

AW-CM286NF

**IEEE 802.11 1X1 ac/a/b/g/n Wireless LAN +
Bluetooth
NGFF Module**

Datasheet

Version 0.8

(For Cert.)

Inspired by wireless

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1. General Description

1-1. Product Overview and Functional Description

AzureWave Technologies, Inc. introduces the IEEE 802.11ac/a/b/g/n 1X1 WLAN & Bluetooth NGFF module --- **AW-CM286NF**. 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-CM286NF, 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, the AW-CM286NF 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-CM286NF. In addition to the support of **WPA/WPA2** and **WEP** 64-bit and 128-bit encryption, the AW-CM286NF 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-CM286NF 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.

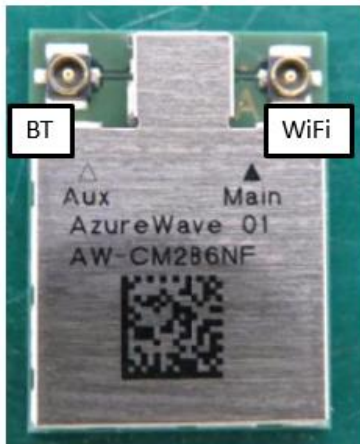
For Bluetooth operation, AW-CM286NF is **Bluetooth 4.2 (supports Low Energy)**.

AW-CM286NF supports **SDIO** for WLAN and BT to the host processor.

AW-CM286NF module adopts Marvell's latest highly-integrated dual-band WLAN & Bluetooth SoC--- **88W8887**. All the other components are implemented by all means to reach the mechanical specification required.

1-2. Key feature:

- Small footprint: 16mm(L) x 12mm(W) x 1.95mm(H)Max
- IEEE 802.11ac compliant, 1x1 spatial stream with data rates up to MCS9 (433 Mbps)
- Bluetooth 4.2 (supports Low Energy (LE))
- SDIO 3.0 device interface may be used as host interface for WLAN/Bluetooth
- PCM/Inter-IC Sound(I2S) for Bluetooth
- Audio Codec interface support
- Multiple power saving modes for low power consumption
- Lead-free design



1-3. Specifications Table

Model Name	AW-CM286NF
Product Description	Wireless LAN + Bluetooth Combo Module
WLAN Standard	IEEE 802.11ac/a/b/g/n, Wi-Fi compliant
Bluetooth Standard	Bluetooth 4.2 complaint with Bluetooth 2.1+Enhanced Data Rate (EDR)
Host Interface	◆ SDIO 3.0 device interface (SPI, 1-bit SDIO, 4-bit SDIO transfer modes at full clock range up to 208 MHz)
Major Chipset	Marvell 88W8887
Dimension	12mm x 16mm x 1.95mm(Max)
Weight	TBD
Package	LGA
Operating Conditions	
Voltage	3.3V+- 10%
Temperature	Operating: -20 ~ 85°C ; Storage: -40 ~ 85°C
Electrical Specifications	
Frequency Range	2.4 GHz ISM radio band / 5 GHz Unlicensed National Information Infrastructure (U-NII) band
Number of Channels	802.11a: USA, Taiwan – 12/4 Most European Countries –19 Japan – 4 802.11b: USA, Canada and Taiwan – 11 Most European Countries – 13 France – 4 802.11g: USA, Canada and Taiwan – 11 Most European Countries – 13 Japan – 13 802.11n(HT20): Channel 1~13(2412~2472) 802.11n(HT40): Channel 1~7(2422~2472)
Modulation	DSSS, OFDM, DBPSK, DQPSK, CCK, 16-QAM, 64-QAM 256-QAM for WLAN GFSK (1Mbps), $\pi/4$ DQPSK (2Mbps) and 8DPSK (3Mbps) for Bluetooth
Output Power	WLAN G band: 11b: 16dBm +/- 2dBm(11M) 11g: 14dBm +/- 2dBm (54M) 11n HT20: 13dBm +/- 2dBm(MCS7) 11n HT40: 12dBm +/- 2dBm(MCS7) WLAN A band: 11a: 13dBm +/- 2dBm(54M) 11n HT20: 12dBm +/- 2dBm(MCS7) 11n HT40: 11dBm +/- 2dBm(MCS7) 11ac VHT_20: 11dBm +/- 2dBm(MCS8) 11ac VHT_40: 10dBm +/- 2dBm(MCS9) 11ac VHT_80: 7dBm +/- 2dBm(MCS9) Bluetooth: Class 2 : 2dBm +/- 2dBm

Receive Sensitivity	WLAN: WLAN G band : 11b:-87dBm (11M) 11g:-73dBm (54M) 11n:HT20 -70dBm (MCS7) HT40 -68dBm (MCS7) WLAN A band: 11a: -68dBm (54M) 11n HT20:-66dBm (MCS7) 11n HT40:-64dBm(MCS7) 11ac VHT_20: -61dBm(MCS8) 11ac VHT_40: -58dBm(MCS9) 11ac VHT_80: -52dBm(MCS9) Bluetooth: BDR:-88dBm(DH1) EDR:-91dBm(2DH5) BLE:-94.5dBm
Data Rates	WLAN 802.11b: 1, 2, 5.5, 11Mbps 802.11a/g: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n: up to 150Mbps 802.11ac:up to 86.7Mbps (20MHz channel) 802.11ac:up to 200Mbps (40MHz channel) 802.11ac:up to 433Mbps (80MHz channel) Bluetooth Bluetooth 2.1+EDR data rates of 1,2, and 3Mbps
ESD Rating	HBM: >2KV per MIL-STD-883H Method 3015.8 CDM:>500V per JEDEC EIA/JESD22-C101E
Operating Range	Open Space: ~300m ; Indoor: ~100m for WLAN Minimum 10 m indoor for Bluetooth The transmission speed may vary according to the environment)
Security	◆ WAPI ◆ WEP 64-bit and 128-bit encryption with H/W TKIP processing ◆ WPA/WPA2 (Wi-Fi Protected Access) ◆ AES-CCMP hardware implementation as part of 802.11i security standard
Operating System Compatibility	Linux (Android, Meego), More information please contact Azurewave FAE.

***WiFi/BT power & sensitivity measure @ module out**

2. Electrical Characteristic

2-1.Absolute Maximum Ratings

Symbol	Parameter	Condition	Min	Typ	Max	Units
VDD_3V3	3.3V input	--	--	3.3	4.0	V
VIO	Host I/O power supply	--	--	3.3	4.0	V
				2.5	3.0	
				1.8	2.2	
VIO_SD	SDIO power supply	--	--	3.3	4.0	V
				1.8	2.2	

2-2.Recommanged Operating Conditions

Symbol	Parameter	Condition	Min	Typ	Max	Units
VBAT_IN	LDO VBAT input	--	2.7	3.3	3.63	V
VIO	1.8V/2.5V/3.3V digital I/O power supply	--	2.97	3.3	3.63	V
			2.25	2.5	2.75	
			1.62	1.8	1.98	
VIO_SD	1.8V/3.3V digital I/O SDIO power supply	--	2.97	3.3	3.63	V
			1.62	1.8	1.98	

2-3.Clock Specifications

2-3-1 External Sleep Clock Timing

External Sleep Clock is necessary for two reasons:

1. Auto frequency Detection.

This is where the internal logic will bin the Ref clock source to figure out what is the reference clock frequency is. This is done so no strapping is needed for telling 8887 what the ref clock input is.

2. Allow low current modes for BT to enter sleep modes such as sniff modes.

The AW-CM286NF external sleep clock pin is powered from the 1.8V voltage supply.

Symbol	Parameter	Min	Typ	Max	Units
CLK	Clock Frequency Range	32 or 32.768 -50ppm	32 or 32.768	32 or 32.768 +50ppm	KHz
T _{HIGH}	Clock high time	40	--	--	ns
T _{LOW}	Clock low time	40	--	--	ns
T _{RISE}	Clock rise time	--	--	5	ns
T _{FALL}	Clock fall time	--	--	5	ns

2-4. Reset Configuration

The AW-CM286NF is reset to its default operating state under the following conditions:

- Power-on reset (POR)
- Software/Firmware reset
- External pin reset (RESETn)

2-4-1. Internal Reset

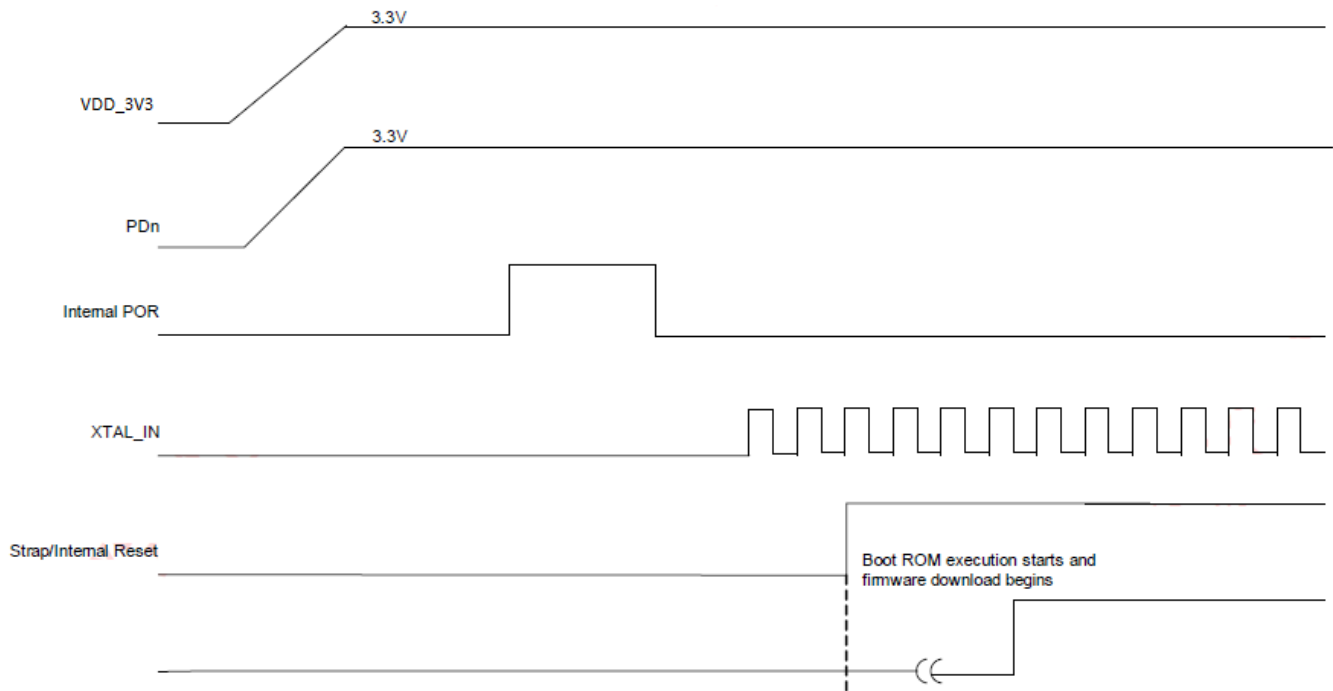
The AW-CM286NF device is reset, and the internal CPU begins the boot sequence when any of the following internal reset events occur:

- Device receives power and VDDL supplies rise (triggers internal POR circuit)
- External pin (PDn) assertion will generate POR

2-4-2. External Reset

The AW-CM286NF is reset when PDn pin is asserted low and the internal CPU begins the boot sequence when the PDn pin transitions from low to high.

2-5. Power up Timing Sequence



3. Host Interfaces

3-1. SDIO Interface

The AW-CM286NF 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-CM286NF 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

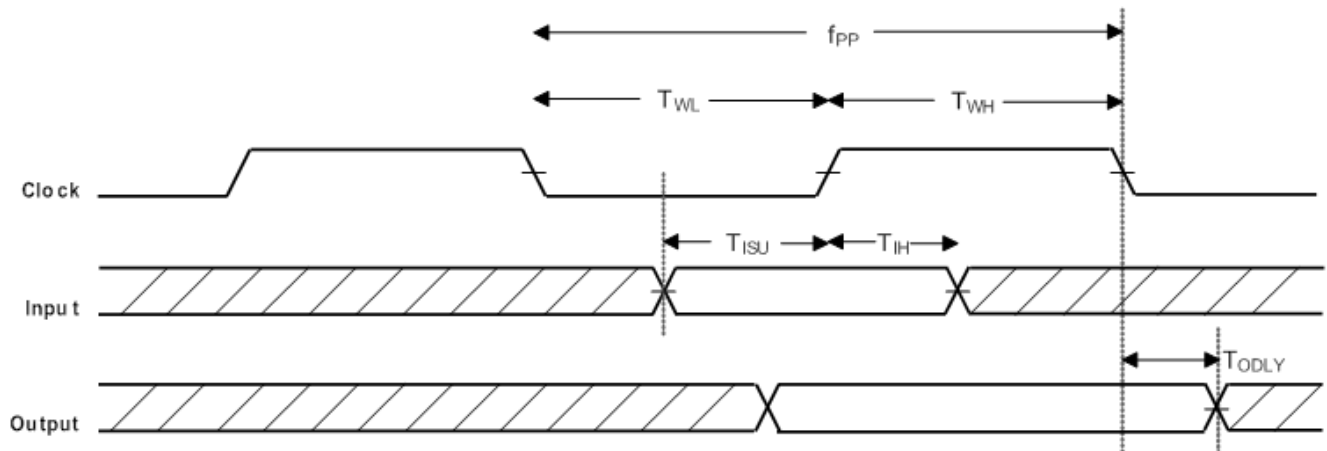
Allows card to interrupt host

3-1-1. 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

3-1-2. Default Speed, High Speed Modes (3.3V)

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



SDIO Protocol Timing Diagram – HighSpeed Mode (3.3V)

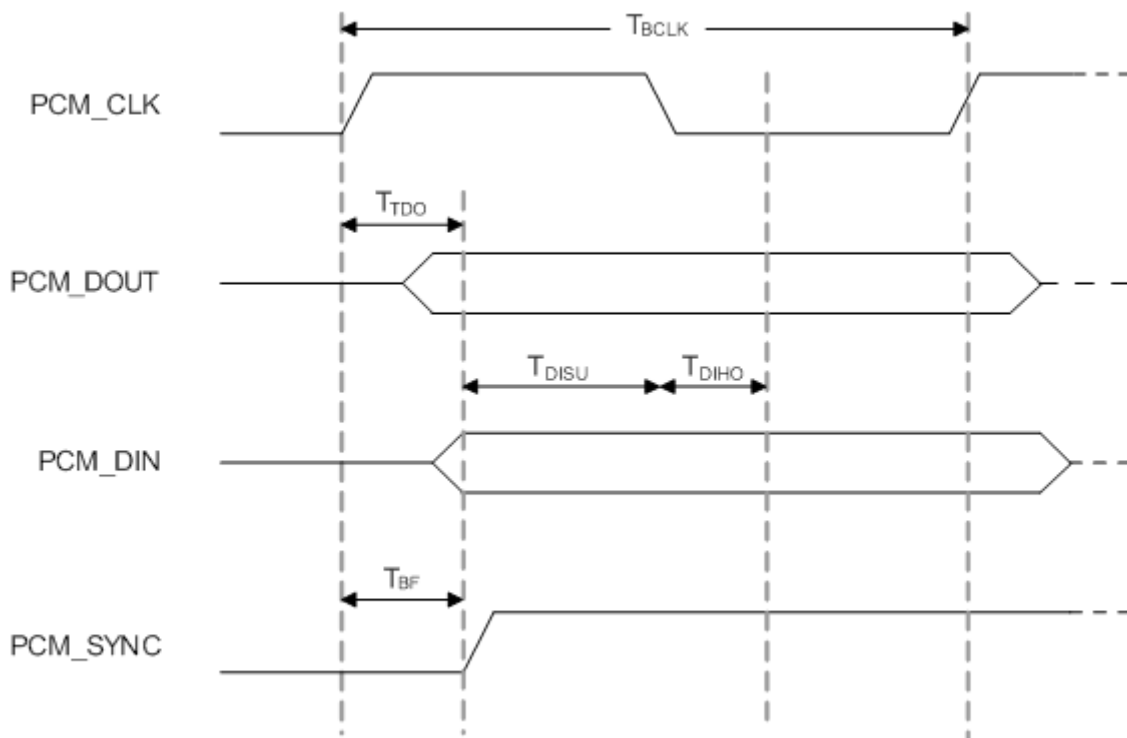
Table shows SDIO Timing Data—Default Speed, High Speed Modes (3.3V)

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

Symbol	Parameter	Condition	Min	Typ	Max	Units
f_{PP}	Clock Frequency	Default Speed	0	--	25	MHz
		High Speed	0	--	50	MHz
T_{WL}	Clock Low Time	Default Speed	10	--	--	ns
		High Speed	7	--	--	ns
T_{WH}	Clock High Time	Default Speed	10	--	--	ns
		High Speed	7	--	--	ns
T_{ISU}	Input Setup Time	Default Speed	5	--	--	ns
		High Speed	6	--	--	ns
T_{IH}	Input Hold Time	Default Speed	5	--	--	ns
		High Speed	2	--	--	ns
T_{ODLY}	Output Delay Time CL $\leq$ 40 pF (1 card)	Default Speed	--	--	14	ns
		High Speed	---	-1	4	ns
T_{OH}	Output Hold Time	High Speed	2.5	--	--	ns

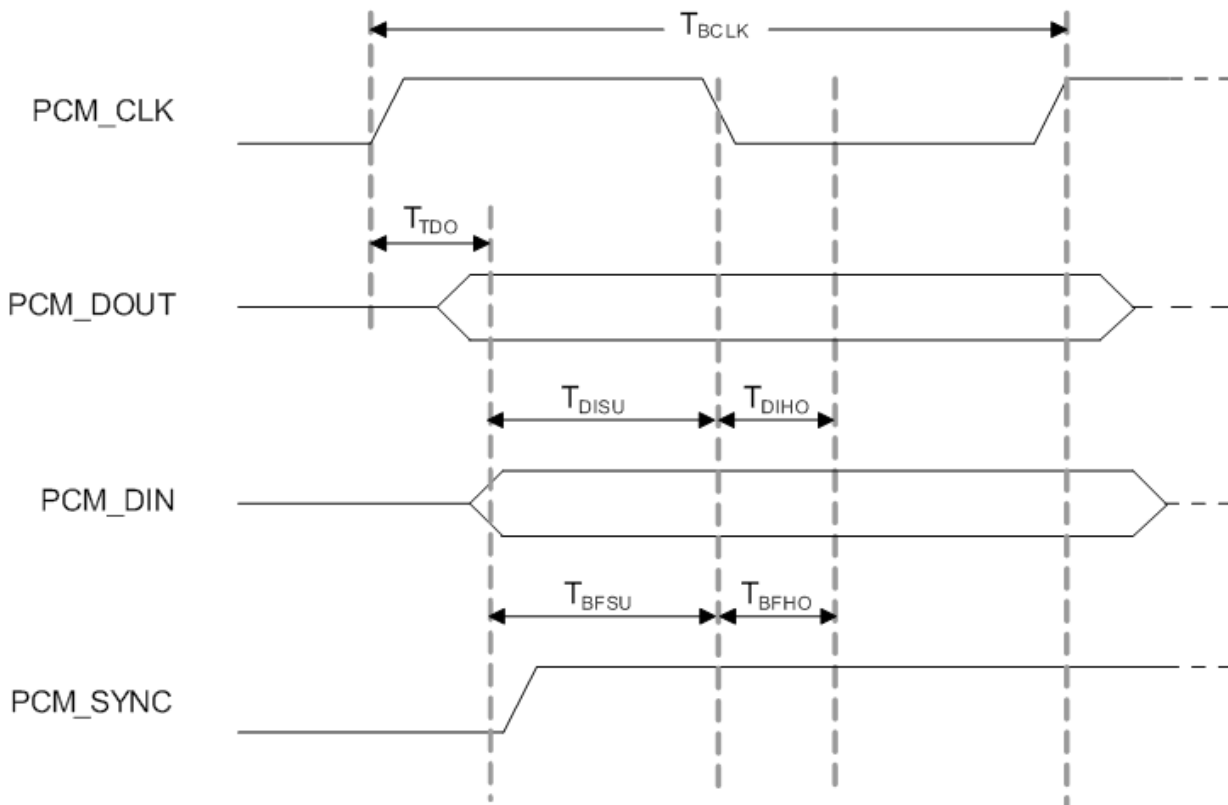
3-2. PCM Interface

3-2-1. PCM Timing Specification – Master Mode



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

3-2-2. 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	--
$T_{BCLK \text{ rise/fall}}$	--	--	--	3	--	ns
T_{DO}	--	--	--	--	30	ns
T_{DISU}	--	--	15	--	--	ns
T_{DIHO}	--	--	10	--	--	ns
T_{BFSU}	--	--	15	--	--	ns
T_{BFHO}	--	--	10	--	--	ns

4. Pin Definition

Pin No	Definition	Basic Description	Type
1	GPIO[15]/TMS	JTAG controller select	
2	GPIO[14]/TCK	JTAG test clock	
3	GPIO[16]/TDI	JTAG test data(input)	I
4	VDD_3V3	3.3V Analog RF Power Supply	I
5	VDD_3V3	3.3V system power supply input	I
6	GND	System Ground Pin	
7	GPIO[17]/TDO	JTAG test data(output)	O
8	NC	No connect	--
9	NC	No connect	--
10	NC	No connect	--
11	GPIO[1]	GPIO[1]	I
12	NC	No connect	--
13	NC	No connect	--
14	NC	No connect	--
15	NC	No connect	--
16	NC	No connect	--
17	GND	System Ground Pin	
18	NC	No connect	--
19	NC	No connect	--
20	GND	System Ground Pin	
21	NC	No connect	--
22	NC	No connect	--
23	GND	System Ground Pin	
24	NC	No connect	--
25	NC	No connect	--
26	GND	System Ground Pin	
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

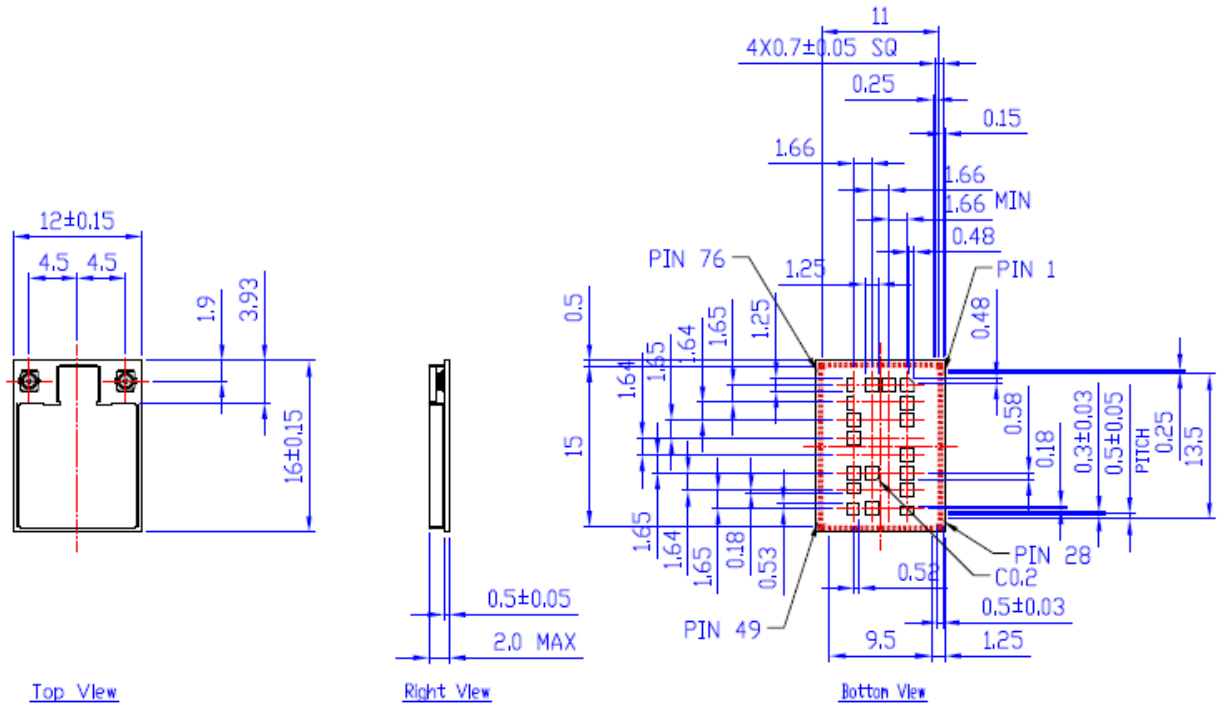
Pin No	Definition	Basic Description	Type
28	GPIO[13]	GPIO[13]	
29	NC	No connect	--
30	NC	No connect	--
31	GPIO[12]	GPIO[12]	--
32	GND	System Ground Pin	
33	NC	No connect	--
34	NC	No connect	--
35	GND	System Ground Pin	
36	NC	No connect	--
37	NC	No connect	--
38	GND	System Ground Pin	
39	NC	No connect	--
40	NC	No connect	--
41	GND	System Ground Pin	
42	GPIO[0]/CLK_REQ	GPIO[0] (input/output)	O
43	NC	No connect	--
44	VIO_SD	1.8V/3.3V Digital I/O SDIO Power Supply	I
45	PDn	Full Power Down (input) (active low)	I
46	NC	No connect	--
47	SD_DAT[3]	SDIO Data line Bit[3]	I/O
48	SD_DAT[2]	SDIO Data line Bit[2]	I/O
49	SD_DAT[1]	SDIO Data line Bit[1]	I/O
50	SD_DAT[0]	SDIO Data line Bit[0]	I/O
51	SD_CMD	SDIO Command/response (input/output)	I/O
52	SD_CLK	SDIO Clock input	I
53	NC	No Connect	
54	GPIO[10]	GPIO[10] (input/output)	I/O
55	GPIO[8]	GPIO[8] (input/output)	I/O
56	GPIO[9]	GPIO[9] (input/output)	I/O
57	GPIO[11]	GPIO[11] (input/output)	I/O
58	GPIO[7]/PCM_SYNC	GPIO[7] (input/output)	I/O

Pin No	Definition	Basic Description	Type
59	GPIO[4]/PCM_IN	GPIO[4] (input/output)	I
60	GPIO[5]/PCM_OUT	GPIO[5] (input/output)	O
61	GPIO[6]/PCM_CLK	GPIO[6] (input/output)	I/O
62	GND	System Ground Pin	
63	NC	No connect	--
64	GPIO[2]/WLAN_LED	LED_OUT_WLAN (output)	O
65	GPIO[3]/BT_LED	LED_OUT_BT (output)	O
66	NC	No connect	--
67	NC	No connect	--
68	GND	System Ground Pin	
69	NC	No connect	--
70	NC	No connect	--
71	GND	System Ground Pin	
72	NC	No connect	--
73	VIO	Digital I/O Power Supply	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	

Pin No	Definition	Basic Description	Type
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	GND	System Ground Pin	
G2	GND	System Ground Pin	
G3	GND	System Ground Pin	
G4	GND	System Ground Pin	
G5	GND	System Ground Pin	
G6	GND	System Ground Pin	
G7	GND	System Ground Pin	
G8	GND	System Ground Pin	
G9	GND	System Ground Pin	
G10	GND	System Ground Pin	
G11	GND	System Ground Pin	
G12	GND	System Ground Pin	
G13	GND	System Ground Pin	
G14	GND	System Ground Pin	
G15	GND	System Ground Pin	
G16	GND	System Ground Pin	
G17	GND	System Ground Pin	
G18	GND	System Ground Pin	
G19	GND	System Ground Pin	
G20	GND	System Ground Pin	
G21	GND	System Ground Pin	
G22	GND	System Ground Pin	

5. Mechanical Information

5-1. Package Outline Drawing



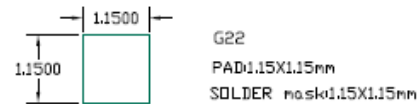
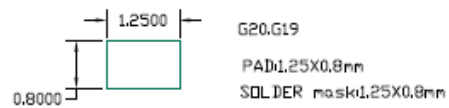
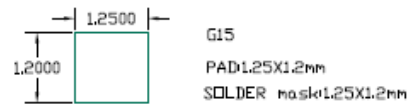
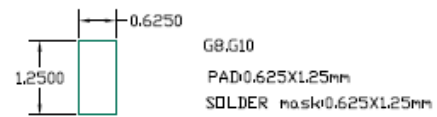
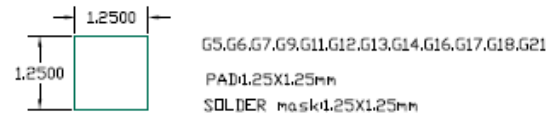
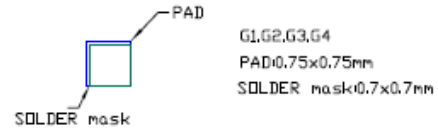
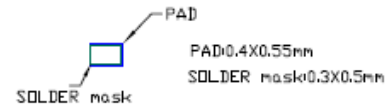
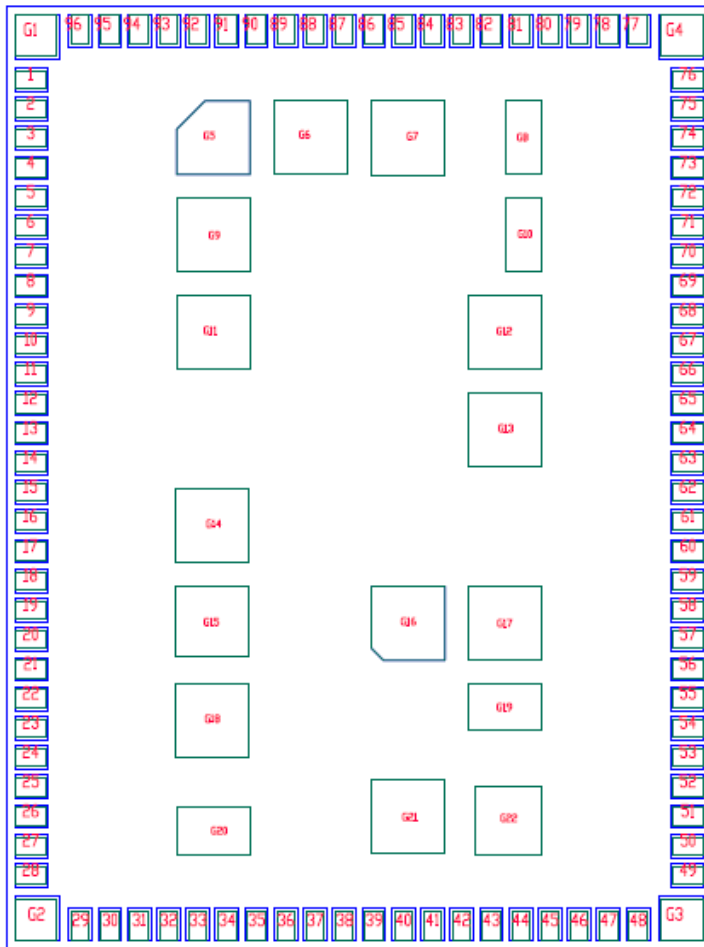
Tolerances unless otherwise specified : $\pm 0.15\text{mm}$

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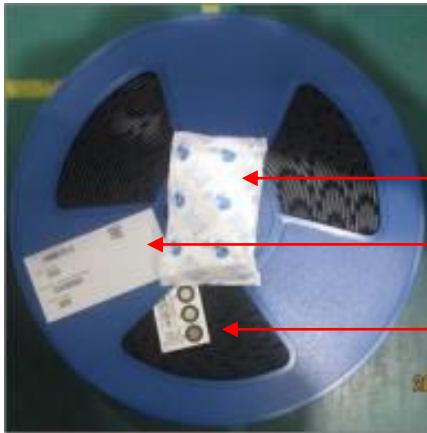
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5-2. Module PCB Layout Footprint



6. Shipping Information

6-1



1 UNIT DESICCANT

AFFIX PACKING LABEL

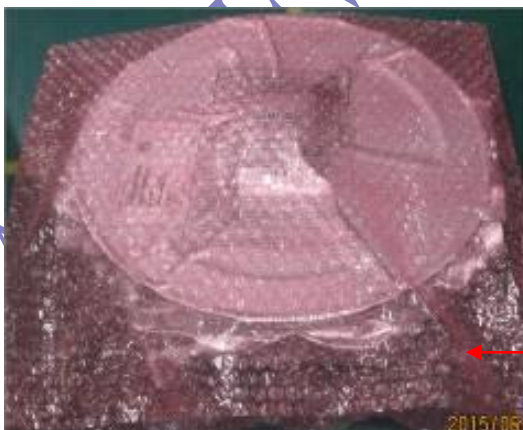
HUMIDITY INDICATOR CARD

6-2



AFFIX PACKING LABEL

6-3



PINK BUBBLE WRAP

6-4



AFFIX PACKING LABEL

6-5

1 Carton= 5 Boxes



TRANSPARENT SEALING TAPE

AFFIX PACKING LABEL

6-6



出货标签

生产标签

包装箱号标签

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

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

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FCC Statement:

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.

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

IMPORTANT NOTE:**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 20 cm between the radiator & your body.

IMPORTANT NOTE:

This module is intended for OEM integrator. The OEM integrator is responsible for the compliance to all the rules that apply to the product into which this certified RF module is integrated.

Additional testing and certification may be necessary when multiple modules are used.

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 20 cm 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.

If the labelling area is small than the palm of the hand, then additional FCC part 15.19 statement is required to be available in the users manual: 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-CM286NF ".

If the labelling area is larger than the palm of the hand, then the following FCC part 15.19 statement has to also be available on the label: 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.	Brand Holder	Brand Holder P/N	Antenna Type	Connector
1	Smart Approach Co.,Ltd.	SE-ECX10-001	PIFA Antenna	I-PEX
2	Smart Approach Co.,Ltd.	SE-ECX10-002	PIFA Antenna	I-PEX
3	Smart Approach Co.,Ltd.	SE-ECX10-003	PIFA Antenna	I-PEX
4	Smart Approach Co.,Ltd.	SE-ECX10-004	PIFA Antenna	I-PEX
5	Smart Approach Co.,Ltd.	SE-ECX10-005	PIFA Antenna	I-PEX
6	Smart Approach Co.,Ltd.	SE-ECX10-006	PIFA Antenna	I-PEX

Ant.	True Gain = antenna gain + cable loss (dBi)				
	2.4G	5G B1	5G B2	5G B3	5G B4
1	-0.94	1.42	1.42	0.58	2.16
2	-1.67	-0.29	-0.33	1.37	1.37
3	1.04	0.92	0.92	2.59	2.59
4	0.31	0.93	0.28	-1.11	-1.37
5	1.01	0.07	0.07	0.34	-0.68
6	0.64	0.38	-0.52	-0.49	-0.68

Note1: There are 6 antennas in the antenna table list.

IC Statement:

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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 radio transmitter (IC: 6100A-CM286NF) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio (IC: 6100A-CM286NF) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Ant.	Brand Holder	Brand Holder P/N	Antenna Type	Connector
1	Smart Approach Co.,Ltd.	SE-ECX10-001	PIFA Antenna	I-PEX
2	Smart Approach Co.,Ltd.	SE-ECX10-002	PIFA Antenna	I-PEX
3	Smart Approach Co.,Ltd.	SE-ECX10-003	PIFA Antenna	I-PEX
4	Smart Approach Co.,Ltd.	SE-ECX10-004	PIFA Antenna	I-PEX
5	Smart Approach Co.,Ltd.	SE-ECX10-005	PIFA Antenna	I-PEX
6	Smart Approach Co.,Ltd.	SE-ECX10-006	PIFA Antenna	I-PEX

Ant.	True Gain = antenna gain + cable loss (dBi)				
	2.4G	5G B1	5G B2	5G B3	5G B4
1	-0.94	1.42	1.42	0.58	2.16
2	-1.67	-0.29	-0.33	1.37	1.37
3	1.04	0.92	0.92	2.59	2.59
4	0.31	0.93	0.28	-1.11	-1.37
5	1.01	0.07	0.07	0.34	-0.68
6	0.64	0.38	-0.52	-0.49	-0.68

Note1: There are 6 antennas in the antenna table list.

Dynamic Frequency Selection (DFS) for devices operating in the bands 5250- 5350 MHz, 5470-5600 MHz and 5650-5725 MHz.

Sélection dynamique de fréquences (DFS) pour les dispositifs fonctionnant dans les bandes 5250-5350 MHz, 5470-5600 MHz et 5650-5725 MHz.

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.

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.

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.

le gain maximal d'antenne permis pour les dispositifs utilisant les bandes 5250-5350 MHz et 5470-5725 MHz doit se conformer à la limite de p.i.r.e.

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 specified for point-to-point and non-point-to-point operation as appropriate.

le gain maximal d'antenne permis (pour les dispositifs utilisant la bande 5725-5850 MHz) doit se conformer à la limite de p.i.r.e. spécifiée pour l'exploitation point à point et non point à point, selon le cas.

For indoor use only.

Pour une utilisation en intérieur uniquement.

IMPORTANT NOTE:

IC Radiation Exposure Statement:

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

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

IMPORTANT NOTE:

This module is intended for OEM integrator. The OEM integrator is responsible for the compliance to all the rules that apply to the product into which this certified RF module is integrated.

Additional testing and certification may be necessary when multiple modules are used.

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 20 cm 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 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 IC: 6100A-CM286NF ".

The Host Model Number (HMN) must be indicated at any location on the exterior of the end product or product packaging or product literature which shall be available with the end product or online.

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FCC Statement:

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.

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

IMPORTANT NOTE:**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 20 cm between the radiator & your body.

IMPORTANT NOTE:

This module is intended for OEM integrator. The OEM integrator is responsible for the compliance to all the rules that apply to the product into which this certified RF module is integrated. Additional testing and certification may be necessary when multiple modules are used.

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 20 cm 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.

If the labelling area is small than the palm of the hand, then additional FCC part 15.19 statement is required to be available in the users manual: 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-CM286NF ".

If the labelling area is larger than the palm of the hand, then the following FCC part 15.19 statement has to also be available on the label: 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.

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1	Smart Approach Co.,Ltd.	SE-ECX10-001	PIFA Antenna	I-PEX
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Note1: There are 6 antennas in the antenna table list.

IC Statement:

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5	Smart Approach Co.,Ltd.	SE-ECX10-005	PIFA Antenna	I-PEX
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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 specified for point-to-point and non-point-to-point operation as appropriate.

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Pour une utilisation en intérieur uniquement.

IMPORTANT NOTE:

IC Radiation Exposure Statement:

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