

**FEATURES**

- Double Side Cooling
- High Surge Capability

**APPLICATIONS**

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

**VOLTAGE RATINGS**

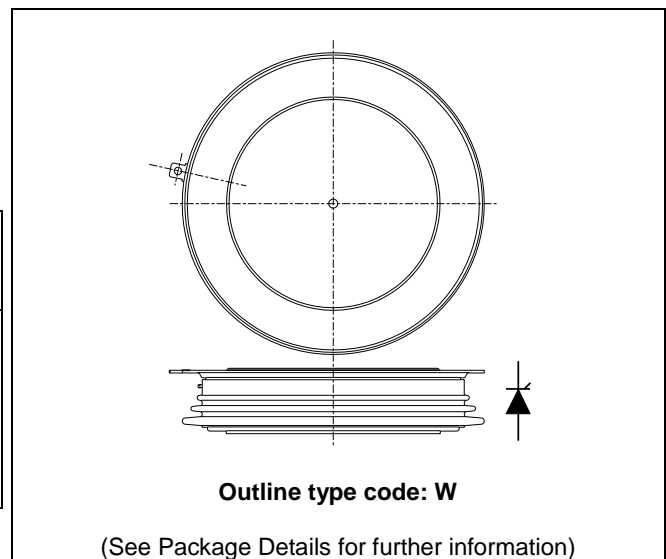
Part and Ordering Number	Repetitive Peak Voltages $V_{DRM}$ and $V_{RRM}$ V	Conditions
DCR4100W42 DCR4100W40 DCR4100W35 DCR4100W30	4200 4000 3500 3000	$T_{vj} = -40^{\circ}\text{C}$ to $125^{\circ}\text{C}$ , $I_{DRM} = I_{RRM} = 200\text{mA}$ , $V_{DRM}, V_{RRM} t_p = 10\text{ms}$ , $V_{DSM} \& V_{RSM} =$ $V_{DRM} \& V_{RRM} + 100\text{V}$ respectively

Lower voltage grades available.

**KEY PARAMETERS**

$V_{DRM}$	<b>4200V</b>
$I_{T(AV)}$	<b>3880A</b>
$I_{TSM}$	<b>53500A</b>
$dV/dt^*$	<b>1500V/<math>\mu\text{s}</math></b>
$dI/dt$	<b>400A/<math>\mu\text{s}</math></b>

\* Higher  $dV/dt$  selections available



**Fig. 1 Package outline**

**ORDERING INFORMATION**

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

For example:

**DCR4100W42**

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

## CURRENT RATINGS

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

Symbol	Parameter	Test Conditions	Max.	Units
<b>Double Side Cooled</b>				
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	3880	A
$I_{T(RMS)}$	RMS value	-	6095	A
$I_T$	Continuous (direct) on-state current	-	5725	A

## SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
$I_{TSM}$	Surge (non-repetitive) on-state current	10ms half sine, $T_{case} = 125^{\circ}\text{C}$	53.5	kA
$I^2t$	$I^2t$ for fusing	$V_R = 0$	14.31	$\text{MA}^2\text{s}$

## THERMAL AND MECHANICAL RATINGS

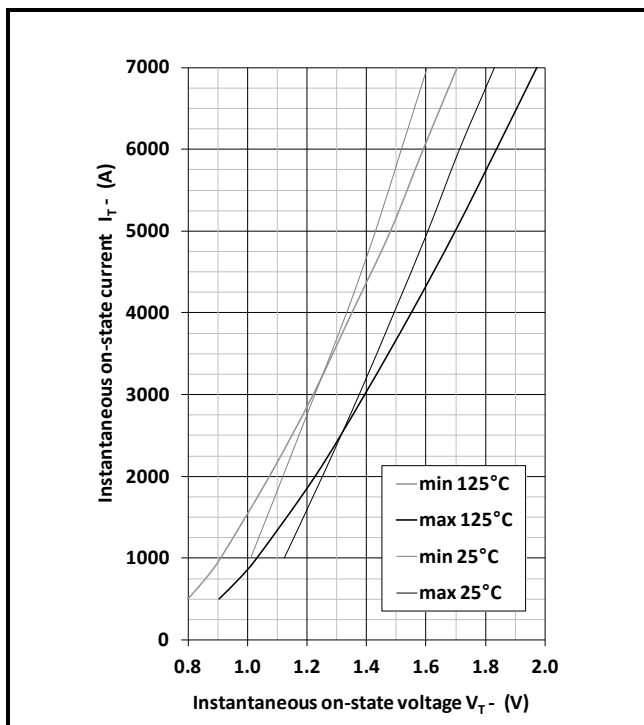
Symbol	Parameter	Test Conditions	Min.	Max.	Units	
$R_{th(j-c)}$	Thermal resistance – junction to case	Double side cooled	DC	-	0.00631	$^{\circ}\text{C/W}$
		Single side cooled	Anode DC	-	0.01115	$^{\circ}\text{C/W}$
			Cathode DC	-	0.01453	$^{\circ}\text{C/W}$
$R_{th(c-h)}$	Thermal resistance – case to heatsink	Clamping force 76kN (with mounting compound)	Double side	-	0.0014	$^{\circ}\text{C/W}$
			Single side	-	0.0028	$^{\circ}\text{C/W}$
$T_{vj}$	Virtual junction temperature	Blocking $V_{DRM} / V_{RRM}$	-	125	$^{\circ}\text{C}$	
$T_{stg}$	Storage temperature range		-55	125	$^{\circ}\text{C}$	
$F_m$	Clamping force		68.0	84.0	kN	

**DYNAMIC CHARACTERISTICS**

Symbol	Parameter	Test Conditions	Min.	Max.	Units	
$I_{RRM}/I_{DRM}$	Peak reverse and off-state current	At $V_{RRM}/V_{DRM}$ , $T_{case} = 125^{\circ}C$	-	200	mA	
$dV/dt$	Max. linear rate of rise of off-state voltage	To 67% $V_{DRM}$ , $T_j = 125^{\circ}C$ , gate open	-	1500	V/ $\mu s$	
$di/dt$	Rate of rise of on-state current	From 67% $V_{DRM}$ to $2x I_{T(AV)}$	Repetitive 50Hz	-	200	A/ $\mu s$
		Gate source 30V, 10 $\Omega$ , $t_r < 0.5\mu s$ , $T_j = 125^{\circ}C$	Non-repetitive	-	400	A/ $\mu s$
$V_{T(TO)}$	Threshold voltage – Low level	700A to 4100A at $T_{case} = 125^{\circ}C$	-	0.83	V	
	Threshold voltage – High level	4100A to 12000A at $T_{case} = 125^{\circ}C$	-	1.0	V	
$r_T$	On-state slope resistance – Low level	700A to 4100A at $T_{case} = 125^{\circ}C$	-	0.1688	m $\Omega$	
	On-state slope resistance – High level	4100A to 12000A at $T_{case} = 125^{\circ}C$	-	0.1263	m $\Omega$	
$t_{gd}$	Delay time	$V_D = 67\% V_{DRM}$ , gate source 30V, 10 $\Omega$ $t_r = 0.5\mu s$ , $T_j = 25^{\circ}C$	TBD	TBD	$\mu s$	
$t_q$	Turn-off time	$T_j = 125^{\circ}C$ , $V_R = 200V$ , $di/dt = 1A/\mu s$ , $dV_{DR}/dt = 20V/\mu s$ linear	250	500	$\mu s$	
$Q_S$	Stored charge	$I_T = 2000A$ , $T_j = 125^{\circ}C$ , $di/dt = 1A/\mu s$ ,	1500	4500	$\mu C$	
$I_L$	Latching current	$T_j = 25^{\circ}C$ , $V_D = 5V$	-	3	A	
$I_H$	Holding current	$T_j = 25^{\circ}C$ , $R_{G-K} = \infty$ , $I_{TM} = 500A$ , $I_T = 5A$	-	300	mA	

**GATE TRIGGER CHARACTERISTICS AND RATINGS**

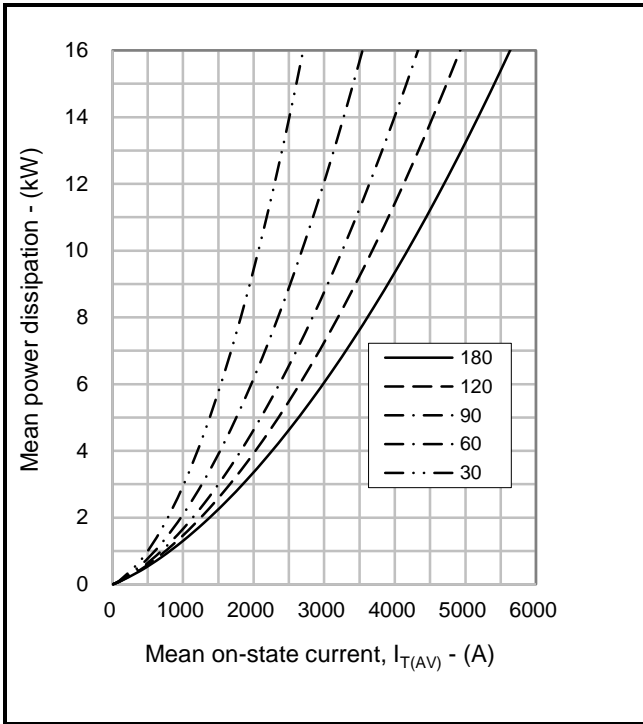
Symbol	Parameter	Test Conditions	Max.	Units
V <sub>GT</sub>	Gate trigger voltage	V <sub>DRM</sub> = 5V, T <sub>case</sub> = 25°C	1.5	V
V <sub>GD</sub>	Gate non-trigger voltage	At V <sub>DRM</sub> , T <sub>case</sub> = 125°C	0.4	V
I <sub>GT</sub>	Gate trigger current	V <sub>DRM</sub> = 5V, T <sub>case</sub> = 25°C	350	mA
I <sub>GD</sub>	Gate non-trigger current	V <sub>DRM</sub> = 5V, T <sub>case</sub> = 25°C	10	mA

**CURVES**

**Fig.2 Maximum & minimum on-state characteristics**
**V<sub>TM</sub> EQUATION**

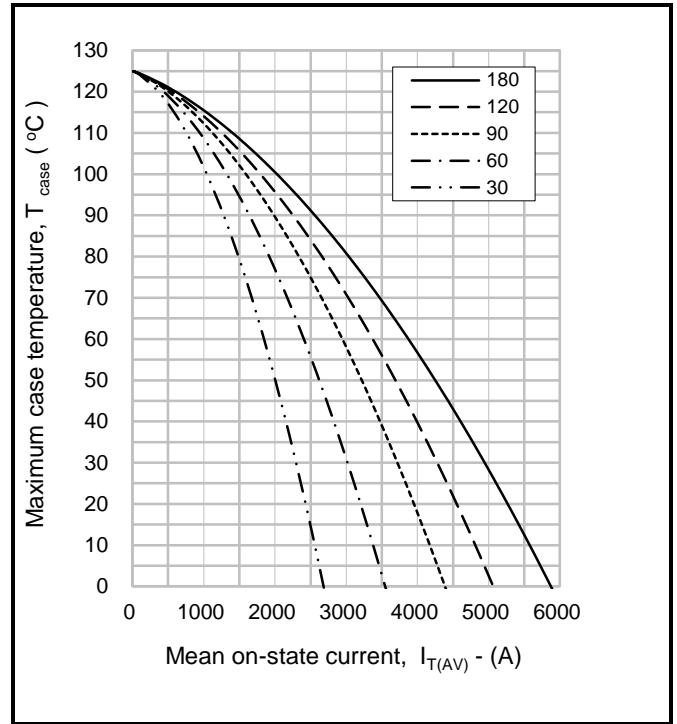
$$V_{TM} = A + B \ln(I_T) + C \cdot I_T + D \cdot \sqrt{I_T}$$

 Where  $A = 0.348967$ 
 $B = 0.066851$ 
 $C = 0.000102$ 
 $D = 0.003788$ 

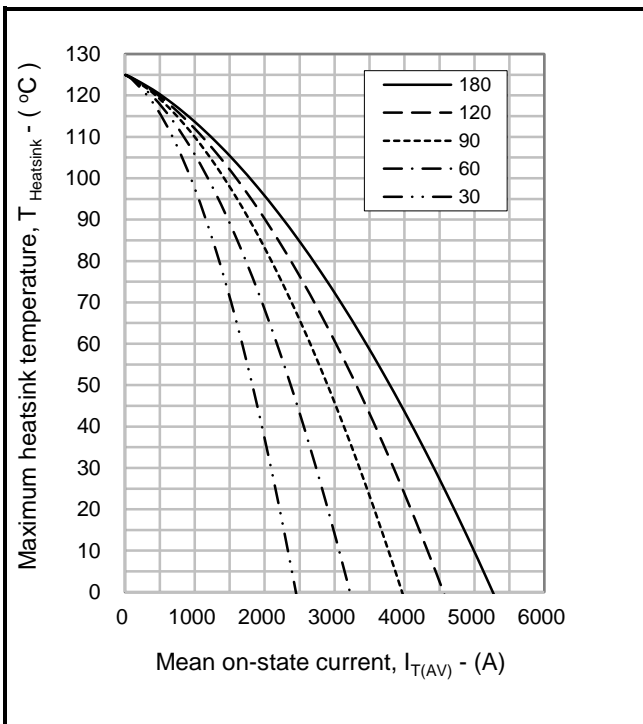
 these values are valid for  $T_j = 125^\circ\text{C}$  for  $I_T$  500A to 10000A



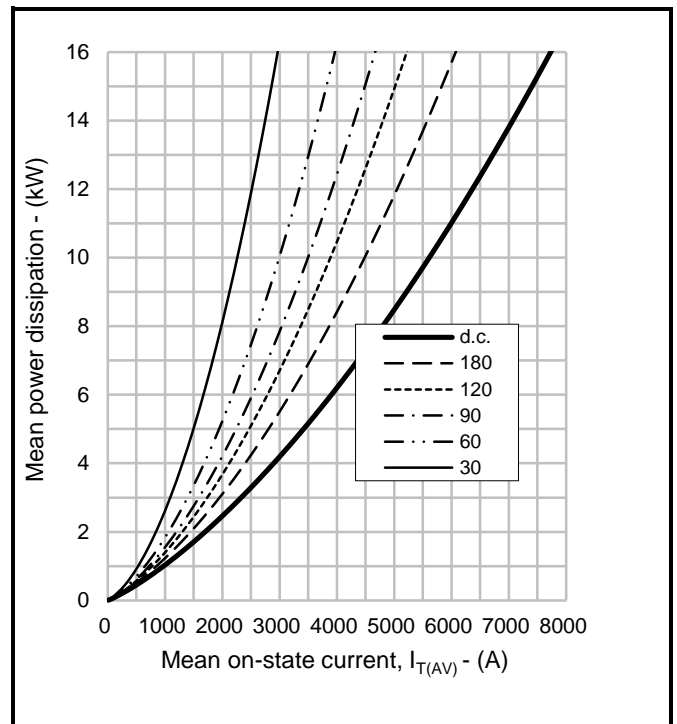
**Fig.3 On-state power dissipation – sine wave**



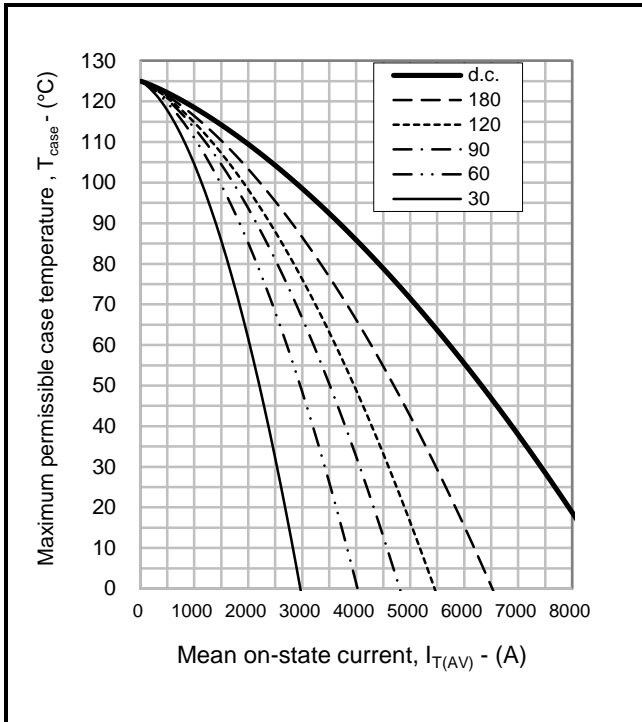
**Fig.4 Maximum permissible case temperature, double side cooled – sine wave**



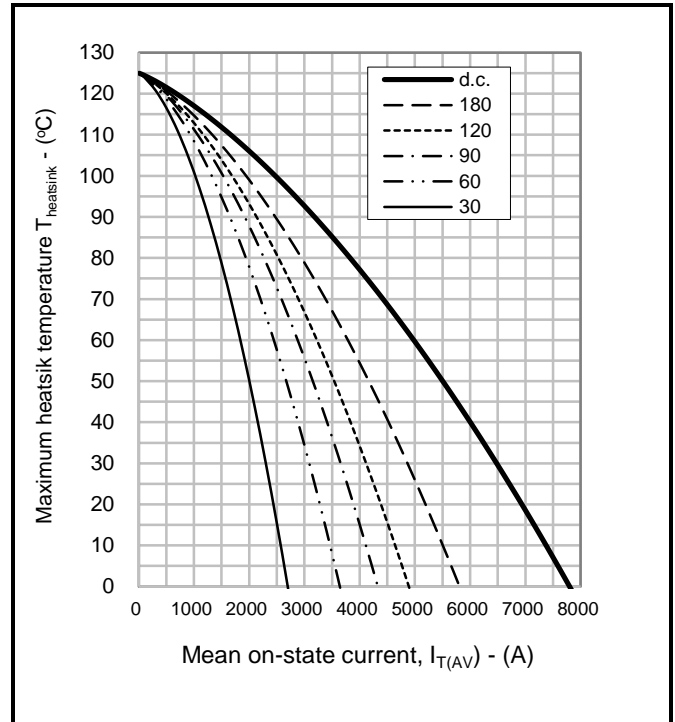
**Fig.5 Maximum permissible heatsink temperature, double side cooled – sine wave**



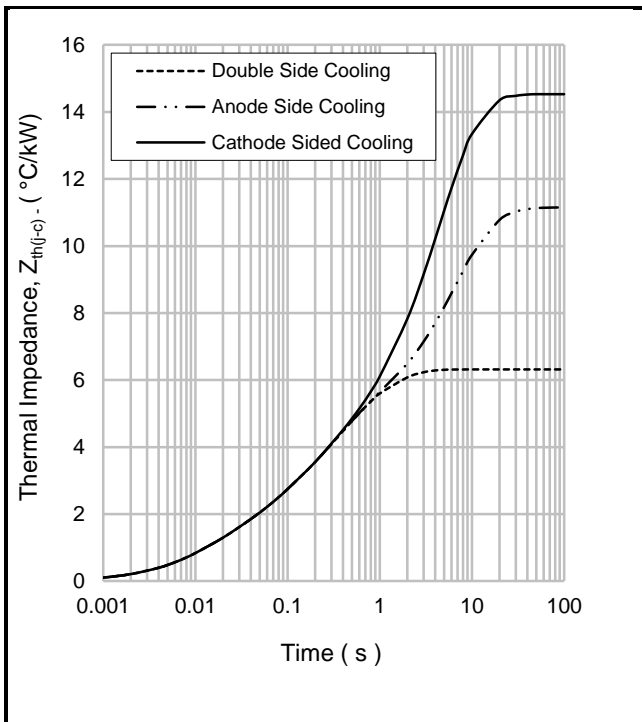
**Fig.6 On-state power dissipation – rectangular wave**



**Fig.7 Maximum permissible case temperature, double side cooled – rectangular wave**



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



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

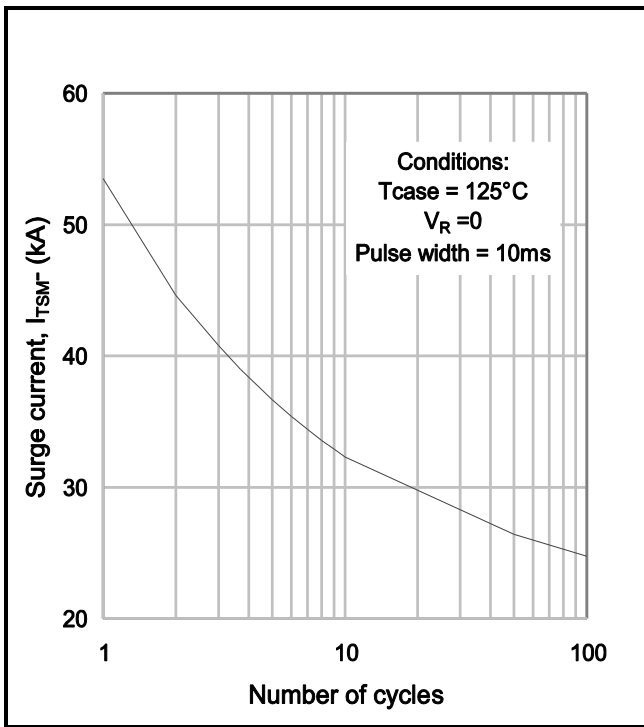
		1	2	3	4
Double side cooled	R <sub>θ</sub> (°C/kW)	0.8816	1.2993	2.8048	1.3305
	T <sub>θ</sub> (s)	0.0106818	0.058404	0.3584979	1.1285
Anode side cooled	R <sub>θ</sub> (°C/kW)	1.5197	3.2398	5.7622	0.6312
	T <sub>θ</sub> (s)	0.0170581	0.2424644	6.013	15.364
Cathode side cooled	R <sub>θ</sub> (°C/kW)	1.4106	2.4667	6.7451	3.9054
	T <sub>θ</sub> (s)	0.0158344	0.1786951	3.6201	6.196

$$Z_{th} = \sum [R_{\theta} \times (1 - \exp. (t/t_{\theta}))] \quad [1]$$

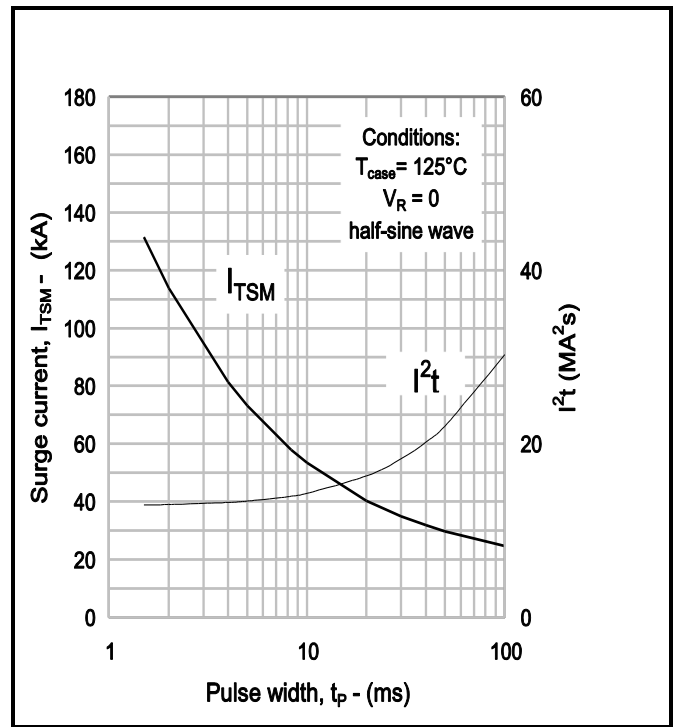
**ΔR<sub>th(j-c)</sub> Conduction**

Tables show the increments of thermal resistance R<sub>th(j-c)</sub> when the device operates at conduction angles other than d.c.

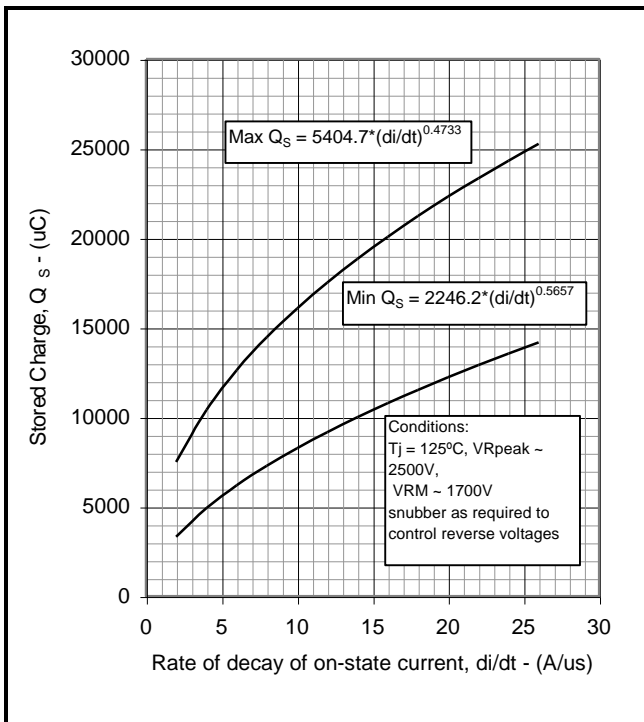
Double side cooling			Anode Side Cooling			Cathode Sided Cooling		
φ°	ΔZ <sub>th</sub> (z)		φ°	ΔZ <sub>th</sub> (z)		φ°	ΔZ <sub>th</sub> (z)	
	sine.	rect.		sine.	rect.		sine.	rect.
180	1.00	0.67	180	0.94	0.64	180	0.95	0.65
120	1.16	0.97	120	1.08	0.91	120	1.09	0.92
90	1.33	1.13	90	1.23	1.06	90	1.25	1.07
60	1.48	1.31	60	1.37	1.22	60	1.38	1.23
30	1.61	1.51	30	1.47	1.38	30	1.49	1.40
15	1.66	1.61	15	1.52	1.47	15	1.54	1.49



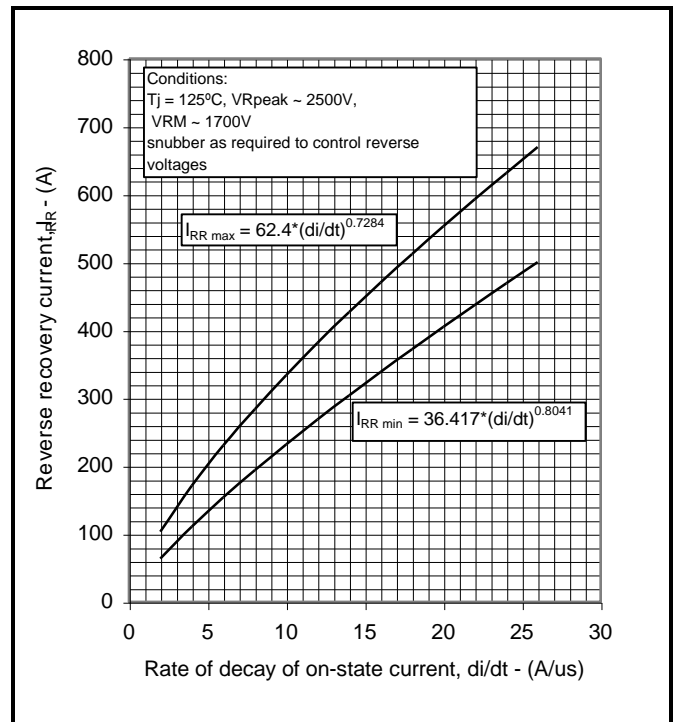
**Fig.10 Multi-cycle surge current**



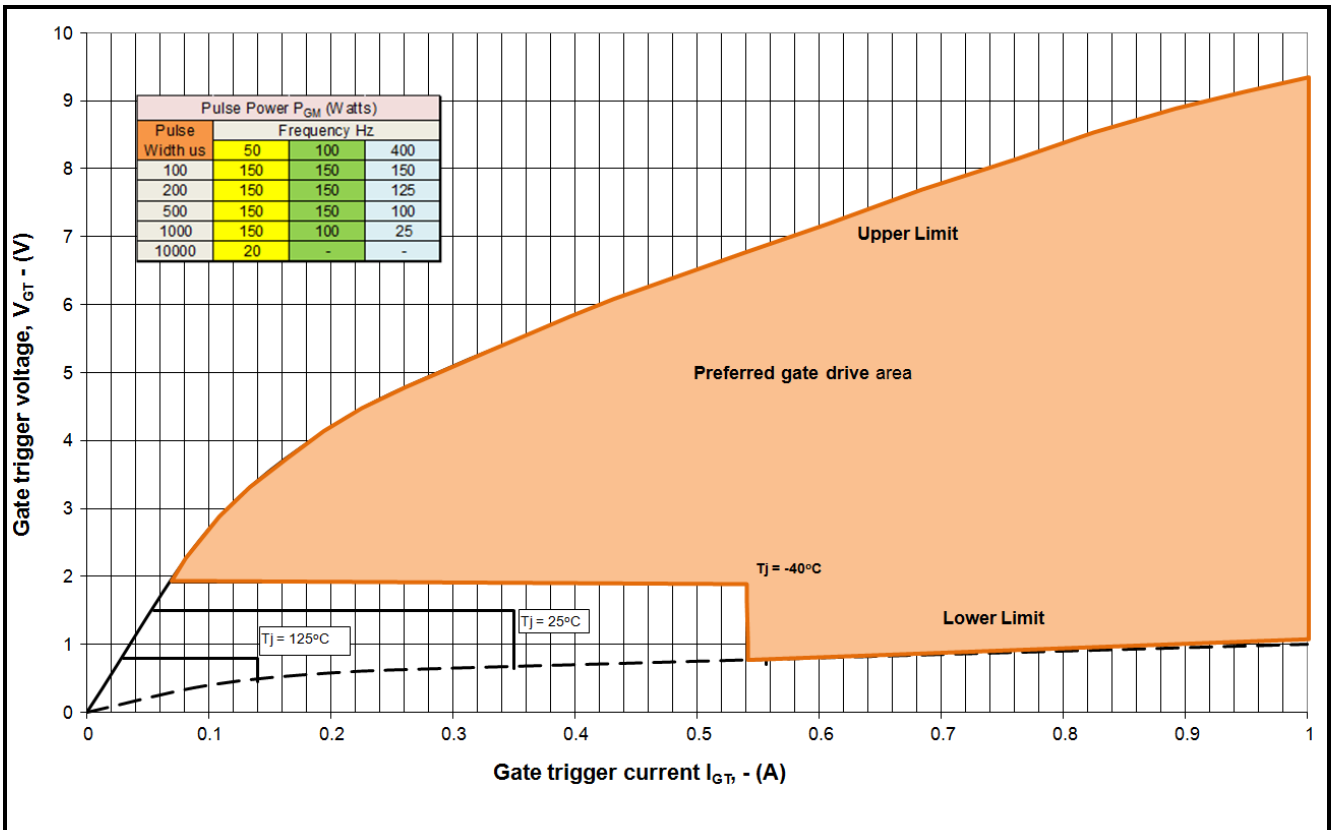
**Fig.11 Single-cycle surge current**



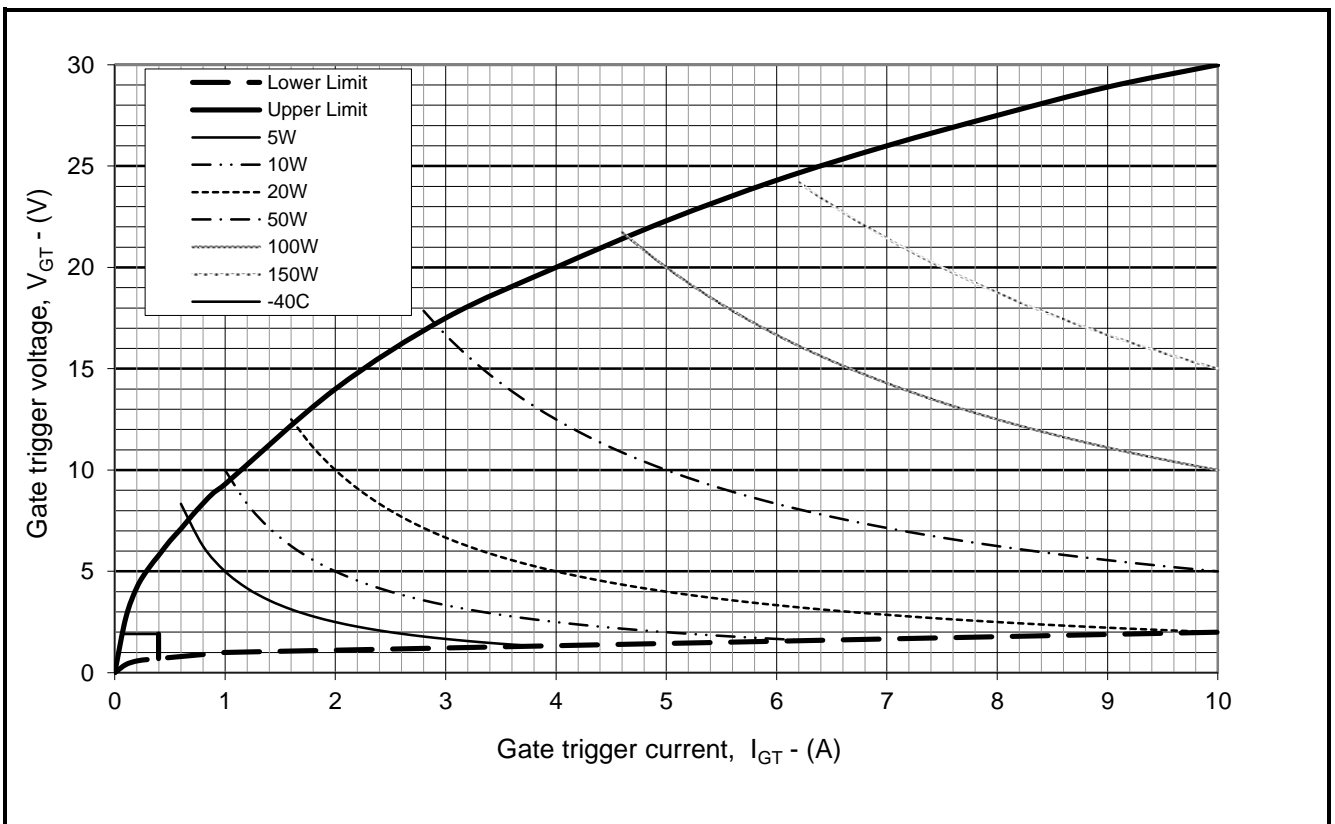
**Fig.12 Stored charge**



**Fig.13 Reverse recovery current**



**Fig14 Gate Characteristics**

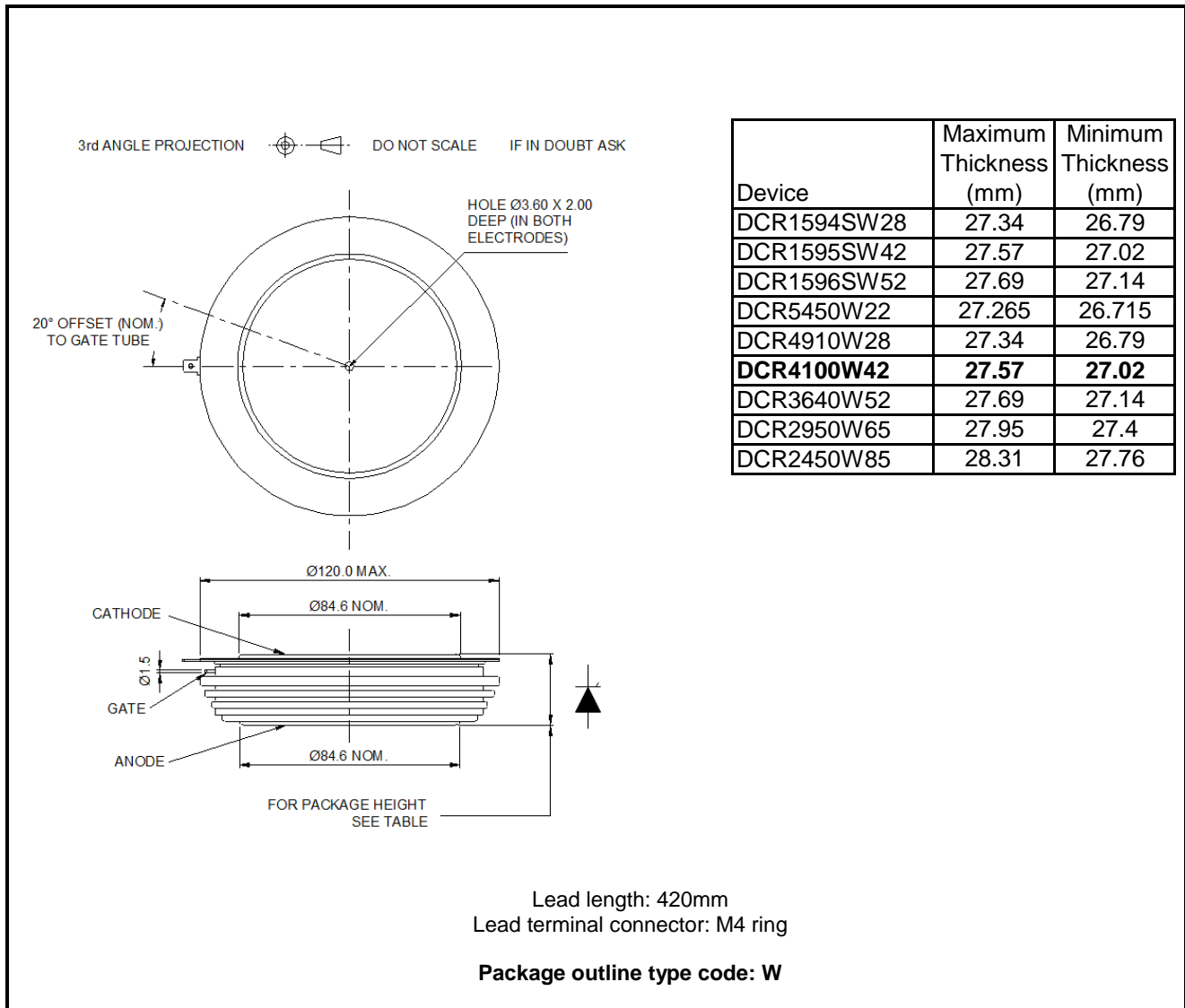


**Fig. 15 Gate characteristics**



**PACKAGE DETAILS**

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


**Fig.16 Package outline**

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**HEADQUARTERS OPERATIONS**

DYNEX SEMICONDUCTOR LIMITED  
Doddington Road, Lincoln, Lincolnshire, LN6 3LF  
United Kingdom.  
Phone: +44 (0) 1522 500500  
Fax: +44 (0) 1522 500550  
Web: <http://www.dynexsemi.com>

**CUSTOMER SERVICE**

Phone: +44 (0) 1522 502753 / 502901  
Fax: +44 (0) 1522 500020  
e-mail: [power\\_solutions@dynexsemi.com](mailto:power_solutions@dynexsemi.com)