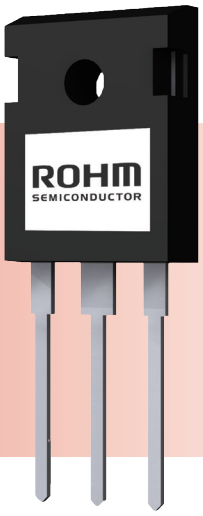
ROHM SEMICONDUCTOR

Innovations Embedded

Silcon Carbide - Schottky Barrier Diodes



Selection Guide

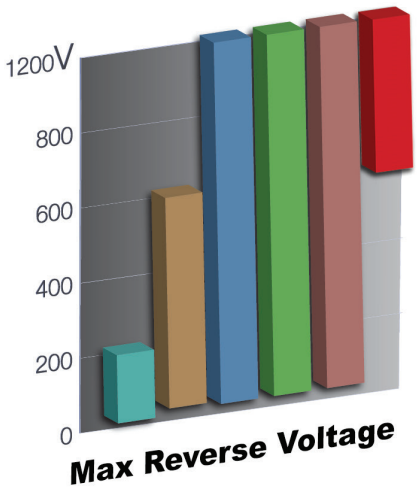
Choosing Silicon Carbide Instead of Silicon

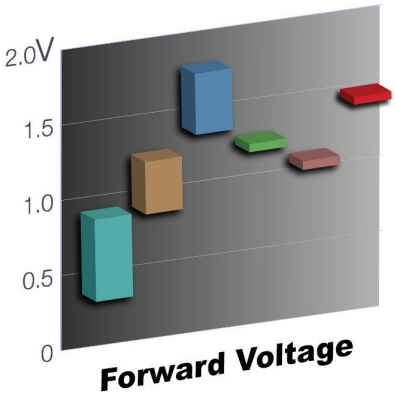
Schottky barrier diodes (SBDs) have the advantage of low forward losses and negligible switching losses compared to other diode technologies. But the narrow bandgap of silicon (Si) SBDs limits their use to a maximum voltage of around 200 V. Si diodes that operate above 200 V have higher V_F and t_{rr}.

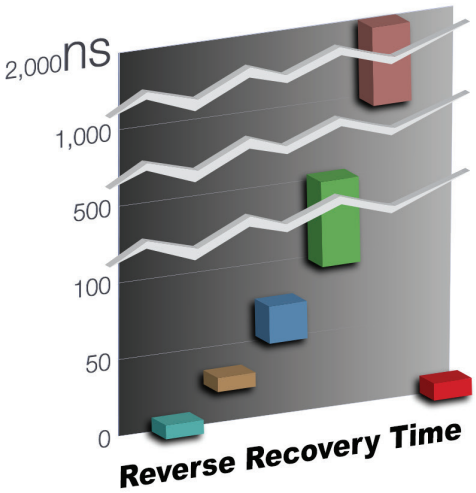
Silicon carbide (SiC) is a compound semiconductor with superior power characteristics to silicon, including a bandgap approximately three times greater, a dielectric breakdown field 10 times higher, and a thermal coefficient three times larger. These characteristics make it ideal for power electronics applications.

Today, the need for higher efficiency in end products is more critical than ever. Although silicon power products continue to see incremental improvements, devices based on compound semiconductor materials deliver significantly better performance—and in some cases not even possible with their silicon counterparts.

This is certainly true for the most basic components in power electronics: diodes and transistors. Silicon carbide Schottky barrier diodes have been available for more than a decade but have not been commercially viable until recently. Volume production is now leading to SiC's acceptance in more and more applications.







Legend

- Si Schottky Barrier Diode
- Si Super Fast Diode
- Si Ultra Fast Diode
- Si Fast Recovery (Epitaxial) Diode
- Si Standard Recovery Diode
- Silicon Carbide Schottky Barrier Diode

650V & 1200V Diodes

ROHM's silicon carbide family of Schottky barrier diodes offers industry-leading low forward voltage and fast recovery time. They maintain low forward voltage (V_F) over a wide operating temperature range which results in lower power dissipation under actual operating conditions. Low V_F minimizes switching loss and enables high switching frequency, resulting in smaller passives and smaller end-product form factors.

Applications

- Power Factor Correction/SMPS
- Solar Inverters
- Motor Drives

Features /Advantages

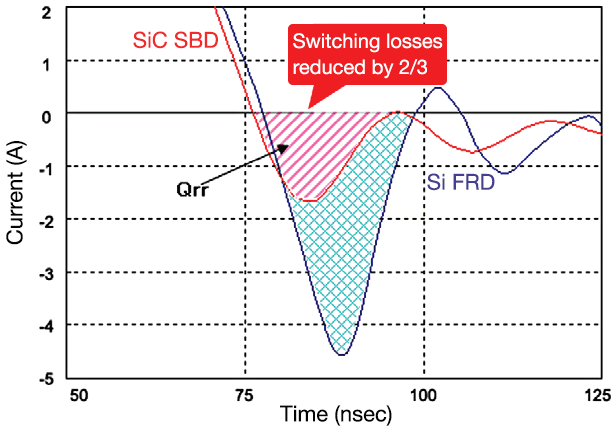
- Extremely low switching loss and reduced EMI emission due to much smaller recovery current
- High operating temperature and smaller losses greatly reduces heat sink requirement

DESIGN NOTE

SiC Performance Improvement over Si FRD

With and SiC Schottky barrier diode (SBD), switching losses are reduced by 2/3 compared to a silicon fast recovery diode (FRD).

(The Si FRD is used for comparison since it has a comparable voltage rating to the SiC SBD.)



2nd Generation Low V_F SBD Product Lineup

Non Automotive Grade

Part Number	V_R (V) Abs Max	I_F (A)	I_{FSM} (A) Abs Max @ 60Hz	V_F (V) Typ	I_R (uA) Max	P_D (W)	Pacakge	Equivalent Circuit
SCS206AJ	650	6	24	1.35	120	48	LPTL (D2-PAK)	
SCS208AJ	650	8	31	1.35	160	62	LPTL (D2-PAK)	
SCS210AJ	650	10	40	1.35	200	83	LPTL (D2-PAK)	
SCS215AJ	650	15	55	1.35	300	100	LPTL (D2-PAK)	
SCS212AJ	650	12	45	1.35	240	88	LPTL (D2-PAK)	
SCS220AJ	650	20	71	1.35	400	100	LPTL (D2-PAK)	
SCS206AG	650	6	24	1.35	120	51	TO-220AC	
SCS208AG	650	8	31	1.35	160	68	TO-220AC	
SCS210AG	650	10	40	1.35	200	78	TO-220AC	
SCS212AG	650	12	45	1.35	240	93	TO-220AC	
SCS215AG	650	15	55	1.35	300	110	TO-220AC	
SCS220AG	650	20	71	1.35	400	130	TO-220AC	
SCS206AM	650	6	24	1.35	120	31	TO-220FM	
SCS208AM	650	8	31	1.35	160	34	TO-220FM	
SCS210AM	650	10	40	1.35	200	34	TO-220FM	
SCS212AM	650	12	45	1.35	240	37	TO-220FM	
SCS215AM	650	15	55	1.35	300	39	TO-220FM	
SCS220AM	650	20	71	1.35	400	40	TO-220FM	
SCS215AE	650	15	55	1.35	300	110	TO-247	
SCS220AE	650	20	71	1.35	400	130	TO-247	
SCS220AE2	650	10/20*	40/80*	1.35	200	160	TO-247	
SCS230AE2	650	15/30*	55/110*	1.35	300	230	TO-247	
SCS240AE2	650	20/40*	71/140*	1.35	400	270	TO-247	
SCS205KG	1200	5	23	1.4	100	88	TO-220AC	
SCS210KG	1200	10	45	1.4	200	150	TO-220AC	
SCS215KG	1200	15	65	1.4	300	180	TO-220AC	
SCS220KG	1200	20	82	1.4	400	210	TO-220AC	
SCS210KE2	1200	5/10*	23/46*	1.4	100	170	TO-247	
SCS220KE2	1200	10/20*	44/88*	1.4	200	280	TO-247	
SCS230KE2	1200	15/30*	65/130*	1.4	300	360	TO-247	
SCS240KE2	1200	20/40*	83/160*	1.4	400	420	TO-247	

*1 pin/package total

Automotive Grade

Part Number	V_R (V) Abs Max	I_F (A)	I_{FSM} (A) Abs Max @ 60Hz	V_F (V) Typ	I_R (uA) Max	P_D (W)	Pacakge	Equivalent Circuit
SCS206AGHR	650	6	24	1.35	120	51	TO-220AC	
SCS208AGHR	650	8	31	1.35	160	68	TO-220AC	
SCS210AGHR	650	10	40	1.35	200	78	TO-220AC	
SCS212AGHR	650	12	45	1.35	400	93	TO-220AC	
SCS215AGHR	650	15	55	1.35	240	110	TO-220AC	
SCS220AGHR	650	20	71	1.35	300	130	TO-220AC	
SCS220AE2HR	650	10/20*	40/80*	1.35	200	160	TO-247	
SCS230AE2HR	650	15/30*	55/110*	1.35	300	124	TO-247	
SCS240AE2HR	650	20/40*	71/140*	1.35	400	270	TO-247	
SCS205KGHR	1200	5	23	1.4	100	88	TO-220AC	
SCS210KGHR	1200	10	45	1.4	200	150	TO-220AC	
SCS215KGHR	1200	15	65	1.4	300	180	TO-220AC	
SCS220KGHR	1200	20	82	1.4	400	210	TO-220AC	
SCS210KE2HR	1200	5/10*	23/46*	1.4	100	170	TO-247	
SCS220KE2HR	1200	10/20*	44/88*	1.4	200	280	TO-247	

*1 pin/package total

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NOTE: For the most current product information, contact a ROHM sales representative in your area.

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