ALPS ALPINE GROUP

NEWS RELEASE

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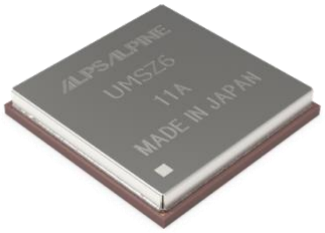
A World First for Automotive Use

Alps Alpine and Furuno Develop GNSS Module – Realizing High-Accuracy Vehicle Positioning to Within 50cm Without Correction Data

UMSZ6 Series: Lane-Level Vehicle Positioning Contributing to Autonomous Driving Advancement

Munich, Germany, November 23, 2021 – Alps Alpine and Furuno Electric Co., Ltd. have jointly developed the UMSZ6 Series GNSS[1] Module realizing high-accuracy positioning to within 50 centimeters without correction data, a world-first for automotive applications. Even on general roads (approx. three meters wide), the module reliably enables vehicle positioning down to the lane level, as is required of various V2X[2] applications, thereby contributing to greater sophistication of autonomous driving functions. With a view to undertaking sales promotion activities worldwide, efforts will be made to enhance the degree of completion of the product through performance evaluations involving demonstration testing. We aim for a start to mass production in 2023.



Technological innovation is gathering momentum within the automotive CASE domains (Connected, Autonomous, Shared & Services, Electric). In the autonomous driving domain, a growing number of vehicles on the road have Level 2 automated driving capability, allowing them to autonomously follow the vehicle in front under certain conditions while staying in their lane. Cars capable of Level 3 automated driving, where the system carries out all driving tasks but under restricted conditions, such as during expressway or low-speed driving, have also recently been

developed. Some are already on the market. However, the spread of Level 3 autonomous vehicles and further advancements in autonomous driving functionality will depend on the availability of vehicle positioning that is more user-friendly and even more accurate.

The UMSZ6 Series GNSS Module jointly developed by Alps Alpine and Furuno realizes high-accuracy vehicle positioning to within 50 centimeters even without having to use position correction data, a world-first for automotive applications. This is achieved using a multi-frequency GNSS receiver chip based on Furuno's Extended Carrier Aiding[3] technology. Running costs associated with RTK[4] base stations, correction data receiving, and correction data use are no longer needed, maximizing cost performance, while reliable vehicle positioning down to the lane level is possible even on general roads (approx. three meters wide). Alps Alpine expertise in module creation accumulated over many years in the automotive business was applied to realize compact dimensions of 17.8 × 18.0 × 3.11mm while conforming to automotive grade, contributing to greater freedom for customers in end-product design.

Under the joint development, Furuno has developed and supplies an original multi-frequency GNSS receiver chip – eRideOPUS 9 (model ePV9000B) – and algorithm. Alps Alpine is using the chip before anyone else to create and commercialize the UMSZ6 Series GNSS Module and will carry out evaluations within a real-car environment to assess performance and interoperability with V2X and other communication modules, and pursue sales promotion within the automotive market.

Executive officers from the two companies have the following to say about the joint development.

Hideo Izumi, Vice President, Device Business, Alps Alpine Co., Ltd.: "Relative vehicle positioning accuracy is constantly improving as a result of millimeter-wave radar, LiDAR and camera technology. Achieving absolute position accuracy down to the lane level is essential for both V2X applications and genuine Level 3

automated driving, but system-related costs associated with RTK technology have been an obstacle. Getting around this with a multi-frequency GNSS receiver chip based on Furuno's Extended Carrier Aiding technology, which realizes high-accuracy vehicle positioning to within 50 centimeters without correction data, will likely prove to be a breakthrough in V2X and advanced autonomous driving technology."

Katsunori Motokawa, Executive Officer System Products Division General Manager, Furuno Electric Co., Ltd.: "Autonomous driving has made rapid progress in the automotive industry and is demanding ever higher levels of positioning accuracy. By teaming up with Alps Alpine, a company with an extensive track record in the automotive market, module creation expertise conforming to stringent automotive grade standards, and C-V2X system offerings, we believe the high positioning accuracy Furuno has achieved can contribute to practical application and greater sophistication of autonomous driving technology."

The next task will be to evaluate the module's performance, for example through demonstration testing, and bring the product to a higher degree of completion as we look ahead to sales promotion worldwide. Our aim is to begin mass production during 2023. Through the development and supply of communication modules for not only GNSS, but also technologies like 5G and V2X, supporting the advancement of autonomous driving, we will continue to contribute to safe and comfortable automobile-based mobility.

Principal Applications

- Telematics control units (TCU)
- V2X onboard units (OBU)

1. Global Navigation Satellite Systems (GNSS): Such systems include GPS (United States), GLONASS (Russia), Galileo (Europe) and BeiDou (China). Here, Regional Navigation Satellite Systems (RNSS), QZSS (Japan) and NavIC (India) are also included.

2. Vehicle-to-everything (V2X): Collective term for technology connecting vehicles to something, such as vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I) and vehicle-to-pedestrians (V2P)
3. Technology for minimizing the effects of noise. Noise was dramatically reduced by eliminating the effects of propagation delay using dual band configuration, with the help of a carrier phase.
4. Real-time kinematic (RTK) positioning: Measurement of relative position using the phase of a carrier wave. Correction data sent to a GNSS receiver from a reference station (GNSS receiver installed in a known location) is used to eliminate systematic errors included in observations. The technology seeks to determine position relative to a reference station with accuracy between several centimeters and several millimeters.

Specifications

Model (no.)	UMSZ6 Series
Dimensions (W×D×H)	17.8 × 18.0 × 3.11mm
Supported satellites	GPS: L1 C/A, L5 GLONASS: L10F BeiDou: B1I, B1C, B2a Galileo: E1B/C, E5a NAVIC: L5 QZSS: L1C/A, L1S, L5 SBAS: L1, L5
Operating temperature range	-40°C to +85°C / 105°C
Supply voltage	+1.8V
Supported features	Dead reckoning (built-in sensor for DR) Antenna diagnostics function

About Furuno Electric Co., Ltd.
Furuno was the first in the world to successfully commercialize a fish finder. The company has since grown into a comprehensive manufacturer of marine electronics through successive development of equipment such as GNSS plotters (navigators), wireless communication devices and marine radar systems, and now enjoys the world's leading market share. Applying positioning and radio technology acquired in the marine domain to land uses, Furuno has developed products including GNSS receivers and onboard electronic toll collection (ETC) units. In the GNSS receiver business, the company supplies products with automotive-grade quality demanding high positioning accuracy, stability and reliability, as well as time synchronization products used by mobile base stations and other key infrastructure. Furuno has around 30 years of experience in this field and continues efforts contributing to a society embracing intelligent transport systems (ITS). Furuno aims to achieve better safety, security and comfort to bring about a society that considers the needs of people and the environment. For more information, visit: https://www.furuno.co.jp/en/

Alps Alpine Co., Ltd. On January 1, 2019, Alps Electric Co., Ltd. and Alpine Electronics, Inc. integrated their businesses and started out afresh as Alps Alpine Co., Ltd with 42,289 employees. Alps Alpine will steadily bring about synergies by drawing

on the two companies' advantages in core devices, system design and software development.
The new company will endeavour to create its own unique value for not only the automotive market, but also mobile devices and consumer electronics, as well as new sectors such as energy, healthcare and industry. For more information please visit www.alpsalpine.com

Alps Alpine Europe GmbH, a subsidiary of Alps Alpine Co., Ltd., was established in 1979. Since 2013 the European Head Office has been located in Munich and as such co-ordinates the Sales, Marketing and Product Engineering activities of our offices in Dusseldorf, Stuttgart, Wolfsburg, Paris, Milton Keynes, Coventry, Gothenburg, Frolunda and Milan, as well as the production activities of our manufacturing site in Dortmund. Alps Electric Europe GmbH changed its name on 01.04.2020 to Alps Alpine Europe GmbH.

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