Antenna Datasheet

Product OC (Antenna Only)**:** YSIS001AA
(Antenna + Rectangular EVB 1)**:** YSIS001AAEVBAA
(Antenna + Rectangular EVB 2)**:** YSIS001AAEVBBA
Version: 1.0
Date: 2023-06-09
Status: Released
Product Name: 433 Spring Antenna
Key Features:
Frequency band: 433–435 MHz (Compatible with B31 and B88)
Efficiency: Up to 47.66% (On 167 × 90 mm GND)
Dimensions: 29 × 7 × 7 mm
RoHS & REACH Compliant
High efficiency, excellent performance

Overview

This metal spring antenna is suitable for LTE B31/B88 and EU433 applications. Operating at 412-427MHz or 433-435MHz or 450-470MHz by different match circuit, it's a high-efficiency antenna which is mounted to the device host PCB using conventional Metal spring antenna reflow process. Ideal for LTE B31/B88 and EU433 frequency bands applications. We provide comprehensive antenna design support such as simulation, testing and manufacturing for custom antenna solutions to meet your specific application needs.

Contents

1 Specification

Test Condition: Assembled On EVB

1.1. Electrical

Electrical	
Frequency Range	412–427 MHz, 433–435 MHz, 450–470 MHz
Impedance	50 Ω
Polarization	Linear
Radiation Pattern	Omni-directional

Electrical - Detail

Band / SPEC	Band	B88	EU433	B31	LoRa	B12 /B13 /B28	B5 /B8 /B26	B1 /B2 /B3
SPEC	Freq. (MHz)	412–427	433–435	450–470	470–510	700–810	820–960	1700–2170
Max VSWR	On 91 × 36 mm GND	3.1	1.6	4.1	-	-	-	-
	On 167 × 90 mm GND	2.2	1.7	2.4	-	-	-	-
Max Return Loss (dB)	On 91 × 36 mm GND	-5.8	-12.7	-4.3	-	-	-	-
	On 167 × 90 mm GND	-8.4	-12.0	-7.6	-	-	-	-
AVG Eff. (%)	On 91 × 36 mm GND	9.9	11.1	14.9	-	-	-	-
	On 167 × 90 mm GND	32.6	37.4	44.9	-	-	-	-
AVG AVG Gain (dB)	On 91 × 36 mm GND	-10.0	-9.5	-8.3	-	-	-	-
	On 167 × 90 mm GND	-4.9	-4.3	-3.5	-	-	-	-
Max Peak Gain (dBi)	On 91 × 36 mm GND	-7.2	-7.0	-5.1	-	-	-	-
	On 167 × 90 mm GND	-1.9	-1.3	0.1	-	-	-	-

VSWR	On 91 × 36 mm GND	≤ 4.1
	On 167 × 90 mm GND	≤ 2.5
Return Loss	On 91 × 36 mm GND	≤ -4.3 dB
	On 167 × 90 mm GND	≤ -7.5 dB
Peak Gain	On 91 × 36 mm GND	≤ -5 dBi
	On 167 × 90 mm GND	≤ 0.1 dBi

1.2. Supported Bands

5G NR / LTE / LTE-Advanced / WCDMA / HSPA / HSPA+ / GPRS / GSM / NB-IoT				
Band	**Frequency (MHz)**	**Uplink (MHz)**	**Downlink (MHz)**	**Covered**
1	2100	1920–1980	2110–2170	-
2	1900	1850–1910	1930–1990	-
3	1800	1710–1785	1805–1880	-
4	1700	1710–1755	2110–2155	-
5	850	824–849	869–894	-
7	2600	2500–2570	2620–2690	-
8	900	880–915	925–960	-
9	1800	1749.9–1784.9	1844.9–1879.9	-
11	1500	1427.9–1447.9	1475.9–1495.9	-
12	700	699–716	729–746	-
13	700	777–787	746–756	-
14	700	788–798	758–768	-
17	700	704–716	734–746	-
18	850	815–830	860–875	-
19	850	830–845	875–890	-
20	800	832–862	791–821	-
21	1500	1447.9–1462.9	1495.9–1510.9	-
22	3500	3410–3490	3510–3590	-
23	2100	2000–2020	2180–2200	-
24	1600	1626.5–1660.5	1525–1559	-
25	1900	1850–1915	1930–1995	-
26	850	814–849	859–894	-

28	700	703–748	758–803	-
31	450	452.5–457.5	462.5–467.5	√
34	2100	2010–2025		-
38	2600	2570–2620		-
39	1900	1880–1920		-
40	2300	2300–2400		-
41	2500	2496–2690		-
42	3500	3400–3600		-
48	3500	3550–3700		-
66	1700	1710–1780	-	-
71	600	663–698	-	-
74	1500	1427–1470	-	-
77	3500	3300–4200		-
78	3500	3300–3800		-
79	4500	4400–5000		-
88	412	410–415	420–425	√
EU433	433	433–435	433–435	√

Note:

- Covered √ means efficiency > 20%.
- Based on 167 × 90 mm GND.

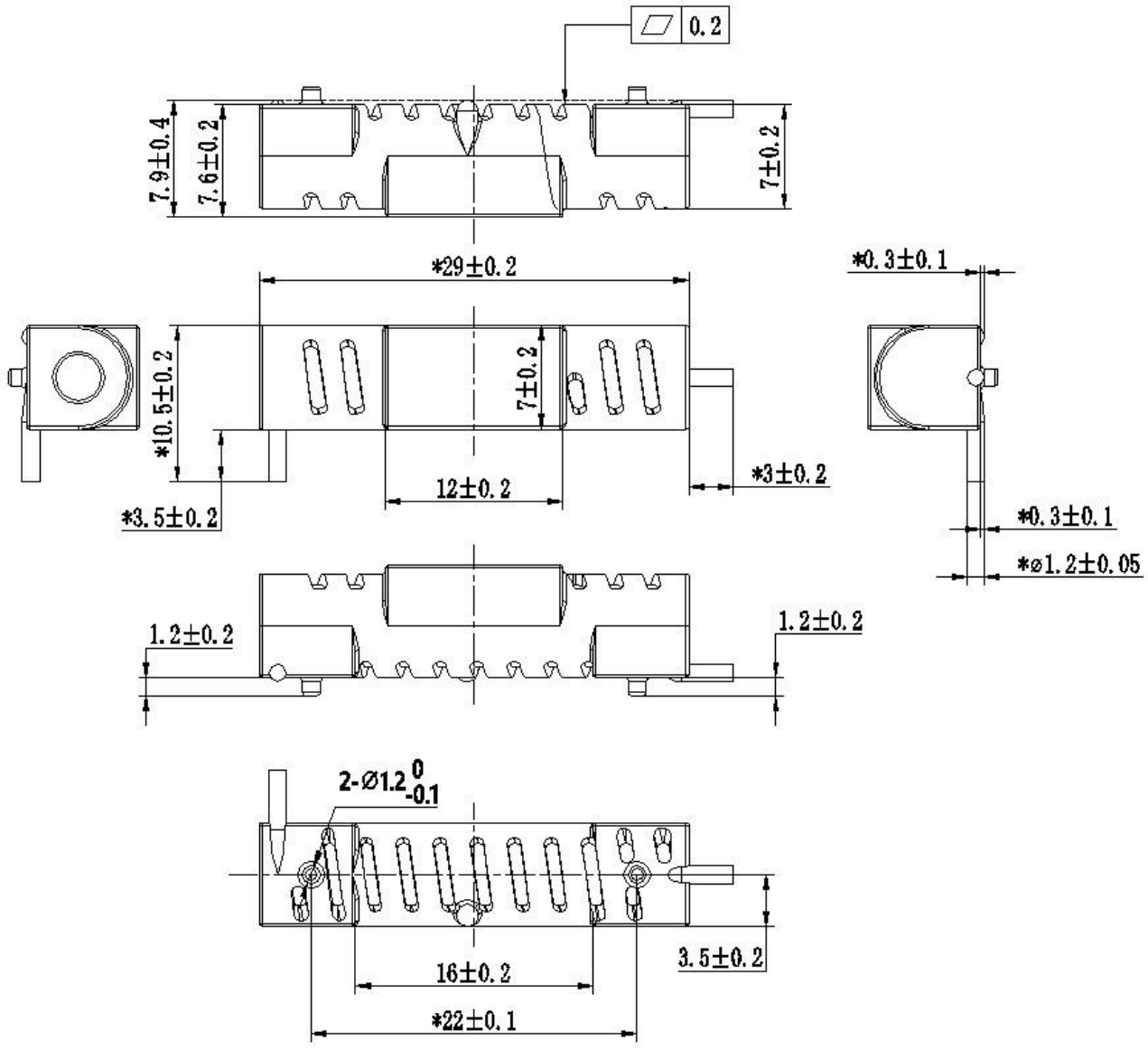
1.3. Mechanical, Environmental & Storage

Mechanical	
Antenna Size	29 × 7 × 7 mm
Material	Metal + LCP
Mounting Type	SMD
Weight	Typ. 3.3 g
Recommended EVB1 Size	185 × 90 × 1 mm
Recommended EVB2 Size	100 × 36 × 1 mm
Environmental	
Operation Temperature	-40 °C to +85 °C
RoHS & REACH Compliant	Yes

Storage	
Storage Temperature	18 °C to 27 °C
Humidity	30–80 % RH
Storage Place	Away from corrosive gas and direct sunlight
Packaging	Antennas should be stored in unopened sealed manufacturer's plastic packaging

2 Drawing

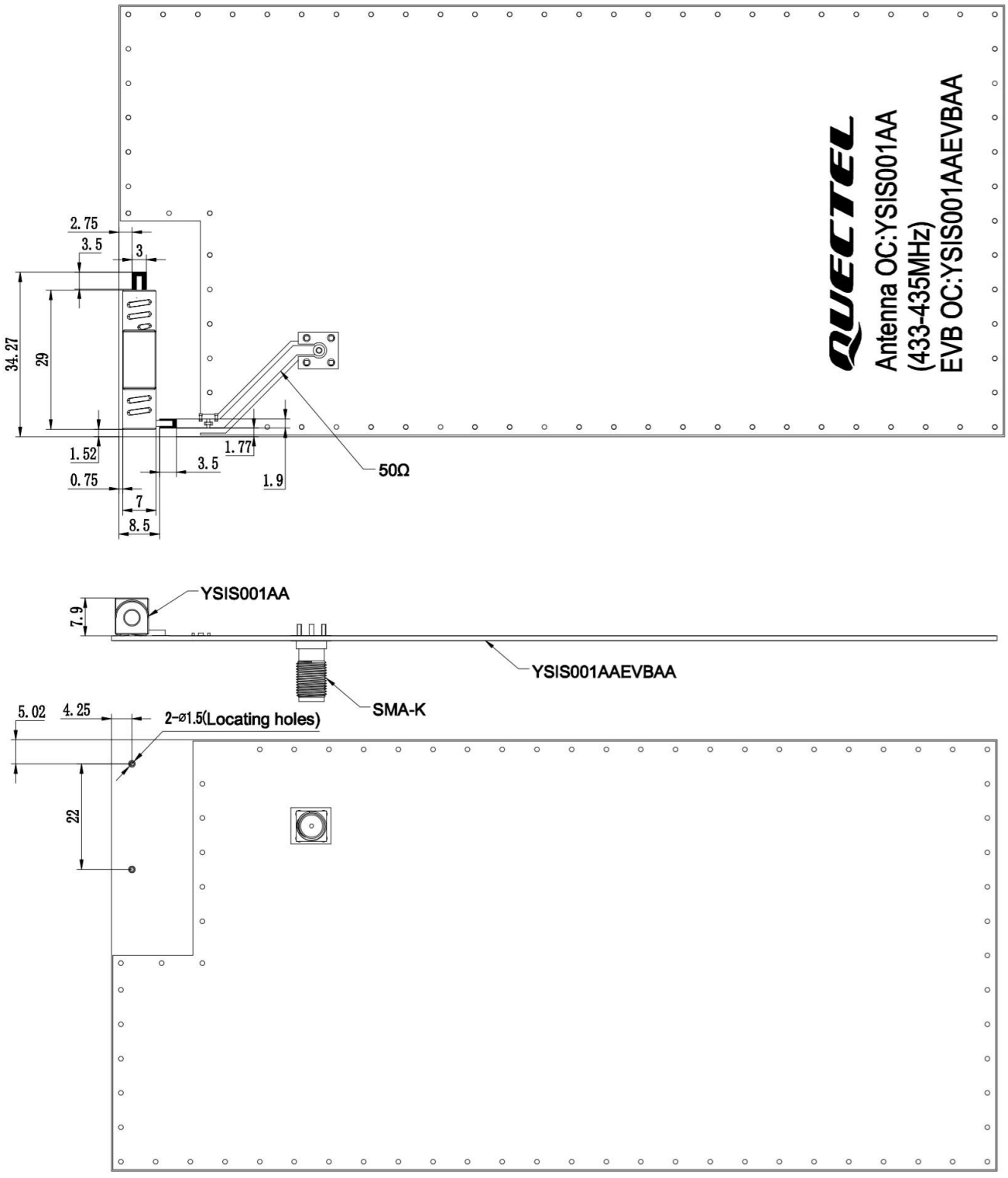
2.1. Antenna



All dimensions in (mm)

2.2. EVB

- YSIS001AAEVBAA



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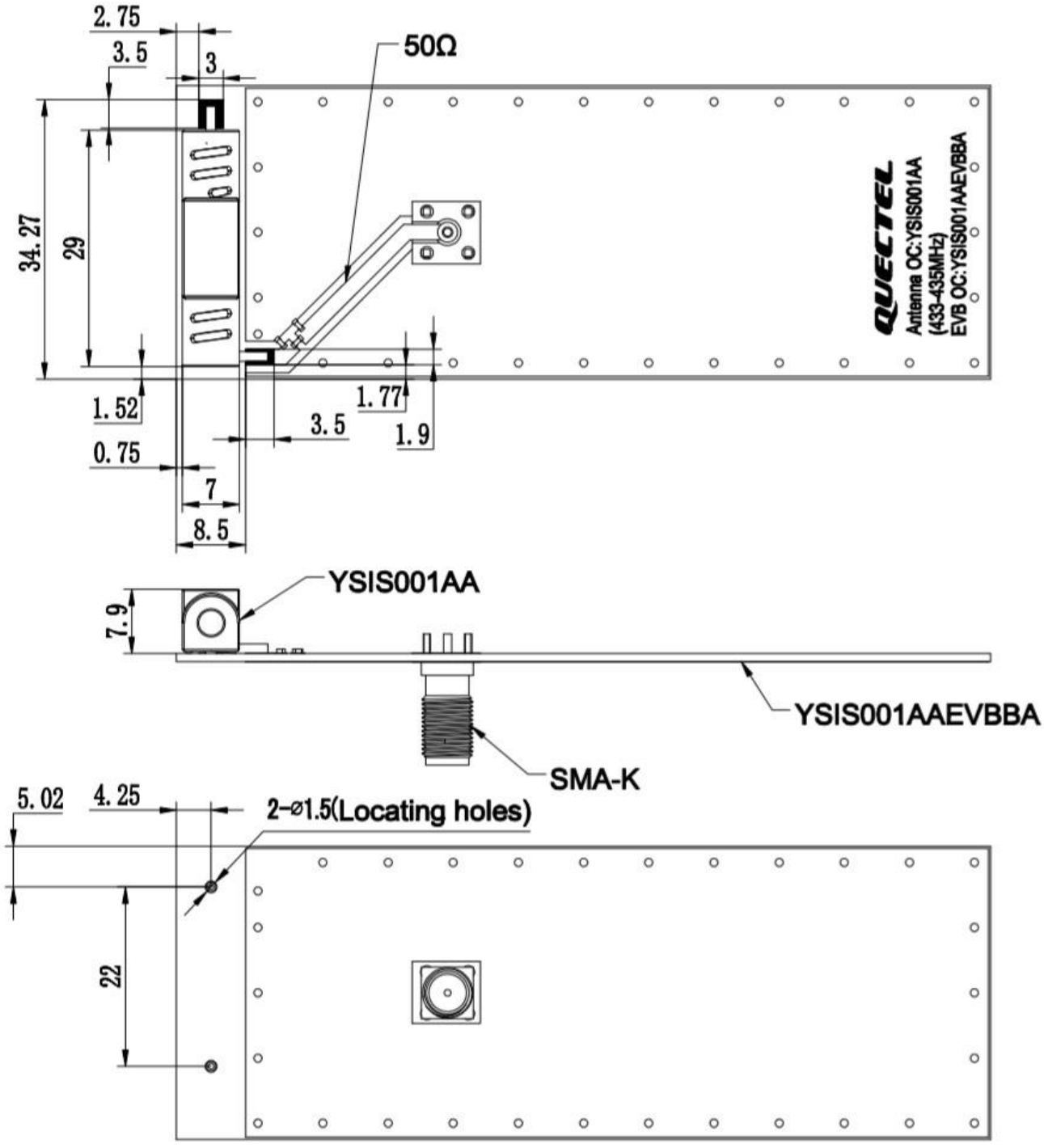
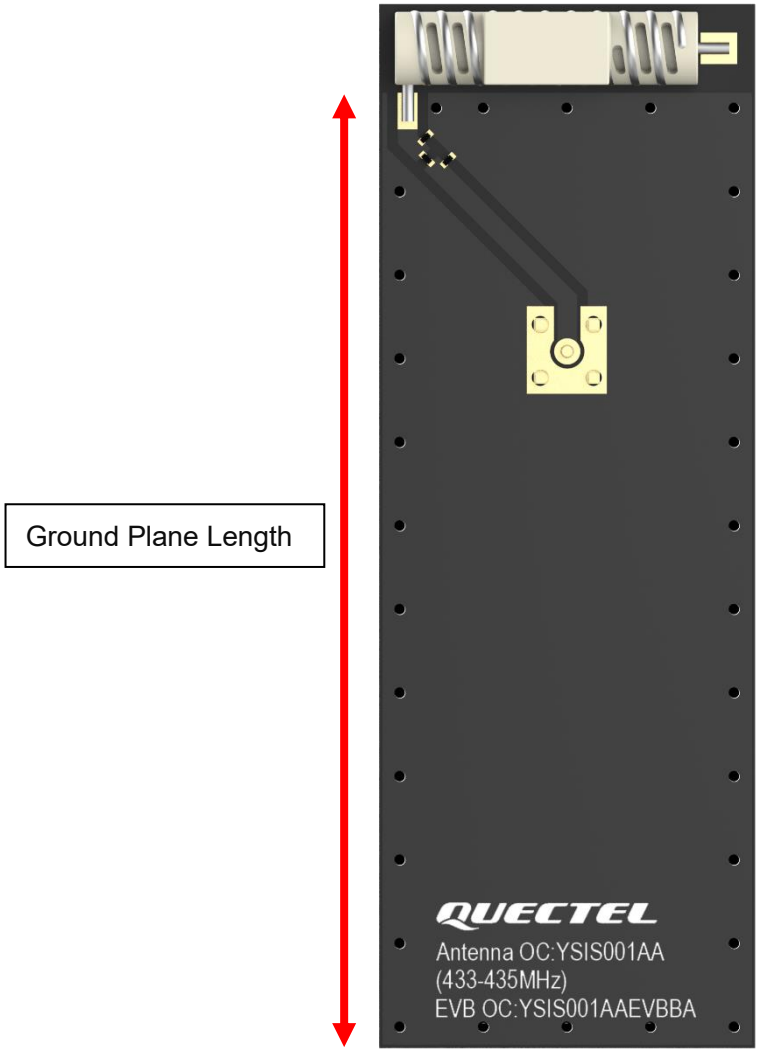


All dimensions in (mm)

3 Detailed Performance

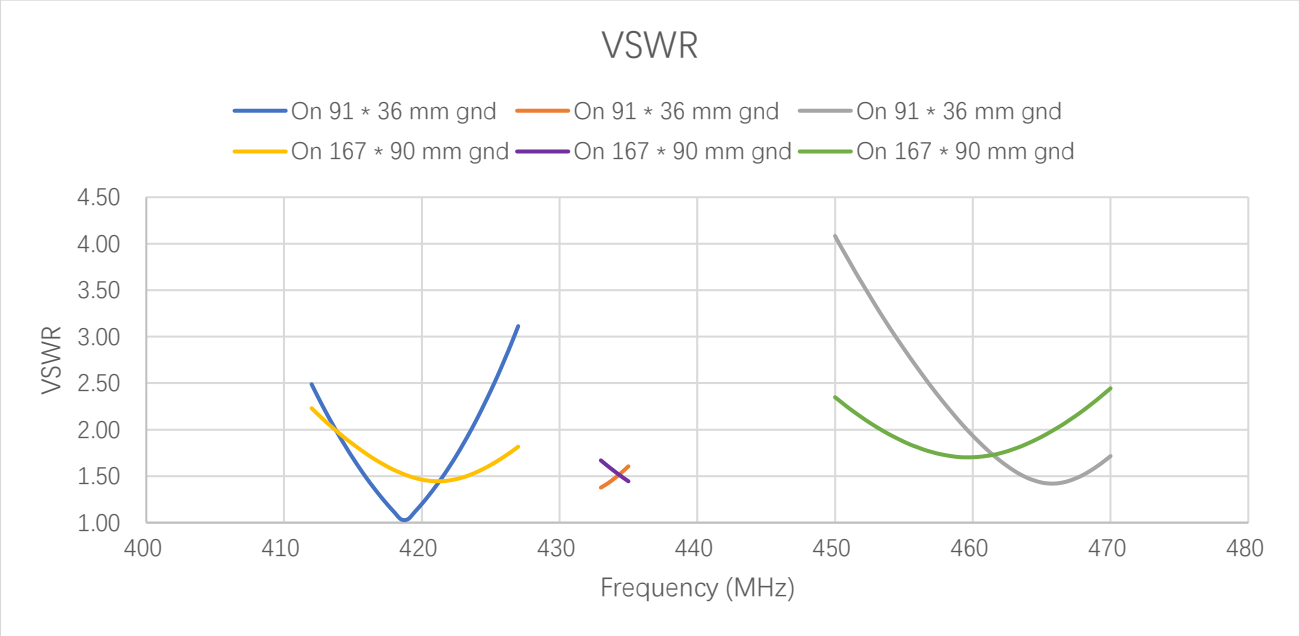
3.1. Overview

The performance of the 433 bands is highly dependent on the ground plane length. The host PCB ground needs to be as long as the device allows. Reducing the GND directly relates to the performance of the 433 bands.



3.2. S-Parameter Test

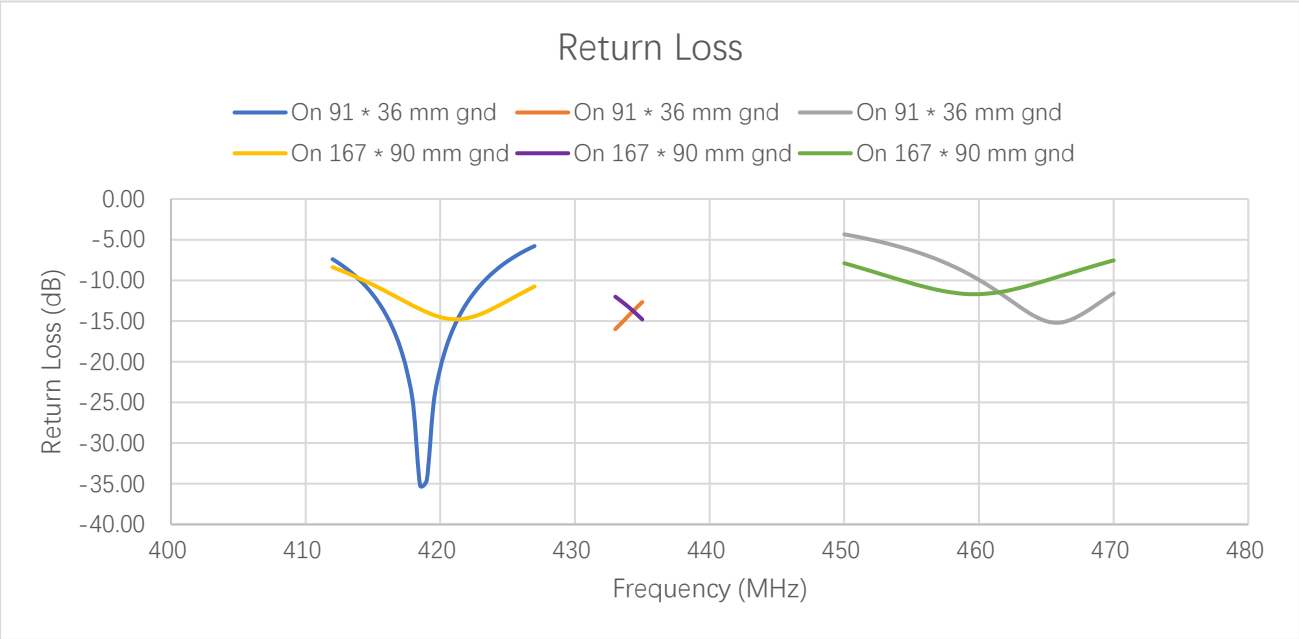
3.2.1. VSWR



VSWR

Frequency (MHz)	412	427	433	435	450	470	490	510	860	870
On 91 × 36 mm GND	2.5	3.1	1.4	1.6	4.1	1.7	-	-	-	-
On 167 × 90 mm GND	2.2	1.8	1.7	1.4	2.4	2.4	-	-	-	-

3.2.2. Return Loss

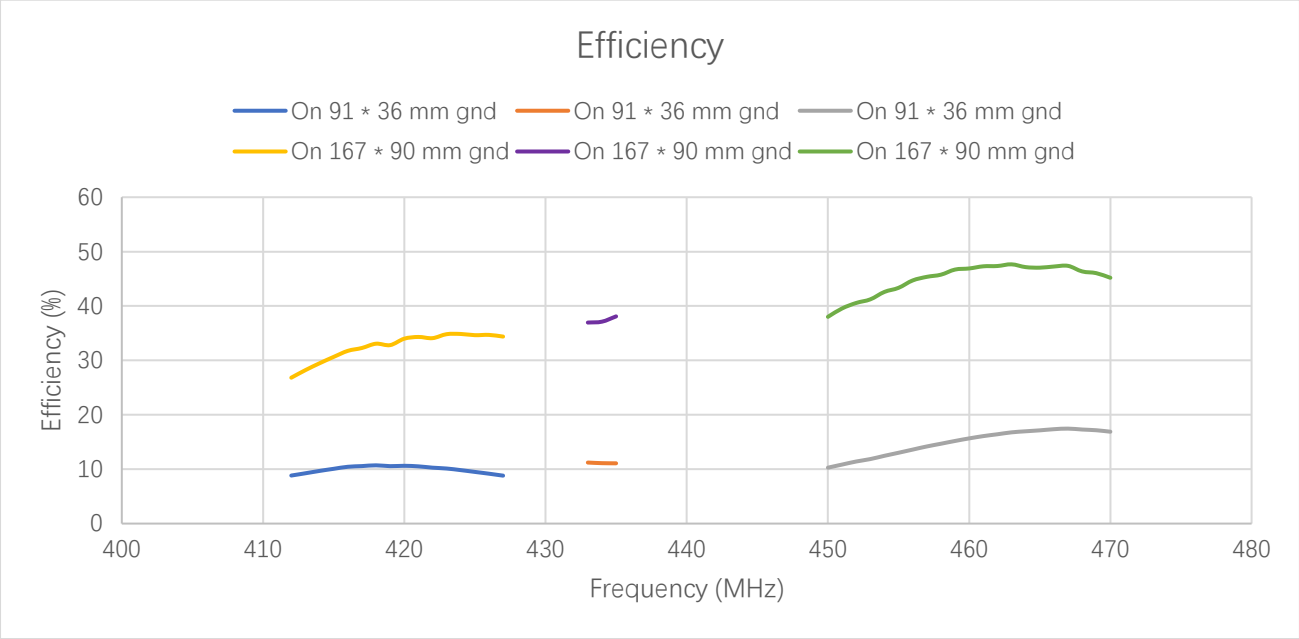


Return Loss (dB)

Frequency (MHz)	412	427	433	435	450	470	490	510	860	870
On 91 × 36 mm GND	-7.4	-5.8	-16.0	-12.7	-4.3	-11.6	-	-	-	-
On 167 × 90 mm GND	-8.4	-10.8	-12.0	-14.8	-7.9	-7.6	-	-	-	-

3.3. Radiation Performance Test

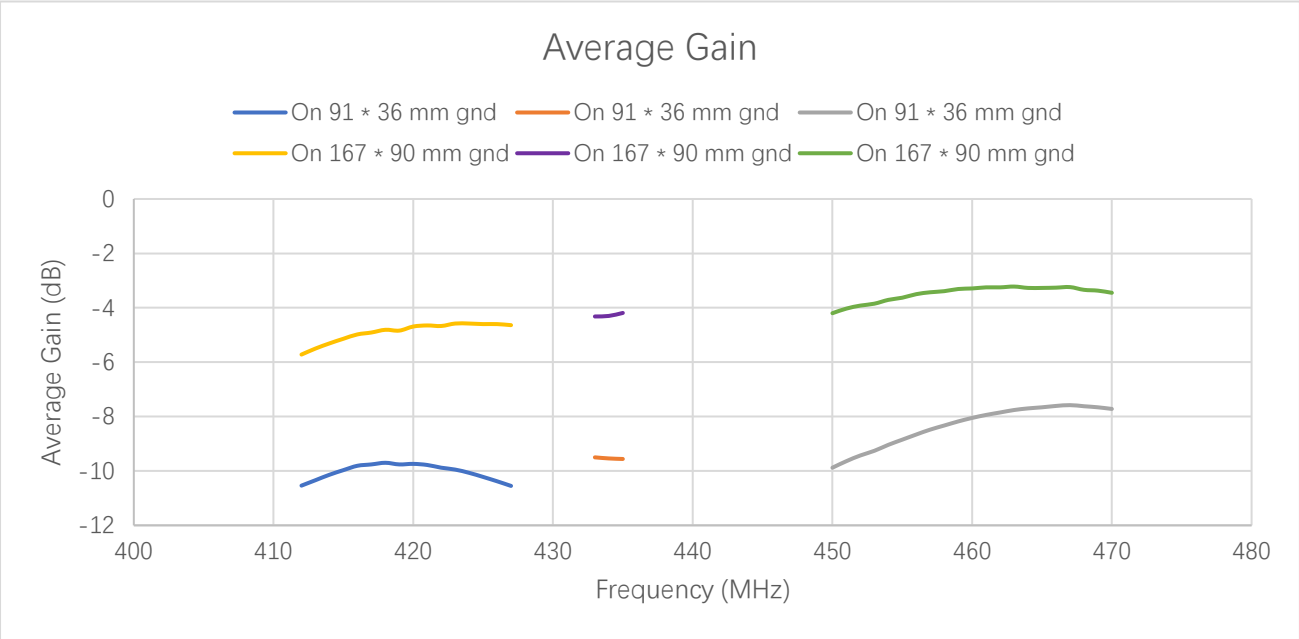
3.3.3. Efficiency



Efficiency (%)

Frequency (MHz)	412	427	433	435	450	470	490	510	860	870
On 91 × 36 mm GND	8.8	8.8	11.2	11.1	10.3	16.9	-	-	-	-
On 167 × 90 mm GND	26.8	34.4	37.0	38.1	38.0	45.2	-	-	-	-

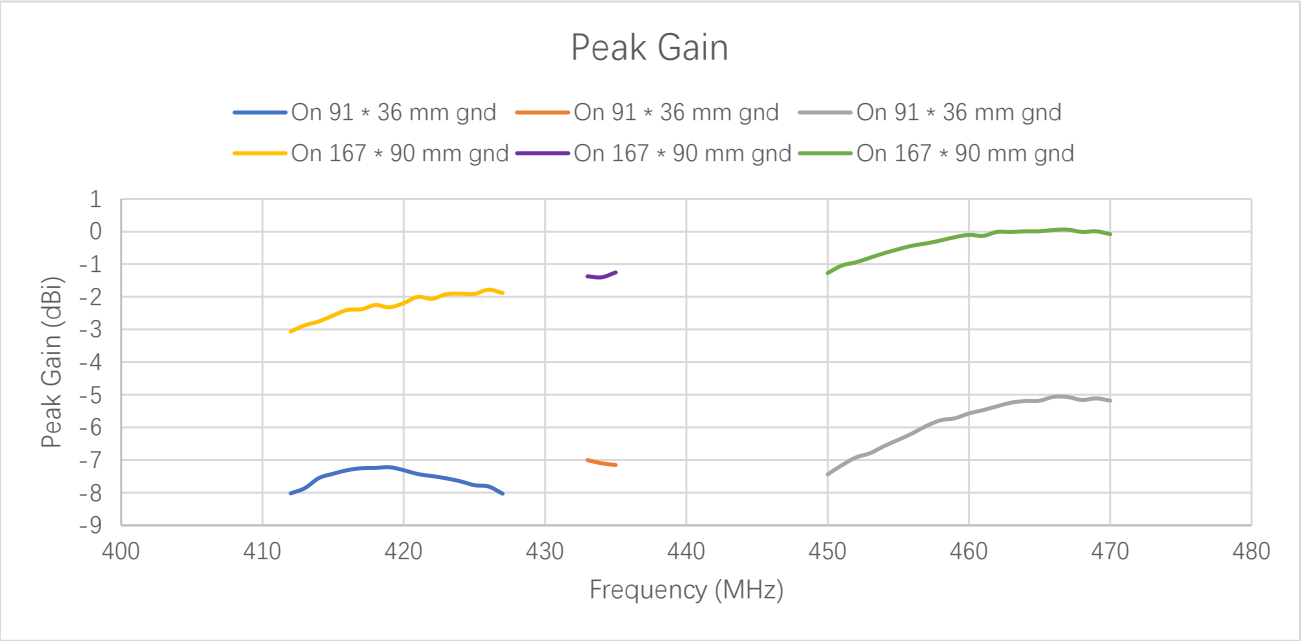
3.3.4. Average Gain



Average Gain (dB)

Frequency (MHz)	412	427	433	435	450	470	490	510	860	870
On 91 × 36 mm GND	-10.5	-10.6	-9.5	-9.6	-9.9	-7.7	-	-	-	-
On 167 × 90 mm GND	-5.7	-4.6	-4.3	-4.2	-4.2	-3.5	-	-	-	-

3.3.5. Peak Gain

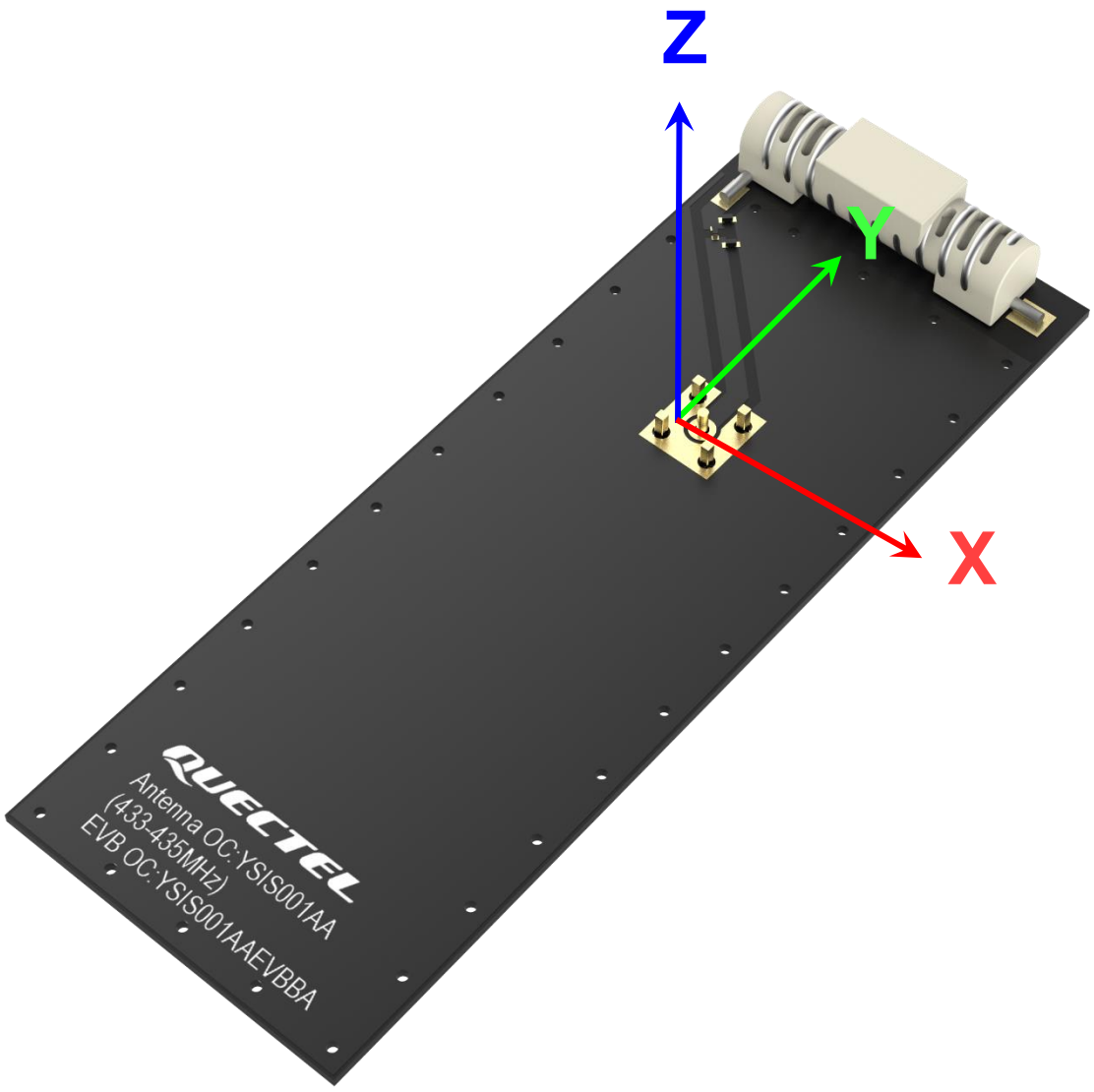


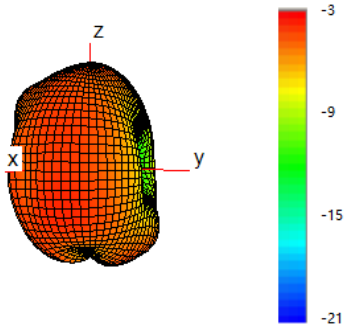
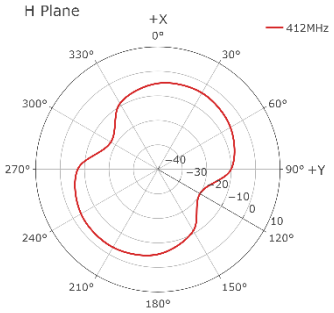
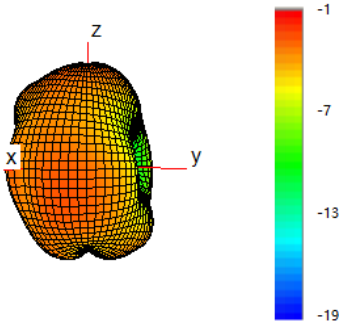
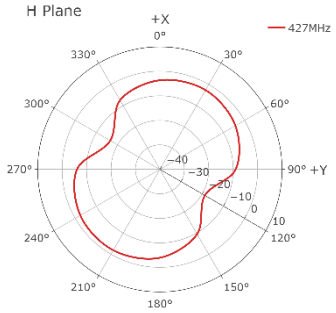
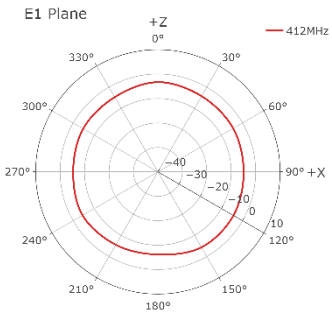
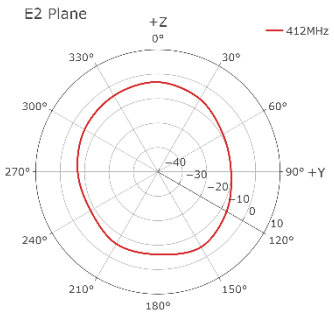
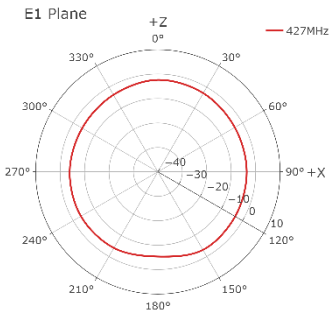
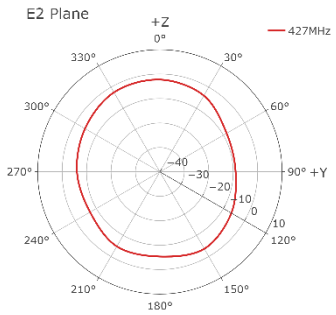
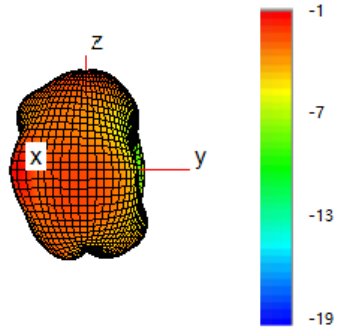
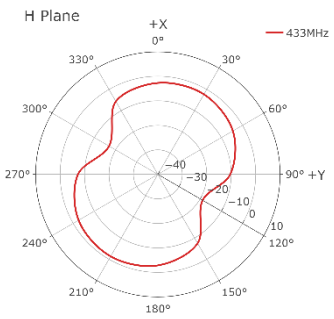
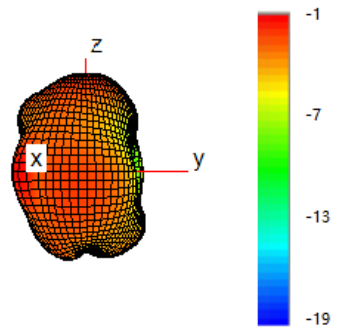
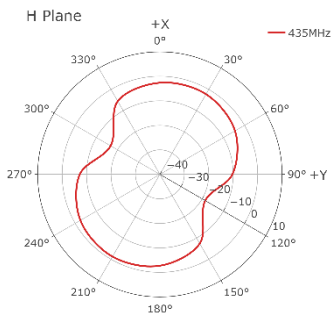
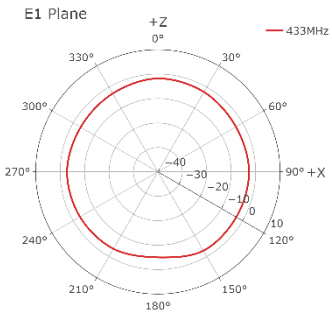
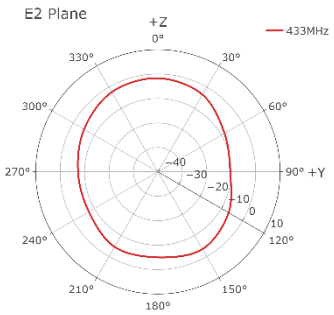
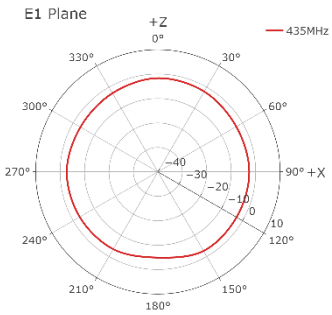
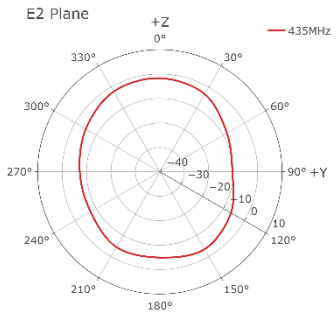
Peak Gain (dBi)

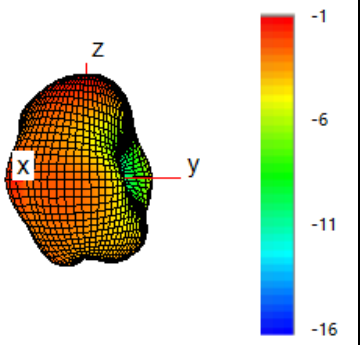
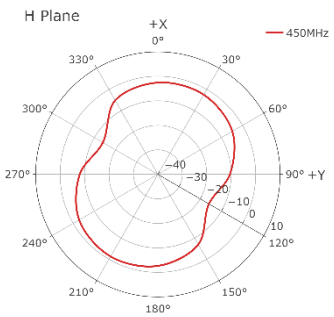
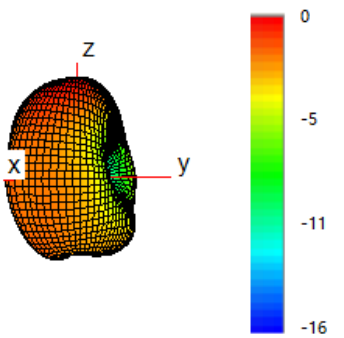
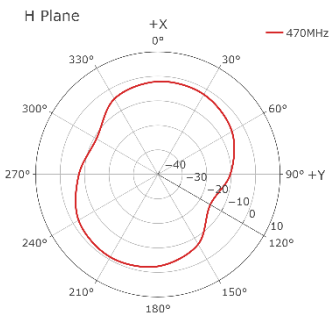
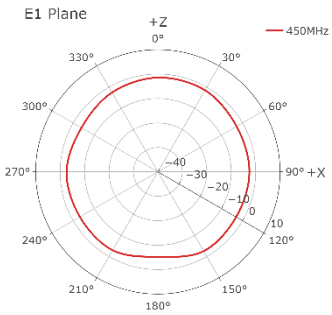
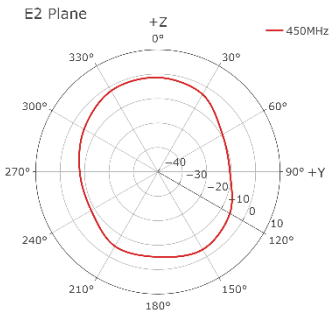
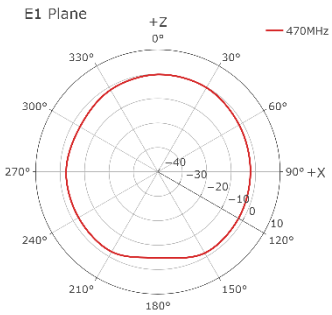
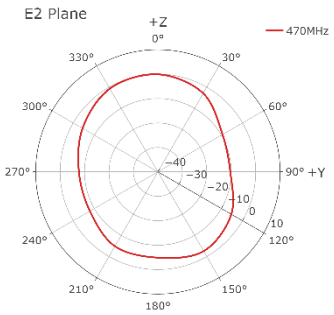
Frequency (MHz)	412	427	433	435	450	470	490	510	860	870
On 91 × 36 mm GND	-8.0	-8.0	-7.0	-7.2	-7.4	-5.2	-	-	-	-
On 167 × 90 mm GND	-3.1	-1.9	-1.4	-1.3	-1.3	-0.1	-	-	-	-

3.3.6. 3D & 2D Radiation Pattern

- Test Status: Assembled on 91 × 36 × 1 mm GND



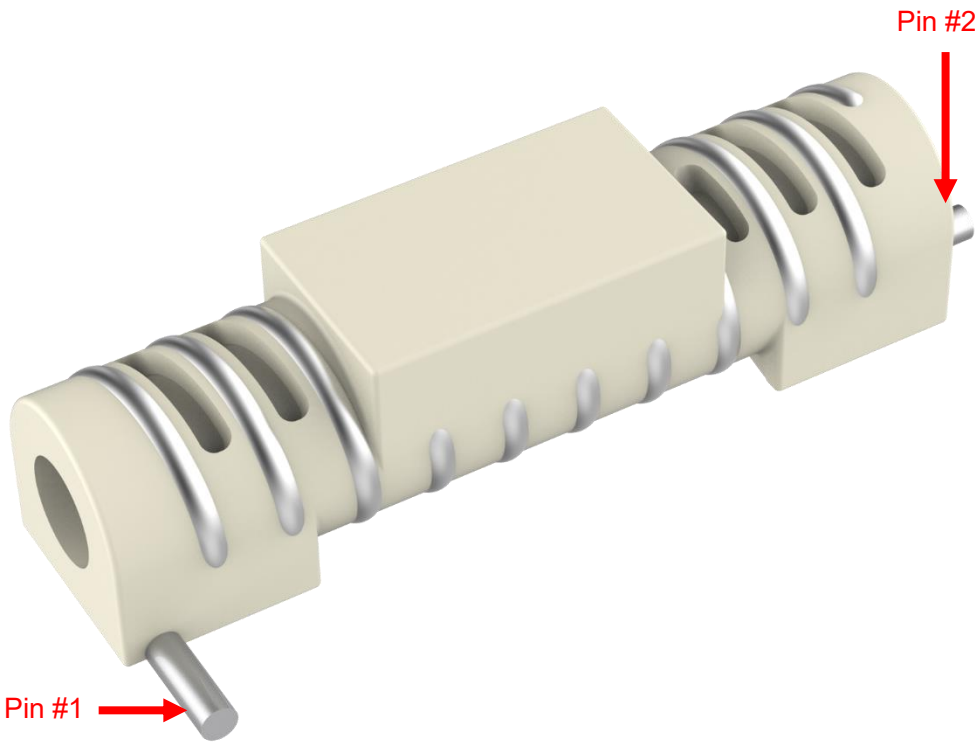
412 MHz		427 MHz	
			
			
433 MHz		435 MHz	
			
			

450 MHz		470 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 2 pins, only one of which work. All other pins are for mechanical strength.

Pin	Description
1	Feed
2	Not used (Mechanical only)



5 Transmission Line

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

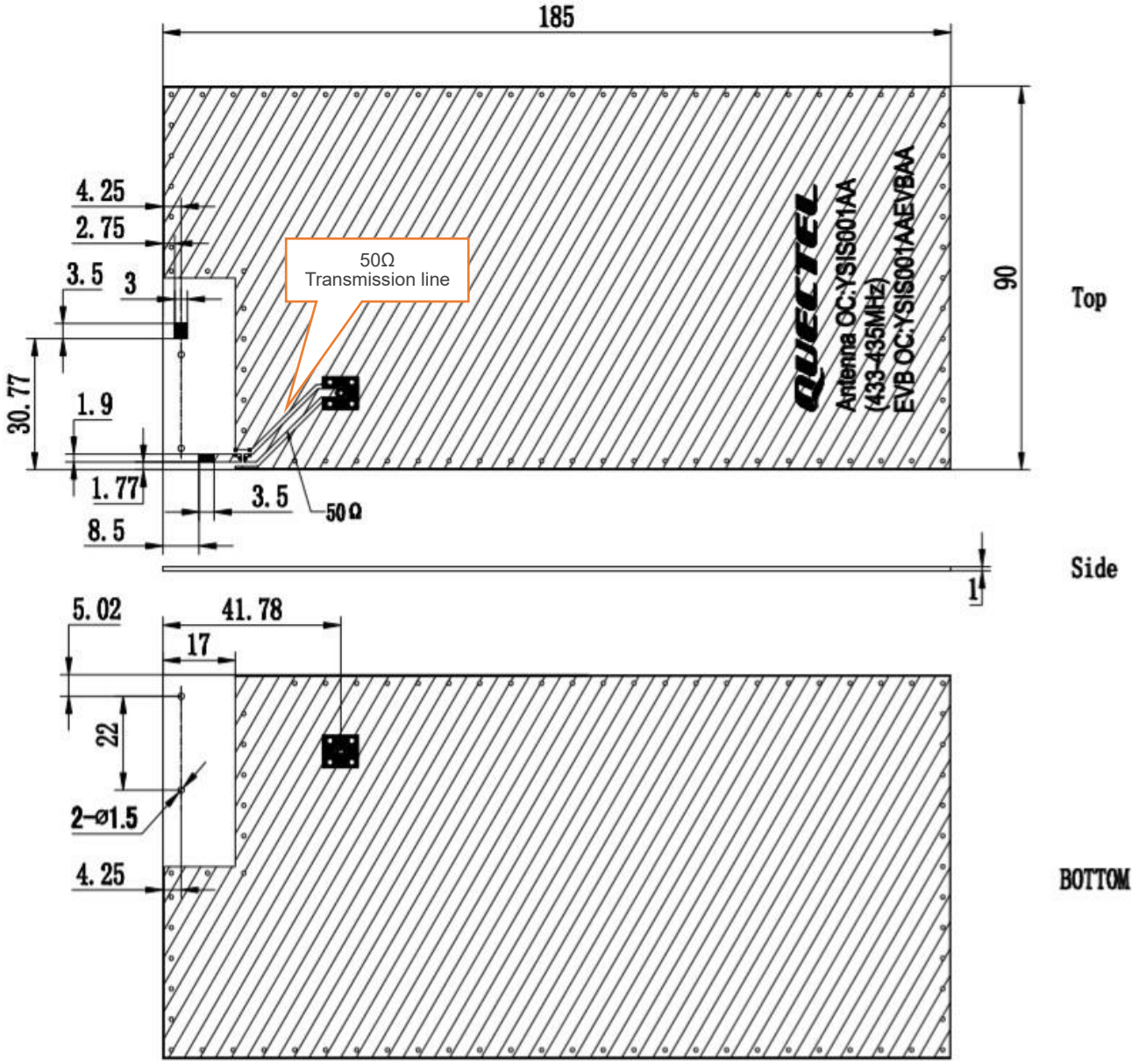
- The length of the transmission lines should be kept as short as possible.
- Any other part of the RF system, such as transceiver, power amplifiers, etc., shall also be designed with an impedance of 50 Ω.

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

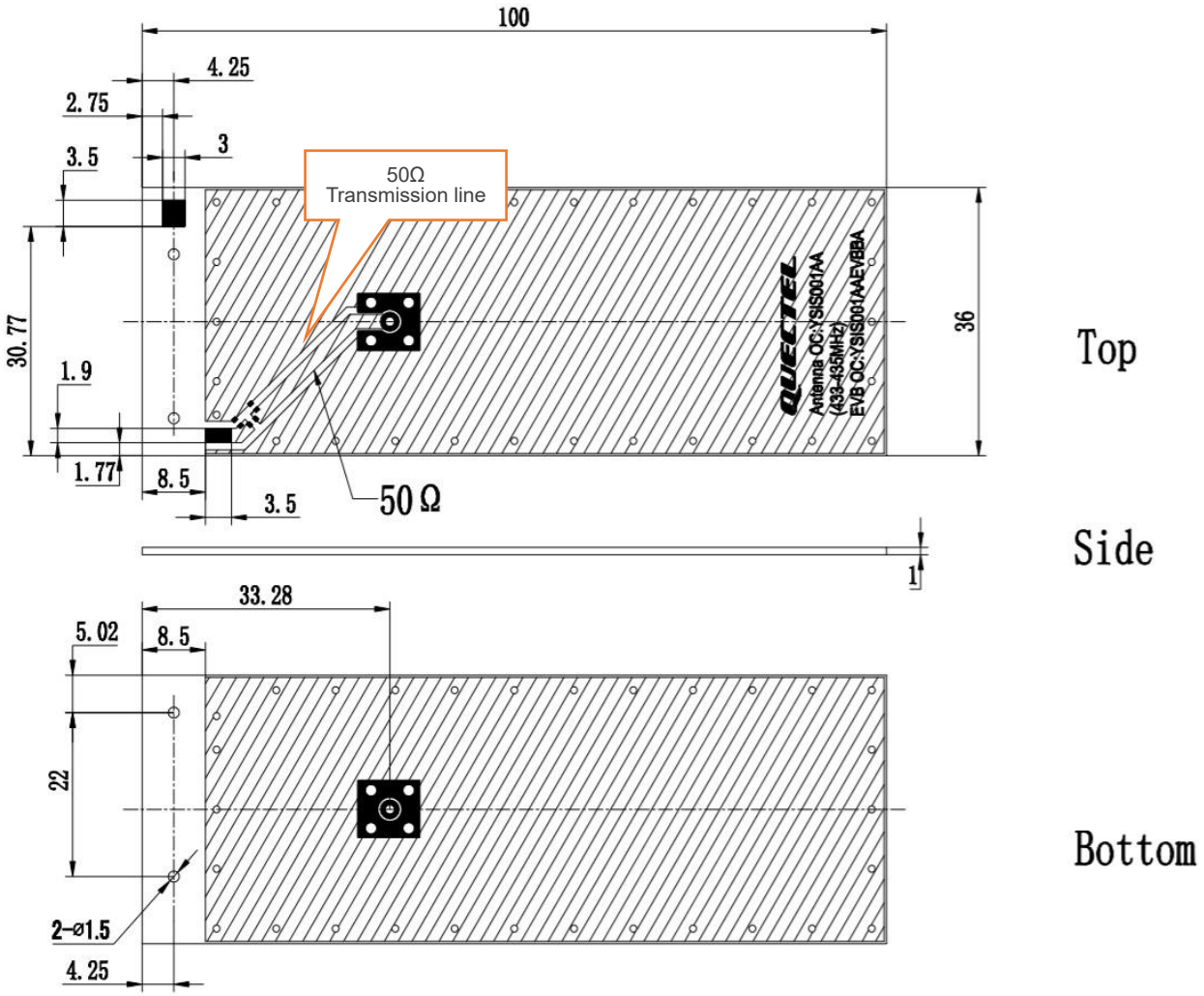
The host PCB must be designed using the PCB footprint shown with the correct clearances. An example of the PCB layout shows the antenna footprint. Please note this clearance area is critical to the performance of the antenna and must be applied through all layers of the PCB.

- YSIS001AAEVBAA



All dimensions in (mm)

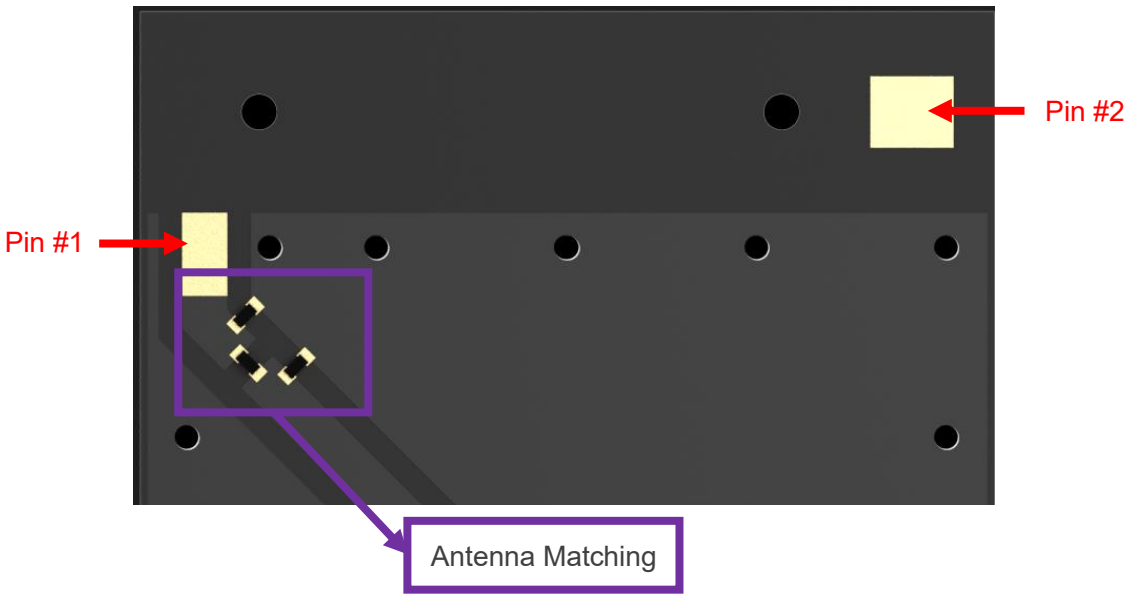
- YSIS001AAEVBBA

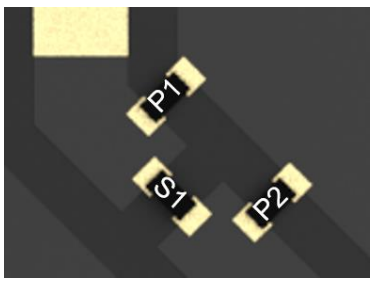


All dimensions in (mm)

7 Matching Circuit

Demo Board Top View





Pads are directly connected to the antenna feed trace.

GND Length = 91 × 36 mm

412-427 MHz	P1	S1	P2			
Default Matching	DNI	22 nH	6.2 nH			
Tolerance	N/A	±3 %	±3 %			

GND Length = 91 × 36 mm

433-435 MHz	P1	S1	P2			
Default Matching	DNI	18 nH	6.8 nH			
Tolerance	N/A	±3 %	±3 %			

GND Length = 91 × 36 mm

450-470 MHz	P1	S1	P2			
Default Matching	DNI	6.8 nH	6.8 nH			
Tolerance	N/A	±3 %	±3 %			

GND Length = 167 × 90 mm

412-427 MHz	P1	S1	P2			
Default Matching	DNI	39 nH	10 nH			
Tolerance	N/A	±3 %	±3 %			

GND Length = 167 × 90 mm

433-435 MHz	P1	S1	P2			
Default Matching	DNI	33 nH	9.1 nH			
Tolerance	N/A	±3 %	±3 %			

GND Length = 167 × 90 mm

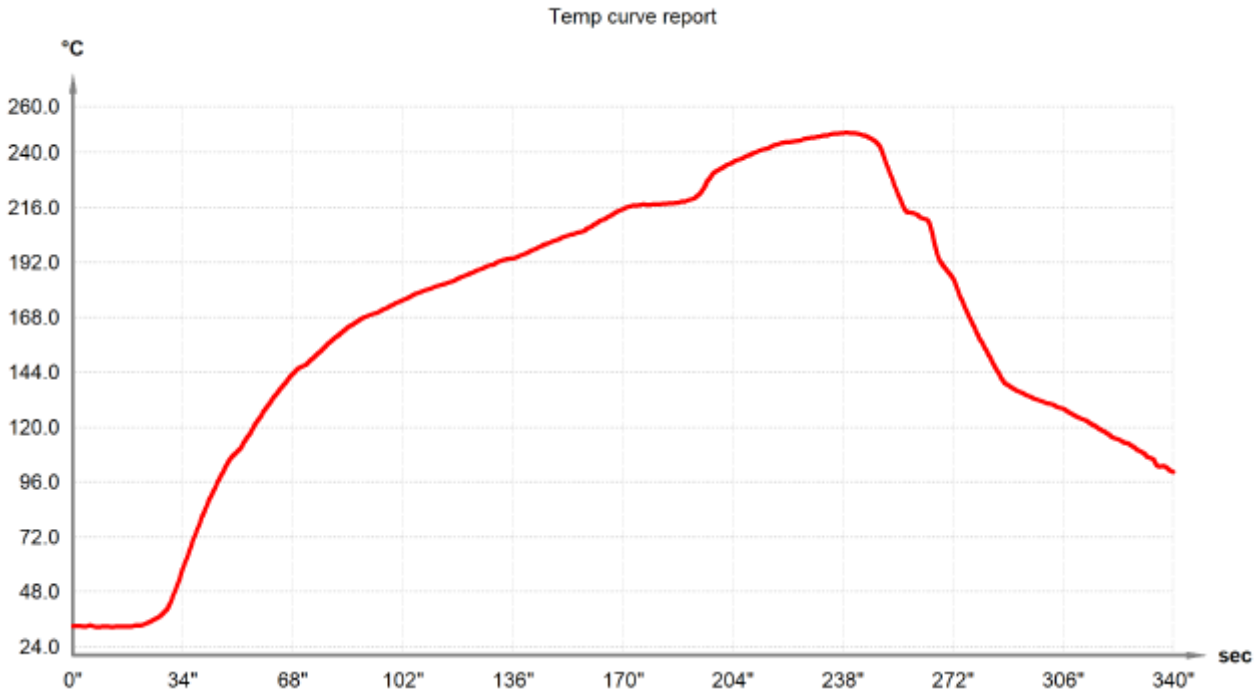
450-470 MHz	P1	S1	P2			
Default Matching	DNI	22 nH	10 nH			
Tolerance	N/A	±3 %	±3 %			

Pin #	Description
1	Feed
2	Not used (Mechanical only)

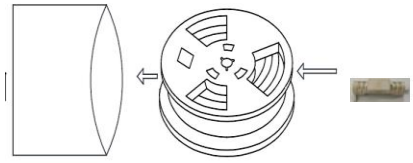
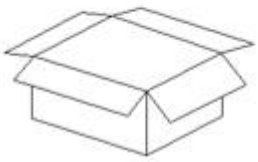
8 Soldering Temperature

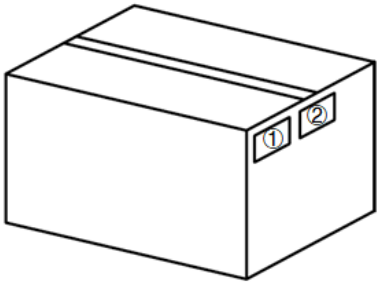
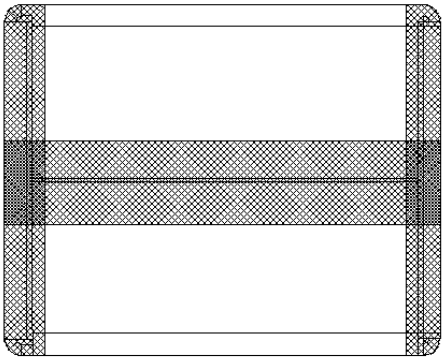
Channels	Name	Heating time 150.0-200.0°C	Above temp 217.0°C	Top temp	Heating slope 150.0-180.0°C	Cooling slope 180.0-150.0°C
1	Pin1	73"	82"	248.7	0.97	-2.92
Refrence value		70.0-95.0s	70.0-90.0s	240.0-250.0°C	0.0-3.0°C/s	-4.0--1.0°C/s

9 Reflow Profile



10 Packaging

Step	Packaging Picture / 2D Picture	Description
1		Product drawing
2		300 antenna products in a reel. The product is vacuumed in a vacuum bag.
3	 	4 Vacuum Bags / Carton Box (1200 PCS / Carton Box) Carton Size: L × W × H = 345 × 345 × 280 mm

4		**Position for Attaching Labels** ① Carton Label ② Quality Label
5		**Sealing Cartons** "工" type sealing cartons

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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Or our local offices. For more information, please visit:
http://www.quectel.com/support/sales.htm.

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Revision History

Version	Date	Author	Note
-	2023-06-09	Mordecai LIU/ Jason LONG/ David LIU/ Bunny ZHANG	Creation of the document
1.0	2023-06-09	Mordecai LIU/ Jason LONG/ David LIU/ Bunny ZHANG	First official release

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