GE-926, u-blox F9P, RTK GNSS PCI Express Half-Mini Card w/ I-PEX MHF RF Connector

RoHS Compliant



Overview

The GE-926 features the high-sensitivity u-blox F9P engine, an RF connector, and an optional backup battery. Its Mini PCI Express standard design allows seamless integration into PC-based systems, while the half-length form factor makes it ideal for space-constrained applications. In addition to the standard USB interface, the device also supports an optional UART/TTL interface.

The GE-926 can simultaneously track L1 and L5 band signals from all major civil navigation systems, including GPS, GLONASS, Galileo, BeiDou, QZSS, and SBAS satellites. Thanks to this capability, a large number of satellites are visible at any time, making positioning easier and more accurate—even in challenging environments where GPS signals are typically weak or obstructed.

The module is configurable as either an RTK base station or RTK rover, enabling high-precision positioning in a variety of real-time kinematic applications. The optional backup battery enables faster position fixes and can be omitted if an extended temperature range is required.

Applications

- UAV (RTK base/rover)
- Automatic farming (RTK base/rover)
- Robotic guidance (RTK rover)

Features

- PCI Express Mini Card standard compliant
- Powered by u-blox NEO-F9P-15B RTK engine
- Supporting L1/L5 band and multiple constellations simultaneously
  - GPS+Galileo+GLONASS+BeiDou+NavIC
  - SBAS, QZSS
- Augmentation support:
  - DGNSS RTCM 10403.3 version 3 messages support for RTK fix.
  - SBAS (WAAS, EGNOS, MSAS, GAGAN),
  - QZSS (L1 C/A and L5 signals & L1S SLAS, Sub-meter Level Augmentation Service)
  - CLAS (Centimeter level augmentation service)
- SPARTN 2.0.1 support
- High sensitivity
  - Acquisition: -148dBm
  - Tracking: -167dBm
- RTK convergence in 12 sec for multi-GNSS.
- Max. RTK update rate (default 1Hz), up to
  - 7 Hz for GPS+GAL+GLO+BDS
  - 8 Hz for GPS+GAL+BDS
  - 14 Hz for GPS+GAL
  - 15 Hz for GPS+GLO
  - 10 Hz for GPS+BDS
  - 25 Hz for GPS only
- **Spoofing detection / monitoring**
  - Multiple constellations should be enabled.
- **Jamming / interference indicator**
  - For continuous wave (narrow-band) jammers/interference only

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- The tiny I-PEX MHF RF connector allows flexibly placing GNSS antenna at a suitable location.
- External active antenna **short circuit protection**
- Optional backup battery for faster position fix.
- Support USB or UART/TTL interface.
- Windows location sensor support
- OMA SUPL compliant A-GPS support
- Excellent EMI protection
- Industrial operating temperature range: -40 ~ 85℃

Technical Specifications

Receiver Performance Data+

Supported GNSS Constellations	u-blox NEO-F9P-15B GPS/SBAS/QZSS: (MHz) L1 C/A (1575.42), L5 (1176.45) GLONASS: (MHz) L1OF (1602+k*0.5625, k= -7,…,5,6), Galileo: (MHz) E1-B/C (1575.42), E5a (1176.45) BeiDou: (MHz) B1I (1561.098) B2a (1176.45) NavIC: (MHz) SPS-L5 (1176.450)
Position Accuracy (1ppm for RTK baseline up to 20km)	Horizontal: (CEP) RTK: 1 cm+1ppm (1km baseline) SBAS: 1 m PVT: 1.5 m Vertical: (using 1km baseline) RTK: 1 cm+1ppm Median SBAS: 1.5 m PVT: 2 m
Velocity Accuracy	0.05 m/s (speed) 0.3° (heading) (50% @ 30 m/s for dynamic operation)
Time Pulse	0.25Hz...10MHz
Signal	RMS: 30ns, 99%: 60ns
Time To First Fix (TTFF) Hot start Aided start Cold start	Autonomous (All at -130dBm) 3sec (GPS+Glonass+Galileo+BeiDou) 4sec (GPS+Glonass+Galileo+BeiDou) 27sec (GPS+Glonass+Galileo+BeiDou)
Sensitivity	GPS+Glonass+Galileo+BeiDou Acquisition: -148 dBm Reacquisition: -160 dBm Tracking & navigation: -167 dBm
Max. Update Rate RTK Convergence Time	a. GPS+Glonass+Galileo+BeiDou b. GPS+Galileo+BeiDoui c. GPS RTK: 7Hz@a, 8Hz@b, 25Hz@c PVT: 7Hz@a, 8Hz@b, 25Hz@c RAW: 10Hz@a, 10Hz@b, 25Hz@c <12s@a&b, <30s@c Depends on atmospheric conditions, baseline length, GNSS antenna, multipath conditions, satellite visibility and geometry
Max. Altitude	80,000 m
Max. Velocity	500 m/s
Protocol Support Default Settings	NMEA 0183 up to v 4.11, ASCII GGA, GLL, GSA, GSV, RMC, VTG, TXT UBX: input/output, u-blox proprietary, binary RTCM 3.3: input/output, binary SPARTN 2.0.1: input, binary UART1 & 2: 38400bps, N-8-1 UART1: NMEA, UBX, RTCM 3.3 enabled Only NMEA output UART2: RTCM 3.3 enabled, No output, NMEA disabled, UBX output disabled, input enabled SPARTN input enabled
Augmentation System Support	QZSS: Track QZSS L1 C/A and L5 concurrently Receive L1S SLAS on L1

	SBAS: WAAS, EGNOS, MSAS, GAGAN DGNSS: RTCM 10403.3 ● Rover mode messages: (RTCM) 1005~1007, 1033, 1074, 1075, 1077, 1084, 1085, 1087, 1094, 1095, 1097, 1124, 1125, 1127, 1230 ● Base mode messages: (RTCM) 1005, 1074, 1077, 1084, 1087, 1094, 1097, 1124, 1127, 1230 ● SPARTN 2.0.1 messages: (SM) 0-0, 0-1, 0-2, 0-3, 1-0, 1-1, 1-2, 1-3, 2-0
Dynamics	< 4g

[+] Note. According to IC Spec

Electrical Data

Power Supply	3.3 ± 0.3 V
Backup power	VBAT: 1.8~3.6 V; 45uA
Power Consumption	95 mA / average tracking (29 SVs)
TTL I/O	V_{IH}: ≥ 2.64V, V_{IL}: ≤ 0.4V V_{OH}: ≥ 2.9V, V_{OL}: ≤ 0.4V

Environmental Data

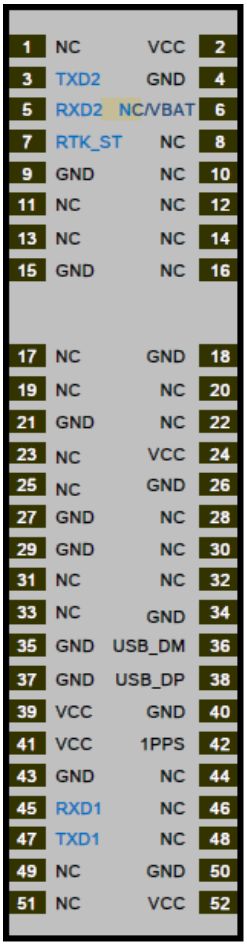
Operating temperature	-40 ~ 85℃ w/o battery -20~60℃ w/ battery
Storage temperature	-40 ~ 85℃ w/o battery -40~60℃ w/ battery

Mechanical Data – 30 x 26.8 x 4.75 (mm)

52-Pin definition

Name	PINs	Function	I/O
VCC	2,24,39,41,52	3.3V power supply, Min 3.0V, Max 3.6V	Input
GND	4,9,15,18,21,26,27,29,34,35,37,40,43,50	Ground	Input
USB_DM	36	USB data signal minus	I/O
USB_DP	38	USB data signal plus	I/O
1PPS/LED	42	1PPS/GPS fix indication	Output
RTK_ST[!]	7	RTK fix state indication	Output
NC/VBAT[!]	6	NC if backup battery equipped or for 1.8~3.6V backup power if backup battery absent.	-/Input
TXD2[!]	3	UART 2 TX, from card	Output
RXD2[!]	5	UART 2 RX, into card	Input
RXD1[!]	45	UART 1 RX, into card	Input
TXD1[!]	47	UART 1 TX, from card	Output
NC	Remaining pins	No connection	-

[!] Proprietary; reserved pins of PCIe Mini Rev. 1.2 are used

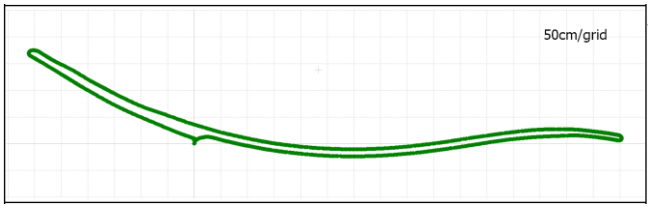


Application

- Mount GE-926 on main board, connect I-PEX to an L1/L5 dual-band GNSS active antenna.

Road Test (For Indicative Reference Only)

- Setup a GE-926 as RTK base in office.
- Connect two GE-926s (acting as RTK rovers) to a notebook, accepting RTCM correction data from above RTK base.
- Fix two GE-926 antennas 64-cm apart on car roof. Log the NMEA output of GE-926s.
- Drive a round-trip along a city road.



- Around 24.7817339,121.0416466

- Calculate the distance for all position pairs and analyze its distance variations.
- Result
  - Average: 63.36cm, 1-sigma = 1.13cm
  - 1-sigma: 70.0%, 2-sigma: 95.5%, 3-sigma: 99.5%,

Ordering Information

GE-926X; X=A/B, default GE-926B

X=	Description
A	Backup battery absent
B	Backup battery built-in

*This document is subject to change without notice.