

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

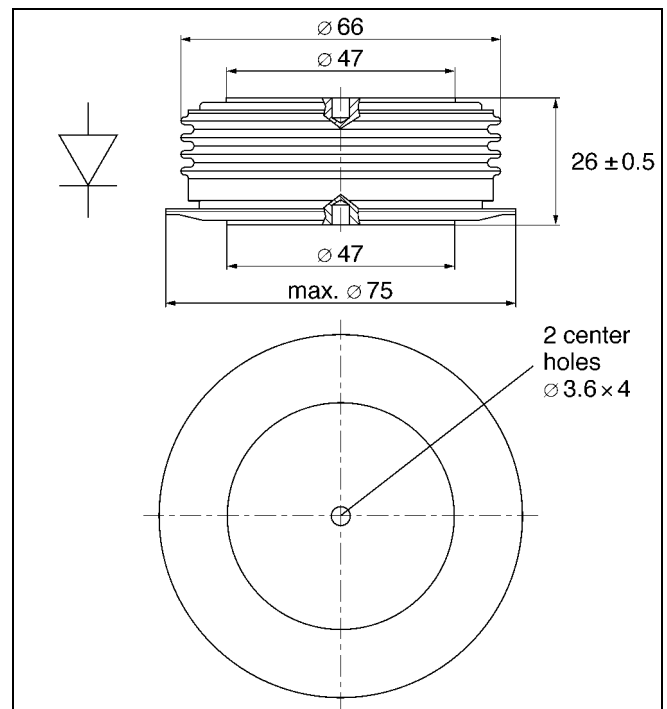
- Optimized for line frequency rectifiers
- Low on-state voltage, narrow V_F -bands for parallel operation
- Self protected against transient overvoltages
- Guaranteed maximum avalanche power dissipation
- Industry standard housing

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 ²
	Device clamped		200 m/s ²
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 Ω		
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		

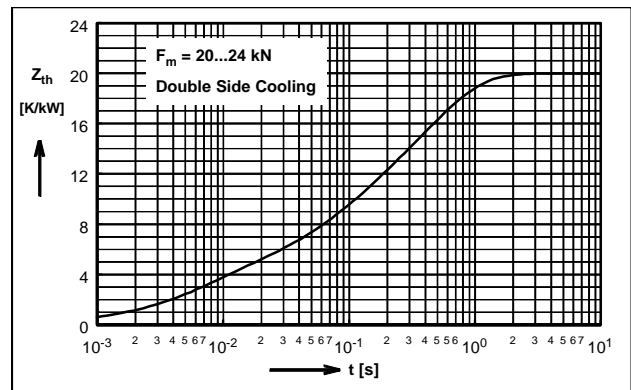
Thermal

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

