New Products and Technologies: Device Innovation and Solutions to Meet Today's Needs

Environmental problems now affect every corner of the globe. The electronics industry is facing this growing epidemic with "green electronics." Today, much of the research and development in the electronics industry is dedicated to the task of stopping or curtailing global warming, mainly through a combination of developing new energy sources and more efficiently using existing resources. Harnessing natural energy, developing an energy-saving car that doesn't use fossil fuels, and building eco-friendly houses that use less energy are just a few examples of the steps being taken to create a low carbon footprint society.

Electronic and semiconductor components are the basic building blocks in our society. They serve as the key devices not just in telecommunication devices or consumer electronics like PDAs, cell phones, flat-screen TVs and digital cameras, but also in industrial devices, automobiles and medical equipment.

As a manufacturer of these fundamental products, ROHM is focused on developing green devices that minimize environmental impact and finding new approaches to meet the needs of safety, security, and health care by combining disparate technologies, including nanotechnology, biotechnology and sensor technology.

In the field of next-generation green products, ROHM has put considerable effort into developing silicon carbide (SiC)[*1] devices. The process has moved from the research stage to the development stage, with practical application soon to be a reality. What makes SiC devices so promising is that they exhibit low on-resistance (little loss from resistance when the switch is turned on) and provide good operating characteristics, even at temperatures of 250°C or greater.

Activities are underway to develop a variety of real-world applications, including DAC modules for solar and wind power, high-efficiency power inverters for hybrid cars and electric trains, and power inverters for industrial devices and high-efficiency air conditioners. One of ROHM's recent successes is the development of a 1200V/230A-class (280kVA equivalent) high-power inverter module for next-generation electric cars equipped with an SiC-SBD (Schottky Barrier Diode) and SiC-MOSFET. This represents the world's first high-power inverter module consisting solely of SiC devices.

The size of this high-power inverter module was significantly reduced by mounting the converter circuit (1-phase) and inverter circuit (3-phase) onto one module.

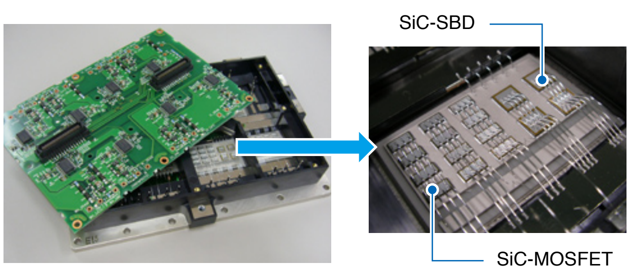

Figure 1: Full SiC Power Inverter Module

Advanced silicon power device semiconductor technology yielded the PrestoMOS™ series[*2] of high-voltage power MOSFETs with an ultra-fast trr super-junction structure. A major problem with conventional high-voltage MOSFETs is the slow reverse recovery time of their internal diodes. For the first time a local trap level was successfully formed within a super-junction MOSFET, reducing the reverse recovery time of the internal diode by roughly 60% over conventional super-junction MOSFETs. This allows for very efficient driving in switching power supplies and the like.

In the optical semiconductor field ROHM has been active in developing LED lighting, which is quickly garnering interest as a next-generation light source due to its excellent energy-saving characteristics. One example is a high color-rendering white power LED light source that is able to more naturally produce hard-to-render reds. ROHM is also committed to offering a comprehensive lineup of LED lighting solutions, including LED driver ICs, power MOSFETs, power resistors, and LED drive power modules that combine these components into a single package. Next-generation LED lighting modules are also currently being developed.

In the next-generation organic EL (Electro Luminescence) lighting panel sector ROHM has teamed up with a number of companies, including Mitsubishi Heavy Industries, Ltd., Toppan Printing Co., Ltd. and Mitsui & Co., Ltd., to establish Lumiotec Inc., with the purpose of exploring the business potential of organic EL panels for lighting.

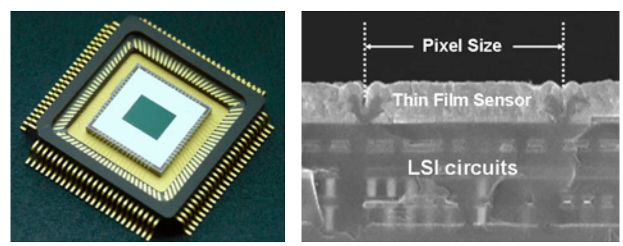

Figure 2: CIGS Sensor and Chip cross-section

In the quest to develop products that improve health, safety, convenience, and comfort, ROHM acquired OKI Semiconductor on October 1, 2008. Utilizing OKI's advanced optical sensor technology has allowed ROHM to extend the range of short-wavelength sensors from X-ray to far-infrared, including OKI Semiconductor's X-ray sensors utilizing SOI[*3] substrates, ROHM ultraviolet (UV-A, UV-B) sensors featuring a new thin-film material (MgZnO[*4]), ROHM CIGS[*5] sensors that offer 100 times the sensitivity of silicon in a broad spectral region from visible light to near infrared, and OKI's IR (Infra Red) image sensors with sensitivity in the far infrared region for easy thermal imaging. Combining image process technologies has yielded devices featuring unprecedented functionality and applicability.

In the biochip[*6] market ROHM, together with Ushio Inc. and Sanwa Kagaku Kenkyusho Co., Ltd. released the Banalyst® Ace and Banalyst Ace CRP in October 2008 – the world's first reagent-based µTAS[*7] measurement analyzer chips. In March 2009, the same group released the Banalyst Ace hsCRP C-reactive protein kit, which is able to quickly and easily measure the CRP value[*8] in the low-concentration region from a small sample of whole blood. These products help reduce the stress on newborns by making it possible to measure the CRP value using only trace amounts of blood.

ROHM's venture spirit continues to flourish in its efforts to develop new technologies and products that benefit society and determining optimized solutions to meet the needs of today and tomorrow.

*1 SiC: Silicon Carbide
*2 PrestoMOS™: Name for our high-speed, high-voltage MOSFETs. ('Presto' is an Italian musical term for 'very fast')
*3 SOI: Silicon On Insulator - technology for forming a silicon device on an insulator
*4 MgZnO: A compound composed of Mg (Magnesium), Zn (Zinc), and O (Oxygen)
*5 CIGS: A compound composed of Cu (Copper), In (Indium), Ga (Gallium), and Se (Selenium)
*6 Biochip: A type of chip based on nanotechnology that is expected to have a major impact on life science research, diagnostic drugs and medical treatment. Microarrays and in-chip microfluidic devices represent the cutting edge of miniaturization and large-scale integration processes.
*7 µTAS (micro-TAS): Short for Micro Total Analysis System. A system in which a variety of fluidic devices are integrated onto a chip measuring anywhere from several mm^2 to several cm^2 for the purpose of performing a series of chemical operations quickly and efficiently.
*8 CRP (C-reactive protein) levels rise dramatically in the blood in response to acute inflammation or decay of body tissue. This makes measuring CRP useful for early detection of infectious disease and determining whether antibiotics need to be administered as well as ascertaining the efficacy of medical treatment.