

Rectifier Diode

5SDD 54N4000

| | | |
|--------------|---|-------------------|
| V_{RSM} | = | 4000 V |
| $I_{F(AV)M}$ | = | 5200 A |
| $I_{F(RMS)}$ | = | 8200 A |
| I_{FSM} | = | $85 \cdot 10^3$ A |
| V_{F0} | = | 0.8 V |
| r_F | = | 0.086 m Ω |

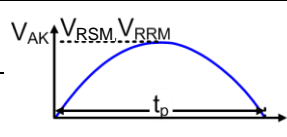
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- Patented free-floating silicon technology
- Very low on-state losses
- Optimum power handling capability

Blocking

Maximum rated values ¹⁾

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



Characteristic values

| Parameter | Symbol | Conditions | min | typ | max | Unit |
|-------------------------|-----------|-------------------------------|-----|-----|-----|------|
| Reverse leakage current | I_{RRM} | V_{RRM} , $T_{vj} = 150$ °C | | | 400 | mA |

Mechanical data

Maximum rated values ¹⁾

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

Characteristic values

| Parameter | Symbol | Conditions | min | typ | max | Unit |
|---------------------------|--------|------------------------------|------|-----|-----|------|
| Weight | m | | | | 2.8 | kg |
| Housing thickness | H | $F_M = 90$ kN, $T_a = 25$ °C | 34.3 | | 35 | mm |
| Surface creepage distance | D_S | | 56 | | | mm |
| Air strike distance | D_a | | 22 | | | 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 |
|-----------------------------------|--------------|--|-----|-----|-------------------|------------------|
| Average on-state current | $I_{F(AV)M}$ | Half sine wave, $T_c = 85\text{ °C}$ | | | 5200 | A |
| RMS on-state current | $I_{F(RMS)}$ | | | | 8200 | A |
| Peak non-repetitive surge current | I_{FSM} | $t_p = 10\text{ ms}$, $T_{vj} = 150\text{ °C}$, sine half wave, $V_R = 0\text{ V}$, after surge | | | $85 \cdot 10^3$ | A |
| Limiting load integral | I^2t | | | | $36.3 \cdot 10^6$ | A ² s |

Characteristic values

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

Switching

Characteristic values

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

Thermal

Maximum rated values ¹⁾

| 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

| 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 |

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 (K/kW) | 3.731 | 1.250 | 0.434 | 0.292 |
| τ_i (s) | 0.8115 | 0.1014 | 0.0089 | 0.0015 |

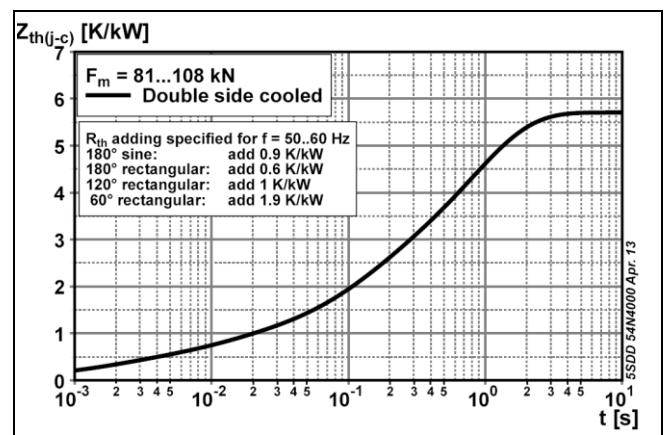


Fig. 1 Transient thermal impedance (junction-to-case) vs. time

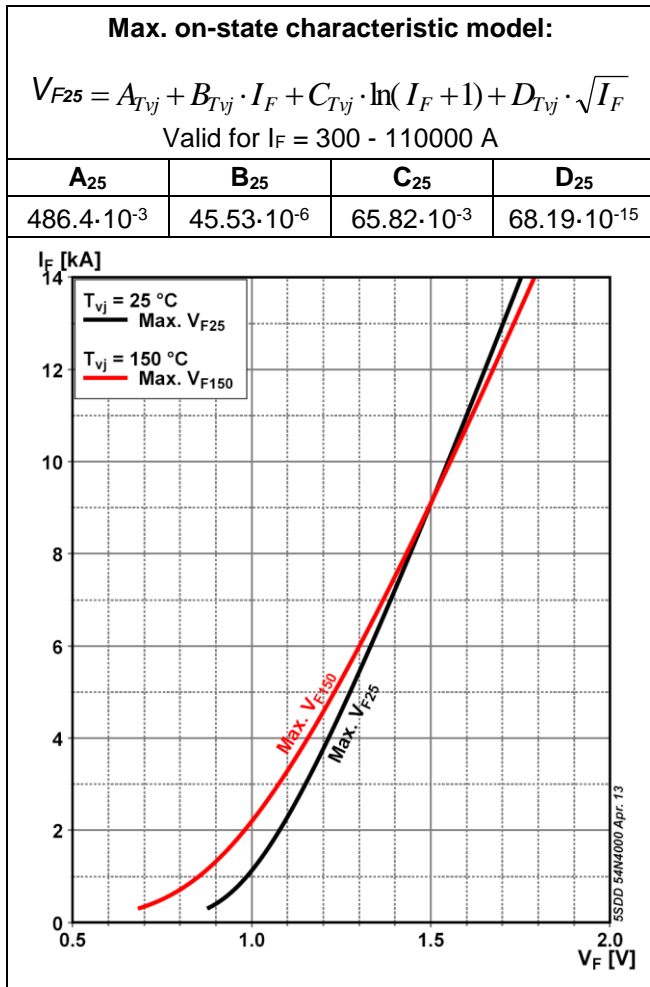


Fig. 2 On-state voltage characteristics

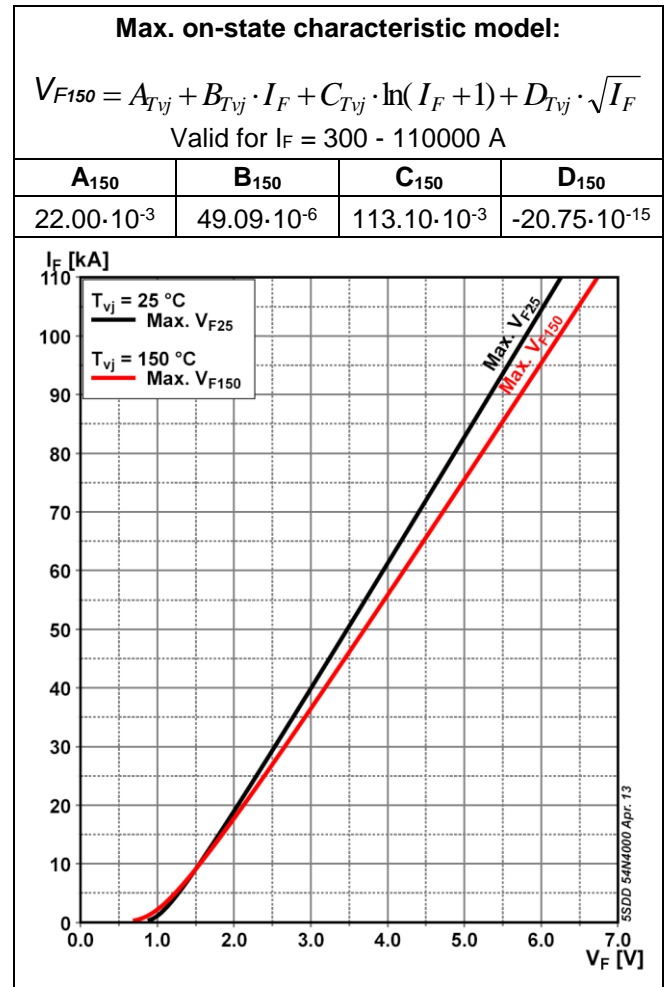


Fig. 3 On-state voltage characteristics

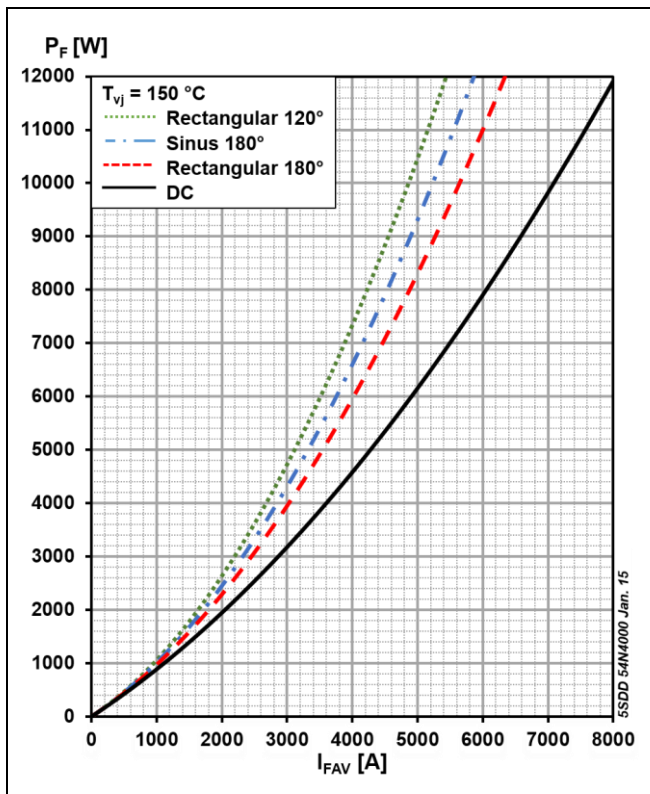


Fig. 4 On-state power dissipation vs. mean on-state current

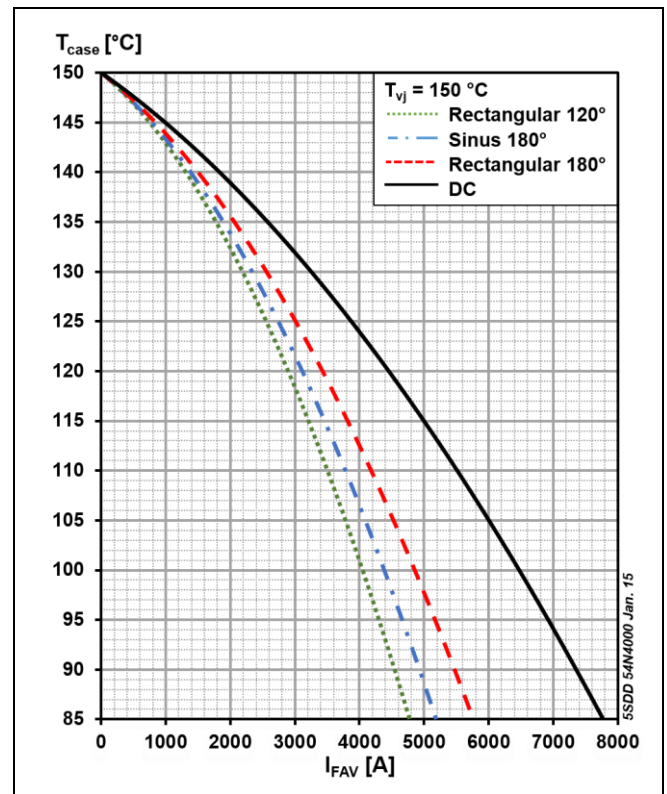


Fig. 5 Max. permissible case temperature vs. mean on-state current

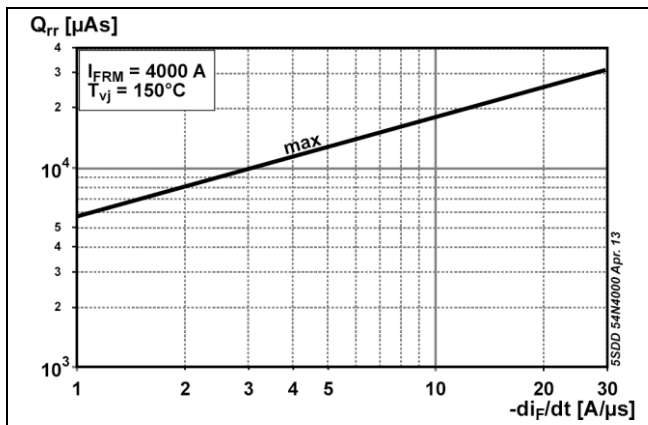


Fig. 6 Reverse recovery charge vs. decay rate of on-state current

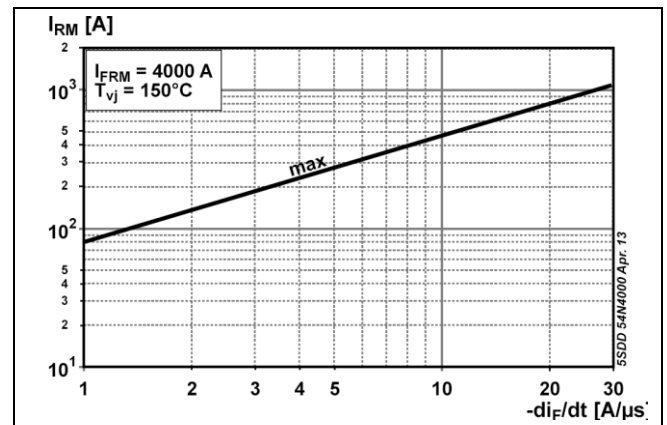


Fig. 7 Peak reverse recovery current vs. decay rate of on-state current

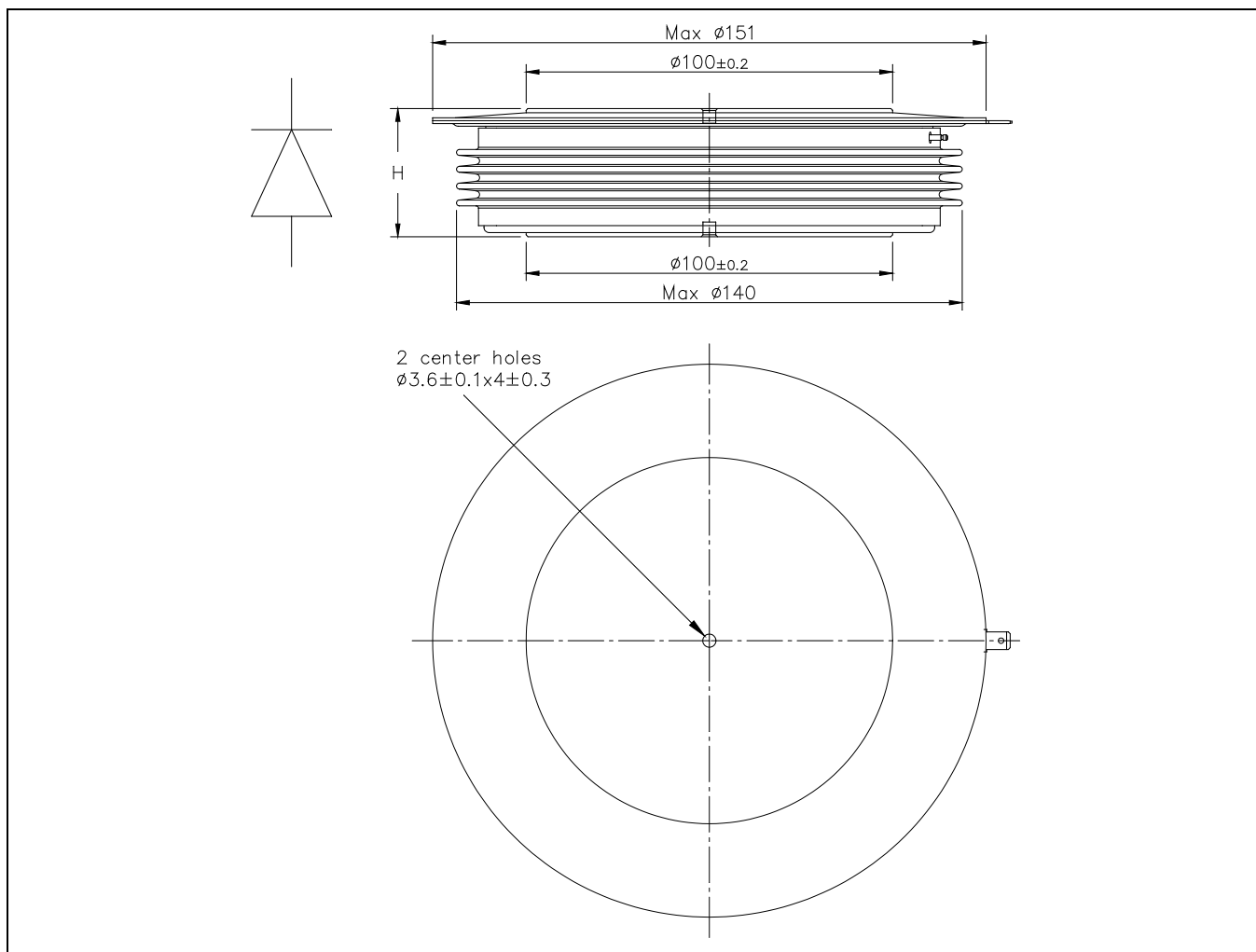


Fig. 8 Device Outline Drawing

Related documents:

| | |
|-----------|--|
| 5SYA 2020 | Design of RC-Snubbers for Phase Control Applications |
| 5SYA 2029 | High Power Rectifier Diodes |
| 5SYA 2036 | Recommendations regarding mechanical clamping of Press Pack High Power Semiconductors |
| 5SYA 2048 | Field Measurements on High Power Press-Pack Semiconductors |
| 5SYA 2051 | Voltage Ratings of High Power Semiconductors |
| 5SZK 9104 | Specification of environmental class for pressure contact diodes, PCTs and GTO, Storage |
| 5SZK 9105 | Specification of environmental class for pressure contact diodes, PCTs and GTO, Transportation |
| 5SZK 9115 | Specification of environmental class for presspack Diodes, PCTs and GTOs, Operation (Industry) |
| 5SZK 9116 | Specification of environmental class for presspack Diodes, PCTs and GTOs, Operation (Traction) |

Please refer to <http://www.abb.com/semiconductors> for current version of documents.

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