

## 1. Features

- Designed for 2.4GHz applications: BT / BLE, Wi-Fi<sup>®</sup> (802.11a/b/g/n), ZigBee<sup>®</sup>, etc.
- Easy to integrate
- Low profile design
- High efficiency
- Intended for SMD mounting
- Supplied in tape and reel

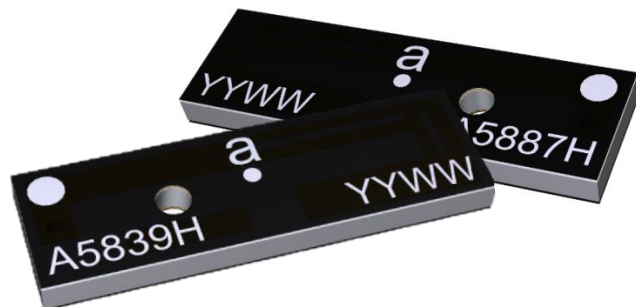
## 2. Description

Rufa is intended for use with all 2.4 GHz applications. The antenna uses a ground plane in order to radiate efficiently, but this ground plane must not extend underneath the antenna itself.

The antenna is available in two versions with the feed locations on the right or left hand side of the antenna.

## 3. Applications

- Wearables
- Notebooks
- PC-cards
- Sensors



## 4. Model Number

**Rufa Left: A5839H**



**Rufa Right: A5887H**



## 5. General Data

|                              |                                   |
|------------------------------|-----------------------------------|
| Product name                 | Rufa                              |
| Model Number                 | A5839H (Left) A5887H (Right)      |
| Frequency                    | 2.4 – 2.5GHz                      |
| Polarization                 | Linear                            |
| Operating temperature        | -40°C to140°C                     |
| Environmental condition test | ISO 16750-4.5.1.1.1/5.1.2.1/5.3.2 |
| Impedance with matching      | 50 $\Omega$                       |
| Weight                       | 0.1 g                             |
| Antenna type                 | SMD                               |
| Dimensions                   | 12.8 x 3.9 x 0.9 (mm)             |

## 6. RF Characteristics

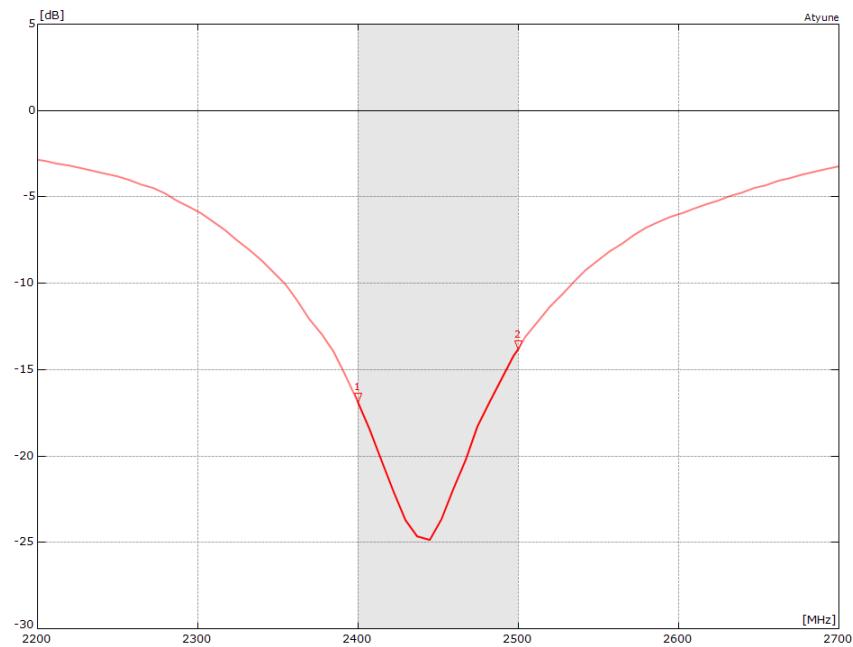
|                       | 2.4 – 2.5 GHz |
|-----------------------|---------------|
| Peak gain             | 2.1dBi        |
| Average gain (Linear) | -1.2dBi       |
| Average efficiency    | 75%           |
| Maximum return loss   | -11dB         |
| Maximum VSWR          | 1.8:1         |

All data measured on Antenna's evaluation PCB  
Model No. A5839H-EVB-1 and A5887H-EVB-1

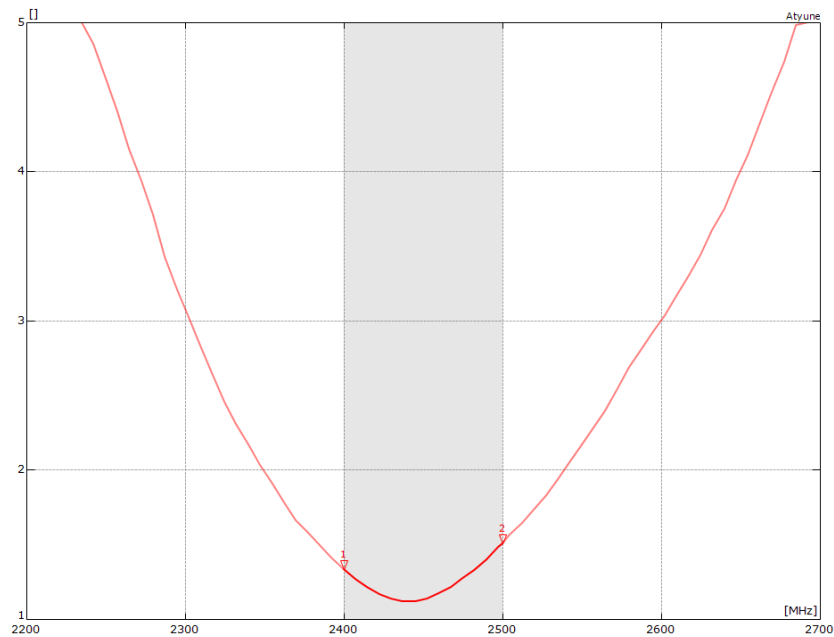
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## 7. RF Performance

### 7.1 Return Loss



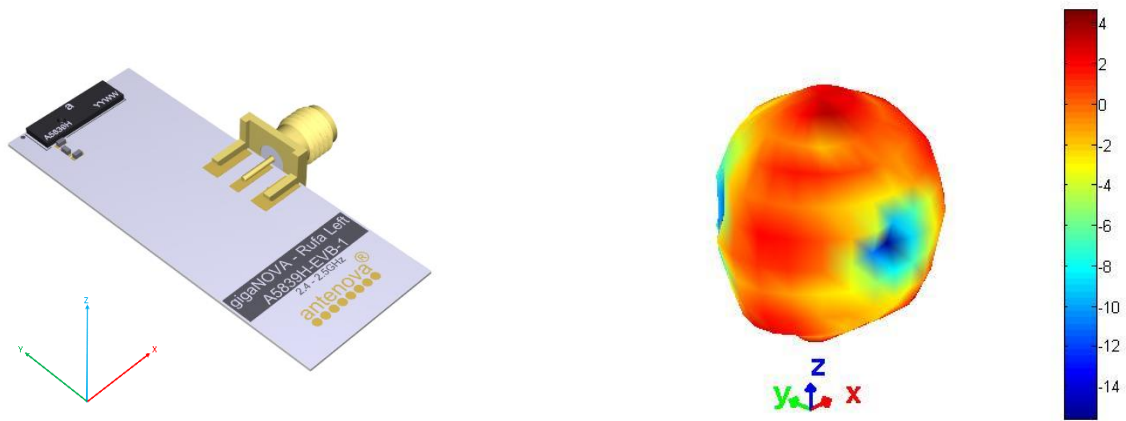
### 7.2 VSWR



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## 7.3 Antenna pattern

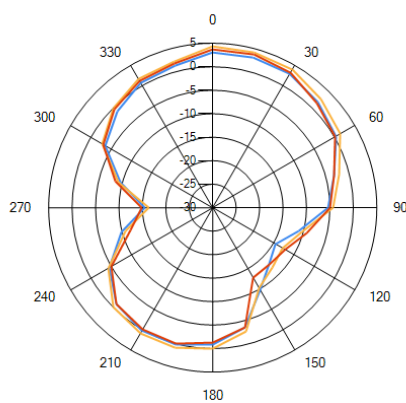
### 7.3.1 2400 MHz – 2500 MHz



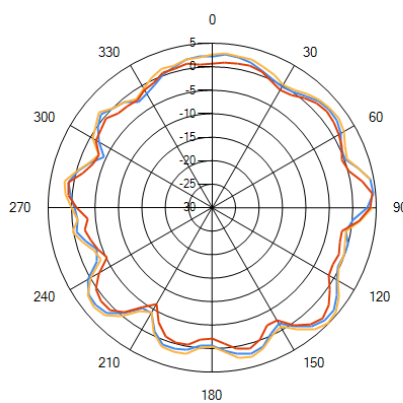
#### 3D pattern at 2450 MHz

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

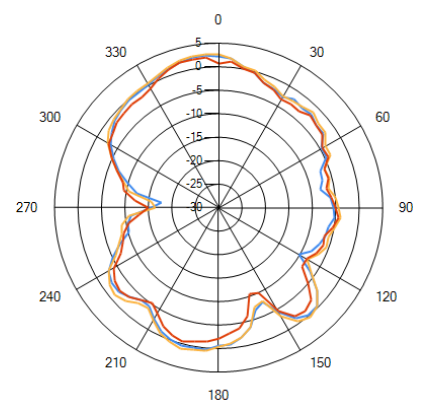
XY



XZ



YZ



— 2.4GHz — 2.45GHz — 2.5GHz

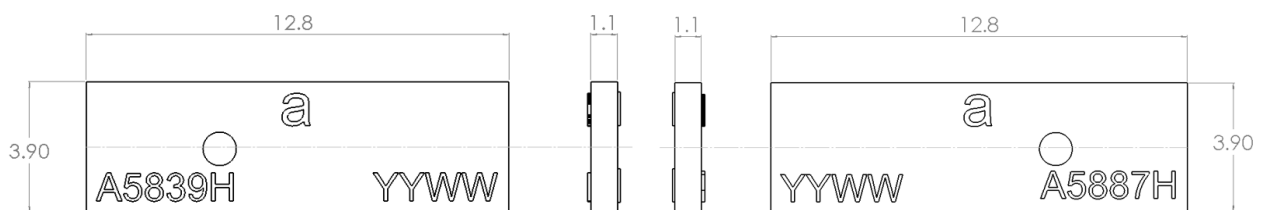
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## 8. Antenna Dimensions

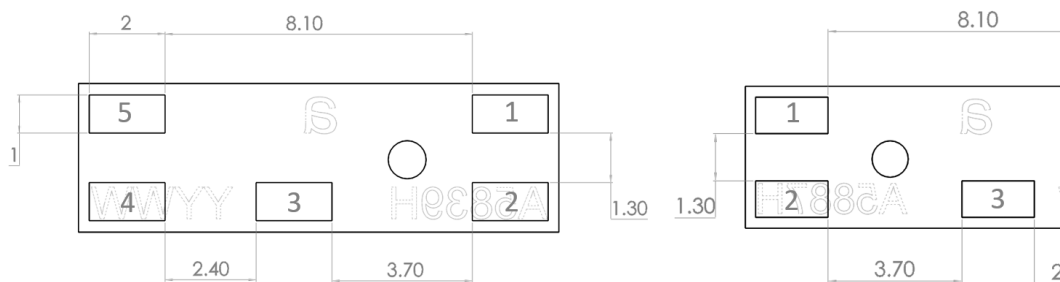
Rufa: A5839H / A5887H



Top side



Bottom Side



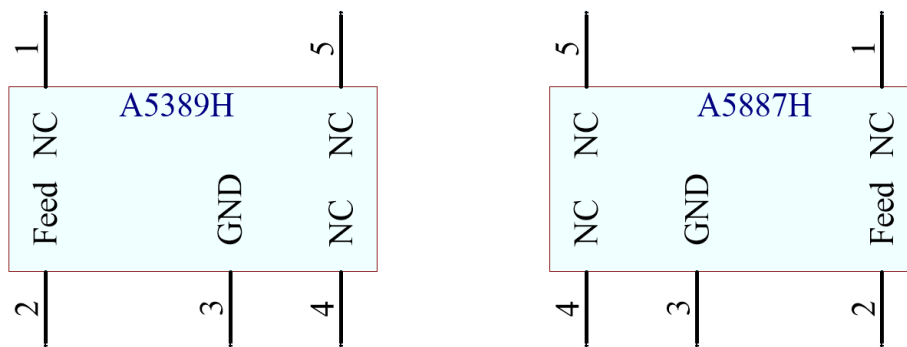
5 solder pads (2.0 x 1.0 mm)  
All Dimensions in (mm)

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## 9. Schematic symbol and Pin definition

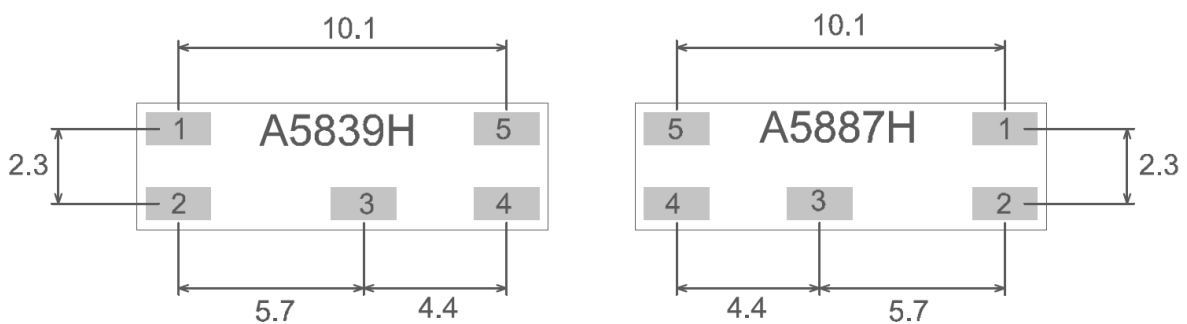
The circuit symbol for the antenna is shown below. The antenna has 5 pins with only two as functional. All other pins are for mechanical strength.

| Pin   | Description                   |
|-------|-------------------------------|
| 2     | Feed                          |
| 3     | GND                           |
| 1,4,5 | Not used<br>(Mechanical only) |



## 10. Antenna footprint

The recommended host PCB footprint is below.



ALL PADS = 2.0 X 1.0 (MM)  
ALL DIMENSIONS IN MM

## 11. Electrical Interface

### 11.1 Transmission Line

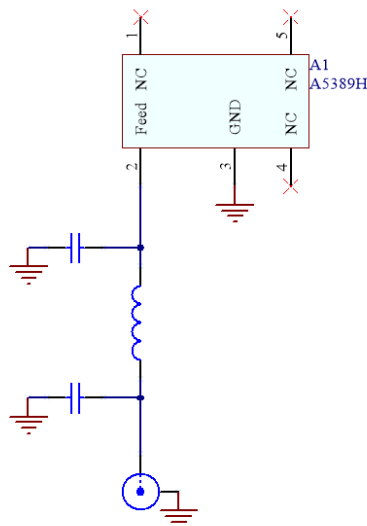
All transmission lines should be designed to have a characteristic impedance of 50Ω.

- 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 50 Ω

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 co-planar transmission is 50 Ω.

### 11.2 Matching Circuit

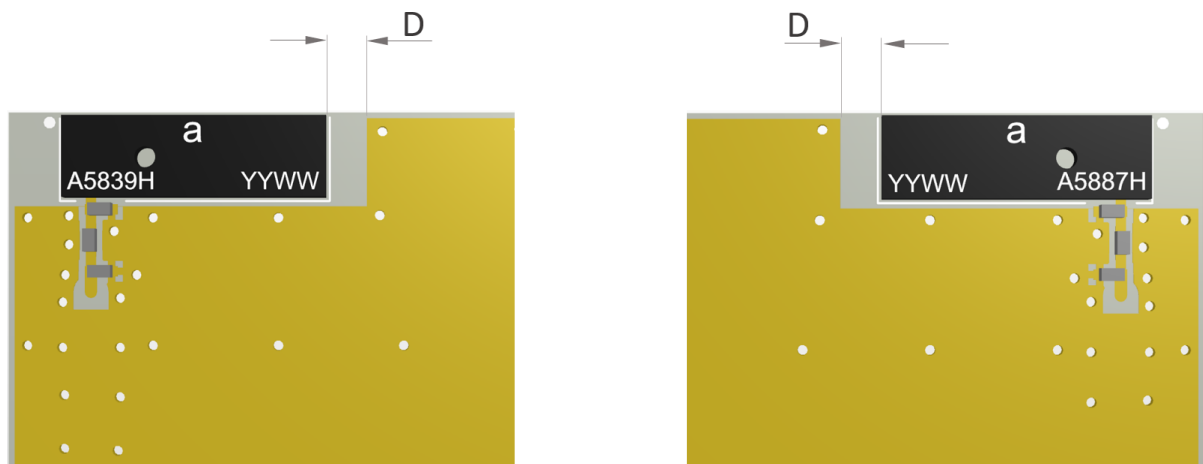
The antenna requires a matching circuit that must be optimized for each product. The matching circuit will require up to three components and the following circuit should be designed into the host PCB. Not all components may be required but should be included as a precaution. The matching network must be placed close to the antenna feed to ensure it is more effective in tuning the antenna.



## 12. Antenna Integration Guide

### 12.1 Antenna Placement

Antenova M2M strongly recommends placing the antenna at the edge of the board. Maximum antenna performance is achieved by placing the antenna towards one of the corners of the PCB and with the feed point of the antenna as close to same corner of the PCB as possible.



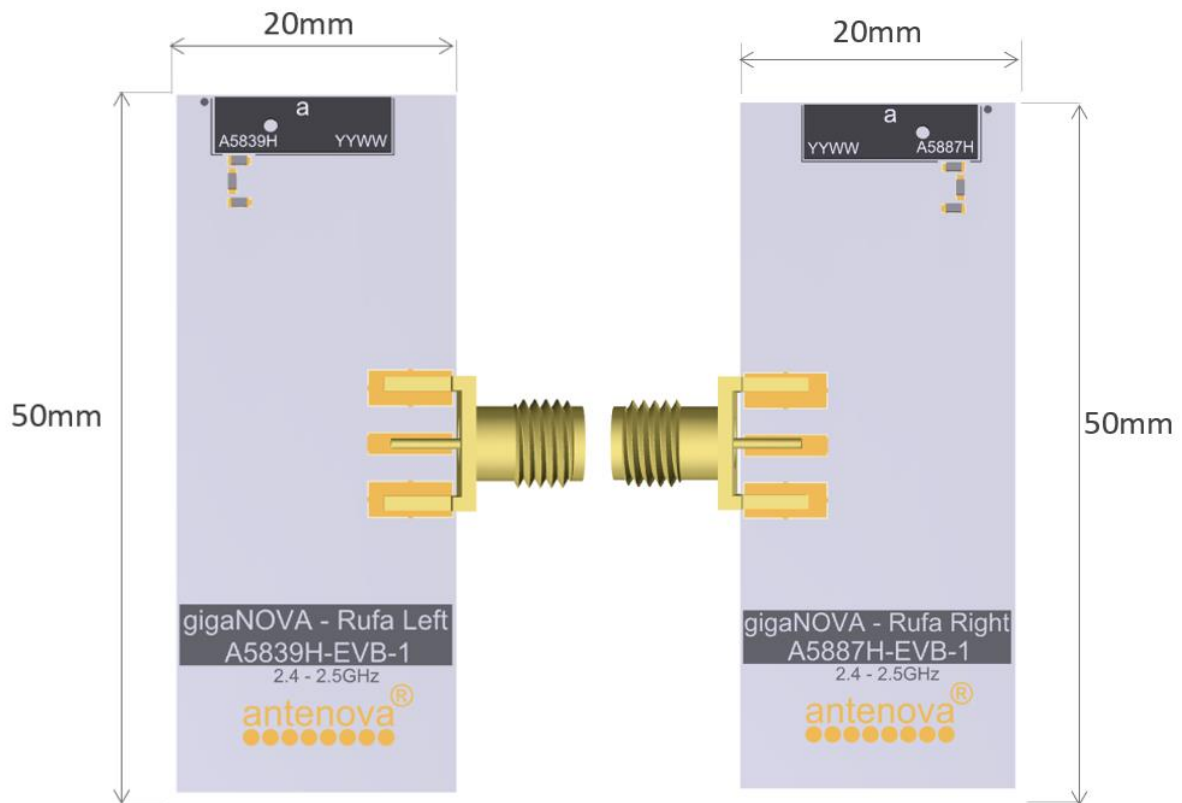
Additional ground and components near the antenna should be at a distance of at least 2mm. Where possible the antenna should be clear of ground from both sides, although the antenna can work well with a minimum clearance of  $D \geq 2 \text{ mm}$  as shown in the drawing above.



## 13. Reference Board

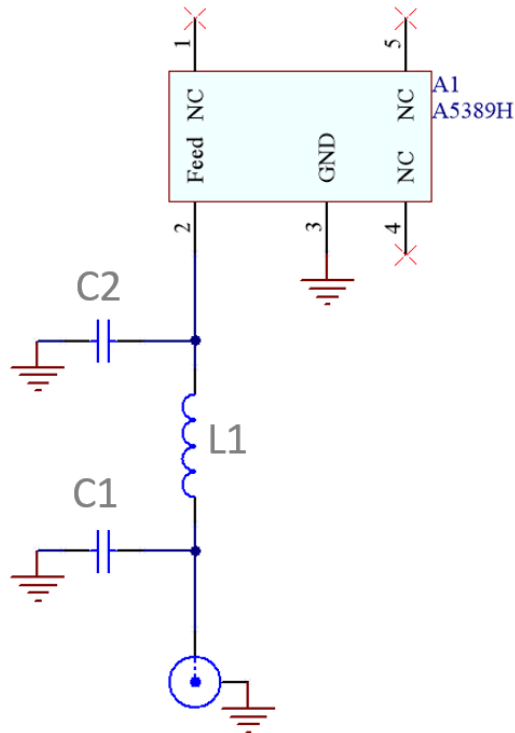
The reference board has been designed for evaluating A5839H / A5887H and includes a SMA female connector.

A5389H / A5887H Evaluation Board



To order a reference board please see [www.antenna.com](http://www.antenna.com)

## 13.1 Reference Board Matching Circuit

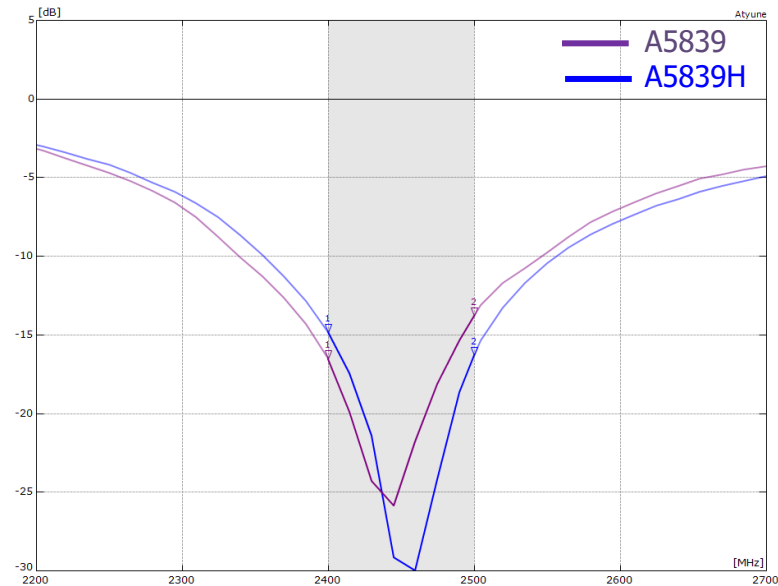


| Designator | Type      | Value      | Description           |
|------------|-----------|------------|-----------------------|
| L1         | Inductor  | 15nH       | Murata LQG15HN series |
| C1         | Capacitor | 2.2pF      | Murata GJM15 series   |
| C2         | Capacitor | Not fitted | Not fitted            |

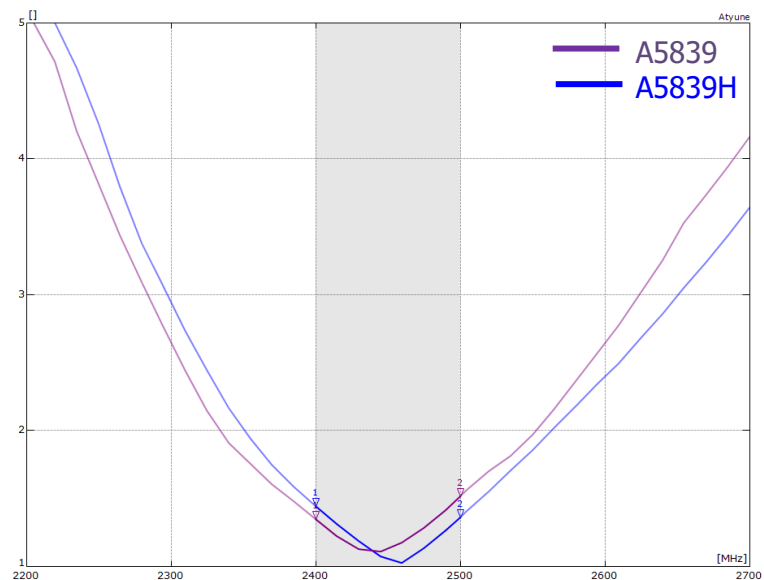
## 14. Comparison S11

The A5839H/A5887H is a direct replacement for the A5839/A5887 original parts. The below is a comparison between each on the same evaluation PCB.

### 14.1 Return Loss

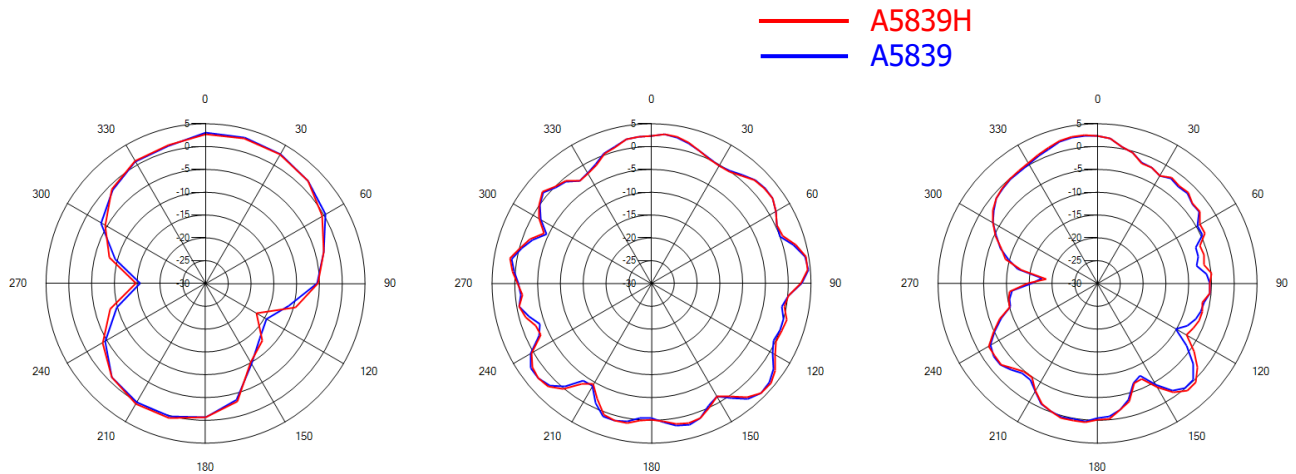


### 14.2 VSWR



## 14.3 Pattern Comparison

The A5839H/A5887H is a direct replacement for the A5839/A5887 original parts. The below is a comparison between each on the same evaluation PCB shown in a polar format.



## 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's website.

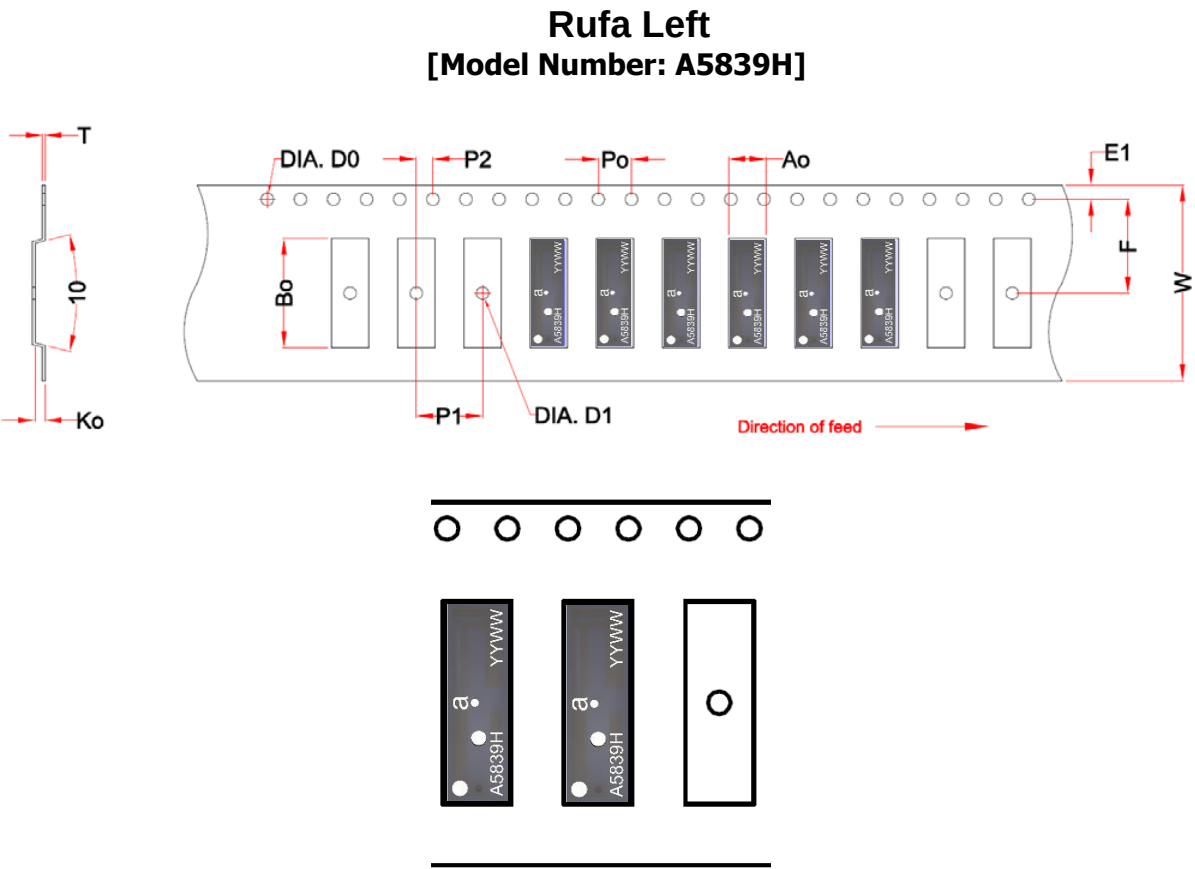
## 17. Packaging

### 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.**

17.2 Tape Characteristics

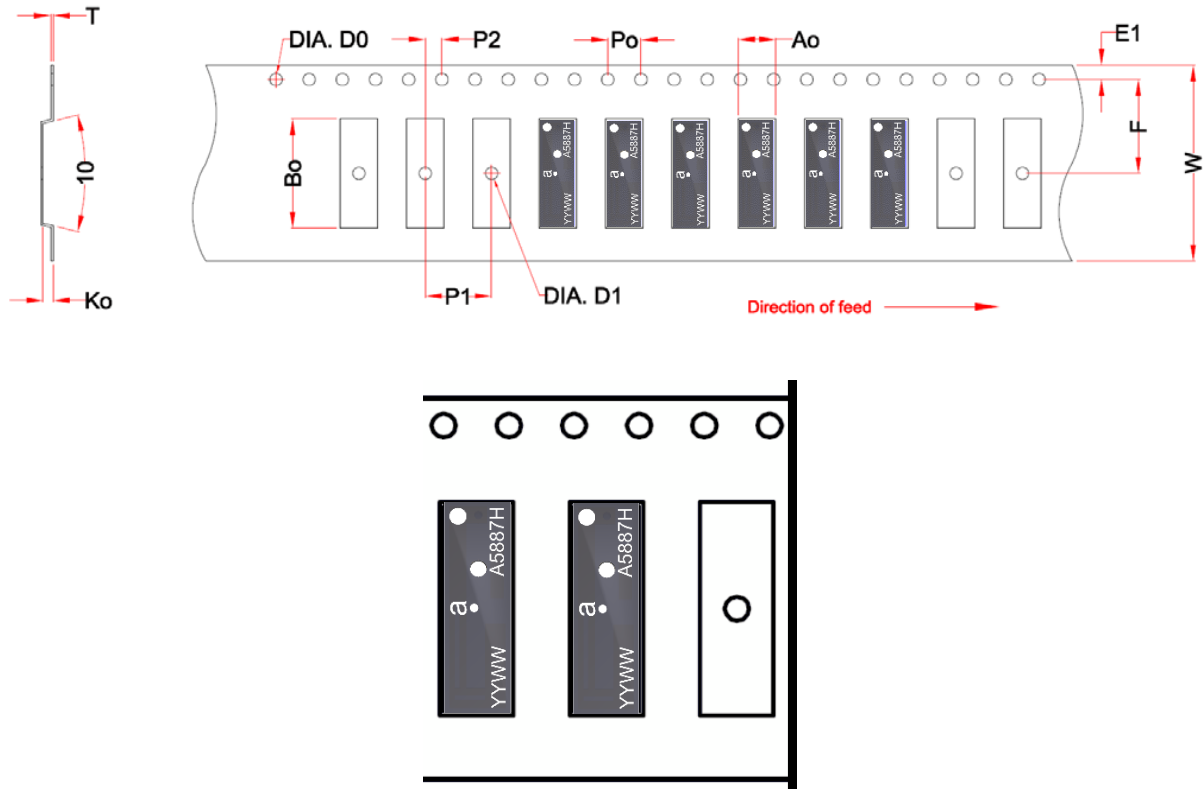


| W        | F          | E1         | P0      | P1      | P2      | A0        | B0         | K0        | T          | D0      | D1      |
|----------|------------|------------|---------|---------|---------|-----------|------------|-----------|------------|---------|---------|
| 24 ± 0.2 | 11.5 ± 0.1 | 1.75 ± 0.1 | 4 ± 0.1 | 8 ± 0.1 | 2 ± 0.1 | 4.3 ± 0.1 | 13.1 ± 0.1 | 1.4 ± 0.1 | 0.3 ± 0.05 | Min 1.5 | Min 1.5 |

Dimensions in mm

| Quantity           | Leading Space            | Trailing Space           |
|--------------------|--------------------------|--------------------------|
| 1000/5000 pcs/reel | 50 blank antenna holders | 37 blank antenna holders |

## Rufa Right [Model Number: A5887H]



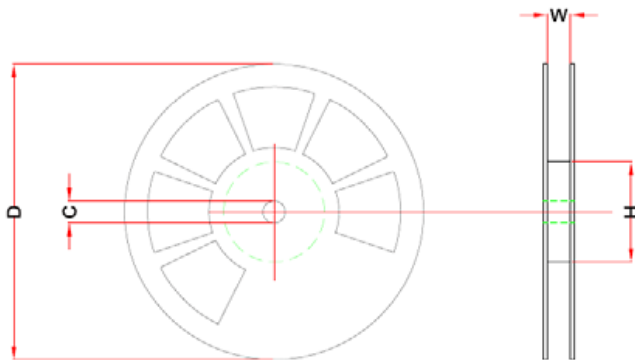
| W        | F          | E1         | P0      | P1      | P2      | A0        | B0         | K0        | T          | D0      | D1      |
|----------|------------|------------|---------|---------|---------|-----------|------------|-----------|------------|---------|---------|
| 24 ± 0.2 | 11.5 ± 0.1 | 1.75 ± 0.1 | 4 ± 0.1 | 8 ± 0.1 | 2 ± 0.1 | 4.3 ± 0.1 | 13.1 ± 0.1 | 1.4 ± 0.1 | 0.3 ± 0.05 | Min 1.5 | Min 1.5 |

Dimensions in mm

| Quantity        | Leading Space            | Trailing Space           |
|-----------------|--------------------------|--------------------------|
| 1000 pcs / reel | 50 blank antenna holders | 37 blank antenna holders |

# Antennas for Wireless Applications

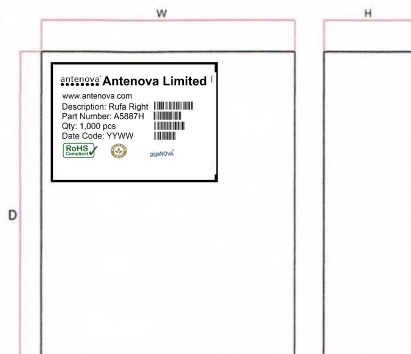
## 17.3 Reel Dimensions



| 1000pc Reel |        |       |      |
|-------------|--------|-------|------|
| W           | D      | H     | C    |
| 24 mm       | 180 mm | 60 mm | 13mm |

| 5000pc Reel |        |       |      |
|-------------|--------|-------|------|
| W           | D      | H     | C    |
| 24 mm       | 330 mm | 80 mm | 13mm |

## 17.4 Box Dimensions



| Width (W) | Breadth (B) | Thickness (H) |
|-----------|-------------|---------------|
| 203 mm    | 188 mm      | 40 mm         |

## 17.5 Bag Properties

Reels are supplied in protective plastic packaging.



## 17.6 Reel Label Information

antenova® **Antenova Limited**  
www.antenova.com  
Description: Rufa Left  
Part Number: A5839H  
Qty: 1,000 pcs  
Date Code: YYWW



antenova® **Antenova Limited**  
www.antenova.com  
Description: Rufa Right  
Part Number: A5887H  
Qty: 1,000 pcs  
Date Code: YYWW



## Quality statements

Antenova's products conform to REACH and RoHS legislation. For our statements regarding these and other quality standards, please see [www.antenova.com](http://www.antenova.com).



## 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.

It is our goal that every customer will create a high performing wireless product using Antenova's antennas. You will find a wealth of design resources, calculators and case studies to aid your design at 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 certifications.

If you cannot find the antenna you require in our product range, please contact us to discuss creating a bespoke antenna to meet your requirement exactly.

## Contacts

Join our online antenna design community: [ask.antenova.com](http://ask.antenova.com)

Order antenna samples and evaluation boards at: [www.antenova.com](http://www.antenova.com)

Request a quotation for antennas by volume: [sales@antenova.com](mailto:sales@antenova.com)

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**Antenova Ltd, 2<sup>nd</sup> Floor Titan Court, 3 Bishop Square,  
Hatfield, AL10 9NA +44 (0) 1223 810600**

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