



RFM Integrated Device, Inc.

PRODUCT SPECIFICATION

Part Number: ANT1003

ANTENNA, PRINT CHIP for
ISM Band, 433/868/915 MHz

(15×4.0×1.2 mm)

Preliminary

1. SCOPE

This specification covers the print chip antenna for ISM Band and 433MHz.

2. Name of the product

This product is named "Print Chip Antenna".



3. Electrical characteristics

3-1 Electrical characteristics of antenna

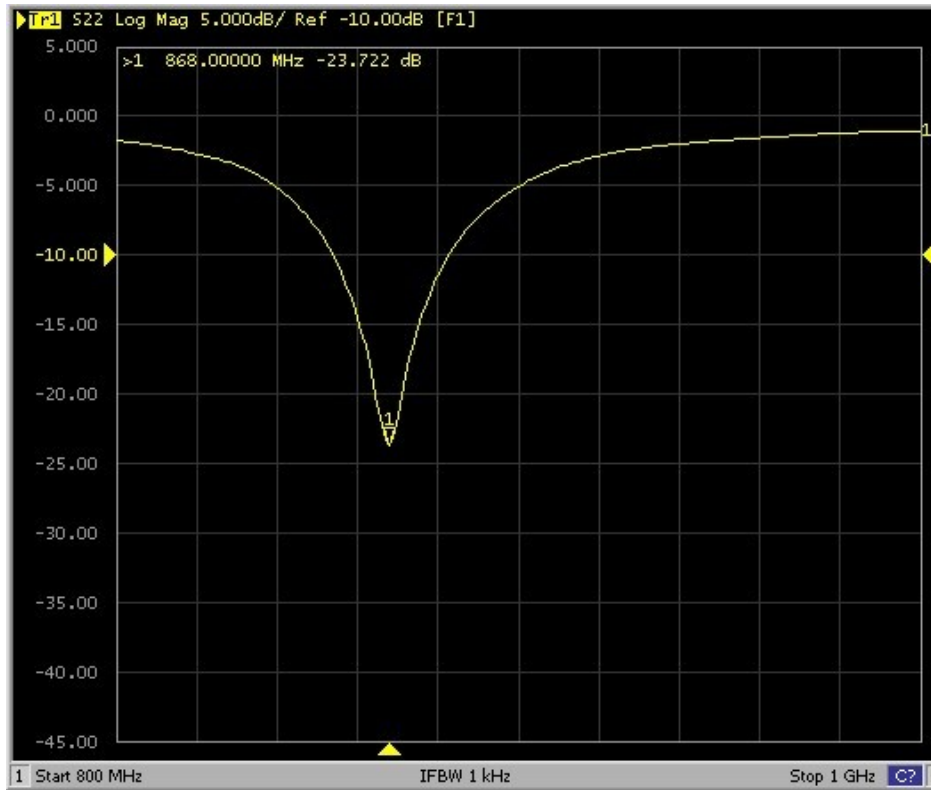
The antenna has the electrical characteristics given in Table 1 under the manufacturer's standard installation conditions shown in the figure of Evaluation Board.

Table 1

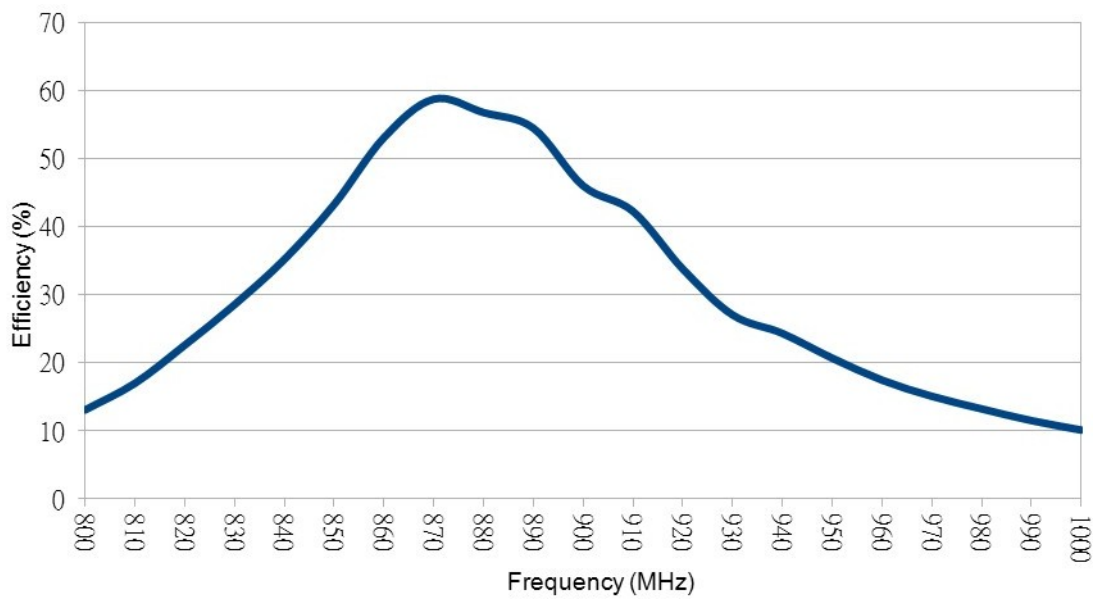
No	Parameter	Specification
1	Working Frequency	868 MHz 915 MHz 433 MHz
2	Dimension	15×4.0×1.2 mm
3	Polarization	Linear
4	Azimuth	Omni-directional
5	Impedance	50 Ω
6	Operating Temperature	-40~85°C

* Actual value will depend on customer ground plane size.

3.2 S11 & Efficiency Measurement ANT 1.



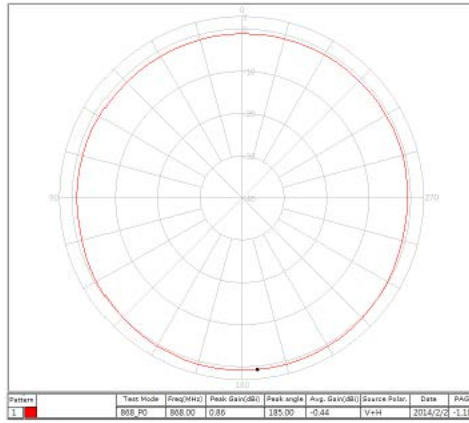
Return Loss : -23.72dB @868MHz



Efficiency(%) : 58.81@868MHz

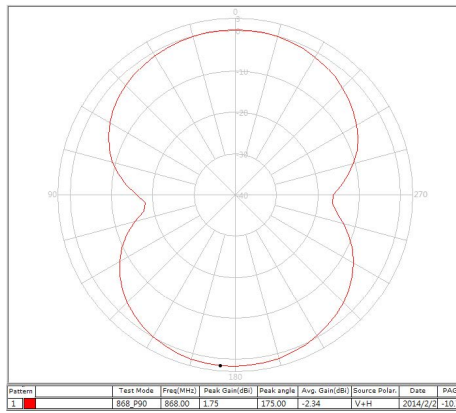
XZ-Plane 868MHz

2D Antenna Pattern Measurement



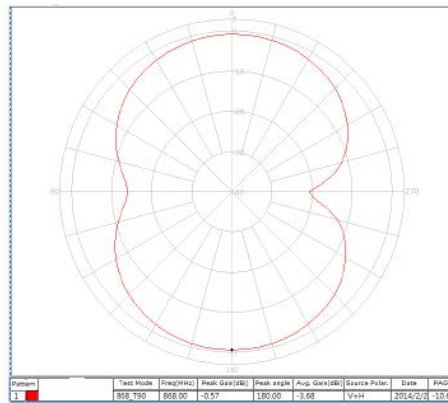
YZ-Plane 868MHz

2D Antenna Pattern Measurement

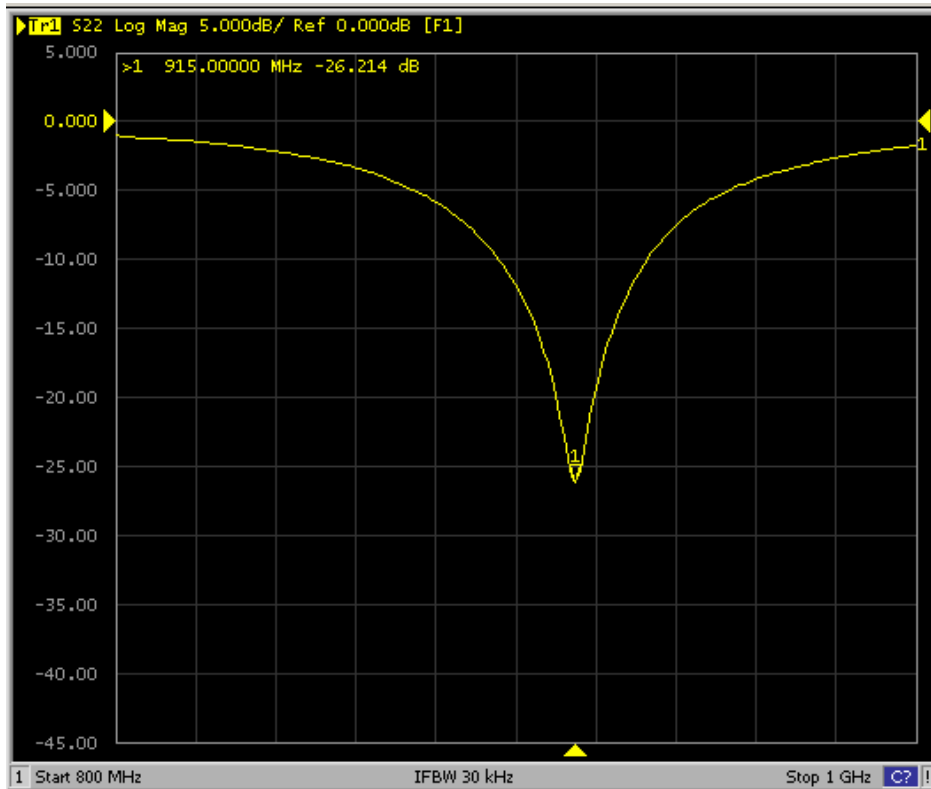


XY-Plane 868MHz

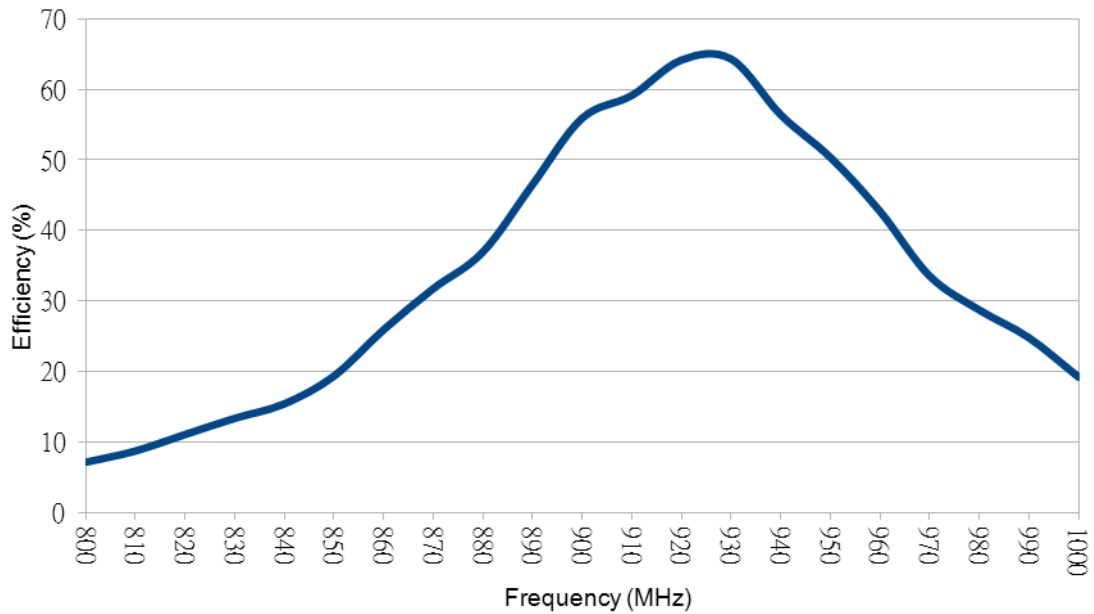
2D Antenna Pattern Measurement



868MHz	Peak Gain (dBi)
XZ-Plane	0.86
YZ-Plane	1.75
XY-Plane	-0.57

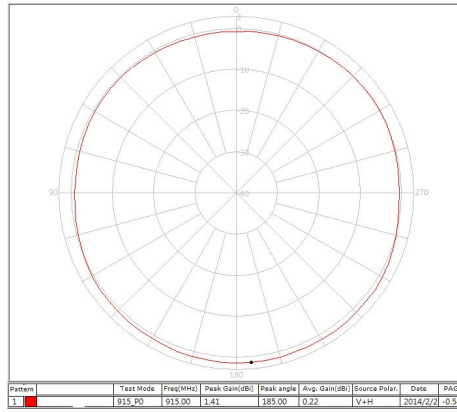


Return Loss : -26.21dB @915MHz

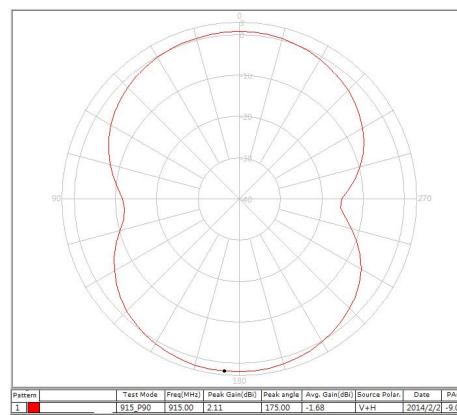


Efficiency(%) : 59.13 @915MHz

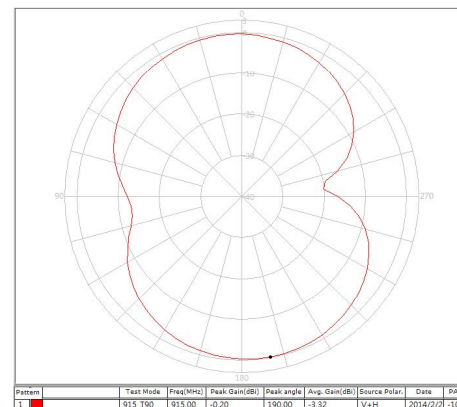
XZ-Plane 915MHz 2D Antenna Pattern Measurement



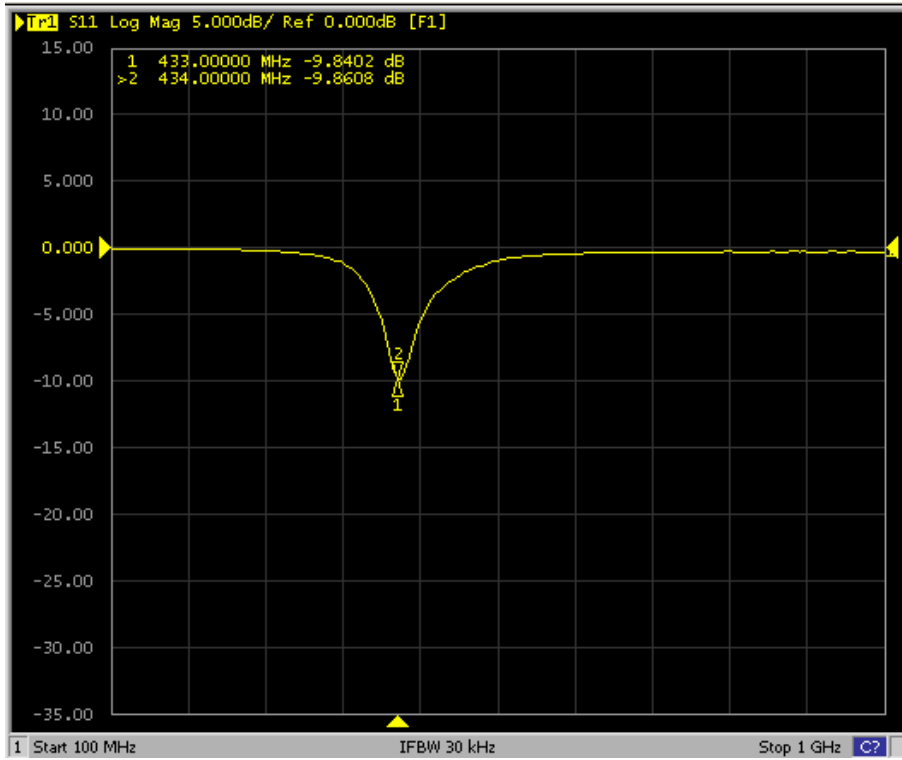
YZ-Plane 915MHz 2D Antenna Pattern Measurement



XY-Plane 915MHz 2D Antenna Pattern Measurement

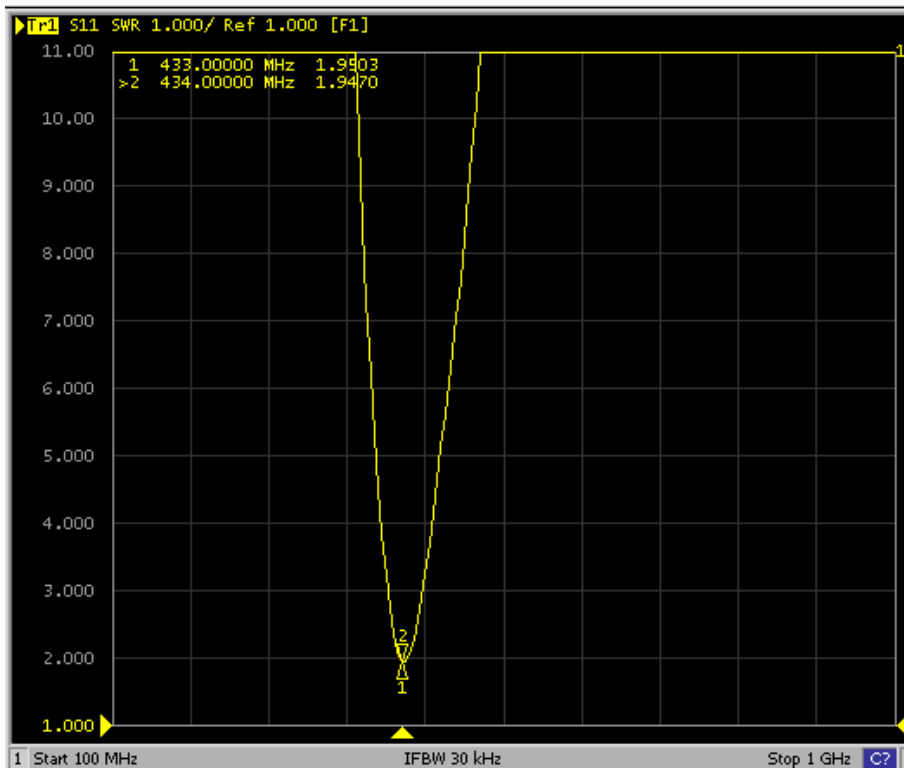


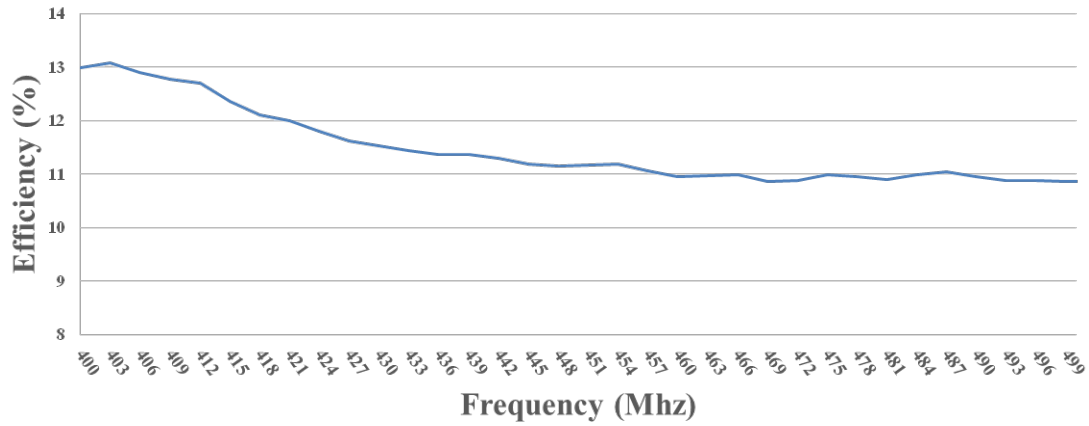
915MHz	Peak Gain (dBi)
XZ-Plane	1.41
YZ-Plane	2.11
XY-Plane	-0.20



Return Loss : -9.84dB @433MHz

Return Loss : -9.86dB @434MHz

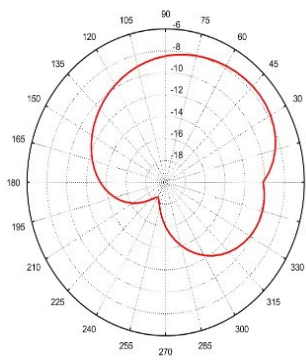




Efficiency(%) : 11.43 @433MHz

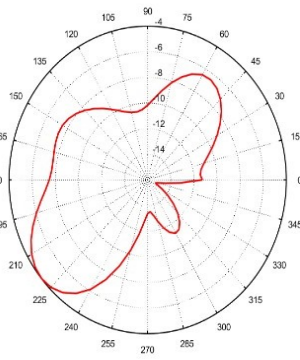
Antenna 2D Pattern

Total_Polar Graph_H_XY Plane



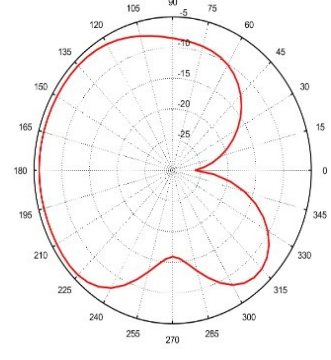
XY-Plane 433MHz

Total_Polar Graph_E1_XZ Plane



XZ-Plane 433MHz

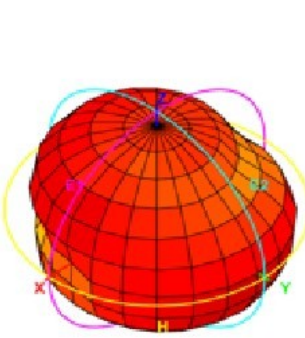
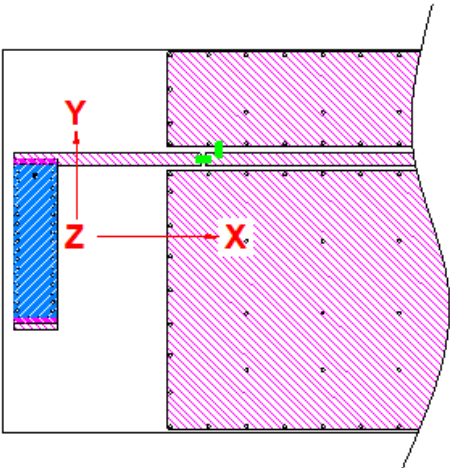
Total_Polar Graph_E2_YZ Plane



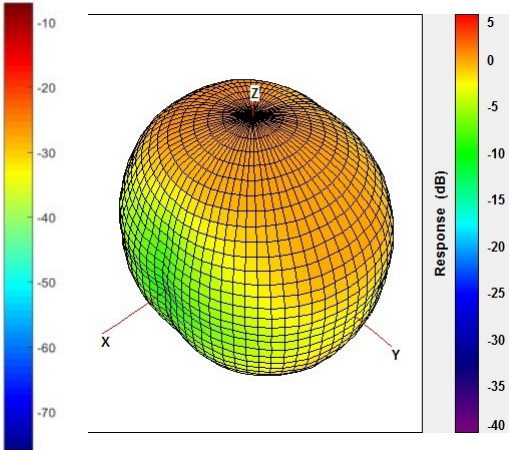
YZ-Plane 433MHz

433MHz	Peak Gain (dBi)
XZ-Plane	-7.75
YZ-Plane	-4.4
XY-Plane	-5.87

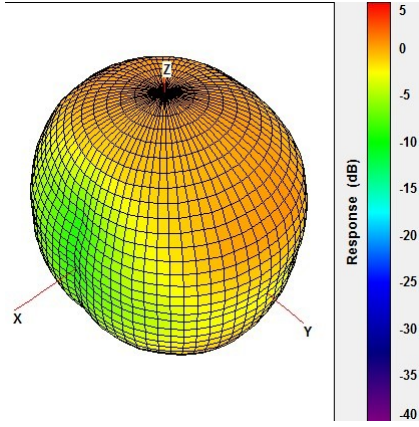
Antenna 3D Pattern



433MHz

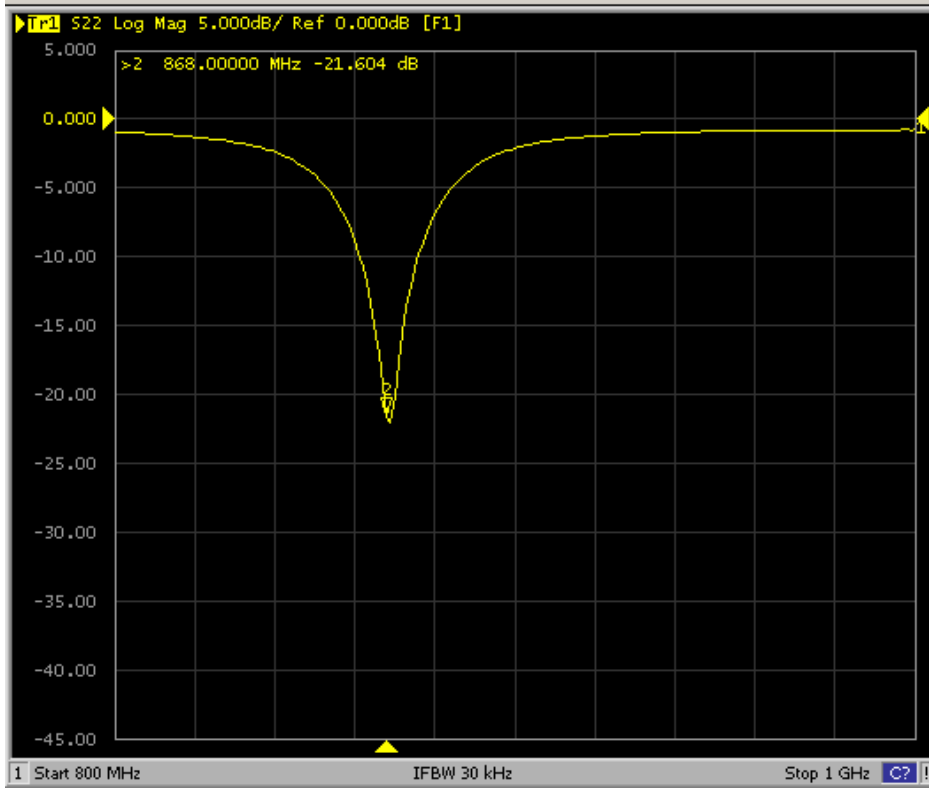


868MHz

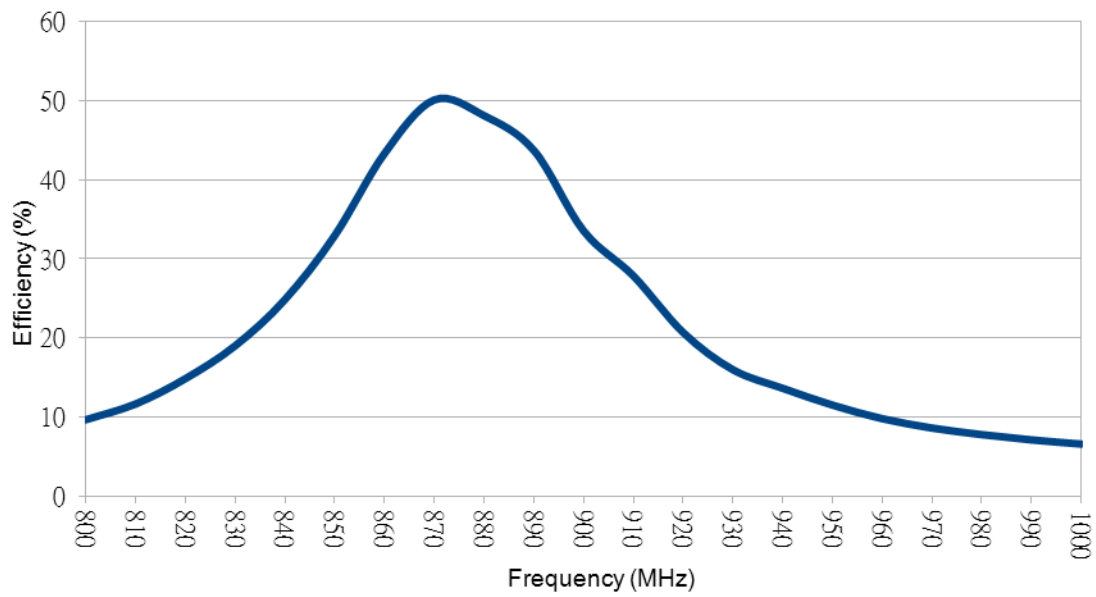


915MHz

ANT 2.



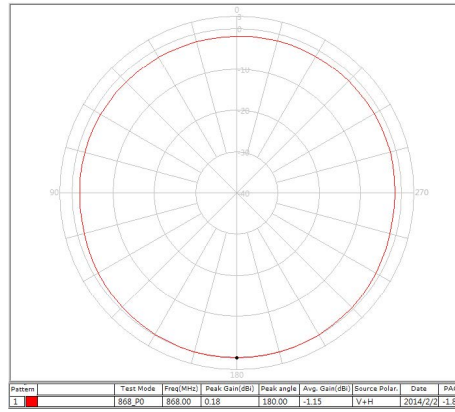
Return Loss : -21.60dB @868MHz



Efficiency(%) : 50.12@868MHz

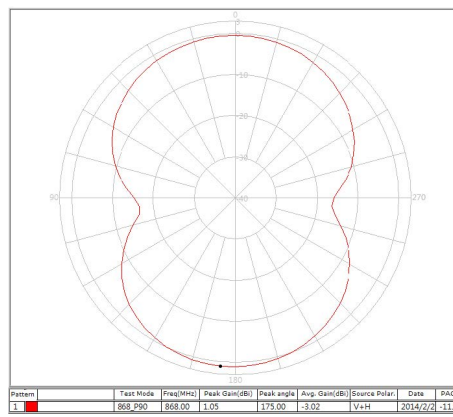
XZ-Plane 868MHz

2D Antenna Pattern Measurement



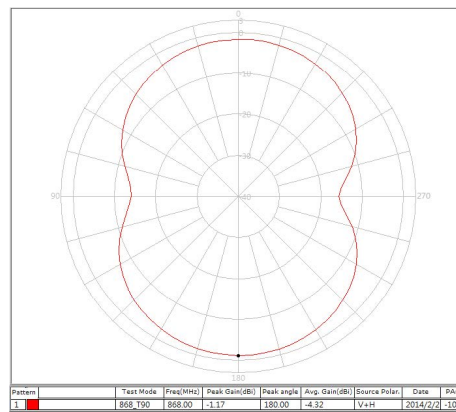
YZ-Plane 868MHz

2D Antenna Pattern Measurement

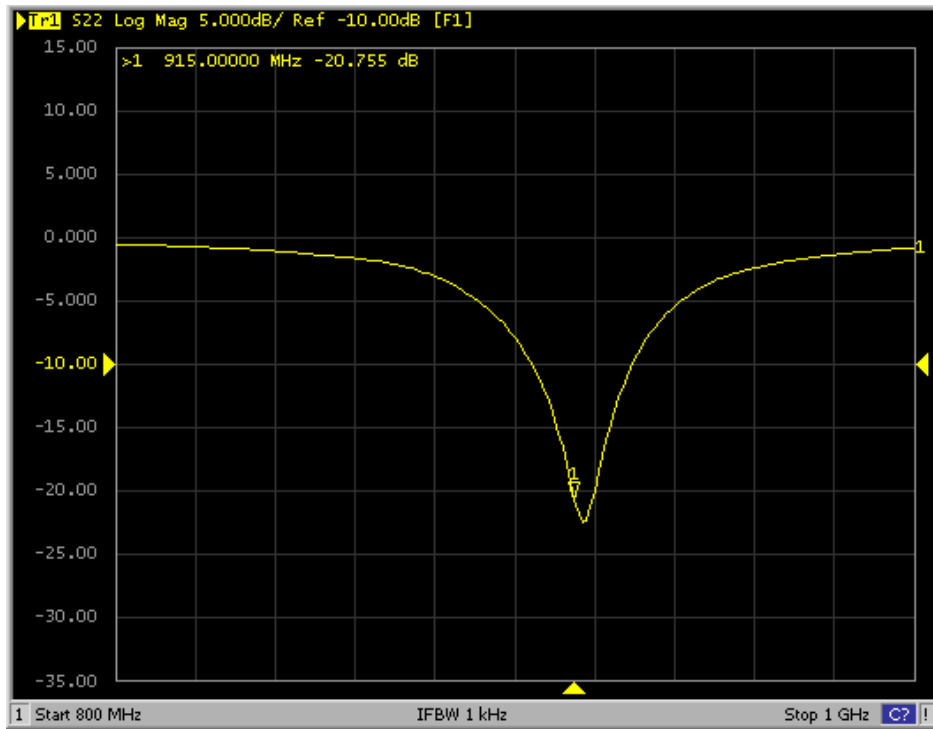


XY-Plane 868MHz

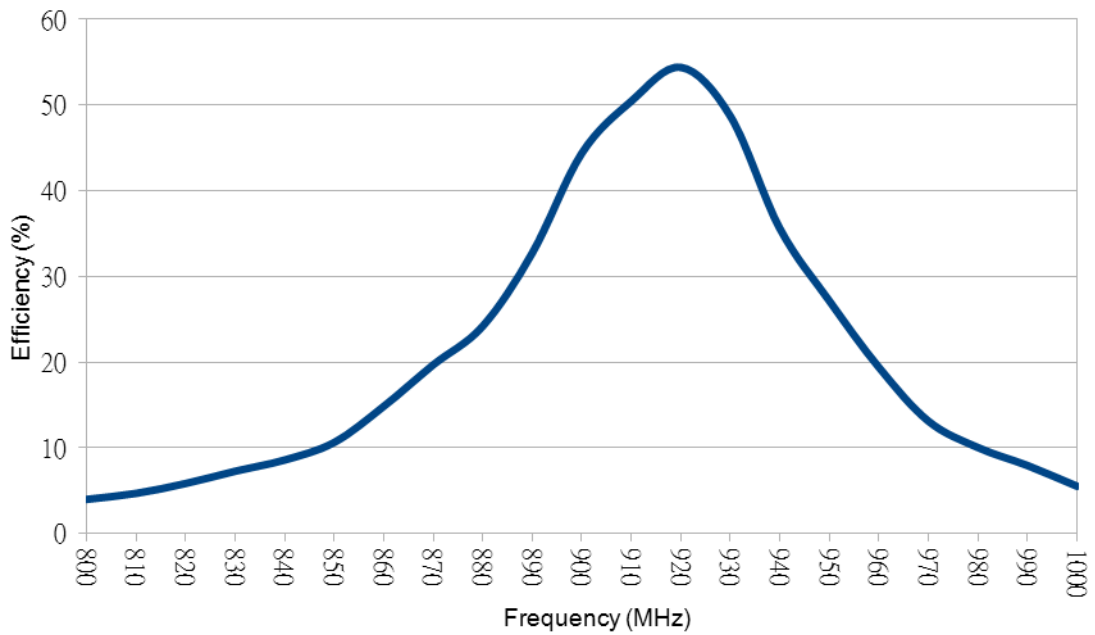
2D Antenna Pattern Measurement



868MHz	Peak Gain (dBi)
XZ-Plane	0.18
YZ-Plane	1.05
XY-Plane	-1.17



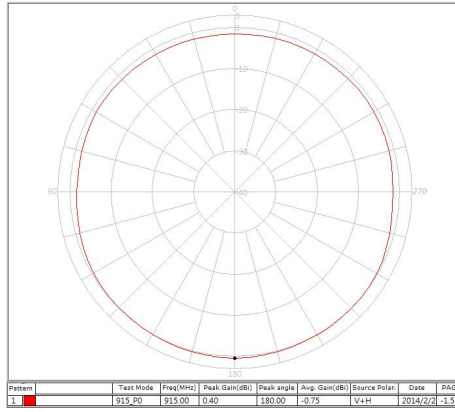
Return Loss : -20.75dB @915MHz



Efficiency(%) : 50.46 @915MHz

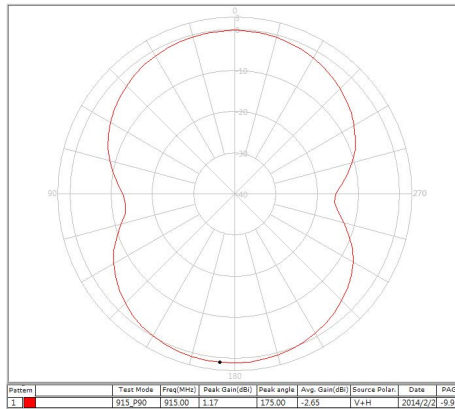
XZ-Plane 915MHz

2D Antenna Pattern Measurement



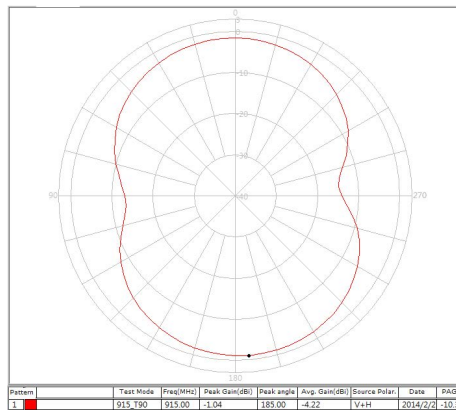
YZ-Plane 915MHz

2D Antenna Pattern Measurement



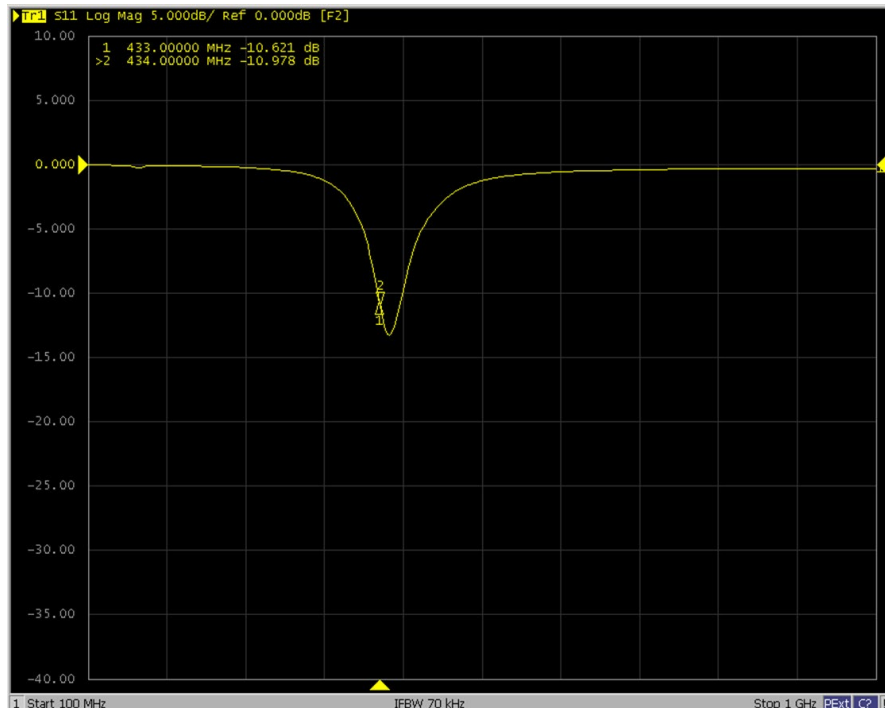
XY-Plane 915MHz

2D Antenna Pattern Measurement



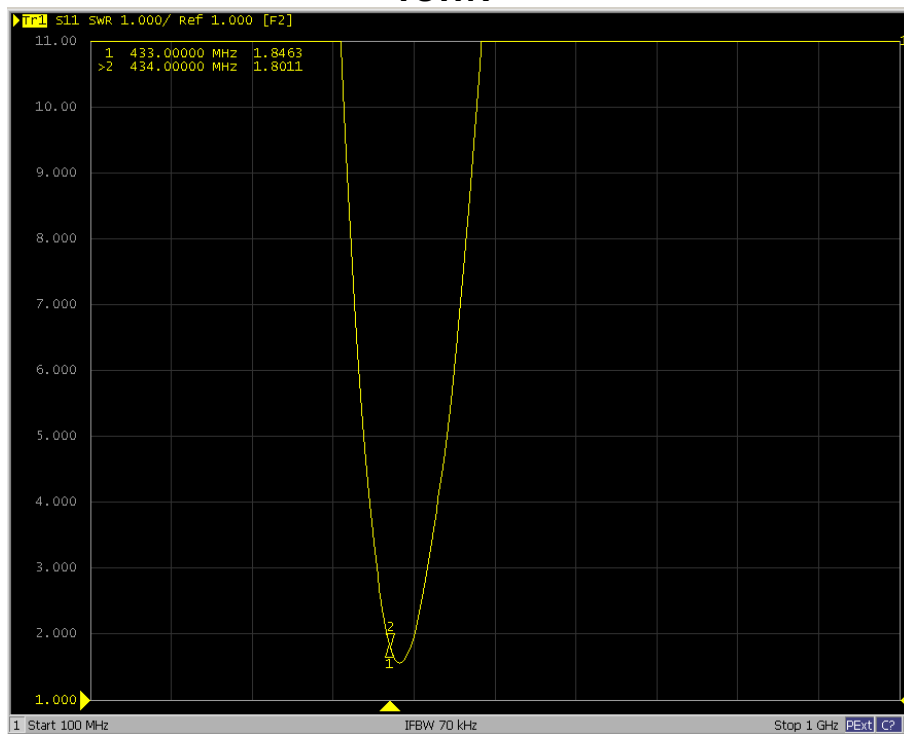
915MHz	Peak Gain (dBi)
XZ-Plane	0.40
YZ-Plane	1.17
XY-Plane	-1.04

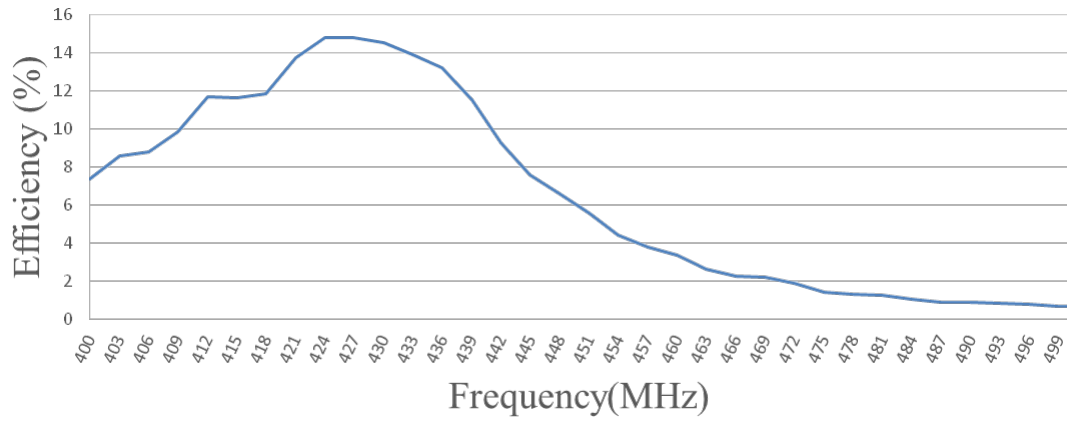
Return Loss



Return Loss : -10.62dB @433MHz
Return Loss : -10.97dB @434MHz

VSWR

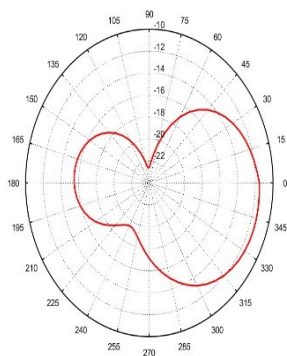




Efficiency(%) : 13.87 @433MHz

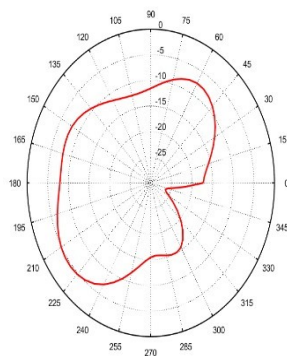
Antenna 2D Pattern

Theta_Polar Graph_H_XY Plane



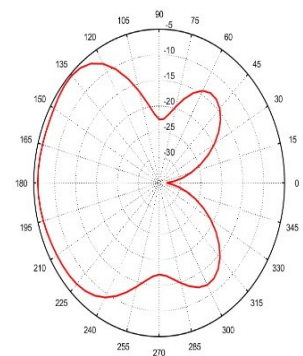
XY-Plane 433MHz

Theta_Polar Graph_E1_XZ Plane



XZ-Plane 433MHz

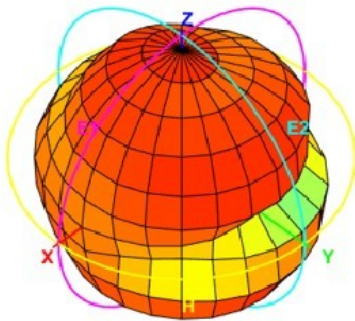
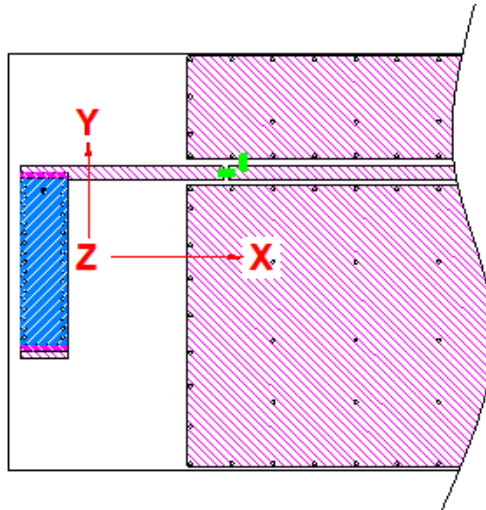
Theta_Polar Graph_E2_YZ Plane



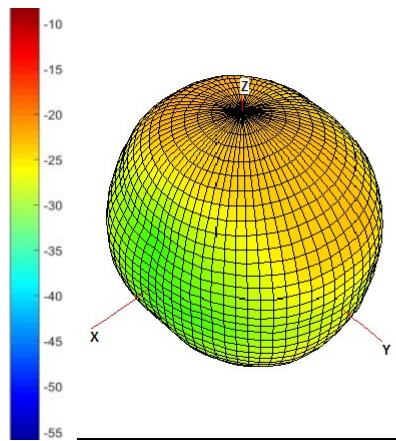
YZ-Plane 433MHz

433MHz	Peak Gain (dBi)
XZ-Plane	-11.55
YZ-Plane	-4.9
XY-Plane	-5.95

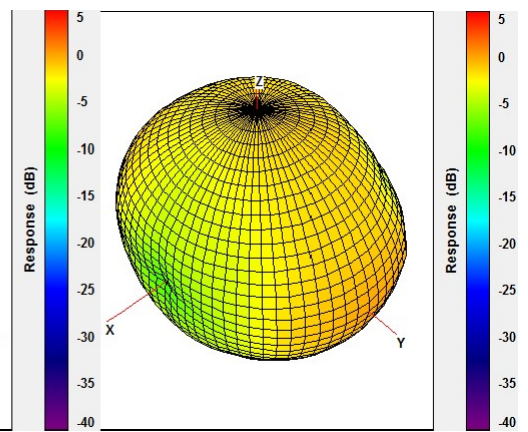
Antenna 3D Pattern



433MHz



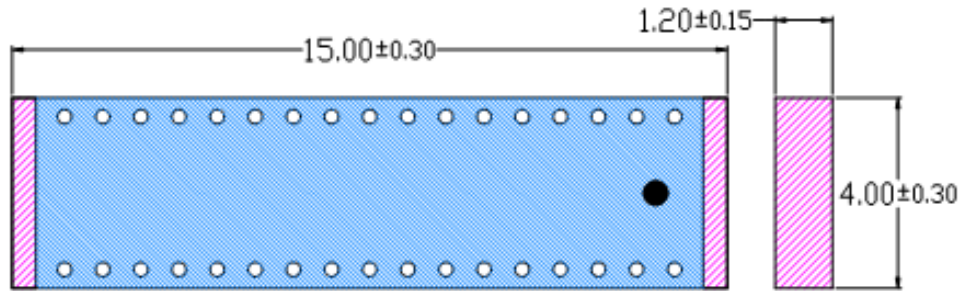
868MHz



915MHz

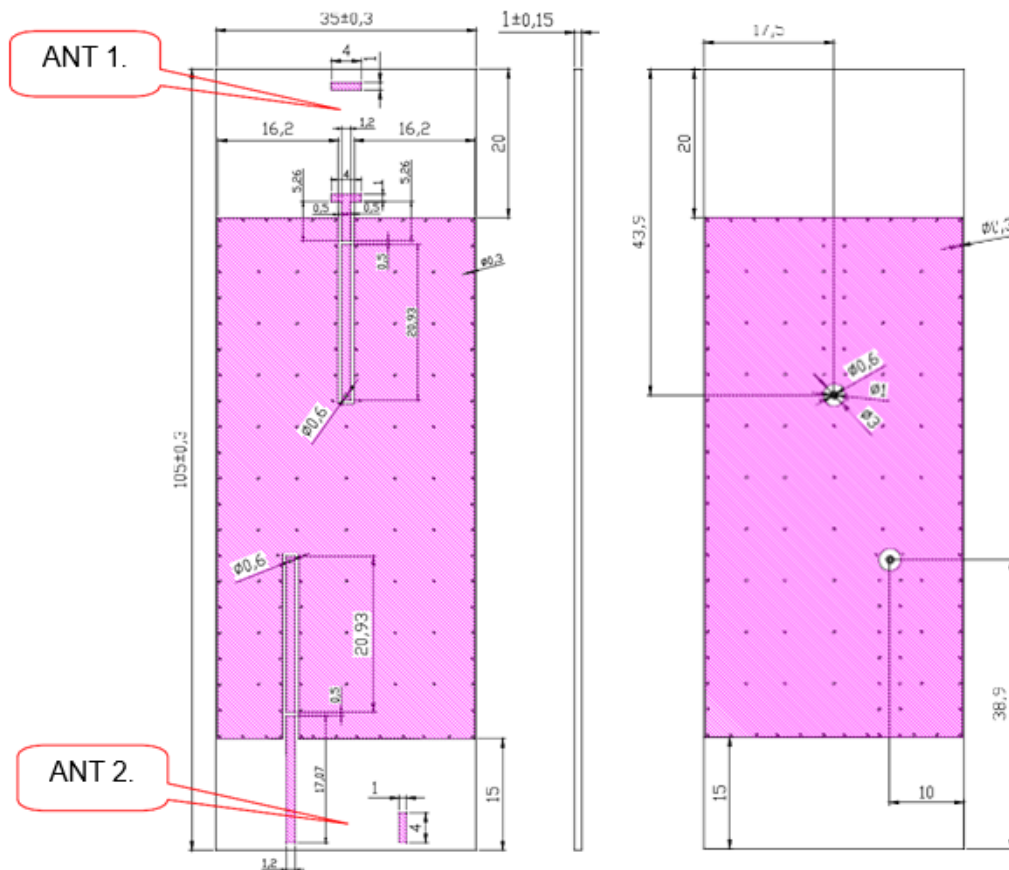
4. Antenna & Demo Board Dimension

4-1 Antenna Dimension



Unit :mm

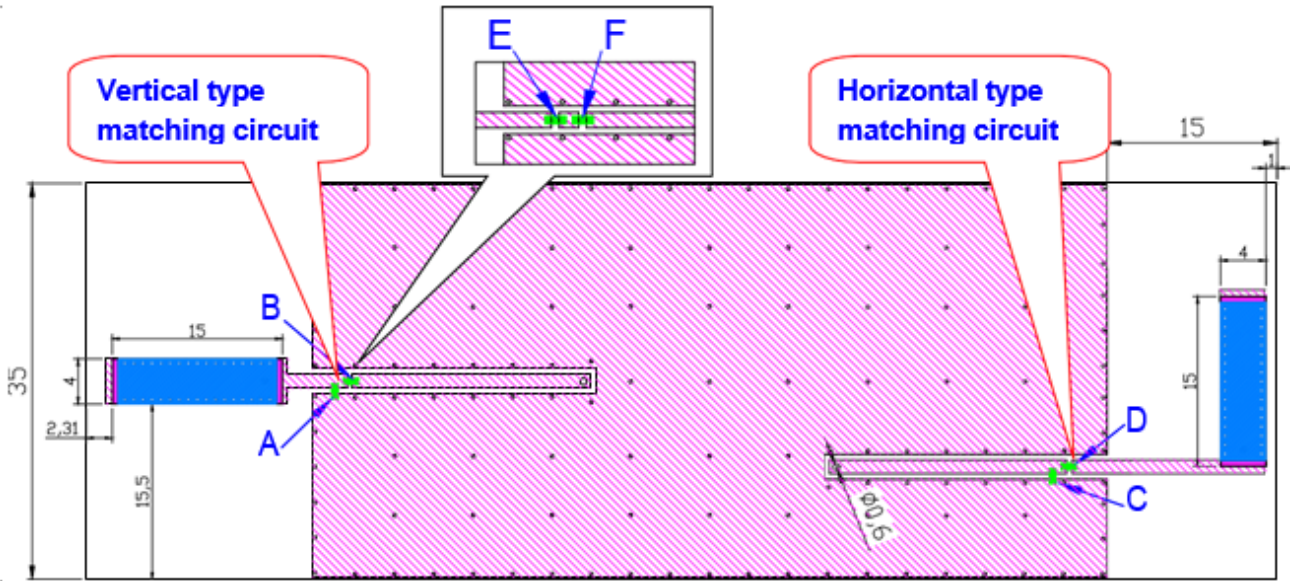
4-2 Demo Board Dimension



5. Antenna Measurement on Demo Board

5-1 Layout 1 Measurement

5-1-1 Matching Circuit



Match Table

Frequency	868 MHz		916 MHz		433 MHz	
Vertical type	A=12nH	B=33nH	A=0.5PF	B=5.6PF	E=82nH	F=15nH
Horizontal type	C=6.8nH	D=4.7PF	D=1.5P		D=91nH	

6. Environmental conditions

6-1 Operating conditions

The antenna has the electrical characteristics given in Tables 1 in the temperature range of -20°C to +80°C and under the environmental conditions of +40°C and 20~80% relative humidity.

6-2 Storage temperature range

The storage temperature range of product is 0°C to +40°C.

7. Reliability tests

7-1 Low-temperature test

Expose the specimen to -40°C for 16 hours and then to normal temperature/humidity for 24 hours or more. After this test, examine its appearance and functions.

7-2 High-temperature test

Expose the specimen to +85°C for 16 hours and then to normal temperature/humidity for 24 hours or more. After this test, examine its appearance and functions.

7-3 High-temperature/high-humidity test

Subject the object to the environmental conditions of +85°C and 90-95% relative humidity for 96 hours, then expose it to normal temperature/humidity for 24 hours or more. After this test, examine its appearance and functions.

7-4 Thermal shock test

Subject the object to cyclic temperature change (-40°C, 30 minutes ⇔ +85°C, 30 minutes) for 5 cycles, then expose it to normal temperature/humidity for 24 hours or more.

7-5 Vibration test

7-5-1 Sinusoidal vibration test

Subject the object to vibrations of 5 to 200 to 5Hz swept in 10 minutes, 4.5G at maximum (2mm amplitude), in X and Y directions for two hours each and in Z direction for four hours. After this test, examine its appearance functions.

7-5-2 Vibration test in packaged condition

Subject the object, which is packaged as illustrated, to vibrations of 15 to 60 to 15Hz swept in 6 minutes, 4G at maximum (2mm amplitude at maximum), applied in X, Y and Z directions for two hours each, i.e. six hours in total. After this test, examine its appearance and functions.

7-6 Free fall test in packaged condition

Drop the object, which is packaged as illustrated, to a concrete surface from the height of 90 cm, on one corner, three edges and six faces once each, i.e. 10 times in total. After this test, examine its appearance and functions.

7-7 Soldering heat resistance test

After the lead pins of the unit are soaked in solder bath at $270 \pm 5^\circ\text{C}$ for 10 ± 0.5 seconds and then be left for more than 1 hour at $25 \pm 5^\circ\text{C}$ in less than 65% relative humidity.

7-8 Adhesion test

The device is subjected to be soldered on test PCB. Then apply 0.5Kg (5N) of force for 10 ± 1 seconds in the direction of parallel to the substrate. (the soldering should be done by reflow and be conducted with care so that the soldering is uniform and free of defect by stress such as heat shock) .

8. Warranty

If any defect occurs from the product during proper use within a year after delivery, it will be repaired or replaced free of charge.

9. Other

Any question arising from this specification manual shall be solved by arrangement made by both parties.

10. Precautions for use

Antenna pattern use a Sn electrode.

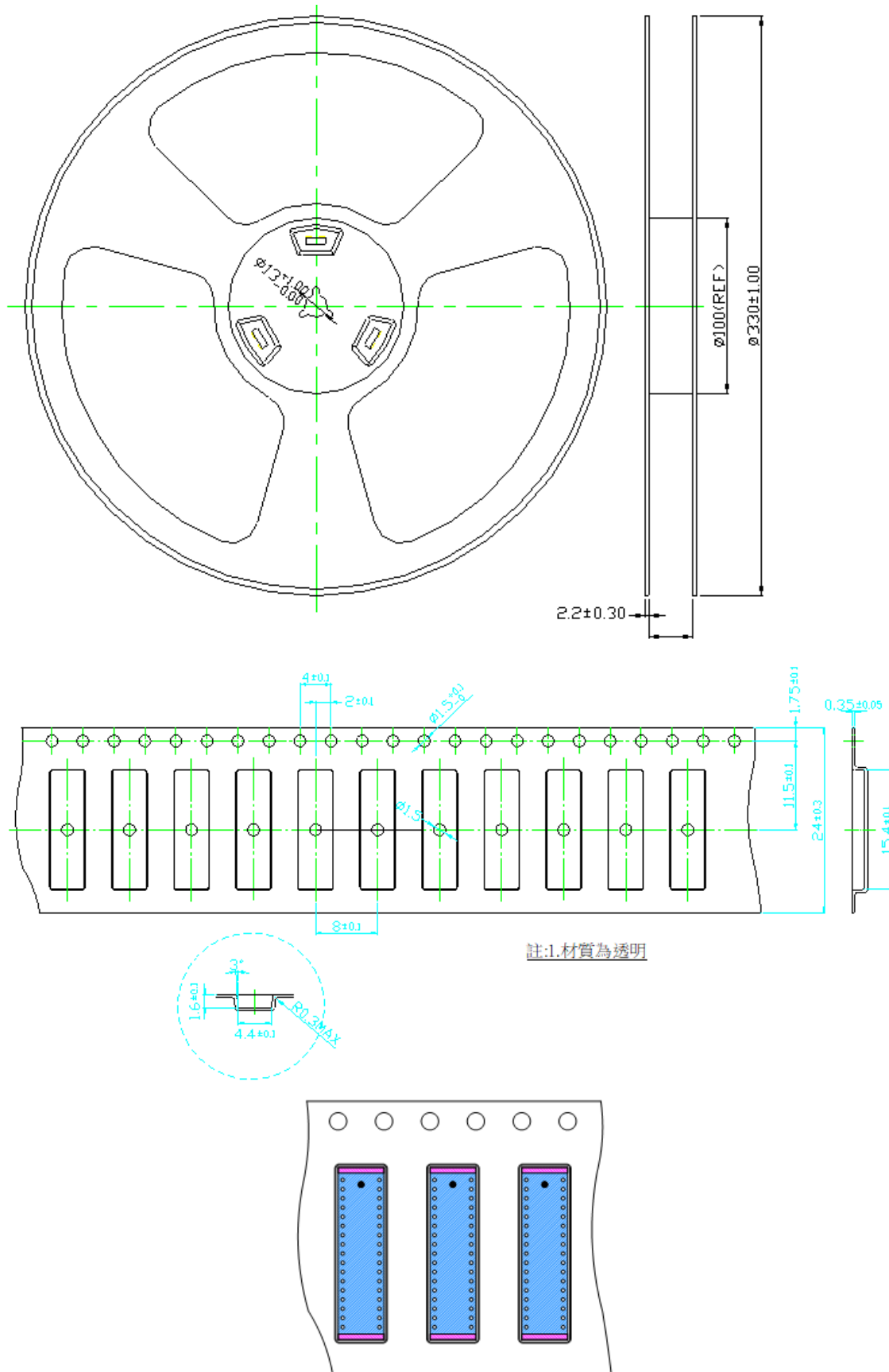
Please don't use the corrosion gas (sulfur gas, chlorine gas) in the atmosphere.

Please don't direct solder onto the Sn electrode of Antenna pattern.

11. Delivery mode

1. Blister tape to IEC 286-3, polyester.

2 .Pieces/tape : 3000pcs.



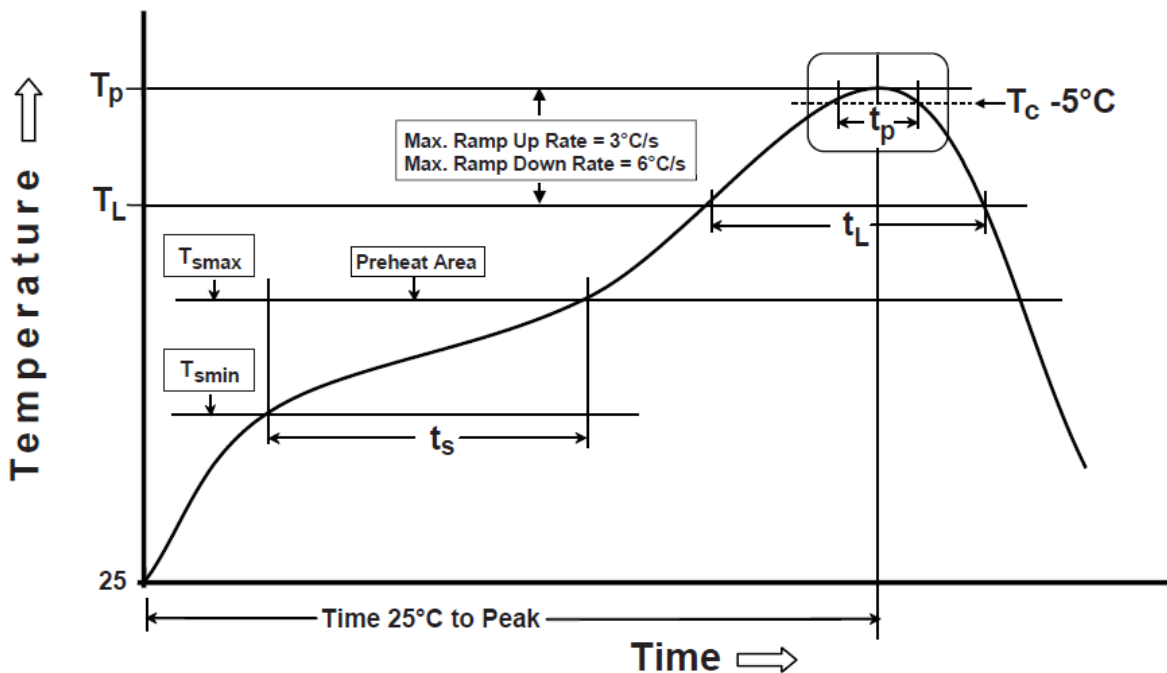
12. Recommended Reflow Temperature Profile

This product can be assembled following Pb-free assembly. According to the Standard IPC/JEDEC J-STD-020C, the temperature profile suggested is as follow:

Phase	Profile features	Pb-Free Assembly (SnAgCu)
PREHEAT	-Temperature Min(T_{smin}) -Temperature Max(T_{smax}) -Time(t_s) form (T_{smin} to T_{smax})	150°C 200°C 60-120 seconds
RAMP-UP	Avg. Ramp-up Rate (T_{smax} to T_P)	3°C/second(max)
REFLOW	-Temperature(T_L) -Total Time above T_L (t_L)	217°C 30-100 seconds
PEAK	-Temperature(T_P) -Time(t_p)	260°C 5 second
RAMP-DOWN	Rate	6°C / second max.
Time from 25°C to Peak Temperature		8 minutes max.
Composition of solder paste		96.5Sn/3Ag/0.5Cu
Solder Paste Model		SHENMAO PF606-P26

Note : All the temperature measure point is on top surface of the component, if temperature over recommend, it will make component surface peeling or damage.

The graphic shows temperature profile for component assembly process in reflow ovens



Soldering With Iron:

Soldering condition : Soldering iron temperature 270 ± 10 °C.

Apply preheating at 120°C for 2-3 minutes. Finish soldering for each terminal within 3 seconds, if soldering iron over temperature 270 ± 10 °C or 3 seconds, it will make component surface peeling or damage.

Soldering iron can not leakage of electricity.