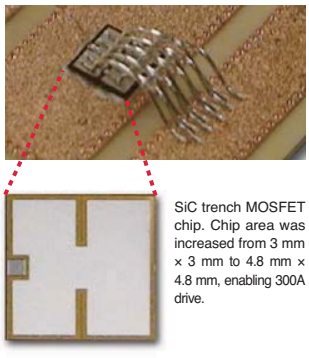
Commercializing next-generation eco-devices through environmentally-focused R&D

ROHM not only seeks semiconductor-based technological innovation through the refinement of manufacturing processes, but has continued the pursuit towards increased functionality by bringing added value utilizing new ideas. This "More than Moore" philosophy continues to fuel the development of new technologies and products that will sustain the next generation by combining a variety of fundamental mechanisms, including new materials, MEMS, and bio/optical technologies.
Minimizing environmental impact continues to be a major consideration in the development of next-generation eco-devices incorporating novel technologies. These products are designed to provide capabilities and functions that meet the emerging need for greater interconnectivity and functionality while greatly contributing to a low-carbon-footprint society.

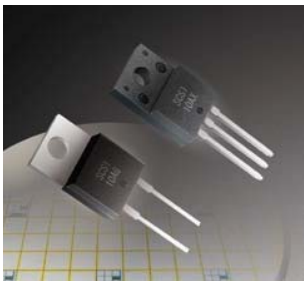
Next-generation material: Silicon Carbide (SiC)

A completely integrated production system has allowed ROHM to develop and mass produce SiC products.

In the field of power electronics, loss from power consumed by silicon-based semiconductor devices during power conversion continues to present major problems. This has led the discovery of SiC, which was found to have material properties superior to silicon – including higher efficiencies that make it attractive from an environmental standpoint. Anticipating this trend, ROHM has progressed with research and development into SiC devices, culminating in the industry's first successful trial production of an SiC MOSFET in 2004, and, more recently, mass production of SiC Schottky barrier diodes (SBD) and power modules.
In October 2009, in collaboration with Kyoto University, ROHM was able to increase the current capacity of a large-area trench gate vertical type SiC MOSFET – previously impossible to achieve. The result is a single chip capable of 300A drive, paving the way for the application of SiC devices in high-current power conversion modules for greater energy conservation.
Furthermore, in order to secure a stable supply of high-quality SiC wafers ROHM acquired SiCrystal (Germany) and established an integrated production system for SiC devices. Also, in 2010 mass production of the first SiC SBDs in Japan was initiated.
SiC devices have been positioned as a core technology in ROHM's next-generation semiconductor business strategy. In addition to further increasing voltage resistance and strengthening its lineup of higher-current SBDs, ROHM is moving towards shifting to mass production and developing additional SiC products such as MOSFETs and IPMs (Intelligent Power Modules).



SiC trench MOSFET chip. Chip area was increased from 3 mm × 3 mm to 4.8 mm × 4.8 mm, enabling 300A drive.



Mass production has begun for SiC SBDs.

Thin, light, flexible

New lighting designs with flexible organic ELs

Organic EL technology – already utilized in the display sector – has recently expanded to lighting devices due to their superior brightness, life span, and eco-friendliness. In order to take advantage of this trend ROHM, in a joint venture with Mitsubishi Heavy Industries, Toppan Printing, Mitsui & Co., and others, has established a new company - Lumiotec – in 2008 in order to assess the commercial viability of organic EL panels for use in lighting.
Organic EL, in principle, allows for greater flexibility and reduces thickness and weight compared with conventional systems, resulting in greater versatility. However, strong gas barrier properties (10–6g/m2day) are required in order to seal the organic EL elements, which deteriorate easily. Sealing the elements between pieces of glass are required, resulting in less than optimum flexibility. In response to this ROHM has successfully developed a structure where the organic EL is sandwiched by ultra-thin glass (thickness of 0.05mm) and a gas barrier layer, ensuring a good deal of flexibility (25mm bending radius) while maintaining high gas barrier properties. The result is a bendable light source with one-eighth the weight and one-sixth the thickness of conventional products, making new lighting designs and products possible.
In the future, in addition to general lighting, ROHM intends to incorporate organic EL technology in higher end products that place a commodity on design, such as airplane/train lighting and displays as well as automotive systems, while continuing efforts towards streamlining mass production.

Flexible organic EL devices feature significantly reduced thickness and weight compared to conventional products, enabling the development of new products, such as personal lighting accessories.

Lumiotec Inc., a joint venture between ROHM and other companies, began sample shipment of organic EL panels for lighting in February 2010. Full-scale mass production is slated to begin shortly.

Easily incorporate network functionality into
household electronics, game consoles, and other devices

IEEE802.11n-compatible baseband LSI for wireless LAN

Wireless LAN systems are faced with the demand for faster speeds in order to meet the increasing amount of data being transmitted from multiple devices. The latest standard, IEEE802.11n, makes high-definition video transmission possible. This is expected to increase the amount of networked devices in the home (i.e. applicances, electronics) as well as in industrial and commercial environments.
However, in order to configure wireless LAN systems it has become necessary to develop software that meets the relevant communication protocol(s), increasing design load and costs, which make it difficult to include additional network functionality.
ROHM utilizes proprietary high-speed wireless LAN technology to integrate a number of functions into a single chip. A full support system is included, making it possible for even customers with no experience in network communication to add wireless LAN capability in their designs.

ROHM sensors utilize a unique structure for stable operation at
low operating current and high temperature.

Two-wavelength lasers diodes for DVD/CD playback

The DVD/CD market has reached maturation and the transition is currently being made to next-generation Blu-ray players. However, backwards compatibility with CD/DVD media is still required, making it necessary to incorporate two lasers. Also, the types of products exposed to severe temperatures, such as game consoles, car navigation systems/DVD players, are increasing.
In answer to this ROHM has developed three types of 2-wavelength laser diodes capable of stable operation at high temperatures (80°C to 85°C). This is achieved through utilization of a unique structure, resulting in operating currents much lower than conventional products. Three package types are offered for greater compatibility. ROHM will continue to develop laser diodes for current and next-generation products that meet market needs.


RLD2WMUR1


RLD2WMDR1


RLD2WMFR1

Touchless device operation

Monolithic optical proximity sensor and illumination sensor IC

Touch-panel mobile phones, or 'smartphones', employ proximity sensors that turn off touch panel functions and the LCD screen when the phone is brought close to the ear when on a call in order to reduce power consumption and prevent malfunction. In addition, since much of the system power is used to drive the LCD, brightness sensors are required to minimize power consumption while maintaining visibility by detecting ambient light.
ROHM has improved on the functionality of optical proximity and brightness sensors and has successfully integrated both onto a single chip. Furthermore, the proximity sensor has been modified to include touchless motion detection – the first in the industry – making operation possible without directly touching the panel.

Zero standby power consumption

Nonvolatile logic counter IC

The increasing functionality of PCs, appliances, and other devices comes with a price – greater standby power consumption due to the utilization of logic system ICs and CPUs that require constant power to maintain internal data.
To solve this dilemma ROHM has developed non-volatile logic counter ICs that can maintain internal data without power. Applying this technology to logic units in a variety of devices will reduce power consumption significantly, by an estimated 15 billion kilowatt-hours per year*. This number is expected to grow as non-volatile technology expands to more products, including portable devices and consumer electronics. An added benefit of this technology can be seen in PCs. Startup times, which are normally up to several dozen seconds, are greatly shortened, resulting in almost immediate startup – similar to watching TV.

*In Japan only. Estimate based on the 'Investigation into Standby Power Consumption' conducted by The Energy Conservation Center, Japan.