



# Antenna Datasheet

**Product OC** (Antenna Only): YC0013AA

**Product OC** (Antenna + Rectangular EVB): YC0013AAEVB

**Version:** 4.1

**Date:** 2024-01-02

**Status:** Released

**Product Name:** Passive GNSS L1 Antenna

**Key Features:**

Frequency Band: 1559–1606 MHz

Dimensions: 3.2 mm × 1.6 mm × 0.6 mm

RoHS and REACH Compliant

# Overview

This Quectel GNSS antenna adopts a diversity of forms to guarantee the most suitable polarization type. Quectel's positioning products support single-band or multi-band operation modes to meet various high-precision positioning requirements of customers' products. Quectel provides both passive and active antennas to satisfy the customer demand for high gain. Such antenna supports different installation or connection methods such as pin mount, surface mount, magnetic mount, internal cable, and external SMA. Customized connector type and cable length are provided according to requirements.

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# 1 Specification

Test Condition: On a 50 mm × 90 mm evaluation board.

## 1.1. Electrical

Electrical	
Frequency Range	1559–1606 MHz
Impedance	50 Ω
Polarization	Linear
Radiation Pattern	Omni-directional

Band	GPS L5	GALILEO E5a	GALILEO E5b	GPS L2 QZSS L2C	GLONASS G2	BEIDOU B3	BEIDOU B1I	GPS L1 GALILEO E1 BEIDOU B1C QZSS L1	GLONASS G1
	BEIDOU B2a-B2I QZSS L5 IRNSS L5								
Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602	
VSWR	-	-	-	-	-	2.4	1.6	1.5	
Return Loss (dB)	-	-	-	-	-	-7.6	-12.6	-13.5	
Efficiency (%)	-	-	-	-	-	56.0	62.1	59.2	
Peak Gain (dBi)	-	-	-	-	-	2.4	1.6	1.5	

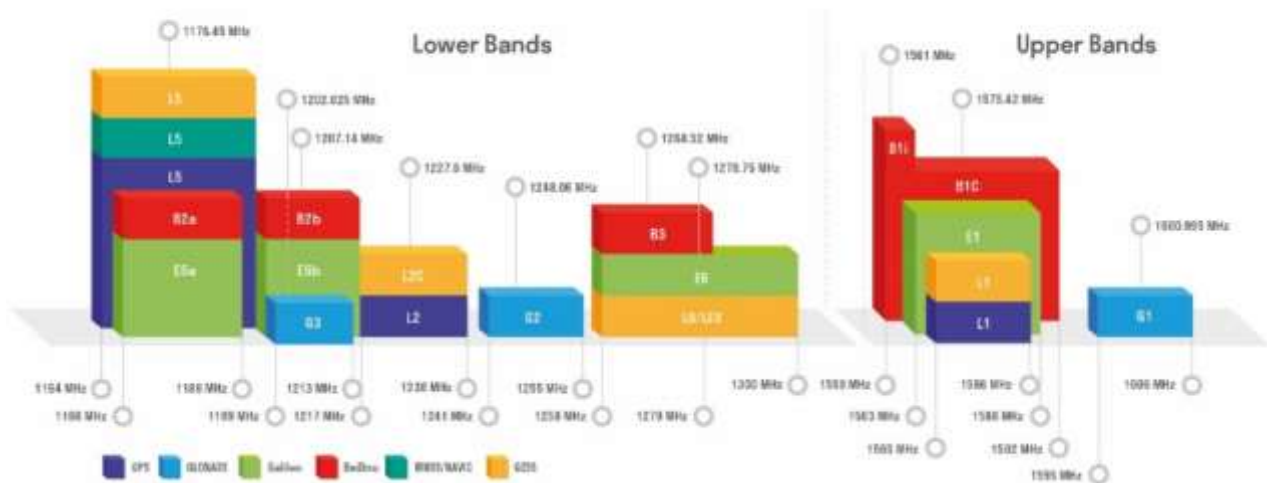
## 1.2. Mechanical & Environmental

Mechanical	
Antenna Dimensions	3.2 mm × 1.6 mm × 0.6 mm
Material & Color	Ceramic & Natural
Mounting Type	SMD
Weight	YC0013AA: Typ. 0.082 g
	YC0013AAEVB: Typ.13.3
Recommended EVB Size	Rectangular EVB: 90 mm × 50 mm
Environmental	
Operation Temperature	-40 °C to +85 °C
Storage Temperature	-40 °C to +85 °C
RoHS and REACH Compliant	Yes

### 1.3. Supported GNSS Frequency Bands

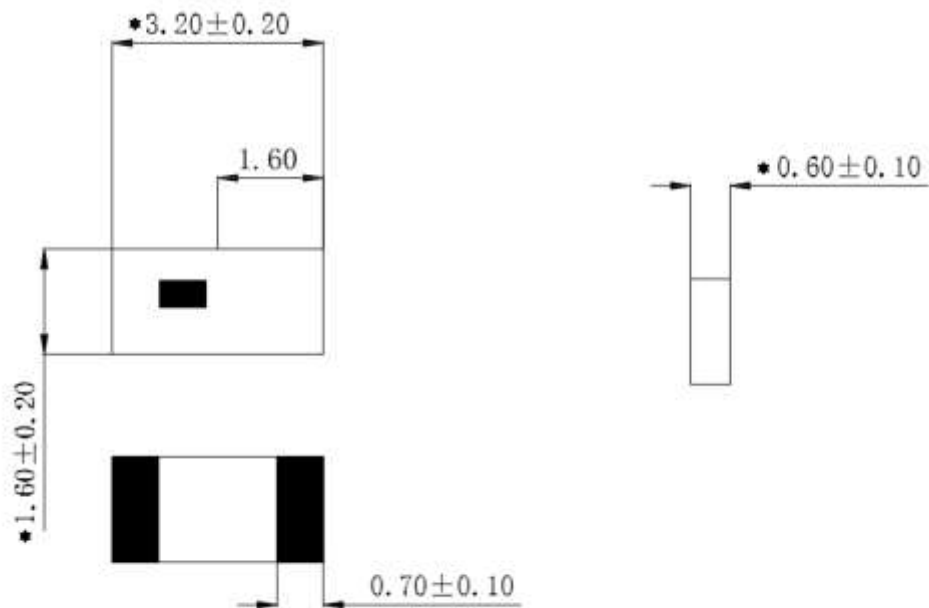
GNSS Frequency Bands (MHz)					
<b>GPS</b>	<b>L1</b> Centre 1575.42 (1565–1586)	<b>L2</b> Centre 1227.6 (1217–1238)	<b>L5</b> Centre 1176.45 (1164–1189)		
	√	-	-		
<b>GLONASS</b>	<b>G1-L10C-L10F</b> Centre 1601 (1595–1606)	<b>G2-L20C-L20F</b> Centre 1248.06 (1241–1255)	<b>G3-L30C</b> Centre 1202.025 (1189–1213)		
	√	-	-		
<b>GALILEO</b>	<b>E1</b> Centre 1575.42 (1563–1588)	<b>E5a</b> Centre 1176.45 (1166–1187)	<b>E5b</b> Centre 1207.14 (1197–1218)	<b>E6</b> Centre 1278.75 (1258–1300)	
	√	-	-	-	
<b>BEIDOU</b>	<b>B1I</b> Centre 1561.098 (1559–1564)	<b>B1C (BeiDou-3)</b> Centre 1575.42 (1559–1592)	<b>B2a</b> Centre 1176.45 (1166–1187)	<b>B2b-B2I</b> Centre 1207.14 (1197–1217)	<b>B3</b> Centre 1268.52 (1258–1279)
	√	√	-	-	-
<b>QZSS</b>	<b>L1</b> Centre 1575.42 (1573–1578)	<b>L2C</b> Centre 1227.6 (1226–1229)	<b>L5</b> Centre 1176.45 (1166–1187)	<b>L6</b> Centre 1278.75 (1257–1300)	
	√	-	-	-	
<b>IRNSS</b>	<b>L5</b> Centre 1176.45 (1164–1189)				
	-				

## GNSS Bands and Constellations

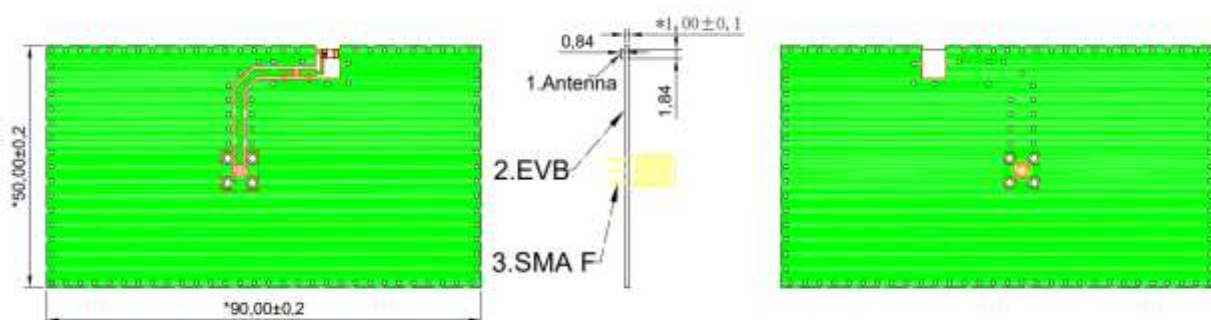


## 2 Drawing

### 2.1. Antenna



### 2.2. Rectangular EVB



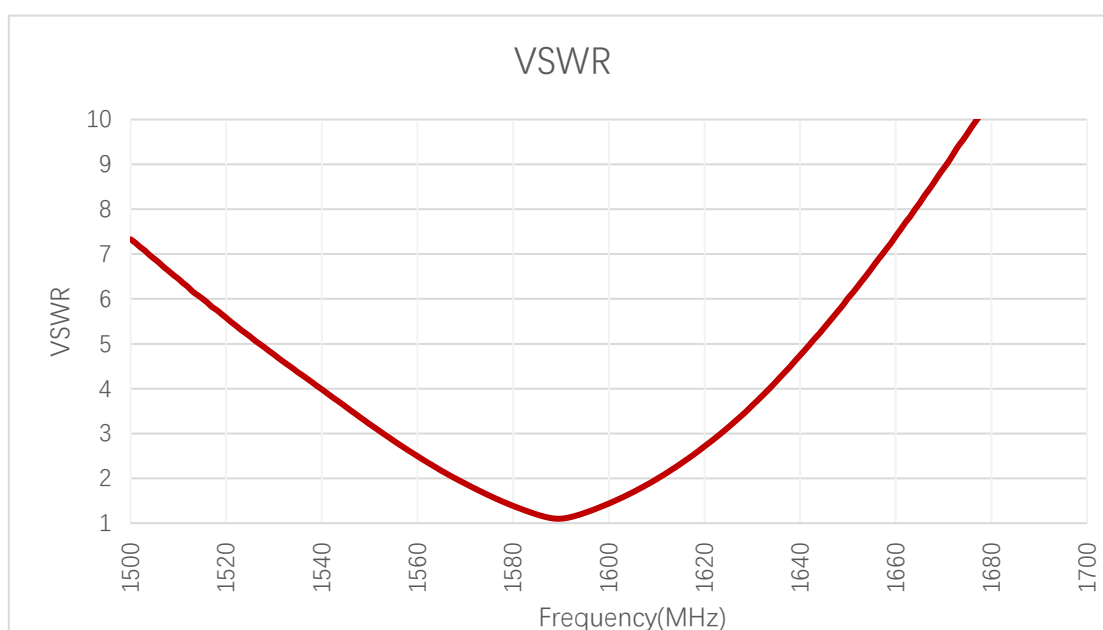
All dimensions are in mm.



# 3 Detailed Performance

## 3.1. S-Parameter Test

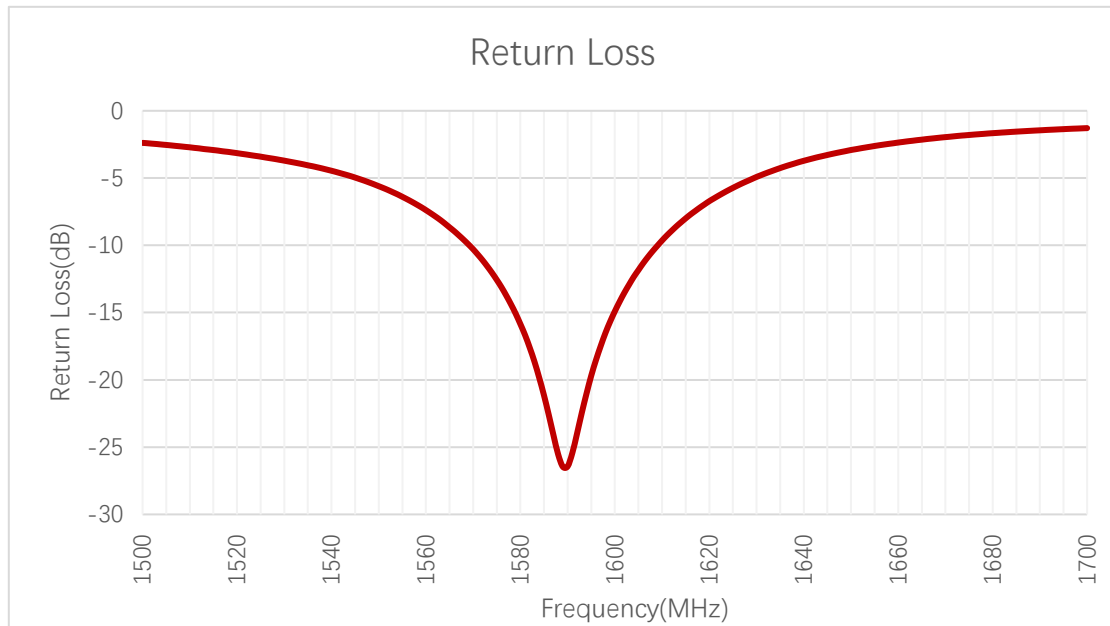
### 3.1.1. VSWR



**VSWR**

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
VSWR	-	-	-	-	-	2.43	1.62	1.53

### 3.1.2. Return Loss

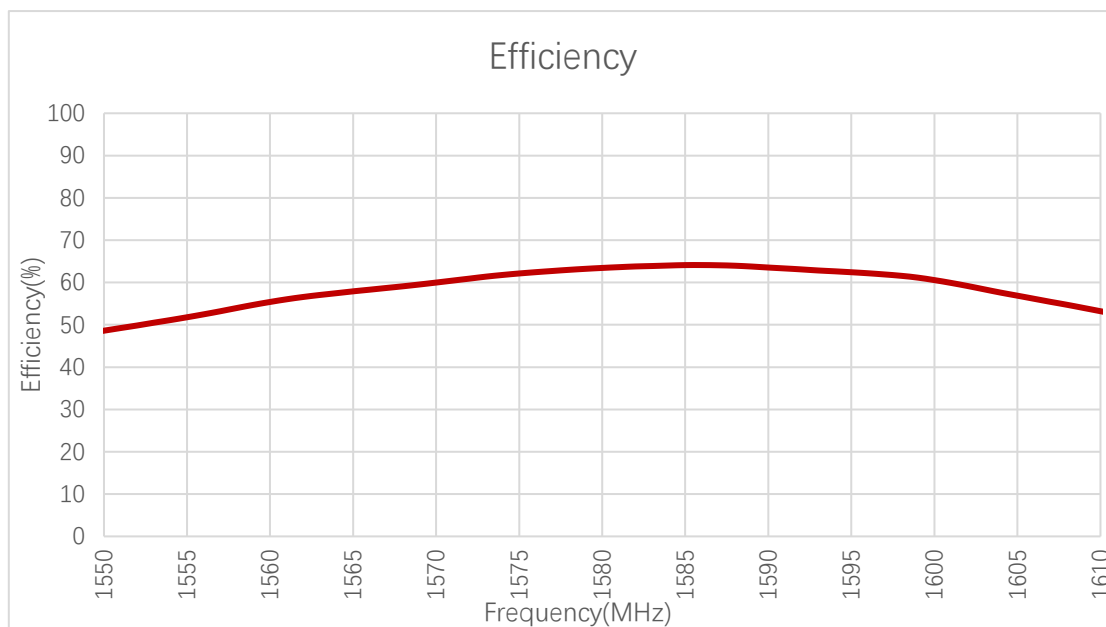


**Return Loss (dB)**

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
Return Loss (dB)	-	-	-	-	-	-7.6	-12.6	-13.5

## 3.2. Radiation Performance Test

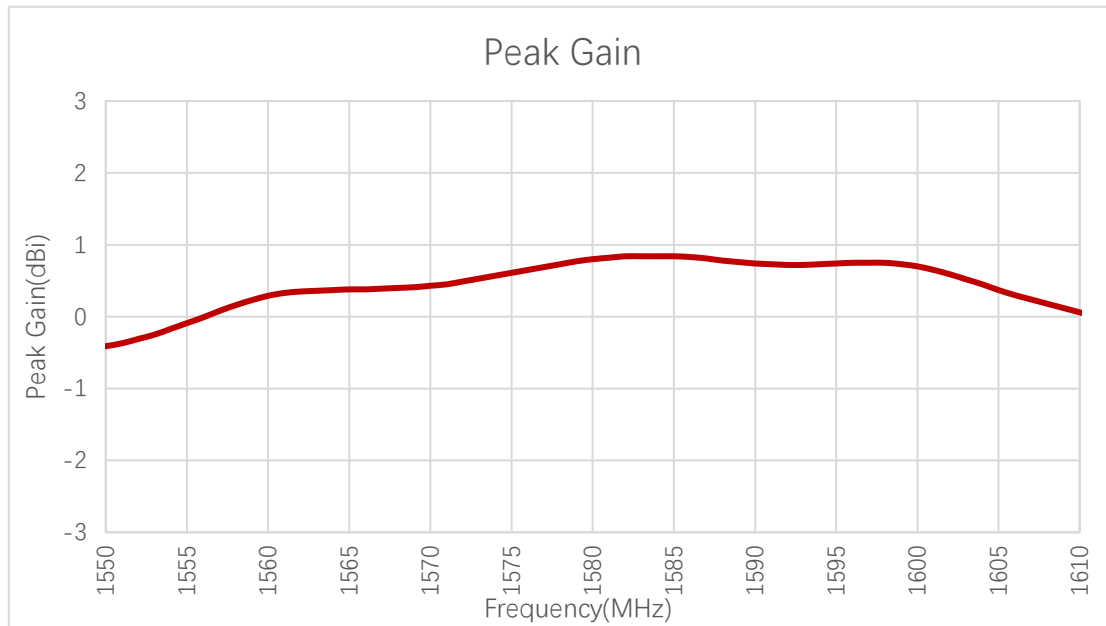
### 3.2.1. Efficiency



**Efficiency (%)**

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
Efficiency (%)	-	-	-	-	-	56.04	62.14	59.18

### 3.2.2. Peak Gain

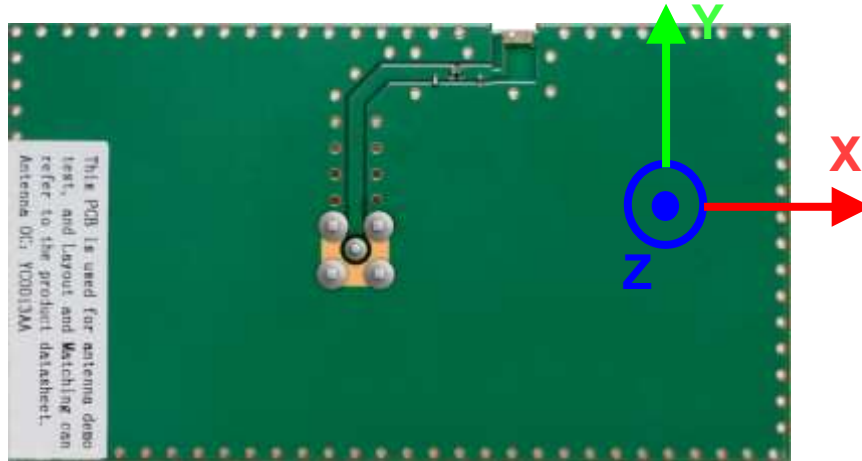


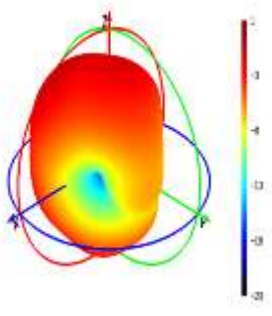
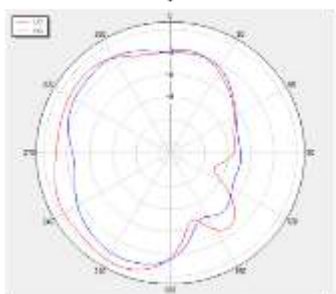
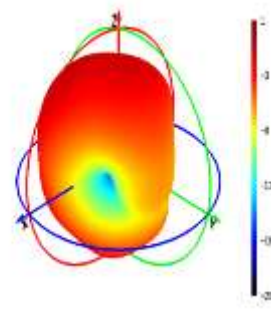
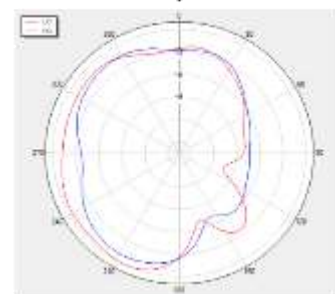
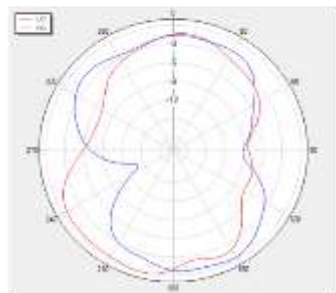
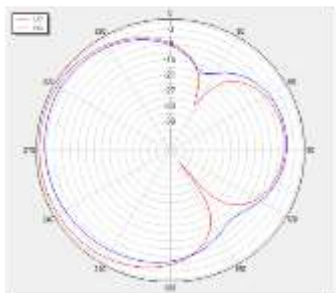
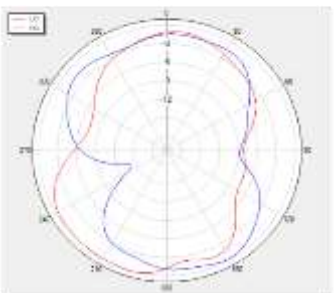
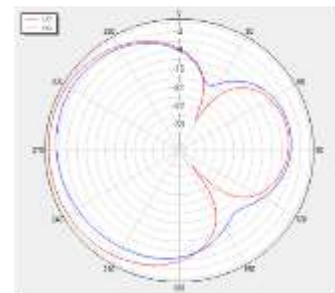
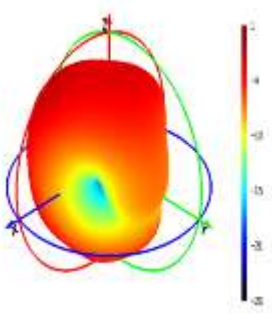
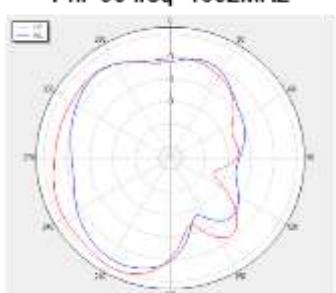
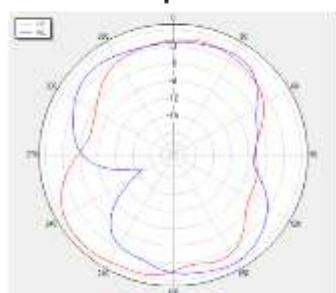
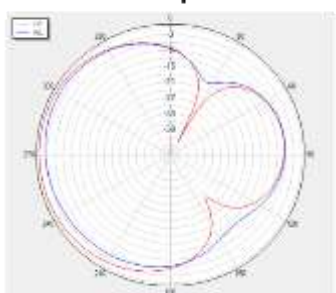
**Peak Gain (dBi)**

Frequency (MHz)	1176	1207	1227	1248	1268	1561	1575	1602
Peak Gain (dBi)	-	-	-	-	-	0.33	0.61	0.59

### 3.2.3. 3D & 2D Radiation Pattern

- Test Condition: Assembled on 90 × 50 GND EVB
- Test Chamber: GL-S-1



1561 MHz		1575 MHz	
	<b>Phi=90 freq=1561MHz</b> 		<b>Phi=90 freq=1575MHz</b> 
<b>Phi=0 freq=1561MHz</b> 	<b>Theta=90 freq=1561MHz</b> 	<b>Phi=0 freq=1575MHz</b> 	<b>Theta=90 freq=1575MHz</b> 
1602 MHz			
	<b>Phi=90 freq=1602MHz</b> 		
<b>Phi=0 freq=1602MHz</b> 	<b>Theta=90 freq=1602MHz</b> 		

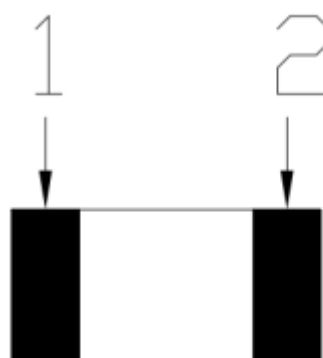
## 4 Schematic Symbol and Pin Definition

- The pin assignment for the antenna is as follows.
- The circuit symbol for the antenna is shown below. The antenna has 2 pins, only one of which works. All other pins are for mechanical strength.

Pin	Description
1	Return / GND
2	Feed



TOP



BOTTOM

## 5 Transmission Line

The characteristic impedance of all transmission lines shall be designed as 50  $\Omega$ .

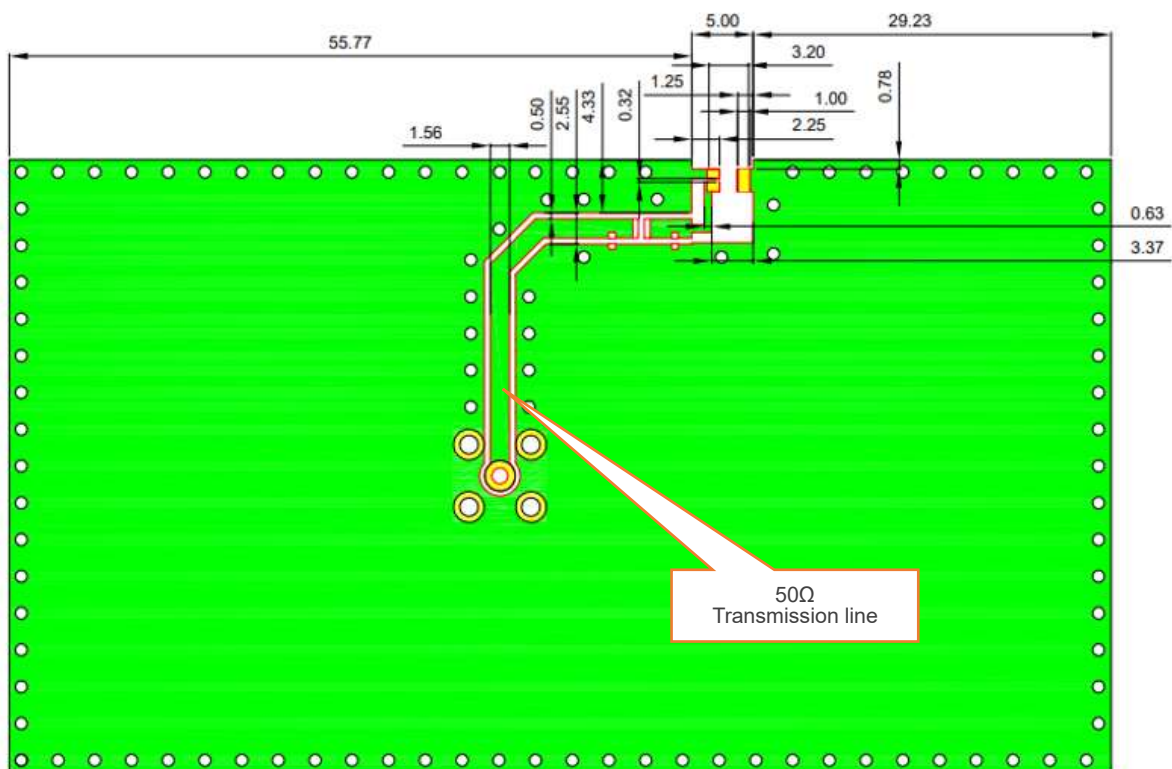
- The length of the transmission lines should be kept as short as possible.
- Any other part of the RF system, such as transceiver, power amplifiers, etc., shall also be designed with an impedance of 50  $\Omega$ .

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  $\Omega$ .



## 6 Recommended PCB Layout

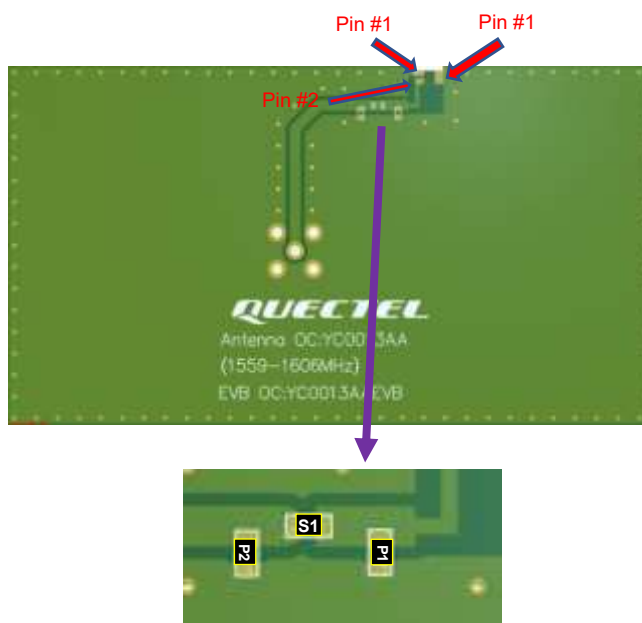
The host PCB must be designed using the PCB footprint shown with the correct clearances. An example of the PCB layout shows the antenna footprint. Please note this clearance area is critical to the performance of the antenna and must be applied through all layers of the PCB.



All dimensions are in mm.

# 7 Matching Circuit

Demo Board Top View



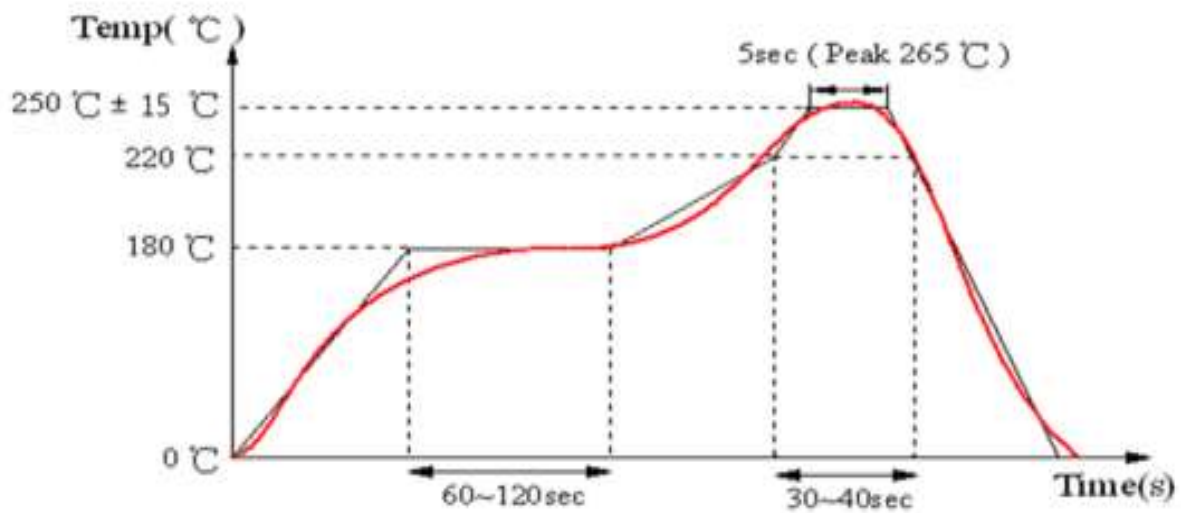
	P1	S1	P2
Default Matching	DNI	3.1pF	2nH
Tolerance	N/A	±5 %	±5 %

Pin #	Description
1	Return / GND
2	Feed

## 8 Soldering Temperature

Phase	Profile Features	PB-Free Assembly
RAMP-UP	Avg. Ramp-up Rate (T <sub>smax</sub> to T <sub>p</sub> )	3 °C/second (Max.)
PREHEAT	Temperature Min (T <sub>smin</sub> ) Temperature Max (T <sub>smax</sub> ) Time (t <sub>smin</sub> to t <sub>smax</sub> )	150 °C 190 °C 110 seconds (Max.)
REFLOW	Temperature (T <sub>L</sub> ) Total Time above T <sub>L</sub> (t <sub>l</sub> )	220 °C 90 seconds (Max.)
PEAK	Temperature (T <sub>p</sub> )	230–250 °C
RAMP-DOWN	Rate	-1 °C/second (Max.)


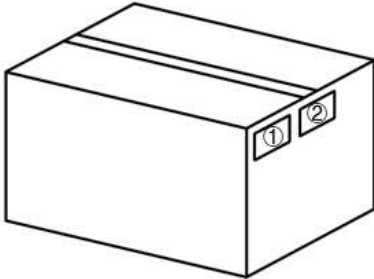
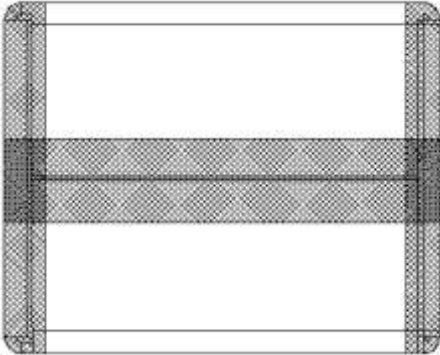
## 9 Reflow Profile





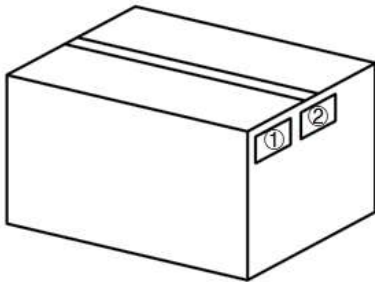
# 10 Packaging

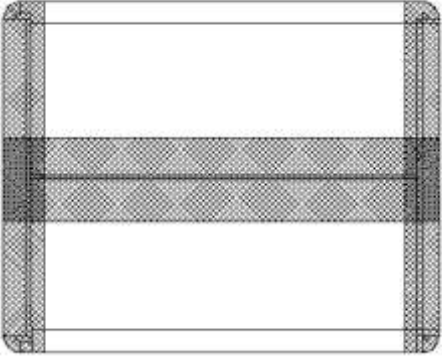
- YC0013AA

Step	Packaging Picture / 2D Picture	Description
1		(3000 PCS / Reel)
2		The product is vacuumed in a vacuum bag.

		<p>(10 Vacuum Bags / Carton Box) (3000 Antennas / Carton Box)</p> <p><u>Carton Size:</u> <u>L × W×H = 300 × 250 × 200 mm</u></p>
3		<p><b>Position for Attaching Labels</b></p> <p>① Carton Label ② Quality Label</p>
4		<p><b>Sealing Cartons</b></p> <p>“工” type sealing cartons</p>

● YC0013AAEVB

Step	Packaging Picture / 2D Picture	Description
1		<p>1 antenna product in a bubble pack. (1 Antenna / Bubble Pack)</p>
2		<p>Put 54 products in one layer, stack 3 layers, and separate each layer with a cardboard. (162 Antennas / Carton Box)</p> <p><u>Carton Size:</u> <u>L × W × H = 390 × 300 × 210 mm</u></p>
3		<p><b>Position for Attaching Labels</b></p> <p>① Carton Label ② Quality Label</p>

4		<p><b>Sealing Cartons</b> “I” type sealing cartons</p>
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# 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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# Revision History

Version	Date	Author	Note
-	2020-12-14	Kenny Yin	Creation of the document
1	2020-12-14	Kenny Yin	First official release
2	2021-06-09	Aria Chu	Updated all test data in this datasheet.
2.1	2021-06-21	Aria Chu	Updated the efficiency and gain charts in Chapter 4.
2.2	2021-06-28	Aria Chu	Updated the efficiency and gain charts in Chapter 4.
2.3	2021-07-08	Aria Chu	Updated the reference PCB design in Chapter 4.8.
2.4	2021-09-28	Aria Chu	Added the new OC YC0013AAEVB on the cover.
2.5	2021-12-03	Aria Chu	Updated the product description in Chapter 1.
3.0	2022-07-20	Wilson Bao	Updated all test data in this datasheet.
4.0	2023-07-12	Tina GAN/ Lucky FENG/ David LIU/ Aria CHU	Updated all test data in this datasheet.
4.1	2024-01-02	Lucky FENG	Updated the drawing (Chapters 2 and 4).



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