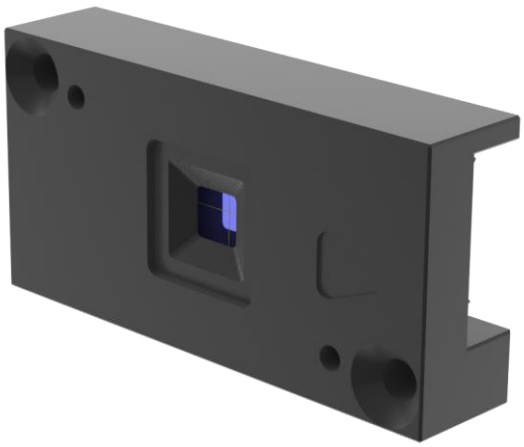

NanoSense
Fine Sun Sensor

Datasheet

High Precision and ultra small vector sun sensor with digital interface

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1 Table of Contents

2 Overview

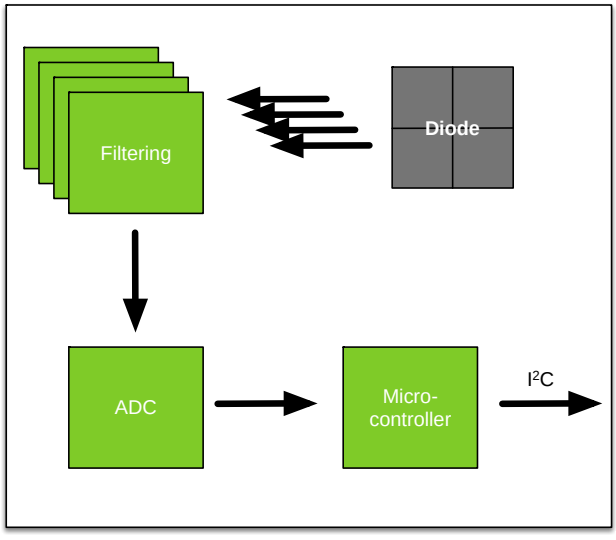
The NanoSense FSS is an ultra-compact vector sun-sensor with an I²C interface designed especially for CubeSats with high ADCS requirements. The FSS comes with elevator unit.

2.1 Highlighted Features

- Small, light, low power
- Digital interface (I²C)
- Wide Field-Of-View
- Integrated temperature sensor
- High temperature range
- Flexible mounting (either rear or front mount)
- Flexible connector (either stack or wire)
- Delivered with calibration data.
- Mass: 2.2 g
- FSS casing size 22 x 11 x 5 mm
- Elevator size 22 x 11 x 1.3 mm

3 How it Works

The sensor is built around a quadrant diode that measures the incidence angle of the sun through a hole in the housing. The signals are filtered and sampled in a 16-bit ADC. The values are processed in a microcontroller and made available over I²C.



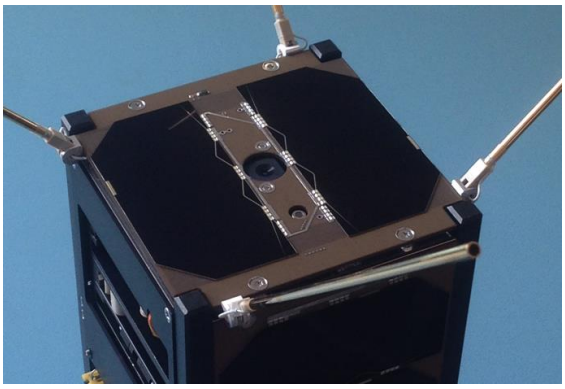
The NanoSense FSS is interfaced through I²C as a slave device. The default address is 0x05 but is configurable by I²C command.

4 Usage

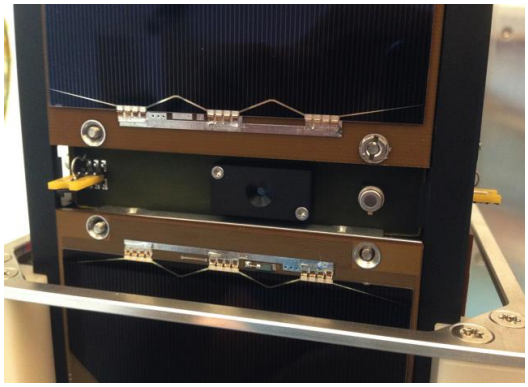
Due to its small size and versatile connector system, the NanoSense FSS can be fitted into many locations on a CubeSat.

It is available with elevators that allow access to both connectors. It can be used to raise the sensor up to ensure that the FSS has a clear field of view. The straight elevator is necessary if the sensor is equiped with the P1 header connector as the P1 connector protrudes further out than the sensor housing. If the sensor is chosen to not include the P1 connector, then the sensor can sit flat on a mounting surface.

The FSS can be mounted internally or externally.



Example of FSS internal mounted



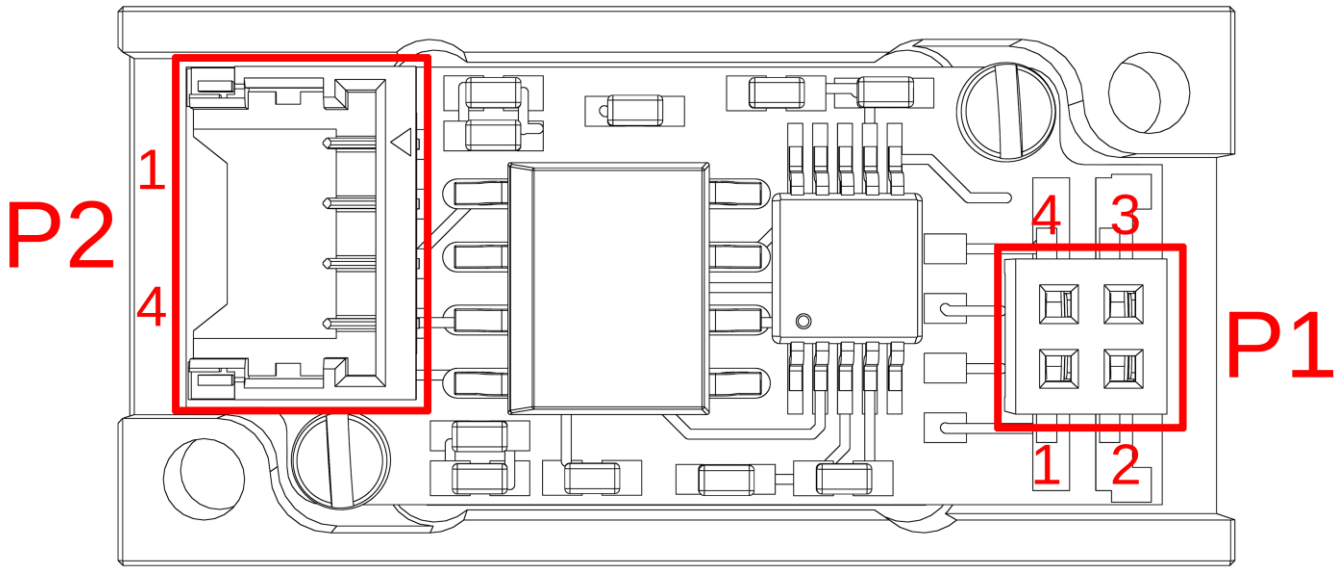
Example of external mounted FSS on an Interstage

CAD of an elevator unit

5 Hardware Layout

5.1 Connector Location

Drawing below is seen from the rear.



5.2 P1 – GSSB Inside

Samtec CLP-102-02-F-D-TR

Pin	Description
1	Vcc
2	GND
3	SDA
4	SCL

The P1 connector can be chosen not to be mounted, view option sheet.

5.3 P2 – GSSB Outside

Pico-EZmate 78171-0004

Pin	Description
1	Vcc
2	GND
3	SDA
4	SCL

6 Absolute Maximum Ratings

Stresses above those listed under Absolute Maximum Rating may cause permanent damage to the FSS. Exposure to absolute maximum rating conditions for extended periods may effect the reliability.

Parameter	Description	Min	Typ.	Max	Unit
Vcc	Maximum supply range	-0.4		3.6	V
Vio	Voltage on SDA and SCL	-0.4		3.6	V
T_{op}	Operational temperature range	-40		100	^{o}C
T_{st}	Storage temperature range	-40		125	^{o}C

7 Electrical Characteristics

Parameter	Description	Min	Typ.	Max	Unit
Vcc	Supply voltage	3.25	3.3	3.35	V
Icc	Supply current (Not sampling)		8	10	µA
Icc	Supply current (Sampling)		3.5	4	mA
F_{i2c}	I^2C frequency		100	100	kHz

8 Product Characteristics

Parameter	Condition	Value
Accuracy (3-sigma)	FOV < 45°, No albedo* FOV < 60°, No albedo*	+/- 0.5° +/- 2.0°
Sample period	Max	10 ms
Field of view	Half Angle	60°

* Albedo influence will degrade accuracy.

The influence of albedo depends on the orbit and attitude of the satellite but can generate errors >10deg.

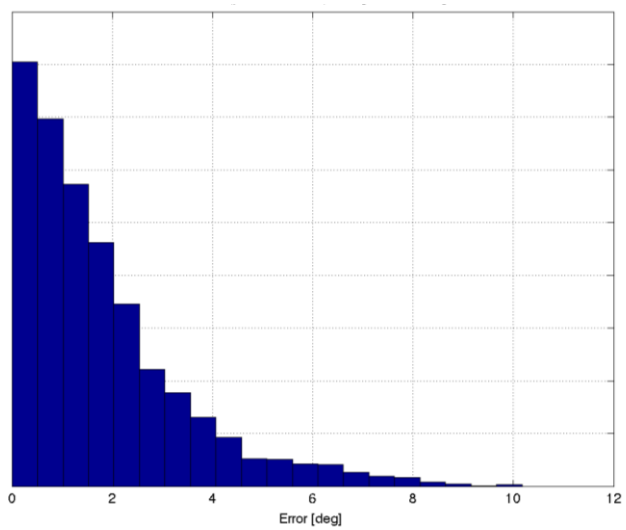
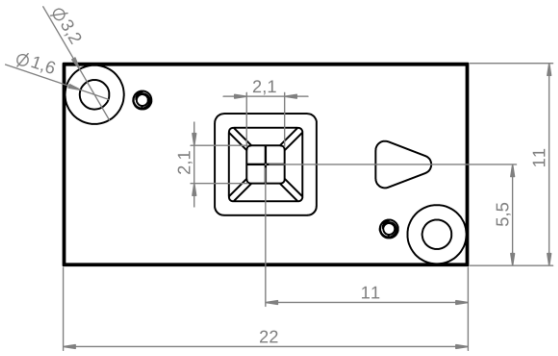


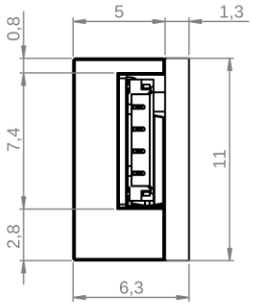
Figure 7 ISS orbit sensor error without albedo correction.

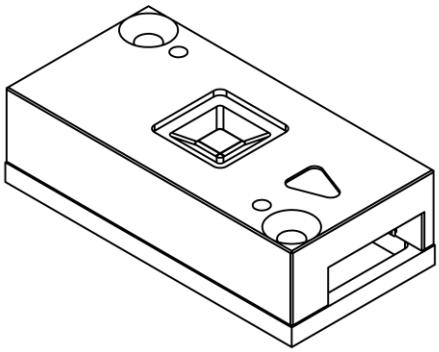
9 Mechanical Drawing

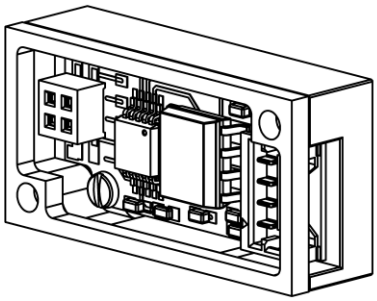
The sensor housing itself measures 22 x 11 x 5 mm with two counter-sunk 1.6 mm non-threaded holes for mounting.

All dimension in mm.









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