DYNEX SEMICONDUCTOR

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_{DRM} V	Conditions
DCR1595SW42	4200	T_{vj} = 0˚ to 125˚C, I_{DRM} = I_{RRM} = 400mA, V_{DRM}, V_{RRM} t_p = 10ms, V_{DSM} & V_{RSM} = V_{DRM} & V_{RRM} + 100V 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:

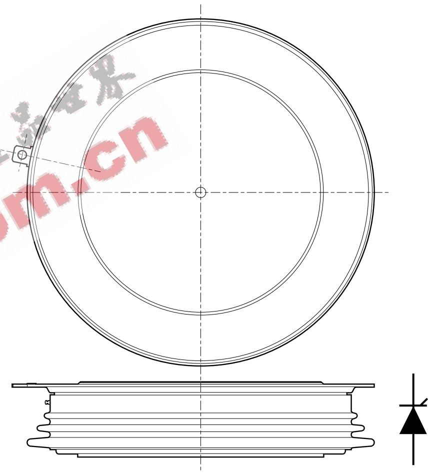
DCR1595SW38

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

KEY PARAMETERS

V_{DRM}		4200V
$I_{T(AV)}$	(max)	3020A
I_{TSM}	(max)	53750A
dV/dt*		1000V/µs
dI/dt		400A/µs

*** Higher dV/dt selections available**



Outline type code: W

(See Package Details for further information)

Fig. 1 Package outline

CURRENT RATINGS

T_{case} = 60°C unless stated otherwise.

Symbol	Parameter	Test Conditions	Max.	Units
Double Side Cooled				
$I_{T(AV)}$	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
Single Side Cooled				
$I_{T(AV)}$	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°C unless stated otherwise.

Symbol	Parameter	Test Conditions	Max.	Units
Double Side Cooled				
$I_{T(AV)}$	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
Single Side Cooled				
$I_{T(AV)}$	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˚C	43.0	kA
I^2t	I^2t for fusing	V_R = 50% V_{RRM} - 1/4 sine	9.25 x 10^6	A^2s
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine, T_{case} = 125˚C	53.75	kA
I^2t	I^2t for fusing	V_R = 0	14.4 x 10^6	A^2s

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	˚CW
		Single side cooled	Anode DC	-	0.016	˚CW
			Cathode DC	-	0.016	˚CW
$R_{th(c-h)}$	Thermal resistance - case to heatsink	Clamping force 70.0kN	Double side	-	0.001	˚CW
		(with mounting compound)	Single side	-	0.002	˚CW
T_{vj}	Virtual junction temperature	On-state (conducting)		-	135	˚C
		Reverse (blocking)		-	125	˚C
T_{stg}	Storage temperature range			–55	125	˚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°C		-	400	mA
dV/dt	Max. linear rate of rise of off-state voltage	To 67% V_{DRM}, T_j = 125°C, gate open		-	1000	V/µs
dI/dt	Rate of rise of on-state current	From 67% V_{DRM} to 2x $I_{T(AV)}$	Repetitive 50Hz	-	200	A/µs
		Gate source 30V, 10Ω, t_r < 0.5µs, T_j = 125°C	Non-repetitive	-	400	A/µs
$V_{T(TO)}$	Threshold voltage	At T_{vj} = 125°C		-		V
r_T	On-state slope resistance	At T_{vj} = 125°C		-	1.03	mΩ
t_{gd}	Delay time	V_D = 67% V_{DRM}, gate source 30V, 15Ω t_r = 0.5µs, Tj = 25°C		0.5	0.19 2	µs
t_q	Turn-off time	I_T = 5000A, t_p = 3.5ms, T_j =125°C, V_R = 900V, dI_{RR}/dt = 4A/µs, V_{DR} = 67% V_{DRM}, dV_{DR}/dt = 20V/µs linear		550	1000	µs
I_L	Latching current	T_j = 25°C, V_D = 5V		220	1000	mA
I_H	Holding current	T_j = 25°C, R_{G-K} = ∞, 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°C	4	V
I_{GT}	Gate trigger current	V_{DRM} = 5V, T_{case} = 25°C	400	mA
V_{GD}	Gate non-trigger voltage	At V_{DRM} T_{case} = 125°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

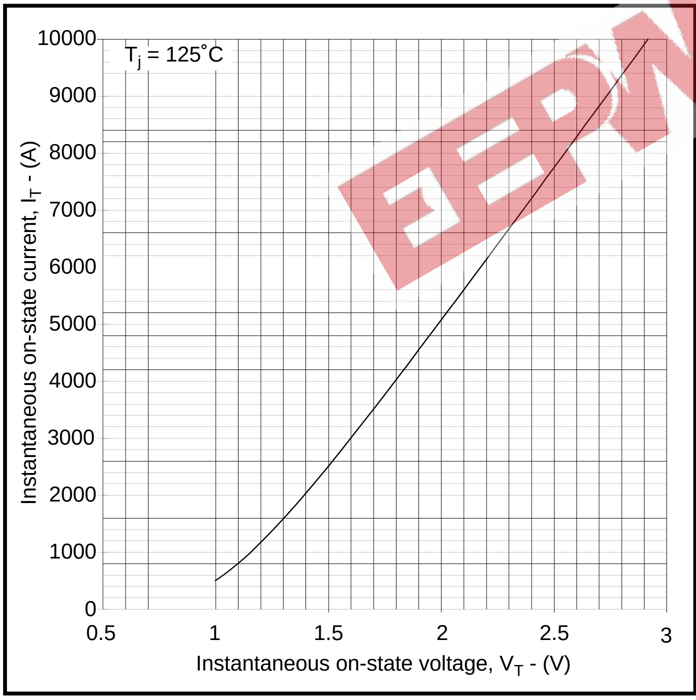


Fig.2 Maximum (limit) on-state characteristics

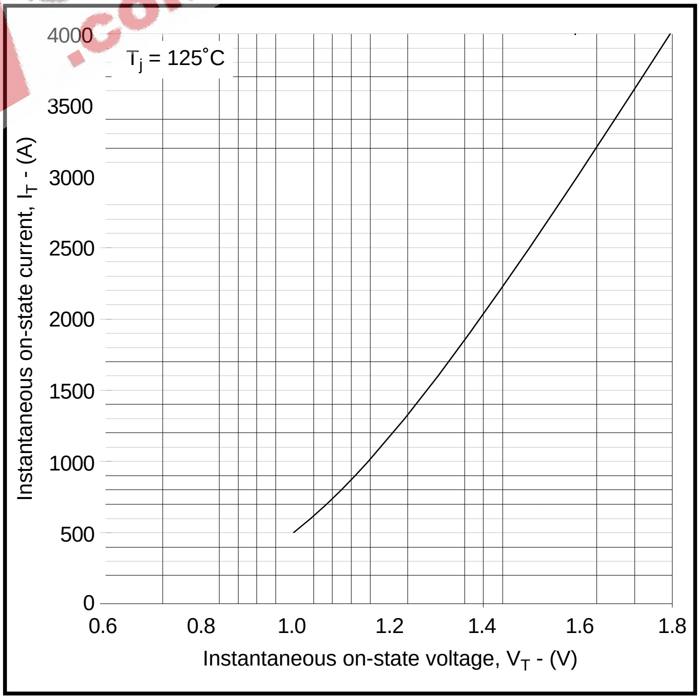


Fig.3 Maximum (limit) on-state characteristics

V_{TM} EQUATION

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

Where
A = 0.02866651
B = 0.1590393
C = 1.947584×10^{-4}
D = -5.23298×10^{-3}

these values are valid for T_j = 125°C for I_T 500A to 10000A

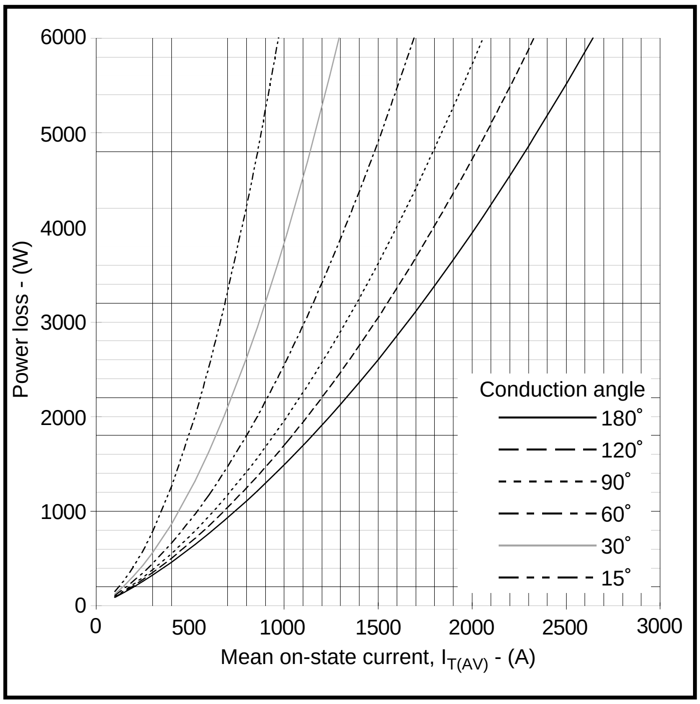


Fig.4 Sine wave power dissipation

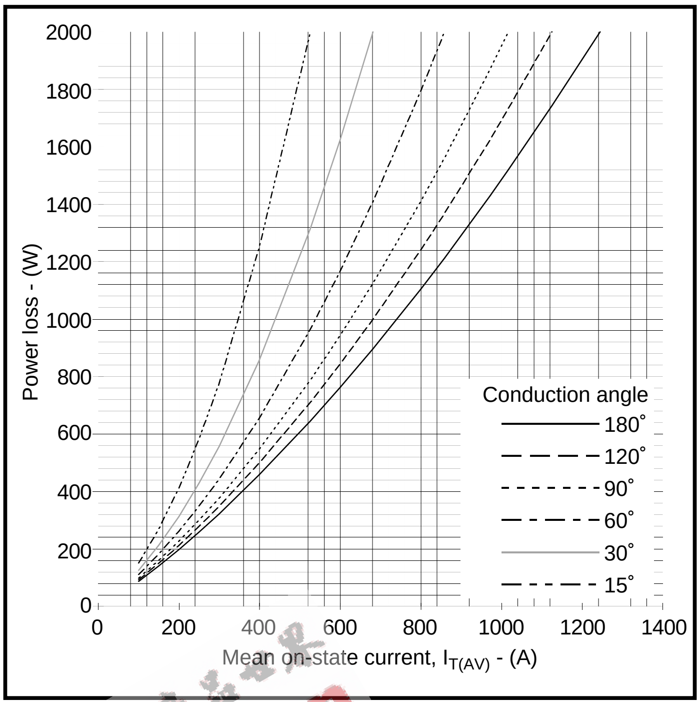


Fig.5 Sine wave power dissipation

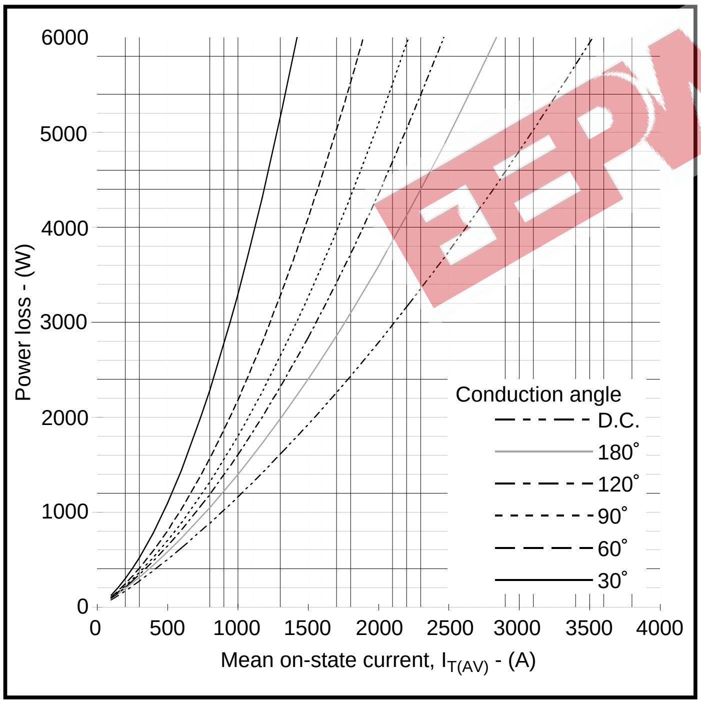


Fig.6 Square wave power dissipation

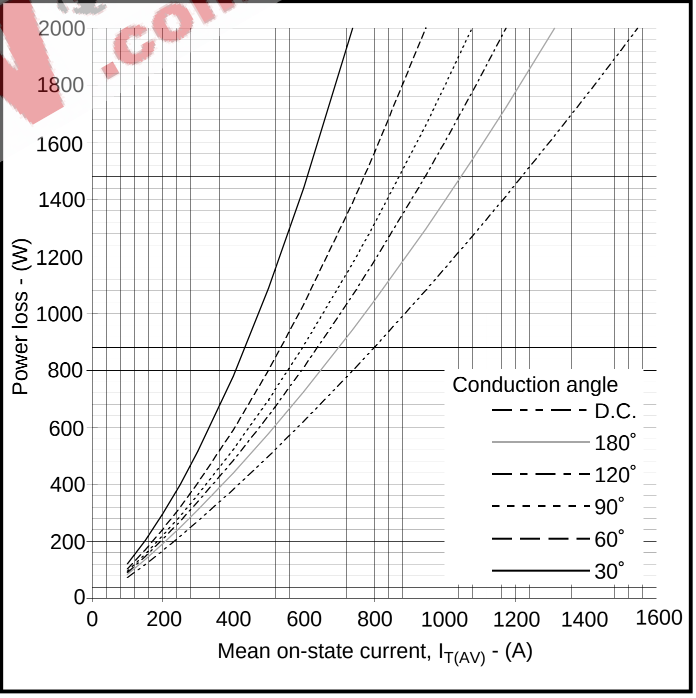


Fig.7 Square wave power dissipation

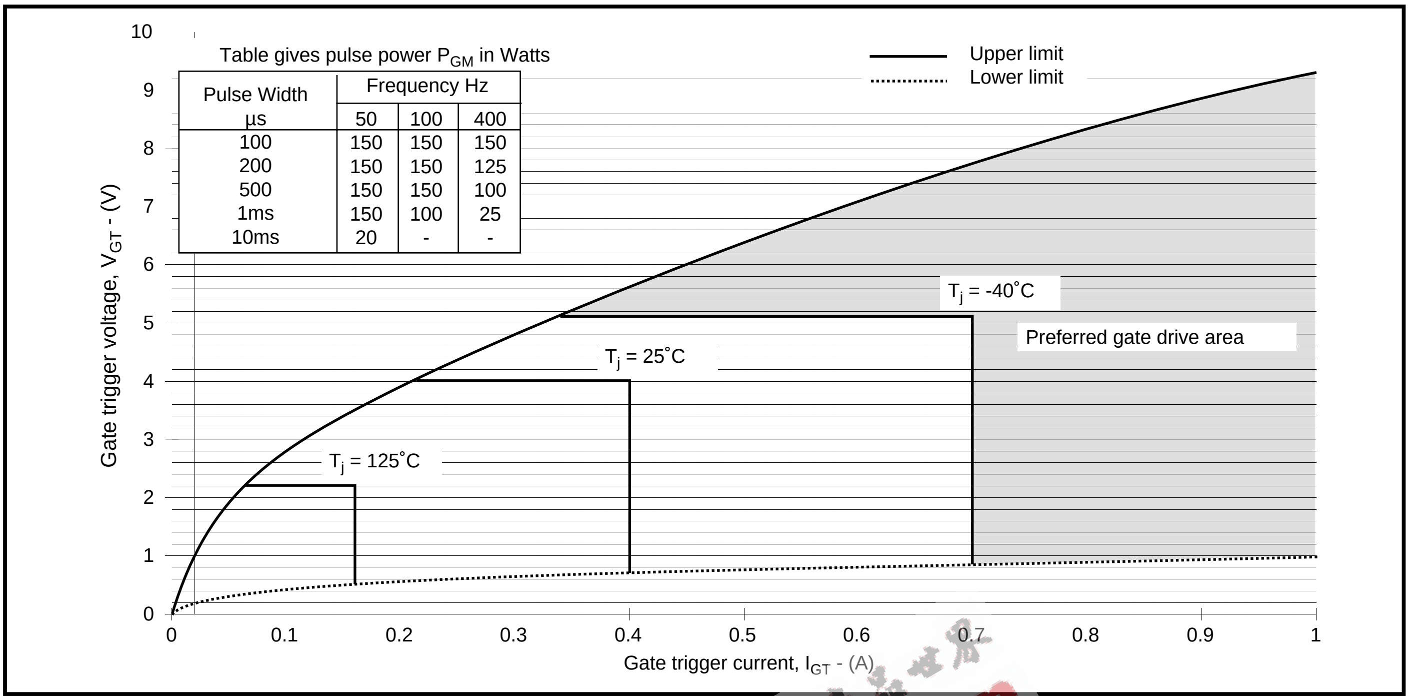


Fig.8 Gate characteristics

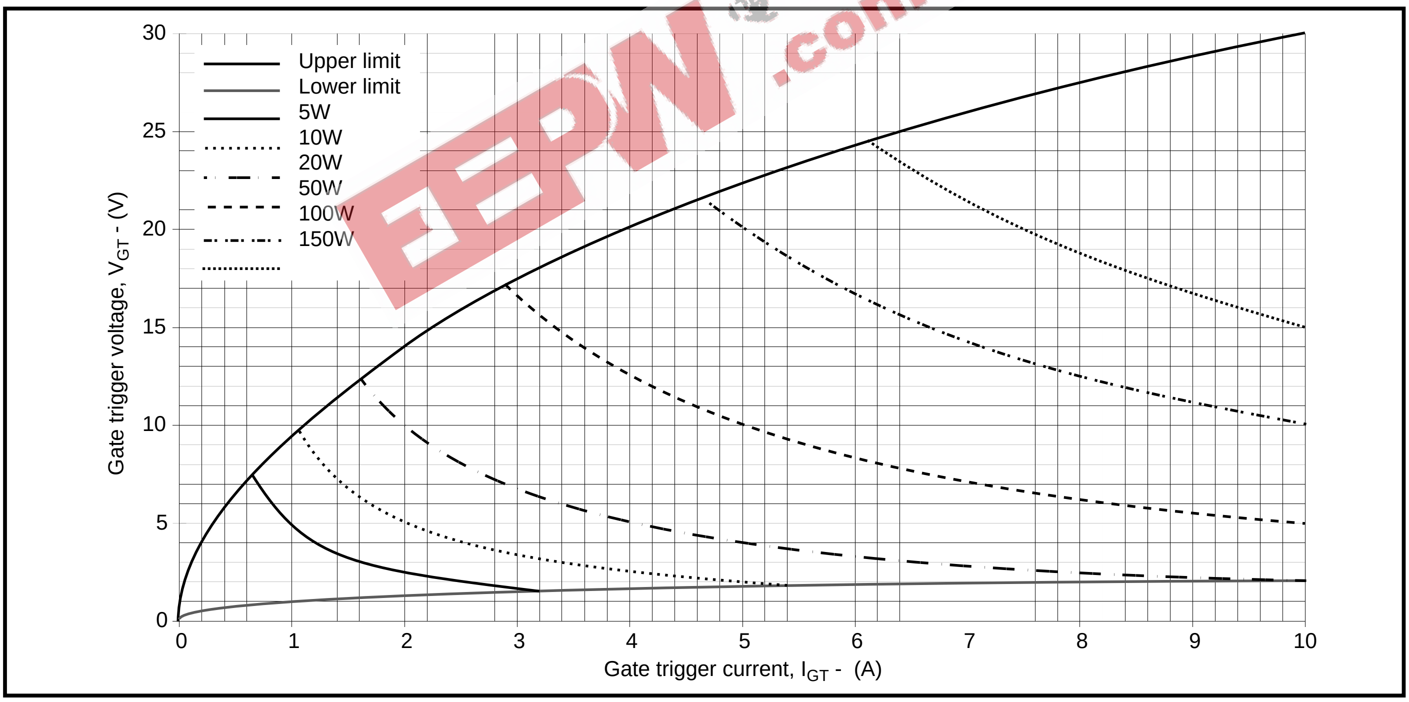


Fig.9 Gate characteristics

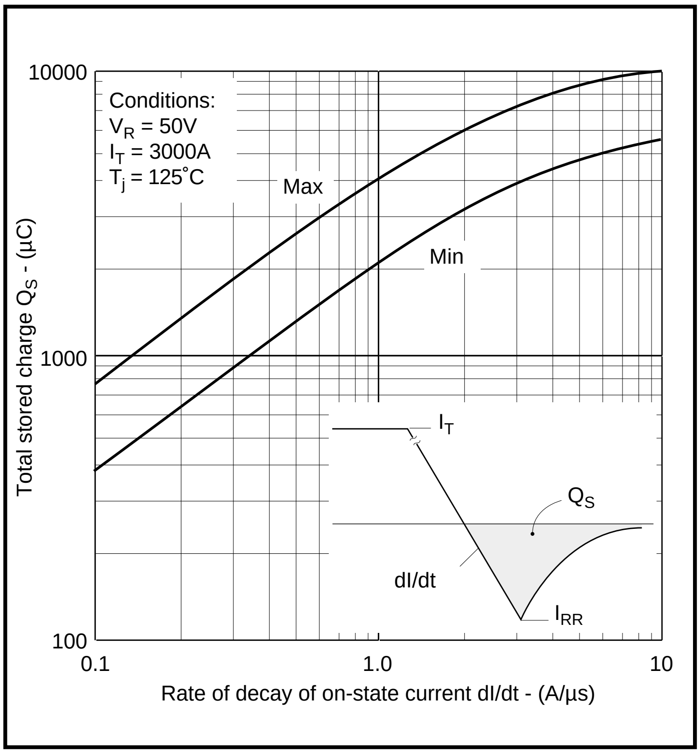


Fig.10 Stored charge

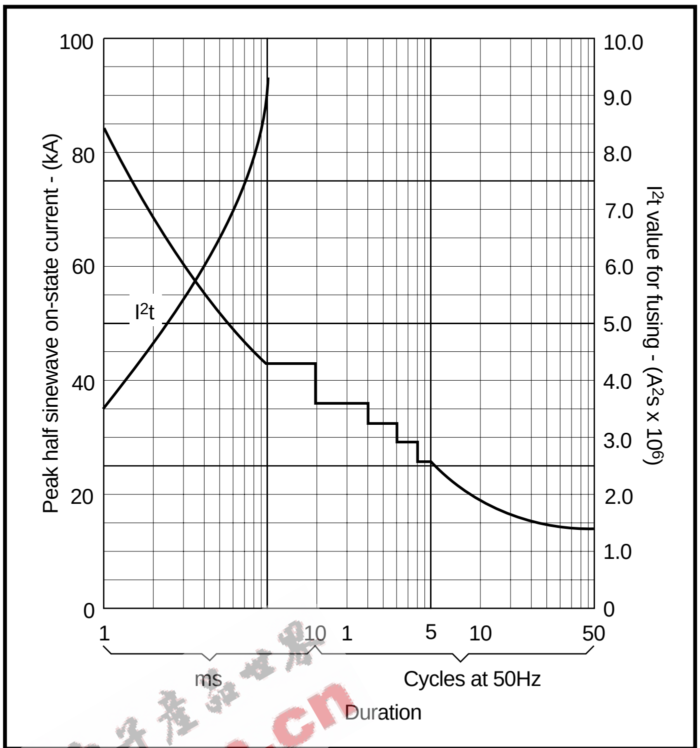
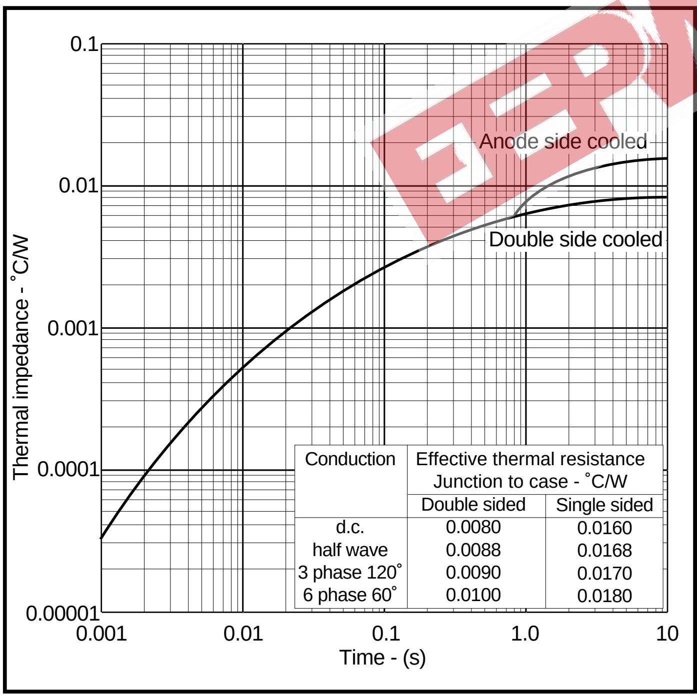


Fig.11 Surge (non-repetitive) on-state current vs time (with 50% V_{RRM} at T_{case} = 125˚C)

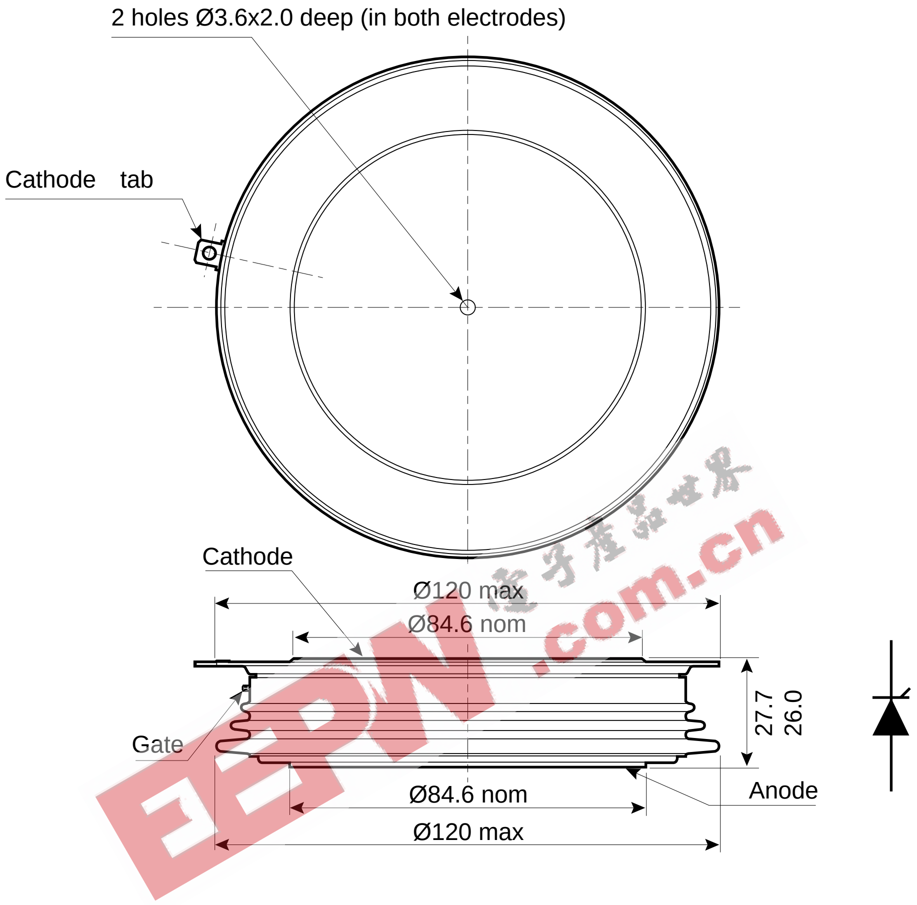


Conduction	Effective thermal resistance Junction to case - ˚C/W	
	Double sided	Single sided
d.c.	0.0080	0.0160
half wave	0.0088	0.0168
3 phase 120˚	0.0090	0.0170
6 phase 60˚	0.0100	0.0180

Fig.12 Maximum (limit) transient thermal impedance - junction to case (˚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 ±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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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.