V_{RRM}	=	4500 V
I_{FAVM}	=	1400 A
I_{FSM}	=	25 kA
V_{F0}	=	1.2 V
r_F	=	0.32 mΩ
V_{DClink}	=	2200 V

Fast Recovery Diode

5SDF 14H4505

Doc. No. 5SYA 1110-02 Aug. 2000

- **Patented free-floating silicon technology**
- **Low on-state and switching losses**
- **Optimized for use as freewheeling diode in GTO converters with low DC link voltages**
- **Standard press-pack housing, hermetically plasma-welded**
- **Cosmic radiation withstand rating**

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	≤ 50 mA	$V_R = V_{RRM,}$ T_j = 125°C	
V_{DClink}	Permanent DC voltage for 100 FIT failure rate	2200 V	100% Duty	Ambient cosmic radiation at sea level in open air.

Mechanical data (see Fig. 11)

F_m	Mounting force	min.	36 kN
		max.	44 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

I_{FAVM}	Max. average on-state current	1400 A	Half sine wave, T_c = 85°C	
I_{FRMS}	Max. RMS on-state current	2200 A		
I_{FSM}	Max. peak non-repetitive surge current	25 kA	tp = 10 ms	Before surge: $T_c = T_j$ = 125°C
		60 kA	tp = 1 ms	
$\int I^2dt$	Max. surge current integral	$3.13 \cdot 10^6$ A^2s	tp = 10 ms	After surge: $V_R \approx 0$ V
		$1.8 \cdot 10^6$ A^2s	tp = 1 ms	
V_F	Forward voltage drop	≤ 2 V	I_F = 2500 A	T_j = 125°C
V_{F0}	Threshold voltage	1.2 V	Approximation for	
r_F	Slope resistance	0.32 mΩ	I_F = 400…4000 A	

Turn-on (see Fig. 3, 4)

V_{fr}	Peak forward recovery voltage	≤ 30 V	di/dt = 500 A/µs, T_j = 125°C

Turn-off (see Fig. 5 to 10)

I_{rr}	Reverse recovery current	≤ 1000 A	di/dt = 100 A/µs, I_F = 2000 A, T_j = 125°C, V_{RM} = 2500 V, C_S = µF (GTO snubber circuit)
Q_{rr}	Reverse recovery charge	≤ 3700 µC	
E_{rr}	Turn-off energy	≤ 1.6 J	

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	≤ 24 K/kW	Anode side cooled	F_M = 36… 44 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	

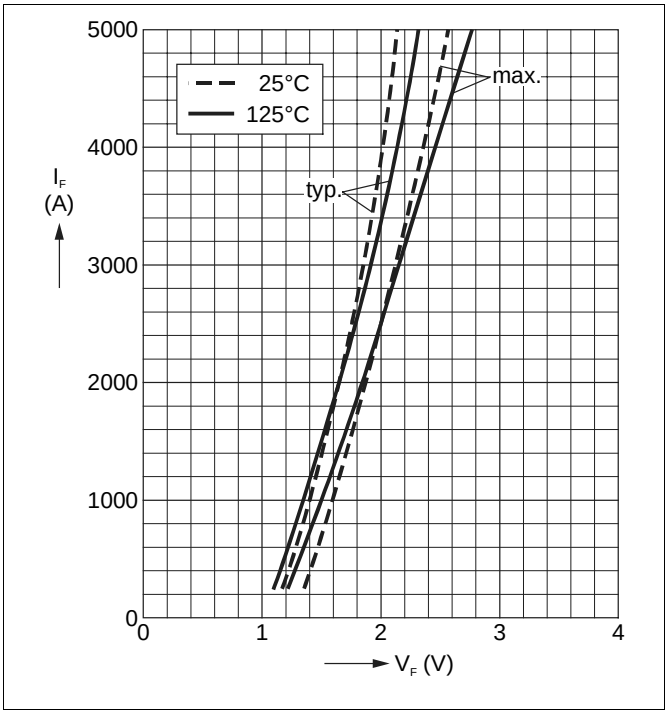


Fig. 1 Forward current vs. forward voltage (typ. and max. values) and linear approximation of max. curve at 125°C.

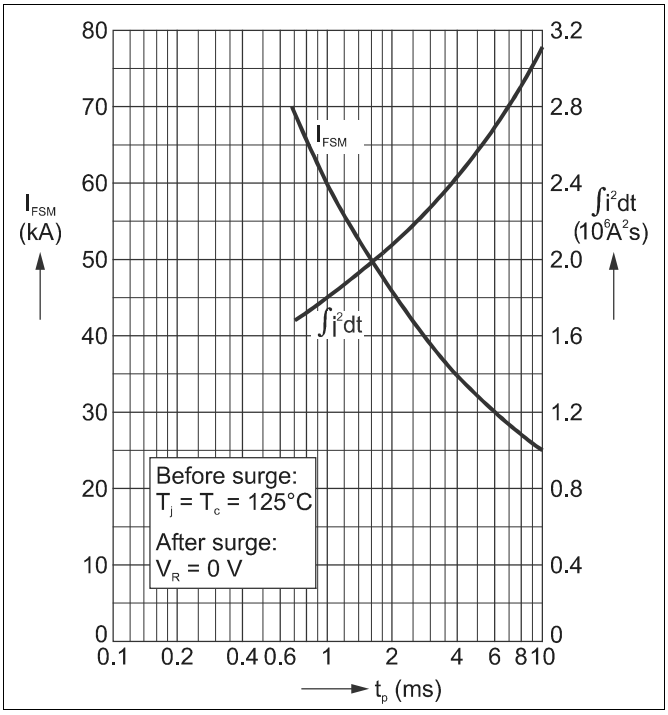


Fig. 2 Surge current and fusing integral vs. pulse width (max. values) for non-repetitive, half-sinusoidal surge current pulses.

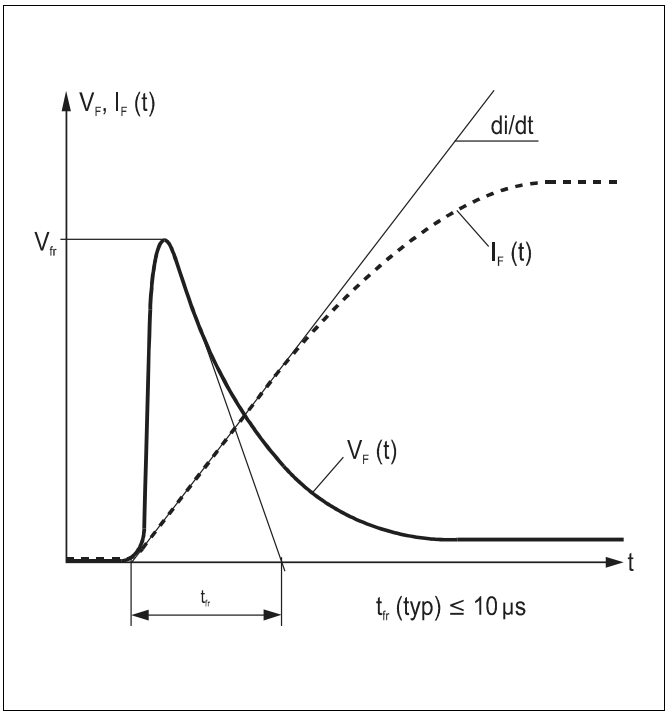


Fig. 3 Typical forward voltage waveform when the diode is turned on with a high di/dt.

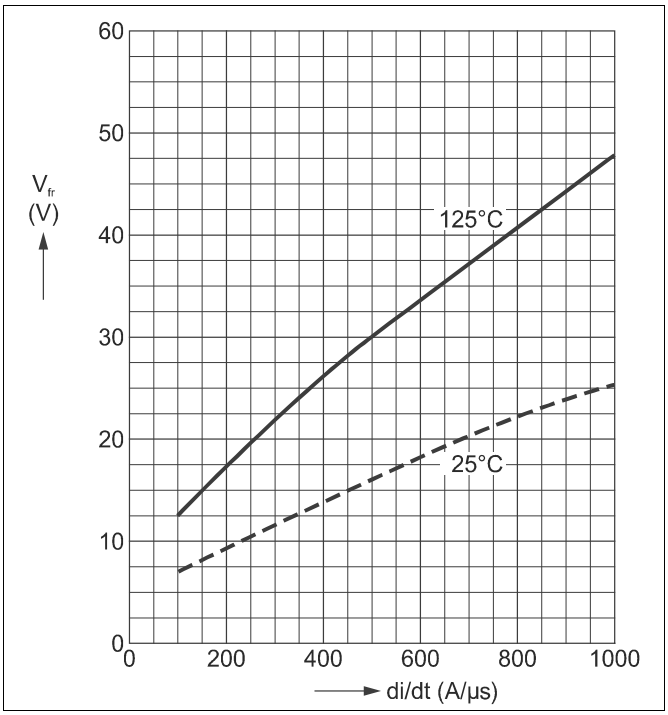


Fig. 4 Forward recovery voltage vs. turn-on di/dt (max. values).

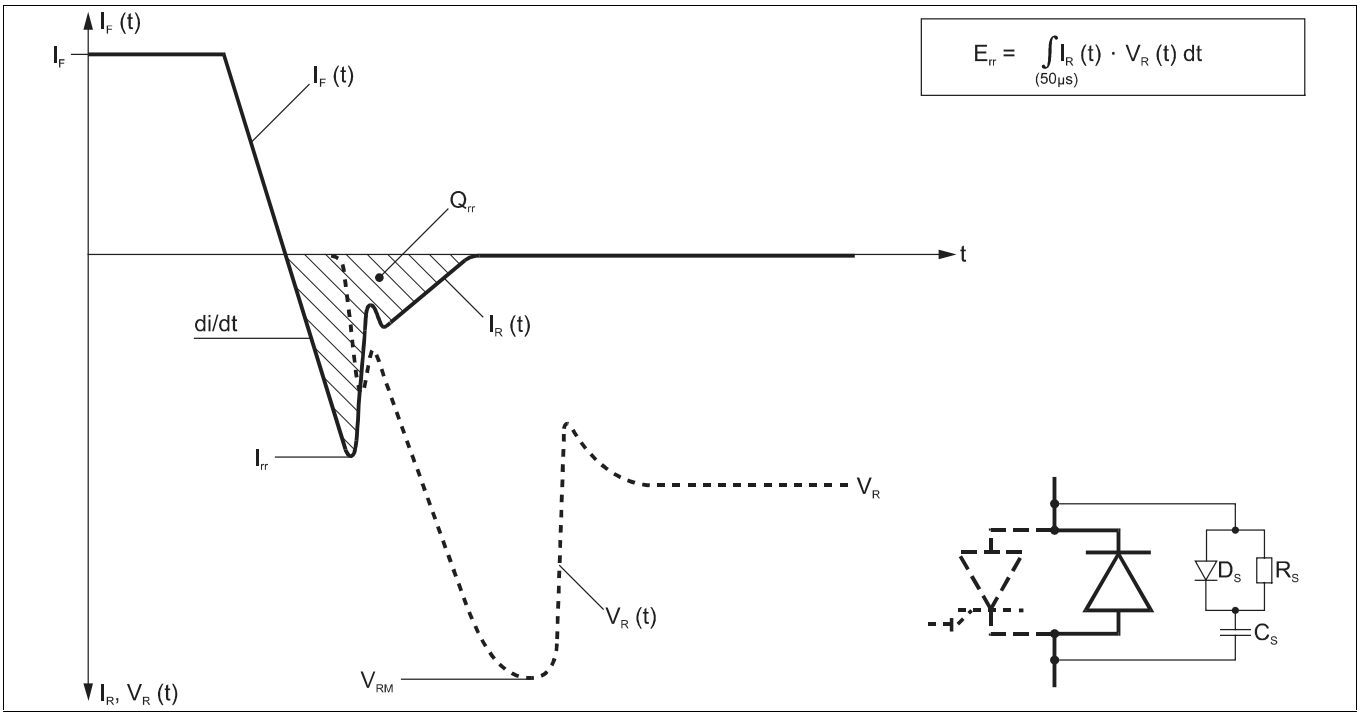


Fig. 5 Typical current and voltage waveforms at turn-off when the diode is connected to an RCD snubber, as often used in GTO circuits.

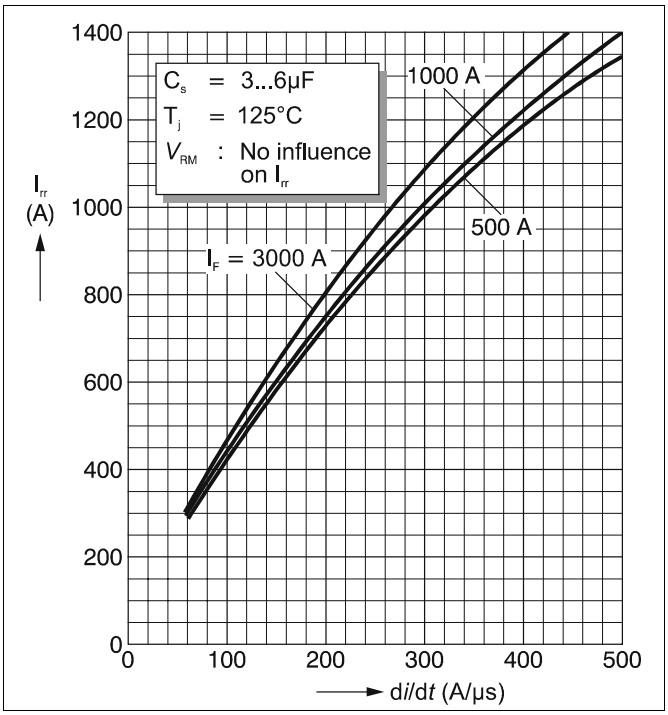


Fig. 6 Reverse recovery current vs. turn off di/dt (max. values).

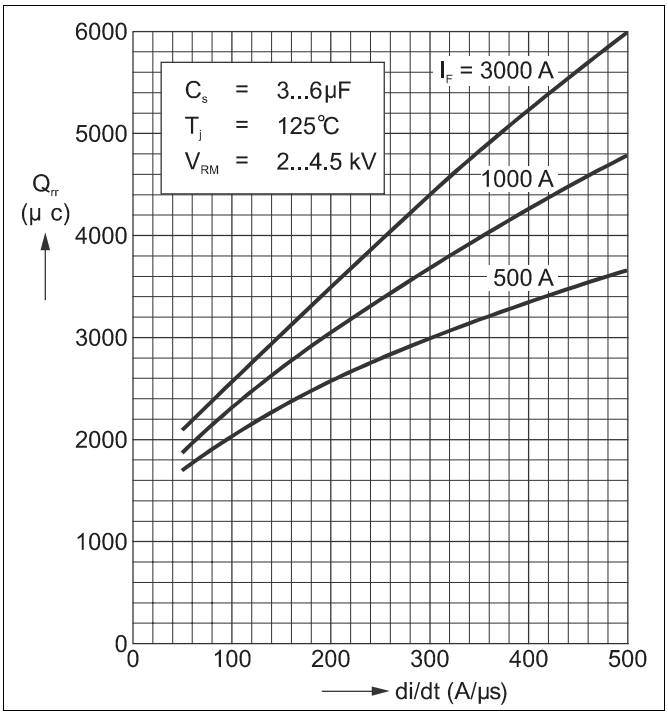


Fig. 7 Reverse recovery charge vs. turn off di/dt (max. values).

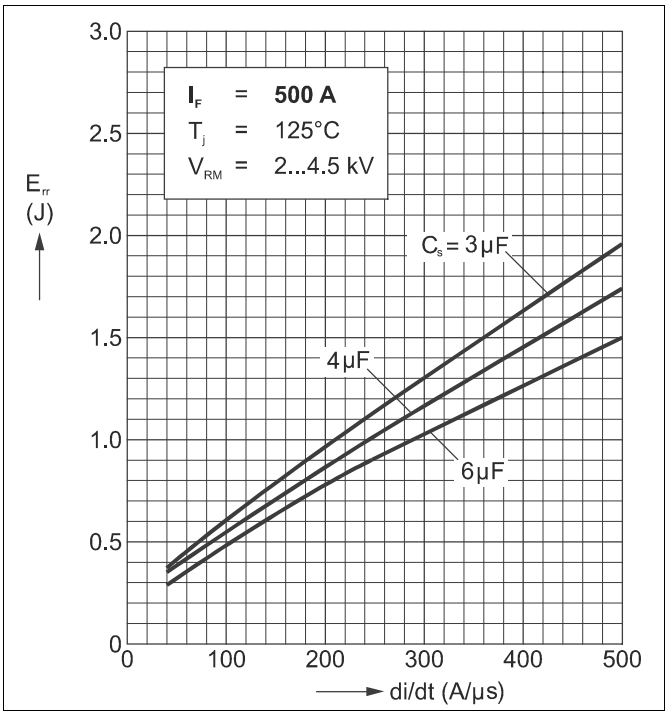


Fig. 8 Turn-off energy vs. turn-off di/dt for I_F = 500 A (max. values).

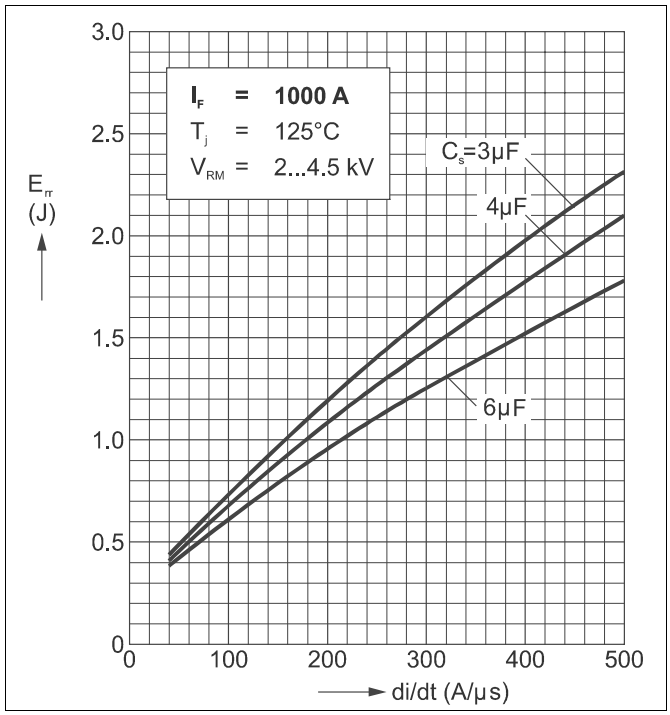


Fig. 9 Turn-off energy vs. turn-off di/dt for I_F = 1000 A (max. values).

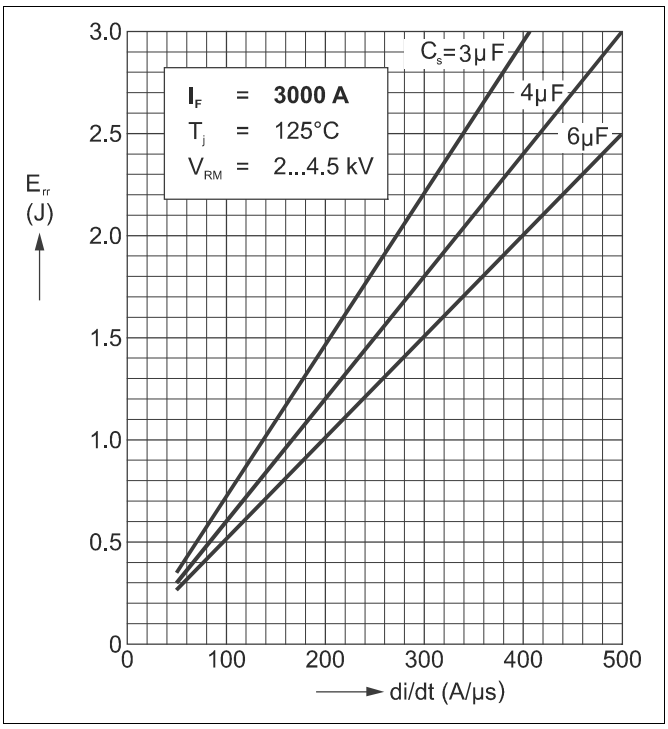


Fig. 10 Turn-off energy vs. turn-off di/dt for I_F = 3000 A (max. values).

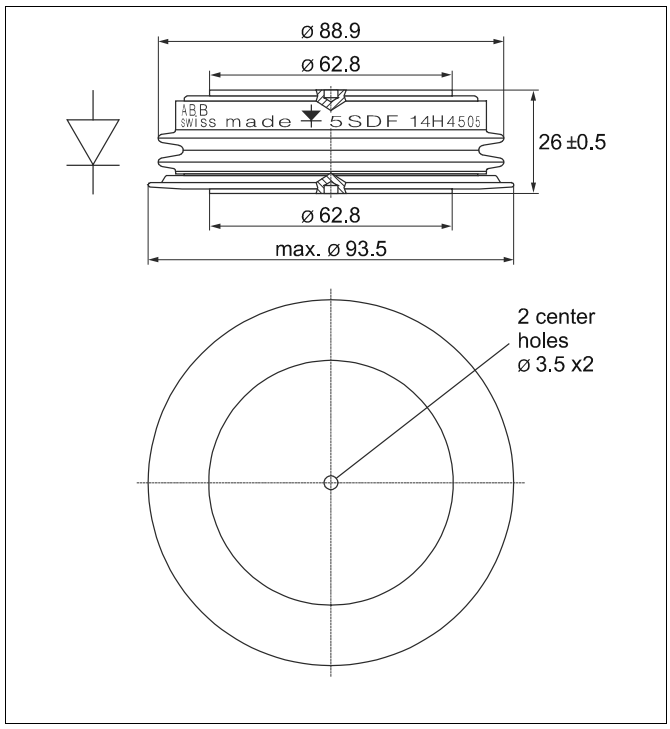
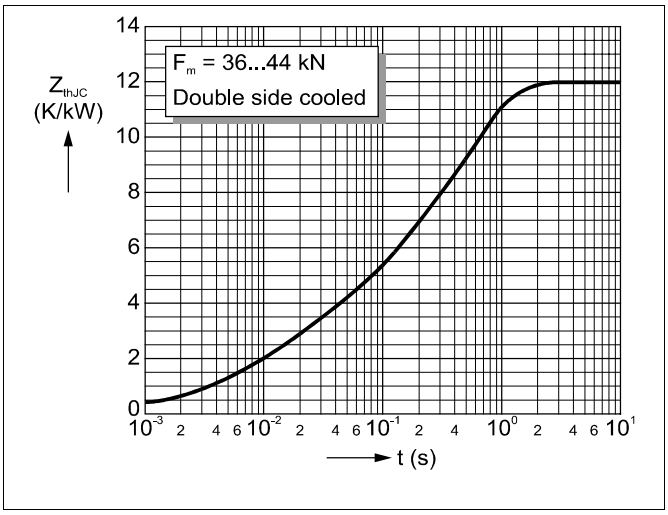


Fig. 11 Outline drawing. All dimensions are in millimeters and represent nominal values unless stated otherwise.



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

i	1	2	3	4
R_i (K/kW)	7.44	2.00	1.84	0.71
τ_i (s)	0.47	0.091	0.011	0.0047

F_m = 36… 44 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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