

Integra LTE Antenna

Part No. SR4L049-L / SR4L049-R

lamiiANT®

Product Specification

1. Features

- Antenna for 4G and 3G applications
- LTE, GSM, CDMA, DCS, PCS, WCDMA, UMTS, HSPDA, GPRS, EDGE, IMT
- Frequencies: 791-960MHz; 1710-2170MHz; 2300-2400MHz; 2500-2690MHz
- Corner placement for ergonomic design-in
- SMD mounted device
- Supplied on Tape and Reel
- Automotive temperature rating.
- Ultra-Compact 23 x 8 x 3.3 (mm)
- Ideal for MIMO systems

2. Description

Integra is intended for use with 4G/3G 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.

3. Applications

- 4G Mi-Fi Routers
- Medical equipment
- Tablets
- OBD++ systems
- MIMO Systems
- Femtocell / Pico stations
- Remote monitoring



Antennas for Wireless M2M Applications

4. Part Number

Integra: SR4L049-L



Integra: SR4L049-R



5. General Data

Product name	Integra
Part Number	SR4L049-L / SR4L049-R
Frequency	791-960MHz 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	23.0 x 8.0 x 3.3 (mm)

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6. RF Characteristics

791 - 960 MHz	
Peak gain	1.9dBi
Average gain (Linear)	-1.5dBi
Average efficiency	>70%
Maximum return loss	-7.8dB
Maximum VSWR	2.3:1

1710 - 2170 MHz	
Peak gain	3.0dBi
Average gain (Linear)	-2.0dBi
Average efficiency	>60%
Maximum return loss	-5.0dB
Maximum VSWR	3.6:1

2300 - 2400 MHz	
Peak gain	3.3dBi
Average gain (Linear)	-2.0dBi
Average efficiency	>60%
Maximum return loss	-9.7dB
Maximum VSWR	1.9:1

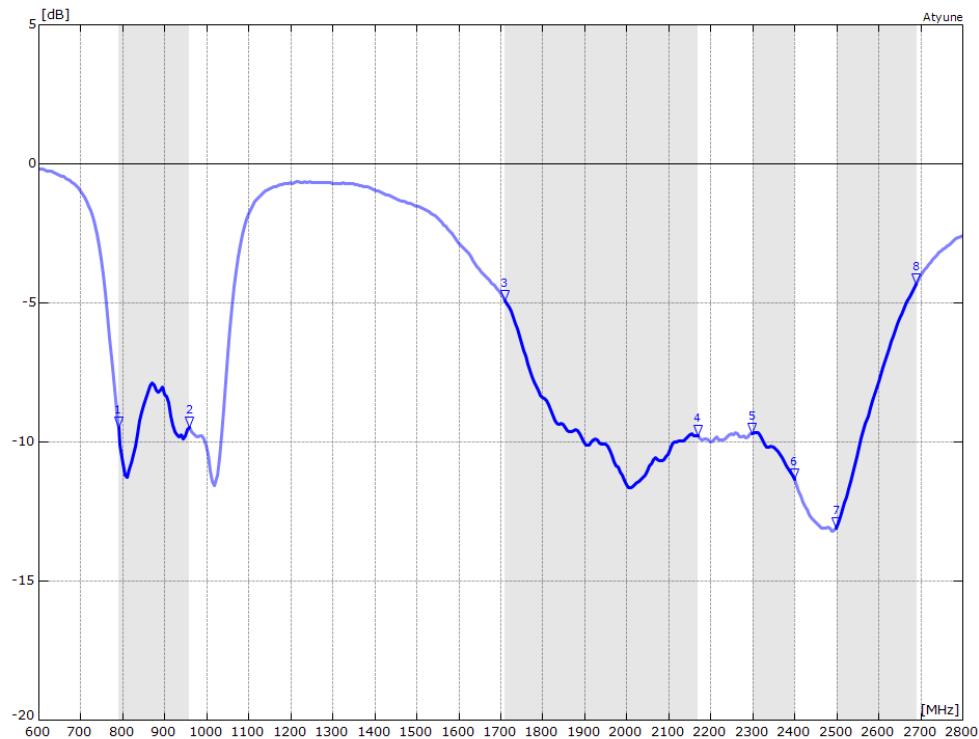
2500 - 2690 MHz	
Peak gain	3.5dBi
Average gain (Linear)	-2.6dBi
Average efficiency	>50%
Maximum return loss	-4.5dB
Maximum VSWR	4.1:1

All data measured on Antenova's evaluation PCB
Part No. SR4L049-EVB-1

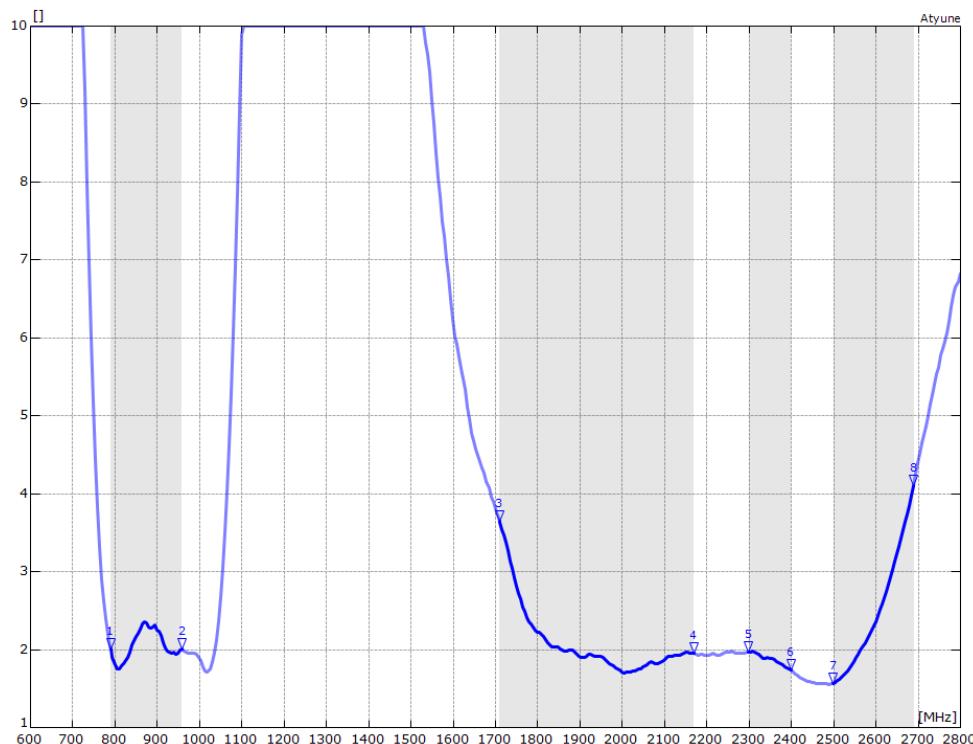
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7. RF Performance

7.1 Return Loss



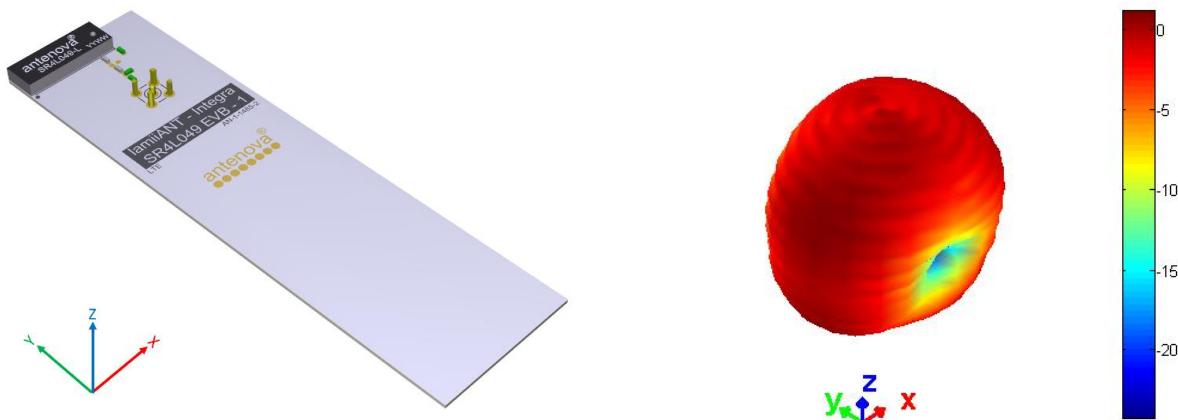
7.2 VSWR



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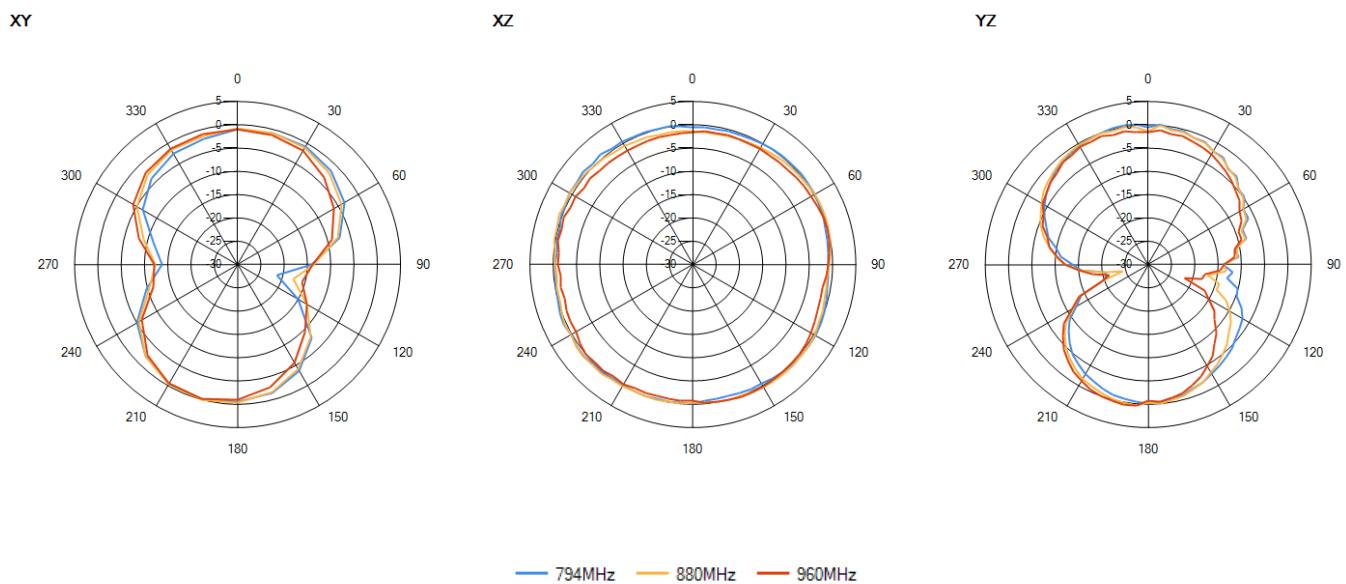
7.3.0 Antenna Pattern

791 MHz – 960 MHz



3D pattern at 880 MHz

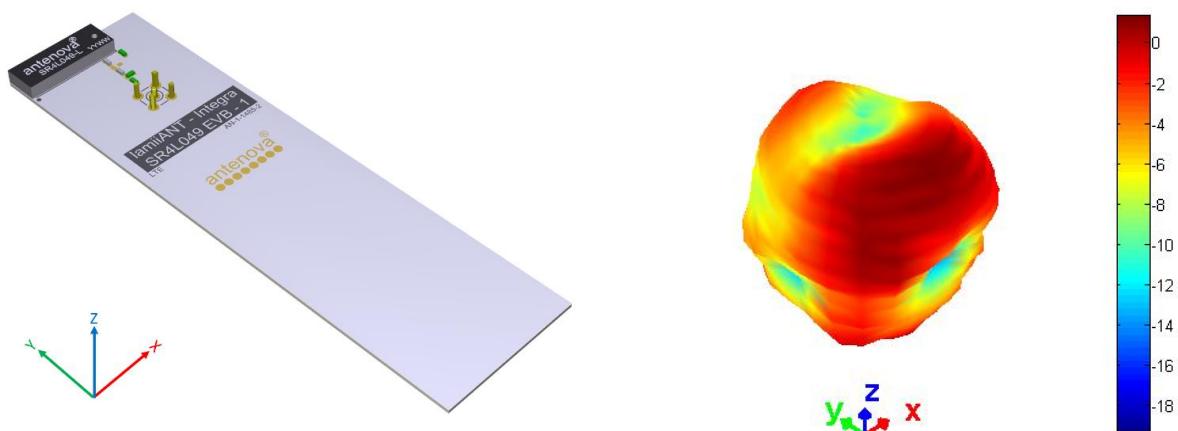
*Drag to rotate pattern and PCB by using Adobe Reader
(Click to Activate)*



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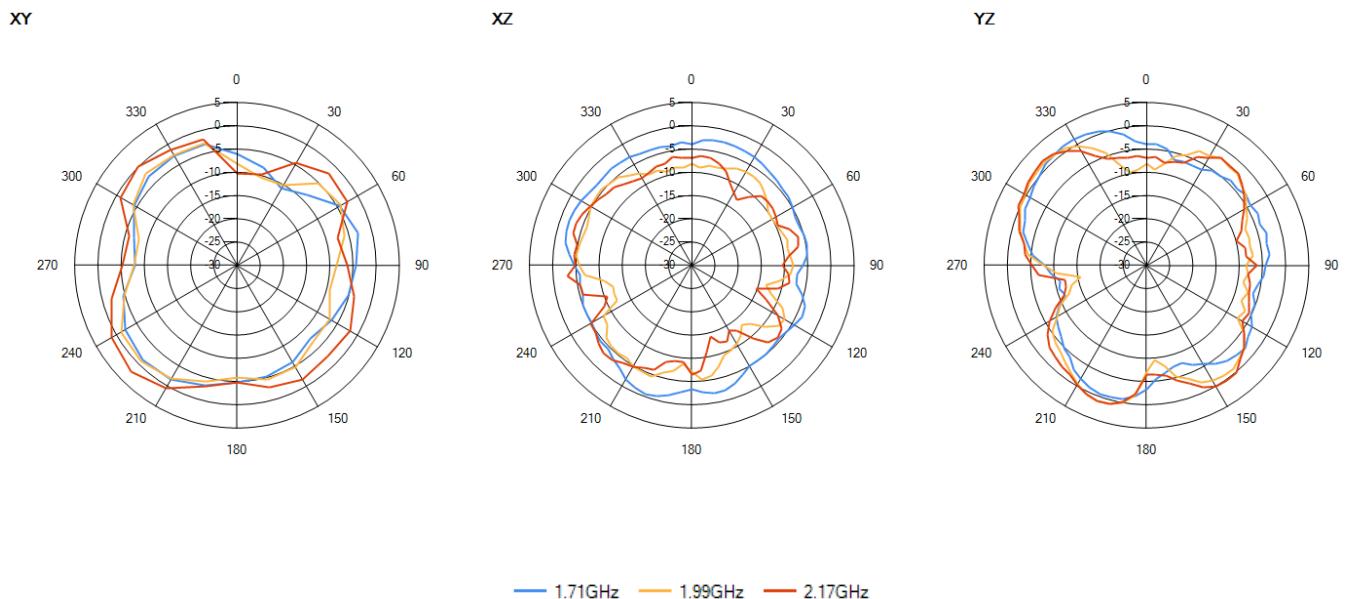
7.3.1 Antenna Pattern

1710 MHz – 2170 MHz



3D pattern at 1990 MHz

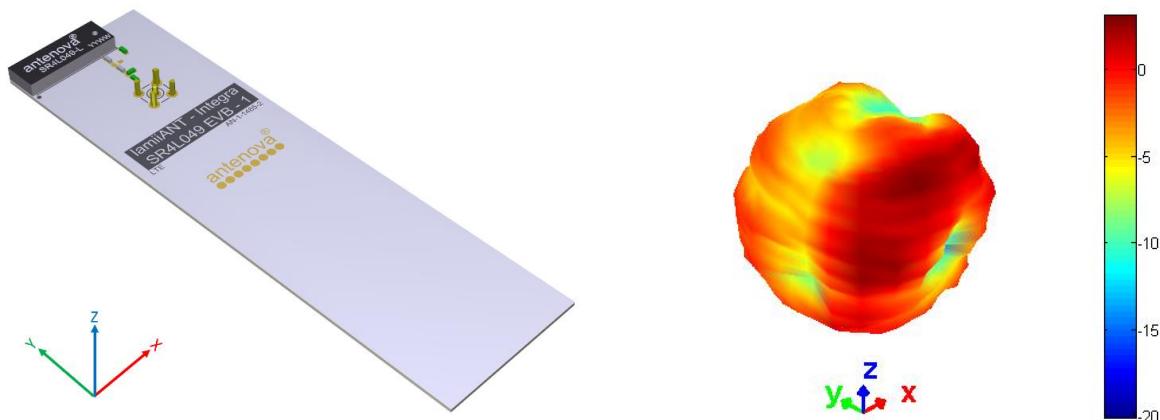
*Drag to rotate pattern and PCB by using Adobe Reader
(Click to Activate)*



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7.3.2 Antenna Pattern

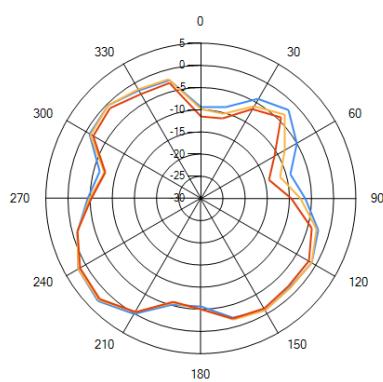
2300 MHz – 2400 MHz



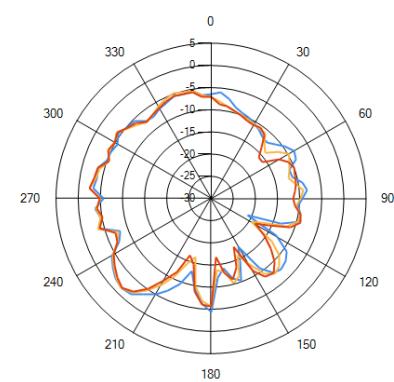
3D pattern at 2.35 GHz

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(Click to Activate)*

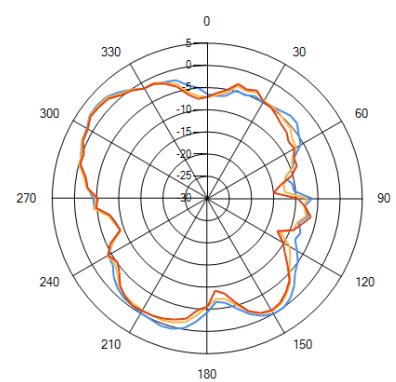
XY



XZ



YZ

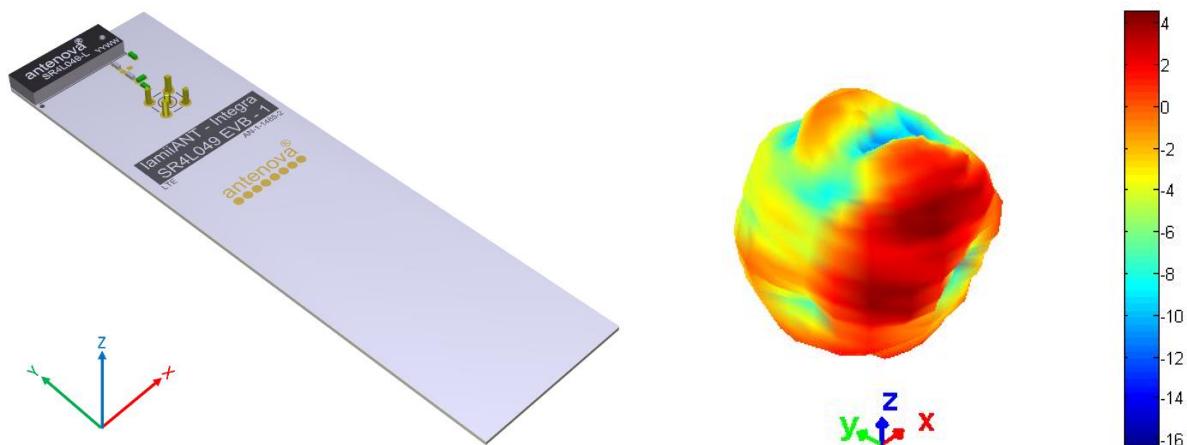


— 2.3GHz — 2.36GHz — 2.4GHz

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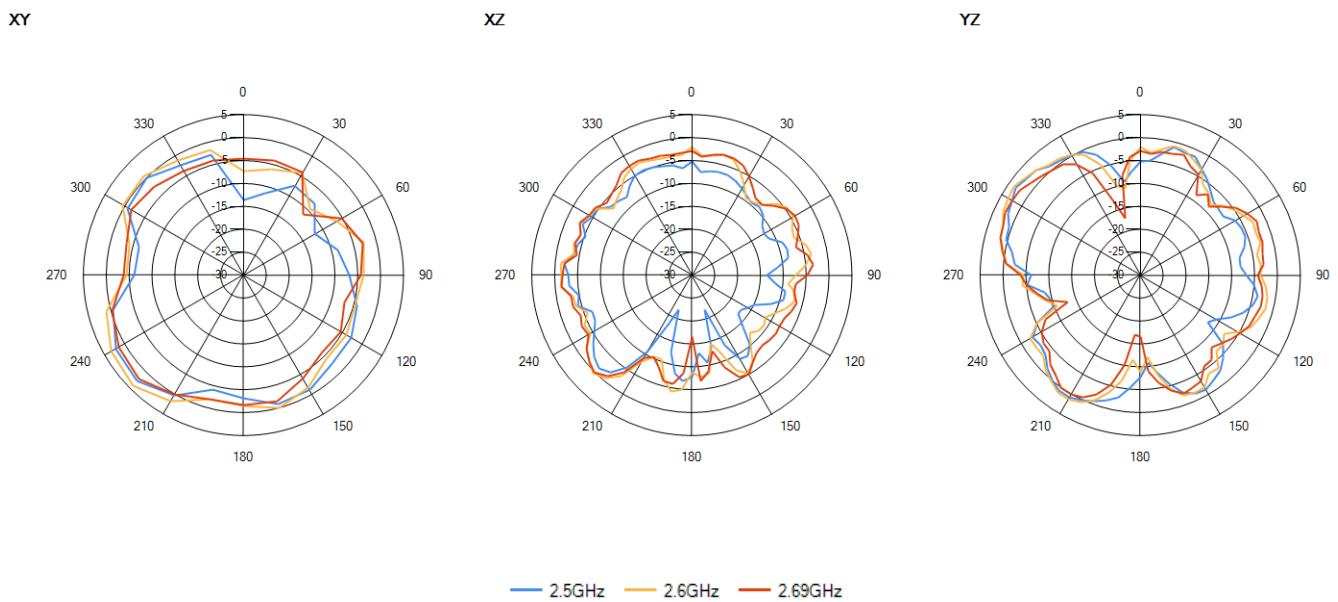
7.3.3 Antenna Pattern

2500 MHz – 2690 MHz



3D pattern at 2.6 GHz

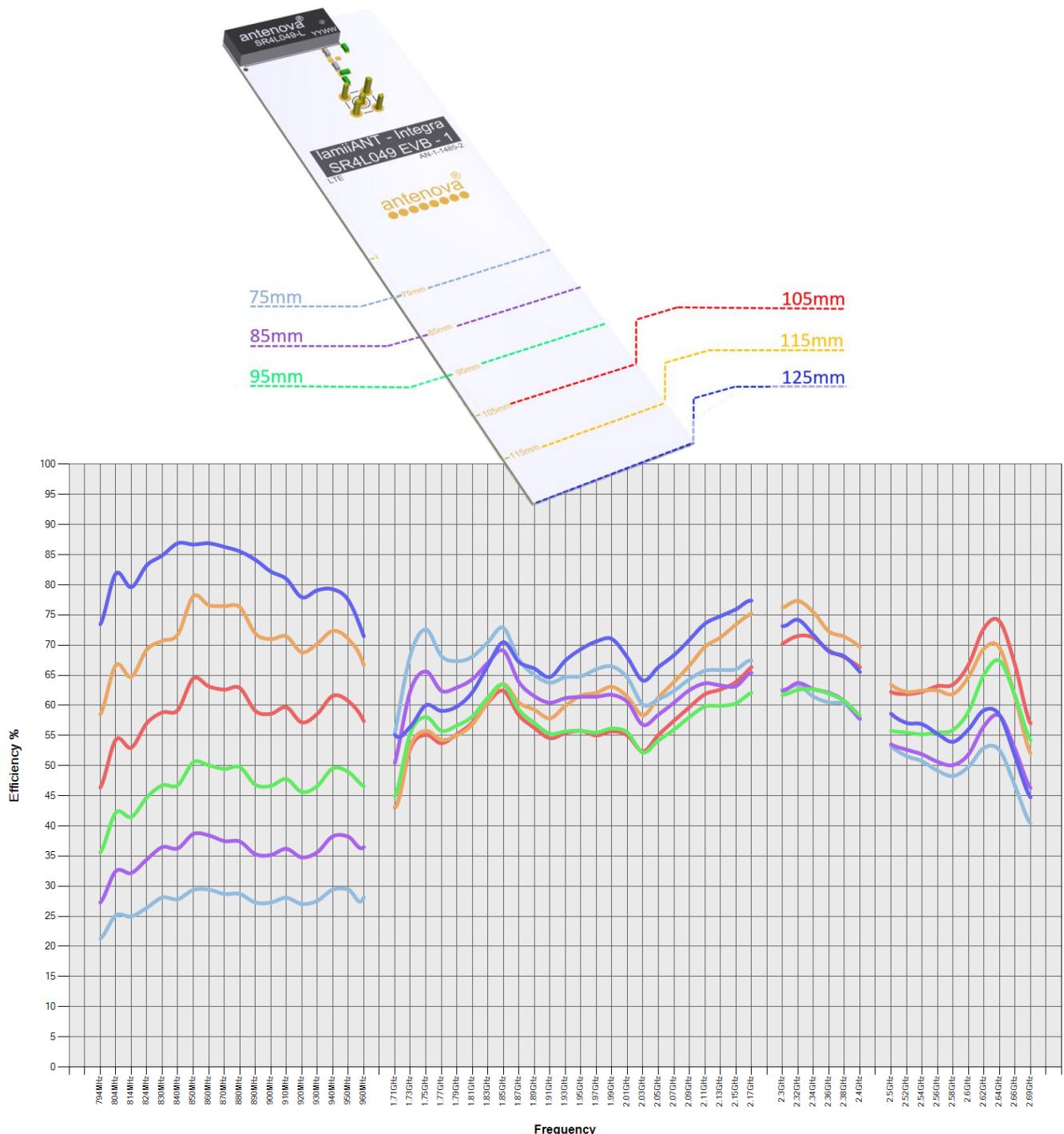
*Drag to rotate pattern and PCB by using Adobe Reader
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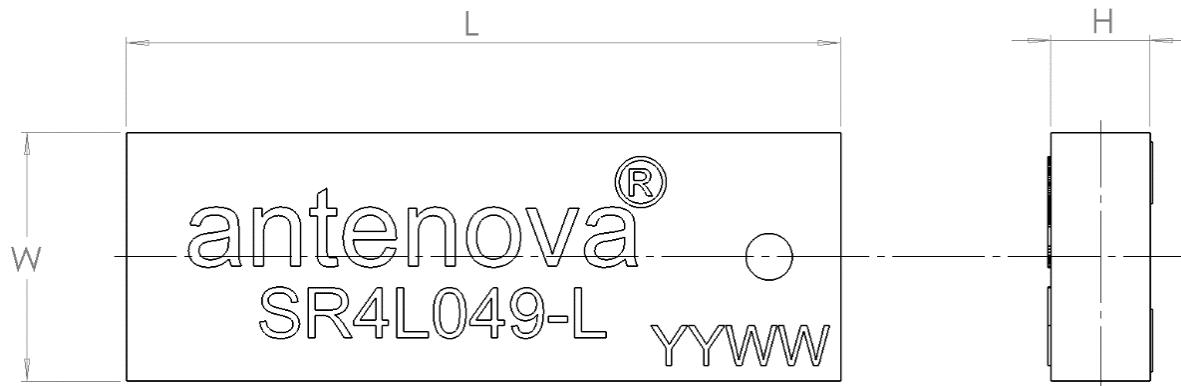
7.4 Host PCB Length Vs. Efficiency

The efficiency of Integra is shown here over varying GND plane lengths.



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8. Antenna Dimensions



All Dimensions in (mm)
-L and -R Dimensions are the same

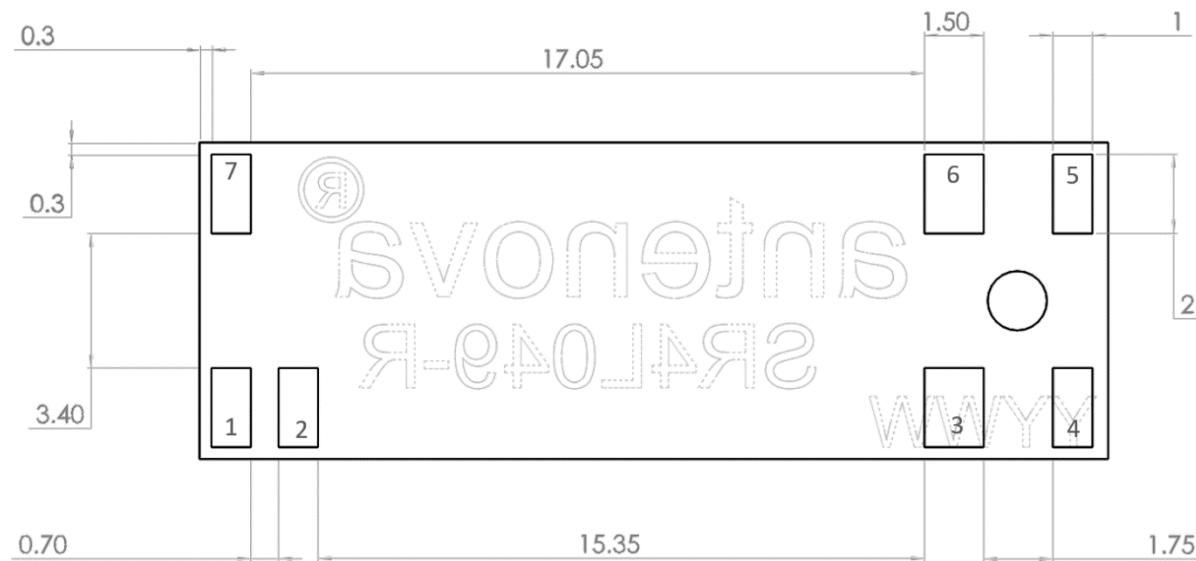
L	W	H
Length	Width	Height
23.0 ±0.1	8.0 ±0.1	3.3 +0.1 -0.0

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Bottom Side SR4L049-L



Bottom Side SR4L049-R



- All Dimensions in (mm)
- View from bottom side of each antenna

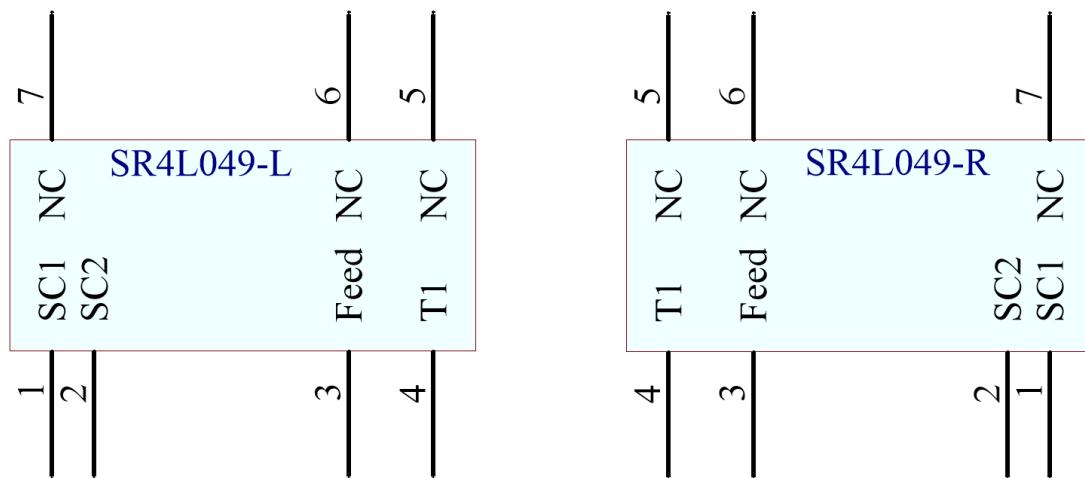
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9.0 Schematic symbol and Pin definition

The circuit symbol for the antenna is shown below.

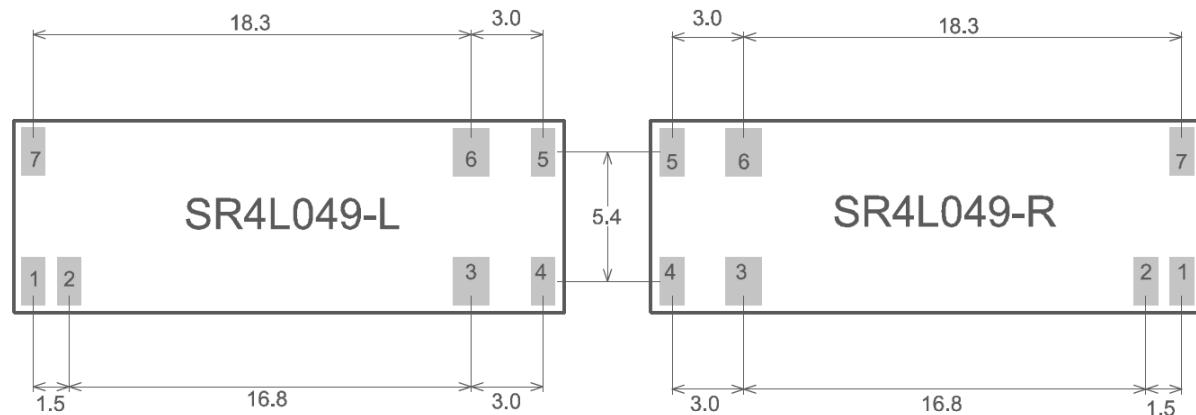
Pin	Name	Description
3	Feed	Transceiver port
4	T1	Return/Tuning
5,6,7	NC	Not used (Mechanical only)
1,2	SC	Pins 2 and 3 short circuit on host PCB

Integra Schematic Symbol



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10.0 Antenna footprint



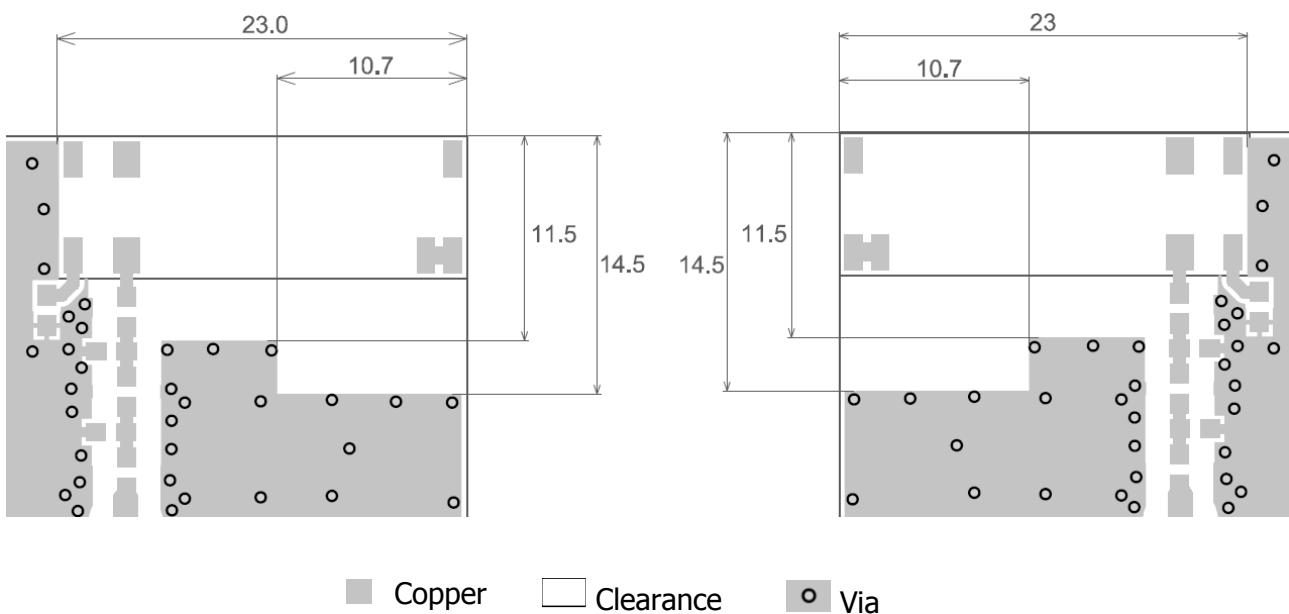
ALL DIMENSIONS IN MM

PADS 1,2,4,5,7 = 2.0 X 1.0 (MM)

PADS 3,6 = 2.0 X 1.5 (MM)

10.1 Host PCB Layout

The footprint and clearance of the host PCB must be designed-in as below.



ALL DIMENSIONS IN MM

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11. Electrical Interface

11.1 Transmission Line

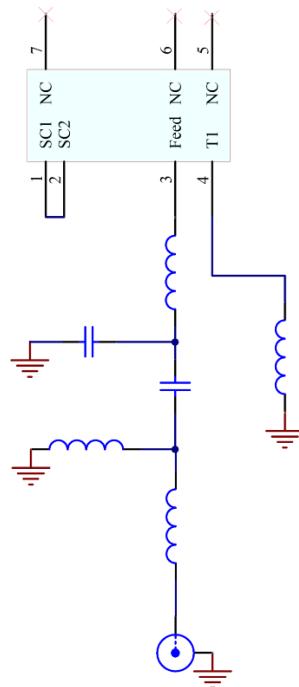
All transmission lines should be designed to have a characteristic impedance of 50Ω .

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

Once the material for the PCB has been chosen (PCB thickness and dielectric constant), a coplanar transmission line can easily be designed using any of the commercial software packages for transmission line design. For the chosen PCB thickness, copper thickness and substrate dielectric constant, the program will calculate the appropriate transmission line width and gaps on either side of the track, so the characteristic impedance of the coplanar transmission is 50Ω .

11.2 Matching Circuit

The antenna requires a matching circuit that must be optimized for each product. The matching circuit will require up to six components, 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.



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12.0 Antenna Integration Guide

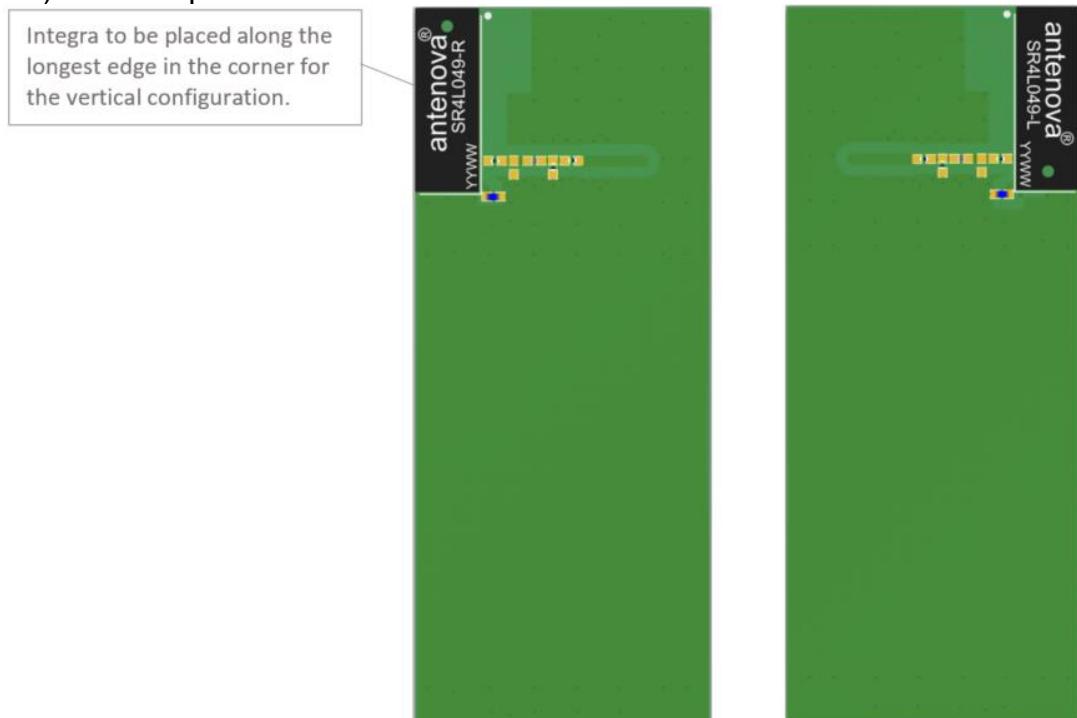
12.1 Antenna Placement

The antenna should ideally be placed on the host PCB using one of the two configurations below.

1) Horizontal placement



2) Vertical placement



Note: Vertical placement optimal minimum GND length required is $\geq 100\text{mm}$

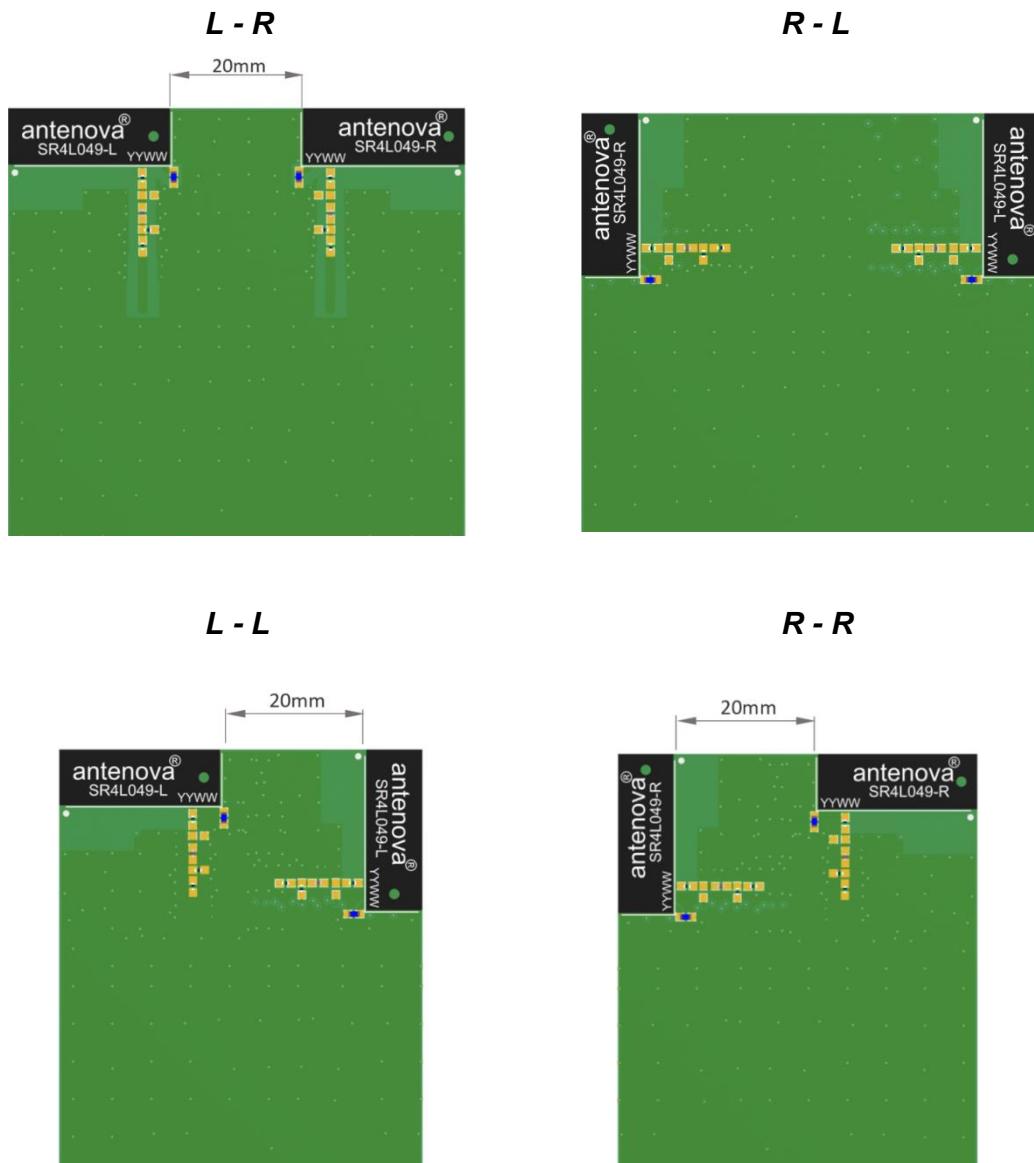
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12.3 Diversity Placement

For a Diversity solution, use 2 x Integra on the same host PCB. For all configurations the distance between them should be $\geq 20\text{mm}$

Please note: It is still advisable to consult Antenova before building the PCB for additional checking of the layout and device.

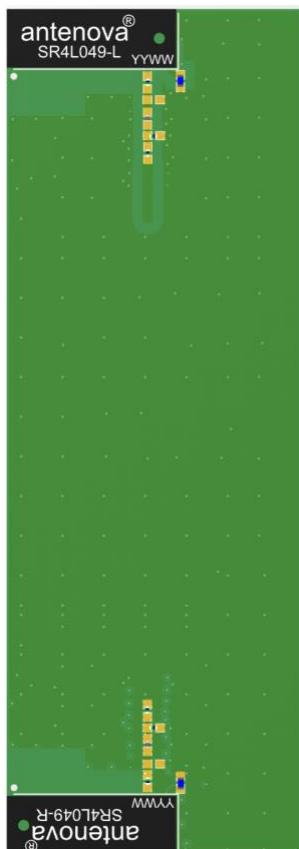
Proximity configurations



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Opposed configurations

L - R



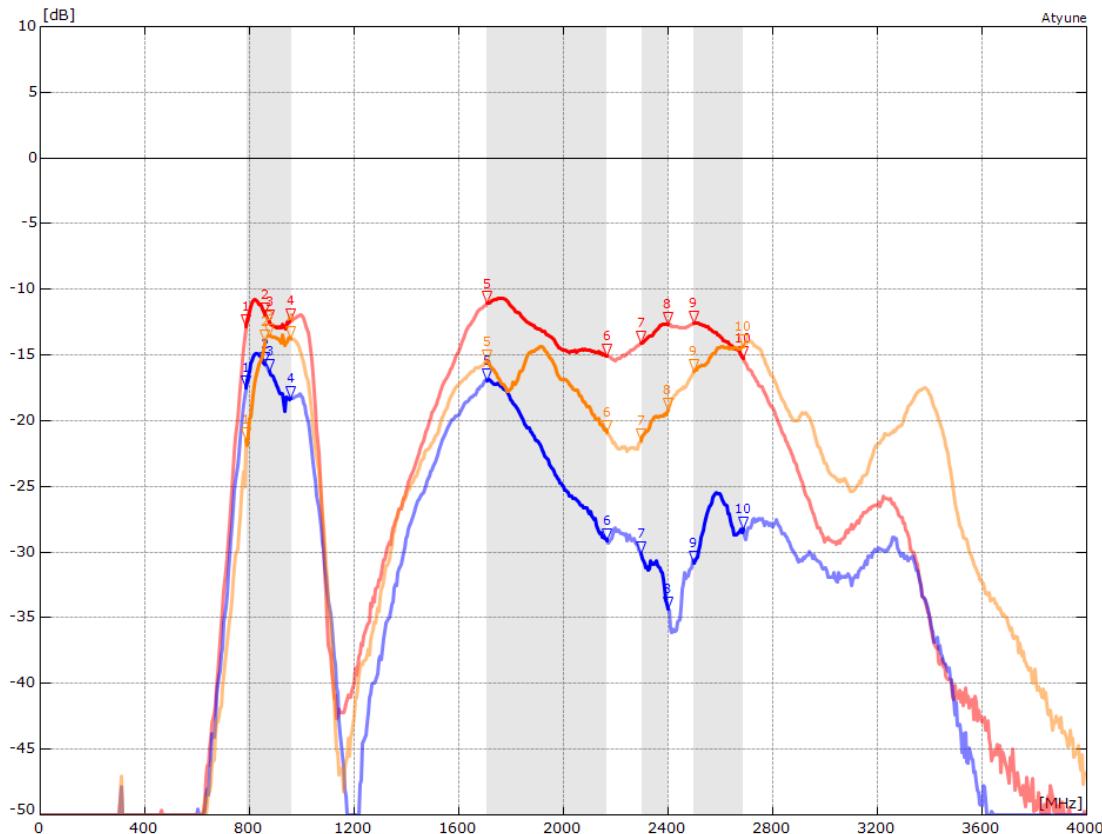
L - L



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12.4 Isolation

The Isolation vs. Distance from Main to Diversity. 40mm, 25mm and 20mm are shown for comparison.

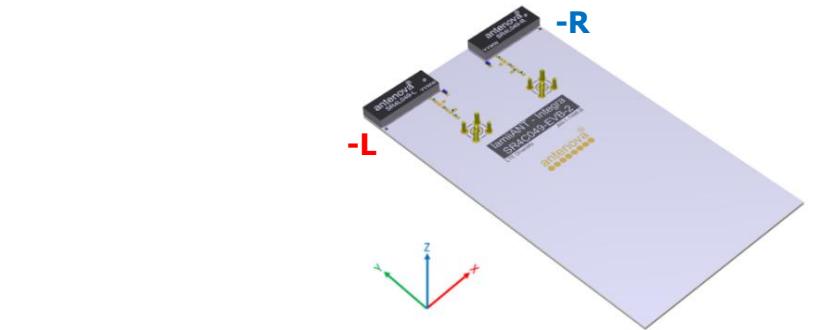


MARKERS:	MHz	dB	MHz	dB	MHz	dB	MHz	dB	MHz	dB	MHz	dB
ISOLATION 20MM.S2P - S21												
—	1: 791	-12.78	3: 880	-12.47	5: 1710	-11.04	7: 2300	-14.07	9: 2500	-12.53		
—	2: 862	-11.87	4: 960	-12.37	6: 2170	-15.04	8: 2400	-12.58	10: 2690	-15.20		
ISOLATION 40MM.S2P - S21												
—	1: 791	-17.40	3: 880	-16.16	5: 1710	-16.87	7: 2300	-30.09	9: 2500	-30.78		
—	2: 862	-15.69	4: 960	-18.25	6: 2170	-29.07	8: 2400	-34.30	10: 2690	-28.16		
ISOLATION 25MM.S2P - S21												
—	1: 791	-21.35	3: 880	-13.50	5: 1710	-15.44	7: 2300	-21.47	9: 2500	-16.18		
—	2: 862	-13.92	4: 960	-13.69	6: 2170	-20.82	8: 2400	-19.14	10: 2690	-14.33		

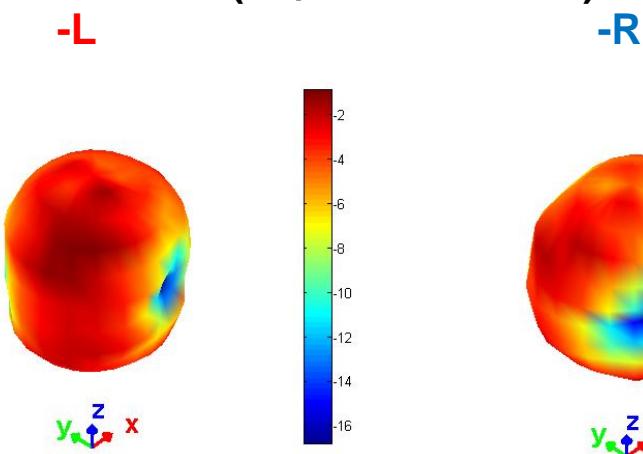
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12.5 Radiation Pattern Diversity

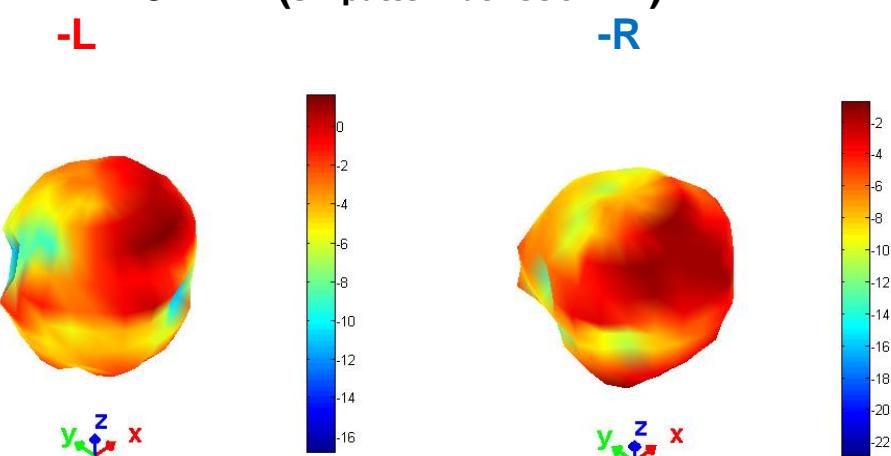
The radiation pattern for SR4L049-EVB-2 Diversity example is shown below for each antenna on two different bands.



791 MHz – 960 MHz (3D pattern at 880 MHz)



1710 MHz – 2170 MHz (3D pattern at 1990 MHz)



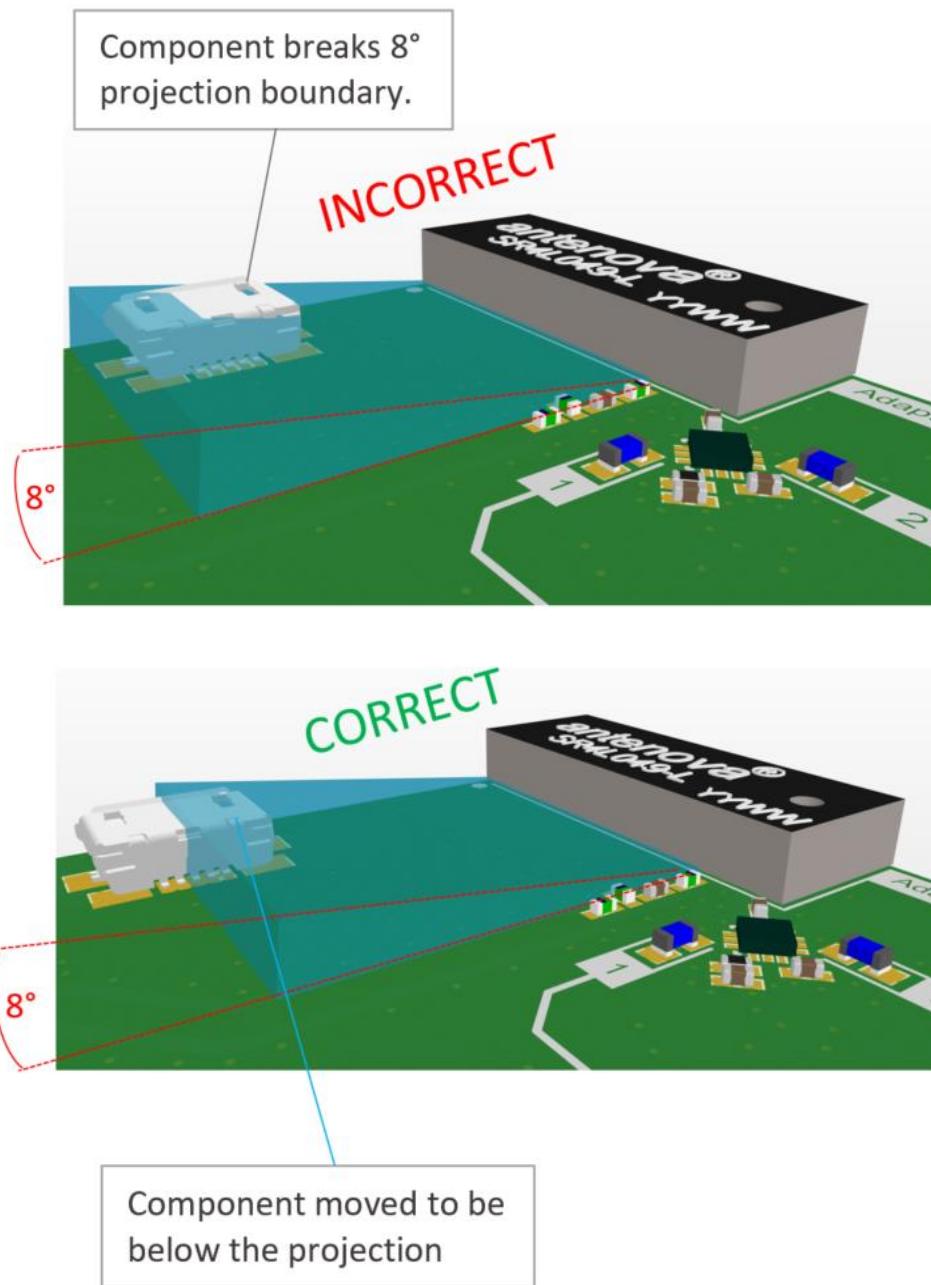
*Drag to rotate pattern and PCB by using Adobe Reader
(Click to Activate)*

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12.6 Component Distance Rule

While it is ideal to keep distance from metal objects and other PCB components, it is possible to have components around the antenna. No set distance is set and varies depending on the height of the component. So rather than setting a defined distance a rule can be given. An 8° projection line can be drawn from the base of the antenna. This can then be used to decide the distance a component can be.

The example below shows a USB connector placed using this rule. Once it is within the 8° limit the distance is known.

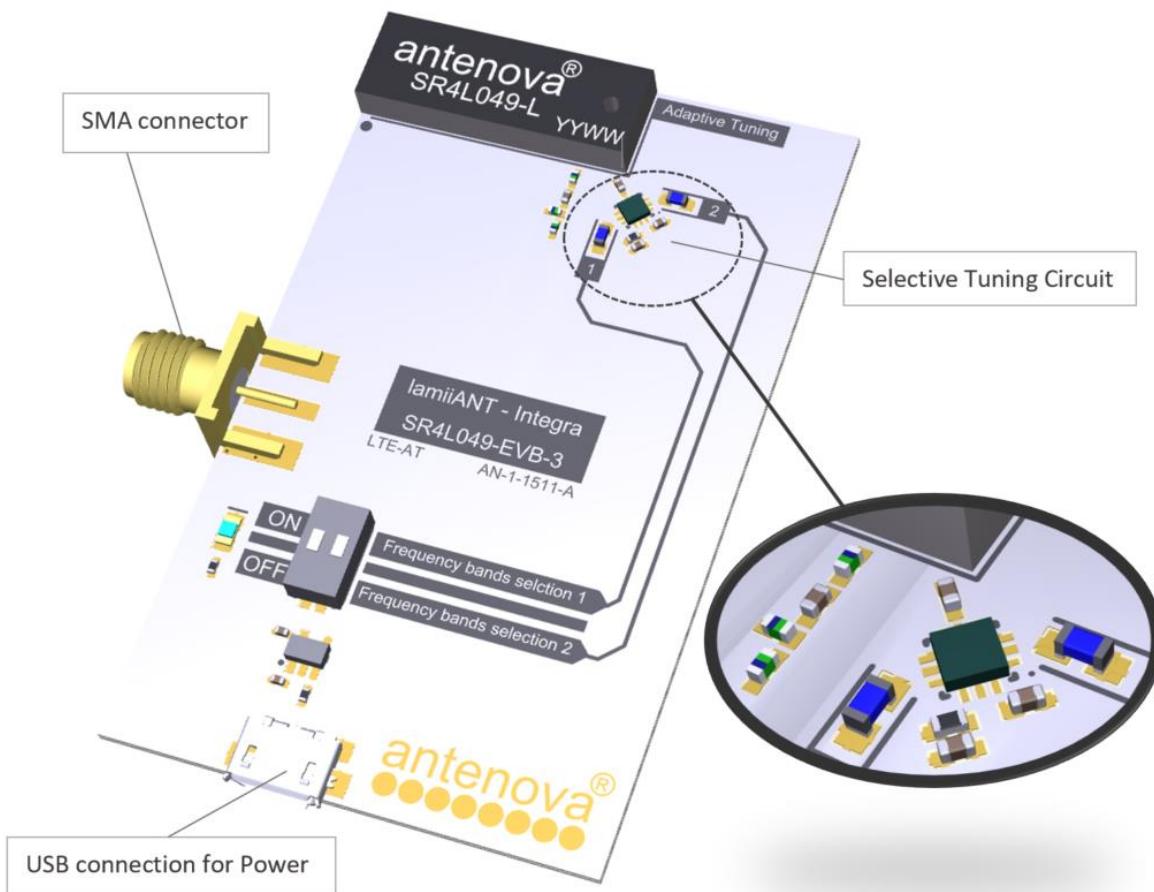


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13.0 Antenna Active Tuning for Smaller GND planes

For a host PCB with a length less than 75mm it is suggested to use an active tuning circuit to overcome the BW reduction seen with smaller GND. This can be implemented on a single antenna or diversity solution. An Antenova EVB kit is available with this circuit (SR4L049-EVB-3).

The SR4L049-EVB-3 evaluation PCB uses a simple RF switching circuit to select between two component values on the T1(Pin4). In this kit the RF switch used is a Peregrine PE423422.

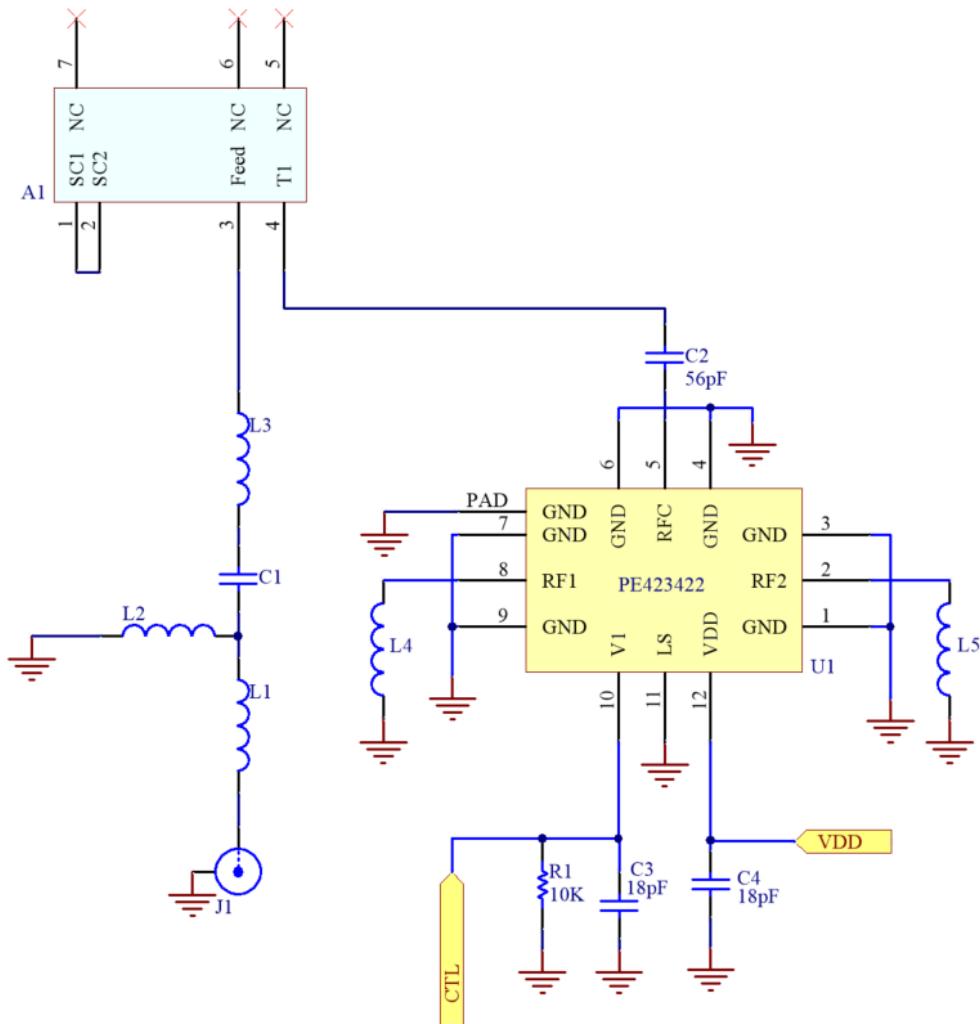


SR4L049-EVB-3 = 65 x 40 (mm)

Antennas for Wireless M2M Applications

13.1 Antenna Active Tuning Circuit

Reference circuit using the Peregrine PE423422. The input matching circuit and L4 and L5 values are dependent on the host PCB/Device.



Designator	Type	Value	Description
U1	RF Switch	PE423422	Peregrine RF SPDT
R1	Resistor	10K	Pull Down
C3, C4	Capacitor	18pF	De-coupler
C2	Capacitor	56pF	DC-Block
L4,L5	Tuning Cap / Ind	-	Dependant on Device
L1,L2,C1,L3	Matching	-	Dependant on Device

Antennas for Wireless M2M Applications

13.2 Antenna Active Tuning Circuit Performance

The SR4L049-EVB-3 was tested in the following configuration:

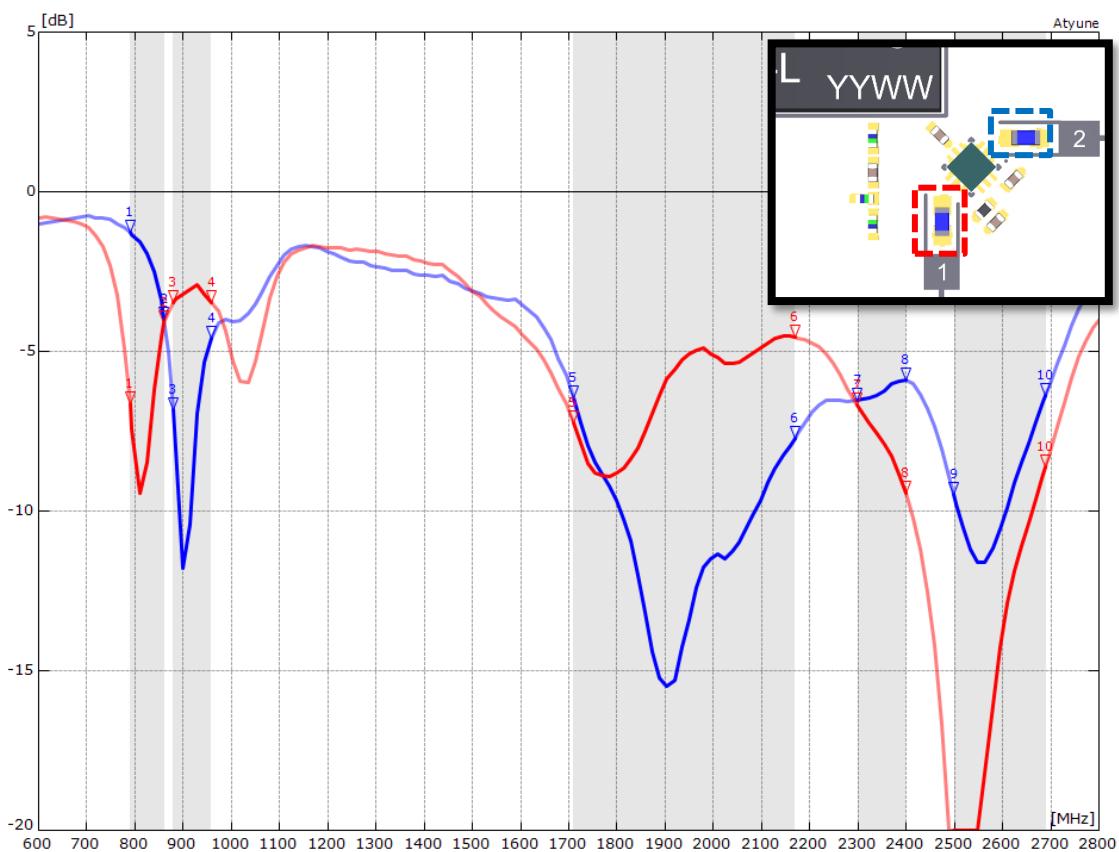
1 = 791-862MHz; 1710-2170MHz, 2300-2400MHz, 2500-2690MHz

2 = 880-960MHz; 1710-2170MHz, 2300-2400MHz, 2500-2690MHz

Only the tuned bands are shown. All high bands equal or exceed the spec on page 3.

	791 - 862 MHz	880 - 960 MHz
Peak gain	-2.0dBi	-1.2dBi
Average gain (Linear)	-4.5dBi	-3.9dBi
Average efficiency	>30%	>30%
Maximum return loss	<-4.1dB	<4.5dB
Maximum VSWR	4.3:1	3.5:1

13.3 Return Loss



Antennas for Wireless M2M Applications

14.0 Reference Board

The reference board has been designed for the purpose to evaluate SR4L049-L and includes an SMA female connector.

SR4L049-EVB-1 Evaluation Board

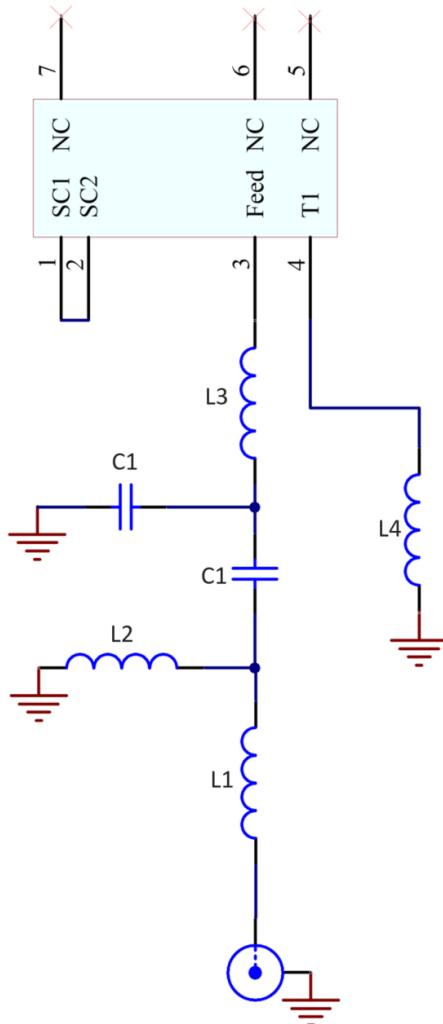


To order a reference board contact sales@antenova-m2m.com.
Please state if a single antenna or two antenna EVB is required.

Antennas for Wireless M2M Applications

14.1 SR4L049-EVB-1 Matching Circuit

The reference board has been designed for the purposes of evaluating SR4L049 and includes an SMA female connector.



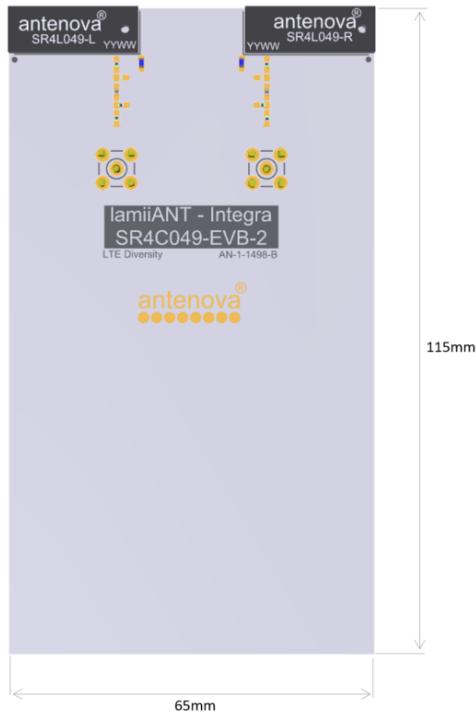
Designator	Type	Value	Description
L1	Inductor	4.7nH	Murata LQG15HN
L2, C1	NA	DNP	Not Fitted
C1	Capacitor	1.2pF	Murata GJM15
L3	Inductor	2.2nH	Murata LQG15HN
L4	Inductor	3.3nH	Murata LQG15HN

Antennas for Wireless M2M Applications

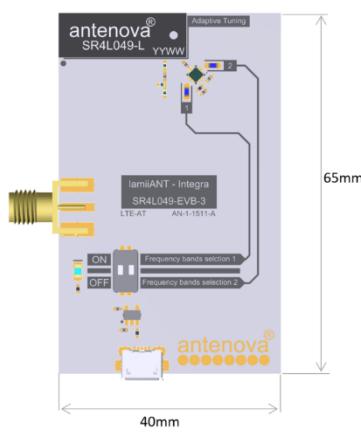
14.2 Diversity EVB Active Tuning EVB

Two more versions of evaluation Inversa are available. Please contact Antenova for more information.

SR4L049-EVB-2 (Diversity Example)



SR4L049-EVB-3 (Active Tuning Solution)



To order a reference board contact sales@antenova-m2m.com.
Please state if a single antenna or two antenna EVB is required.

Antennas for Wireless M2M Applications

15. 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:

- The maximum temperature should not exceed 240 °C.
- However 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.

16. Hazardous Material Regulation Conformance

The antenna has been tested to conform to RoHS requirements. A certificate of conformance is available from Antenova M2M's website.

17. Packaging

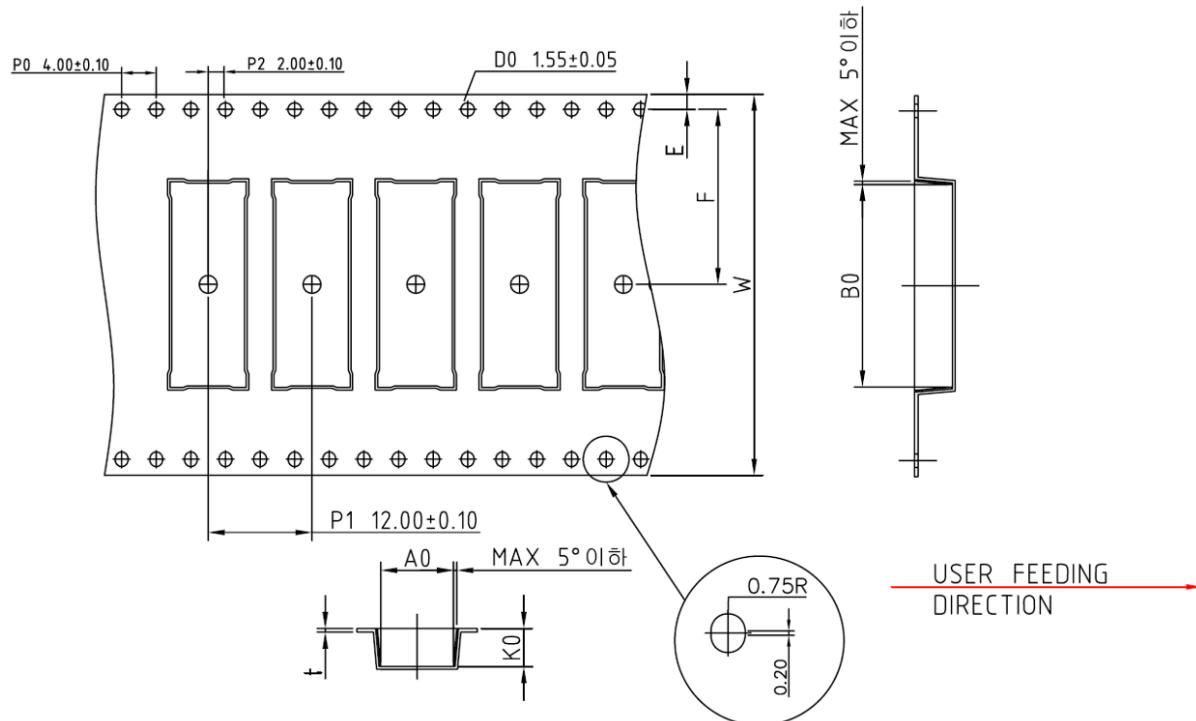
17.1 Optimal Storage Conditions

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.

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 like storage conditions as in above table.

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17.2 Tape Characteristics



Ko	Ao	Bo	P0	P1	P2
4.40 ± 0.1	8.40 ± 0.1	23.40 ± 0.1	4.00 ± 0.1	12.00 ± 0.1	2.00 ± 0.1

E	F	W	t
1.75 ± 0.1	20.20 ± 0.15	44.00 ± 0.3	0.40 ± 0.05

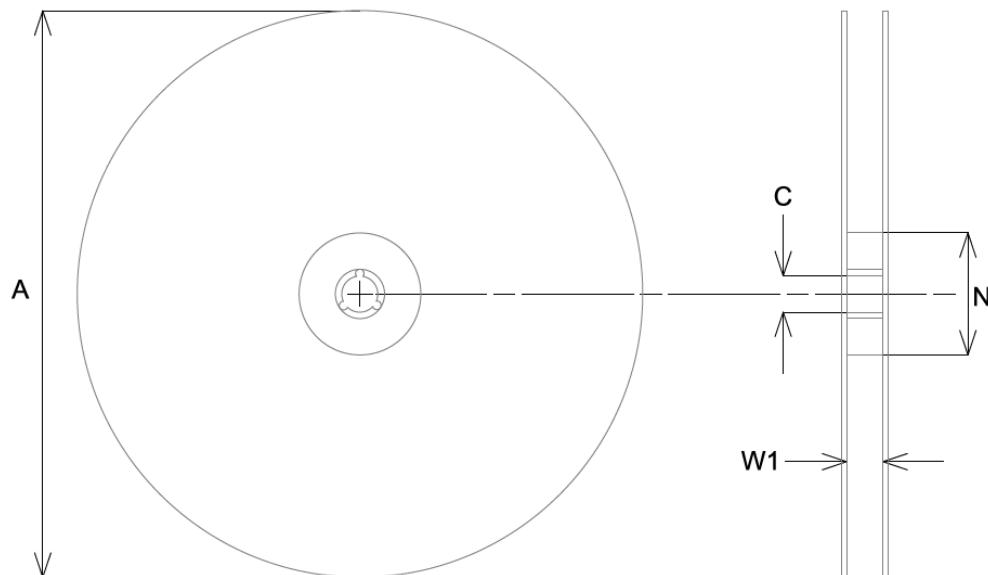
Dimensions in mm

Notes:

- 1) 10 sprocket hole pitch cumulative tolerance ±0.2
- 2) Camber not to exceed 1mm in 100mm
- 3) Ao and Bo measured on a plane 0.1mm above the bottom of the pocket
- 4) Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier

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17.3 Reel Dimensions

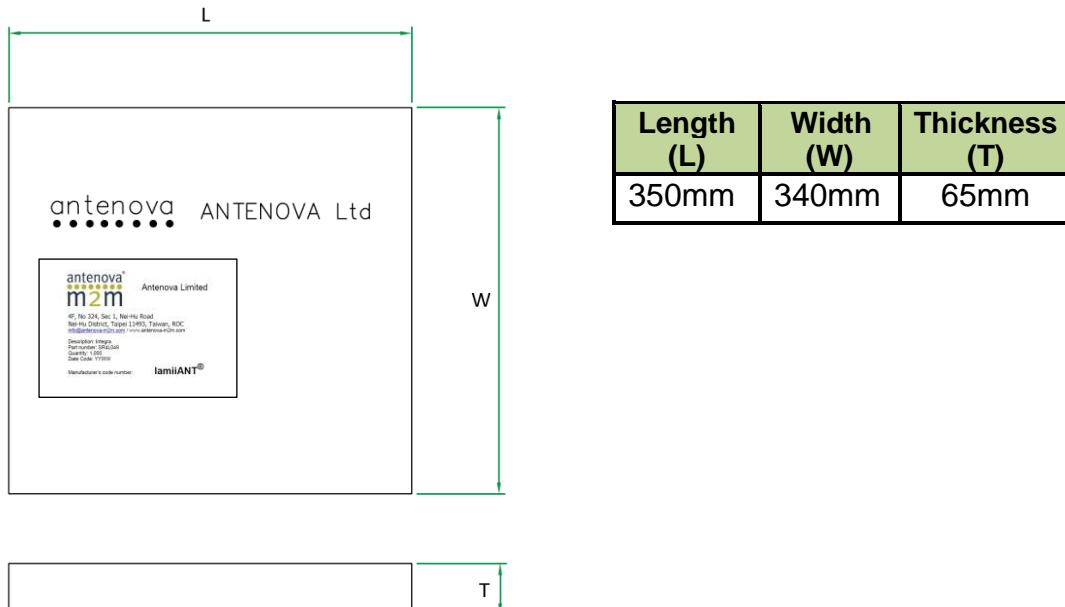


A	C	N	W1
330.0 ± 2.0	13.0 ± 0.5	80.0 ± 0.2	56 ± 0.3

All dimensions in mm

Antennas for Wireless M2M Applications

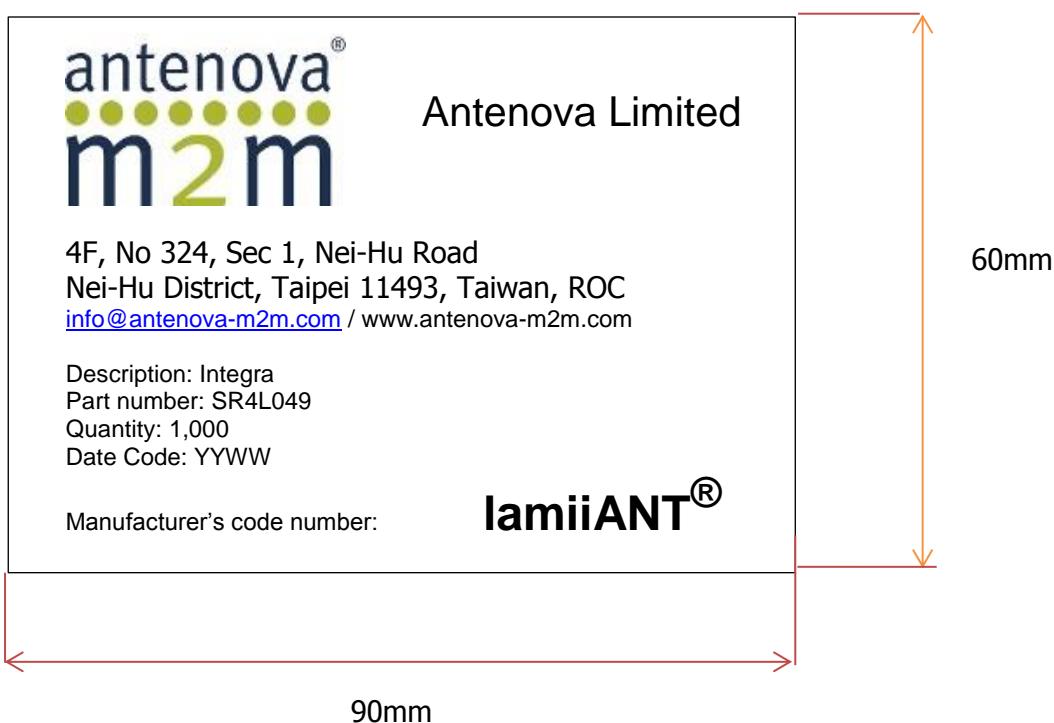
17.4 Box Dimensions



17.5 Bag Properties

Reels are supplied in protective plastic packaging.

17.6 Reel Label Information



Antennas for Wireless M2M Applications



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