DCR504ST

Phase Control Thyristor

Supersedes January 2000version, DS4448 -4.0 DS4448 -5.0 July 2001

FEATURES

- Double Side Cooling
- High Surge Capability
- High Mean Current
- Fatigue Free

APPLICATIONS

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

VOLTAGE RATINGS

Type Number	Repetitive Peak Voltages V_{DRM} V_{RRM} V	Conditions
DCR504ST14	1400	T_{vj} = 0° to 125°C, I_{DRM} = I_{RRM} = 30mA, V_{DRM}, V_{RRM} t_p = 10ms, V_{DSM} & V_{RSM} = V_{DRM} & V_{RRM} + 100V respectively
DCR504ST13	1300	
DCR504ST12	1200	
DCR504ST11	1100	
DCR504ST10	1000	

Lower voltage grades available.

ORDERING INFORMATION

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

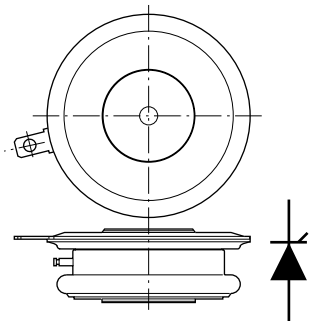
For example:

DCR504ST12

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}	**1400V**
$I_{T(AV)}$	**456A**
I_{TSM}	**6800A**
dVdt	**1000V/μs**
dI/dt	**700A/μs**



Outline type code: T
See Package Details for further information.

Fig. 1 Package outline

CURRENT RATINGS

T_{case} = 60˚C unless stated otherwise

Symbol	Parameter	Conditions	Max.	Units
Double Side Cooled				
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	456	A
$I_{T(RMS)}$	RMS value	-	717	A
I_T	Continuous (direct) on-state current	-	655	A
Single Side Cooled (Anode side)				
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	322	A
$I_{T(RMS)}$	RMS value	-	505	A
I_T	Continuous (direct) on-state current	-	425	A

CURRENT RATINGS

T_{case} = 80˚C unless stated otherwise

Symbol	Parameter	Conditions	Max.	Units
Double Side Cooled				
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	355	A
$I_{T(RMS)}$	RMS value	-	557	A
I_T	Continuous (direct) on-state current	-	495	A
Single Side Cooled (Anode side)				
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	248	A
$I_{T(RMS)}$	RMS value	-	390	A
I_T	Continuous (direct) on-state current	-	310	A

SURGE RATINGS

Symbol	Parameter	Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine; T_{case} = 125°C	5.5	kA
I^2t	I^2t for fusing	V_R = 50% V_{RRM} - 1/4 sine	150x 10^3	A^2s
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine; T_{case} = 125°C	6.8	kA
I^2t	I^2t for fusing	V_R = 0	231 x 10^3	A^2s

THERMAL AND MECHANICAL DATA

Symbol	Parameter	Conditions		Min.	Max.	Units
$R_{th(j-c)}$	Thermal resistance - junction to case	Double side cooled	dc	-	0.063	°C/W
		Single side cooled	Anode dc	-	0.11	°C/W
			Cathode dc	-	0.147	°C/W
$R_{th(c-h)}$	Thermal resistance - case to heatsink	Clamping force 4.5kN with mounting compound	Double side	-	0.02	°C/W
			Single side	-	0.04	°C/W
T_{vj}	Virtual junction temperature	On-state (conducting)		-	135	°C
		Reverse (blocking)		-	125	°C
T_{stg}	Storage temperature range			–55	125	°C
-	Clamping force			4.0	5.0	kN

DYNAMIC CHARACTERISTICS

Symbol	Parameter	Conditions		Typ.	Max.	Units
I_{RRM}/I_{DRM}	Peak reverse and off-state current	At V_{RRM}/V_{DRM}, T_{case} = 125°C		-	30	mA
dV/dt	Maximum linear rate of rise of off-state voltage	To 67% V_{DRM} T_j = 125°C. Gate open circuit.		-	1000	V/µs
dI/dt	Rate of rise of on-state current	From 67% V_{DRM} to 700A Gate source 10V, 5Ω $t_r \leq 0.5$µs, T_j = 125°C	Repetitive 50Hz	-	350	A/µs
			Non-repetitive	-	700	A/µs
$V_{T(TO)}$	Threshold voltage	At T_{vj} = 125°C		-	1.05	V
r_T	On-state slope resistance	At T_{vj} = 125°C		-	0.8	mΩ
t_{gd}	Delay time	V_D = 67% V_{DRM}, Gate source 20V, 10Ω dI_G/dt = 20A/µs, T_j = 25°C		-	0.8	µs
I_L	Latching current	T_j = 25°C, V_D = 10V		-	200	mA
I_H	Holding current	T_j = 25°C, R_{g-k} = ∞		-	30	mA
t_q	Turn-off time	I_T = 300A, t_p = 1ms, T_j = 125°C, V_R = 50V, dI_{RR}/dt = 20A/µs, V_{DR} = 67% V_{DRM}, dV_{DR}/dt = 20V/µs linear.		300	-	µs

GATE TRIGGER CHARACTERISTICS AND RATINGS

Symbol	Parameter	Conditions	Max.	Units
V_{GT}	Gate trigger voltage	V_{DRM} = 5V, T_{case} = 25°C	3.0	V
I_{GT}	Gate trigger current	V_{DRM} = 5V, T_{case} = 25°C	150	mA
V_{GD}	Gate non-trigger voltage	At 67% 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	10	A
P_{GM}	Peak gate power	See table, gate characteristics curve	100	W
$P_{G(AV)}$	Mean gate power		5	W

CURVES

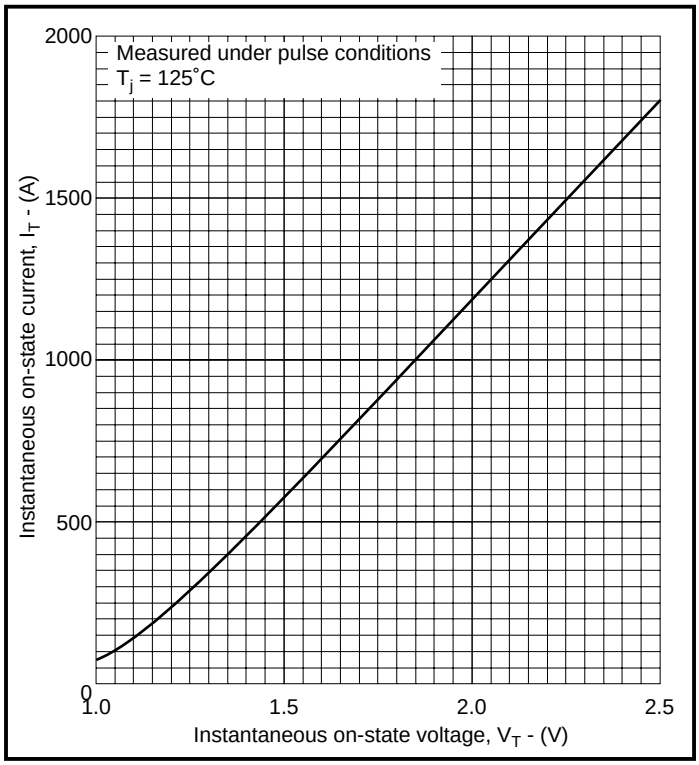


Fig.2 Maximum (limit) on-state characteristics

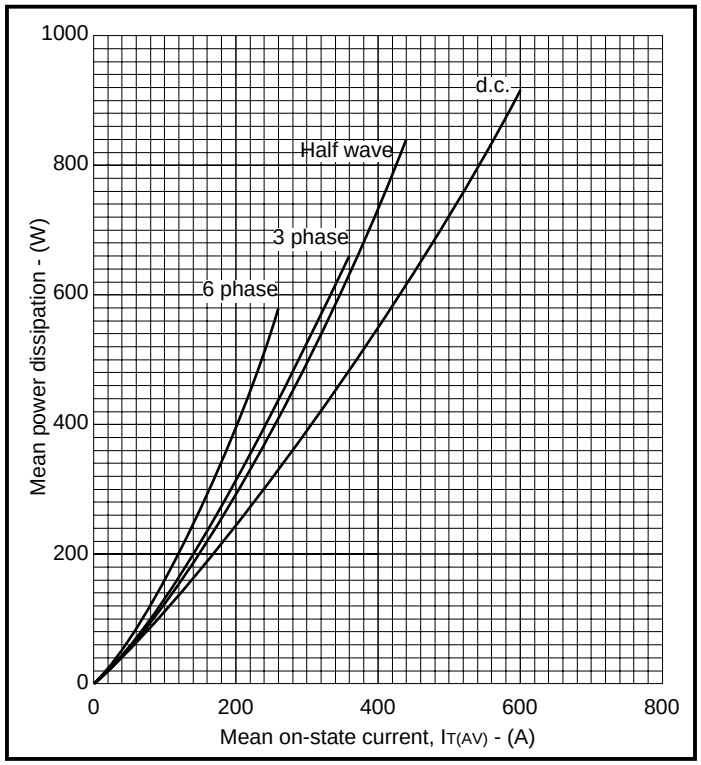


Fig.3 Dissipation curves

V_{TM} Equation:-

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

Where A = 0.351375
B = 0.171814
C = 0.000964
D = –0.020616

these values are valid for T_j = 125˚C for I_T 500A to 1800A

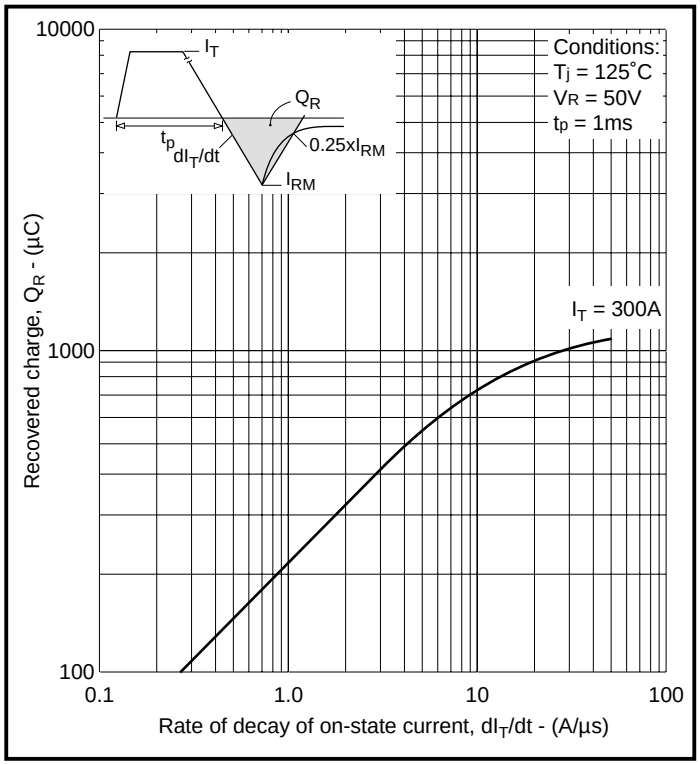


Fig.4 Recovered charge

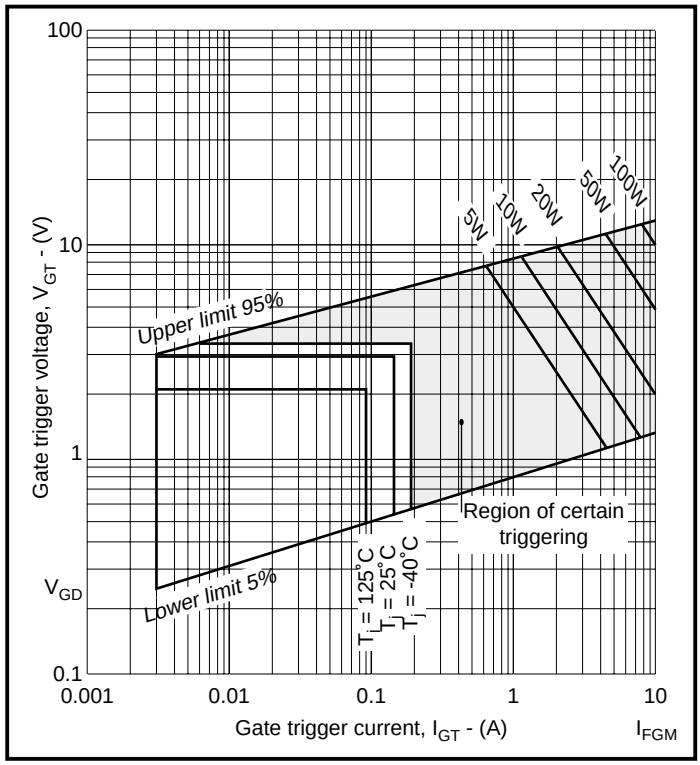


Fig.5 Gate characteristics

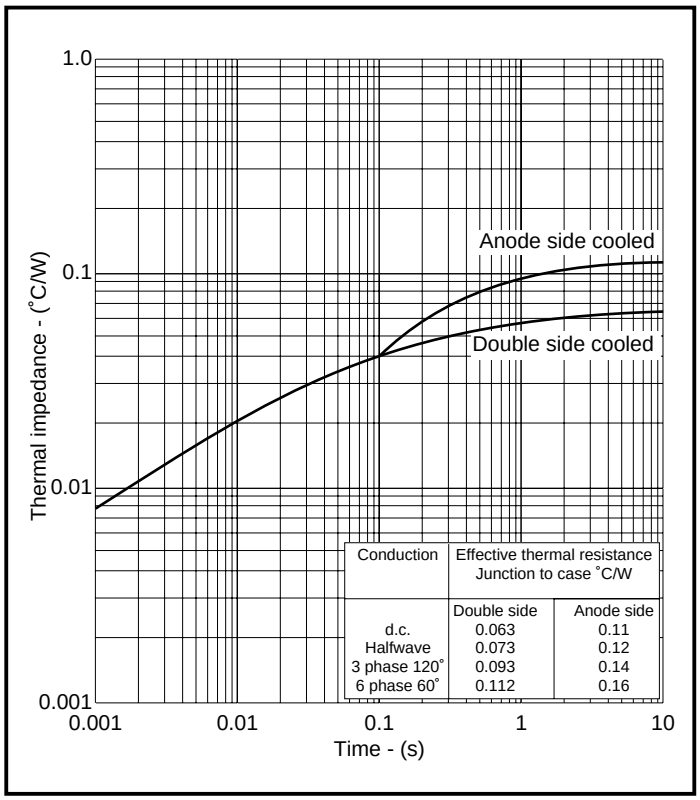


Fig.6 Maximum (limit) transient thermal impedance - junction to case

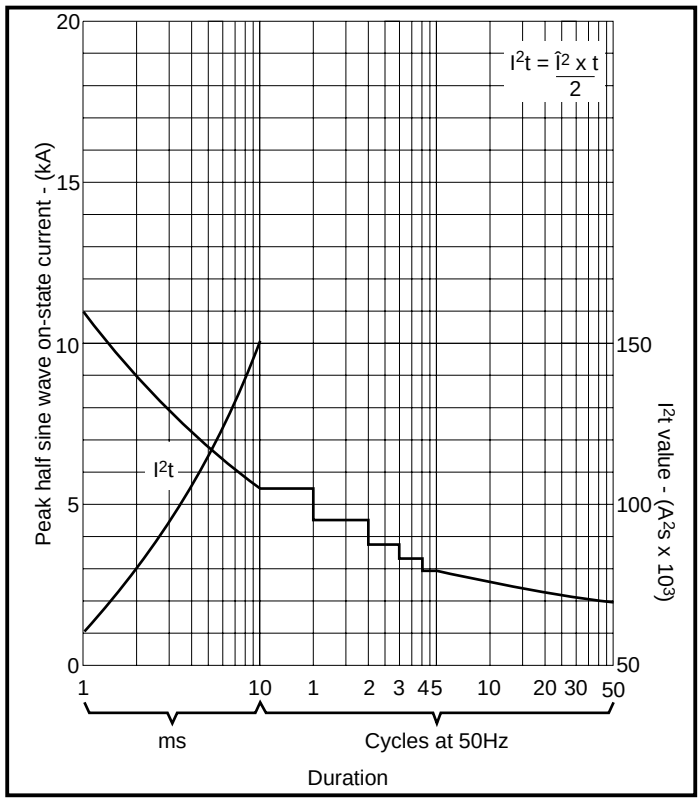
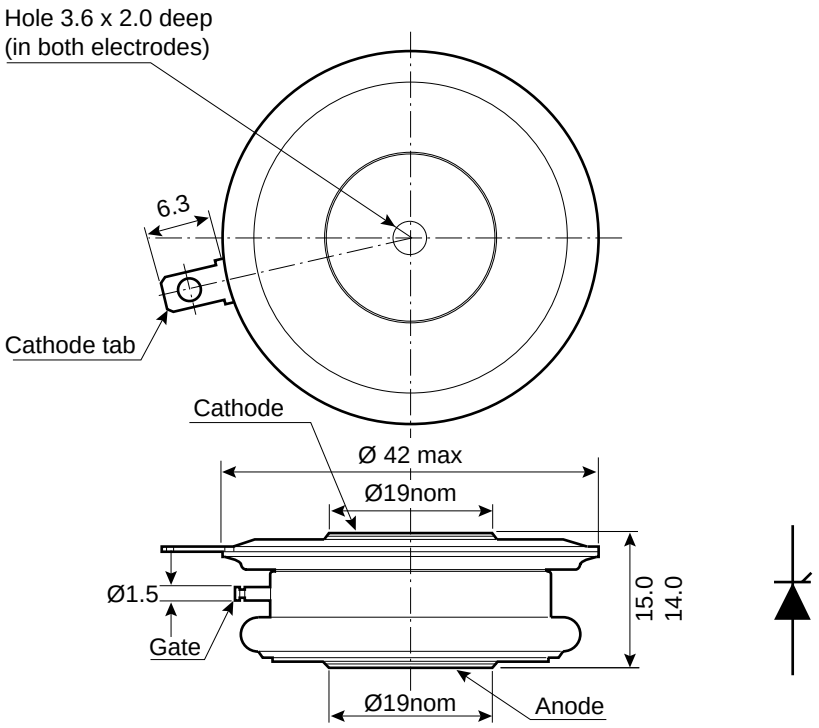


Fig.7 Surge (non-repetitive) on-state current vs time (with 50% V_{RRM} at T_{case} 125˚C)

PACKAGE DETAILS

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



Nominal weight: 55g
Clamping force: 4.5kN ±10%
Lead length: 205mm
Lead terminal connector: M4 ring

Package outine type code: T

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 / clamping systems in line with advances in device types and the voltage 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 up to date 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 offers a varied selection of pre-loaded clamps to suit all of our manufactured devices. This include cube clamps for single side cooling of 'T' 22mm

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

Power Assembly has its own proprietary range of extruded aluminium heatsinks. They have been designed to optimise the performance or our 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.

http://www.dynexsemi.com

e-mail: power_solutions@dynexsemi.com

HEADQUARTERS OPERATIONS
DYNEX SEMICONDUCTOR LTD
Doddington Road, Lincoln.
Lincolnshire. LN6 3LF. United Kingdom.
Tel: 00-44-(0)1522-500500
Fax: 00-44-(0)1522-500550

DYNEX POWER INC.
99 Bank Street, Suite 410,
Ottawa, Ontario, Canada, K1P 6B9
Tel: 613.723.7035
Fax: 613.723.1518
Toll Free: 1.888.33.DYNEX (39639)

CUSTOMER SERVICE CENTRES
Mainland Europe Tel: +33 (0)1 58 04 91 00. Fax: +33 (0)1 46 38 51 33
North America Tel: (613) 723-7035. Fax: (613) 723-1518.
UK, Scandinavia & Rest Of World Tel: +44 (0)1522 500500. Fax: +44 (0)1522 500020

SALES OFFICES
Mainland Europe Tel: +33 (0)1 58 04 91 00. Fax: +33 (0)1 46 38 51 33
North America Tel: (613) 723-7035. Fax: (613) 723-1518. Toll Free: 1.888.33.DYNEX (39639) /
Tel: (949) 733-3005. Fax: (949) 733-2986.
UK, Scandinavia & Rest Of World Tel: +44 (0)1522 500500. Fax: +44 (0)1522 500020

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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.