

Theory of Operations

Somewear Hotspot



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Overview

This document is a supplement to the Somewear Hotspot User Manual. The User Manual describes the theory of operation at a high level and is focused on enabling the end user to understand how to use the Somewear Hotspot. That document is intended for general release. This document describes details of the theory of operation that are of specific interest to regulatory bodies. The document is not intended for general release.

Summary

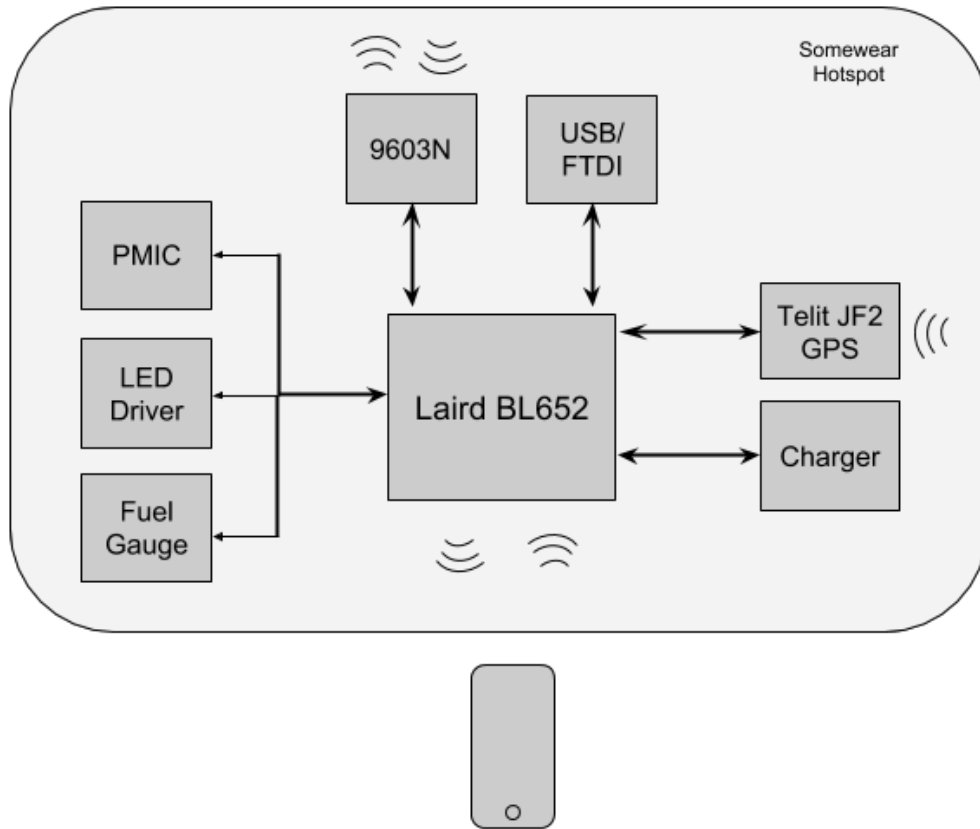
The Somewear Hotspot is a Bluetooth and satellite transceiver that provides a Bluetooth enabled smartphone constant connectivity even outside cellular coverage. It supports the following functions:

1. Two way messaging
2. Location Sharing
3. Weather Updates
4. SOS

Modules and Block Diagram

The Somewear Hotspot uses the Somewear 9603N (FCC ID: 2AQYN9603N, IC: 24246-9603N) module to connect to Iridium's LEO satellite constellation and the Laird BL652 (FCC ID: SQGBL652, IC: 3147A-BL652) to communicate with a Bluetooth enabled smartphone. It also incorporates a Telit JF2 GPS receiver to enable standalone location tracking.

Figure 1. Block Diagram



Antennas

The Somewear Hotspot contains three antennas, one for each of the modules mentioned above. Below are the specifications and datasheet for each one.

Antenna for Iridium 9603N

Bands (MHz):	1621
Frequency (MHz):	1616-1627
Return Loss (dB) :	~-11.3
VSWR:	~1.8:1
Efficiency (%):	~76.8
Peak Gain (dBi):	~2.7
Average Gain (dB):	~-1.1
Impedance (Ohms):	50
Axial Ratio (dB):	3 max
Radiation Pattern:	Hemispherical

Polarization: RHCP

Datasheet: [2JCP2542601a](#)

Antenna for Telit JF2

Bands (MHz): 1575
Frequency (MHz): 1575.42
Return Loss (dB) : ~-12.1
VSWR: ~1.7:1
Efficiency (%): ~52.9
Peak Gain (dBi): ~1.3
Average Gain (dB): ~-2.8
Impedance (Ohms): 50
Axial Ratio (dB): 3 max
Radiation Pattern: Hemispherical
Polarization: RHCP

Datasheet: [2JCP1840101a](#)

Antenna for Laird BL652

Bands (MHz): 2400
Frequency (MHz): 2400-2500
VSWR: 2 max.
Peak Gain (dBi): 0.5
Average Gain (dB): -0.5
Impedance (Ohms): 50

Datasheet: [AT3216 -B2R7HAA](#)

Appendix

Datasheets

2JCP2542601a_SOMUSA

Iridium Ceramic Thru-Hole Mount



FEATURES

Please check our Iridium DevKit 2JDK0226a-A28:

<https://www.2j-antennasusa.com/antenna/2jdk0226a-a28/178>

Thru-Hole Mount

Ground Plane Independent

Iridium (1616-1627 MHz)

25 x 25 x 4 mm

ANTENNA AND ELECTRICAL SPECIFICATIONS

2JCP2542601a_SOMUSA	
Standard	Iridium
Band (MHz)	1621
Frequency(MHz)	1616-1627
Return Loss (dB)	~-11.3
VSWR	~1.8:1
Efficiency (%)	~76.8
Peak Gain (dBic)	~2.7
Average Gain (dB)	~-1.1
Impedance	50
Axial Ratio (dB)	3 max
Radiation Pattern	Hemispherical
Polarization	RHCP

Antenna Measurement Conditions

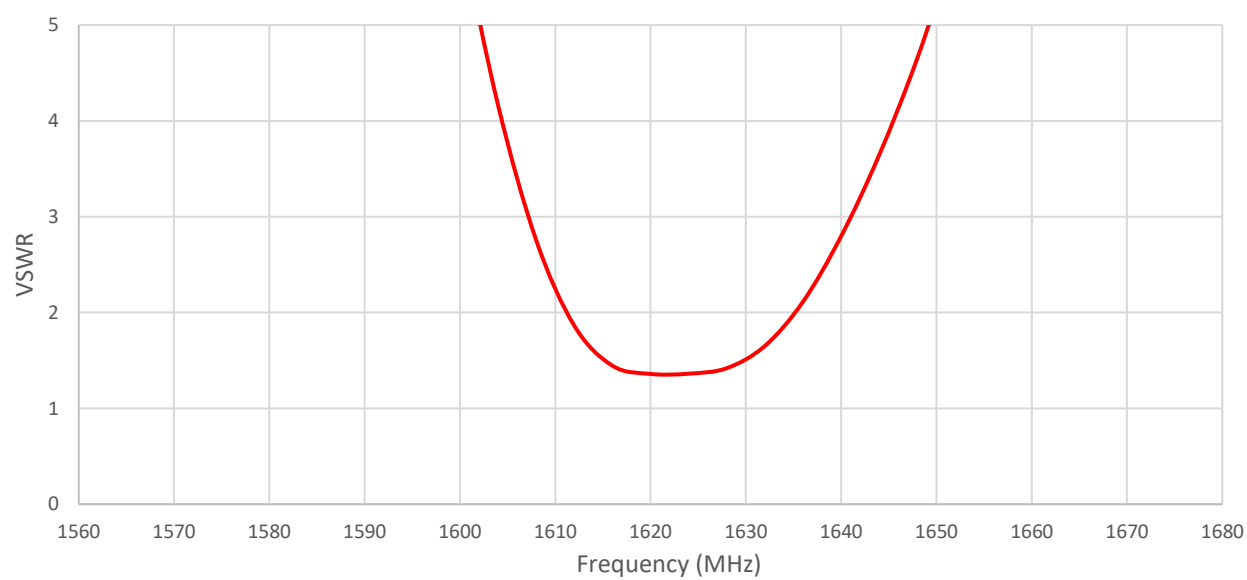
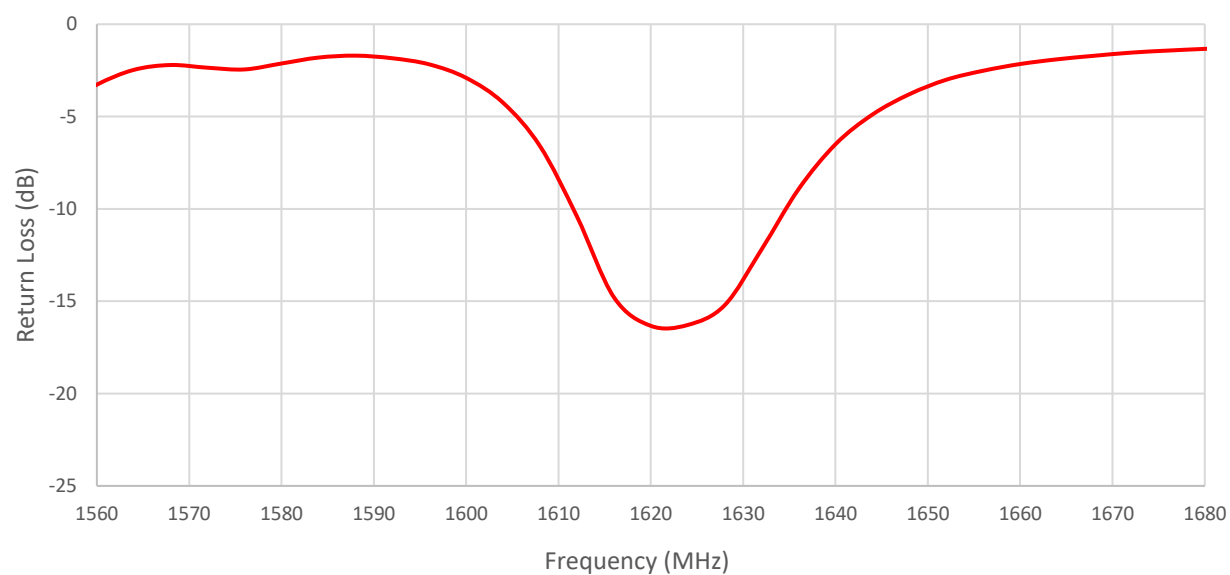
Mounted on Ground Plane of 70 x 70 mm

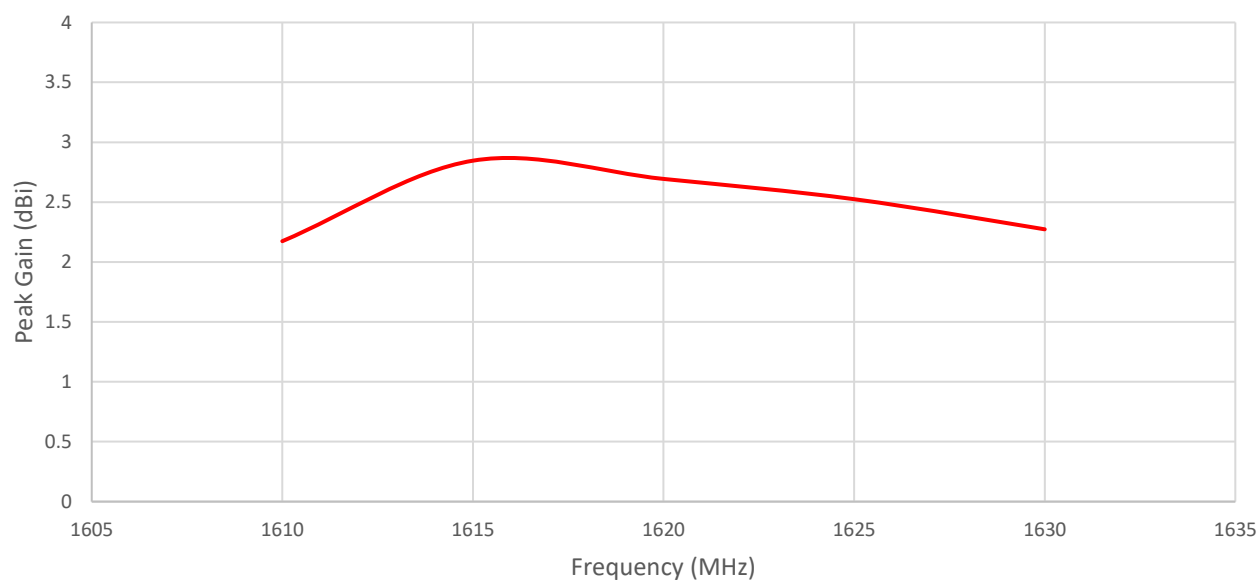
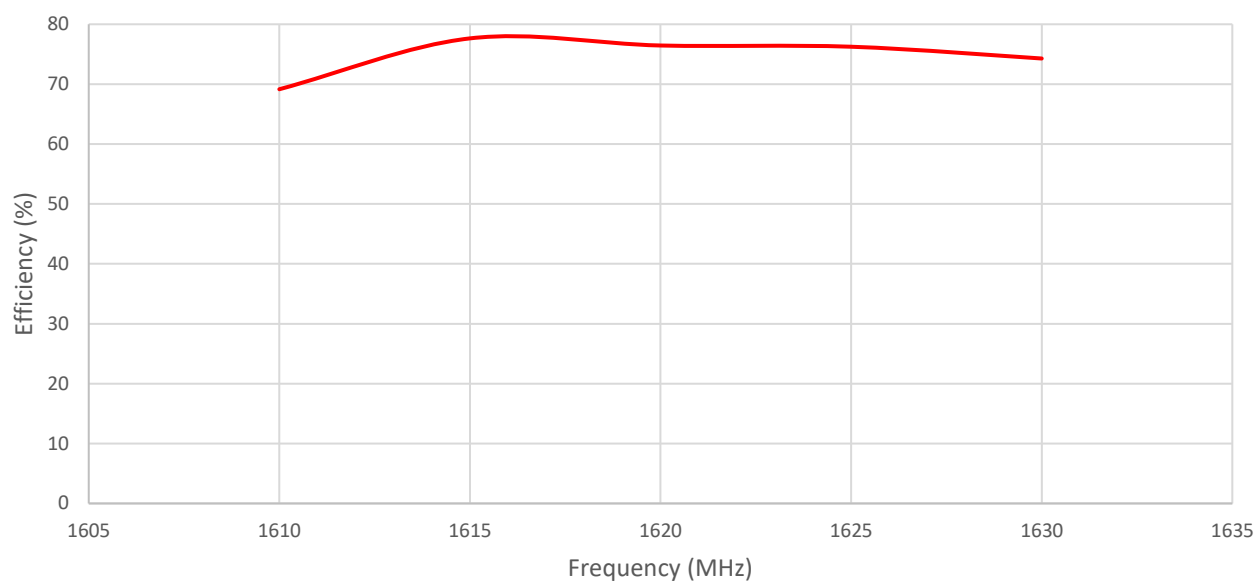
Measured in Certified CTIA 3D Anechoic Chamber

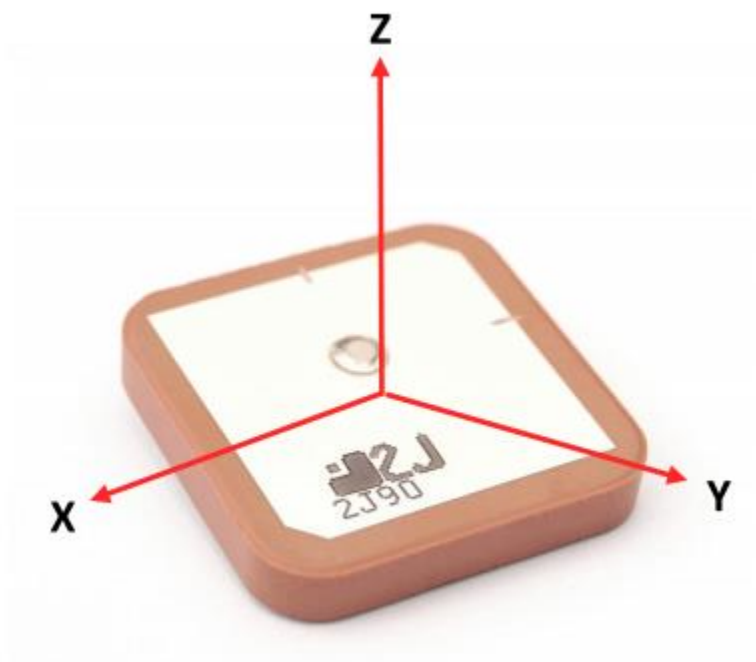
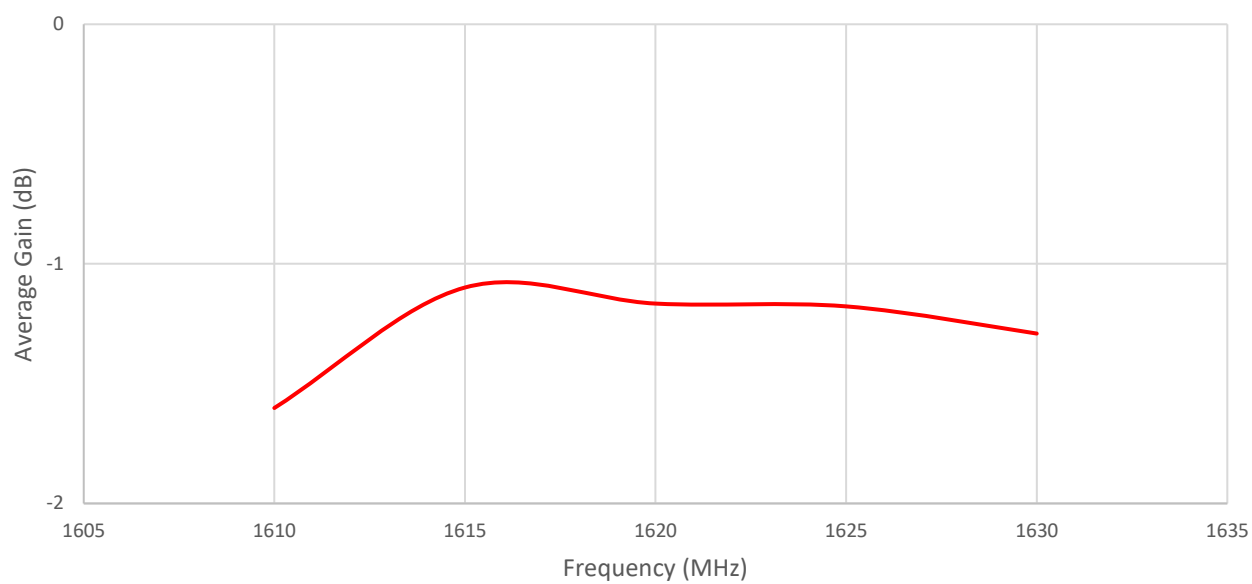
MECHANICAL AND ENVIRONMENTAL SPECIFICATIONS

Specification	2JCP2542601a_SOMUSA
Mounting Type	Thru-Hole Mount
Dimensions (mm)	25 x 25 x 4
Operating Temperature (C)	-40 to +85
Storage Temperature (C)	-40 to +85
Substance Compliance	RoHS

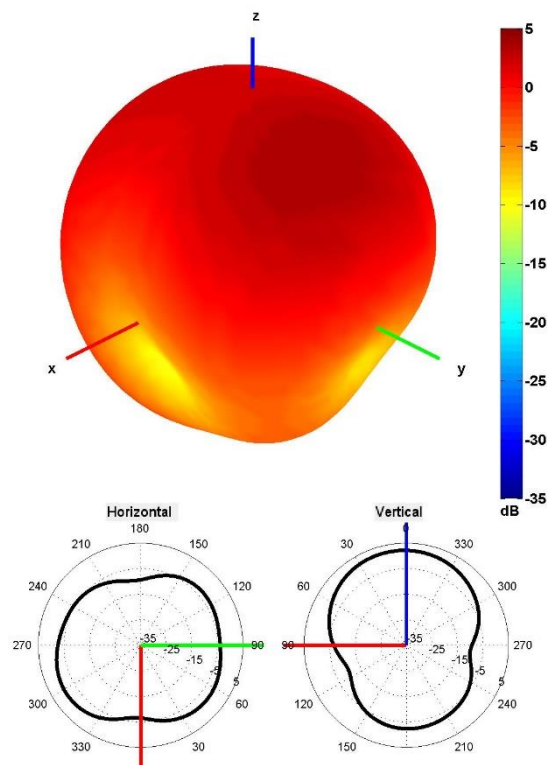
ANTENNA PARAMETERS







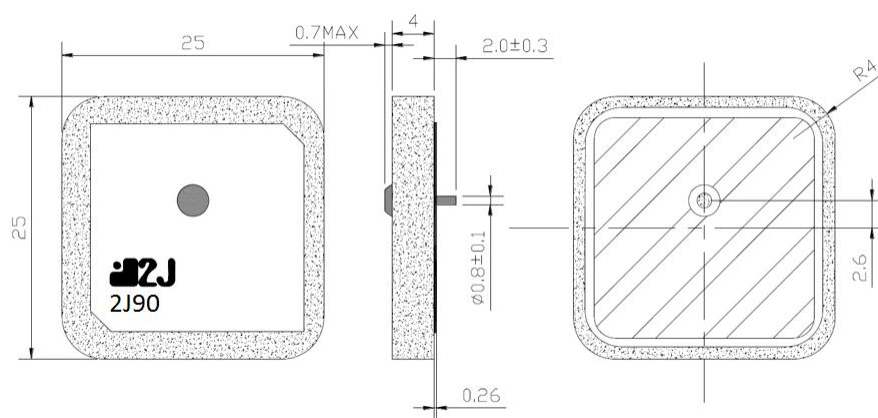
RADIATION PATTERN REFERENCE



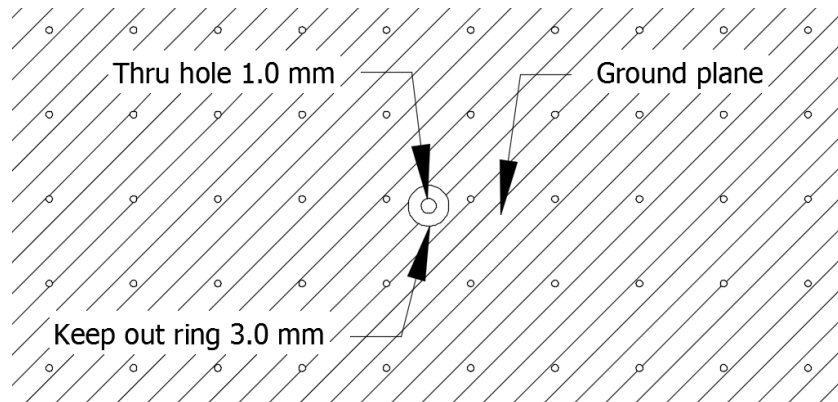
1621 MHz RADIATION PATTERN

ANTENNA DRAWINGS

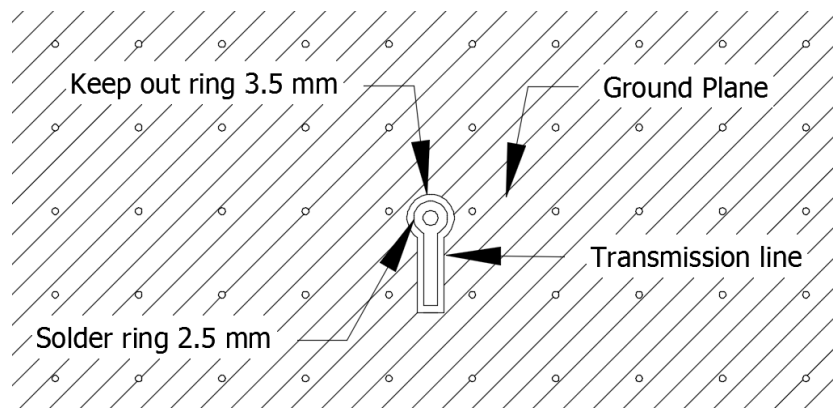
Patch dimensions



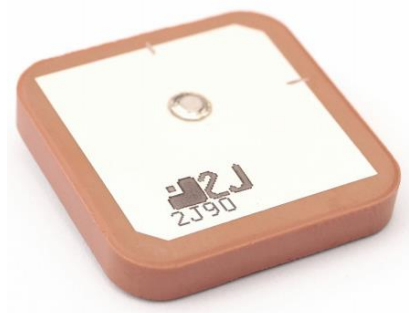
Layout for top layer



Layout for bottom layer



ANTENNA IMAGES



2JCP1840101a_SOMUSA

GNSS Ceramic Thru-Hole Mount



FEATURES

Please check our GNSS DevKit 2JDK18401a-A28 :
<https://www.2j-antennasusa.com/antenna/2jdk0101a-a28/115>
Thru-Hole Mount
High Gain
Ground Plane Independent
GPS/ QZSS/Galileo (1575 MHz)
18 x 18 x 4 mm

ANTENNA AND ELECTRICAL SPECIFICATIONS

Parameters	2JCP1840101a_SOMUSA
Standard	GPS / QZSS / Galileo
Band (MHz)	1575
Frequency(MHz)	1575.42
Return Loss (dB)	~-12.1
VSWR	~1.7:1
Efficiency (%)	~52.9
Peak Gain (dBic)	~1.3
Average Gain (dB)	~-2.8
Impedance (Ohms)	50
Radiation Pattern	Hemispherical
Axial Ratio (dB)	3 max
Polarization	RHCP

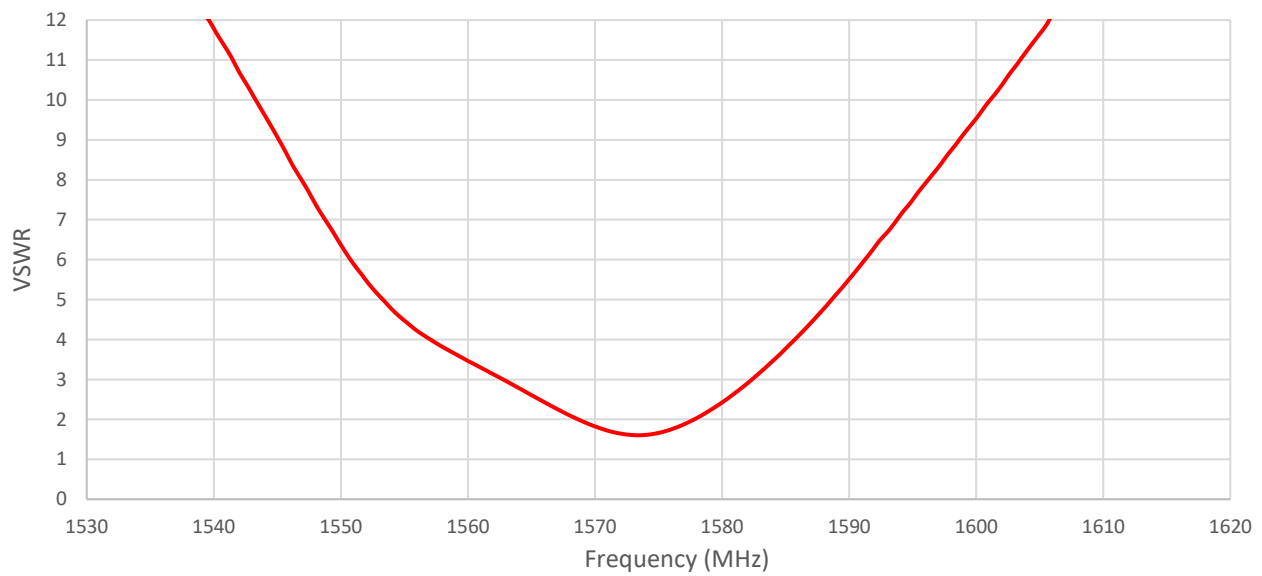
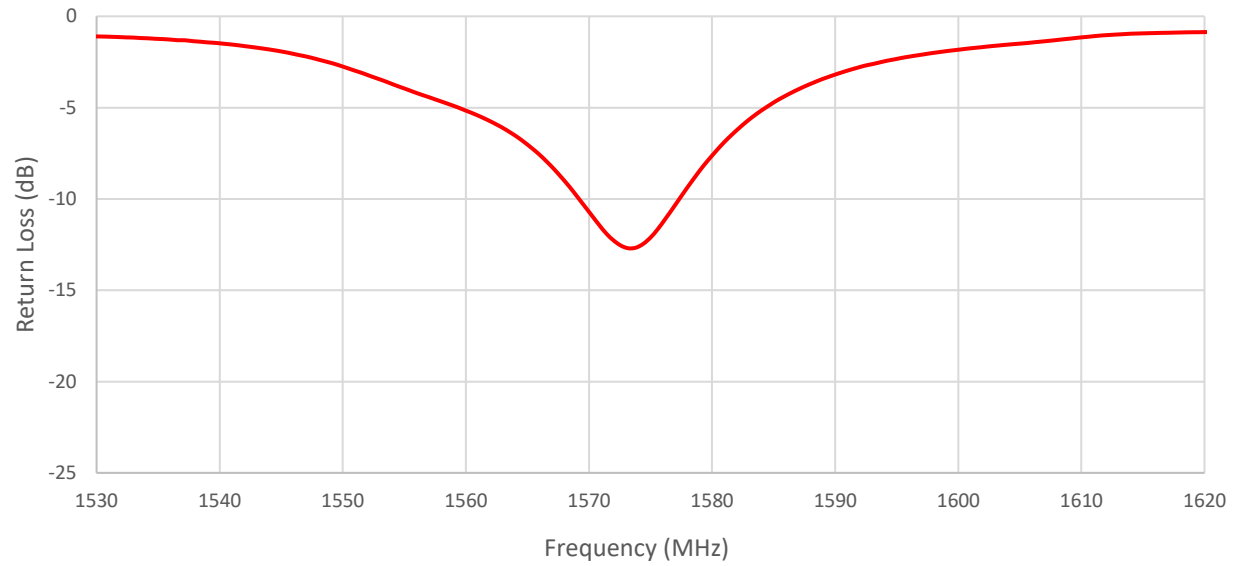
Antenna Measurement Conditions

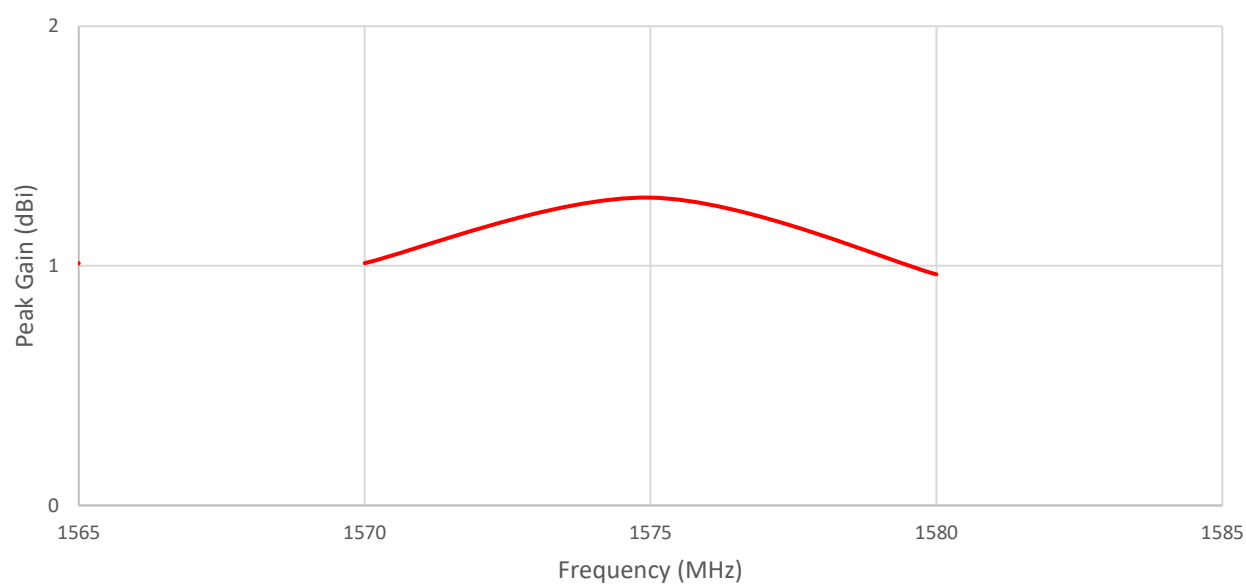
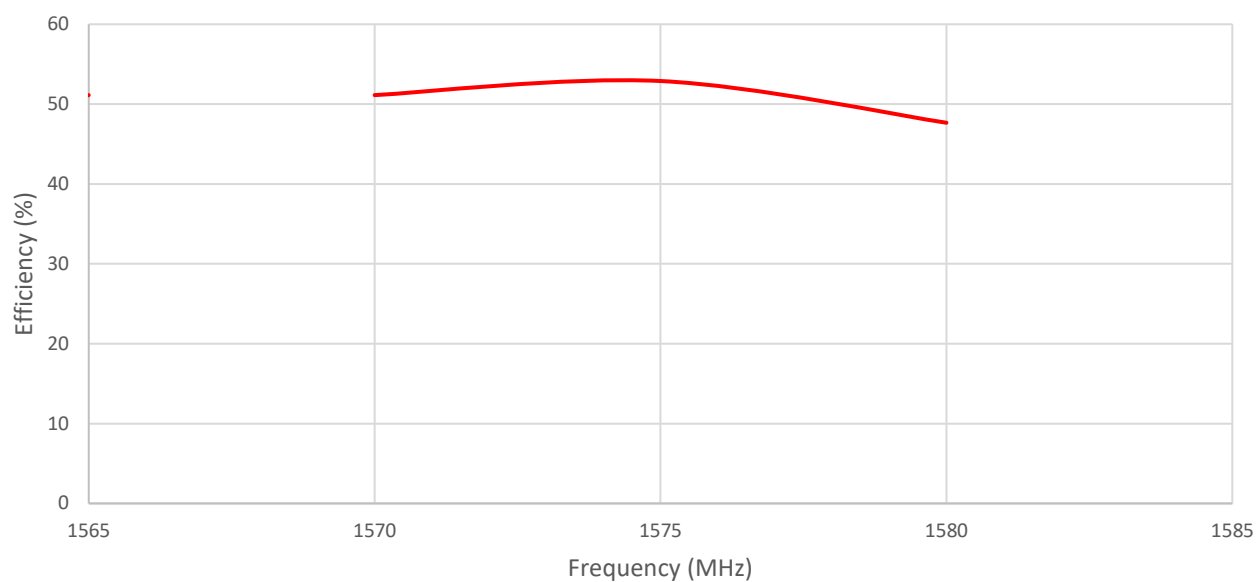
Mounted on Ground Plane of 70 x 70 mm
Measured in Certified CTIA 3D Anechoic Chamber

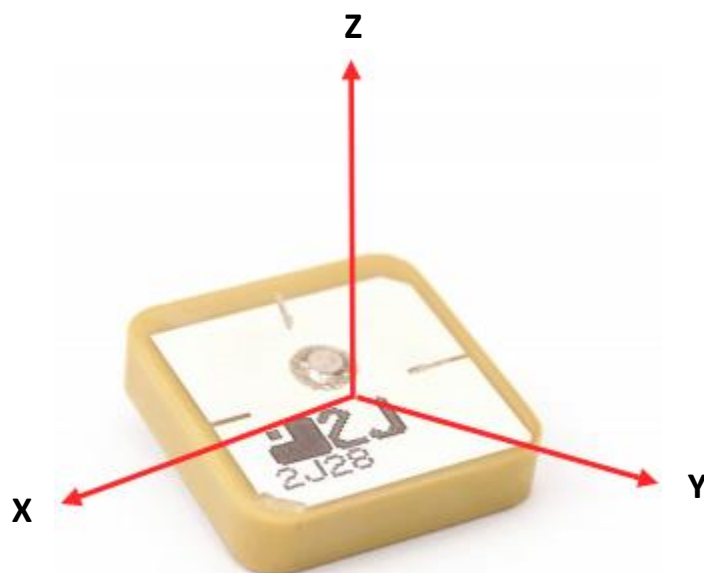
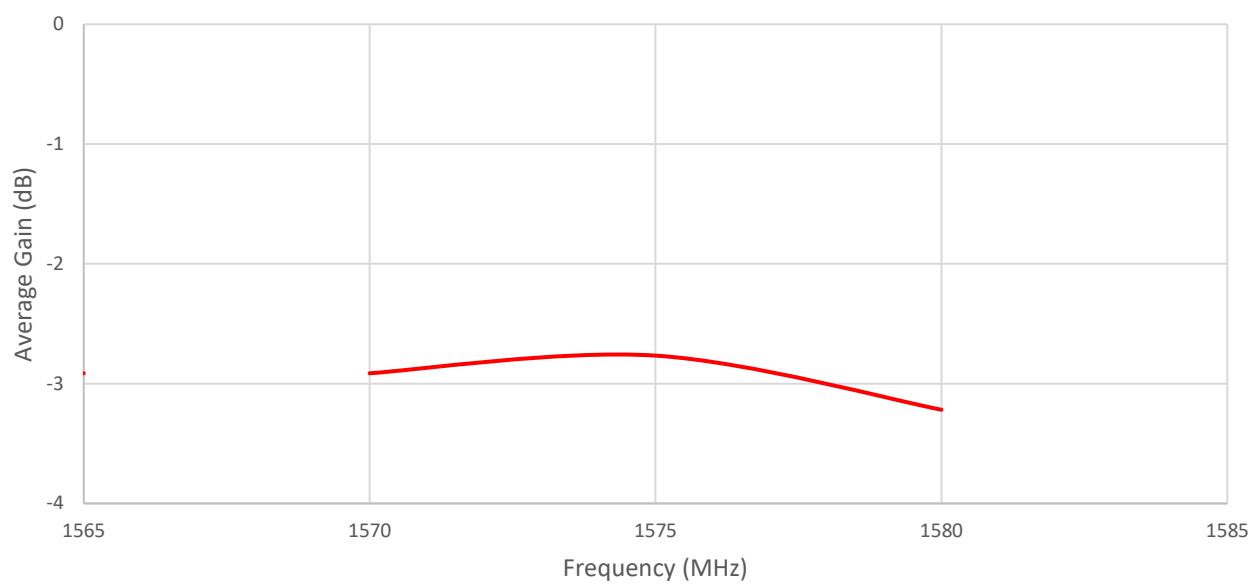
MECHANICAL AND ENVIRONMENTAL SPECIFICATIONS

Specification	2JCP1840101a_SOMUSA
Mounting Type	Thru-Hole Mount
Adhesive	Nitto 5000NS
Dimensions (mm)	18 x 18 x 4
Operating Temperature (C)	-40 to +85
Storage Temperature (C)	-40 to +85
Substance Compliance	RoHS

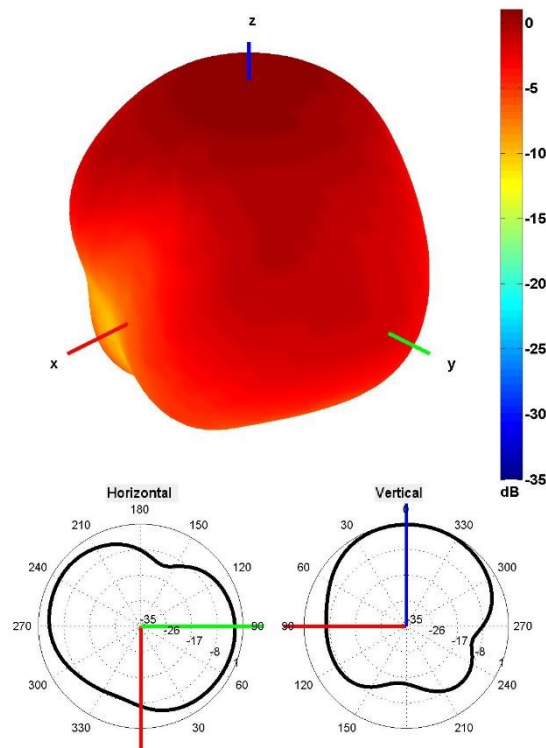
ANTENNA PARAMETERS







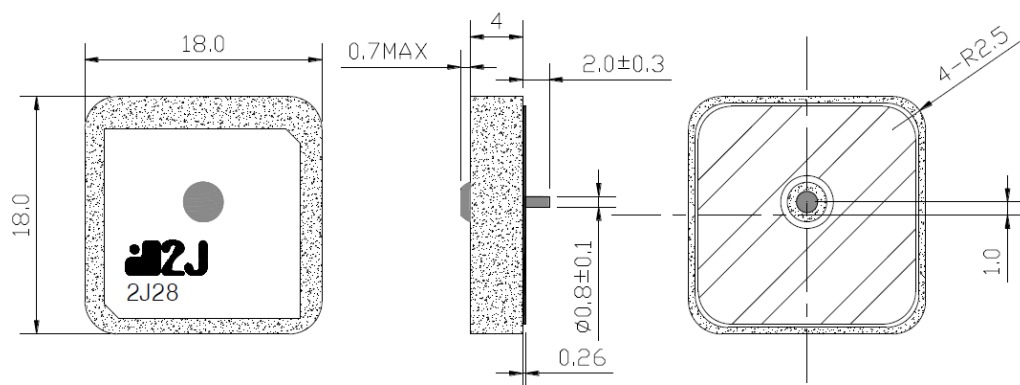
RADIATION PATTERN REFERENCE



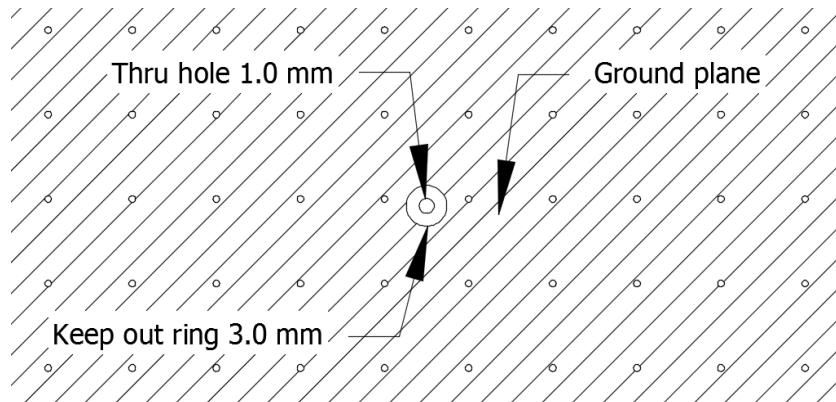
1575 MHz RADIATION PATTERN

ANTENNA DRAWINGS

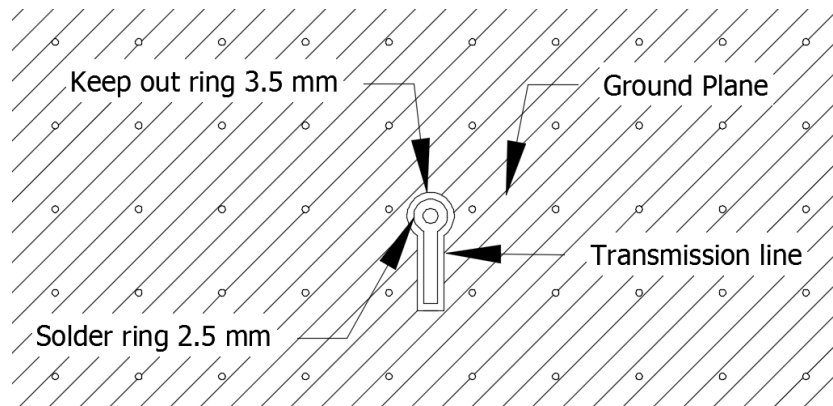
Patch Dimensions



Layout for top layer



Layout for bottom layer



ANTENNA IMAGES



AT3216 Series

Multilayer Chip Antenna

Features

- ❖ Monolithic SMD with small, low-profile and light-weight type.
- ❖ Wide bandwidth

Applications

- ❖ Bluetooth/Wireless LAN/Home RF
- ❖ ISM band 2.4GHz applications



Specifications

Part Number	Frequency Range (MHz)	Peak Gain (XZ-V)	Average Gain (XZ-V)	VSWR	Impedance
AT3216 -B2R7HAA_	2400 ~ 2500	0.5 dBi typ.	-0.5 dBi typ.	2 max.	50 Ω

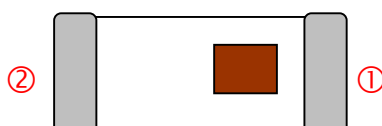
Q'ty/Reel (pcs) : 3,000pcs
 Operating Temperature Range : -40 ~ +85 °C
 Storage Temperature Range : -40 ~ +85 °C
 Power Capacity : 3W max.

Part Number

AT 3216 - B 2R7 HAA □ □
 ① ② ③ ④ ⑤ ⑥ ⑦

① Type	AT : Antenna	② Dimensions (L × W)	3.2× 1.6 mm
③ Material Code	B	④ Frequency Range	2R7=2700MHz
⑤ Specification Code	HAA	⑥ Packaging	T: Tape & Reel B: Bulk
⑦ Soldering	=lead-containing /LF=lead-free		

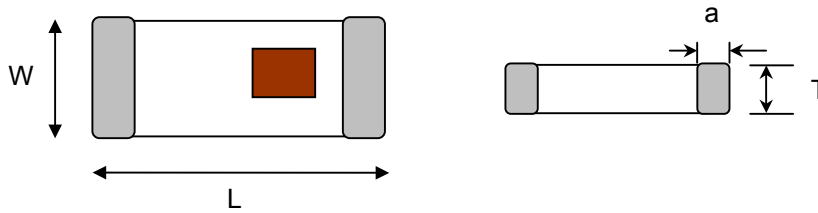
Terminal Configuration



No.	Terminal Name	No.	Terminal Name
①	Feeding Point	②	NC

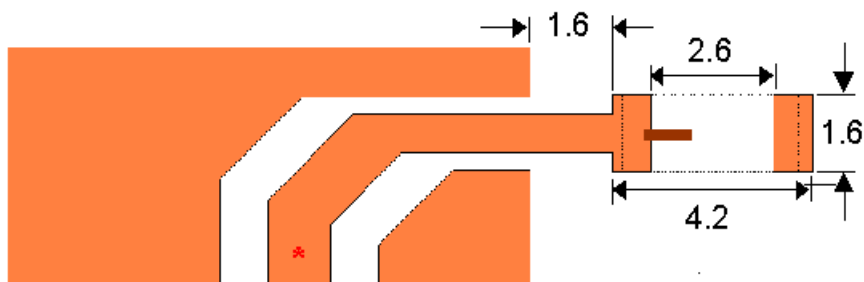
Dimensions and Recommended PC Board Pattern

Unit : mm

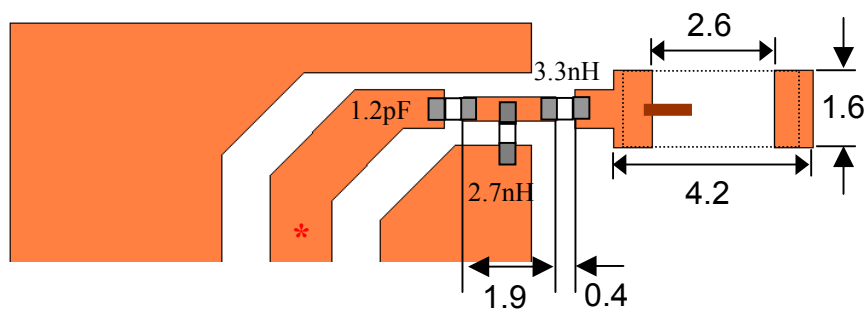


Mark	L	W	T	a
Dimensions	3.2 ± 0.2	1.6 ± 0.2	$1.3 + 0.1 / - 0.2$	0.5 ± 0.3

(a) Without Matching Circuits



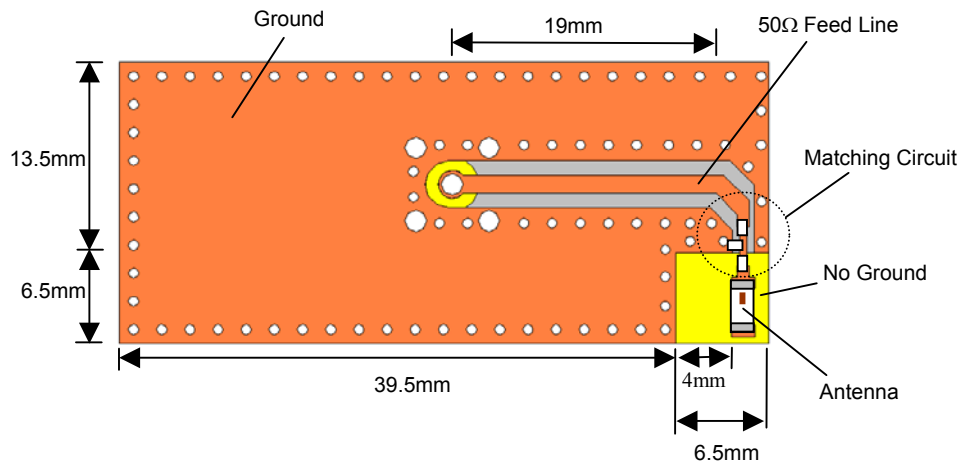
(b) With Matching Circuits



*Line width should be designed to match 50Ω characteristic impedance, depending on PCB material and thickness.

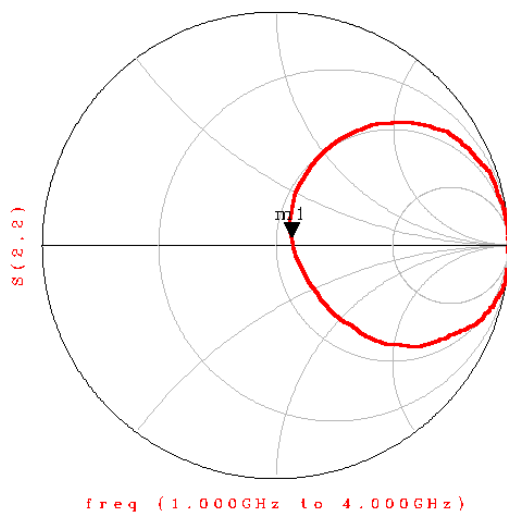
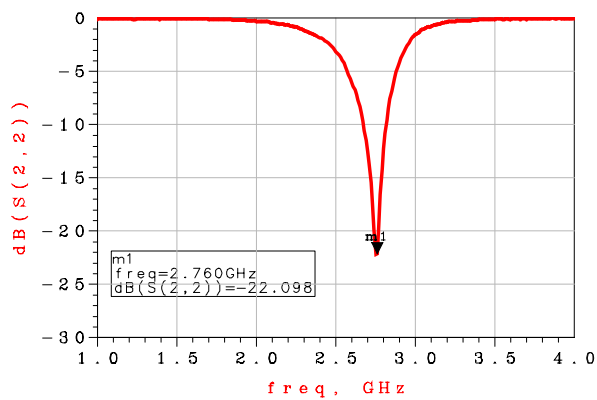
Typical Electrical Characteristics (T=25°C)

❖ Test Board

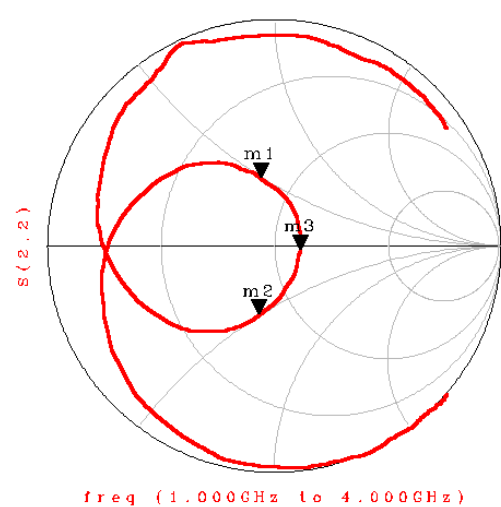
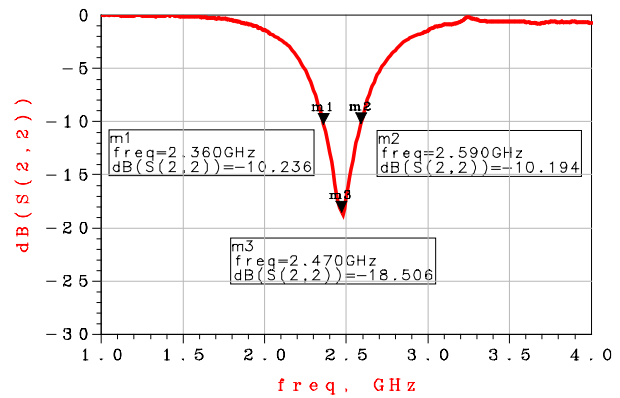


❖ Return Loss

(a) Without Matching Circuits

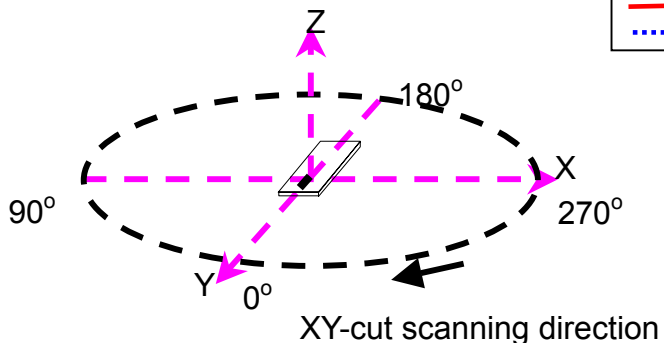


(b) With Matching Circuits

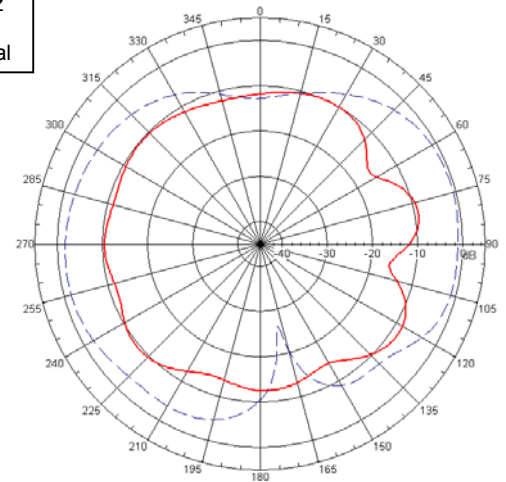


Radiation Patterns

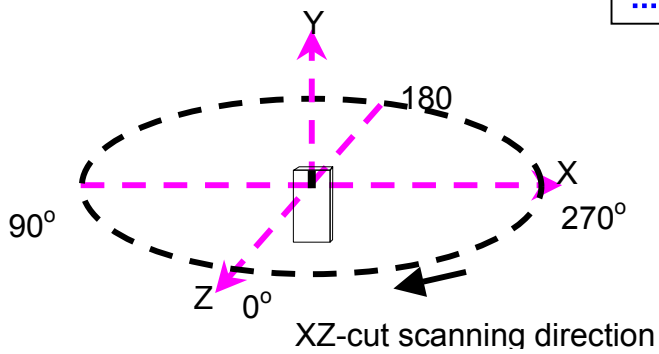
XY-V/XY-H



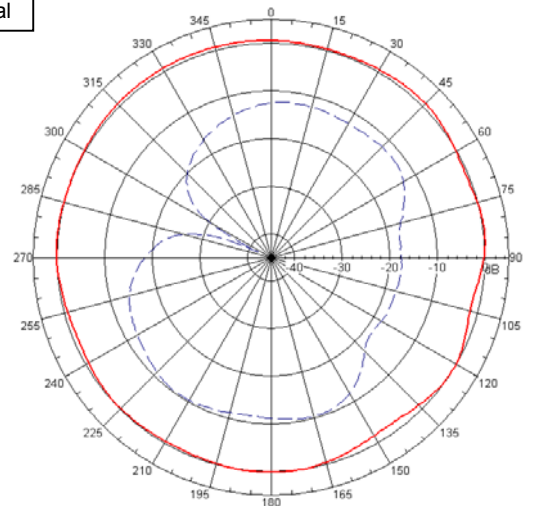
XY cut @2.45GHz
— Vertical
- - - Horizontal



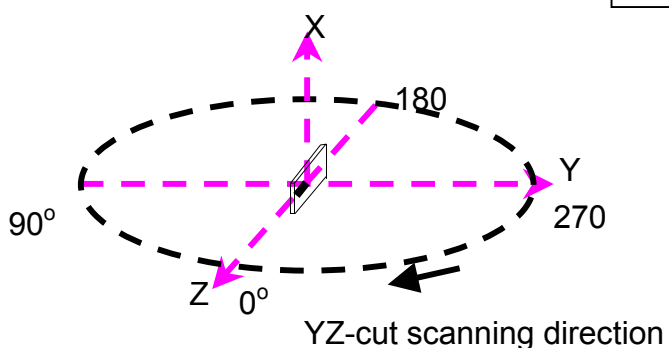
XZ-V/XZ-H



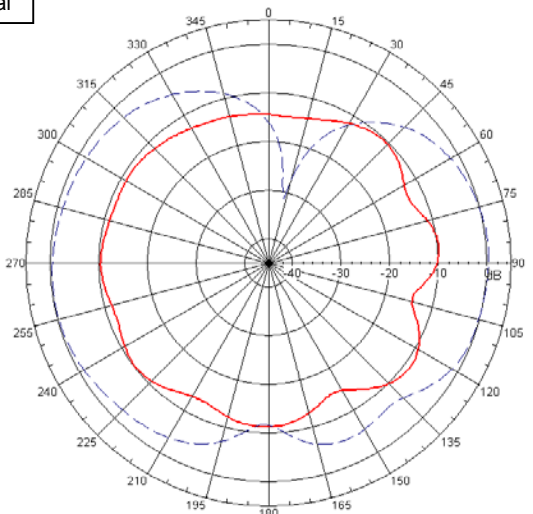
XZ cut @2.45GHz
— Vertical
- - - Horizontal



YZ-V/YZ-H



YZ cut @2.45GHz
— Vertical
- - - Horizontal



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Datasheets for electronic components.