

## Key Parameters

|            |   |         |
|------------|---|---------|
| $V_{RRM}$  | = | 5000 V  |
| $I_{FAVM}$ | = | 690 A   |
| $I_{FSM}$  | = | 7.0 kA  |
| $V_{F0}$   | = | 1.10 V  |
| $r_F$      | = | 1.01 mΩ |

# Avalanche Rectifier Diode

## 5SDA 06D5007

Doc. No. 5SYA 1125 - 01 Apr-98

## Features

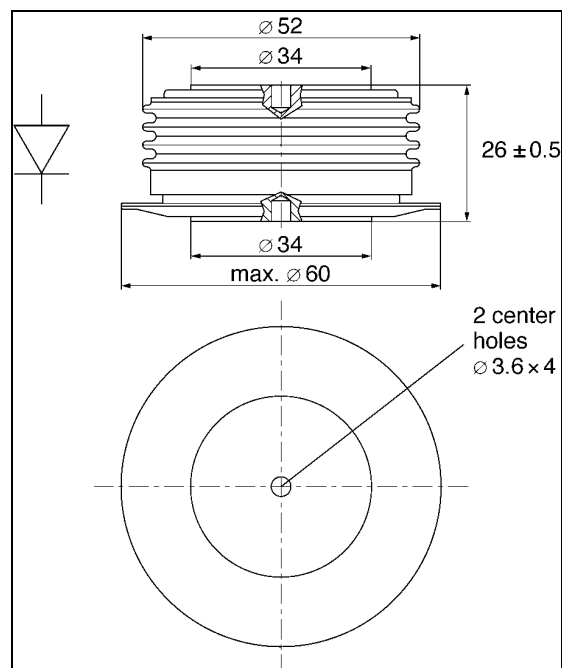
- Optimized for line frequency rectifiers
- Low on-state voltage, narrow  $V_F$ -bands for parallel operation
- Self protected against transient overvoltages
- Guaranteed maximum avalanche power dissipation
- Industry standard housing

## Blocking

| Part number | 5SDA 06D5007         | 5SDA 06D4407 | 5SDA 06D3807 | Condition                                        |
|-------------|----------------------|--------------|--------------|--------------------------------------------------|
| $V_{RRM}$   | 5000                 | 4400         | 3800         | $f = 50 \text{ Hz}$ $t_P = 10 \text{ ms}$        |
| $V_{RSM}$   | 5500                 | 4840         | 4180         | $t_P = 10 \text{ ms}$ $T_j = 160^\circ\text{C}$  |
| $I_{RRM}$   | $\leq 50 \text{ mA}$ |              |              | $V_{RRM}$ $T_j = 160^\circ\text{C}$              |
| $P_{RSM}$   | $\leq 70 \text{ kW}$ |              |              | $t_P = 20 \mu\text{s}$ $T_j = 45^\circ\text{C}$  |
|             | $\leq 50 \text{ kW}$ |              |              | $t_P = 20 \mu\text{s}$ $T_j = 160^\circ\text{C}$ |

## Mechanical data

|       |                           |      |                      |
|-------|---------------------------|------|----------------------|
| $F_M$ | Mounting force            | min. | 10 kN                |
|       |                           | max. | 12 kN                |
| a     | Acceleration              |      |                      |
|       | Device unclamped          |      | 50 m/s <sup>2</sup>  |
|       | Device clamped            |      | 200 m/s <sup>2</sup> |
| m     | Weight                    |      | 0.25 kg              |
| $D_S$ | Surface creepage distance |      | 30 mm                |
| $D_a$ | Air strike distance       |      | 20.5 mm              |



## On-state

|                    |                                        |                                      |                                       |   |              |                        |
|--------------------|----------------------------------------|--------------------------------------|---------------------------------------|---|--------------|------------------------|
| I <sub>FAVM</sub>  | Max. average on-state current          | 690 A                                | Half sine wave, T <sub>C</sub> = 85°C |   |              |                        |
| I <sub>FRMS</sub>  | Max. RMS on-state current              | 1090 A                               |                                       |   |              |                        |
| I <sub>FSM</sub>   | Max. peak non-repetitive surge current | 7.0 kA                               | t <sub>p</sub>                        | = | 10 ms        | T <sub>j</sub> = 160°C |
|                    |                                        | 7.6 kA                               | t <sub>p</sub>                        | = | 8.3 ms       | After surge:           |
| I <sup>2</sup> t   | Limiting load integral                 | 245·10 <sup>3</sup> A <sup>2</sup> s | t <sub>p</sub>                        | = | 10 ms        | V <sub>R</sub> ≈ 0V    |
|                    |                                        | 240·10 <sup>3</sup> A <sup>2</sup> s | t <sub>p</sub>                        | = | 8.3 ms       |                        |
| V <sub>F0</sub>    | Threshold voltage                      | 1.10 V                               | I <sub>F</sub>                        | = | 700 - 2000 A | T <sub>j</sub> = 160°C |
| r <sub>F</sub>     | Slope resistance                       | 1.01 mΩ                              |                                       |   |              |                        |
| V <sub>F min</sub> | On-state voltage                       | 2.00 V                               | I <sub>F</sub>                        | = | 1800 A       | T <sub>j</sub> = 25°C  |
| V <sub>F max</sub> | On-state voltage                       | 2.40 V                               |                                       |   |              |                        |

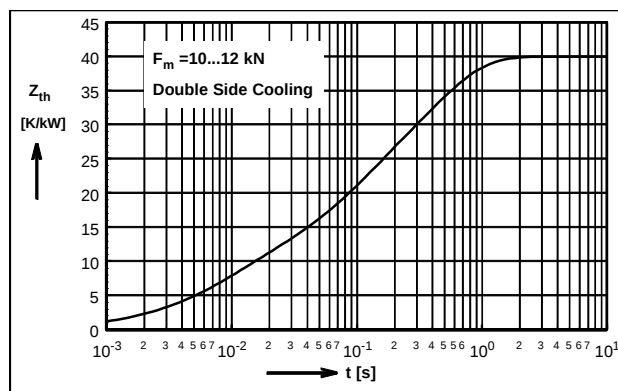
## Thermal

|            |                                                  |             |                     |
|------------|--------------------------------------------------|-------------|---------------------|
| $T_j$      | Storage and operating junction temperature range | -40...160°C |                     |
| $R_{thJC}$ | Thermal resistance junction to case              | 80 K/kW     | Anode side cooled   |
|            |                                                  | 80 K/kW     | Cathode side cooled |
|            |                                                  | 40 K/kW     | Double side cooled  |
| $R_{thCH}$ | Thermal resistance case to heat sink             | 16 K/kW     | Single side cooled  |
|            |                                                  | 8 K/kW      | Double side cooled  |

Analytical function for transient thermal impedance:

$$Z_{thJC}(t) = \sum_{i=1}^4 R_i(1 - e^{-t/\tau_i})$$

| i                    | 1     | 2     | 3     | 4      |
|----------------------|-------|-------|-------|--------|
| $R_i \text{ (K/kW)}$ | 20.95 | 10.57 | 7.15  | 1.33   |
| $\tau_i \text{ (s)}$ | 0.396 | 0.072 | 0.009 | 0.0044 |



For a given case temperature  $T_c$  at ambient temperature  $T_a$  the maximum on-state current can be calculated as follows:

$$I_{FAVM} = \frac{-V_{F0} + \sqrt{(V_{F0})^2 + 4 \cdot f^2 \cdot r_f \cdot P}}{2 \cdot f^2 \cdot r_f}$$

$$\text{where } P = \frac{T_{J \max} - T_C}{R_{thjc}} \text{ or } P = \frac{T_{J \max} - T_A}{R_{thja}}$$

|                                     |                                |                                |                               |
|-------------------------------------|--------------------------------|--------------------------------|-------------------------------|
| $I_{FAVM} \text{ (A)}$              | $P \text{ (W)}$                | $V_{F0} \text{ (V)}$           | $r_f \text{ (}\Omega\text{)}$ |
| $T_{\max} \text{ (}^\circ\text{C)}$ | $T_c \text{ (}^\circ\text{C)}$ | $T_a \text{ (}^\circ\text{C)}$ |                               |
| $R_{thja} \text{ (K/kW)}$           | $R_{thJC} \text{ (K/kW)}$      |                                |                               |
| $f^2 =$                             | 1                              | for DC current                 |                               |
|                                     | 2.5                            | for half-sine wave             |                               |
|                                     | 3.1                            | for 120° el., sine             |                               |
|                                     | 6                              | for 60° el., sine              |                               |