Renesas Releases DC/DC Converter Power MOSFET Chip Set Achieving Industry's Highest Power Efficiency of 90 percent

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Renesas Technology Corp. today announced a power MOSFET chip set, comprising a high-side(*1) RJK0305DPB and low-side(*1) RJK0301DPB, for DC-DC converters used in servers, notebook PCs, communication devices, and similar products.Sample shipments will begin in June 2005 in Japan.

This chip set achieves greatly improved performance through the use of a newly developed process specifically for power supply use.The industry’s highest power efficiency of 90% is achieved with 12 V input and 1.3 V/20 A output, and lower power loss has enabled the power supply output current to be increased by approximately 15% compared with previous Renesas products, making possible smaller power supplies with greater current capacity.

With power MOSFETs, switching loss normally increases at higher frequencies, but the improved high-speed performance of the RJK0305DPB offers high-speed switching capable of handling even the widely used high frequency of 1 MHz.

Background>

In applications such as servers, notebook PCs, and communication devices, increased power consumption of the CPU, memory, and other components brings a need for improvements in power efficiency and

output current from the DC-DC converters supplying power to these chips.As the output current is limited by heat generation due to power loss, there is a demand for lower loss in power MOSFETs, which are among those DC-DC converter components associated with the greatest degree of power loss.

In response to this need, Renesas Technology currently mass-produces power MOSFETs achieving low loss through the use of a trench gate process, package improvements, and so forth, and these low-loss power MOSFETs have been well received by the market.Now, to provide for the larger currents and further miniaturization envisaged for future DC-DC converters, Renesas Technology has further extended previous power MOSFET high-efficiency technology and developed a new process optimized for dedicated power supply use.The RJK0305DPB and RJK0301DPB power MOSFET chip set offering greatly improved performance is being released as the initial product employing this new process.

This chip set comprises an RJK0305DPB high-side power MOSFET and RJK0301DPB low-side power MOSFET for use in DC-DC converters performing conversion of a 12 V or 19 V input voltage to a 0.8 V to 2.5 V output voltage in servers, notebook PCs, and communication devices.

Thanks to the new process for dedicated power supply use, power supply efficiency has been improved from the 87.5% of previous Renesas products to 90% in the case of a 12 V input voltage, 1.3 V output voltage, and 20 A output current.In addition, power loss has been reduced by approximately 22%, from 3.7 W to 2.9 W, making possible an approximately 15% improvement in power supply output current with no change in thermal radiation conditions.

Information on the Power MOSFETs

The RJK0305DPB and RJK0301DPB employ a new process and design optimized for the performance required of the respective products.Thus the RJK0305DPB features a drain-gate charge (Qgd) approximately 15% lower than previous Renesas products in order to improve switching speed, which is crucial for the high-side element, while the RJK0301DPB offers an approximately 20% reduction in on-resistance(*2) in order to reduce conduction loss, which is an important parameter for the low-side element.

The package used is an LFPAK (Loss Free Package: Renesas package code) high-thermal-radiation, low-inductance(*3) Renesas package with an established track record in high-efficiency power supply applications, allowing control of larger currents.

Renesas Technology will continue to extend its lineup of products employing the newly developed process, with the development of SOP-8 mounted models as well as 60 V and 100 V products, in order to expand the range of applications to include such products as insulating DC-DC converters for communication devices.

Notes:

1. High-side and low-side elements: These elements are used as non-insulating type DC-DC converter switches, enabling voltage conversion to be performed by means of alternate on/off switching while maintaining synchronization between the high side and low side.Usually, the input voltage of a server DC-DC converter is 12 V while the CPU uses a lower voltage of 1.2 V to 1.3 V or less, and therefore for the high-side on-period a short pulse of approximately 10% or so of one cycle is controlled, and the remaining 90% is the on-period of the low-side element, so that an element whose characteristics emphasize switching speed is selected for the high-side element, and an element whose characteristics emphasize low on-resistance is selected for the low-side element.

2. On-resistance: Operational resistance when a power MOSFET operates.On-resistance is the parameter that most affects power MOSFET performance, with performance increasing as on-resistance decreases.
3. Inductance: A component that is naturally present in wiring and impedes current variation, having a value approximately proportional to the length of the wiring.The larger this value, the greater is the extent to which the high-speed switching operation of a power MOSFET is impeded.In high-frequency switching regions, in particular, inductance is a cause of major switching loss.

DC-DC converters: Notebook PCs, servers, communication devices, etc.

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