

Fast Recovery Diode

5SDF 05F4502

V_{RRM}	=	4500 V
I_{FAVM}	=	16 kA
I_{FSM}	=	2.42 V
$V_{FO rF}$	=	2.1 mΩ
V_{DCLink}	=	2800 V

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- 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	$V_R = V_{RRM}$, $T_j = 115^\circ\text{C}$	
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
D_s	Surface creepage distance	\geq	33 mm
D_a	Air strike distance	\geq	20 mm

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On-state (see Fig. 1, 2)

I_{FAVM}	Max. average on-state current	435 A	Half sine wave, $T_c = 70^\circ\text{C}$
I_{FRMS}	Max. RMS on-state current	685 A	

I _{FSM}	Max. peak non-repetitive surge current	16 kA	t _p = 10 ms	Before surge: T _c = T _j = 115°C
		32 kA	t _p = 1 ms	
I ² dt	Max. surge current integral	1.28·10 ⁶ A ² s	t _p = 10 ms	After surge: V _R ≈ 0 V
		0.5·10 ⁶ A ² s	t _p = 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 I _F = 200...2000 A	
r _F	Slope resistance	2.1 mΩ		

Turn-on

V _{fr}	Peak forward recovery voltage	≤ 370 V	di/dt = 1000 A/μs, T _j = 115°C
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Turn-off (see Fig. 3, 4)

di/dt _{crit}	Max. decay rate of on-state current	≤ 430 A/μs	I _F = 1100 A, T _j = 115 °C V _{Dclink} = 2800 V
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				

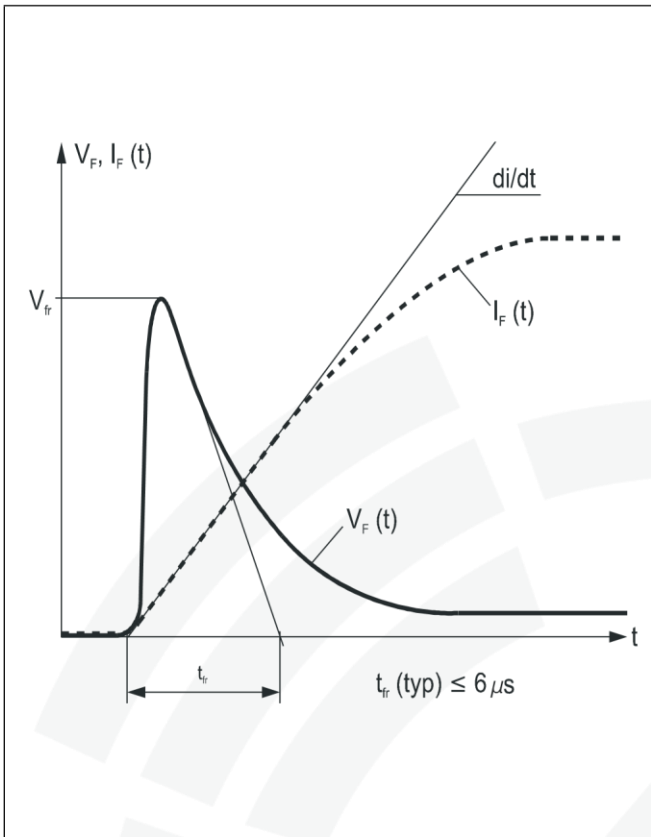


Fig. 1 Typical forward voltage waveform when the diode is turned on with high di/dt .

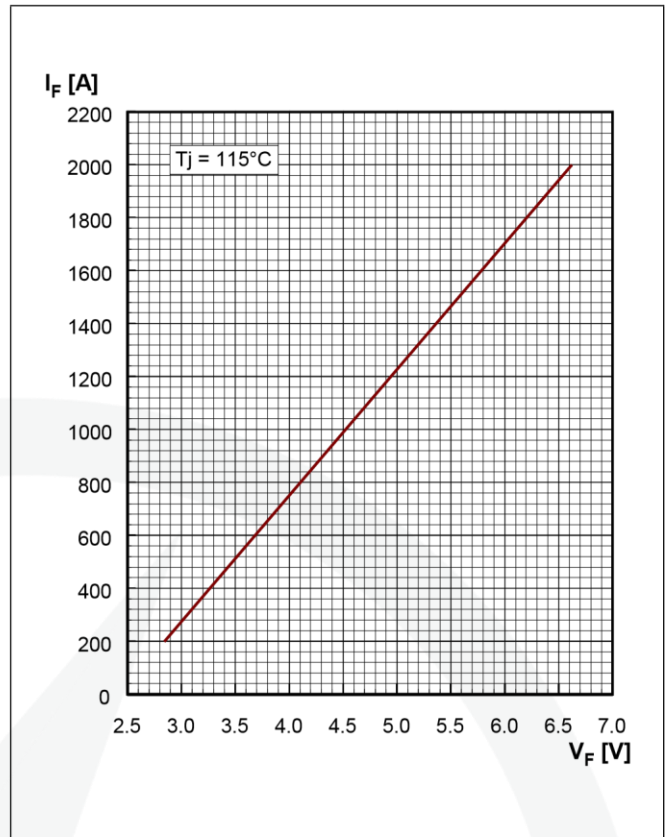


Fig. 2 Forward current vs. forward voltage.

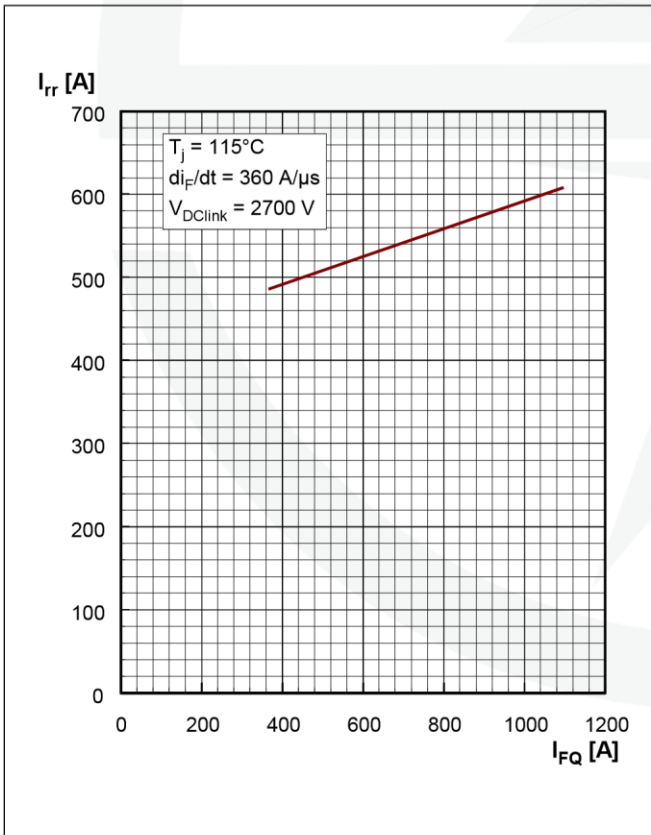


Fig. 3 Diode reverse recovery current vs. turn-off current.

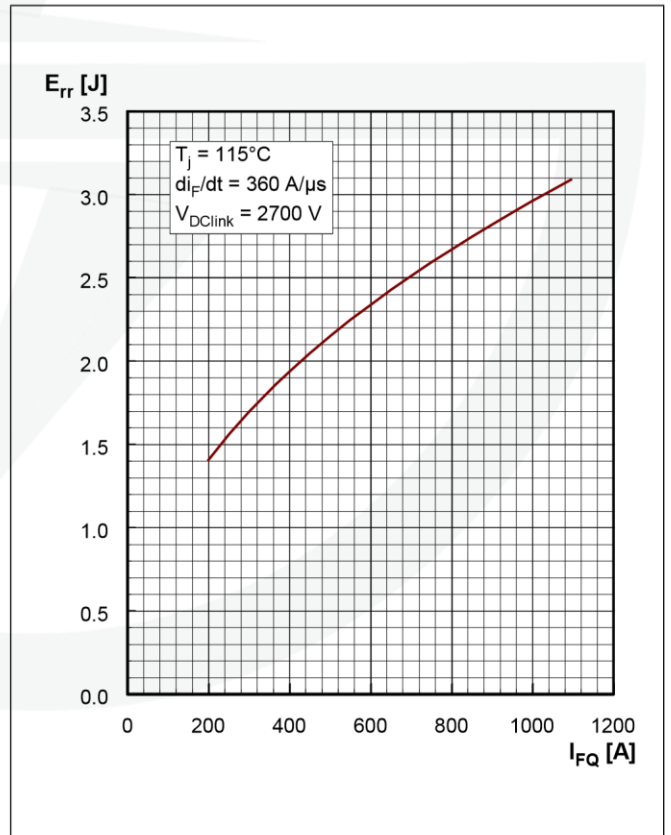


Fig. 4 Diode turn-off energy per pulse vs. turn-off current.

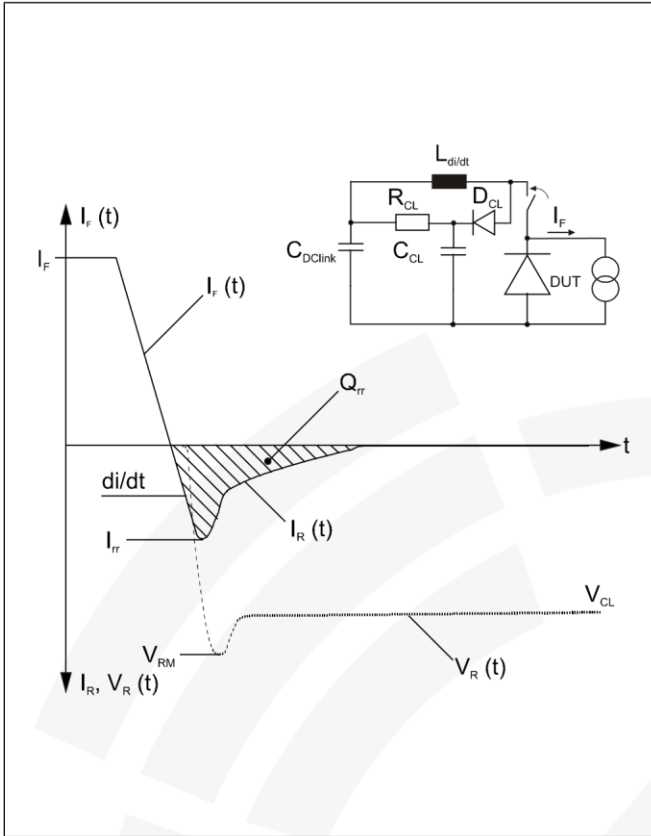


Fig. 5 Typical current and voltage waveforms at turn-off in a circuit with voltage clamp.

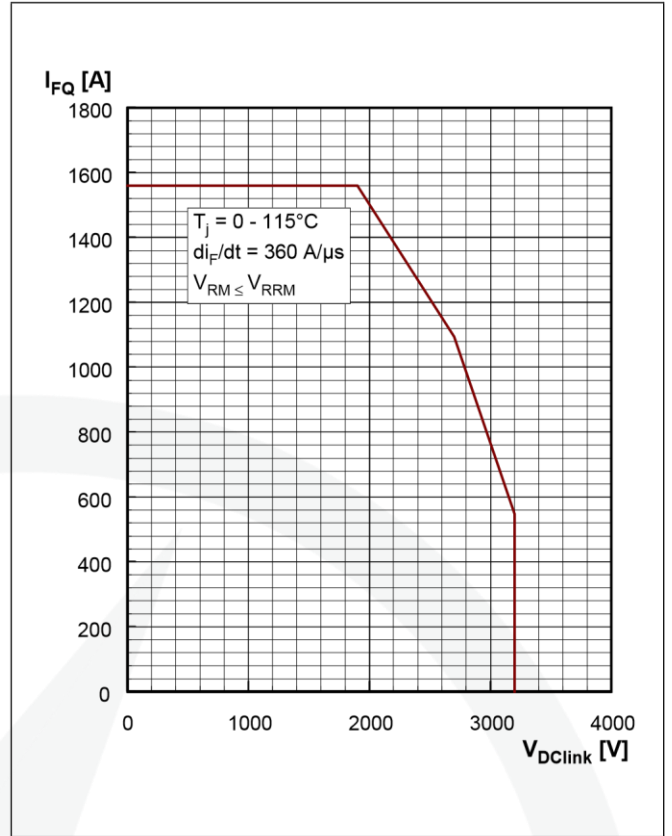


Fig. 6 Max. repetitive diode forward current.

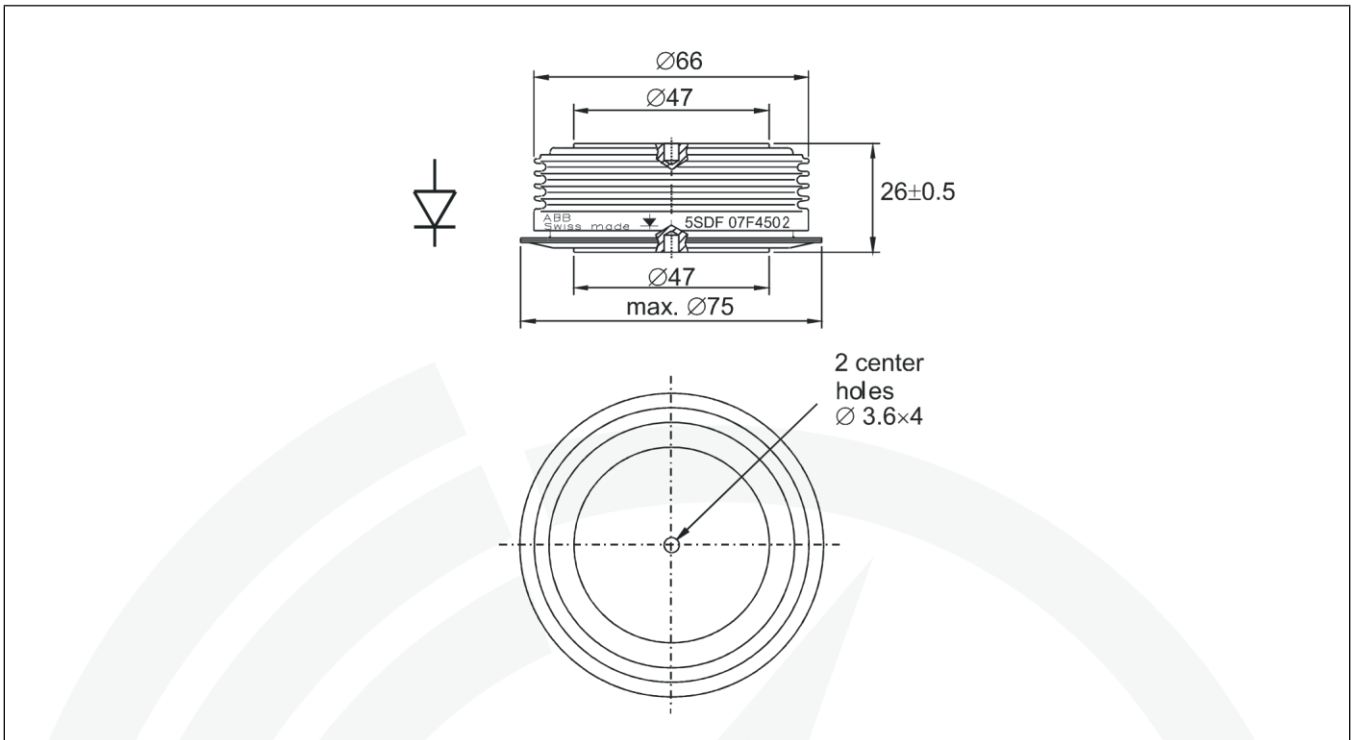


Fig. 7 Outline drawing. All dimensions are in millimeters and represent nominal values unless stated otherwise.