Datasheet

SN:2024-0307A

V1.0

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BB170

Ultra Low-Power Bluetooth 5.1 module

Introduction

BB170(S) is a high-performance,industrial,ultra low-power BLE 5.3 module,which based on Goodix SoC GR5331.It provides rich interfaces such as UART, SPI, I2C, ADC, PWM. At the same time,it adopts a small stamp package and convenient for engineers to develop.

Key features

- **Frequency band**
  BLE: 2402～2480MHz

- **Ultra low-power consumption**
  2.0 to 3.6 V supply voltage range
  < 3.8 mA peak current in TX (0dBm,1Mbps)
  < 4.7 mA peak current in RX(1Mbps)
  1.9 µA at 3V in System OFF mode
  (no RAM retention)

- **High sensitivity**
  -97.5dBm sensitivity(1Mbps,PER<30.8%)
  -95dBm sensitivity(2Mbps,PER<30.8%)
  -105dBm sensitivity(125Kbps,PER<30.8%)
  TX power: -20dBm~ +6dBm(DC-DC mode)

- **Protocol support**
  BLE 4.x / 5.x
  BLE mode: 1Mbps
  Long Range mode: 500kbps / 125kbps

- **Microprocessor & Memory**
  ARM®Cortex®-M4F 32-bit processor 64MHz
  512KB Flash and 96KB RAM

- **Interface**
  11*General purpose I/O pins
  2* UART / 2*SPI / 2*I2C
  1*13-bit ADC
  2*PWM
  1*RTC

- **Dimension**
  10.5mm×16mm×1.75mm(BB170)
  10.5mm×16mm×2.1mm(BB170S)

Applications

- Advanced computer peripherals and I/O devices
  Mouse / keyboard / Multi-touch trackpad
- Interactive entertainment devices
  Gaming controllers
  Remote controls
- Internet of things (IoT)
  Smart home sensors and controllers
  Industrial IoT sensors and controllers

Ordering information

Part No.	Temperature	Package	MOQ	Shield	Antenna
BB170	-40°C ~ +85°C	SMD	1600	No	ANT on Board
BB170S	-40°C ~ +85°C	SMD	1600	Yes	ANT on Board

Contents

1. Introduction

1.1 Description

BB170(S) is a high-performance,industrial,ultra low-power BLE 5.3 module,which based on Goodix SoC GR5331.It provides rich interfaces such as UART, SPI, I2C, ADC, PWM. At the same time,it adopts a small stamp package and convenient for engineers to develop.

1.2 Specifications

Specifications are shown in the following **Table 1.1**.

Table 1.1 Specifications of BB170

Function	Description
Flash	512KB
RAM	96KB
Microprocessor	64MHz ARM®Cortex-M4F 32-bit
Protocol support	BLE4.0/4.1/4.2/5.0/5.3
Frequency Band	2402MHz ~ 2480MHz (BLE)
On-air data rate	1 Mbps BLE mode 500kbps, 125kbps Long Range mode
TX power	-20～+6dBm
Sensitivity	-97.5dBm(1Mbps,PER<30.8%)@BLE -95dBm(2Mbps,PER<30.8%)@BLE -102dBm(500Kbps,PER<30.8%)@LongRange -105dBm(125Kbps,PER<30.8%)@LongRange
Power consumption	TX peak current: 3.8mA (0dBm/1Mbps/DC-DC mode) RX peak current: 4.7mA (1Mbps) 1.7μA ultra deep sleep mode at 3.3V,System OFF mode, no RAM retention
Digital interfaces	2*SPI / 2*I2C / 2*UART / 2*PWM
Analog interfaces	1*13-bit ADC
Timer	2*32-bit timer / 1*RTC / 1*WDT
Peripherals	AES/TRNG
GPIO	11
Operation temperature	-40°C～85°C
Package	SMD
Dimension	10.5mm*16mm*1.75mm(BB170) / 2.1mm(BB170S)

2. Pin assignments

2.1 Top view

Top view of BB170 is shown in **Figure 2.1**.

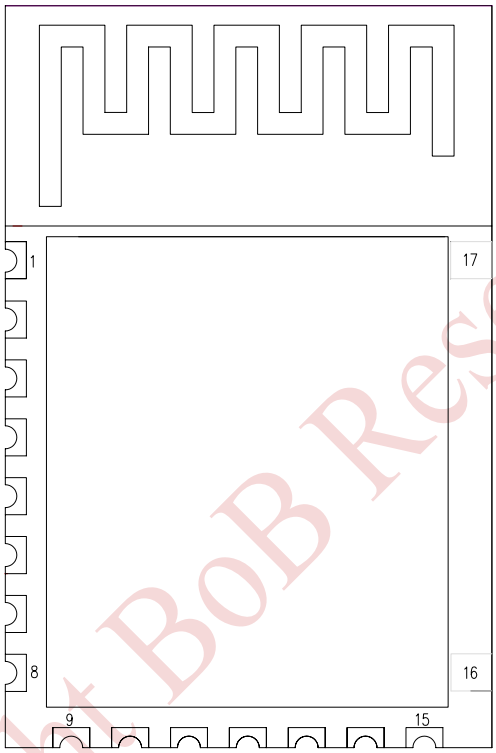


Figure 2.1 BB170 pin assignments(top view)

2.2 Pin assignments

The BB170 pin assignment is shown in **Table 2.1.**

Table 2.1 Pin assignment description

Pin No.	Pin name	Description
1	GND	Power ground
2	SWDIO/GPIO_1	Serial wire debug I/O for debug and programming / Digital I/O
3	SWCLK/GPIO_0	Serial wire debug clock input for debug and programming / Digital I/O
4	CHIP_EN	Module reset(active low) [Note]①
5	MSIO7	Analog input / Digital I/O
6	AON_GPIO_1	Always-on GPIO
7	MSIO6	Analog input / Digital I/O
8	MSIO5	Analog intput / Digital I/O
9	AON_GPIO_0	Always-on GPIO

① The nRESET pin of BB170 can be used according to the product requirements.

10	AON_GPIO_2	Always-on GPIO
11	AON_GPIO_3	Always-on GPIO
12	AON_GPIO_4	Always-on GPIO
13	AON_GPIO_5	Always-on GPIO
14	VDD	Power input, 3.0 ~ 3.6V (recommended voltage range)
15	GND	Power ground
16	GND	Power ground
17	GND	Power ground

2.3 Pin Mux

The I/O pin attributes of the BB170 are shown in the following **Table 2.2**.

Table 2.2 Pin Mux

I/O type	Default power-on state	Internal pull-up/down	Default pull-up/down	PIN Interupt	Chip wakeup	Analog input
GPIO	L	Y	Down	Y	N	N
AON_GPIO	L	Y	Down	Y	Y	N
MSIO	Hi-Z	N	Down	N	N	Y

3. Specifications and parameters

3.1 Absolute maximum ratings

The absolute maximum ratings of BB170 is shown in **Table 3.1**.

Item	Parameter		Description
	Min	Max	
VDD (V)	-0.3	3.8	Exposure to absolute maximum ratings for prolonged periods of time may affect the reliability of the device.
I/O pin voltage (V)	-0.3	3.8	VDD voltage ≤ 3.8V
RF input level (dBm)	-	10	*
Reference transmission distance (m)	-	60	Module to module, @+6dBm[Note]②
Operating temperature (℃)	-40	+85	*
Storage temperature (℃)	-40	+125	Normal temperature storage is recommended

Table 3.1 Absolute maximum ratings

3.2 ESD parameters

The ESD parameters of BB170 is shown in Table 3.2.

Table 3.2 ESD parameters

Item		Minimum	Maximum	Remark
ESD	Human Body Model	-	2000V	
	Human Body Model Class	-	2	
	Charged Device Model	-	500V	All pins
	Charged Device Model	-	400V	ANT pin

② The reference communication distance is closely related to hardware construction, test site environment, etc, which is for reference only.

3.3 Operating conditions

The operating conditions of BB170 is shown in **Table 3.3**.

Table 3.3 Recommended operating conditions

Item	Min	Typical	Max	Remark
Operating temperature (℃)	-40	+25	+85	
VDD（V）	2.0	3.3	3.6	
TH_{POR}(V)	-	1.75	-	Power-on threshold
TH_{BOR}(V)	-	1.6	-	Brown-out threshold

3.4 Power consumption

The power consumption of BB170 is shown in **Table 3.4**.

Table 3.4 Reference power consumption

Item	Typical	Unit	Description	Conditions
$I_{tx,peak}$	10.5	mA	TX only run current, @+6 dBm,1Mbps	VDD=3.3V, temperature=25℃
$I_{tx,peak}$	3.8	mA	TX only run current, @0 dBm,1Mbps,DC-DC mode	
$I_{Rx,peak}$	4.7	mA	RX only run current, @1 Mbps	
I_{Sleep}	2.8	μA	Sleep mode,GPIO off, RAM retention, Wake-up on BLE controller、RTC or Sleep timer.	
$I_{Deep\ Sleep}$	1.7	μA	Ultra deep sleep mode,GPIO off, no RAM retention, Wake-up on AON_I/O、reset or Sleep Timer.	
$I_{Power\text{-}down}$	0.2	μA	Off mode,nothing is on except VBAT, chip in reset mode	

3.5 RF parameters

The parameters of BB170 is shown in **Table 3.5.**

Item	Typical	Unit	Conditions
Frequency band	2402～2480	MHz	BLE mode
TX Power	-20～+6	dBm	
Receiving sensitivity	-97.5	dBm	BLE mode, 1Mbps, PER≤ 30.8%
Receiving sensitivity	-102	dBm	BLE mode, 500Kbps, PER≤ 30.8%
Receiving sensitivity	-105	dBm	BLE mode, 125Kbps, PER≤ 30.8%

Table 3.5 RF parameters of BB170

4. Typical application

The typical application circuit of BB170 is shown in **Figure 4.1**.

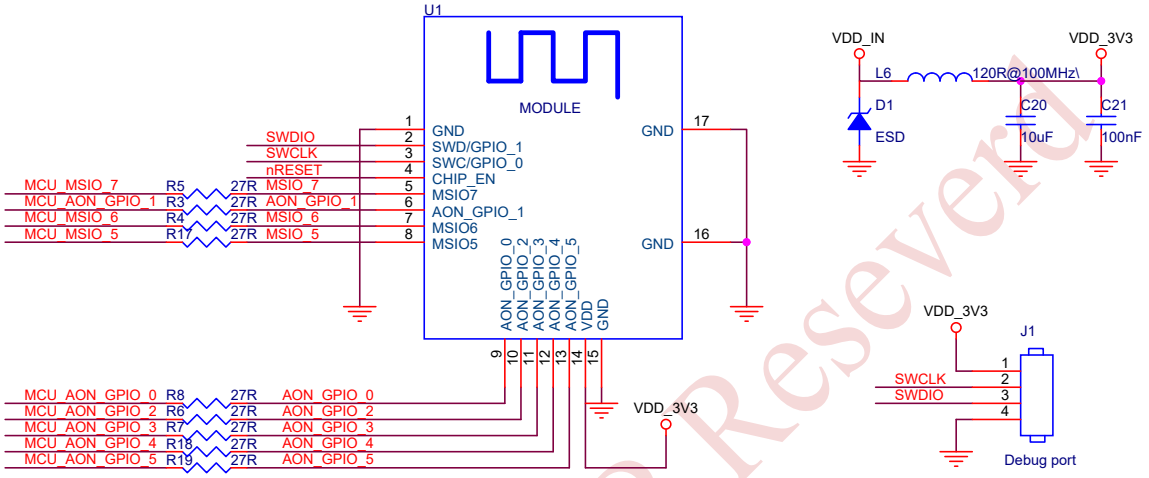


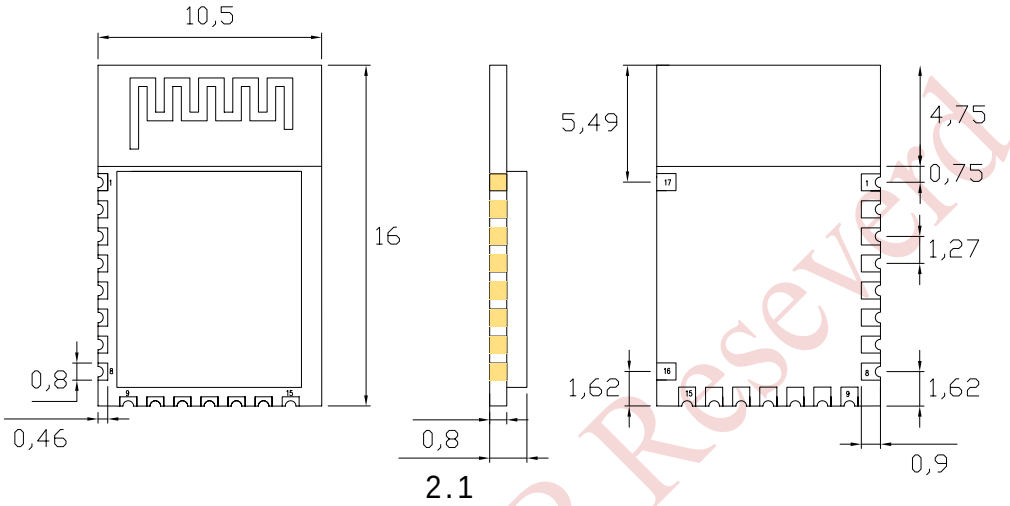
Figure 4.1 Typical application circuit

5. Mechanical specifications

5.1 Dimensions

The dimensions of BB170 & BB170S is shown in the **Figure 5.1、Figure 5.2**

Height is the only difference between BB170 and BB170S.



Unit：mm

Figure 5.1 Dimensions of BB170

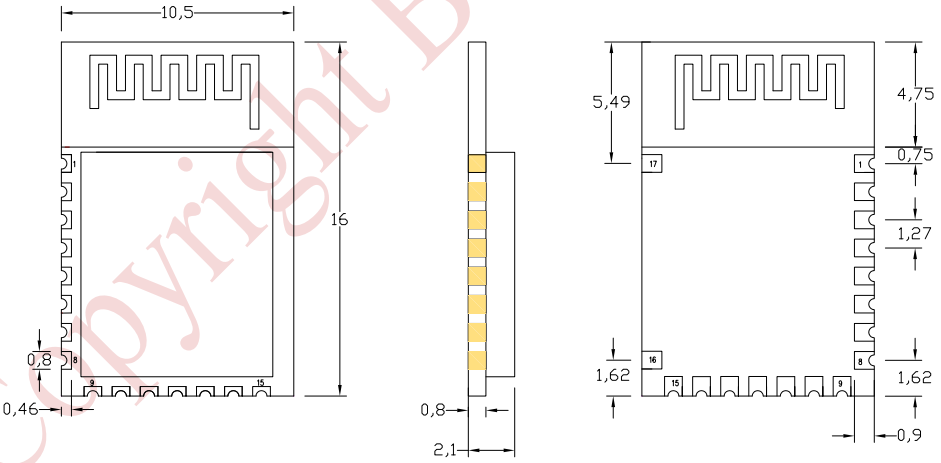


Figure 5.2 Dimensions of BB170S

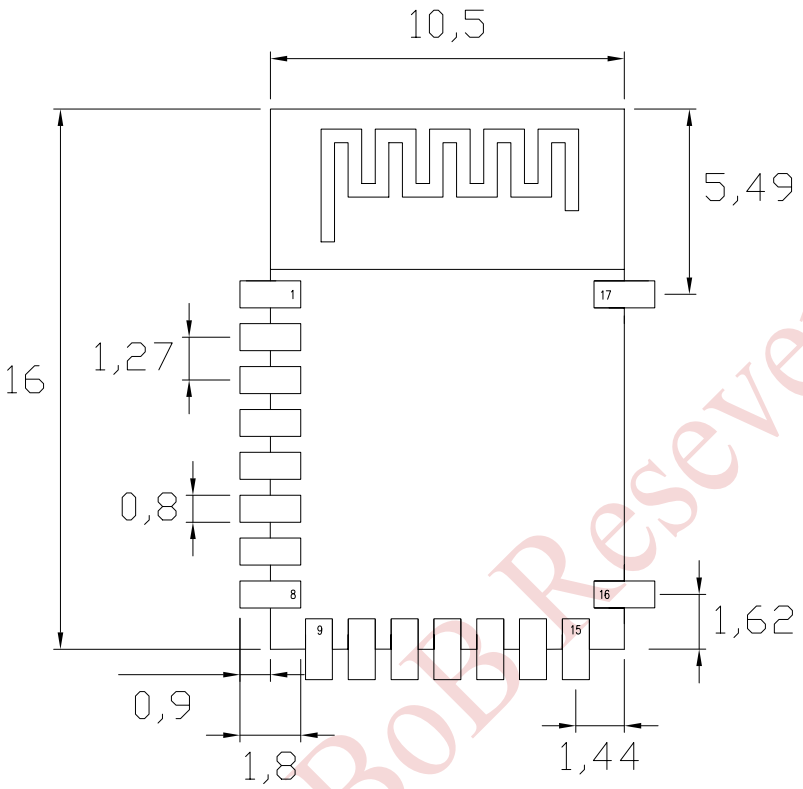
Unit：mm

Table 5.1 Dimensions of BB170(S)

Model	Length	Width	Height	PCB Thickness	PAD Size	PIN Spacing	Shield
BB170	16mm	10.5mm	2.1mm	0.8mm	0.9mm×0.8mm	1.27mm	Yes
BB170S	16mm	10.5mm	2.1mm	0.8mm	0.9mm×0.8mm	1.27mm	Yes

5.2 PCB footprint

The recommended PCB footprint of BB170 is shown in **Figure 5.3.**



Unit：mm

Figure 5.3 Recommended PCB footprint

6. Welding instructions

6.1 Recommended temperature reflow profile

The recommended SMT temperature reflow profile of BB170 is shown in **Figure 6.1**.

61

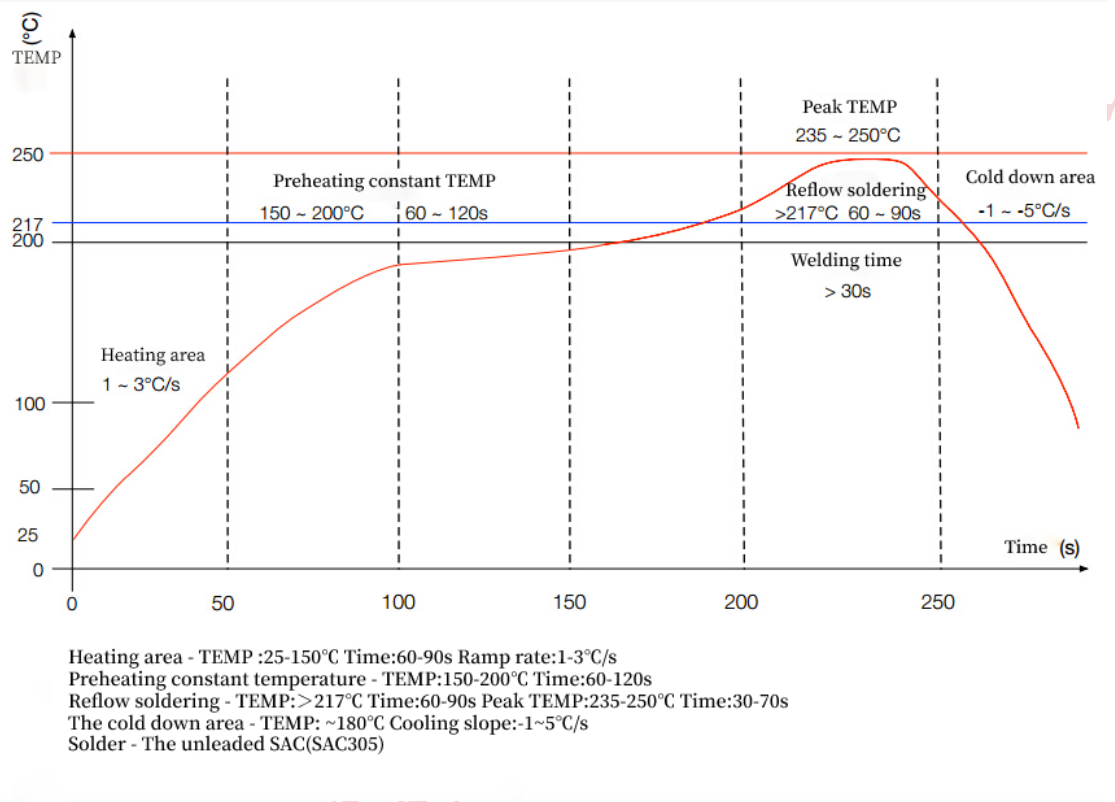


Figure 6.1 Temperature reflow profile

7. Part number & Selections

The selection list related to BB170 is shown in **Table 7.1**.

Part No.	SoC	Frequency band	Transmission power	Bluetooth protocol	Dimensions	Antenna	Shield
BB170	GR5331	2.4GHz	+6dBm	5.3	10.5×16×2.1mm	ANT on board	Yes
BB170S	GR5331	2.4GHz	+6dBm	5.3	10.5×16×2.1mm	ANT on board	Yes

Table 7.1 List of selections

8. Sales channel & Service

Shenzhen Best of Best Holdings Co., Ltd.

Add：Rm.1501A,East Tower,FIYTA Tech. Bldg.,Southern District of High-tech Industrial Park,Nanshan District,Shenzhen 518057,P.R.China

Tel：86-755-86018818

Fax：86-755-86018808

Web：www.bobholdings.com

Beijing office

Add：Room 1006 Quantum Plaza，No.23 Zhi Chun Road，Hai Dian District，Beijing

Tel：86-10-82358601/2/3/4

Fax：86-10-82358605

Shanghai office

Add：Room 2003-2004, Mingshen Center Bldg., No. 3131 Kaixuan Rd.,Xuhui District, Shanghai, P.R.C.

Tel：86-21-54071701

Fax：86-21-54071702

Chengdu office

Add：Room 1402, Bldg#2, Shudu Center, No.138, Tianfu No.2 Street, Mid Section, Tianfu Avenue, High-Tech District, Chengdu City, Sichuan Province, China

Tel：86-28-85355677

Fax：86-28-85350890

Guangzhou office

Add：Room 620 6 floor,ao yuan city plaza,hanxi avenueGuangzhou,China.

Tel：86-20-34776690

9. Revision history

Version	Date	Description	Reviser
V1.0	2024/03/07	Initial version	Wesley/Damon

FCC Statement
FCC standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247
PCB antenna with antenna gain -0.03dBi
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
Note: This equipment has been tested and found to comply with 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 circuit different from that to which the receiver is connected.
−Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement
This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: “Contains Transmitter Module FCC ID: 2A6CI-BB170 Or Contains FCC ID: 2A6CI-BB170”

When the module is installed inside another device, the user manual of the host must contain below warning statements;
1. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference.
(2) This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with 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 circuit different from that to which the receiver is connected.
−Consult the dealer or an experienced radio/TV technician for help.
2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.
Any company of the host device which install this modular with modular approval should perform the test of radiated & conducted emission and spurious emission,etc. according to FCC part 15C : 15.247 and 15.209 & 15.207 ,15B Class B requirement, Only if the test result comply with FCC part 15C : 15.247 and 15.209 & 15.207 ,15B Class B requirement, then the host can be sold legally.