

## NanoUtil Top GSSB

## Datasheet

Interface and Antenna Release System

Product name: NanoUtil Top GSSB

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Approved by: BGS

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## 2 Changelog

Date	Revision	Author	Description
09/07/2015	3.0	DJS	Initial Revision
11/04/2016	3.1	KLK	New layout. Rename NanoHub Top to NanoUtil Top
15/09/2016	3.2	KLK	Spelling error and version number corrected
1/11/2016	3.3	DJS	Added pinout for P1
14/7/2017	3.4	KLK	Name change from Top to Top GSSB, New layout. Text and picture overhaul.
09/03/2021	3.5	KERA	Updated names for connector placements.

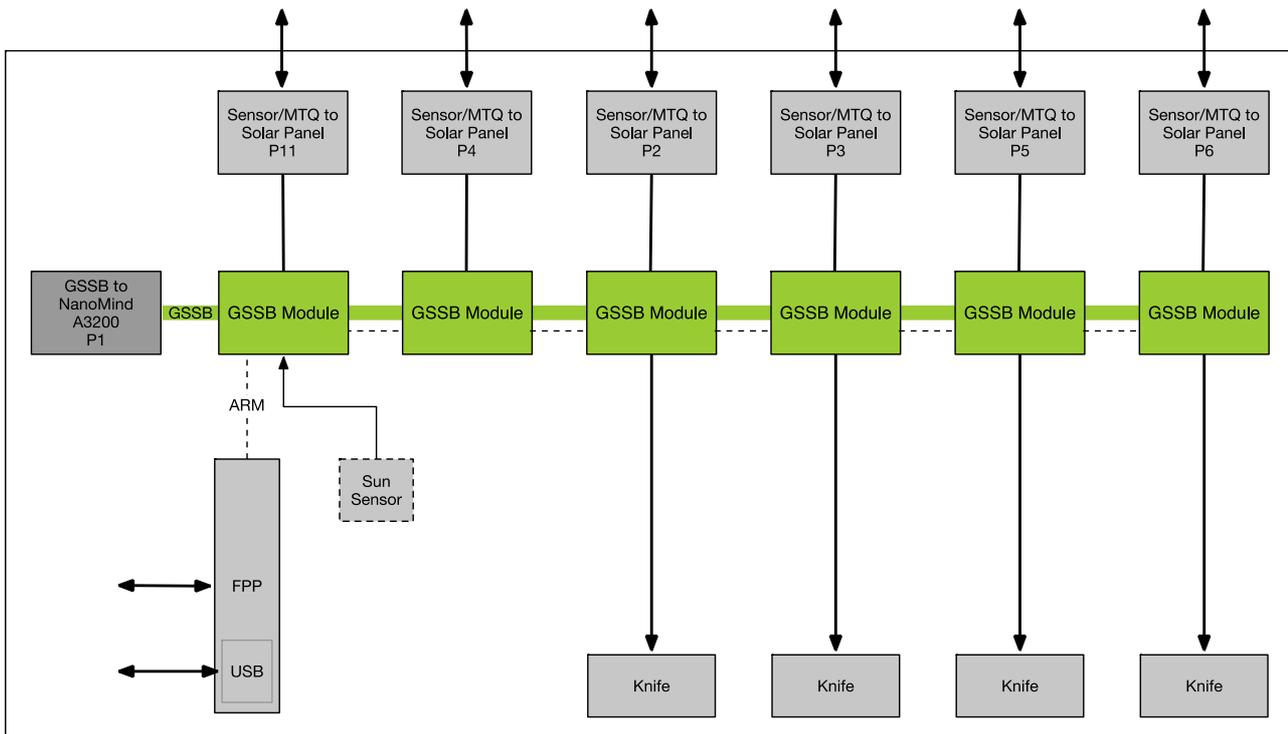
### 3 Overview

The NanoUtil Top GSSB is an antenna release and interface system primarily designed for use in 1U CubeSats. The Top GSSB is compatible with GomSpace and Innovative Solutions in Space (ISIS) products and is designed for use with GomSpace 2<sup>nd</sup> Generation avionics including the NanoMind A3200 and NanoDock DMC-3.

#### 3.1 Highlighted Features

- Flight preparation panel including
  - Remove Before Flight (RBF)
  - Antenna release ARM
  - Kill switch override and reset
  - Battery charging interface
  - USB interface
- ADS interface to 6 solar panels
  - Coarse sun sensor input
  - PWM Magnetorquer output via a NanoMind A3200
- Antenna release system (dual electrical knife system with sense feedback)
- Coarse sun sensor for ADS

#### 3.2 Block Diagram



The NanoUtil Top GSSB consists of 6 independent, low power GSSB modules that are used to collect ADS data from solar panels and actuate electric knives. The GSSB bus itself is designed around a robust, fully isolated I<sup>2</sup>C bus that provides coarse ADS data to the NanoMind over a simple interface. In addition to the GSSB system, the NanoUtil Top GSSB also contains a flight preparation panel, which allows the satellite operator to connect to the satellite using GOSH, use the RBF pin, use safing and deployable arming pins, and charge the satellite.

### 3.3 Integration

The NanoUtil Top GSSB is designed to be integrated in the top or bottom of a 1U CubeSat, opposite the GomSpace ANT430 UHF antenna. The images below show the NanoUtil Top GSSB integrated in a 1U NanoEye spacecraft. Note the in the right image of Figure 1, the NanoEye spacecraft is safed using the RBF, KS and ARM pins. This configuration ensures the spacecraft is fully powered down without the possibility of deploying the antennas when the spacecraft is powered on.

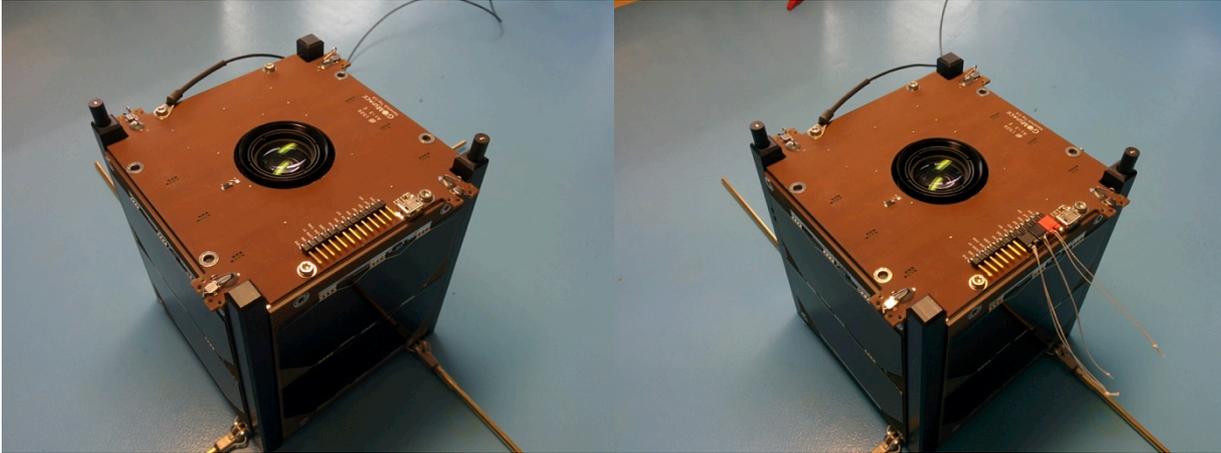


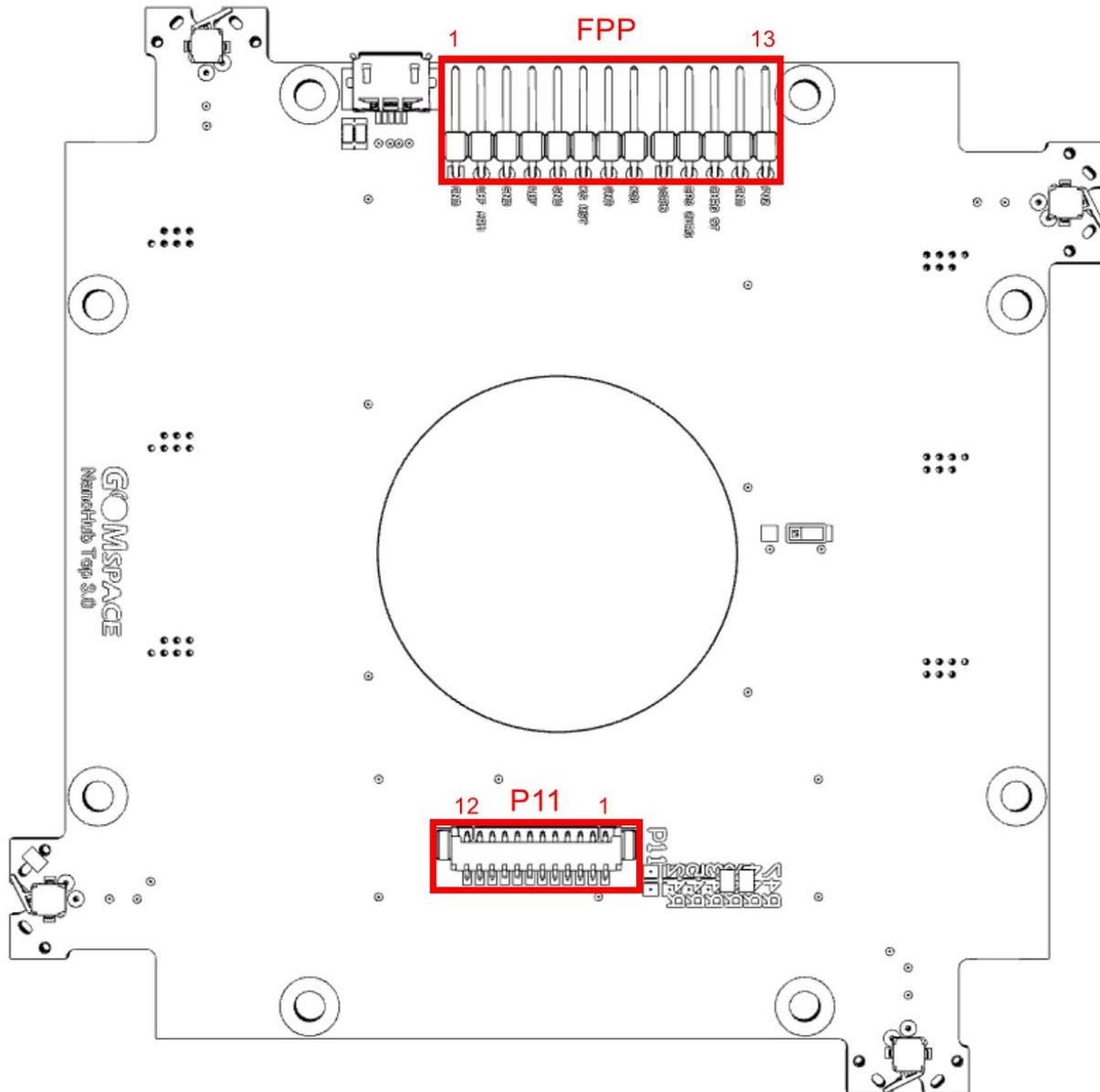
Figure 1: Left: NanoUtil Top GSSB integrated on a 1U NanoEye in flight configuration, Right: NanoEye safed with FPP jumpers

### 3.4 Sixth Solar Panel Connector

If a sixth solar panel is required, a sixth connector (P11) can be mounted on the top of the PCB. This makes the sun sensor redundant and is therefore removed.

## 4 Hardware Layout, Connectors and Pinouts

### 4.1 Top GSSB Top Layout



### 4.1.1 FPP - Flight Preparation Panel Interface

2.54 mm Header

Pin	Description
1	GND
2	UHF ARM
3	GND
4	RBF
5	GND
6	KS RST
7	GND
8	KS1
9	USB5V
10	EPS CHRG
11	CHRG ST
12	GND
13	PVZ

Use a 2.54 female jumper

Of the FPP connectors, four are intended for use with the NanoPower. The KS “kill switch” input can be used to override the actual kill switch of the satellite, i.e. to activate the satellite when in the launcher-pod. KS\_RST will switch off the satellite again. With a jumper shorting the pins of RBF the satellite cannot activate, regardless of the kill switch. For more documentation of these, see the NanoPower datasheet.

The ARM is for arming/disarming the antenna release system. With a jumper shorting the pins of ARM, the antennas cannot be released.

### 4.1.2 P11 - Solar Panel Connectors (optional)

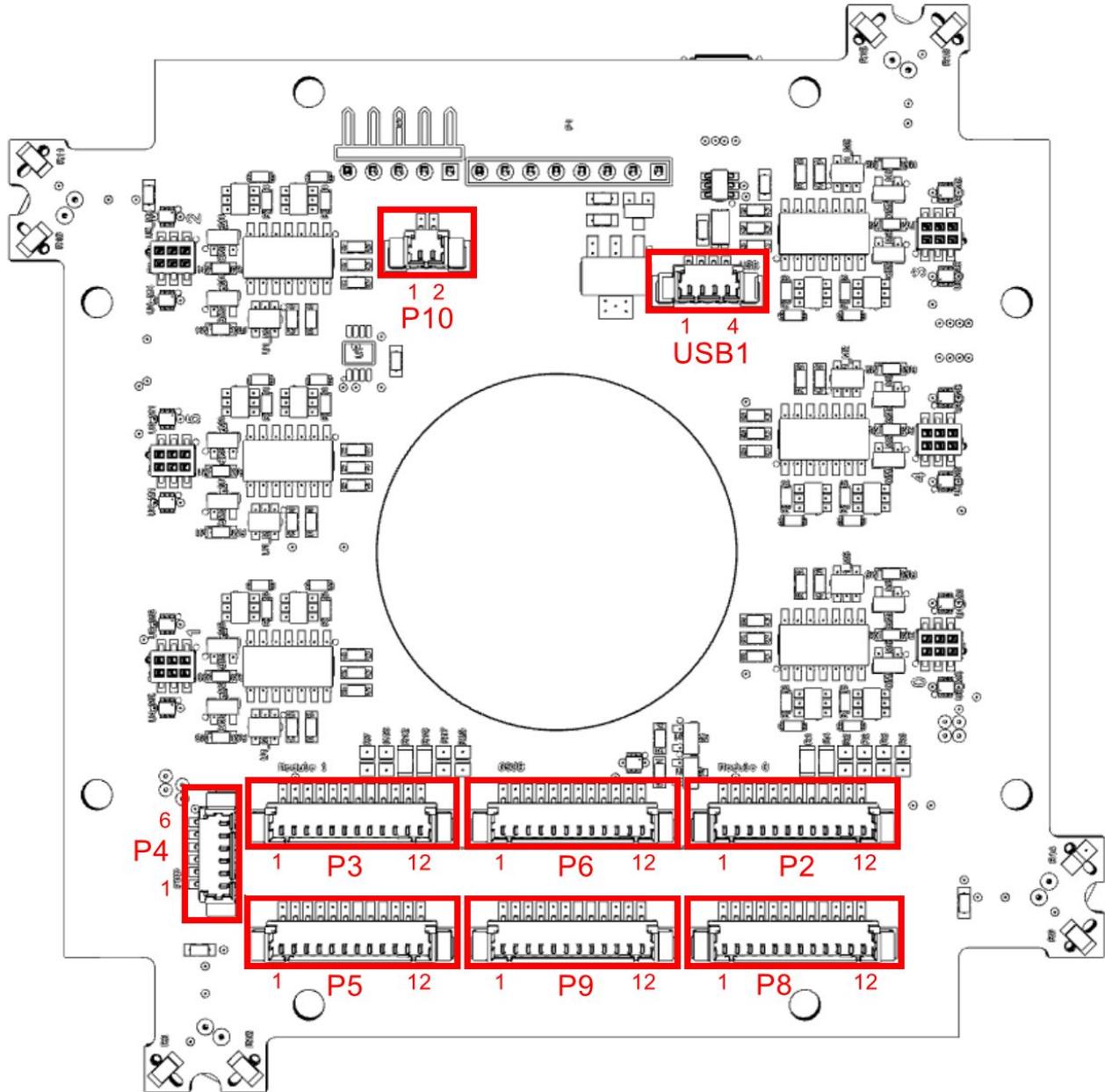
Molex Picoblade 53398-1271

The solar panel connectors provide the hub GSSB modules with raw ADS sensor data and power the built in magnetorquers.

Pin	Description
1	SPI CS
2	VCC
3	SPI MISO
4	SPI SCK
5	Sun Sensor Anode
6	Sun Sensor Cathode
7	NC
8	NC
9	NC
10	GND
11	Magnetorquer -
12	Magnetorquer +

Same as connector P2-P6.

## 4.2 Top GSSB Bottom Layout



#### 4.2.1 P6 - GSSB Connector

Molex Picoblade 53398-1271

The GSSB connector connects directly to the GomSpace NanoMind A3200 headers J5-J6 to communicate with the NanoMind.

Pin	Description
1	Magnetorquer +Z
2	Magnetorquer -Z
3	Magnetorquer +Y
4	Magnetorquer -Y
5	Magnetorquer +X
6	Magnetorquer -X
7	VAUX
8	VCC2
9	GND
10	VCC
11	SCL
12	SDA

#### 4.2.2 P2 - P3 - P5 - P8 - P9 - Solar Panel Connectors

Molex Picoblade 53398-1271

The solar panel connectors provide the hub GSSB modules with raw ADS sensor data and power the built in magnetorquers.

Pin	Description
1	SPI CS
2	VCC
3	SPI MISO
4	SPI SCK
5	Sun Sensor Anode
6	Sun Sensor Cathode
7	NC
8	NC
9	NC
10	GND
11	Magnetorquer -
12	Magnetorquer +

### 4.2.3 P4 - FPP to EPS Connector

6WAY SMT 1.25 Straight

The FPP harness connects the RBF and FPP functionality of the NanoUtil Top GSSB to the EPS.

Pin	Description
1	GND
2	RBF
3	KS
4	KS_RESET
5	Vbat (EPS charge state monitoring)
6	Charge

### 4.2.4 P10 - PV Z Solar Charging Input Connector

Molex Picoblade 53398-0271

P10 provides a solar charging interface to the satellite. This allows the operator to charge the satellite from an external power supply using a solar panel input on the EPS. This has the benefit of using the full suite of protection circuits available on the EPS and simulating on-orbit charging performance.

Pin	Description
1	Power
2	GND

### 4.2.5 USB1 - Connector

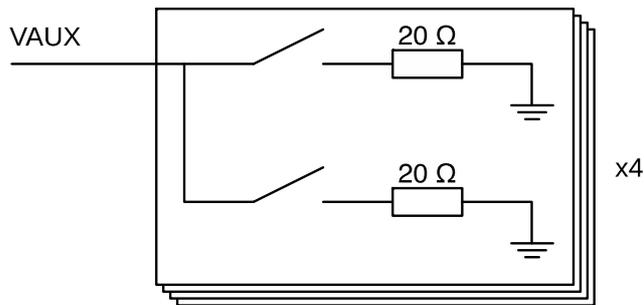
Molex Picoblade 53261-0471

USB1 connects to the FTDI present on the GomSpace NanoDock

Pin	Description
1	GND
2	USB_5V
3	DN
4	DP

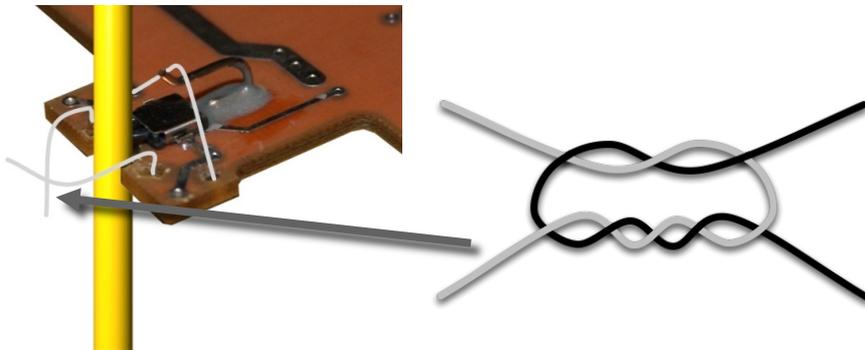
## 5 Antenna Release

The antenna release system itself consists of small wings off the main PCB with two burn resistors and a normally-open sense switch. Each burn resistor can be operated independently and the sense switch can be used for detection of successful deployment.



### 5.1 Stow Procedure

Use 40 cm burn wire. Insert both ends of wire through the inner holes of the release PCB from the side with the spring. Place a loop of the wire at hook on a spring. Pull both ends over the burn resistors and through the outer two holes. Tie ends around antenna using two surgeon's knots on top of each other.



## 6 Absolute Maximum Ratings

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

Symbol	Description	Min.	Max.	Unit
VCC	Supply voltage	3.3	3.4	V
I	Supply current	-	1	A
T <sub>amb</sub>	Operating Temperature	-60	80	°C
T <sub>stg</sub>	Storage Temperature	-65	120	°C
T <sub>j</sub>	Junction Temperature		150	°C
V <sub>io</sub>	Voltage on I <sup>2</sup> C	-0.3	3.6	V

## 7 Electrical Characteristics

Symbol	Description	Min.	Typ.	Max.	Unit
VCC	Supply voltage		3.3		V
I	Supply current	1	<5 (avg)	20	mA
VAUX	Knife activation voltage	6	VBAT	8.4	V
I <sub>knife</sub>	Knife activation current	0.3		0.42	A

## 8 Physical Characteristics

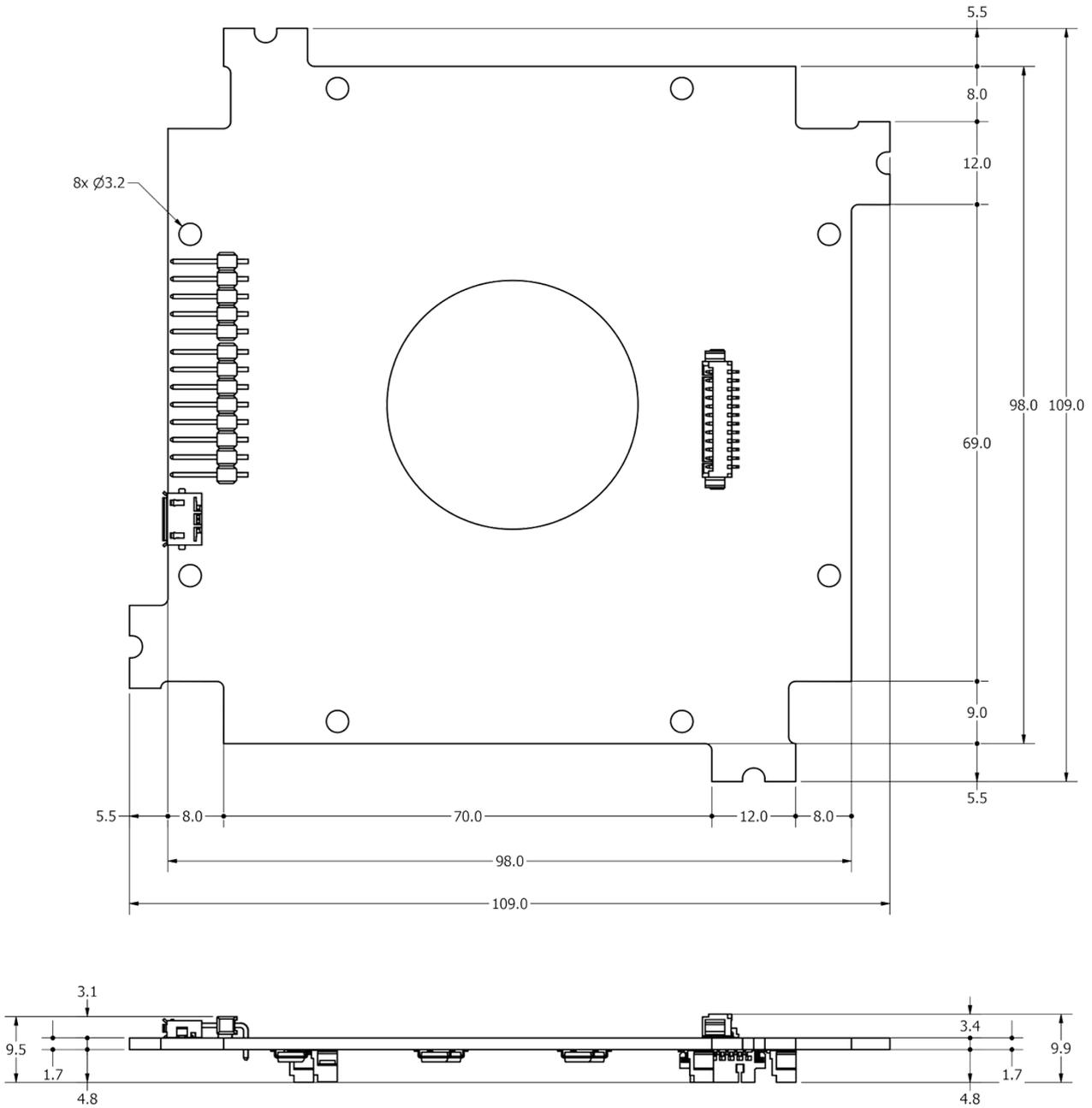
The screw holes and size of the PCB fits a standard PC104.

Description	Value	Unit
<b>Mass – without top sun connector</b>	37	g
<b>Dimensions</b>	Fits standard PC104 See chapter 10	mm



## 10 Mechanical Drawing

All dimensions in mm.



## 11 Disclaimer

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