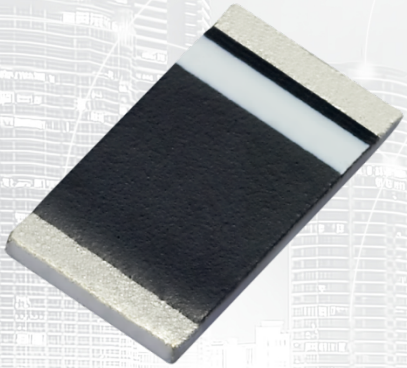
TAOGLAS®



Datasheet

Part No:
ILA.08

Description

868MHz Embedded Ceramic Loop Antenna for ISM/Lora/LPWAN/Sigfox

Features:

High Efficiency
Omnidirectional
Low profile
Tiny Size
Dims: 5.0*3.0*0.5mm
Surface-Mount
RoHS & REACH Compliant

1. Introduction

The ILA.08 is an 868MHz ISM band embedded ceramic loop antenna from Taoglas with high efficiency of 45% at the center of the band. It is the perfect solution for the growing number of devices using the 868MHz band, such as Sigfox or LoRa applications in Europe, for smart metering applications.

This antenna works the best when placed at the center of the board edge. The ILA.08 antenna, at 5*3*0.5 mm, is low profile and would be suitable for devices with space constraints. The ILA.08 is delivered on tape and reel and now allows M2M customers to use an omnidirectional SMT antenna. The omnidirectional radiation characteristics allow for excellent performance regardless of device orientation. This is especially useful for devices that are not fixed in one particular spot during use. When there is little PCB space available for antenna placement, but high performance is required, the ILA.08 is the ideal choice.

The antenna is manufactured in a TS16949 first tier automotive approved facility and has passed the most stringent reliability testing. Since it is SMD, it is much easier to integrate and more reliable in high volume production compared to helical antennas which are cumbersome to install and subject to variability due to the need for manual assembly.

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.

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.

Typical Applications Include:
Sigfox, Lora, LPWAN, Automated Meter Reading (AMR), Radio Frequency Identification (RFID), Remote Monitoring, Healthcare, Sensing, Alarm Systems, Handheld Devices

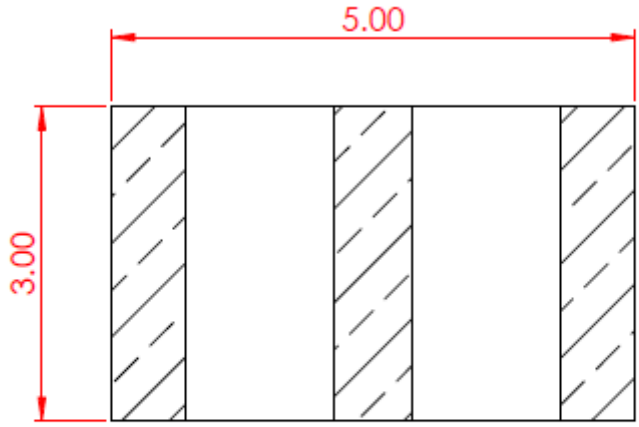
2. Specification

Electrical								
Band	Frequency (MHz)	Efficiency (%)	Average Gain (dB)	Peak Gain (dBi)	Impedance	Polarization	Radiation Pattern	Max. input power
868MHz	862-874	36.0	-4.43	-0.46	50 Ω	Linear	Omni	10W

Mechanical	
Dimensions	5.0 x 3.0 x 0.5mm
Ground plane	80 x 40mm
Weight	0.02g

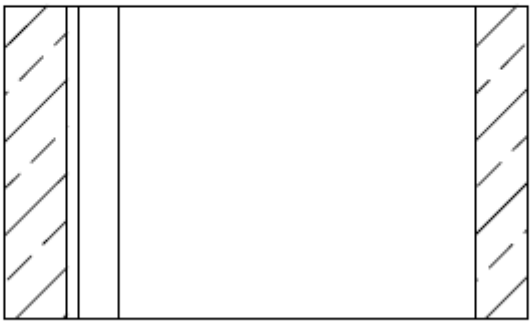
Environmental	
Temperature Range	-40°C to 85°C
Storage Temperature	-40°C to 85°C
Humidity	20% to 70%
Moisture Sensitivity Level	3 (168 Hours)

3. Mechanical Drawing



TOP VIEW

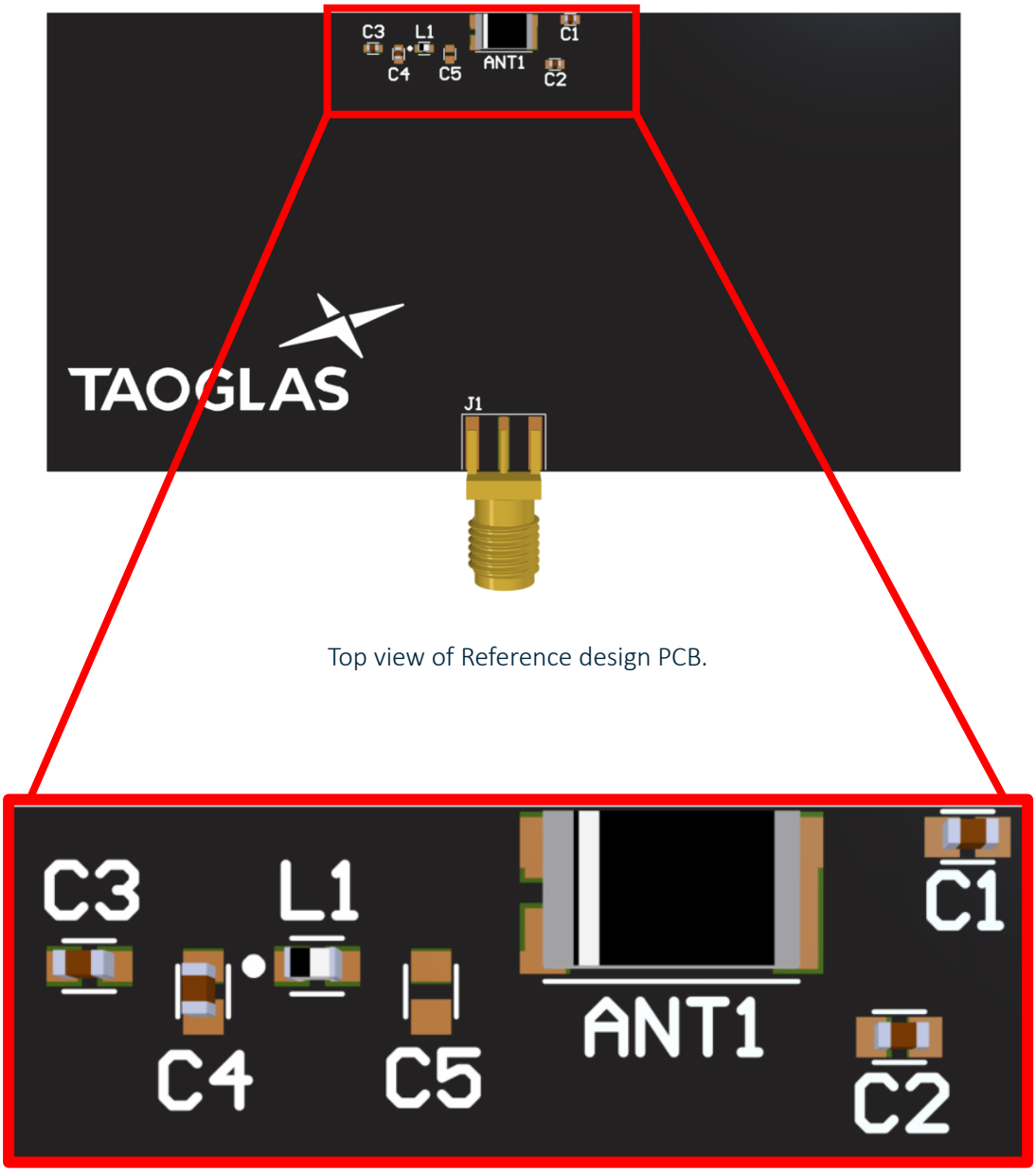
FRONT VIEW



BOTTOM VIEW

4. Antenna Integration Guide

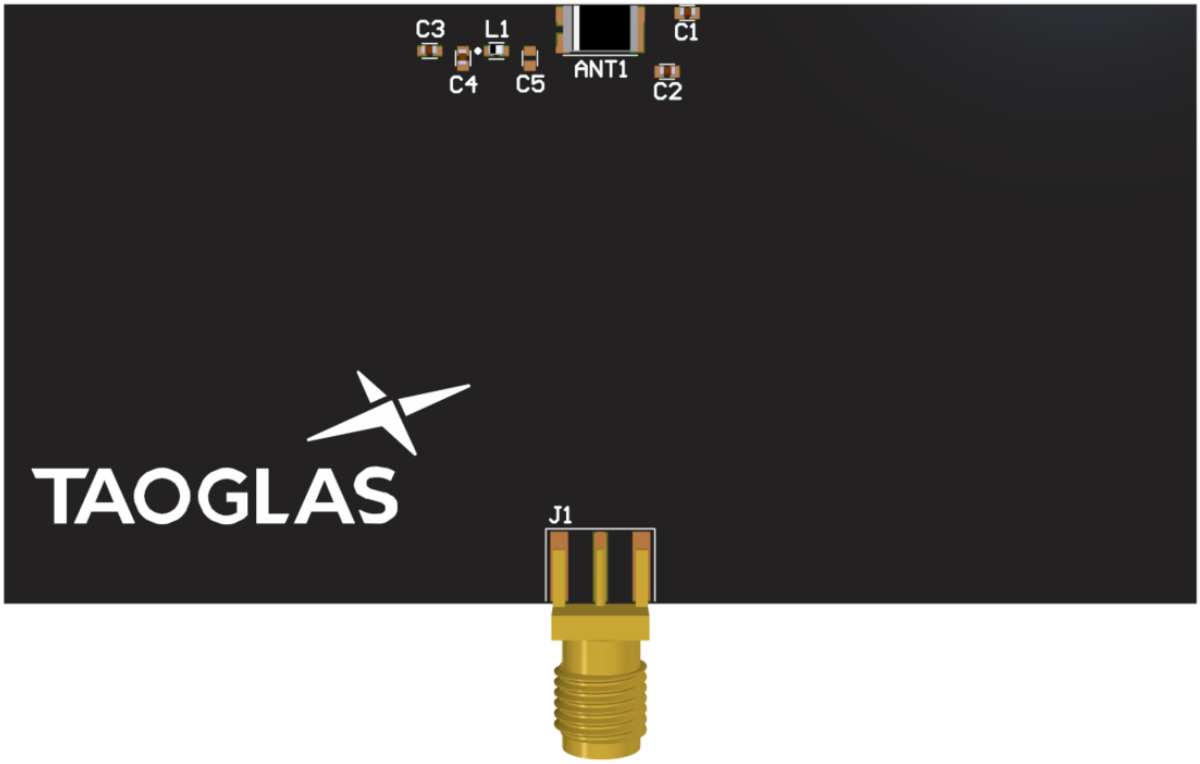
The following is an example on how to integrate the ILA.08 into a design. This antenna has 4 pins, where one pin is used for the RF Feed. Taoglas recommends using a minimum of 80x40mm ground plane (PCB) to ensure optimal performance.
The antenna should be placed mid-point on the long side of the PCB to take advantage of the ground plane on each side of the antenna.



Top view of Reference design PCB.

Please find the Integration files in Altium, 2D formats and the 3D model for the ILA.08 here:
https://www.taoglas.com/product/530-5-ila-08-868mhz-embedded-ceramic-loop-antenna-ismloralpwansigfox/

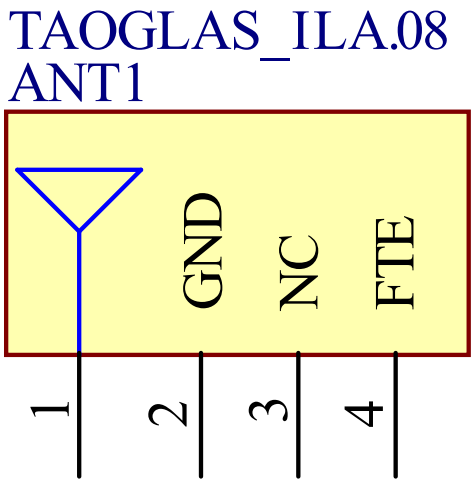
4.1 Schematic Symbol and Pin Definitions



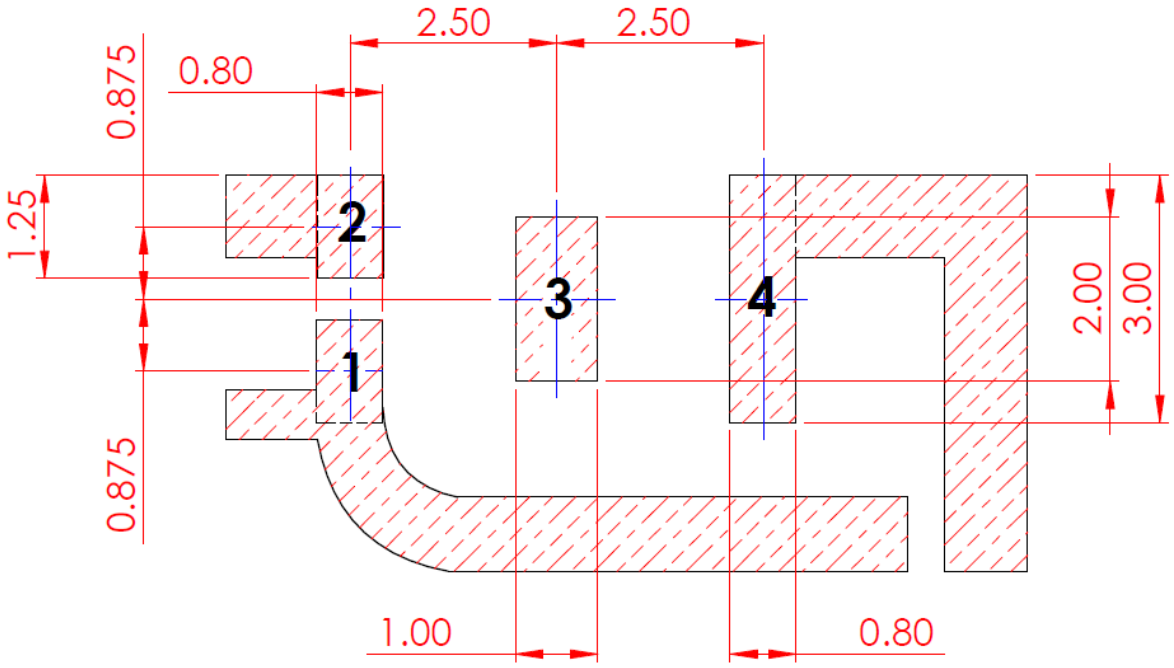
Above is a 3D model of the ILA.08 on a Reference design PCB.

The circuit symbol for the ILA.08 is shown below. The antenna has 4 pins as indicated below.

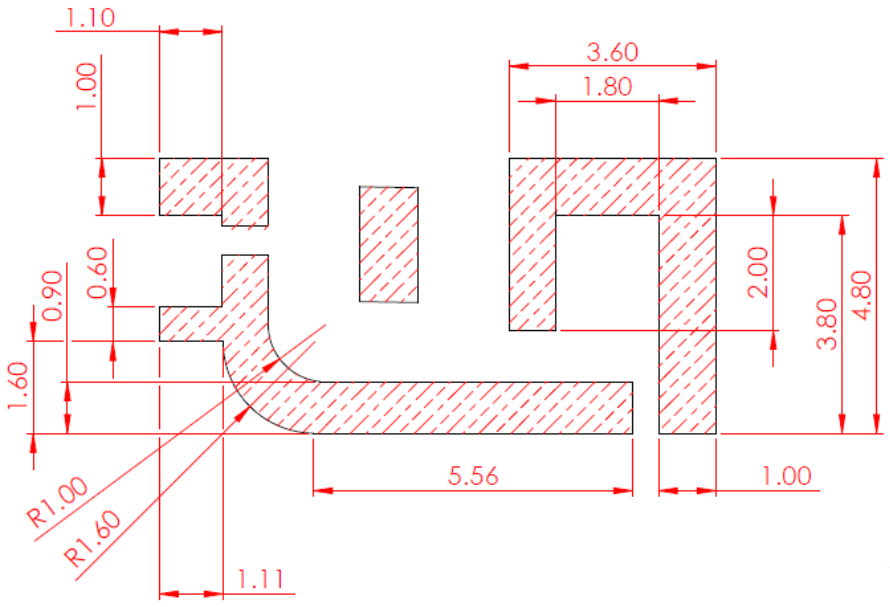
Pin	Description
1	RF Feed
2	Ground
3	Mechanical, No Connection
4	Fine Tuning Element



4.2 Copper Footprint

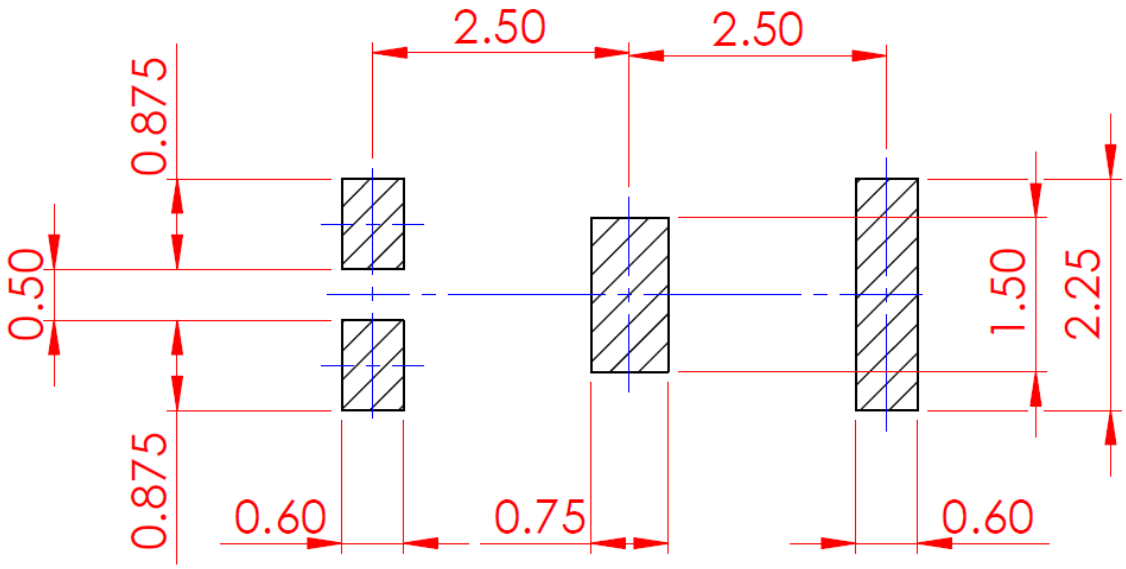


Pin	Description
1	RF Feed
2	Ground
3	Mechanical, No Connection
4	Fine Tuning Element

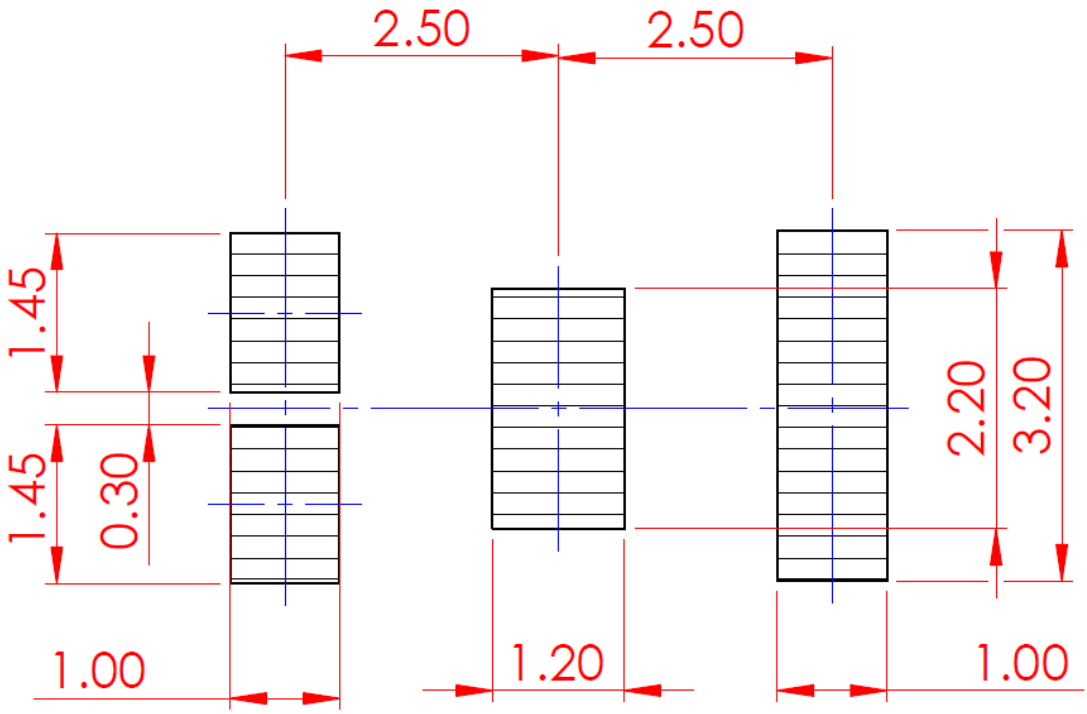


*Detailed trace dimensions.

4.3 Solder Paste

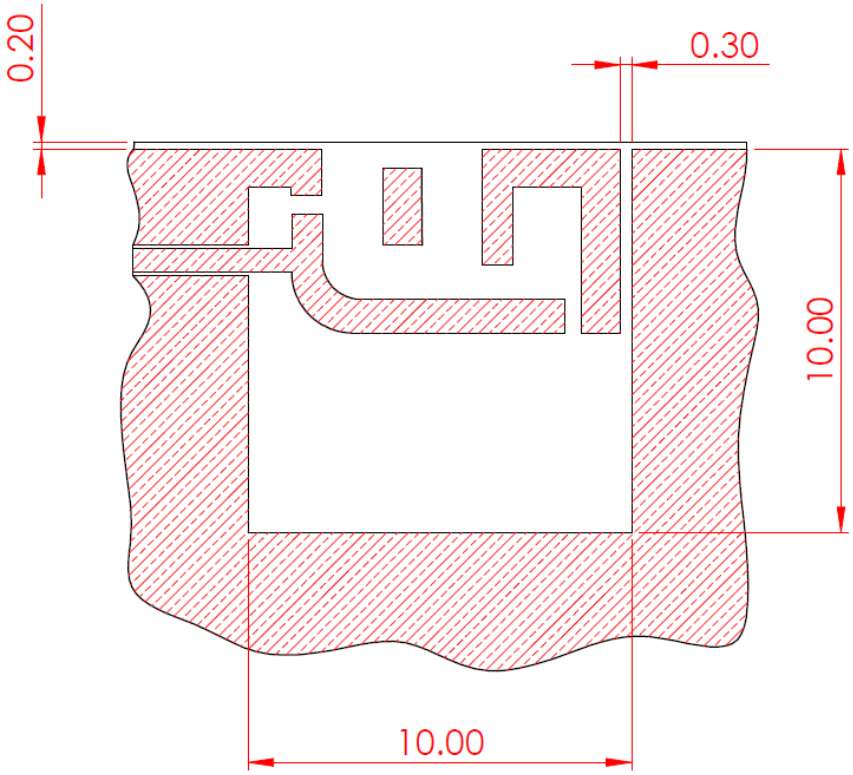


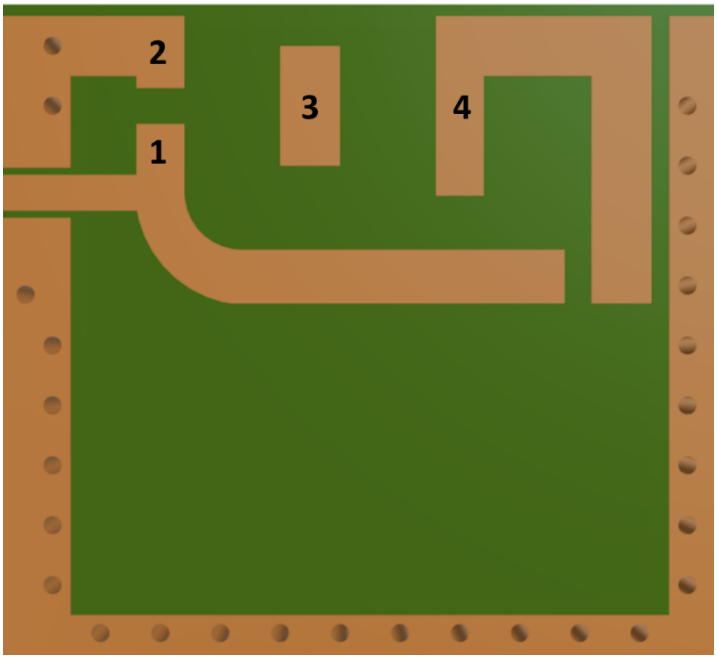
4.4 Solder Mask



4.5 Copper Keep out

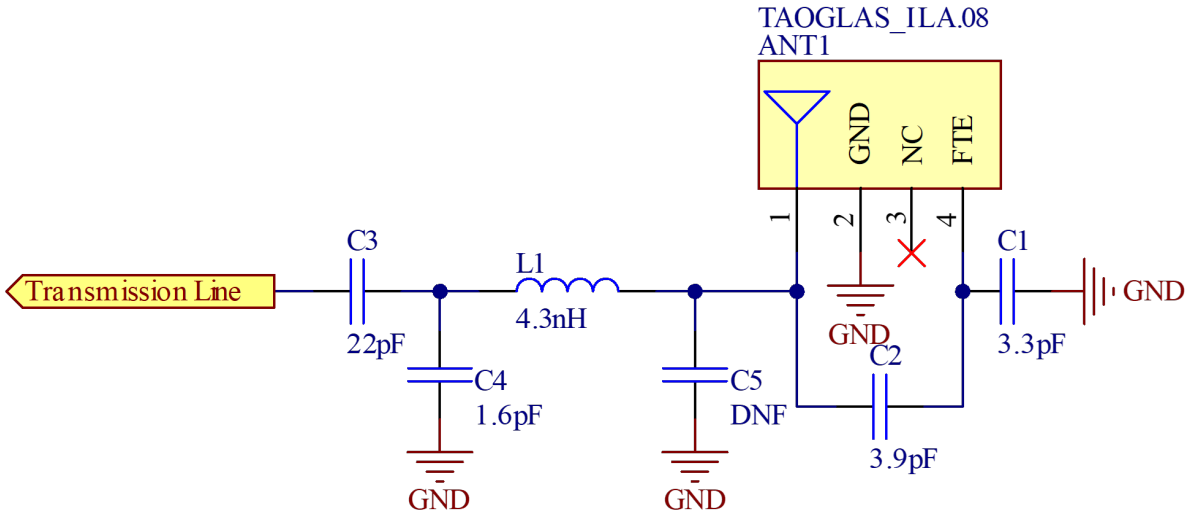
The footprint and clearance on the PCB must comply with the antenna's specification. The PCB layout shown in the diagrams below demonstrates the ILA.08 clearance area. The copper keep out area applies to all layers on the PCB.
The copper clearance area extends to 10mm in length and width around the antenna. The PCB edge clearance should be a minimum of 0.1mm, example below is 0.2mm.





4.6 Schematic Layout

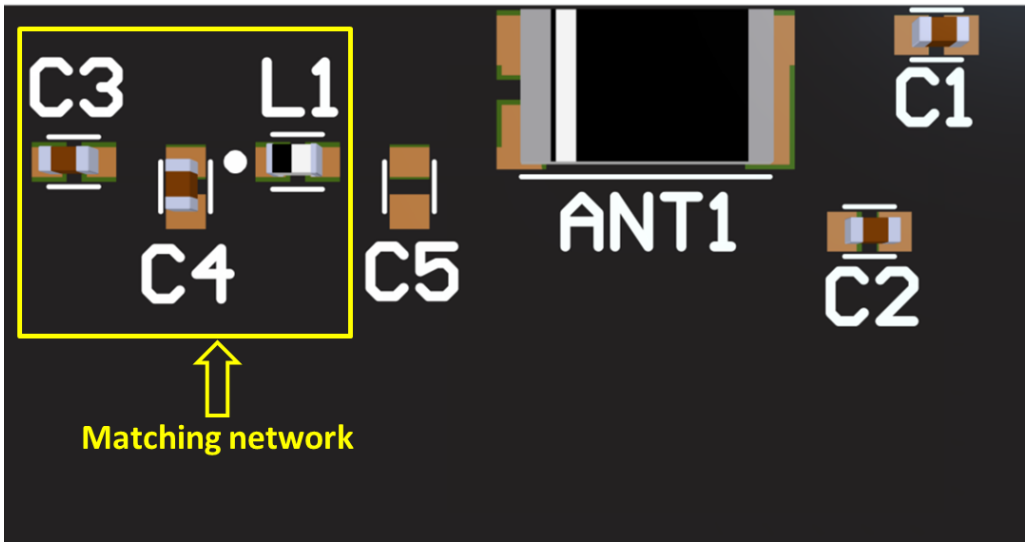
Matching components with the ILA.08 are required for the antenna to have optimal performance in the spaces specified in the schematic below. Additional matching components may be necessary for your device, Taoglas recommends incorporating extra component footprints, forming a matching network, for the ILA.08.



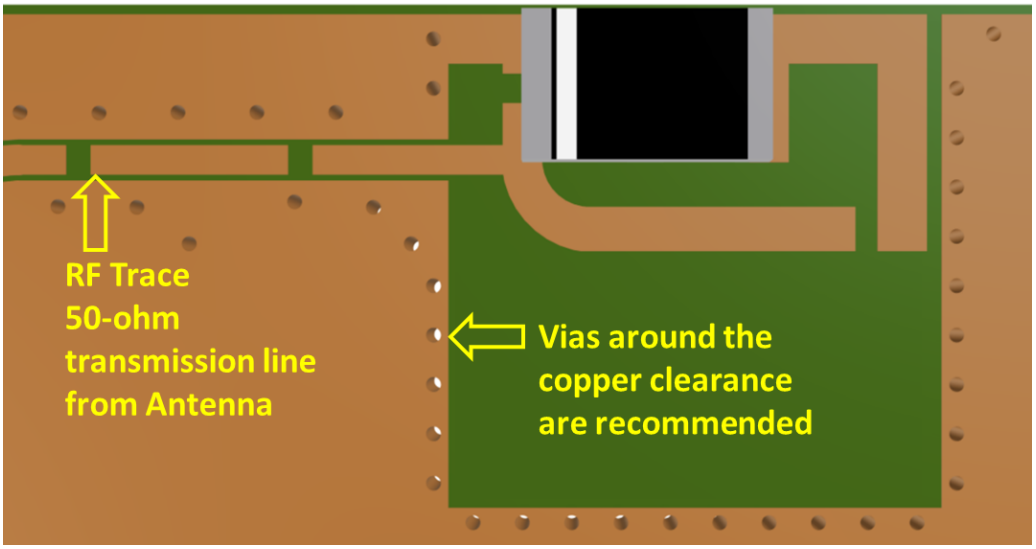
Designator	Type	Value	Manufacturer	Manufacturer Part Number
C1	Capacitor	3.3pF	Murata	GRM1555C1H3R3CA01D
C2	Capacitor	3.9pF	Murata	GRM1555C1H3R9CA01D
C3	Capacitor	22pF	Murata	GRM1555C1H220JA01D
C4	Capacitor	1.6pF	Murata	GJM1555C1H1R6WB01D
C5	-	Not Fitted	-	-
L1	Inductor	4.3nH	TDK	MHQ1005P4N3CT000

4.7 Antenna Integration

The ILA.08 should be placed mid-point on the long side of the PCB to take advantage of the ground plane extending from each side of the antenna.
The RF trace must maintain a 50 Ohm transmission line. A Matching Network is recommended for the RF transmission line, the values and components for the matching circuit will depend on the tuning needed.
Ground vias should be placed around the transmission line and the copper clearance area.



ILA.08 antenna mounted on a Reference Design PCB, showing “Pi” matching network.

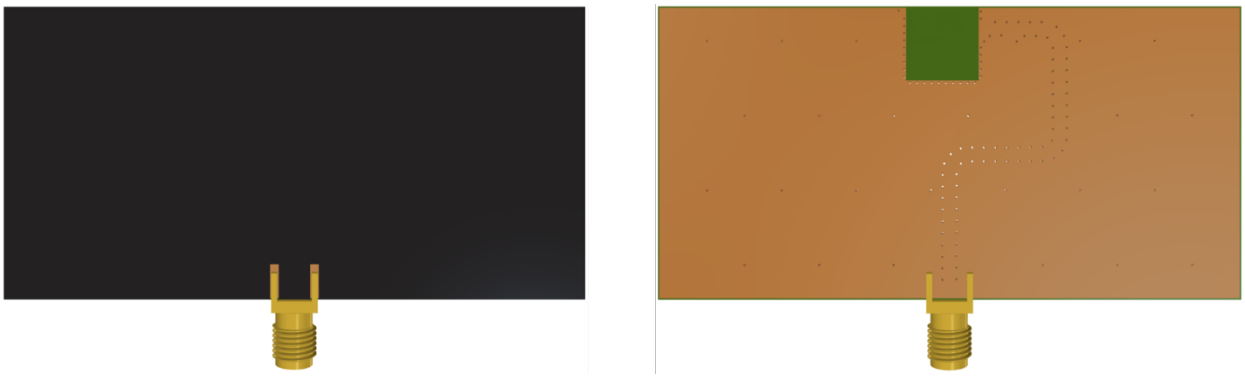


ILA.08 antenna mounted on a Reference Design PCB, showing transmission line and integration notes.

4.8 Final Integration

The top side image shown below highlights the antenna transmission line. Taoglas recommends using a minimum of 80x40mm ground plane (PCB) to ensure optimal performance.

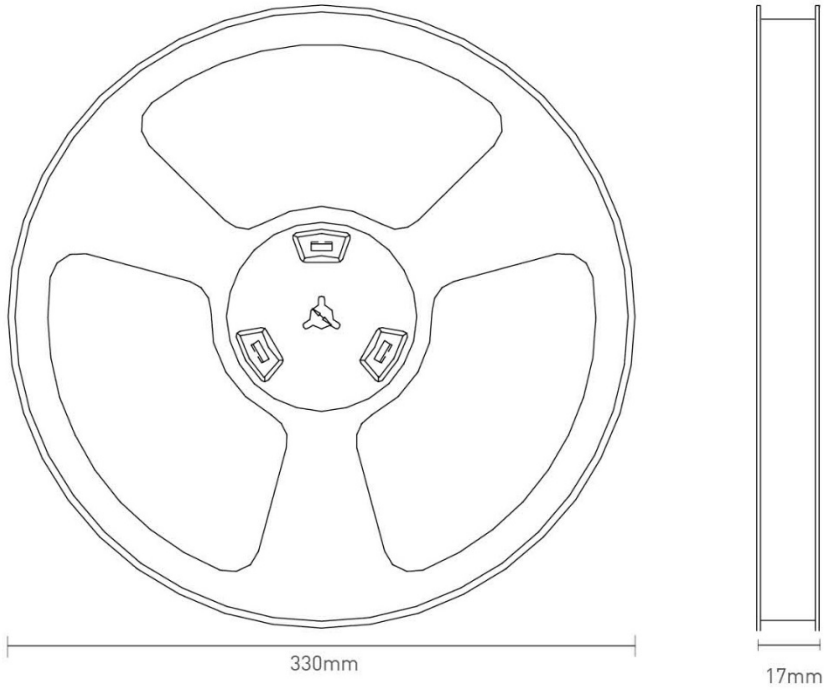
Top Side (ILA.08 placement on 80x40mm Reference Design PCB)



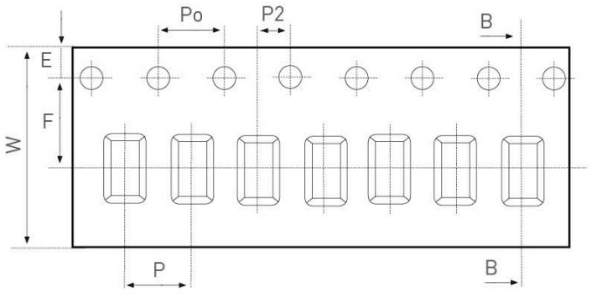
Bottom Side (80x40mm Reference Design PCB)

5. Packaging

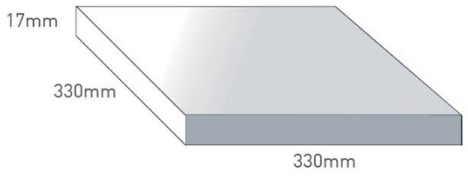
6000 pcs ILA.08 per tape & reel
Dimensions - 330*330*17mm
Weight - 680g



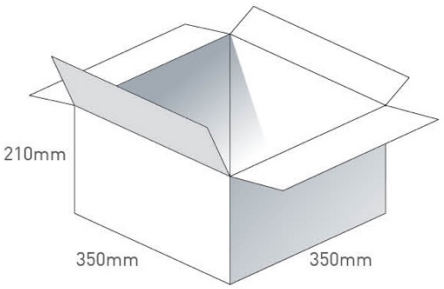
Tape Dimensions (unit: mm)		
Feature	Spec	Tolerances
W	12.00	±0.30
P	4.00	±0.10
E	1.75	±0.10
F	5.50	±0.10
P2	2.00	±0.10
D	1.50	+0.10 -0.00
Po	4.00	±0.10
10Po	40.00	±0.10



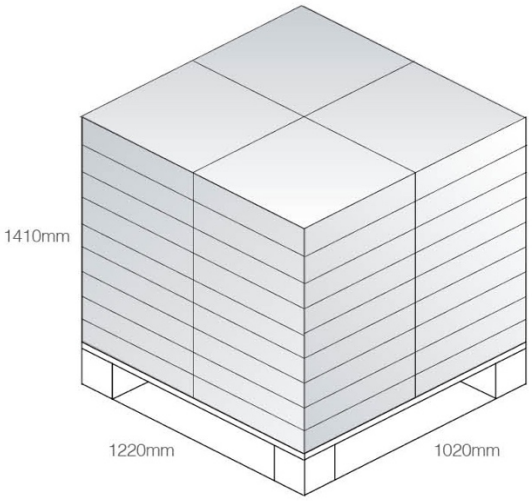
6000 pcs ILA.08
1 reel in small inner box
Dimensions - 330*330*17
Weight - 680g



9 boxes / 54000 pcs in one carton
Carton Dimensions - 350*350*210mm
Weight - 6.69Kg

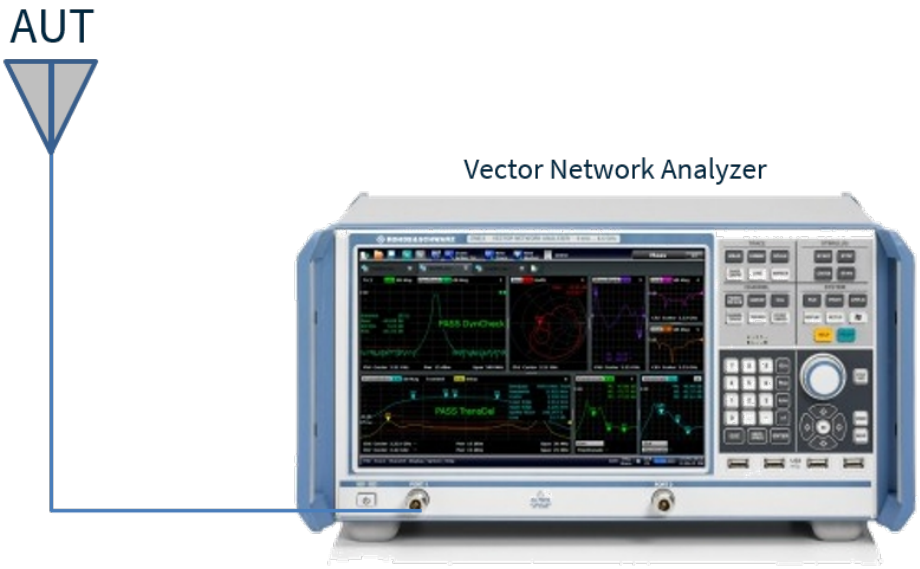


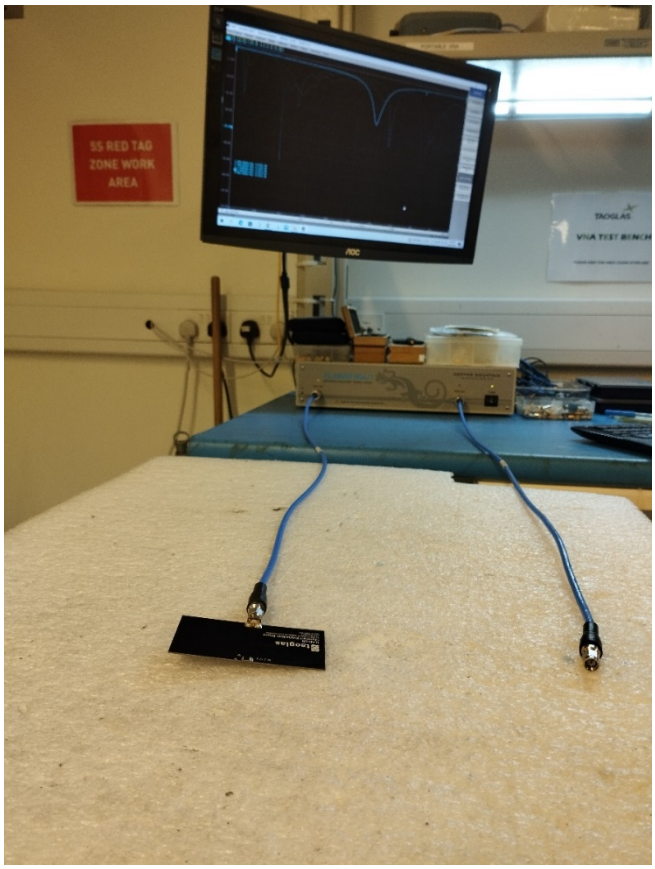
Pallet Dimensions 1220*1020*1410mm
36 Cartons per Pallet
4 Cartons per layer
9 Layers



6. Antenna Characteristics

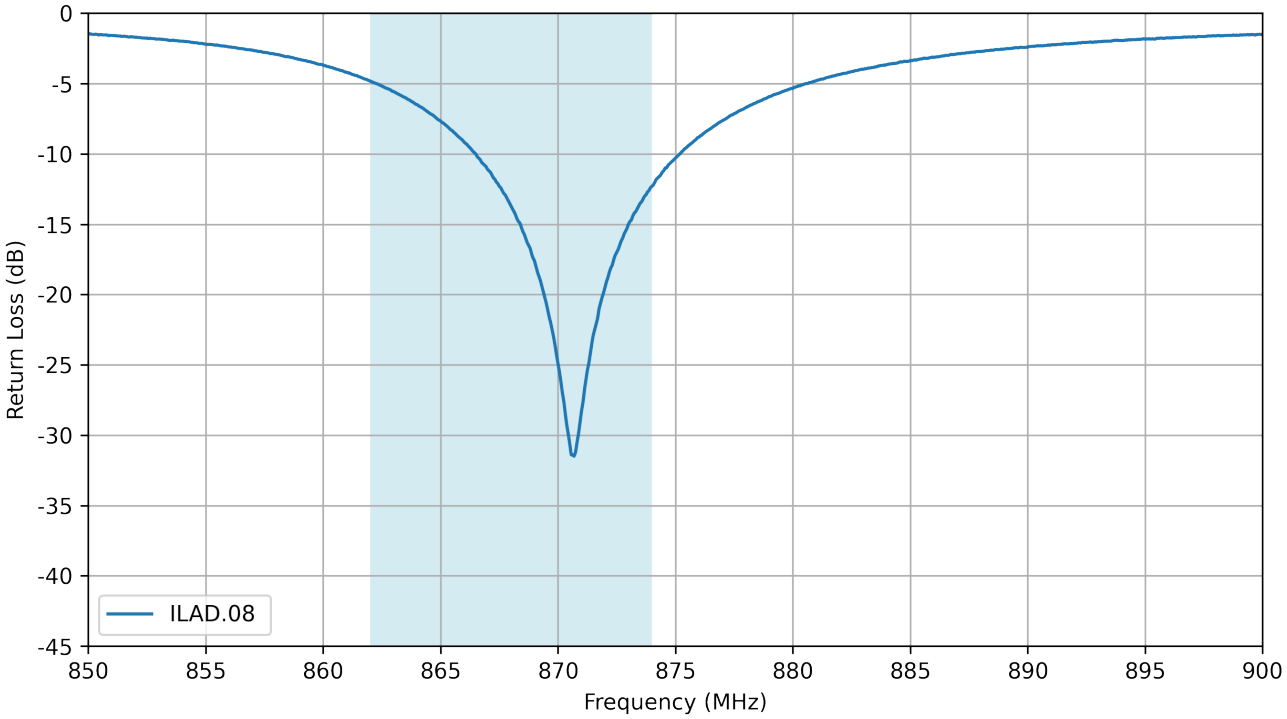
6.1 Test Setup



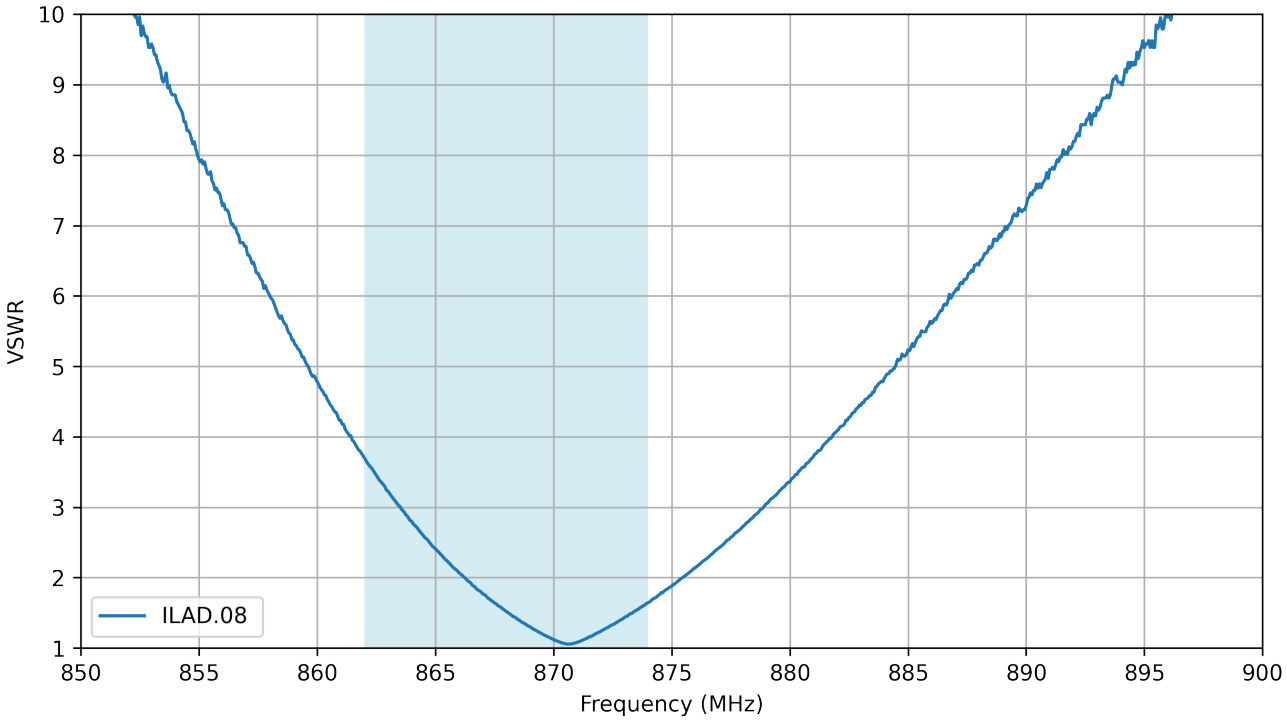


VNA Test Set-up

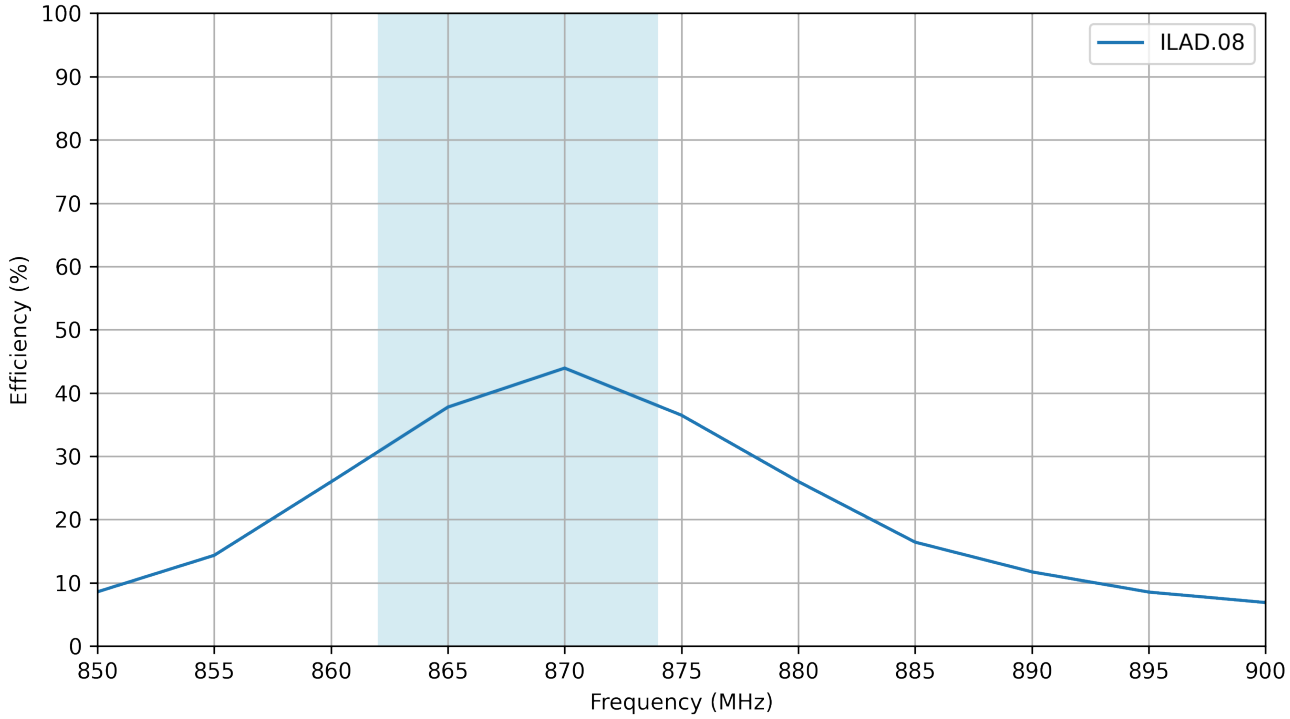
6.2 Return Loss



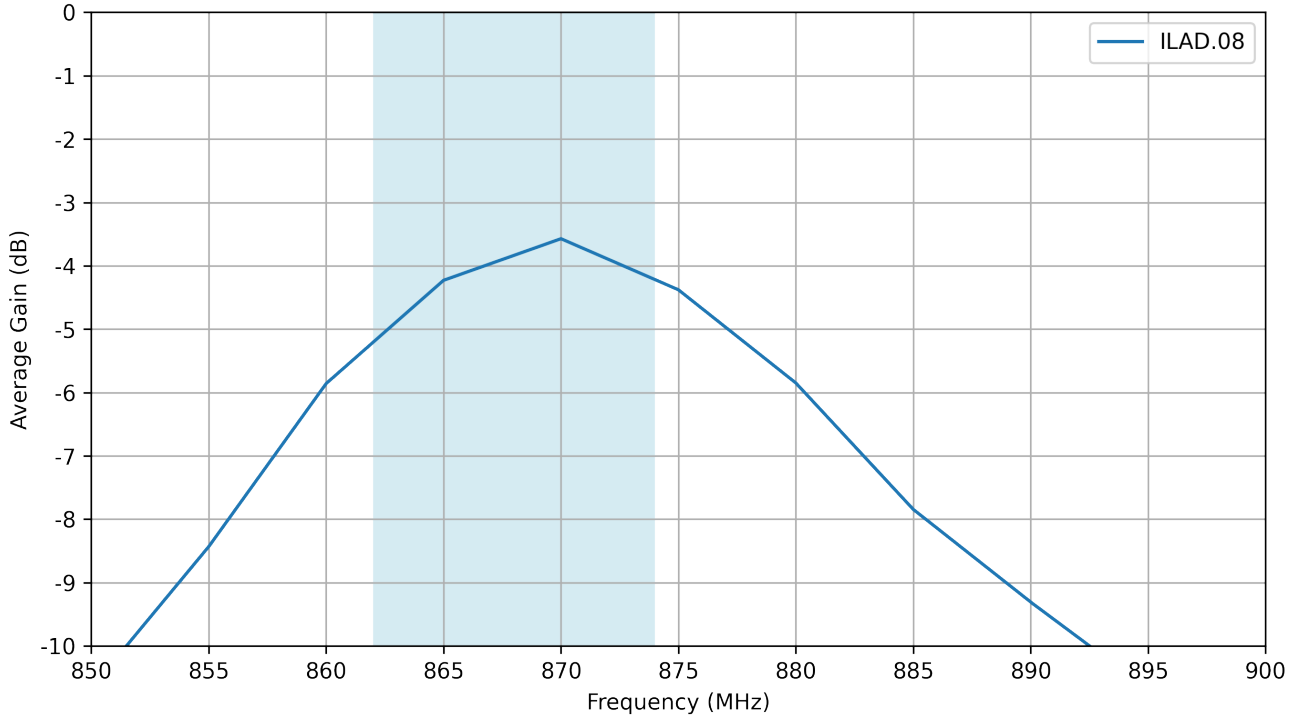
6.3 VSWR



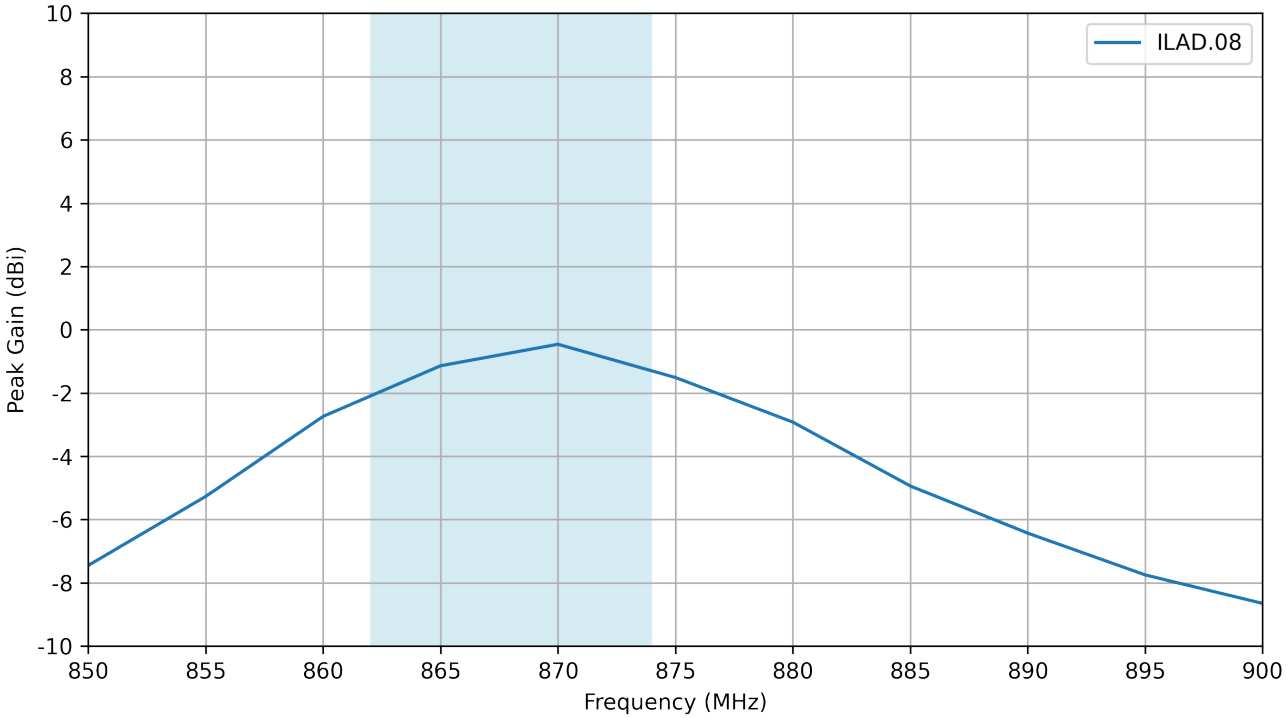
6.4 Efficiency



6.5 Average Gain

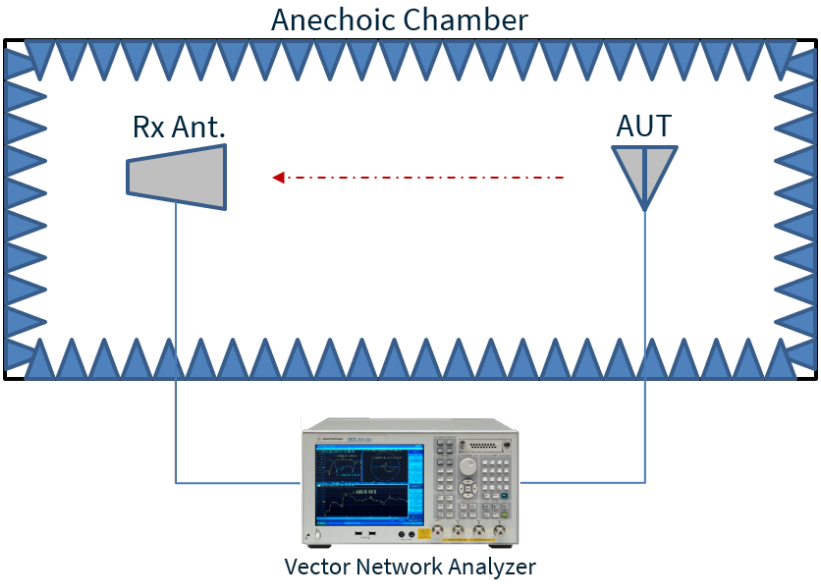


6.6 Peak Gain


ILAD.08
Peak Gain (dBi)
10
8
6
4
2
0
-2
-4
-6
-8
-10
850
855
860
865
870
875
880
885
890
895
900
Frequency (MHz)

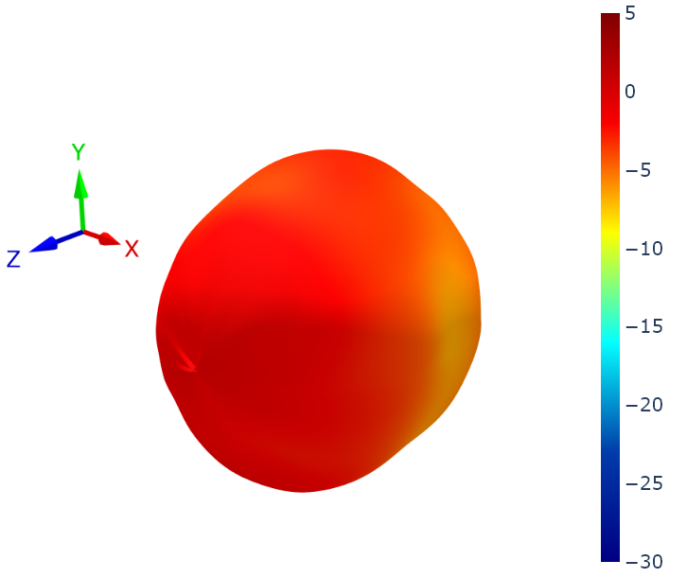
7. Radiation Patterns

7.1 Test Setup

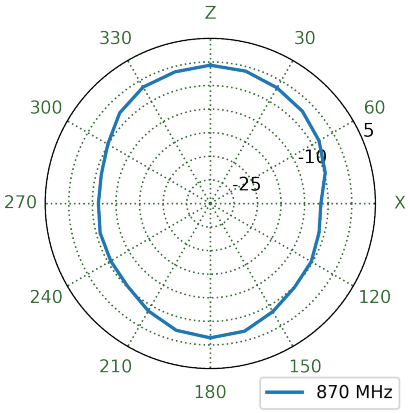


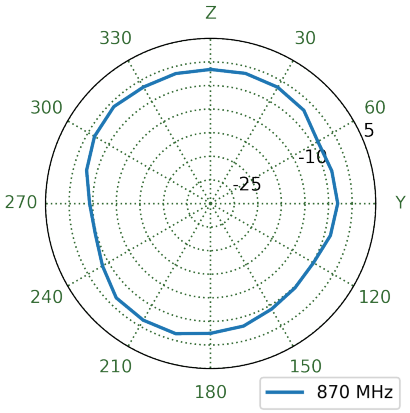
Chamber Test Set-up

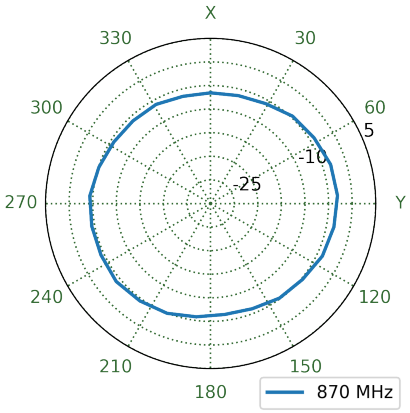
7.2 Patterns at 868 MHz



XZ Plane	YZ Plane	XY Plane







Changelog for the datasheet

SPE-16-8-050 – ILA.08

Revision: E (Current Version)	
Date:	2024-07-18
Changes:	Full datasheet update including datasheet flow.
Changes Made by:	Gary West

Previous Revisions

Revision: D	
Date:	2023-09-06
Changes:	Updated Solder Reflow Information
Changes Made by:	Cesar Sousa

Revision: C	
Date:	2023-03-13
Changes:	Antenna Integration Guide
Changes Made by:	Cesar Sousa

Revision: B	
Date:	2021-10-31
Changes:	Format Change, MSL
Changes Made by:	Erik Landi

Revision: A (Original First Release)	
Date:	2016-05-17
Notes:	Initial Release
Author:	STAFF

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