Phase Control Thyristor

DS5649 1.1 January 2007 (LN25138)

FEATURES

- Double Side Cooling
- High Surge Capability
- Low Inductance Internal Construction

APPLICATIONS

- High Voltage Power Converters
- DC Motor Control
- High Voltage Power Supplies

VOLTAGE RATINGS

Part and Ordering Number	Repetitive Peak Voltages V_{DRM} and V_{RRM} V	Conditions
DCR5980A18 DCR5980A16 DCR5980A14 DCR5980A12	1800 1600 1400 1200	T_{vj} = 0°C to 125°C, I_{DRM} = I_{RRM} = 500mA, V_{DRM}, V_{RRM} t_p = 10ms, V_{DSM} & V_{RSM} = V_{DRM} & V_{RRM} + 100V respectively

Lower voltage grades available.

ORDERING INFORMATION

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

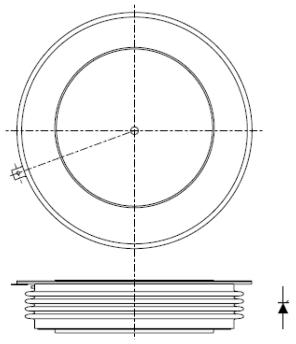
For example:

DCR5980A14

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}	**1800V**
$I_{T(AV)}$	**5985A**
I_{TSM}	**98000A**
dV/dt*	**1000V/µs**
dI/dt	**250A/µs**



Outline type code: A

(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	5985	A
$I_{T(RMS)}$	RMS value	-	9400	A
I_T	Continuous (direct) on-state current	-	8400	A
Single Side Cooled (Anode side)				
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	3820	A
$I_{T(RMS)}$	RMS value	-	6000	A
I_T	Continuous (direct) on-state current	-	4920	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	4650	A
$I_{T(RMS)}$	RMS value	-	7300	A
I_T	Continuous (direct) on-state current	-	6360	A
Single Side Cooled (Anode side)				
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	2910	A
$I_{T(RMS)}$	RMS value	-	4570	A
I_T	Continuous (direct) on-state current	-	3630	A

SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine, T_{case} = 125°C	78.0	kA
I^2t	I^2t for fusing	V_R = 50%VRRM - ¼ Sine	30.4×10^6	A^2s
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine, T_{case} = 125°C V_R = 0	98.0	kA
I^2t	I^2t for fusing		48×10^6	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	-	0.0065	°C/W
		Single side cooled	Anode DC	-	0.013	°C/W
			Cathode DC	-	0.013	°C/W
$R_{th(c-h)}$	Thermal resistance – case to heatsink	Clamping force 83.0kN	Double side	-	0.001	°C/W
		(with mounting compound)	Single side	-	0.002	°C/W
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			74.0	91.0	kN

DYNAMIC CHARACTERISTICS

Symbol	Parameter	Test Conditions		Min.	Max.	Units
I_{RRM}/I_{DRM}	Peak reverse and off-state current	At V_{RRM}/V_{DRM}, T_{case} = 125°C		-	500	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 1100A	Repetitive 50Hz	-	250	A/µs
		Gate source 20V, 20Ω, t_r = 0.5µs to 1A, T_j = 125°C	Non-repetitive	-	500	A/µs
$V_{T(TO)}$	Threshold voltage – Low level	At T_{vj} = 125°C		-	0.77	V
r_T	On-state slope resistance – Low level	At T_{vj} = 125°C		-	0.05	mΩ
t_{gd}	Delay time	V_D = 67% V_{DRM}, gate source 30V, 15Ω t_r = 0.5µs, T_j = 25°C		1.0	1.5	µs
I_L	Latching current	T_j = 25°C, V_D = 5V		150	750	mA
I_H	Holding current	T_j = 25°C, V_{G-K} = ∞		40	200	mA

GATE TRIGGER CHARACTERISTICS AND RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
V_{GT}	Gate trigger voltage	V_{DRM} = 5V, T_{case} = 25°C	3.5	V
V_{GD}	Gate non-trigger voltage	At V_{DRM}, T_{case} = 125°C	0.25	V
I_{GT}	Gate trigger current	V_{DRM} = 5V, T_{case} = 25°C	500	mA
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 forward gate voltage	-	5	V
I_{FGM}	Peak forward gate current	Anode positive with respect to cathode	30	A
P_{GM}	Peak gate power	See Gate Characteristics curve/table	150	W
$P_{G(AV)}$	Mean gate power	-	10	W

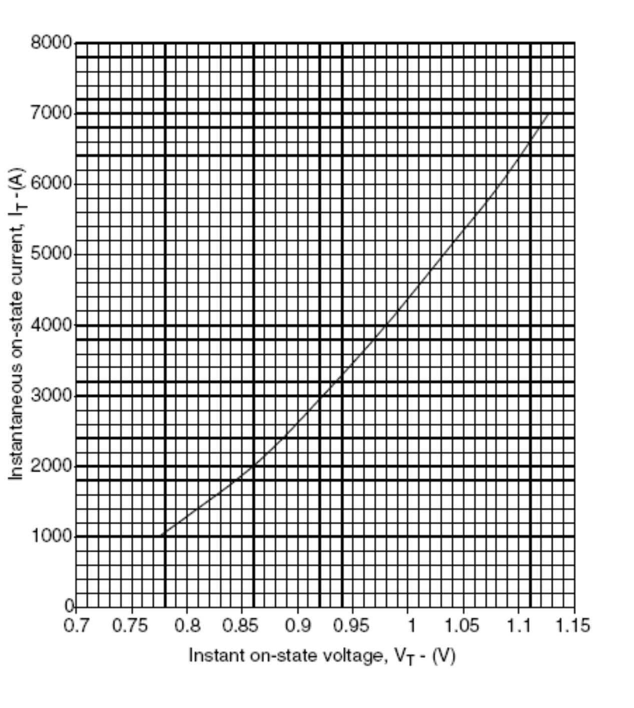


Fig.2 Maximum (limit) on-state characteristics

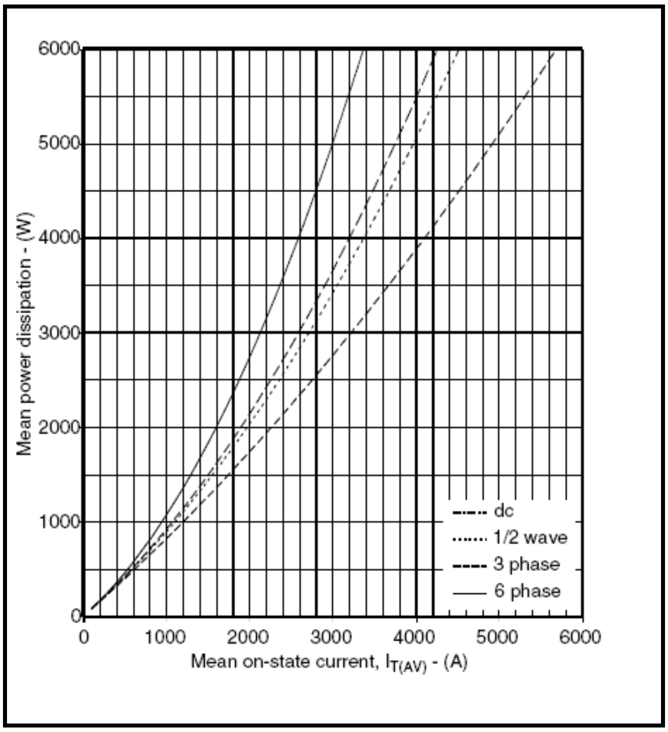


Fig.3 Power dissipation curves

V_{TM} Equation:-

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

Where A = 0.4624
B = 0.0275
C = 2.2501×10^{-5}
D = 0.0032

these values are valid for $T_j = 125^\circ C$ for I_T 500A to 7000A

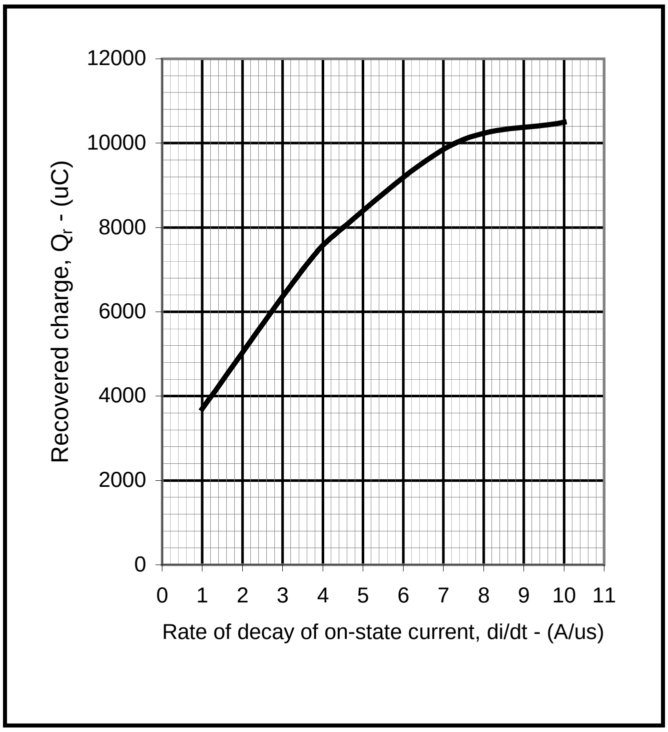


Fig.4 Recovered charge

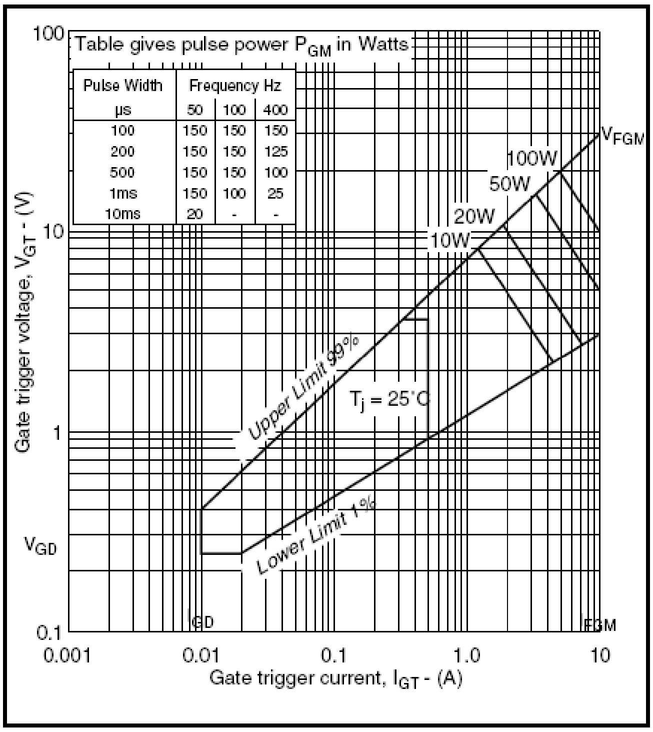


Fig.5 Gate characteristics

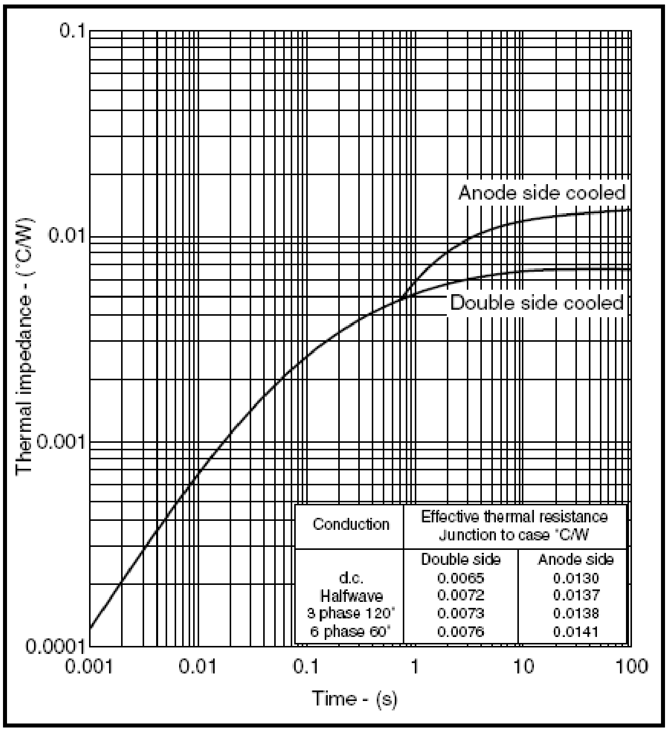


Fig.6 Maximum (limit) transient thermal impedance-junction to case (°C/W)

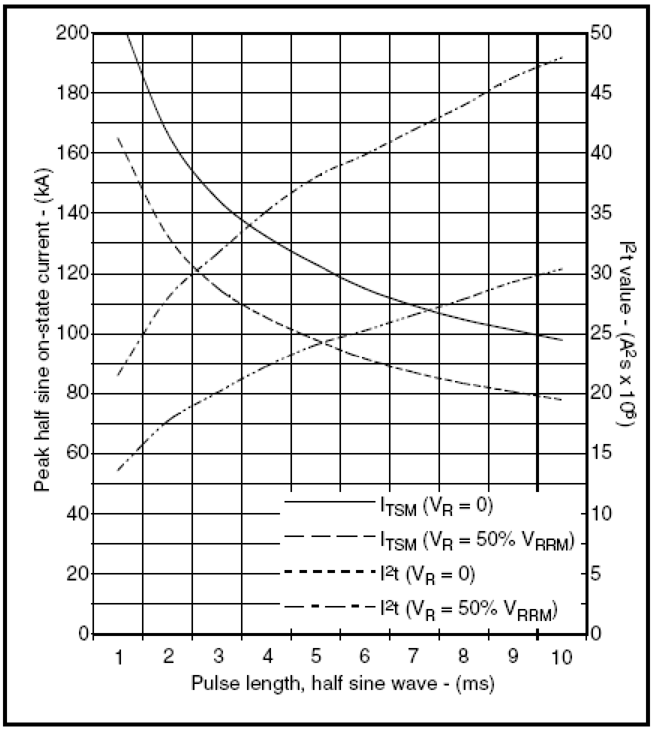


Fig.7 Sub-cycle surge current

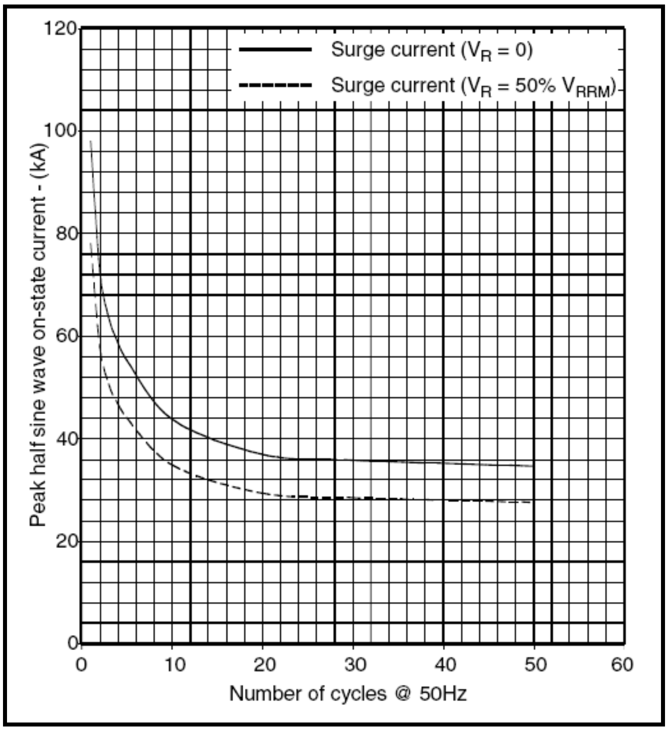
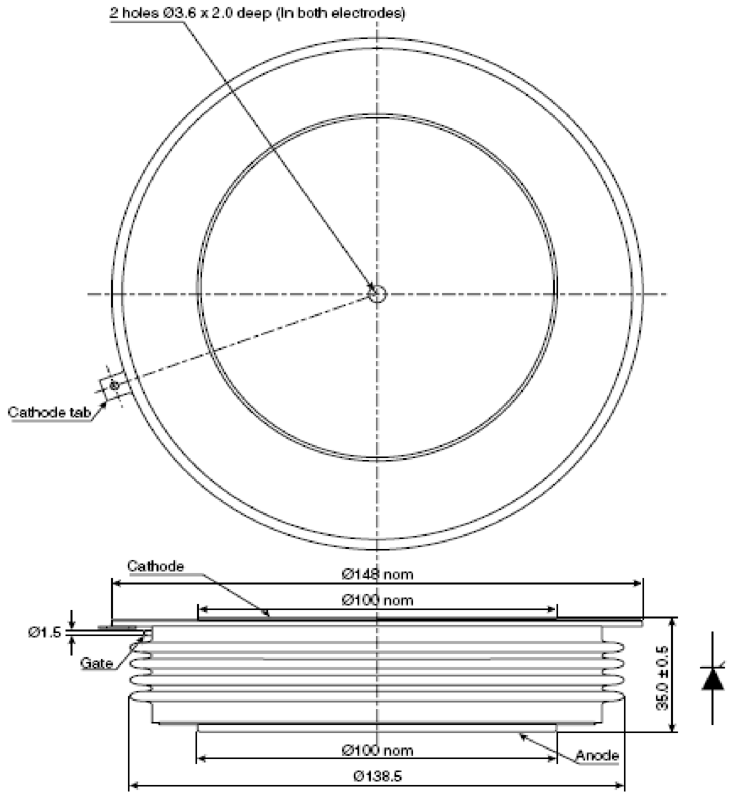


Fig.8 Multi-cycle surge current

PACKAGE DETAILS

For further package information, please contact Customer Services. All dimensions in mm, unless stated otherwise. DO NOT SCALE.



Nominal weight: 2575g

Lead length: 420mm
Lead terminal connector: M4 ring

Package outline type code: A

Fig.7 Package outline

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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