DCR1594SW

Phase Control Thyristor

Replaces January 2000 version, DS4247-4.0

DS4247-5.0 July 2001

FEATURES

- Double Side Cooling
- High Surge Capability

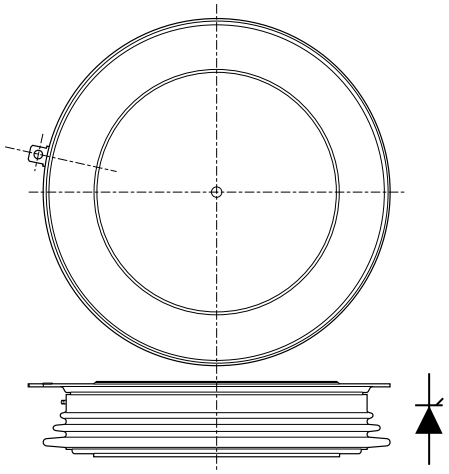
APPLICATIONS

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

KEY PARAMETERS

V_{DRM}		2800V
$I_{T(AV)}$	(max)	3875A
I_{TSM}	(max)	62500A
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

VOLTAGE RATINGS

Part and Ordering Number	Repetitive Peak Voltages V_{DRM} and V_{DRM} V	Conditions
DCR1594SW28	2800	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
DCR1594SW27	2700	
DCR1594SW26	2600	
DCR1594SW25	2500	
DCR1594SW24	2400	
DCR1594SW23	2300	

Lower voltage grades available.

ORDERING INFORMATION

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

For example:

DCR1594SW25

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} = 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	3875	A
$I_{T(RMS)}$	RMS value	-	6087	A
I_T	Continuous (direct) on-state current	-	5439	A
Single Side Cooled				
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	2478	A
$I_{T(RMS)}$	RMS value	-	3892	A
I_T	Continuous (direct) on-state current	-	3199	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	3035	A
$I_{T(RMS)}$	RMS value	-	4765	A
I_T	Continuous (direct) on-state current	-	4125	A
Single Side Cooled				
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	1890	A
$I_{T(RMS)}$	RMS value	-	2970	A
I_T	Continuous (direct) on-state current	-	2405	A

SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine, T_{case} = 125˚C	50	kA
I^2t	I^2t for fusing	V_R = 50% V_{RRM} - 1/4 sine	12.5 x 10^6	A^2s
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine, T_{case} = 125˚C	62.5	kA
I^2t	I^2t for fusing	V_R = 0	19.5 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	-	250	A/µs
		Gate source 30V, 10Ω, $t_r \leq 0.5\mu s$, T_j = 125˚C	Non-repetitive	-	400	A/µs
$V_{T(TO)}$	Threshold voltage	At T_{vj} = 125˚C		-	0.94	V
r_T	On-state slope resistance	At T_{vj} = 125˚C		-	0.099	mΩ
t_{gd}	Delay time	V_D = 67% V_{DRM}, gate source 30V, 15Ω t_r = 0.5µs, Tj = 25˚C		0.5	2.0	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		450	900	µs
I_L	Latching current	T_j = 25˚C, V_D = 5V		100	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

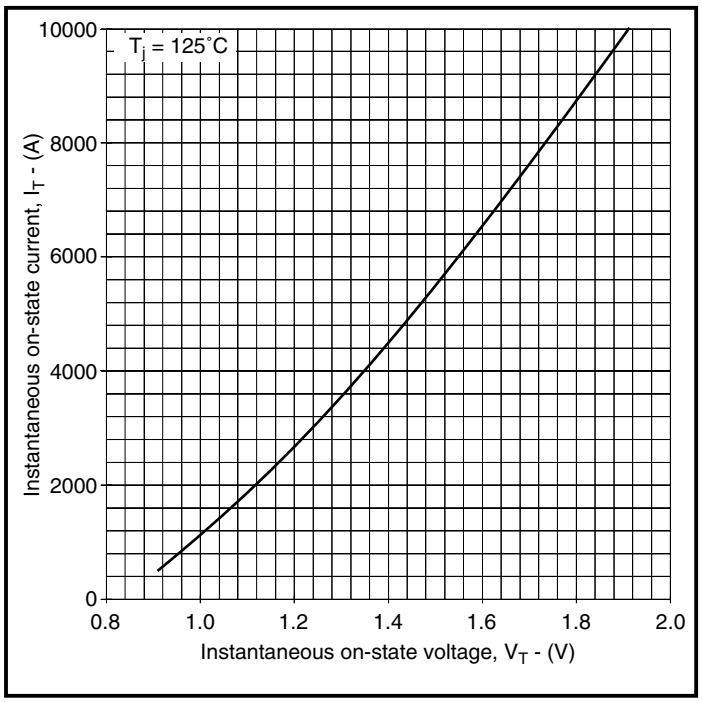


Fig.2 Maximum (limit) on-state characteristics

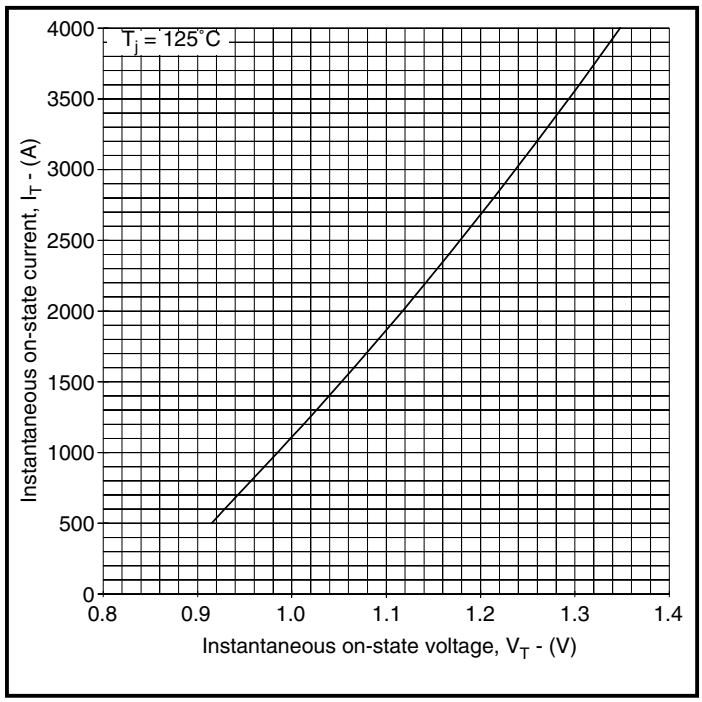


Fig.3 Maximum (limit) on-state characteristics

V_{TM} EQUATION

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

Where A = 1.152158
B = – 0.08401428
C = 3.351054×10^{-5}
D = 0.01199439

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

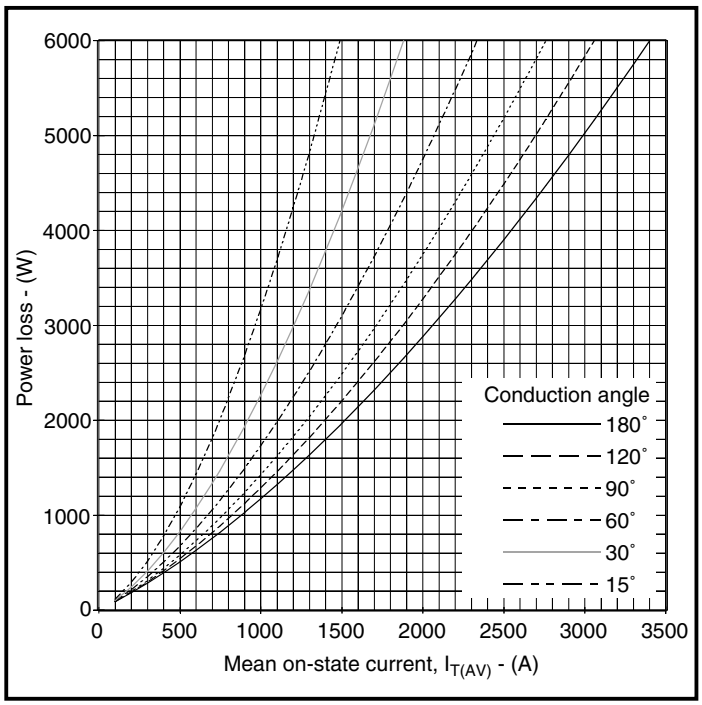


Fig.4 Sine wave power dissipation

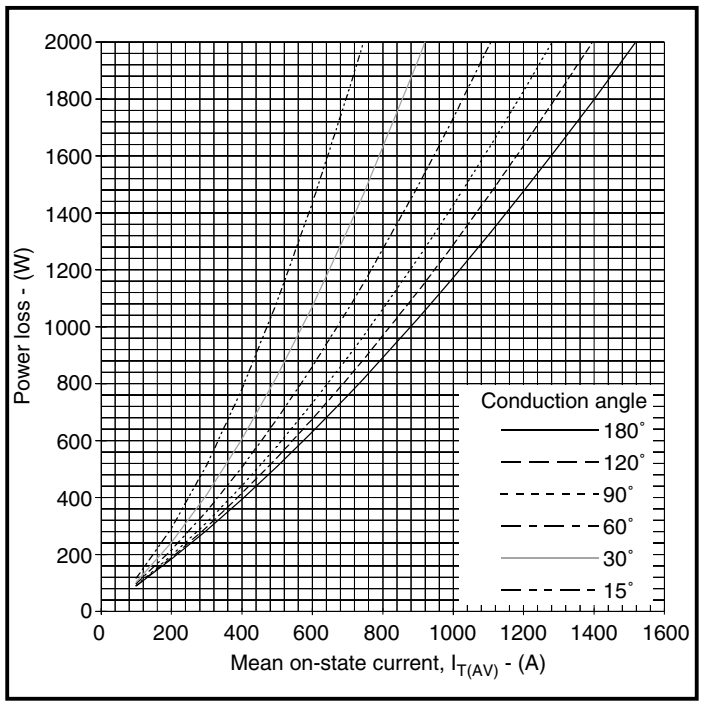


Fig.5 Sine wave power dissipation

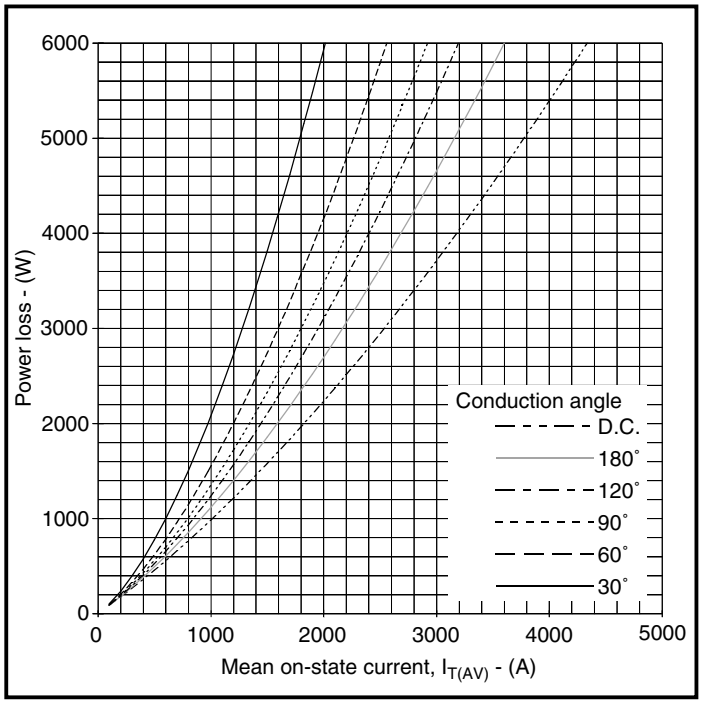


Fig.6 Square wave power dissipation

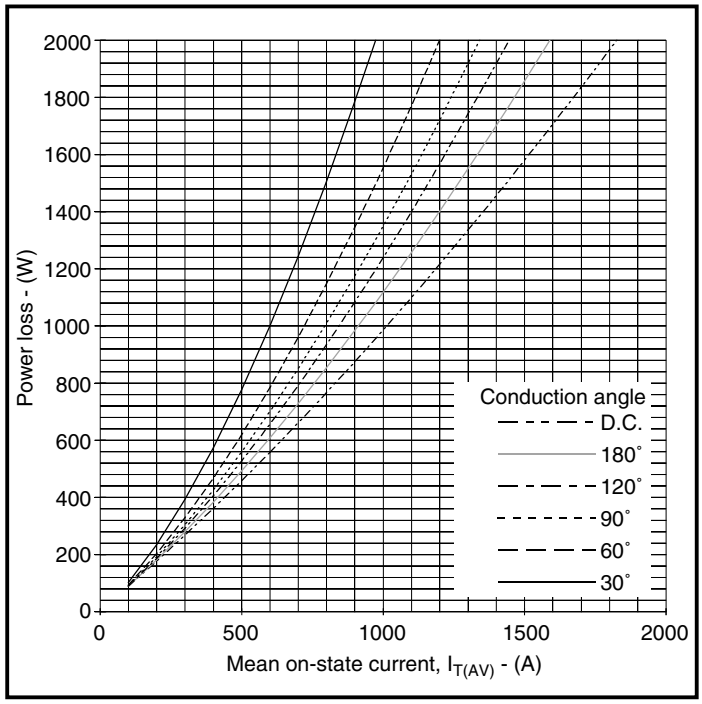


Fig.7 Square wave power dissipation

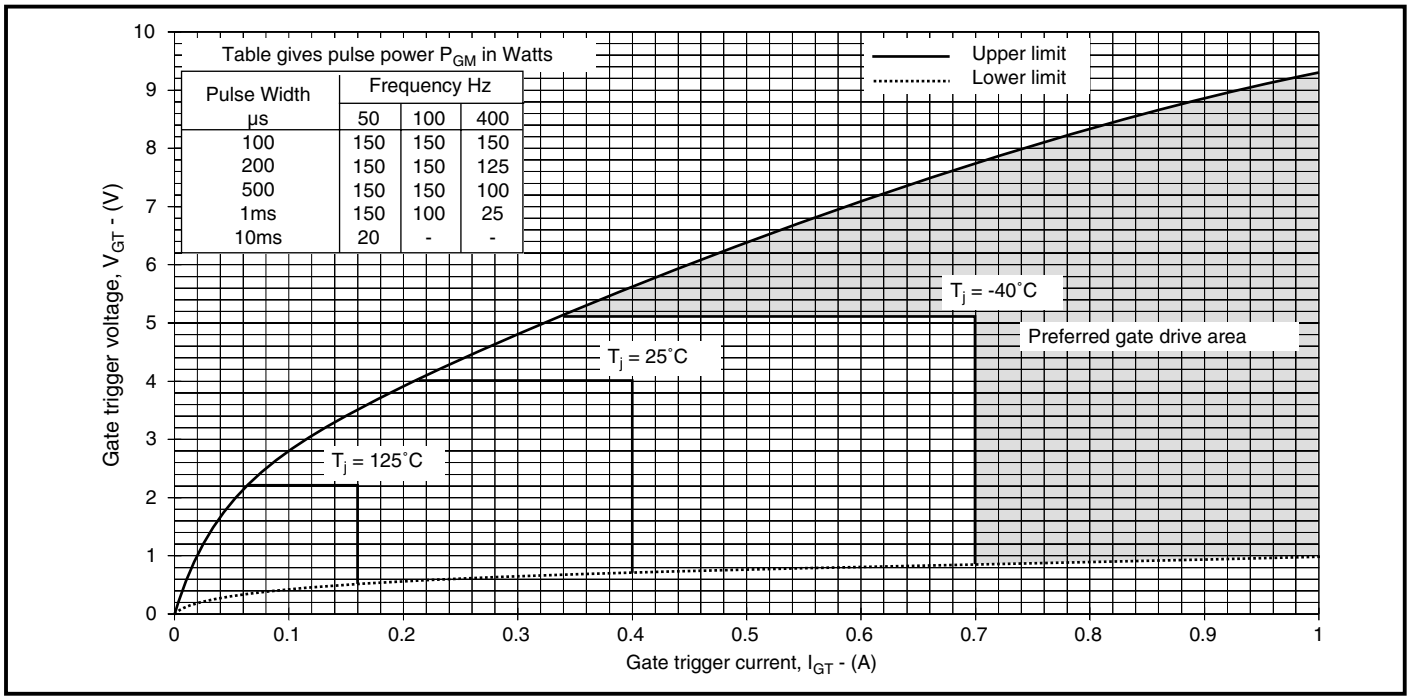


Fig.8 Gate characteristics

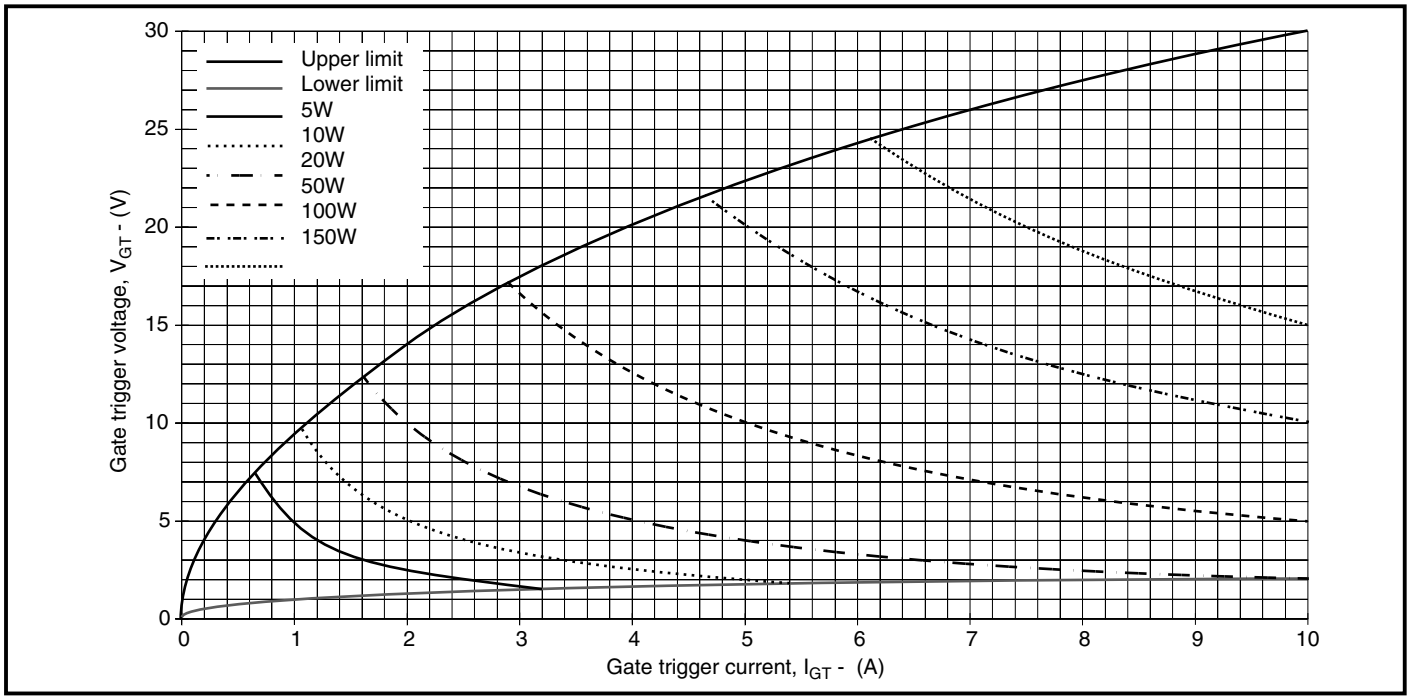


Fig.9 Gate characteristics

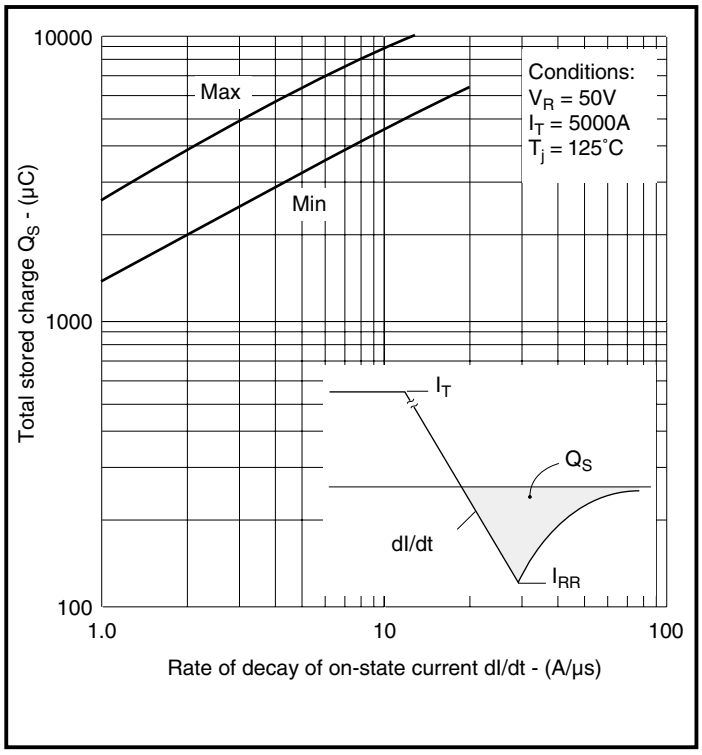


Fig.10 Stored charge

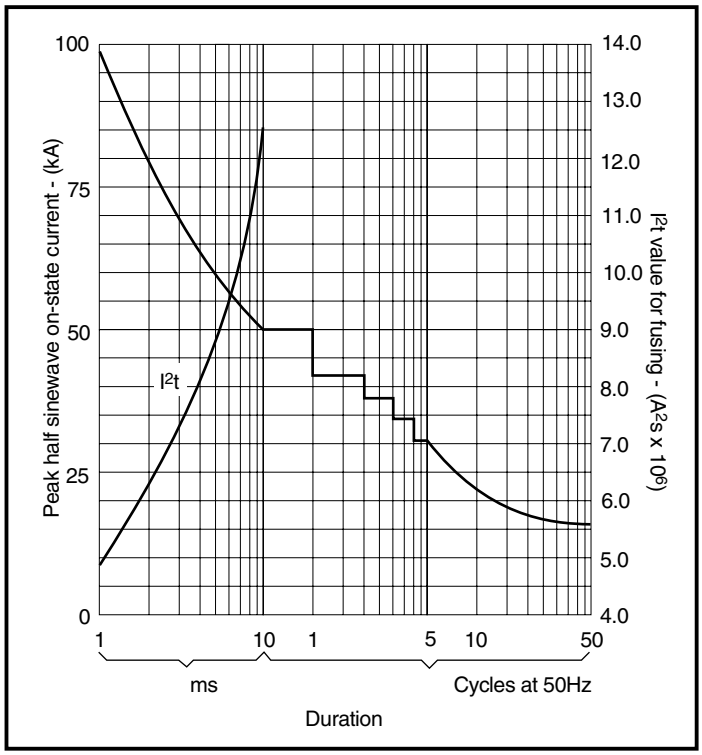
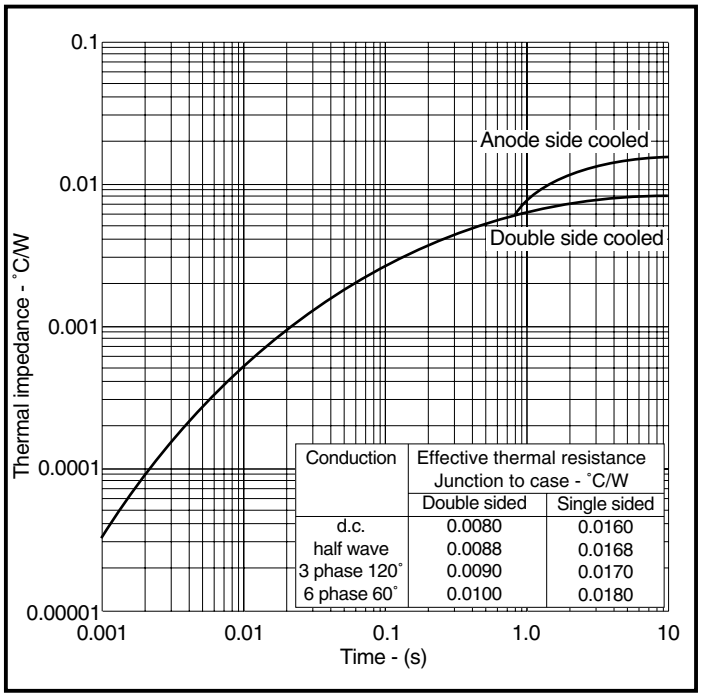


Fig.11 Surge (non-repetitive) on-state current vs time (with 50% V_{RRM} at T_{case} = 125˚C)

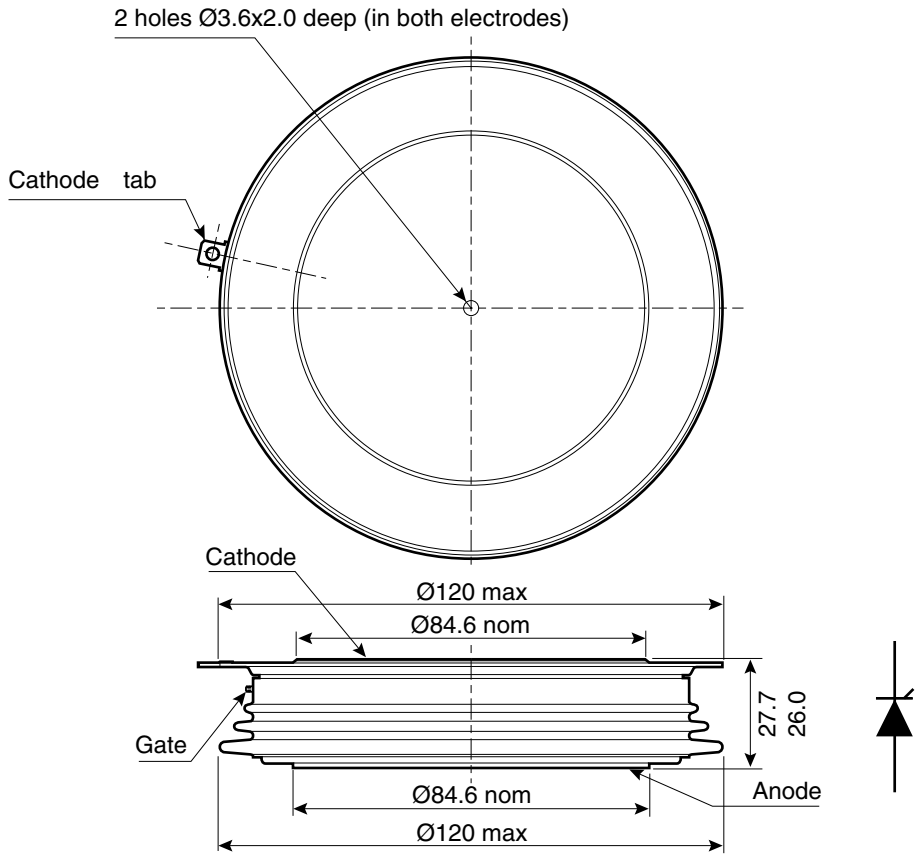


Conduction	Effective thermal resistance Junction to case - ˚C/W	
	Double sided	Single sided
d.c.	0.0080	0.0160
half wave	0.0088	0.0168
3 phase 120˚	0.0090	0.0170
6 phase 60˚	0.0100	0.0180

Fig.12 Maximum (limit) transient thermal impedance - junction to case (˚C/W)

PACKAGE DETAILS

For further package information, please contact Customer Services. 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 offers 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).

HEATSINKS

The Power Assembly group has its own proprietary range of extruded aluminium heatsinks which 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 Services.

Stresses above those listed in this data sheet may cause permanent damage to the device. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture of the package. Appropriate safety precautions should always be followed.

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