

# **AW-XH323-SUR**

**IEEE 802.11 a/b/g/n/ac/ax Wi-Fi  
+ Bluetooth 5.2 Combo SIP Module**

## **Datasheet**

**Rev.C**

**DF**

**(For Standard)**

## Features

### Wi-Fi

- 802.11a/b/g/n/ac/ax compliant, tri-band capable (2.4/5/6 GHz).
- 5/6 GHz: 20/40/80-MHz channels, 1024-QAM, 2x2 MIMO providing up to 1.2 Gbps PHY data rate.
- 2.4 GHz: 20/40-MHz channels, 1024-QAM, 2x2 MIMO providing up to 574 Mbps PHY data rate.
- 802.11ax STA mode and Soft AP mode with 11ax scheduled access.
- Supports 802.11d, h, k, r, v, w, ai.
- Zero-wait dynamic frequency selection (DFS): Background channel availability check (CAC) scan for immediate switch to candidate DFS channel.
- On-chip power amplifiers and low-noise amplifiers.
- Supports multipoint external coexistence interface to optimize bandwidth utilization with other co-located wireless technologies such as LTE.
- Fast VSDB (Virtual Simultaneous Dual Band)
- WPA, WAPI STA, WPA2 (Enterprise) and WPA3 (Enterprise) support for powerful encryption and authentication
- AES and TKIP in hardware for faster data encryption and IEEE 802.11i compatibility
- Reference WLAN subsystem provides Wi-Fi Protected Setup (WPS)
- Worldwide regulatory support: Global products supported with worldwide homologated design
- Integrated Arm® Cortex® R4 processor with

tightly coupled memory for complete WLAN subsystem functionality. This architecture offloads the host processor completely from WLAN functionality.

- Transmission and reception of HE-SU and HE-ER-SU PPDU.
- Reception of HE-MU PPDU -OFDMA/MU-MIMO Frame.
- Transmission of HE-TB PPDU (Uplink MU OFDMA).

### Bluetooth

- Bluetooth 5.2 (BDR + EDR + BLE).
- All Bluetooth 5.0/5.1/5.2 optional features supported including LE-Audio.
- Dedicated Bluetooth RF path for best WLAN-BT coexistence performance.
- Bluetooth Class 1 or Class 2 transmitter operation.
- 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.
- Interface support, host controller interface (HCI) using a high-speed UART interface and PCM/I2S for audio data.
- Supports multiple simultaneous Advanced Audio Distribution.
- Profiles (A2DP) for stereo sound.
- On-chip memory includes 512 KB SRAM and 2 MB ROM.



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# 1. Introduction

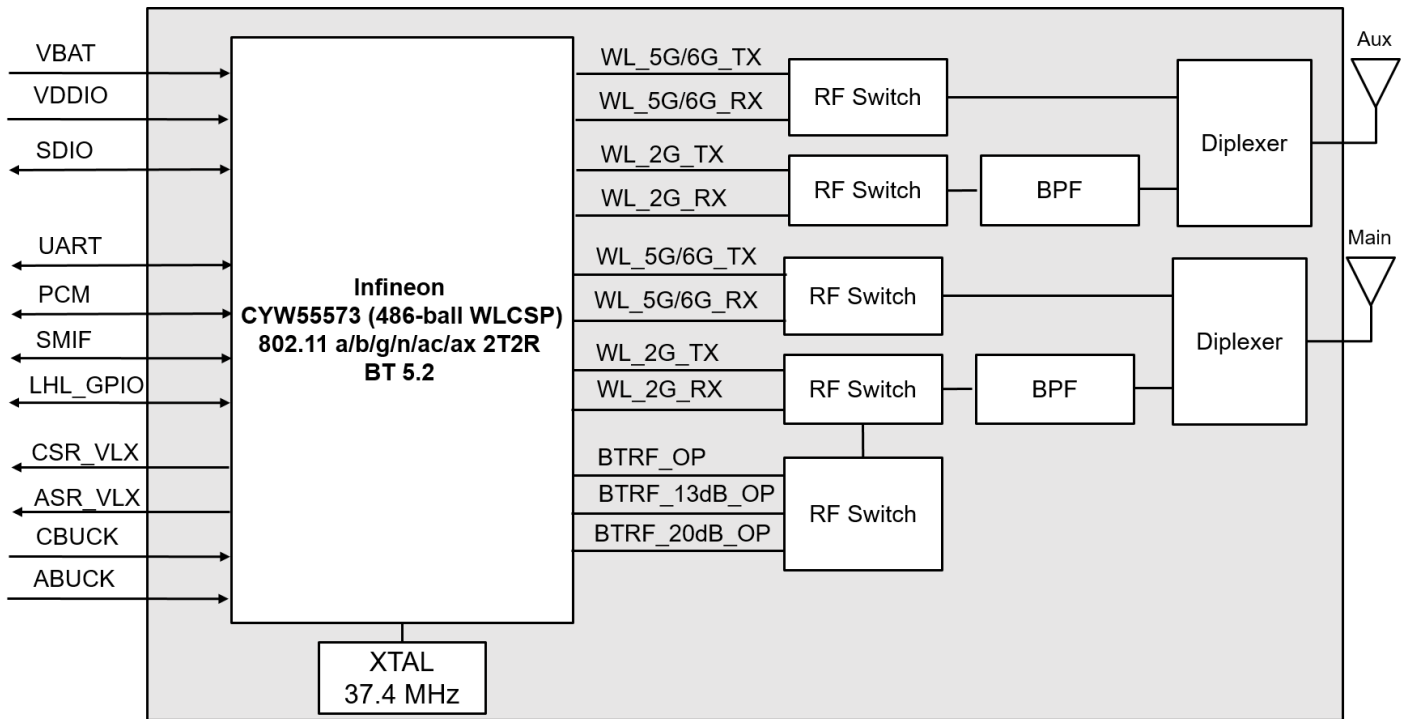
## 1.1 Product Overview

The AW-XH323-SUR device provides the highest level of integration for Commercial and Consumer IoT wireless systems with integrated dual-band 2x2 MIMO IEEE 802.11ax WLAN MAC/baseband/radio, Bluetooth 5.2 MAC/baseband/radio, and integrated Power Management Unit. WLAN and Bluetooth radios also include on-chip power amplifiers and low-noise amplifiers to further reduce the need for external components.

WLAN interfaces to host processor through a SDIO 3.0 interface while Bluetooth host interface is provided through high-speed 4-wire UART interface. Additionally, the Bluetooth section supports PCM and I2S interfaces for audio applications.

AW-XH323-SUR is qualified to operate across Industrial (-40 °C to +85 °C) temperature range.

## 1.2 Block Diagram



**AW-XH323-SUR Block Diagram**

## 1.3 Specifications Table

### 1.3.1 General

Features	Description
<b>Product Description</b>	IEEE 802.11 a/b/g/n/ac/ax Wi-Fi + Bluetooth 5.2 Combo SIP Module
<b>Major Chipset</b>	Infineon CYW55573 (486-ball WLCSP)
<b>Host Interface</b>	Wi-Fi + BT ● SDIO + UART  <b>Note:</b> Please refer to G10 pin of 2.3 Host configuration interface table for your interface choice
<b>Dimension</b>	10mm x 10mm x 1.26mm
<b>Form factor</b>	Sip module, 117 pins
<b>Antenna</b>	2T2R, external ANT1(Main) : Wi-Fi/Bluetooth → TX/RX ANT2(Aux) : Wi-Fi → TX/RX
<b>Weight</b>	TBD

### 1.3.2 WLAN

Features	Description
<b>WLAN Standard</b>	IEEE 802.11 a/b/g/n/ac/ax 2T2R
<b>WLAN VID/PID</b>	N/A
<b>WLAN SVID/SPID</b>	N/A
<b>Frequency Range</b>	WLAN: 2.4 / 5 / 6 GHz Band
<b>Modulation</b>	DSSS DBPSK(1Mbps), DQPSK(2Mbps), CCK(11/5.5Mbps) OFDM BPSK(9/6Mbps/MCS0), QPSK(18/12Mbps/MCS1~2), 16-QAM(36/24Mbps/MCS3~4), 64-QAM(72.2/54/48Mbps/MCS5~7), 256-QAM(MCS8~9), 1024-QAM(MCS10~11)
<b>Number of Channels</b>	<b>2.4GHz</b> ● USA, Canada and Taiwan – 1 ~ 11 ● China, Most European Countries – 1 ~ 13 ● Japan, 1 ~ 13

	<b>5GHz</b> <ul style="list-style-type: none"> <li>USA, EUROPE – 36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 149, 153, 157, 161, 165</li> </ul> <b>6GHz</b> <ul style="list-style-type: none"> <li>CH1~CH233</li> </ul>																																																																										
	<b>2.4G</b> <table border="1"> <thead> <tr> <th></th> <th>Min</th> <th>Typ</th> <th>Max</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>11b (11Mbps) @EVM&lt;8%</td> <td>18</td> <td>19.5</td> <td>21</td> <td>dBm</td> </tr> <tr> <td>11g (54Mbps) @EVM ≤ -25 dB</td> <td>16.5</td> <td>18</td> <td>19.5</td> <td>dBm</td> </tr> <tr> <td>11n (HT20 MCS7) @EVM ≤ -27 dB</td> <td>14.5</td> <td>17</td> <td>18.5</td> <td>dBm</td> </tr> <tr> <td>11ax (HE20 MCS11) @EVM ≤ -35 dB</td> <td>13.5</td> <td>15</td> <td>16.5</td> <td>dBm</td> </tr> </tbody> </table> <b>5G</b> <table border="1"> <thead> <tr> <th></th> <th>Min</th> <th>Typ</th> <th>Max</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>11a (54Mbps) @EVM&lt;-25 dB</td> <td>14.5</td> <td>16.5</td> <td>18.5</td> <td>dBm</td> </tr> <tr> <td>11n (HT20 MCS7) @EVM ≤ -27 dB</td> <td>13.5</td> <td>15.5</td> <td>17.5</td> <td>dBm</td> </tr> <tr> <td>11n (HT40 MCS7) @EVM ≤ -27 dB</td> <td>13.5</td> <td>15.5</td> <td>17.5</td> <td>dBm</td> </tr> <tr> <td>11ac (VHT20 MCS8) @EVM ≤ -30 dB</td> <td>12</td> <td>14</td> <td>16</td> <td>dBm</td> </tr> <tr> <td>11ac (VHT40 MCS9) @EVM ≤ -32 dB</td> <td>10.5</td> <td>12.5</td> <td>14.5</td> <td>dBm</td> </tr> <tr> <td>11ac (VHT80 MCS9) @EVM ≤ -32 dB</td> <td>9.5</td> <td>11.5</td> <td>13.5</td> <td>dBm</td> </tr> <tr> <td>11ax (HE20 MCS11) @EVM ≤ -35 dB</td> <td>11</td> <td>13</td> <td>15</td> <td>dBm</td> </tr> <tr> <td>11ax (HE40 MCS11) @EVM ≤ -35 dB</td> <td>11</td> <td>13</td> <td>15</td> <td>dBm</td> </tr> <tr> <td>11ax (HE80 MCS11) @EVM ≤ -35 dB</td> <td>10</td> <td>12</td> <td>14</td> <td>dBm</td> </tr> </tbody> </table>		Min	Typ	Max	Unit	11b (11Mbps) @EVM<8%	18	19.5	21	dBm	11g (54Mbps) @EVM ≤ -25 dB	16.5	18	19.5	dBm	11n (HT20 MCS7) @EVM ≤ -27 dB	14.5	17	18.5	dBm	11ax (HE20 MCS11) @EVM ≤ -35 dB	13.5	15	16.5	dBm		Min	Typ	Max	Unit	11a (54Mbps) @EVM<-25 dB	14.5	16.5	18.5	dBm	11n (HT20 MCS7) @EVM ≤ -27 dB	13.5	15.5	17.5	dBm	11n (HT40 MCS7) @EVM ≤ -27 dB	13.5	15.5	17.5	dBm	11ac (VHT20 MCS8) @EVM ≤ -30 dB	12	14	16	dBm	11ac (VHT40 MCS9) @EVM ≤ -32 dB	10.5	12.5	14.5	dBm	11ac (VHT80 MCS9) @EVM ≤ -32 dB	9.5	11.5	13.5	dBm	11ax (HE20 MCS11) @EVM ≤ -35 dB	11	13	15	dBm	11ax (HE40 MCS11) @EVM ≤ -35 dB	11	13	15	dBm	11ax (HE80 MCS11) @EVM ≤ -35 dB	10	12	14
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<b>Output Power<sup>1</sup></b> <b>(Board Level Limit)*</b>																																																																											

<sup>1</sup> Unless otherwise stated, limit values apply for an ambient temperature of +25 °C.

<b>Receiver Sensitivity**</b>	<b>6G</b>				
		Min	Typ	Max	Unit
	11ax (HE20 MCS11) @EVM $\leq$ -35 dB		10		dBm
	11ax (HE40 MCS11) @EVM $\leq$ -35 dB		10		dBm
	11ax (HE80 MCS11) @EVM $\leq$ -35 dB		10		dBm
	<b>2.4G</b>				
		Min	Typ	Max	Unit
	11b (11Mbps)		-89	-85	dBm
	11g (54Mbps)		-77	-74	dBm
	11n (HT20 MCS7)		-75	-72	dBm
	11ax (HE20 MCS11)		-64	-61	dBm
	<b>5G(n/ac packets with LDPC)</b>				
		Min	Typ	Max	Unit
11a (54Mbps)		-74	-71	dBm	
11n (HT20 MCS7)		-72	-69	dBm	
11n (HT40 MCS7)		-69	-66	dBm	
11ac (VHT20 MCS8)		-67	-64	dBm	
11ac (VHT40 MCS9)		-63	-60	dBm	
11ac (VHT80 MCS9)		-60	-57	dBm	
11ax (HE20 MCS11)		-61	-58	dBm	
11ax (HE40 MCS11)		-56	-53	dBm	
11ax (HE80 MCS11)		-55	-52	dBm	
<b>6G</b>					
	Min	Typ	Max	Unit	
11ax (HE20 MCS11)		-52		dBm	
11ax (HE40 MCS11)		-52		dBm	
11ax (HE80 MCS11)		-52		dBm	



<b>Data Rate</b>	802.11b: 1, 2, 5.5, 11Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n: MCS0~7 HT20/HT40 802.11a: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11ac: MCS0~8 VHT20 802.11ac: MCS0~9 VHT40/VHT80 802.11ax: MCS10~11 HE20/HE40/HE80
<b>Security</b>	<ul style="list-style-type: none"> <li>● WEP</li> <li>● WPA/WPA2/WPA3 Enterprise with 192-bit encryption</li> <li>● WMM, WMM-PS (U-APSD), WMM-SA</li> <li>● AES (hardware accelerator),</li> <li>● TKIP (hardware accelerator)</li> <li>● CKIP (software support)</li> </ul>

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

**\*\* Project is in engineering stage, RF performance is still being verified.**

### 1.3.3 Bluetooth

Features	Description				
<b>Bluetooth Standard</b>	Bluetooth 5.2				
<b>Bluetooth VID/PID</b>	N/A				
<b>Frequency Range</b>	2400~2483.5MHz				
<b>Modulation</b>	GFSK (1Mbps), $\pi/4$ DQPSK (2Mbps) and 8DPSK (3Mbps)				
<b>Output Power*</b>		Min	Typ	Max	Unit
	BDR	4	7	10	dBm
	Low Energy (2MHz)	4	7	10	dBm
<b>Receiver Sensitivity**</b>		Min	Typ	Max	Unit
	BDR		-90	-87	dBm
	EDR		-86	-83	dBm
	Low Energy (2MHz)		-92	-89	dBm

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

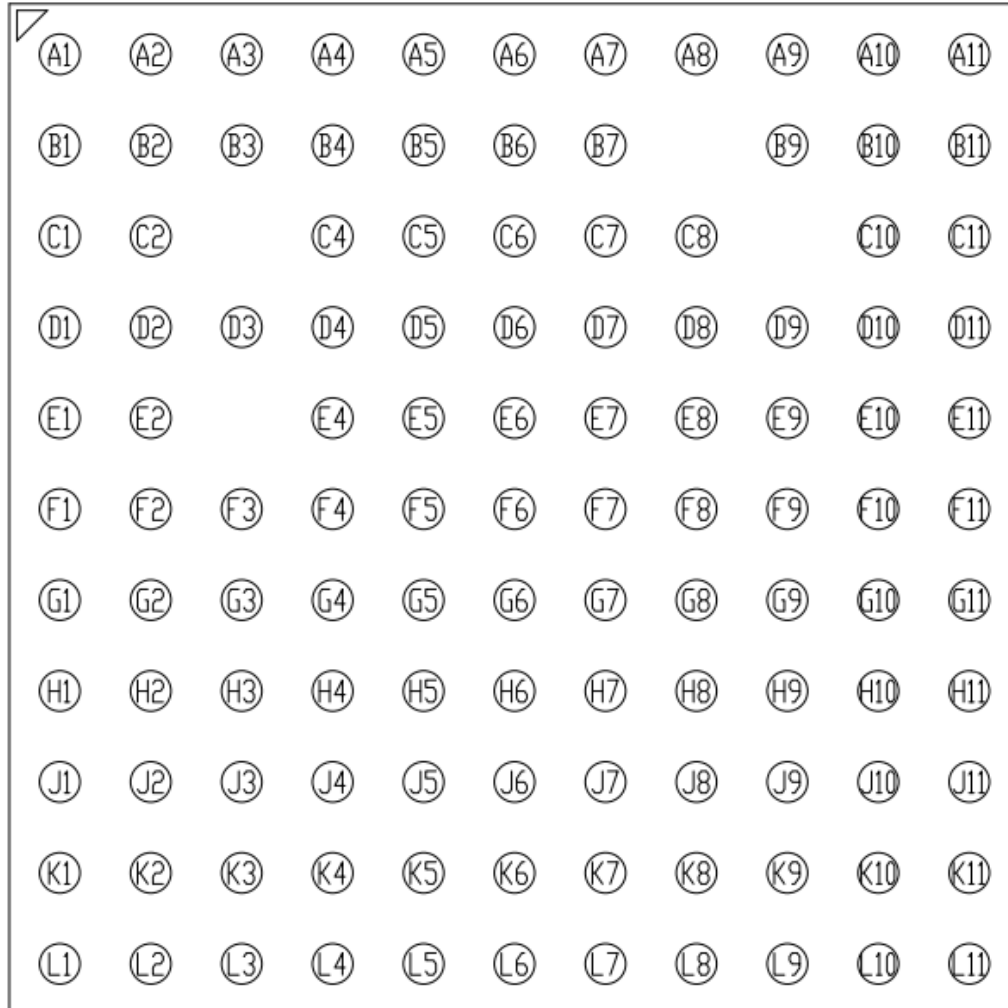
\*\* Project is in engineering stage, RF performance is still being verified.

### 1.3.4 Operating Conditions

Features	Description
<b>Operating Conditions</b>	
<b>Voltage</b>	3.3V
<b>Operating Temperature</b>	-40°C to 85°C
<b>Operating Humidity</b>	less than 85% R.H.
<b>Storage Temperature</b>	-40°C to 85°C
<b>Storage Humidity</b>	less than 60% R.H.
<b>ESD Protection</b>	
<b>Human Body Model</b>	TBD
<b>Changed Device Model</b>	TBD

## 2. Pin Definition

### 2.1 Pin Map



**AW-XH323-SUR Pin Map (Top View)**

## 2.2 Pin Table

Pin No	Definition	Basic Description	Voltage	Type
<b>A1</b>	GND	Ground.	-	GND
<b>A2</b>	RESERVED	Please don't connect to this pin.	-	-
<b>A3</b>	RESERVED	Please don't connect to this pin.	-	-
<b>A4</b>	RESERVED	Please don't connect to this pin.	-	-
<b>A5</b>	RESERVED	Please don't connect to this pin.	-	-
<b>A6</b>	RESERVED	Please don't connect to this pin.	-	-
<b>A7</b>	RESERVED	Please don't connect to this pin.	-	-
<b>A8</b>	GND	Ground.	-	GND
<b>A9</b>	CSR_VLX	CSR Power Stage Output to Inductor	0.9V	O
<b>A10</b>	ASR_VLX	ASR Power Stage Output to Inductor	1.12V	O
<b>A11</b>	GND	Ground.	-	GND
<b>B1</b>	GND	Ground.	-	GND
<b>B2</b>	GND	Ground.	-	GND
<b>B3</b>	GND	Ground.	-	GND
<b>B4</b>	GND	Ground.	-	GND
<b>B5</b>	GND	Ground.	-	GND
<b>B6</b>	GND	Ground.	-	GND
<b>B7</b>	GND	Ground.	-	GND
<b>B9</b>	CSR_VLX	CSR Power Stage Output to Inductor	0.9V	O
<b>B10</b>	ASR_VLX	ASR Power Stage Output to Inductor	1.12V	O
<b>B11</b>	GND	Ground.	-	GND
<b>C1</b>	WL_REG_ON	Low asserting reset for WiFi core	3.3V	I
<b>C2</b>	BT_PCM_SYNC	PCM sync signal	1.8V	I/O
<b>C4</b>	RESERVED	Please don't connect to this pin.	-	-

<b>C5</b>	GND	Ground.	-	GND
<b>C6</b>	LHL_GPIO5	Miscellaneous General Purpose I/O	1.8V	I/O
<b>C7</b>	BT_REG_ON	Low asserting reset for Bluetooth core	3.3V	I
<b>C8</b>	GND	Ground.	-	GND
<b>C10</b>	VBAT	Main power voltage source input	3.3V	PWR
<b>C11</b>	VBAT	Main power voltage source input	3.3V	PWR
<b>D1</b>	RESERVED	Please don't connect to this pin.	-	-
<b>D2</b>	BT_PCM_IN	PCM data input.	1.8V	I
<b>D3</b>	BT_PCM_OUT	PCM data output.	1.8V	O
<b>D4</b>	BT_PCM_CLK	PCM clock; can be master (output) or slave (input).	1.8V	I/O
<b>D5</b>	RESERVED	Please don't connect to this pin.	1.8V	-
<b>D6</b>	LHL_GPIO3	Miscellaneous General Purpose I/O	1.8V	I/O
<b>D7</b>	LHL_GPIO2	Miscellaneous General Purpose I/O	1.8V	I/O
<b>D8</b>	GND	Ground.	-	GND
<b>D9</b>	CBUCK_0P9	Internal Buck 0.9V voltage generation pin.	0.9V	I
<b>D10</b>	CBUCK_0P9	Internal Buck 0.9V voltage generation pin.	0.9V	I
<b>D11</b>	ABUCK_1P12	Internal Buck 1.12V voltage generation pin.	1.12V	I
<b>E1</b>	GND	Ground.	-	GND
<b>E2</b>	GPIO_0_WL_HOST_WAKE	WL Host Wake.	1.8V	O
<b>E4</b>	BT_DEV_WAKE	Bluetooth DEVICE WAKE	1.8V	I/O
<b>E5</b>	GND	Ground.	-	GND
<b>E6</b>	LHL_GPIO4	Miscellaneous General Purpose I/O	1.8V	I/O
<b>E7</b>	GPIO_11_WL_UART_TX	Debug UART Serial Output.	1.8V	O
<b>E8</b>	GND	Ground.	-	GND
<b>E9</b>	GPIO_10_WL_UART_RX	Debug UART Serial Input.	1.8V	I

<b>E10</b>	GND	Ground.	-	GND
<b>E11</b>	ABUCK_1P12	Internal Buck 1.12V voltage generation pin.	1.12V	I
<b>F1</b>	BT_UART_RTS_N	Bluetooth UART request to send	1.8V	O
<b>F2</b>	BT_UART_CTS_N	Bluetooth UART clear to send	1.8V	I
<b>F3</b>	BT_HOST_WAKE	Bluetooth HOST_WAKE.	1.8V	I/O
<b>F4</b>	BT_CLK_REQ	A Bluetooth clock request.	1.8V	I/O
<b>F5</b>	GND	Ground.	-	GND
<b>F6</b>	LHL_GPIO0	Miscellaneous General Purpose I/O	1.8V	I/O
<b>F7</b>	LPO_IN	External Sleep Clock Input (32.768 kHz)	1.8V	I
<b>F8</b>	GND	Ground.	-	GND
<b>F9</b>	GND	Ground.	-	GND
<b>F10</b>	GND	Ground.	-	GND
<b>F11</b>	VDDIO	1.8 V IO Supply for WLAN GPIOs	1.8V	PWR
<b>G1</b>	BT_UART_TXD	Bluetooth UART serial data output	1.8V	O
<b>G2</b>	BT_UART_RXD	Bluetooth UART serial data input	1.8V	I
<b>G3</b>	GND	Ground.	-	GND
<b>G4</b>	GND	Ground.	-	GND
<b>G5</b>	GND	Ground.	-	GND
<b>G6</b>	GND	Ground.	-	GND
<b>G7</b>	GND	Ground.	-	GND
<b>G8</b>	GND	Ground.	-	GND
<b>G9</b>	GND	Ground.	-	GND
<b>G10</b>	GPIO_1	Strap option	1.8V	I/O
<b>G11</b>	GND	Ground.	-	GND
<b>H1</b>	SDIO_CMD	SDIO Command Line	1.8V	I/O
<b>H2</b>	SDIO_DATA_0	SDIO Data Line 0	1.8V	I/O

<b>H3</b>	SDIO_DATA_3	SDIO Data Line 3	1.8V	I/O
<b>H4</b>	SDIO_DATA_2	SDIO Data Line 2	1.8V	I/O
<b>H5</b>	GND	Ground.	-	GND
<b>H6</b>	WL_DEV_WAKE	WL DEV_WAKE.	1.8V	I/O
<b>H7</b>	GND	Ground.	-	GND
<b>H8</b>	GND	Ground.	-	GND
<b>H9</b>	RESERVED	Please don't connect to this pin.	-	-
<b>H10</b>	RESERVED	Please don't connect to this pin.	-	-
<b>H11</b>	RESERVED	Please don't connect to this pin.	-	-
<b>J1</b>	SDIO_CLK	SDIO Clock Input	1.8V	I
<b>J2</b>	SDIO_DATA_1	SDIO Data Line 1	1.8V	I/O
<b>J3</b>	GND	Ground.	-	GND
<b>J4</b>	GND	Ground.	-	GND
<b>J5</b>	GND	Ground.	-	GND
<b>J6</b>	GND	Ground.	-	GND
<b>J7</b>	GND	Ground.	-	GND
<b>J8</b>	GND	Ground.	-	GND
<b>J9</b>	RESERVED	Please don't connect to this pin.	-	-
<b>J10</b>	RESERVED	Please don't connect to this pin.	-	-
<b>J11</b>	RESERVED	Please don't connect to this pin.	-	-
<b>K1</b>	GND	Ground.	-	GND
<b>K2</b>	GND	Ground.	-	GND
<b>K3</b>	GND	Ground.	-	GND
<b>K4</b>	GND	Ground.	-	GND
<b>K5</b>	GND	Ground.	-	GND
<b>K6</b>	BT_GPIO_11	BT General Purpose I/O	1.8V	I/O

<b>K7</b>	GND	Ground.	-	GND
<b>K8</b>	GND	Ground.	-	GND
<b>K9</b>	GND	Ground.	-	GND
<b>K10</b>	GND	Ground.	-	GND
<b>K11</b>	GND	Ground.	-	GND
<b>L1</b>	GND	Ground.	-	GND
<b>L2</b>	RESERVED	Please don't connect to this pin.	-	-
<b>L3</b>	GND	Ground.	-	GND
<b>L4</b>	GND	Ground.	-	GND
<b>L5</b>	C0_ANT	WLAN/BT Main RF TX/RX path.		RF
<b>L6</b>	GND	Ground.	-	GND
<b>L7</b>	GND	Ground.	-	GND
<b>L8</b>	GND	Ground.	-	GND
<b>L9</b>	GND	Ground.	-	GND
<b>L10</b>	C1_ANT	WLAN Aux RF TX/RX path.		RF
<b>L11</b>	GND	Ground.	-	GND

## 2.3 Host Configuration Interface Table

Pin No	Definition	Interface	Strap
G10	GPIO_1	SDIO	0



### 3. Electrical Characteristics

#### 3.1 Absolute Maximum Ratings

Symbol	Parameter	Minimum	Typical	Maximum	Unit
<b>VBAT</b>	DC supply for the VBAT and PA driver supply	-0.5	-	6.0	V
<b>VDDIO</b>	DC supply voltage for digital I/O	-0.5	-	2.2	V
<b>Tj</b>	Maximum junction temperature	-	-	125	°C

#### 3.2 Recommended Operating Conditions

Symbol	Parameter	Minimum	Typical	Maximum	Unit
<b>VBAT</b>	Power supply for Internal Regulator	3.135	3.3	3.465	V
<b>VDDIO</b>	DC supply voltage for digital I/O	1.71	1.8	1.89	V

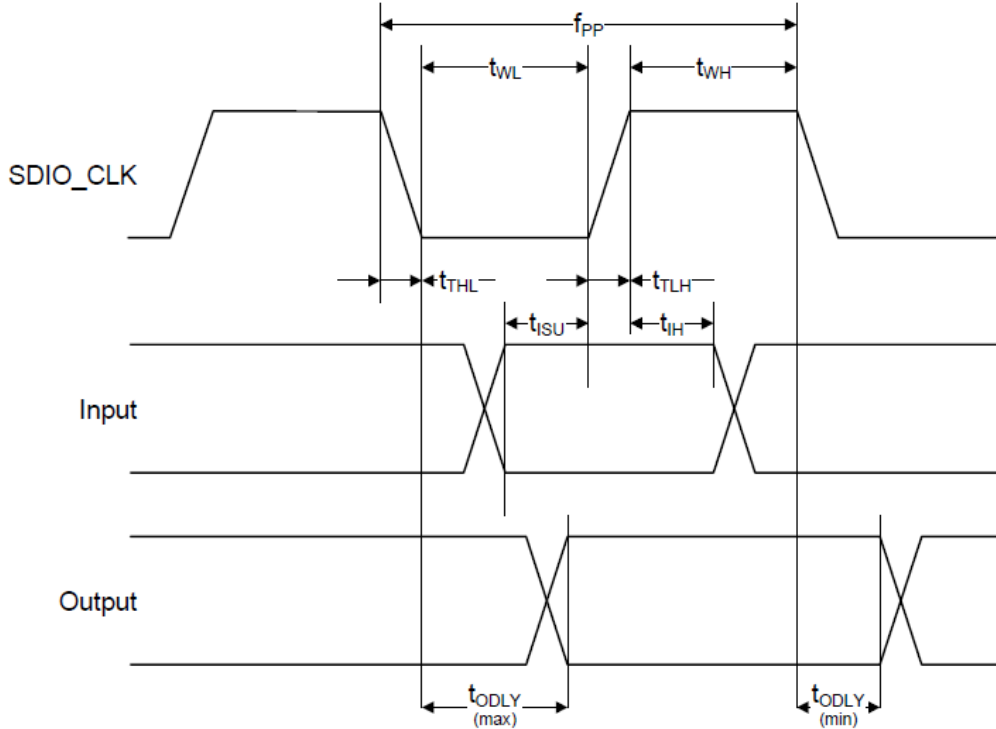
#### 3.3 Digital IO Pin DC Characteristics

Symbol	Parameter	Minimum	Typical	Maximum	Unit
<b>Digital I/O pins, VDDIO=1.8V</b>					
<b>V<sub>IH</sub></b>	Input high voltage	0.65 × VDDIO	-	-	V
<b>V<sub>IL</sub></b>	Input low voltage	-	-	0.35 × VDDIO	V
<b>V<sub>OH</sub></b>	Output high voltage	VDDIO – 0.45	-	-	V
<b>V<sub>OL</sub></b>	Output Low Voltage	-	-	0.45	V

### 3.4 Host Interface

#### 3.4.1 SDIO Interface

##### SDIO Bus Timing (Default Mode)

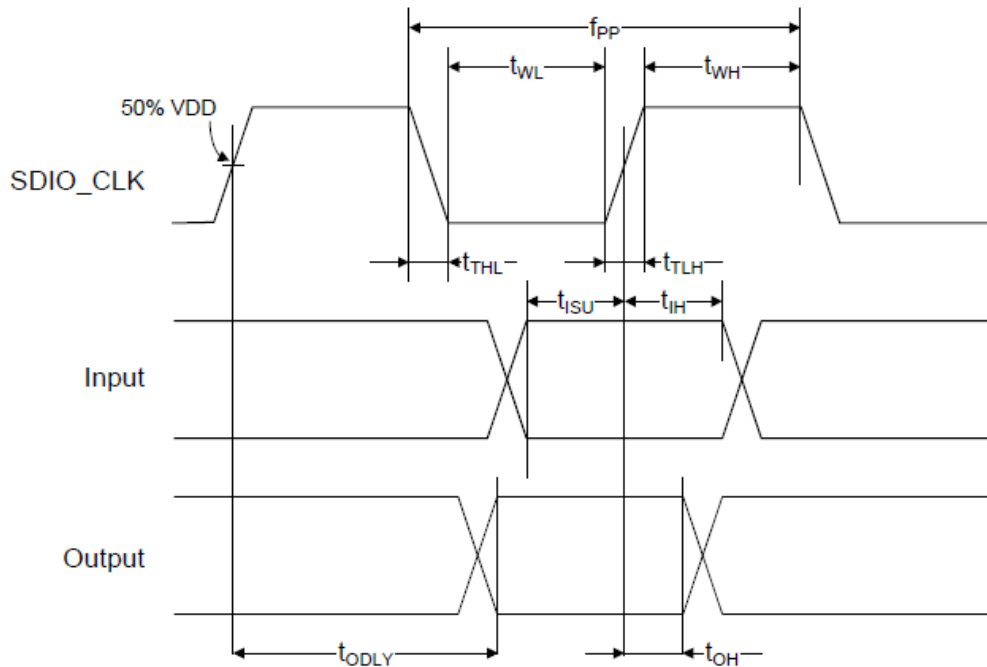


##### SDIO Bus Timing Parameters (Default Mode)

Parameter	Symbol	Minimum	Typical	Maximum	Unit
<b>SDIO CLK (All values are referred to minimum VIH and maximum VIL)</b>					
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
<b>Inputs: CMD, DAT (referenced to CLK)</b>					
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 <sub>ODLY</sub>	0	–	14	ns
Output delay time – Identification mode	t <sub>ODLY</sub>	0	–	50	ns

### SDIO Bus Timing (High-Speed Mode)



### SDIO Bus Timing Parameters (High-Speed Mode)

Parameter	Symbol	Minimum	Typical	Maximum	Unit
<b>SDIO CLK (all values are referred to minimum V<sub>IH</sub> and maximum V<sub>IL</sub><sup>b</sup>)</b>					
Frequency – Data Transfer Mode	f <sub>PP</sub>	0	–	50	MHz
Frequency – Identification Mode	f <sub>OD</sub>	0	–	400	kHz
Clock low time	t <sub>WL</sub>	7	–	–	ns
Clock high time	t <sub>WH</sub>	7	–	–	ns
Clock rise time	t <sub>TLH</sub>	–	–	3	ns
Clock low time	t <sub>THL</sub>	–	–	3	ns
<b>Inputs: CMD, DAT (referenced to CLK)</b>					
Input setup Time	t <sub>ISU</sub>	6	–	–	ns
Input hold Time	t <sub>IH</sub>	2	–	–	ns

Outputs: CMD, DAT (referenced to CLK)					
Output delay time – Data Transfer Mode	t <sub>ODLY</sub>	–	–	14	ns
Output hold time	t <sub>OH</sub>	2.5	–	–	ns
Total system capacitance (each line)	CL	–	–	40	pF

### 3.4.2 UART Interface

The AW-XH323-SUR UART is a standard 4-wire interface (RX, TX, RTS, and CTS) with adjustable baud rates from 9600 bps to 4.0 Mbps. The baud rate may be selected through a vendor-specific UART HCI command.

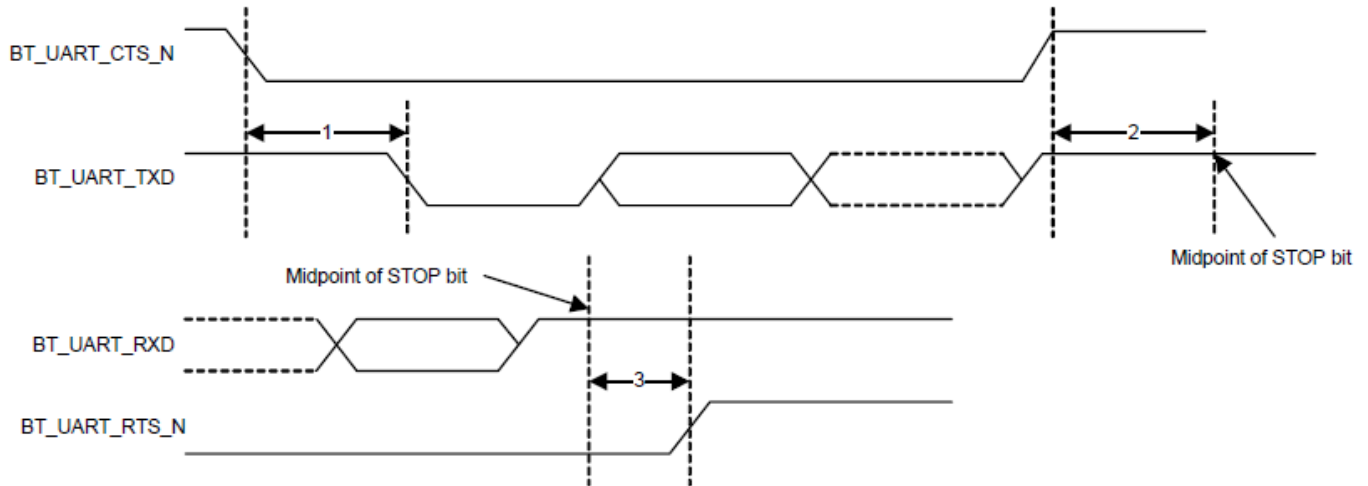
UART has a 1040-byte receive FIFO and a 1040-byte transmit FIFO to support EDR. Access to the FIFOs is conducted through the AHB interface through either DMA/CPU. The UART supports the Bluetooth 5.0 UART HCI specification. The default baud rate is 115.2 Kbaud.

The AW-XH323-SUR 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 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-XH323-SUR 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 No.	Name	Description	Type
F1	BT_UART_RTS_N	UART request-to-send. Active-low request-to-send signal for the HCI UART interface. BT LED control pin.	O
F2	BT_UART_CTS_N	UART clear-to-send. Active-low clear-to-send signal for the HCI UART interface.	I
G1	BT_UART_TXD	UART Serial Output. Serial data output for the HCI UART interface.	O
G2	BT_UART_RXD	UART serial input. Serial data input for the HCI UART interface.	I



### UART Timing

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

### 3.5 Power up Timing Sequence

AW-XH323-SUR 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.

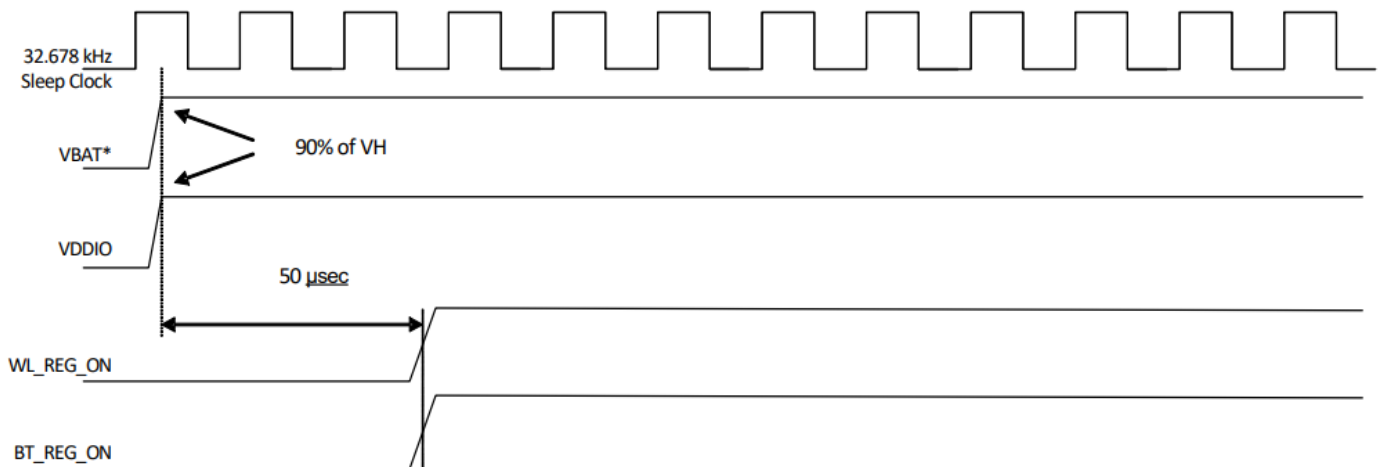
#### Description of Control Signals

- **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-XH323-SUR 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-XH323-SUR 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

- VBAT and VDDIO should not rise 10%–90% faster than 40 microseconds.

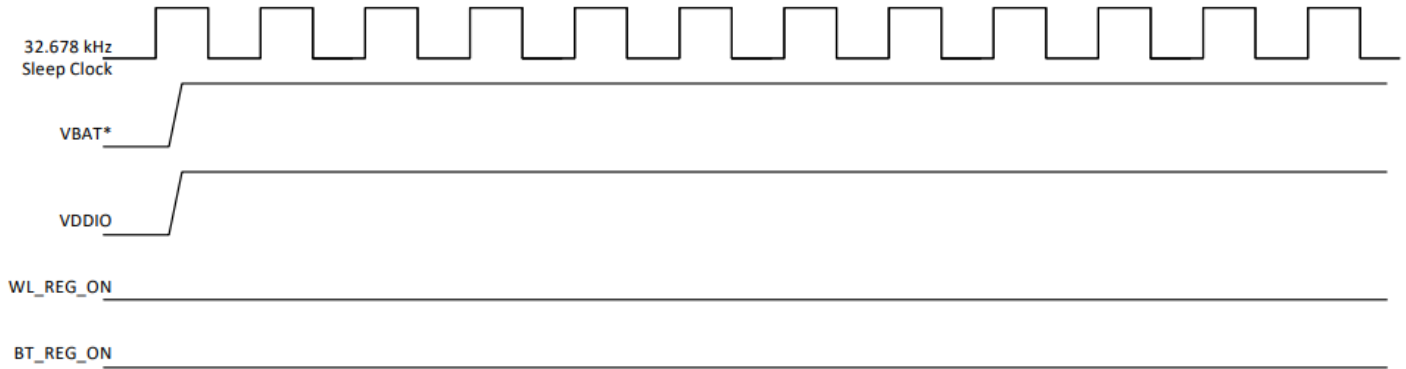
#### WLAN = ON, Bluetooth = ON



**\*Notes:**

1. VBAT and VDDIO should not rise 10%–90% faster than 40 microseconds.
2. 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.

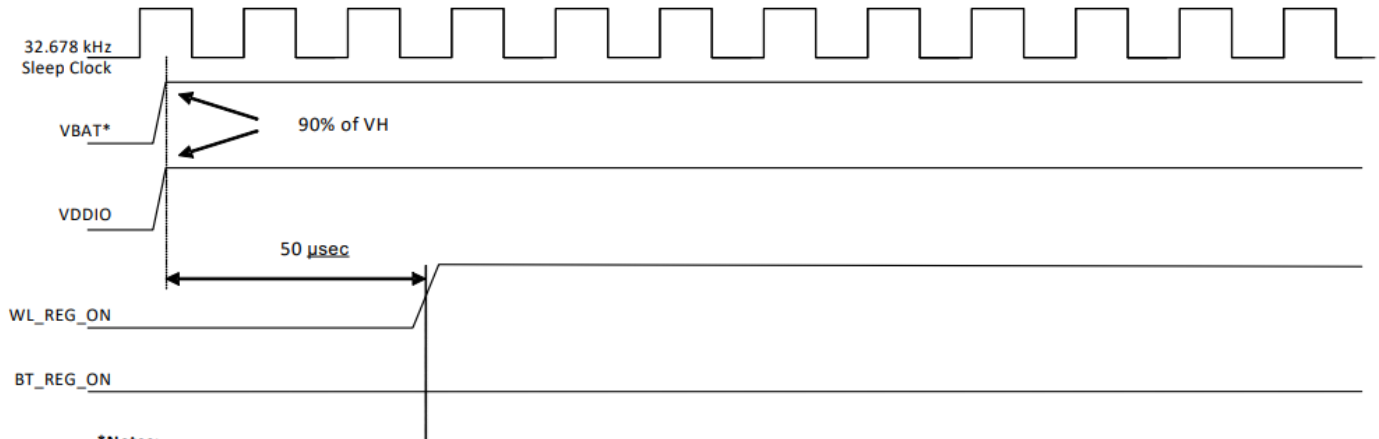
**WLAN = OFF, Bluetooth = OFF**



**\*Notes:**

1. VBAT and VDDIO should not rise 10%–90% faster than 40 microseconds.
2. 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.

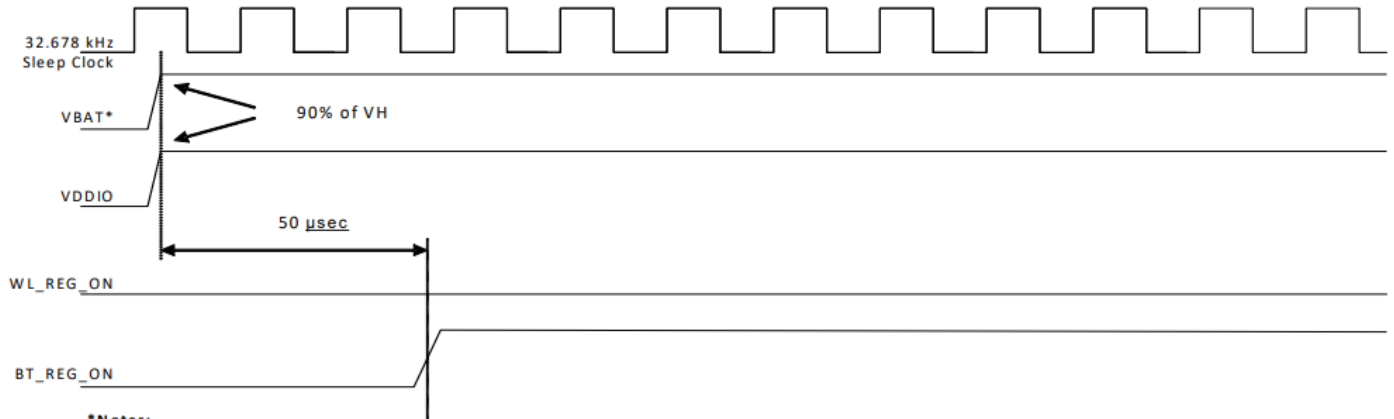
**WLAN = ON, Bluetooth = OFF**



**\*Notes:**

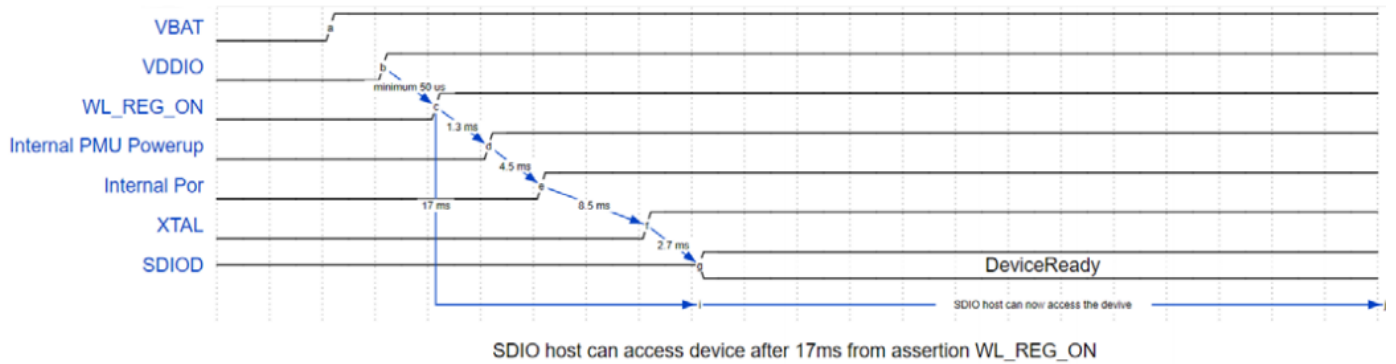
1. VBAT and VDDIO should not rise 10%–90% faster than 40 microseconds.
2. VBAT should be up before or at the same time as VDDIO. VDDIO should NOT be present first or be held high before VBAT is high.

**WLAN = OFF, Bluetooth = ON**



- \*Notes:**
1. VBAT and VDDIO should not rise 10%–90% faster than 40 microseconds.
  2. 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.

**WLAN Boot-Up Sequence for SDIO Host**





## **3.6 Power Consumption\***

### **3.6.1 WLAN**

TBD

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

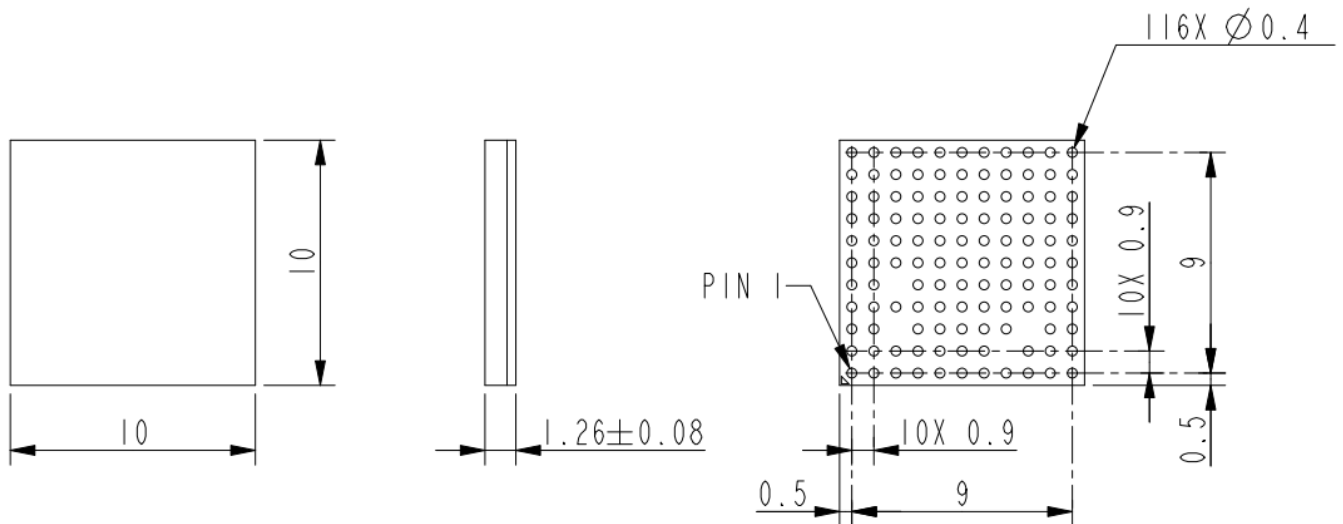
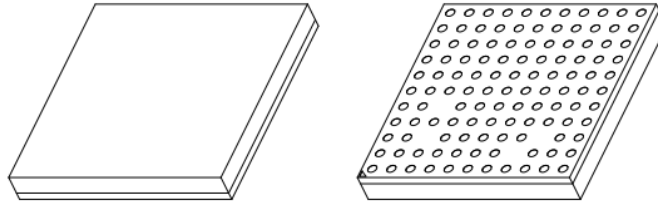
### **3.6.2 Bluetooth**

TBD

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

## 4. Mechanical Information

### 4.1 Mechanical Drawing



## 5. Packaging Information

TBD