Silicon carbide CoolSiC™ Schottky diodes

Selection guide

www.infineon.com/sic

Silicon carbide

Improve efficiency and solution costs

Silicon carbide (SiC) devices belong to the so-called wide bandgap semiconductor group, which offers a number of attractive characteristics for high voltage power semiconductors when compared to commonly used silicon (Si). In particular, the much higher breakdown field strength and thermal conductivity of silicon carbide allow developing devices which by far outperform the corresponding silicon-based ones, and enable efficiency levels unattainable otherwise. Infineon's portfolio of SiC devices covers 600 V and 650 V to 1200 V Schottky diodes as well as the revolutionary CoolSiC™ MOSFET.

Advantages of silicon carbide over silicon devices

The differences in material properties between silicon carbide and silicon limit the fabrication of practical silicon unipolar diodes (Schottky diodes) to a range up to 100-150 V, with a relatively high on-state resistance and leakage current. In SiC, Schottky diodes can reach a much higher breakdown voltage. Infineon offers products up to 1200 V in discrete packages and up to 1700 V in modules.

Features

- No reverse recovery charge
- Purely capacitive switching
- High operating temperature ($T_{j, max}$ =175°C)

Advantages

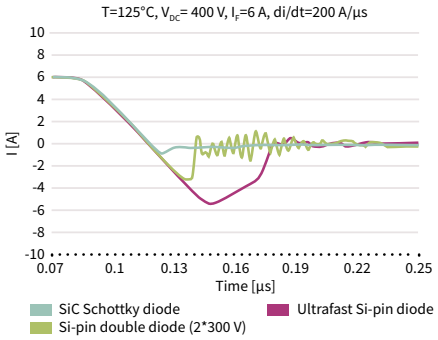
- Low turn-off losses
- Reduction of CoolMOS™ or IGBT turn-on loss
- Switching losses independent from load current, switching speed and temperature

Benefits

- System efficiency improvement compared to Si diodes
- Reduced cooling requirements
- Enabling higher frequency/increased power density
- Higher system reliability due to lower operating temperature
- Reduced EMI

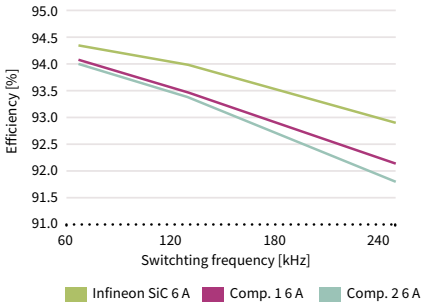
Applications

- Server
- Telecom
- Solar
- UPS
- EV charging
- Energy storage
- PC power
- Motor drives
- Lighting
- CAV



Reverse recovery charge of SiC Schottky diodes versus Si-pin diodes

The majority of carrier characteristics imply no reverse recovery charge and the only contribution to the switching losses comes from the tiny displacement charge of capacitive nature. In the same voltage range, silicon devices have a bipolar component resulting in much higher switching losses. The graph shows the comparison between various 600 V devices.



Improved system efficiency (PFC in CCM mode operation, full load, low line)

The fast switching characteristics of the SiC diodes provide clear efficiency improvements at system level. The performance gap between SiC and high-end silicon devices increases with the operating frequency.

Infineon is the world's first SiC discrete power supplier. The long market presence and experience enable Infineon to deliver highly reliable, industry-leading SiC performance. With over 10 years pioneering experience in developing and manufacturing SiC diodes, Infineon's latest CoolSiC™ Schottky diode generation 6 family sets benchmark in quality, efficiency and reliability.

Silicon carbide portfolio

CoolSiC™ Schottky diodes 650 V G6

ACTIVE & PREFERRED

I_F [A]	TO-220 R2L	TO-247 Dual Die	TO-247	Double DPAK	D²PAK R2L	ThinPAK 8x8
4	IDH04G65C6			IDDD04G65C6		
6	IDH06G65C6			IDDD06G65C6		
8	IDH08G65C6			IDDD08G65C6		
10	IDH10G65C6			IDDD10G65C6		
12	IDH12G65C6			IDDD12G65C6		
16	IDH16G65C6			IDDD16G65C6		
20	IDH20G65C6			IDDD20G65C6		

CoolSiC™ Schottky diodes 650 V G3

ACTIVE

I_F [A]	TO-220 R2L	TO-247 Dual Die	TO-247	DPAK R2L	D²PAK	ThinPAK 8x8
3	IDH03SG60C			IDD03SG60C		
4	IDH04SG60C			IDD04SG60C		
5	IDH05SG60C			IDD05SG60C		
6	IDH06SG60C			IDD06SG60C		
8	IDH08SG60C			IDD08SG60C		
9	IDH09SG60C			IDD09SG60C		
10	IDH10SG60C			IDD10SG60C		
12	IDH12SG60C			IDD12SG60C		

CoolSiC™ Schottky diodes 650 V G5

ACTIVE

I_F [A]	TO-220 R2L	TO-247 Dual Die	TO-247	D²PAK R2L	ThinPAK 8x8
2	IDH02G65C5			IDK02G65C5	IDL02G65C5
3	IDH03G65C5			IDK03G65C5	
4	IDH04G65C5			IDK04G65C5	IDL04G65C5
5	IDH05G65C5			IDK05G65C5	
6	IDH06G65C5			IDK06G65C5	IDL06G65C5
8	IDH08G65C5			IDK08G65C5	IDL08G65C5
9	IDH09G65C5			IDK09G65C5	
10	IDH10G65C5		IDW10G65C5	IDK10G65C5	IDL10G65C5
12	IDH12G65C5		IDW12G65C5	IDK12G65C5	IDL12G65C5
16	IDH16G65C5		IDW16G65C5		
20	IDH20G65C5	IDW20G65C5B	IDW20G65C5		
24		IDW24G65C5B			
30/32		IDW32G65C5B	IDW30G65C5		
40		IDW40G65C5B	IDW40G65C5		

CoolSiC™ Schottky diodes 1200 V G5

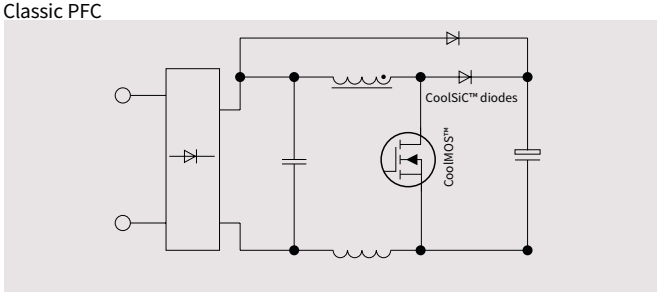
ACTIVE & PREFERRED

I_F [A]	TO-220 R2L	TO-247 Dual Die	TO-247 R2L	DPAK R2L
2	IDH02G120C5			IDM02G120C5
5	IDH05G120C5			IDM02G120C5
8	IDH08G120C5			IDM08G120C5
10	IDH10G120C5	IDW10G120C5B	IDWD10G120C5	IDM10G120C5
15/16	IDH16G120C5	IDW15G120C5B	IDWD15G120C5	
20	IDH20G120C5	IDW20G120C5B	IDWD20G120C5	
30		IDW30G120C5B	IDWD30G120C5	
40		IDW40G120C5B	IDWD40G120C5	

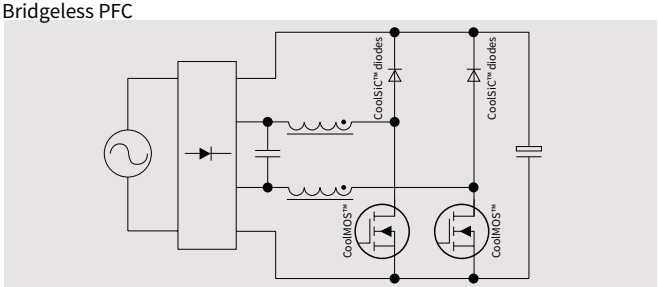
„B“ in product name refers to common-cathode configuration

Common SiC diodes applications and topologies

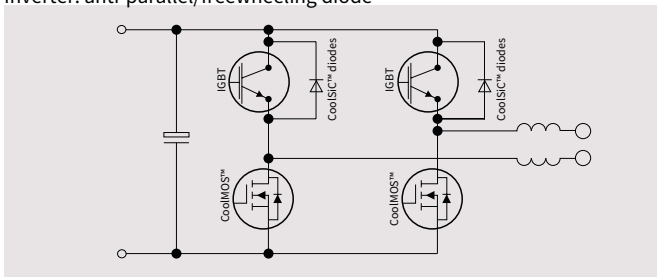
Classic PFC



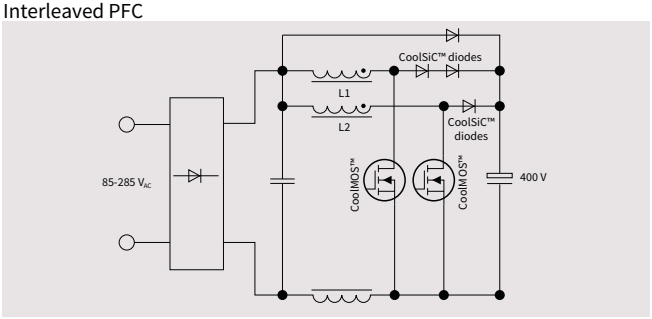
Bridgeless PFC



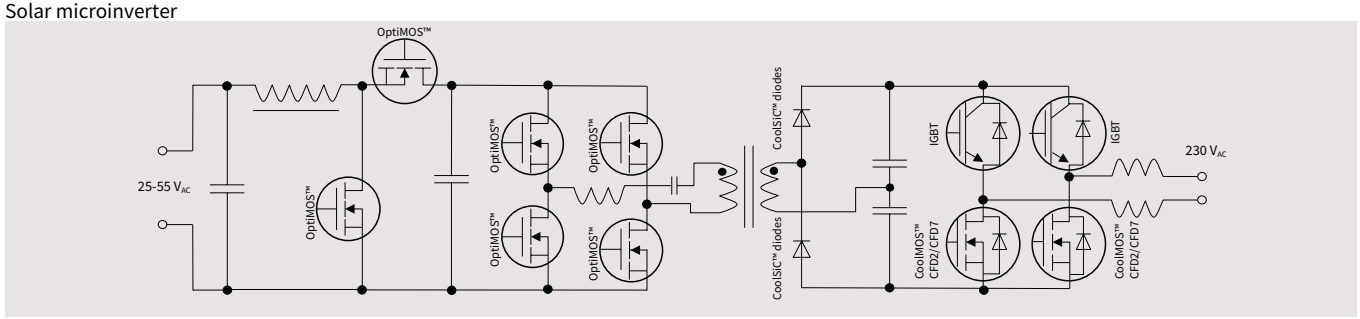
Inverter: anti-parallel/freewheeling diode



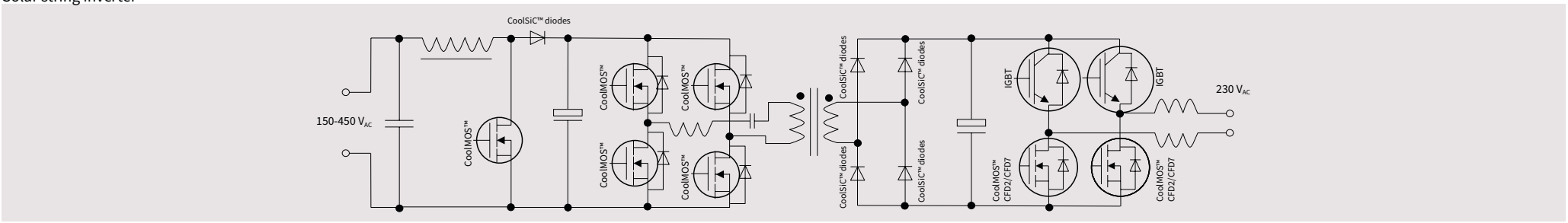
Interleaved PFC



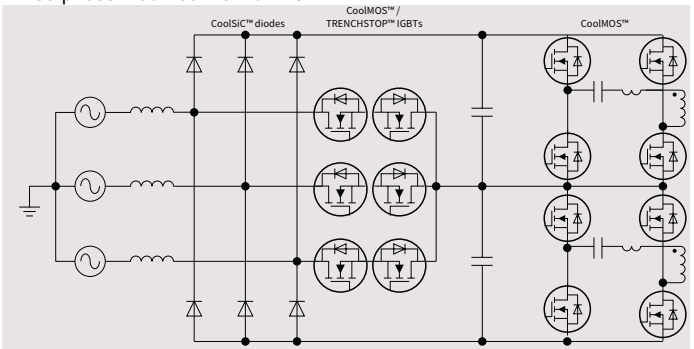
Solar microinverter



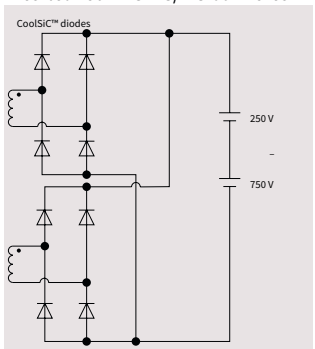
Solar string inverter



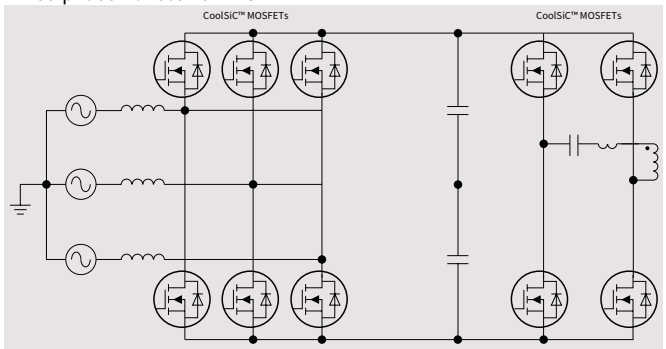
Three-phase modified Vienna PFC



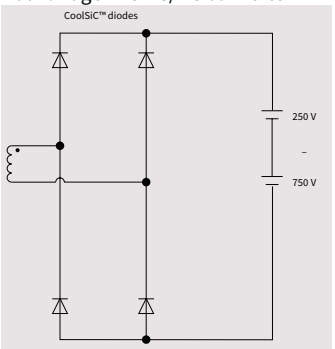
Interleaved LLC DC/DC converter



Three-phase B6 rectifier PFC



Half-bridge LLC DC/DC converter



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