Volume 9:

Development Activities - Power Management Devices

Power MOSFETs contribute to reduced power consumption and miniaturization of cells

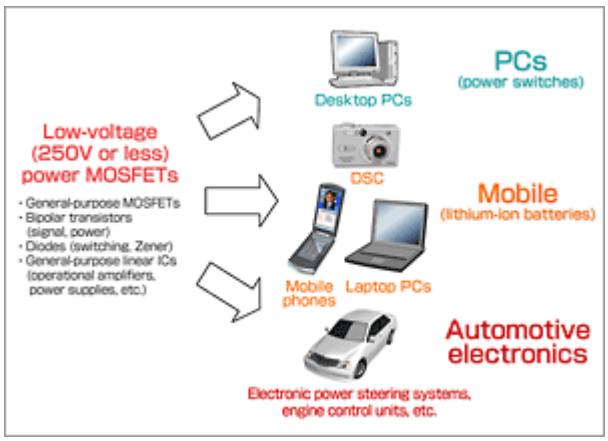

Figure 1 Application fields in which power management devices are used
[**Enlarged image**]

NEC Electronics has long taken a proactive approach to power management, developing and commercializing semiconductors such as power MOSFETs, diodes and transistors for a broad spectrum of applications. Our current offering includes power management devices that contribute to lower power consumption and miniaturization of automotive electronic devices, personal computers and mobile phones (**Figure 1**). Here we will introduce our power MOSFETs, which play an active role in products such as desktop computer motherboards, laptop computers and mobile phone batteries.

The role of power MOSFETs in motherboards and laptop computers

The proliferation of the Internet has led to demand for both higher performance and speed, and put a great burden on CPUs, which are the heart of PCs. This burden has resulted in higher power consumption by CPUs and, in turn, increased heat generation. Power MOSFETs are primarily used around the power sources of CPUs to reduce the on-resistance that occurs when electric current flows (in the "on" state), making it easier for electric current to flow and heat generation to be controlled (**Figure 2**). NEC Electronics power MOSFETs generate less heat by realizing a low on-resistance rating (typically 2.7mΩ at VGS = 10V) that ranks at the top of the industry. This achievement was made possible through the use of a 0.25μm process referred to as UMOS-4 in 2SK3993, which is aimed at low-side switches for the synchronous rectification system DC/DC converter power sources used in motherboards.

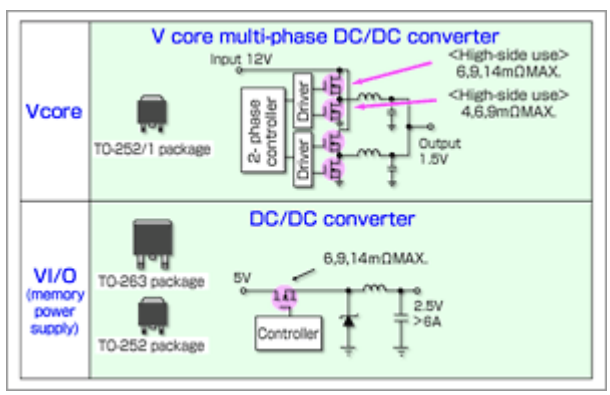

Figure 2 Motherboard power supply circuit
[**Enlarged image**]

For laptop computers, which are easily portable, users want batteries capable of powering their laptops for long periods of time. To extend the life of such batteries, it is necessary to lower the amount of power

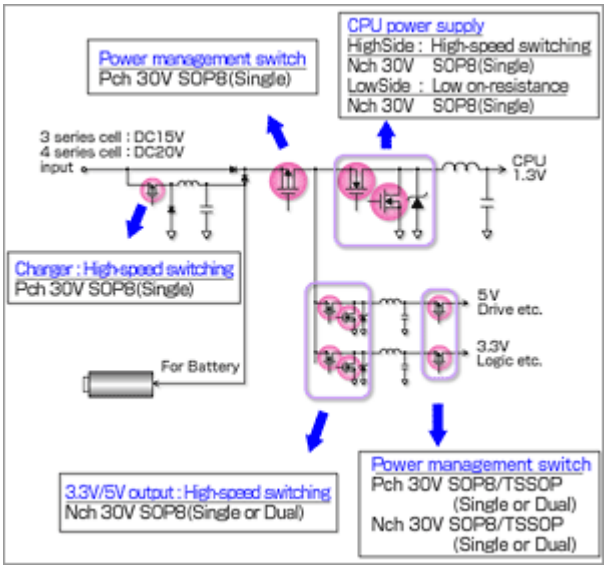

Figure 3 Block diagram of a laptop computer power source
[**Enlarged image**]

consumed by these laptops and reduce loss. Power consumption can be controlled by lowering electric current and on-resistance, and power MOSFETs, which are used in the battery circuits, are assigned this role (**Figure 3**). In its µPA2707GR MOSFET, NEC Electronics has realized a low on-resistance rating of 3.4mΩ that ranks at the top of the industry. And by optimizing gate and feedback capacitance characteristics, we have minimized the penetration current that occurs when high-side elements are turned on. In this way, we are supporting the realization of batteries that are capable of providing power over extended periods of time through reductions in power consumption. We have also achieved reductions in heat generation with our lineup of packages featuring heat sinks referred to as heat spreaders.

Mobile phone battery conservation

NEC Electronics' power MOSFETs also play an active role in mobile phone battery conservation. Positioned in protection circuits that are built into mobile phone batteries, power MOSFETs stop overcharge and overcurrent as well as prevent problems before they even occur (**Figure 4**). And just as with laptop computers, to enable usage over extended periods of time with just a single charge of the battery, it is essential for loss to be controlled when power MOSFETs are turned on. NEC Electronics has a complete lineup of power MOSFETs for battery conservation use. The µPA2450BTL in particular uses a 2-mm-wide 6-pin HWSON package and realizes low on-resistance through the use of a 0.25µm process and wireless bonding mounting technology. These features make it possible to develop mobile phones that are smaller, slimmer and capable of being used for long periods of time.

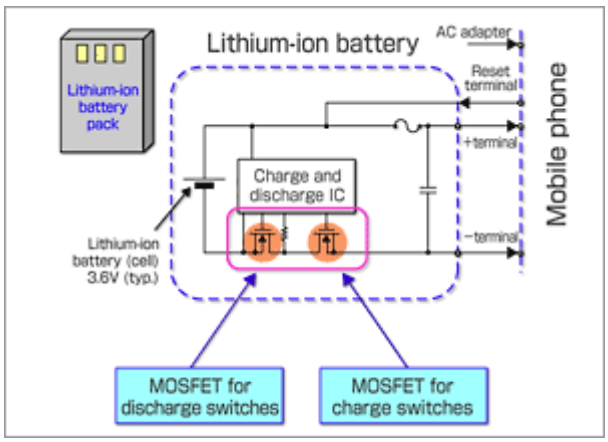

Figure 4 Block diagram of a battery protection circuit
[**Enlarged image**]

NEC Electronics has an extensive lineup of low on-resistance power MOSFETs aimed at meeting the needs of its customers in a broad range of sectors. In the future, we will continue to work actively in the field of power management.

Links

- **Product Information: Transistors, diodes**

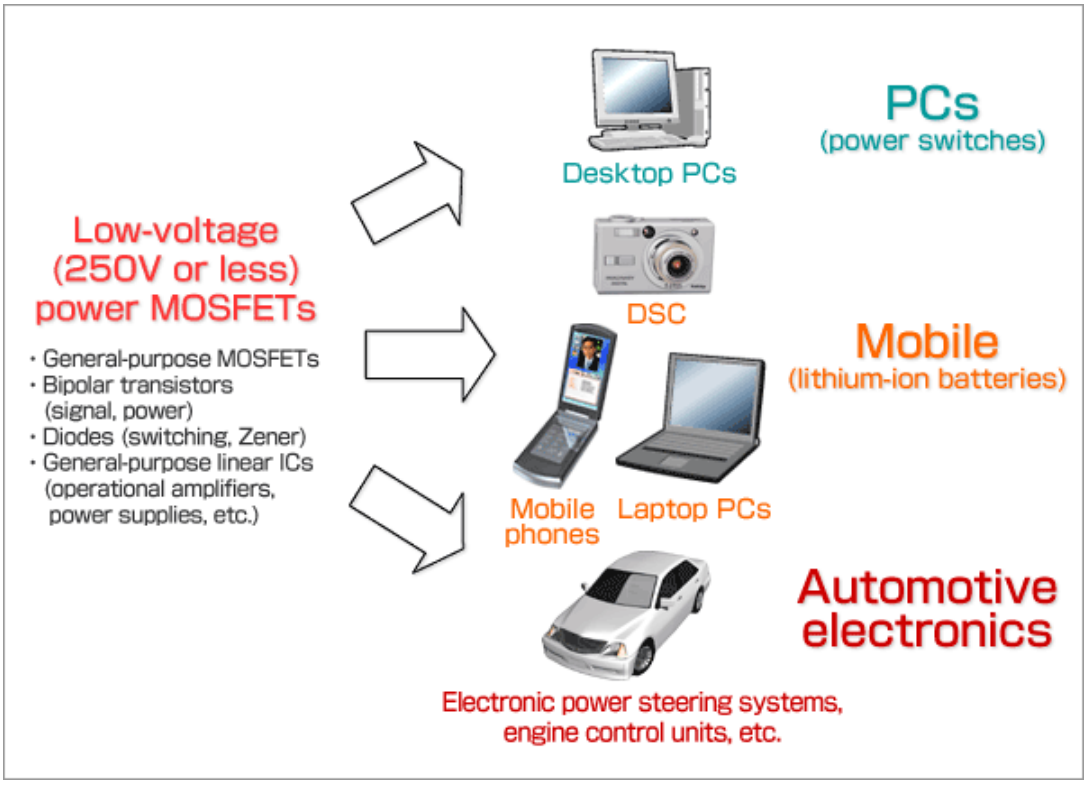

Figure 1 Application fields in which power management devices are used

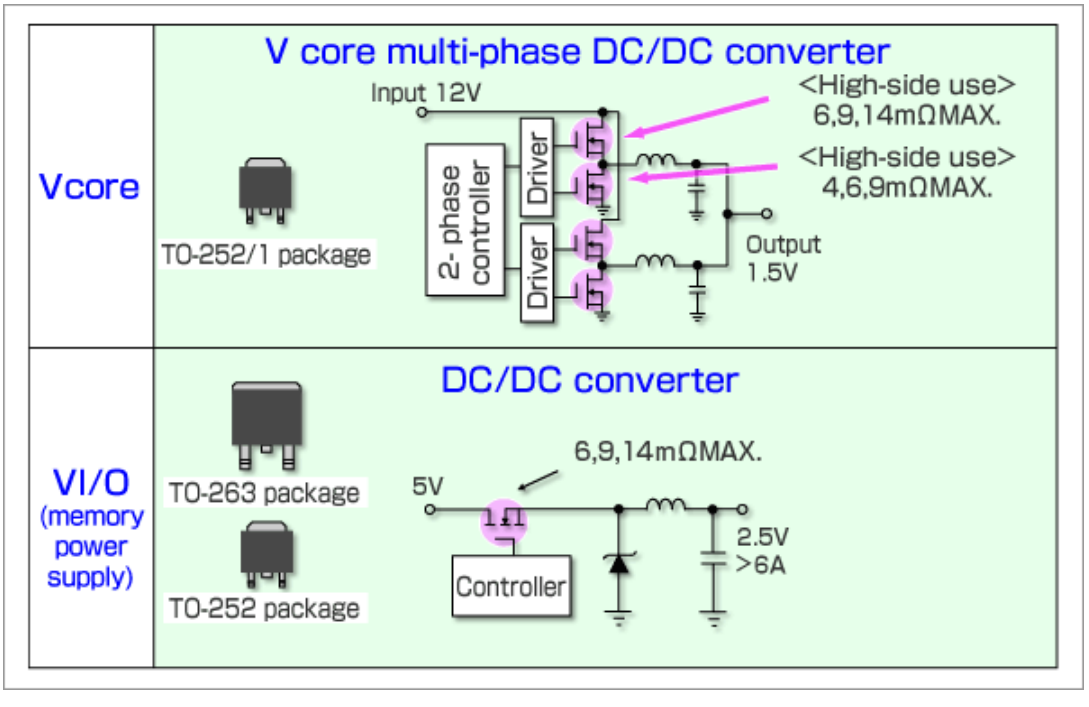

Figure 2 Motherboard power supply circuit

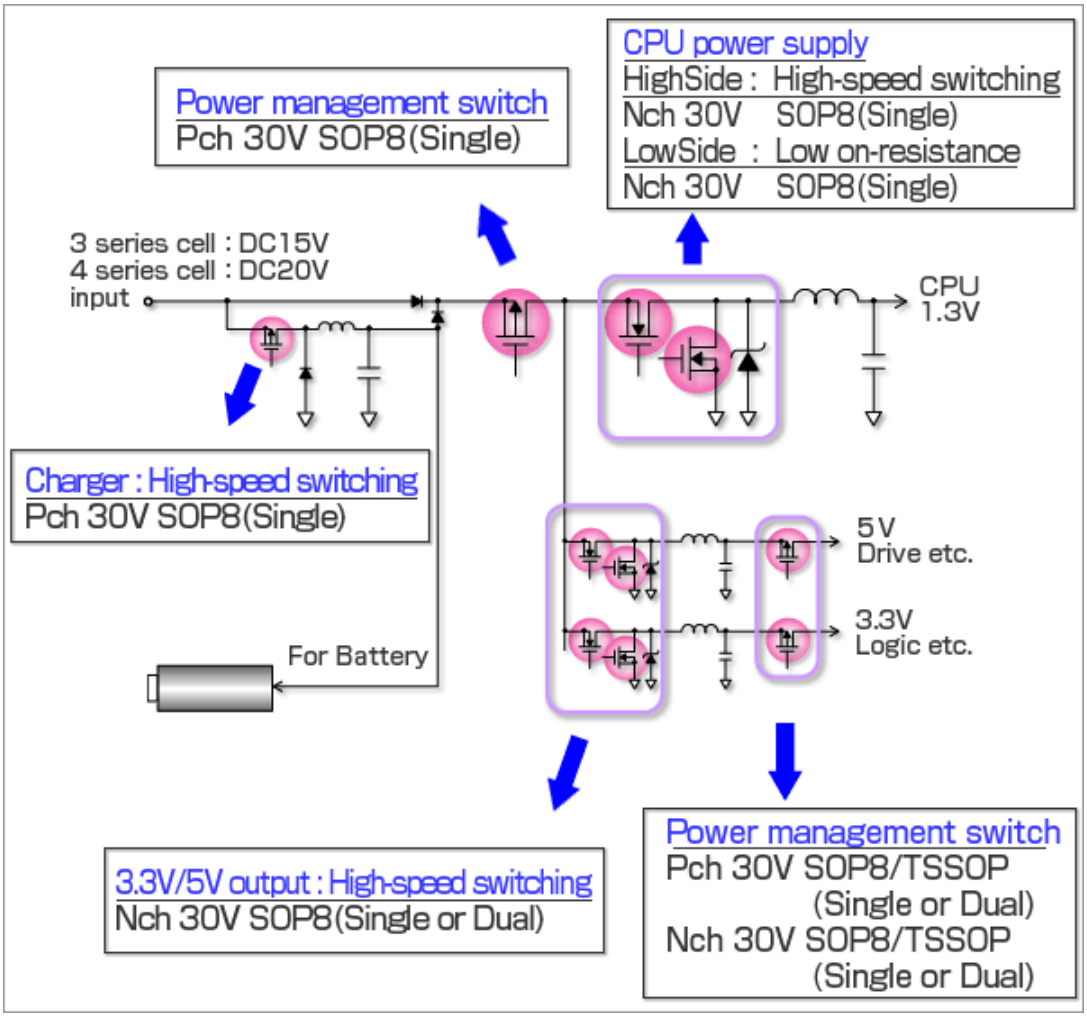

Figure 3 Block diagram of a laptop computer power source

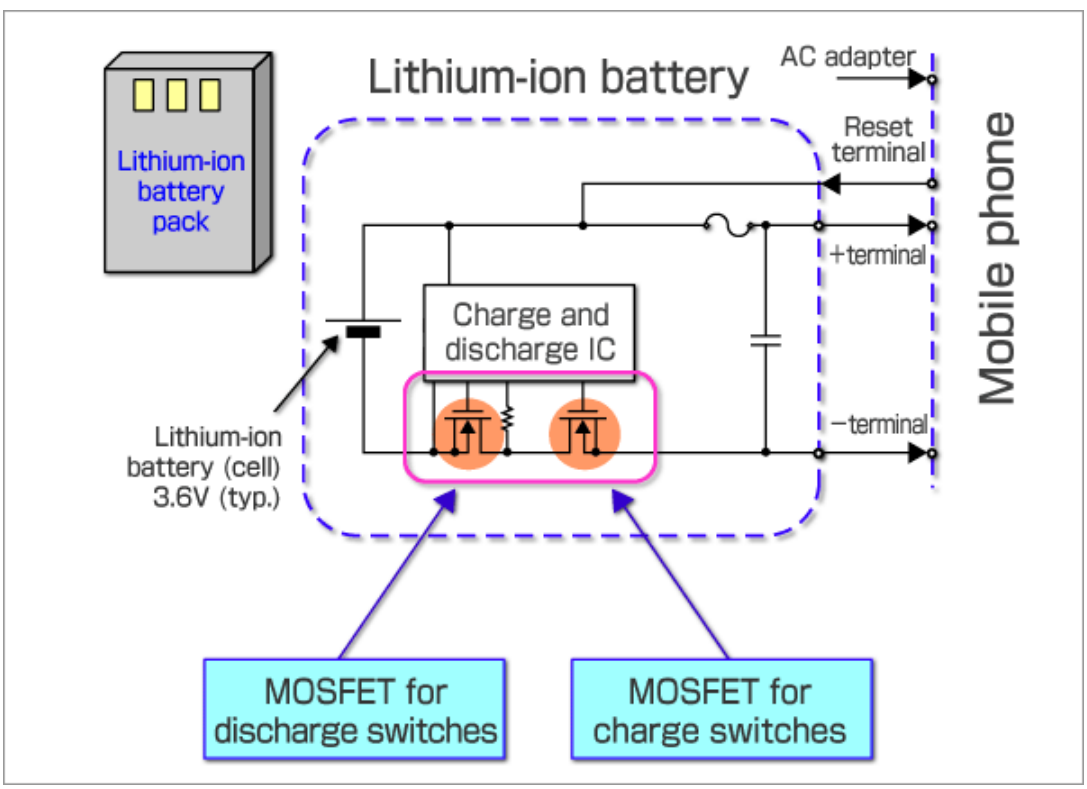

Figure 4 Block diagram of a battery protection circuit