

DCR1850L52

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Phase Control Thyristor

Preliminary Information

DS5879-1.2 June 2008 (LN26208)

FEATURES

- Double Side Cooling
- High Surge Capability

KEY PARAMETERS

	5200V
I _{T(AV)}	1845A
ITSM	26250A
dV/dt*	1500V/μs
dl/dt	300A/μs

APPLICATIONS

- High Power Drives
- High Voltage Power Supplies
- Static Switches

VOLTAGE RATINGS

Part and Ordering Number	Repetitive Peak Voltages V _{DRM} and V _{RRM} V	Conditions
DCR1850L52* DCR1850L50 DCR1850L48	5200 5000 4800	$ \begin{array}{l} T_{vj} = -40 \ ^{\circ} C \ to \ 125 \ ^{\circ} C, \\ I_{DRM} = I_{RRM} = 300 \text{mA}, \\ V_{DRM}, \ V_{RRM} \ t_p = 10 \text{ms}, \\ V_{DSM} \ & V_{RSM} = \\ V_{DRM} \ & V_{RRM} \ + 100 V \\ respectively \end{array} $

Lower voltage grades available. * 5000V @ -40° C, 5200V @ 0° C

ORDERING INFORMATION

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

For example:

DCR1850L52

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

* Higher dV/dt selections available

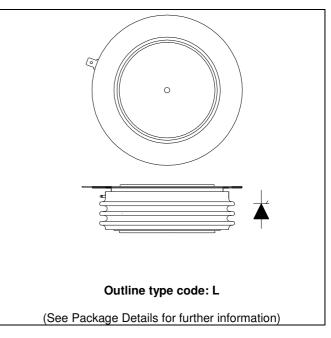


Fig. 1 Package outline



CURRENT RATINGS

 T_{case} = 60 °C unless stated otherwise

Symbol	Parameter	Test Conditions	Max.	Units
Double Si	de Cooled			
I _{T(AV)}	Mean on-state current	Half wave resistive load	1845	А
I _{T(RMS)}	RMS value	-	2898	А
Ι _Τ	Continuous (direct) on-state current	-	2719	А

SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
I _{TSM}	Surge (non-repetitive) on-state current	10ms half sine, $T_{case} = 125 $ °C	26.25	kA
l ² t	I ² t for fusing	V _R = 0	3.45	MA ² s

THERMAL AND MECHANICAL RATINGS

Symbol	Parameter	Test Condition	S	Min.	Max.	Units
R _{th(j-c)}	Thermal resistance – junction to case	Double side cooled	DC	-	0.0117	℃/W
		Single side cooled	Anode DC	-	0.0187	°C/W
			Cathode DC	-	0.0329	°C/W
R _{th(c-h)}	Thermal resistance – case to heatsink	Clamping force 37kN	Double side	-	0.0025	°C/W
		(with mounting compound)	Single side	-	0.005	°C/W
T_{vj}	Virtual junction temperature	On-state (conducting)		-	135	°C
		Reverse (blocking)		-	125	°C
T _{stg}	Storage temperature range			-55	125	°C
Fm	Clamping force			33.0	41.0	kN



DYNAMIC CHARACTERISTICS

Symbol	Parameter	Test Conditio	ons	Min.	Max.	Units
I _{RRM} /I _{DRM}	Peak reverse and off-state current	At V _{RRM} /V _{DRM} , T _{case} = 125 °C		-	300	mA
dV/dt	Max. linear rate of rise of off-state voltage	To 67% V _{DRM} , T _j = 125 °C, ga	ate open	-	1500	V/µs
dl/dt	Rate of rise of on-state current	From 67% V_{DRM} to 2x $I_{\text{T}(\text{AV})}$	Repetitive 50Hz	-	150	A/µs
		Gate source 30V, 10Ω , Non-repetitive $t_r < 0.5\mu$ s, $T_i = 125 \ ^{\circ}$ C		-	300	A/µs
V _{T(TO)}	Threshold voltage – Low level	500A to 2000A at T _{case} = 125	5℃	-	0.932	V
	Threshold voltage – High level	2000A to 7000A at T _{case} = 125 ℃		-	1.100	V
r _T	On-state slope resistance – Low level	500A to 2000A at T _{case} = 125 ℃		-	0.434	mΩ
	On-state slope resistance – High level	2000A to 7000A at T _{case} = 125 ℃		-	0.346	mΩ
t _{gd}	Delay time	$V_D = 67\% V_{DRM}$, gate source $t_r = 0.5\mu s$, $T_i = 25 $ °C	-	3	μs	
t _q	Turn-off time	$T_j = 125 ^{\circ}\text{C}, V_R = 200\text{V}, d\text{I/dt}$ $dV_{DR}/dt = 20\text{V/}\mu\text{s}$ linear	700	1100	μs	
Qs	Stored charge	$I_T = 2000A, T_j = 125 ^{\circ}C, dI/dt - 1A/\mu s,$		1200	2800	μC
ΙL	Latching current	$T_j = 25 ^{\circ}\text{C}, V_D = 5V$		-	3	А
Iн	Holding current	$T_j = 25 ^{\circ}C, R_{G-K} = \infty, I_{TM} = 50$	0A, I _T = 5A	-	300	mA

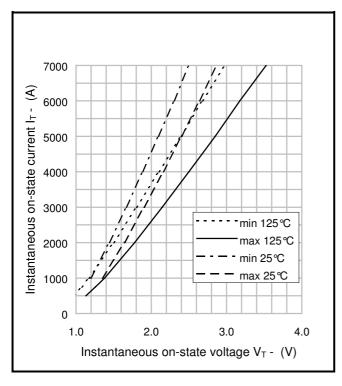


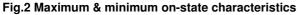


GATE TRIGGER CHARACTERISTICS AND RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
V _{GT}	Gate trigger voltage	$V_{DRM} = 5V, T_{case} = 25 ^{\circ}C$	1.5	V
V_{GD}	Gate non-trigger voltage	At 50% V _{DRM,} T _{case} = 125 ℃	0.4	۷
I _{GT}	Gate trigger current	V _{DRM} = 5V, T _{case} = 25℃	250	mA
I _{GD}	Gate non-trigger current	At 50% V _{DRM,} T _{case} = 125 ℃	15	mA

CURVES





V_{TM} EQUATION

Where A = -0.142705 B = 0.203033 C = 0.000358 D = -0.00751 these values are valid for $T_j = 125$ °C for I_T 100A to 7200A

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



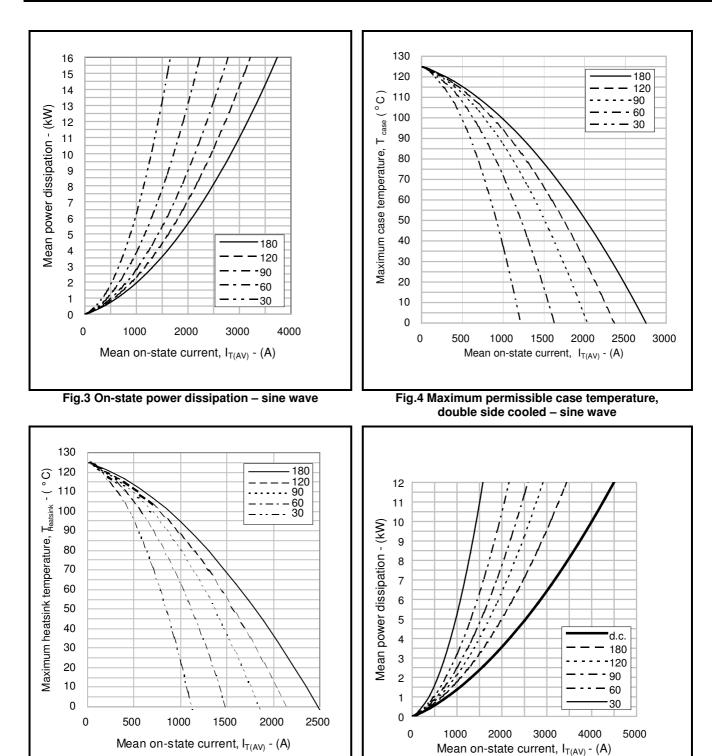


Fig.5 Maximum permissible heatsink temperature, double side cooled – sine wave

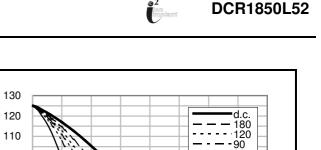


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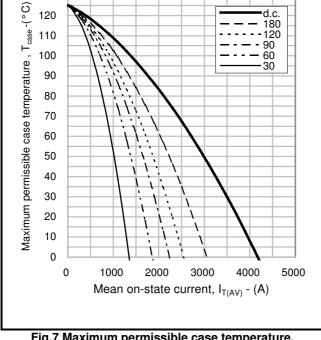
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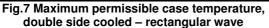


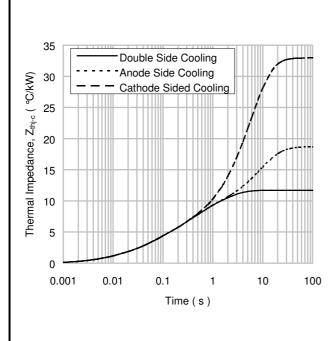
130



60 30







Maximum heatsink temperature T_{heatsink} -(° C) 80 70 60 50 40 30 20 10 0 0 1000 2000 3000 4000 Mean on-state current, $I_{T(AV)}$ - (A)

Fig.8 Maximum permissible heatsink temperature, double side cooled - rectangular wave

	1	2	3	4
R _i (℃/kW)	0.8342	2.6074	4.2073	4.041
T _i (s)	0.008639	0.0533503	0.3309504	1.612
R _i (℃/kW)	0.9647	2.8312	4.9433	9.909
T _i (s)	0.0096096	0.0627037	0.4198958	8.908
R _i (℃/kW)	0.9285	2.9366	2.3581	26.683
T _i (s)	0.0093033	0.0621535	0.3092235	5.835
	T _i (s) R _i (°C/kW) T _i (s) R _i (°C/kW)	Ti (s) 0.008639 Ri (°C/kW) 0.9647 Ti (s) 0.0096096 Ri (°C/kW) 0.9285	$\begin{array}{c c} T_{i}\left(s\right) & 0.008639 & 0.0533503 \\ R_{i}\left({}^{\circ}C/kW \right) & 0.9647 & 2.8312 \\ T_{i}\left(s\right) & 0.0096096 & 0.0627037 \\ R_{i}\left({}^{\circ}C/kW \right) & 0.9285 & 2.9366 \end{array}$	$\begin{array}{c c c c c c c c c c c c c c c c c c c $

rec 0.97 1.39

> 1.63 1.88 2.15

 $\Delta R_{\text{th(j-c)}}$ Conduction

100

90

Tables show the increments of thermal resistance $R_{\text{th}(j\cdot c)}$ when the device operates at conduction angles other than d.c.

	Double side cooling			Double side cooling				Anode Side	Cooling
	$\Delta Z_{th}(z)$				ΔZ	_h (z)			
θ°	sine.	rect.		θ°	sine.	rect			
180	1.45	0.98		180	1.43	0.97			
120	1.68	1.40		120	1.66	1.39			
90	1.93	1.64		90	1.90	1.62			
60	2.16	1.90		60	2.12	1.88			
30	2.34	2.19		30	2.30	2.15			
15	2.42	2.34		15	2.37	2.30			

Cathode Sided Cooling						
	∆Zti	n (Z)				
θ°	sine. rect.					
180	1.44	0.97				
120	1.66	1.39				
90	1.91	1.63				
60	2.14	1.89				
30	2.31	2.17				
15	2.39	2.31				

Fig.9 Maximum (limit) transient thermal impedance – junction to case (°C/kW)



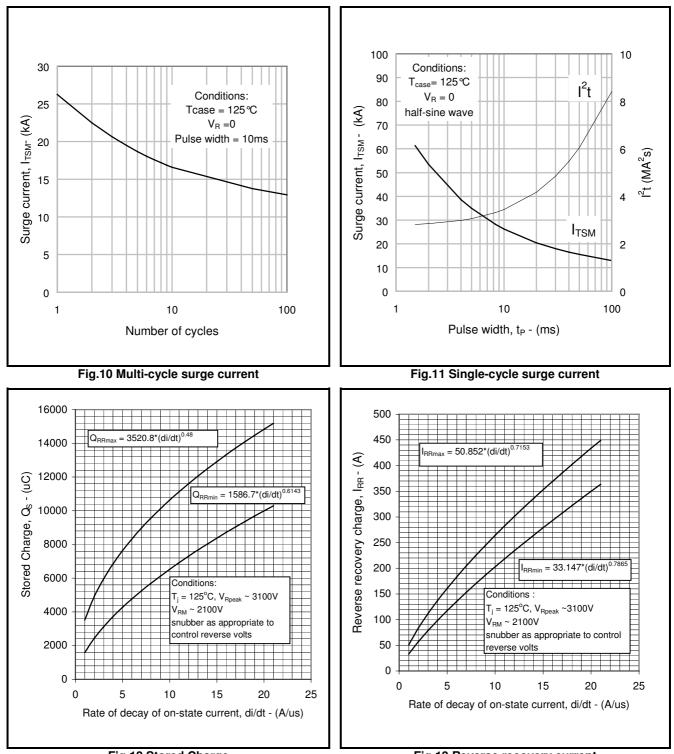


Fig.12 Stored Charge

Fig.13 Reverse recovery current

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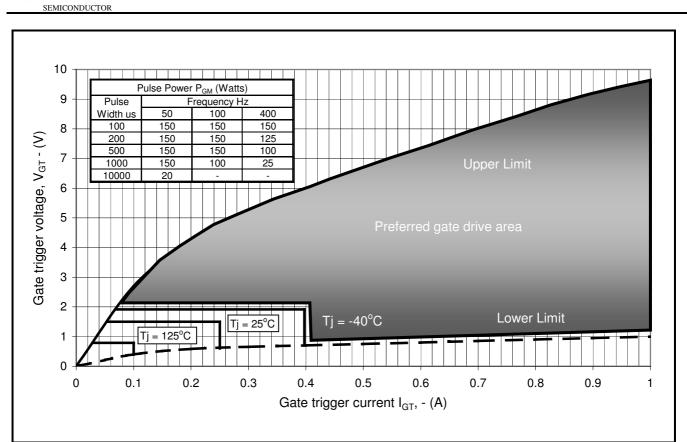


Fig14 Gate Characteristics

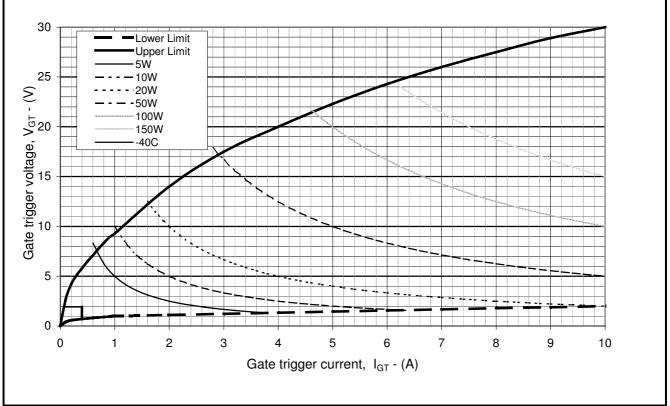


Fig. 15 Gate characteristics

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PACKAGE DETAILS

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

ANGLE PROJECTION O DO NOT SCALE JE N DOUBT ASK HOLE Ø3.60 X 2.00 DEEP (IN BOTH LECTRODES) O GATE TUBE O GATE TUBE O GATE TUBE O GATE STALE O GATE ST	Device DCR1374SBA18 DCR1375SBA28 DCR1376SBA36 DCR2690L22 DCR2480L28 DCR2040L42 DCR1850L52 DCR1570L65 DCR1300L85	Maximum Thickness (mm) 34.515 34.59 34.515 34.59 34.59 34.82 34.59 34.82 34.94 35.2 35.56	Minimum Thickness (mm) 33.965 34.04 34.27 33.965 34.04 34.27 34.39 34.65 35.01
Lead length: 420 Lead terminal connecto Package outline type	r: M4 ring		

Fig.16 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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