V_{RRM}	=	4500	V
I_{FAVM}	=	435	A
I_{FSM}	=	16	kA
V_{F0}	=	2.42	V
r_F	=	2.1	mΩ
V_{DClink}	=	2800	V

Fast Recovery Diode

5SDF 05F4502

Doc. No. 5SYA1151-01 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	≤ 20 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.	18 kN	
		max.	22 kN	
a	Acceleration: Device unclamped Device clamped		 50 m/s^2 200 m/s^2	
m	Weight		0.46 kg	
D_S	Surface creepage distance		≥ 33 mm	
D_a	Air strike distance		≥ 20 mm	

On-state (see Fig. 1, 2)

I_{FAVM}	Max. average on-state current	435 A	Half sine wave, T_c = 70°C	
I_{FRMS}	Max. RMS on-state current	685 A		
I_{FSM}	Max. peak non-repetitive surge current	16 kA	tp = 10 ms	Before surge: $T_c = T_j$ = 115°C
		32 kA	tp = 1 ms	
$\int I^2dt$	Max. surge current integral	$1.28 \cdot 10^6$ A^2s	tp = 10 ms	After surge: $V_R \approx 0$ V
		$0.5 \cdot 10^6$ A^2s	tp = 1 ms	
V_F	Forward voltage drop	≤ 4.7 V	I_F = 1100 A	T_j = 115°C
V_{F0}	Threshold voltage	2.42 V	Approximation for	
r_F	Slope resistance	2.1 mΩ	I_F = 200…2000 A	

Turn-on

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

Turn-off (see Fig. 3, 4)

di/dt_{crit}	Max. decay rate of on-state current	≤ 430 A/µs	I_F = 1100 A, V_{Dclink} = 2800 V	T_j = 115 °C
I_{rr}	Reverse recovery current	≤ 610 A	I_F = 1100 A, di/dt = 360 A/µs,	V_{DClink} = 2700 V, T_j = 115°C,
Q_{rr}	Reverse recovery charge	≤ µC		
E_{rr}	Turn-off energy	≤ 3.1 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	≤ 32 K/kW	Anode side cooled	F_m = 18… 22 kN
		≤ 32 K/kW	Cathode side cooled	
		≤ 17 K/kW	Double side cooled	
R_{thCH}	Thermal resistance case to heatsink	≤ 10 K/kW	Single side cooled	
		≤ 5 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)	9.64	3.08	1.18	0.55
τ_i(s)	0.381	0.428	0.0048	0.0013
F_m = 18… 22 kN Double side cooled				

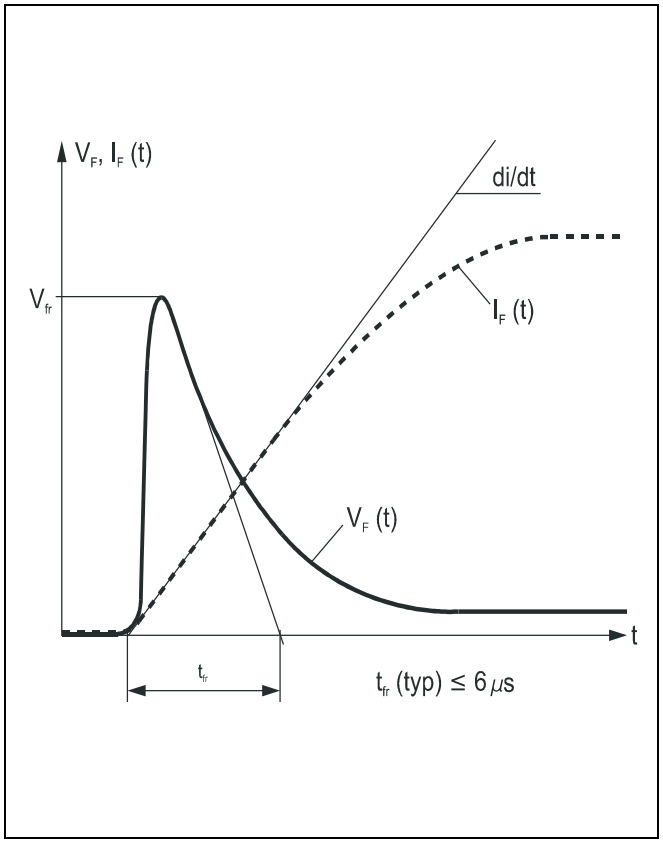

Fig. 1 Typical forward voltage waveform when the diode is turned on with high di/dt.

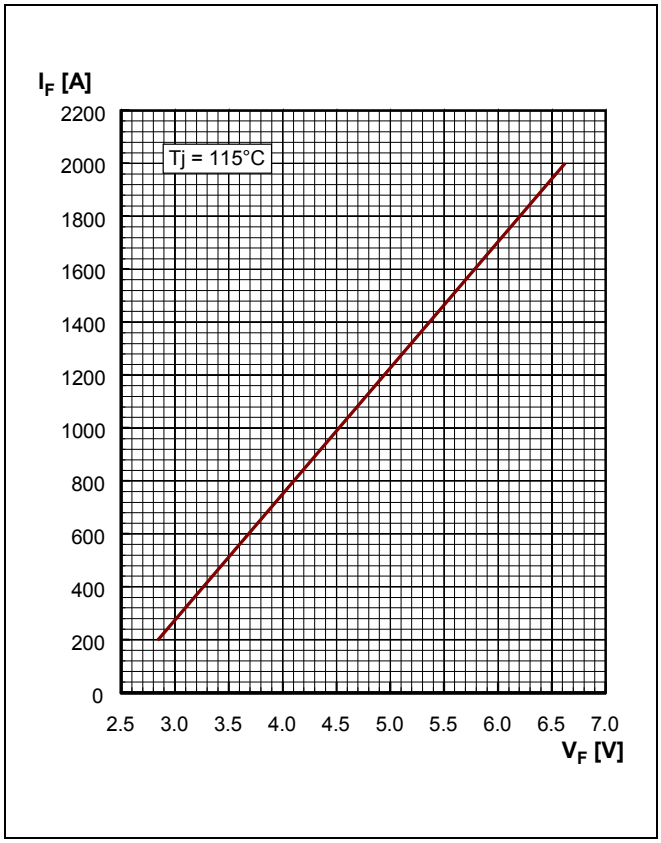

Fig. 2 Forward current vs. forward voltage.

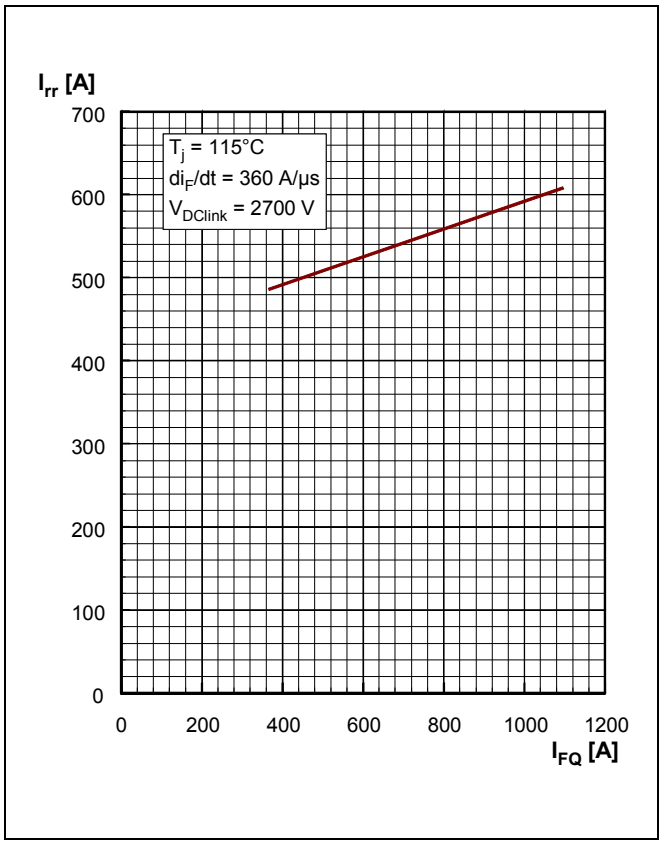

Fig. 3 Diode reverse recovery current vs. turn-off current.

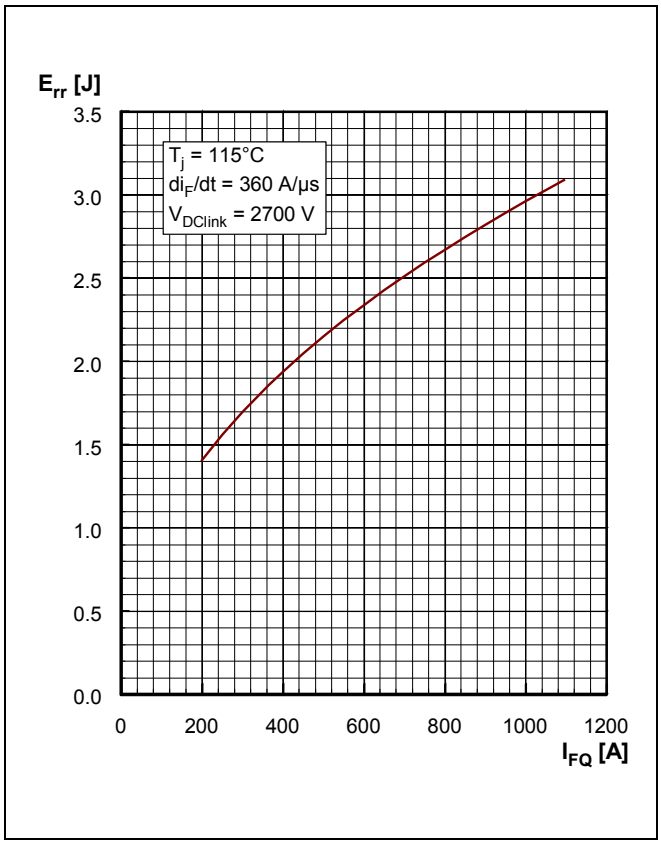

Fig. 4 Diode turn-off energy per pulse vs. turn-off current.

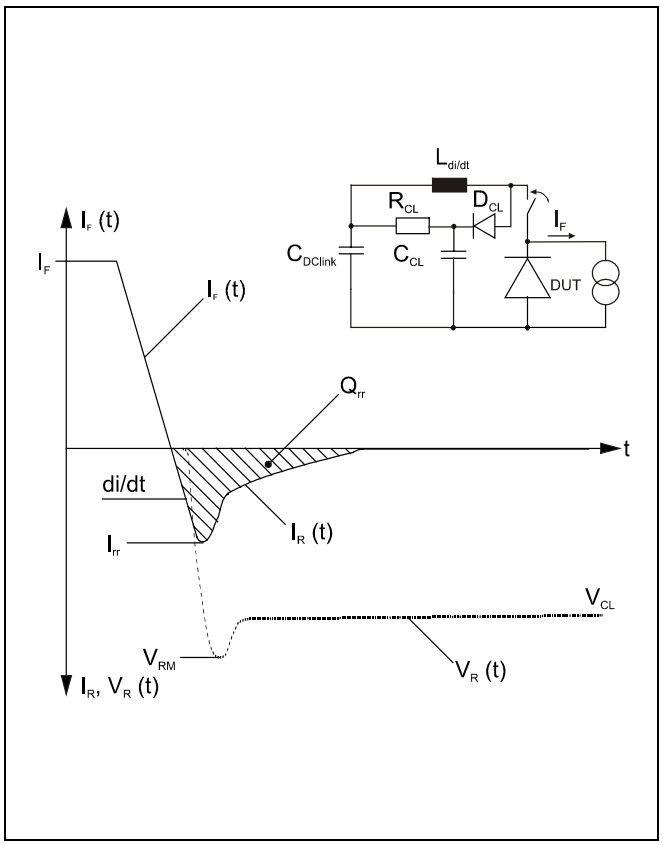

Fig. 5 Typical current and voltage waveforms at turn-off in a circuit with voltage clamp.

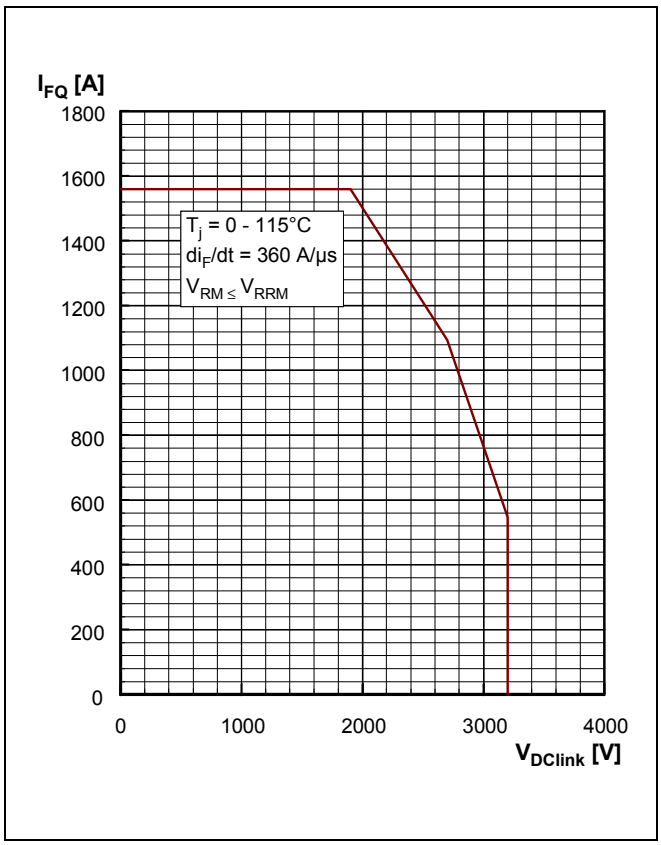

Fig. 6 Max. repetitive diode forward current.

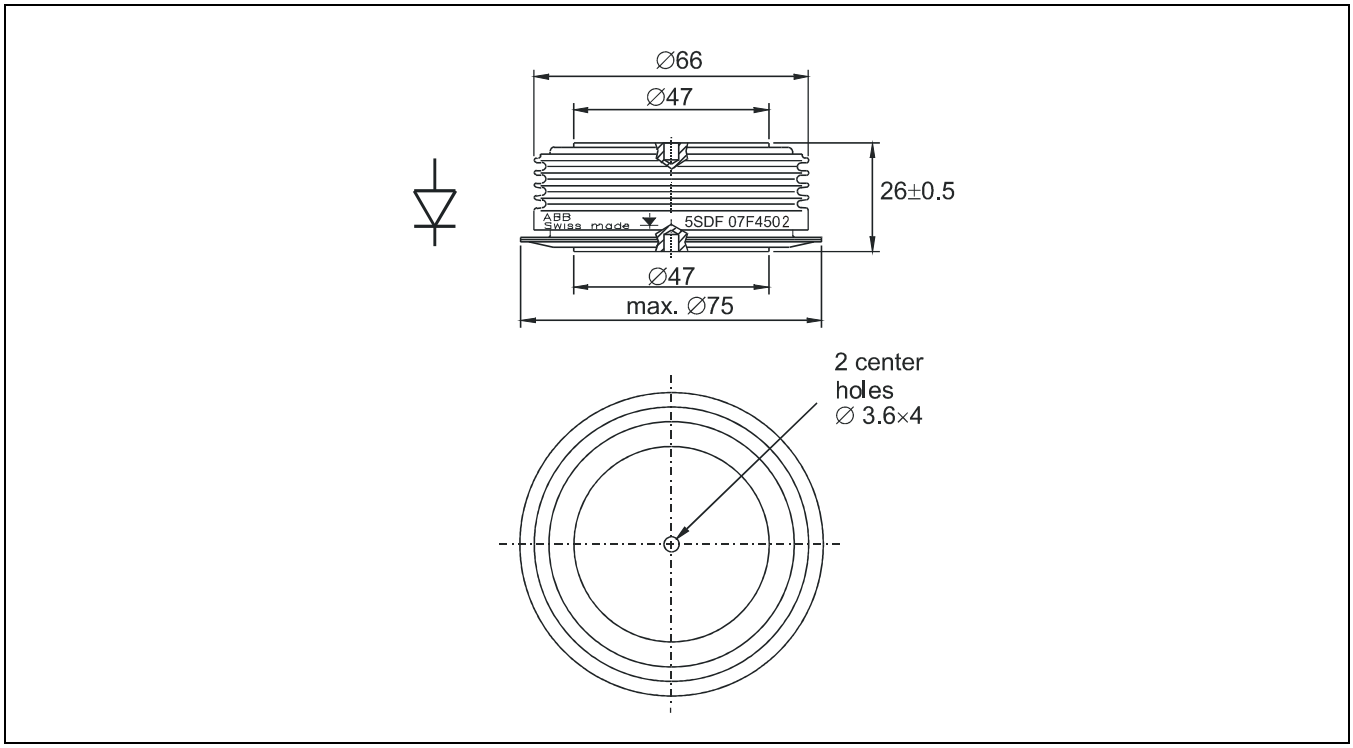

Fig. 7 Outline drawing. All dimensions are in millimeters and represent nominal values unless stated otherwise.

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