TAOGLAS

Datasheet

GNSS Surface Mount Patch Antenna

Part No:
SGPDF254.A

Description

GPS/GLONASS/BeiDou/Galileo SMD Dual Feed Patch Antenna

Features:

Embedded Dual-Feed Patch for Lowest Axial Ratio

Covers Bands:

- GPS L1C
- GLONASS L1
- Galileo E1
- BeiDou B1

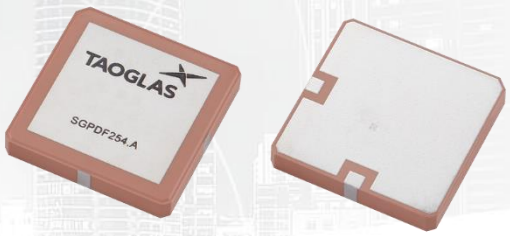
SMD Antenna – No Cable and Connector Required

Dimension: 25*25*4mm

Designed for a 70x70mm Ground plane

RoHS & Reach Compliant

1. Introduction



The Taoglas SGPDF254.A is a single band passive GNSS patch covering GPS/GLONASS/BeiDou/Galileo. The SGPDF254.A has been designed with a dual feed patch to enhance performance by improving multipath rejection so signals can be received and sent more clearly.

The SGPDF254.A is mounted via SMD process via tape and reel for ease of installation, reflow information can be found within the datasheet.

As with many high performance Taoglas patches, the series is produced in a TS16949 automotive quality approved facility, and each patch produced is 100% tested for gain (S21) and return loss (S11) to ensure total consistency of performance.

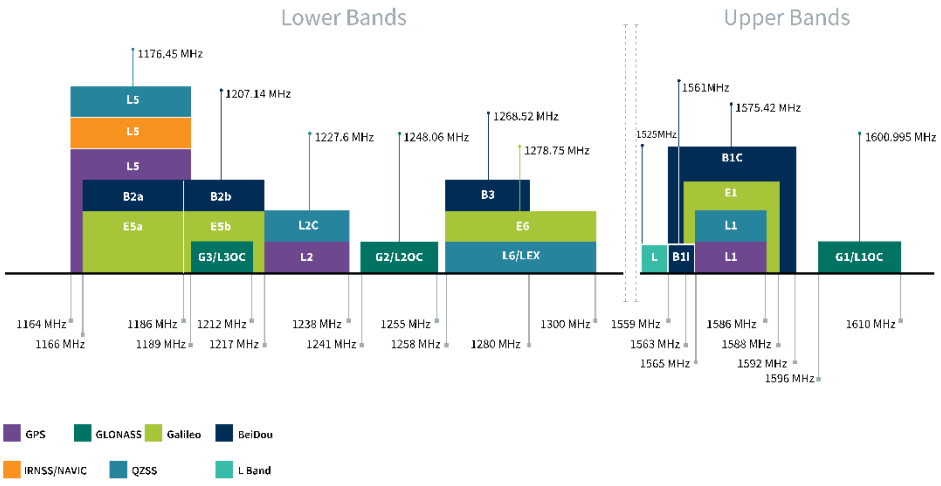
Typical Applications Include:

- Wearables
- Asset Tracking
- Navigation Systems

Taoglas also offers custom tuning service based on minimum order quantities, contact your regional Taoglas customer support team for further information.

2. Specification

GNSS Frequency Bands					
GPS	L1 1575.42 MHz	L2 1227.6 MHz	L5 1176.45 MHz		
	■	□	□		
GLONASS	G1 1602 MHz	G2 1248 MHz	G3 1207 MHz		
	■	□	□		
Galileo	E1 1575.24 MHz	E5a 1176.45 MHz	E5b 1201.5 MHz	E6 1278.75 MHz	
	■	□	□	□	
BeiDou	B1C 1575.42 MHz	B1I 1561 MHz	B2a 1176.45 MHz	B2b 1207.14 MHz	B3 1268.52 MHz
	■	■	□	□	□
L-Band	L-Band 1542 MHz				
	■				
QZSS (Regional)	L1 1575.42 MHz	L2C 1227.6 MHz	L5 1176.45 MHz	L6 1278.75e6	
	■	□	□	□	
IRNSS (Regional)	L5 1176.45 MHz				
	□				
SBAS	L1/E1/B1 1575.42 MHz	L5/B2a/E5a 1176.45 MHz	G1 1602 MHz	G2 1248 MHz	G3 1207 MHz
	■	□	■	□	□



GNSS Bands and Constellations

GNSS Electrical			
Frequency (MHz)	**1561**	**1575.42**	**1603**
Efficiency (%)	30.3	61.8	50.7
Average Gain (dB)	-5.19	-2.09	-2.95
Peak Gain (dBi)	1.23	4.36	3.55
Impedance	50 Ω		
Polarization	Linear		
Radiation Pattern	Directional		

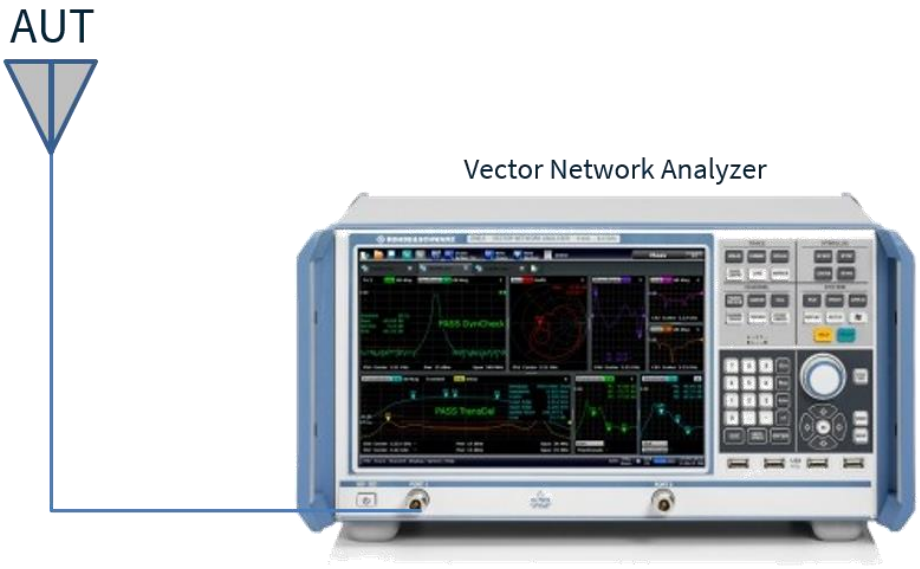
Mechanical	
Ceramic Dimension (mm)	25 x 25 x 4
Weight (g)	10
Material	Ceramic

Environmental	
Operation Temperature	-40°C to 85°C
Humidity	Non-condensing 65°C 95% RH
Moisture Sensitivity Level (MSL)	3 (168 Hours)

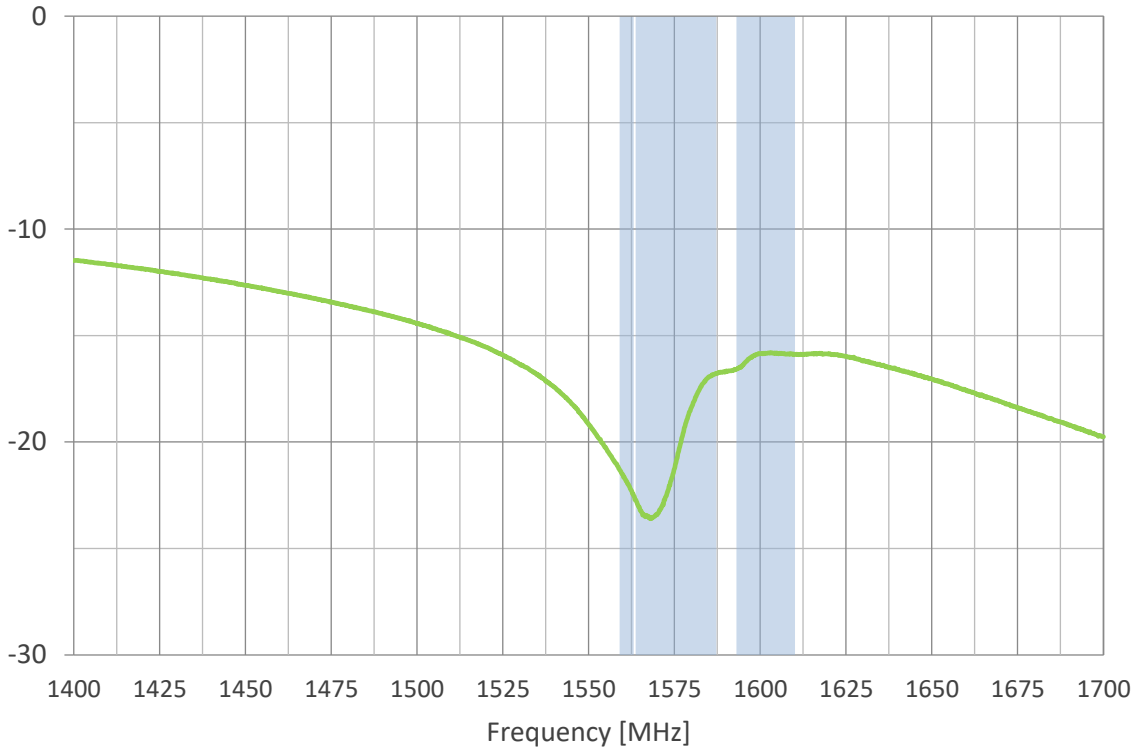
* Antenna properties were measured with the antenna mounted on 70*70mm Ground Plane.

3. Antenna Characteristics

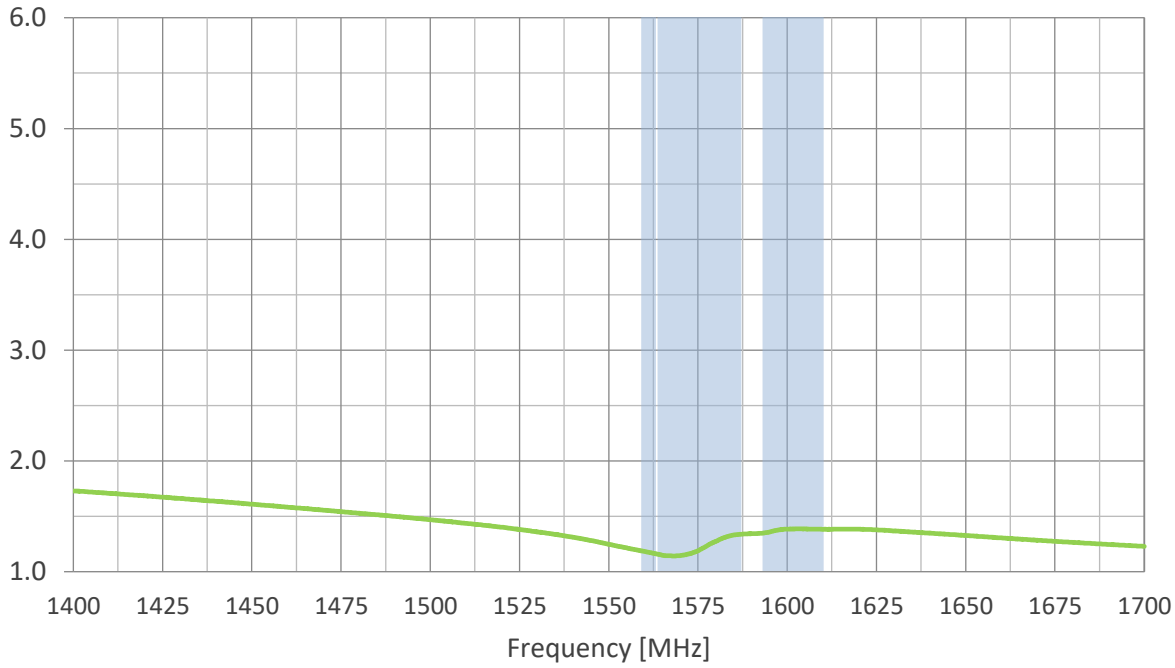
3.1 S11 / VSWR / Return Loss Test Setup



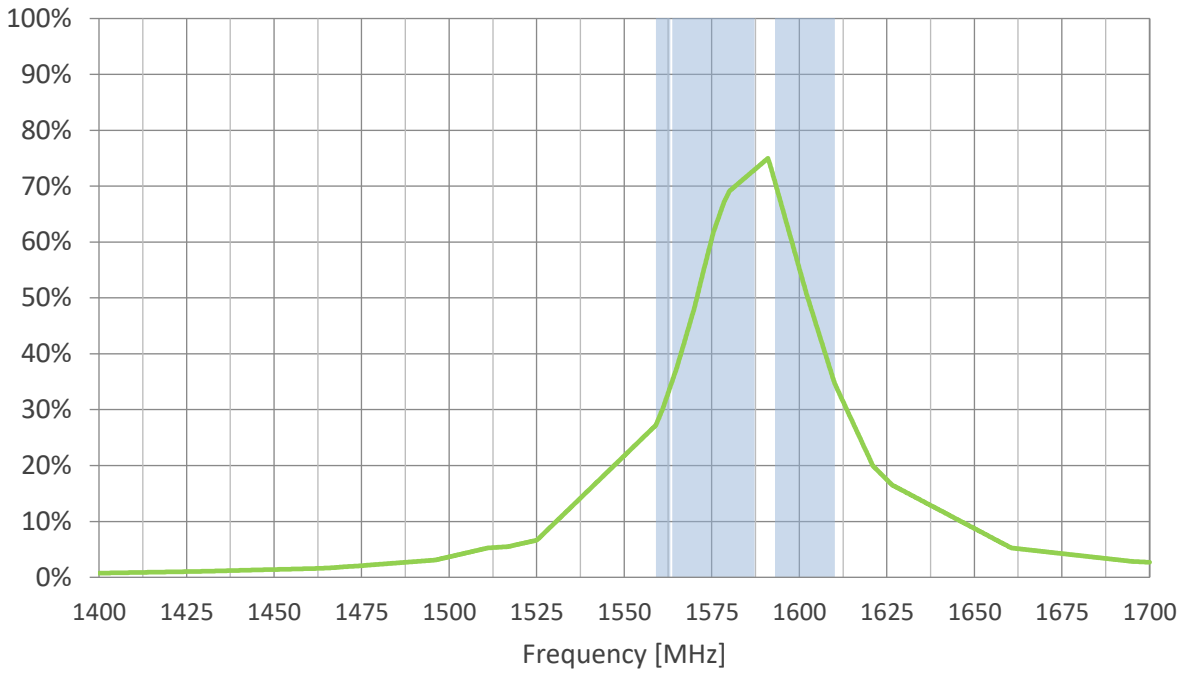
3.2 Return Loss



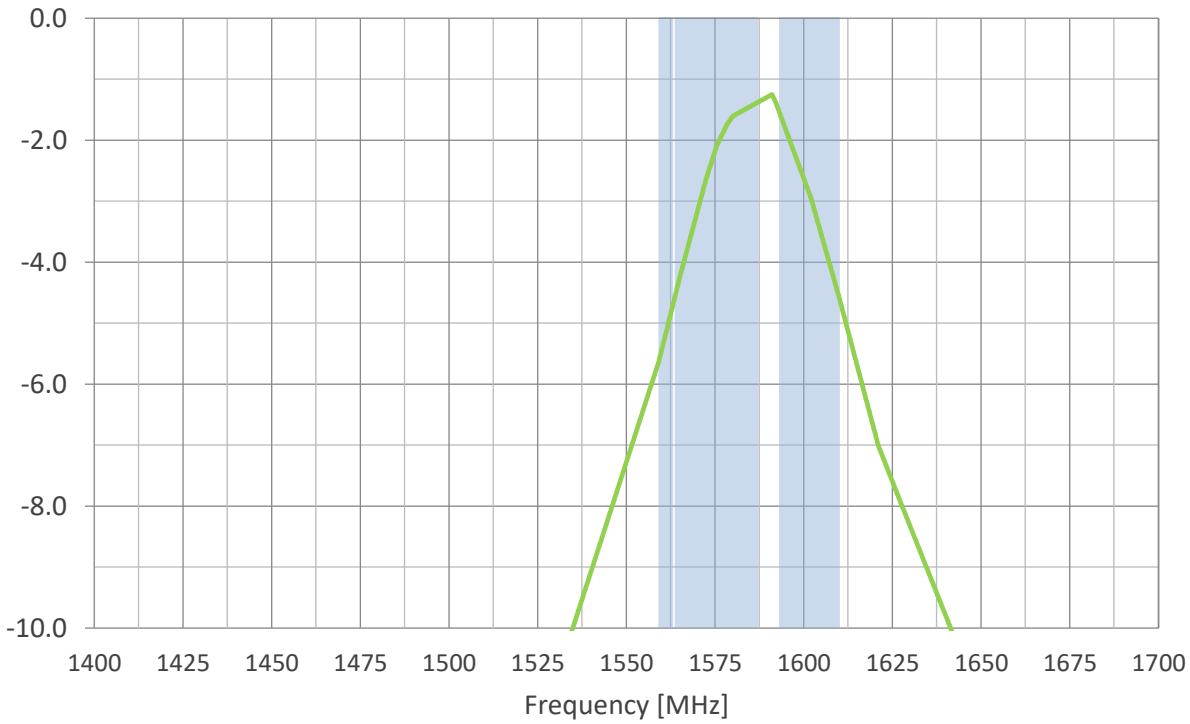
3.3 VSWR



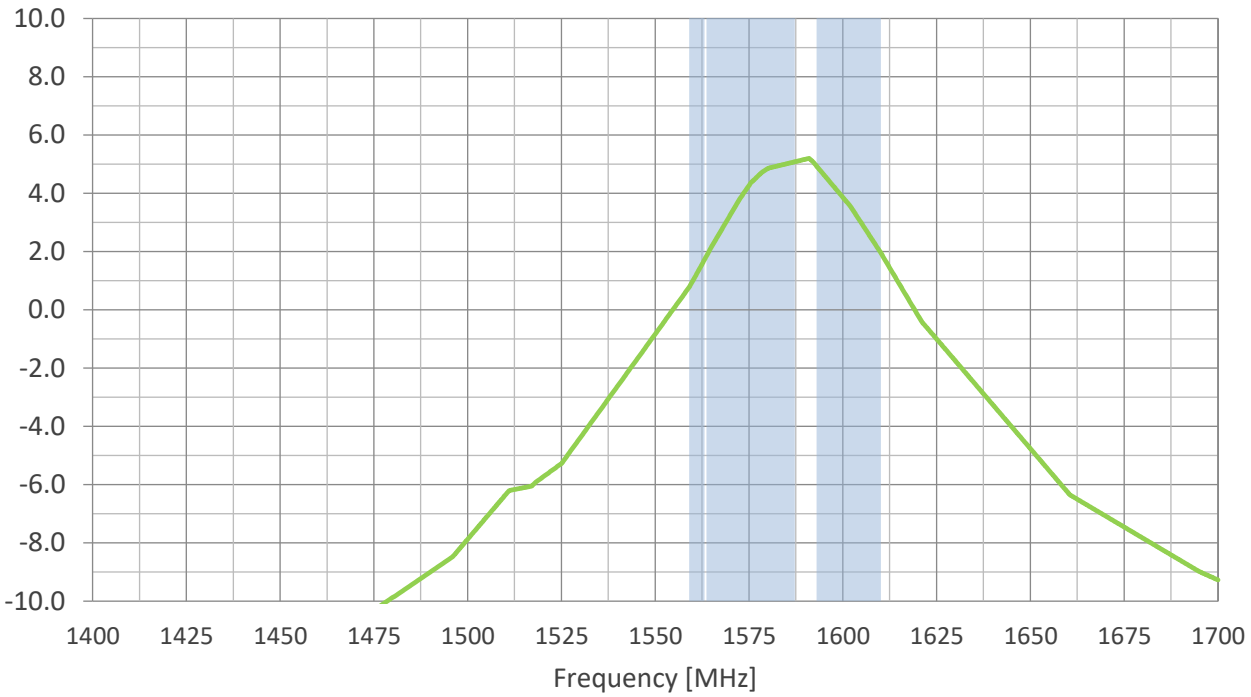
3.4 Efficiency



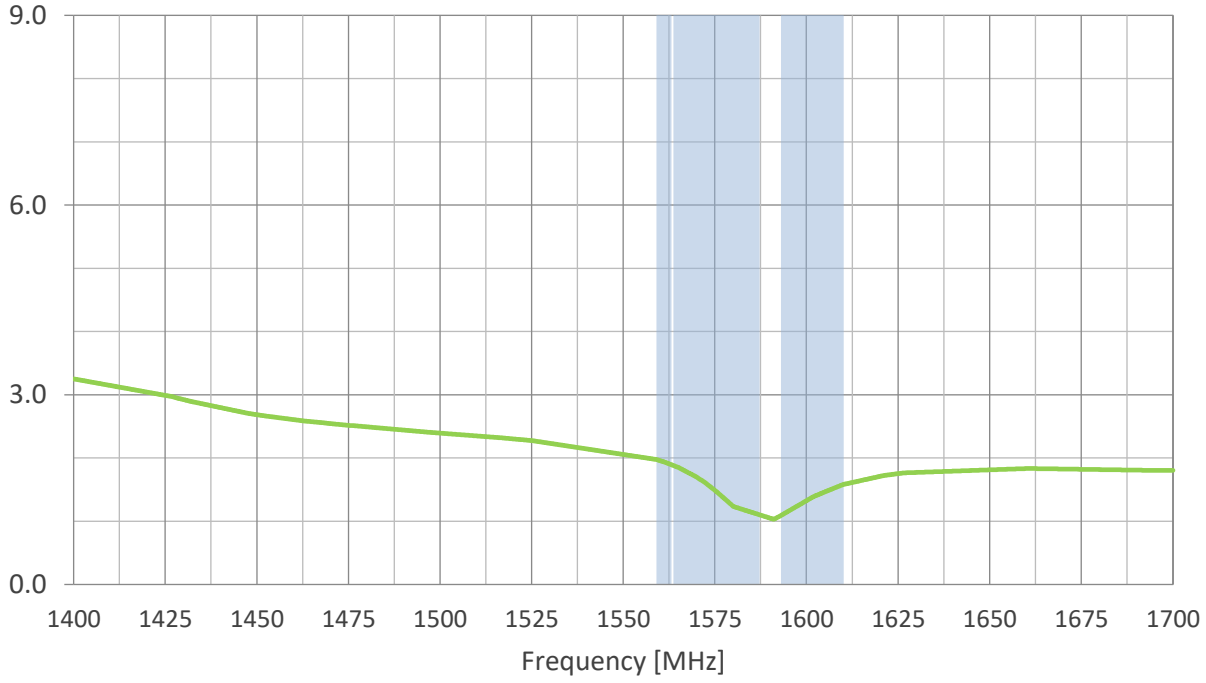
3.5 Average Gain



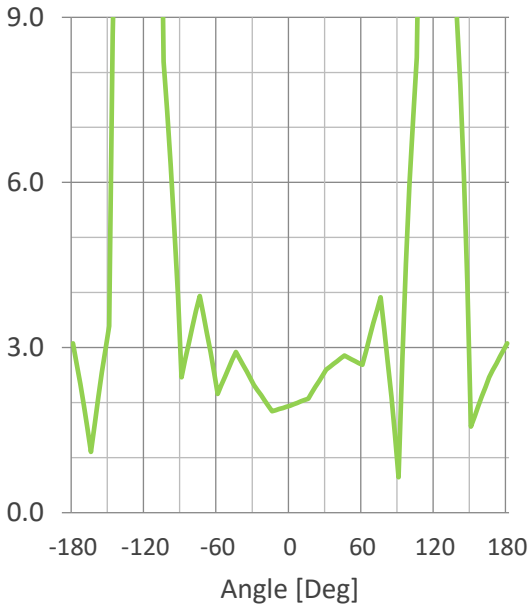
3.6 Peak Gain

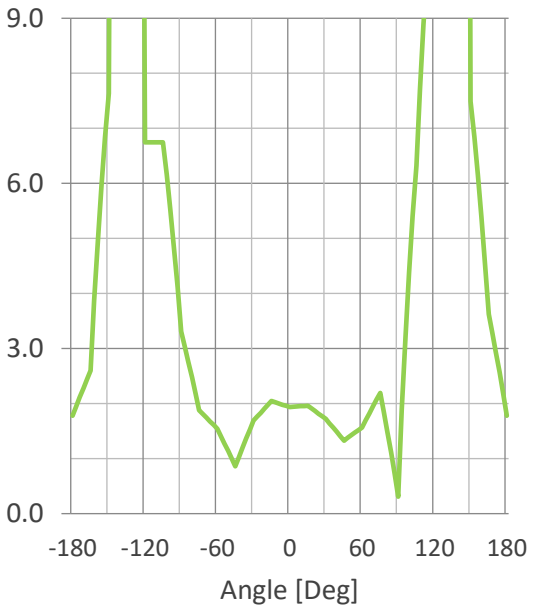


3.7 Axial Ratio vs Frequency

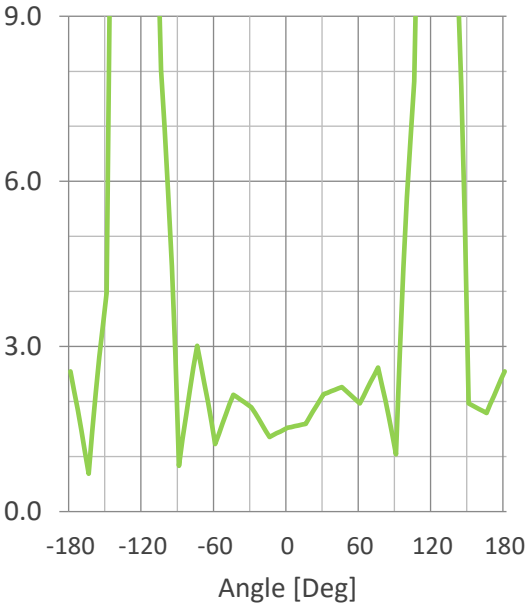


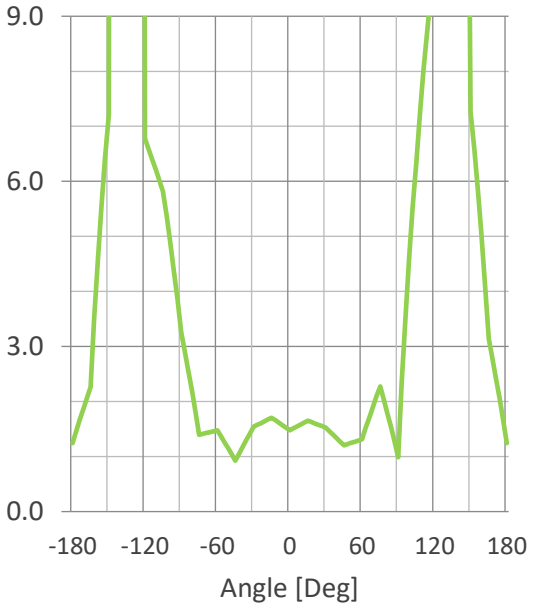
3.8 Axial Ratio @1561MHz



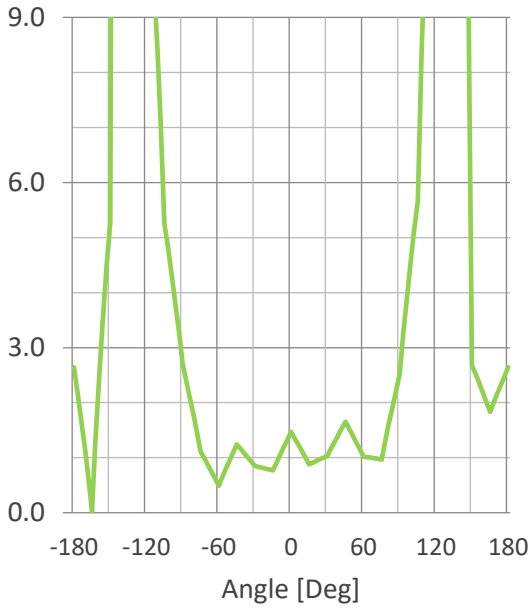


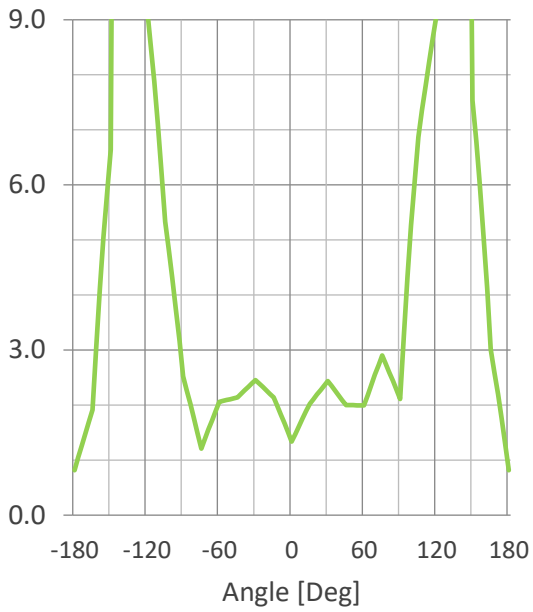
3.9 Axial Ratio @1575MHz





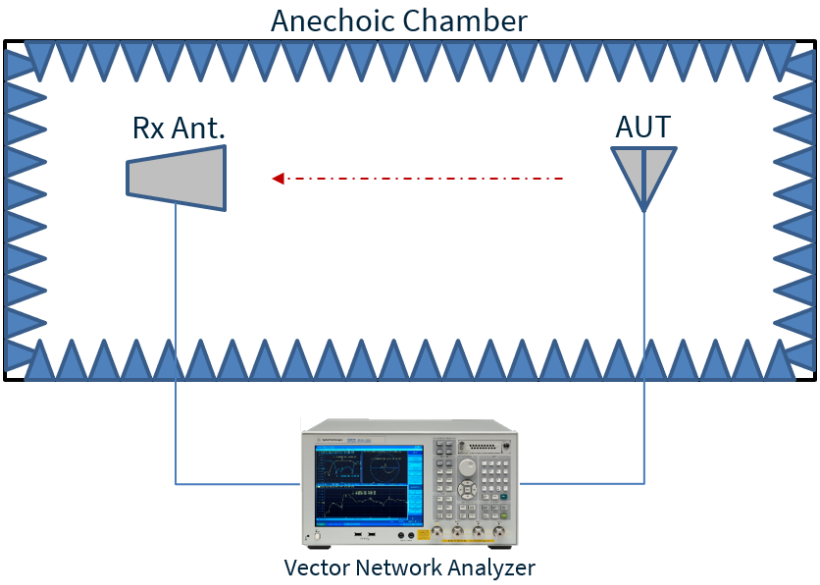
3.10 Axial Ratio @1602MHz

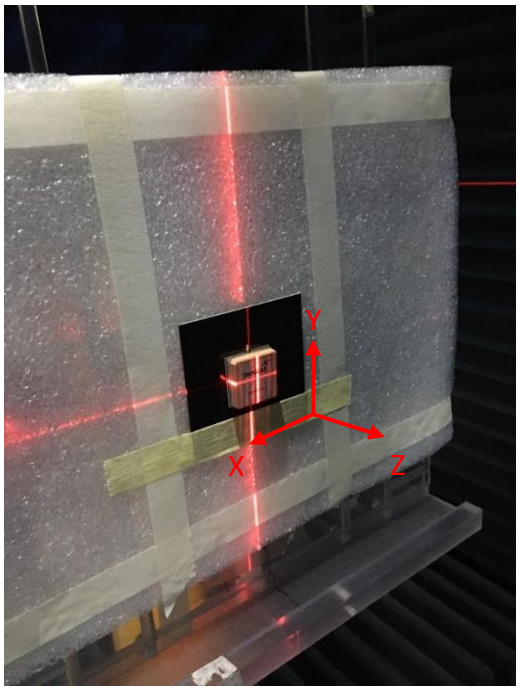




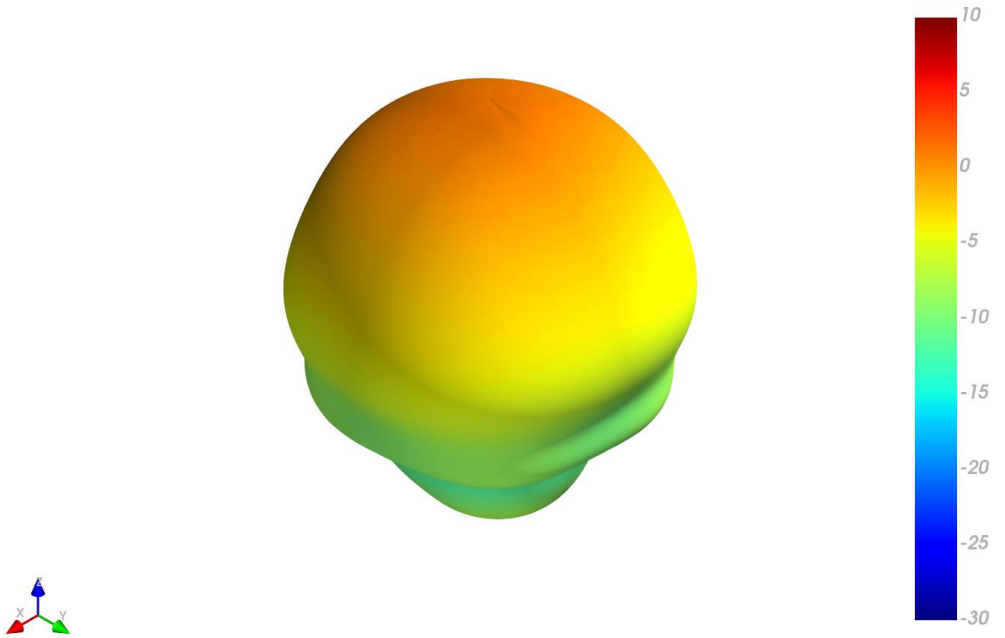
4. Radiation Patterns

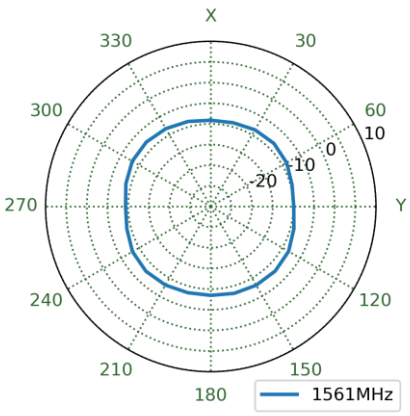
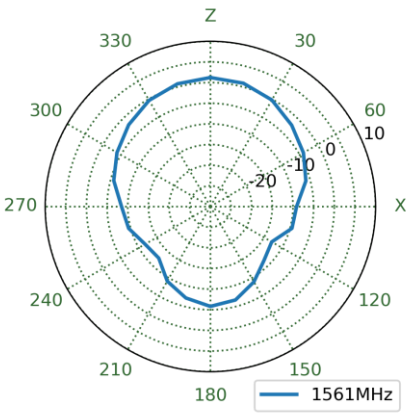
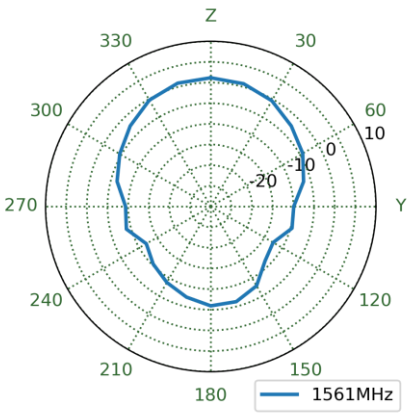
4.1 Test Setup



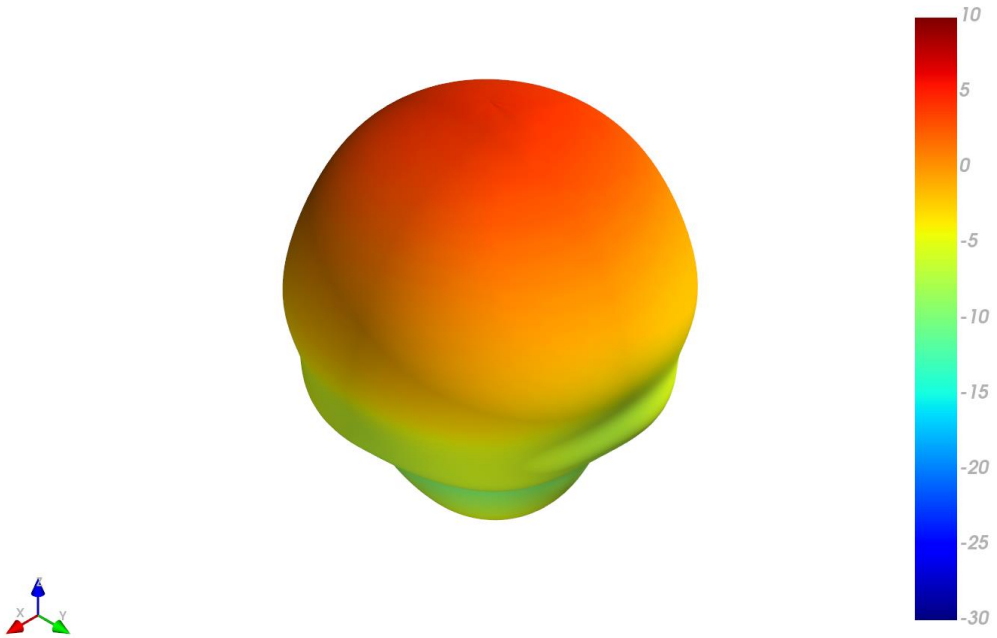


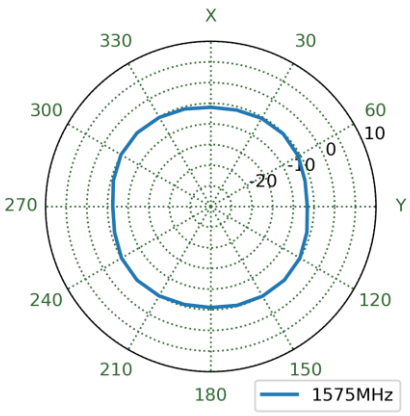
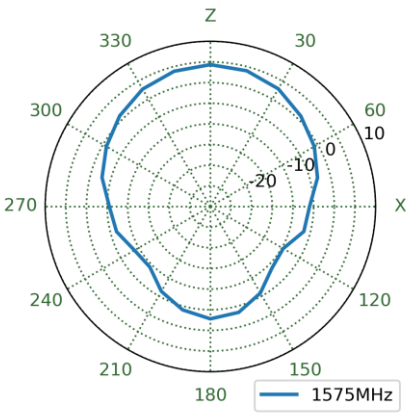
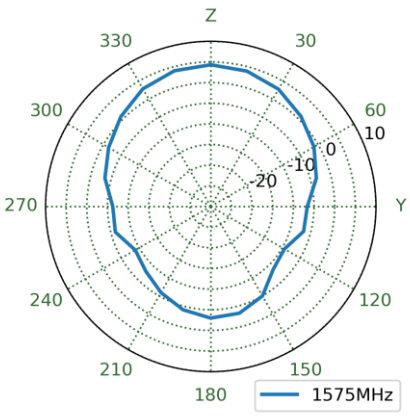
4.2 Radiation Patterns @1561MHz



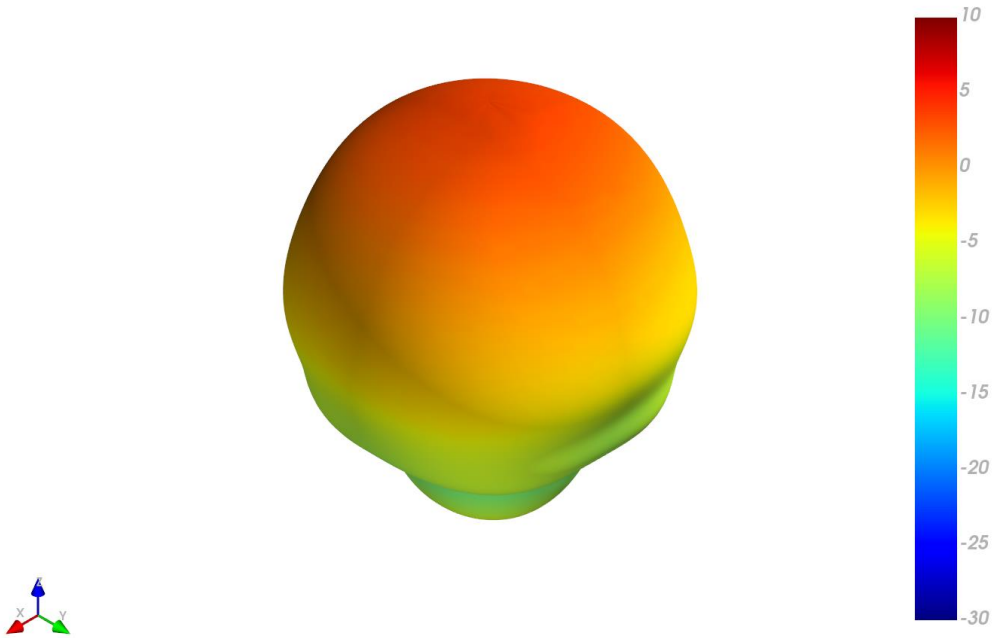
XY Plane	XZ Plane	YZ Plane
		

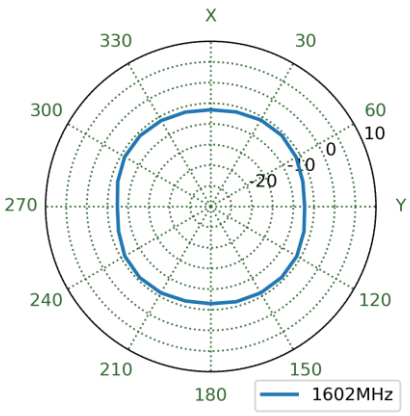
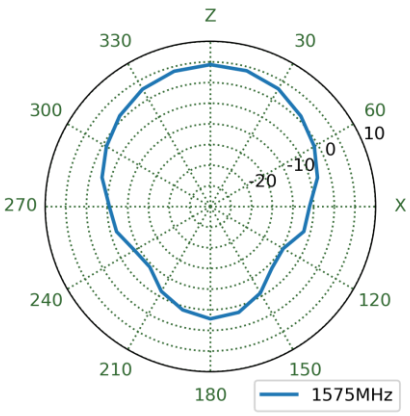
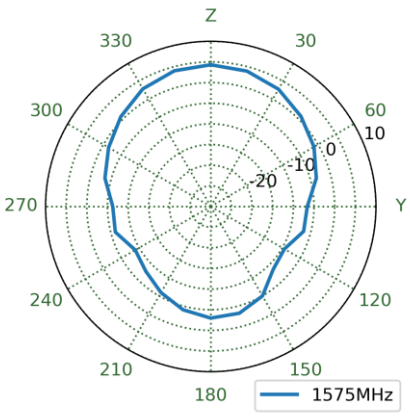
4.3 Radiation Patterns @1575MHz



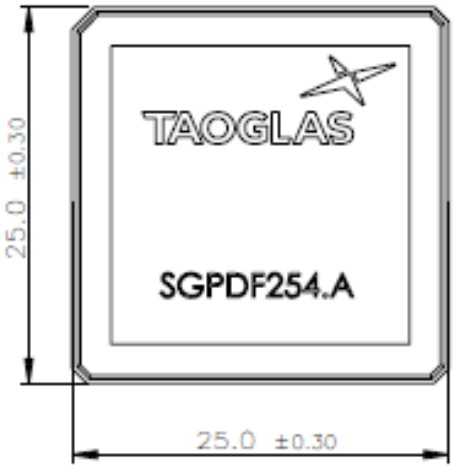
XY Plane	XZ Plane	YZ Plane
		

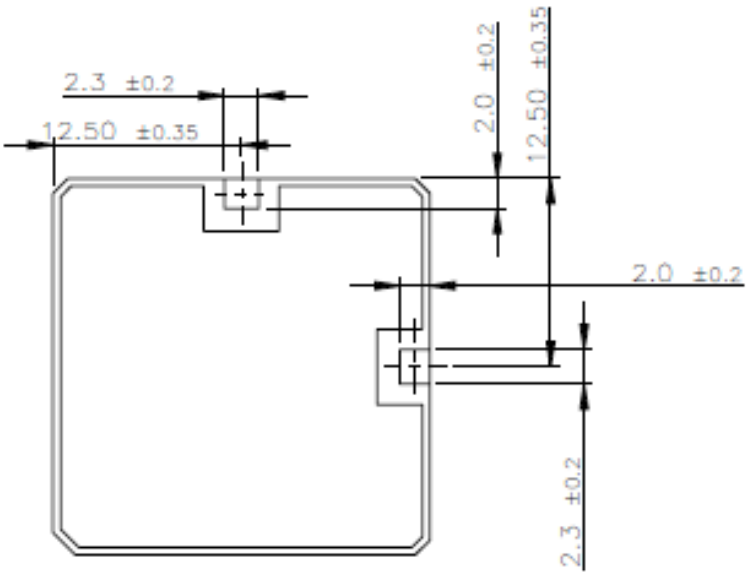
4.4 Radiation Patterns @1602MHz



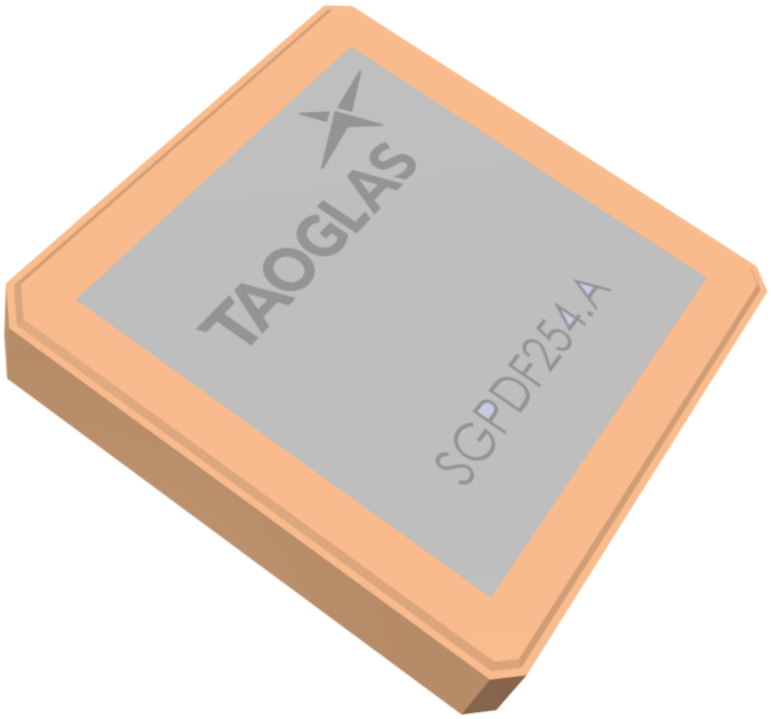
XY Plane	XZ Plane	YZ Plane
		

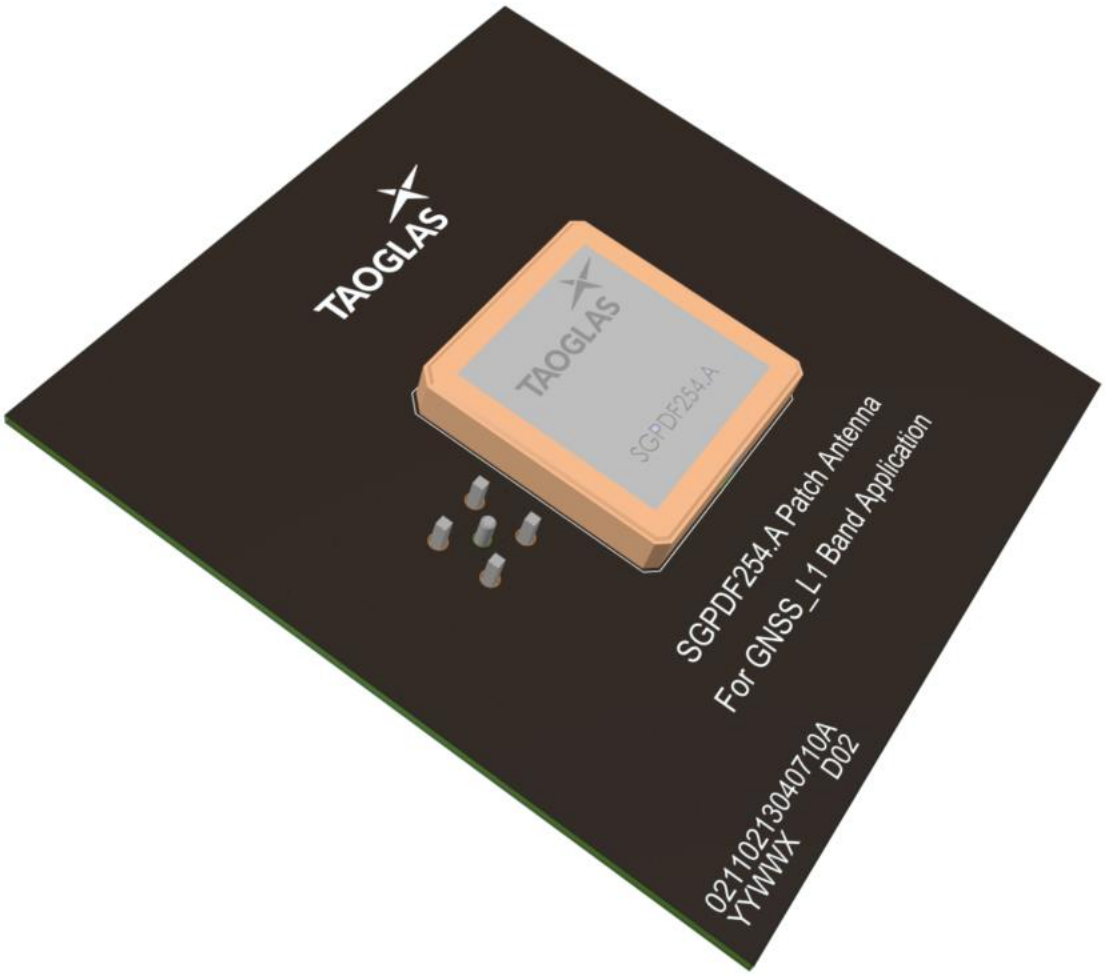
5. Mechanical Drawing





6. Antenna Integration Guide

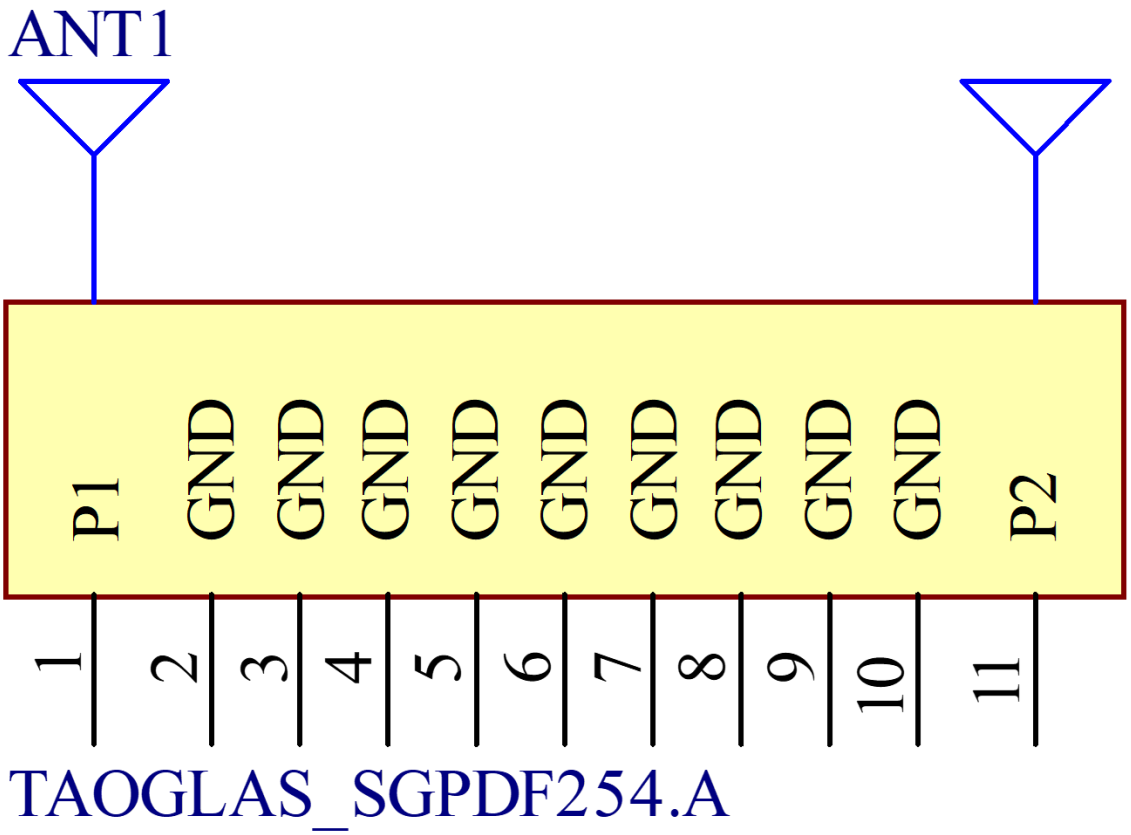




6.1 Schematic Symbol and Pin Definition

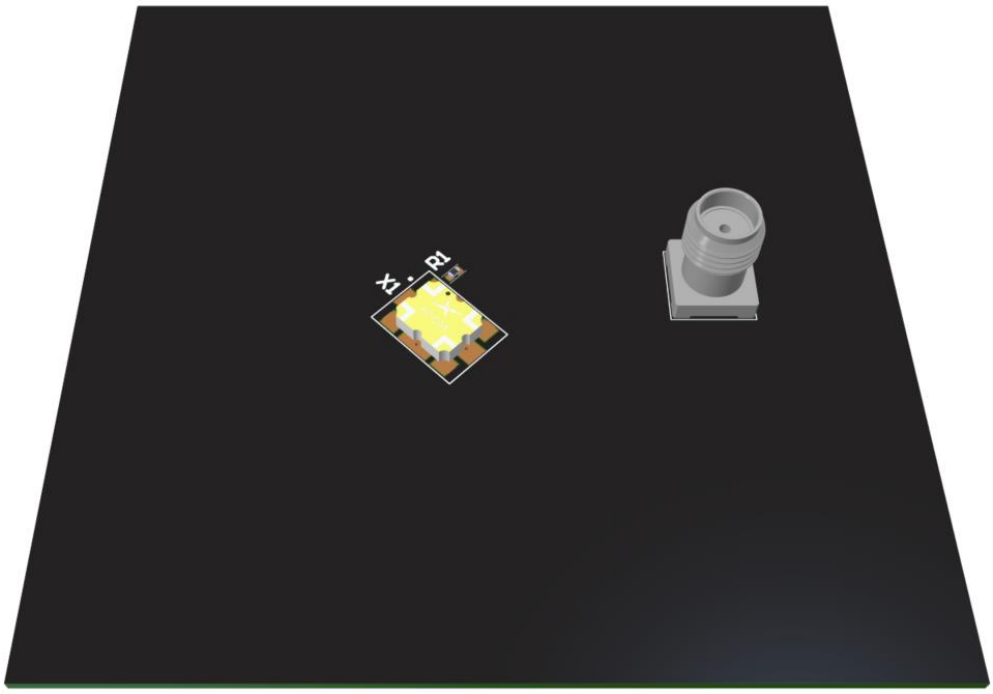
The circuit symbol for the antenna is shown below. The antenna has 11 pins as indicated below.

Pin	Description
1	RF Feed (Position 1)
2-10	Ground
11	RF Feed (Position 2)

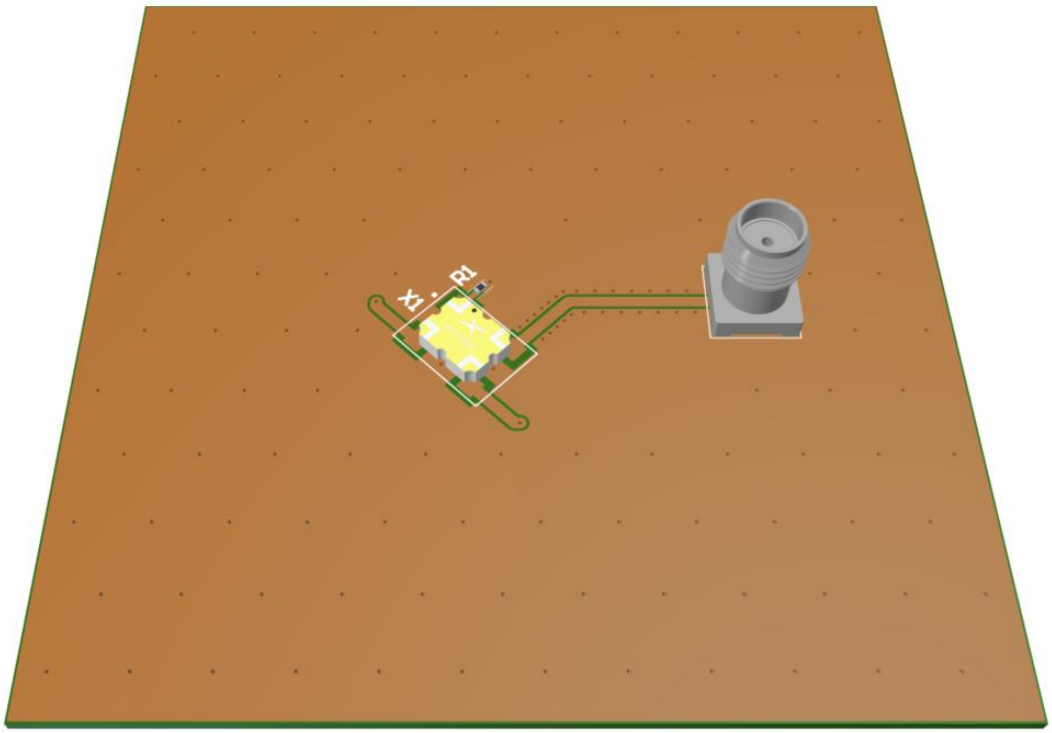


6.2 Antenna Integration

The antenna should be placed at the center of the ground plane with a length and width of 70mm. Maintaining a square 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.



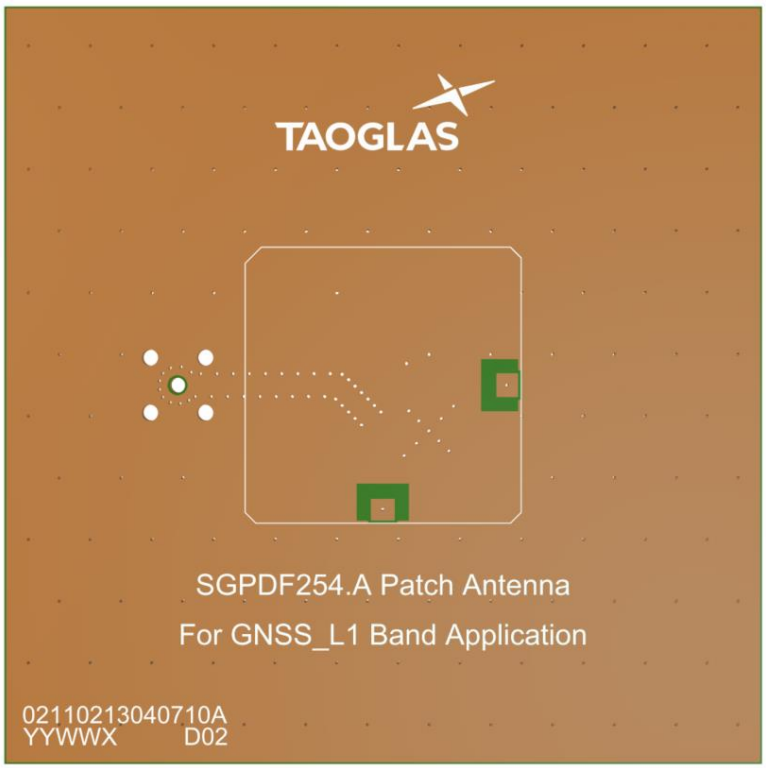
Bottom Side with Solder Mask



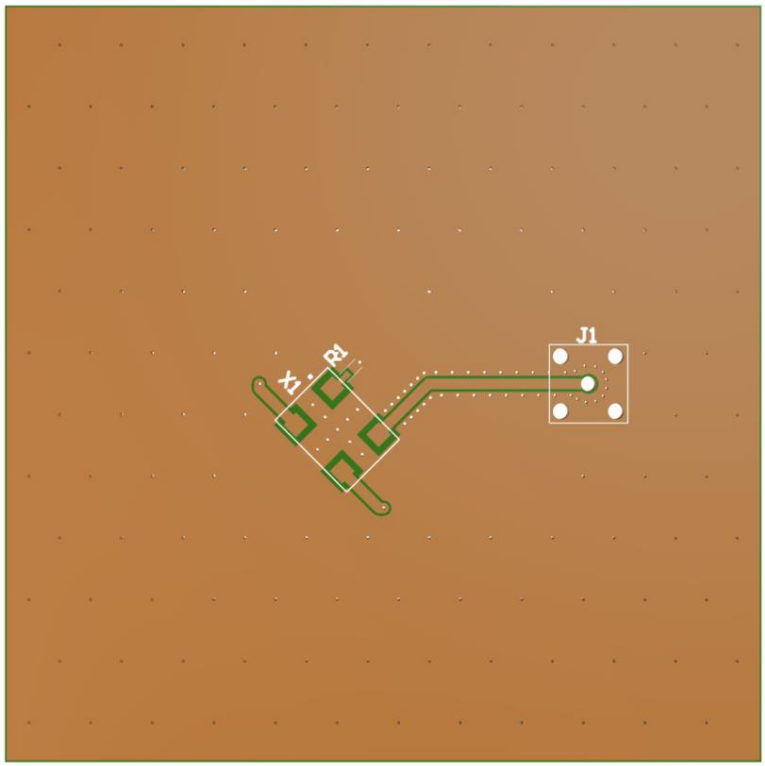
Top Side without Solder Mask

6.3 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.



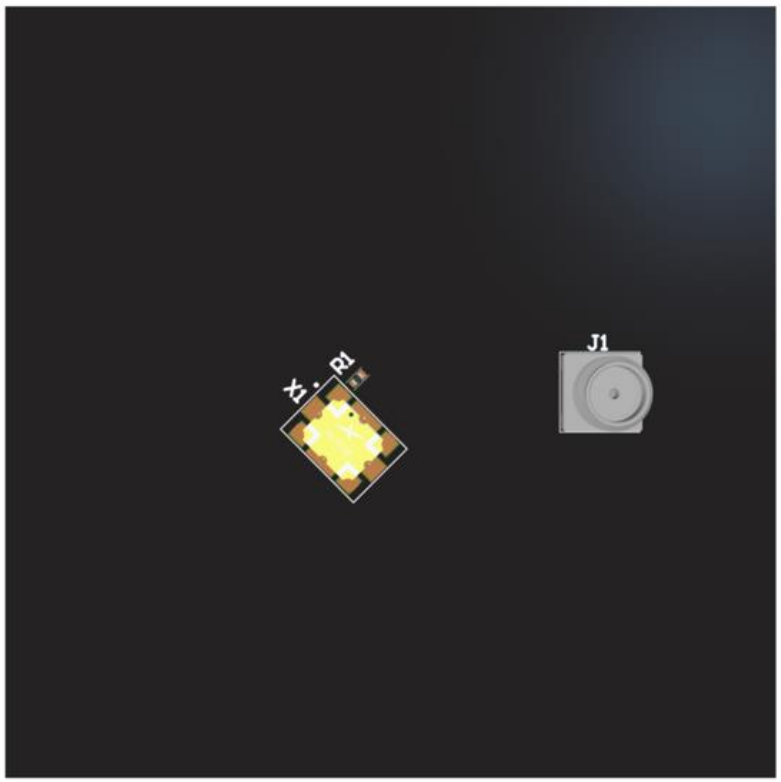
Topside



Bottom Side

6.4 Evaluation Board

Topside

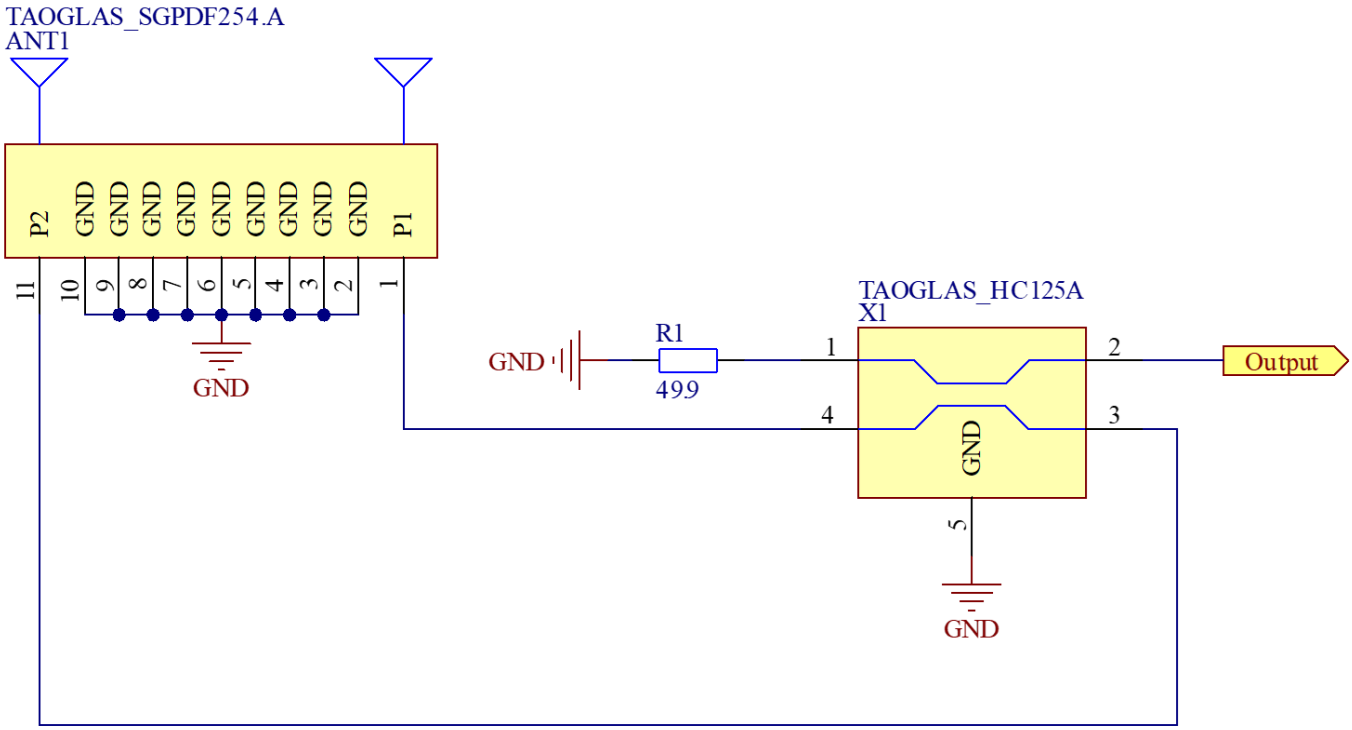


Bottom Side

6.5 Footprint

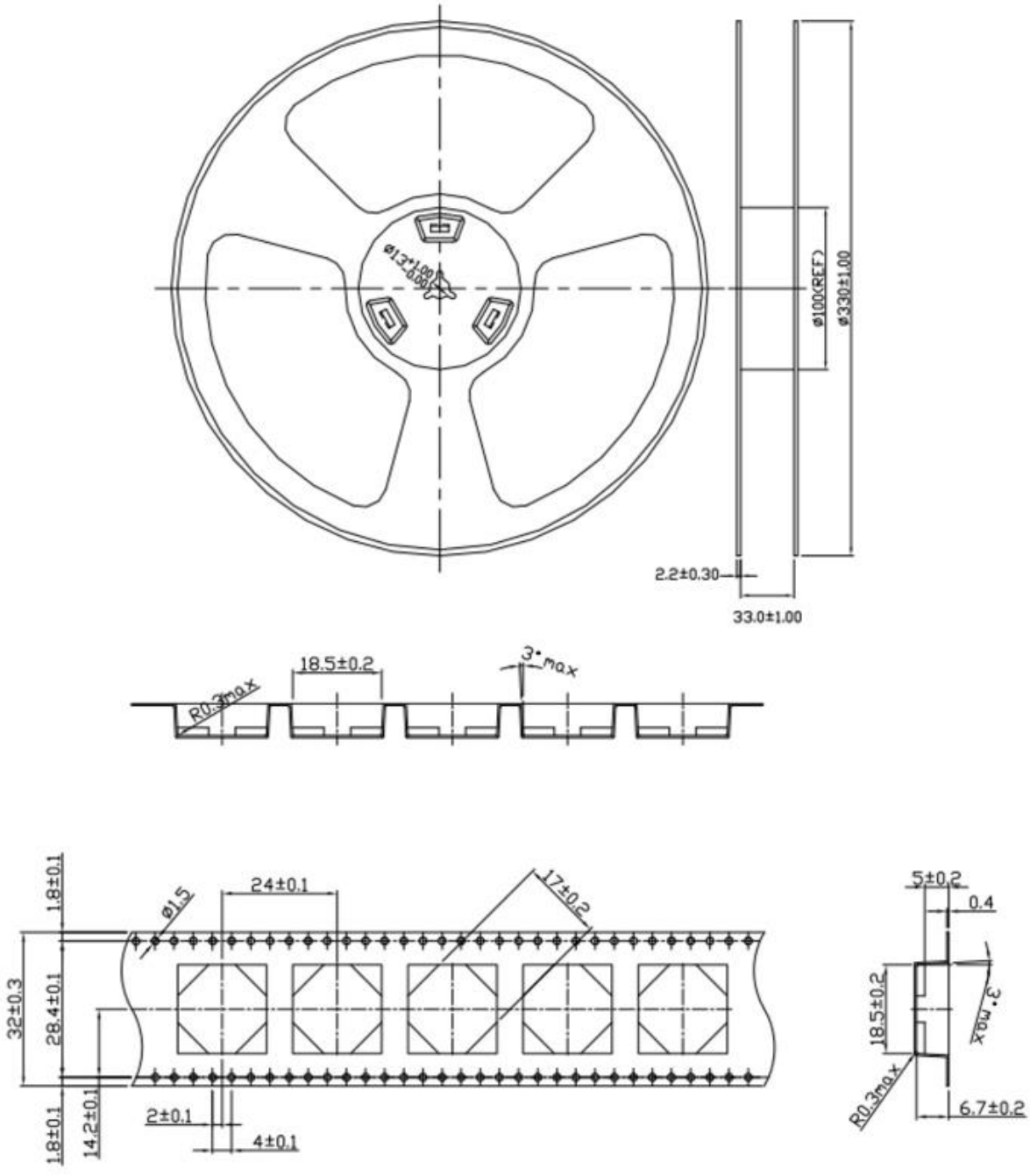
Each patch element uses an orthogonal feed that needs to be combined in a hybrid coupler to ensure optimal axial ratio. Taoglas recommends our HC125.A, a high-performance hybrid coupler specifically engineered for use with our multi feed patches. The HC125.As is required for this antenna. This hybrid coupler should be placed close to the antenna pins and terminated correctly using a 49.9ohm resistor in parallel. The output of the hybrid coupler can feed into a path for GNSS filtering and amplification

Designator	Type	Value	Manufacturer	Manufacturer Part Number
R1	Resistor	49.9 Ohms	Panasonic Electronic Components	ERJ-2RKF49R9X

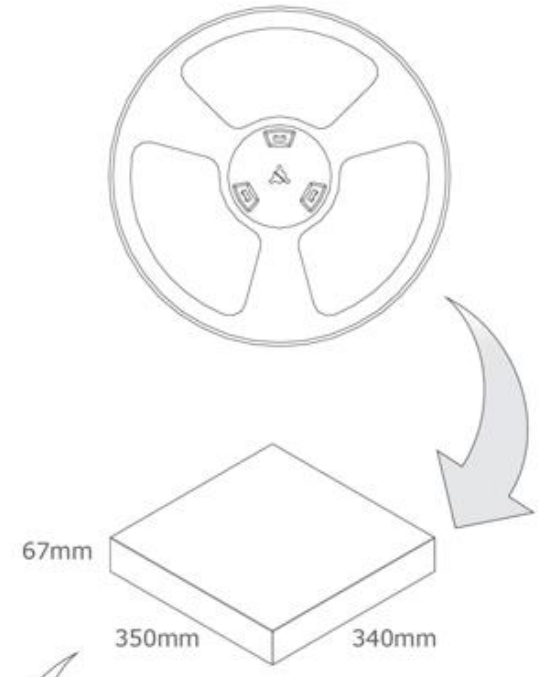


7. Packaging

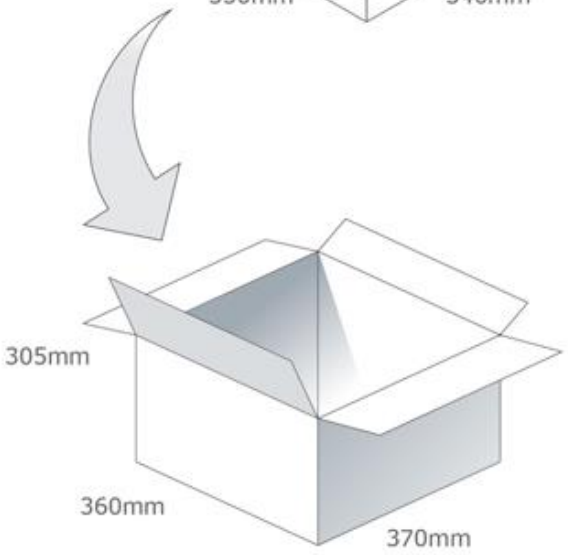
200 pc SGPDF254.A per reel
Dimensions – Ø330*33mm
Weight – 2.125Kg



200 pc SGPDF254.A per small box
Dimensions – 350*340*67mm
Weight – 2.125Kg

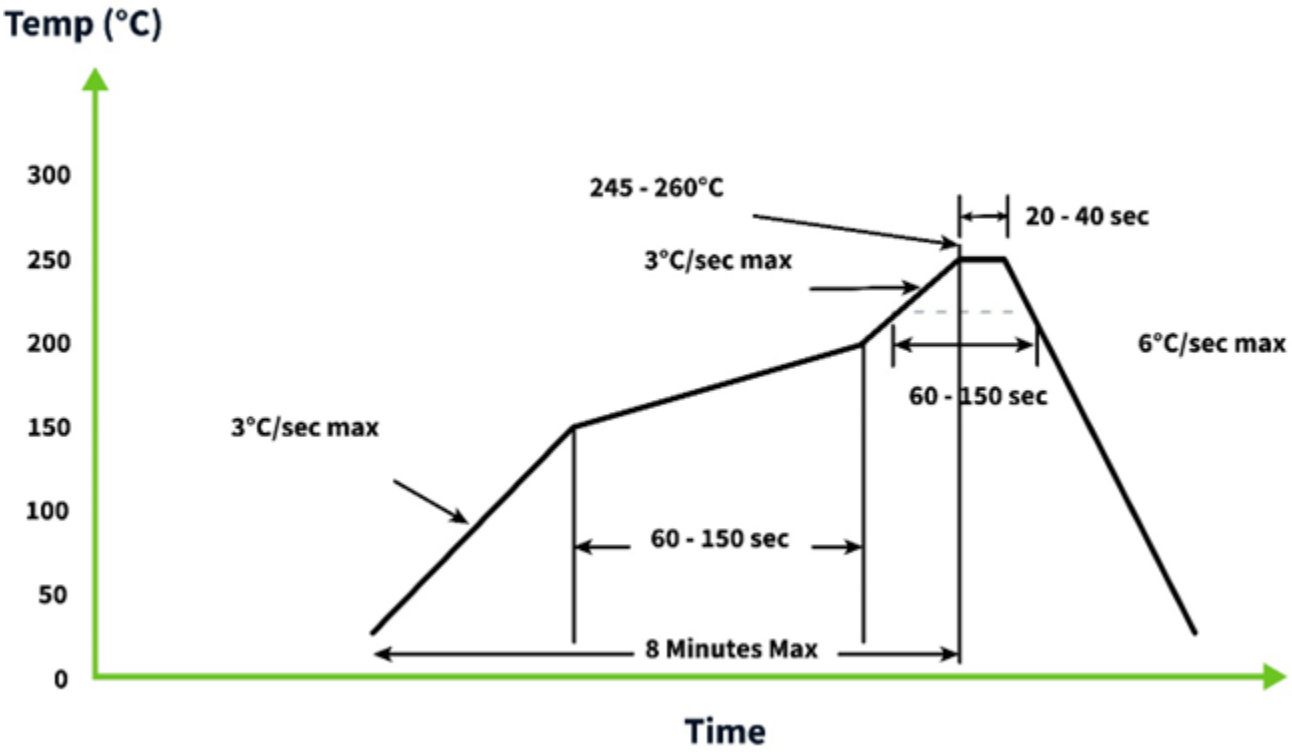


800 pc SGPDF254.A per carton
Dimensions – 370*360*305mm
Weight – 8.5Kg



8. Solder Reflow Profile

The SGPDF254.A can be assembled by following the recommended soldering temperatures are as follows:

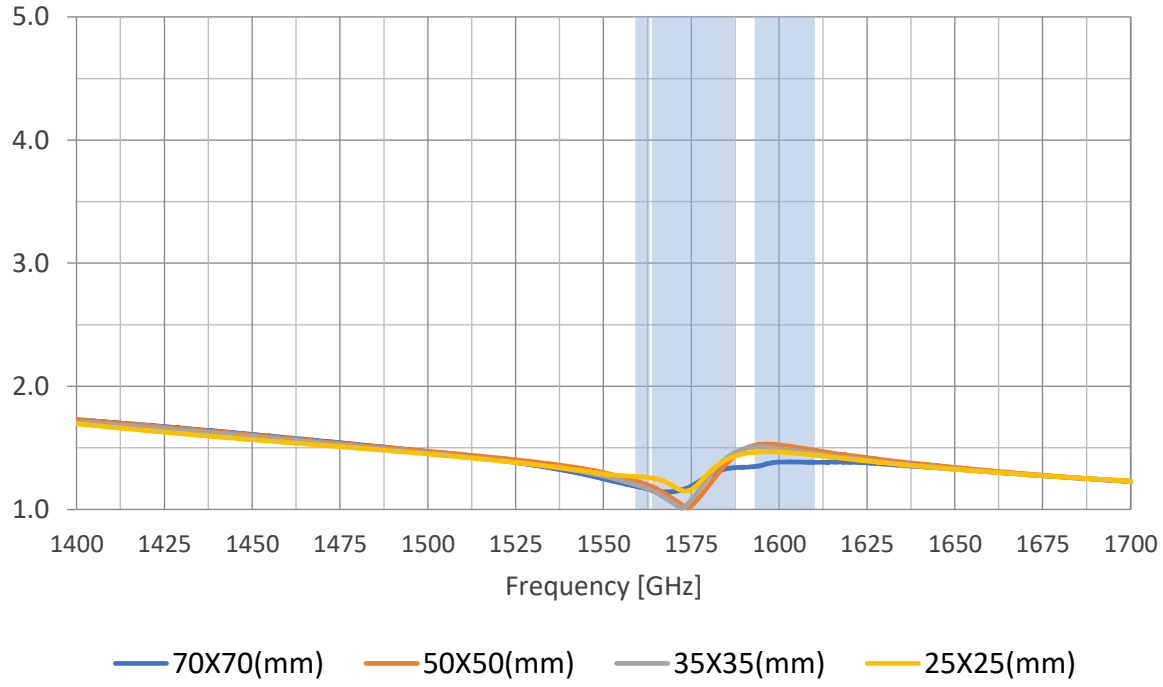


The is not limited to the number of passes through the reflow process. Smaller components are typically mounted on the first pass, however, we do advise mounting the when placing larger components on the board during subsequent reflows.

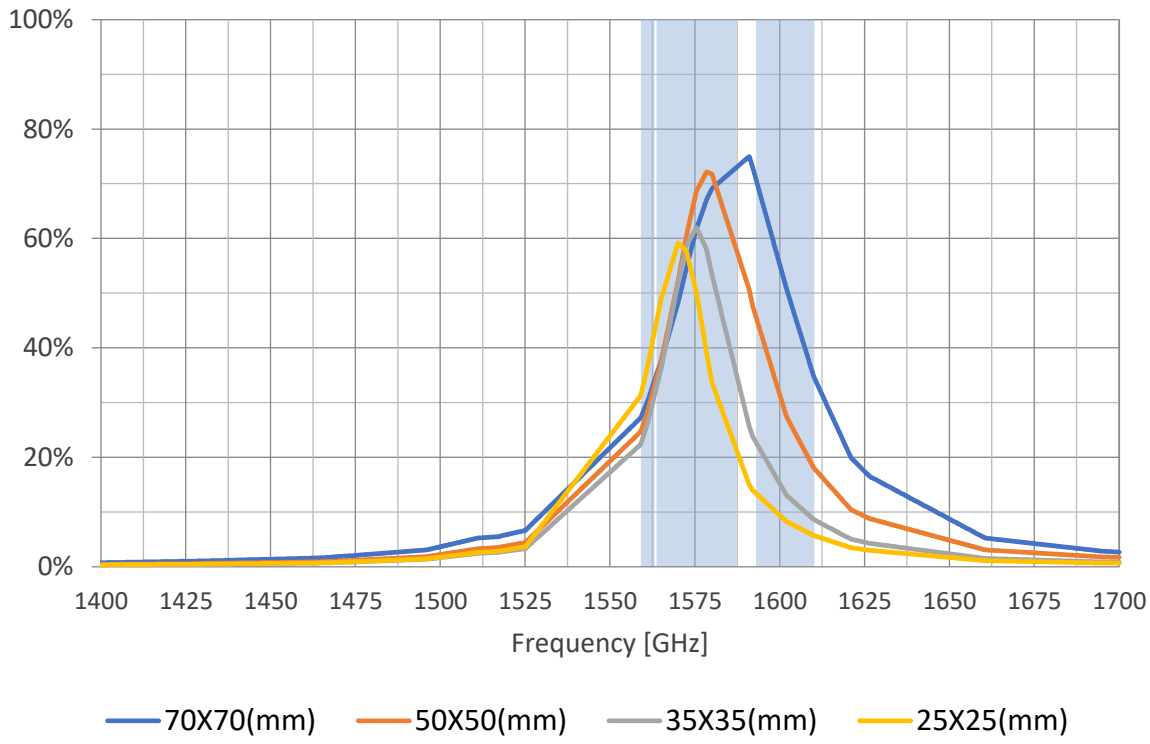
9. Application Note

The SGGB254.A performance varies at different ground plane sizes, the results are shown in this section

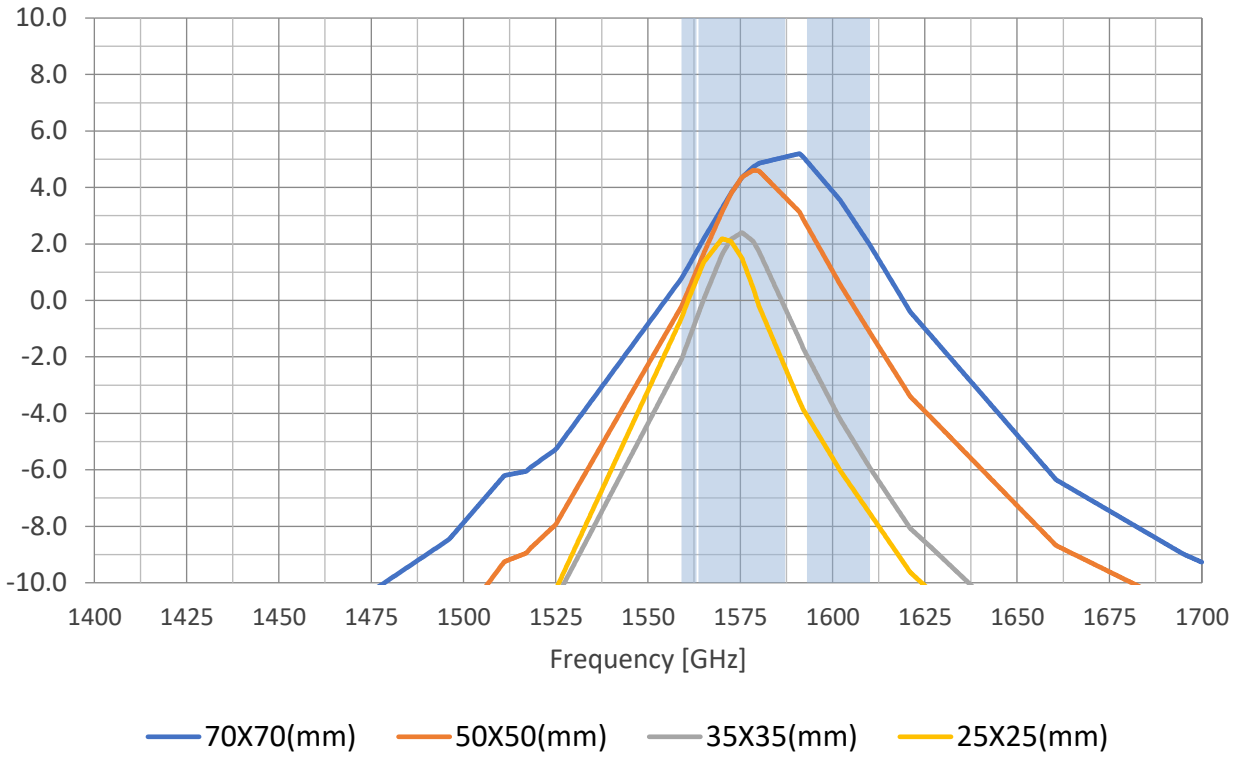
9.1 VSWR



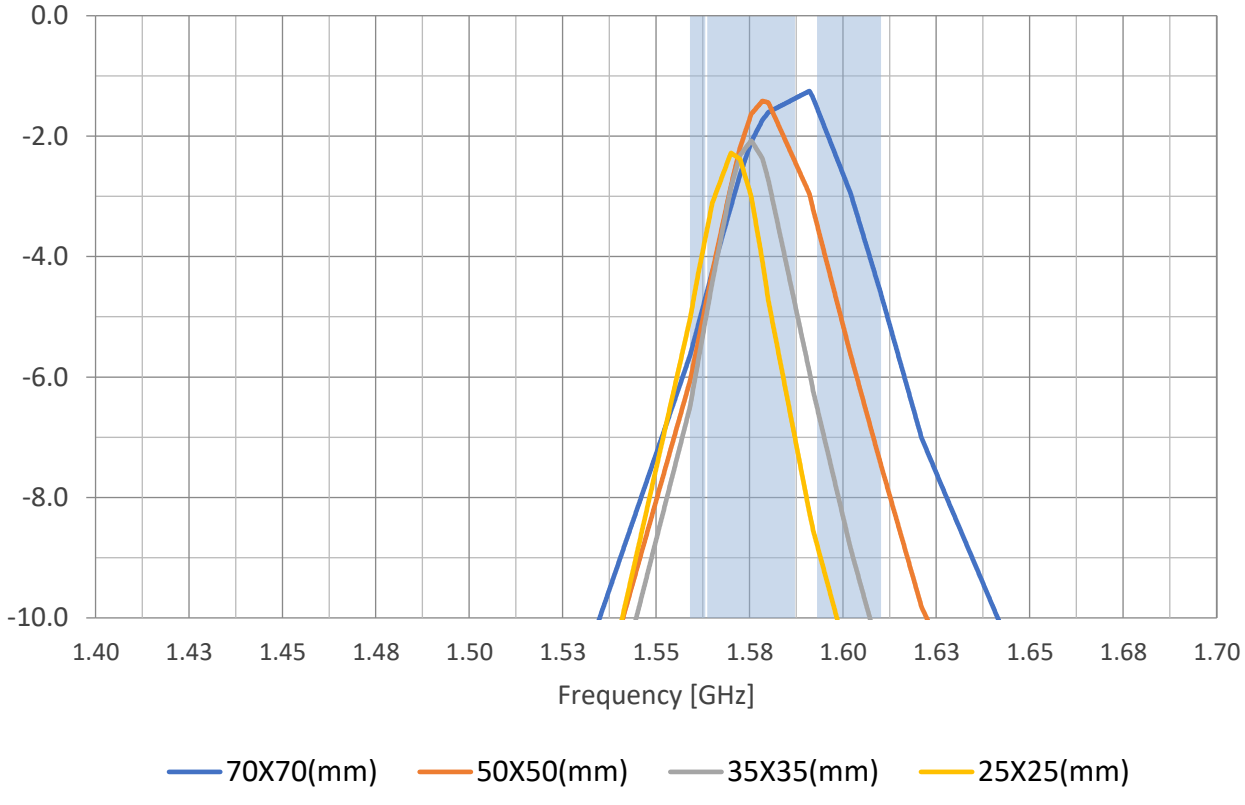
9.2 Efficiency



9.3 Peak Gain



9.4 Efficiency



Changelog for the datasheet

SPE-23-8-189- SGPDF254.A

Revision: A (Original First Release)	
Date:	2023-06-22
Notes:	Initial Release
Author:	Gary West

Previous Revisions

TAOGLAS®

www.taoglas.com

Mouser Electronics

Authorized Distributor

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Taoglas:

SGPDF254.A