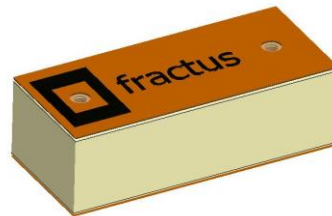




# **Fractus Compact Dual-band Reach Xtend™**

2.4 GHz and 4.9-5.875 GHz

*Chip Antenna*



**Antenna Part Number:  
FR05-S1-NO-1-004**

This product is protected by at least the following patents PAT. US 7,148,850, US 7,202,822 and other domestic and international patents pending. Any update on new patents linked to this product will appear in <http://www.fractus.com/index.php/fractus/patents>

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





## TABLE OF CONTENTS

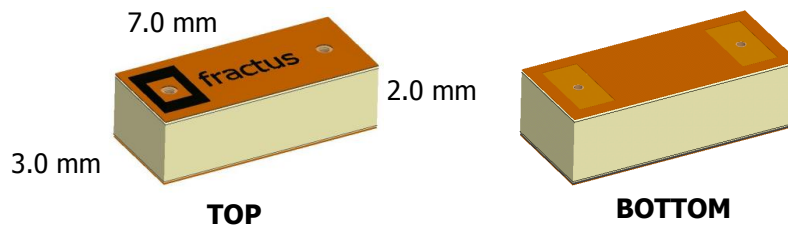
<b>1. ANTENNA DESCRIPTION</b>	<b>3</b>
<b>2. QUICK REFERENCE GUIDE</b>	<b>3</b>
<b>3. ELECTRICAL PERFORMANCE</b>	<b>4</b>
<b>3.1 FRACTUS EVALUATION BOARD</b>	<b>4</b>
<b>3.2. VSWR AND EFFICIENCY</b>	<b>4</b>
<b>3.3. RADIATION PATTERN, GAIN AND EFFICIENCY</b>	<b>5</b>
<b>3.4. CAPABILITIES AND MEASUREMENT SYSTEMS</b>	<b>6</b>
<b>4. MECHANICAL CHARACTERISTICS</b>	<b>7</b>
<b>4.1. DIMENSIONS, TOLERANCES &amp; MATERIALS</b>	<b>7</b>
<b>4.2. COLOUR RANGE FOR THE INK</b>	<b>7</b>
<b>4.3. ANTENNA FOOTPRINT (as used in the evaluation board)</b>	<b>8</b>
<b>5. MATCHING NETWORK</b>	<b>8</b>
<b>6. ASSEMBLY PROCESS</b>	<b>9</b>
<b>7. PACKAGING</b>	<b>11</b>



## 1. ANTENNA DESCRIPTION

Fractus® Compact Dual-band Reach Xtend™ chip antenna is engineered specifically for high performance dual-band WLAN devices operating at both 2.4 GHz and 4.9-5.875 GHz and using 802.11 a/b/g/n systems. Compact Dual-band Reach Xtend combines small size with high performance to improve the functionality of your wireless devices. Its small dimensions allow various configurations within the USB devices and may help Cardbus devices in the enhancement of their throughput by using MIMO algorithms with more than 2 antennas.

The Compact Dual-band Reach Xtend chip antenna uses space-filling properties of Fractus technology to minimise its size while maintaining a high radiation efficiency value. This directly impacts antenna reliability in achieving a greater communication range (distance) and in improving battery life. Compact Dual-band Reach Xtend features an omnidirectional radiation pattern optimal for highly scattered environments such as indoor environments and public spaces. Moreover, its broad bandwidth gives you design flexibility to create robust designs that operate at all global WLAN standards.



### APPLICATIONS

- Headsets
- Wireless Phone
- Modules WLAN 802.11 a/b/g/n
- USB Dongles
- Sensors (Thickness measurement...)

### PRODUCT BENEFITS

- High efficiency and gain
- Small footprint
- Cost-effective
- Multiband behaviour. Worldwide standard compatible
- Easy-to-use (pick and place)

## 2. QUICK REFERENCE GUIDE

Technical Features	802.11 b/g/n	802.11 a/n
Frequency Range	2.4-2.5 GHz	4.9-5.875 GHz
Peak Gain	1.8 dBi	4.9 dBi
VSWR	< 2:1	< 2:1
Average Efficiency	70.0%	73.7%
Radiation Pattern	Omnidirectional	
Weight (approx.)	0.1 g	
Temperature	-40 to +85 °C	
Impedance	50 Ω	
Antenna Dimensions (L x W x H)	7.0 mm x 3.0 mm x 2.0 mm	

**Table 1** -Technical Features. Measures from the evaluation board (55.4 mm x 20.0 mm x 0.8 mm PCB). See picture in page 5.

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

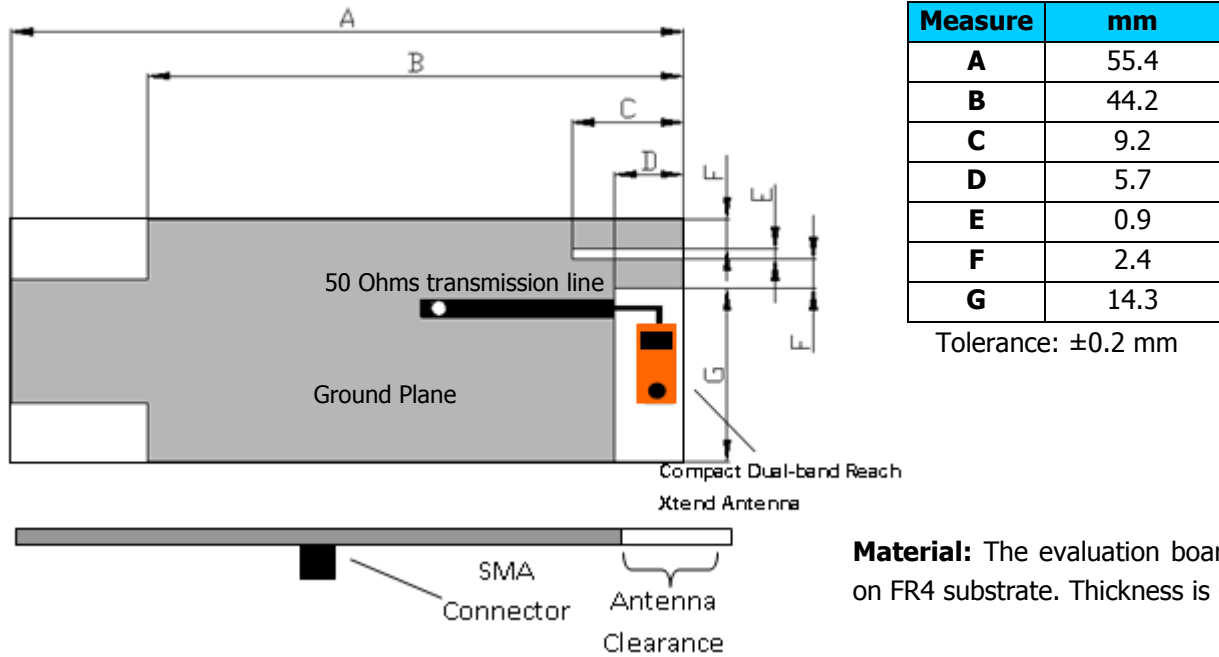
FRACTUS S.A.  
[www.fractus.com](http://www.fractus.com)  
Tel: +34 935442690  
Fax: +34 935442691



### 3. ELECTRICAL PERFORMANCE

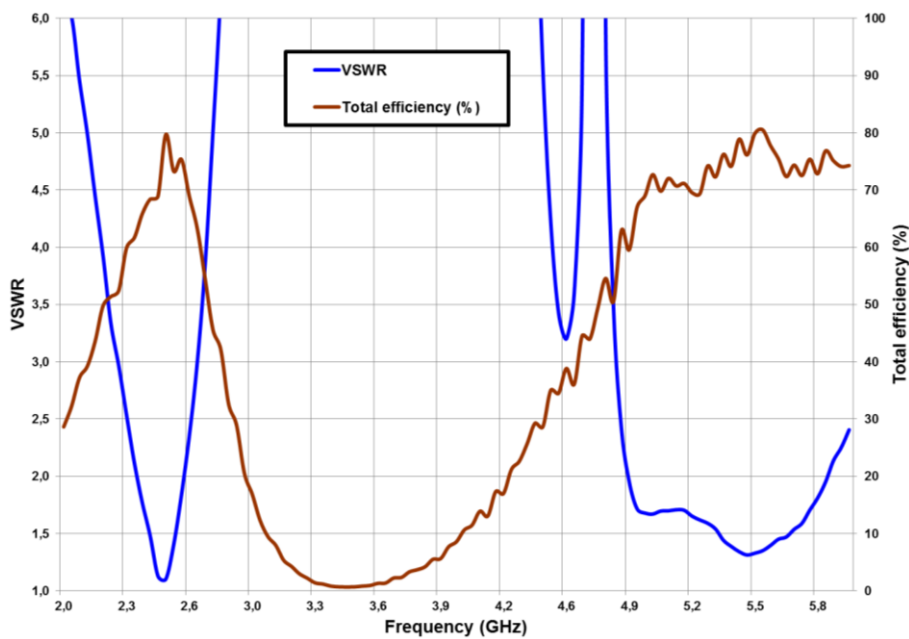
#### 3.1 FRACTUS EVALUATION BOARD

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



**Figure 1** – Compact Dual-band Reach Xtend Evaluation Board.  
See picture in page 5

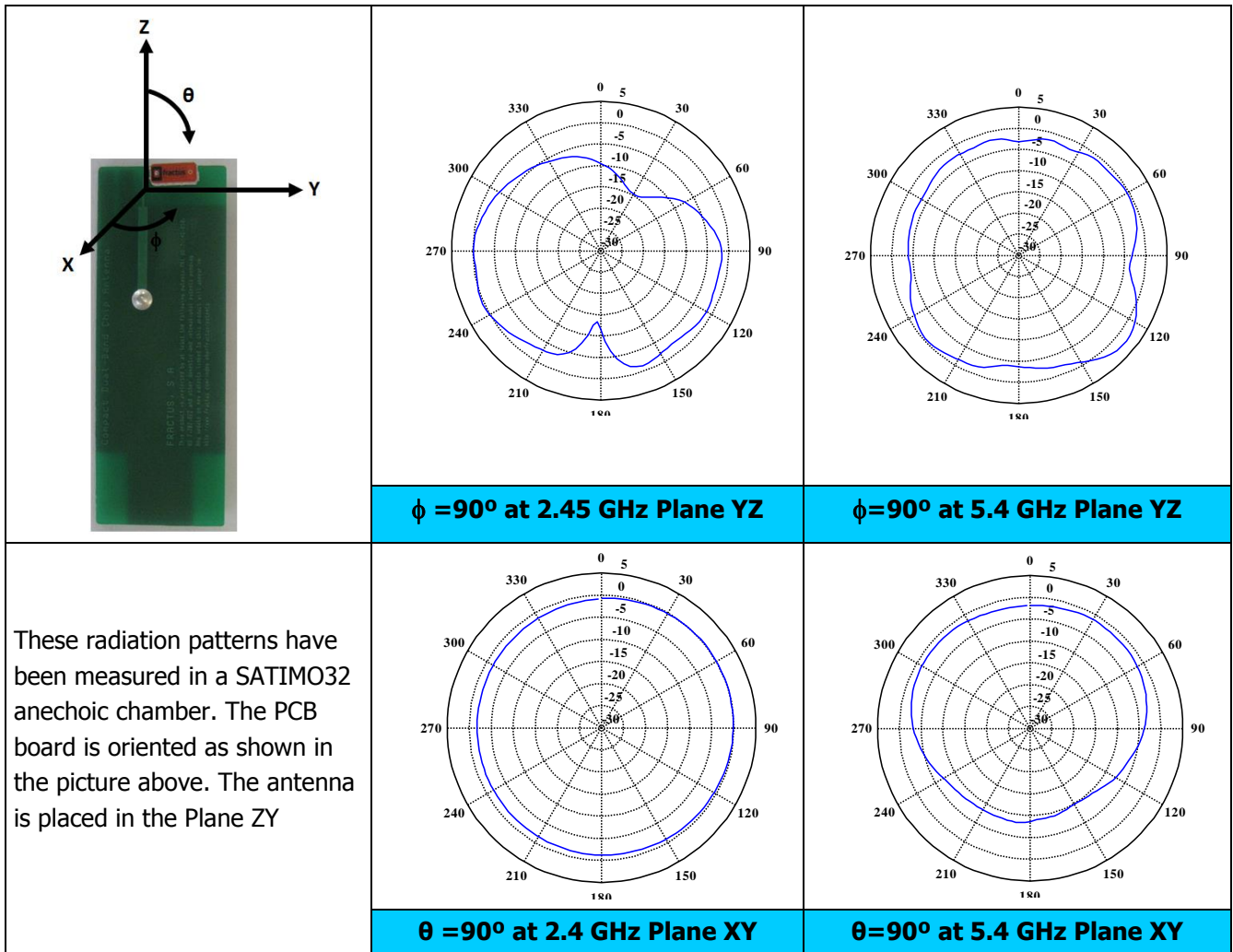
#### 3.2. VSWR AND EFFICIENCY



**Graph 1** - VSWR (Voltage Standing Wave Ratio) and Efficiency (%) vs. Frequency



## 3.3. RADIATION PATTERN, GAIN AND EFFICIENCY



		2.4-2.5 GHz	4.9-5.875 GHz
<b>Gain</b>	<b>Peak Gain</b>	1.8 dBi	4.9 dBi
	<b>Average Gain across the band</b>	1.3 dBi	3.2 dBi
	<b>Gain Range across the band</b>	1.0 dBi <-> 1.7 dBi	1.8 dBi <-> 4.9 dBi
<b>Efficiency</b>	<b>Peak Efficiency</b>	79.0 %	80.5 %
	<b>Average Efficiency across the band</b>	70.0 %	73.7 %
	<b>Efficiency Range across the band</b>	65.8 % - 79.0 %	65.9 % - 80.5 %

**Table 2** – Antenna Gain and Efficiency within the 2.4-2.5 GHz band and the 4.9-5.875 GHz band. Measures made in the evaluation board and in the Satimo STARGATE 32 anechoic chamber.



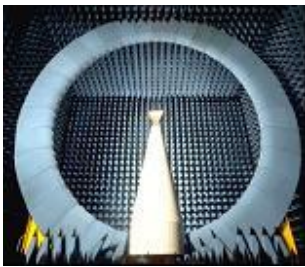
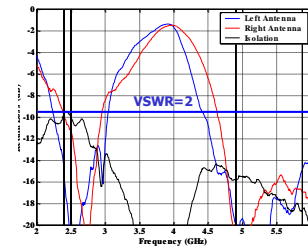
## 3.4. CAPABILITIES AND MEASUREMENT SYSTEMS

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.



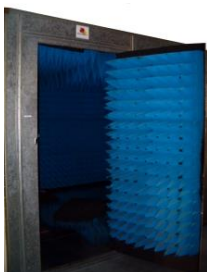
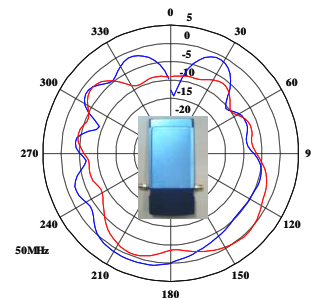
**Agilent E5071B**

VSWR  
&  
S Parameters



**SATIMO's STARGATE 32**

Radiation  
Pattern  
&  
Efficiency



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



## 4. MECHANICAL CHARACTERISTICS

### 4.1. DIMENSIONS, TOLERANCES & MATERIALS

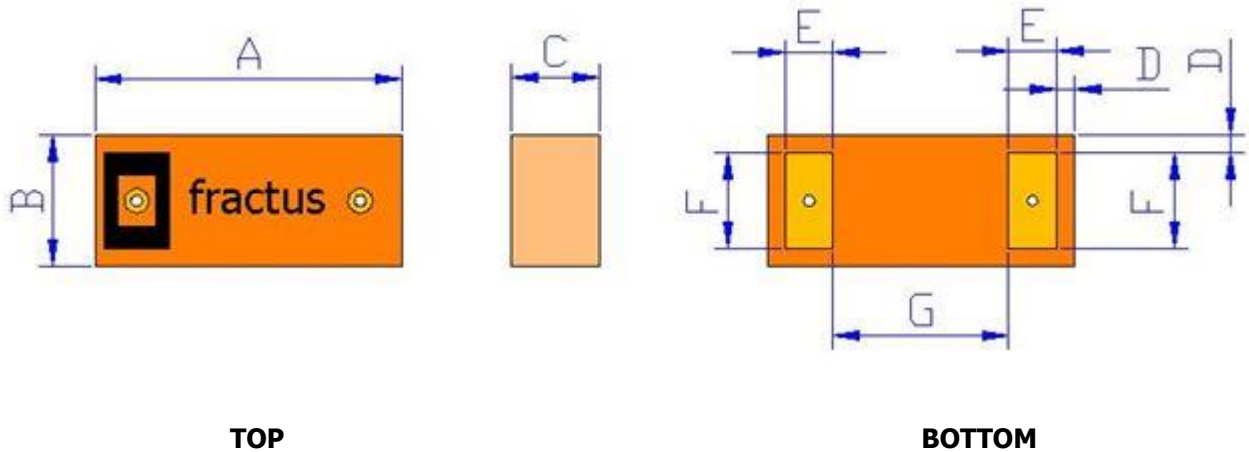


Figure 2 – Antenna Dimensions and Tolerances

Measure	mm	Measure	mm
A	$7.0 \pm 0.2$	E	$1.1 \pm 0.1$
B	$3.0 \pm 0.2$	F	$2.2 \pm 0.1$
C	$2.0 \pm 0.2$	G	$4.0 \pm 0.2$
D	$0.4 \pm 0.15$		

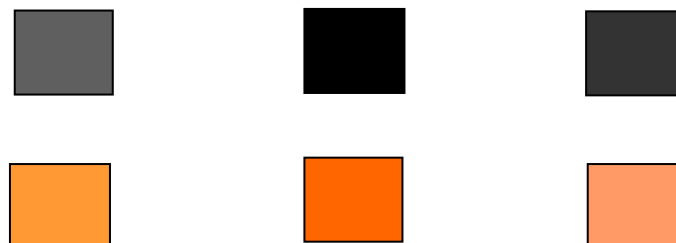
The black square located on the top side of the antenna indicates the feed pad.

Fractus Compact Dual-band Reach Xtend chip antenna is compliant with the restriction of the use of hazardous substances (RoHS).

The RoHS certificate can be downloaded from <http://www.fractus.com/index.php/fractus/documentation>

### 4.2. COLOUR RANGE FOR THE INK

The next figure shows the range of the colours in the antenna:

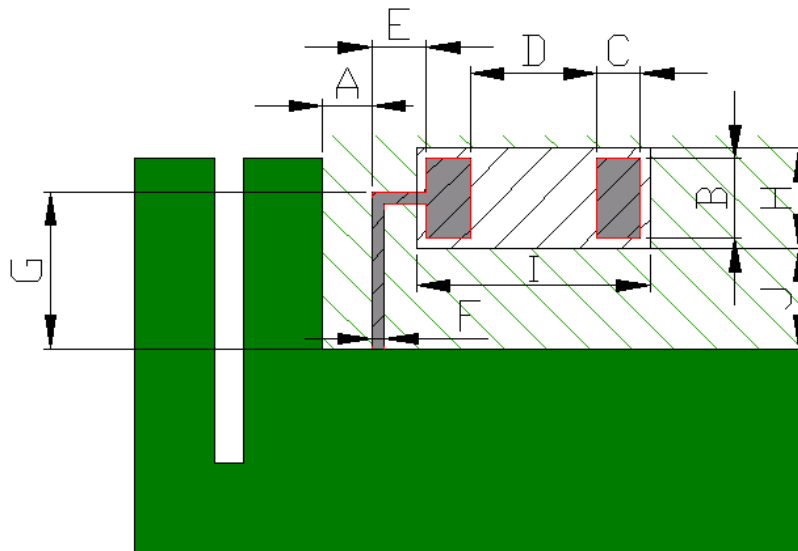


Acceptable colour range



## 4.3. ANTENNA FOOTPRINT (as used in the evaluation board)

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 3 applies for a 0.8 mm thickness FR4 PCB.



Measure	mm
A	1.5
B	2.4
C	1.3
D	3.8
E	1.6
F	0.4
G	4.7
H	3.0
I	7.0
J	3.0

Tolerance:  $\pm 0.2$  mm

**Figure 3** – 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 design, please contact [info@fractus.com](mailto:info@fractus.com)

## 5. MATCHING NETWORK

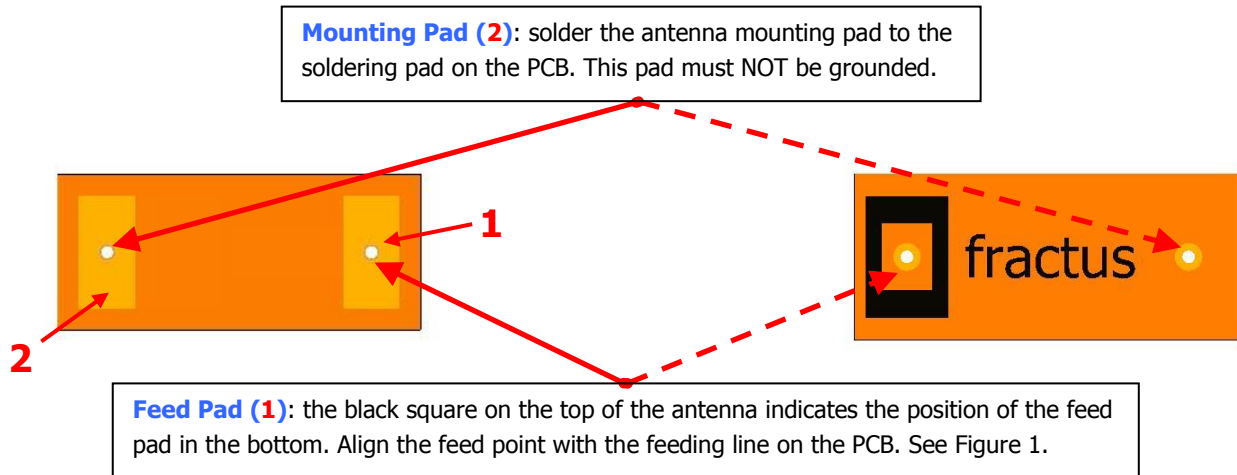
The specs of a Fractus standard antenna are measured in their evaluation board, which is an ideal case. In a real design, components nearby the antenna, LCD's, batteries, covers, connectors, etc affect the antenna performance. This is the reason why it is highly recommended to place 0402 pads for a PI 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).





## 6. ASSEMBLY PROCESS

Figure 4 shows the back and front view of the Compact Dual-band Reach Xtend chip antenna, which indicates the location of the feeding point and the mounting pad:

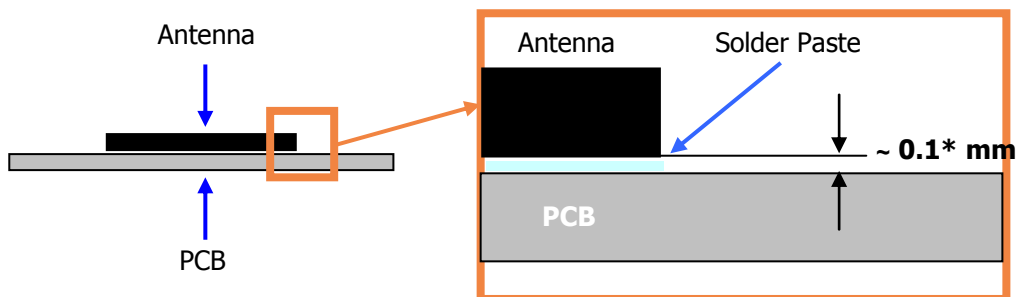


**Figure 4** – Pads of the Compact Dual-band Reach Xtend Chip Antenna.

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 6 of page 10.
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 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.

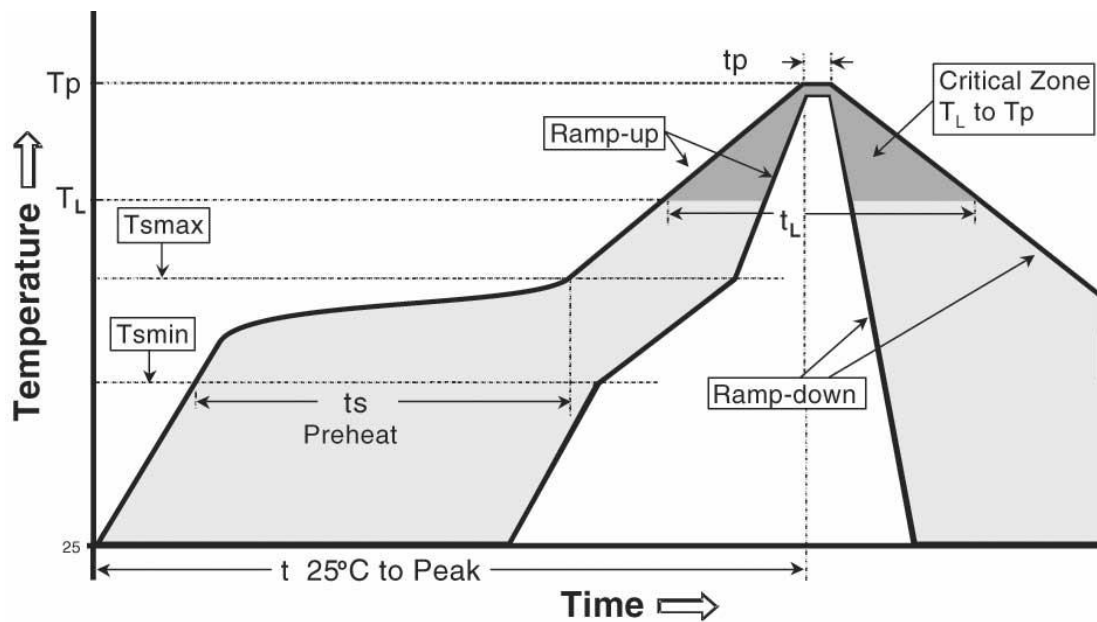


Fractus Compact Dual-band Reach Xtend chip antenna can be assembled following the Pb-free assembly process. According to the Standard **IPC/JEDEC J-STD-020C**, the temperature profile suggested is as follows:

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

**Table 3** – Recommended soldering temperatures

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

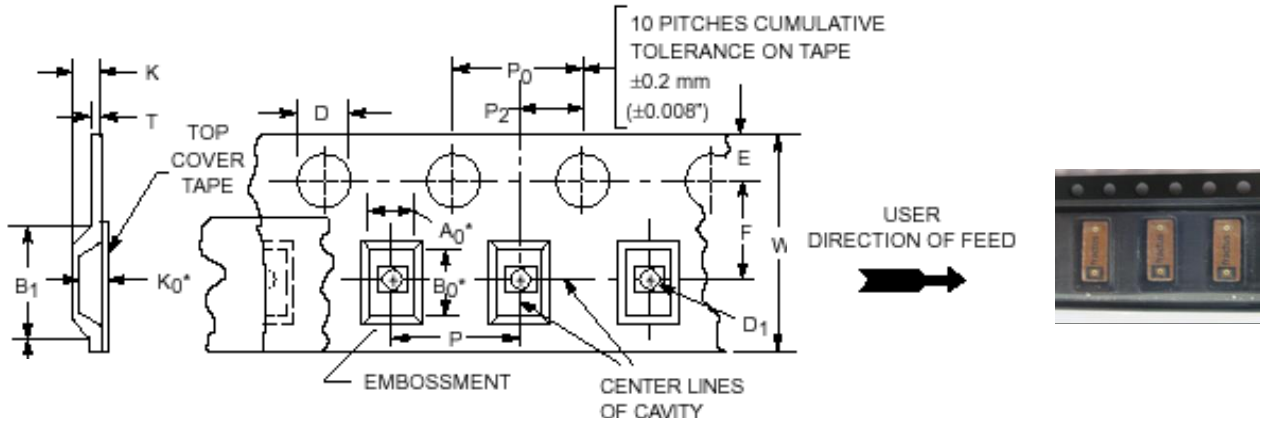


**Figure 6** – Temperature profile



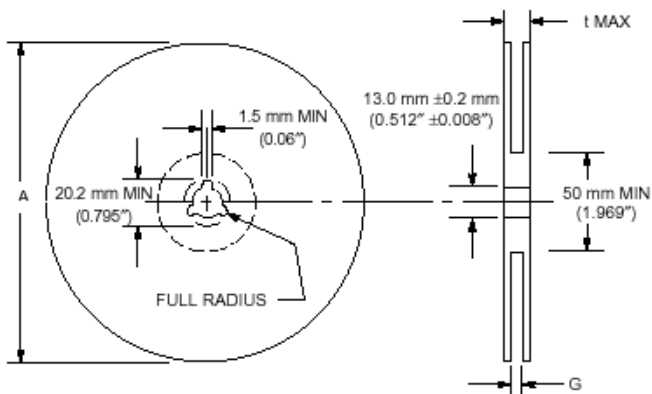
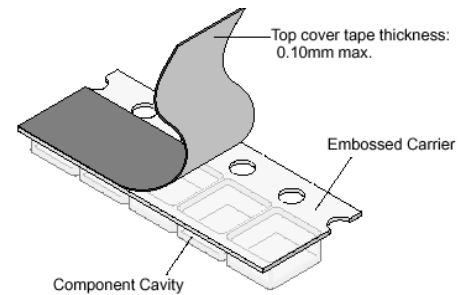
## 7. PACKAGING

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



**Figure 7** –Tape dimensions & image including antennas

Measure	mm	Measure	mm
<b>TAPE SIZE (W)</b>	16.0 ± 0.3	<b>Wmax</b>	16.3
<b>A0</b>	3.6 ± 0.1	<b>E</b>	1.7 ± 0.1
<b>B0</b>	7.5 ± 0.1	<b>F</b>	7.5 ± 0.1
<b>K0</b>	2.5 ± 0.1	<b>K</b>	2.8 ± 0.1
<b>B1</b>	8.1 ± 0.1	<b>P</b>	8.0 ± 0.1
<b>D</b>	1.55 ± 0.05	<b>P0</b>	4.0 ± 0.1
<b>D1</b>	1.55 ± 0.05	<b>P2</b>	2.0 ± 0.1



Measure	mm
<b>A</b>	330 ± 1
<b>G</b>	17.5 ± 0.2
<b>t max</b>	21.5 ± 0.2

**Reel Capacity:** 2500 antennas.

**Figure 8** – Reel Dimensions and capacity