V_{RRM}	=	2500	V
I_{FAVM}	=	950	A
I_{FSM}	=	21	kA
V_{F0}	=	1.2	V
r_F	=	0.38	mΩ
V_{DClink}	=	1500	V

Fast Recovery Diode

5SDF 11F2501

Doc. No. 5SYA 1113-04 Aug. 2000

- **Patented free-floating silicon technology**
- **Low on-state and switching losses**
- **Optimized for use as freewheeling diode in GTO converters**
- **Standard press-pack 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	1500	V	100% Duty	Ambient cosmic radiation at sea level in open air.

Mechanical data (see Fig. 11)

F_m	Mounting force	min.	20	kN
		max.	24	kN
a	Acceleration: Device unclamped Device clamped		 50 200	 m/s^2 m/s^2
m	Weight		0.46	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	950 A	Half sine wave, T_c = 85°C	
I_{FRMS}	Max. RMS on-state current	1500 A		
I_{FSM}	Max. peak non-repetitive surge current	21 kA	tp = 10 ms	Before surge:
		65 kA	tp = 1 ms	$T_c = T_j$ = 125°C
$\int I^2dt$	Max. surge current integral	$2.2{\cdot}10^6$ A^2s	tp = 10 ms	After surge:
		$2.1{\cdot}10^6$ A^2s	tp = 1 ms	$V_R \approx 0$ V
V_F	Forward voltage drop	≤ 1.6 V	I_F = 1000 A	T_j = 125°C
V_{F0}	Threshold voltage	1.2 V	Approximation for	
r_F	Slope resistance	0.38 mΩ	I_F = 400…4000 A	

Turn-on (see Fig. 3, 4)

V_{fr}	Peak forward recovery voltage	≤ 16 V	di/dt = 500 A/µs, T_j = 125°C

Turn-off (see Fig. 5 to 10)

I_{rr}	Reverse recovery current	≤ 550 A	di/dt = 100 A/µs, I_F = 2000 A,
Q_{rr}	Reverse recovery charge	≤ 1200 µC	T_j = 125°C, V_{RM} = 2500 V,
E_{rr}	Turn-off energy	≤ 0.45 J	C_S = µF (GTO snubber circuit)

Thermal (see Fig. 12)

T_j	Operating junction temperature range	-40...125°C		
T_{stg}	Storage temperature range	-40...125°C		
R_{thJC}	Thermal resistance junction to case	≤ 40 K/kW	Anode side cooled	F_M = 20… 24 kN
		≤ 40 K/kW	Cathode side cooled	
		≤ 20 K/kW	Double side cooled	
R_{thCH}	Thermal resistance case to heatsink	≤ 10 K/kW	Single side cooled	
		≤ 5 K/kW	Double side cooled	

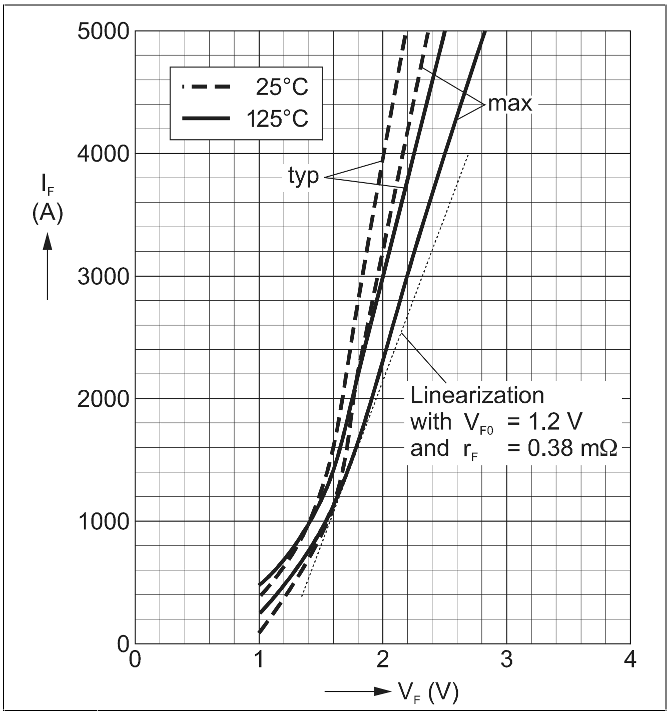

Fig. 1 Forward current vs. forward voltage (typ. and max. values) and linear approximation of max. curve at 125°C.

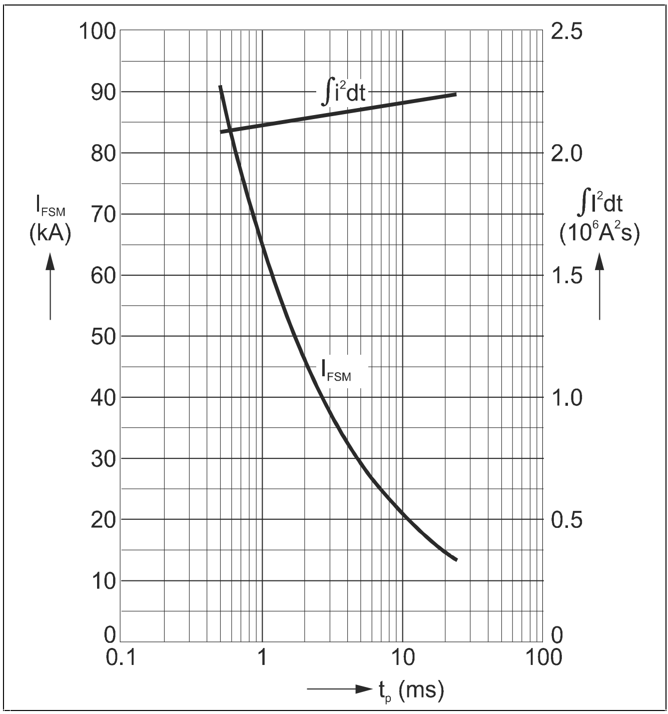

Fig. 2 Surge current and fusing integral vs. pulse width (max. values) for non-repetitive, half-sinusoidal surge current pulses.

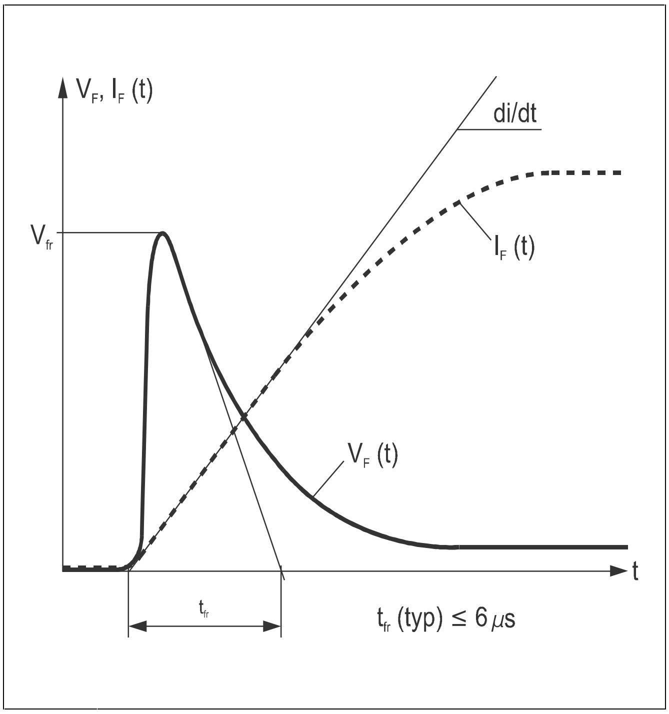

Fig. 3 Typical forward voltage waveform when the diode is turned on with a high di/dt.

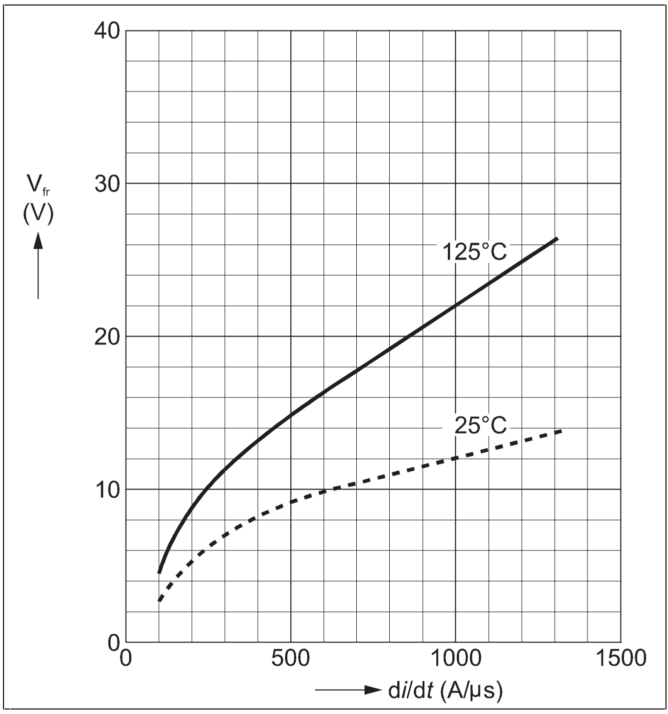

Fig. 4 Forward recovery voltage vs. turn-on di/dt (max. values).

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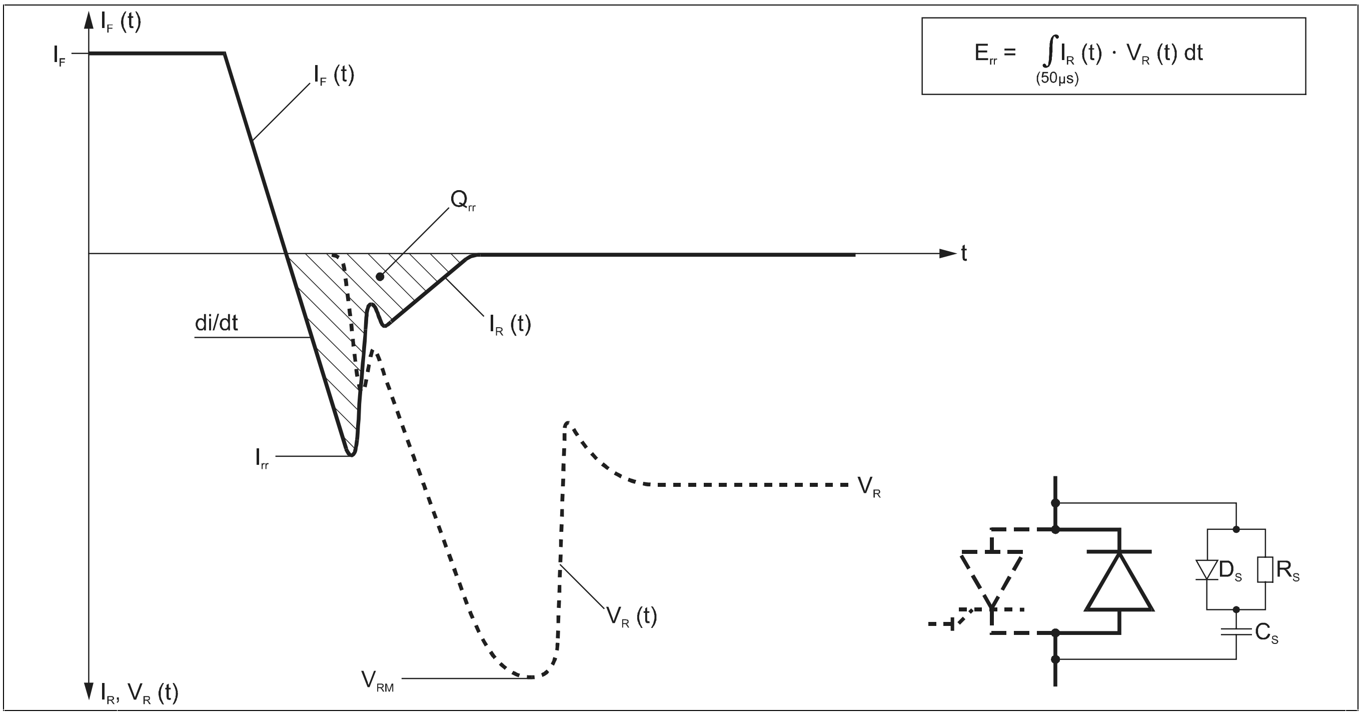


Fig. 5 Typical current and voltage waveforms at turn-off when the diode is connected to an RCD snubber, as often used in GTO circuits.

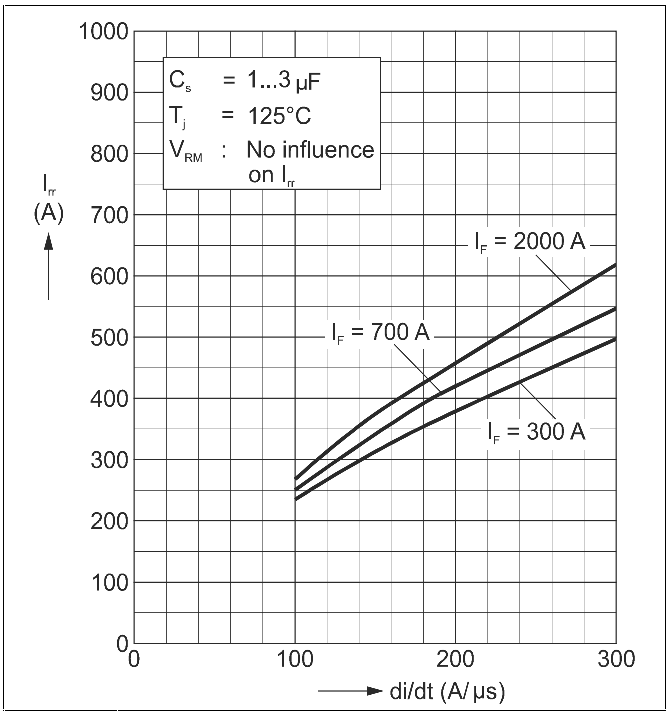


Fig. 6 Reverse recovery current vs. turn off di/dt (max. values).

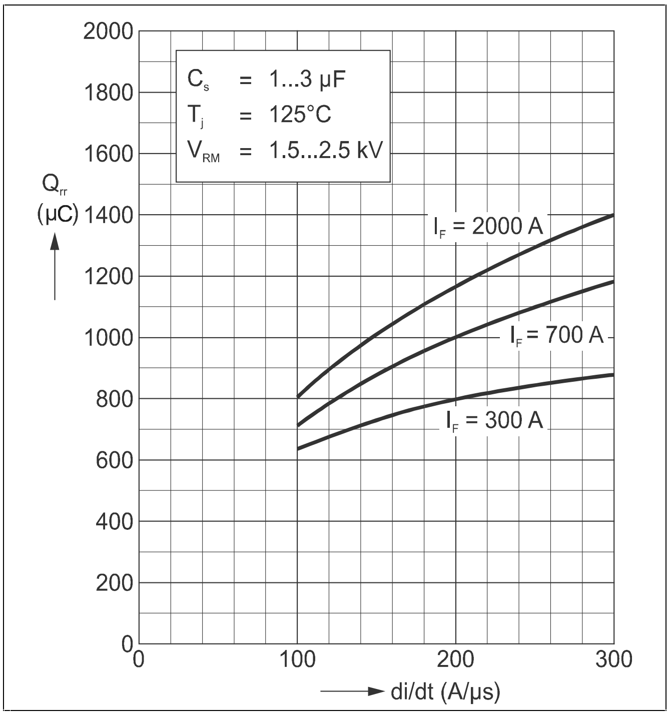


Fig. 7 Reverse recovery charge vs. turn off di/dt (max. values).

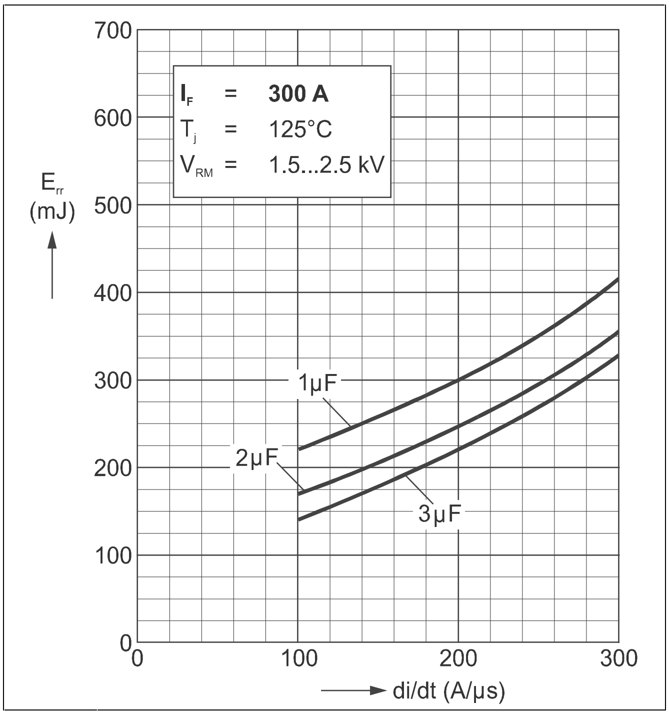


Fig. 8 Turn-off energy vs. turn-off di/dt for I_F = 300 A (max. values).

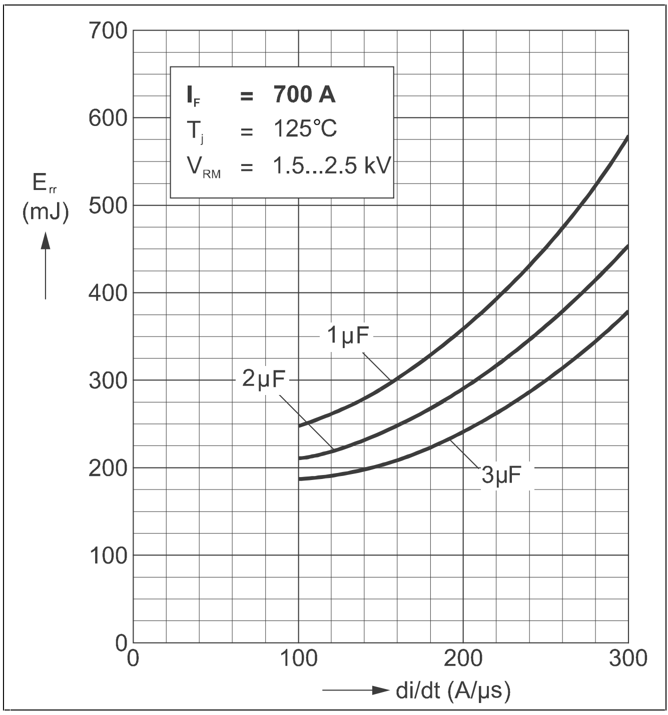


Fig. 9 Turn-off energy vs. turn-off di/dt for I_F = 700 A (max. values).

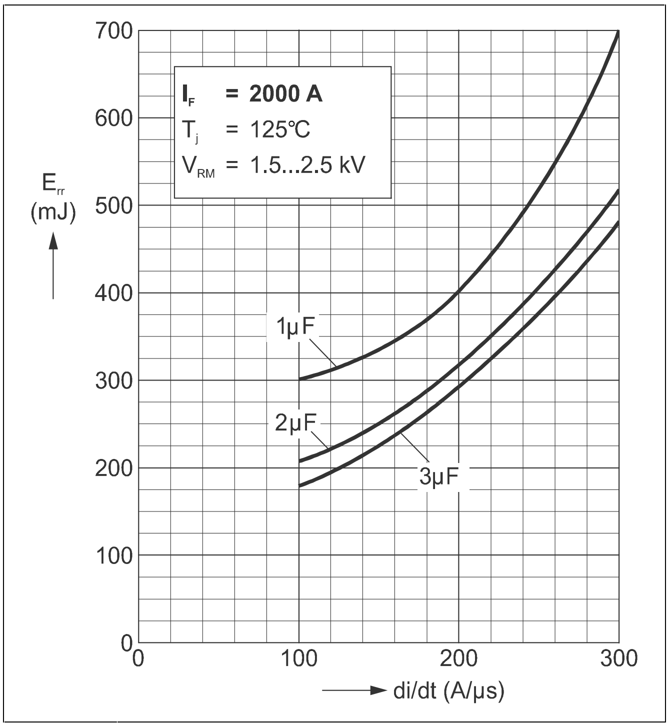


Fig. 10 Turn-off energy vs. turn-off di/dt for I_F = 2000 A (max. values).

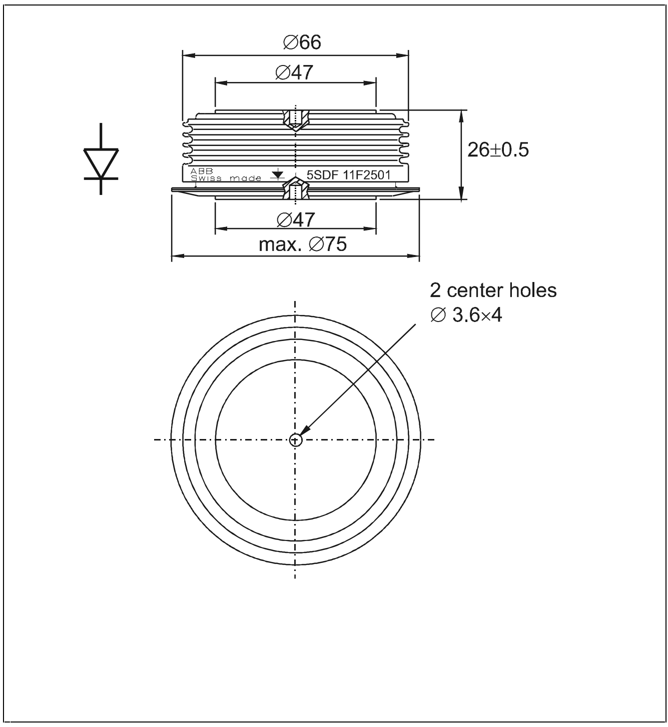
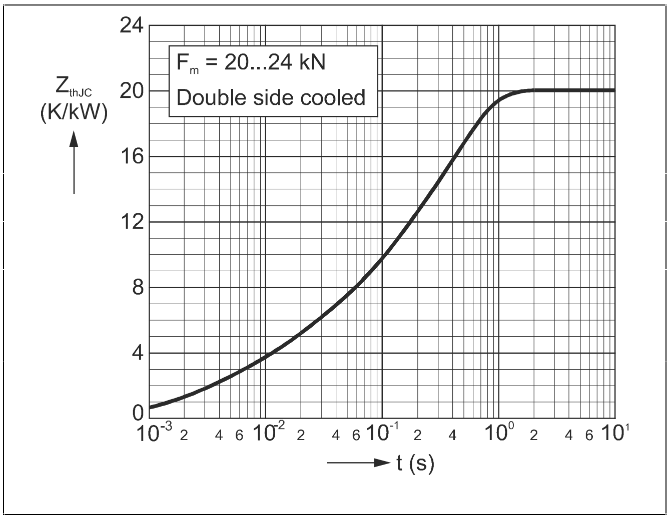


Fig. 11 Outline drawing. All dimensions are in millimeters and represent nominal values unless stated otherwise.



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

i	1	2	3	4
R_i (K/kW)	11.83	4.26	1.63	2.28
τ_i (s)	0.432	0.071	0.01	0.0054

F_m = 20… 24 kN

Double side cooled

Fig. 12 Transient thermal impedance (junction-to-case) vs. time in analytical and graphical form (max. values).

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