# DS2009SF

## Rectifier Diode

Replaces September 2001 version, DS4190-4.0

DS4190-4.1 December 2001

### FEATURES

- Double Side Cooling
- High Surge Capability

### APPLICATIONS

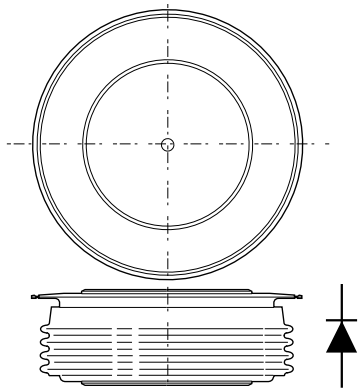
- Rectification
- Freewheel Diode
- DC Motor Control
- Power Supplies
- Welding
- Battery Chargers

### KEY PARAMETERS

$V_{RRM}$ **4800V**

$I_{F(AV)}$ **1428A**

$I_{FSM}$ **20500A**



**Outline type code: F**

See Package Details for further information.

**Fig. 1 Package outline**

### VOLTAGE RATINGS

| Type Number | Repetitive Peak Reverse Voltage $V_{RRM}$ V | Conditions |
|---|---|---|
| DS2009SF48 | 4800 | $V_{RSM} = V_{RRM} + 100V$ |
| DS2009SF47 | 4700 | |
| DS2009SF46 | 4600 | |
| DS2009SF45 | 4500 | |
| DS2009SF44 | 4400 | |
| DS2009SF43 | 4300 | |

Lower voltage grades available.

### ORDERING INFORMATION

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

**DS2009SF47**

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

## CURRENT RATINGS

**$T_{case}$ = 75°C unless otherwise stated**

| Symbol | Parameter | Conditions | Max. | Units |
|---|---|---|---|---|
| **Double Side Cooled** | | | | |
| $I_{F(AV)}$ | Mean forward current | Half wave resistive load | 1428 | A |
| $I_{F(RMS)}$ | RMS value | - | 2242 | A |
| $I_F$ | Continuous (direct) forward current | - | 2082 | A |
| **Single Side Cooled (Anode side)** | | | | |
| $I_{F(AV)}$ | Mean forward current | Half wave resistive load | 1033 | A |
| $I_{F(RMS)}$ | RMS value | - | 1622 | A |
| $I_F$ | Continuous (direct) forward current | - | 1424 | A |

**$T_{case}$ = 100°C unless otherwise stated**

| Symbol | Parameter | Conditions | Max. | Units |
|---|---|---|---|---|
| **Double Side Cooled** | | | | |
| $I_{F(AV)}$ | Mean forward current | Half wave resistive load | 1105 | A |
| $I_{F(RMS)}$ | RMS value | - | 1735 | A |
| $I_F$ | Continuous (direct) forward current | - | 1580 | A |
| **Single Side Cooled (Anode side)** | | | | |
| $I_{F(AV)}$ | Mean forward current | Half wave resistive load | 730 | A |
| $I_{F(RMS)}$ | RMS value | - | 1145 | A |
| $I_F$ | Continuous (direct) forward current | - | 960 | A |

## SURGE RATINGS

| Symbol | Parameter | Conditions | Max. | Units |
|---|---|---|---|---|
| $I_{FSM}$ | Surge (non-repetitive) forward current | 10ms half sine; $T_{case}$ = 150°C | 16.5 | kA |
| $I^2t$ | $I^2t$ for fusing | $V_R$ = 50% $V_{RRM}$ - 1/4 sine | 1.35 x $10^6$ | $A^2s$ |
| $I_{FSM}$ | Surge (non-repetitive) forward current | 10ms half sine; $T_{case}$ = 150°C | 20.5 | kA |
| $I^2t$ | $I^2t$ for fusing | $V_R$ = 0 | 2.125 x $10^6$ | $A^2s$ |

## 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 | °C/W |
| | | Single side cooled | Anode dc | - | 0.038 | °C/W |
| | | | Cathode dc | - | 0.052 | °C/W |
| $R_{th(c-h)}$ | Thermal resistance - case to heatsink | Clamping force 19.5kN with mounting compound | Double side | - | 0.004 | °C/W |
| | | | Single side | - | 0.008 | °C/W |
| $T_{vj}$ | Virtual junction temperature | Forward (conducting) | | - | 160 | °C |
| | | Reverse (blocking) | | - | 150 | °C |
| $T_{stg}$ | Storage temperature range | | | -55 | 175 | °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°C | - | 1.8 | V |
| $I_{RRM}$ | Peak reverse current | At $V_{RRM}$, $T_{case}$ = 150°C | - | 75 | mA |
| $Q_S$ | Total stored charge | $I_F$ = 2000A, $dI_{RR}/dt$ = 3A/µs, | - | 4000 | µC |
| $I_{RM}$ | Peak recovery current | $T_{case}$ = 150˚C, $V_R$ = 100V | - | 115 | A |
| $V_{TO}$ | Threshold voltage | At $T_{vj}$ = 150˚C | - | 0.84 | V |
| $r_T$ | Slope resistance | At $T_{vj}$ = 150˚C | - | 0.383 | mΩ |

## CURVES

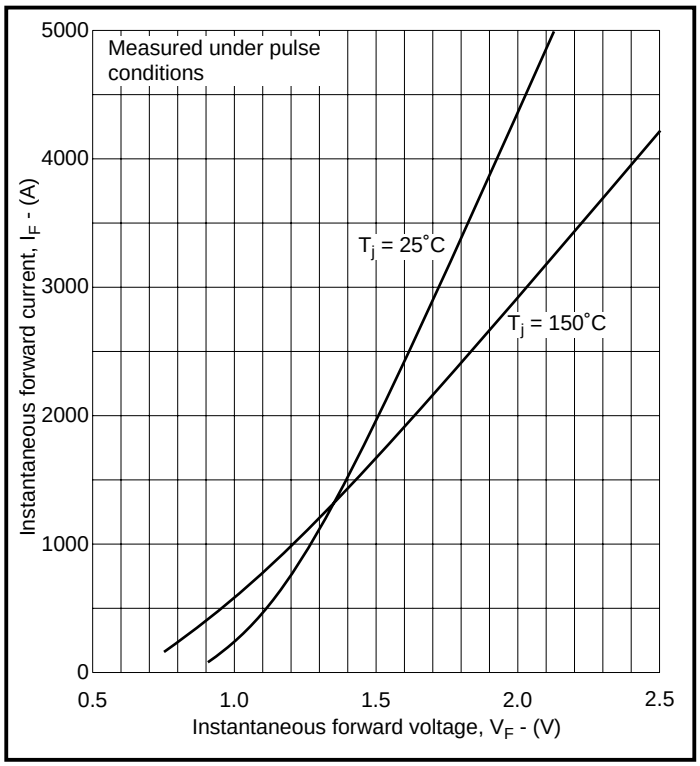



**Fig.2 Maximum (limit) forward characteristics**

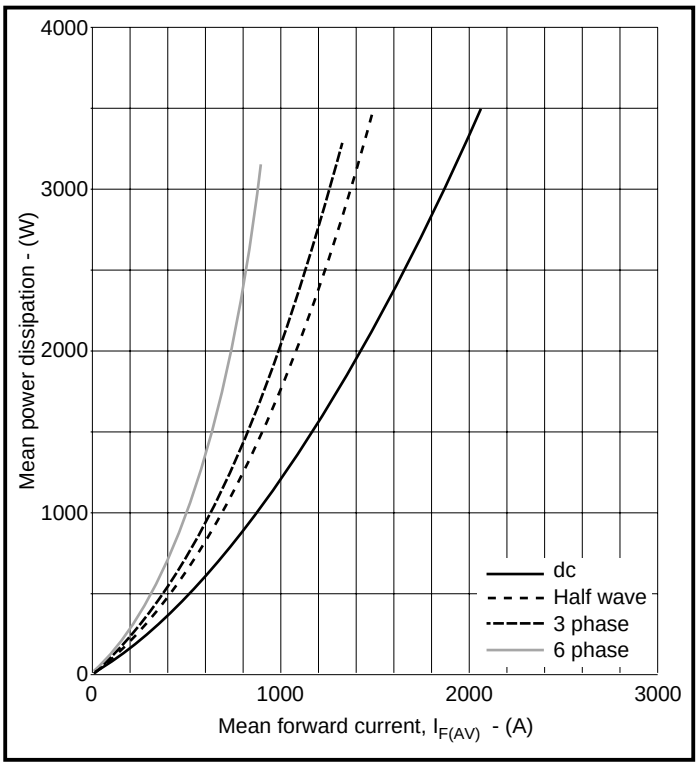



**Fig.3 Dissipation curves**

$V_{FM}$ Equation:-

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

Where A = 0.290476
B = 0.06449
C = 0.000335
D = 0.00408

these values are valid for $T_j$ = 125˚C for $I_F$ 500A to 5000A

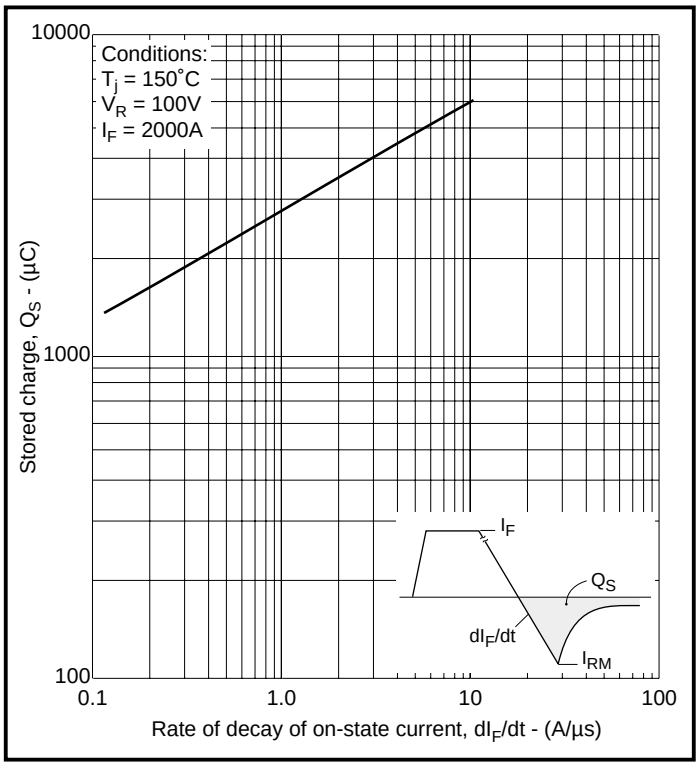



**Fig.4 Total stored charge**

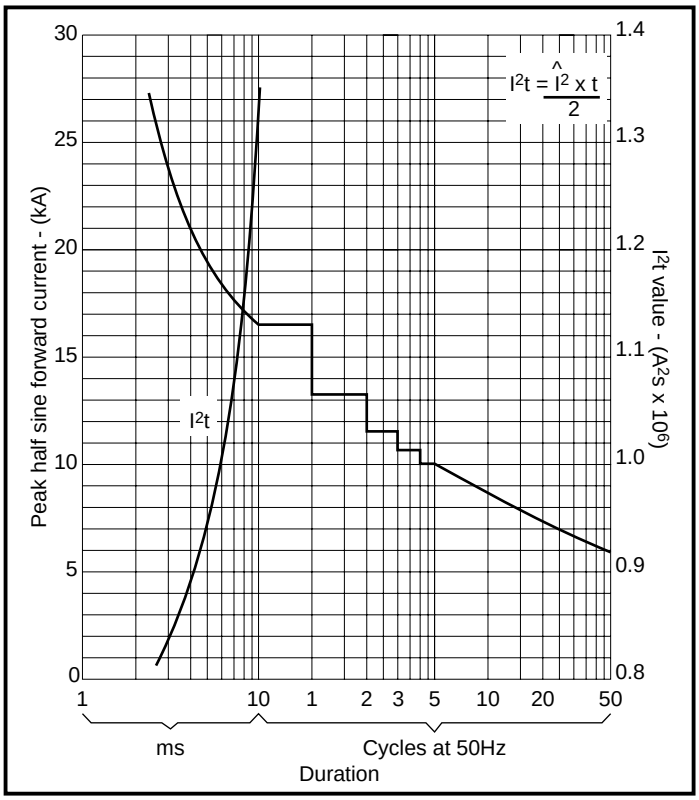
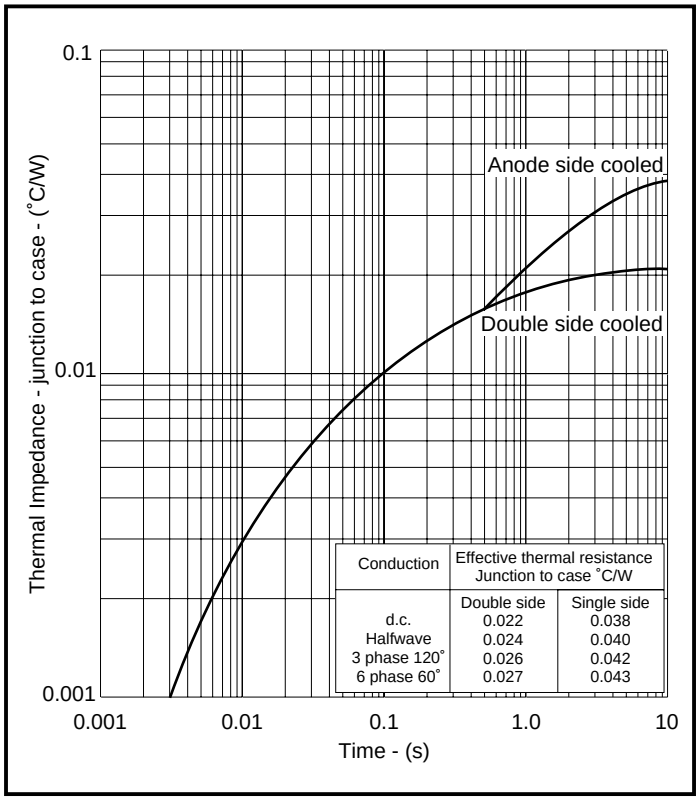



**Fig.5 Surge (non-repetitive) forward current vs time (with 50% $V_{RRM}$ at $T_{case}$ 150˚C)**

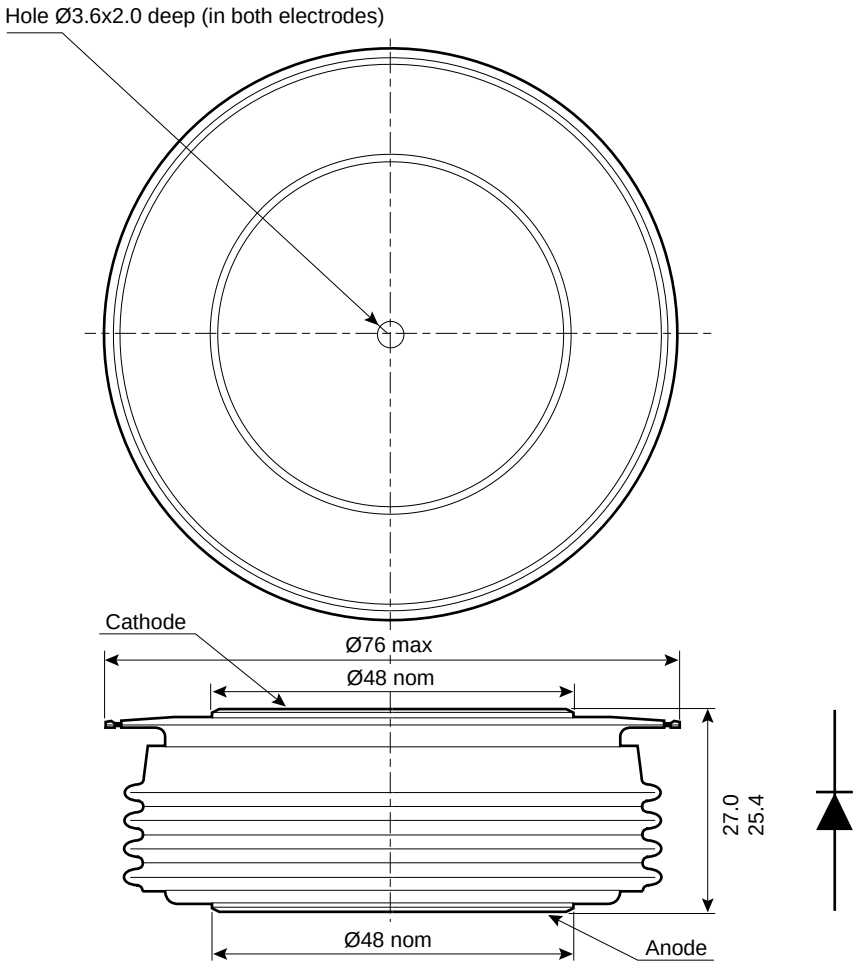



| Conduction | Effective thermal resistance Junction to case ˚C/W | |
|---|---|---|
| | Double side | Single side |
| d.c. | 0.022 | 0.038 |
| Halfwave | 0.024 | 0.040 |
| 3 phase 120˚ | 0.026 | 0.042 |
| 6 phase 60˚ | 0.027 | 0.043 |

**Fig.6 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 ± 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 or 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.

DYNEX SEMICONDUCTOR

**http://www.dynexsemi.com**

**e-mail: 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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**Target Information:** This is the most tentative form of information and represents a very preliminary specification. No actual design work on the product has been started.

**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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