

AW-CU598

Wireless MCU with Integrated Wi-Fi 6 and Bluetooth Low Energy 5.3 Module

Datasheet

Rev. E

DF

(For Standard)

Features

WLAN

- ◆ Support 1x1 dual-band 2.4 GHz/5 GHz Wi-Fi a/b/g/n/ac/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)
- ◆ Power save features
- ◆ WPA2/WPA3 personal and enterprise

Bluetooth

- ◆ Supports Bluetooth LE 5.3(Class 2) certified and Bluetooth LE 5.2 features supported
- ◆ Wi-Fi/Bluetooth coexistence protocol support
- ◆ Intelligent Adaptive Frequency Hopping (AFH)
- ◆ Bluetooth LE Privacy 1.2
- ◆ Bluetooth LE Long Range
- ◆ Bluetooth LE 2 Mbps
- ◆ Bluetooth LE Isochronous Channels
- ◆ Bluetooth LE Audio with integrated LC3 codec
- ◆ Security: AES

Revision History

Document NO: R2-2598-DST-01

Version	Revision Date	DCN NO.	Description	Initials	Approved
A	2023/02/04	DCN028668	<ul style="list-style-type: none"> ● Draft version 	Roger Liu	N.C Chen
B	2023/06/27	DCN029399	<ul style="list-style-type: none"> ● Update block diagram ● Update pin table 	Roger Liu	N.C Chen
C	2023/08/30	DCN029967	<ul style="list-style-type: none"> ● Modify feature and pin table ● Update RF specification 	Roger Liu	N.C Chen
D	2023/10/30	DCN030381	<ul style="list-style-type: none"> ● Modify Pin Table GPIO[13] and GPIO[14] to SWCLK and SWDIO 	Roger Liu	N.C Chen
E	2023/12/14	DCN030759	<ul style="list-style-type: none"> ● Update Packing information ● Update Dimension 	Roger Liu	N.C Chen

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1. Introduction

1.1 Product Overview

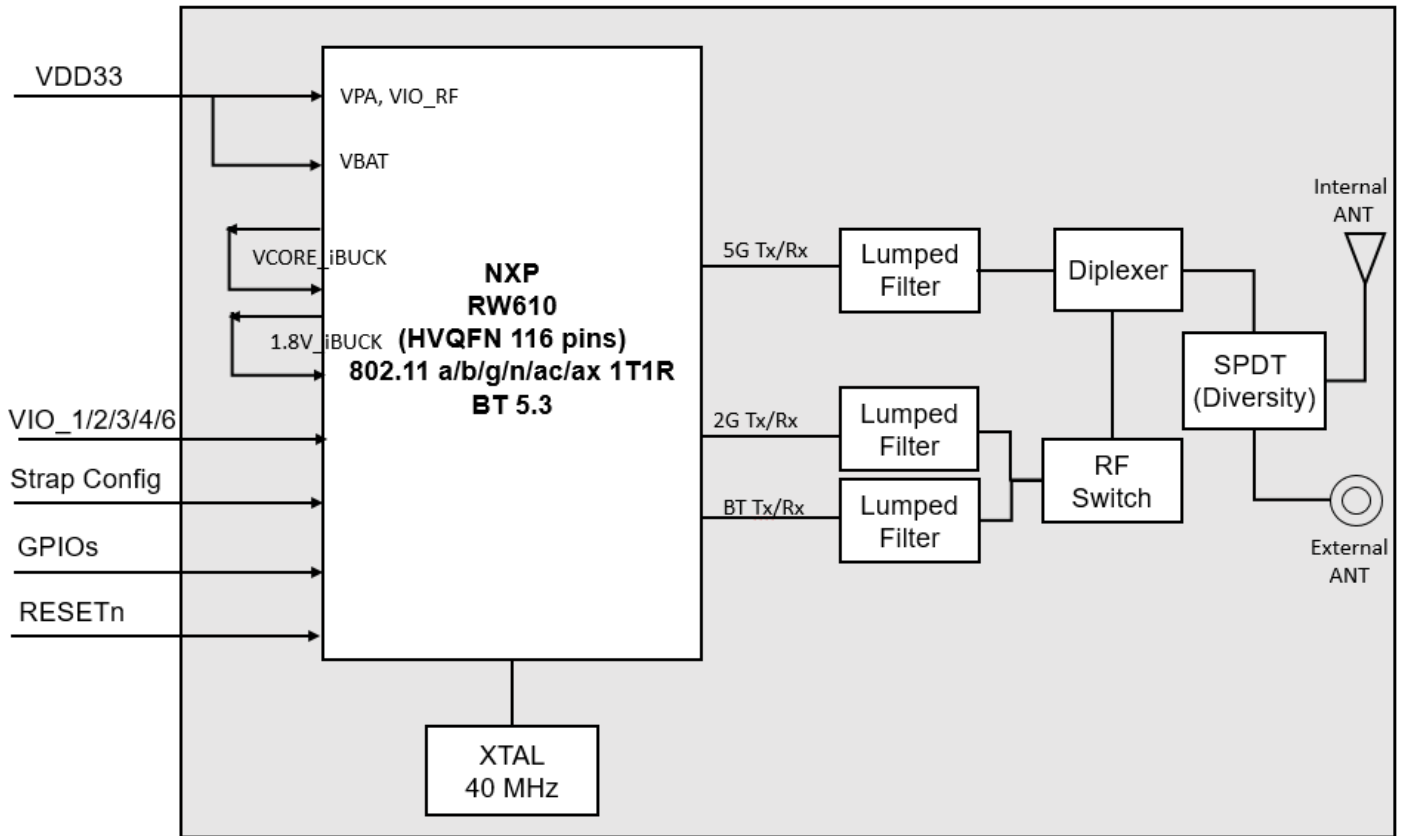
AzureWave **AW-CU598** is a highly integrated, low-power tri-radio Wireless RW610 MCU with an integrated MCU and Wi-Fi 6 + Bluetooth Low Energy (LE) 5.3 radios designed for a broad array of applications. Applications include connected smart home devices, enterprise and industrial automation, smart accessories, and smart energy.

AW-CU598 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-CU598 includes a full-featured 1x1 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 Bluetooth LE radio supports 2 Mbit/s high-speed data rate, long range and extended advertising as well as LE Audio for a better overall audio experience. In addition, **AW-CU598** can support Matter over Wi-Fi or Matter over Thread offering a common, interoperable application layer across ecosystems and products.

The advanced design of the **AW-CU598** 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



AW-CU598 Block Diagram

1.3 Specifications Table

1.3.1 General

Features	Description
Product Description	IEEE 802.11 a/b/g/n/ac/ax Wi-Fi 6 with Bluetooth 5.3 Module
Major Chipset	NXP RW610 HVQFN(116 pins)
Host Interface	UART/JTAG
Dimension	28 mm x 15 mm x 3.15 mm(Max)
Package	LGA module, 88 pins
Antenna	u.FL Connector Receptacle ANT1 : Wi-Fi / BT → TX/RX(diversity) Printed antenna ANT2 : Wi-Fi / BT → TX/RX(diversity)
Weight	1.8 g

1.3.2 WLAN

Features	Description
WLAN Standard	IEEE 802.11 a/b/g/n/ac/ax 1T1R
WLAN VID/PID	NA
WLAN SVID/SPID	NA
Frequency Range	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
Modulation	DSSS, OFDM, DBPSK, DQPSK, CCK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM, OFDMA
Number of Channels	2.4GHz: <ul style="list-style-type: none"> ■ USA, NORTH AMERICA, Canada and Taiwan - 1 ~ 11 ■ China, Australia, Most European Countries - 1 ~ 13 ■ Japan - 1 ~ 13 5GHz: <ul style="list-style-type: none"> ■ USA, Canada, Most European Countries - 36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 149, 153, 157, 161, 165

	<ul style="list-style-type: none"> ■ 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 																									
Output Power (Board Level Limit)*	2.4G																									
	<table border="1"> <thead> <tr> <th></th> <th>Min</th> <th>Typ</th> <th>Max</th> <th>Unit</th> </tr> </thead> <tbody> <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> </tbody> </table>		Min	Typ	Max	Unit	11b (11Mbps) @EVM<35%	16	18	20	dBm	11g (54Mbps) @EVM≤-25 dB	14.5	16	17.5	dBm	11n (HT20 MCS7) @EVM≤-27 dB	13.5	15	16.5	dBm	11ax(HE20 MCS9) @EVM≤-32 dB	12.5	14	15.5	dBm
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11ax(HE20 MCS9)	-	-65	-62	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	<ul style="list-style-type: none"> ■ Wi-Fi: WPA2/WPA3 personal and enterprise and AES/CCMP/CMAC/GCMP ■ BT: AES
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1.3.3 Bluetooth

Features	Description				
Bluetooth Standard	Full Bluetooth 5.3 features				
Frequency Range	2402MHz~2483.5MHz				
Modulation	GFSK				
Output Power		Min	Typ	Max	Unit
	Low Energy	0	2	4	dBm
Receiver Sensitivity	BT Sensitivity (PER<30.8%)				
		Min	Typ	Max	Unit
	Low Energy	-	-95	-92	dBm

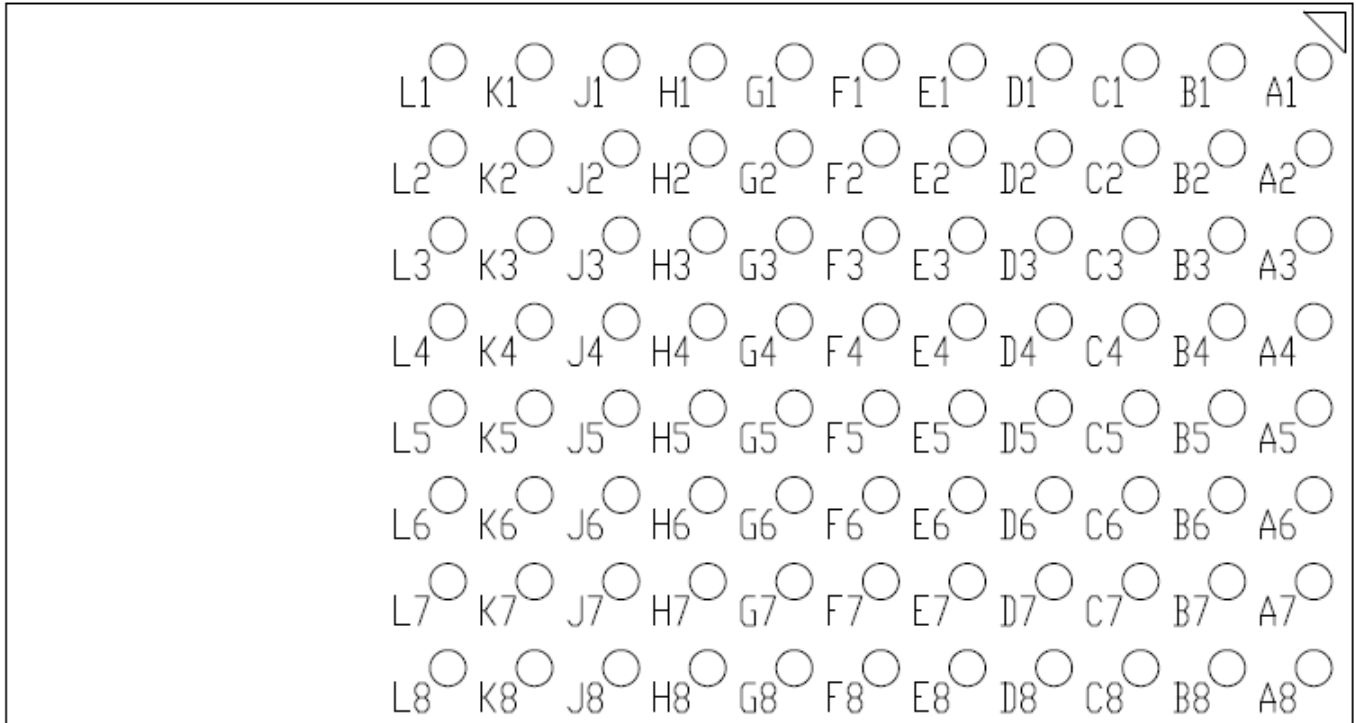
* If you have any certification questions about output power please contact FAE directly.

1.3.4 Operating Conditions

Features	Description
Operating Conditions	
Voltage	3.3V +-5%
Operating Temperature	-40°C ~ 85°C
Operating Humidity	Less than 85% R.H.
Storage Temperature	-40°C to +85°C
Storage Humidity	Less than 60% R.H.
ESD Protection	
Human Body Model	+2KV
Changed Device Model	+500V

2. Pin Definition

2.1 Pin Map



AW-CU598 Pin Map (Top View)

2.2 Pin Table

2.2.1 Power

Pin No	Definition	Basic Description	Voltage	Type
A7	3.3V_IN_1	3.3V Power input	3.3V	P
B7	3.3V_IN_2	3.3V Power input	3.3V	P
K1	VIO_1	1.8V/3.3V Digital I/O Power Supply	1.8V/3.3V	P
F1	VIO_2	1.8V/3.3V Digital I/O Power Supply	1.8V/3.3V	P
A2	VIO_3	1.8V/3.3V Digital I/O Power Supply	1.8V/3.3V	P
E1	VIO_4	1.8V/3.3V Digital I/O Power Supply	1.8V/3.3V	P
B8	VIO_6	1.8V/3.3V Digital I/O Power Supply	1.8V/3.3V	P

2.2.2 GPIO

Pin No	Definition	Basic Description	Voltage	Type
A3	GPIO_22	GPIO[22]/AON_XTAL32K_IN/SLP_CLK_32K/ SCT0_PIN_INP2/ENET_RX_DATA0	VIO_3	I/O
A5	USB_DM	USB bus data-	3.3V	I/O
A6	USB_DP	USB bus data+	3.3V	I/O
B1	GPIO_24	GPIO[24]/AON_WAKEUP/CT1_MAT2/CT_INP6/ ENET_TIMER2/FC3_RXD_SDA_MOSI_DATA_USA RT/I2C/I2S/SPI	VIO_3	I/O
B2	GPIO_26	GPIO[26]/AON_CAPT/SCT0_OUT4/SCT0_PIN_INP 4/ENET_TIMER3/FC3_TXD_SCL_MISO_WS_USA RT/I2C/I2S/SPI	VIO_3	I/O
B3	GPIO_23	GPIO[23]/AON_XTAL32K_OUT/SCT0_PIN_INP3/E NET_RX_DATA1	VIO_3	I/O
B4	GPIO_25	GPIO[25]/AON_WAKEUP/CT1_MAT3/ CT_INP7/ ENET_CLK/FC3_SCK_USART/I2S/SPI	VIO_3	I/O
B5	USB_VBUS	VBUS selection, 5 V analog power supply	---	I/O
B6	USB_IDPIN	USB OTG ID pin	3.3V	I
C1	GPIO_28	QSPI flash slave select 0	VIO_4	I/O
C2	GPIO_31	Data bit 1 for QSPI flash	VIO_4	I/O
C3	GPIO_32	Data bit 2 for QSPI flash / SPIO0[0]	VIO_4	I/O
C4	GPIO_29	QSPI flash data strobe input/output	VIO_4	I/O
C5	GPIO_27	GPIO[27]/AON_OUT/SCT0_OUT5/SCT0_PIN_INP5 /ENET_TIMER0	VIO_3	I/O
C6	GPIO_4	GPIO[4]/Coexistence mode /SCT0_OUT1/SCT0_PIN_INP1/CLKIN_FRM_PD/ FC0_SCK_USART/I2S/SPI	VIO_6	I/O
C7	GPIO_3	GPIO[3]/SCT0_OUT0/SCT0_PIN_INP0/FC0_TXD_	VIO_6	I/O

		SCL_MISO_WS_USART/I2C/I2S/SPI		
C8	RESETn	Full Power-down (input) (active low) 0 = full power-down mode 1 = normal mode This pin has an internal pull high 51k ohm to 3.3V	3.3V	I
D1	GPIO_34	GPIO[34]/ QSPI_flash_CLK0/ SPIO0[2]	VIO_4	I/O
D2	GPIO_33	GPIO[33]/ QSPI_flash_D3/ SPIO0[1]	VIO_4	I/O
D3	GPIO_30	GPIO[30]/ QSPI_flash_D0	VIO_4	I/O
D7	GPIO_2	GPIO[2]/FC0_RXD_SDA_MOSI_DATA_USART/I2C/I2S/SPI	VIO_6	I/O
D8	GPIO_49	GPIO[49]/LCD_D4/LCD SPI interface chip select/ADC0_7/ADC1_7/ACOMP7/SPIO0[17]	VIO_6	I/O
E7	GPIO_48	GPIO[48]/LCD 8080 interface read control /LCD SPI interface clock/ADC0_6/ ADC1_6/ ACOMP6/ SPIO0[16]	VIO_6	I/O
E8	GPIO_47	GPIO[47]/LCD_D3 /LCD SPI interface data/ ADC0_5/ ACOMP5/ SPIO0[15]	VIO_6	I/O
F2	GPIO_13	GPIO[13]/ CT_INP3/CT0_MAT3/ SWCLK/ FC2_RXD_SDA_MOSI_DATA_USART/I2C/I2S/SPI	VIO_2	I/O
F7	GPIO_46	GPIO[46]/ LCD_D2/LCD SPI interface data in_out/ADC0_4/ ACOMP4/ SPIO0[14]	VIO_6	I/O
F8	GPIO_45	GPIO[45]/LCD tearing effect input signal used to synchronize MCU frame writing/ LCD tearing effect input signal used to synchronize MCU frame writing/ ADC0_3/ACOMP3/EXT_VREF_ADC0_DAC/ SPIO0[13]	VIO_6	I/O
G1	GPIO_15	GPIO[15]/SD_CLK/UTICK_CAP0/UCLK/FC2_SCK_USART/I2S/SPI	VIO_2	I/O
G2	GPIO_16	GPIO[16]/SD_D3/UTICK_CAP1/URST/FC2_CTS_SDA_SSELN0_USART/FC2_CTS_SDA_SSELN0_SPI/FC2_CTS_SDA_SSELN0_I2C_COPY	VIO_2	I/O
G7	GPIO_44	GPIO[44]/DAC_A/ADC0_2/ ACOMP2/output signal to reset the LCD device/SPIO0[12]	VIO_6	I/O
G8	GPIO_43	GPIO[43]/LCD_D1/ADC0_1/ACOMP1/DAC_B/SPIO0[11]	VIO_6	I/O
H1	GPIO_17	GPIO[17]/SDIO_CMD/UTICK_CAP2/UIO/FC2_RTS_SCL_SSELN1_USART/FC2_RTS_SCL_SSELN1_I2C_COPY	VIO_2	I/O
H2	GPIO_18	GPIO[18]/SDIO_DAT2/UTICK_CAP3/UVS/ GPIO_INT_BMAT	VIO_2	I/O
H7	GPIO_42	GPIO[42]/ ADC0_0/ACOMP0/LCD_D0/SPIO0[10]	VIO_6	I/O
H8	GPIO_50	GPIO[50]/FREQME_GPIO_CLK/ADC_DAC_TRIGGER/ SPIO0[18]	VIO_6	I/O
J1	GPIO_19	GPIO[19]/SDIO_DAT0/FC3_RTS_SCL_SSELN1_U	VIO_2	I/O

		SART/ FC3_RTS_SCL_SSELN1_I2C_COPY		
J2	GPIO_20	GPIO[20]/SDIO_DAT1/FC3_CTS_SDA_SSELN0_U SART/SPI/_I2C_COPY	VIO_2	I/O
J3	RF_CNTL1	RF_CNTL1	3.3V	O
J4	RF_CNTL2	RF_CNTL2	3.3V	O
J5	RF_CNTL3	RF_CNTL3	3.3V	O
J7	EXT_FREQ	External radio frequency input signal (optional) - muxed with WCI-2_SOUT signal of WCI-2 interface.	1.8V	I
J8	EXT_PRI	External radio input priority signal (optional) Priority of the request from the external radio.	1.8V	I
K2	GPIO_14	GPIO[14]/ CT_INP4/CT1_MAT0/ SWDIO/ FC2_TXD_SCL_MISO_WS_USART/I2C/I2S/SPI	VIO_2	I/O
K3	GPIO_7	GPIO[7]/ JTAG_TMS/ FC1_SCK_USART/I2S/SPI	VIO_1	I/O
K4	GPIO_8	GPIO[8]/ JTAG_TDI/ FC1_TXD_SCL_MISO_WS_USART/I2C/I2S/SPI	VIO_1	I/O
K5	GPIO_10	GPIO[10]/ JTAG_TRSTN/ FC1_RTS_SCL_SSELN1_USART	VIO_1	I/O
K7	EXT_GNT	External radio grant output signal	1.8V	O
K8	EXT_REQ	Request from external radio	1.8V	I
L2	GPIO_5	GPIO[5]/ MCLK/FC0_RTS_SCL_SSELN1_USART	VIO_1	I/O
L3	GPIO_6	GPIO[6]/ JTAG_TCK/ FC1_CTS_SDA_SSELN0_USART/SPI	VIO_1	I/O
L4	GPIO_9	GPIO[9]/ JTAG_TDO/ FC1_RXD_SDA_MOSI_DATA_USART/I2C/I2S/SPI	VIO_1	I/O
L5	GPIO_11	GPIO[11]/ SCT0_OUT8:	VIO_1	I/O
L7	GPIO_12	GPIO[12]/UTMI_DRV_VBUS/CT0_MAT2/CT_INP2/ SD_HOST_INT	3.3V	I/O

2.2.3 GND

Pin No	Definition	Basic Description	Voltage	Type
A1	GND_A1	Ground	---	---
A4	GND_A4	Ground	---	---
A8	GND_A8	Ground	---	---
D4	GND_D4	Ground	---	---
D5	GND_D5	Ground	---	---
D6	GND_D6	Ground	---	---
E2	GND_E2	Ground	---	---
E3	GND_E3	Ground	---	---
E4	GND_E4	Ground	---	---
E5	GND_E5	Ground	---	---
E6	GND_E6	Ground	---	---
F3	GND_F3	Ground	---	---
F4	GND_F4	Ground	---	---

F5	GND_F5	Ground	---	---
F6	GND_F6	Ground	---	---
G3	GND_G3	Ground	---	---
G4	GND_G4	Ground	---	---
G5	GND_G5	Ground	---	---
G6	GND_G6	Ground	---	---
H3	GND_H3	Ground	---	---
H4	GND_H4	Ground	---	---
H5	GND_H5	Ground	---	---
H6	GND_H6	Ground	---	---
J6	GND_J6	Ground	---	---
K6	GND_K6	Ground	---	---
L1	GND_L1	Ground	---	---
L6	GND_L6	Ground	---	---
L8	GND_L8	Ground	---	---

3. Electrical Characteristics

3.1 Absolute Maximum Ratings

Symbol	Parameter	Minimum	Typical	Maximum	Unit
V _{BAT}	DC supply for the 3.3V input	-	3.3	3.96	V
V _{IO}	1.8 V/3.3 V digital I/O power supply	-	1.8	2.16	V
			3.3	3.96	V

3.2 Recommended Operating Conditions

Symbol	Parameter	Minimum	Typical	Maximum	Unit
V _{BAT}	DC supply for the 3.3V input	3.14	3.3	3.46	V
V _{IO}	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

3.3 Digital IO Pin DC Characteristics

3.3.1 V_{IO} 1.8V Operation

Symbol	Parameter	Minimum	Typical	Maximum	Unit
V _{IO}	I/O pad supply voltage	1.71	1.8	1.89	V
V _{IH}	Input high voltage	0.7*V _{IO}	-	V _{IO} +0.4	V
V _{IL}	Input low voltage	-0.4	-	0.3*V _{IO}	
V _{HYS}	Input Hysteresis	100	-	-	mV

3.3.2 V_{IO} 3.3V Operation

Symbol	Parameter	Minimum	Typical	Maximum	Unit
V _{IO}	I/O pad supply voltage	3.14	3.3	3.46	V
V _{IH}	Input high voltage	0.7*V _{IO}	-	V _{IO} +0.4	V
V _{IL}	Input low voltage	-0.4	-	0.3*V _{IO}	
V _{HYS}	Input Hysteresis	100	-	-	mV

3.4 Power Consumption

Power Supply=3.3V				
MCU Status	WiFi Deep Sleep	WiFi STA Connected	WiFi IEEE Power Saving	WiFi Power Down
	200Mhz	200Mhz	200Mhz	200Mhz
PM0(Active)	TBD			
PM1(Idle)				
PM2(Standby)				
PM3(Sleep)				
PM4(Shutdown)				

Current Unit: mA

- (1) The MCU gets its clock from the WiFi subsection. When WiFi is powered down, the MCU is forced to run off of the internal RC32M clock. NXP does not recommend this and hence this mode is not supported. Customers can instead put the WiFi in Deep Sleep to save power.

- CURRENT consumption (MFG WLAN TX /RX)

Item				Power Supply=3.3V			
Band (GHz)	Mode	BW (MHz)	RF Power (dBm)	Transmit		Receive	
				Max.	Avg.	Max.	Avg.
2.4	11b@1M	20	17	TBD			
	11b@11M	20	17				
	11g@54M	20	14				
	11n@MCS7	20	13				

*Current Unit: mA

Note: DUT set Adjust Packet gap with Sifs. Ext: Enter option: 35 1 1

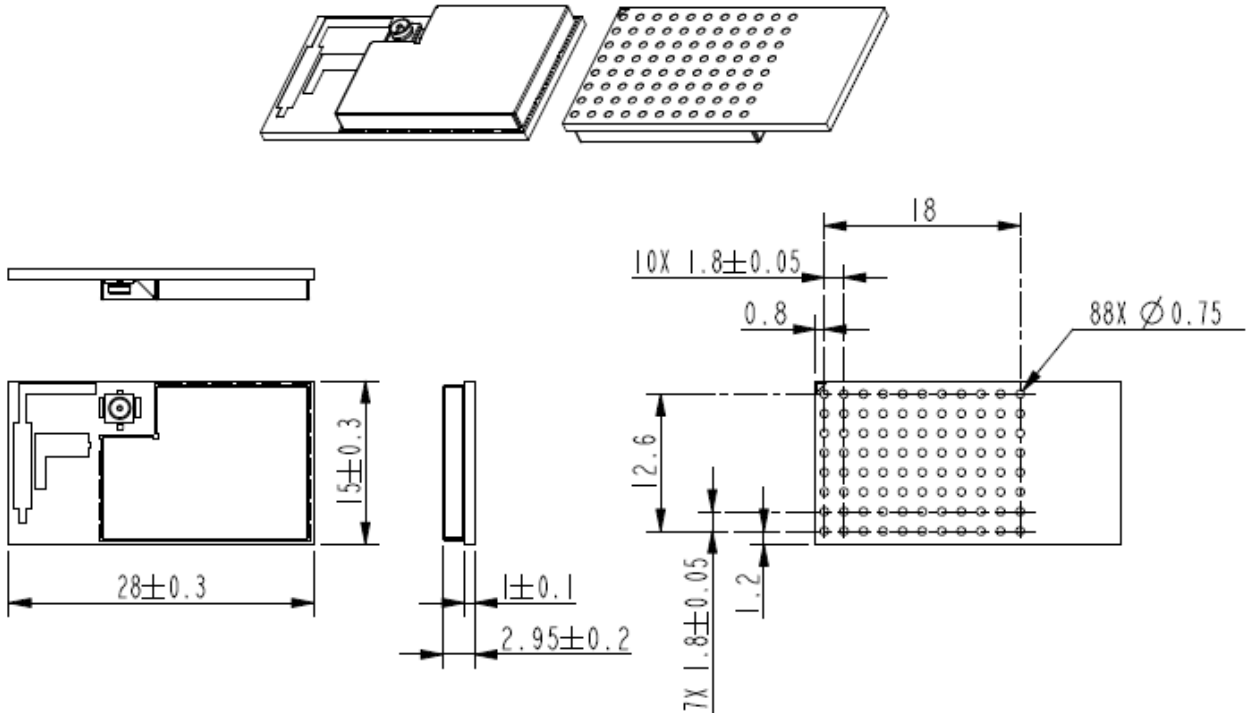
3.5 External 32.768KHZ Crystal Requirement

An external 32.768kHz crystal can be used for low-power consumption. Below are the specifications for this crystal.

Parameter	Min	Typ	Max	Unit
Output frequency	-	32.768	-	kHz
Frequency accuracy(Over process, voltage, temperature (PVT))	-	-	-22/-192	PPM
Temperature tolerance (From -40°C to 120°C)	-	0.0192	-	%
Start-up time(From power on to CLK_RDY without noise injection)	-	208	380	ms
Start-up time(From power on to CLK_RDY with noise injection)	-	15	170	ms
Duty cycle	46.7	47.4	49.77	%
Crystal ESR resistance		50	80	k Ω

4. Mechanical Information

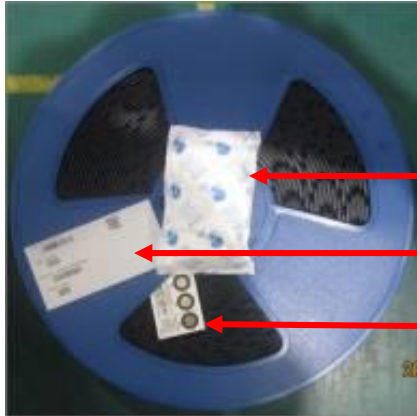
4.1 Mechanical Drawing



TOLERANCE UNLESS OTHERWISE SPECIFIED: ± 0.1 mm

5. Packing Information

1. One reel can pack 2,400pcs modules
2. One production label is pasted on the reel, one desiccant and one humidity indicator card are put on the reel



← One desiccant

← One production label

← One humidity indicator card

3. One reel is put into the anti-static moisture barrier bag, and then one label is pasted on the bag



← One production label

4. A bag is put into the anti-static pink bubble wrap



← One anti-static pink bubble wrap

5. A bubble wrap is put into the inner box and then one label is pasted on the inner box



One production label

6. 3 inner boxes could be put into one carton

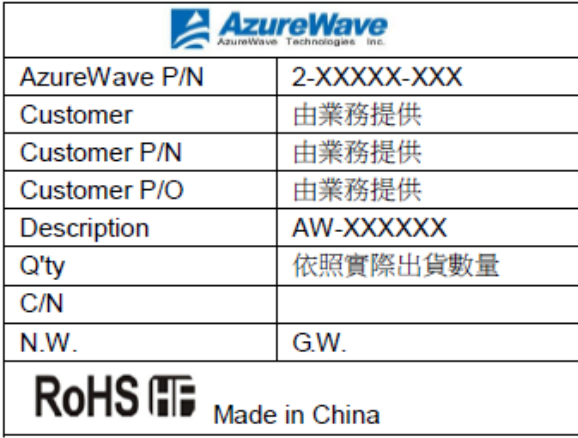



7. Sealing the carton by AzureWave tape



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



<p>Example of carton label</p>	 <p>The example shows the AzureWave logo at the top, followed by a table with fields: AzureWave P/N (2-XXXXX-XXX), Customer (由業務提供), Customer P/N (由業務提供), Customer P/O (由業務提供), Description (AW-XXXXXX), Q'ty (依照實際出貨數量), C/N, and N.W. (G.W.). Below the table is a RoHS logo and 'Made in China'.</p>
<p>Example of box label</p>	 <p>The example shows a barcode with 'BOX0275351' below it. To the right of the barcode, it displays '2-XXXXX-XXX', '數量: XXX', and 'XXXXXX 股份有限公司'.</p>

Example of production label	
Example of balance label	

Note:

- ◆ 1 reel = 1 inner box = 800pcs
- ◆ 1 carton = 3 inner boxes = 3 * 800pcs = 2,400pcs

Appendix