

AW-AM457-D

IEEE 802.11 1X1 a/b/g/n Wireless LAN + Bluetooth 5.1 Combo LGA Module

Datasheet

Rev. D

DF

For Standard

Features

WLAN

- ◆ Support 802.11 a/b/g/n
- ◆ Dual bands: 2.4 GHz and 5 GHz
- ◆ Single stream 802.11n with 20/40 MHz channels for 5G and 20 MHz only for 2.4G
- ◆ Up to MCS7 data rates (150 Mbps)
- ◆ Support 802.11mc for location
- ◆ Dynamic Rapid Channel Switching (DRCS) for simultaneous and power efficient operation in 2.4 GHz and 5 GHz bands
- ◆ Interface to coexist with 802.15.4, LTE, or other radios.
- ◆ Security: WPA3 and WPA.

Bluetooth

- ◆ Full Bluetooth 5.1 features
- ◆ Long range - 4x coverage
- ◆ 2 Mbps data rate - 2x faster
- ◆ Connection/connectionless AoA
- ◆ Connection/connectionless AoD
- ◆ Improved advertisement capacity- enables more IoT services
- ◆ Audio interface: I2S and PCM
- ◆ Security: AES

Revision History

Document NO: R2-2457-DST-01

Version	Revision Date	DCN NO.	Description	Initials	Approved
A	2020/01/21	DCN016710	● Draft version	Renton Tao	N.C Chen
B	2020/12/10	DCN018928	● Modify model name ● Add specification table and operating temperature ● Add ESD information ● Modify pin table(Pin 19) ● Add power sequence ● Add Power Consumption ● Modify operating conditions	Roger Liu	N.C Chen
C	2021/02/18	DCN020661	● Modify datasheet form ● Modify Host Interface ● Modify Bluetooth specification ● Update box label information ● Modify 2.4G n mode bandwidth ● Update packing information	Roger Liu	N.C Chen
D	2021/09/26	DCN023395	● Modify pin table for GPIO and pin 59~68 to NC ● Remove USB interface	Roger Liu	N.C Chen

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1. Introduction

1.1 Product Overview

AzureWave Technologies, Inc. introduces the IEEE 802.11a/b/g/n WLAN, BT, combo module – **AW-AM457-D**. With four advanced radio technologies integrated into a module, AW-AM457-D provides the best and most convenient SMT process. The module is targeted to mobile devices including, Tablet PC, Portable Media Players (PMPs), Portable Navigation Devices (PNDs), Personal Digital Assistants (PDAs), Tracking Devices, Gaming Devices which need convenient SMT process, low power consumption.

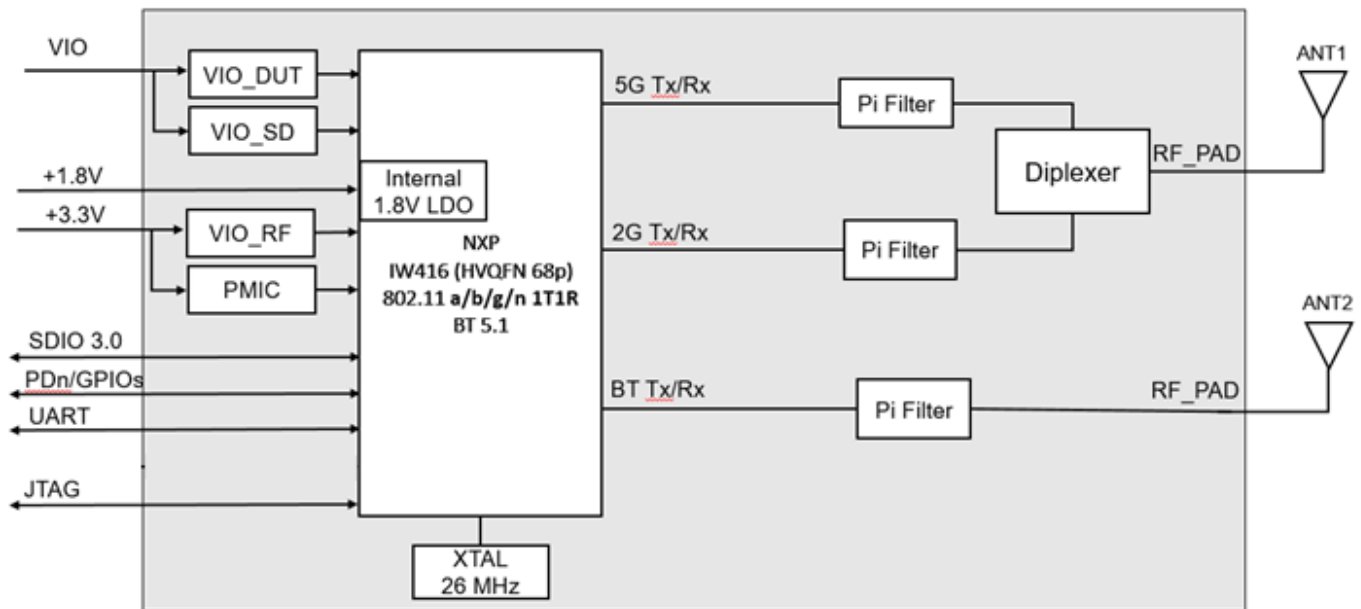
By using AW-AM457-D, the customers can easily integrate the Wi-Fi, BT, by a combo module with the benefits of **high design flexibility, high success rate on SMT process, short development cycle, and quick time-to-market.**

Compliance with the IEEE 802.11a/b/g/n standard, the AW-AM457-D uses **DSSS, 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-AM457-D.

The AW-AM457-D supports standard interface **SDIO3.0 for WLAN, UART for BT**. AW-AM457-D is suitable for multiple mobile processors for different applications. With the combo functions and the good performance, the AW-AM457-D is the best solution for the consumer electronics and the tablet PC.

1.2 Block Diagram

A simplified block diagram of the AW-AM457-D module is depicted in the figure below.



AW-AM457-D Block Diagram

1.3 Specifications Table

1.3.1 General

Features	Description
Product Description	IEEE 802.11 a/b/g/n Wi-Fi with Bluetooth 5.1 Combo Module
Major Chipset	NXP IW416 (68-pin HVQFN)
Host Interface	WiFi + BT SDIO + UART
Dimension	15 mm X 15 mm x 2.5 mm(Max)
Form factor	LGA module, 76 pins
Antenna	For LGA, "1T1R, external ANT1 : WiFi → TX/RX ANT2 : Bluetooth → TX/RX
Weight	0.5 g

1.3.2 WLAN

Features	Description
WLAN Standard	IEEE 802.11 a/b/g/n 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
Number of Channels	2.4GHz: ■ USA, NORTH AMERICA, Canada and Taiwan - 1 ~ 11 ■ China, Australia, Most European Countries - 1 ~ 13 ■ Japan, 1 ~ 13 5GHz: ■ USA, Canada, Most European Countries - 36,40,44,48,52,56,60,64,100,104,108,112,116,120,124,128,132,136,140,149,153,157,161,165 ■ 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				
		Min	Typ	Max	Unit
	11b (11Mbps) @EVM<35%	15.5	17	18.5	dBm
	11g (54Mbps) @EVM≤-30 dB	14.5	16	17.5	dBm
	11n (HT20 MCS7) @EVM≤-30 dB	12.5	14	15.5	dBm
	5G				
		Min	Typ	Max	Unit
	11a (54Mbps) @EVM≤-27 dB	14	16	18	dBm
	11n (HT20 MCS7) @EVM≤-28 dB	13	15	17	dBm
	11n (HT40 MCS7) @EVM≤-28 dB	12	14	16	dBm
Receiver Sensitivity	2.4G				
		Min	Typ	Max	Unit
	11b (11Mbps)	-	-86	-83	dBm
	11g (54Mbps)	-	-73	-70	dBm
	11n (HT20 MCS7)	-	-69	-66	dBm
	5G				
		Min	Typ	Max	Unit
	11a (54Mbps)	-	-71	-68	dBm
	11n (HT20 MCS7)	-	-68	-65	dBm
	11n (HT40 MCS7)	-	-66	-63	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), 150 Mbps (40 MHz channel)				
Security	■ WiFi: WPA/WPA3 ■ BT: AES				

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

1.3.3 Bluetooth

Features	Description				
Bluetooth Standard	Full Bluetooth 5.1 features				
Bluetooth VID/PID	NA				
Frequency Rage	2402MHz~2483MHz				
Modulation	Header GFSK Payload 2M: $\pi/4$ -DQPSK Payload 3M: 8DPSK				
Output Power		Min	Typ	Max	Unit
	BDR	0	2	4	dBm
	EDR	0	2	4	dBm
	Low Energy	0	2	4	dBm
Receiver Sensitivity		Min	Typ	Max	Unit
	BDR(DH1)	-	-83	-80	dBm
	EDR(2DH5)	-	-88	-85	dBm
	EDR(3DH5)	-	-83	-80	dBm
	Low Energy	-	-96	-93	dBm
	BT Sensitivity (BER<0.1%)				

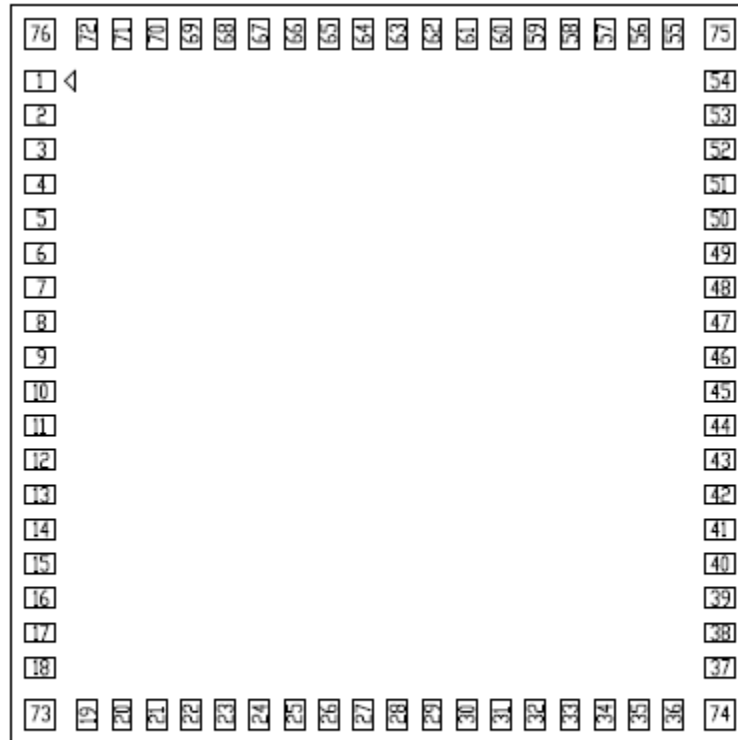
1.3.4 Operating Conditions

Features	Description
Operating Conditions	
Voltage	3.3V +-5%
Operating Temperature	0 °C to +70 °C
Operating Humidity	less than 85% R.H.
Storage Temperature	-40 °C to +125 °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-AM457-D pin out drawing (top view).



PIN DEFINED (TOP VIEW)

2.2 Pin Table

Pin No	Definition	Basic Description	Voltage	Type
1	NC	Floating Pin, No connect to anything.	---	Floating
2	NC	Floating Pin, No connect to anything.	---	Floating
3	WCI_SOUT	WCI interface serial output pin, for coexistence with LTE, 802.15.4 radio, or other external radios	1.8V	O
4	WCI_SIN	WCI interface serial input pin, for coexistence with LTE, 802.15.4 radio, or other external radios	1.8V	I
5	NC	Floating Pin, No connect to anything.	---	Floating
6	GND	Ground	---	---
7	SLP_CLK_IN	External Low Power Clock input (32.768KHz)	VDDIO	I
8	GND	Ground	---	---
9	GPIO[1]	GPIO Mode : GPIO[1]/WiFi to Host Wake	VDDIO	I/O
10	GPIO[4]	GPIO Mode : GPIO[4]/PCM_DOUT	VDDIO	I/O
11	GPIO[5]	GPIO Mode : GPIO[5]/PCM_DIN	VDDIO	I/O
12	GPIO[6]	GPIO Mode : GPIO[6]/PCM_CLK	VDDIO	I/O
13	GPIO[7]	GPIO Mode : GPIO[7]/PCM_SYNC	VDDIO	I/O
14	GND	Ground	---	---
15	3V3	3.3V power voltage source input	3.3V	P
16	3V3	3.3V power voltage source input	3.3V	P
17	GND	Ground	---	---
18	Reserved	Reserved(Do not connect to anything)	---	Floating
19	Reserved	Reserved(Do not connect to anything)	---	Floating
20	NC	Floating Pin, No connect to anything.	---	Floating
21	1V8_IN	AVDD18 input	1.8V	P
22	VIO	1.8V/3.3V Digital I/O Power Supply	1.8V/3.3V	P
23	GND	Ground	---	---
24	GND	Ground	---	---
25	NC	Floating Pin, No connect to anything.	---	Floating
26	NC	Floating Pin, No connect to anything.	---	Floating
27	NC	Floating Pin, No connect to anything.	---	Floating
28	NC	Floating Pin, No connect to anything.	---	Floating
29	PDn	Full Power-down input pin (active low) 0 = full power-down mode 1 = normal mode	1.8V	I
30	SDIO_DATA_CMD	SDIO Command	VIO_SD	I/O
31	GND	Ground	---	---
32	SDIO_DATA_CLK	SDIO Clock input	VIO_SD	I
33	SDIO_DATA_0	SDIO Data line Bit[0]	VIO_SD	I/O
34	SDIO_DATA_1	SDIO Data line Bit[1]	VIO_SD	I/O
35	SDIO_DATA_2	SDIO Data line Bit[2]	VIO_SD	I/O
36	SDIO_DATA_3	SDIO Data line Bit[3]	VIO_SD	I/O
37	VIO_SD	1.8V/3.3V SDIO Power Supply	1.8V/3.3V	P

38	GND	Ground	---	---
39	Reserved	Reserved(Do not connect to anything)	---	Floating
40	Reserved	Reserved(Do not connect to anything)	---	Floating
41	GND	Ground	---	---
42	UART_RX	UART SIN pin	VDDIO	I
43	UART_TX	UART SOUT.pin	VDDIO	O
44	UART_RTSn	UART Mode: UART_RTSn (output) (active low)	VDDIO	O
45	UART_CTSn	UART Mode: UART_CTSn input pin (active low)	VDDIO	I
46	GPIO[3]	GPIO Mode : GPIO[3]/JTAG_TDO	VDDIO	I/O
47	GPIO[2]	GPIO Mode : GPIO[2]/JTAG_TDI	VDDIO	I/O
48	GPIO[14]	GPIO Mode : GPIO[14]/JTAG_TCK	VDDIO	I/O
49	GPIO[15]	GPIO Mode : GPIO[15]/JTAG_TMS	VDDIO	I/O
50	GPIO[12]	GPIO Mode : GPIO[12]/Host to BT Wake	VDDIO	I/O
51	GPIO[0]	GPIO Mode : GPIO[0].	VDDIO	I/O
52	GPIO[13]	GPIO Mode : GPIO[13]/Host to WiFi Wake	VDDIO	I/O
53	CON[0]	Firmware Boot Options for Host interface. See below table*	VIO	I
54	CON[1]	Firmware Boot Options for Host interface. See below table*	VIO	I
55	GND	Ground	---	---
56	BT_ANT	BT RF pin	---	I/O
57	GND	Ground	---	---
58	GND	Ground	---	---
59	NC	Floating Pin, No connect to anything.	---	Floating
60	NC	Floating Pin, No connect to anything.	---	Floating
61	NC	Floating Pin, No connect to anything.	---	Floating
62	NC	Floating Pin, No connect to anything.	---	Floating
63	NC	Floating Pin, No connect to anything.	---	Floating
64	NC	Floating Pin, No connect to anything.	---	Floating
65	NC	Floating Pin, No connect to anything.	---	Floating
66	NC	Floating Pin, No connect to anything.	---	Floating
67	NC	Floating Pin, No connect to anything.	---	Floating
68	NC	Floating Pin, No connect to anything.	---	Floating
69	GND	Ground	---	---
70	GND	Ground	---	---
71	WL_ANT	WLAN RF pin	---	I/O
72	GND	Ground	---	---
73	GND	Ground	---	---
74	GND	Ground	---	---
75	GND	Ground	---	---
76	GND	Ground	---	---

*Firmware Boot options for Host Interface

Strap Value [1:0]	WLAN	Bluetooth/LE	Firmware Download	Firmware Download Mode	Number of SDIO Functions
10	SDIO	UART	SDIO+UART	Parallel	1(WLAN)

3. Electrical Characteristics

3.1 Absolute Maximum Ratings

Symbol	Parameter	Minimum	Typical	Maximum	Unit
3V3	DC supply for the 3.3V input	-	3.3	3.96	V
VIO	I/O power supply	-	3.3	4.0	V
		-	1.8	2.2	
VIO_SD	SDIO power supply	-	3.3	4.0	V
		-	1.8	2.2	

3.2 Recommended Operating Conditions

Symbol	Parameter	Minimum	Typical	Maximum	Unit
3.3V	DC supply for the 3.3V input	3.14	3.3	3.46	V
VIO	1.8V/3.3V digital I/O power supply	2.97	3.3	3.47	V
		1.62	1.8	1.98	
VIO_SD	1.8V/3.3V SDIO power supply	2.97	3.3	3.47	V
		1.62	1.8	1.98	

3.3 Digital IO Pin DC Characteristics

3.3.1 1.8V Operation (VIO)

Symbol	Parameter	Minimum	Typical	Maximum	Unit
V _{IH}	Input high voltage	0.7*VIO	-	VIO+0.4	V
V _{IL}	Input low voltage	-0.4	-	0.3*VIO	
V _{OH}	Output high voltage	VIO-0.4	-	-	
V _{OL}	Output low voltage	-	-	0.4	
V _{HYS}	Input Hysteresis	100			mV

3.3.2 3.3V Operation (VIO)

Symbol	Parameter	Minimum	Typical	Maximum	Unit
V _{IH}	Input high voltage	0.7*VIO	-	VIO+0.4	V
V _{IL}	Input low voltage	-0.4	-	0.3*VIO	
V _{OH}	Output High Voltage	VIO-0.4	-	-	
V _{OL}	Output Low Voltage	-	-	0.4	
V _{HYS}	Input Hysteresis	100			mV

3.3.3 1.8V Operation (VIO_SD)

Symbol	Parameter	Minimum	Typical	Maximum	Unit
V _{IH}	Input high voltage	0.7*VIO_SD	-	VIO_SD+0.4	V
V _{IL}	Input low voltage	-0.4	-	0.3*VIO_SD	
V _{OH}	Output High Voltage	VIO_SD-0.4	-	-	
V _{OL}	Output Low Voltage	-	-	0.4	
V _{HYS}	Input Hysteresis	100			mV

3.3.4 3.3V Operation (VIO_SD)

Symbol	Parameter	Minimum	Typical	Maximum	Unit
V _{IH}	Input high voltage	0.7*VIO_SD	-	VIO_SD+0.4	V
V _{IL}	Input low voltage	-0.4	-	0.3* VIO_SD	
V _{OH}	Output High Voltage	VIO_SD-0.4	-	-	
V _{OL}	Output Low Voltage	-	-	0.4	
V _{HYS}	Input Hysteresis	100			mV

3.4 Host Interface

3.4.1 SDIO Interface

The AW-AM457-D supports a SDIO device interface that conforms to the industry SDIO Full-Speed card specification and allows a host controller using the SDIO bus protocol to access the Wireless SoC device.

The AW-AM457-D 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.

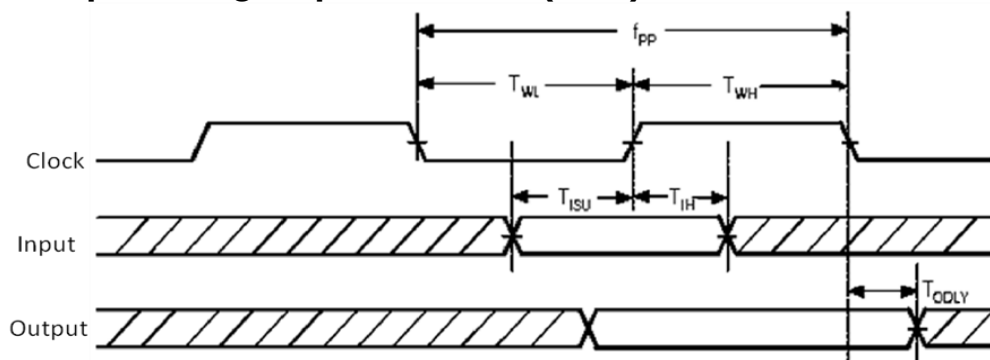
- ◆ Support SDIO 3.0 Standard.
- ◆ On-chip memory used for CIS.
- ◆ Supports 4-bit SDIO and 1-bit SDIO transfer modes.
- ◆ Special interrupt register for information exchange.
- ◆ Allows card to interrupt host.

SDIO Interface Signals

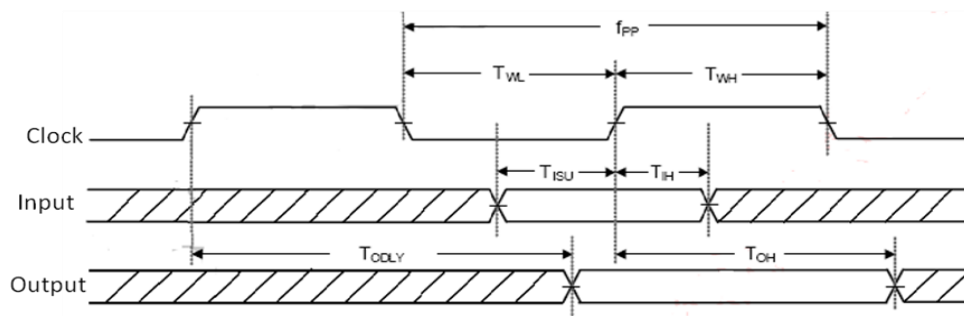
AW-AM457-D SDIO Pin Name	Type	Description
SDIO_DATA_CLK	I	SDIO 4-bit mode: Clock SDIO 1-bit mode: Clock
SDIO_DATA_CMD	I/O	SDIO 4-bit mode: Command line SDIO 1-bit mode: Command line
SDIO_DATA_3	I/O	SDIO 4-bit mode: Data line Bit[3] SDIO 1-bit mode: Not used
SDIO_DATA_2	I/O	SDIO 4-bit mode: Data line Bit[2] or Read Wait (optional) SDIO 1-bit mode: Read Wait (optional)
SDIO_DATA_1	I/O	SDIO 4-bit mode: Data line Bit[1] SDIO 1-bit mode: Interrupt
SDIO_DATA_0	I/O	SDIO 4-bit mode: Data line Bit[0] SDIO 1-bit mode: Data line

3.4.2 SDIO Protocol Timing

3.4.2.1 Default Speed, High-Speed Modes (3.3V)



SDIO protocol timing Diagram - Default mode. (3.3V)

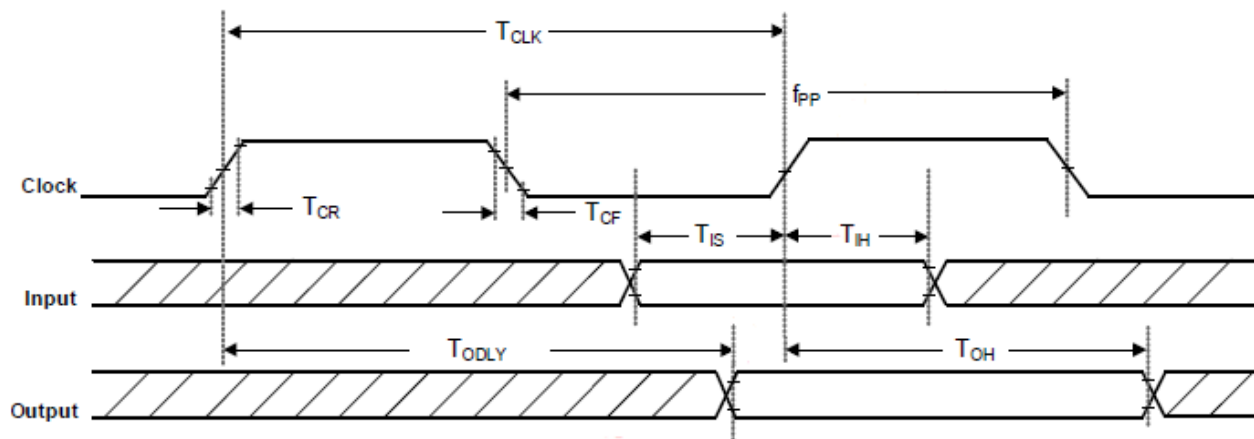


SDIO protocol timing Diagram - High Speed mode. (3.3V)

Symbol	Parameter	Condition	Min	Typ	Max	Units
f _{pp}	CLK Frequency	Normal	0	--	25	MHz
		High Speed	0	--	50	MHz
T _{WH}	CLK High Time	Normal	10	--	--	ns
		High Speed	7	--	--	ns
T _{WL}	CLK Low Time	Normal	10	--	--	ns
		High Speed	7	--	--	ns
T _{ISU}	Input Setup Time	Normal	5	--	--	ns
		High Speed	6	--	--	ns
T _{IH}	Input Hold Time	Normal	5	--	--	ns
		High Speed	2	--	--	ns
T _{ODLY}	Output Delay Time	Normal	--	--	14	ns
	CL ≤ 40pF (1 card)	High Speed	--	--	14	ns
T _{OH}	Output Hold Time	High Speed	2.5	--	--	ns

SDIO Timing Data – Default Speed / High-Speed modes. (3.3V)

3.4.2.2 SDR12, SDR25, SDR50 Modes (up to 100MHz) (1.8V)

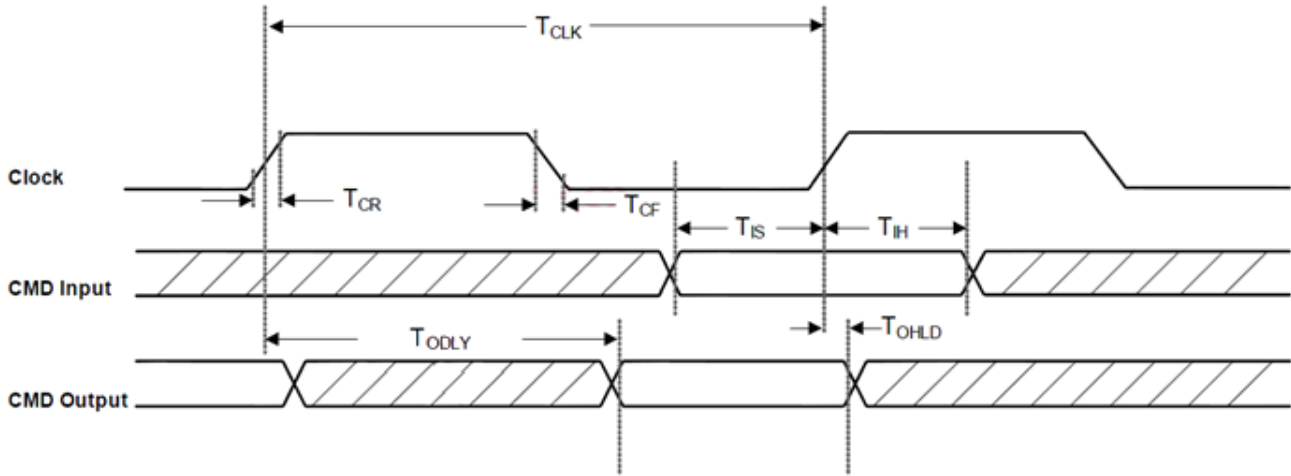


SDIO Protocol Timing Diagram - SDR12, SDR25, SDR50 Modes (up to 100 MHz)(1.8V)

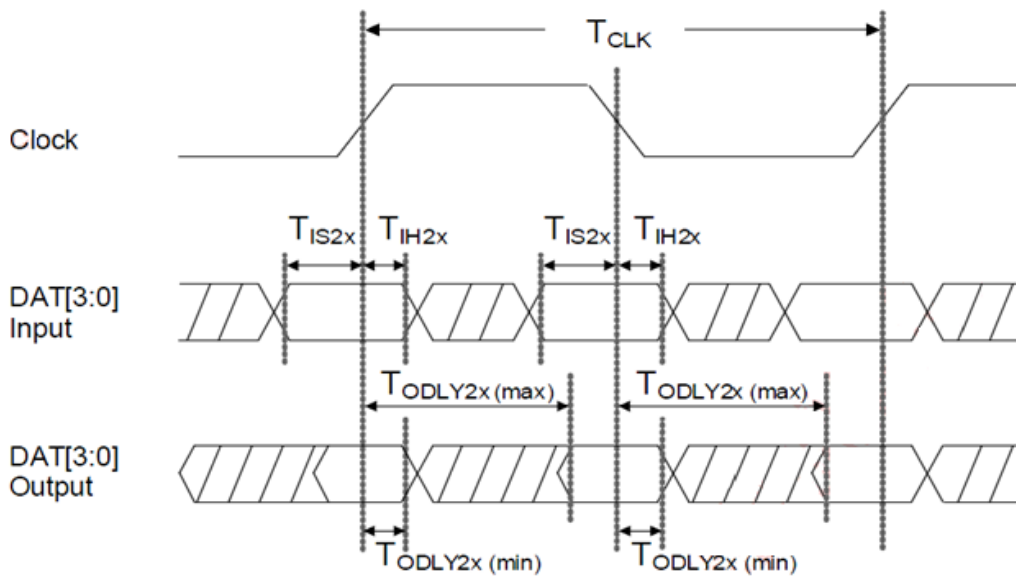
Symbol	Parameter	Condition	Min	Typ	Max	Units
F_{pp}	CLK Frequency	SDR12/25/50	25	-	100	MHz
T_{CLK}	Clock Time	SDR12/25/50	10	-	40	ns
T_{IS}	Input Setup Time	SDR12/25/50	3	-	-	ns
T_{IH}	Input Hold Time	SDR12/25/50	0.8	-	-	ns
T_{CR}, T_{CF}	Rise time, fall time TCR, TCF < 2ns(max) at 100MHz CCARD = 10pF	SDR12/25/50	-	-	$0.2 \cdot T_{CLK}$	ns
T_{ODLY}	Output Delay Time CL ≤ 30pF	SDR12/25/50	-	-	7.5	ns
T_{OH}	Output Hold Time CL = 15pF	SDR12/25/50	1.5	-	-	ns

SDIO Timing Data - SDR12/25/50 modes. (1.8V)

3.4.2.3 DDR50 Mode (50MHz) (1.8V)



SDIO CMD Timing Diagram - DDR50 Mode (50 MHz)



SDIO DAT[3:0] Timing Diagram - DDR50 Mode¹ (50 MHz)

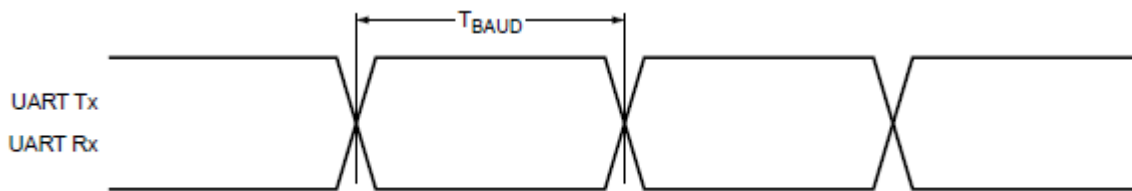
¹ In DDR50 mode, DAT[3:0] lines are sampled on both edges of the clock (not applicable for CMD line).

Symbol	Parameter	Condition	Min	Typ	Max	Units
Clock						
T _{CLK}	Clock time	DDR50	20	-	-	ns
T _{CR} , T _{CF}	Rise time, fall time	DDR50	-	-	0.2*T _{CLK}	Ns
Clock Duty		DDR50	45	-	55	%
CMD Input						
T _{IS}	Input setup time	DDR50	6	-	-	ns
T _{IH}	Input hold time	DDR50	0.8	-	-	ns
CMD Output						
T _{ODLY}	Output delay time during data transfer mode	DDR50	-	-	13.7	ns
T _{OHLD}	Output hold time	DDR50	1.5	-	-	ns
DAT [3:0] Input						
T _{IS2X}	Input setup time	DDR50	3	-	-	ns
T _{IH2X}	Input hold time	DDR50	0.8	-	-	ns
DAT [3:0] Output						
T _{ODLY2X(max)}	Output delay time during data transfer mode	DDR50	-	-	7	ns
T _{ODLY2X(min)}	Output hold time	DDR50	1.5	-	-	ns

SDIO Timing Data - DDR50 Mode (50MHz)

3.4.3.High-Speed UART Interface

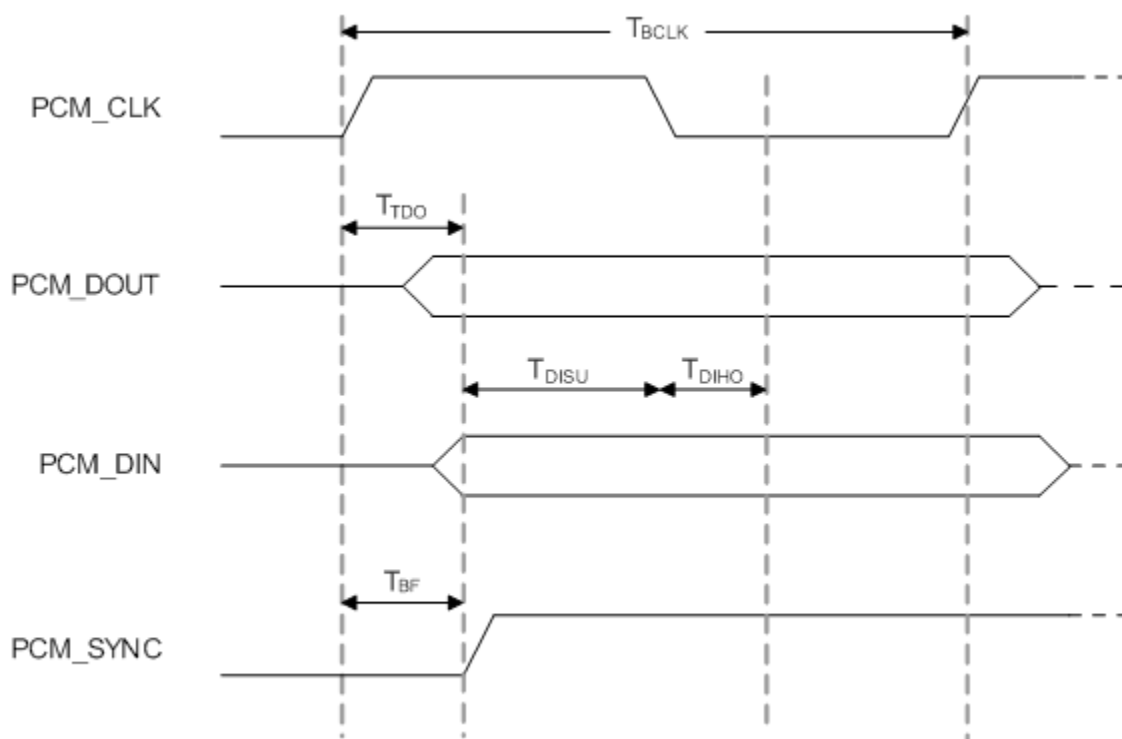
The AW-AM457-D supports a high-speed Universal Asynchronous Receiver/Transmitter (UART) interface, compliant to the industry standard 16550 specification. High-speed baud rates are supported to provide the physical transport between the device and the host for exchanging Bluetooth data.



Symbol	Parameter	Condition	Min	Typ	Max	Units
T_{BAUD}	Baud rate	26MHz input clock	250	-	-	ns

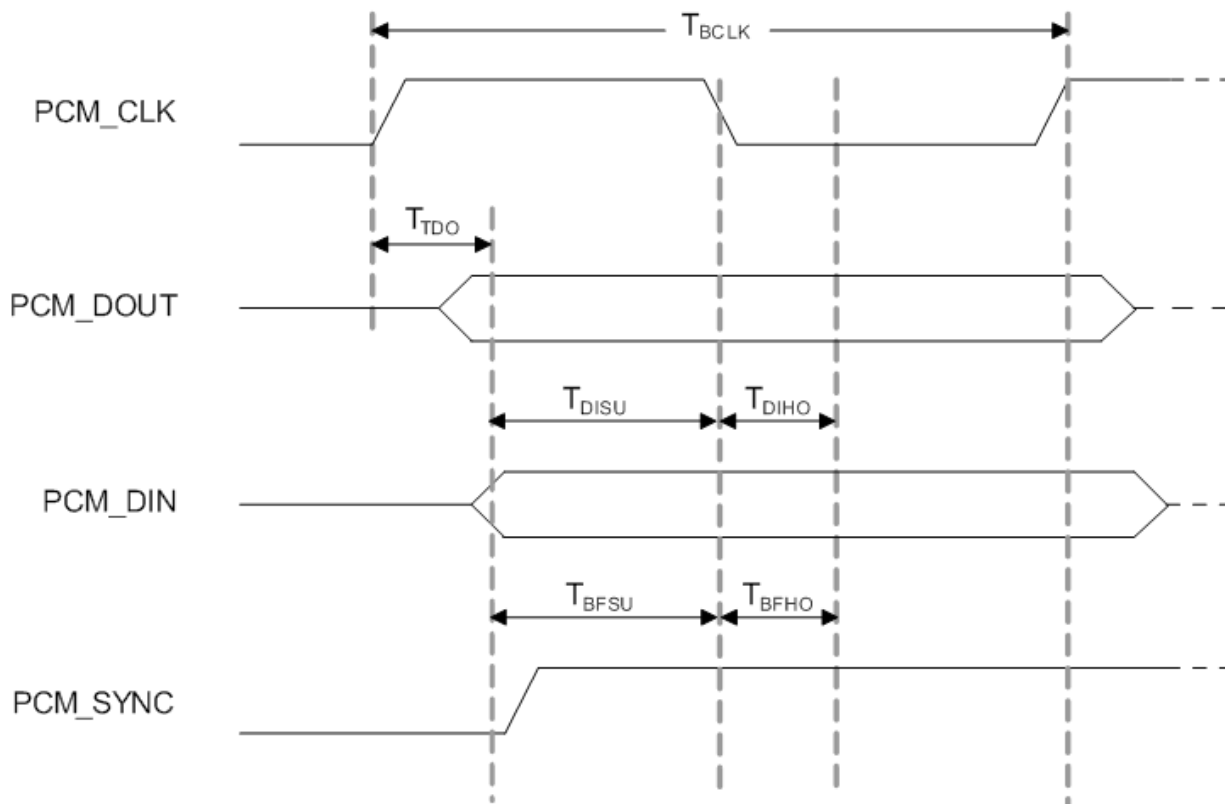
3.4.4 PCM Interface

3.4.4.1 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_{DIHO}	--	--	15	--	--	ns
T_{BF}	--	--	--	--	15	ns

3.4.4.2 PCM Timing Specification – Slave Mode

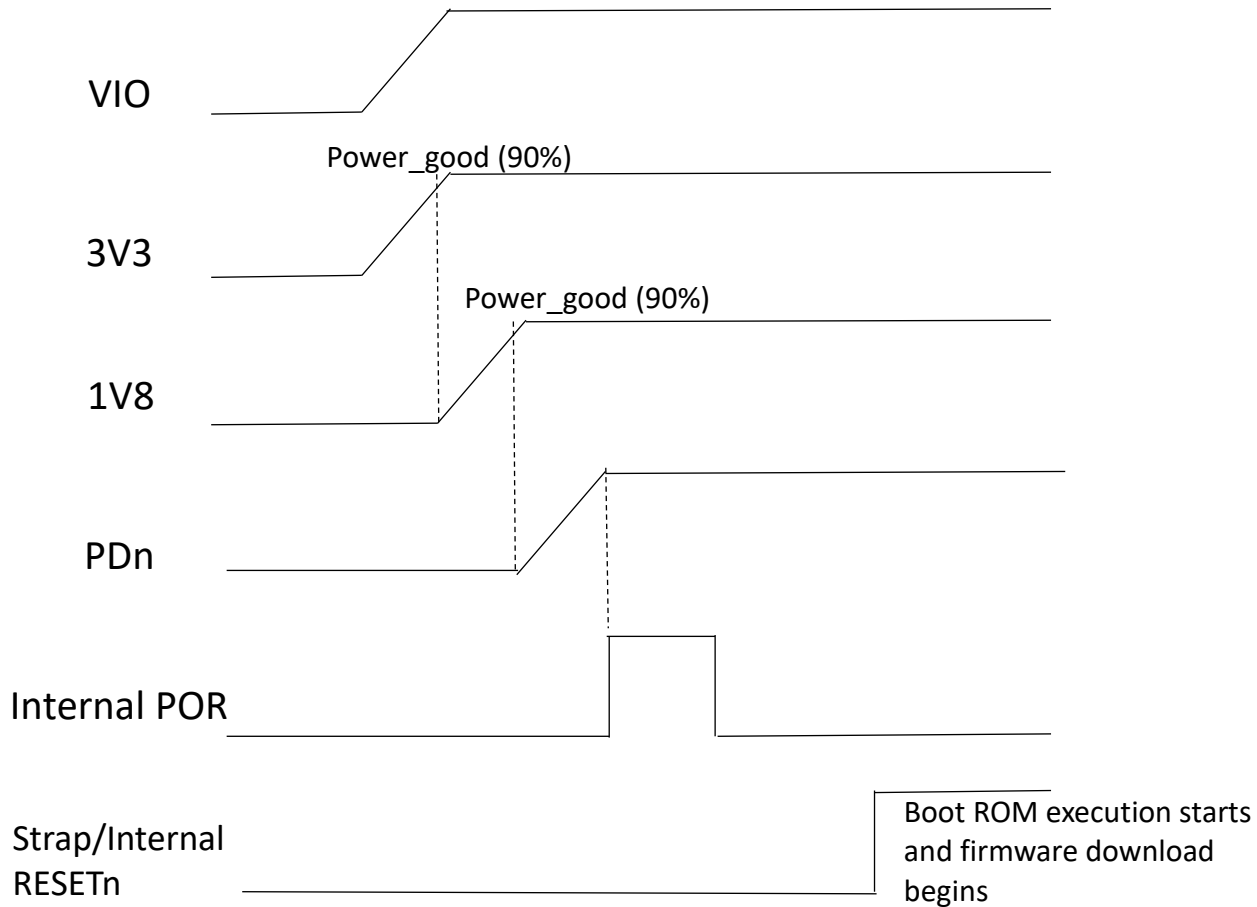


Symbol	Parameter	Condition	Min	Typ	Max	Units
F_{BCLK}	--	--	--	2/2.048	--	MHz
Duty Cycle $_{BCLK}$	--	--	0.4	0.5	0.6	--
T_{BCLK} rise/fall	--	--	--	3	--	ns
T_{DO}	--	--	--	--	30	ns
T_{DISU}	--	--	15	--	--	ns
T_{DIHO}	--	--	10	--	--	ns
T_{BFSU}	--	--	15	--	--	ns
T_{BFHO}	--	--	10	--	--	ns

3.5 Timing Sequence

AW-AM457-D power up timing sequence.

- VDD33 must be good (90%) before +1.8V starts ramping up.
- +1.8V must be good (90%) before PDn starts ramping up.



3.6 Power Consumption

3.6.1 WLAN

Test Condition

1. All results are with the **Bluetooth off** .(hciconfig hci0 down)
2. All results are run to **take 3 minutes** then record the test **average** and maximum value.

No.	Item			VDD=3.3 V		
				Max.	Avg.	
1	WLAN OFF ^{*(1)}			TBD	TBD	
2	Sleep ^{*(3)}			TBD	TBD	
3	Power Save DTIM1 (2.4GHz) ^{*(4) (6)}			TBD	TBD	
4	Power Save DTIM3 (2.4GHz) ^{*(5) (6)}			TBD	TBD	
5	Power Save DTIM1 (5GHz) ^{*(4) (6)}			TBD	TBD	
6	Power Save DTIM3 (5GHz) ^{*(5) (6)}			TBD	TBD	
No.	Item			VDD=3.3 V		
				Max.	Avg.	
Band (GHz)	Mode	BW (MHz)	RF Power (dBm)	Transmit		
				Max.	Avg.	Duty (%)
2.4	11b@1Mbps	20	17	387.3mA	383.7mA	93 %
	11g@54Mbps	20	16	343.9mA	336.9mA	72 %
	11n@MCS7	20	14	311.8mA	305.4mA	70 %
	11n@MCS7	40	14	303.9mA	297.9mA	62 %
5	11a@54Mbps	20	16	454.2mA	447.0mA	75 %
	11n@MCS7	20	15	435.3mA	427.8mA	74 %
	11n@MCS7	40	14	403.4mA	395.8mA	74 %
Band (GHz)	Mode	BW(MHz)		Receive		
				Max.	Avg.	
2.4	11b@1Mbps	20		80.0mA	74.1mA	
	11n@MCS7	20		79.3mA	82.2mA	
5	11a@54Mbps	20		120.4mA	101.5mA	
	11n@MCS7	20		102.2mA	99.4mA	
	11n@MCS7	40		119.0mA	116.2mA	
No.	Item			VIO=3.3 V		
				Max.	Avg.	
1	WLAN OFF ^{*(1)}			TBD	TBD	
2	Sleep ^{*(3)}			TBD	TBD	
3	Power Save DTIM1 (2.4GHz) ^{*(4) (6)}			TBD	TBD	
4	Power Save DTIM3 (2.4GHz) ^{*(5) (6)}			TBD	TBD	
5	Power Save DTIM1 (5GHz) ^{*(4) (6)}			TBD	TBD	
6	Power Save DTIM3 (5GHz) ^{*(5) (6)}			TBD	TBD	
No.	Item			VIO=3.3 V		

Band (GHz)	Mode	BW (MHz)	RF Power (dBm)	Max.		Avg.
				Transmit		
				Max.	Avg.	Duty (%)
2.4	11b@1Mbps	20	17	2.80mA	2.78mA	52 %
	11g@54Mbps	20	16	2.79mA	2.78mA	52 %
	11n@MCS7	20	14	2.79mA	2.78mA	48 %
	11n@MCS7	40	14	2.80mA	2.78mA	48 %
5	11a@54Mbps	20	16	2.80mA	2.79mA	48 %
	11n@MCS7	20	15	2.80mA	2.78mA	47 %
	11n@MCS7	40	14	2.80mA	2.78mA	49 %
Band (GHz)	Mode	BW(MHz)	Receive			
			Max.		Avg.	
2.4	11b@1Mbps	20	2.78mA		2.77mA	
	11n@MCS7	20	2.79mA		2.78mA	
5	11a@54Mbps	20	2.79mA		2.78mA	
	11n@MCS7	20	2.79mA		2.78mA	
	11n@MCS7	40	2.79mA		2.78mA	

No.	Item			VDD=1.8 V		
				Max.	Avg.	
1	WLAN OFF ^{*(1)}			TBD	TBD	
2	Sleep ^{*(3)}			TBD	TBD	
3	Power Save DTIM1 (2.4GHz) ^{*(4) (6)}			TBD	TBD	
No.	Item			VDD=1.8 V		
				Max.	Avg.	
Band (GHz)	Mode	BW (MHz)	RF Power (dBm)	Transmit		
				Max.	Avg.	Duty (%)
2.4	11b@1Mbps	20	17	182.5 mA	177.4 mA	98%
	11g@54Mbps	20	16	181.4 mA	180.3 mA	80%
	11n@MCS7	20	14	178.6 mA	177.8 mA	79%
	11n@MCS7	40	14	179.8 mA	179.1 mA	70%
5	11a@54Mbps	20	16	210.7 mA	204.5 mA	83%
	11n@MCS7	20	15	212.4 mA	209.0 mA	80%
	11n@MCS7	40	14	213.0 mA	210.2 mA	73%
Band (GHz)	Mode	BW(MHz)		Receive		
				Max.	Avg.	
2.4	11b@1Mbps	20		70.0 mA	69.7 mA	
	11n@MCS7	20		76.2 mA	76.1 mA	
5	11a@54Mbps	20		96.5 mA	96.4 mA	
	11n@MCS7	20		95.5 mA	95.3 mA	
	11n@MCS7	40		108.9 mA	108.7 mA	

3.6.2 Bluetooth

Test Condition

1. The Bluetooth is in **test mode** run transmit or receive with a specified output power measure current consumption.
2. All results are run to **take 3 minutes** then record the test **average** and maximum value.

No.	Mode	Packet Type	RF Power (dBm)	VDD=3.3 V	
				Max.	Avg.
1	Transmit ^{*(1)}	DH5	12	177.4mA	152.3mA
2	Receive ^{*(2)}	3DH5	n/a	99.2mA	95.5mA
3	Transmit ^{*(3)}	LE	10	115.6mA	105.7mA
4	Receive ^{*(4)}	LE	n/a	104.0mA	97.1mA
No.	Mode	Packet Type	RF Power (dBm)	VIO=3.3V	
				Max.	Avg.
1	Transmit ^{*(1)}	DH5	12	2.79mA	2.77mA
2	Receive ^{*(2)}	3DH5	n/a	2.77mA	2.76mA
3	Transmit ^{*(3)}	LE	10	2.80mA	2.77mA
4	Receive ^{*(4)}	LE	n/a	2.77mA	2.76mA
No.	Mode	Packet Type	RF Power (dBm)	VDD=1.8V	
				Max.	Avg.
1	Transmit ^{*(1)}	DH5	12	131.2mA	129.5mA
2	Receive ^{*(2)}	3DH5	n/a	94.3mA	93.3mA
3	Transmit ^{*(3)}	LE	10	121.5mA	119.2mA
4	Receive ^{*(4)}	LE	n/a	95.7mA	94.7mA

3.7 Sleep Clock

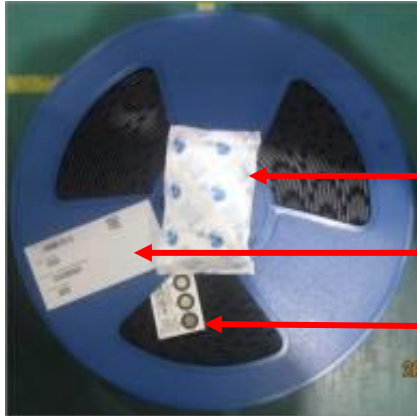
An external crystal is used for generating all radio frequencies and normal operation clocking. As an alternative, an external frequency reference driven by a temperature-compensated crystal oscillator (TCXO) signal may be used. No software settings are required to differentiate between the two. In addition, a low-power oscillator (LPO) is provided for lower power mode timing.

External 32.768KHz Low-Power Oscillator

Symbol	Parameter	Min	Typ	Max	Units
CLK	Clock frequency range/ accuracy ■ CMOS input clock signal type ■ ± 250 ppm (initial, aging, temperature)	-	32.768	-	kHz
PN	Phase noise requirement (@ 100KHz)	-	-125	-	dBc/Hz
J _c	Cycle jitter	-	1.5	-	ns (RMS)
SR	Slew rate limit (10-90%)	-	-	100	ns
DC	Duty cycle tolerance	20	-	80	%

5. Packing Information

1. One reel can pack 750pcs 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

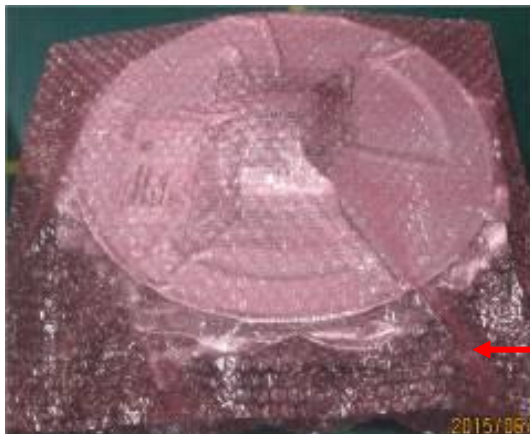
One humidity indicator card

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



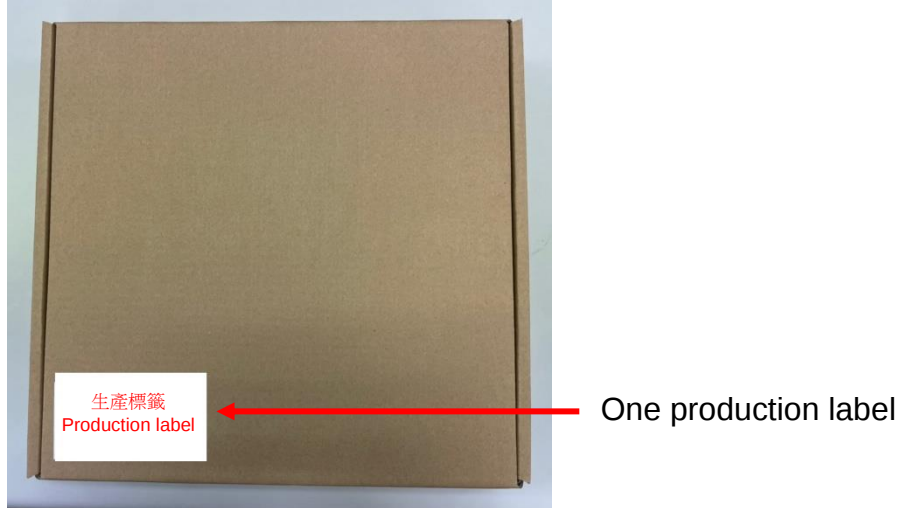
One production label

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



6. 4 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

One carton label

One box label



Example of carton label	 <table border="1"> <tr> <td>AzureWave P/N</td><td>2-XXXXX-XXX</td></tr> <tr> <td>Customer</td><td>由業務提供</td></tr> <tr> <td>Customer P/N</td><td>由業務提供</td></tr> <tr> <td>Customer P/O</td><td>由業務提供</td></tr> <tr> <td>Description</td><td>AW-XXXXXX</td></tr> <tr> <td>Q'ty</td><td>依照實際出貨數量</td></tr> <tr> <td>C/N</td><td></td></tr> <tr> <td>N.W.</td><td>G.W.</td></tr> </table> RoHS  Made in China	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		N.W.	G.W.
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																	
N.W.	G.W.																
Example of box label	 BOX0275351 2-XXXXX-XXX 数量: XXX XXXXXX 股份有限公司																



AzureWave

AzureWave Technologies, Inc.

Example of production label	
Example of balance label	

Note:

- ◆ 1 reel = 1 inner box = 750pcs
- ◆ 1 carton = 4 inner boxes = 4 * 750pcs = 3,000pcs