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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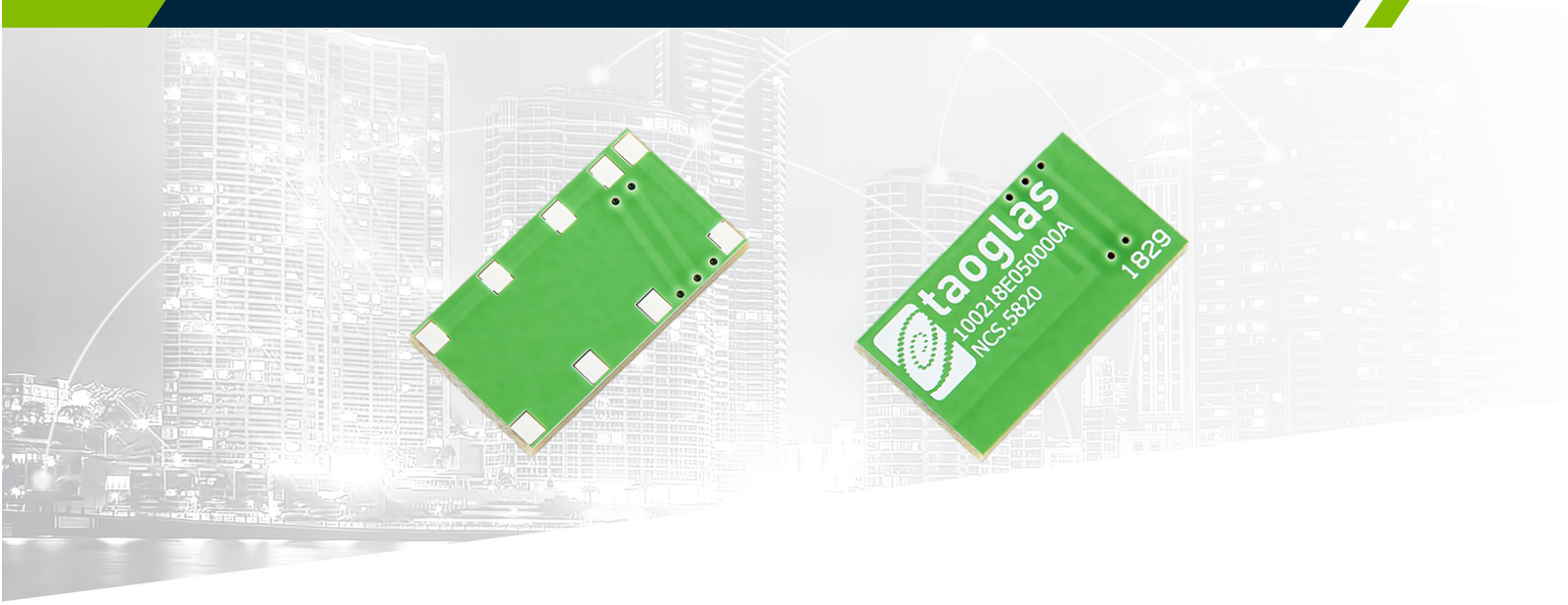
Ireland ISO 9001: 2015 Certified

Taiwan ISO 9001: 2015 Certified

1. Introduction



The evolution of IoT connectivity has seen an urgent need for a low power way to connect thousands of devices. The Extensis NCS series of NB-IoT embedded antennas are the smallest form factor antennas on the market to facilitate this demand.

This part no. the NCS.5820 supports Bands 5 (824-894MHz), 8 (880-960MHz) and 20 (791-862MHz) and demonstrates excellent efficiency in providing global NB-IoT coverage. This antenna will allow the device manufacturer to enjoy mobilization between all bands so that the device can be used in more than one region with more than one carrier. On the contrary, an antenna covering only one band will have less mobility and will not be suitable for international roaming over Low Power Wide Area networks.

With a super low profile height of 1.6 mm and a footprint of just 11 x 20mm, the surface mount antenna can be easily integrated into even the smallest of devices. It allows device designers to take advantage of all of the benefits of NB-IoT technology, including reduced power consumption and increased battery life; increased system capacity and spectrum efficiency; and extended coverage in both rural and deep indoors environments all with a very small form factor. For testing, it can be supplied on the NCSD.5820 evaluation board, see section 5.2.

Typical applications include:

:: Remote monitoring / Smart meters
:: Smart cities & buildings
:: Agriculture
:: Network devices
:: Manufacturing automation,
:: Environment and asset tracking.

Ease of integration and exceptional performance of this antenna make it the perfect starting point for any NB-IoT device design. It is also an ideal choice for cost-sensitive applications considering also that the material used for this antenna is lower cost than the traditional ceramic NB-IoT antenna.

Overall, this antenna is suitable for applications that need to meet the following requirements:

- Small footprint, low profile design factors
- Long battery life of up to 10 years is required
- Deep indoor penetration with +20dB link budget compared with GSM is required
- Low cost, with an industry target of < $5 per radio module. The material used for this antenna is lower cost than the traditional ceramic NB-IoT antenna
- High security from proven LTE-based security mechanisms
- A worldwide 3GPP industry standard on operator-managed networks in licensed spectrum
- Possibility of up to 100x more devices per cell compared with GSM

For more information or support with integrating this antenna into your device, please contact your regional Taoglas Customer Support Team.

2. Specifications

Electrical			
Frequency (MHz)	Band 5	Band 8	Band 20
	824~894	880~960	791~862
Peak Gain (dBi)*	0.1	0.1	-0.8
Average Gain (dB)*	-3.8	-3.6	-4.1
Efficiency (%)*	42	44	39
Return Loss (dB)*	<-6	<-7	<-7
Polarization	Linear		
Impedance	50 Ω		
Maximum Input Power	5W		

Mechanical	
Antenna Dimensions	20mm x 11mm 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

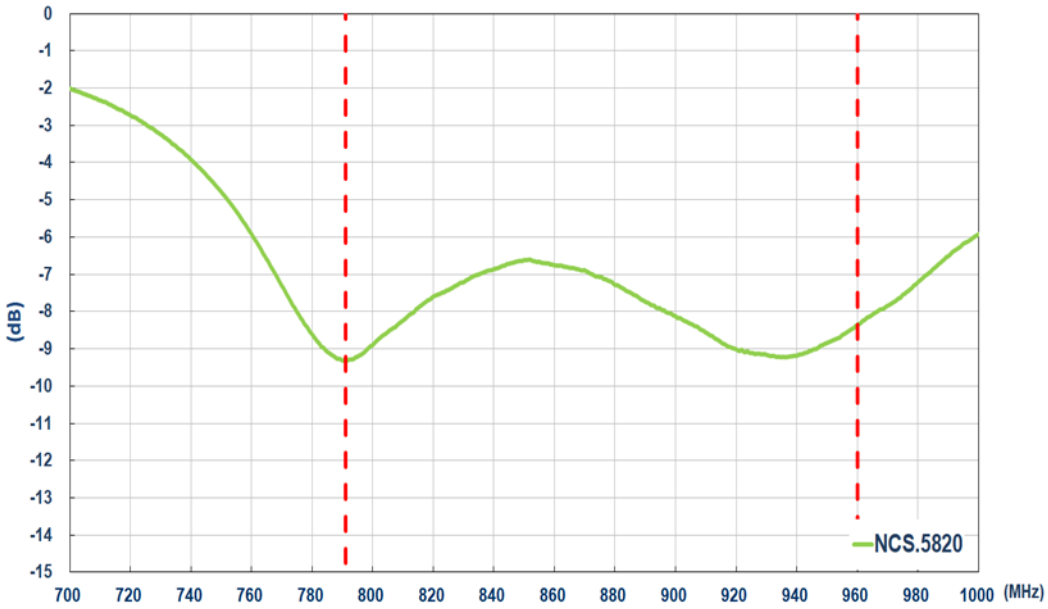
*Note: All measurements were conducted with SMT on a 115*35mm evaluation board with 100mm length ground plane and matching circuit. See EVB drawing and matching circuit diagram in Section 5 and Section 7.

3. Antenna Characteristics

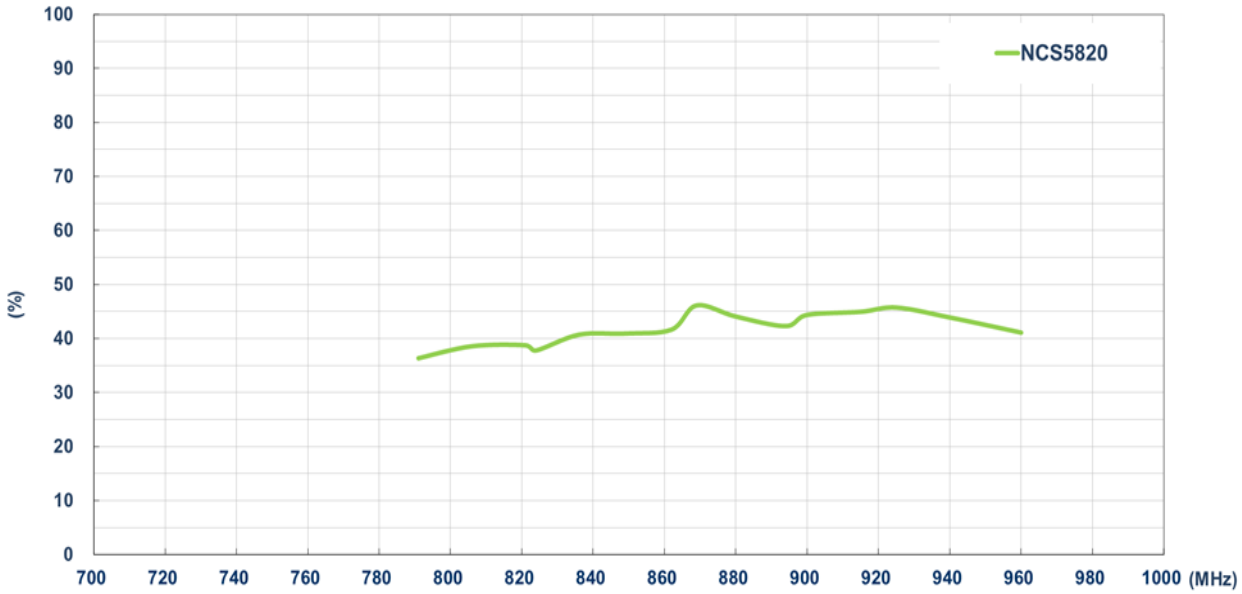
All data was measured on the evaluation board illustrated in Section 5, with the documented matching circuit.

3.1 NCS.5820

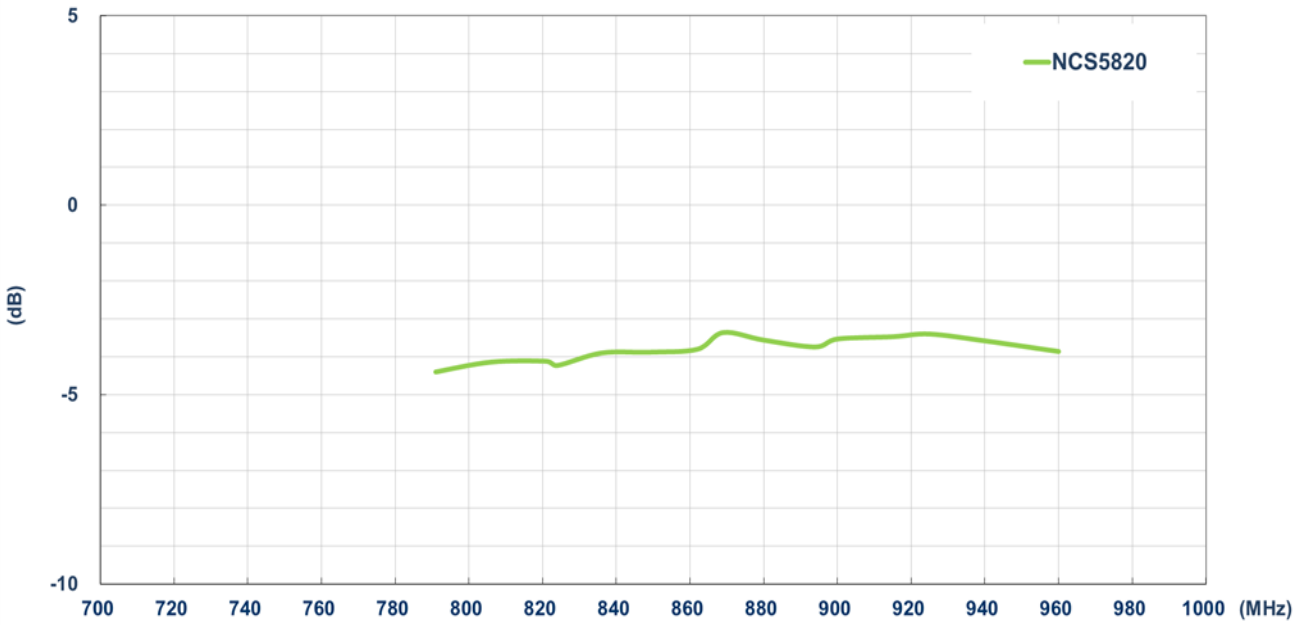
Return Loss



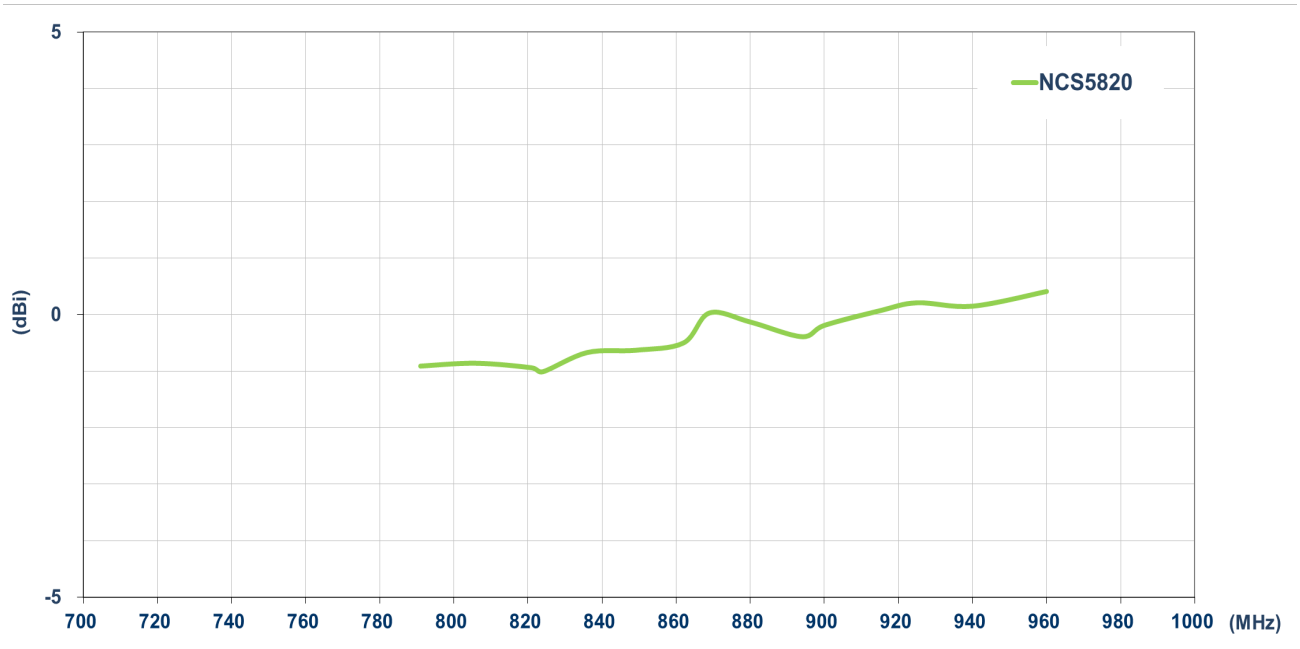
Efficiency



Average Gain

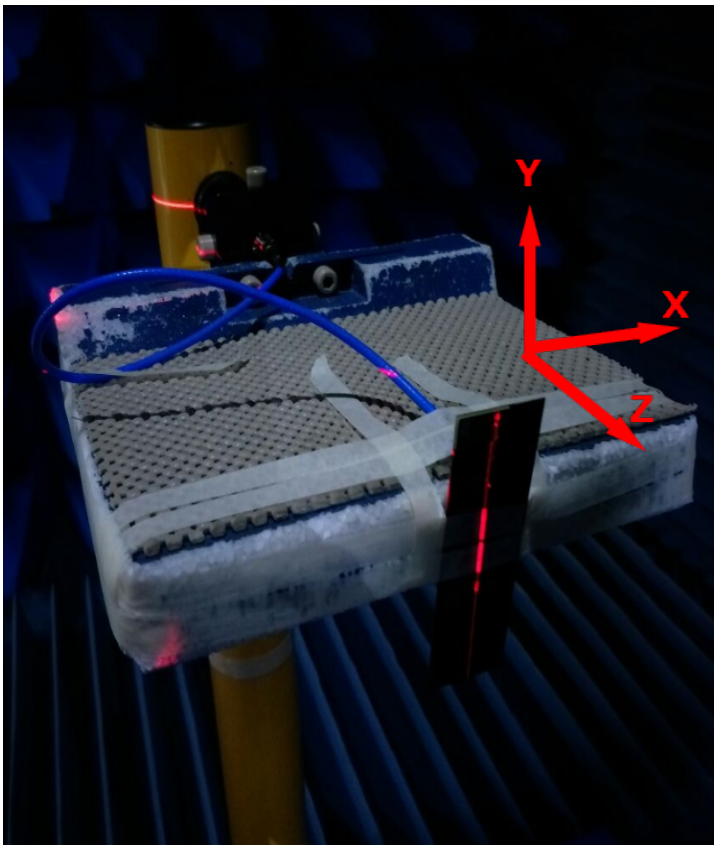


Peak Gain

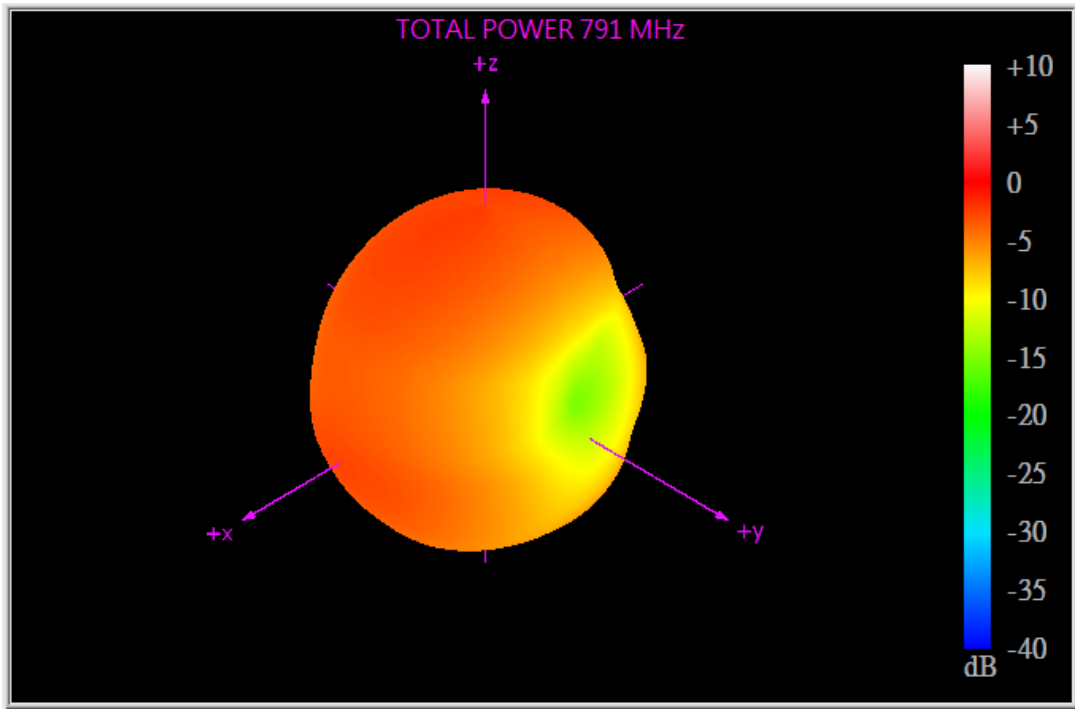


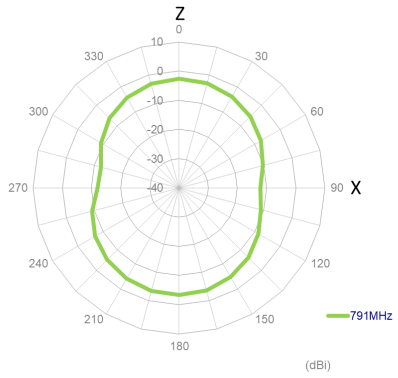
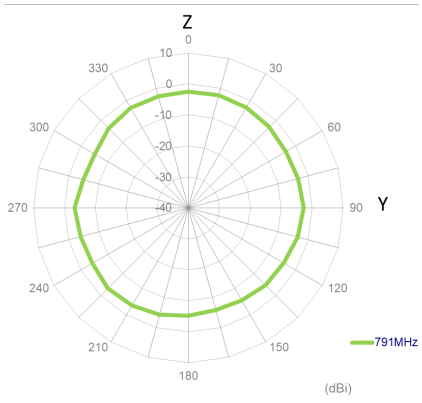
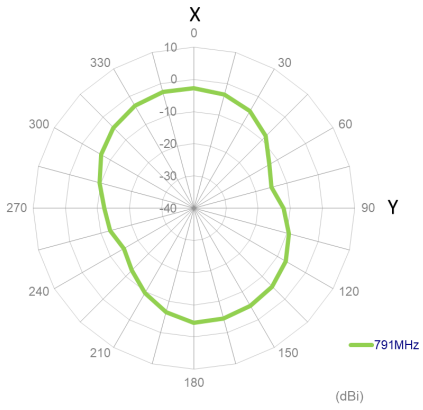
4. Radiation Patterns

4.1 Test Setup - on NCSD.5820 Evaluation Board

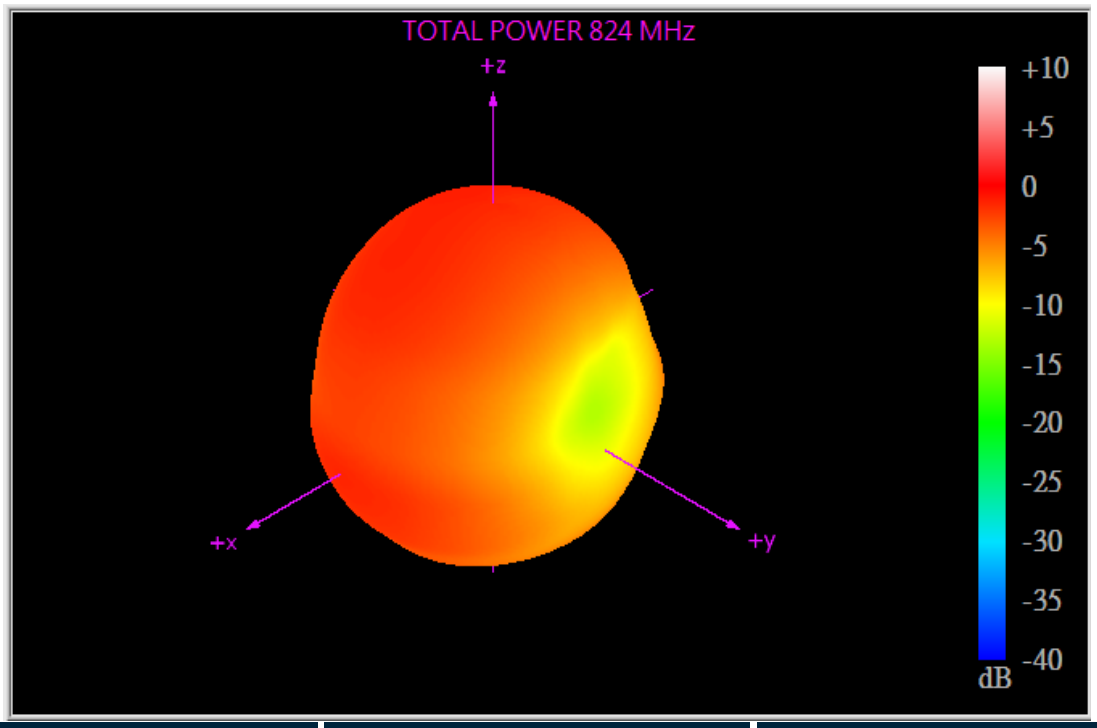


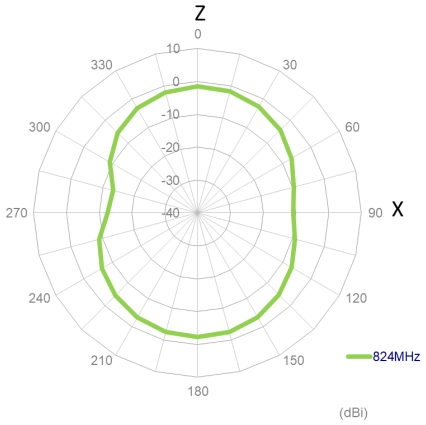
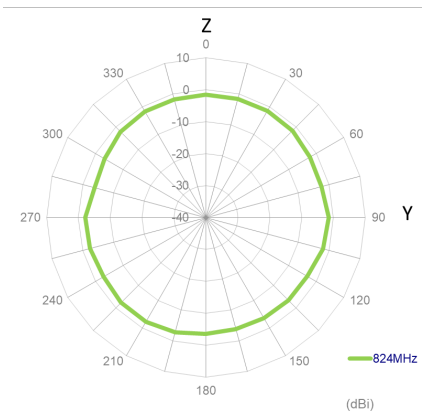
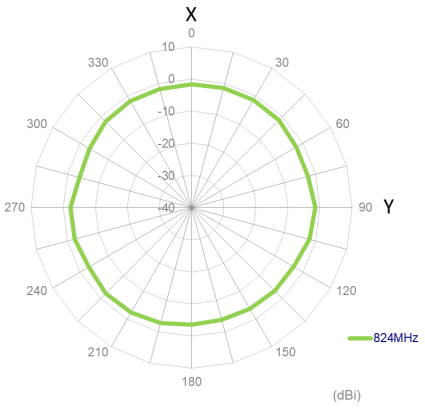
4.2 791MHz 3D and 2D Radiation Patterns



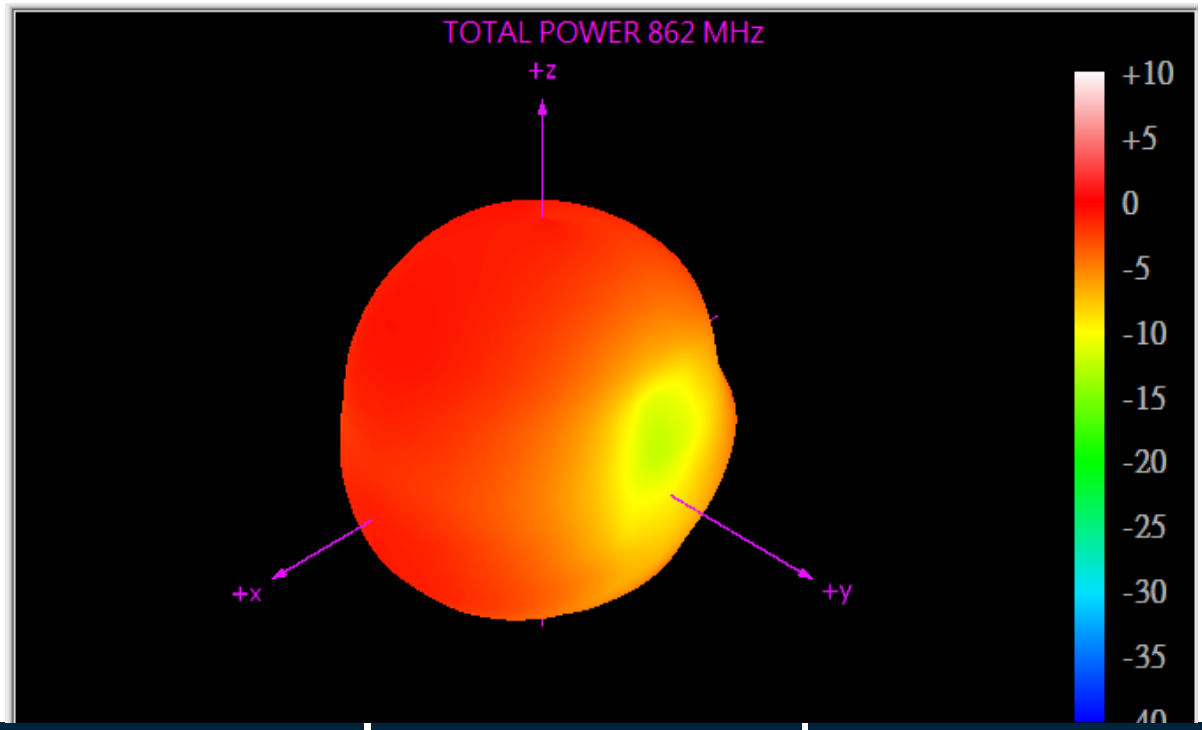
XZ Plane	YZ Plane	XY Plane
		

4.3 824 MHz 3D and 2D Radiation Patterns

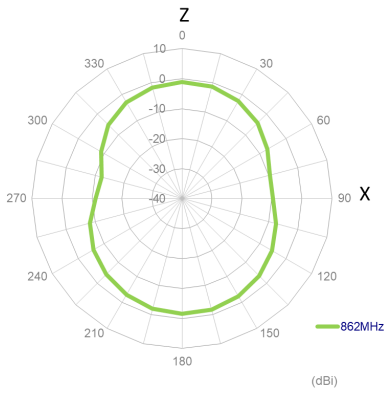


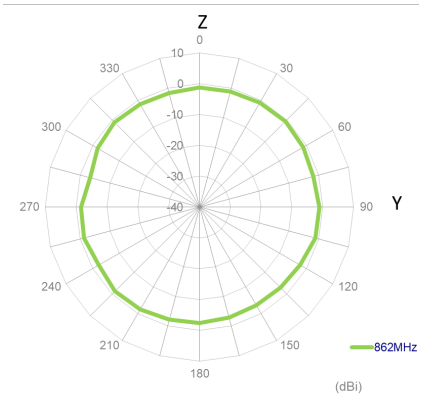
XZ Plane	YZ Plane	XY Plane
		

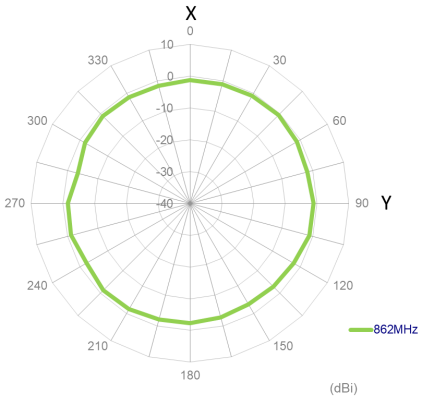
4.4 862 MHz 3D and 2D Radiation Patterns



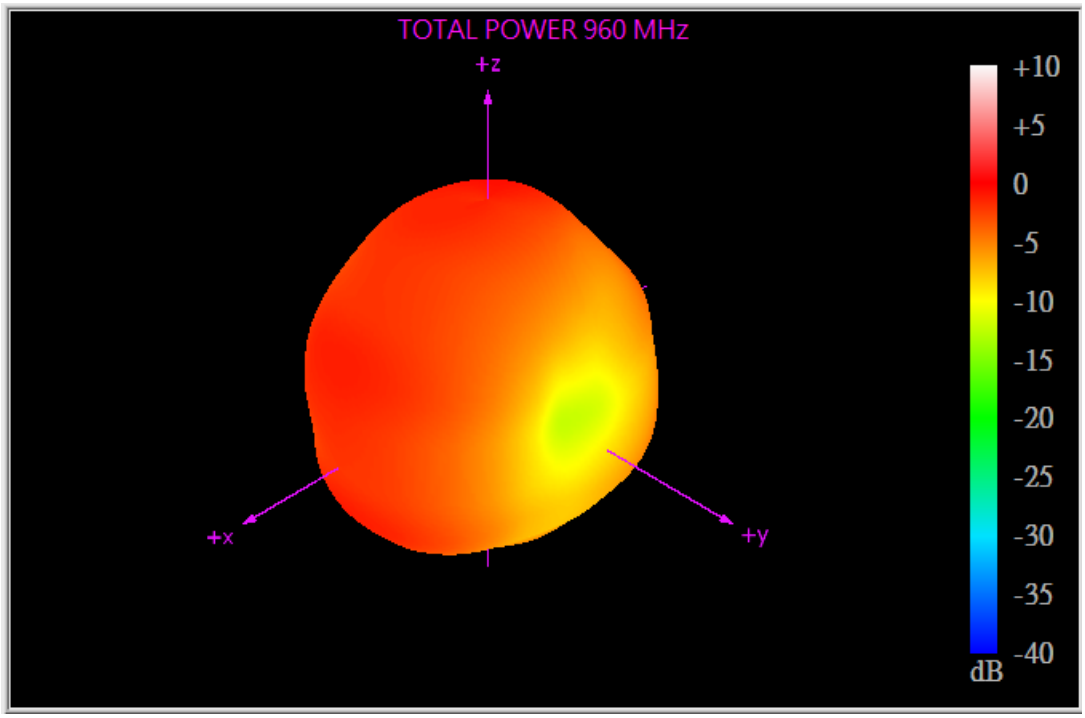
XZ Plane	YZ Plane	XY Plane



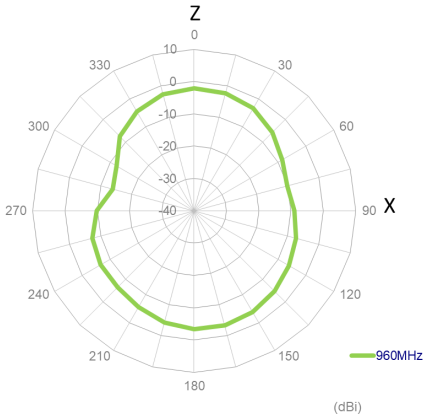


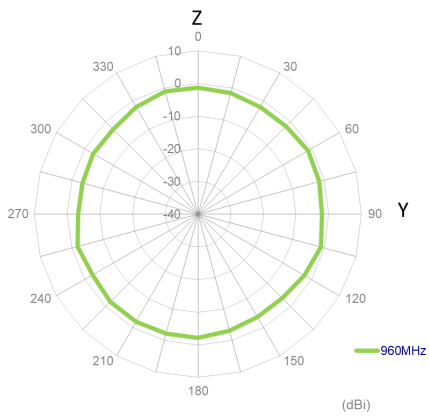


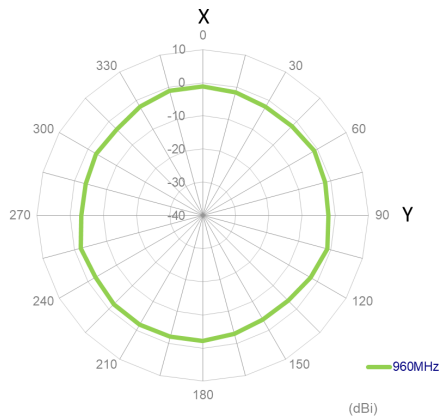
4.5 960 MHz 3D and 2D Radiation Patterns



XZ Plane	YZ Plane	XY Plane

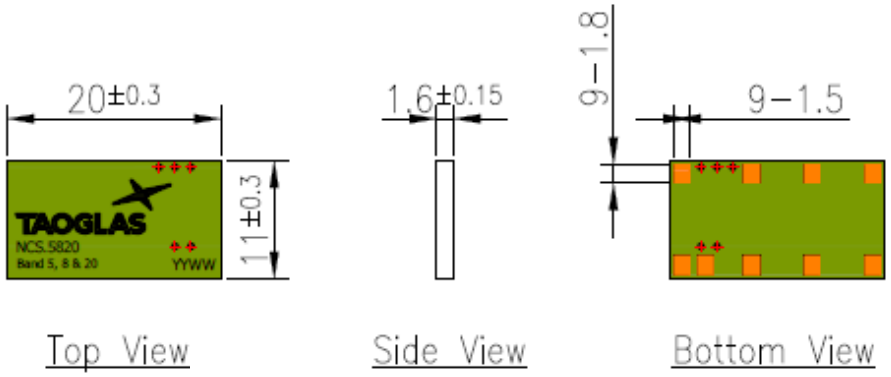




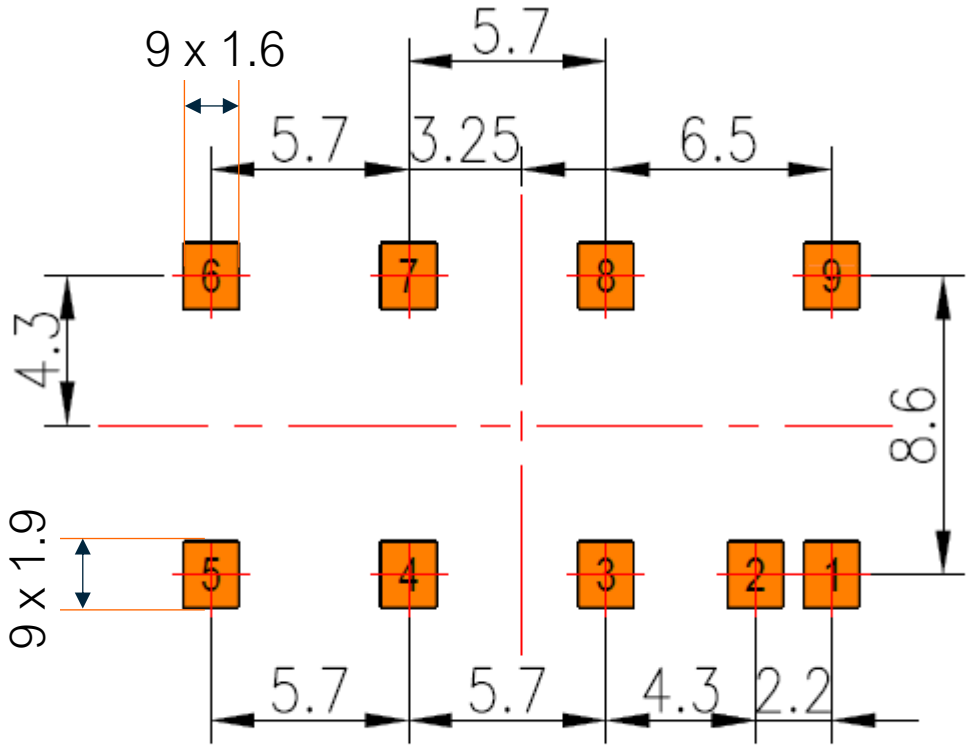


5. Mechanical Drawing (Units: mm)

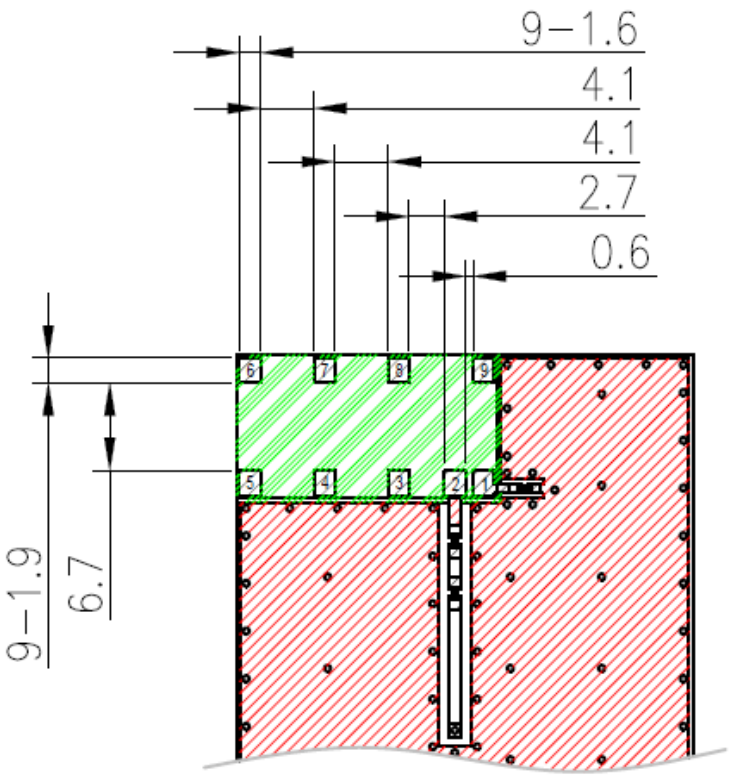
5.1 Antenna Drawing



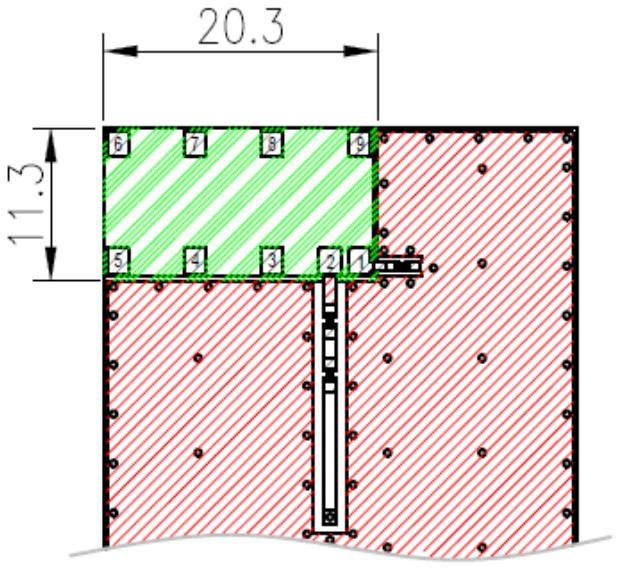
5.2 Antenna Footprint



5.3 Pad Layout

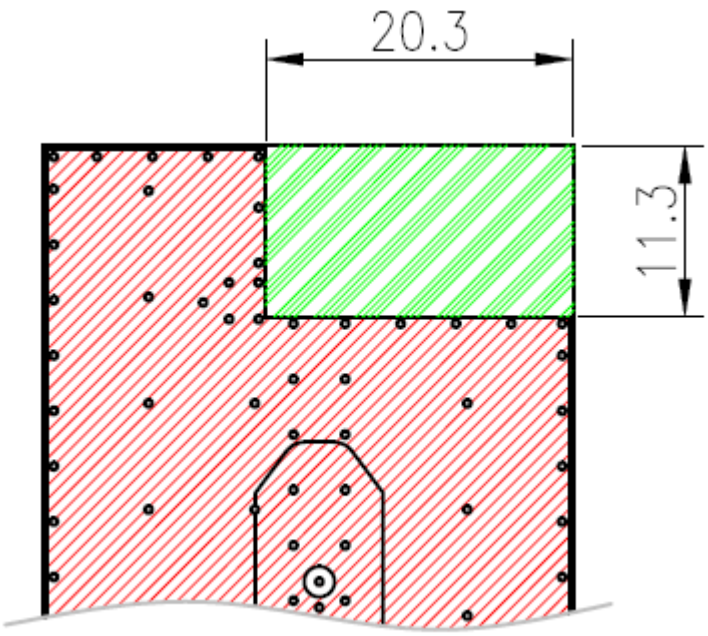


5.4 Copper Keep Out Area – Top View



Note:
1. Week Batch Code
   Example: 2013 Week 10=1310
2. Soldered area
3. Copper area
4. Logo & Text Ink Printing : White
5. Ground Clearance Area
6. HASL
7. Soldermask (Green_LF03HF)
8. Matching – Value Changes According To Ground And Layout.

5.5 Copper Keep-Out Area – Bottom View



Note:
1. Week Batch Code
   Example: 2013 Week 10=1310
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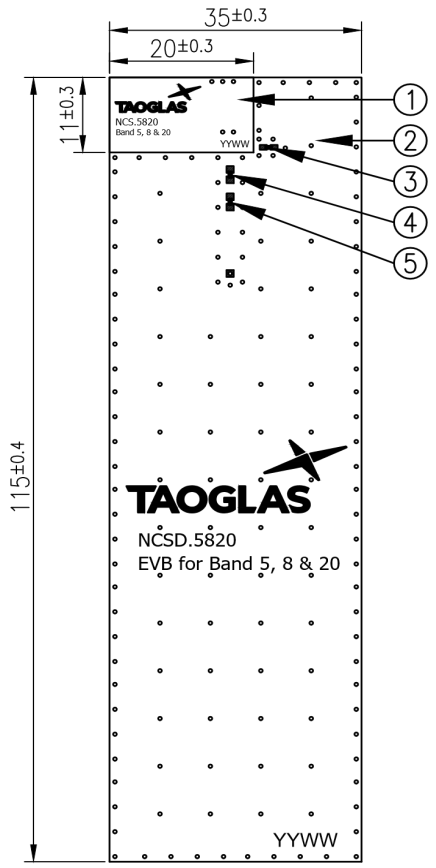
3. Copper area
4. Logo & Text Ink Printing : White
5. Ground Clearance Area
6. HASL
7. Soldermask (Green_LF03HF)
8. Matching – Value Changes According To Ground And Layout.

5.6 Evaluation Board

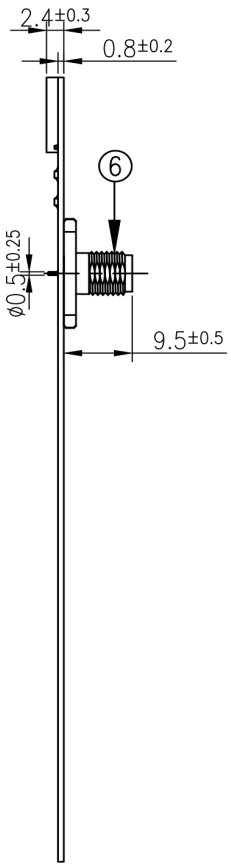
ISO NO: EDW-18-8-6321 <Release>

REV	ZONE	DESCRIPTION	ENG	APPROVED	ISSUED DATE
D01	ALL	Initial Design	Rachel	Haley	2018/05/30
D02	ALL	Modify the Inductor	Rachel	Haley	2018/06/08
D03	ALL	Modify PCB finish color	Rachel	Haley	2018/07/18
D04	ALL	Modify PCB printing	Rachel	Haley	2018/08/08
D05	ALL	Modify PCB finish color Replace the new LOGO <ECR-18-8-259>	Ruby	Aaron/Kevin	2020/02/21

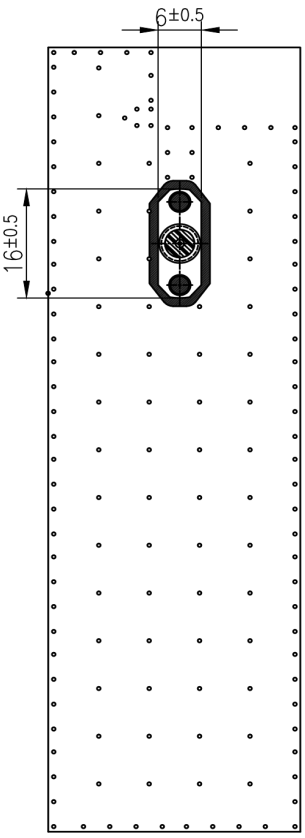
Top View D04 D05



Side View



Bottom View



	Name	P/N	Material	Finish	QTY
D03 1	NCS.5820 PCB Antenna	100218E050000A	Composite 1.6t	Green	1
D05 D03 2	NB-Iot EVB PCB	100218E070000A	Composite 0.8t	Black	1
3	2.7nH Inductor (0402)	001517J050000A	Ceramic	Natural	1
4	1.2pF Capacitor (0402)	001516E000000A	Ceramic	Natural	1
D02 5	22nH Inductor (0402)	001518F010000A	Ceramic	Natural	1
6	SMA(F) ST PCB	200413B000002A	Brass	Au Plated	1

Note:
1. All material must be RoHS compliant.
2. Soldered area
3. Logo & Text Ink Printing : White

UNLESS OTHERWISE SPECFIED
TOLERANCES ON:
.X± 0.2
XX.± 0.5 .XX± 0.1
X.± 0.3 .XXX± 0.05

DATE: 2018/08/08 | MAT'L:
UNIT: mm | FINISH:
THIRD ANGLE PROJECTION | SCALE: 1/1

APPROVED BY: Haley | CHECKED BY: Jack | DRAWN BY: Rachel | CUSTOMERS SIGNATURE / DATE

TAOGLAS. TW Design Centre

REV D05

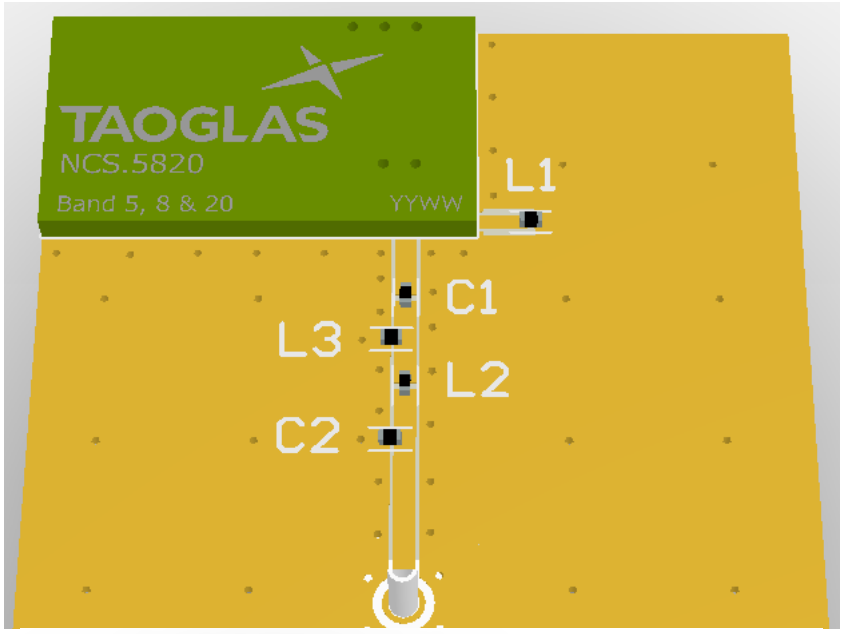
TITLE. : Evaluation Board for NCS.5820 NB-IoT
FR4 PCB Antenna for Band 5, 8 & 20 w/ 5 pcs

PART NO. : NCSD.5820

6. Antenna Integration Guide

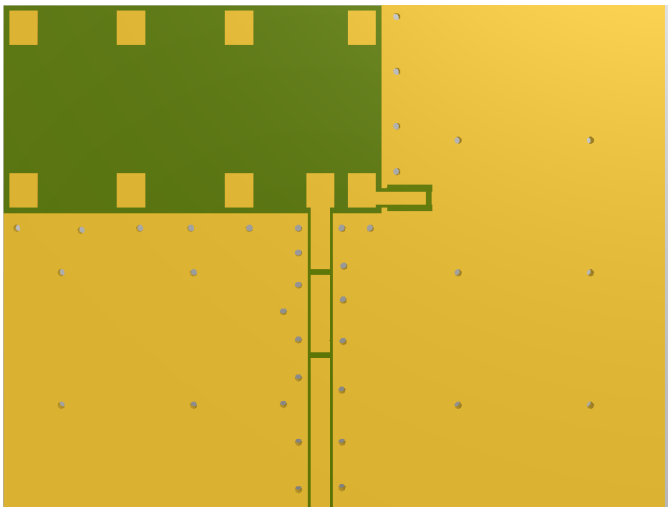
6.1 Integration Guide

The ideal location for the antenna is as illustrated in the below diagram; on the PCB's shortest side, in the left corner. This allows placement of the optimized matching components alongside the antenna.

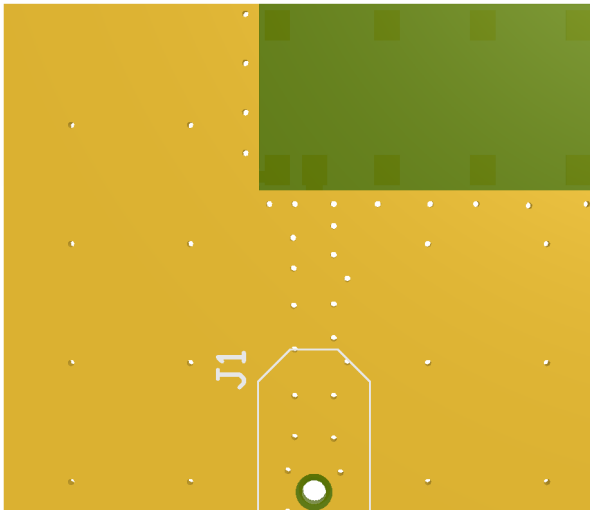


6.2 PCB Layout

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.



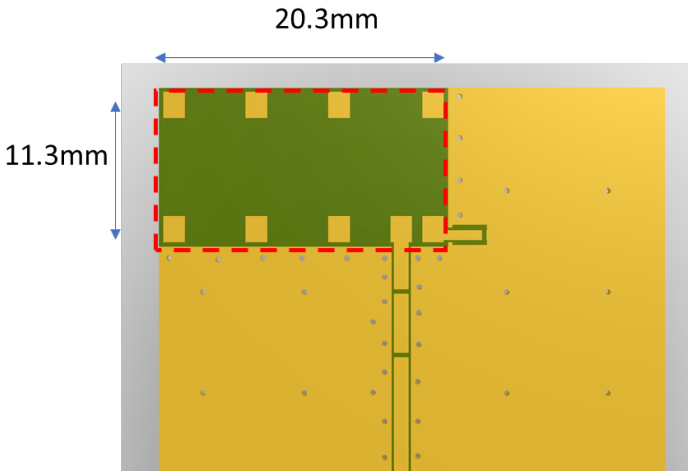
Top View



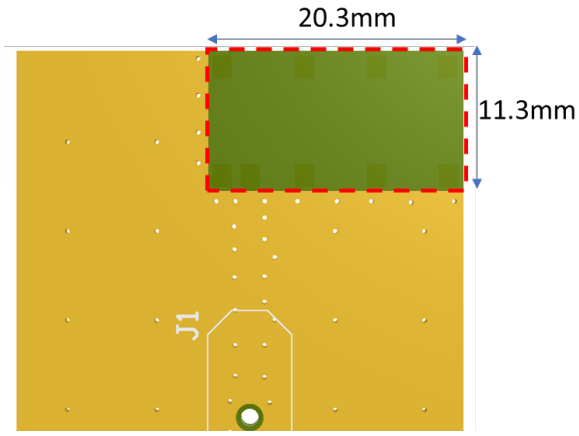
Bottom View

6.3 PCB Clearance

In the figure in this section, the footprint and clearance are defined through all layers on the PCB. Only the antenna pads and connections to feed and GND are present within this clearance area (marked RED). The clearance area required is 20.3 x 11.3 (mm).



Top View

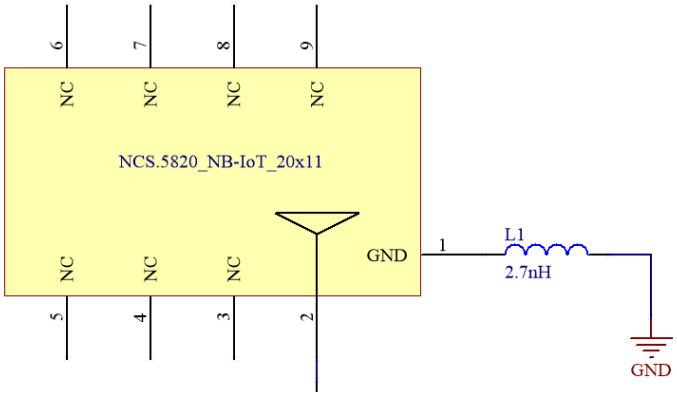


Bottom View

6.4 Schematic Symbol and Pin Definitions

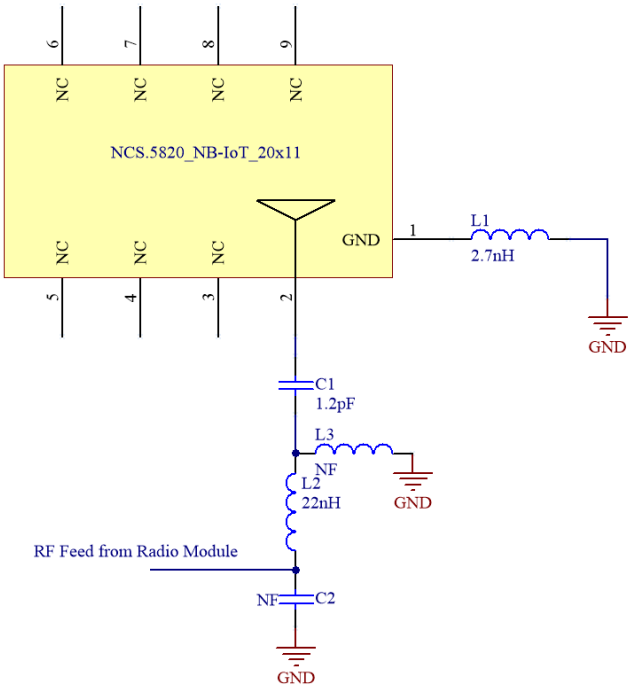
The circuit symbol for the antenna is shown below. The antenna has 9 pins with only two as functional.

Pin	Description
1	Ground
2	RF Feed
3, 4, 5, 6, 7, 8, 9	Not Connected



7. Evaluation Board Matching Circuit

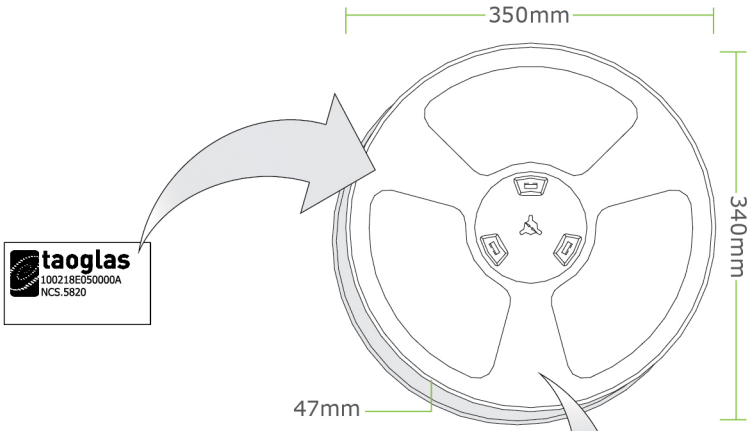
This antenna requires a matching circuit which can be optimized for each product integration. This matching circuit will require up to four components and the circuit illustrated in the below diagram should be designed onto the carrier PCB. All components may not be required but should be included as a provision. To ensure optimum tuning the matching network must be placed in close proximity to the antenna feed.



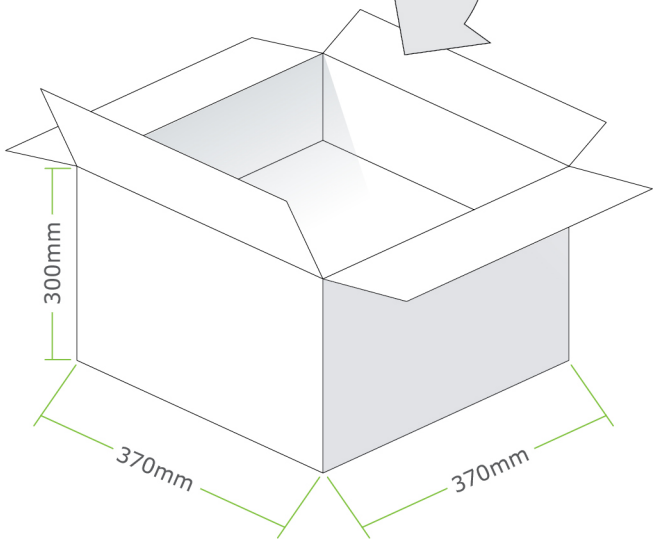
Matching Components			
Designator	Type	Value	Description
C1	Capacitor	1.2pF	Murata GJM1555 series
C2	Not Fitted		
L1	Inductor	2.7nH	Murata LQG15HS series
L2	Inductor	22nH	Murata LQG15HS series
L3	Not Fitted		

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



Changelog for the datasheet

SPE-18-8-099 – NCS.5820

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

Previous Revisions

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

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

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