

|            |   |                      |
|------------|---|----------------------|
| $V_{RSM}$  | = | 5200 V               |
| $I_{FAVM}$ | = | 1978 A               |
| $I_{FRMS}$ | = | 3106 A               |
| $I_{FSM}$  | = | $25.6 \times 10^3$ A |
| $V_{F0}$   | = | 0.94 V               |
| $r_F$      | = | 0.284 mΩ             |

# Rectifier Diode

## 5SDD 20F5000

Doc. No. 5SYA1162-01 Jan. 03

- Very low on-state losses
- Optimum power handling capability

### Blocking

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

| Parameter                             | Symbol    | Conditions                                                      | Value | Unit |
|---------------------------------------|-----------|-----------------------------------------------------------------|-------|------|
| Repetitive peak reverse voltage       | $V_{RRM}$ | $f = 50$ Hz, $t_p = 10$ ms, $T_j = -40 \dots 160^\circ\text{C}$ | 5000  | V    |
| Non - repetitive peak reverse voltage | $V_{RSM}$ | $f = 5$ Hz, $t_p = 10$ ms, $T_j = -40 \dots 160^\circ\text{C}$  | 5200  | V    |

*Characteristic values*

| Parameter                      | Symbol    | Conditions                            | min | typ | max | Unit |
|--------------------------------|-----------|---------------------------------------|-----|-----|-----|------|
| Max. (reverse) leakage current | $I_{RRM}$ | $V_{RRM}$ , $T_j = 160^\circ\text{C}$ |     |     | 50  | mA   |

### Mechanical data

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

| Parameter      | Symbol | Conditions       | min | typ | max | Unit           |
|----------------|--------|------------------|-----|-----|-----|----------------|
| Mounting force | $F_M$  |                  | 20  | 22  | 24  | kN             |
| Acceleration   | $a$    | Device unclamped |     |     | 50  | $\text{m/s}^2$ |
| Acceleration   | $a$    | Device clamped   |     |     | 100 | $\text{m/s}^2$ |

*Characteristic values*

| Parameter                 | Symbol | Conditions | min | typ | max | Unit |
|---------------------------|--------|------------|-----|-----|-----|------|
| Weight                    | $m$    |            |     | 0.5 |     | kg   |
| Housing thickness         | $H$    |            |     | 26  |     | mm   |
| Pole-piece diameter       | $D_P$  |            |     | 47  |     | mm   |
| Surface creepage distance | $D_S$  |            | 33  |     |     | mm   |
| Air strike distance       | $D_a$  |            | 18  |     |     | mm   |

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

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## On-state

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

| Parameter                              | Symbol     | Conditions                                                                | min | typ | max                 | Unit                 |
|----------------------------------------|------------|---------------------------------------------------------------------------|-----|-----|---------------------|----------------------|
| Max. average on-state current          | $I_{FAVM}$ | 50 Hz, Half sine wave, $T_C = 85^\circ\text{C}$                           |     |     | 1978                | A                    |
| Max. RMS on-state current              | $I_{FRMS}$ |                                                                           |     |     | 3106                | A                    |
| Max. peak non-repetitive surge current | $I_{FSM}$  | $t_p = 10\text{ ms}$ , $T_j = 160^\circ\text{C}$ ,<br>$V_R = 0\text{ V}$  |     |     | $25.6 \times 10^3$  | A                    |
| Limiting load integral                 | $I^2t$     |                                                                           |     |     | $2.727 \times 10^6$ | $\text{A}^2\text{s}$ |
| Max. peak non-repetitive surge current | $I_{FSM}$  | $t_p = 8.3\text{ ms}$ , $T_j = 160^\circ\text{C}$ ,<br>$V_R = 0\text{ V}$ |     |     | $24 \times 10^3$    | A                    |
| Limiting load integral                 | $I^2t$     |                                                                           |     |     | $2.88 \times 10^6$  | $\text{A}^2\text{s}$ |

### Characteristic values

| Parameter         | Symbol     | Conditions                                                    | min | typ | max   | Unit             |
|-------------------|------------|---------------------------------------------------------------|-----|-----|-------|------------------|
| On-state voltage  | $V_F$      | $I_F = 4000\text{ A}$ , $T_j = 160^\circ\text{C}$             |     |     | 2.1   | V                |
| Threshold voltage | $V_{(T0)}$ | $T_j = 160^\circ\text{C}$<br>$I_T = 2827 \dots 8480\text{ A}$ |     |     | 0.94  | V                |
| Slope resistance  | $r_T$      |                                                               |     |     | 0.284 | $\text{m}\Omega$ |

## Switching

### Characteristic values

| Parameter       | Symbol   | Conditions                                                                                                           | min | typ  | max  | Unit           |
|-----------------|----------|----------------------------------------------------------------------------------------------------------------------|-----|------|------|----------------|
| Recovery charge | $Q_{rr}$ | $di_F/dt = -30\text{ A}/\mu\text{s}$ , $V_R = 100\text{ V}$<br>$I_{FRM} = 1000\text{ A}$ , $T_j = 160^\circ\text{C}$ |     | 4500 | 5500 | $\mu\text{As}$ |

## Thermal

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

| Parameter                            | Symbol    | Conditions | min | typ | max | Unit             |
|--------------------------------------|-----------|------------|-----|-----|-----|------------------|
| Operating junction temperature range | $T_{vj}$  |            | -40 |     | 160 | $^\circ\text{C}$ |
| Storage temperature range            | $T_{stg}$ |            | -40 |     | 160 | $^\circ\text{C}$ |

### Characteristic values

| Parameter                           | Symbol         | Conditions          | min | typ | max | Unit |
|-------------------------------------|----------------|---------------------|-----|-----|-----|------|
| Thermal resistance junction to case | $R_{th(j-c)}$  | Double-side cooled  |     |     | 15  | K/kW |
|                                     | $R_{th(j-c)A}$ | Anode-side cooled   |     |     | 24  | K/kW |
|                                     | $R_{th(j-c)C}$ | Cathode-side cooled |     |     | 40  | K/kW |
| Thermal resistance case to heatsink | $R_{th(c-h)}$  | Double-side cooled  |     |     | 4   | K/kW |
|                                     | $R_{th(c-h)}$  | Single-side cooled  |     |     | 8   | 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      |
|--------------------|--------|--------|--------|--------|
| $R_i(\text{K/kW})$ | 6.060  | 3.850  | 3.780  | 1.320  |
| $\tau_i(\text{s})$ | 0.6937 | 0.2040 | 0.0452 | 0.0040 |

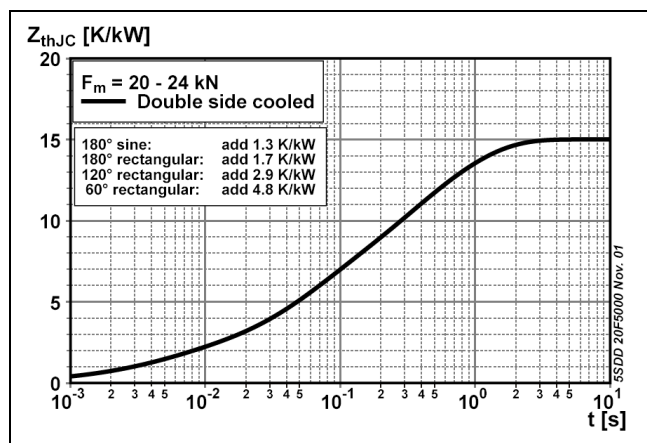
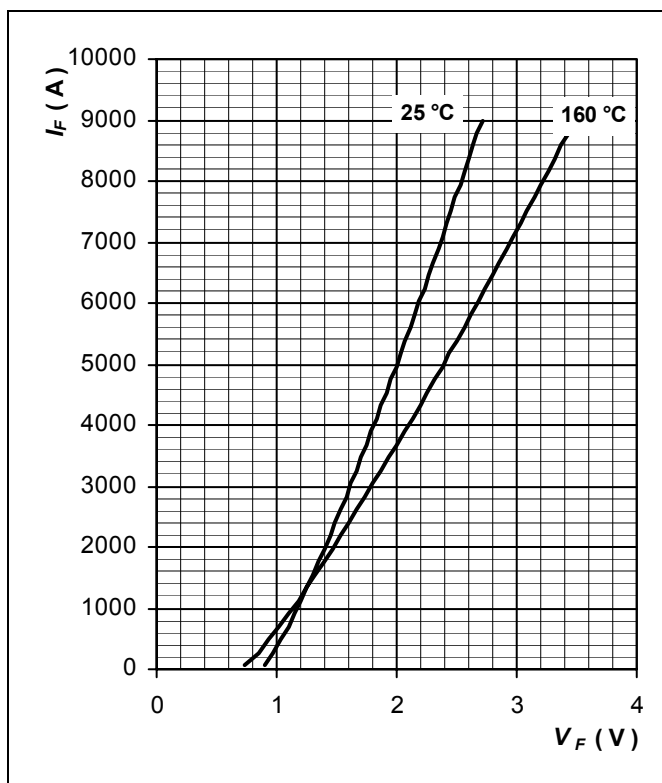
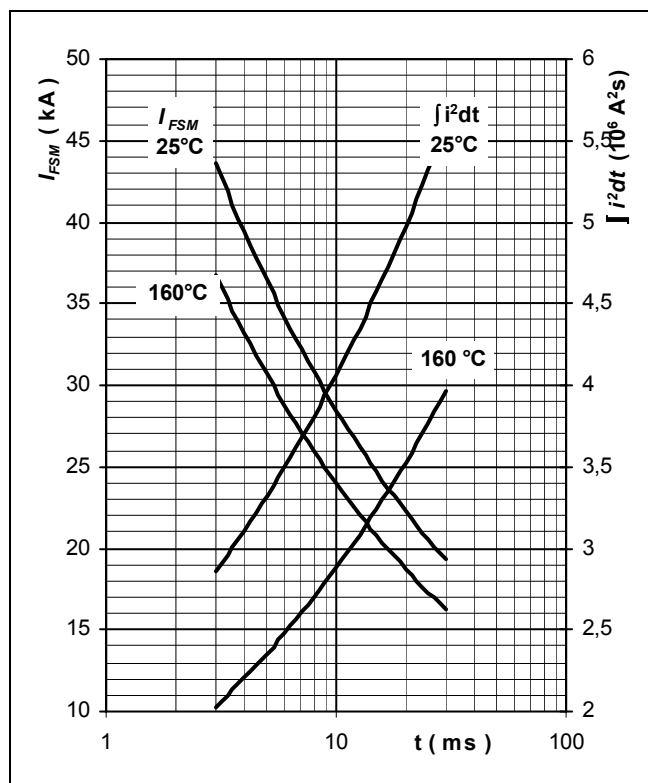


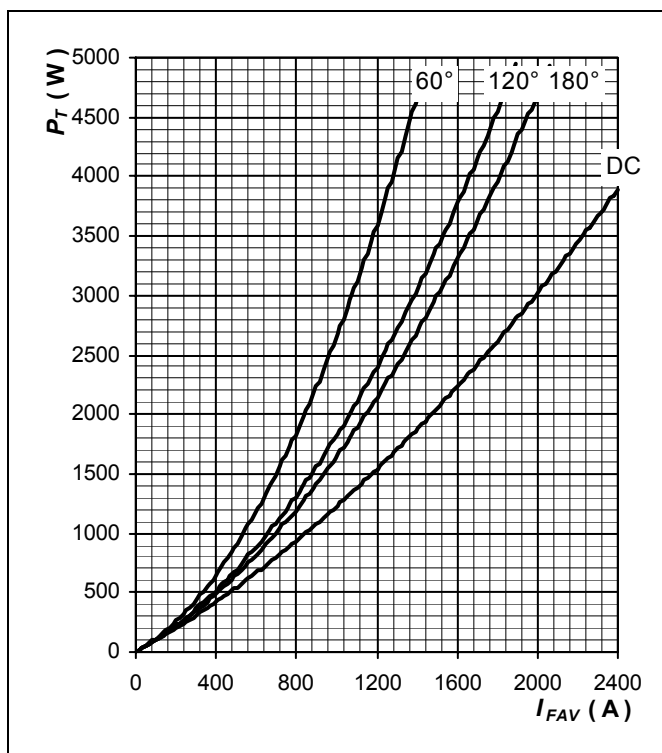
Fig. 1 Transient thermal impedance junction-to-case.



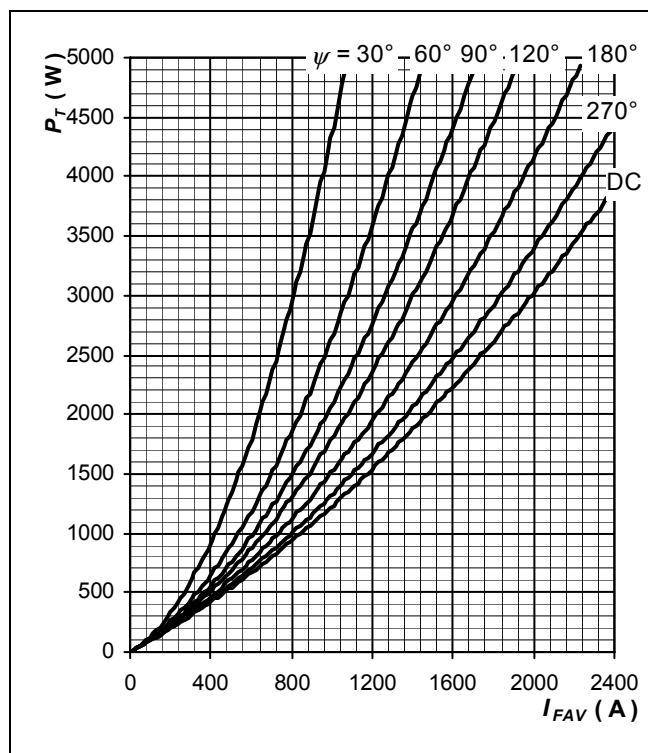
**Fig. 2** Max. on-state characteristics.



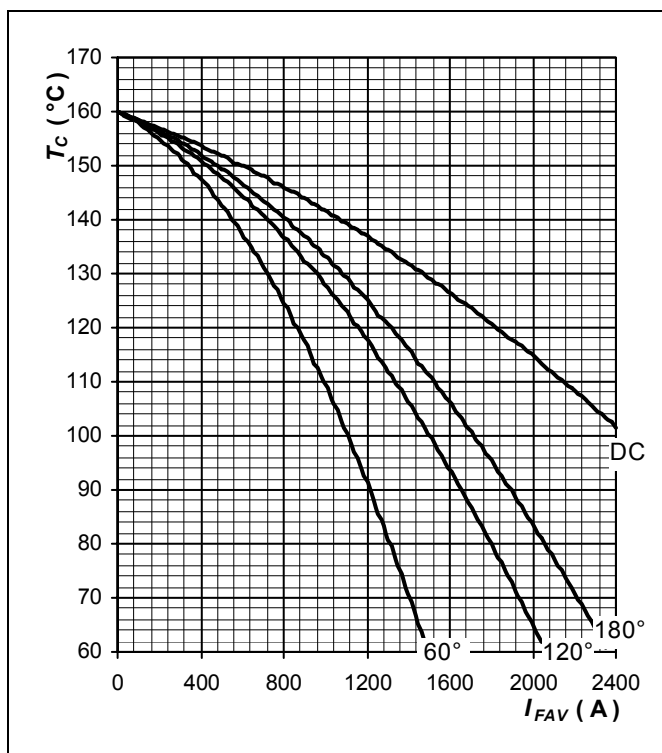
**Fig. 3** Surge forward current vs. pulse length. Half sine wave, single pulse,  $V_R = 0$  V



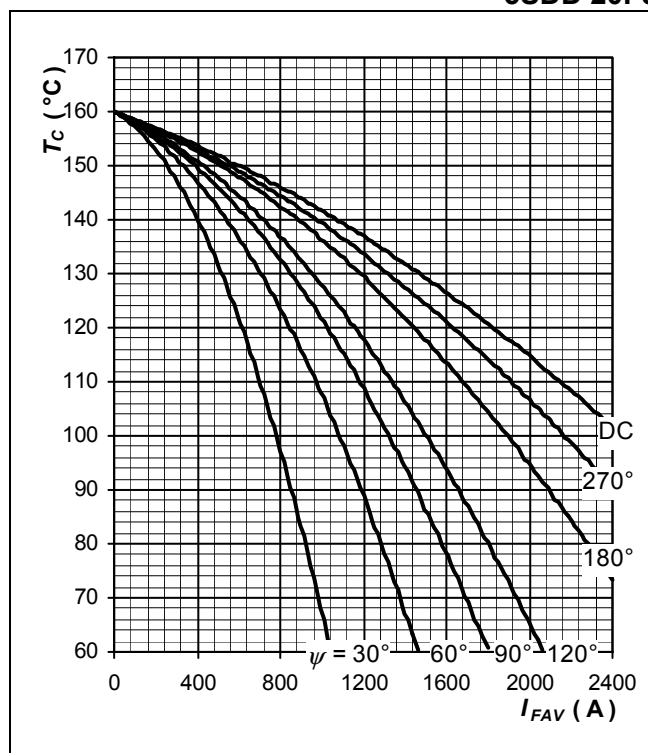
**Fig. 4** Forward power loss vs. average forward current, sine waveform,  $f = 50$  Hz



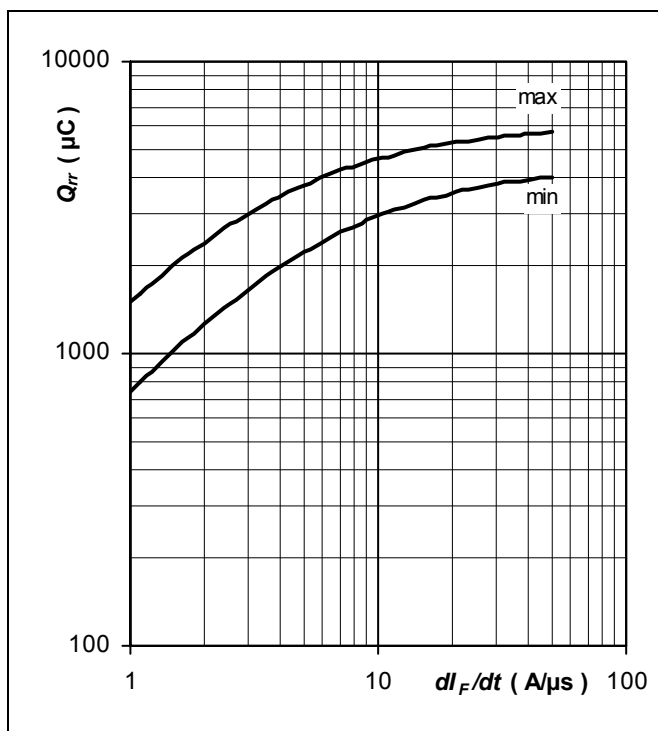
**Fig. 5** Forward power loss vs. average forward current, square waveform,  $f = 50$  Hz



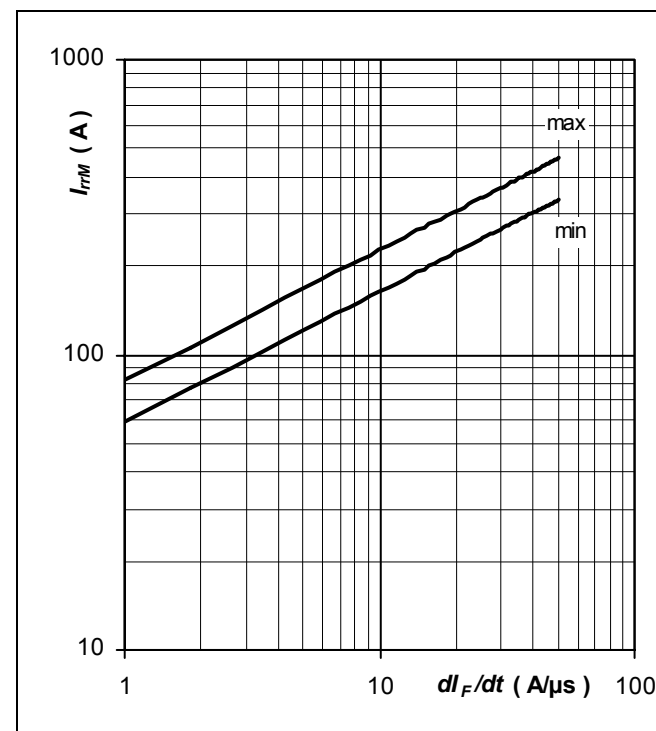
**Fig. 6** Max. case temperature vs. aver. forward current, sine waveform,  $f = 50$  Hz



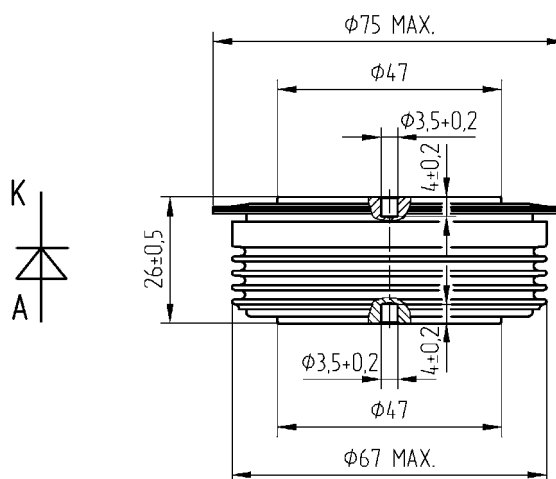
**Fig. 7** Max. case temperature vs. aver. forward current, square waveform,  $f = 50$  Hz



**Fig. 8** Reverse recovery charge vs.  $di_F/dt$ ,  $I_F = 1000$  A;  $T_J = T_{Jmax}$ , limit values



**Fig. 9** Peak reverse recovery current vs.  $di_F/dt$ ,  $I_F = 1000$  A;  $T_J = T_{Jmax}$ , limit values



**Fig. 10** Outline drawing. All dimensions are in millimeters and represent nominal values unless stated otherwise.

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