

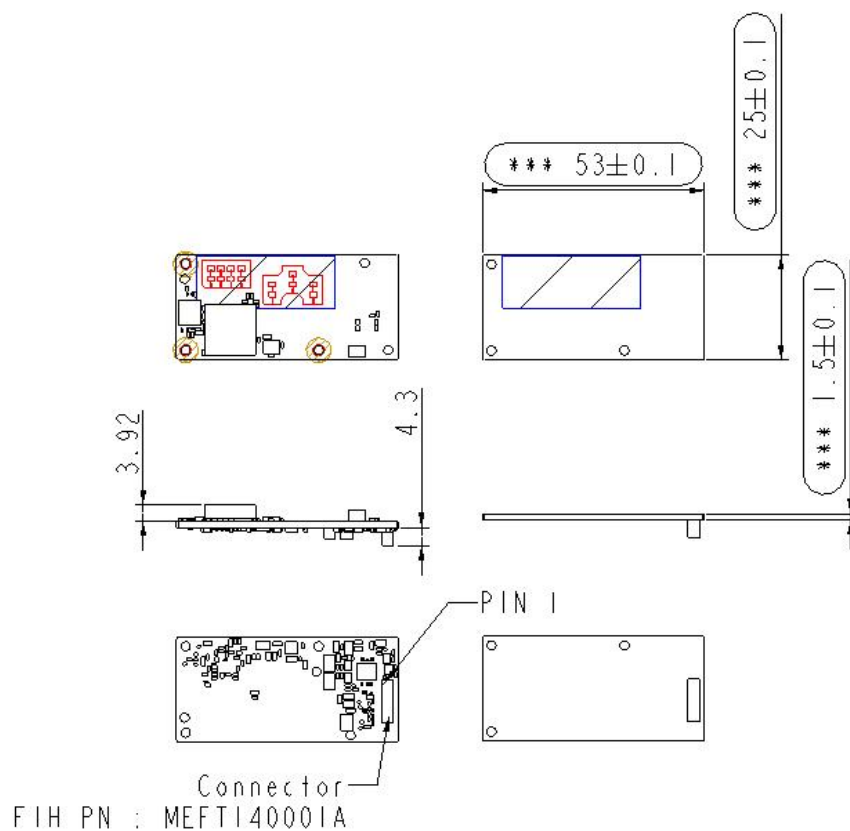
MW001 60GHz Radar Specification

Version	Date	Page	Description
0.1	2024/7/22	All	Initial Version
0.2	2024/8/13	Page5	Add mmWave Module pictures. , and optimize package.

1. Features

- Frequency range : 60 - 64 GHz
- Number of receivers : 4
- Number of transmitters : 3
- ADC sampling rate (ksps) : 25000
- RX noise figure : 12 dB
- Phase noise at 1 MHz : -93 dBc/Hz
- Arm CPU : Arm Cortex-R4F at 200 MHz
- Coprocessors : Radar Hardware Accelerator
- DSP type : 1 C67x DSP @ 600MHz
- Interface : UART
- Operating temperature range (°C)-10 to 60
- Storage temperature range (°C)-40 to 70

2. Dimension(53mm*25mm*9.8mm)



3. Electric Specifications

3.1 Absolute Maximum Ratings

Item	Description	Min.	Max.	Unit
VCC	DC power in	-0.3	6	V
I/O pin voltage	UART,RESET,INT,Mode	-0.3	3.6	V

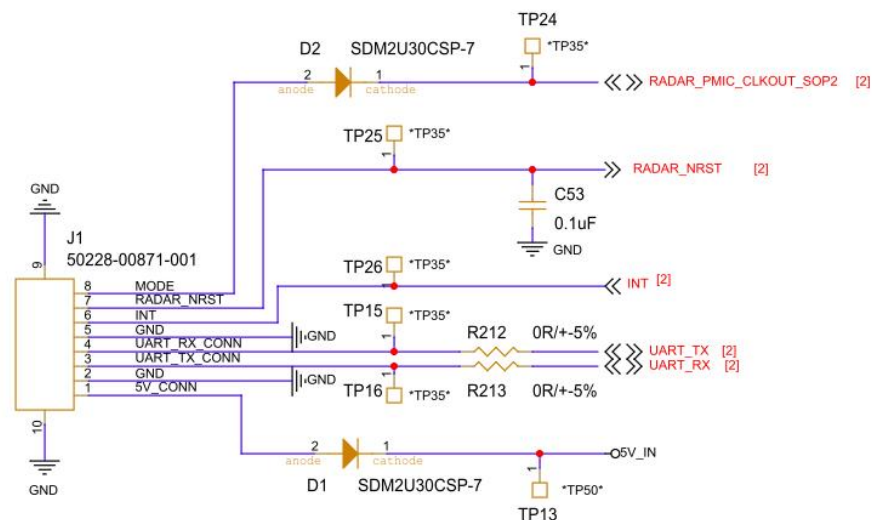
3.2 Normal Operating Ratings

Item	Description	Min.	Max.	Unit
Operating voltage	DC power in	4.75	5.5	V
Operating current	Function Mode	600		mA

4.Connector pin-define

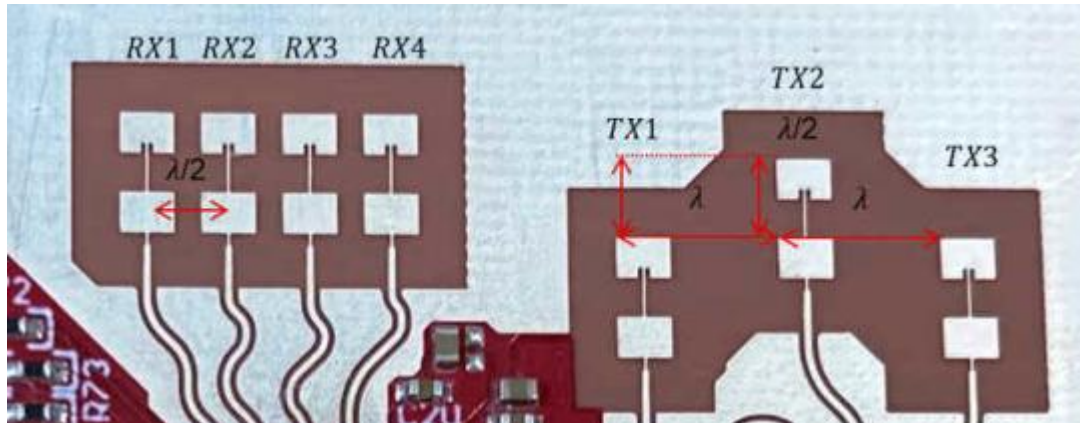
1	5V	
2	GND	
3	UART_RX	3.3V · input · connect SOC UART_TX
4	UART_TX	3.3V · output · connect SOC UART_RX
5	GND	
6	INT	output
7	NRST	input
8	MODE	L: function mode; H: flashing mode

mmWave Module connector J1

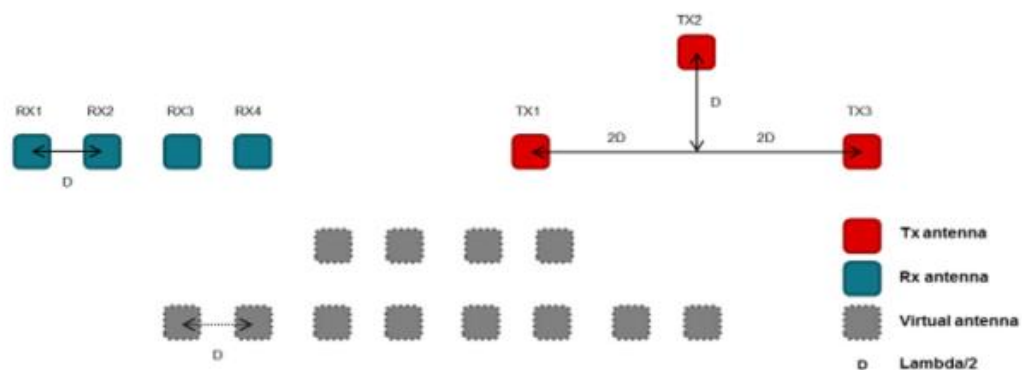


5. Antenna Description

Antenna array includes four receivers and three transmitters FR4 based antennas on the PCB. Below pic shows the Antenna configuration.



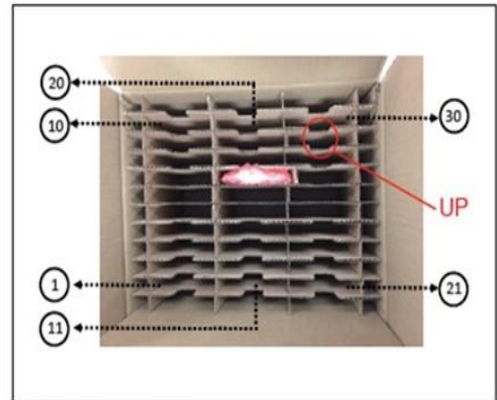
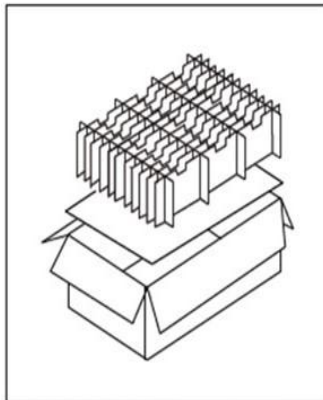
The transmitter and receiver antenna's positions form a **virtual array of 12 transmitter and receiver pairs**. This allows the object detections finer azimuthal angular resolution (15°) and coarse elevation angular resolution (58°). Receiver antennas are spaced at distance D ($\text{Lambda}/2$) and Transmitter antenna Tx1 and Tx2 spaced at $2D$ (lambda) in azimuthal plane and D ($\text{Lambda}/2$) in elevation plane. Tx2 and Tx3 are placed at D ($\text{Lambda}/2$) in the elevation and $2D$ (Lambda) in azimuth plane. Below pic shows the virtual array.



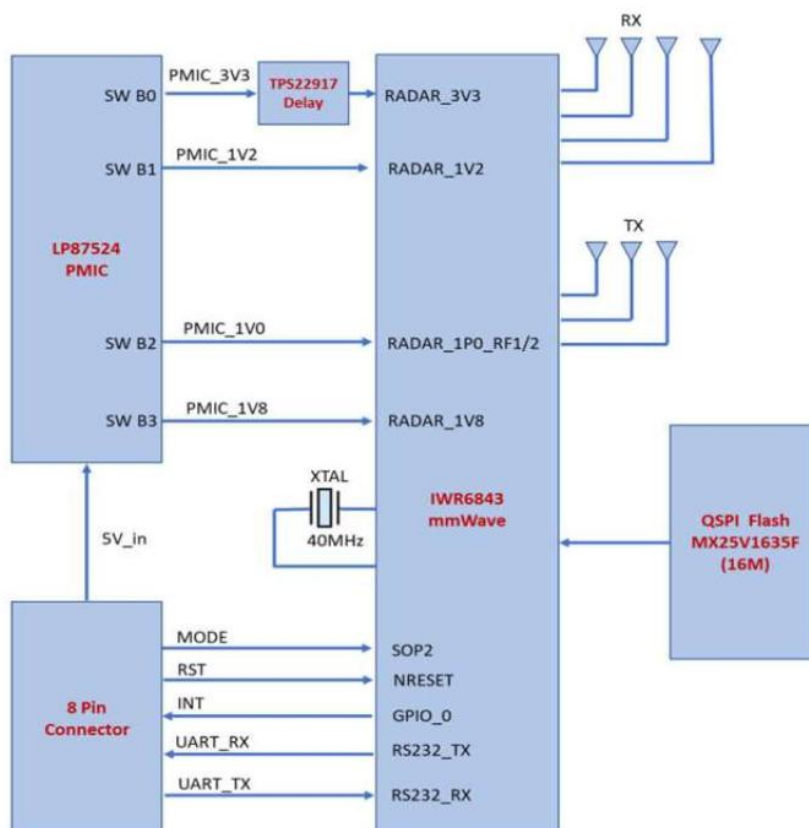
6. Package

The mmWave module will be packed by plastic-bag as below picture.

And 2pcs module be put into 1 cell-area, 1*carton box will contain 60pcs mmWave module.



7. Block Diagram

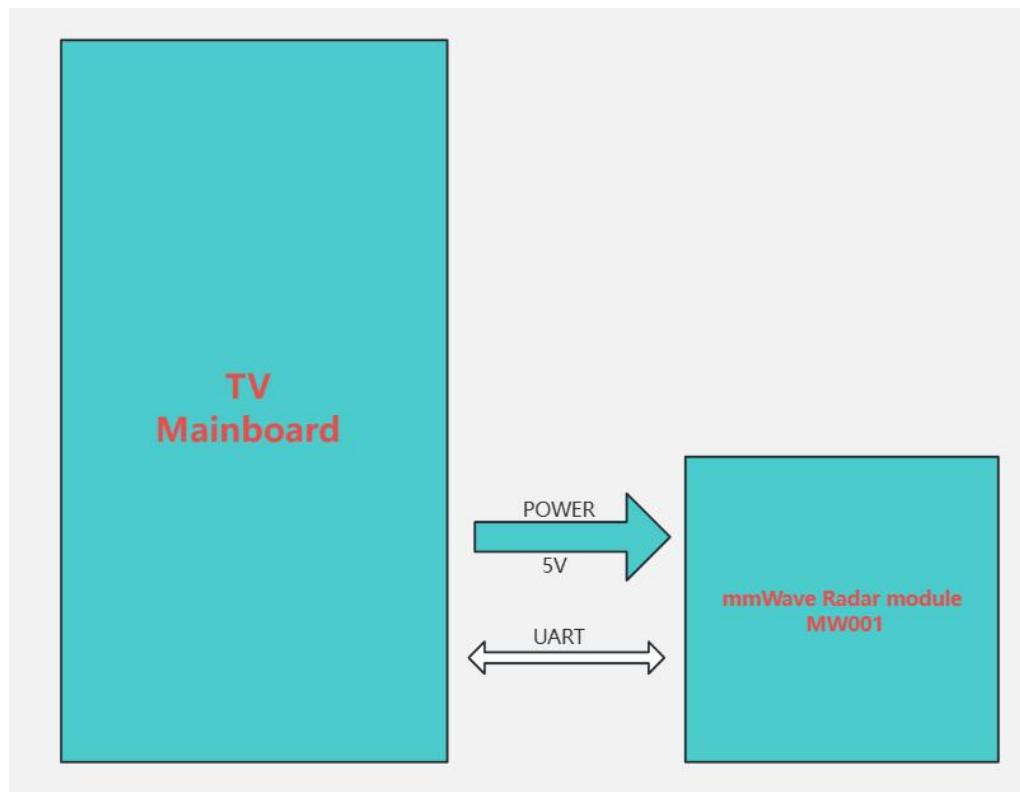


8. Applications

The radar module is applied to the entire television system, which can accurately measure the number of people watching TV, their posture and distance, thereby enabling the TV to achieve more intelligent functions.

9. About Radar Module connect with TV Mainboard

The radar module is used as an independent module and does not need to be integrated on a motherboard. It can be pulled out of the motherboard through an 8-pin connection cable. The definition of Radar Module's connector please refer to Page 5. And refer to the definition of the radar module connector and require the TV motherboard to support UART, corresponding GPIO functions, and provide a 5V 600mA power supply.

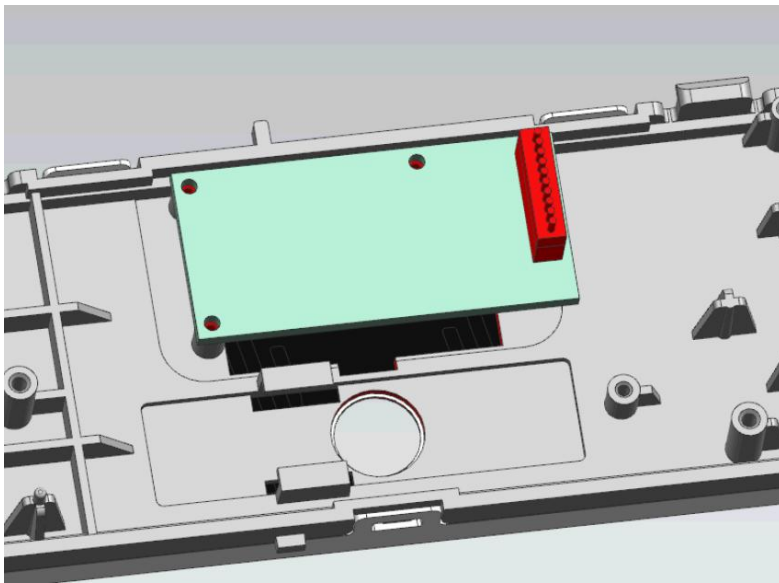


10. About Radar Module integration into entire TV machine

It is necessary to ensure that there are no metal structures blocking the front of the radar and that the distance between the radar module and the shielding panel is appropriate when installing the radar module on the entire machine. Suggest referring to the current structural design, the material of the shading panel is ABS, the height of the bolt fixing the radar is 5mm, and the thickness of ABS plastic is 4.3mm.

The current structural design is to place the radar module on the TV speaker mesh, as shown in the picture below, the specific installation steps are as follows:

- 1) Place the radar module in the middle of the TV speaker mesh
- 2) Fix it on the TV speaker mesh with three self tapping screws
- 3) Connect the 8-pin cable to the TV Mainboard



FCC Statement:

Please take attention that changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. 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.

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

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.

(1) List of applicable FCC rules

FCC Part 15 Subpart C 15.255

(2) Specific operational use conditions

The module is a mmWave Module with 60GHz function, this device is used indoors.

Modulation: FMCW

Antenna Type: Integrated Patch Antenna

Operation Frequency: 60-64GHz

(3) Limited module procedure

The module doesn't have its own RF shielding, The host should provide the RF shielding to the modular, which belong to Limited module.

(4) Trace antenna designs

Not applicable The module has its own antenna, and doesn't need a hosts printed board micro strip trace antenna etc.

(5) 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.

(6) Antenna used

Antenna Type: Integrated Patch Antenna

Gain: 7dBi for each antenna

Impedance: 50 Ohm

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 Sleeve monopole 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.).

(7) Labelling Instruction for Host Product Integrator

Host product manufacturers need to provide a physical or e-label stating "Contains FCC ID: 2BBQXMW001" with their finished product.

(8) Information on test modes and additional testing requirements

Host manufacturer must perform test of radiated & conducted emission and spurious emission, e.t.c according to the actual test modes for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product. Only when all the test results of test modes comply with FCC requirements, then the end product can be sold legally.

(9) Additional testing, Part 15 Subpart B disclaimer

This modular transmitter is only FCC authorized for the specific rule parts listed on our grant, 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. Host manufacturer in any case shall ensure host product which is installed and operating with the module is in compliant with Part 15B requirements. Please note that For a Class B or Class A digital device or peripheral, the instructions furnished the user manual of the end-user product shall include statement set out in §15.105 Information to the user or such similar statement and place it in a prominent location in the text of host product manual. Original texts as following:

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.

(10) Note EMI Considerations

Note EMI Considerations: D04 Module Integration Guide has been considered as “best practice” for RF design engineering testing and evaluation of non-linear interactions which can generate additional non-compliant limits due to module placement to host components or properties.

For standalone mode, D04 Module Integration Guide was referenced, and simultaneous mode considered for the host product to confirm compliance.

(11) How to make changes

Only the Grantee is permitted to make permissive changes.

Additional Testing and Grantee Evaluation for Host Product.

The module is a limited module and complies with the requirement of FCC Part 15.255. According to FCC Part 15 Subpart C section 15.212, the radio elements must have the radio frequency circuitry shielded.

However, due to there is no shield for this module, this module is granted as a Limited Modular Approval. A C2PC is required for new host application. Only Grantees are permitted to make permissive changes. Please contact us for further process.

The OEM integrators should follow the following C2PC test plan, Base on Module RF report “FCCSZ2023-0060-RF” under FCC ID: 2BBQXMW001.

For the host product installed this module exactly according to this guide, and did not make any hardware or software modifications to the module or modified the software but does not affect the radio characteristics, the host product will need to evaluate according to FCC Part 15 Subpart C §15.255 for 60GHz Radar:

- **PEAK EIRP**
- **Radiated spurious emissions with the other co-located transmitters.**
- **RF Exposure evaluation for the simultaneous transmission**

The host product shall be evaluated for ensuring the continuous compliance for the FCC rules that apply to the host product. Additional guidance for testing host products is provided in KDB Publication 996369 D02 and D04. This module was tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to the final host. The host will still need to be reassessed for compliance to this portion of rule requirements. For the host product is not installed according to this guide, the module certification will be invalid and a new grant certification will be required for the host product.

OEM Integration Instructions

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

- The module shall be only used with the external antenna(s) that has been originally tested and certified with this module.
- The antenna must be installed such that 20 cm is maintained between the antenna and users
- This device and its antenna(s) must not be co-located with any other transmitters except in accordance with FCC multi-transmitter product procedures.

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.).

Restrictions

- 1.This equipment is prohibited to be used on satellite equipment.
- 2.This equipment is field disturbance sensor and fixed installation. It is prohibited to use it on the vehicle radar systems.
- 3.This equipment is prohibited to be used on the aircraft.
- 4.This equipment is used indoors.

RF Exposure evaluation for the simultaneous transmission of the co-located transmitters.

The host product shall be evaluation for ensuring the continuous compliance for the FCC rules that apply to the host product. Additional guidance for testing host products is provided in KDB Publication 996369 D02 and D04. This module was tested as a subsystem and it's certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to final host. The host will still need to be reassessed for compliance to this portion of rule requirements. For the host product is not installed according to tis guide, the module certification will be invalid and a new grant certification will be required for the host product.

Installation Guidance:

Before installing the module to the host, you must mount the module in a location and environment that meets the following requirements:

Ensure that the location is within the cabinet of host, and ensure that any part of the module is not exposed outside the cabinet;

Ensure that the location is dry;

Ensure that the location is within the operating temperature $-40^{\circ}\text{C}\sim 75^{\circ}\text{C}$;

Mount the module in a high location as possible. Mounting the module below ground level can reduce the range of the system;

Mount the module in a location that is far away from sources of interference, such as electric motors, heating, air conditioning units, and other sources of electrical noise. Large metal object like heating ducts and plumbing can also shield the electromagnetic waves;

Ensure that there are no obstructions blocking the rear of the unit;

Ensure the power supply voltage always within 5.0Vdc

The module is typically use in industrial, household and general office / iTE and audio & video end-products. The module must be installed in the host equipment such that at least 20cm is maintained between the antenna and users' body.