V_{RRM}	=	2500	V
I_{FAVM}	=	490	A
I_{FSM}	=	8.5	kA
V_{F0}	=	1.4	V
r_F	=	0.52	mΩ
V_{DClink}	=	1100	V

Fast Recovery Diode

5SDF 05D2501

Doc. No. 5SYA 1112-03 Aug. 2000

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

Blocking

V_{RRM}	Repetitive peak reverse voltage	2500 V	Half sine wave, t_P = 10 ms, f = 50 Hz		
I_{RRM}	Repetitive peak reverse current	≤ 50 mA	$V_R = V_{RRM}$, T_j = 125°C		
V_{DClink}	Permanent DC voltage for 100 FIT failure rate	1100 V	100% Duty	Ambient cosmic radiation at sea level in open air.
		1500 V	5% Duty	

Mechanical data (see Fig. 7)

F_m	Mounting force	min.	10 kN
		max.	12 kN
a	Acceleration: Device unclamped Device clamped		 50 m/s^2 200 m/s^2
m	Weight		0.25 kg
D_S	Surface creepage distance		≥ 30 mm
D_a	Air strike distance		≥ 20 mm

On-state (see Fig. 1, 2)

I_{FAVM}	Max. average on-state current	490 A	Half sine wave, T_c = 85°C	
I_{FRMS}	Max. RMS on-state current	770 A		
I_{FSM}	Max. peak non-repetitive surge current	8.5 kA	tp = 10 ms	Before surge:
		27 kA	tp = 1 ms	$T_c = T_j$ = 125°C
$\int I^2dt$	Max. surge current integral	$0.36 \cdot 10^6$ A^2s	tp = 10 ms	After surge:
		$0.37 \cdot 10^6$ A^2s	tp = 1 ms	$V_R \approx 0$ V
V_F	Forward voltage drop	≤ 1.9 V	I_F = 1000 A	T_j = 125°C
V_{F0}	Threshold voltage	1.4 V	Approximation for	
r_F	Slope resistance	0.52 mΩ	I_F = 600…4000 A	

Turn-on (see Fig. 3, 4)

V_{fr}	Peak forward recovery voltage	≤ 17 V	di/dt = 500 A/µs, T_j = 125°C

Turn-off (see Fig. 5)

I_{rr}	Reverse recovery current	≤ 175 A	di/dt = 100 A/µs,	T_j = 125 °C,
Q_{rr}	Reverse recovery charge	≤ 500 µC	I_F = 2000 A,	V_{RM} = 2500 V,
E_{rr}	Turn-off energy	≤ -- J	R_S = 22 Ω,	C_S = 0.22 µF

Thermal (see Fig. 8)

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

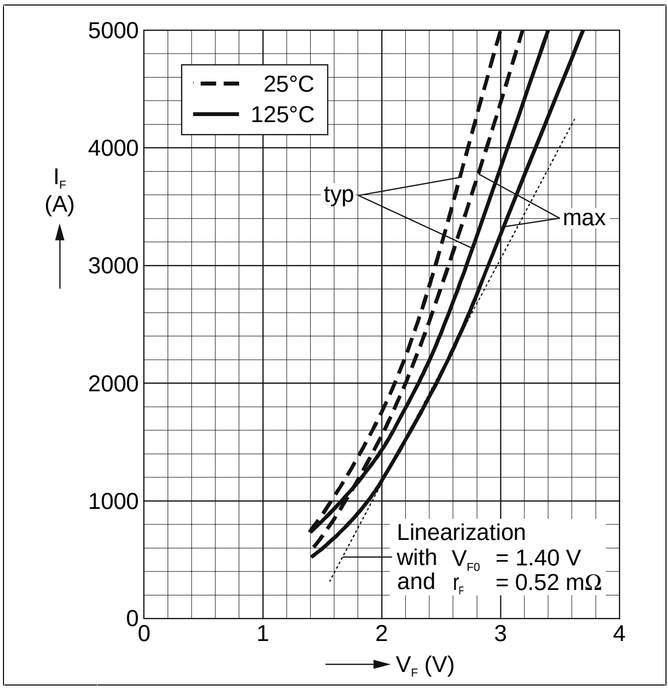


Fig. 1 Forward current vs. forward voltage (typ. and max. values) and linear approximation of max. curve at 125°C.

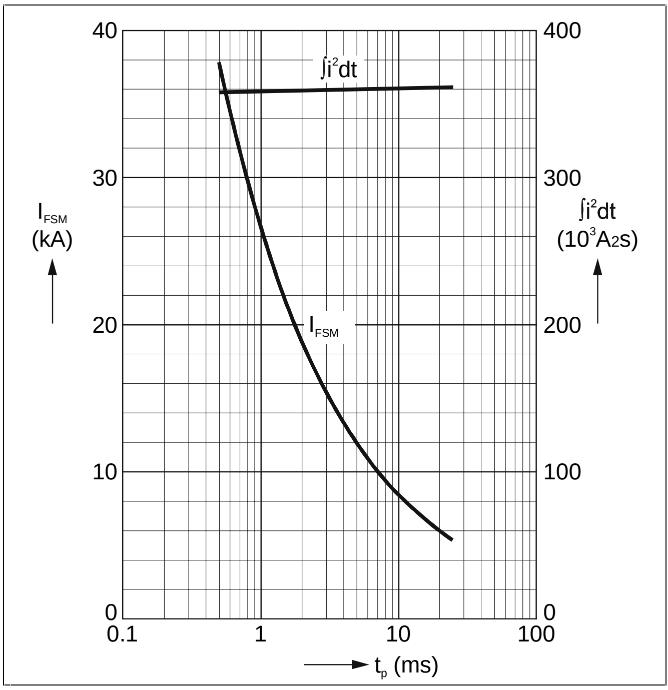


Fig. 2 Surge current and fusing integral vs. pulse width (max. values) for non-repetitive, half-sinusoidal surge current pulses.

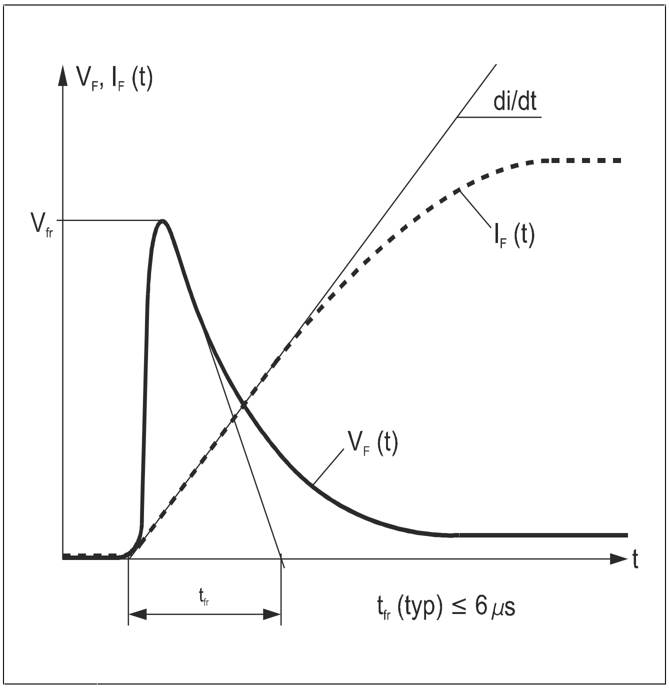


Fig. 3 Typical forward voltage waveform when the diode is turned on with a high di/dt.

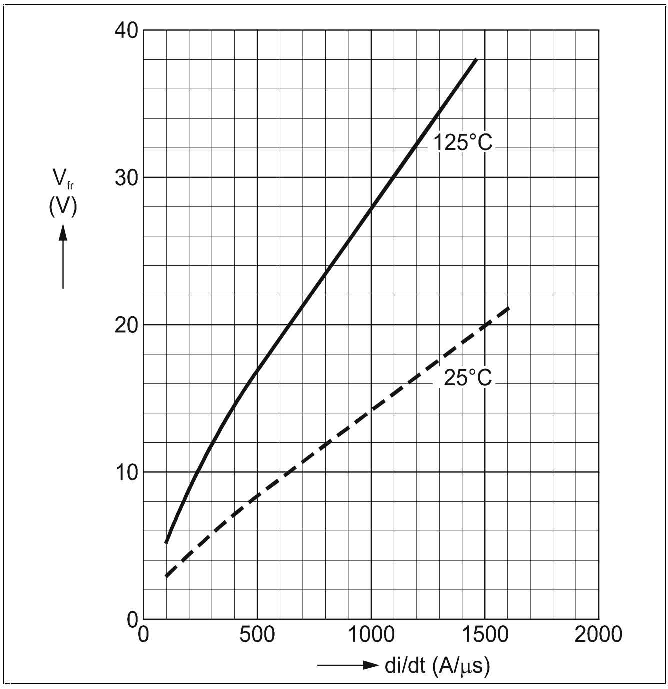


Fig. 4 Forward recovery voltage vs. turn-on di/dt (max. values).

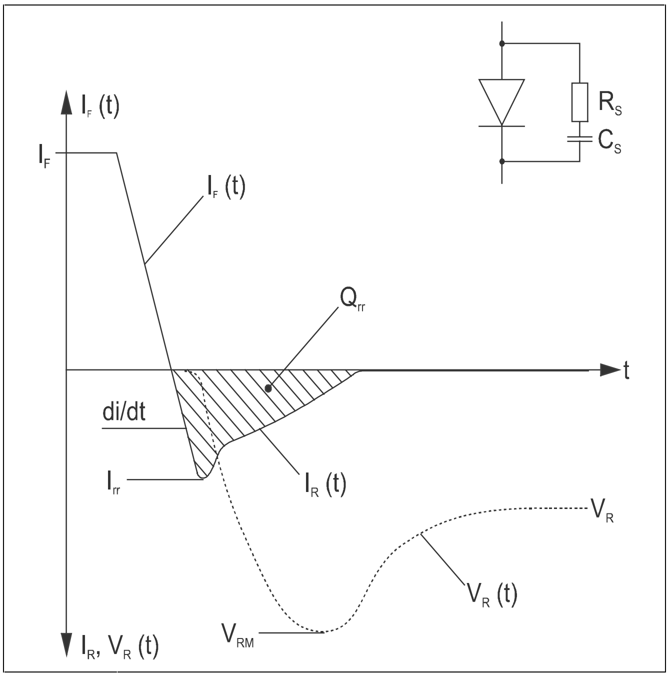


Fig. 5 Typical current and voltage waveforms at turn-off with conventional RC snubber circuit.

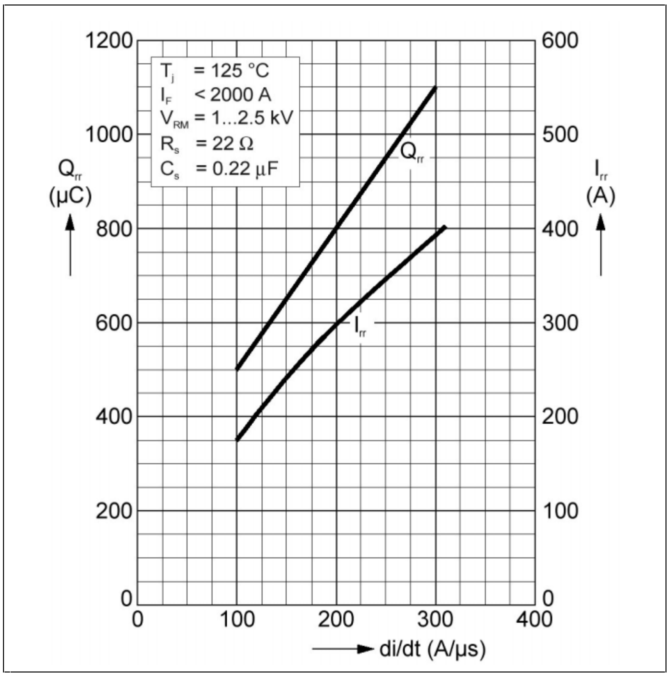


Fig. 6 Reverse recovery current and reverse recovery charge vs. di/dt (max. values).

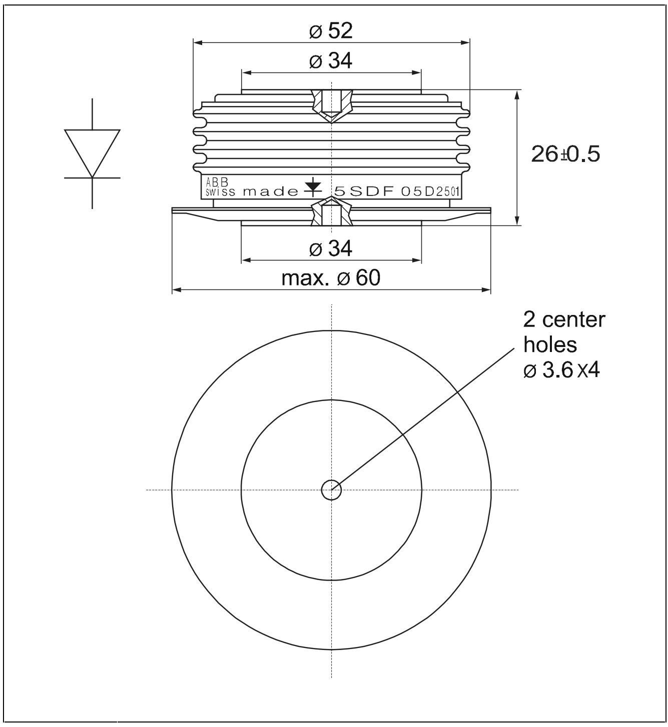
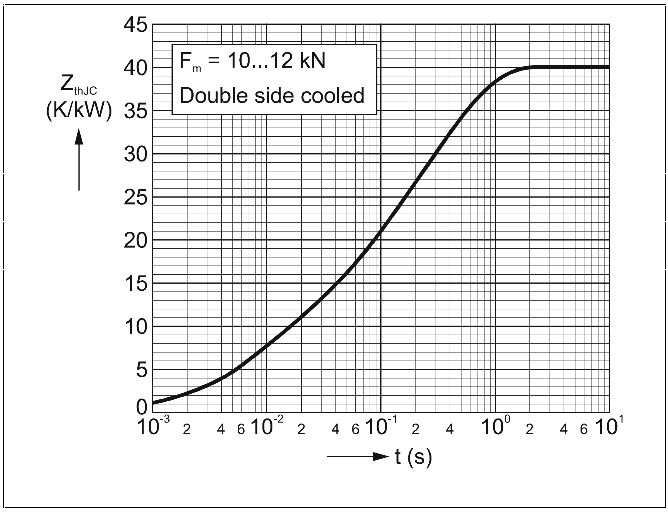


Fig. 7 Outline drawing. All dimensions are in millimeters and represent nominal values unless stated otherwise.



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

i	1	2	3	4
R_i (K/kW)	20.95	10.57	7.15	1.33
τ_i (s)	0.396	0.072	0.009	0.0044

F_m = 10… 12 kN

Double side cooled

Fig. 8 Transient thermal impedance (junction-to-case) vs. time in analytical and graphical form (max. values).

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Doc. No. 5SYA 1112-03 Aug. 2000