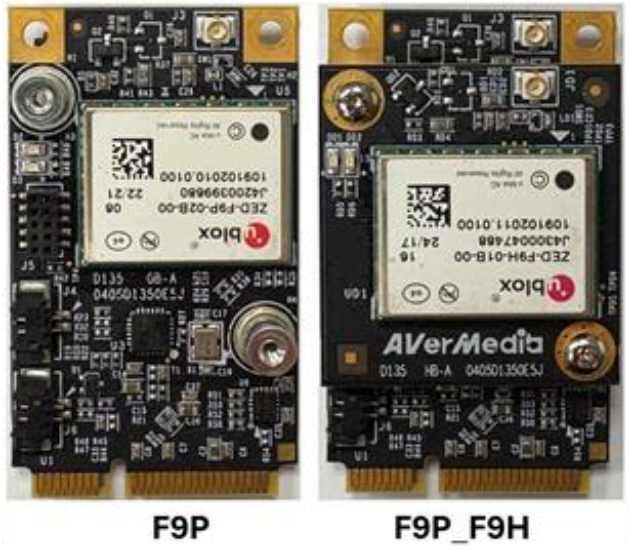
# AVerMedia's
# RTK-GNSS With 6-axis IMU board
(Preliminary)

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Technical Support: Professional User

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# Preface

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**Revision History**

| Revision | Date | Updates |
|---|---|---|
| Version 0.1 | Apr, 17, 2025 | 1st Released. |
| Version 0.2 | Jul, 15, 2025 | Updated content. |
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https://www.avermedia.com/contact-us

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**Limited Product Warranty**

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You may obtain the warranty service by delivering this product to an authorized AVerMedia business partner or to AVerMedia along with the proof of purchase. Product returned to AVerMedia must be pre-authorized by AVerMedia with an RMA (Return Material Authorization) number marked on the outside of the package and sent prepaid, insured, and packaged for safe shipment. AVerMedia will return the product by prepaid shipment service.

It is not recommended to disassemble the box PC, which will impact the warranty. The limited product warranty is only valid over the serviceable life of the product. This is defined as the period during which all components are available. Should the product prove to be irreparable, AVerMedia reserves the right to substitute an equivalent product if available or to retract the product warranty if no replacement is available.

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**ESD Warning**

Electronic components and circuits are sensitive to Electrostatic Discharge (ESD). When handling any circuit board assemblies including AVerMedia products, it is highly recommended that ESD safety precautions can be observed. ESD safe best practices can include, but are not limited to, the following:

1. Leave the circuit board in the antistatic package until it is ready to be installed.
2. Use a grounded wrist strap when handling the circuit board. At a minimum, you need to touch a grounded metal object to dissipate any static charge, which may be present on you.
3. Avoid handling the circuit board in carpeted areas.
4. Handle the board by the edges and avoid the contact with the components.
5. Only handle the circuit boards in ESD safe areas, which may include ESD floor and/or table mats, wrist strap stations, and ESD safe lab coats.

**Safety Precaution:**

1. All cautions and warnings on the device should be noted.
2. For safety consideration, do NOT open the device if not a qualified service staff.
3. Place the device on a solid surface during installation to prevent falls.
4. Keep the device away from humidity.
5. Do NOT leave this device in an un-controlled environment with temperatures beyond the device's permitted storage temperature to avoid damage.
6. All adaptors and cables supplied by AVerMedia are verified. Do NOT use any others not supplied by AVerMedia to avoid any malfunction or fires.
7. Make sure the power source matches the power rating of the device.
8. Place the power cord where people cannot step on it. Do not put anything on the power cord.
9. Always completely disconnect the power while the device is not in use or idle for a long time.
10. Disconnect the device from any AC supply before cleaning. While cleaning, use a damp cloth instead of liquid or spray detergents.
11. Make sure the device is installed near a power outlet and easily accessible.
12. Do not cover the openings on the device to ensure optimal heat dissipation.
13. Pay attention to the heatsink or heat spreader of the device when the system is running.
14. Never pour any liquid into the openings. This could cause fire or electric shock.
15. Static electricity should be noted while installing any internal components. Consider using a grounding wrist strap and put all electronic parts in static-shielded containers.

If the following situations occur, please contact our service personnel:

(1) The device is dropped or damaged
(2) Damaged power cord or plug
(3) Exposure to excessive moisture
(4) Liquid intrusion into the device
(5) Any obvious signs of damage displayed on the device
(6) Device is not working as expected or in a manner as described in this manual

## Introduction

AVerMedia’s RTK GNSS with 6-axis IMU board is designed to expand the RTK GNSS and 6-axis IMU capabilities of AVerMedia's D135 product and must be used in combination with the AVerMedia AI BOX PC.

Utilizing the U-blox ZED F9 series, it brings high-precision GNSS technology with RTK functionality to the AVerMedia AI BOX PC.

This board includes a 6-axis IMU (Inertial Measurement Unit), which provides a 3-axis accelerometer and a 3-axis gyroscope for motion tracking and gesture detection applications.

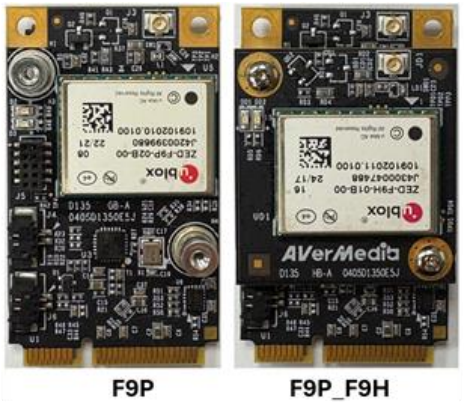
# 1. Specification

The RTK-GNSS with 6-axis IMU board is designed to expand the RTKGNSS and 6-axis IMU capabilities of AVerMedia's D135 product and must be used in combination with the AVerMedia AI BOX PC.

- note : IMU is option

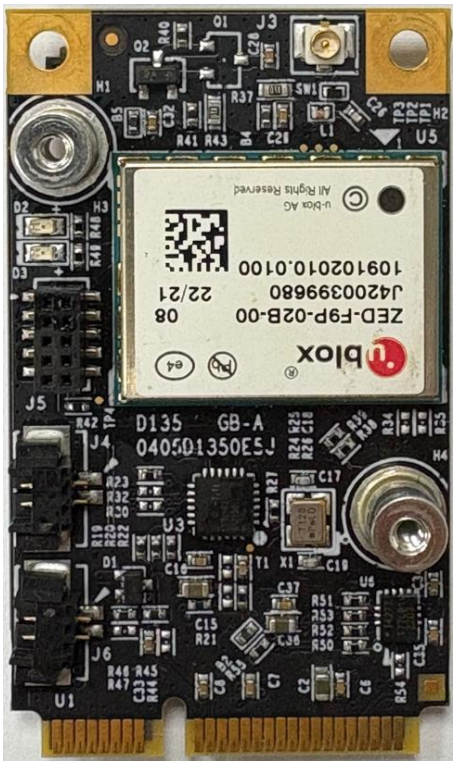
Utilizing the U-blox ZED F9 series, it brings high-precision GNSS technology with RTK functionality to the AVerMedia AI BOX PC.

This board includes a 6-axis IMU (Inertial Measurement Unit), which provides a 3-axis accelerometer and a 3-axis gyroscope for motion tracking and gesture detection applications.



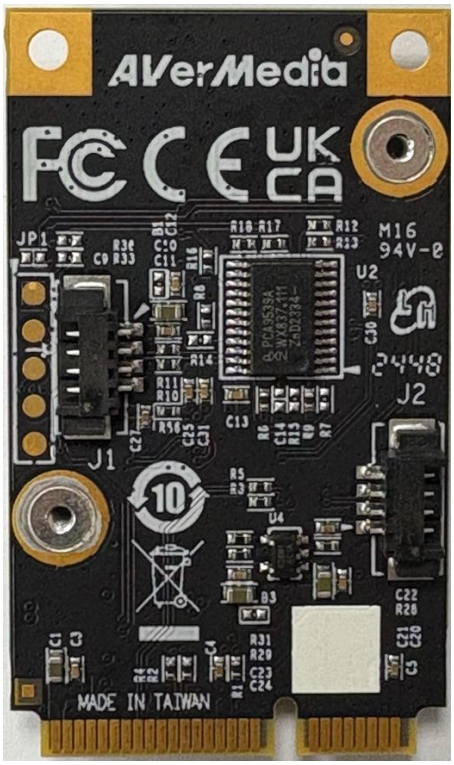

| | |
|---|---|
| Model | RTK-GNSS With 6-axis IMU board |
| Applicable product | D135 |
| Connector type | mPCIe / USB wafer |
| RTK-System GNSS receiver (moving base) | U-blox ZED-F9P |
| Heading GNSS receiver (rover) | U-blox ZED-F9H (Optional) |
| inertial measurement unit | 6-axis IMU, 3-axis accelerometer and 3-axis gyroscope |
| GNSS | BeiDou, Galileo, GLONASS, GPS / QZSS |
| GNSS bands | B1I, B2I, E1B/C, E5b, L1C/A, L1OF, L2C, L2OF |
| External I/O | - 1 x MHF for RTK-GNSS active Antenna<br>- 1 x MHF for Heading-GNSS active Antenna (Optional) |
| Internal I/O | - 1 x 4pin wafer for GNSS (5V power input & USB 2.0)<br>- 1 x 4pin wafer for IMU (3.3V Power input & I2C)<br>- 1 x 2pin wafer for RTK-GNSS PPS output<br>- 1 x 2pin wafer for Battery input<br>- Reserved 1 x 5 pin header for RTK-GNSS control (I2C/UART/SPI mode) |
| Expansion | 10pin wafer for Dual-RTK Heading-GNSS module expansion |
| Indication | - 2x LED for RTK-GNSS Status indication<br>- 2x LED for Heading-GNSS Status indication (Option)<br>- Indicates the current geofence status and RTK positioning status |
| Power Input | - 3.3V +/- 5% (supplied by the Mini PCIe socket)<br>- Reserved 5V +/- 5% (4pin GNSS wafer)<br>- Reserved 3.3V +/- 5% (4pin IMU wafer) |
| Environment | - Operating temperature -40˚C ~ 85˚C<br>- Storage temperature -40˚C ~ 85˚C |
| PCB/Electronics Mechanical Info | U-blox ZED-F9P: Mini PCIe standard (full size) : 30 x 50.8 x 10.2 mm<br>U-blox ZED-F9P+F9H: Mini PCIe standard (full size) : 30 x 50.8 x 13.7mm<br>PCB Thickness: 1.6mm |

## Table 4: RTK GNSS Module Top View Interface





## Table 5: RTK GNSS Module Bottom View Interface



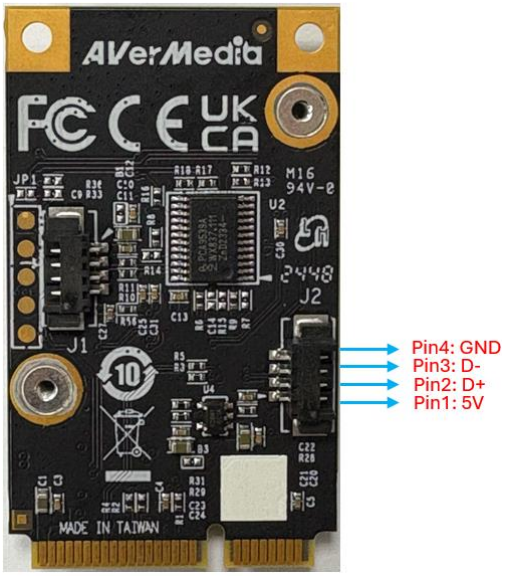

# 2. RTK GNSS Module STANDARD and CUSTOM EXPANSION CONNECTORS

mPCIe Pin Definition:

| Row | Pin | Symbol | Type | Description | Status |
|---|---|---|---|---|---|
| TOP | 7 | GND | | | |
| TOP | 9 | GND | G | | |
| TOP | 15 | GND | G | | |
| TOP | - | KEY | - | Mechanical Key | |
| TOP | 17 | RTC_BAT | I | connect a backup supply to the GNSS modules to keep configuration and positioning data | Proprietary |
| TOP | 19 | IMU_INT_2 | I | IMU Interrupt output | Proprietary |
| TOP | 21 | GND | G | | |
| TOP | 27 | GND | G | | |
| TOP | 29 | GND | G | | |
| TOP | 35 | GND | G | | |
| TOP | 37 | GND | G | | |
| TOP | 39 | +3.3 Vaux | P | Max 500mA | |
| TOP | 41 | +3.3 Vaux | P | Max 500mA | |
| TOP | 43 | GND | G | | |
| TOP | 45 | IMU_INT_1 | P | IMU Interrupt output | Proprietary |
| BOT | 2 | +3.3 Vaux | P | Max 500mA | |
| BOT | 4 | GND | G | | |
| BOT | - | KEY | - | Mechanical Key | |
| BOT | 18 | GND | G | | |
| BOT | 22 | PERST# | I | Module Reset (Internally pulled up. active LOW) | |
| BOT | 24 | +3.3 Vaux | P | Max 500mA | |
| BOT | 26 | GND | G | | |
| BOT | 30 | SMB_CLK | | I2C_SCL | |
| BOT | 32 | SMB_DATA | | I2C_SDA | |
| BOT | 34 | GND | G | | |
| BOT | 36 | USB_D- | I/O | USB 2.0 differential data (-) | |
| BOT | 38 | USB_D+ | I/O | USB 2.0 differential data (+) | |
| BOT | 40 | GND | G | | |
| BOT | 50 | GND | G | | |
| BOT | 52 | 3.3 Vaux | P | Max 500mA | |

### 2.1.1 USB Ports

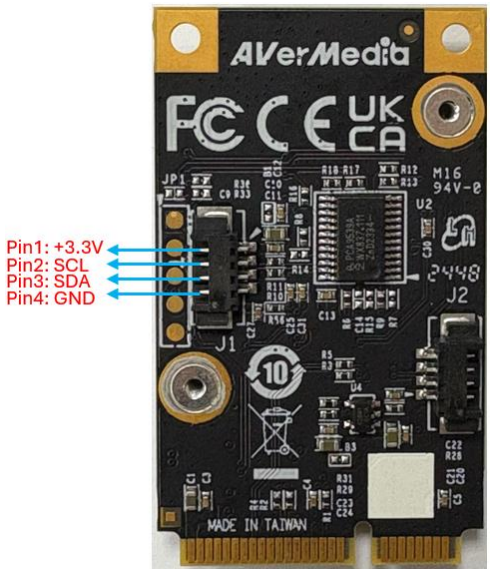
The RTK GNSS module's USB interface allows connection to processor boards with a standard USB 2.0 interface.

| Function | Description | |
|---|---|---|
| Location | BOT / J2 |  |
| Type | 1.25mm Pitch WTB Wafer | |
| Part Number | ACES 50271-0040N-001/SA | |
| Mating Connector | Mates With: Housing: ACES 50276-004H;<br>Terminal: 85106-T/8520 | |
| Voltage / Current | Input (Max): 5V / 500mA | |



### 2.1.2 I2C Wafer

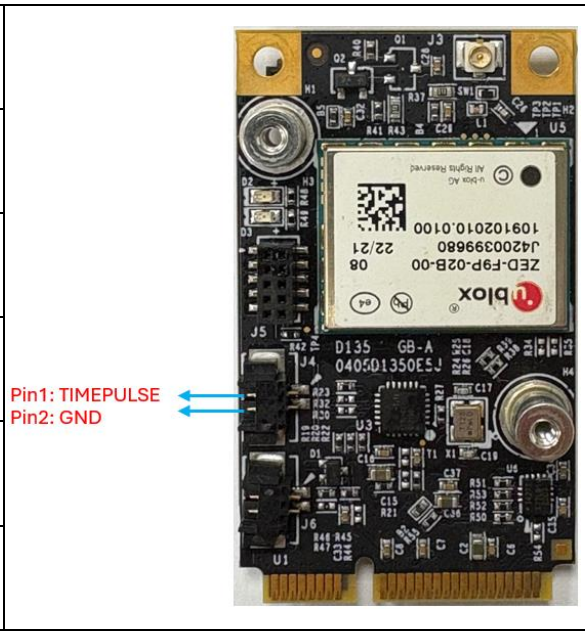
The RTK GNSS module I2C interface allows connection to processor boards with a standard I2C interface. The host system must provide the I2C SDA and SCL pullup resistors.

| Function | Description | |
|---|---|---|
| Location | BOT / J1 |  |
| Type | 1.25mm Pitch WTB Wafer | |
| Part Number | ACES 50271-0040N-001/SA | |
| Mating Connector | Mates With: Housing: 50276-004H;<br>Terminal: 85106-T/8520 | |
| Voltage / Current | Input (Max): 5V / 500mA | |

### 2.1.3 TIMEPULSE Interface

The F9P timepulse (PPS) output of the base GNSS can be directly connected by connector J4 to a receiver with 1.8V CMOS.

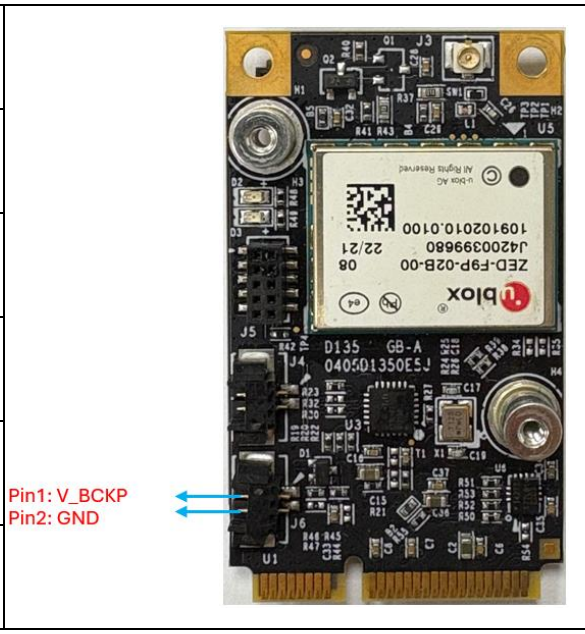
| Function | Description |
|---|---|
| Location | TOP / J4 |
| Type | 1.25mm Pitch WTB Wafer |
| Part Number | ACES 50271-0020N-001/SA |
| Mating Connector | Mates With: Housing: 50276-002H;<br>Terminal: 85106-T/8520 |
| Voltage / Current | Output (Max): 3.3V / 5A |




### 2.1.4 Backup Supply

The J6 connector enables connection of a backup power supply to the GNSS modules, ensuring that configuration and positioning data are retained when power from the mPCIe or USB interface is disconnected.

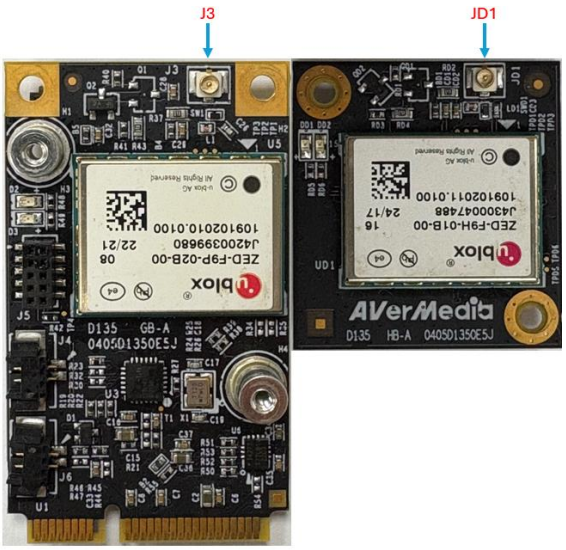
| Function | Description |
|---|---|
| Location | TOP / J6 |
| Type | 1.25mm Pitch WTB Wafer |
| Part Number | ACES 50271-0020N-001/SA |
| Mating Connector | Mates With: Housing: 50276-002H;<br>Terminal: 85106-T/8520 |
| Voltage / Current | Input (typ): 3.3V / 15uA |



### 2.1.5 Antenna Interface

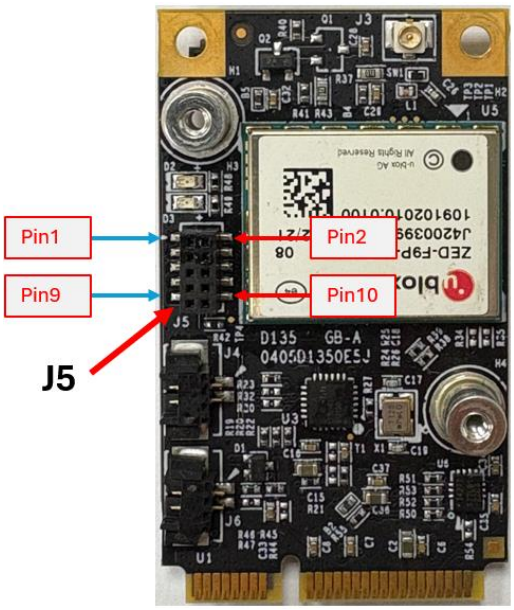
The GNSS antenna is connected via a 50-ohm impedance I-PEX MHF (U.FL-compatible) male connector to the ZED-F9P module at port J3 and to the ZED-F9H module at port JD1.

| Function | Description |
|---|---|
| Location | TOP / J3 & JD1 (50-ohm impedance) |
| Type | I-PEX MHF |
| Part Number | N/A |
| Mating Connector | N/A |
| Voltage / Current | Output (typ): 3.3V / 300mA |




### 2.1.6 Board to Board connect Pin Definition

The board-to-board connector is used to connect the ZED-F9P and ZED-F9H modules.



# J5 Connector pin definition

| Pin | Symbol | Type | Description |
|---|---|---|---|
| 1 | F9H_RTK_STAT | I | Provides an indication of the RTK positioning status |
| 2 | +3.3V_GPS | P | Max 500mA |
| 3 | F9H_TIMEPULSE | I | F9H_TIMEPULSE Output |
| 4 | USB_D+ | I/O | USB 2.0 differential data (+) |
| 5 | GND | G | |
| 6 | USB_D- | I/O | USB 2.0 differential data (-) |
| 7 | GNSS_RESET | O | Reset ZED-F9P |
| 8 | GND | G | |
| 9 | V_BKCP | P | Backup Supply |
| 10 | F9P_TX2 | O | base and the rover are connected via corresponding UART2 interfaces of the modules. |