



Special Feature: Power Electronics for Hybrid Vehicles

Overview

Yoshiyuki Hattori

Department Manager
System & Electronics Engineering Dept. III

The reduction of CO₂ emissions from automobiles is required to prevent global warming. Recently, the proliferation of electrically driven vehicles, such as hybrid vehicles (HVs), plug-in hybrid vehicles (PHVs), electric vehicles, and fuel cell vehicles, which do not emit as much CO₂ as conventional internal combustion engine vehicles, is accelerating, and this is helping to provide a solution to the environmental problem. HVs and PHVs are leading the market of electrically driven vehicles.

This special feature focuses on power electronics for HVs and PHVs. Power electronics refers to circuits and systems performing supply, conversion, and electric power control, using power semiconductor switching devices. Power electronics is a key technology in HVs, which uses not only an engine but also an electric motor as the source of power.

Low power consumption, high efficiency, and downsizing are important issues for HV power electronics.

This special feature presents a multiport DC/DC converter for a dual-voltage 12 V/48 V HV subsystem, a battery charger using an isolated single-phase matrix converter, and a new electromagnetic torque converter that is composed of a set of double rotors and a stator.

In addition, due to the increase in the number of power electronics devices, there is concern that the electromagnetic noise and the electromagnetic field leakage generated by these devices will influence in-vehicle electronic devices and the human body.

Here, the analysis of electromagnetic noise generated from HV control systems as well as suppression methods, and an analysis of the influence of magnetic field leakage from a wireless power transfer system on the human body are discussed.

Moreover, 200 V power supplies as well as conventional 12 V power supplies have been introduced in HVs. The number of power electronics devices directly connected to this high-voltage power line will increase in the future. A communication system using such high-voltage power lines is also proposed.