V_{RRM}	=	4500	V
I_{FAVM}	=	810	A
I_{FSM}	=	24	kA
V_{F0}	=	2.42	V
r_F	=	1.1	mΩ
V_{DClink}	=	2800	V

Fast Recovery Diode

5SDF 10H4502

PRELIMINARY

Doc. No. 5SYA1115-03 Sep. 01

- **Patented free-floating technology**
- **Industry standard housing**
- **Cosmic radiation withstand rating**
- **Low on-state and switching losses**
- **Optimized to use in snubberless operation**

Blocking

V_{RRM}	Repetitive peak reverse voltage	4500 V	Half sine wave, t_P = 10 ms, f = 50 Hz	
I_{RRM}	Repetitive peak reverse current	≤ 30 mA	$V_R = V_{RRM}$, T_j = 115°C	
V_{DClink}	Permanent DC voltage for 100 FIT failure rate	2800 V	100% Duty	Ambient cosmic radiation at sea level in open air.
V_{DClink}	Permanent DC voltage for 100 FIT failure rate	3200 V	5% Duty	

Mechanical data

F_m	Mounting force	min.	42 kN	
		max.	46 kN	
a	Acceleration: Device unclamped Device clamped		 50 m/s^2 200 m/s^2	
m	Weight		0.83 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	810 A	Half sine wave, T_c = 70°C	
I_{FRMS}	Max. RMS on-state current	1270 A		
I_{FSM}	Max. peak non-repetitive surge current	24 kA	tp = 10 ms	Before surge: $T_c = T_j$ = 115°C
		40 kA	tp = 1 ms	
$\int I^2dt$	Max. surge current integral	$2.88 \cdot 10^6$ A^2s	tp = 10 ms	After surge: $V_R \approx 0$ V
		$0.8 \cdot 10^6$ A^2s	tp = 1 ms	
V_F	Forward voltage drop	≤ 4.85 V	I_F = 2200 A	T_j = 115°C
V_{F0}	Threshold voltage	2.42 V	Approximation for	
r_F	Slope resistance	1.1 mΩ	I_F = 400…3000 A	

Turn-on (see Fig. 3, 4)

V_{fr}	Peak forward recovery voltage	≤ 370 V	di/dt = 1000 A/µs, T_j = 115°C

Turn-off

di/dt_{crit}	Max. decay rate of on-state current	≤ 650 A/µs	I_F = 2200 A, T_j = 115 °C V_{Dclink} = 2800 V
I_{rr}	Reverse recovery current	≤ 1150 A	
Q_{rr}	Reverse recovery charge	≤ 2200 µC	
E_{rr}	Turn-off energy	≤ 4.5 J	

Thermal

T_j	Operating junction temperature range	-40...115°C		
T_{stg}	Storage temperature range	-40...125°C		
R_{thJC}	Thermal resistance junction to case	≤ 24 K/kW	Anode side cooled	F_m = 42… 46 kN
		≤ 24 K/kW	Cathode side cooled	
		≤ 12 K/kW	Double side cooled	
R_{thCH}	Thermal resistance case to heatsink	≤ 6 K/kW	Single side cooled	
		≤ 3 K/kW	Double side cooled	

Analytical function for transient thermal impedance.

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

i	1	2	3	4
R_i(K/kW)	5.64	2.01	0.74	0.40
τ_i(s)	0.524	0.0632	0.0065	0.0015
F_m = 42… 46 kN Double side cooled				

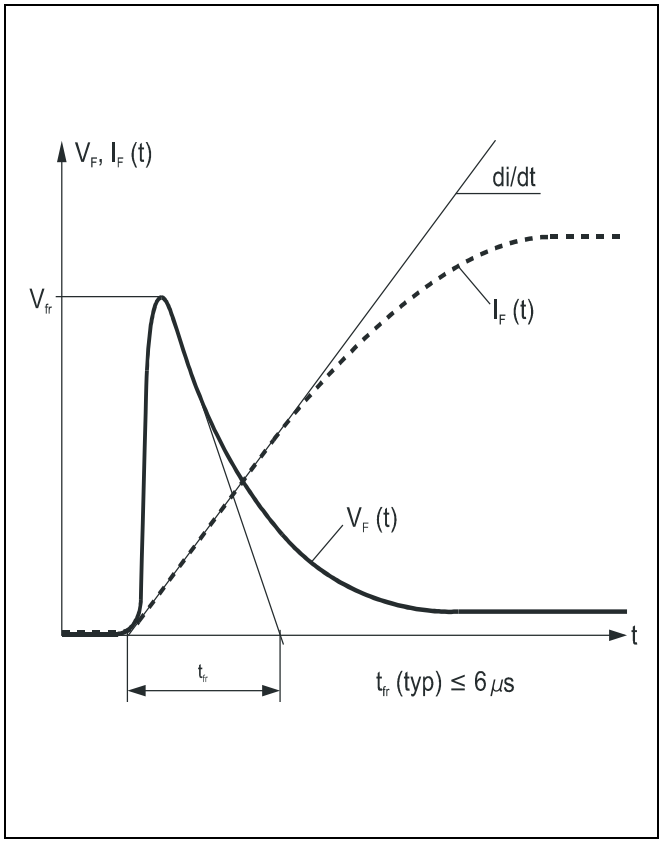

Fig. 1 Typical forward voltage waveform when the diode is turned on with high di/dt.

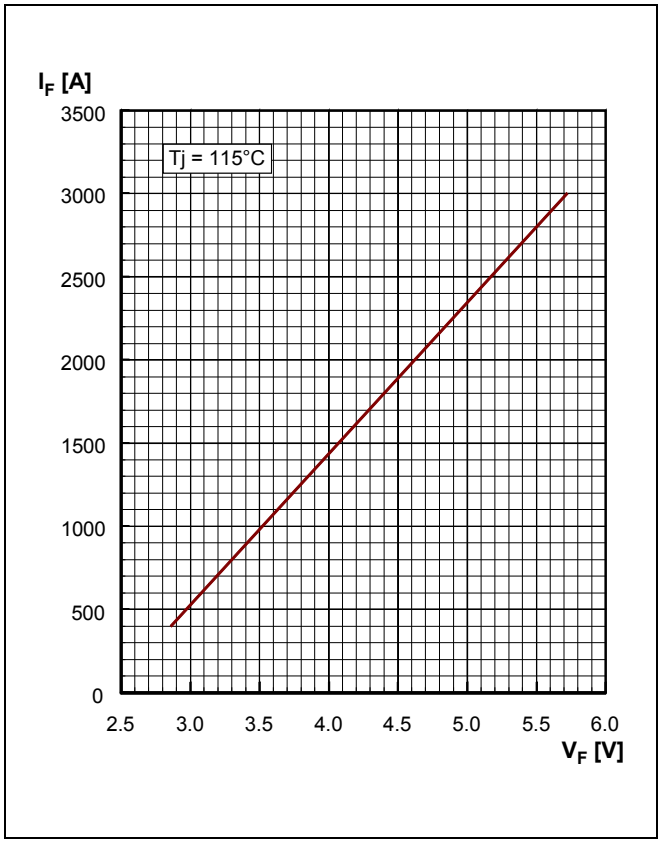

Fig. 2 Forward current vs. forward voltage.

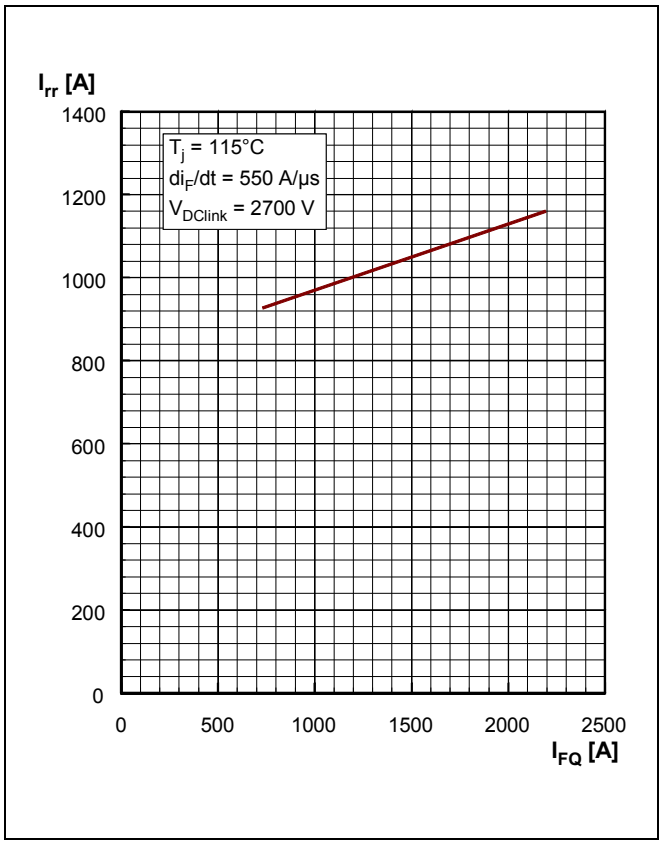

Fig. 3 Diode reverse recovery current vs. turn-off current.

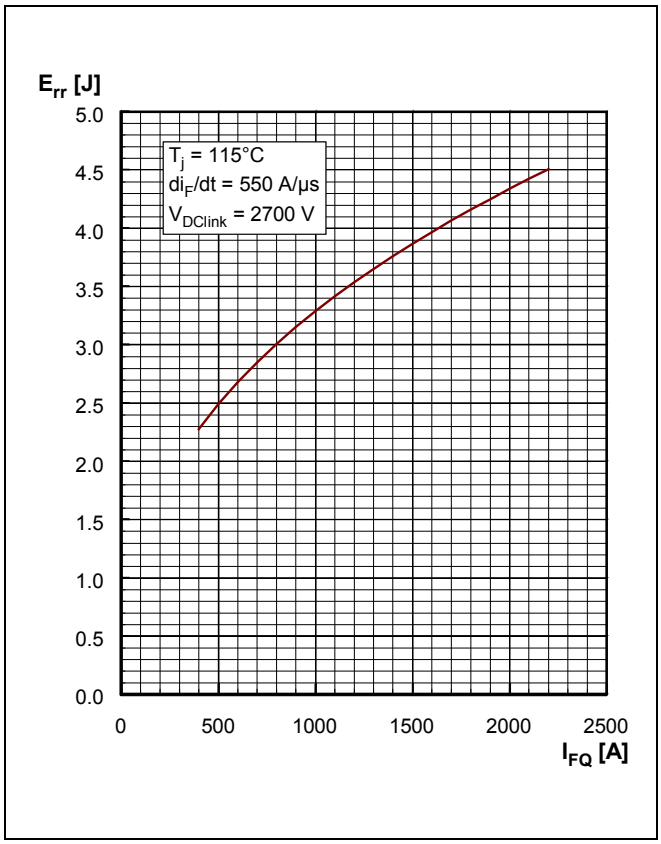

Fig. 4 Diode turn-off energy per pulse vs. turn-off current.

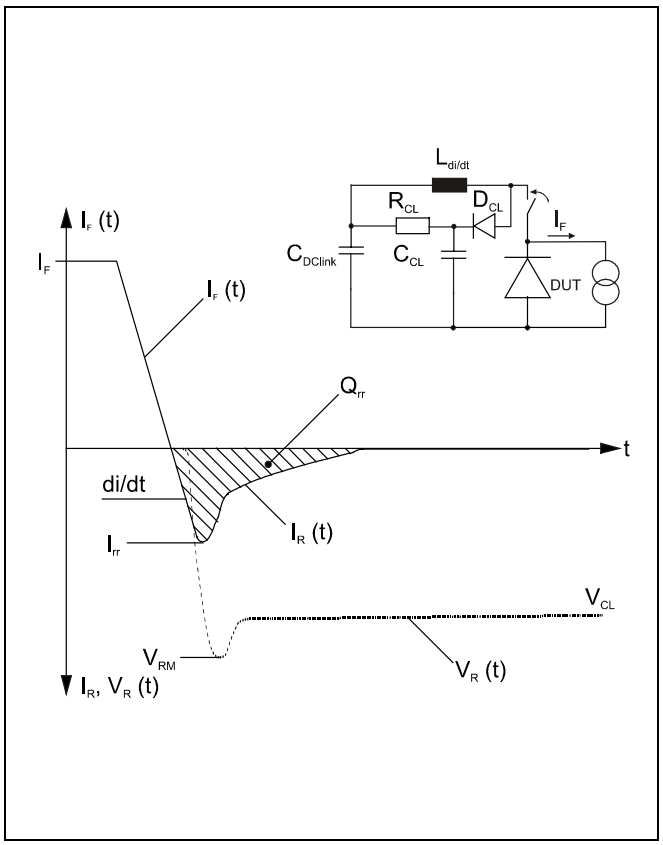

Fig. 5 Typical current and voltage waveforms at turn-off in a circuit with voltage clamp.

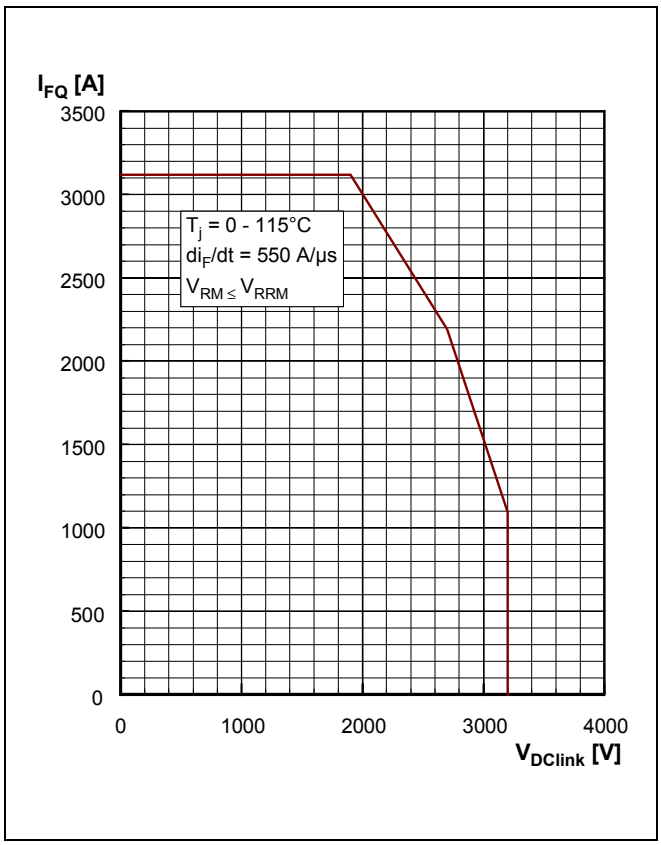

Fig. 6 Max. repetitive diode forward current.

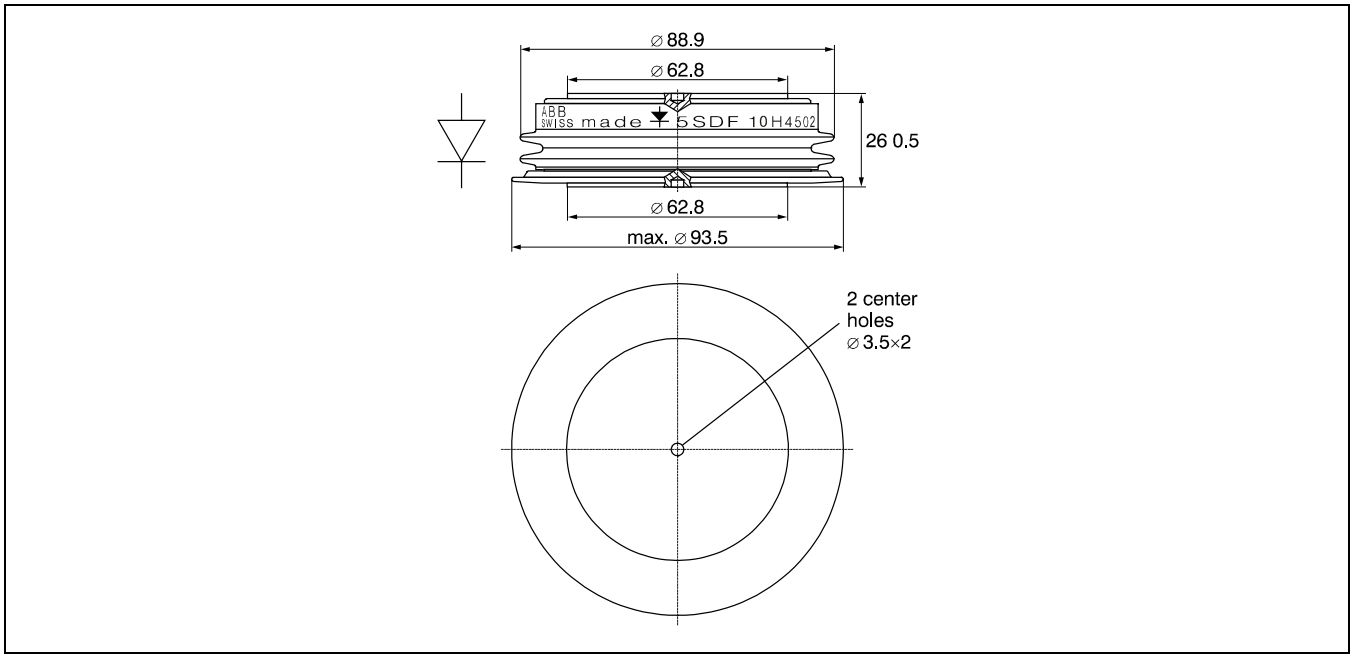

Fig. 7 Outline drawing. All dimensions are in millimeters and represent nominal values unless stated otherwise.

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