



Volume 5:

The development of power MOSFETs for electronic automotive devices

Environmental problems facing the automotive industry

In the automotive industry, which has long been actively engaged in environmental management, awareness of global environmental problems has reached an even higher level. In particular, the improvement of fuel consumption and reduction of CO₂ emissions, both of which are directly related to global warming, have become urgent issues, and automobile manufacturers are currently engaged in fierce competition with one another in the area of technological development. Take, for example, the development of electric power steering. With conventional power steering, part of the engine output is utilized to create oil pressure, which means that energy may be generated even when the steering wheel is not in operation, thus resulting in wasted energy. Correspondingly, with electric power steering, which is gaining popularity in light motor vehicles, the required energy is generated only when the steering wheel is actually in operation. For this reason, not only is it possible to prevent the generation of unnecessary energy, but also to drastically improve energy utilization efficiency.

The increasing necessity for a host of semiconductors in automobiles

To ubiquitously increase energy utilization efficiency in automobiles, the percentage of electrically controlled automobile functions is rising. Along with this, there is currently an upsurge in the number of semiconductors installed in automobiles. In fact, there are even some automobiles that are installed with upwards of 100 semiconductors (Figure 1). Since even higher electrical energy is needed in electronic automotive devices such as electric power steering or anti-lock braking systems, there is now a strong demand for the development of semiconductors capable of carrying even larger electric currents.

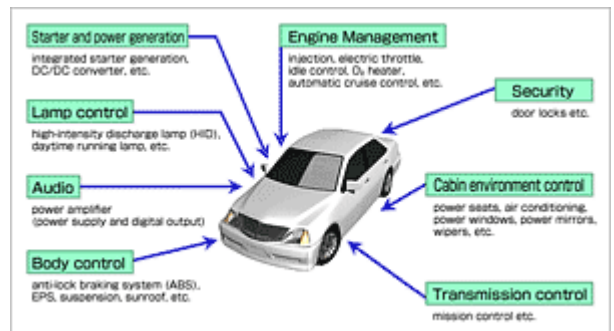


Figure 1 Major applications for automobiles in which power MOSFETs are installed [Enlarged image]

NEC Electronics came to the realization that to meet the need for larger electric currents, it would be necessary to develop power MOSFETs capable of keeping on-resistance (the value of resistance when electric currents flow) down. Since the smaller the value of resistance is, the larger the electric current that can be carried, this reduction in on-resistance makes it possible to minimize power loss. For this reason, the need for larger electrical currents in electronic automotive devices and power efficiency improvement can be met.

Power MOSFETs for mounted electronic automotive devices by NEC Electronics

NEC Electronics has gained an edge over its industry rivals by successfully developing products that have an on-resistance value 20 to 40% lower than conventional ones, and began sample shipments in October 2003. The four recently developed power MOSFETs with the world's lowest on-resistance are the 2SK3811, 2SK3812, 2SK3813 and 2SK3814. By adopting the industry-leading 0.25µm process MOSFET, these products are capable of reducing on-resistance 20 to 40% compared to our conventional power MOSFETs. Among

them, the 2SK3811 reduces on-resistance from the conventional 2.4mΩ (max.) to the world's lowest value of 1.9mΩ. At the same time the 2SK3811 ensure an electric current rating of 110A. Moreover, this product, which has a 40V rating, is gaining widespread popularity primarily as a power MOSFET for use in high-power electronic automotive devices. Since its TO-263 package complies with the JEDEC standard, this power MOSFET appears to have a very promising future as a semiconductor for automotive solutions.

To provide even more complete solutions aimed at the automotive industry, NEC Electronics plans to both strengthen its development of products that have specifications meeting the needs of our customers and gradually put new products on the market. Our power MOSFETs will continue to contribute to environmentally friendly automobile production.

Related Links

- [Examples of system applications for automobiles](#)

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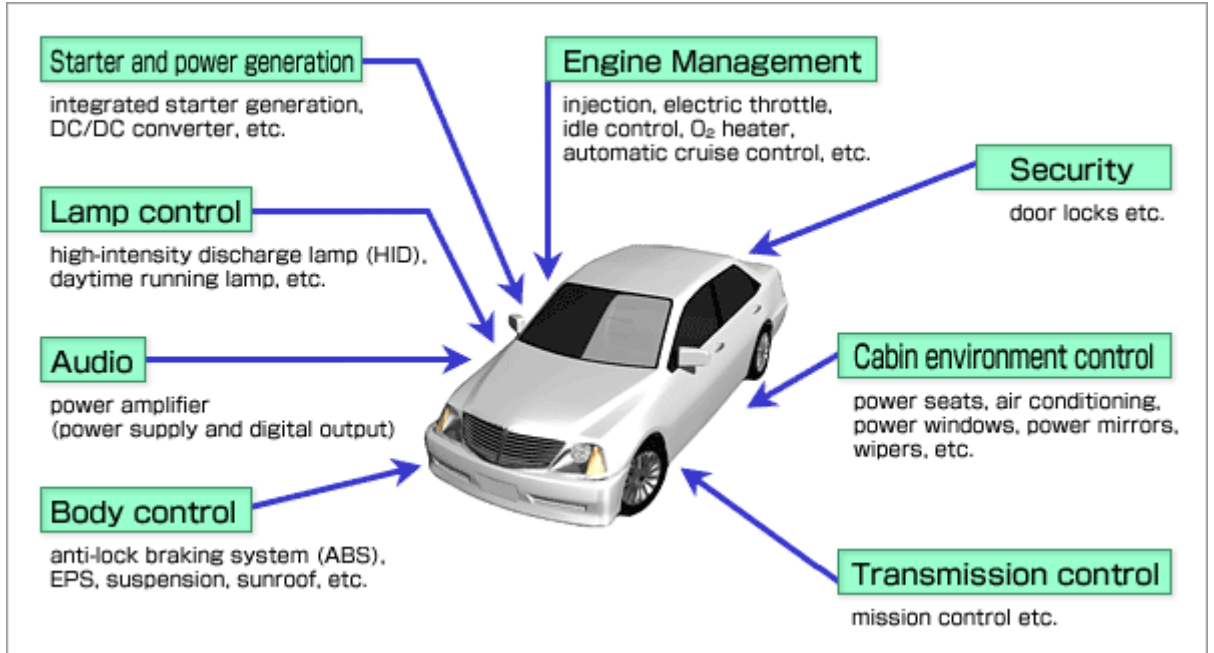


Figure 1 Major applications for automobiles in which power MOSFETs are installed

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