AC-DC Converter ICs Add Built-In 1700-V SiC MOSFET For More Compact Designs

ROHM Semiconductor's BM2SCQ12xT-LBZ series ac-dc converter ICs feature a built-in 1700-V SiC MOSFET, which represents a first of its kind co-packaging of an ac-dc converter IC and SiC MOSFET, according to the vendor. This series is optimized for industrial applications including street lamps, commercial ac systems, and general-purpose ac servos and inverters used in high-power equipment.

In recent years, the growing demand for energy savings has resulted in the adoption of power semiconductors such as SiC in 400-Vac industrial applications. On the other hand, industrial equipment consists of the main power supply circuit and a built-in auxiliary power supply that supplies power to various control systems. Currently, in the auxiliary power supply the use of low-voltage silicon MOSFETs and IGBTs limits the amount of power savings.

In 2015, the company began offering ac-dc converter ICs for driving high-voltage, low-loss SiC MOSFETs. Now it has created what is described as the industry's first ac-dc converter ICs with a built-in SiC MOSFET. These devices are expected to further accelerate the adoption of ac-dc converters that use SiC MOSFETs in industrial equipment (Fig. 1).

Incorporating a SiC MOSFET and control circuitry optimized for auxiliary power supplies for industrial equipment in a single package significantly reduces the number of parts required when compared to conventional designs (from 12 pieces plus heat sink to a single IC, see Fig. 2).

This level of integration also aids in minimizing both the component failure risk and the resources required to develop systems using SiC MOSFETs. In addition, this product enables the improvement of power efficiency by 5% (decreasing power loss by 28%, see Fig. 3). These features translate to dramatic reduction in size, improved reliability, and superior power savings in industrial applications.

The integrated design reduces the resources required for component selection and reliability evaluation for the clamp and drive circuits while also minimizing component failure risk and simplifying the development effort for SiC MOSFET adoption.

In addition, overload protection (FB OLP), overvoltage protection (V_{CC} OVP) of the supply voltage pin, and a high accuracy thermal shutdown function (achieved through the built-in SiC MOSFETs) are built in, along with the overcurrent protection and secondary overvoltage protection functions. This enables the incorporation of multiple protection circuits for industrial power supplies that require continuous operation, leading to a significant improvement in system reliability. The ICs are offered with a choice of auto-restart or latch on the overload and overvoltage protection functions (see the table).

Samples and OEM quantities of the BM2SCQ12xT-LBZ series ICs are available now. Evaluation boards will be released later this year. For more information, see Rohm's AC-DC Converter ICs page.

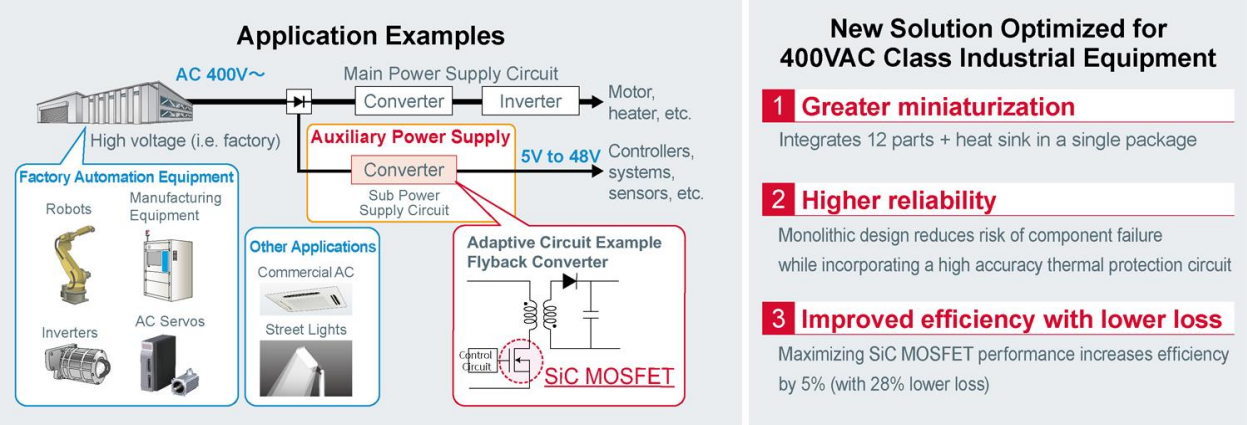

Fig. 1. The BM2SCQ12xT-LBZ series adopts a dedicated package that incorporates a 1700-V SiC MOSFET along with the controller and SiC MOSFET gate-drive circuit circuitry optimized for industrial auxiliary power supplies.

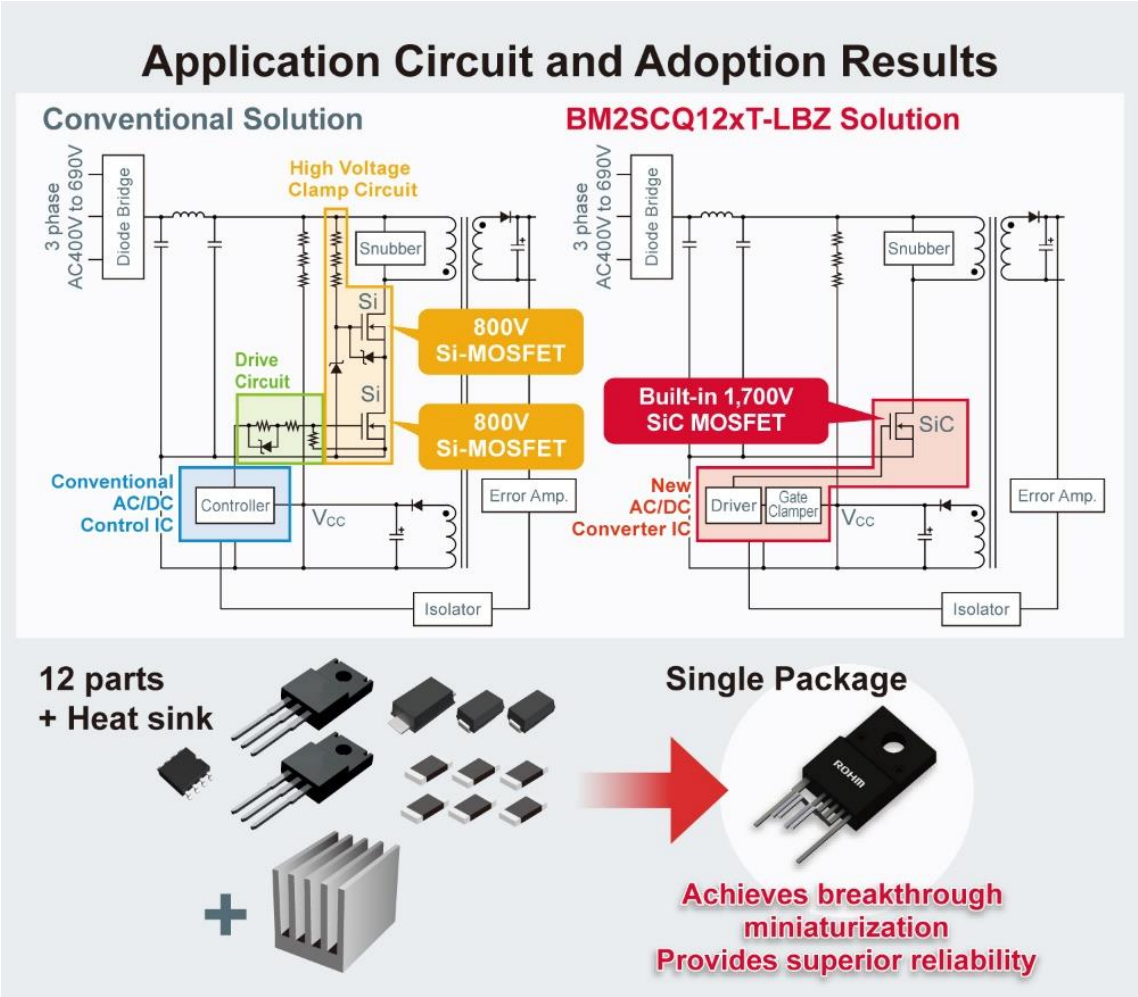

Fig. 2. The BM2SCQ12xT-LBZ series ICs replace up to 12 components (ac-dc converter IC, 800-V Si MOSFET x 2, Zener diode x 3, resistor x 6) and the heatsink with a single package, dramatically reducing the number of external parts required. In addition, the high withstand voltage and voltage noise resistance of the internal SiC MOSFET make it possible to reduce the size of components used for noise suppression.

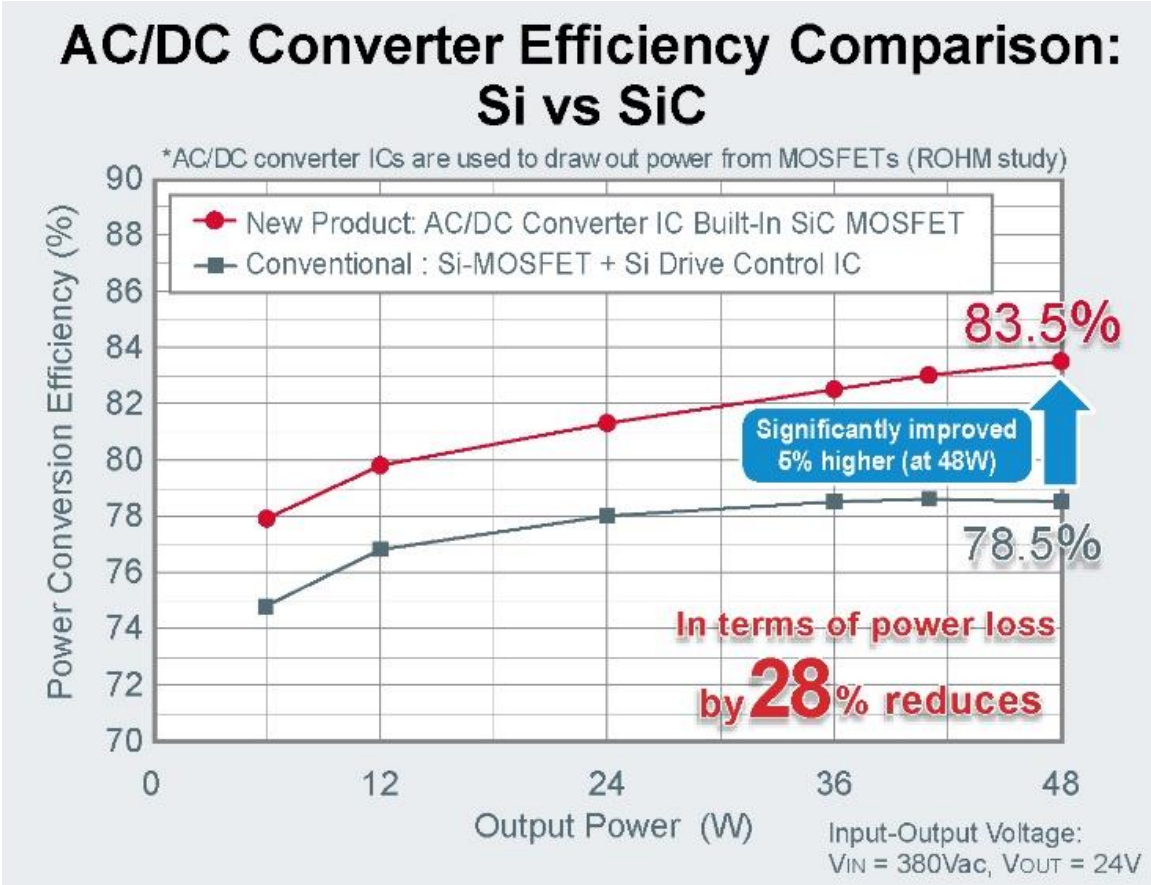

Fig. 3. The internal SiC MOSFET and the built-in gate driver circuit optimized for this SiC MOSFET improve efficiency by as much as 5% over conventional Si MOSFETs (ROHM April 2018 study). Also, a quasi-resonant method is adopted for the control circuit that enables operation at higher efficiency and lower noise than conventional PWM designs, minimizing the effects of noise in industrial equipment.

Table. Key specifications for the BM2SCQ12xT-LBZ series ICs ac-dc converter ICs.

Part No.	Supply Voltage Range	Normal Operating Current	Burst Operating Current	Max. Operating Frequency	FB OLP	VCC OVP	Operating Temperature Range
BM2SCQ121T-LBZ	VCC: 15.0 V to 27.5 V DRAIN: 1700 V (max.)	2000 µA (typ.)	500 µA (typ.)	120 kHz (typ.)	Auto Restart	Latch	-40°C to 105°C
BM2SCQ122T-LBZ					Latch	Latch	
BM2SCQ123T-LBZ					Auto Restart	Auto Restart	
BM2SCQ124T-LBZ					Latch	Auto Restart	