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Your innovation.
Accelerated.

CBRS in a chip antenna package

APPLICATION NOTES
ONE mXTEND[™] (NN02-201)

ONE mXTEND[™]: CBRS in a chip antenna package

- **Antenna component:** ONE mXTEND[™] NN02-201
- **Dimensions :** 7.0 mm x 3.0 mm x 1.0 mm
- **Frequency regions:** 3400 MHz to 3800 MHz



CBRS coverage in a super slim chip antenna

The **smallest volume cellular antenna** ever is here to cover **CBRS** in your next wireless design.

The ONE mXTEND[™] antenna booster, with a tiny volume of only **21mm³**, is designed to provide **cellular, Wi-Fi connectivity or CBRS** in a miniature and ultra slim antenna component.

Featuring Ignion's unique Virtual Antenna[™] technology, this ultra-compact chip antenna has been designed to cover a broad range of frequency standards and use cases. From multiband cellular connectivity for **2G, 3G, 4G, 5G, NB-IoT, LTE-M-CAT1, Wi-Fi 6E** to **CBRS** all in the same antenna package.

The new ONE mXTEND[™] **ultra slim antenna** booster, measuring only 7.0 x 3.0 x 1.0 mm, can fit in just about any wireless product and offers **CBRS**, mobile or Wi-Fi connectivity for a limitless range of applications including **Retail Points-of-Sale, CBRS access points** and **hotspots** for stadiums and event sites, IoT sensors and asset trackers in manufacturing plants. **Transportation, logistics** and **healthcare** devices can be easily connected with ONE mXTEND[™]. It is **tiny, slim, multiband** and can be assembled into the PCB with pick and place machinery just like any other component.

CBRS is taking on the upcoming wireless market challenge of providing connectivity with a high level of adaptability to **many different devices**, an off the shelf antenna that allows for a **quick and cheap time to market** is essential for device designers.

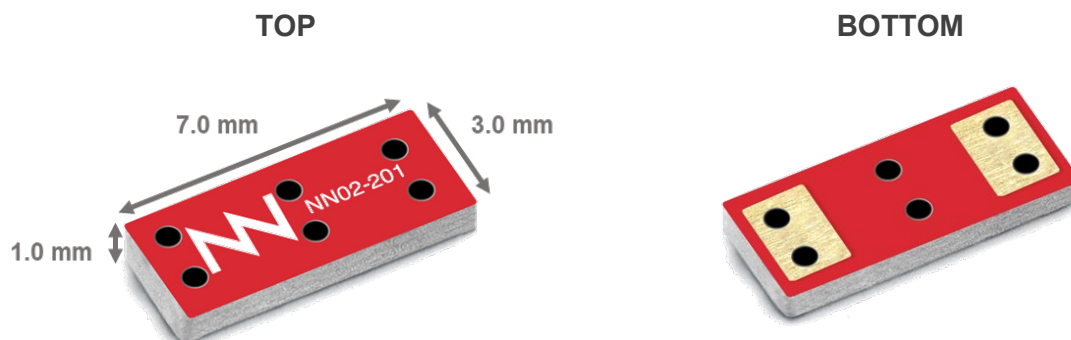
ONE mXTEND[™]: CBRS made simple.

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1. PRODUCT DESCRIPTION NN02-201

The ONE mXTEND[™] antenna booster has been specifically designed for providing multiband performance in wireless devices with small space requirements. It is a miniature antenna capable of being adapted, with a high level of flexibility, to the designer's needs. Featured by an extremely reduced package, the ONE mXTEND[™] is a versatile product capable of providing 2G, 3G, 4G, and 5G, Wi-Fi and CBRS coverage through one antenna package. The configuration presented herein illustrates how to tune the antenna component to provide CBRS coverage (3400 – 3800 MHz).



Material: The ONE mXTEND[™] antenna booster is built on glass epoxy substrate.

APPLICATIONS

- Points-of-Sale (Retail)
- Kiosks
- Inventory tracking
- CBRS Access Points/Hotspots
- Surveillance Cameras
- Healthcare Sensor
- Asset Tracking

BENEFITS

- High efficiency
- Small size
- Cost-effective
- Easy-to-use (pick and place)
- Off-the-Shelf standard product (no customization is required)
- Versatile: same product for Cellular/Wi-Fi/CBRS.

The ONE mXTEND[™] antenna booster belongs to a new generation of antenna solutions based on Virtual Antenna[™] technology owned by Ignion. This technology allows conventional and custom antenna solutions to be replaced by a new class of so-called antenna boosters, delivered in the form of a new range of miniature and off-the-shelf chip antenna components. These new chip antennas are by nature multiband and multipurpose, so they fit in a variety of wireless platforms to provide a wireless link for many different communication services. By using a Virtual Antenna[™] component the design becomes more predictable compared to a custom solution, making the whole process **faster, cheaper and easier**.

2. EVALUATION BOARD (CBRS)

2.1. QUICK REFERENCE GUIDE

Technical features	3400 MHz – 3800 MHz
Average Efficiency	> 65 %
Peak Gain	3.4
VSWR	< 2:1
Radiation Pattern	Omnidirectional
Polarization	Linear
Weight (approx.)	0.02 g.
Temperature	-40 to +125 °C
Impedance	50 Ω
Dimensions (L x W x H)	7.0 mm x 3.0 mm x 1.0 mm

Table 1 – Technical Features. Measurements from the evaluation board (Figure 1)

2.2. EVALUATION BOARD

This evaluation board (part number: EB_NN02-201-5G) is made with a coplanar grounded transmission line (trace on the PCB) to connect the ONE mXTEND™ antenna booster with the SMA connector. The ONE mXTEND™ provides operation in the frequency region from 3400 MHz to 3800 MHz, through a single input/output port.

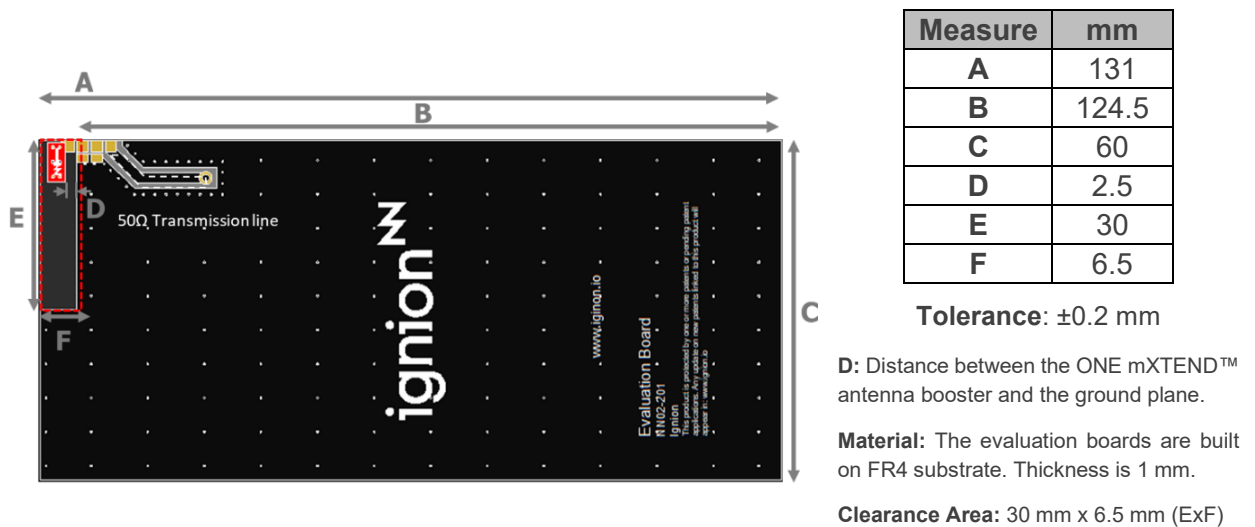


Figure 1 – EB_NN02-201-5G. Evaluation board providing operation at CBRS bands (from 3400 MHz to 3800 MHz).

This product and its use are protected by one or more of the following PAT. US 62/529032; and other domestic and international patents pending. Additional information about patents related to this product is available at <https://ignion.io/files/Patent-list-NN.pdf>

2.3. MATCHING NETWORK

ONE mXTEND[™] antenna booster needs a matching network to connect to your CBRS receiver. This section describes a suitable matching network (Figure 2) for ONE mXTEND[™] and the resulting product specs when measured in the reference evaluation board (EB_NN02-201-5G) (Figure 1). Please note that different devices with different form factors, ground planes, and nearby components may need a different matching network.

The ONE mXTEND[™] antenna booster is a versatile product providing a broadband solution able to cover the CBRS frequency bands (3400 – 3800 MHz). This solution can also easily be tuned to operate in other frequency bands such as cellular 4G/5G or Wi-Fi including Wi-Fi 6E by changing the matching network. If you need assistance to design your matching network, please contact support@ignion.io, or try our free-of-charge¹ [Antenna Intelligence Cloud](#) design service, which will get you a chip antenna design including a custom matching network for your device in 24h¹. Other information related to Ignion's range of R&D services is available at: <https://www.ignion.io/rdservices/>

The following figure shows the recommended matching network for the CBRS band in a reference design such as that in Fig.1:

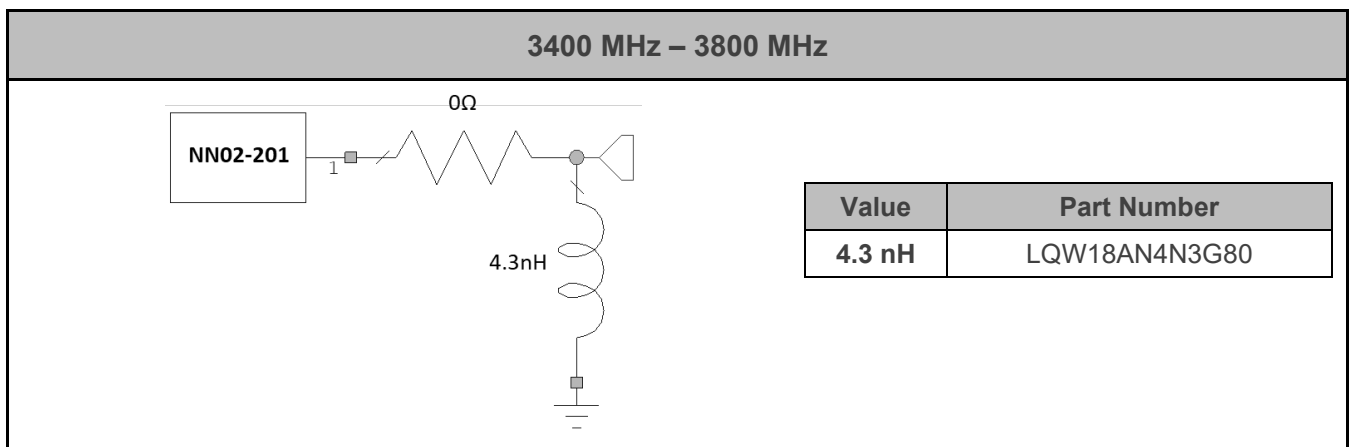


Figure 2 – Matching network implemented in the evaluation board (Figure 1).

To ensure optimal results, the use of high-quality factor (Q) and tight tolerance components is highly recommended (e.g. Murata components with part numbers as in Figure 2). The antenna performance is always conditioned by its operating environment meaning that differences in the device, including differences in printed circuit board sizes, components near the antenna, displays, batteries, covers, connectors, etc. affect the antenna performance. Accordingly, it is highly recommended to place pads compatible with 0402 and 0603 SMD components for a matching network as close as possible to the feeding point of the antenna element. This should be done in the ground plane area, not in the clearance area. By tuning the matching network in your final design after your final surrounding components are in place (batteries, displays, covers, etc.) you will be able to optimize the antenna performance without changing the antenna part.

¹ See terms and conditions for a free Antenna Intelligence Cloud service in 24h at: <https://www.ignion.io/antenna-intelligence/>

2.4. VSWR AND TOTAL EFFICIENCY

VSWR (Voltage Standing Wave Ratio) and Total Efficiency versus Frequency (GHz).

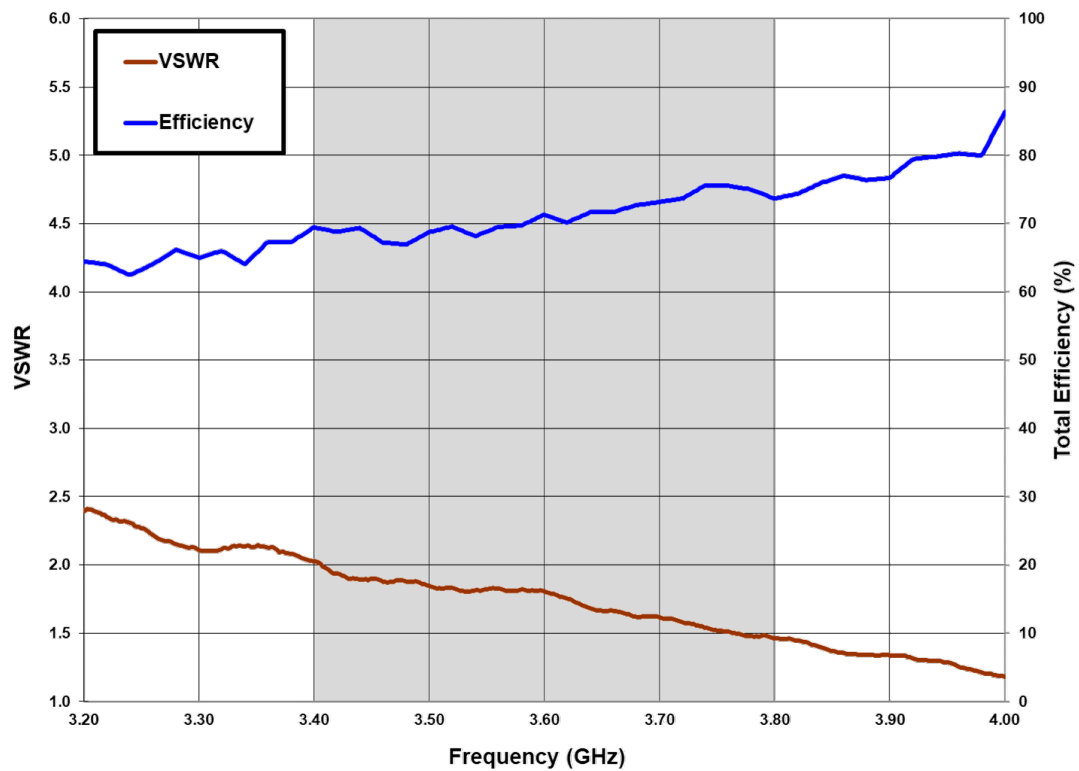
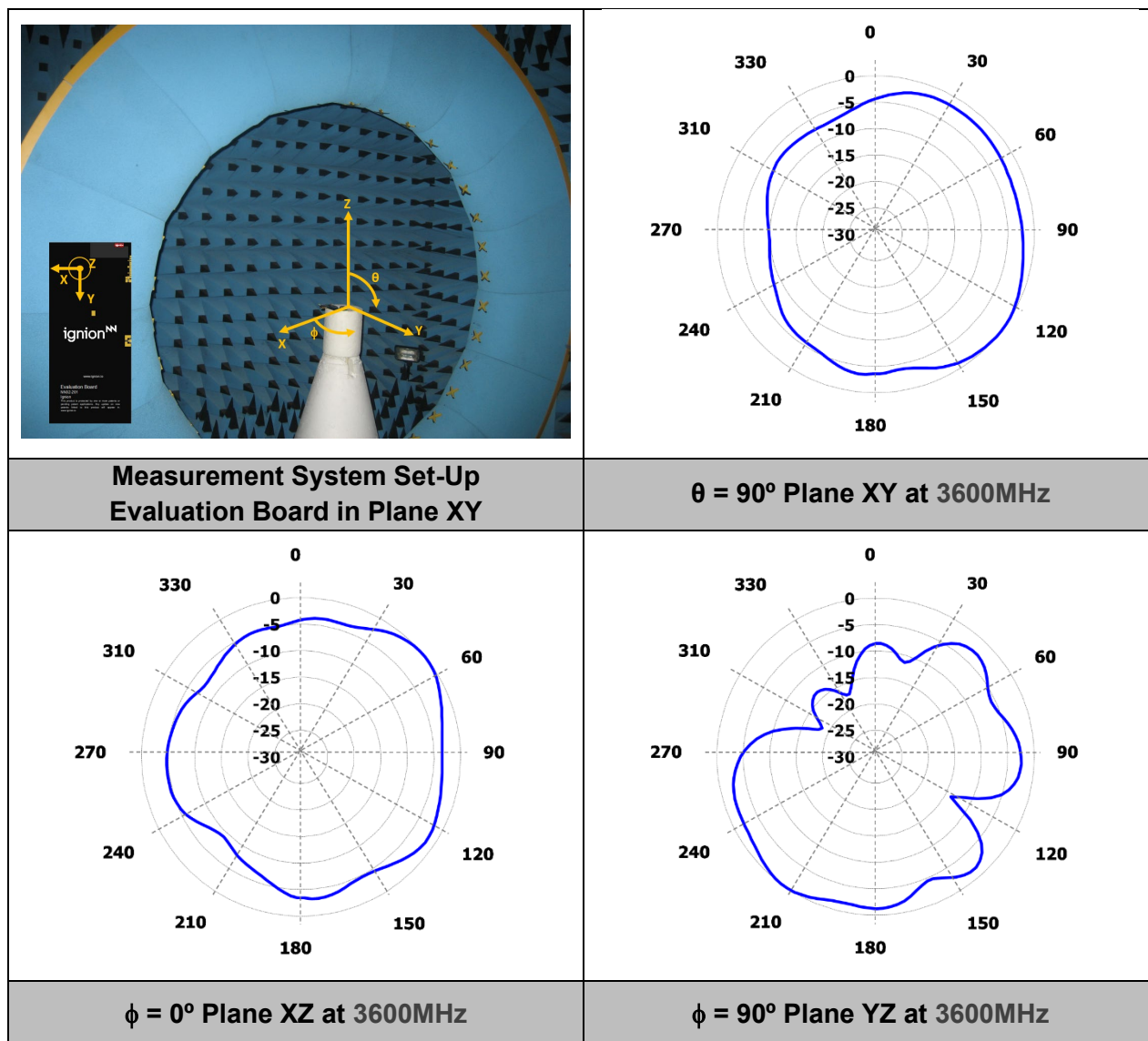


Figure 3 – VSWR and Total Efficiency at the CBRS band (3400 MHz – 3800 MHz) (from the evaluation board) (Figure 1).

2.5. RADIATION PATTERNS (3.4 GHz – 3.8 GHz), GAIN, AND EFFICIENCY



Gain	Peak Gain	3.4dBi
	Average Gain across the band	3.1dBi
	Gain Range across the band (min, max)	2.9dBi \leftrightarrow 3.4dBi
Efficiency	Peak Efficiency	75.6%
	Average Efficiency across the band	71.0%
	Efficiency Range across the band (min, max)	68.8 – 75.6%

Table 2 – Antenna Gain and Total Efficiency from the evaluation board (Figure 1) 5G bands (3400 MHz – 3800 MHz). Measurements made in the Satimo STARGATE 32 anechoic chamber.

2.6. RECOMMENDED ANTENNA FOOTPRINT FOR NN02-201

The ONE mXTEND[™] antenna booster (NN02-201) must be placed as close as possible to a corner of the PCB. See below the recommended footprint dimensions when it is placed close to a corner of the PCB with the feeding line aligned with the longest side of the board according to the Evaluation Board (**Figure 1**).

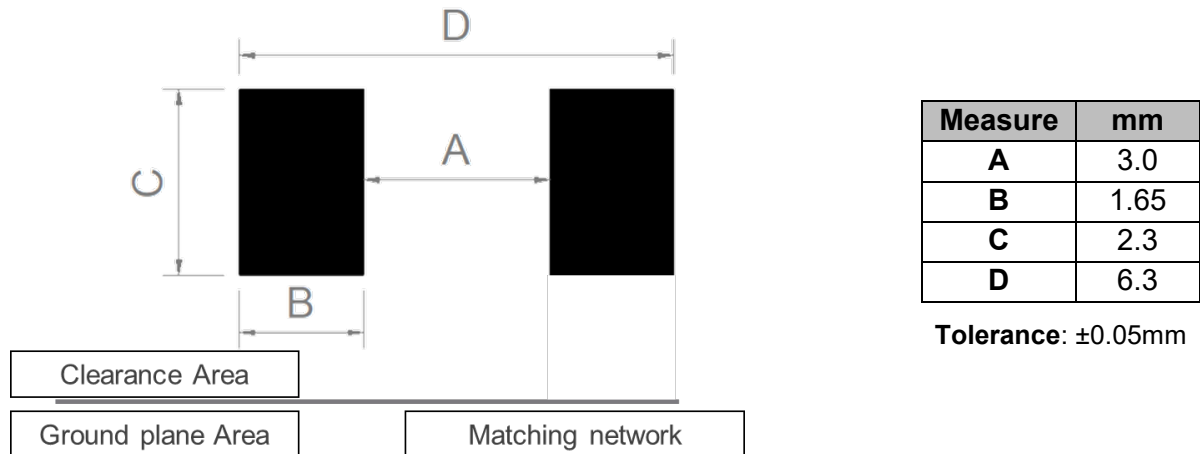


Figure 4 - Footprint dimensions for the ONE mXTEND[™] (NN02-201) antenna booster.

Need help in starting fast with a ONE mXTEND[™] design? Use Ignion's **Antenna Intelligence Cloud** tool at get your proof-of-concept design in as little as 24h. Click here <https://ignion.io/antenna-intelligence/> or scan the QR code below.



The ONE mXTEND[™] antenna booster and other Ignion products are based upon proprietary Virtual Antenna[™] technology that is protected by one or more of the following patents and patent applications: <https://ignion.io/files/Patent-list-NN.pdf>

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

ISO 9001: 2015 Certified



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