

BREO-BLE-A1Bluetooth Module Specification

Product Model: BREO-BLE-A1

Hardware Version: V1.0

Document Version: V1.0

Effective Date: 2024-06-01

Content

1 Summary..... 3

2 Internal Chip Block Diagram..... 4

3 Performance Parameters..... 4

4 Module Dimension Diagram..... 6

5 Module Pin Definition Diagram..... 7

6 Pin Function Description..... 7

7 Precautions..... 8

8 Recommended Reflow Temperature..... 9

9 Module Pictures..... 10



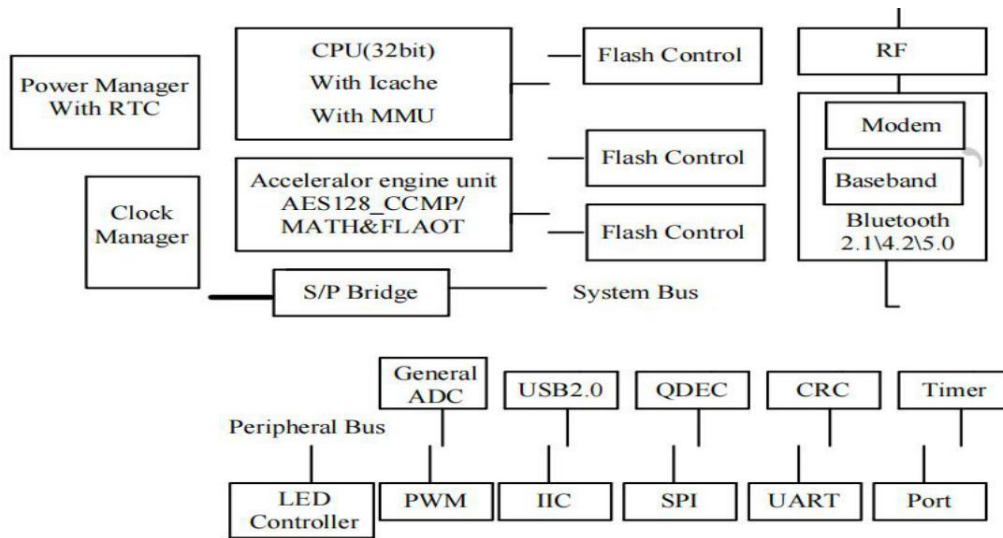
1 Summary

The BREO-BLE-A1 is a module designed based on the AC6328A chip, a highly integrated wireless System-on-Chip (SoC). It integrates a RISC 32-bit MCU and supports Bluetooth Low Energy 5.0 protocol; it integrates a high-performance RF transceiver, baseband, low-power processor, programmable protocols, and profiles to support a wide range of applications. The module has 73KB of data RAM and 2Mbit of Flash, making it suitable for custom applications. The module also supports firmware OTA encoding mechanism; the chip is designed and integrated with advanced technology, featuring ultra-low power consumption and ultra-low leakage power; the embedded high-order interference suppression filter and fast automatic gain control logic enable it to operate well in high-interference environments.

Basic Features

- Bluetooth Low Energy 5.0 protocol
- Receiving Sensitivity up to -92dBm
- Transmission Power up to +8dBm
- All 10 IOs have pull-up or pull-down, allowing flexible selection
- 32-bit RISC core with 73KB data storage and up to 96MHz speed
- Operating Voltage 1.8~3.4V
- Interfaces and Peripherals
 - 3 GPIOs
 - 16-bit PWM
 - Supports Full-Speed USB OTG interface
 - 3-channel 10-bit General Purpose ADC
 - GPIO with multiplexed interface functions
 - Watchdog function
 - Power-on reset function
 - One I2C supporting Master and Slave modes
 - Three full-duplex advanced UARTs (DMA)
 - One channel 8-level low-power detection

2 Internal Chip Block Diagram



3 Performance Parameters

3.1 RF Parameters

Parameter		Min	Typ	Max	Unit	Test Conditions
RF Transmit Power			4	6	dBm	25°C, Power Supply VDDIO=3.3V 2441MHz
RF Power Control Range			20		dB	
20dB Bandwidth			950		KHz	
Adjacent Channel	+2MHz		-40		dBm	
	-2MHz		-38		dBm	
Transmit Power	+3MHz		-44		dBm	
	-3MHz		-35		dBm	

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-92		dBm	25°C, Power Supply VDDIO=3.3V 2441MHz
Co-channel Interference Rejection			-13		dB	
Adjacent Channel Interference Rejection	+1MHz		+5		dB	
	-1MHz		+2		dB	
	+2MHz		+37		dB	
	-2MHz		+36		dB	
	+3MHz		+40		dB	
	-3MHz		+35		dB	

3.2 DC Characteristics

Parameter (Condition)	Min	Typical	Max	Unit
POWER Supply	1.8	3.0	3.4	V
VIH High level	VCC-0.3		VCC+0.3	V
VIL Low level	VSS		VSS+0.3	V
VOH High level (IOH=-0.25mA)	VCC-0.3		VCC	V
VOL Low level (IOL=0.25mA)	VSS		VSS+0.3	V
Deep sleep (1 kHz Timer)			10	uA
Shut down			450	nA
Sleep current (RF OFF, 32 kHz clock, DIG Retention)			2	uA
Active RX(3.3V)		7.5		mA
Active TX@0dBm(3.3V)		7.9		mA

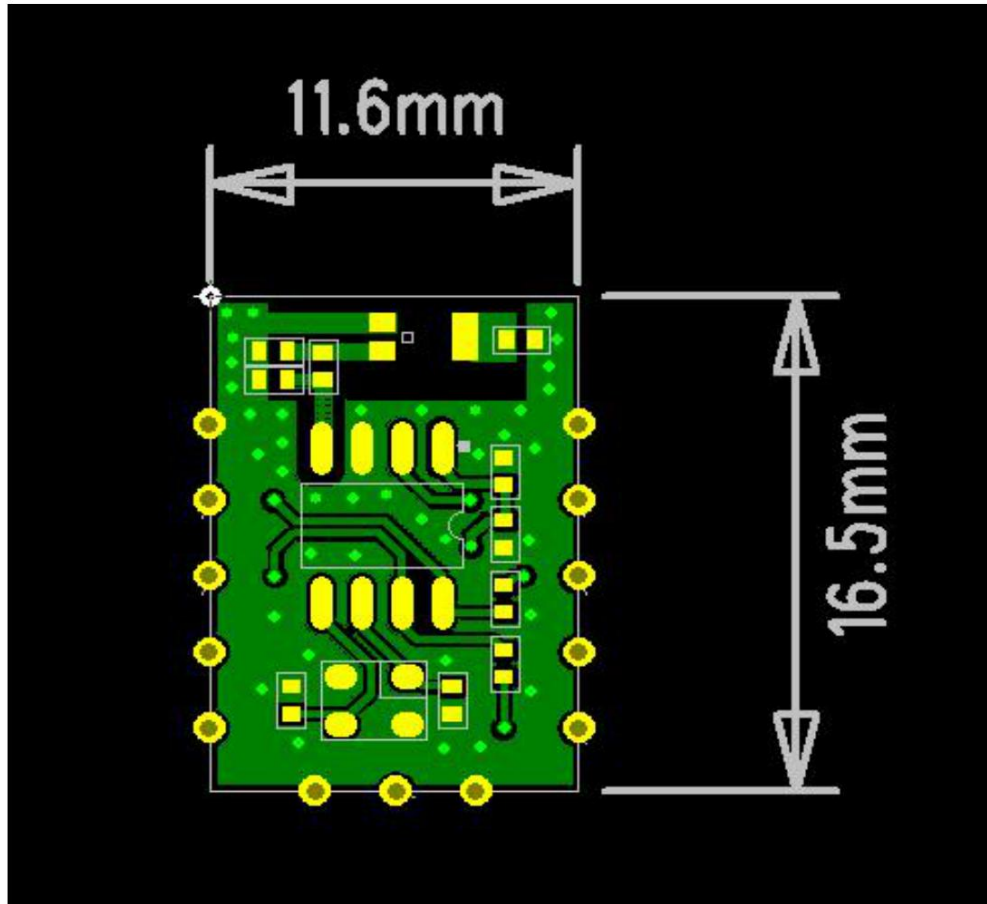
3.3 Environmental Parameters

Environment condition	
Temperature	Operating Temperature: -40 deg.C ~85 deg.C
	Storage Temperature: -55 deg.C ~125 deg.C
Humidity	Operating Humidity: 5% ~95% (Non-condensing)
	Storage Humidity: 5% ~95% (Non-condensing)

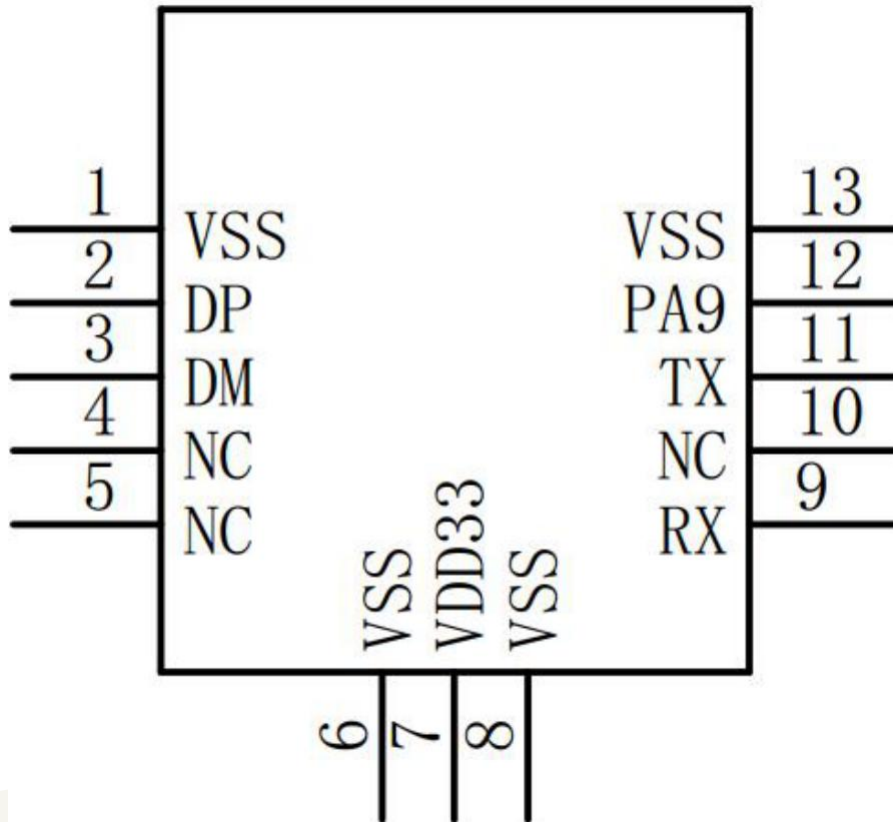
4 Module Dimension Diagram

PCB Dimensions:

◆ Dimensions (L x W x H): L:16.5mm * W:11.6mm * H:0.8mm(-0.1/+0.1)mm



5 Module Pin Definition Diagram



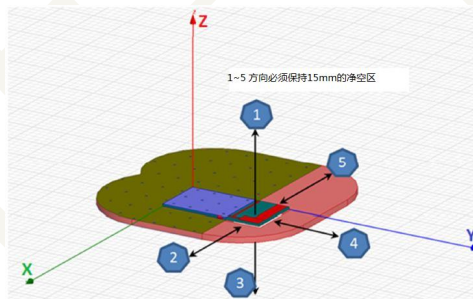
6 Pin Function Description

Pin	Symb	I/O	Description
1	VSS	GND	GND
2	DP	Digital I/O	General purpose IO I2C SCL UART_TXD ADC Channel 10
3	DM	Digital I/O	General purpose IO I2C SDA UART_RXD ADC Channel 11
4	NC		
5	NC		
6	VSS	GND	GND
7	VDD	POWER	VDD3.3V

8	VSS	GND	GND
9	RX	Digital I/O	General purpose IO I2C SDA UART_RXD ADC Channel 11
10	NC		
11	TX	Digital I/O	General purpose IO I2C SCL UART_TXD ADC Channel 10
12	PA9	Digital I/O	General purpose IO ADC Channel 8
13	VSS	GND	GND

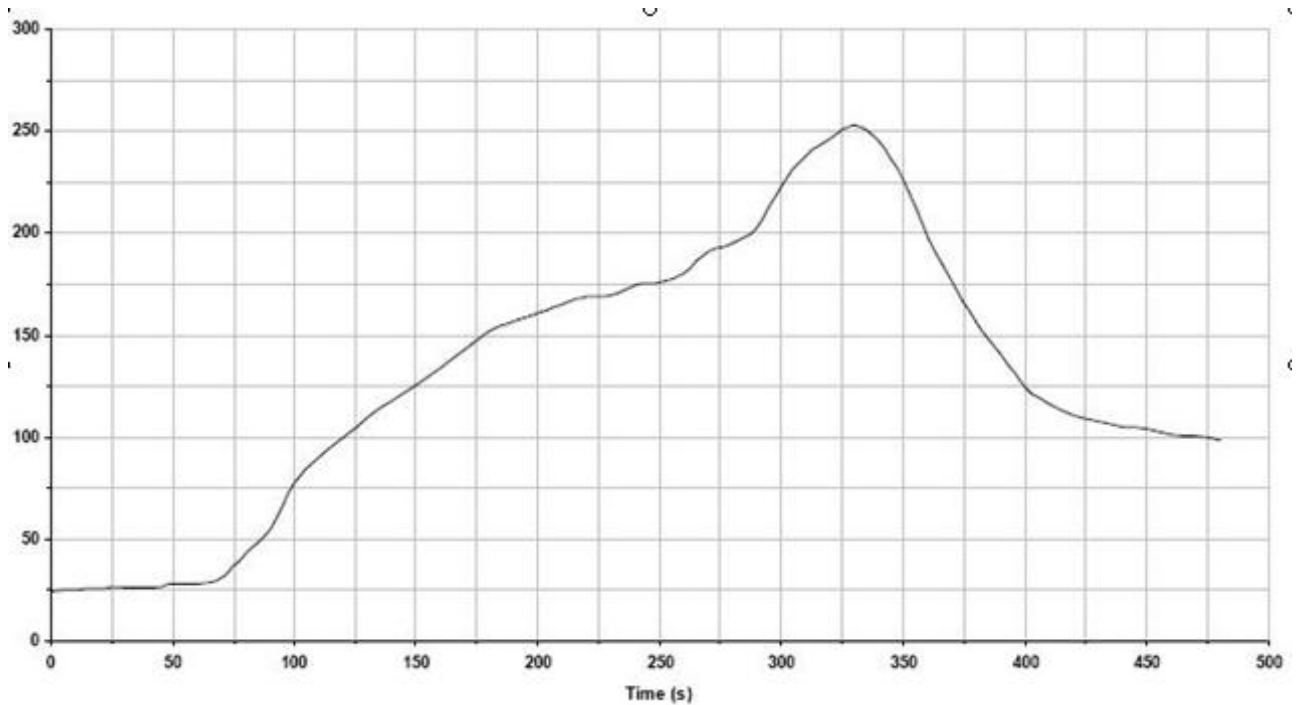
7 Precautions

- A. During module use, please avoid the impact of interference sources such as power amplifiers, boost circuits, and DC/DC circuits on the module. Avoid forming series circuits between the module's power supply loop and high-power circuit units to reduce interference
- B. If there are batteries, metal objects, LCD screens, speakers, etc., next to the module antenna, they must be at least 15mm away from the antenna (as shown in the figure)



- C. PCB Layout: As metal can weaken antenna performance, it is strictly prohibited to place ground planes or traces under the module antenna area when designing the board. It is better to hollow out this area if possible
- D. Since metal enclosures shield wireless RF signals, it is recommended not to install the module inside a metal enclosure
- E. Regarding the usage environment for Bluetooth, wireless signals are easily significantly affected by the surrounding environment. Obstacles such as trees and metal can absorb wireless signals, thus affecting the data transmission range in practical applications

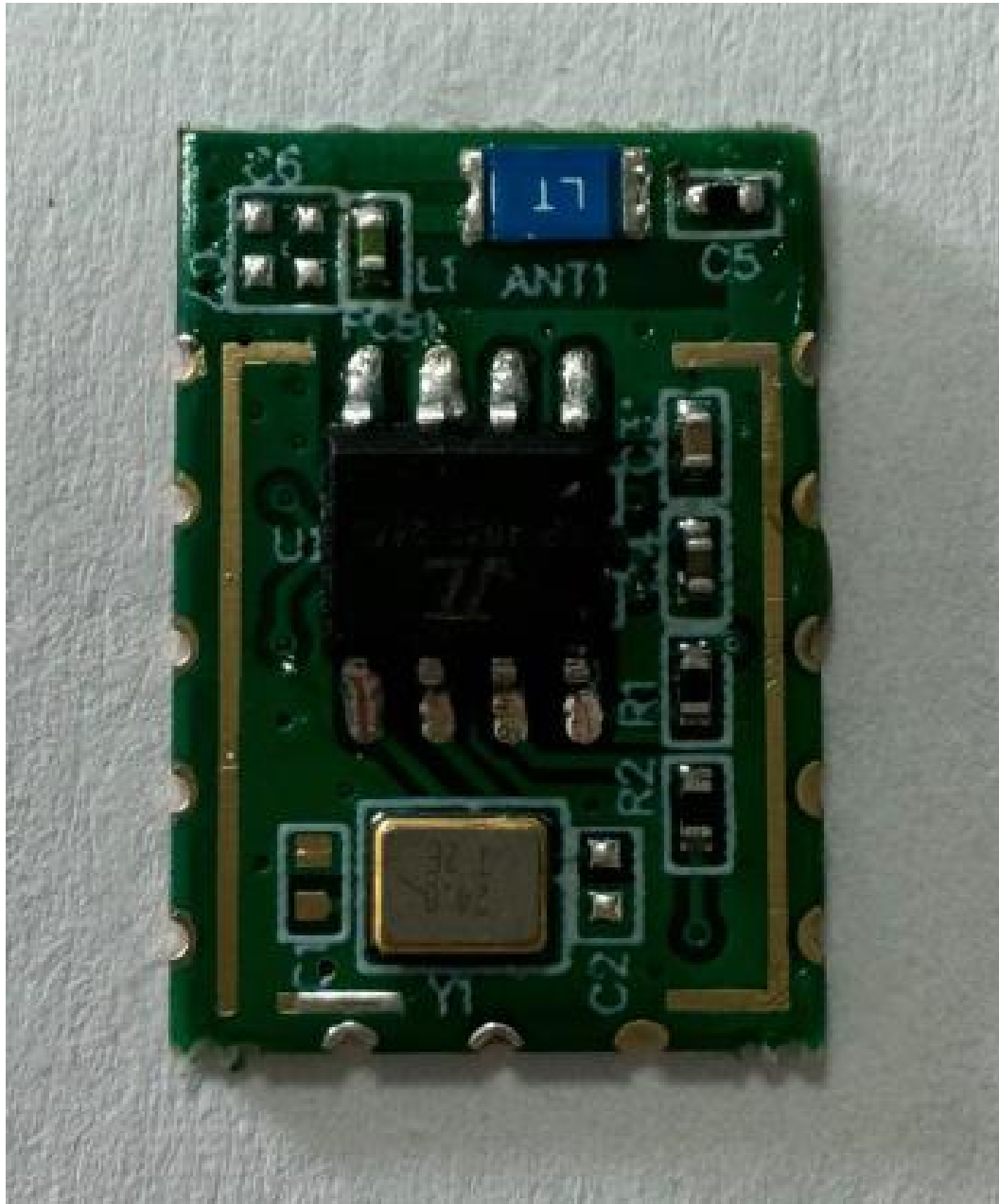
8 Recommended Reflow Temperature



Key features of the profile:

- Initial Ramp=1-2.5°C/sec to 175°C equilibrium
- Equilibrium time=60 to 80 seconds
- Ramp to Maximum temperature (250°C)=3°C/sec Max
- Time above liquidus temperature(217°C): 45 - 90 seconds
- Device absolute maximum reflow temperature: 250°C

9 Module Pictures



THE END!

OEM integration instructions:

This device is intended only for OEM integrators under the following conditions:

The transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the external antenna(s) that has been originally tested and certified with this module.

As long as the conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End product labeling:

The final end product must be labeled in a visible area with the following: "Contains Transmitter Module FCC ID: 2BSPG-BREO ".

Information that must be placed in the end user manual:

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

2.2 List of applicable FCC rules

FCC Part 15 Subpart C 15.247

2.3 Specific operational use conditions

The module WiFi Module is a module with BLE function.

Operation Frequency: 2402 MHz ~ 2480 MHz

The module can be used for mobile or applications with the maximum; The host manufacturer installing this module into their product must ensure that the final composite product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation. The host manufacturer has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

2.4 Limited module procedures

Not applicable. The module is a Single module and complies with the requirement of FCC Part 15.212.

2.5 Trace antenna designs

Not applicable. The module has its own antenna, and doesn't need a host's printed board microstrip trace antenna etc.

2.6 RF exposure considerations

The module must be installed in the host equipment such that at least 20cm is maintained between the antenna and users' body; and if RF exposure statement or module layout is changed, then the host product manufacturer required to take responsibility of the module through a change in FCC ID or new application. The FCC ID of the module cannot be used on the final product. In these circumstances, the host manufacturer will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization

This device is intended only for host manufacturers under the following conditions: The transmitter module may not be co-located with any other transmitter or antenna;

The module shall be only used with the internal antenna(s) that has been originally tested and certified with this module. The antenna must be either permanently attached or employ a 'unique' antenna coupler.

As long as the conditions above are met, further transmitter test will not be required. However, the host manufacturer is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

2.8 Label and compliance information

Host product manufacturers need to provide a physical or e-label stating "Contains FCC ID: 2BSPG-BREO "with their finished product.

2.9 Information on test modes and additional testing requirements

Data transfer module demo board can control the EUT work in RF test mode at specified test channel. Additional testing, Part 15 Subpart B disclaimer.

The module without unintentional-radiator digital circuit, so the module does not required an evaluation by FCC Part 15 Subpart B. The host should be evaluated by the FCC Subpart B.

2.10 Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for FCC Part 15 Subpart C 15.247 and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

FCC STATEMENT :

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 generate, 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.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.