

Power Device Catalog

Ver.7.0

ROHM
SEMICONDUCTOR

EcoSiC

EcoGaN

EcoIGBT

EcoMOS

Power

Electronics for the Future

Contributing to achieving a sustainable society through the development of innovative power devices.

A leading manufacturer of semiconductors and electronic components for over 60 years, ROHM continues to supply products featuring superior quality and reliability for a wide range of markets, from consumer electronics and IT equipment to industrial equipment and automotive applications, based on a corporate objective of 'Quality First' established since its founding.

In pursuit of a sustainable society, where reducing environmental impact and achieving carbon neutrality have become urgent priorities, ROHM is advancing the development of innovative power semiconductors (power devices) that contribute to building energy-saving, high efficiency systems by exploring the potential of materials, device structure, packaging, and other technologies.

The ROHM Group supports product development and stable supply through a vertically integrated production system in which the entire manufacturing process, from the material stage to finished products, is carried out in-house. Infusing a high level of quality into every process ensures outstanding traceability and an optimized supply chain, making it possible to deliver the superior quality, high reliability, and stable supply that meet market demands.

ROHM will continue to carry out product development that meets the needs of customers and markets while providing society with advanced, high quality products that contribute to the realization of a sustainable society.



ROHM Co., Ltd.

The company name of ROHM, a semiconductor manufacturer, combines "R" the first letter of our original main product, resistors, with the unit for resistance "ohm". The "R" now also stands for Reliability. Quality First is ROHM's corporate policy.

Production System

- High quality, high reliability manufacturing and stable supply through vertical integration
- Outstanding traceability
- Launched a Product Longevity Program

Product Development

- Matching design and manufacturing technologies through circuit design, layout, and processes
- Product development that leverages heat dissipation design and packaging technologies
- Industry-leading cutting-edge power semiconductors

Solutions

- Wide range of products from resistors to semiconductors and modules
- High efficiency solutions centered on power and analog semiconductors
- Design support based on accumulated technical expertise
- Online support content facilitates design

ROHM develops innovative products that contribute to energy conservation, miniaturization, safety, and security in society, particularly the automotive and industrial equipment fields, by combining design, manufacturing, quality assurance, and other technologies cultivated over many years. We also contribute to the advancement of electronics, and ultimately, culture, through a reliable production system that combines high quality and reliability with stable supply.

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QUALITY and STABLE SUPPLY

Achieving high quality and stable supply through a vertically integrated production system

ROHM pursues 'Quality First' manufacturing.

To guarantee consistent quality assurance and stable supply, the ROHM Group has established a vertically integrated production system in which the entire manufacturing process, from the material stage to finished products, is completed in-house, together with a BCM (Business Continuity Management) system that can maintain product supply even in the event of unforeseen circumstances such as natural disasters. The result is a business model that is less susceptible to the effects of natural and man-made disasters compared to general fabless and foundry, ensuring stable supply to customers around the world.

What's more, ROHM products achieve 4M traceability (Man, Machine, Material, Method) in all processes by allowing production information (production data/lot data) to be obtained from the actual items.

Packaging

Our overseas production facilities leverage the latest assembly technologies together with unmatched quality



Si
SiC

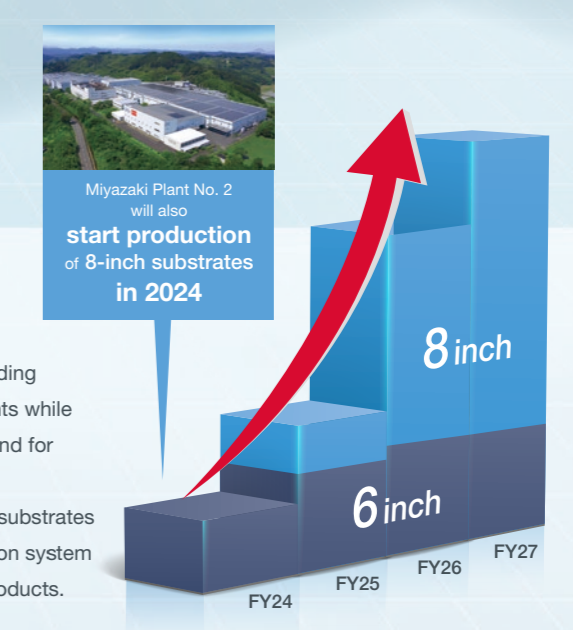
SiCrystal
A ROHM Group Company

SiC Single-crystal Wafer Manufacturer
SiCrystal, a German SiC single-crystal wafer manufacturer, became a member of the ROHM Group in 2009

Increasing the production capacity for SiC products

ROHM is expanding production capacity by adding production lines at its wafer manufacturing plants while opening a new plant to meet the growing demand for SiC products.

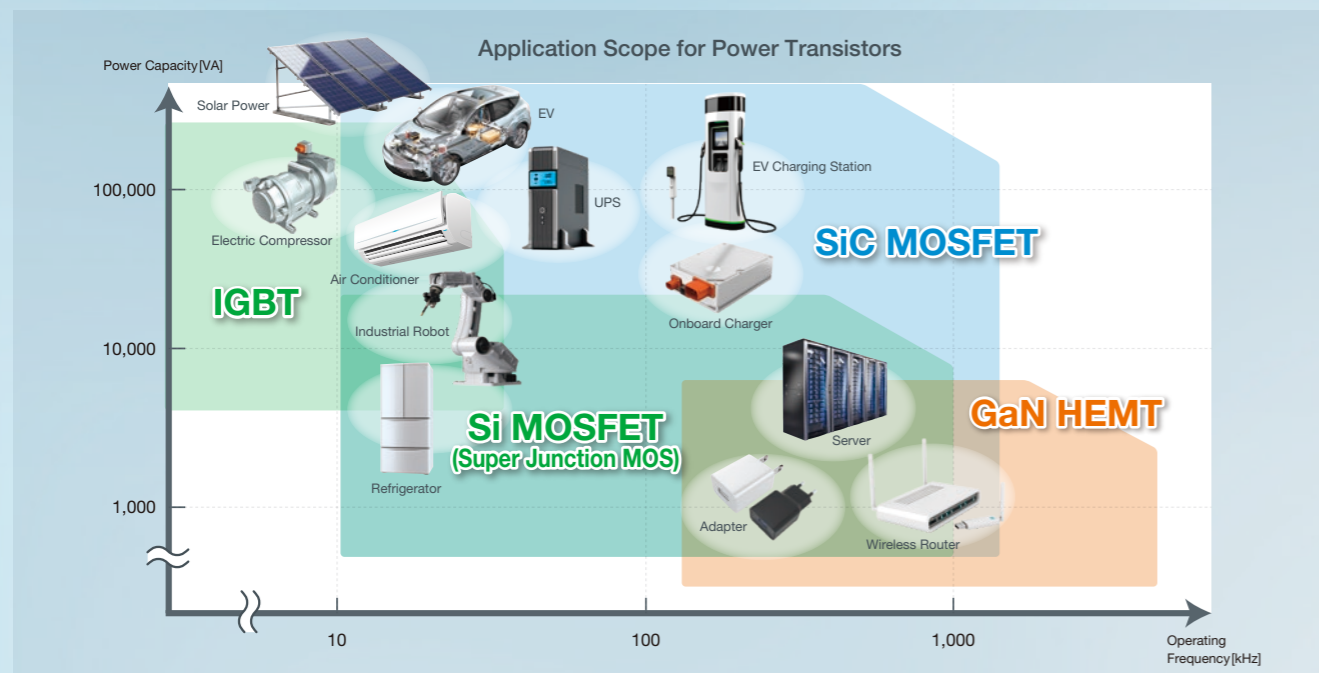
In 2024, ROHM will begin production of 8-inch substrates at Miyazaki Plant No. 2, establishing a production system that significantly increases the supply of SiC products.



PRODUCT and SOLUTION

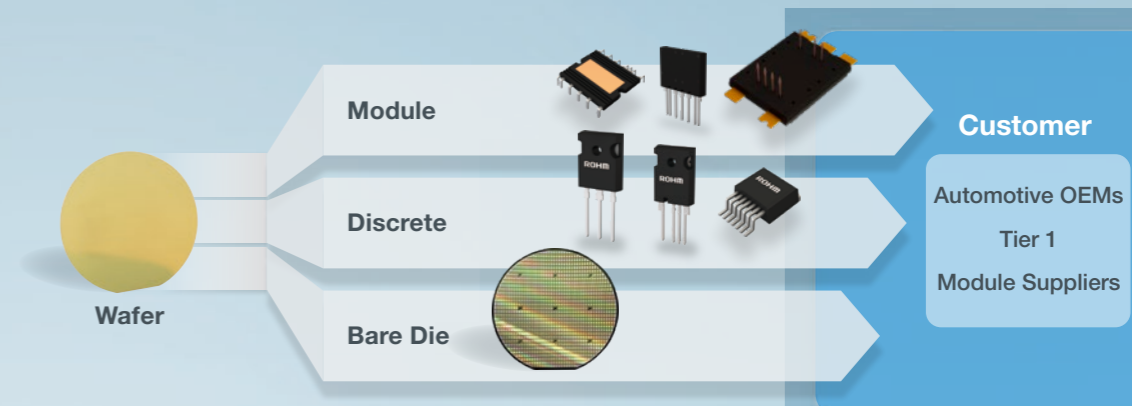
PRODUCT

ROHM power devices not only include silicon and silicon carbide devices, but also gallium nitride products that are already being mass produced, providing optimal solutions based on application needs.



A wide variety of product types enable extensive business opportunities

ROHM develops power semiconductor products not only as discrete package devices, but also modules and even bare chips (bare dies). Taking SiC MOSFETs for the automotive sector as an example, a wide range of product form factors and packaging options allow ROHM to provide devices and solutions to a wide variety of customers, including OEMs, Tier 1 manufacturers, and module suppliers. We also offer isolated gate driver ICs for driving SiC MOSFETs and evaluation boards, as well as support for designing modules using bare chips.



We are able to provide devices and solutions to a variety of customers through a range of form factors and packages by completing all processes, from wafer fabrication to device design and packaging, in-house.

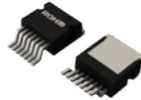

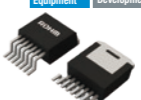

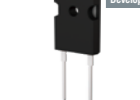
The Power Eco Family contributes to building ecosystems

ROHM has positioned power devices that can contribute to the construction of an ecosystem through performance improvement and optimization of applications under the brand concept 'Power Eco Family'. Under the Power Eco Family umbrella, ROHM offers SiC devices branded as EcoSiC™, and GaN devices as EcoGaN™, along with silicon power IGBTs and high voltage MOSFETs as EcoIGBT™ and EcoMOS™, respectively - each designed to be components of an ecosystem that addresses social issues such as carbon neutrality by pursuing advanced characteristics and solutions.

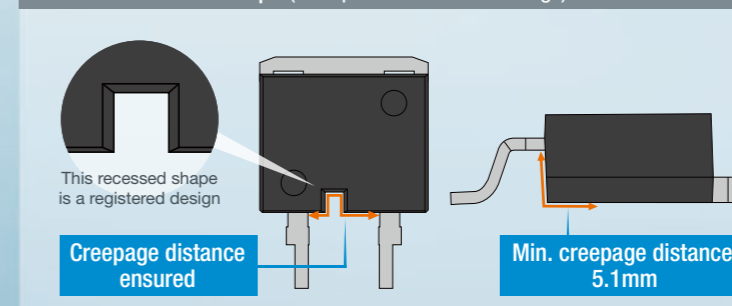


Developing packages with large creepage distance is advantageous for isolation design

Isolation design is essential for equipment operating at high voltages. ROHM has developed packages featuring a larger creepage distance than conventional products, providing solutions that contribute to isolation design and safety measures in applications.

Creepage distance-increased packages (for SiC power devices)					
Product Category	SiC MOSFET			SiC Schottky Barrier Diode	
Package					
Creepage Distance [mm]	4.7	7.8	6.1	5.1	8 (TBD)

Overview of New Shape (Example of TO-263-2L Package)



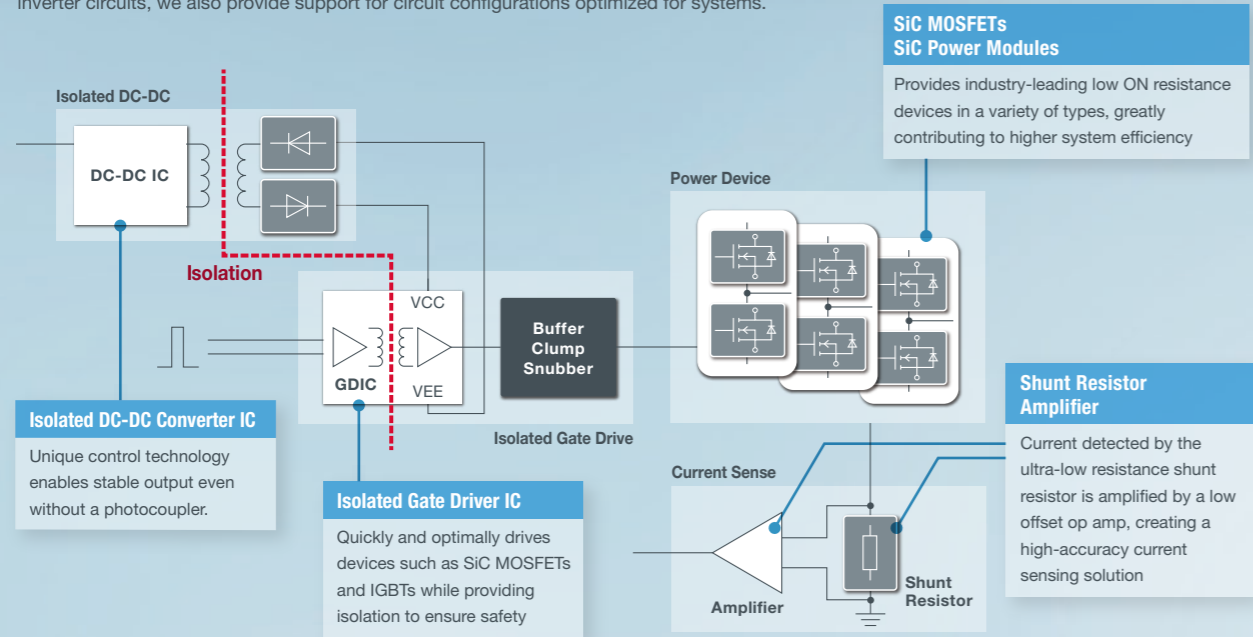
PRODUCT and SOLUTION

SOLUTION

ROHM's considerable capabilities allow us to deliver solutions tailored to application needs.

Drive Solutions Using Power Devices

In addition to products such as power devices and driver ICs ideal for power supplies and inverter circuits, we also provide support for circuit configurations optimized for systems.



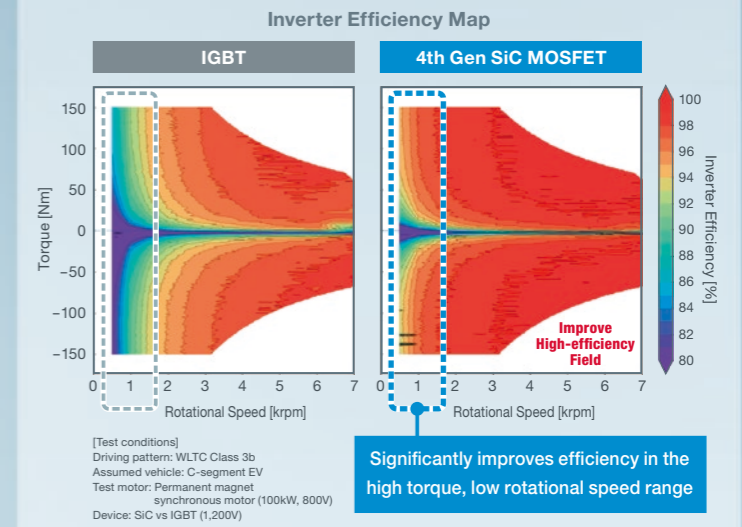
Motor Bench Evaluation for Actual Use

ROHM utilizes motor benches (that generate loads using motors) to conduct evaluations. By connecting a module equipped with power semiconductors at the end of the test motor, it is possible to measure the efficiency and electricity consumption when using power semiconductors in xEV applications such as main inverters. For example, when connecting IGBTs and ROHM's 4th Gen SiC MOSFETs to a main inverter, it can be seen that the red distribution is wider for the SiC MOSFETs than IGBTs, indicating higher efficiency. Based on these results, when evaluating electricity consumption under the international WLTC fuel consumption test, it was found that the 4th Gen SiC MOSFETs can improve electricity consumption by up to 10% compared to IGBTs.

ROHM Motor Bench Evaluation Facilities



Inverter Efficiency Comparison: 4th Gen SiC MOSFET vs IGBT



Product Longevity Program

To ensure worry-free use in industrial and other equipment with long life cycles, we disclose products scheduled for long-term supply along with estimated supply periods on our website.

ROHM established a Product Longevity Program (PLP) to meet the demand of customers developing equipment with long life cycles. The PLP designates a supply period of 10 to 20 years for select products, taking into consideration production systems, equipment, and material procurement conditions, with the supply status and estimated supply duration for each product posted on ROHM's website. Over 1,800 products are registered in the program, ranging from resistors to semiconductor devices, ICs, and modules (as of July 2024).

Information (target products, supply periods) will be updated once a year to allow customers to adopt our products with confidence.

Product Longevity Program (PLP)

To provide a reliable option for industrial and other equipment with long life cycles, we disclose supply periods for products covered under our Product Longevity Program.

Products Applicable for Long-Term Supply

Product Category	Part Number	Features	Launch Date	Support Period from 2024 (Year)	Available units	Start Date of Normal Supply
Switching Diodes	1S0395H	High-speed switching 80V, 120mA, Switching Diode	2023/04	10	2034/03	2034/04
Switching Diodes	1S0395H4H	High-speed switching 80V, 120mA, Switching Diode for Automotive	2023/04	10	2034/03	2034/04
Switching Diodes	1S04009H	High-speed switching 80V, 120mA, Switching Diode	2023/04	10	2034/03	2034/04
Switching Diodes	1S04009H4H	High-speed switching 80V, 120mA, Switching Diode for Automotive	2023/04	10	2034/03	2034/04
General Purpose Bipolar Transistors	2SA1876L3	PNP 30V 32A, 50V 120mA, General Purpose Transistor	2023/04	10	2034/03	2034/04
General Purpose Bipolar Transistors	2SA1876L3H2C	PNP 30V 32A, 50V 120mA, General Purpose Transistor for Automotive	2023/04	10	2034/03	2034/04
General Purpose Bipolar Transistors	2SA1774E3	PNP 30V 42A, 50V 120mA, General Purpose Transistor	2023/04	10	2034/03	2034/04
General Purpose Bipolar Transistors	2SA1774E3H2C	PNP 30V 42A, 50V 120mA, General Purpose Amplification Transistor for Automotive	2023/04	10	2034/03	2034/04
General Purpose Bipolar Transistors	2SA1202E3	PNP 30V 45A, 120V 25A, Low VCE(sat) Transistor	2023/04	10	2034/03	2034/04
General Purpose Bipolar Transistors	2SA1202E3H2C	PNP 30V 45A, 120V 25A, Low Frequency Transistor for Automotive	2023/04	10	2034/03	2034/04

Showing 8 to 13 of 1388 entries

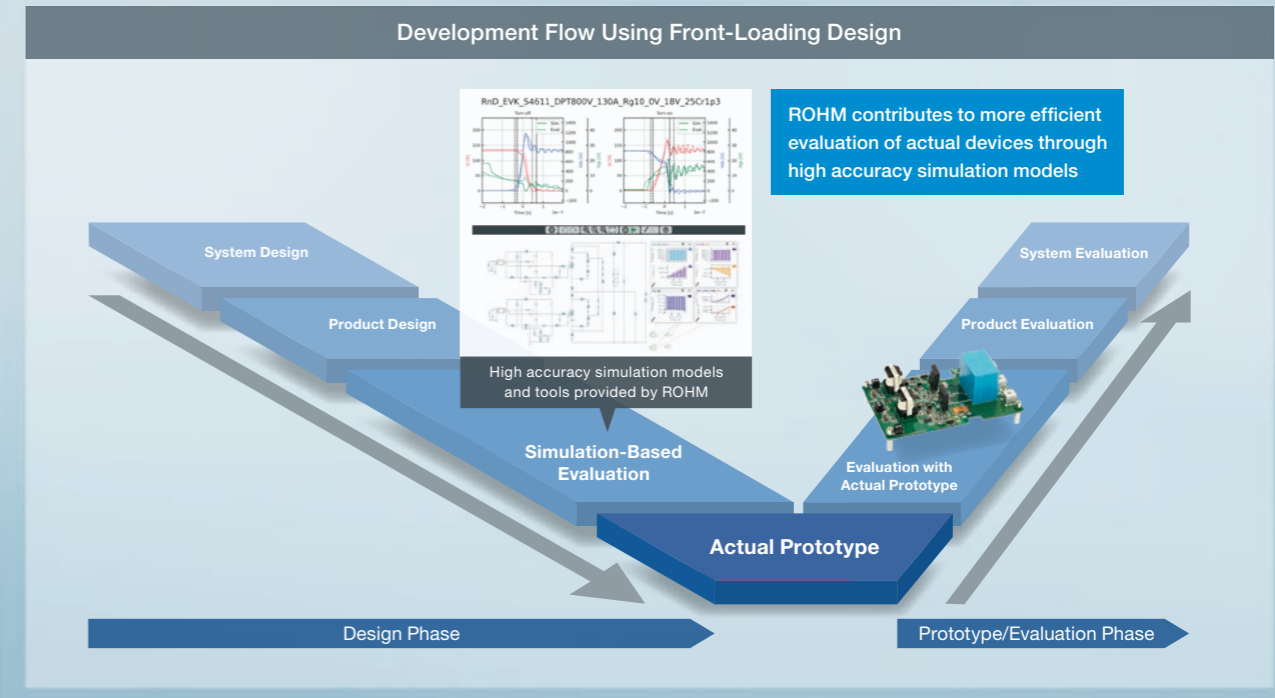
Perform parametric search by product category, part number, or estimated supply period

Product Longevity Program

High Accuracy Simulation Supports Efficient Evaluation of Actual Equipment

New generation power devices enable compact, high efficiency power electronics designs through features such as fast switching. However, in actual circuit boards the influence of parasitic inductance becomes more pronounced, making it difficult to evaluate device performance solely through real-world testing, leading to an increasing need for numerous physical prototype tests. Therefore, front-loading design using simulation is being promoted to reduce design iteration (rework).

ROHM provides highly accurate simulation models and tools that address issues such as parasitic inductance during actual device evaluation, contributing to increased efficiency in physical prototyping along with reduced development time for customers.




PRODUCT and SOLUTION

Design support in line with the customer's development stage






SUPPORT

Design support content that helps solve issues at all stages of customer development is available for immediate access on ROHM's website. ROHM provides solutions that can be readily used in customer circuit designing, such as content for each product required when designing, and application circuits with drive ICs that maximize the performance of power semiconductors.














Development Start

For contents without links , please visit the respective product page

Initial Study - Component Selection

- Identify market and technology trends
 - ▶ White Paper 
 - ▶ Catalogs-Brochures 
- Verify the device from the application
 - ▶ Application Block Diagram 
- Confirm recommended devices from the circuit topology
 - ▶ Topology Selection 
- Verify the reference design
 - ▶ Reference Design 

Circuit Design - Simulation

- Check detailed product characteristics
 - ▶ Datasheets 
 - ▶ Reference Design 
 - ▶ Application Notes 
 - ▶ ROHM Solution Simulator 
- Carry out circuit simulation
 - ▶ Design Models  (SPICE/PSpice®  LTspice®  PLECS® 
 - ▶ Thermal Models  Ray Files  IBIS Models 
 - ▶ Design Calculation Tool (Calculation Sheet )
 - ▶ ROHM Solution Simulator 
 - ▶ Application Notes
- Evaluate the products
 - ▶ Product Samples-Evaluation Board (EVK)

Board Design - Evaluation

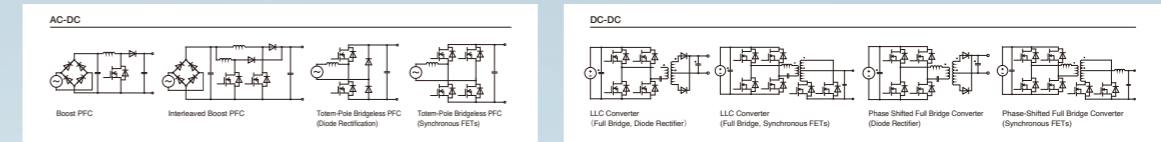
- Implement board design, evaluate the prototype board
 - ▶ PCB Library
 - ▶ Package Information
 - ▶ Application Notes

Mass Production Preparation

- Prepare for mass production
 - ▶ Environmental Data
 - ▶ Manufacturing Plant Information

Mass Production

Optimized Device Proposals Based on Circuit Configuration [Topology Selection]



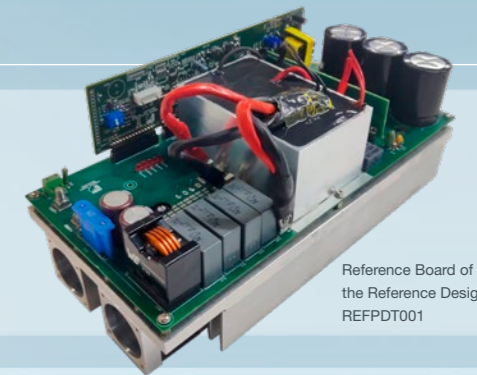
Topology Selection presents the devices most suitable for the circuit configuration (topology) used in the customer's application. Referencing the combination of devices that make up the circuit reduces the number of resources required for component selection.

 Topology Selection

Evaluated Design Data [Reference Design]

Reference Design is design data that has been evaluated at the circuit level for the application. Circuit schematics, Bill of Materials (BOM), evaluation data, and Gerber board data are included for easy design reuse. Some boards are also available for sale, eliminating the need to develop boards for actual device verification.

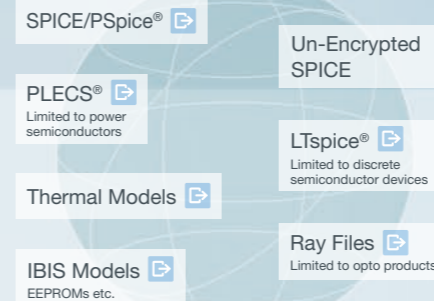
 Reference Designs



Reference Board of the Reference Design REFPDT001

Multiple Design Models for Different Tools and Applications

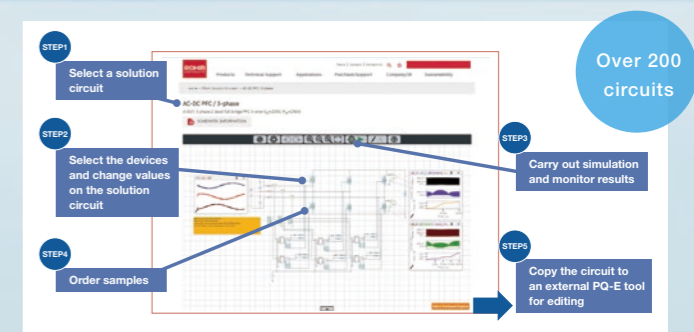
Various design models including thermal models, PLECS models, and Ray files are available for thermal, optical, and electronic circuit simulations. Usage is supported by application notes.



PSpice® is a registered trademark of Cadence Design Systems, Inc. LTspice® is a registered trademark of Analog Devices, Inc. PLECS® is a registered trademark of Plexim, Inc.

ROHM Solution Simulator Enables Batch Verification of Power Semiconductors and Various ICs

ROHM Solution Simulator is a free electronic circuit simulator hosted on ROHM's website. A wide range of applications is supported, from initial studies to system-level operation verification. ROHM power semiconductors, driver/power supply ICs, and passive components (e.g. shunt resistors) can be easily and accurately verified together in a solution circuit close to actual user conditions.



 ROHM Solution Simulator

SiC Power Devices



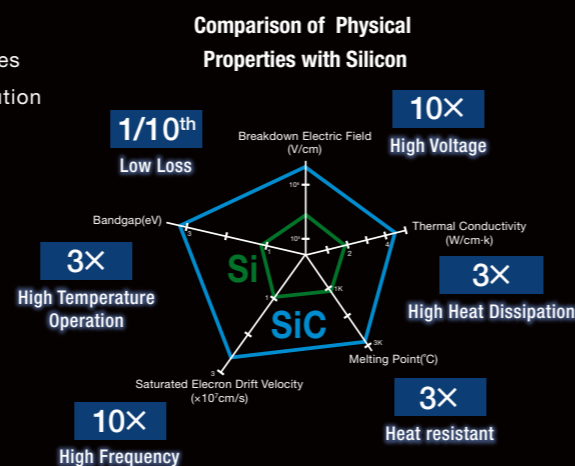
SiC Power Semiconductors Contribute to Greater Energy Savings and Application Miniaturization

Energy conservation and higher efficiency in electrical equipment have become major issues as countries around the world work towards carbon neutrality.

The switch from conventional cars powered by fossil fuels to electric vehicles (EVs), communication base stations and data servers that support the evolution of digital transformation (DX), and industrial equipment undergoing rapid technological innovation are all requiring more energy-efficient systems.

Using electrical energy involves various power conversions, making conversion efficiency an important consideration. Therefore, SiC power semiconductors capable of delivering significant energy savings along with high efficiency are garnering considerable attention.

As an SiC products pioneer and the leading supplier in the industry to mass-produce and ensure a stable supply of SiC power semiconductors, ROHM is uniquely positioned to contribute to solving issues through innovative technologies and power solutions.



Key Devices for High Efficiency, Energy-Saving



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 are not only characterized by low ON resistance even at high voltages, but also feature low turn ON/OFF losses. Indeed, they can be considered key devices for achieving high efficiency and energy savings.

Stable operation even at high temperatures



Another advantage of the large bandgap of SiC semiconductors is the ability to operate at high temperatures. SiC semiconductors can operate at 200°C or more, unlike their silicon counterparts with a temperature 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.

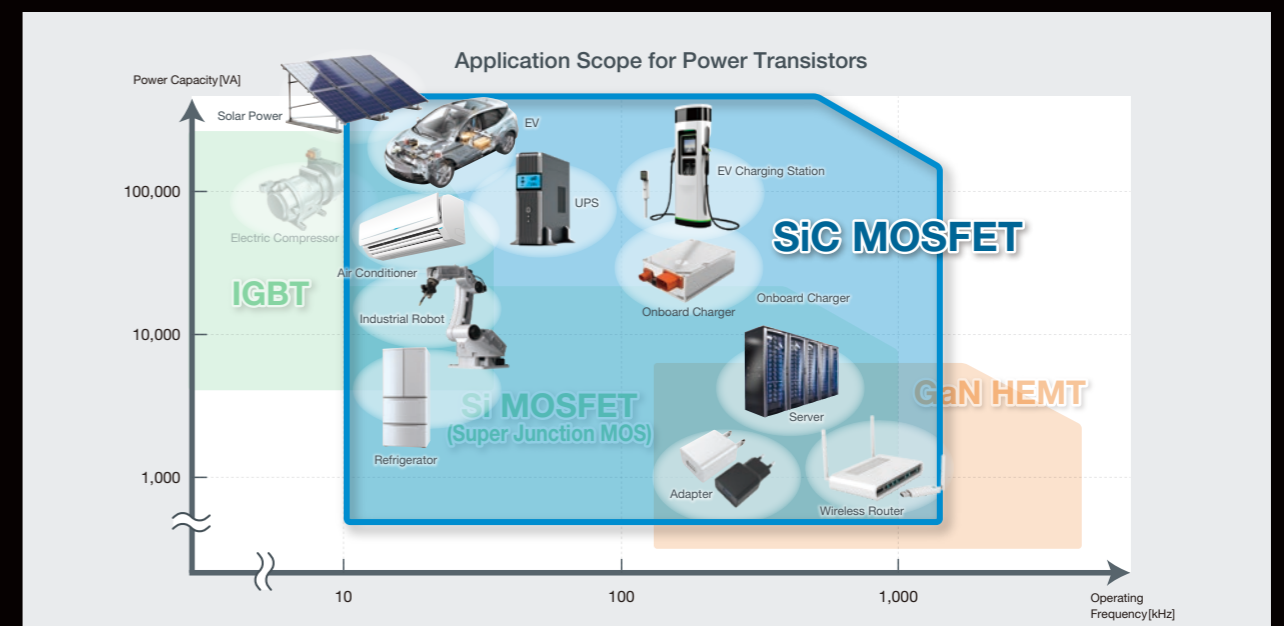
Smaller Circuits



SiC semiconductors are capable of switching high voltages at high speeds, allowing the impedance of capacitors and inductors in switching power supply and inverter circuits to be reduced. In other words, circuits can be configured with smaller components, reducing system size.

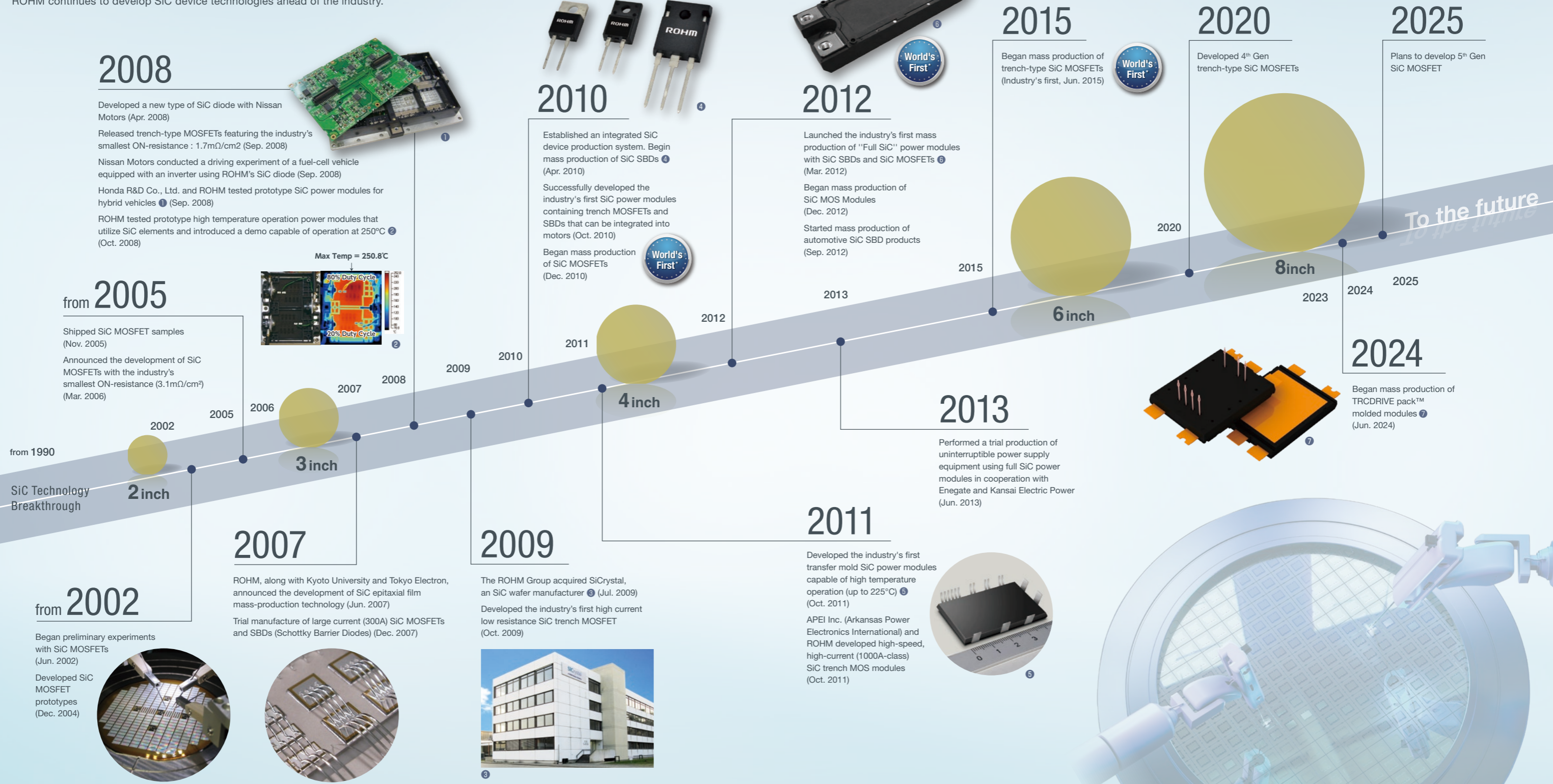
ROHM's SiC Power Semiconductors

ROHM not only provides silicon-based high voltage IGBTs, MOSFETs, and diodes (SBDs, FRDs), but is also focused on the development of SiC MOSFETs and SiC SBDs for the power semiconductor field. Since becoming the first in the world to mass produce SiC MOSFETs in 2010, ROHM has continued to lead the industry in technological innovation and product development by developing in-house technologies essential for the evolution of SiC devices, from SiC wafer fabrication and new device structures to production processes, packaging, and quality control methods. Each type of power semiconductor has its own unique characteristics, so the best solution will vary depending on the needs of the customer and application. ROHM can provide a wide range of solutions by combining various power semiconductors (power devices) with analog ICs that maximize their performance.



Focusing on cutting-edge SiC technology and leading the industry through innovative R&D

As the first supplier in the world to begin mass production of SiC MOSFETs in 2010, followed by the first full SiC power modules in 2012 and trench-type SiC MOSFETs (3rd Gen) in 2015, ROHM continues to develop SiC device technologies ahead of the industry.



SiC MOSFET

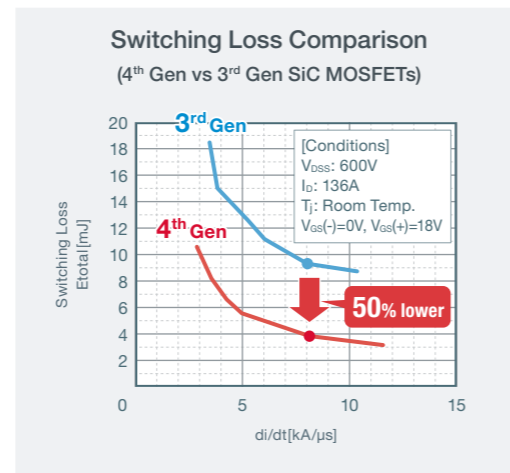
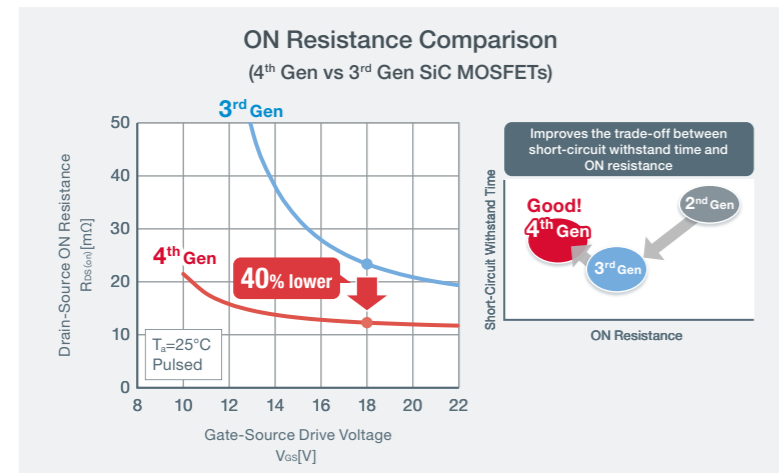
Further evolving the original double trench structure achieves class-leading low ON resistance.

ROHM's 4th Gen SiC MOSFETs significantly improve short-circuit withstand time compared to conventional products while also achieving class-leading low ON resistance. This contributes to lower power consumption and greater miniaturization in applications such as inverters and switching power supplies.

Features

- Improves short-circuit withstand time vs conventional 3rd Gen products
- Reduces ON resistance and switching loss by approx. 40% and 50%, respectively
- Offered in both surface-mount and insertion (through-hole) package types

*For bare chips (bare die), please contact a sales representative



SiC Schottky Barrier Diode

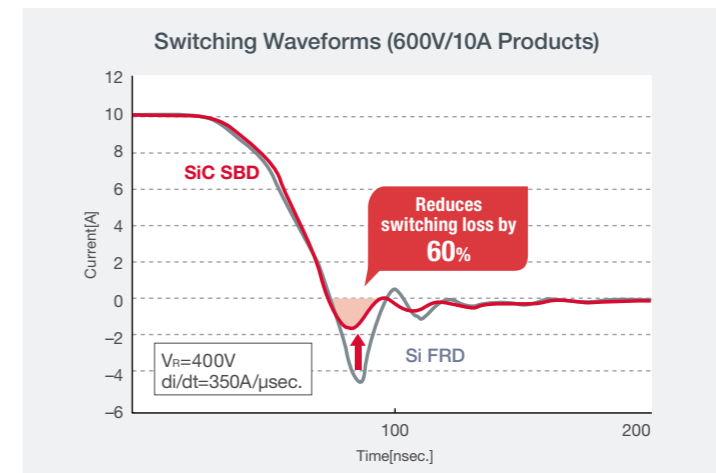
Dramatically reduces switching loss

ROHM SiC Schottky barrier diodes reduce switching loss by delivering a shorter reverse recovery time (t_{rr}) and lower V_F than Si FRDs (Fast Recovery Diodes), making them ideal for PFC circuits and inverter applications.

Features

- Shorter reverse recovery time (t_{rr}) and smaller reverse recovery charge (Q_{rr}) vs FRDs, reducing switching loss
- Combines Low V_F with high surge withstand tolerance
- Expanded package lineup ranging from TO-263 to TO-220
- Wide creepage distance package TO-263-2L contributes to insulated design

*For bare chips (bare die), please contact a sales representative



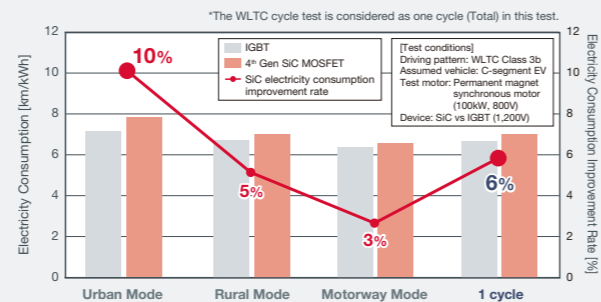
Market Background and ROHM 4th Gen SiC MOSFETs

The automotive industry is developing more energy-efficient, compact, and lightweight electric systems in order to achieve the goal of reducing environmental impact, including carbon neutrality. Especially for electric vehicles (EVs), the traction inverter, which plays a central role in the drive system, needs to be made more efficient to extend the cruising range and reduce the size of the on-board battery, increasing the expectations for SiC power devices.



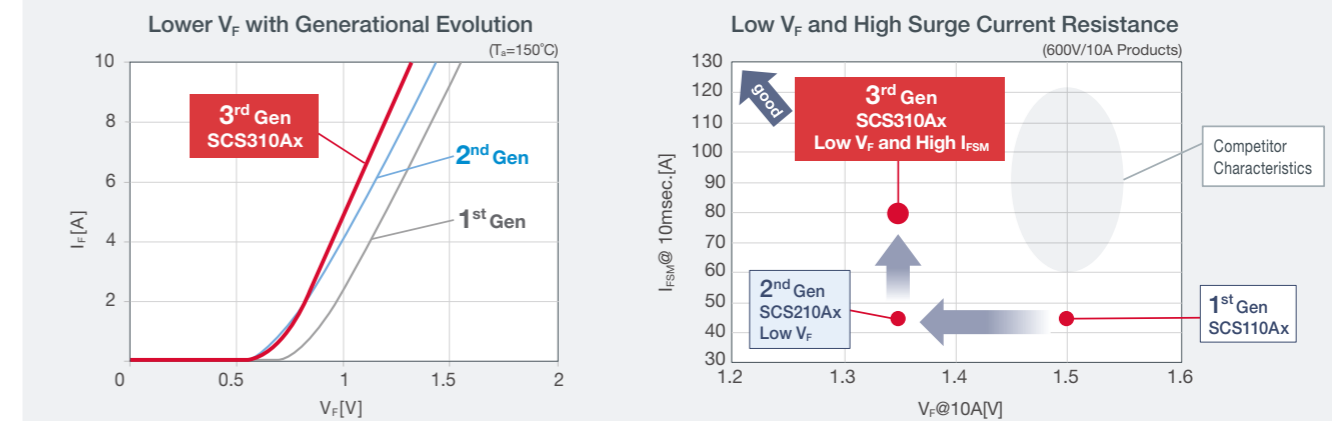
Electricity Cost Comparison: IGBT vs 4th Gen SiC MOSFET

Calculated using the WLTC fuel efficiency test an international standard



Compared to IGBT, 4th Gen SiC MOSFET improve electricity consumptions by 10% in Urban Mode, and by 6% in Total

Achieves lower V_F with the generational evolution of device processes



4th Gen SiC MOSFETs Lineup (Discrete)

V_{DS} [V]	$R_{\text{DS(on)}}$ (Typ) [m Ω]	Through Hole Type		Surface Mount Type	
		TO-247 (TO-247N)	TO-247-4L	TO-263-7L	TO-263-7LA Wide Creepage Distance
750	13	SCT4013DE	SCT4013DR	SCT4013DW7	SCT4026DWA/SCT4026DWAHR
	26	SCT4026DE/SCT4026DEHR	SCT4026DR/SCT4026DRHR	SCT4026DW7/SCT4026DW7HR	SCT4045DWA/SCT4045DWAHR
	45	SCT4045DE/SCT4045DEHR	SCT4045DR/SCT4045DRHR	SCT4045DW7/SCT4045DW7HR	SCT4045DWA/SCT4045DWAHR
1,200	18	SCT4018KE	SCT4018KR	SCT4018KW7	SCT4036KWA/SCT4036KWAHR
	36	SCT4036KE/SCT4036KEHR	SCT4036KR/SCT4036KRHR	SCT4036KW7	SCT4062KWA/SCT4062KWAHR
	62	SCT4062KE/SCT4062KEHR	SCT4062KR/SCT4062KRHR	SCT4062KW7/SCT4062KW7HR	SCT4062KWA/SCT4062KWAHR

Note: Part numbers with HR at the end indicate automotive-grade (AEC-Q101 qualified) products. Package indicates JEDEC code. () denotes ROHM package type.

SiC Schottky Barrier Diodes Lineup (Discrete)

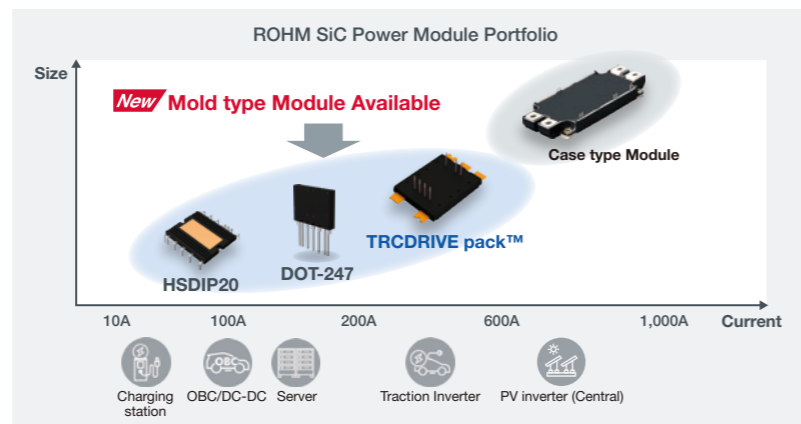
V_{DS} [V]	Through Hole Type				Surface Mount Type	
	TO-220AC (TO-220ACGE)	TO-220AC (TO-220ACG)	TO-220FM (TO-220FM-2LGE)	TO-247 (TO-247N)	TO-263AB (LPTL)	New TO-263-2L Wide Creepage Distance
650	SCS3xxAG	SCS2xxAG	SCS3xxAM	SCS2xxAE	SCS2xxAJ	SCS2xxAN
				SCS2xxAEHR	SCS2xxAJHR	SCS2xxANHR
				SCS2xxAE2	SCS3xxAJ	
1,200		SCS2xxKG		SCS2xxAE2HR		
				SCS2xxKE2		SCS2xxKN
				SCS2xxKE2HR		SCS2xxKNHR

Note: Part numbers with HR at the end indicate automotive-grade (AEC-Q101 qualified) products. Package indicates JEDEC code. () denotes ROHM package type.

SiC Power Module

As a pioneer in SiC power devices, ROHM led the industry in 2012 with the first mass production of case-type full SiC power modules. In recent years, we have focused on commercializing compact molded-type modules, with mass production already underway. Expanding our lineup makes it possible to deliver power solutions optimized for a broad range of applications and needs.

*For more details on SiC power modules (Mold type), please contact a sales representative



SiC Power Module (Mold Type)

MOLD TYPE

TRCDRIVE pack™

[TRC(ti: or si) DRIVE(dráiv) pack(pack)]

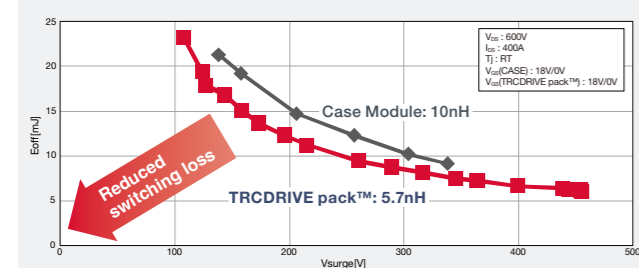
Compact, high current density modules contribute to the evolution of traction inverters

TRCDRIVE pack™ consists of compact, single-sided high heat dissipation molded modules developed for the drive circuit of traction inverter drives using ROHM's proprietary module technology. Evaluation kits for double pulse and three-phase full bridge configurations are also available for immediate testing.

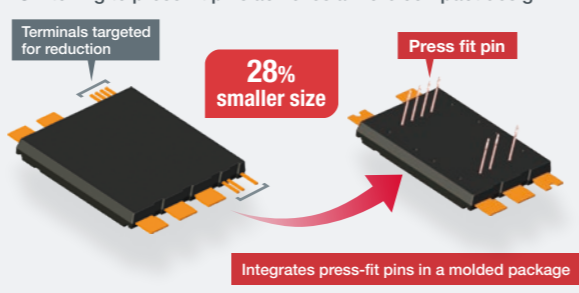
Features

- Low inductance enables high current density
- Compact easy-to-mount single-sided high heat dissipation molded package
- Achieves higher productivity vs case types
- Reduces package size by adopting press-fit pins

Switching Loss Comparison: Conventional vs TRCDRIVE pack™



Switching to press-fit pins achieves a more compact design



Part No.	Absolute Max Ratings(Tj=25°C)				Tj [°C]	Heat Sink Assembly	Module Type	Built-in MOSFET	Topology	AQG 324 Qualified			
	V _{DS} [V]	R _{DS(on)} [mΩ]	DC Current [A]*1	AC Current [A]**2									
New BST500D08P4A104	750	2.0	506	417	-40 to +175	TIM: heat dissipation sheet Ag Sinter	Small A type (Small) 41.6mm x 52.5mm	4th Gen. SiC MOSFET	Half bridge	YES			
☆ BST500D08P4A114				429									
New BST400D12P4A101	1,200	2.8	394	326		TIM: heat dissipation sheet Ag Sinter	Small A type (Small) 41.6mm x 52.5mm	4th Gen. SiC MOSFET	Half bridge		YES		
☆ BST400D12P4A111				336									
New BST740D08P4A154	750	1.4	738	634		TIM: heat dissipation sheet Ag Sinter	Large A type (Large) 58.6mm x 52.5mm	4th Gen. SiC MOSFET	Half bridge			YES	
☆ BST1040D08P4A156		1.0	1,039	736									
☆ BST740D08P4A164		1.4	738	659									
☆ BST1040D08P4A166		1.0	1,039	771									
New BST580D12P4A151	1,200	1.9	575	475		TIM: heat dissipation sheet Ag Sinter	Large A type (Large) 58.6mm x 52.5mm	4th Gen. SiC MOSFET	Half bridge				YES
☆ BST780D12P4A153		1.2	778	571									
☆ BST580D12P4A161		1.9	575	494									
☆ BST780D12P4A163		1.2	778	593									

*1 Tj=60°C, V_{DS}=18V *2 Tj=65°C, V_{CC}=800V/500V, f_{sw}=10kHz, Modulation=0.9, Power factor=0.9

☆: Under Development

MOLD TYPE

Insertion Package Module

SiC power devices for applications like onboard chargers (OBC) and DC-DC converters are commonly available in discrete packages such as TO-247 and TO-263. However, applying a modular approach to high-power circuits can significantly reduce both application size and weight. In this context, ROHM offers insertion package modules designed for applications such as OBCs and DC-DC.

*For more details on SiC power modules (molded type), please contact a sales representative

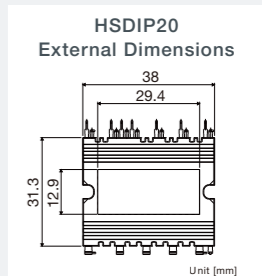
HSDIP20 Package

Contributes to the miniaturization of OBC/DC-DC circuit topologies

HSDIP20 achieves among the class-leading small module size by specializing functions for OBCs and DC-DC converters. Beyond the 6-in-1 and 4-in-1 modules tailored to various OBC/DC-DC topologies, including PFC (6pcs) and LLC (4pcs) circuits, we also offer a hybrid module (36mΩ×4pcs+18mΩ×2pcs) ideal for bridgeless totem-pole PFC, allowing us to provide modules customized to diverse customer needs.

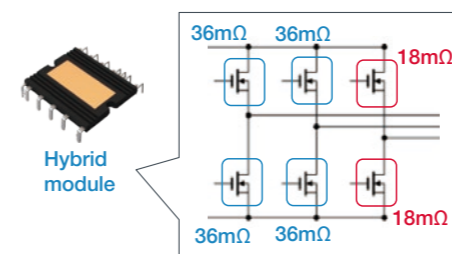
Features

- Lineup optimized for various OBC/DC-DC topologies
- Achieves class-leading compact size among equivalent products by optimizing the internal layout and pin configuration
- The heat dissipation pad utilizes an insulating structure with high thermal conductivity AlN, enabling high efficiency thermal management.

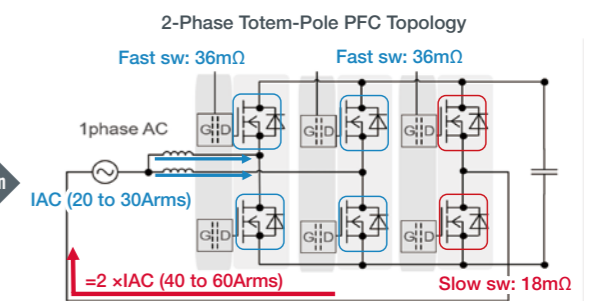


Example of Achieving a 2-Phase Totem-Pole PFC for 6.6kW Class OBC in a Single Package

Internal Circuit of HSDIP20 Package Hybrid Module



Implementation



DOT-247 Package

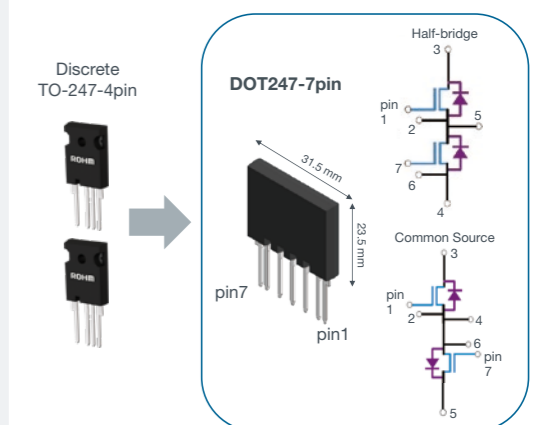
Ideal for high-capacity trends in OBC/DC-DC and FCV (Fuel Cell Vehicle) superchargers

The DOT-247 module integrates 2 SiC MOSFETs for a half-bridge configuration. Compared to a configuration using two discrete TO-247 packages, the placement of upper and lower MOSFETs is closer, maximizing the the high-speed switching capability of SiC MOSFETs by reducing parasitic inductance. In addition to half-bridge circuits, it is also possible to configure source-common and chopper circuits, achieving 57% lower Ron than competitor products.

Features

- Enables half-bridge and common-source configurations with SiC MOSFETs
- Adopts a hole-less package that supports large currents in the 100 to 200A class
- Improves heat dissipation characteristics
- Enables high-speed switching

Replacing 2 SiC MOSFETs with the DOT-247



SiC Power Module (Case Type)

CASE TYPE

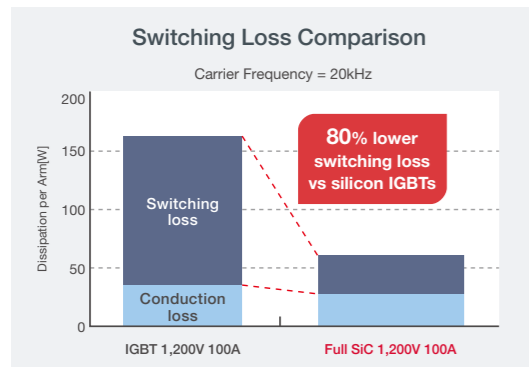
Established a proven track record of reliable adoption since the world's first* mass production of full SiC power modules in 2012

SiC power modules significantly reduce switching losses compared with silicon IGBTs of equivalent ratings. At the same time, their ability to operate at high frequencies above 100kHz makes them suitable for a wide range of automotive and industrial equipment applications.

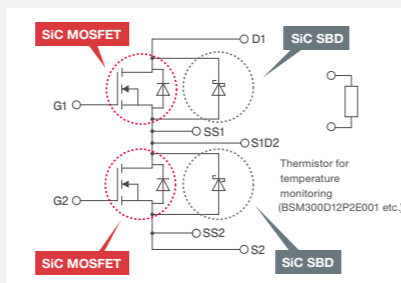
Features

- Compared to IGBT modules, switching losses are reduced by up to 80%
- SiC device characteristics enable high-speed switching
- 600A class high-current specification
- Prepare the half bridge type and the boost-buck chopper type

*ROHM study



Internal Circuit Example (Half Bridge Circuit)



Full SiC Power Module Lineup

V _{oss} [V]	R _{DS(on)} [mΩ]	Case Type		
		C type	E type	G type
1,200	34	BSM080D12P2C008		
	20	BSM120D12P2C005 BSM120C12P2C201		
	12.8	BSM180D12P2C101		
	12.2		BSM180C12P2E202 BSM180D12P2E002	
	10	BSM180D12P3C007 BSM180C12P3C202		
	7.3		BSM300D12P2E001	
	6.3		BSM300C12P3E201 BSM300C12P3E301	
	5.75			BSM400D12P2G003
	5.55		BSM300D12P3E005	
	4.5			BSM400D12P3G002
	4			BSM300D12P4G101 BSM450D12P4G102
	3.3			BSM600D12P3G001 BSM600D12P4G103
	3			
	2.7			
1,700	8		BSM250D17P2E004	

Supporting Content

New How to Suppress the Parallel Drive Oscillation in SiC Modules

SiC MOSFET Bare Die Application Note



In recent years, power modules equipped with multiple SiC MOSFET elements (bare chips) connected in parallel have seen increasing use in applications like traction inverters for electric vehicles (EVs). However, parallel connection of high-speed devices such as SiC MOSFETs can cause oscillation between devices, potentially leading to failure or damage. As a result, implementing oscillation suppression countermeasures has become a critical concern in the market. This application note outlines effective methods for suppressing oscillation in power modules.

5kW High Efficiency Fan-less Inverter Circuit Reference Design with SiC MOSFETs [REFPDT007]

The REFPDT007 utilizes a transformer-link interleaved circuit in the inverter block that takes advantage of the high-frequency switching performance of SiC MOSFETs to achieve a power conversion efficiency of 99% or higher at 5kW. SiC MOSFETs (SCT3017AL, SCT3030AL) are implemented in a novel circuit topology that delivers high efficiency by reducing winding reactance and copper losses. High 99% efficiency (51W) operation that suppresses heat generation enables cooling using just small heat dissipation fins without the need for a cooling fan. What's more, the interleaved design doubles the apparent switching frequency, while miniaturization of the smoothing filter halves the size and weight compared to conventional full-bridge types.



Reference Board

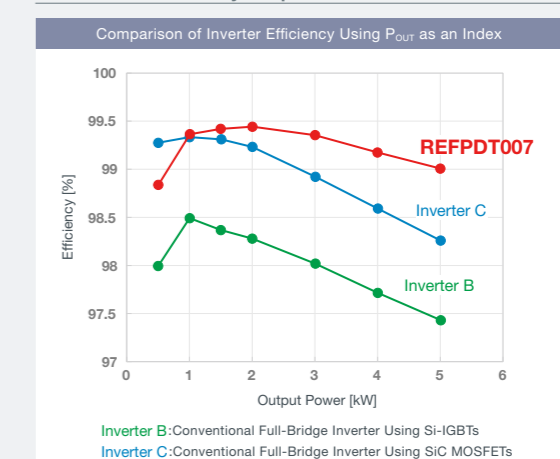
Specifications

Reference Board Part No.	REFPDT007-EVK-001
V _{IN}	DC320V
V _{OUT}	AC200V
I _{OUT}	AC25A
f _{sw}	40kHz
I _{OUT,pp} /I _{OUT,peak}	Less than 0.2
Bm Max	Less than 0.15T

*This reference board consists of three boards

Reference Board Part No.	Type
REFPDT007-EVK-001A	Power Stage
REFPDT007-EVK-001B	Controller Board
REFPDT007-EVK-001C	Aux Power Supply

REFPDT007 Efficiency Graph



Design Data e.g.: REFPDT007-EVK-001A

Circuit Diagram

Bill of Materials

Layout

REFPDT007
5kW High-Efficiency Fan-less Inverter Reference Design

Isolated Gate Driver IC

Achieves high-speed operation that supports IGBTs, Si-MOSFETs, and SiC MOSFETs

ROHM has developed an on-chip transformer process utilizing unique microfabrication technology. This breakthrough has led to the successful commercialization of compact gate drivers that incorporate isolation elements.

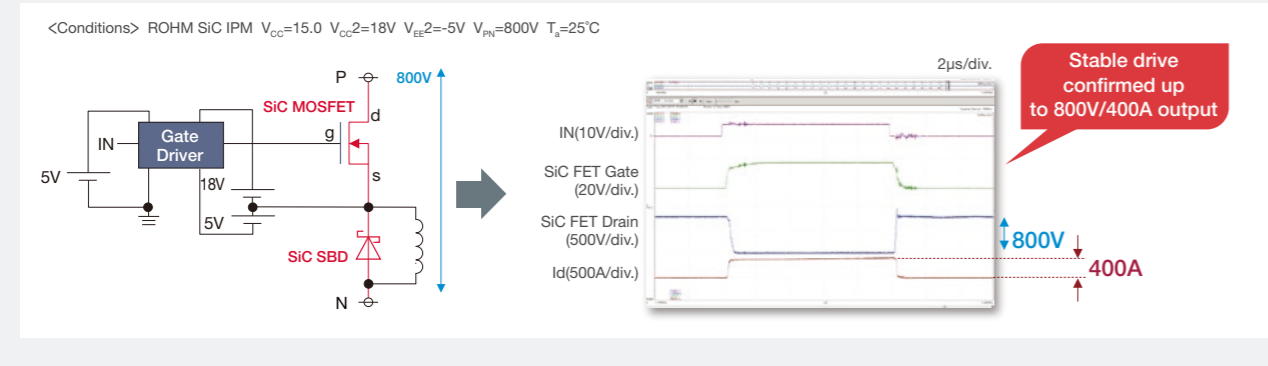
Features

- High-speed operation with a maximum input/output delay time of 60ns
- Achieves an isolation voltage of 2,500Vrms/3,750Vrms using a coreless transformer
- Unique noise cancellation technology ensures high CMR (Common-Mode Noise Rejection)
- Lineup supports high V_{GS} and negative power supplies
- Compact packages (SOP-JW8: 4.9x6.0xMax 1.65[mm]) (SSOP-B20W: 6.5x8.1xMax 2.01[mm]) (SSOP-B10W: 3.5x10.2xMax 1.9[mm])

Recommended Operating Range (e.g.: BM6101FV-C)

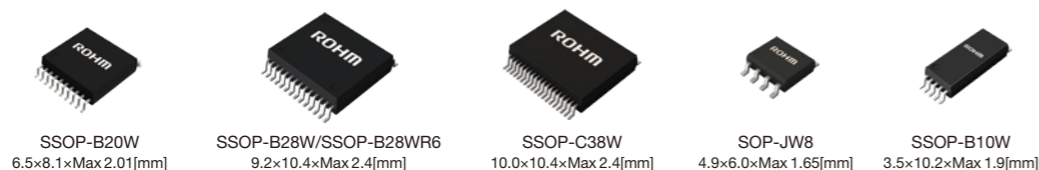
Parameter	Symbol	Min	Max	Unit
Input Supply Voltage	V_{CC1}	+4.5	+5.5	V
Output Supply Voltage	V_{CC2}	+14	+24	V
Output V_{EE} Voltage	V_{EE2}	-12	±0	V
Operating Temperature Range	T_a	-40	+125	°C

IPM Operating Waveforms (e.g.: BM6101FV-C)



Isolated Gate Driver ICs Lineup

Part No.	Input Supply Voltage [V]	Output Positive Supply Voltage [V]	Output Negative Supply Voltage [V]	Isolation Voltage [Vrms]	Input/Output Delay Time [ns]	Minimum Input Pulse Width [ns]	Max Output Current [A]	Operating Temperature [°C]	Package	Automotive Grade (AEC-Q100)
BM6101FV-C	4.5 to 5.5	14 to 24	-12 to 0	2,500	350	180	3	-40 to +125	SSOP-B20W	YES
BM6102FV-C	4.5 to 5.5	14 to 20	-	2,500	200	100	3	-40 to +125	SSOP-B20W	YES
BM6104FV-C	4.5 to 5.5	10 to 24	-12 to 0	2,500	150	90	3	-40 to +125	SSOP-B20W	YES
BM6108FV-LB	4.5 to 5.5	10 to 24	-12 to 0	2,500	150	90	5	-40 to +105	SSOP-B20W	-
BM6109FV-C	4.5 to 5.5	14 to 18	-	2,500	700	600	4.5	-40 to +125	SSOP-B28W	YES
BM6112FV-C	4.5 to 5.5	14 to 20	-12 to 0	3,750	150	90	20	-40 to +125	SSOP-B28W	YES
BM60052AFV-C	4 to 32	10 to 20	-12 to 0	2,500	120	90	3	-40 to +125	SSOP-B28W	YES
BM60054AFV-C	4 to 32	10 to 20	-12 to 0	2,500	120	90	3	-40 to +125	SSOP-B28W	YES
BM60055FV-C	4.5 to 30	9 to 24	-	2,500	250	170	5	-40 to +125	SSOP-B28W	YES
BM60059FV-C	4.5 to 24	14 to 24	-	2,500	450	400	10	-40 to +125	SSOP-B28W	YES
BM60060FV-C	8 to 24	13.5 to 24	-	2,500	210	90	9	-40 to +125	SSOP-B28W	YES
BM60068FU-C	4.5 to 5.5	14 to 20	-12 to 0	3,750	150	90	6	-40 to +125	SSOP-C38W	YES
BM6112HFV-C	4.5 to 5.5	14 to 20	-12 to 0	3,750	150	90	20	-40 to +125	SSOP-B28WR6	YES
BM61M22BFJ-C	4.5 to 5.5	9 to 24	-	2,500	60	60	2	-40 to +125	SOP-JW8	YES
BM61M41RFV-C	4.5 to 5.5	9 to 24	-	3,750	65	60	4	-40 to +125	SSOP-B10W	YES
BM61S40RFV-C	4.5 to 5.5	16 to 20	-	3,750	65	60	4	-40 to +125	SSOP-B10W	YES
BM61S41RFV-C	4.5 to 5.5	16 to 24	-	3,750	65	60	4	-40 to +125	SSOP-B10W	YES

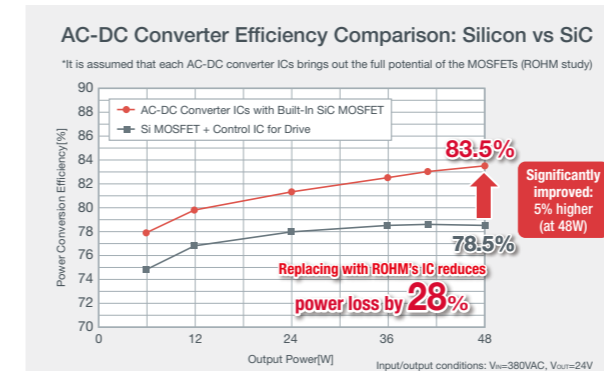


ROHM provides analog ICs that maximize the performance of SiC power devices. In particular, for AC-DC converters, ROHM has developed power ICs for SiC MOSFETs, leading the industry.

AC-DC Converter IC with Built-in SiC MOSFET

AC-DC converter ICs enable dramatic energy savings and miniaturization

The BM2SC12xFP2-LBZ series is the industry's first (as of 2019) to combine an SiC MOSFET with control circuitry optimized for auxiliary industrial power supplies, delivering unprecedented power saving performance in a single package. This facilitates the development of energy-efficient AC-DC converters, leading to compact, energy efficient, reliable solutions for auxiliary power supplies in 400V AC industrial equipment.



- ## Features
- Combines a high-voltage 1,700V SiC MOSFET and control IC in a single package
 - Significantly reduces the number of peripheral parts (12 parts + heat sink can be reduced to 1 part)
 - Low-loss SiC MOSFETs minimize system power consumption
 - Decreasing the number of parts while incorporating protection functions contributes to improved system reliability
 - Package lineup includes through hole types that support heat sinks along with surface mount options compatible with automated assembly

1,700V AC-DC Converter ICs with Built-in SiC MOSFET Lineup

Part No.	Supply Voltage [V]	SiC MOSFET V_{GS} (Max)[V]	Control Method	Max Frequency [kHz]	ON Resistance [Ω]	Steep Overcurrent Limiter [A]	OCP Switching Function	V_{CC} OVP Protection	BR UVLO	FB OLP Protection	ZT OVP Protection	Package
BM2SCQ121T-LBZ	15 to 27.5	1,700	QR	120	1.12	-	✓	Latch	-	Auto Restart	Latch	TO220-6M
BM2SCQ122T-LBZ										Latch		TO220-6M
BM2SCQ123T-LBZ										Auto Restart		TO220-6M
BM2SCQ124T-LBZ	15 to 27.5	1,700	QR	120	1.12	-	✓	Auto Restart	✓	Auto Restart	Latch	TO220-6M
BM2SC121FP2-LBZ										Latch		TO263-7L
BM2SC122FP2-LBZ										Latch		TO263-7L
BM2SC123FP2-LBZ	15 to 27.5	1,700	QR	120	1.12	-	✓	Auto Restart	✓	Auto Restart	Latch	TO263-7L
BM2SC124FP2-LBZ										Latch		TO263-7L
BM2SC125FP2-LBZ										Auto Restart		TO263-7L



AC-DC Controller IC for SiC MOSFET Drive

Simplifies the adoption of SiC MOSFETs in AC-DC converters

Leveraging the ROHM's strengths of both power devices and analog ICs, the BD768xFJ series was developed to accelerate the adoption of high efficiency AC-DC converters using SiC MOSFETs. As of 2015, AC-DC converters utilizing SiC devices were primarily comprised of discrete components, but the BD768xFJ established a new standard for control ICs.

- ## Features
- Supports high-voltage SiC MOSFET drive for AC-DC circuits
 - Replacing Si-MOSFETs with SiC MOSFETs improves efficiency by up to 5%
 - Enables the miniaturization of circuits and heat dissipation components
 - Multiple protection operations support high voltage operation (690V)

AC-DC Controller ICs for SiC MOSFET Drive (Isolated DC-DC Control) Lineup

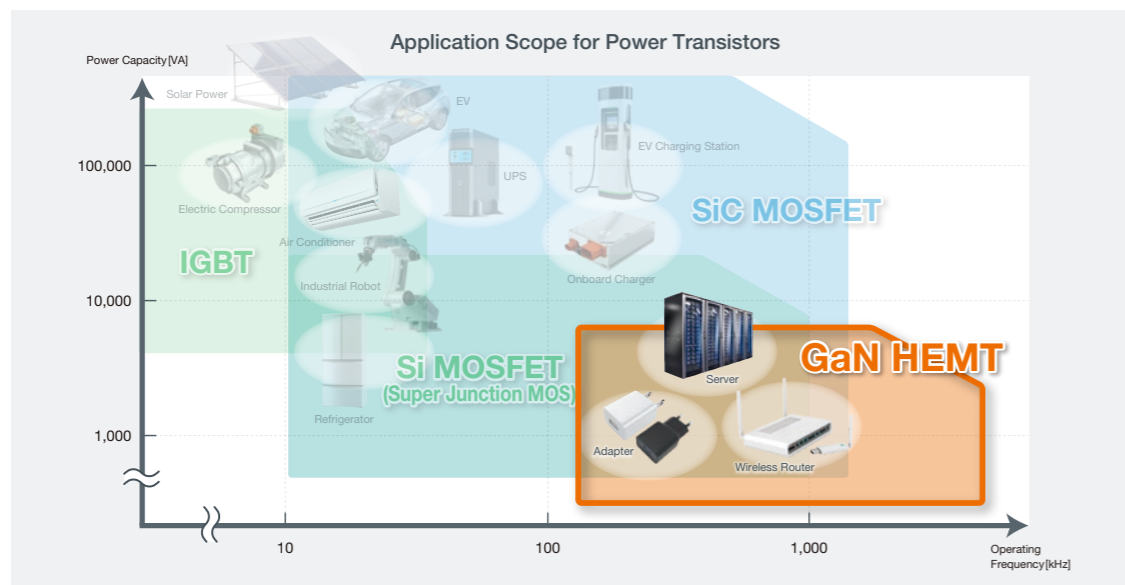
Part No.	Supply Voltage [V]	Control Method	Startup Circuit	Starting Current [mA]	Max Frequency [kHz]	Frequency Reduction Function	AC Voltage Correction	FB OLP Protection	V_{CC} OVP Protection	ZT OVP Protection	Package
BD7682FJ-LB	15 to 27.5	QR	-	-	120	✓	✓	Auto Restart	Latch	Latch	SOP-J8
BD7683FJ-LB								Latch			SOP-J8
BD7684FJ-LB								Auto Restart			SOP-J8
BD7685FJ-LB								Latch			SOP-J8



GaN HEMT

GaN power devices from the SiC pioneer

The power capacity and operating frequency range of power devices can vary greatly depending on their materials and structure. Gallium nitride (GaN) power devices such as GaN HEMTs combine low ON resistance with excellent high-speed switching performance, making it possible to reduce both power consumption and the size of peripheral components in a variety of power supplies. ROHM's lineup includes 150V/600V rated EcoGaN™ products designed to support the creation of sustainable ecosystems. Analog ICs are also available to maximize the performance of GaN HEMTs.



GaN (Gallium Nitride)

= A type of compound semiconductor material

A type of compound semiconductor material

Like SiC, GaN is a material with great potential for use in power devices.

	Si	4H-SiC	GaN
Bandgap [eV]	1.12	3.2	3.4
Dielectric Constant	11.7	9.66	8.9
Dielectric Breakdown Electric Field [MV/cm]	0.3	3	3.3
Electron Saturation Velocity [10 ⁷ cm/s]	1	2	2.5
Bulk Electron Mobility [cm ² /Vs]	1,350	720	900
Thermal Conductivity [W/cm-K]	1.5	4.5	2 to 3

- Wide Bandgap
- High dielectric breakdown electric field
- High electron saturation velocity

HEMT (High Electron Mobility Transistor)

= A type of transistor element structure

Power Device Performance Comparison (650V withstand)

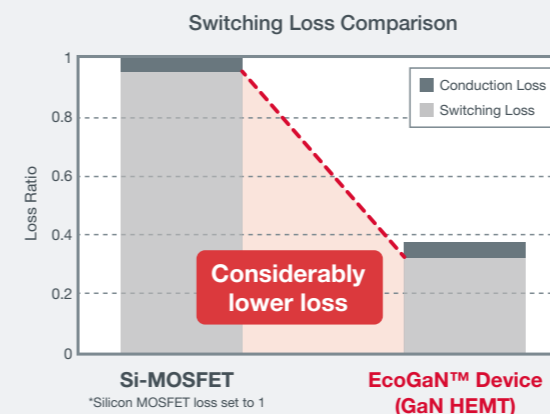
In particular, excellent high-speed switching characteristics that cannot be achieved with silicon MOSFETs contribute to higher system performance.

	Si SJ MOSFET ^{1,2}	SiC MOSFET	GaN HEMT
Withstand Voltage Range	500V to 1kV	600V to several kV	to 650V
Comparative Breakdown Voltage Conditions	650V	650V	650V
Supports Large Currents	Good	Good	Average
High-Speed Switching Characteristics	Average	Good	Very good
- Ron·Qg ¹	1 ²	0.63	0.1
- Switching Speed	1 ²	2	10
- Qrr ³	0.73μC	0.25μC	0nC

¹ An indicator of switching performance. The lower this value is, the better the switching performance.
² With silicon SJ MOSFET Ron·Qg and switching loss set as 1.
³ The amount of charge flowing during reverse recovery time due to the parasitic capacitance of the PN junction. The lower this value is, the better the switching performance.
⁴ Indicates a Super Junction MOSFET

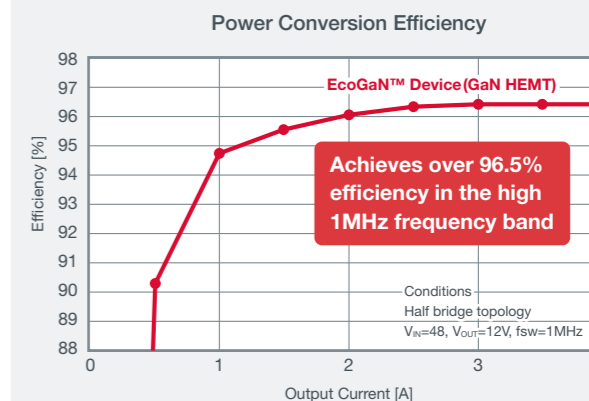
Overview of ROHM's EcoGaN™ (GaN HEMTs)

Significantly reduces switching loss compared with silicon MOSFETs



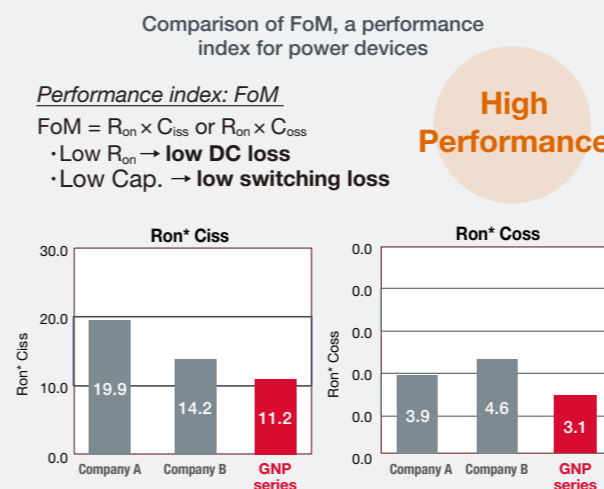
EcoGaN™ can switch with an Ron·Qg (a key indicator of loss) approximately 20x lower than that of Si-MOSFETs, significantly reducing switching losses.

Ensures high efficiency even in 1MHz high-speed switching DC-DC power supply circuits



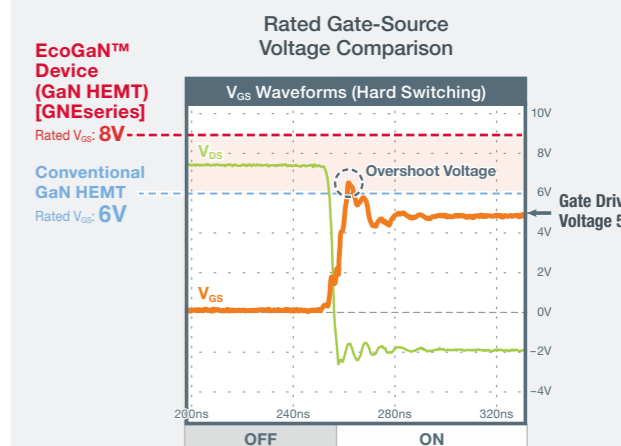
Even during high-speed 1MHz switching, high-efficiency operation can be achieved by significantly reducing switching losses, allowing for the miniaturization of coils, capacitors, and ultimately the entire system.

Among GaN devices, the GNP series of 650V GaN HEMTs is designed for ultra-low loss performance.



The GNP series of 650V GaN HEMTs achieves superior FoM (Figure of Merit) compared to competitors, enabling lower-loss switching operation.

The 150V GaN HEMT GNE series features a rated gate-source voltage of 8V

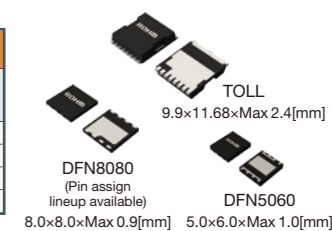


The GNE series of 150V GaN HEMTs provides sufficient voltage margin to handle voltage overshoots, improving circuit reliability.

GaN HEMT Lineup (150V/650V Rated Voltages)

Part No.	Grade	V _{GS} [V]	R _{DS(on)} [mΩ]	V _{GS} Maximum Rating [V]	Package
GNP1xxxTC	Standard	650	150, 70	6	DFN8080
New GNP2xxxTEC	Standard	650	130, 70, 50	6	DFN8080
New GNP20xxTD	Standard	650	70, 50, 25	6	TOLL
GNE10xxTB	Standard	150	40, 8.5	8	DFN5060

Note: The xx and xxx in the part number is determined by the integers of the R_{DS(on)} value (e.g. 150mΩ= GNP150TC, 8.5mΩ= GNE1008TB)

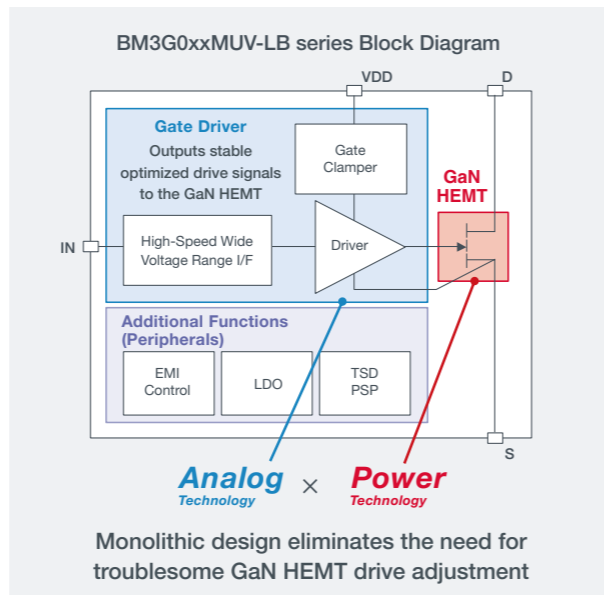


GaN HEMT Power Stage IC

GaN HEMT + Gate Driver

Reduces component volume by up to 99% compared to existing silicon MOSFETs

ROHM GaN HEMT power stage ICs integrate a GaN HEMT and gate driver in a single package, delivering an optimized solution that maximizes performance for electronic systems demanding high power density and efficiency. At the same time, support for a wide drive voltage range from 2.5V to 30V enables compatibility with virtually any controller IC. These features make it possible to replace conventional discrete power devices such as Si-MOSFETs

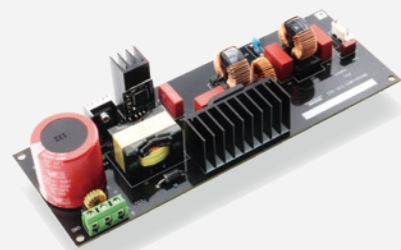


Part No.	Drain Pin Voltage (Max)[V]	Input Voltage Range [V]	Supply Pin Voltage [V]	Supply Pin Operating Current (Typ)[μA]	Supply Pin Quiescent Current (Typ) [μA]	ON Resistance (Typ)[mΩ]	Delay Time Turn ON/OFF (Typ) [ns]	Package
BM3G015MUV-LB	650	-0.6 to 30	6.25 to 30	450	150	150	11/15	VQFN046V8080
BM3G007MUV-LB	650	-0.6 to 30	6.25 to 30	650	180	70	12/15	VQFN046V8080

VQFN046V8080
8.0x8.0xMax 1.0[mm]

Supporting Content

BM3G007MUV-EVK-002
240W PFC BM3G007MUV Evaluation Board



Spec.	Value
Max Power	240W
Size	210mm x 75mm
Peak Efficiency	97.8% @230Vac
Input Voltage	90 to 264 Vac
Output Voltage	395V
Output Current	0.6A

GNP2130TEC-EVK-001
100W PFC + LLC GNP2130TEC Evaluation Board

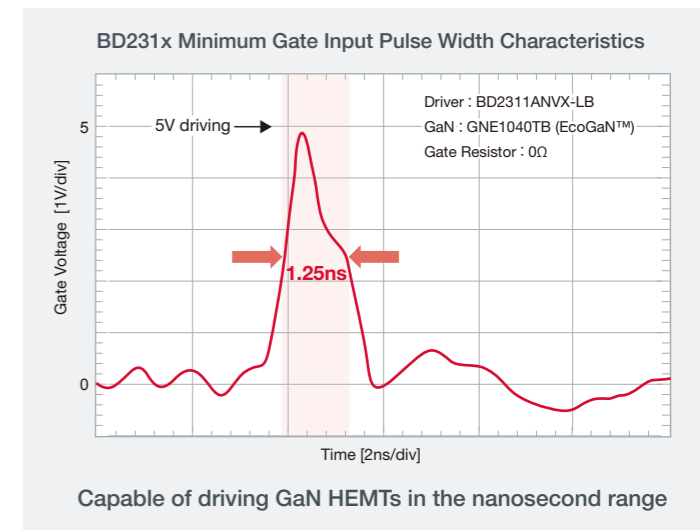


Spec.	Value
Max Power	100W (convection)
Size	104mm x 53mm x 23mm
Power Density	1.18W/cc = 19.5W/inch ³
Peak Efficiency	95.0% @230Vac
No-load power consumption	< 0.3W
Input Voltage	90 to 264 Vac
Output Voltage	24V

In addition to GaN power devices that contribute to energy savings and miniaturization, ROHM also offers a lineup of gate drivers and controllers that maximize device performance.

Gate Driver IC for GaN HEMT

To maximize performance in applications, power devices must receive the proper drive signals. ROHM provides a wide range of gate driver ICs for driving GaN HEMTs. For example, the BD231x series supports high-speed switching with pulse widths as small as 1.25ns for driving GaN HEMTs, while an original overshoot suppression circuit enhances the reliability of GaN devices. Pairing these drivers with ROHM's GNE series of 150V GaN HEMTs ensures exceptionally high operational stability.



Part No.	Drive Type	Input Supply Voltage [V]	Output Current (Typ) [A]	Delay Time Turn ON/OFF (Typ) [ns]	Minimum Input Pulse Width (Typ) [ns]	Package [mm]	Automotive Grade (AEC-Q100)
New BD2311ANVX-LB	Single-channel Driver	4.5 to 5.5	5.4/2.7	3.4/3.0	1.25	SSON06RX2020 2.0x2.0x0.6(Max)	—
New BD2311ANVX-C	Single-channel Driver	4.5 to 5.5	5.4/2.7	3.4/3.0	1.25	SSON06RX2020 2.0x2.0x0.6(Max)	YES
New BD2312AGWL-LB	Single-channel Driver	4.5 to 5.5	5.4/2.7	3.4/3.0	1.25	UCSP50L1C 1.2x0.8x0.57(Max)	—
New BD2122MUF-LA	Half-Bridge Driver	4.5 to 5.5	3.5/7.0	22/22	10	VQFN016FV3030 3.0x3.0x1.0(Max)	—
New BM6GD11BFJ-LB	Isolated Single-channel Driver	4.5 to 5.5	+3.0/-3.0	50/50	65	SOP-JW8 6.0x4.9x1.6(Max)	—

Controller IC for GaN HEMT

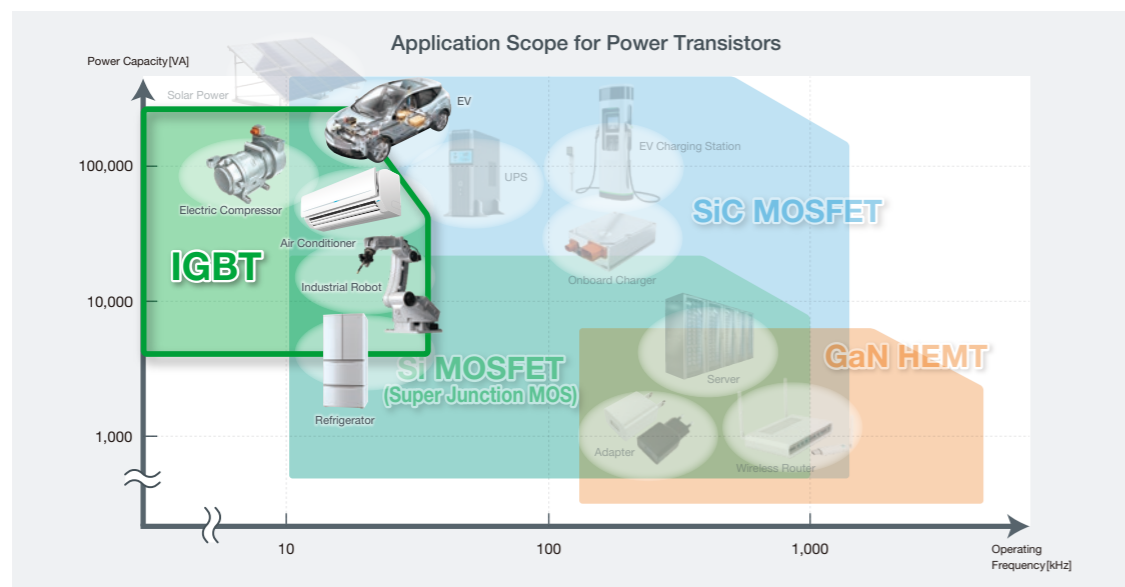
When adopting power devices in power supply applications, the control signals and function required will vary depending on the power supply topology. ROHM offers a lineup of controller ICs suitable for various power supply topologies utilizing GaN HEMTs. Despite being smaller than competing products, these controller ICs achieve high-speed 2MHz switching along with ultra-low quiescent current in the 100μA range, ensuring the high-efficiency operation of GaN HEMTs.

Part No.	Topology	Input Supply Voltage [V]	HV Input Voltage [V]	Switching Frequency	Quiescent Current [μA]	Package [mm]	Automotive Grade (AEC-Q100)
New BM85060FV-LB	Totem Pole PFC (CRM)	8.0 to 36	Up to 650	25kHz to 2MHz	250	SSOP-B20 6.5x6.4x1.45(Max)	—
New BM85080FV-LB	LLC	8.0 to 30	Up to 650	25kHz to 2MHz	150	SSOP-B20 6.5x6.4x1.45(Max)	—
New BD9JZ01MUV-LB	Buck	4.0 to 100	0.8 to 60	100kHz to 3MHz	9	VQFN024V4040 4.0x4.0x1.0(Max)	—

IGBT

Expands market share with a wide range of form factors, from bare chips to discrete devices and modules

As vehicle electrification progresses, the demand for IGBTs is increasing in applications such as electric compressors and HV heaters (PTC heaters), with ROHM IGBTs seeing widespread adoption. ROHM offers a lineup of products under the EcoIGBT™ brand that supports the creation of a sustainable ecosystem, featuring field stop trench IGBTs used in the automotive and industrial sectors, as well as ignition IGBTs for vehicle ignition applications. Field stop trench IGBTs in particular are available not only as discrete components, but also bare dies (chips) and IGBT-IPM. ROHM also offers diodes for IGBT modules, expanding market share with a wide range of products to meet customer needs.



Voltage Classification by ROHM IGBT Product Type	Field Stop Trench IGBT		Ignition IGBT	FRD for IGBT Module
	Discrete	Bare Die		
600V	600V		400V	650V
650V	650V			
1,200V	1,200V		430V	1,200V
1,800V	1,800V			

Examples of Field Stop Trench IGBT Discrete Products	Series Name	Generation	Automotive-Grade	V _{CE(sat)} (Typ)	High Speed Switching	SCSOA	Lineup Summary
	High Speed Fast Switching RGW/RGWS series	3 rd Gen	AEC-Q101	Best in Class: Min 1.5V	✓	—	650V 20 to 75A@100°C
	High SCSOA guaranteed RGS series	2 nd Gen	AEC-Q101	1.65V	—	8μs	650V 15 to 75A@100°C
				1.7V	—	Best in Class: 10μs	1,200V 15 to 40A@100°C
New High SCSOA guaranteed RGA series	4 th Gen	AEC-Q101	Best in Class: 1.65V	—	Best in Class: 10μs	1,200V 15 to 40A@100°C	

4th Gen IGBT

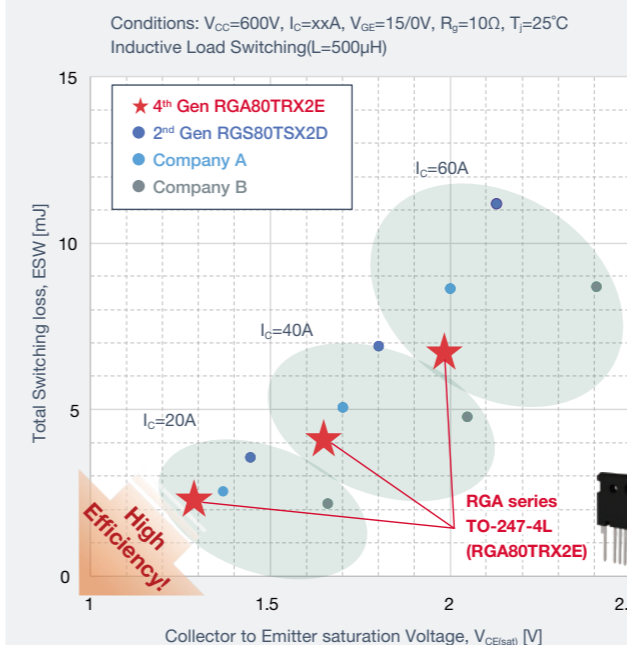
New ultra-high performance 1,200V IGBTs for automotive applications are now available that combine low loss and high short-circuit withstand capability with support for creepage distance

ROHM has developed its latest 4th Gen RGA series of field stop trench IGBTs, building on the proven reliability of the previous generation with features such as high short-circuit resistance to achieve class-leading low switching loss performance. At the same time, the products are offered in a package that considers creepage distance, making them ideal for high voltage applications requiring enhanced reliability.

Features

- Low V_{CE(sat)} and low switching loss contribute to higher efficiency
- High reliability products: AEC-Q101 qualified (discrete), a short-circuit withstand time of 10μs
- TO-247-4L package considers creepage distance
- Offered in both discrete and bare chip form factors

Achieves class-leading Low V_{CE(sat)} and switching loss



The RGA series contributes to improved application efficiency by reducing the collector-to-emitter saturation voltage along with total switching losses.

ROHM's package for high voltage simplifies the implementation of implementing creepage distance measures

	TO-247	Competitor TO-247-4L	ROHM Wide Creepage Distance TO-247-4L
Package			
Creepage Distance	2.7mm	3.9mm	7.8mm
Rated Voltage (Pollution Degree 2)	380V	580V	1,100V

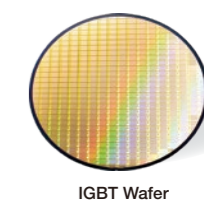
The RGA series uses a TO-247-4L package that supports with creepage distance requirements, reducing the burden of implementing creepage distance measures in 800V high voltage applications such as automotive field.

New 4th Gen IGBT Lineup [RGA series] (V_{CE(sat)}/V_F=1.65V)

Product Type	V _{CE(sat)} [V]	I _c [A] T _C =100°C	Package			
			TO-247-4L (Wide Creepage Distance)		TO-247N	
Discrete	1,200	32	IGBT	IGBT with built-in FRD	IGBT	IGBT with built-in FRD
			RGA30TRX2HR	RGA30TRX2EHR	RGA30TSX2HR	RGA30TSX2EHR
			RGA50TRX2HR	RGA50TRX2EHR	RGA50TSX2HR	RGA50TSX2EHR
			RGA60TRX2HR	RGA60TRX2EHR	RGA60TSX2HR	RGA60TSX2EHR
		69	RGA80TRX2HR	RGA80TRX2EHR	RGA80TSX2HR	RGA80TSX2EHR

Product Type	V _{CE(sat)} [V]	I _c /I _{SM} *nominal	IGBT Bare Die	FRD for IGBT Bare Die
Bare Die	1,200	10 to 200	SG84xxWN	SH22xxWN

*Depends on the thermal properties of assembly.



IGBT Wafer

IGBT-IPM

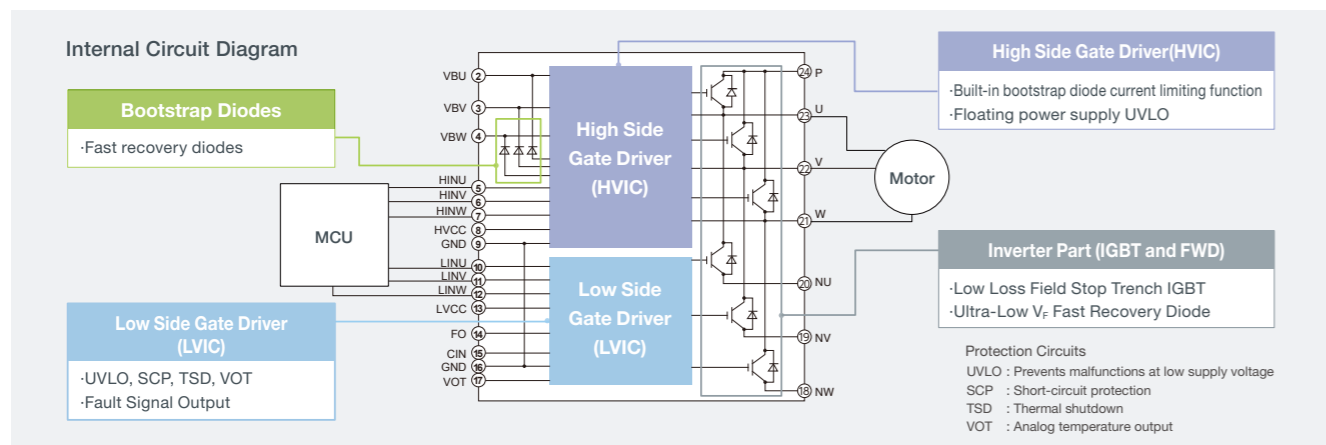
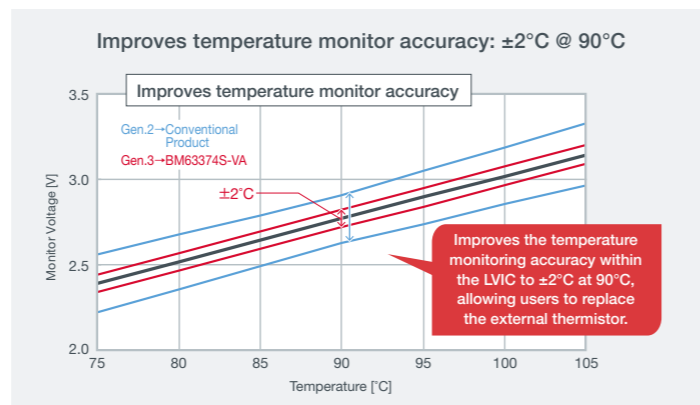
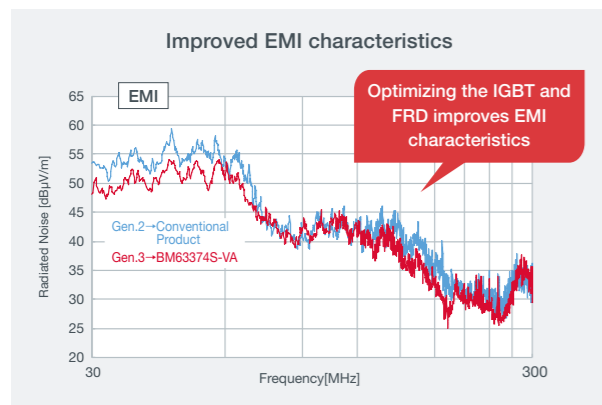
IGBT + Gate Driver

Achieves motor drive in a single package

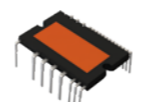
Integrates main components (i.e. IGBT, gate drivers, peripheral circuits) required for motor drive in a single package. We support optimized IGBT designs tailored to specific applications.

Features

- Integrates an IGBT, FWD (Free Wheeling Diode), bootstrap diodes, and gate drivers in a single package
- Broad lineup from 10A to 50A in the same package size and pin layout
- A full range of protection circuits (short-circuit, thermal shutdown, analog temperature output circuit) is built in, along with a FAULT signal output function when the protection circuits operate

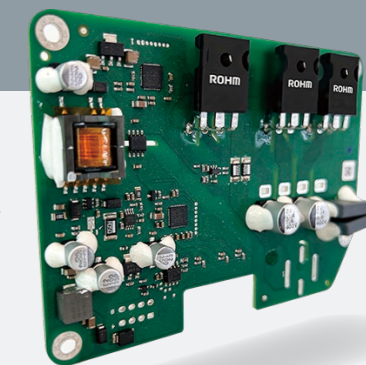


IGBT-IPM Lineup (PWM Input Frequency $f_c \leq 20\text{kHz}$)								
Part No.	Grade	V_{CES} [V]	I_c [A]	$V_{\text{ce(sat)}}$ [V]	Isolation Voltage ^{*1} [Vrms]	Temperature Protection Function ^{*2}	Collector Loss ^{*3} [W]	Package
BM63373S-VA	Standard	600	10	1.5	1,500	TSD/VOT	33	HSDIP25
BM63373S-VC	Standard	600	10	1.5	1,500	TSD/VOT	33	HSDIP25VC
BM63573S-VA	Standard	600	10	1.5	1,500	VOT	33	HSDIP25
BM63573S-VC	Standard	600	10	1.5	1,500	VOT	33	HSDIP25VC
BM63374S-VA	Standard	600	15	1.5	1,500	TSD/VOT	41	HSDIP25
BM63374S-VC	Standard	600	15	1.5	1,500	TSD/VOT	41	HSDIP25VC
BM63574S-VA	Standard	600	15	1.5	1,500	VOT	41	HSDIP25
BM63574S-VC	Standard	600	15	1.5	1,500	VOT	41	HSDIP25VC
BM63375S-VA	Standard	600	20	1.45	1,500	TSD/VOT	44	HSDIP25
BM63375S-VC	Standard	600	20	1.45	1,500	TSD/VOT	44	HSDIP25VC
BM63575S-VA	Standard	600	20	1.45	1,500	VOT	44	HSDIP25
BM63575S-VC	Standard	600	20	1.45	1,500	VOT	44	HSDIP25VC
BM63377S-VA	Standard	600	30	1.4	1,500	TSD/VOT	50	HSDIP25
BM63377S-VC	Standard	600	30	1.4	1,500	TSD/VOT	50	HSDIP25VC
BM63577S-VA	Standard	600	30	1.4	1,500	VOT	59	HSDIP25
BM63577S-VC	Standard	600	30	1.4	1,500	VOT	59	HSDIP25VC
New BM63587H-VA	Automotive	600	30	1.55	1,500	VOT	83	HSDIP25HT
New BM63589H-VA	Automotive	600	50	1.6	1,500	VOT	357	HSDIP25HT



*1: AC60Hz, 1 min., supports 2500Vrms when using a convex heat sink *2: TSD= Thermal shutdown circuit, VOT= Analog temperature output circuit *3: Per element

High Voltage PTC Heater Reference Design [REF66011]



In electric vehicles that lack engine waste heat, PTC heaters are utilized as a heat source to bring temperatures to optimal levels, enhancing driving stability and cabin comfort. PTC heaters also function as discharge circuits to ensure the safety of high-voltage batteries. Developed in collaboration with automotive electronics provider Intron Technology, this reference design incorporates a 1,200V/40A IGBT (RGS80TSX2DHR) to control ON/OFF switching of the PTC element.

Application

High Voltage PTC Heater

Specifications

Board Number	REF66011_PCB
Grade	Automotive
Input Voltage (Low Voltage)	9V to 16V
Input Voltage (High Voltage)	250V to 470V
Output Power	7kW
Board size	120mm × 90mm

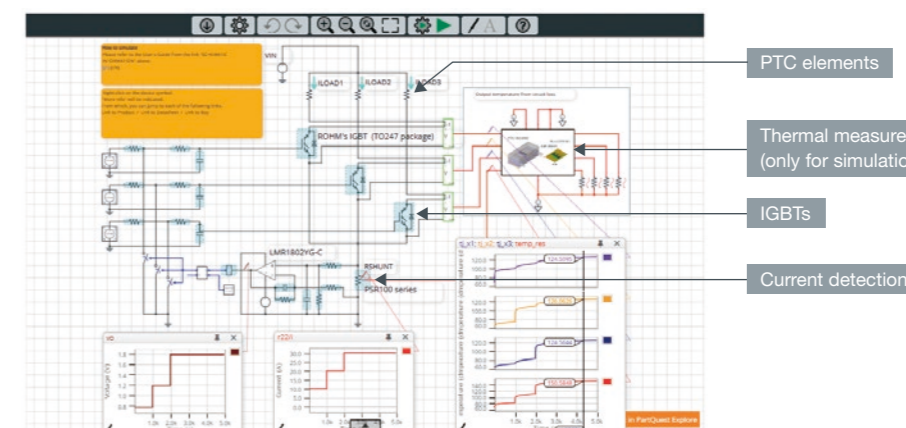
Designed by



Intron Technology Co. Ltd., Website

Related Simulation Circuit (ROHM Solution Simulator)

PTC Heater Thermal Circuit Simulation



Main Products

Board Number	Part Number	Product Category	Datasheet	SPICE	LTspice®	Thermal Model	ROHM Solution Simulator
REF66011_PCB	RGS80TSX2DHR	Field Stop Trench IGBT	Link	✓	✓	✓	✓

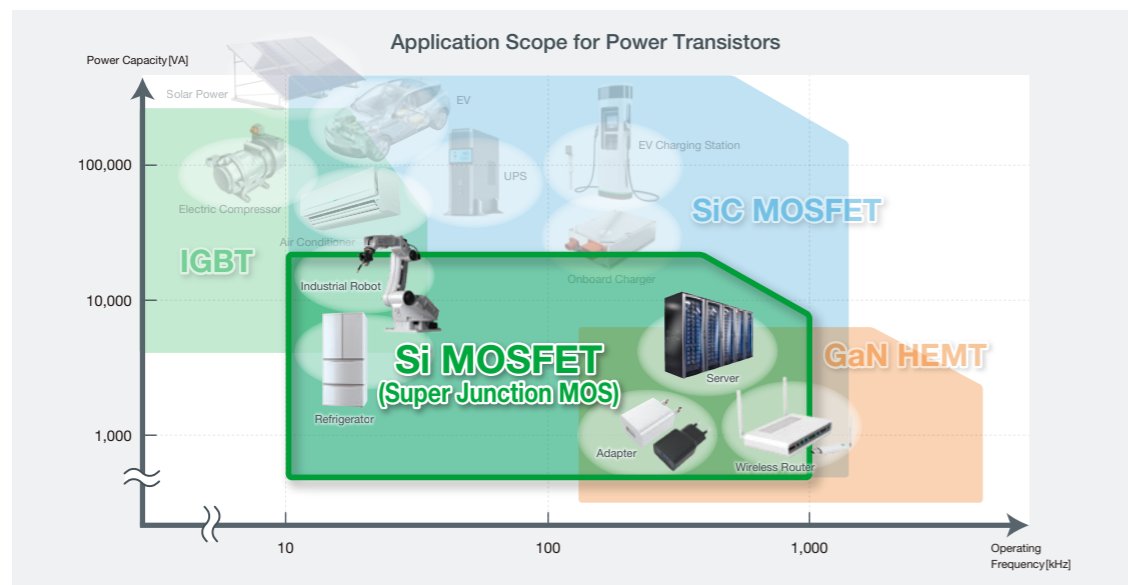
High Voltage PTC Heater Reference Design [REF66011]



Si Power MOSFET

Silicon power devices that have been used in the market for many years along with IGBTs.

ROHM not only offers power transistors using new materials such as SiC MOSFETs and GaN HEMTs, but also an extensive lineup of conventional Si power MOSFETs. Among these are high-voltage super junction MOSFETs under the EcoMOS™ brand that contribute to the development of social ecosystems by combining low noise with high-speed switching.



Super Junction MOSFET

Lineup focused on usability

ROHM super junction MOSFETs are focused not only on energy efficiency in applications, but also ease of use. ROHM offers a wide range of ON-resistances and packages by type to meet various specifications such as low noise.

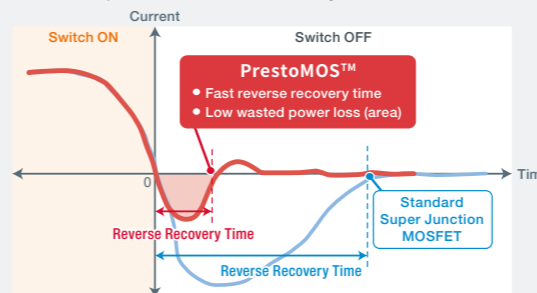
Features

- Superior A·Ron characteristics (reduced 40% vs conventional products)
- Series categorized by type, such as low noise, high-speed switching, and built-in high-speed diodes
- Expanded package lineup ranging from SOT-223 to TO-247

Super Junction MOSFET Technologies and Features

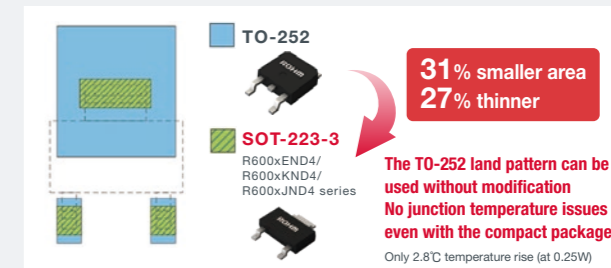
Device Technology: Improved reverse recovery characteristics (trr) of the built-in diode by original MOSFETs 'PrestoMOS™'

Relationship Between Reverse Recovery Time and Power Loss



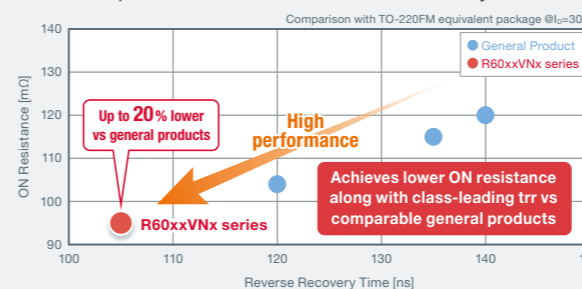
Miniaturization Technology: Consideration for replacement from TO-252 Compact SOT-223-3 package

Footprint Comparison: TO-252 vs SOT-223-3

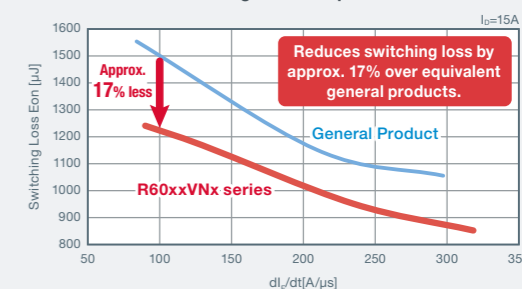


High-speed switching type R60xxVNx series with built-in high-speed diode (PrestoMOS™) pursues lower loss

Comparison of ON Resistance vs Reverse Recovery Time

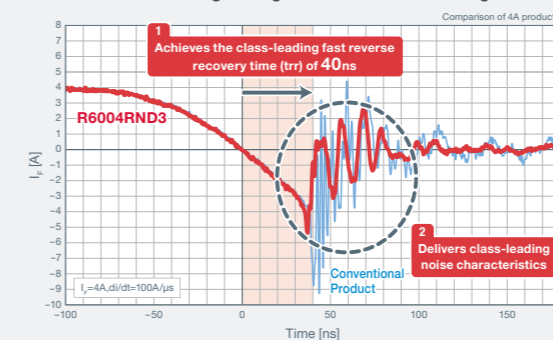


Switching Loss Comparison

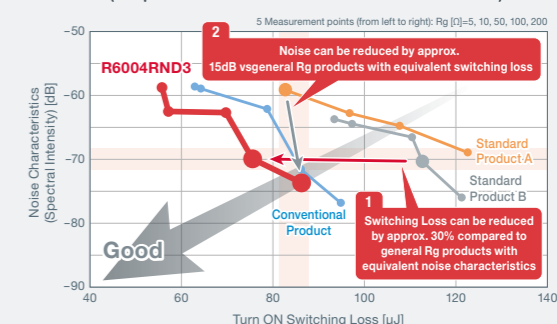


Low noise type R60xxRNx series with built-in high-speed diode (PrestoMOS™) pursues greater ease of use

Current Waveform Flowing Through the Built-in Diode During Switching



Application Benefit: Improved Trade-Off Between Noise and Loss (Comparison at 40MHz under ROHM measurement conditions)



600V Super Junction MOSFETs Lineup

Specifications	Package						
	Surface Mount Type			Through Hole Type			
	SOT-223-3	DPAK/TO-252	D2PAK/LPTS	TO-220AB	TO-220FM	TO-3PF	TO-247
Dimensions	6.5x7.0xMax 1.8[mm]	6.6x10.0xMax 2.4[mm]	10.1x13.1xMax 4.7[mm]	10.16x29.07x4.44[mm]	10.1x29.07x4.7[mm]	15.5x43.8x5.5[mm]	15.94x41.02x5.02[mm]
Low Noise	R600xEND4	R600xEND3	R600xENJ		R600xENX	R600xENZ	R600xENZ4
High-Speed Switching	R600xKND4	R600xKND3	R600xKNJ		R600xKNX	R600xKNZ	R600xKNZ4
Built High-Speed Diode (PrestoMOS™)	R600xJND4	R600xYND3				R600xYNZ	R600xYNZ4
		R600xJND3					
		R600xRND3 (Low Noise)	R600xRNJ		R600xRNX	R600xRNZ	R600xRNZ4
		R600xVND3 (High-Speed Switching)		R600xVN3 (High-Speed Switching)	R600xVNX (High-Speed Switching)	R600xVNZ (High-Speed Switching)	R600xVNZ4 (High-Speed Switching)

*ROHM Super Junction MOSFETs include not only 600V but also 650V and 800V variants. For more information, please visit ROHM's website.

Legend: :3rd Gen (orange), :4th Gen (green)

MOS-IPM

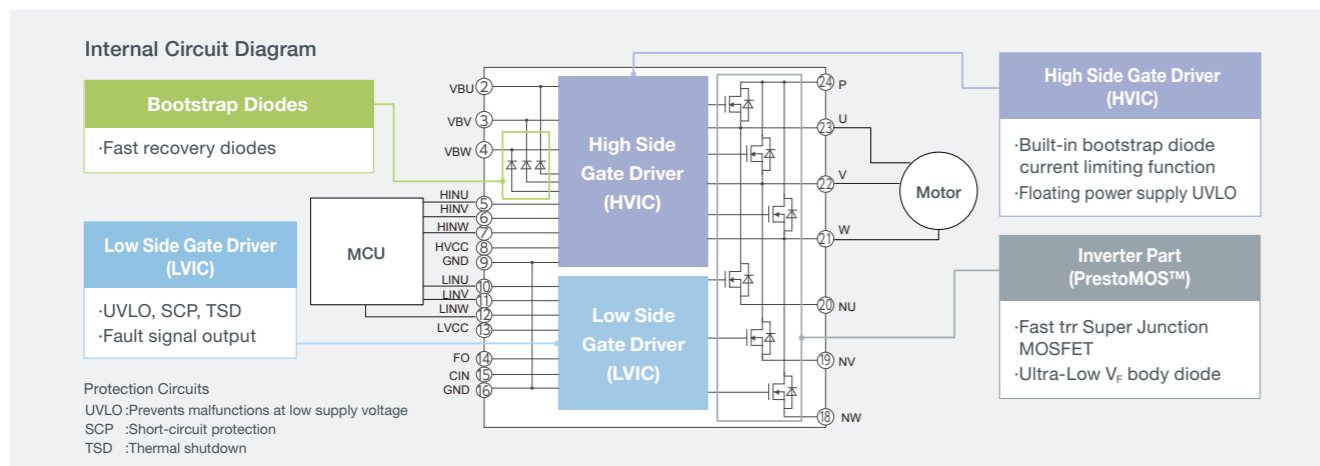
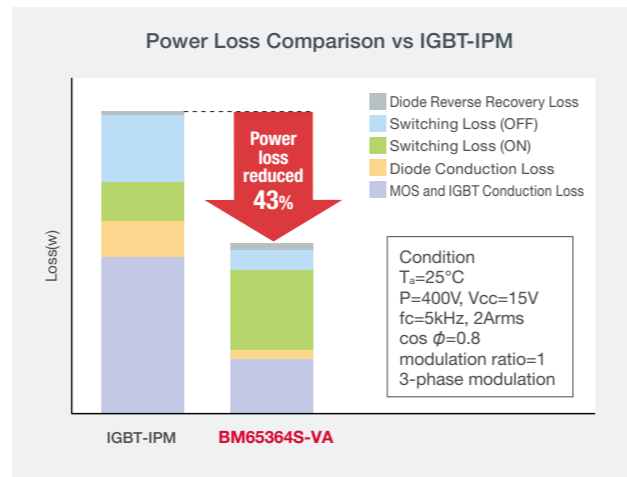
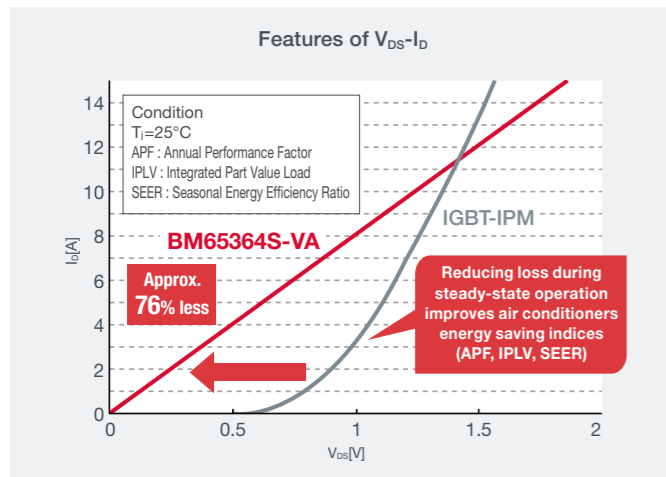
PrestoMOS™ + Gate Driver

Significantly reduces losses during steady-state operation in air conditioners vs IGBT-IPM.

Integrates main components (i.e. MOSFETs, gate drivers, peripheral circuits) required for motor drive in a single package. PrestoMOS™ is used at the output stage to reduce power consumption in the low current range.

Features

- Integrates PrestoMOS™, bootstrap diodes, and gate drivers in a single package
- Multiple protection circuits (short-circuit current, thermal shutdown) are built in, along with a FAULT signal output function when the protection circuits operate



MOS-IPM Lineup (PWM Input Frequency $f_c \leq 20\text{kHz}$)								
Part No.	Grade	V_{DS} [V]	I_b [A]	R_{on} [mΩ]	Isolation Voltage ^{*1} [Vrms]	Temperature Protection Function ^{*2}	Drain Loss ^{*3} [W]	Package
BM65364S-VA	Standard	600	15	120	1,500	TSD	62	HSDIP25
BM65364S-VC	Standard	600	15	120	1,500	TSD	62	HSDIP25VC
New BM65374S-VA	Standard	600	15	110	1,500	TSD	TBD	HSDIP25
New BM65374S-VC	Standard	600	15	110	1,500	TSD	TBD	HSDIP25VC
New BM65375S-VA	Standard	600	20	85	1,500	TSD	62	HSDIP25
New BM65375S-VC	Standard	600	20	85	1,500	TSD	62	HSDIP25VC

*1: Supports 2500Vrms when using convex heat sink at AC60Hz for 1min *2: TSD = Thermal shutdown Circuit *3: Per element.



HSDIP25
38.0x24.0x3.5[mm]



HSDIP25VC
38.0x24.0x3.5[mm]

WEB SITE

ROHM Website

ROHM's website provides product materials including datasheets, technical documents such as application notes, design tools, and other content useful for development and learning.

These can be used not only for product searches, but also for collecting information and solving problems.

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