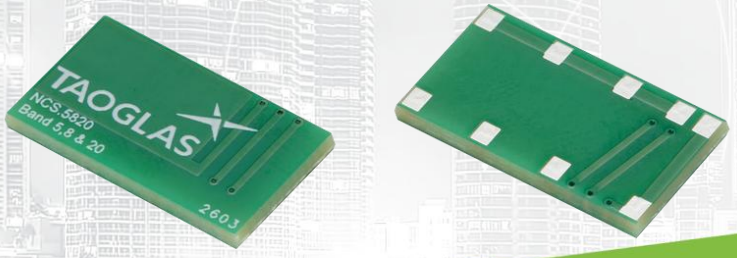
TAOGLAS



Datasheet

NCS.5820

Part No:
NCS.5820

Description

Extensis NCS Series Embedded NB-IoT SMD Antenna covering Bands 5, 8 & 20

Features:

Low Profile, Small Footprint SMD Antenna

Global NB-IoT Coverage for:

- Band 5, 824-894MHz
- Band 8, 880-960MHz
- Band 20, 791-862MHz

High Efficiency across each Band

Dimensions: 20 x 11 x 1.6mm

RoHS & Reach Compliant

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Ireland & USA ISO 9001:2015 Certified

Taiwan ISO 9001:2015 Certified

1. Introduction

The Extensis® **NCS series** of embedded NB-IoT antennas is designed to meet the growing demand for ultra-low-power, high-density IoT connectivity. The NCS.5820 is one of the smallest form-factor NB-IoT antennas available, enabling global deployments in space-constrained devices.

Covering LTE Bands 5 (824–894 MHz), 8 (880–960 MHz), and 20 (791–862 MHz), the NCS.5820 provides efficient multi-band operation for worldwide NB-IoT coverage. This allows a single antenna design to support multiple regions and carriers, making it well suited for international roaming across LPWAN networks.

With an ultra-low profile of just 1.6 mm and a compact 11 × 20 mm footprint, the surface-mount antenna is easy to integrate into even the smallest devices. It enables the benefits of NB-IoT technology, including low power consumption, long battery life, and reliable connectivity in rural and deep-indoor environments. An evaluation board (NCSD.5820) is available for testing.

Typical applications include:

- Smart metering and remote monitoring
- Smart cities and buildings
- Manufacturing automation
- Agriculture
- Environmental and asset tracking

Ease of integration, strong RF performance, and a low-cost FR-4 construction make the NCS.5820 an ideal choice for cost-sensitive NB-IoT device designs.

For further optimization to customer-specific device environments and for support to integrate and test this antennas performance in your device, contact your regional Taoglas Customer Services Team.

2. Specification

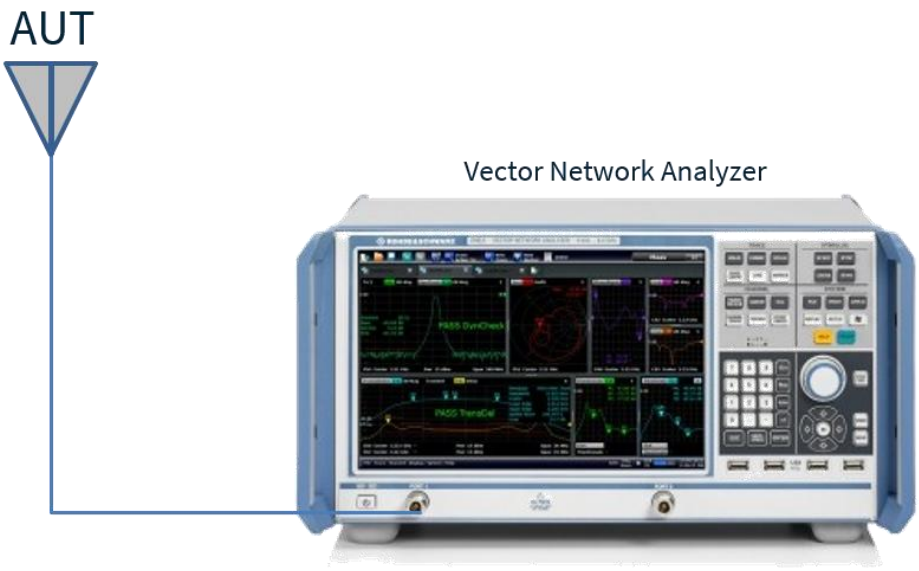
Electrical								
Band	Frequency (MHz)	Efficiency (%)	Average Gain (dB)	Peak Gain (dBi)	Impedance	Polarization	Radiation Pattern	Max. input power
915MHz	902-928	50.3	-2.99	0.50	50 Ω	Linear	Omni directional	5W
868MHz	863-870	44.6	-3.51	0.03				
Band 5	824-894	44.1	-3.55	0.60				
Band 8	880-960	48.8	-3.12	0.60				
Band 20	791-862	38.1	-4.20	-0.08				

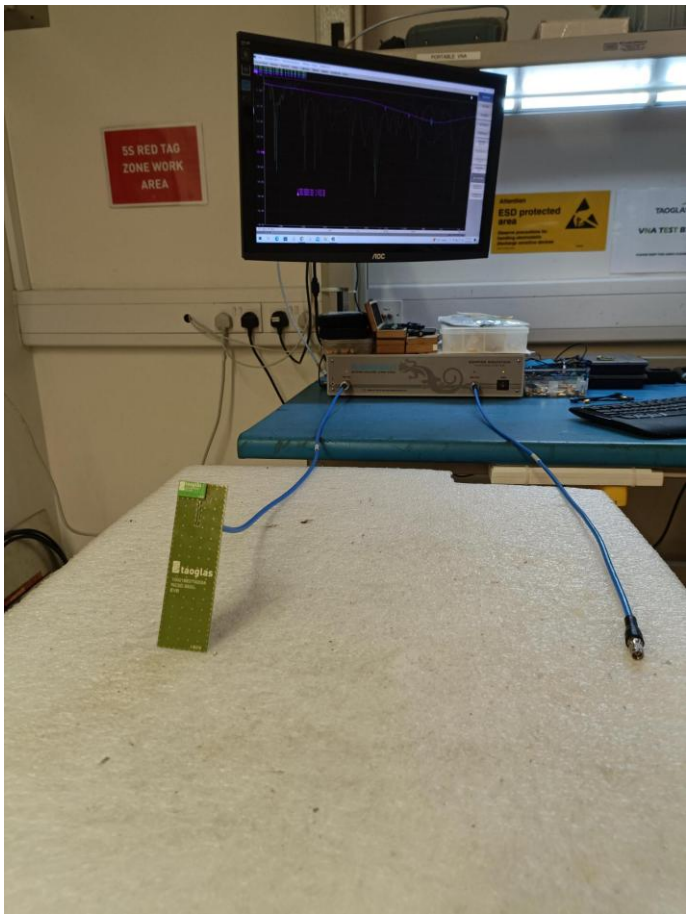
Mechanical	
Antenna Dimensions	20.0 x 11.0 x 1.6mm
Material	FR4
Weight	0.74 g
Soldering Type	SMT through Reflow

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

3. Antenna Characteristics

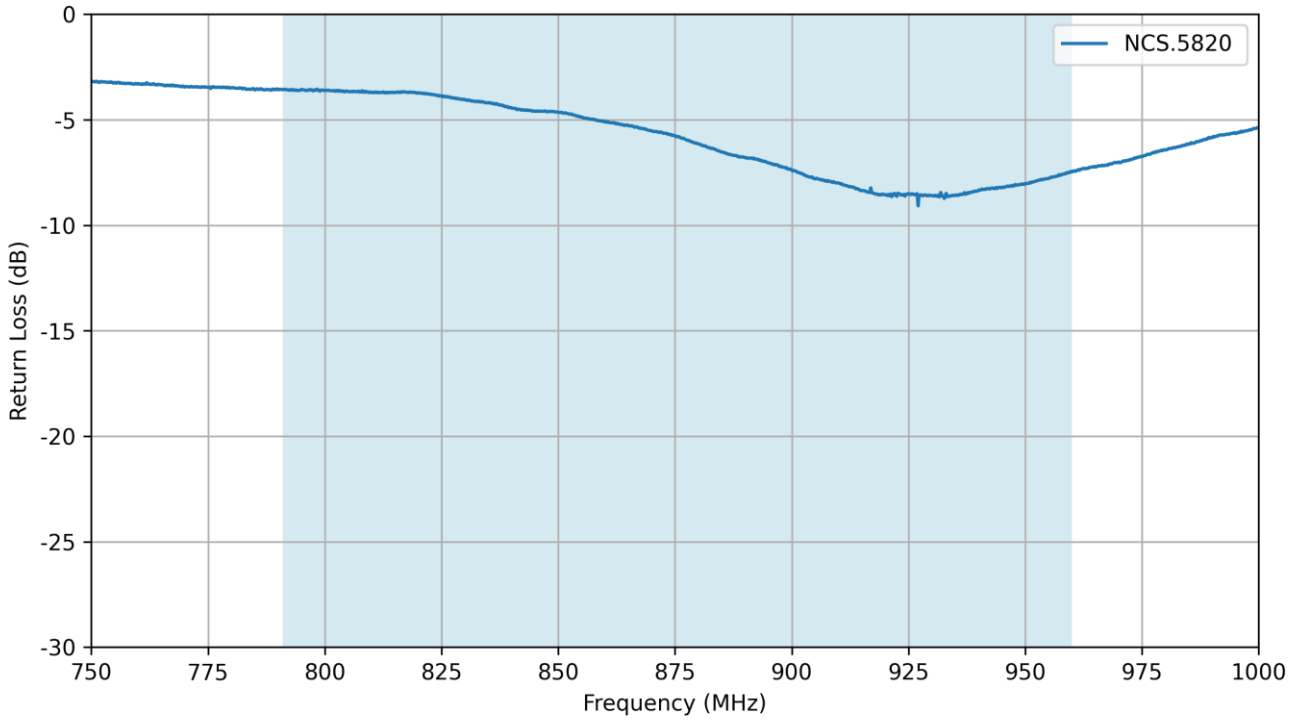
3.1 Test Setup



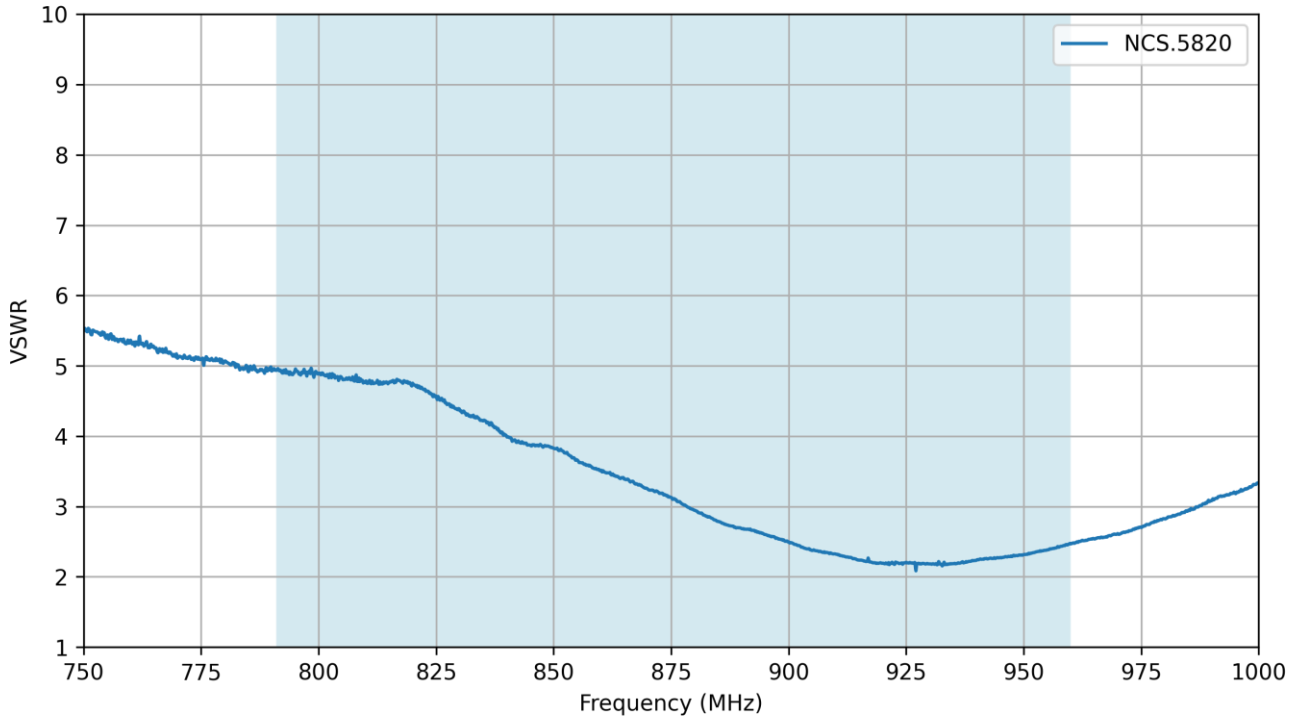


VNA Test Set-up

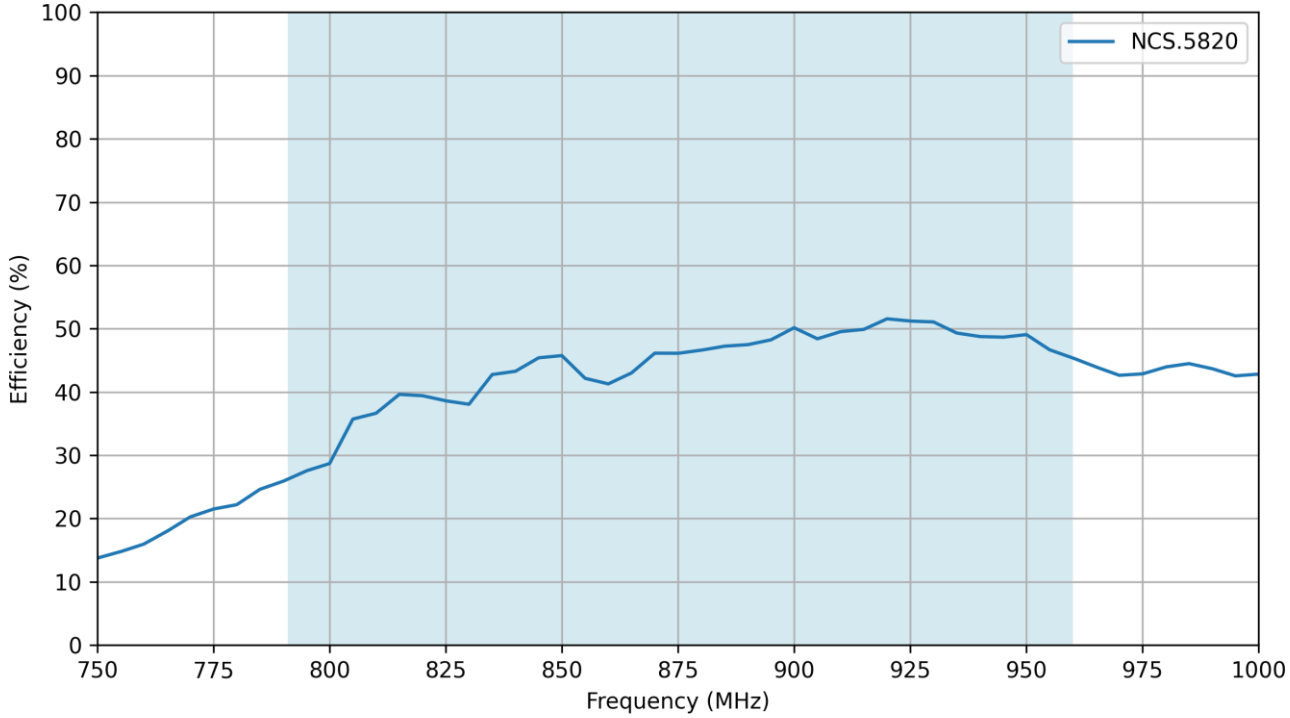
3.2 Return Loss



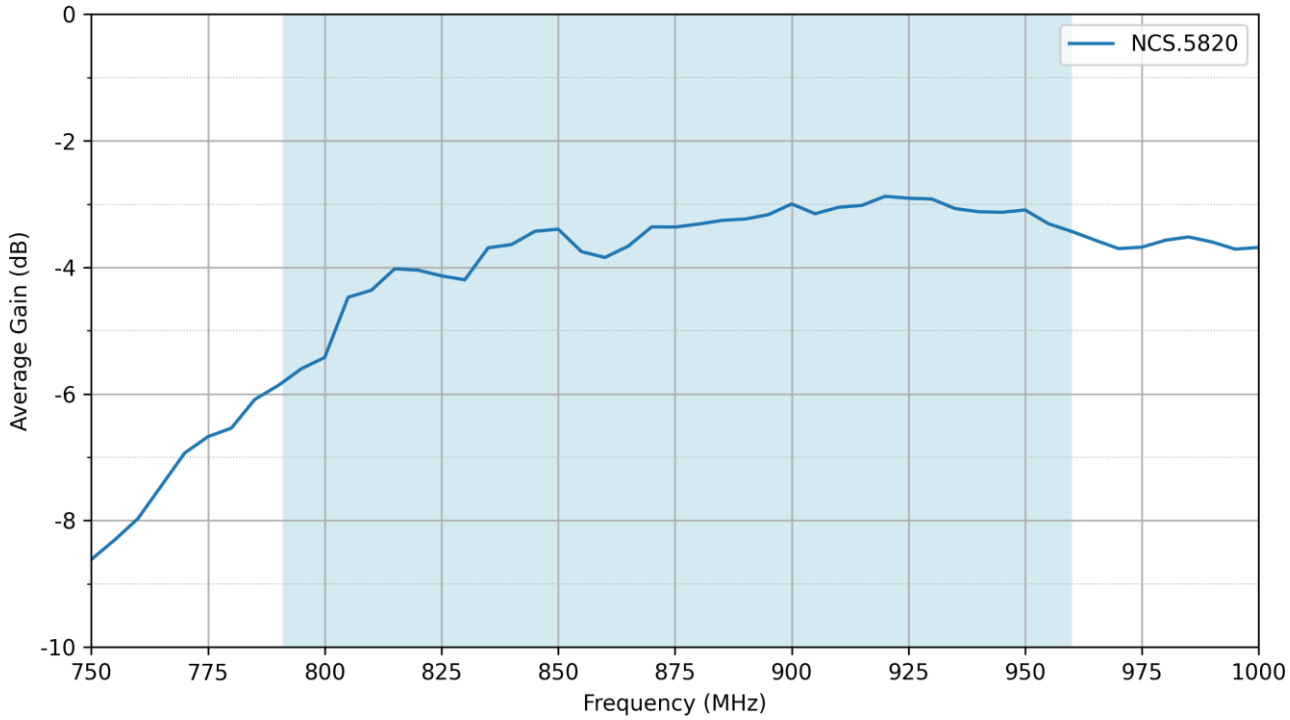
3.3 VSWR



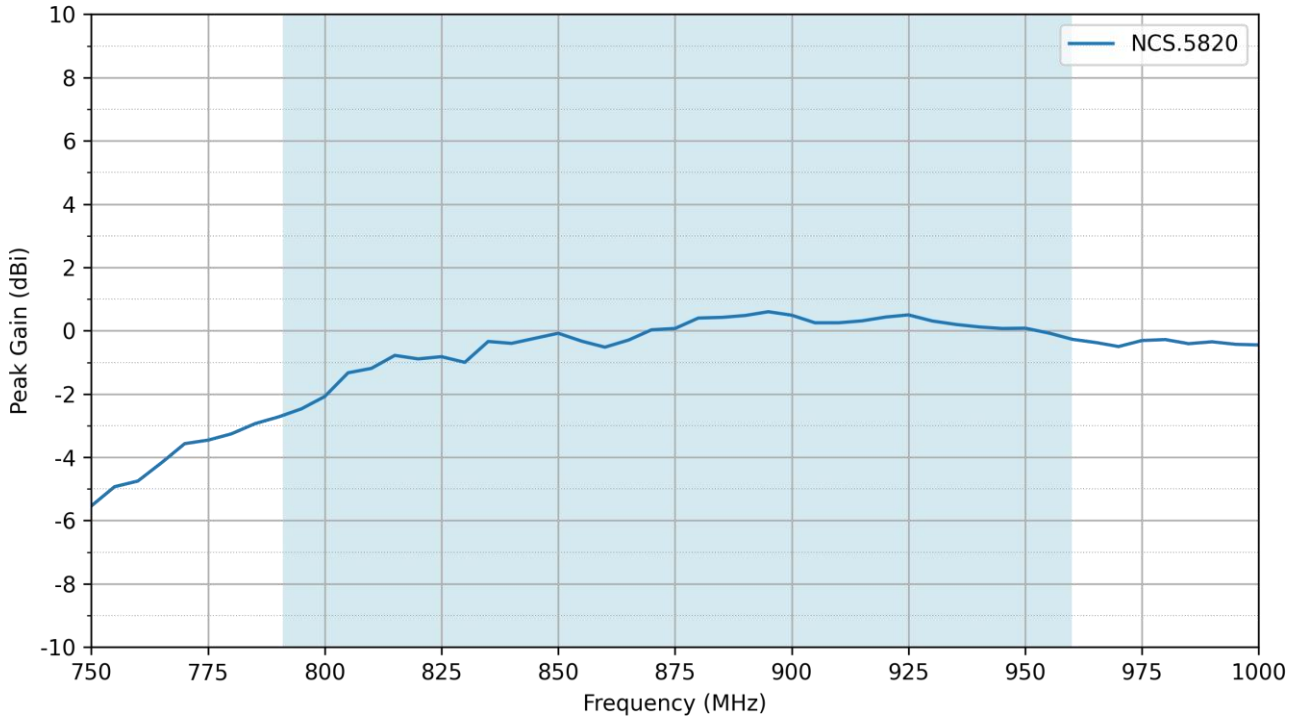
3.4 Efficiency



3.5 Average Gain

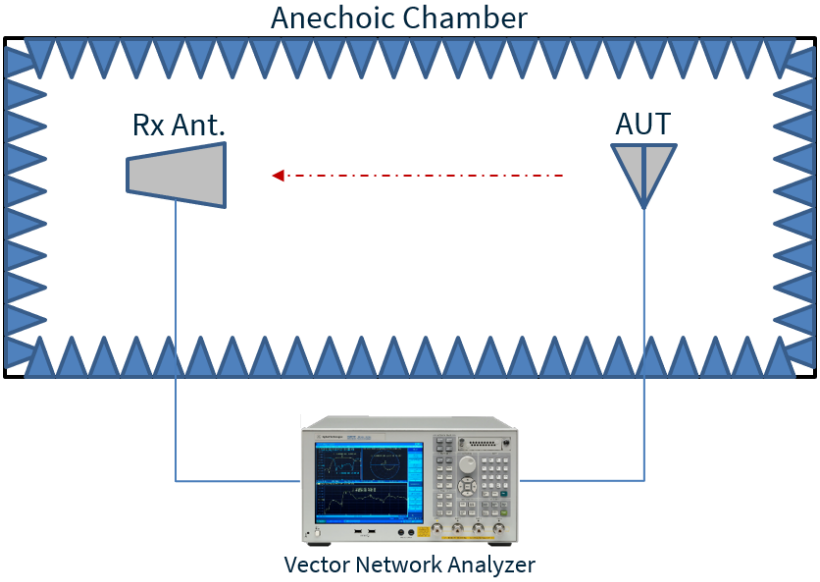


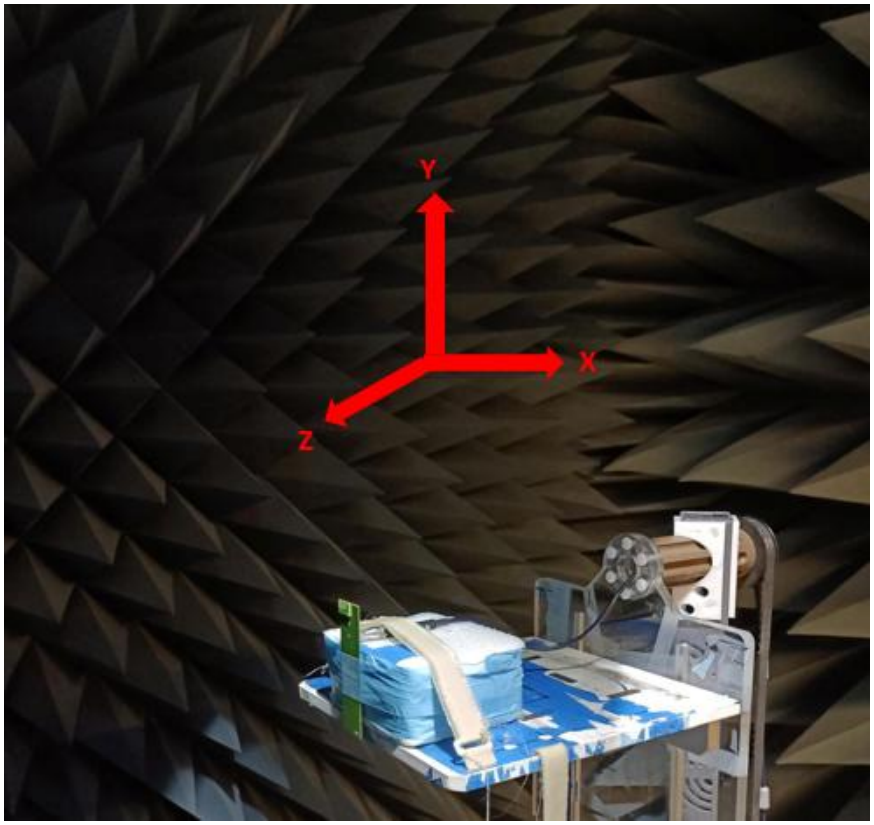
3.6 Peak Gain


NCS.5820
Peak Gain (dBi)
10
8
6
4
2
0
-2
-4
-6
-8
-10
750
775
800
825
850
875
900
925
950
975
1000
Frequency (MHz)

4. Radiation Patterns

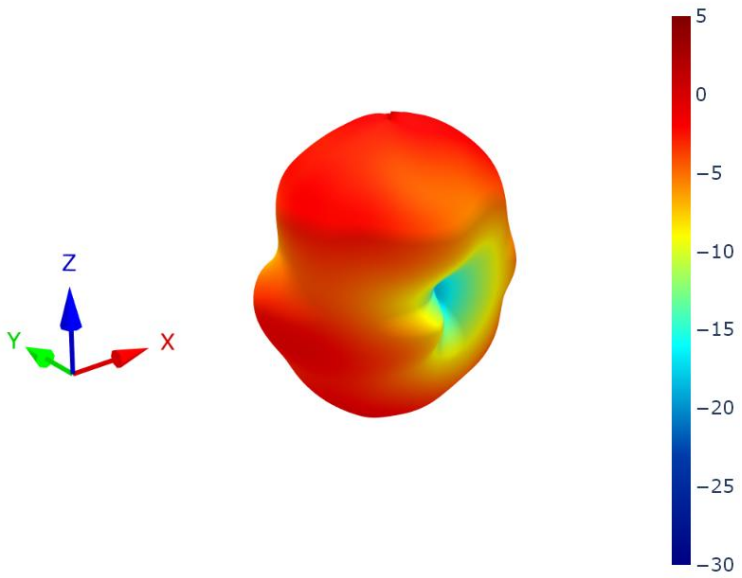
4.1 Test Setup



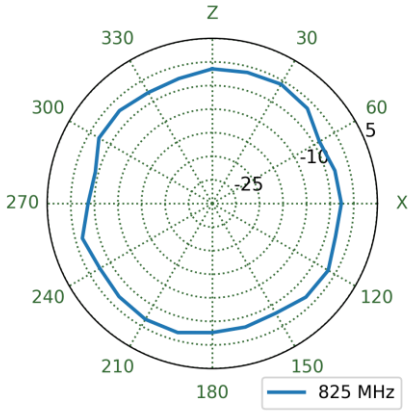


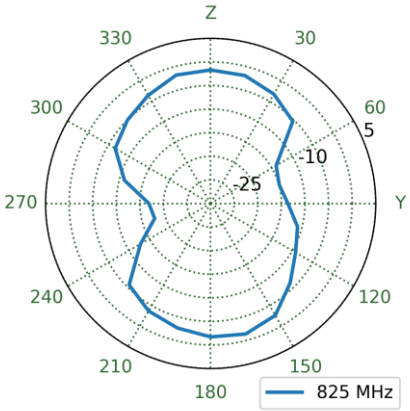
Chamber Test Set-up

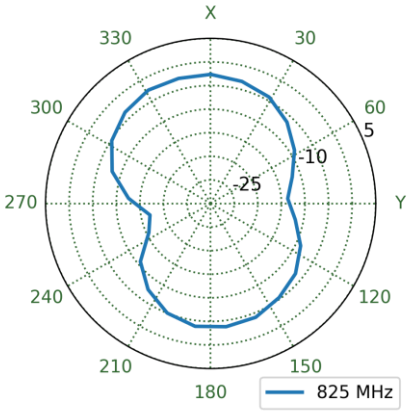
4.2 Patterns at 825 MHz



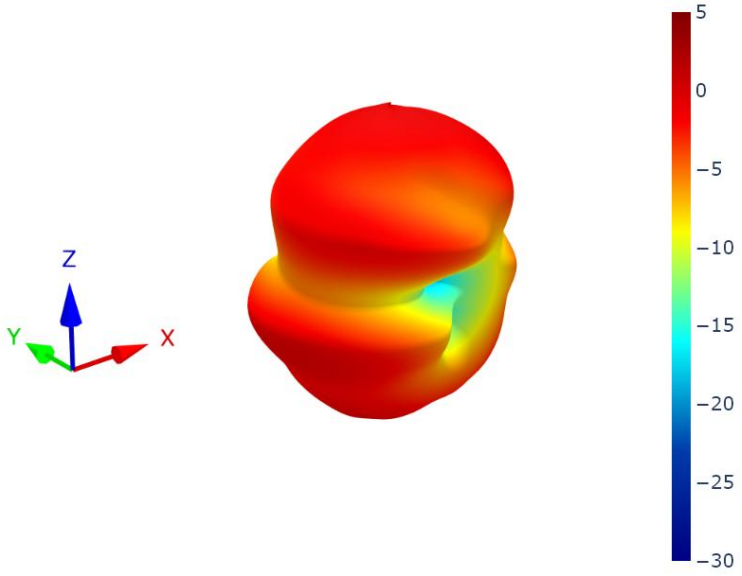
XZ Plane	YZ Plane	XY Plane



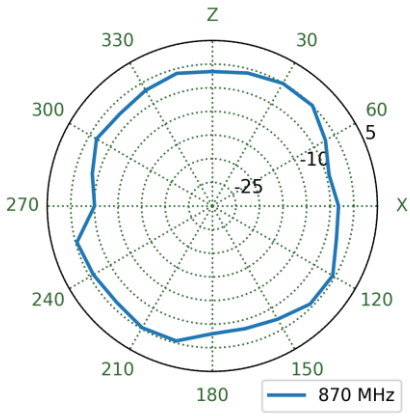


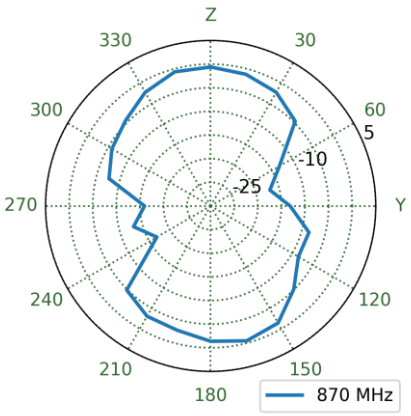


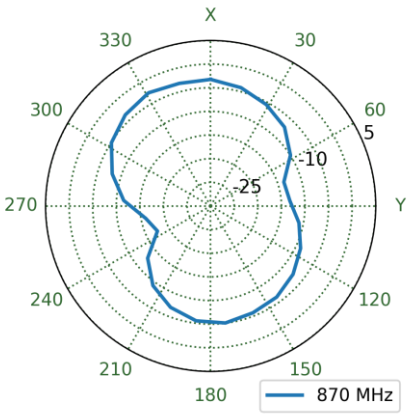
4.3 Patterns at 868 MHz



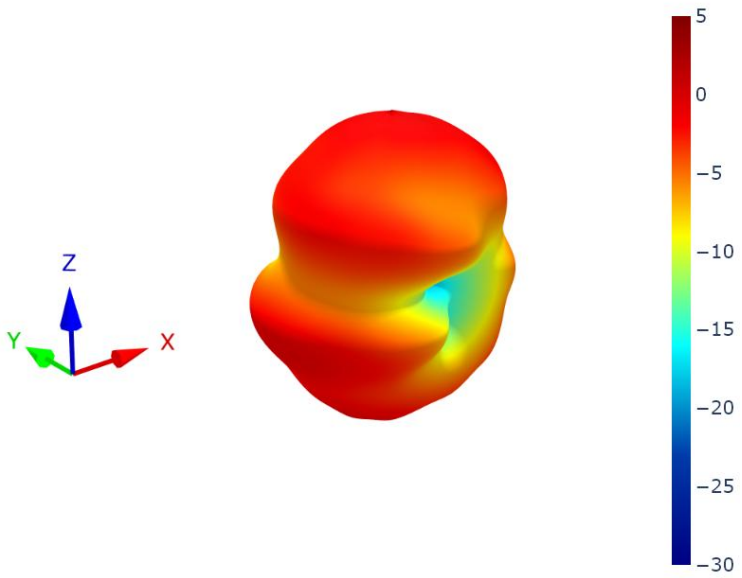
XZ Plane	YZ Plane	XY Plane



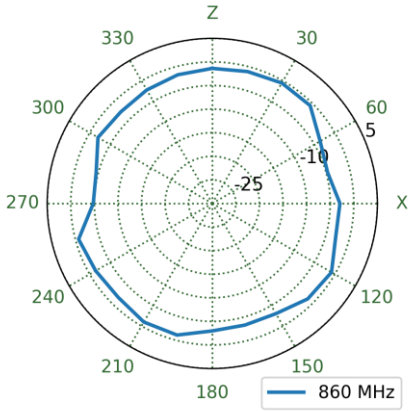


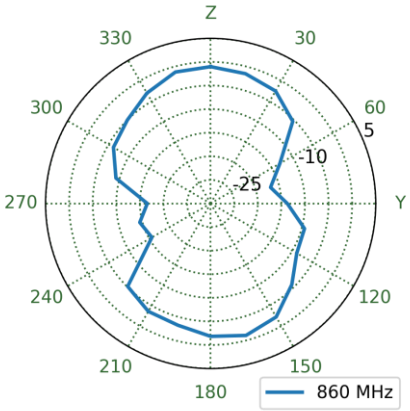


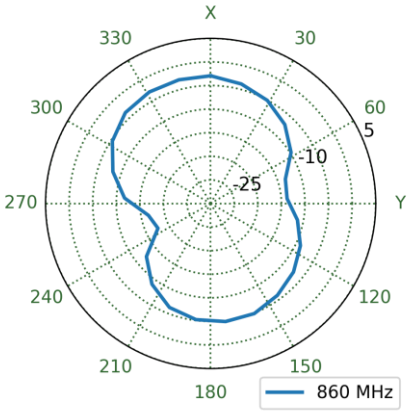
4.4 Patterns at 860 MHz



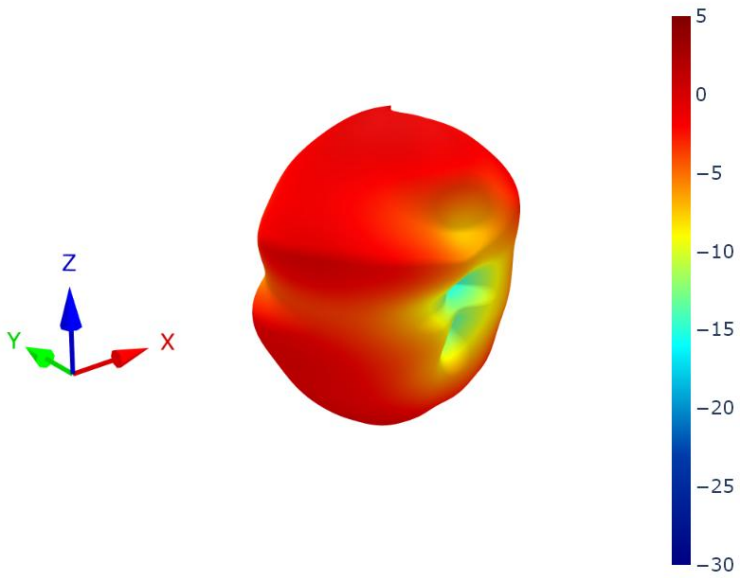
XZ Plane	YZ Plane	XY Plane



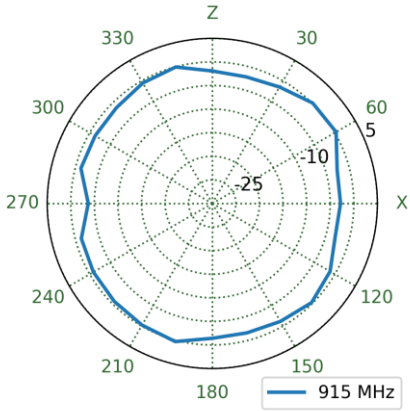


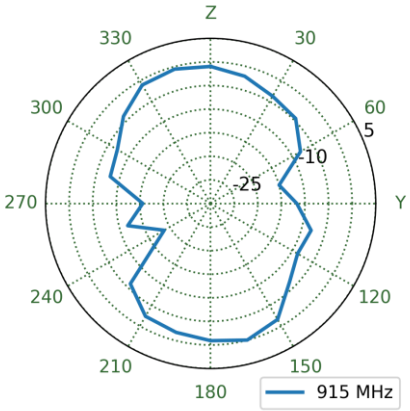


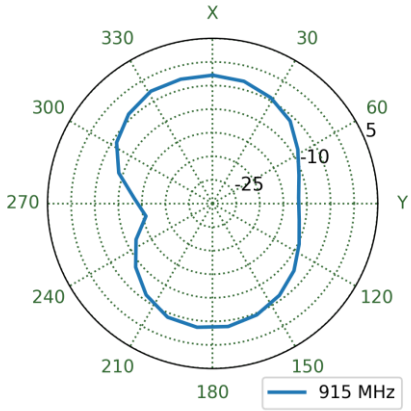
4.5 Patterns at 915 MHz



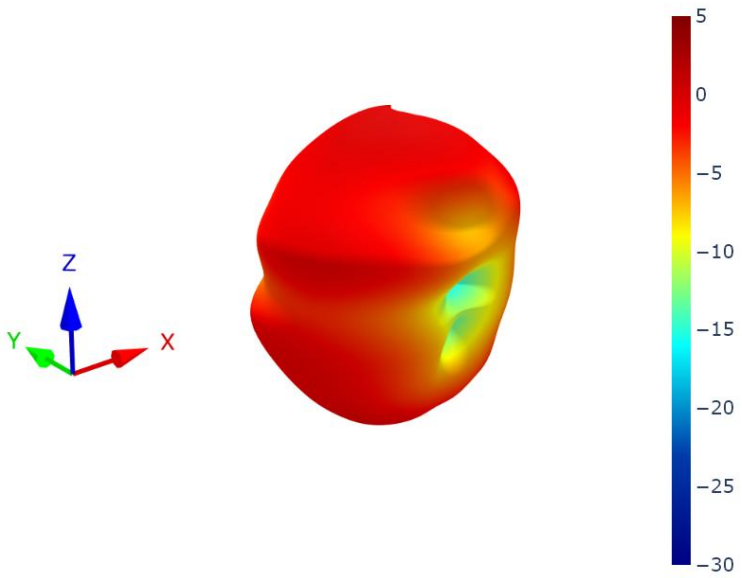
XZ Plane	YZ Plane	XY Plane



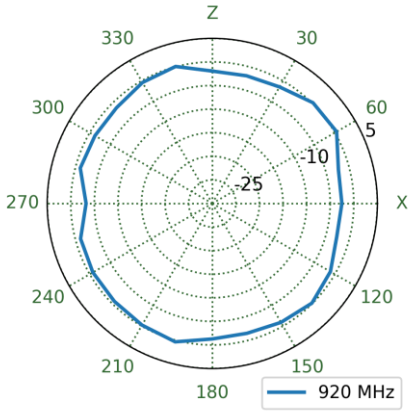


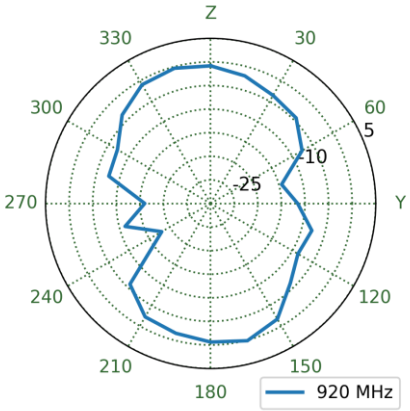


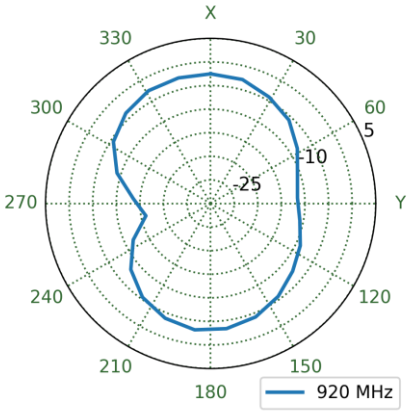
4.6 Patterns at 920 MHz



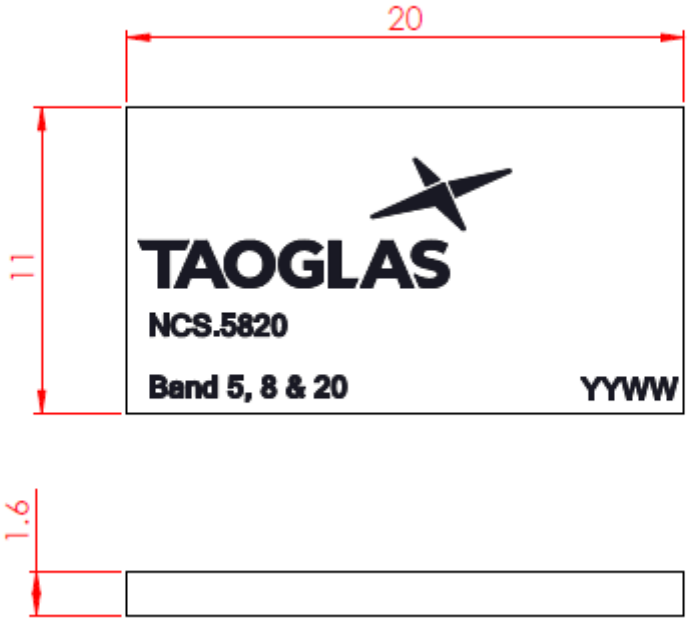
XZ Plane	YZ Plane	XY Plane

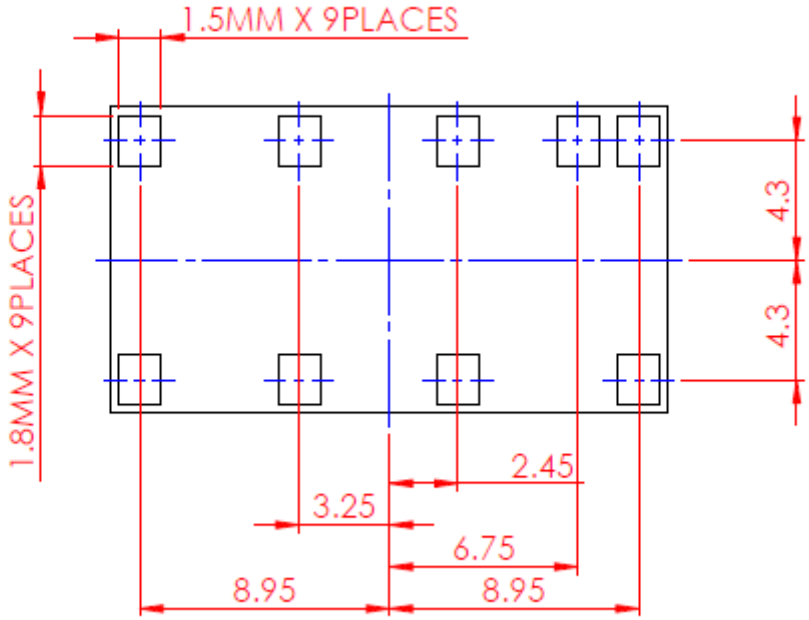






5. Mechanical Drawing





6. Antenna Integration Guide

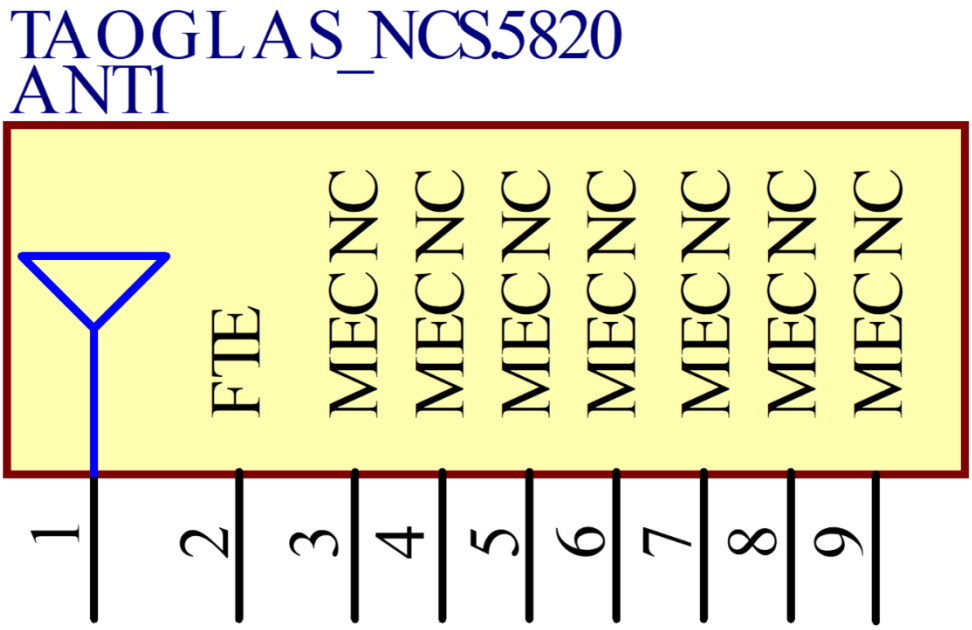
The following is an example on how to integrate the NCS.5820 into a design. This antenna has 9 pins, where one pin is used for the RF Feed. Taoglas recommends using a minimum of 115x35mm ground plane (PCB) to ensure optimal performance.

Please find the Integration files in Altium, 2D formats and the 3D model for the NCS.5820 here:
https://www.taoglas.com/product/ncs-5820-plus-evb-nb-iot-fr4-pcb-antenna-for-bands-5-8-20/

6.1 Schematic and Symbol Definition

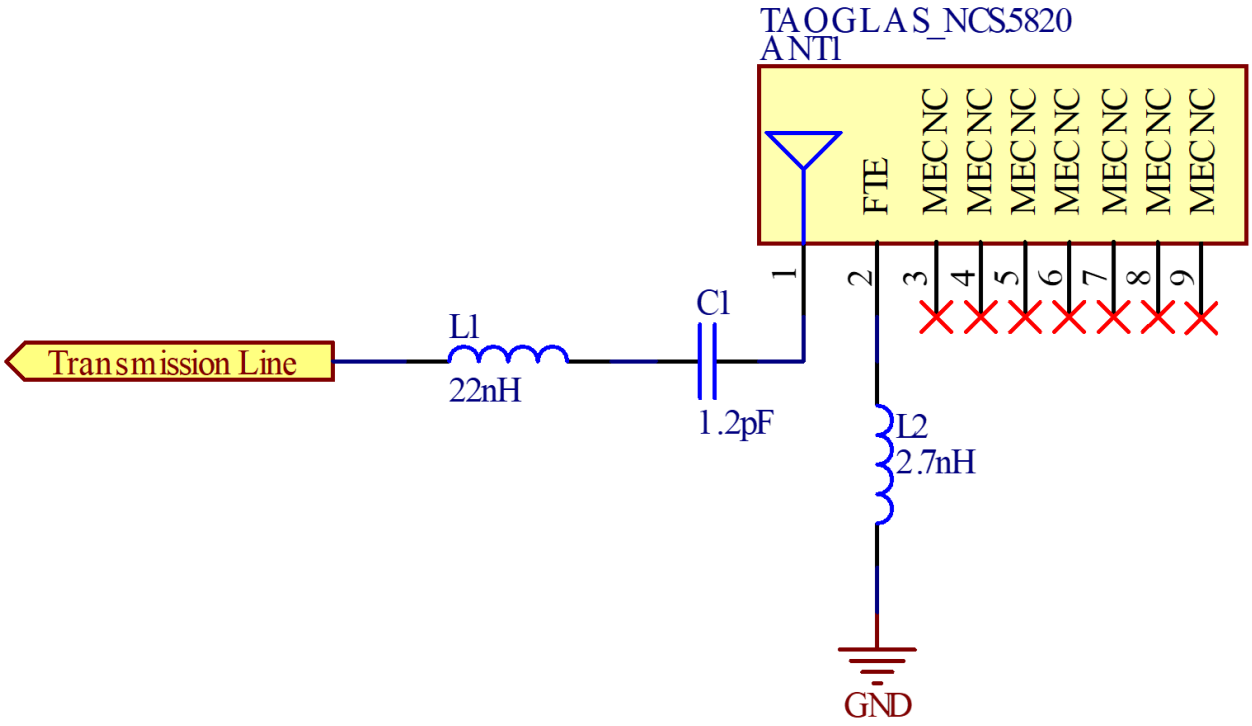
The circuit symbol for the NCS.5820 is shown below. The antenna has 9 pins as indicated below.

Pin	Description
1	RF Feed
2	Fine Tuning Element
3, 4, 5, 6, 7, 8, 9	Mechanical, Not Connected



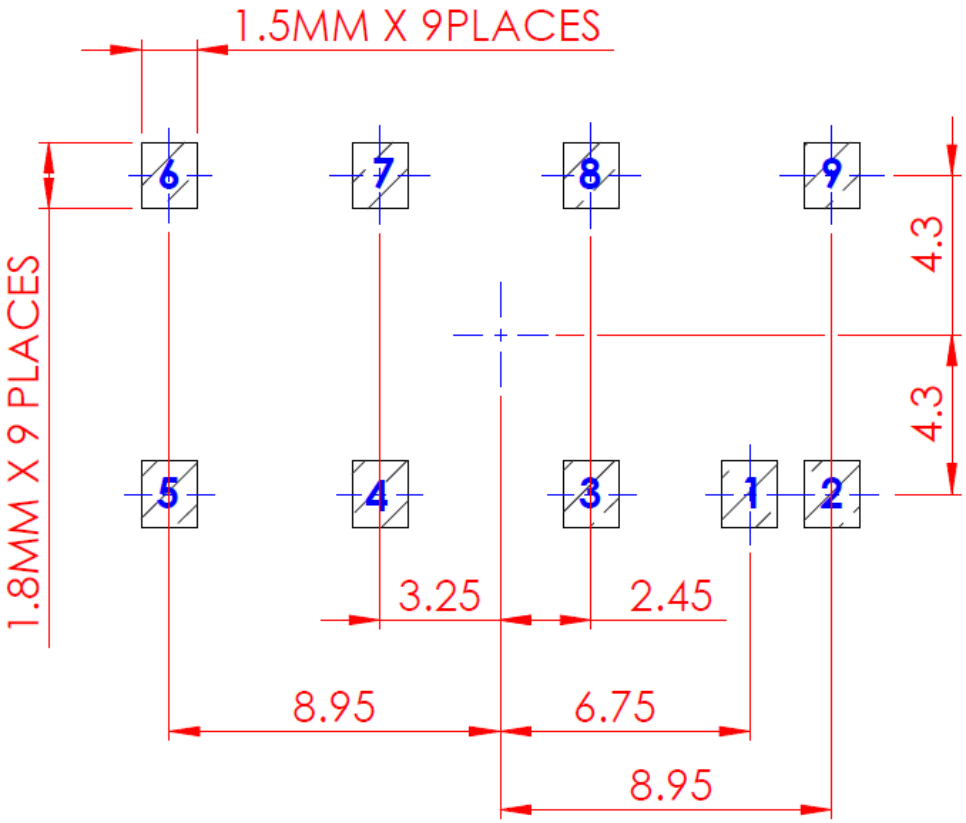
6.2 Schematic Layout

Matching components with the NCS.5820 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 for the NCS.5820.



Designator	Type	Value	Manufacturer	Manufacturer Part Number
C1	Capacitor	1.2pF	Murata	GRM1555C1H1R2BA01D
L1	Inductor	22nH	TDK	MHQ1005P22NJT000
L2	Inductor	2.7nH	Murata	LQG15HS2N7S02D

6.3 Footprint

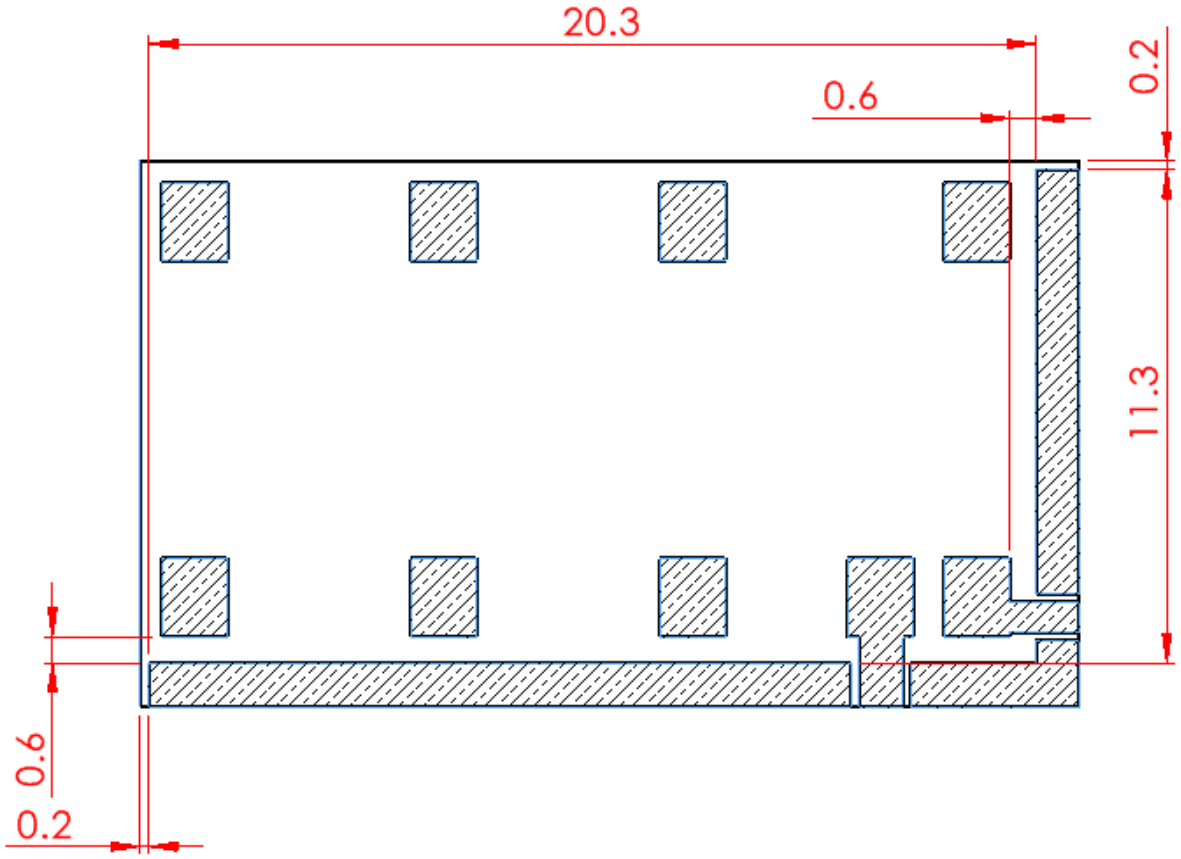


Pin	Description
1	RF Feed
2	Fine Tuning Element
3, 4, 5, 6, 7, 8, 9	Mechanical, Not Connected

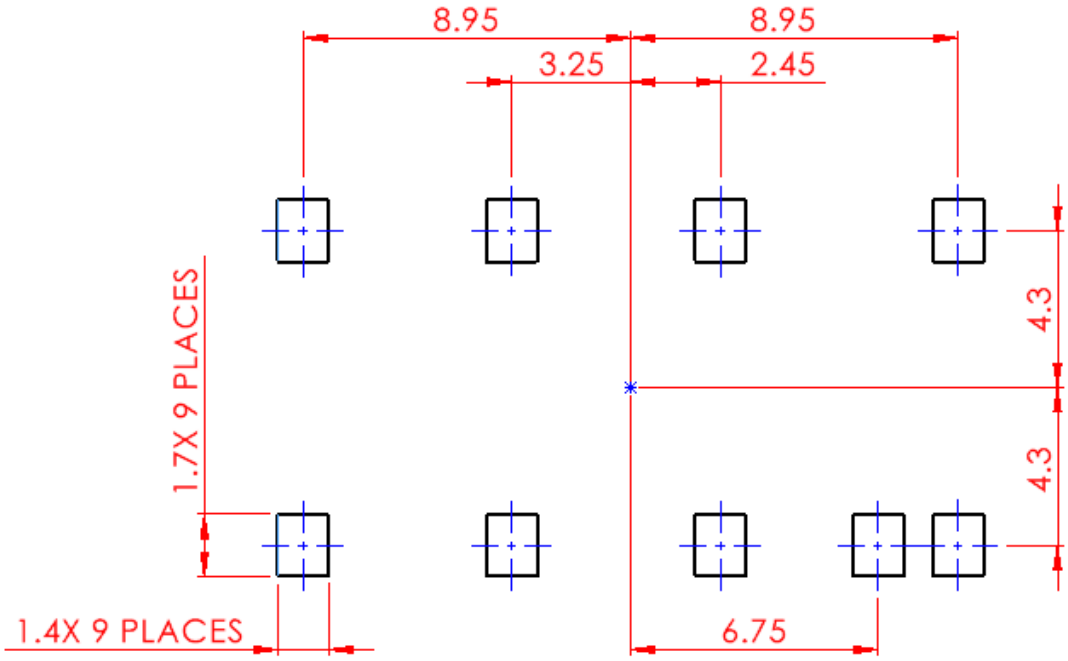
6.4 Copper Clearance

The footprint and clearance on the PCB must comply with the antenna's specification. The PCB layout shown in the diagrams below demonstrates the NCS.5820 clearance area. The copper keep out area applies to all layers that are below the NCS.5820.

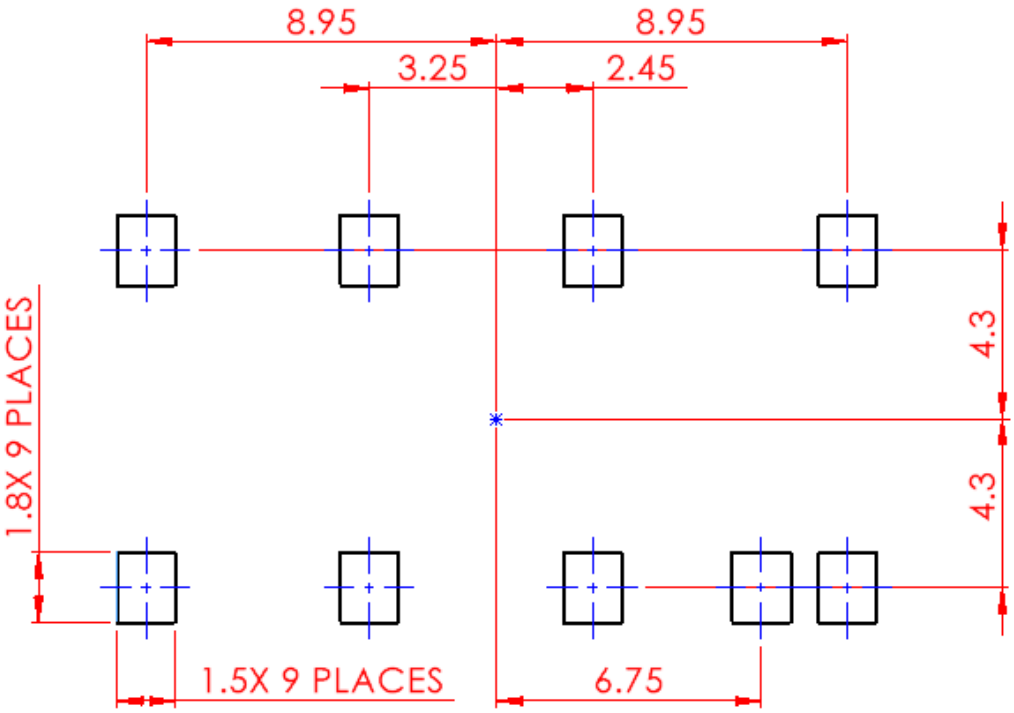
The copper clearance area should extend to 11.3mm in length and 20.3mm in width from the corner of the ground plane. The PCB edge clearance should be at least 0.2mm from the antenna.



6.5 Top Solder Paste

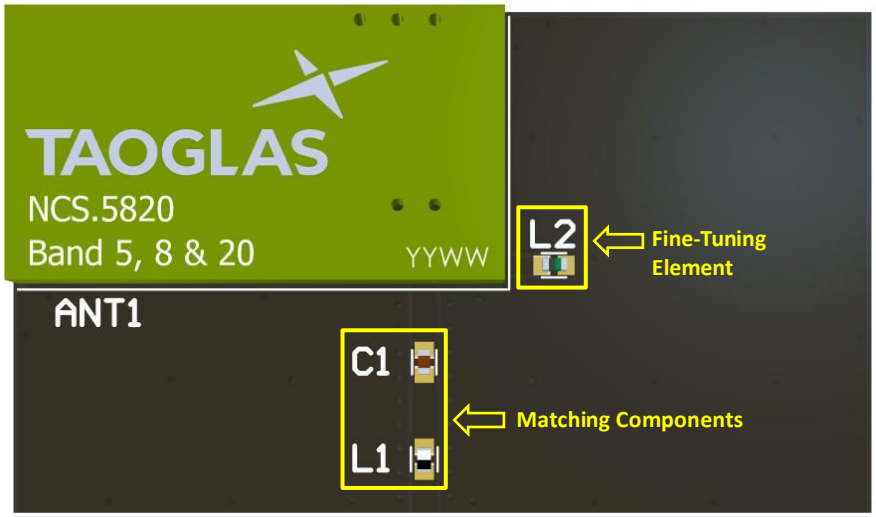


6.6 Top Solder Mask

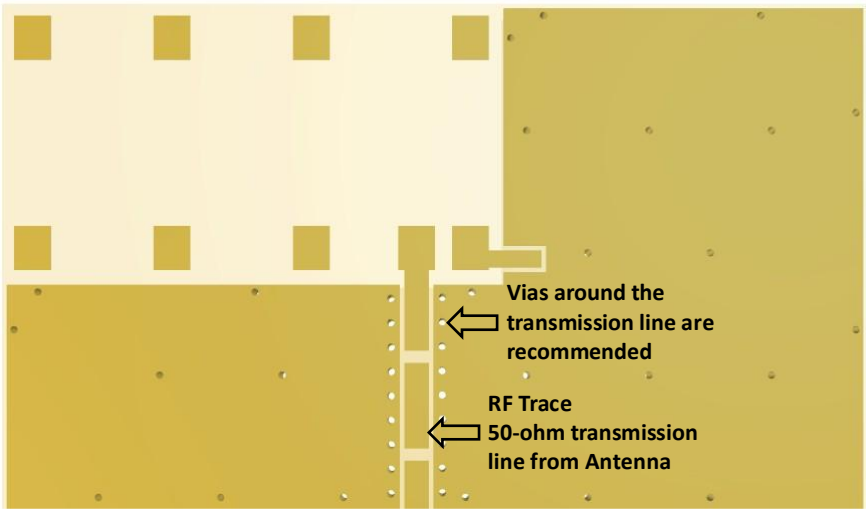


6.7 Antenna Integration

The NCS.5820 should be placed in the left-hand corner on the short side of the PCB, to take advantage of the ground plane. The RF trace must maintain a 50 Ohm transmission line. Matching components are 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 copper keep out area.



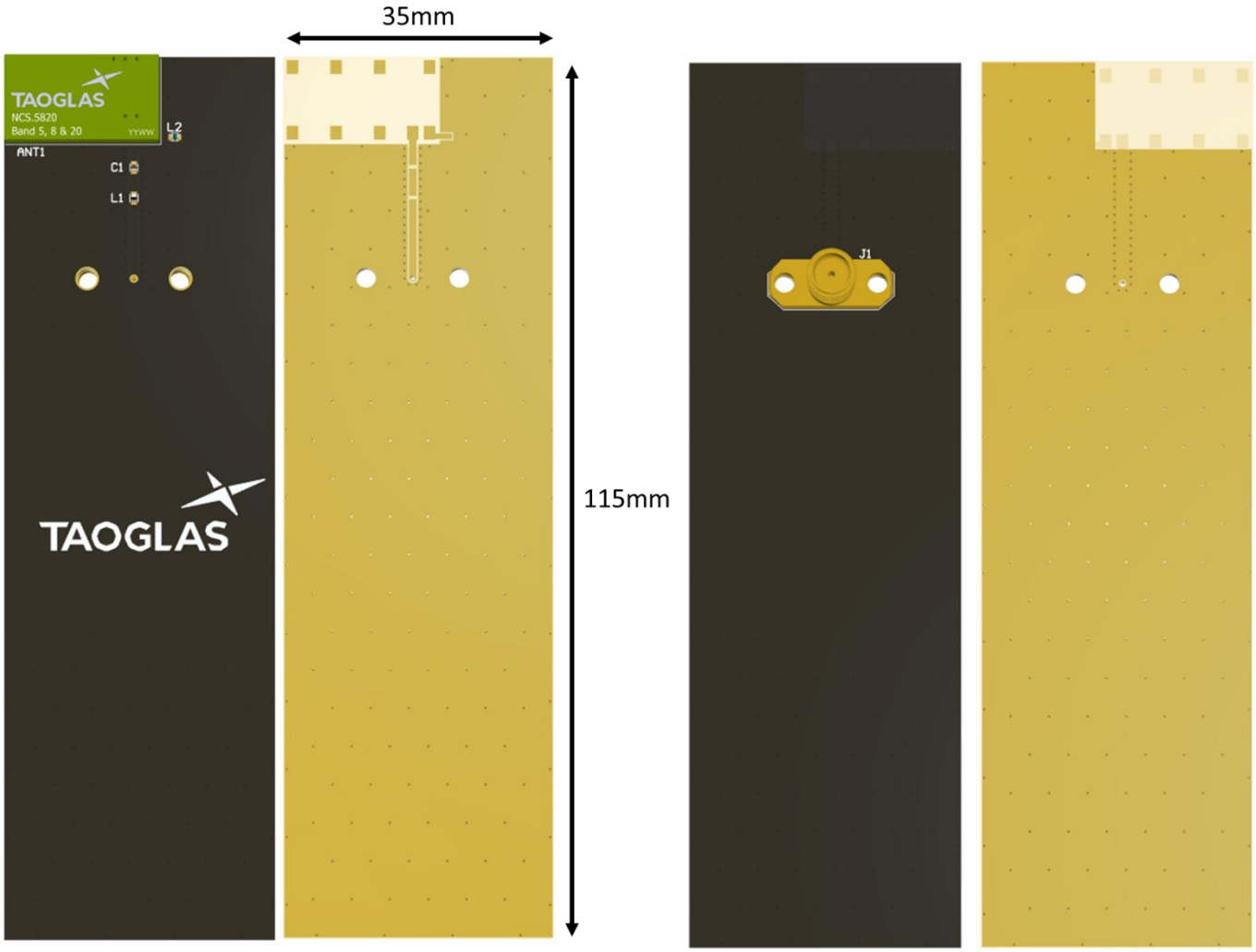
NCS.5820 antenna mounted on a PCB reference design, showing the transmission line and integration notes.



Without Antenna

6.8 Final Integration

The top side image shown below highlights the antenna transmission line. Taoglas recommends using a minimum of 115x35mm ground plane (PCB) to ensure optimal performance.

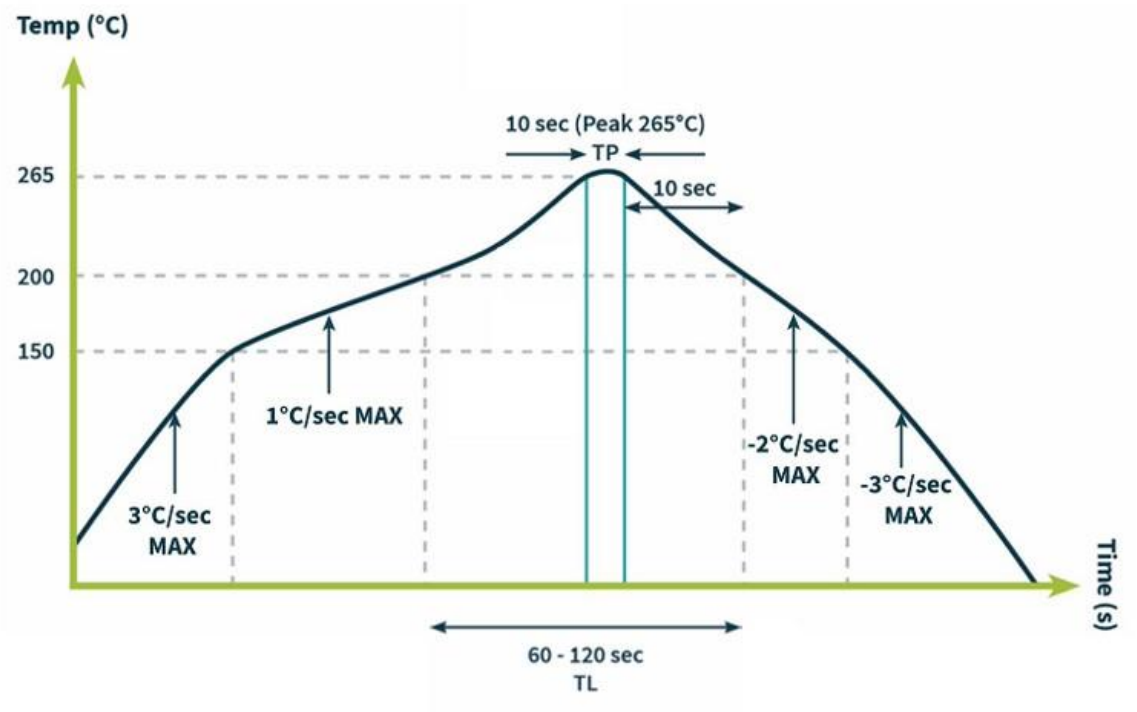


Topside

Bottom side

7. Solder Reflow Profile

The NCS.5820 can be assembled by following the recommended soldering temperatures are as follows:

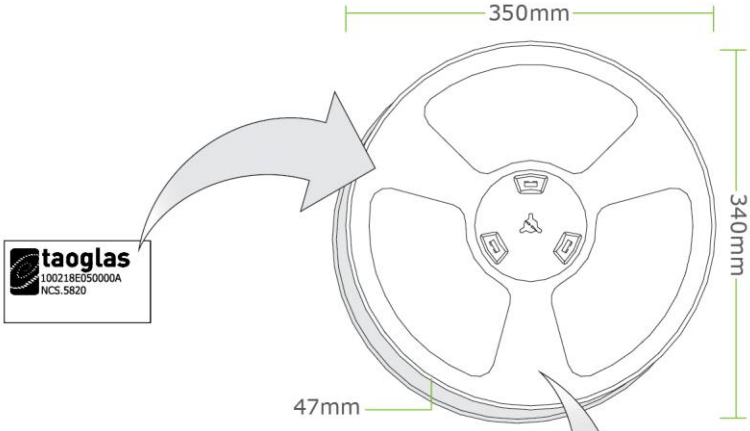


*Temperatures listed within a tolerance of +/- 10º C

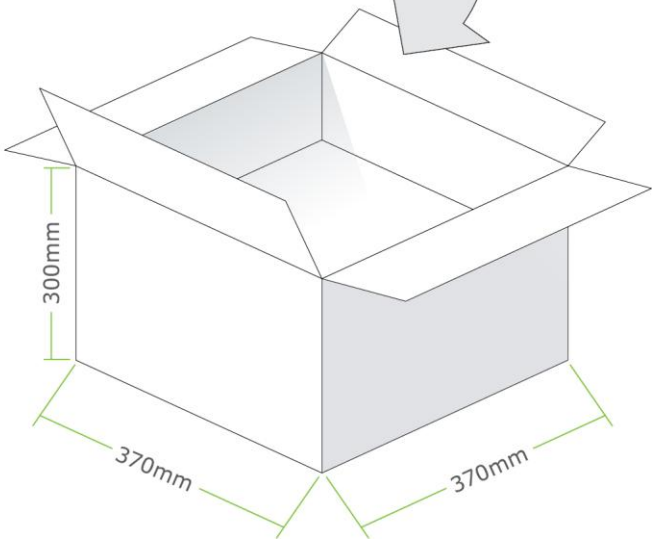
Smaller components are typically mounted on the first pass, however, we do advise mounting the NCS.5820 when placing larger components on the board during subsequent reflows.

8. Packaging

1000pcs NCS.5820 per Tape & Reel
Dimensions - 350*340*47mm
Weight: 1Kg

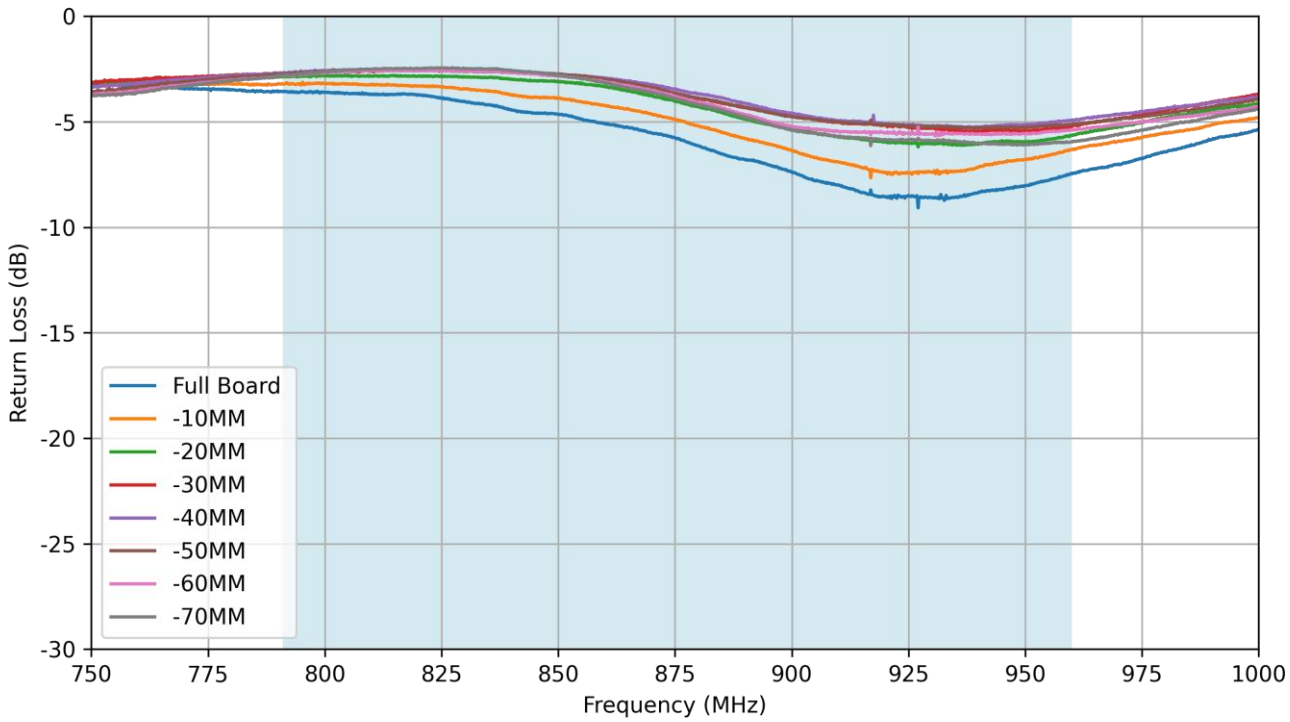


6000pcs NCS.5820 per carton
Dimensions: 370*370*300mm
Weight: 6Kg

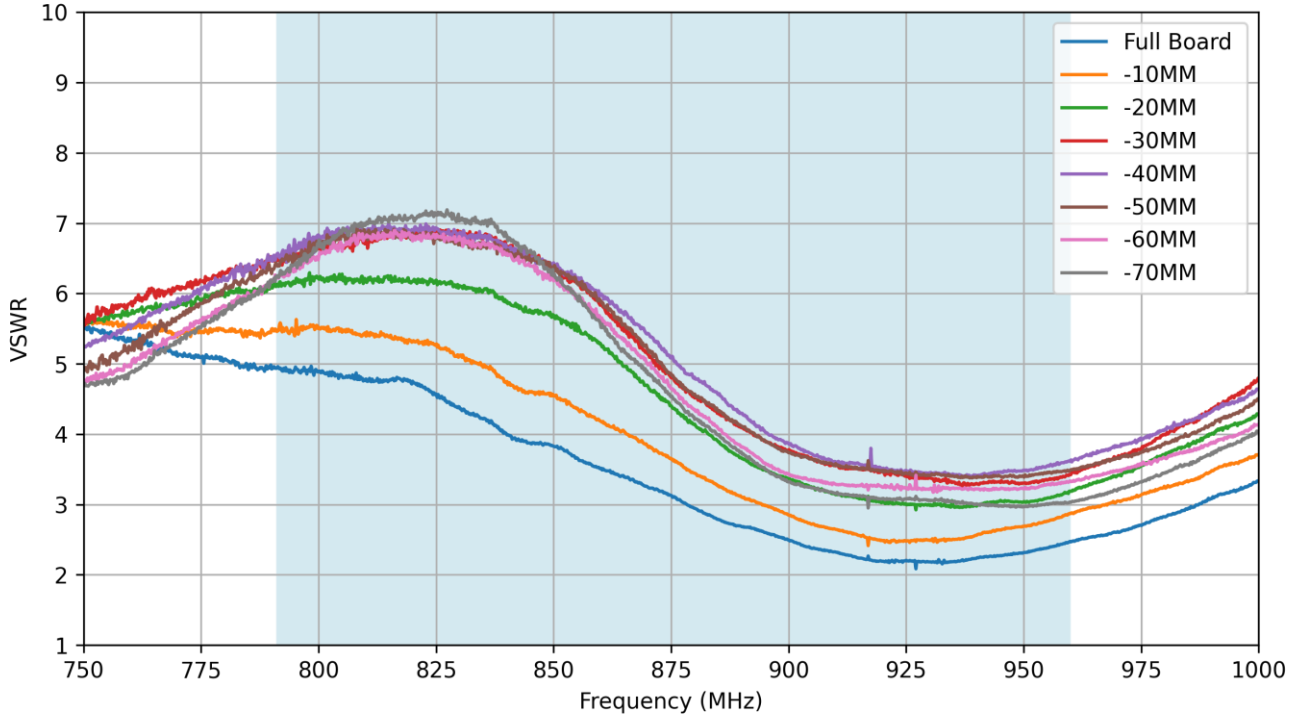


9. Application Note

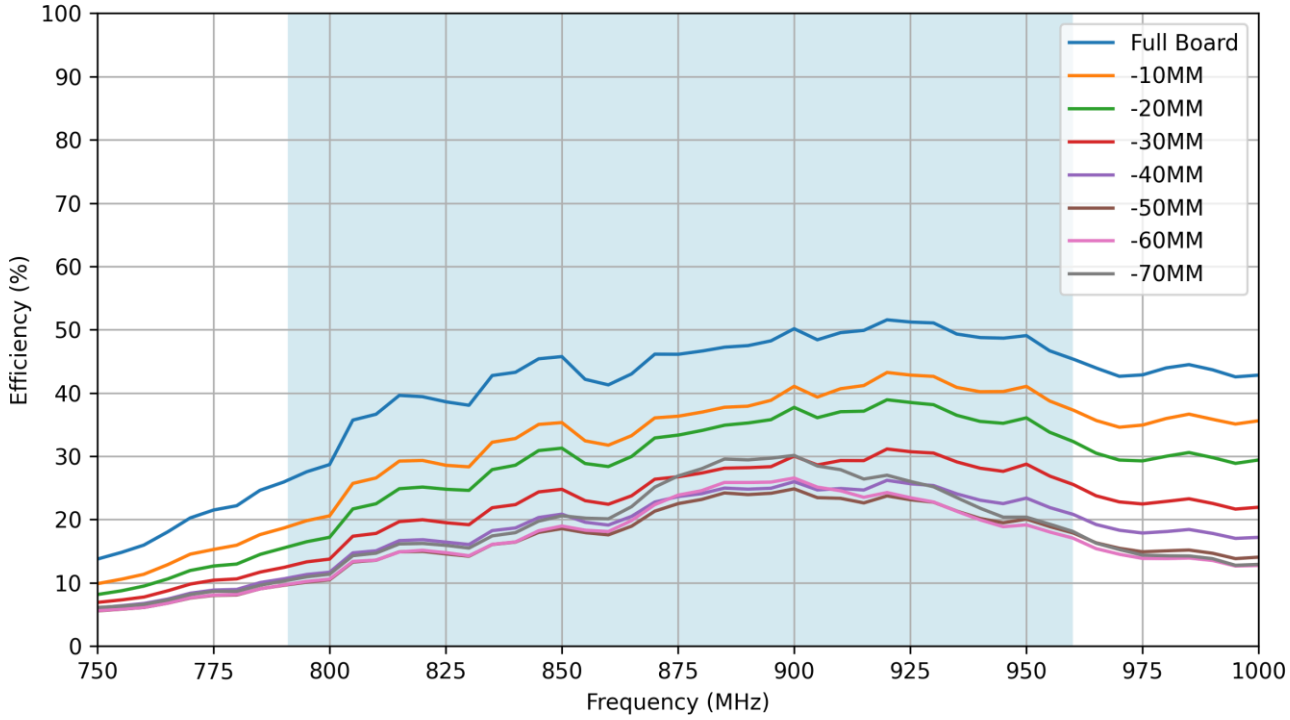
9.1 Return Loss



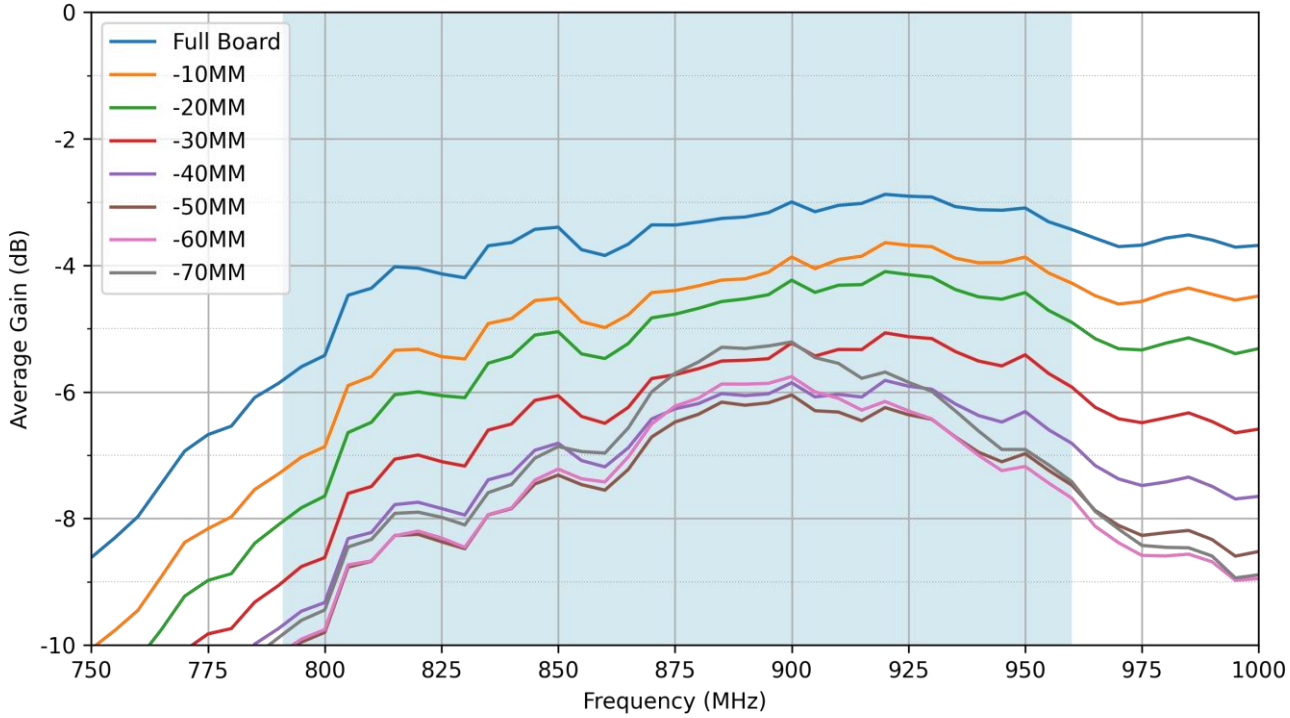
9.2 VSWR



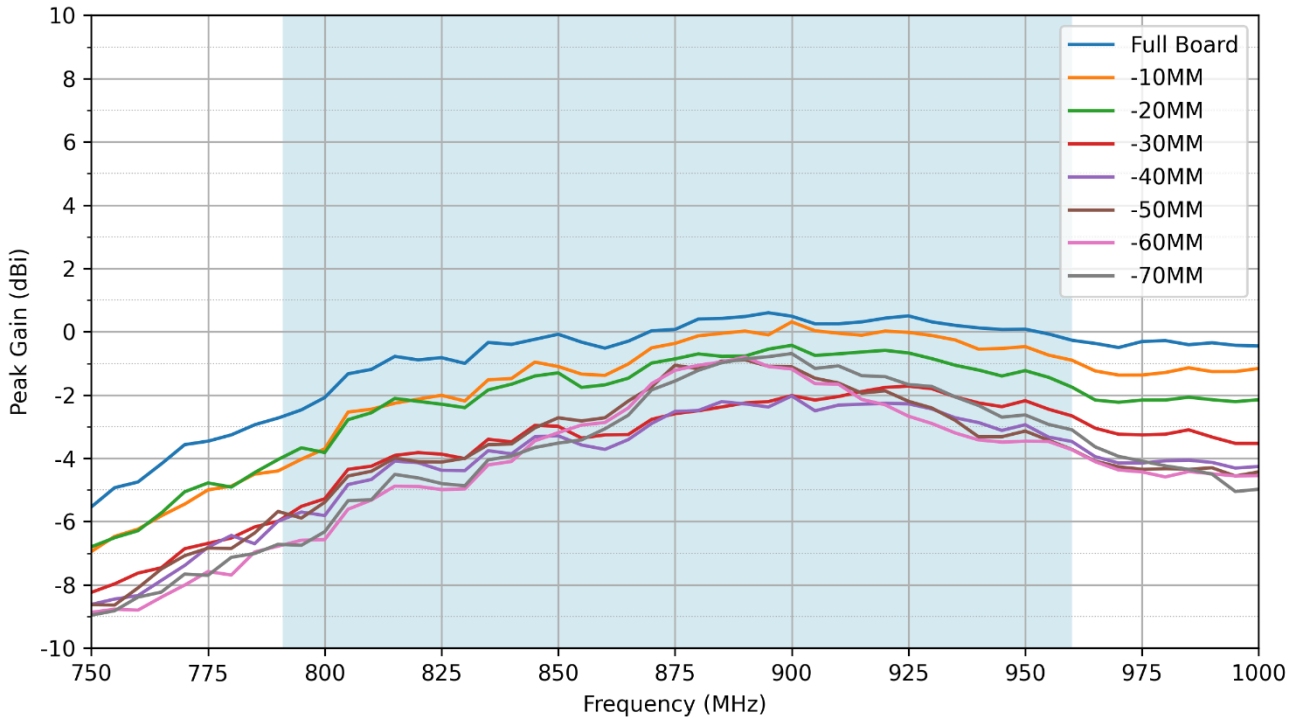
9.3 Efficiency



9.4 Average Gain



9.5 Peak Gain



Changelog for the datasheet

SPE-18-8-099 – NCS.5820

Revision: H (Current Version)	
Date:	2026-03-13
Changes:	Updated antenna integration guide and product photo.
Changes Made by:	Gary West

Previous Revisions

Revision: G	
Date:	2023-10-11
Changes:	Full datasheet update
Changes Made by:	Gary West

Revision: B	
Date:	2018-09-17
Changes:	Updated Drawing
Changes Made by:	Jack Conroy

Revision: F	
Date:	2020-08-17
Changes:	Updated MSL information.
Changes Made by:	Erik Landi

Revision: A (Initial Release)	
Date:	2018-12-11
Changes:	Initial Release
Changes Made by:	Jack Conroy

Revision: E	
Date:	2020-08-17
Changes:	Updated Pin Information
Changes Made by:	Jack Conroy

Revision: D	
Date:	2020-02-27
Changes:	Updated Footprint Data
Changes Made by:	Jack Conroy

Revision: C	
Date:	2019-09-19
Changes:	Updated Template
Changes Made by:	Yu Kai Yeung

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