

NEWS RELEASE

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Alps Alpine Develops Hands-Off Detection ECU for Autonomous Driving Assistance Systems and Begins Mass Production

Four-Electrode Multi-Zone Configuration Distinguishes Between Driver Grip Variations for Safer Mobility

Munich, Germany, July 16, 2021 – Alps Alpine has developed an electronic control unit (ECU)¹ for hands-off detection to support autonomous driving systems by distinguishing between variations in a driver's grip on the steering wheel. Mass production began in spring 2021 and the plan is to gradually expand deployment to a range of vehicle models. To accommodate advancements in autonomous driving support and further contribute to safe and comfortable mobility, development for next-generation models is already underway.

Background to the Development

Technological innovation is gathering speed within the automotive CASE domains of connected cars, autonomous driving, sharing and services, and electrification. In the field of autonomous driving, we see growing deployment of systems that enable a vehicle, under certain conditions, to automatically follow the car in front while keeping to the lane. One recently developed advanced autonomous driving system now on the market performs all driving tasks under limited scenarios, such as while traveling on an expressway or at low speeds.

Vehicles equipped with these features need to be able to detect and assess a driver's driving status to allow safe and smooth switching between automated and manual driving. One aspect is hands-off detection, a function for determining the status of the driver's grip on the steering wheel that interacts with other systems for assessing driving status to enable safe switching between driver-controlled and system-controlled modes. Safety features are necessary given the ongoing sophistication of autonomous

driving assistance systems, and legislation is progressing. Provisions under the R79 international regulation are one example.

Determining the right time to switch between autonomous driving assistance and manual driving requires constant monitoring of the vehicle's drive status and the driver's driving posture to ensure safety. If the continuation of autonomous driving assistance is deemed inappropriate, the driver needs to be quickly warned that the assistance is to be disengaged and urged to immediately revert to manual driving. Safety assurances demand much more precise detection of diverse variations of the driver's grip on the steering wheel.

Outline of the Development

1. System Configuration

Capacitive sensing is the dominant technology used for steering wheel touch detection due to its cost and functional performance. The ECU uses data obtained via a special-purpose capacitive sensor, wrapped around the steering wheel, to determine if the driver is touching it and conveys the assessment to an advanced driver assistance system (ADAS). Whereas existing hands-off detection systems are mono-zone setups, with a single electrode, Alps Alpine has developed a multi-zone configuration with four electrodes (see Fig. 1). Dividing the steering wheel and grip patterns into smaller sections enables efficient system switching and enhanced touch assessment reliability.

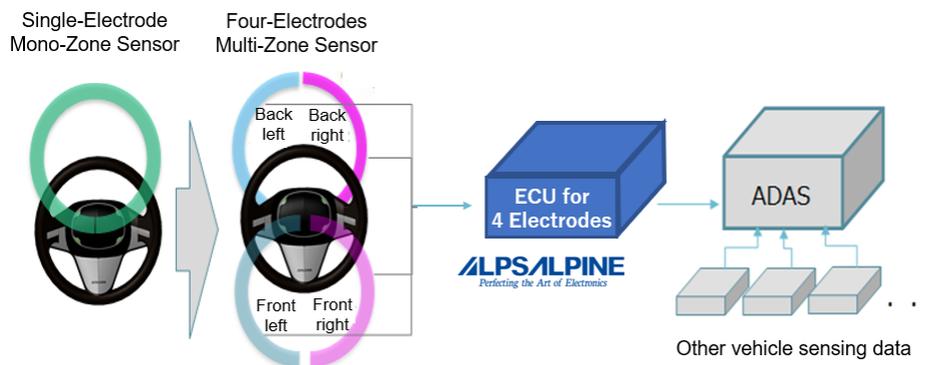


Fig.1

2. Product Outline

Resilience to physical stress is a necessary consideration when employing capacitive control, as is the need to maintain resistance to environmental factors – temperature, humidity and electromagnetic noise – and the feel of the sensor itself. It is also essential to have separate, optimal control for sensor materials specific to



the application. Alps Alpine started producing touch panels for notebook PCs and game consoles in the 1990s and automotive control panels for capacitive touch-type in-vehicle infotainment (IVI) systems in the 2010s. The company has plenty of experience applying capacitive control technology to a diverse range of sensor materials and environments spanning product domains from consumer electronics to automobiles. Utilizing this knowledge, we have developed a hands-off detection ECU for use with a special-purpose steering wheel capacitive sensor. Deliveries to steering wheel manufacturers began in spring 2021.

1) Industry-first four-electrode sensor (see Fig. 1)

The sensor electrode is divided into four sections to enable identification of various grip states. This allows a more detailed assessment of driving status than a basic touching/not touching determination reached using an existing single-electrode sensor.

2) Original capacitive control ASIC²

Alps Alpine has developed an original capacitive control ASIC with improved durability and versatility for conformance to strict automotive standards.

3) Optimal algorithms for different applications

Steering wheel design, sensor material, electromagnetic compatibility³...conditions vary from model to model, leading to variance in data obtained via the capacitive sensor. To accommodate the separate circumstances, Alps Alpine can supply an originally

developed algorithm that seeks individual optimization, for example with parameter changes.

4) Failure self-diagnosis function

Reliability is enhanced by an original failure determination feature and the product conforms to ISO 26262, the international standard on the functional safety of electrical and electronic systems in automobiles.

Outlook

By fiscal 2025, we can expect further advancements among autonomous driving assistance features and needs for hands-off detection are predicted to grow all over the world. The success of this product's development forms a base on which to approach automobile and steering wheel manufacturers with product proposals and expand sales. Alps Alpine will also put forward product proposals, representing examples of applied capacitive technology, for a wide range of human-machine interfaces (HMI) both inside and outside the vehicle cabin, not just hands-off detection. This is part of our contribution to safe and comfortable automobile-based mobility.

1. An ECU is an embedded system for engine or electronic control in an automobile.
2. Application-specific integrated circuit
3. Electromagnetic compatibility is having characteristics that reduce the noise emitted from electronic devices and prevent operational error as a result of nearby electrical noise.

Specifications

Model	ECU for Hands-Off Detection
Dimensions (W×D×H)	40 × 45 × 12mm (ref.)
Interface	LIN 2.1 or 2.2
Operating voltage/current	8-16V/Up to 100mA
Guaranteed operating temperature range	-40°C to +85°C

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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