

## User manual

*Product description:* IEEE 802.11g/n 2x2 USB module

*WNC model name:* DNUB-S1

*Samsung model name:* DNUBS1

*Version:* V2.0



**Networking Product Center**

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Subject to change without notices

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## 1. Introduction

DNUB-S1 is a USB embedded module compliant with IEEE802.11n Draft 2.0 standard. The core chipset is from Broadcom, part number BCM43231.

## 2. Features

- 2x2 MIMO technology
- Data rates up to 130Mbps for 20MHz channels and 300Mbps for 40MHz channels
- Designs meet Pb-free/RoHS worldwide requirements
- Integrated ARM® Cortex-M3™ CPU and on-chip RAM for USB host offload
- Single driver across platforms simplifies driver update process and improves customer satisfaction
- WPA™/WPA2™
- Cisco® Compatible Extensions (CCXv4, CCXv5)
- Full-rate AES engine in hardware
- WMM® for quality of service
- Integrated 2.4G Power Amplifier (BCM43231) provides path to lower solution cost for single-band designs
- Support for Windows® XP, Windows Vista®, and Linux® Operating Systems
- USB AP functionality provides 802.11n dual-band upgrade path to legacy routers and gateways
  
- LED reserved for special application.

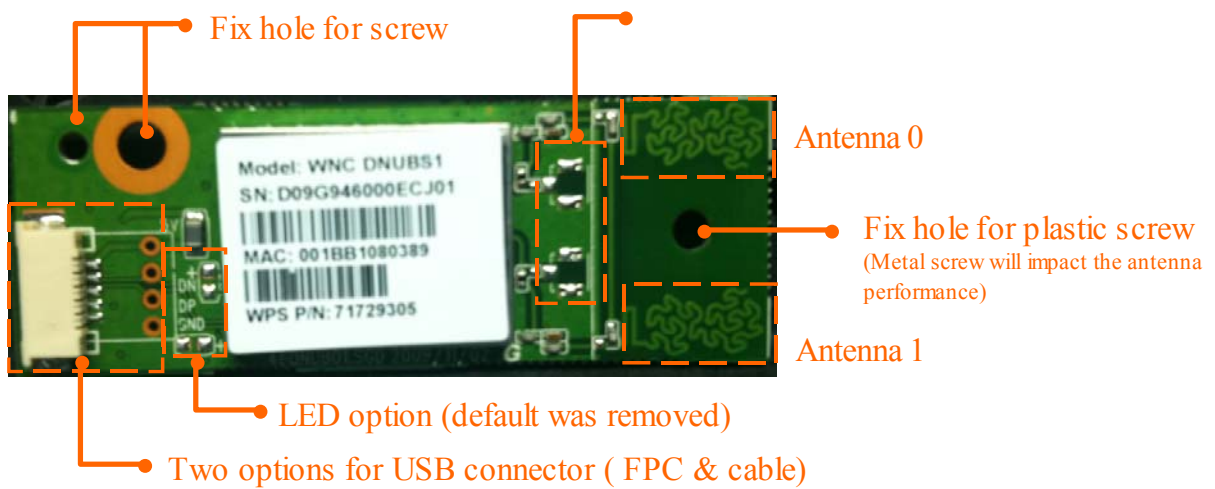
### 3. Hardware Architecture:

#### 3.1 Main Chipset Information

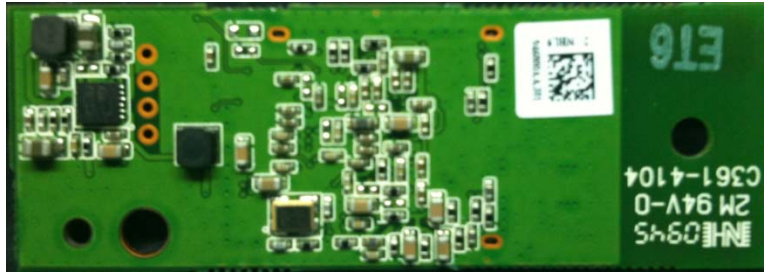
Item	Vender	Part number
MAC/BBP/Radio Transceiver/PA	Broadcom	BCM43231

#### 3.3 Outlook Diagram

##### Top view

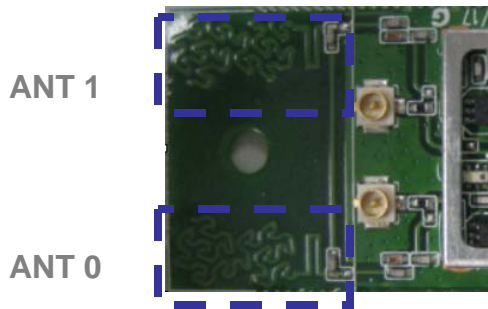


**Bottom view**

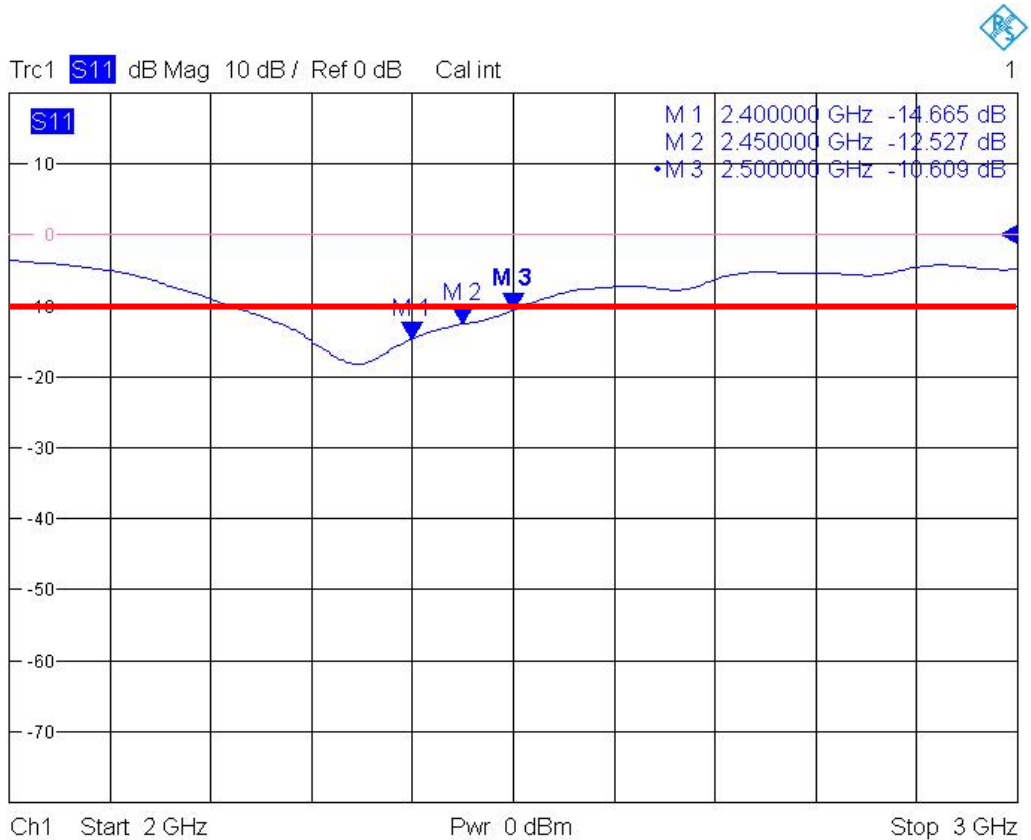


**3.4 Antennas Information**

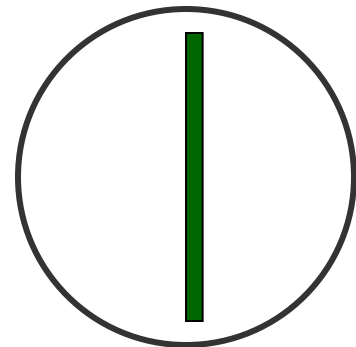
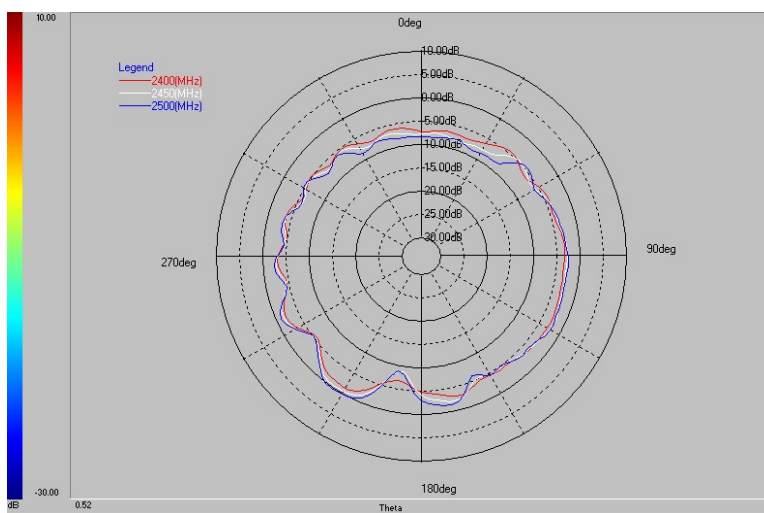
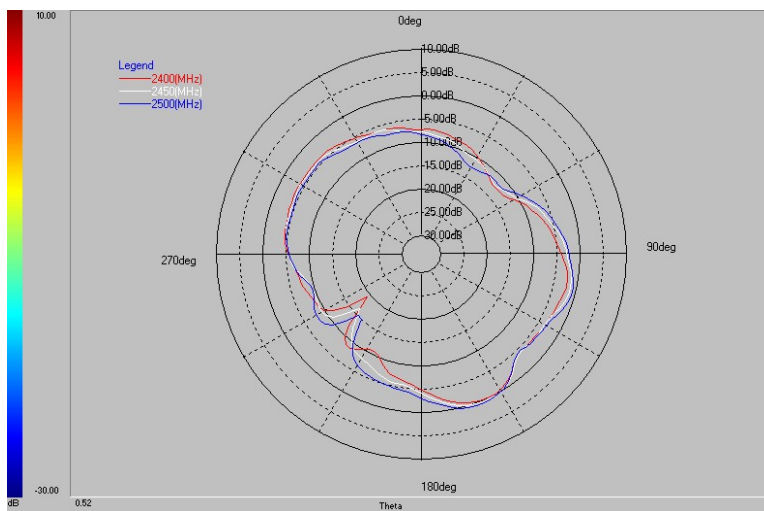
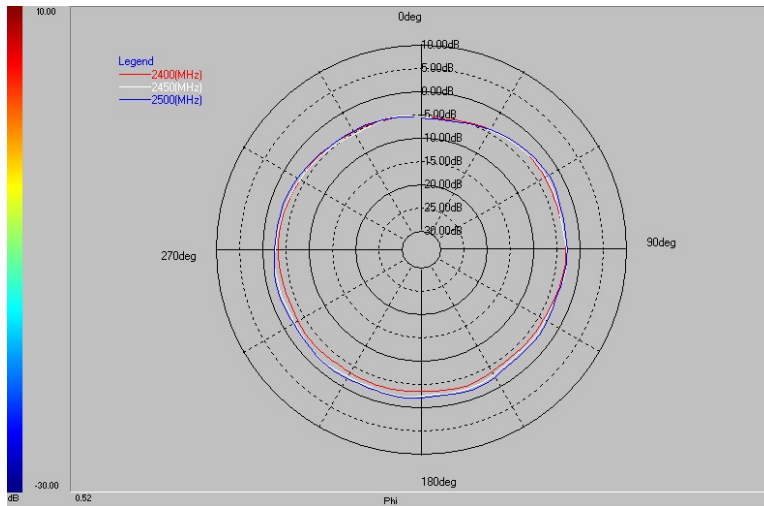
Two trace antennas supporting both TX & RX.



**3.4.1 VSWR**

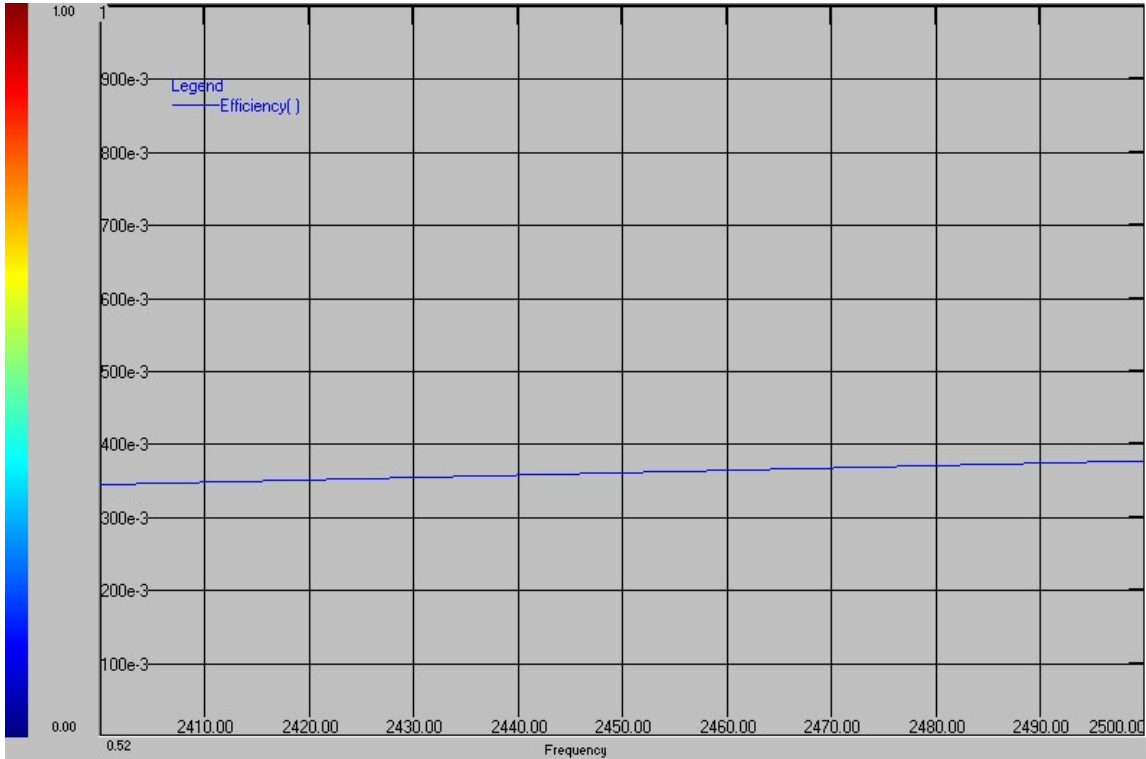


### 3.4.2 Antenna Pattern



### 3.4.3 Efficiency

The efficiency is 35%.



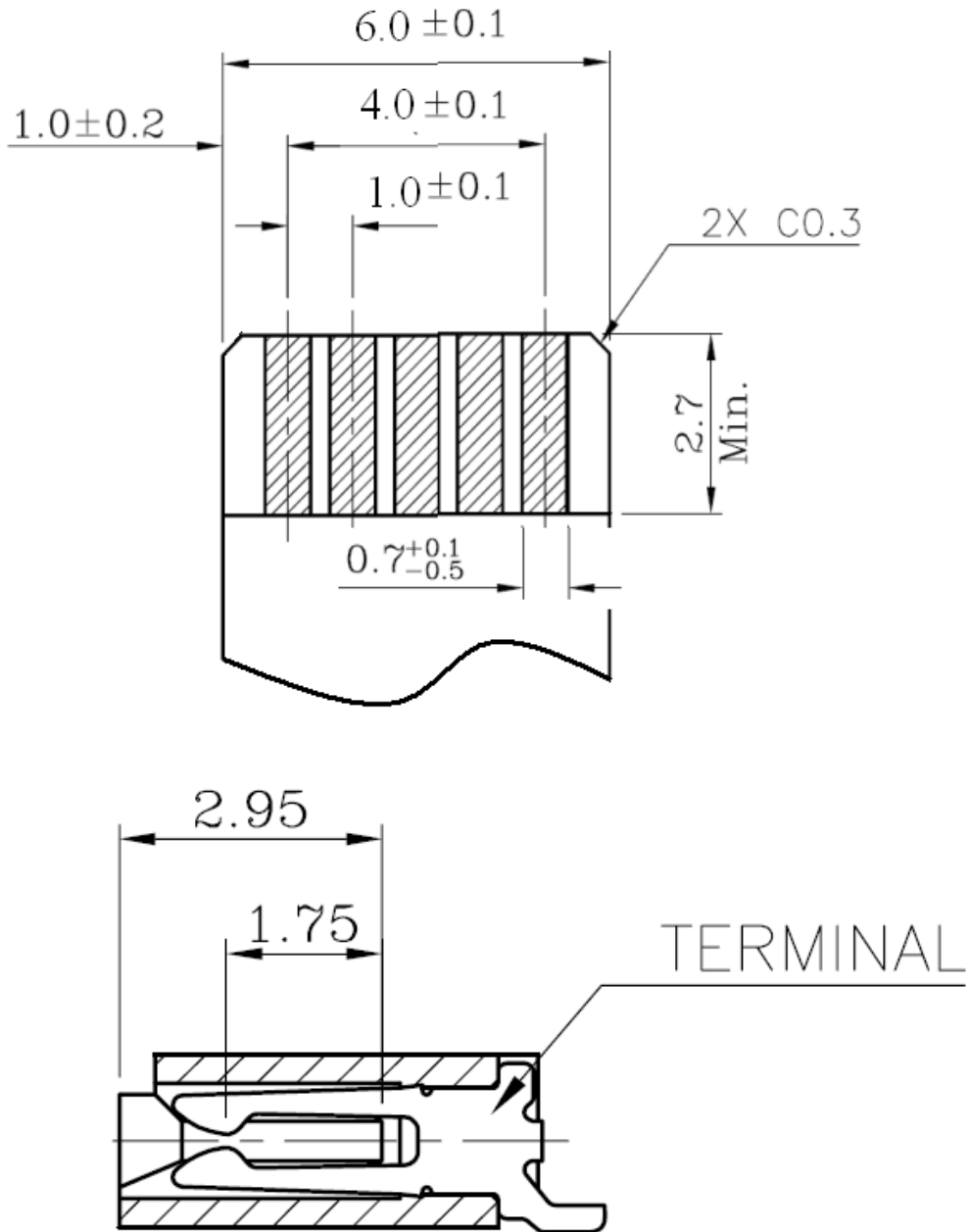
### 3.4.4 Gain Table

MHz	Peak gain (dBi)		
	XY plan	XZ plan	YZ plan
2400	-3.03	-0.09	-1.32
2450	-2.15	0.23	-0.58
2500	-1.89	0.6	0.33

## 4. Interface definition



## USB FPC Cable & connector







## 6. Specifications:

### 6.1 Supply Voltage:

5V±5% DC

### 6.2 Current Consumption

Condition	5V supply only	Unit
	Peak	
11b TX mode@16dBm	265	mA
11g TX mode@15dBm	260	
11b Throughput . Tx	400	
11g Throughput . Tx	390	
Associated and idle with power saving	170	
HT20 Tx MCS8	420	
HT20 Tx MCS15	390	
HT40 Tx MCS8	580	
HT40 Tx MCS15	550	

(Typical level, with +/- 50mA tolerance)

### 6.3 RF power

(Typical power level per chain with +/- 2.5 dB tolerance ) ( unit:dBm )

20MHz BW	MHz			40MHz BW	MHz		
	2412	2437	2472		2412	2437	2472
1Mbps	16	16	16	HT40MCS0	13.5	13.5	13.5
2Mbps	16	16	16	HT40MCS1	13.5	13.5	13.5
5.5Mbps	16	16	16	HT40MCS2	13.5	13.5	13.5
11Mbps	16	16	16	HT40MCS3	13.5	13.5	13.5
6Mbps	15	15	15	HT40MCS4	13.5	13.5	13.5
9Mbps	15	15	15	HT40MCS5	13.5	13.5	13.5
12Mbps	15	15	15	HT40MCS6	13.5	13.5	13.5
18Mbps	15	15	15	HT40MCS7	13.5	13.5	13.5
24Mbps	15	15	15				
36Mbps	15	15	15				
48Mbps	15	15	15				
54Mbps	15	15	15				
HT20MCS0	13.5	13.5	13.5				
HT20MCS1	13.5	13.5	13.5				
HT20MCS2	13.5	13.5	13.5				
HT20MCS3	13.5	13.5	13.5				
HT20MCS4	13.5	13.5	13.5				
HT20MCS5	13.5	13.5	13.5				
HT20MCS6	13.5	13.5	13.5				
HT20MCS7	13.5	13.5	13.5				

Notes: Power level for different country domains is country dependent and Broadcom driver & SPROM will control the regulatory power table. Therefore, the actual power may be lower than this number.

## 6.4 RF Sensitivity

(Typical sensitivity level, 2RX with +/- 6 dB tolerance) ( unit:dBm )

20MHz BW	MHz			40MHz BW	MHz		
	2412	2442	2472		2412	2442	2472
1Mbps	-98	-98	-98	HT40 MCS0	-89	-89	-89
2Mbps	-96	-96	-96	HT40 MCS1	-88	-88	-88
5.5Mbps	-93	-93	-93	HT40 MCS2	-86	-86	-86
11Mbps	-89	-89	-89	HT40 MCS3	-82	-82	-82
6Mbps	-91	-91	-91	HT40 MCS4	-80	-80	-80
9Mbps	-90	-90	-90	HT40 MCS5	-74	-74	-74
12Mbps	-89	-89	-89	HT40 MCS6	-73	-73	-73
18Mbps	-88	-88	-88	HT40 MCS7	-71	-71	-71
24Mbps	-86	-86	-86				
36Mbps	-83	-83	-83				
48Mbps	-77	-77	-77				
54Mbps	-76	-76	-76				
HT20 MCS0	-92	-92	-92				
HT20 MCS1	-91	-91	-91				
HT20 MCS2	-90	-90	-90				
HT20 MCS3	-85	-85	-85				
HT20 MCS4	-83	-83	-83				
HT20 MCS5	-77	-77	-77				
HT20 MCS6	-76	-76	-76				
HT20 MCS7	-74	-74	-74				

## 6.5 Environmental Spec.

Operating Temperature Range: 0degree C~ 60degree C  
Storage Temperature Range: Temperature: -20~80°C Humidity: 95%(MAX)  
Operating Humidity Range: 10%~90% (No dew condensation)

## 7. NOTICE

FCC ID: A3LDNUBS1

### NOTICE

In accordance with FCC Part 15, the A3LDNUBS1 is listed as a Modular Transmitter device. End products that include the A3LDNUBS1 shall have the words "Contains Transmitter module FCC ID: A3LDNUBS1" on an exterior label

I.

**This device complies with Part 15 of FCC Rules. Operation is Subject to following two conditions:**

**(1) This device may not cause harmful interference, and**

**(2) This device must accept any interference received including interference that cause undesired operation.**

This equipment has been tested and found to comply within the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a different circuit from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help.

The transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

The available scientific evidence does not show that any health problems are associated with using low power wireless devices. There is no proof, however, that these low power wireless devices are absolutely safe. Low power wireless devices emit low levels of radio frequency energy (RF) in the microwave range while being used. Whereas high levels of RF can produce health effects (by heating tissue), exposure to low-level RF that does not produce heating effects causes no known adverse health effects. Many studies of low-level RF exposures have not found any biological effects. Some studies have suggested that some biological effects might occur, but such findings have not been confirmed by additional research.

To satisfy RF exposure requirements, this device and its antenna(s) must operate with a separation distance of at least 20 centimeters from all persons and must not be co-located or operated in conjunction with any other antenna or transmitter. End-users must be provided with specific operating instructions for satisfying RF exposure.

### FCC WARNING:

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

## **Information for Canadian Users (IC Notice)**

**IC : 649E-DNUBS1**

The term "IC" before the radio certification number only signifies that Industry Canada technical specifications were met. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

This Class B digital apparatus complies with Canadian ICES-003.

To prevent radio interference to the licensed service, this device is intended to be operated indoors and away from windows to provide maximum shielding. Equipment that is installed outdoors is subject to licensing.

This device has been designed to operate with an antenna having a maximum gain of 0.6dB. Antennas having a higher gain are strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms.

To reduce potential radio interference to others, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than required for successful communication.

The available scientific evidence does not show that any health problems are associated with using low power wireless devices. There is no proof, however, that these low power wireless devices are absolutely safe. Low power wireless devices emit low levels of radio frequency energy (RF) in the microwave range while being used. Whereas high levels of RF can produce health effects (by heating tissue), exposure to low-level RF that does not produce heating effects causes no known adverse health effects. Many studies of low-level RF exposures have not found any biological effects. Some studies have suggested that some biological effects might occur, but such findings have not been confirmed by addition

## **8. Installation**

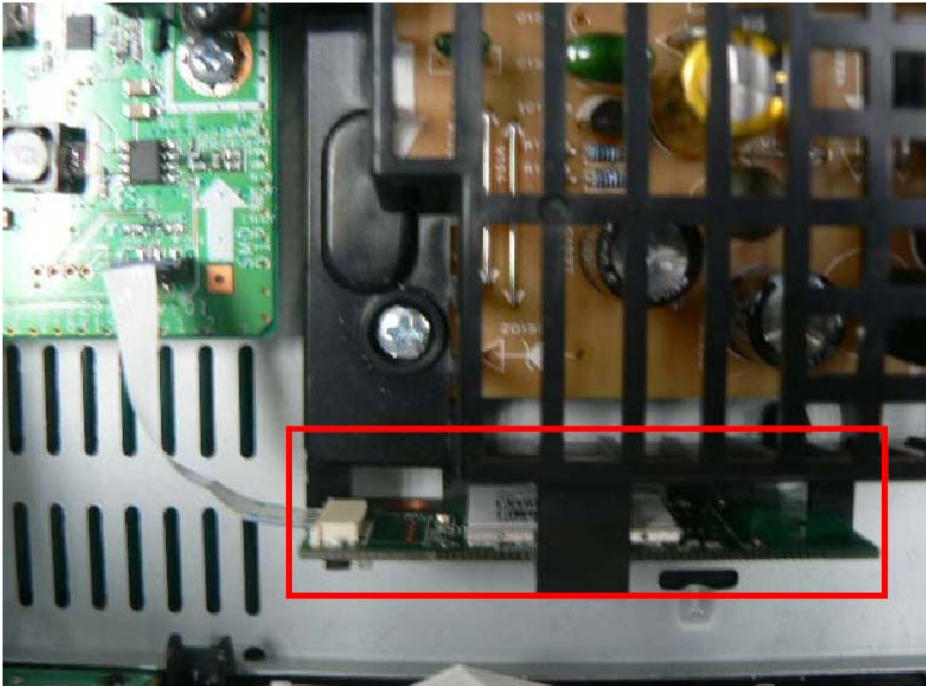
This radio module must be installed in a device and not allow the user to replace nor modify it. Besides, it was under FCC modular approval, therefore there are some rules need to follow while adopting this module :

1. Include content "FCC ID : A3LDNUBS1" on the label of your device.
2. Use the on-board trace antenna (refer to the spec in this document ).

### 8.1 Installation Procedure

1. Be sure to use the proper antistatic handling techniques
2. Insert the DNUBS1 into the machine and fix it by bracket.

#### TOP view



#### Side view

