

NanoCom
AM2150P / AM2150PS Antenna System

Datasheet

Product name: AM2150-P and AM2150-PS

Document No.: 1029876

Revision: 1.4

Author: PNN

Approved by: ROBB

Approval date: 23-08-2022

Confidentiality Notice

This document is submitted for a specific purpose as agreed in writing and contains information, which is confidential and proprietary. The recipient agrees by accepting this document, that this material will not be used, transferred, reproduced, modified, copied or disclosed in whole or in part, in any manner or to any third party, except own staff to meet the purpose for which it was submitted without prior written consent.

GomSpace © 2022

Table of Contents

1	OVERVIEW	4
1.1	Highlighted Features.....	4
1.2	Functional Description	5
2	HARDWARE LAYOUT, CONNECTORS	5
3	ABSOLUTE MAXIMUM RATINGS	6
4	RF AND ELECTRICAL CHARACTERISTICS	6
4.1	Antenna Measurements.....	6
4.1.1	ANT2150-P Standalone.....	7
4.1.2	ANT2150-P/PS System	8
5	PHYSICAL CHARACTERISTICS	11
6	MECHANICAL DRAWING	12
6.1	AM2150P Type A.....	12
6.2	AM2150P Type B.....	13
6.3	AM2150P Type C	14
6.4	AM2150P Type D	15
6.5	AM2150PS Type A	16
6.6	AM2150PS Type B	17
6.7	AM2150PS Type C	18
6.8	AM2150PS Type D	19
7	DISCLAIMER	20

1 Overview

The NanoCom AM2150-P/PS is an S-band antenna solution for systems requiring near omni-directional radiation pattern and right-hand circular polarization. It is designed to complement AX2150 low power radio but will work with other radio systems as well.

Used as a two-antenna system with antennas mounted on opposite satellite faces, the system form a near omni-directional antenna system for nano satellite applications.

NanoCom AM2150-P and AM2150-PS are based on the flight proven AM2150 stacked-patch antenna element used in GomSpace ANT2000 products with extensive and successful flight heritage since 2017.

It should be noted that AM2150-P is a standalone patch antenna that can be used for directional S-band communication systems.

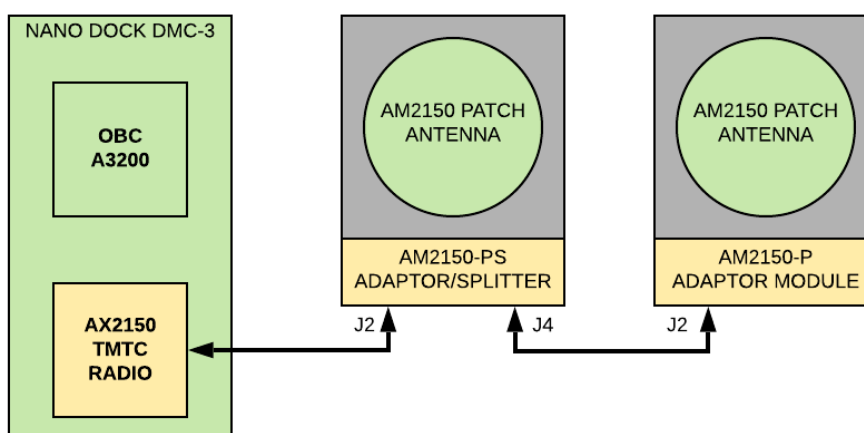


Figure 1-1. Typical AM2150-P / AM2150-PS TMTc Application

1.1 Highlighted Features

- Features
 - Advanced stacked patch antenna designed with low loss materials
 - Coverage 2025 – 2290 MHz
 - Radiation pattern: near omni-directional
 - Right-hand circular polarization
 - All metallic parts connected to ground
 - No restrictions on coax cable. System not sensitive to feed phase.
- Performance
 - Matching $|S_{11}| < -10\text{dB}$
 - Antenna gain:
 - $> -12\text{ dBi}$ for $>85\%$ of directions.
 - $> 0\text{ dBi}$ for 20% of directions.
- Interfaces
 - Choice of mounting plates (as ANT2000) for different mounting locations.
 - MCX Coaxial connectors
 - Mass $<100\text{g}$ pr. module excluding harness

1.2 Functional Description

The NanoCom AM2150-P/PS module are sandwiched around a mounting plate (several types available) with a wideband stacked patch antenna element on the “outside” and an adaptor PCB on the “inside” containing the antenna feed network and for the AM2150-PS an additional power splitter. The antenna and adaptor are interfaced using RF compression connectors with flight heritage from ANT2000 and other GomSpace antenna products.

In the typical application the patches will be mounted on opposite satellite faces for best coverage. An example of the resulting radiation pattern is shown in Figure 1-2. The radiation pattern shows that the antenna system has two main lobes with a band of lower gain perpendicular to the main lobes.

For a tumbling satellite where the direction towards the ground station is more or less random the antenna system gain will have to be evaluated using a statistical approach resulting in a “link probability”

For communication with a stabilised satellite the link quality and coverage will depend on the mounting of the patch antennas and the nominal flight mode. Ideally one of the patch antennas should be mounted facing towards Earth.

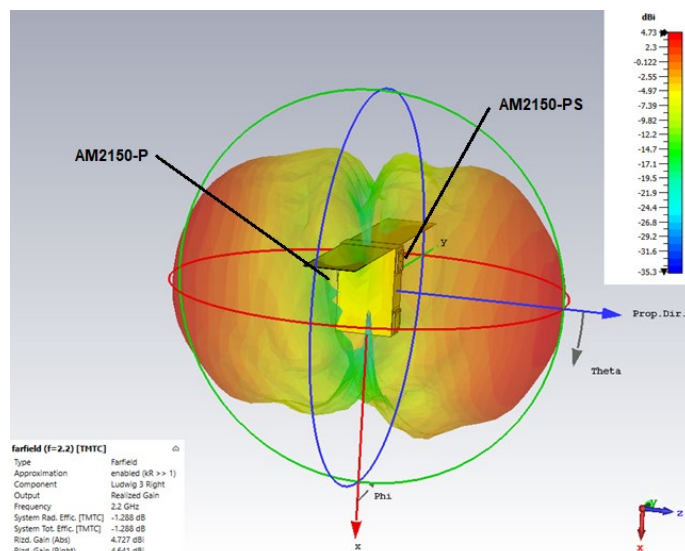


Figure 1-2. Radiation pattern on 6U with top mounted solar panels. Antennas are mounted on $\pm Y$ face.

2 Hardware Layout, Connectors

In the typical application the connections will be as shown in Figure 1-1 with AM2150-P (J2) connected to AM2150-PS (J4). The radio equipment is connected to AM2150-PS (J2)

All connectors are 50Ω MCX types and should be connected by suitable 50Ω coaxial cables.



Figure 2-1. Connector placement on AM2150-P (left) and AM2150-PS (right)

3 Absolute Maximum Ratings

Symbol	Description	Conditions	Value	Unit
P_{max}	Maxim input power (J2)	Average	5*	W
T_{op}	Operating temperature		-40 to 85	°C
$T_{storage}$	Storage temperature		-40 to 85	°C

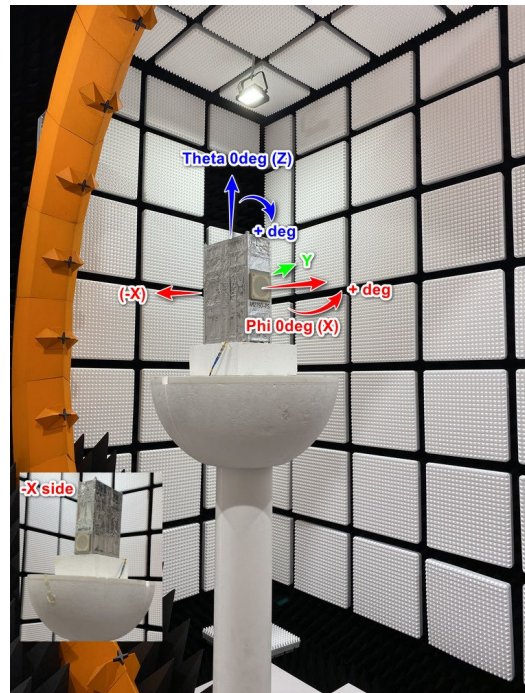
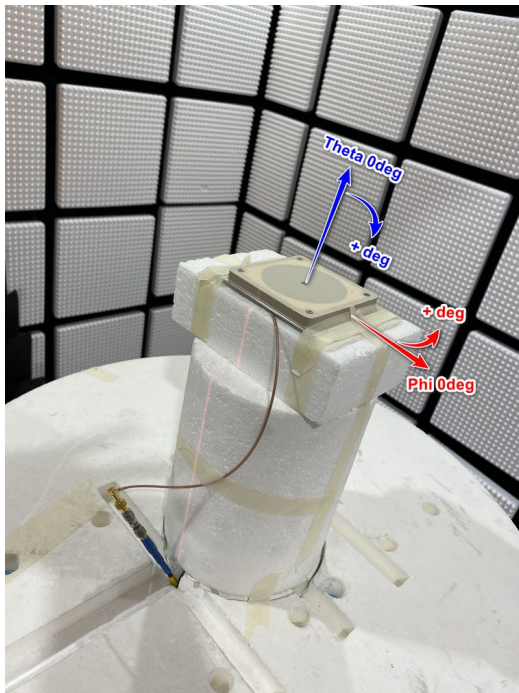
* for application at higher power levels contact GomSpace

4 RF and Electrical Characteristics

Symbol	Description	Conditions	Value	Unit
Z_o	Nominal impedance		50	Ω
$ S_{11} $	Input matching (P2/P4)	All	< -10	dB
$G_{a,sys}$	System (ANT2150-P/PS) antenna gain for all directions	> -12 dBi > 0 dBi	85 20	% %
$G_{a,sin}$	ANT2150-P antenna gain boresight		6.8 – 7.5	dBi

4.1 Antenna Measurements

Antenna radiation pattern and axial ratio has been measured using a Satimo SG24 system. The tested HW configurations and antenna plotting coordinates are shown below.



AM2150PS face Phi = 0deg (X), Theta = +90deg
 AM2150P face Phi=-180deg (-X), Theta -90deg

Figure 4-1. Test setup / plotting coordinates AM2150-P standalone (left) and AM2150-P/PS system on 6U (right).

4.1.1 ANT2150-P Standalone

Plots of RHCP gain and axial ratio for selected frequencies and phi cuts are shown below for ANT2150-P standalone.

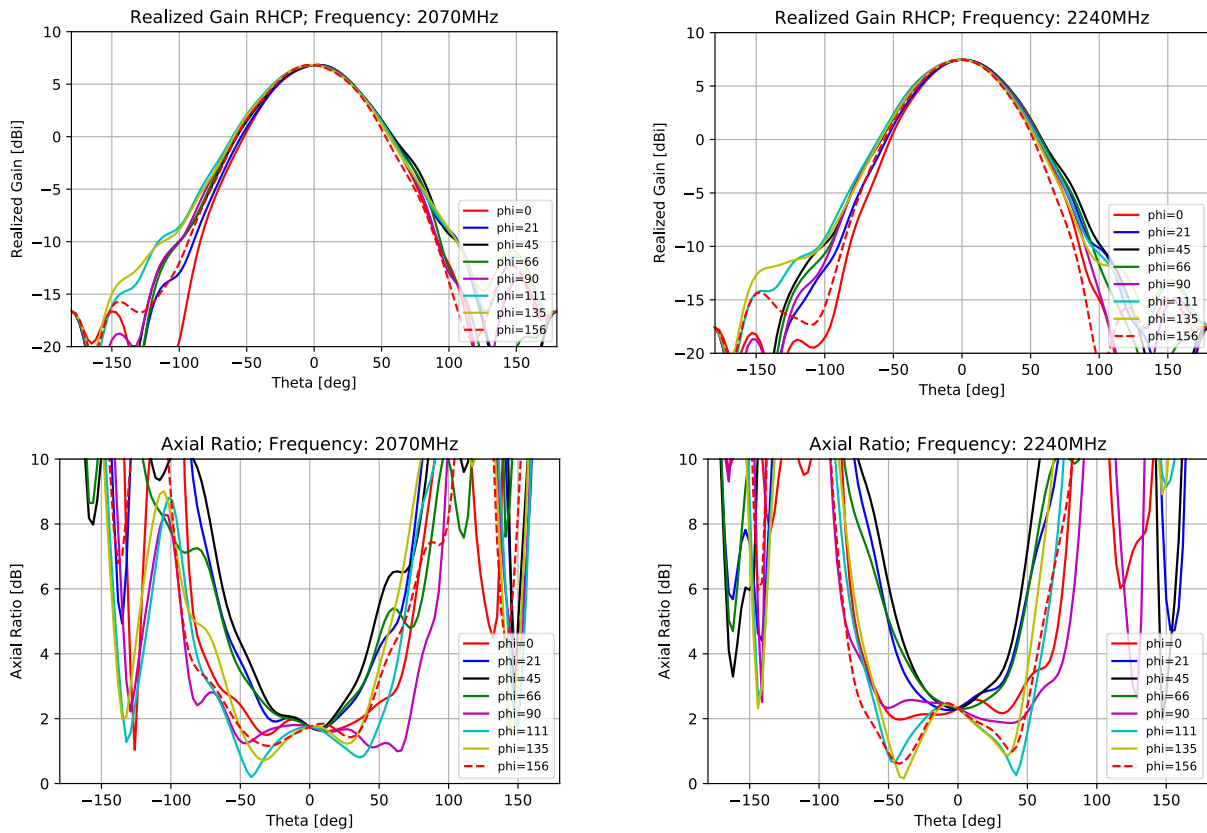


Figure 4-2. AM2150-P single patch gain and axial ratio for 2070MHz and 2240MHz.

4.1.2 ANT2150-P/PS System

Plots of RHCP gain and axial ratio for selected frequencies and XYZ planes are shown below for ANT2150-P/PS antenna system.

ANT2150-PS is placed in the middle quadrant on a 6U structure pointing $\Phi = 0^\circ$, $\Theta = 90^\circ$, and ANT2150-P is placed in a lower quadrant on the opposite side pointing $\Phi = 0^\circ$, $\Theta = -90^\circ$.

The antennas are interconnected using a 30cm long RG178 based coax cable, having a loss of 0.8dB in the tested frequency band.

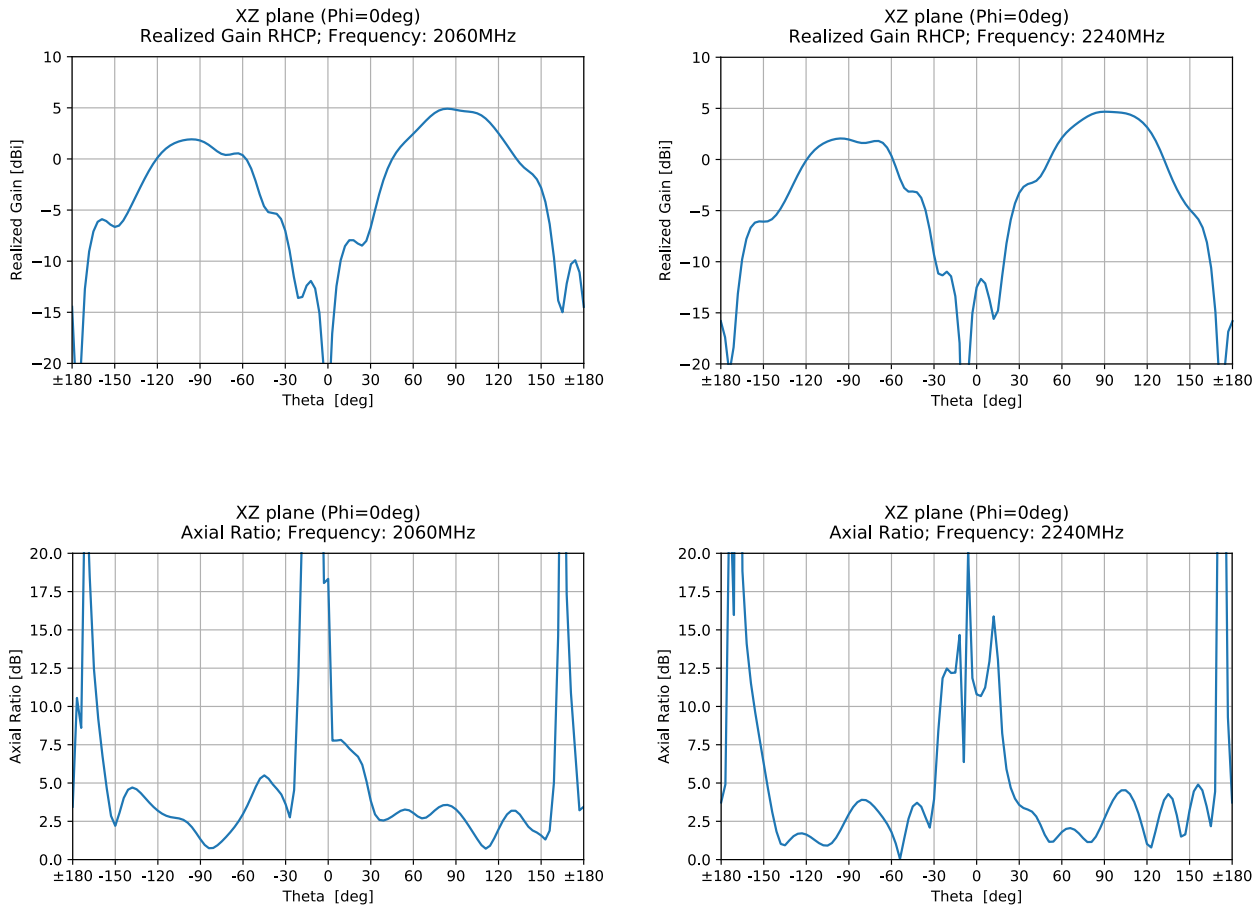


Figure 4-3. Antenna system gain and axial ratio for 2060MHz and 2240MHz – XZ Plane.

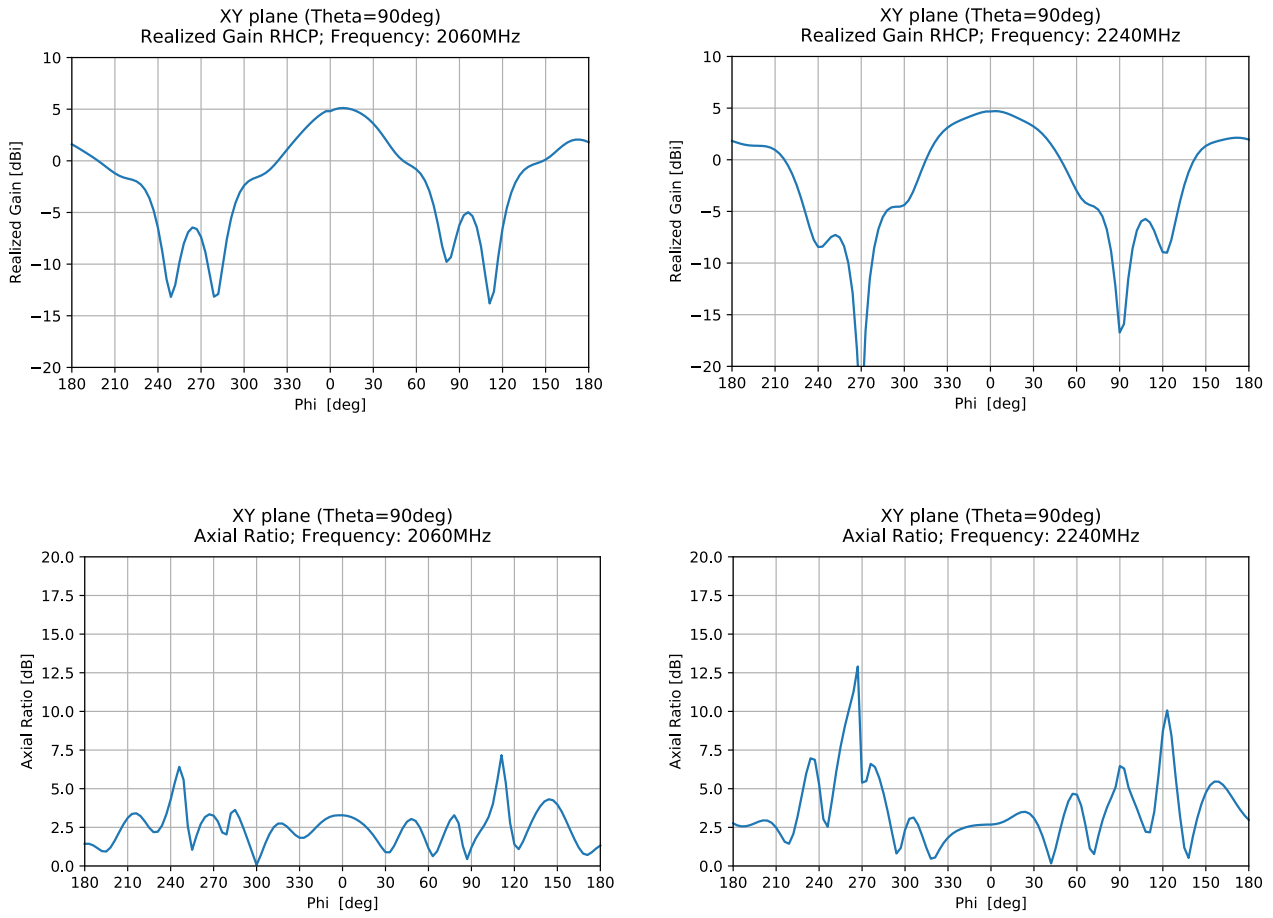


Figure 4-4. Antenna system gain and axial ratio for 2060MHz and 2240MHz – XY Plane.

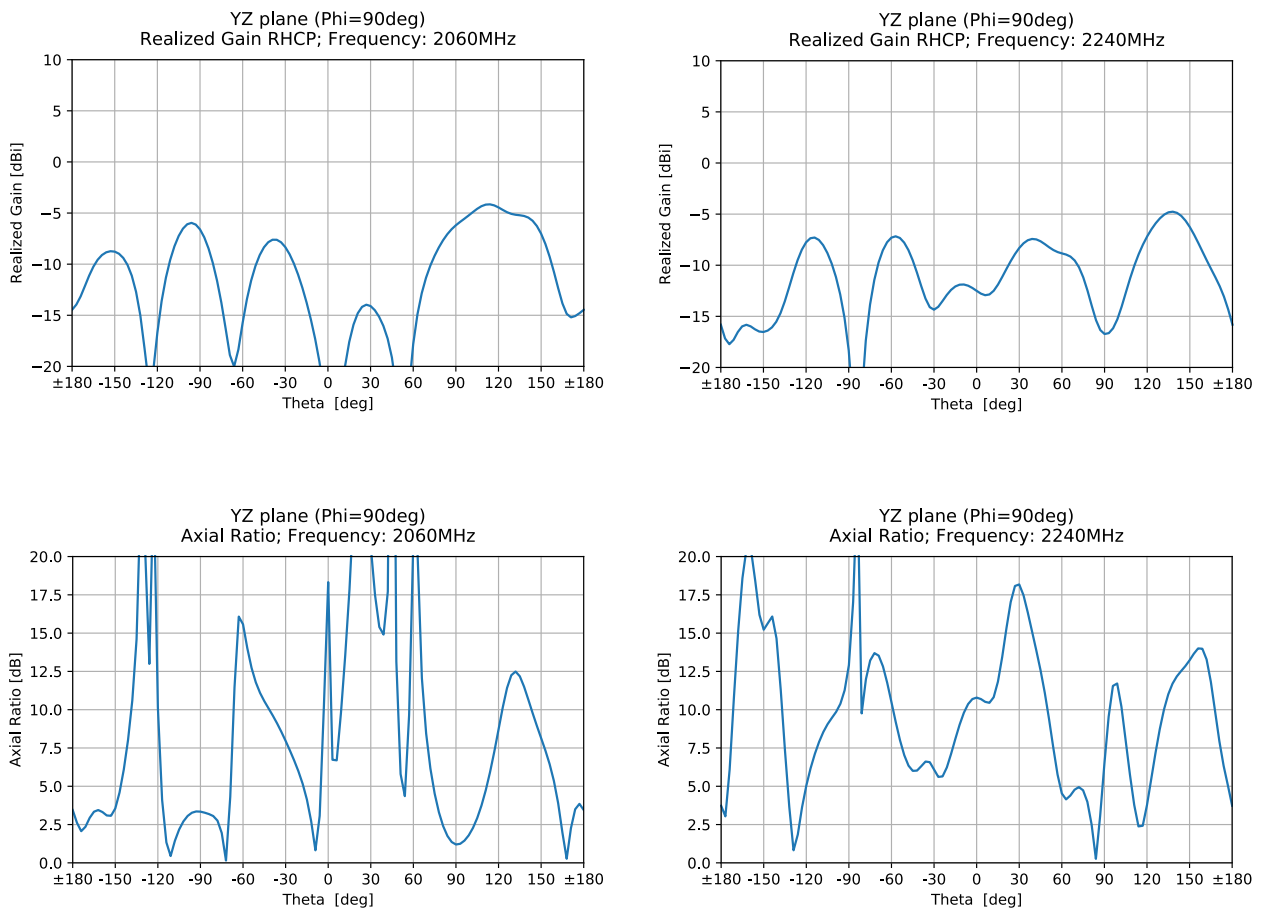


Figure 4-5. Antenna system gain and axial ratio for 2060MHz and 2240MHz – YZ Plane.

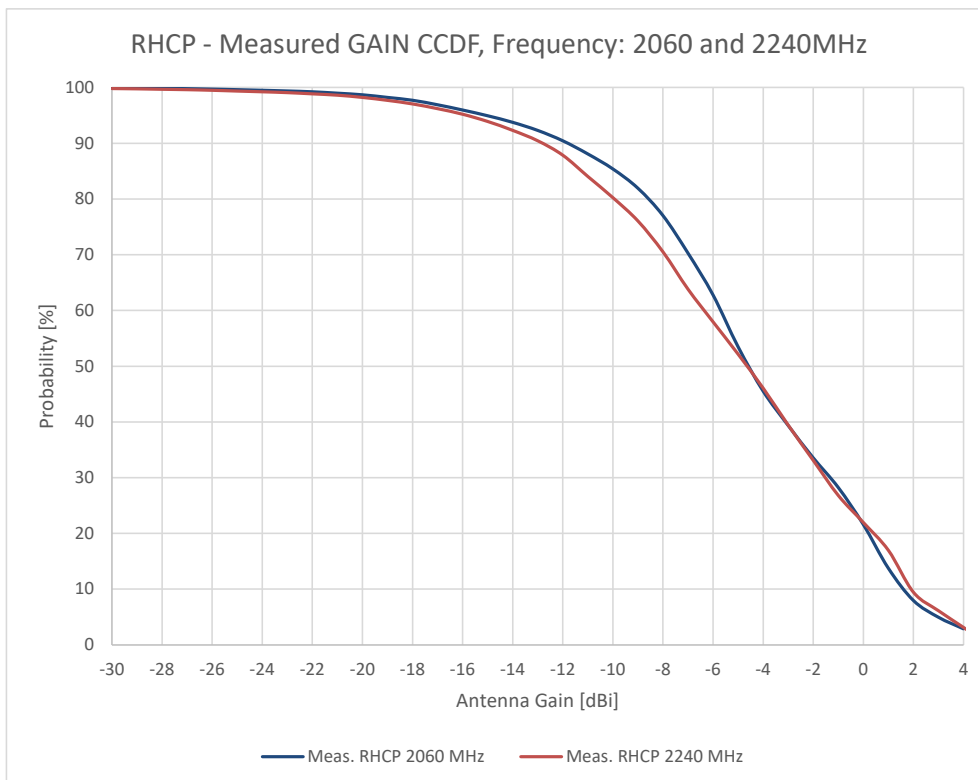


Figure 4-6. Antenna system gain CCDF for all directions.

5 Physical Characteristics

Symbol	Description	Conditions	Value	Unit
Size	Size depends on mounting options	See detail drawings		
M_p	Mass AM2150-P (incl. mounting plate)		90	g
M_{ps}	Mass AM2150-PS (incl. mounting plate)		93	g

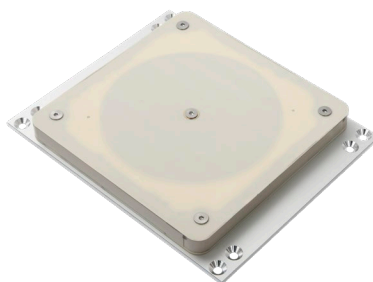
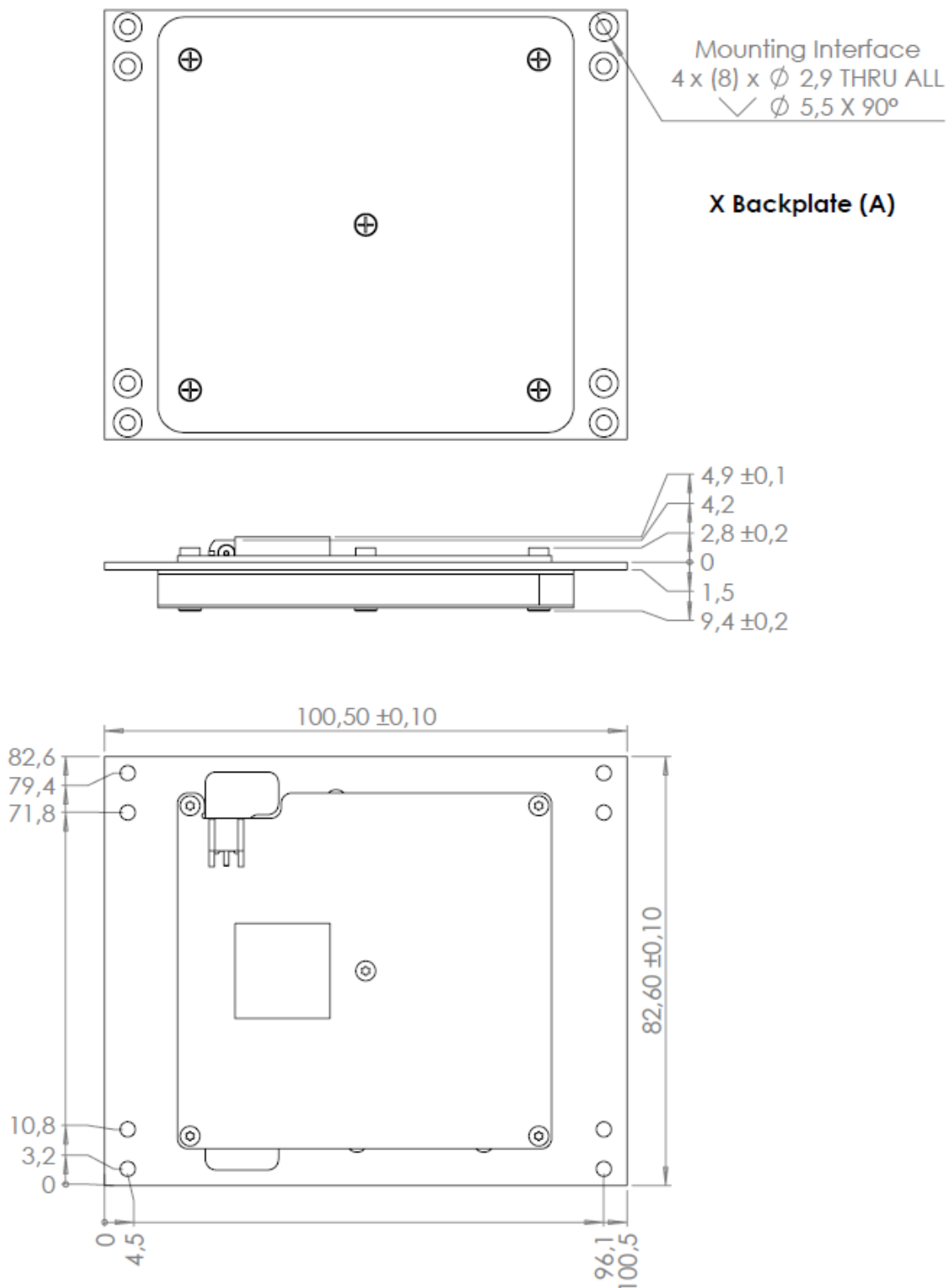


Figure 5-1. Mounting plate used for mass measurement.

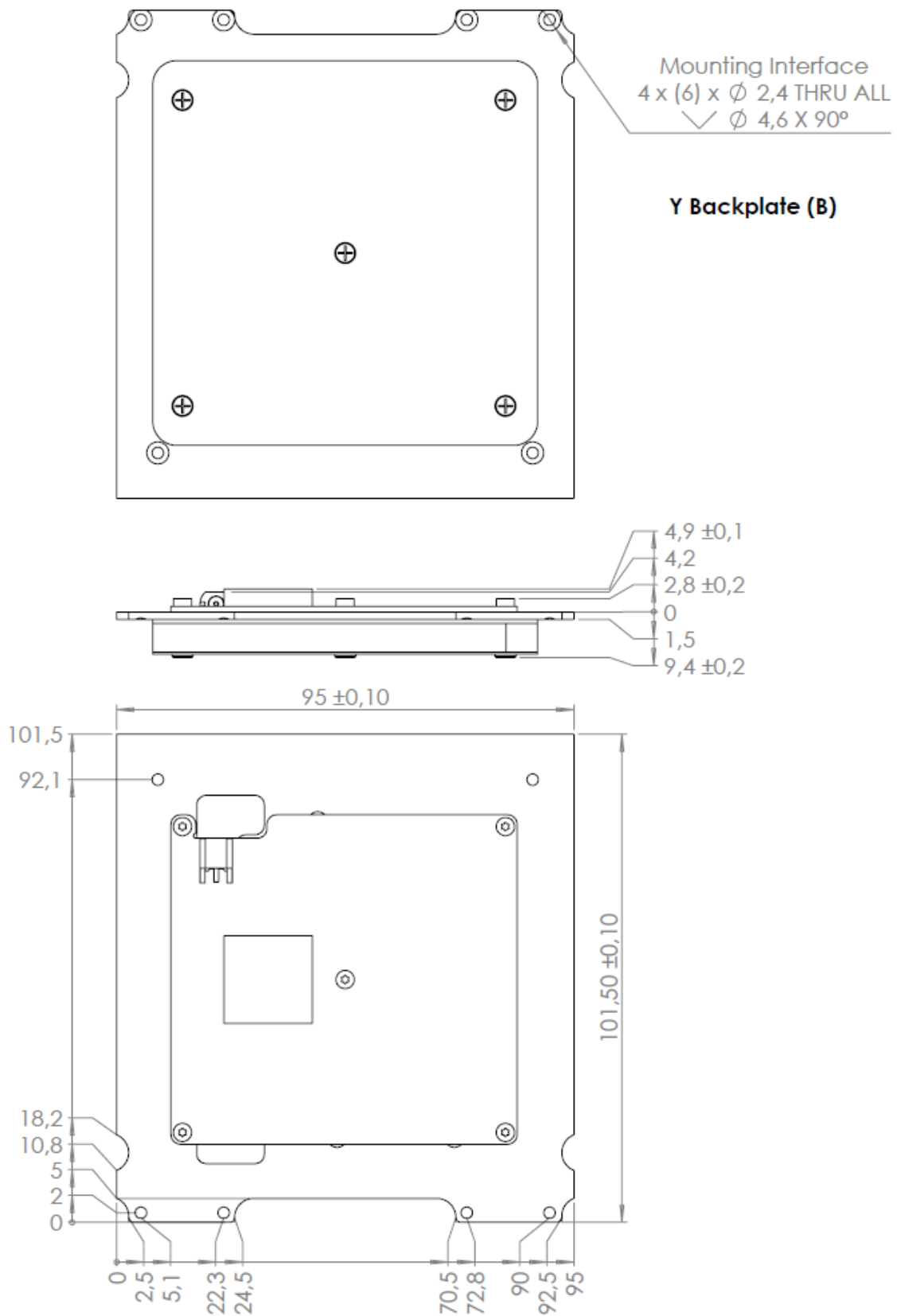
6 Mechanical Drawing

All dimensions in mm.

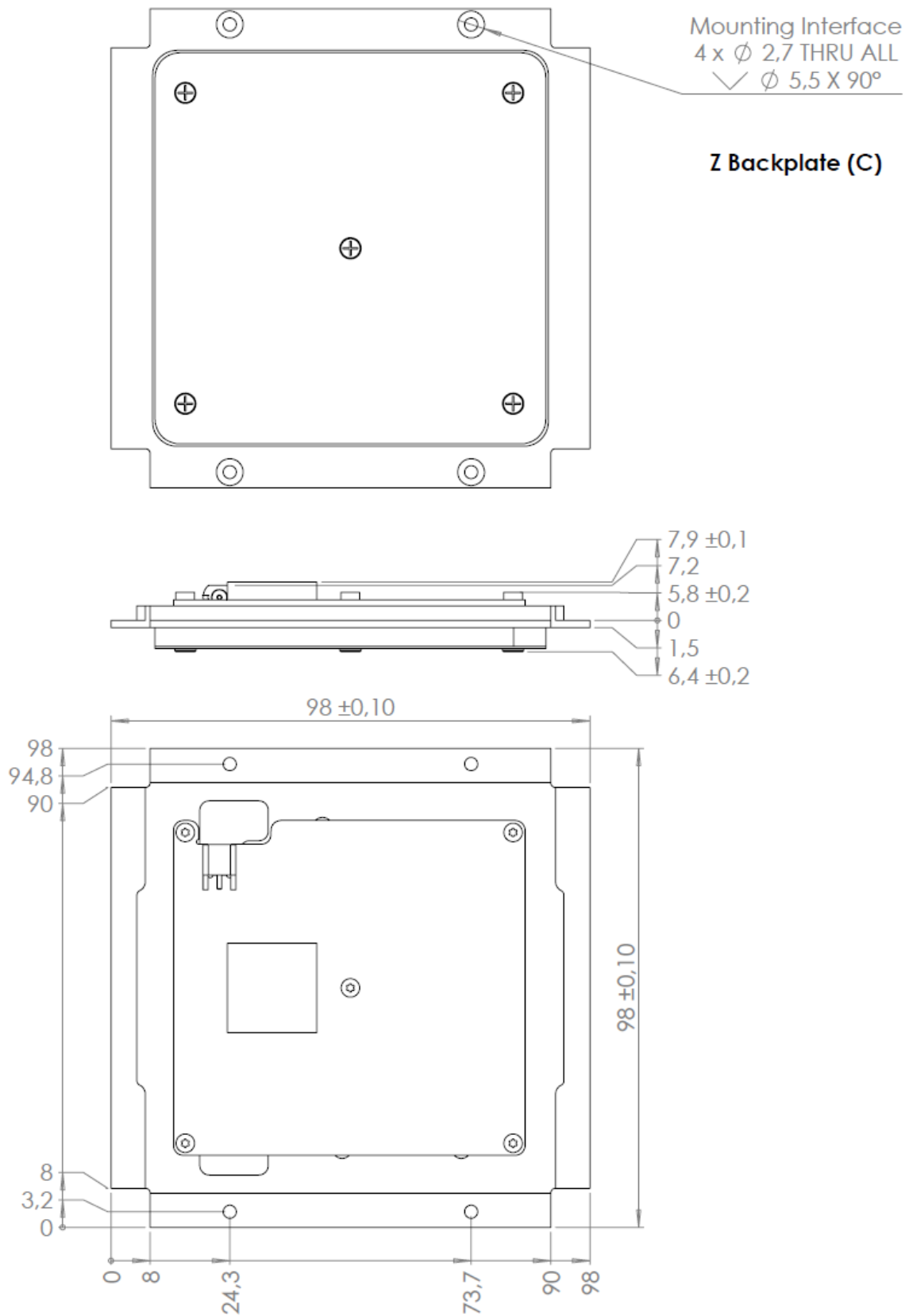
6.1 AM2150P Type A



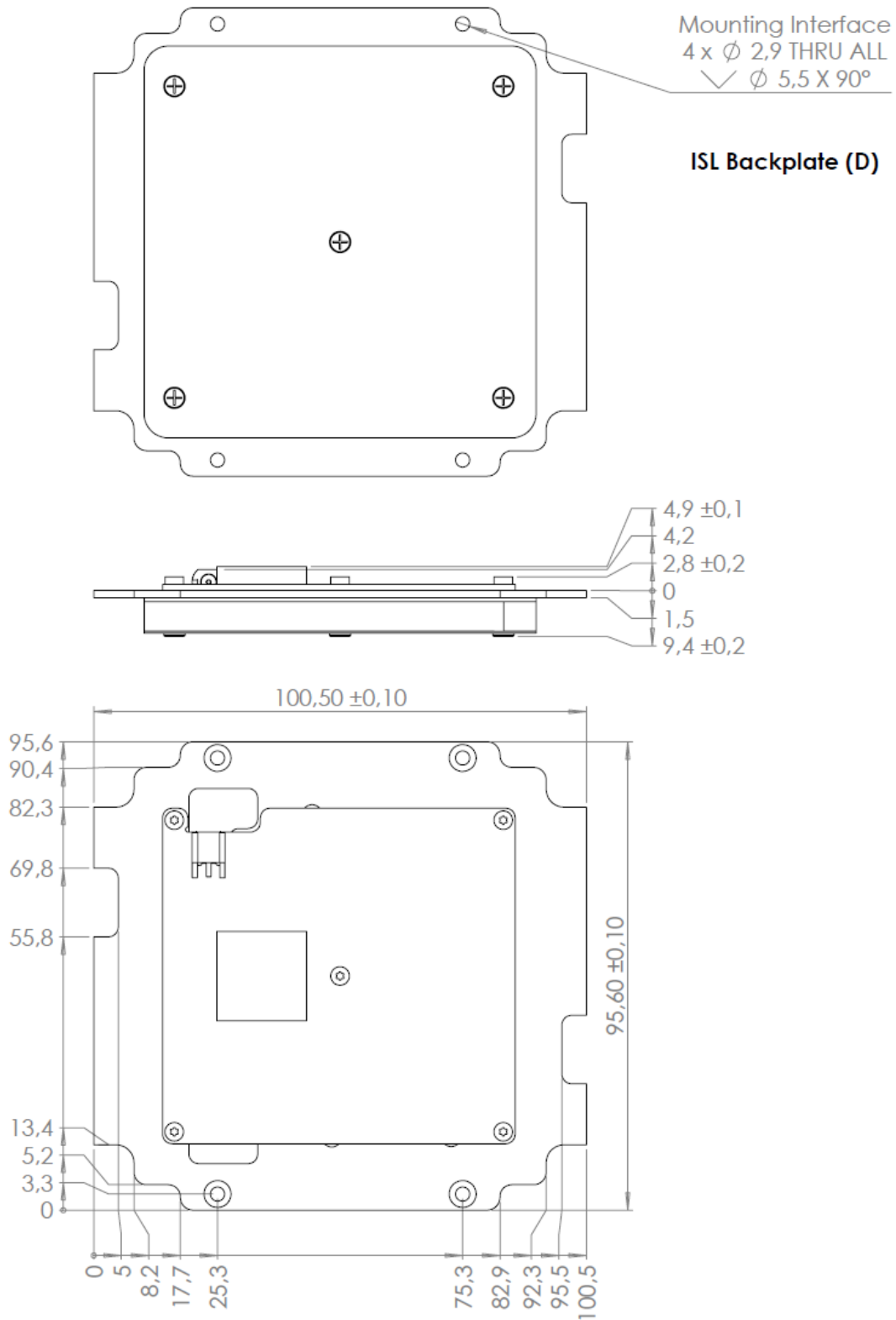
6.2 AM2150P Type B



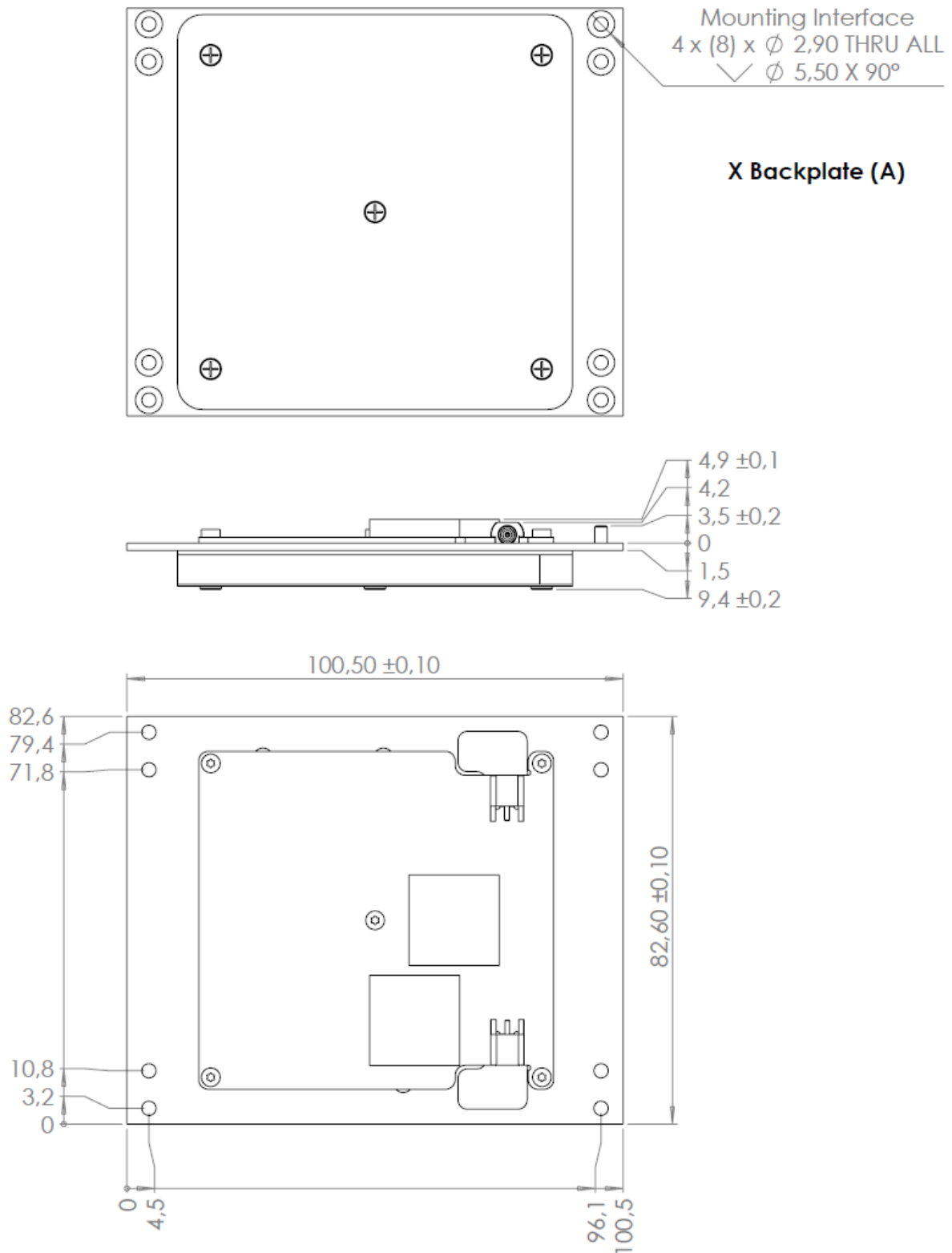
6.3 AM2150P Type C



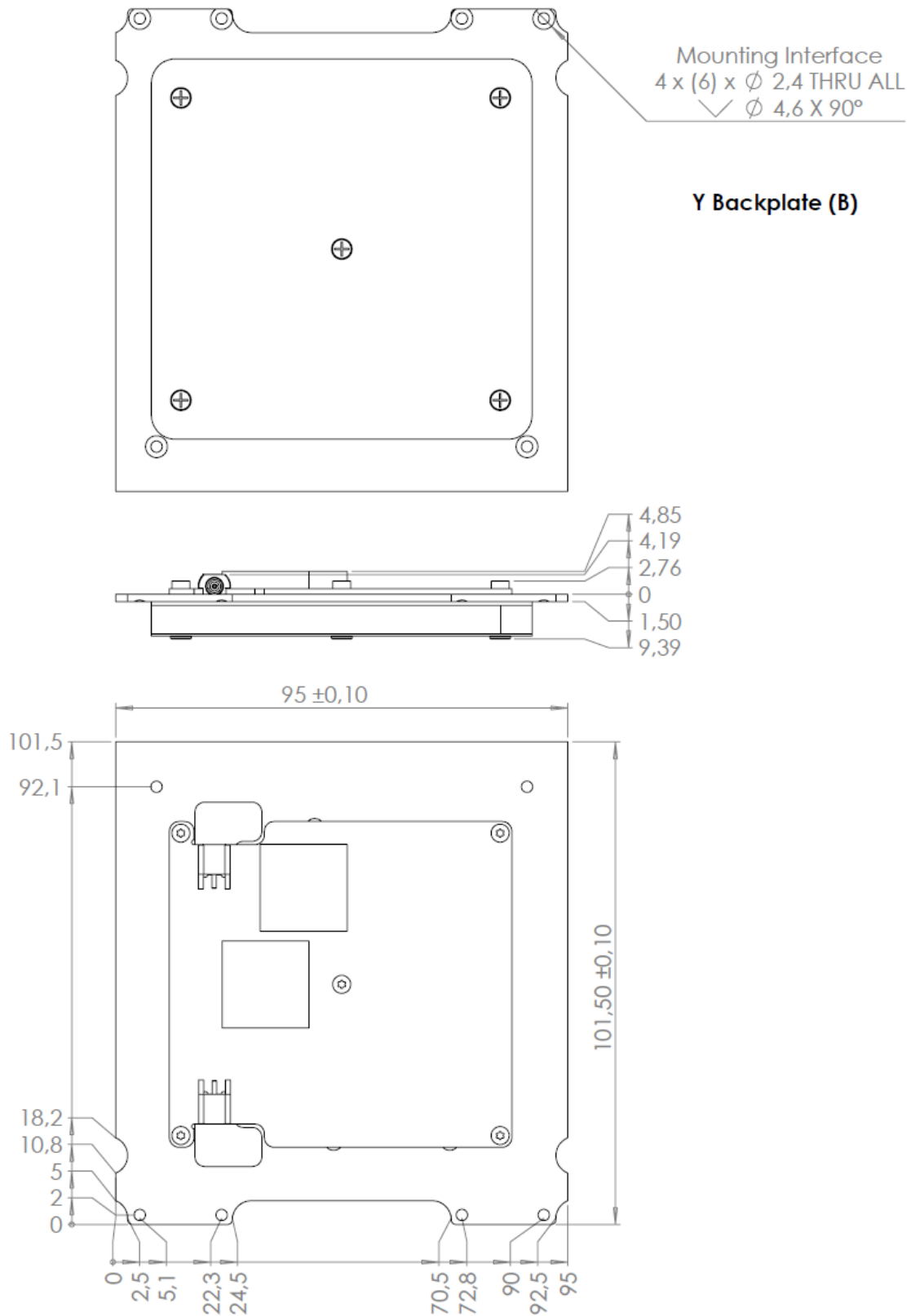
6.4 AM2150P Type D



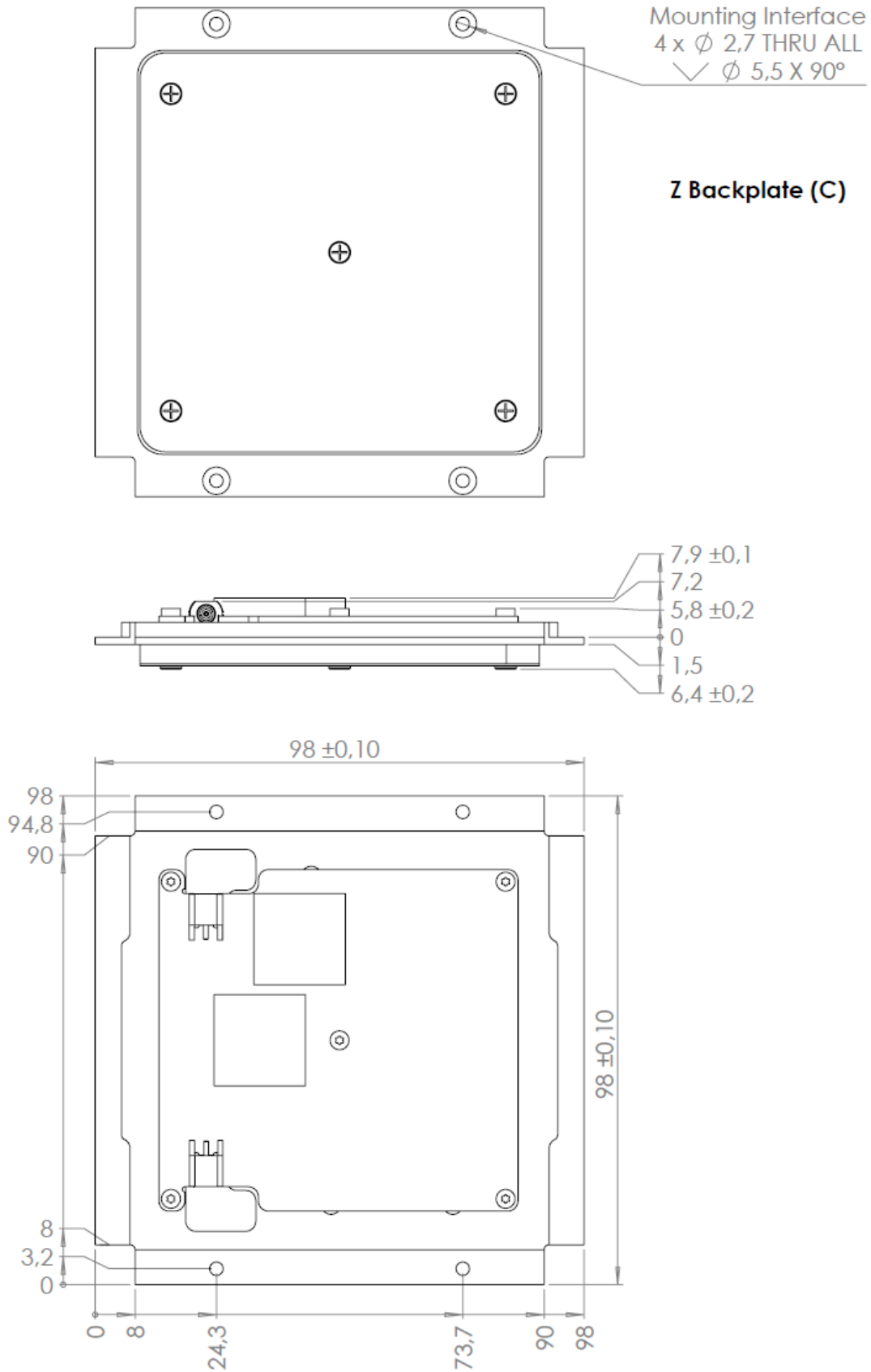
6.5 AM2150PS Type A



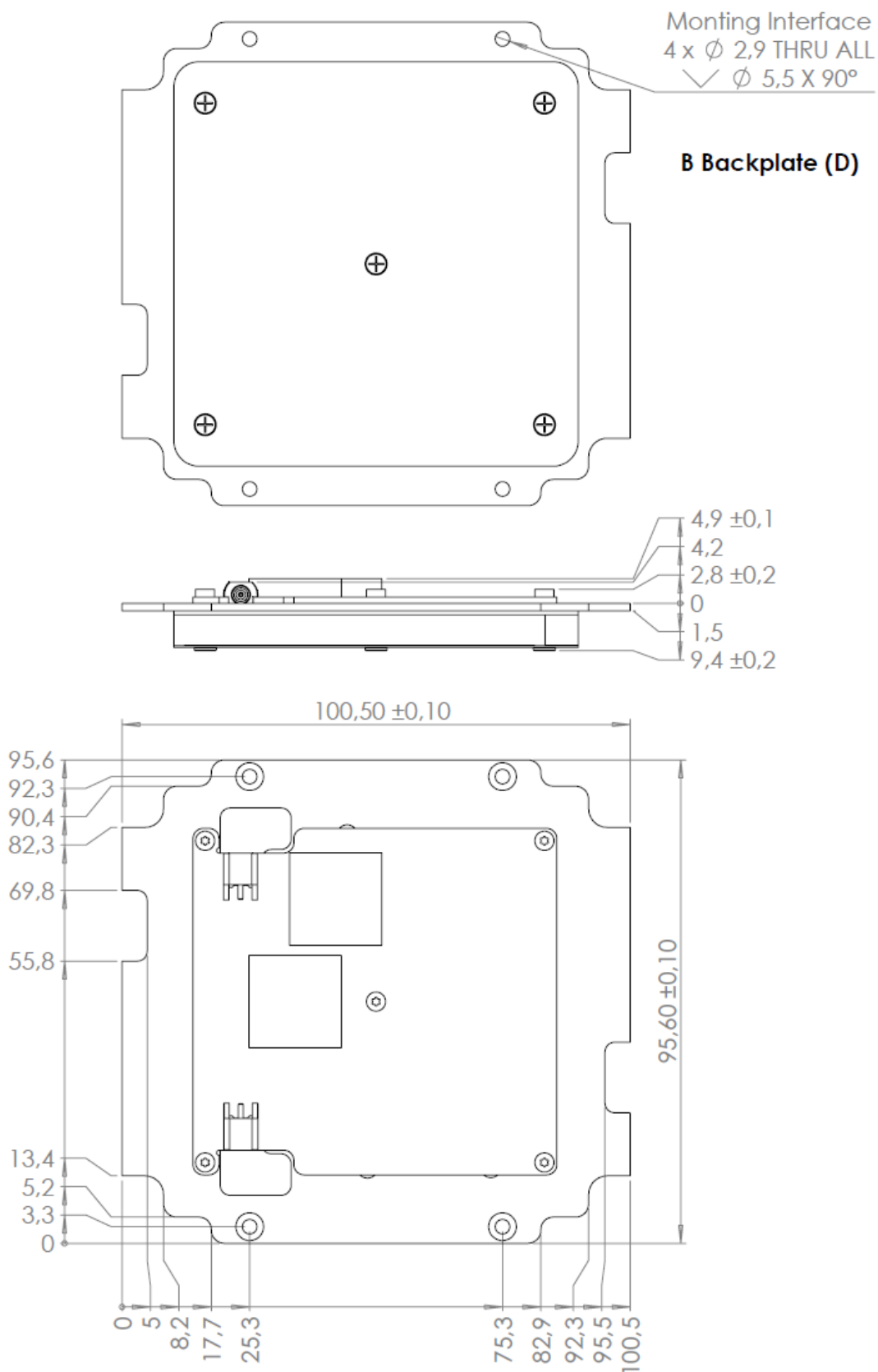
6.6 AM2150PS Type B



6.7 AM2150PS Type C



6.8 AM2150PS Type D



7 Disclaimer

The information in this document is subject to change without notice and should not be construed as a commitment by GomSpace. GomSpace assumes no responsibility for any errors that may appear in this document.

In no event shall GomSpace be liable for incidental or consequential damages arising from use of this document or the software and hardware described in this document.