

AW-CB161H

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

B2

Datasheet

Version 0.7

Revision History

Document Release	Date	Modification	Initials	Approved
Version 0. 1	2013/03/12	First Release	Amos Fu	Antonio Chu
Version 0. 2	2013/05/30	Update Power UP Sequencing Update module photo Add 6.Mechanical Dimensions	Ethan Huang Sophie Lo	Chiehhao Liao Patrick Lin
Version 0. 3	2013/07/12	Update Operating Conditions Update Power Consumption Weight	Ethan Huang Sophie Lo	Chiehhao Liao Patrick Lin
Version 0.4	2013/8/15	Update module photo	Yvonne	Patrick
Version 0.5	2013/9/27	Update block diagram	Yvonne	Patrick
Version 0.6	2013/11/5	Update module photo	Yvonne	Patrick
Version 0.7	2013/12/31	Remove BT 3.0 + HS function	Yvonne	Patrick

1. Introduction

AzureWave Technologies, Inc. introduces the pioneer of the IEEE 802.11 a/b/g/n/ac WIFI with Bluetooth 4.0 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 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 class I and provides a complete 2.4GHz Bluetooth system which is fully compliant to Bluetooth 4.0 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.

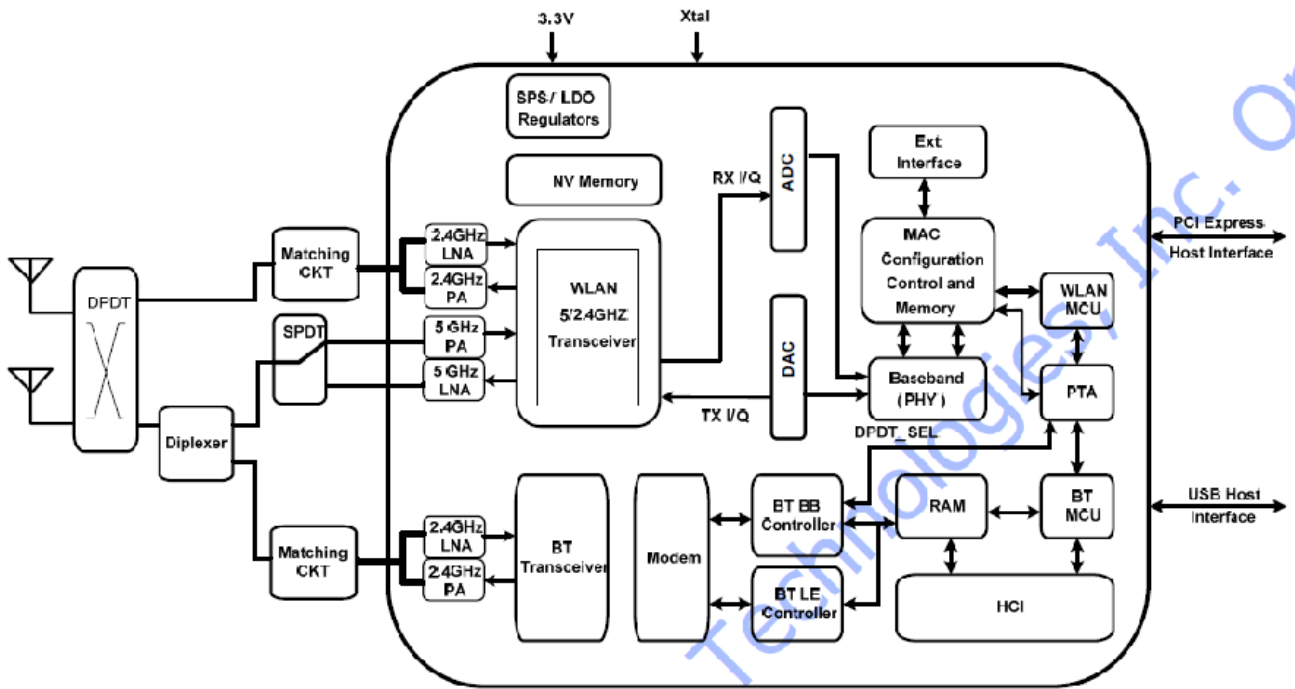
2. Features

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
- ◆ 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

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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 class I Combo half mini card Module
BlueTooth Standard	IEEE 802.11a/b/g/n/ac, Wi-Fi compliant / Bluetooth4.0 Standard
Host Interface	Wi-Fi : PCI-E , BT : USB
Major Chipset	RTL8821AE
Wi-Fi SSV/PID	1A3B/ 2161
BT V/PID	13D3/ 3414
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 °C
Storage temperature	-40~85°C
Electrical Specifications	
Frequency Range	Wi-Fi: 2.4 GHz ISM Bands 2.412-2.472 GHz, 2.484 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)

	<p>802.11n @5GHz: 12 dBm +/- 2 dBm (HT40 MCS7)</p> <p>802.11ac @5GHz: 12 dBm +/- 2 dBm (HT80 MCS7)</p> <p>802.11ac @5GHz: 10 dBm +/- 2 dBm (HT80 MCS9)</p> <p>BT: $0 \leq \text{Output Power} \leq 8 \text{ dBm}$ (Conductive)</p>
Receive Sensitivity	<p>Wi-Fi:</p> <p>802.11a: less than -65 dBm (54M)</p> <p>802.11b: less than -76 dBm (11M)</p> <p>802.11g: less than -65 dBm (54M)</p> <p>802.11n@2.4GHz: less than -64 dBm (HT20 MCS7)</p> <p>802.11n @2.4GHz: less than -61 dBm (HT40 MCS7)</p> <p>802.11n@5GHz: less than -64 dBm (HT20 MCS7)</p> <p>802.11n @5GHz: less than -61 dBm (HT40 MCS7)</p> <p>802.11ac @5GHz: less than -51 dBm (VHT80 MCS9)</p> <p>BT: BER < 0.1% (Anritsu 8852B Tx -70 dBm)</p>
Operating Range	<p>Wi-Fi: Open Space: (300m) / Indoor:(100m)</p> <p>(The transmission speed may vary according to the environment)</p> <p>BT: 10m~20m (depending on environment and NB model)</p>
Regulatory	Follow RTL8821AE regulatory list

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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

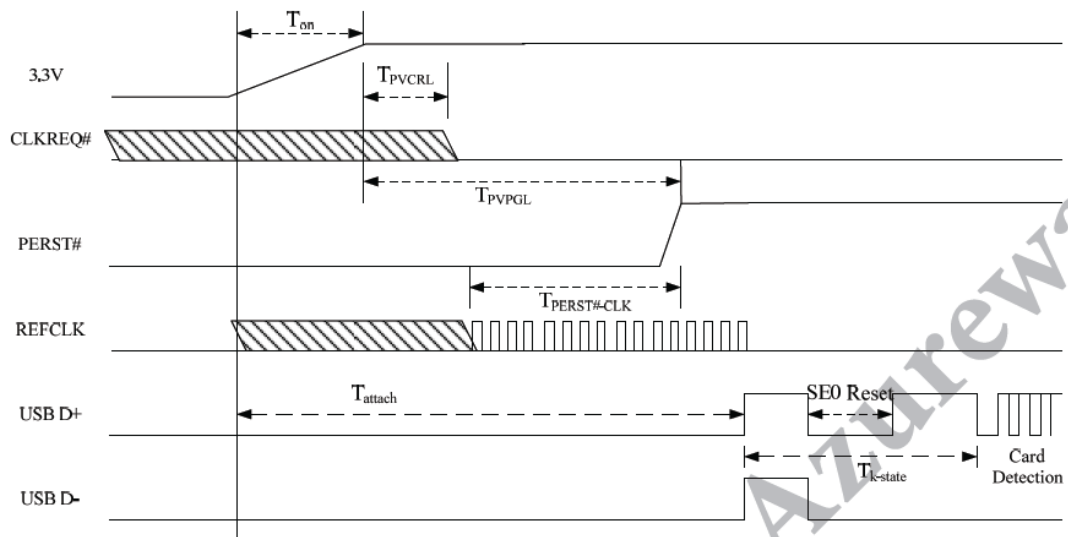


Figure 5. RTL8821AE PCIe and USB Bus Power On Sequence

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 register 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

2.4GHz

Test Bed		DELL Vostro 3450		
Test OS		Windows 8 Professional x64		
Test AP		NETGEAR R6300		
Driver Version		AZ_RTL8723AE_8723BE_8821AE_2010.2.0530.2013		
Test Voltage		3.3V		
Item		Disable ASPM Mode	L1 Mode	NOTE
WLAN Module No Connect AP	AVG	34.7 mA	9.3 mA	
	MAX	132.3 mA	118.4 mA	
	MIN	28.7 mA	1.5 mA	
WLAN Module Connect to the AP	AVG	43.3 mA	24.2 mA	
	MAX	136.4 mA	106.8 mA	
	MIN	35.0 mA	17.4 mA	
WLAN RF OFF		28.8 mA	2.8 mA	
Transmit Packet Test HT 40*		235.4 mA	207.6 mA	
Receiver Packet Test HT 40*		124.0 mA	106.1 mA	

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

5GHz

Test Bed		DELL Vostro 3450		
Test OS		Windows 8 Professional x64		
Test AP		NETGEAR R6300		
Driver Version		AZ_RTL8723AE_8723BE_8821AE_2010.2.0530.2013		
Test Voltage		3.3V		
Item		Disable ASPM Mode	L1 Mode	NOTE
WLAN Module No Connect AP	AVG	34.9 mA	9.1 mA	
	MAX	132.5 mA	118.2 mA	
	MIN	28.5 mA	1.6 mA	
WLAN Module Connect to the AP	AVG	43.6 mA	25.3 mA	
	MAX	142.1 mA	125.6 mA	
	MIN	35.8 mA	18.1 mA	
WLAN RF OFF		29.0 mA	2.8 mA	
Transmit Packet Test VHT 80*		267.9 mA	265.9 mA	
Receiver Packet Test VHT 80*		168.8 mA	161.4 mA	

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

BLUETOOTH (2.1)

Test Bed		DELL 3450	
Test OS		Windows 8 Professional x64	
Driver Version		RTBlue_744.744.0529.2013	
Test Voltage		3.3V	
Item		UNIT	Note
BT Module No Connect BT	AVG	4.7 mA	
	MAX	14.9 mA	
	MIN	4.1 mA	
BT Module Connect BT	AVG	12.2 mA	
	MAX	17.8 mA	
	MIN	11.6 mA	
BT RF OFF		1.8 mA	
Transmit Packet		37.0 mA	
Receiver Packet		30.6 mA	

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

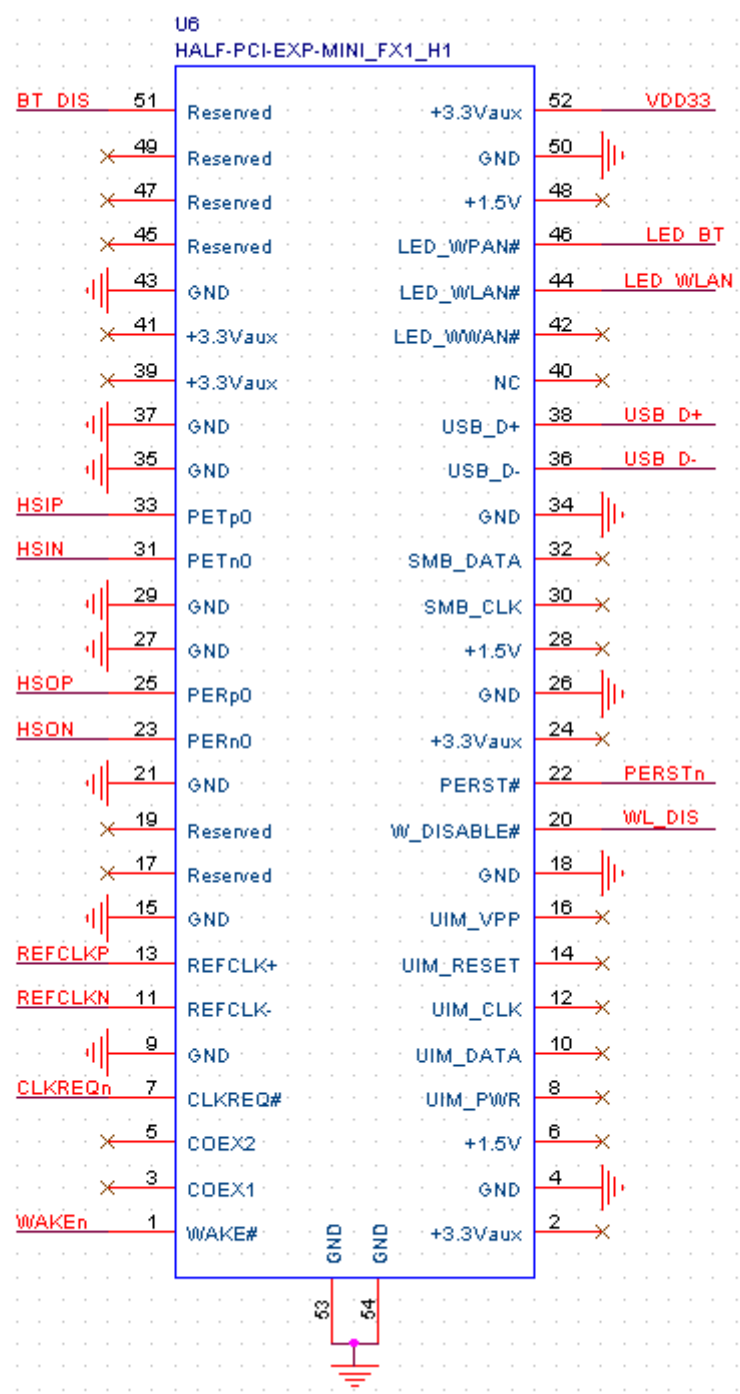
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5. Connector Pin-out Definitions

Pin No.	Definition	Basic Description	Type
1	WAKE#	Open 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	PERNO	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#	<p>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.</p> <p>This pin can be also defined as the BT Radio-off function with host interface remaining connected.</p>	Input
52	+3.3VAUX	3.3V/3.3AUX power supply (Use 3.3AUX for WOWL supporting)	VCC

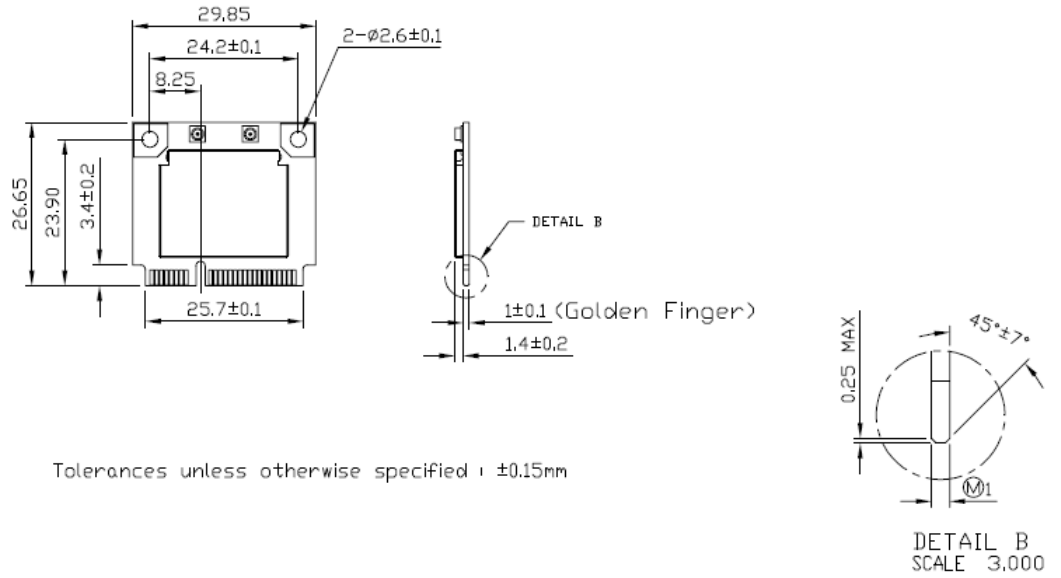
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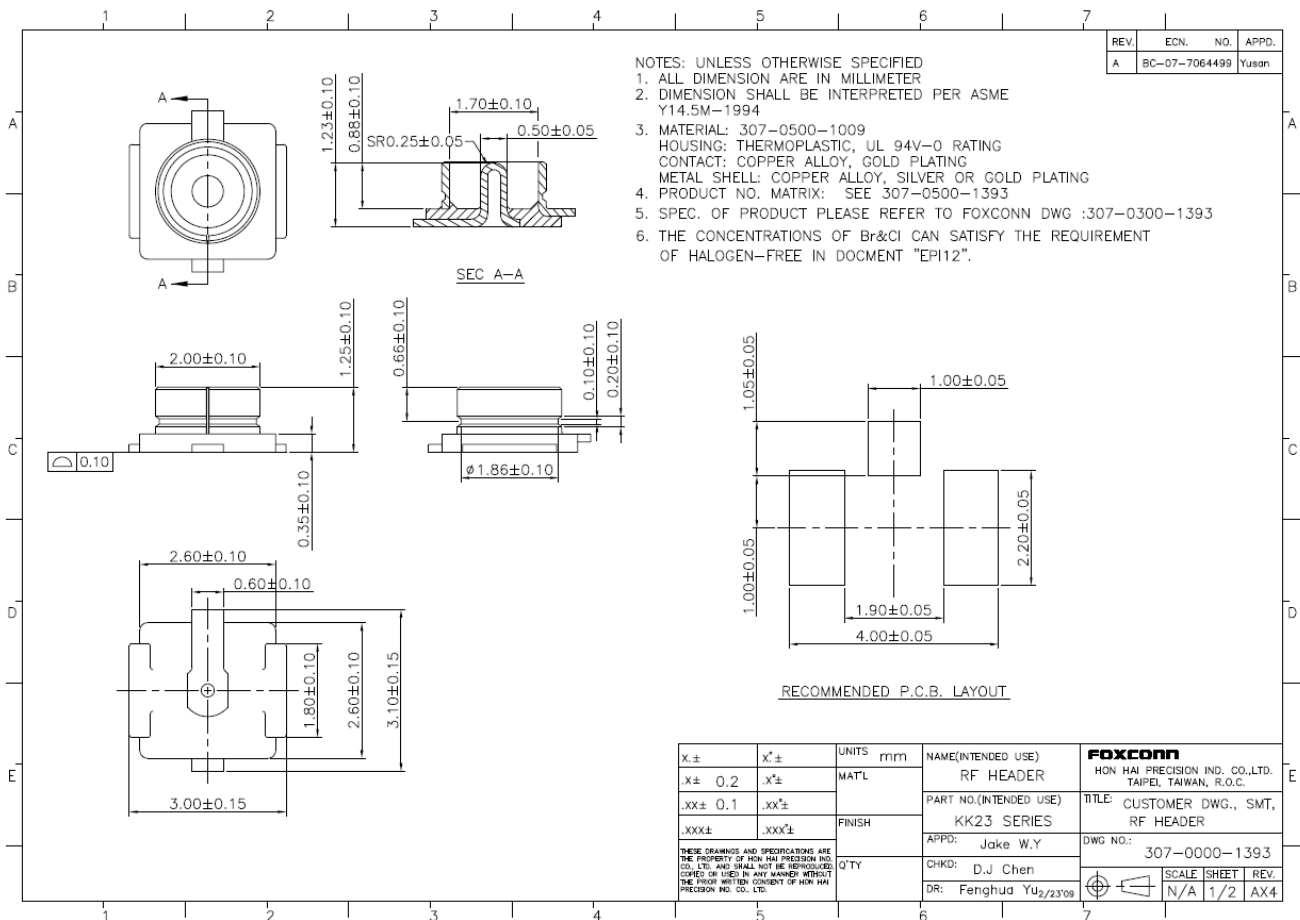
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6. Mechanical Dimensions



RF CONNECTOR

DAW



7. Module Photo



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