

V_{RRM}	=	2500 V
I_{FAVM}	=	490 A
I_{FSM}	=	8.5×10^3 A
V_{F0}	=	1.4 V
r_F	=	0.52 m Ω
V_{DClink}	=	1100 V

Fast Recovery Diode

5SDF 05D2501

Doc. No. 5SYA1112-03 Jan. 03

- Patented free-floating silicon technology
- Low switching losses
- Optimized for use as snubber diode in GTO converters
- Industry standard press-pack ceramic housing, hermetically cold-welded
- Cosmic radiation withstand rating

Blocking

Maximum rated values ¹⁾

Parameter	Symbol	Conditions	Value	Unit
Repetitive peak reverse voltage	V_{RRM}	$f = 50$ Hz, $t_p = 10$ ms, $T_j = 125^\circ\text{C}$	2500	V
Permanent DC voltage for 100 FIT failure rate	V_{DClink}	Ambient cosmic radiation at sea level in open air. (100% Duty)	1100	V
Permanent DC voltage for 100 FIT failure rate	V_{DClink}	Ambient cosmic radiation at sea level in open air. (5% Duty)	1500	V

Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
Repetitive peak reverse current	I_{RRM}	$V_R = V_{RRM}$, $T_j = 125^\circ\text{C}$			50	mA

Mechanical data

Maximum rated values ¹⁾

Parameter	Symbol	Conditions	min	typ	max	Unit
Mounting force	F_M		10	11	12	kN
Acceleration	a	Device unclamped			50	m/s ²
Acceleration	a	Device clamped			200	m/s ²

Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
Weight	m			0.25		kg
Housing thickness	H			26		mm
Pole-piece diameter	D_P			34		mm
Surface creepage distance	D_S		30			mm
Air strike distance	D_a		20			mm

1) Maximum rated values indicate limits beyond which damage to the device may occur

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On-state

Maximum rated values ¹⁾

Parameter	Symbol	Conditions	min	typ	max	Unit
Max. average on-state current	I_{FAVM}	Half sine wave, $T_C = 85\text{ °C}$			490	A
Max. RMS on-state current	I_{FRMS}				770	A
Max. peak non-repetitive surge current	I_{FSM}	$t_p = 10\text{ ms}$, $T_j = 125\text{ °C}$, $V_R \approx 0\text{ V}$			8.5×10^3	A
Limiting load integral	I^2t				360×10^3	A^2s
Max. peak non-repetitive surge current	I_{FSM}	$t_p = 1\text{ ms}$, $T_j = 125\text{ °C}$, $V_R \approx 0\text{ V}$			27×10^3	A
Limiting load integral	I^2t				370×10^3	A^2s

Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
On-state voltage	V_F	$I_F = 1000\text{ A}$, $T_j = 125\text{ °C}$			1.9	V
Threshold voltage	$V_{(TO)}$	$T_j = 125\text{ °C}$ $I_T = 600 \dots 4000\text{ A}$			1.4	V
Slope resistance	r_T				0.52	$m\Omega$

Turn-on

Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
Peak forward recovery voltage	V_{fr}	$di/dt = 500\text{ A}/\mu\text{s}$, $T_j = 125\text{ °C}$			17	V

Turn-off

Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
Reverse recovery current	I_{RM}	$di/dt = 250\text{ A}/\mu\text{s}$, $T_j = 125\text{ °C}$, $I_F = 1000\text{ A}$, $V_{RM} = 2500\text{ V}$, $R_S = 5\ \Omega$, $C_S = 0.10\ \mu\text{F}$			400	A
Reverse recovery charge	Q_{rr}				1150	μC
Turn-off energy	E_{rr}				--	J

Thermal

Maximum rated values ¹⁾

Parameter	Symbol	Conditions	min	typ	max	Unit
Operating junction temperature range	T _{vj}		-40		125	°C
Storage temperature range	T _{stg}		-40		125	°C

Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
Thermal resistance junction to case	R _{th(j-c)}	Double-side cooled			40	K/kW
	R _{th(j-c)A}	Anode-side cooled			80	K/kW
	R _{th(j-c)C}	Cathode-side cooled			80	K/kW
Thermal resistance case to heatsink	R _{th(c-h)}	Double-side cooled			8	K/kW
	R _{th(c-h)}	Single-side cooled			16	K/kW

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)	20.950	10.570	7.150	1.330
τ _i (s)	0.3960	0.0720	0.0090	0.0044

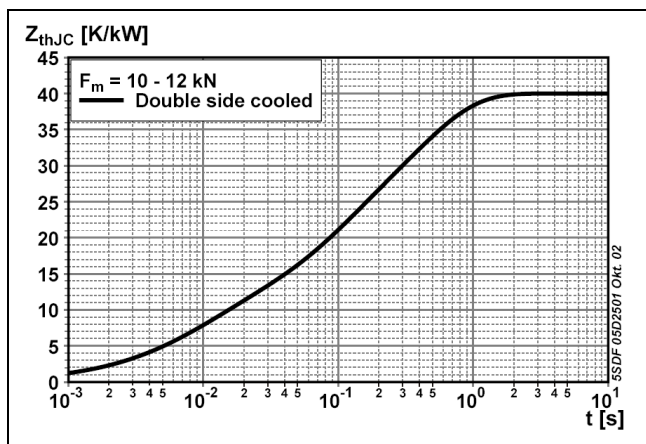


Fig. 1 Transient thermal impedance junction-to-case.

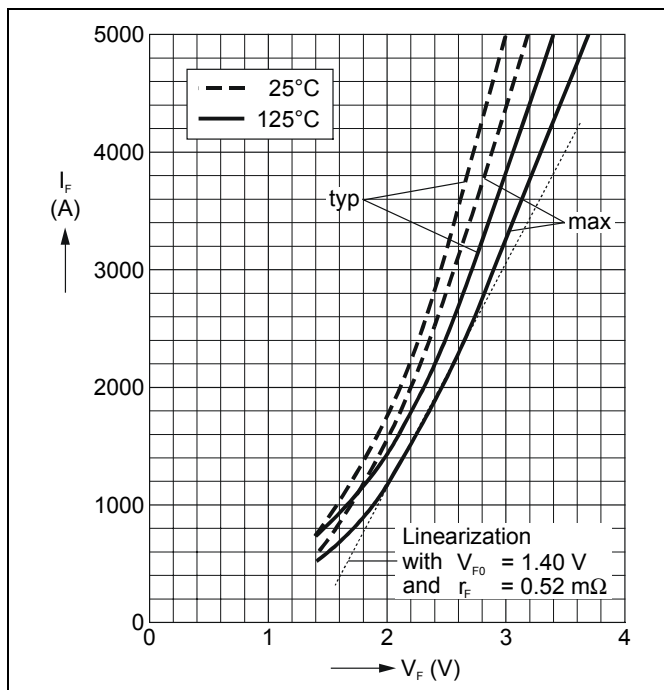


Fig. 2 Forward current vs. forward voltage (typ. and max. values) and linear approximation of max. curve at 125°C.

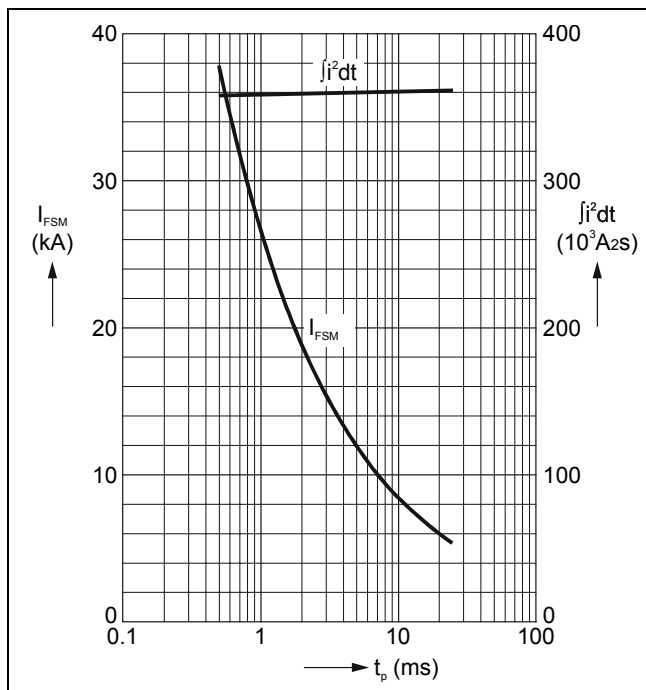


Fig. 3 Surge current and fusing integral vs. pulse width (max. values) for non-repetitive, half-sinusoidal surge current pulses.

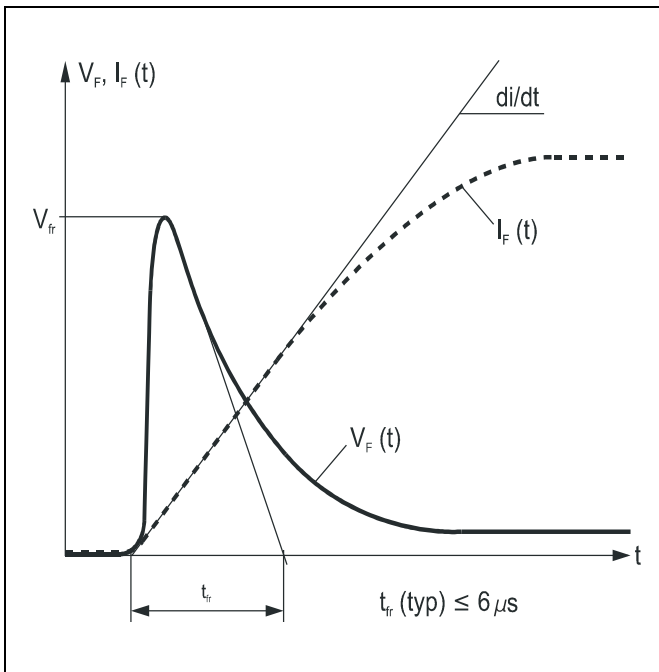


Fig. 4 Typical forward voltage waveform when the diode is turned on with a high di/dt.

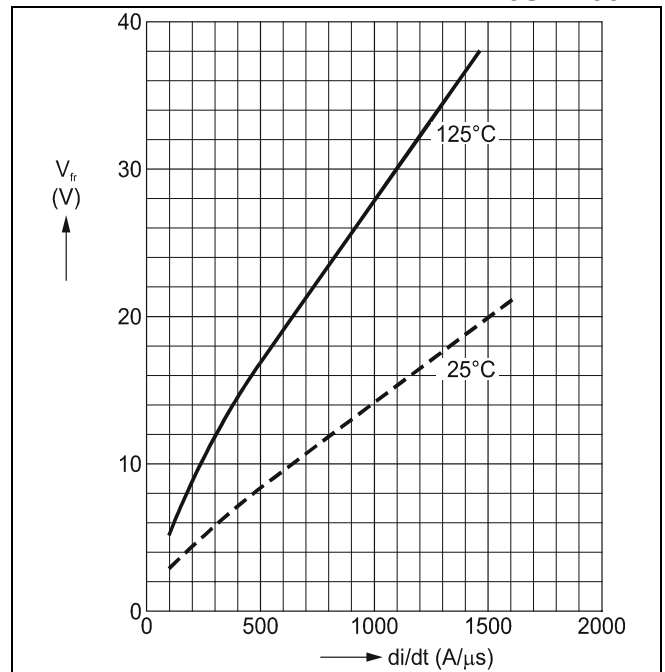


Fig. 5 Forward recovery voltage vs. turn-on di/dt (max. values).

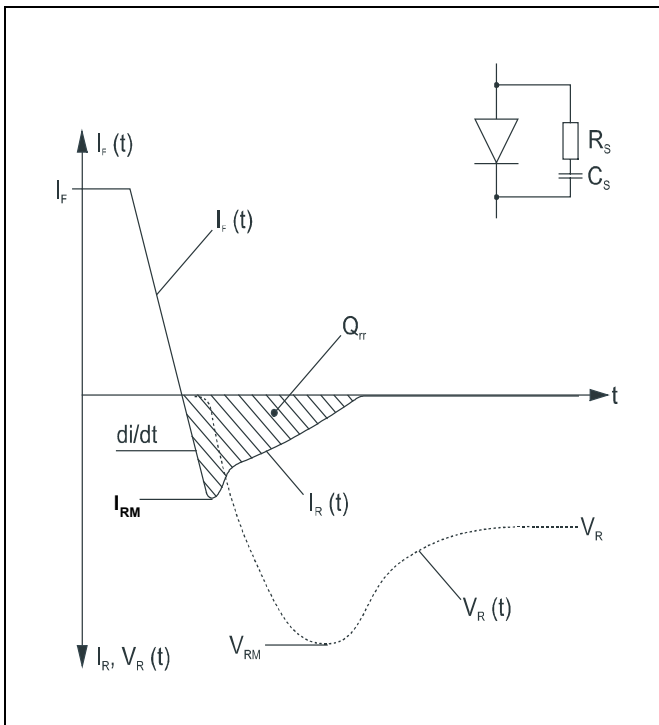


Fig. 6 Typical current and voltage waveforms at turn-off with conventional RC snubber circuit.

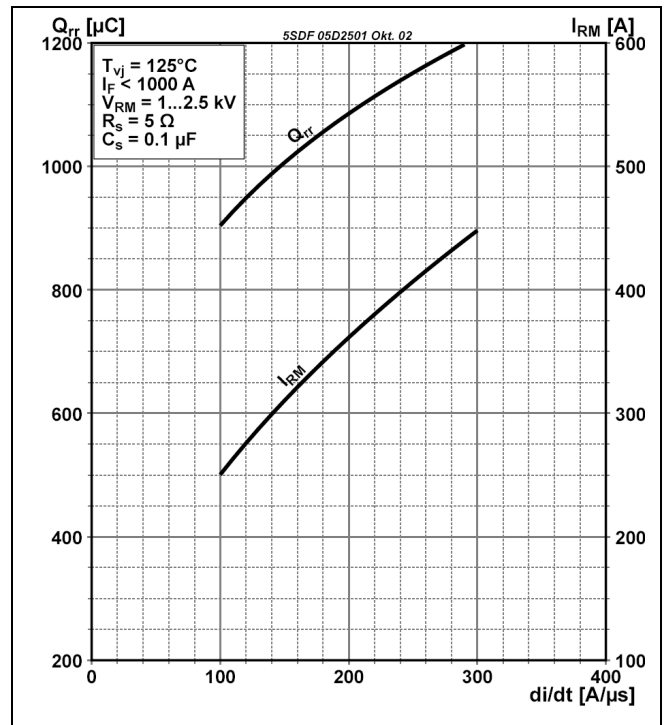


Fig. 7 Peak reverse recovery current vs. di_F/dt, I_F = 1000 A; T_j = T_{jmax}, limit values

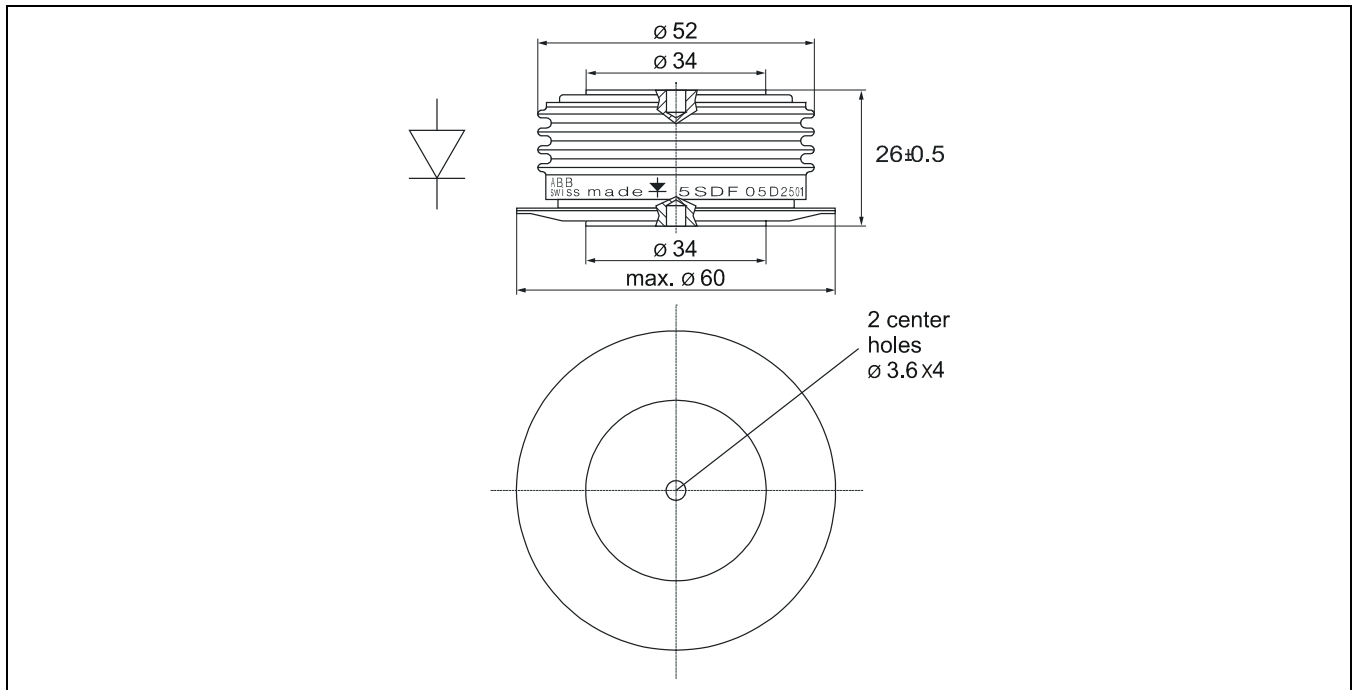


Fig. 8 Outline drawing. All dimensions are in millimeters and represent nominal values unless stated otherwise.

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