

Dual-Band Wi-Fi Chip Antenna



AANI-CH-0078

Request Samples



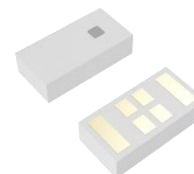
Check Inventory



1.6 x 0.8 x 0.4 mm
RoHS/RoHS II Compliant
MSL Level = 1

Description

This high-performance Dual-band chip antenna, in a compact 1.6 x 0.8 x 0.4 mm SMD form factor, is engineered for next-generation Wi-Fi and concurrent Bluetooth®/Zigbee®/Thread operation. Optimized for PCB edge mounting, it delivers a peak gain of 2.7 dBi and an exceptional 75% average total efficiency, ensuring robust wireless coverage. With a low return loss of ≤ -9.5 dB and linear polarization, it maximizes power transfer and link reliability for Wi-Fi, IoT, M2M, and home automation applications. This RoHS-compliant, MSL Level 1 antenna is an ideal solution for space-constrained, high-throughput devices.



Features

- Frequency Range: 2400 - 2483.5 / 5150 – 5850 MHz
- From Factor: 1.6 x 0.8 x 0.4 mm
- Low Return Loss: ≤ -9.5 dB
- Peak Gain: 2.7 dBi
- Average Total Efficiency: 75%
- Linear Polarization
- Surface Mount (SMD)
- Integration: PCB edge mounting
- [RoHS Compliant](#) | [MSL Level 1](#)

Applications

- Wi-Fi / WLAN coverage
- Bluetooth® / ZigBee® / Thread/ Matter
- Home Automation and Remote Sensing
- IoT, M2M, Wearables
- Wireless Remote Control

Ordering Information

Part Number	Description
AANI-CH-0078	Dual-Band Wi-Fi Chip Antenna on Cut Tape
AANI-CH-0078-T	Dual-Band Wi-Fi Chip Antenna on Tape & Reel

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



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MSL Level = 1

Electrical Specification

Parameter	Specification		Unit
Operating Frequency	2400 - 2483.5	5150 - 5850	MHz
Return Loss	< -11	< -9.5	dB
VSWR	< 1.75	< 2.0	:1
Peak Gain	2.5	2.7	dBi
Minimum Total Efficiency	70.67	72.65	%
Average Total Efficiency	75.06	75.52	%
Maximum Total Efficiency	79.85	78.54	%
Polarization	Linear		-
Impedance	50		Ω
Radiation Pattern	Omni-directional		-
Input Power	≤ 3.0		W

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	1.6 x 0.8 x 0.4 mm
Evaluation board Dimension	20 x 50 mm
Recommended Ground Clearance for Antenna	8 x 5 mm
Mounting Type	Surface Mount
Mounting Location	PCB Edge Mounting
Material(s)	Ceramic
Additional Resources	Download STEP File, Package Drawing, 3D PDF

Environmental Specification

Parameter	Specification
Operating & Storage Temperature (Unpackaged Component)	-40°C ~ +95°C
Storage Temperature in Packaging	-10°C ~ +40°C
Packaging Storage Relative Humidity	70% (Max.)
MSL Level	1
RoHS Complaint	Yes



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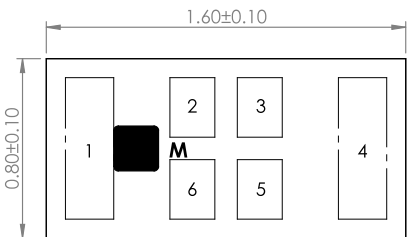


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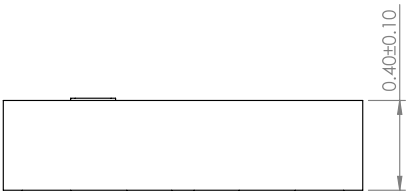


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RoHS/RoHS II Compliant
MSL Level = 1

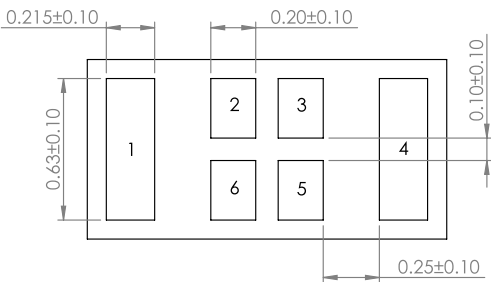
Product Dimensions & Recommended Land Pattern



TOP VIEW

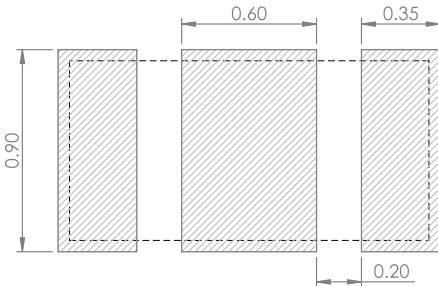


FRONT VIEW

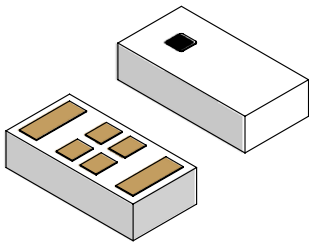


BOTTOM VIEW

RECOMMENDED LAND PATTERN



Pin #	Function
1	Port for 2.4 GHz
2	Feed
3	Feed
4	Port for 5.5 GHz
5	Feed
6	Feed
M	MARK



Unit : mm

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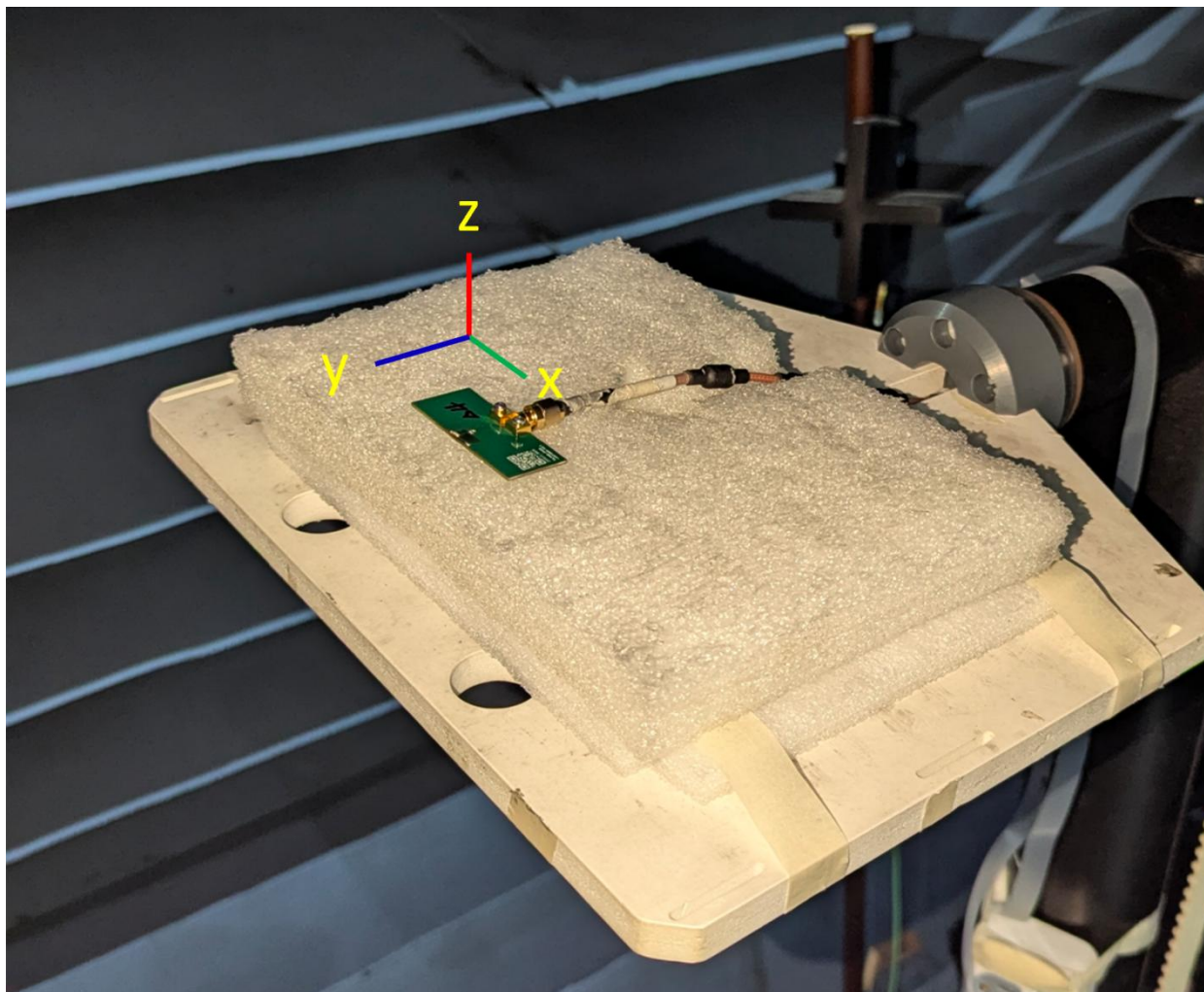
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Measurement Setup

The radiation measurements were all done in an anechoic chamber with the antenna implemented on its evaluation board (Abracon AANI-CH-0078-EVB).



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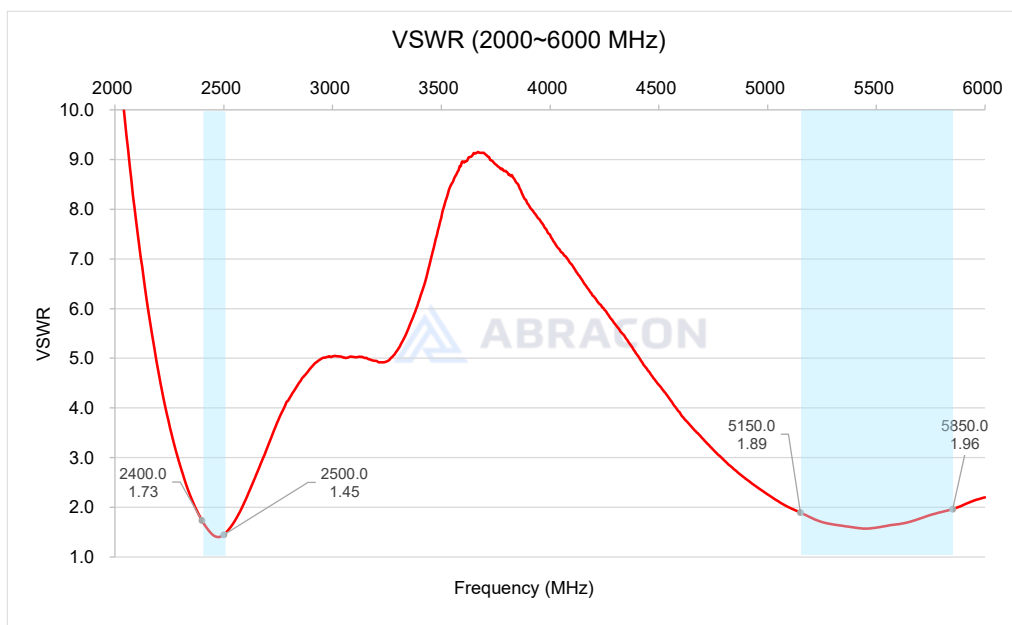
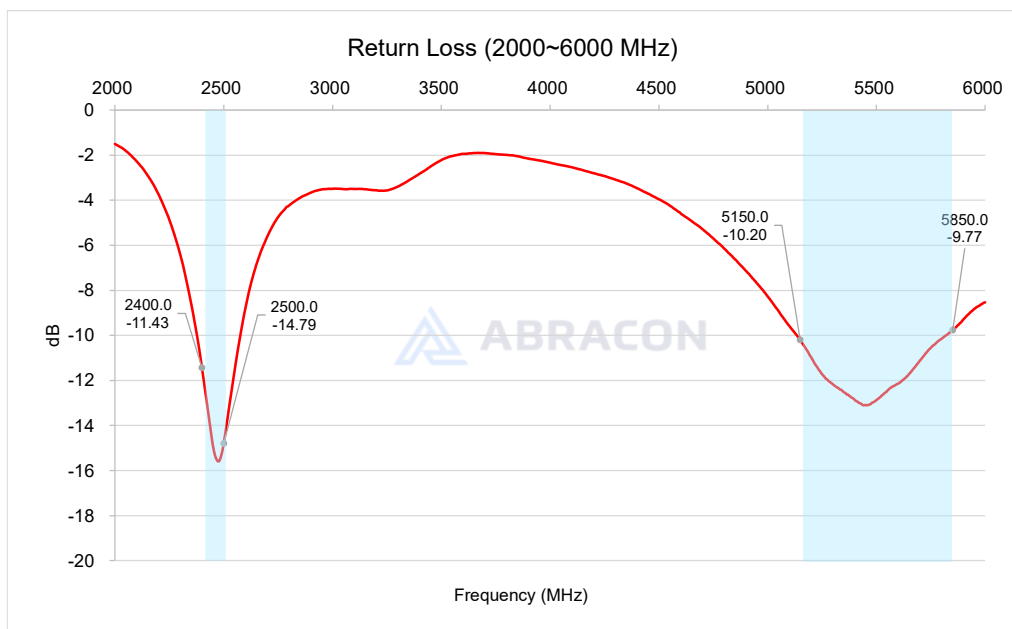


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Reflection Characteristics – Return Loss & VSWR



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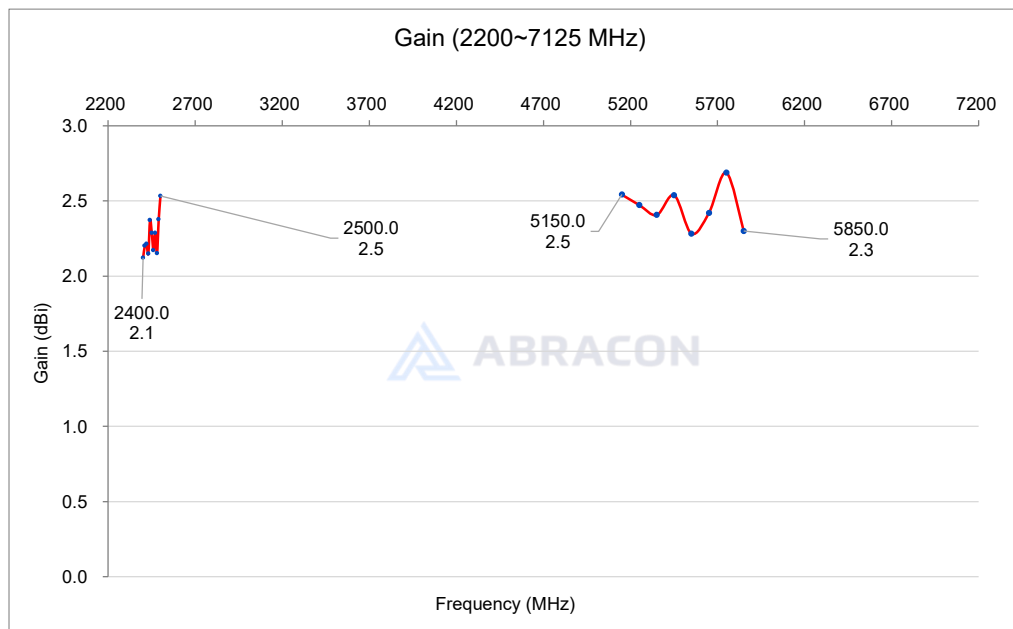


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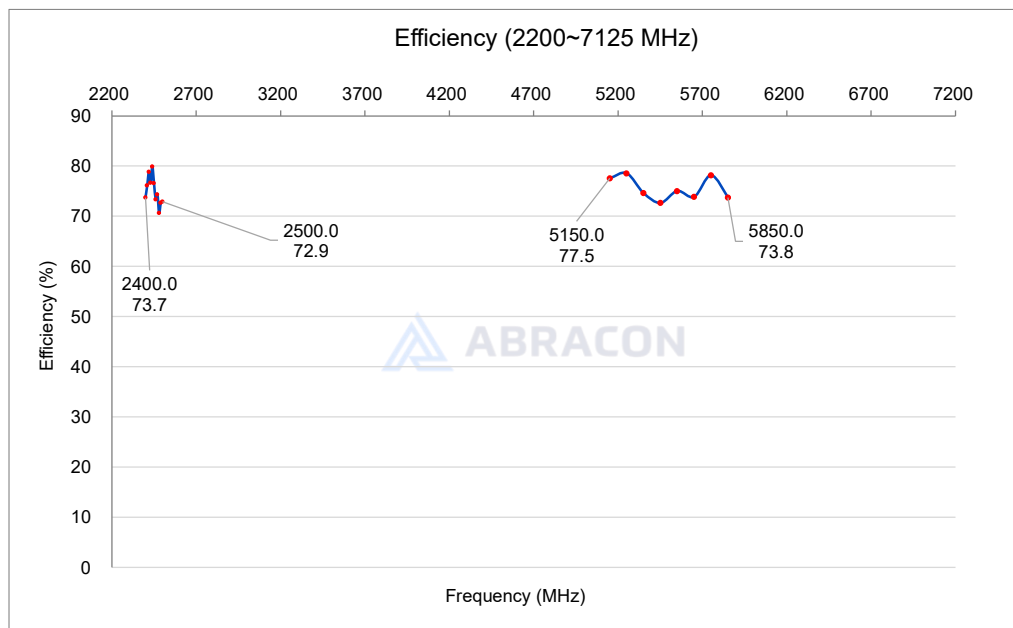


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Radiation Characteristics – Peak Gain



Radiation Characteristics – Total Efficiency (%)



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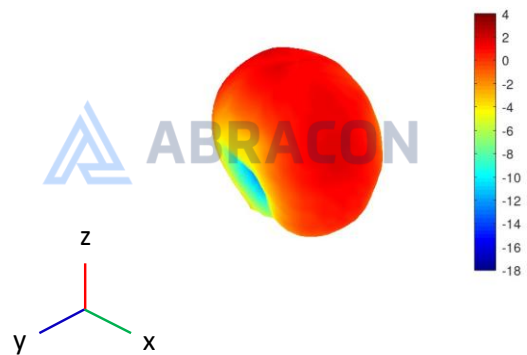
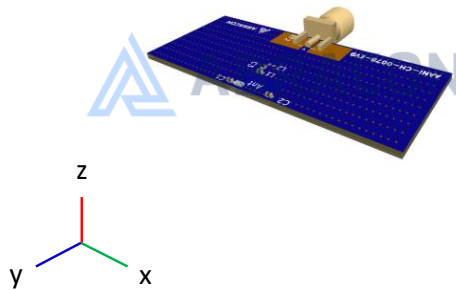
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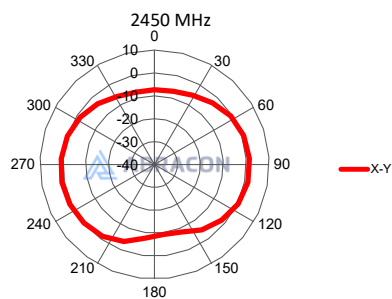
1.6 x 0.8 x 0.4 mm
RoHS/RoHS II Compliant
MSL Level = 1

Radiation Characteristics – 3D & 2D pattern

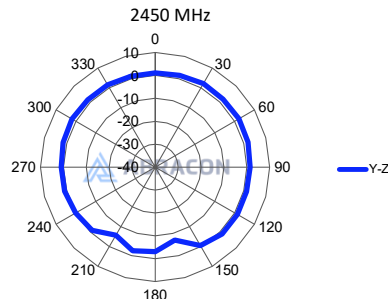
2450MHz



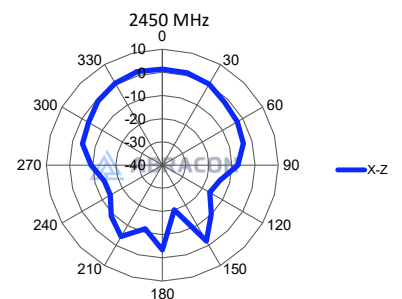
XY plane



YZ plane



XZ plane



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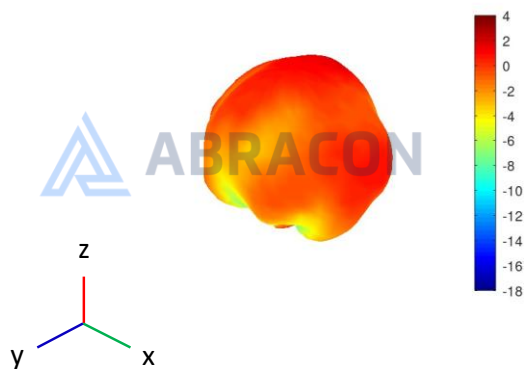
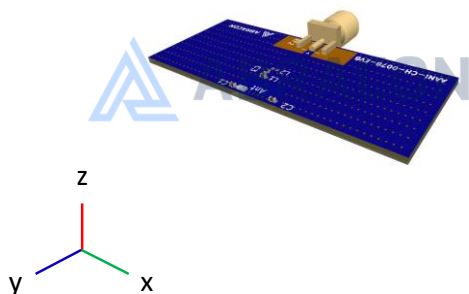


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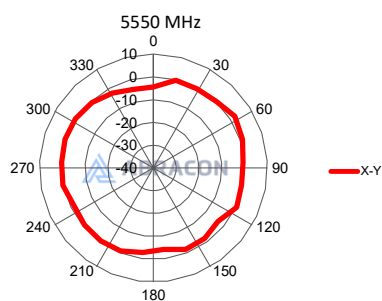


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MSL Level = 1

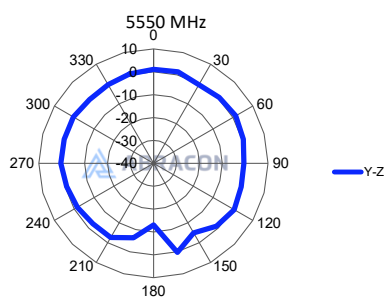
5550MHz



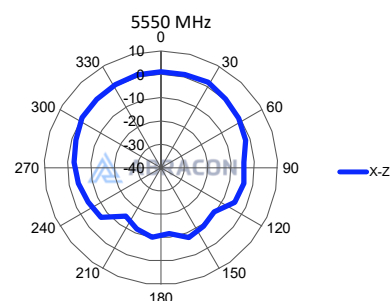
XY plane



YZ plane



XZ plane



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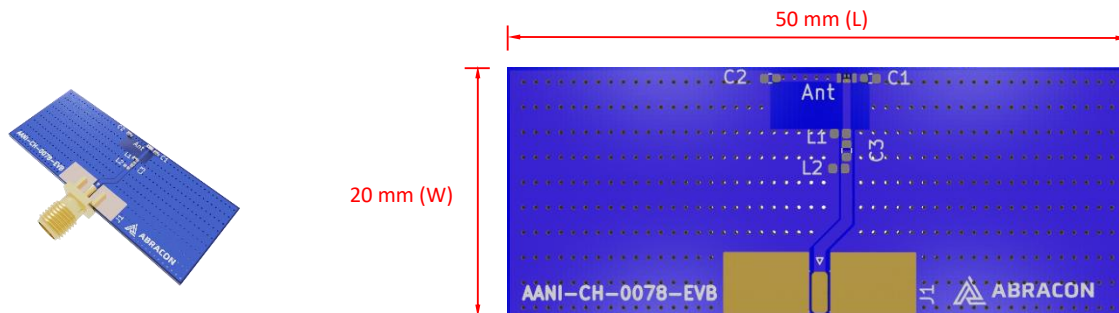
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Evaluation Board Outline & Matching Circuit

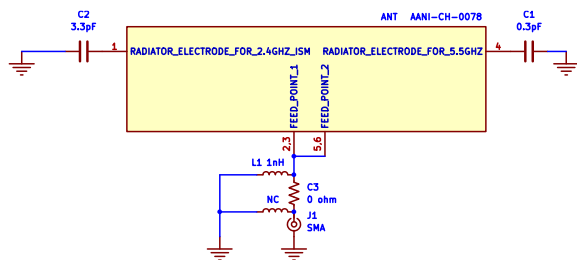
The evaluation board (Abracon AANI-CH-0078-EVB) is developed to simplify antenna testing and evaluation. It has a size of 20 mm (W) x 50 mm (L) and includes an SMA connector. The purpose is to give a reference design for an optimal antenna implementation. The evaluation board can also be used to test other implementations by cutting and soldering the PCB into any device.



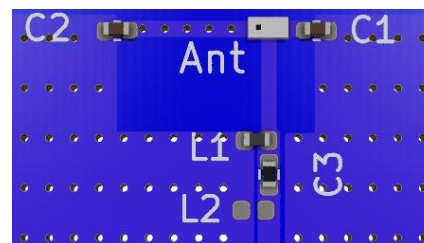
The evaluation board has a matching circuit implemented next to the antenna. This is aimed to enable optimization possibilities for the user. The component positions are sized for 0402 (1005 metric) SMD components.

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 2.4–2.484 GHz and 5.15GHz-5.85GHz range using the components listed below (equivalents may be used):

Schematic



Layout



Component	Description	Manufacturer	Part Number	QTY
Ant	Dual-Band Wi-Fi Chip Antenna	Abracon	AANI-CH-0078	1
L1	1nH Inductor (0402 / 1005 Metric)	Abracon	AIMC-0402HQ-1N0B-T	1
C1	0.3pF Capacitor (0402 / 1005 Metric)	Murata	-	1
C2	3.3pF Capacitor (0402 / 1005 Metric)	Murata	-	1
C3	0 Ω Resistor (0402 / 1005 Metric)	Murata	-	1

**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.



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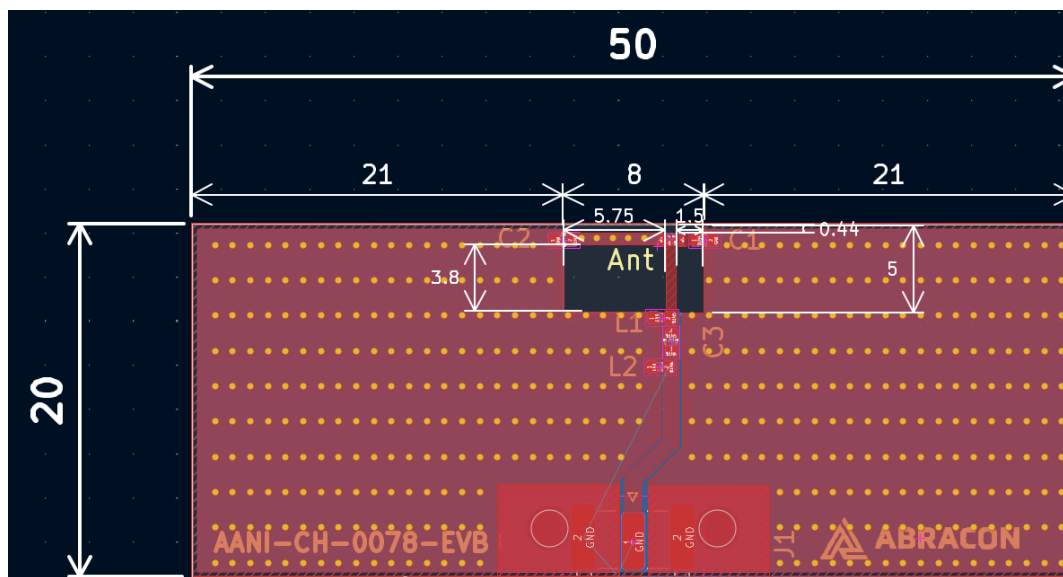
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Recommended PCB Layout

If there are several layers in the PCB, there is an advantage to add vias for smooth interconnection of the ground areas to avoid splits in the ground plane. It is also important that ground clearance is respected through all layers of the PCB. It is recommended to implement a matching network to optimize the antenna impedance in your application.



Unit : mm

EVb Layer Stack up

Number	Name	Type	Material	Thickness (mm)	Weight (oz)	Dk	Orientation	Copper Orientation
	Top Overlay	Overlay						
	Top Solder	Solder Mask	Solder Resist	0.01		3.5		
1	Top Layer	Signal		0.035	1		Top	Above
	Dielectric 1	Dielectric	FR-4	0.91		4.8		
2	Bottom Layer	Signal		0.035	1		Bottom	Below
	Bottom Solder	Solder Mask	Solder Resist	0.01		3.5		
	Bottom Overlay	Overlay						



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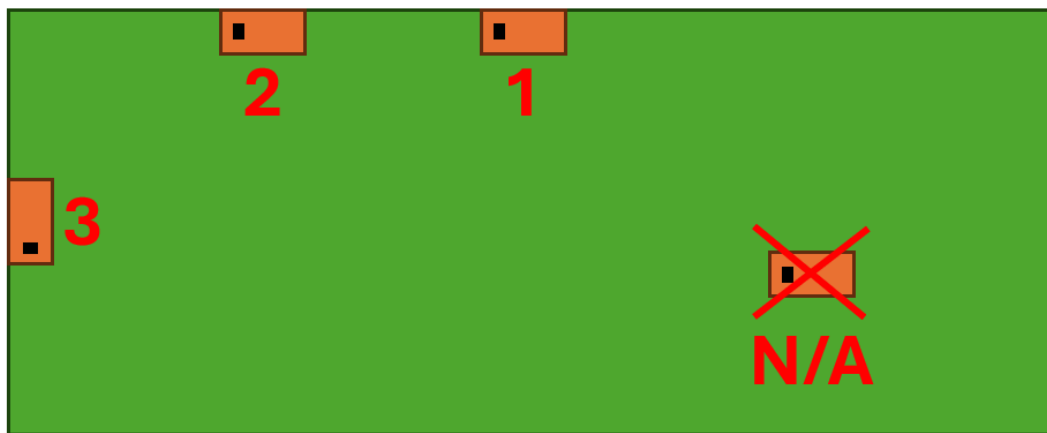


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RoHS/RoHS II Compliant
MSL Level = 1

General Implementation Guidelines

The antenna can be positioned in different ways, although there are some positions which are more beneficial. The below illustration 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.



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.

For technical assistance, please contact [Abracon online support](#) through our online support platform.

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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Reflow Profile [JEDEC J-STD-020]

Solder paste: Sn/3.0Ag/0.5Cu

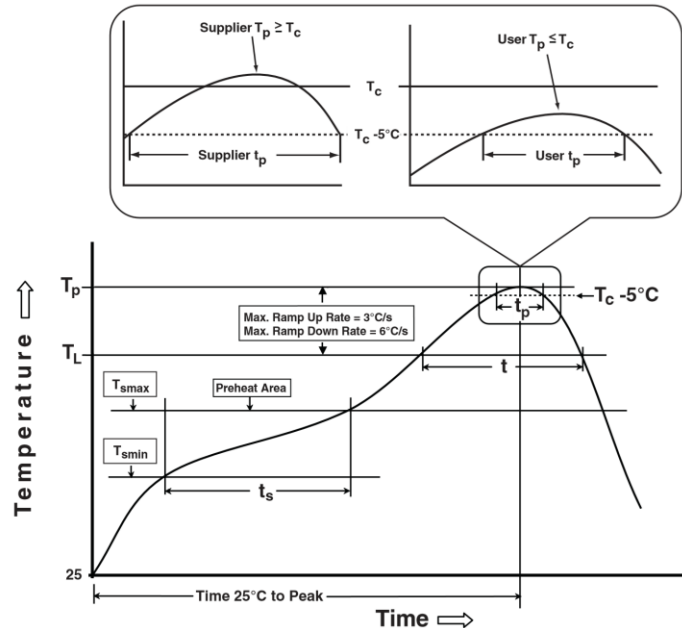


Table 1

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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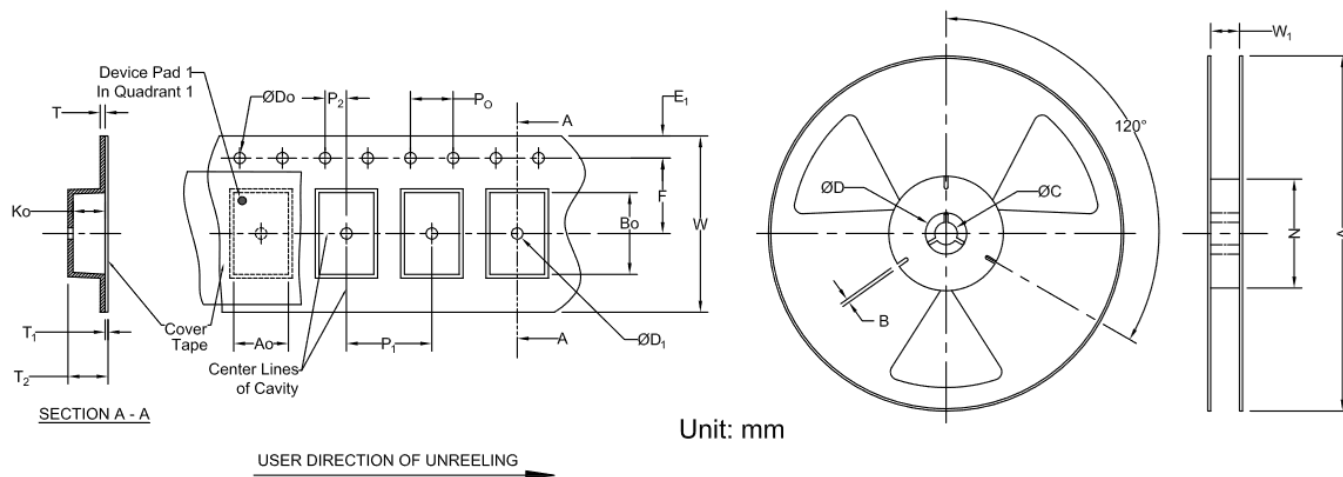
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MSL Level = 1

Packaging

Tape & Reel dimensions:



Carrier Tape Specifications (mm)

Do	K ₀	E ₁	P ₀	F	P ₁	P ₂	W	A ₀	B ₀	Reel Qty
1.50 ± 0.1	0.75 ± 0.05	1.75 ± 0.1	4.0 ± 0.1	3.5 ± 0.1	4.0 ± 0.1	2.0 ± 0.1	8.0 ± 0.1	1.1 ± 0.1	1.9 ± 0.1	5,000

Reel Specifications (mm)

A	W ₁	N	D
178 ± 2.0	8.5 ± 1.0	60 ± 2.0	21.0 ± 0.8

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