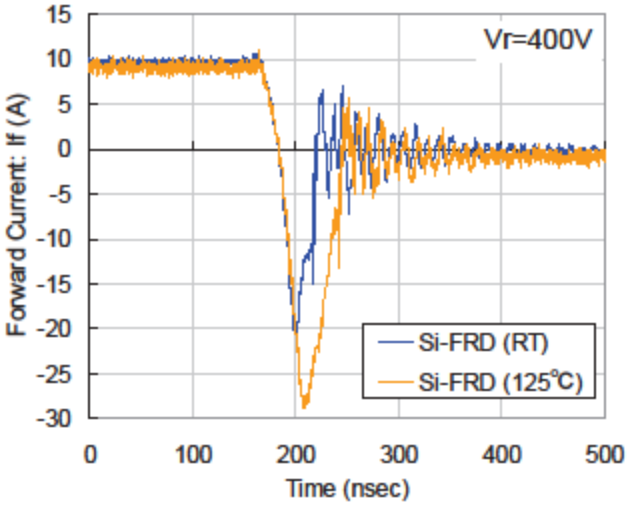
Rohm Silicon Carbide (SiC) Schottky Barrier Diodes Characteristics

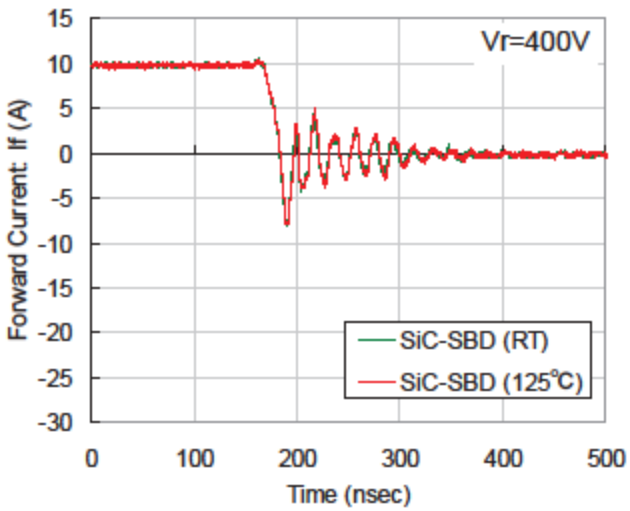
ROHM SiC SBD

Reverse Recovery Characteristics: Si-FRD vs SiC-SBD

Si-FRD



SiC-SBD



Large recovery current and noise
Even worse at higher temperature

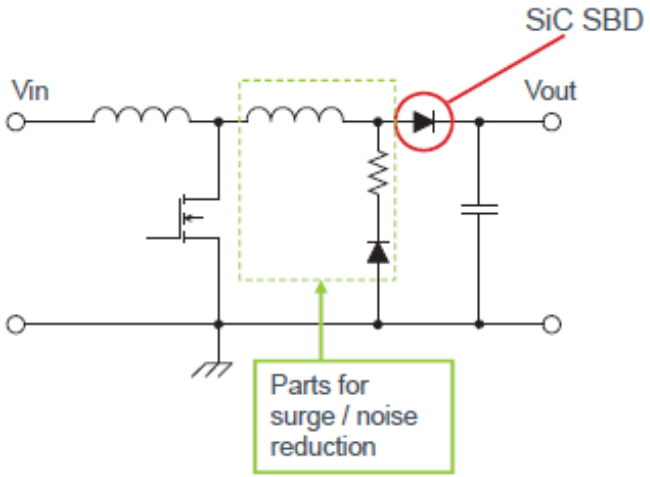
Small recovery current
No temperature dependency

ROHM Co.,Ltd.

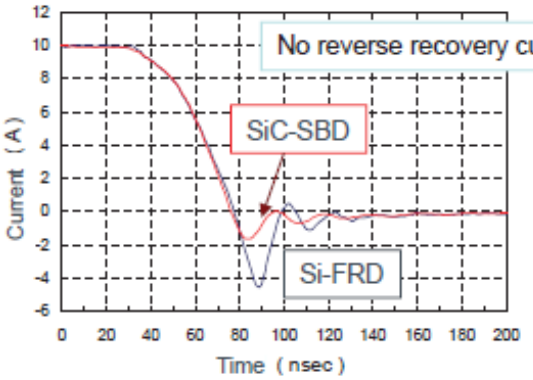
ROHM SiC SBD

Benefit of SiC SBD in PFC Circuit

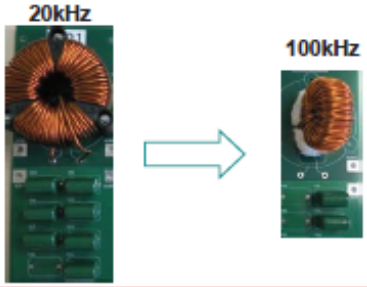
No recovery loss of SiC SBD enables improvement of efficiency while increasing switching frequency, and reduction of overall dimension of circuit



Switching waveform (600V 10A)



Dimension of circuit board



Higher switching frequency enables downsizing of components

ROHM SiC MOSFET

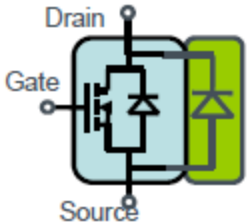
2nd Gen DMOSFET Product Lineup

BV_{DSS}	P/N	Package	$R_{Ds}on$	I_D max	SBD	Status
1200V	SCT2080KEC	TO247	80mΩ	40A	-	MP
1200V	SCH2080KEC	TO247	80mΩ	40A	Co-packed	MP
1200V	SCT2160KEC	TO247	160mΩ	22A	-	MP
1200V	SCT2280KEC	TO247	280mΩ	14A	-	MP
1200V	SCT2450KEC	TO247	450mΩ	10A	-	MP
650V	SCT2120AFC	TO220AB	120mΩ	29A	-	MP
400V	SCTMU001F (For Audio)	TO220AB	120mΩ	20A	-	MP

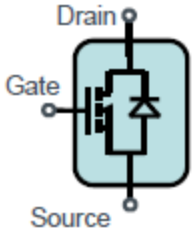
TO247

TO220AB

SCHseries



SCTseries



As of Oct 24, 2013

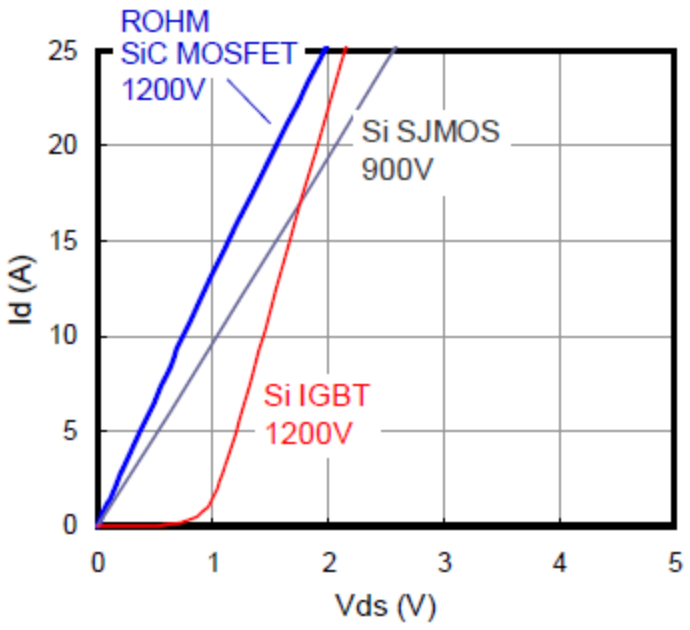
ROHM Co.,Ltd.

Rohm Silicon Carbide (SiC) MOSFET Characteristics

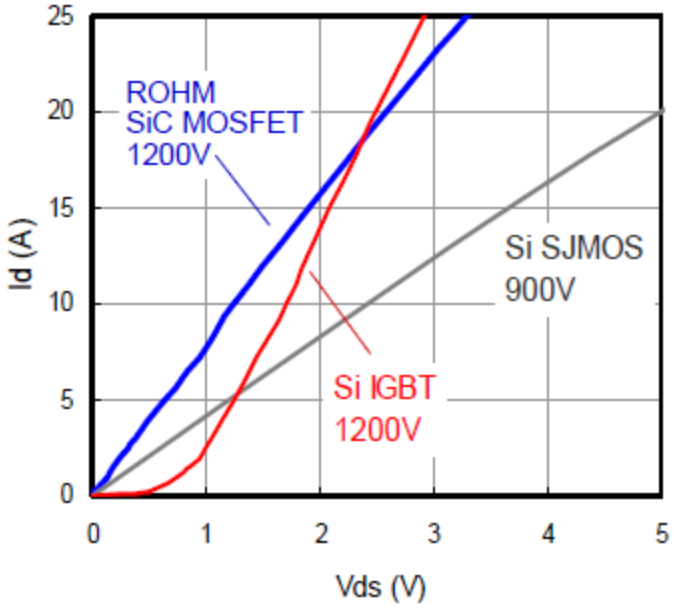
ROHM SiC MOSFET

Comparison of Vds-Id characteristics

Comparison of Vd – Id（at T=25°C）



Comparison of Vd – Id（at T=150°C）



※These data are provided to show a result of evaluation done by ROHM for your reference. ROHM does not guarantee any of the characteristics shown here.

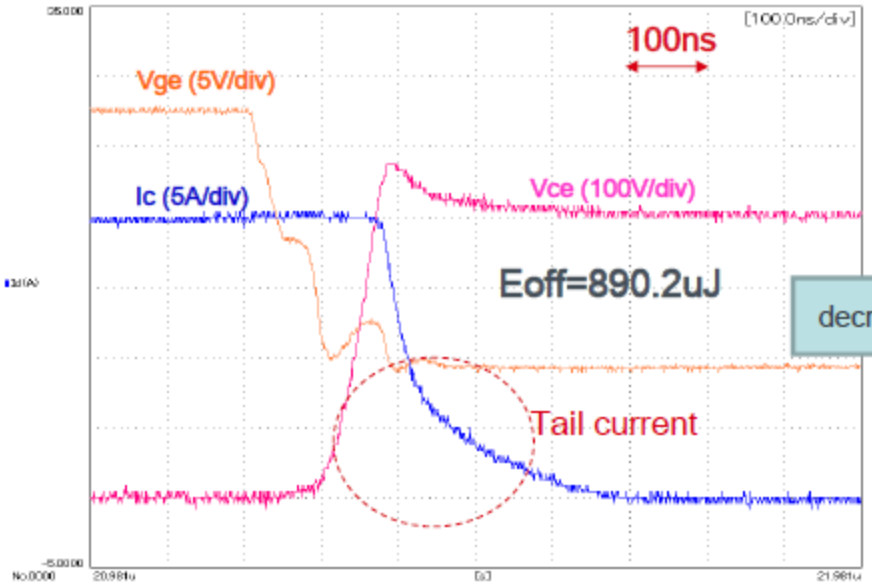
ROHM Co.,Ltd.

ROHM SiC MOSFET

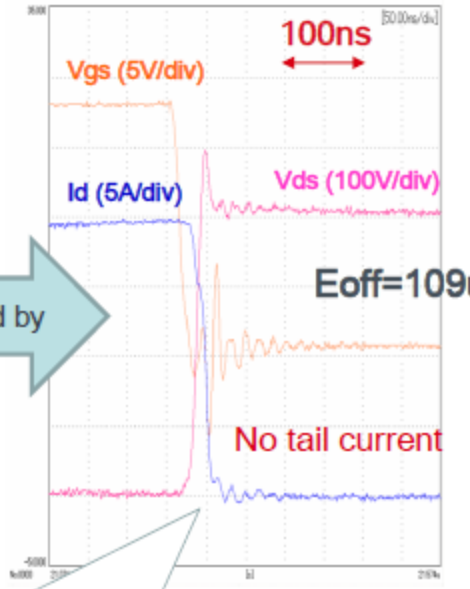
Turn-Off Loss

Vdd=400V, Ic=20A, Ta=25°C
Vgs=+18V/0V, Rg external =5.6ohm

IGBT+FRD



SCH2080KE (SiC-MOS+SBD)



Eoff decreased by 88%

Tail current results in large switching loss
Worse at elevated temperatures

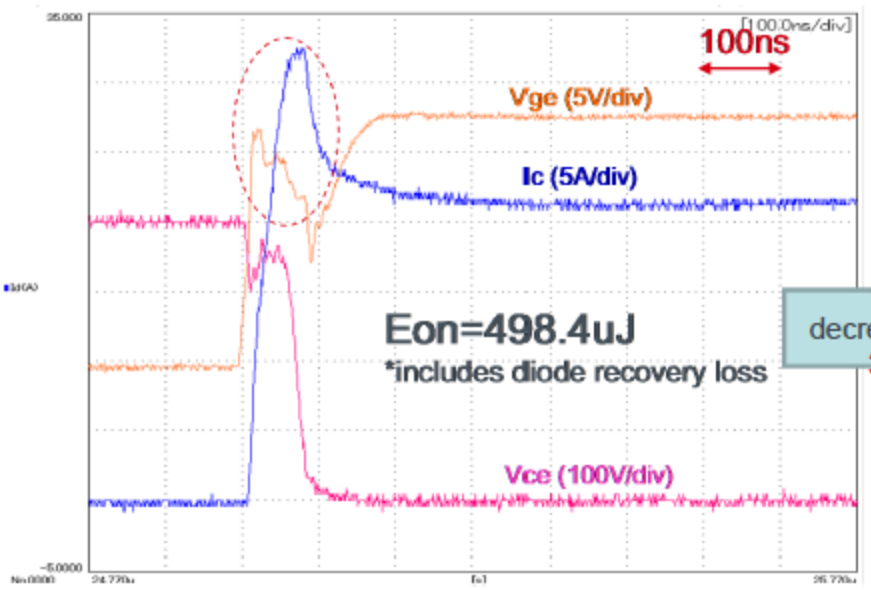
Small Rg (0-5Ω) is recommended for high speed switching
(The device has high internal Rg)

ROHM SiC MOSFET

Turn-On Loss

Vdd=400V, Ic=20A, Ta=25°C
Vgs=+18V/0V, Rg external =5.6ohm

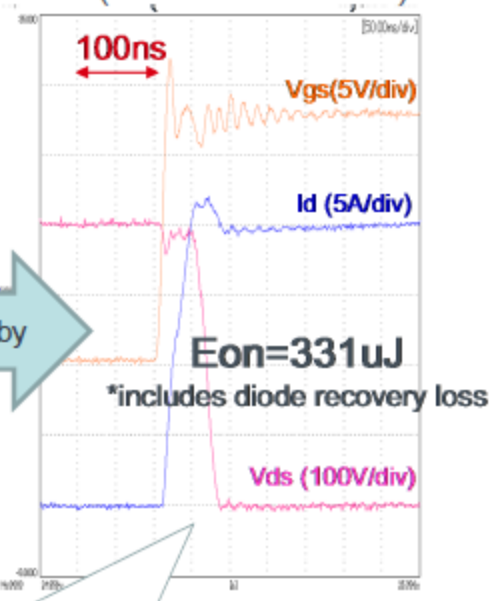
IGBT+FRD



Large switching loss due to FRD's recovery current
Worse at elevated temperatures

Eon decreased by 34%

SCH2080KE (SiC-MOS+SBD)



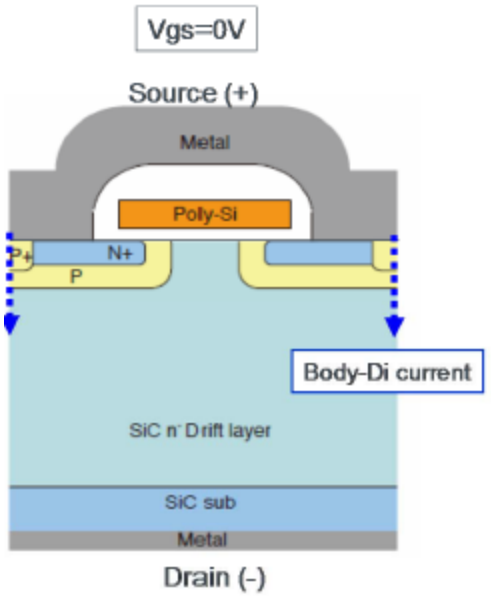
Small Rg (0-5Ω) is recommended for high speed switching
(The device has high internal Rg)

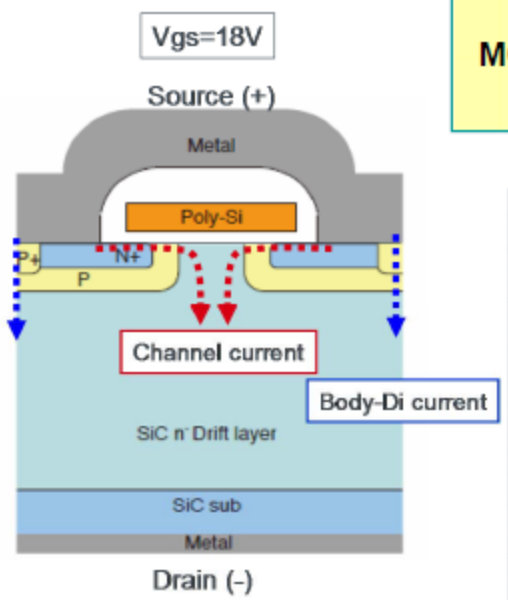
ROHM Co.,Ltd.

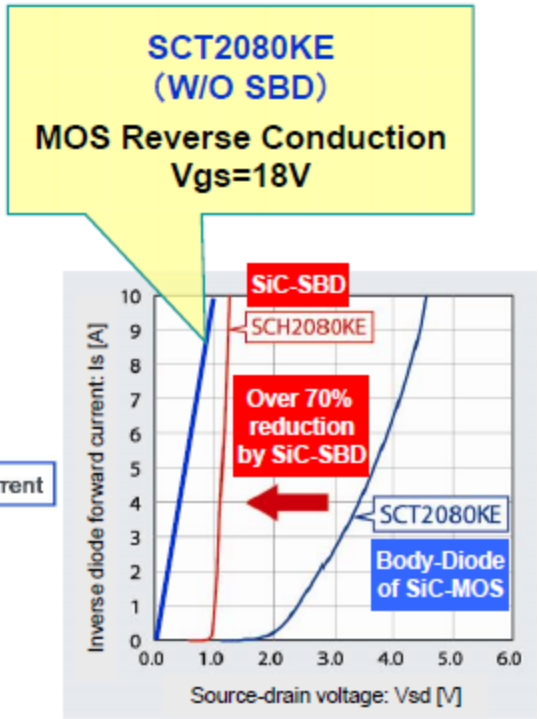
ROHM SiC MOSFET

Reverse Conduction of SiC-MOSFET

Although VF of SiC-MOSFET is very high, it allows reverse conduction through channel with its gate turning on.



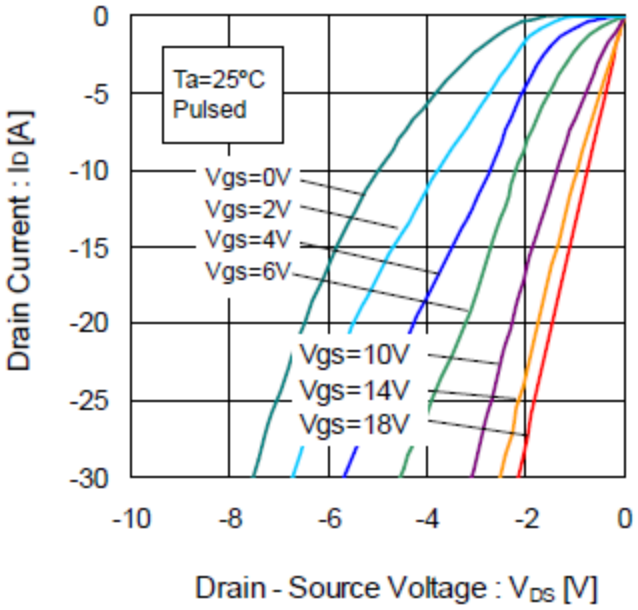




ROHM SiC MOSFET

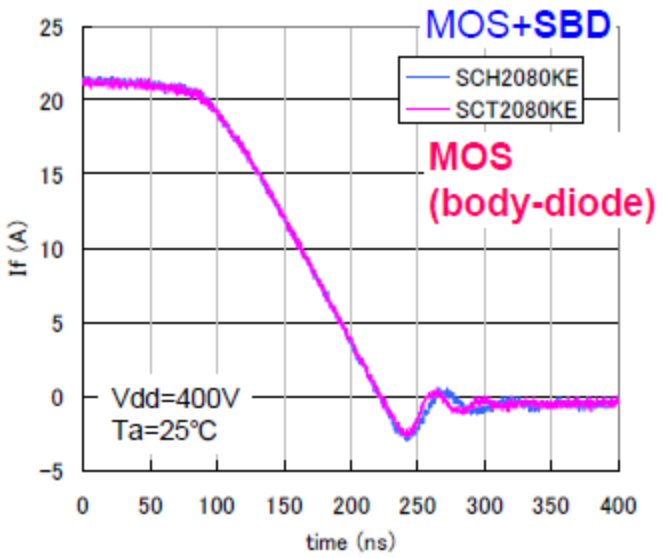
Characteristics of Body Di of SiC-MOSFET

Vd- Id Characteristics (reverse direction)



As a wide-bandgap semiconductor, Vf of body Di is high. But with its gate turning on, much lower Vf can be obtained by reverse conduction

Reverse recovery waveform



Unlike Si MOSFET, SiC MOSFET has a body Di with a quite small t_{rr}

ROHM Co.,Ltd.