

## Key Parameters

$V_{RRM}$	=	3800 V
$I_{FAVM}$	=	1620 A
$I_{FSM}$	=	20.5 kA
$V_{F0}$	=	1.03 V
$r_F$	=	0.32 mΩ

# Avalanche Rectifier Diode

## 5SDA 16F3806

Doc. No. 5SYA 1128 - 01 Apr-98

## Features

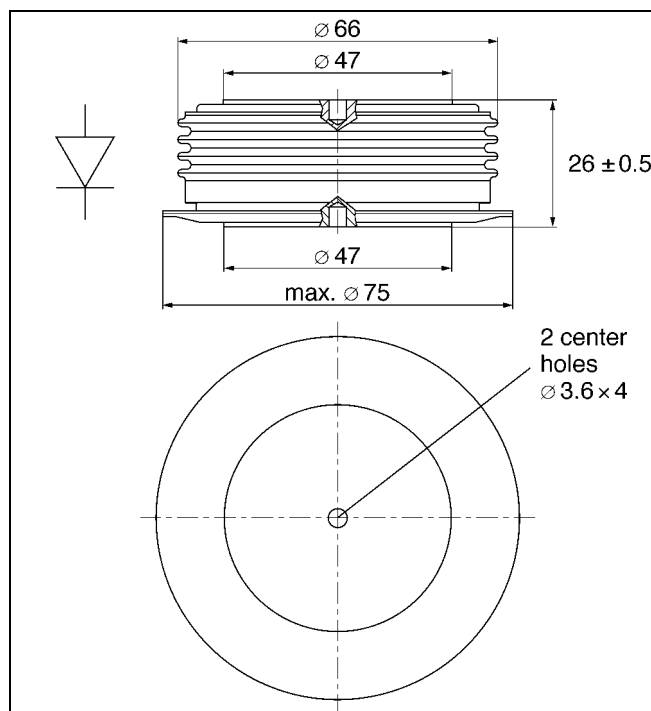
- Optimized for line frequency rectifiers
- Low on-state voltage, narrow  $V_F$ -bands for parallel operation
- Self protected against transient overvoltages
- Guaranteed maximum avalanche power dissipation
- Industry standard housing

## Blocking

Part number	5SDA 16F3806	5SDA 16F3206	Condition
$V_{RRM}$	3800	3200	$f = 50 \text{ Hz}$ $t_p = 10 \text{ ms}$
$V_{RSM}$	4180	3520	$t_p = 10 \text{ ms}$ $T_j = 160^\circ\text{C}$
$I_{RRM}$	$\leq 50 \text{ mA}$		$V_{RRM}$ $T_j = 160^\circ\text{C}$
$P_{RSM}$	$\leq 70 \text{ kW}$		$t_p = 20 \mu\text{s}$ $T_j = 45^\circ\text{C}$
	$\leq 50 \text{ kW}$		$t_p = 20 \mu\text{s}$ $T_j = 160^\circ\text{C}$

## Mechanical data

$F_M$	Mounting force	min.	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



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### On-state

$I_{FAVM}$	Max. average on-state current	1620 A	Half sine wave, $T_c = 85^\circ\text{C}$	
$I_{FRMS}$	Max. RMS on-state current	2540 A		
$I_{FSM}$	Max. peak non-repetitive surge current	20.5 kA	$t_p =$	10 ms
		22.3 kA	$t_p =$	8.3 ms
$I^2t$	Limiting load integral	$2100 \cdot 10^3 \text{ A}^2\text{s}$	$t_p =$	10 ms
		$2070 \cdot 10^3 \text{ A}^2\text{s}$	$t_p =$	8.3 ms
$V_{F0}$	Threshold voltage	1.03 V	$I_F = 1000 - 3000 \text{ A}$	$T_j = 160^\circ\text{C}$
$r_F$	Slope resistance	0.32 m $\Omega$		
$V_{Fmin}$	On-state voltage	1.70 V	$I_F = 4000 \text{ A}$	$T_j = 25^\circ\text{C}$
$V_{Fmax}$	On-state voltage	2.00 V		

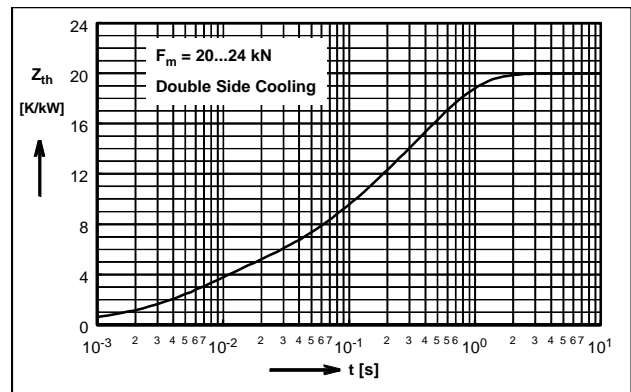
### Thermal

$T_j$	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:

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

i	1	2	3	4
$R_i$ (K/kW)	11.83	4.26	1.63	2.28
$\tau_i$ (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:

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

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

