

# DENSO Develops Products Used in Toyota's New Prius

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**Contact: Bridgette LaRose**

DENSO International America, Inc.

Phone: (248) 372-8266

bridgette-larose@denso-diam.com

Contributing to improving the vehicle's environmental and safety performance

**KARIYA (Japan)** – DENSO Corporation is helping Toyota Motor Corp. make its next generation Prius safer, more fuel efficient and greener for the environment. DENSO has worked with Toyota to develop new hybrid, sensing and thermal technologies that help improve the safety, comfort and environmental performance of Toyota's new Prius, which launches in Japan in December and in other regions around the world early 2016.

The new products related to the environment are a power control unit and a motor stator, which are smaller and lighter than the previous models. The technologies related to safety include a millimeter-wave radar sensor, vision sensor, and an ITS Connect-supported in-vehicle device, which improves safety such as collision prevention. Moreover, a new, more energy efficient automotive air conditioning system helps improve the comfort and environmental performance of the new Prius.

## **1. Power Control Unit:**

As hybrid vehicles become increasingly sophisticated, the power control unit, which regulates the current flow from the battery to the electric motor, is required to be smaller, yet more powerful. The new power control unit, which has a more efficient cooling structure and a more highly integrated semiconductor device, is about 33 percent smaller than that of the previous Prius.

## **2. Motor Stator:**

Motors in hybrid vehicles are used as drive motors but they also function as generators, converting energy during coasting and braking. The

stator, which is a key component of a motor, produces a magnetic field when the stator coil windings are energized, which in turn rotates the motor.

The new motor stator, which has been developed by DENSO and Toyota, is made with a new, innovative coil winding technique and is about 20 percent lighter than that used in the previous Prius.

### **3. Millimeter-Wave Radar Sensor and Vision Sensor:**

These sensors are part of Toyota's Safety Sense P (TSSP) safety package, which is used in Toyota's mid-range and luxury vehicle models. The millimeter-wave radar sensor uses radio waves to measure the distance and direction of the object ahead, while the vision sensor uses a camera to detect road lane markings and the object in front .

Previously, these sensors worked separately; however, DENSO has enabled them to work with each other while making full use of the advantages of each sensor to achieve more rapid and accurate detection. This has helped the development of practical safety functions including autonomous emergency braking (vehicle and pedestrian), full-speed range adaptive cruise control, lane departure warning and lane keeping assist, and, automatic high beam.

### **4. Wireless unit for ITS Connect service:**

The wireless unit for ITS Connect service is a radio communication device to help prevent road accidents and improve traffic efficiency. The new in-vehicle device has three functions: (1) to communicate via radio waves with vehicles and roadside communication devices in real-time within several hundred meters, (2) to determine the latitude and longitude of the location of the vehicle to send this information to nearby vehicles, and (3) to analyze the traffic situation based on the information obtained via radio communication, and thus determine what driving support system needs to be activated. These functions help enable the operation of ITS Connect, which provides vehicle-to-infrastructure and vehicle-to-vehicle communications

\* A cooperative driving support system that uses the dedicated ITS frequency of 760 MHz for road-to-vehicle and vehicle-to-vehicle communications

### **5. Automotive air conditioning system:**

DENSO's new automotive air conditioning system uses a more efficient

electric compressor and an ejector-integrated evaporator (heat exchanger), which reduces power consumption for air cooling by about 18 percent compared to the system used in the previous Prius.

Moreover, this air conditioning system has a two-layer recirculated/fresh air unit to draw in external air while circulating internal air to ensure the performance of air heating during the winter months and prevent the windshield from fogging up. This reduces the heat loss due to air ventilation by 30 percent. The double suction blower structure is designed to deliver warm internal air to the feet of the vehicle occupants and cool external air to the windshield to prevent it from fogging up, in order to ensure the air heating performance and visibility.

**About DENSO:** DENSO Corp., headquartered in Kariya, Aichi prefecture, Japan, is a leading global automotive supplier of advanced technology, systems and components in the areas of thermal, powertrain control, electronics and information and safety. Its customers include all the world's major carmakers. Worldwide, the company has more than 200 subsidiaries and affiliates in 38 countries and regions (including Japan) and employs more than 140,000 people. Consolidated global sales for the fiscal year ending March 31, 2015, totaled US\$35.9 billion. Last fiscal year, DENSO spent 9.2 percent of its global consolidated sales on research and development. DENSO common stock is traded on the Tokyo and Nagoya stock exchanges. For more information, go to [www.globaldenso.com](http://www.globaldenso.com), or visit our media website at [www.densomediacycenter.com](http://www.densomediacycenter.com).

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