

GNSS L1/ L2/ L5/ L6 Ceramic Chip Antenna



AANI-CH-0243

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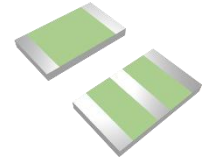
Check Inventory



5.0 x 3.0 x 0.5 mm
RoHS/RoHS II Compliant
MSL Level = 1

Description

This advanced multi-frequency GNSS antenna delivers comprehensive support across GPS L1/L2/L5, Galileo, Beidou, QZSS, SBAS, and IRNSS constellations. Measuring 5.0 x 3.0 x 0.5 mm and weighing 0.025 grams, it features exceptional performance with peak gains of 2.3 dBic (L1), 2.0 dBic (L2), 1.8 dBic (L5), and 1.7 dBic (L6), paired with high efficiencies of 70% (L1), 72% (L2), and 70% (L5), and 60% (L6). This RoHS-compliant antenna enables reliable navigation for UAVs, autonomous vehicles, precision agriculture, and land survey systems where robust multi-band reception in challenging environments is essential.



Features

- Multiband Multi-Constellations GNSS Support
 - GPS: L1/L2/L5
 - Galileo: E1/E5a/E6
 - Beidou: B1I/B1C/B2I/B2a/B2b
 - QZSS: L1/L2/L5/L6
 - SBAS: L1/L5
- Size: 5.0 x 3.0 x 0.5 mm
- Peak Gain: 2.3 dBic (L1), 2.0 dBic (L2), 1.8 dBic (L5), 1.7 dBic (L6)
- High Efficiency: 70% (L1), 72% (L2), 70% (L5), 60% (L6)
- [RoHS Compliant](#) | [MSL Level 1](#)

Applications

- UAVs and Drones
- Robotics and Autonomous Driving
- Asset Tracking and Telematics
- Intelligent Transportation
- Precision Land Survey Positioning
- Precision Agriculture

Ordering Information

Part Number	Description
AANI-CH-0243	GNSS L1/ L2/ L5/ L6 Ceramic Chip Antenna on Cut Tape
AANI-CH-0243-T	GNSS L1/ L2/ L5/ L6 Ceramic Chip Antenna on Tape & Reel
AANI-CH-0243-EVB	GNSS L1/ L2/ L5/ L6 Ceramic Chip Antenna Evaluation Board

Note: Other options not listed may be available upon request via [Abracon online support](#)



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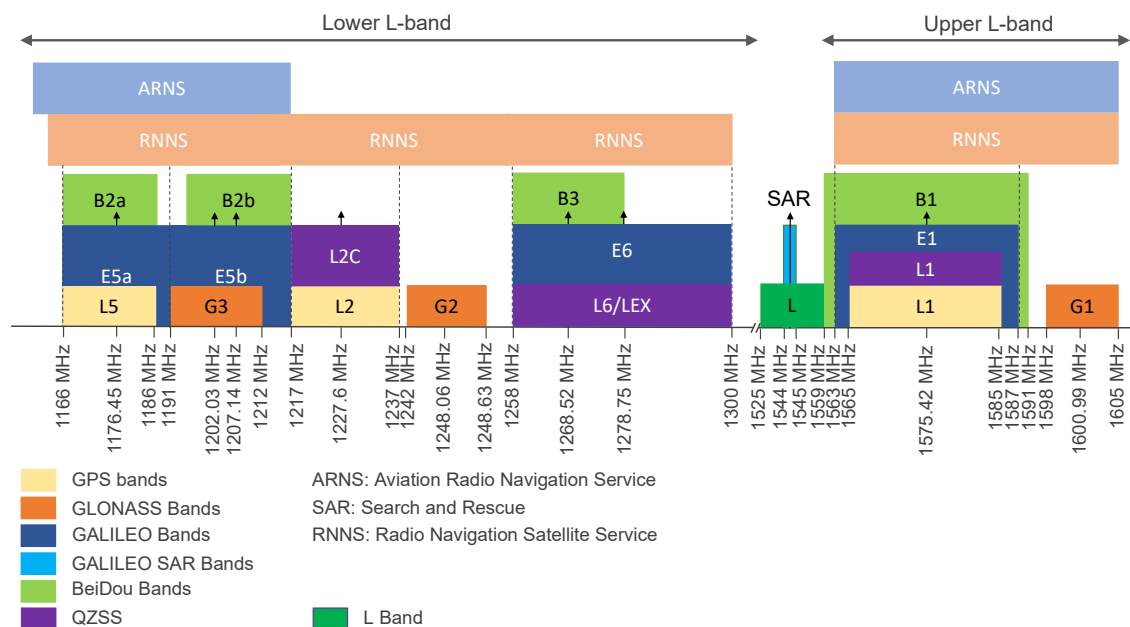
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GNSS Frequency Bands Covered

GPS	L1 1575.42MHz	L2 1227.6MHz	L5 1176.45MHz	
	■	■	■	
GLONASS	G1 1598.06-1609.31MHz	G2 1242.93-1251.68MHz	G3 1202.025MHz	
	■	■	■	
Galileo	E1 1575.42MHz	E5a 1176.45MHz	E5b 1201.5MHz	E6 1278.75MHz
	■	■	■	■
BeiDou	B1I 1561MHz	B1c 1575.42MHz	B2a/B2I 1176.45MHz	B2/B2b 1207.4MHz
	■	■	■	■
QZSS	L1 1575.42MHz	L2 1227.6MHz	L5 1176.45MHz	L6 1278.75MHz
	■	■	■	■
IRNSS/NAVIC			L5 1176.45MHz	
			■	
SBAS	L1/E1/B1 1575.42MHz		L5/B2a/E5a 1176.45MHz	
	■		■	



Frequency allocation: GNSS systems, upper L bands and lower L bands



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Electrical Specification

Parameters	Typ.				Units
Frequency	1176.45 (L5)	1227.6 (L2)	1278.75 (L6)	1575.42 (L1)	MHz
VSWR (Typ.)	2.0	3.0	4.0	2.0	:1
Peak Gain	1.8	2.0	1.7	2.3	dBi
Maximum Efficiency	70	72	60	70	%
Polarization	Linear				-
Nominal Impedance	50				Ω

Note: All measurements were performed using the evaluation board in a free-space environment. Actual performance may vary depending on factors such as the ground plane, specific application, and surrounding environment.

Mechanical Specification

Parameter	Specification
Antenna Dimension	5.0 x 3.0 x 0.5 mm
Evaluation Board Dimension	80 x 40 mm
Recommended Ground Clearance for Antenna	14.86 x 9.73 mm
Mounting Type	SMT mount
Mounting Location	PCB Center Mounting
Material(s)	Ceramic
Weight	0.025 g
Additional Resources	Download STEP File, Package Drawing, 3D PDF

Environmental Specification

Parameter	Specification
Operating Temperature	-40°C to +85°C
Storage Temperature	-40°C to +85°C
RoHS Compliance	Yes



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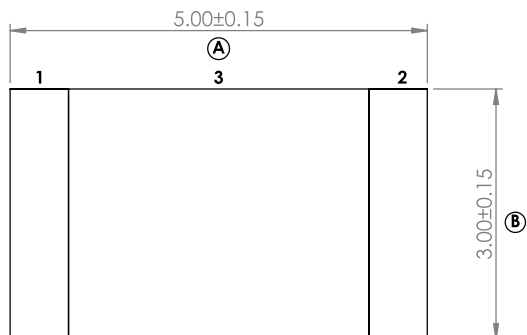


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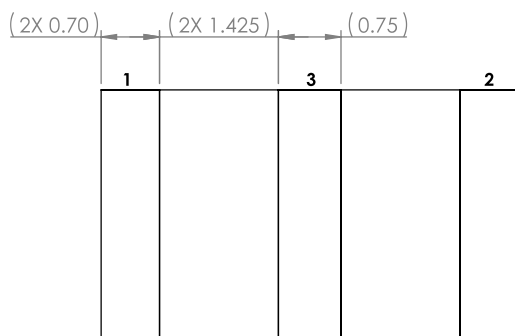
Product Dimensions & Recommended Land Pattern



TOP VIEW

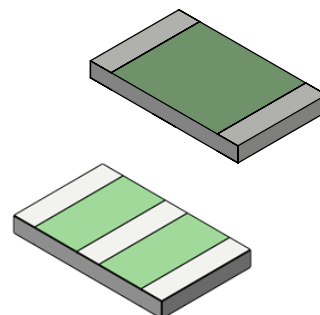


FRONT VIEW



BOTTOM VIEW

Pin #	Function
1	TUNING/GROUND
2	TUNING/GROUND
3	SIGNAL



NOTES:

1. ALL MATERIALS ARE RoHS 2.0 COMPLIANT.
2. "A-C" CRITICAL DIMENSIONS.
3. "()" REFERENCE DIMENSIONS.

Unit : mm

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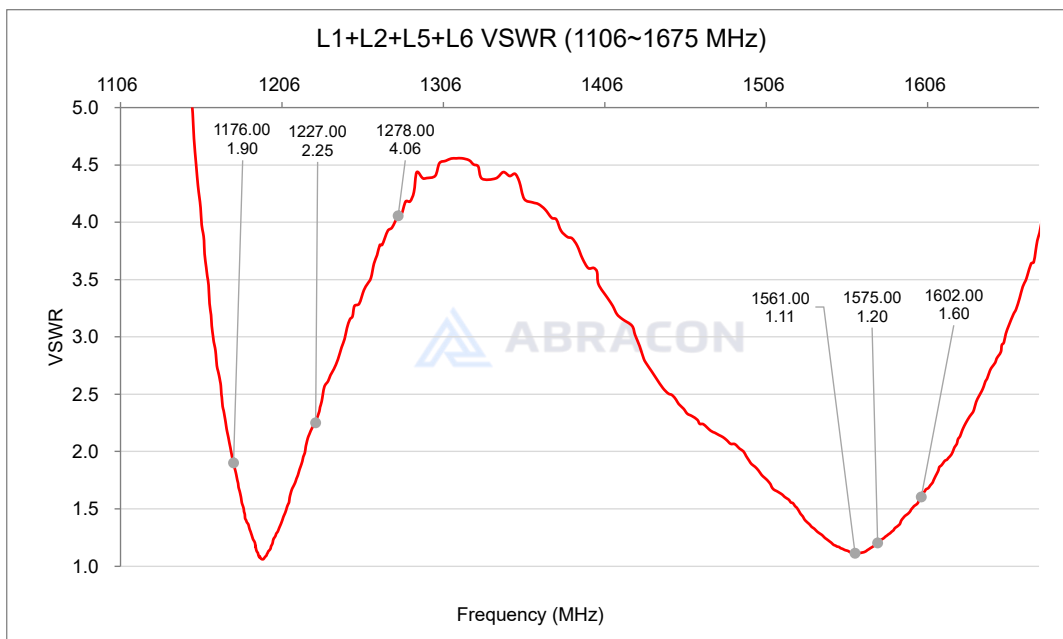
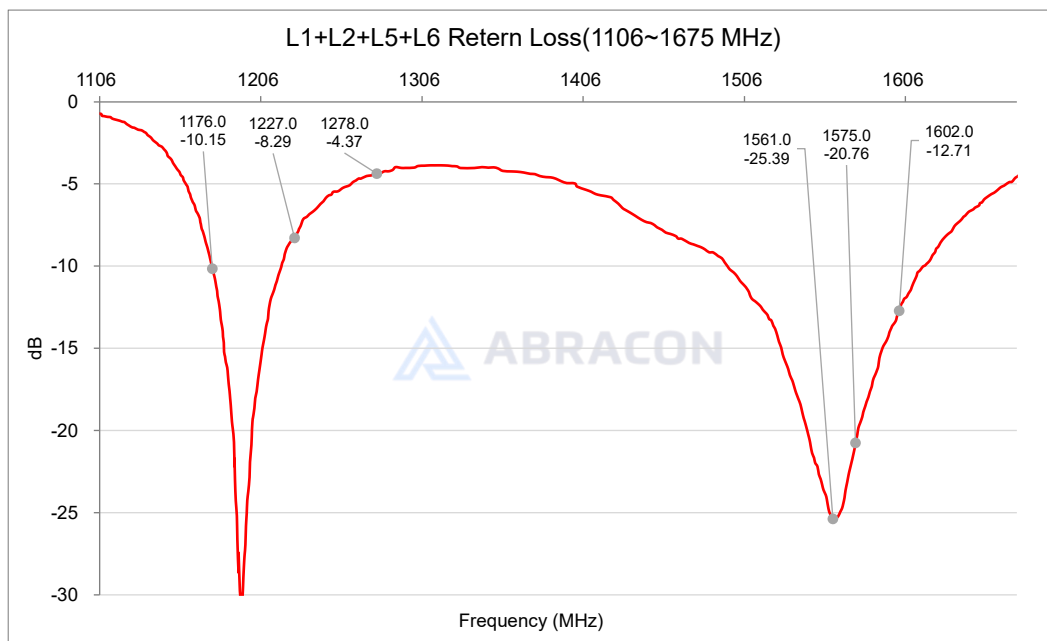


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Reflection Characteristics – Return Loss & VSWR



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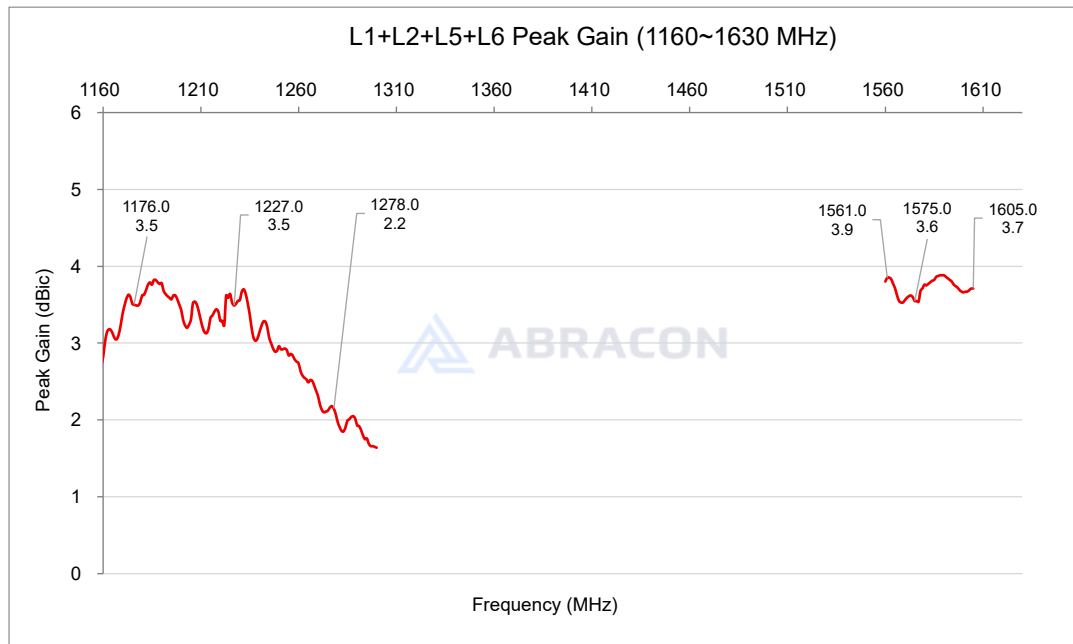


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Radiation Characteristics – Gain



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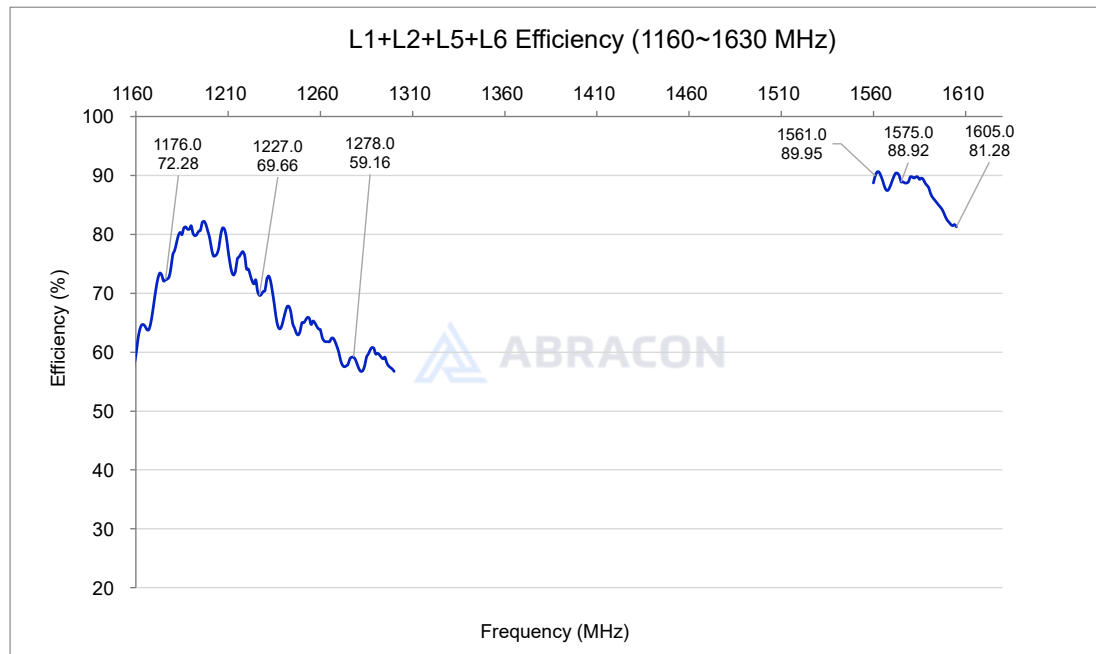


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Radiation Characteristics – Total Efficiency (%)



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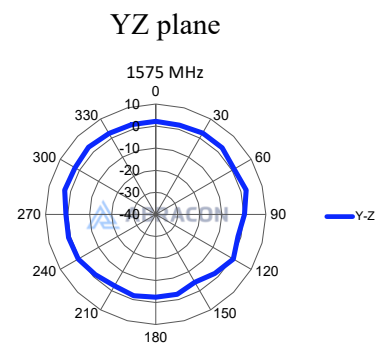
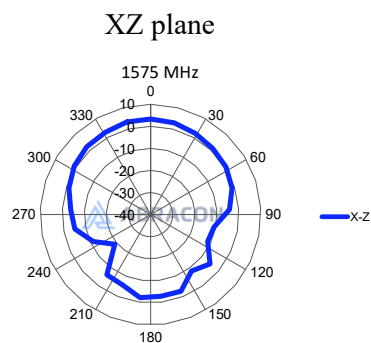
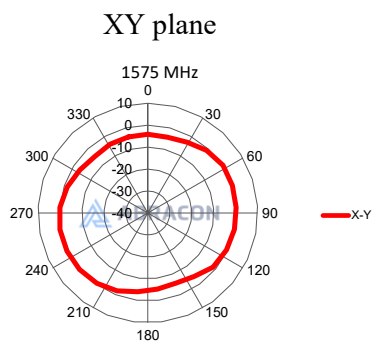
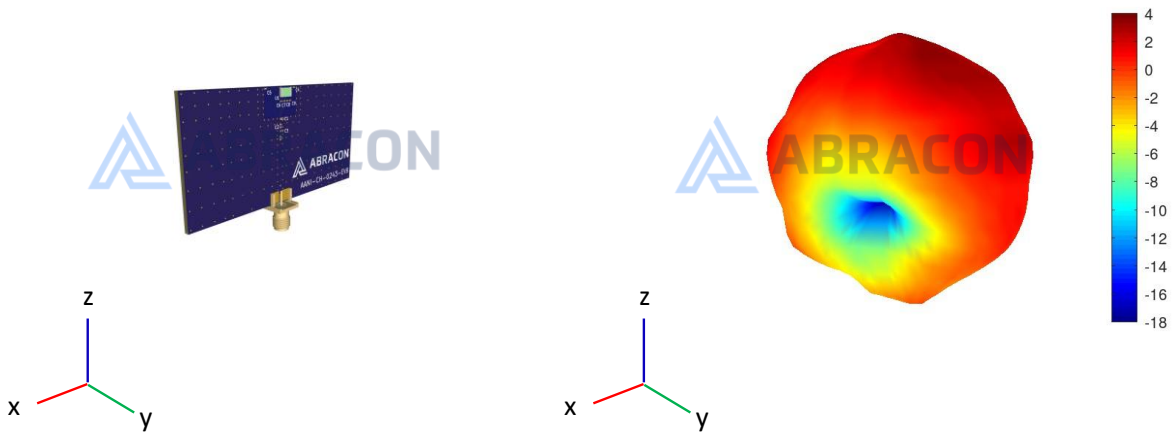
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Radiation Characteristics – 3D & 2D Pattern

1575.42 MHz (L1)



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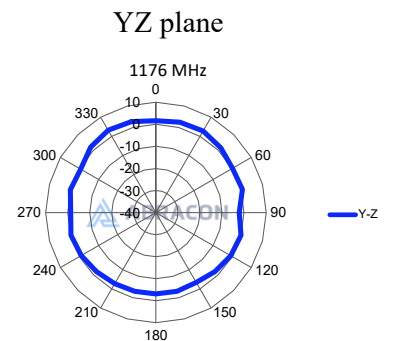
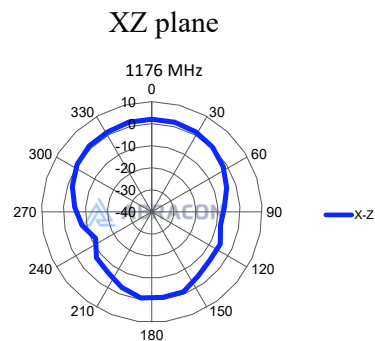
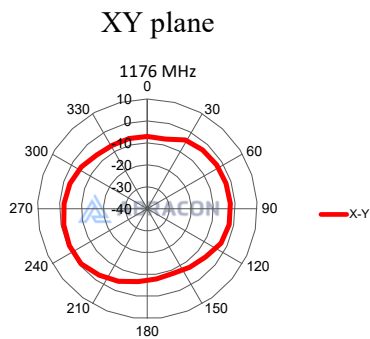
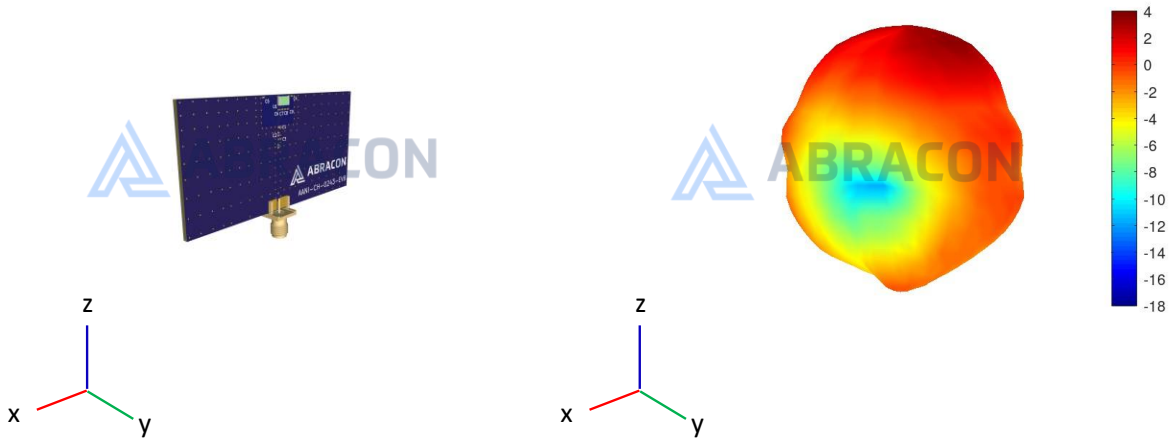


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1176MHz (L5)



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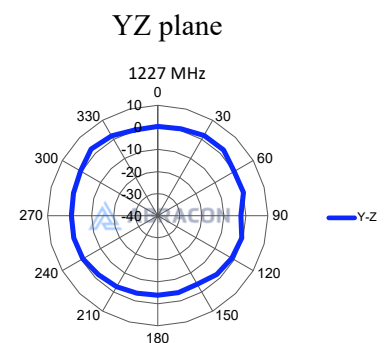
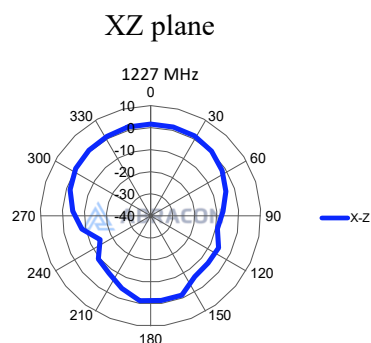
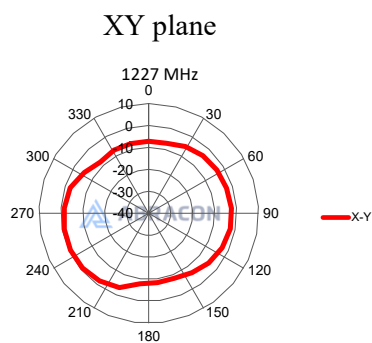
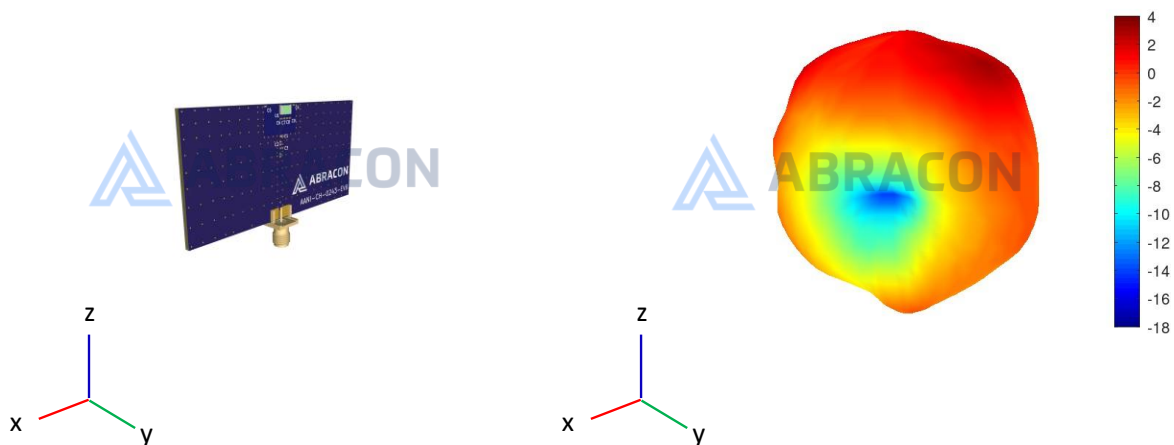


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5.0 x 3.0 x 0.5 mm
RoHS/RoHS II Compliant
MSL Level = 1

1227 MHz (L2)



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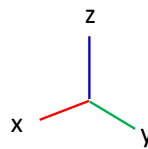
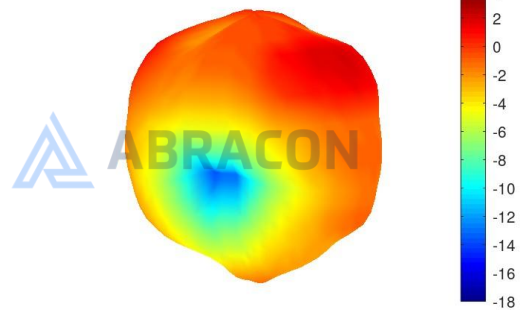
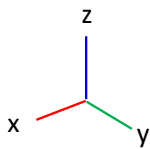
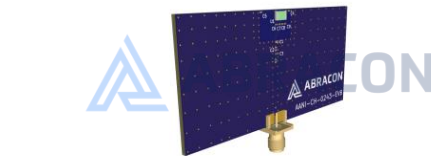


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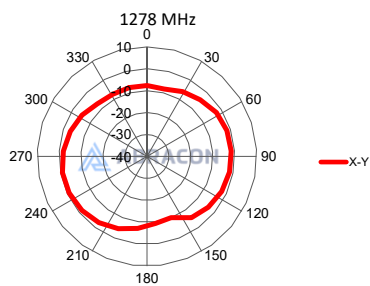


5.0 x 3.0 x 0.5 mm
RoHS/RoHS II Compliant
MSL Level = 1

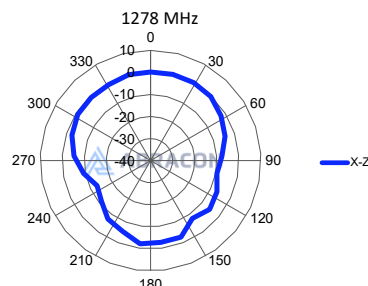
1278 MHz (L6)



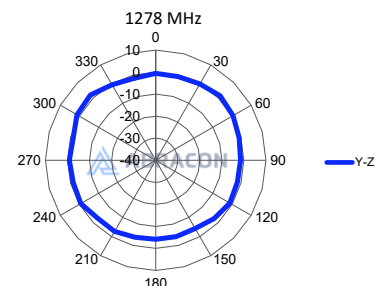
XY plane



XZ plane



YZ plane



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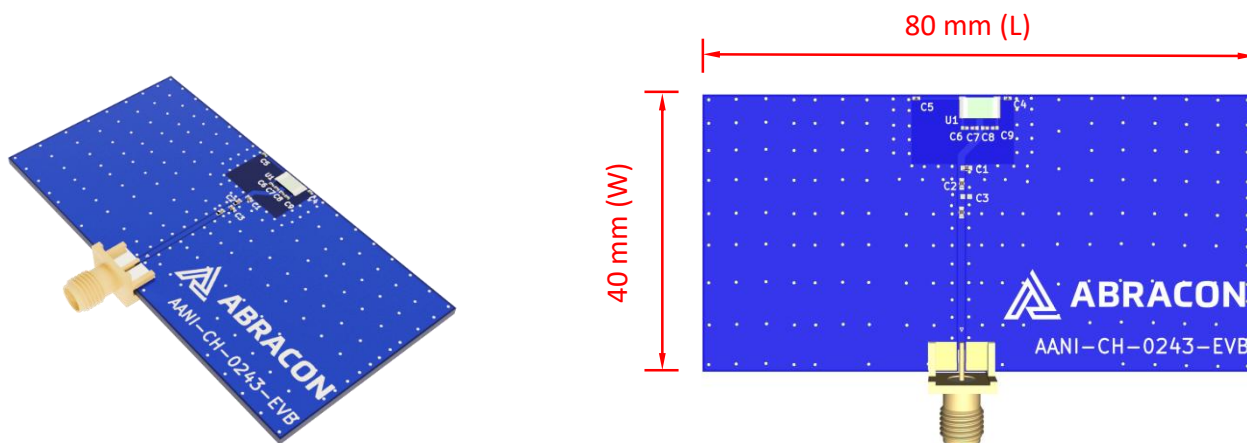
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5.0 x 3.0 x 0.5 mm
RoHS/RoHS II Compliant
MSL Level = 1

Evaluation Board Outline & Matching Circuit

The evaluation board (Abracon AANI-CH-0243 -EVB) is developed to simplify antenna testing and evaluation. It has a size of 80 mm (L) x 40 mm (W) and includes an SMA connector. The purpose is to give a reference design for an optimal antenna implementation. The evaluation board can also be used to test other implementations by cutting and soldering the PCB into any device.



Unit : mm

The evaluation board has a matching circuit implemented next to the antenna. This is aimed at enabling optimization possibilities for the user. The component positions are sized for 0402 (1005 metric) SMD components.

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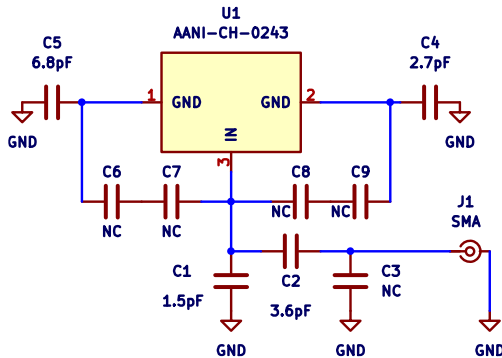
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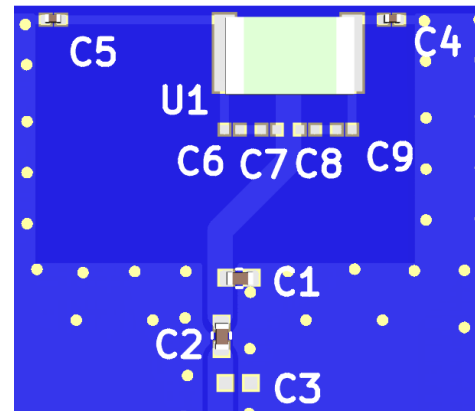
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MSL Level = 1

The antenna requires a matching circuit to fine-tune the resonant frequency and achieve optimal balance. The evaluation board is pre-tuned for optimal performance in the L band range using the components listed below (equivalents may be used):

Schematic



Layout



Component	Description	Manufacturer	Part Number	QTY
Ant.	GNSS L1/ L2/ L5/ L6 Ceramic Chip Antenna	Abracon	AANI-CH-0243	1
C1	1.5 pF Capacitor (0402 / 1005 Metric)	Murata	-	1
C2	3.6 pF Capacitor (0402 / 1005 Metric)	Murata	-	1
C3	NC	-	-	-
C4	2.7 pF Capacitor (0201 / 0603 Metric)	Murata	-	1
C5	6.8 pF Capacitor (0201 / 0603 Metric)	Murata	-	1
C6 – C9	NC (Fine tuning Elements)	-	-	-

**However, it is common that the resonant frequency will shift during implementation in an arbitrary device. Therefore, this matching may be changed with other values/components/brands for compensation of such effects.

Transmission Line

The transmission line should be kept as short as possible and be designed to have a characteristic impedance of 50Ω. Abracon recommends using a Co-Planar Waveguide with Ground (CPWG), which dimensions can be derived by any trusted calculator, using the correct input for PCB materials and layer stack-up.

For details on PCB layout and reference design, please reach out to [Abracon online support](#).



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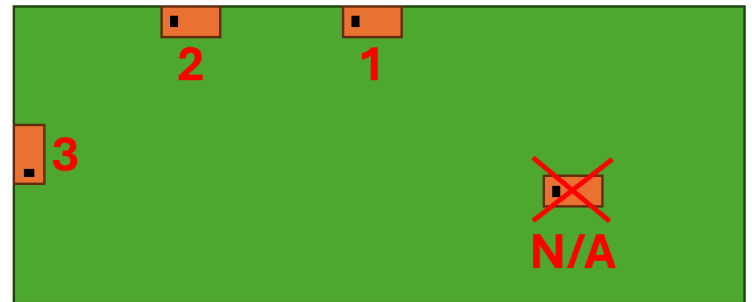
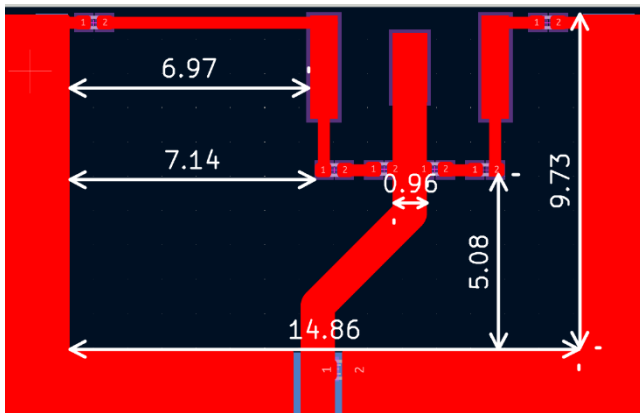


5.0 x 3.0 x 0.5 mm
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MSL Level = 1

General Implementation Guidelines

The antenna can be positioned in different ways, although there are some positions which are more beneficial. The illustration below shows a typical PCB with examples on different antenna positions (the GND cutout is not visualized):

- The optimal position is usually option 1. Options 2 and 3 are also possible.
- The antenna must be placed along the PCB edge, i.e., it cannot be placed in the middle (see "N/A").
- Option 2 or 3 may be the best option for PCB's much larger than the evaluation board.



Unit : mm

The rectangular copper cutout in the footprint must extend through all layers of the PCB stack-up, ensuring there is **no copper on any layer in this area**. Additionally, a robust via structure around the cutout and along the edge of the ground plane is highly recommended for optimal performance.

It is important to note that plastic and metal parts in close proximity to antennas may significantly affect antenna tuning and performance. For instance, a plastic housing above the antenna often causes the resonant frequency to shift downward. Since such effects are challenging to predict without detailed design information, it is recommended to measure the antenna performance in the final device after implementation. To compensate for potential frequency shifts, implementing a matching network on the antenna feed is advisable.

Another general consideration for surface-mounted antennas relates to PCB population. Electrical components placed near the antenna may impact its tuning and radiation performance. To mitigate this, components in the surrounding area should be positioned below a topographical slope. This slope should begin at the PCB level near the antenna's designated keep-out zone and gradually increase in height as distance from the antenna grows.

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Reflow Profile [JEDEC J-STD-020]

Solder paste: Sn/3.0Ag/0.5Cu

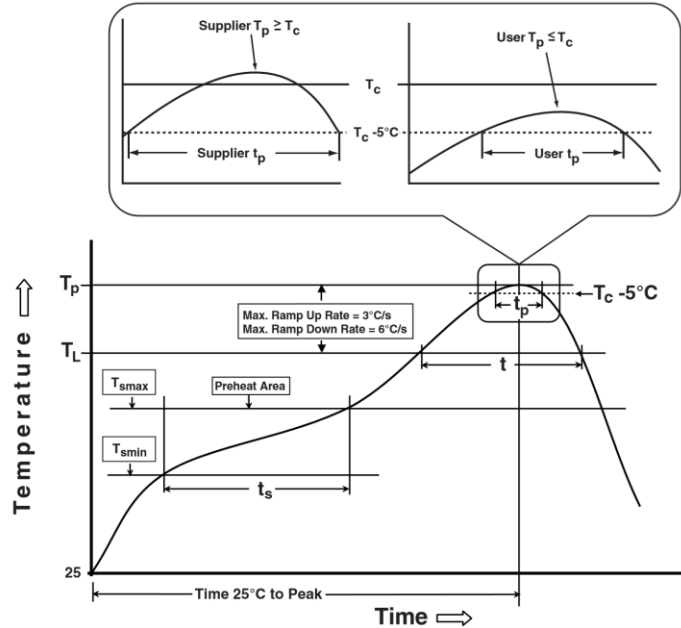


Table 1

SnPb Eutectic Process
Classification Temperatures (T_c)

Package Thickness	Volume mm ³ <350	Volume mm ³ ≥350
<2.5mm	235°C	220°C
≥2.5mm	220°C	220°C

Table 2

Pb-Free Process
Classification Temperatures (T_c)

Package Thickness	Volume mm ³ <350	Volume mm ³ 350-2000	Volume mm ³ >2000
<1.6mm	260°C	260°C	260°C
1.6mm - 2.5mm	260°C	250°C	245°C
>2.5mm	250°C	245°C	245°C

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat / soak		
Temperature minimum (T_{smin})	100°C	150°C
Temperature maximum (T_{smax})	150°C	200°C
Time (T_{smin} to T_{smax}) (t_s)	60 – 120 sec.	60 – 90 sec.
Average ramp-up rate (T_{smax} to T_p)	3°C/sec. max	3°C/sec. max
Liquidous temperature (T_L)	183°C	217°C
Time at Liquidous (T_L)	60 – 150 sec.	60 – 150 sec.
Peak package body temperature (T_p)*	See Table 1	See Table 2
Time (T_p)* within 5°C of the specified classification temperature (T_c)	20 sec.	10 sec.
Ramp-down rate (T_p to T_{smax})	6°C/sec. max	6°C/sec. max
Time 25°C to peak temperature	6 min. max	8 min. max
Reflow cycles	2 max	2 max

*Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum.

**Tolerance for time at peak profile temperature (t_p) is defined as a supplier minimum and a user maximum.



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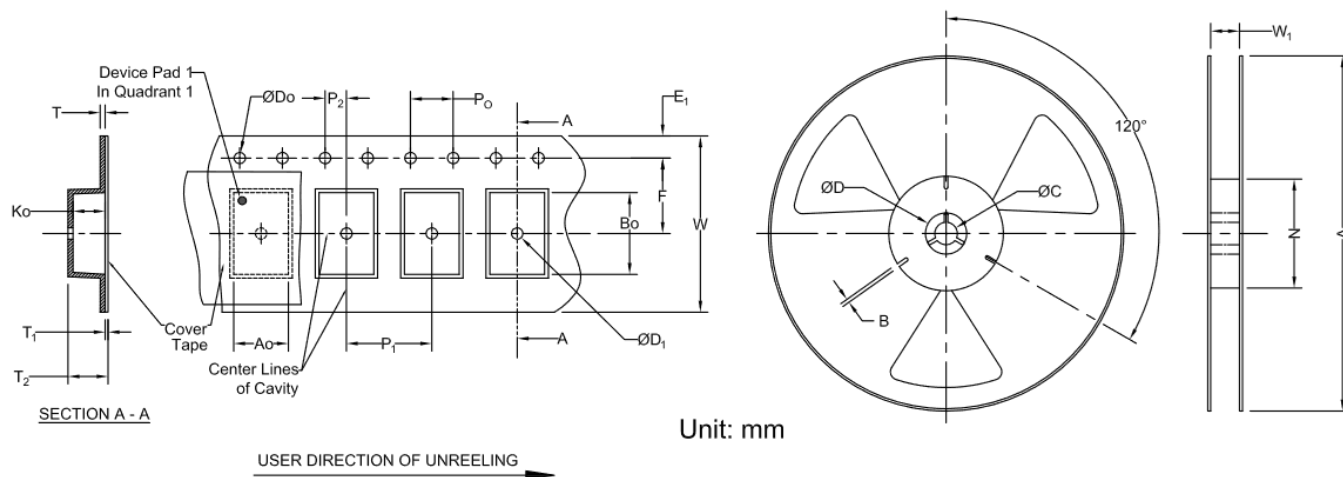
Check Inventory



5.0 x 3.0 x 0.5 mm
RoHS/RoHS II Compliant
MSL Level = 1

Packaging

Tape & Reel dimensions:



Carrier Tape Specifications (mm)

D ₀	K ₀	E ₁	P ₀	F	P ₁	P ₂	W	A ₀	B ₀	Reel Qty
1.50 ± 0.1	0.9 +0.2/-0.1	1.75 ± 0.1	4.0 ± 0.1	5.5 ± 0.1	8.0 ± 0.1	2.0 ± 0.1	12.0 ± 0.3	3.25 +0.2/-0.1	5.25 +0.2/-0.1	6,000

Reel Specifications (mm)

A	W ₁	N	C
330	13.4 ± 1.0	99 ± 0.5	13.5 ± 0.5

ATTENTION: Abracon LLC's products are Commercial-Off-The-Shelf ('COTS'), which are designed, intended, and validated for use in commercial, industrial, and automotive applications. The customer is responsible for testing and verifying the performance of an Abracon solution to meet their system-level requirements.



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