



# DCR1595SW

## Phase Control Thyristor

Replaces October 2000 version, DS4248-5.0

DS4248-6.1 July 2001

### 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 $V_{DRM}$ and $V_{RRM}$ V	Conditions
DCR1595SW42	4200	$T_{vj} = 0^{\circ} \text{ to } 125^{\circ}\text{C}$ , $I_{DRM} = I_{RRM} = 400\text{mA}$ , $V_{DRM}, V_{RRM} t_p = 10\text{ms}$ , $V_{DSM} \& V_{RSM} =$ $V_{DRM} \& V_{RRM} + 100\text{V}$ respectively
DCR1595SW41	4100	
DCR1595SW40	4000	
DCR1595SW39	3900	
DCR1595SW38	3800	
DCR1595SW37	3700	

Lower voltage grades available.

### ORDERING INFORMATION

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

For example:

**DCR1595SW38**

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

### KEY PARAMETERS

$V_{DRM}$		<b>4200V</b>
$I_{T(AV)}$	<b>(max)</b>	<b>3020A</b>
$I_{TSM}$	<b>(max)</b>	<b>53750A</b>
$dV/dt^*$		<b>1000V/<math>\mu\text{s}</math></b>
$dI/dt$		<b>400A/<math>\mu\text{s}</math></b>

\* Higher  $dV/dt$  selections available

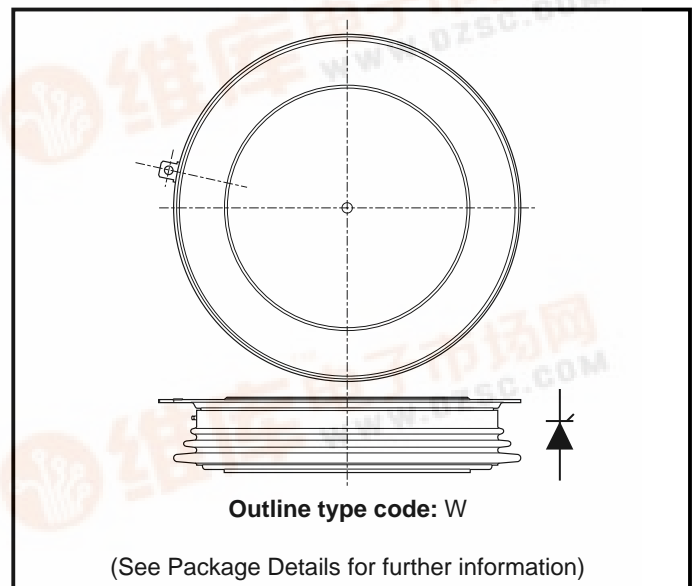


Fig. 1 Package outline

## CURRENT RATINGS

$T_{case} = 60^{\circ}\text{C}$  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	3020	A
$I_{T(RMS)}$	RMS value	-	4745	A
$I_T$	Continuous (direct) on-state current	-	4370	A
<b>Single Side Cooled</b>				
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	1975	A
$I_{T(RMS)}$	RMS value	-	3105	A
$I_T$	Continuous (direct) on-state current	-	2650	A

$T_{case} = 80^{\circ}\text{C}$  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	2380	A
$I_{T(RMS)}$	RMS value	-	3735	A
$I_T$	Continuous (direct) on-state current	-	3360	A
<b>Single Side Cooled</b>				
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	1530	A
$I_{T(RMS)}$	RMS value	-	2405	A
$I_T$	Continuous (direct) on-state current	-	1996	A

## SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
$I_{TSM}$	Surge (non-repetitive) on-state current	10ms half sine, $T_{case} = 125^{\circ}C$ $V_R = 50\% V_{RRM} - 1/4$ sine	43.0	kA
$I^2t$	$I^2t$ for fusing		$9.25 \times 10^6$	A <sup>2</sup> s
$I_{TSM}$	Surge (non-repetitive) on-state current	10ms half sine, $T_{case} = 125^{\circ}C$ $V_R = 0$	53.75	kA
$I^2t$	$I^2t$ for fusing		$14.4 \times 10^6$	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

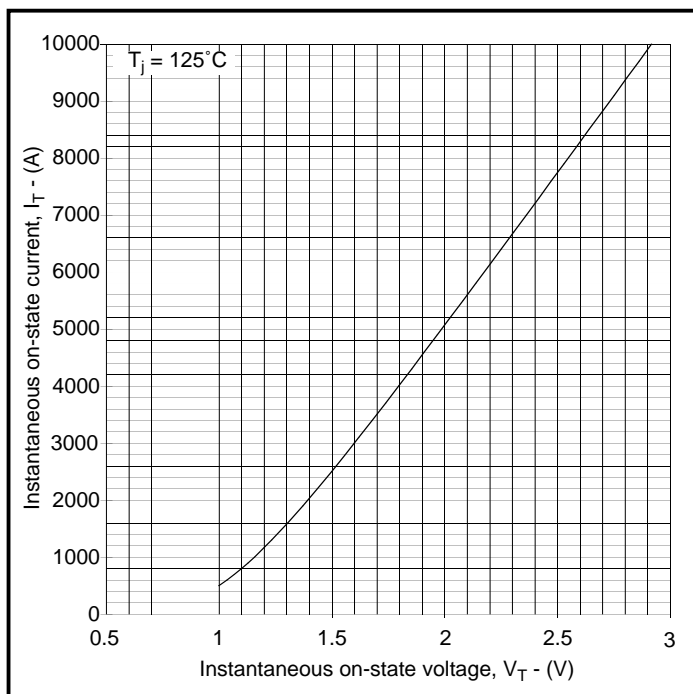
## SURGE RATINGS

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	-	200	A/ $\mu s$
		Gate source 30V, 10 $\Omega$ , $t_r < 0.5\mu s$ , $T_j = 125^{\circ}C$	Non-repetitive	-	400	A/ $\mu s$
$V_{T(TO)}$	Threshold voltage	At $T_{vj} = 125^{\circ}C$		-		V
$r_T$	On-state slope resistance	At $T_{vj} = 125^{\circ}C$		-	1.03	m $\Omega$
$t_{gd}$	Delay time	$V_D = 67\% V_{DRM}$ , gate source 30V, 15 $\Omega$ $t_r = 0.5\mu s$ , $T_j = 25^{\circ}C$		0.5	0.19 2	$\mu s$
$t_q$	Turn-off time	$I_T = 5000A$ , $t_p = 3.5ms$ , $T_j = 125^{\circ}C$ , $V_R = 900V$ , $dI_{RR}/dt = 4A/\mu s$ , $V_{DR} = 67\% V_{DRM}$ , $dV_{DR}/dt = 20V/\mu s$ linear		550	1000	$\mu s$
$I_L$	Latching current	$T_j = 25^{\circ}C$ , $V_D = 5V$		220	1000	mA
$I_H$	Holding current	$T_j = 25^{\circ}C$ , $R_{G-K} = \infty$ , $I_{TM} = 500A$ , $I_T = 5A$		50	250	mA

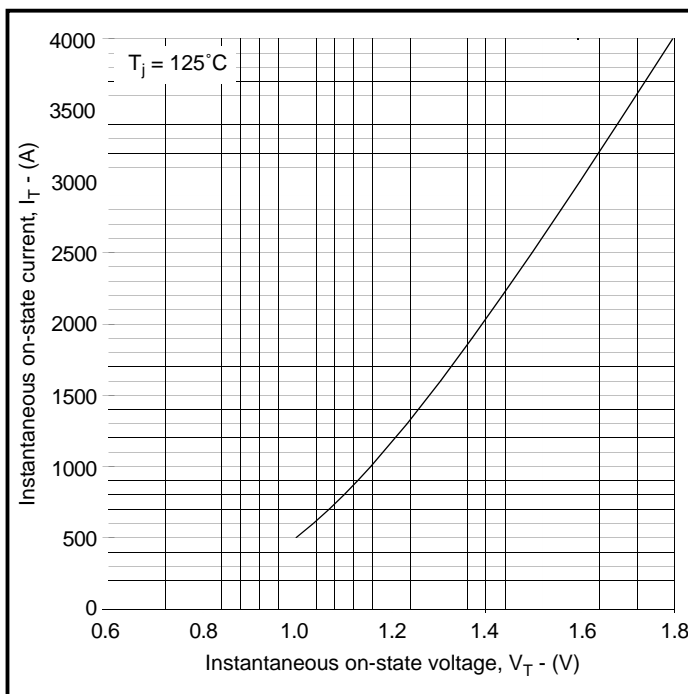
## GATE TRIGGER CHARACTERISTICS AND RATINGS

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

$$A = 0.02866651$$

$$B = 0.1590393$$

$$C = 1.947584 \times 10^{-4}$$

$$D = -5.23298 \times 10^{-3}$$

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

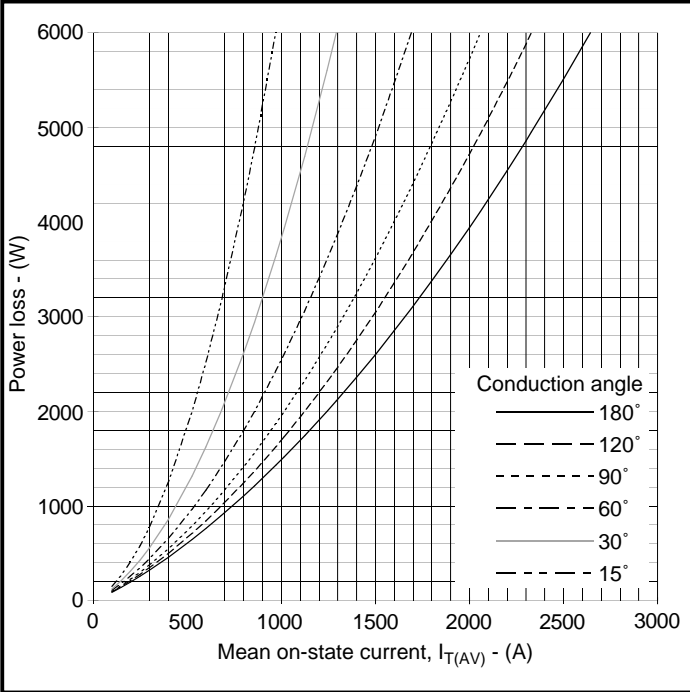


Fig.4 Sine wave power dissipation

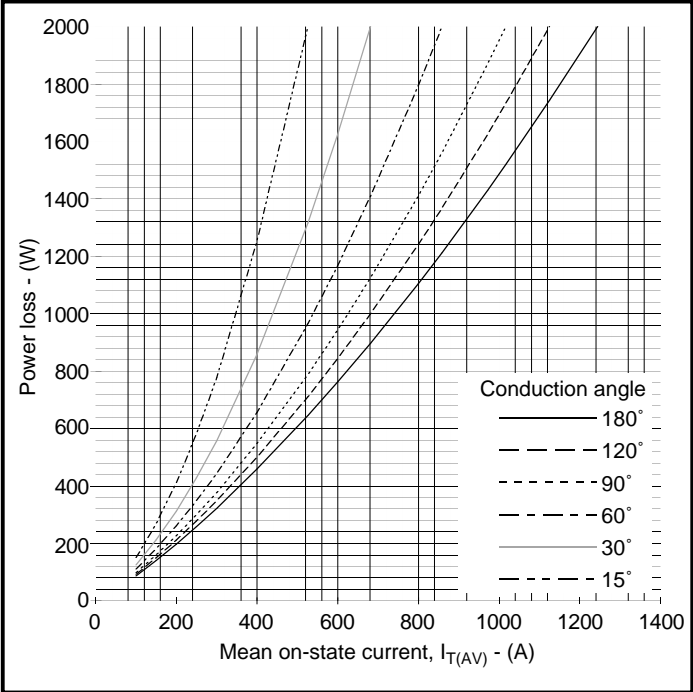


Fig.5 Sine wave power dissipation

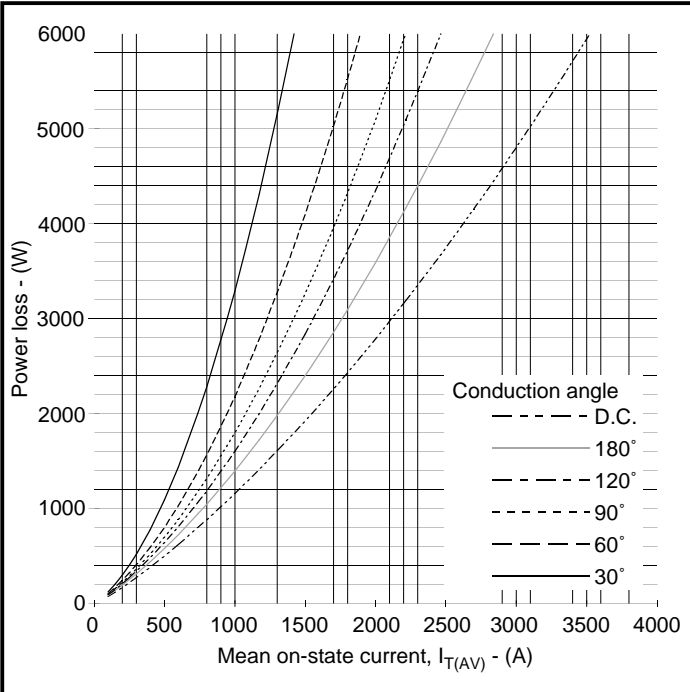


Fig.6 Square wave power dissipation

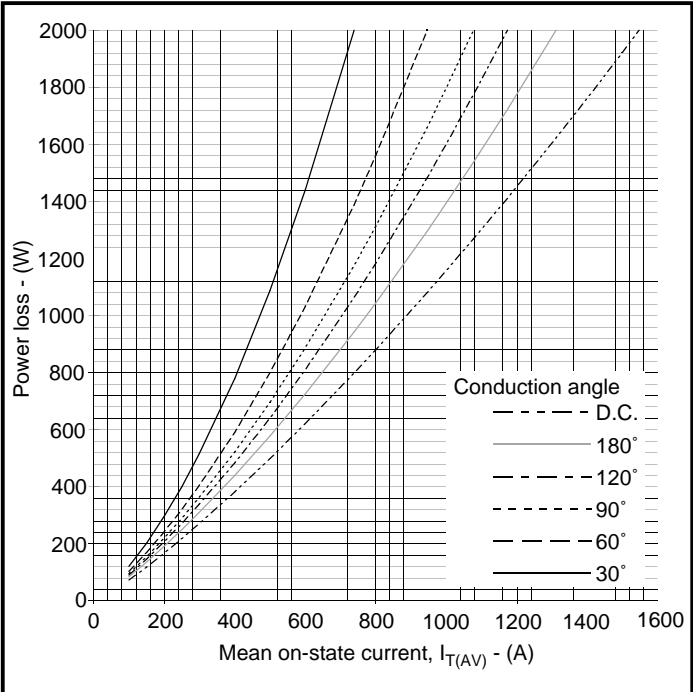
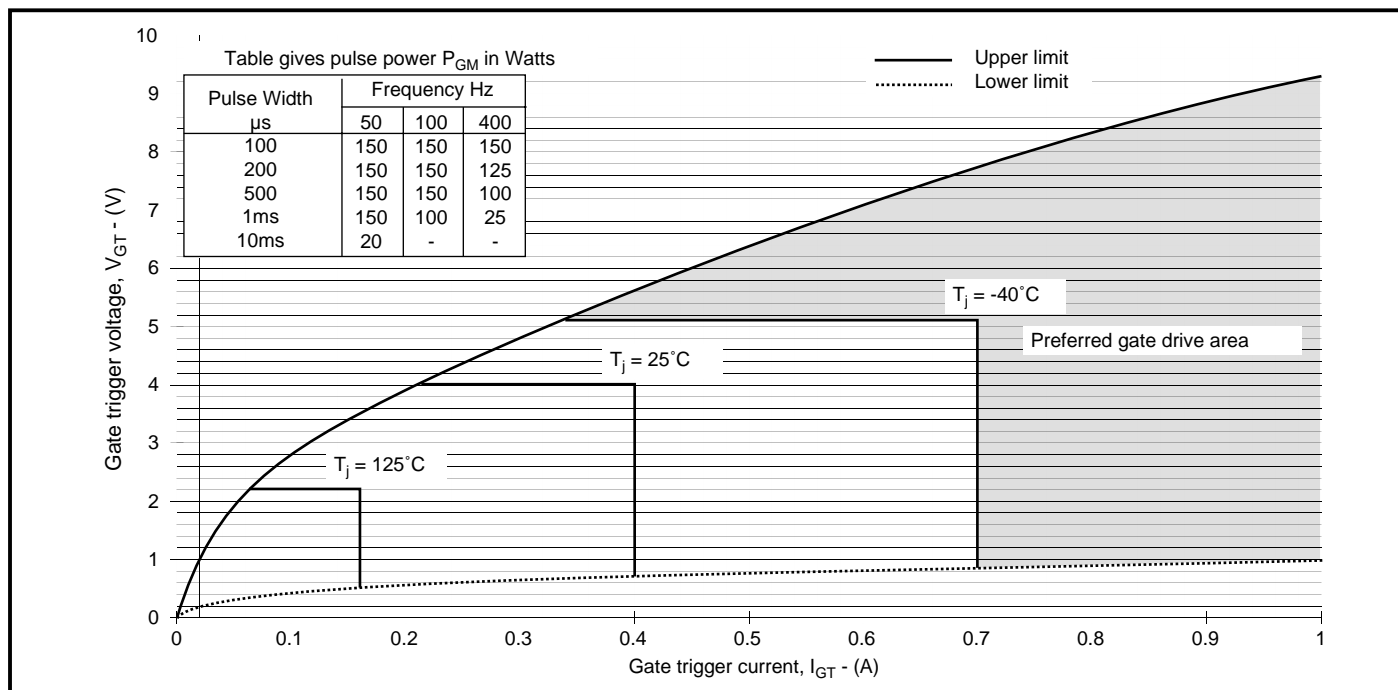
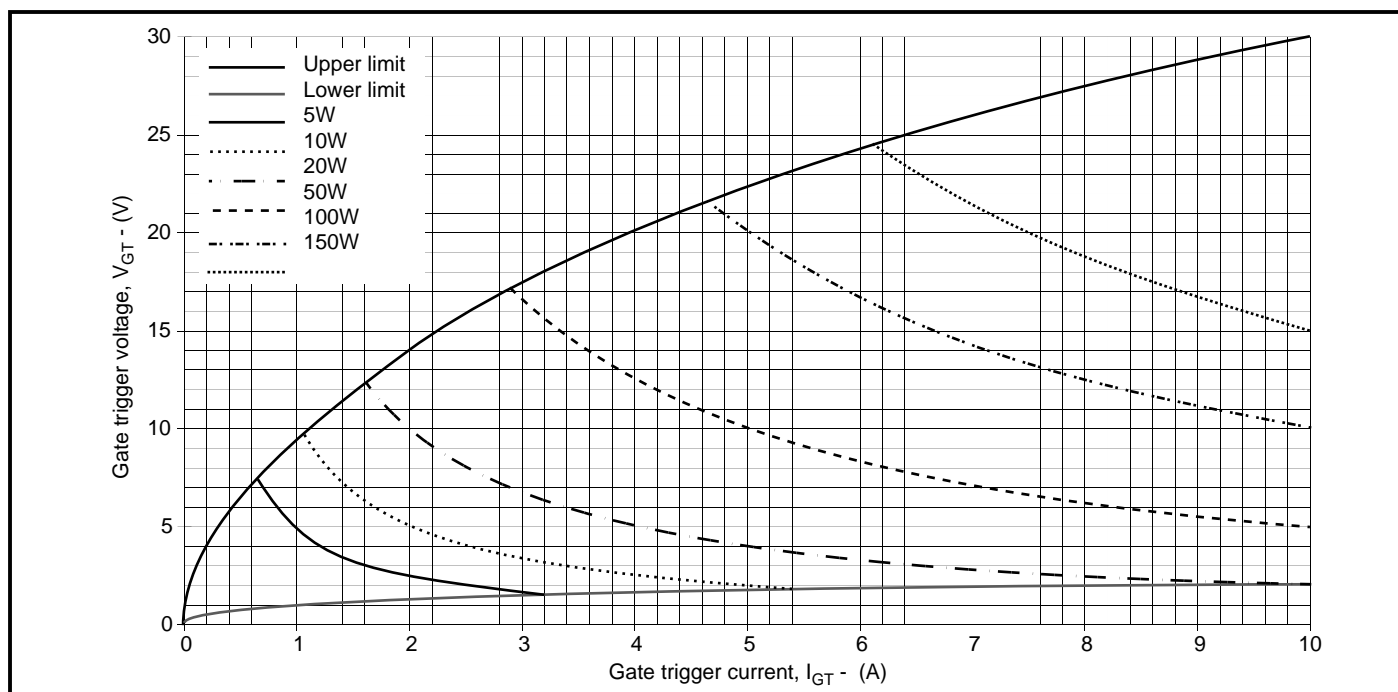


Fig.7 Square wave power dissipation



**Fig.8 Gate characteristics**



**Fig.9 Gate characteristics**

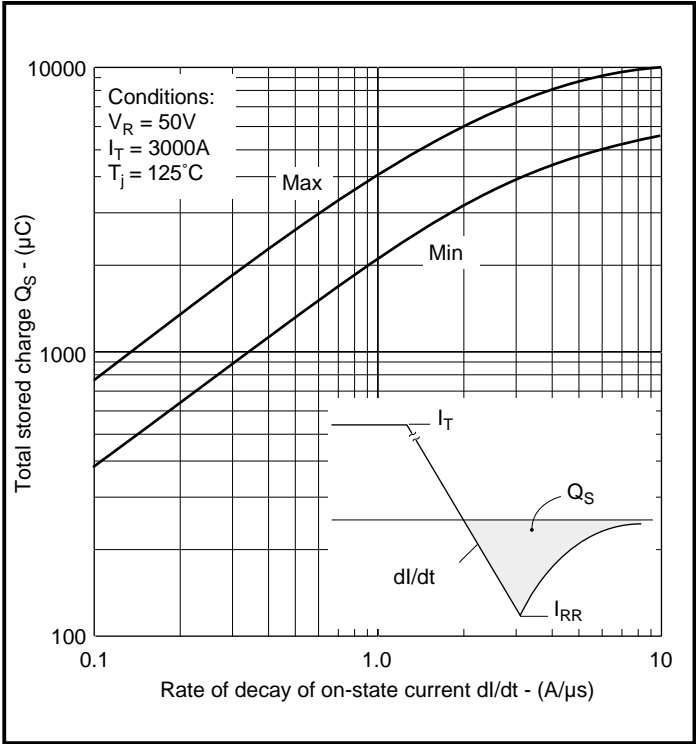


Fig.10 Stored charge

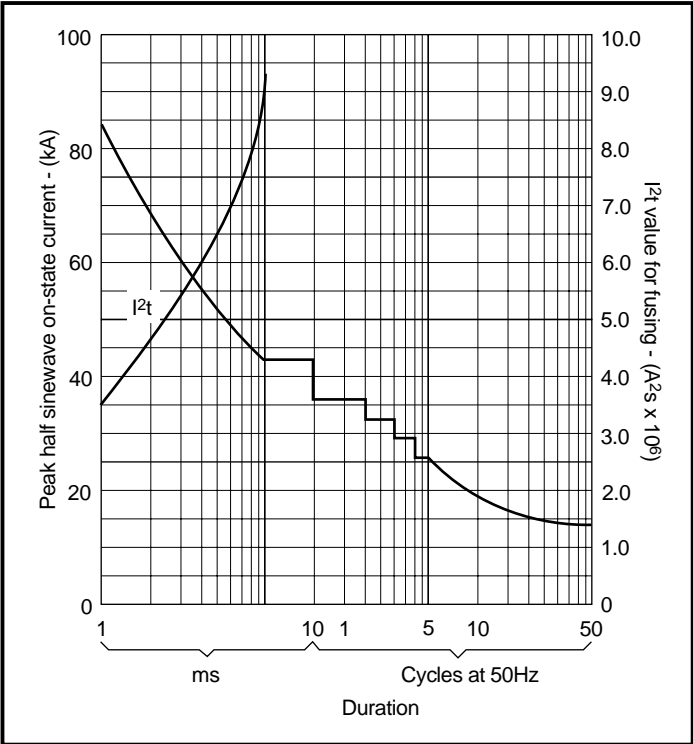


Fig.11 Surge (non-repetitive) on-state current vs time  
(with 50%  $V_{RRM}$  at  $T_{case} = 125^\circ C$ )

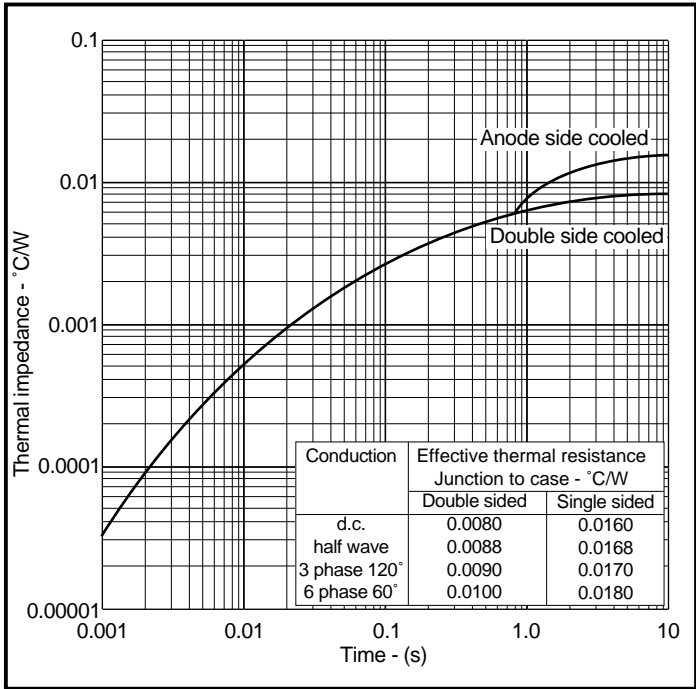
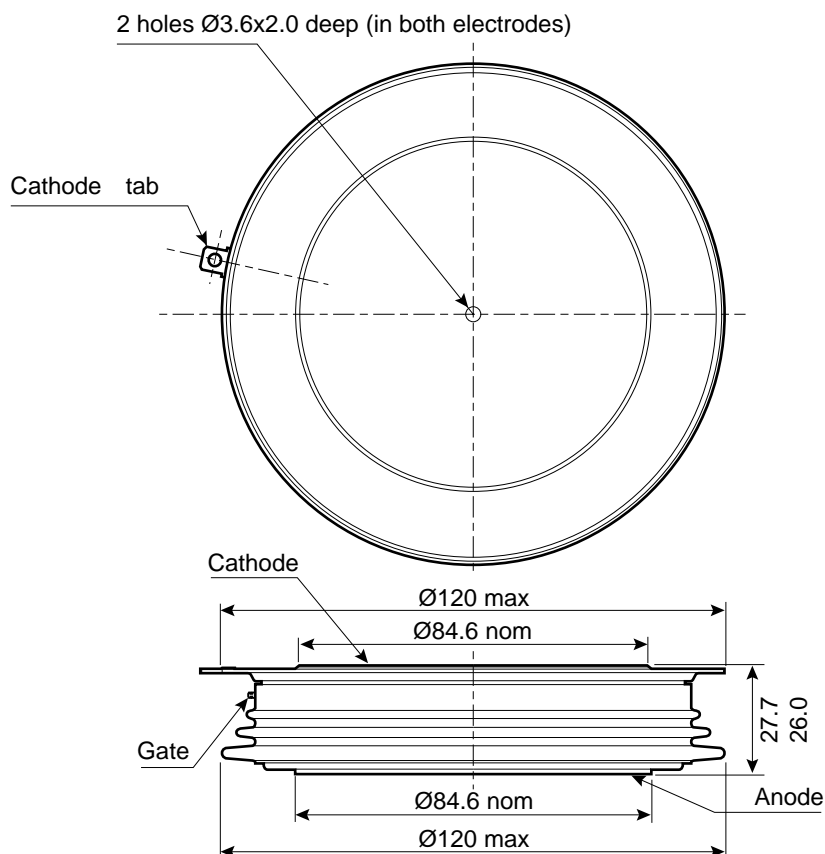


Fig.12 Maximum (limit) transient thermal impedance -  
junction to case ( $^\circ C/W$ )



## 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.



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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.

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