



# TAOGLAS®



# Datasheet

## 2.4GHz High Efficiency Loop Antenna

**Part No:**  
WLA.01

**Description:**  
2400MHz to 2500MHz WLAN/Wi-Fi/Bluetooth

**Features:**  
3.2\*1.6\*0.5mm  
Low Profile  
Peak gain 1dBi typ  
50 Ohm Impedance  
CE Certified  
RoHS and REACH Compliant

1. Introduction	3
2. Specifications	5
3. Antenna Characteristics	6
4. Radiation Patterns	9
5. Mechanical Drawing	13
6. Antenna Integration Guide	14
7. Packaging	24
<hr/>	
Changelog	25

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## 1. Introduction



The WLA.01 2.4GHz Loop antenna is a high efficiency, miniature SMD, edge mounted ceramic antenna for very small space requirements for Wi-Fi, WLAN, Zigbee, Bluetooth, and 802.11 applications. The WLA.01 uses the main PCB as its ground plane, thereby increasing Antenna Efficiency. It is tuned for different PCB sizes by simply changing the value of the matching circuit. At 3.2mm\*1.6mm\*0.5mm, the WLA.01 is one of the smallest antennas available worldwide. This antenna is delivered on tape and Reel.

Upon testing of any of our antennas with your device and a selection of appropriate layout, integration technique, or cable, Taoglas can make sure any of our antennas' peak gain will be below the peak gain limits. Taoglas can then issue a specification and/or report for the selected antenna in your device that will clearly show it complying with the peak gain limits, so you can be assured you are meeting regulatory requirements for that module.

For example, a module manufacturer may state that the antenna must have less than 2dBi peak gain, but you don't need to select an embedded antenna that has a peak gain of less than 2dBi in free-space. This will give you a less optimized solution. It is better to go for a slightly higher free-space peak gain of 3dBi or more if available. Once that antenna gets integrated into your device, performance will degrade below this 2dBi peak gain due to the effects of GND plane, surrounding components, and device housing. If you want to be absolutely sure, contact Taoglas and we will test. Choosing a Taoglas antenna with a higher peak gain than what is specified by the module manufacturer and enlisting our help will ensure you are getting the best performance possible without exceeding the peak gain limits.

This antenna can be mounted with no performance degradation in either orientation as long as the antenna is soldered correctly via Surface mounting. Please see the integration instructions section for further detail regarding the optimum way to integrate this antenna into your device.

The WLA.01 is designed to mount at the center of the edge of an evaluation board of 80 x 40mm. The antenna performance was measured with the WLA.01 mounted on the evaluation board with SMA(F) connector.

Typical Applications Include:

- Bluetooth earphone systems
- Hand-held devices when Bluetooth/Wi-Fi functions are needed, e.g., Smart phone.
- IEEE802.11 b/g
- ZigBee
- Wireless PCMCIA cards or USB dongle

For further optimization to customer-specific device environments and for support to integrate and test this antennas performance in your device, contact your regional Taoglas Customer Services Team.

Our Taoglas Taiwan Tainan is our primary manufacturing and engineering site and houses a significant portion of our operations workforce including manufacturing, test, failure analysis, purchasing, production planning, and quality. Located in an international science park in the Sinshih District, our growing facility and team of experts ensures fast regional response times and global operational excellence in manufacturing services.

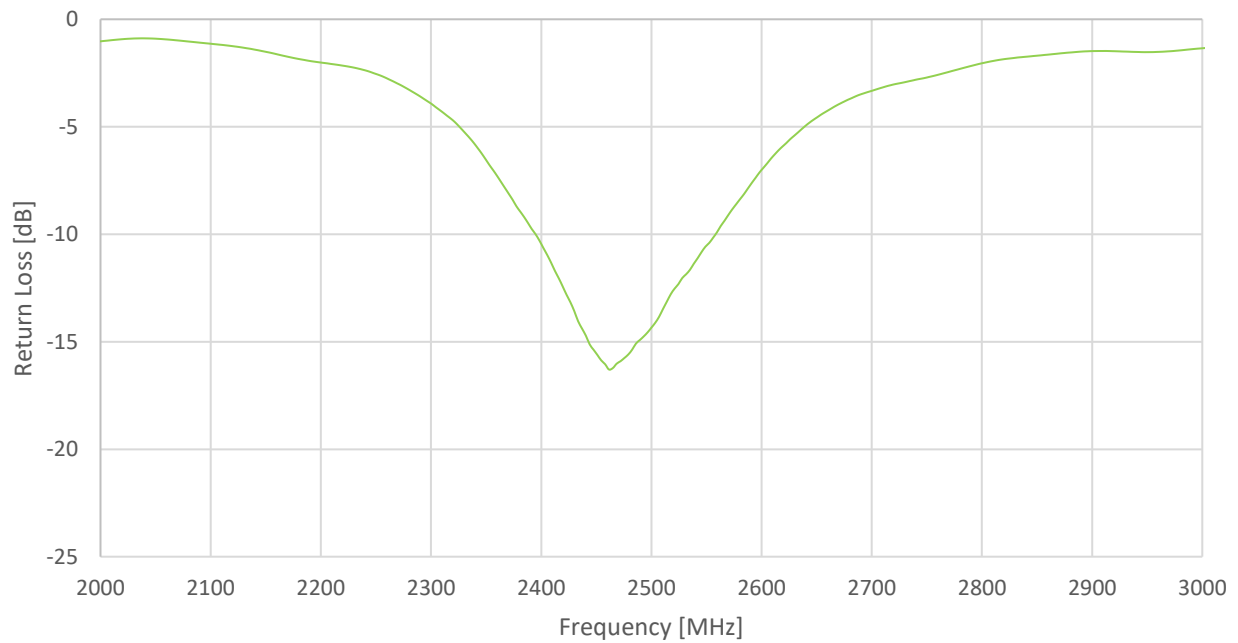
Address: Taoglas Manufacturing Site, 4F.-2, No.15, Guoji Road, Xinshi District, Tainan City 744, Taiwan (R.O.C.)  
Contact: +886 3 3681223

## 2. Specifications

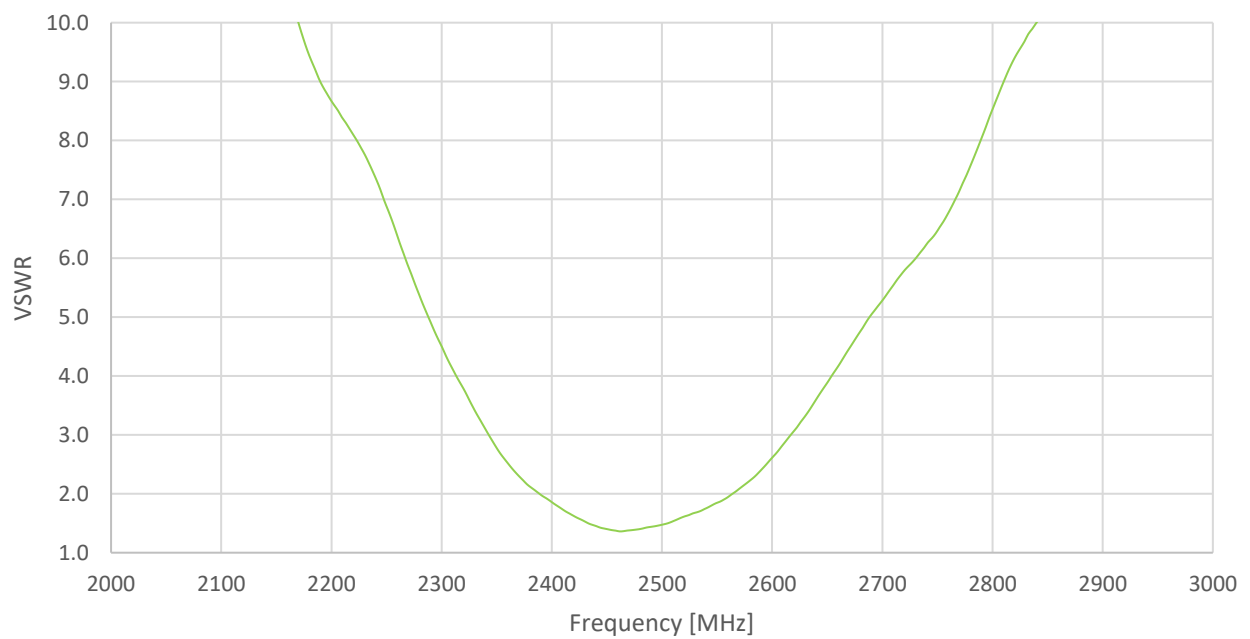
Electrical	
Centre Frequency	2400-2500MHz
VSWR	2.5 Max
Radiation Pattern	Omnidirectional
Input Power	5W
Bandwidth	100MHz min.
Peak Gain	1dBi typ.
Efficiency	68% typ.
Impedance	50 $\Omega$
Mechanical	
Dimensions	3.2*1.6*0.5mm
Material	Ceramic
Environmental	
Operating Temperature	-40°C~+85°C
Storage Temperature	-40°C~+105°C
Temperature Coefficient (tf)	0 $\pm$ 20 ppm @-20°C to +80°C
Recommended Reel Storage Condition	5°C to 40°C Relative Humidity 20% to 70%
Moisture Sensitivity Level (MSL)	3 (168 Hours)

### 3. Antenna Characteristics

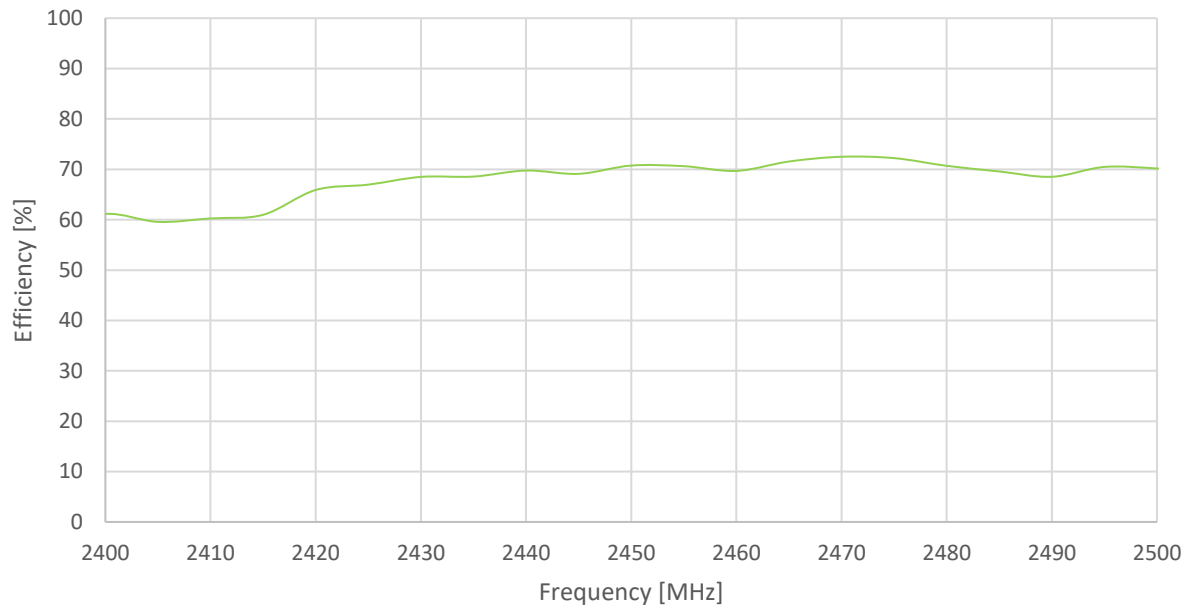
#### 3.1 Return Loss



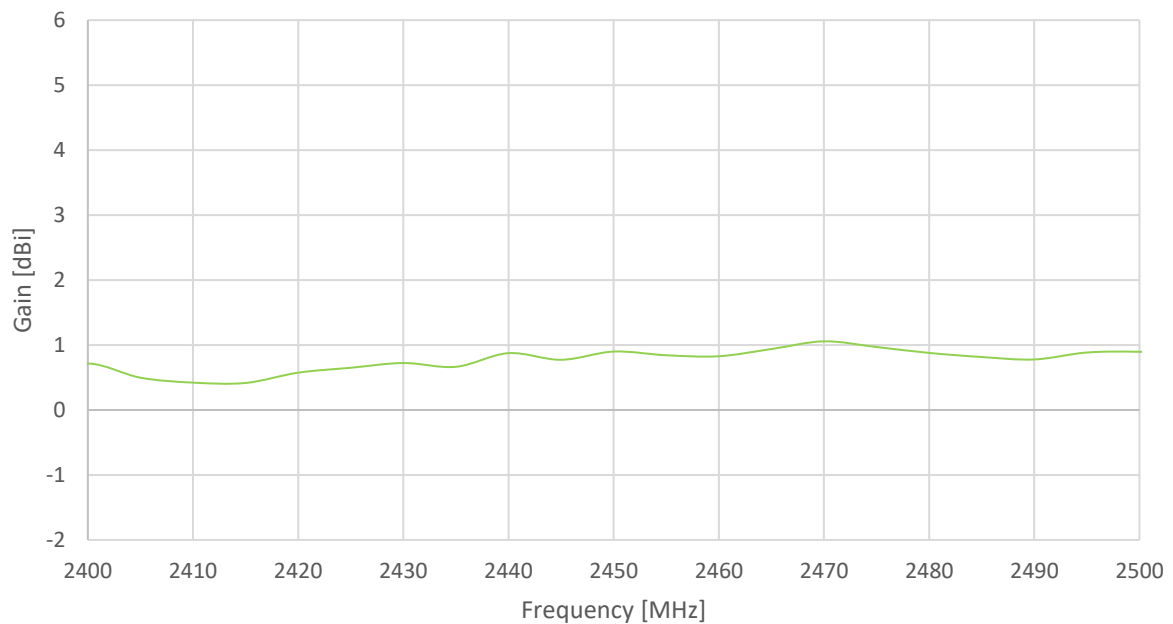
#### 3.2 VSWR



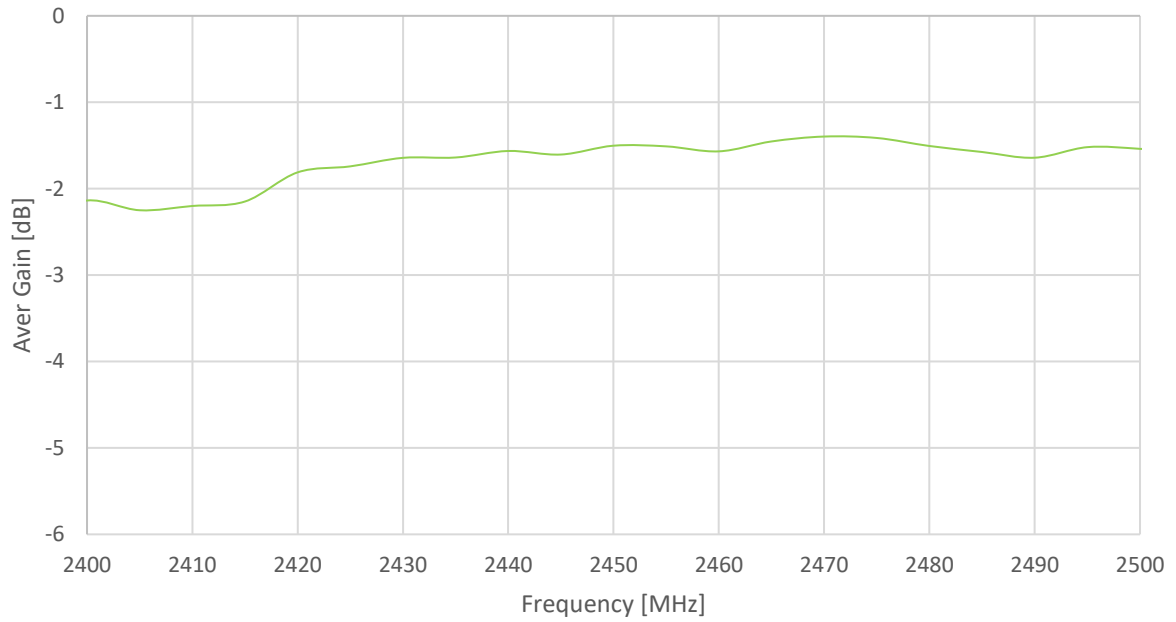
### 3.3 Efficiency



### 3.4 Peak Gain



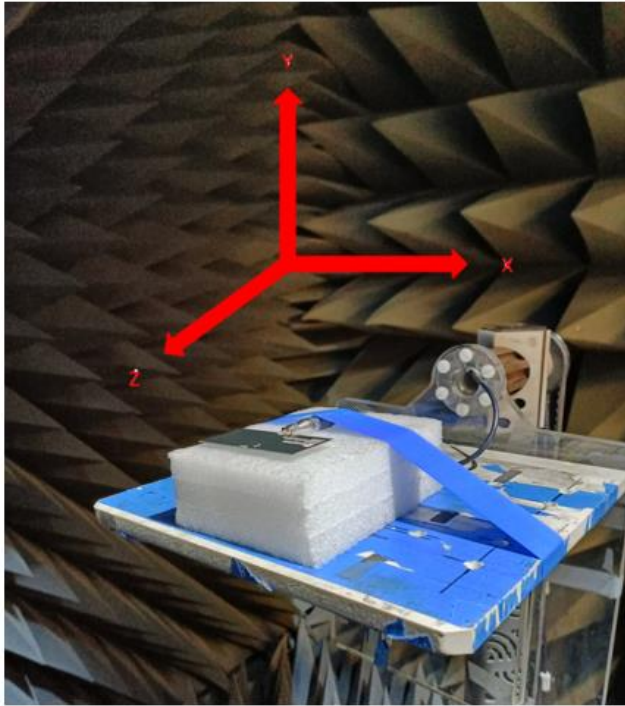
### 3.5 Average Gain



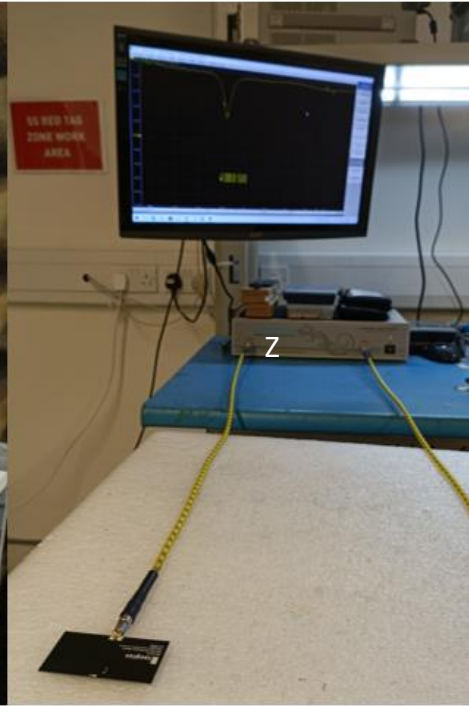


## 4. Radiation Patterns

### 4.1 Test Setup

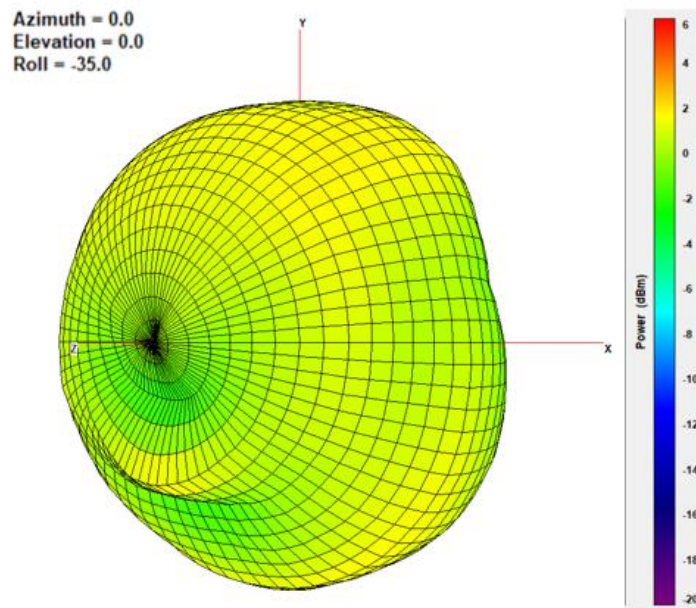


Chamber Setup



VNA Setup

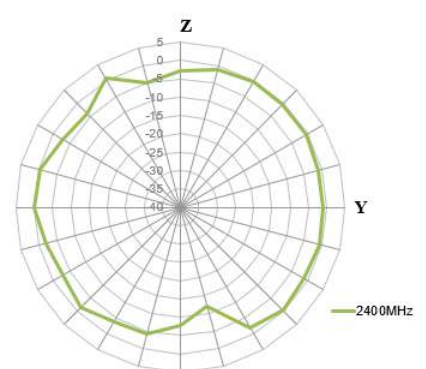
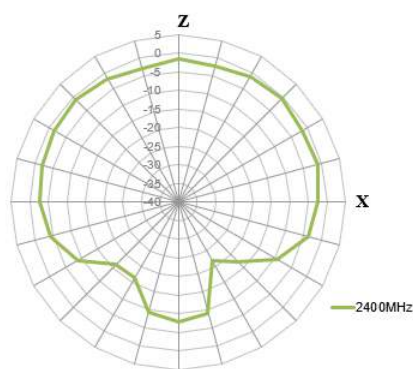
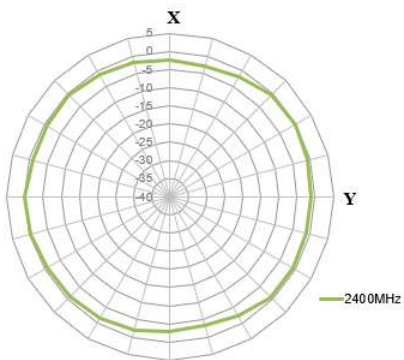
4.2 2400MHz 3D and 2D Radiation Patterns



XY Plane

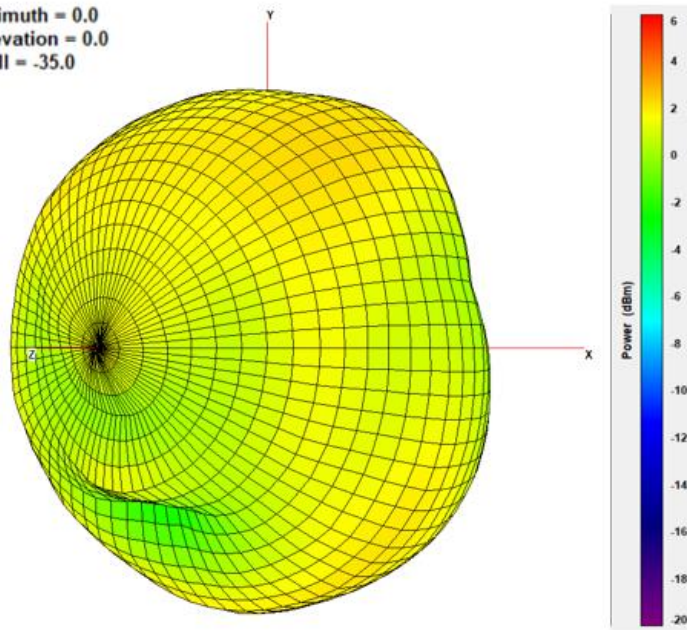
XZ Plane

YZ Plane



2450MHz

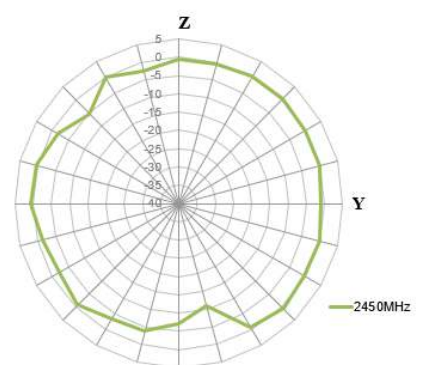
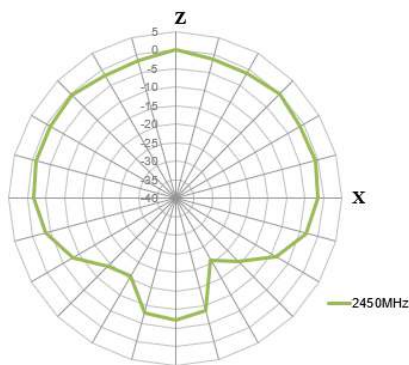
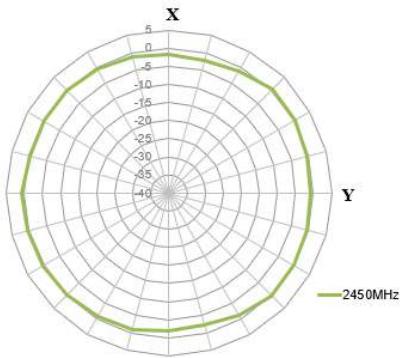
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Elevation = 0.0  
Roll = -35.0



XY Plane

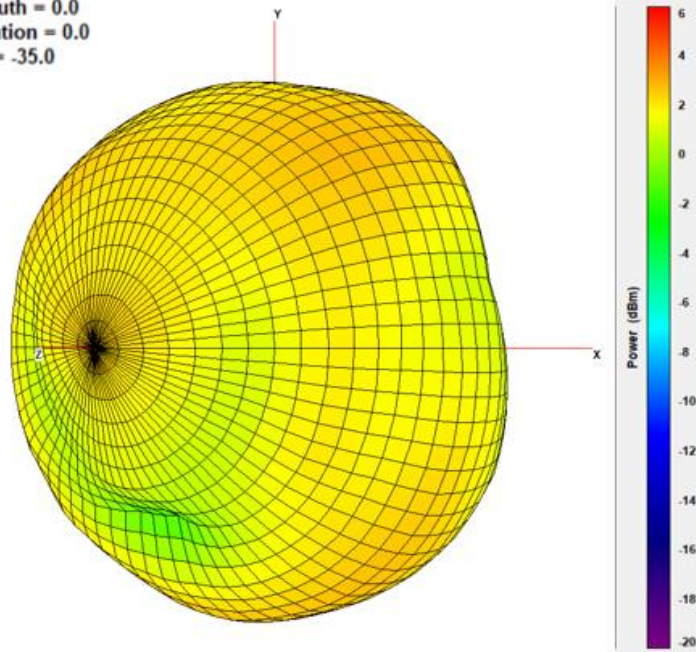
XZ Plane

YZ Plane



2500MHz

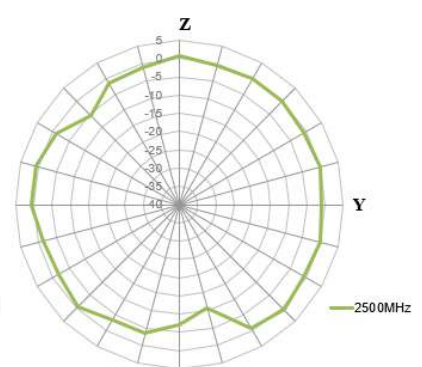
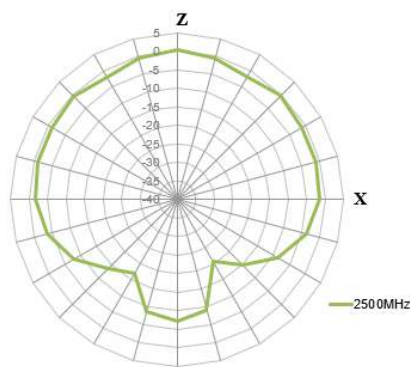
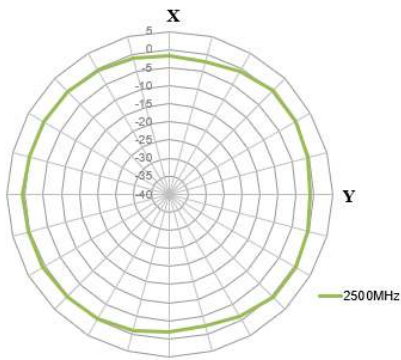
Azimuth = 0.0  
Elevation = 0.0  
Roll = -35.0





XY Plane

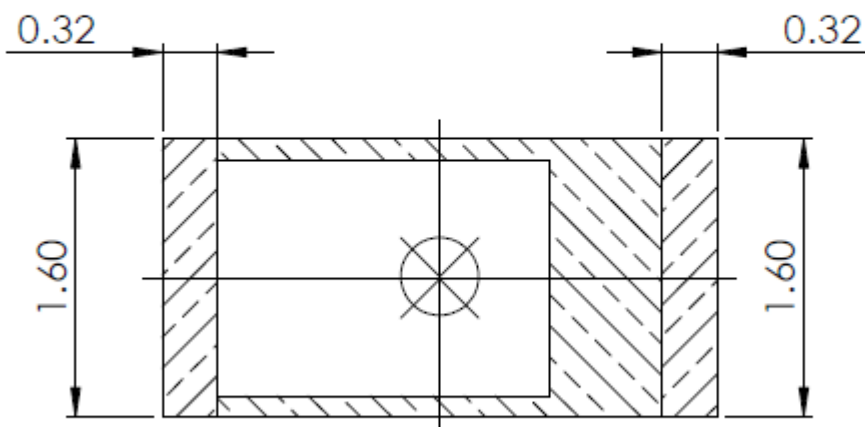
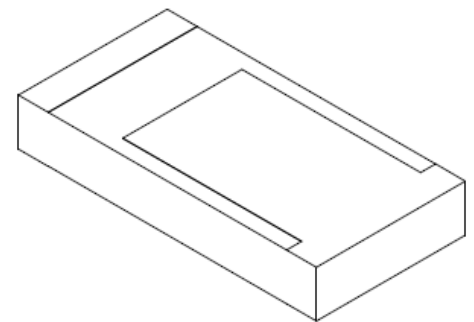
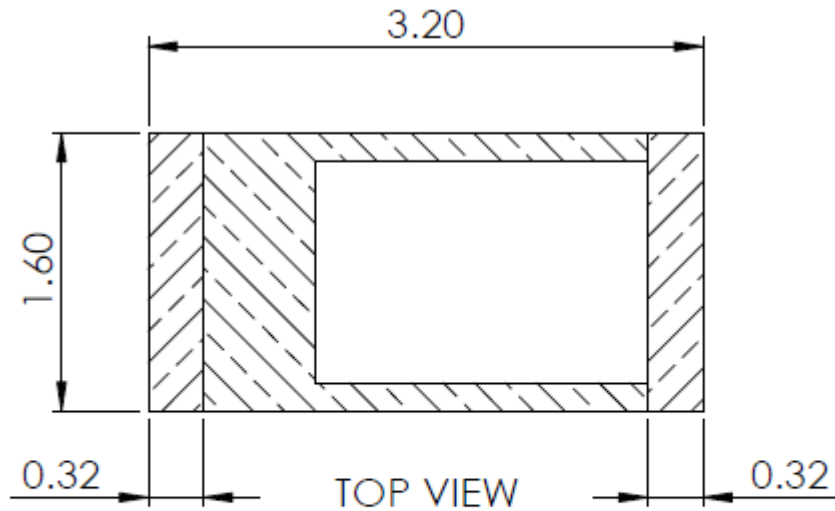
XZ Plane

YZ Plane

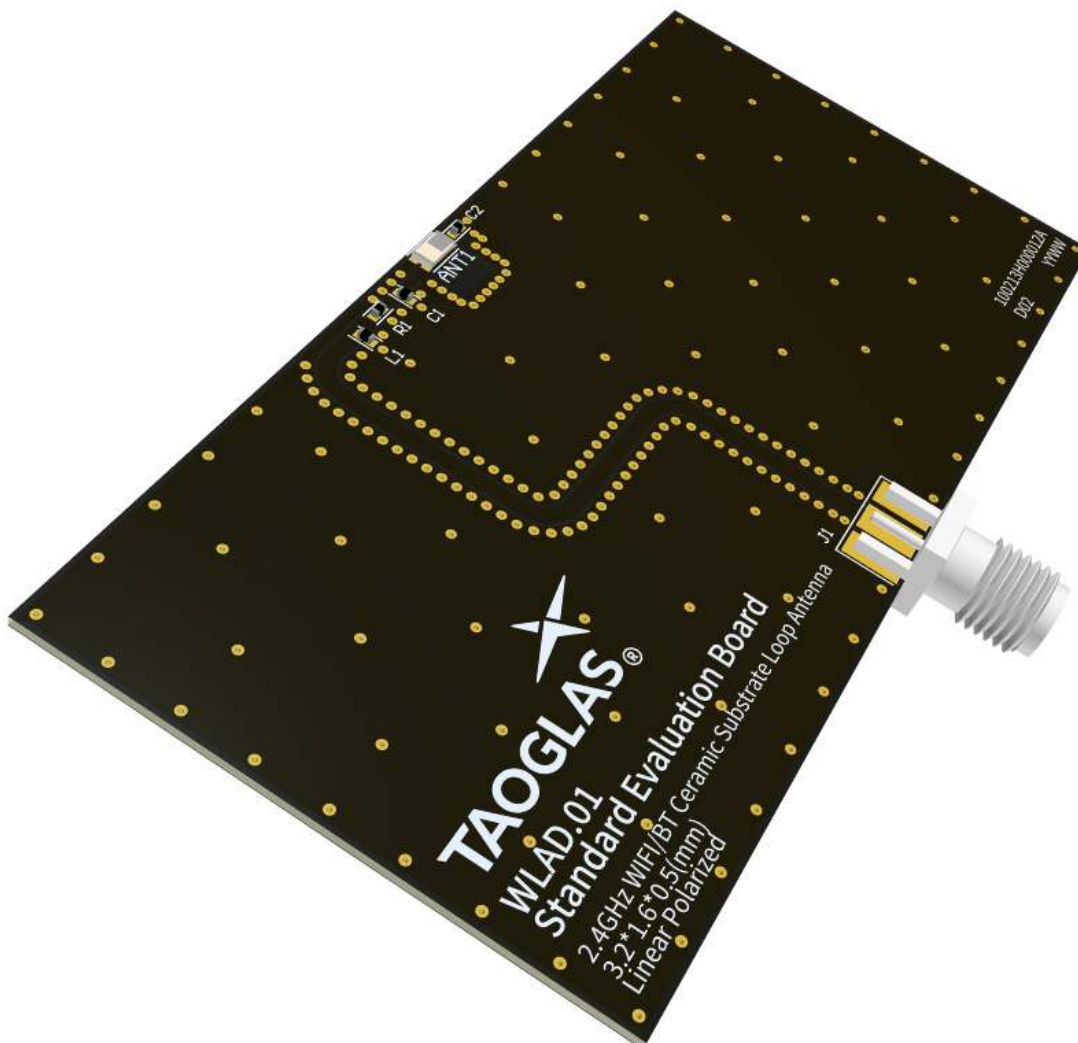
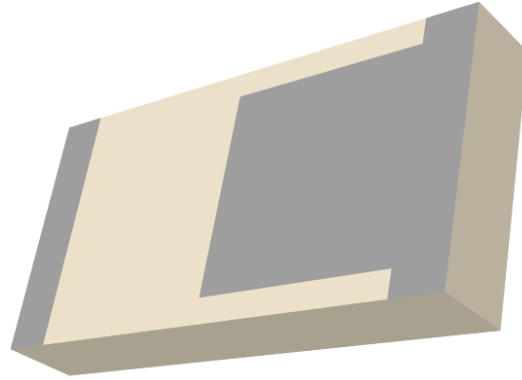


## 5. Mechanical Drawing (Units: mm)

 AG PLATING  
 SOLDERING AREA



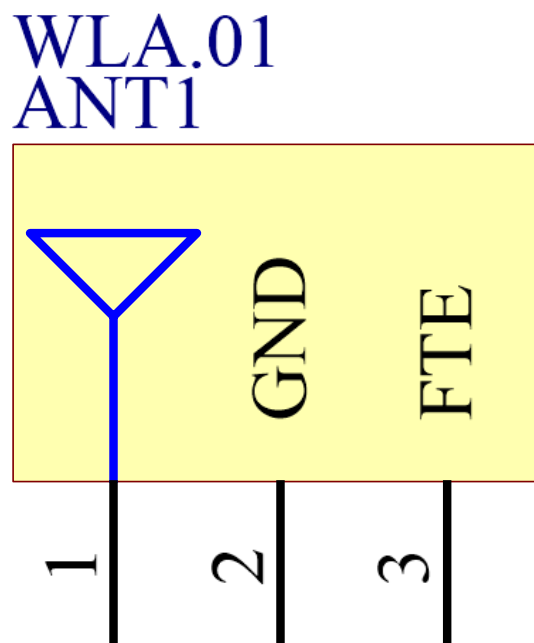
## 6. Antenna Intergration Guide



## 6.1 Schematic Symbol and Pin Definition

The circuit symbol for the antenna is shown below. The antenna has 3 pins with only three pins as functional.

Pin	Description
1	RF Feed
2	Ground
3	FTE

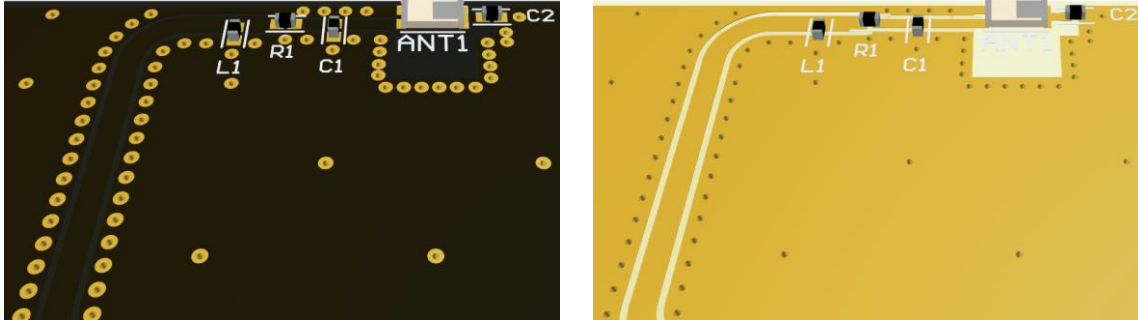


Please note you can download the design files, 3D model, 2D drawings and CST simulation files from the website here:

<https://www.taoglas.com/product/wla-01-2-42-5ghz-ceramic-loop-antenna-3-21-60-5mm-linear-polarized/>

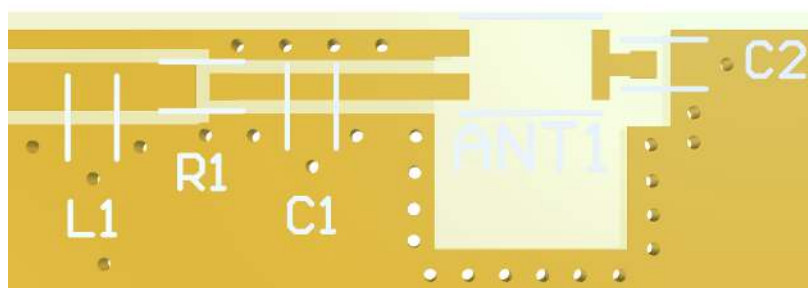
## 6.2 Antenna Integration

Whatever the size of the PCB, the antenna should ideally be placed on the PCB's longest side, to take advantage of the ground plane. Optimized matching components can be placed as shown.

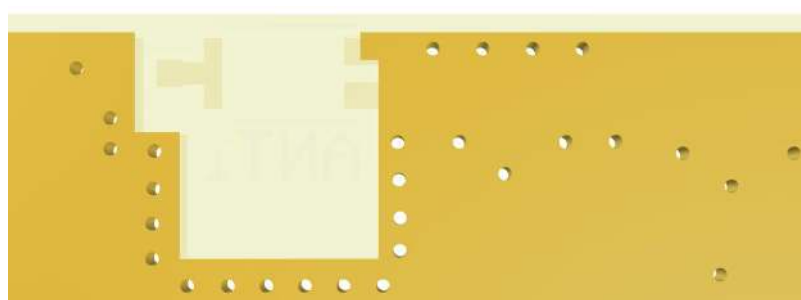


## 6.3 PCB Layout

The footprint and clearance on the PCB must meet the antenna specification. An example of the PCB layout shows the antenna footprint with clearance. Note the placement of the component C2. C2 is connected to Pin 3 of the antenna and helps with fine-tuning of the antenna. Further, note the placement of the additional components L1, R1, C1. These form a pi-matching network to help with matching the antenna in its final environment.



Topside

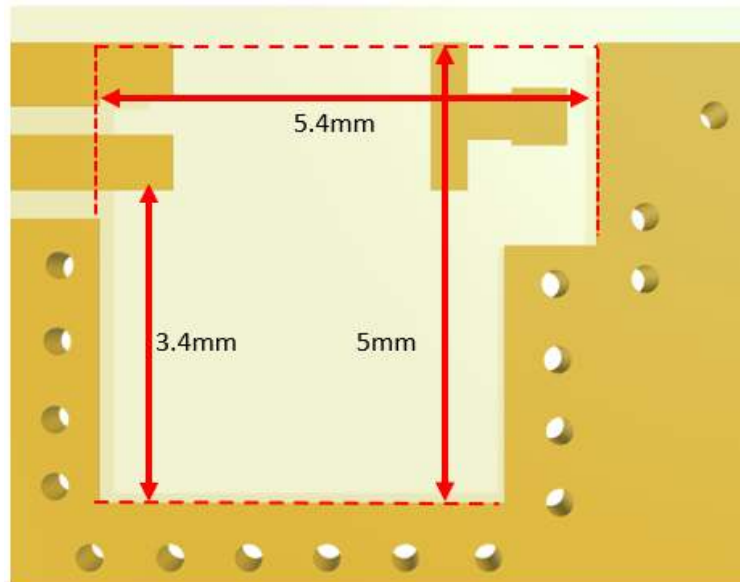


Bottom Side

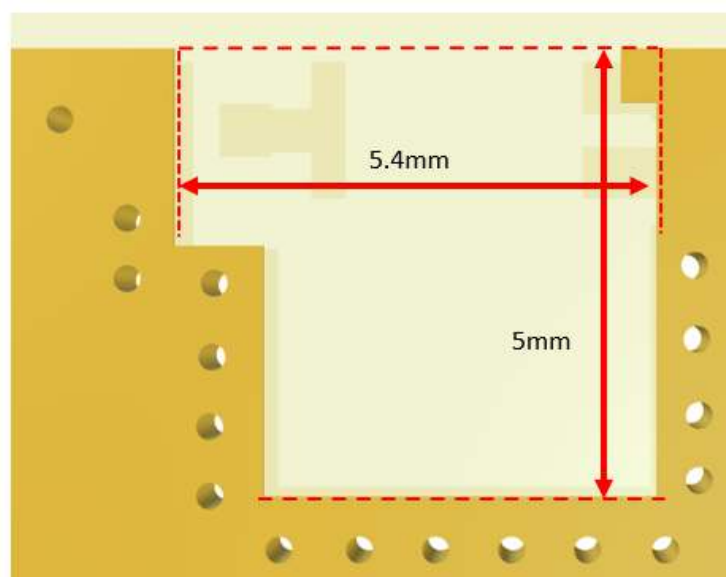


## 6.4 PCB Keep Out

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 (marked RED). The clearance area extends to 5mm in length & 5.4mm in width. This clearance area includes the bottom side and ALL internal layers on the PCB.

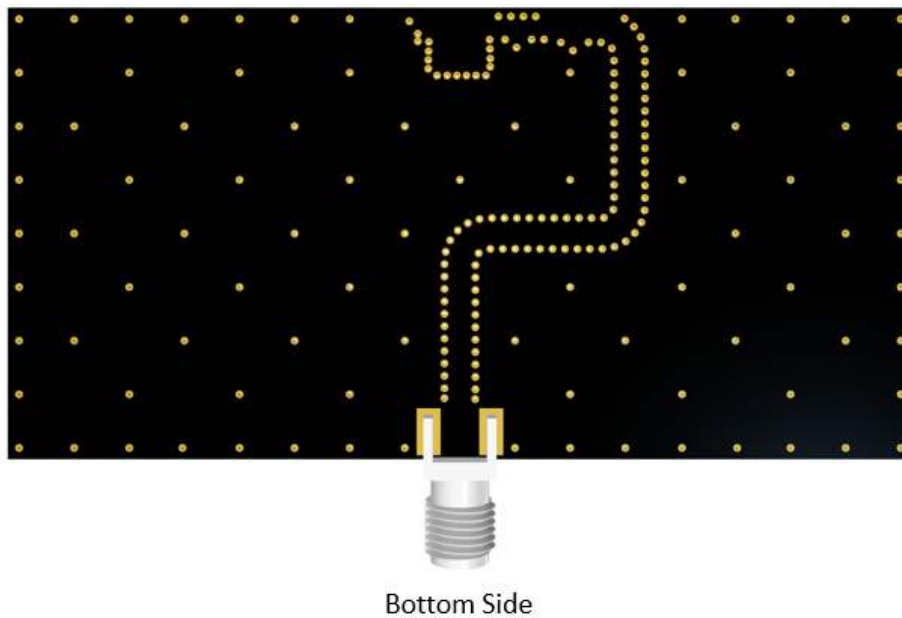
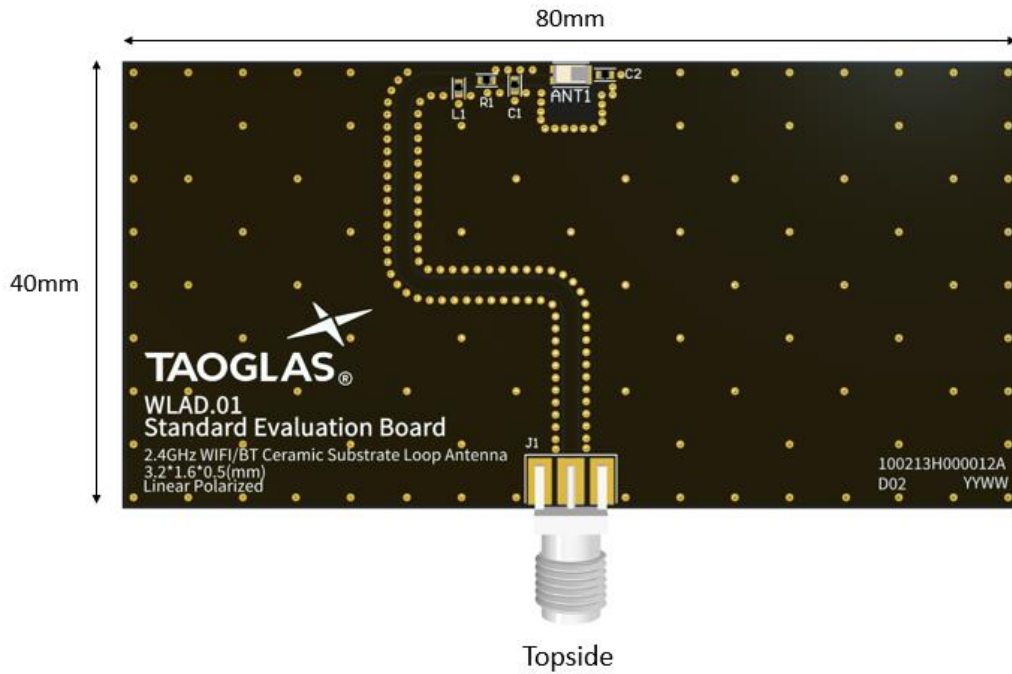


Topside

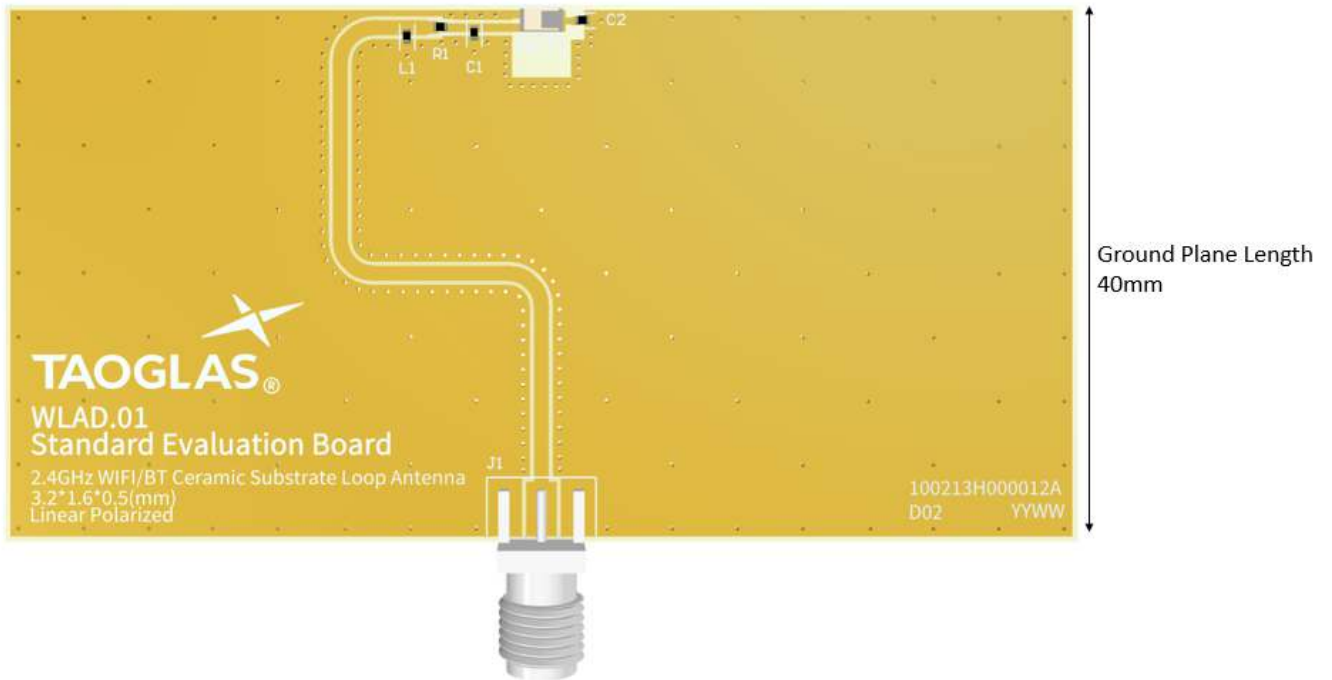


Bottom Side

6.5 Evaluation Board

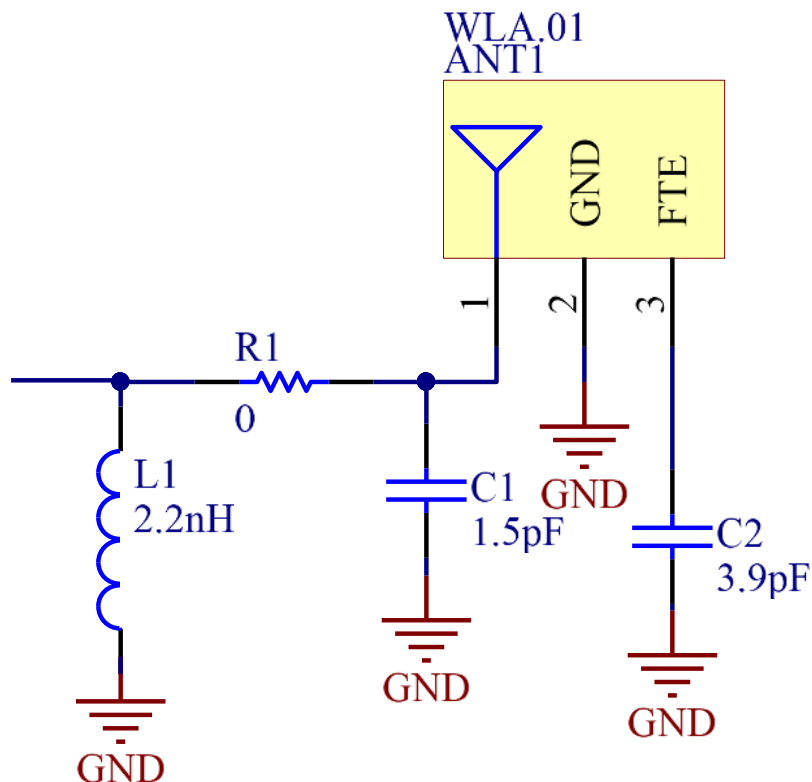


6.6 Evaluation Board Ground Plane Length



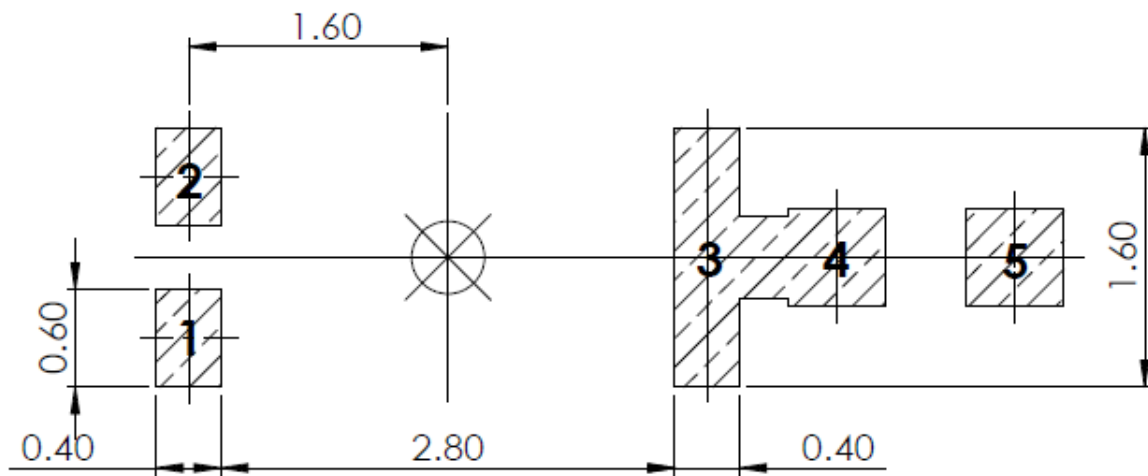
## 6.7 Evaluation Board Matching Circuit

A matching component (C1) in parallel with the WLA.01 is required for the antenna to have optimal performance on the evaluation board, located outside of the ground plane in the space specified in the above images. Additional matching components may be necessary for your device, so we recommend incorporating extra component footprints, forming a “pi” network, between the cellular module and the edge of the ground plane.



Designator	Type	Value	Manufacturer	Manufacturer Part Number
L1	Inductor	2.2nH	TDK	MLK1005S2N2ST000
R1	Resistor	0 Ohms	Yageo	RC0402FR-070RL
C1	Capacitor	1.5pF	Murata	GRM1555C1H1R5CA01D
C2	Capacitor	3.9pF	Murata	GRM1555C1H3R9CA01D

## 6.8 PCB Footprint Information

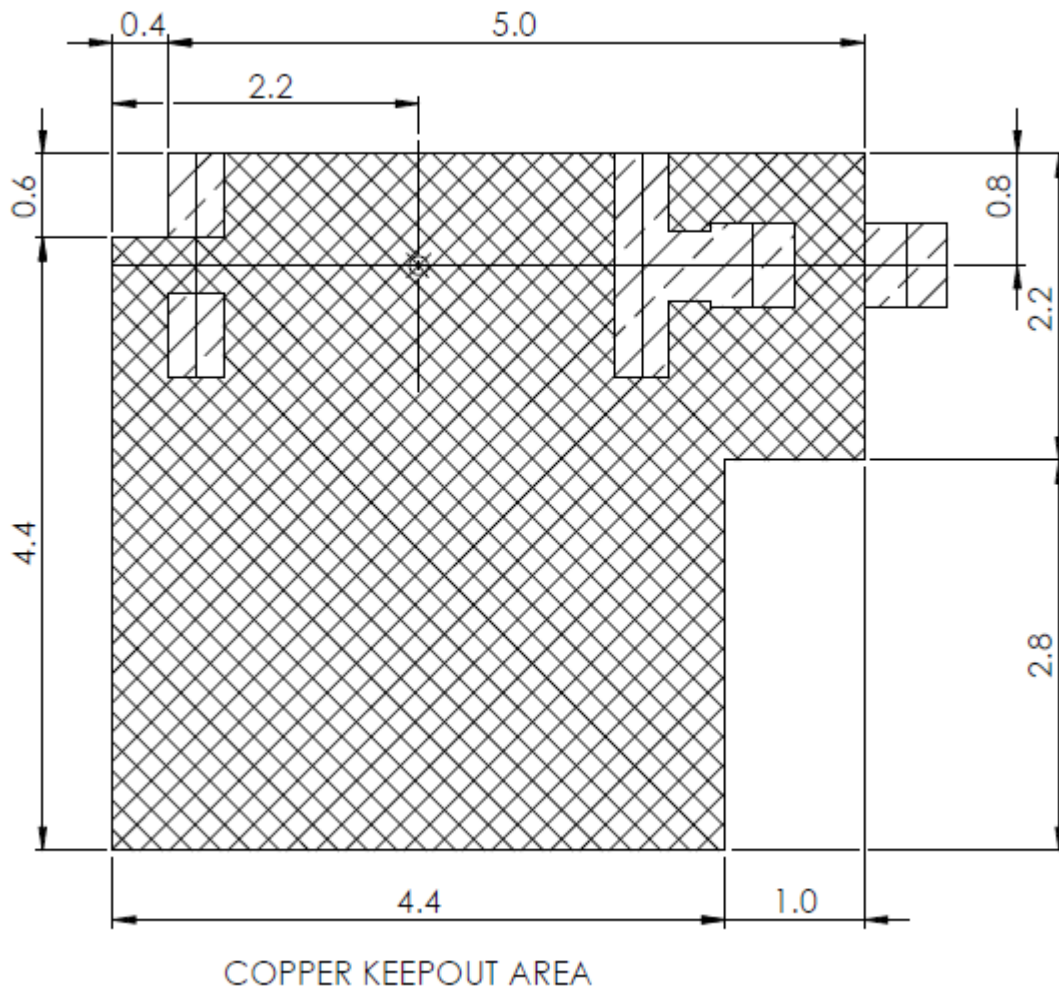


PCB FOOTPRINT

PIN:	DESCRIPTION:
1	Feed (50 ohm)
2	Ground
3	FTE
4,5	Fine Tuning Components

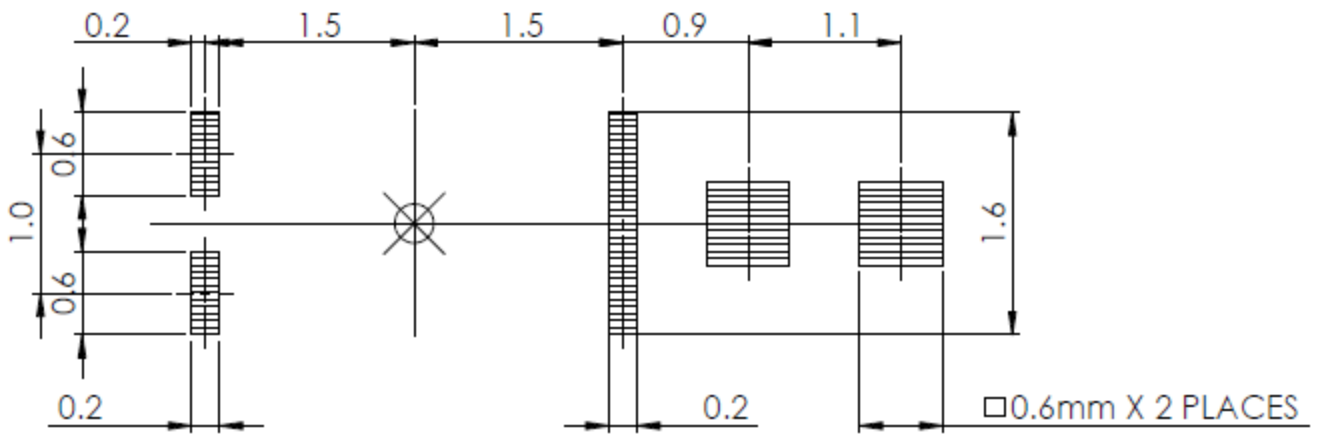
6.9 Copper Keepout Area

- NOTES:
-  - COPPER AREA
  -  - COPPER KEEPOUT AREA
  -  - PASTE AREA



6.10 Top Solder Paste

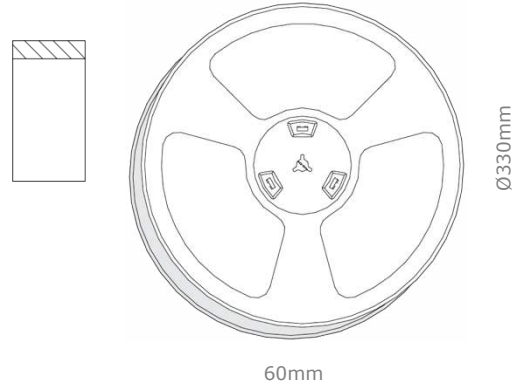
- NOTES:
-  - COPPER AREA
  -  - COPPER KEEPOUT AREA
  -  - PASTE AREA



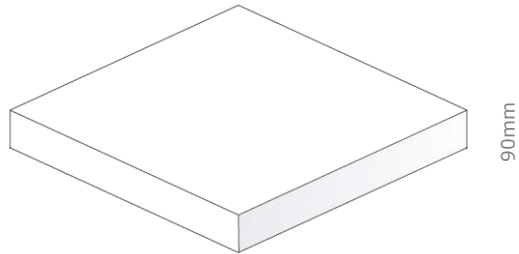
TOP SOLDER PASTE

## 7. Packaging

6000pcs WLA.01 per Tape and Reel  
 Dimensions: Ø330\*60mm  
 Weight: 3.23Kg



6000pcs WLA.01 per Carton  
 Dimensions: 340\*340\*90mm  
 Weight: 3.5Kg





Changelog for the datasheet

**SPE-11-8-146 – WLA.01**

**Revision: R (Current Version)**

Date:	2023-02-20
Changes:	Updated Electrical Specifications
Changes Made by:	Cesar Sousa

**Previous Revisions**

**Revision: Q**

Date:	2023-01-02
Changes:	Updated Specifications
Changes Made by:	Cesar Sousa

**Revision: L**

Date:	2018-09-10
Changes:	
Changes Made by:	Jack Conroy

**Revision: P**

Date:	2022-07-05
Changes:	Updated Footprint ME drawing.
Changes Made by:	Gary West

**Revision: K**

Date:	2016-12-20
Changes:	Updated drawing as per PCN-80
Changes Made by:	Andy Mahoney

**Revision: O**

Date:	2022-01-14
Changes:	Updated Antenna Integration Guide
Changes Made by:	Gary West

**Revision: J**

Date:	2016-09-28
Changes:	Amended drawing to make clearer that only certain pads should be connected to GND
Changes Made by:	Jack Conroy

**Revision: N**

Date:	2021-10-18
Changes:	Full datasheet template update, Retested antenna and populated graphs, Added MSL to spec table & Added antenna integration guide.
Changes Made by:	Gary West

**Revision: I**

Date:	2016-09-13
Changes:	
Changes Made by:	Technical Writer

**Revision: M**

Date:	2019-08-27
Changes:	Updated drawings, packaging and overall typography
Changes Made by:	Russell Meyler

**Revision: H**

Date:	2015-08-21
Changes:	Added note on gain
Changes Made by:	Aine Doyle

**Previous Revisions (Continued)**

<b>Revision: G</b>	
Date:	2014-07-23
Changes:	Updated Frequency Page 3
Changes Made by:	Aine Doyle

<b>Revision: A (Original First Release)</b>	
Date:	2011-11-30
Notes:	First Release
Author:	Technical Writer

<b>Revision: F</b>	
Date:	2014-07-14
Changes:	Added in Solder details
Changes Made by:	Aine Doyle

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<b>Revision: E</b>	
Date:	2014-04-23
Changes:	Amended 6.2 Mtaching component table
Changes Made by:	Aine Doyle

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<b>Revision: D</b>	
Date:	2014-01-31
Changes:	Amended drawings of EVB
Changes Made by:	Aine Doyle

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<b>Revision: C</b>	
Date:	2012-06-27
Changes:	
Changes Made by:	Technical Writer

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<b>Revision: B</b>	
Date:	2012-12-01
Changes:	
Changes Made by:	Technical Writer

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