V_{RRM}	=	4500 V
$I_{F(AV)M}$	=	1100 A
I_{FSM}	=	20×10^3 A
$V_{(T0)}$	=	1.75 V
r_T	=	0.88 mW
V_{DClink}	=	2800 V

Fast Recovery Diode

5SDF 10H4503

Doc. No. 5SYA1163-01 Oct. 06

- **Patented free-floating technology**
- **Industry standard housing**
- **Cosmic radiation withstand rating**
- **Low on-state and switching losses**
- **Optimized for snubberless operation**

Blocking

Maximum rated values [1)]

Parameter	Symbol	Conditions	Value	Unit
Repetitive peak reverse voltage	V_{RRM}	f = 50 Hz, t_p = 10ms, T_{vj} = 125°C	4500	V
Permanent DC voltage for 100 FIT failure rate	$V_{DC\text{-}link}$	Ambient cosmic radiation at sea level in open air. (100% Duty)	2800	V
Permanent DC voltage for 100 FIT failure rate	$V_{DC\text{-}link}$	Ambient cosmic radiation at sea level in open air. (5% Duty)	3200	V

Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
Repetitive peak reverse current	I_{RRM}	$V_R = V_{RRM}$, T_{vj} = 125°C			50	mA

Mechanical data

Maximum rated values [1)]

Parameter	Symbol	Conditions	min	typ	max	Unit
Mounting force	F_m		36	40	46	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				0.83	kg
Housing thickness	H		26.0		26.4	mm
Surface creepage distance	D_S		33			mm
Air strike distance	D_a		20			mm

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

On-state

Maximum rated values [1)]

Parameter	Symbol	Conditions	min	typ	max	Unit
Max. average on-state current	$I_{F(AV)M}$	Half sine wave, T_C = 70 °C			1100	A
Max. RMS on-state current	$I_{F(RMS)}$				1740	A
Max. peak non-repetitive surge current	I_{FSM}	t_p = 10 ms, T_{vj} = 125°C, V_R = 0 V			20×10^3	A
Limiting load integral	I^2t				2×10^6	A^2s
Max. peak non-repetitive surge current	I_{FSM}	t_p = 30 ms, T_{vj} = 125°C, V_R = 0 V			12×10^3	A
Limiting load integral	I^2t				2.16×10^6	A^2s

Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
On-state voltage	V_F	I_F = 2500 A, T_{vj} = 125°C		3.1	3.8	V
Threshold voltage	$V_{(T0)}$	T_{vj} = 125°C I_F = 500...2500 A			1.75	V
Slope resistance	r_T				0.88	mΩ

Turn-on

Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
Peak forward recovery voltage	V_{FRM}	dI_F/dt = 600 A/µs, T_{vj} = 125°C			80	V
		dI_F/dt = 3000 A/µs, T_{vj} = 125°C			250	V

Turn-off

Maximum rated values [1)]

Parameter	Symbol	Conditions	min	typ	max	Unit
Max. decay rate of on-state current	di/dt_{crit}	I_{FM} = 4000 A, T_{vj} = 125 °C $V_{DC\text{-}link}$ = 2800 V			600	A/µs

Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
Reverse recovery current	I_{RM}	I_{FM} = 3300 A, $V_{DC\text{-}Link}$ = 2800 V			1520	A
Reverse recovery charge	Q_{rr}	$-dI_F/dt$ = 600 A/µs, L_{CL} = 300 nH			5250	µC
Turn-off energy	E_{rr}	C_{CL} = 10 µF, R_{CL} = 0.65 Ω, T_{vj} = 125°C, D_{CL} = 5SDF 10H4503			9.5	J

Thermal

Maximum rated values [Note 1]

Parameter	Symbol	Conditions	min	typ	max	Unit
Operating junction temperature range	T_{vj}		0		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 F_m = 36...46 kN			12	K/kW
	$R_{th(j-c)A}$	Anode-side cooled F_m = 36...46 kN			24	K/kW
	$R_{th(j-c)C}$	Cathode-side cooled F_m = 36...46 kN			24	K/kW
Thermal resistance case to heatsink	$R_{th(c-h)}$	Double-side cooled F_m = 36...46 kN			3	K/kW
	$R_{th(c-h)}$	Single-side cooled F_m = 36...46 kN			6	K/kW

Analytical function for transient thermal impedance:

$$Z_{th(j-c)}(t) = \sum_{i=1}^{n} R_{th\,i}(1 - e^{-t/t_i})$$

i	1	2	3	4
$R_{th\,i}$(K/kW)	7.705	2.748	1.009	0.539
τ_i(s)	0.5244	0.0633	0.0065	0.0015

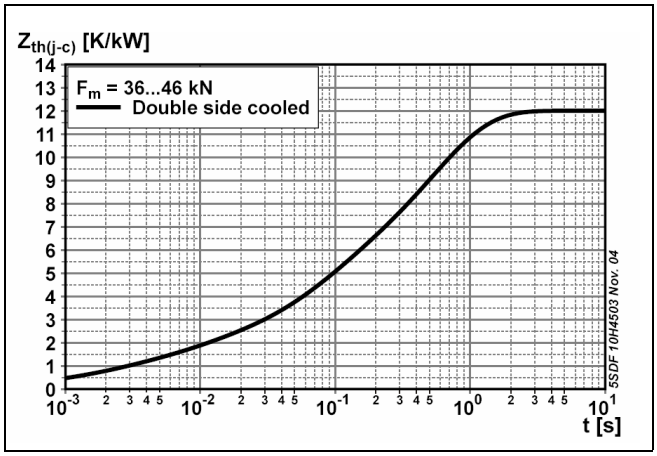

Fig. 1 Transient thermal impedance junction-to-case

Max. on-state characteristic model:

$$V_{F0} = A_{Tvj} + B_{Tvj} \cdot I_F + C_{Tvj} \cdot \ln(I_F + 1) + D_{Tvj} \cdot \sqrt{I_F}$$

Valid for I_F = 300 – 30000 A

A_0	B_0	C_0	D_0
915.50×10^{-3}	347.20×10^{-6}	202.5×10^{-3}	0.00

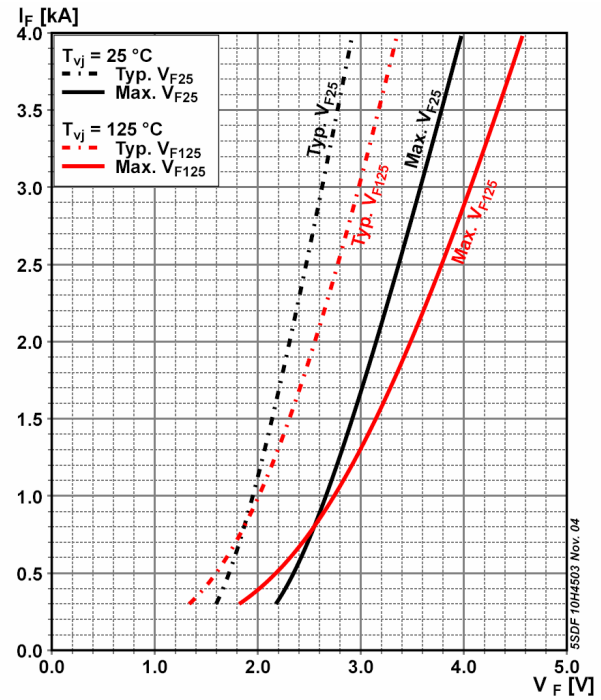

Fig. 2 Max. on-state voltage characteristics

Max. on-state characteristic model:

$$V_{F125} = A_{Tvj} + B_{Tvj} \cdot I_F + C_{Tvj} \cdot \ln(I_F + 1) + D_{Tvj} \cdot \sqrt{I_F}$$

Valid for I_F = 300 – 30000 A

A_{125}	B_{125}	C_{125}	D_{125}
-1.49	352.90×10^{-6}	561.70×10^{-3}	0.00

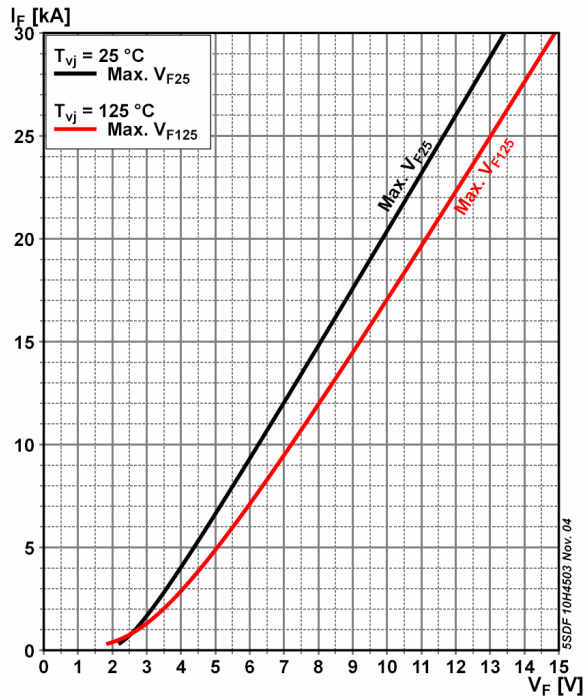

Fig. 3 Max. on-state voltage characteristics

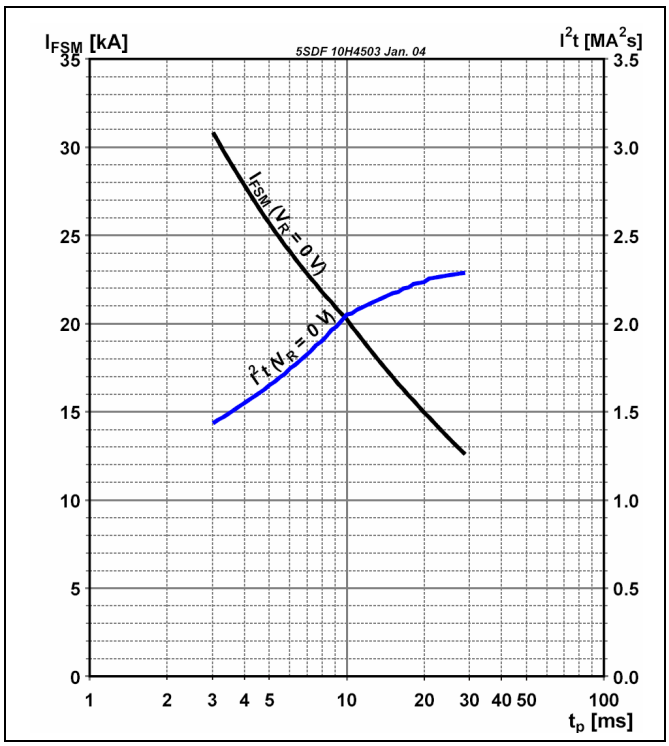

Fig. 4 Surge on-state current vs. pulse length. Half-sine wave

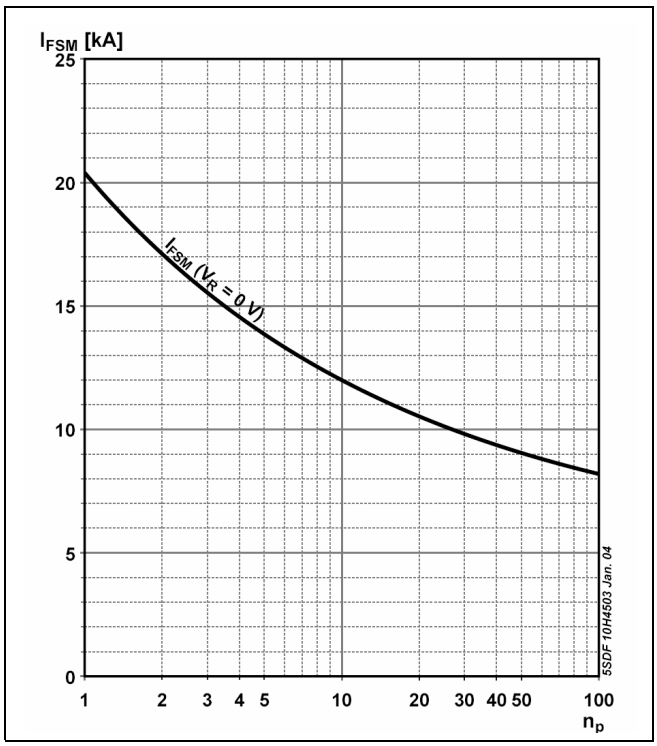

Fig. 5 Surge on-state current vs. number of pulses, half-sine wave, 10 ms, 50Hz

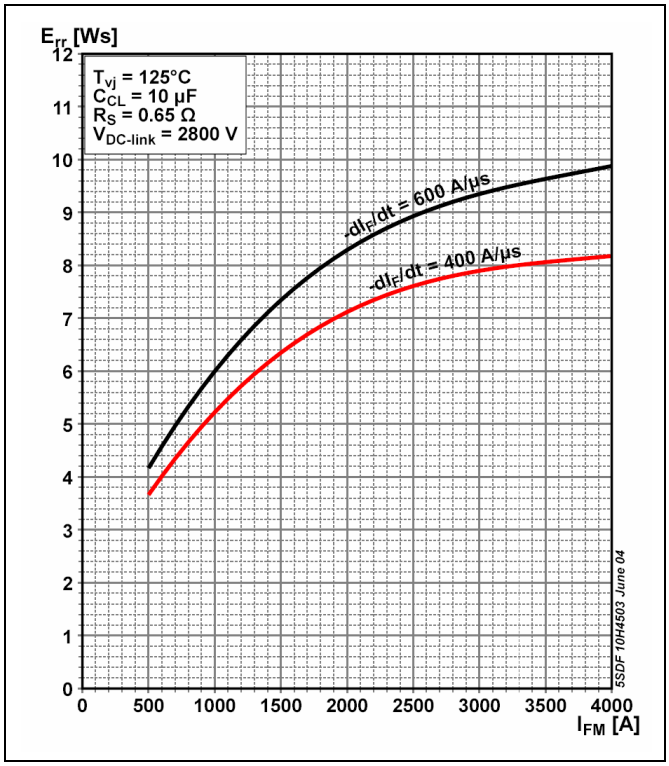

Fig. 6 Upper scatter range of turn-off energy per pulse vs. turn-off current

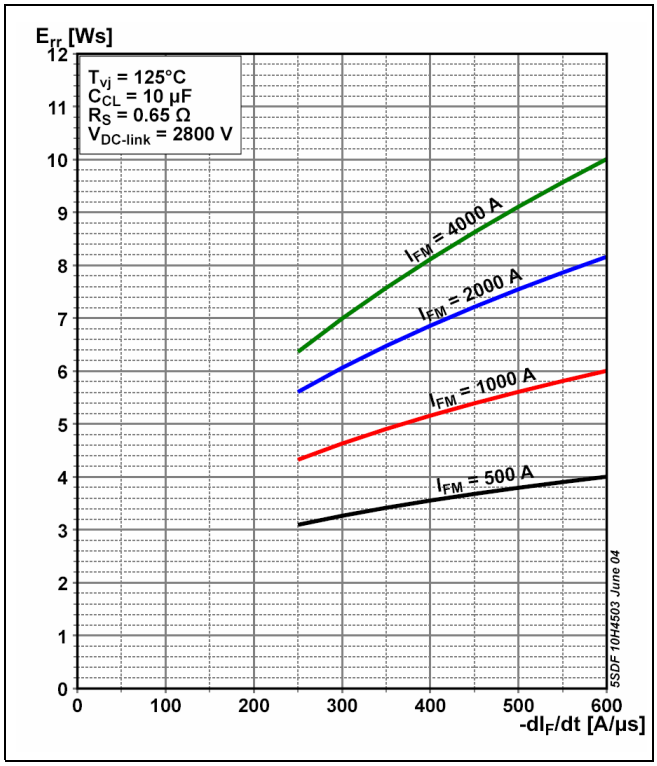

Fig. 7 Upper scatter range of turn-off energy per pulse vs reverse current rise rate

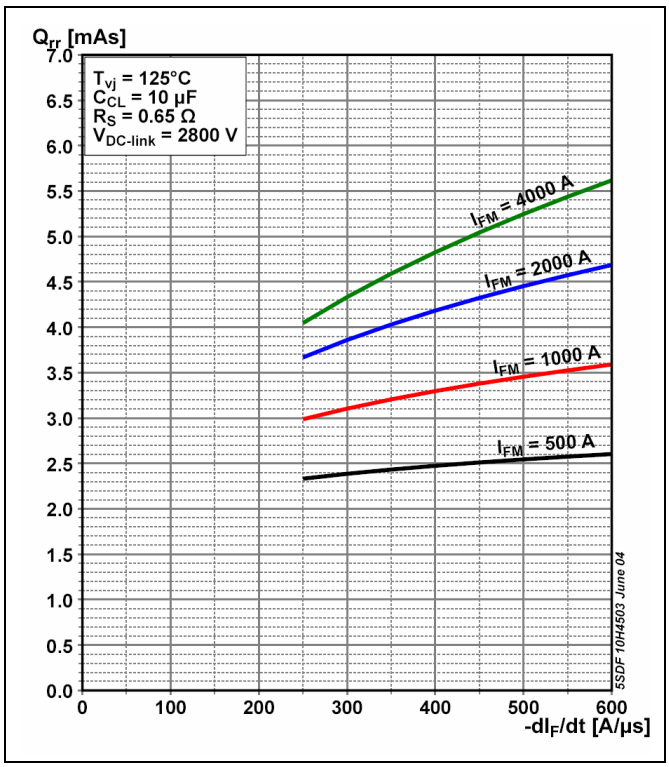

Fig. 8 Upper scatter range of repetitive reverse recovery charge vs reverse current rise rate.

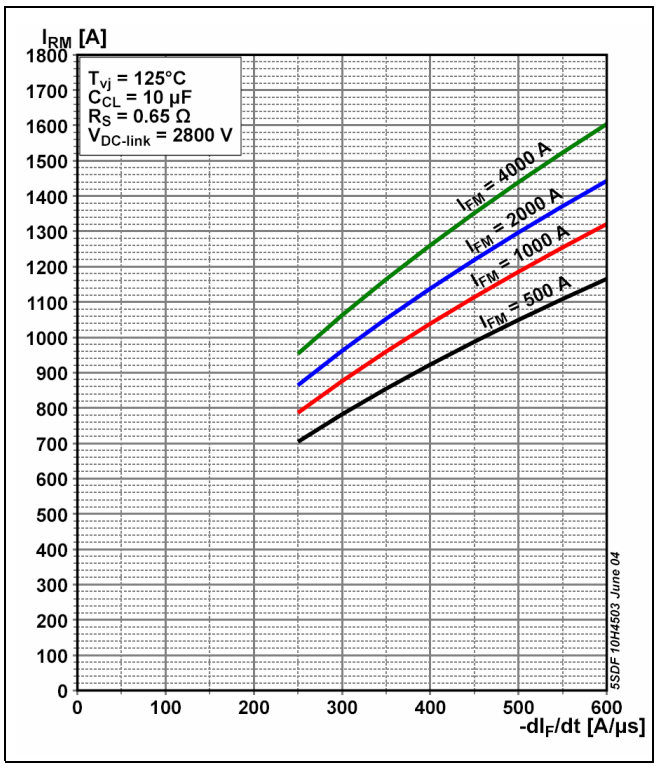

Fig. 9 Upper scatter range of reverse recovery current vs reverse current rise rate

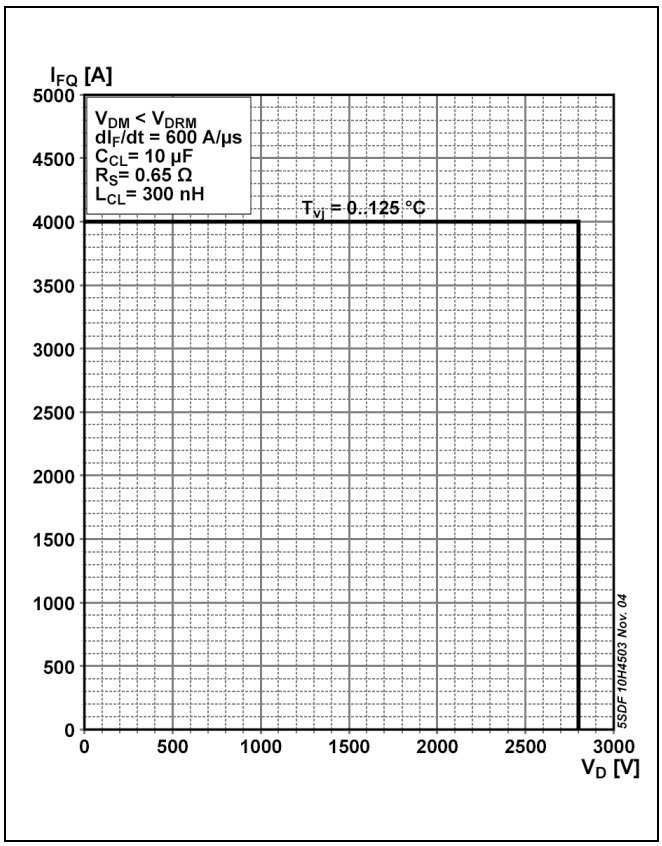

Fig. 10 Diode Safe Operating Area

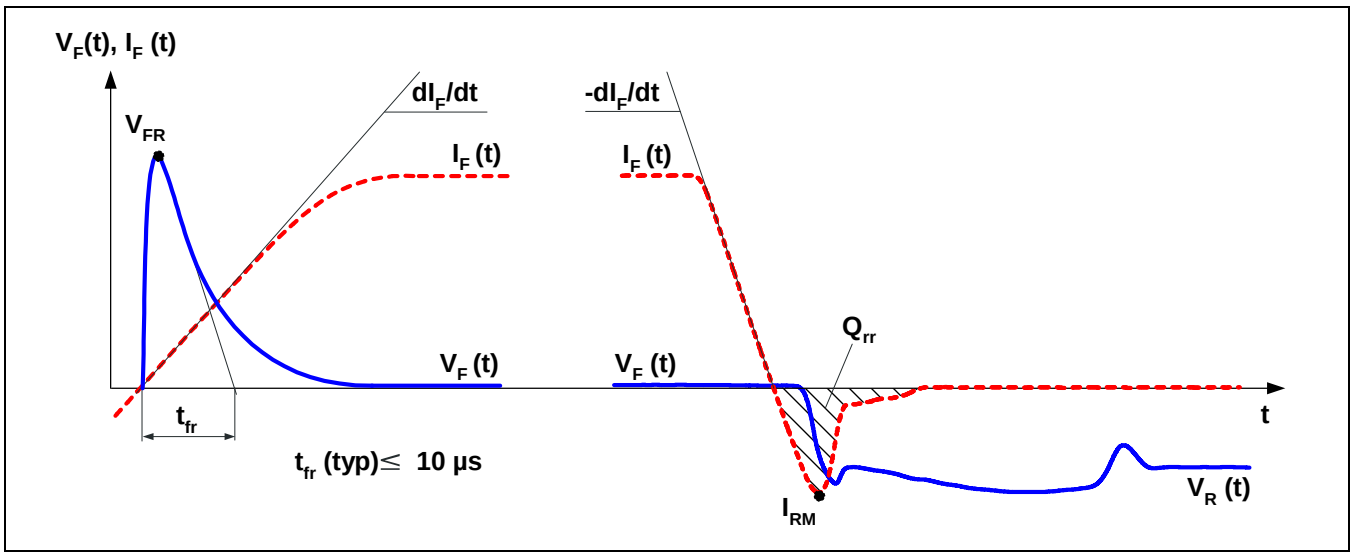

Fig. 11 General current and voltage waveforms

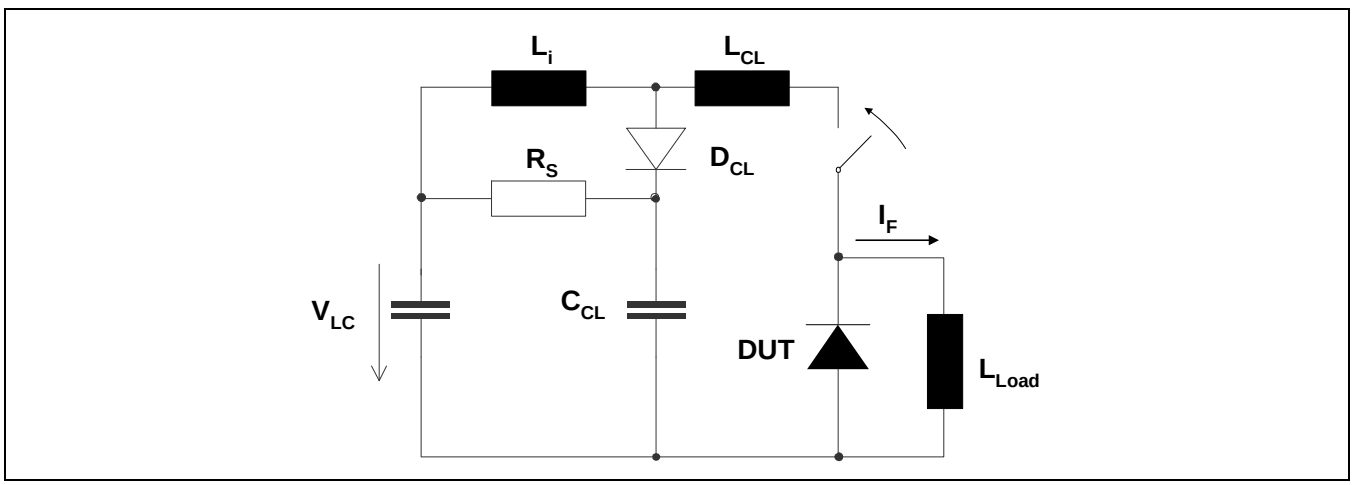

Fig. 12 Test circuit.

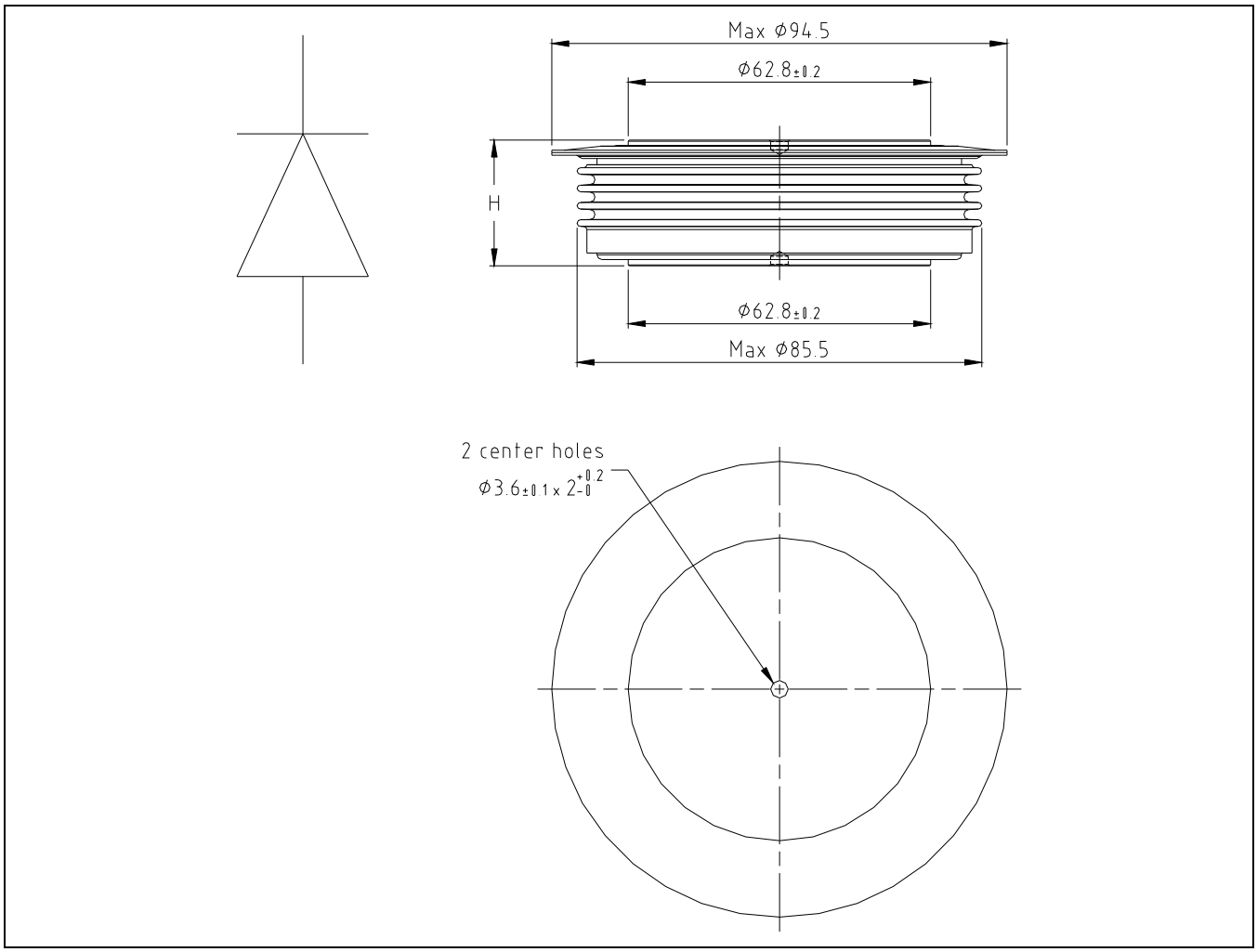

Fig. 13 Outline drawing, all dimensions are in millimeters and represent nominal values unless stated otherwise

Related documents:

Doc. Nr	Titel
5SYA 2036	Recommendations regarding mechanical clamping of Press Pack High Power Semiconductors
5SZK 9104	Specification of environmental class for pressure contact diodes, PCTs and GTO, STORAGE available on request, please contact factory
5SZK 9105	Specification of environmental class for pressure contact diodes, PCTs and GTO, TRANSPORTATION available on request, please contact factory

Please refer to http://www.abb.com/semiconductors for actual versions.

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