



TAOGLAS®



Datasheet

Active GNSS Surface Mount 25mm Patch

Part No:
ASGGB254.A

Description:

GPS/GLONASS/BeiDou/Galileo SMD Active Patch
with Embedded Active Circuitry

Features:

Covers bands:

- GPS L1
- GLONASS G1
- Galileo E1
- BeiDou B1

Embedded Active Circuitry

SMD Antenna – No Cable and Connector Required

Dimensions: 25*25*6.5mm

Designed for a 70*70mm Ground plane

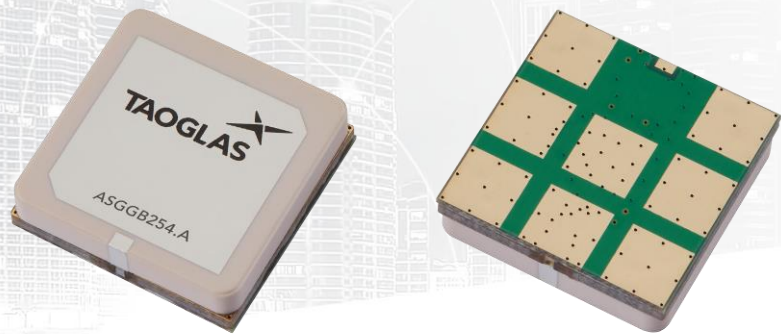
RoHS & Reach Compliant

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1. Introduction



The Taoglas ASGGB254.A is a single band active GNSS patch covering GPS/GLONASS/BeiDou/Galileo. With hidden active circuitry embedded between the ceramic patch and PCB base, it has been designed to allow the user to mount it directly onto their device PCB. This eliminates the need for using a cable and connector thus speeding up the assembly process by allowing successfully solder surface mount components to a circuit board via the SMD process. The ASGGB254 measures 25 x 25 x 6.45mm and is optimized for a ground plane size of 70*70mm being required for operation however smaller ground planes can be used.

The ASGGB254 also includes a two-stage LNA and a front-end SAW filter to reduce out of band noise such as from nearby cellular transceivers and this improves the probability of the wireless device passing radiated spurious emissions certification. As with many high performance Taoglas patches, the ASGGB 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. If space on a user device is at a premium, a smaller patch, the 18x18mm ASGGB184.A is also available.

Typical applications include:

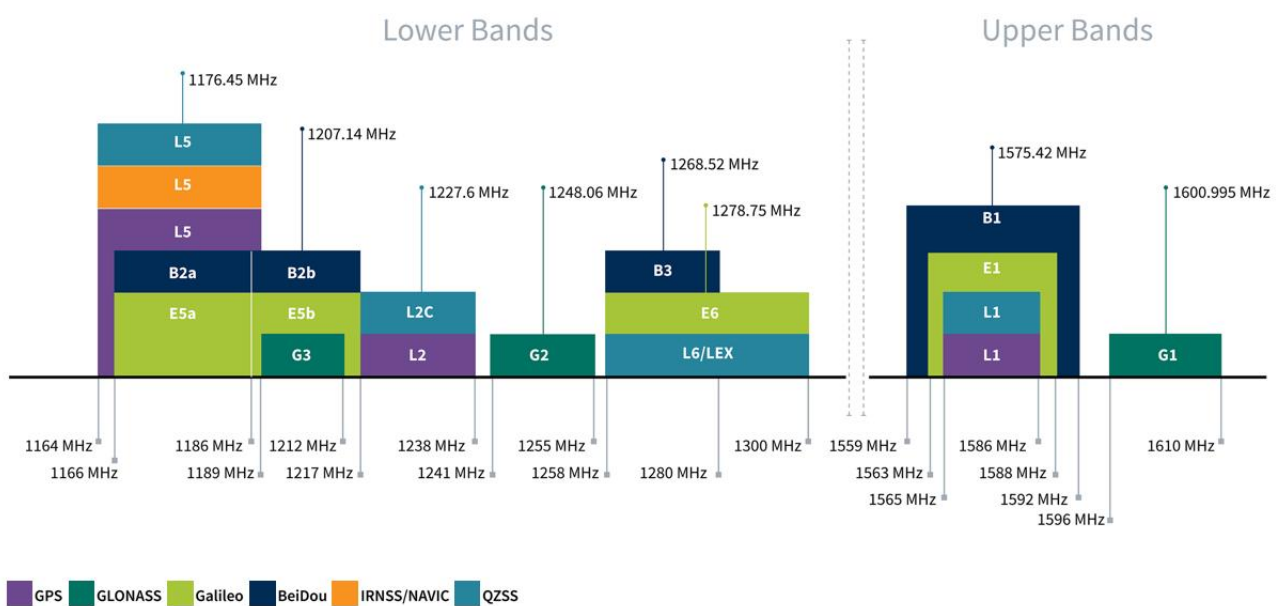
- Navigation
- Commercial Transportation
- Asset Tracking

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

2. Specifications

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

*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)	1561	1575.42	1602
VSWR (max.)	3.5	2.7	3.8
Passive Antenna Efficiency (%)	51	69.6	52.9
Passive Antenna Gain at Zenith (dBi)	1	2.7	2.1
Average Gain (dB)	-2.9	-1.6	-2.8
Axial Ratio (dB)	17.6	10	16.2
Polarization	RHCP		
Impedance	50Ω		
Field Test Results			
TTF	20.86s		
PDOP	0.929		
2*DRMS	78cm		

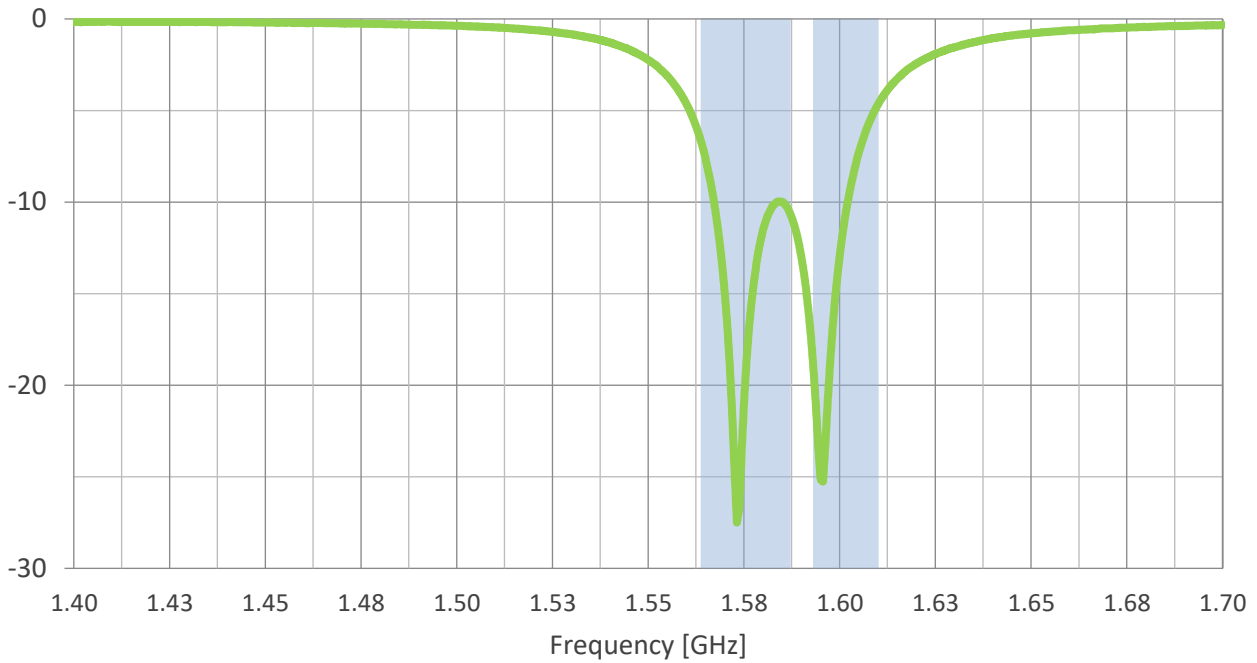
*Tested on 70*70mm Ground Plane, in an open sky environment with U-blox Zed-F9P receiver

LNA and Filter Electrical Properties			
Frequency (MHz)	1561	1575.42	1602
VSWR (max.)	2:1	2:1	2:1
Gain@1.8V (Typ.)	29.94	30.22	29.47
Gain@3.0V (Typ.)	30.32	30.60	29.79
Gain@5.5V (Typ.)	30.93	31.22	30.46
Noise@1.8V (Typ.)	2.50	2.29	2.63
Noise@3.0V (Typ.)	2.49	2.29	2.67
Noise@5.5V (Typ.)	2.46	2.32	2.63
Power consumption@1.8V (Typ.)	9.11		
Power consumption@3.0V (Typ.)	9.35		
Power consumption@5.5V (Typ.)	11.06		
Total Specification (Through Antenna, SAW Filter and LNA)			
Frequency (MHz)	1575.42	1602	
Gain@3V (dBi)	30±5 dBi	30±5 dBi	
Output Impedance	50 Ω		

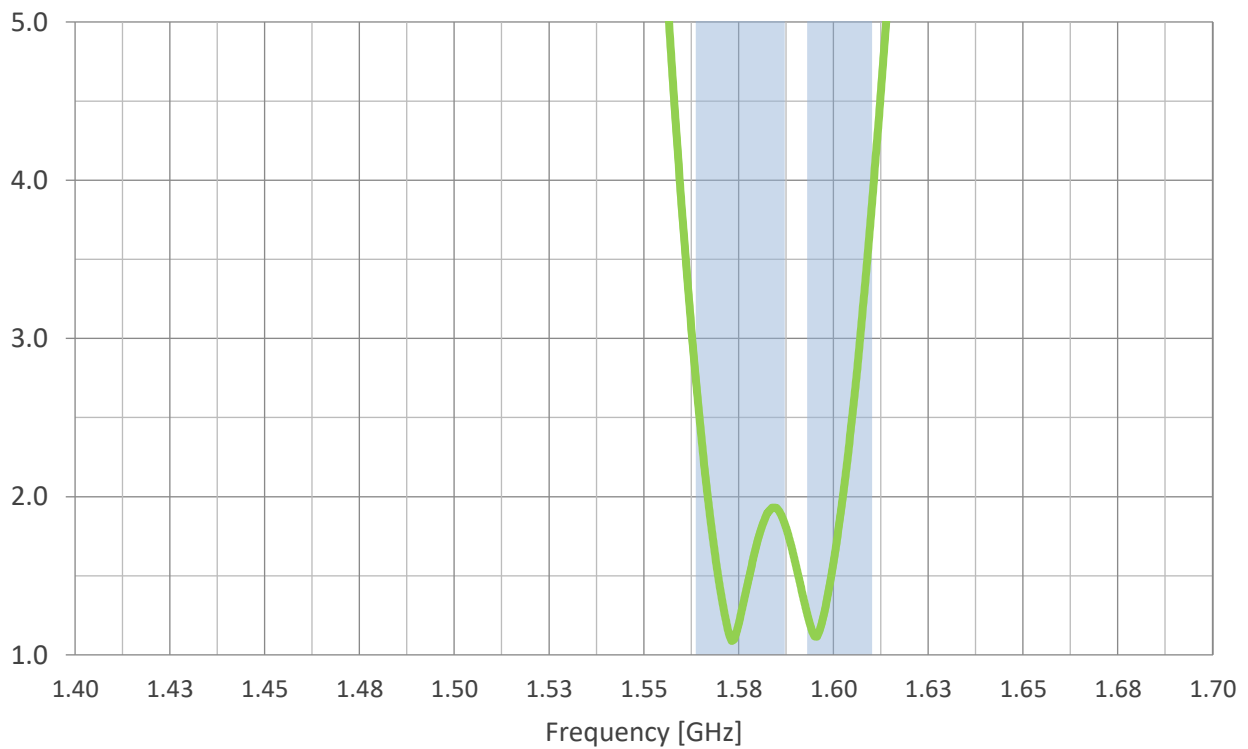
Mechanical	
Height	6.45mm
Planner Dimension	25*25mm
Material	Ceramic
Ground Plane Size	50*50mm
Weight	12g
Environmental	
Temperature Range	-40°C to 85°C

3. Antenna Characteristics

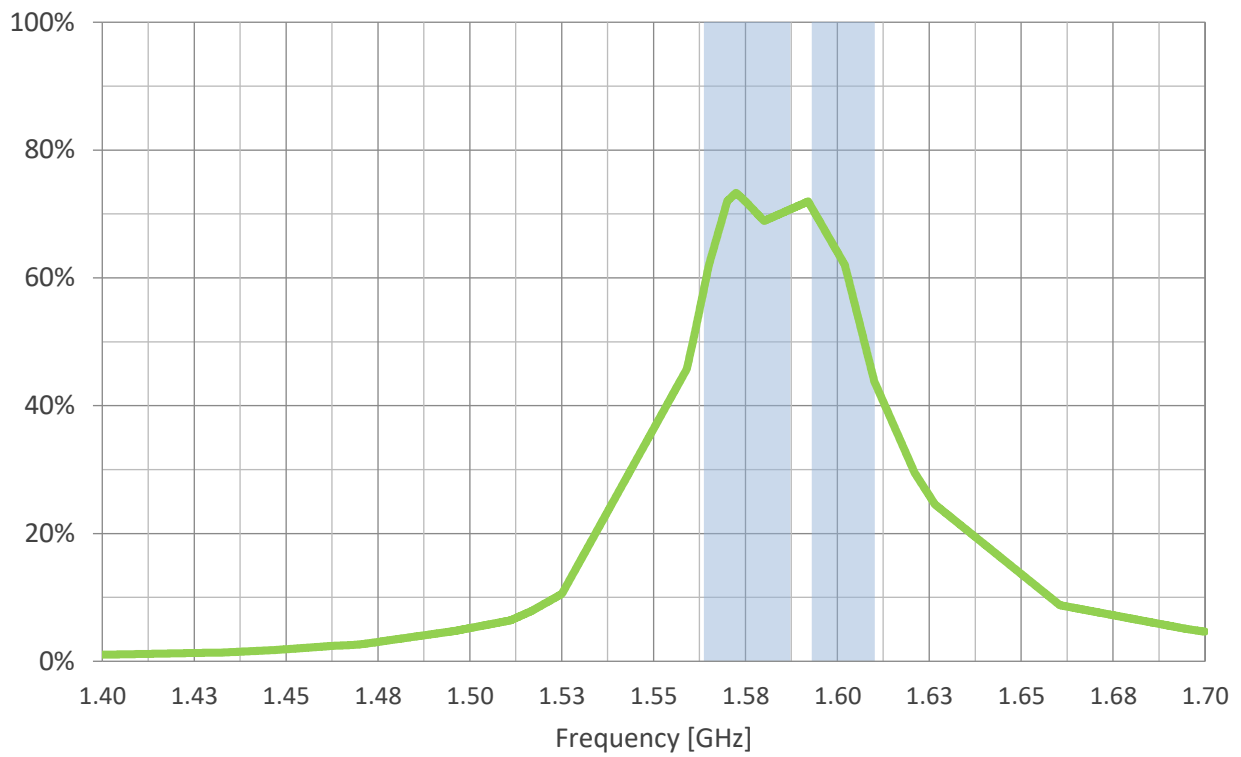
3.1 Return Loss



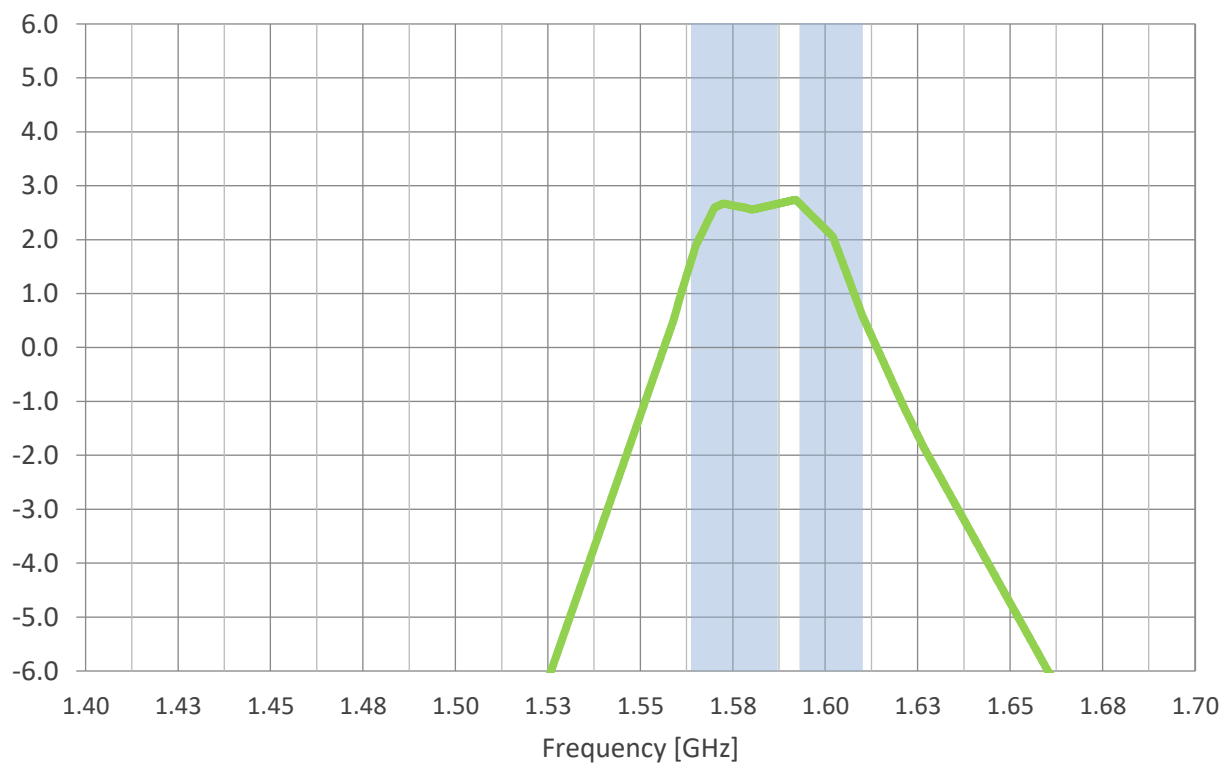
3.2 VSWR



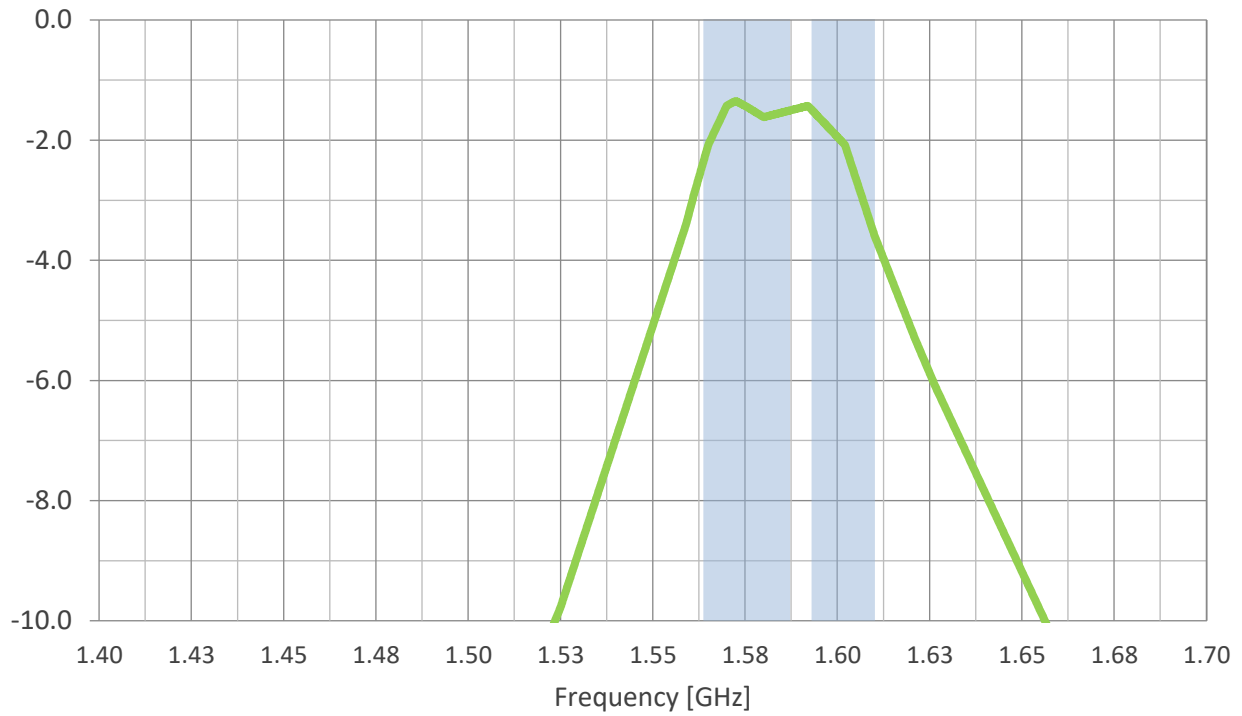
3.3 Efficiency



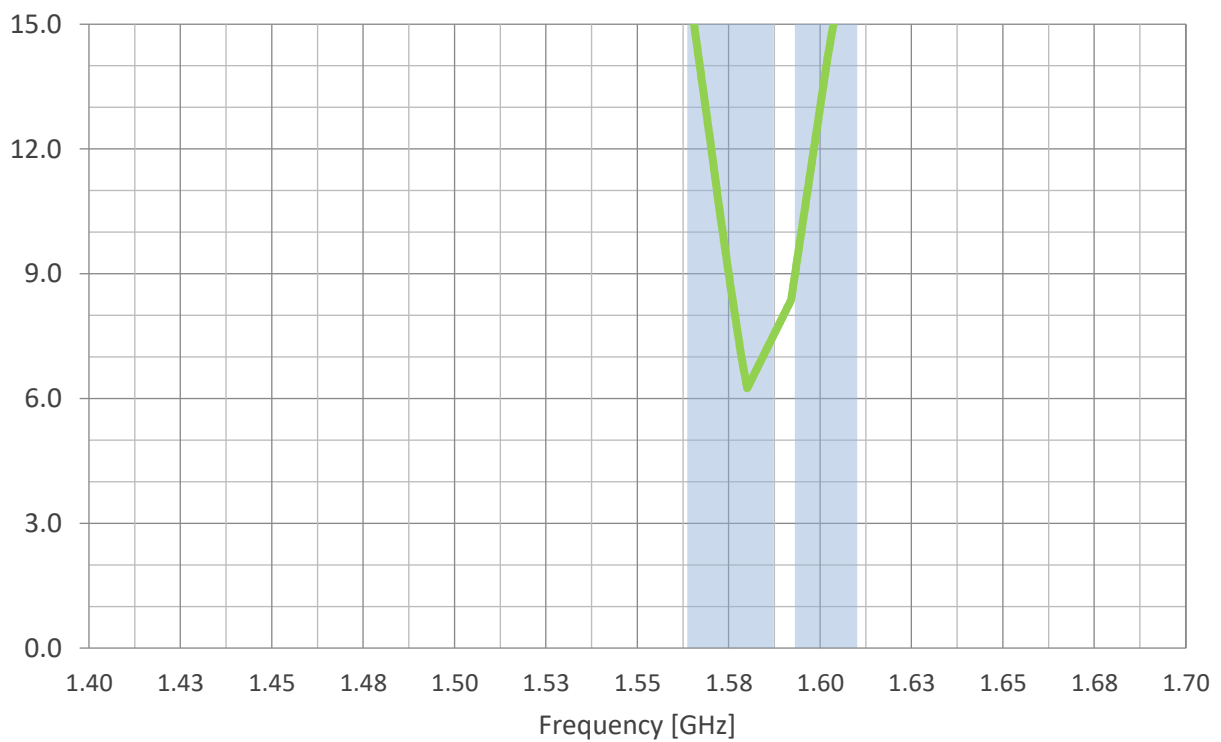
3.4 Peak Gain



3.5 Average Gain



3.6 Axial Ratio vs Frequency

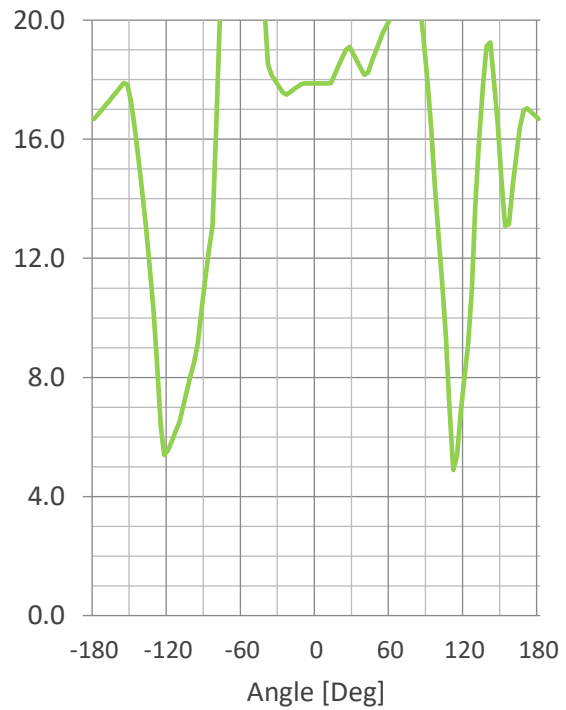
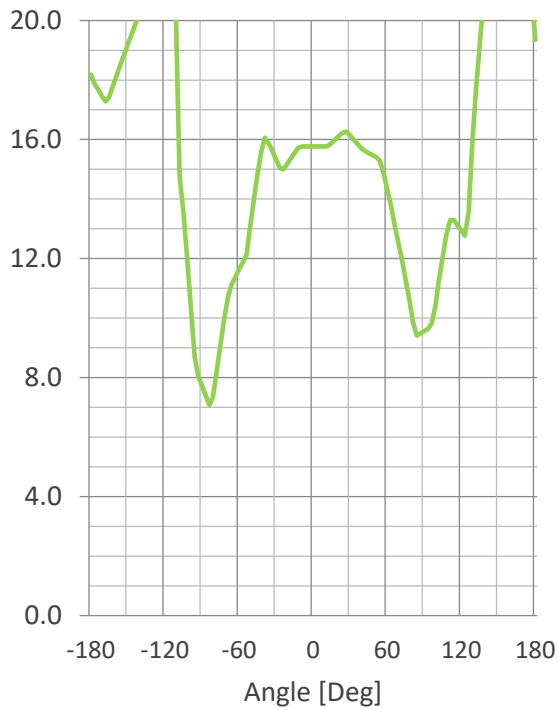


3.7 Axial Ratio Degrees

1561MHz

Phi = 0

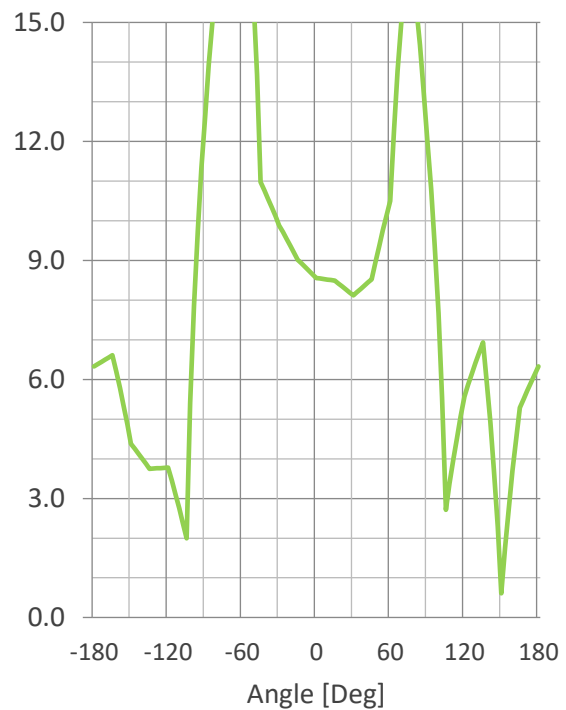
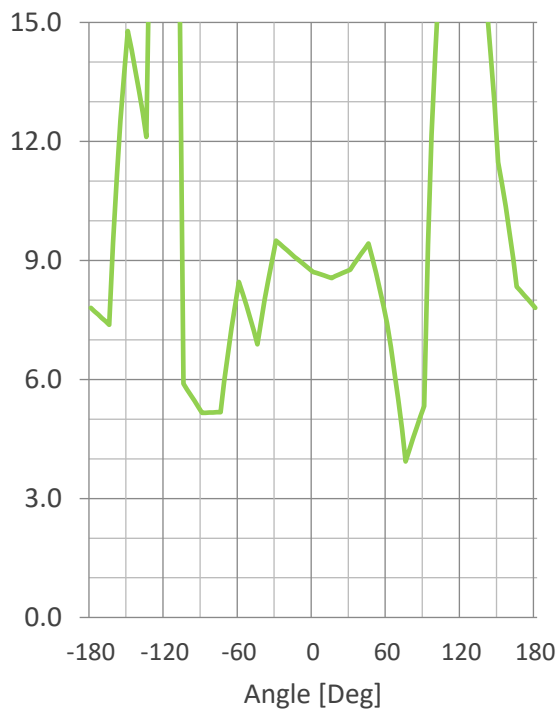
Phi = 90



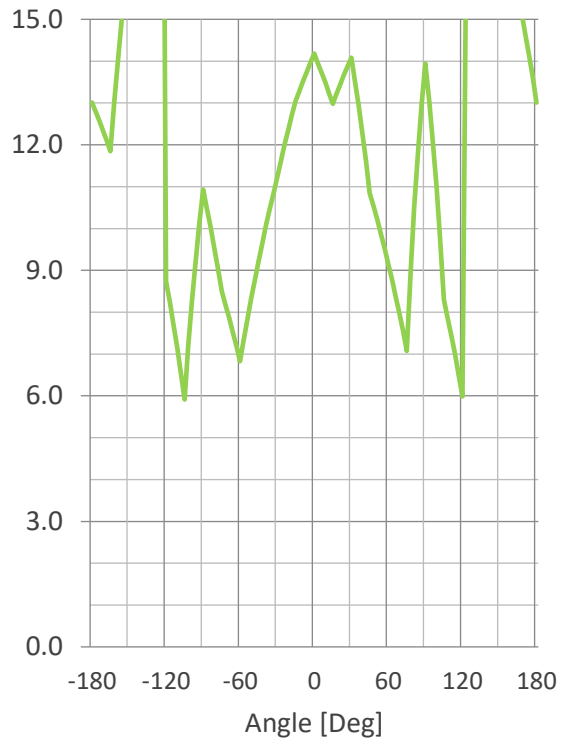
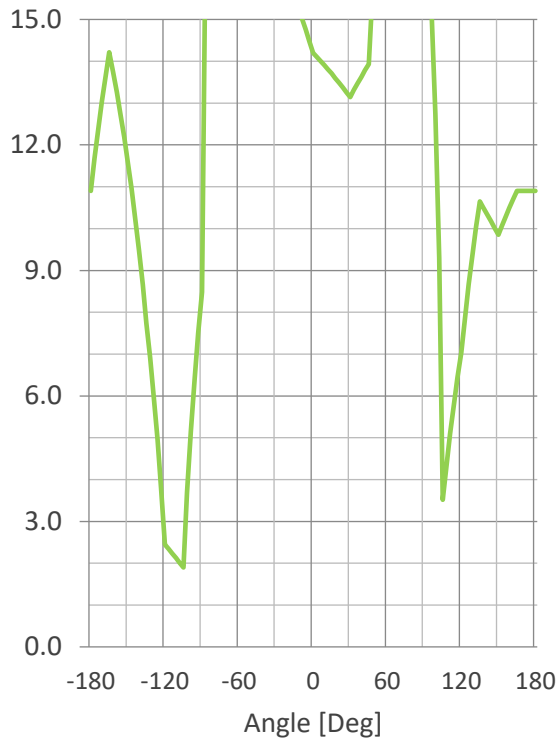
1575.42MHz

Phi = 0

Phi = 90

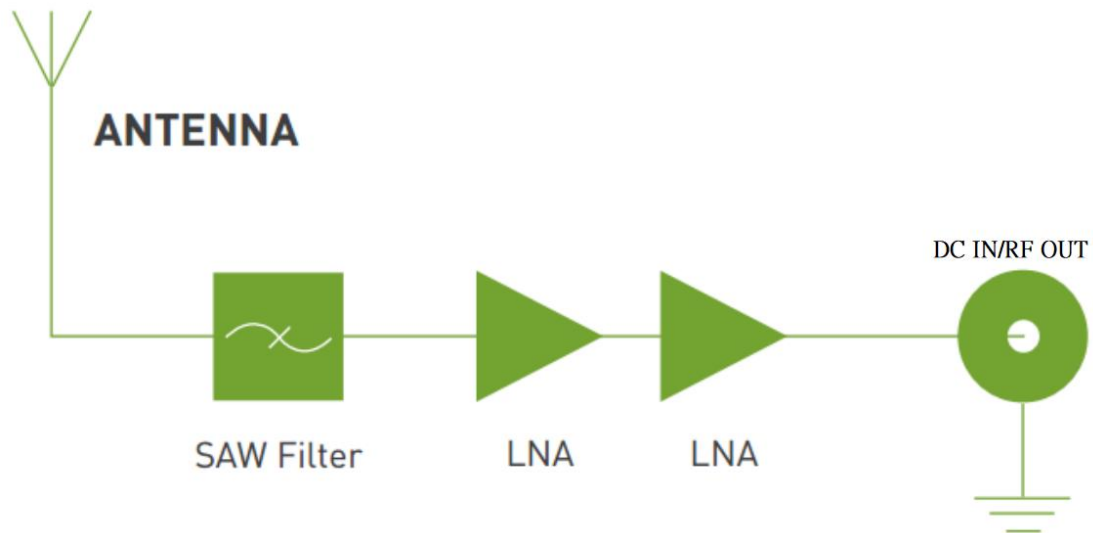


1602MHz

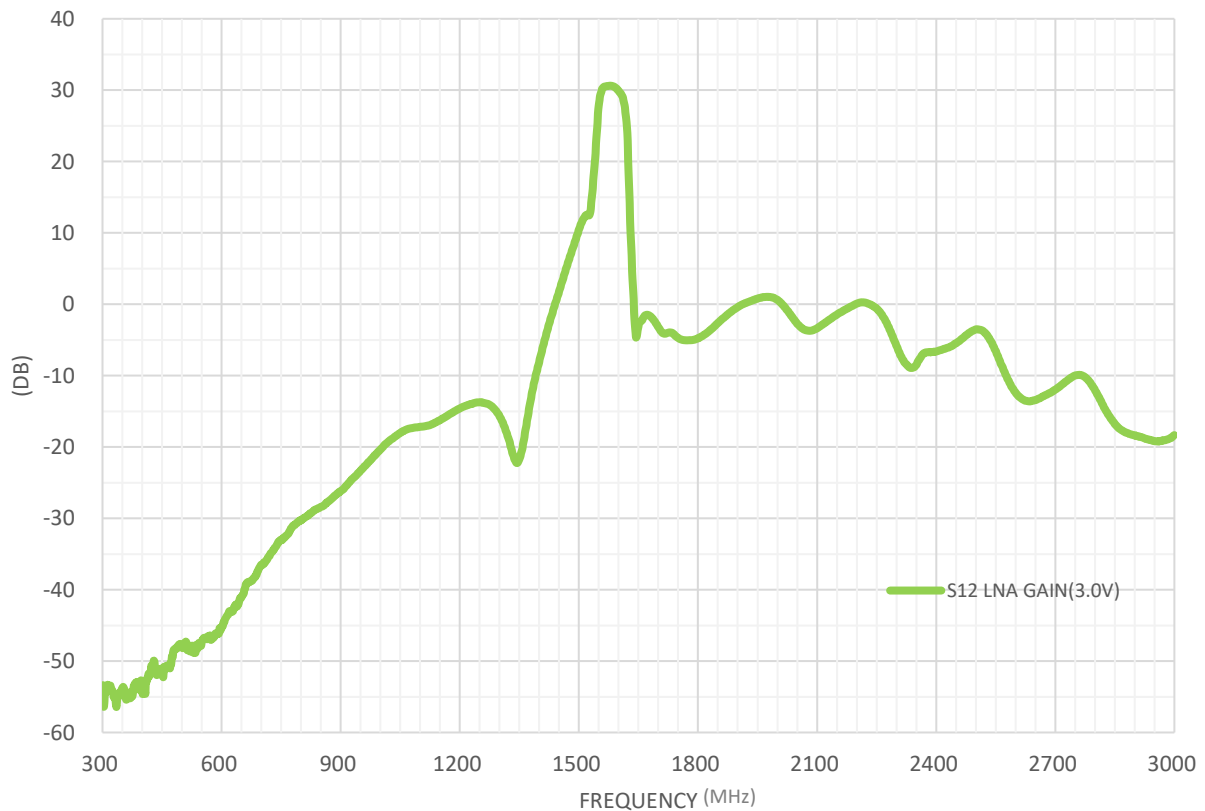


4. LNA Characteristics

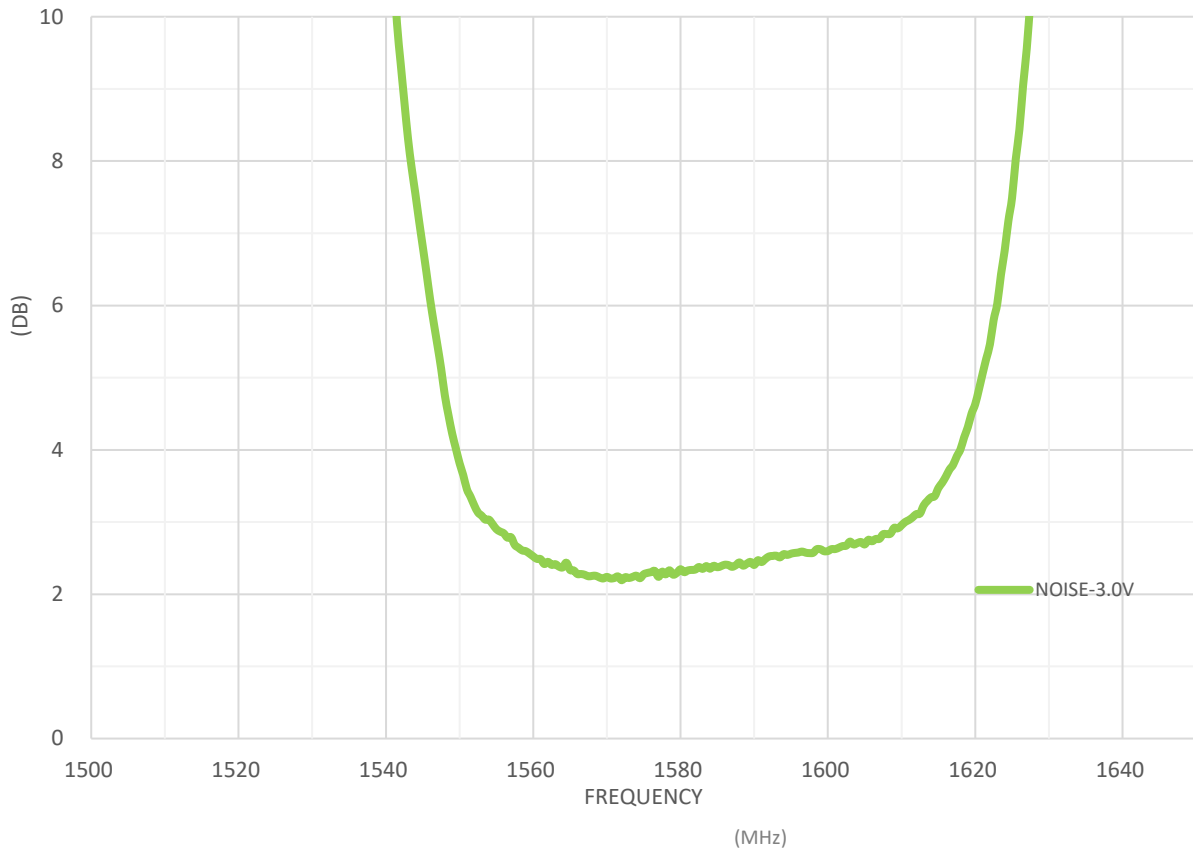
4.1 LNA Block Diagram



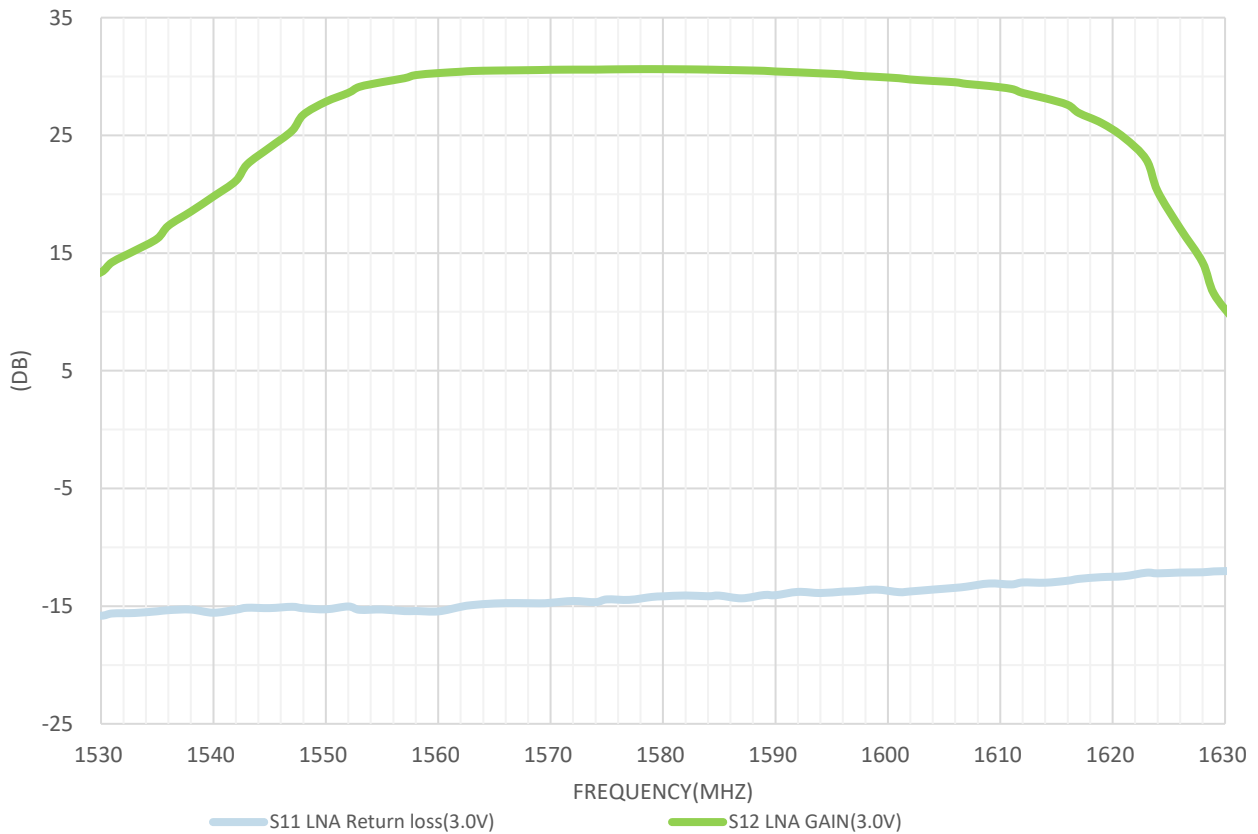
4.2 LNA Gain



4.3 Noise Figure @ 3.0V



4.4 LNA Gain @ 3.0V



5. Field Test Results

In this section Taoglas will present the field test result for ASGGB254.A antenna. The test was performed when the antenna was mounted on a static rooftop test set up in an open sky environment for at least **6 hours**.

Taoglas will show the field test results using the following receivers:

5.1 Ublox ZED-F9P

Receiver features:

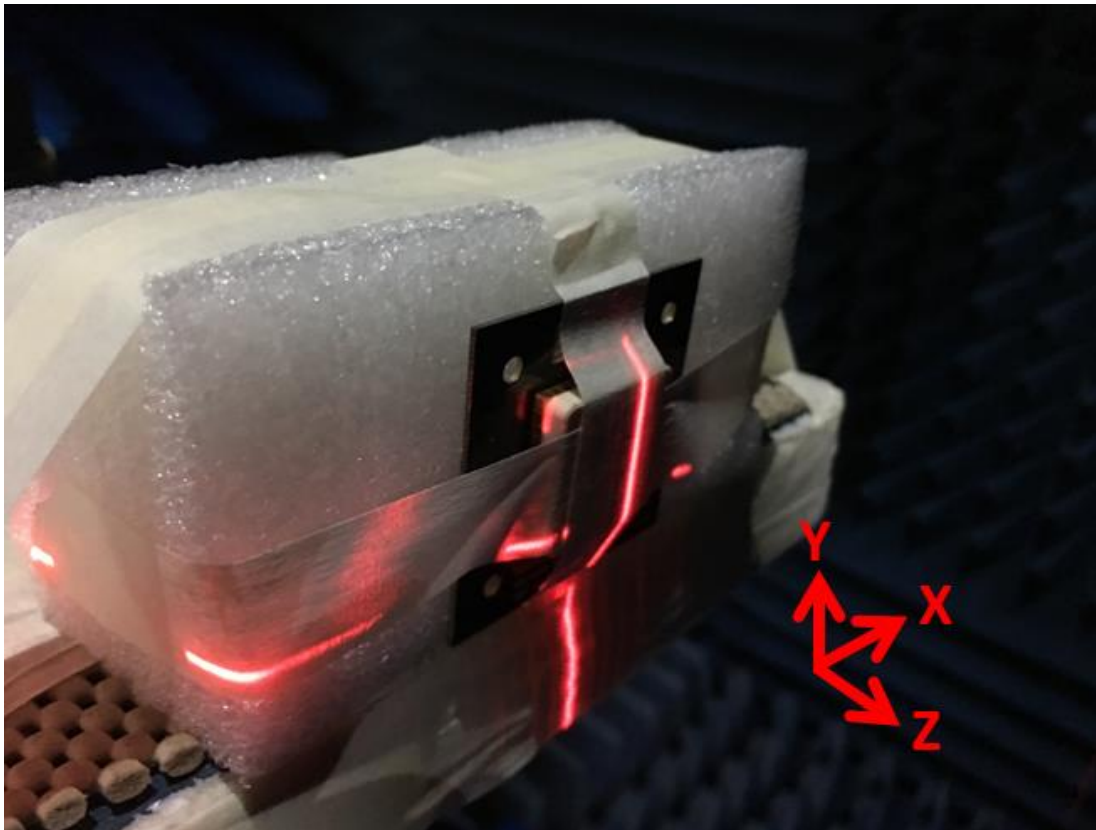
- Multi-band GNSS: 184-channel GPS L1C/A L2C, GLONASS: L1OF L2OF, Galileo: E1B/C E5b, BeiDou: B1I B2I, QZSS: L1C/A L2C
- Multi-band RTK with fast convergence times and reliable performance
- Nav. update rate RTK up to 20 Hz
- Position accuracy = RTK 0.01 m + 1 ppm CEP

Positioning Accuracy Table (2D Accuracy)

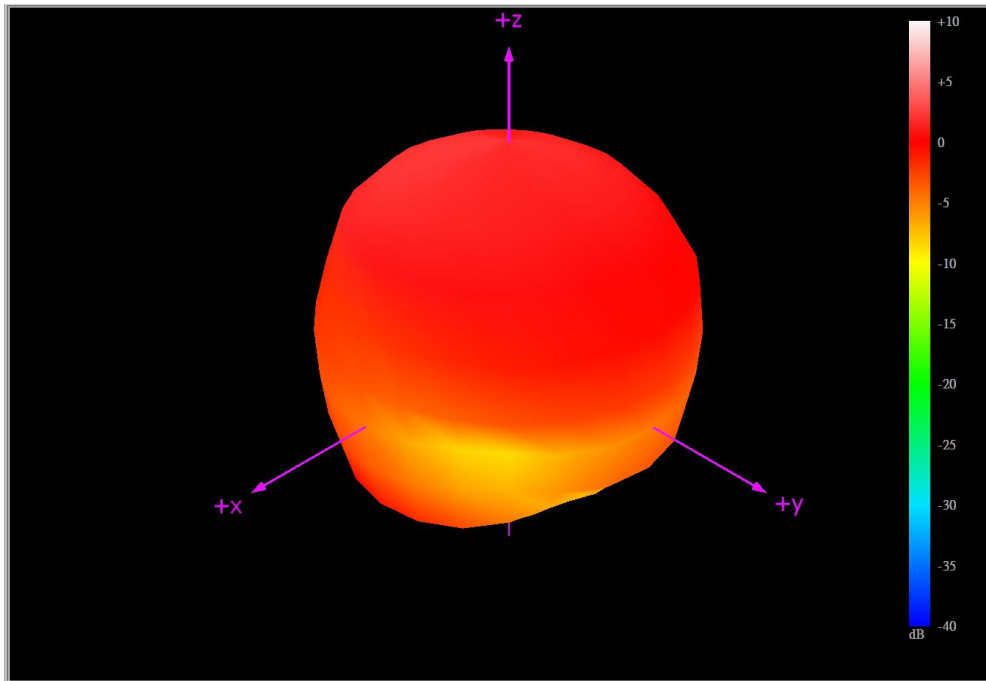
Test Condition	Correction Service	CEP (50%)	DRMS (68%)	2DRMS (95-98.2%)
On 35*35mm EVB	RTK DISABLED	51.9 cm	62.26 cm	124.52 cm
On 25*25mm EVB	RTK DISABLED	58.24 cm	72.77 cm	145.54 cm

6. Radiation Patterns

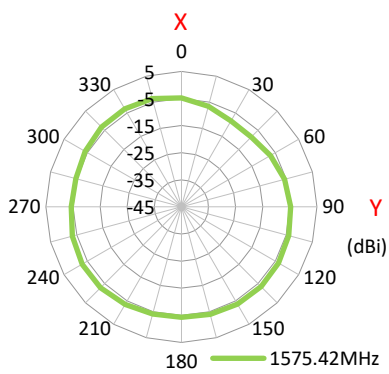
6.1 Test Setup – on 70*70mm Ground Plane



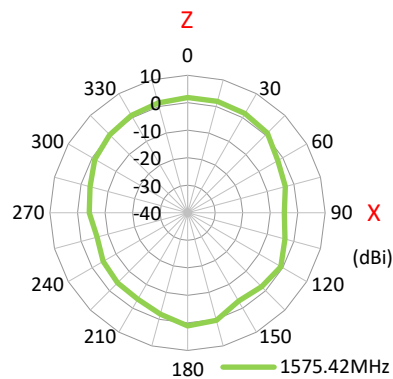
6.2 1575.42MHz 3D and 2D Radiation Patterns



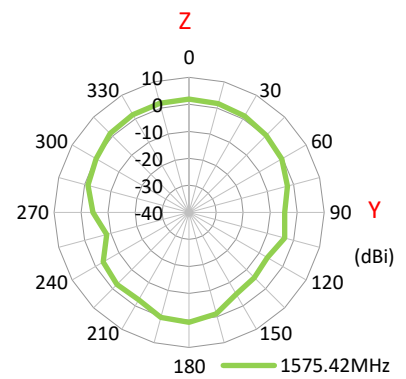
XY Plane



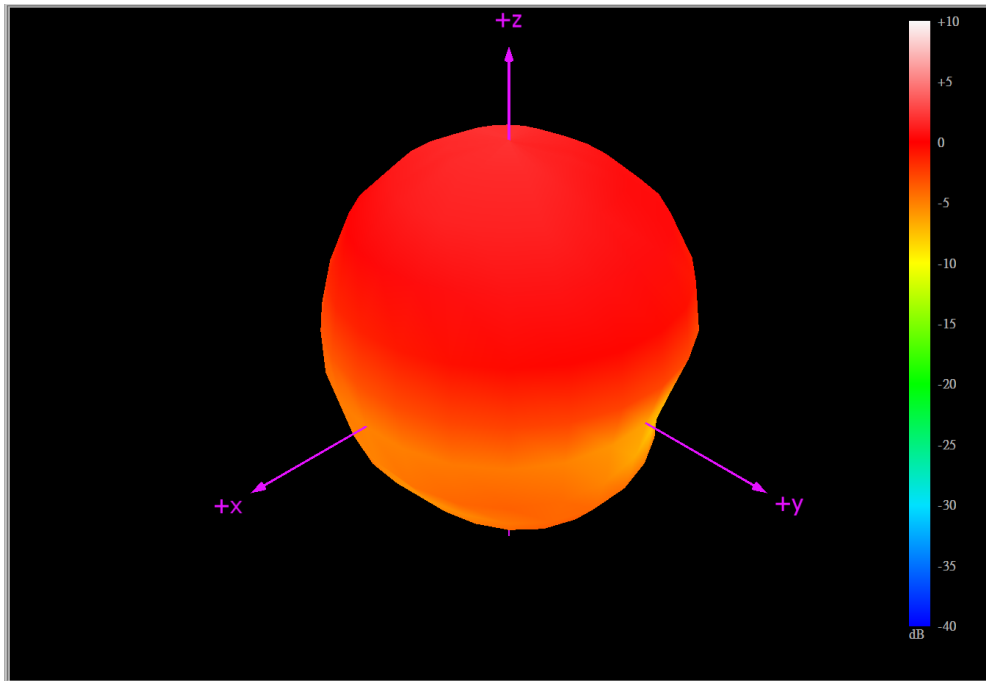
XZ Plane



YZ Plane



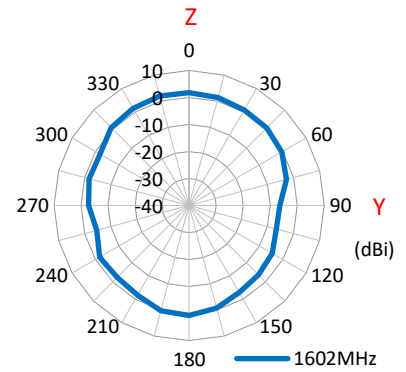
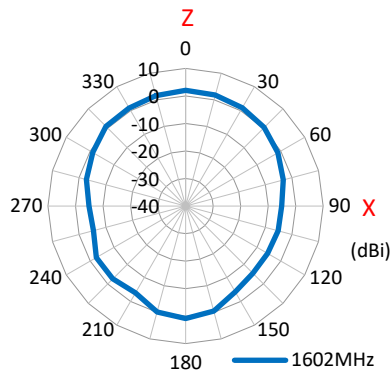
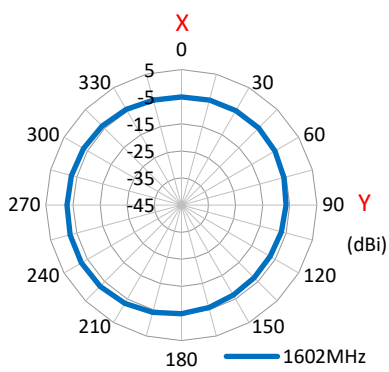
6.3 1602MHz 3D and 2D Radiation Patterns



XY Plane

XZ Plane

YZ Plane



7. Mechanical Drawing (Units: mm)

ISO NO.: EDW-20-8-0567

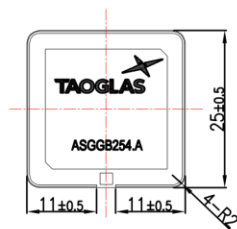
STATE: Release

NOTES:

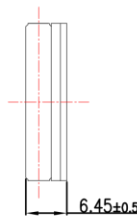
1. Ag Plated area
2. Solder Mask area
3. Copper area
4. Paste area
5. Copper Keepout Area
6. Copper keepout should extend through all PCB layers.
7. Any vias in pads should be either filled or tented to prevent solder from wicking away from the pad during reflow.
8. The dimension tolerances should follow standard PCB manufacturing guidelines

REV.	DESCRIPTION	ENG.	APPROVED	DATE
D01	Initial Design	Mickey	Buluto	2020/06/30
D02	Change the direction of the bottom view	Mickey	Buluto	2020/10/07

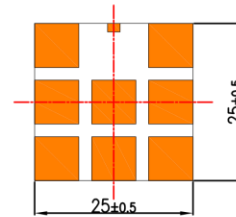
Top View



Side View



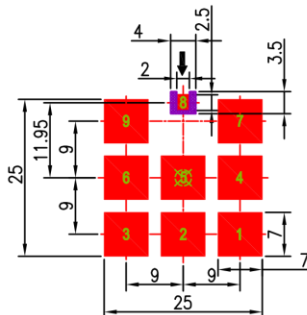
Bottom View



Foot Print

Top Copper

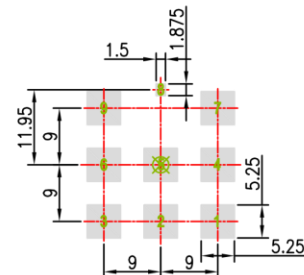
Pads 1, 2, 3, 4, 5, 6, 7 and 9 are the same size. They should be connected to GND.



→ :
Connected to 50 ohm transmission line.

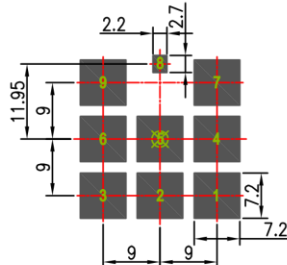
Top Solder Paste

Pads 1, 2, 3, 4, 5, 6, 7 and 9 are the same size.

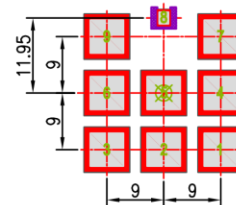


Top Solder Mask

Pads 1, 2, 3, 4, 5, 6, 7 and 9 are the same size. This drawing is a negative of solder mask. Black regions are anti-mask.



Composite Diagram

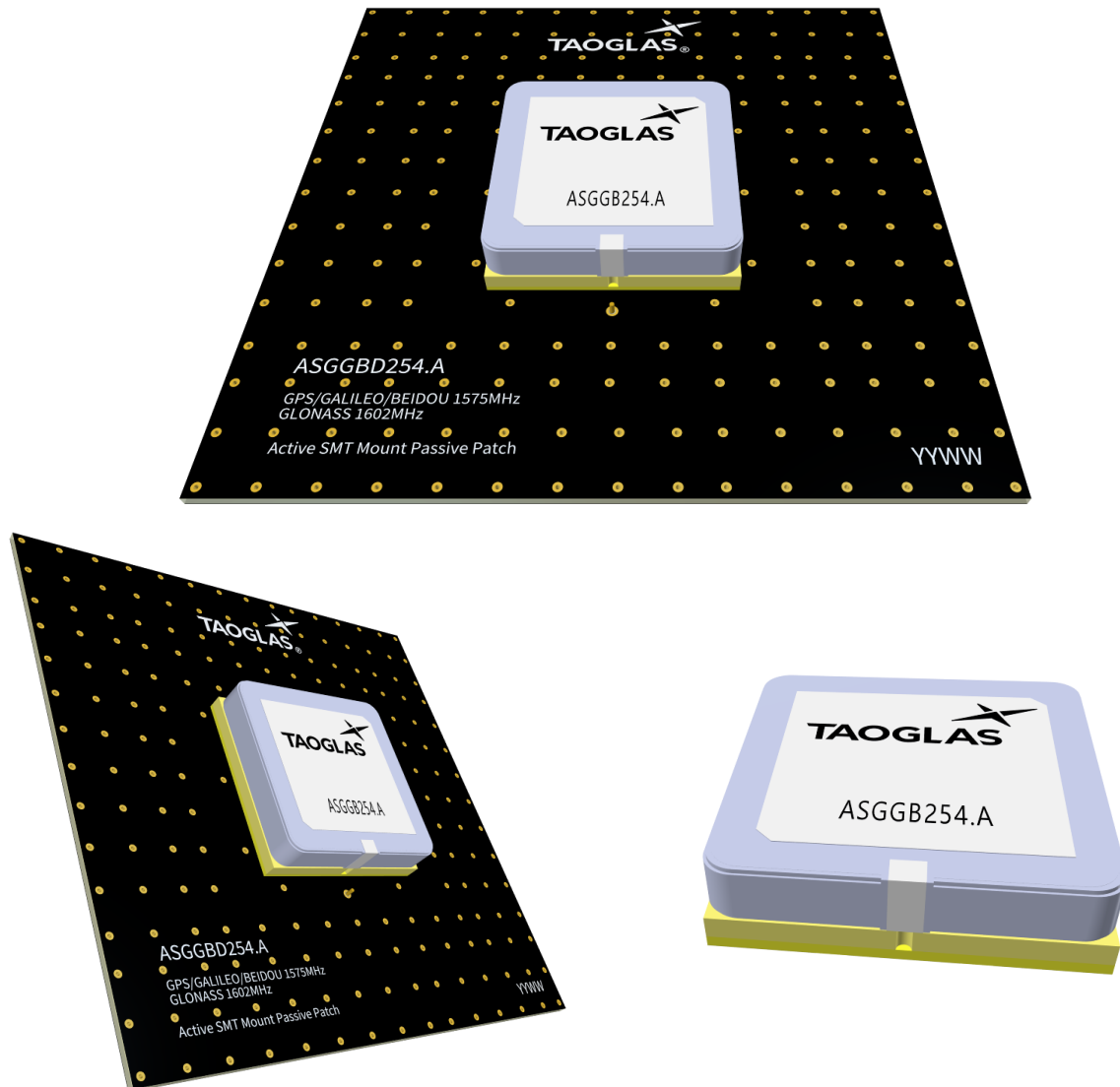


APPROVED BY: Buluto	<p>TW Design Centre This drawing and its inherent design concepts are property of Taoglas. Not to be copied or given to third parties without the written consent of Taoglas.</p>
CHECK BY: Leo	
DRAWN BY: Mickey	
DATE: 2020/06/30	
UNLESS OTHERWISE SPECIFIED TOLERANCES ON: XX±0.5, X±0.3, J±0.2, J±0.1, J00±0.05	TITLE : 2 Stage SMD Active GPS/GLONASS/BeiDou/Galileo 25*25*4mm Patch
THIRD ANGLE PROJECTION	PART NO. : ASGGB254.A
	UNIT: mm SCALE: 1:1 PAGES: 1/1 REV. D02

8. Antenna Integration Guide

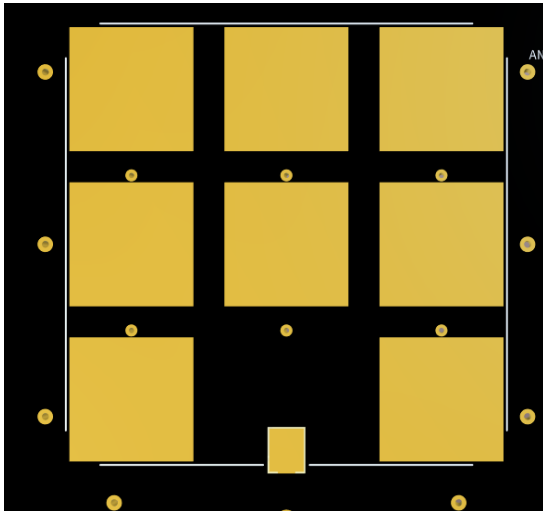
8.1 Integration Guide

Whatever the size of the PCB, the ideal location for the antenna is as illustrated in the below image.

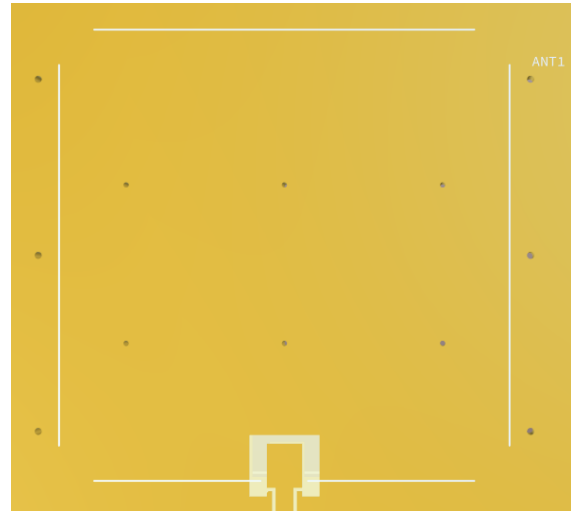


8.2 PCB Layout

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 and the clearance required. Note the 8 large Ground Pads do not have any thermal relief connections. Do not place thermal relief connections between the ground pads as this will cause the resonance of the antenna to shift.



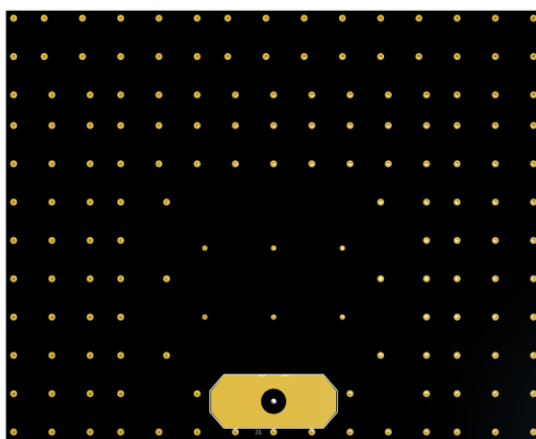
Topside with Solder Mask



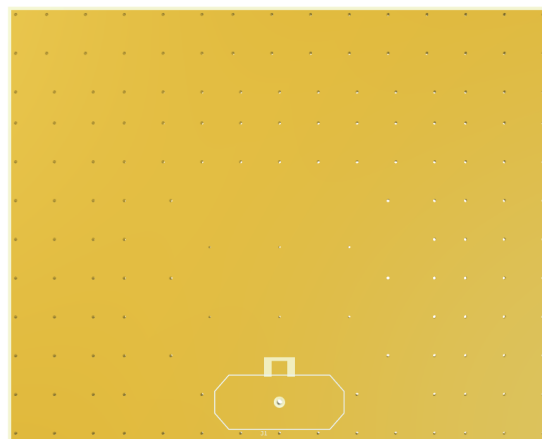
Topside without SolderMask

8.3 PCB Clearance

There is no clearance required on the bottom side of the PCB. Please ensure the ground plane is uniform under the component.



Bottom Side with Solder Mask

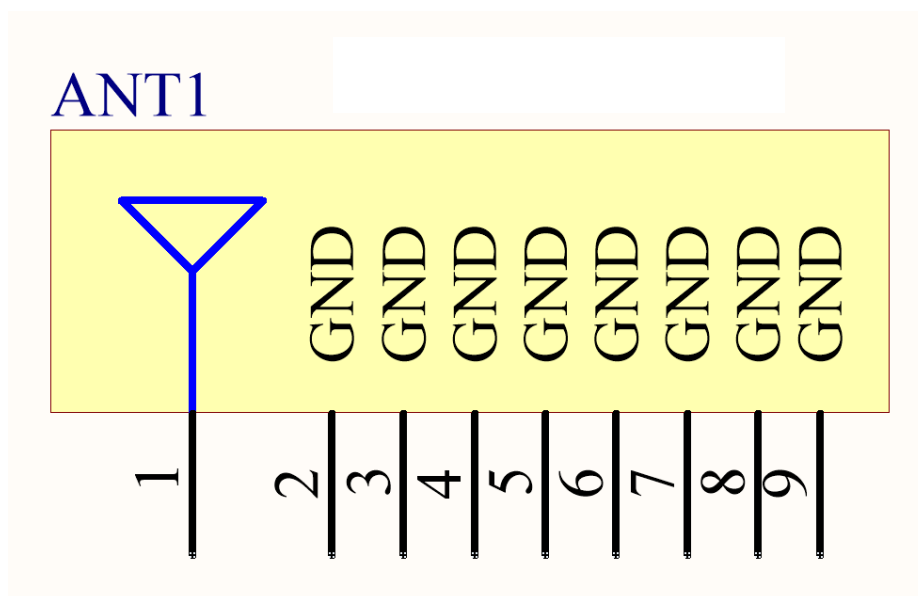


Bottom Side without Solder Mask

8.4 Schematic Symbol and Pin Definitions

The circuit symbol for the antenna is shown below. The antenna has 9 pins. Pin 1 is the RF Feed and the remaining pins are connected to Ground.

Pin	Description
1	RF Feed
2, 3, 4, 5, 6, 7, 8, 9	Ground



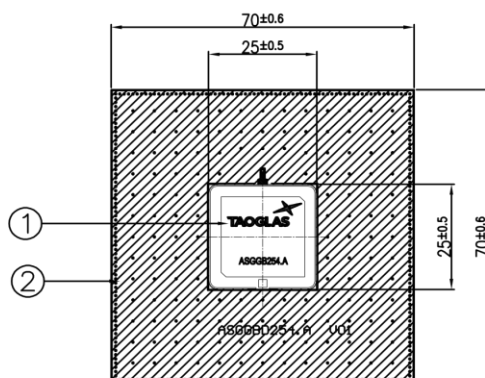
9. Evaluation Board Drawing

ISO NO.: EDW-20-8-0597

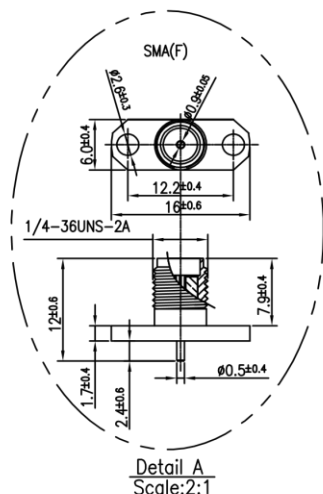
STATE: Release

NOTES: 1.Solder Mask (Black)
 2.Solder Area

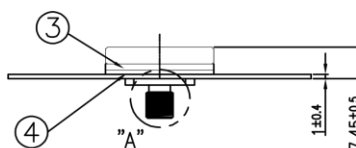
REV.	DESCRIPTION	ENG.	APPROVED	DATE
D01	Initial Design	Mickey	Buluto	2020/07/09



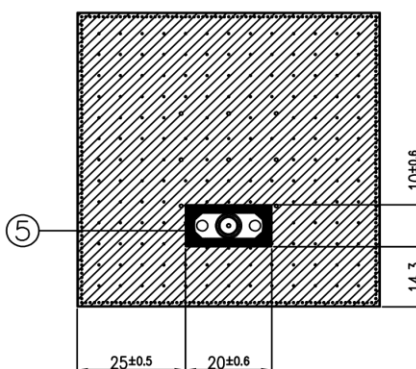
Top



Detail A
Scale: 2:1



Side



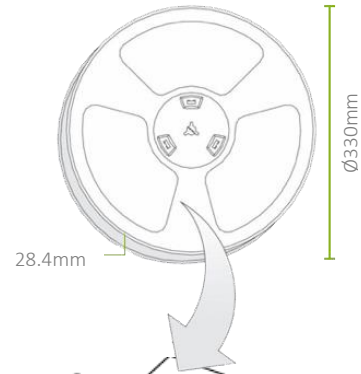
Bottom

	Name	P/N	Material	Finish	QTY
1	ASGG254.A Patch	013A6160001150	Ceramic	Clear	1
2	ASGG254.A PCB	-	Composite 1t	Clear	1
3	PCB	-	FR4 (NP-140) 1.44t	Au Plated	1
4	PCB	-	FR4 (NP-140) 1t	Au Plated	1
5	SMA(F)ST	200411000007A	Brass	Clear	1

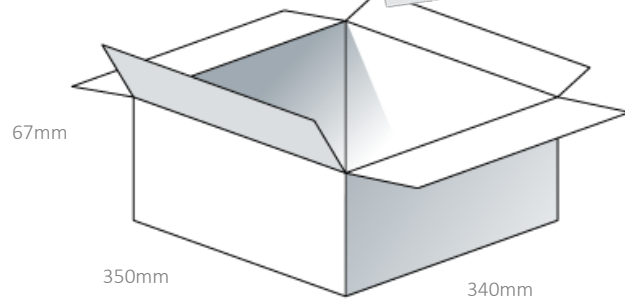
APPROVED BY: Buluto	TW Design Centre This drawing and its inherent design concepts are property of Taoglas. Not to be copied or given to third parties without the written consent of Taoglas.
CHECK BY: Leo	
DRAWN BY: Mickey	TITLE : 2 Stage SMD Active GPS/GLONASS/BeiDou/Galileo 25*25*4mm Patch eval board with 5 pcs PART NO. : ASGGBD254.A
DATE: 2020/07/09	
UNLESS OTHERWISE SPECIFIED TOLERANCES ON:	XX±0.5 X±0.3 .XX±0.2 .X±0.1 .XXX±0.05
THIRD ANGLE PROJECTION	UNIT: mm SCALE: 1:1.5 PAGES: 1/1 REV. D01

10. Packaging

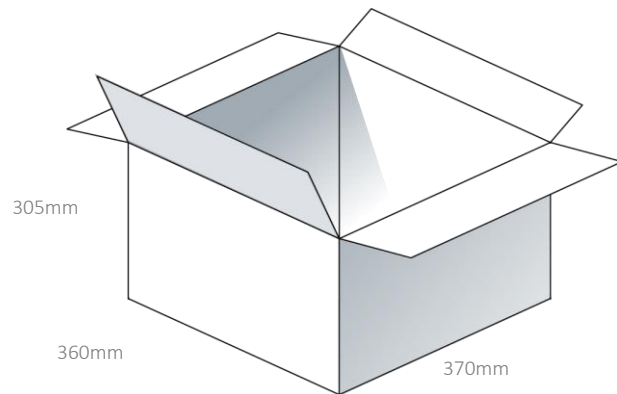
200pcs ASGGB254.A per Tape & Reel
 Dimensions - $\varnothing 330 \times 28.4$
 Weight – 2.5Kg



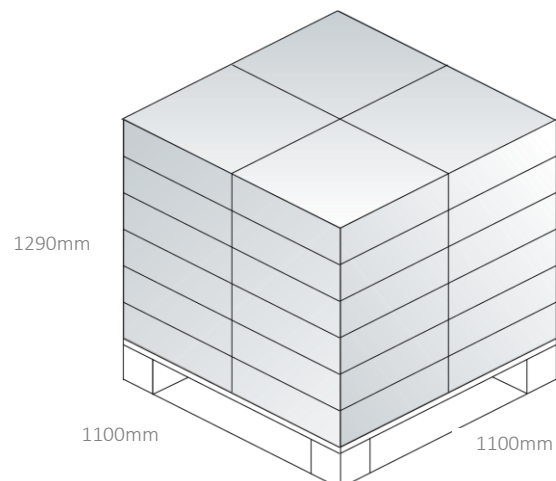
200pcs ASGGB254.A per carton
 Dimensions - 350*340*67mm
 Weight – 2.6Kg



800pcs ASGGB254.A per carton
 Dimensions - 360*370*305mm
 Weight – 10.3Kg



Pallet Dimensions:
 1100*1100*1300mm
 36 Cartons Per Pallet
 9 Cartons Per Layer, 4 Layers

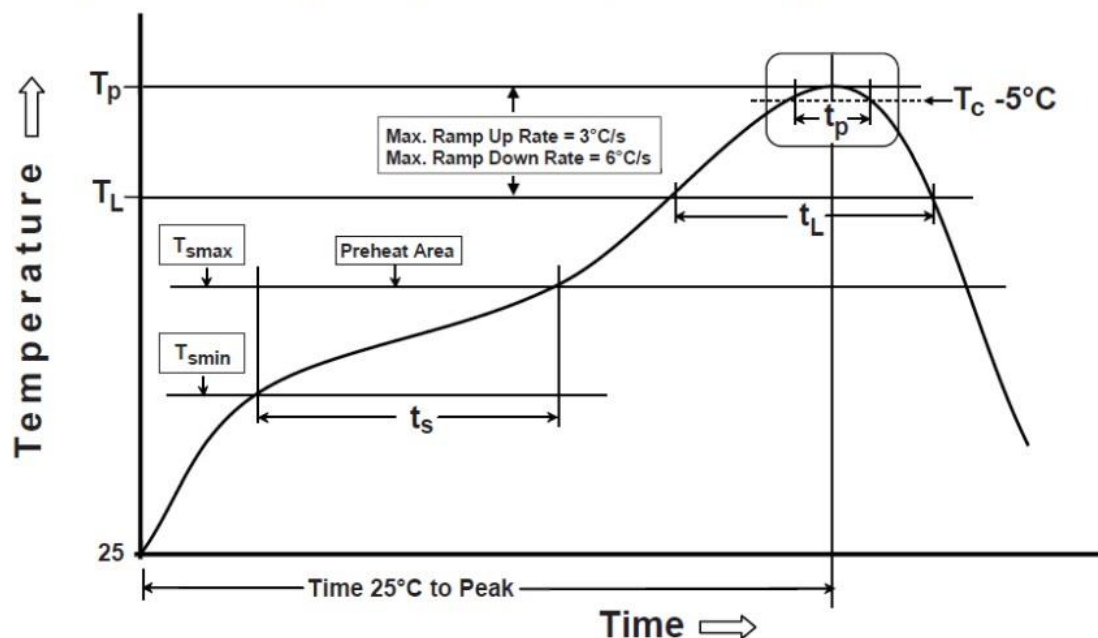


11. Recommended Reflow Solder Profile

ASGGB254.A can be assembled following Pb-free assembly. According to the Standard IPC/JEDEC J-STD-020C, the temperature profile suggested is as follow:

Phase	Profile Features	Pb-Free Assembly (SnAgCu)
PREHEAT	Temperature Min (Ts min)	150°C
	Temperature Max (Ts max)	200°C
	Time(ts) from (Ts min to Ts max)	60-120 seconds
RAMP-UP	Avg. Ramp-up Rate (Ts max to TP)	3°C/second(max)
REFLOW	Temperature (TL)	217°C
	Total Time above TL (tL)	30-100 seconds
PEAK	Temperature (TP)	260°C
	Time (tp)	2-5 seconds
RAMP-DOWN	Rate	3°C/second(max)
Time from 25°C to Peak Temperature		8 minutes max.
Composition of solder paste		96.5Sn/3Ag/0.5Cu
Solder Paste Model		SHENMAO PF606-P26

The graphic shows temperature profile for component assembly process in reflow ovens



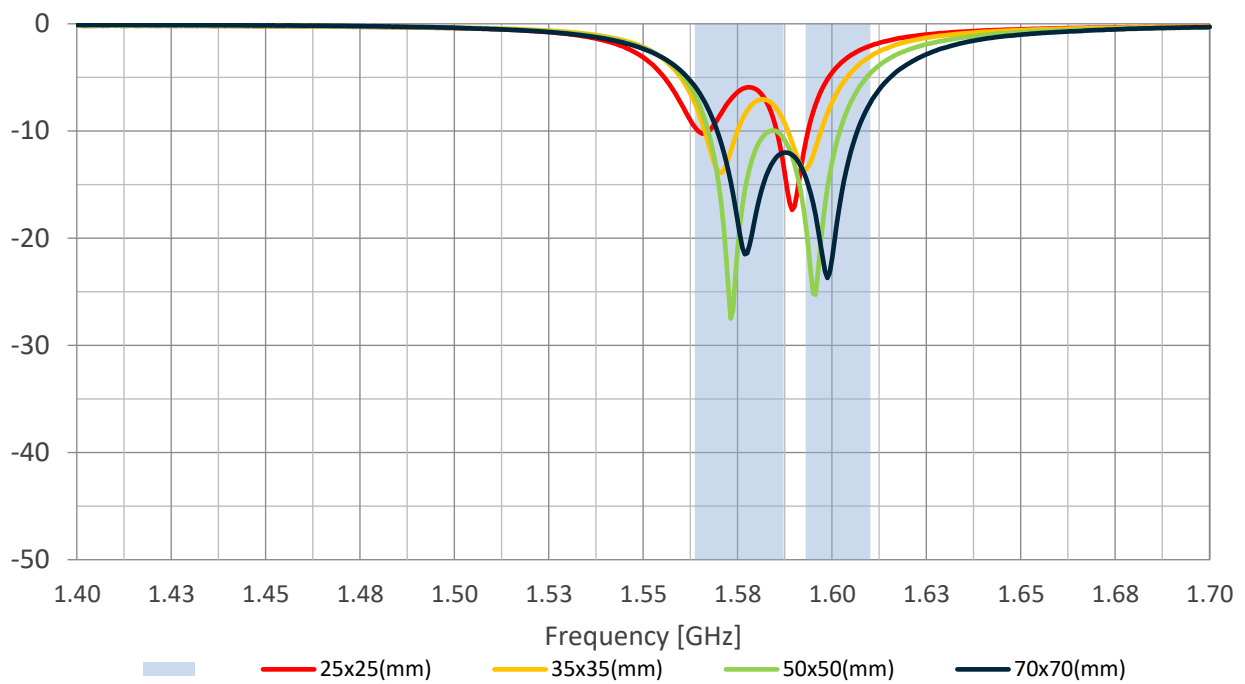
Soldering Iron condition: Soldering iron temperature 270°C±10°C.

Apply preheating at 120°C for 2-3 minutes. Finish soldering for each terminal within 3 seconds, if soldering iron temperature over 270°C±10°C or 3 seconds, it will make cause component surface peeling or damage.

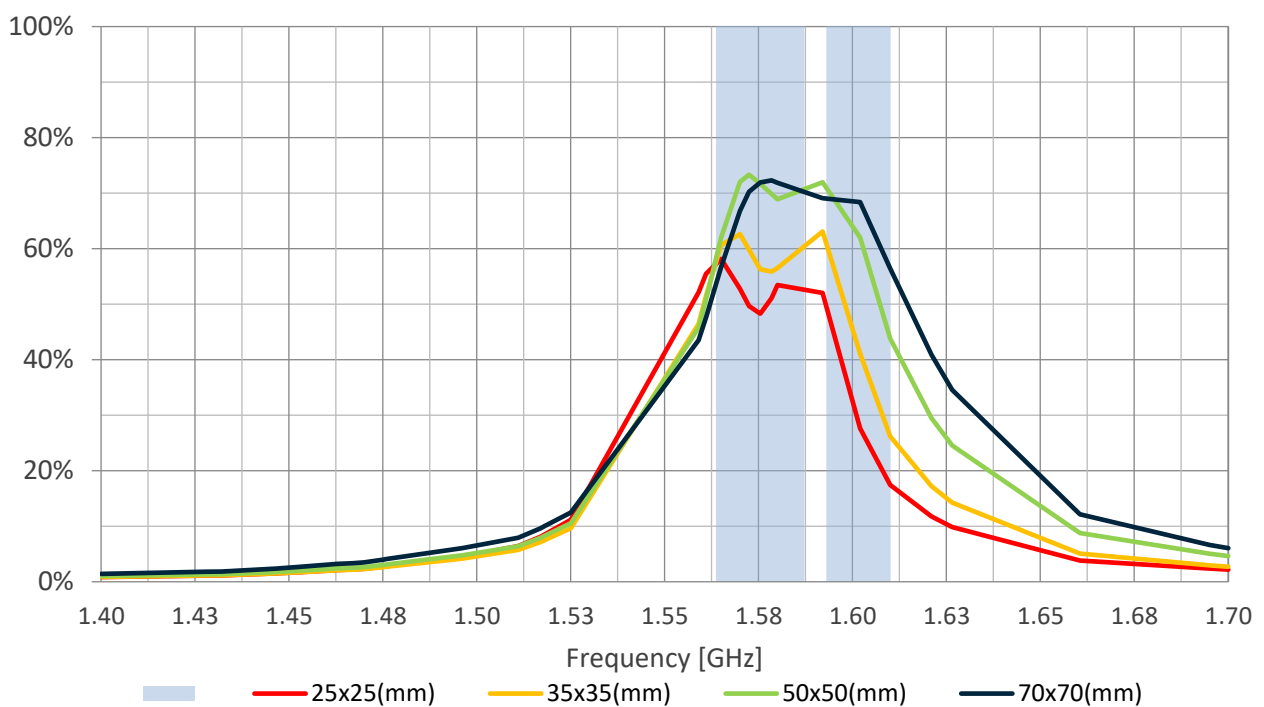
12. Application Note

The ASGGB254.A performance varies at different ground plane sizes, the results are shown in this section.

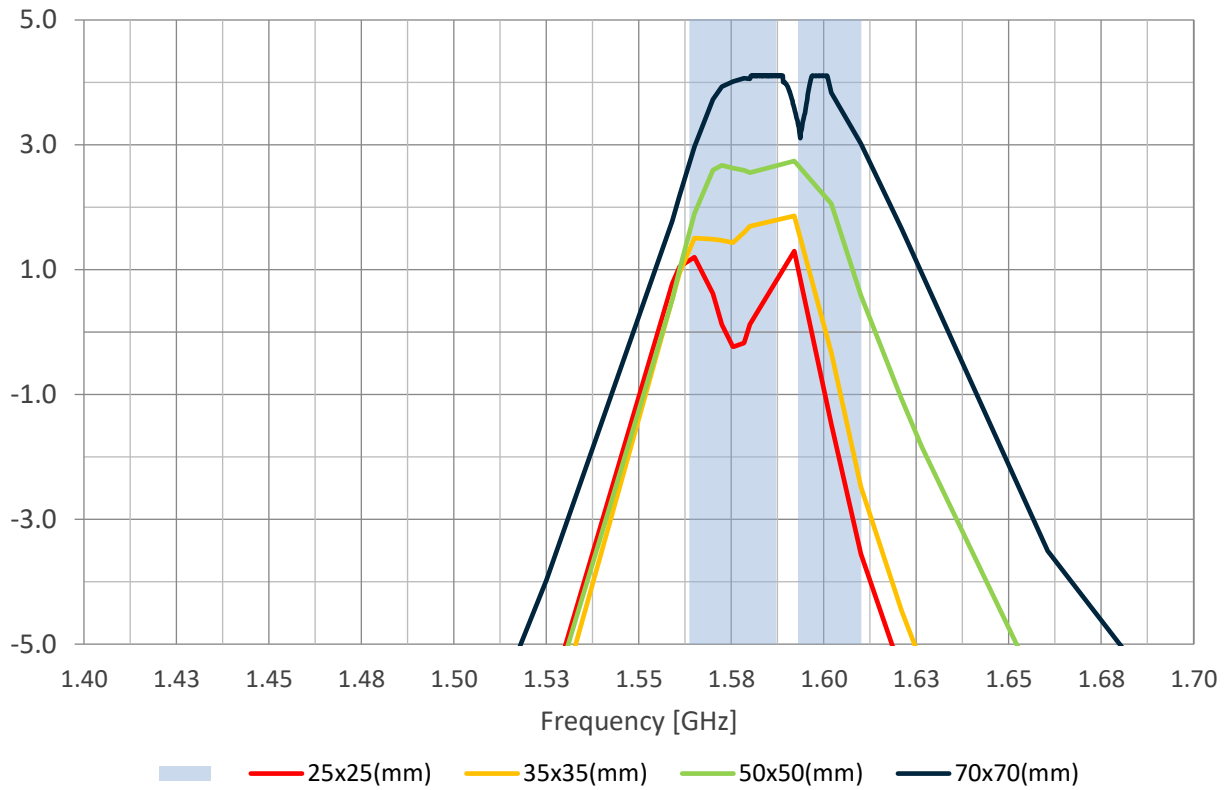
12.1 Return Loss



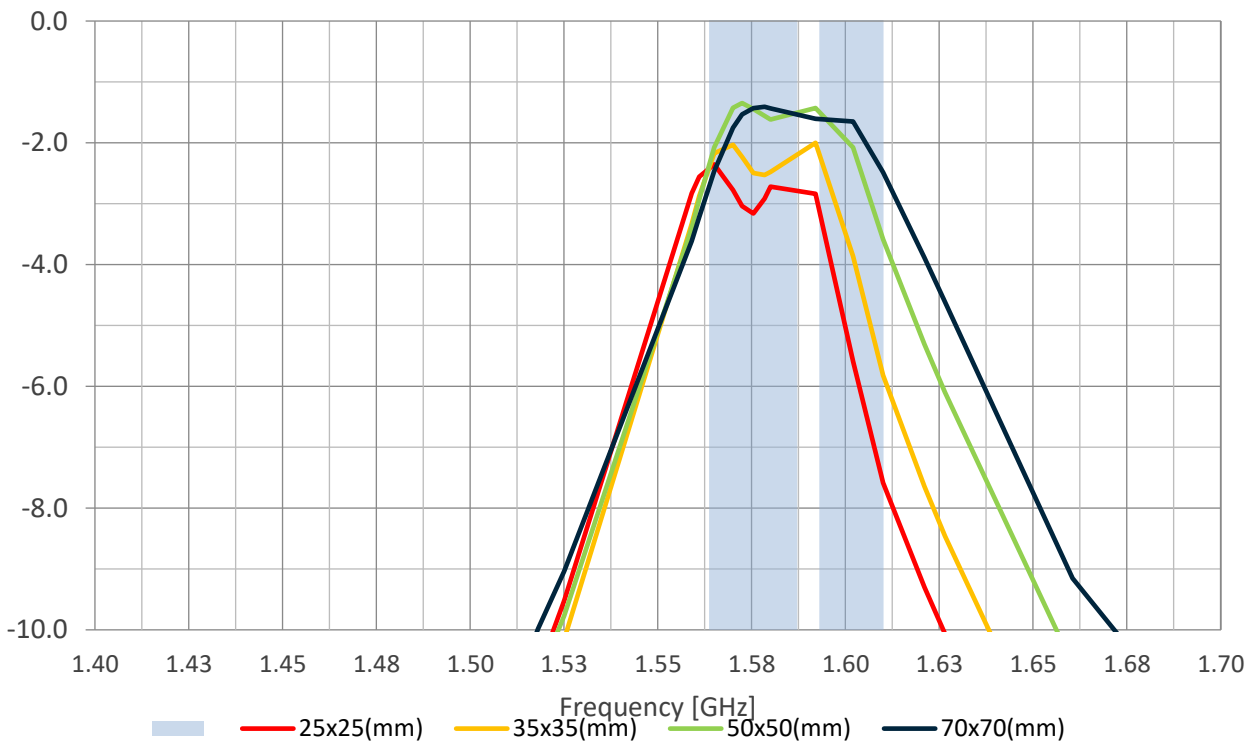
12.2 Efficiency



12.3 Peak Gain

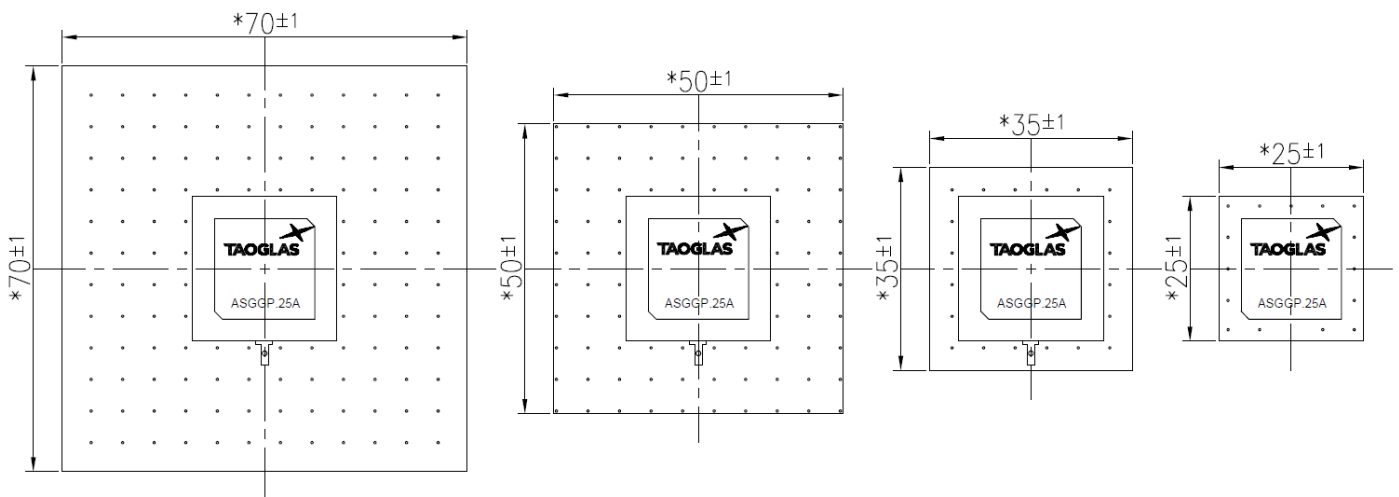


12.4 Average Gain



12.5 Performance Table

		BeiDou 1559-1563 MHz	GPS 1564-1587 MHz	GLONASS 1593-1610 MHz
Efficiency avg. for the freq. band	25x25(mm)	54.96	52.23	22.53
	35x35(mm)	51.42	58.62	33.63
	50x50(mm)	51.02	69.63	52.90
	70x70(mm)	47.75	68.30	62.40
Avg. Gain avg. for the freq. band	25x25(mm)	-2.60	-2.83	-6.59
	35x35(mm)	-2.90	-2.32	-4.84
	50x50(mm)	-2.94	-1.58	-2.83
	70x70(mm)	-3.22	-1.67	-2.07
Peak Gain for Gtotal	25x25(mm)	0.99	1.20	-1.47
	35x35(mm)	0.91	1.70	-0.33
	50x50(mm)	0.99	2.67	2.06
	70x70(mm)	2.18	4.07	3.84
AR at Zenith avg. for the freq. band	25x25(mm)	16.56	10.42	44.55
	35x35(mm)	16.47	10.92	19.41
	50x50(mm)	17.60	9.98	16.22
	70x70(mm)	16.13	9.36	12.39



Changelog for the datasheet

SPE-20-8-081 – ASGGB254.A

Revision: A (Original First Release)

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Notes:

Author: Jack Conroy

Previous Revisions



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