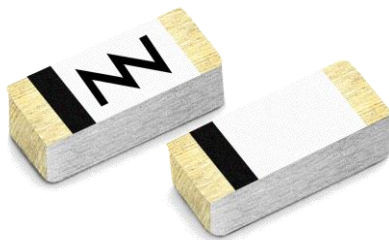


## Micro Reach Xtend™ (NN01-110) – AN for Bluetooth and WiFi Handsets 2.4-2.5 GHz

Fractus Antennas specializes in enabling effective mobile communications. Using Fractus Antennas technology, we design and manufacture optimized antennas to make your wireless devices more competitive. Our mission is to help our clients develop innovative products and accelerate their time to market through our expertise in antenna design, testing and manufacturing.



Micro Reach Xtend™

NN01-110

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Fractus Antennas is an ISO 9001:2008 certified company. All our antennas are lead-free and RoHS compliant.

ISO 9001: 2015 Certified



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# 1. RECOMMENDED PCB LAYOUT FOR A NEW DESIGN

The following example describes the basics for a new design of a bluetooth handset or a WiFi handset single band. Notice the importance of the antenna location, ground plane area, clearance area and the pads for a PI matching network (close to the antenna feeding point but in the ground plane area). All images below are not corresponding to real sizes.

## 1.1. BLUETOOTH OR WIFI (2.4-2.5 GHz) WITH THE MICRO REACH XTEND™ CHIP ANTENNA (NN01-110)

The ground plane area of the Micro Reach Xtend™ standard evaluation board (pages 4 and 5 of the [user manual](#)) has been extended to 120 mm x 60 mm. This area is in line with the average dimensions of the most popular smartphones available in the market.



Measure	mm
A	120.0
B	60.0
C	115.0
D	5.2
E	5.0
F	7.0
G	53.0

**Tolerance:** ±0.2mm

**Note:** For recommended distances between the antenna and the ground plane please go to the [user manual](#) (antenna footprint, Figure 5, Page 10).

**Material:** The evaluation board is built on FR4 substrate. Thickness is 1 mm

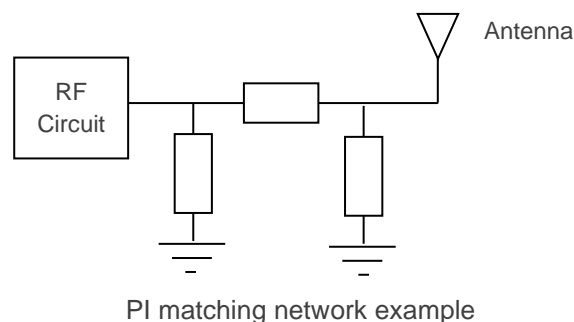
**Clearance Area:** 7.0 mm x 5.0 mm (Fx E)

**Figure 1** – Example of the Micro Reach Xtend™ antenna in a 120 x 60 mm PCB.

## 1.2. MATCHING NETWORK IN FREE SPACE

The specs of a Fractus Antennas standard antenna are measured in their evaluation board (in free space), which is an ideal case. In a real design, components nearby the antenna, semiconductors, 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 PI matching network as close as possible to the antenna feeding point. Do it in the ground plane area, not in the clearance area. This is a degree of freedom to tune the antenna once the design is finished and taking into account all elements of the system (batteries, displays, covers, etc).

Please notice that different devices with different ground planes and different components nearby the Micro Reach Xtend™ chip antenna 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@fractusantennas.com](mailto:support@fractusantennas.com), or try our free-of-charge **NN Wireless Fast-Track** design service, you will get your chip antenna design including a custom matching network for your device in 24h<sup>1</sup>. Other related to NN's range of R&D services is available at: <https://www.fractusantennas.com/rdservices/>



In the evaluation board showed in Figure 1 the values of the components are the following (0402 SMD, high-Q):

- Z1: Empty pad, no component
- Z2: 6.2 nH inductor
- Z3: 1.3 pF capacitor

To design a matching network in a new device, please contact [support@fractusantennas.com](mailto:support@fractusantennas.com) and request a quotation for the service.

<sup>1</sup> See terms and conditions for a free NN Wireless Fast-Track service at: <https://www.fractusantennas.com/fast-track-project/>

### 1.3. VSWR AND EFFICIENCY

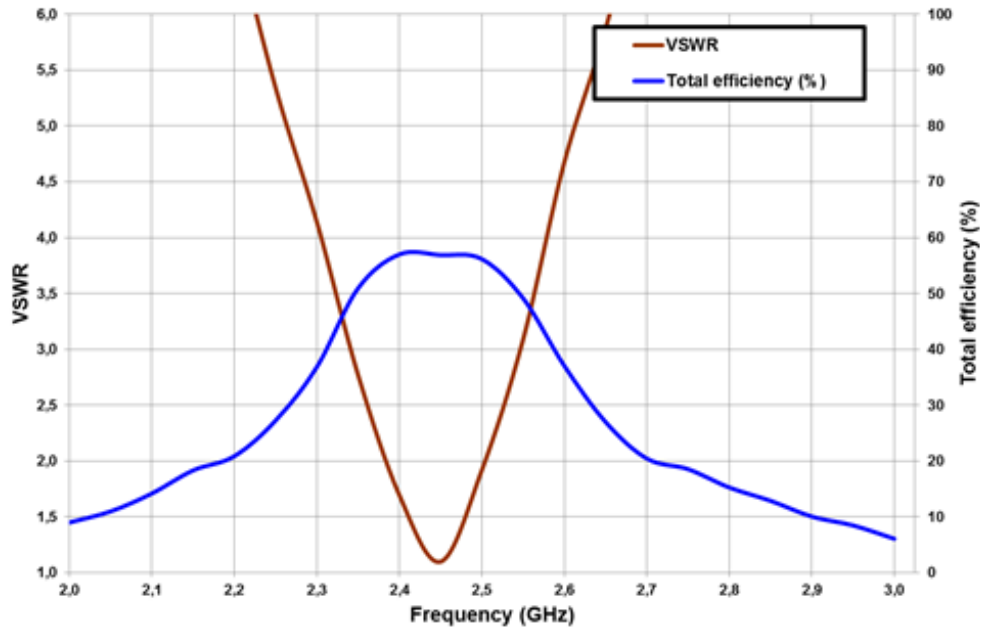


Figure 2 – VSWR (Voltage Standing Wave Ratio) and Efficiency (%) vs. Frequency.

The average efficiency across the 2.4 – 2.5 GHz band is around 56% while the average VSWR is around 1.6. In the 2.45 GHz frequency, the efficiency gets the peak of 57% and the VSWR gets the minimum value of 1.1.

Notice that the clearance area is the same in the standard Micro Reach Xtend™ evaluation board than in the 120 mm x 60 mm version. If the clearance area could be extended in the final design, then the performance of the antenna would be even better.

## 2. MATCHING NETWORK CONSIDERING THE HUMAN BODY EFFECT

The human head and hand affect the performance of the antenna and may produce a frequency downshift. Therefore the configuration of the matching network has to be designed with a phantom head and/or a phantom hand to optimize the antenna performance.

Please contact [support@fractusantennas.com](mailto:support@fractusantennas.com) for more information related to the antenna matching service with a phantom head and/or a phantom hand.