TAOGLAS

Datasheet

Part No:
MCS6.A

Description

NB-IoT / CAT M1 Low Profile 4G SMD Dielectric Antenna

Features:

GSM / CDMA / DCS / PCS / WCDMA / UMTS /HSDPA / GPRS / EDGE
NB-IoT / CAT M1 Bands
698 - 960MHz / 1710 - 2690MHz
High Efficiency Multi-Band SMD antenna
Low profile 42 x 10 x 3mm
RoHS & REACH Compliant

1. Introduction

The MCS6.A is a low profile SMD NB-IoT / CAT M1 Bands / 4G/3G/2G embedded antenna designed for direct SMD mount on a device PCB. It provides high efficiency in a very small form factor of just 42 x 10 x 3mm.

NB-IoT / CAT M1 is a low power wide area (LPWA) technology specifically designed for IoT and M2M. NB-IoT / CAT M1 technology offers lower maintenance cost, with greater efficiency and reliability by reducing power consumption and providing deeper penetration compared to standard cellular technologies. It operates on secure mobile networks making it suited to automotive, smart meter, medical and smart city applications.

If tuning is required, the MCS6.A can be tuned for the device environment without the need for new tooling. Its rectangular shape and very small size make it very easy to integrate. It is supplied on tape and reel ensuring that it can be mounted via pick and place to reflow solder directly on the edge of the PCB board.

Contact your regional Taoglas Customer Support Team for quick and professional support from our senior engineering team on integration and matching of the antenna to your device.

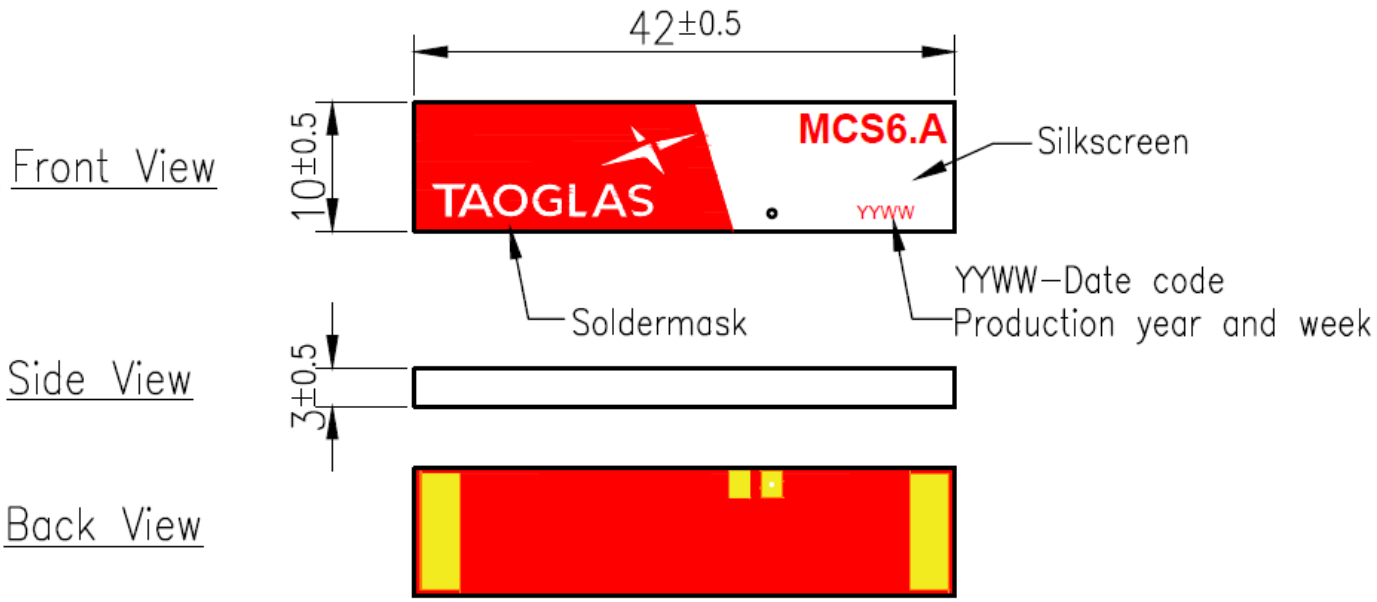
2. Specification

Electrical								
Band	Frequency (MHz)	Efficiency (%)	Average Gain (dB)	Peak Gain (dBi)	Impedance	Polarization	Radiation Pattern	Max. input power
Bands 5,8,20,28	700-900	66.2	-1.79	2.55	50 Ω	Linear	Omni directional	5W
Bands 2,3,4,25,66	1700-2100	76.9	-1.14	4.76				
Bands 1,40	2300-2600	66.5	-1.77	4.64				
All measurements completed on 107 x 45mm Ground Plane.								

Mechanical	
Antenna Dimensions	42mm x 10mm x 3mm
Material	FR4
Weight	2.50g
Soldering Type	SMT through Reflow

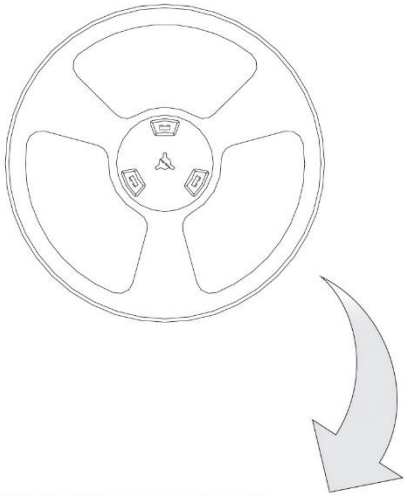
Environmental	
Operation Temperature	-40°C to +85°C
Storage Temperature	-40°C to +85°C
Moisture Sensitivity Level (MSL)	3 (168 Hours)

3. Mechanical Drawing

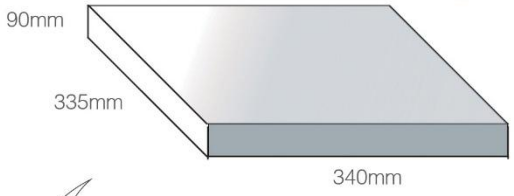


4. Packaging

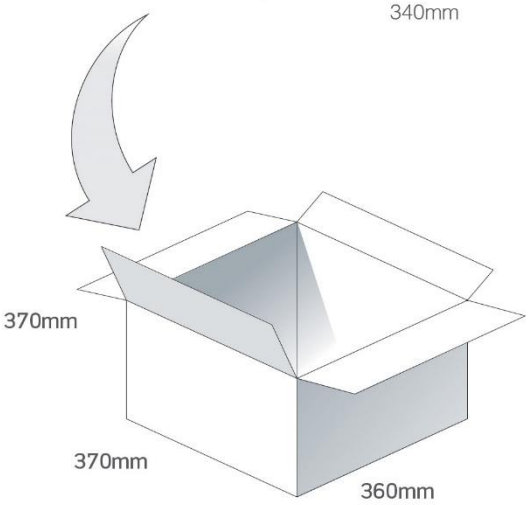
1000 pcs MCS6.A reel
Dimensions - 330*330*60mm
Weight - 2kg



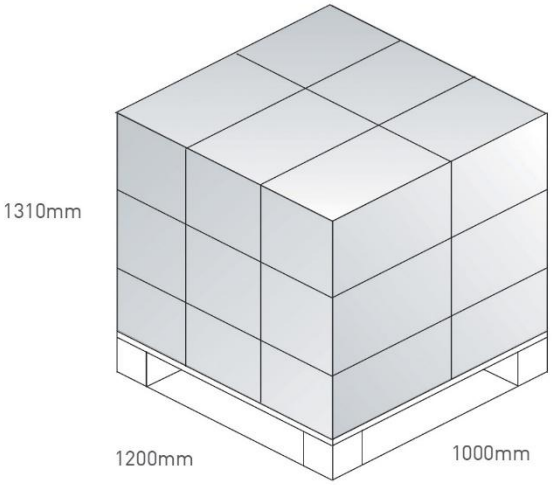
1000 pcs MCS6.A / 1 Reel in small box
Dimensions - 335*340*90mm
Weight - 2.1Kg



4 reels, 4000 pcs in one carton
Carton Dimensions - 370*360*370mm
Weight - 9.2Kg



Pallet Dimensions 1200*1000*1310mm
18 Cartons per Pallet
6 Cartons per layer
3 Layers



6. Antenna Integration Guide

The following is an example on how to integrate the MCS6.A into a design. This antenna has 4 pins, where one pin is used for the RF Feed. Taoglas recommends using a minimum of 107x45mm ground plane (PCB) to ensure optimal performance.

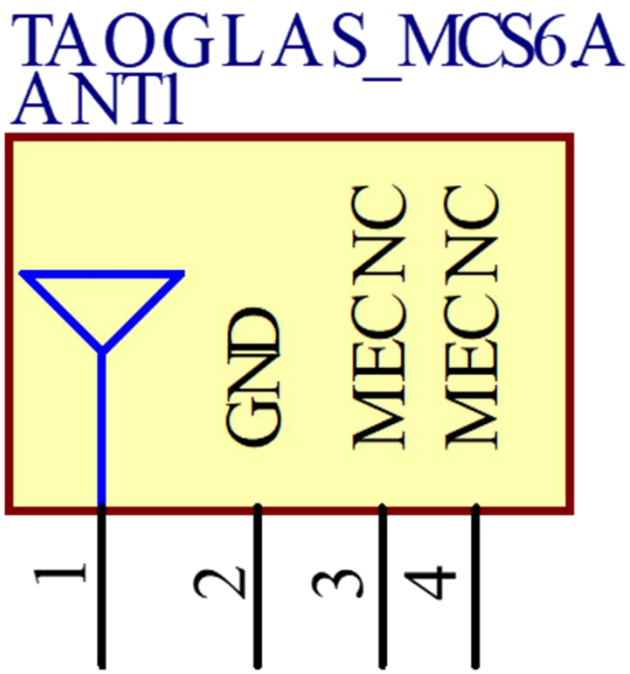
Top view of PCB reference design

Please find the Integration files in Altium, 2D formats and the 3D model for the MCS6.A here: https://www.taoglas.com/product/mcs6-a-nb-iot-cat-m1-low-profile-ltecellular-smd-dielectric-antenna/

6.1 Schematic Symbol and Pin Definition

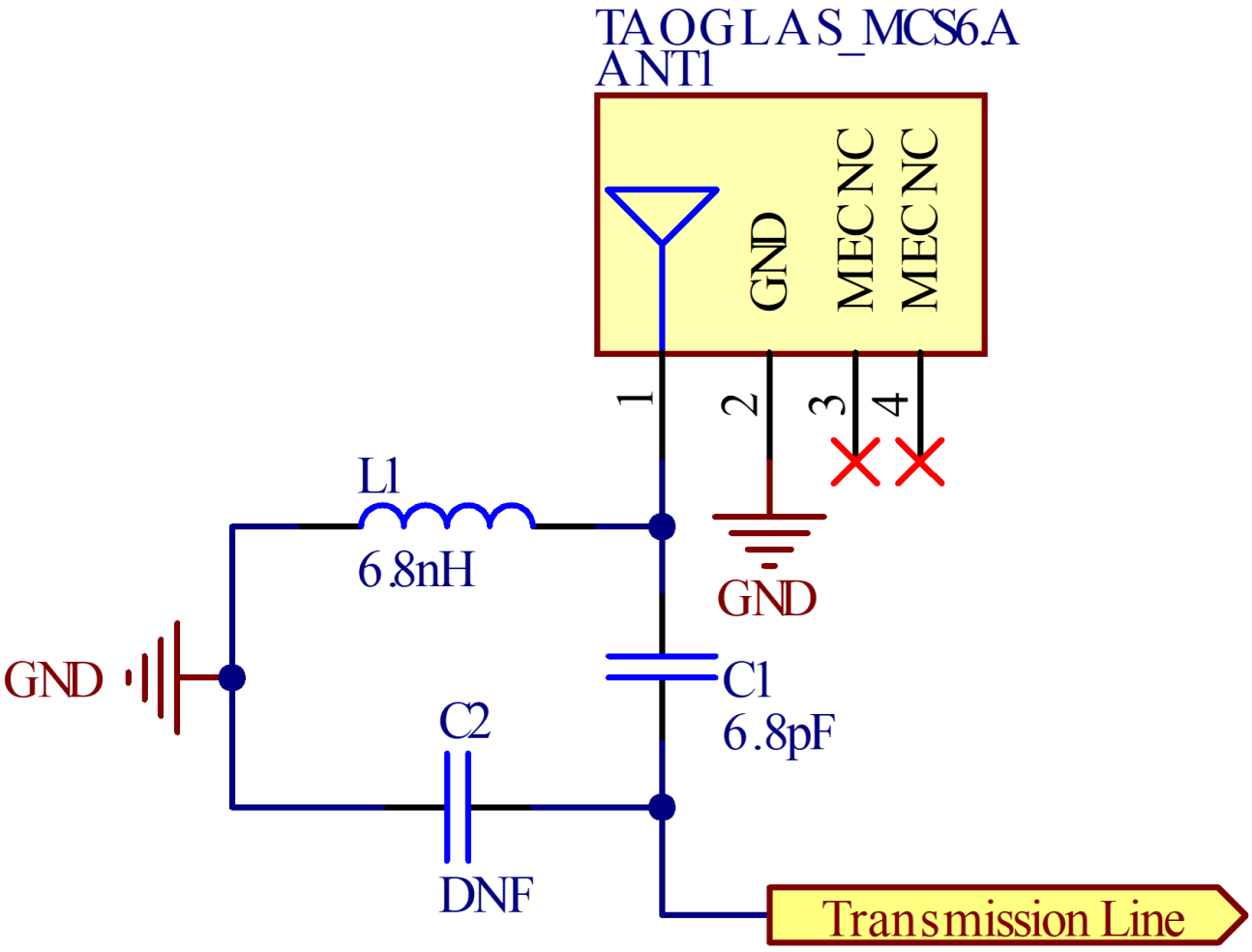
The circuit symbol for the MCS6.A is shown below. The antenna has 4 pins as indicated below.

Pin	Description
1	RF Feed
2	Ground
3, 4	Mechanical, Not Connected



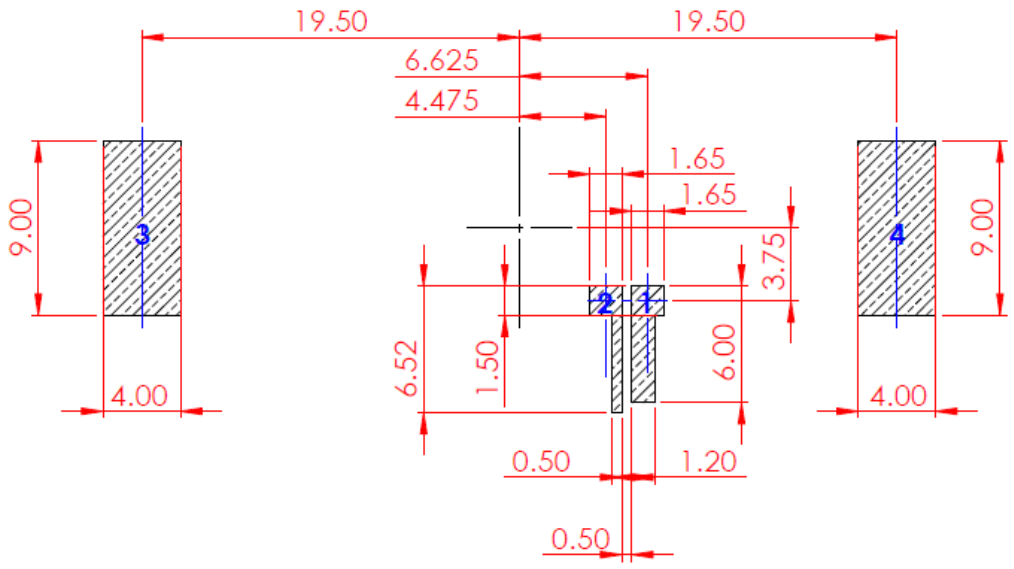
6.2 Schematic Layout

Matching components with the MCS6.A 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 “pi” network, for the MCS6.A.



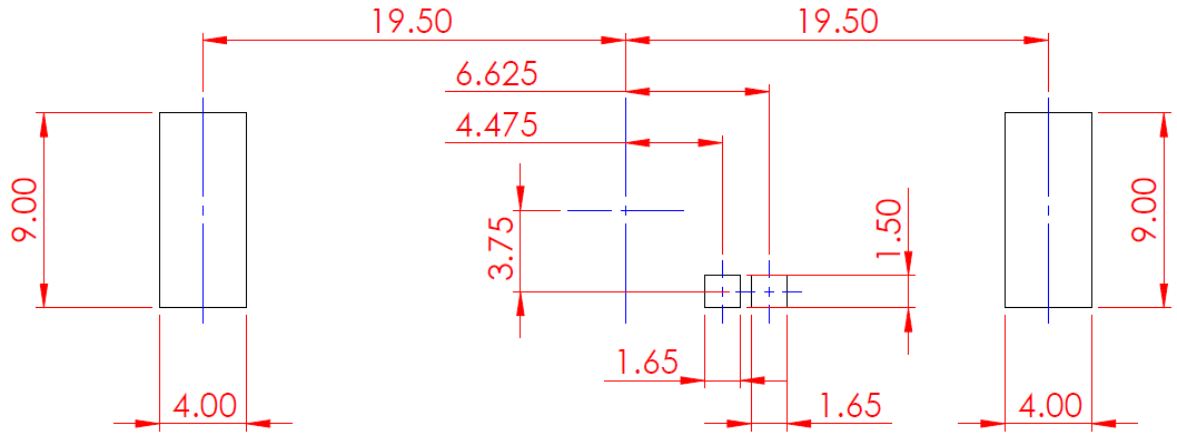
Designator	Type	Value	Manufacturer	Manufacturer Part Number
C1	Capacitor	6.8pF	Murata	GRM1555C1H6R8DA01D
C2	Capacitor	Not Fitted	-	-
L1	Inductor	6.8nH	TDK	MHQ1005P6N8JT000

6.3 Footprint

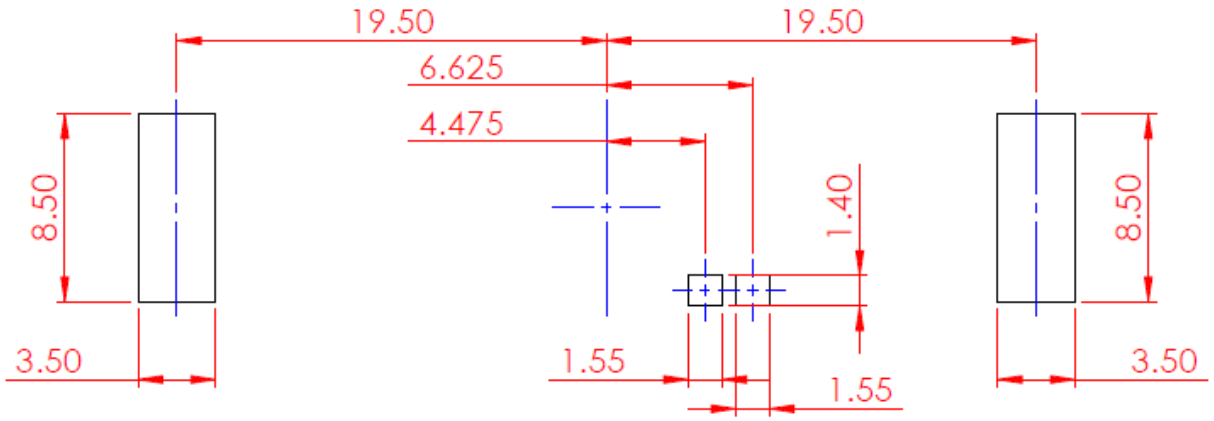


PIN:	DESCRIPTION:
1	FEED
2	GROUND
3	NOT CONNECTED
4	NOT CONNECTED

6.4 Top Solder Mask



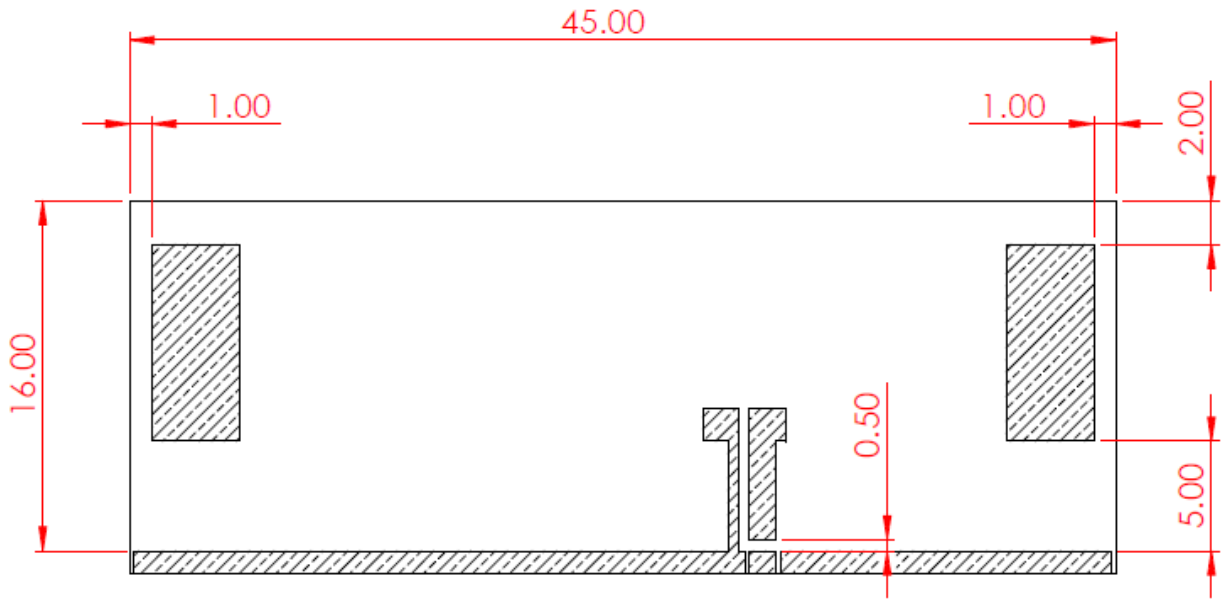
6.5 Top Solder Paste



6.6 Copper Clearance

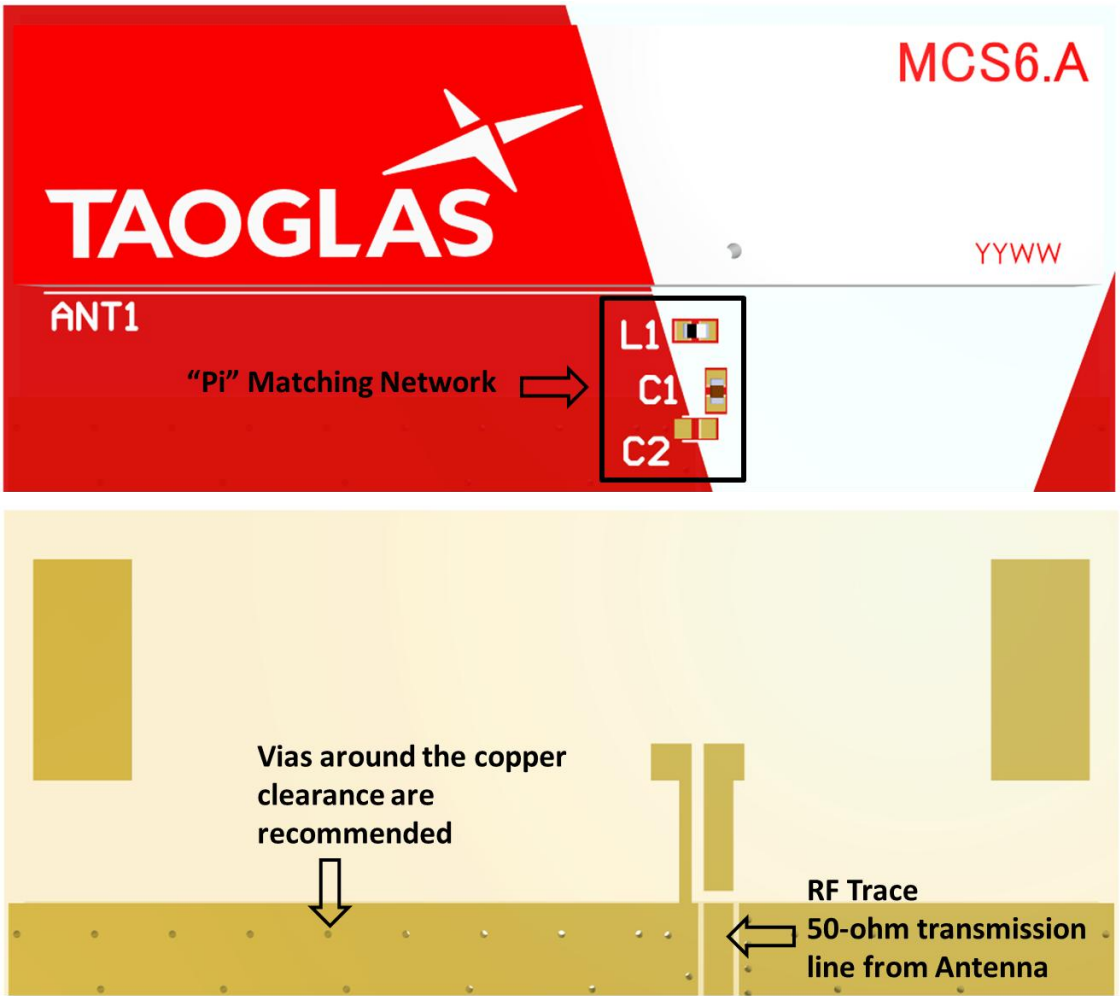
The footprint and clearance on the PCB must comply with the antenna's specification. The PCB layout shown in the diagrams below demonstrates the MCS6.A clearance area. The copper keep out area applies to all layers that are below the MCS6.A.

The copper clearance area should extend to 5mm from the antenna pads to the ground plane. The PCB edge clearance should be 2mm from the top and 1mm from the sides.



6.7 Antenna Integration

The MCS6.A should be placed in the centre, as close to the edge on the long side of the PCB as possible, to take advantage of the ground plane. The RF trace must maintain a 50 Ohm transmission line. A “pi” 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.

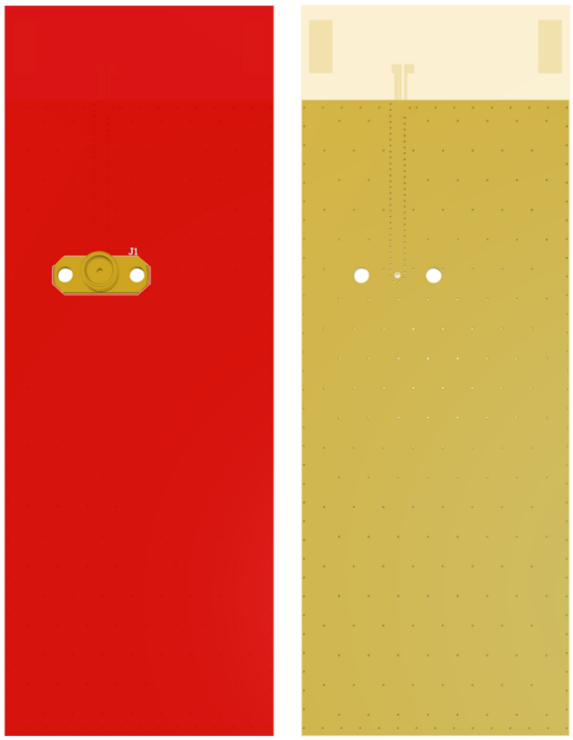


MCS6.A antenna mounted on a PCB reference design, showing the transmission line and integration notes.

6.8 Final Integration

The top side image shown below highlights the antenna transmission line. Taoglas recommends using a minimum of 107x45mm ground plane (PCB) to ensure optimal performance.

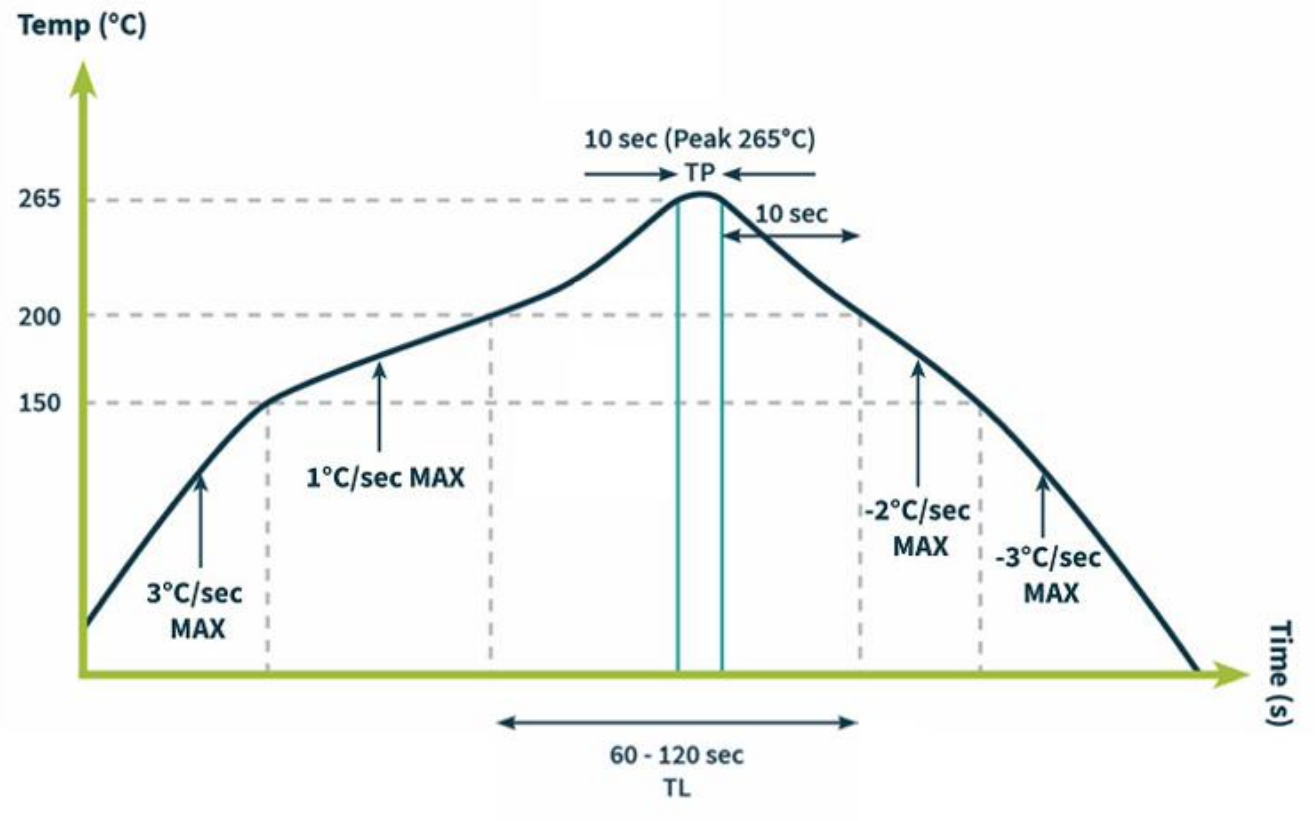
Top Side (MCS6.A placement on 107x45mm PCB reference design)



Bottom Side

7. Solder Reflow Profile

The MCS6.A can be assembled by following the recommended soldering temperatures are as follows:



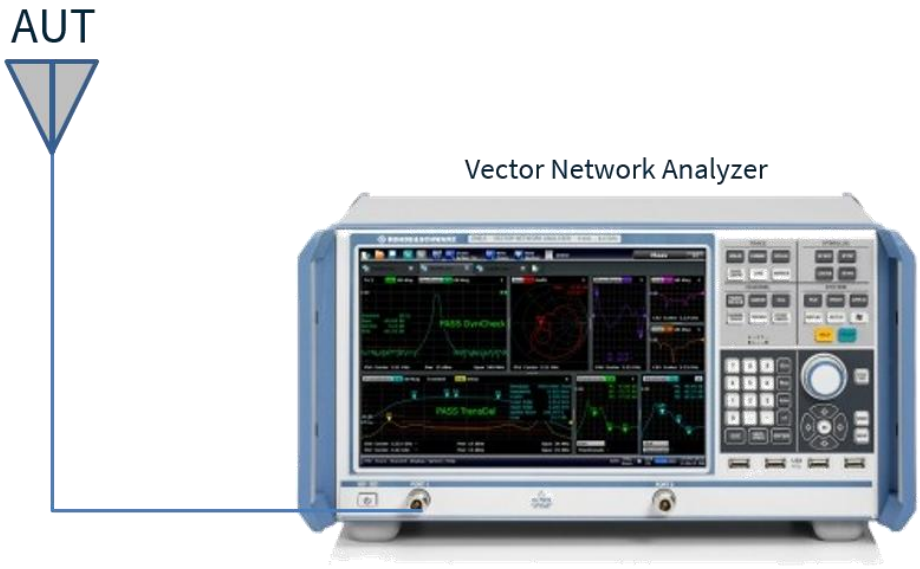
*Temperatures listed within a tolerance of +/- 10º C

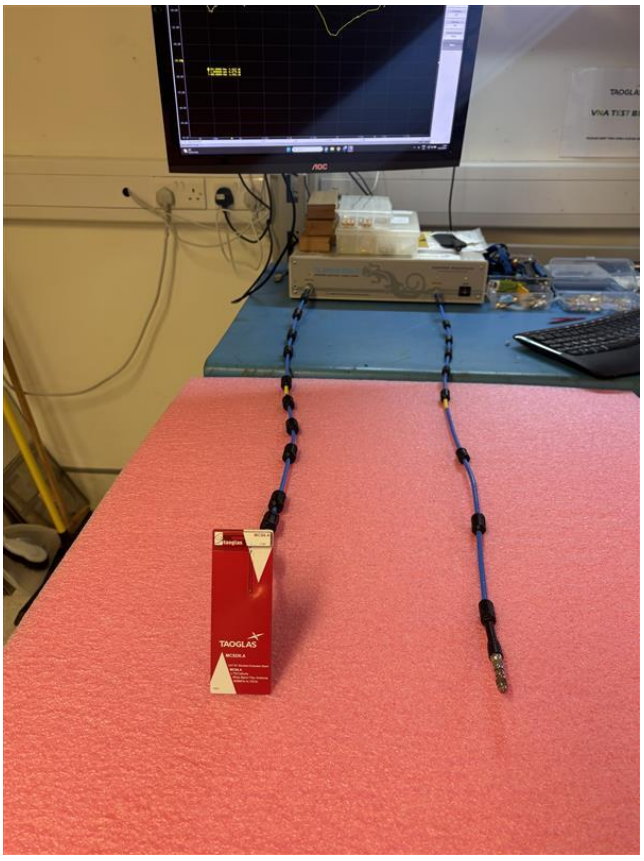
Smaller components are typically mounted on the first pass, however, we do advise mounting the MCS6.A when placing larger components on the board during subsequent reflows.

Note: Soldering flux classified ROL0 under IPC J-STD-004 is recommended.

8. Antenna Characteristics

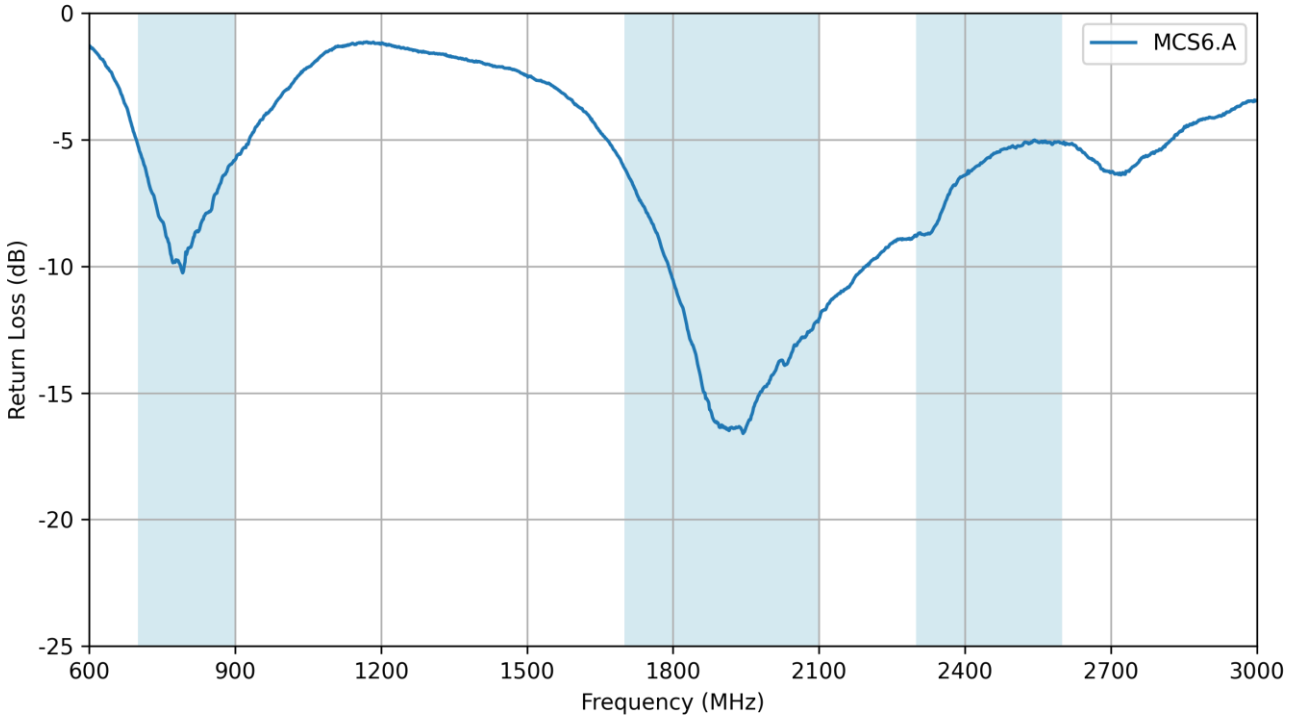
8.1 Test Setup



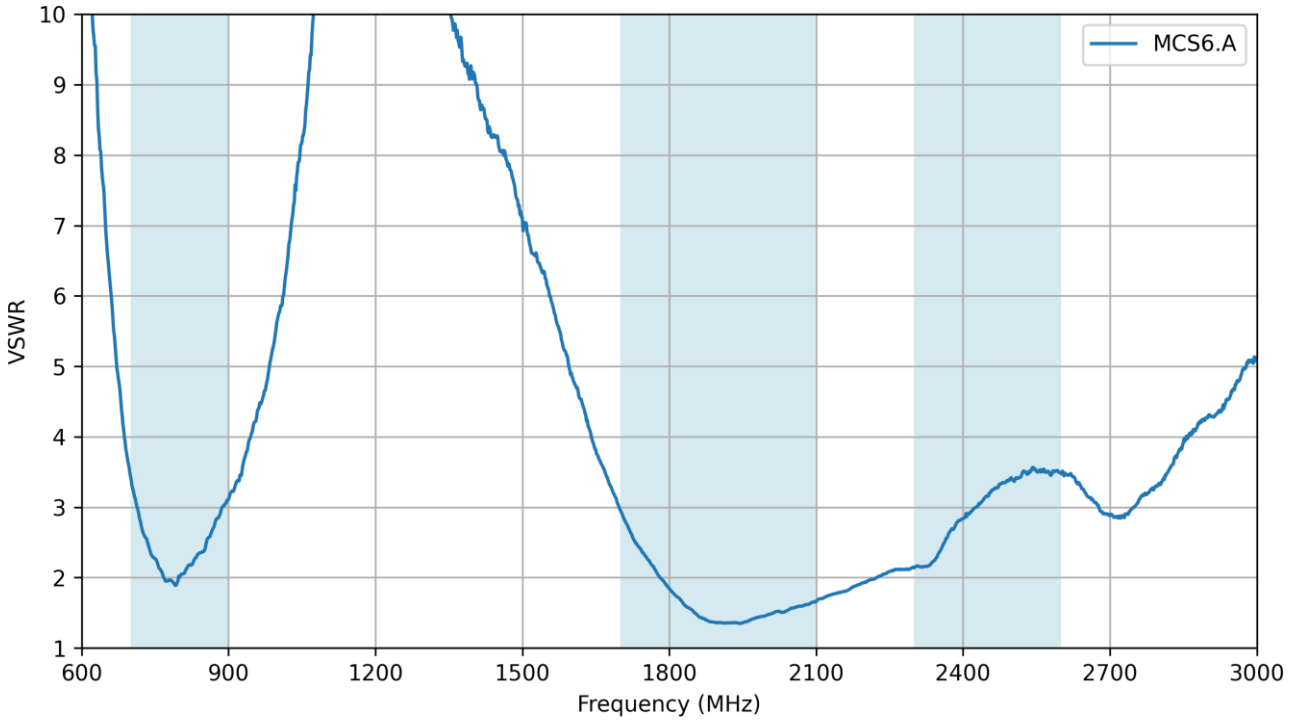


VNA Test Set-up

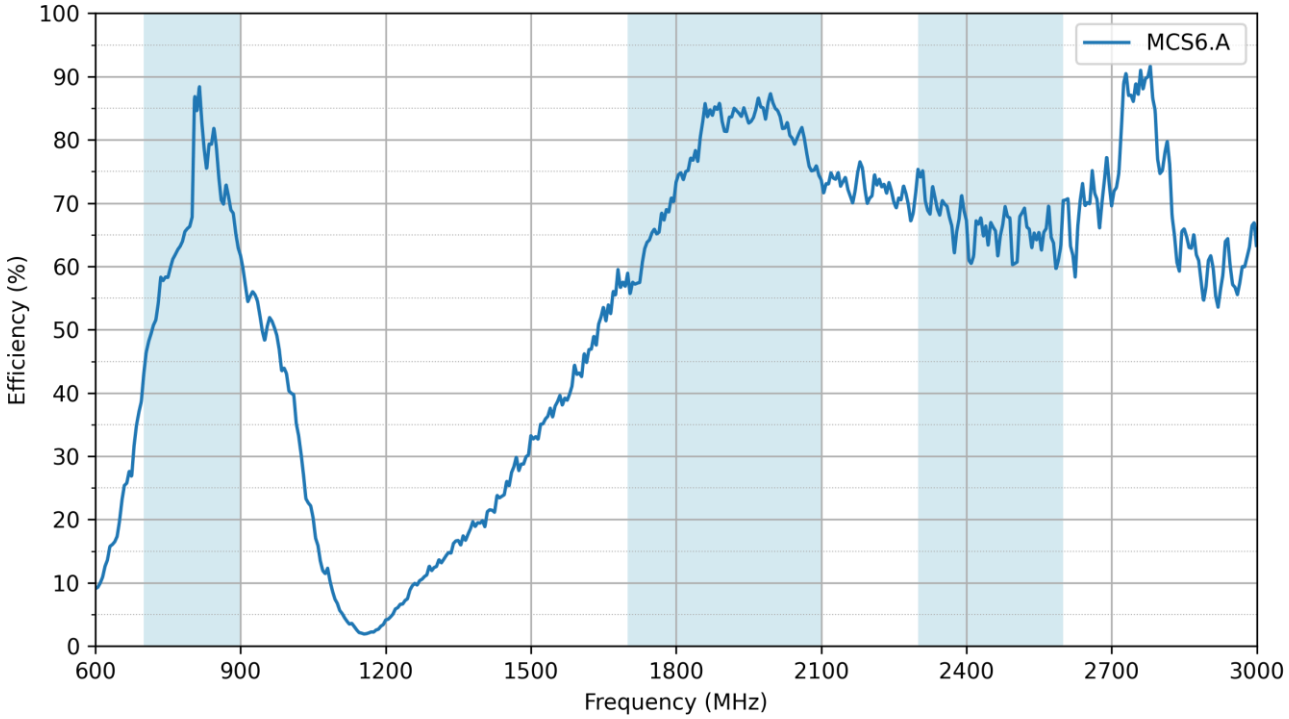
8.2 Return Loss



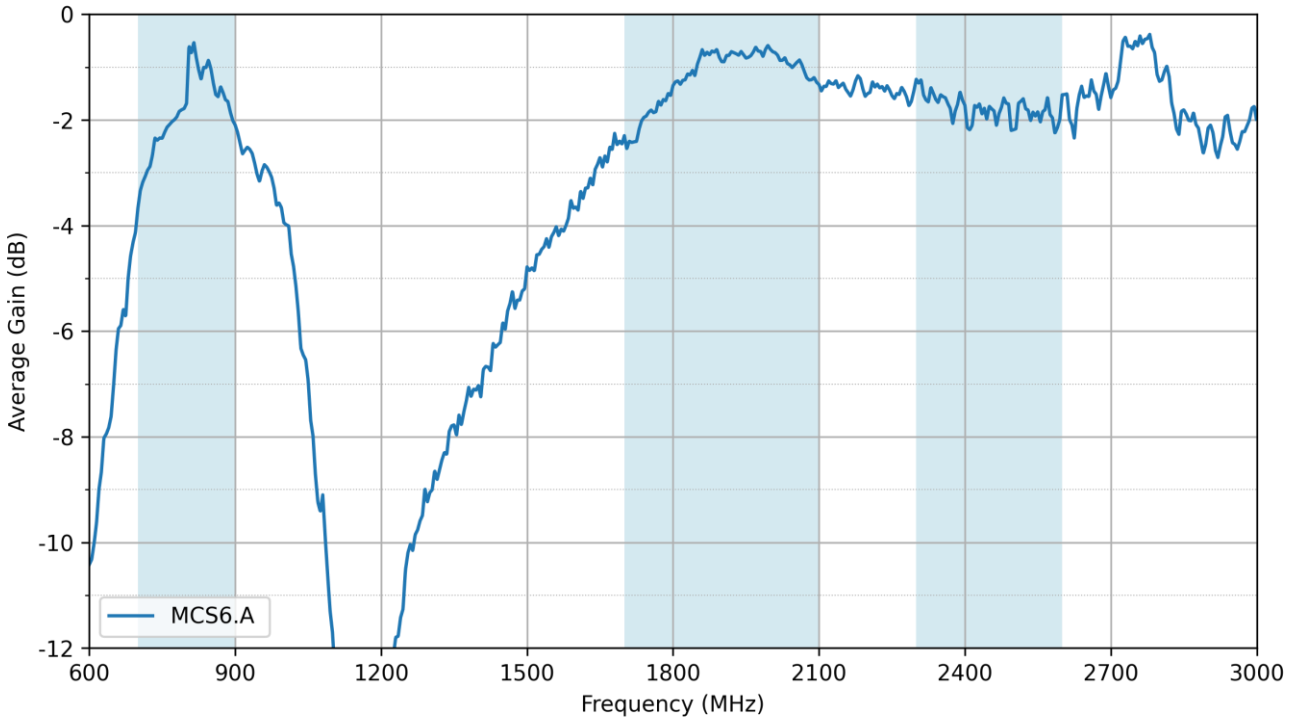
8.3 VSWR



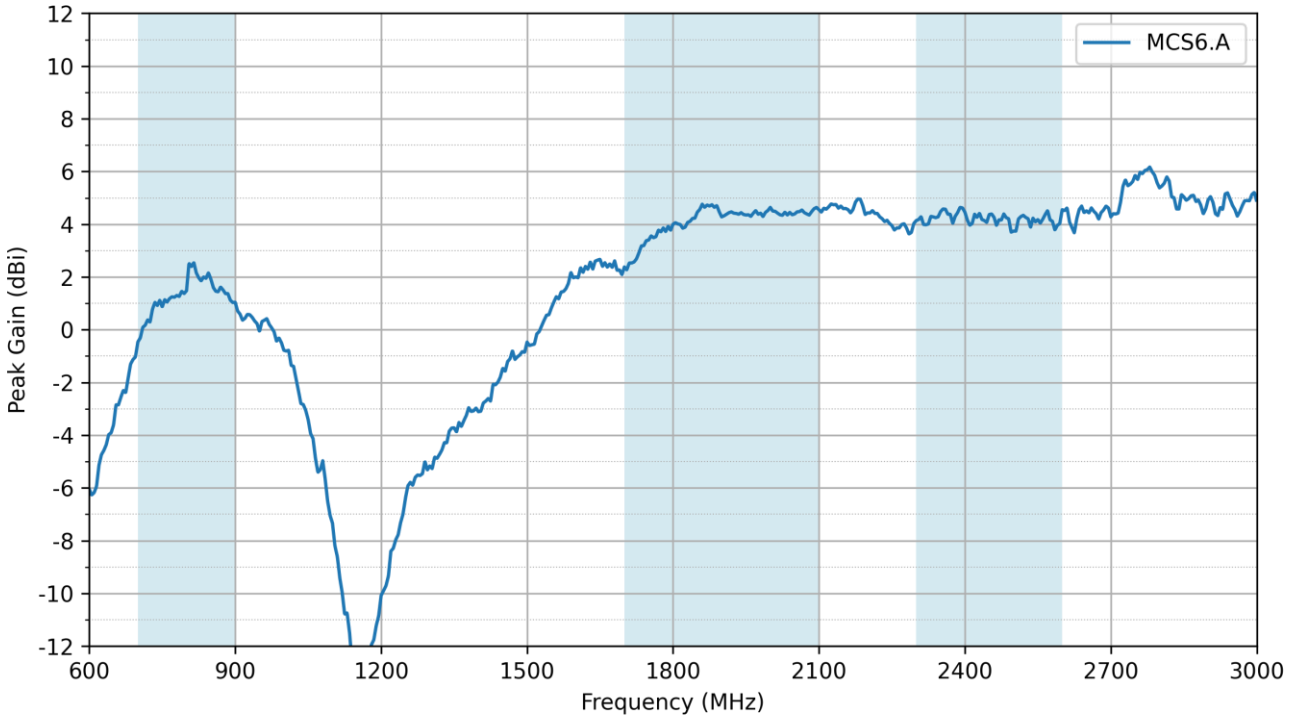
8.4 Efficiency



8.5 Average Gain

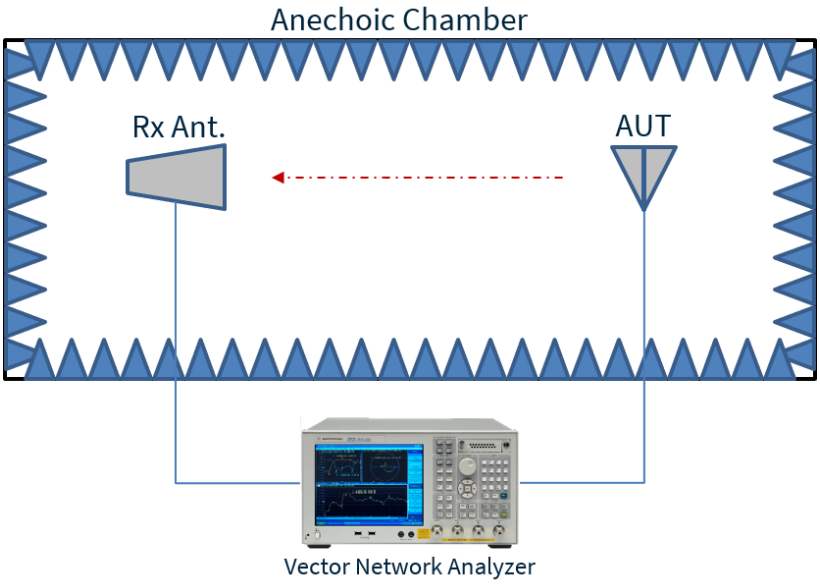


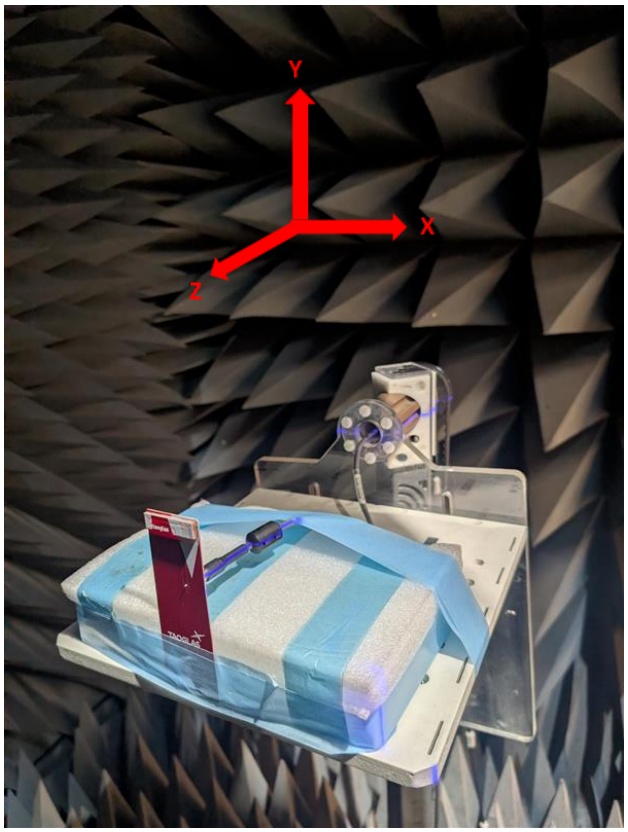
8.6 Peak Gain


MCS6.A
Peak Gain (dBi)
Frequency (MHz)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
600
900
1200
1500
1800
2100
2400
2700
3000

9. Radiation Patterns

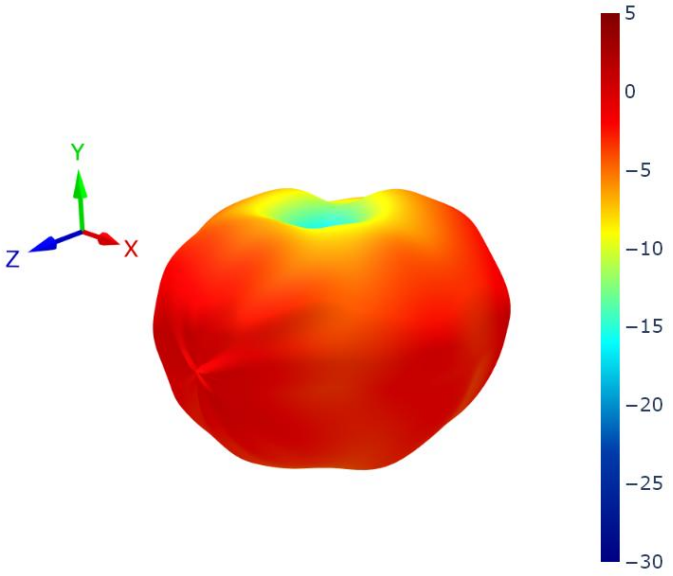
9.1 Test Setup

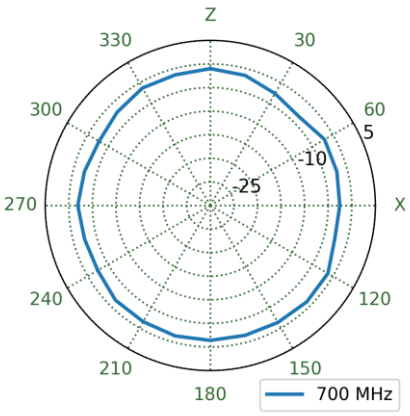
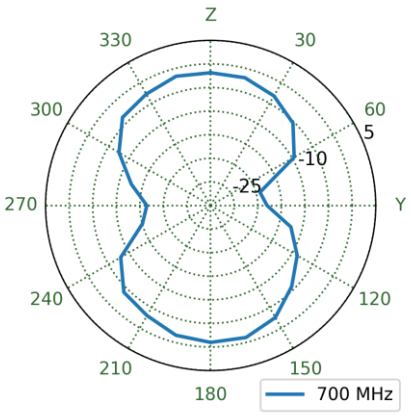
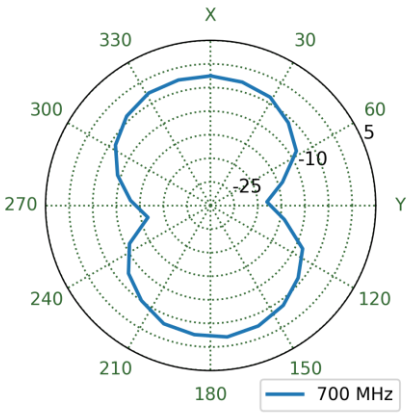




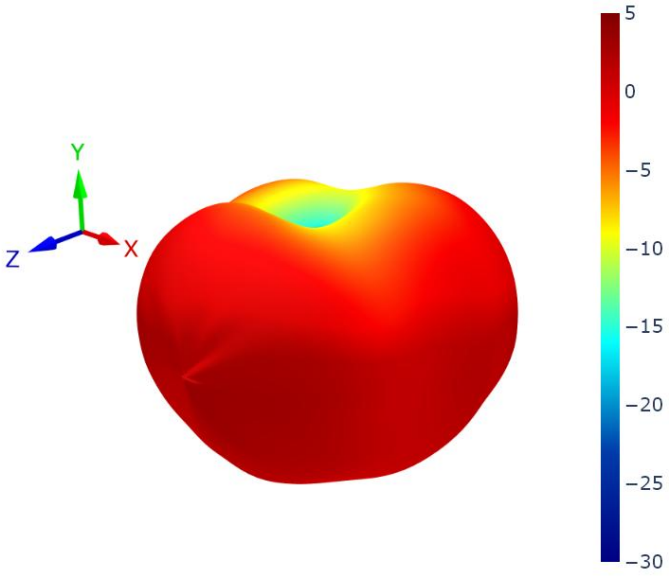
Chamber Test Set-up

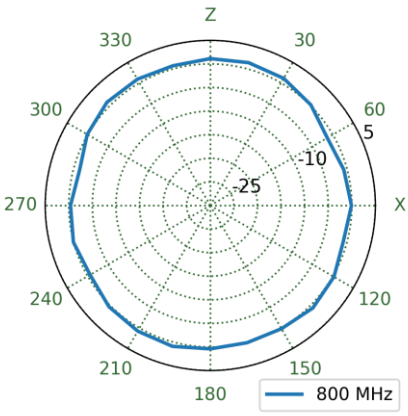
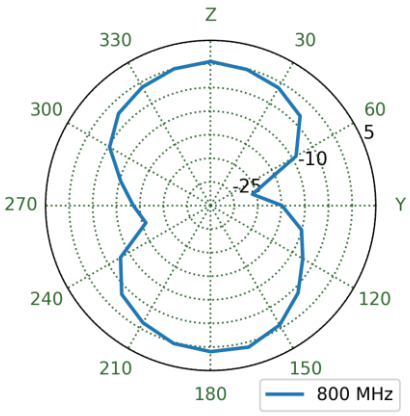
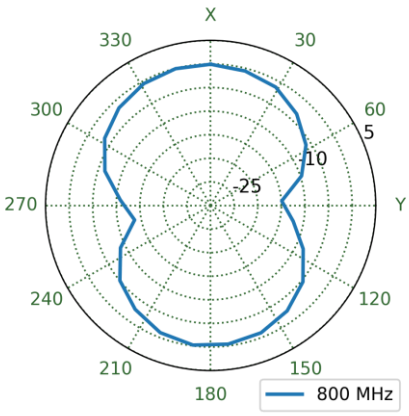
9.2 Patterns at 700 MHz



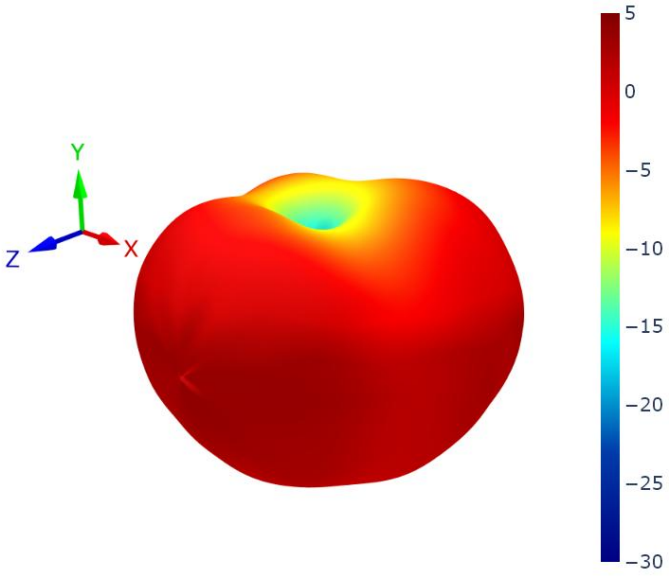
XZ Plane	YZ Plane	XY Plane
		

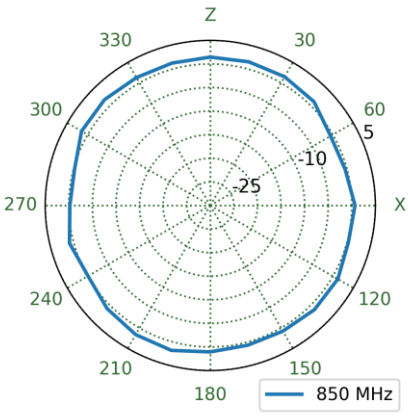
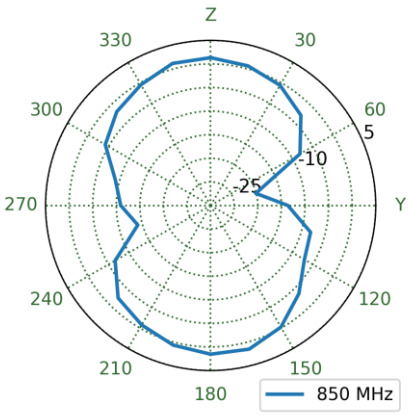
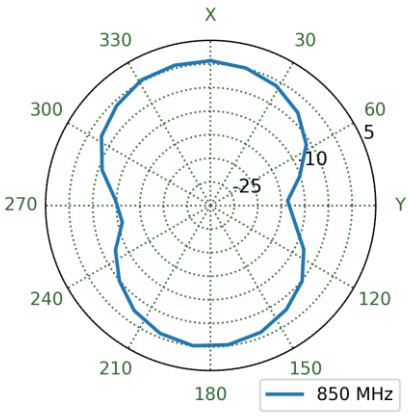
9.3 Patterns at 800 MHz



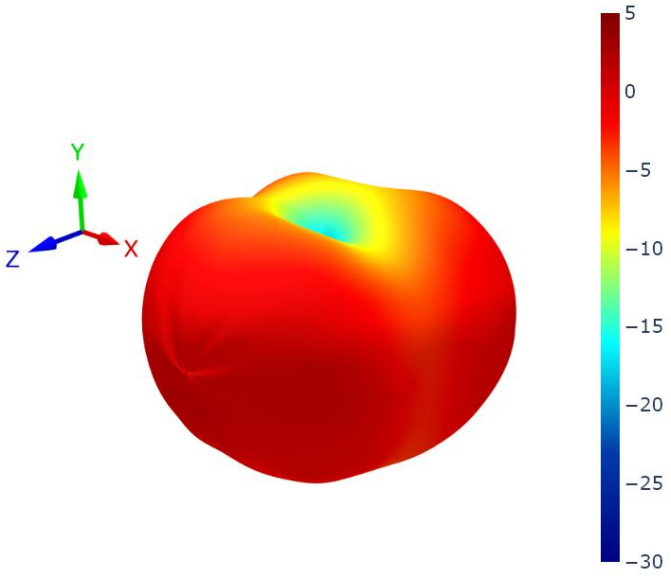
XZ Plane	YZ Plane	XY Plane
		

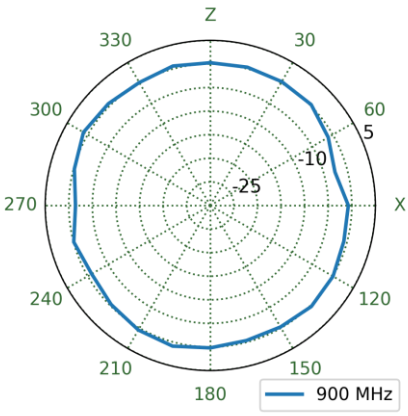
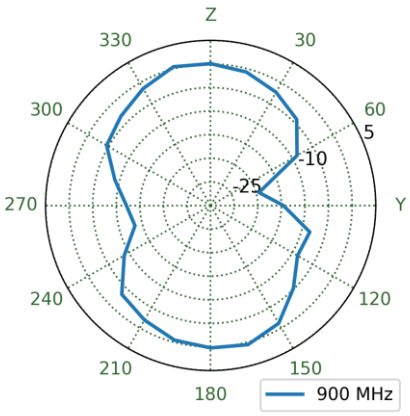
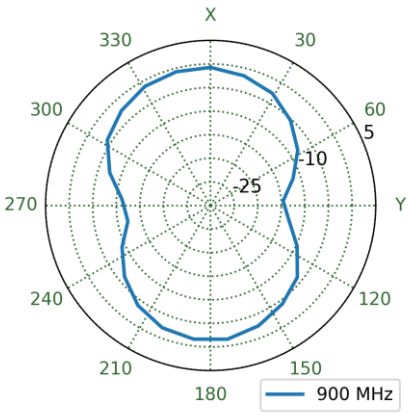
9.4 Patterns at 850 MHz



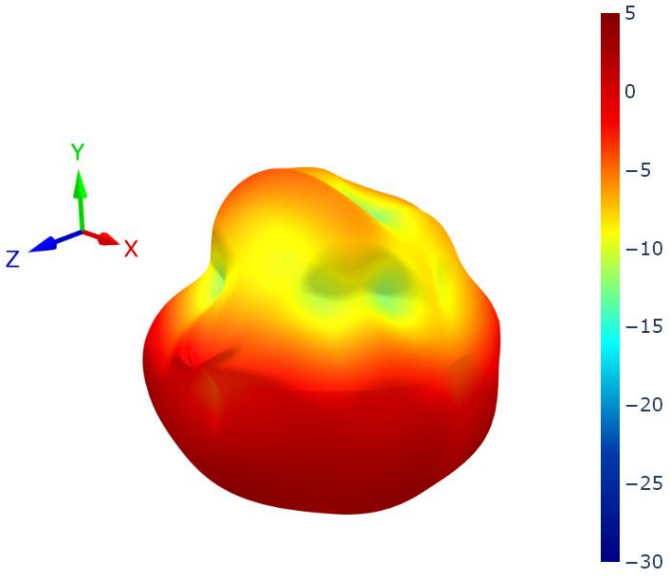
XZ Plane	YZ Plane	XY Plane
		

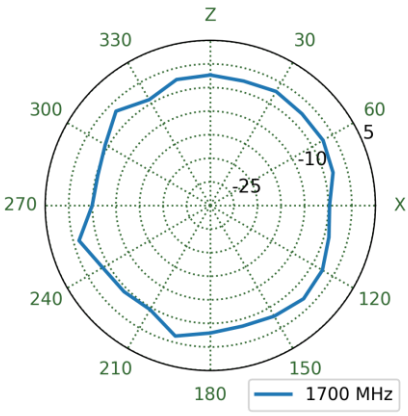
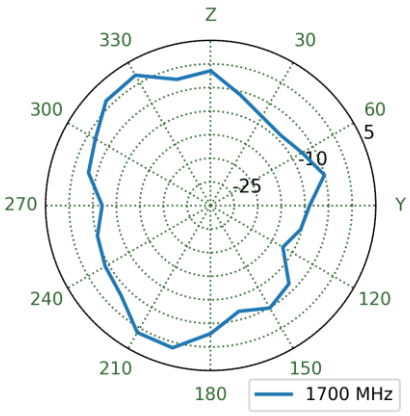
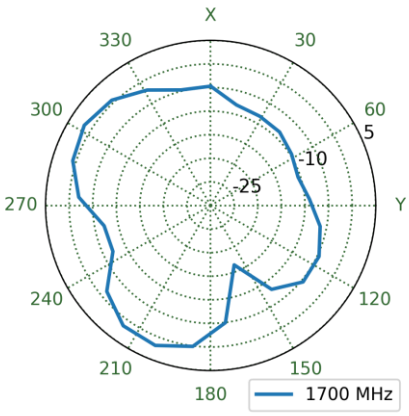
9.5 Patterns at 900 MHz



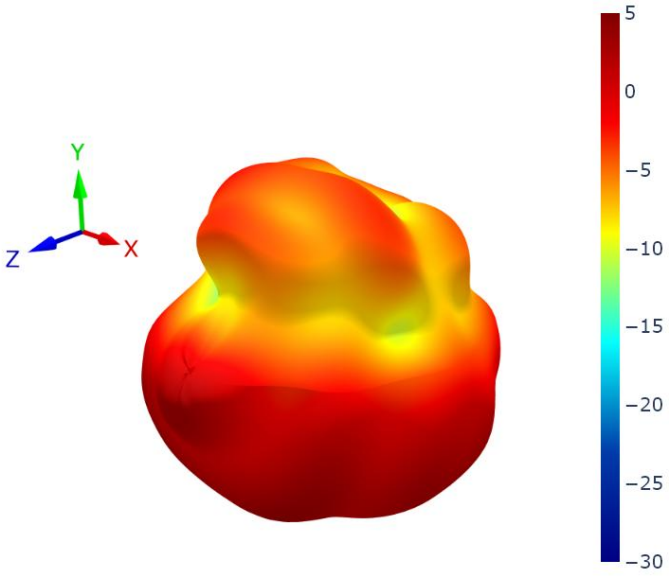
XZ Plane	YZ Plane	XY Plane
		

9.6 Patterns at 1700 MHz

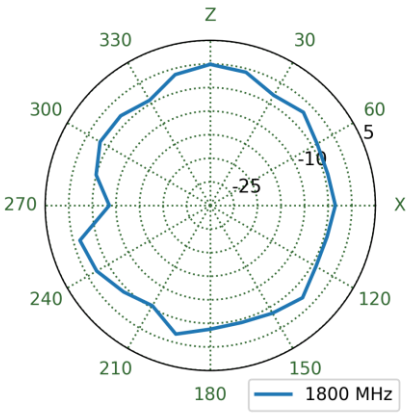


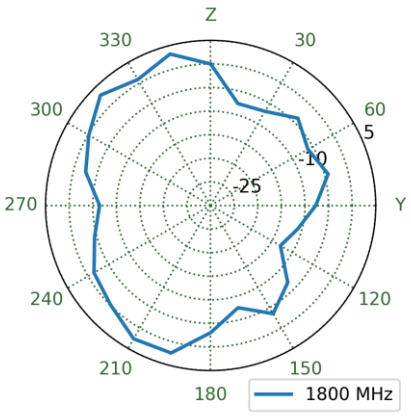
XZ Plane	YZ Plane	XY Plane
		

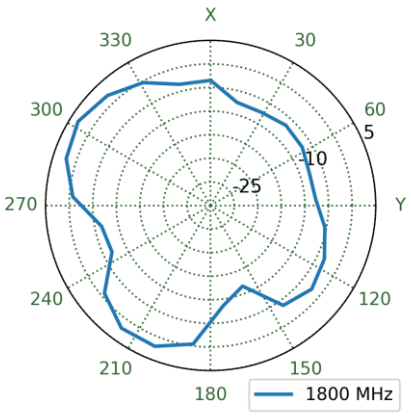
9.7 Patterns at 1800 MHz



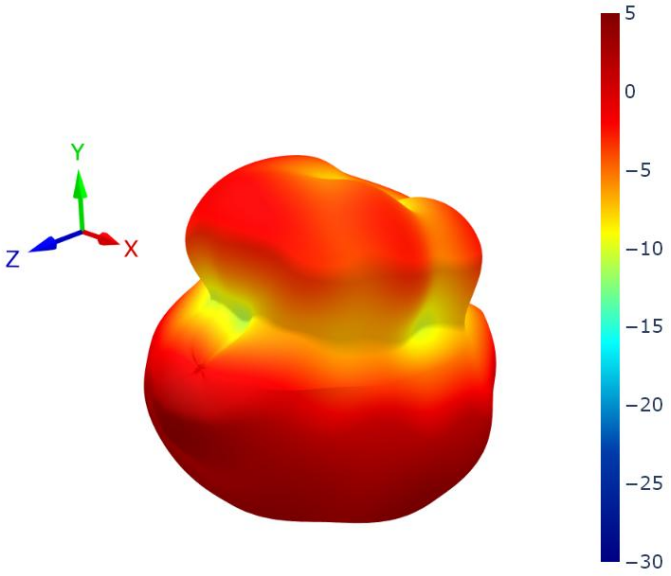
XZ Plane	YZ Plane	XY Plane

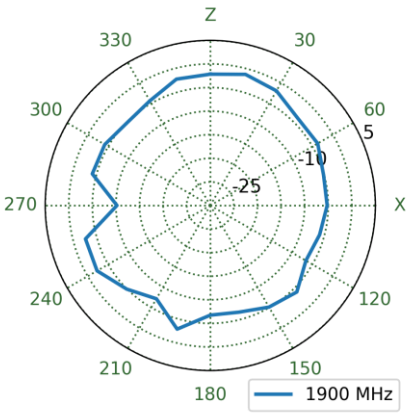
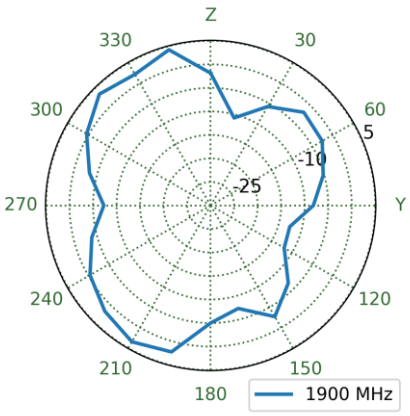
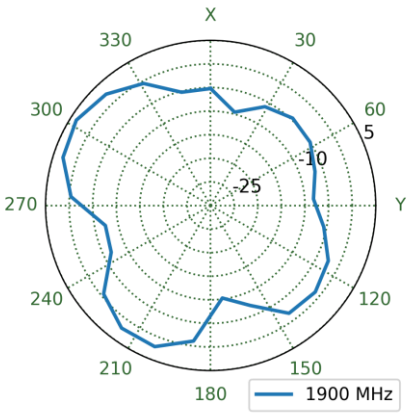




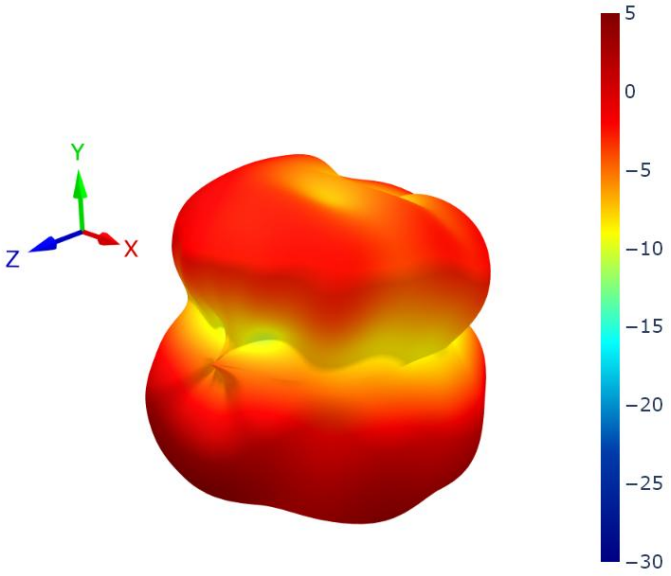


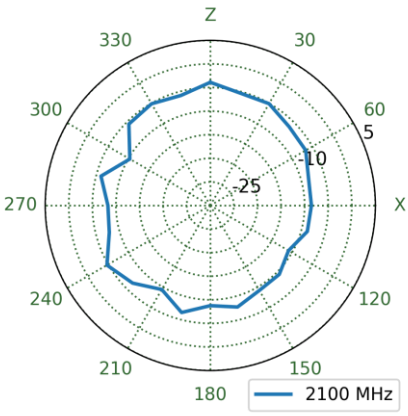
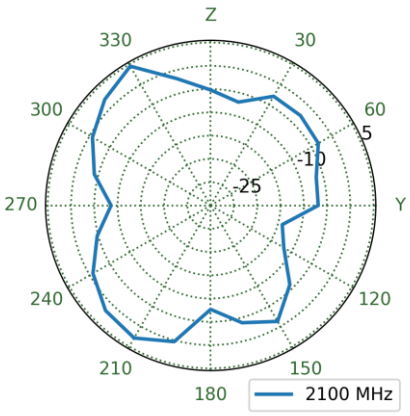
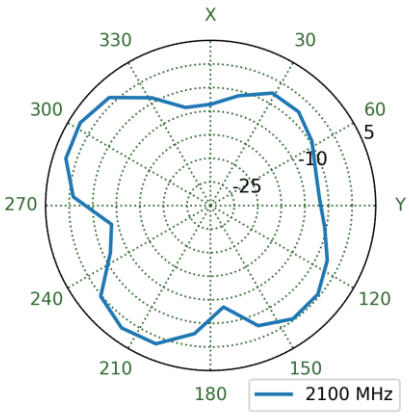
9.8 Patterns at 1900 MHz



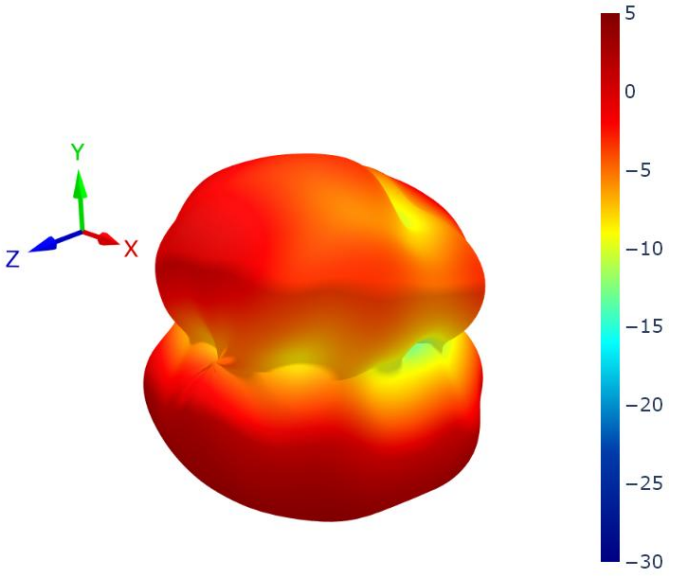
XZ Plane	YZ Plane	XY Plane
		

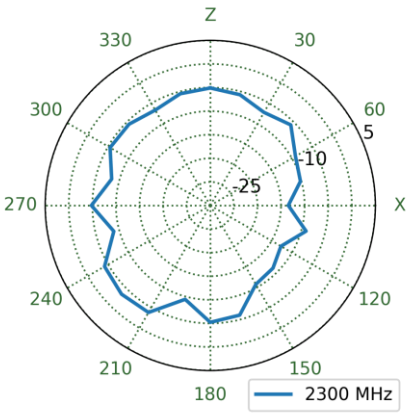
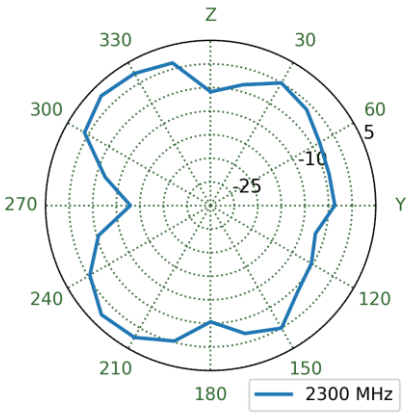
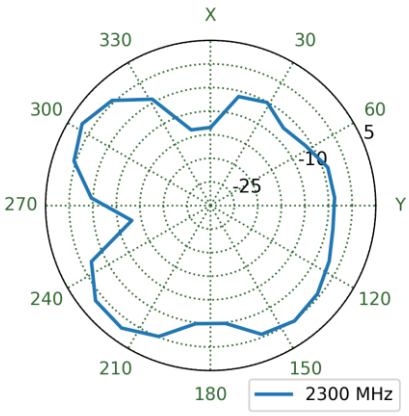
9.9 Patterns at 2100 MHz



XZ Plane	YZ Plane	XY Plane
		

9.10 Patterns at 2300 MHz



XZ Plane	YZ Plane	XY Plane
		

Changelog for the datasheet

SPE-17-8-036 – MCS6.A

Revision: H (Current Version)	
Date:	2025-12-04
Changes:	Full datasheet update
Changes Made by:	Gary West

Previous Revisions

Revision: G	
Date:	2023-10-31
Changes:	Added Solder Reflow Profile
Changes Made by:	Cesar Sousa

Revision: B	
Date:	2017-08-08
Changes:	Drawing Updated
Changes Made by:	Andy Mahoney

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

Revision: A (Original First Release)	
Date:	2017-08-10
Notes:	
Author:	Jack Conroy

Revision: E	
Date:	2021-09-14
Changes:	MSL, font and datasheet rev as it was listed as the "B" version.
Changes Made by:	Erik Landi

Revision: D	
Date:	2019-07-25
Changes:	Template & EVB Drawing
Changes Made by:	Jack Conroy

Revision: C	
Date:	2018-10-23
Changes:	Pads Amended
Changes Made by:	David Connolly

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