



## NanoCom ANT1090-P

### Datasheet

Active or Passive Patch Antenna for 1090 MHz

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## 2 Overview

The NanoCom ANT1090-P is a patch antenna designed especially for ADS-B signal reception. It is available in an active and a passive version, which makes it capable of interfacing with the GomSpace SDR transceivers or the dedicated GomSpace ADS-B receiver.

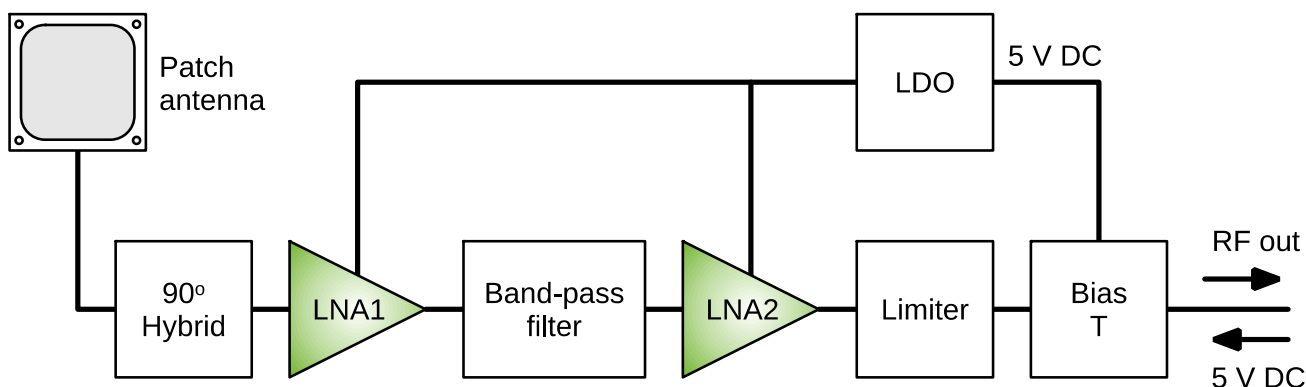
The antenna is built as a sandwich around an aluminium shield/mounting plate. The antenna module is placed on the outside of the mounting plate. The electronics module as well as the SSMCX RF connectors is located on the inside of the mounting plate under an additional aluminium shield.. This construction allows flexible mounting on several different satellite structures – just by changing the mounting plate.

### 2.1 Highlighted Features

- Integrated antenna and LNA/filters results in optimum RF noise figure performance
- Flexible sandwich construction allows flexible mounting on different satellite structures – just by changing the shield/mounting plate.
- RHCP
- Gain: 4.5 dBi
- 1090 MHz
- Shielded electronics
- PCB material: Rogers 4003C substrate (IPC class 3 production)
- IPC-A-610 Class 3 assembly

### 2.2 Active Version

The block diagram of the Active antenna LNA system on the back of the antenna module is depicted below. The diagram illustrates that the input signal is passed through a hybrid coupler to receive the circular polarized signal. The RHCP signal is forwarded to the LNA and filtering section. The LNA chain is powered through the coax cable (RF out) via a Bias T block with a LDO stabilizing the voltage level. A limiter is included to protect the SDR receiver from damage by high power from transmitters.

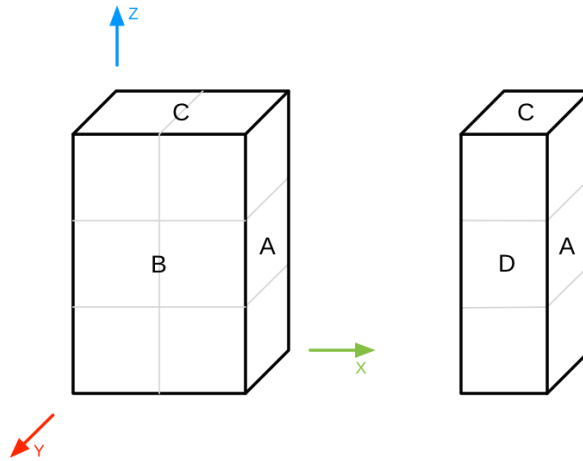


### 2.3 Passive Version

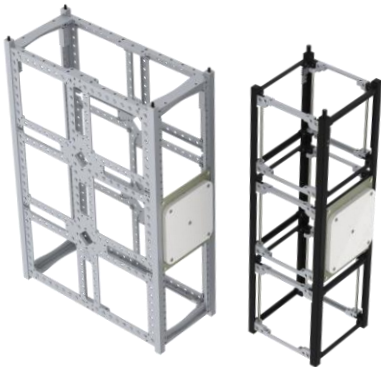
The passive version of the antenna provides a direct connection from the patch antenna to the receiver through the 90° hybrid coupler. Again, the RHCP signal is selected

### 3 Mounting Plate

Four different mounting plates are available, depending on where the ANT1090-P is placed on a nano-satellite. They are all 1.5 mm aluminium. The 3U is used as an example; the plates can also be mounted on 1U and 2U nano-satellite.



**Type A**



Used on the A-side of a 3U or 6U structure

**Type B**



Used on the B-side of a 6U structure.

**Type C**



Used on the top or bottom of a 3U structure. Does not exceed the height of the structure rails.

**Type D**



Used on the D side of a 3U structure

## 4 Connector

A standard SSMCX connector is located on the back of the antenna sandwich assembly. This connector is used as the RF output from the antenna as well as it is used as the supply input for the active version (supply through the RF cable).

## 5 Absolute Maximum Ratings

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the ANT1090-P. Exposure to absolute maximum rating conditions for extended periods may affect the reliability.

Symbol	Description	Typ.	Max.	Unit
V <sub>DC</sub>	DC supply voltage for LNA, active version		5.75	V
T <sub>operation</sub>	Operating temperature	-40	85	°C
T <sub>storage</sub>	Storage temperature	-40	85	°C

## 6 Electrical Characteristics, active version

Symbol	Description	Min.	Typ.	Max.	Unit
V <sub>DC</sub>	DC supply voltage for LNA	4.0	5.0	5.25	V
I <sub>DC</sub>	DC current needed from supply	30	31	40	mA

## 7 Physical Characteristics

Depending on mounting plate. Approximate values bellow:

Description	Value	Unit
Mass	135	g
Size	100.0 x 100.0 x 12.0	mm

## 8 RF Performance Characteristics

### 8.1 Patch Antenna Performance with Type B & C backplates

Parameter	Result	Unit
Return loss	< -8	dB
Realized Gain, centre frequency	> 4.5	dBi
3 dB beam width	> 80	°
Polarization	RHCP	
Frequency	1.085 – 1.095	GHz
Axial Ratio within ±40 degrees theta	< 3	dB

### 8.2 Patch Antenna Performance with Type A & D backplates attached to structure

Parameter	Result	Unit
Return loss	< -8	dB
Realized Gain, centre frequency	> 4.5	dBi
3 dB beam width	> 60	°
Polarization	RHCP	
Frequency	1.085 – 1.095	GHz
Axial Ratio within ±40 degrees theta	< 6	dB

### 8.3 Electronics module performance

#### Active

Symbol	Description	Test temperature	Min.	Max.	Unit
Gain	LNA Gain (ref plane to RX conn.)	-40~85°C	27	32	dB
NF	LNA Noise Figure (ref. plane)	-40~85°C		1.5	dB
Frequency	LNA frequency band	-40~85°C	1085	1095	MHz
P <sub>1dB</sub>	LNA output power@ 1 dB compression point	25°C	-2		dBm
IP <sub>3i</sub>	LNA 3rd order intercept point	25°C		8	dBm
P <sub>in</sub>	Input RF power level to LNA	25°C		-20	dBm
P <sub>out, max</sub>	LNA maximum RF output power	25°C		5	dBm

Note: The limiter functions while the P<sub>out</sub> is higher than 0 dBm and as such P<sub>out</sub> is kept lower than 5 dBm. This function will protect the SDR receiver from damage by high power from transmitters.

#### Passive

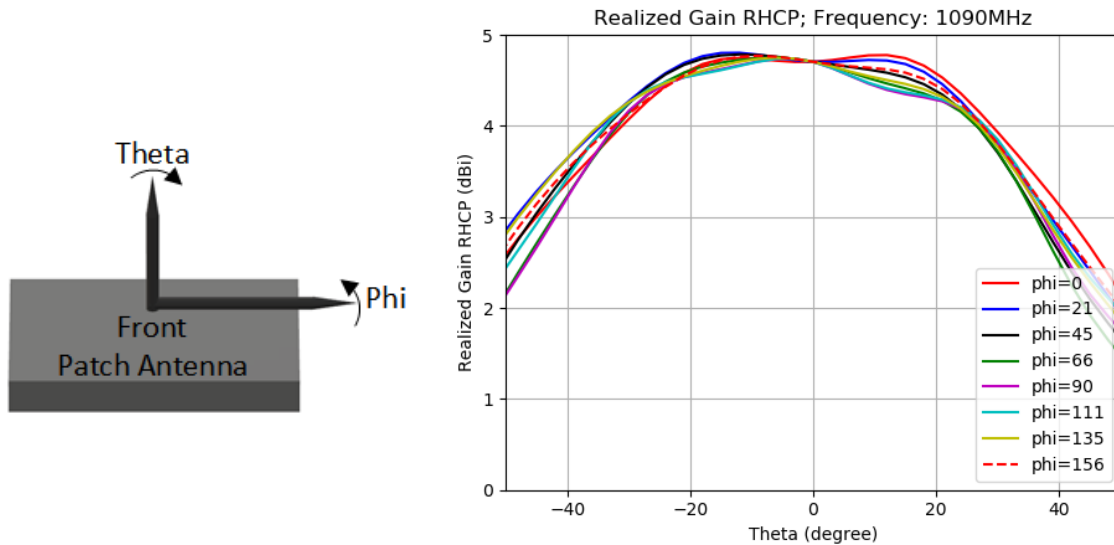
Symbol	Description	Test temperature	Min.	Max.	Unit
RL	Return loss for combined output	-40~85°C		-15	dB
IL	Insert loss	-40~85°C		-0.35	dB

## 9 Antenna Performance

Figure below is a typical measured radiation pattern, and a definition of the Phi and Theta angles used to describe the general antenna performance with Type B & C backplates.

The antenna module includes connectors and matching circuit and has two feed ports which must be driven 90° out of phase to generate a circular polarized radiation.

On the electronics board a hybrid coupler generates the necessary quadrature signals. For the antenna measurements, an adaptor board with the same hybrid coupler is used as test interface and the adaptor board loss (~0.30 dB) is compensated in the measurements.

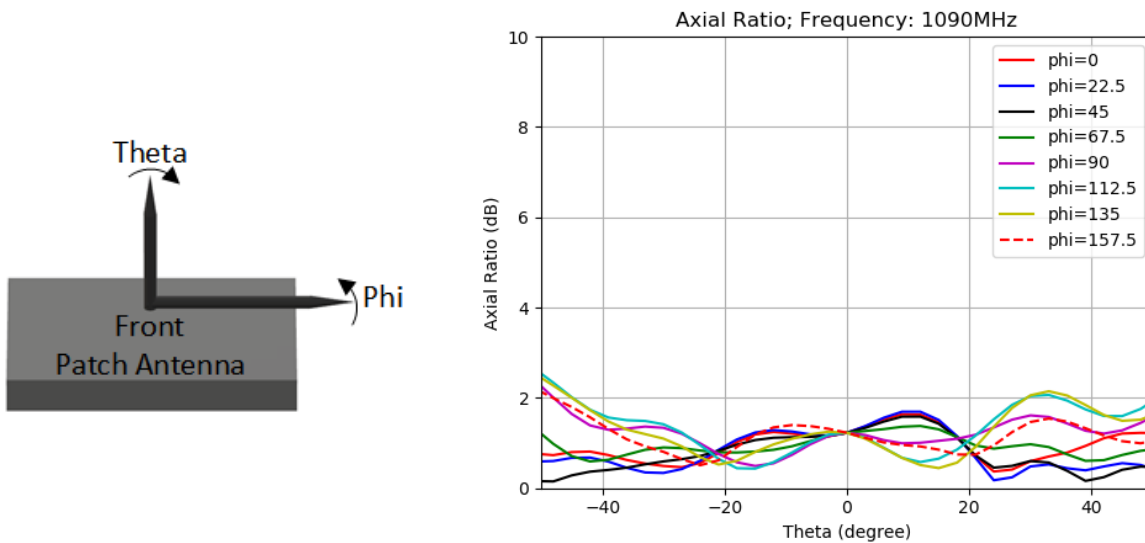


### 9.1 Axial Ratio

ANT1090-P is circular polarized, and product polarization is determined by the electronics PCB.

Below is the axial ratio as a function of Theta for different Phi angels.

As seen the axial ratio is excellent well beyond the  $\pm 40^\circ$  half-power beamwidth.

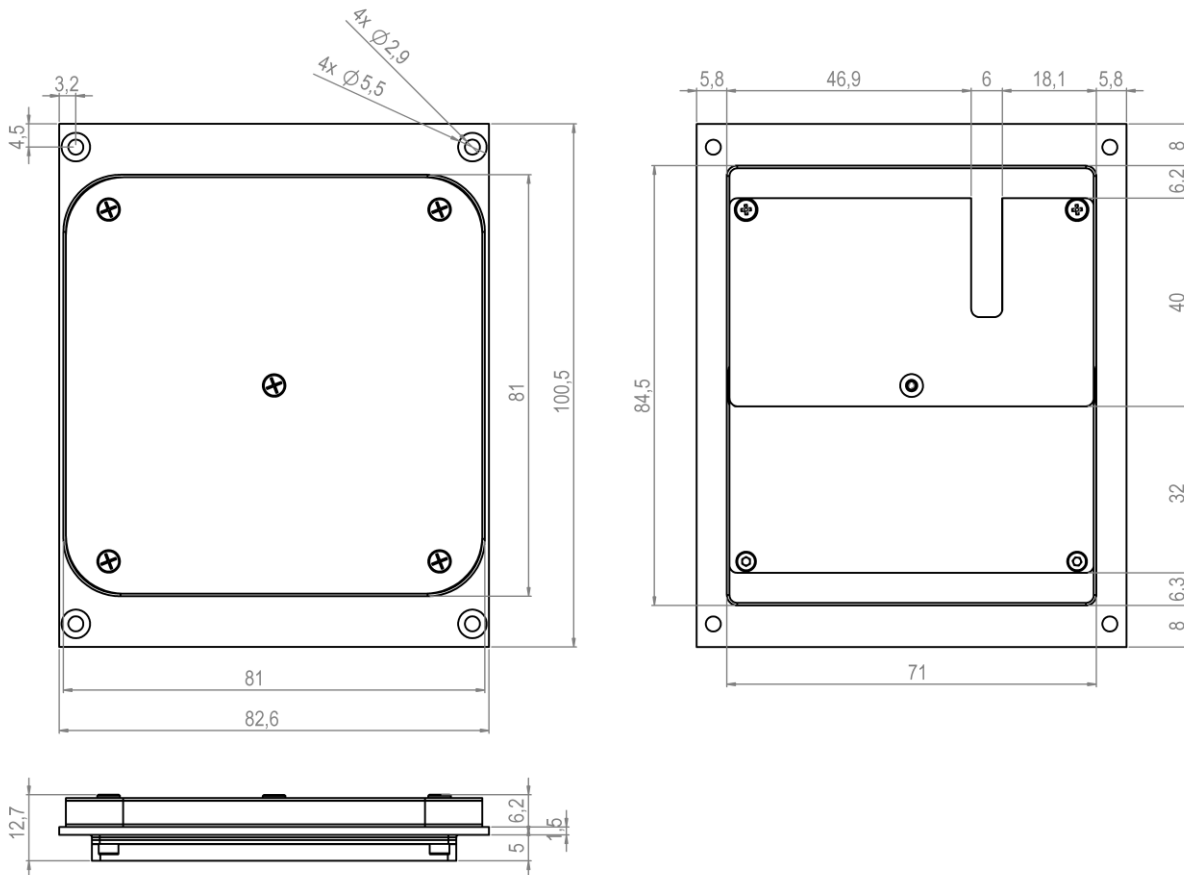




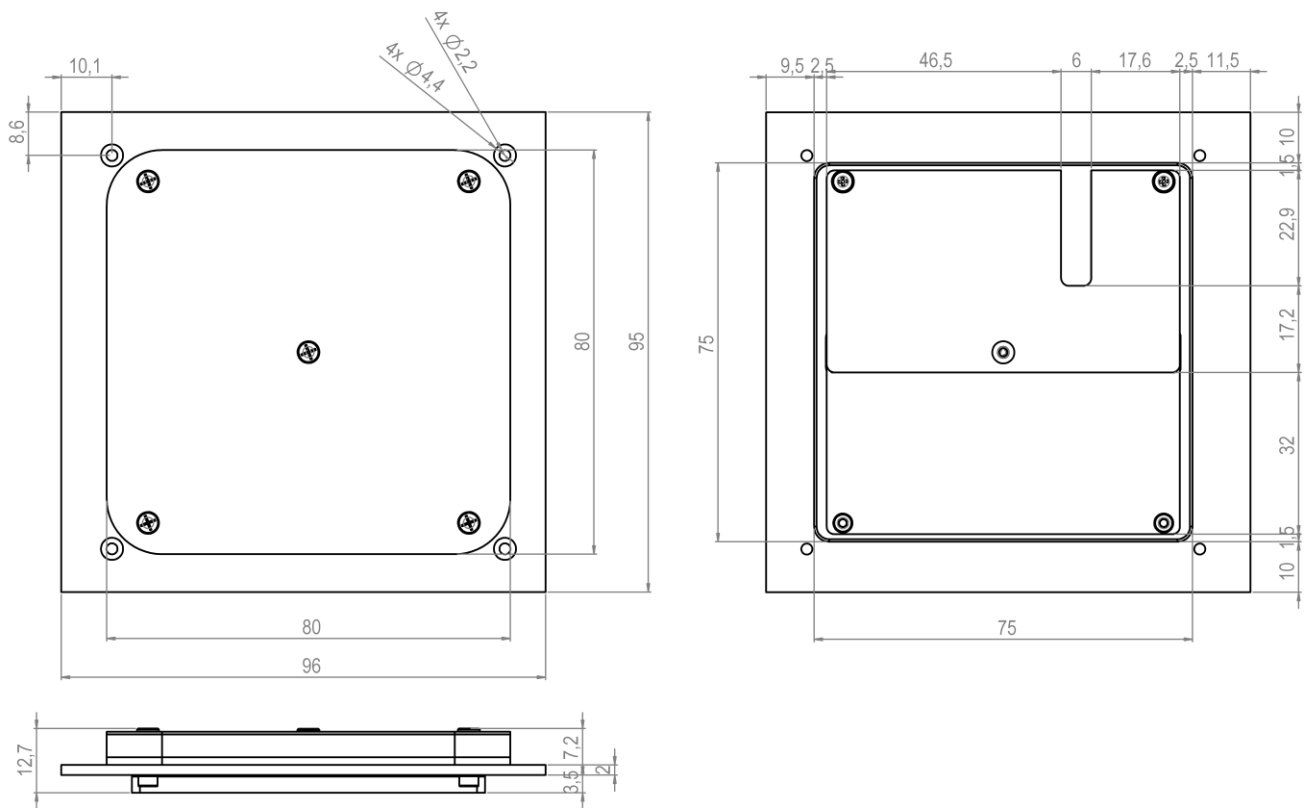
## 10 Mechanical Drawing

All dimensions in mm.

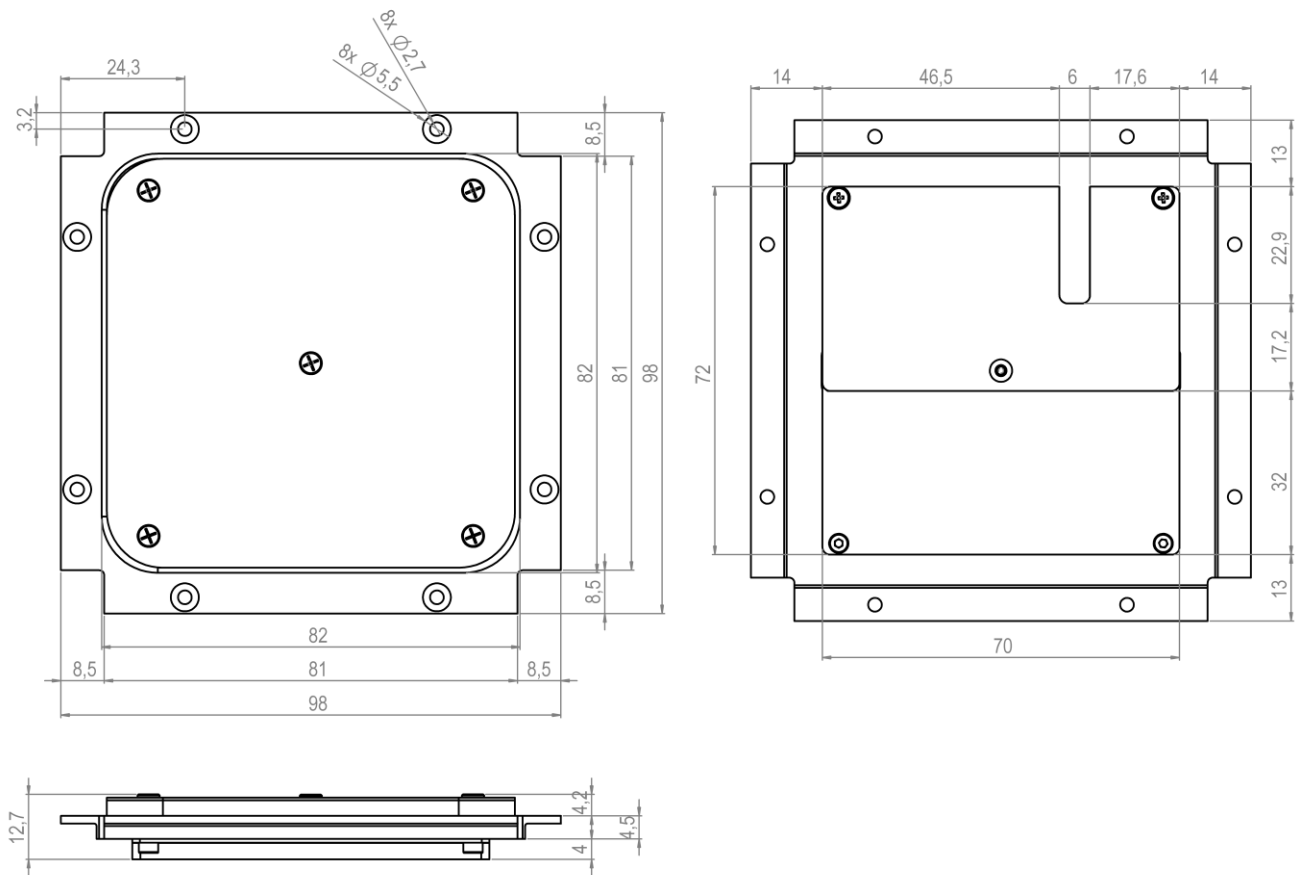
### 10.1 Type A



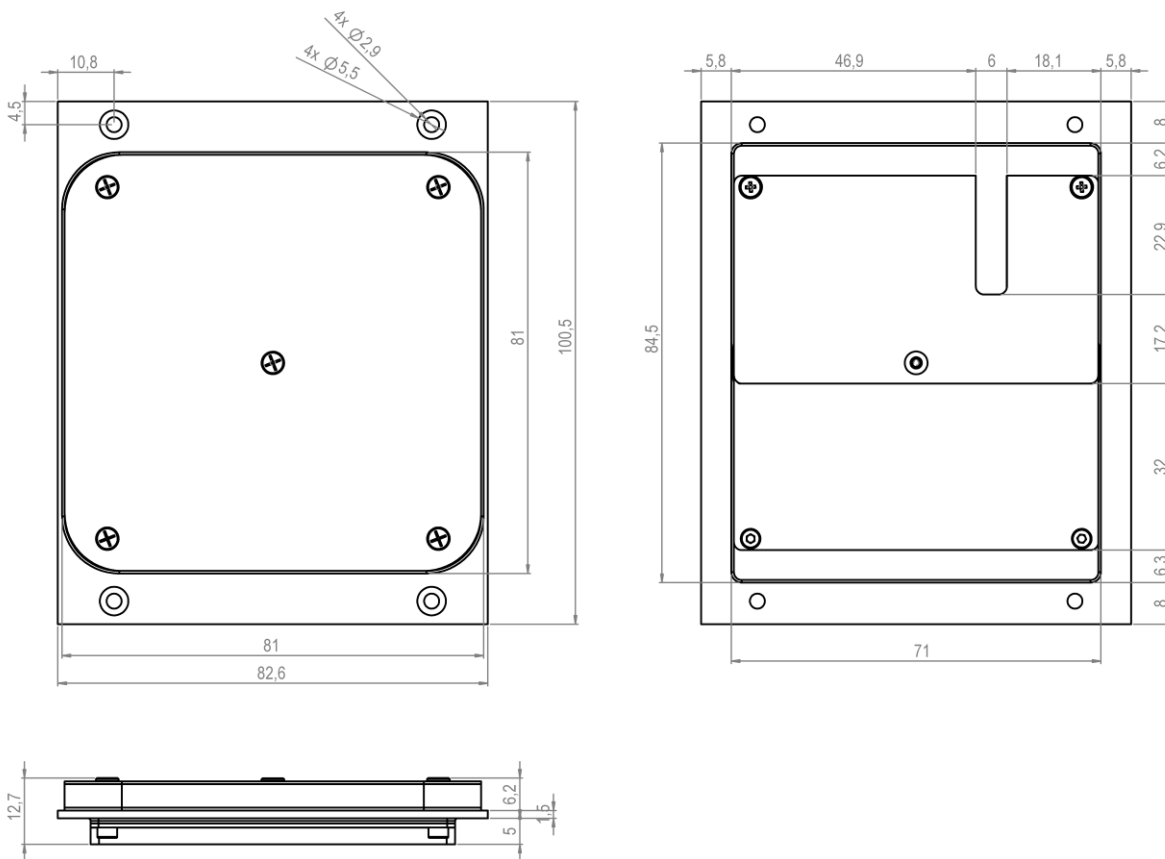
## 10.2 Type B



### 10.3 Type C



### 10.4 Type D



### 11 Disclaimer

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## 12 Related GomSpace Products

### 12.1 NanoCom ADS-B

The NanoCom ANT1090-P is specifically designed for the GomSpace NanoCom ADS-B used for picking up and broadcast airplanes positions. It has flown successfully on many missions. See datasheet for further information.



### 12.2 Software Defined Radio (SDR) Platform

The SDR platform is utilized for a high-speed S-band ground link and for inter-satellite links utilizing S- or K band in a highly miniaturized radio system for long distance communication.

The unit contains a transceiver (NanoCom TR-600) and a powerful FPGA module (NanoMind Z7000).

