V_{RRM}	=	4500 V
I_{FAVM}	=	1650 A
I_{FSM}	=	26 kA
V_{F0}	=	1.9 V
r_F	=	0.79 mΩ
V_{DClink}	=	2800 V

Fast Recovery Diode

5SDF 16L4503

PRELIMINARY

Doc. No. 5SYA1164-00 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	≤ 150 mA	$V_R = V_{RRM}$, T_j = 125°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 (see Fig. 6)

F_m	Mounting force	min.	36 kN
		max.	70 kN
a	Acceleration: Device unclamped Device clamped		 50 m/s^2 200 m/s^2
m	Weight		1.45 kg
D_S	Surface creepage distance		≥ 33 mm
D_a	Air strike distance		≥ 14 mm

On-state (see Fig. 3)

I_{FAVM}	Max. average on-state current	1650 A	Half sine wave, T_c = 70°C	
I_{FRMS}	Max. RMS on-state current	2590 A		
I_{FSM}	Max. peak non-repetitive surge current	26 kA	tp = 10 ms	Before surge: $T_c = T_j$ = 125°C
		47 kA	tp = 1 ms	
$\int I^2dt$	Max. surge current integral	$3.4 \cdot 10^6$ A^2s	tp = 10 ms	After surge: $V_R \approx 0$ V
		$1.1 \cdot 10^6$ A^2s	tp = 1 ms	
V_F	Forward voltage drop	≤ 4.51 V	I_F = 3300 A	T_j = 125°C
V_{F0}	Threshold voltage	1.9 V	Approximation for	
r_F	Slope resistance	0.79 mΩ	I_F = 500…4000 A	

Turn-on (see Fig. 2)

V_{fr}	Peak forward recovery voltage	≤ 80 V	di/dt = 600 A/µs, T_j = 125°C

Turn-off (see Fig. 5, 7)

di/dt_{crit}	Max. decay rate of on-state current	≤ 600 A/µs	I_F = 4000 A, T_j = 125 °C V_{Dclink} = 2800 V
I_{rr}	Reverse recovery current	≤ 1200 A	I_F = 3300 A, $V_{DC\text{-}Link}$ = 2800 V di/dt = 600 A/µs, L_{CL} = 300 nH C_{CL} = 8 µF, R_{CL} = 0.6 Ω, T_j = 125°C
Q_{rr}	Reverse recovery charge	≤ 3900 µC	
E_{rr}	Turn-off energy	≤ 9.0 J	

Thermal (see Fig. 1)

T_j	Operating junction temperature range	0...125°C		
T_{stg}	Storage temperature range	-40...125°C		
R_{thJC}	Thermal resistance junction to case	≤ 13 K/kW	Anode side cooled	F_m = 36… 70 kN
		≤ 13 K/kW	Cathode side cooled	
		≤ 6.5 K/kW	Double side cooled	
R_{thCH}	Thermal resistance case to heatsink	≤ 5 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)	4.05	1.28	0.62	0.56
τ_i(s)	0.56685	0.10686	0.01239	0.00300
F_m = 36… 70 kN Double side cooled				

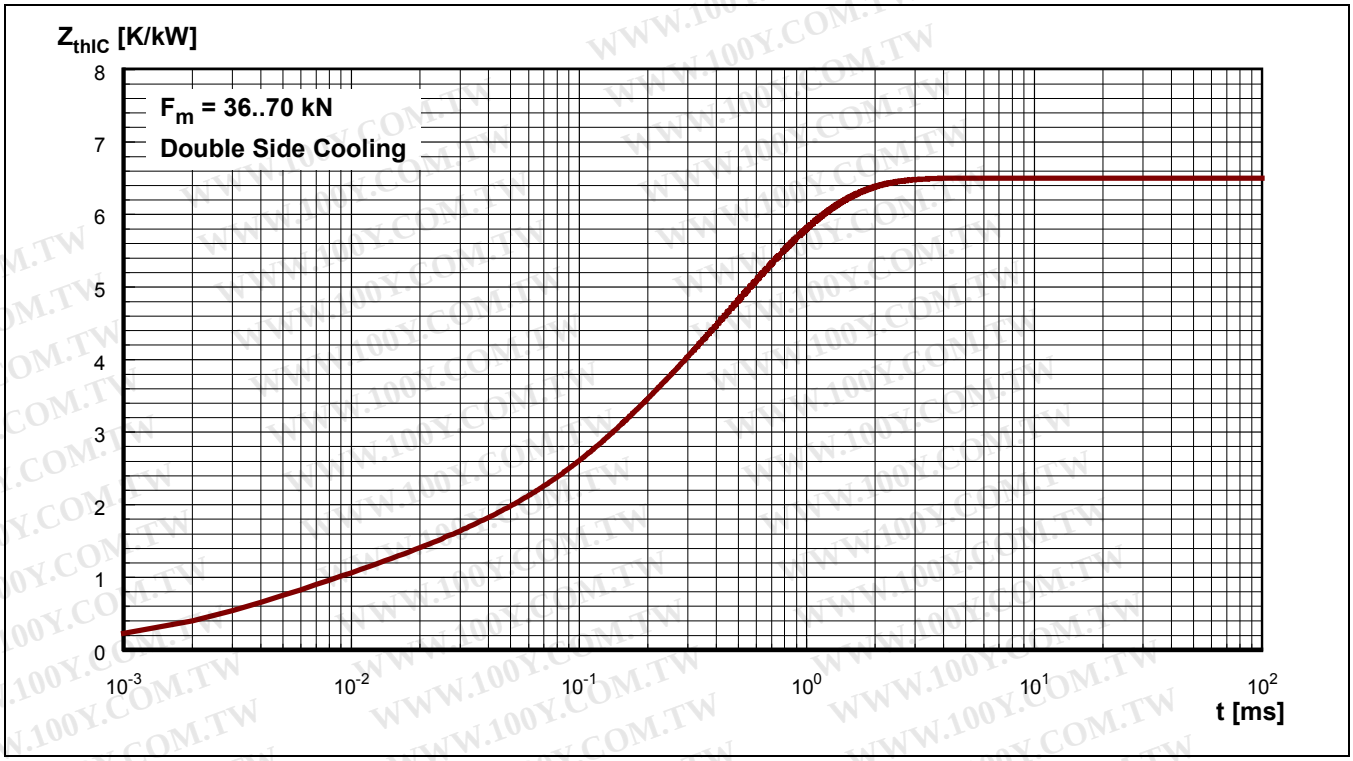

Fig. 1 Transient thermal impedance (junction to case) vs. time in analytical and graphical form (max. values).

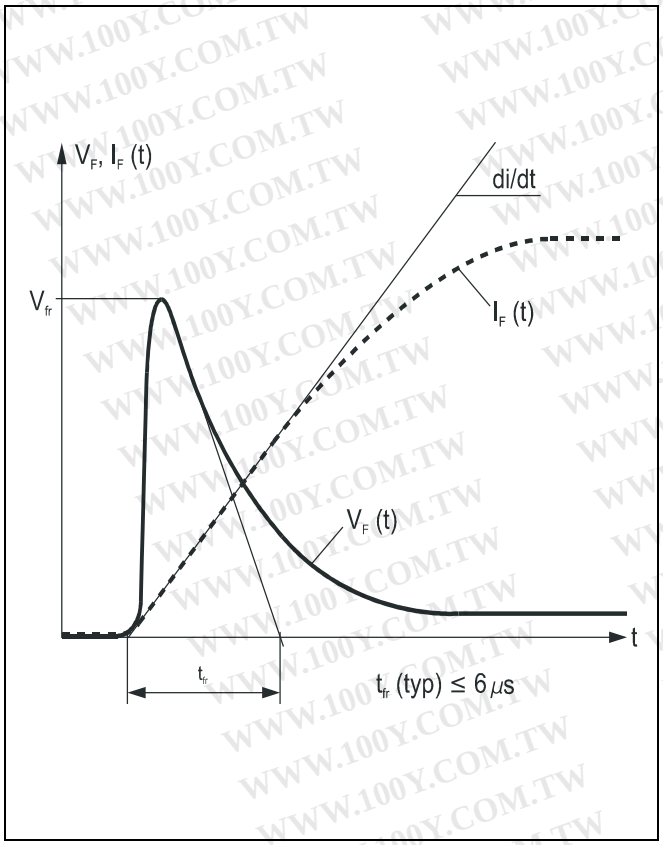

Fig. 2 Typical forward voltage waveform when the diode is turned on with high di/dt.

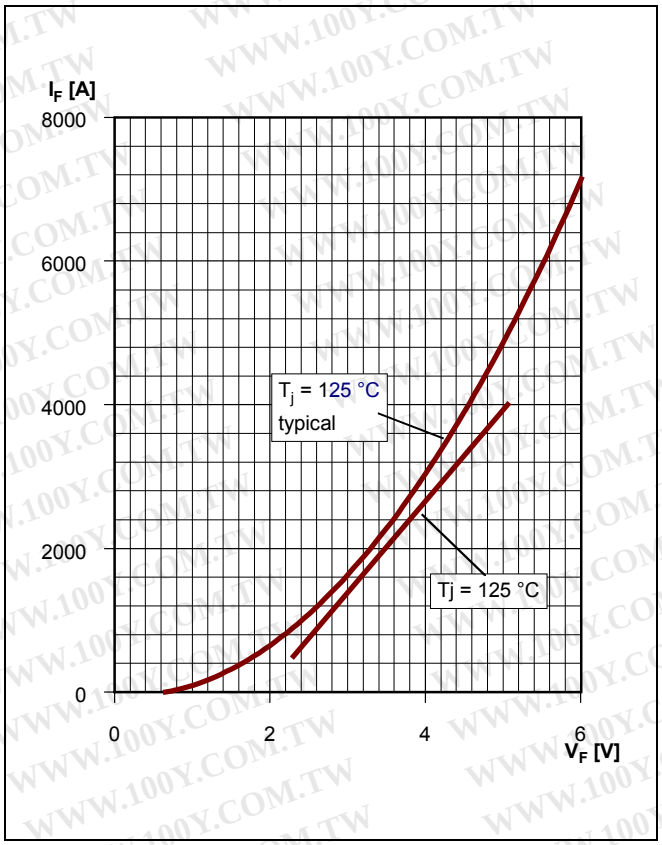

Fig. 3 Forward current vs. forward voltage.

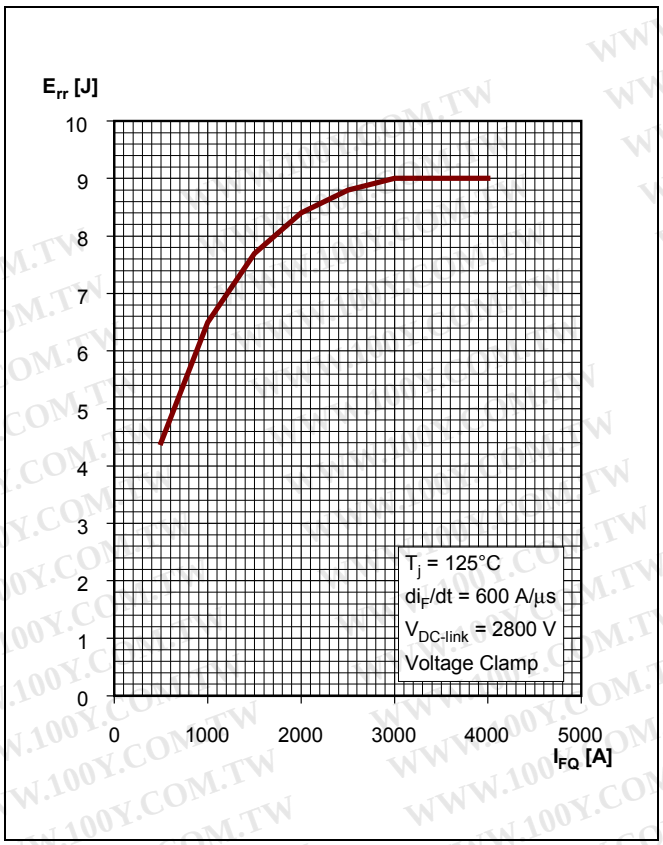

Fig. 4 Diode turn-off energy per pulse vs. turn-off current.

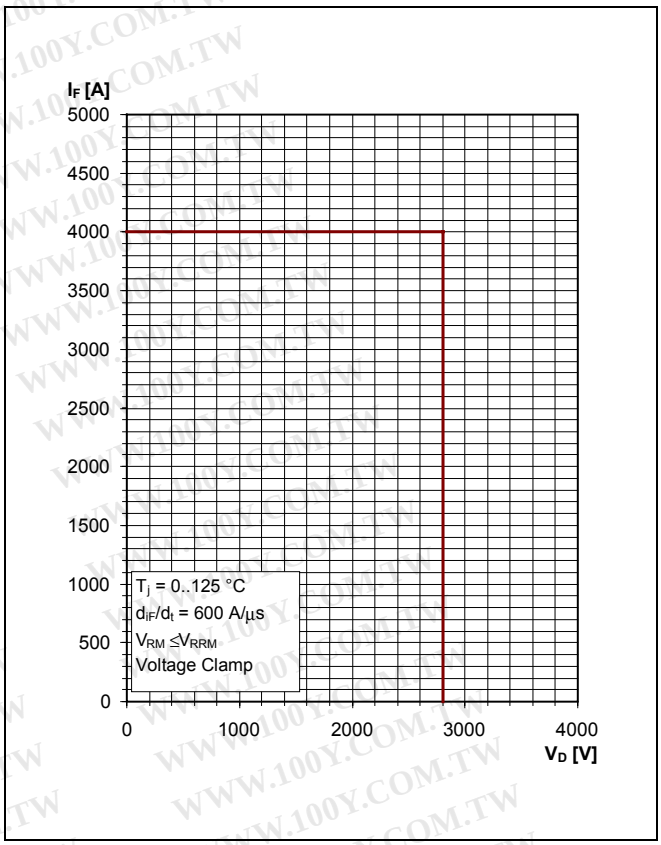

Fig. 5 Max. repetitive turn off current.

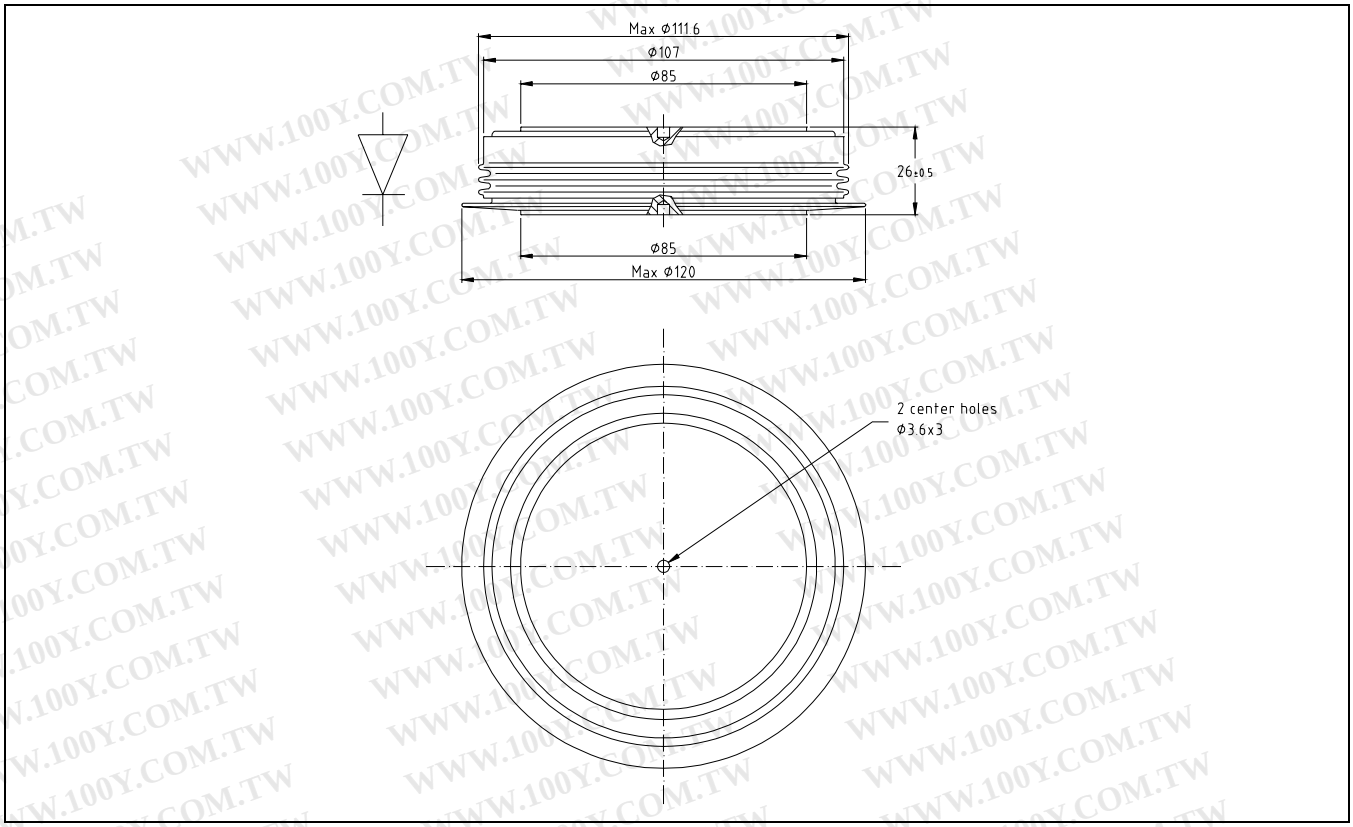

Fig. 6 Outline drawing. All dimensions are in millimeters and represent nominal values unless stated otherwise.

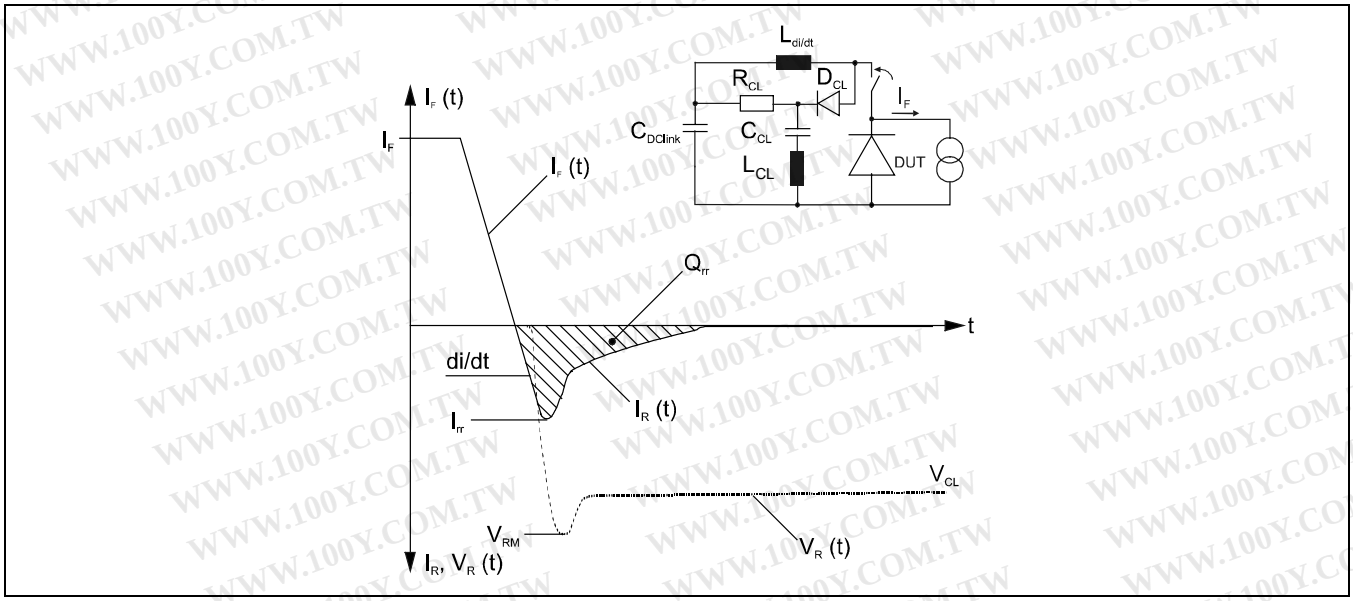

Fig. 7 Typical current and voltage waveforms at turn-off in a circuit with voltage clamp.

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