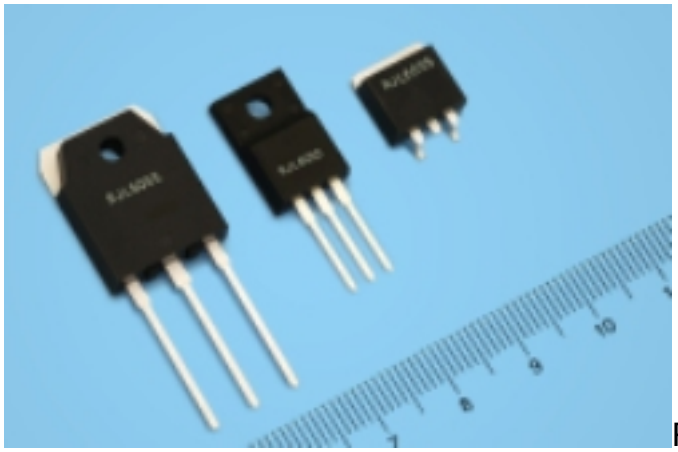
New Super Junction MOSFETs



Renesas Electronics Corporation today announced the availability of three new super-junction metal-oxide-semiconductor field-effect-transistors (Super Junction MOSFETs) featuring figure of merit: on-state resistance x gate change in a 600 V power semiconductor device suitable for high-speed motor drives, DC-DC converters, and DC-AC inverter applications. This ultra low on-state resistance and low gate charge combination benchmark, combined with the fast body diode feature, allow the new RJL60S5DPP, RJL60S5DPK and RJL60S5DPE devices to contribute to improved power efficiency in home appliance motor drives, such as for air conditioners, that employ high-speed motors with inverterized control.

In recent years, greater environmental awareness has led efforts to increase the energy efficiency of electronic devices and reduce our energy footprint. In particular, there has been a strong emphasis on reducing loss and improving power efficiency in the power supply circuits of home appliances such as air conditioners and TVs. This has spurred demand for lower loss (which is a function of lower on-state resistance and better switching characteristics) in the power devices used in such products, to improve overall energy efficiency.

Previously, air conditioners and other home appliances employing high-voltage, high-speed motors and inverters typically used IGBTs with discrete Fast Recovery Diodes (FRDs), in one package, to enable a short reverse recovery time (trr). Now, the need for even higher switching speeds, coupled with the need for even lower loss with stable operation and performance is generating demand for Super Junction MOSFETs with fast recovery body diode characteristics. Unlike a conventional planar structure, the Super Junction MOSFETs enable a decrease of the on-resistance without reducing the voltage tolerance of the device, making it possible to produce MOSFETs with a lower on-resistance per unit of area. To meet the growing need for these devices as the industry moves toward a more energy-conscious perspective, Renesas has leveraged its accumulated expertise in power device technology to develop a family of new high-performance Super Junction MOSFETs with high-speed body diodes, for low loss and improved high-speed switching performance.

Key features of the new Super Junction MOSFETs:

(1) Ultra low on-state resistance

Leveraging expertise gained from earlier Super Junction MOSFET devices designed for applications, such as PC servers and LCD TVs [1], Renesas has achieved an on-state resistance of 150 m? (typical value) in a 600 V power semiconductor device along with a low gate charge. This enables improved power efficiency for applications such as home appliances that employ high-speed motors and inverterized control.

(2) Shorter reverse recovery time

The new Super Junction MOSFET devices have built-in fast body diodes with specifications optimized for high-speed motor control applications. There is a significant reduction in the diodes' reverse recovery time to only 150 ns, about one third that of the diodes in similar-rated existing Super Junction MOSFET devices.

(3) High-speed switching capability with significantly reduced side effects such as ringing

Renesas improved the gate drain capacitance by optimizing the surface configuration, thereby minimizing ringing, while preserving high-speed switching performance. This improvement contributes to reduced loss and stable operation, especially in three-phase bridge circuits, which are widely used in high-speed motor and inverter control applications.

www.renesas.com [2]

Posted by Sara Cohen, Editorial Intern

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