



# fractus

Optimised Antennas  
for Wireless Devices



DATA SHEET · PRODUCTS & SERVICES

## Small SMD chip antenna for headset, compact flash, secure digital and small PCB devices



Fractus specialises in enabling effective mobile communications. Using fractal technology, we design and manufacture optimised 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.

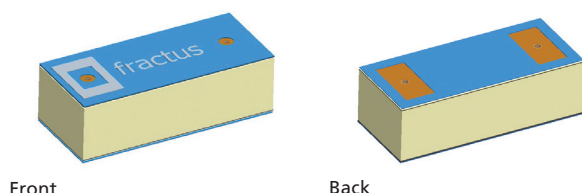
### Fractus® Compact Reach Xtend™ Chip Antenna

P/N: FR05-S1-N-0-102

The **Fractus Compact Reach Xtend Chip Antenna** for Bluetooth® and 802.11 b/g WLAN is a tiny rectangular 3D-shaped antenna suitable for headset, compact flash (CF), secure digital (SD) and other small PCB devices operating at 2.4 GHz where high performance and low-cost are mandatory. Its broad bandwidth ensures high quality signal reception and transmission across wireless devices and different plastic housing designs.

Taking advantage of the space-filling properties of fractals, this **small mono-pole** antenna is ideal for use within indoor (highly scattered) environments. The **Fractus Compact Reach Xtend Chip Antenna** speeds your time to market by allowing you to easily integrate it within your industrial design (SMD mounting).

7 x 3 x 2 mm (image larger than actual size)



PAT. US7148850

### Product Benefits

#### ■ Small form factor

Allows integration into space limited areas easily and efficiently with minimum clearance area.

#### ■ Broad bandwidth

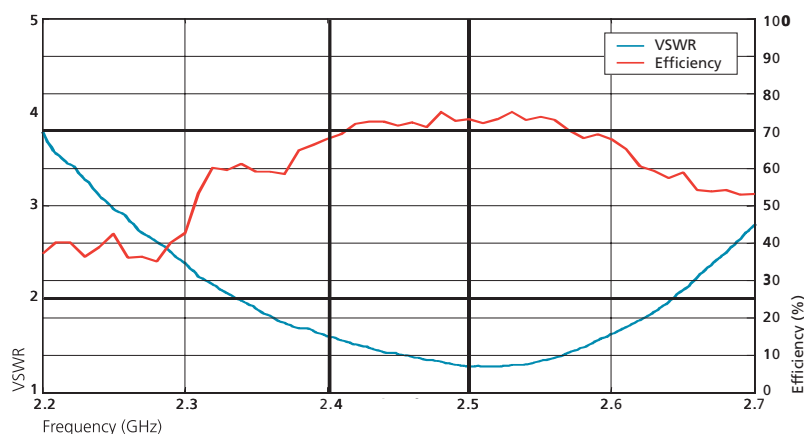
Ensures robust performance when considering different plastic housing and close body proximity.

#### ■ Omnidirectional pattern

Optimises device usage due to a uniform radiation pattern.

#### ■ Multi-mode support

Works for Bluetooth, and Wi-Fi 802.11b and g standards.



Frequency Range	2.4 - 2.5 GHz
Efficiency	> 70 %
Peak Gain	> 1 dBi
VSWR	< 2:1
Weight	0.20 g
Temperature	-40 to +85 °C
Impedance	50 Ω unbalanced
Dimensions	7 x 3 x 2 mm

Measured results from a standard PCB of 47x23 mm

Please contact your sales representative at [wireless@fractus.com](mailto:wireless@fractus.com) to obtain additional information on recommended configurations for different UWB devices. Fractus: [www.fractus.com](http://www.fractus.com) Reference: DS\_FR05-S1-N-0-102\_v01



# fractus

Optimised Antennas  
for Wireless Devices

## RoHS Certificate of Compliance

### SUPPLIER INFORMATION

Supplier Name: **Fractus, S.A.**  
Address: **Avd. Alcalde Barnils, 64-68**  
  
City: **Sant Cugat del Vallès**  
Phone: **+34 935 442 690**  
Fax: **+34 935 442 691**  
Zip: **08174**  
State: **SPAIN**  
[www.fractus.com](http://www.fractus.com)

### CONTACT PERSON

Supplier contact name: **Elena Gracia**  
Title: **Supply Chain Manager**  
Email address: **elena.gracia@fractus.com**  
Phone: **+34 935 442 690**

Product Part Number **FR05-S1-N-0-102**  
Product Name **Compact Reach Xtend™ Chip antenna**

### DECLARATION STATEMENT OF MATERIAL CONTENTS

Review Date **24/11/2006**



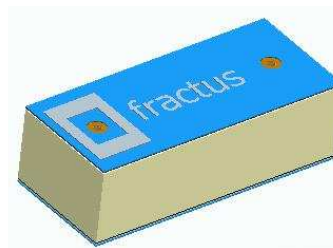
Banned Substances	Units	Method Detection Limit (ppm)	Results
(Pb) Lead and Lead Compounds	mg/Kg	5	Material Not Detected
(Pb) Soldering with Lead	mg/Kg	5	Material Not Detected
(Cd) Cadmium and Cadmium Compounds	mg/Kg	0.5	Material Not Detected
(Hg) Mercury and Mercury Compounds	mg/Kg	2	Material Not Detected
(Cr <sup>+6</sup> ) Hexavalent Chromium and Hexavalent Chromium Compounds	mg/Kg	1	Material Not Detected
Polybrominated Biphenyls(PBBs)/ Polybrominated Biphenyls Ethers(PBDEs)	mg/Kg	5	Material Not Detected
Chlorofluorocarbons(CFCs)/ Hydrochlorofluorocarbons(HCFC)	mg/Kg	0	Material Not Detected
Polychlorinated Biphenyls(PCBs)	mg/Kg	0	Material Not Detected
Asbestos	mg/Kg	0	Material Not Detected
Radioactive Materials	mg/Kg	0	Material Not Detected



# Fractus Compact Reach Xtend™

Bluetooth® , 802.11b/g WLAN

*Chip Antenna*



**Antenna Part Number:  
FR05-S1-N-0-102**

ISO 9001  
BUREAU VERITAS  
Certification





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Fractus is an **ISO 9001:2000** certified company  
All our antennas are lead-free and **RoHS** compliant

## NOTES

The product described in this document is protected worldwide by the following Patents and Patent Applications owned by Fractus: US7148850, US7164386, US7202822; PAT.PEND.WO0154225. Any update on new patents linked to this product will appear in <http://www.fractus.com/index.php/fractus/patents>

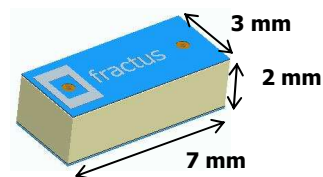
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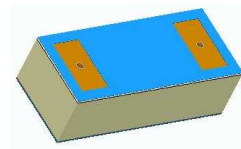
## ANTENNA DESCRIPTION

Fractus® Compact Reach Xtend™ chip antenna is engineered specifically for Bluetooth®, WLAN 802.11 b/g and other wireless devices operating at the ISM 2.4 GHz band. Compact Reach Xtend combines small form factor size and high performance to improve the functionality of your wireless devices.

The Compact Reach Xtend is a low-cost antenna solution that combines small form factor and high performance with integration flexibility making it ideal for small consumer electronics devices such as wireless headsets and USB dongles.



Front



Back

### APPLICATIONS

- Wireless Headsets
- WLAN 802.11 b/g USB-dongles
- Bluetooth USB and serial Dongles
- Compact Flash (CF) and Secure Digital (SD) cards
- Cellular handsets
- Digital Cameras

### BENEFITS

- Low cost
- High efficiency
- Small form factor

## QUICK REFERENCE GUIDE

Technical Features	
Frequency range	2400-2500 MHz
Radiation Efficiency	> 70%
Radiation Pattern	Omnidirectional
Peak Gain	> 1 dBi
VSWR	< 2:1
Polarization	Linear
Weight	0.1 g
Temperature	-40 to + 85°C
Impedance	50Ω
Dimensions	7x3x2 mm (L x W x H)

**Table 1** - Technical Features

**Note :** results measured in a reference evaluation board of 47x23 mm described in the following section.

Please contact your sales representative at [wireless@fractus.com](mailto:wireless@fractus.com) if you require additional information on antenna integration or optimisation on your PCB.

FRACTUS S.A.

[www.fractus.com](http://www.fractus.com)

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Fax: +34 935442691



## ELECTRICAL PERFORMANCE

### FRACTUS EVALUATION BOARD

The Fractus configuration used in testing the Compact Reach Xtend chip antenna is displayed in Figure 1.

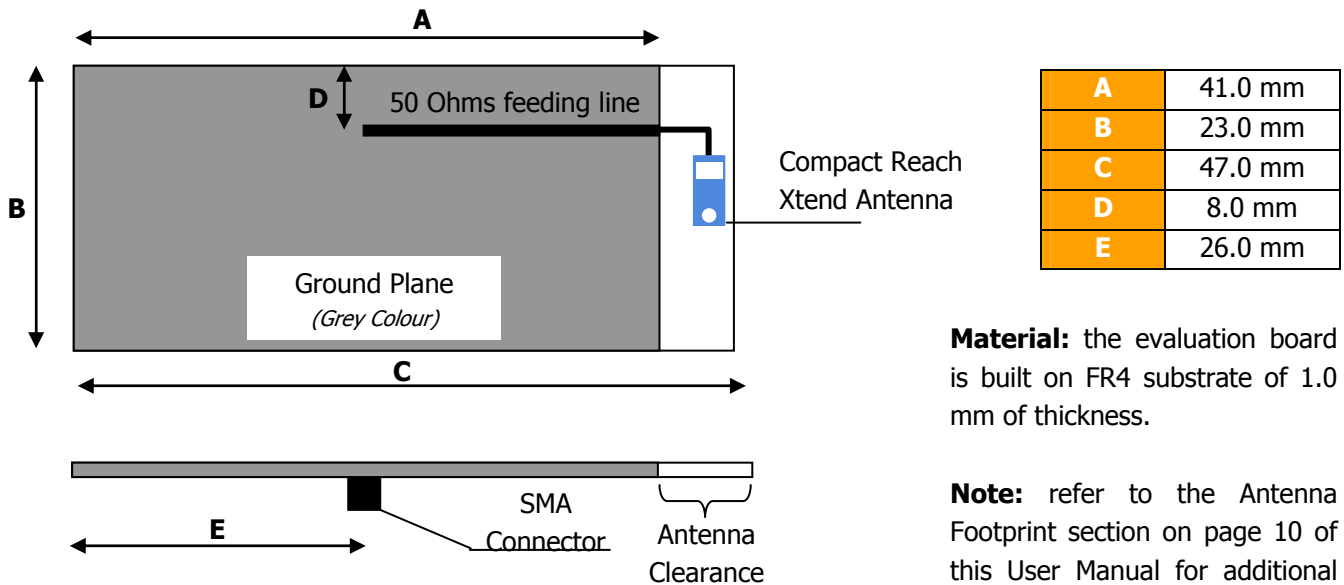
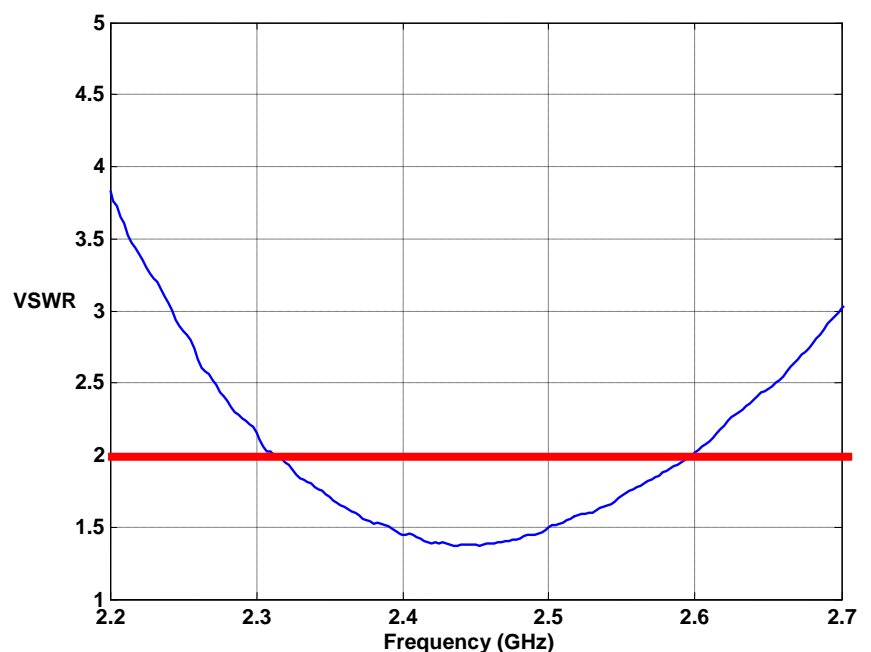


Figure 1 – Compact Reach Xtend Evaluation Board

### VSWR

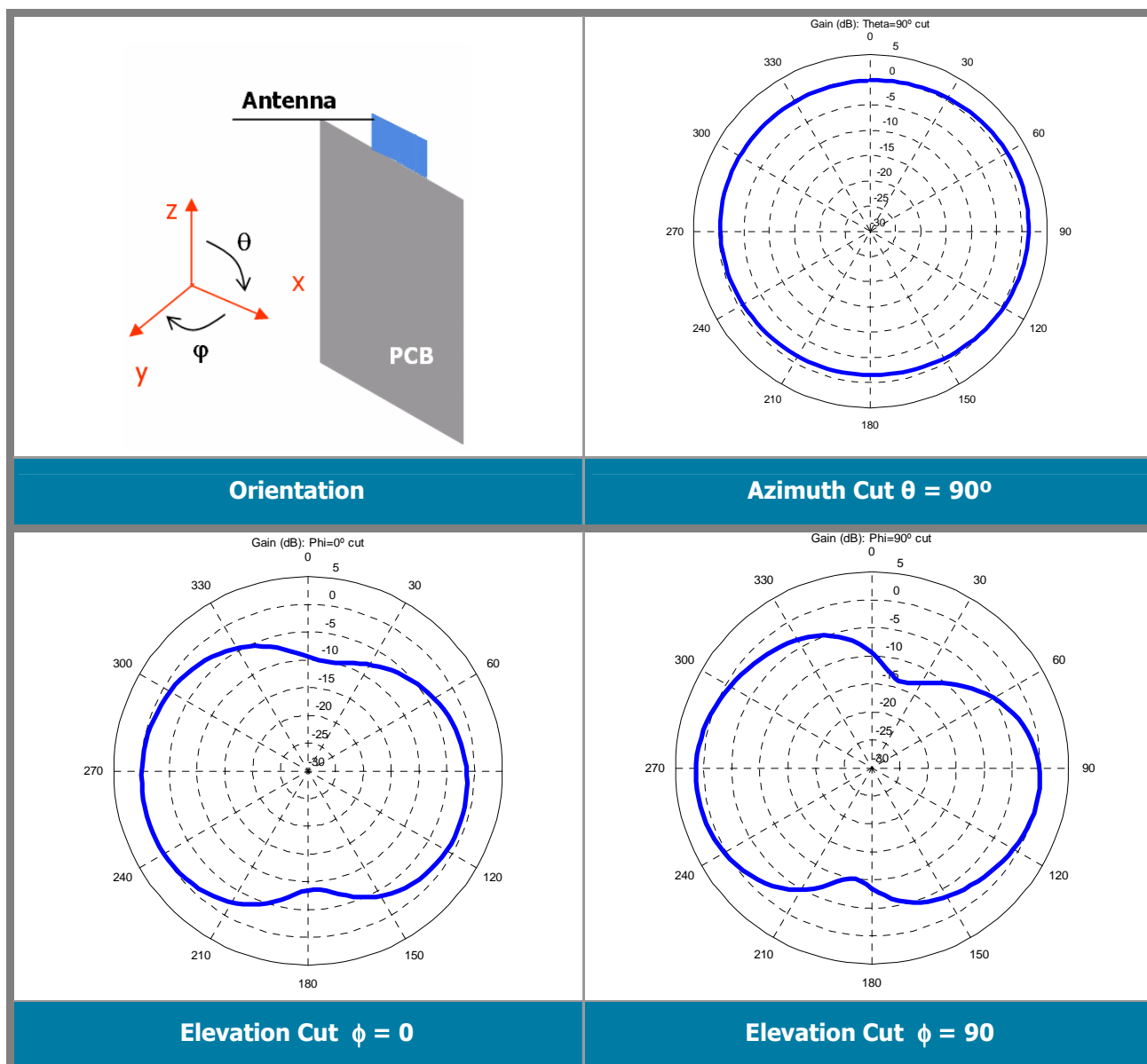
VSWR (Voltage Standing Wave Ratio)  
versus Frequency (GHz)

- <2:1 within the ISM-2.4 GHz band
  - 2.4-2.483 in US and Europe
  - 2.471-2.497 in Japan





### Radiation Pattern, Gain and Efficiency



Gain	Peak Gain	1.5 dBi
	Average Gain	-2.3 dBi
Efficiency	Peak Efficiency	75 %
	Average Efficiency	70 %

**Table 2** – Antenna Gain and Efficiency within the 2.4-2.5 GHz band



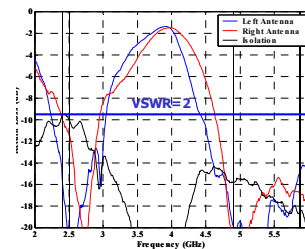
### CAPABILITIES AND MEASUREMENT SYSTEMS

Fractus specialises in designing and manufacturing optimised antennas for wireless applications and providing our clients with RF expertise. We offer turn-key antenna products and antenna integration support to minimise your time requirement and maximize your return on investment during your product development efforts. We also provide our clients with the opportunity to leverage our in-house testing and measurement facilities to obtain accurate results quickly and efficiently.



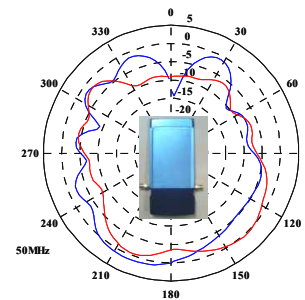
**R&S VNA 20KHz-8GHz ZVCE**

VSWR  
&  
S Parameters



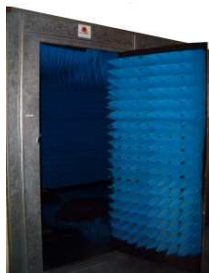
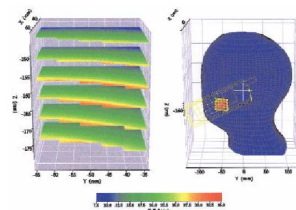
**SATIMO's STARGATE 32**

Radiation  
Pattern  
&  
Efficiency



**DASY-4 (SPEAG)**

SAR Levels



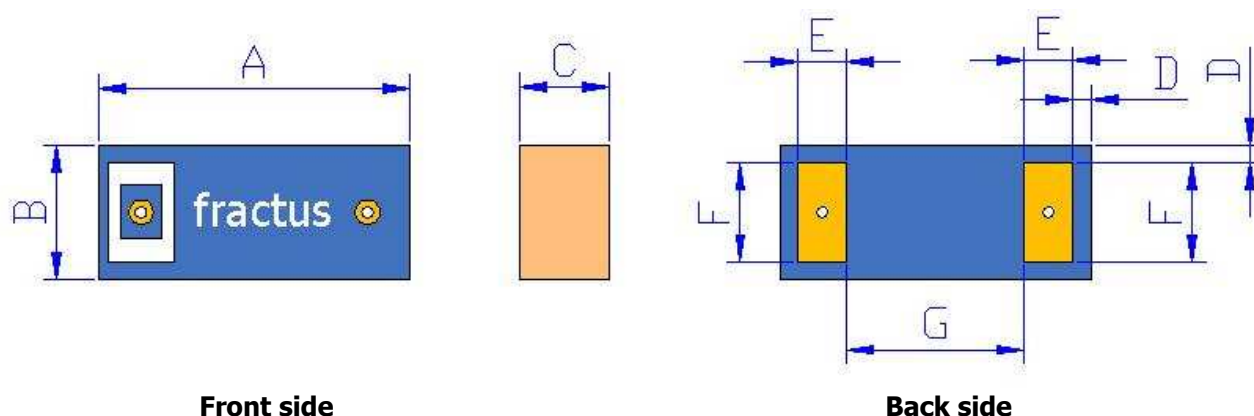
**Anechoic and semi-anechoic chambers and full equipped in-house lab**





## MECHANICAL CHARACTERISTICS

### DIMENSIONS, TOLERANCES & MATERIALS



**Figure 2 – Antenna Dimensions and Tolerances**

<b>A</b>	$7.00 \pm 0.20$	<b>E</b>	$1.10 \pm 0.10$
<b>B</b>	$3.00 \pm 0.20$	<b>F</b>	$2.20 \pm 0.10$
<b>C</b>	$2.00 \pm 0.20$	<b>G</b>	$4.00 \pm 0.20$
<b>D</b>	$0.40 \pm 0.15$		

*All dimensions are in millimetres (mm)*

The white rectangle located on the front side of the antenna provides you with a visual cue to mount the antenna. It is located physically above the feed point of the antenna and has been included to decrease possible manufacturing error.

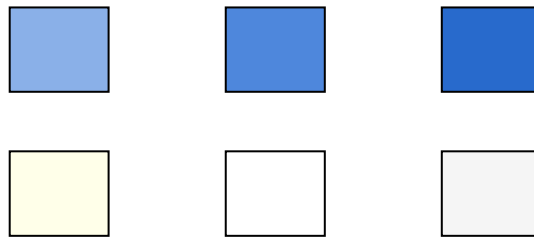
Fractus Compact Reach Xtend chip antenna is compliant with the directive **2002/95/EC** on the restriction of the use of hazardous substances (**RoHS**). Should you require a green certificate (RoHS report), please contact your sales representative at [wireless@fractus.com](mailto:wireless@fractus.com).



### SPECIFICATIONS FOR INK

<b>Blue (pantone 312)</b>	<ul style="list-style-type: none"><li>• 50% Blue CARAPACE EMP 110-3245</li><li>• 50% White ink CARAPACE</li></ul>
<b>White</b>	<ul style="list-style-type: none"><li>• White ink CARAPACE</li></ul>
<b>Black (solder mask)</b>	<ul style="list-style-type: none"><li>• Black Taiyo PSR4000</li></ul>

Next figure shows the correct colours of the antenna:

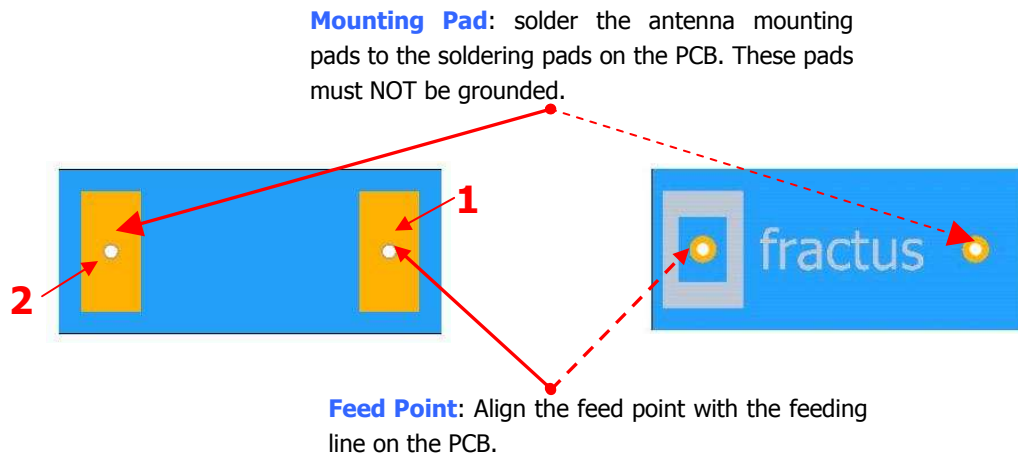


**Acceptable colour range**



### ASSEMBLY PROCESS

Figure 3 shows the back and front view of the Compact Reach Xtend chip antenna, which indicates the location of the feeding point and the mounting pad:

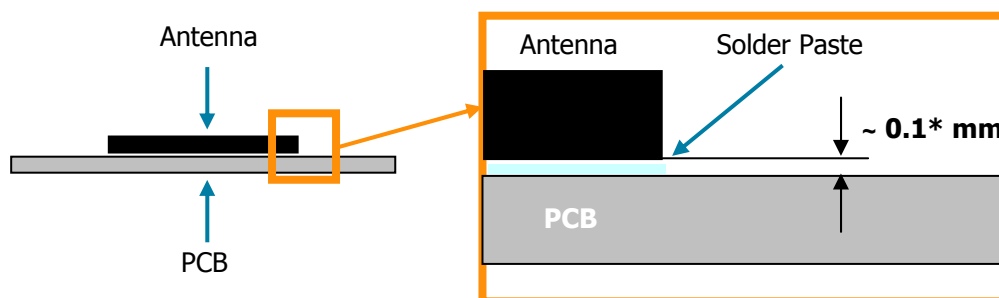


**Figure 3** – Views of the Compact Reach Xtend Chip Antenna.

As a surface mount device (SMD), this antenna is compatible with industry standard soldering processes. The basic assembly procedure for this antenna is as follows:

1. Apply a solder paste on the pads of the PCB. Place the antenna on the board.
2. Perform a reflow process according to the temperature profile detailed in table 3, figure 5 of page 9.
3. After soldering the antenna to the circuit board, perform a cleaning process to remove any residual flux. Fractus 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 4** - 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.

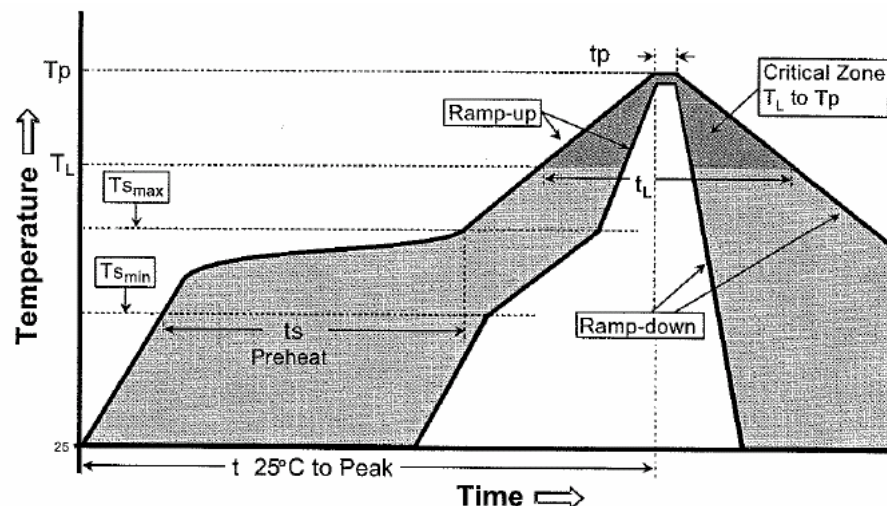


Fractus Compact Reach Xtend chip antenna can be assembled following either Sn-Pb or Pb-free assembly processes. According to the Standard **IPC/JEDEC J-STD-020C**, the temperature profile suggested is as follows:

Phase	Profile features	Sn-Pb Assembly	Pb-Free Assembly (SnAgCu)
RAMP-UP	Avg. Ramp-up Rate ( $T_{smax}$ to $T_p$ )	3 °C / second (max.)	3 °C / second (max.)
PREHEAT	<ul style="list-style-type: none"><li>- Temperature Min (<math>T_{smin}</math>)</li><li>- Temperature Max (<math>T_{smax}</math>)</li><li>- Time (<math>t_{smin}</math> to <math>t_{smax}</math>)</li></ul>	100 °C 150 °C 60-120 seconds	150°C 200°C 60-180 seconds
REFLOW	<ul style="list-style-type: none"><li>- Temperature (<math>T_L</math>)</li><li>- Total Time above <math>T_L</math> (<math>t_L</math>)</li></ul>	183 °C 60-150 seconds	217 °C 60-150 seconds
PEAK	<ul style="list-style-type: none"><li>- Temperature (<math>T_p</math>)</li><li>- Time (<math>t_p</math>)</li></ul>	235 °C 10-30 seconds	260 °C 20-40 second
RAMP-DOWN	Rate	6 °C / second max.	6 °C/second max.
Time from 25 °C to Peak Temperature		6 minutes max.	8 minutes max.

**Table 3** – Recommended soldering temperatures

Next graphic shows temperature profile (grey zone) for the antenna assembly process in reflow ovens.

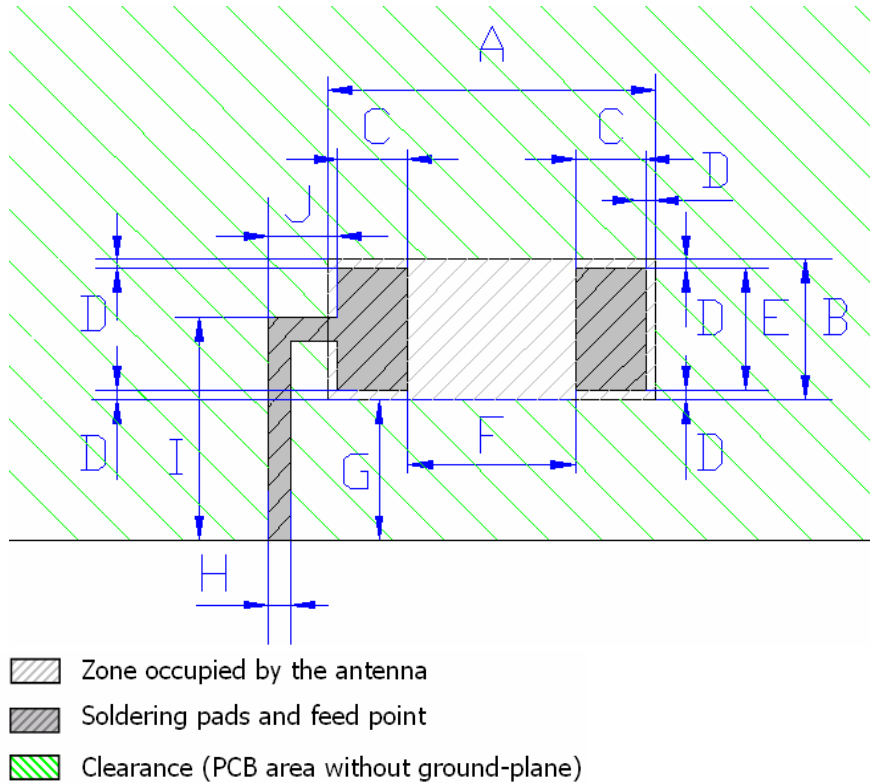


**Figure 5** – Temperature profile



### ANTENNA FOOTPRINT

This antenna footprint applies for the reference evaluation board described in page 4 of this User Manual. Feeding line dimensions over the clearance zone described in figure 6 applies for a 1 mm thickness FR4 PCB.



Letter	Meas.
A	7.00
B	3.00
C	1.50
D	0.20
E	2.60
F	3.60
G	3.00
H	0.50
I	4.75
J	1.50

*All dimensions are in millimetres.*

**Figure 6 – Antenna Footprint Details**

Other PCB form factors and configurations may require a different feeding configuration, feeding line dimensions and clearance areas. If you require support for the integration of the antenna in your industrial design, we would be pleased to assist you with this design process.

Please, contact your sales representative at [wireless@fractus.com](mailto:wireless@fractus.com) to get additional information on recommended configurations for different devices:

FRACTUS S.A.

[www.fractus.com](http://www.fractus.com),

Tel: +34 935442690

Fax: +34 935442691



### PACKAGING

The Compact Reach Xtend chip antenna is available in tape and reel packaging.

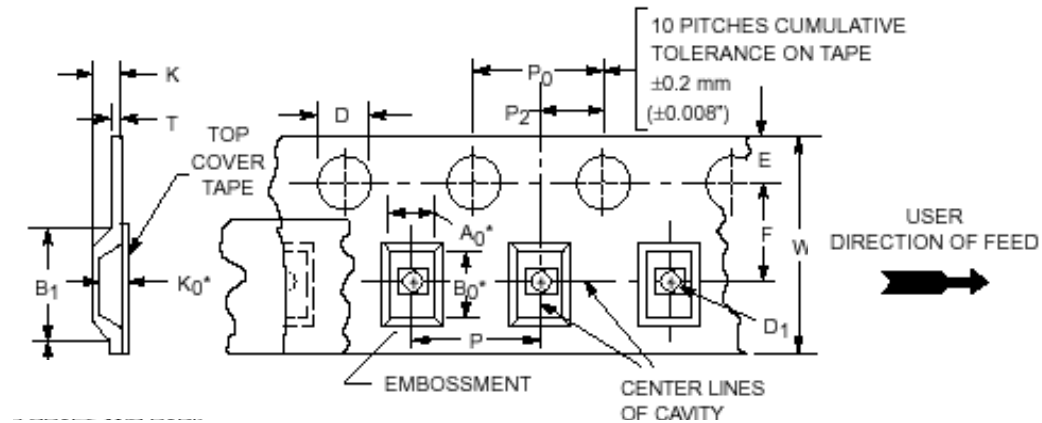
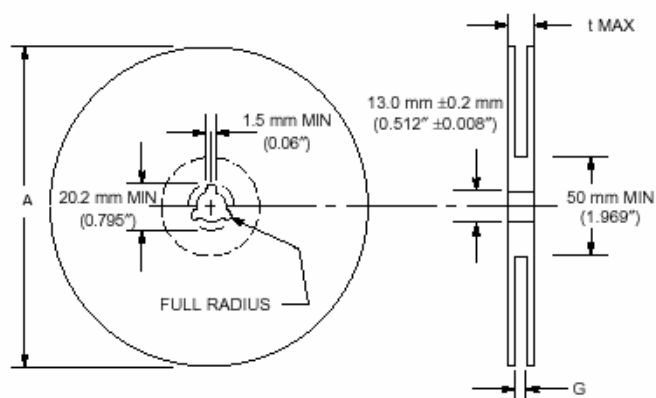
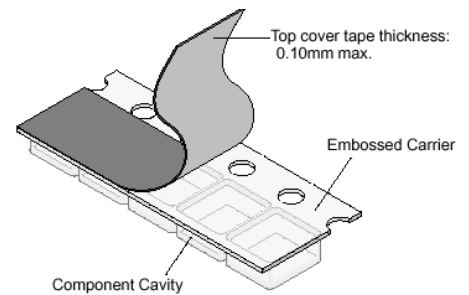


Figure 7 – Tape Dimensions

<b>TAPE WIDTH</b>	16	<b>Wmax</b>	16.3
<b>A0</b>	3.8	<b>E</b>	1.7
<b>B0</b>	7.8	<b>F</b>	7.5
<b>K0</b>	2.3	<b>K</b>	2.6 max
<b>B1</b>	8.2 max	<b>P</b>	8.0
<b>D</b>	1.5	<b>P0</b>	4.0
<b>D1</b>	1.5 min	<b>P2</b>	2.0

All dimensions are in millimetres (mm).



<b>A max</b>	330
<b>G</b>	16.4
<b>t max</b>	22.4

All dimensions are in millimetres (mm)

**Reel Capacity:** 2500 antennas.

Figure 8 – Reel Dimensions and Capacity