Antenna

YC0001AA Datasheet

Antenna Services

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About the Document

Revision History

Version	Date	Author	Note
1.0	2020-05-28	Kenny YIN	Initial
2.0	2020-06-22	Kenny YIN	Updated the specifications.
2.1	2020-12-11	Kenny YIN	Updated the antenna image in Chapter 2.
2.2	2021-01-27	Kenny YIN	Added the return loss data, pattern laboratory pictures, package parameters.
2.3	2021-03-17	Kenny YIN	Updated the product height tolerance (Chapter 12).
2.4	2021-07-12	Aria CHU	Updated the drawing in Chapter 12.
2.5	2021-12-06	Aria CHU	Updated the product description in Chapter 1.

Contents

1 Product Description

This Quectel embedded 4G FPC antenna covers main 4G LTE bands and is compatible with 3G/2G/LPWA bands. Featuring high efficiency and gain, it is an ideal antenna for a smooth and stable connection with high-efficiency data transmission even under the influence of the device's internal structure. Ground plane independent, it's designed to be mounted directly to the underside of either a plastic or non-metallic enclosure. Ease of integration with a cable and connector which can be customized to meet your product design and RF module.

2 Product Features

- Cellular LTE
- High efficiency
- Excellent performance

3 Product Specifications

Passive Electrical Specifications	
Frequency Range	698–960 MHz, 1710–2690 MHz
Input Impendence	50 Ω
VSWR	≤ 4.0
Gain	≤ 3.0 dBi
Polarization Type	Linear
Mechanical Specifications	
Antenna Size	35.0 mm (L) × 8.5 mm (W) × 3.0 mm (H)
Carrier	FR4
Connector Type	SMD
Working Temperature	-40 °C to +85 °C
Radome Color	Black

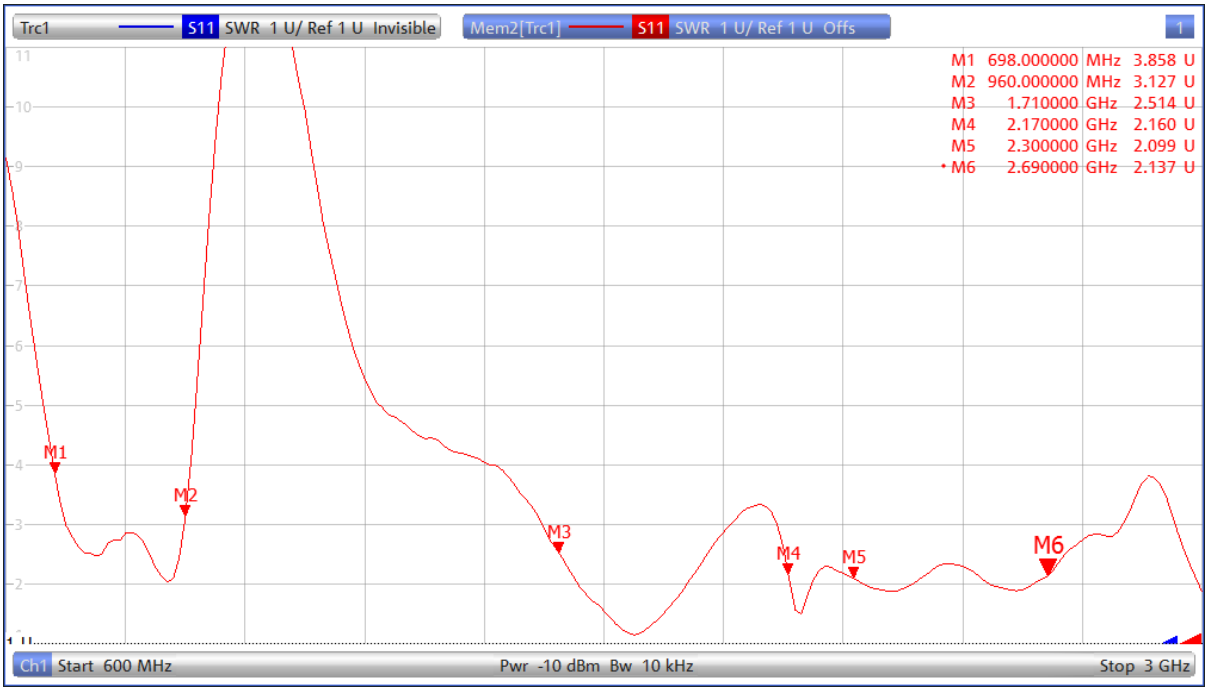
4 Overall Performance

4.1. Test Environment

- KEYSIGHT VNA Network Analyzer E5063A 100 kHz – 6.5 GHz.
- RayZone®2800 Chamber 5G (FR1) SISO/MIMO, 400 MHz – 6.0 GHz.

4.2 VSWR

- Board length 110 mm



Frequency (MHz)	698	960	1710	2170	2300	2690
VSWR	3.85	3.12	2.51	2.16	2.09	2.13

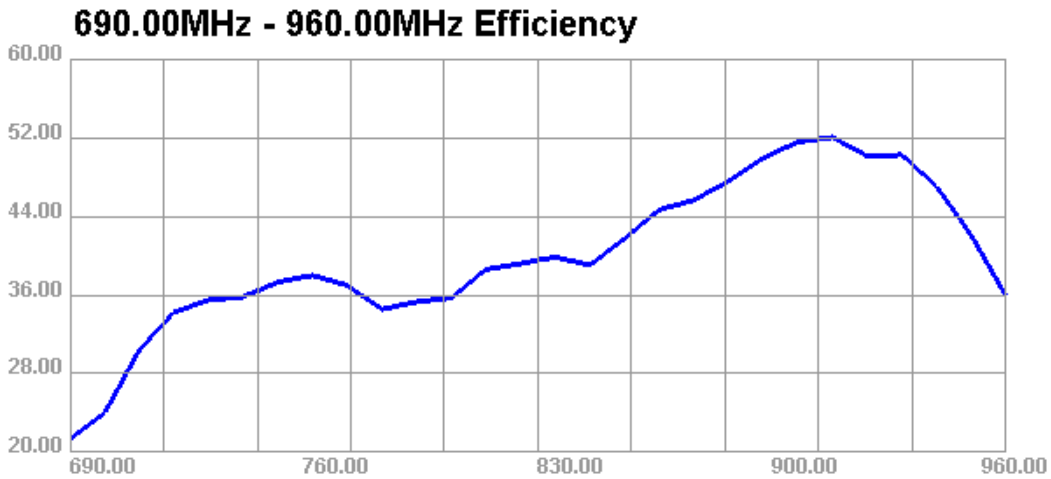
4.3 Return Loss

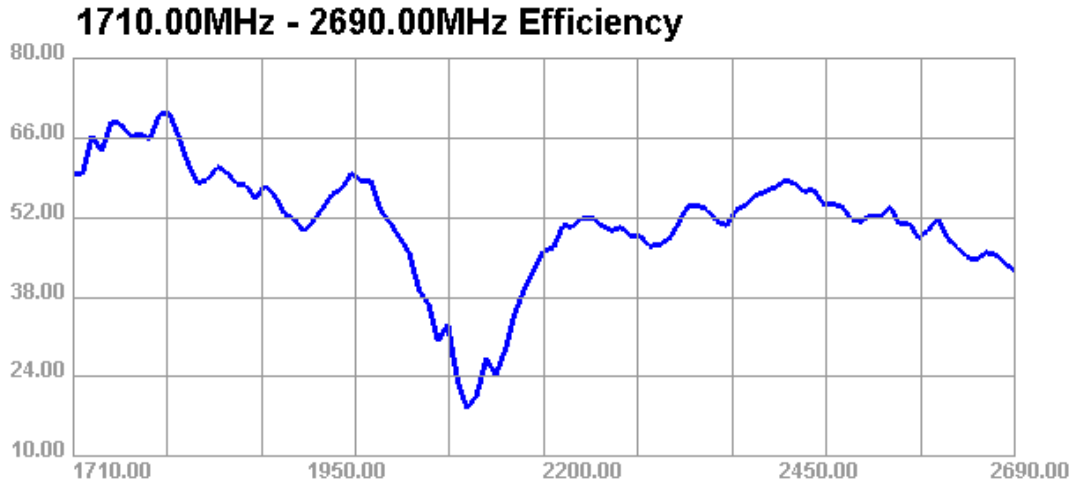
- Board length 110 mm

Frequency (MHz)	698	960	1710	2170	2300	2690
Return Loss	-4.54	-4.99	-13.12	-6.50	-14.55	-9.46

4.4 Efficiency

- Board length 110 mm

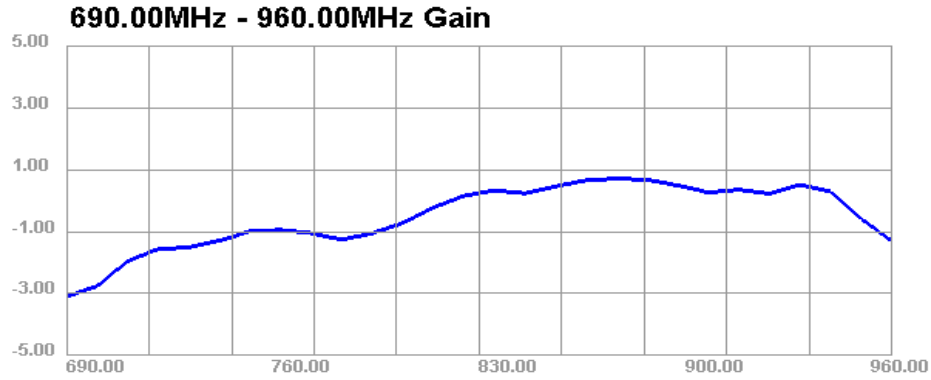


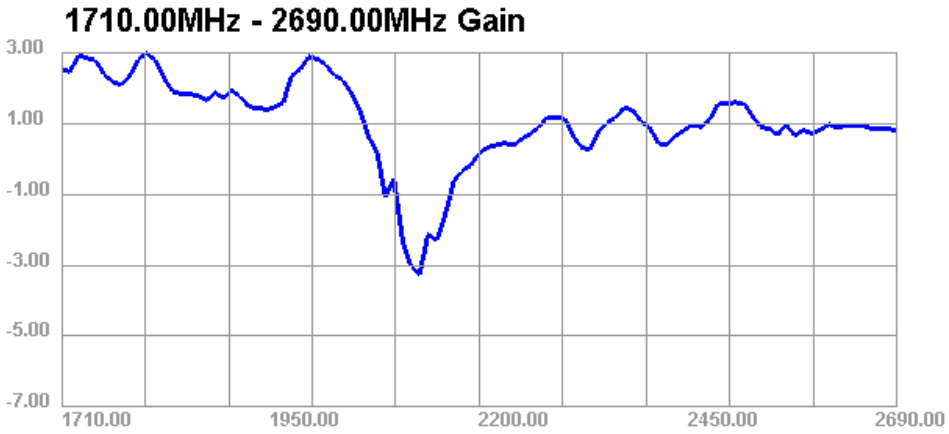


Frequency (MHz)	698	960	1710	2170	2300	2690
Efficiency (%)	21.4	36.0	59.8	35.3	48.8	42.7

4.5 Gain

- Board length 110 mm

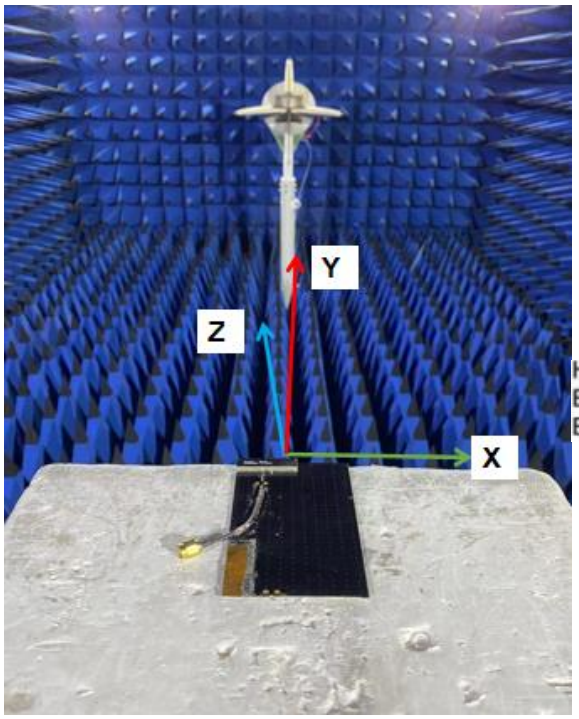




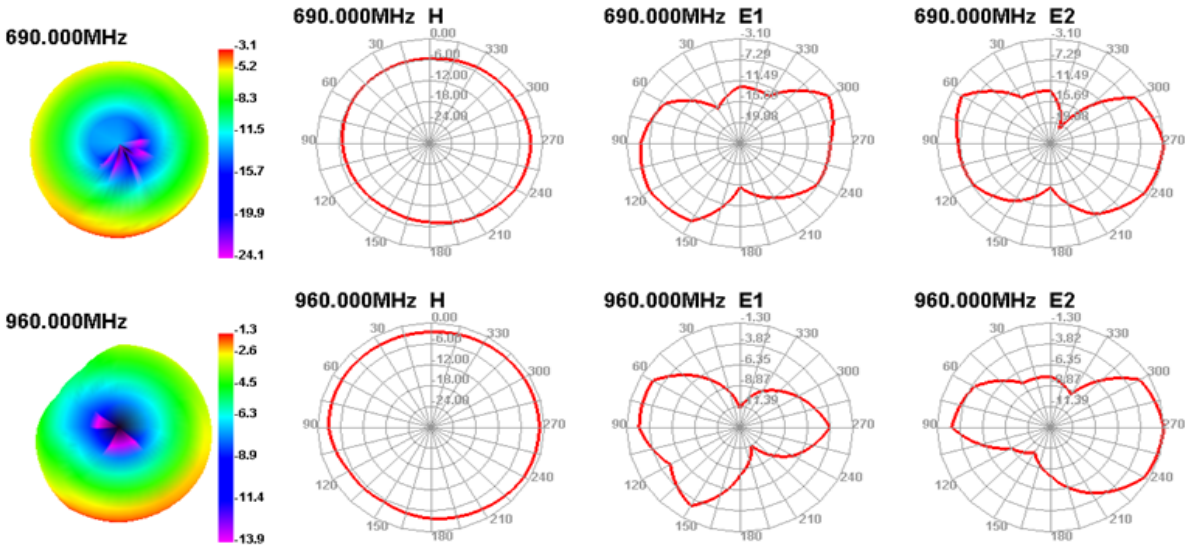
Frequency (MHz)	698	960	1710	2170	2300	2690
Gain (dBi)	-2.73	-1.20	1.97	-1.54	1.33	0.95

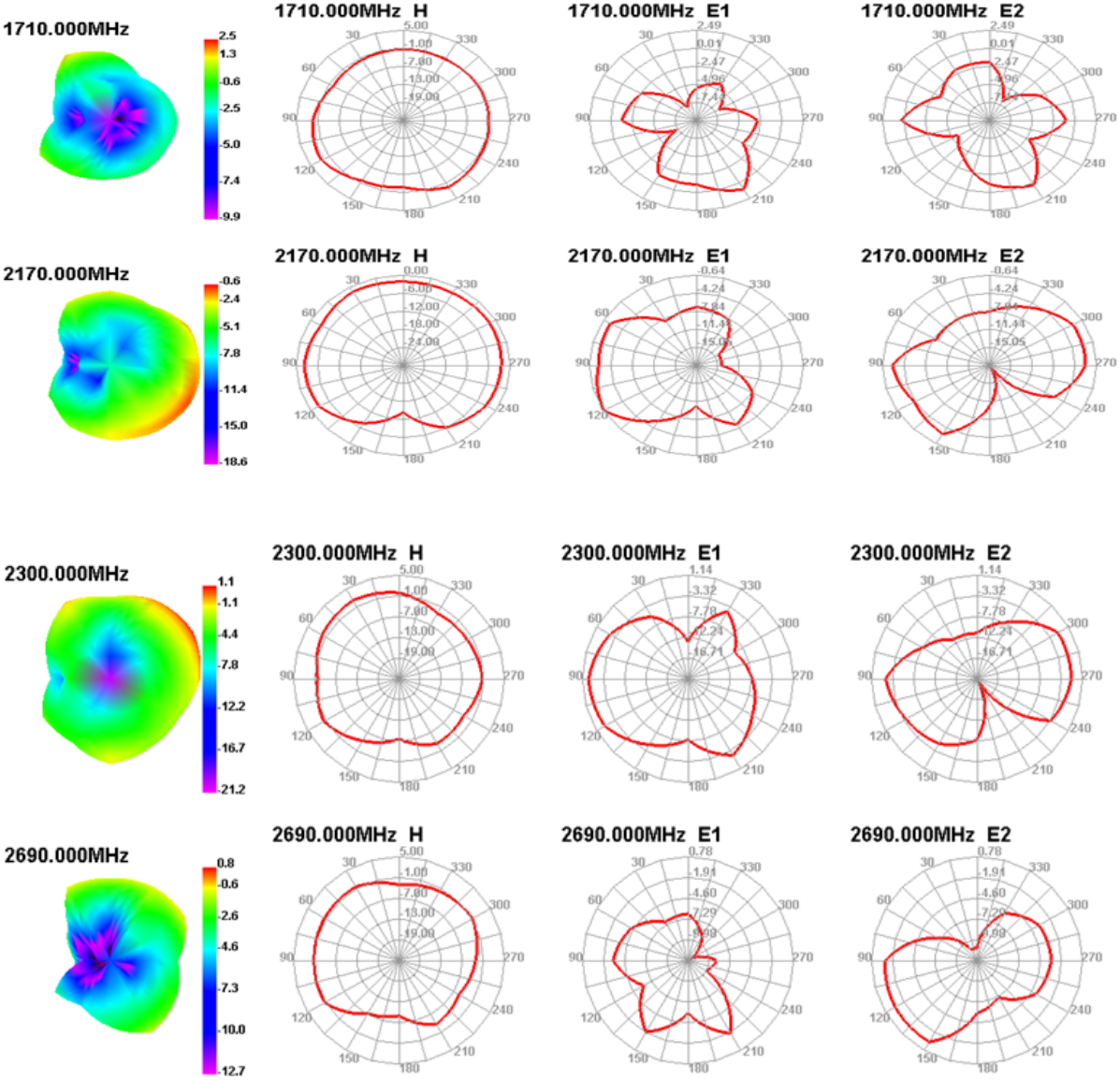
4.6 Radiation Patterns

- Board length 110 mm



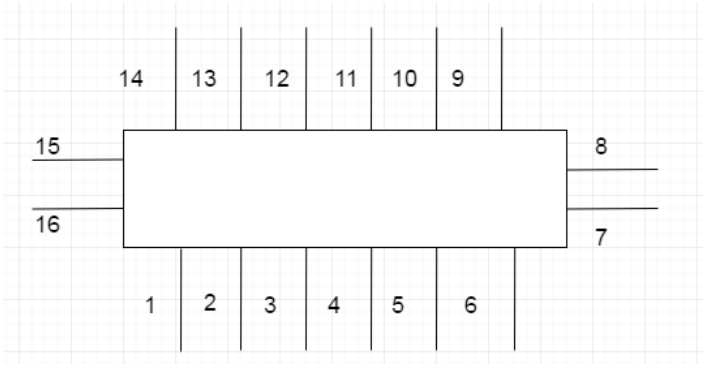
H plane: the tangent of XY
E1 plane: the tangent of XZ
E2 plane: the tangent of YZ




1710.000MHz
2.5
1.3
-0.6
-2.5
-5.0
-7.4
-9.9
1710.000MHz H
1710.000MHz E1
1710.000MHz E2
2170.000MHz
-0.6
-2.4
-5.1
-7.8
-11.4
-15.0
-18.6
2170.000MHz H
2170.000MHz E1
2170.000MHz E2
2300.000MHz
1.1
-1.1
-4.4
-7.8
-12.2
-16.7
-21.2
2300.000MHz H
2300.000MHz E1
2300.000MHz E2
2690.000MHz
0.8
-0.6
-2.6
-4.6
-7.3
-10.0
-12.7
2690.000MHz H
2690.000MHz E1
2690.000MHz E2

5 Schematic Symbol and Pin Definition

The pin assignment for the antenna is as follows. The antenna has 16 pins and only two work. All other pins are designed for mechanical strength.

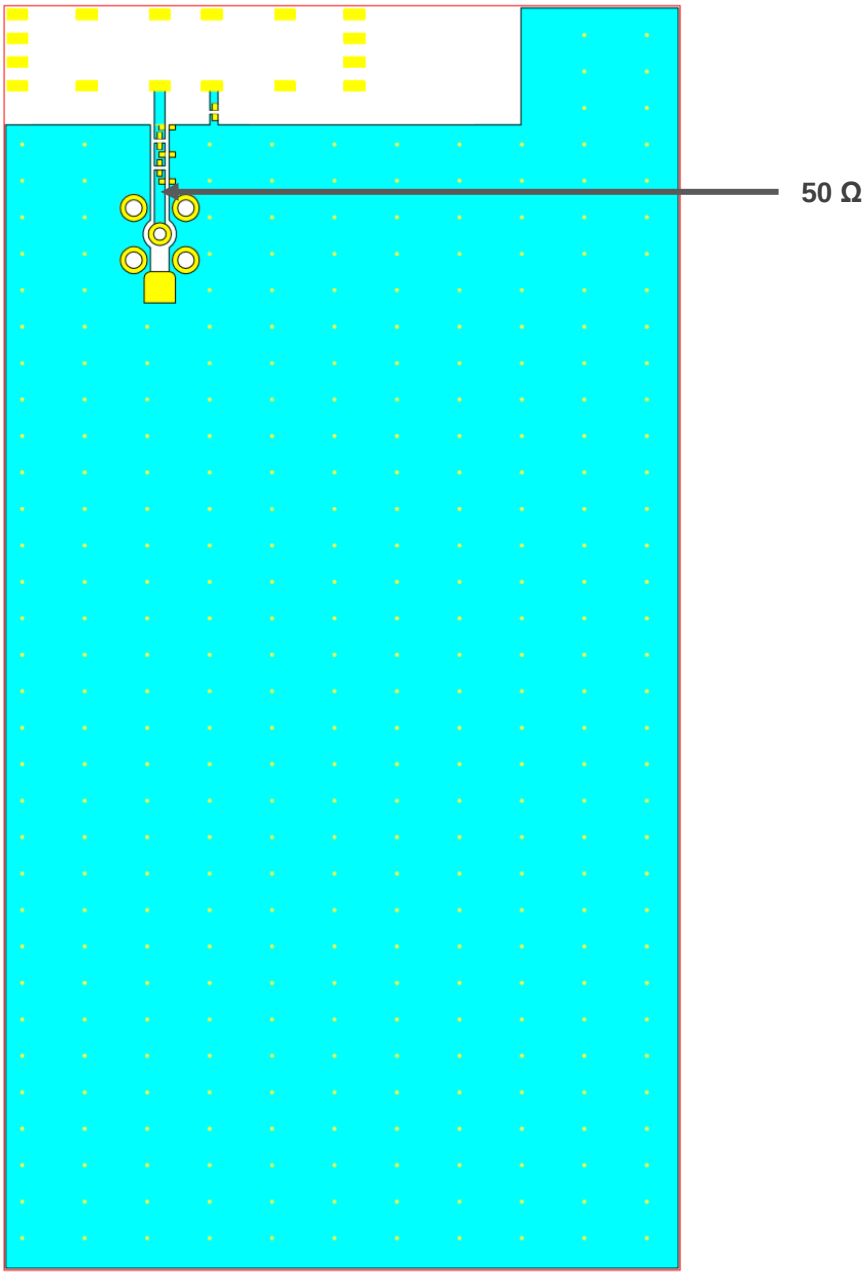


Pin No.	Description
3	Feed
4	Return/GND
1, 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16	Not used (mechanical only)

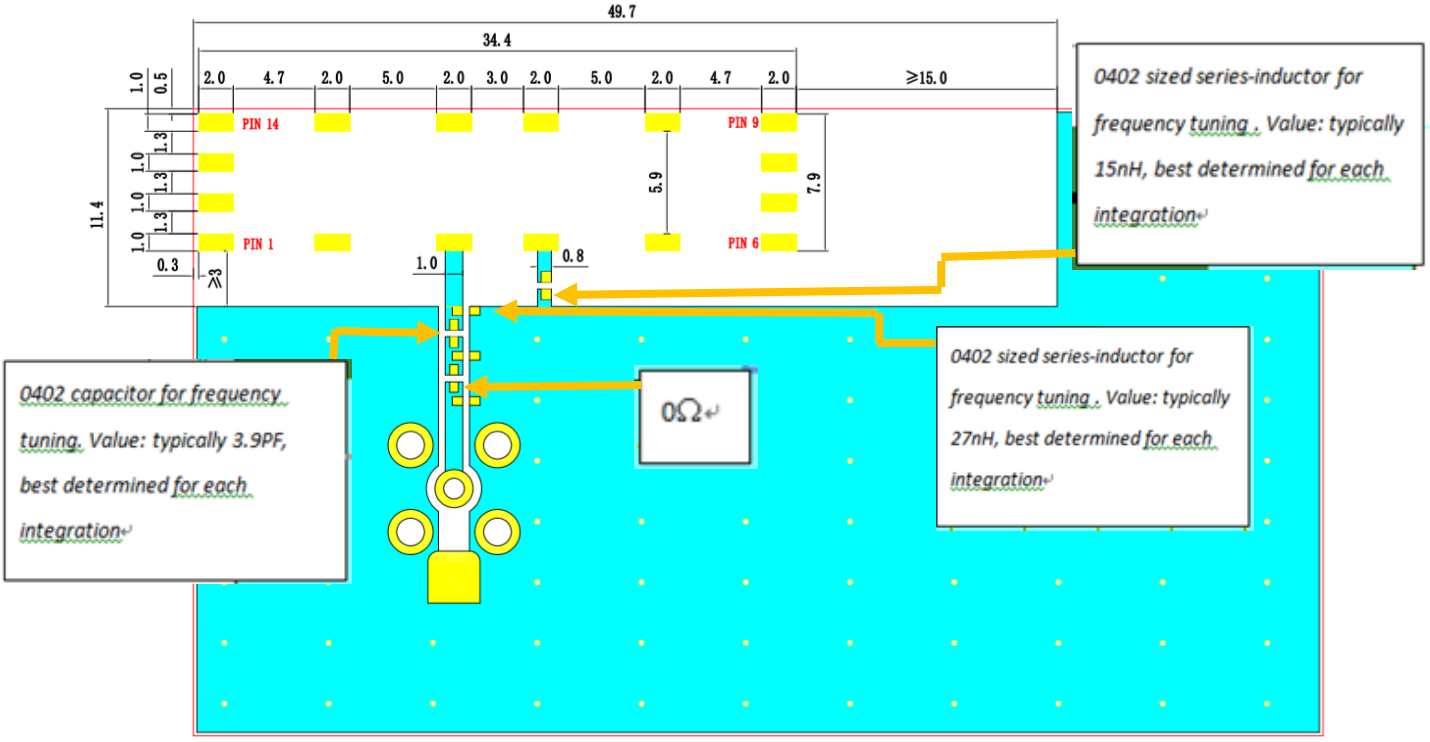
6 Transmission Line

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

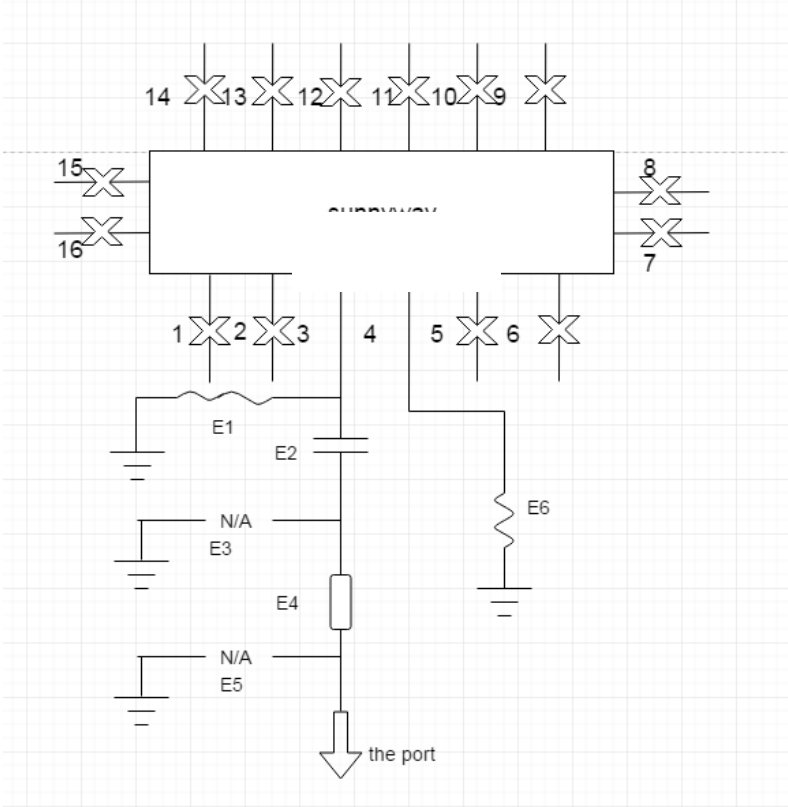
- The length of the transmission lines should be kept to as short as possible.
- Any other part of the RF system, such as transceiver, power amplifiers, etc., shall also be designed with an impedance of 50 Ω.



7 Matching Circuit



The antenna requires a matching circuit that must be optimized for each product. The matching circuit will require up to six components and the following circuit should be designed into the host PCB. Not all components may be required but should be included as a precaution. The matching network must be placed close to the antenna feed to ensure it is more effective in tuning the antenna.

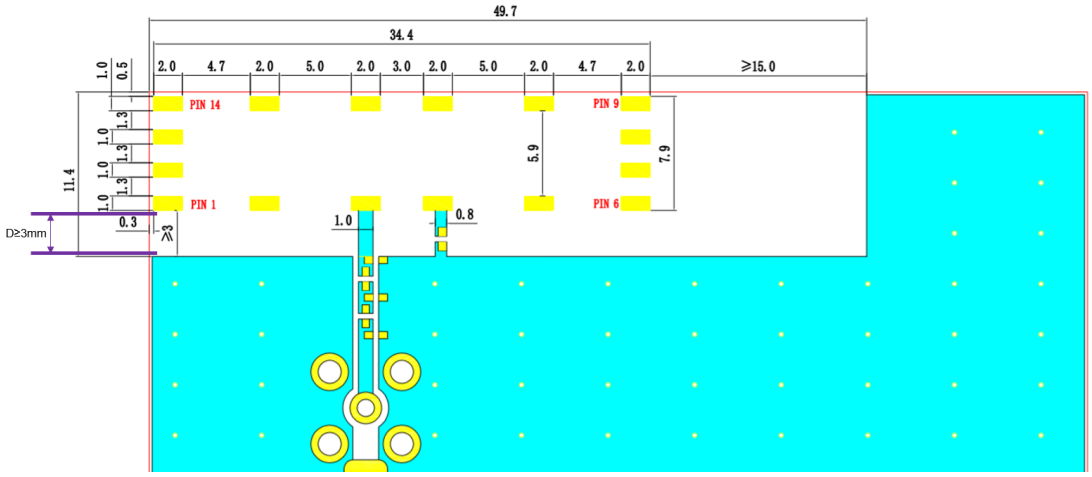


	Type	Value
E1	Inductor	27 nH
E2	Capacitor	3.9 pF
E3	-	-
E4	Capacitance	0 Ω
E5	-	-
E6	Inductor	15 nH

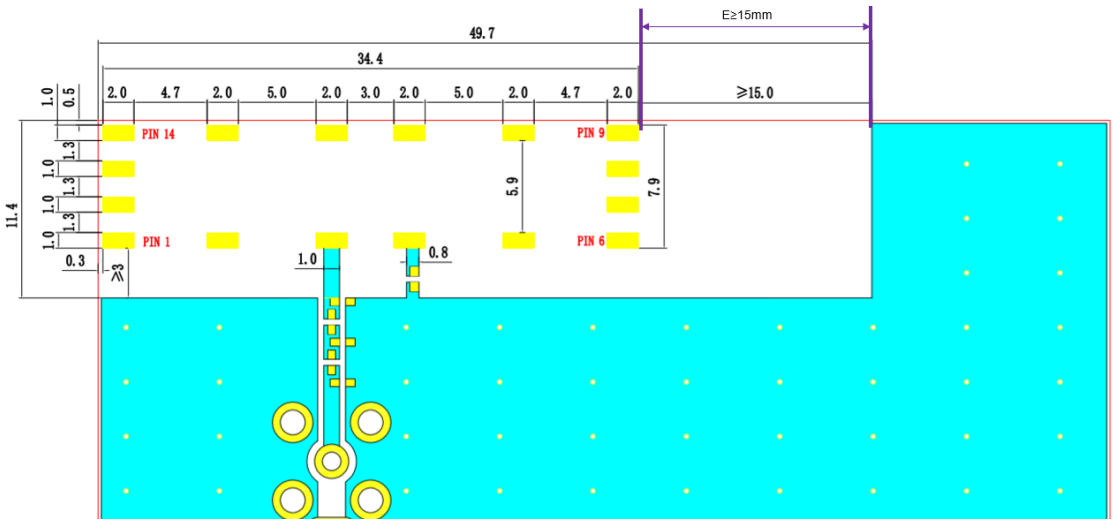
8 Host PCB Requirement

The printed circuit board of the host must ensure that the antenna clearance area meets the antenna specifications. It is suggested that putting the antenna in the corner of the PCB.

An example of a PCB layout shown as below:



Gap D is required from the edge of the antenna to the ground plane. This should be maintained along the edge of the antenna placement, **minimum value is 3 mm**.

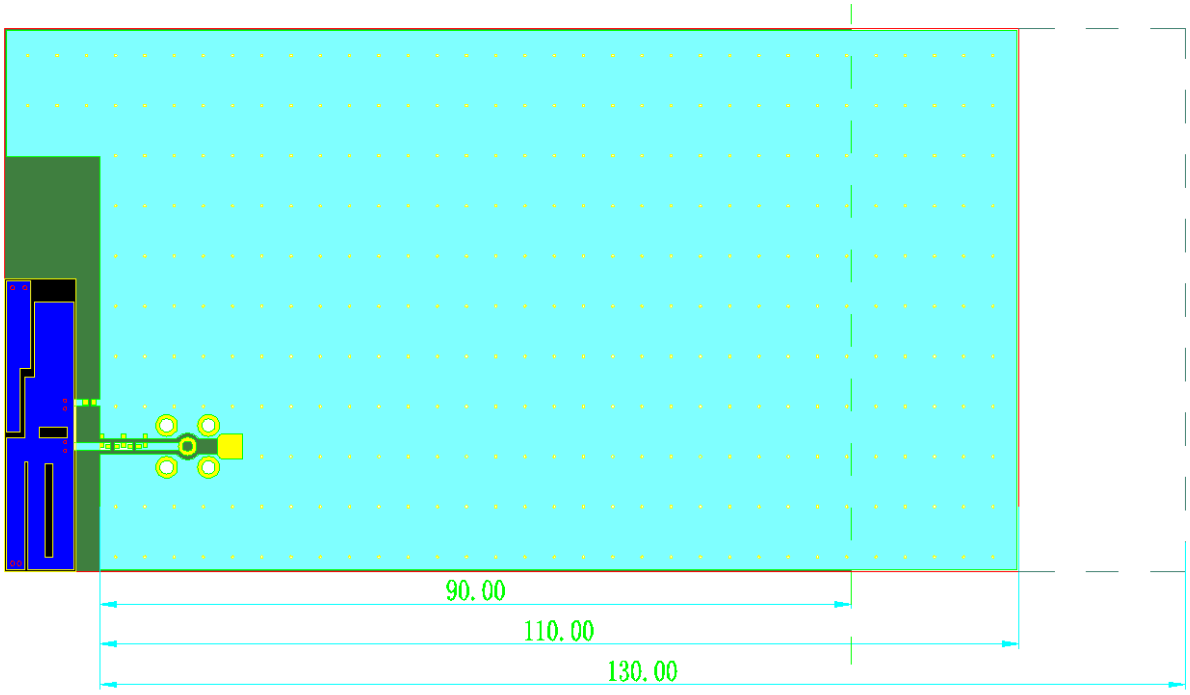


Gap E is required from the edge of the antenna to the ground plane or PCB traces, **minimum value is 15 mm.**

8.1. Host PCB Size

The performance of the low frequency section depends on the length of the ground plane. Reducing GND length will directly impact on the performance of low frequency band.

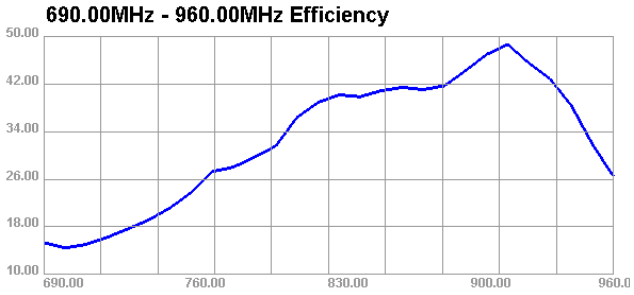
Taking antenna efficiency measurement results on different GND sizes as an example:

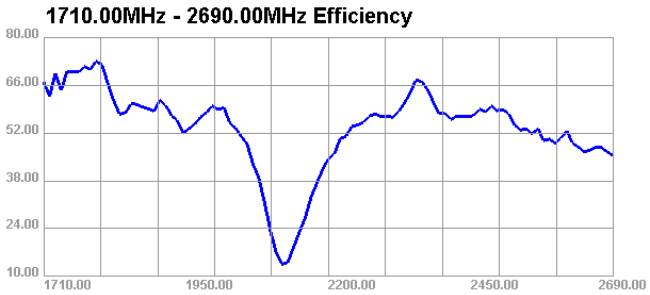


Passive Efficiency vs. PCB Length

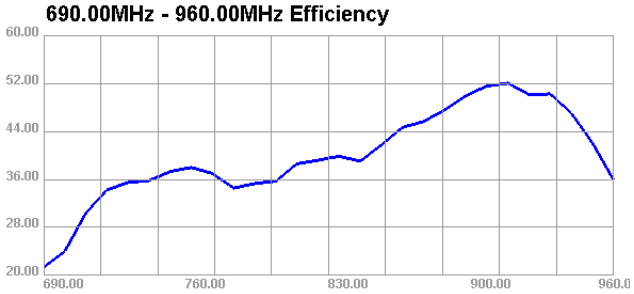
Note: all results are measured in Quectel's anechoic chamber.

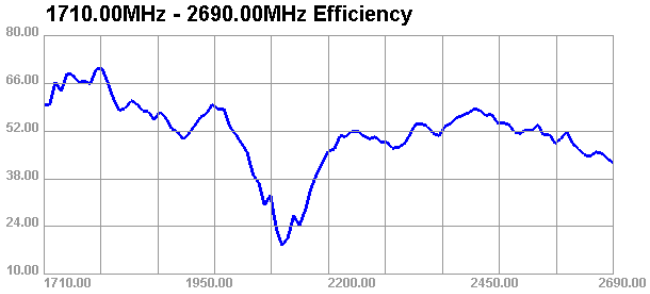
- Board length 90 mm



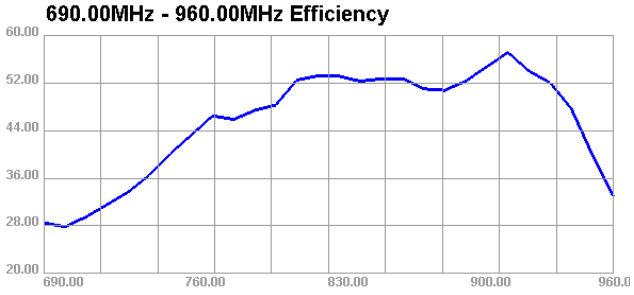


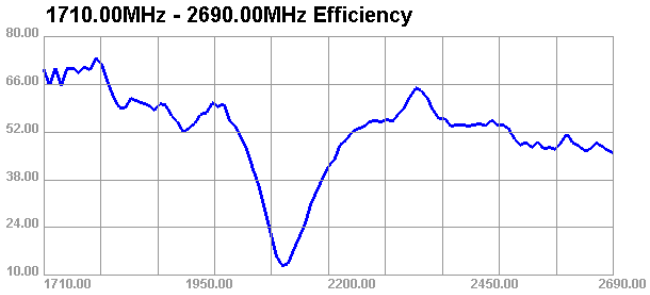
- Board length 110 mm





- Board length 130 mm

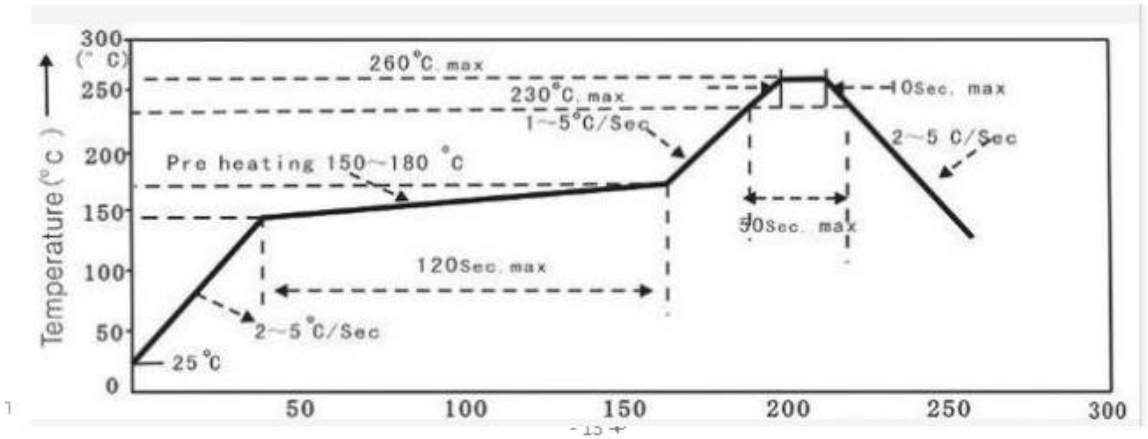




9 Soldering Temperature

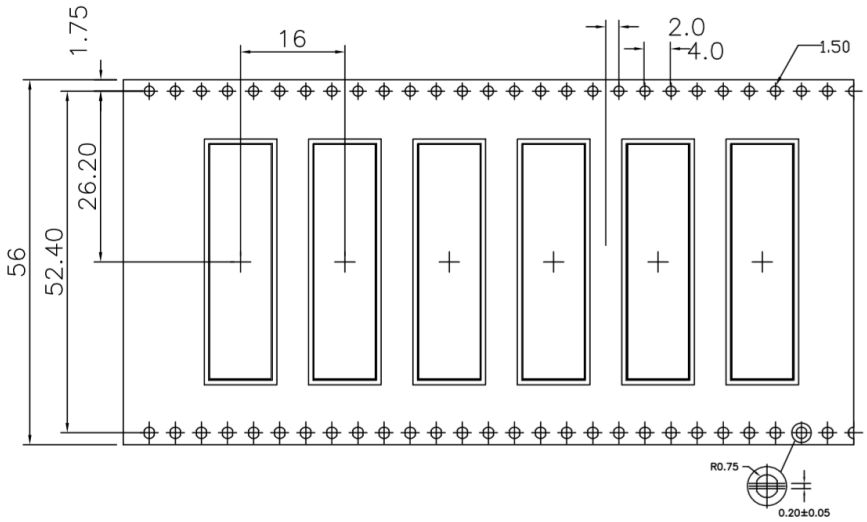
Phase	Profile Features	PB-Free Assembly (Max.)
RAMP-UP	Avg. Ramp-up Rate (Tsmax to Tp)	3 °C/second (Max.)
PREHEAT	Temperature Min. (Tsmin) Temperature Max. (Tsmax) Time (Tsmin to Tsmax)	150 °C 180 °C 120 seconds (Max.)
REFLOW	Temperature (TL) Total Time above TL (tl)	210 °C 50 seconds (Max.)
PEAK	Temperature (Tp) Time (tp)	260 °C 10 seconds (Max.)
RAMP-DOWN	Rate	5 °C/second (Max.)

10 Reflow Profile

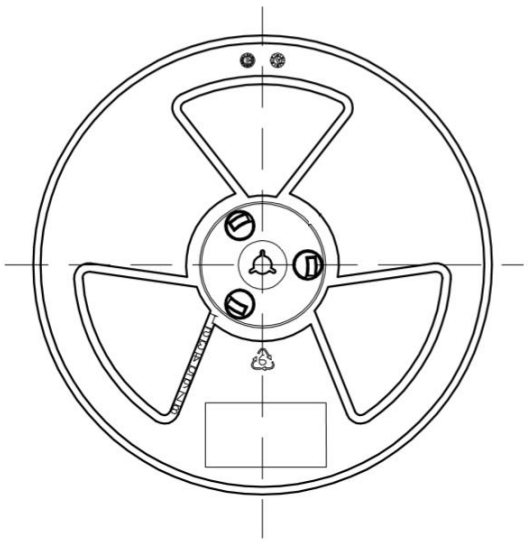


11 Package

- Quantity/Reel: 1000 pcs/Reel
- Carrier tape dimensions (mm)



- Taping reel dimensions (mm)



330 mm × 56.4 mm

12 Product Size (Unit: mm)