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ALL mXTEND™

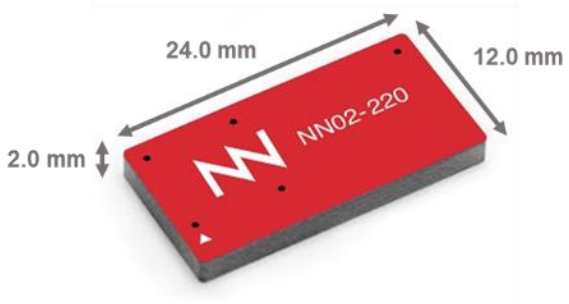
NN02-220

USER MANUAL

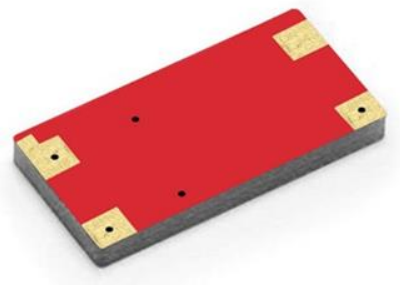
ALL mXTEND™: A STANDARD ANTENNA SOLUTION FOR MOBILE FREQUENCY BANDS.

The ALL mXTEND™ chip antenna component has been specifically designed for providing multiband performance in wireless devices, enabling worldwide coverage by allowing operation in the communication standards GSM850, GSM900, GSM1800/DCS, GSM1900/PCS, UMTS, LTE450, LTE700, LTE800, LTE850, LTE900, LTE1700, LTE1800, LTE1900, LTE2000, LTE2100, LTE2300, LTE2500, and LTE2600.

TOP



BOTTOM



Material: The ALL mXTEND™ chip antenna component is built on glass epoxy substrate.

Most used industries.

- **Smart Metering**
- **Smart Home & Buildings**
- **Industrial IoT**
- **Automotive Telematics**
- **Asset Tracking & Logistics**

ALL mXTEND™ benefits.

- **High performance**: A global cellular antenna for IoT and mobile devices with high performance in the sub-GHz frequency range.
- **Multiband:** All cellular bands covered: 2G/3G/4G/5G and NB-IoT/LTE-M applications in a 24.0 mm x 12.0 mm x 2.0 mm antenna package.
- **Global reach:** Through multiband performance (worldwide standards compatible.
- **Reliability:** Off-the-Shelf standard product, no antenna part customization (electronic optimization)
- **Use cases:** Smart metering, smart city sensors, automotive.

Operation bands summary.

GSM, UMTS, LTE, LTE-M, NB-IoT, 5G, and many more within the range of 400 MHz to 8000 MHz.

CHAPTER INDEX

1 CONFIGURATION OVERVIEW

The ALL mXTEND™ chip antenna component is a versatile antenna component that can be easily tuned to operate at any wireless frequency. Table 1 provides an overview of a few examples of configurations of the ALL mXTEND™ chip antenna component for popular wireless frequencies.

Configuration	Frequency range	Frequency Regions
CELLULAR IoT	698 – 960 MHz & 1710 – 2690 MHz	2
CELLULAR FOR SMART METERS	698 – 960 MHz & 1710 – 2690 MHz	2
CELLULAR FOR SHARKFIN AUTOMOTIVE	698 – 960 MHz & 1710 – 2690 MHz	2

Table 1 - List of communication standards included in this user manual sorted by frequency range.

The following table presents the technical specifications of the ALL mXTEND™ chip antenna component, including its radiation pattern, polarization, weight, temperature range, impedance, and dimensions. These features make the ALL mXTEND™ a highly versatile and durable component that can be easily integrated into a wide range of wireless applications.

Technical Features	ALL mXTEND™ (NN02-220)
Radiation Pattern	Omnidirectional
Polarization	Linear
Weight (approx.)	1.23 g
Temperature	-40 to +125 ºC
Impedance	50 Ω

Table 2 - Technical features for the ALL mXTEND™.

PURCHASE EVALUATION BOARD THROUGH DISTRIBUTOR

Any of the evaluation boards shown in this document can be purchased through our main distributors, find them here: https://ignion.io/distributors/.

1.1. ALL mXTEND™ FOR CELLULAR IoT

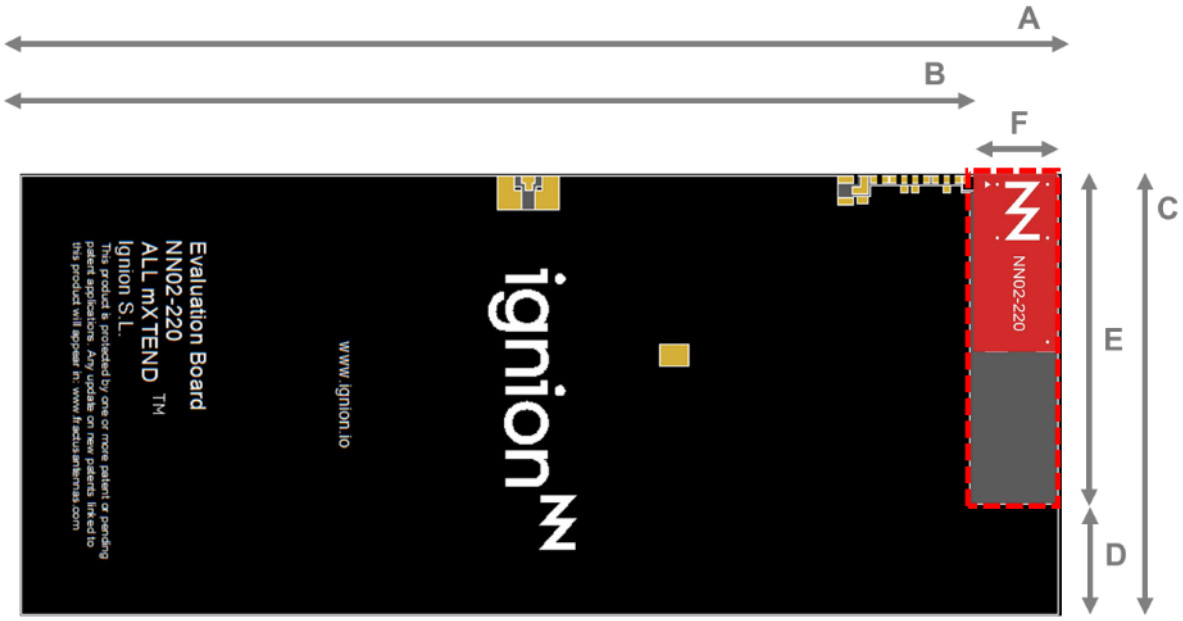
ALL mXTEND™ is designed to cater to a wide range of wireless communication standards, including LTE CAT 1, LTE CAT-M and NB-IoT. It provides reliable operation across multiple frequency bands, ensuring a reliable path to passing cellular certification.

Technical Features	698 – 960 MHz	1710 – 2690 MHz
Average Efficiency	> 55 %	> 75 %
Peak Gain	2.3 dBi	3.1 dBi
VSWR	< 3:1	

Table 3 - Performance of ALL mXTEND™ configured for Cellular IoT on evaluation board (142 mm x 60 mm x 1 mm).

EVALUATION BOARD FOR CELLULAR IoT

This Evaluation Board (part number: EB_NN02-220) integrates one ALL mXTEND™ chip antenna component to provide operation in two frequency regions, from 698 MHz to 960 MHz and from 1710 MHz to 2690 MHz. A UFL cable connects this single input/output port to the SMA connector.



Measure	mm
A	142
B	130
C	60
D	15
E	45
F	12

Tolerance: ±0.2 mm

Material: The Evaluation Boards are built on FR4 substrate. Thickness is 1 mm.

Clearance Area: 45 x 12 mm (ExF)

Figure 1 – EB_NN02-220. Evaluation Board 1 port providing operation in 2 frequency ranges, 698 – 960MHz and 1710 – 2690MHz.

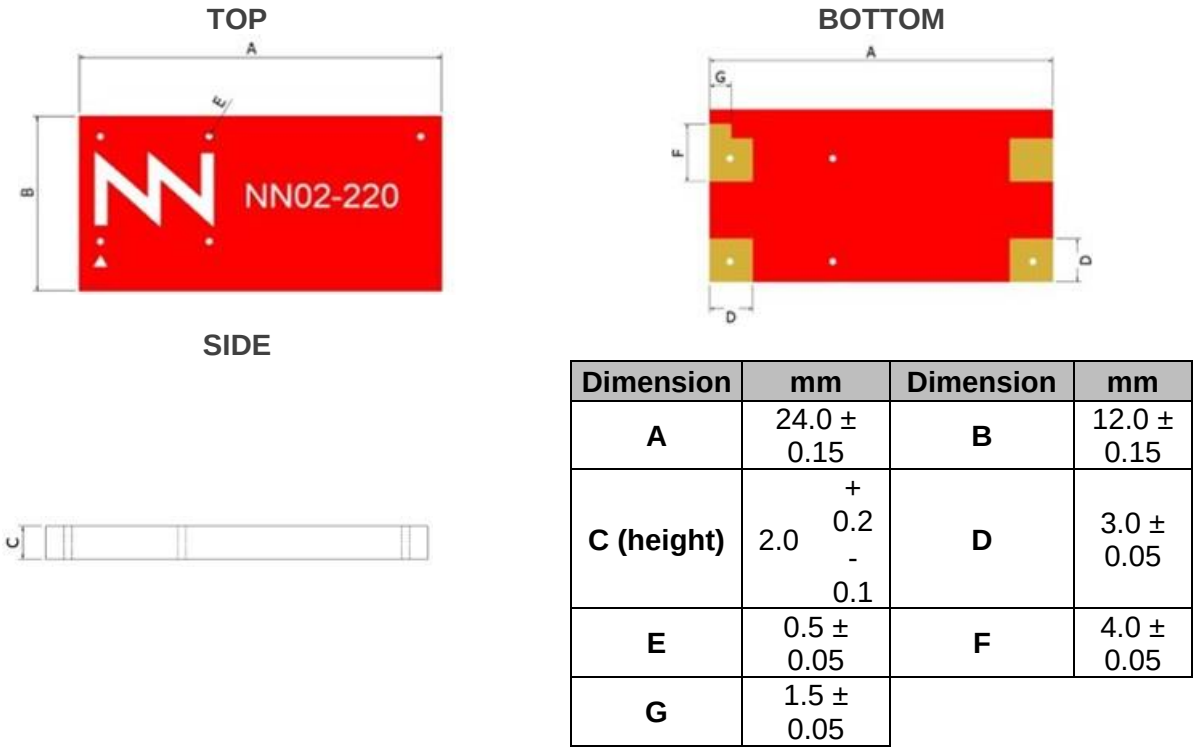
1.2. ASSESS YOUR OWN DEVICE REQUIREMENTS

If you are designing a device with a different size or operating frequency than shown above, you can assess the performance of this configuration using our free-of-charge Oxion™ platform. This platform provides a complete design report, including expected performance and tailored design guide, within 24 hours. For additional information about Ignion's range of R&D services, please visit: https://ignion.io/resources-support/technical-center/engineering-support/. If you require further assistance, please contact support@ignion.io.

Purchase this or other evaluation boards through our main distributors by visiting the following link: https://ignion.io/distributors/.

2 MECHANICAL SPECIFICATIONS

2.1 DIMENSIONS, TOLERANCES, AND RoHS



Dimension	mm	Dimension	mm
A	24.0 ± 0.15	**B**	12.0 ± 0.15
C (height)	$2.0^{+0.2}_{-0.1}$	**D**	3.0 ± 0.05
E	0.5 ± 0.05	**F**	4.0 ± 0.05
G	1.5 ± 0.05		

Figure 2 – ALL mXTEND™ chip antenna component's dimensions and tolerances.

The ALL mXTEND™ (NN02-220) chip antenna component is compliant with the restriction of the use of hazardous substances (**RoHS**). For more information, please contact support@ignion.io.

The RoHS certificate can be downloaded from https://ignion.io/files/RoHS_NN02-220.pdf.

2.2 SPECIFICATIONS FOR THE INK

The next figure shows the range of the colors in the ALL mXTEND™ antenna booster:

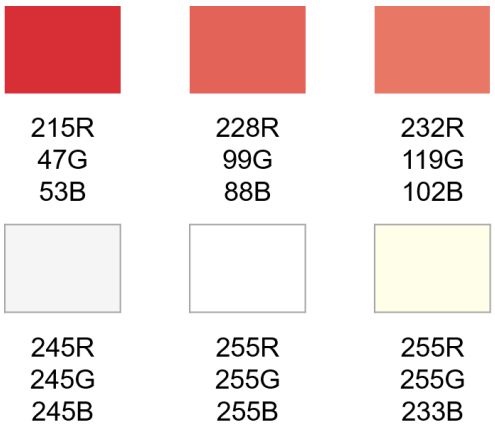


Figure 3 – Acceptable color range.

3 ASSEMBLY AND MANUFACTURING

Figure 4 shows the back and front views of the ALL mXTEND™ chip antenna component NN02-220. Due to the product configuration, the feeding pad is pad 1.

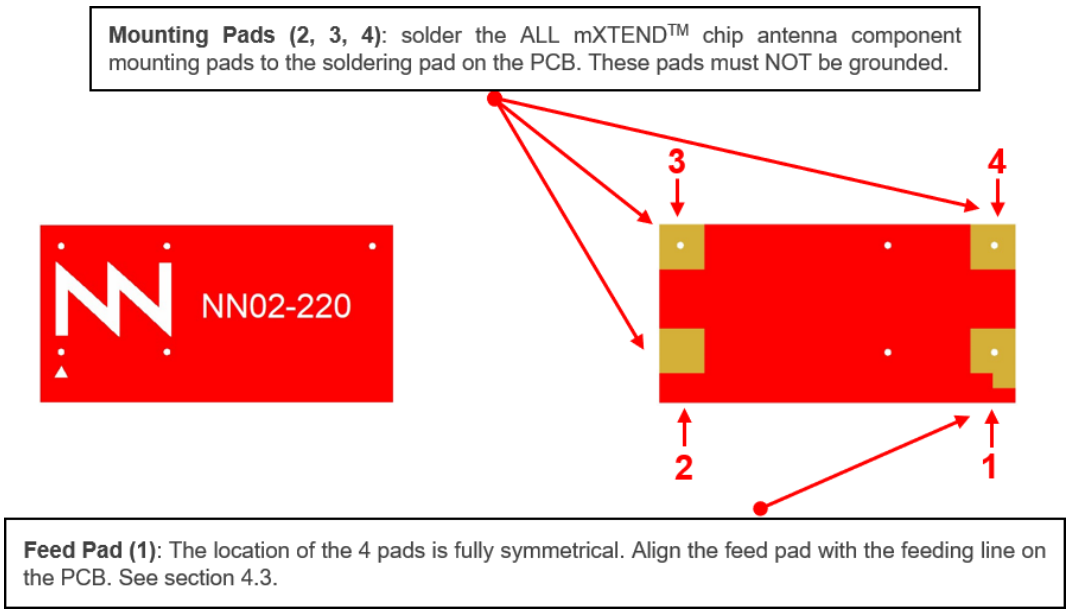


Figure 4 – Pads of the ALL mXTEND™ chip antenna component (NN02-220).

As a surface mount device (SMD), the ALL mXTEND™ chip antenna component is compatible with industry standard soldering processes. The basic assembly procedure for the ALL mXTEND™ chip antenna component is as follows:

1. Apply a solder paste on the pads of the PCB. Place the ALL mXTEND™ chip antenna component on the board.
2. Perform a reflow process according to the temperature profile detailed in Table 4, Figure 5 and Figure 6.
3. After soldering the ALL mXTEND™ chip antenna component to the circuit board, perform a cleaning process to remove any residual flux. Ignion recommends conducting a visual inspection after the cleaning process to verify that all reflux has been removed.

The drawing below shows the soldering details obtained after a correct assembly process:

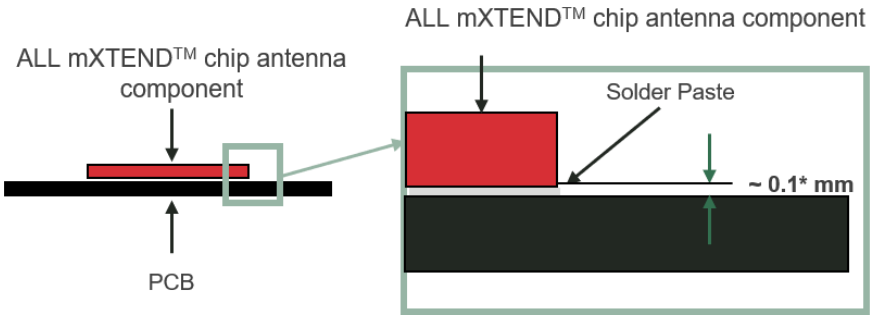


Figure 5 – Soldering Details.

NOTE(*): Solder paste thickness after the assembly process will depend on the thickness of the soldering stencil mask. A stencil thickness equal or larger than 127 microns (5 mils) is required.

The ALL mXTEND™ chip antenna component NN02-220 can be assembled following the Pb-free assembly process. According to the Standard **IPC/JEDEC J-STD-020C**, the temperature profile suggested is as follows:

Phase	Profile features	Pb-Free Assembly (SnAgCu)
RAMP-UP	Avg. Ramp-up Rate (Tsmax to Tp)	3 ºC / second (max.)
PREHEAT	- Temperature Min (Tsmin) - Temperature Max (Tsmax) - Time (tsmin to tsmax)	150 ºC 200 ºC 60-180 seconds
REFLOW	- Temperature (TL) - Total Time above TL (tL)	217 ºC 60-150 seconds
PEAK	- Temperature (Tp) - Time (tp)	260 ºC 20-40 seconds
RAMP-DOWN	Rate	6 ºC/second max
Time from 25 ºC to Peak Temperature		8 minutes max

Table 4 - Recommended soldering temperatures.

Next graphic shows temperature profile (grey zone) for the ALL mXTEND™ chip antenna component assembly process reflows ovens.

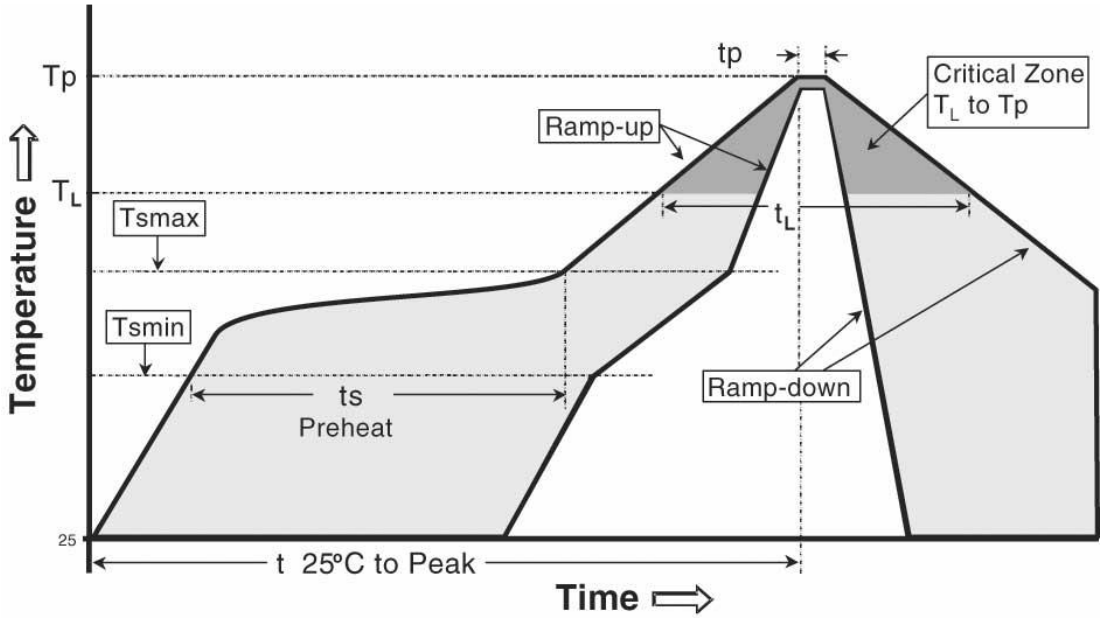
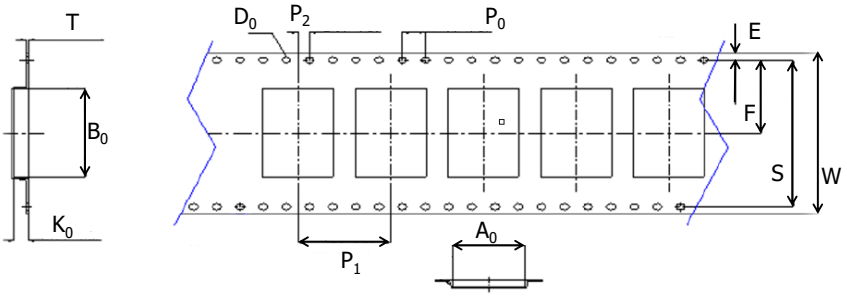


Figure 6 – Temperature profile.

4 PACKAGING

The ALL mXTEND™ chip antenna component NN02-220 is delivered in tape and reel packaging. Ambient room conditions according to Moisture Sensitivity Level (MSL1): Unlimited floor life at 30 °C/85%RH.



Measure	mm
Ao	12.3 ± 0.1
Bo	24.3 ± 0.1
Ko	2.5 ± 0.1
W	44.0 ± 0.3
D_0	1.55 ± 0.05
P_1	16.0 ± 0.1
P_0	4.0 ± 0.1
P_2	2.0 ± 0.1
E	1.75 ± 0.1
F	20.2 ± 0.1
S	40.4 ± 0.3
T	0.3 ± 0.05

Figure 7 - Tape dimensions and tolerances.

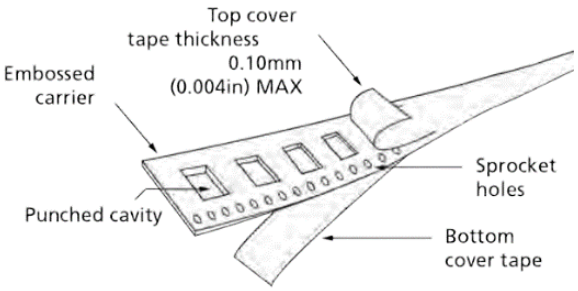
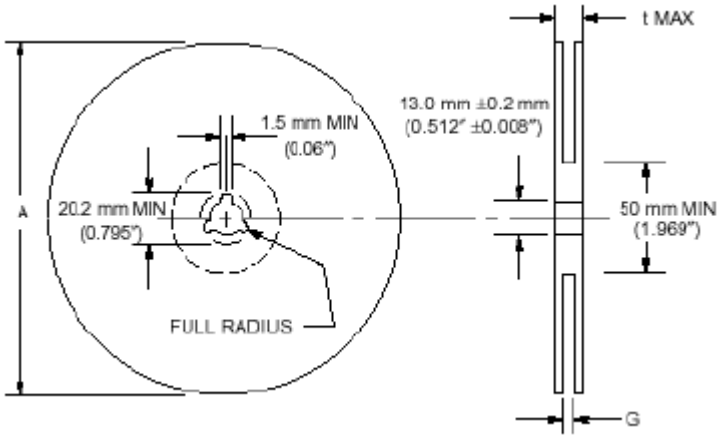


Figure 8 - Image of the tape.



Measure	mm		
A	330	±	1.0
G	17.5	±	0.2
t MAX	21.5	±	0.2

Reel Capacity: 1500 pcs

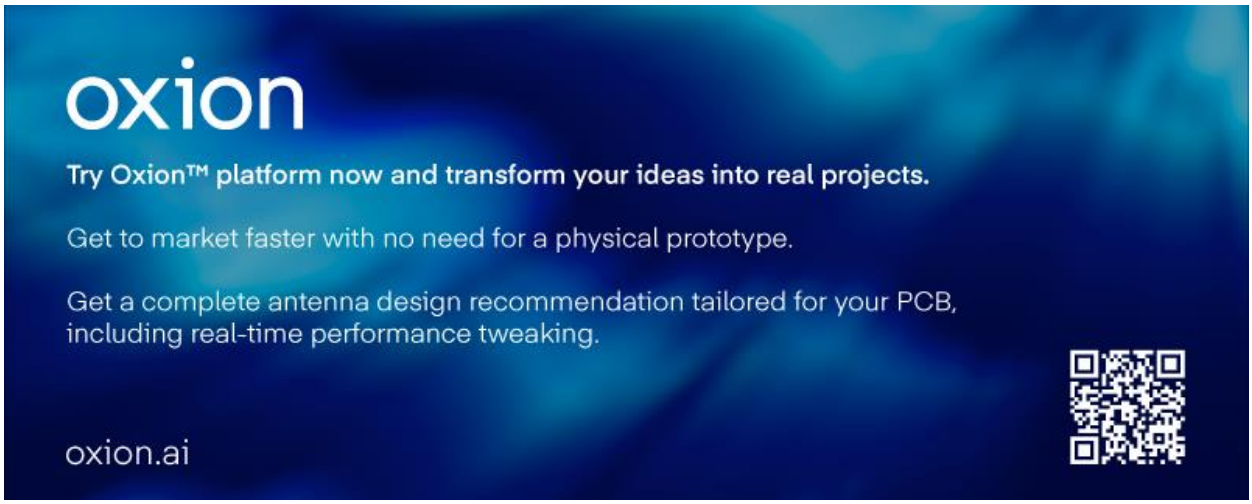
Figure 9 – Reel Dimensions and Capacity.

5 EASY DESIGN JOURNEY WITH VIRTUAL ANTENNA® TECHNOLOGY

This is the simple step by step design journey when designing with Virtual Antenna® technology. You can either do it yourself or you can leverage Ignion's comprehensive support. Our team of experts is available throughout every step, from feasibility to certification and can help ensure you get the antenna right.

Figure 10 – Virtual Antenna® design journey for a successful IoT solution.

Step 1 - Feasibility: The Oxion™ platform provides feasibility results on a bare PCB in terms of reflection coefficient, total efficiency, and design recommendations such as antenna placement and clearance area.



Step 2 - Build design file: Build the design files (Gerber files) with optimal antenna integration based on Ignion templates and design recommendations received from the Oxion™ platform.

Step 3 - EM simulation: Validation of the design files with an Electro-Magnetic (EM) simulation of the full device considering every component, ensuring project requirements are met. Further allowing evaluation of design changes and their impact to the antenna performance.

Step 4 - Final Gerber design file sanity check: Check done by Ignion free of charge, ensuring that the antenna, matching network layout and other design recommendations on the final Gerber file follows the design guidelines before manufacturing.

Step 5 - Produce prototype and test: Verify performance results are aligned with expectations, easily fine-tune matching network if needed.

Step 6 - Certification pre-test: Perform OTA tests to ensure the device is meeting certification requirements.

Ignion is an ISO 9001:2015 certified company. All our antennas are lead-free and RoHS compliant.

ISO 9001: 2015 Certified

6 ANNEX: List of bands

6.1 Cellular IoT bands covered

Bands	Uplink (MHz)	Downlink (MHz)	Region
1	1920 – 1980	2110 – 2170	GLOBAL
2	1850 – 1910	1930 – 1990	NA
3	1710 – 1785	1805 – 1880	GLOBAL
4	1710 – 1755	2110 – 2155	NA
5	824 – 849	869 – 894	NA
6	830 – 840	875 – 885	APAC
7	2500 - 2570	2620 - 2690	GLOBAL
8	880 - 915	925 - 960	GLOBAL
9	1749.9 - 1784.9	1844.9 - 1879.9	APAC
10	1710 – 1770	2110 – 2170	APAC
12	699 - 716	729 – 746	GLOBAL
13	777 – 787	746 - 7756	GLOBAL
14	788 - 798	758 – 768	GLOBAL
15	1900 – 1920	2600 – 2620	-
17	704 - 716	734 - 746	GLOBAL
18	815 – 830	860 – 875	JAPAN
19	830 – 845	875 – 890	JAPAN
20	832 – 862	791 – 821	EMEA
23	2000 – 2020	2180 – 2200	NA
25	1850 – 1915	1930 – 1995	NA
26	814 – 849	859 – 894	NA
27	807 – 824	852 – 869	NA
31	452.5 – 457.5	462.5 – 467.5	-
34	2010 – 2025	2010 – 2025	EMEA
37	1910 – 1930	1910 – 1930	NA
39	1880 – 1920	1880 – 1920	CHINA
65	1920 – 2010	2110 – 2200	GLOBAL
66	1710 – 1780	2110 – 2200	NA
70	1695 – 1710	1995 – 2020	NA
71	663 – 698	617 – 652	
72	451 – 456	461 – 466	-

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