AW-CB161H

IEEE 802.11a/b/g/n/ac Wi-Fi with Bluetooth 4.0 / 3.0 + HS Combo Half Mini Card

BC

Datasheet

Version 0.4

Revision History

Document Release	Date	Modification	Initials	Approved
Version 0. 1	2014/07/01	First Release	Yvonne Chen	Patrick Lin
Version 0.2	2014/8/15	Update block diagram	Roger	Amos
Version 0.3	2014/12/17	Add power consumption result	Roger	Amos
Version 0.4	2015/6/8	Not support BT3.0+HS under Win10 OS after	Yvonne Chen	Patrick Lin

1. INTRODUCTION

AzureWave Technologies, Inc. introduces the pioneer of the IEEE 802.11 a/b/g/n/ac WIFI with Bluetooth 4.0 and BT3.0+HS class I combo half mini card module --- **AW-CB161H.** The AW-CB161H IEEE 802.11 a/b/g/n/ac PCIE WIFI with Bluetooth 4.0 + BT3.0 HS class I combo module is a highly integrated wireless local area network (WLAN) solution to let users enjoy the digital content through the latest wireless technology without using the extra cables and cords.   It combines with Bluetooth 4.0 and 3.0 + HS class I and provides a complete 2.4GHz Bluetooth system which is fully compliant to Bluetooth 4.0 and 3.0 + HS and v2.1 that supports EDR of 2Mbps and 3Mbps for data and audio communications.   It enables a high performance, cost effective, low power, compact solution that easily fits onto the PCI Express and USB Combo half mini Card.

Compliant with the IEEE 802.11a/b/g/n/ac standard, AW-CB161H uses Direct Sequence Spread Spectrum (DSSS), Orthogonal Frequency Division Multiplexing (OFDM), BPSK, QPSK, CCK and QAM baseband modulation technologies.
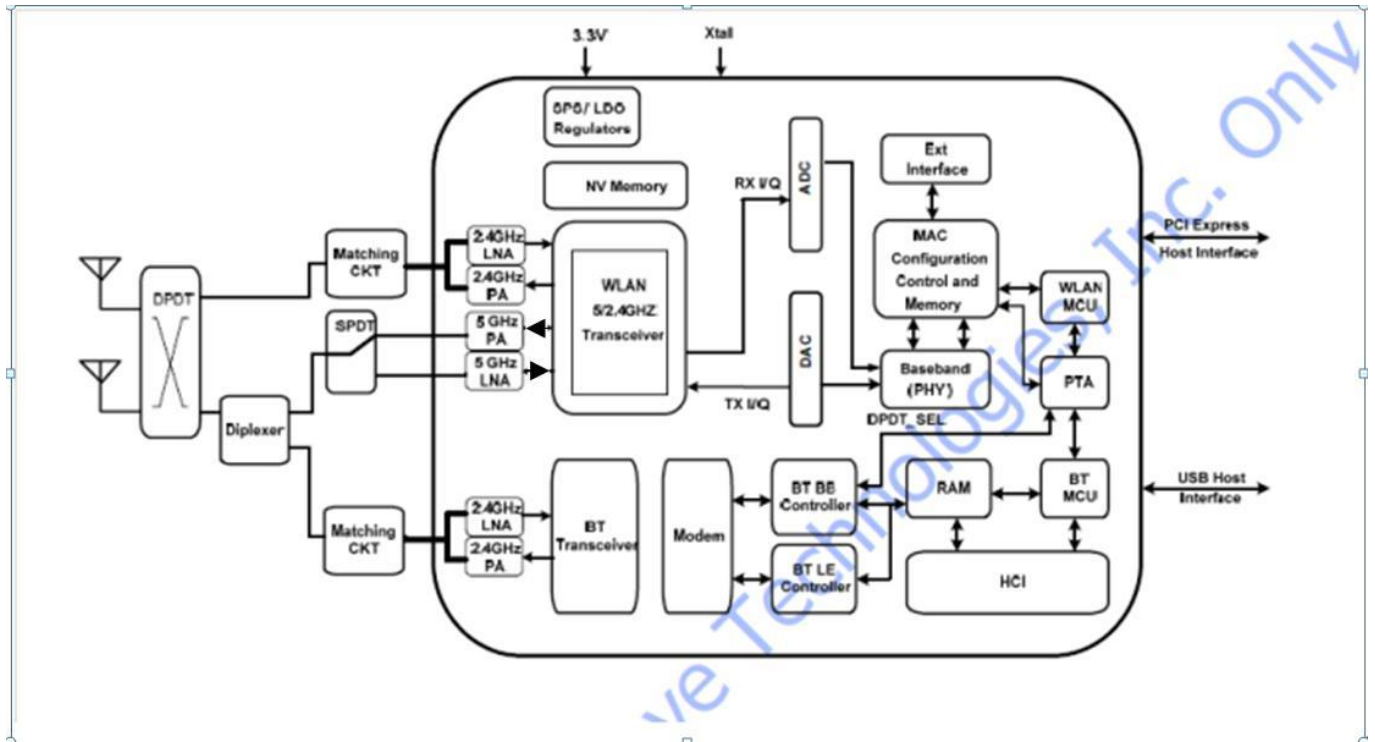
Compare to 802.11n technology, 802.11ac standard makes big improvement on speed and range. AW-CB161H module adopts REALTEK solution. The module design is based on the RTL8821AE single chip.

2. FEATURES

- High speed wireless connection up to 433.3Mbps transmit/receive PHY rate using 80MHz bandwidth
- 2 antennas to support 1(Transmit) × 1(Receive) diversity technology and Bluetooth
- WCS (Wireless Coexistence System)
- Low power consumption and high performance
- Enhanced wireless security
- Fully qualified Bluetooth BT4.0 and BT3.0 + High speed system
- Enhanced Data Rate(EDR) compliant for both 2Mbps and 3Mbps supported
- Fully speed operation with Piconet and Scatternet support
- Electrical compliant to USB1.1 & 2.0
- Please notice: not support BT3.0+HS under Win10 OS after

3. BLOCK DIAGRAM

4. GENERAL SPECIFICATIONS

Model Name	AW-CB161H
Product Description	IEEE 802.11 a/b/g/n/ac Wi-Fi with Bluetooth 4.0 + 3.0 HS class I Combo half mini card Module
BlueTooth Standard	IEEE 802.11a/b/g/n/ac, Wi-Fi compliant / Bluetooth4.0 + 3.0 HS Standard
Host Interface	Wi-Fi : PCI-E , BT : USB
Major Chipset	RTL8821AE
Wi-Fi SSV/PID	1A3B/ 216A
BT V/PID	13D3/ 3458
Dimension	29.85mm x 26.65mm x 1.5 mm (Tolerance remarked in mechanical drawing)
Weight	3.28g
Antenna	Standard U.FL Connector 1: Ant1(Main): Wi-Fi Tx/Rx + BT 2: Ant2(Aux): Wi-Fi Tx/Rx + BT
Operating Conditions	
Voltage	3.3V +/- 9%
Temperature	0~70 ºC
Storage temperature	-40~85ºC
Electrical Specifications	
Frequency Range	Wi-Fi: 2.4 GHz ISM Bands 2.412-2.472 GHz 　　　　5.15-5.25 GHz (FCC UNII-low band) for US/Canada, Japan 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 BT: 2402MHz~2483MHz
Modulation	Wi-Fi: 　802.11a/g/n/ac: OFDM 　802.11b: CCK(11, 5.5Mbps), DQPSK(2Mbps), BPSK(1Mbps) BT: 　Header GFSK 　Payload 2M: 4-DQPSK 　Payload 3M: 8DPSK
Output Power	Wi-Fi: 　8802.11a: 13 dBm +/- 2 dBm (54Mbps) 　802.11b: 16 dBm +/- 2 dBm (11Mbps) 　802.11g: 14 dBm +/- 2 dBm (54Mbps) 　802.11n @2.4GHz: 13 dBm +/- 2 dBm (HT20 MCS7) 　802.11n @2.4GHz: 13 dBm +/- 2dBm (HT40 MCS7)

	802.11n @5GHz: 12 dBm +/- 2 dBm (HT20 MCS7) 802.11n @5GHz: 12 dBm +/- 2 dBm (HT40 MCS7) 802.11ac @5GHz: 12 dBm +/- 2 dBm (HT80 MCS7) 802.11ac @5GHz: 10 dBm +/- 2 dBm (HT80 MCS9) BT: 0 ≤ Output Power ≤ 8 dBm (Conductive)

Receive Sensitivity	Wi-Fi:
	    802.11a: less than -65 dBm (54M)
	    802.11b: less than -76 dBm (11M)
	    802.11g: less than -65 dBm (54M)
	    802.11n@2.4GHz: less than -64 dBm (HT20 MCS7)
	    802.11n @2.4GHz: less than -61 dBm (HT40 MCS7)
	    802.11n@5GHz: less than -64 dBm (HT20 MCS7)
	    802.11n @5GHz: less than -61 dBm (HT40 MCS7)
	    802.11ac @5GHz: less than -51 dBm (VHT80 MCS9)
	
	BT: BER < 0.1% (Anritsu 8852B Tx -70 dBm)

Operating Range	Wi-Fi: Open Space: (300m) / Indoor:(100m) (The transmission speed may vary according to the environment) BT: 10m~20m (depending on environment and NB model)
Regulatory	Follow RTL8821AE regulatory list

4-1. Absolute Maximum Ratings

Symbol	Parameter	Max. Rating	Unit
V_{dd33}	Maximum I/O supply voltage	+3.6V	V

4-2. Recommended Operating Conditions

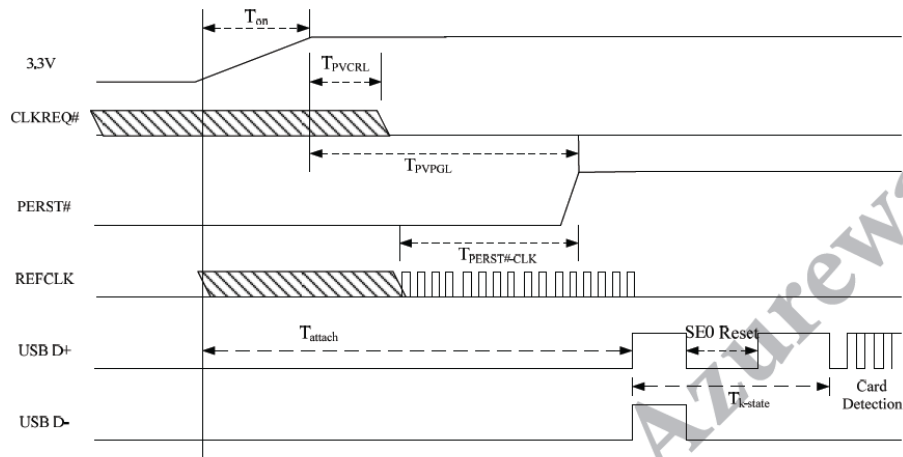| Symbol	Parameter	Rating	Unit
V_{dd33}	I/O voltage	3~3.6	V

4-3. Power UP Sequencing

Figure 5.   RTL8821AE PCIe and USB Bus Power On Sequence

T_{on}: The main power ramp up duration
T_{PVCRL}: Power valid to CLKREQ# output active
T_{PVPGL}: Power valid to PERST# input inactive
$T_{PERST\#-CLK}$: Reference clock stable before PERST# inactive
T_{attach}: USB attach state
$T_{k-state}$: the duration from resister attached to USB host starting card detection procedure

Table 13.   The typical timing range

symbol	Unit	Min	Typical	Max
T_{on}	ms	--	1.5	5
T_{PVCRL}	us	--		100
T_{PVPGL}	ms	1		--
$T_{PERST\#-CLK}$	us	100		--
T_{attach}	ms	2	7	15
$T_{k-state}$	ms	50	250	--

4-4. Power consumption

Test Bed	DELL Vostro 3450				
Test OS	Windows 8.1 Professional x64				
Test AP	NETGEAR R6300				
Driver Version	AZ_RTL8723AE_8723BE_8821AE_Win7_Win8.X_2012.16.0523.2014				
Test Voltage	3.3V				
Item		2.4 GHz		5 GHz		Note
		Disable ASPM	L1 mode	Disable ASPM	L1 mode	
No connect AP	AVG	37.9 mA	27.9 mA	38.4 mA	28.1 mA	
	MAX	187.8 mA	186.3 mA	186.7 mA	188.0 mA	
	MIN	28.3 mA	16.4 mA	28.3 mA	16.4 mA	
Connect AP	AVG	116.1 mA	107.1 mA	116.3 mA	113.6 mA	
	MAX	285.9 mA	284.5 mA	198.1 mA	198.2 mA	
	MIN	84.4 mA	76.5 mA	85.7 mA	78.0 mA	
WLAN RF OFF		24.0 mA	23.9 mA	24.0 mA	24.1 mA	
Transmit by HT40/VHT80		257.8 mA	265.8 mA	359.5 mA	356.2 mA	
Receiver by HT40/VHT80		183.8 mA	183.9 mA	225.7 mA	223.2 mA	

Note: 1.The power consumption data were measured when NB operated in DC (battery) mode.

2.Bluetooth function is disabled.

BLUETOOTH

Test Bed	DELL 3450	
Test OS	Windows 8.1 Professional x64	
Driver Version	RTBlueR_810.810.812.0402.2014	
Test Voltage	3.3V	
Item		Current value	Note
No connect BT device	AVG	24.0 mA	
	MAX	35.8 mA	
	MIN	22.5 mA	
connect BT device	AVG	29.7 mA	
	MAX	41.1 mA	
	MIN	28.3 mA	
BT RF OFF		16.0 mA	
Transmit by BER 2.1		54.9 mA	
Receiver by BER 2.1		44.7 mA	

Note:1.The power consumption data were measured when NB operated in DC (battery) mode
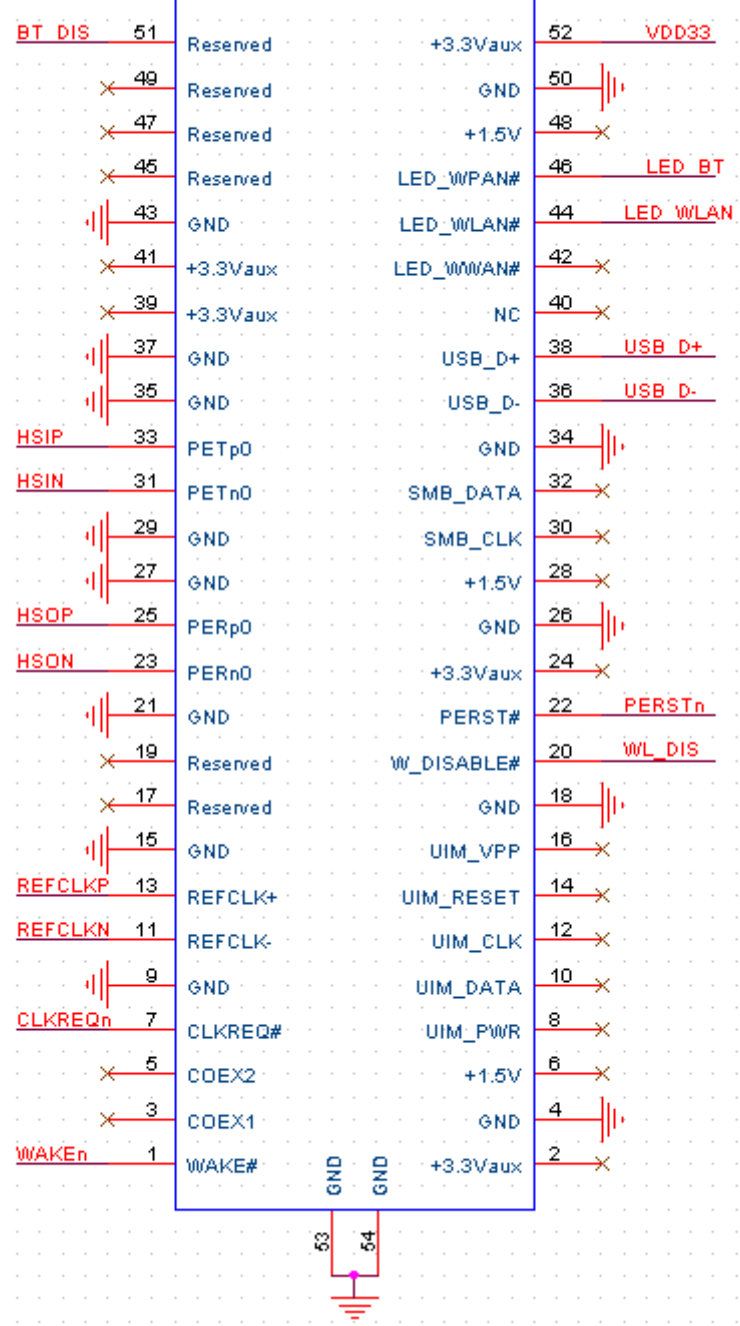
2. Wifi function is disabled.

5. CONNECTOR PIN-OUT DEFINITIONS

Pin No.	Definition	Basic Description	Type
1	WAKE#	**O**pen Drain active Low signal. This signal is used to request that the system return from a sleep/suspended state to service a function initiated wake event.	Output Open-Drain
2	NC	Floating Pin, No connect to anything.	Floating
3	NC	Floating Pin, No connect to anything.	Floating
4	GND	Ground.	GND
5	NC	Floating Pin, No connect to anything.	Floating
6	NC	Floating Pin, No connect to anything.	Floating
7	CLKREQn	Reference clock request	Output
8	NC	Floating Pin, No connect to anything.	Floating
9	GND	Ground.	GND
10	NC	Floating Pin, No connect to anything.	Floating
11	REFCLKN	Differential reference clock.	Input
12	NC	Floating Pin, No connect to anything.	Floating
13	REFCLKP	Differential reference clock.	Input
14	NC	Floating Pin, No connect to anything.	Floating
15	GND	Ground.	GND
16	NC	Floating Pin, No connect to anything.	Floating
17	NC	Floating Pin, No connect to anything.	Floating
18	GND	Ground.	GND
19	NC	Floating Pin, No connect to anything.	Floating
20	W_DISABLE#	WLAN disable control.	Input
21	GND	Ground.	GND
22	PERSTn	PCI express fundamental reset.	Input
23	PERN0	Differential transmit.	Output
24	NC	Floating Pin, No connect to anything.	Floating
25	PERp0	Differential transmit.	Output
26	GND	Ground.	GND
27	GND	Ground.	GND
28	NC	Floating Pin, No connect to anything.	Floating
29	GND	Ground.	GND
30	NC	Floating Pin, No connect to anything.	Floating
31	PETn0	Differential receive.	Input
32	NC	Floating Pin, No connect to anything.	Floating
33	PETp0	Differential receive.	Input
34	GND	Ground.	GND
35	GND	Ground.	GND
36	USB_D-	USB Differential signal	Output/ Input
37	GND	Ground.	GND
38	USB_D+	USB Differential signal	Output/ Input

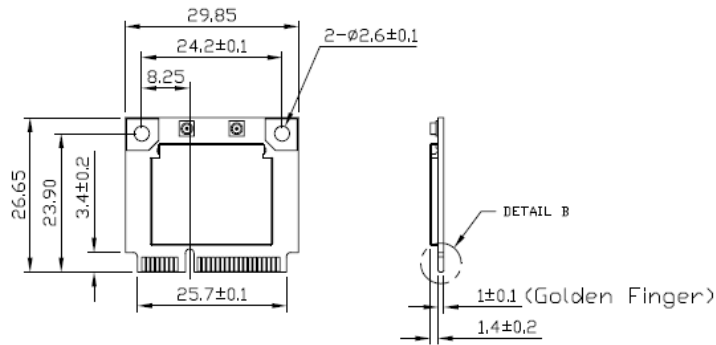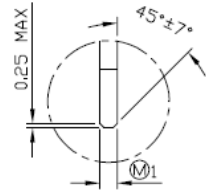| 39	NC	Floating Pin, No connect to anything.	Floating
40	NC	Floating Pin, No connect to anything.	Floating
41	NC	Floating Pin, No connect to anything.	Floating
42	NC	Floating Pin, No connect to anything.	Floating
43	GND	Ground.	GND
44	LED_WLAN#	Active low signal. The signal is used to provide status indicators via LED.	Output
45	NC	Floating Pin, No connect to anything.	Floating
46	LED_BT#	Active low signal. The signal is used to provide status indicators via LED.	Output
47	NC	Floating Pin, No connect to anything.	Floating
48	NC	Floating Pin, No connect to anything.	Floating
49	NC	Floating Pin, No connect to anything.	Floating
50	GND	Ground.	GND
51	BT_DISABLE#	This pin can externally shut down the RTL8821AE BT function when BT_DIS# is pulled Low. When this pin is pulled low, USB interface will be also disabled. This pin can be also defined as the BT Radio-off function with host interface remaining connected.	Input
52	+3.3VAUX	3.3V/3.3AUX power supply (Use 3.3AUX for WOWL supporting)	VCC

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HALF-PCI-EXP-MINI_FX1_H1

Pin	Signal		Signal	Pin	
BT_DIS 51	Reserved		+3.3Vaux	52	VDD33
49	Reserved		GND	50	
47	Reserved		+1.5V	48	
45	Reserved		LED_WPAN#	46	LED_BT
43	GND		LED_WLAN#	44	LED_WLAN
41	+3.3Vaux		LED_WWAN#	42	
39	+3.3Vaux		NC	40	
37	GND		USB_D+	38	USB_D+
35	GND		USB_D-	36	USB_D-
HSIP 33	PETp0		GND	34	
HSIN 31	PETn0		SMB_DATA	32	
29	GND		SMB_CLK	30	
27	GND		+1.5V	28	
HSOP 25	PERp0		GND	26	
HSON 23	PERn0		+3.3Vaux	24	
21	GND		PERST#	22	PERSTn
19	Reserved		W_DISABLE#	20	WL_DIS
17	Reserved		GND	18	
15	GND		UIM_VPP	16	
REFCLKP 13	REFCLK+		UIM_RESET	14	
REFCLKN 11	REFCLK-		UIM_CLK	12	
9	GND		UIM_DATA	10	
CLKREQn 7	CLKREQ#		UIM_PWR	8	
5	COEX2		+1.5V	6	
3	COEX1		GND	4	
WAKEn 1	WAKE#		+3.3Vaux	2	

GND 53   GND 54

RF CONNECTOR

Top View

Bottom View