# OnBoard 2.4 GHz Mini SMD - Antenna



**PRO-OB-607**

Request Samples | Check Inventory

**9.90 x 4.30 x 2.00 mm**
**RoHS/RoHS II Compliant**
**MSL Level = 1**

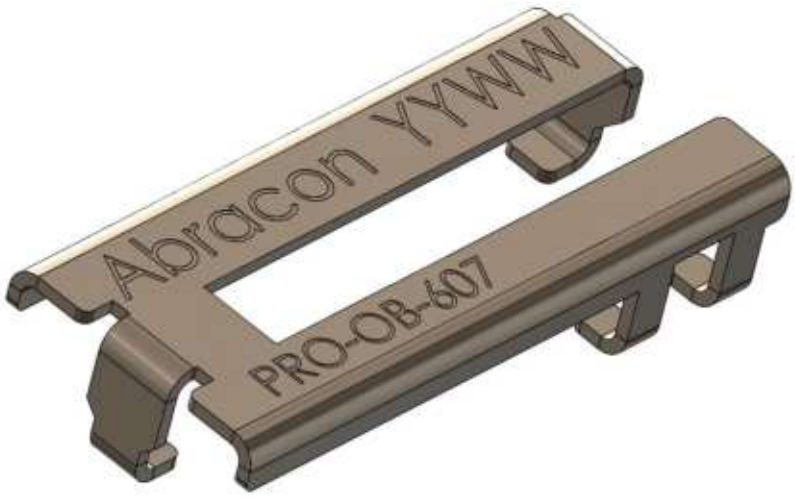
## Features

- Ultra Compact
- Low Profile of 2 mm
- Mixed Linear Polarization
- Peak Gain of -0.6 dBi
- Surface Mount
- Durable-Shelf life of up to 10 years

## Applications

- Wi-Fi/BT/BLE/ZigBee/ISM Applications
- IoT, M2M
  - Industrial
  - Infrastructure
  - Medical
- Remote Technology / Monitoring
- Network Devices
- Consumer Tracking
- Smart Home
- Smart Wearables

## Product Image




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**MSL Level = 1**

## Electrical Specification

| Parameter | Specification | Unit |
|---|---|---|
| Operating Frequency | 2400 - 2497 | MHz |
| Return Loss | < -6.3 | dB |
| Polarization | Mixed Linear | - |
| Peak Gain | -0.6 | dBi |
| Efficiency | > 23 | % |
| Impedance | 50 | Ω |

*Note: All measurements were conducted on the evaluation board in free space. Performance will vary depending on the ground plane, application, and environment.*

## Mechanical Specification

| Parameter | Specification |
|---|---|
| Antenna Dimension | 9.90 x 4.30 x 2.00 mm |
| Evaluation board Dimension | 48 x 18 mm |
| Mounting Type | Surface Mount |

## Environmental Specification

| Parameter | Specification |
|---|---|
| Operating Temperature | -40°C to +125°C |
| Storage Temperature | |
| Maximum Temperature | 400°C |
| RoHS Compliance | Yes<br>Compliant with EU directive 2011/65/EU and 2015/863 |
| Shelf life | 10 years |
| MSL | Level 1, unlimited |

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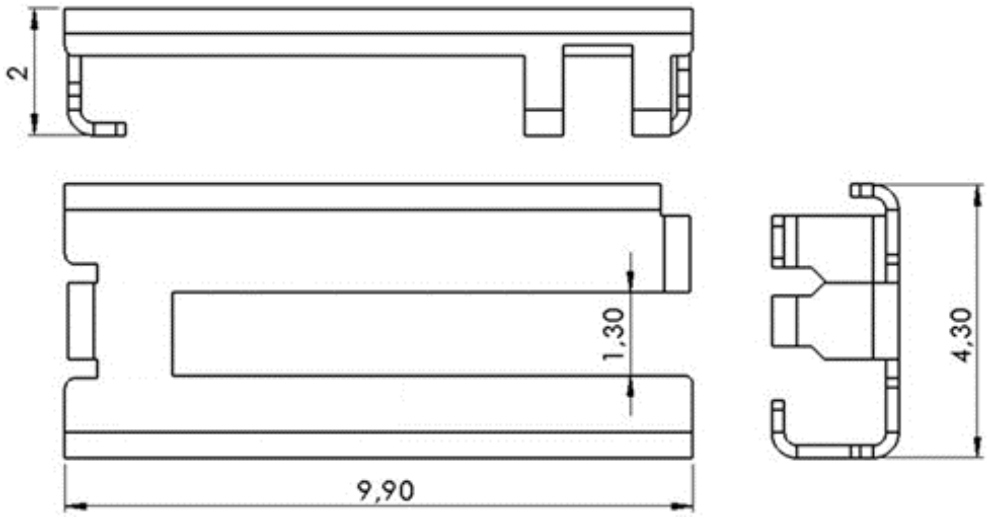


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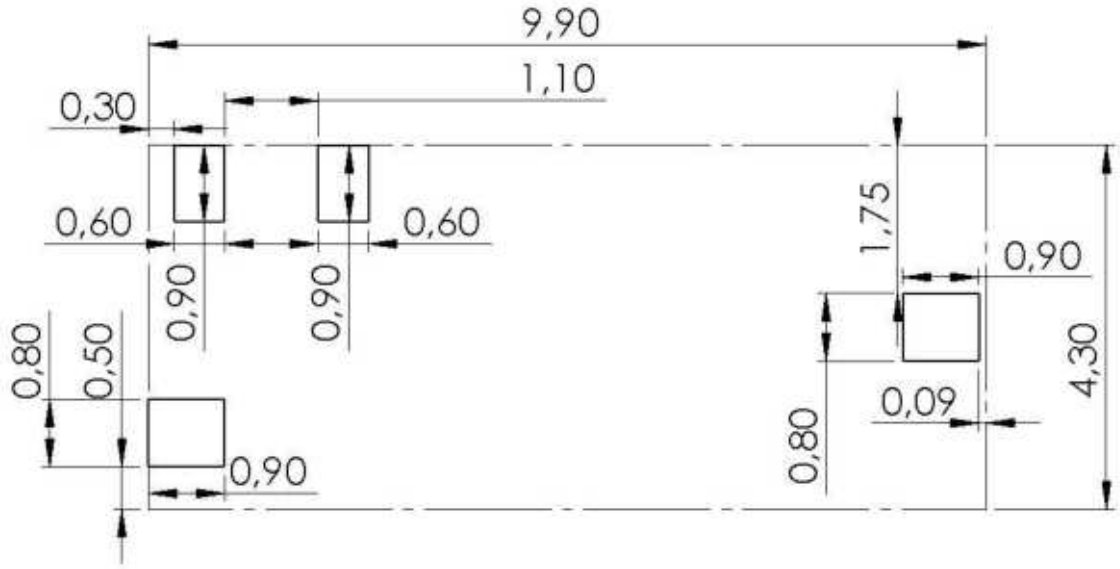
**9.90 x 4.30 x 2.00 mm**
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## Product Dimensions




*Unit : mm*

## Antenna pins and keep-out block




*Unit : mm*

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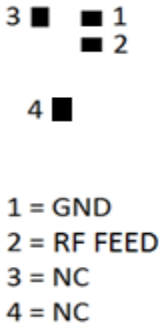
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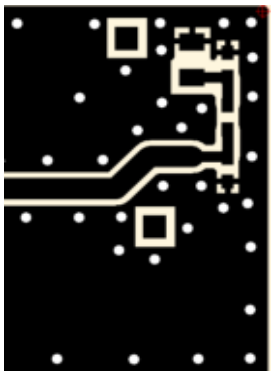
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## PCB layout and antenna pin numbering

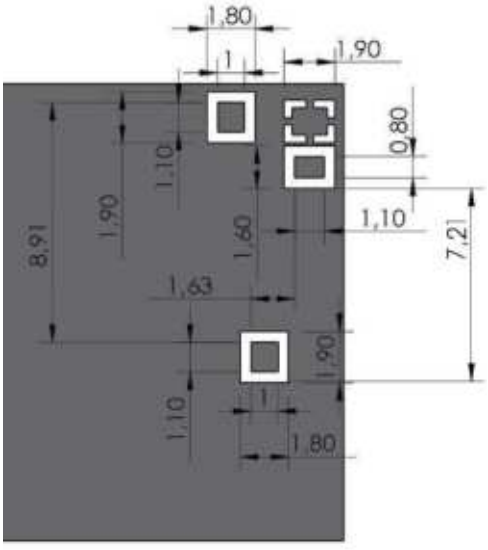
The antenna uses PIFA technology and should thus be mounted on a ground plane. If there are several layers in the PCB, there is an advantage to add vias for smooth interconnection of the ground areas to avoid splits in the ground plane. It is also important that there is a ground clearance around the NC pads and the RF feed pad, through all layers of the PCB. It is recommended to implement a matching network to optimize the antenna impedance in your application. The components can be positioned under the antenna. See recommendations in the figures below.



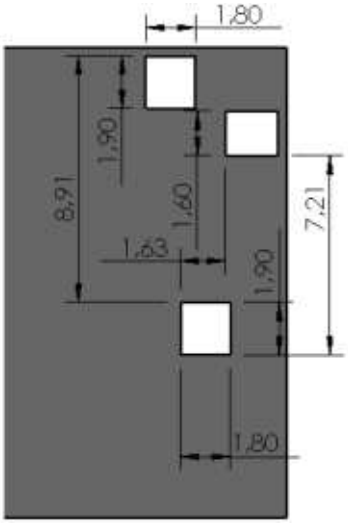

*Pin configuration*



*PCB Layout (from evaluation board)*




*Top Layer*




*Bottom Layer (Clearance through all layer)*

*Unit: mm*

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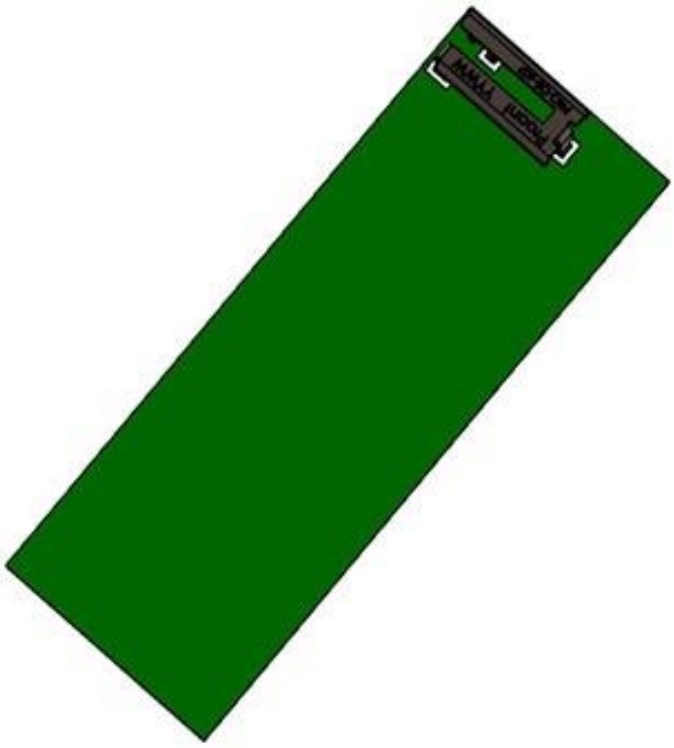
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## Measurement Setup

The antenna measurements were all done in free space with the SMD 2400 Mini evaluation board (PRO-EB-609) that has a PCB size of 48 x 18 mm.



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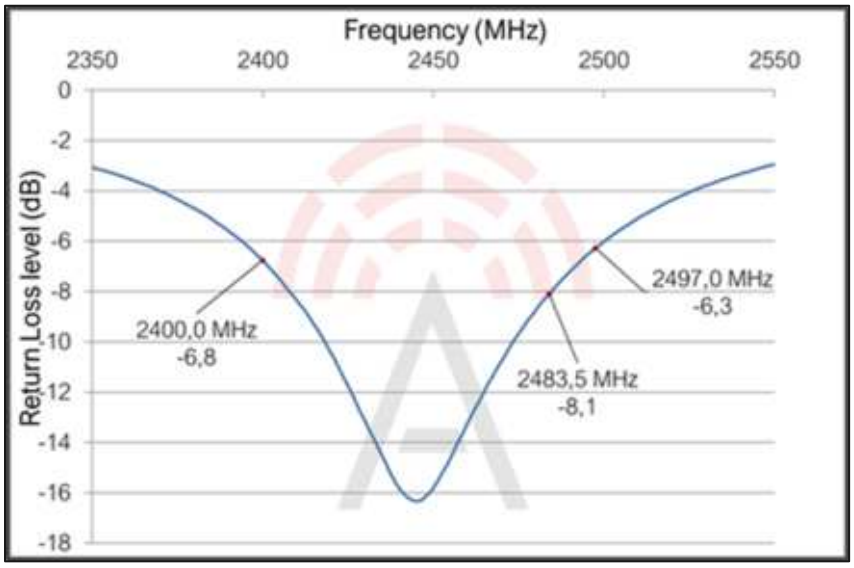


**PRO-OB-607**

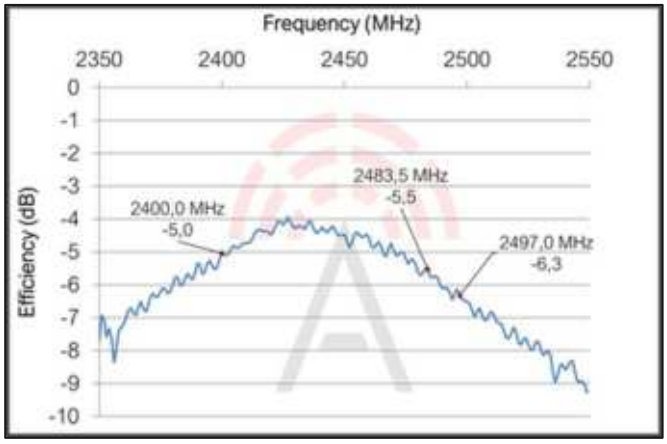
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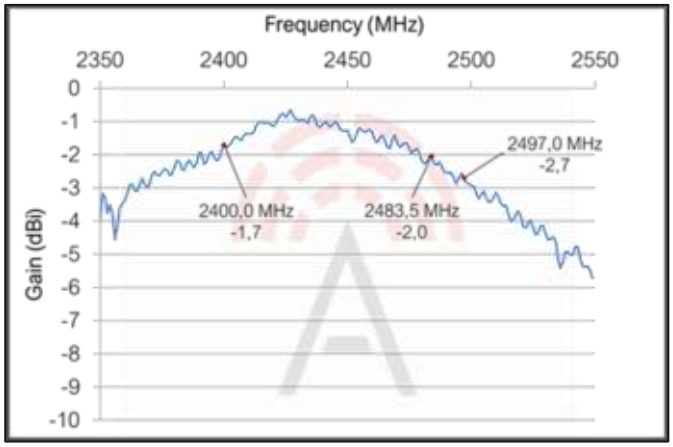
## Reflection Characteristics – Return Loss




## Total Radiation Efficiency




## Maximum Radiation Gain





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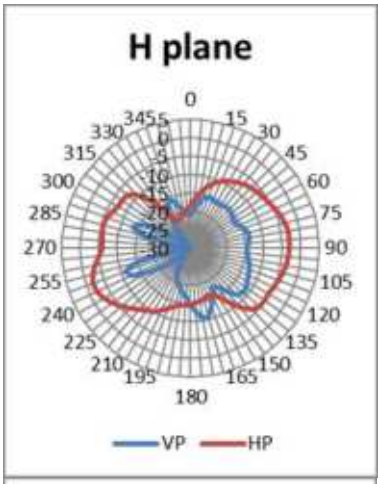


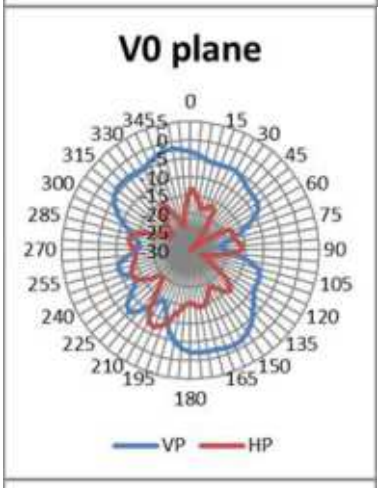
**PRO-OB-607**

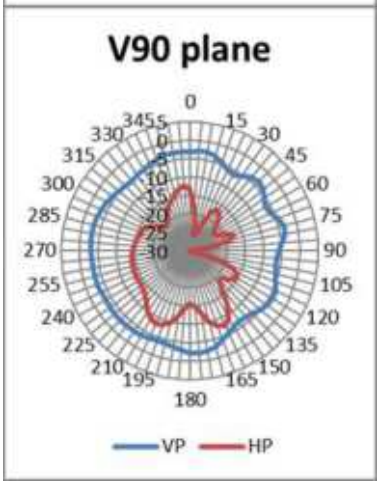
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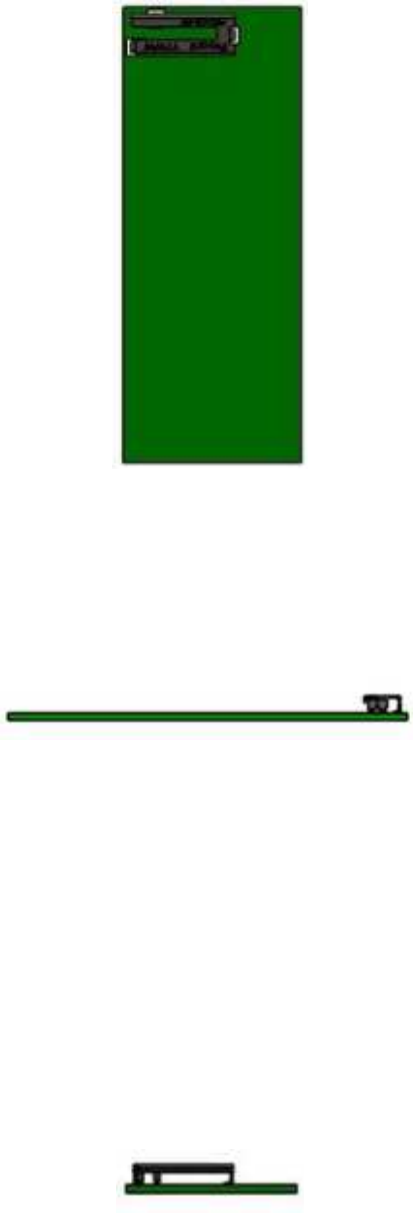
## Radiation Characteristics – 2D Pattern (2400 MHz)




*VP: Vertical Polarization*
*HP: Horisontal Polarization*



*Unit: dBi*


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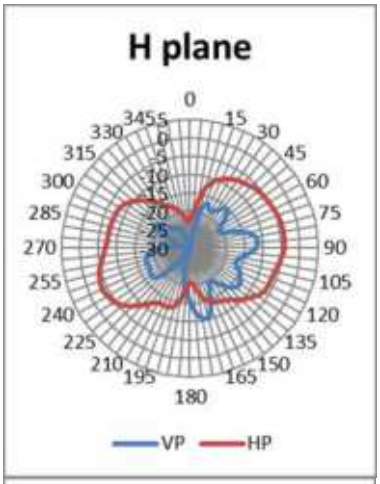


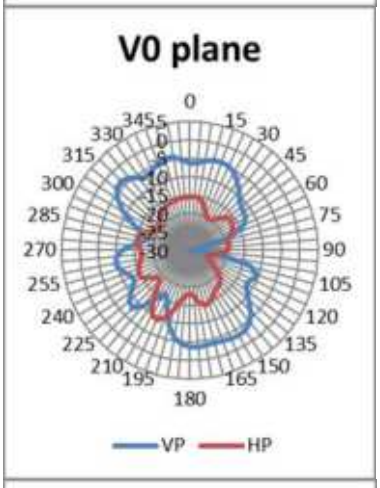
**PRO-OB-607**

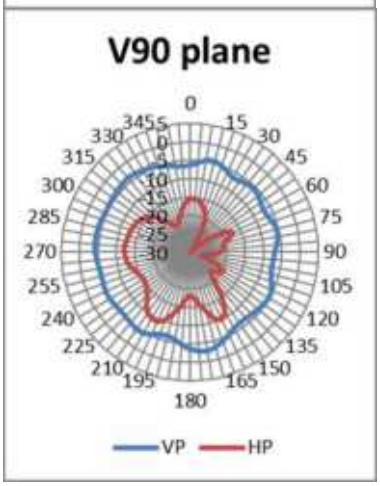
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**MSL Level = 1**

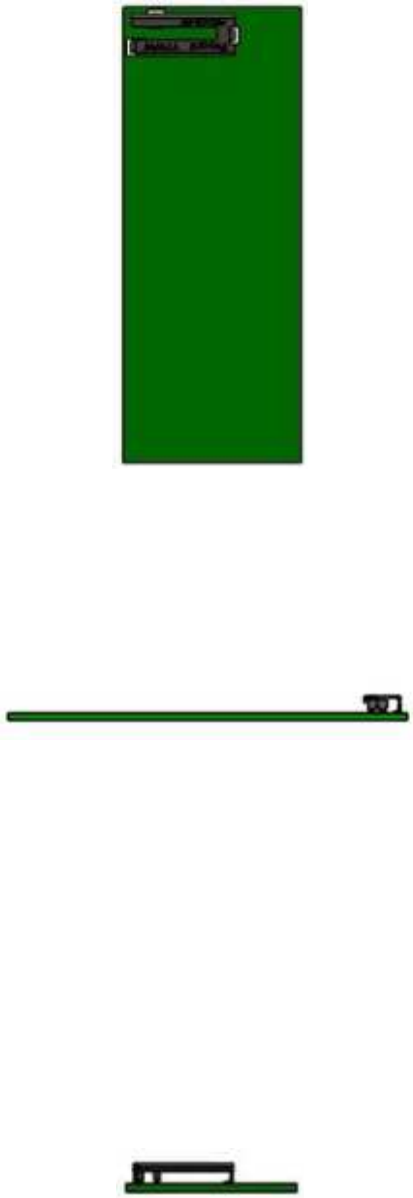
## Radiation Characteristics – 2D Pattern (2497 MHz)




*VP: Vertical Polarization*
*HP: Horisontal Polarization*



*Unit: dBi*


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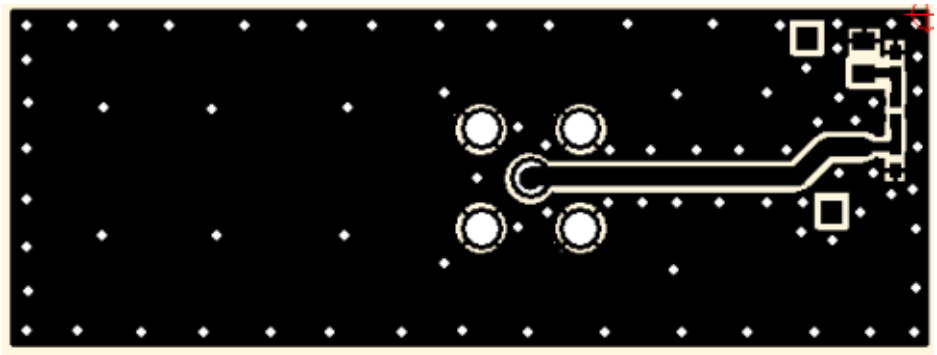
**PRO-OB-607**

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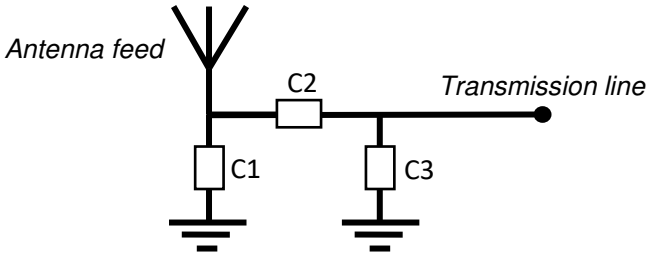
## Evaluation Board Outline & Matching Circuit

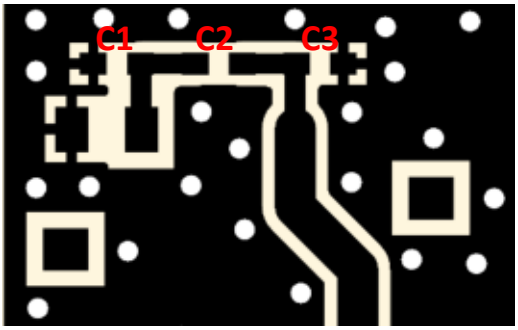
The evaluation board (PRO-EB-609) is developed to simplify antenna testing and evaluation. It has an arbitrary size of 48 x 18 mm and includes an SMA connector. The purpose is to give a reference design for an optimal antenna implementation. The evaluation board can also be used to test other implementations by cutting and soldering the PCB into any device.



*Evaluation board outline*

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.




*Matching circuit*

The antenna needs a matching circuit to adjust the resonant frequency balance. When delivered, the evaluation board is tuned for optimum balance at the 2.4 GHz band. The component values for this setup are:

C1 = 0.4 pF  C2 = 0.6 pF  C3 = 1.1 pF

However, it is common that the resonant frequency will shift during implementation in an arbitrary device. Therefore, this matching may be changed for compensation of such effects. This is further described in General Implementation Guidelines section below.

# OnBoard 2.4 GHz Mini SMD - Antenna



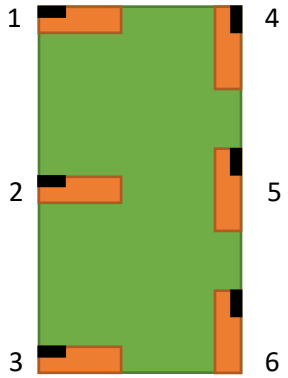
**PRO-OB-607**

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## General Implementation Guidelines

The antenna can be positioned in different ways, although there are some positions which are more beneficial. Below picture shows a typical PCB with examples on different antenna positions. The optimal position is option 1 or 4.




= *GND pin(s)*

Optimal

1 & 4
3
6
2 & 5

The antenna should be aligned with the PCB edge if possible, preferably with the GND pin(s) close to a corner.

The antenna enables that small electrical components are mounted inside the antenna keep-out block. This is a space-efficient solution which has very little influence on the performance. It may have an impact on the antenna tuning, but is fully possible if there is limited space on the PCB.

Another general aspect on surface mounted antennas is regarding the PCB population. If other electrical components are positioned in the surrounding area of the antenna, some impact on the antenna tuning and radiated performance may be expected. It is recommended that such components are distributed below a topographical slope that starts on PCB level at the antenna keep-out block, and slowly increases the height.

It shall also be highlighted that plastic and metal parts in the near proximity of antennas may influence the antenna tuning and/or performance. This aspect should be noted as a general guideline for all antennas. The effects are difficult to estimate without detailed information, but it is common that a plastic housing above the antenna shifts the resonant frequency down. It is recommended to measure the antenna in the actual device after implementation.

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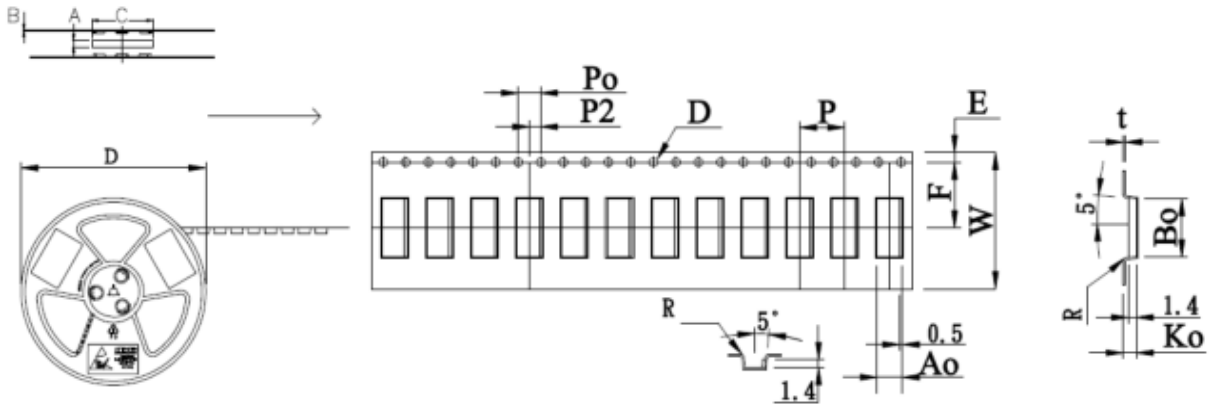
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**MSL Level = 1**

## Packaging

The antenna is delivered on tape and reel according to following specifications. The quantity per 13” reel is 2500 pcs.

| SPEC | 13" REEL W: 24 mm | | | | |
|---|---|---|---|---|---|
| | Material: HIPS | | | | |
| ITEM | A | B | C | D | Surface Resistivity |
| DIM | 24.5 ± $^{+1.0}_{-0.1}$ mm | 2.2 ± 0.2mm | 100 ± 1.0 mm | 330 ± 1.5mm | <= $10^{9\sim11}$ Ω/□ |
| ALTERNATE | | | | | |




| ITEM | SPEC |
|---|---|
| W | $24.0^{+0.30}_{-0.30}$ |
| Ao | $4.50^{+0.10}_{-0.10}$ |
| Bo | $10.2^{+0.10}_{-0.10}$ |
| Ko | $2.30^{+0.10}_{-0.10}$ |
| P | $8.00^{+0.10}_{-0.10}$ |
| F | $11.5^{+0.10}_{-0.10}$ |
| E | $1.75^{+0.10}_{-0.10}$ |
| Do | $1.50^{+0.10}_{-0.00}$ |
| D1 | $0.00^{+0.10}_{-0.10}$ |
| Po | $4.00^{+0.10}_{-0.10}$ |
| P2 | $2.00^{+0.10}_{-0.10}$ |
| t | $0.30^{+0.05}_{-0.05}$ |

*Unit: mm (unless otherwise noted)*

NOTE:

- 10 sprocket hole pitch cumulative tolerance.
- Carrier camber not to exceed 1mm in 250mm.
- Ao and Bo measured on a plane 0.35mm above the bottom of the pocket.
- Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
- All dimensions meet EIA-481-D requirements.
- Material: Blacknductivelystyrene
- Component load per 13” reel: 2500pec/20.5M (before & after 56 pcs)

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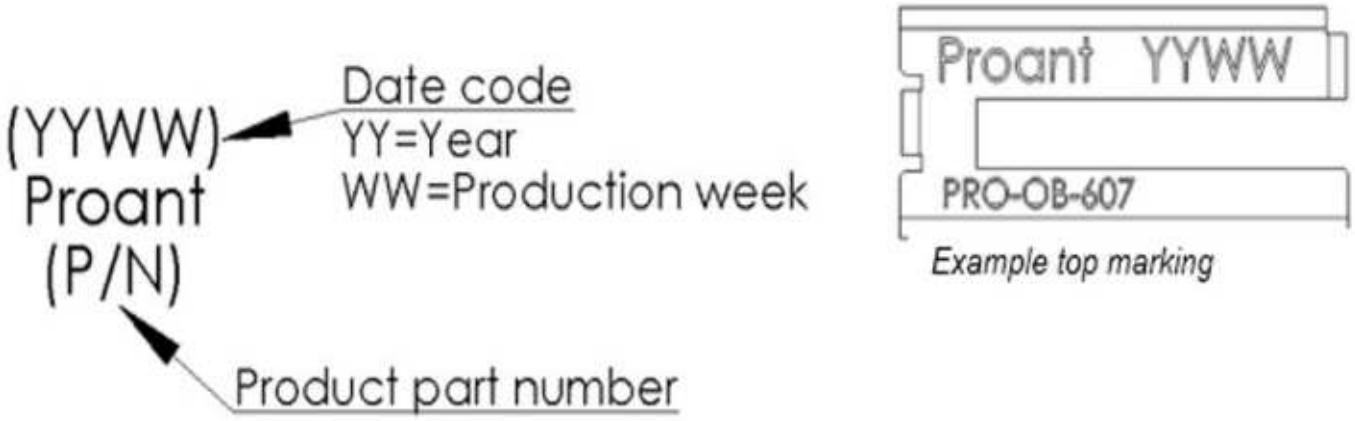
**9.90 x 4.30 x 2.00 mm**
**RoHS/RoHS II Compliant**
**MSL Level = 1**

## Part Marking

The top marking of the antenna is arranged according to the following illustration.




There will be a transition period for the part marking until production batches after 2222 (YYWW). Produced batches before 2222 are marked according to the below illustration.




## Ordering Information

| Part number | Part name | Details |
|---|---|---|
| PRO-OB-607 | OnBoard SMD 2400 Mini | Antenna for 2.4 GHz ISM band. |
| PRO-EB-609 | Evaluation board, Onboard SMD 2400 Mini | Evaluation board with PRO-OB-607 for WLAN/Wifi, Bluetooth, Zigbee, RFID, WirelessHART applications. |

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