

$V_{RRM}$	=	6000 V
$I_{FAVM}$	=	250 A
$I_{FSM}$	=	3.6 kA
$V_{F0}$	=	2.5 V
$r_F$	=	2.5 m $\Omega$
$V_{DClink}$	=	3000 V

## Fast Recovery Diode

# 5SDF 02D6002

## PRELIMINARY

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- Patented free-floating silicon technology
- Low switching losses
- Optimized for use as snubber diode in high-voltage GTO converters
- Standard press-pack ceramic housing, hermetically cold-welded
- Cosmic radiation withstand rating

### Blocking

$V_{RRM}$	Repetitive peak reverse voltage	6000 V	Half sine wave, $t_p = 10$ ms, $f = 50$ Hz	
$I_{RRM}$	Repetitive peak reverse current	$\leq 50$ mA	$V_R = V_{RRM}$ , $T_j = 125^\circ\text{C}$	
$V_{DClink}$	Permanent DC voltage for 100 FIT failure rate	3000 V	100% Duty	Ambient cosmic radiation at sea level in open air.
		3800 V	5% Duty	

### Mechanical data (see Fig. 6)

$F_m$	Mounting force	min.	10 kN
		max.	12 kN
a	Acceleration:		
	Device unclamped	50 m/s <sup>2</sup>	
	Device clamped	200 m/s <sup>2</sup>	
m	Weight	0.25 kg	
$D_s$	Surface creepage distance	$\geq$	30 mm
$D_a$	Air strike distance	$\geq$	20 mm

**On-state** (see Fig. 1, 2)

$I_{FAVM}$	Max. average on-state current	250 A	Half sine wave, $T_c = 85^\circ\text{C}$	
$I_{FRMS}$	Max. RMS on-state current	400 A		
$I_{FSM}$	Max. peak non-repetitive surge current	3.6 kA	$t_p = 10 \text{ ms}$	Before surge: $T_c = T_j = 125^\circ\text{C}$
		11.4 kA	$t_p = 1 \text{ ms}$	
$\int I^2 dt$	Max. surge current integral	$65 \cdot 10^3 \text{ A}^2\text{s}$	$t_p = 10 \text{ ms}$	After surge: $V_R \approx 0 \text{ V}$
		$65 \cdot 10^3 \text{ A}^2\text{s}$	$t_p = 1 \text{ ms}$	
$V_F$	Forward voltage drop	$\leq 5 \text{ V}$	$I_F = 1000 \text{ A}$	$T_j = 125^\circ\text{C}$
$V_{F0}$	Threshold voltage	2.5 V	Approximation for	
$r_F$	Slope resistance	2.5 m $\Omega$	$I_F = 200 \dots 4000 \text{ A}$	

**Turn-on** (see Fig. 3, 4)

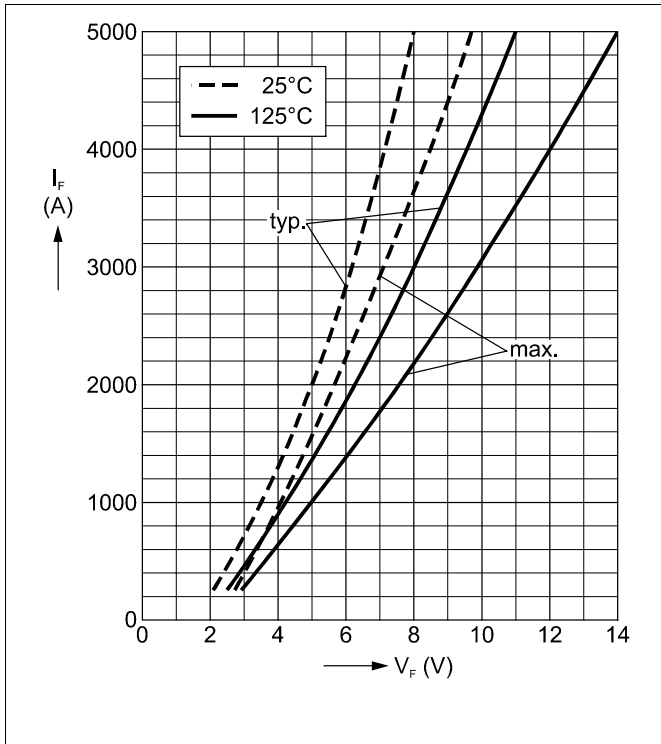
$V_{fr}$	Peak forward recovery voltage	$\leq 370 \text{ V}$	$di/dt = 1000 \text{ A}/\mu\text{s}$ , $T_j = 125^\circ\text{C}$
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**Turn-off** (see Fig. 5)

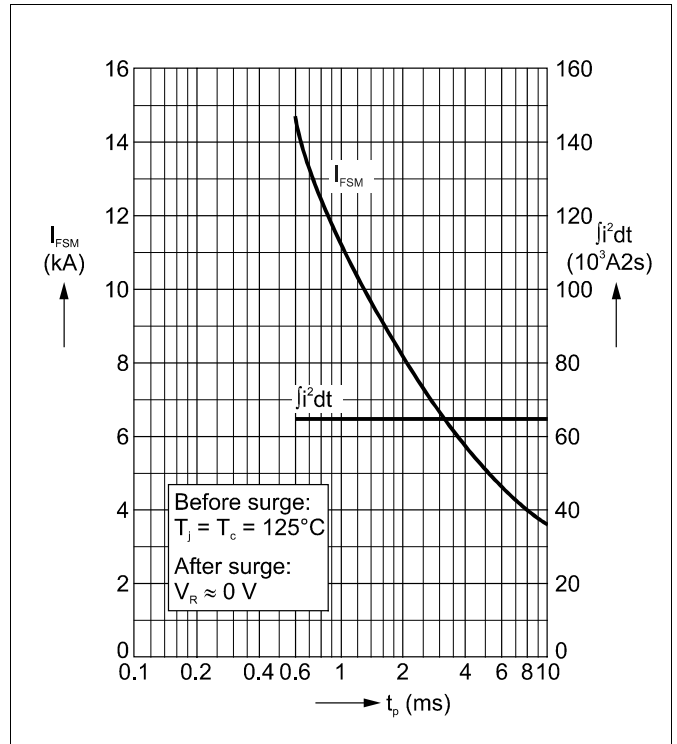
$I_{rr}$	Reverse recovery current	$\leq 260 \text{ A}$	$di/dt = 100 \text{ A}/\mu\text{s}$ , $T_j = 125^\circ\text{C}$ , $I_F = 1000 \text{ A}$ , $V_{RM} = V$ , $R_S = 22 \Omega$ , $C_S = 0.22 \mu\text{F}$
$Q_{rr}$	Reverse recovery charge	$\leq 2000 \mu\text{C}$	
$E_{rr}$	Turn-off energy	$\leq \text{-- J}$	

**Thermal** (see Fig. 7)

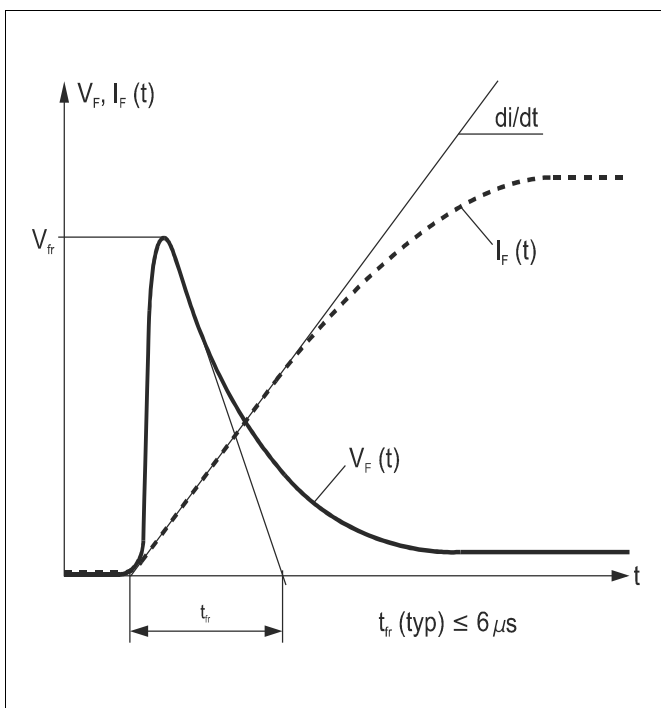
$T_j$	Operating junction temperature range	-40...125°C		
$T_{stg}$	Storage temperature range	-40...125°C		
$R_{thJC}$	Thermal resistance junction to case	$\leq 80 \text{ K/kW}$	Anode side cooled	$F_M = 10 \dots 12 \text{ kN}$
		$\leq 80 \text{ K/kW}$	Cathode side cooled	
		$\leq 40 \text{ K/kW}$	Double side cooled	
$R_{thCH}$	Thermal resistance case to heatsink	$\leq 16 \text{ K/kW}$	Single side cooled	
		$\leq 8 \text{ K/kW}$	Double side cooled	



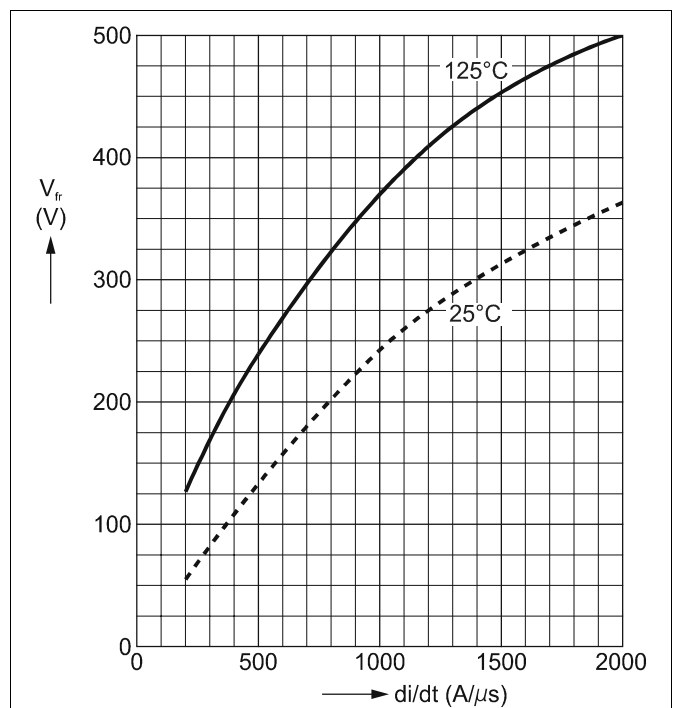
**Fig. 1** Forward current vs. forward voltage (typ. and max. values).



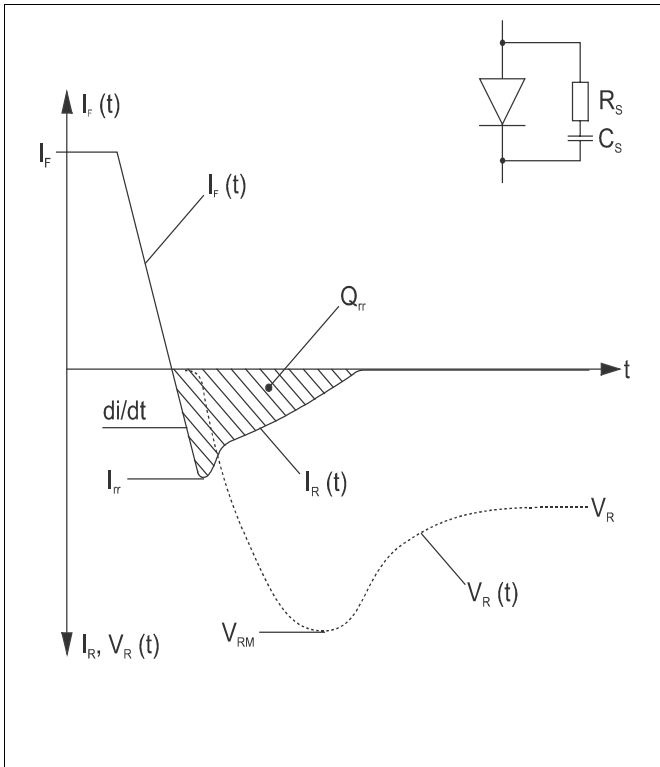
**Fig. 2** Surge current and fusing integral vs. pulse width (max. values) for non repetitive, half-sinusoidal surge current pulses.



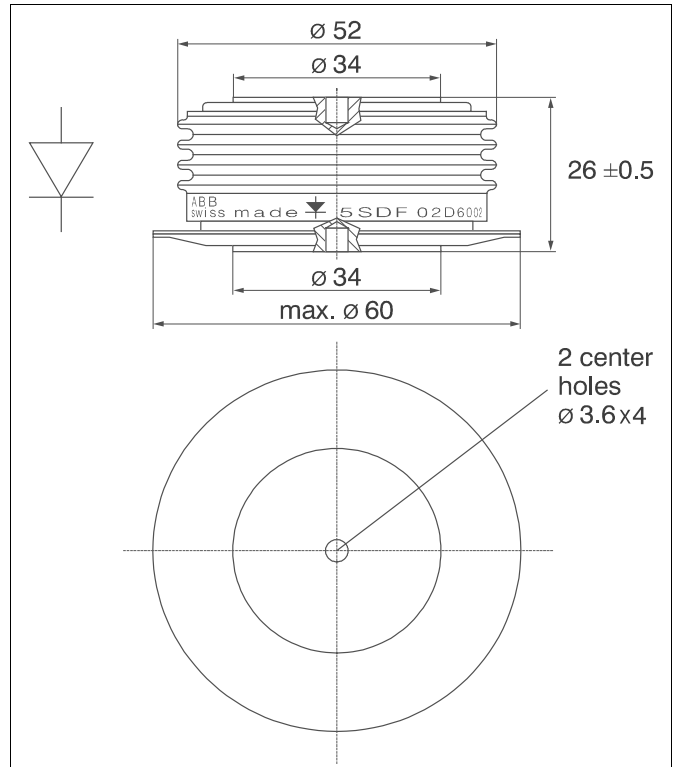
**Fig. 3** Typical forward voltage waveform when the diode is turned on with a high  $di/dt$ .



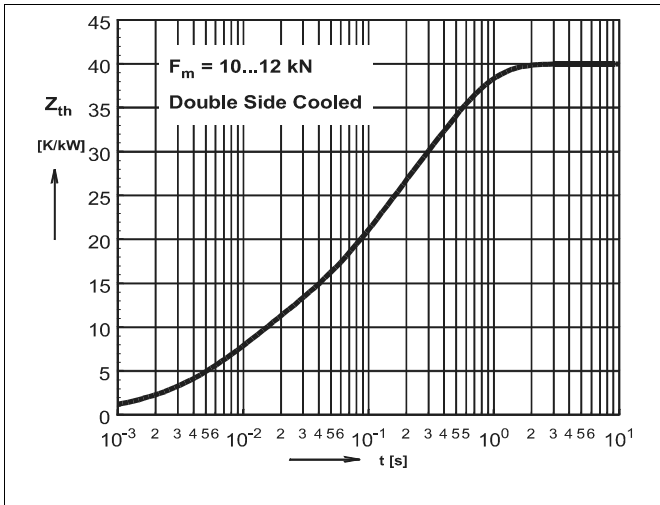
**Fig. 4** Forward recovery voltage vs. turn-on  $di/dt$  (max. values).



**Fig. 5** Typical current and voltage waveforms at turn-off with conventional RC snubber circuit



**Fig. 6** Outline drawing. All dimensions are in millimeters and represent nominal values unless stated otherwise.



**Fig. 7** Transient thermal impedance (junction to case) vs. time in analytical and graphical form (max. values).

$$Z_{thJC}(t) = \sum_{i=1}^4 R_i (1 - e^{-t/\tau_i})$$

i	1	2	3	4
R <sub>i</sub> (K/kW)	20.95	10.57	7.15	1.33
τ <sub>i</sub> (s)	0.396	0.072	0.009	0.0044

F<sub>m</sub> = 10... 12 kN  
Double side cooled

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