AW-AH306

IEEE 802.11 a/b/g/n Wi-Fi with ac friendly + Bluetooth 5.0 Combo SIP Module

Datasheet

Rev. 0A

DF

(For Standard)

Features

WLAN

- Full IEEE 802.11a/b/g/n/ac 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 5.0 features supported.
- Bluetooth Class 1 or Class 2 transmitter operation.
- Supports BDR (1Mbps), EDR (2/3Mbps), BLE
- Host controller interface (HCI) using a high-speed UART interface.
- PCM for audio data.

Revision History

Document NO: R2-1306-DST-01

Version	Revision Date	DCN NO.	Description	Initials	Approved
Version0.1	2018/05/29		● First Release	JM.Pang	Chihhao Liao
Version 0.2	2018/11/29		● Update ● 1.2.1 WLAN ● 1.4.1 General ● 1.4.2 WLAN ● 1.4.3 Bluetooth	JM.Pang	Chihhao Liao
Version 0.3	2019/07/08		● Update ● 1.4 Specification tablet ● 3.2 Recommended Operating Conditions	JM.Pang	Chihhao Liao
A	2020/04/06	DCN017075	● Datasheet format update ● Pin map update	JM.Pang	Chihhao Liao

AzureWave Technologies, Inc.

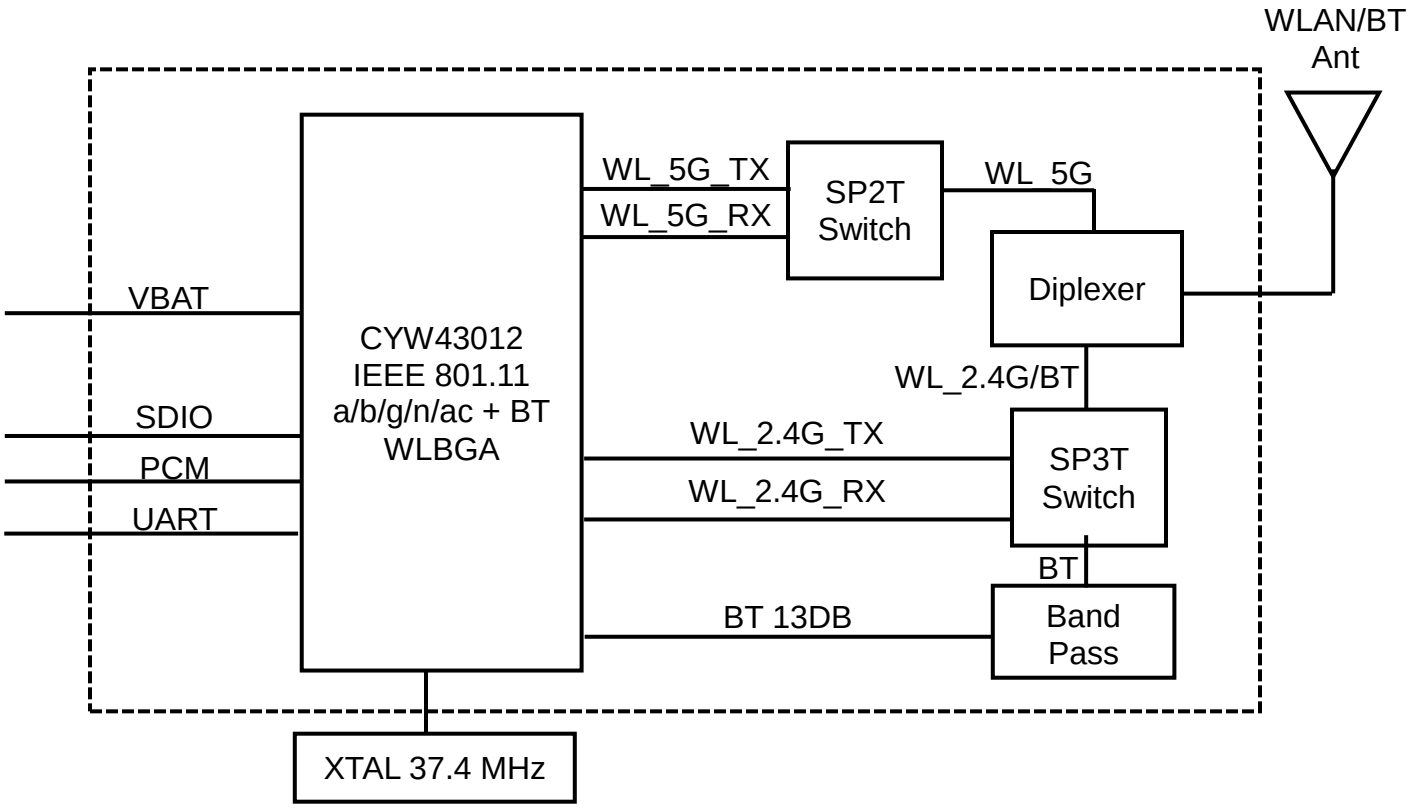
Table of Contents

1. Introduction

1.1 Product Overview

The Cypress CYW43012 single-chip device integrates an IEEE 802.11a/b/g/n compliant 802.11ac-friendly MAC/baseband/radio and Bluetooth 5.0+ 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



AW-AH306 BLOCK DIAGRAM

1.4 Specifications Table

1.4.1 General

Features	Description
Product Description	IEEE 802.11a/b/g/n with ac friendly, Wi-Fi compliant/ Bluetooth
Major Chipset	CYW43012
Host Interface	Wi-Fi: SDIO BT: UART
Dimension	8.5mm x 7mm x 1.21mm
Package	SIP (LGA type)
Antenna	Ant 1: WiFi Tx/Rx + BT
Weight	0.0002g

1.4.2 WLAN

Features	Description
WLAN Standard	IEEE802.11 a/b/g/n with ac friendly
WLAN VID/PID	N/A
WLAN SVID/SPID	N/A
Frequency Rage	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

<table>
<tr><td></td><td>Most European Countries – 1 ~ 13
802.11a:
USA – 36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 149, 153, 157, 161, 165</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>13</td><td>15</td><td>17</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>
5G
<table>
<tr><td></td><td>Min</td><td>Typ</td><td>Max</td><td>Unit</td></tr>
<tr><td>11a (54Mbps)
@EVM≦-25 dB</td><td>11</td><td>13</td><td>15</td><td>dBm</td></tr>
<tr><td>11n (HT20 MCS7)
@EVM≦-27 dB</td><td>11</td><td>13</td><td>15</td><td>dBm</td></tr>
<tr><td>11ac (VHT20 MCS8)
@EVM≦-30 dB</td><td>8</td><td>10</td><td>12</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>-88</td><td>-85</td><td>dBm</td></tr>
<tr><td>11g (54Mbps)</td><td></td><td>-76</td><td>-73</td><td>dBm</td></tr>
<tr><td>11n (HT20 MCS7)</td><td></td><td>-76</td><td>-73</td><td>dBm</td></tr>
</table>
5G
<table>
<tr><td></td><td>Min</td><td>Typ</td><td>Max</td><td>Unit</td></tr>
<tr><td>11a (54Mbps)</td><td></td><td>-74</td><td>-71</td><td>dBm</td></tr>
<tr><td>11n (HT20 MCS7)</td><td></td><td>-74</td><td>-71</td><td>dBm</td></tr>
<tr><td>11ac (VHT20 MCS8)</td><td></td><td>-70</td><td>-67</td><td>dBm</td></tr>
</table></td></tr>
<tr><td>Data Rate</td><td>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</td></tr>
<tr><td>Security</td><td>WEP
WPA Personal, WPA2 Personal
WMM, WMM-PS (U-APSD), WMM-SA, AES (hardware accelerator)
TKIP (hardware accelerator)
CKIP (software support)</td></tr>
</table>

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

1.4.3 Bluetooth

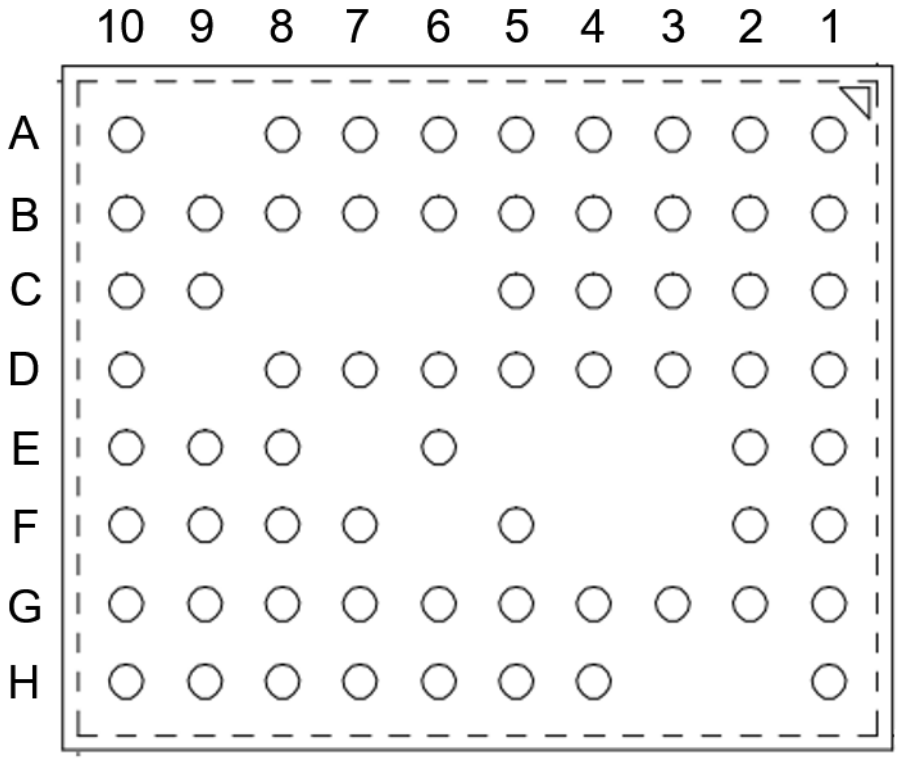
<table>
<tr><th>Features</th><th>Description</th></tr>
<tr><td>Bluetooth Standard</td><td>Bluetooth 5.0</td></tr>
<tr><td>Bluetooth VID/PID</td><td>NA</td></tr>
<tr><td>Frequency Rage</td><td>2402MHz~2480MHz</td></tr>
<tr><td>Modulation</td><td>Header GFSK
Payload 2M: 4-DQPSK
Payload 3M: 8DPSK</td></tr>
<tr><td>Output Power</td><td>
<table>
<tr><td></td><td>Min</td><td>Typ</td><td>Max</td><td>Unit</td></tr>
<tr><td>Basic Rate</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>BT Sensitivity (BER<0.1%)
<table>
<tr><td></td><td>Min</td><td>Typ</td><td>Max</td><td>Unit</td></tr>
<tr><td>BR</td><td></td><td>-88</td><td>-85</td><td>dBm</td></tr>
<tr><td>EDR</td><td></td><td>-90</td><td>-87</td><td>dBm</td></tr>
<tr><td>Low Energy</td><td></td><td>-86</td><td>-83</td><td>dBm</td></tr>
</table>
</td></tr>
</table>

1.4.4 Operating Conditions

Features	Description
Operating Conditions	
Voltage	VBAT: 3.2~4.4V VIO : 1.8
Operating Temperature	-20 to +70 ˚C
Operating Humidity	Less than 85%R.H.
Storage Temperature	-40 to +85 ˚C
Storage Humidity	Less than 60%R.H.
ESD Protection	
Human Body Model	1.8KV per MIL-STD-883H Method 3015.8
Changed Device Model	250V per JEDEC EIA/JESD22-C101E

2. Pin Definition

2.1 Pin Map



AW-AH306 Bottom View Pin Map

2.2 Pin Table

Pin No	Definition	Basic Description	Voltage	Type
G4	SDIO_CMD	SDIO Command Input		I/O
G7	SDIO_CLK	SDIO Clock Input		I
F8	SDIO_DATA0	SDIO Data Line 0		I/O
G5	SDIO_DATA1	SDIO Data Line 1		I/O
G6	SDIO_DATA2	SDIO Data Line 2		I/O
G8	SDIO_DATA3	SDIO Data Line 3		I/O
D8	SECI_OUTGPIO_5	GPIO configuration pin		I/O
D10	GPIO_6	GPIO configuration pin		I/O
E8	SECI_IN/GPIO_4	GPIO configuration pin		I/O
F9	GPIO_2	GPIO configuration pin		I/O
G1	WL_BT_ANT	WLAN/BT RF TX/RX path.		RF
B6	WL_XTAL_IN	Crystal Input(37.4MHz)		I
B7	WL_XTAL_OUT	Crystal Output(37.4MHz)		O
C10	LPO	External 32K or RTC clock		I
E1	CLK_REQ	Reference clock request		I/O
D5	BT_PCM_SYNC	PCM Synchronization control		O
D6	BT_PCM_CLK	PCM Clock		I/O
D4	BT_PCM_IN	PCM data Input		I
D7	BT_PCM_OUT	PCM data Out		O
A3	BT_UART_RTS_N	High-Speed UART RTS		O
B1	BT_UART_CTS_N	High-Speed UART CTS		I
A2	BT_UART_TXD	High-Speed UART Data Out		O
B2	BT_UART_RXD	High-Speed UART Data In		I
D1	NC	Floating Pin		Floating
D2	BT_HOSTWAKE	BT Host Wake		O
E9	WL_SDIO_HOSTWAKE	WL Host Wake		O
F5	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
C9	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		I

		internal 200k ohm pull down resistor that is enabled by default. It can be disabled through programming.		
H5	ET_LINREG_CAP_OUT	Bypass capacitor connection for internal linear regulator inside envelope tracking module		O
G10	LDO_VDD1P22	Input for CLDO and output for LPLDO		I/O
H8	VDDOUT_BT3P3_1	Output of 3.3V Bluetooth LDO	3.3V	O
A5	VDDOUT_BT3P3_2	Output of 3.3V Bluetooth LDO	3.3V	O
B10	VDDOUT_AON	Muxed output of MEM, core, and LPLDOs		O
B9	VDDOUT_MEMLPLDO	Output of 0.7V LDO for low-power memory	0.7V	O
H9	VIN_LDO_OUT	Internal Buck voltage generation pin	1.2V	VCC
A4	BT_LDOVDDV1P22	Bluetooth LDO 1.2V power supply	1.2V	PWR
A8	BT_VDD_XTAL	Power supply to XTAL	3.3V	PWR
A7	BT_XTAL_VDD_V1P22	Power supply to XTAL	3.3V	PWR
G2	WRF_DIRECT_VDD_V1P22	Input from 1.22V buck regulator driving radio cap-less ,LDOs inside frequency synthesizer	1.22V	PWR
G3	WRF_PMU_VDD_V1P22	Input from 1.22V buck regulator driving radio cap-less LDOs and transmitter blocks	1.22V	PWR
H7	VBAT	3.3V power pin	3.3V	VCC
H6	VBAT_2	3.3V power pin	3.3V	VCC
F10	VDDIO	1.8V VDDIO supply for WLAN and BT	1.8V	VCC
D3	P0	Function pin		I/O
C5	P1	Function pin		I/O
B4	P5_BT_DEV_WAKE	BT Device Wake		I
B5	P6	Function pin		I/O
C3	P7	Function pin		I/O
C1	P8	Function pin		I/O
C2	P9	Function pin		I/O
B3	P11	Function pin		I/O
C4	P12	Function pin		I/O
A1	GND	Ground		GND
A6	GND	Ground.		GND
A10	GND	Ground.		GND
B8	GND	Ground.		GND
E2	GND	Ground.		GND
E6	GND	Ground.		GND
E10	GND	Ground.		GND
F1	GND	Ground.		GND

F2	**GND**	**Ground.**		**GND**
F7	**GND**	**Ground.**		**GND**
G9	**GND**	**Ground.**		**GND**
H1	**GND**	**Ground.**		**GND**
H4	**GND**	**Ground.**		**GND**
H10	**GND**	**Ground.**		**GND**

3. Electrical Characteristics

3.1 Absolute Maximum Ratings

Symbol	Parameter	Minimum	Typical	Maximum	Unit
VBAT	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
VDDIO RF	DC supply voltage for RF switch I/Os	-0.5	-	4.10	V
Tj	Maximum junction temperature	-	-	125	˚C
TBD	Maximum input power for RX input ports	-	-	0	dBm

3.2 Recommended Operating Conditions

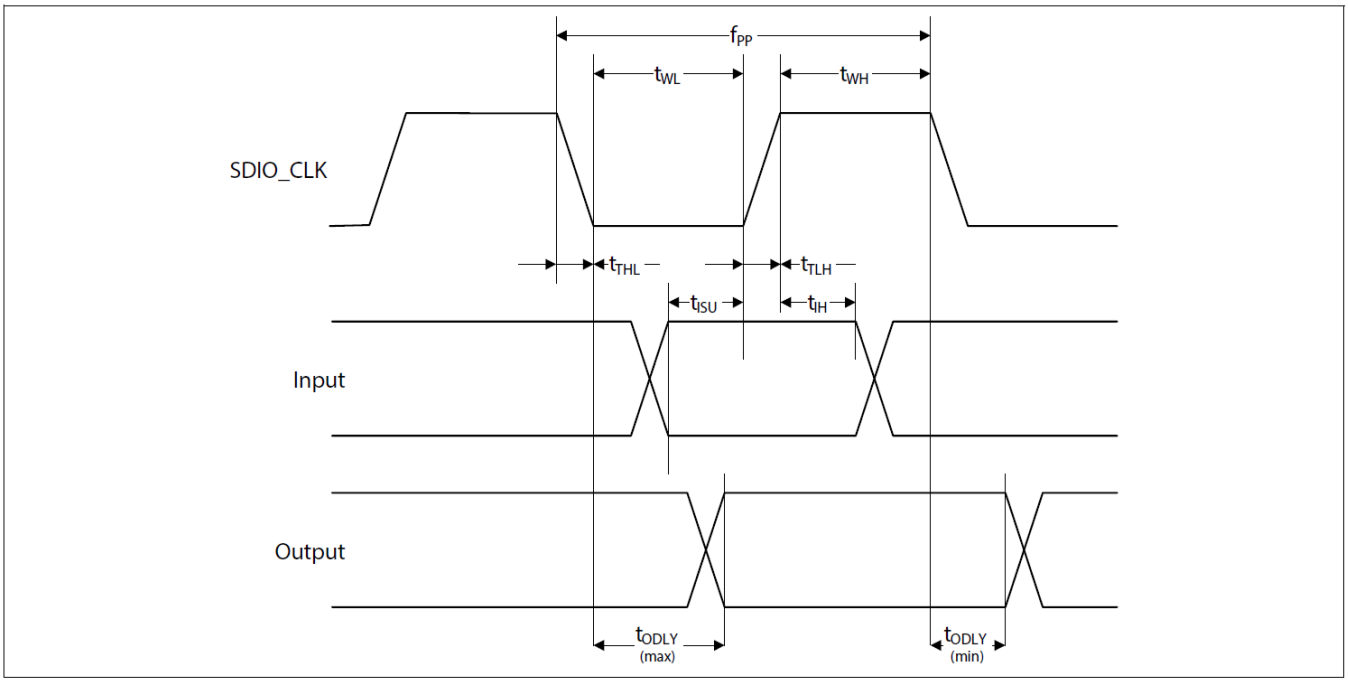
Symbol	Parameter	Minimum	Typical	Maximum	Unit
VBAT	Power supply for Internal Regulator and FEM	3.2	3.6	4.4	V
VDDIO	DC supply voltage for digital I/O	1.62	1.8	1.98	V

3.3 Digital IO Pin DC Characteristics

Symbol	Parameter	Minimum	Typical	Maximum	Unit
Digital I/O pins, VDDIO=1.8V					
V_{IH}	Input high voltage	0.65 x VDDIO	-	-	V
V_{IL}	Input low voltage	-	-	0.35 × VDDIO	V
V_{OH}	Output High Voltage @ 2mA	VDDIO – 0.45	-	-	V
V_{OL}	Output Low Voltage @ 2mA	-	-	0.45	V

3.4 Power up Timing Sequence

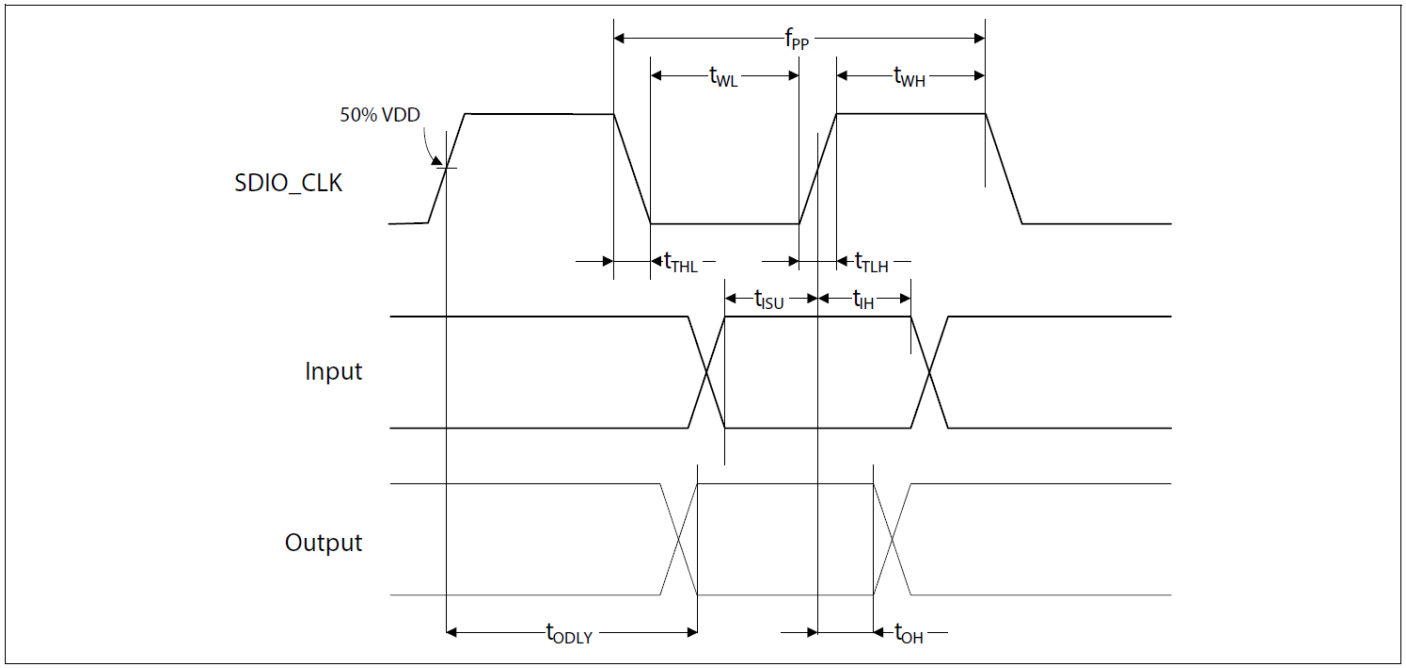
3.4.1 SDIO Host Interface Specification



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- enced to CLK)					
Input setup Time	t_{ISU}	6	–	–	ns
Input hold Time	t_{IH}	2	–	–	ns
Outputs: CMD, DAT (refer- enced 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-AH136 UART can perform XON/XOFF flow control and includes hardware support for the Serial Line Input Protocol (SLIP).

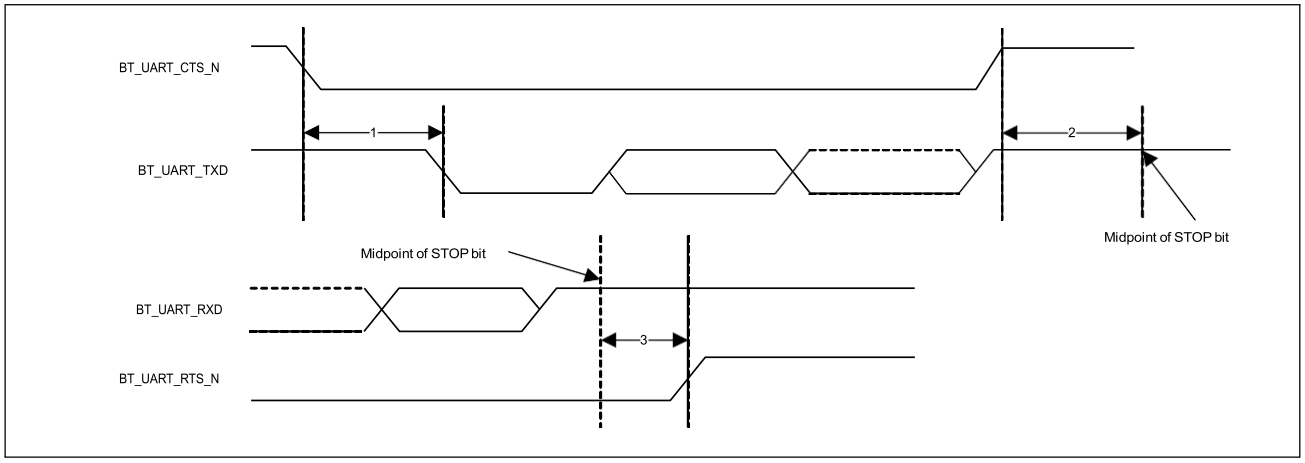
It can also perform wake-on activity. For example, activity on the RX or CTS inputs can wake the chip from a sleep state.

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-AH306 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 Number	Signal Name	Description	Type
A2	BT_UART_TXD	Bluetooth UART Serial Output. Serial data output for the HCI UART Interface	O
B2	BT_UART_RXD	Bluetooth UART Series Input. Serial data input for the HCI UART Interface	I
A3	BT_UART_RTS_N	Bluetooth UART Request-to-Send. Active-low request-to-send signal for the HCI UART interface	I
B1	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-AH306 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-AH136 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-AH136 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-AH136 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.

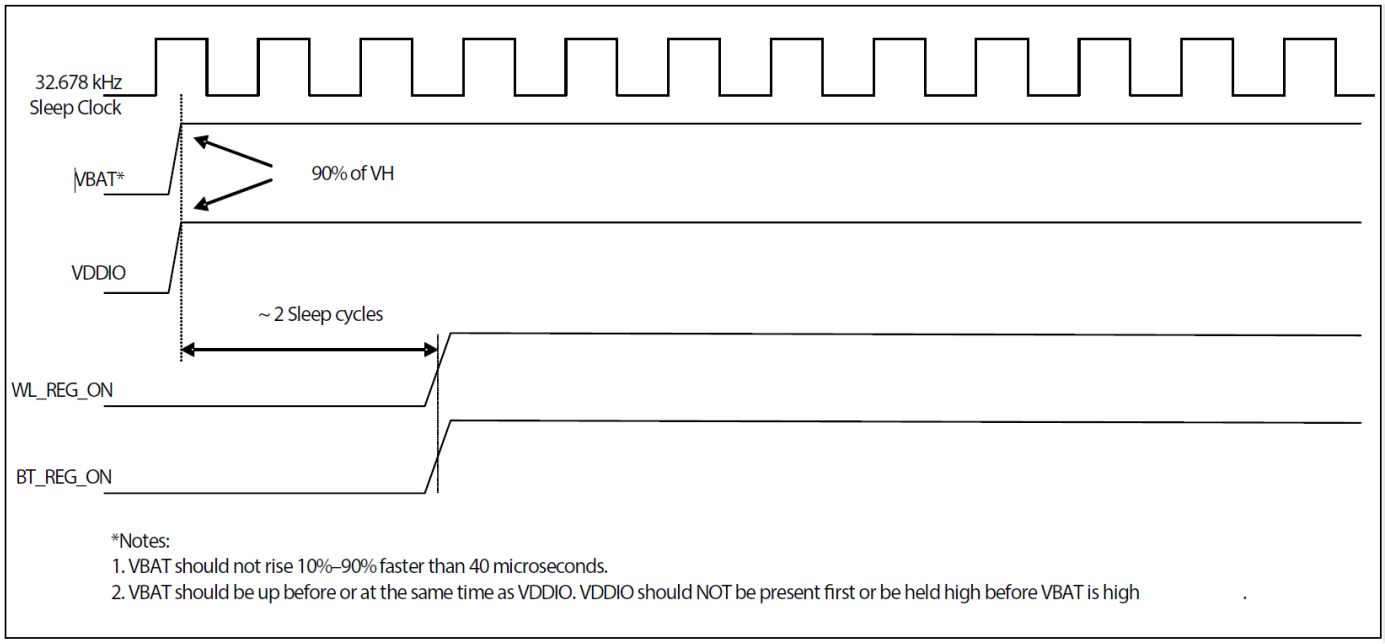
Power-Up/Power-Down/Reset Circuits

The AW-AM342SM has two signals that enable or disable the Bluetooth and WLAN circuits and the internal regulator blocks, allowing the host to control power consumption.

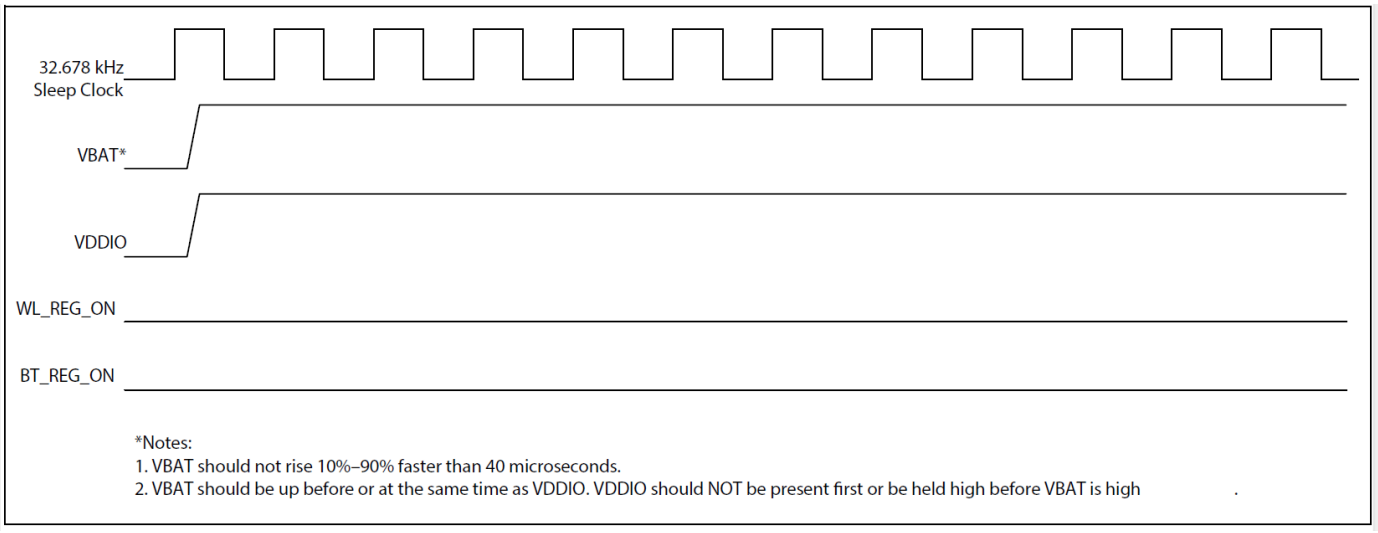
Signal	Description
WL_REG_ON	This signal is used by the PMU (with BT_REG_ON) to power-up the WLAN section. It is also OR-gated with the BT EG ON input to control the internal AW-AM342SM regulators. When this pin is high, the regulators are enabled and the WLAN section is out of reset. When

	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-AM342SM 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.

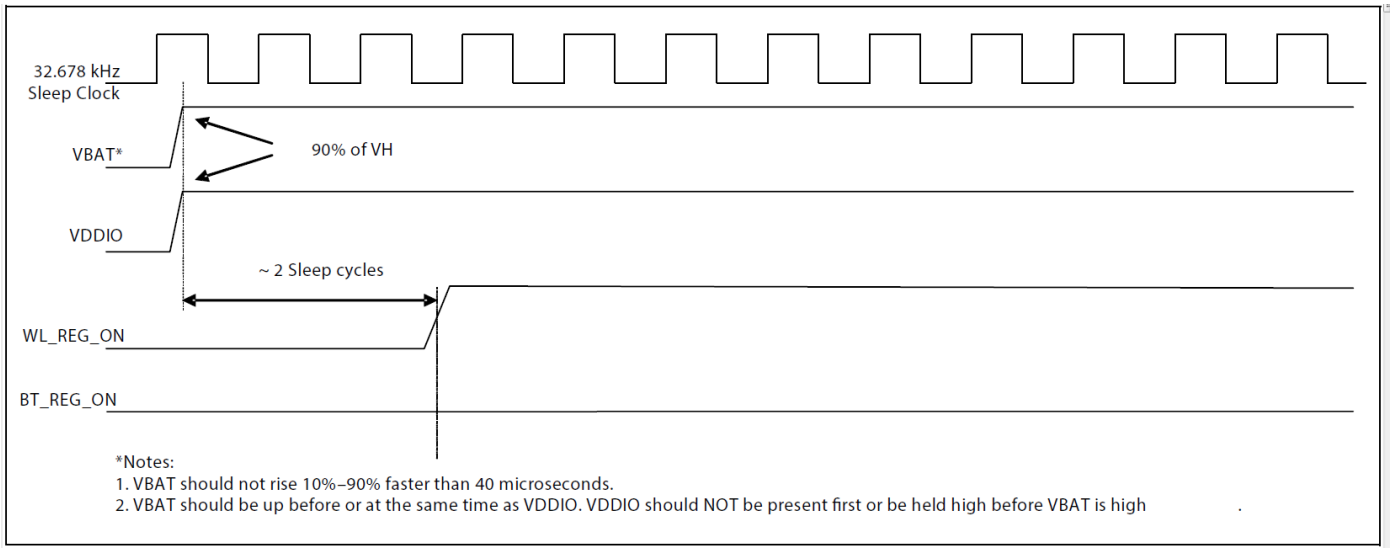
Power-Up/Power-Down/Reset Control Signals



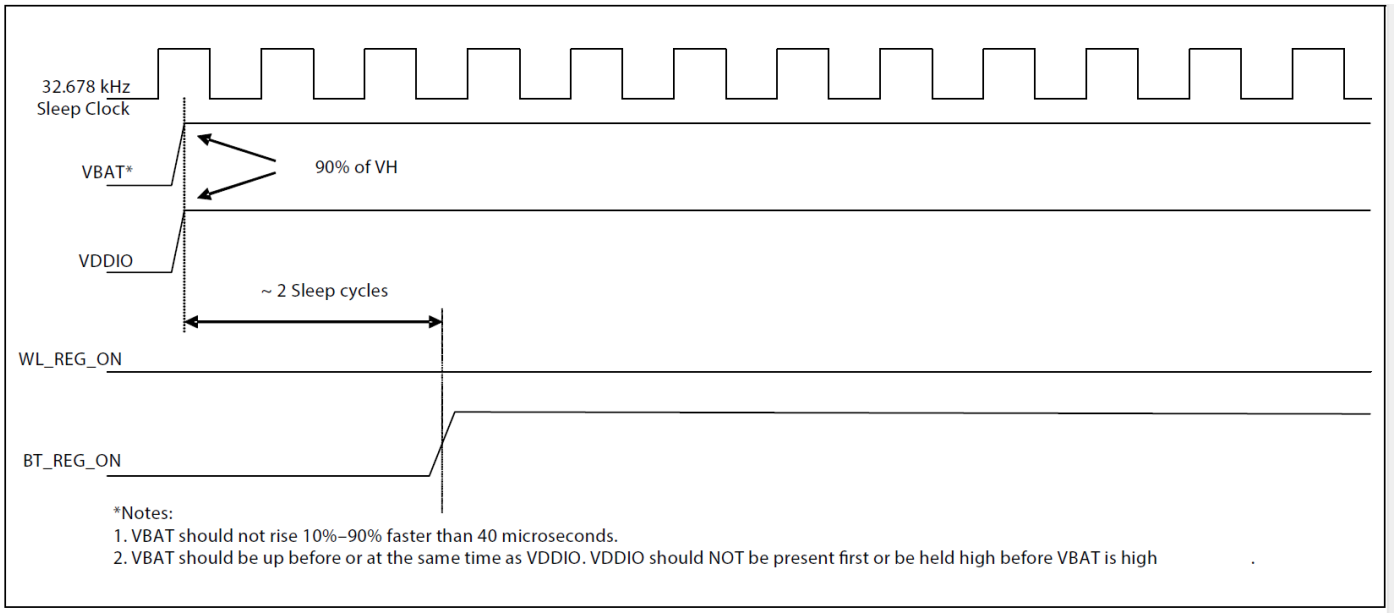
WLAN = ON, Bluetooth = ON



WLAN = OFF, Bluetooth = OFF



WLAN = ON, Bluetooth = OFF



WLAN = OFF, Bluetooth = ON

3.5 Power Consumption*

3.5.1 WLAN

	Item			VBAT=3.3V				
Band (GHz)	Mode	BW (MHz)	RF Power (dBm)	Transmit			Receive	
				Max.	Avg.	DUTY %	Max.	Avg.
2.4	11b@1Mbps	20	18	TBD	TBD	TBD	TBD	TBD
	11g@54Mbps	20	16	TBD	TBD	TBD	TBD	TBD
	11n@MCS7	20	15	TBD	TBD	TBD	TBD	TBD
	11n@MCS7	40	14	TBD	TBD	TBD	TBD	TBD
5	11a@54Mbps	20	15	TBD	TBD	TBD	TBD	TBD
	11n@MCS7	20	15	TBD	TBD	TBD	TBD	TBD
	11n@MCS7	40	13	TBD	TBD	TBD	TBD	TBD
	11ac@MCS9 NSS1	80	12	TBD	TBD	TBD	TBD	TBD

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

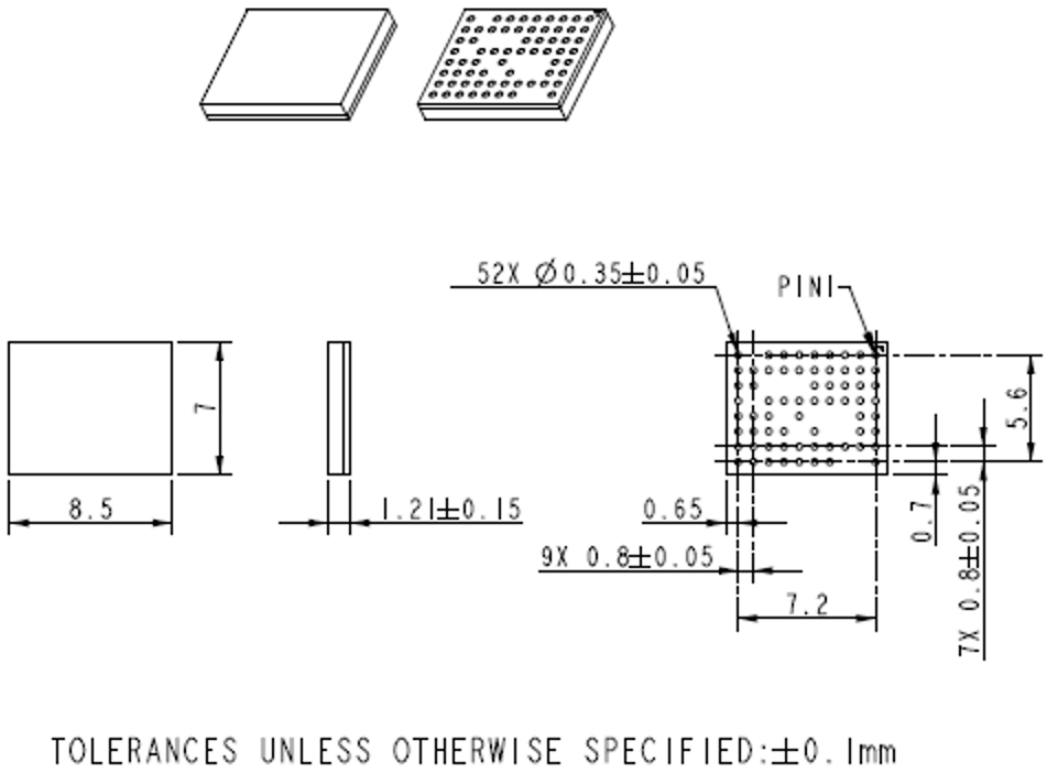
3.5.2 Bluetooth

No.	Mode	VBAT=3.3V			
		Transmit		Receive	
		Max.	Avg.	Max.	Avg.
1	Transmit (DH5)	TBD	TBD	TBD	TBD
2	Receive (3-DH5)	TBD	TBD	TBD	TBD

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

4. Mechanical Information

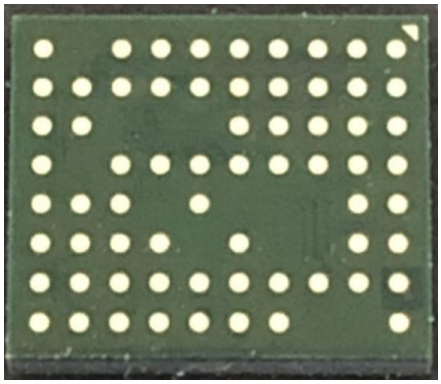
4.1 Mechanical Drawing



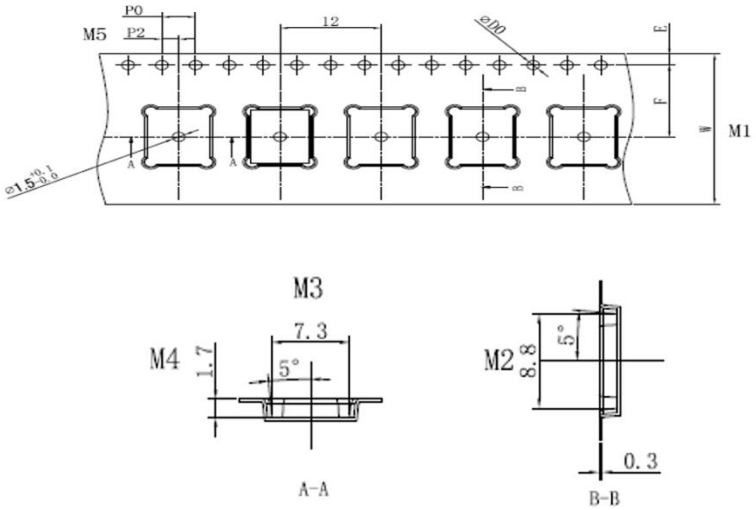
TOLERANCES UNLESS OTHERWISE SPECIFIED:±0.1mm

5. Packaging Information

5-1 Module photo

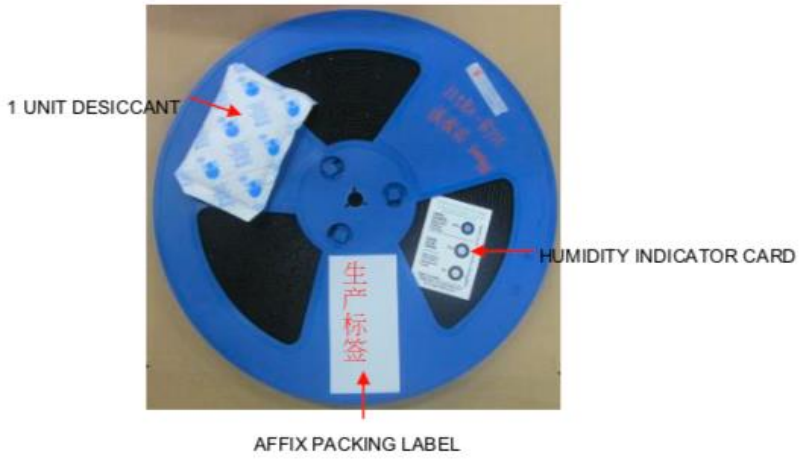


5-2 Put module in the same location.
The module polarity direction is on the upper left of the tape carrier.

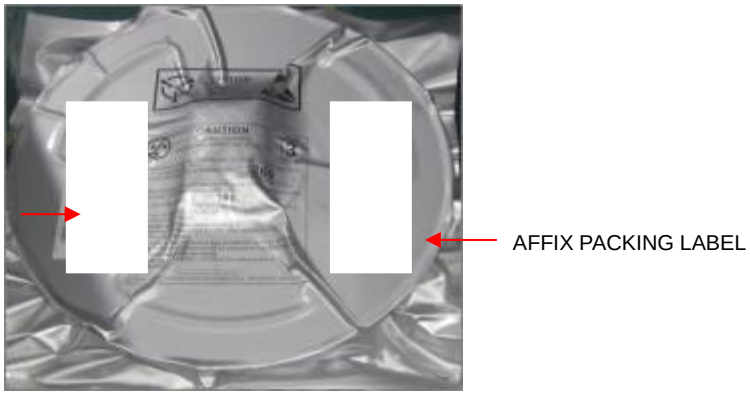


尺寸栏	
E	1.75±0.10
E2	22.25 MIN
F	11.50±0.10
P2	2.00±0.10
øDo	$1.50^{+0.10}_{0.00}$
øD1	
Po	4.00±0.10
10Po	40.00±0.20
W	24.00±0.30
P	12.00±0.10
Ao	7.30±0.10
BO	8.80±0.10
KO	1.70±0.10
t	0.30±0.05

5-3



5-4



5-5

5-6

5-7

1 Carton= 5 Boxes

5-8

Note: 1 tape reel = 1 box = 2,800pcs

1 carton = 5 boxes = 5 * 2,800pcs=14,000pcs