Antenna Datasheet

Product OC (Antenna Only)**:** YCGS024AA
Product OC (Antenna + Rectangular EVB)**:** YCGS024AAEVB
Version: 2.0
Date: 2023-11-21
Status: Released

Product Name: Combo Antenna
Key Features:
Frequency band: Wi-Fi: 2400–2500 MHz
GNSS: 1565–1586 MHz
Efficiency: Up to 64.74 %
Dimensions: 3.2 mm × 1.6 mm × 0.5 mm
RoHS and REACH Compliant

Overview

To meet customers' requirements for the high performance, high integration, and integrated appearance of their products, Quectel provides a combined internal antenna series. The internal antenna series can integrate a variety of antennas, such as 5G, 4G, GNSS, Wi-Fi antennas, to achieve communication functions of 5G MIMO, 4G, GNSS, and Wi-Fi. These internal antenna series can be mounted inside the devices, supports multiple connector types and cable lengths. It is a more flexible and reliable high-performance antenna solution for the applications need internal antennas.

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1 Specification

Test Condition: Assembled On 80 mm × 40 mm EVB

1.1. Electrical

Electrical Specifications		
Frequency Range	**Wi-Fi 1**	2400–2500 MHz
	GPS	1565-1586 MHz
Radiation Pattern	**Wi-Fi 1**	Omni-directional
	GPS	Omni-directional
Polarization	**Wi-Fi 1**	Linear
	GPS	Linear
Impedance		50 Ω
Isolation	**Wi-Fi - GPS**	≤ -12.20 dB

1.1.1. Wi-Fi

Electrical - Detail		
SPEC / **Band**	**Band**	**Wi-Fi 2.4G**
	Freq. (MHz)	**2400–2500**
Max VSWR		1.9
Max Return Loss (dB)		-10.3
AVG Eff. (%)		61.3
AVG AVG Gain(dB)		-2.1
Max Peak Gain (dBi)		0.7
VSWR		≤ 1.9
Return Loss		≤ -10.3 dB
Peak Gain		≤ 0.7 dBi

1.1.2. GPS

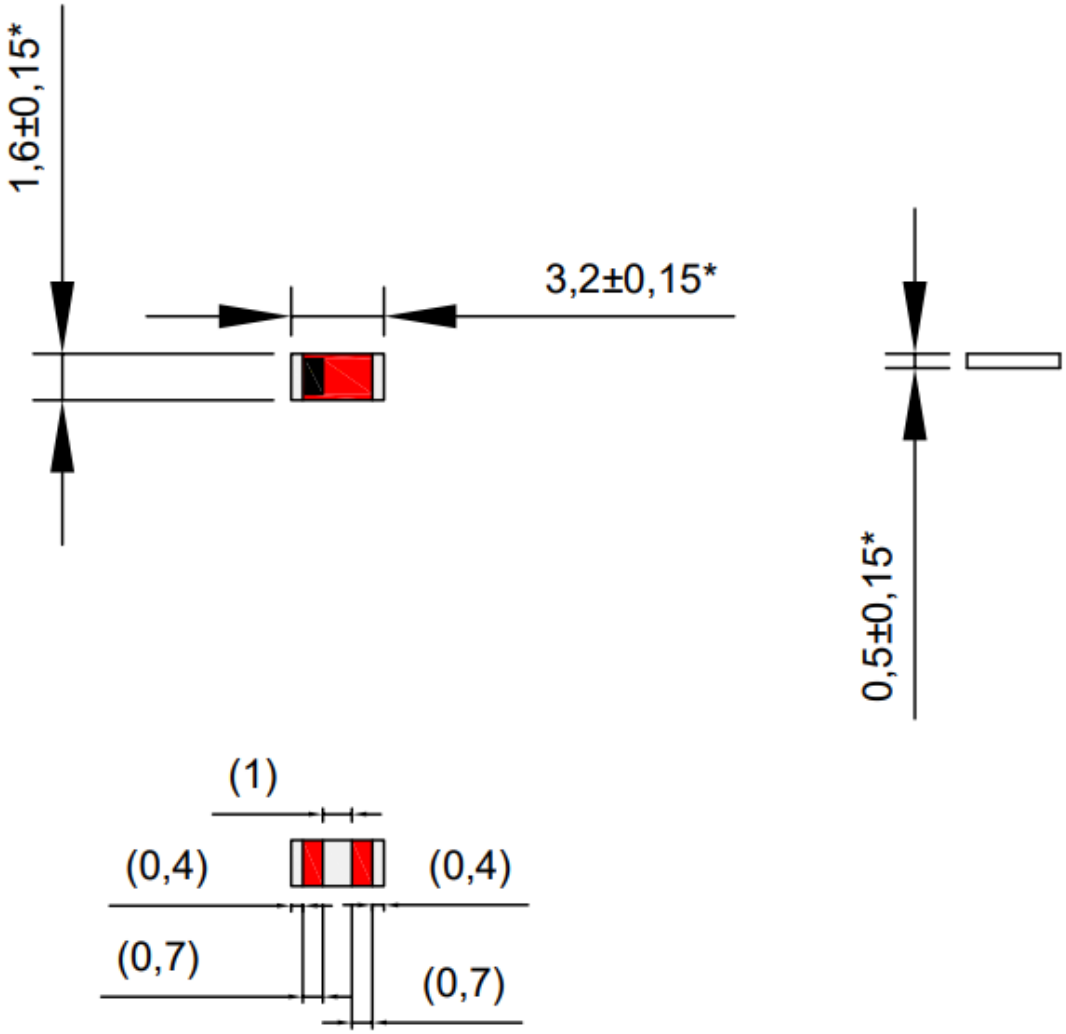
Electrical - Detail		
SPEC / Band	Band	GPS L1
	Freq. (MHz)	1565-1586
Max VSWR		1.65
Max Return Loss (dB)		-12.2
AVG Eff. (%)		53.88
AVG AVG Gain (dB)		-2.69
Max Peak Gain (dBi)		0.65
VSWR		≤ 1.65
Return Loss		≤ -12.2 dB
Peak Gain		≤ 0.65 dBi

1.2. Mechanical & Environmental

Mechanical	
Antenna Size	3.2 mm × 1.6 mm × 0.5 mm
Material & Color	Ceramic & Red
Antenna Weight	Typ. 0.008 g
Mounting Type	SMD
Recommended EVB Size	Rectangular EVB: 80 mm × 40 mm
Environmental	
Operation Temperature	-40 °C to +85 °C
Storage Temperature	-40 °C to +85 °C
RoHS and REACH Compliant	Yes

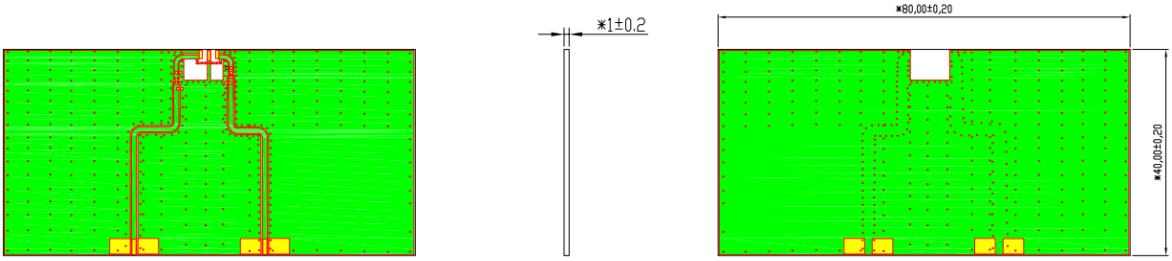
2 Drawing

2.1. Antenna



All dimensions are in mm

2.2. Rectangular EVB

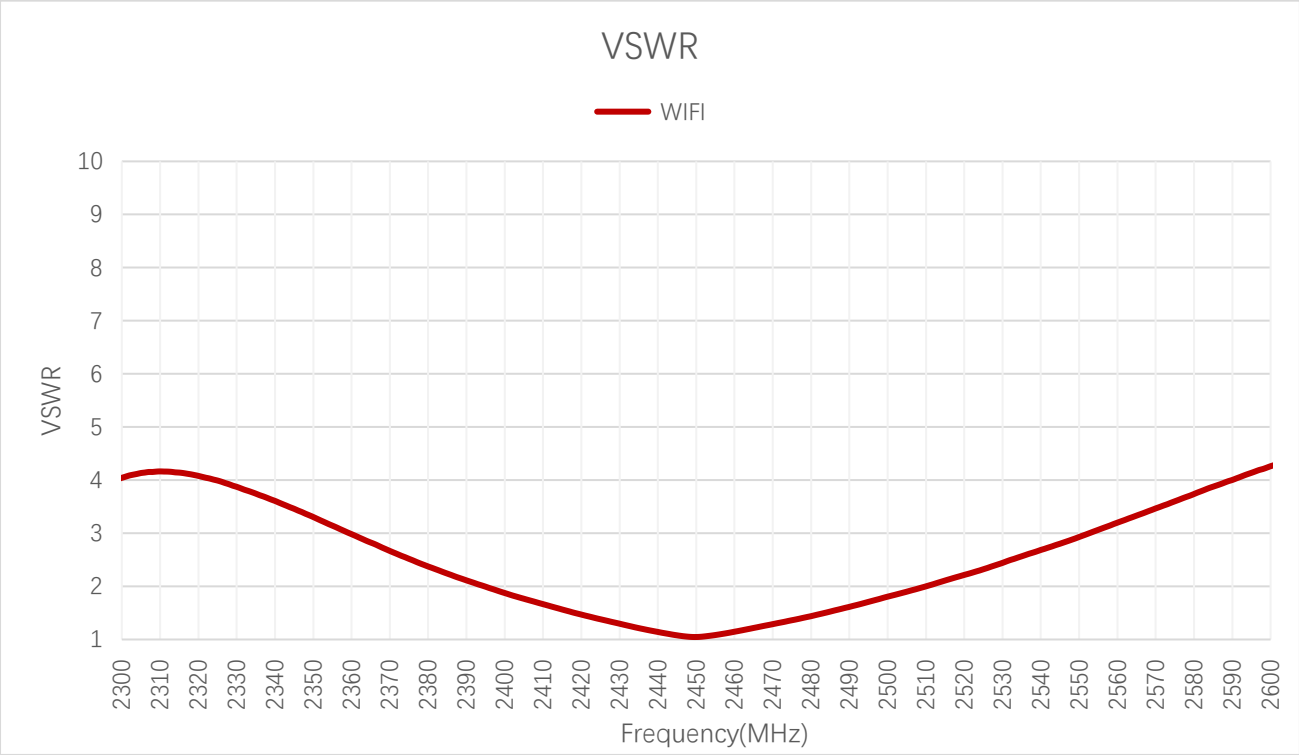


All dimensions are in mm.

3 Detailed Performance

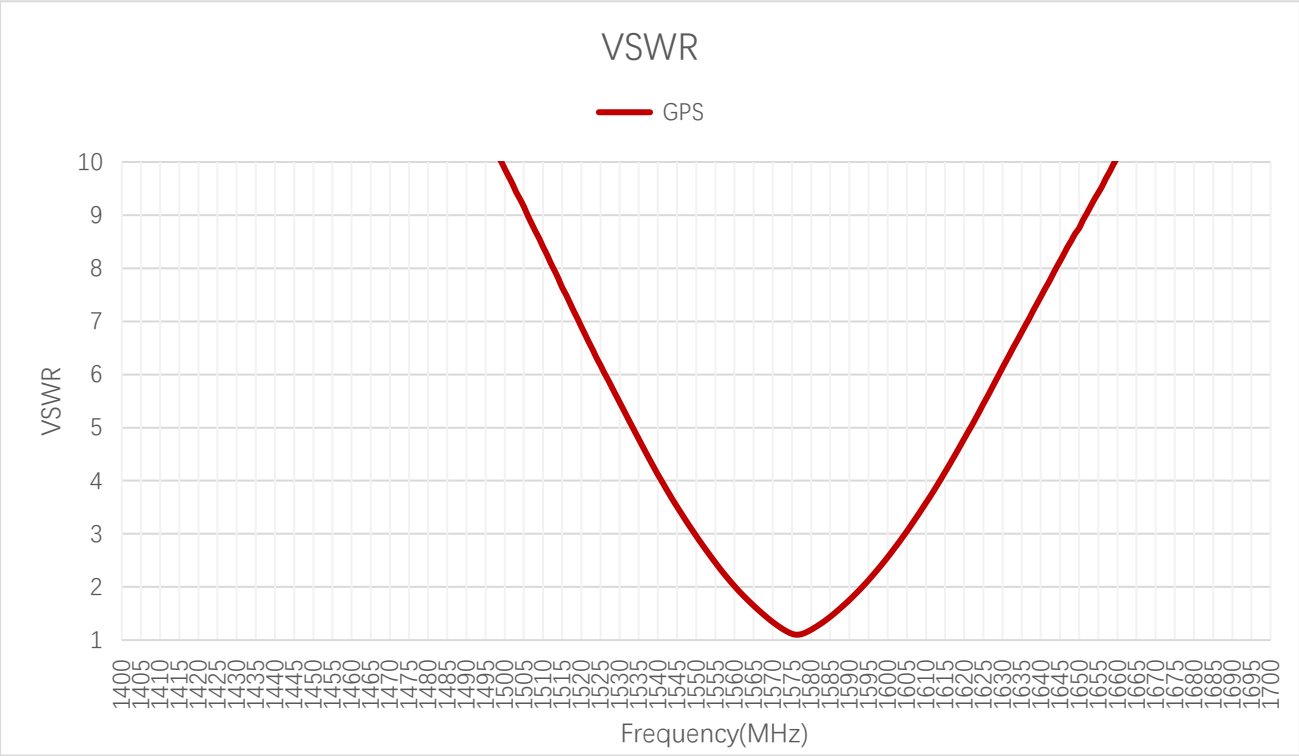
3.1. S-Parameter Test

3.1.1. VSWR



VSWR - Wi-Fi

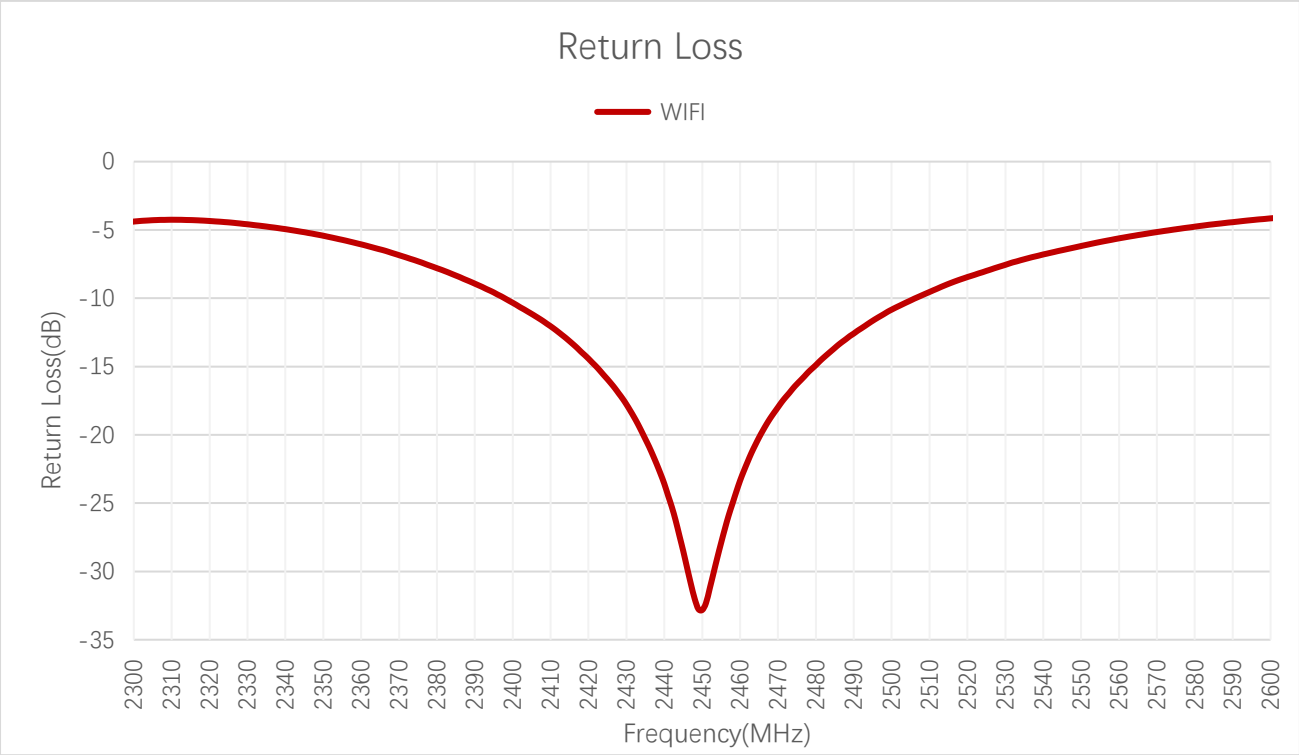
Frequency (MHz)	2400	2450	2500
On 80 × 40 mm EVB	1.87	1.05	1.81



VSWR - GPS

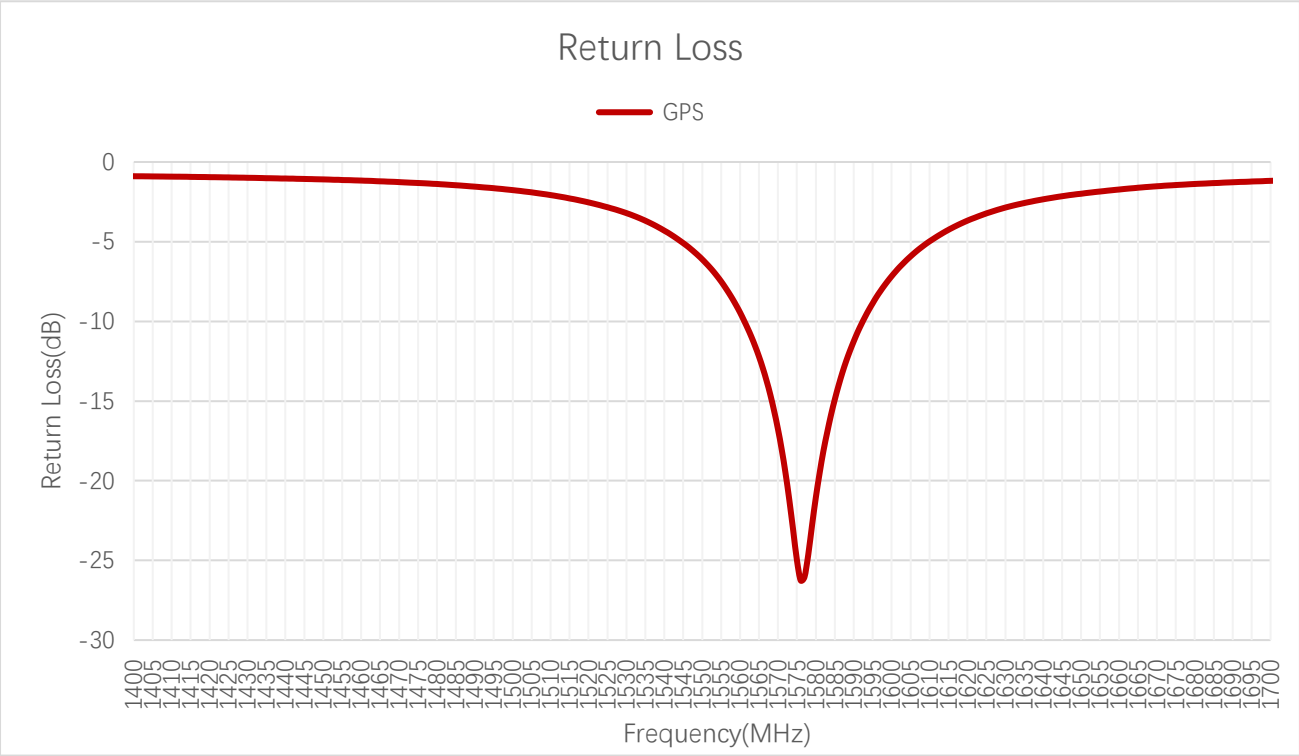
Frequency (MHz)	1565	1575	1586
On 80 × 40 mm EVB	1.65	1.12	1.50

3.1.2. Return Loss



Return Loss (dB) - Wi-Fi

Frequency (MHz)	2400	2450	2500
On 80 × 40 mm EVB	-10.34	-32.83	-10.84

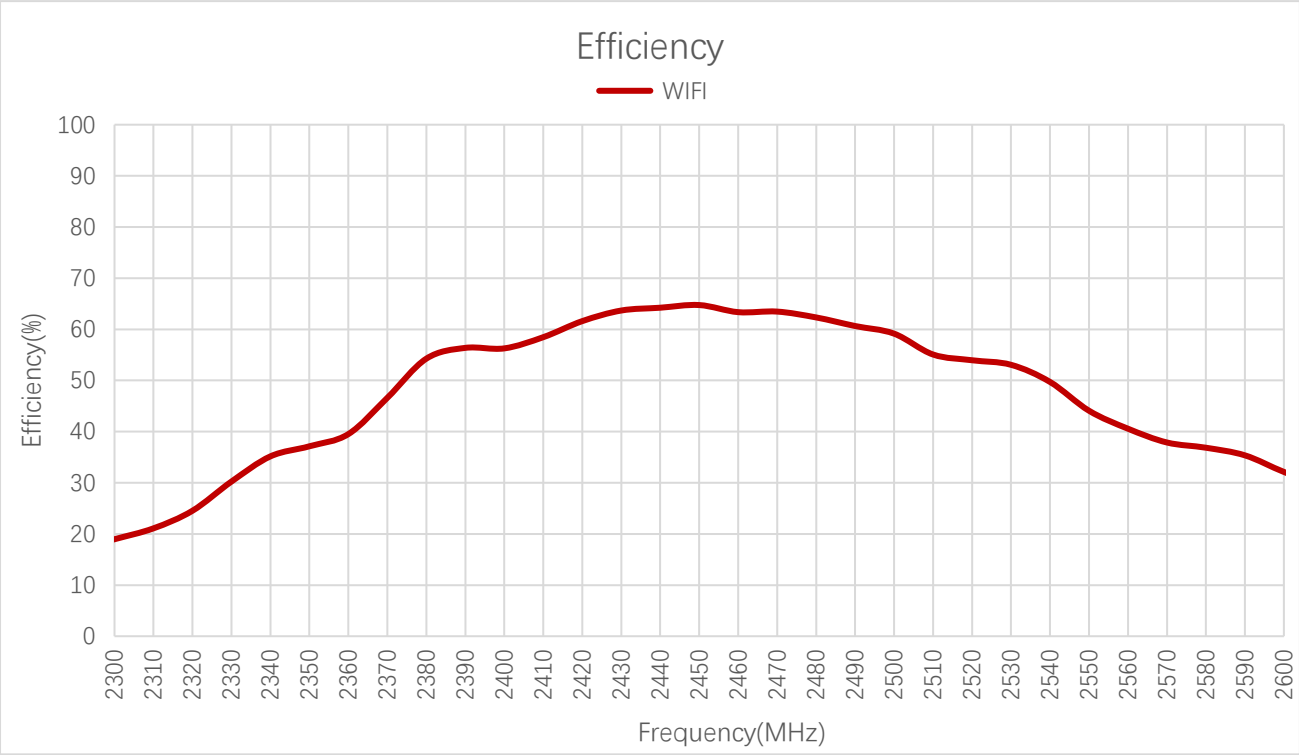


Return Loss (dB) - GPS

Frequency (MHz)	1565	1575	1586
On 80 × 40 mm EVB	-12.21	-24.98	-14.02

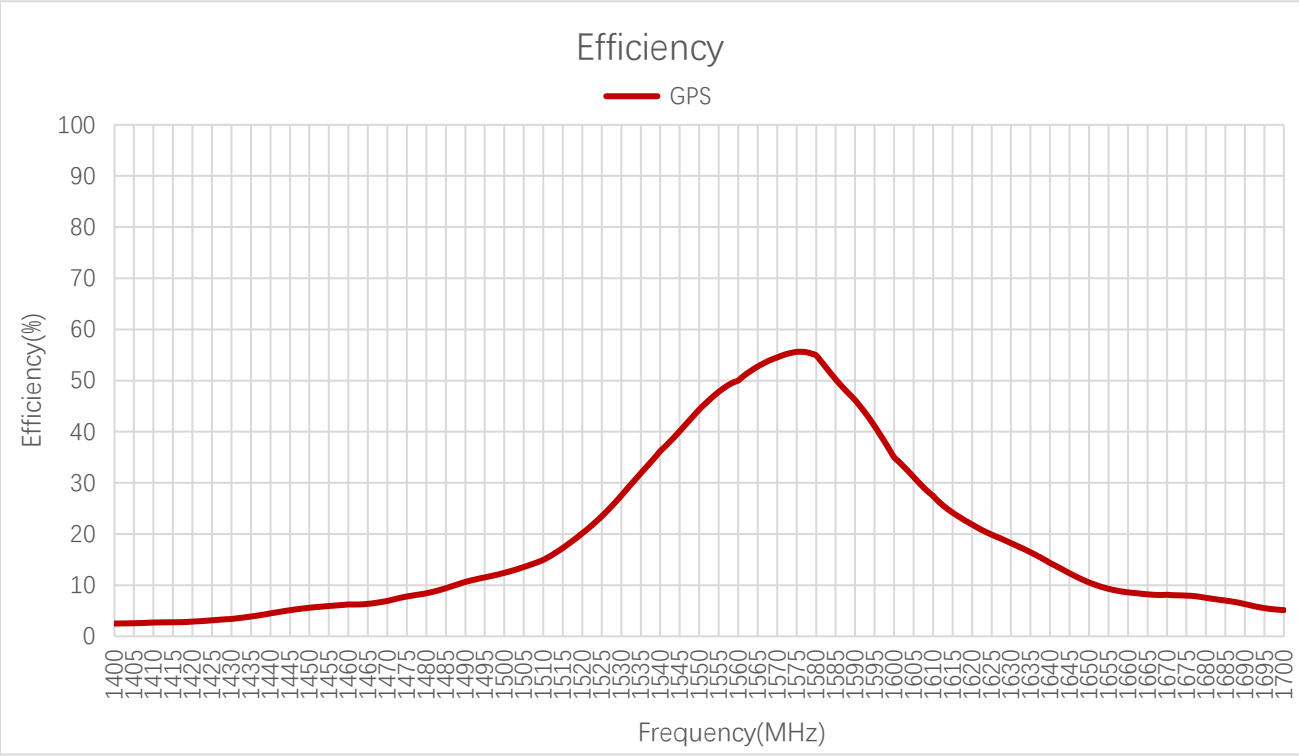
3.2. Radiation Performance Test

3.2.1. Efficiency



Efficiency (%) - Wi-Fi

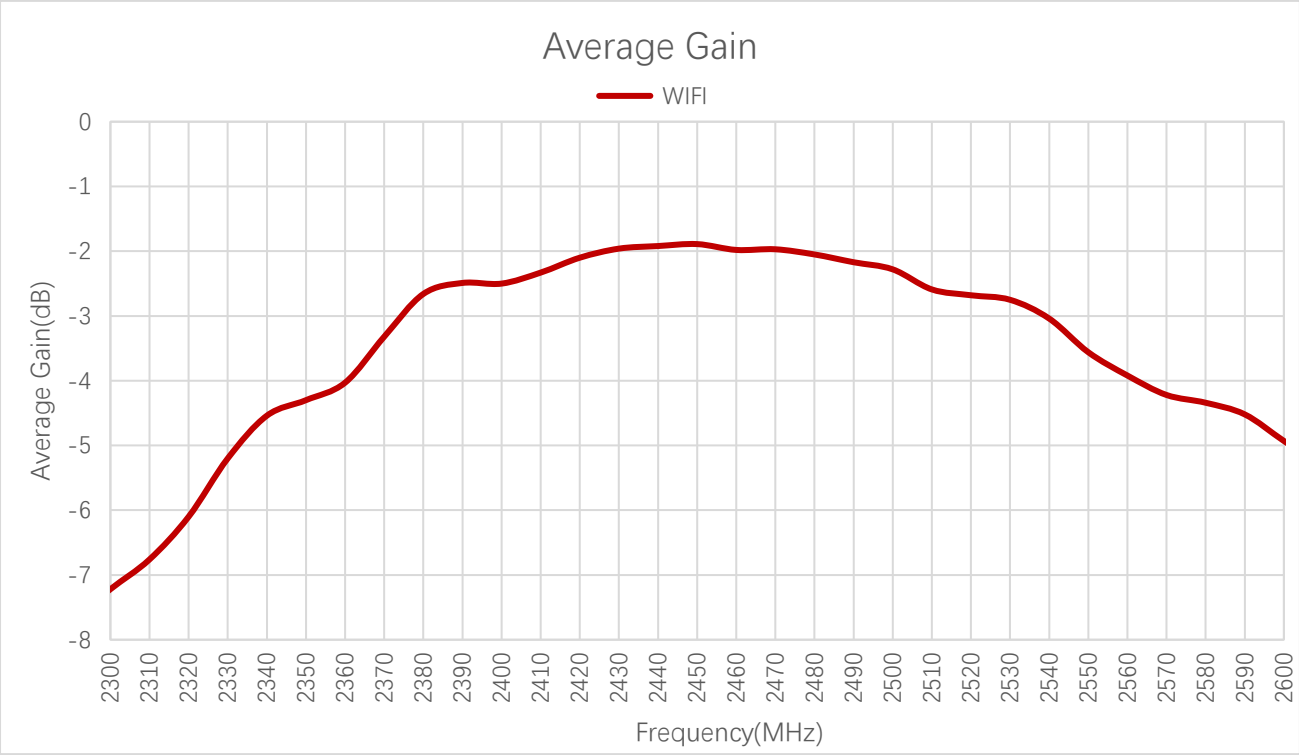
Frequency (MHz)	2400	2450	2500
On 80 × 40 mm EVB	56.27	64.74	59.15



Efficiency (%) - GPS

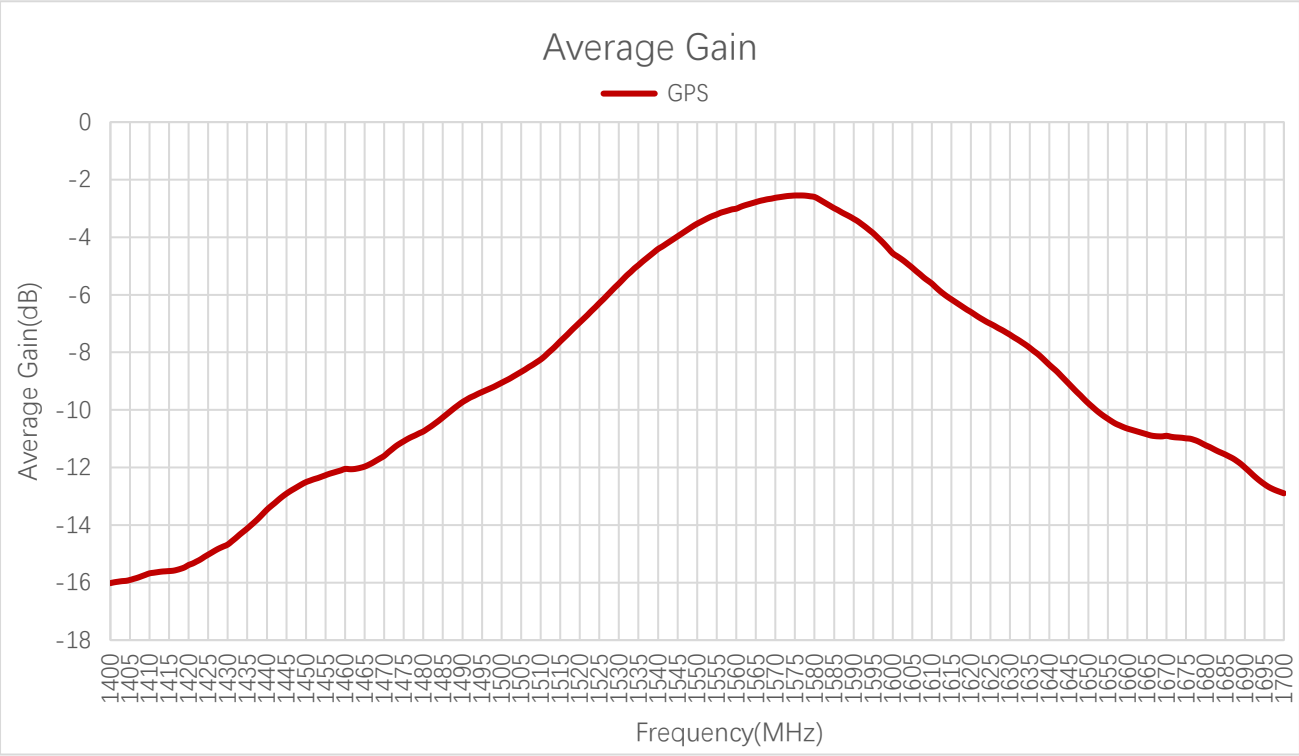
Frequency (MHz)	1565	1575	1586
On 80 × 40 mm EVB	52.74	55.62	49.38

3.2.2. Average Gain



Average Gain (dB) - Wi-Fi

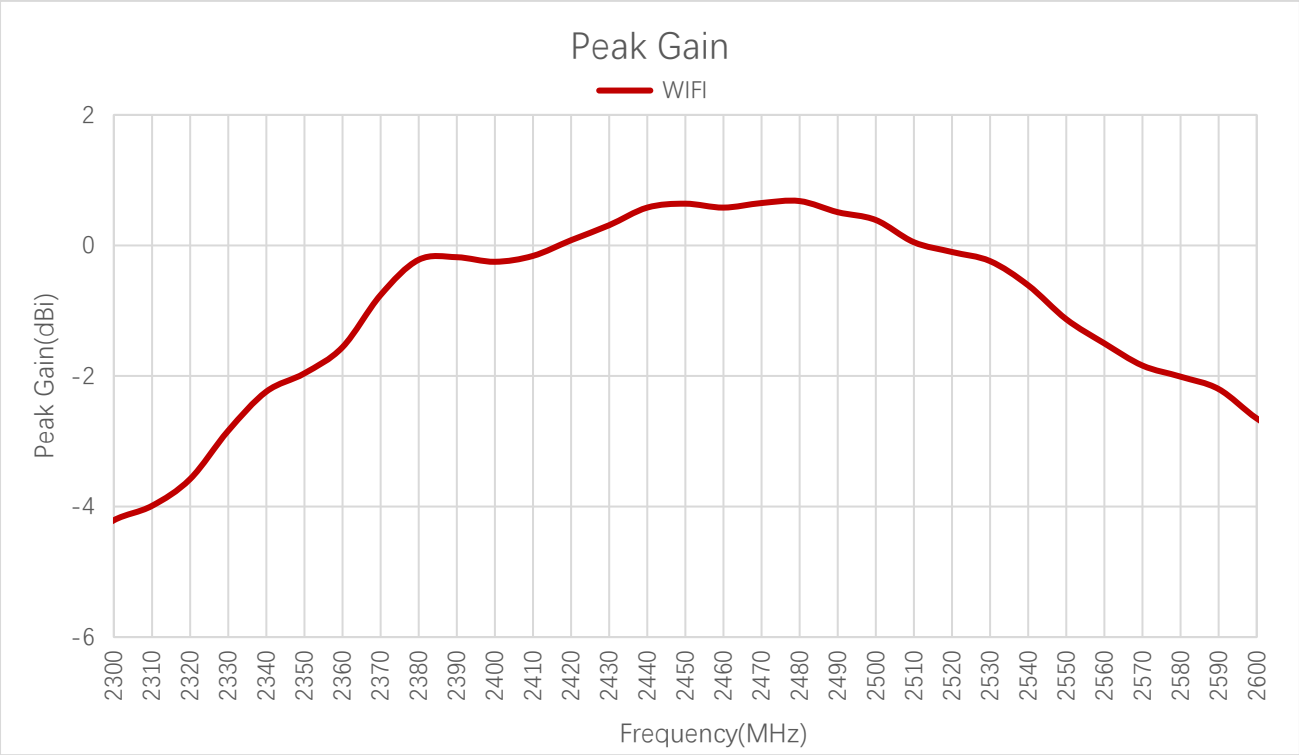
Frequency (MHz)	2400	2450	2500
On 80 × 40 mm EVB	-2.50	-1.89	-2.28



Average Gain (dB) - GPS

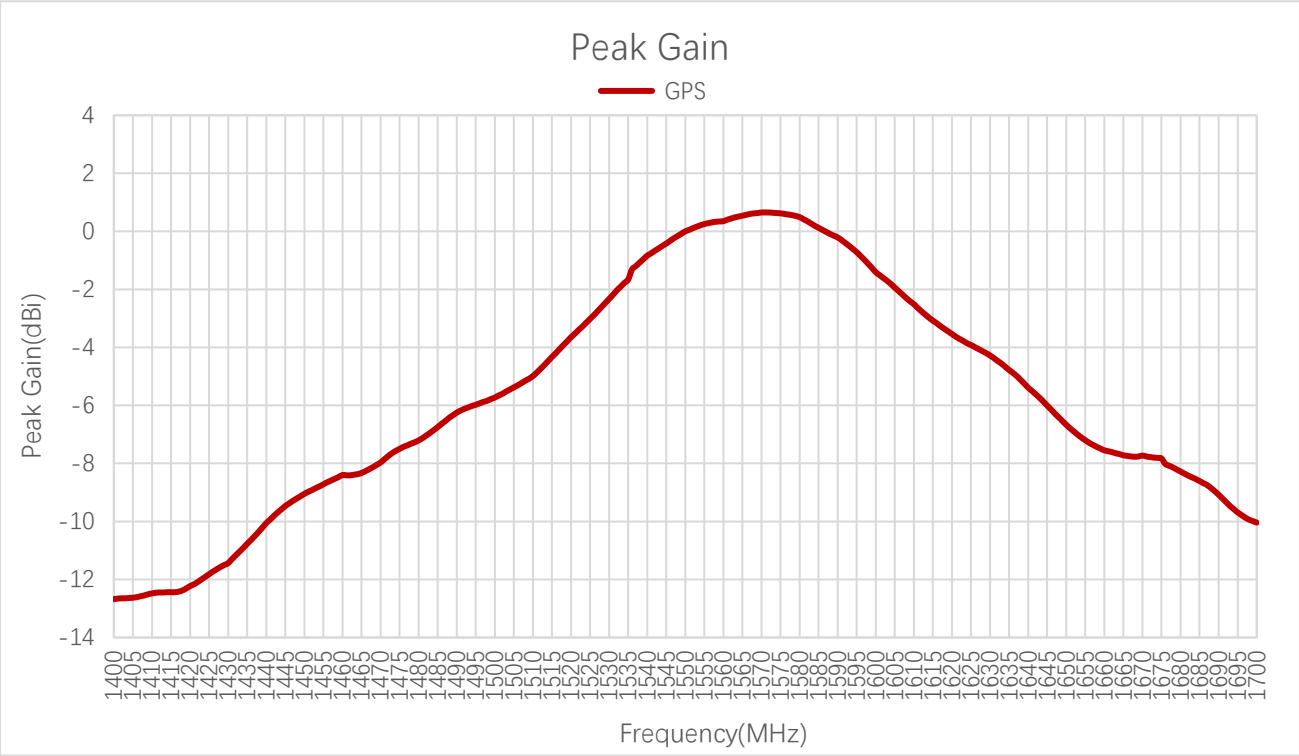
Frequency (MHz)	1565	1575	1586
On 80 × 40 mm EVB	-2.78	-2.55	-3.06

3.2.3. Peak Gain



Peak Gain (dBi) - Wi-Fi

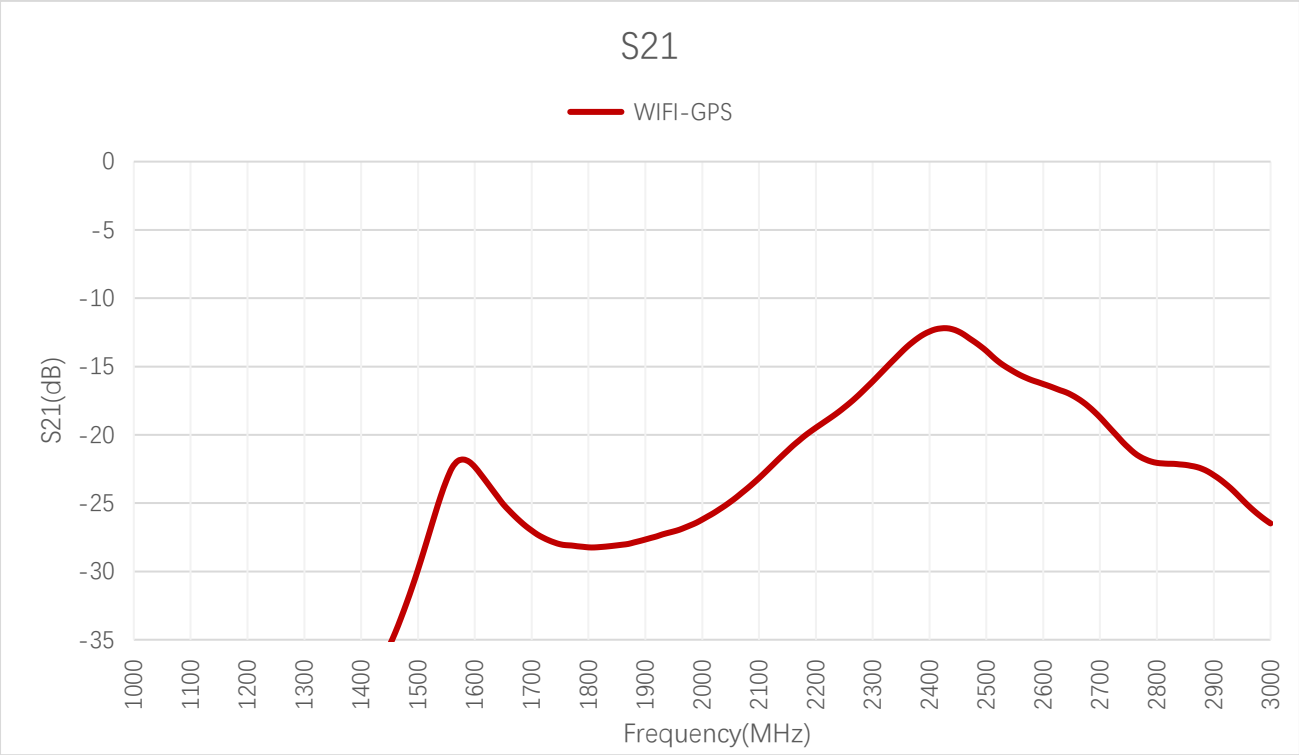
Frequency (MHz)	2400	2450	2500
On 80 × 40 mm EVB	-0.25	0.64	0.39



Peak Gain (dBi) - GPS

Frequency (MHz)	1565	1575	1586
On 80 × 40 mm EVB	0.54	0.64	0.05

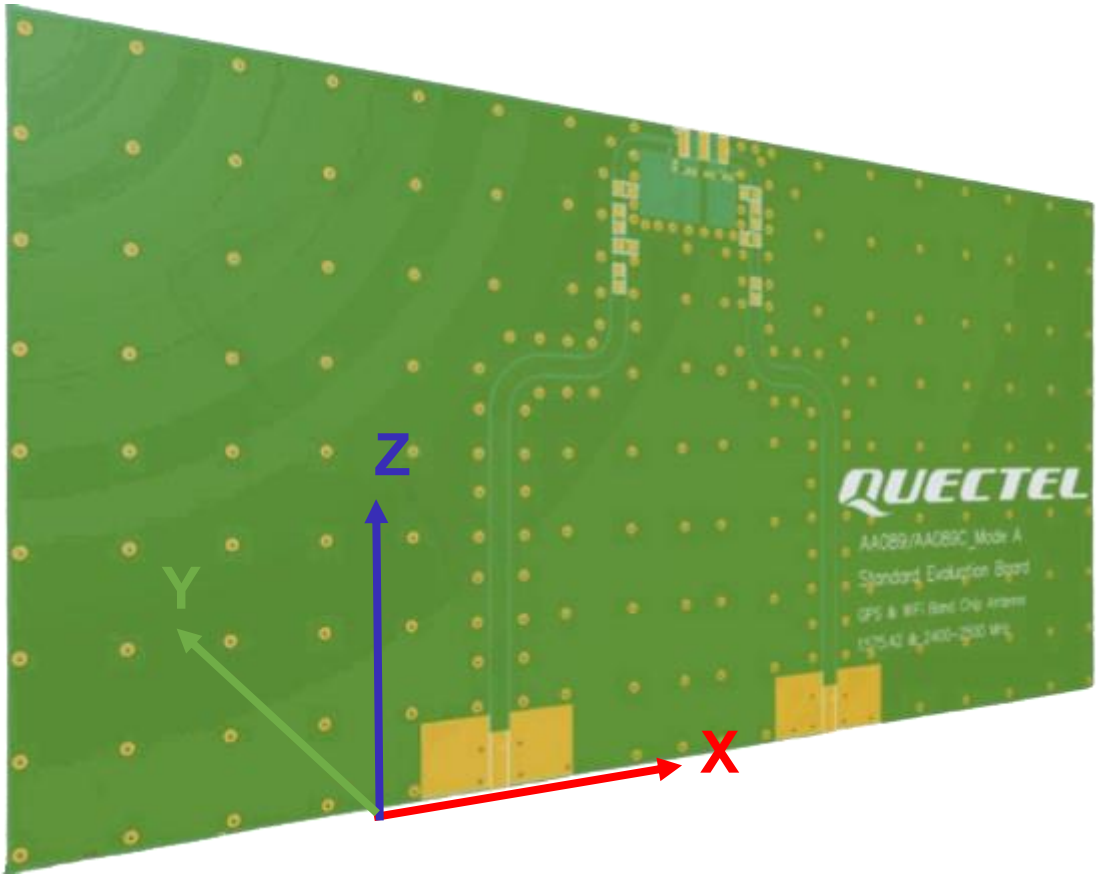
3.2.4. Isolation



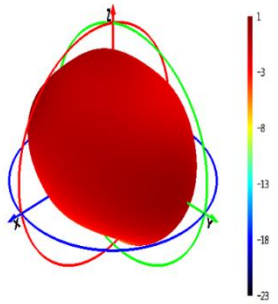
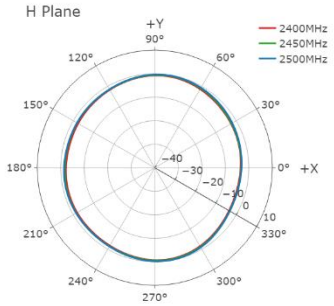
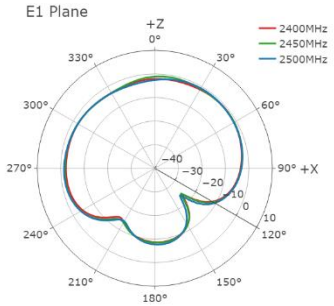
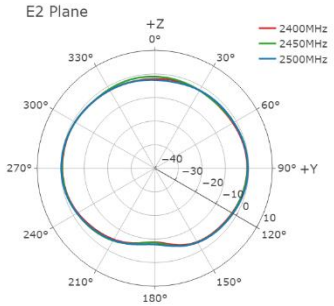
Frequency (MHz)	1575	2450
On 80 × 40 mm EVB	-21.86	-12.42

3.2.5. 3D & 2D Radiation Pattern

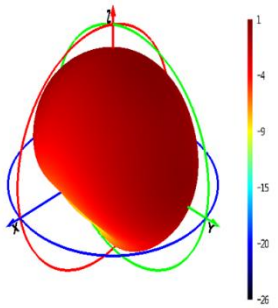
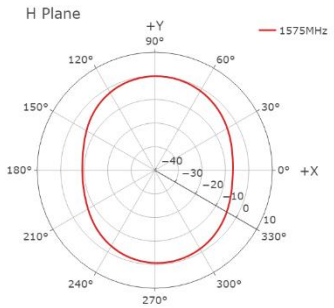
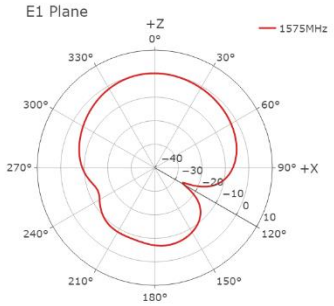
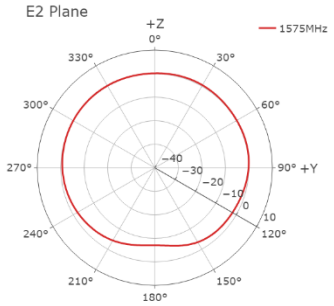
- Test Status: Assembled on 80 mm × 40 mm EVB
- Test Chamber: GL-S-2



- Wi-Fi

2450 MHz	
	
	

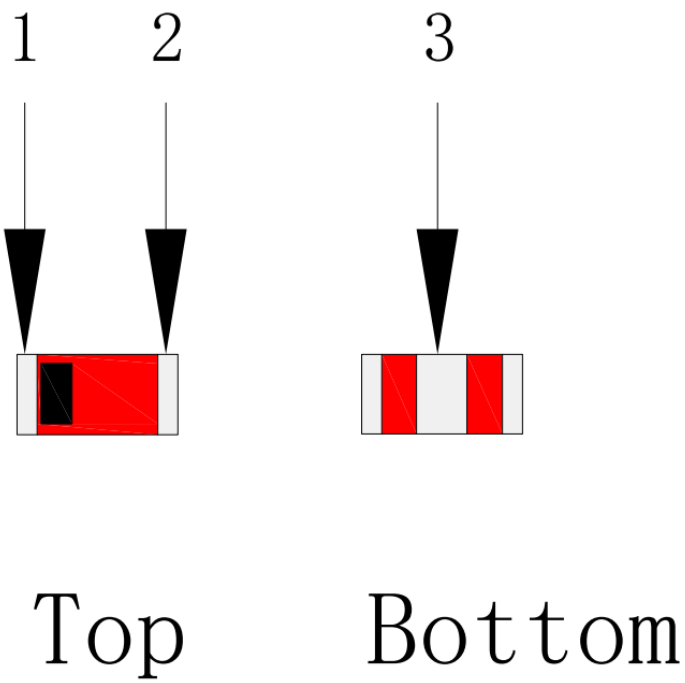
- GPS

1575 MHz	
	
	

4 Schematic Symbol and Pin Definition

- The pin assignment for the antenna is as follows.
- The circuit symbol for the antenna is shown below. The antenna has 3 pins, all working.

Pin	Description
1, 2	Feed
3	Return / GND



5 Transmission Line

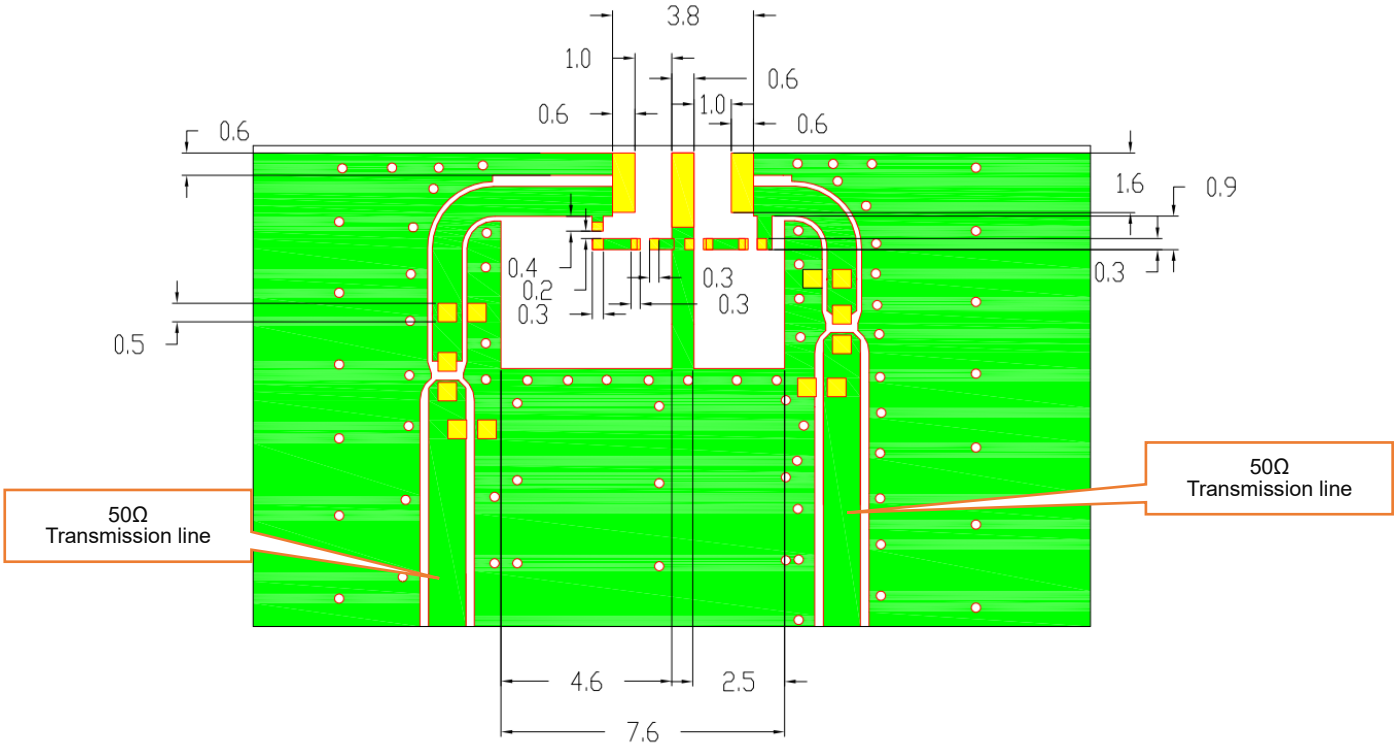
The characteristic impedance of all transmission lines shall be designed as 50 Ω.

- The length of the transmission lines should be kept as short as possible.
- Any other part of the RF system, such as transceiver, power amplifiers, etc., shall also be designed with an impedance of 50 Ω.

Once the material for the PCB has been chosen (PCB thickness and dielectric constant), a coplanar transmission line can easily be designed using any of the commercial software packages for transmission line design. For the chosen PCB thickness, copper thickness and substrate dielectric constant, the program will calculate the appropriate transmission line width and gaps on either side of the track so the characteristic impedance of the coplanar transmission is 50 Ω.

6 Recommended PCB Layout

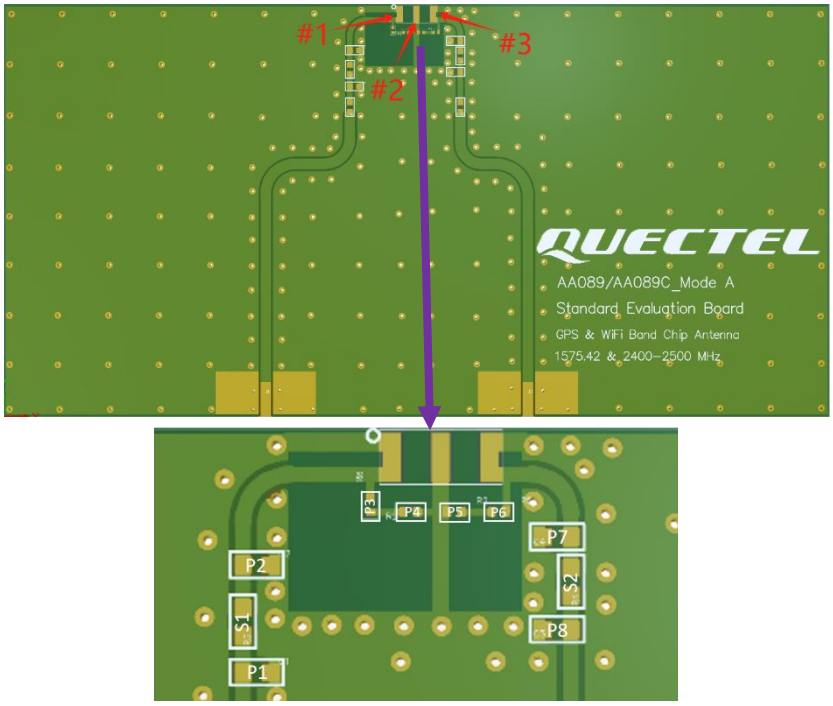
The host PCB must be designed using the PCB footprint shown with the correct clearances. An example of the PCB layout shows the antenna footprint. Please note this clearance area is critical to the performance of the antenna and must be applied through all layers of the PCB.



All dimensions are in mm.

7 Matching Circuit

Demo Board Top View



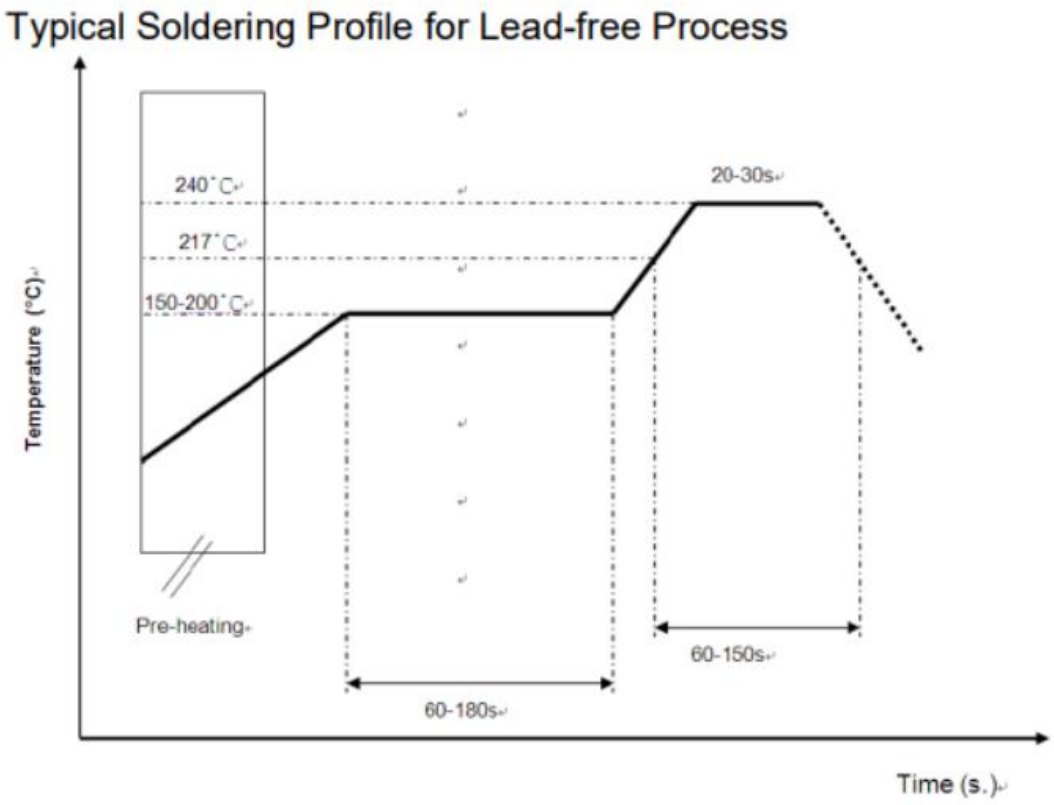
	P1	S1	P2	P3	P4
Default Matching	5.1nH	0Ω	N/A	2.7pF	1.0pF
Tolerance	±0.3nH	/	N/A	±0.05pF	±0.05pF
	P5	**P6**	**P7**	**S2**	**P8**
Default Matching	0.75pF	0.55pF	N/A	0Ω	N/A
Tolerance	±0.05pF	±0.05pF	N/A	/	N/A

Pin #	Description
1	Feed
2	Return / GND
3	Feed

8 Soldering Temperature

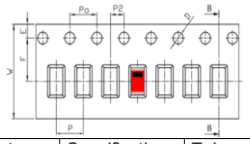
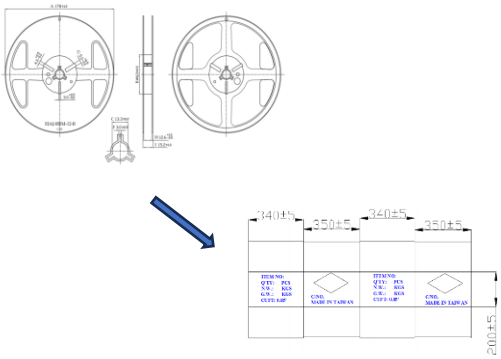
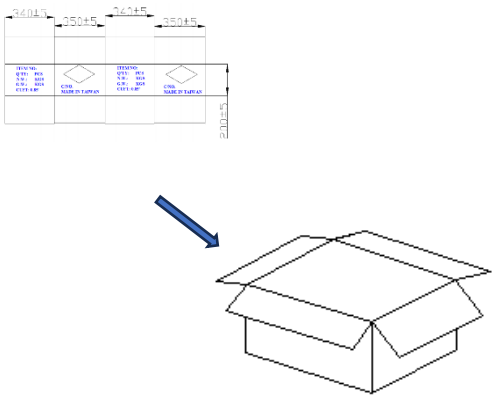
Phase	Profile Features	PB-Free Assembly
RAMP-UP	Avg. Ramp-up Rate (Tsmax to Tp)	3 °C/second (Max.)
PREHEAT	Temperature Min (Tsmin) Temperature Max (Tsmax) Time (tsmin to tsmax)	150 °C 190 °C 110 seconds (Max.)
REFLOW	Temperature (TL) Total Time above TL (tl)	220 °C 90 seconds (Max.)
PEAK	Temperature (Tp)	230–250 °C
RAMP-DOWN	Rate	-1 °C/second (Max.)

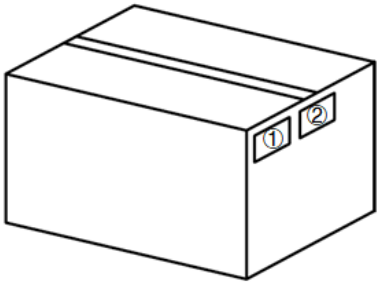
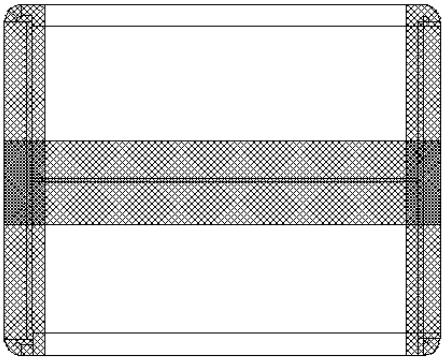
9 Reflow Profile



*Recommended solder paste alloy: SAC305 (Sn96.5 /Ag3 /Cu0.5) Lead Free solder paste

10 Packaging

Step	Packaging Picture / 2D Picture	Description
1	 Feature | Specifications | Tolerances W | 12.00 | ±0.30 P | 4.00 | ±0.10 E | 1.75 | ±0.10 F | 5.50 | ±0.10 P2 | 2.00 | ±0.10 D | 1.50 | +0.10 -0.00 Po | 4.00 | ±0.10 10Po | 40.00 | ±0.20	Reel
2		(5000 PCS Antenna Products / Reel) Put 3 reels into the inner box.
3		(2 Inner boxes / Per Carton Box) (30000 PCS Antennas / Carton Box) Estimated quantity Products that cannot fill the entire carton box are packed in a suitable size carton box. <u>Carton Size:</u> <u>L × W × H = 275 × 275 × 185 mm</u>

4		**Position for Attaching Labels** ① Carton Label ② Quality Label
5		**Sealing Cartons** “工” type sealing cartons
Note	The initial packaging method described above is for reference only, and the final actual packaging method shall be subject to the actual shipping packaging.	

Contact Us

At Quectel, our aim is to provide timely and comprehensive services to our customers. If you require any assistance, please contact our headquarters:

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Tel: +86 21 5108 6236
Email: info@quectel.com

Or our local offices. For more information, please visit:
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Revision History

Version	Date	Author	Note
-	2022-05-27	Junsen LI/ Joye WANG	Creation of the document
1.0	2022-05-27	Junsen LI/ Joye WANG	First official release
1.1	2022-09-20	Junsen LI	Added Chapter 5.
2.0	2023-11-21	Weston ZHANG/ Lucky FENG/ David LIU/ Vinnie LIU	1 Numerous changes were made to this document. It should be read in its entirety. 2 Updated the template.

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