



# DS2004SF

## Rectifier Diode

Replaces September 2001 version, DS4188-5.0

DS4188-5.1 December 2001

### APPLICATIONS

- Rectification
- Freewheel Diode
- DC Motor Control
- Power Supplies
- Welding
- Battery Chargers

### FEATURES

- Double Side Cooling
- High Surge Capability

### VOLTAGE RATINGS

Type Number	Repetitive Peak Reverse Voltage $V_{RRM}$ V	Conditions
DS2004SF28	2800	$V_{RSM} = V_{RRM} + 100V$
DS2004SF27	2700	
DS2004SF26	2600	
DS2004SF25	2500	
DS2004SF24	2400	

Lower voltage grades available.

### ORDERING INFORMATION

When ordering, select the required part number shown in the Voltage Ratings selection table, e.g.:

#### DS2004SF26

Note: Please use the complete part number when ordering and quote this number in any future correspondence relating to your order.

### KEY PARAMETERS

$V_{RRM}$  **2800V**  
 $I_{F(AV)}$  **2372A**  
 $I_{FSM}$  **31250A**

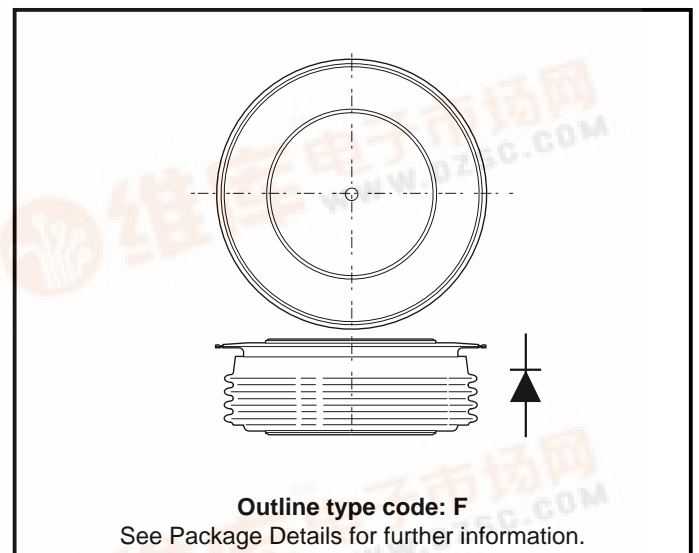


Fig. 1 Package outline

## CURRENT RATINGS

 $T_{case} = 75^{\circ}\text{C}$  unless otherwise stated

Symbol	Parameter	Conditions	Max.	Units
<b>Double Side Cooled</b>				
$I_{F(AV)}$	Mean forward current	Half wave resistive load	2372	A
$I_{F(RMS)}$	RMS value	-	3726	A
$I_F$	Continuous (direct) forward current	-	3352	A
<b>Single Side Cooled (Anode side)</b>				
$I_{F(AV)}$	Mean forward current	Half wave resistive load	1684	A
$I_{F(RMS)}$	RMS value	-	2645	A
$I_F$	Continuous (direct) forward current	-	2235	A

 $T_{case} = 100^{\circ}\text{C}$  unless otherwise stated

Symbol	Parameter	Conditions	Max.	Units
<b>Double Side Cooled</b>				
$I_{F(AV)}$	Mean forward current	Half wave resistive load,	1960	A
$I_{F(RMS)}$	RMS value	-	3077	A
$I_F$	Continuous (direct) forward current	-	2750	A
<b>Single Side Cooled (Anode side)</b>				
$I_{F(AV)}$	Mean forward current	Half wave resistive load	1300	A
$I_{F(RMS)}$	RMS value	-	2040	A
$I_F$	Continuous (direct) forward current	-	1600	A

## SURGE RATINGS

Symbol	Parameter	Conditions	Max.	Units
$I_{FSM}$	Surge (non-repetitive) forward current	10ms half sine; $T_{case} = 175^{\circ}C$ $V_R = 50\% V_{RRM} - 1/4$ sine	25.0	kA
$I^2t$	$I^2t$ for fusing		$3.12 \times 10^6$	A <sup>2</sup> s
$I_{FSM}$	Surge (non-repetitive) forward current	10ms half sine; $T_{case} = 175^{\circ}C$ $V_R = 0$	31.25	kA
$I^2t$	$I^2t$ for fusing		$4.88 \times 10^6$	A <sup>2</sup> s

## THERMAL AND MECHANICAL DATA

Symbol	Parameter	Conditions		Min.	Max.	Units
$R_{th(j-c)}$	Thermal resistance - junction to case	Double side cooled	dc	-	0.022	$^{\circ}C/W$
		Single side cooled	Anode dc	-	0.038	$^{\circ}C/W$
			Cathode dc	-	0.052	$^{\circ}C/W$
$R_{th(c-h)}$	Thermal resistance - case to heatsink	Clamping force 19.5kN with mounting compound	Double side	-	0.004	$^{\circ}C/W$
			Single side	-	0.008	$^{\circ}C/W$
$T_{vj}$	Virtual junction temperature	Forward (conducting)		-	185	$^{\circ}C$
		Reverse (blocking)		-	175	$^{\circ}C$
$T_{stg}$	Storage temperature range			-55	180	$^{\circ}C$
-	Clamping force			18.0	22.0	kN

CHARACTERISTICS

Symbol	Parameter	Conditions	Min.	Max.	Units
$V_{FM}$	Forward voltage	At 3400A peak, $T_{case} = 25^{\circ}C$	-	1.3	V
$I_{RRM}$	Peak reverse current	At $V_{RRM}$ , $T_{case} = 175^{\circ}C$	-	50	mA
$Q_S$	Total stored charge	$I_F = 2000A$ , $di_{RR}/dt = 3A/\mu s$ , $T_{case} = 175^{\circ}C$ , $V_R = 100V$	-	2500	$\mu C$
$I_{RR}$	Peak recovery current		-	105	A
$V_{TO}$	Threshold voltage	At $T_{vj} = 175^{\circ}C$	-	0.82	V
$r_T$	Slope resistance	At $T_{vj} = 175^{\circ}C$	-	0.16	m $\Omega$

CURVES

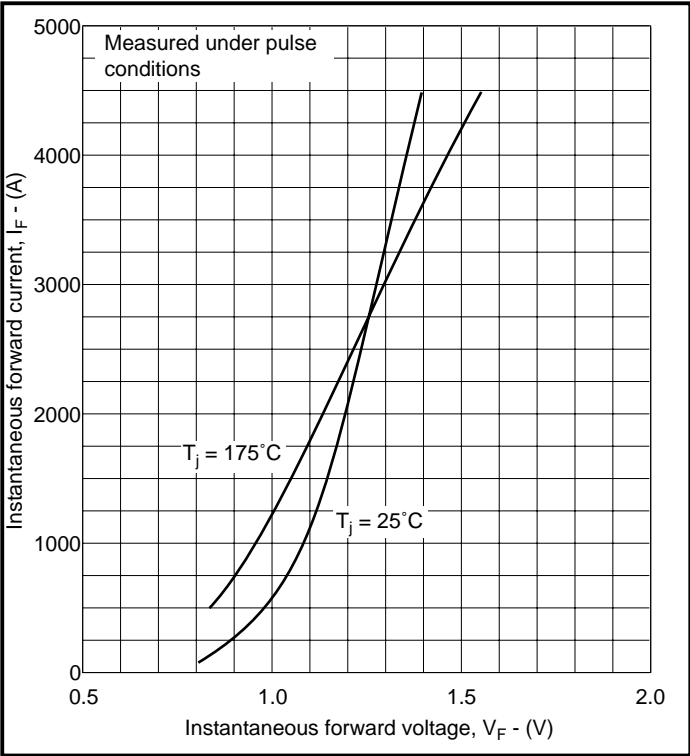


Fig.2 Maximum (limit) forward characteristics

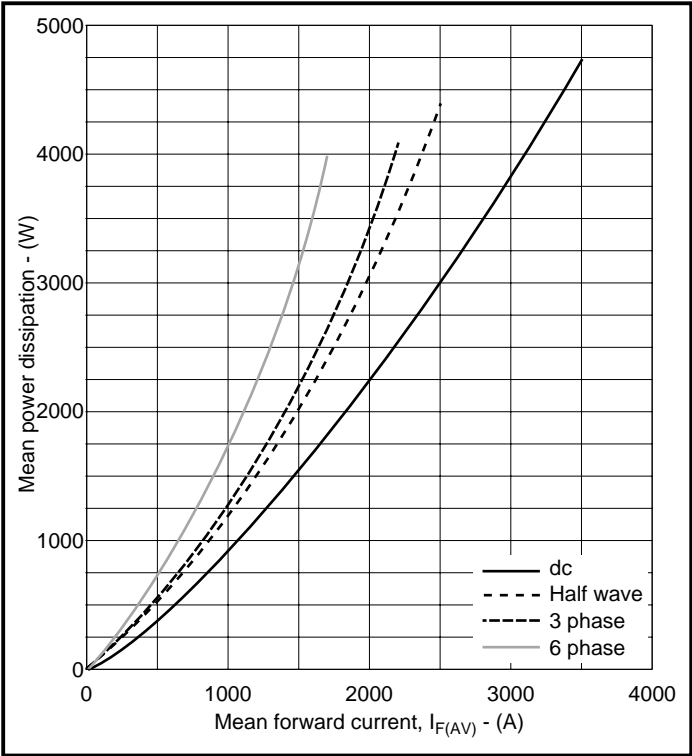


Fig.3 Dissipation curves

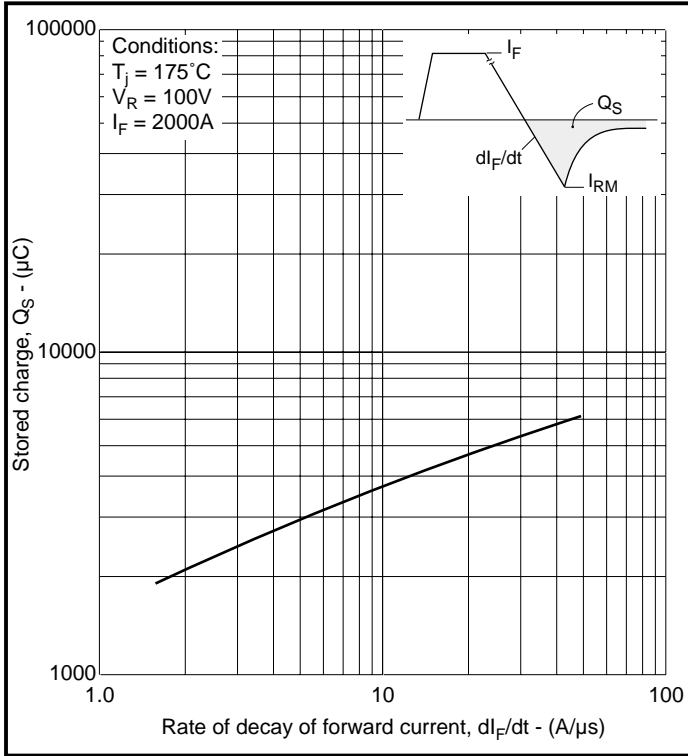
$V_{FM}$  Equation:-

$V_{FM} = A + B \ln(I_F) + C \cdot I_F + D \cdot \sqrt{I_F}$

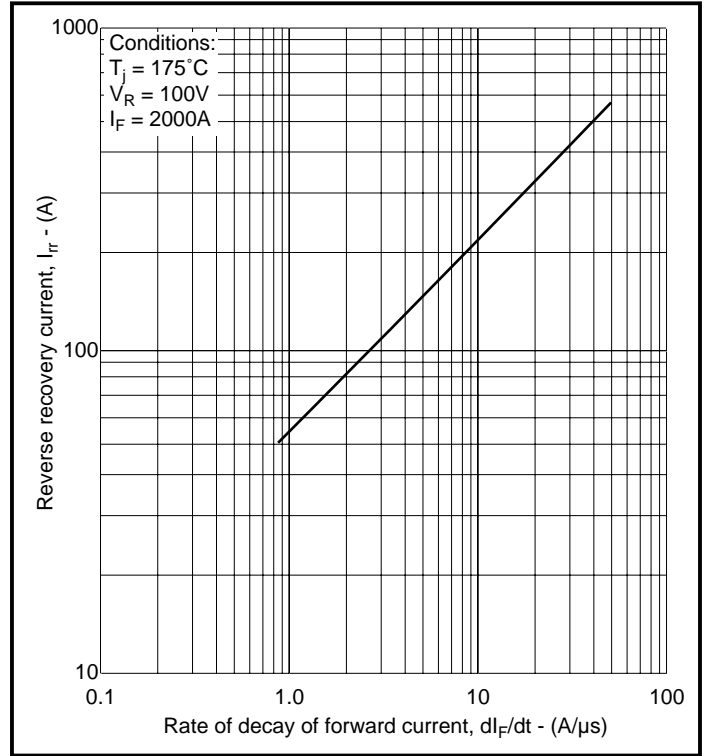
Where

$A = -0.23148$   
 $B = 0.203801$   
 $C = 0.00023$   
 $D = -0.0443$

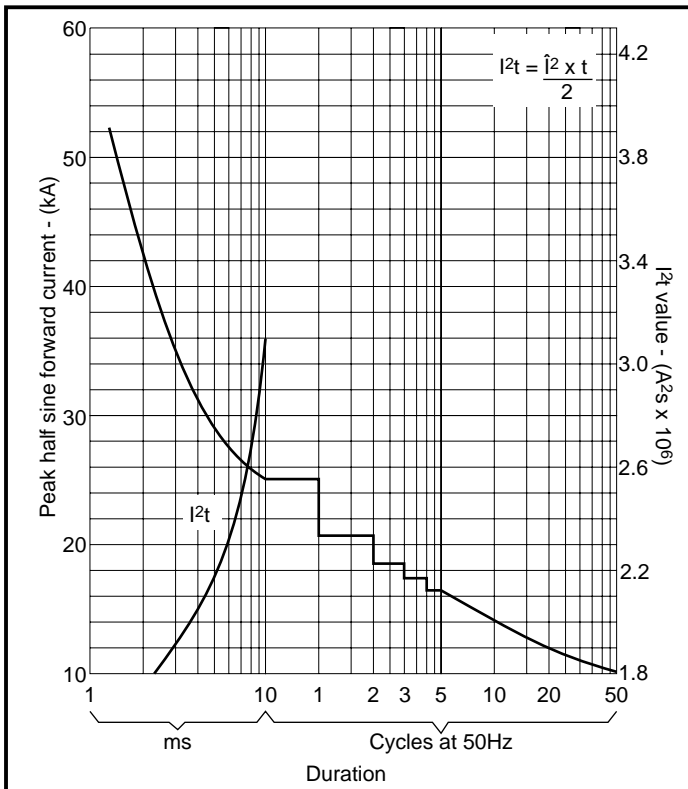
these values are valid for  $T_j = 125^{\circ}C$  for  $I_F$  500A to 5000A



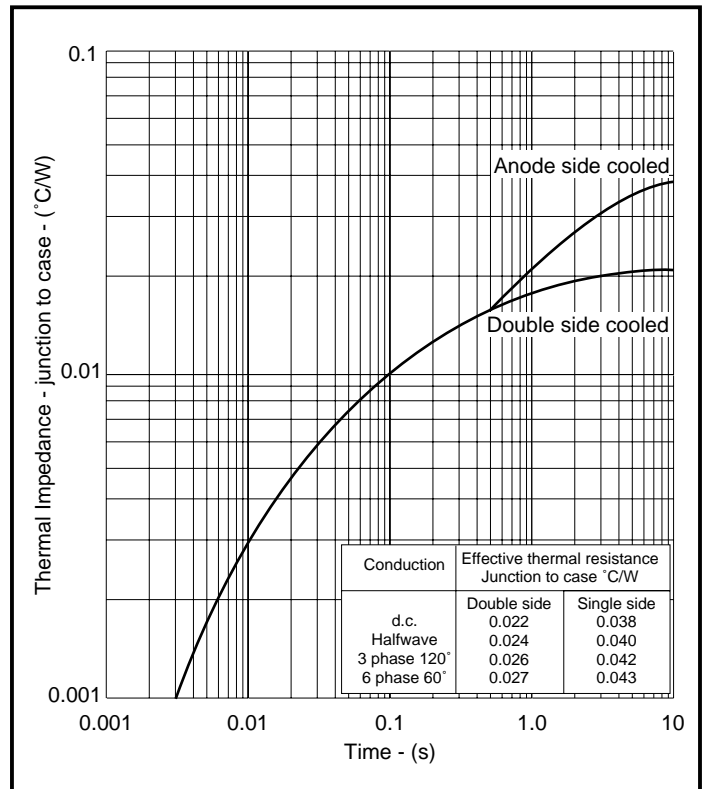
**Fig.4 Total stored charge**



**Fig.5 Maximum reverse recovery current**



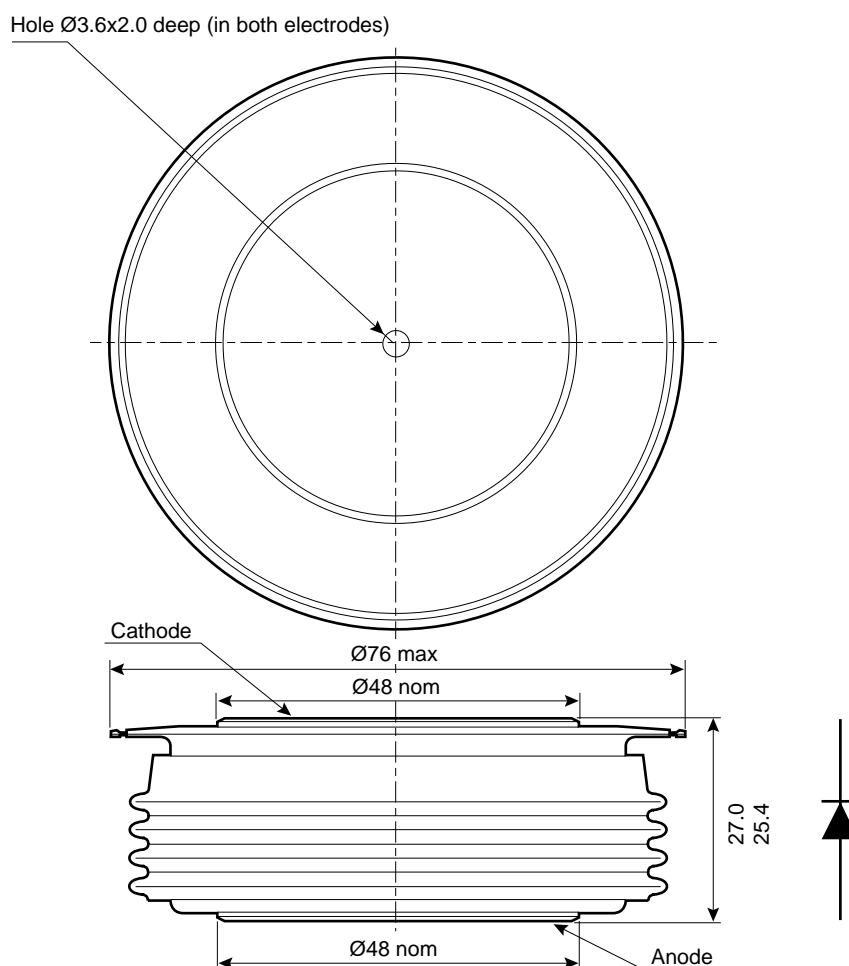
**Fig.6 Surge (non-repetitive) forward current vs time  
(with 50%  $V_{RRM}$  at  $T_{case} 175^\circ\text{C}$ )**



**Fig.7 Maximum (limit) transient thermal impedance - junction to case**

## PACKAGE DETAILS

For further package information, please contact your nearest Customer Service Centre. All dimensions in mm, unless stated otherwise.  
DO NOT SCALE.



Nominal weight: 450g  
Clamping force: 19.6kN  $\pm$  10%

Package outline type code: F

### Note:

1. Package maybe supplied with pins and/or tags.

## POWER ASSEMBLY CAPABILITY

The Power Assembly group was set up to provide a support service for those customers requiring more than the basic semiconductor, and has developed a flexible range of heatsink / clamping systems in line with advances in device types and the voltage and current capability of our semiconductors.

We offer an extensive range of air and liquid cooled assemblies covering the full range of circuit designs in general use today. The Assembly group continues to offer high quality engineering support dedicated to designing new units to satisfy the growing needs of our customers.

Using the up to date CAD methods our team of design and applications engineers aim to provide the Power Assembly Complete solution (PACs).

## DEVICE CLAMPS

Disc devices require the correct clamping force to ensure their safe operation. The PACs range offers a varied selection of pre-loaded clamps to suit all of our manufactured devices. This include cube clamps for single side cooling of 'T' 22mm

Clamps are available for single or double side cooling, with high insulation versions for high voltage assemblies.

Please refer to our application note on device clamping, AN4839

## HEATSINKS

Power Assembly has its own proprietary range of extruded aluminium heatsinks. They have been designed to optimise the performance of our semiconductors. Data with respect to air natural, forced air and liquid cooling (with flow rates) is available on request.

For further information on device clamps, heatsinks and assemblies, please contact your nearest Sales Representative or Customer Services.



<http://www.dynexsemi.com>

e-mail: [power\\_solutions@dynexsemi.com](mailto:power_solutions@dynexsemi.com)

### HEADQUARTERS OPERATIONS

#### **DYNEX SEMICONDUCTOR LTD**

Doddington Road, Lincoln.

Lincolnshire. LN6 3LF. United Kingdom.

Tel: 00-44-(0)1522-500500

Fax: 00-44-(0)1522-500550

#### **DYNEX POWER INC.**

99 Bank Street, Suite 410,

Ottawa, Ontario, Canada, K1P 6B9

Tel: 613.723.7035

Fax: 613.723.1518

Toll Free: 1.888.33.DYNEX (39639)

### CUSTOMER SERVICE CENTRES

**Mainland Europe** Tel: +33 (0)1 58 04 91 00. Fax: +33 (0)1 46 38 51 33

**North America** Tel: (613) 723-7035. Fax: (613) 723-1518.

**UK, Scandinavia & Rest Of World** Tel: +44 (0)1522 500500. Fax: +44 (0)1522 500020

### SALES OFFICES

**Mainland Europe** Tel: +33 (0)1 58 04 91 00. Fax: +33 (0)1 46 38 51 33

**North America** Tel: (613) 723-7035. Fax: (613) 723-1518. Toll Free: 1.888.33.DYNEX (39639) /

Tel: (949) 733-3005. Fax: (949) 733-2986.

**UK, Scandinavia & Rest Of World** Tel: +44 (0)1522 500500. Fax: +44 (0)1522 500020

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**Preliminary Information:** The product is in design and development. The datasheet represents the product as it is understood but details may change.

**Advance Information:** The product design is complete and final characterisation for volume production is well in hand.

**No Annotation:** The product parameters are fixed and the product is available to datasheet specification.

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