

|              |   |                    |
|--------------|---|--------------------|
| $V_{RSM}$    | = | 3000 V             |
| $I_{F(AV)M}$ | = | 1285 A             |
| $I_{F(RMS)}$ | = | 2019 A             |
| $I_{FSM}$    | = | $15 \times 10^3$ A |
| $V_{F0}$     | = | 0.933 V            |
| $r_F$        | = | 0.242 mW           |

# Rectifier Diode

## 5SDD 11D2800

Doc. No. 5SYA1166-00 Okt. 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, $T_j = -40 \dots 160^\circ\text{C}$ | 2800  | V    |
| Non - repetitive peak reverse voltage | $V_{RSM}$ | $f = 5$ Hz, $t_p = 10$ ms, $T_j = -40 \dots 160^\circ\text{C}$  | 3000  | V    |

Characteristic values

| Parameter                      | Symbol    | Conditions                            | min | typ | max | Unit |
|--------------------------------|-----------|---------------------------------------|-----|-----|-----|------|
| Max. (reverse) leakage current | $I_{RRM}$ | $V_{RRM}$ , $T_j = 160^\circ\text{C}$ |     |     | 30  | mA   |

### Mechanical data

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

| Parameter      | Symbol | Conditions       | min | typ | max | Unit           |
|----------------|--------|------------------|-----|-----|-----|----------------|
| Mounting force | $F_M$  |                  | 8   | 10  | 12  | 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      |                                         |      | 0.3 |      | kg   |
| Housing thickness         | H      | $F_M = 10$ kN, $T_a = 25^\circ\text{C}$ | 25.5 |     | 26.5 | 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          | $I_{F(AV)M}$ | 50 Hz, Half sine wave, $T_C = 85\text{ °C}$                           |     |     | 1285                | A                |
| Max. RMS on-state current              | $I_{F(RMS)}$ |                                                                       |     |     | 2019                | A                |
| Max. peak non-repetitive surge current | $I_{FSM}$    | $t_p = 10\text{ ms}$ , $T_j = 160\text{ °C}$ ,<br>$V_R = 0\text{ V}$  |     |     | $15 \times 10^3$    | A                |
| Limiting load integral                 | $I^2t$       |                                                                       |     |     | $1.125 \times 10^6$ | A <sup>2</sup> S |
| Max. peak non-repetitive surge current | $I_{FSM}$    | $t_p = 8.3\text{ ms}$ , $T_j = 160\text{ °C}$ ,<br>$V_R = 0\text{ V}$ |     |     | $16 \times 10^3$    | A                |
| Limiting load integral                 | $I^2t$       |                                                                       |     |     | $1.066 \times 10^6$ | A <sup>2</sup> S |

### Characteristic values

| Parameter         | Symbol     | Conditions                                                | min | typ | max   | Unit |
|-------------------|------------|-----------------------------------------------------------|-----|-----|-------|------|
| On-state voltage  | $V_F$      | $I_F = 1500\text{ A}$ , $T_j = 160\text{ °C}$             |     |     | 1.3   | V    |
| Threshold voltage | $V_{(T0)}$ | $T_j = 160\text{ °C}$<br>$I_T = 1500 \dots 4500\text{ A}$ |     |     | 0.933 | V    |
| Slope resistance  | $r_T$      |                                                           |     |     | 0.242 | mΩ   |

## 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>$I_{FRM} = 1000\text{ A}$ , $T_j = 160\text{ °C}$ |     | 2200 | 3000 | μAs  |

## Thermal

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

| Parameter                            | Symbol    | Conditions | min | typ | max | Unit |
|--------------------------------------|-----------|------------|-----|-----|-----|------|
| Operating junction temperature range | $T_{vj}$  |            | -40 |     | 160 | °C   |
| Storage temperature range            | $T_{stg}$ |            | -40 |     | 175 | °C   |

### Characteristic values

| Parameter                           | Symbol         | Conditions                                       | min | typ | max | Unit |
|-------------------------------------|----------------|--------------------------------------------------|-----|-----|-----|------|
| Thermal resistance junction to case | $R_{th(j-c)}$  | Double-side cooled<br>$F_m = 8...12 \text{ kN}$  |     |     | 32  | K/kW |
|                                     | $R_{th(j-c)A}$ | Anode-side cooled<br>$F_m = 8...12 \text{ kN}$   |     |     | 50  | K/kW |
|                                     | $R_{th(j-c)C}$ | Cathode-side cooled<br>$F_m = 8...12 \text{ kN}$ |     |     | 88  | K/kW |
| Thermal resistance case to heatsink | $R_{th(c-h)}$  | Double-side cooled<br>$F_m = 8...12 \text{ kN}$  |     |     | 8   | K/kW |
|                                     | $R_{th(c-h)}$  | Single-side cooled<br>$F_m = 8...12 \text{ kN}$  |     |     | 16  | K/kW |

Analytical function for transient thermal impedance:

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

| i                         | 1      | 2      | 3      | 4      |
|---------------------------|--------|--------|--------|--------|
| $R_{th i} \text{ (K/kW)}$ | 11.600 | 10.110 | 7.870  | 2.410  |
| $\tau_i \text{ (s)}$      | 0.7033 | 0.2185 | 0.0588 | 0.0042 |

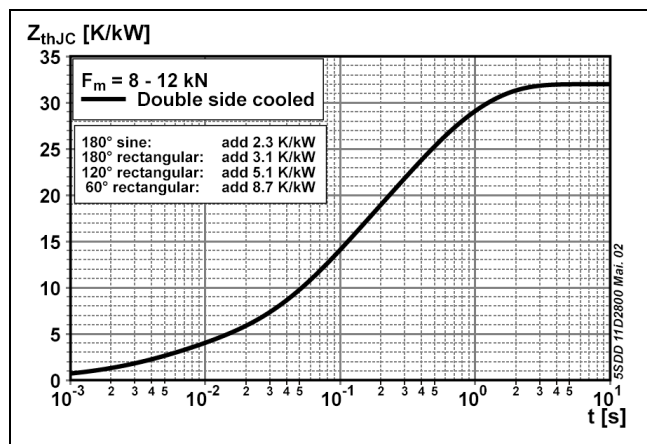
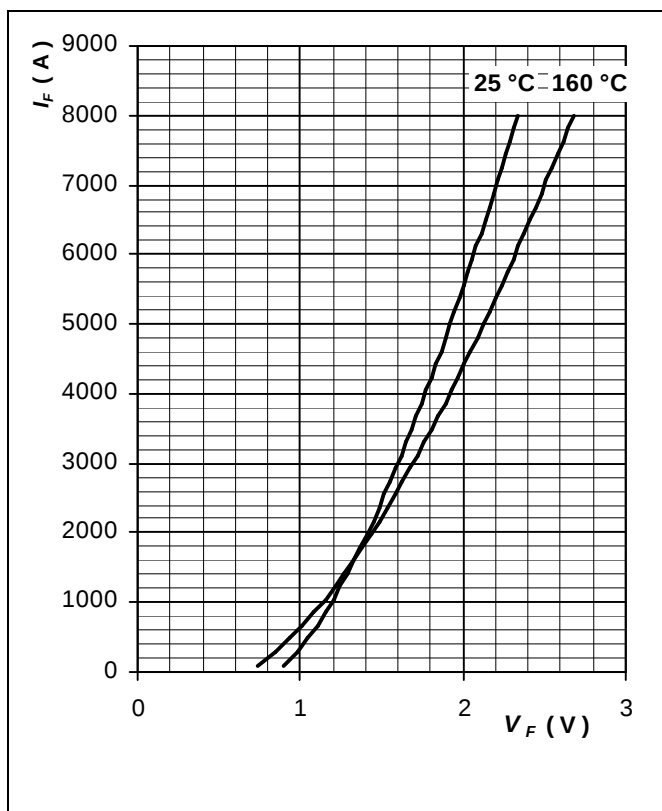
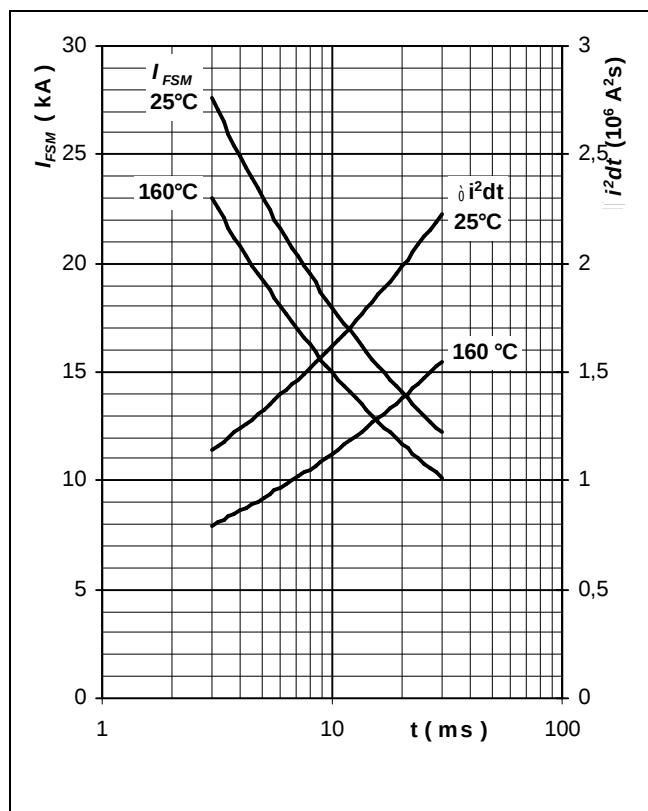


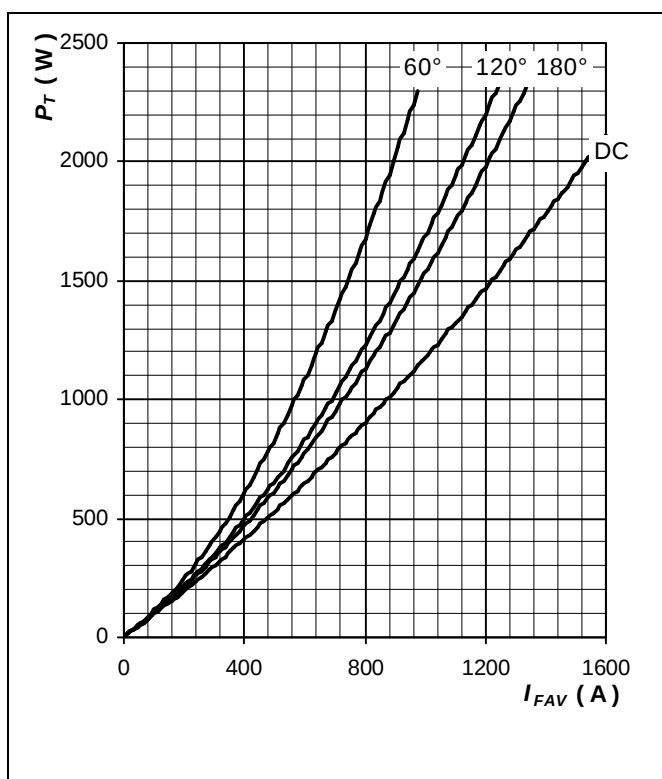
Fig. 1 Transient thermal impedance junction-to-case.



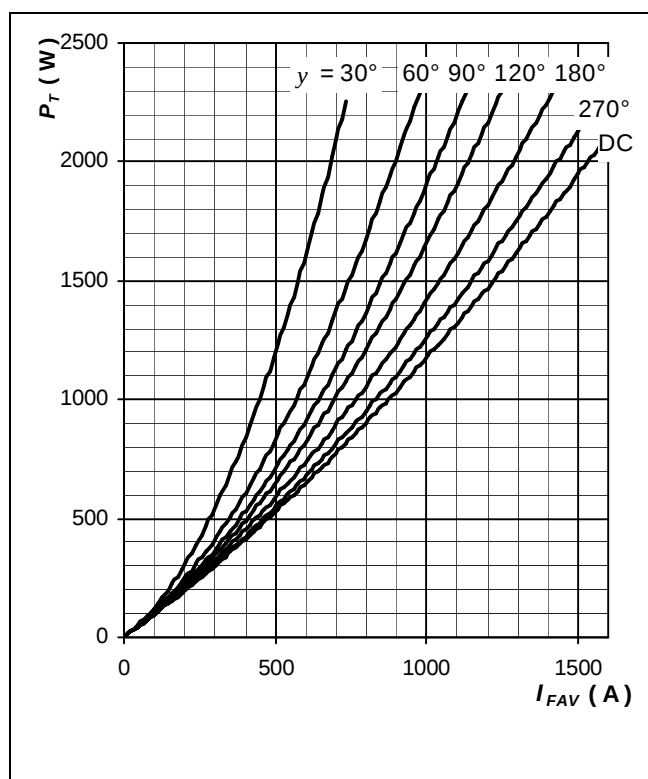
**Fig. 2** Max. on-state characteristics.



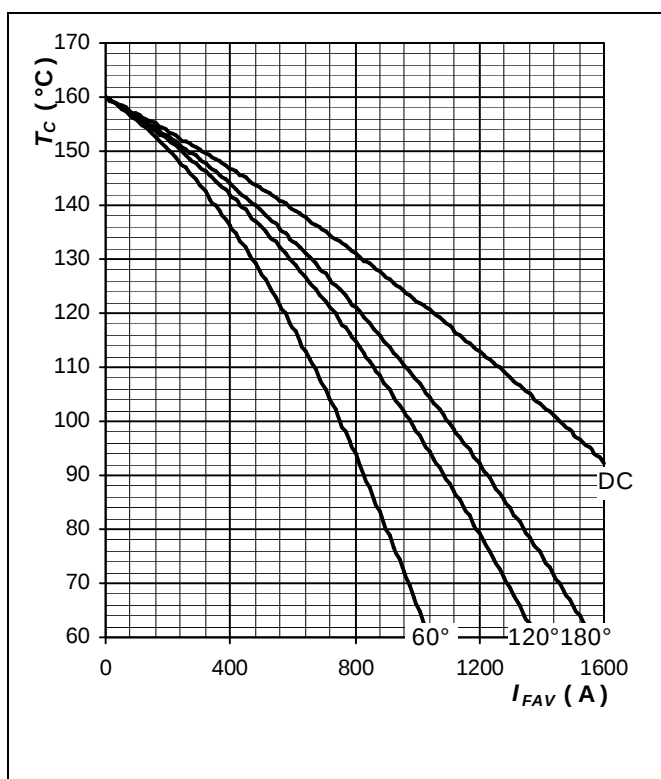
**Fig. 3** Surge forward current vs. pulse length. Half sine wave, single pulse,  $V_R = 0$  V



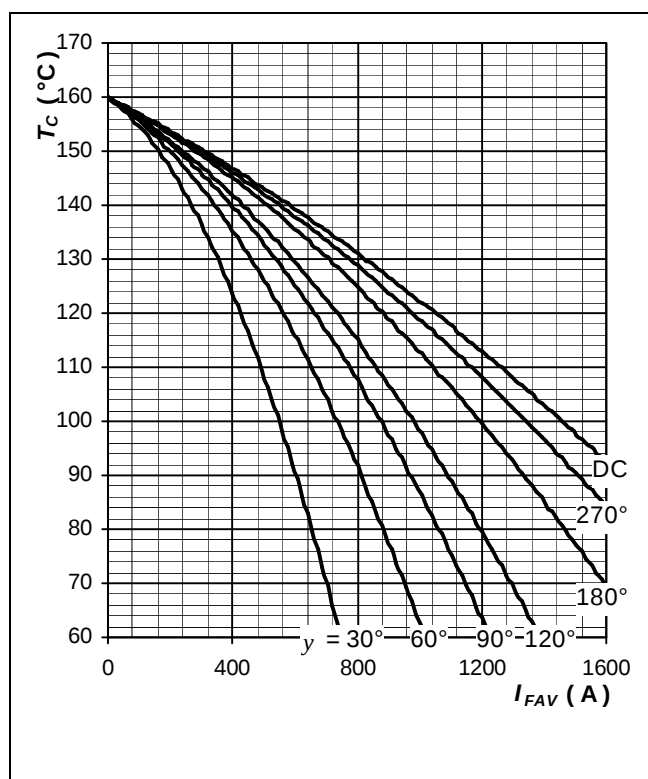
**Fig. 4** Forward power loss vs. average forward current, sine waveform,  $f = 50$  Hz



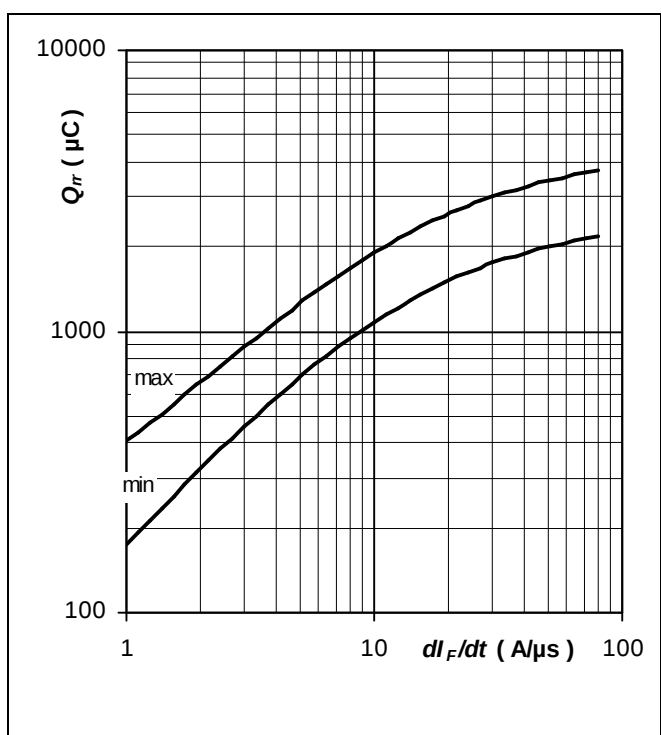
**Fig. 5** Forward power loss vs. average forward current, square waveform,  $f = 50$  Hz



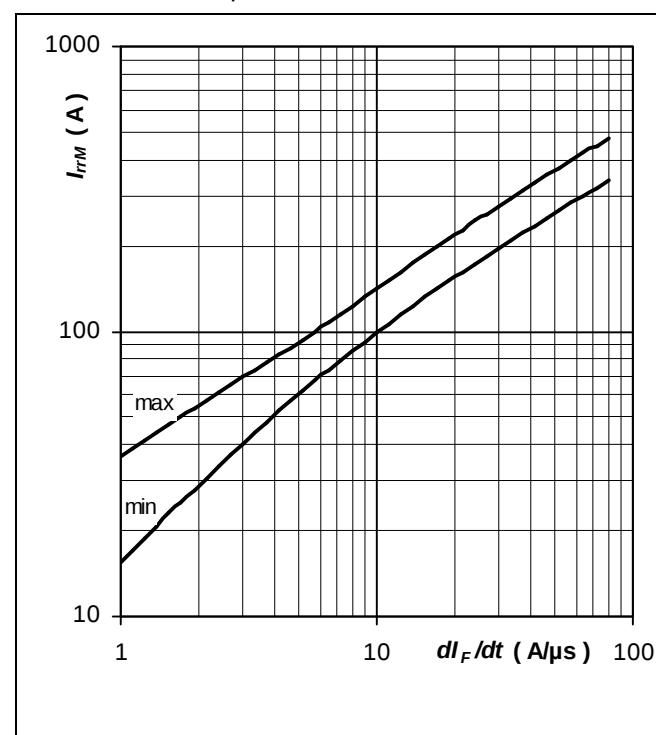
**Fig. 6** Max. case temperature vs. aver. forward current, sine waveform,  $f = 50$  Hz



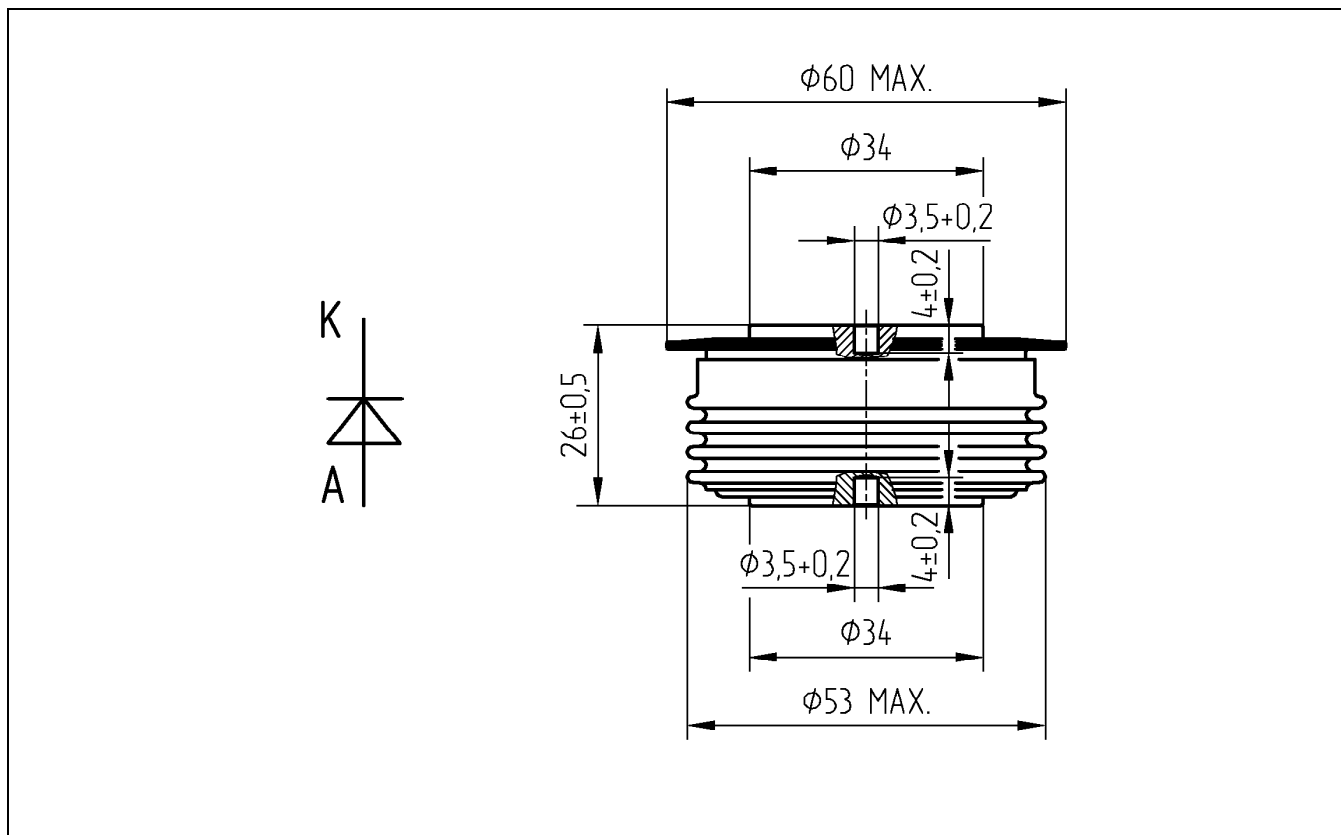
**Fig. 7** Max. case temperature vs. aver. forward current, square waveform,  $f = 50$  Hz



**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.

### Related application notes:

| Doc. Nr   | Titel                                                                                 |
|-----------|---------------------------------------------------------------------------------------|
| 5SYA 2020 | Design of RC-Snubbers for Phase Control Applications                                  |
| 5SYA 2029 | Designing Large Rectifiers with High Power Diodes                                     |
| 5SYA 2036 | Recommendations regarding mechanical clamping of Press Pack High Power Semiconductors |

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

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