Warpspace GPS module V1.0 Rev. B

1. Application

- For CubeSat
  small and light GPS module

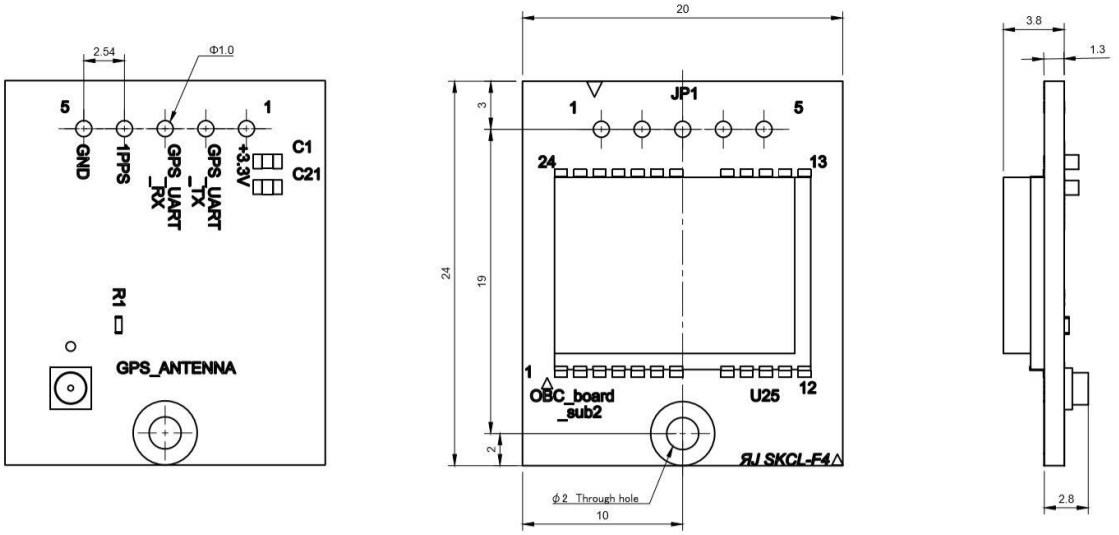
2. Feature

- Small and light GPS module
  Small: 24.0 mm Length
  x 20.0 mm Width
  x 5.3 mm Height
  Light: 3.0 g
- GPS L1 C/A and GLONASS L1
  signal tracking available
- QZSS, WASS, EGNOS,
  MSAS, GAGAN
  augmentation system available
- UART interface (3.3V LVTTL level)
- Output protocol:
  NMEA 0183 or Raw binary
- Update rate: 1/2/4/5/8/10/20 Hz
  (default 1Hz)
- Wide operational limit:
  Altitude < 8000 km,
  Velocity < 11.2 km/s
- High sensitivity: -148 dBm (cold start)
- Support active antenna:
- powering 3VDC bias voltage
- NASA TRL Level 6 satisfied.

3. Description

The Warpspace GPS module is Small and light GPS module. This have high reliability and availability by high sensitivity and supporting GNSS signal which GPS L1 C/A, GLONASS L1 signal and augmentation system.
The Warpspace GPS module is available high altitude and high velocity in space.
The Warpspace GPS module is useful for development of CubeSat.

4. Module layout and I/O specifications



Module size

24.0 mm Length x 20.0 mm Width x Height 5.3 mm

Input

RF Connector is U.FL/I-PEX receptacle.

NAME	I/O	DESCRIPTION
GPS_ANTENNA (RF_IN)	I/O	RF input, connect to antenna. 3VDC bias output for powering active antenna

Output

Connector is 2.54 mm pitch 5 pin.

PIN		I/O	DESCRIPTION
No.	NAME		
1	+3.3V	I	Supply voltage
2	GPS_UART_TX	I	Serial input; requires a pullup resistor
3	GPS_UART_RX	O	Serial output; requires a pullup resistor
4	1PPS	O	1 Hz reference signal.
5	GND	-	Ground

5. Specifications

5-1. Absolute maximum ratings

Parameter	Min.	Max.	Unit
Supply Voltage (VCC)	-0.5	3.6	Volt
Input Pin Voltage	-0.5	3.6	Volt
Input Power at RF_IN		+5	dBm

5-2. Electric Characteristics

Parameter	Min.	Typ.	Max.	Unit
Supply Voltage (VCC)	3.0	3.3	3.6	Volt
Acquisition Current (exclude active antenna current)		45		mA
Tracking Current (exclude active antenna current)		39		mA
Output LOW Voltage			0.4	Volt
Output HIGH Voltage	2.4			Volt
Input LOW Voltage			0.8	Volt
Input HIGH Voltage	2			Volt
Input LOW Current	-10		10	uA
Input HIGH Current	-10		10	uA
RF Input Impedance (RF_IN)		50		Ohm
RF_IN short circuit current limit			70	mA
VCC to RF_IN voltage drop with 5mA active antenna loading		0.33		Volt
VCC to RF_IN voltage drop with 10mA active antenna loading		0.42		Volt
VCC to RF_IN voltage drop with 20mA active antenna loading		0.60		Volt
VCC to RF_IN voltage drop with 30mA active antenna loading		0.77		Volt

5-3. General

Parameter	Description
Dimension	24.0 mm Length x 20.0 mm Width x Height 5.3 mm
Weight	3.0 g
Supply Voltage (VCC)	3.3 VDC +/-10%
Current Consumption	45 mA (Maximum)
Operating Temperature	-40℃ ~ +85℃
Storage Temperature	-55℃ ~ +100℃

5-3. GPS Specifications

Parameter	Description
Receiver Type	L1 C/A code, 167 channels
Receiver Modes	GPS/GLONASS
Augmentation System	QZSS, WAAS, EGNOS, MSAS, GAGAN
Accuracy	Position 2.5m CEP (on Ground)
	Velocity 0.1m/sec (on Ground)
	Time 10ns (on Ground)
Startup Time	1/28/29 second hot/warm/cold start under open sky average
Reacquisition	1s
Sensitivity	-148 dBm cold start
	-160 dBm re-acquisition
	-165 dBm tracking
Update Rate	1/2/4/5/8/10/20 Hz (default 1Hz)
Dynamics	4 G (39.2 m/sec^2)
Operational Limits	Altitude < 8000 km
	Velocity < 11.2 km/s
Serial Interface	3.3 V (LVTTL Level)
	Line Code: NRZ (Non-Return-to-Zero)
	Default 9600 baud, 8, N, 1
Protocol	NMEA-0183 V3.01/Raw binary
Datum	Default WGS-84, User definable

NOTE: Raw binary format and binary control command describe another document.

CHANGE LOG

Rev.	Date	Author	Comments
B	20200613	Y. Nakagawa	Replace figure and add line code
A	20200305	Y. Nakagawa	Initial release