

### FEATURES

- Double Side Cooling
- High Surge Capability

### APPLICATIONS

- High Power Drives
- High Voltage Power Supplies
- DC Motor Control
- Welding
- Battery Chargers

### VOLTAGE RATINGS

| Part and Ordering Number | Repetitive Peak Voltages<br>$V_{\text{DRM}}$ and $V_{\text{RRM}}$<br>V | Conditions                                                                                                                                                                                                                                                                                                 |
|--------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DCR1595SW52              | 5200                                                                   | $T_{\text{vj}} = 0^{\circ} \text{ to } 125^{\circ}\text{C}$ ,<br>$I_{\text{DRM}} = I_{\text{RRM}} = 400\text{mA}$ ,<br>$V_{\text{DRM}}, V_{\text{RRM}}, t_p = 10\text{ms}$ ,<br>$V_{\text{DSM}} \text{ \& } V_{\text{RSM}} =$<br>$V_{\text{DRM}} \text{ \& } V_{\text{RRM}} + 100\text{V}$<br>respectively |
| DCR1595SW51              | 5100                                                                   |                                                                                                                                                                                                                                                                                                            |
| DCR1595SW50              | 5000                                                                   |                                                                                                                                                                                                                                                                                                            |
| DCR1595SW49              | 4900                                                                   |                                                                                                                                                                                                                                                                                                            |
| DCR1595SW48              | 4800                                                                   |                                                                                                                                                                                                                                                                                                            |
| DCR1595SW47              | 4700                                                                   |                                                                                                                                                                                                                                                                                                            |

Lower voltage grades available.

### KEY PARAMETERS

|                    |       |                      |
|--------------------|-------|----------------------|
| $V_{\text{DRM}}$   |       | 5200V                |
| $I_{\text{T(AV)}}$ | (max) | 2856A                |
| $I_{\text{TSM}}$   | (max) | 46000A               |
| $dV/dt$ *          |       | 1000V/ $\mu\text{s}$ |
| $dI/dt$            |       | 300A/ $\mu\text{s}$  |

\* Higher  $dV/dt$  selections available

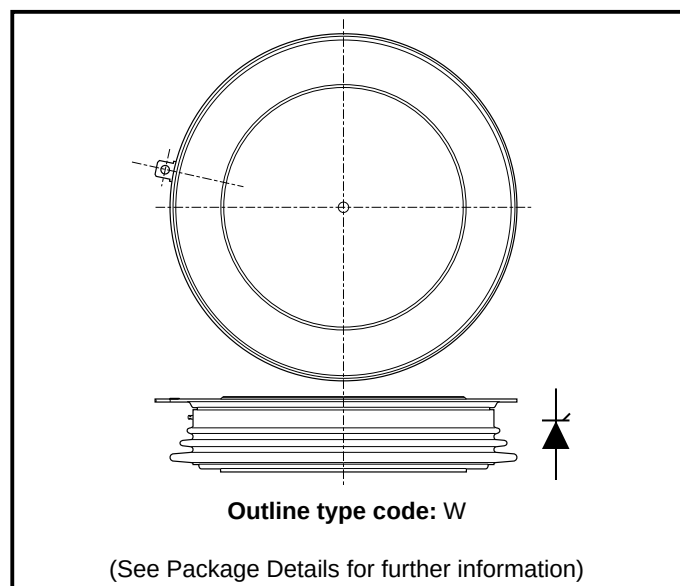


Fig. 1 Package outline

### ORDERING INFORMATION

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

For example:

**DCR1596SW52**

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

## CURRENT RATINGS

$T_{\text{case}} = 60^{\circ}\text{C}$  unless stated otherwise.

| Symbol                    | Parameter                            | Test Conditions          | Max. | Units |
|---------------------------|--------------------------------------|--------------------------|------|-------|
| <b>Double Side Cooled</b> |                                      |                          |      |       |
| $I_{T(AV)}$               | Mean on-state current                | Half wave resistive load | 2856 | A     |
| $I_{T(RMS)}$              | RMS value                            | -                        | 4487 | A     |
| $I_T$                     | Continuous (direct) on-state current | -                        | 4185 | A     |
| <b>Single Side Cooled</b> |                                      |                          |      |       |
| $I_{T(AV)}$               | Mean on-state current                | Half wave resistive load | 1889 | A     |
| $I_{T(RMS)}$              | RMS value                            | -                        | 2967 | A     |
| $I_T$                     | Continuous (direct) on-state current | -                        | 2573 | A     |

$T_{\text{case}} = 80^{\circ}\text{C}$  unless stated otherwise.

| Symbol                    | Parameter                            | Test Conditions          | Max. | Units |
|---------------------------|--------------------------------------|--------------------------|------|-------|
| <b>Double Side Cooled</b> |                                      |                          |      |       |
| $I_{T(AV)}$               | Mean on-state current                | Half wave resistive load | 2260 | A     |
| $I_{T(RMS)}$              | RMS value                            | -                        | 3550 | A     |
| $I_T$                     | Continuous (direct) on-state current | -                        | 3230 | A     |
| <b>Single Side Cooled</b> |                                      |                          |      |       |
| $I_{T(AV)}$               | Mean on-state current                | Half wave resistive load | 1465 | A     |
| $I_{T(RMS)}$              | RMS value                            | -                        | 2300 | A     |
| $I_T$                     | Continuous (direct) on-state current | -                        | 1950 | A     |

## SURGE RATINGS

| Symbol    | Parameter                               | Test Conditions                           | Max.               | Units            |
|-----------|-----------------------------------------|-------------------------------------------|--------------------|------------------|
| $I_{TSM}$ | Surge (non-repetitive) on-state current | 10ms half sine, $T_{case} = 125^{\circ}C$ | 37                 | kA               |
| $I^2t$    | $I^2t$ for fusing                       | $V_R = 50\% V_{RRM} - 1/4$ sine           | $6.85 \times 10^6$ | A <sup>2</sup> s |
| $I_{TSM}$ | Surge (non-repetitive) on-state current | 10ms half sine, $T_{case} = 125^{\circ}C$ | 46                 | kA               |
| $I^2t$    | $I^2t$ for fusing                       | $V_R = 0$                                 | $10.6 \times 10^6$ | A <sup>2</sup> s |

## THERMAL AND MECHANICAL RATINGS

| Symbol        | Parameter                             | Test Conditions          |             | Min. | Max.  | Units        |
|---------------|---------------------------------------|--------------------------|-------------|------|-------|--------------|
| $R_{th(j-c)}$ | Thermal resistance - junction to case | Double side cooled       | DC          | -    | 0.008 | $^{\circ}CW$ |
|               |                                       | Single side cooled       | Anode DC    | -    | 0.016 | $^{\circ}CW$ |
|               |                                       |                          | Cathode DC  | -    | 0.016 | $^{\circ}CW$ |
| $R_{th(c-h)}$ | Thermal resistance - case to heatsink | Clamping force 70.0kN    | Double side | -    | 0.001 | $^{\circ}CW$ |
|               |                                       | (with mounting compound) | Single side | -    | 0.002 | $^{\circ}CW$ |
| $T_{vj}$      | Virtual junction temperature          | On-state (conducting)    |             | -    | 135   | $^{\circ}C$  |
|               |                                       | Reverse (blocking)       |             | -    | 125   | $^{\circ}C$  |
| $T_{stg}$     | Storage temperature range             |                          |             | -55  | 125   | $^{\circ}C$  |
| $F_m$         | Clamping force                        |                          |             | 63.0 | 77.0  | kN           |

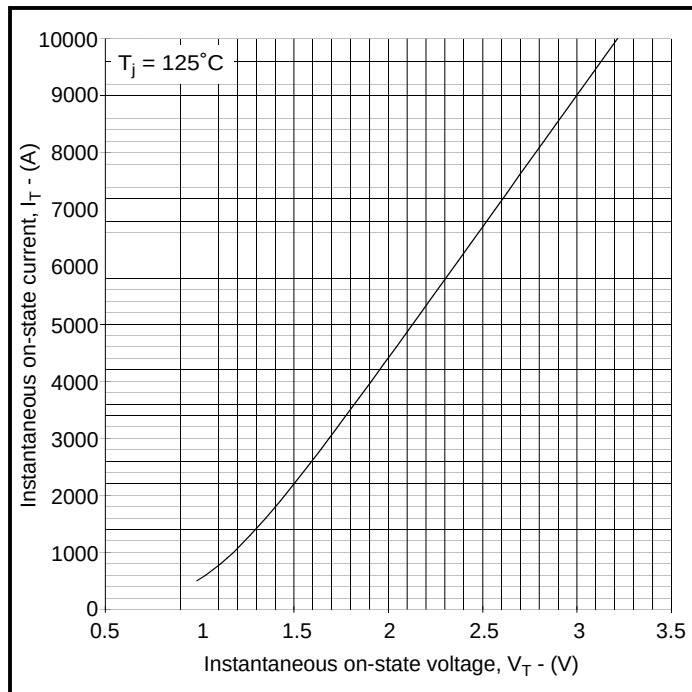
## SURGE RATINGS

| Symbol            | Parameter                                     | Test Conditions                                                                                                                                                    |                 | Min. | Max.  | Units      |
|-------------------|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|-------|------------|
| $I_{RRM}/I_{RRM}$ | Peak reverse and off-state current            | At $V_{RRM}/V_{DRM}$ , $T_{case} = 125^{\circ}C$                                                                                                                   |                 | -    | 400   | mA         |
| $dV/dt$           | Max. linear rate of rise of off-state voltage | To 67% $V_{DRM}$ , $T_j = 125^{\circ}C$ , gate open                                                                                                                |                 | -    | 1000  | V/ $\mu s$ |
| $dI/dt$           | Rate of rise of on-state current              | From 67% $V_{DRM}$ to $2 \times I_{T(AV)}$                                                                                                                         | Repetitive 50Hz | -    | 120   | A/ $\mu s$ |
|                   |                                               | Gate source 20V, 10 $\Omega$ ,<br>$t_r < 0.5\mu s$ , $T_j = 125^{\circ}C$                                                                                          | Non-repetitive  | -    | 300   | A/ $\mu s$ |
| $V_{T(To)}$       | Threshold voltage                             | At $T_{vj} = 125^{\circ}C$                                                                                                                                         |                 | -    | 1.0   | V          |
| $r_T$             | On-state slope resistance                     | At $T_{vj} = 125^{\circ}C$                                                                                                                                         |                 | -    | 0.225 | m $\Omega$ |
| $t_{gd}$          | Delay time                                    | $V_D = 67\% V_{DRM}$ , gate source 30V, 15 $\Omega$<br>$t_r = 0.5\mu s$ , $T_j = 25^{\circ}C$                                                                      |                 | 0.5  | 1.5   | $\mu s$    |
| $t_q$             | Turn-off time                                 | $I_T = 5000A$ , $t_p = 3.5ms$ , $T_j = 125^{\circ}C$ ,<br>$V_R = 900V$ , $dI_{RR}/dt = 4A/\mu s$ ,<br>$V_{DR} = 67\% V_{DRM}$ ,<br>$dV_{DR}/dt = 20V/\mu s$ linear |                 | 500  | 1000  | $\mu s$    |
| $I_L$             | Latching current                              | $T_j = 25^{\circ}C$ , $V_D = 5V$                                                                                                                                   |                 | 100  | 1000  | mA         |
| $I_H$             | Holding current                               | $T_j = 25^{\circ}C$ , $R_{G-K} = \infty$ , $I_{TM} = 500A$ , $I_T = 5A$                                                                                            |                 | 20   | 150   | mA         |

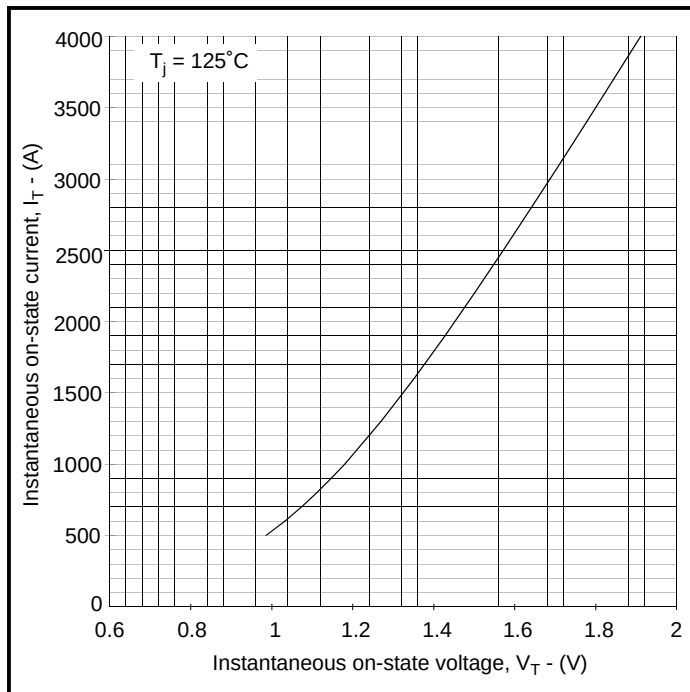
## GATE TRIGGER CHARACTERISTICS AND RATINGS

| Symbol      | Parameter                 | Test Conditions                        | Max. | Units |
|-------------|---------------------------|----------------------------------------|------|-------|
| $V_{GT}$    | Gate trigger voltage      | $V_{DRM} = 5V, T_{case} = 25^{\circ}C$ | 4    | V     |
| $I_{GT}$    | Gate trigger current      | $V_{DRM} = 5V, T_{case} = 25^{\circ}C$ | 400  | mA    |
| $V_{GD}$    | Gate non-trigger voltage  | At $V_{DRM}, T_{case} = 125^{\circ}C$  | 0.25 | V     |
| $V_{FGM}$   | Peak forward gate voltage | Anode positive with respect to cathode | 30   | V     |
| $V_{FGN}$   | Peak forward gate voltage | Anode negative with respect to cathode | 0.25 | V     |
| $V_{RGM}$   | Peak reverse gate voltage | -                                      | 5    | V     |
| $I_{FGM}$   | Peak forward gate current | Anode positive with respect to cathode | 30   | A     |
| $P_{GM}$    | Peak gate power           | See table fig. 8 and 9                 | 150  | W     |
| $P_{G(AV)}$ | Mean gate power           | -                                      | 10   | W     |

## CURVES



**Fig.2 Maximum (limit) on-state characteristics**



**Fig.3 Maximum (limit) on-state characteristics**

### $V_{TM}$ EQUATION

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

Where

$$A = -0.5011559$$

$$B = 0.2638417$$

$$C = 2.536711 \times 10^{-4}$$

$$D = -0.01249303$$

these values are valid for  $T_j = 125^{\circ}C$  for  $I_T$  500A to 10000A

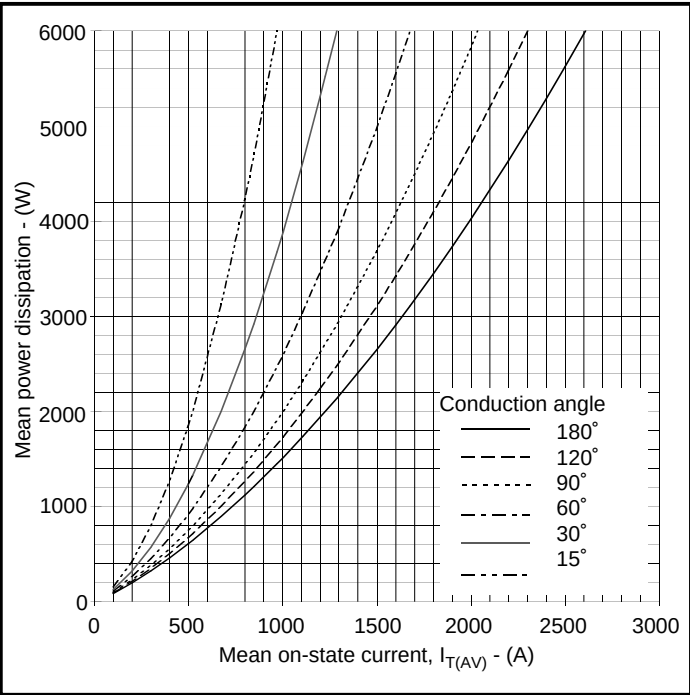


Fig.4 Sine wave power dissipation

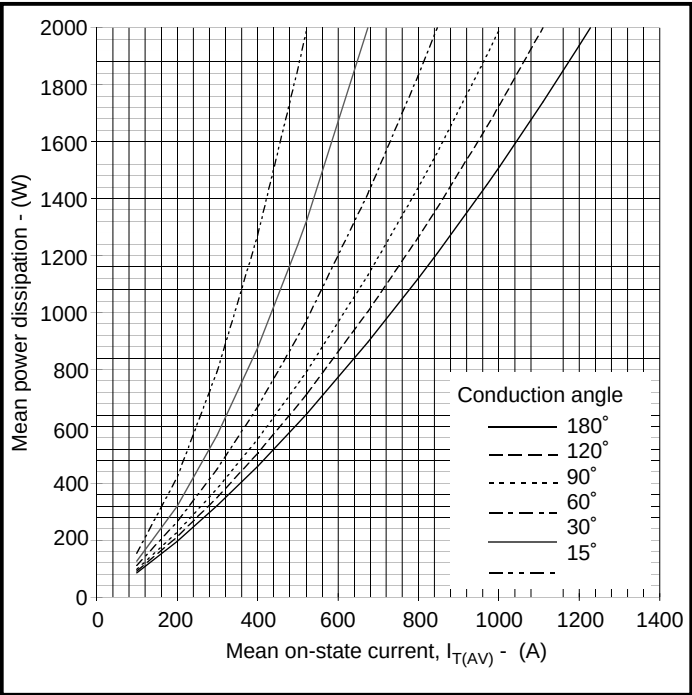


Fig.5 Sine wave power dissipation

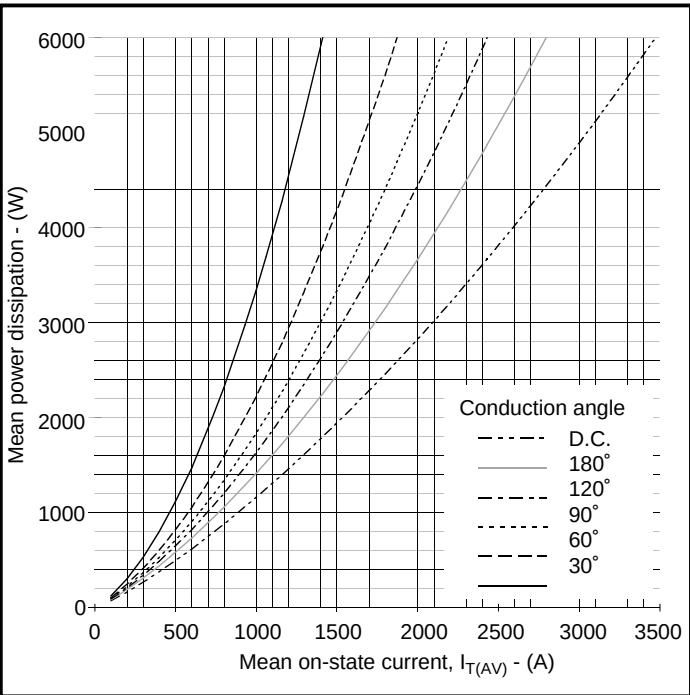


Fig.6 Square wave power dissipation

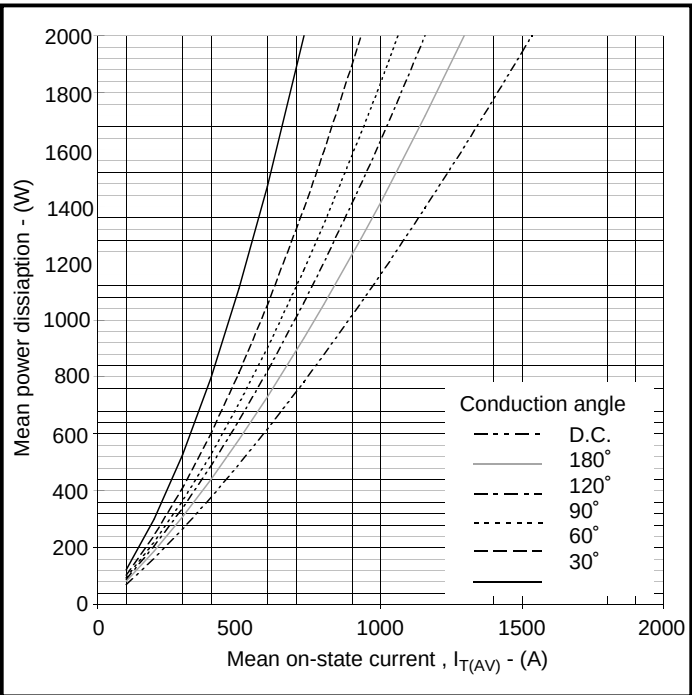
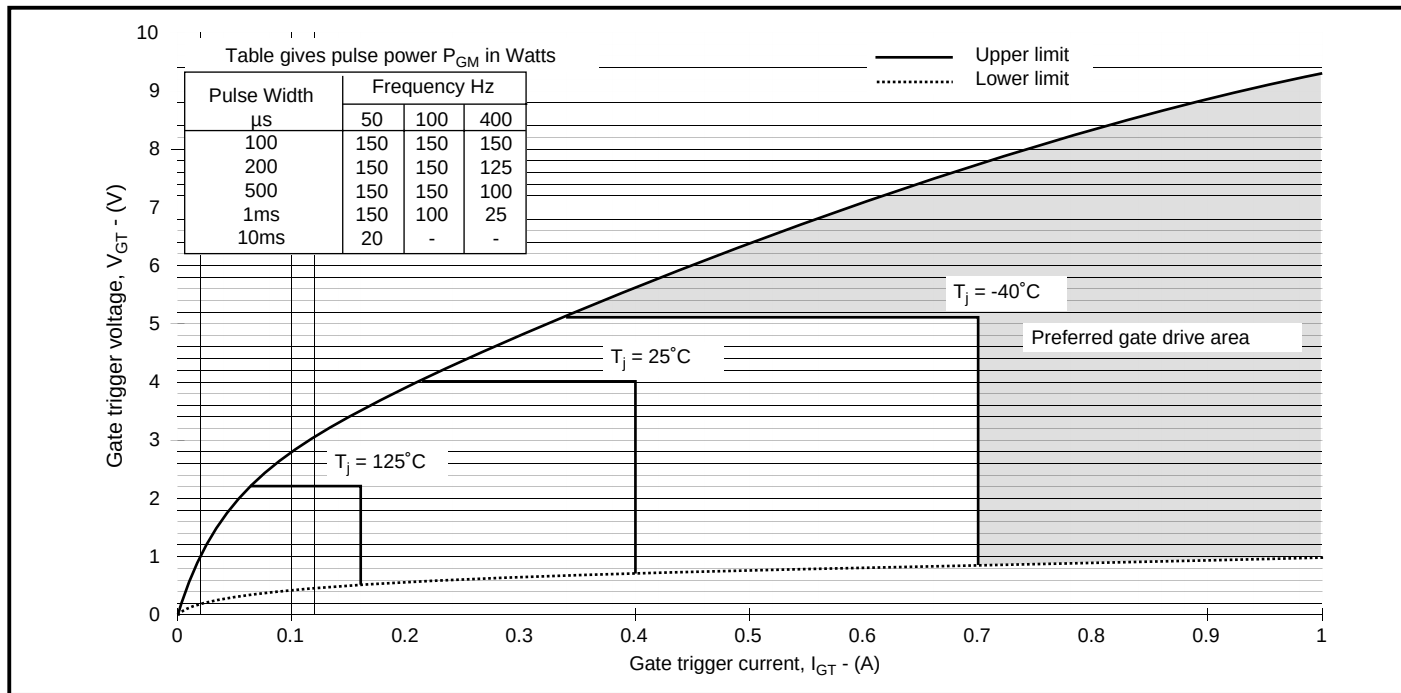
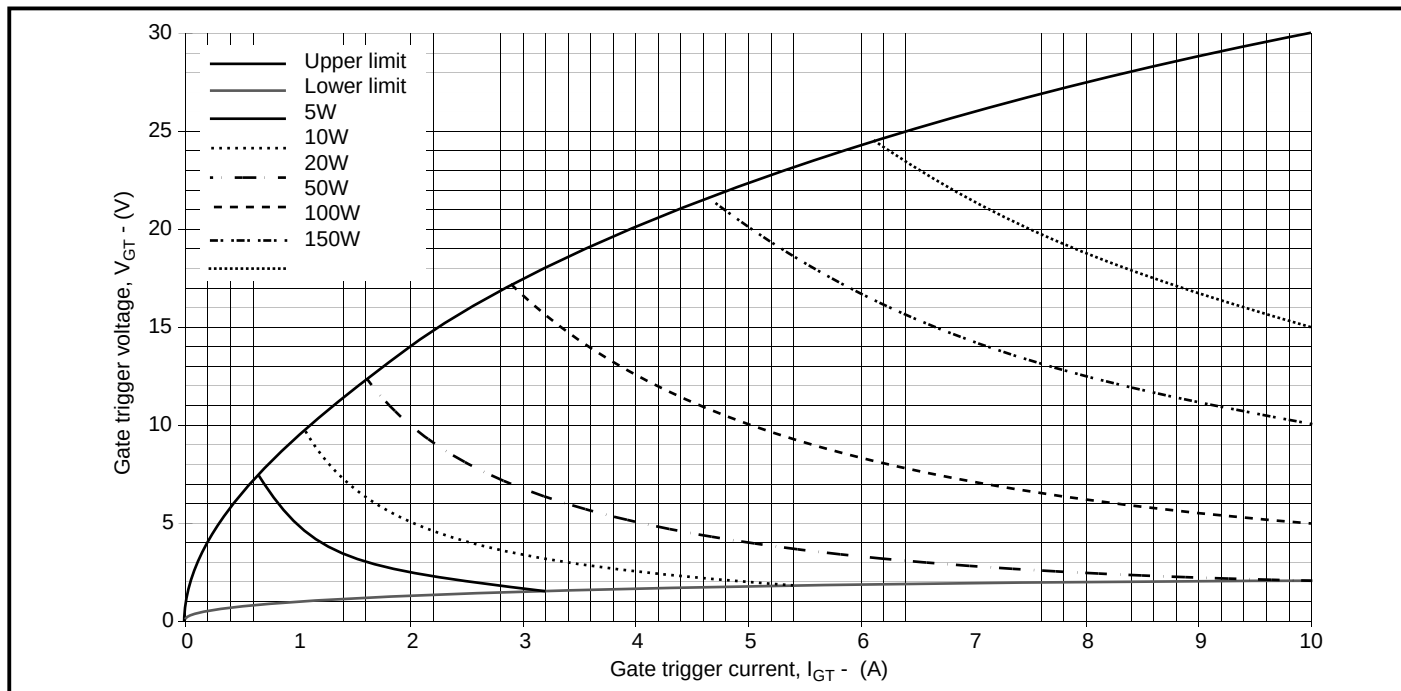


Fig.7 Square wave power dissipation



**Fig.8 Gate characteristics**



**Fig.9 Gate characteristics**

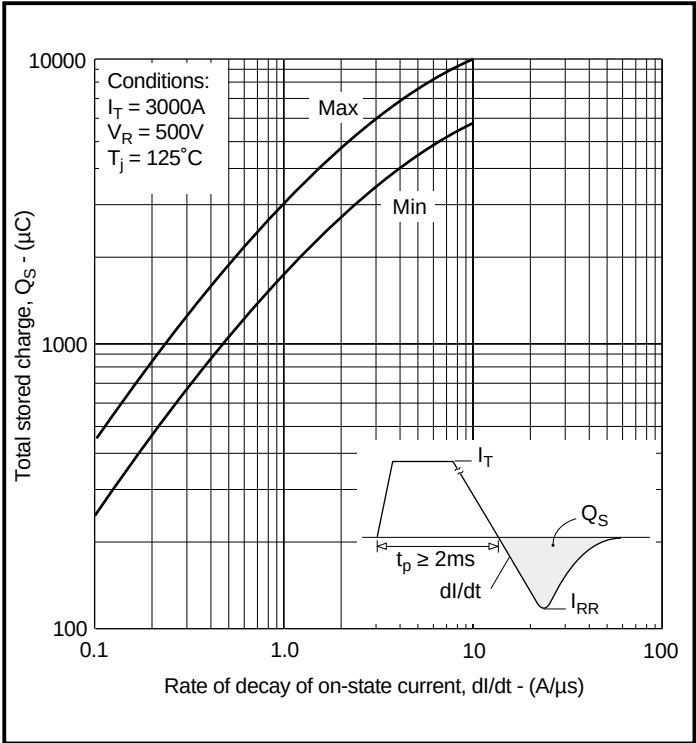


Fig.10 Stored charge

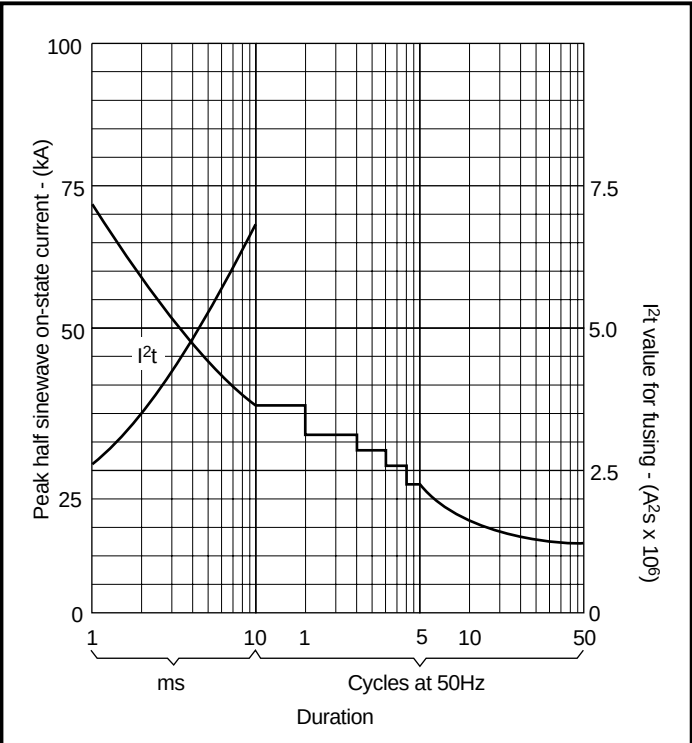


Fig.11 Surge (non-repetitive) on-state current vs time  
(with 50%  $V_{RRM}$  at  $T_{case} = 125^\circ C$ )

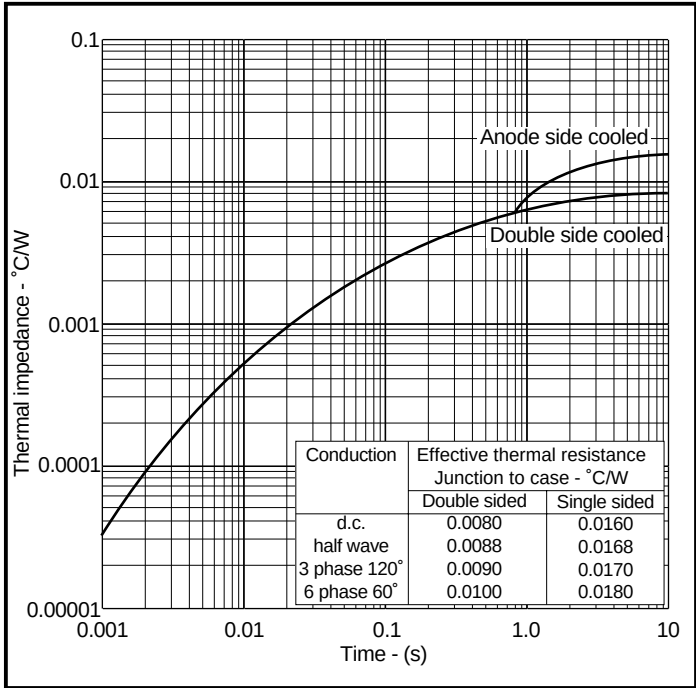
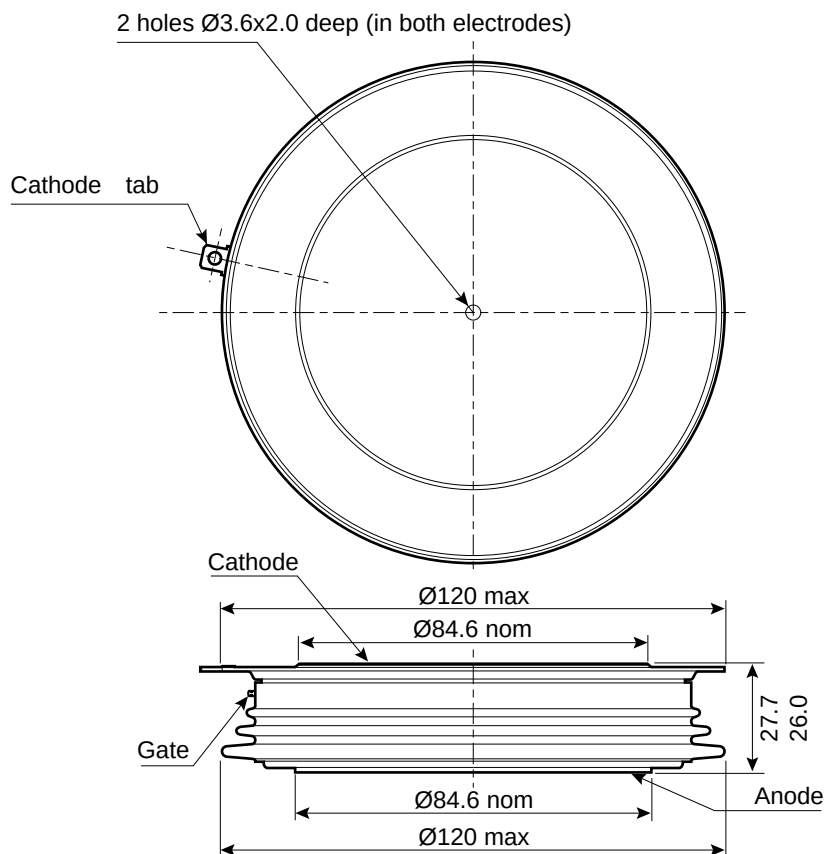


Fig.12 Maximum (limit) transient thermal impedance -  
junction to case ( $^\circ C/W$ )



## PACKAGE DETAILS

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



Nominal weight: 2600g  
Clamping force: 70kN  $\pm 10\%$   
Lead length: 420mm  
Lead terminal connector: M4 ring

**Package outline type code: W**

## 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 and clamping systems in line with advances in device voltages 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 latest 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 includes a varied selection of pre-loaded clamps to suit all of our manufactured devices. Types available include cube clamps for single side cooling of 'T' 23mm and 'E' 30mm discs, and bar clamps right up to 83kN for our 'Z' 100mm thyristors and diodes.

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

The Power Assembly group has its own proprietary range of extruded aluminium heatsinks. They have been designed to optimise the performance of Dynex 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 service office.



<http://www.dynexsemi.com>

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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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