



# TAOGLAS®



# Datasheet

## GNSS Dual Feed Stacked Patch

**Part No:**  
HP54510A

### Description:

Passive Multiband High Precision GNSS L1/L5 Stacked Patch Antenna

### Features:

Bands Covered:

- BeiDou (B1/B2a)
- GPS/QZSS (L1/L5)
- GLONASS (G1)
- Galileo (E1/E5a)
- L Band Corrections

Dual pin, dual feed, 4-pin configuration

Dimensions: 45 x 45 x 10mm

RoHS & Reach Compliant

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# 1. Introduction



The Taoglas HP54510A is a high performance, multi-band passive GNSS antenna that has been carefully designed to provide fantastic positional accuracy on the L1/L5 GNSS spectrum. It covers GPS/QZSS L1/L5, GLONASS G1, Galileo E1/E5a, BeiDou B1/B2a, as well as SBAS (WAAS/EGNOS/GAGAN/SDCM/SNAS) as well as the L Band at 1525MHz.

Correct implementation of the HP54510A allows the user to achieve higher location accuracy, as well as stability of position tracking in urban environments. The stacked patch construction has excellent performance across the full bandwidth of the antenna.

Its design has an even gain across the hemisphere, giving excellent axial ratio, which in turn makes it extremely resilient to multipath rejection and provides excellent phase centre stability to ensure a location is correctly established in a navigation system.

Typical applications that benefit from high precision capabilities include:

- Autonomous Driving
- Precision Agriculture
- Telematics & Container / Asset Tracking
- Timing Accuracy Synchronization
- Precision Positioning for Robotics

The HP54510A is the latest embedded addition to Taoglas' product portfolio of high precision GNSS antennas. When used on the base and/or the rover as part of an RTK configuration, the HP54510A can achieve genuine cm-level accuracy with proven results.

Full integration guidelines are contained in Section 7 of this datasheet including the Taoglas HC125.A hybrid coupler that will be required for use for dual pin feed patch integrations.

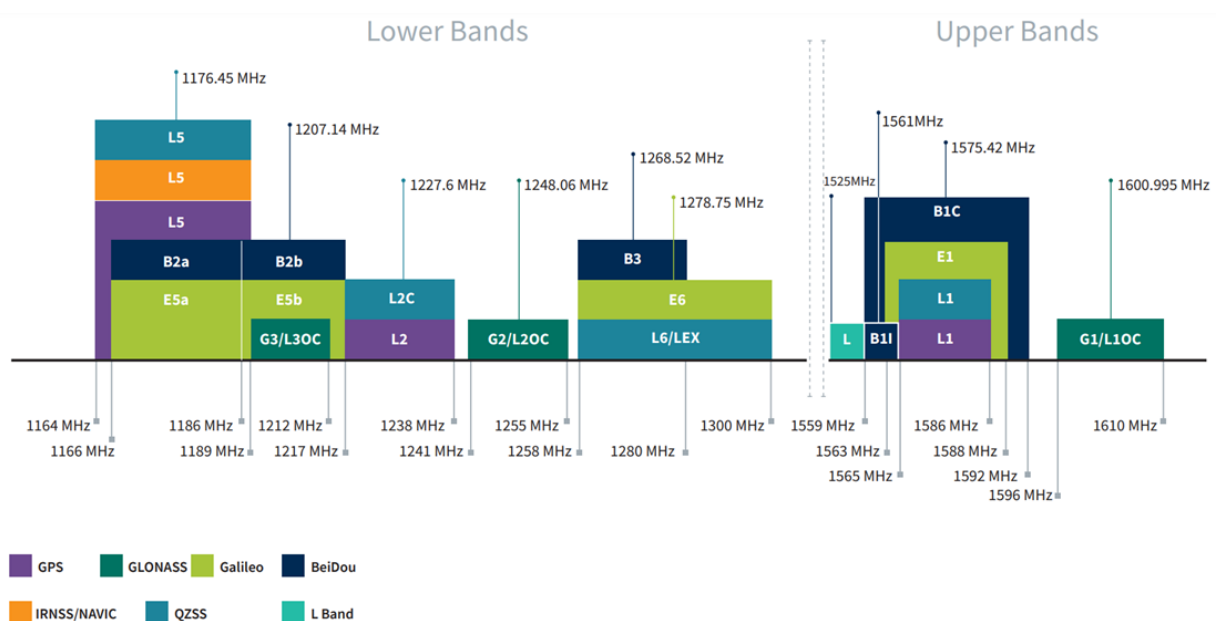
Contact your regional Taoglas Customer Services team for more information on any of the products listed above or for support regarding integration.

## 2. Specifications

GNSS Frequency Band						
GPS	L1	L2	L5			
	■	□	■			
GLONASS	G1	G2	G3			
	■	□	□			
Galileo	E1	E5a	E5b	E6		
	■	■	□	□		
Beidou	B1	B2a	B2b	B3		
	■	■	□	□		
L Band	L					
	■					
QZSS (Regional)	L1	L2C	L5	L6		
	■	□	■	□		
IRNSS (Regional)	L5					
	■					
SBAS	L1/E1/B1	L5/B2a/E5a	G1	G2	G3	
	■	■	■	□	□	

■ GNSS Frequency Bands Covered. □ GNSS Frequency Bands Not Covered.

\*SBAS systems: WASS(L1/L5), EGNOS(E1/E5a), SDCM(G1/G2/G3), SNAS(B1,B2a), GAGAN(L1/L5), QZSS(L1/L5), KAZZ(L1/L5).



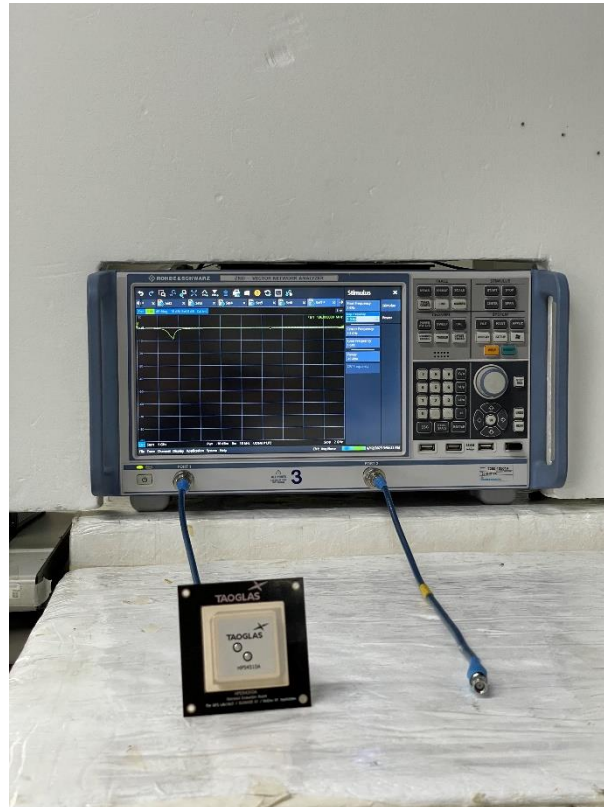
GNSS Electrical					
Frequency (MHz)	GPS L5	L Band	BeiDou B1	GPS L1	GLONASS G1
	1166-1187	1525-1559	1559-1563	1563-1587	1593-1610
Efficiency (%)	82.7	71.5	83.5	83.5	61.1
Average Gain (dB)	-0.83	-1.46	-0.78	-0.78	-2.14
Peak Gain (dBi)	4.82	4.94	5.06	5.08	4.15
Impedance	50 Ω				
Polarization	RHCP				
Radiation Pattern	Directional				
AR at Zenith	7.72	0.57	0.80	0.87	1.91

\*Antenna properties were measured with the antenna mounted on 70\*70mm Ground Plane with Hybrid Coupler

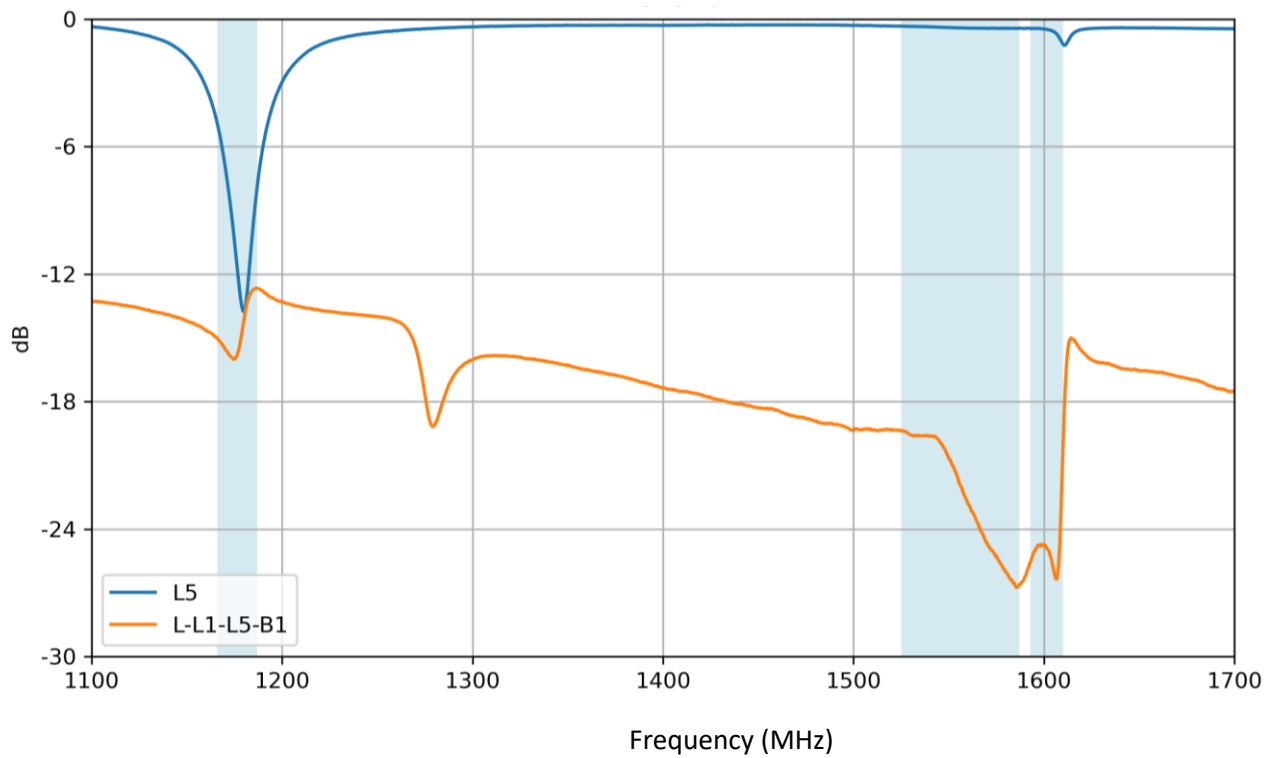
Mechanical	
Dimensions	45x45x10 mm
Weight	54g
Material	Ceramic
Environmental	
Temperature Range	-40°C to 85°C
Humidity	Non-condensing 65°C 95% RH
Moisture Sensitivity Level (MSL)	3 (168 Hours)

## 3. Antenna Characteristics

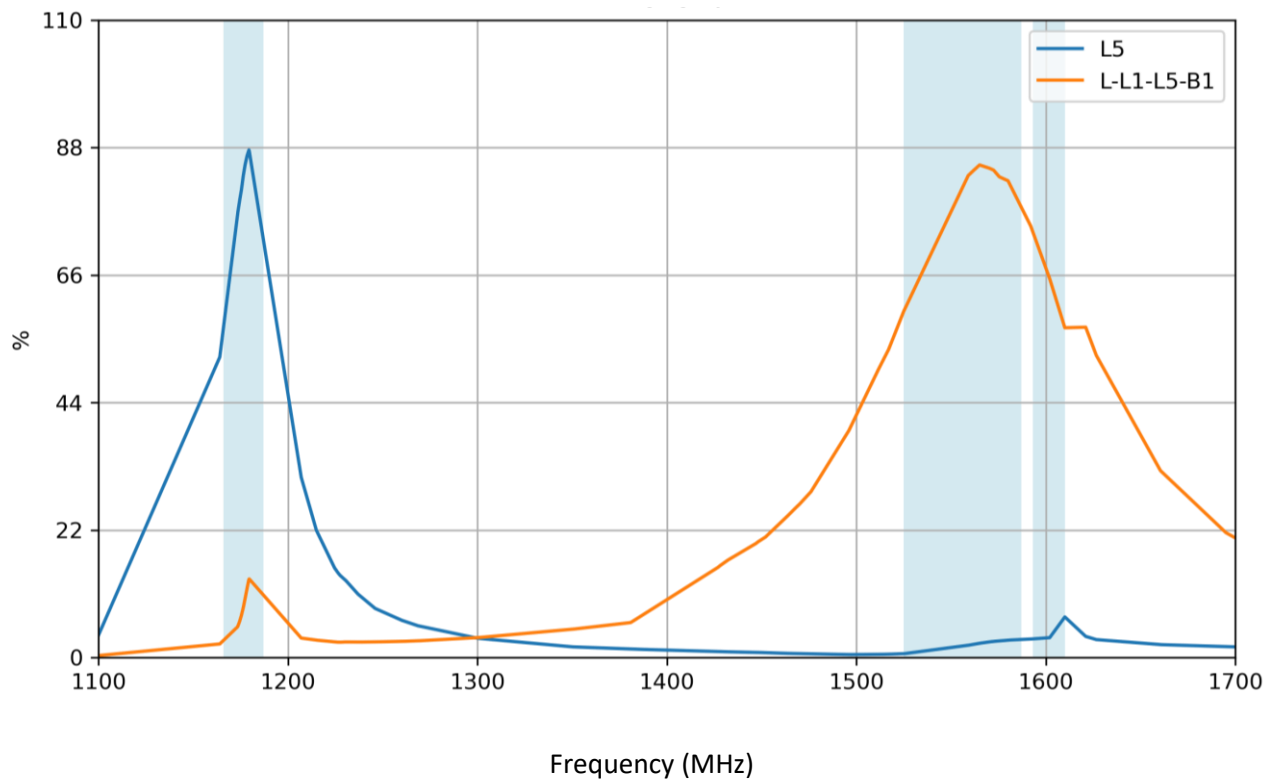
### 3.1 Measurement environment



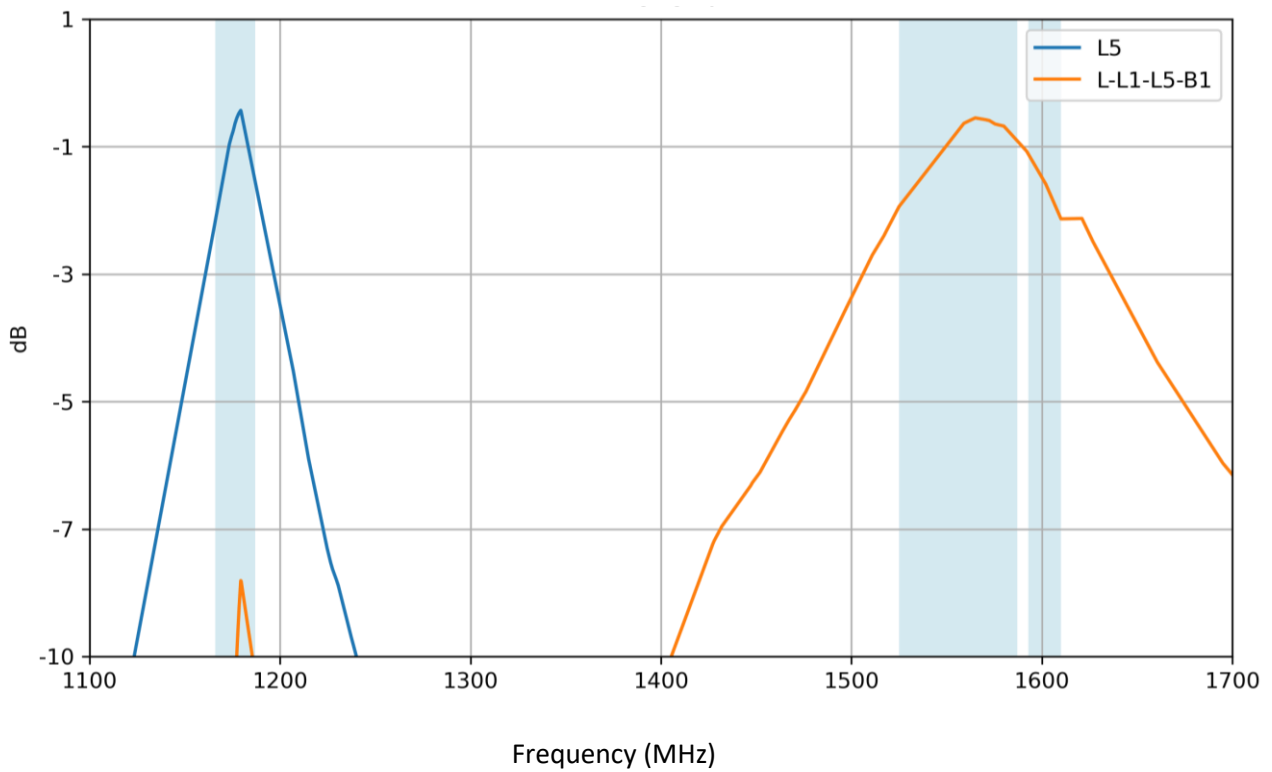
### 3.2 Return Loss



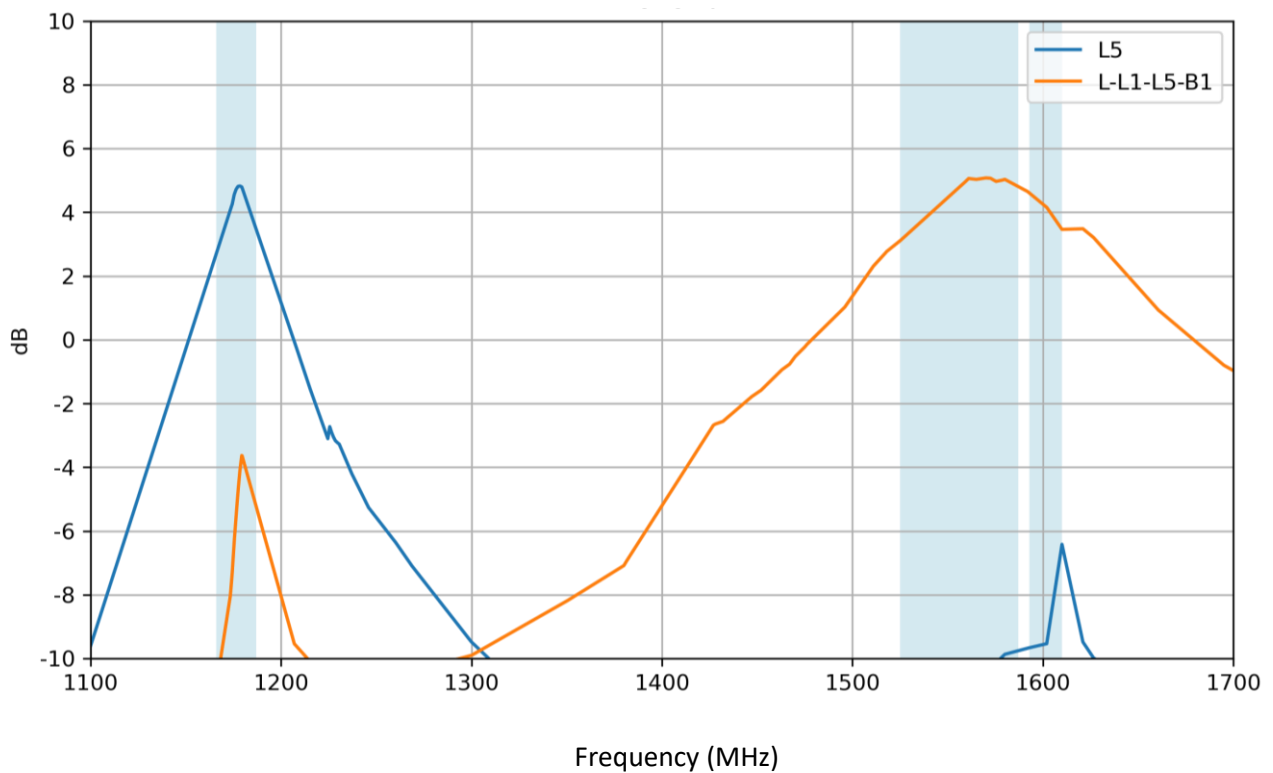
### 3.3 Efficiency



### 3.4 Average Gain



### 3.5 Peak Gain





## 4. Radiation Patterns

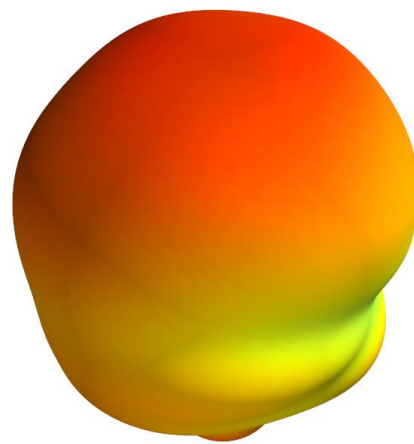
### 4.1 Test Setup



70\*70mm Ground Plane

4.2 Radiation Patterns

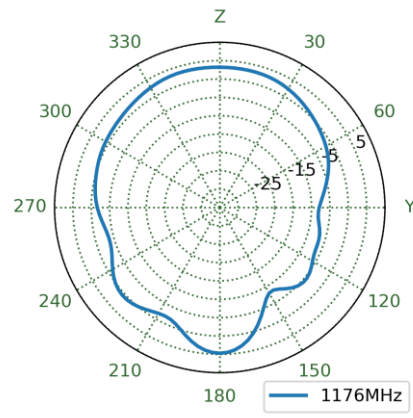
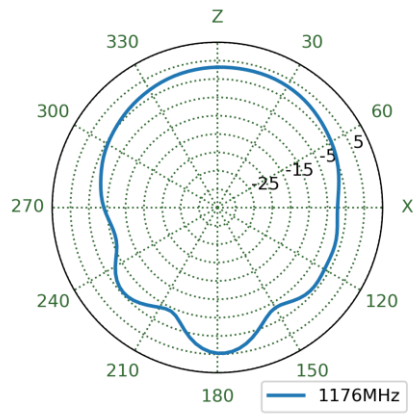
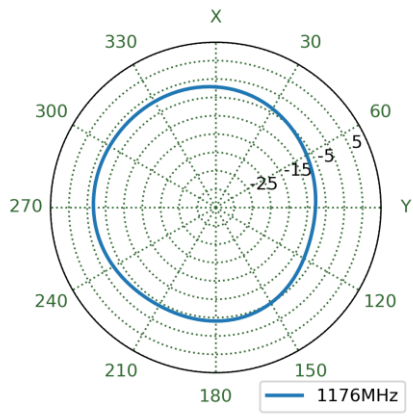
1176.45MHz



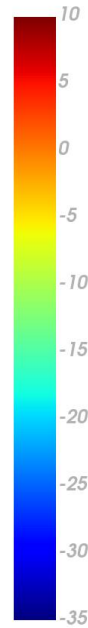
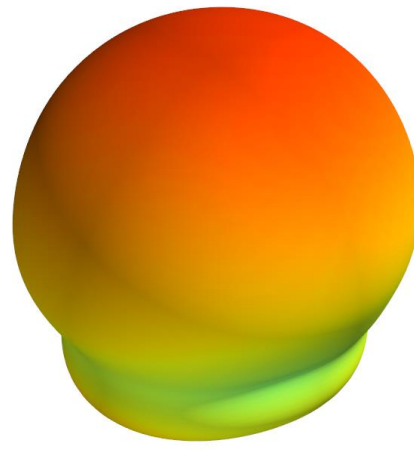
XY Plane

XZ Plane

YZ Plane



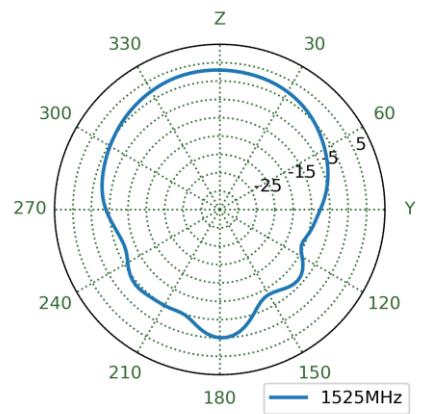
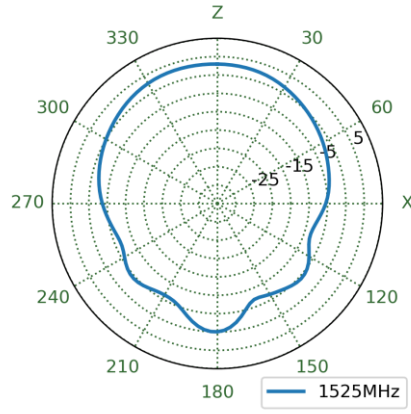
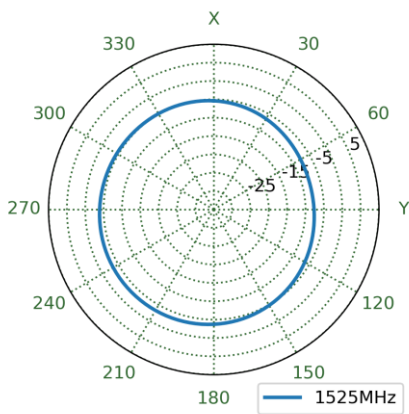
1525MHz



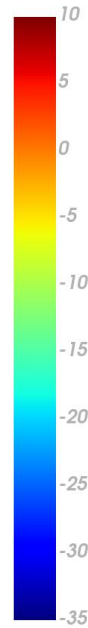
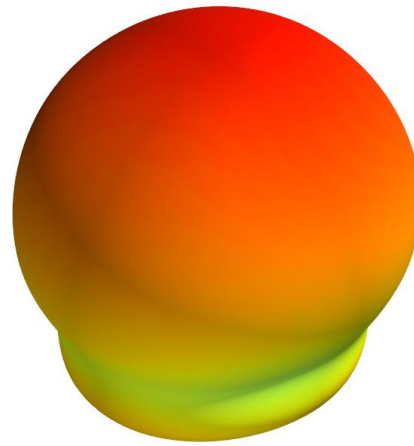
XY Plane

XZ Plane

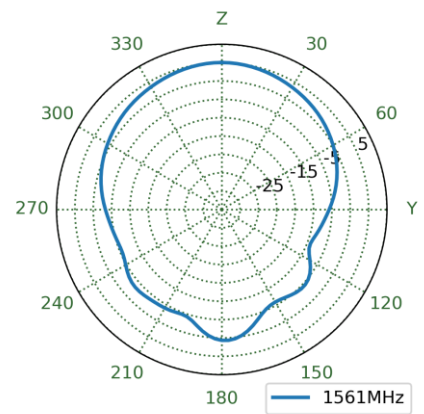
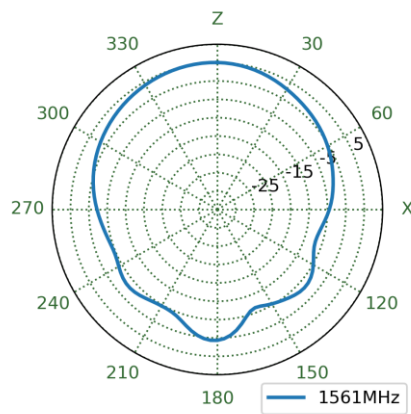
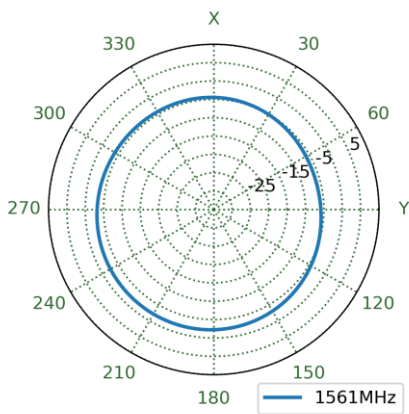
YZ Plane



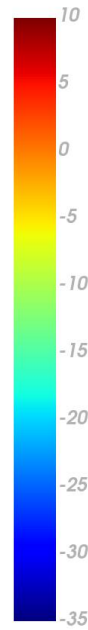
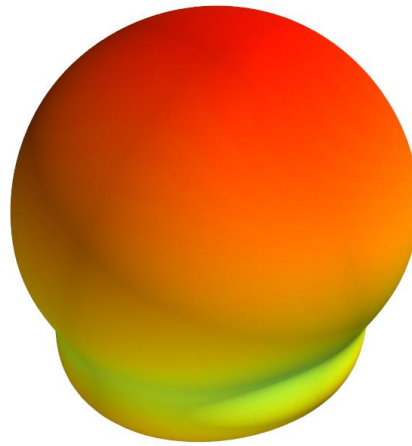
1561MHz



XY Plane      XZ Plane      YZ Plane



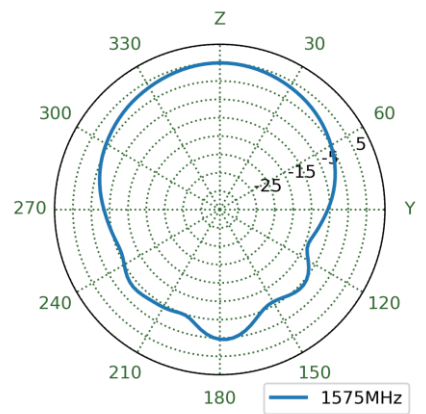
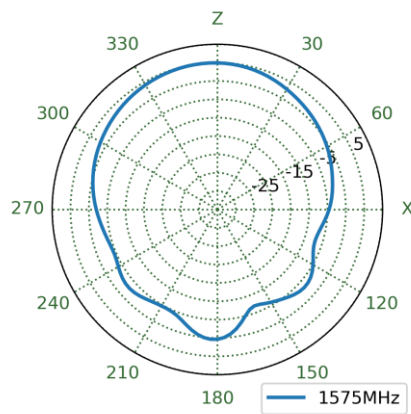
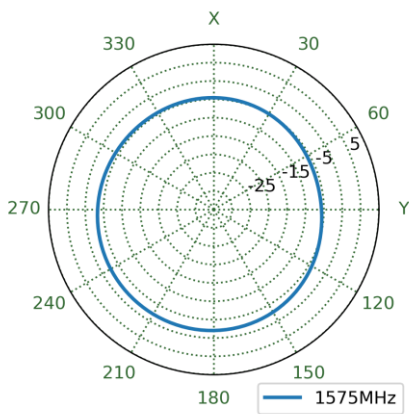
1575MHz



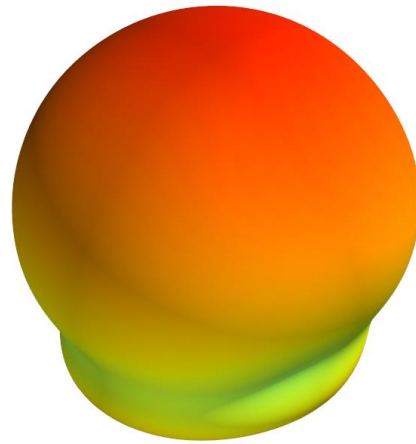
XY Plane

XZ Plane

YZ Plane



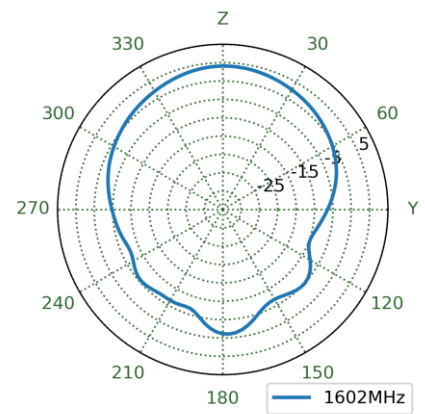
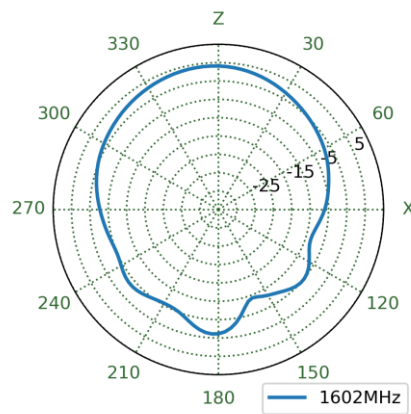
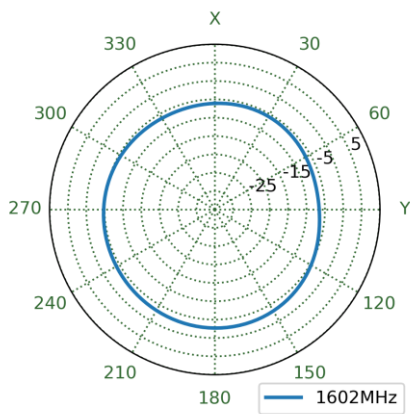
1602MHz



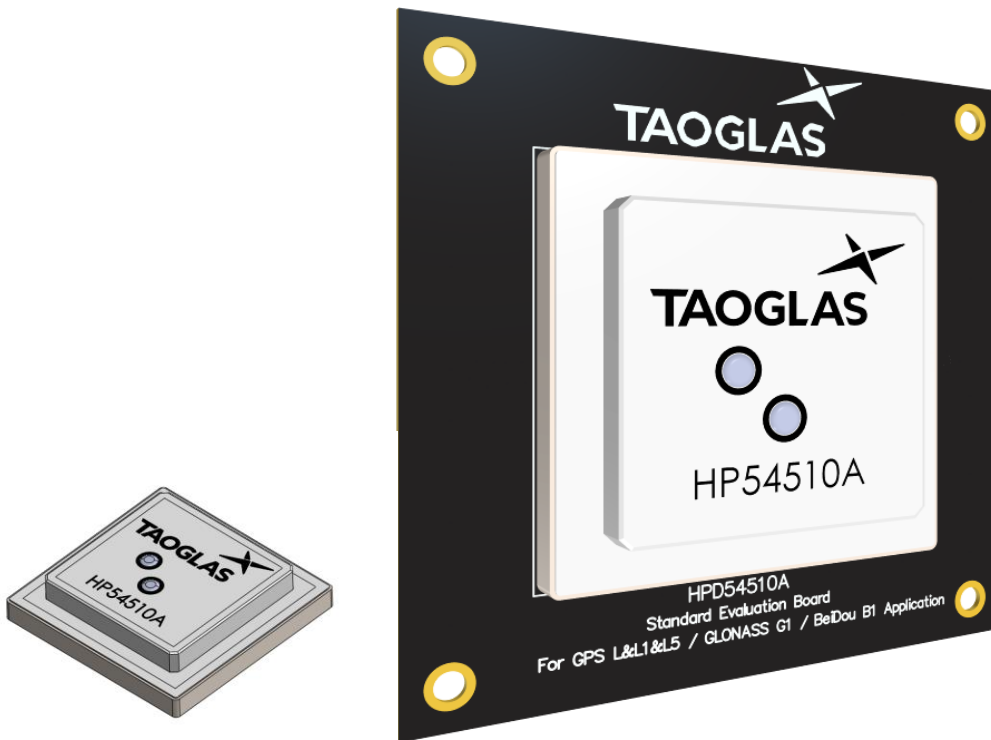
XY Plane

XZ Plane

YZ Plane



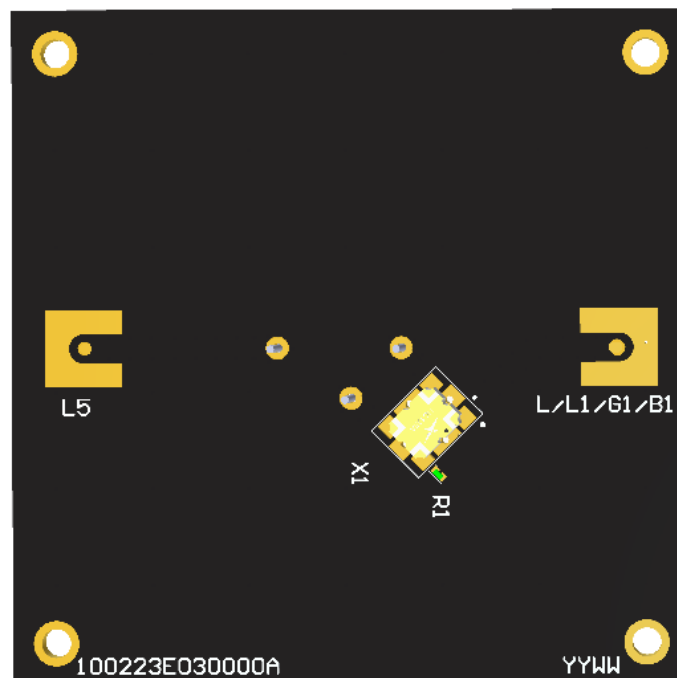
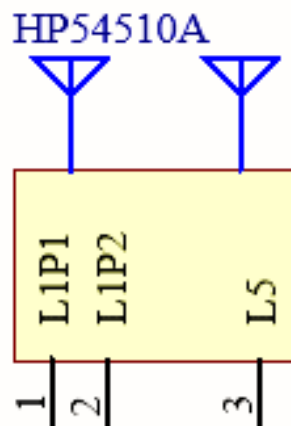
## 5. Antenna Integration Guide



## 5.1 Schematic Symbol and Pin Definition

The antenna has 3 pins as indicated below. The L1 P1 and L1 P2 (Pin 1 and 2) represent the higher GNSS frequency bands at 1525 - 1610MHz, and the L5 (Pin3) represents the lower GNSS frequency bands at 1166- 1187MHz.

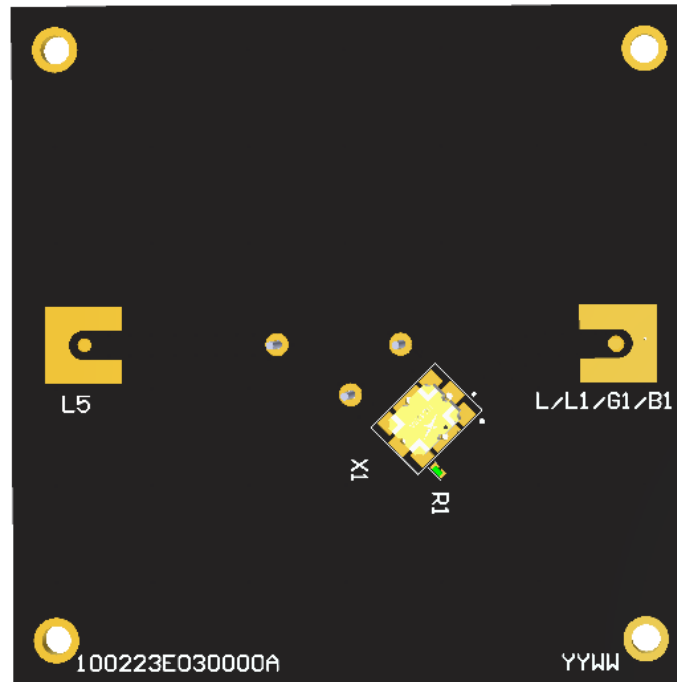
Pin	Description
1	L1 P1 (0°)
2	L2 P2 (-90°)
3	L5 (0°)



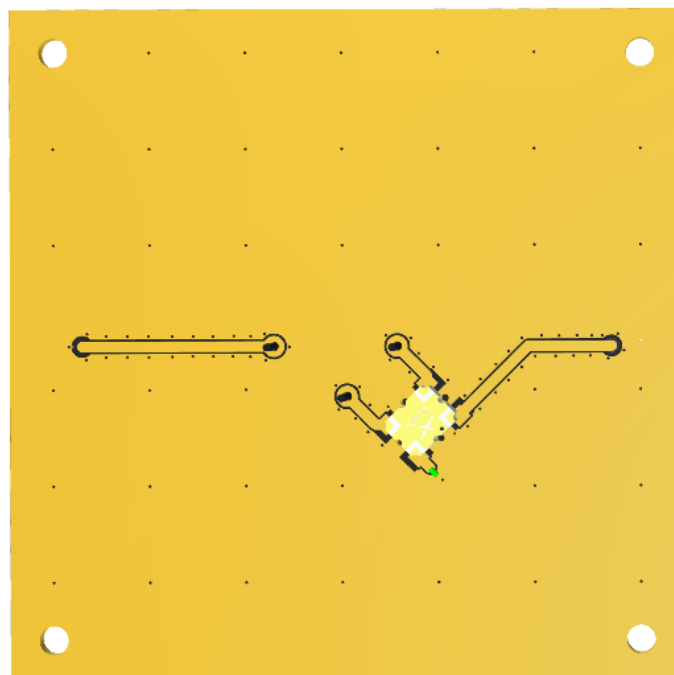


## 5.2 Antenna Integration

The antenna should be placed at the center of the PCB, in our integration we have used a 70mm X 70mm PCB evaluation board. Maintaining a symmetric ground plane shape and symmetric environment around the antenna is critical to maintaining the excellent axial ratio and phase center performance shown in this datasheet. The opposite side of the PCB from the antenna may be used for device electronics and does not need to maintain symmetry.



Bottom Side with Solder Mask



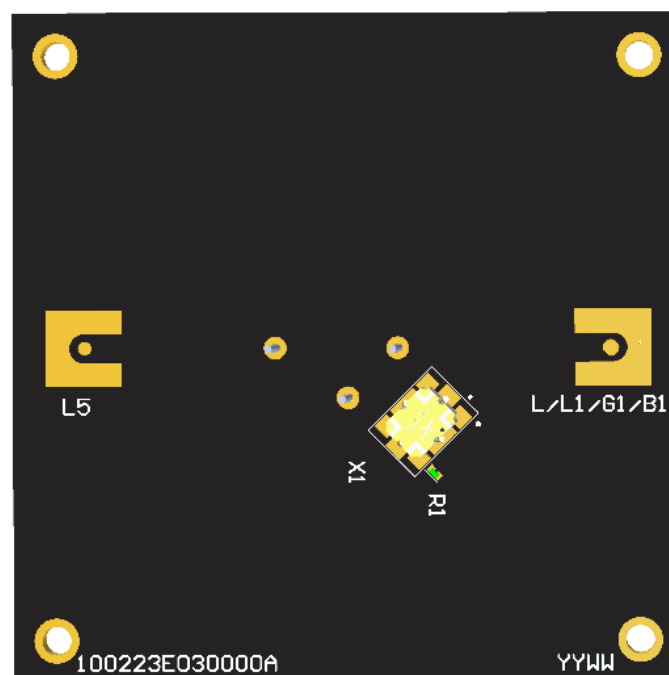
Bottom Side without Solder Mask

### 5.3 PCB Layout

The footprint and clearance on the PCB must comply with the antenna specification. The PCB layout shown in the diagram below demonstrates the antenna footprint. Note that the hybrid couplers may be placed closer to the antenna pins. It is important that the trace length of the antenna pin is equal to its hybrid coupler. This is required to maintain signal phase integrity.

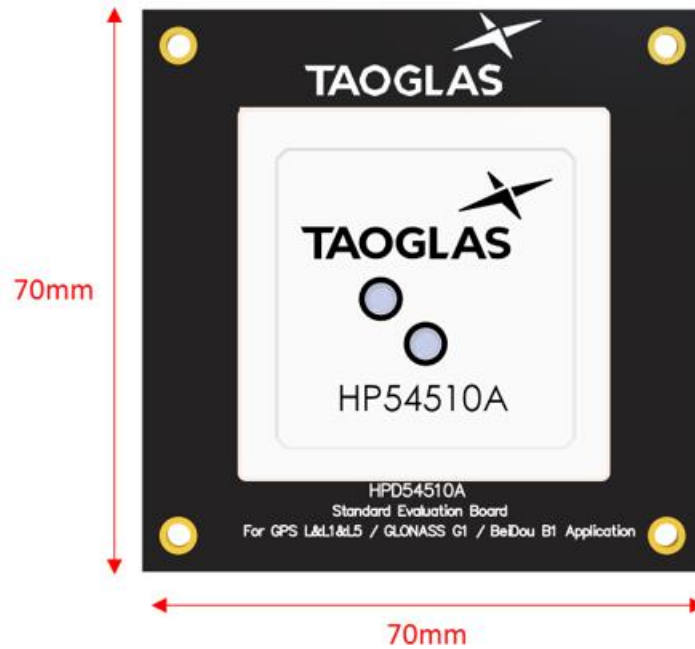


Topside

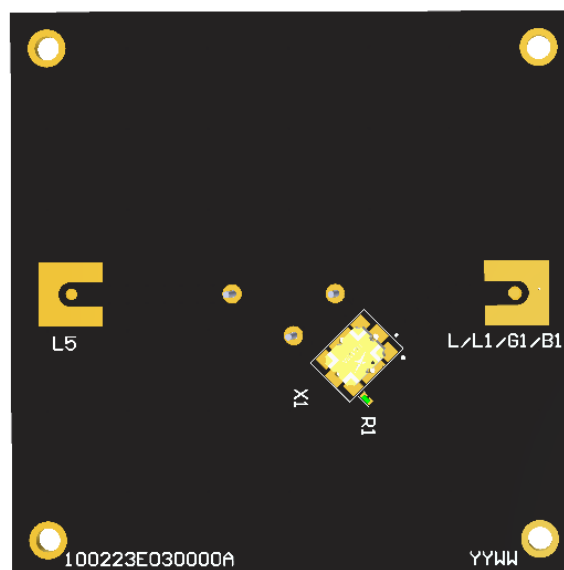


Bottom Side

5.5 Evaluation Board



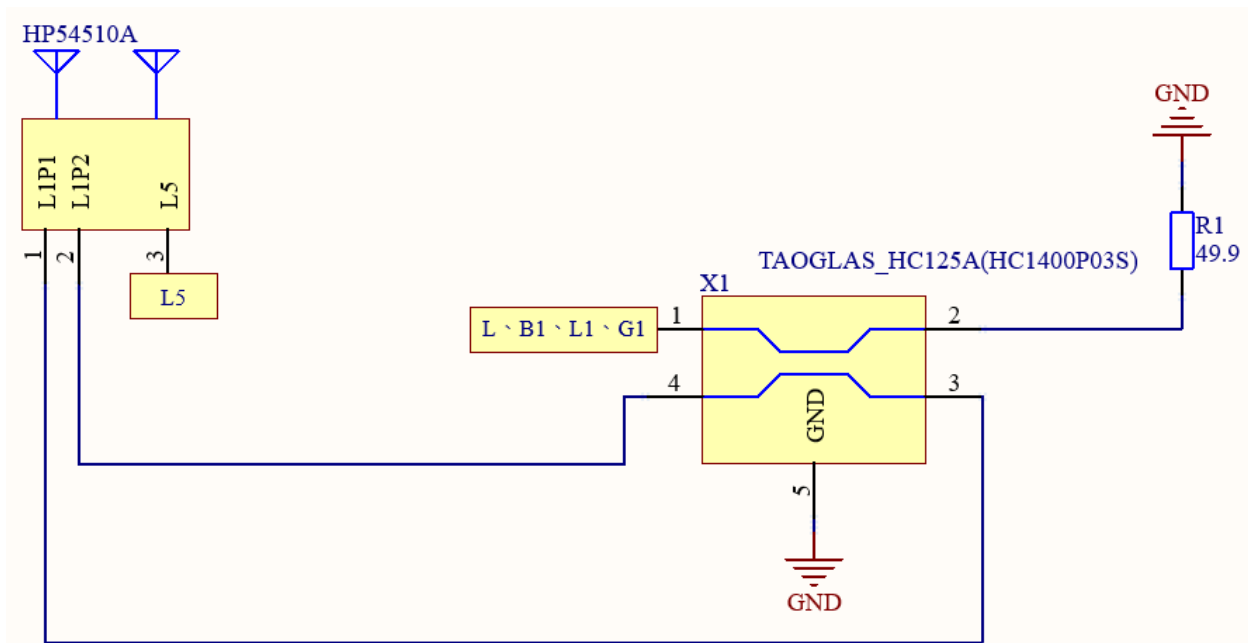
Topside



Bottom Side

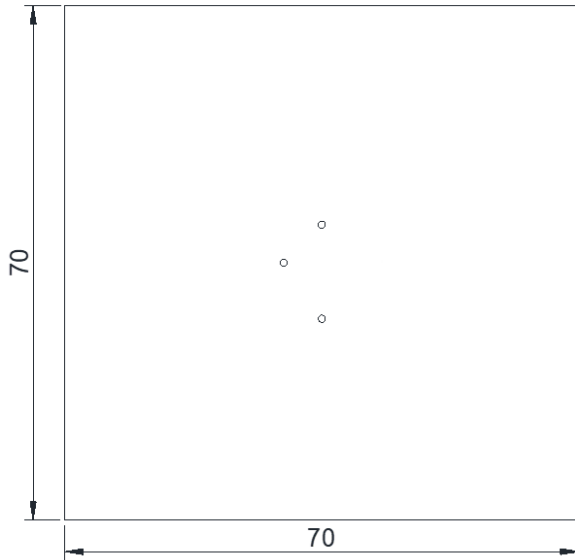
## 5.6 Evaluation Board Matching Circuit

The top patch element uses two quadrature feeds, which must be combined in a hybrid coupler to ensure the best axial ratio. Taoglas recommends our HC125A, a high-performance hybrid coupler designed for use with our multi-feed patches. One HC125A. This antenna requires a GNSS high operating frequency band (1525-1610MHz). The hybrid coupler should be placed close to the antenna pins and properly terminated with a 50-ohm shunt resistor. The hybrid coupler output can be fed into paths for high-band GNSS filtering and amplification.

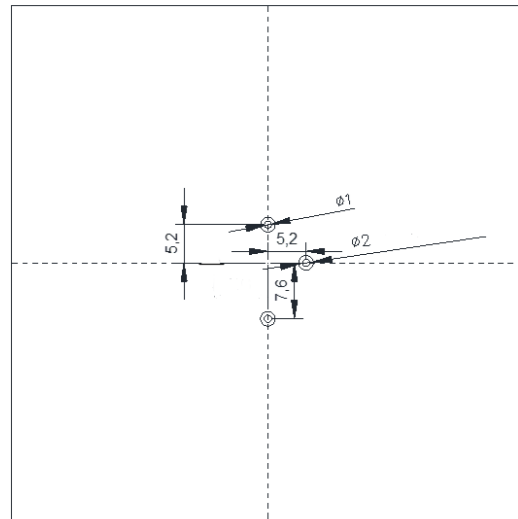


5.6 Footprint

TOP SIDE OF PCB

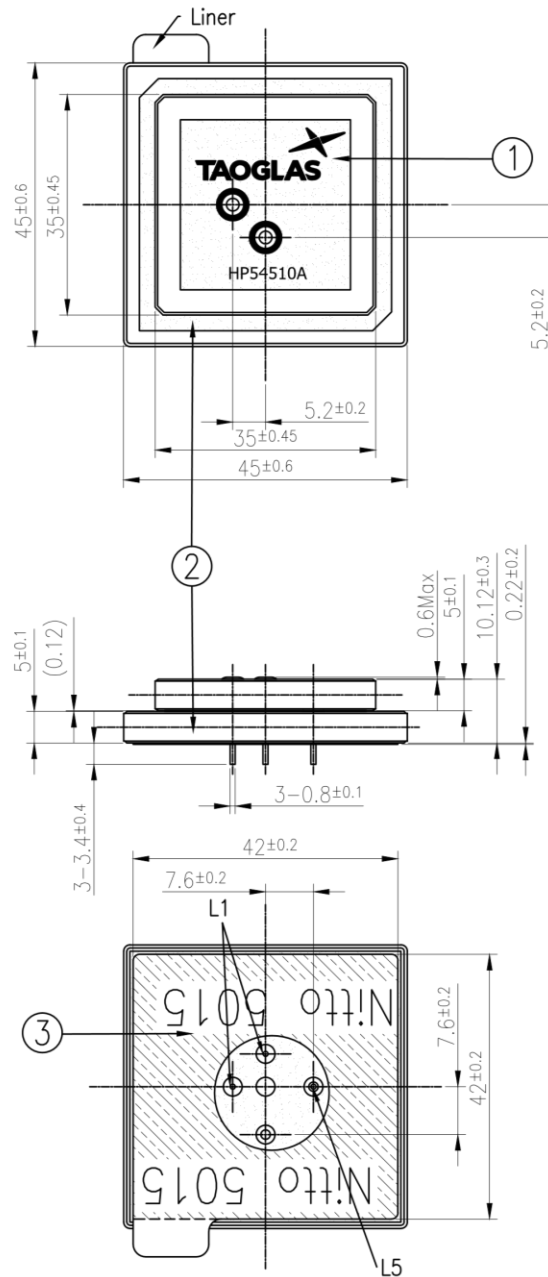


BOTTOM SIDE OF PCB



Unit: mm

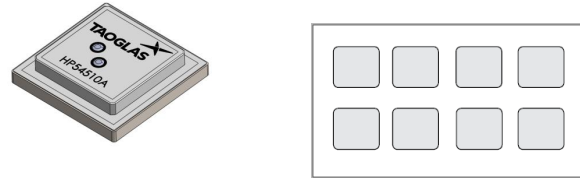
# 6. Mechanical Drawing



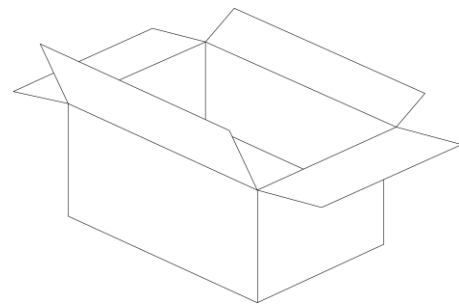
	Name	Material	Finish	QTY
1	Top Patch (35x35x5mm)	Ceramic	Clear	1
2	Bottom Patch (45x45x5mm)	Ceramic	Clear	1
3	Double sided Adhesive	NITTO 5015	White Liner	1

## 7. Packaging

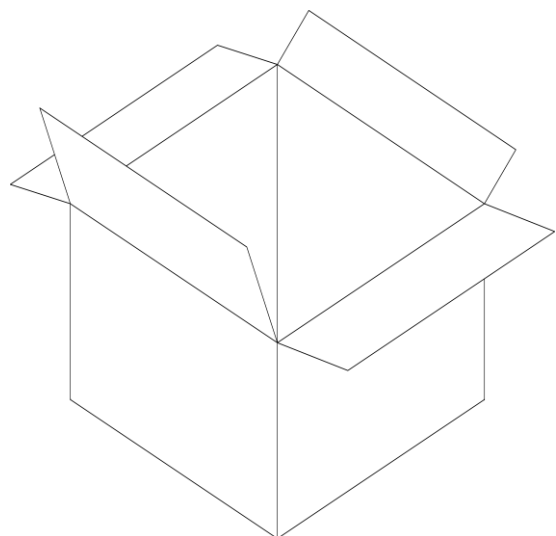
8pcs HP54510 per Tray  
32pcs / Vacuum package



32pcs HP54510 per Small Box  
Dimensions - 236\*154\*96mm



128pcs HP54510 per Carton  
Dimensions - 370\*370\*300mm



Changelog for the datasheet

**SPE-23-8-224– HP54510A**

**Revision: A (Original First Release)**

Date: 2023-07-14

Notes: Initial Release

Author: Cesar Sousa

**Previous Revisions**






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