

## Key Parameters

$V_{RRM}$	=	2300 V
$I_{FAVM}$	=	1140 A
$I_{FSM}$	=	13.5 kA
$V_{F0}$	=	0.83 V
$r_F$	=	0.30 mΩ

# Avalanche Rectifier Diode

## 5SDA 10D2303

Doc. No. 5SYA 1120 - 01 Apr-98

## Features

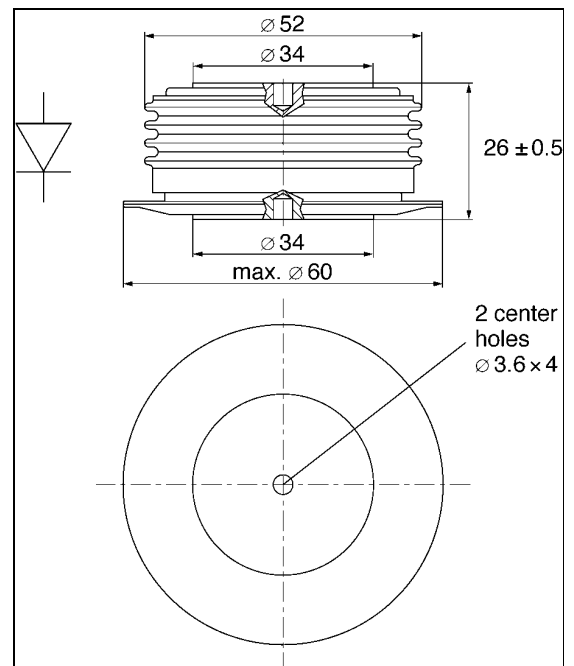
- Optimized for line frequency rectifiers
- Low on-state voltage, narrow  $V_F$ -bands for parallel operation
- Self protected against transient overvoltages
- Guaranteed maximum avalanche power dissipation
- Industry standard housing

## Blocking

Part number	5SDA 10D2303	5SDA 10D2003	5SDA 10D1703	Condition
$V_{RRM}$	2300	2000	1700	$f = 50 \text{ Hz}$ $t_p = 10 \text{ ms}$
$V_{RSM}$	2530	2200	1870	$t_p = 10 \text{ ms}$ $T_j = 160^\circ\text{C}$
$I_{RRM}$	$\leq 50 \text{ mA}$			$V_{RRM}$ $T_j = 160^\circ\text{C}$
$P_{RSM}$	$\leq 70 \text{ kW}$			$t_p = 20 \mu\text{s}$ $T_j = 45^\circ\text{C}$
	$\leq 50 \text{ kW}$			$t_p = 20 \mu\text{s}$ $T_j = 160^\circ\text{C}$

## 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

$I_{FAVM}$	Max. average on-state current	1140 A	Half sine wave, $T_c = 85^\circ\text{C}$	
$I_{FRMS}$	Max. RMS on-state current	1790 A		
$I_{FSM}$	Max. peak non-repetitive surge current	13.5 kA	$t_p =$	10 ms
		14.5 kA	$t_p =$	8.3 ms
$I^2t$	Limiting load integral	$910 \cdot 10^3 \text{ A}^2\text{s}$	$t_p =$	10 ms
		$875 \cdot 10^3 \text{ A}^2\text{s}$	$t_p =$	8.3 ms
$V_{F0}$	Threshold voltage	0.83 V	$I_F =$	1000 - 3000 A
$r_F$	Slope resistance	0.30 mΩ		
$V_{Fmin}$	On-state voltage	1.20 V	$I_F =$	1800 A
$V_{Fmax}$	On-state voltage	1.35 V		

$T_j = 160^\circ\text{C}$   
 After surge:  
 $V_R \approx 0\text{V}$   
 $T_j = 160^\circ\text{C}$   
 $T_j = 25^\circ\text{C}$

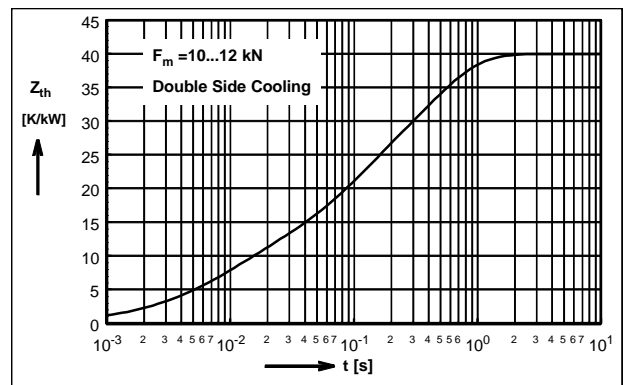
### Thermal

$T_j$	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:

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

i	1	2	3	4
$R \text{ (K/kW)}$	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:

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

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

