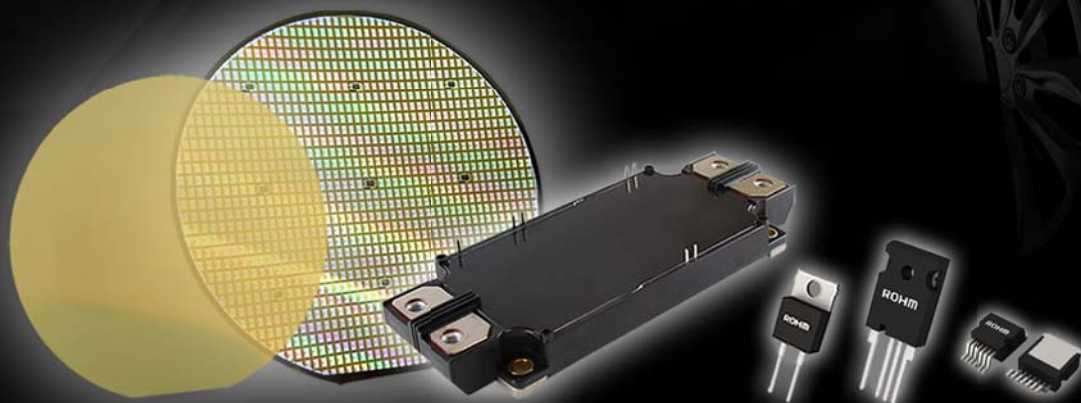


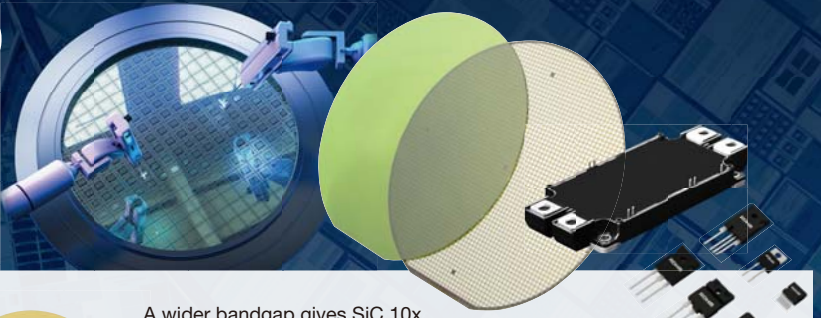
SiC POWER DEVICES

POWER THE FUTURE



SiC Wafer
SiC Diode(SBD)
SiC MOSFET
SiC Power Module

SiC Devices Contribute to Greater Energy Savings and Set Miniaturization



High efficiency Energy-saving

High
voltage



Low
loss

A wider bandgap gives SiC 10x the dielectric breakdown electric field strength of silicon. This allows SiC MOSFETs to operate at up to 3,000V, compared to just 1,000V with conventional silicon MOSFETs. At the same time, SiC MOSFETs provide reduced ON resistances even at high voltages along with low turn ON/OFF losses, making them truly the best devices for achieving high efficiency and energy savings.

Stable operation even at high temperatures

Heat
resistant

Another advantage of SiC's large bandgap is the ability to operate at high temperatures. As a result, SiC can operate at 200°C or more, unlike silicon with a limit of just 150°C. This is revolutionizing the way we think about system heat dissipation design and thermal safety. For example, it will be possible to incorporate devices in the wheels of EVs while making inverters and their cooling systems smaller.

Smaller peripheral circuits

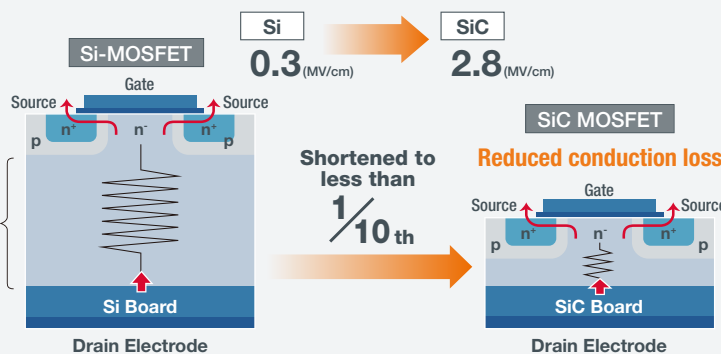
High
frequency
drive

SiC can switch high voltages at high speeds. This allows the impedances of the capacitors and inductors that make up the switching regulator circuits to be reduced. In other words, smaller components can be used, which has the advantage of minimizing system size.

Comparison of the Physical Property Constants Between Si and SiC

(Dielectric Breakdown
Electric Field Strength)

Dielectric
Breakdown
Area



High dielectric field
breakdown strength provides
superior withstand voltage
and lower loss

High voltage

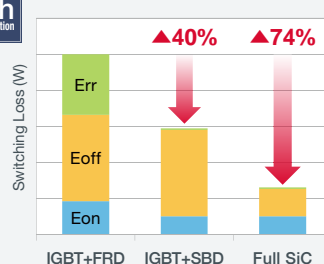
Low ON resistance

Si-IGBT vs SiC MOSFET Conduction Loss Comparison



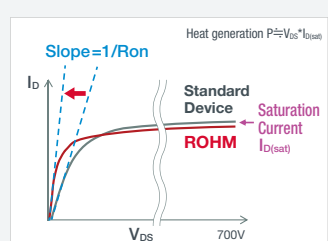
Large difference especially in the low current region significantly improves efficiency during city driving

Si-IGBT vs SiC MOSFET Switching Loss Comparison



Adopting full SiC greatly reduces switching loss

Id vs Vds Characteristics Comparison



High short-circuit tolerance with lower $I_{D(sat)}$

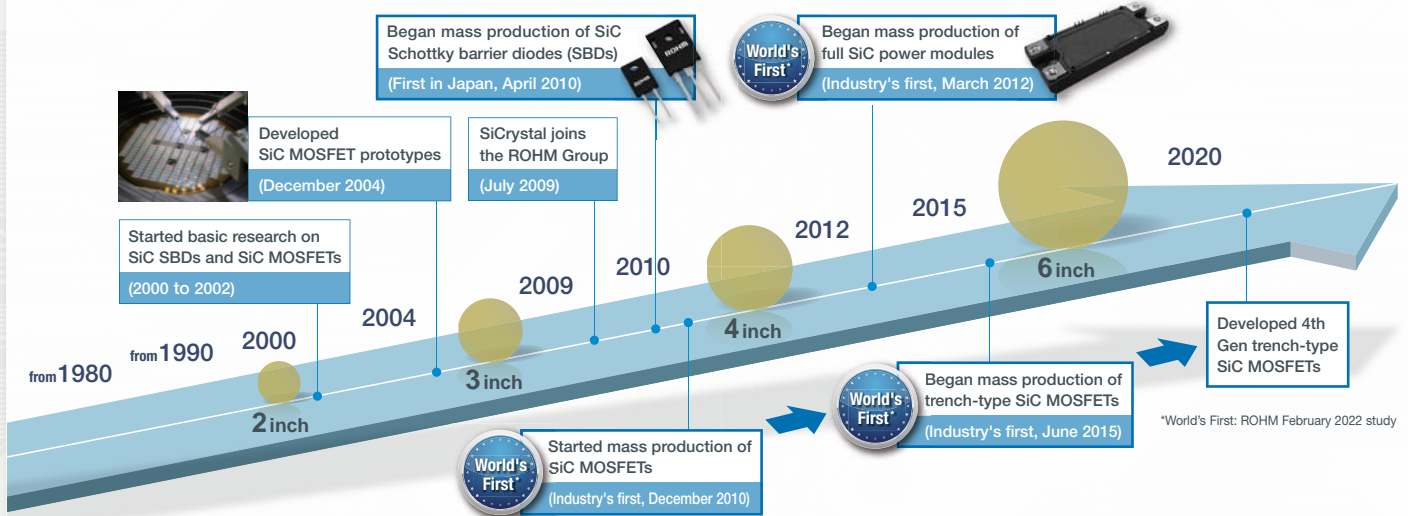
Combining 20+ years of knowledge and technologies with a reliable production system

ROHM's SiC Device Business

ROHM has been conducting pioneering research on SiC devices since 2000, when we first discovered the remarkable benefits of SiC.

But although the superior characteristics have been recognized in the industry, the lack of performance and mass production stability have proven to be a bottleneck.

Unlike other suppliers, ROHM is able to complete the entire process, from wafer fabrication to device design and packaging, utilizing an in-house production system.



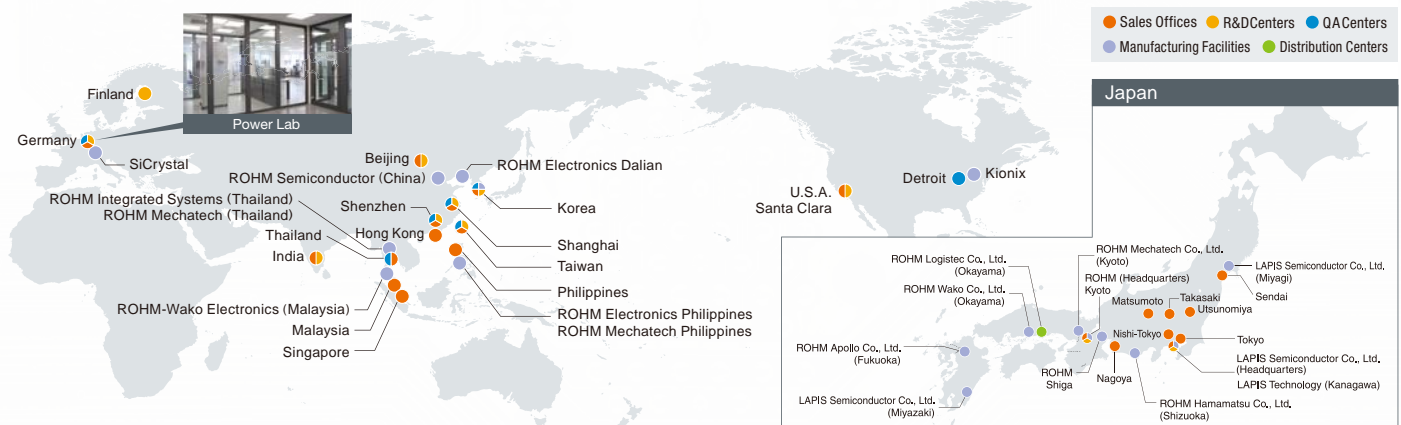
Integrated production system for SiC power semiconductors



Application-Level Support

ROHM's Support System

We provide global support for the integrated design of high-speed switching SiC devices and gate drivers that combine high accuracy with fast switching control.



SiC MOSFET Evaluation Board



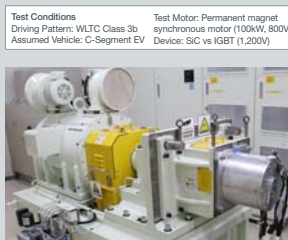
An evaluation board is offered that allows for easy evaluation of SiC devices

ROHM Solution Simulator

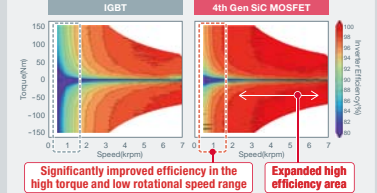


Simulates SiC devices in environments closer to real-world applications, including gate drivers and peripheral circuits.

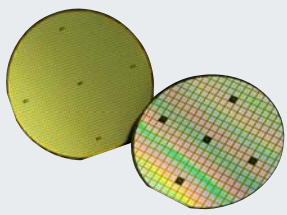


Electricity Cost Testing of EVs Based on the International WLTC Standard



Inverter Efficiency Comparison: 4th Gen SiC MOSFET vs IGBT



ROHM SiC Device Lineup

Device Form	Device Type	Breakdown Voltage	ON Resistance (mΩ)	I _F
Wafer Chip Wafers are diced and shipped. Requires customers to perform die and wire bonding. 	Diode (SBD)	650V	–	2A to 40A
		1,200V	–	5A to 40A
	2nd Gen MOSFET	1,200V	80mΩ to 450mΩ	–
		1,700V	1,150mΩ	–
	3rd Gen MOSFET	650V	17mΩ to 120mΩ	–
		1,200V	22mΩ to 160mΩ	–
	New 4th Gen MOSFET	750V	8mΩ to 45mΩ	–
		1,200V	11mΩ to 62mΩ	–
Discrete(Molded Package) In addition to the TO-220 and TO-247, our broad package lineup includes the surface mount TO-263 and TO-268 types. 	Diode (SBD)	650V	–	2A to 40A
		1,200V	–	5A to 40A
	2nd Gen MOSFET	1,200V	80mΩ to 450mΩ	–
		1,700V	1,150mΩ	–
	3rd Gen MOSFET	650V	17mΩ to 120mΩ	–
		1,200V	22mΩ to 160mΩ	–
	New 4th Gen MOSFET	750V	13mΩ to 45mΩ	–
		1,200V	18mΩ to 62mΩ	–
Full SiC Power Modules Three types of SiC power modules are offered that can drive up to 1,200V/600A. 	SiC MOSFET SiC Diode	1,200V / 1,700V	3mΩ to 34mΩ	I _D =80A to 600A

AC/DC Converter IC with Built-in SiC MOSFET

Includes the world's first AC/DC converters that leverage the advantages of SiC, such as higher efficiency and heat resistance, to achieve superior performance in a smaller form factor.



*ROHM February 2022 study

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Catalog No.64X7321E 02.2022 PDF © 2022 ROHM Co., Ltd.

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