AW-CE123H

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

Datasheet

Version 0.4

B1

Revision History

Document Release	Date	Modification	Initials	Approved
Version 0.1	2012/11/06	First Release	Andy Chen Emily Wang	Eric Lee Ray Lee
Version 0.2	2012/11/14	1. Modify Operating Temperature 2. Update Power sequence table 3. Add RF Connector Drawing	Andy Chen Emily Wang	Eric Lee Ray Lee
Version 0.3	2013/12/19	Modify module photo (FCC label)	Yvonne	Patrick
Version 0.4	2013/12/27	Remove BT 3.0 + HS	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 II combo half mini card module --- **AW-CE123H.** The AW-CE123H IEEE 802.11 a/b/g/n/ac PCIE WIFI with Bluetooth 4.0 class II 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 II 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-CE123H 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.

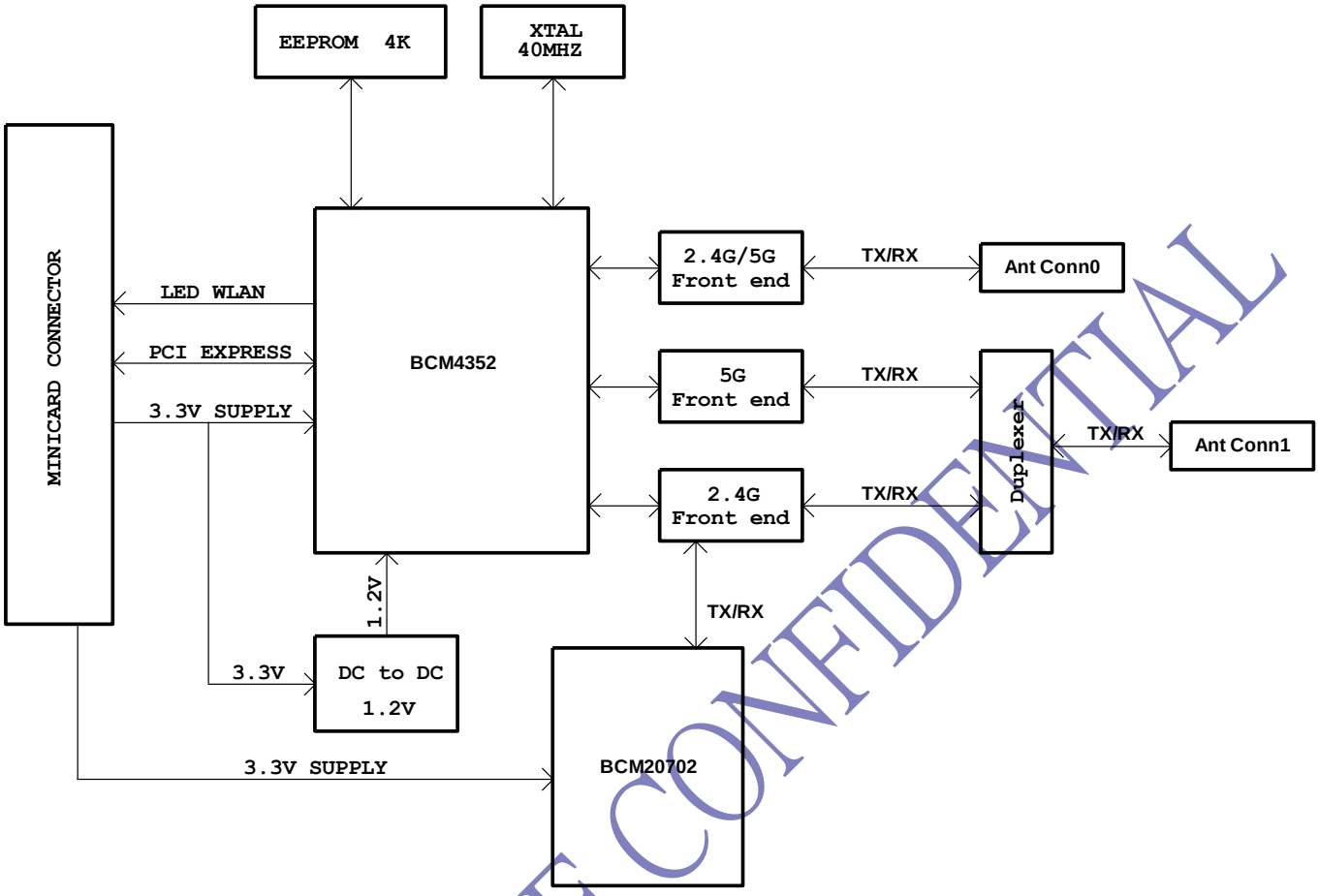
Faster Speed: WLAN up to 867Mbps data rate.

AW-CE123H module adopts Broadcom **BCM4352 and BCM20702** solution. The module design is based on the BCM4352 and BCM20702 solution.

2. Features

- **High speed wireless connection up to 867 Mbps for Wi-Fi**
- **2 antennas to support 2(Transmit) × 2(Receive) diversity technology and Bluetooth**
- **WCS (Wireless Coexistence System)**
- **Low power consumption and high performance**
- **Enhanced wireless security**
- **Fully qualified Bluetooth BT4.0 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**

3. Block Diagram



4. General Specifications

Model Name	AW-CE123H
Product Description	**IEEE 802.11 a/b/g/n/ac Wi-Fi with Bluetooth 4.0 class II 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	**Broadcom BCM4352 and BCM20702**
Wi-Fi SSPID	**2123**
Wi-Fi SSVID	**1A3B**
BT PID	**3404**
BT VID	**13D3**
Dimension	**29.85mm x 26.65mm x 3.8mm (Tolerance remarked in mechanical drawing)**
Weight	**3.52 g**
Antenna	**Standard U.FL Connector** **1: Ant0(J0/J3): Wi-Fi Tx/Rx** **2: Ant1(J1/J4): Wi-Fi Tx/Rx + BT**
Operating Conditions	
Voltage	**3.3V +/- 9%**
Operating Temperature	**0~70 °C**
Storage temperature	**0~85 °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:** **802.11a: 13.5 dBm +/-1.5dBm (54Mbps)** **802.11b: 17.5 dBm +/-1.5dBm (11Mbps)** **802.11g: 15.5 dBm +/-1.5dBm (54Mbps)** **802.11n @2.4GHz: 15.5 dBm +/-1.5dBm (HT20 MCS7)**

	802.11n @2.4GHz: 15.5 dBm +/-1.5dBm (HT40 MCS7) 802.11n @5GHz: 13.5 dBm +/-1.5dBm (HT20 MCS7) 802.11n @5GHz: 13.5 dBm +/-1.5dBm (HT40 MCS7) 802.11ac @5GHz: 11.5 dBm +/-1.5dBm (HT80 MCS7) BT: -6 ≤ Output Power ≤ +4 dBm (Conductive)
Receive Sensitivity	Wi-Fi: 802.11a: 54M -65 dBm 802.11b: 11M -76 dBm 802.11g: 54M -65 dBm 802.11n@2.4GHz: HT20 MCS7 -64 dBm 802.11n @2.4GHz: HT40 MCS7 -61 dBm 802.11n@5GHz: HT20 MCS7 -64 dBm 802.11n @5GHz: HT40 MCS7 -61 dBm 802.11ac @5GHz: VHT80 MCS9 -51 dBm 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 BCM4352HMB regulatory list: 1. USA, Canada, EU RTTE (31 countries) will be ready on 8/31 US time. 2. 2nd tier and others schedule, please follow BCM4352HMB country list.

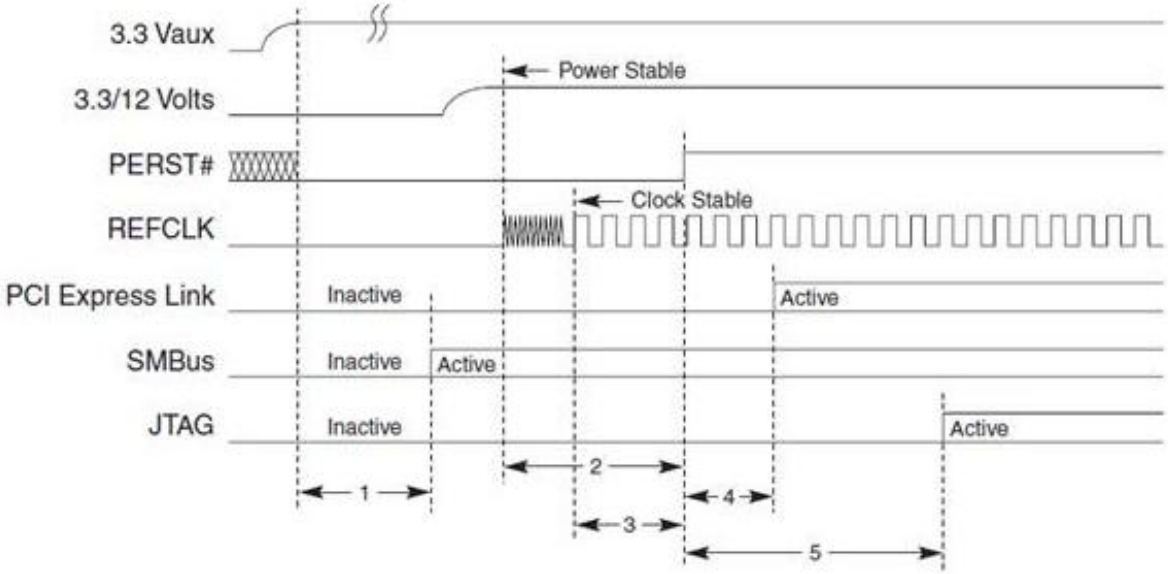
4-1. Absolute Maximum Ratings

Symbol	Parameter	Max. Rating	Unit
V_{dd33}	Maximum I/O supply voltage	+3.8V	V

4-2. Recommended Operating Conditions

Symbol	Parameter	Rating	Unit
V_{dd33}	I/O voltage	**3~3.63**	V

4-3. Power UP Sequencing



1. 3.3Vaux stable to SMBus driven (optional). If no 3.3Vaux on platform, the delay is from +3.3V stable
2. Minimum time from power rails within specified tolerance to PERST# inactive (T_{PVPERL})
3. Minimum clock valid to PERST# inactive ($T_{PERST-CLK}$)
4. Minimum PERST# inactive to PCI Express link out of electrical idle
5. Minimum PERST# inactive to JTAG driven (optional)

Symbol	Parameter	Min	Max	Units
T_{PVPERL}	Power stable to PERST# inactive	100		ms
$T_{PERST-CLK}$	REFCLK stable before PERST# inactive	100		µs
T_{PERST}	PERST# active time	100		µs
T_{FAIL}	Power level invalid to PERST# active		500	ns
T_{WKRF}	WAKE# rise – fall time		100	ns

4-4. Power Consumption

WLAN 2.4G

Test Bed		LENOVO L420		
Test OS		Windows 8 RTM x64 6.2.9200		
Test AP		NETGEAR R6300		
Driver Version		AZ_BCM_4352_Win8_6.30.95.14_20120907		
Test Voltage		3.3V		
Item		Disable ASPM Mode	ASPM L1 Mode	NOTE
WLAN Module No Connect AP	MAX	334.3 mA	293.8 mA	
WLAN Module Connect to the AP	MAX	334.7 mA	258.1 mA	
WLAN RF OFF		82.5 mA	36.7 mA	
Transmit Packet Test HT 40*		646.5 mA	548.6 mA	
Receiver Packet Test HT 40*		411.3 mA	391.0 mA	

WLAN 5G(AC)

Test Bed		LENOVO L420		
Test OS		Windows 8 RTM 6.2.9200		
Test AP		NETGEAR R6300		
Driver Version		AZ_BCM_4352_Win8_6.30.95.14_20120907		
Test Voltage		3.3V		
Item		Disable ASPM Mode	ASPM L1 Mode	NOTE
WLAN Module No Connect AP	MAX	335.5 mA	296.2 mA	
WLAN Module Connect to the AP	MAX	486.8 mA	428.6 mA	
WLAN RF OFF		82.4 mA	36.8 mA	
Transmit Packet Test HT 80*		757.8 mA	709.8 mA	
Receiver Packet Test HT 80*		604.4 mA	585.6 mA	

Note: 1.The power consumption data were measured when NB operated in DC (battery) mode.
2.Bluetooth function is disable.
3.In the shield room test.

BT (2.0)

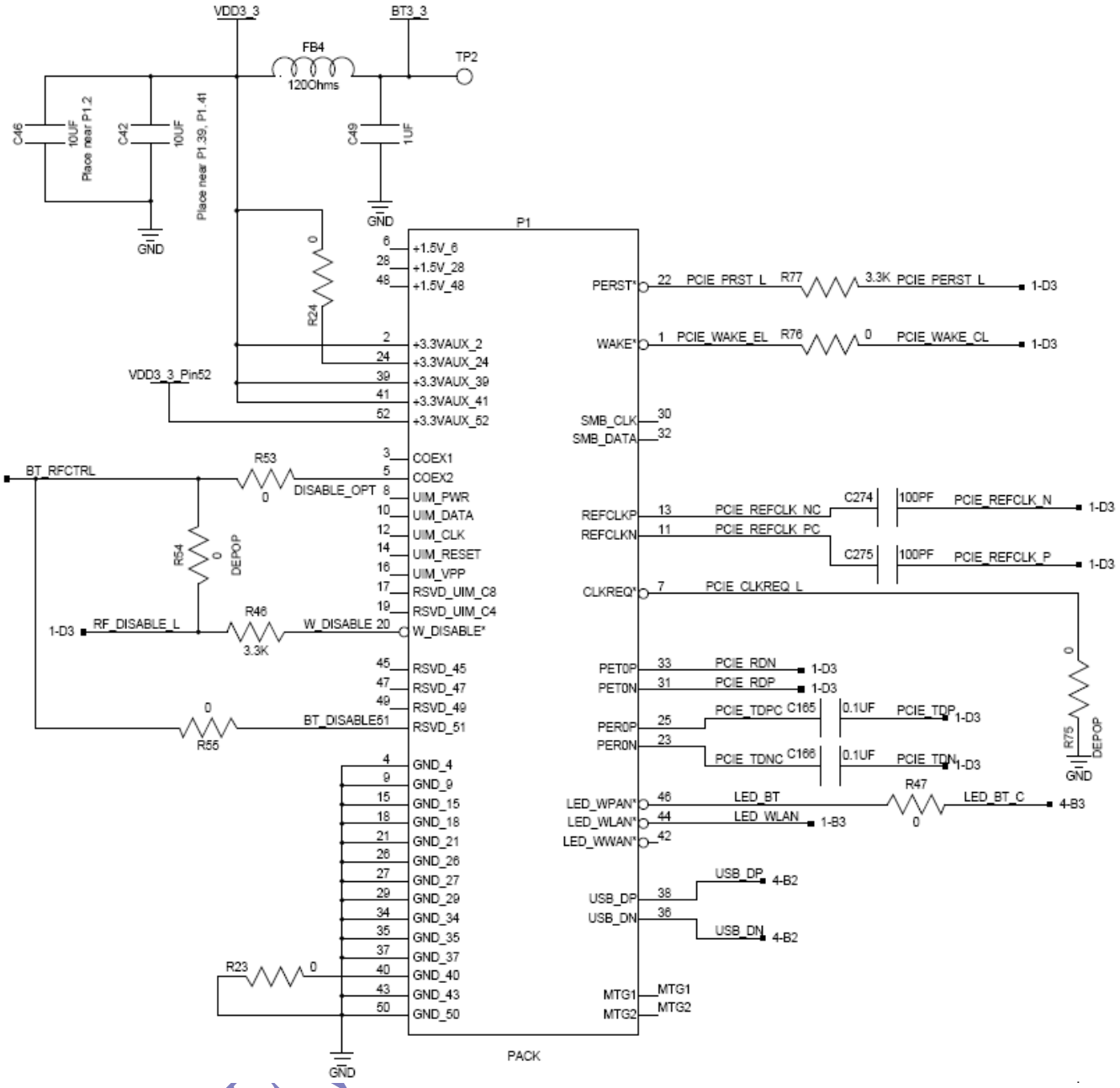
Test Bed		DELL 3450	
Test OS		Windows 8 RTM x64 6.2.9200	
Driver Version		BTW_Win8_12.0.0.2200_20120910	
Test Voltage		3.3V	
Item		UNIT	Note
BT Module No Connect BT	MAX	96.9 mA	
BT Module Connect BT	MAX	106.9 mA	
BT RF OFF		79.7 mA	
Transmit Packet		112.4 mA	
Receiver Packet		106.5 mA	

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

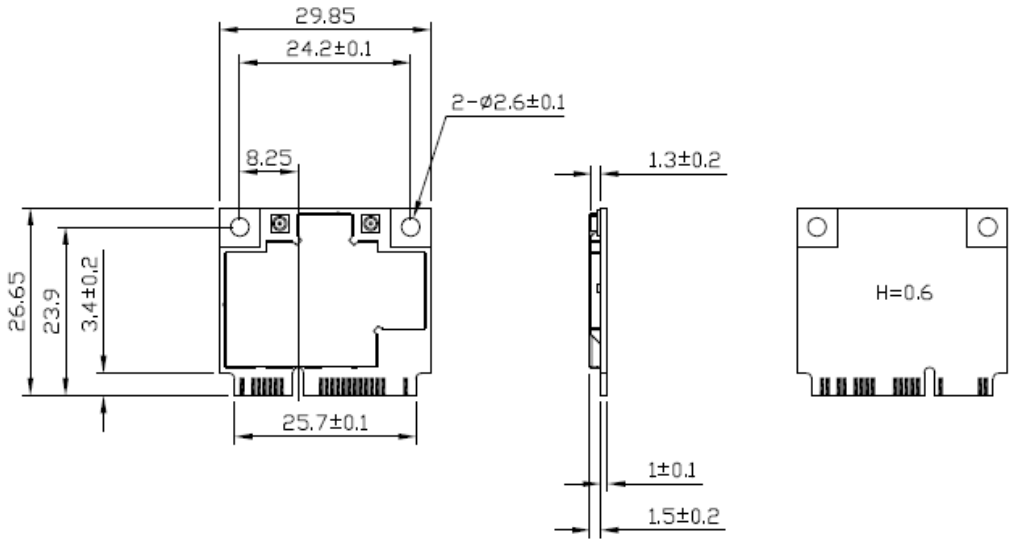
5. Connector Pin-out Definitions

Pin No.	Definition	Basic Description	Type
1	WAKE#	Wake up WLAN (active low).	Output
2	3.3Vaux	3.3Vaux power supply	VCC
3	NC	No connect. Should be left open	
4	GND	Ground	GND
5	BT_DISABLE_L	BT disable control (Active low).	Input
6	NC	No connect.	
7	CLKREQ_L	Reference clock request.	Output
8	NC	No connect. Should be left open.	
9	GND	Ground	GND
10	NC	No connect. Should be left open.	
11	REFCLK-	Differential reference clock	CLK
12	NC	No connect. Should be left open.	
13	REFCLK+	Differential reference clock	CLK
14	NC	No connect. Should be left open.	
15	GND	Ground	GND
16	NC	No connect. Should be left open.	
17	NC	No connect. Should be left open.	
18	GND	Ground	GND
19	NC	No connect. Should be left open.	
20	WLAN_DISABLE_L	WLAN disable control (Active low).	Input
21	GND	Ground	GND
22	PERST_L	PCI express fundamental reset	Input
23	PERn0	Differential transmit	Output
24	3.3Vaux	3.3Vaux power supply	VCC
25	PERp0	Differential transmit	Output
26	GND	Ground	GND
27	GND	Ground	GND
28	NC	No connect.	
29	GND	Ground	GND

30	NC	No connect. Should be left open.	
31	PETn0	Differential receive	Input
32	NC	No connect. Should be left open.	
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	3.3Vaux	3.3Vaux power supply	VCC
40	GND	Ground	GND
41	3.3Vaux	3.3Vaux power supply	VCC
42	NC	No connect. Should be left open.	
43	GND	Ground	GND
44	LED_WLAN_L	Active low signal. The signal is used to provide status indicators via LED.	Output
45	NC	No connect. Should be left open.	
46	LED_BT_L	Active low signal. The signal is used to provide status indicators via LED.	Output
47	NC	No connect. Should be left open.	
48	NC	No connect.	
49	NC	No connect. Should be left open.	
50	GND	Ground	GND
51	BT_DISABLE_L	BT disable control (Active low).	Input
52	3.3Vaux	3.3Vaux power supply	VCC



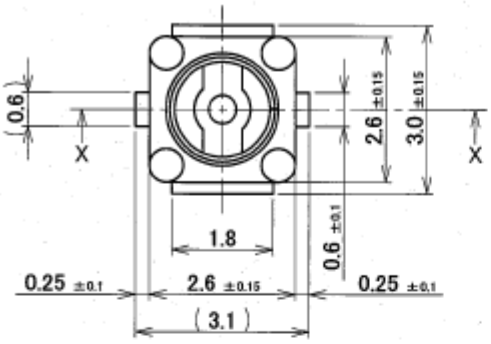
6. Mechanical Dimensions

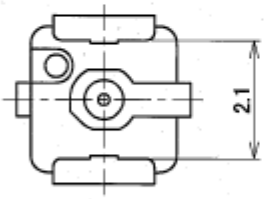


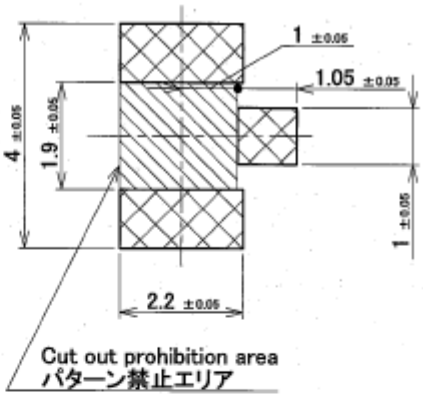
Tolerances unless otherwise specified : ±0.15mm

		AzureWave					SCALE 1 / 1		DESCRIPTION PCB ASSY.		MODEL NO: 2123H	APPROVAL
							Q'TY 1 PCS		MATERIAL	FINISH	DWG NO: RD4-2123H-COD-01-A	DESIGNED KEVIN LIN
		DIM.	0~80	80~180	180~315	315~800	UNIT MM	REV A			PART NO:	DATE 2012/08/30
DESCRIPTION	DATE	TOL.	0.1	0.15	0.20	0.25						

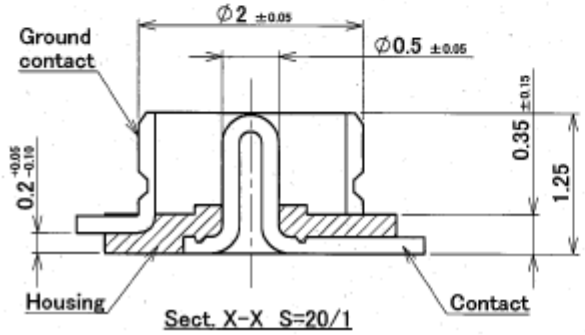
RF CONNECTOR







RECOMMENDED FOOTPRINT PATTERN



Sect. X-X S=20/1

Notes.

1. Material
   (1) Housing : LCP, UL94V-0, white
   (2) Contact : brass
   Au 0.1 μm MIN. over Ni 1.27 μm MIN.
   (3) Ground Contact : phosphor bronze
   Au 0.05 μm MIN. over Ni 1.27 μm MIN.
2. Coplanarity : 0.1mm MAX.
3. Packing : emboss tape
4. Mating partner Part No. :
   20278-***R-**
   20311-**1R-08
5. This is "Pb-free" connector.
6. RoHS compliant.

7. Module Photo