

# Calvus Penta-band SMD Antenna

Part No. A10340

Product Specification

## 1 Features

- GSM/UMTS antenna supporting up to 5 frequency bands
- High efficiency
- Easy to integrate
- Intended for SMD mounting
- Supplied in tape on reel

Calvus supports the following communication standards:

| GSM/GPRS/EDGE                                         | CDMA2000<br>1xRTT/EV-DO/EV-DV           | UMTS<br>WCDMA/HSPA             | Other Standards                                     |
|-------------------------------------------------------|-----------------------------------------|--------------------------------|-----------------------------------------------------|
| GSM850<br>(E)GSM900<br>GSM1800 (DCS)<br>GSM1900 (PCS) | Band Classes:<br>1,2,3,4,6,8,9,12,14,15 | Bands I – VI<br>Bands VIII – X | Korean PCS<br>DECT (outside USA)<br>TD-SCDMA<br>AWS |

## 2 Description

Calvus uses a ground plane in order to radiate efficiently, but the ground plane must not be present underneath the antenna itself.

The antenna uses a matching circuit to achieve optimized results for the specific frequency bands that are required. This product specification shows the performance of the antenna when optimized to cover a typical penta-band reception: GSM850/900/1800/1900 and WCDMA. If the antenna is used for fewer than 5 bands, higher efficiencies are possible.

## 3 Applications

- Femto / Pico base stations
- Vehicle tracking
- Machine to machine communication
- Remote monitoring



## 4 Part numbers

**A10340**



## 5 General data

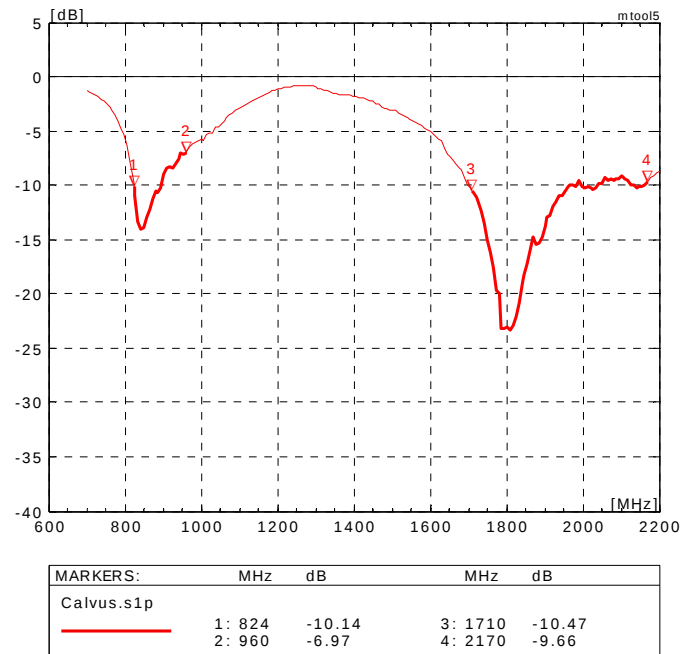
|                         |                                   |
|-------------------------|-----------------------------------|
| Product name            | Calvus GSM SMD                    |
| Part Numbers:           | A10340                            |
| Frequency (typical)     | 824MHz-960MHz<br>1710MHz -2170MHz |
| Polarization            | Linear                            |
| Operating temperature   | -40 °C to +85 °C                  |
| Impedance with matching | 50 $\Omega$                       |
| Weight                  | <2g                               |
| Antenna type            | SMD                               |
| Dimensions:             | 27 x 8 x 3.2 [mm]                 |

## 6 Electrical characteristics

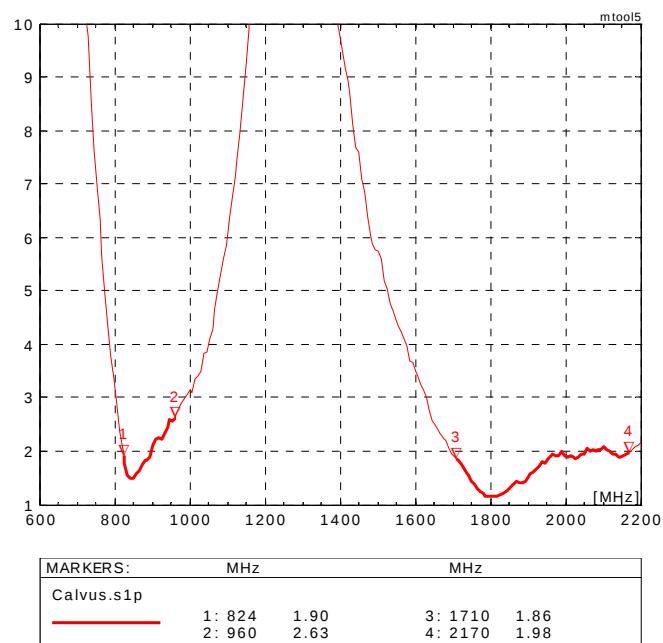
|                                                    | Typical performance                                        | Conditions                                                                                                                                                                |
|----------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Peak gain                                          | 1.7 dBi @ 862 MHz<br>3.0 dBi @ 1848 MHz                    | <p>All data measured on Antenna's reference board,<br/>part number <b>A10340-U1</b></p> <p>Data given for the 824MHz-960MHz and 1710MHz-<br/>2170MHz frequency ranges</p> |
| Average gain                                       | -1.8 dBi<br>824 - 960 MHz<br><br>-1.6 dBi<br>1710-2170 MHz |                                                                                                                                                                           |
| Average efficiency<br>824-960 MHz<br>1710-2170 MHz | 66%<br>69%                                                 |                                                                                                                                                                           |
| Maximum Return Loss                                | -6dB                                                       |                                                                                                                                                                           |
| Maximum VSWR                                       | 3:1                                                        |                                                                                                                                                                           |

## 7 Electrical performance

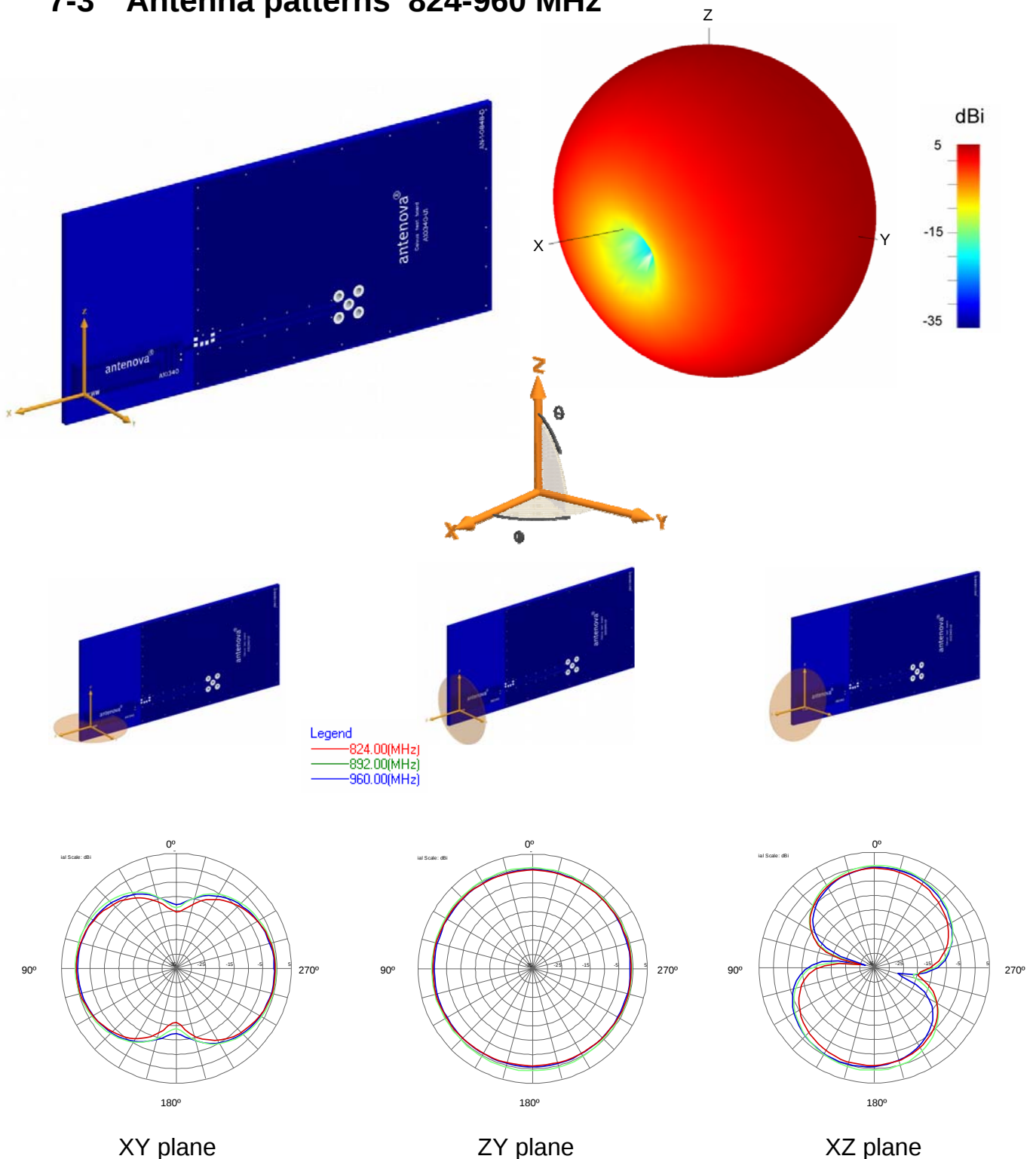
### 7-1 Return Loss



### 7-2 VSWR



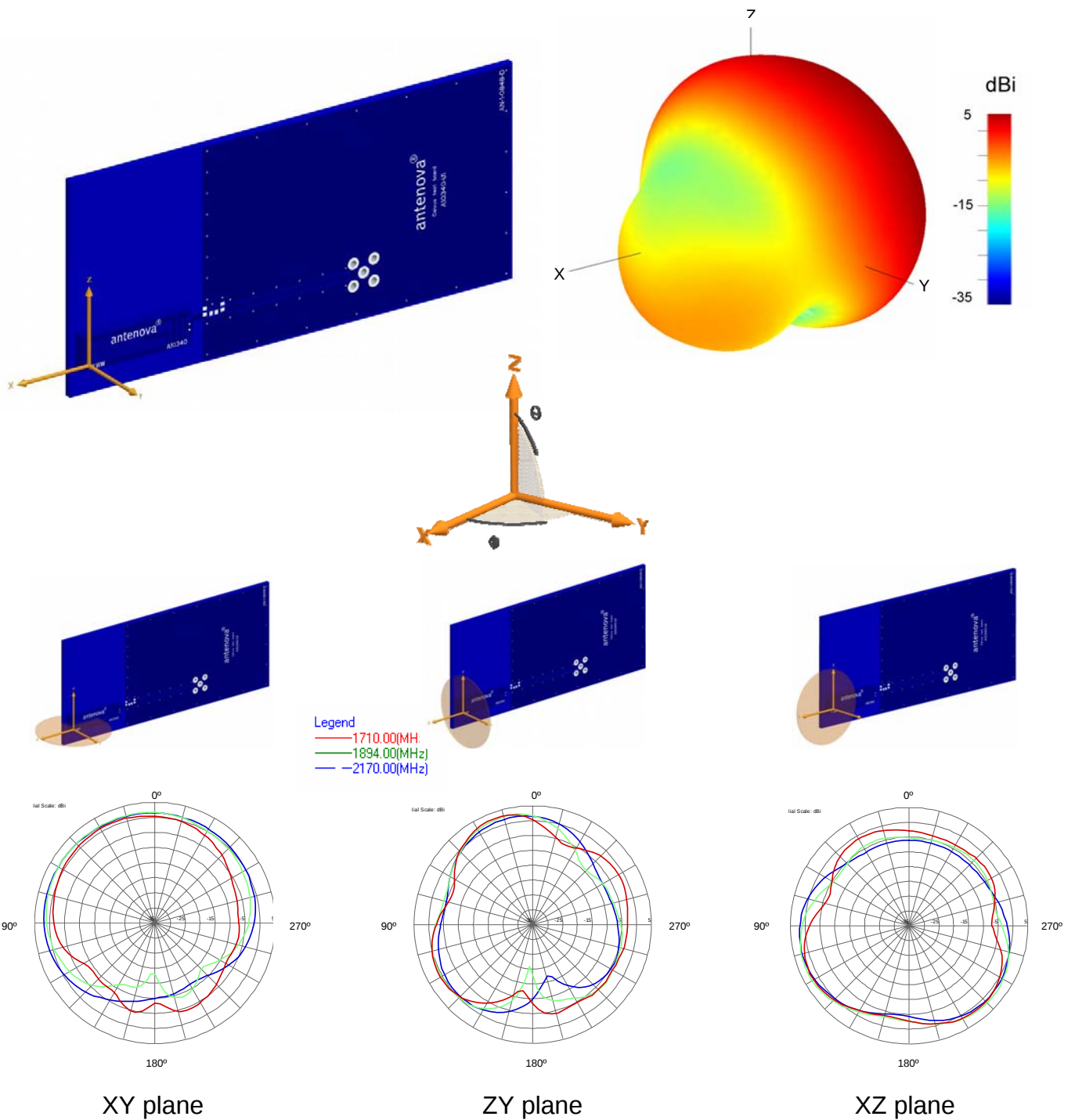
## 7-3 Antenna patterns 824-960 MHz



Patterns show combined polarisations measured on reference board A10340-U1. 3D Pattern measured at 892MHz

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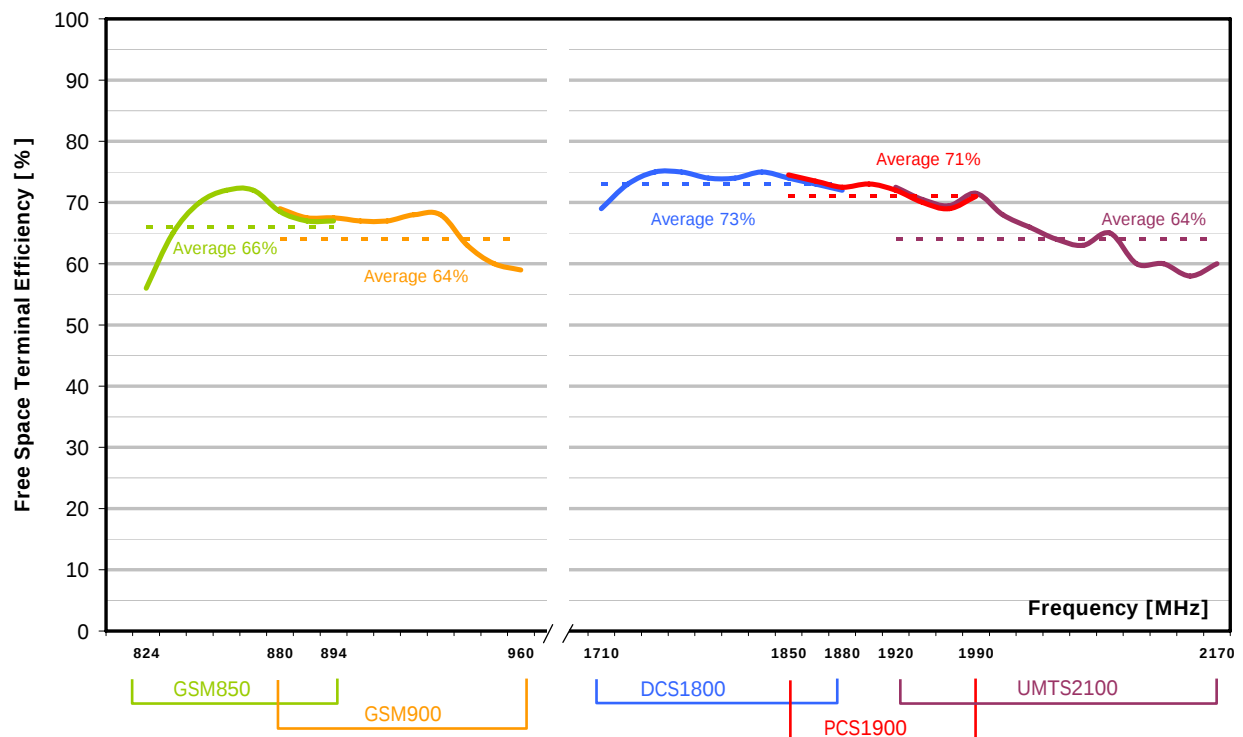
## 7-4 Antenna patterns 1710 – 2170 MHz



Patterns show combined polarisations measured on reference board A10340-U1. 3D Pattern measured at 1894MHz

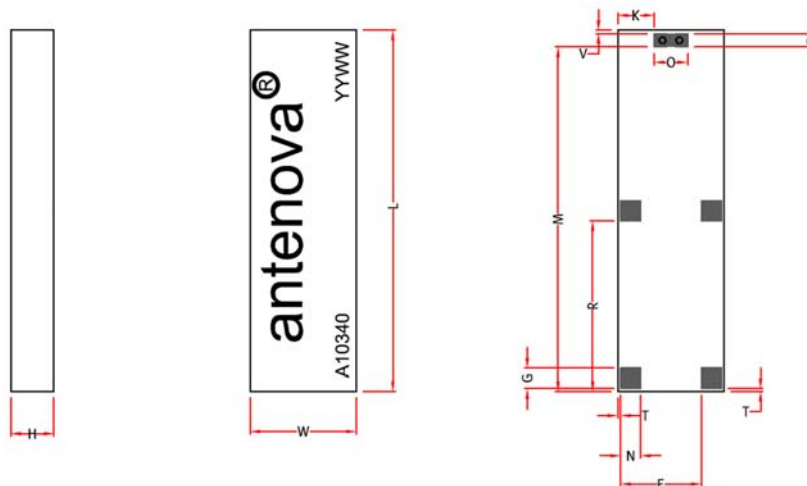
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## 8 Antenna efficiency



Calvus efficiency in free space

## 9 Antenna dimensions

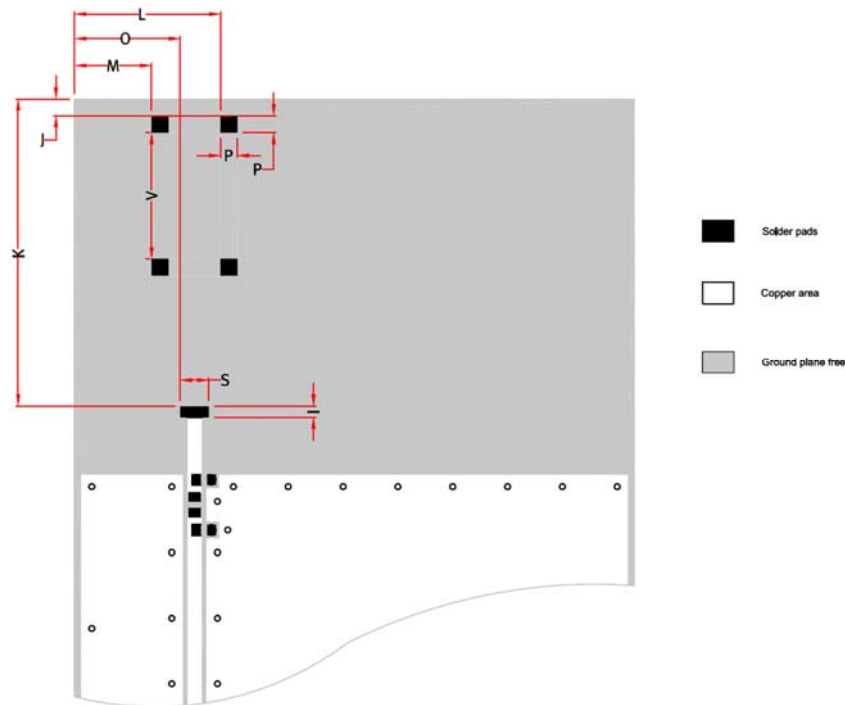


| L            | W              | H              | E               | N              | T              | G              | R                | M                 | V               | O              | K              | P            |
|--------------|----------------|----------------|-----------------|----------------|----------------|----------------|------------------|-------------------|-----------------|----------------|----------------|--------------|
| Length       | Width          | Height         |                 |                |                |                |                  |                   |                 |                |                |              |
| 27<br>+/-0.2 | 7.92<br>+/-0.2 | 3.2<br>+/-0.15 | 6.22<br>+/-0.15 | 1.5<br>+/-0.15 | 0.2<br>+/-0.15 | 1.5<br>+/-0.15 | 12.76<br>+/-0.15 | 25.76<br>+/- 0.15 | 0.25<br>+/-0.15 | 2.5<br>+/-0.15 | 2.7<br>+/-0.15 | 1<br>+/-0.15 |

Dimensions in mm

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## 10 Antenna footprint



### Calvus GSM (Part No: A10340)

CAD files of the antenna footprint are available from Antenova on request. Please contact [info@antenova.com](mailto:info@antenova.com) for further details.

| I             | S             | K               | J              | M              | O              | L               | V                | C             | P             |
|---------------|---------------|-----------------|----------------|----------------|----------------|-----------------|------------------|---------------|---------------|
|               | Feed          |                 |                |                |                |                 |                  |               |               |
| 1.0<br>+/-0.1 | 2.5<br>+/-0.1 | 27.02<br>+/-0.1 | 1.46<br>+/-0.1 | 6.74<br>+/-0.1 | 9.25<br>+/-0.1 | 12.75<br>+/-0.1 | 11.06<br>+/- 0.1 | 2.7<br>+/-0.1 | 1.5<br>+/-0.1 |

Dimensions in mm

## 11 Electrical interface

### 11-1 Transmission lines

The antenna should be connected using an RF transmission line.

- All transmission lines should be designed to have a characteristic impedance of 50  $\Omega$
- The length of the transmission lines should be kept to a minimum
- Any other parts of the RF system like transceivers, power amplifiers, etc, should also be designed to have an impedance of 50  $\Omega$

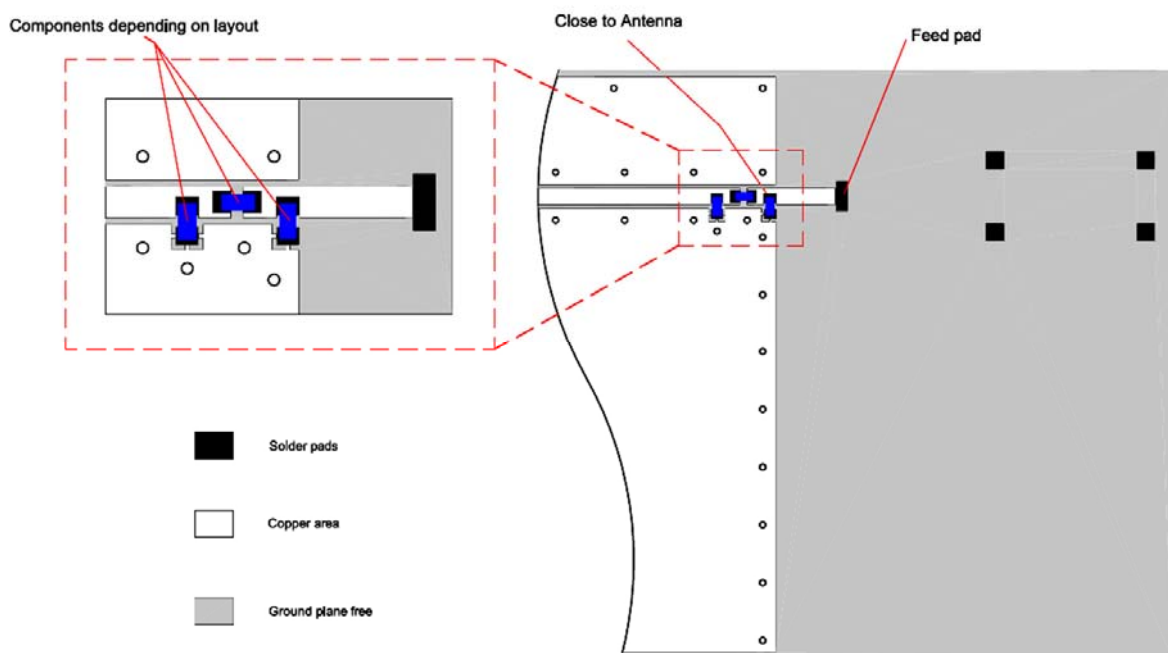
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Once the material for the PCB has been chosen (PCB thickness and dielectric constant), a co-planar transmission line can easily be designed using any of the commercial software packages for transmission line design. For the chosen PCB thickness, copper thickness and substrate dielectric constant, the program will calculate the appropriate transmission line width and gaps on either side of the track so the characteristic impedance of the co-planar transmission line is 50Ω.

## 11-2 Matching circuit

The antenna requires a matching circuit that must be optimized for each customer's product. The matching circuit will require up to three components depending on the impedance of the antenna when situated in the device, and pads have been designed for 0603 components for best results. In addition to the matching circuit, a separate DC blocking capacitor will also be required between the radio and the antenna matching circuit.

The following pad layout should be designed into the device so the correct circuit can be installed:



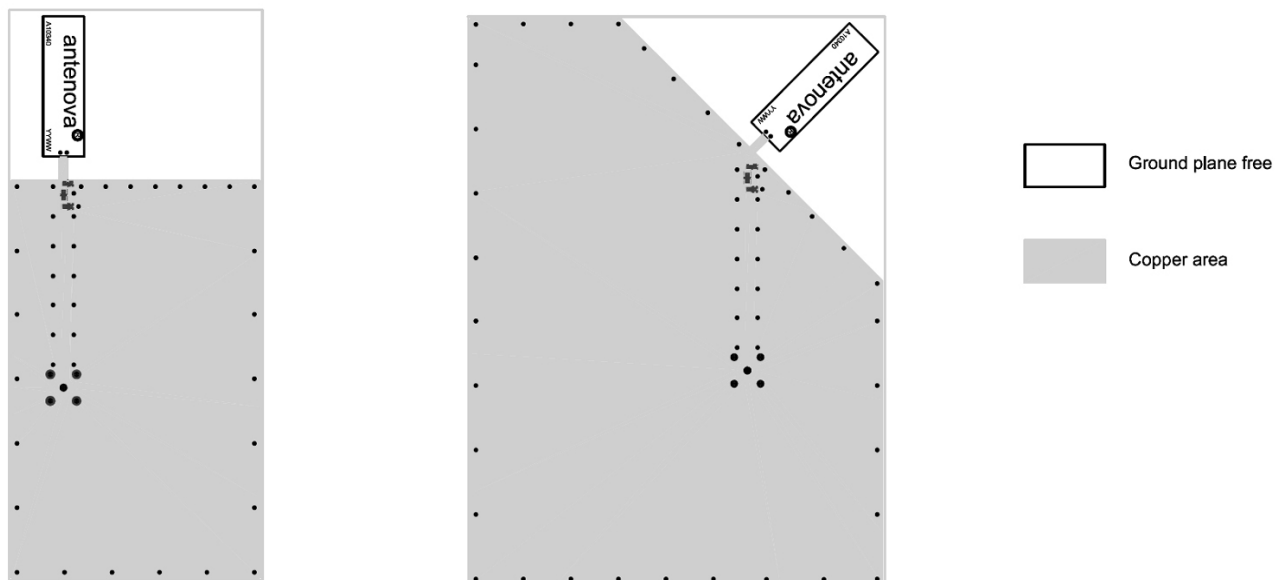
**Note:** The component values for the matching circuit will vary depending on the size of the PCB and surrounding components. The impedance of the antenna should be measured before selecting suitable matching components. Antenova offers a matching service on request. Contact [info@antenova.com](mailto:info@antenova.com) for further information.

## 11-3 Antenna placement

Calvus should be fitted to the device so that power from the antenna can radiate into free space. Antenova recommends fitting the antenna close to the corner of the PCB with few components or metal objects nearby. Ground can be placed at the side of the antenna closest to the feed, and it is recommended that any ground either side of the antenna should be at least 15mm away. The area directly above and below should be free from components or conducting objects.

Antenova offers a full range of development support to ensure efficient implementation of the antenna into the specific design. To overcome RF design issues, matching circuits, transmission lines, layout and other components, please contact Antenova ([info@antenova.com](mailto:info@antenova.com)) for design and placement recommendations.

Two recommended configurations are shown below, but other layouts are possible.

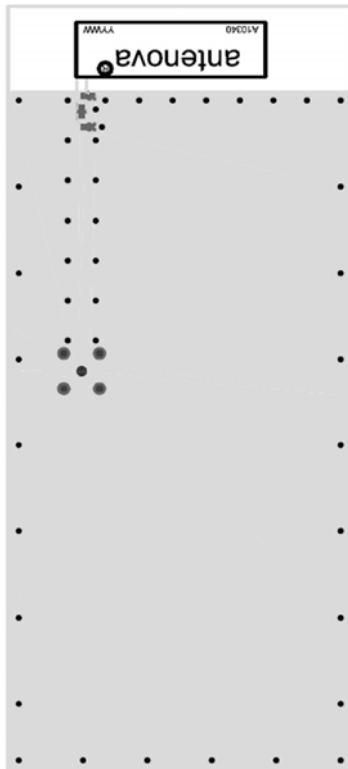


**Recommended PCB layouts: antenna mounted straight (left) and at 45 degrees (right).**

## 11-4 Space saving configuration

Where board space is limited, Calvus can be positioned closer to the main PCB ground plane as shown below. In this position good results can be achieved in up to three bands as shown in the performance table. However, if all five bands are required, this configuration is not recommended.

Please contact [info@antenova.com](mailto:info@antenova.com) for technical advice on getting the best results from Calvus into your product.

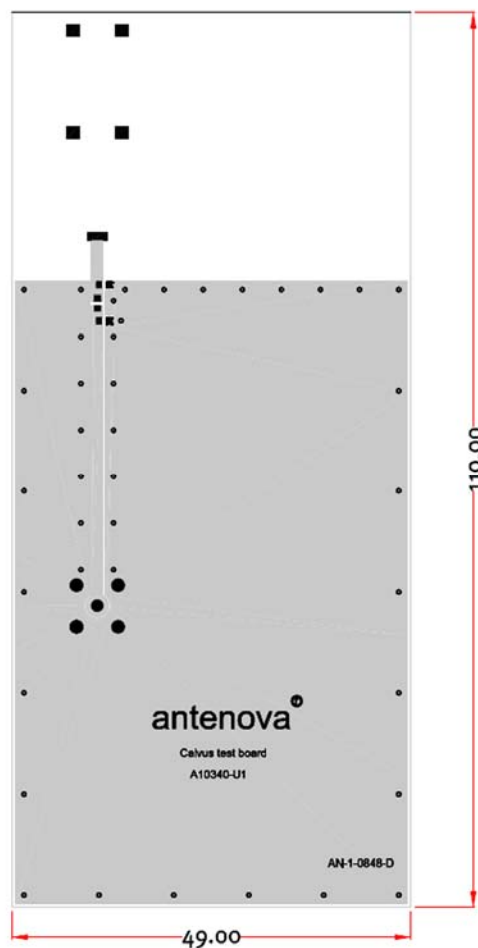


Space Saving Performance

|                     | Typical performance | Conditions                                                                                              |
|---------------------|---------------------|---------------------------------------------------------------------------------------------------------|
| Peak gain           | 1.4dBi              | <b>Space Saving Layout</b><br><br>Data given for the 880MHz-960MHz and 1710MHz-1990MHz frequency ranges |
| Average gain        | -3.5dBi             |                                                                                                         |
| Average efficiency  | 45%                 |                                                                                                         |
| Maximum Return Loss | -3.0dB              |                                                                                                         |
| Maximum VSWR        | 5.9:1               |                                                                                                         |

## 11-5 Reference board

The reference board has been designed for evaluation purposes of Calvus GSM antenna and it includes a SMA female connector. The reference board is available with Calvus tuned to cover 5 bands: GSM850/900/1800/1900 and WCDMA, Part number: A10340-U1



Dimensions in mm

To order a reference board contact [info@antenna.com](mailto:info@antenna.com)

## 12 Soldering

This antenna is suitable for lead free soldering.

The reflow profile should be adjusted to suit the PCBA, oven and solder paste, while observing the following conditions:

- The maximum temperature should not exceed 240 °C
- However for lead free soldering, a maximum temperature of 255 °C for no more than 20 seconds is permitted.
- The antenna should not be exposed to temperatures exceeding 120 °C more than 3 times during the soldering process.

## 13 Hazardous material regulation conformance

Calvus has been designed to be free of halogen flame retardants and is manufactured using halogen-free material. However, traces of halogens may be present in the final product if they are included in other processes taking place in the manufacturing plant.

The antenna has been tested to conform to RoHS requirements. A certificate of conformance is available from Antenova's website.

## 14 Packaging

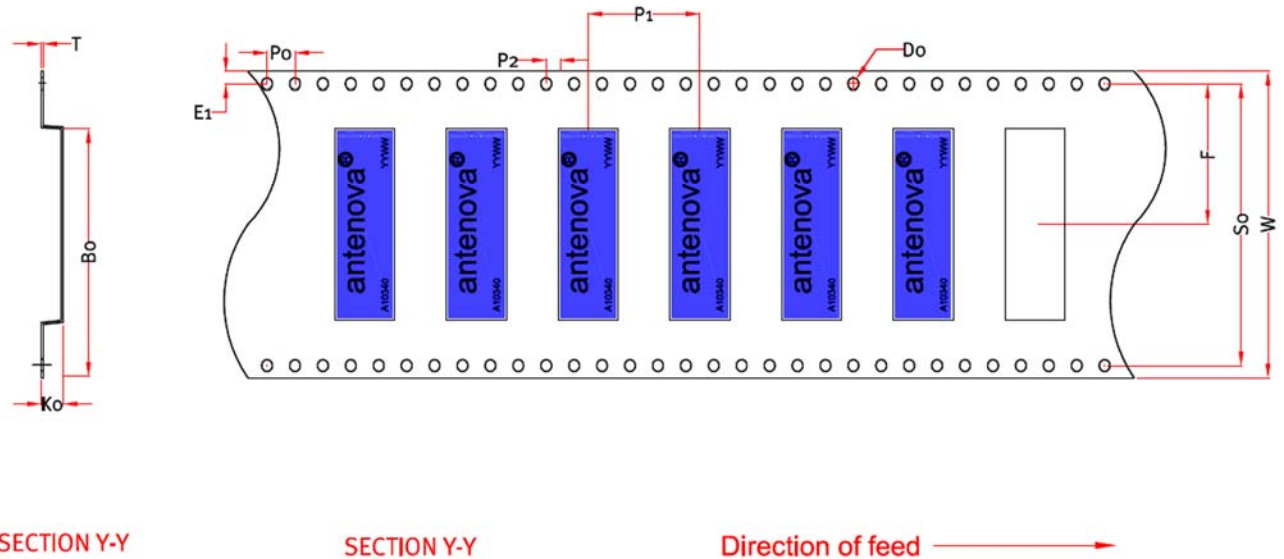
### 14-1 Optimal storage conditions for packaged reels

|               |                                                                             |
|---------------|-----------------------------------------------------------------------------|
| Temperature   | -10°C to 40°C                                                               |
| Humidity      | Less than 75% RH                                                            |
| Shelf Life    | 18 Months                                                                   |
| Storage place | Away from corrosive gas and direct sunlight                                 |
| Packaging     | Reels should be stored in unopened sealed manufacturer's plastic packaging. |

**Note:** Storage of open reels of antennas is not recommended due to possible oxidization of pads on antennas. If short term storage is necessary, then it is highly recommended that the bag containing the antenna reel is re-sealed and stored in like storage conditions as in above table.

## 14-2 Tape characteristics

### Calvus

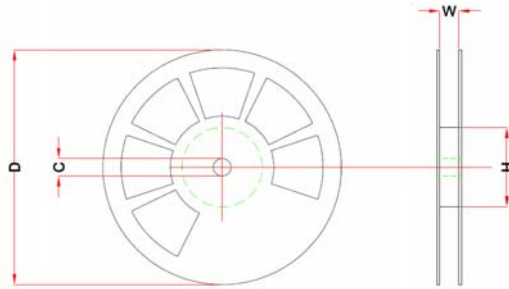


| W          | F            | E1           | P0        | P1         | P2        | A0          | B0           | K0          | S0           | T            | D0              |
|------------|--------------|--------------|-----------|------------|-----------|-------------|--------------|-------------|--------------|--------------|-----------------|
| 44 +/- 0.2 | 20.2 +/- 0.1 | 1.75 +/- 0.1 | 4 +/- 0.1 | 16 +/- 0.1 | 2 +/- 0.1 | 8.6 +/- 0.1 | 27.6 +/- 0.1 | 3.2 +/- 0.1 | 40.4 +/- 0.1 | 0.3 +/- 0.05 | Min 1.5 +/- 0.1 |

Dimensions in mm

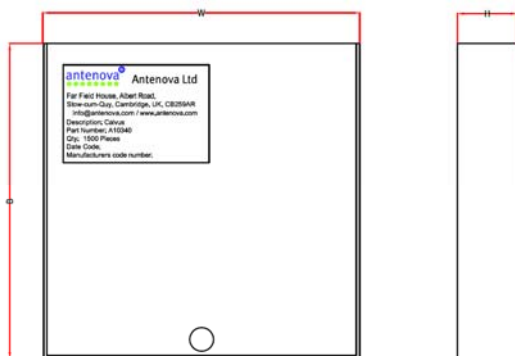
| Quantity        | Leading Space            | Trailing Space           |
|-----------------|--------------------------|--------------------------|
| 1500 pcs / reel | 50 blank antenna holders | 50 blank antenna holders |

### 14-3 Reel dimensions



| Width | Reel Diameter  | Hub Diameter | Shaft Diameter |
|-------|----------------|--------------|----------------|
| 48 mm | 330 +/- 2.0 mm | 80 mm        | 13 +/- 0.5 mm  |

### 14-4 Box dimensions



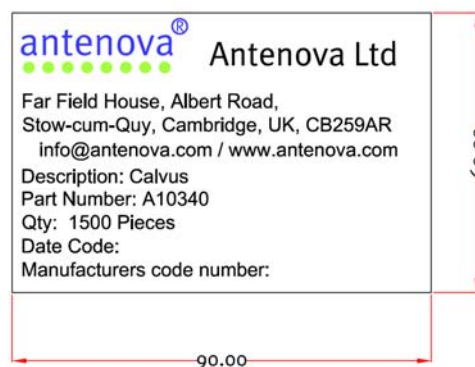
| Width<br>W | Breadth<br>B | Thickness<br>H |
|------------|--------------|----------------|
| 355 mm     | 340 mm       | 58 mm          |

### 14-5 Bag properties

Reels are supplied in protective plastic packaging

### 14-6 Box label information

#### Calvus



Dimensions in mm



**[www.antenova.com](http://www.antenova.com)**

**Corporate Headquarters**

Antenova Ltd.  
Far Field House  
Albert Road  
Stow-cum-Quy  
Cambridge  
CB25 9AR  
UK

**Tel:** +44 1223 810600  
**Fax:** +44 1223 810650  
**Email:** [info@antenova.com](mailto:info@antenova.com)

**North America Headquarters**

Antenova Ltd.  
Rogers Business Park  
2541 Technology Drive Suite 403  
Elgin, IL 60124  
USA

**Tel:** +1 (847) 551 9710  
**Fax:** +1 (847) 551 9719  
**Email:** [info@antenova.com](mailto:info@antenova.com)

**Asia Headquarters**

Antenova Asia Ltd.  
4F, No. 324, Sec. 1, Nei-Hu Road  
Nei-Hu District  
Taipei 11493  
Taiwan, ROC

**Tel:** +886 (0) 2 8797 8630  
**Fax:** +886 (0) 2 8797 6890  
**Email:** [info@antenova.com](mailto:info@antenova.com)

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