Piksi® Multi Inertial

PRODUCT SUMMARY

Multi-Frequency, Multi-Constellation Centimeter-Accurate GNSS + INS Solution

The Piksi Multi Inertial GNSS receiver elevates the multi-frequency, multi-constellation RTK GNSS receiver that is Piksi Multi with an integrated inertial fusion solution to deliver fast convergence times and improved performance in difficult GNSS environments such as tunnels, urban canyons and under foliage.

CONTINUOUS AND ROBUST INERTIAL NAVIGATION SYSTEM (INS) POSITIONING

Piksi Multi Inertial combines the RTK GNSS and inertial fusion capabilities of Swift Navigation's Starling® Positioning Engine to deliver a continuous and robust positioning system for a variety of applications. INS integration provides positioning during GNSS outages and times where there is little to no GNSS visibility.

CENTIMETER-LEVEL ACCURACY

Autonomous systems require precision navigation—especially those that perform critical functions. Swift Navigation solutions utilize real-time kinematic (RTK) technology, providing location solutions that are 100 times more accurate than traditional GPS.

FAST CONVERGENCE TIMES

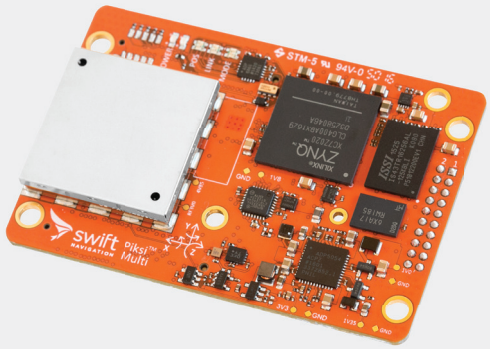
Multiple signal bands enable faster convergence times to high-precision mode. Single band RTK systems converge in minutes, while Piksi Multi converges to a high-precision solution within seconds. This allows for much faster system start times, as well as faster reacquisitions, which is critical to robotic systems.

ROBUST GNSS POSITIONING PERFORMANCE

Piksi Multi Inertial supports GPS L1/L2, GLONASS G1/G2, BeiDou B1/B2, Galileo E1/E5b for RTK measurements and positioning and SBAS for robust sub-meter positioning in non-RTK mode. Additional constellations create more robust positioning performance in a variety of challenging skyview environments. Integrated MEMS oscillator technology enhances robustness under vibration and shock.

RAPID PROTOTYPING

Piksi Multi Inertial is designed to be easy to use. The Piksi Multi Inertial Receiver Pack includes: 1 Piksi Multi Inertial GNSS receiver; 1 integrator-friendly Evaluation Board; a 6-month free trial license of Skylark™, a power supply and cables to ease prototyping and integration.



BENEFITS

- Combines GNSS + RTK + IMU Technologies
- Continuous Position Outputs even in GNSS-Denied Areas
- Increased Robustness to Challenging GNSS Environments
- Future-Proof Hardware with In-Field Software Upgrades
- Intuitive LEDs for Status and Diagnostics
- Highly Competitive Pricing
- Fast RTK Convergence Times

FEATURES

- Integrated Inertial Navigation Capability
- Centimeter-Level Positioning Accuracy
- Provides GNSS + INS Solutions at up to 10Hz Update Frequency
- Compatible with Swift's Skylark Cloud Corrections Service
- Dual Frequency and Multi Constellation
- Advanced MEMS Oscillator Technology
- Flexible Interfaces Including UART, Ethernet, CAN[6] and USB

Piksi Multi Inertial

GNSS Characteristics

GNSS Signal Tracking

GPS L1/L2, GLONASS G1/G2,
BeiDou B1/B2, Galileo E1/E5b
SBAS[1]

GNSS Data Rates

Measurements (Raw Data)	Up to 10 Hz
Standard Position Outputs	Up to 10 Hz
RTK Position Outputs	Up to 10 Hz[2]
Swift Binary Protocol (SBP) and NMEA-0183	

Maximum Operating Limits[3]

Velocity	515 m/s

Electrical & I/O

Power

Input Voltage	5 - 15 V DC
Typical Power Consumption	2.9 W[5]

Antenna LNA Power Specifications

Output Voltage	4.85 V DC
Max Output Current	100 mA

Connectors

1 x 20 Pin SAMTEC Connector (PN: TMM-110-03-F-D)
2 x 60 Pin High Density Connectors (PN: 61082-061400LF)
1 x MMCX Female Antenna Port

Communication Interfaces

2 x UART-LVTTL Ports (1 Mbps)
2 x CAN[6] Bus (1 Mbps)
Ethernet support up to 100Mbps
2 x USB 2.0 (1 Device, 1 Host)

IMU Specifications[4]

Angular Range	+/- 250 deg/sec (Default) +/- 125 / 500 / 1000 / 2000 (Configurable)
Acceleration	+/- 4 g (Default) +/- 2 / 8 / 16 g (Configurable)
IMU Raw Data Rate	25 - 200 Hz (100Hz recommended)

Physical & Environmental

Dimensions[7]	48 mm x 71 mm x 12.4 mm Form factor compatible with common GNSS modules
Weight	26 g
Temperature[8]	
Operating	-40° C to +85° C
Storage	-40° C to +85° C
Humidity	95% non-condensing as measured by MIL-STD-810G, Method 507.5 Procedure II
Vibration (Operating and Survival)	
Random	MIL-STD 810G, Method 514.6 (Category 24, 7.7 g RMS)
Sinusoidal	IEC 60068-2-6 (Test Fc–5g)
Mechanical Shock	
Operating	MIL-STD 810G, Method 516.6, Procedure I (40 g)
Survival	MIL-STD-810G, Method 516.6, Procedure V (75 g)

Communication

Navigation Outputs	SBP and NMEA 0183 (Configurable)
Reference Inputs / Outputs	RTCM 3.x
Network Protocol Supported	NTRIP Client

Position Performance Specifications

Position, Velocity & Time Accuracy

Horizontal Position Accuracy (CEP 50 in SBAS Mode)	0.75 m[9]
Velocity Accuracy	0.03 m/s RMS
Time Accuracy	60 ns RMS
Real Time Kinematic (RTK Accuracy 1σ)	
- Horizontal	0.010 m + 1 ppm
- Vertical	0.015 m + 1 ppm
RTK Initialization Parameters	
- Initialization Time	< 10 s
- Initialization Reliability	> 99%
- Solution Latency	< 30 ms

Time to First Fix (TTFF) Specifications[9]

Hot Start[10]	Cold Start[11]	Reacquisition[12]
< 5 s	< 60 s	< 2 s

Performance During GNSS-RTK Outages

		Position Accuracy 2-Sigma (m) RMS		Velocity Accuracy (m/s) RMS	
Outages	**Prior Position Mode**	**Horizontal**	**Vertical**	**Horizontal**	**Vertical**
1 second	RTK	0.02	0.06	0.035	0.020
5 seconds	RTK	0.05	0.09	0.040	0.030
10 seconds	RTK	0.17	0.16	0.055	0.045

The accuracy of position and velocity solutions provided during GNSS outages is dependent on the accuracy of solutions prior to the GNSS outage. The table above represents solution performance during GNSS outages directly preceded by RTK fix GNSS solutions.

1 SBAS Support includes the United States-based Wide Area Augmentation Systems (WAAS), the pan-European Union-based European Geostationary Navigation Overlay Navigation System (EGNOS), the Japanese Multifunctional Transport Satellites (MTSAT) Satellite Augmentation System (MSAS) providing coverage for Japan and Australia and the GPS-Aided GEO Augmented Navigation (GAGAN) regional system operated by the Indian government.
2 Current firmware supports 10Hz GPS L1/L2, GLONASS G1/G2, BeiDou B1/B2, Galileo E1/E5b low-latency RTK positioning or 5 Hz GPS L1/L2, GLONASS G1/G2, BeiDou B1/B2, Galileo E1/E5b time matched RTK positioning.
3 As required by the U.S. Department of Commerce to comply with export licensing restrictions.
4 Please refer to the Bosch BMI160 datasheet.
5 Typical power consumption by module in RTK positioning mode.
6 CANBus on Piksi Multi is currently hardware ready and is electrically verified. We do not support any specific CAN output protocol (e.g. J1939) and have no immediate plans to do so.
7 A hardware update on the Piksi Multi to use a higher grade CPU with better thermal characteristics was implemented, resulting in 0.4mm height increase of the Piksi Multi. Contact customer support for more information on this.
8 The use of an on-board heat sink is required in applications where ambient temperatures exceed 65°C. The receiver board ships with a provided heat sink attachment.
9 In open sky and strong signals conditions.
10 Hot Start is the time taken by the receiver to achieve a standard position fix after a brief outage. For example, the time taken to fix a position for a car that is exiting a long tunnel. This can also be simulated by a simple RF on/off test with outages between 30 and 50 seconds.
11 Cold Start is the time taken by the receiver to achieve a standard position fix after a prolonged outage. For example, the time taken to achieve a position fix for a car that has been parked overnight in a garage and once it sees the sky view for the first time.
12 Re-acquisition is defined as the time taken to re-acquire position lock after brief moment of outage. For example, a car traveling under a freeway/highway overpass. This can also be simulated by a simple RF on/off test with outages between 1 and 5 seconds.