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Cellular connectivity: 3G, 4G and 5G, all in one antenna

APPLICATION NOTE
TRIO mXTEND[™] (NN03-310)

TRIO mXTEND[™]: TOP TRIPLE MOBILE COVERAGE

- **Antenna Component:** TRIO mXTEND[™] NN03-310
- **Dimensions :** 30.0 mm x 3.0 mm x 1.0 mm
- **Frequency regions:** 698-960 MHz, 1710-2690 MHz and 3400-3800 MHz



5G goes beyond the connection of people as the industry is now connecting things. The new generation of mobile communication technology goes even further as technology is now **connecting everything**. 5G has to take on the challenge given by the upcoming wireless market that requires all types of mobile communications standards and a high level of adaptability to many different multiband wireless devices.

The new TRIO mXTEND[™] is a **modular, multiband** and **multi-port** antenna that has been designed for providing **top quality mobile** operation at **3G, 4G** and **5G** in three frequency regions: 698-960 MHz, 1710-2690 MHz and 3400-3800 MHz. This triple mobile coverage of the TRIO mXTEND[™] is presented in an **ultra slim, off the shelf component of only 1.0 mm height**. This enables TRIO mXTEND[™] to be assembled into virtually any mobile or IoT device.

TRIO mXTEND[™] is **fully reconfigurable**, being adaptable to any mobile standard requirement thanks to its modular and multi-port nature that allows the operation at 3G, 4G and 5G at the same time and also the possibility of having other operation architectures depending of the service and application needed. The same component is able, for example, to cover 3G, 4G and 5G simultaneously but also to tune only a full top 5G frequency bands coverage.

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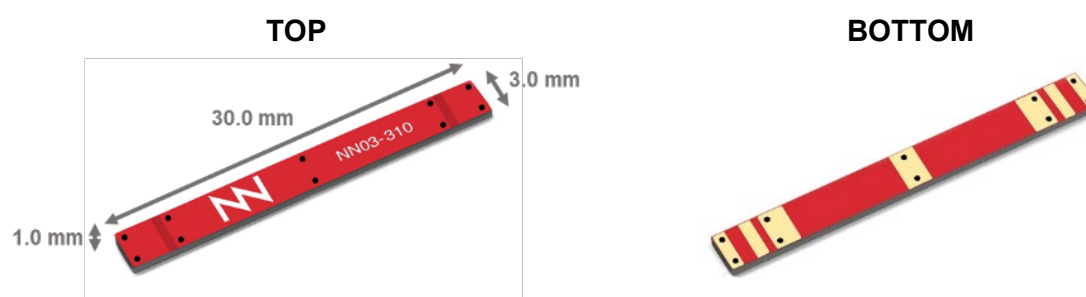
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1. PRODUCT DESCRIPTION NN03-310

The TRIO mXTEND™ chip antenna component has been specifically designed for providing the major level of flexibility to operate any required frequency band inside any wireless device. TRIO mXTEND™ chip antenna component is capable of operating the main mobile communication standards, enabling worldwide 3G, 4G and 5G coverage, such as GSM850, GSM900, GSM1800/DCS, GSM1900/PCS, UMTS, LTE700, LTE800, LTE850, LTE900, LTE1700, LTE1800, LTE1900, LTE2000, LTE2100, LTE2300, LTE2500, and LTE2600, (698-960MHz and 1710-2690MHz) and 5G (3400-3800MHz), through the same antenna component.

The TRIO mXTEND™ chip antenna component offers the flexibility to be tuned at the frequency regions of interest through the proper adjustment of the matching network. This characteristic provides an important benefit since removes the need of including different antenna parts inside the same wireless device for operating different communication standards, thus reducing considerably the integration complexity while saving costs. The results gathered herein presents how the matching network should be configured for operating the main mobile communication standards of 3G, 4G and 5G.

Finally, if you need assistance to design your matching network beyond this application note, please contact support@ignion.io, or if you are designing a **different device size** or a **different frequency band**, we can assist you in less than 24 hours. Please, try our free-of-charge¹ [Antenna Intelligence Cloud](#), which will get you a complete design report including a custom matching network for your device in 24h¹. Additional information related to NN's range of R&D services is available at: <https://ignion.io/rdservices/>



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

APPLICATIONS

- Handset
- Smartphones
- Tablets
- Laptop PCs
- Smart Meters
- IoT Devices
- Modules
- Routers

BENEFITS

- High efficiency
- Small size
- Cost-effective
- Easy-to-use (pick and place)
- Multiband behaviour (worldwide standards)
- Off-the-Shelf Standard Product (no customization is required)

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

The TRIO mXTEND™ chip antenna component belongs to a new generation of antenna solutions based on the Virtual Antenna® technology owned by Ignion. The technology is mainly focused on replacing conventional antenna solutions by miniature and standard components.

2. EVALUATION BOARD (698-960MHz, 1710-2690MHz and 3400-3800MHz)

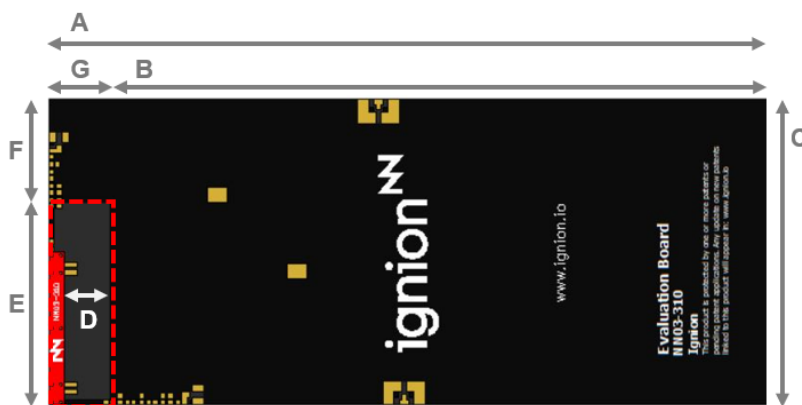
2.1. QUICK REFERENCE GUIDE

Technical features	698 – 960 MHz	1710 – 2690 MHz	3400 – 3800 MHz
Average Efficiency	> 50 %	> 60 %	> 65 %
Peak Gain	1.5 dBi	2.7 dBi	3.8 dBi
VSWR	< 3:1		< 2:1
Radiation Pattern	Omnidirectional		
Polarization	Linear		
Weight (approx.)	0.25 g		
Temperature	-40 to +125 °C		
Impedance	50 Ω		
Dimensions (L x W x H)	30.0 mm x 3.0 mm x 1.0 mm		

Table 1 – Technical features. Measures from the Evaluation Board. See Figure 1. Note that for obtaining comparable results, a ground plane length larger than 100 mm is recommended.

2.2. EVALUATION BOARD (698-960 MHz, 1710-2690 MHz and 3400-3800 MHz)

This Evaluation Board (part number: EB_NN03-310-M-5G) integrates one TRIO mXTEND™ chip antenna component to provide operation from 698 to 960 MHz, 1710 to 2690 MHz at port #1, and 3400 to 3800 MHz at port #2. Two UFL cable connects each input/output port to SMA connectors.



Measure	mm
A	142
B	130
C	60
D	9
E	40
F	20
G	12

Tolerance: ±0.2 mm

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

D: Distance between the TRIO mXTEND™ chip antenna component and the ground plane.

Clearance Area: 40 mm x 12 mm (ExG)

Figure 1 – EB_NN03-310-M-5G. Evaluation Board for providing operation at 698 – 960MHz (Port #1), 1710 – 2690MHz and 3400 – 3800MHz (Port #2).

This product and its use are protected by at least one or more of the following [patents and patent applications](#) PAT. US 62/529032; and other domestic and international patents pending. Additional information about patents related to this product is available at www.ignion.io/virtual-antenna/.

2.3. MATCHING NETWORK

The specs of a Ignion standard product are measured in their Evaluation Board, which is an ideal case. In a real design, components nearby the antenna, LCD's, batteries, covers, connectors, etc. affect the antenna performance. This is the reason why it is highly recommended placing pads compatible with 0402 and 0603 SMD components for a matching network as close as possible to the feeding point. Do it in the ground plane area, not in the clearance area. This provides a degree of freedom to tune the TRIO mXTEND™ chip antenna component once the design is finished and taking into account all elements of the system (batteries, displays, covers, etc.).

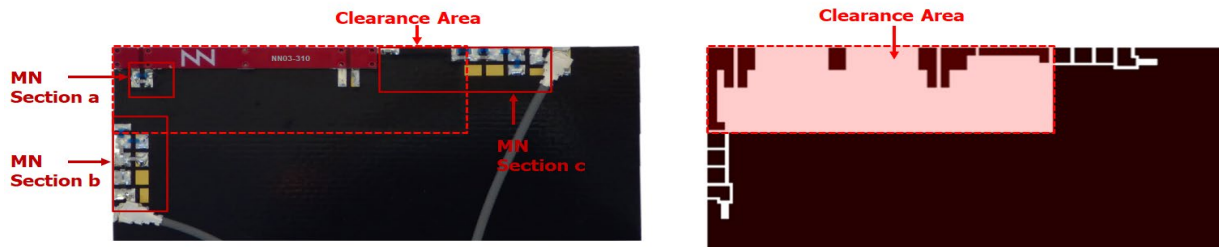


Figure 2 – Matching network distribution

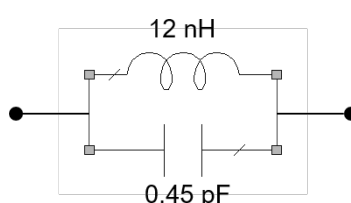
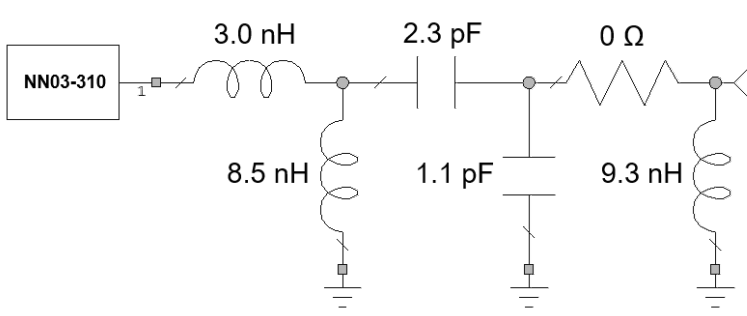
698 MHz – 960 MHz and 1710 MHz – 2690 MHz															
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Figure 3 – Matching network implemented in the Evaluation Board port #1 (Figure 1).

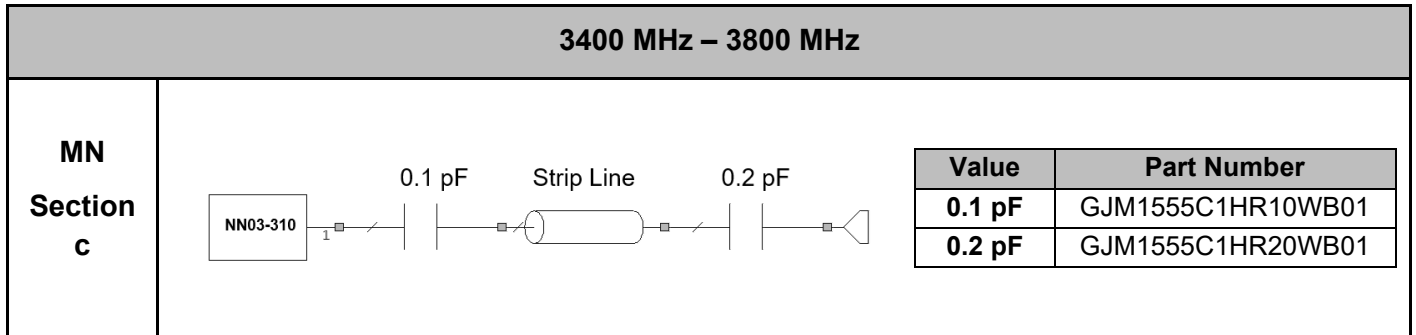


Figure 4 – Matching network implemented in the Evaluation Board port #2 (Figure 1).

Please notice that different devices with different ground planes and different components nearby the TRIO mXTEND™ chip antenna component may need a different matching network. To ensure optimal results, the use of high Q and tight tolerance components is highly recommended (Murata components). If you need assistance to design your matching network beyond this application note, please contact support@ignion.io, or if you are designing a **different device size** or a **different frequency band**, we can assist you in less than 24 hours. Please, try our free-of-charge¹ [Antenna Intelligence Cloud](#), which will get you a complete design report including a custom matching network for your device in 24h². Additional information related to NN's range of R&D services is available at: <https://ignion.io/rdservices/>

² 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).

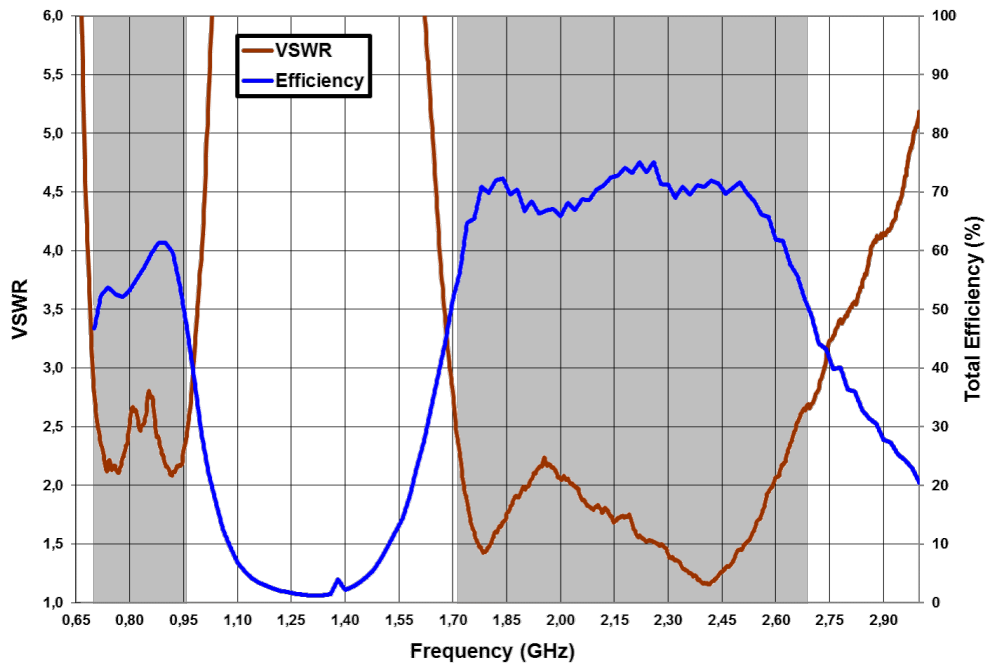


Figure 5 – VSWR and Total Efficiency for the 698 – 960 MHz frequency range and for the 1710 – 2690 MHz frequency range (from the Evaluation Board, port #1 (Figure 1)).

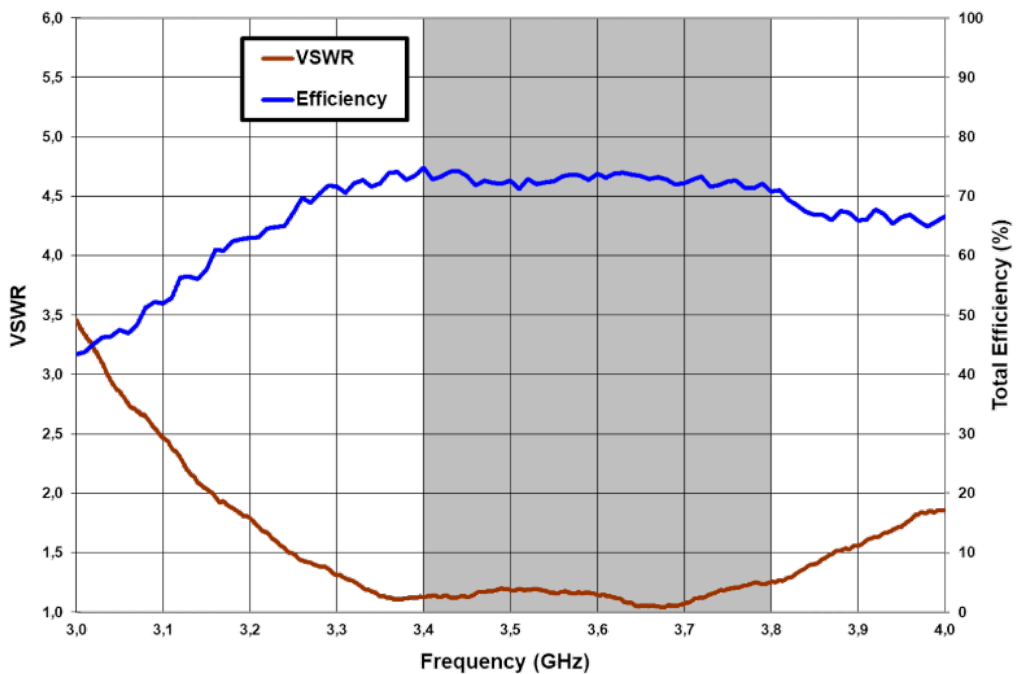


Figure 6 – VSWR and Total Efficiency for the 3400 – 3800 MHz frequency range (from the Evaluation Board, port #2 (Figure 1)).

2.5. TRANSMISSION COEFFICIENT

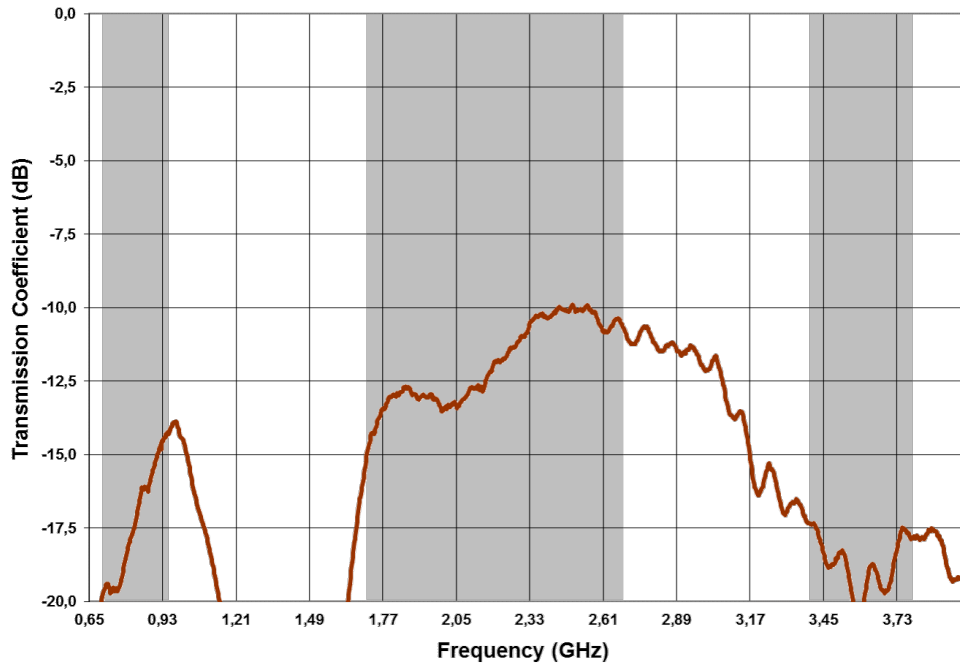


Figure 7 – Transmission coefficient for the 698-960 MHz range, for 1710 – 2690 MHz range and for the 3400 – 3800 MHz range (from the Evaluation Board (Figure 1)).

2.6. RECOMMENDED FOOTPRINT FOR THE SOLUTION

Assuming that the TRIO mXTEND™ chip antenna component (NN03-310) is placed in the clearance area of the PCB, see below the recommended footprint dimensions, to provide operation from 698 to 960 MHz, 1710 to 2690 MHz at port #1, and 3400 to 3800 MHz at port #2.

Measure	mm
A	12.0
B	23.0
C	3.0
D	0.5
E	1.0
F	8.5
G	2.0
H	2.5
I	10.0
J	7.0

Tolerance:
±0.05mm

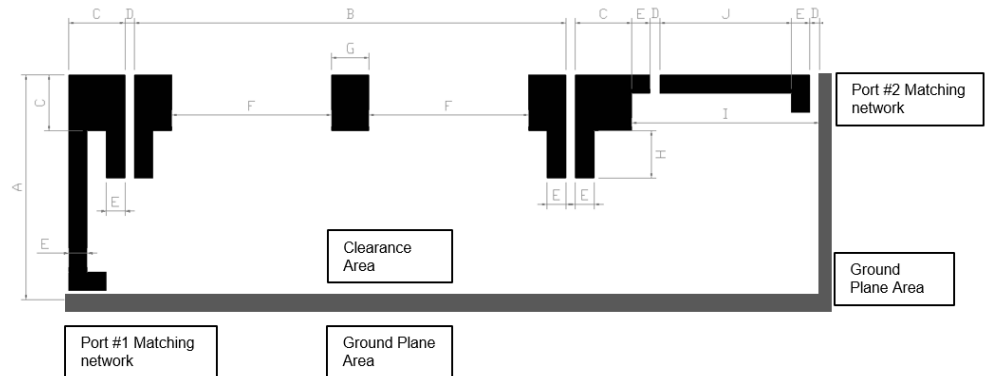


Figure 8 – Footprint dimensions for the single chip antenna component.

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

ISO 9001: 2015 Certified



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