AW-NM512

IEEE 802.11 b/g/n Wireless LAN And Bluetooth Module

Datasheet

Rev. B

DF

(For Standard)

Features

Overview

- Integrates Cypress solutions of CYW43439_A1 WiFi /BT/SoC
- SDIO v2.0 interfaces support for WLAN
- High speed UART and PCM for Bluetooth
- Lead-free Design
- 12.0mm(L) x 12.0mm(W) x 1.5 mm(H) 47 pin LGA package
- With Crystal(XTAL)

WiFi

- Single band 2.4 GHz 802.11 b/g/n
- SDIO v2.0, including DS and HS modes
- Security–WEP, WPA/WPA2/WPA3, AES (HW), TKIP (HW), CKIP (SW), WMM/WMM-PS/WMM-SA
- Data Rate up to 72.2Mbps

Bluetooth

- Supports extended Synchronous Connections (eSCO), for enhanced voice quality by allowing for retransmission of dropped packets
- Adaptive Frequency Hopping (AFH) for reducing radio frequency interference
- Maximum UART baud rates up to 4 Mbps
- Supports Bluetooth 5.0's LE Secure Connections
- Fully supports Bluetooth Core Specification version 5.0 + (Enhanced Data Rate) EDR features:
  - Adaptive Frequency Hopping (AFH)
  - Quality of Service (QoS)
  - Extended Synchronous Connections (eSCO) — Voice Connections
  - Fast Connect (interlaced page and inquiry scans)
  - Secure Simple Pairing (SSP)
  - Sniff Subrating (SSR)
  - Encryption Pause Resume (EPR)
  - Extended Inquiry Response (EIR)
  - Link Supervision Timeout (LST)
- Interface support – Host Controller Interface (HCI) using a high-speed UART interface and PCM for audio data

Revision History

Document NO: **R2-2512-DST-01**

Version	Revision Date	DCN NO.	Description	Initials	Approved
A	2020/09/23	DCN018490	● First Initial	QM.TAN	N.C Chen
B	2021/01/20	DCN020585	● Update Specifications Table	QM.TAN	N.C Chen

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1. Introduction

1.1 Product Overview

AzureWave Technologies, Inc. introduces the advanced IEEE 802.11 b/g/n WLAN and Bluetooth combo module - AW-NM512. The module is targeted to mobile and embedded devices which need small footprint package, low power consumption, and multiple OS support. The module supports 2.4GHz IEEE 802.11n MAC/baseband/radio, and Bluetooth 5.0 compliance. It also features an integrated Power Management Unit (PMU), Power Amplifiers (PAs), and a Low Noise Amplifier (LNA) to address the needs of mobile devices that require minimal power consumption and compact size. By using AW-NM512, 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. Specified in the IEEE 802.11 standard minimize the system power requirements by using AW-NM512. In addition to the support of WPA/WPA2/WPA3 and WEP encryption, the AW-NM512 also supports the IEEE 802.11i security standard through AES and TKIP acceleration hardware for faster data encryption. For the video, voice and multimedia applications the AW-NM512 support 802.11e Quality of Service (QoS). The host interface is SDIO v2.0 interface.

For Bluetooth operation, the AW-NM512 is Bluetooth 5.0 compliant. The Bluetooth transmitter also features a Class 1 power amplifier. The AW-NM512 supports extended Synchronous Connections (eSCO), for enhanced voice quality by allowing for retransmission of dropped packets, and Adaptive Frequency Hopping (AFH) for reducing radio frequency interference. It also incorporates all Bluetooth 5.0 features including Secure Simple Pairing, Sniff Subrating, and Encryption Pause and Resume. An independent, high-speed UART is provided for the Bluetooth host interface. The Bluetooth subsystem presents a standard Host Controller Interface (HCI) via a high speed UART and PCM for audio.

1.2 Specifications Table

1.2.1 General

Features	Description
Product Description	IEEE 802.11 b/g/n Wireless LAN and Bluetooth Module
Major Chipset	Cypress CYW43439 (WLBGA 63b)
Host Interface	WiFi + BT ● SDIO + UART
Dimension	12.0mm(L) x 12.0mm(W) x 1.5 mm(H)
Form factor	● LGA module, 47 pins
Antenna	For LGA, “1T1R, external” ANT1(Main)：WiFi/Bluetooth → TX/RX
Weight	0.4g

1.2.2 WLAN

Features	Description
WLAN Standard	IEEE 802.11 b/g/n, 1T1R
WLAN VID/PID	N/A
WLAN SVID/SPID	N/A
Frequency Range	2.4 GHz ISM Bands 2.412-2.472 GHz
Modulation	DSSS, OFDM, BPSK(9/6Mbps), QPSK(18/12Mbps), DBPSK(1Mbps), DQPSK(2Mbps), CCK(11/5.5Mbps), 16-QAM(36/24Mbps), 64-QAM (72.2/54/48Mbps)
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:

<table>
<tr><td></td><td>USA and Canada – 1 ~ 11
Most European Countries – 1 ~ 13</td></tr>
<tr><td>Output Power
(Board Level Limit)*</td><td>2.4G
<table>
<tr><td></td><td>Min</td><td>Typ</td><td>Max</td><td>Unit</td></tr>
<tr><td>11b (11Mbps)
@EVM<35%</td><td>16</td><td>18</td><td>20</td><td>dBm</td></tr>
<tr><td>11g (54Mbps)
@EVM≦-25 dB</td><td>14</td><td>16</td><td>18</td><td>dBm</td></tr>
<tr><td>11n (HT20 MCS7)
@EVM≦-27 dB</td><td>13</td><td>15</td><td>17</td><td>dBm</td></tr>
</table></td></tr>
<tr><td>Receiver Sensitivity</td><td>2.4G
<table>
<tr><td></td><td>Min</td><td>Typ</td><td>Max</td><td>Unit</td></tr>
<tr><td>11b (11Mbps)</td><td></td><td>-89</td><td>-84</td><td>dBm</td></tr>
<tr><td>11g (54Mbps)</td><td></td><td>-76</td><td>-71</td><td>dBm</td></tr>
<tr><td>11n (HT20 MCS7)</td><td></td><td>-73</td><td>-68</td><td>dBm</td></tr>
</table></td></tr>
<tr><td>Data Rate</td><td>802.11b: 1, 2, 5.5, 11Mbps
802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps
802.11n:MCS 0~7 HT20</td></tr>
<tr><td>Security</td><td>◆ WPA™- WPA2™- and WPA3™ support for powerful encryption and authentication
◆ AES in WLAN hardware for faster data encryption and IEEE802.11i compatibility
◆ Reference WLAN subsystem provides Wi‐Fi Protected Setup (WPS).
Wi-Fi Protected Setup (WPS)</td></tr>
</table>

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

1.2.3 Bluetooth

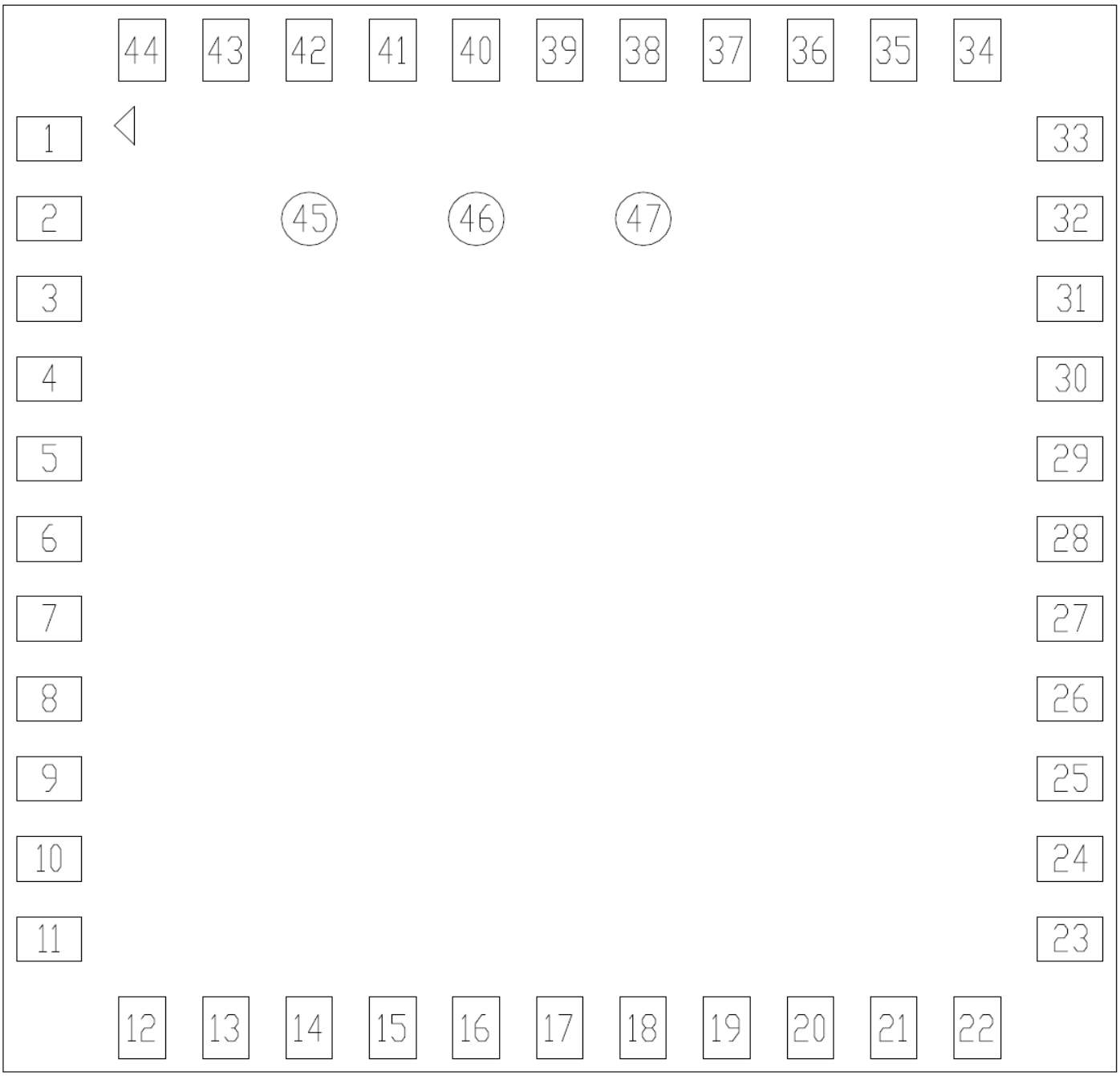
<table>
<tr><th>Features</th><th>Description</th></tr>
<tr><td>Bluetooth Standard</td><td>Bluetooth 5.0</td></tr>
<tr><td>Bluetooth VID/PID</td><td>N/A</td></tr>
<tr><td>Frequency Range</td><td>2400~2483.5MHz</td></tr>
<tr><td>Modulation</td><td>GFSK (1Mbps), Π/4DQPSK (2Mbps) and 8DPSK (3Mbps)</td></tr>
<tr><td>Output Power</td><td>6≤ Output Power ≤ +10 dBm (Conductive)
<table>
<tr><td></td><td>Min</td><td>Typ</td><td>Max</td><td>Unit</td></tr>
<tr><td>BDR</td><td>6</td><td>8</td><td>10</td><td>dBm</td></tr>
<tr><td>EDR</td><td>6</td><td>8</td><td>10</td><td>dBm</td></tr>
<tr><td>Low Energy</td><td>6</td><td>8</td><td>10</td><td>dBm</td></tr>
</table></td></tr>
<tr><td>Receiver Sensitivity</td><td>
<table>
<tr><td></td><td>Min</td><td>Typ</td><td>Max</td><td>Unit</td></tr>
<tr><td>DH5</td><td></td><td>-91</td><td>-86</td><td>dBm</td></tr>
<tr><td>2DH5</td><td></td><td>-91</td><td>-86</td><td>dBm</td></tr>
<tr><td>3DH5</td><td></td><td>-83</td><td>-79</td><td>dBm</td></tr>
</table></td></tr>
</table>

1.2.4 Operating Conditions

Features	Description
Operating Conditions	
Voltage	VBAT:3.2V~4.8V (3.6V Typical)
Operating Temperature	-30℃ to 70 ℃ (Optimal RF performance guarantee -20℃~70 ℃)
Operating Humidity	less than 85% R.H.
Storage Temperature	-40℃ to 85 ℃
Storage Humidity	less than 60% R.H.
ESD Protection	
Human Body Model	1000V
Changed Device Model	300V

2. Pin Definition

2.1 Pin Map



AW-NM512 Pin Map (Top View)

2.2 Pin Table

Pin No	Definition	Basic Description	Voltage	Type
1	GND	Ground.		GND
2	WL_BT_ANT	WLAN/BT RF TX/RX path.		RF
3	GND	Ground.		GND
4	NC	Floating Pin, No connect to anything.		Floating
5	NC	Floating Pin, No connect to anything.		Floating
6	BT_WAKE_DEV	HOST wake-up Bluetooth device	VDDIO	I
7	BT_HOST_WAKE	Bluetooth device to wake-up HOST	VDDIO	O
8	CLK_REQ	The module asserts CLK_REQ when Bluetooth or WLAN directs the host to turn on the reference clock. The CLK_REQ polarity is active-high	VDDIO	O
9	VBAT	3.3V power pin	VBAT	PWR
10	NC	Floating Pin, No connect to anything.		Floating
11	NC	Floating Pin, No connect to anything.		Floating
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.	VDDIO	I
13	WL_HOST_WAKE	WLAN device to wake-up HOST	VDDIO	O
14	SDIO_DATA_2	SDIO Data Line 2	VDDIO	I/O
15	SDIO_DATA_3	SDIO Data Line 3	VDDIO	I/O
16	SDIO_CMD	SDIO Command Input	VDDIO	I/O
17	SDIO_CLK	SDIO Clock Input	VDDIO	I
18	SDIO_DATA_0	SDIO Data Line 0	VDDIO	I/O
19	SDIO_DATA_1	SDIO Data Line 1	VDDIO	I/O
20	GND	Ground.		GND
21	VIN_LDO_OUT	Internal Buck 1.2V voltage generation pin	1.4V	O
22	VDDIO	1.8V-3.3V VDDIO supply for WLAN and BT	VDDIO	PWR
23	VIN_LDO	Internal Buck 1.2V voltage generation pin	1.4V	I
24	LPO	External 32K or RTC clock	0.2~3.3V	I

25	PCM_OUT	PCM data Out	VDDIO	O
26	PCM_CLK	PCM Clock	VDDIO	I/O
27	PCM_IN	PCM data Input	VDDIO	I
28	PCM_SYNC	PCM Synchronization control	VDDIO	O
29	NC	Floating Pin, No connect to anything.		Floating
30	NC	Floating Pin, No connect to anything.		Floating
31	GND	Ground.		GND
32	NC	Floating Pin, No connect to anything.		Floating
33	GND	Ground.		GND
34	BT_REG_ON	Used by PMU to power up or power down the 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.	VDDIO	I
35	NC	Floating Pin, No connect to anything.		Floating
36	GND	Ground.		GND
37	NC	Floating Pin, No connect to anything.		Floating
38	NC	Floating Pin, No connect to anything.		Floating
39	GPIO2	Wi-Fi Co-existence pin with LTE(WLAN_SECI_RX)	VDDIO	I
40	GPIO1	Wi-Fi Co-existence pin with LTE(WLAN_SECI_TX)	VDDIO	O
41	UART_RTS_N	High-Speed UART RTS	VDDIO	O
42	UART_OUT	High-Speed UART Data Out	VDDIO	O
43	UART_IN	High-Speed UART Data In	VDDIO	I
44	UART_CTS_N	High-Speed UART CTS	VDDIO	I
45	NC	Floating Pin, No connect to anything.		Floating
46	NC	Floating Pin, No connect to anything.		Floating
47	NC	Floating Pin, No connect to anything.		Floating

3. Electrical Characteristics

3.1 Absolute Maximum Ratings

Symbol	Parameter	Minimum	Typical	Maximum	Unit
VBAT	Power supply for Internal Regulators	-0.5		6	V
VDDIO	DC supply voltage for digital I/O	-0.5		3.9	V

3.2 Recommended Operating Conditions

Symbol	Parameter	Minimum	Typical	Maximum	Unit
VBAT	Power supply for Internal Regulators	3*	3.6	4.8*	V

***Optimal RF performance is guaranteed only for 3.2V<VBAT<4.8V**

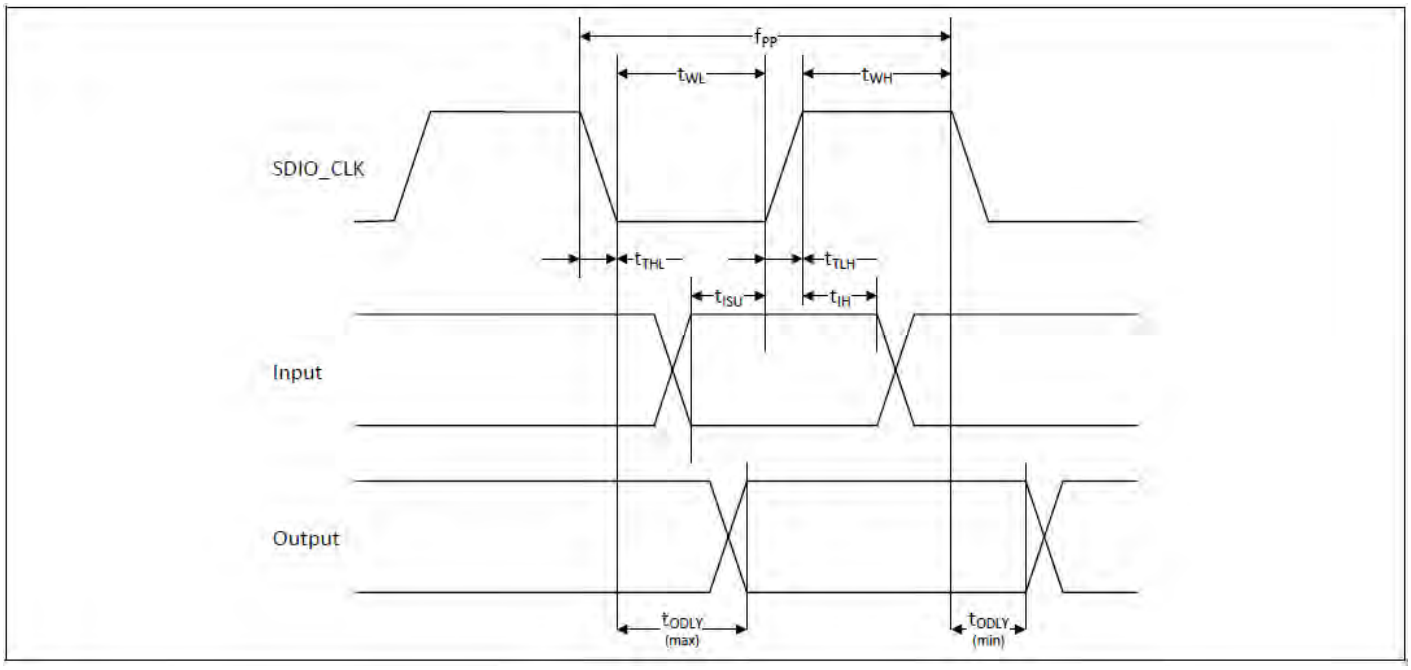
3.3 Digital IO Pin DC Characteristics

Symbol	Parameter	Minimum	Typical	Maximum	Unit
For SDIO Interface VDDIO =1.8V					
VIH	Input high voltage	1.27	-	-	V
VIL	Input low voltage	-	-	0.58	V
VOH	Output High Voltage @ 2mA	1.4	-	-	V
VOL	Output Low Voltage @ 2mA	-	-	0.45	V
For SDIO Interface VDDIO =3.3V					
VIH	Input high voltage	0.625 x VDDIO	-	-	V
VIL	Input low voltage	-	-	0.25 x VDDIO	V
VOH	Output High Voltage @ 2mA	0.75 x VDDIO	-	-	V
VOL	Output Low Voltage @ 2mA	-	-	0.125 x VDDIO	V
Other Digital Interface VDDIO=1.8V					
VIH	Input high voltage	0.65 x VDDIO	-	-	V
VIL	Input low voltage	-	-	0.35 x VDDIO	V
VOH	Output High Voltage @ 2mA	VDDIO – 0.45	-	-	V

VOL	Output Low Voltage @ 2mA	-	-	0.45	V
Other Digital Interface VDDIO=3.3V					
VIH	Input high voltage	2.00	-	-	V
VIL	Input low voltage	-	-	0.80	V
VOH	Output High Voltage @ 2mA	VDDIO – 0.4	-	-	V
V	Output Low Voltage @ 2mA	-	-	0.40	V

3.4 Host Interface

3.4.1 SDIO



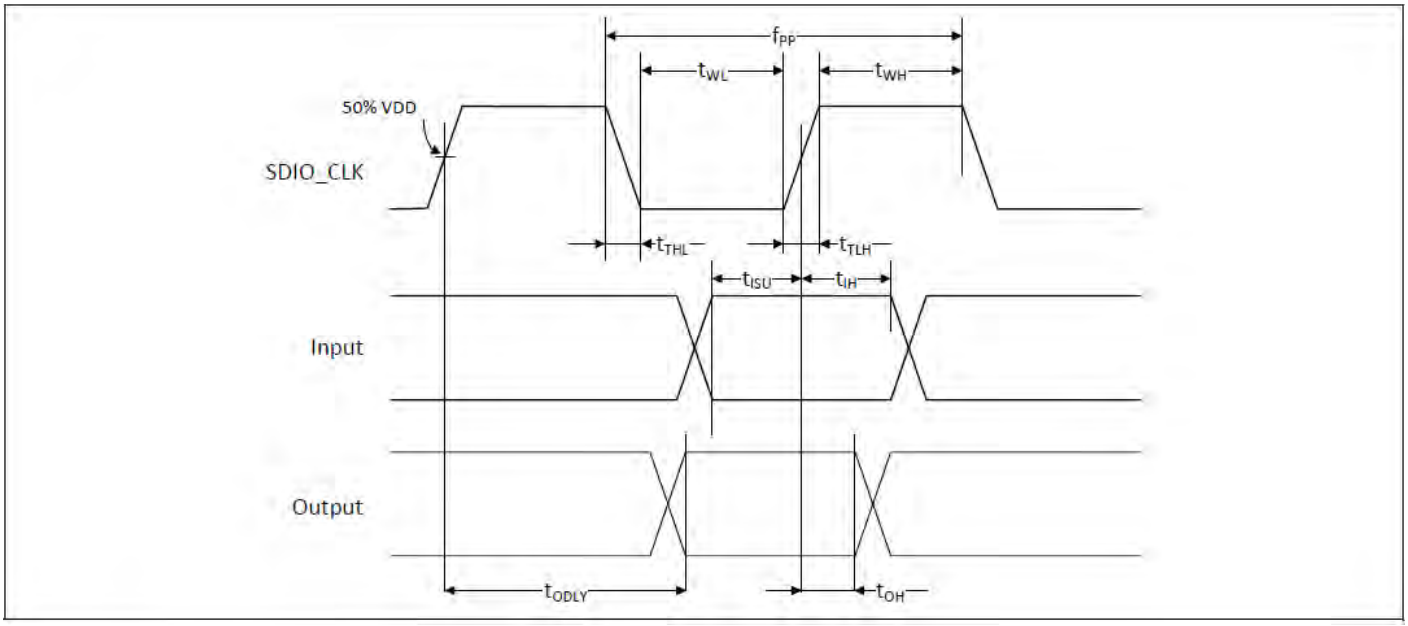
SDIO Bus Timing (Default Mode)

Parameter	Symbol	Minimum	Typical	Maximum	Unit
SDIO CLK (All values are referred to minimum VIH and maximum VIL*)					
Frequency – Data Transfer mode	fPP	0	–	25	MHz
Frequency – Identification mode	fOD	0	–	400	kHz
Clock low time	tWL	10	–	–	ns
Clock high time	tWH	10	–	–	ns
Clock rise time	tTLH	–	–	10	ns
Clock low time	tTHL	–	–	10	ns
Inputs: CMD, DAT (referenced to CLK)					
Input setup time	tISU	5	–	–	ns
Input hold time	tIH	5	–	–	ns
Outputs: CMD, DAT (referenced to CLK)					

Output delay time – Data Transfer mode	tODLY	0	–	14	ns
Output delay time – Identification mode	tODLY	0	–	50	ns

SDIO Bus Timing Parameters (Default Mode)

* min(VIH) = 0.7 × VDDIO and max(VIL) = 0.2 × VDDIO



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	fPP	0	–	50	MHz
Frequency – Identification Mode	fOD	0	–	400	kHz
Clock low time	tWL	7	–	–	ns
Clock high time	tWH	7	–	–	ns
Clock rise time	tTLH	–	–	3	ns
Clock low time	tTHL	–	–	3	ns
Inputs: CMD, DAT (referenced to CLK)					
Input setup Time	tISU	6	–	–	ns
Input hold Time	tIH	2	–	–	ns

Outputs: CMD, DAT (referenced to CLK)					
Output delay time – Data Transfer Mode	tODLY	–	–	14	ns
Output hold time	tOH	2.5	–	–	ns
Total system capacitance (each line)	CL	–	–	40	pF

SDIO Bus Timing a Parameters (High-Speed Mode)

* min(Vih) = 0.7 × VDDIO and max(Vil) = 0.2 × VDDIO

3.4.2 UART Interface

The AW-NM512 includes a single UART for Bluetooth. The UART is a standard 4-wire interface (RX, TX, RTS, and CTS) with adjustable baud rates from 9600 bps to 4.0 Mbps. The interface features an automatic baud rate detection capability that returns a baud rate selection. Alternatively, the baud rate may be selected through a vendor-specific UART HCI command.

UART has a 1040-byte receive FIFO and a 1040-byte transmit FIFO to support EDR. Access to the FIFOs is conducted through the AHB interface through either DMA or the CPU. The UART supports the Bluetooth 5.0 UART HCI specification: H4, a custom Extended H4, and H5. The default baud rate is 115.2 Kbaud.

The UART supports the 3-wire H5 UART transport, as described in the Bluetooth specification (“Three-wire UART Transport Layer”).Compared to H4, the H5 UART transport reduces the number of signal lines required by eliminating the CTS and RTS signals.

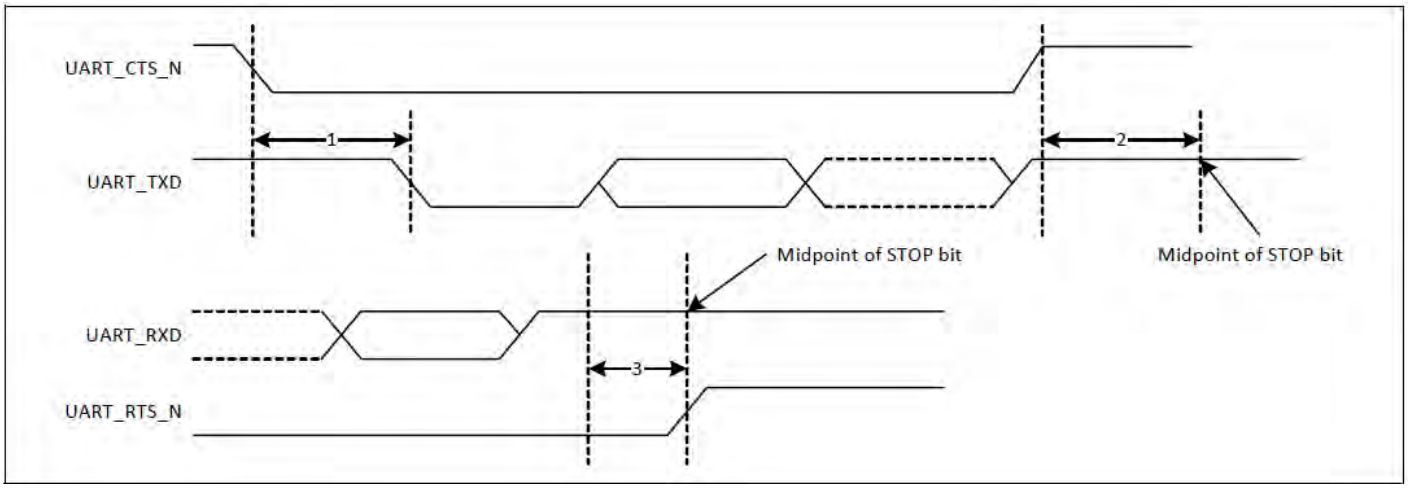
The AW-NM512 UART can perform XON/XOFF flow control and includes hardware support for the Serial Line Input Protocol (SLIP). It can also perform wake-on activity. For example, activity on the RX or CTS inputs can wake the chip from a sleep state.

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-NM512 UARTs operate correctly with the host UART as long as the combined baud rate error of the two

devices is within ±2%.

UART Interface Signals

PIN No.	Name	Description	Type
40	UART_TXD	Bluetooth UART Serial Output. Serial data output for the HCI UART Interface	O
41	UART_RXD	Bluetooth UART Series Input. Serial data input for the HCI UART Interface	I
43	UART_RTS_N	Bluetooth UART Request-to-Send. Active-low request-to-send signal for the HCI UART interface	O
42	UART_CTS_N	Bluetooth UART Clear-to-Send. Active-low clear-to-send signal for the HCI UART interface.	I

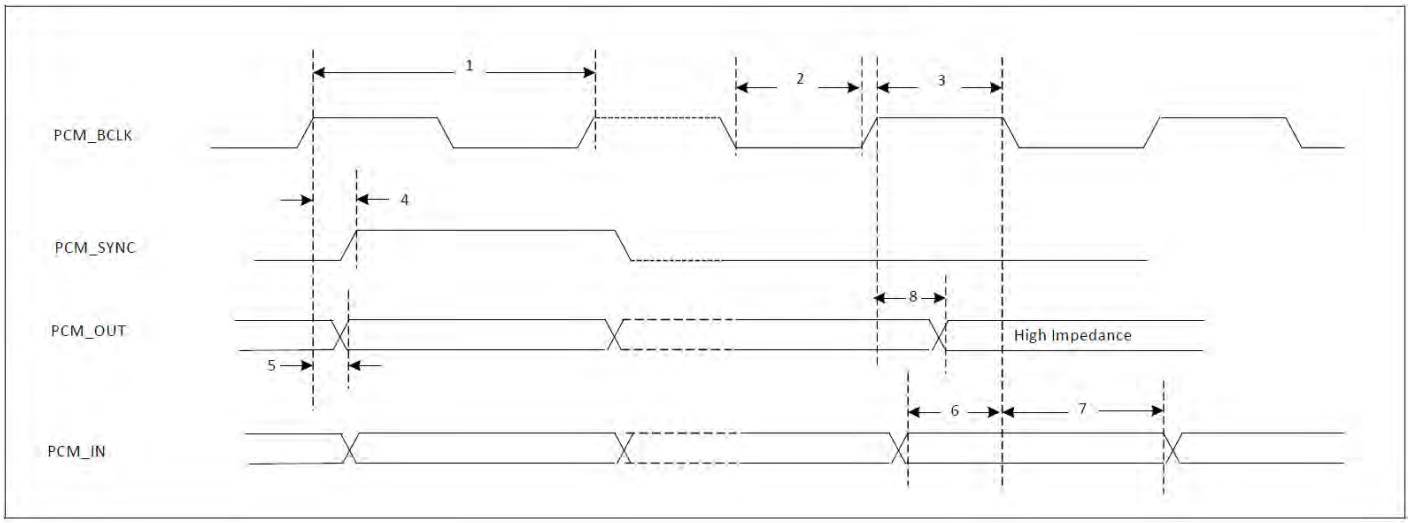


UART Timing

	Reference Characteristics	Minimum	Typical	Maximum	Unit
1	Delay time, UART_CTS_N low to UART_TXD valid	–	–	1.5	Bit periods
2	Setup time, UART_CTS_N high before midpoint of stop bit	–	–	0.5	Bit periods
3	Delay time, midpoint of stop bit to UART_RTS_N high	–	–	0.5	Bit periods

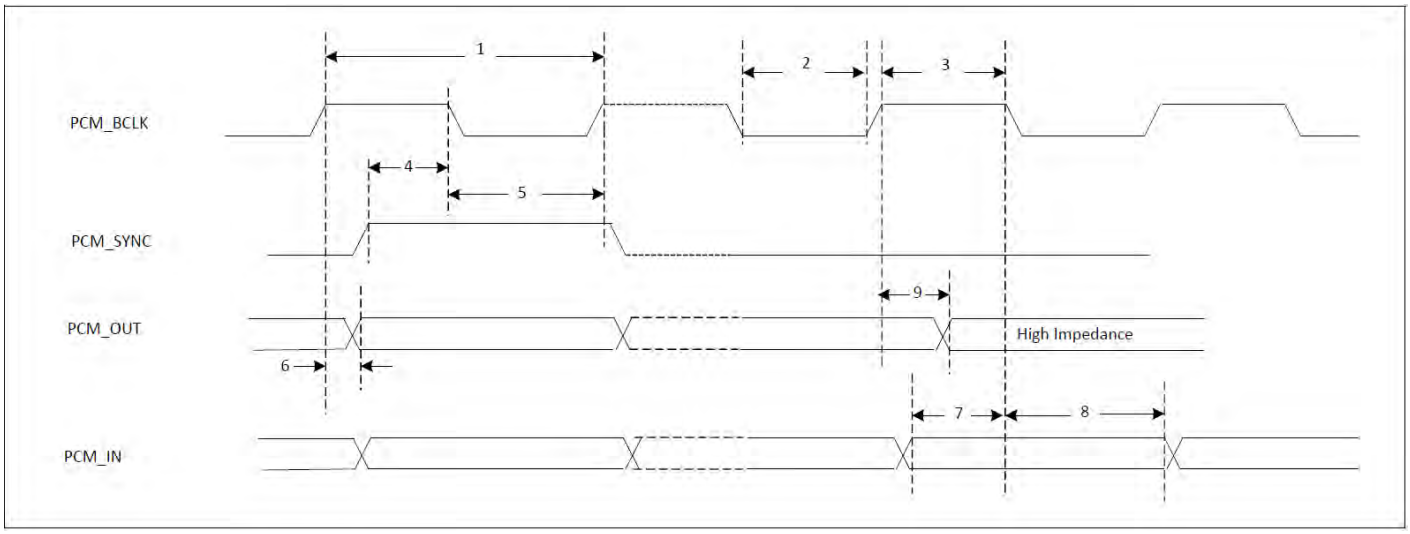
UART Timing Specifications

3.4.3 PCM Interface Timing



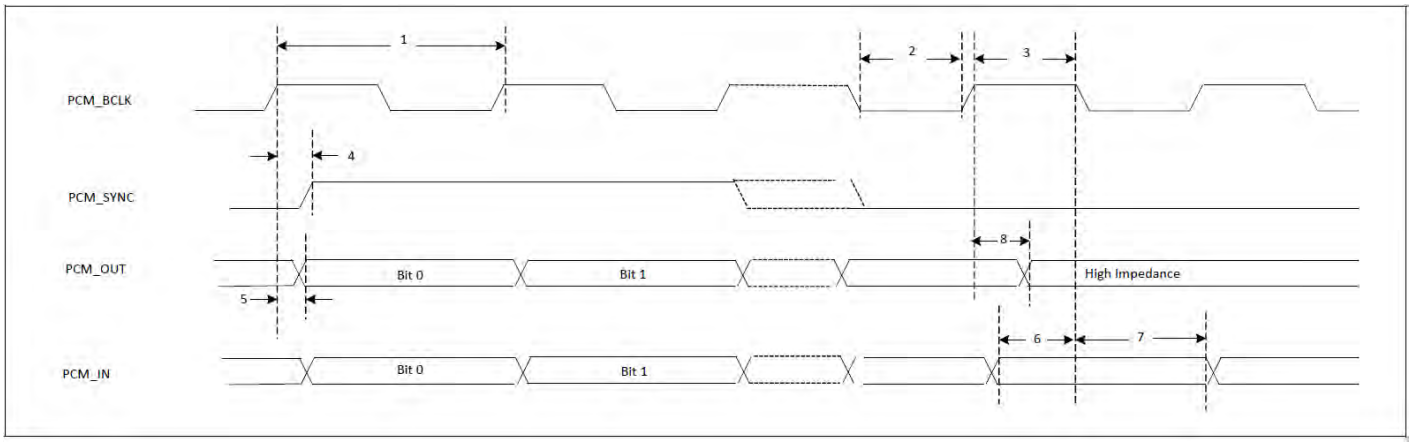
PCM Timing Diagram(Short Frame Sync, Master Mode)

	Reference Characteristics	Minimum	Typical	Maximum	Unit
1	PCM bit clock frequency			12	MHz
2	PCM bit clock low	41			ns
3	PCM bit clock high	41			ns
4	PCM_SYNC delay	0		25	ns
5	PCM_OUT delay	0		25	ns
6	PCM_IN setup	8			ns
7	PCM_IN hold	8			ns
8	Delay from rising edge of PCM_BCLK during last bit period to PCM_OUT becoming high impedance	0		25	ns



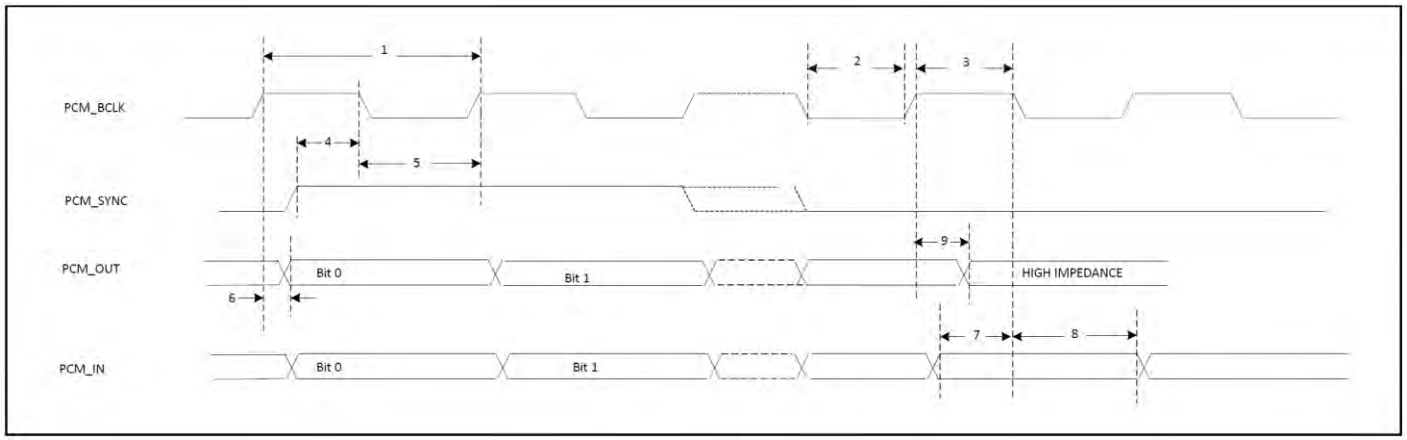
PCM Timing Diagram(Short Frame Sync, Slave Mode)

	Reference Characteristics	Minimum	Typical	Maximum	Unit
1	PCM bit clock frequency			12	MHz
2	PCM bit clock low	41			ns
3	PCM bit clock high	41			ns
4	PCM_SYNC setup	8			ns
5	PCM_SYNC hold	8			ns
6	PCM_OUT delay	0		25	ns
7	PCM_IN setup	8			ns
8	PCM_IN hold	8			ns
9	Delay from rising edge of PCM_BCLK during last bit period to PCM_OUT becoming high impedance	0		25	ns



PCM Timing Diagram(Long Frame Sync, Master Mode)

	Reference Characteristics	Minimum	Typical	Maximum	Unit
1	PCM bit clock frequency			12	MHz
2	PCM bit clock low	41			ns
3	PCM bit clock high	41			ns
4	PCM_SYNC delay	0		25	ns
5	PCM_OUT delay	0		25	ns
6	PCM_IN setup	8			ns
7	PCM_IN hold	8			ns
8	Delay from rising edge of PCM_BCLK during last bit period to PCM_OUT becoming high impedance	0		25	ns

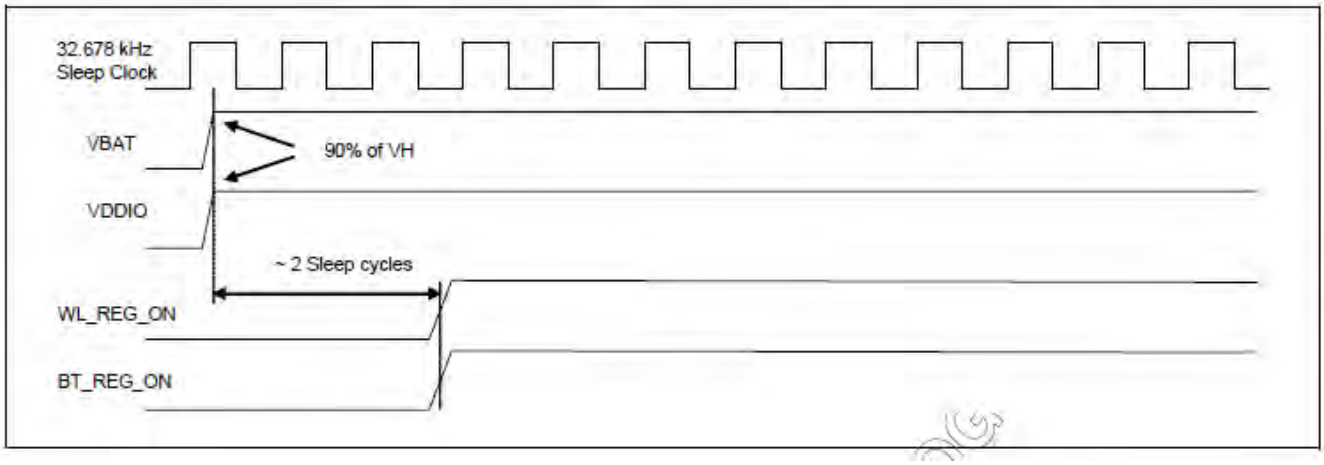


PCM Timing Diagram(Long Frame Sync, Slave Mode)

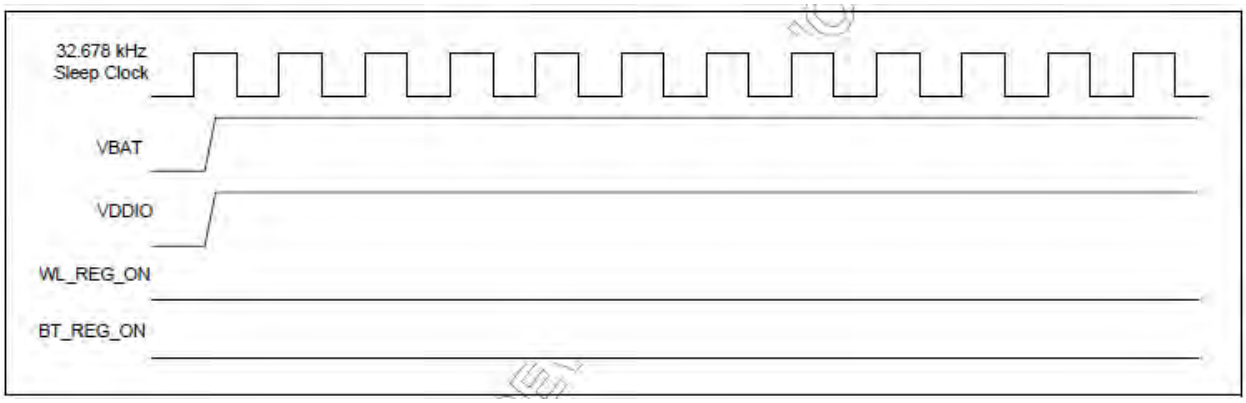
	Reference Characteristics	Minimum	Typical	Maximum	Unit
1	PCM bit clock frequency			12	MHz
2	PCM bit clock low	41			ns
3	PCM bit clock high	41			ns
4	PCM_SYNC setup	8			ns
5	PCM_SYNC hold	8			ns
6	PCM_OUT delay	0		25	ns
7	PCM_IN setup	8			ns
8	PCM_IN hold	8			ns
9	Delay from rising edge of PCM_BCLK during last bit period to PCM_OUT becoming high impedance	0		25	ns

3.5 Power up Timing Sequence

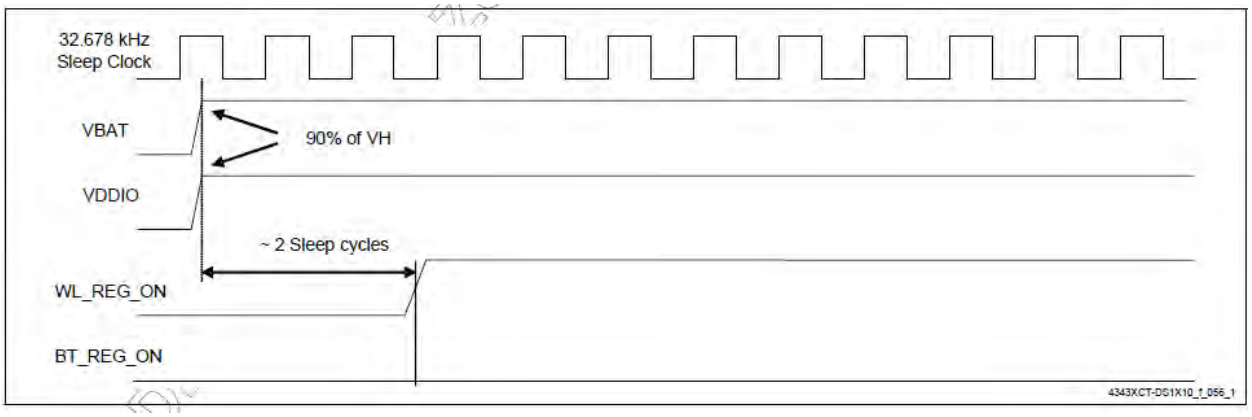
WLAN = ON, Bluetooth = ON



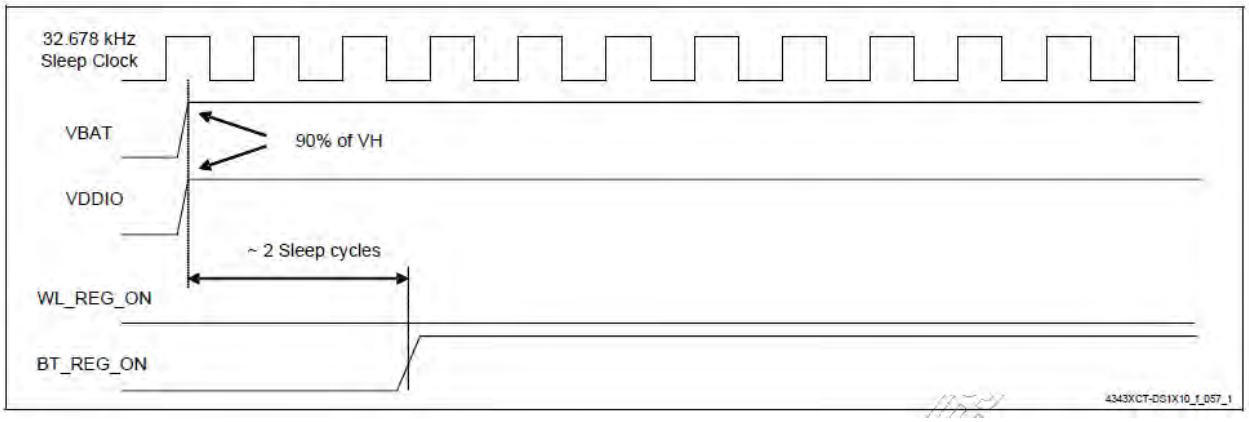
WLAN = OFF, Bluetooth = OFF



WLAN = ON, Bluetooth = OFF



WLAN = OFF, Bluetooth = ON



3.6 Frequency References

The AW-NM512 uses an external 26MHz xtal for normal operation and an external 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 ± 30% over process, voltage, and temperature, which is adequate for some applications. However, a trade-off caused by this wide LPO tolerance is a small current consumption increase during WLAN power save mode that is incurred by the need to wake up earlier to avoid missing beacons.

The preferred approach for WLAN is to connect a precision external 26MHz & 32.768 kHz clock that meets the requirements listed in Table below.

Parameter	Conditions/Notes	Crystal			External Frequency Reference			
		Min.	Typ.	Max.	Min.	Typ.	Max.	Units
Frequency			26			26		MHz
Crystal load capacitance			12					pF
ESR				60				Ohms
Drive level	External crystal must be able to tolerate this drive level	200						uW
Input Impedance (XTAL_IN)	Resistive				10k	100k		Ohms
	Capacitive						7	pF
Input Voltage(XTAL_IN)	AC-coupled analog signal				400		1260	mV(p-p)
Input Low Level(XTAL_IN)	DC-coupled digital signal				0		0.2	V
Input High Level(XTAL_IN)	DC-coupled digital signal				1		1.26	V
Frequency tolerance Initial + over temperature		-20	0	20	-20	0	20	ppm

Parameter	LPO	Units
Nominal input frequency	32.768	kHz
Frequency accuracy	+-200	ppm
Duty cycle	30 - 70	%
Input signal amplitude	200 - 3300	mV , p-p
Input impedance	>100	kΩ
	<5	pF
Signal type	Square-wave or sine-wave	-
Clock jitter (during initial start-up)	<10000	ppm

3.7 Power Consumption*

3.7.1 WLAN

Band (GHz)	Mode	BW (MHz)	RF Power (dBm)	Transmit			Receive	
				Max.	Avg.	Duty. (%)	Max.	Avg.
2.4 (5)(6)	11b@1Mbps	20	17	TBD	TBD	TBD	TBD	TBD
	11b@11Mbps	20	17	TBD	TBD	TBD	TBD	TBD
	11g@6Mbps	20	15	TBD	TBD	TBD	TBD	TBD
	11g@54Mbps	20	15	TBD	TBD	TBD	TBD	TBD
	11n@MCS0	20	13	TBD	TBD	TBD	TBD	TBD
	11n@MCS7	20	13	TBD	TBD	TBD	TBD	TBD

Current Unit: mA
(5)Using MFG firmware.
(6)Using LeCroy to measuare Duty cycle's Max and recoard Measure->Mean , Mean= Avg

3.7.2 Bluetooth

No.	Mode	Packet Type	VBAT_IN=3.3 V	
			Max.	Avg.
1.	Deepsleep	N/A	TBD	TBD
2.	Transmit	DH5	TBD	TBD
3.	Receive	3-DH5	TBD	TBD

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

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 15.247

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-NM512 is designed for 50 Ohm characteristic impedance, and the connection between AW-NM512 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.

To maximize the radiated power (and corresponding communication range), the length of the transmission line between AW-NM512 and antenna should be made as short as possible. In order to minimize interference between traces, they should be adequately spaced. Ideally, all RF traces should be surrounded on the same layer by ground fill.

RF I/O interface to antenna connector on the PCB shall accomplished via microstrip MHF4 connector. The multiplexer on carry board PCB with interface to antenna. The connector on carry board PCB with interfaces to antenna must be of a unique type to disable connection to a non-permissible antenna in compliance with FCC section 15.203. The following connectors are allowed.

MHF4 Connector: I-PEX, model 20449-001E or equivalent Custom 50 ohm coaxial pigtail from PCB to antenna

AW-NM512 shall follow the above design rule for characteristic impedance of 50 ohms +/- 10% and measure microstrip or stripline transmission line width on PCB.

Any deviation(s) from the defined parameters described above require that the host product manufacturer 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.

Brand	Model	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type
Walsin	RFMTA340715IMLB301	3	2.4~2.5	PIFA	i-pex(MHF)

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following: “Contains FCC ID: TLZ-NM512”. 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-NM512".

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-NM512".

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.

DETACHABLE ANTENNA USAGE

This radio transmitter [IC: 6100A-NM512] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Le présent émetteur radio [IC: 6100A-NM512] a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

Brand	Model	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type
Walsin	RFMTA340715IMLB301	3	2.4~2.5	PIFA	i-pex(MHF)