

Key Parameters

| | | |
|------------|---|---------|
| V_{RRM} | = | 2600 V |
| I_{FAVM} | = | 1020 A |
| I_{FSM} | = | 11.5 kA |
| V_{F0} | = | 0.87 V |
| r_F | = | 0.39 mΩ |

Avalanche Rectifier Diode

5SDA 09D2604

Doc. No. 5SYA 1121 - 01 Apr-98

Features

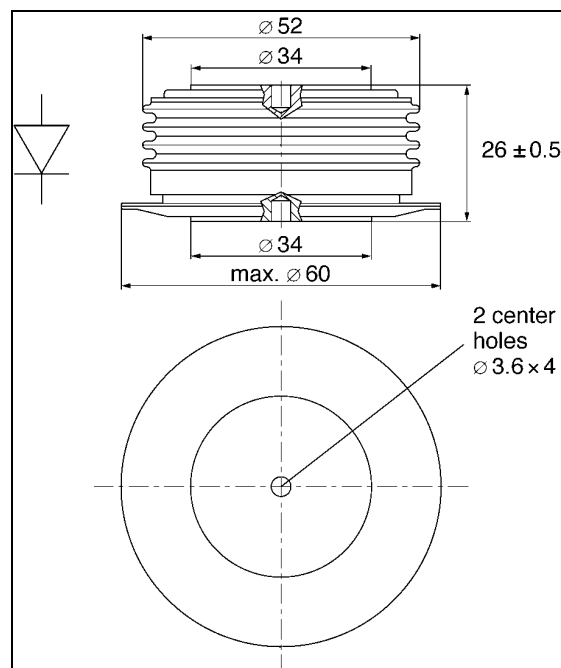
- Optimized for line frequency rectifiers
- Low on-state voltage, narrow V_F -bands for parallel operation
- Self protected against transient overvoltages
- Guaranteed maximum avalanche power dissipation
- Industry standard housing

Blocking

| Part number | 5SDA 09D2604 | 5SDA 09D2304 | 5SDA 09D2004 | Condition |
|-------------|----------------------|--------------|--------------|--|
| V_{RRM} | 2600 | 2300 | 2000 | $f = 50 \text{ Hz}$ $t_p = 10 \text{ ms}$ |
| V_{RSM} | 2860 | 2530 | 2200 | $t_p = 10 \text{ ms}$ $T_j = 160^\circ\text{C}$ |
| 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 ² |
| | Device clamped | | 200 m/s ² |
| m | Weight | | 0.25 kg |
| D_s | Surface creepage distance | | 30 mm |
| D_a | Air strike distance | | 20.5 mm |



On-state

| | | | | |
|------------|--|--------------------------------------|--|--|
| I_{FAVM} | Max. average on-state current | 1020 A | Half sine wave, $T_c = 85^\circ\text{C}$ | |
| I_{FRMS} | Max. RMS on-state current | 1600 A | | |
| I_{FSM} | Max. peak non-repetitive surge current | 11.5 kA | $t_p = 10 \text{ ms}$ | $T_j = 160^\circ\text{C}$ After surge: $V_D = V_R = 0\text{V}$ |
| | | 12.5 kA | $t_p = 8.3 \text{ ms}$ | |
| I^2t | Limiting load integral | $660 \cdot 10^3 \text{ A}^2\text{s}$ | $t_p = 10 \text{ ms}$ | |
| | | $650 \cdot 10^3 \text{ A}^2\text{s}$ | $t_p = 8.3 \text{ ms}$ | |
| V_{F0} | Threshold voltage | 0.87 V | $I_F = 1000 - 3000 \text{ A}$ | $T_j = 160^\circ\text{C}$ |
| r_F | Slope resistance | 0.39 mΩ | | |
| V_{Fmin} | On-state voltage | 1.35 V | $I_F = 1800 \text{ A}$ | $T_j = 25^\circ\text{C}$ |
| V_{Fmax} | On-state voltage | 1.50 V | | |

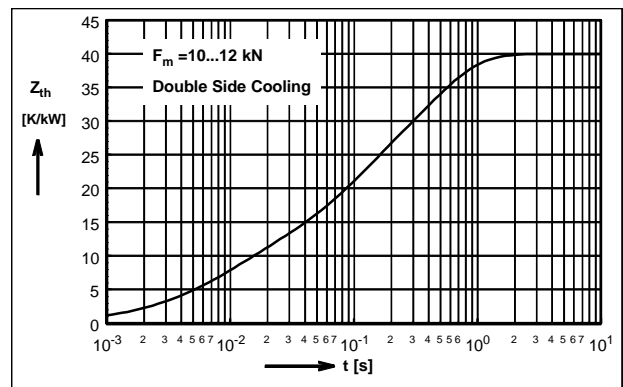
Thermal

| | | | |
|------------|--|-------------|---------------------|
| 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 (K/kW) | 20.95 | 10.57 | 7.15 | 1.33 |
| τ_i (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:

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

where $P = \frac{T_{Jmax} - T_c}{R_{thjc}}$ or $P = \frac{T_{Jmax} - T_a}{R_{thja}}$

| | | | |
|-------------------|------------------------|--------------|-----------|
| I_{FAVM} (A) | P (W) | V_{F0} (V) | r_f (Ω) |
| T_{max} (°C) | T_c (°C) | T_a (°C) | |
| R_{thja} (K/kW) | R_{thJC} (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 | | |

