

AW-AM497,AW-AM617

802.11ac with BT5.2 Combo Module
802.11ac with BT5.3 Combo Module

Datasheet

Rev. H

DF

(For Standard)

Features

WLAN

- Full IEEE 802.11a/b/g/n compatibility with enhanced performance:
- 802.11ac friendly, MCS8 (256-QAM) for 20 MHz channels in 5 GHz band.
- Single spatial stream with PHY data rates of up to 72.2 Mbps with 802.11n (MCS7) and 78 Mbps with 802.11ac (MCS8).
- 20 MHz channels with optional SGI support for MCS0-MCS7.
- IEEE 802.11ac explicit beamformer support.
- TX and RX low-density parity check (LDPC) support for improved range and power efficiency.
- Receive space-time block coding (STBC)
- On-chip power amplifier/low-noise amplifier for both bands.

Bluetooth

- All optional Bluetooth 5.2 features supported.
- Bluetooth Class 1 or Class 2 transmitter operation.
- Supports BDR (1Mbps), EDR (2/3Mbps), BLE (1/2Mbps).
- Host controller interface (HCI) using a high-speed UART interface.
- PCM for audio data.
- Bluetooth 5.2 compliant with 2 Mbps GFSK data rate for BLE.

Revision History

Document NO: **R2-2497-DST-01**

Version	Revision Date	DCN NO.	Description	Initials	Approved
A	2020/07/27	DCN018259	● First Release	QM.TAN	N.C Chen
B	2021/01/26	DCN020584	● Re-format	QM.TAN	N.C Chen
C	2021/04/13	DCN021225	● Cypress to Infineon ● Update ESD Specification ● Modify BT Rx Specification	QM.TAN	N.C Chen
D	2021/06/18	DCN022113	● Update Power Consumption ● Update ESD Specification	QM.TAN	N.C Chen
E	2021/08/19	DCN022947	● Update Pin Out	QM.TAN	N.C Chen
F	2022/04/07	DCN025890	● Modified BT Ver. 5.0 to 5.2	QM.TAN	N.C Chen
G	2022/10/04	DCN027596	● Modified BT Power Spec	QM.TAN	N.C Chen
H	2023/04/13	DCN029041	● Removed External Crystal Information	QM.TAN	N.C Chen

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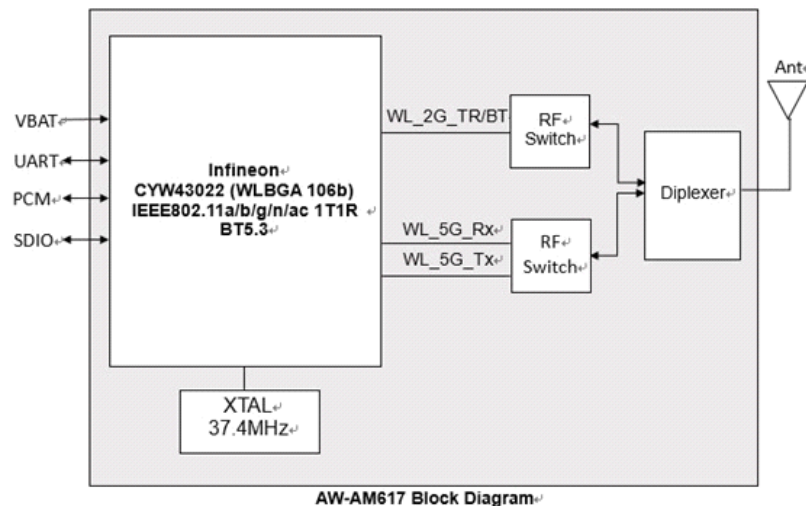
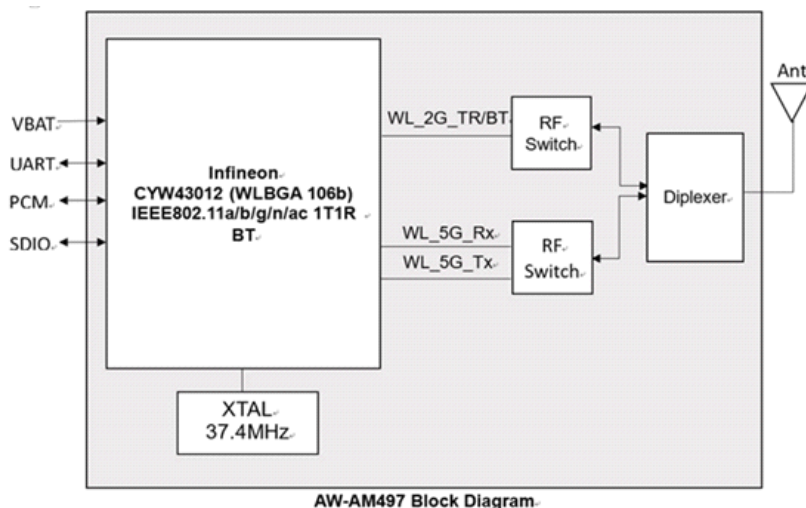
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1. Introduction

1.1 Product Overview

The Infineon CYW43012 single-chip device integrates a IEEE 802.11a/b/g/n compliant 802.11ac-friendly MAC/baseband/radio and Bluetooth 5.2 + EDR (enhanced data rate). It provides a small form-factor solution with minimal external components to drive down cost for mass volumes and allows for handheld device flexibility in size, form, and function. Comprehensive power management circuitry and software ensure the system can meet the needs of highly mobile devices that require minimal power consumption and reliable operation.

1.2 Block Diagram



1.3 Specifications Table

1.3.1 General

Features	Description
Product Description	IEEE 802.11 a/b/g/n Wi-Fi with ac friendly + Bluetooth 5.2 Combo LGA Module
Major Chipset	CYW43012 (WLBGA 106p)
Host Interface	WiFi + BT ● SDIO + UART
Dimension	12.0mm(L) x 12.0mm(W) x 1.75 mm(H)
Form Factor	● LGA module, 47 pins
Antenna	For LGA, "1T1R, external" ANT1(Main) : WiFi/Bluetooth → TX/RX
Weight	0.5g

1.3.2 WLAN

Features	Description
WLAN Standard	IEEE802.11 a/b/g/n/ac 1T1R
WLAN VID/PID	N/A
WLAN SVID/SPID	N/A
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	802.11a/g/n/ac: OFDM 802.11b: CCK(11, 5.5Mbps), DQPSK(2Mbps), BPSK(1Mbps)
Number of Channels	802.11b: USA, Canada and Taiwan – 1 ~ 11 Most European Countries – 1 ~ 13 802.11g: USA and Canada – 1 ~ 11 Most European Countries – 1 ~ 13 802.11n: USA and Canada – 1 ~ 11 Most European Countries – 1 ~ 13



	802.11a,802.11n (HT20) and 802.11ac (VHT20): USA – 36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140,144,149, 153, 157, 161, 165 Canada-36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 132, 136, 140,144,149, 153, 157, 161, 165				
Output Power (Board Level Limit)*	2.4G				
		Min	Typ	Max	Unit
	11b (11Mbps) @EVM<35%	16	18	20	dBm
	11g (54Mbps) @EVM≤-25 dB	13	15	17	dBm
	11n (HT20 MCS7) @EVM≤-27 dB	13	15	17	dBm
	5G				
		Min	Typ	Max	Unit
	11a (54Mbps) @EVM≤-25 dB	11	13	15	dBm
	11n (HT20 MCS7) @EVM≤-27 dB	11	13	15	dBm
	11ac (VHT20 MCS8) @EVM≤-30 dB	8	10	12	dBm
Receiver Sensitivity	2.4G				
		Min	Typ	Max	Unit
	11b (11Mbps)	-	-89	-86	dBm
	11g (54Mbps)	-	-77	-74	dBm
	11n (HT20 MCS7)	-	-77	-74	dBm
	5G				
		Min	Typ	Max	Unit
	11a (54Mbps)	-	-75	-72	dBm
	11n (HT20 MCS7)	-	-75	-72	dBm
	11ac (VHT20 MCS8)	-	-72	-69	dBm
Data Rate	802.11b: 1, 2, 5.5, 11Mbps 802.11a/g: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n:MCS0~7 802.11ac:MCS0~8				
Security	◆ WEP ◆ WPA Personal, WPA2 Personal, WPA3 Personal ◆ WMM, WMM-PS (U-APSD), WMM-SA, AES (hardware accelerator)				

	◆ TKIP (hardware accelerator) ◆ CKIP (software support)
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* If you have any certification questions about output power please contact FAE directly.

1.3.3 Bluetooth

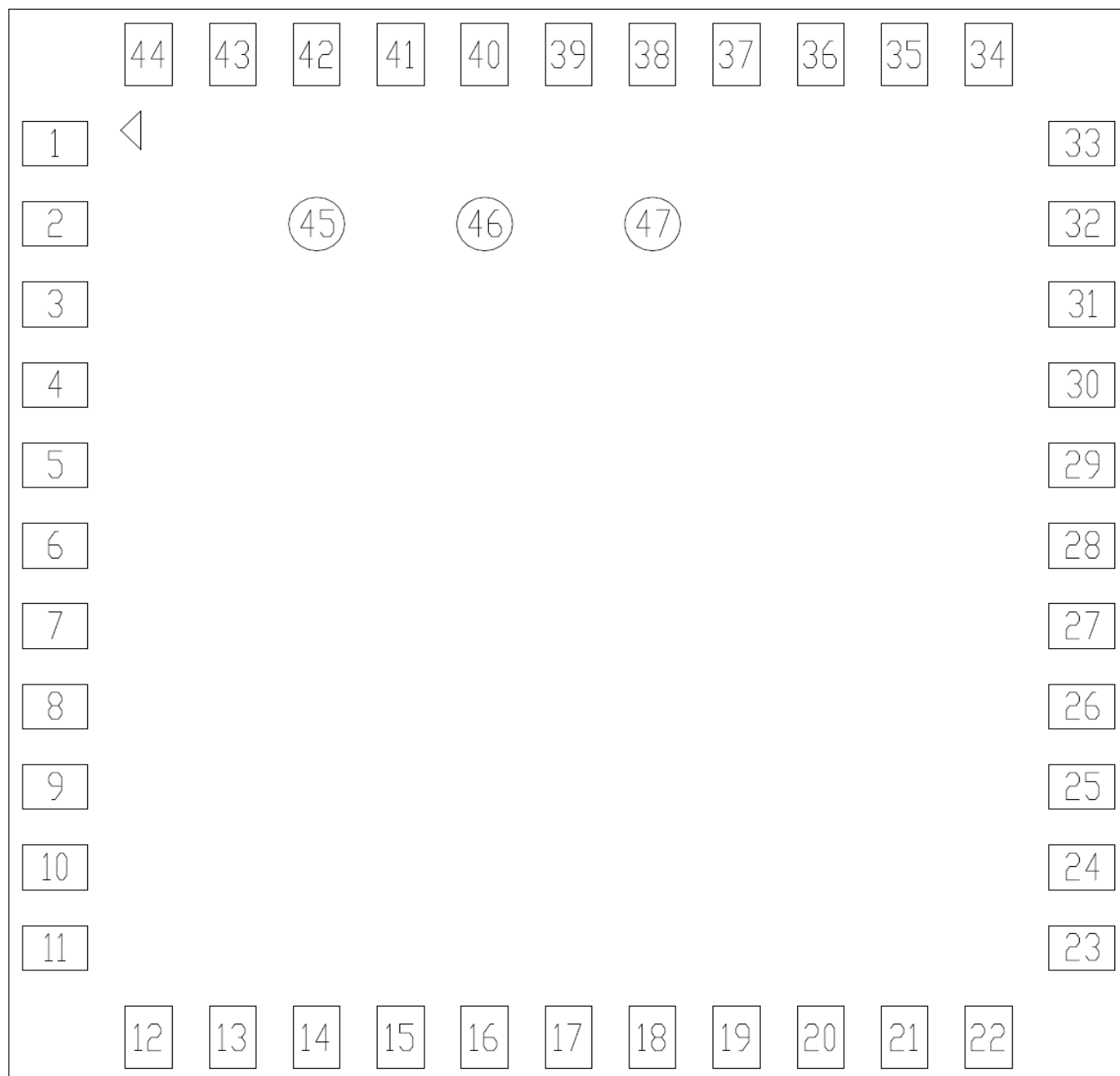
Features	Description				
Bluetooth Standard	Bluetooth 5.2 (Core Specification)				
Bluetooth VID/PID	N/A				
Frequency Range	2402MHz~2480MHz				
Modulation	Header GFSK Payload 2M: 4-DQPSK Payload 3M: 8DPSK				
Output Power		Min	Typ	Max	Unit
	Basic Rate	3		10	dBm
	Low Energy	3		10	dBm
Receiver Sensitivity	BT Sensitivity (BER<0.1%)				
		Min	Typ	Max	Unit
	BDR		-92	-87	dBm
	EDR (2DH5)		-92	-87	dBm
	EDR (3DH5)		-87	-82	dBm
	Low Energy		-95	-90	dBm

1.3.4 Operating Conditions

Features	Description
Operating Conditions	
Voltage	VBAT: 3.2~4.4V VIO : 1.8V
Operating Temperature	-20°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	1.5KV per MIL-STD-883H Method 3015.8
Changed Device Model	500V per JEDEC EIA/JESD22-C101E

2. Pin Definition

2.1 Pin Map



AW-AM497 Pin Map (Top View)

2.2 Pin Table

Pin No	Definition	Basic Description	Voltage	Type
1	GND1	Ground.		GND
2	WL_BT_ANT	WLAN/BT RF TX/RX path.		RF
3	GND2	Ground.		GND
4	NC1	Floating		I/O
5	NC2	Floating		I/O
6	BT_WAKE	BT Device Wake		I
7	BT_HOST_WAKE	BT Host Wake		O
8	CLK_REQ	Reference clock request		I/O
9	VBAT	3.3V power pin	3.3V	VCC
10	NC3	Floating		I
11	NC4	Floating		O
12	WL_REG_ON	Used by PMU to power up or power down the internal regulators used by the WLAN section. Also, when deasserted, this pin holds the WLAN section in reset. This pin has an internal 200k ohm pull down resistor that is enabled by default. It can be disabled through programming.		I
13	WL_HOST_WAKE	WL Host Wake		O
14	SDIO_DATA_2	SDIO Data Line 2		I/O
15	SDIO_DATA_3	SDIO Data Line 3		I/O
16	SDIO_CMD	SDIO Command Input		I/O
17	SDIO_CLK	SDIO Clock		I
18	SDIO_DATA_0	SDIO Data Line 0		I/O
19	SDIO_DATA_1	SDIO Data Line 1		I/O
20	GND3	Ground.		GND
21	VIN_LDO_OUT	Internal Buck voltage generation pin		VCC
22	VDDIO	1.8V VDDIO supply for WLAN and BT	1.8V	VCC
23	VIN_LDO	Internal Buck voltage generation pin		VCC
24	LPO	External 32K or RTG clock		I
25	PCM_OUT	PCM data out		O
26	PCM_CLK	PCM clock		I/O
27	PCM_IN	PCM data input		I
28	PCM_SYNC	PCM Synchronization control		O
29	NC5	Floating		I/O
30	NC6	Floating		Floating
31	GND4	Ground.		GND
32	NC7	Floating		I/O
33	GND5	Ground.		GND
34	BT_REG_ON	Used by PMU to power up or power down the		I

		internal regulators used by the Bluetooth section. Also, when deasserted, this pin holds the Bluetooth section in reset. This pin has an internal 200k ohm pull down resistor that is enabled by default. It can be disabled through programming.		
35	NC8	Floating		I/O
36	GND	Ground		GND
37	GPIO6	GPIO configuration pin		I/O
38	GPIO4	SECI_IN		I/O
39	GPIO2	GPIO configuration pin		I/O
40	GPIO5	SECI_OUT		I/O
41	UART_RTS_N	High-Speed UART RTS		O
42	UART_TXD	High-Speed UART Data Out		O
43	UART_RXD	High-Speed UART Data In		I
44	UART_CTS_N	High-Speed UART CTS		I
45	TP1	Floating		I/O
46	TP2	Floating		I/O
47	GPIO1_P7	GPIO configuration pin		I/O

3. Electrical Characteristics

3.1 Absolute Maximum Ratings

Symbol	Parameter	Minimum	Typical	Maximum	Unit
V _{BAT}	DC supply for the VBAT and PA driver supply	-0.5	-	+5.0	V
V _{IO}	DC supply voltage for digital I/O	-0.5	-	2.20	V
V _{DDIO RF}	DC supply voltage for RF switch I/Os	-0.5	-	4.10	V
T _j	Maximum junction temperature	-	-	125	°C
TBD	Maximum input power for RX input ports ^b	-	-	0	dBm

3.2 Recommended Operating Conditions

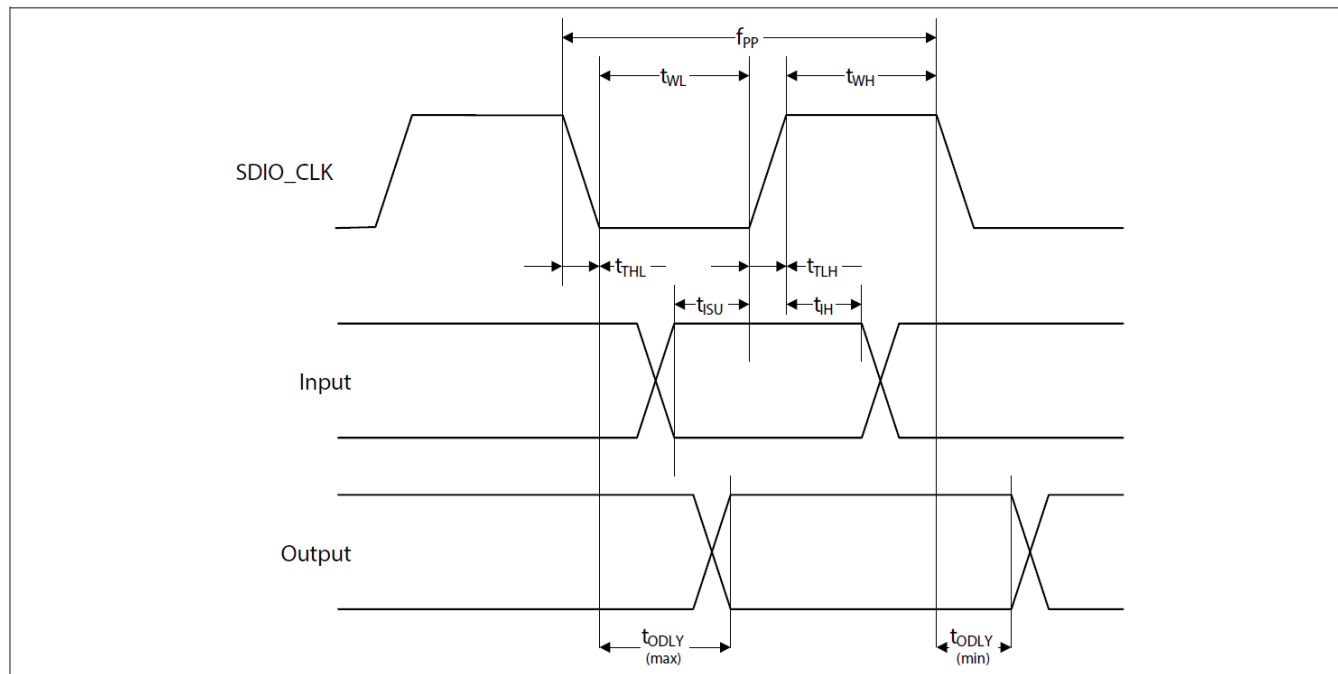
Symbol	Parameter	Minimum	Typical	Maximum	Unit
V _{BAT}	Power supply for Internal Regulator and FEM	3.2	3.6	4.4	V
V _{DDIO}	DC supply voltage for digital I/O	1.62	1.8	1.98	V

3.3 Digital IO Pin DC Characteristics

Symbol	Parameter	Minimum	Typical	Maximum	Unit
V _{IH}	Input high voltage (V _{DDIO})	0.65 × V _{DDIO}	-	-	V
V _{IL}	Input low voltage (V _{DDIO})	-	-	0.35 × V _{DDIO}	V
V _{OH}	Output High Voltage @ 2mA	V _{DDIO} – 0.45	-	-	V
V _{OL}	Output Low Voltage @ 2mA	-	-	0.45	V

3.4 Power up Timing Sequence

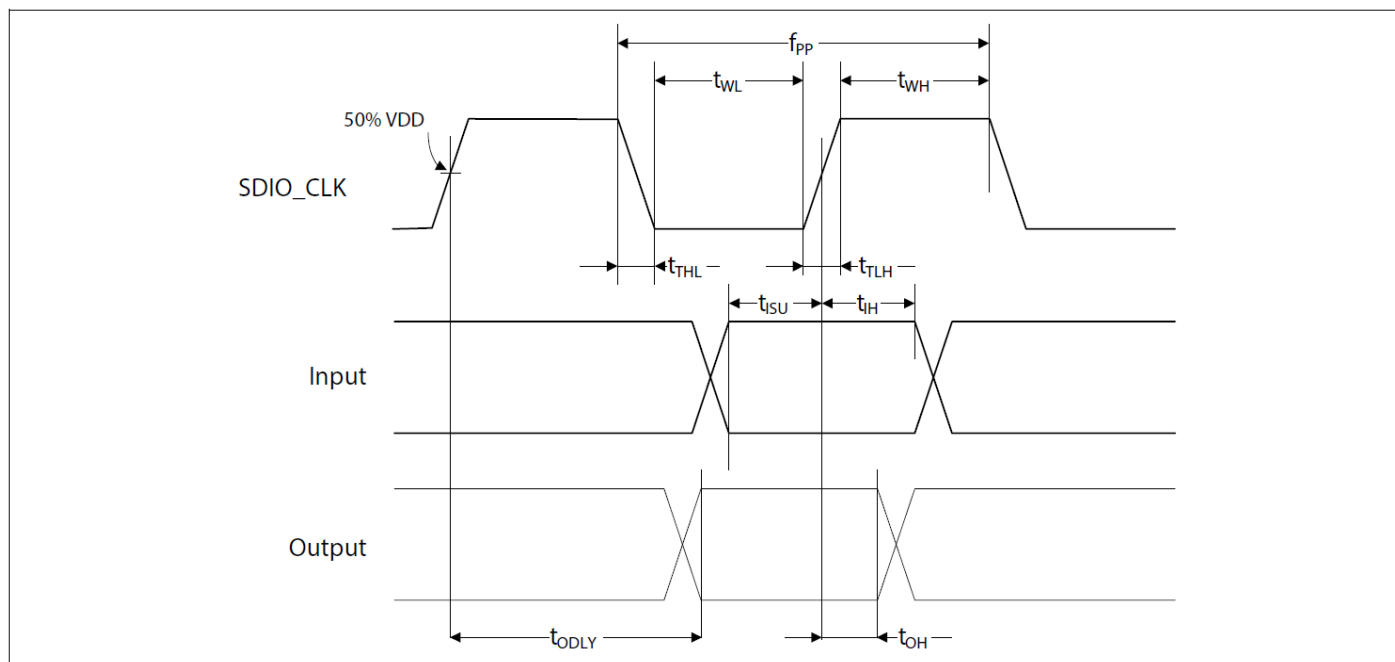
3.4.1 SDIO Host Interface Specification



SDIO Bus Timing (Default Mode)

Parameter	Symbol	Minimum	Typical	Maximum	Unit
SDIO CLK (All values are referred to minimum VIH and maximum VIL)					
Frequency – Data Transfer mode	f_{PP}	0	–	25	MHz
Frequency – Identification mode	f_{OD}	0	–	400	kHz
Clock low time	t_{WL}	10	–	–	ns
Clock high time	t_{WH}	10	–	–	ns
Clock rise time	t_{TLH}	–	–	10	ns
Clock low time	t_{THL}	–	–	10	ns
Inputs: CMD, DAT (referenced to CLK)					
Input setup time	t_{ISU}	5	–	–	ns
Input hold time	t_{IH}	5	–	–	ns
Outputs: CMD, DAT (referenced to CLK)					
Output delay time – Data Transfer mode	t_{ODLY}	0	–	14	ns
Output delay time – Identification mode	t_{ODLY}	0	–	50	ns

SDIO Bus Timing Parameters (Default Mode)



SDIO Bus Timing (High-Speed Mode)

Parameter	Symbol	Minimum	Typical	Maximum	Unit
SDIO CLK (all values are referred to minimum VIH and maximum VIL)					
Frequency – Data Transfer Mode	f_{PP}	0	–	50	MHz
Frequency – Identification Mode	f_{OD}	0	–	400	kHz
Clock low time	t_{WL}	7	–	–	ns
Clock high time	t_{WH}	7	–	–	ns
Clock rise time	t_{TLH}	–	–	3	ns
Clock low time	t_{THL}	–	–	3	ns
Inputs: CMD, DAT (refer- ended to CLK)					
Input setup Time	t_{ISU}	6	–	–	ns
Input hold Time	t_{IH}	2	–	–	ns
Outputs: CMD, DAT (refer- ended to CLK)					
Output delay time – Data Transfer Mode	t_{ODLY}	–	–	14	ns
Output hold time	t_{OH}	2.5	–	–	ns
Total system capacitance (each line)	CL	–	–	40	pF

SDIO Bus Timing a Parameters (High-Speed Mode)

3.4.2 UART Interface

The BT HCI UART is a standard 4-wire interface (RX, TX, RTS, and CTS) with adjustable baud rates from 115200 bps to 4.0 Mbps.

The interface features an automatic baud rate detection capability that returns a baud rate selection. The baud rate may be changed using a vendor-specific UART HCI command.

The UART has a 1040-byte receive FIFO and a 1040-byte transmit FIFO to support EDR. Access to the FIFOs is through the AHB interface through either DMA or the CPU. The UART supports the Bluetooth UART HCI H4 specification. The default baud rate is 115.2 Kbaud.

The AW-AM497 UART can perform XON/XOFF flow control and includes hardware support for the Serial Line Input Protocol (SLIP).

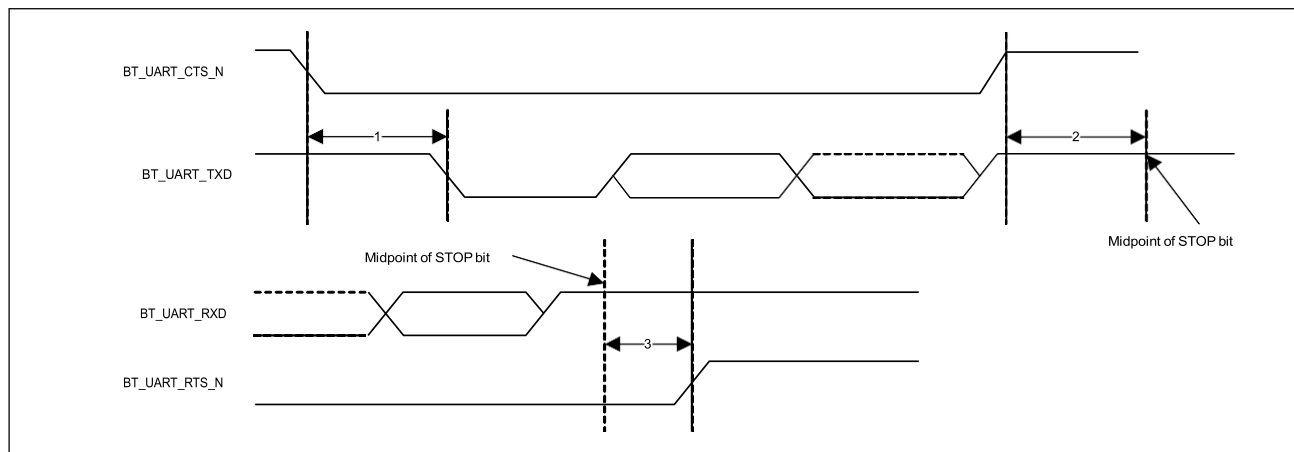
It can also perform wake-on activity. For example, activity on the RX or CTS inputs can wake the chip from a sleep state.

Normally, the UART baud rate is set by a configuration record downloaded after device reset, or by automatic baud rate detection, and the host does not need to adjust the baud rate. Support for changing the baud rate during normal HCI UART operation is included through a vendor-specific command that allows the host to adjust the contents of the baud rate registers.

The AW-AM497 UARTs operate correctly with the host UART as long as the combined baud rate error of the two devices is within $\pm 2\%$.

UART Interface Signals

Pin Number	Signal Name	Description	Type
42	BT_UART_TXD	Bluetooth UART Serial Output. Serial data output for the HCI UART Interface	O
43	BT_UART_RXD	Bluetooth UART Series Input. Serial data input for the HCI UART Interface	I
41	BT_UART_RTS_N	Bluetooth UART Request-to-Send. Active-low request-to-send signal for the HCI UART interface	I
44	BT_UART_CTS_N	Bluetooth UART Clear-to-Send. Active-low clear-to-send signal for the HCI UART interface.	O



UART Timing

	Reference Characteristics	Minimum	Typical	Maximum	Unit
1	Delay time, BT_UART_CTS_N low to BT_UART_TXD valid	—	—	1.5	Bit periods
2	Setup time, BT_UART_CTS_N high before midpoint of stop bit	—	—	0.5	Bit periods
3	Delay time, midpoint of stop bit to BT_UART_RTS_N high	—	—	0.5	Bit periods

UART Timing Specifications

3.4.3 Sequencing of Reset and Regulator Control Signals

The AW-AM497 has two signals that allow the host to control power consumption by enabling or disabling the Bluetooth, WLAN, and internal regulator blocks. These signals are described below. Additionally, diagrams are provided to indicate proper sequencing of the signals for various operational states. The timing values indicated are minimum required values; longer delays are also acceptable.

Description of Control Signals

WL_REG_ON: Used by the PMU to power-up the WLAN section. It is also OR-gated with the BT_REG_ON input to control the internal AW-AM497 regulators. When this pin is high, the regulators are enabled and the WLAN section is out of reset. When this pin is low the WLAN section is in reset. If both the BT_REG_ON and WL_REG_ON pins are low, the regulators are disabled.

BT_REG_ON: Used by the PMU (OR-gated with WL REG ON) to power-up the internal AW-AM497 regulators. If both the BT_REG_ON and WL_REG_ON pins are low, the regulators are disabled. When this pin is low and WL_REG_ON is high, the BT section is in reset.

Note: The AW-AM497 has an internal power-on reset (POR) circuit. The device will be held in reset for a maximum of 110 ms after VDDC and VDDIO have both passed the POR threshold. Wait at least 150 ms after VDDC and VDDIO are available before initiating Host SDIO, UART or SPI accesses.

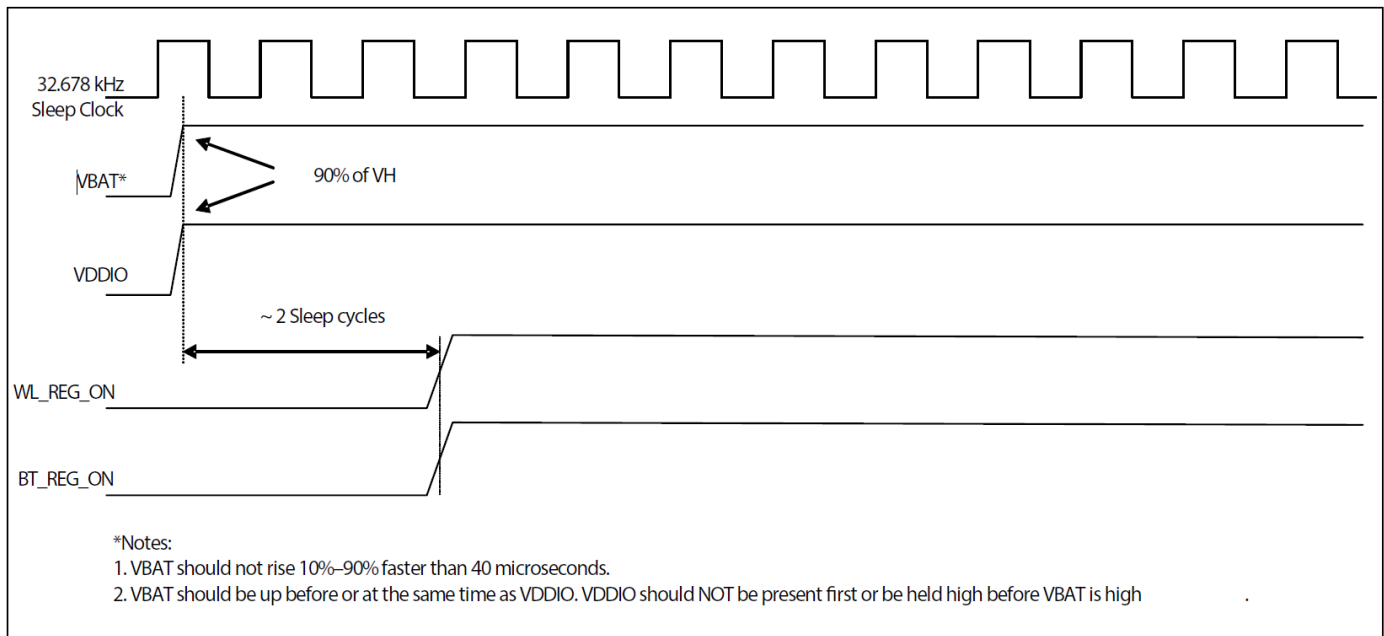
Note: VBAT should not rise 10%–90% faster than 40 microseconds. VBAT should be up before or at the same time as VDDIO. VDDIO should NOT be present first or be held high before VBAT is high.

Power-Up/Power-Down/Reset Circuits

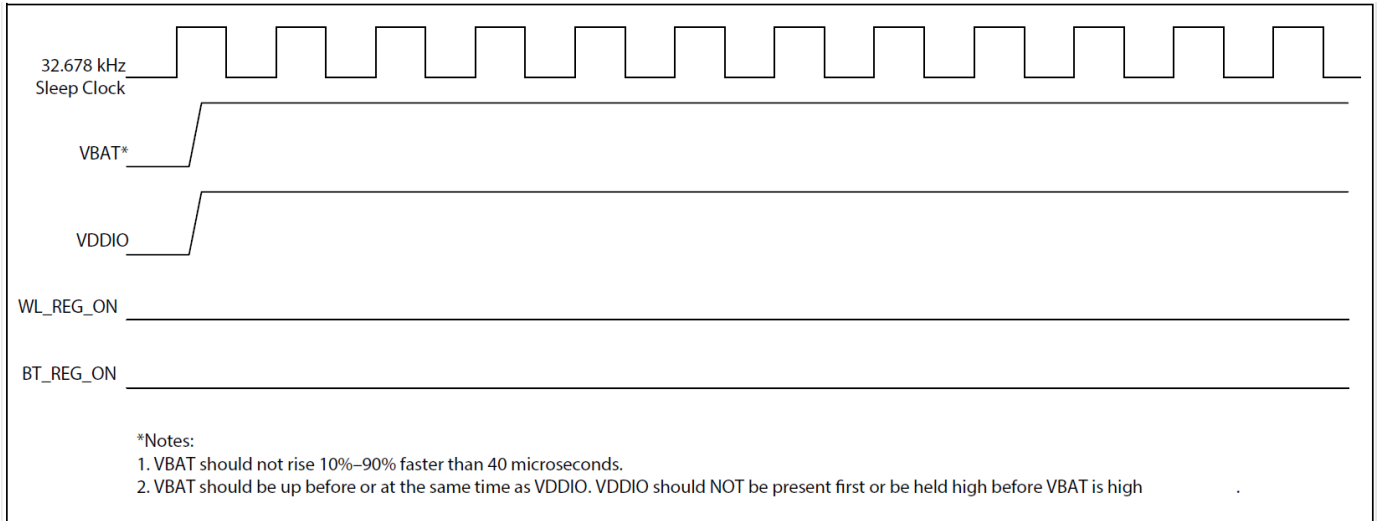
The AW-AM497 has two signals that enable or disable the Bluetooth and WLAN circuits and the internal regulator blocks, allowing the host to control power consumption.

Signal	Description
WL_REG_ON	This signal is used by the PMU (with BT_REG_ON) to power-up the WLAN section. It is also OR-gated with the BT EG ON input to control the internal AW-AM497 regulators. When this pin is high, the regulators are enabled and the WLAN section is out of reset. When this pin is low, the WLAN section is in reset. If BT_REG_ON and WL_REG_ON are both low, the regulators are disabled. This pin has an internal 50 kΩ pull-down resistor that is auto enabled and disabled when the input is low and high, respectively
BT_REG_ON	This signal is used by the PMU (with WL_REG_ON) to decide whether or not to power down the internal AW-AM497 regulators. If BT_REG_ON and WL_REG_ON are low, the regulators will be disabled. This pin has an internal 50 kΩ pull-down resistor that is auto enabled and disabled when the input is low and high, respectively.

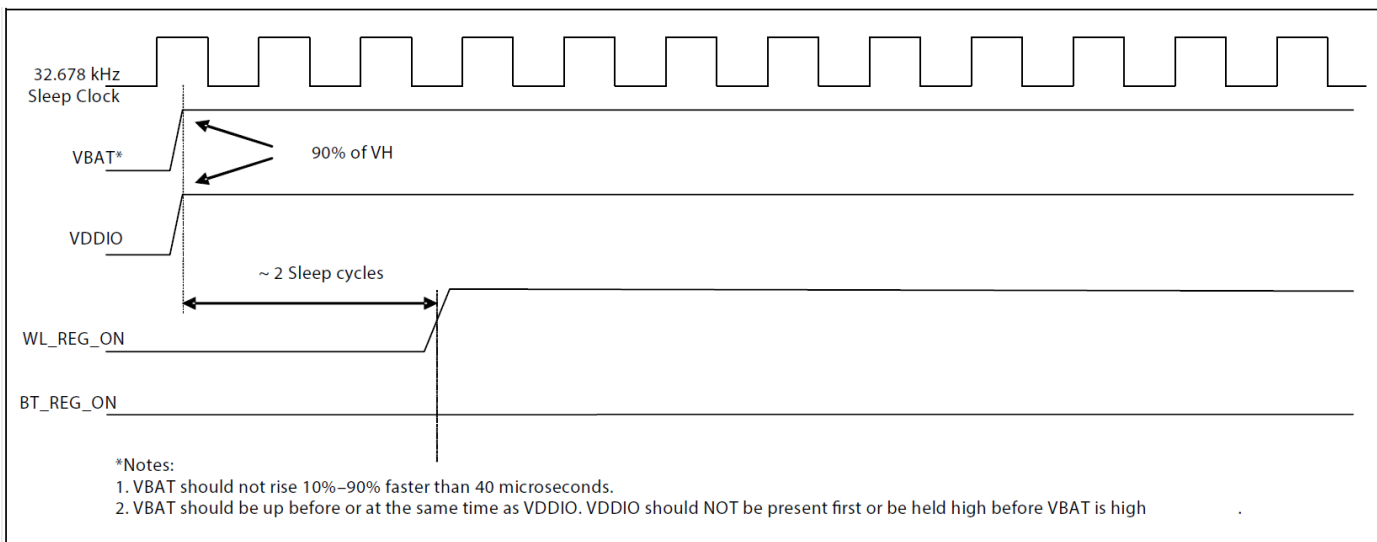
Power-Up/Power-Down/Reset Control Signals



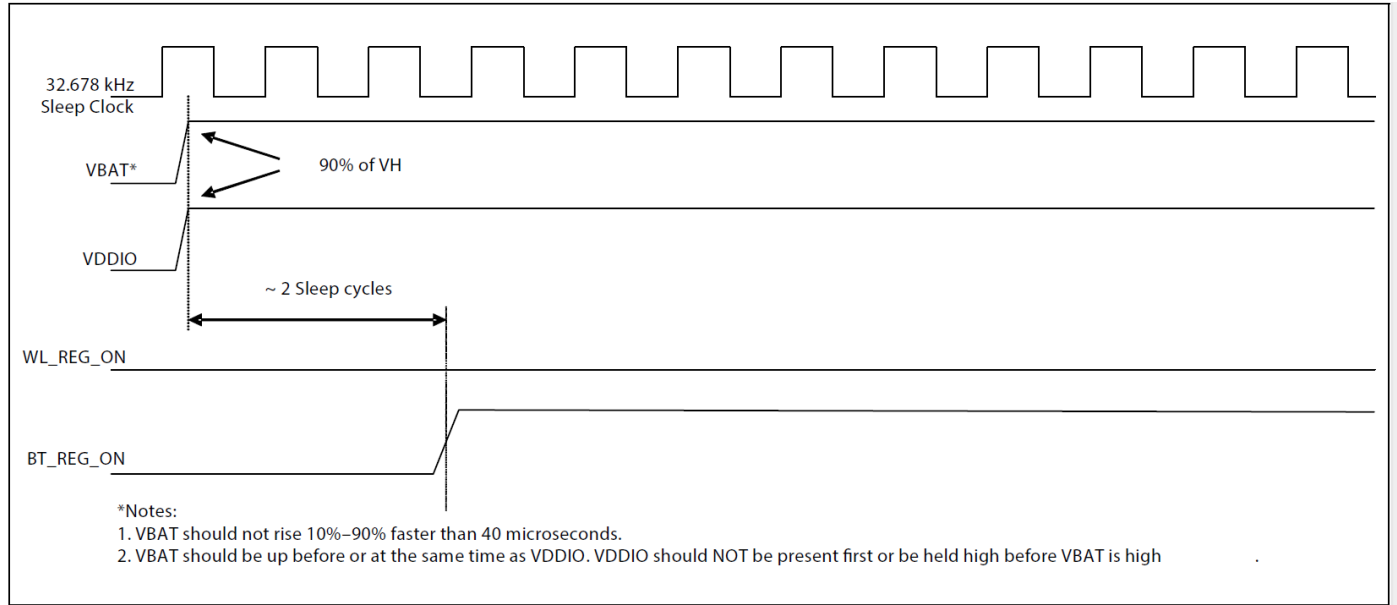
WLAN = ON, Bluetooth = ON



WLAN = OFF, Bluetooth = OFF



WLAN = ON, Bluetooth = OFF



WLAN = OFF, Bluetooth = ON

3.5 Power Consumption*

3.5.1 WLAN

No.	Item			VBAT=3.3V(mA)		
				Max.	Avg.	
1	WLAN OFF ^{*(1)}			1.9uA		
2	Sleep ^{*(3)}			3.0uA	2.9uA	
3	Power Save DTIM1 (2.4GHz) ^{*(4) (6)}			14.1mA	309uA	
4	Power Save DTIM3 (2.4GHz) ^{*(5) (6)}			23.1mA	233uA	
5	Power Save DTIM1 (5GHz) ^{*(4) (6)}			14.2mA	230uA	
6	Power Save DTIM3 (5GHz) ^{*(5) (6)}			15.5mA	127uA	
Band (GHz)	Mode	BW (MHz)	RF Power (dBm)	Transmit		
				Max.	Avg.	Duty (%)
2.4	11b@1Mbps	20	18	202	201	98
	11g@54Mbps	20	15	124	122	64
	11n@MCS7	20	15	119	118	67
5	11a@54Mbps	20	13	177	176	66
	11n@MCS7	20	13	173	172	68
	11ac@MCS8 NSS1	20	10	154	153	49
Band (GHz)	Mode	BW(MHz)		Receive		
				Max.	Avg.	
2.4	11b@1Mbps	20		21.1	19.8	
	11n@MCS7	20		20.8	20.1	
5	11a@54Mbps	20		23.2	22.3	
	11ac@MCS8 NSS1	20		24.1	23.1	

* The power consumption is based on Azurewave test environment, these data for reference only.

No.	Item			VDDIO=1.8 V	
				Max.	Avg.
1	WLAN OFF ^{*(1)}			0.29uA	
2	Sleep ^{*(3)}			105uA	105uA
3	Power Save DTIM1 (2.4GHz) ^{*(4) (6)}			376uA	111uA
Band (GHz)	Mode	BW (MHz)	RF Power (dBm)	Transmit	
				Max.	Avg.
2.4	11b@1Mbps	20	18	2.3mA	2.3mA
Band (GHz)	Mode	BW(MHz)		Receive	
				Max.	Avg.
2.4	11b@1Mbps	20		429uA	424uA

3.5.2 Bluetooth

No.	Mode	Packet Type	RF Power (dBm)	VBAT=3.3 V	
				Max.	Avg.
1	Sleep	n/a	n/a	3.8uA	2.9uA
2	Transmit ^{*(1)}	DH5	9.5	24mA	23mA
3	Receive ^{*(1)}	DH5	n/a	9.6mA	9.5mA
4	Transmit ^{*(2)}	LE	9.4	19.9mA	19.7mA
5	Receive	LE	n/a	10.4mA	10.4mA

* The power consumption is based on Azurewave test environment, these data for reference only.

3.6 Frequency Reference

An external crystal is used for generating all radio frequencies and normal operation clocking. As an alternative, an external frequency reference may be used. In addition, a low-power oscillator (LPO) is provided for lower power mode timing.

External 32.768KHz Low-Power Oscillator

The AW-AM497 uses a secondary low frequency clock for low-power-mode timing. Either the internal low-precision LPO or an external 32.768 kHz precision oscillator is required. The internal LPO frequency range is approximately 33 kHz $\pm$ 30% over process, voltage, and temperature, which is adequate for some applications. However, one trade-off caused by this wide LPO tolerance is a small current consumption increase during power save mode that is incurred by the need to wake-up earlier to avoid missing beacons. Whenever possible, the preferred approach is to use a precision external 32.768 kHz clock that meets the requirements listed in below.

Parameter	LPO Clock	Units
Nominal input frequency	32.768	kHz
Frequency accuracy	± 250	ppm
Duty cycle	30–70	%
Input signal amplitude	500–1800	mV, p-p
Signal type	Square-wave or sine-wave	–
Input impedance ^a	>100k	Ω

External 32.768 kHz Sleep Clock Specifications

5. Packaging Information

1. One reel = 1,500pcs 12*12 LGA module.
(一卷數量為 1500pcs.)
2. One production label is pasted on the reel.
One desiccant & one humidity indicator card are put on the reel.
(卷軸貼上一張生產標籤，同時放上一包防潮包及濕度指示卡.)



3. One reel is put into the anti-static moisture barrier bag with one production label on the bag.
(卷軸放進入防靜電鋁袋，再貼上生產標籤.)



4. The anti-static reel is put into the pink bubble wrap.

(防靜電鋁箔袋放進氣泡袋.)

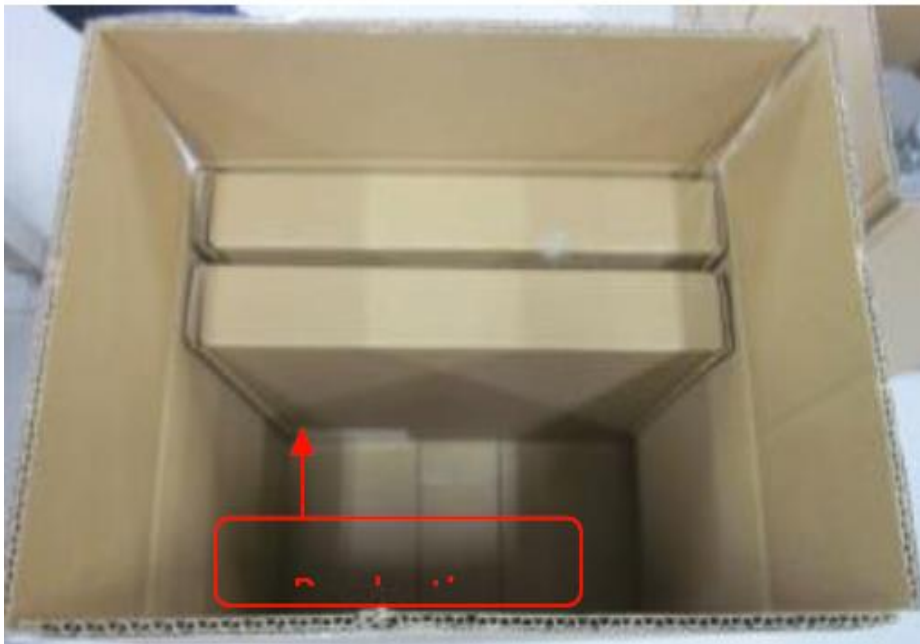
Then put into the inner box with one production label pasted on the box.

(氣泡袋放進內箱中，再貼上一張生產標籤.)



5. One outer box contained 5 inner boxes.

(一個外箱可放五個內箱盒.)



6. Sealing the carton with Azurewave logo tape.
(使用海華 Logo 膠帶將外箱進行工字型封箱)



7. One carton label and one box label are pasted on the carton.
If one carton is not full, one balance label will be pasted on the carton
(外箱上貼附出貨標籤和箱號標籤；如不滿箱，需貼附尾數標籤)



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 transmitter module may not be co-located with any other transmitter or antenna.

As long as **1** condition above is 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) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les **1** condition 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-AM497617**".

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-AM497617**".

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;

(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;

(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

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.

This device meets all the other requirements specified in Part 15E, Section 15.407 of the FCC Rules.

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 15.247 and 15E.

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.

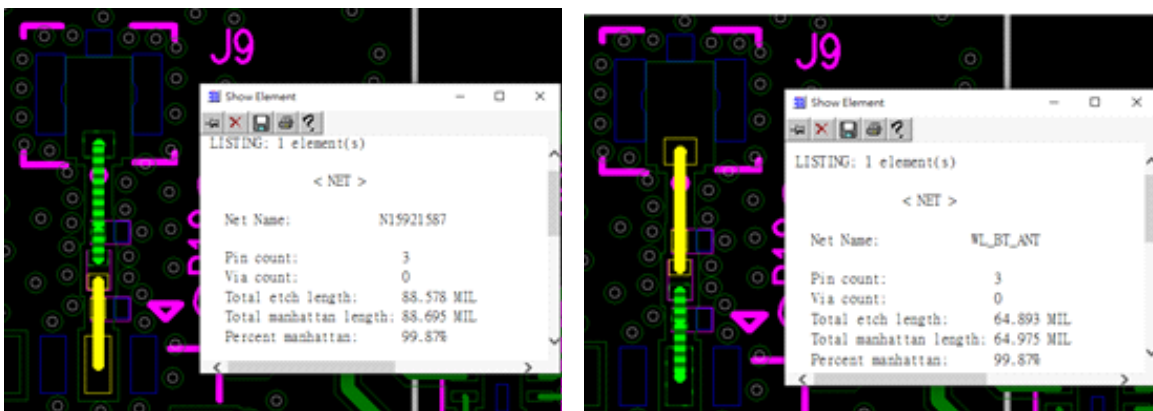
2.4 Limited module procedures

Not applicable.

2.5 Trace antenna designs

The AW-AM497617 is configured for monostatic operation, which requires only a single RF I/O pin for full simplex communication. The output must be routed to the antenna via 50 ohm microstrip or stripline on the PCB. No coupling capacitor is required given that the RF pin is AC-coupled internal to the AW-AM497617. To maximize the radiated power (and corresponding communication range), the length of the transmission line between _Model name_ and antenna should be made as short as possible.

The AW-AM497617 is designed for 50 Ohm characteristic impedance, and the connection between AW-AM497617 and antenna should all be designed for 50 Ohm characteristic impedance. If using PCB connections, should design the PCB layout for 50 Ohm characteristic impedance using microstrip, stripline, etc. (Figure 1)



Microstrip

Figure 1: PCB Transmission Line Styles

For example, user can design Microstrip according to PCB stack up (Figure 2) by tool Polar (Microstrip Impedance, Figure 3) to get PCB path width for RF is 15 mil.

Layer	Layer Type	Layer Structure	Thickness(mil)
	Soldermask		0.8
L1	Top	0.5oz+Plating	1.7
		Prepreg	5
L2	Plane	1oz	1.26
		Core	12
L3	Plane	1oz	1.26
		Prepreg	5
L4	Bottom	0.5oz+Plating	1.7
	Soldermask		0.8
Total Thickness			29.52

Figure 2: PCB Stack Up

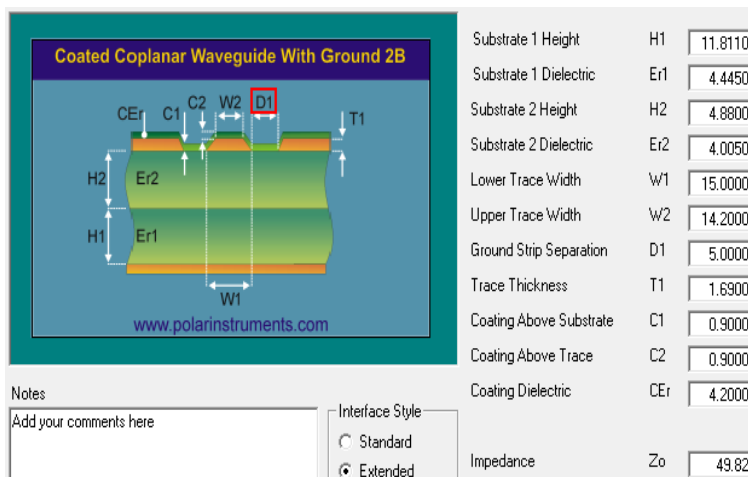
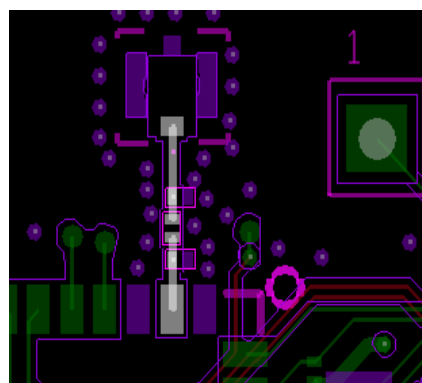


Figure 3: Microstrip Impedance

Any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

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.

<u>Antenna NO.</u>	<u>RF Chain NO.</u>	<u>Brand</u>	<u>Model</u>	<u>Antenna Net Gain(dBi)</u>	<u>Frequency range</u>	<u>Antenna Type</u>	<u>Connector Type</u>	<u>*Cable Length</u>
<u>1</u>	<u>Chain 0</u>	<u>MAG.LAYERS</u>	<u>MSA-4008-25GC1-A2</u>	<u>2.98</u> <u>5.16</u>	<u>2.4~2.4835GHz</u> <u>5.15~5.85GHz</u>	<u>PIFA</u>	<u>ipex(MHF)</u>	<u>150 mm</u>

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following: "Contains FCC ID: TLZ-AM497617". 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