

# **AW-CM276NF**

## **IEEE 802.11a/b/g/n/ac Wireless LAN 2T2R and Bluetooth 5.3 Combo Module (M.2 1216)**

### **Datasheet**

**Rev. H**

**0B**

**(For Standard)**

## Features

### WiFi

- PCIe M.2 TYPE 1216: 16mm(L) x 12mm(W) x 1.85 mm(H)(Max), 130pins LGA package
- SDIO 3.0 or PCIe support for WLAN
- Sub-meter accuracy WiFi indoor locationing(802.11mc)
- Multiple power saving modes for low power consumption
- IEEE 802.11i for advanced security
- Quality of Service (QoS) support for multimedia applications
- Support China WAPI
- Lead-free design

### Bluetooth

- UART interfaces support for Bluetooth
- High speed UART,PCM interfaces
- Audio Codec interface support
- Bluetooth 5.3 compliant with Bluetooth 2.1 + Enhanced Data Rate (EDR)

## Revision History

Document NO: R2-2276NF-DST-01

Version	Revision Date	DCN NO.	Description	Initials	Approved
A	2019/10/23	DCN016172	● Initial Version(new format)	Renton Tao	NC Chen
B	2020/02/05	DCN016708	● Add configuration table for Host interface	Renton Tao	NC Chen
C	2020/06/16	DCN017530	● Remove watermark ● Correct typo	Renton Tao	NC Chen
D	2020/10/26	DCN018877	● Add BT SDIO support for host I/O	Renton Tao	NC Chen
E	2020/11/18	DCN019231	● Add WPA3 supported	Renton Tao	NC Chen
F	2021/04/08	DCN021289	● Add pin numbers description ● Change to new format ● Update chipset vendor to NXP	Renton Tao	NC Chen
G	2021/12/22	DCN025127	● Update to Bluetooth 5.3 supported	Renton Tao	NC Chen
H	2022/05/26	DCN026309	● Correct typo ● Correct supported frequency range	Renton Tao	NC Chen

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## 1. Introduction

### 1.1 Product Overview

**AzureWave Technologies, Inc.** introduces the IEEE 802.11ac/a/b/g/n 2X2 MU-MIMO WLAN & Bluetooth NGFF module --- **AW-CM276NF**. The module is targeted to mobile devices including **Notebook, TV, Tablet and Gaming Device** which need small package module, low power consumption, multiple interfaces and OS support. By using AW-CM276NF, the customers can easily enable the Wi-Fi, and BT embedded applications with the benefits of **high design flexibility, short development cycle, and quick time-to-market**.

Compliance with the IEEE 802.11ac/a/b/g/n standard supporting 802.11ac Wave 2, the AW-CM276NF uses Direct Sequence Spread Spectrum (**DSSS**), Orthogonal Frequency Division Multiplexing (**OFDM**), **DBPSK, DQPSK, CCK** and **QAM** baseband modulation technologies. A high level of integration and full implementation of the power management functions specified in the IEEE 802.11 standard minimize the system power requirements by using AW-CM276NF. In addition to the support of **WPA/WPA2/WPA3** and **WEP** 64-bit and 128-bit encryption, the AW-CM276NF also supports the **IEEE 802.11i** security standard through the implementation of **Advanced Encryption Standard (AES)/Counter Mode CBC-MAC Protocol (CCMP)**, Wired Equivalent Privacy (**WEP**) with Temporal Key Integrity Protocol (**TKIP**), Advanced Encryption Standard (**AES**)/Cipher-Based Message Authentication Code (**CMAC**), and WLAN Authentication and Privacy Infrastructure (**WAPI**) security mechanisms.

For the video, voice and multimedia applications the AW-CM276NF support **802.11e Quality of Service (QoS)**. The device also supports **802.11h Dynamic Frequency Selection (DFS)** for detecting radar pulses when operating in the 5GHz range.

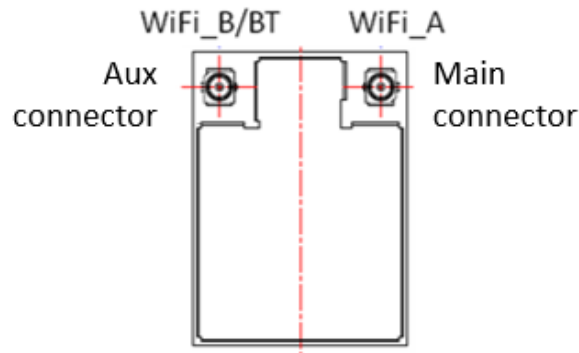
For Bluetooth operation, AW-CM276NF is **Bluetooth 5.3 (supports Low Energy)**.

**AW-CM276NF** supports **PCIE and SDIO3.0** for WLAN and high speed **UART interfaces** for Bluetooth to the host processor.

**AW-CM276NF** is suitable for multiple mobile processors for different applications with the support cellular phone co-existence.

**AW-CM276NF** module adopts NXP's latest highly-integrated dual-band WLAN & Bluetooth SoC--- **88W8997**. All the other components are implemented by all means to reach the mechanical specification required.

## 1.2. Module antenna configuration



**Module antenna configuration**

## 1.3 Specifications Table

### 1.3.1 General

Features	Description
<b>Product Description</b>	IEEE 802.11 2X2 WiFi 5 MIMO Wireless LAN + Bluetooth 5.3 Combo LGA Module
<b>Major Chipset</b>	NXP 88W8997
<b>Host Interface</b>	WiFi + BT <ul style="list-style-type: none"> <li>● PCIe2.0 + UART</li> <li>● SDIO3.0 + UART</li> </ul> (For Host configuration interface, please refer to section 2.3)
<b>Dimension</b>	12 mm X 16 mm x 1.85 mm(Max) (Tolerance remarked in mechanical drawing)
<b>Form factor</b>	M.2 1216 130pins LGA package
<b>Antenna</b>	I-PEX MHF4 Connector Receptacle (20449) Main : WiFi → TX/RX Aux : WiFi/Bluetooth → TX/RX
<b>Weight</b>	0.5 g

### 1.3.2 WLAN

Features	Description																																																							
WLAN Standard	IEEE 802.11 a/b/g/n/ac																																																							
WLAN VID/PID	1B4B/2B42																																																							
<b>WLAN SVID/SPID</b>	N/A																																																							
Frequency Range	2.4 GHz : 2.412 ~ 2.484 GHz 5 GHz : 5.18 ~5.825GHz																																																							
Modulation	DSSS, OFDM, DBPSK, DQPSK, CCK, 16-QAM, 64-QAM, 256-QAM																																																							
Number of Channels	<b>2.4GHz</b> <ul style="list-style-type: none"> <li>■ USA, NORTH AMERICA, Canada and Taiwan – 1 ~ 11</li> <li>■ China, Australia, Most European Countries, Japan – 1 ~ 13</li> </ul> <b>5GHz</b> <ul style="list-style-type: none"> <li>■ USA, EUROPE –36,40,44,48,52,56,60,64,100,104,108,112,116,120,124,128,132,136,140,149,153,157,161,165</li> </ul>																																																							
Output Power (Board Level Limit)*	<b>2.4GHz</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Min</th> <th>Typ</th> <th>Max</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>11b (11Mbps) @EVM&lt;35%</td> <td>15.5</td> <td>17</td> <td>18.5</td> <td>dBm</td> </tr> <tr> <td>11g (54Mbps) @EVM ≤ -27 dB</td> <td>14.5</td> <td>16</td> <td>17.5</td> <td>dBm</td> </tr> <tr> <td>11n (HT20 MCS7) @EVM ≤ -28 dB</td> <td>14.5</td> <td>16</td> <td>17.5</td> <td>dBm</td> </tr> <tr> <td>11n (HT40 MCS7) @EVM ≤ -28 dB</td> <td>12.5</td> <td>14</td> <td>15.5</td> <td>dBm</td> </tr> </tbody> </table> <b>5GHz</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Min</th> <th>Typ</th> <th>Max</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>11a (54Mbps) @EVM ≤ -27 dB</td> <td>11</td> <td>13</td> <td>15</td> <td>dBm</td> </tr> <tr> <td>11n (HT20 MCS7) @EVM ≤ -28 dB</td> <td>11</td> <td>13</td> <td>15</td> <td>dBm</td> </tr> <tr> <td>11n (HT40 MCS7) @EVM ≤ -28 dB</td> <td>10</td> <td>12</td> <td>14</td> <td>dBm</td> </tr> <tr> <td>11ac (VHT20 MCS8) @EVM ≤ -30 dB</td> <td>11</td> <td>13</td> <td>15</td> <td>dBm</td> </tr> <tr> <td>11ac (VHT40 MCS9) @EVM ≤ -32 dB</td> <td>10</td> <td>12</td> <td>14</td> <td>dBm</td> </tr> </tbody> </table>		Min	Typ	Max	Unit	11b (11Mbps) @EVM<35%	15.5	17	18.5	dBm	11g (54Mbps) @EVM ≤ -27 dB	14.5	16	17.5	dBm	11n (HT20 MCS7) @EVM ≤ -28 dB	14.5	16	17.5	dBm	11n (HT40 MCS7) @EVM ≤ -28 dB	12.5	14	15.5	dBm		Min	Typ	Max	Unit	11a (54Mbps) @EVM ≤ -27 dB	11	13	15	dBm	11n (HT20 MCS7) @EVM ≤ -28 dB	11	13	15	dBm	11n (HT40 MCS7) @EVM ≤ -28 dB	10	12	14	dBm	11ac (VHT20 MCS8) @EVM ≤ -30 dB	11	13	15	dBm	11ac (VHT40 MCS9) @EVM ≤ -32 dB	10	12	14	dBm
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11ac(VHT80 MCS9)		-60	-57	dBm																																			
Security	<ul style="list-style-type: none"> <li>■ 802.11b: 1, 2, 5.5, 11Mbps</li> <li>■ 802.11a/g: 6, 9, 12, 18, 24, 36, 48, 54Mbps</li> <li>■ 802.11n: up to 150Mbps-single</li> <li>■ 802.11n: up to 300Mbps-2x2 MIMO</li> <li>■ 802.11ac: up to 192.6Mbps (20MHz channel)</li> <li>■ 802.11ac: up to 400Mbps (40MHz channel)</li> <li>802.11ac: up to 866.7Mbps (80MHz channel)</li> </ul>																																						
	<ul style="list-style-type: none"> <li>■ WAPI</li> <li>■ WEP 64-bit and 128-bit encryption with H/W TKIP processing</li> <li>■ WPA/WPA2/WPA3 (Wi-Fi Protected Access)</li> </ul> AES-CCMP hardware implementation as part of 802.11i security standard																																						

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



### 1.3.3 Bluetooth

Features	Description				
<b>Bluetooth Standard</b>	Bluetooth 2.1 and 3.0+Enhanced Data Rate (EDR) + BT 5.3				
<b>Bluetooth VID/PID</b>	1286/204E				
<b>Frequency Range</b>	2402MHz~2480MHz				
<b>Modulation</b>	Header GFSK Payload 2M: $\pi/4$ -DQPSK Payload 3M: 8DPSK				
<b>Output Power</b>		Min	Typ	Max	Unit
	BDR	0	2	4	dBm
	EDR	0	2	4	dBm
	BLE	0	2	4	dBm
<b>Receiver Sensitivity</b>		Min	Typ	Max	Unit
	BDR		-83		dBm

### 1.3.4 Operating Conditions

Features	Description
<b>Operating Conditions</b>	
<b>Voltage</b>	3.3V±5%
<b>Operating Temperature</b>	-30 °C~ 85°C
<b>Operating Humidity</b>	less than 85% R.H.
<b>Storage Temperature</b>	-40 °C~ 125°C
<b>Storage Humidity</b>	less than 60% R.H.
<b>ESD Protection</b>	
<b>Human Body Model</b>	+2kV
<b>Charged Device Model</b>	+500V

## 2. Pin Definition

### 2.1. Pin map

	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77				
	GND(G1)	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND(G4)		
1	NC																					GND	76	
2	NC																						GND	75
3	NC																						GND	74
4	3.3V		GND(G5)			GND(G13)						GND(G21)				GND(G29)						VID	73	
5	3.3V																					3.3V	72	
6	GND																					GND	71	
7	NC		GND(G6)			GND(G14)						GND(G22)				GND(G30)						USB_DP	70	
8	CONFIG_HOST[0]																					USB_DM	69	
9	CONFIG_HOST[1]																					GND	68	
10	CONFIG_HOST[2]																					NC	67	
11	GPIO[17]UART_LTE_SOUT/TDO		GND(G7)			GND(G15)						GND(G23)				GND(G31)						GPIO[15]TMS/Host Wake WLAN	66	
12	GPIO[16]UART_LTE_SIN/TDI																					GPIO[3]BT_LED	65	
13	CONFIG_HOST[3]		GND(G8)			GND(G16)						GND(G24)				GND(G32)						GPIO[2]WLAN_LED	64	
14	NC																					GPIO[22]PCI_E_W_DISABLEn	63	
15	GPIO[1]																					GND	62	
16	NC																					GPIO[6]PCM_CLK	61	
17	GND		GND(G9)									GND(G25)				GND(G33)						GPIO[5]PCM_OUT	60	
18	GPIO[25]																					GPIO[4]PCM_IN	59	
19	NC																					GPIO[7]PCM_SYNC	58	
20	GND		GND(G10)									GND(G26)				GND(G34)						GPIO[11]UART_RTSn	57	
21	GPIO[26]																					GPIO[9]UART_SIN	56	
22	GPIO[27]																					GPIO[8]UART_SOUT	55	
23	GND		GND(G11)			GND(G19)						GND(G27)				GND(G35)						GPIO[10]UART_CTSn	54	
24	ATEST0																					GPIO[12]UARTHostWakeBT	53	
25	NC																					SD_CLK	52	
26	GND		GND(G12)			GND(G20)						GND(G28)				GND(G36)						SD_CMD	51	
27	SLP_CLK																					SD_DAT[0]	50	
28	GPIO[13]BT_IRQ[0]																					SD_DAT[1]	49	
	GND(G2)	PCI_E_WAKEn	PCI_E_CLKREQn	GPIO[21]/PCI_E_PERSTn	GND	PCI_E_RCLK_N	PCI_E_RCLK_P	GND	PCI_E_TX_N/USB3.0_TX_N	PCI_E_TX_P/USB3.0_TX_P	GND	PCI_E_RX_N/USB3.0_RX_N	PCI_E_RX_P/USB3.0_RX_P	GND	GPIO[0]/CLK_REQ	NC	VIO_SD	PDn	GPIO[14]/TCK/WLAN Wake Host	SD_DAT[3]	SD_DAT[2]	GND(G3)		
		29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48			

## 2.2. Pin Table

Pin No	Definition	Basic Description	Voltage	Type
1	NC	NC		
2	NC	NC		
3	NC	NC		
4	3.3V	3.3V Power Supply	3.3V	I
5	3.3V	3.3V Power Supply	3.3V	I
6	GND	System Ground Pin		GND
7	NC	NC		
8	CONFIG_HOST[0]	Configuration: CONFIG_HOST[0]		
9	CONFIG_HOST[1]	Configuration: CONFIG_HOST[1]		
10	CONFIG_HOST[2]	Configuration: CONFIG_HOST[2]		
11	GPIO[17] /UART_LTE_SOUT/TDO	GPIO[17] / UART_LTE_SOUT/TDO (output)	VIO	O
12	GPIO[16] /UART_LTE_SIN/TDI	GPIO[16] / UART_LTE_SIN/TDI (input)	VIO	I
13	CONFIG_HOST[3]	Configuration: CONFIG_HOST[3]		
14	NC	NC		
15	GPIO[1]	GPIO[1] (input/output)	VIO	I/O
16	NC	NC		I/O
17	GND	System Ground Pin		GND
18	GPIO[25]	GPIO[25] (input/output)	VIO	I/O
19	NC	NC		
20	GND	System Ground Pin		GND
21	GPIO[26]	GPIO[26] (input/output)	VIO	I/O
22	GPIO[27]	GPIO[27] (input/output)	VIO	I/O
23	GND	System Ground Pin		
24	ATEST0	NC, reserved for debug		I
25	NC	NC		I/O
26	GND	System Ground Pin		GND
27	SLP_CLK	Sleep Clock Input Used for WLAN and Bluetooth low-power modes. External sleep clock of 32.768 KHz must be used for auto reference clock calibration and for WLAN/Bluetooth low power operation.		I
28	GPIO[13]/BT IRQ(O)	GPIO[13]/ BT Wake Host(active low) (output)	VIO	O
29	PCIE_WAKEn	PCIe wake signal (input/output) (active low)	VIO	I/O
30	PCIE_CLKREQn	PCIe clock request (input/output) (active low)	VIO	I/O
31	GPIO[21]/PCIE_PERSTn	PCIe host indication to reset the device (input) (active low)	VIO	I
32	GND	System Ground Pin		GND
33	PCIE_RCLK_N	PCI Express Differential Clock Input—Negative	1.8V(internal)	I
34	PCIE_RCLK_P	PCI Express Differential Clock Input—Positive	1.8V(internal)	I
35	GND	System Ground Pin		GND
36	PCIE_TX_N/USB3.0_TX_N	PCI Express Transmit Data—Negative / USB 3.0 TX negative	1.8V(internal)	O
37	PCIE_TX_P/USB3.0_TX_P	PCI Express Transmit Data—Positive / USB 3.0 TX positive	1.8V(internal)	O
38	GND	System Ground Pin		GND
39	PCIE_RX_N/USB3.0_RX_N	PCI Express Receive Data—Negative / USB 3.0 RX negative	1.8V(internal)	I
40	PCIE_RX_P/USB3.0_RX_P	PCI Express Receive Data—Positive / USB 3.0 RX positive	1.8V(internal)	I
41	GND	System Ground Pin		GND
42	GPIO[0]/CLK_REQ	GPIO[0] (input/output)	VIO	O

43	NC	NC		
44	VIO_SD	1.8V/3.3V Digital I/O SDIO Power Supply	VIO_SD	I
45	PDn	Full Power Down (input) (active low)	3.3V	I
46	GPIO[14] /TCK/WLAN Wake Host	GPIO[14]/TCK/WLAN Wake Host(active low) (output)	VIO	O
47	SD_DAT[3]	SDIO Data line Bit[3]	VIO_SD	I/O
48	SD_DAT[2]	SDIO Data line Bit[2]	VIO_SD	I/O
49	SD_DAT[1]	SDIO Data line Bit[1]	VIO_SD	I/O
50	SD_DAT[0]	SDIO Data line Bit[0]	VIO_SD	I/O
51	SD_CMD	SDIO Command/response (input/output)	VIO_SD	I/O
52	SD_CLK	SDIO Clock input	VIO_SD	I
53	GPIO[12] / UART Host Wake BT	GPIO[12]/ UART Host Wake BT(active low) (input)	VIO	I
54	GPIO[10] / UART_CTSn	GPIO[10] / UART_CTSn (input)	VIO	I
55	GPIO[8] / UART_SOUT	GPIO[8] / UART_SOUT (output)	VIO	O
56	GPIO[9] / UART_SIN	GPIO[9] / UART_SIN (input)	VIO	I
57	GPIO[11] / UART_RTSn	GPIO[11] / UART_RTSn (output)	VIO	O
58	GPIO[7] / PCM_SYNC	GPIO[7] / PCM_SYNC (input/output)	VIO	I/O
59	GPIO[4] / PCM_IN	GPIO[4] / PCM_IN (input)	VIO	I
60	GPIO[5] / PCM_OUT	GPIO[5] / PCM_OUT (output)	VIO	O
61	GPIO[6] / PCM_CLK	GPIO[6] / PCM_CLK (input)	VIO	I
62	GND	System Ground Pin		GND
63	GPIO[22] / PCIE_W_DISABLEn	GPIO[22] / PCIE_W_DISABLEn (input)	VIO	I
64	GPIO[2] / WLAN_LED	LED_OUT_WLAN (output)	VIO	O
65	GPIO[3] / BT_LED	LED_OUT_BT (output)	VIO	O
66	GPIO[15] / TMS/ Host Wake WLAN	GPIO[15] / JTAG TMS/ Host Wake WLAN (input)	VIO	I
67	NC	NC		
68	GND	System Ground Pin		GND
69	USB_DM	USB Serial Differential Data Minus	3.3V	I/O
70	USB_DP	USB Serial Differential Data Plus	3.3V	I/O
71	GND	System Ground Pin		GND
72	3.3V	3.3V Power Supply	3.3V	I
73	VIO	Digital I/O Power Supply	VIO	I
74	GND	System Ground Pin		
75	GND	System Ground Pin		
76	GND	System Ground Pin		
77	GND	System Ground Pin		
78	GND	System Ground Pin		
79	GND	System Ground Pin		
80	GND	System Ground Pin		
81	GND	System Ground Pin		

82	GND	System Ground Pin		
83	GND	System Ground Pin		
84	GND	System Ground Pin		
85	GND	System Ground Pin		
86	GND	System Ground Pin		
87	GND	System Ground Pin		
88	GND	System Ground Pin		
89	GND	System Ground Pin		
90	GND	System Ground Pin		
91	GND	System Ground Pin		
92	GND	System Ground Pin		
93	GND	System Ground Pin		
94	GND	System Ground Pin		
95	GND	System Ground Pin		
96	GND	System Ground Pin		
G1-G36	GND	System Ground Pin		

**Notes:**

1. PCIE Impedance targets: Single-ended Z of 60 ohms +- 15% . Differential Impedance of ~100 ohm +- 20%.
2. USB Impedance targets: D+/D- are differential and should have 90ohms impedance.
3. \* Implement by different hardware version.

**Note: Interface supports and combinations as shown below:**

Scenario	WLAN	BT	Strap value, CON[2:0]
1	SDIO	UART	000
2	reserved	reserved	001
3	reserved	reserved	010
4	PCIe	UART	011
5	reserved	reserved	100
6	reserved	reserved	101
7	reserved	reserved	110
8	reserved	reserved	111

**\*Configuration pins:**

Pin No.	Configuration
10	CON[2]
9	CON[1]
8	CON[0]

### 3. Electrical Characteristics

#### 3.1 Absolute Maximum Ratings

Symbol	Parameter	Condition	Minimum	Typical	Maximum	Unit
Pin73/ VIO	Host I/O power supply	--	--	1.8	2.2	V
		--	--	2.5	3.0	
		--	--	3.3	4.0	
Pin44/ VIO_SD	SDIO power supply	--	--	1.8	2.2	
		--	--	3.3	4.0	
Pin4,5,72/ 3.3V	3.3V VBAT input	-	-	3.3	3.63	V
Tstorage	Storage Temperature	-	-40	-	125	°C

#### 3.2 Recommended Operating Conditions

Symbol	Parameter	Condition	Minimum	Typical	Maximum	Units
Pin73/ VIO	1.8V/2.5V/3.3V digital I/O power supply	--	1.62	1.8	1.98	V
		--	2.25	2.5	2.75	
		--	2.97	3.3	3.63	
Pin44/ VIO_SD	1.8V/3.3V digital I/O SDIO power supply	--	1.62	1.8	1.98	V
		--	2.97	3.3	3.63	
Pin4,5,72/ 3.3V	3.3V VBAT input	--	3.14	3.14	3.3	V
T <sub>A</sub>	Ambient operating temperature	--	-30		85	°C

### 3.3 Digital IO Pin DC Characteristics

#### 3.3.1 DC Electricals-1.8V Operation (VIO)

Symbol	Parameter	Minimum	Typical	Maximum	Unit
V <sub>IH</sub>	Input high voltage	0.7*V <sub>IO</sub>	-	V <sub>IO</sub> +0.4	V
V <sub>IL</sub>	Input low voltage	-0.4	-	0.3*V <sub>IO</sub>	
V <sub>OH</sub>	Output high voltage	V <sub>IO</sub> -0.4	-	-	
V <sub>OL</sub>	Output low voltage	-	-	0.4	
V <sub>HYS</sub>	Input Hysteresis	100			mV

#### 3.3.2 3.3V Operation (VIO)

Symbol	Parameter	Minimum	Typical	Maximum	Unit
V <sub>IH</sub>	Input high voltage	0.7*V <sub>IO</sub>	-	V <sub>IO</sub> +0.4	V
V <sub>IL</sub>	Input low voltage	-0.4	-	0.3*V <sub>IO</sub>	
V <sub>OH</sub>	Output High Voltage	V <sub>IO</sub> -0.4	-	-	
V <sub>OL</sub>	Output Low Voltage	-	-	0.4	
V <sub>HYS</sub>	Input Hysteresis	100			mV

#### 3.3.3 1.8V Operation (VIO\_SD)

Symbol	Parameter	Minimum	Typical	Maximum	Unit
V <sub>IH</sub>	Input high voltage	0.7*V <sub>IO_SD</sub>	-	V <sub>IO_SD</sub> +0.4	V
V <sub>IL</sub>	Input low voltage	-0.4	-	0.3*V <sub>IO_SD</sub>	
V <sub>OH</sub>	Output High Voltage	V <sub>IO_SD</sub> -0.4	-	-	
V <sub>OL</sub>	Output Low Voltage	-	-	0.4	
V <sub>HYS</sub>	Input Hysteresis	100			mV

#### 3.3.4 3.3V Operation (VIO\_SD)

Symbol	Parameter	Minimum	Typical	Maximum	Unit
V <sub>IH</sub>	Input high voltage	0.7*V <sub>IO_SD</sub>	-	V <sub>IO_SD</sub> +0.4	V
V <sub>IL</sub>	Input low voltage	-0.4	-	0.3* V <sub>IO_SD</sub>	
V <sub>OH</sub>	Output High Voltage	V <sub>IO_SD</sub> -0.4	-	-	
V <sub>OL</sub>	Output Low Voltage	-	-	0.4	
V <sub>HYS</sub>	Input Hysteresis	100			mV



## 3.4 Host Interface

### 3.4.1. SDIO Interface

The AW-CM276NF supports a SDIO device interface that conforms to the industry standard SDIO Full-Speed card specification and allows a host controller using the SDIO bus protocol to access the Wireless module device.

The AW-CM276NF acts as the device on the SDIO bus. The host unit can access registers of the SDIO interface directly and can access shared memory in the device through the use of BARs and a DMA engine.

The SDIO device interface main features include:

Supports SDIO 3.0 Standard

On-chip memory used for CIS

Supports SPI, 1-bit SDIO, and 4-bit SDIO transfer modes

Special interrupt register for information exchange

Allows card to interrupt host

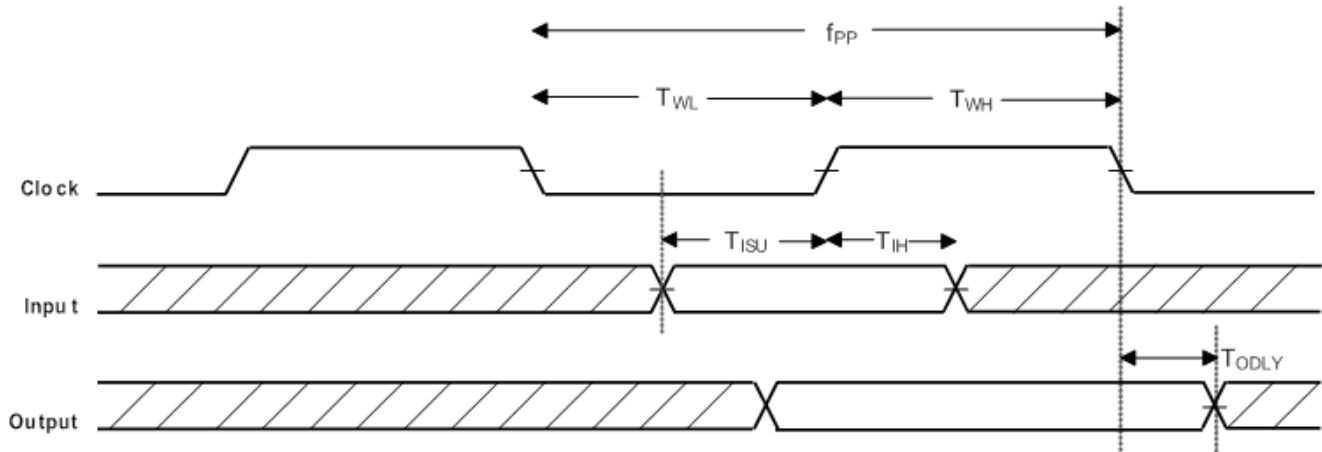
#### 3.4.1.1. SDIO Interface Signal Description

Pin Name	Signal Name	Type	Description
SD_CLK	CLK	I/O	SDIO 1-bit mode: Clock SDIO SPI mode: Clock
SD_CMD	CMD	I/O	SDIO 1-bit mode: Command line SDIO SPI mode: Data input
SD_DAT[3]	DAT3	I/O	SDIO 4-bit mode: Data line bit [3] SDIO 1-bit mode: Not used SDIO SPI mode: Chip select (active low)
SD_DAT[2]	DAT2	I/O	SDIO 4-bit mode: Data line bit [2] or Read Wait (optional) SDIO 1-bit mode: Read Wait (optional) SDIO SPI mode: Reserved
SD_DAT[1]	DAT1	I/O	SDIO 4-bit mode: Data line bit [1] SDIO 1-bit mode: Interrupt SDIO SPI mode: Interrupt

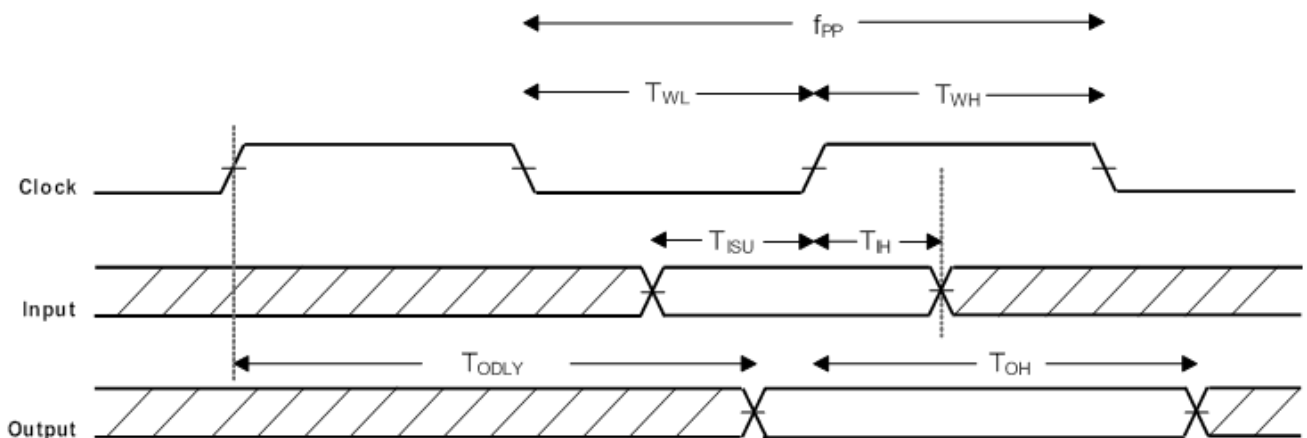
SD_DAT[0]	DAT0	I/O	SDIO 4-bit mode: Data line bit [0] SDIO 1-bit mode: Data line SDIO SPI mode: Data output
-----------	------	-----	--

### 3.4.1.2. Default Speed, High Speed Modes (3.3V)

#### SDIO Protocol Timing Diagram – Default Speed Mode (3.3V)



#### SDIO Protocol Timing Diagram – HighSpeed Mode (3.3V)



#### Table shows SDIO Timing Data—Default Speed, High Speed Modes (3.3V)

NOTE: Over full range of values specified in the Recommended Operating Conditions unless otherwise specified.

Symbol	Parameter	Condition	Min	Typ	Max	Units
f <sub>PP</sub>	Clock Frequency	Default Speed	0	--	25	MHz
		High Speed	0	--	50	MHz
T <sub>WL</sub>	Clock Low Time	Default Speed	10	--	--	ns
		High Speed	7	--	--	ns
T <sub>WH</sub>	Clock High Time	Default Speed	10	--	--	ns
		High Speed	7	--	--	ns
T <sub>ISU</sub>	Input Setup Time	Default Speed	5	--	--	ns
		High Speed	6	--	--	ns
T <sub>IH</sub>	Input Hold Time	Default Speed	5	--	--	ns
		High Speed	2	--	--	ns
T <sub>ODLY</sub>	Output Delay Time CL ≤ 40 pF (1 card)	Default Speed	--	--	14	ns
		High Speed	---	-1	4	ns
T <sub>OH</sub>	Output Hold Time	High Speed	2.5	--	--	ns

### 3.4.1.3. SDR12, SDR25, SDR50 Modes (up to 100MHz) (1.8V)

#### SDIO Protocol Timing Diagram – SDR12,SDR25,SDR50 Modes (up to 100MHz) (1.8V)

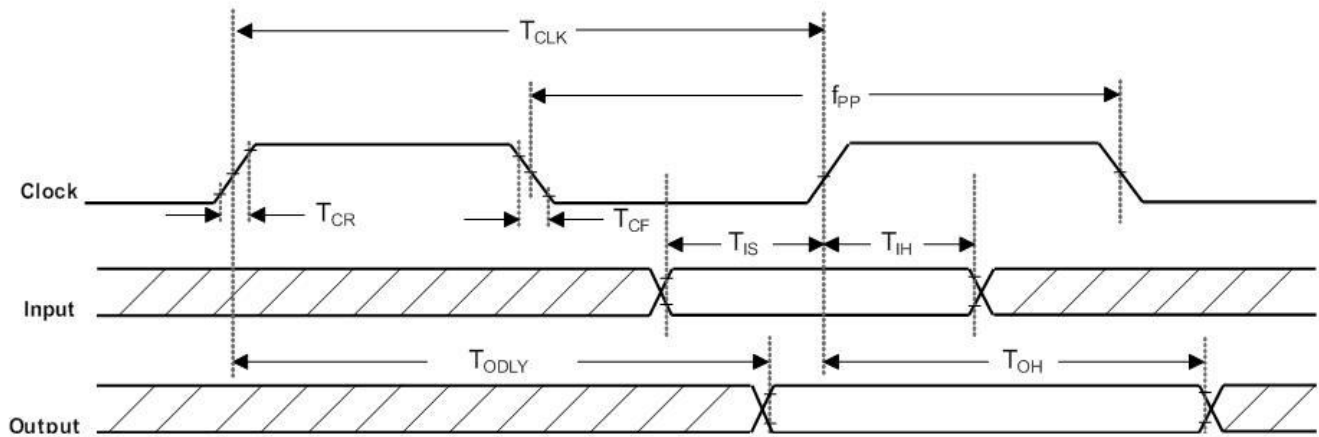


Table shows SDIO Timing Data—SDR12,SDR25,SDR50 Modes (up to 100MHz) (1.8V)

Symbol	Parameter	Condition	Min	Typ	Max	Units
$f_{PP}$	Clock frequency	SDR12/25/50	25	--	100	MHz
$T_{IS}$	Input setup time	SDR12/25/50	3	--	--	ns
$T_{IH}$	Input hold time	SDR12/25/50	0.8	--	--	ns
$T_{CLK}$	Clock time	SDR12/25/50	10	--	40	ns
$T_{CR}, T_{CF}$	Rise time, fall time $T_{CR}, T_{CF} < 2$ ns (max) at 100 MHz $C_{CARD} = 10$ pF	SDR12/25/50	--	--	$0.2 * T_{CLK}$	ns
$T_{ODLY}$	Output delay time $C_L \leq 30$ pF	SDR12/25/50	--	--	7.5	ns
$T_{OH}$	Output hold time $C_L = 15$ pF	SDR12/25/50	1.5	--	--	ns

### 3.4.1.4. SDR104 Modes (208MHz) (1.8V)

#### SDIO Protocol Timing Diagram –SDR104 Mode (208MHz)

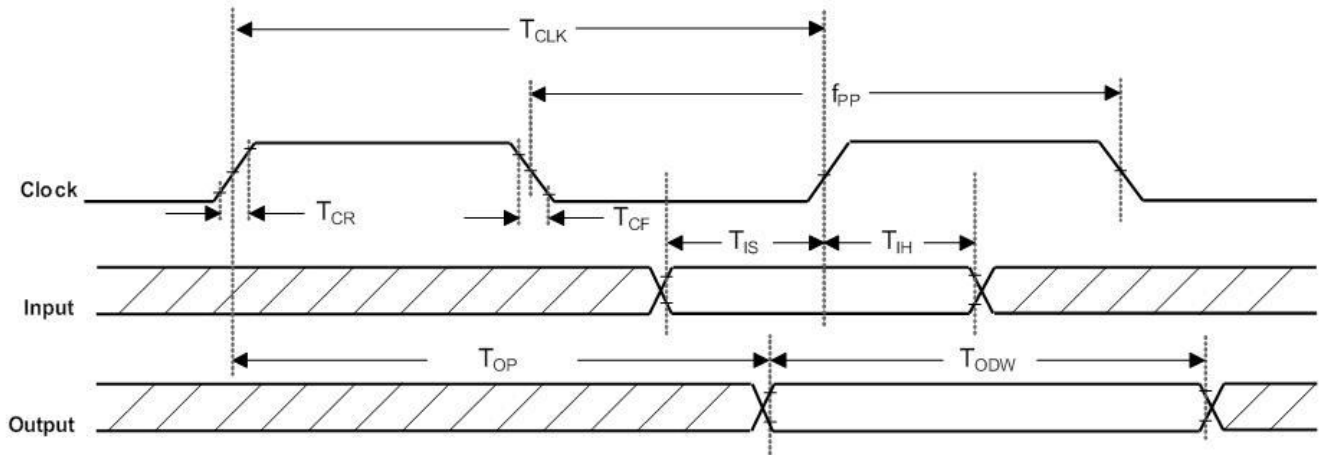


Table shows SDIO Timing Data—SDR104 Mode (208MHz)

Symbol	Parameter	Condition	Min	Typ	Max	Units
$f_{PP}$	Clock frequency	SDR104	0	--	208	MHz
$T_{IS}$	Input setup time	SDR104	1.4	--	--	ns
$T_{IH}$	Input hold time	SDR104	0.8	--	--	ns
$T_{CLK}$	Clock time	SDR104	4.8	--	--	ns
$T_{CR}, T_{CF}$	Rise time, fall time $T_{CR}, T_{CF} < 0.96$ ns (max) at 208 MHz $C_{CARD} = 10$ pF	SDR104	--	--	$0.2 * T_{CLK}$	ns
$T_{OP}$	Card output phase	SDR104	0	--	10	ns
$T_{ODW}$	Output timing of variable data window	SDR104	2.88	--	--	ns

### 3.4.2. PCI Express Interface

#### 3.4.2.1. Differential Tx Output Electricals

Symbol	Parameter	Min	Typ	Max	Units
UI	Unit interval Each UI is 400 ps $\pm$ 300 PPM. UI does not account for SSC dictated variations.	399.98	400	400.12	ps
$V_{Tx\_DIFFpp}$	Differential peak-to-peak output voltage $V_{Tx\_DIFFpp} = 2 *  V_{Tx\_D+} - V_{Tx\_D-} $	0.800	--	1.2	V
$V_{Tx\_DE\_RATIO}$	De-emphasized differential output voltage (ratio)	-3.0	-3.5	-4.0	db
$T_{Rx\_EYE}$	Minimum Tx eye width	0.75	--	--	UI
$T_{Rx\_EYE\_MEDIAN\_MAX\_JIT}$	Maximum time between jitter median and maximum deviation from median	--	--	0.125	UI
$T_{Tx\_RISE}$ , $T_{Tx\_FALL}$	D+/D- Tx output rise/fall time	0.125	--	--	UI
$V_{Tx\_CM\_DC\_ACTIVE\_IDLE\_DELTA}$	Absolute delta of DC common mode voltage during L0 and electrical idle	0-	-	100	mV
$V_{Tx\_CM\_DC\_LINE\_DELTA}$	Absolute delta of DC common mode voltage between D+ and D-	0-	-	25	mV
$V_{Tx\_IDLE\_DIFFp}$	Electrical idle differential peak output voltage	0	--	20	mV
$V_{Tx\_RCV\_DETECT}$	Voltage change allowed during receiver detection	--	--	600	mV
$V_{Tx\_DC\_CM}$	Tx DC common mode voltage	--	--	3.6	V
$I_{Tx\_SHORT}$	Tx short circuit current limit	--	--	90	mA
$T_{Tx\_IDLE\_MIN}$	Minimum time spent in electrical idle	50	--	--	UI
$T_{Tx\_IDLE\_SET\_TO\_IDLE}$	Maximum time to transition to a valid electrical idle after sending an electrical idle ordered set	--	--	20	UI
$T_{Tx\_IDLE\_TO\_DIFF\_DATA}$	Maximum time to transition to valid Tx specifications after leaving an electrical idle condition	--	--	20	UI
$RL_{Tx\_DIFF}$	Differential return loss	10	--	--	dB
$RL_{Tx\_CM}$	Common mode return loss	6	--	--	dB
$C_{Tx}$	AC coupling capacitor	75	--	200	nF
$T_{Crosstalk}$	Crosstalk random timeout	0	--	1	ms

### 3.4.2.2. Differential Rx Output Electricals

Symbol	Parameter	Min	Typ	Max	Units
UI	Unit interval Each UI is 400 ps $\pm$ 300 ppm. UI does not account for SSC dictated variations.	399.98	400	400.12	ps
V <sub>Rx_DIFFpp</sub>	Differential peak-to-peak voltage $V_{Rx\_DIFFpp} = 2 *  V_{Rx-D+} - V_{Rx-D-} $	0.175	--	1.2	V
T <sub>Rx_EYE</sub>	Minimum receiver eye width	0.4	--	--	UI
T <sub>Rx_EYE_MEDIAN_MAX_JIT</sub>	Maximum time between jitter median and maximum deviation from median	--	--	0.3	UI
V <sub>Rx_CM_ACp</sub>	AC peak common mode input voltage	--	--	150	mV
RL <sub>Rx_DIFF</sub>	Differential return loss	10	--	--	dB
RL <sub>Rx_CM</sub>	Common mode return loss	6	--	--	dB
Z <sub>Rx_DIFF_DC</sub>	DC differential input impedance	80	100	120	$\Omega$
Z <sub>Rx_DC</sub>	DC input impedance	40	50	60	$\Omega$
Z <sub>Rx_HIGH_IMP_DC_POS</sub>	Powered down DC input impedance positive	50	--	--	k
Z <sub>Rx_HIGH_IMP_DC_NEG</sub>	Powered down DC input impedance negative	1	--	--	k $\Omega$
V <sub>Rx_IDLE_DET_DIFFpp</sub>	Electrical idle detect threshold	65	--	175	mV
T <sub>Rx_IDLE_DET_DIFF_ENTERTIME</sub>	Unexpected electrical idle enter detect threshold integration time	--	--	10	ms
L <sub>Rx_SKEW</sub>	Total skew	---	-2	0	ns

### 3.4.3. USB Interface

The USB device interface is compliant with the Universal Serial Bus Specification, Revision 2.0, April 27, 2000. A USB host uses the USB cable bus and the USB 2.0 device interface to communicate with the chip.

The main features of the USB device interface include:

High/full speed operation (480/12 Mbps)

Suspend/host resume/device resume (remote wake-up)

Built-in DMA engine that reduces interrupt loads on the embedded processor and reduces the system bus bandwidth requirement for serving the USB device operation

The USB 2.0 device interface is designed with 3.3V signal level pads.

### 3.4.3.1. USB 2.0 Device Interface Description

Table shows the signal mapping between the AW-CM276NF and the USB Specification, Revision 2.0.

Pin Name	USB 2.0 Specification Pin Name	Description
Pin72/ 3V3_USB	VBUS	USB Bus Power Supply On-board regulator regulates voltage from VBUS level to voltage levels used by USB PHY.
	GND	USB Bus Ground Common ground on SoC device.
Pin70/ USB_DP	D+	USB Bus Data Positive. One of the differential data pair.
Pin69/ USB_DN	D-	USB Bus Data Negative. One of the differential data pair.

### 3.4.3.2. USB 2.0 Device Functional Description

The device controller uses internal Scatter/Gather DMA engine to transfer the transmit packet from internal SRAM to USB and the receive packet from USB to internal SRAM. The Device IN Endpoint DMA (DIEPDMA<sub>n</sub>) and Device OUT Endpoint DMA (DOEPDMA<sub>n</sub>) registers are used by the DMA engine to access the base descriptor. The application is interrupted after the programmed transfer size extracted from the descriptors is transmitted or received. By using registers, interrupts, and special data structures, the device controller can communicate with the device controller driver (application/software) about bus states, host request, and data transfer status. The device controller driver also has all of the routines to respond to the device framework commands issued by a USB host, so it controls the attachment, configuration, operation, and detachment of the device.

### 3.4.4. High-Speed UART Interface

The AW-CM276NF supports a high-speed Universal Asynchronous Receiver/Transmitter (UART) interface, compliant to the industry standard 16550 specification. High-speed baud rates are supported to provide the physical transport between the device and the host for exchanging Bluetooth data. Table shows the rates supported.

The UART interface features include:

- FIFO mode permanently selected for transmit and receive operations

- Two pins for transmit and receive operations



Two flow control pins

Interrupt triggers for low-power, high throughput operation

The UART interface operation includes:

Upload boot code to the internal CPU (for debug purposes)

Support diagnostic tests

Support data input/output operations for peripheral devices connected through a standard UART interface

#### UART Baud Rates Supported

Baud Rate				
1200	38400	460800	1500000	3000000
2400	57600	500000	1843200	3250000
4800	76800	921600	2000000	3692300
9600	115200	1000000	2100000	4000000
19200	230400	1382400	2764800	--

### 3.4.4.1. UART Interface Signal Description

Table shows the standard UART signal names on the device.

Signal Name	16550 Standard Pin Name	Description
<b>Data Bus</b>		
UART_SIN	SIN	Serial data input from modem, data set, or peripheral device
UART_SOUT	SOUT	Serial data output from modem, data set, or peripheral device
<b>Modem Control</b>		
UART_RTSN	RTS	Request To Send output to modem, data set, or peripheral device (active low)
UART_CTSN	CTS	Clear To Send input from modem, data set, or peripheral device (active low)

### 3.4.4.2. UART Interface Functional Description

#### 3.4.4.2.1. Booting from UART

When booting from the UART, the AW-CM276NF device has the following requirements:

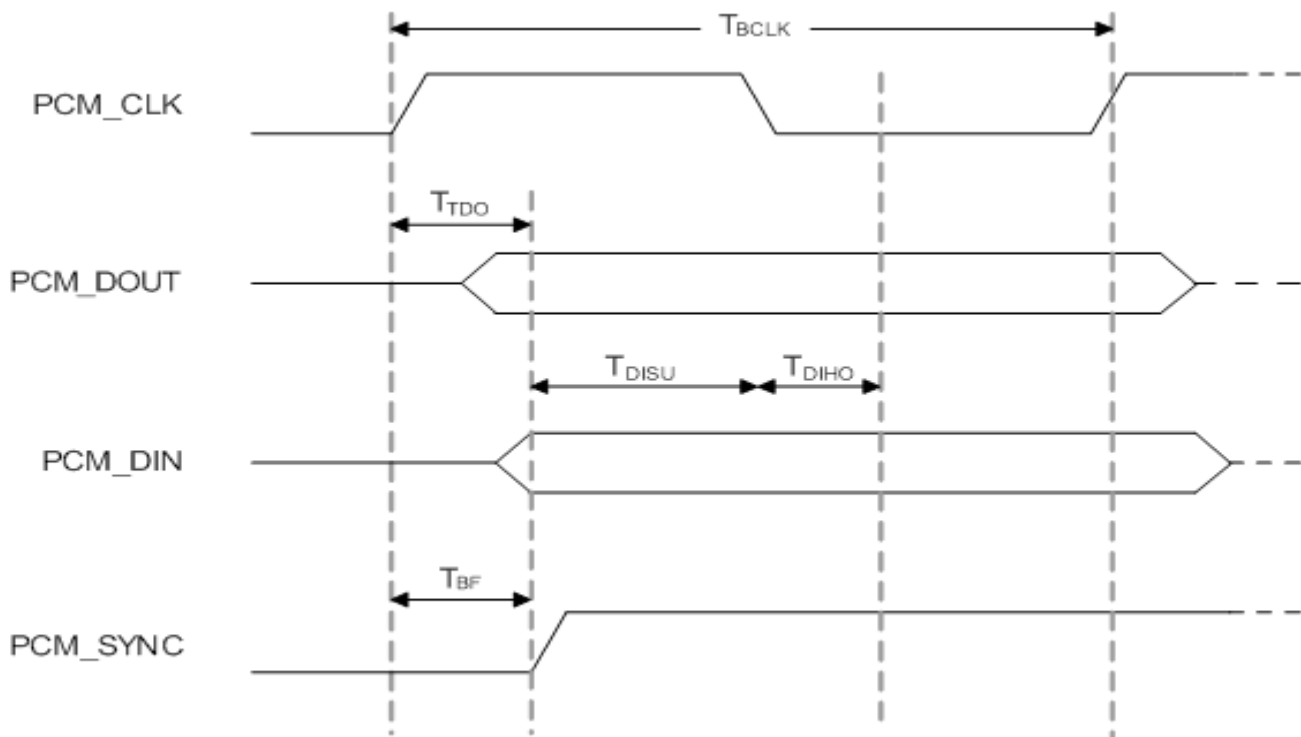
System Requirement	Description
Number of data bits	8 bits
Stop bits	1 bit
Parity	No parity
Baud Rate	115200

### 3.4.4.2.2. UART as Test Port

Test diagnostic programs may be uploaded to the CPU through the UART interface. During execution, the diagnostic program transmits performance and status information through the UART by performing a write to the PBU address space designated to the UART.

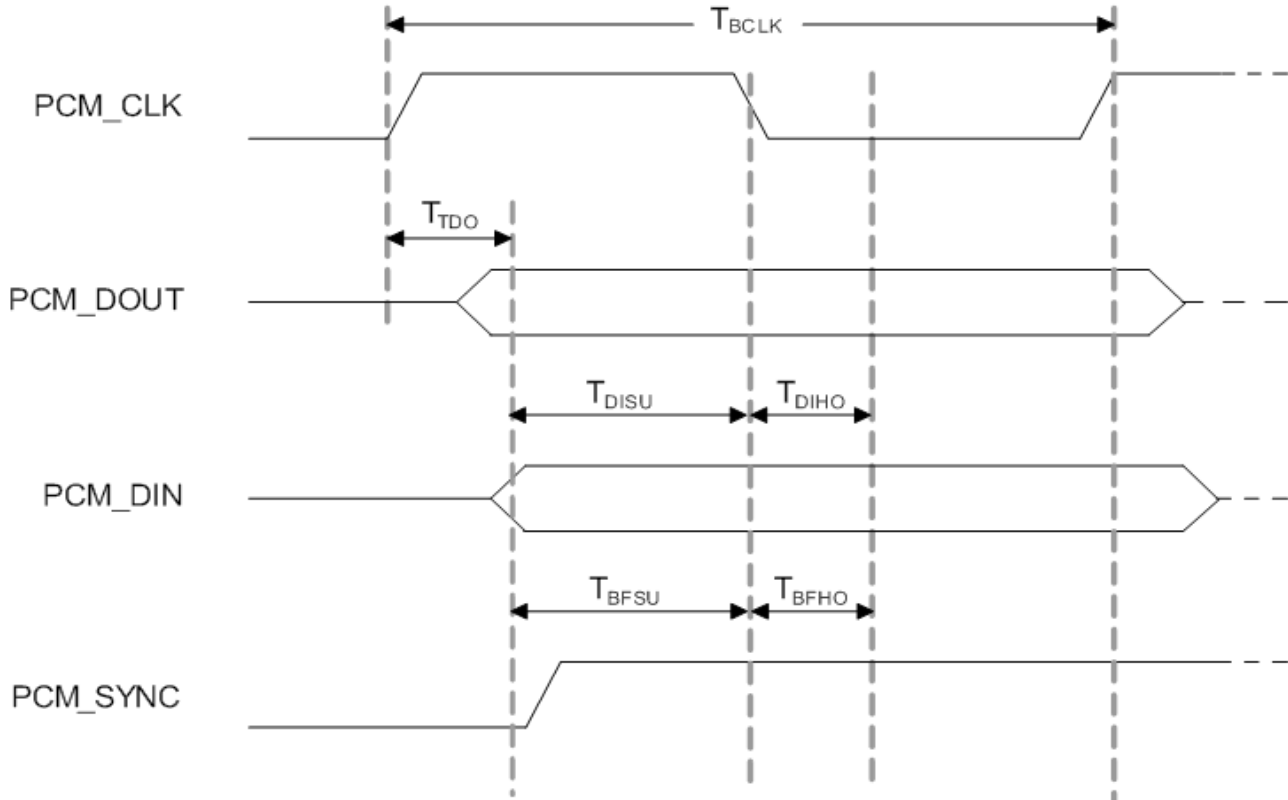
## 3.4.5. PCM Interface

### 3.4.5.1. PCM Timing Specification – Master Mode



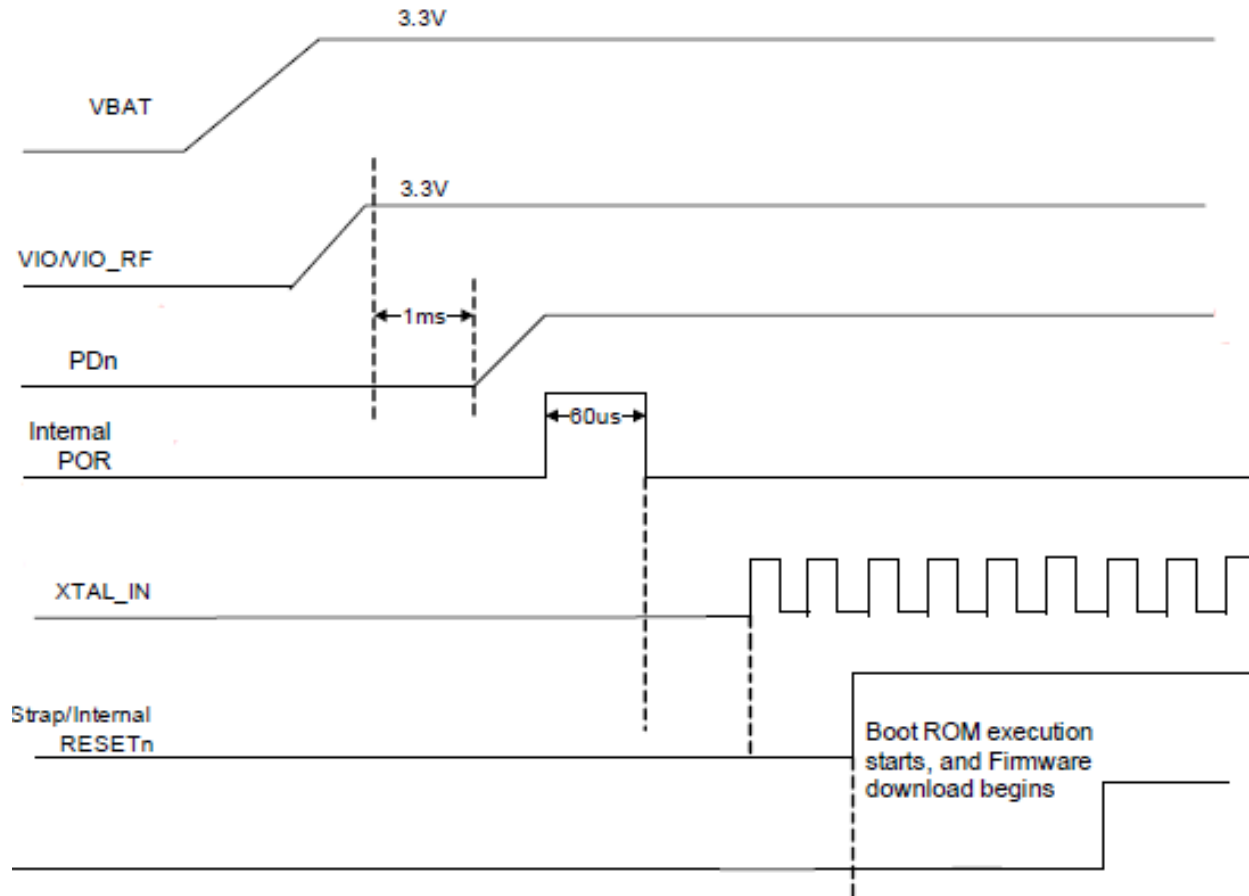
Symbol	Parameter	Condition	Min	Typ	Max	Units
$F_{BCLK}$	--	--	--	2/2.048	--	MHz
Duty Cycle $_{BCLK}$	--	--	0.4	0.5	0.6	--
$T_{BCLK\ rise/fall}$	--	--	--	3	--	ns
$T_{DO}$	--	--	--	--	15	ns
$T_{DISU}$	--	--	20	--	--	ns
$T_{DHO}$	--	--	15	--	--	ns
$T_{BF}$	--	--	--	--	15	ns

### 3.4.5.2. PCM Timing Specification – Slave Mode



Symbol	Parameter	Condition	Min	Typ	Max	Unit s
$F_{BCLK}$	--	--	--	2/2.048	--	MHz
Duty Cycle $_{BCLK}$	--	--	0.4	0.5	0.6	--
$T_{BCLK\ rise/fall}$	--	--	--	3	--	ns
$T_{DO}$	--	--	--	--	30	ns
$T_{DISU}$	--	--	15	--	--	ns
$T_{DIHO}$	--	--	10	--	--	ns
$T_{BFSU}$	--	--	15	--	--	ns
$T_{BFHO}$	--	--	10	--	--	ns

### 3.5. Power up Timing Sequence



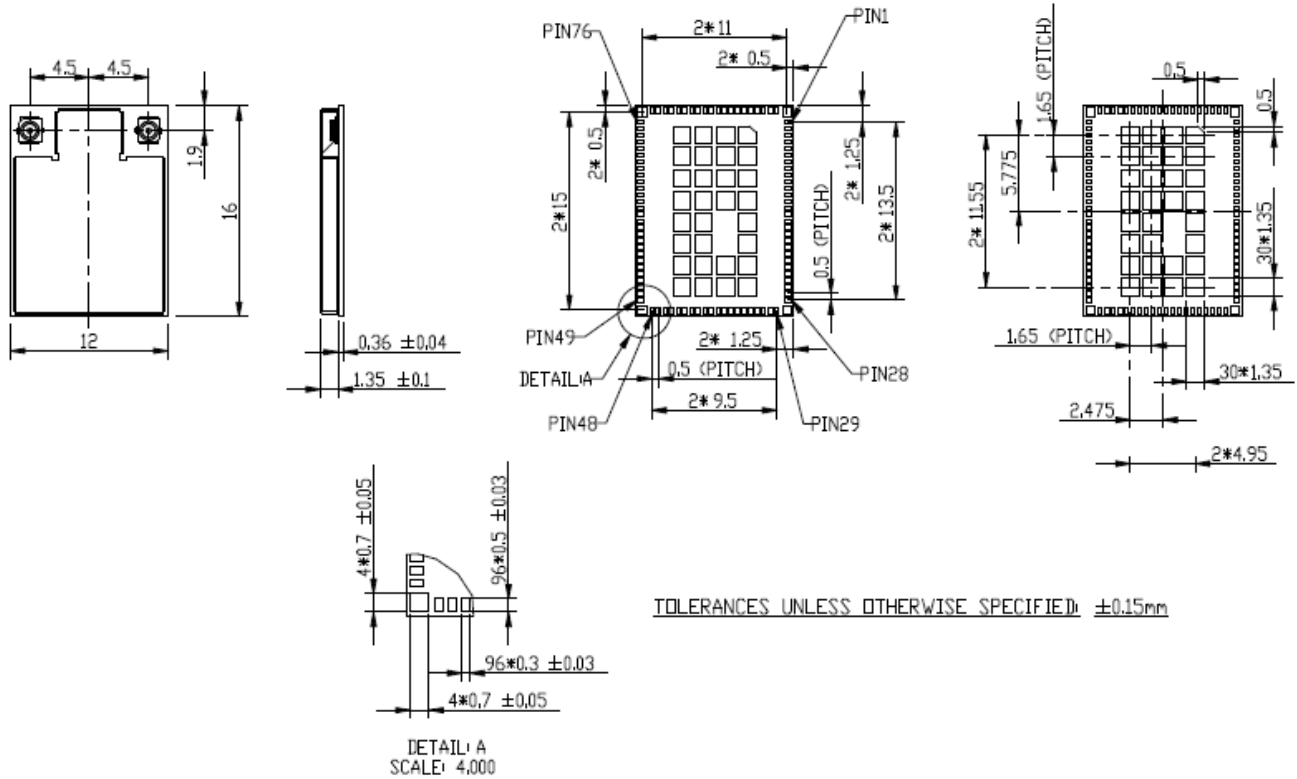
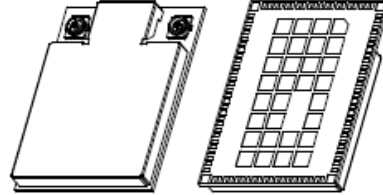
#### 3.5.1. Reset Configuration

The AW-CM276NF is reset to its default operating state under the following conditions:

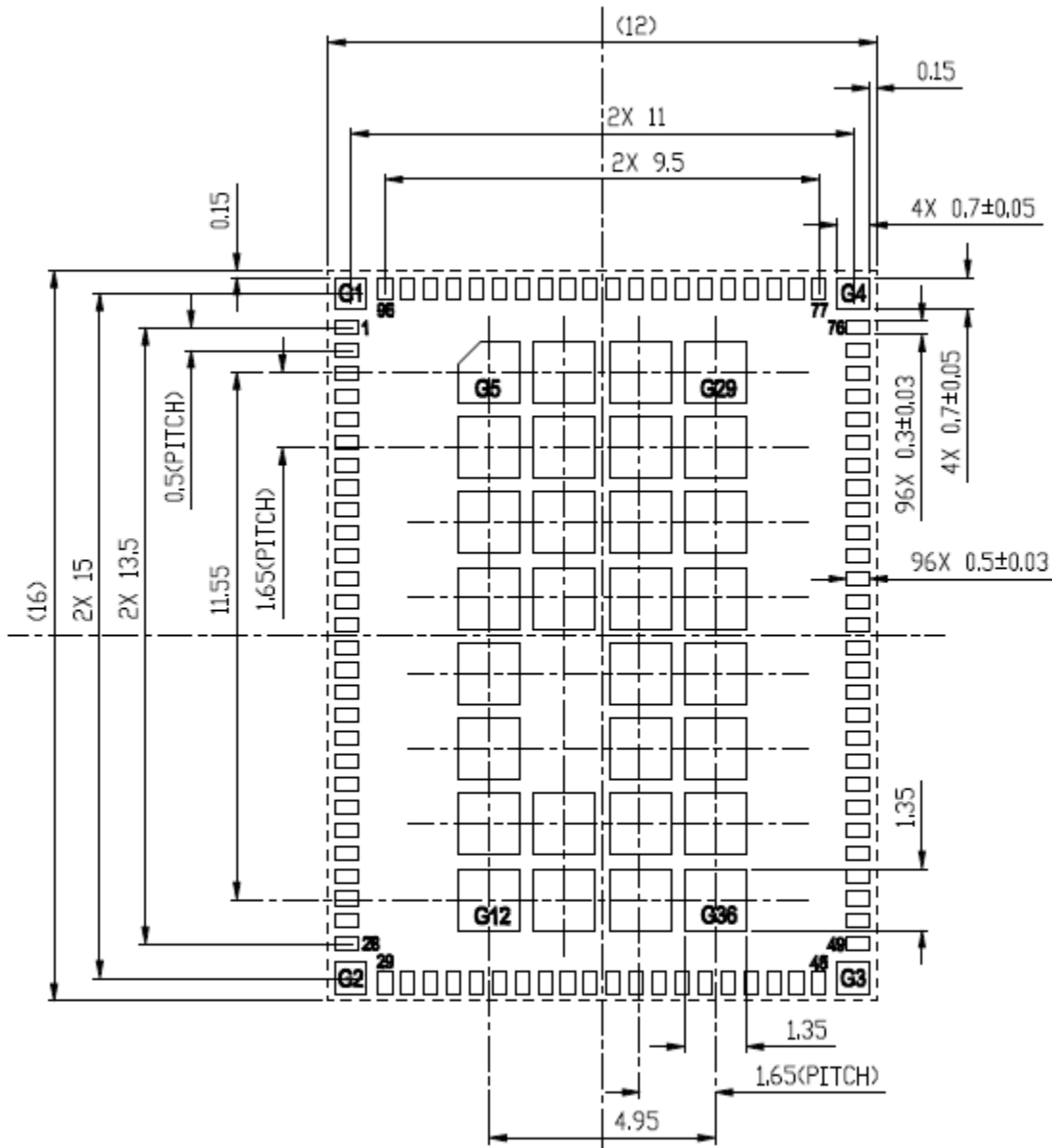
- Power-on reset (POR)
- Software/Firmware reset
- External pin for power down (PDn)

## 4. Mechanical Information

### 4.1 Mechanical Drawing

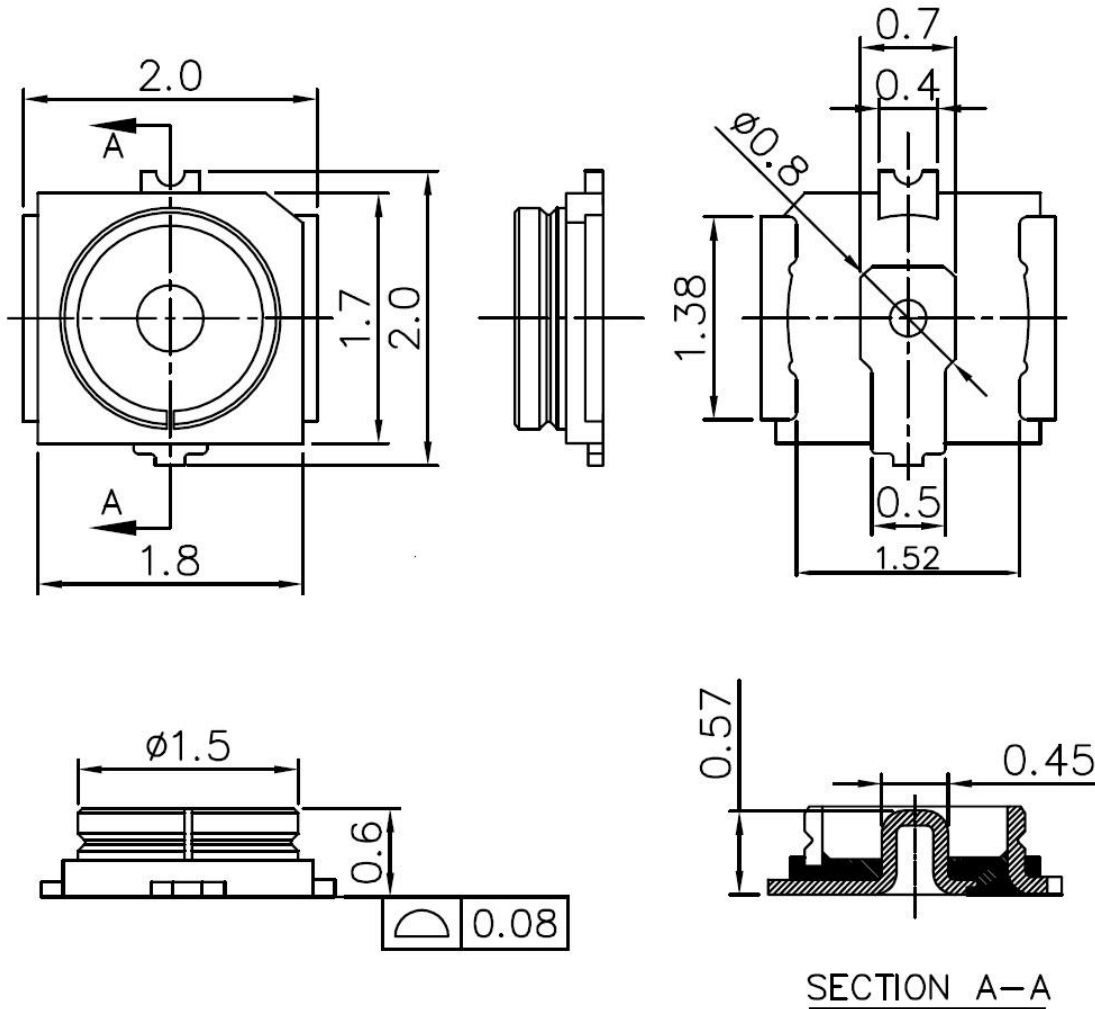


## 4.2. Pin out drawing



RECOMMENDED SOLDER PAD LAYOUT

### 4.3. Antenna connector drawing

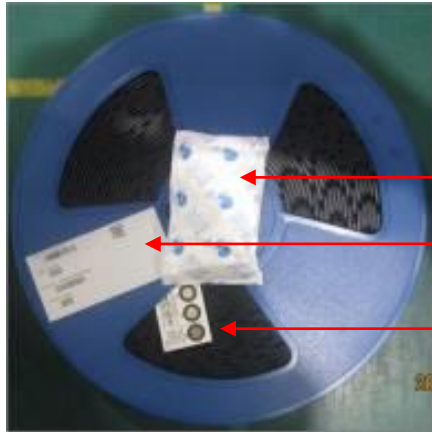


UNITS: mm



## 5. Packaging Information

### 5.1



1 UNIT DESICCANT

AFFIX PACKING LABEL

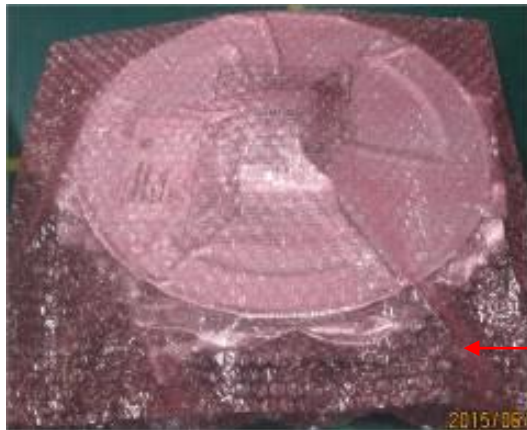
HUMIDITY INDICATOR CARD

### 5.2



AFFIX PACKING LABEL

### 5.3



PINK BUBBLE WRAP

**5.4**



AFFIX PACKING LABEL

**5.5**

1 Carton= 5 Boxes



**5.6**



**Note:** 1 tape reel = 1 box = 1,500pcs

**1 carton = 5 boxes = 5 \* 1,500pcs=7,500pcs**

### **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 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 transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

#### **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.

This module is intended for OEM integrators only. Per FCC KDB 996369 D03 OEM Manual v01 guidance, the following conditions must be strictly followed when using this certified module:

**KDB 996369 D03 OEM Manual v01 rule sections:**

**2.2 List of applicable FCC rules**

This module has been tested for compliance to FCC Part 15

**2.3 Summarize the 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) or being used in a portable condition will need a separate reassessment through a class II permissive change application or new certification.

**2.4 Limited module procedures**

Not applicable.

**2.5 Trace antenna designs**

Not applicable.

**2.6 RF exposure considerations**

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.

**2.7 Antennas**

The following antennas have been certified for use with this module; antennas of the same type with equal or lower gain may also be used with this module. The antenna must be installed such that 20 cm can be maintained between the antenna and users.

Original								
Antenna Set	Brand	Model	Chain No.	Antenna Net. Gain (dBi)	Frequency Range (MHz)	Antenna Type	Connector Type	Cable Length
1	MAG.LAYERS	MSA-4008-25GC1-A1	Chain 0(Aux)	2.98	2400~2500	PIFA	i-pex(MHF)	15cm
				5.16	4900~5900			
			Chain 1(Main)	2.98	2400~2500			
				5.16	4900~5900			
2	Bondale	G-RA0K10090176-1436B	Chain 0(Aux)	1.9	2400~2500	Dipole	RP-SMA	120mm
				3.6	4900~5800			
			Chain 1(Main)	1.9	2400~2500			
				3.6	4900~5800			
3	San Jose	UEN-201	Chain 0(Aux)	2.4	2400~2500	Dipole	RP-SMA	120mm
				4.4	4900~5800			
			Chain 1(Main)	2.4	2400~2500			
				4.4	4900~5800			

4	Unictron	H2B1PC1A1C175L	Chain 0(Aux)	1.6	2400-2500	PCB	I-pex	100±5mm
				4.8	5150~5850			
			Chain 1(Main)	1.6	2400-2500	PCB	I-pex	100±5mm
				4.8	5150~5850			
5	LSR	001-0012	Chain 0(Aux)	2	2400-2500	Dipole	RP-SMA	100mm
				2	5150~5850			
			Chain 1(Main)	2	2400-2500	Dipole	RP-SMA	100mm
				2	5150~5850			
6	Laird	MAF94051	Chain 0(Aux)	2.4	2400-2500	Dipole	RP-SMA	100mm
				3.4	5150~5850			
			Chain 1(Main)	2.4	2400-2500	Dipole	RP-SMA	100mm
				3.4	5150~5850			
7	Taoglas	GW.59.3153	Chain 0(Aux)	2.86	2400-2500	Dipole	RP-SMA	100mm
				4.74	5150~5850			
			Chain 1(Main)	2.86	2400-2500	Dipole	RP-SMA	100mm
				4.74	5150~5850			
8	Chang Hong	DA-2458-02-SMR	Chain 0(Aux)	2.85	2400-2500	Dipole	RP-SMA	100mm
				2.17	5150~5850			
			Chain 1(Main)	2.85	2400-2500	Dipole	RP-SMA	100mm
				3.13	5150~5850			
9	Unictron	H2B1PD1A1C385L	Chain 0(Aux)	2.8	2400-2500	PCB	I-pex	100mm
				4.2	5150~5850			
			Chain 1(Main)	2.8	2400-2500	PCB	I-pex	100mm
				4.2	5150~5850			
10	Molex	2042811100	Chain 0(Aux)	2.562	2400-2500	PCB	I-pex	100mm
				3.094	5150~5850			
			Chain 1(Main)	2.562	2400-2500	PCB	I-pex	100mm
				3.094	5150~5850			

Antenna Set	Brand	Model	Chain No.	Antenna Net. Gain (dBi)	Frequency Range (MHz)	Antenna Type	Connector Type	Cable Length
11	Molex	1461531100	Chain 0(Aux)	1.829	2400-2500	PCB	I-pex	100mm
				2.485	5150~5850			
			Chain 1(Main)	1.829	2400-2500	PCB	I-pex	100mm
				2.485	5150~5850			
12	MAG.LAYERS	MSA-4008-25GC1-A2	Chain 0(Aux)	2.98	2400-2500	PIFA	i-pex(MHF)	NA
				5.16	5150~5850			
			Chain 1(Main)	2.98	2400-2500	PIFA	i-pex(MHF)	NA
				5.16	5150~5850			
13	lynwave	5-PP005049	Chain 0(Aux)	2.7	2400-2500	PCB	IPEX 4L	30mm
				4.4	5150~5850			
			Chain 1(Main)	2.7	2400-2500	PCB	IPEX 4L	30mm
				4.5	5150~5850			
14	Unictron	PC-W09-01	Chain 0(Aux)	1.41	2400~2500	Dipole	ipex 4L	110 mm
				2.89	5150~5850			
		PC-W09-01	Chain 1(Main)	1.31	2400~2500	Dipole	ipex 4L	110 mm
				2.92	5150~5850			

Antenna Set	Brand	Model	Chain No.	Antenna Net. Gain (dBi)	Frequency Range (MHz)	Antenna Type	Connector Type	Cable Length
15	INPAQ	WA-M-LB-01-128	Chain 0(Aux)	2.68	2400-2500	PIFA	ipex(MHF)	145 mm
				4.19	5150-5850			
		WA-M-LB-02-262	Chain 1(Main)	2.44	2400-2500	PIFA	ipex(MHF)	
				4.08	5150-5850			
16	Nissei Limited	FML2.4W45A-160-MHF4L	Chain 0(Aux)	3.13	2400-2500	PCB	ipex(MHF)	160 mm
				4.94	5150~5850			
			Chain 1(Main)	3.13	2400-2500	PCB	ipex(MHF)	
				4.94	5150~5850			

### 2.8 Label and compliance information

The final end product must be labeled in a visible area with the following: “Contains FCC ID: TLZ-CM276NF”. The grantee's FCC ID can be used only when all FCC compliance requirements are met.

### 2.9 Information on test modes and additional testing requirements

This transmitter is tested in a standalone mobile RF exposure condition and any co-located or simultaneous transmission with other transmitter(s) or portable use will require a separate class II permissive change re-evaluation or new certification.

### 2.10 Additional testing, Part 15 Subpart B disclaimer

This transmitter module is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to the final host. The final host will still need to be reassessed for compliance to this portion of rule requirements if applicable.

As long as all conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

**IMPORTANT NOTE:** In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not 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 authorization.

### **Manual Information To the End User**

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.

**OEM/Host manufacturer responsibilities**

OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market. This includes reassessing the transmitter module for compliance with the Radio and EMF essential requirements of the FCC rules. This module must not be incorporated into any other device or system without retesting for compliance as multi-radio and combined equipment

**Industry Canada statement:**

This device complies with ISED's licence-exempt RSSs. 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.

Le présent appareil est conforme aux CNR d'ISED applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

**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.

**Déclaration d'exposition aux radiations:**

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé à plus de 20 cm entre le radiateur et votre corps.



**This device is intended only for OEM integrators under the following conditions: (For module device use)**

- 1) The antenna must be installed and operated with greater than 20cm between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as **2** conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

**Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif module)**

- 1) L'antenne doit être installé et exploité avec plus de 20 cm entre l'antenne et les utilisateurs, et

2) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les **2** conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

**IMPORTANT NOTE:**

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

**NOTE IMPORTANTE:**

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

**End Product Labeling**

This transmitter module is authorized only for use in device where the antenna may be installed and operated with greater than 20cm between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains IC: 6100A-CM276NF".

**Plaque signalétique du produit final**

Ce module émetteur est autorisé uniquement pour une utilisation dans un appareil où l'antenne peut être installée et utilisée à plus de 20 cm entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: **6100A-CM276NF**".

**Manual Information To the End User**

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.

**Manuel d'information à l'utilisateur final**

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module. Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.

**Caution :**

- (i) 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;
- (ii) 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;
- (iii) 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;
- (iv) 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.

**Avertissement:**

Le guide d'utilisation des dispositifs pour réseaux locaux doit inclure des instructions précises sur les restrictions susmentionnées, notamment :

- (i) les dispositifs fonctionnant dans la bande 5150-5250 MHz sont réservés uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux;
- (ii) pour les dispositifs munis d'antennes amovibles, le gain maximal d'antenne permis pour les dispositifs utilisant les bandes de 5 250 à 5 350 MHz et de 5 470 à 5 725 MHz doit être conforme à la limite de la p.i.r.e.;
- (iii) pour les dispositifs munis d'antennes amovibles, le gain maximal d'antenne permis (pour les dispositifs utilisant la bande de 5 725 à 5 850 MHz) doit être conforme à la limite de la p.i.r.e. spécifiée, selon le cas;
- (iv) lorsqu'il y a lieu, les types d'antennes (s'il y en a plusieurs), les numéros de modèle de l'antenne et les pires angles d'inclinaison nécessaires pour rester conforme à l'exigence de la p.i.r.e. applicable au masque d'élévation, énoncée à la section 6.2.2.3, doivent être clairement indiqués