

$V_{RSM} = 4000 \text{ V}$

$I_{F(AV)M} = 5200 \text{ A}$

$I_{F(RMS)} = 8200 \text{ A}$

$I_{FSM} = 85 \cdot 10^3 \text{ A}$

$V_{F0} = 0.8 \text{ V}$

$r_F = 0.086 \text{ m}\Omega$

## Rectifier Diode

# 5SDD 54N4000

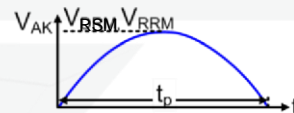
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- Patented free-floating silicon technology
- Very low on-state losses
- Optimum power handling capability

## Blocking

Maximum rated values <sup>1)</sup>

Parameter	Symbol	Conditions	Value	Unit
Max repetitive peak reverse voltage	$V_{RRM}$	$f = 50 \text{ Hz}, t_p = 10 \text{ ms}, T_{vj} = 0 \dots 150 \text{ }^\circ\text{C}$	3600	V
Max non-repetitive peak reverse voltage	$V_{RSM}$	$f = 5 \text{ Hz}, t_p = 10 \text{ ms}, T_{vj} = 0 \dots 150 \text{ }^\circ\text{C}$	4000	V



Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
Reverse leakage current	$I_{RRM}$	$V_{RRM}, T_{vj} = 150 \text{ }^\circ\text{C}$			400	mA

## Mechanical data

Maximum rated values <sup>1)</sup>

Parameter	Symbol	Conditions	min	typ	max	Unit
Mounting force	$F_M$		81	90	108	kN
Acceleration	a	Device unclamped			50	m/s <sup>2</sup>
Acceleration	a	Device clamped			100	m/s <sup>2</sup>

Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
Weight	m				2.8	kg
Housing thickness	H	$F_M = 90 \text{ kN}, T_a = 25 \text{ }^\circ\text{C}$	34.3		35	mm
Surface creepage distance	$D_s$		56			mm
Air strike distance	$D_a$		22			mm

<sup>1)</sup> Maximum rated values indicate limits beyond which damage to the device may occur

## On-state

### Maximum rated values <sup>1)</sup>

Parameter	Symbol	Conditions	min	typ	max	Unit
Average on-state current	$I_{F(AV)M}$	Half sine wave, $T_c = 85\text{ }^\circ\text{C}$			5200	A
RMS on-state current	$I_{F(RMS)}$				8200	A
Peak non-repetitive surge current	$I_{FSM}$	$t_p = 10\text{ ms}$ , $T_{vj} = 150\text{ }^\circ\text{C}$ , sine half wave, $V_R = 0\text{ V}$ , after surge			$85 \cdot 10^3$	A
Limiting load integral	$I^2t$				$36.3 \cdot 10^6$	$\text{A}^2\text{s}$

### Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
On-state voltage	$V_F$	$I_F = 5000\text{ A}$ , $T_{vj} = 150\text{ }^\circ\text{C}$			1.23	V
Threshold voltage	$V_{F0}$	$T_{vj} = 150\text{ }^\circ\text{C}$			0.8	V
Slope resistance	$r_F$	$I_F = 2500 \dots 7500\text{ A}$			0.086	$\text{m}\Omega$

## Switching

### Characteristic values

Parameter	Symbol	Conditions	min	typ	max	Unit
Reverse recovery charge	$Q_{rr}$	$di_F/dt = -10\text{ A}/\mu\text{s}$ , $V_R = 200\text{ V}$ $I_F = 4000\text{ A}$ , $T_{vj} = 150\text{ }^\circ\text{C}$			18000	$\mu\text{As}$
Reverse recovery current	$I_{RM}$				470	A

Parameter	Symbol	Conditions	min	typ	max	Unit
Thermal resistance junction to case	$R_{th(j-c)}$	Double-side cooled $F_m = 81... 108 \text{ kN}$			5.7	K/kW
	$R_{th(j-c)A}$	Anode-side cooled $F_m = 81... 108 \text{ kN}$			11.4	K/kW
	$R_{th(j-c)C}$	Cathode-side cooled $F_m = 81... 108 \text{ kN}$			11.4	K/kW
Thermal resistance case to heatsink	$R_{th(c-h)}$	Double-side cooled $F_m = 81... 108 \text{ kN}$			1	K/kW
	$R_{th(c-h)}$	Single-side cooled $F_m = 81... 108 \text{ kN}$			2	K/kW

## Thermal

### Maximum rated values <sup>1)</sup>

Parameter	Symbol	Conditions	min	typ	max	Unit
Operating junction temperature range	$T_{vj}$		0		150	°C
Storage temperature range	$T_{stg}$		-40		150	°C

### Characteristic values

Analytical function for transient thermal impedance:

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

i	1	2	3	4
$R_i(\text{K/kW})$	3.731	1.250	0.434	0.292
$\tau_i(\text{s})$	0.8115	0.1014	0.0089	0.0015

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

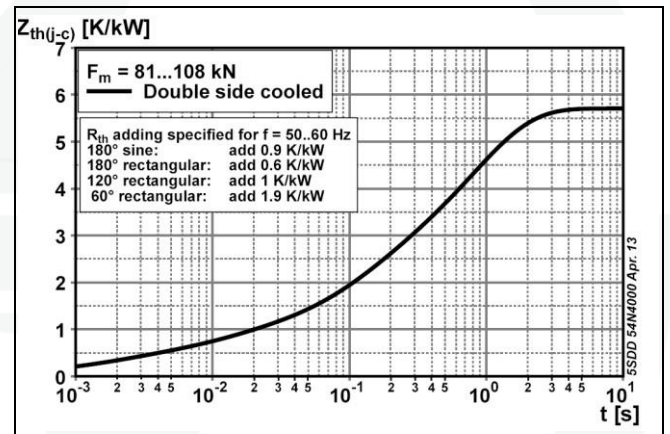


Fig. 1 Transient thermal impedance (junction-to-case) vs. time

**Max. on-state characteris**

$$V_{F25} \approx A_{Tvj} \cdot B_{Tvj} \cdot I_F \cdot C_{Tvj} \cdot \ln(I_F \cdot 1) \cdot D_{Tvj} \cdot \sqrt{I_F}$$

Valid for  $I_F = 300 - 110000$  A

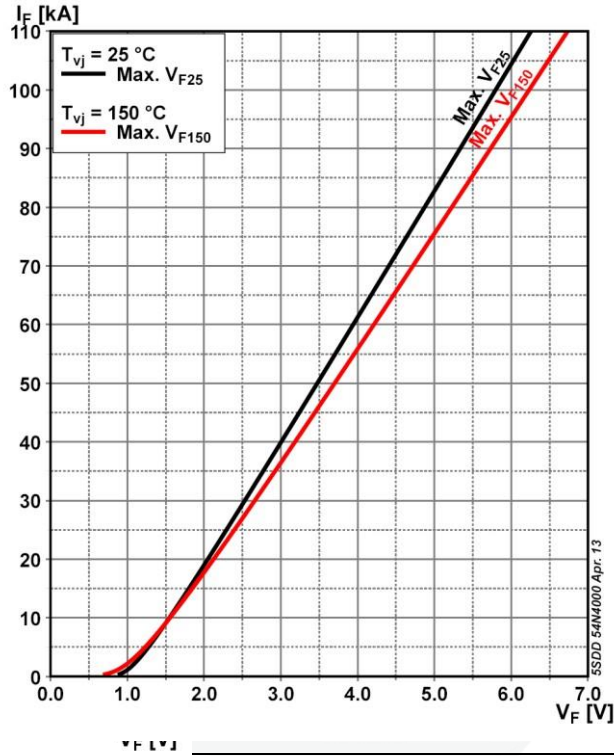
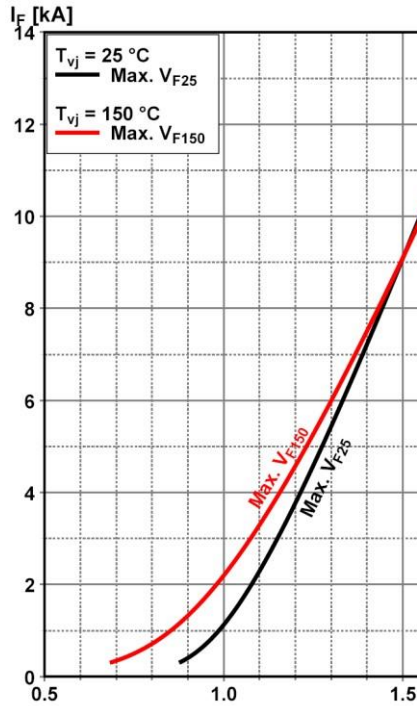
A <sub>25</sub>	B <sub>25</sub>	C <sub>2</sub>
486.4 · 10 <sup>-3</sup>	45.53 · 10 <sup>-6</sup>	65.82

**Max. on-state characteristic model:**

$$V_{F150} \approx A_{Tvj} \cdot B_{Tvj} \cdot I_F \cdot C_{Tvj} \cdot \ln(I_F \cdot 1) \cdot D_{Tvj} \cdot \sqrt{I_F}$$

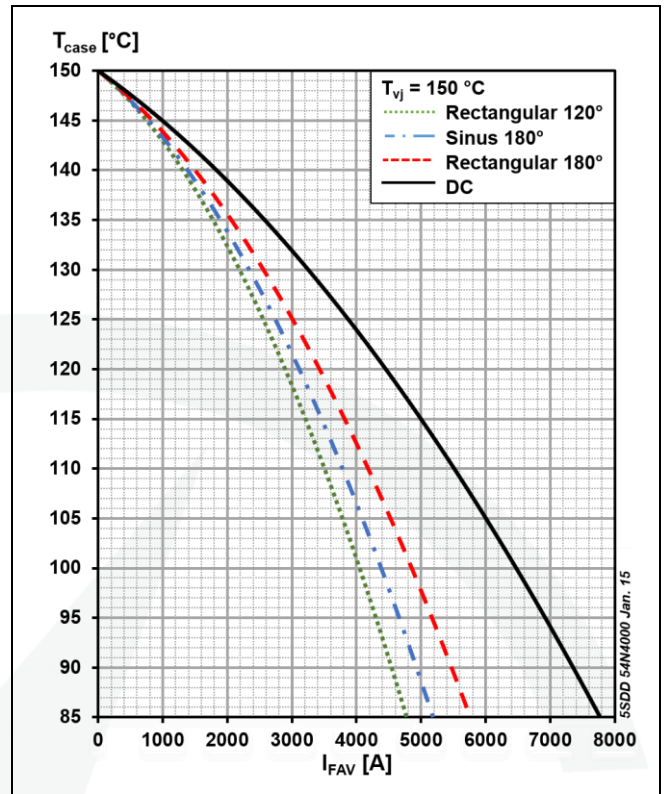
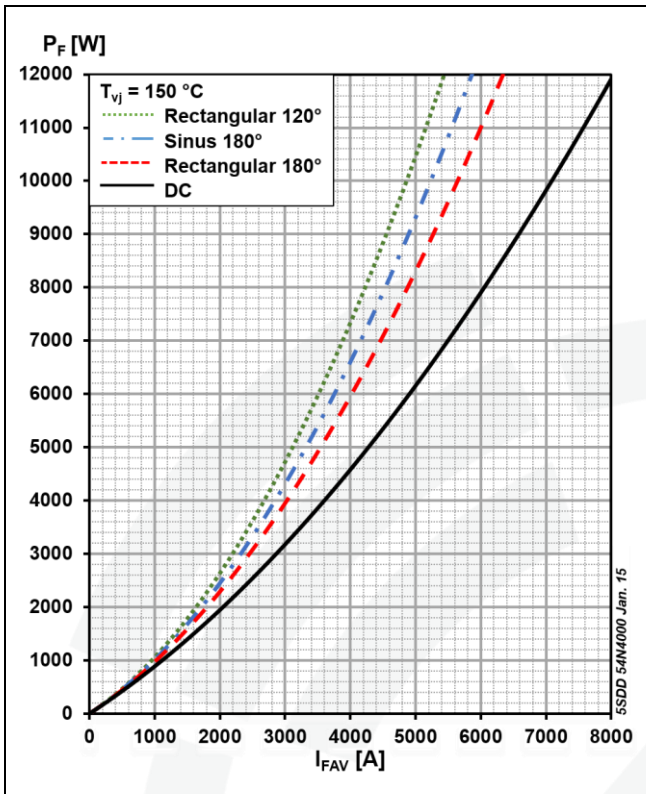
Valid for  $I_F = 300 - 110000$  A

A <sub>150</sub>	B <sub>150</sub>	C <sub>150</sub>	D <sub>150</sub>
22.00 · 10 <sup>-3</sup>	49.09 · 10 <sup>-6</sup>	113.10 · 10 <sup>-3</sup>	-20.75 · 10 <sup>-15</sup>



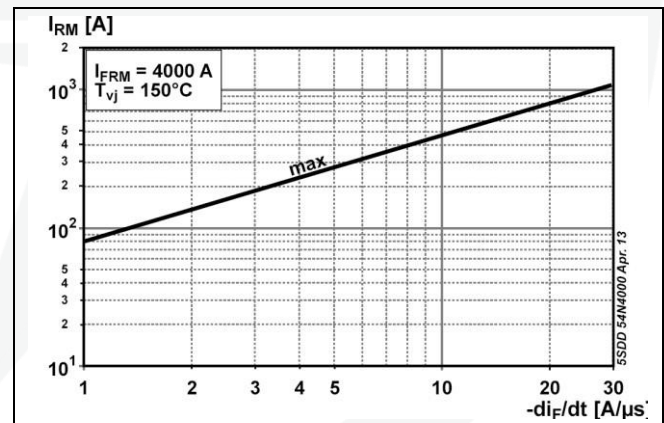
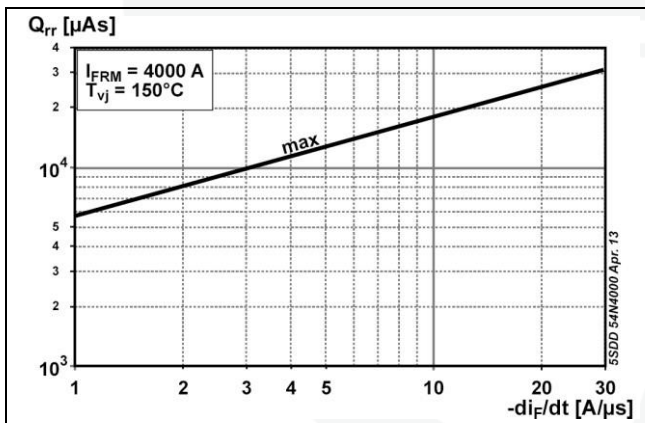
**Fig. 2** On-state voltage characteristics

**Fig. 3** On-state voltage characteristics



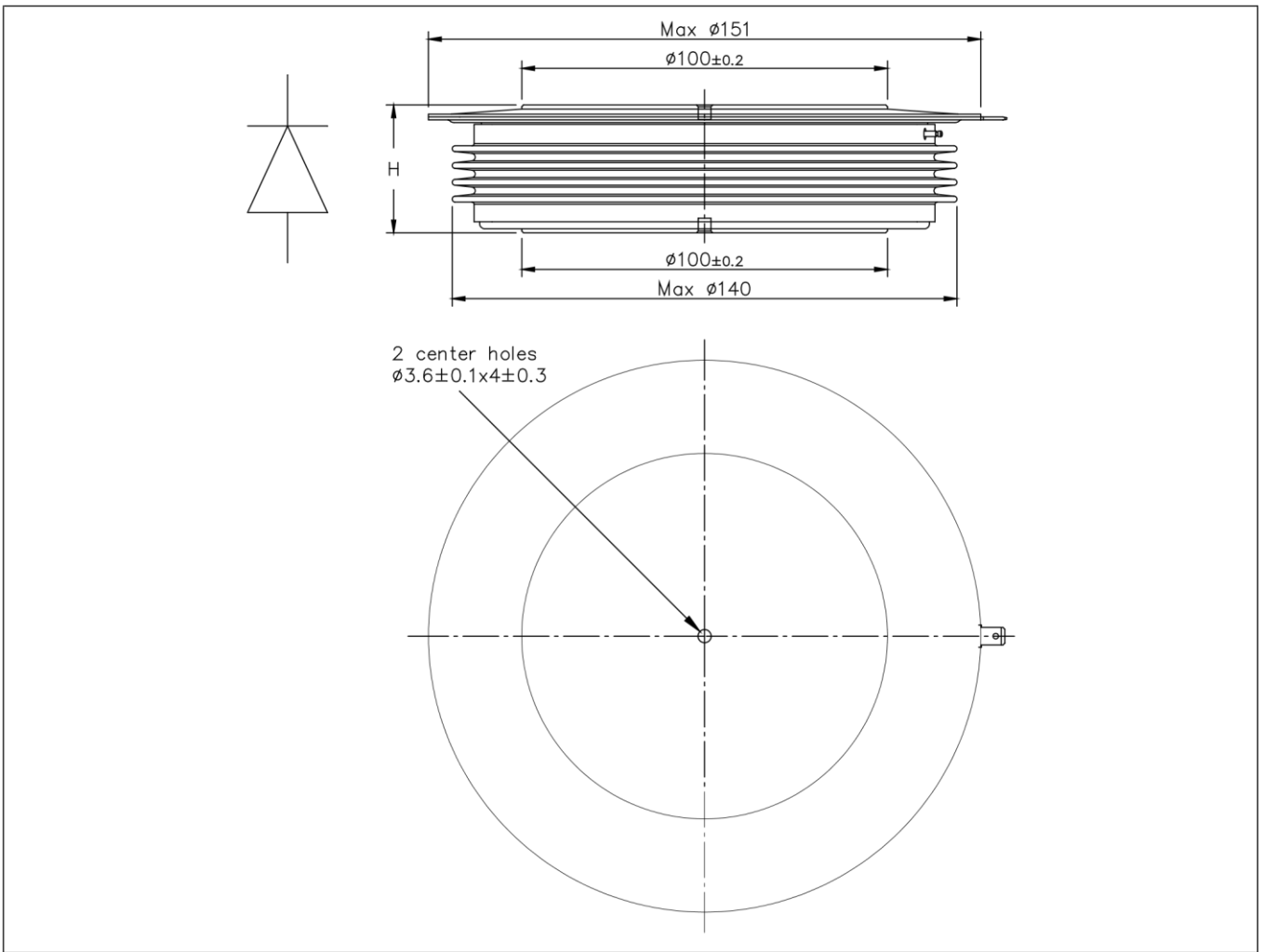
**Fig. 4** On-state power dissipation vs. mean on-state current

**Fig. 5** Max. permissible case temperature vs. mean current



**Fig. 6** Reverse recovery charge vs. decay rate of on-state current

**Fig. 7** Peak reverse recovery current vs. decay rate of on-state current



**Fig. 8** Device Outline Drawing