5G/4G LTE FULL BANDS SMD ANTENNA

Part Number: LK1830101/LK1830102

Description: 5G/4G LTE Full Bands SMD Antenna

Frequency: 600-960MHz/1400-2690MHz/3300-6000MHz

Size: 40 mm x 5 mm x 1 mm

Features:

- Support 5G NR FR1 sub-6GHz, 4G LTE full bands and GNSS L1 band
- Omni-directional radiation pattern
- Low Gain with high efficiency for easy certification
- Surface Mount Device (SMD) tape & reel supply
- Easy integration and flexible placement
- Ultra-low profile with a height of 1.0 mm

RoHS compliant

Revision: A

Nov 20, 2020

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1.0 Product Description

The LK1830101 and LK1830102 are ultra-low profile SMD antenna with a height of 1 mm, utilizing cutting-edge technology that enables them to support 5G NR sub-6GHz (FR1) full bands, 4G LTE full bands, LTE-CAT M series, NB-IoT and GNSS simultaneously. Additionally, they are also compatible with 3G and 2G wireless communications. Furthermore, their extremely small form factors make them easier for designers to create incredible products with high integration and a thinner profile while maintaining superior antenna performance. Excellent antenna efficiency across the operating frequencies enables delivery of high data rates at the system level.

LK1830102 is a mirrored design of LK1830101 with equivalent performance.

Features:

- Easy integration
- Low Gain for easy certification
- Omni-directional radiation pattern
- Low profile with flexible placement
- SMD supplied in Tape & Reel

Applications:

- Tracker
- Industrial IOT
- Healthcare
- Autonomous
- Satellite IoT

2.0 General Specification

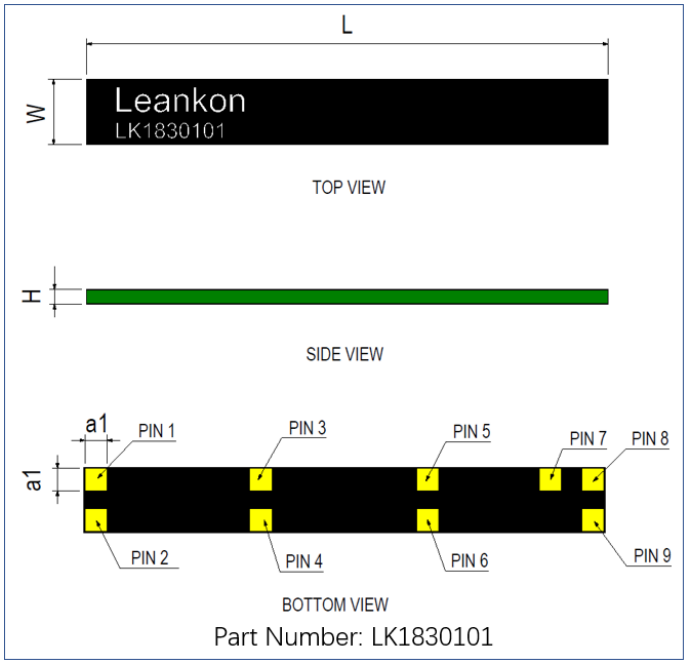
Part Number	**LK1830101/LK1830102**				
Frequency (MHz)	617-960	1427-1700	1710-2690	3300-5000	5000-5925
S11 (Return Loss) (dB)	< -5.0	< -2.0	< -7.0	< -5.0	< -5.0
VSWR	< 3.6	< 8.7	< 2.6	< 3.6	< 3.6
Average Efficiency	> 55%	> 45%	> 70%	> 60%	> 45%
Peak Gain (dBi)	1.6	3.0	3.3	4.2	3.7
Polarization	Linear				
Radiation Pattern	Omni-directional				
Antenna Type	Monopole				
Impedance	50 Ω				
Power Rating	5 Watts				
Weight	Approx. 4.1g				
Operation Temperature	-40℃ to +125℃				
Storage Temperature	-40℃ to +85℃				

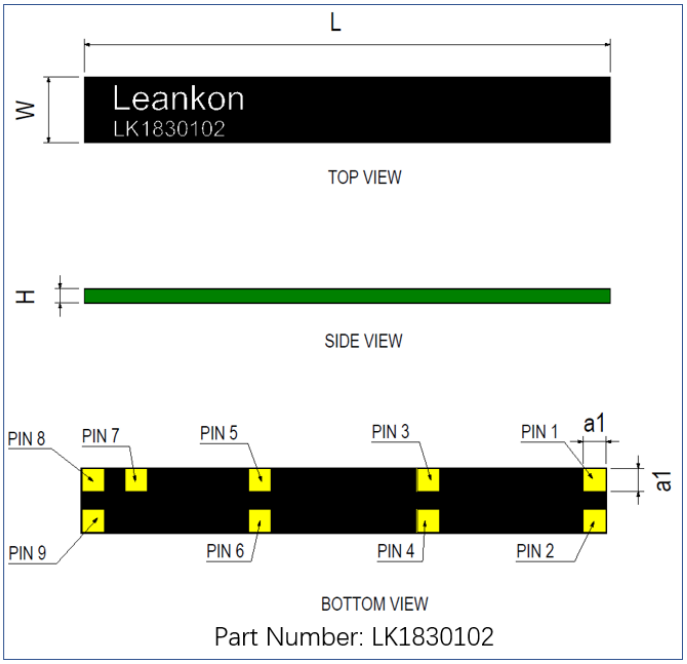
Notes:

1. The above performances are the typical values measured on the Leankon evaluation board.
2. GNSS support frequency range: 1559 - 1610MHz for GPS, BEIDOU, GLONASS and GALILEO.

3.0 Mechanical and Environmental Specification

3.1 Product Dimension





Typical Antenna Dimensions:

L (mm)	W (mm)	H (mm)	a1 (mm)
40.0±0.2	5.0±0.15	1.0±0.1	1.7±0.1

Pin Description:

Pin	Definition	Description
Pin 7	Feeding pad	Connect to feeding transmission line
Pin 8	Grounding pad	Connect to ground plane of the main PCB
Pin 1-6 Pin 9	Dummy pad	Mechanical strength. Do not connect to ground plane.

3.2 Environmental Specification

Item	Test item	Test condition	Specifications
1	**Temperature Cycling Test**	-40˚C (30 minutes) to 125˚C (30 minutes) 1008 cycles	1. No apparent damage 2. Electrical properties within the test Spec.
2	**High temperature high humidity test**	85˚C; 85% RH for 96 hours	1. No apparent damage 2. Electrical properties within the test Spec.
3	**High Temperature test**	1000 hours at 125˚C	1. No apparent damage 2. Electrical properties within the test Spec.
4	**Salt Mist test**	Concentration: 5%±1 Spray time: 24 hours Ambient Temperature: 35 ± 2°C`	1. No apparent damage 2. Electrical properties within the test Spec.
5	**Shear force**	Push from side surface (length side) after IR reflow soldering	> 60.0 Kgf

4.0 Electrical Characteristics

The electrical characteristics are measured on the Leankon evaluation board, whose size is 145 mm x 42 mm x 1 mm.

Figure 4.1: The evaluation board of LK1830101

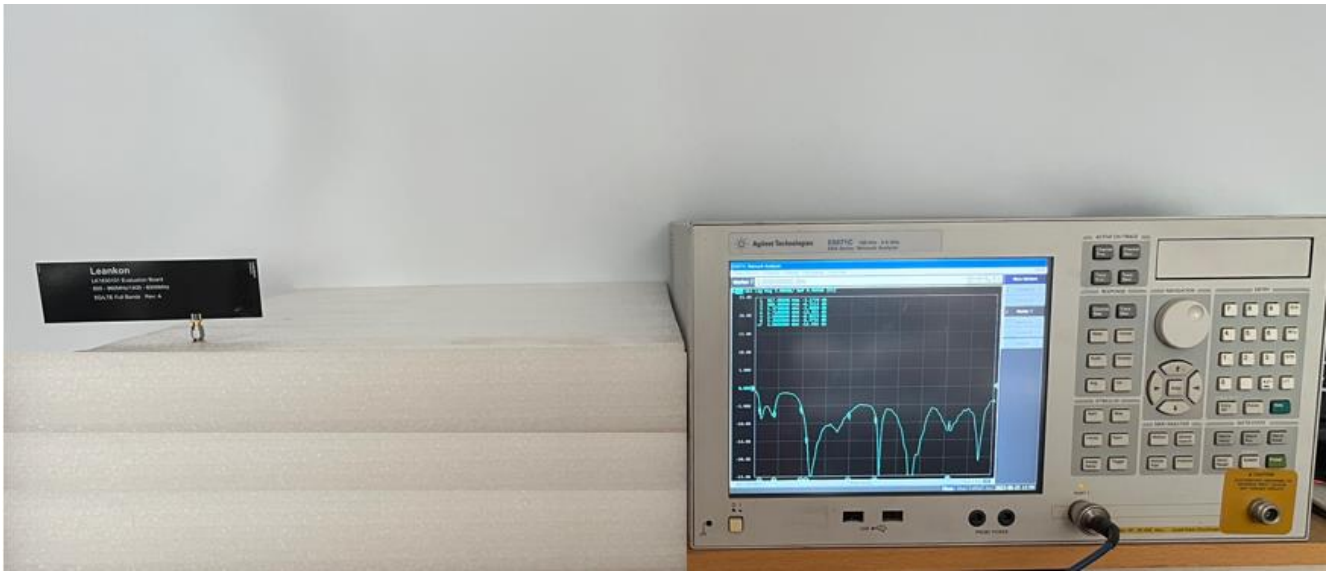


Figure 4.2: The free space test condition of Return Loss and VSWR

Note: To request an evaluation board for pre-verification, please reach out to info@leankon.com.

4.1 S11/Return Loss

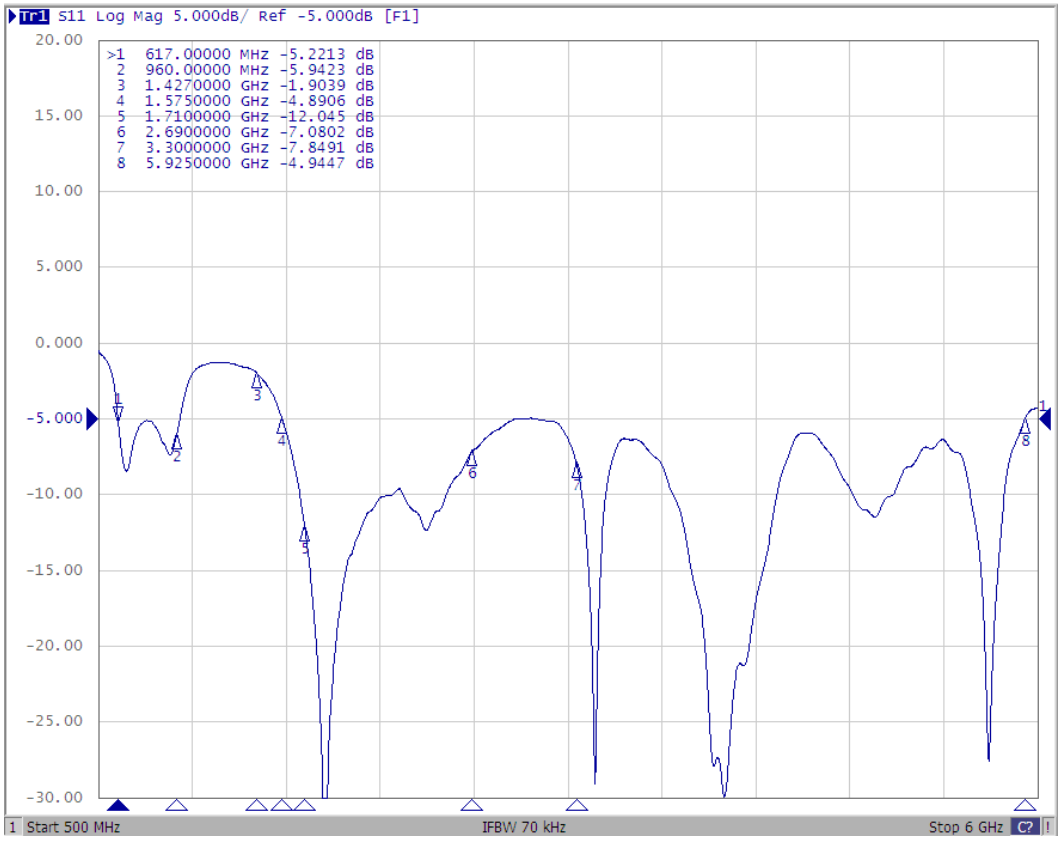


Figure 4.3 S11/Return Loss in Free Space

4.2 VSWR

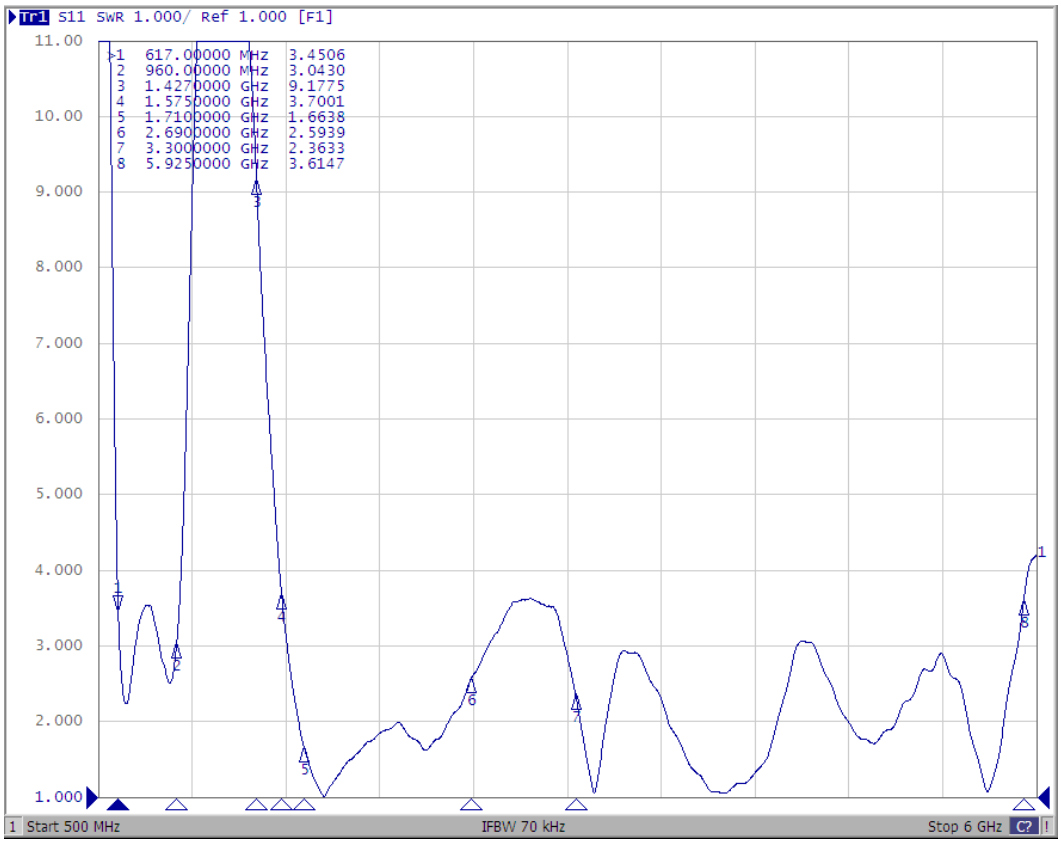


Figure 4.4 VSWR in Free Space

4.3 Efficiency

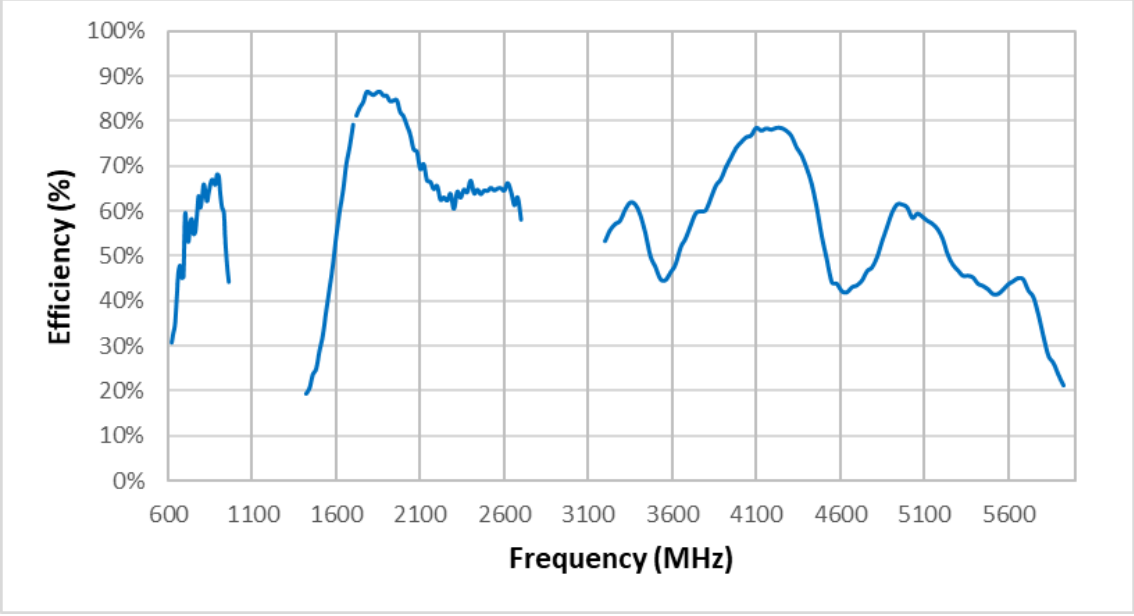


Figure 4.5 Efficiency in Free Space

4.4 Peak Gain

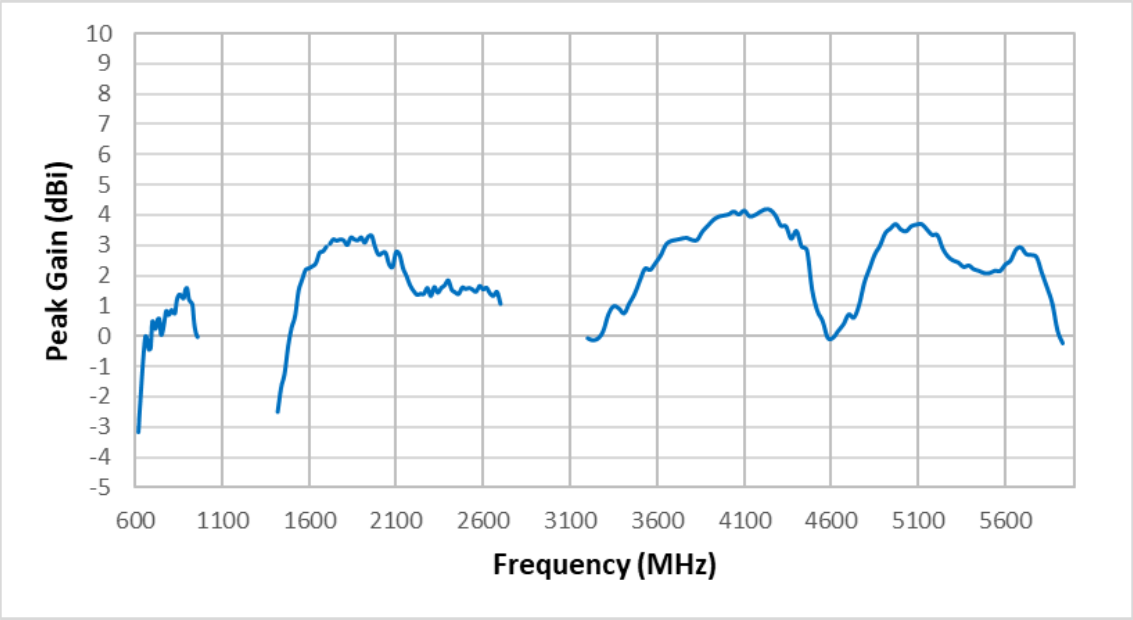
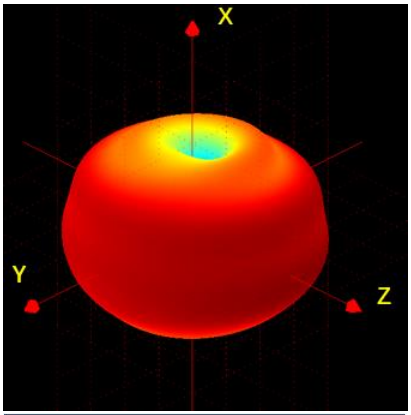


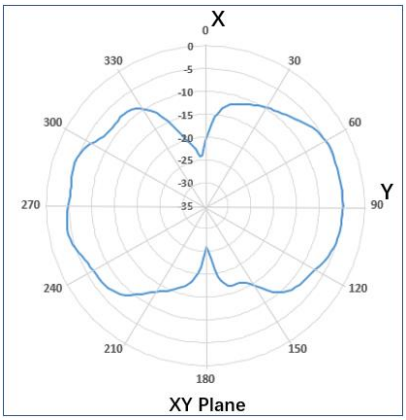
Figure 4.6 Peak Gain in Free Space

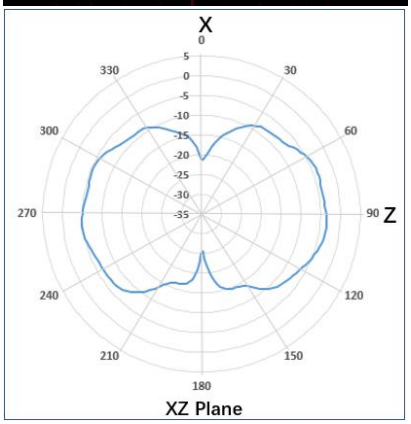
4.5 Radiation Pattern

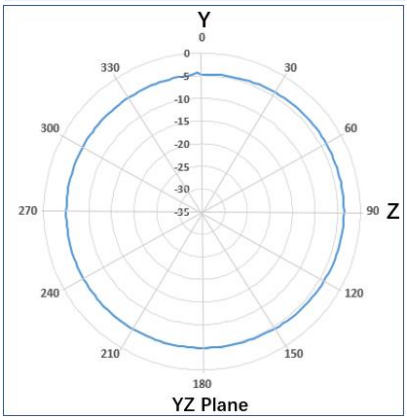
Below shows the antenna radiation pattern measured condition in 3D anechoic chamber.

■ 620MHz Radiation Pattern

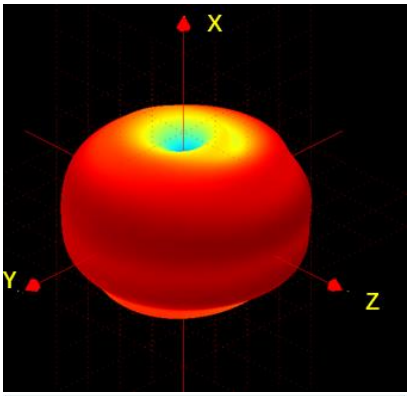


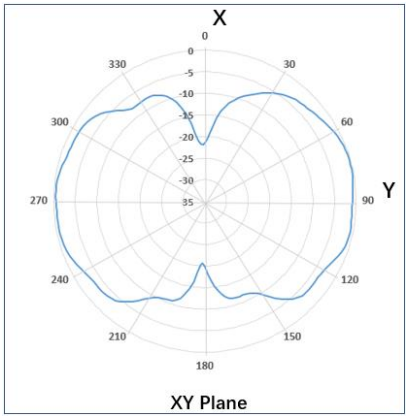


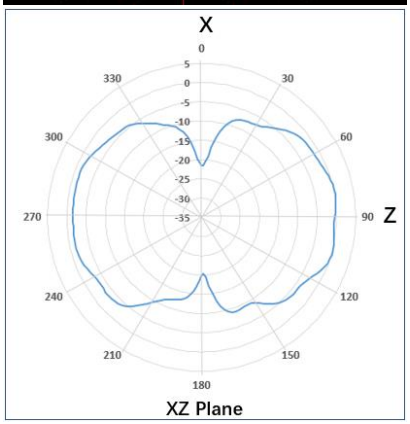


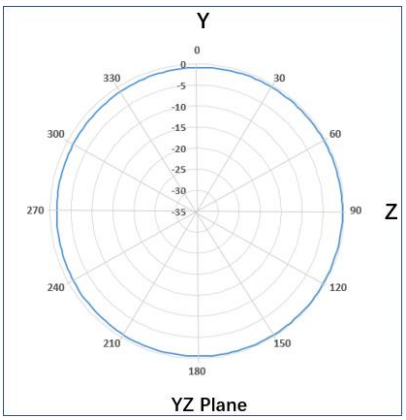


■ 700MHz Radiation Pattern

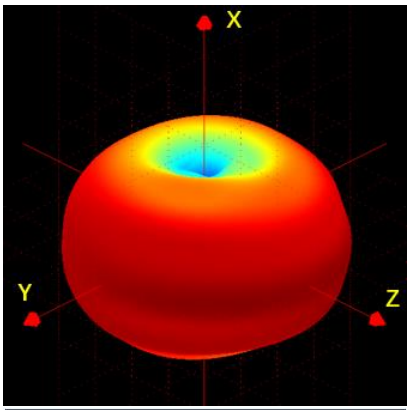


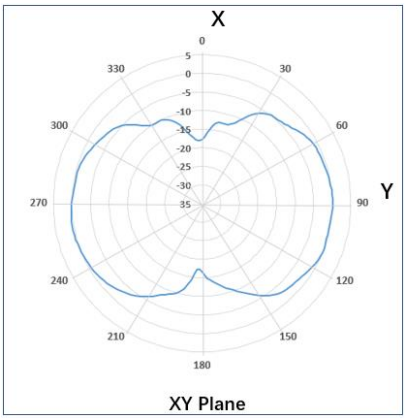


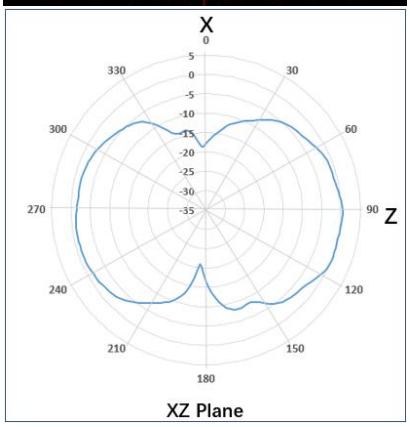


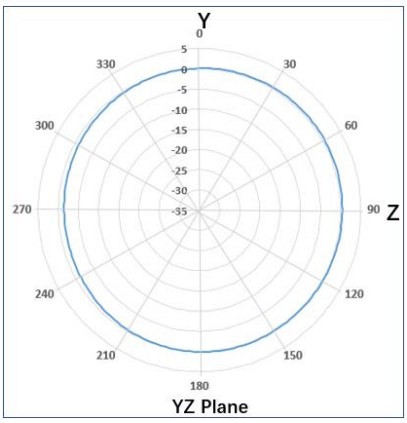


■ 830MHz Radiation Pattern

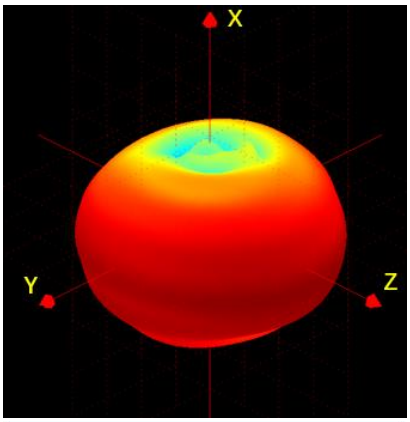


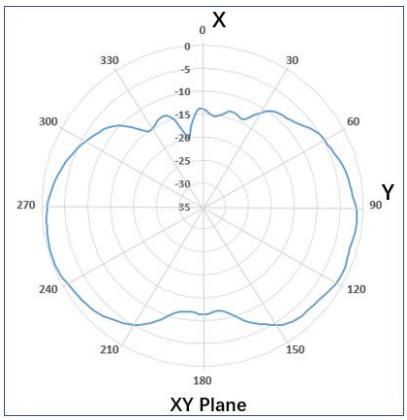


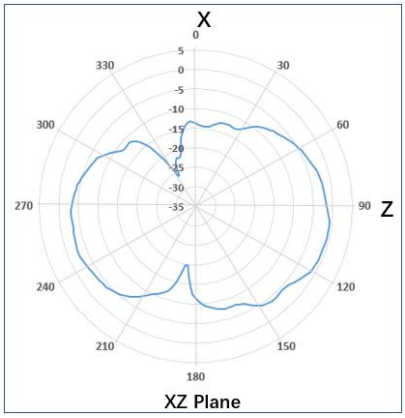


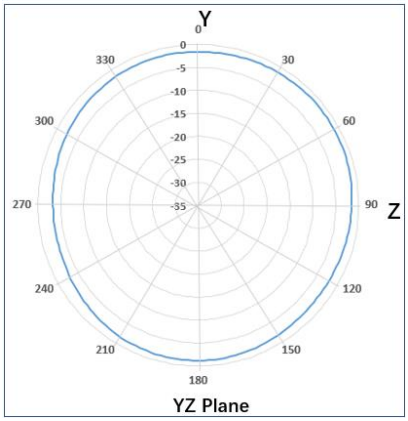


■ 960MHz Radiation Pattern

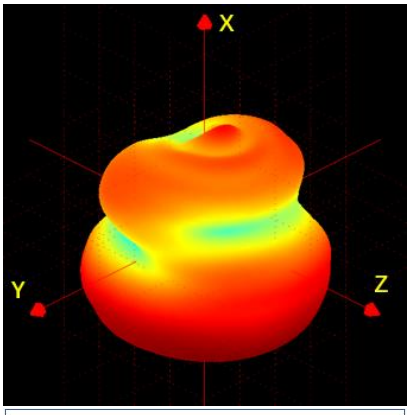


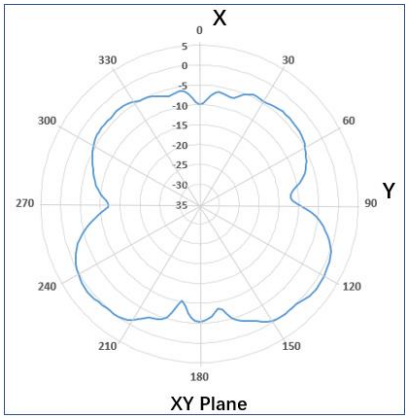


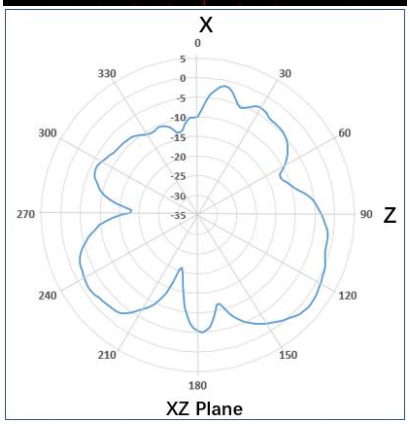


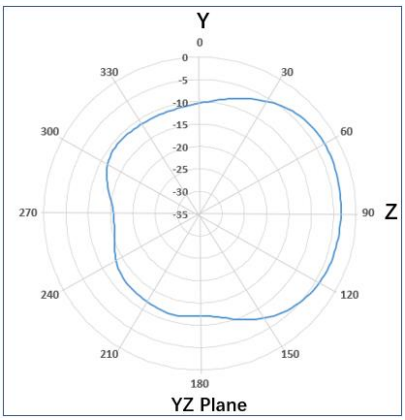


■ 1575MHz Radiation Pattern

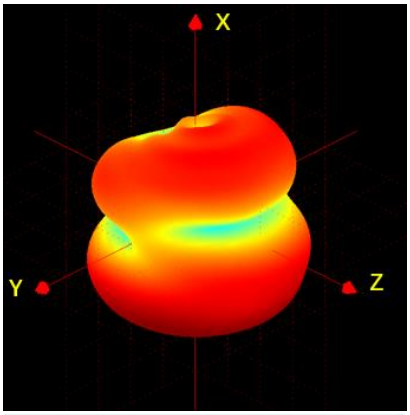


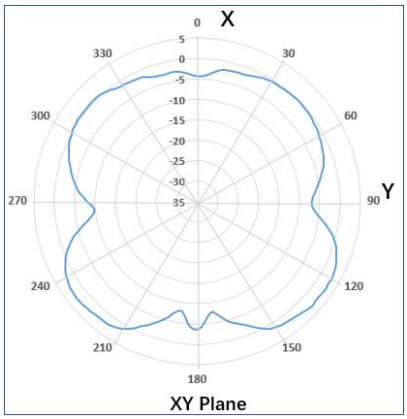


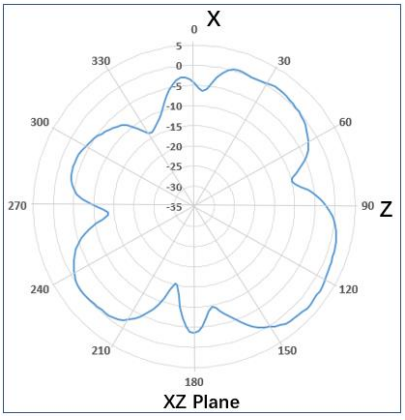


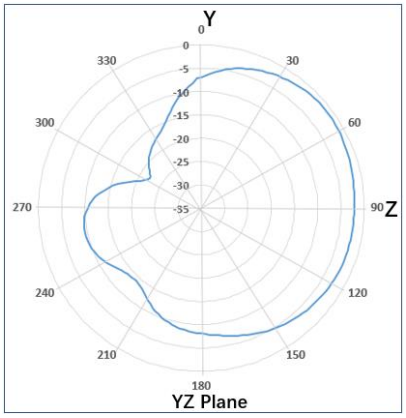


■ 1750MHz Radiation Pattern

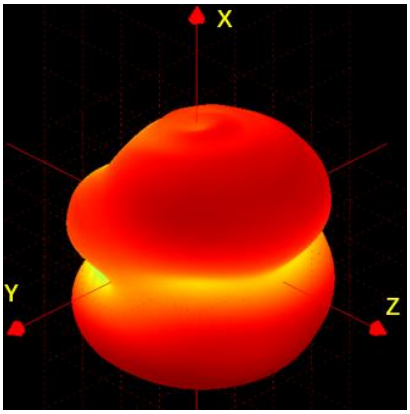


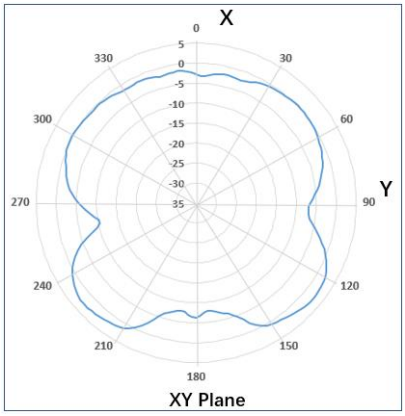


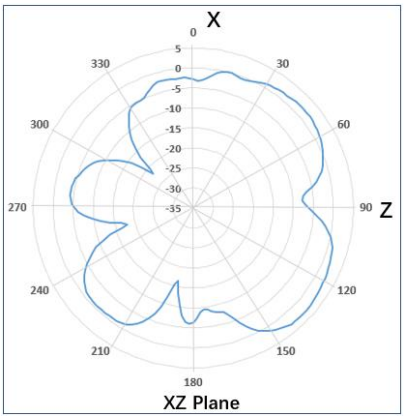


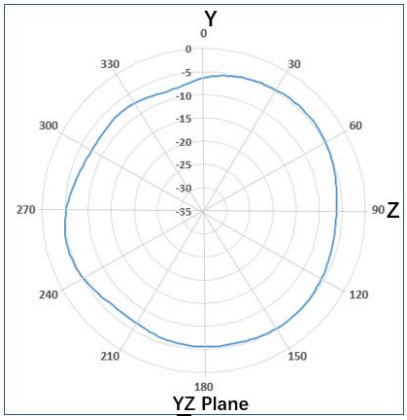


■ 1960MHz Radiation Pattern

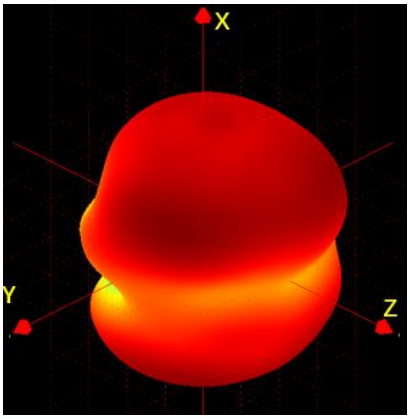


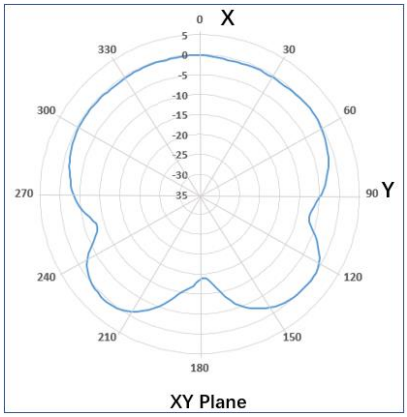


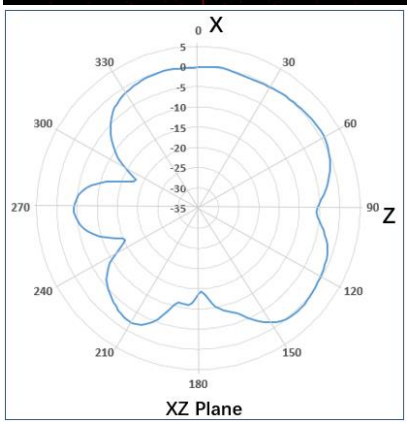


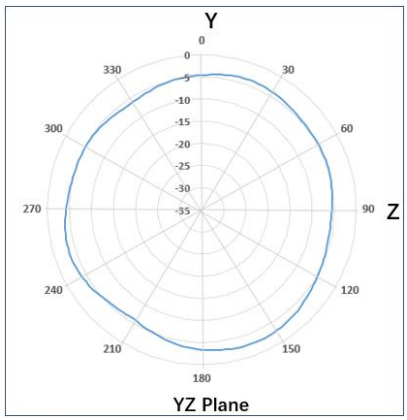


■ 2170MHz Radiation Pattern

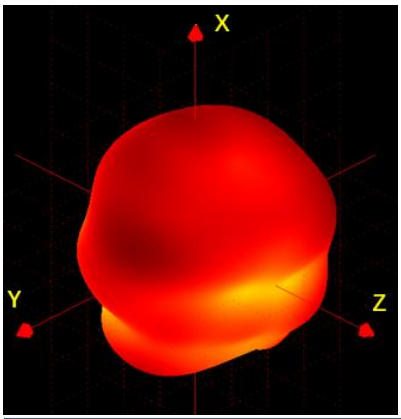


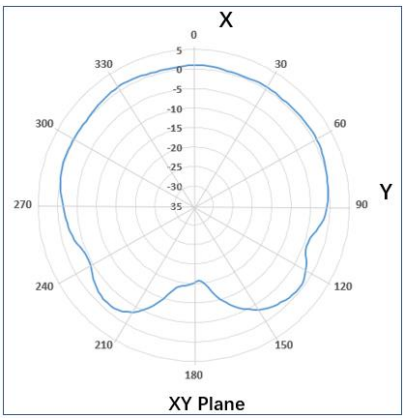


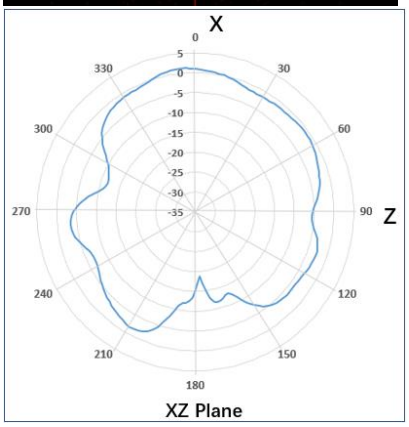


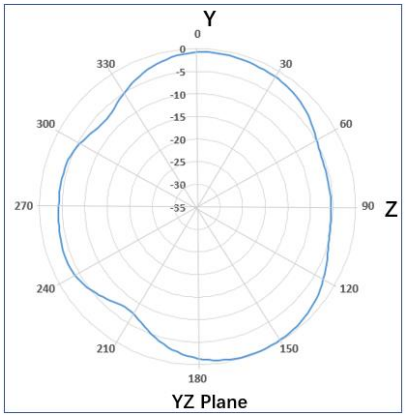


■ 2350MHz Radiation Pattern

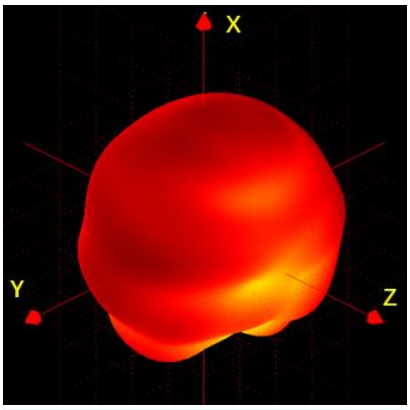


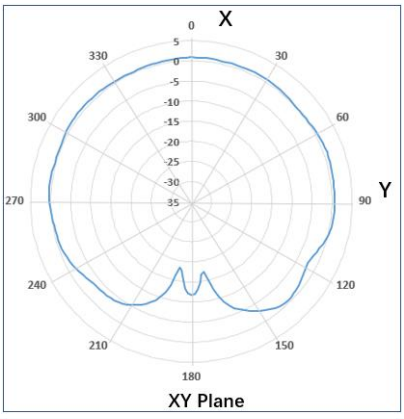


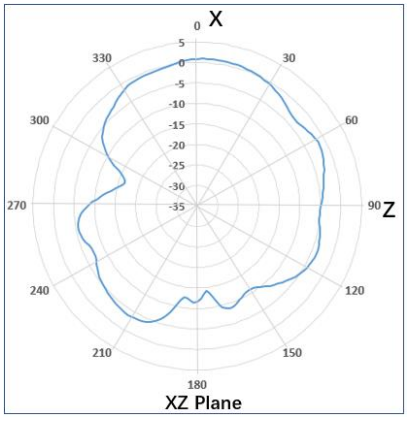


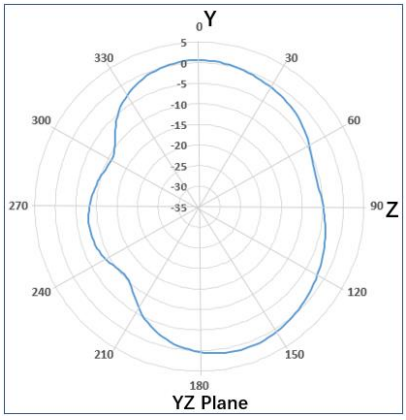


■ 2600MHz Radiation Pattern

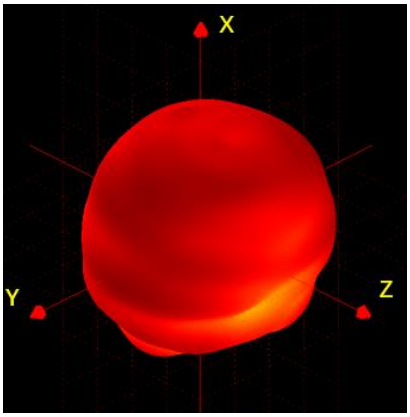


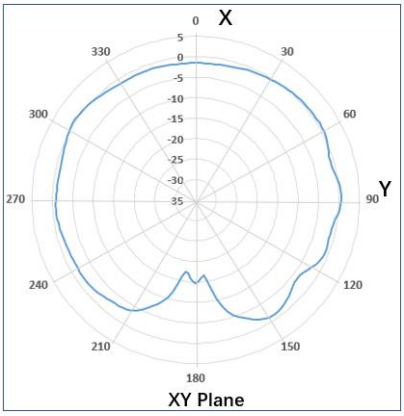


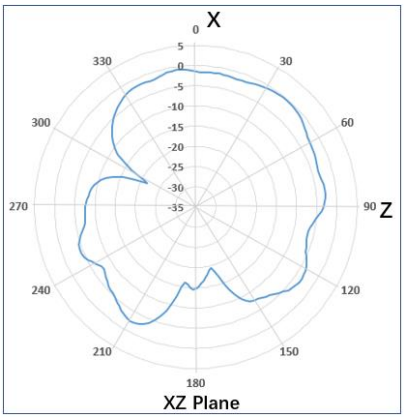


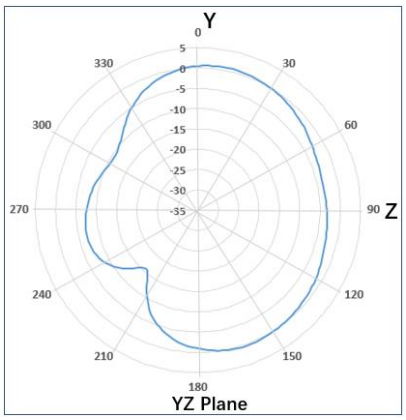


■ 3400MHz Radiation Pattern

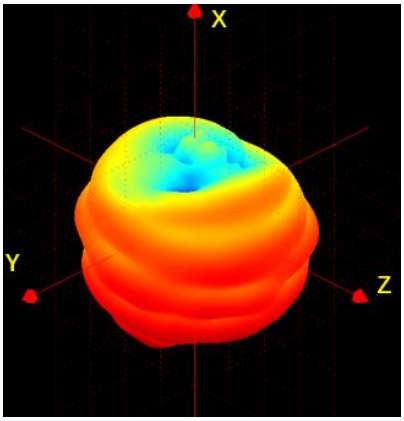


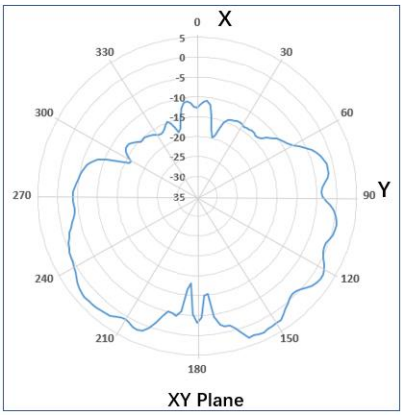


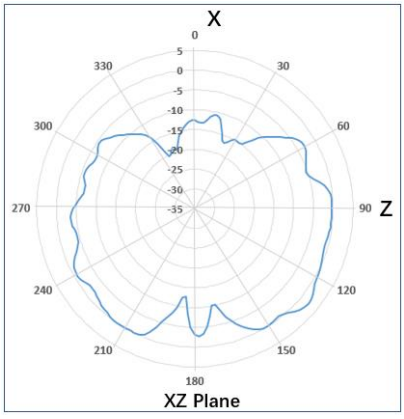


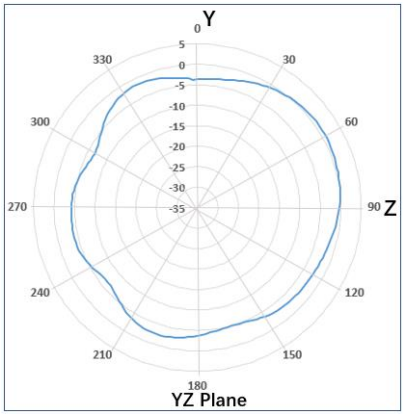


■ 3700MHz Radiation Pattern

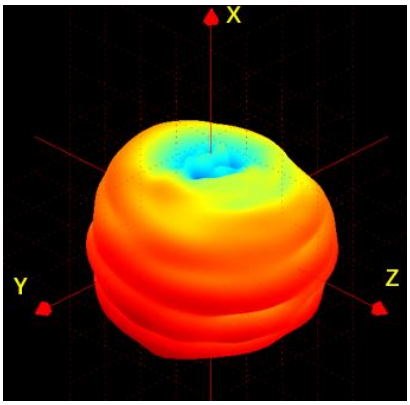


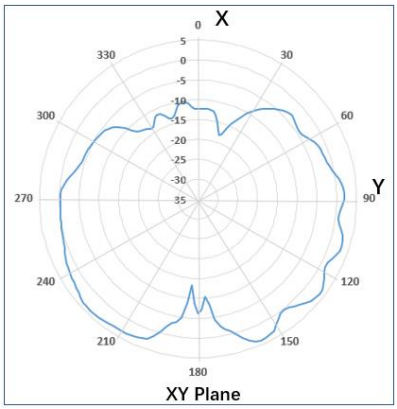


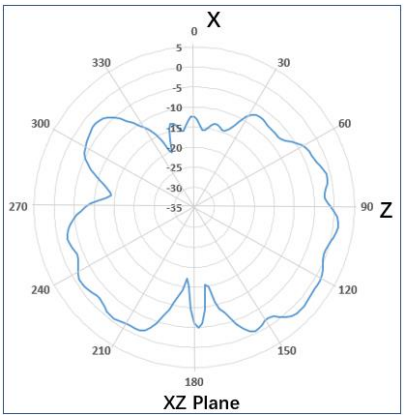


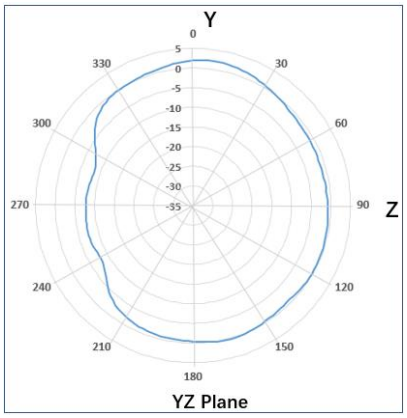


■ 4180MHz Radiation Pattern

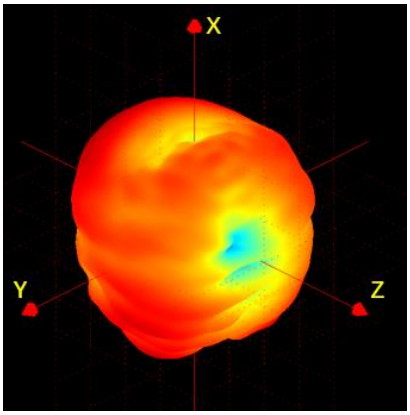


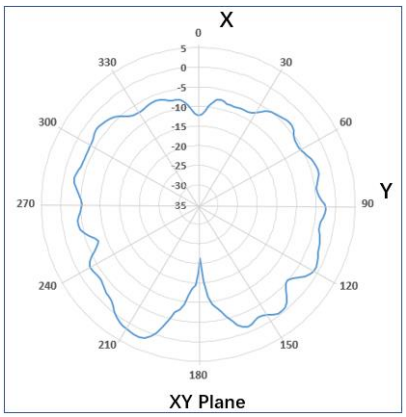


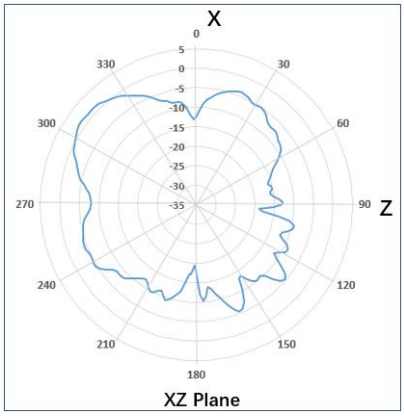


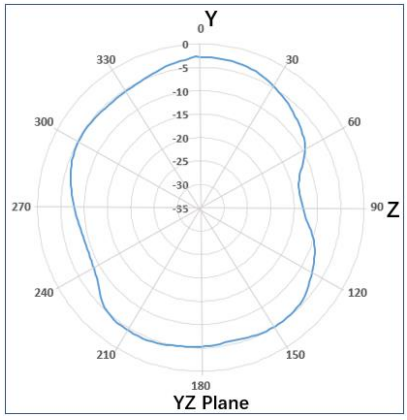


■ 5720MHz Radiation Pattern









5.0 Recommended PCB Layout

5.1 Recommended PCB Layout

To provide designer with more options, two different PCB layouts are offered. Details of these two layouts are shown in Figure 5.1.1 and Figure 5.1.2.
The antenna performances of these two PCB layouts are equivalent.

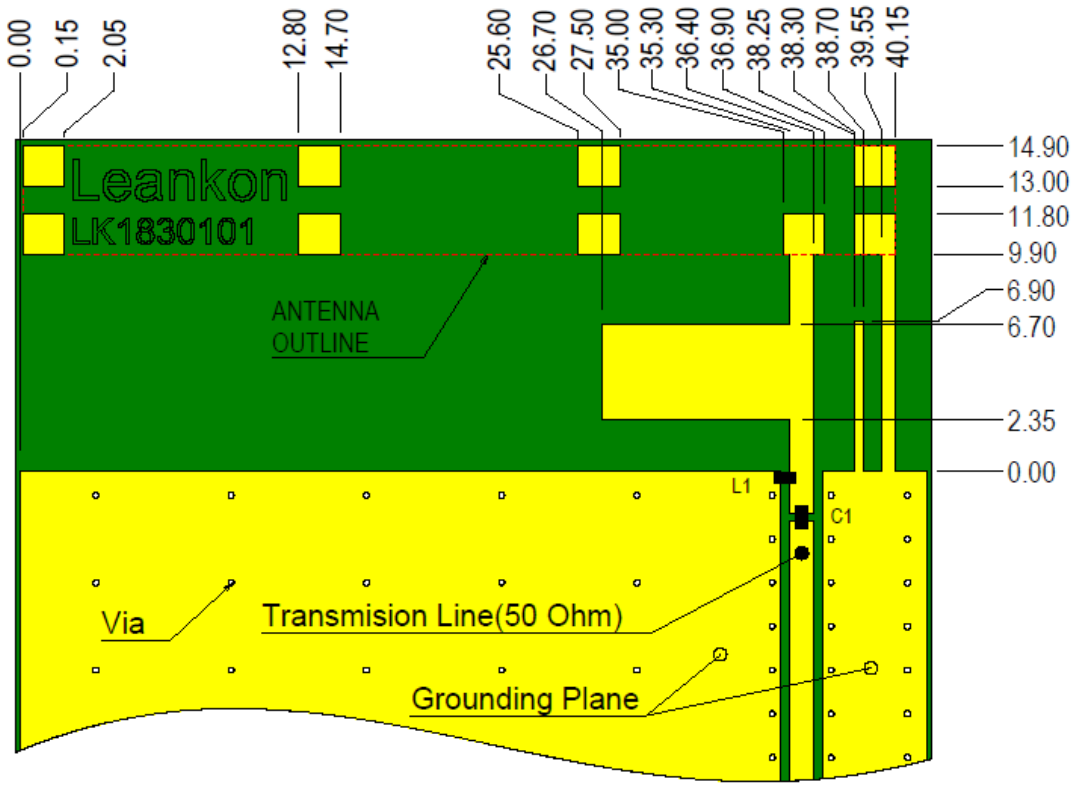


Figure 5.1.1: Recommended PCB Layout of LK1830101

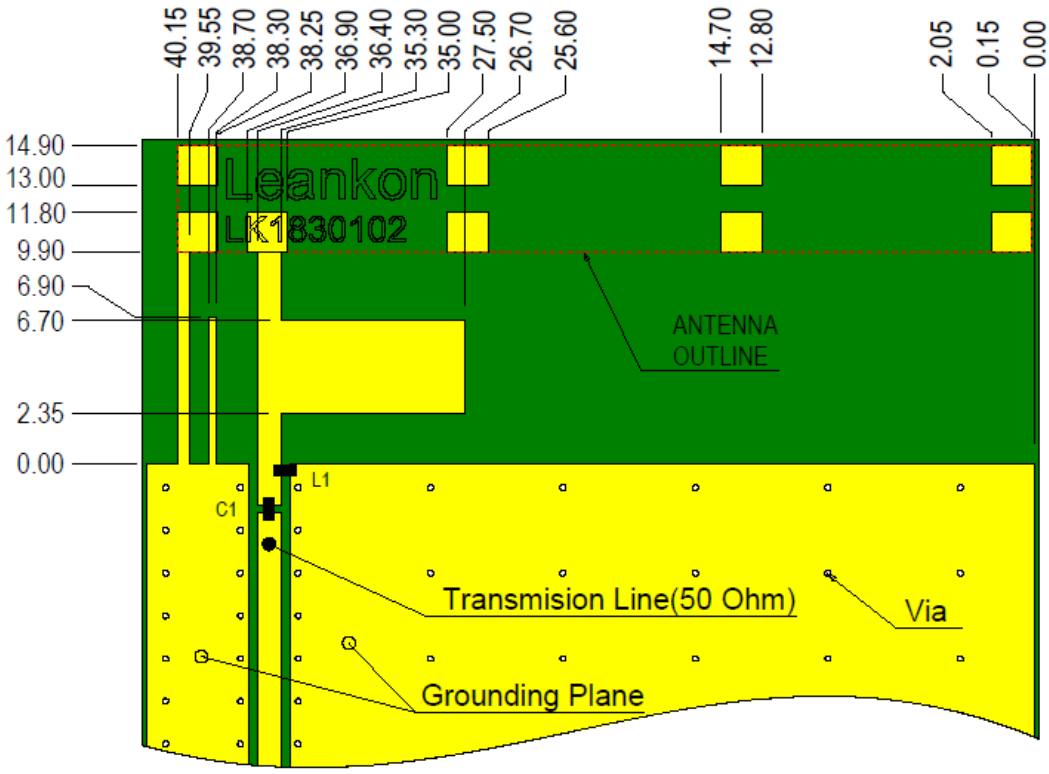


Figure 5.1.2: Recommended PCB Layout of LK1830102

5.2 Recommended Soldering Pad

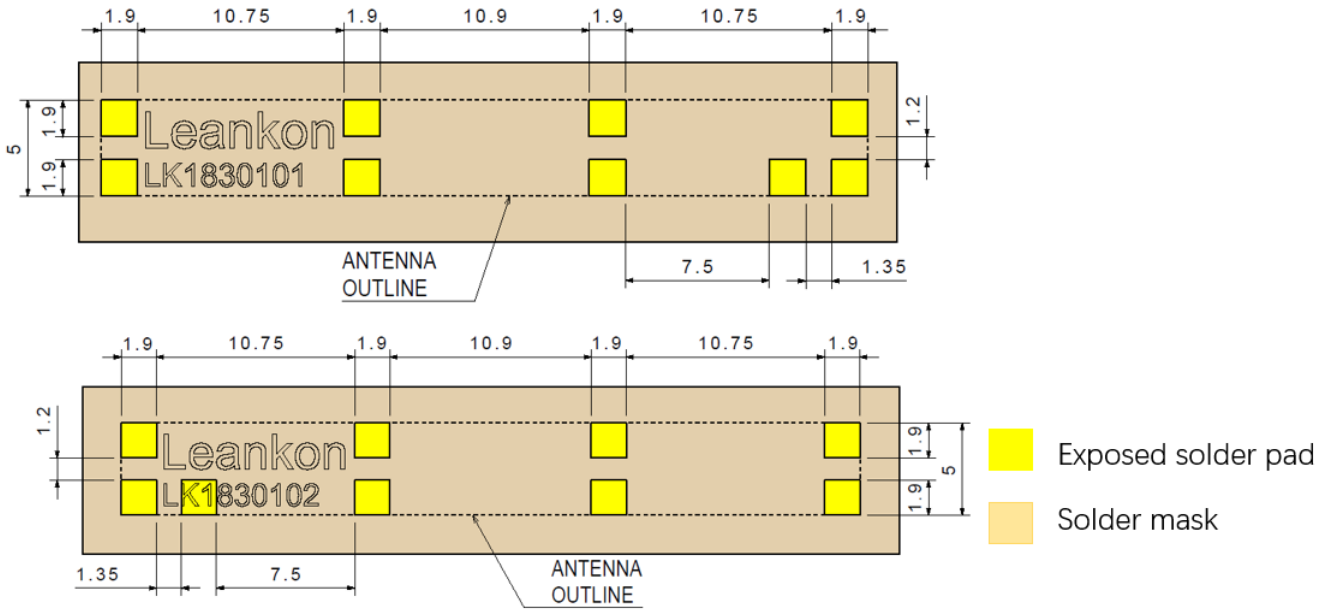


Figure 5.2.1: Recommended Soldering Pads on host PCB

5.3 Recommended Clearance Area

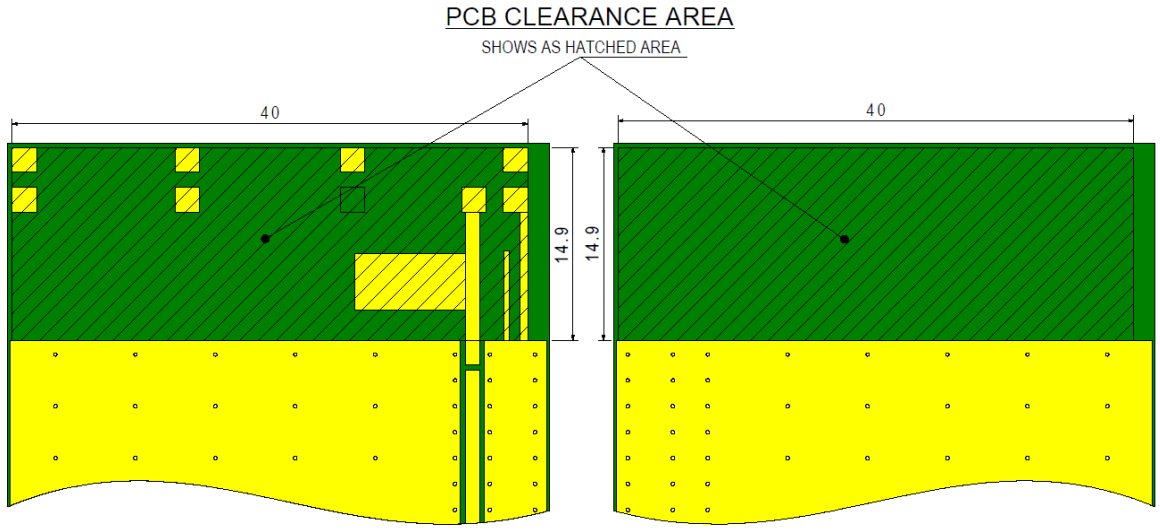


Figure 5.3.1: Recommended PCB Clearance Area of LK1830101 Scenario A

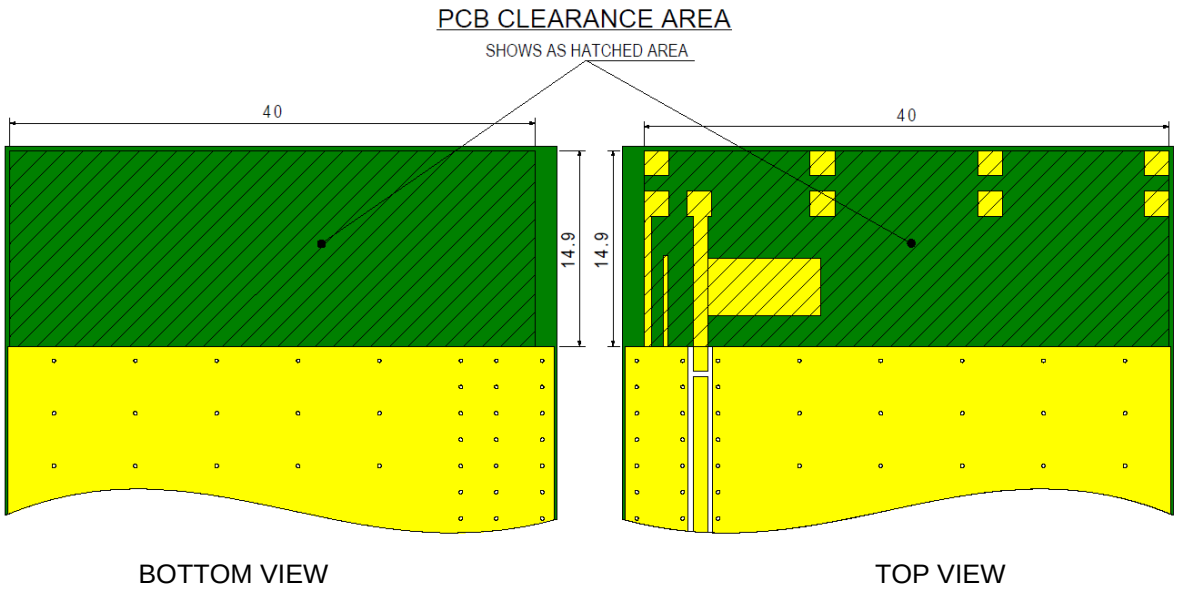


Figure 5.3.2: Recommended PCB Clearance Area of LK1830102 Scenario A

Notes:

1. The term “clearance” also refers to “keep out”. The recommended clearance area is 40mm x 14.9mm.
2. In all PCB layers, the clearance area must be free of ground plane or metal.

As shown in Figures 5.3.3 and 5.3.4, when the main PCB width exceeds 65 mm, it is recommended to add another 25 mm of clearance.

The entire width of the main PCB should be used as the clearance area when its width is less than 65 mm, in order to maintain optimal antenna performance.

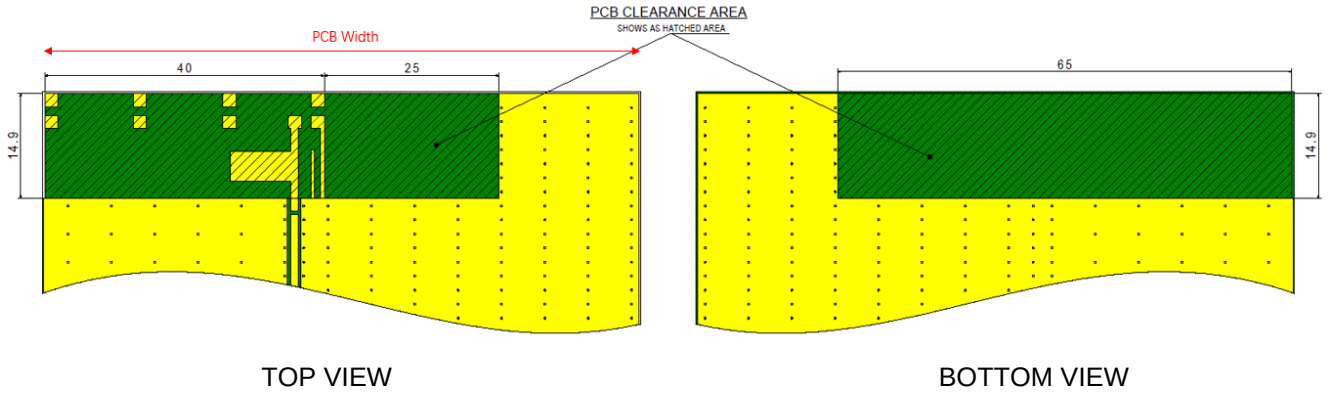


Figure 5.3.3: Recommended PCB Clearance Area of LK1830101 Scenario B

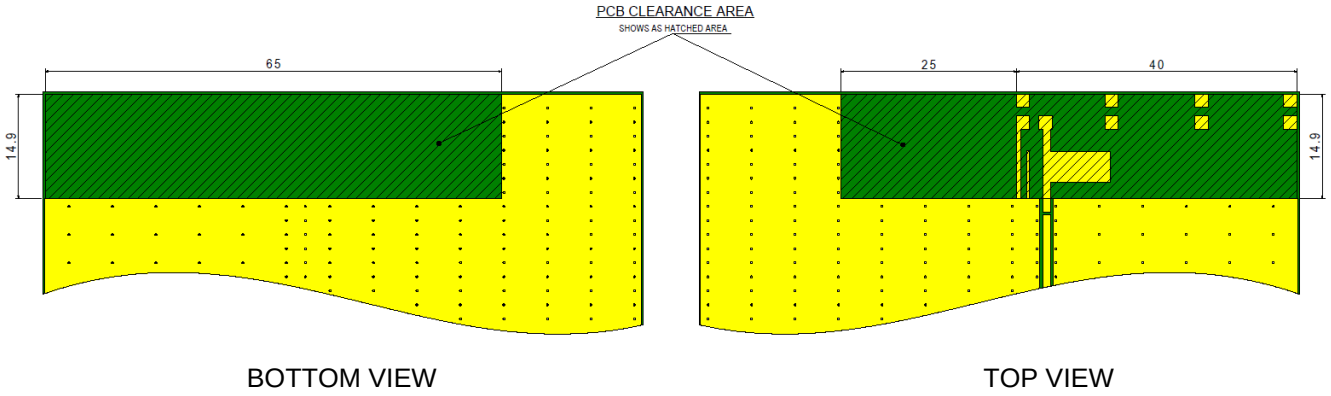


Figure 5.3.4: Recommended PCB Clearance Area of LK1830102 Scenario B

5.4 Antenna Placement Application Guidelines

LK1830101/LK1830102 provide flexible antenna placement for various PCB sizes. Assumed PCB size is X (mm) by Y (mm), as shown in Figure 5.4.1:

1) When Y>X, the recommended antenna placement is shown below, and vice versa.
2) To achieve optimal antenna performance in actual device with different PCB shapes, Leankon offers free antenna simulation service to ensure acceptable antenna performance before PCB fabrication.
3) The guidance of LK1830101 also applies to LK1830102.

Figure 5.4.1: The antenna placement of LK1830101

The antenna can be placed on either the top layer or the bottom layer of the host PCB. The following demonstrates the three mounting methods on the host PCB. Mounting the antenna on the same layer as the module is preferred to minimize transmission line loss.

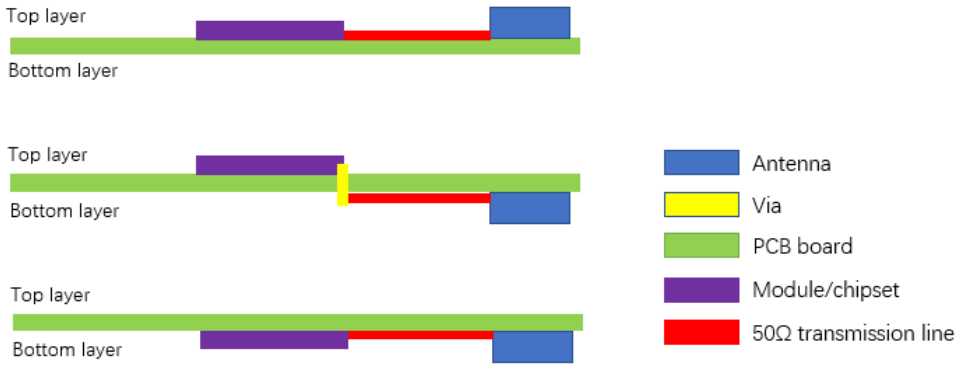


Figure 5.4.2: The antenna placements on host PCB

6.0 Matching Network

A matching network is proposed on the host PCB for both LK1830101 and LK1830102 to maximize impedance bandwidth. It is highly recommended to design the PCB layout according to the reference matching component positions provided below for optimal antenna performance.

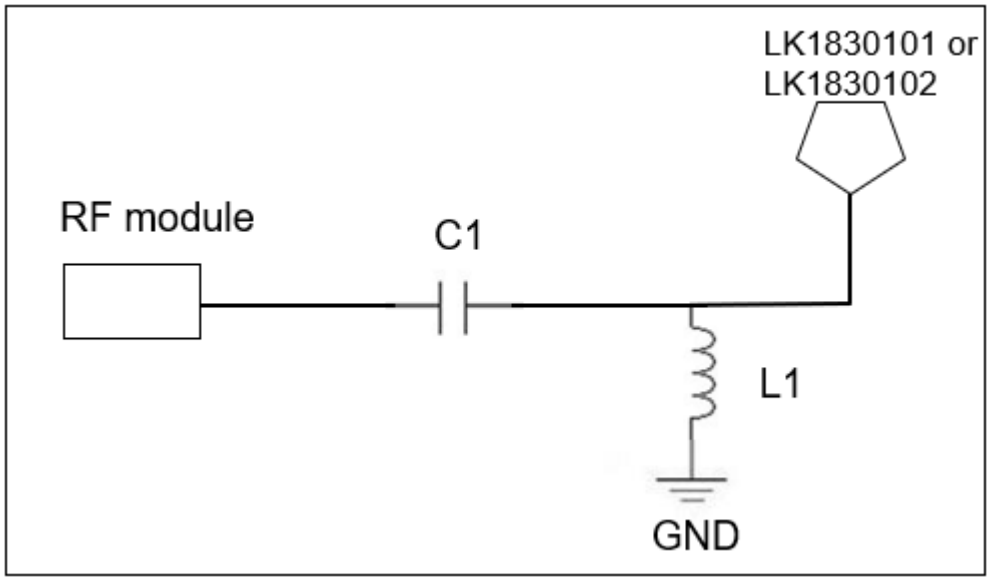


Figure 6.1: The schematics of matching circuit

Table 1: Recommended matching circuit values

Matching circuit	Value	Size	Part number
L1	12.0 nH	0402	LQW15AN12NG00D
C1	2.7 pF	0402	GRM1555C1H2R7BA01D

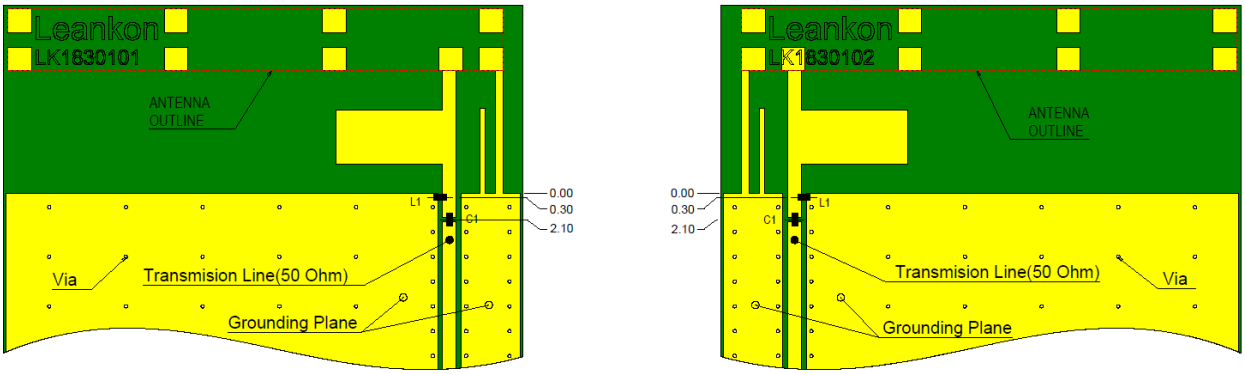


Figure 6.2: Location dimensions of matching circuit

Notes:

1. In real-world device applications, antenna resonance frequencies may be affected by factors such as shielding cans, PCB size and shape, device enclosures, and so on. To compensate for these impacts, slight adjustments to the matching circuit values are necessary. Leankon offers free technical support to designers in order to streamline the development process，which includes:

   a) Early-phase antenna selection and placement recommendations.
   b) Antenna PCB layout evaluation and recommendations.
   c) Antenna performance evaluation based on actual applications.
   d) Matching network optimization in actual devices.
   e) Passive antenna parameter measurements in actual devices, such as Return loss,Gain, Efficiency, and Radiation pattern, among others.

f) Active antenna measurements in actual devices, such as OTA (Over The Air) tests for both TRP (Total Radiation Power) and TIS (Total Isotropic Sensitivity) to reduce the certification risks.

2. Leankon also offers the custom design services for specific applications where off-the-shelf products are not suitable.
3. For more information or technical support, please contact info@leankon.com to speak directly with engineering team.

7.0 Recommended Reflow Profile

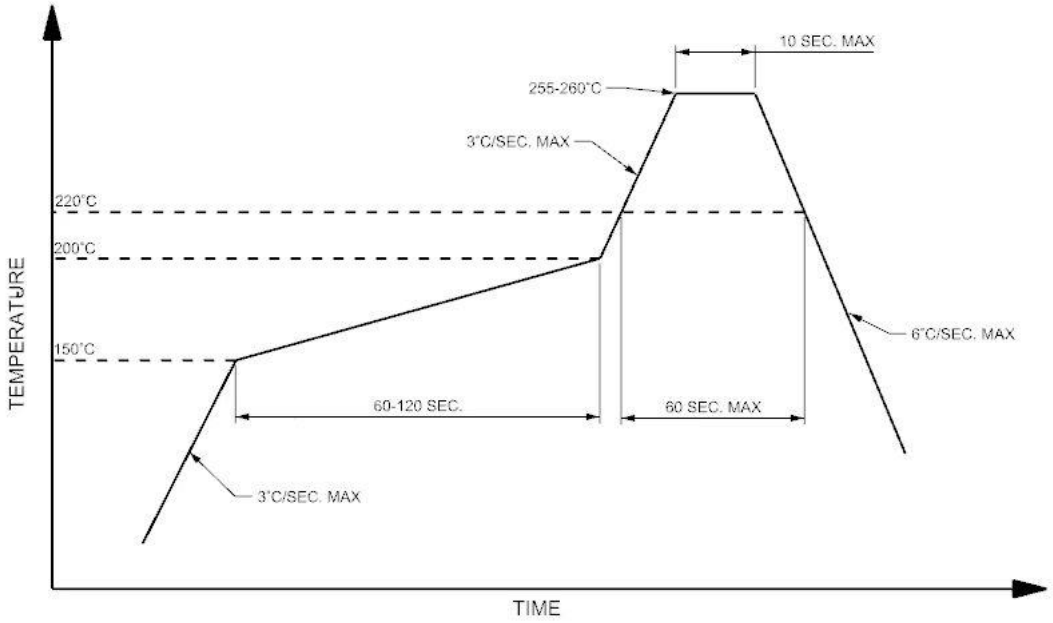
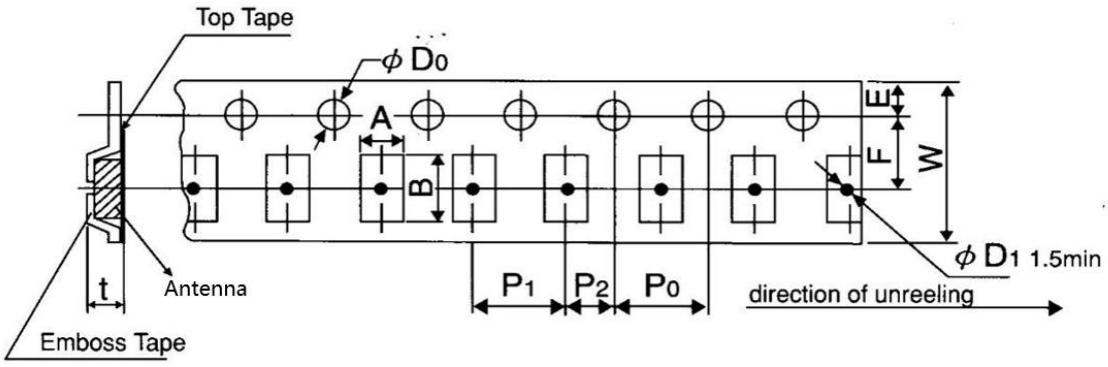


Figure 7.1: Recommended Reflow profile

8.0 Packaging

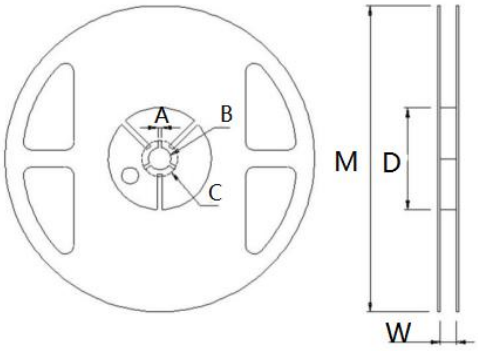
■ Tape dimensions (Unit: mm)

A	B	D0	E	F	P0	P1	P2	W	D1	T
±0.2	±0.2	0~ +0.5	±0.1	±0.05	±0.1	±0.1	±0.1	±0.2	±0.05	±0.15
5.6	40.6	1.50	1.75	3.50	4.00	12.0	NA	56.0	NA	1.8



■ Reel dimensions (Unit: mm)

A	B	C	D	M	W
±0.5	±0.5	±0.5	±0.1	±2.0	±0.5
2.00	13.5	21.0	60.0	330.0	58.0



■ Package Quantity

1 Carton	1 box	1 reel	Total 30000pcs/carton
5 boxes	2 reels	3000pcs	

9.0 Website and Company Address

Website: www.leankon.com
Address: B1337 1F, Building 3, 5018 Hutai Road, Baoshan District, Shanghai China.

10.0 Revision History

Revision	Date	Description	Issued by:
A	2020-11-20	Initial release	Tony

NOTE:

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