AW-CU442

IEEE 802.11 b/g/n 1T1R WLAN and Bluetooth Low Energy Microcontroller Module

Datasheet

(For Standard)
(Halogen Free)

Features

WiFi

802.11 b/g/n/ 1x1, 2.4GHz

Support 20MHz/40MHz up to MCS7

Low power architecture

Support low power TX/RX for short range application

Low power beacon listen mode

Low power Rx mode

Very low power suspends mode (DLPS)

Bluetooth

Support BLE

Support both central and peripheral modes

Internal co-existence mechanism between and WIFI and BT to share the same antenna

Support BLE5.0

Peripheral Interface

USB host controller with HS/FS/LS capability

HS-SD/MMC 2.0

SDIO device with highest SDR25 supported

HS_UART/LP_UART supported

Standard and fast mode I2C supported

I2S with 8/12/16/24/32/48/…./176.4 KHz sampling rate

Maximum 2 SPI supported. One supports baud rate up to 50MHz;the other one supports baud rate up to 25MHz

Support PWM with configurable duration and duty cycle from 0~100%

Support External Timer Trigger Event (ETE function) with configurable period in low power mode

Revision History

Document NO: R2-2442-DST-01

Version	Revision Date	DCN NO.	Description	Initials	Approved
A	2020/02/03		● Initial	Peter Chen	N.C. Chen
B	2020/02/05		● 2.2 pin table correction	Peter Chen	N.C. Chen
C	2020/02/12		● 2.1 pin map correction	Peter Chen	N.C. Chen

Table of Contents

1. Introduction

1.1 Product Overview

AzureWave presents AW-CU442 802.11b/g/n 1T1R WLAN and Bluetooth low energy (5.0) Microcontroller Solution provides a highly cost-effective, flexible and easy to-use hardware/software platform to build a new generation of connected, smart devices. These smart-connected devices enable device to deliver a broad-range of services to consumers including energy-management, demand-response, home automation and remote access. This allows a user to manage comfort and convenience, also run diagnostics and receive alerts and notifications, in addition to managing and controlling the device. Developers can leverage the rich connectivity features of these new smart devices to create a new generation of innovative new applications and services

The architecture features the Realtek RTL8721CSM-VA1 integrated single-chip low power dual band (2.4G) wireless LAN and Bluetooth Low Energy (5.0) communication controller. It consists of high-performance MCU (latest architecture v8m, Cortex-M4F instruction compatible) named KM4, a low power MCU (v8m, Cortex-M0 instruction compatible) named KM0, WLAN (802.11b/g/n) MAC, a 1T1R capable WLAN baseband, RF, Bluetooth and peripherals.

The AW-CU442 is powered by production quality, field-tested Realtek Easy Connect software that includes a rich set of software components that work together to support the development of Smart Energy devices, and enable these devices to connect to mobile clients such as smart-phones, Internet-based Cloud and Smart-Grid services. The feature-rich software stack enables OEMs to focus on application-specific software functionality, thus enabling rapid development and reduced software development costs and risks.

1.2 Specifications Table

1.2.1 General

Features	Description
Product Description	802.11b/g/n 1T1R WLAN and Bluetooth low energy (5.0) Microcontroller Module
Major Chipset	RTL8721CSM-VA1 (with pSRAM 4MB)
Host Interface	UART
Flash	SPI interface for Flash connection
Dimension	18 mm x 13 mm x 2.45 mm(Max)
Package	57-pin LGA
Antenna	Internal printing Antenna for WLAN/BT
Weight	TBD

1.2.2 WLAN

Features	Description
WLAN Standard	IEEE 802.11b/g/n, Wi-Fi compliant
Frequency Rage	2.4 GHz ISM radio band
Modulation	DSSS, OFDM, DBPSK, DQPSK, CCK, 16-QAM, 64-QAM for WLAN
Number of Channels	USA, North America, Canada and Taiwan – 1 ~ 11 China, Australia, Most European Countries – 1 ~ 13 Japan, 1 ~ 14(CH14 only for 802.11b)
Output Power	**2.4G** 15 18 20 dBm 11 14 16 dBm 11 14 16 dBm 10 13 15 dBm
Receiver Sensitivity	**2.4G**
Data Rate	WLAN: 802.11b: 1, 2, 5.5, 11Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n: up to 150Mbps-single
Security	TBD

1.2.3 Bluetooth

Features	Description
Bluetooth Standard	Bluetooth 5.0 complaint (BLE)
Frequency Rage	2402~2480MHz
Modulation	BLE
Output Power	
Receiver Sensitivity	

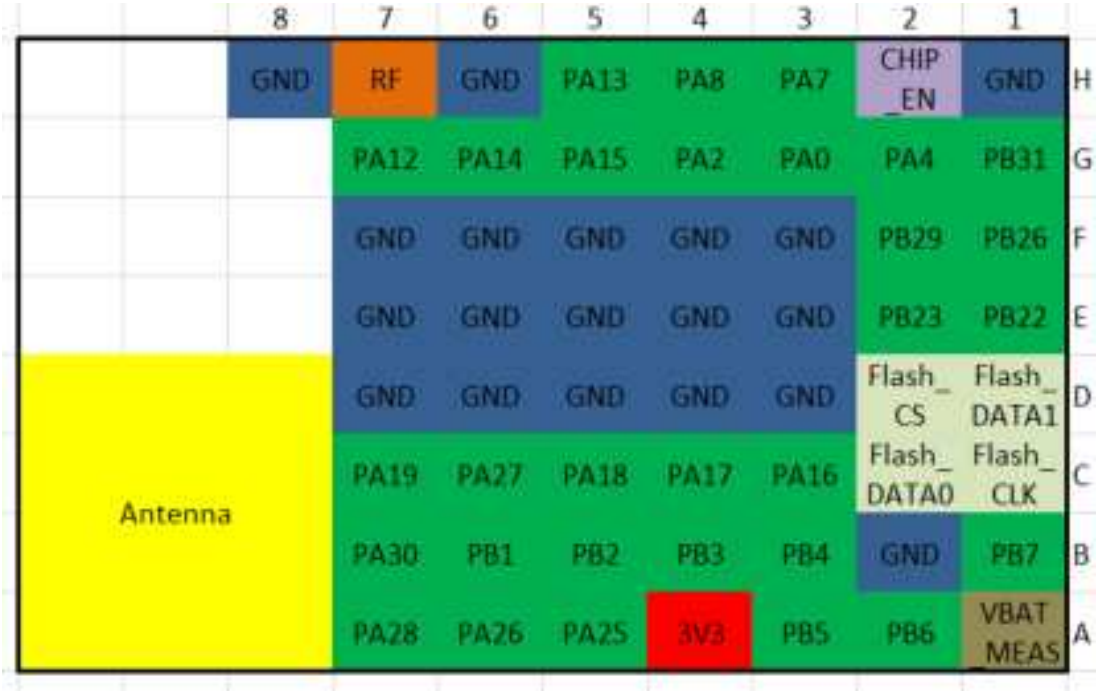
1.2.4 Operating Conditions

Features	Description
Operating Conditions	
Voltage	3.3V
Operating Temperature	-20 ~ 85℃
Operating Humidity	less than 85% R.H.
Storage Temperature	-40 ~ 85℃
Storage Humidity	less than 60% R.H.
ESD Protection	
Human Body Model	TBD
Changed Device Model	TBD

2. Pin Definition

2.1 Pin Map

AW-CU442 Top View Pin Map



2.2 Pin Table

Pin No	Definition	Basic Description	Voltage	Type
A1	VBAT_MEAS	ADC input pin, 5V tolerance		I
A2	PB6	The MUX function GPIO pin.		I/O
A3	PB5	The MUX function GPIO pin.		I/O
A4	3V3	3.3V power supply		VCC
A5	PA25	The MUX function GPIO pin.		I/O
A6	PA26	The MUX function GPIO pin.		I/O
A7	PA28	The MUX function GPIO pin.		I/O
B1	PB7	The MUX function GPIO pin.		I/O
B2	GND	Ground.		GND
B3	PB4	The MUX function GPIO pin.		I/O
B4	PB3	The MUX function GPIO pin.		I/O
B5	PB2	The MUX function GPIO pin.		I/O
B6	PB1	The MUX function GPIO pin.		I/O
B7	PA30	The MUX function GPIO pin.		I/O
C1	Flash_CLK	Connecting to external flash CLK(Clock input) pin		O
C2	Flash_DATA0	Connecting to external flash SIO0(Serial Data Input) pin		I/O
C3	PA16	The MUX function GPIO pin.		I/O
C4	PA17	The MUX function GPIO pin.		I/O
C5	PA18	The MUX function GPIO pin.		I/O
C6	PA27	The MUX function GPIO pin.		I/O
C7	PA19	The MUX function GPIO pin.		I/O
D1	Flash_DATA1	Connecting to external flash SIO1(Serial Data Output) pin		I/O
D2	Flash_CS	Connecting to external flash CS(Chip Select) pin		I
D3	GND	Ground.		GND
D4	GND	Ground.		GND
D5	GND	Ground.		GND
D6	GND	Ground.		GND
D7	GND	Ground.		GND

E1	PB22	The MUX function GPIO pin.	I/O
E2	PB23	The MUX function GPIO pin.	I/O
E3	GND	Ground.	GND
E4	GND	Ground.	GND
E5	GND	Ground.	GND
E6	GND	Ground.	GND
E7	GND	Ground.	GND
F1	PB26	The MUX function GPIO pin.	I/O
F2	PB29	The MUX function GPIO pin.	I/O
F3	GND	Ground.	GND
F4	GND	Ground.	GND
F5	GND	Ground.	GND
F6	GND	Ground.	GND
F7	GND	Ground.	GND
G1	PB31	The MUX function GPIO pin.	I/O
G2	PA4	The MUX function GPIO pin.	I/O
G3	PA0	The MUX function GPIO pin.	I/O
G4	PA2	The MUX function GPIO pin.	I/O
G5	PA15	The MUX function GPIO pin.	I/O
G6	PA14	The MUX function GPIO pin.	I/O
G7	PA12	The MUX function GPIO pin.	I/O
H1	GND	Ground.	GND
H2	CHIP_EN	Enable Chip:1 Enable Chip, 0 Shut Down Chip	I
H3	PA7	UART_LOG_TXD, UART_DOWNLOAD	I/O
H4	PA8	UART_LOG_RXD	I/O
H5	PA13	The MUX function GPIO pin.	I/O
H6	GND	Ground.	GND
H7	RF	WIiFi/BT RF interface (option)	I/O
H8	GND	Ground.	GND

* Note: By default, Pin H3 and H4 are UART interface (Pin H3 is UART TX, Pin H4 is UART RX).
When AW-CU442 is booting, Pin H3 is strap pin (low active) to enter the flash download mode.

2.3 GPIO Function Table

Port Name	FUNC_ID0	FUNC_ID1	FUNC_ID2	FUNC_ID3	FUNC_ID4	FUNC_ID5	FUNC_ID6	FUNC_ID7	FUNC_ID8	FUNC_ID9	FUNC_ID10	FUNC_ID11
	gpio	UART DATA	LOG UART RTS/CTS	SPI	RTC	IR	SPI flash	I2C	SDIO	HS pwm	LP pwm	SWD
PA[0]	PA[0]											
PA[2]	PA[2]											
PA[4]	PA[4]											
PA[7]	PA[7]		UART_LOG_TXD									
PA[8]	PA[8]		UART_LOG_RXD									
PA[12]	PA[12]	LP_UART_TXD		SPI1_MOSI						HS_PWM0	LP_PWM0	
PA[13]	PA[13]	LP_UART_RXD		SPI1_MISO						HS_PWM1	LP_PWM1	
PA[14]	PA[14]		LP_UART_RTS	SPI1_CLK								
PA[15]	PA[15]		LP_UART_CTS	SPI1_CS								
PA[16]	PA[16]		HS_UART0_RTS	SPI0_MOSI								
PA[17]	PA[17]		HS_UART0_CTS	SPI0_MISO								
PA[18]	PA[18]	HS_UART0_TXD		SPI0_CLK								
PA[19]	PA[19]	HS_UART0_RXD		SPI0_CS								
PA[25]	PA[25]	LP_UART_RXD		HS_USI_SPI_MO		IR_TX		LP_I2C_SCL		HS_PWM4	LP_PWM4	
PA[26]	PA[26]	LP_UART_TXD		HS_USI_SPI_MI		IR_RX		LP_I2C_SDA		HS_PWM5	LP_PWM5	
PA[27]	PA[27]		LP_UART_RTS									SWD_DATA
PA[28]	PA[28]		LP_UART_CTS	HS_USI_SPI_CS						HS_PWM6	LP_PWM0	
PA[30]	PA[30]			HS_USI_SPI_CLK						HS_PWM7	LP_PWM1	
PB[1]	PB[1]	LP_UART_TXD										
PB[2]	PB[2]	LP_UART_RXD										
PB[3]	PB[3]											SWD_CLK
PB[4]	PB[4]			SPI1_MOSI	RTC EXT_32K					HS_PWM8	LP_PWM2	
PB[5]	PB[5]			SPI1_MISO	RTC_OUT			LP_I2C_SCL		HS_PWM9	LP_PWM3	
PB[6]	PB[6]			SPI1_CLK	LP_TIM4_TRIG			LP_I2C_SDA				
PB[7]	PB[7]			SPI1_CS	LP_TIM5_TRIG					HS_PWM17	LP_PWM5	
PB[22]	PB[22]				LP_TIM4_TRIG	IR_RX	SPI_DATA3		SD_D0	HS_PWM14	LP_PWM2	
PB[23]	PB[23]				LP_TIM5_TRIG	IR_TX	SPI_DATA2		SD_D1	HS_PWM15	LP_PWM3	
PB[26]	PB[26]											
PB[29]	PB[29]					IR_RX						
PB[31]	PB[31]					IR_TX						

Port Name	FUNC_ID0	FUNC_ID12	FUNC_ID13	FUNC_ID14	FUNC_ID15	FUNC_ID16	FUNC_ID18	FUNC_ID20	FUNC_ID21	FUNC_ID22
	gpio	I2S/DMIC	LCD	USB	HEADPHONE	SGPIO	Wifi only RFE control	Ext. BT	Combo RFE control	HS timer trig
PA[0]	PA[0]	I2S_SD_RX			QDEC_IDX	SGPIO	ANT_SEL_P			
PA[2]	PA[2]	I2S_CLK			QDEC_PHB	SGPIO_OUT	TRSW_P			
PA[4]	PA[4]	I2S_WS			QDEC_PHA		TRSW_N			
PA[7]	PA[7]						ANT_SEL_P			
PA[8]	PA[8]						ANT_SEL_N			
PA[12]	PA[12]	I2S_MCLK					ANT_SEL_N	GRANT_BT	EN_EXLNA	
PA[13]	PA[13]	I2S_SD_TX1					ANT_SEL_P	GRANT_BT_N	EN_EXPA	
PA[14]	PA[14]	I2S_SD_TX2					ANT_SEL_N	BT_DIS		
PA[15]	PA[15]						ANT_SEL_P	BT_WAKE_HOST		
PA[16]	PA[16]						ANT_SEL_N	HOST_WAKE_BT		
PA[17]	PA[17]						ANT_SEL_P	BT_CLK_REQ		
PA[18]	PA[18]							MBOX_I2C_SDA		
PA[19]	PA[19]		LCD_D0					MBOX_I2C_SCL		
PA[25]	PA[25]		LCD_D9	HSDM				MBOX_I2C_INT		
PA[26]	PA[26]		LCD_D8	HSDP				BT_ACT		
PA[27]	PA[27]							WLAN_ACT		
PA[28]	PA[28]		LCD_D7	RREF				BT_CK		
PA[30]	PA[30]		LCD_D6	VBUS_OTG				EXTBT_UART_RTS		
PB[1]	PB[1]	DMIC_CLK				SGPIO_OUT	ANT_SEL_N	BT_STR	EN_EXLNA	HS_TIM4_TRIG
PB[2]	PB[2]	DMIC_DATA				SGPIO	ANT_SEL_P	PCM_CLK	EN_EXPA	HS_TIM5_TRIG
PB[3]	PB[3]							PCM_SYNC		
PB[4]	PB[4]	I2S_SD_TX1		ID_OTG				PCM_IN		HS_TIM4_TRIG
PB[5]	PB[5]	I2S_SD_TX2						PCM_OUT		HS_TIM5_TRIG
PB[6]	PB[6]							EXTBT_UART_TX		
PB[7]	PB[7]							EXTBT_UART_RXD		
PB[22]	PB[22]	I2S_SD_RX	LCD_RD	ID_OTG	QDEC_PHB	SGPIO_OUT		EXTBT_UART_CTS		
PB[23]	PB[23]	I2S_MCLK	LCD_WR		QDEC_PHA	SGPIO_OUT		EXT_32K		
PB[26]	PB[26]	I2S_SD_TXD			HEADPHONE_DET	SGPIO	TRSW_N			
PB[29]	PB[29]	I2S_CLK				SGPIO	TRSW_P			
PB[31]	PB[31]	I2S_WS			QDEC_PHA	SGPIO				

Port Name	FUNC_ID0	FUNC_ID23	FUNC_ID28	FUNC_ID29	FUNC_ID30	FUNC_ID31	
	gpio	Debug Port	Ext32K	key scan/ROW	key scan/COL	WAKEUP	default pull
PA[0]	PA[0]						
PA[2]	PA[2]						
PA[4]	PA[4]						
PA[7]	PA[7]						Internal UP
PA[8]	PA[8]						Internal UP
PA[12]	PA[12]			KEY_ROW0		LGPIO[0]	
PA[13]	PA[13]			KEY_ROW1		LGPIO[1]	EfusePullCtrl0
PA[14]	PA[14]		RTC_OUT	KEY_ROW2		LGPIO[2]	
PA[15]	PA[15]		RTC EXT_32K	KEY_ROW3	KEY_COL6	LGPIO[3]	EfusePullCtrl1
PA[16]	PA[16]	wlmac_dbggpio[10]		KEY_ROW4	KEY_COL5		
PA[17]	PA[17]	wlmac_dbggpio[11]		KEY_ROW6	KEY_COL3		
PA[18]	PA[18]	wlmac_dbggpio[12]	RTC_OUT	KEY_ROW5	KEY_COL4		
PA[19]	PA[19]	wlmac_dbggpio[13]			KEY_COL2		
PA[25]	PA[25]	wlmac_dbggpio[0]			KEY_COL1		EfusePullCtrl2
PA[26]	PA[26]	wlmac_dbggpio[1]			KEY_COL0		
PA[27]	PA[27]	wlmac_dbggpio[2]					Internal UP
PA[28]	PA[28]	wlmac_dbggpio[3]					EfusePullCtrl3
PA[30]	PA[30]	wlmac_dbggpio[4]					External UP
PB[1]	PB[1]	wlmac_dbggpio[5]					EfusePullCtrl4
PB[2]	PB[2]	wlmac_dbggpio[6]					
PB[3]	PB[3]	wlmac_dbggpio[7]					
PB[4]	PB[4]	wlmac_dbggpio[14]					
PB[5]	PB[5]	wlmac_dbggpio[15]					
PB[6]	PB[6]	wlmac_dbggpio[16]					
PB[7]	PB[7]	wlmac_dbggpio[17]					EfusePullCtrl5
PB[22]	PB[22]	wlmac_dbggpio[8]					EfusePullCtrl7
PB[23]	PB[23]	wlmac_dbggpio[9]					
PB[26]	PB[26]						
PB[29]	PB[29]	wlmac_dbggpio[29]					
PB[31]	PB[31]	wlmac_dbggpio[31]					

3. Electrical Characteristics

3.1 Absolute Maximum Ratings

Symbol	Parameter	Minimum	Typical	Maximum	Unit
3V3	3.3V Power supply		3.3	3.6	V

3.2 Recommended Operating Conditions

Symbol	Parameter	Minimum	Typical	Maximum	Unit
3V3	3.3V Power supply	3.0	3.3	3.6	V

3.3 Digital IO Pin DC Characteristics

Symbol	Parameter	Minimum	Typical	Maximum	Unit
VIH	Input high voltage	2	--		V
VIL	Input low voltage		--	0.8	V
VOH	Output high voltage	2.4	--		V
VOL	Output low voltage		--	0.4	V

3.4 Host Interface

3.4.1 UART Interface

TBD

3.5 Power up Timing Sequence

TBD

3.6 Power Consumption*

3.6.1 WLAN

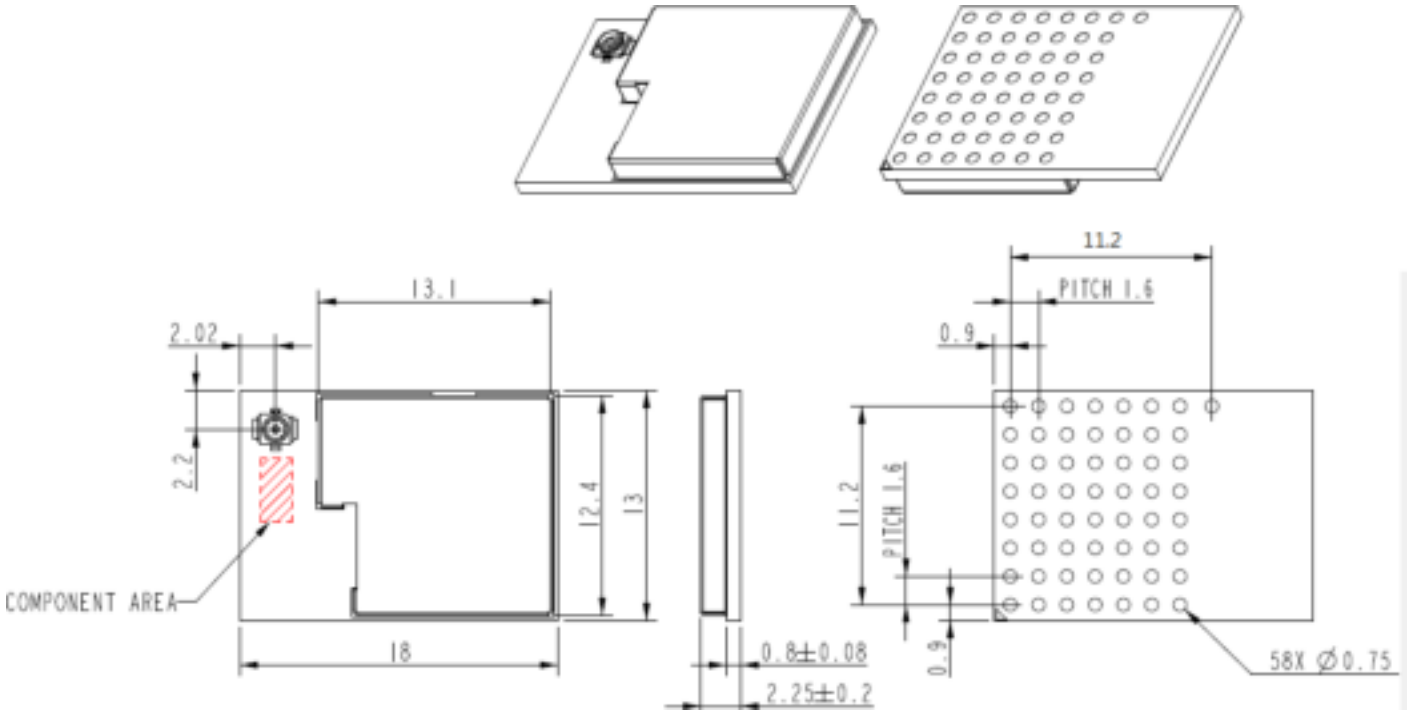
TBD

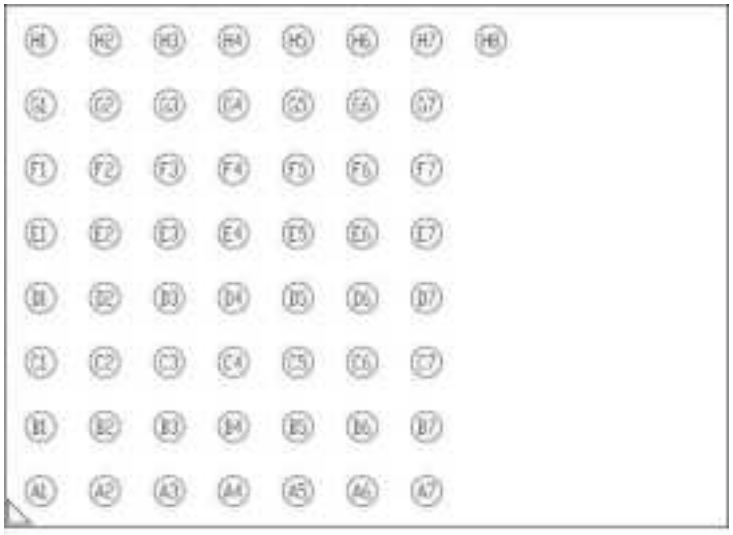
3.6.2 Bluetooth

TBD

4. Mechanical Information

4.1 Mechanical Drawing

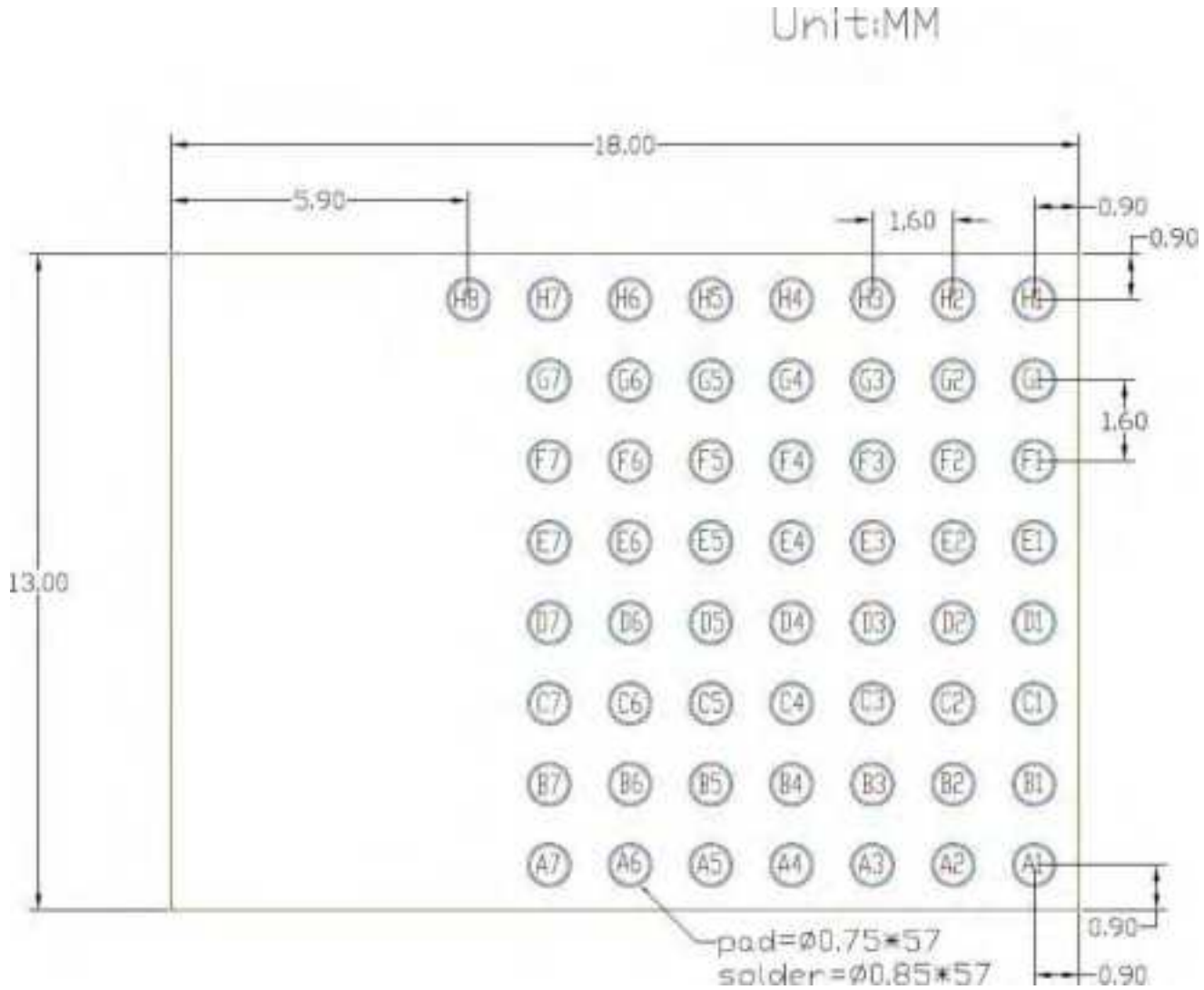




PIN DEFINED(BOTTOM VIEW)

4.2 Recommend Footprint

- For customer using pads SMD (Solder Mask Defined)



AW-CU442 Recommend Footprint (Top View)

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.

FCC 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.

For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible.

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.

20cm minimum distance has to be able to be maintained between the antenna and the users for the host this module is integrated into. Under such configuration, the FCC radiation exposure limits set forth for an population/uncontrolled environment can be satisfied.

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 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-CU442 ".

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.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	LYNwave	AOX20X054AA0	Chip Antenna	N/A	3.62

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.

For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible.
Pour les produits disponibles aux États-Unis / Canada du marché, seul le canal 1 à 11 peuvent être exploités. Sélection d'autres canaux n'est pas possible.

This device and its antenna(s) must not be co-located with any other transmitters except in accordance with IC multi-transmitter product procedures.
Referring to the multi-transmitter policy, multiple-transmitter(s) and module(s) can be operated simultaneously without reassessment permissive change.
Cet appareil et son antenne (s) ne doit pas être co-localisés ou fonctionnement en association avec une autre antenne ou transmetteur.

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.

MPORTANT 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.

20cm minimum distance has to be able to be maintained between the antenna and the users for the host this module is integrated into. Under such configuration, the IC RSS-102 radiation exposure limits set forth for an population/uncontrolled environment can be satisfied.

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-CU442 ".

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.