 3.3V input	3.14	3.3	3.46	V
VIO	1.8 V/3.3 V digital I/O power supply	1.71	1.8	1.89	V
		3.14	3.3	3.46	V

Digital IO Pin DC Characteristics

VIO 1.8V Operation

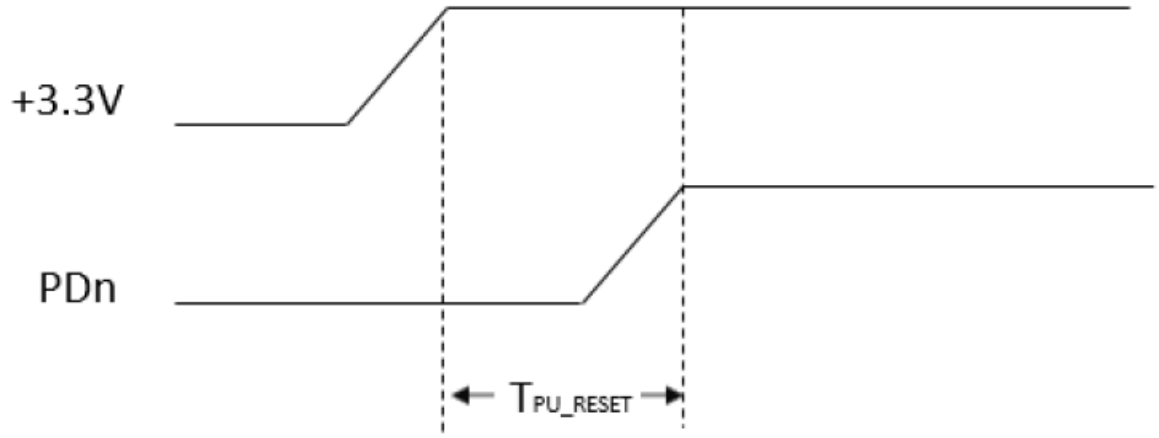
Symbol	Parameter	Minimum	Typical	Maximum	Unit
VIO	I/O pad supply voltage	1.62	1.8	1.98	V
VIH	Input high voltage	0.7*VIO	–	VIO+0.4	V
VIL	Input low voltage	-0.4	–	0.3*VIO	
VOH	Output High Voltage	VIO-0.4	–	–	
VOL	Output Low Voltage	–	–	0.4	
VHYS	Input Hysteresis	100			mV

VIO 3.3V Operation

Symbol	Parameter	Minimum	Typical	Maximum	Unit
VIO	I/O pad supply voltage	2.97	3.3	3.63	V
VIH	Input high voltage	0.7*VIO	–	VIO+0.4	V
VIL	Input low voltage	-0.4	–	0.3*VIO	

VOH	Output High Voltage	VIO-0.4	–	–	
VOL	Output Low Voltage	–	–	0.4	
VHYS	Input Hysteresis	100			mV

Power On Sequence



Symbol	Parameter	Min	Typ	Max	Units
Tpu_reset	Valid power to PDn deasserted	0	–	–	ms

Power Consumption

WLAN

Band (GHz)	Mode	BW(MHz)	RF Power (dBm)	VBAT_IN=3.3 V	
				Transmit	
				Max.	Avg.
2.4	11b@1Mbps	20	18	291	286
	11g@54Mbps	20	16	266	251
	11n@MCS7	20	15	243	230
	11ax@MCS0 NSS1	20	14	235	230
	11ax@MCS11 NSS1	20	14	240	222
5	11a@6Mbps	20	16	391	384
	11n@MCS7	20	15	375	354
	11ac@MCS0 NSS1	20	14	352	347
	11ac@MCS8 NSS1	20	14	350	327
	11ax@MCS0 NSS1	20	13	340	334
	11ax@MCS11 NSS1	20	13	337	315
Band (GHz)	Mode	BW(MHz)		Receive	
				Max.	Avg.
2.4	11b@11Mbps	20		90	86
	11g@54Mbps	20		92	89
	11n@MCS7	20		91	88
	11ax@MCS11 NSS1	20		87	83
5	11a@54Mbps	20		108	104
	11n@MCS7	20		109	104
	11ac@MCS8 NSS1	20		107	104
	11ax@MCS11 NSS1	20		107	102

Current Unit: mA

Normal Mode

VBAT_IN=3.3V								
MCU Status	**WiFi Deep Sleep**	**WiFi STA Connected**		**WiFi IEEE Power Saving**				**WiFi Power Down**
		2.4G	**5G**	**2.4G**		**5G**		
				DTIM 1	**DTIM10**	**DTIM1**	**DTIM10**	
PM0(Active)	27.1	71.8	91.5	NA				27.2
PM1(Idle)	18.3	62.8	83.5	21.1	18.8	19.4	18.6	18.4
PM2(Standby)	7.1	51.9	72.5	10.2	7.7	8.2	7.6	7.0
PM3(Sleep)	2.7	50.3	71.2	6.0	3.2	3.8	3.7	2.7
PM4(Shutdown)	NA	NA		NA				NA

Current Unit: mA

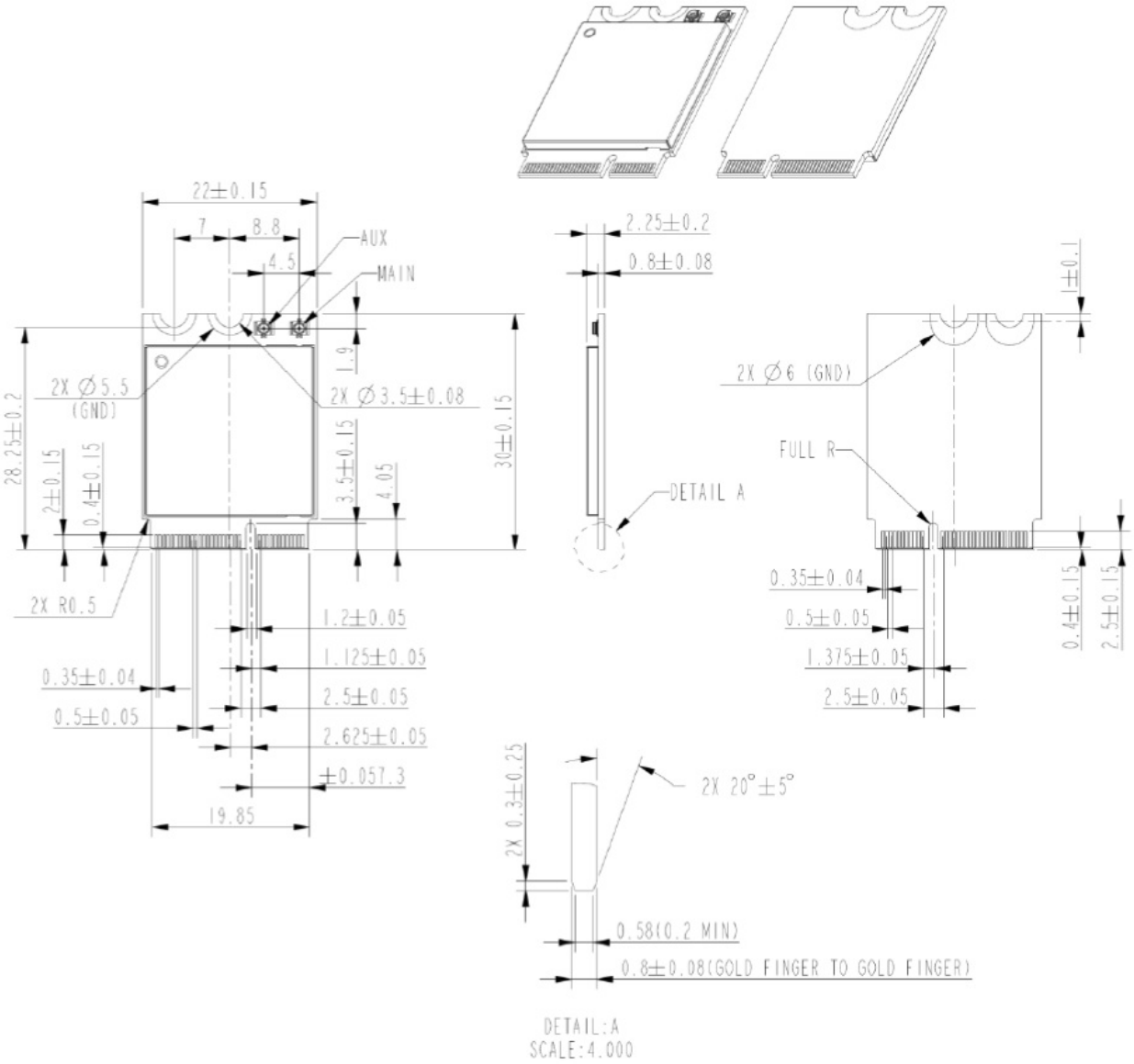
Peak Current

No.	**Item**	**VBAT=3.3 V**
		Max.
1	Peak current during device initialization	547
2	Peak current during device scan AP	534
3	Peak current during device connect AP	515

Current Unit: mA

Mechanical Information

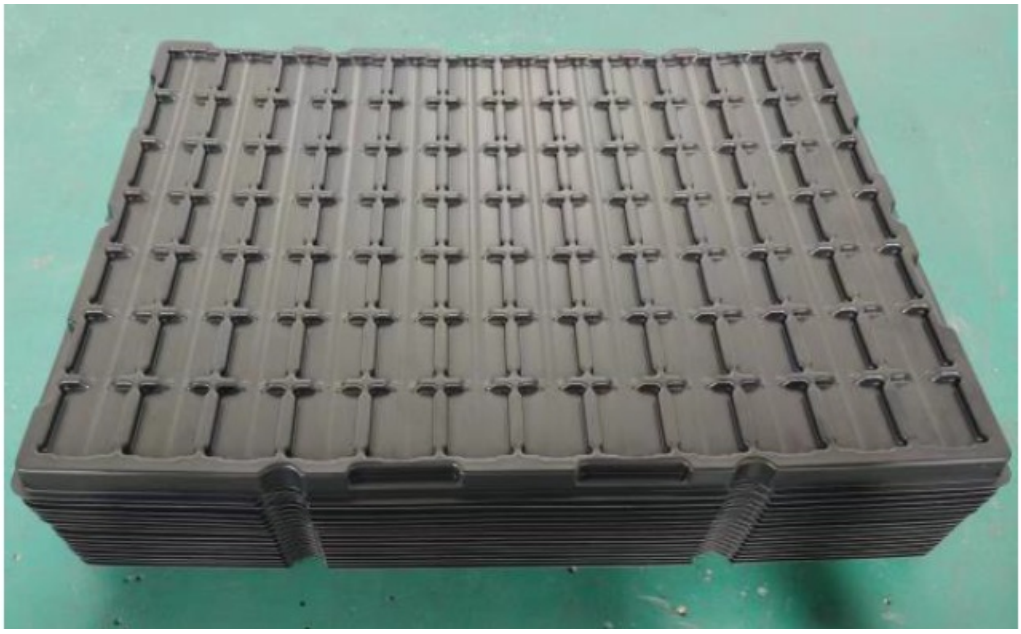
Mechanical Drawing



Packing Information

1. 84pcs M.2 2230 modules put in one tray

2. The trays are stacked with each other, and add more one tray on the top, so the total number of trays is 14pcs, i.e. 13pcs tray (full) and 1pcs tray (empty)



3. Use P.P Strap to pack 14pcs trays and add one packing label on the top

4. Put the two packed tray into the box

5. Seal the carton by Azure Wave tape

6. One carton label and one box label pasted on the carton. If the carton is not full, add one balance label pasted on the carton

Label Information on the carton

<table>
<tr><td>Example of Packing Label</td><td> 
</td></tr>
<tr><td>Example of carton label</td><td>
<table>
<tr><td colspan="2">AzureWave
AzureWave Technologies Inc.</td></tr>
<tr><td>Azure Wave P/N</td><td>AW-CU603</td></tr>
<tr><td>Customer</td><td>Provided by Sales</td></tr>
<tr><td>Customer P/N</td><td>Provided by Sales</td></tr>
<tr><td>Customer P/O</td><td>Provided by Sales</td></tr>
<tr><td>Description</td><td>AW-CU603</td></tr>
<tr><td>Q’ty</td><td></td></tr>
<tr><td>C/N</td><td></td></tr>
<tr><td>N.W.</td><td>G.W.</td></tr>
<tr><td colspan="2">RoHS Made in China</td></tr>
</table>
</td></tr>
<tr><td>Example of box label</td><td> 
</td></tr>
<tr><td>Example of balance label</td><td> 
</td></tr>
</table>

Note:

- 1 Packed Tray = 13pcs Tray = 1092 pcs
- 1 Carton = 2 Packed Tray = 2184 pcs

Federal Communication Commission Interference 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.

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.

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

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 & your body.

Industry Canada Statement
CAN ICES-3(B)/ NMB-3(B)
This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s licence-exempt RSS(s).

Radiation Exposure Statement:
This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with greater than 20cm between the radiator & your body.

Caution :

1. The device for operation in the band 5150-5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;
2. For devices with detachable antenna(s), the maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall be such that the equipment still complies with the e.i.r.p. limit;
3. For devices with detachable antenna(s), the maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits as appropriate;
4. Where applicable, antenna type(s), antenna models(s), and worst-case tilt angle(s) necessary to remain compliant with the e.i.r.p. elevation mask requirement set forth in section 6.2.2.3 shall be clearly indicated.

This module is limited to OEM installation ONLY.

List of applicable FCC rules
Compliance with FCC Part 15C, 15E regulation.

Specific operational use conditions
The module is tested for standalone mobile RF exposure use condition. Any other usage conditions such as co-location with other transmitter(s) will need a separate reassessment through a class II permissive change application or new certification.

Limited module procedures
Not applicable to this device

RF exposure considerations
This module is limited to installation in mobile or fixed applications, according to §2.1091(b). The separate approval is required for all other operating configurations, including portable configurations with respect to Part §2.1093 and different antenna configurations

Antennas:

1. The antenna must be installed such that 20 cm is maintained between the antenna and users,
2. The transmitter module may not be co-located with any other transmitter or antenna.
3. To comply with FCC/IC regulations limiting both maximum RF output power and human exposure to RF radiation, the maximum antenna gain including cable loss in a mobile exposure condition must not exceed:
    - **Antenna Type:** PIFA
    - **Antenna gain:** 3.5 dBi in 2.4GHz (frequency); 5 dBi in 5 GHz (frequency)
    - **Antenna Connector (if applicable):** IPEX MHF4

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC/IC authorization is no longer considered valid and the FCC ID/IC ID 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/IC authorization.

Label and compliance information
When the module is installed in the host device, the FCC ID/ IC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily removed. If not, a second label must be placed on the outside of the final device that contains the following text: “Contains FCC ID: TLZ-CU603”, “Contains IC: 6100A-CU603 “
The grantee’s FCC ID/IC ID can be used only when all FCC/IC compliance requirements are met. 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/warning as show in this manual.

Information on test modes and additional testing requirements
This radio module must not be installed to co-locate and operating simultaneously with other radios in the host system except in accordance with FCC multi-transmitter product procedures. Additional testing and equipment authorization may be required operate simultaneously with other radio.

Additional testing, Part 15 Subpart B disclaimer
The host manufacturer is required to show compliance with Part 15 Subpart B while the transmitter module(s) are installed and operating. The modules should be transmitting and the evaluation should confirm that the module’s intentional emissions are compliant (i.e. fundamental and out of band emissions). The host manufacturer must

verify that there are no additional unintentional emissions other than what is permitted in Part 15 Subpart B or emissions are complaint with the transmitter(s) rule(s).

Note EMI Considerations
Please follow the guidance provided for host manufacturers in KDB publications 996369 D02 and D04.

How to make changes
Only Grantees are permitted to make permissive changes.

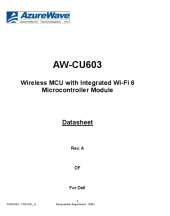
Please contact us if the host integrator expect the module to be used differently than as granted:

- Company Name: Azure Wave Technologies (USA), Inc.
- Company Address:467 Saratoga ave #108 San Jose, CA 95129 United States
- Japan : 5GHz band (W52,W53): Indoor use only (except communicate to W52 high power radio)

Frequently Asked Questions (FAQ)

- **Q: What are the supported Wi-Fi standards?**
  A: The AW-CU603 supports Wi-Fi 6 (802.11ax) standards for enhanced performance.
- **Q: How do I ensure secure operation?**
  A: The module features Trust Zone-M and on-the-fly decryption engine for secure operation. Ensure proper encryption protocols are utilized.
- **Q: Can the AW-CU603 be used in smart home devices?**
  A: Yes, the AW-CU603 is suitable for connected smart home devices along with other applications like enterprise automation and smart accessories.

Documents / Resources

	AzureWave AW-CM358MA Wireless MCU with Integrated Wi-Fi 6 Microcontroller Module [pdf] User Manual CU603, TLZ-CU603, AW-CU603, AW-CM358MA Wireless MCU with Integrated Wi-Fi 6 Microcontroller Module, AW-CM358MA, Wireless MCU with Integrated Wi-Fi 6 Microcontroller Module, Integrated Wi-Fi 6 Microcontroller Module, Wi-Fi 6 Microcontroller Module, 6 Microcontroller Module, Microcontroller Module

References

- User Manual