# DCR1300L85





# **Phase Control Thyristor**

DS5816-3 January 2014 (LN31241)

### **FEATURES**

- Double Side Cooling
- High Surge Capability

### **APPLICATIONS**

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

### **VOLTAGE RATINGS**

Part and Ordering Number	Repetitive Peak Voltages V <sub>DRM</sub> and V <sub>RRM</sub> V	Conditions
DCR1300L85* DCR1300L80 DCR1300L75 DCR1300L70	8500 8000 7500 7000	$\begin{array}{l} T_{vj} = -40^{\circ}C \ to \ 125^{\circ}C, \\ I_{DRM} = I_{RRM} = 300 \text{mA}, \\ V_{DRM}, \ V_{RRM} \ t_p = 10 \text{ms}, \\ V_{DSM} \& \ V_{RSM} = \\ V_{DRM} \& \ V_{RRM} + 100 \text{V} \\ \text{respectively} \end{array}$

Lower voltage grades available. \*8200V @  $-40^{\circ}$  C, 8500V @  $0^{\circ}$  C

#### **ORDERING INFORMATION**

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

For example:

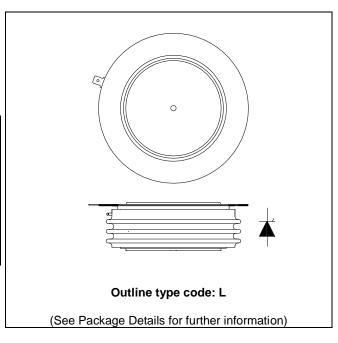
### DCR1300L85

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

### **KEY PARAMETERS**

8500V
1300A
17600A
1500V/µs
400A/µs

#### \* Higher dV/dt selections available



#### Fig. 1 Package outline



# **CURRENT RATINGS**

 $T_{case} = 60^{\circ}C$  unless stated otherwise

Symbol	Parameter	Test Conditions	Max.	Units
Double Sid	de Cooled			
I <sub>T(AV)</sub>	Mean on-state current	Half wave resistive load	1300	А
I <sub>T(RMS)</sub>	RMS value	-	2037	А
Ι <sub>Τ</sub>	Continuous (direct) on-state current	-	1963	А

# SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
I <sub>TSM</sub>	Surge (non-repetitive) on-state current	10ms half sine, $T_{case} = 125^{\circ}C$	17.6	kA
l <sup>2</sup> t	I <sup>2</sup> t for fusing	$V_R = 0$	1.55	MA <sup>2</sup> s

## THERMAL AND MECHANICAL RATINGS

Symbol	Parameter	Test Conditions		Min.	Max.	Units
R <sub>th(j-c)</sub>	Thermal resistance – junction to case	Double side cooled	DC	-	0.0117	°C/W
		Single side cooled	Anode DC	-	0.0187	°C/W
			Cathode DC	-	0.0329	°C/W
R <sub>th(c-h)</sub>	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	Blocking V <sub>DRM</sub> / <sub>VRRM</sub>		-	125	°C
T <sub>stg</sub>	Storage temperature range			-55	125	°C
Fm	Clamping force			33	41	kN



# **DYNAMIC CHARACTERISTICS**

Symbol	Parameter	Test Conditions		Min.	Max.	Units
I <sub>RRM</sub> /I <sub>DRM</sub>	Peak reverse and off-state current	At V <sub>RRM</sub> /V <sub>DRM</sub> , T <sub>case</sub> = 125°C		-	300	mA
dV/dt	Max. linear rate of rise of off-state voltage	To 67% V <sub>DRM</sub> , T <sub>j</sub> = 125°C, ga	ate open	-	1500	V/µs
dl/dt	Rate of rise of on-state current	From 67% $V_{\text{DRM}}$ to 2x $I_{\text{T(AV)}}$	Repetitive 50Hz	-	200	A/µs
		Gate source 30V, $10\Omega$ ,	Non-repetitive	-	400	A/µs
		t <sub>r</sub> < 0.5µs, T <sub>j</sub> = 125°C				
V <sub>T(TO)</sub>	Threshold voltage – Low level	100A to 2000A at $T_{case} = 125$	5°C	-	1.2	V
	Threshold voltage – High level	2000A to 7000A at T <sub>case</sub> = 125°C		-	1.35	V
r <sub>T</sub>	On-state slope resistance – Low level	100A to 2000A at T <sub>case</sub> = 125°C		-	0.8615	mΩ
	On-state slope resistance – High level	2000A to 7000A at T <sub>case</sub> = 125°C		-	0.767	mΩ
t <sub>gd</sub>	Delay time	$V_D = 67\% V_{DRM}$ , gate source	30V, 10Ω	-	3	μs
		$t_r = 0.5 \mu s, T_j = 25^{\circ}C$				
tq	Turn-off time	$T_j = 125^{\circ}C, V_R = 200V, dI/dt$	= 1A/µs,	-	1200	μs
		$dV_{DR}/dt = 20V/\mu s$ linear				
Qs	Stored charge	$I_T = 2000A, T_j = 125^{\circ}C, dI/dt - 1A/\mu s,$		4000	6500	μC
١L	Latching current	$T_j = 25^{\circ}C, V_D = 5V$		-	3	А
Ι <sub>Η</sub>	Holding current	$T_j = 25^{\circ}C, R_{G-K} = \infty, I_{TM} = 50^{\circ}$	0A, I <sub>T</sub> = 5A	-	300	mA

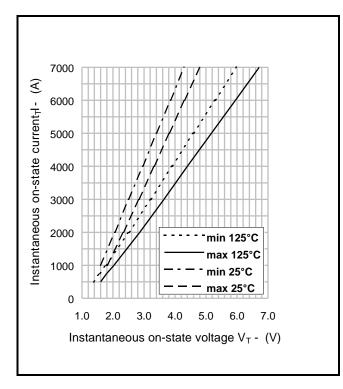


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# GATE TRIGGER CHARACTERISTICS AND RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
V <sub>GT</sub>	Gate trigger voltage	$V_{DRM} = 5V, T_{case} = 25^{\circ}C$	1.5	V
$V_{GD}$	Gate non-trigger voltage	At 50% V <sub>DRM</sub> , T <sub>case</sub> = 125°C	0.4	V
I <sub>GT</sub>	Gate trigger current	$V_{DRM} = 5V, T_{case} = 25^{\circ}C$	350	mA
I <sub>GD</sub>	Gate non-trigger current	At 50% V <sub>DRM</sub> , T <sub>case</sub> = 125°C	15	mA

## **CURVES**



#### Fig.2 Maximum & minimum on-state characteristics

# $V_{\text{TM}}$ EQUATION

Where A = 1.565095B = -0.121495 $V_{TM} = A + BIn (I_T) + C.I_T + D.\sqrt{I_T}$ C = 0.000638D = 0.021051these values are valid for  $T_{j}$  = 125°C for  $I_{T}$  100A to 10000A



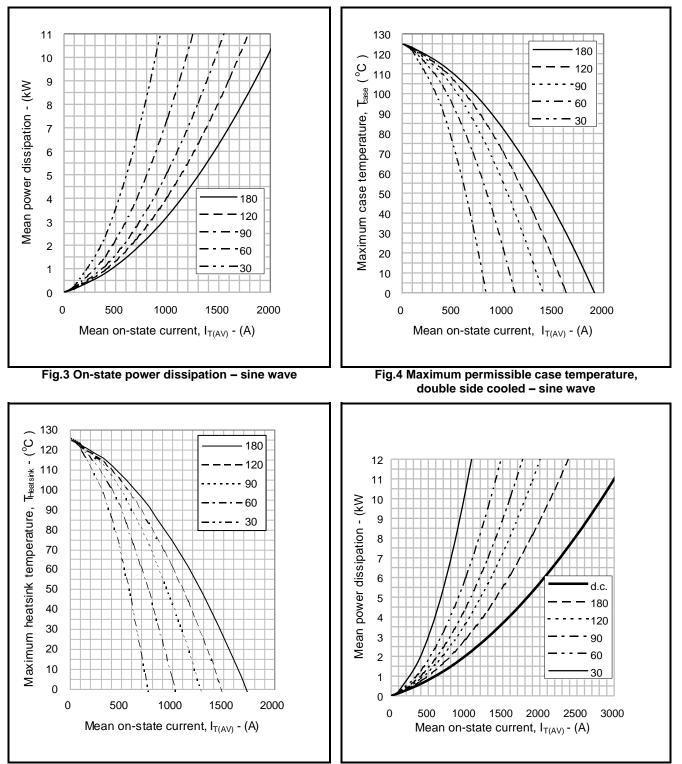
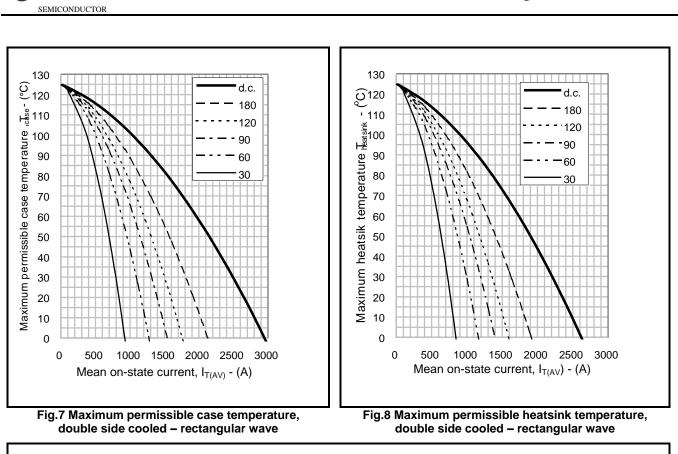
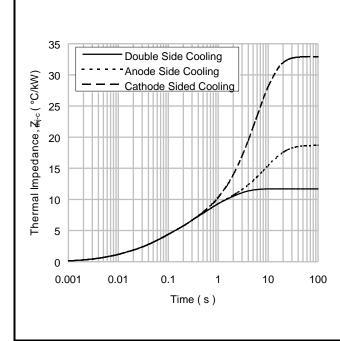


Fig.5 Maximum permissible heatsink temperature, double side cooled – sine wave

Fig.6 On-state power dissipation - rectangular wave





		1	2	3	4
Double side cooled	R <sub>i</sub> (°C/kW)	0.8342	2.6074	4.2073	4.041
	T <sub>i</sub> (s)	0.008639	0.0533503	0.3309504	1.612
Anode side cooled	R <sub>i</sub> (°C/kW)	0.9647	2.8312	4.9433	9.909
	T <sub>i</sub> (s)	0.0096096	0.0627037	0.4198958	8.908
Cathode side cooled	R <sub>i</sub> (°C/kW)	0.9285	2.9366	2.3581	26.683
	T <sub>i</sub> (s)	0.0093033	0.0621535	0.3092235	5.835

[1]

rect 0.97

1.39 1.62 1.88

$$Z_{th} = \sum [R_i x (1 - exp. (t/t_i))]$$

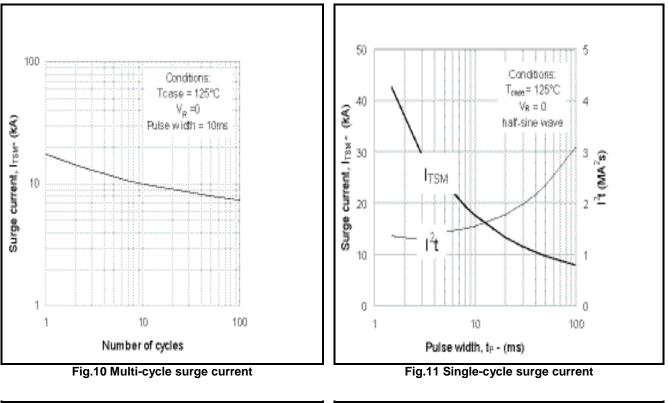
 $\Delta \mathsf{R}_{\text{th(j-c)}} \text{ Conduction}$ Tables show the increments of thermal resistance  $\mathsf{R}_{\mathsf{th}(j\text{-}c)}$  when the device operates at conduction angles other than d.c.

	Double side cooling			Double side cooling				Anode Side	Cooling
	$\Delta Z_{th}(z)$		$\Delta Z_{th}(z)$				$\Delta Z_{1}$	<sub>h</sub> (z)	
θ°	sine.	rect.	I	θ°	sine.	rect			
180	1.45	0.98		180	1.43	0.97			
120	1.68	1.40	I	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			
15	2.42	2.34	l	15	2.37	2			

Cathode Sided Cooling			
	$\Delta Z_{th}(z)$		
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)





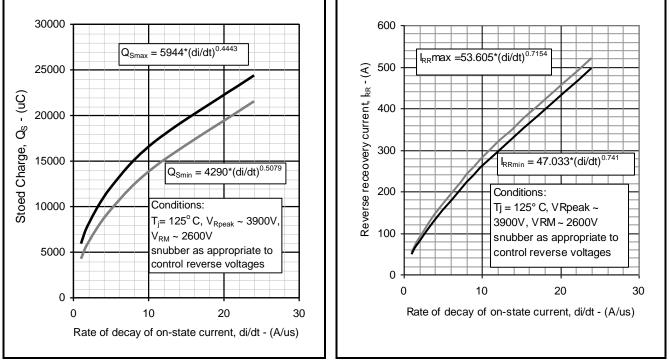
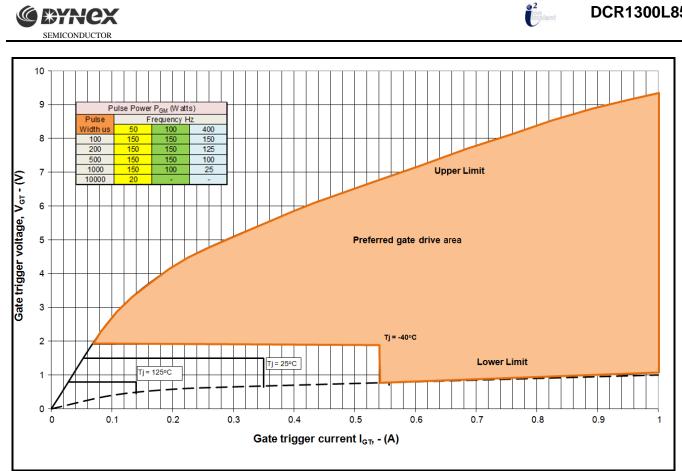


Fig.12 Reverse recovery charge

Fig. 13 Reverse recovery current



**Fig14 Gate Characteristics** 

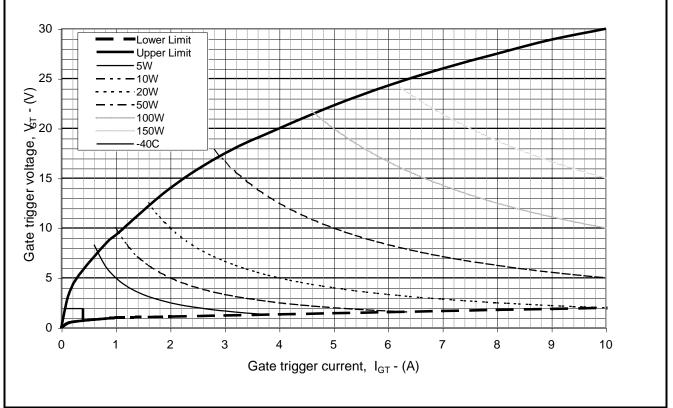


Fig. 15 Gate characteristics



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# PACKAGE DETAILS

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

SIDANGLE PROJECTION	Device DCR1374SBA18 DCR1375SBA28 DCR1376SBA36 DCR2690L22 DCR2480L28 DCR2040L42 DCR1850L52 DCR1570L65 DCR1300L85	Maximum Thickness (mm) 34.515 34.59 34.82 34.515 34.59 34.82 34.94 35.2 <b>35.56</b>	Minimum Thickness (mm) 33.965 34.04 34.27 33.965 34.04 34.27 34.39 34.65 <b>35.01</b>
Nominal weight: 15 Clamping force: 37kN Lead length: 420r Lead terminal connector <b>Package outline type</b>	I ±10% nm r: M4 ring		

Fig.16 Package outline





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