Product Summary

ZED-F9K

High precision dead reckoning with integrated IMU sensors

Continuous lane accurate positioning under the most challenging conditions

- Decimeter level accuracy for automotive mass markets
- Ideal for ADAS, V2X and head-up displays
- Turnkey multi-band RTK solution with built-in inertial sensors
- Low latency position update rate of up to 30 Hz

Product description

The ZED-F9K module with the u-blox F9 multi-band GNSS receiver features rapid convergence time within seconds. This mass-market component provides decimeter-level positioning with high availability, while making use of all four GNSS constellations simultaneously.

It is the first dead reckoning module with an integrated Inertial Measurement Unit (IMU) capable of high precision positioning. The sophisticated built-in algorithms fuse the IMU data, GNSS measurements, wheel ticks, and vehicle dynamics model to provide lane accurate positioning where GNSS alone would fail. The module operates under open-sky motorways, in the wooded countryside, in difficult urban environments, and even in tunnels and underground parking. In modern automotive applications, such as Advanced Driver Assistance System (ADAS) where availability can improve the safety of our roads, ZED-F9K is the ultimate solution.

The device is a turnkey solution eliminating the technical risk of integrating third party libraries, precise positioning engines, and the multi-faceted hardware engineering aspects of radio frequency design and digital design. The u-blox approach provides a transparent evaluation of the positioning solution and provides clear lines of responsibility for design support, while reducing supply chain complexity during production.

ZED-F9K is ideal for innovative automotive architecture designs with limited space and power. The module provides accurate location services to the increasing number of intelligent Electronic Control Units (ECU), such as telematics control units, navigation systems, infotainment, and V2X safety systems.

The module reaches a high navigation output rate of up to 30 Hz. The on-board processor augments fused GNSS position with additional IMU-based position estimates. Drivers experience responsive, lag-free user interfaces. ZED-F9K can output raw IMU and raw GNSS data for advanced applications. ZED-F9K modules are manufactured in ISO/TS 16949 certified sites and are fully tested on a system level. Qualification tests are performed as stipulated in the ISO 16750 standard: “Road vehicles – Environmental conditions and testing for electrical and electronic equipment”.

Objective Specification

<table>
<thead>
<tr>
<th>Grade</th>
<th>Automotive</th>
<th>Professional</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>GNSS</td>
<td>GPS/QZSS</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td></td>
<td>GLONASS</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Galileo</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BeiDou</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>Number of concurrent GNSS</td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interfaces</th>
<th>UART</th>
<th>SPI</th>
<th>DDC (I²C compliant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZED-F9K</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Features</th>
<th>Programmable (Flash)</th>
<th>☑</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Carrier phase output</td>
<td>☑</td>
</tr>
<tr>
<td></td>
<td>Additional SAW</td>
<td>☑</td>
</tr>
<tr>
<td></td>
<td>Timepulse output</td>
<td>1</td>
</tr>
</tbody>
</table>

| Power supply | 2.7 V – 3.6 V | ☑ |

UBX-18018218 - R01
## Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
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</thead>
<tbody>
<tr>
<td>Receiver type</td>
<td>184-channel u-blox F9 engine</td>
</tr>
<tr>
<td></td>
<td>GPS L1C/A L2C, GLO L1OF L2OF, GAL E1B/C E5b, BDS B1I B2I, QZSS L1C/A L2C</td>
</tr>
<tr>
<td>Nav. update rate&lt;sup&gt;1&lt;/sup&gt;</td>
<td>up to 30 Hz</td>
</tr>
<tr>
<td>Position accuracy&lt;sup&gt;2&lt;/sup&gt;</td>
<td>SBAS 1 m CEP</td>
</tr>
<tr>
<td></td>
<td>RTK 0.2 m + 1 ppm CEP</td>
</tr>
<tr>
<td>ADR position error</td>
<td>&lt; 2% of distance travelled without GNSS</td>
</tr>
<tr>
<td>Convergence time&lt;sup&gt;2&lt;/sup&gt;</td>
<td>RTK &lt; 10 s</td>
</tr>
<tr>
<td>Acquisition</td>
<td>Cold starts 26 s</td>
</tr>
<tr>
<td></td>
<td>Aided starts 2 s</td>
</tr>
<tr>
<td></td>
<td>Reacquisition 2 s</td>
</tr>
<tr>
<td>Built-in</td>
<td>TCXO, RTC, flash memory, 3D accelerometer, 3D gyroscope, diplexer, SAW filter</td>
</tr>
</tbody>
</table>

<sup>1</sup> The highest navigation rate can limit the number of supported constellations.

<sup>2</sup> Depends on atmospheric conditions, baseline length, multipath conditions, GNSS antenna, satellite visibility, and geometry. SBAS will be supported in ZED-F9K-01B.

## Environmental data, quality & reliability

<table>
<thead>
<tr>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temp.</td>
</tr>
<tr>
<td>Storage temp.</td>
</tr>
<tr>
<td>RoHS compliant (lead-free, 2015/863/EU)</td>
</tr>
<tr>
<td>Green (halogen-free)</td>
</tr>
<tr>
<td>Qualification according to ISO 16750</td>
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<tr>
<td>Manufactured and fully tested in ISO/TS 16949 certified production sites</td>
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</table>

## Support products

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>ZED-F9K-00B</td>
<td>u-blox F9 multi-band high precision dead reckoning, professional grade</td>
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## Further information

For contact information, see www.u-blox.com/contact-us.

For more product details and ordering information, see the product data sheet.

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