Power Device Catalog Vol.5.3

ROHM SEMICONDUCTOR

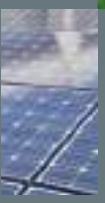
ROHM Co.,Ltd.

SiC.

A next-generation semiconductor that traveled 4.6 billion years to get here.

The latent power of SiC is brought to life through our passionate engineers.

Extremely rare in nature, naturally occurring SiC was first discovered in trace amounts in meteorites dating back over 4.6 billion years ago, much older than our solar system.
Eventually, it became possible to synthesize SiC with superior semiconductor properties. But the process proved to be extremely difficult, with several obstacles that hampered mass production and baffled even the top researchers in the world.
ROHM began pioneering the mass production of SiC power devices in the 1990s.
At the time, high-quality SiC wafers were quite scarce, and in the absence of a well-equipped research environment, ROHM went on daily excursions to research facilities through-out the country to conduct experiments.
But ROHM engineers continued to persevere, and even as the state of the global economy worsened they dedicated themselves to im-proving the production line and creating original testing methodology while increasing processing accuracy, culminating in the world's first successful mass production of SiC DMOS in 2010.
This moment was a perfect example of passion coming to fruition for the betterment of society.
ROHM will continue to meet new challenges. As a leader in SiC power devices, we are committed to reaching even higher standards of quality and expanding research over a broad range of fields.



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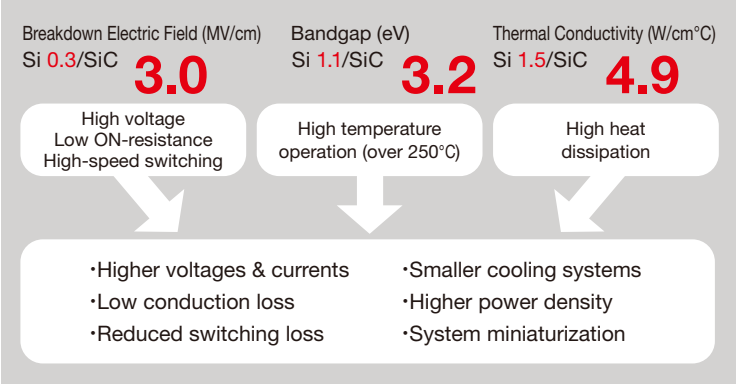
SiC - the next generation of compact, energy-saving Eco Devices

The demand for power is increasing on a global scale every year while fossil fuels continue to be depleted and global warming is growing at an alarming rate. This requires better solutions and more effective use of power and resources. ROHM provides Eco Devices designed for lower power consumption and high efficiency operation. These include highly integrated circuits utilizing sophisticated, low power ICs, passive components, opto electronics and modules that save energy and reduce CO_2 emissions. Included are next-generation SiC devices that promise even lower power consumption and higher efficiency.

Lower power loss and high temperature operation in a smaller form factor

In the power device field for power conversion and control, SiC (Silicon Carbide) is garnering increased attention as a next-generation semiconductor material due to its superior characteristics compared with silicon, including lower ON-resistance, faster switching speeds, and higher temperature operation.

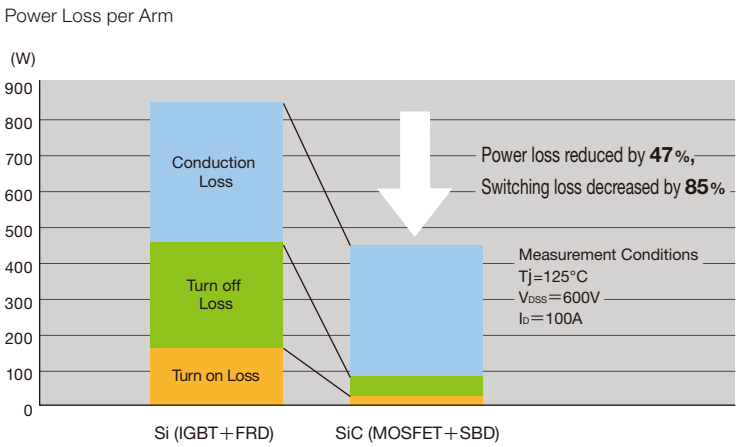
■ Performance Comparison : SiC vs. Si



SiC devices being implemented in a variety of fields, including the power supply, automotive, railway, industrial, and consumer sectors

SiC devices allow for smaller products with lower power consumption that make mounting possible even in tight spaces. Additional advantages include high voltage and high temperature operation, enabling stable operation under harsh conditions-impossible with silicon-based products. In hybrid vehicles and EVs SiC power solutions contribute to increased fuel economy and a larger cabin area, while in solar power generation applications they improve power loss by approximately 50%, contributing to reduced global warming.

■ Power Loss Comparison



SiC Wafer

Full SiC Power Modules

Discrete

Photovoltaics
Increase power conditioner efficiency

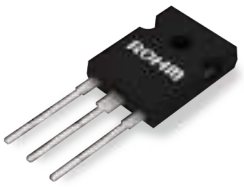
EV
(i.e. hybrid/electric vehicles)
Reduce cooling system size, decrease weight, and increase fuel economy

EV Charging Stations
Reduce charging time by increasing output

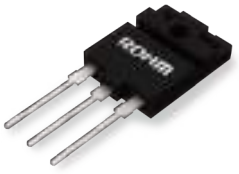
SiC Power Devices

The industry's 1st mass produced SiC makes the previously impossible "possible"

SiC MOSFETs



TO-247
(TO-247N)



TO-3PFM

TO-268-2L

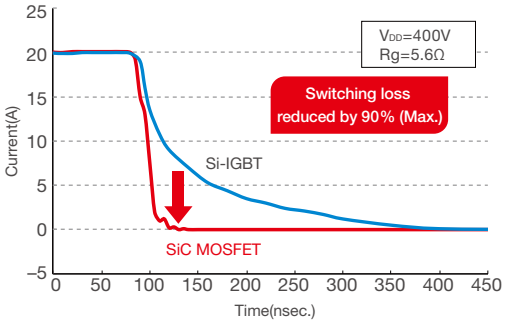
TO-220AB

Packages indicate JEDEC notation.
( ) refer to ROHM package type.

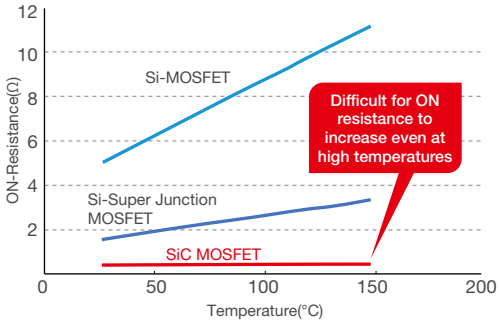
High speed switching with low ON-resistance

SiC MOSFET enables simultaneous high speed switching with low ON-resistance - normally impossible with silicone-based products. Additional features include superior electric characteristics at high temperatures and significantly lower switching loss, allowing smaller peripheral components to be used.

Turn OFF Characteristics (Compared with 1,200V-Class Products)



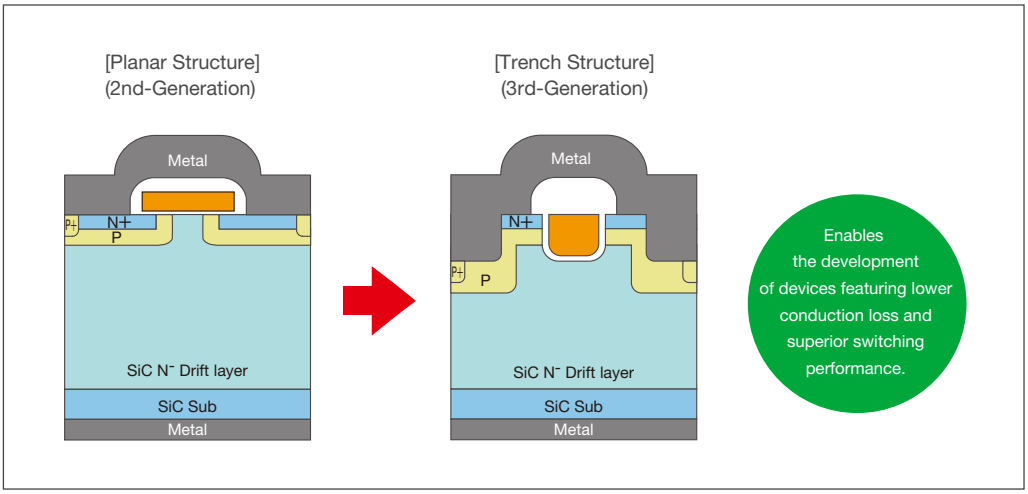
ON-Resistance Temperature Characteristics (Compared with 650V-Class Products)



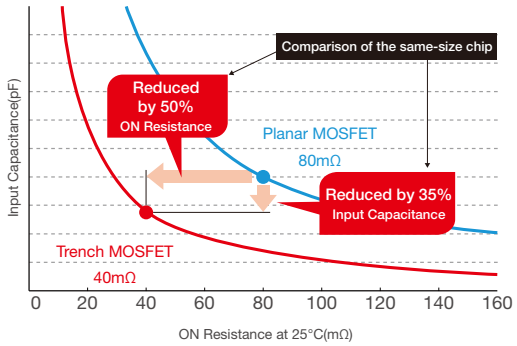
Evolution to the next generation, 3rd-Generation SiC MOSFET

ROHM is the first in the world* to develop and mass-produce trench-type SiC MOSFETs. Achieving lower ON resistance makes it possible to reduce power loss in a variety of devices.

*October 2018 ROHM study

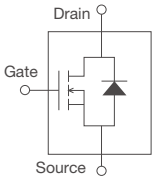


SiC MOSFET Performance Comparison : Planar vs. Trench

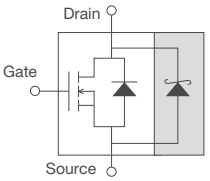


Internal Circuit Diagrams

SCT series



SCH series



SiC MOSFETs

Part No.	Automotive Grade AEC-Q101	Polarity (ch)	V_{DSS} (V)	I_D (A)	P_D(W) (T_C=25°C)	$R_{DS(on)}$ Typ.(mΩ)	Qg Typ.(nC)		Package
						V_{GS}=18V	V_{GS}=18V	Drive Voltage(V)	
2nd Generation(Planer type)									
SCT2120AF	–	N	650	29	165	120	61	18	TO-220AB
SCH2080KE	–	N	1,200	40	262	80	106	18	TO-247 (TO-247N)
SCT2080KE	–	N	1,200	40	262	80	106	18	
SCT2160KE	–	N	1,200	22	165	160	62	18	
SCT2280KE	–	N	1,200	14	108	280	35	18	
SCT2450KE	–	N	1,200	10	85	450	27	18	
SCT2750NY	–	N	1,700	5.9	57	750	17	18	TO-268-2L
SCT2H12NY	–	N	1,700	4	44	1,150	14	18	
SCT2H12NZ	–	N	1,700	3.7	35	1,150	14	18	TO-3PFM
3rd Generation(Trench type)									
SCT3017AL	–	N	650	118	427	17	172	18	TO-247 (TO-247N)
SCT3022AL	–	N	650	93	339	22	133	18	
SCT3030AL	–	N	650	70	262	30	104	18	
SCT3060AL	–	N	650	39	165	60	58	18	
SCT3080AL	–	N	650	30	134	80	48	18	
SCT3120AL	–	N	650	21	103	120	38	18	
SCT3022KL	–	N	1,200	95	427	22	178	18	
SCT3030KL	–	N	1,200	72	339	30	131	18	
SCT3040KL	–	N	1,200	55	262	40	107	18	
SCT3080KL	–	N	1,200	31	165	80	60	18	
New **SCT3105KL**	–	N	1,200	24	134	105	51	18	
SCT3160KL	–	N	1,200	17	103	160	42	18	

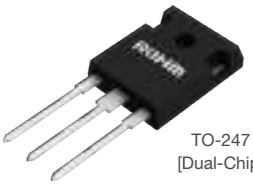
Packages indicate JEDEC notation. ( ) refer to ROHM package type.

SiC SBDs (Schottky Barrier Diodes)

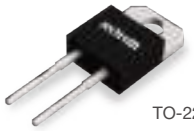
TO-220ACP

TO-220FM

TO-263AB
(LPTL)



TO-247
[Dual-Chip]



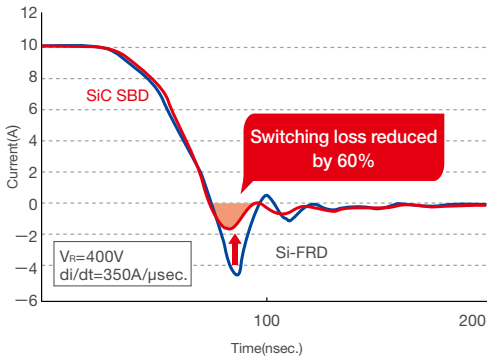
TO-220AC

Packages indicate JEDEC notation.
( ) refer to ROHM package type.

Significantly lower switching loss

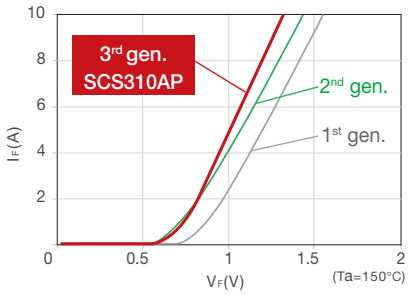
SBDs were developed utilizing SiC, making them ideal for PFC (Power Factor Correction) circuits and inverters. Ultra-small reverse recovery time (impossible to achieve with silicon FRDs (Fast Recovery Diodes)) enables high-speed switching. This minimizes reverse recovery charge (Qrr), reducing switching loss considerably and contributes to end-product miniaturization.

Switching Waveforms(600V/10A)

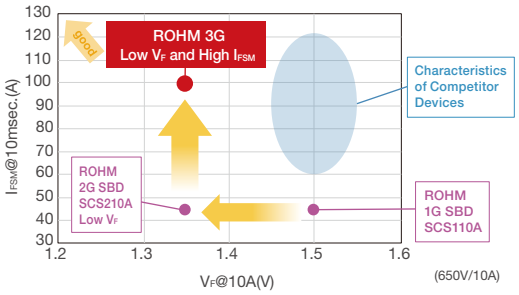


ROHM continues to improve its device processes and implement low V_F in line with generational changes

Achieves Lower V_F Along with Generational Evolution



Low V_F and High Surge Resistance



3rd-Generation SiC Schottky Barrier Diodes

Part No.	Automotive Grade AEC-Q101*	Absolute Maximum Ratings(Ta=25°C)				Electrical Characteristics(Ta=25°C)				Package	Equivalent Circuit Diagram
		V_{RM} (V)	V_R (V)	I_F (A)	I_{FSM}(A) 50Hz.1~	V_F(V) Typ.	I_F(A)	I_R(μA) Max.	V_R(V)		
New SCS302AJ	–	650	650	2	19	1.35	2	10	650	TO-263AB (LPTL)	
New SCS304AJ	–	650	650	4	27	1.35	4	20	650		
New SCS306AJ	–	650	650	6	47	1.35	6	30	650		
New SCS308AJ	–	650	650	8	67	1.35	8	40	650		
New SCS310AJ	–	650	650	10	82	1.35	10	50	650		
New SCS312AJ	–	650	650	12	96	1.35	12	60	650		
New SCS315AJ	–	650	650	15	112	1.35	15	75	650		
New SCS320AJ	–	650	650	20	123	1.35	20	100	650		
New SCS302AHG	–	650	650	2	19	1	2	10	650	TO-220ACP	
New SCS304AHG	–	650	650	4	27	1	4	20	650		
New SCS306AHG	–	650	650	6	47	1	6	30	650		
New SCS308AHG	–	650	650	8	67	1	8	40	650		
New SCS310AHG	–	650	650	10	82	1	10	50	650		
New SCS312AHG	–	650	650	12	96	1	12	60	650		
New SCS315AHG	–	650	650	15	112	1	15	75	650		
New SCS320AHG	–	650	650	20	123	1	20	100	650		
New SCS304AM	–	650	650	4	27	1	4	20	650	TO-220FM	
New SCS306AM	–	650	650	6	47	1	6	30	650		
New SCS308AM	–	650	650	8	67	1	8	40	650		
New SCS310AM	–	650	650	10	82	1	10	50	650		
New SCS312AM	–	650	650	12	96	1	12	60	650		
New SCS315AM	–	650	650	15	112	1	15	75	650		
New SCS320AM	–	650	650	20	123	1	20	100	650		

Packages indicate JEDEC notation. ( ) refer to ROHM package type. * Rev.C

2nd-Generation SiC Schottky Barrier Diodes

Part No.	Automotive Grade AEC-Q101*2	Absolute Maximum Ratings(Ta=25°C)				Electrical Characteristics(Ta=25°C)				Package	Equivalent Circuit Diagram
		V_{RM} (V)	V_R (V)	I_F (A)	I_{FSM}(A) 50Hz,1	V_F(V) Typ.	I_F(A)	I_R(μA) Max.	V_R(V)		
SCS206AJ	–	650	650	6	22	1.35	6	120	600	TO-263AB (LPTL)	
SCS208AJ	–	650	650	8	29	1.35	8	160	600		
SCS210AJ	–	650	650	10	38	1.35	10	200	600		
SCS212AJ	–	650	650	12	42	1.35	12	240	600		
SCS215AJ	–	650	650	15	52	1.35	15	300	600		
SCS220AJ	–	650	650	20	67	1.35	20	400	600		
SCS206AJHR	YES	650	650	6	22	1.35	6	120	600		
SCS208AJHR	YES	650	650	8	29	1.35	8	160	600		
SCS210AJHR	YES	650	650	10	38	1.35	10	200	600		
SCS212AJHR	YES	650	650	12	42	1.35	12	240	600		
SCS215AJHR	YES	650	650	15	52	1.35	15	300	600		
SCS220AJHR	YES	650	650	20	67	1.35	20	400	600		
SCS206AG	–	650	650	6	22	1.35	6	120	600	TO-220AC	
SCS208AG	–	650	650	8	29	1.35	8	160	600		
SCS210AG	–	650	650	10	38	1.35	10	200	600		
SCS212AG	–	650	650	12	42	1.35	12	240	600		
SCS215AG	–	650	650	15	52	1.35	15	300	600		
SCS220AG	–	650	650	20	67	1.35	20	400	600		
SCS206AGHR	YES	650	650	6	22	1.35	6	120	600		
SCS208AGHR	YES	650	650	8	29	1.35	8	160	600		
SCS210AGHR	YES	650	650	10	38	1.35	10	200	600		
SCS212AGHR	YES	650	650	12	42	1.35	12	240	600		
SCS215AGHR	YES	650	650	15	52	1.35	15	300	600		
SCS220AGHR	YES	650	650	20	67	1.35	20	400	600		
SCS206AM	–	650	650	6	22	1.35	6	120	600	TO-220FM	
SCS208AM	–	650	650	8	29	1.35	8	160	600		
SCS210AM	–	650	650	10	38	1.35	10	200	600		
SCS212AM	–	650	650	12	42	1.35	12	240	600		
SCS215AM	–	650	650	15	52	1.35	15	300	600		
SCS220AM	–	650	650	20	67	1.35	20	400	600		
SCS215AE	–	650	650	15	52	1.35	15	300	600	TO-247	
SCS220AE	–	650	650	20	67	1.35	20	400	600		
SCS220AE2	–	650	650	10/20*1	38/76*1	1.35	10	200	600		
SCS230AE2	–	650	650	15/30*1	52/104*1	1.35	15	300	600		
SCS240AE2	–	650	650	20/40*1	67/135*1	1.35	20	400	600		
SCS220AE2HR	YES	650	650	10/20*1	38/76*1	1.35	10	200	600		
SCS230AE2HR	YES	650	650	15/30*1	52/104*1	1.35	15	300	600		
SCS240AE2HR	YES	650	650	20/40*1	67/135*1	1.35	20	400	600		
SCS205KG	–	1,200	1,200	5	22	1.4	5	100	1,200	TO-220AC	
SCS210KG	–	1,200	1,200	10	42	1.4	10	200	1,200		
SCS215KG	–	1,200	1,200	15	62	1.4	15	300	1,200		
SCS220KG	–	1,200	1,200	20	78	1.4	20	400	1,200		
SCS205KGHR	YES	1,200	1,200	5	22	1.4	5	100	1,200		
SCS210KGHR	YES	1,200	1,200	10	42	1.4	10	200	1,200		
SCS215KGHR	YES	1,200	1,200	15	62	1.4	15	300	1,200		
SCS220KGHR	YES	1,200	1,200	20	78	1.4	20	400	1,200		
SCS210KE2	–	1,200	1,200	5/10*1	22/45*1	1.4	5	100	1,200	TO-247	
SCS220KE2	–	1,200	1,200	10/20*1	42/84*1	1.4	10	200	1,200		
SCS230KE2	–	1,200	1,200	15/30*1	62/124*1	1.4	15	300	1,200		
SCS240KE2	–	1,200	1,200	20/40*1	78/157*1	1.4	20	400	1,200		
SCS210KE2HR	YES	1,200	1,200	5/10*1	22/45*1	1.4	5	100	1,200		
SCS220KE2HR	YES	1,200	1,200	10/20*1	42/84*1	1.4	10	200	1,200		
SCS230KE2AHR	YES	1,200	1,200	15/30*1	62/124*1	1.4	15	300	1,200		
SCS240KE2AHR	YES	1,200	1,200	20/40*1	78/157*1	1.4	20	400	1,200		

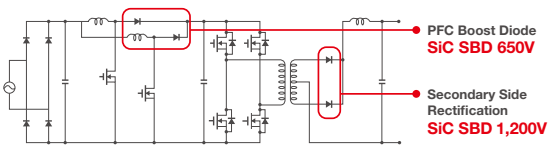
Packages indicate JEDEC notation. ( ) refer to ROHM package type.

*1 : (Per Leg/Device) *2 : Rev.C

ROHM offers automotive-grade(AEC-Q101 qualified) products

ROHM SiC SBD have been adopted in a variety of charging circuits in electric/hybrid vehicles.

Example : Automotive Charging Circuit



Full SiC Power Modules

Switching loss reduced by 85%(Max.)

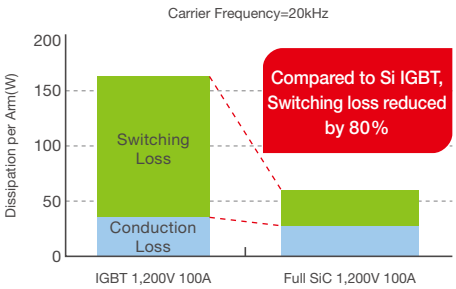
ROHM has developed low-surge-noise power modules integrating SiC devices produced in-house, maximizing high-speed performance. The result is significantly reduced switching loss compared with conventional Si IGBTs.

C type

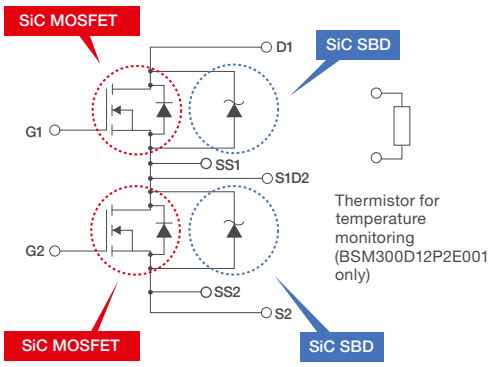
E type

G type

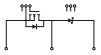
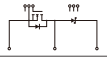
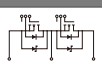
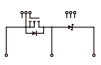
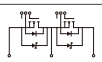
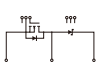
Switching Loss Comparison



Internal Circuit Diagram(Half Bridge Circuit)



Full SiC Power Modules

Part No.	Absolute Maximum Ratings(Tj=25°C)						Internal Circuit
	V_{DSS} (V)	I_D (A)	Tj (°C)	Tstg (°C)	Visol(V) AC 1min.	Package	
2nd-Generation							
BSM080D12P2C008	1,200	80	−40 to +175	−40 to +125	2,500	C type	
BSM120D12P2C005	1,200	120	−40 to +175	−40 to +125	2,500		
BSM120C12P2C201	1,200	120	−40 to +175	−40 to +125	2,500		
BSM180D12P2C101	1,200	180	−40 to +175	−40 to +125	2,500		
New BSM180C12P2E202	1,200	180	−40 to +175	−40 to +125	2,500	E type	
BSM180D12P2E002	1,200	180	−40 to +175	−40 to +125	2,500		
BSM300D12P2E001	1,200	300	−40 to +175	−40 to +125	2,500		
New BSM400D12P2G003	1,200	400	−40 to +175	−40 to +175	2,500	G type	
3rd-Generation							
BSM180D12P3C007	1,200	180	−40 to +175	−40 to +125	2,500	C type	
BSM180C12P3C202	1,200	180	−40 to +175	−40 to +125	2,500		
BSM300C12P3E201	1,200	300	−40 to +175	−40 to +125	2,500	E type	
New BSM400C12P3G202	1,200	400	−40 to +175	−40 to +125	2,500	G type	
BSM400D12P3G002	1,200	400	−40 to +175	−40 to +125	2,500		
New BSM600C12P3G201	1,200	600	−40 to +175	−40 to +125	2,500		
BSM600D12P3G001	1,200	600	−40 to +175	−40 to +125	2,500		

Peripheral SiC ICs

Supports SiC power semiconductors and contributes to increased adoption

Isolated Gate Driver

SSOP-B20W

SSOP-B10W

High-speed operation supports SiC

Features

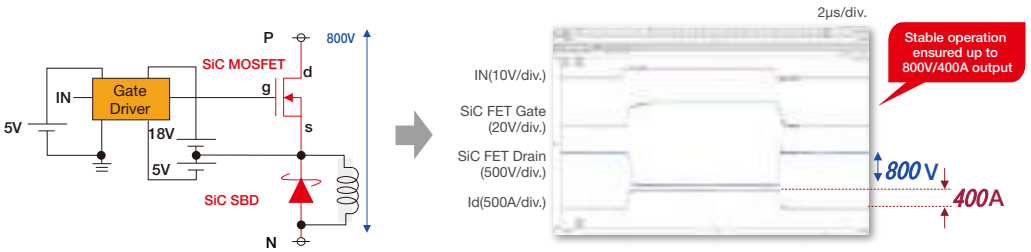
- High-speed operation with a Max. I/O delay time of 60ns
- Core-less transformer utilized for 2,500Vrms or 3,750Vrms isolation
- Original noise cancelling technology results in high CMR (Common Mode Rejection)
- Supports high V_{GS}/negative voltage power supplies* *BM6101FV-C, BM6104FV-C
- Compact package
  (SSOP-B20W : 6.5×8.1×2.01mm)
  (SSOP-B10W : 3.5×10.2×1.9mm)

Recommended Operating Range(BM6101FV-C)

Parameter	Symbol	Min.	Max.	Unit
Input Supply Voltage	$V_{CC}1$	+4.5	+5.5	V
Output Supply Voltage	$V_{CC}2$	+14	+24	V
Output V_{EE} Voltage	$V_{EE}2$	−12	±0	V
Operating Temperature Range	Ta	−40	+125	°C

IPM Operating Waveforms(BM6101FV-C)

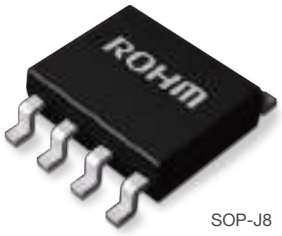
<Conditions> ROHM SiC IPM $V_{CC}1$=5.0V $V_{CC}2$=18V $V_{EE}2$=−5V V_{PN}=800V Ta=25°C



Isolated Gate Drivers(Automotive Grade)

Part No.	Input-side Supply Voltage(V)	Output-side Positive Supply Voltage(V)	Output-side Negative Supply Voltage(V)	Isolation Voltage (Vrms)	I/O Delay Time (ns)	Minimum Input Pulse Width(ns)	Maximum Output Current(A)	Operating Temperature (°C)	Function	Package
BM6101FV-C	4.5 to 5.5	14 to 24	−12 to 0	2,500	350	180	3	−40 to +125	Miller Clamp/Fail Output/ Built-in under voltage lock out circuit/Thermal protection/ Short current protection/DESAT/ Soft turn-off function for short current protection	SSOP-B20W
BM6102FV-C	4.5 to 5.5	14 to 20	–	2,500	200	100	3	−40 to +125		
BM6104FV-C	4.5 to 5.5	10 to 24	−12 to 0	2,500	150	90	3	−40 to +125	Miller Clamp/Fail Output/ Built-in under voltage lock out circuit/ Short current protection/DESAT/Soft turn-off function for short current protection	
BM61S40RFV-C	4.5 to 5.5	16 to 20	–	3,750	60	60	4	−40 to +125	Miller Clamp/ Overvoltage Protection Circuit/ Built-in under voltage lock out circuit	SSOP-B10W

AC/DC Converter



SOP-J8

World's first* AC/DC converter control ICs for SiC drive

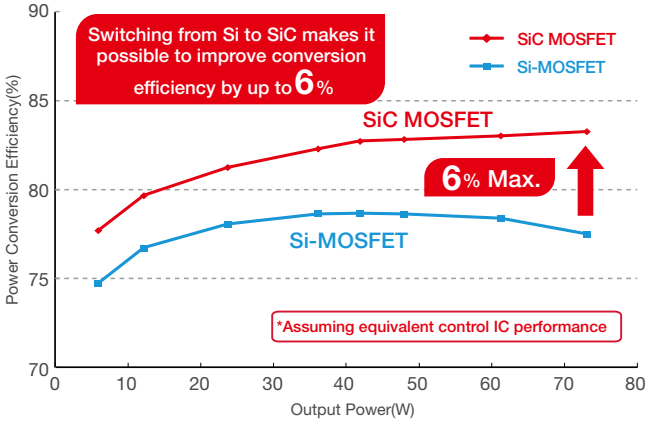
These ICs make it easy to configure an AC/DC converter with built-in SiC MOSFET that up to now has only been possible using discrete configurations. The increased proliferation of SiC power devices is expected to provide added value to the AC/DC converter market, which demands increased power savings and miniaturization.

*October 2018 ROHM study

Features

- Maximizes SiC MOSFET performance and contributes to dramatically reduced power consumption
- Enabling SiC MOSFET drive allows for greater miniaturization
- Multiple protection functions support high voltage operation up to 690V AC

AC/DC Converter Efficiency Comparison : Si vs SiC



AC/DC Converter ICs(For SiC MOSFET Driving)

Part No.	Supply Voltage (V)	Control Method	MOSFET	MOSFET Performance	Maximum Frequency (kHz)	FBOLP	Brown Out	V_{CC} OVP	Package
BD7682FJ-LB	15 to 27.5	QR	External	—	120	Self-restart	✓(adjustable)	Latch	SOP-J8
BD7683FJ-LB	15 to 27.5	QR	External	—	120	Latch	✓(adjustable)	Latch	SOP-J8
BD7684FJ-LB	15 to 27.5	QR	External	—	120	Self-restart	✓(adjustable)	Self-restart	SOP-J8
BD7685FJ-LB	15 to 27.5	QR	External	—	120	Latch	✓(adjustable)	Self-restart	SOP-J8

SiC Evaluation Boards

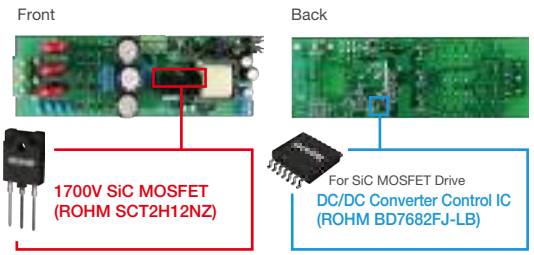
Evaluation boards for ROHM SiC products are offered

ROHM offers a variety of tools ideal for evaluating SiC power devices and SiC peripheral ICs, including boards that integrate components such as a gate driver with built-in power supply or AC/DC converter control IC for SiC MOSFET drive that make it possible to easily evaluate ROHM SiC power devices.

Features
- Loss simulator available (online) allows users to simulate the loss of full SiC modules. (Please use the QR code below to access the support page.)

Power Supply Board for Evaluation Offered

Easily verify the performance of ROHM's SCT2H12NZ SiC MOSFET.



BD7682FJ-LB-EVK-402

- AC/DC evaluation board for SiC MOSFET drive (flyback converter)
- Onboard 1,700V SiC MOSFET (SCT2H12NZ)
- Onboard DC/DC converter control IC (BD7682FJ-LB)
- 3-phase 400 to 690V AC input, 24V/1A output

2ch Gate Driver Reference Board with Built-in Flyback Power Supply

2ch board supports direct mounting of ROHM's BSM300D12P2E001 300A/1,200V full SiC power module. Integrated isolated DC/DC converter provides the necessary gate voltage.

BM60052FV-EVK-001

- Capable of directly driving ROHM's BSM300D12P2E001 300A/1,200V SiC power module
- Multiple protection functions (short-circuit detection, soft turn OFF, FLT output, UVLO, gate monitoring output, Miller clamp)

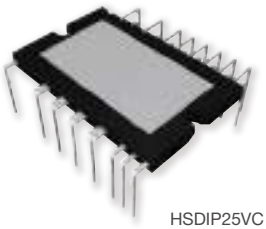
*For details and information on other evaluation boards, please refer to our SiC support page. Boards can be purchased through online distributors.
https://www.rohm.com/power-device-support

IPMs (Intelligent Power Modules)

ROHM offers intelligent products ideal for motor control

IGBT-IPMs

HSDIP25



HSDIP25VC

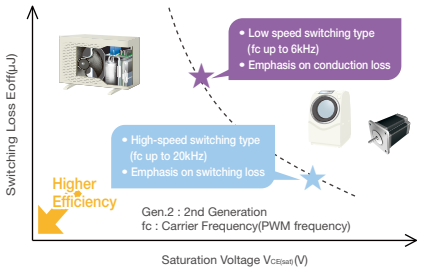
Motor control integrated into a single package

All components required for motor control, including the power device control IC and peripheral circuitry, are incorporated into a single package. ROHM utilizes an IGBT-optimized design customized for a range of applications.

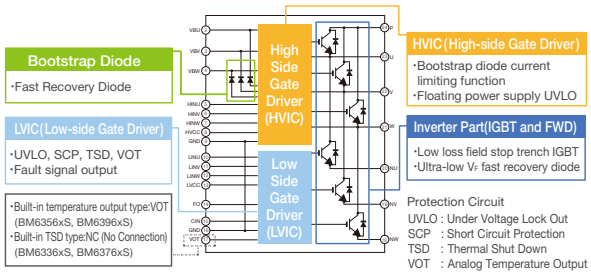
Features

- The lineup consists of two series (low-speed/highspeed switching) featuring an IGBT-optimized design that supports a variety or requirements
- An IGBT, FWD (Free Wheeling Diode), bootstrap diode, and gate driver are integrated into a single package
- Multiple protection circuits (short-circuit current protection, power supply UVLO and thermal shutdown circuits) along with a FAULT signal output function that activates during protection operation

Adopting an Application-specific IGBT Results in High-efficiency Drive Operation



Circuit Diagram



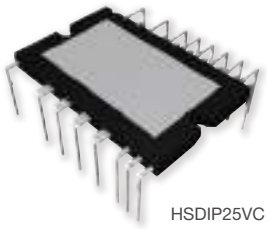
IGBT-IPMs(IGBT)

Part No.	Power Device	V_{CES} (V)	I_C (A)	$V_{CE(sat)}$ (V)	PWM Input Frequency(kHz)	Isolation Voltage*1 (Vrms)	Thermal Protection Function*2	Package
BM63363S-VA	IGBT	600	10	1.5	less than 6	1,500	TSD	HSDIP25
BM63363S-VC	IGBT	600	10	1.5	less than 6	1,500	TSD	HSDIP25VC
BM63563S-VA	IGBT	600	10	1.5	less than 6	1,500	VOT	HSDIP25
BM63563S-VC	IGBT	600	10	1.5	less than 6	1,500	VOT	HSDIP25VC
BM63763S-VA	IGBT	600	10	1.7	less than 20	1,500	TSD	HSDIP25
BM63763S-VC	IGBT	600	10	1.7	less than 20	1,500	TSD	HSDIP25VC
BM63963S-VA	IGBT	600	10	1.7	less than 20	1,500	VOT	HSDIP25
BM63963S-VC	IGBT	600	10	1.7	less than 20	1,500	VOT	HSDIP25VC
BM63364S-VA	IGBT	600	15	1.5	less than 6	1,500	TSD	HSDIP25
BM63364S-VC	IGBT	600	15	1.5	less than 6	1,500	TSD	HSDIP25VC
BM63564S-VA	IGBT	600	15	1.5	less than 6	1,500	VOT	HSDIP25
BM63564S-VC	IGBT	600	15	1.5	less than 6	1,500	VOT	HSDIP25VC
BM63764S-VA	IGBT	600	15	1.7	less than 20	1,500	TSD	HSDIP25
BM63764S-VC	IGBT	600	15	1.7	less than 20	1,500	TSD	HSDIP25VC
BM63964S-VA	IGBT	600	15	1.7	less than 20	1,500	VOT	HSDIP25
BM63964S-VC	IGBT	600	15	1.7	less than 20	1,500	VOT	HSDIP25VC
BM63767S-VA	IGBT	600	30	1.7	less than 20	1,500	TSD	HSDIP25
BM63767S-VC	IGBT	600	30	1.7	less than 20	1,500	TSD	HSDIP25VC
BM63967S-VA	IGBT	600	30	1.7	less than 20	1,500	VOT	HSDIP25
BM63967S-VC	IGBT	600	30	1.7	less than 20	1,500	VOT	HSDIP25VC

*1 AC 60Hz, 1min., corresponds to 2,500Vrms isolation in the case of a convex-shaped heat sink.
*2 TSD：Thermal Shut Down, VOT：Analog Temperature Output

MOS IPMs

HSDIP25



HSDIP25VC

Contributes to higher efficiency in motor drive devices

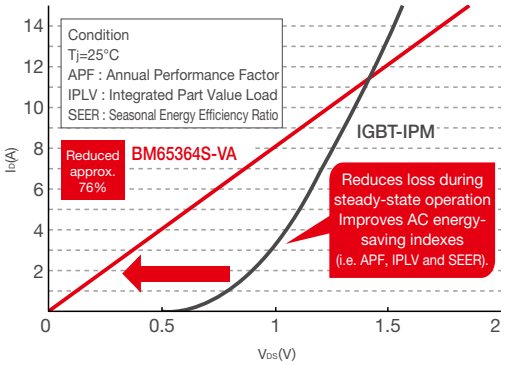
High-efficiency IPM products utilizing ROHM's PrestoMOS™. Compared to IGBT IPM, loss during normal AC operation is reduced significantly.

Features

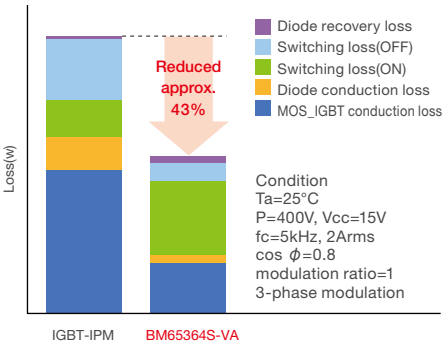
- 600V/15A IPM with Built-in PrestoMOS™
- Utilizes a MOSFET device to improve efficiency during steady state operation
- Integrates a bootstrap diode, Presto MOS™ and gate driver
- Multiple protection circuits (short-circuit current protection, power supply UVLO and thermal shutdown circuits) along with a FAULT signal output function that activates during protection operation

*"PrestoMOS™" is a pending trademark of ROHM Co., Ltd.

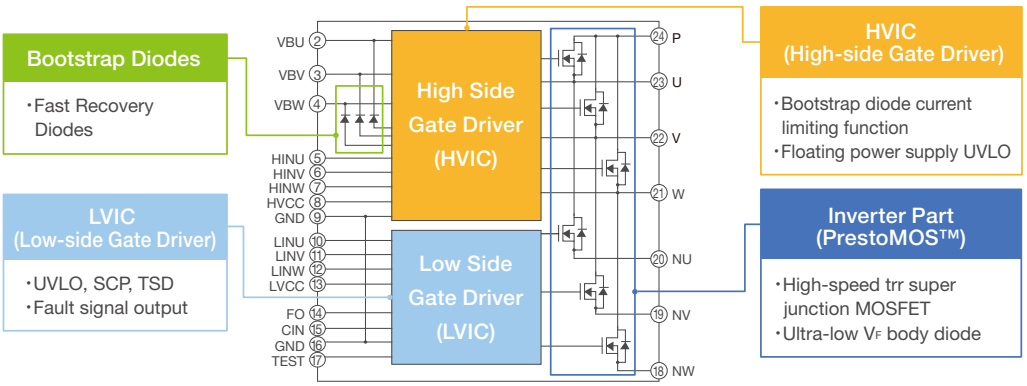
V_{DS}-I_D Features



Power Loss Comparison with IGBT-IPM



Circuit Diagram



Protection Circuits UVLO : Under Voltage Lock Out
SCP : Short Circuit Protection TSD : Thermal Shut Down

MOS IPMs

Part No.	Power Device	V_{DSS} (V)	I_D (A)	R_{on} (mΩ)	Recomended Switching Frequency(kHz)	Isolation Voltage*1 (Vrms)	Thermal Protection Function*2	Package
BM65364S-VA	MOSFET	600	15	120	less than 20	1,500	TSD	HSDIP25
BM65364S-VC	MOSFET	600	15	120	less than 20	1,500	TSD	HSDIP25VC

*1 AC 60Hz, 1min., corresponds to 2,500Vrms isolation in the case of a convex-shaped heat sink.
*2 TSD : Thermal Shut Down, VOT : Analog Temperature Output

IGBTs (Insulated Gate Bipolar Transistor)

Contributes to greater efficiency and energy savings in a variety of high voltage, large current applications

Ignition IGBTs

TO-252

TO-263S
(LPDS)

Packages indicate JEDEC notation.
( ) refer to ROHM package type.

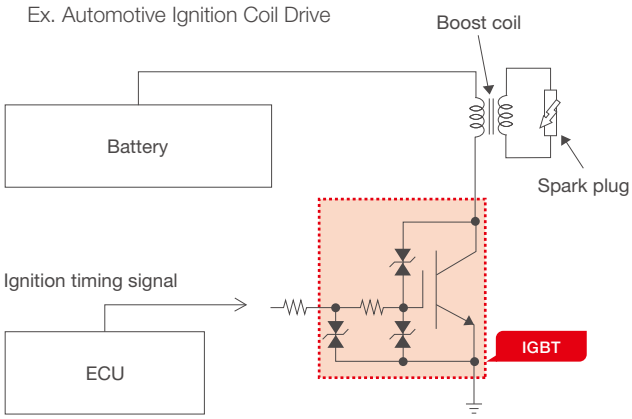
High reliability products optimized for automotive ignition applications featuring both low $V_{CE(sat)}$ and high avalanche tolerance.

Features

- Class-leading efficiency achieved through an optimized tradeoff between $V_{CE(sat)}$ and avalanche tolerance
- Built-in Gate protection diode
- Gate resistance/Gate-emitter resistance (optional)
- Automotive-grade (AEC-Q101 qualified)

*October 2018 ROHM study

Internal Circuit Diagram



Ignition IGBTs

	Part No.	Automotive Grade (AEC-Q101)	V_{CES} (V)	V_{GES} (V)	I_C (A)	P_D (W)	E_{as} (mJ)	$V_{CE(sat)}$ Typ. (V)	Package	Equivalent Circuit Diagram
	RGPZ10BM40FH	YES	430±30	±10	20	107	250	1.6	TO-252	
☆	**RGPZ30BM56HR**	YES	560±30	±10	30	166	300	1.4		
	RGPR10BM40FH	YES	430±30	±10	20	107	250	1.6		
☆	**RGPR20BM36HR**	YES	360±30	±10	20	107	250	1.6		
	RGPR20NS43HR	YES	430±30	±10	20	107	250	1.6	TO-263S (LPDS)	
☆	**RGPR30BM56HR**	YES	560±30	±10	30	166	300	1.4	TO-252	
	RGPR30BM40HR	YES	400±30	±10	30	125	300	1.6		
	RGPR30NS40HR	YES	400±30	±10	30	125	300	1.6	TO-263S (LPDS)	
☆	**RGPR50NS45HR**	YES	450±30	±10	50	187	500	1.6		

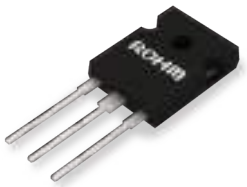
Packages indicate JEDEC notation. ( ) refer to ROHM package type. ☆ : Under Development

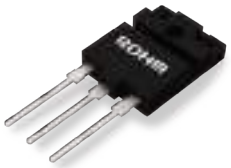
Field Stop Trench IGBTs

ROHM utilizes original trench gate and thin wafer technologies to achieve low $V_{CE(sat)}$ and reduced switching loss.

Features

- Low $V_{CE(sat)}$ & switching loss
- A broad lineup is offered that makes it possible to select the ideal solution based on set requirements
- Automotive-grade (AEC-Q101 qualified) RGS series


TO-247N


TO-3PFM


TO-263S (LPDS)


TO-262


TO-252


TO-263L (LPDL)


TO-220NFM

Packages indicate JEDEC notation.
( ) refer to ROHM package type.

Portfolio of ROHMs' Field Stop Trench IGBTs

Part No.	Automotive Grade Available (AEC-Q101)	$V_{CE(sat)}$	SW	SC SOA	Lineup	
3rd-Generation						
High speed switching RGW series	–	◎	◎	–	☆650V	30 to 50A@100°C
SCSOA 2μs guaranteed RGTV series	–	◎	◎	2μs	☆650V	30 to 80A@100°C
2nd-Generation						
Low $V_{CE(sat)}$ RGCL series	–	◎	–	–	600V	30 to 40A@100°C
High speed switching RGTH series	–	○	○	–	650V	20 to 50A@100°C
SCSOA 5μs guaranteed RGT series	–	○	–	◎ 5μs	650V	4 to 50A@100°C
SCSOA 8 to 10μs guaranteed RGS series	YES	○	–	◎ 8μs	650V	30 to 50A@100°C
		○	–	◎ 10μs	650V ☆1,200V	30 to 50A@100°C 25 to 40A@100°C

☆ : Under Development

Field Stop Trench IGBTs

Part No.	Automotive Grade (AEC-Q101)	V_{CES} (V)	I_C(A) T_C= 25°C	I_C(A) T_C= 100°C	P_D (W)	$V_{CE(sat)}$ Typ. (V)	$V_{CE(sat)}$ I_C (A)	tsc Min. (μsec)	$I_{F(Diode)}$(A) T_C= 25°C	$I_{F(Diode)}$(A) T_C= 100°C	$V_{F(Diode)}$ Typ. (V)	I_F (A)	Package
RGTH40TS65	–	650	40	20	144	1.6	20	–	–	–	–	–	TO-247N
RGTH50TS65	–	650	50	25	174	1.6	25	–	–	–	–	–	
RGTH60TS65	–	650	58	30	194	1.6	30	–	–	–	–	–	
RGTH80TS65	–	650	70	40	234	1.6	40	–	–	–	–	–	
RGTH00TS65	–	650	85	50	277	1.6	50	–	–	–	–	–	
RGTH40TS65D	–	650	40	20	144	1.6	20	–	35	20	1.45	20	
RGTH50TS65D	–	650	50	25	174	1.6	25	–	35	20	1.45	20	
RGTH60TS65D	–	650	58	30	194	1.6	30	–	40	20	1.35	20	
RGTH80TS65D	–	650	70	40	234	1.6	40	–	40	20	1.35	20	
RGTH00TS65D	–	650	85	50	277	1.6	50	–	50	30	1.45	30	
RGTH40TK65	–	650	23	14	56	1.6	20	–	–	–	–	–	TO-3PFM
RGTH50TK65	–	650	26	16	59	1.6	25	–	–	–	–	–	
RGTH60TK65	–	650	28	17	61	1.6	30	–	–	–	–	–	
RGTH80TK65	–	650	31	19	66	1.6	40	–	–	–	–	–	
RGTH00TK65	–	650	35	21	72	1.6	50	–	–	–	–	–	
RGTH40TK65D	–	650	23	14	56	1.6	20	–	26	15	1.45	20	
RGTH50TK65D	–	650	26	16	59	1.6	25	–	26	15	1.45	20	
RGTH60TK65D	–	650	28	17	61	1.6	30	–	28	16	1.35	20	
RGTH80TK65D	–	650	31	19	66	1.6	40	–	28	16	1.35	20	
RGTH00TK65D	–	650	35	21	72	1.6	50	–	34	19	1.45	30	
New RGW60TS65	–	650	60	30	178	1.5	30	–	–	–	–	–	TO-247N
New RGW80TS65	–	650	78	40	214	1.5	40	–	–	–	–	–	
New RGW00TS65	–	650	96	50	254	1.5	50	–	–	–	–	–	
New RGW80TS65D	–	650	78	40	214	1.5	40	–	40	20	1.45	20	
New RGW60TS65D	–	650	60	30	178	1.5	30	–	40	20	1.45	20	
New RGW00TS65D	–	650	96	50	254	1.5	50	–	56	30	1.45	30	
New RGW60TK65	–	650	33	20	72	1.5	30	–	–	–	–	–	TO-3PFM
New RGW80TK65	–	650	39	23	81	1.5	40	–	–	–	–	–	
New RGW80TK65E	–	650	39	23	81	1.5	40	–	46	26	1.45	50	
New RGW00TK65	–	650	45	26	89	1.5	50	–	–	–	–	–	
New RGW60TK65D	–	650	33	20	72	1.5	30	–	27	16	1.45	20	
New RGW80TK65D	–	650	39	23	81	1.5	40	–	27	16	1.45	20	
New RGW00TK65D	–	650	45	26	89	1.5	50	–	34	19	1.45	30	
RGCL60TS60	–	600	48	30	111	1.4	30	–	–	–	–	–	TO-247N
RGCL80TS60	–	600	65	40	148	1.4	40	–	–	–	–	–	
RGCL60TS60D	–	600	48	30	111	1.4	30	–	35	20	1.45	20	
RGCL80TS60D	–	600	65	40	148	1.4	40	–	35	20	1.45	20	
RGCL60TK60	–	600	30	18	54	1.4	30	–	–	–	–	–	TO-3PFM
RGCL80TK60	–	600	35	21	57	1.4	40	–	–	–	–	–	
RGCL60TK60D	–	600	30	18	54	1.4	30	–	26	15	1.45	20	
RGCL80TK60D	–	600	35	21	57	1.4	40	–	26	15	1.45	20	
New RGC80TSX8R	–	1,800	80	40	535	2.2	40	–	80	40	1.8	40	TO-247N
RGT8BM65D	–	650	8	4	62	1.65	4	5	7	4	1.45	4	TO-252
RGT16BM65D	–	650	16	8	94	1.65	8	5	16	8	1.4	8	
RGT8NS65D	–	650	8	4	65	1.65	4	5	7	4	1.45	4	TO-263S(LPDS)/ TO-262
RGT16NS65D	–	650	16	8	94	1.65	8	5	16	8	1.4	8	
RGT30NS65D	–	650	30	15	133	1.65	15	5	26	15	1.5	15	
RGT40NS65D	–	650	40	20	161	1.65	20	5	35	20	1.45	20	
RGT50NS65D	–	650	48	25	194	1.65	25	5	35	20	1.45	20	
RGT8NL65D	–	650	8	4	65	1.65	4	5	7	4	1.45	4	TO-263L(LPDL)
RGT16NL65D	–	650	16	8	94	1.65	8	5	16	8	1.4	8	
RGT30NL65D	–	650	30	15	133	1.65	15	5	26	15	1.5	15	
RGT40NL65D	–	650	40	20	161	1.65	20	5	35	20	1.45	20	
RGT50NL65D	–	650	48	25	194	1.65	25	5	35	20	1.45	20	
RGT16TM65D	–	650	9	5	22	1.65	8	5	13	7	1.4	8	TO-220NFM
RGT30TM65D	–	650	14	8	32	1.65	15	5	17	9	1.5	15	
RGT40TM65D	–	650	17	10	39	1.65	20	5	22	13	1.45	20	
RGT50TM65D	–	650	21	13	47	1.65	25	5	22	13	1.45	20	
RGTV60TS65	–	650	60	30	194	1.5	30	2	–	–	–	–	TO-247N
RGTV00TS65	–	650	95	50	276	1.5	50	2	–	–	–	–	
RGTVX6TS65	–	650	144	80	404	1.5	80	2	–	–	–	–	
RGTV60TS65D	–	650	60	30	194	1.5	30	2	56	30	1.45	30	
RGTV00TS65D	–	650	95	50	276	1.5	50	2	84	50	1.45	50	
RGT40TS65D	–	650	40	20	144	1.65	20	5	35	20	1.45	20	
RGT50TS65D	–	650	48	25	174	1.65	25	5	35	20	1.45	20	
RGT60TS65D	–	650	55	30	194	1.65	30	5	40	20	1.35	20	
RGT80TS65D	–	650	70	40	234	1.65	40	5	40	20	1.35	20	
RGT00TS65D	–	650	85	50	277	1.65	50	5	50	30	1.45	30	
New RGTV60TK65	–	650	33	20	76	1.5	30	2	–	–	–	–	TO-3PFM
New RGTV00TK65	–	650	45	26	94	1.5	50	2	–	–	–	–	
New RGTV60TK65D	–	650	33	20	76	1.5	30	2	34	19	1.45	30	
New RGTV00TK65D	–	650	45	26	94	1.5	50	2	46	26	1.45	50	
RGS60TS65DHR	YES	650	56	30	223	1.65	30	8	56	30	1.45	30	TO-247N
RGS80TS65DHR	YES	650	73	40	272	1.65	40	8	56	30	1.45	30	
RGS00TS65DHR	YES	650	88	50	326	1.65	50	8	56	30	1.45	30	
RGS00TS65EHR	YES	650	88	50	326	1.65	50	8	84	50	1.45	50	

Packages indicate JEDEC notation. ( ) refer to ROHM package type.

High Withstand Voltage Discretes

Supports high withstand voltage, high surge circuits

Fast Recovery Diodes

TO-220ACFP

TO-220AC

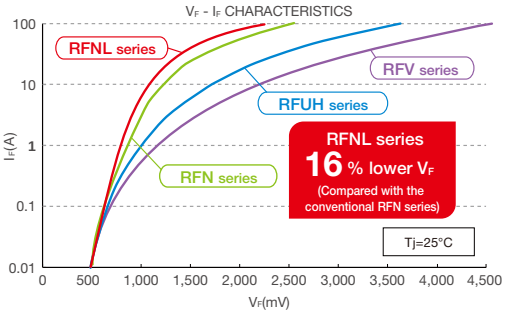
TO-252 (DPAK)

Packages indicate JEDEC notation.
〔 〕refer to GENERAL code.

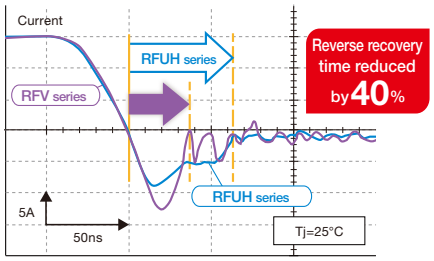
Provides optimized characteristics for each application

Features
- Ideal for PFC (Power Factor Correction)
- Improved characteristics
- Broad lineup
- Ultra-low V_F units/High-speed trr models

High efficiency/low V_F Lower V_F contributes to greater energy savings



High-speed trr characteristics New processes utilized to achieve ultra-high-speed trr



Fast Recovery Diodes
Example) RFNL5BM6S FH TL
Part No. / Grade Code / Taping Code

RFNL series : Super Low V_F type

Part No.	Grade Code		Taping Code	Automotive Grade (AEC-Q101)	Absolute Maximum Ratings(Tc=25°C)				Electrical Characteristics(Tj=25°C)*1							Package	Equivalent Circuit Diagram
	General	Automotive*			V_{RM} (V)	V_R (V)	I_O (A)	I_{FSM}(A) 60Hz. 1	V_F(V) Max.	I_F(A)	I_R(μA) Max.	V_R(V)	trr(ns) Max.	I_F(A)	I_R(A)		
RFNL5BM6S	—	FH	TL	YES	600	600	5	50	1.3	5	10	600	60	0.5	1	TO-252 [DPAK]	
RFNL5BGE6S	*	—	TL	—	600	600	5	50	1.3	5	10	600	60	0.5	1		
RFNL5TJ6S	G	FHG	C9	YES	600	600	5	50	1.3	5	10	600	60	0.5	1	TO-220ACFP	
RFNL10TJ6S	G	FHG	C9	YES	600	600	10	120	1.25 1.3	8 10	10	600	65	0.5	1		
RFNL15TJ6S	G	FHG	C9	YES	600	600	15	160	1.3	15	10	600	65	0.5	1		
RFNL20TJ6S	G	FHG	C9	YES	600	600	20	200	1.3	20	10	600	70	0.5	1		

RFV series : Super High-Speed trr Hard Recovery type

Part No.	Grade Code		Taping Code	Automotive Grade (AEC-Q101)	Absolute Maximum Ratings(Tc=25°C)				Electrical Characteristics(Tj=25°C)*1							Package	Equivalent Circuit Diagram
	General	Automotive*			V_{RM} (V)	V_R (V)	I_O (A)	I_{FSM}(A) 60Hz. 1	V_F(V) Max.	I_F(A)	I_R(μA) Max.	V_R(V)	trr(ns) Max.	I_F(A)	I_R(A)		
RFV5BM6S	*	FH	TL	YES	600	600	5	60	2.8	5	10	600	20	0.5	1	TO-252 [DPAK]	
RFV8BM6S	*	FH	TL	YES	600	600	8	100	2.8	8	10	600	25	0.5	1		
RFVS8TJ6S	G	—	C9	—	600	600	8	60	3.0	8	10	600	20	0.5	1	TO-220ACFP	
RFV8TJ6S	G	—	C9	—	600	600	8	100	2.8	8	10	600	25	0.5	1		
RFV12TJ6S	G	—	C9	—	600	600	12	120	2.8	12	10	600	25	0.5	1		
RFV15TJ6S	G	—	C9	—	600	600	15	150	2.8	15	10	600	30	0.5	1		
RFVS8TG6S	G	—	C9	—	600	600	8	60	3.0	8	10	600	20	0.5	1	TO-220AC	
RFV8TG6S	G	—	C9	—	600	600	8	100	2.8	8	10	600	25	0.5	1		
RFV12TG6S	G	—	C9	—	600	600	12	120	2.8	12	10	600	25	0.5	1		
RFV15TG6S	G	—	C9	—	600	600	15	150	2.8	15	10	600	30	0.5	1		
RFV30TG6S	G	—	C9	—	600	600	30	200	2.8	30	10	600	40	0.5	1		

Packages indicate JEDEC notation. 〔 〕refer to GENERAL code. *General part no. have no grade code. *1: Value/Chip

4th Generation Fast Recovery Diodes

Supports high surge circuitry and increases withstand voltage while significantly reduces switching noise

Features
- Higher guaranteed withstand voltage 600V ⇒ 650V
- Significantly reduced recovery noise
- Achieves tighter guaranteed V_F and I_R values
- AEC-Q101 compliance (planned)

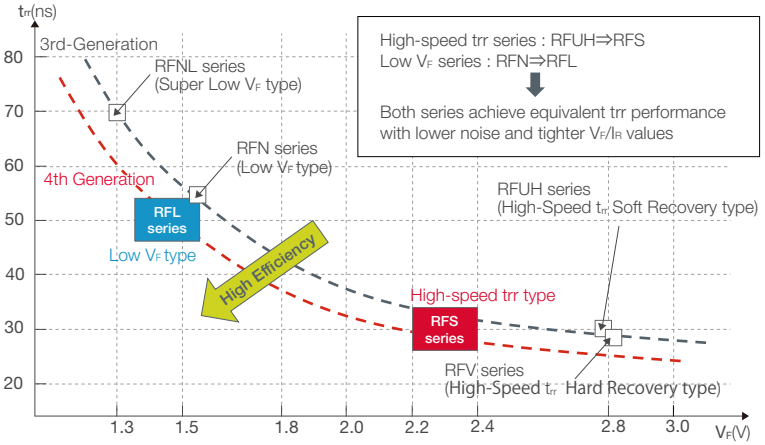
Application
- PFC Circuit
  - •Large household appliances such as AC
  - •Onboard Chargers
  - •Industrial equipment such as charging stands
- Rectifier Circuit
  - •LLC converter/full bridge

TO-220ACFP

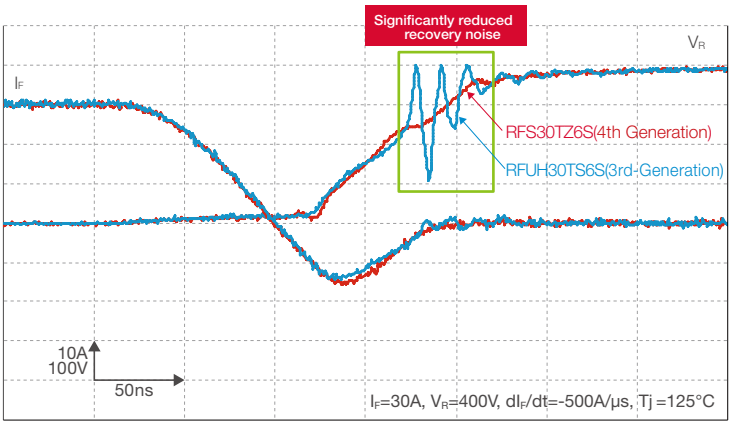
TO-247-2L

TO-247-3L

Evolution to the 4th Generation



Significantly Reduced Recovery Noise



Fast Recovery Diodes

Example) RFS20TJ6SFHGC9

Part No. | Grade Code | Taping Code

4th Generation RFS series High-Speed trr type

	Part No.	Grade Code		Taping Code	Automotive Grade (AEC-Q101)	Absolute Maximum Ratings(Tc=25°C)				Electrical Characteristics(Tj=25°C)*1							Package	Equivalent Circuit Diagram
		General	Automotive*			VRM (V)	VR (V)	IO (A)	IFSM(A) 60Hz. 1	VF(V) Max.	IF(A)	IR(μA) Max.	VR(V)	trr(ns) Max.	IF(A)	IR(A)		
☆	RFS20TJ6S	G	FHG	C9	YES	650	650	20	120	2.3	20	3	650	35	0.5	1	TO-220ACFP	
☆	RFS30TSG6D	*	—	—	—	650	650	30	80	2.3	15	3	650	35	0.5	1	TO-247-3L	
☆	RFS30TZG6S	*	—	—	—	650	650	30	160	2.3	30	5	650	45	0.5	1	TO-247-2L	
☆	RFS30TZ6S	G	FHG	C11	YES	650	650	30	160	2.3	30	5	650	45	0.5	1	TO-247N-2L	
☆	RFS60TZG6S	*	—	—	—	650	650	60	180	2.3	60	10	650	65	0.5	1	TO-247-2L	
☆	RFS60TZ6S	G	FHG	C11	YES	650	650	60	180	2.3	60	10	650	65	0.5	1	TO-247N-2L	

4th Generation RFL series Low V_F type

	Part No.	Grade Code		Taping Code	Automotive Grade (AEC-Q101)	Absolute Maximum Ratings(Tc=25°C)				Electrical Characteristics (Tj=25°C)*1							Package	Equivalent Circuit Diagram
		General	Automotive*			VRM (V)	VR (V)	IO (A)	IFSM(A) 60Hz. 1	VF(V) Max.	IF(A)	IR(μA) Max.	VR(V)	trr(ns) Max.	IF(A)	IR(A)		
☆	RFL30TZG6S	*	—	—	—	650	650	30	180	1.5	30	5	650	60	0.5	1	TO-247-2L	
☆	RFL30TZ6S	G	FHG	C11	YES	650	650	30	180	1.5	30	5	650	60	0.5	1	TO-247N-2L	
☆	RFL60TZG6S	*	—	—	—	650	650	60	200	1.5	60	10	650	80	0.5	1	TO-247-2L	
☆	RFL60TZ6S	G	FHG	C11	YES	650	650	60	200	1.5	60	10	650	80	0.5	1	TO-247N-2L	

Please note that 4th generation fast recovery diodes are currently under development, and specifications are subject to change without notice. ＊General part no. have no grade code. *1: Value/Chip ☆ : Under Development

Super Junction MOSFETs

TO-252
(DPAK)

TO-263S
(LPTS)
[SC-83]
(D2PAK)

TO-220FM

TO-3PF

TO-247

TO-220AB

Packages indicate JEDEC notation.
( ) refer to ROHM package type.
[ ] refer to JEITA code.
〔 〕refer to GENERAL code.

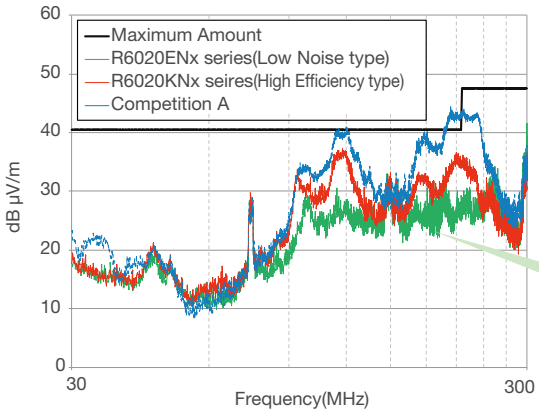
Achieves low noise and low ON resistance

Features

- Superior A•Ron characteristics (40% lower than conventional products)
- Select from among 3 different series based on application needs (low noise, fast switching, fast reverse recovery time)
- Broad package lineup, from TO-247 to TO-252
- Exceedingly low noise makes them ideal for power supply circuits requiring noise countermeasures; suitable replacements for planar types

Noise Evaluation

Horizontally polarized radiant noise (dB μV/m), 146W input

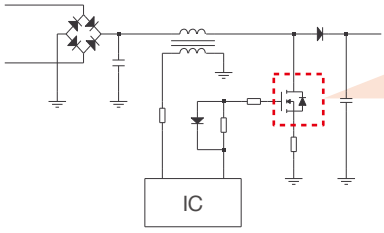


The R6xxxENx series, featuring exceedingly low noise, is recommended for power supply circuits requiring noise countermeasures

Efficiency Evaluation

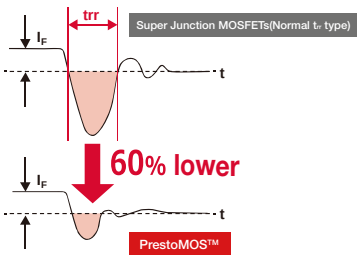
The fast-switching R6xxxKNx series are recommended for power supply circuits demanding lower loss and greater efficiency

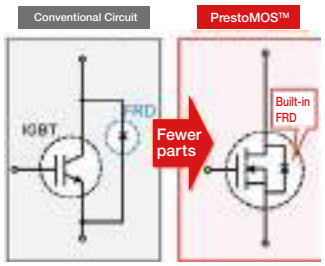
Evaluation Circuit : PFC Circuit
Critical Mode
Input 100V/60Hz
Output 120W



Fast Reverse Recovery Time

Improved body diode characteristics increase energy savings





Low Noise type

	Product No.		Polarity (ch)	V_{DSS} (V)	I_D (A)	P_D(W) (T_C= 25°C)	$R_{DS(on)}$(Ω) V_{GS}=15V		Qg Typ. (nC) V_{GS}= 15V	Drive Voltage (V)	Package
	Part No.	Taping Code					Typ.	Max.			
	R6011END3	TL1	N	600	11	124	0.340	0.390	32	10	TO-252 [DPAK]
	R6009END3	TL1		600	9	94	0.500	0.535	23	10	
	R6007END3	TL1		600	7	78	0.570	0.620	20	10	
	R6004END3	TL1		600	4	59	0.900	0.980	15	10	
New	**R6002END3**	TL1		600	1.7	26	2.800	3.400	6.5	10	
☆	**R6511END3**	TL1		650	11	124	0.360	0.400	32	10	
☆	**R6509END3**	TL1		650	9	94	0.530	0.585	24	10	
☆	**R6507END3**	TL1		650	7	78	0.605	0.665	20	10	
☆	**R6504END3**	TL1		650	4	59	0.955	1.050	15	10	
☆	**R6502END3**	TL1		650	1.7	24	3.000	3.300	6.5	10	
	R6024ENJ	TL	N	600	24	245	0.150	0.165	70	10	TO-263S (LPTS) [SC-83] 〔D2PAK〕
	R6020ENJ	TL		600	20	231	0.170	0.196	60	10	
	R6015ENJ	TL		600	15	184	0.260	0.290	40	10	
	R6011ENJ	TL		600	11	124	0.340	0.390	32	10	
	R6009ENJ	TL		600	9	94	0.500	0.535	23	10	
	R6007ENJ	TL		600	7	78	0.570	0.620	20	10	
	R6004ENJ	TL		600	4	58	0.900	0.980	15	10	
	R6524ENJ	TL		650	24	245	0.160	0.185	70	10	
	R6520ENJ	TL		650	20	231	0.185	0.205	61	10	
	R6515ENJ	TL		650	15	184	0.280	0.315	40	10	
	R6511ENJ	TL		650	11	124	0.360	0.400	32	10	
	R6509ENJ	TL		650	9	94	0.530	0.585	24	10	
	R6507ENJ	TL		650	7	78	0.605	0.665	20	10	
	R6504ENJ	TL		650	4	58	0.955	1.050	15	10	
	R6030ENX	—*	N	600	30	86	0.115	0.130	85	10	TO-220FM
	R6024ENX	—*		600	24	74	0.150	0.165	70	10	
	R6020ENX	—*		600	20	68	0.170	0.196	60	10	
	R6015ENX	—*		600	15	60	0.260	0.290	40	10	
	R6011ENX	—*		600	11	53	0.340	0.390	32	10	
	R6009ENX	—*		600	9	48	0.500	0.535	23	10	
	R6007ENX	—*		600	7	46	0.570	0.620	20	10	
	R6004ENX	—*		600	4	35	0.900	0.980	15	10	
	R6530ENX	—*		650	30	86	0.125	0.140	90	10	
	R6524ENX	—*		650	24	74	0.160	0.185	70	10	
	R6520ENX	—*		650	20	68	0.185	0.205	61	10	
	R6515ENX	—*		650	15	60	0.280	0.315	40	10	
	R6511ENX	—*		650	11	53	0.360	0.400	32	10	
	R6509ENX	—*		650	9	48	0.530	0.585	24	10	
	R6507ENX	—*		650	7	46	0.605	0.665	20	10	
	R6504ENX	—*		650	4	35	0.955	1.050	15	10	
	R6035ENZ	C8	N	600	35	102	0.095	0.102	110	10	TO-3PF
	R6030ENZ	C8		600	30	86	0.115	0.130	85	10	
	R6024ENZ	C8		600	24	74	0.150	0.165	70	10	
	R6020ENZ	C8		600	20	68	0.170	0.196	60	10	
	R6015ENZ	C8		600	15	60	0.260	0.290	40	10	
	R6535ENZ	C8		650	35	102	0.098	0.115	113	10	
	R6530ENZ	C8		650	30	86	0.125	0.140	90	10	
	R6524ENZ	C8		650	24	74	0.160	0.185	70	10	
	R6520ENZ	C8		650	20	68	0.185	0.205	61	10	
	R6515ENZ	C8		650	15	60	0.280	0.315	40	10	
New	**R6076ENZ4**	C13	N	600	76	735	0.038	0.042	260	10	TO-247
New	**R6047ENZ4**	C13		600	47	481	0.066	0.072	145	10	
☆	**R6035ENZ4**	C13		600	35	379	0.095	0.102	110	10	
☆	**R6030ENZ4**	C13		600	30	305	0.115	0.130	85	10	
☆	**R6024ENZ4**	C13		600	24	245	0.150	0.165	70	10	
☆	**R6020ENZ4**	C13		600	20	231	0.170	0.196	60	10	
New	**R6576ENZ4**	C13		650	76	735	0.040	0.046	260	10	
☆	**R6547ENZ4**	C13		650	47	481	0.070	0.080	145	10	
☆	**R6535ENZ4**	C13		650	35	379	0.098	0.115	110	10	
☆	**R6530ENZ4**	C13		650	30	305	0.125	0.140	85	10	
☆	**R6524ENZ4**	C13		650	24	245	0.160	0.185	70	10	
☆	**R6520ENZ4**	C13		650	20	231	0.185	0.205	60	10	

Packages indicate JEDEC notation. ( ) refer to ROHM package type. [ ] refer to JEITA code. 〔 〕refer to GENERAL code.
* Packing code : C7 G(The tube package) is possible, too ☆ : Under Development

Super Junction MOSFETs

TO-252
(DPAK)

TO-263S
(LPTS)
[SC-83]
(D2PAK)

TO-220FM

TO-3PF

TO-247

TO-220AB

Packages indicate JEDEC notation.
( ) refer to ROHM package type.
[ ] refer to JEITA code.
〔 〕refer to GENERAL code.

High-speed Switching type

Product No.		Polarity (ch)	V_{DSS} (V)	I_D (A)	P_D(W) (T_C= 25°C)	$R_{DS(on)}$(Ω) V_{GS}=10V		Qg Typ. (nC) V_{GS}= 10V	Drive Voltage (V)	Package
Part No.	Taping Code					Typ.	Max.			
R6011KND3	TL1	N	600	11	124	0.340	0.390	22	10	TO-252 〔DPAK〕
R6009KND3	TL1		600	9	94	0.500	0.535	16.5	10	
R6007KND3	TL1		600	7	78	0.570	0.620	15	10	
R6006KND3	TL1		600	6	70	0.720	0.830	12	10	
R6003KND3	TL1		600	3	44	1.300	1.500	8	10	
☆ **R6511KND3**	TL1		650	11	124	0.360	0.400	22	10	
☆ **R6509KND3**	TL1		650	9	94	0.530	0.585	16.5	10	
☆ **R6507KND3**	TL1		650	7	78	0.605	0.665	15	10	
☆ **R6504KND3**	TL1		650	4	58	0.955	1.050	10	10	
R6024KNJ	TL	N	600	24	245	0.150	0.165	46	10	TO-263S (LPTS) [SC-83] 〔D2PAK〕
R6020KNJ	TL		600	20	231	0.170	0.196	40	10	
R6015KNJ	TL		600	15	184	0.260	0.290	30	10	
R6011KNJ	TL		600	11	124	0.340	0.390	22	10	
R6009KNJ	TL		600	9	94	0.500	0.535	16.5	10	
R6007KNJ	TL		600	7	78	0.570	0.620	15	10	
R6004KNJ	TL		600	4	58	0.900	0.980	10	10	
R6524KNJ	TL		650	24	245	0.160	0.185	46	10	
R6520KNJ	TL		650	20	231	0.185	0.205	40	10	
R6515KNJ	TL		650	15	184	0.280	0.315	30	10	
R6511KNJ	TL		650	11	124	0.360	0.400	22	10	
R6509KNJ	TL		650	9	94	0.530	0.585	16.5	10	
R6507KNJ	TL		650	7	78	0.605	0.665	15	10	
R6504KNJ	TL		650	4	58	0.955	1.050	10	10	
R6030KNX	—*	N	600	30	86	0.115	0.130	56	10	TO-220FM
R6024KNX	—*		600	24	74	0.150	0.165	46	10	
R6020KNX	—*		600	20	68	0.170	0.196	40	10	
R6015KNX	—*		600	15	60	0.260	0.290	30	10	
R6011KNX	—*		600	11	53	0.340	0.390	22	10	
R6009KNX	—*		600	9	48	0.500	0.535	16.5	10	
R6007KNX	—*		600	7	46	0.570	0.620	15	10	
R6006KNX	—*		600	6	40	0.720	0.830	12	10	
R6004KNX	—*		600	4	35	0.900	0.980	10	10	
R6530KNX	—*		650	30	86	0.125	0.140	56	10	
R6524KNX	—*		650	24	74	0.160	0.185	46	10	
R6520KNX	—*		650	20	68	0.185	0.205	40	10	
R6515KNX	—*		650	15	60	0.280	0.315	30	10	
R6511KNX	—*		650	11	53	0.360	0.400	22	10	
R6509KNX	—*		650	9	48	0.530	0.585	16.5	10	
R6507KNX	—*		650	7	46	0.605	0.665	15	10	
R6504KNX	—*		650	4	35	0.955	1.050	10	10	
R6035KNZ	C8	N	600	35	102	0.095	0.102	72	10	TO-3PF
R6030KNZ	C8		600	30	86	0.115	0.130	56	10	
R6024KNZ	C8		600	24	74	0.150	0.165	46	10	
R6020KNZ	C8		600	20	68	0.170	0.196	40	10	
R6015KNZ	C8		600	15	60	0.260	0.290	30	10	
R6535KNZ	C8		650	35	102	0.098	0.115	72	10	
R6530KNZ	C8		650	30	86	0.125	0.140	56	10	
R6524KNZ	C8		650	24	74	0.160	0.185	46	10	
R6520KNZ	C8		650	20	68	0.185	0.205	40	10	
R6515KNZ	C8		650	15	60	0.280	0.315	30	10	
New **R6076KNZ4**	C13	N	600	76	735	0.040	0.042	165	10	TO-247
New **R6047KNZ4**	C13		600	47	481	0.070	0.072	100	10	
☆ **R6035KNZ4**	C13		600	35	379	0.095	0.102	72	10	
☆ **R6030KNZ4**	C13		600	30	305	0.115	0.130	56	10	
☆ **R6024KNZ4**	C13		600	24	245	0.150	0.165	46	10	
☆ **R6020KNZ4**	C13		600	20	231	0.170	0.196	40	10	
☆ **R6576KNZ4**	C13		650	76	735	0.040	0.046	165	10	
New **R6547KNZ4**	C13		650	47	481	0.070	0.080	100	10	
☆ **R6535KNZ4**	C13		650	35	379	0.098	0.115	72	10	
☆ **R6530KNZ4**	C13		650	30	305	0.125	0.140	56	10	
☆ **R6524KNZ4**	C13		650	24	245	0.160	0.185	45	10	
New **R6520KNZ4**	C13		650	20	231	0.185	0.205	40	10	
R6535KNX1	C10	N	650	35	102	0.098	0.115	72	10	TO-220AB
R6530KNX1	C10		650	30	86	0.125	0.140	56	10	
R6524KNX1	C10		650	24	74	0.160	0.185	45	10	
R6520KNX1	C10		650	20	68	0.185	0.205	40	10	
R6515KNX1	C10		650	15	60	0.280	0.315	27.5	10	

Packages indicate JEDEC notation. ( ) refer to ROHM package type. [ ] refer to JEITA code. 〔 〕refer to GENERAL code.
* Packing code : C7 G(The tube package) is possible, too ☆ : Under Development

High-speed trr type <PrestoMOS™>

Product No.		Polarity (ch)	V_{DSS} (V)	I_D (A)	P_D(W) (T_C= 25°C)	$R_{DS(on)}$(Ω) V_{GS}=15V		Qg Typ. (nC) V_{GS}= 15V	trr (Typ.) (ns)	Drive Voltage (V)	Package
Part No.	Taping Code					Typ.	Max.				
New R6009JND3	TL1	N	600	9	125	0.450	0.585	22	65	15	TO-252 [DPAK]
New R6007JND3	TL1		600	7	96	0.600	0.780	17.5	60	15	
New R6006JND3	TL1		600	6	86	0.720	0.936	15.5	58	15	
New R6004JND3	TL1		600	4	60	1.100	1.430	10.5	45	15	
New R6020JNJ	TL	N	600	20	252	0.200	0.260	50	85	15	TO-263S (LPTS) [SC-83] [D2PAK]
New R6018JNJ	TL		600	18	220	0.220	0.286	42	80	15	
New R6012JNJ	TL		600	12	160	0.300	0.390	28	70	15	
New R6009JNJ	TL		600	9	125	0.450	0.585	22	65	15	
New R6007JNJ	TL		600	7	96	0.600	0.780	17.5	60	15	
New R6006JNJ	TL		600	6	86	0.720	0.936	15.5	58	15	
New R6004JNJ	TL		600	4	60	1.100	1.430	10.5	45	15	
New R6025JNX	C7 G	N	600	25	85	0.140	0.182	57	90	15	TO-220FM
New R6020JNX	C7 G		600	20	76	0.200	0.260	45	85	15	
New R6018JNX	C7 G		600	18	72	0.220	0.286	42	80	15	
New R6012JNX	C7 G		600	12	60	0.300	0.390	28	70	15	
New R6009JNX	C7 G		600	9	53	0.450	0.585	22	65	15	
New R6007JNX	C7 G		600	7	46	0.600	0.780	17.5	60	15	
New R6006JNX	C7 G		600	6	43	0.720	0.936	15.5	58	15	
New R6004JNX	C7 G		600	4	35	1.100	1.430	10.5	45	15	
☆ R6050JNZ	C8	N	600	50	120	0.064	0.083	120	120	15	TO-3PF
New R6030JNZ	C8		600	30	93	0.110	0.143	75	100	15	
New R6025JNZ	C8		600	25	85	0.140	0.182	65	90	15	
New R6020JNZ	C8		600	20	76	0.180	0.234	50	85	15	
☆ R6070JNZ4	C13	N	600	70	770	0.045	0.058	160	135	15	TO-247
☆ R6050JNZ4	C13		600	50	615	0.064	0.083	120	120	15	
☆ R6042JNZ4	C13		600	42	495	0.080	0.104	100	110	15	
☆ R6030JNZ4	C13	N	600	30	370	0.110	0.143	74	100	15	
☆ R6025JNZ4	C13		600	25	306	0.150	0.195	65	90	15	
☆ R6020JNZ4	C13		600	20	252	0.180	0.234	45	85	15	

Packages indicate JEDEC notation. ( ) refer to ROHM package type. [ ] refer to JEITA code. 〔 〕refer to GENERAL code.
☆ : Under Development

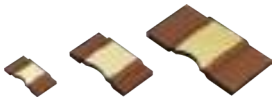
Resistors for Current Detection

Ideal for current detection in large-current applications

Shunt Resistors

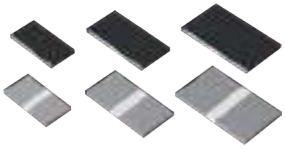
This series features high rated power and ultra-low resistances ideal for current detection in high power sets. Adopting a high performance alloy material as the resistive element ensures superior temperature coefficient of resistance (TCR), even in the ultra-low-ohmic region.

PSR series



PSR100 PSR400 PSR500

GMR series



☆GMR50 GMR100 ☆GMR320

☆: Under Development

PMR series

PMR18 PMR25

PMR50 PMR100

LTR series

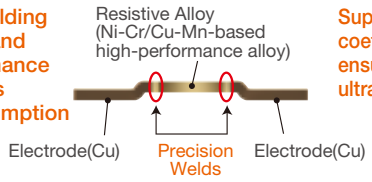
LTR18 LTR50

LTR100 LHR18

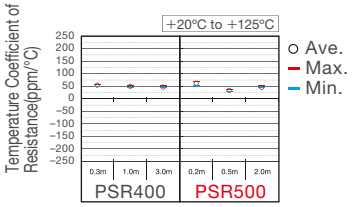
Metal Plate Ultra-Low-Ohmic/High Power type(PSR series)

- High power (3W to 5W class)
- Ultra-low resistances from 0.2mΩ
- Convex structure
- Special alloy used for low TCR

Precision welding technology and high-performance alloy reduces power consumption



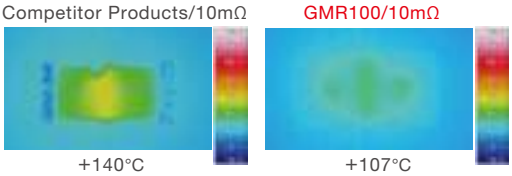
Superior temperature coefficient of resistance ensured even in the ultra-low-ohmic region



Metal Plate Low Ohmic/High Power type(GMR series)

- High power : 5W Max.
- Low TCR using a special metal alloy
- Original construction enables high heat dissipation and excellent temperature cycling characteristics

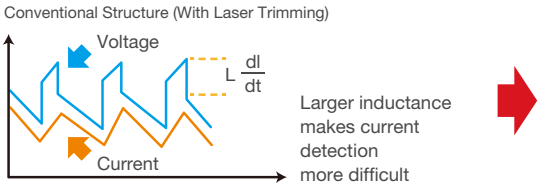
Surface Temperature Comparison



Metal Plate Ultra-Low-Ohmic type(PMR series)

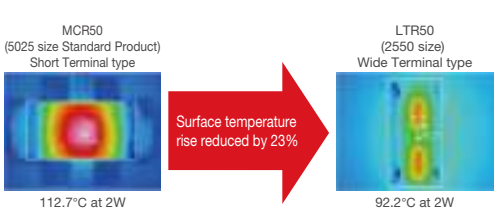
- High power (2W class)
- Original trimless structure
- Multiple package types

Trimless Structure Improves Current Detection Accuracy

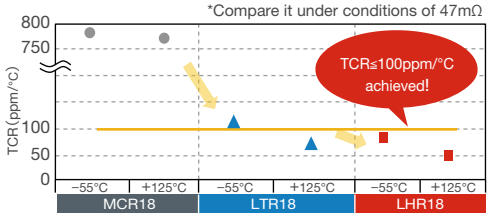


Thick Film Low-Ohmic/Wide Terminal type(LTR/LHR series)

Superior Heat Dissipation Characteristics

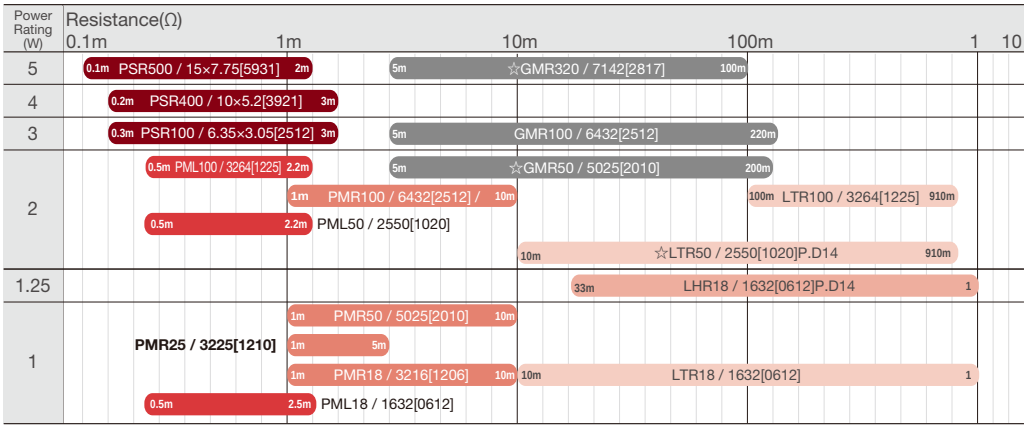


Reduced Temperature Coefficient of Resistance



Quick Resistance Range Reference
(Extract 1W or more) (Part No./mm[inch])

PSR GMR PML PMR Metal Strip　　UCR LHR LTR MCR Thick Film



☆ : Under Development

Metal Plate Ultra-Low-Ohmic/High Power type(PSR series)

Part No.	Size Code mm(inch)	Rated Power (70°C)	Tolerance	Temperature* Coefficient(ppm/°C)	Resistance Range(mΩ)	Operating Temperature(°C)	Automotive Grade AEC-Q200
New PSR100	6432 (2512)	3W	F(±1%)	±150	0.3	−55 to +170	YES
				±115	0.5		
				±100	1.0		
				±50	2.0, 3.0		
PSR400	10×5.2 (3921)	4W	F(±1%)	125±50	☆0.2		YES
				±175	0.3, 0.5		
				±75	1.0, 2.0, 3.0		
PSR500	15×7.75 (5931)	5W	F(±1%)	200±50	☆0.1		YES
				±225	0.2		
				±150	0.3, 0.4, 0.5		
				±75	1.0, 2.0		

*(+20°C to +125°C)　☆ : Under Development

Metal Plate Low Ohmic/High Power type(GMR series)

Part No.	Size Code mm(inch)	Rated Power (70°C)	Tolerance	Temperature*1 Coefficient(ppm/°C)	Resistance Range(mΩ)	Operating Temperature(°C)	Automotive Grade AEC-Q200
☆ GMR50	5025 (2010)	2W	F(±1%)	0 to +50	5mΩ	−55 to +170	Preparing
				±25	10mΩ to 200mΩ(E6 series*2*3)		
New GMR100	6432 (2512)	3W	F(±1%)	0 to +50	☆5mΩ		YES
				±20	10mΩ to 220mΩ(E6 series*2)		
☆ GMR320	7142 (2817)	5W	F(±1%)	0 to +100	5mΩ		Preparing
				±25	10mΩ to 100mΩ(E6 series*2*3)		

☆ : Under Development (The development schedule may vary depending on resistance value. Please Contacts us.)
*1 (+20°C to +60°C)
*2 Please contact us for resistance values outside the nominal range.
*3 The development schedule may vary depending on resistance value.

Metal Plate Ultra-Low-Ohmic type(PMR series)

Part No.	Size Code mm(inch)	Rated Power (70°C)	Tolerance	Temperature Coefficient(ppm/°C)	Resistance Range (mΩ)	Operating Temperature(°C)	Automotive Grade AEC-Q200
PMR18	3216(1206)	1W	J(±5%) F(±1%)	±100	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	−55 to +155	YES
PMR25	3225(1210)	1W	J(±5%) F(±1%)	±100	1, 2, 3, 4, 5		YES
PMR50	5025(2010)	1W	J(±5%) F(±1%)	±100	1, 2, 3, 4, 5, 6, 7, 8, 9, 10		YES
PMR100	6432(2512)	2W	J(±5%) F(±1%)	±150	1, 2		YES
				±100	3, 4, 5, 6, 7, 8, 9, 10		
		☆3W	J(±5%) F(±1%)	±150	1, 2		

☆ : Under Development

Thick Film Low-Ohmic/Wide Terminal type(LTR/LHR series)

Part No.	Size Code mm(inch)	Rated Power (70°C)	Tolerance	Temperature Coefficient(ppm/°C)	Resistance Range	Operating Temperature(°C)	Automotive Grade AEC-Q200
New LHR18	1632 (0612)	1.25W	J(±5%)	0 to 125	33mΩ to 39mΩ(E24 series)	−55 to +155	YES
				0 to 100	43mΩ to 270mΩ(E24 series)		
			F(±1%)	0 to 75	300mΩ to 1Ω(E24 series)		
LTR18	1632 (0612)	1W	J(±5%)	0 to 300	10mΩ to 18mΩ(E24 series)		YES
				0 to 200	20mΩ to 47mΩ(E24 series)		
			F(±1%)	0 to 150	51mΩ to 470mΩ(E24 series)		
				±100	510mΩ to 1Ω(E24 series)		
New LTR50	2550 (1020)	2W	J(±5%)	0 to 300	10mΩ to 18mΩ(E24 series)		YES
				0 to 200	20mΩ to 47mΩ(E24 series)		
			F(±1%)	0 to 150	51mΩ to 91mΩ(E24 series)		
				±100	100mΩ to 910mΩ(E24 series)		
LTR100	3264 (1225)	2W	J(±5%)	±200	100mΩ to 910mΩ(E24 series)		YES
			F(±1%)	0 to 150			
		☆3W	J(±5%)	0 to 300	10mΩ to 18mΩ(E24 series)		
				0 to 200	20mΩ to 47mΩ(E24 series)		
			F(±1%)	0 to 150	51mΩ to 91mΩ(E24 series)		

☆ : Under Development

A vertically integrated production system ensures high quality and stable supply

A 'Quality First' objective allows ROHM to establish a vertically integrated manufacturing system for SiC production. In addition to acquiring SiCrystal, a German wafer fabrication company in 2009, the ROHM Group continues to implement activities to improve quality throughout the entire manufacturing process, from wafers to packages. World-class manufacturing technologies and stable production capacity provide increased cost competitiveness and ensures a stable, long-term supply of new products.

State-of-the-art package

ROHM provides the latest assembling technologies such as CSP, BGA, COF and stacked package

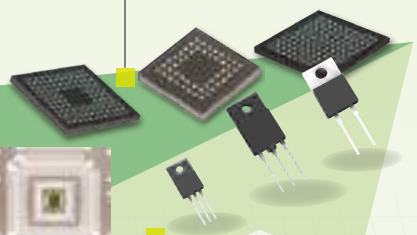
In-house manufactured dies and lead frames

To enhance quality, ROHM manufactures dies to punch lead frames and molding dies within the company

Stringent material requirements

Complete wafer production, from silicon ingot pulling

Silicon ore



Packaging

Assembly Line

Frame & Dies

Photo Mask

CAD

Silicon Ingot

Wafer Process

Wafer

Silicon
Si

Silicon carbide
SiC

Low inductance modules A

A low inductance modules utilizing SiC's high-speed characteristics was developed

In-house production equipment

High quality, high volume, and stable manufacturing are guaranteed utilizing in-house production equipment

In-house manufactured photomask

Pursuing high quality through consistent quality control from IC chip design layout to photo mask production

SiC processes

High quality lines integrating SiC's unique processes are utilized

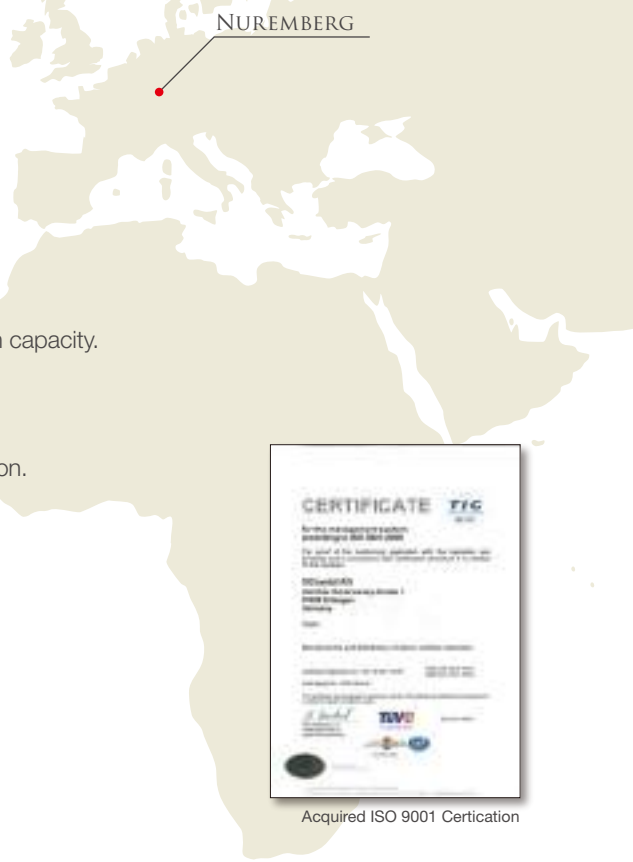
SiCrystal
A ROHM Group Company

SiCrystal is a German SiC single crystal wafer manufacturer who joined the ROHM Group in 2009.

All production equipment are developed in-house

SiCrystal

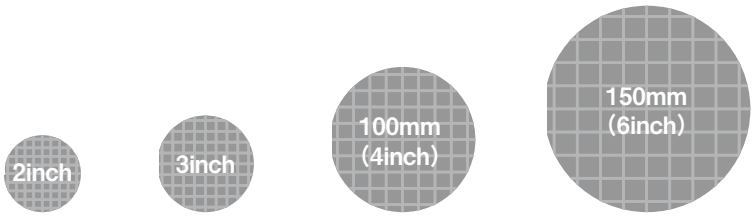
A ROHM Group Company



SiCrystal AG, the largest SiC monocrystal wafer manufacturer in Europe, became a member of the ROHM Group in 2009.
SiCrystal was established in 1997 in Germany based on a SiC monocrystal growth technology development project launched in 1994.
Mass production and supply of SiC wafers began in 2001.
In 2012, SiCrystal relocated to a new plant in Nuremberg to increase production capacity.
With the corporate philosophy "Stable Quality", SiCrystal has adopted an integrated wafer production system from raw SiC material to crystal growth, wafer processing, and inspection, and in 1999 was granted ISO 9001 certification.

Acquired ISO 9001 Certication

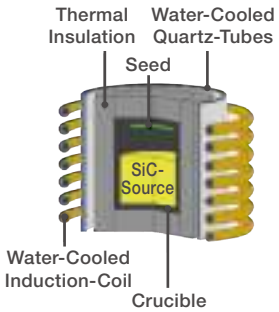
■ Manufactured Product : SiC Wafers



■ SiC Wafer Process Flow

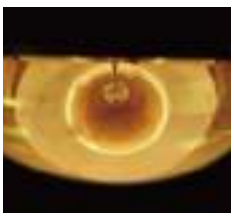
State-of-the-art Crystal Growth Technology

SiC boules are produced through a crystal growth process utilizing a modified Rayleigh method that sublimates SiC powder at high temperatures and crystallizes it into a low-temperature seed crystal.
Whereas conventional silicon ingots are liquid phase growth crystals created from melt, the sublimation method involves a slower growth rate which may result in crystal defects, so delicate technology is required for crystal control.
At SiCrystal, advanced crystal technology is achieved by leveraging numerical analysis.



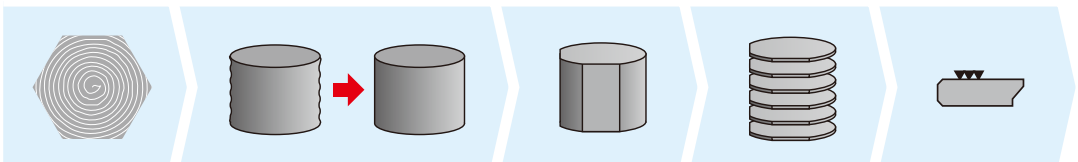
For SiC

Temperature range : 2,000 to 2,500°C
Principle : Sublimation growth by evaporation of SiC powder and subsequent atomic layer growth on the seed crystal. Process control is more complex and growth rate is slower than liquid phase growth.



For Si

Temperature : 1,415 to 1,450°C
Principle : Liquid phase growth by solidification of the melt on the seed crystal. The method has a comparatively high growth rate.

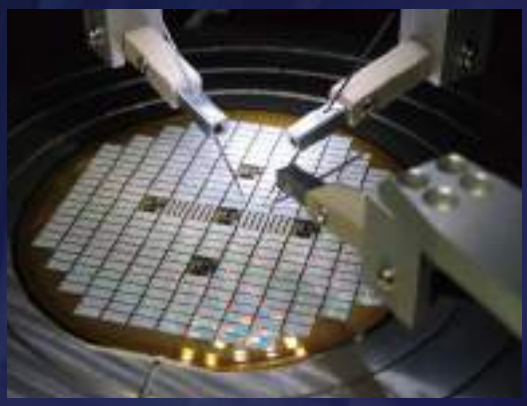


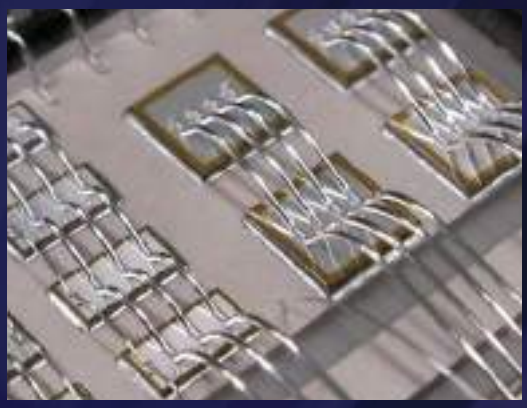
1. As-grown Crystal
2. Diameter Grinding
3. Flat Grinding
4. Wire-Sawing
5. Edge Grinding/ Polishing/ Cleaning

SiC Wafer

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

SiC Technology Breakthrough





2002

Began preliminary experiments with SiC MOSFETs
(Jun. 2002)

Developed SiC MOSFET prototypes
(Dec. 2004)

2005

Shipped SiC MOSFET samples
(Nov. 2005)

Announced the development of SiC MOSFETs with the industry's smallest ON resistance (3.1mΩ/cm^2)
(Mar. 2006)

2007

ROHM, along with Kyoto University and Tokyo Electron, announced the development of SiC epi film mass-production technology
(Jun. 2007)

Trial manufacture of large current (300A) SiC MOSFETs and SBDs (Schottky Barrier Diodes)
(Dec. 2007)

③

④

2010

Established an integrated SiC device production system. Begin mass production of SiC SBDs ④
(Apr. 2010)

Successfully developed the industry's first SiC power modules containing trench MOSFETs and SBDs that can be integrated into motors
(Oct. 2010)

Began mass production of SiC MOSFETs
(Dec. 2010)

2011

Developed the industry's first transfer mold SiC power modules capable of high temperature operation (up to 225°C) ⑤
(Oct. 2011)

APEI Inc. (Arkansas Power Electronics International) and ROHM developed high-speed, high-current (1000A-class) SiC trench MOS modules
(Oct. 2011)

ROHM has been focused on developing SiC for use as a material for next-generation power devices for years, collaborating with universities and end-users in order to cultivate technological know-how and expertise. This culminated in Japan's first mass-produced Schottky barrier diodes in April 2010 and the industry's first commercially available SiC transistors (MOSFET) in December. And in March 2012 ROHM unveiled the industry's first mass production of Full SiC Power Modules.

History

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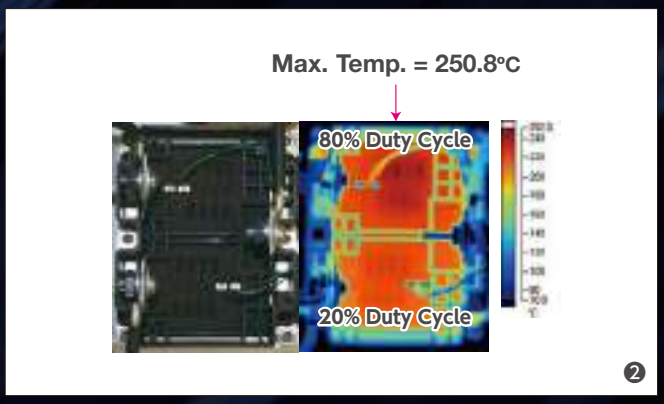


❷

2008

Developed a new type of SiC diode with Nissan Motors (Apr. 2008)

Released trench-type MOSFETs featuring the industry's smallest ON-resistance : 1.7mΩcm² (Sep. 2008)

Nissan Motors conducted a driving experiment of a fuel-cell vehicle equipped with an inverter using ROHM's SiC diode (Sep. 2008)

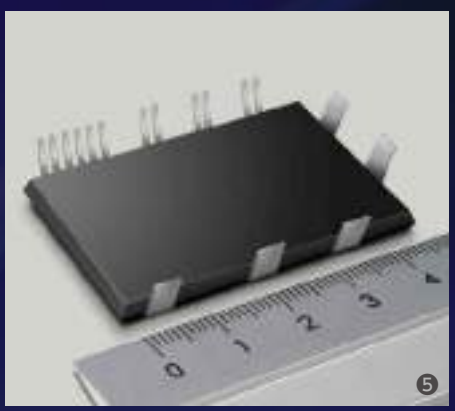
Honda R&D Co., Ltd. and ROHM tested prototype SiC power modules for hybrid vehicles ❶ (Sep. 2008)

ROHM tested prototype high temperature operation power modules that utilize SiC elements and introduced a demo capable of operation at 250 °C ❷ (Oct. 2008)

2009

The ROHM Group acquired SiCrystal, an SiC wafer manufacturer ❸ (Jul. 2009)

Developed the industry's first high current low resistance SiC trench MOSFET (Oct. 2009)



❺

❻

❼

2012

Launched the industry's first mass production of "Full SiC" power modules with SiC SBDs and SiC MOSFETs ❻ (Mar. 2012)

Began mass production of SiC MOS Modules (Dec. 2012) History

Started mass production of automotive SiC SBD products (Sep. 2012)

2013

Performed a trial production of uninterruptible power supply equipment using full SiC power modules in cooperation with Enegate and Kansai Electric Power (Jun. 2013)

2015

2016

Integrated into the main drive inverter of vehicles in Formula E, the world's premier racing class for electric cars. For Season 3, which began on October 9, 2016, we offer cutting-edge power semiconductors and SiC power devices for the inverter block that comprises the core of the drive system, contributing to smaller, lighter, more efficient vehicles. ❼ (Oct. 2016)

ROHM Group Locations

ROHM Group Locations (Japan)

Sales Offices

Kyoto	Nagoya	Mito	Takasaki
Tokyo	Fukuoka	Nishi-Tokyo	Utsunomiya
Yokohama	Matsumoto	Sendai	

Manufacturing Facilities

ROHM Shiga Co., Ltd.
ROHM Hamamatsu Co., Ltd.
ROHM Wako Co., Ltd.
ROHM Apollo Co., Ltd.
ROHM Mechatech Co., Ltd.
LAPIS Semiconductor Miyagi Co., Ltd.
LAPIS Semiconductor Miyazaki Co., Ltd.

Design Centers

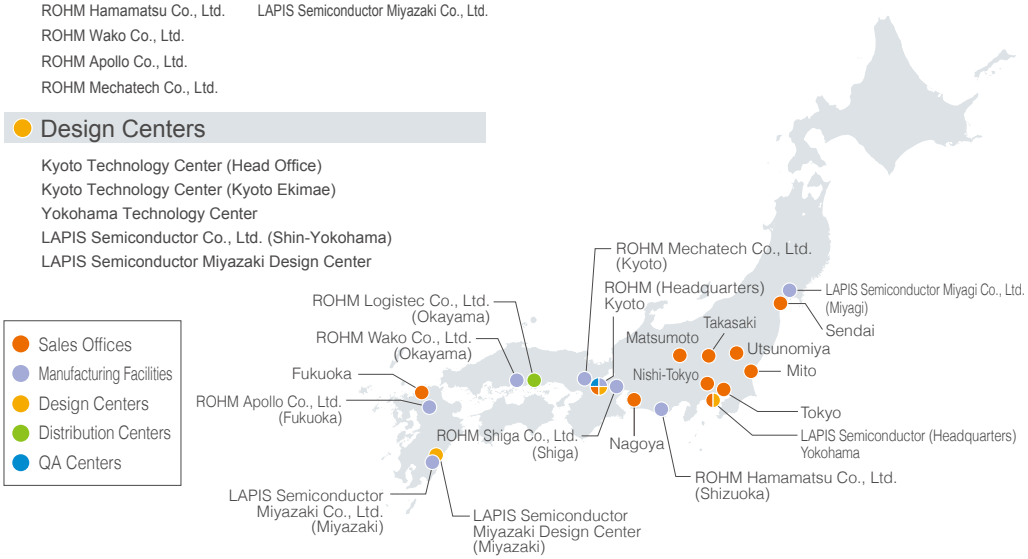
Kyoto Technology Center (Head Office)
Kyoto Technology Center (Kyoto Ekimae)
Yokohama Technology Center
LAPIS Semiconductor Co., Ltd. (Shin-Yokohama)
LAPIS Semiconductor Miyazaki Design Center

Distribution Centers

ROHM Logistec Co., Ltd.

QA Centers

Kyoto QA Center



ROHM Group Locations (Global)

Sales Offices

ASIA	ROHM Semiconductor Korea Corporation
	ROHM Semiconductor Trading (Dalian) Co., Ltd.
	ROHM Semiconductor (Shanghai) Co., Ltd.
	ROHM Semiconductor (Shenzhen) Co., Ltd.
	ROHM Semiconductor Hong Kong Co., Ltd.
	ROHM Semiconductor Taiwan Co., Ltd.
	ROHM Semiconductor Singapore Pte. Ltd.
	ROHM Semiconductor Philippines Corporation
	ROHM Semiconductor (Thailand) Co., Ltd.
	ROHM Semiconductor Malaysia Sdn. Bhd.
	ROHM Semiconductor India Pvt. Ltd.
AMERICA	ROHM Semiconductor U.S.A., LLC
	ROHM Semiconductor do Brasil Ltda.
EUROPE	ROHM Semiconductor GmbH

Manufacturing Facilities

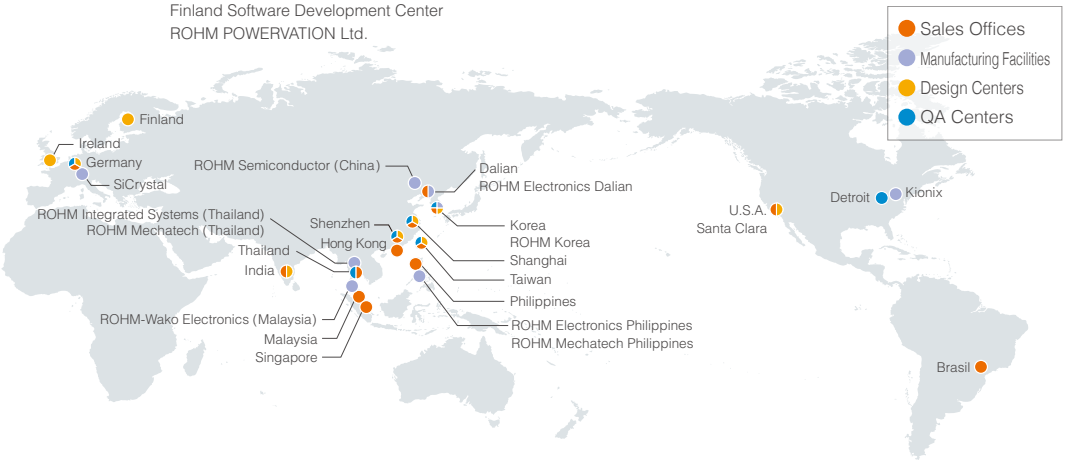
ASIA	ROHM Korea Corporation
	ROHM Electronics Philippines, Inc.
	ROHM Integrated Systems (Thailand) Co., Ltd.
	ROHM Semiconductor (China) Co., Ltd.
	ROHM Electronics Dalian Co., Ltd.
	ROHM-Wako Electronics (Malaysia) Sdn. Bhd.
	ROHM Mechatech Philippines, Inc.
	ROHM Mechatech (Thailand) Co., Ltd.
AMERICA	Kionix, Inc.
EUROPE	SiCrystal GmbH

Design Centers

ASIA	Korea Design Center
	Shanghai Design Center
	Shenzhen Design Center
	Taiwan Design Center
	India Design Center
AMERICA	America Design Center (Santa Clara)
EUROPE	Europe Design Center
	Finland Software Development Center
	ROHM POWERVATION Ltd.

QA Centers

ASIA	Korea QA Center
	Shanghai QA Center
	Shenzhen QA Center
	Taiwan QA Center
	Thailand QA Center
AMERICA	USA QA Center
EUROPE	Europe QA Center



SiC for Eco Devices

Reducing environmental load

SiC power devices deliver superior energy savings. ROHM is expanding its lineup of SiC power devices with innovative new products that minimize power consumption in order to reduce greenhouse gas emissions and lessen environmental impact.

ROHM SPICE Models

① A total of 4,883* models have been uploaded covering a wide range of products, from ICs to discretes

Products list*		
	■ ICs	2,250products
	■ Discretes	2,633products (Power Devices, Transistors, Diodes, LEDs, etc...)

*October 2018 ROHM study

② SPICE models are stored in one place, making it possible to download files in 3 easy steps

Cadence's Website : PSpice.com

PSpice Community

PSpice, one of the mainstream or CAD products, is an industry-learning circuit simulation and validation solution that enables continuous operation throughout Cadence's entire PCD design flow.

ROHM page in PSpice
http://www.pspice.com/models/rohm

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Atlanta	+1-770-754-5972	Nuremberg	+49-911-810452-26	Beijing	+86-10-8525-2483	India	+91-80-4125-0811
Boston	+1-781-565-1138	France	+33 (0) 1 40 60 87 30	Shanghai	+86-21-6072-8612	Kyoto	+81-75-365-1077
Chicago	+1-847-368-1006	United Kingdom	+44-1-908-272400	Shenzhen	+86-755-8307-3008	Yokohama	+81-45-476-2121
Detroit	+1-248-348-9920	Finland	+358-400-726 124	Hong Kong	+852-2740-6262		
San Diego	+1-858-625-3600	Spain	+34-9375-24320	Taiwan	+886-2-2500-6956		
Mexico	+52-33-3123-2001	Hungary	+36-1-950-5859	Singapore	+65-6436-5100		
Brazil	+55-11-3539-6320	Italy	+39-039-5783432	Philippines	+63-2-807-6872		
Germany	+49-2154-921-0	Seoul	+82-2-8182-700	Thailand	+66-2-254-4890		

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ROHM Co.,Ltd.
21 Saiin Mizosaki-cho, Ukyo-ku,
Kyoto 615-8585 Japan
TEL : +81-75-311-2121 FAX : +81-75-315-0172
www.rohm.com

ROHM SEMICONDUCTOR