

## Key Parameters

$V_{RRM}$	=	3200 V
$I_{FAVM}$	=	2110 A
$I_{FSM}$	=	26.0 kA
$V_{F0}$	=	0.89 V
$r_F$	=	0.17 mΩ

# Avalanche Rectifier Diode

## 5SDA 21F3204

Doc. No. 5SYA 1130 - 01 Apr-98

## Features

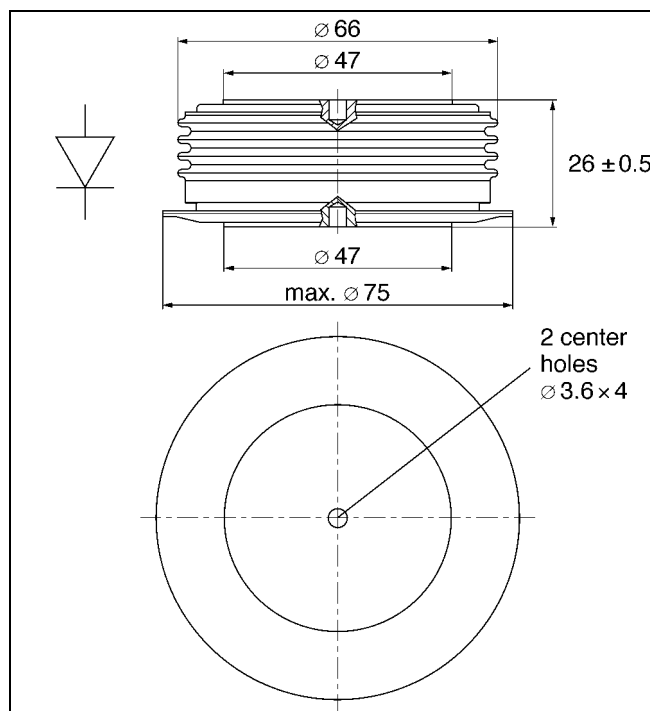
- Optimized for line frequency rectifiers
- Low on-state voltage, narrow  $V_F$ -bands for parallel operation
- Self protected against transient overvoltages
- Guaranteed maximum avalanche power dissipation
- Industry standard housing

## Blocking

Part number	5SDA 21F3204	5SDA 21F2904	5SDA 21F2604	Condition
$V_{RRM}$	3200	2900	2600	$f = 50 \text{ Hz}$ $t_p = 10 \text{ ms}$
$V_{RSM}$	3520	3140	2860	$t_p = 10 \text{ ms}$ $T_j = 160^\circ\text{C}$
$I_{RRM}$	$\leq 50 \text{ mA}$			$V_{RRM}$ $T_j = 160^\circ\text{C}$
$P_{RSM}$	$\leq 100 \text{ kW}$			$t_p = 20 \mu\text{s}$ $T_j = 45^\circ\text{C}$
	$\leq 75 \text{ kW}$			$t_p = 20 \mu\text{s}$ $T_j = 160^\circ\text{C}$

## Mechanical data

$F_M$	Mounting force	min.	20 kN
		max.	24 kN
a	Acceleration		
	Device unclamped	50 m/s <sup>2</sup>	
	Device clamped	200 m/s <sup>2</sup>	
m	Weight	0.5 kg	
$D_s$	Surface creepage distance	30 mm	
$D_a$	Air strike distance	20 mm	



### On-state

$I_{FAVM}$	Max. average on-state current	2110 A	Half sine wave, $T_c = 85^\circ\text{C}$	
$I_{FRMS}$	Max. RMS on-state current	3310 A		
$I_{FSM}$	Max. peak non-repetitive surge current	26.0 kA	$t_p =$	10 ms
		28.0 kA	$t_p =$	8.3 ms
$I^2t$	Limiting load integral	$4205 \cdot 10^3 \text{ A}^2\text{s}$	$t_p =$	10 ms
		$3270 \cdot 10^3 \text{ A}^2\text{s}$	$t_p =$	8.3 ms
$V_{F0}$	Threshold voltage	0.89 V	$I_F = 2000 - 6000 \text{ A}$	$T_j = 160^\circ\text{C}$
$r_F$	Slope resistance	0.17 m $\Omega$		
$V_{Fmin}$	On-state voltage	1.35 V	$I_F = 4000 \text{ A}$	$T_j = 25^\circ\text{C}$
$V_{Fmax}$	On-state voltage	1.50 V		

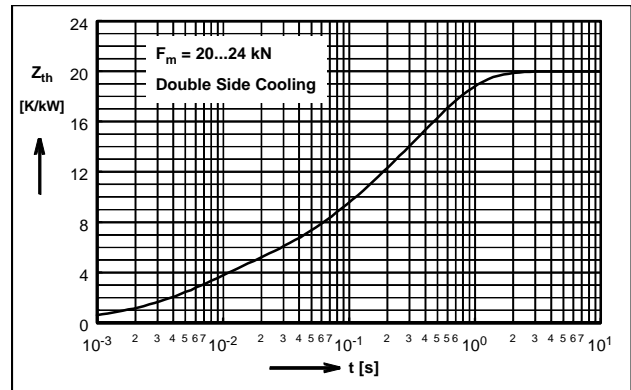
### Thermal

$T_j$	Storage and operating junction temperature range	-40...160°C	
$R_{thJC}$	Thermal resistance junction to case	40 K/kW	Anode side cooled
		40 K/kW	Cathode side cooled
		20 K/kW	Double side cooled
$R_{thCH}$	Thermal resistance case to heat sink	10 K/kW	Single side cooled
		5 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
$R \text{ (K/kW)}$	11.83	4.26	1.63	2.28
$\tau_i \text{ (s)}$	0.432	0.071	0.01	0.0054



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

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

$I_{FAVM} \text{ (A)}$        $P \text{ (W)}$        $V_{F0} \text{ (V)}$        $r_f \text{ (}\Omega\text{)}$   
 $T_{max} \text{ (}^\circ\text{C)}$        $T_c \text{ (}^\circ\text{C)}$        $T_a \text{ (}^\circ\text{C)}$   
 $R_{thja} \text{ (K/kW)}$        $R_{thJC} \text{ (K/kW)}$

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

$f^2 =$       1      for DC current  
               2.5      for half-sine wave  
               3.1      for 120° el., sine  
               6      for 60° el., sine

