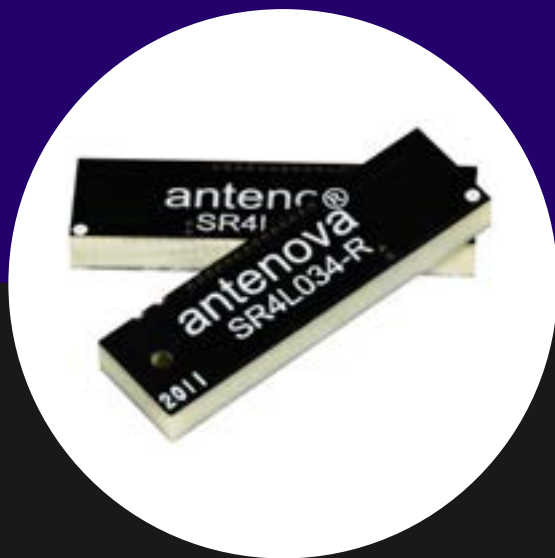


DATASHEET

Inversa

SR4L034-L • lamiiANT®
SR4L034-R • lamiiANT®



1. Description

Inversa is intended for use with 3G/4G applications. As a single antenna or in MIMO systems, this antenna was specifically designed for coexistence and minimal space requirements by being corner placed on the host PCB. This product specification shows the performance of the antenna over all stated frequency ranges.

2. Applications

- 4G Mi-Fi Routers
- Medical equipment
- Tablets
- OBD2 systems
- MIMO systems
- Femtocel / Picocell basestations
- Remote monitoring

3. General data

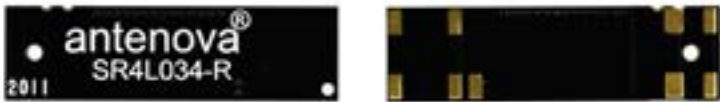
Frequency	698-960MHz 1710-2170MHz 2300-2400MHz 2500-2690MHz
Polarization	Linear
Operating temperature	-40°C to 140°C
Environmental condition test	ISO16750-4 5.1.1.1/5.1.2.1/5.3.2
Impedance with matching	50 Ω
Weight	<2.5g
Antenna type	SMD
Dimensions	28.0 x 8.0 x 3.3 (mm)

4. Part number

Inversa left
SR4L034-L



Inversa right
SR4L034-R



5. Active antenna specifications

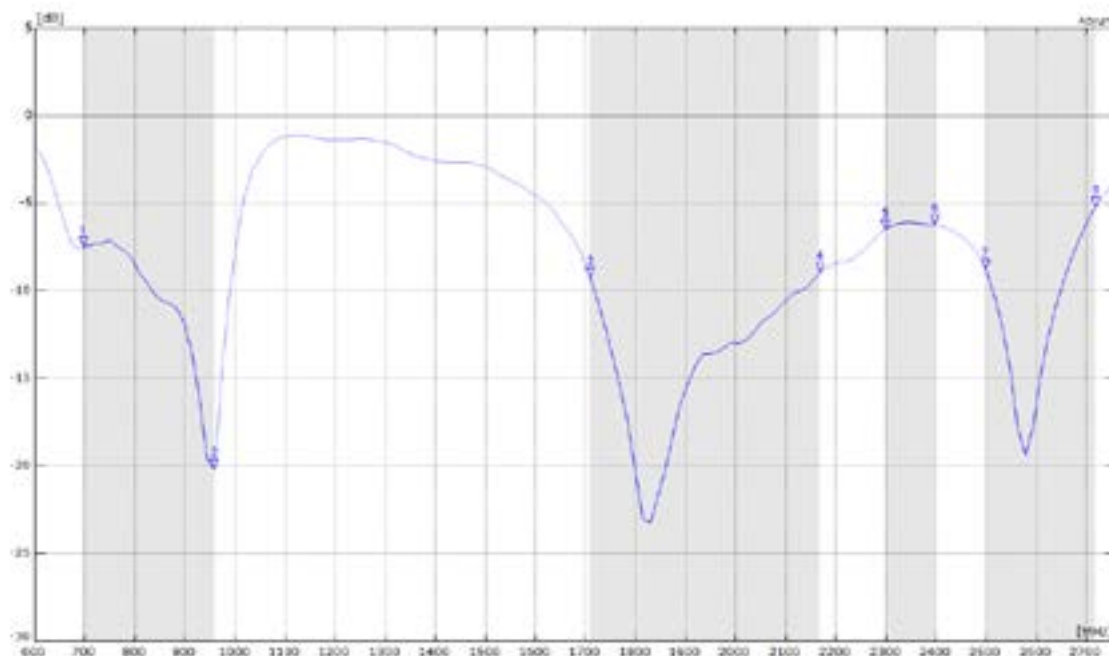
	698-824 MHz	824-960 MHz	1710-2170 MHz
Peak gain	0.40dBi	1.60dBi	3.50dBi
Average gain (Linear)	-2.0dBi	-1.10dBi	-2.00dBi
Average efficiency	>55%	>70%	>60%
Maximum return loss	-6.0dB	-6.6dB	-5.1dB
Maximum VSWR	2.8:1	2.8:1	3.5:1

	2300-2400 MHz	2500-2690 MHz
Peak gain	3.60dBi	2.10dBi
Average gain (Linear)	-1.60dBi	-2.30dBi
Average efficiency	>60%	>55%
Maximum return loss	-7.0dB	-4.9dB
Maximum VSWR	2.5:1	3.7:1

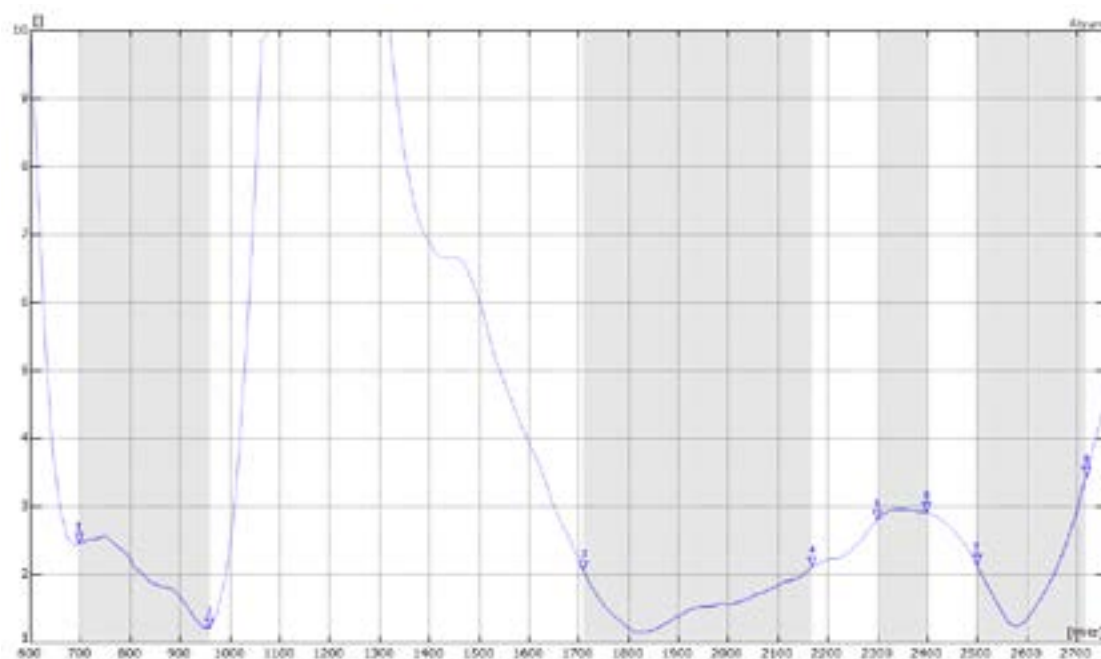
All data measured on Antenna's evaluation PCB
Part No. SR4L034-EVB-4

6. RF performance

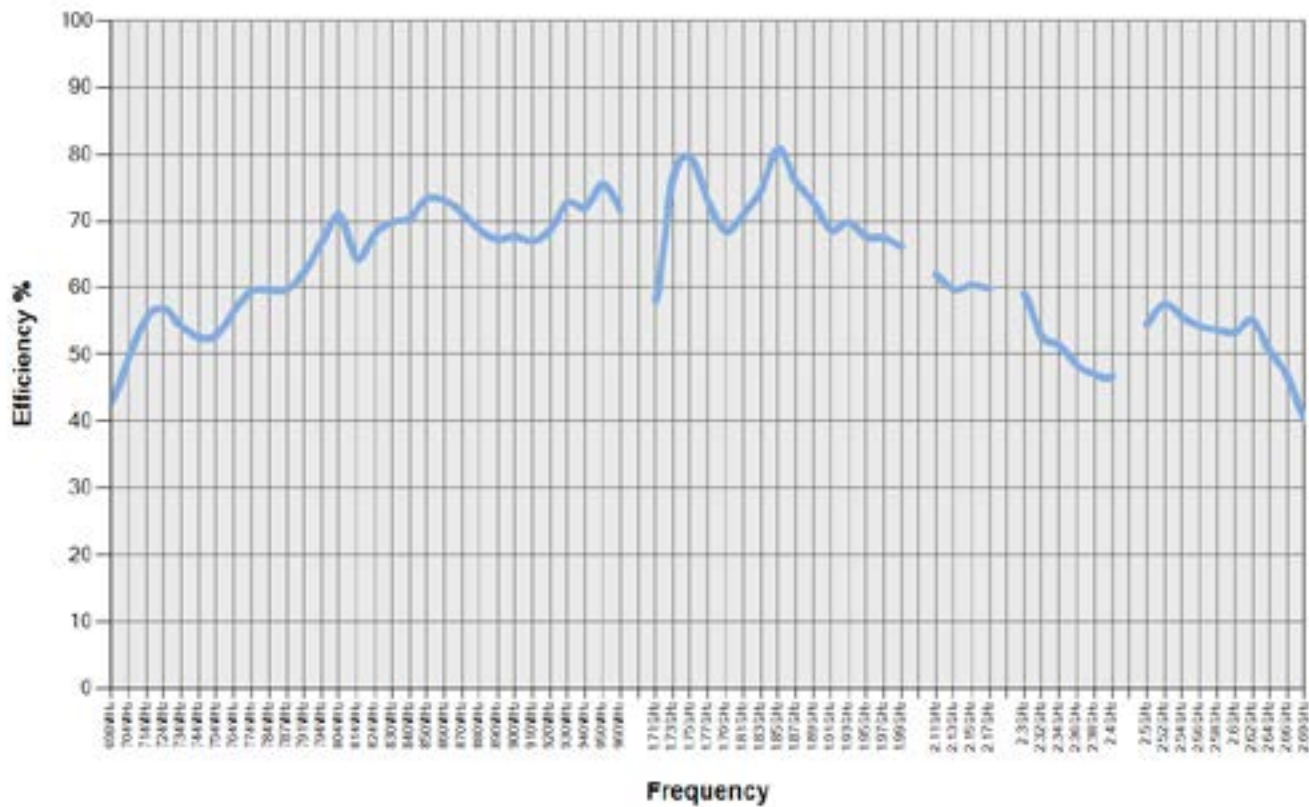
6.1. Return loss



6.2 VSWR



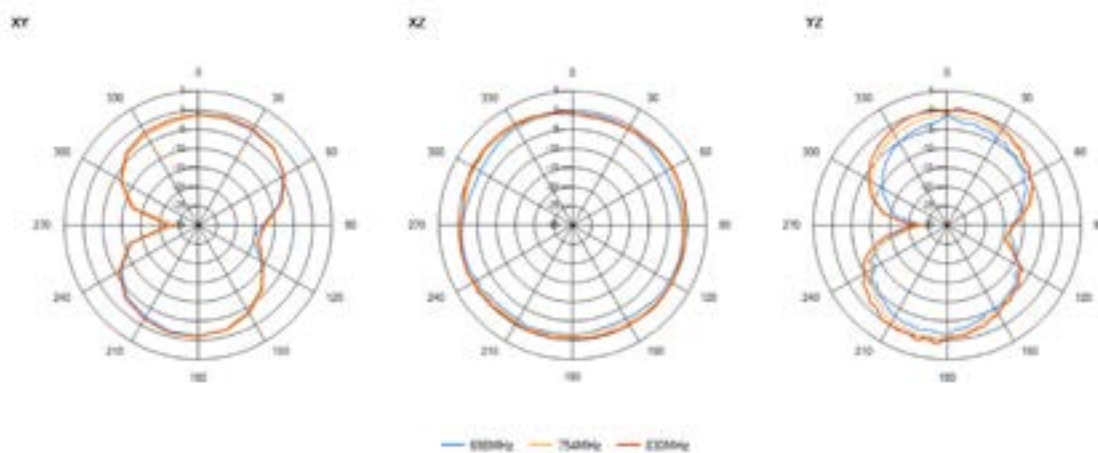
6.3 Efficiency



6.4. Antenna pattern

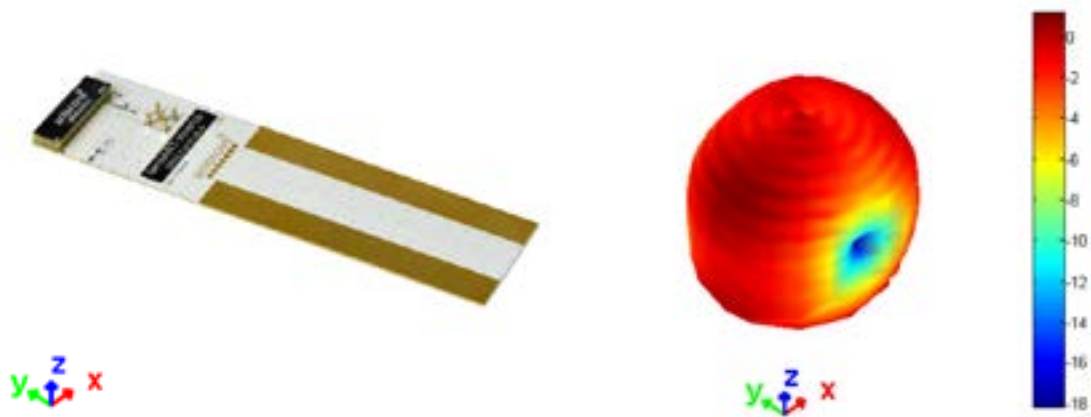
6.4.1. 698 MHz - 825 MHz

3D pattern at 746 MHz

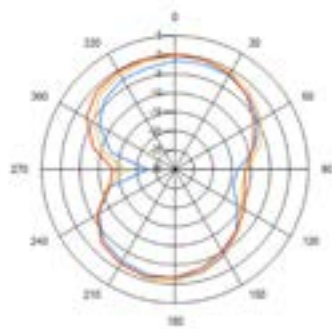


6.4.2. 825 MHz - 960 MHz

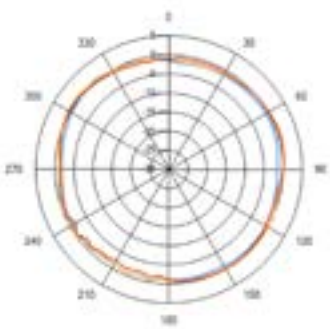
3D pattern at 880 MHz



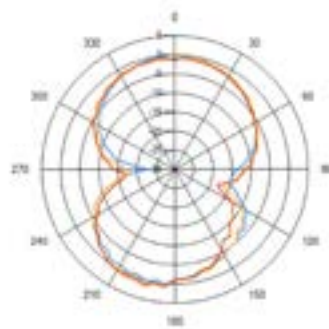
XY



XZ



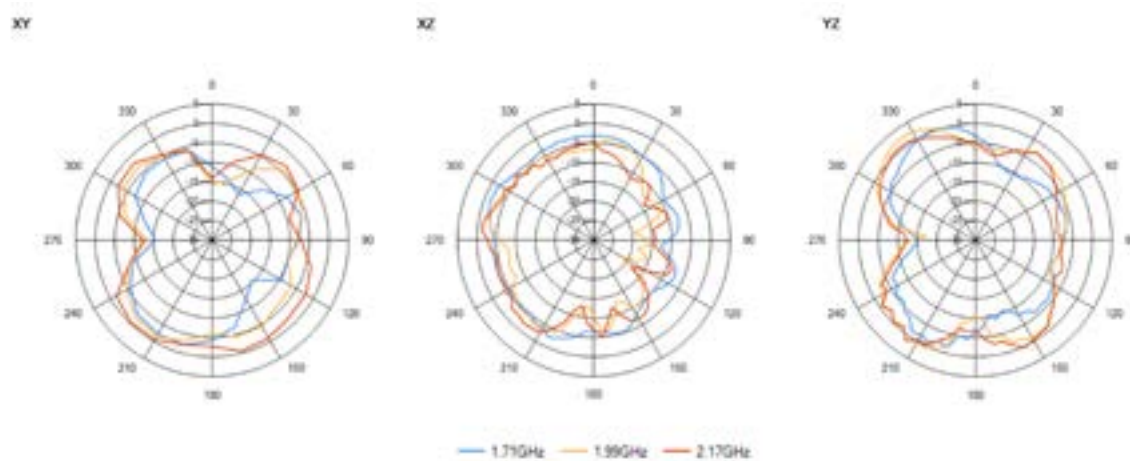
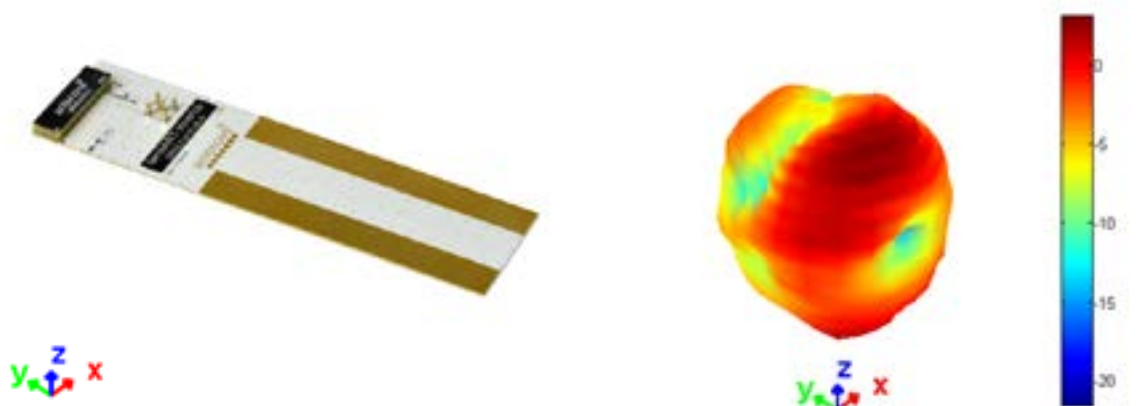
YZ



— 824MHz — 880MHz — 960MHz

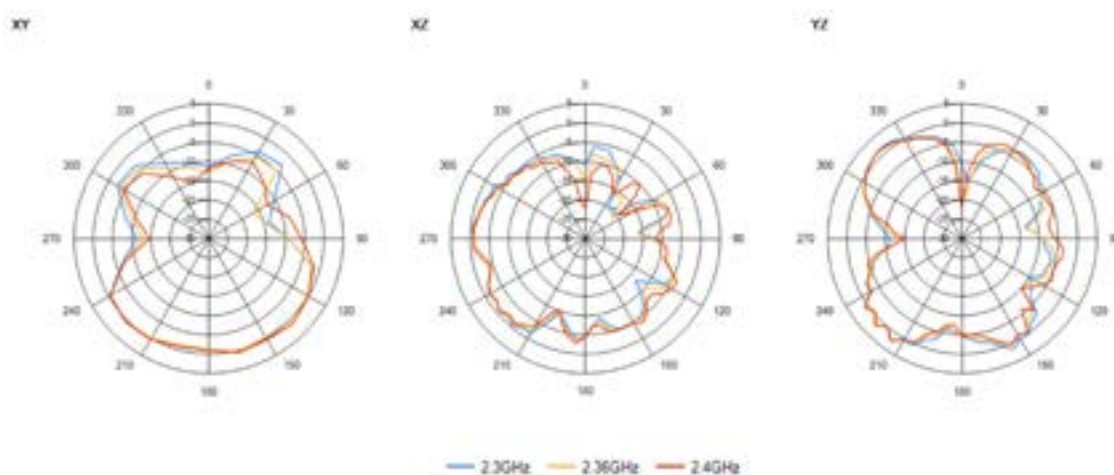
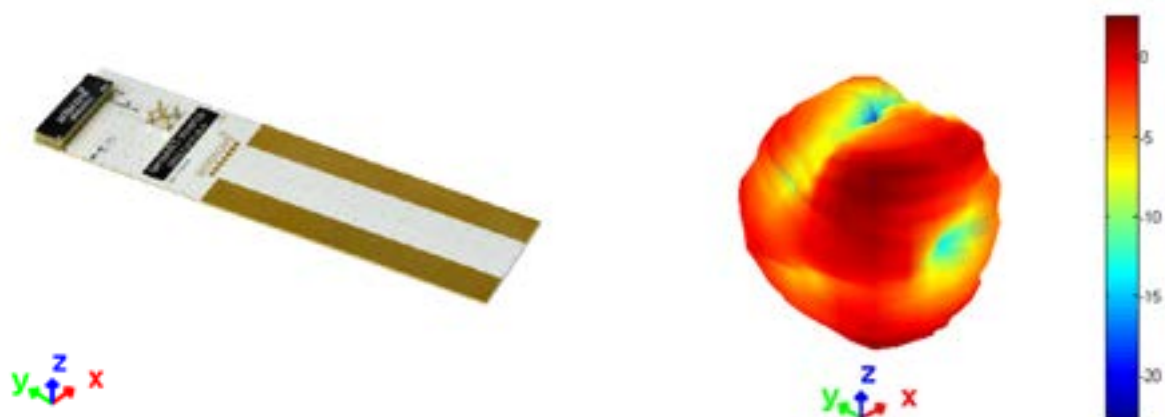
6.4.3. 170 MHz - 2170 MHz

3D pattern at 880 MHz



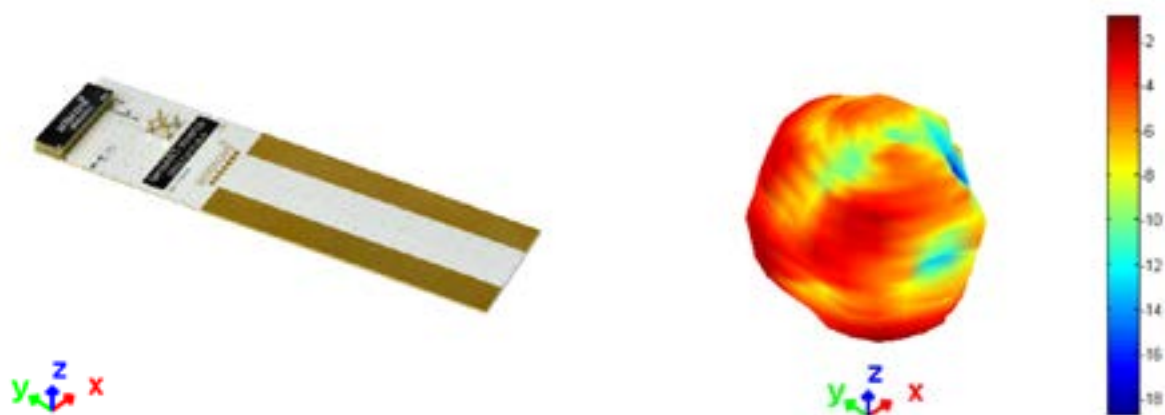
6.4.4. 2300 MHz - 2400 MHz

3D pattern at 2.35 GHz

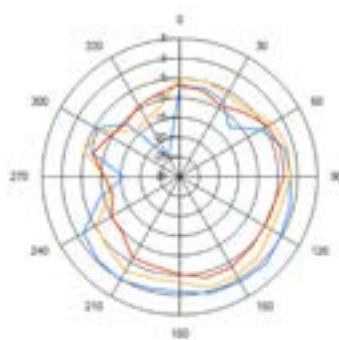


6.4.5. 2500 MHz - 2690 MHz

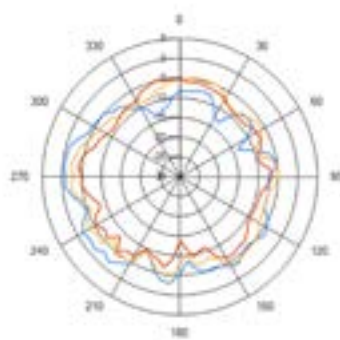
3D pattern at 2.6 GHz



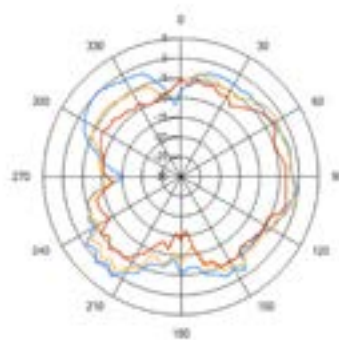
XY



XZ



YZ



— 2.5GHz — 2.6GHz — 2.68GHz

6.5. Optimising antenna efficiency

All SMD cellular antennas require a ground plane on the host PCB for best radiation efficiency, especially in the sub-GHz bands. On an ideal PCB the antenna needs the ground plane length to be greater than a quarter wavelength of the lowest frequency used. If the ground plane is less than this, the efficiency will be reduced. E.g. to calculate the wavelength of 698MHz:

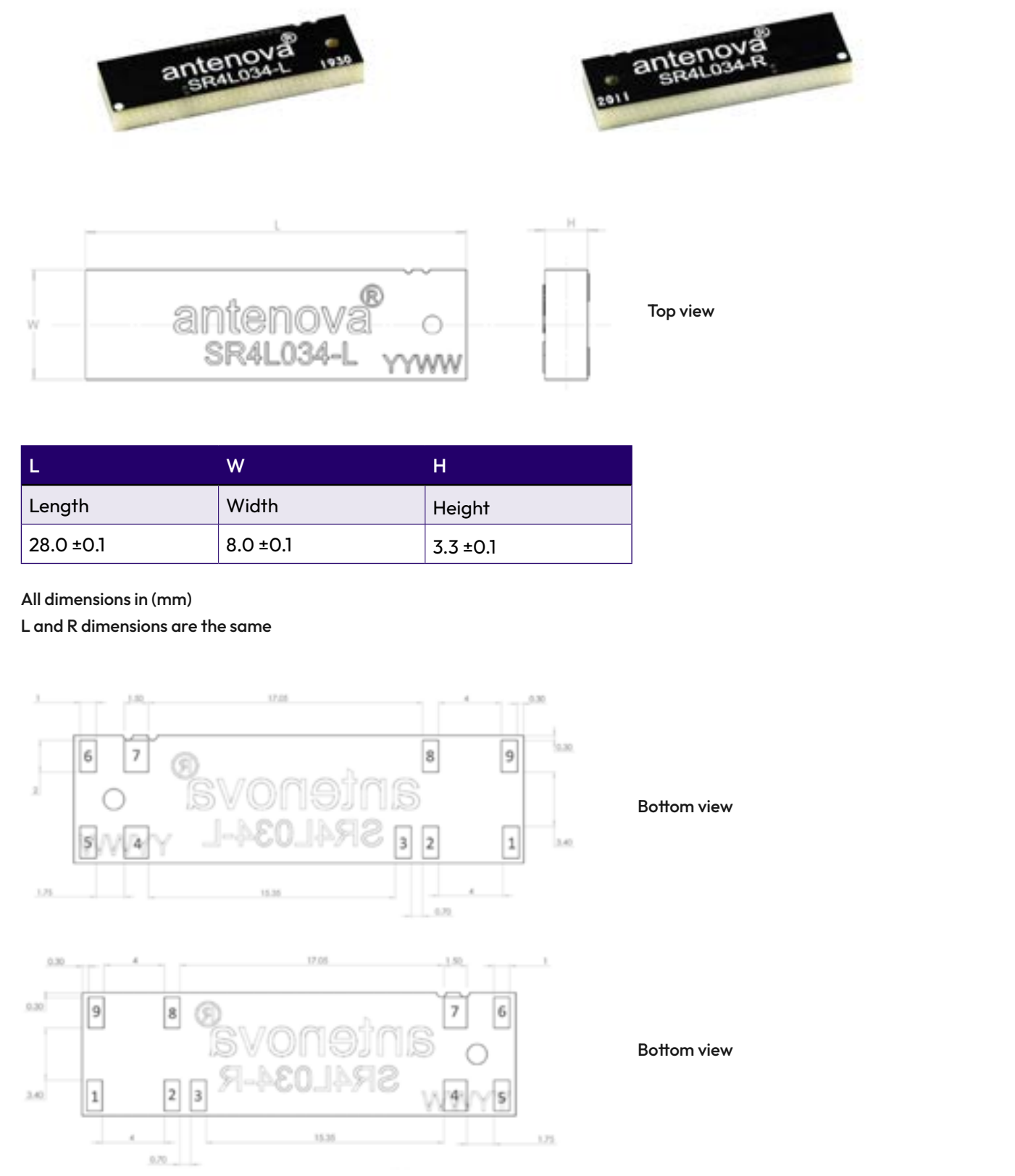
$$\lambda = \frac{c}{f} = \frac{3 \times 10^8}{698 \times 10^6} = 430\text{mm}$$

$$\frac{1}{4} \lambda = 107\text{mm}$$

In practise, the optimum PCB length will be slightly greater than $\frac{1}{4}$ wavelength + antenna + clearance area, for Inversa that optimum PCB length is 130mm.



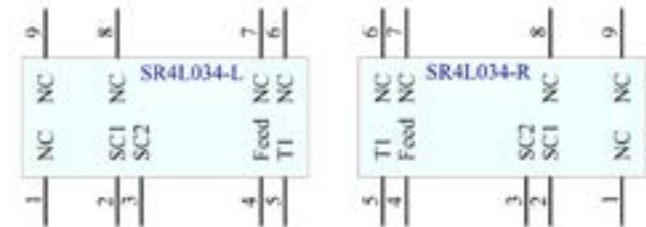
7. Antenna dimensions



8. Schematic symbol and pin definition

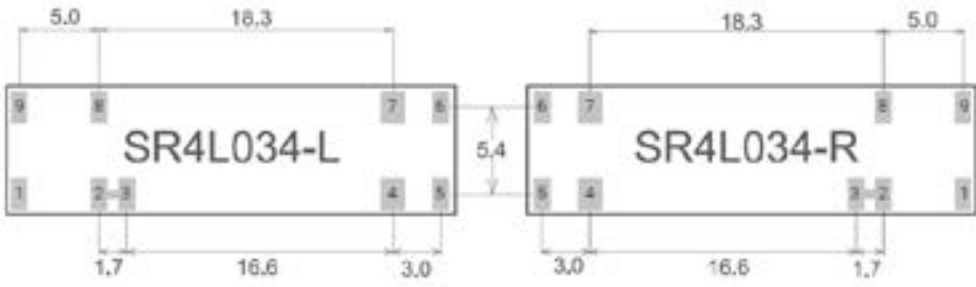
The circuit symbol for the antenna is shown below. The antenna has 9 pins with only 4 as functional. All other pins are for mechanical strength.

Pin	Description
4	Feed (Transceiver port)
5	T1 (Return/Tuning)
1, 6, 7, 8, 9	NC (Not used, mechanical only)
2, 3	SC (Pins 2 and 3 short circuit on host PCB)



9. Host PCB footprint

The recommended host PCB footprint is below.



Pads 1, 2, 3, 5, 6, 8, 9 = 2.0 x 1.0 (mm)
Pads 4, 7 = 2.0 x 1.5 (mm)

10. Electrical interface

10.1. Transmission line

All transmission lines should be designed to have a characteristic impedance of 50Ω .

- The length of each transmission lines should be kept to a minimum
- All other parts of the RF system like transceivers, power amplifiers, etc, should also be designed to have a 50Ω impedance

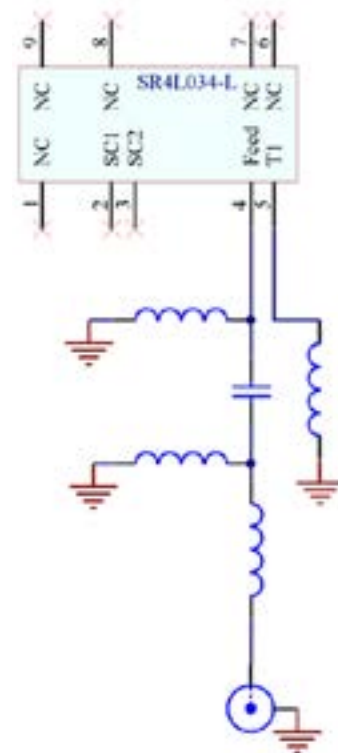
A co-planar transmission line can be designed using an online transmission line calculator tool, such as:

<https://blog.antenna.com/rf-transmission-line-calculator>

The PCB thickness, copper thickness and substrate dielectric constant are entered, then the tool calculates the transmission line width and gaps on either side of the track to give a 50Ω impedance.

10.2. 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 should be placed close to the antenna feed to ensure it is

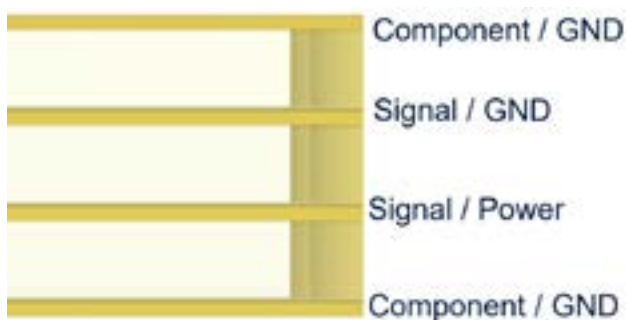


11. Antenna integration guide

We recommend the following during the design phase to maximise antenna performance and minimize noise:

- Minimum 4 layer PCB
- Route signals and power internally where possible
- Flood all layers with ground
- Knit ground on all layers together with plenty of vias

Follow placement guidance carefully, in addition Antenova provide technical support to help you through all stages of your design. Register for an account on <https://ask.antenova.com/> to access technical support.

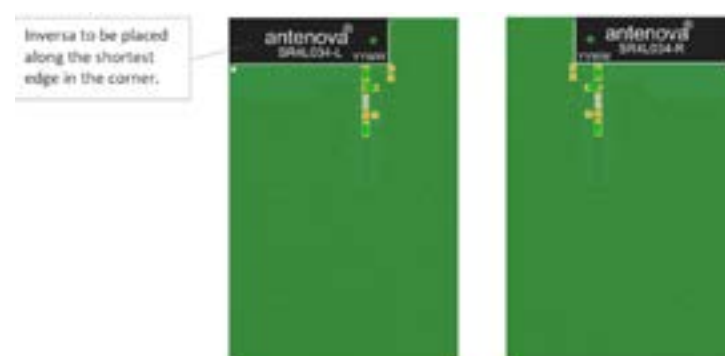


11.1. Antenna placement

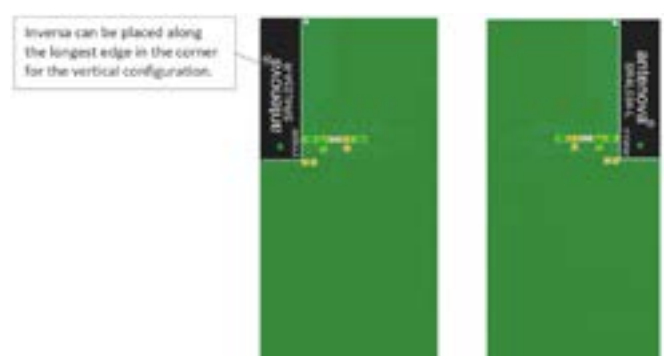
The best position for the antenna is in the corner of the short side of the PCB. This allows the longer side of the PCB to be a ground plane, a long ground plane improves the antenna's efficiency. The Antenova placement tool can be used to advise on antenna placement, see:

<https://blog.antenova.com/intelligent-antenna-selection-and-placement-tool-antenova>

Horizontal placement

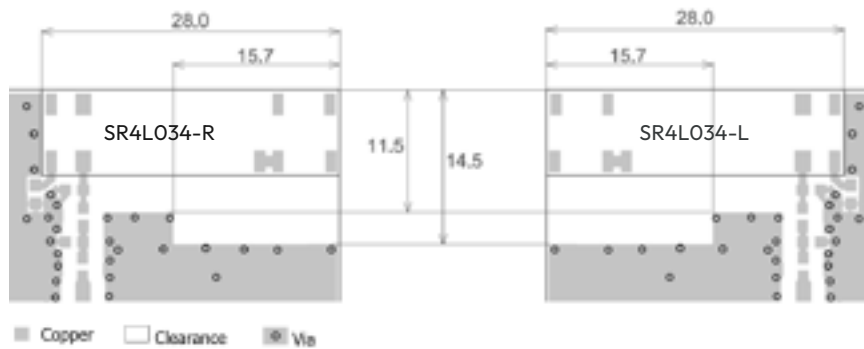


Vertical placement



11.2. Host 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.

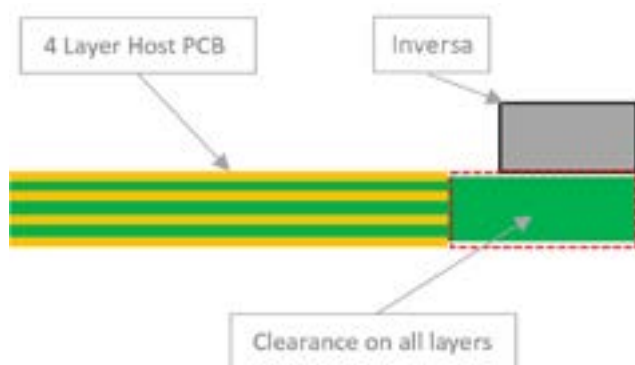


All dimensions in (mm)

11.3. Host PCB clearance

The diagram below shows the antenna footprint and clearance through all layers on the PCB. Only the antenna pads and connections to feed and GND are present within this clearance area.

Placement of components and GND with traces adjacent to the antenna should maintain a minimum clearance of 15mm from either side. The antenna should therefore be placed in the corner to only have one side affected.



11.4. Diversity

The Inversa antenna is suitable for use in diversity antennas. To implement a diversity antenna, follow the guidance given in the Diversity Antennas app note. This can be downloaded from Antenova.com.

12. Reference board

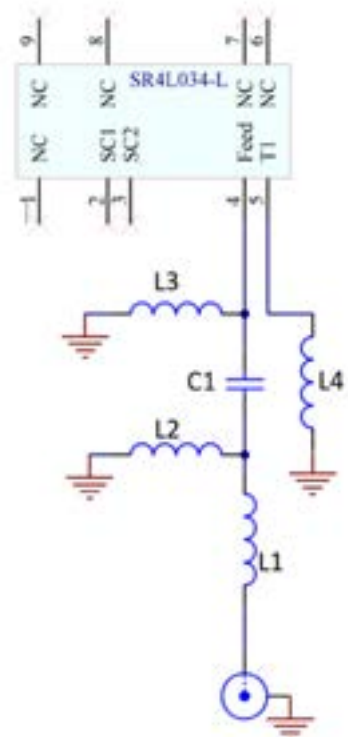
A reference board is used for evaluating the antenna SR4L034-L and it includes a SMA female connector. (Part number: SR4L034-EVB-4).

To order a reference board
Please see antenova.com



12.1. Reference board matching circuit

Designator	Type	Value	Description
L1	Resistor	OR	Non-Specific
L2	Inductor	22nH	Murata LQG15HN series
C1	Capacitor	1.8pF	Murata GJM15 series
L3	Inductor	39nH	Murata LQG15HN series
L4	Inductor	6.8nH	Murata LQG15HN series



13. Soldering

This antenna is suitable for lead free soldering. The reflow profile should be adjusted to suit the device, oven and solder paste, while observing the following conditions:

- For leaded soldering, the maximum temperature should not exceed 240 °C.
- For lead free soldering, a maximum temperature of 255 °C for no more than 20 seconds is permitted.
- The antenna should not be exposed to temperatures exceeding 120 °C more than 3 times during the soldering process.

14. Hazardous material regulation conformance

The antenna has been tested to conform to RoHS and REACH requirements. A certificate of conformance is available from Antenova's website.

15. Packaging

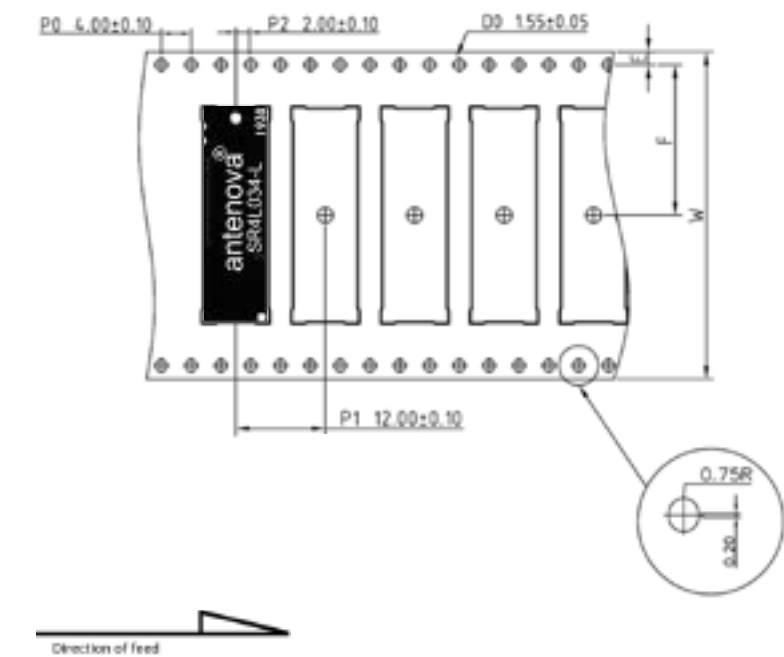
15.1. Optimal storage conditions

Temperature	-10°C to 40°C
Humidity	Less than 75% RH
Shelf life	24 Months
Storage place	Away from corrosive gas and direct sunlight
Packaging	Reels should be stored in unopened sealed manufacturer's plastic packaging.
MSL level	1

Note: Storage of open reels of antennas is not recommended due to possible oxidization of pads on antennas. If short term storage is necessary, then it is highly recommended that the bag containing the antenna reel is re-sealed and stored in conditions as described in the table above.

The shelf life of the antenna is 2 years provided the factory seal on the package has not been broken.

15.2. Tape characteristics



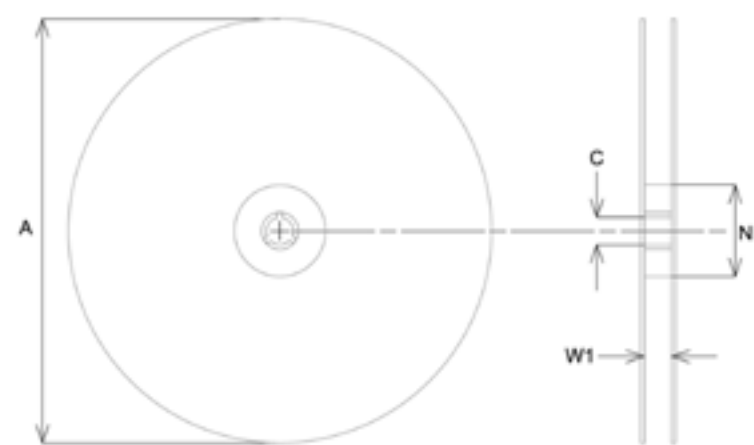
P0	P1	P2	D0
4.00 ± 0.1	12.00 ± 0.1	2.00 ± 0.1	1.55 ± 0.1

E	F	W
1.75 ± 0.1	20.20 ± 0.15	44.00 ± 0.3

All dimensions in (mm)

Quantity	Leading space	Trailing space
1000 pcs / reel	30 blank antenna holders	30 blank antenna holders

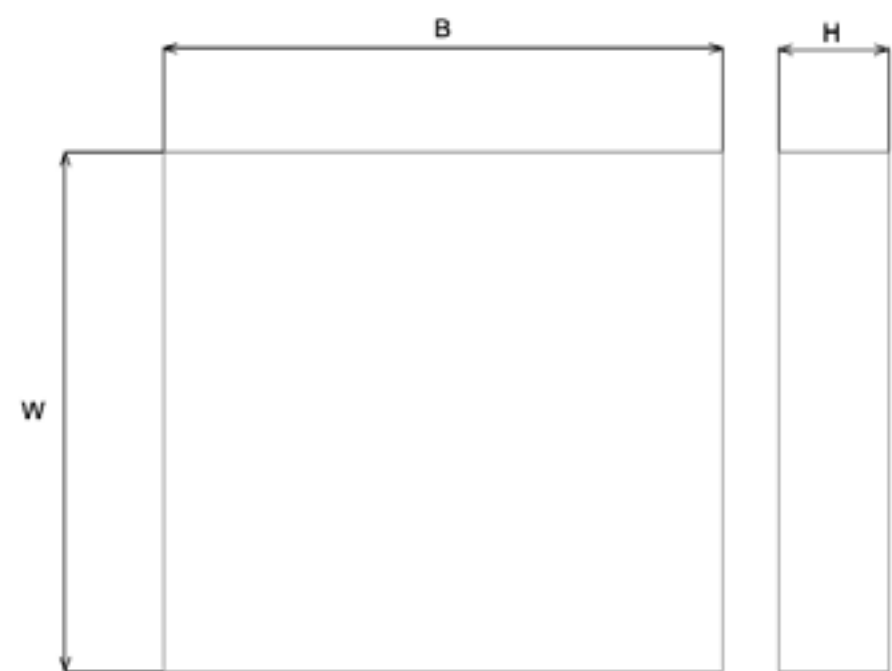
15.3. Reel dimensions



A	B	N	W1
330.0 ± 2.0	13.0 ± 0.5	178.0 ± 0.2	44 ± 0.3

All dimensions in (mm)

15.4. Box dimensions



Width (W)	Breadth (B)	Height (H)
350mm	340mm	65mm

15.5. Bag properties

Reels are supplied in protective plastic packaging.

15.6. Reel label information



Caution

This Bag Contains:
SENSITIVE ELECTRONIC DEVICES

LEVEL
3

1. Calculated shelf life in sealed bag: 12 months at <40°C and <90% relative humidity (RH).
2. After bag is opened, devices that will be subjected to airflow or other high temperature process must:
 - a) Mounted within: 168 hours of factory conditions <30°C/60% RH, or
 - b) Stored per J-STD-033
3. Devices required bake, before mounting if:
 - a) Humidity indicator card reads >30% when read at 25°C ± 1,
 - b) 2a or 2b not met
4. If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure.
Note: Level and body temperature defined by IPC/JEDEC J-STD-033

Quality statements

Antenova's products conform to REACH and RoHS legislation. For our statements regarding these and other quality standards, please see antenova.com.

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Datasheet version

2.01 released Mar 18th 2021

2.02 released May 26th 2021

2.03 released Aug 31st 2021

2.04 released Apr 22th 2022

Antenna design, integration and test resources

Product designers – the details contained in this datasheet will help you to complete your embedded antenna design. Please follow our technical advice carefully to obtain optimum antenna performance.

We aim to support our customers to create high performance wireless products. You will find a wealth of design resources, calculators and case studies to aid your design on our website.

Antenova's design laboratories are equipped with the latest antenna design tools and test chambers. We provide antenna design, test and technical integration services to help you complete your design and obtain the required certifications.

If you cannot find the antenna you require in our product range, please contact us to discuss creating a custom antenna to meet your exact requirements.

Share knowledge with RF Experts around the world

ask.antenova is a global forum for
designers and engineers working with
wireless technology

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evaluation boards, and read our
antenna resources**

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sales@antenova.com

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