Antenna Datasheet

Product OC (Antenna Only): YC0013AA
Product OC (Antenna + Rectangular EVB): YC0013AAEVB
Version: 4.3
Date: 2024-12-11
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.

Contents

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

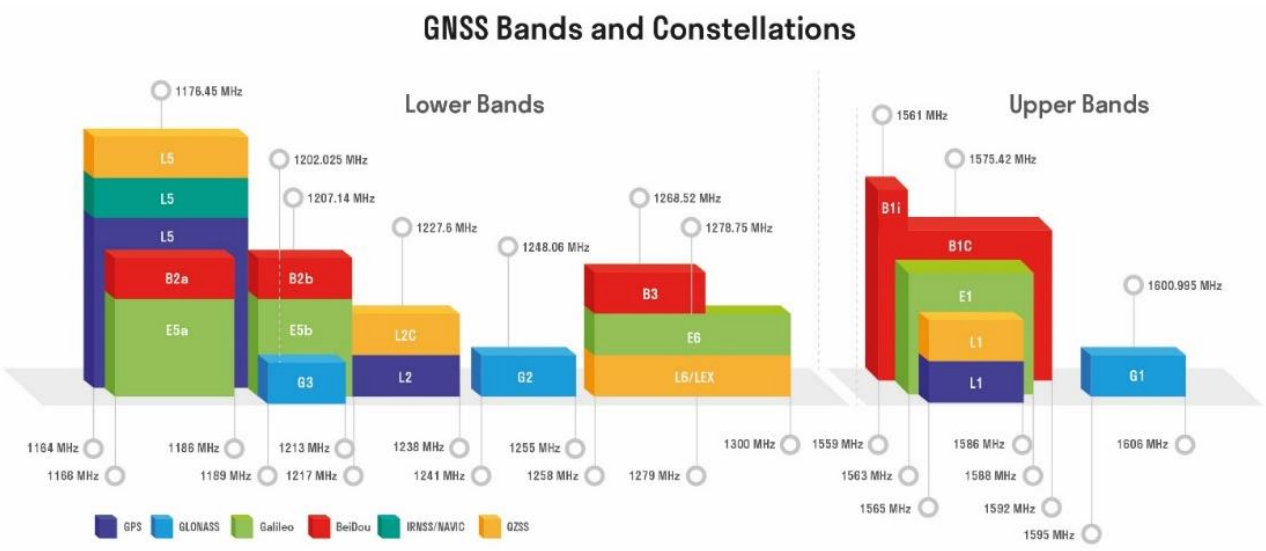
Band / Frequency (MHz)	GPS L5 GALILEO E5a BDS B2a-B2I QZSS L5 IRNSS L5	GALILEO E5b BDS B2b	GPS L2 QZSS L2C	GLONASS G2	BDS B3	BDS B1I	GPS L1 GALILEO E1 BDS B1C QZSS L1	GLONASS G1
	1176	1207	1227	1248	1268	1561	1575	1602
VSWR	-	-	-	-	-	2.4	1.6	1.5
Return Loss (dB)	-	-	-	-	-	-7.6	-12.6	-13.5
Efficiency (%)	-	-	-	-	-	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

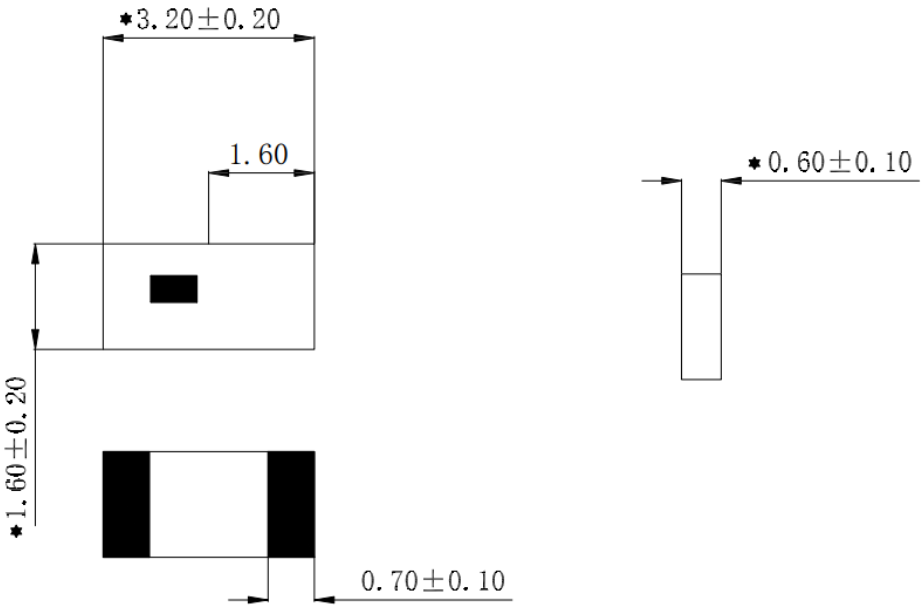
1.3. Supported GNSS Frequency Bands

GNSS Frequency Bands (MHz)					
GPS	**L1** Centre 1575.42 (1565–1586)	**L2** Centre 1227.6 (1217–1238)	**L5** Centre 1176.45 (1164–1189)		
	√	-	-		
GLONASS	**G1-L1OC-L1OF** Centre 1601 (1595–1606)	**G2-L2OC-L2OF** Centre 1248.06 (1241–1255)	**G3-L3OC** Centre 1202.025 (1189–1213)		
	√	-	-		
GALILEO	**E1** Centre 1575.42 (1563–1588)	**E5a** Centre 1176.45 (1166–1187)	**E5b** Centre 1207.14 (1197–1218)	**E6** Centre 1278.75 (1258–1300)	
	√	-	-	-	
BDS	**B1I** Centre 1561.098 (1559–1564)	**B1C (BDS-3)** Centre 1575.42 (1559–1592)	**B2a** Centre 1176.45 (1166–1187)	**B2b-B2I** Centre 1207.14 (1197–1217)	**B3** Centre 1268.52 (1258–1279)
	√	√	-	-	-
QZSS	**L1** Centre 1575.42 (1573–1578)	**L2C** Centre 1227.6 (1226–1229)	**L5** Centre 1176.45 (1166–1187)	**L6** Centre 1278.75 (1257–1300)	
	√	-	-	-	
IRNSS	**L5** Centre 1176.45 (1164–1189)				
	-				

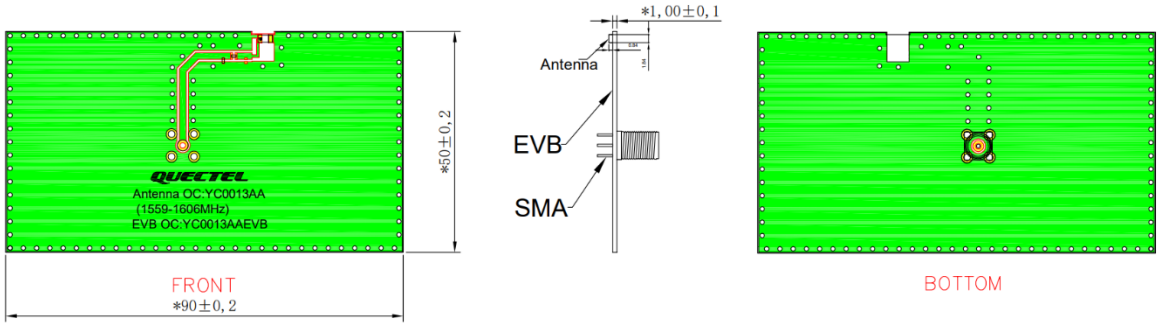

GNSS Bands and Constellations
Lower Bands
Upper Bands
1176.45 MHz
1202.025 MHz
1207.14 MHz
1227.6 MHz
1248.06 MHz
1268.52 MHz
1278.75 MHz
L5
L5
L5
B2a
E5a
B2b
E5b
G3
L2C
L2
G2
B3
E6
L6/LEX
1561 MHz
1575.42 MHz
B1i
B1C
E1
L1
L1
1600.995 MHz
G1
1164 MHz
1168 MHz
1186 MHz
1189 MHz
1213 MHz
1217 MHz
1238 MHz
1241 MHz
1255 MHz
1258 MHz
1279 MHz
1300 MHz
1559 MHz
1563 MHz
1565 MHz
1586 MHz
1588 MHz
1592 MHz
1595 MHz
1606 MHz
GPS
GLONASS
Galileo
BeiDou
IRNSS/NAVIC
QZSS

2 Drawing

2.1. Antenna



2.2. Rectangular EVB

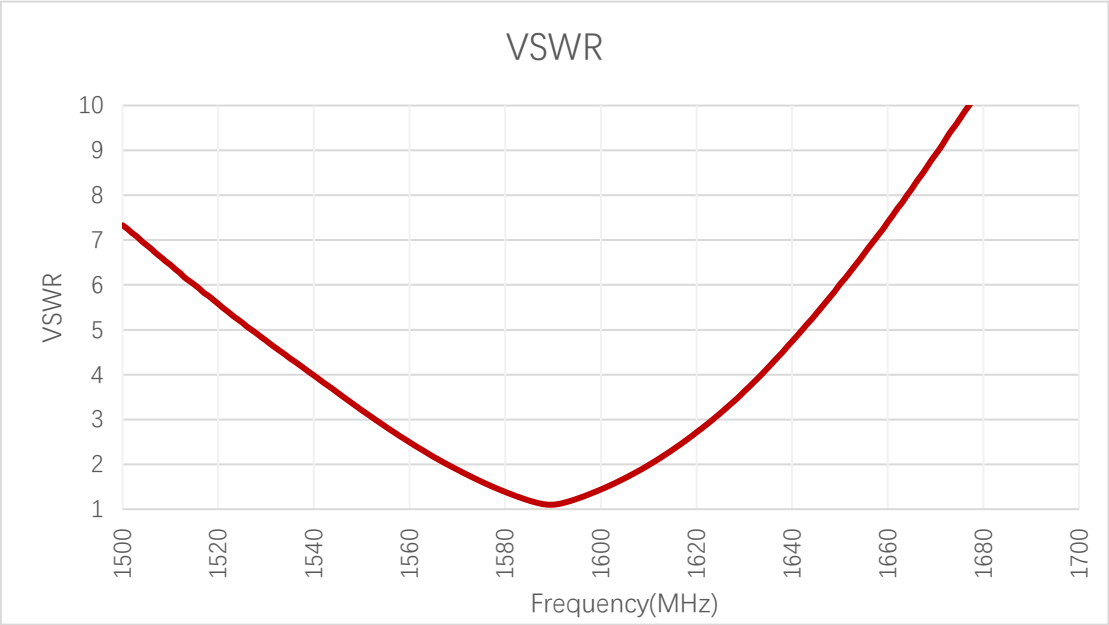


All dimensions are in mm.

3 Detailed Performance

3.1. S-Parameter Test

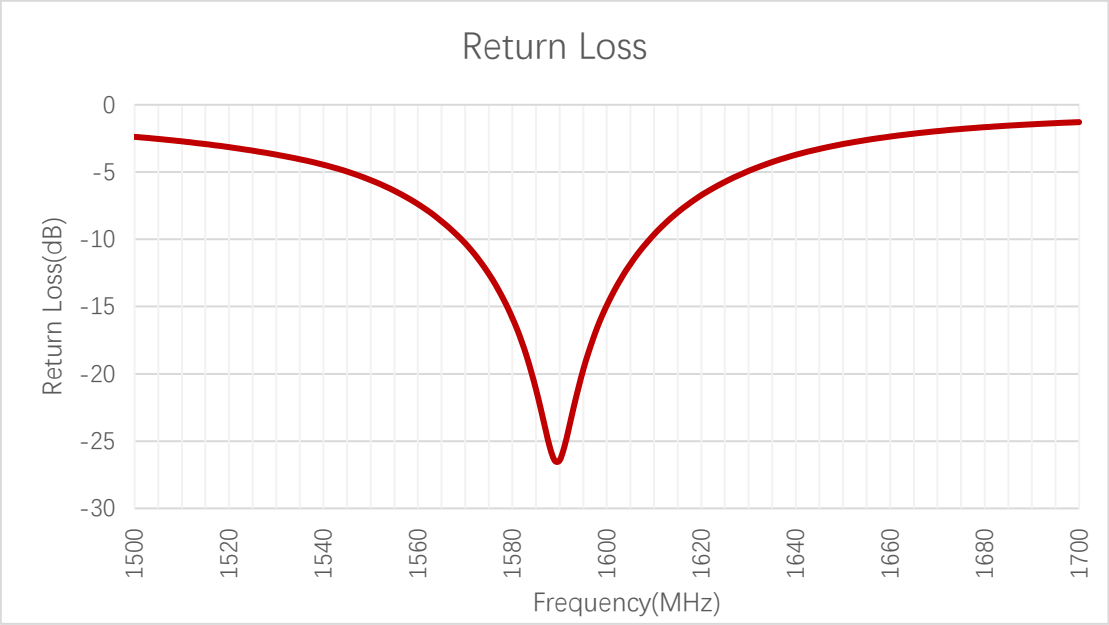
3.1.1. VSWR



VSWR

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

3.1.2. Return Loss

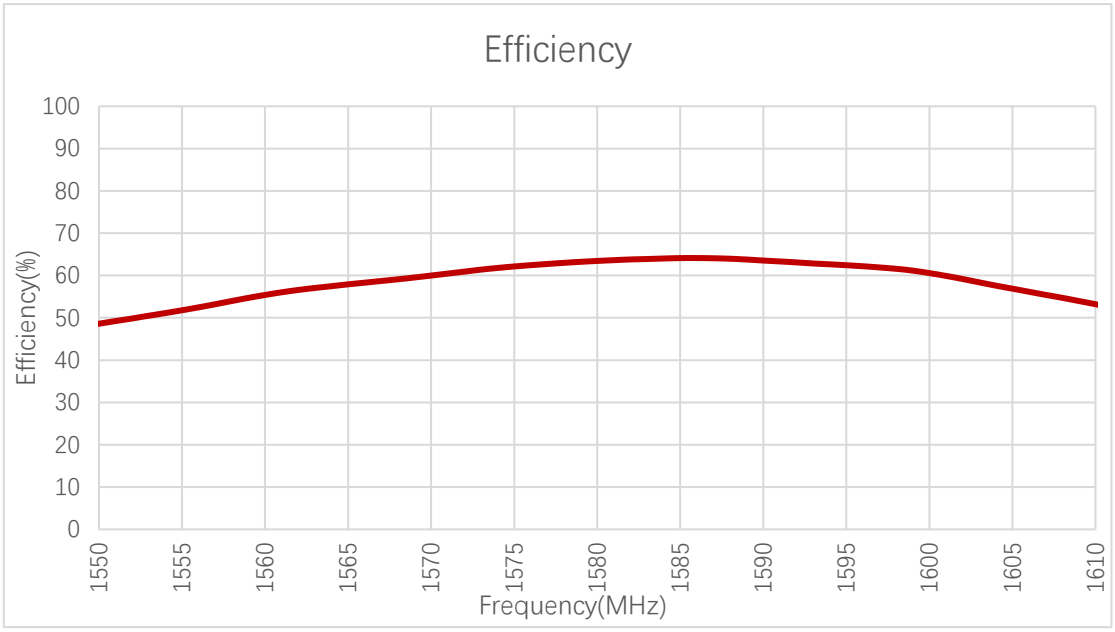


Return Loss (dB)

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

3.2. Radiation Performance Test

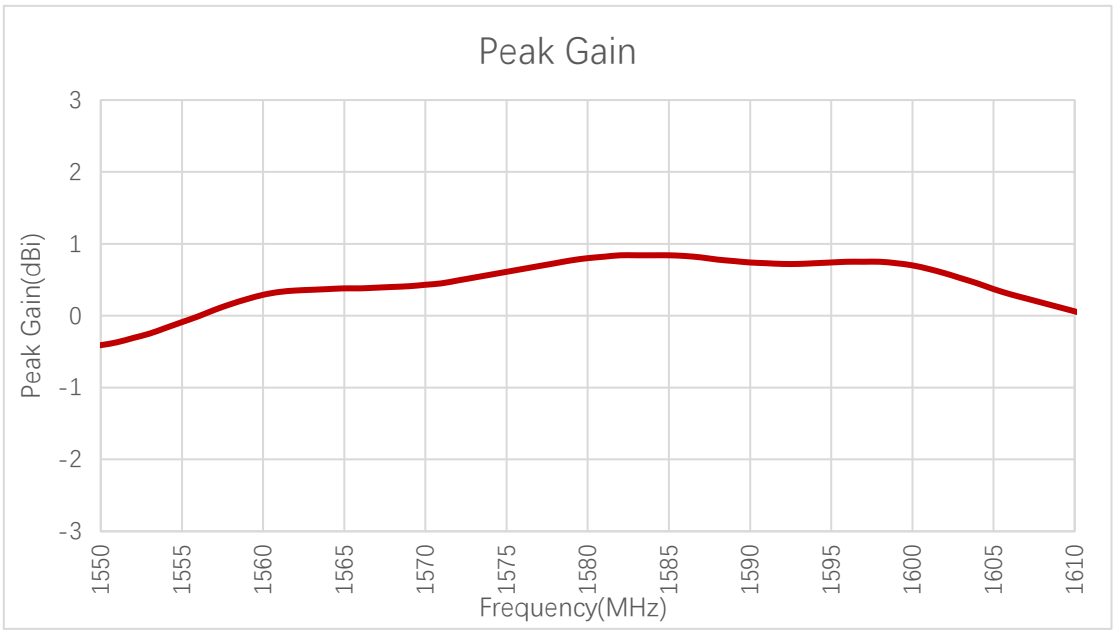
3.2.1. Efficiency



Efficiency (%)

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

3.2.2. Peak Gain

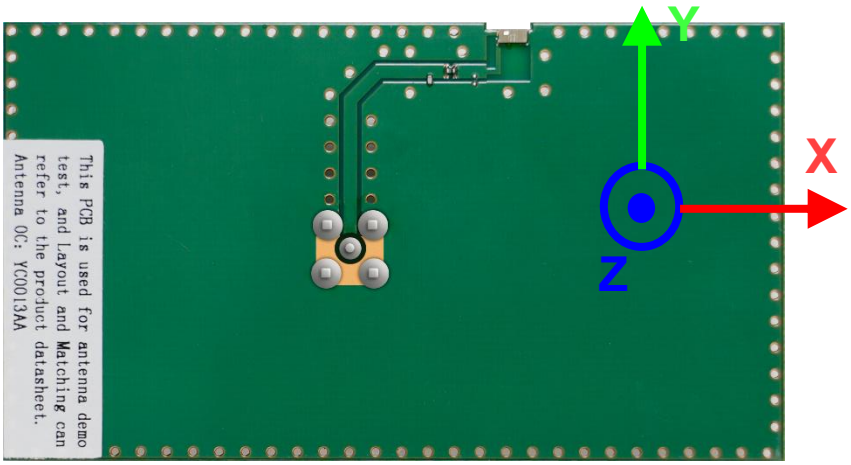


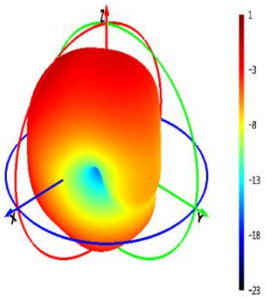
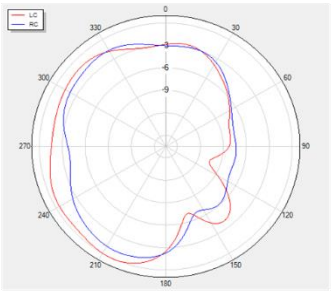
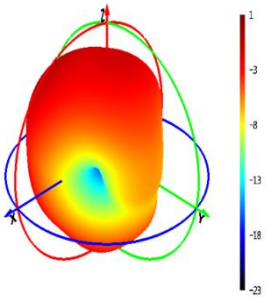
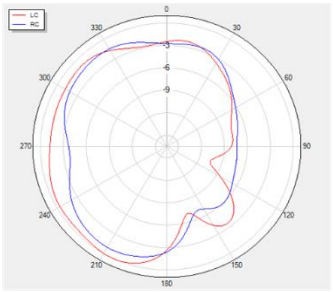
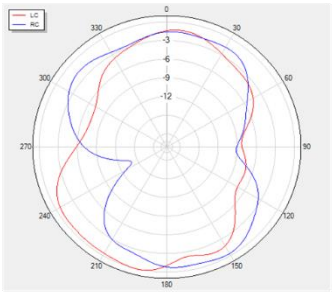
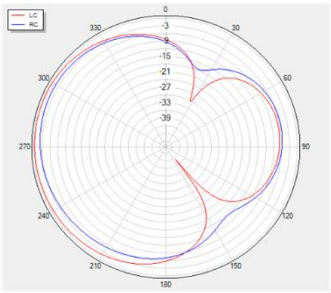
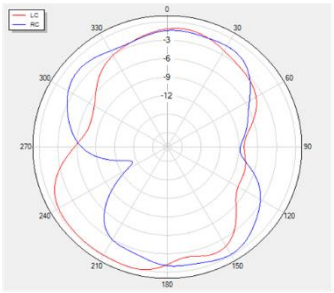
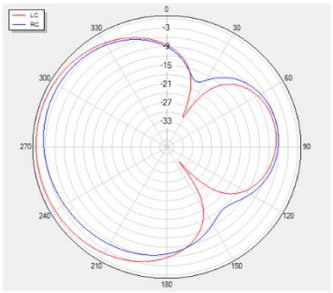
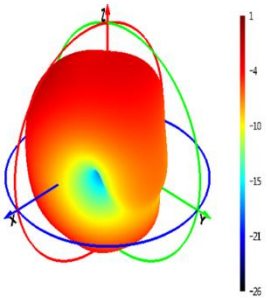
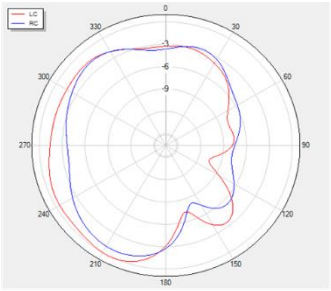
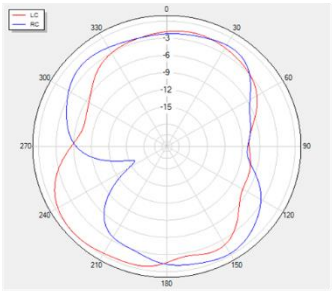
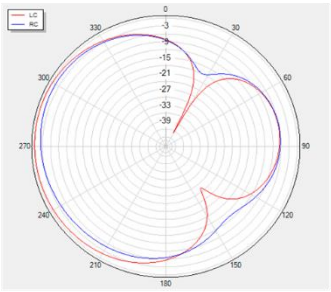
Peak Gain (dBi)

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 mm × 50 mm GND EVB
- Test Chamber: GL-S-1

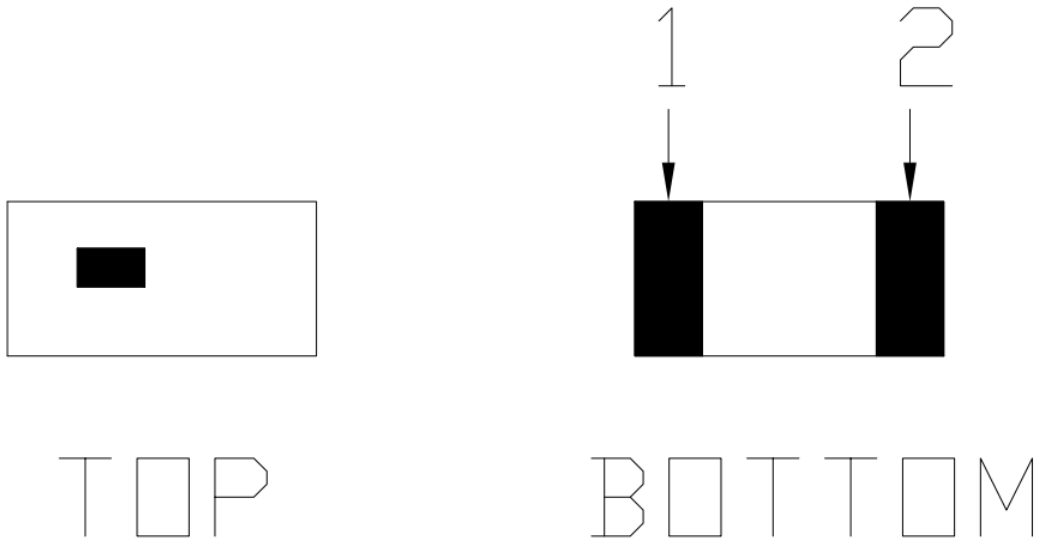


1561 MHz		1575 MHz	
	Phi=90 freq=1561MHz 		Phi=90 freq=1575MHz 
Phi=0 freq=1561MHz 	Theta=90 freq=1561MHz 	Phi=0 freq=1575MHz 	Theta=90 freq=1575MHz 
1602 MHz			
	Phi=90 freq=1602MHz 		
Phi=0 freq=1602MHz 	Theta=90 freq=1602MHz 		

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



5 Transmission Line

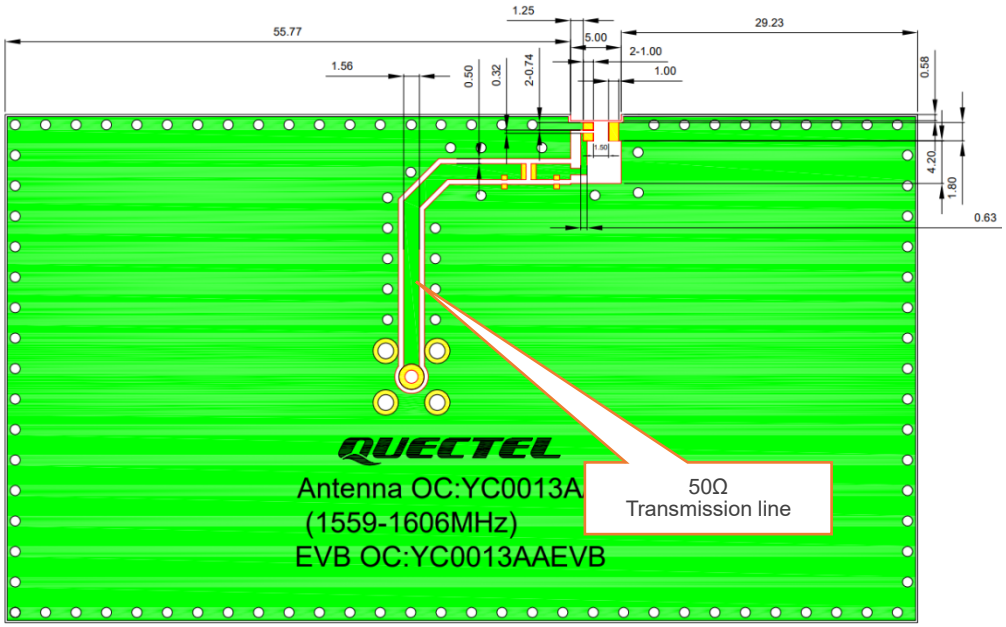
The characteristic impedance of all transmission lines shall be designed as 50 Ω.

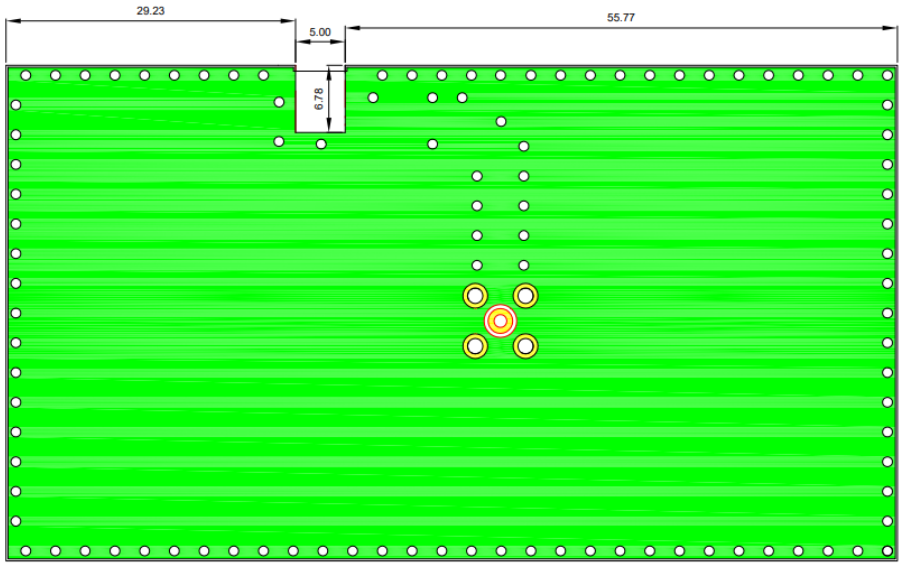
- The length of the transmission lines should be kept as short as possible.
- Any other part of the RF system, such as transceiver, power amplifiers, etc., shall also be designed with an impedance of 50 Ω.

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.

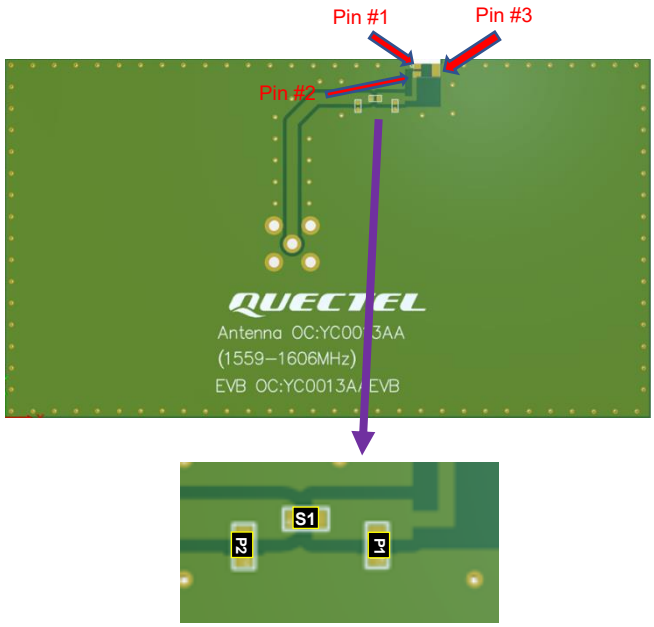




All dimensions are in mm.

7 Matching Circuit

Demo Board Top View



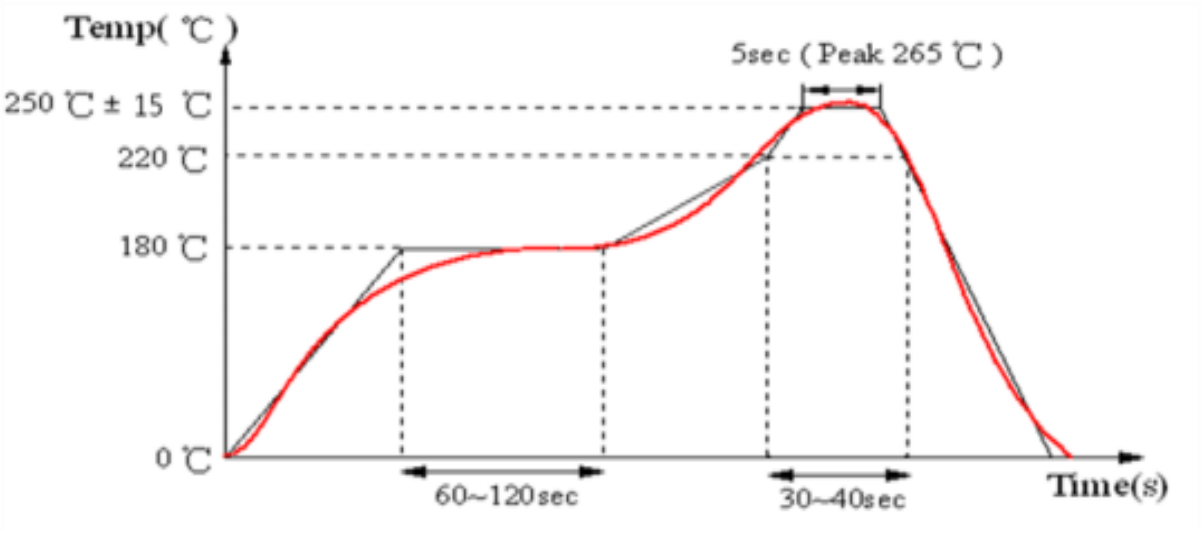
	P1	S1	P2
Default Matching	DNI	3.1pF	2nH
Tolerance	N/A	±5 %	±5 %

Pin #	Description
1,3	Return / GND
2	Feed

8 Soldering Temperature

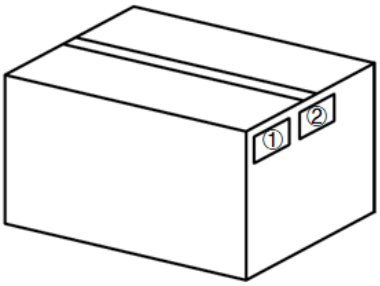
Phase	Profile Features	PB-Free Assembly
RAMP-UP	Avg. Ramp-up Rate (Tsmax to Tp)	3 °C/second (Max.)
PREHEAT	Temperature Min (Tsmin) Temperature Max (Tsmax) Time (tsmin to tsmax)	150 °C 190 °C 110 seconds (Max.)
REFLOW	Temperature (TL) Total Time above TL (tl)	220 °C 90 seconds (Max.)
PEAK	Temperature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

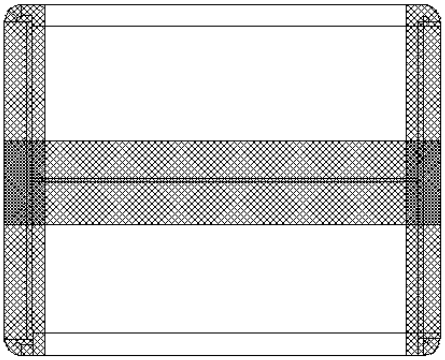
9 Reflow Profile



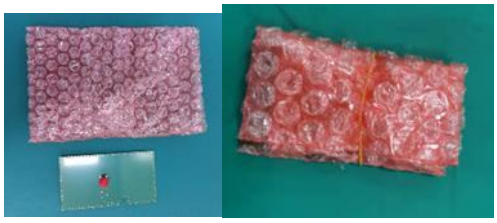
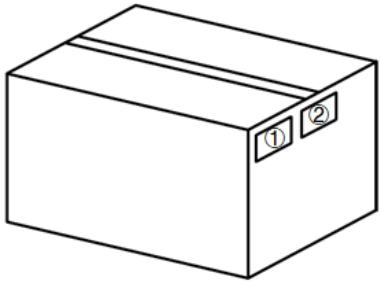
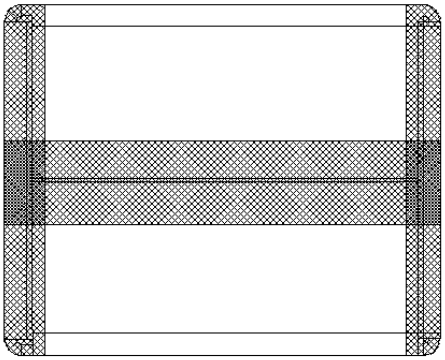
10 Packaging

- **YC0013AA**

Step	Packaging Picture / 2D Picture	Description
1		(3000 PCS / Reel)
2		The product is vacuumed in a vacuum bag.
3		(10 Vacuum Bags / Carton Box) (3000 Antennas / Carton Box) Carton Size: L × W×H = 300 × 250 × 200 mm
4		**Position for Attaching Labels** ① Carton Label ② Quality Label

5		**Sealing Cartons** H-shaped 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.	

- **YC0013AAEVB**

Step	Packaging Picture / 2D Picture	Description
1		1 antenna product in a bubble pack. (1 Antenna / Bubble Pack)
2		Put 54 products in one layer, stack 3 layers, and separate each layer with a cardboard. (162 Antennas / Carton Box) Carton Size: L × W × H = 390 × 300 × 210 mm
3		**Position for Attaching Labels** ③ Carton Label ④ Quality Label
4		**Sealing Cartons** H-shaped 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
-	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).
4.2	2024-04-24	Lucky FENG	Updated the drawing (Chapters 2 and 6).
4.3	2024-12-11	Tina GAN	Updated the pin number in matching circuit picture (Chapter 7).

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