

**FEATURES**

- Double Side Cooling
- High Surge Capability

**APPLICATIONS**

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

**VOLTAGE RATINGS**

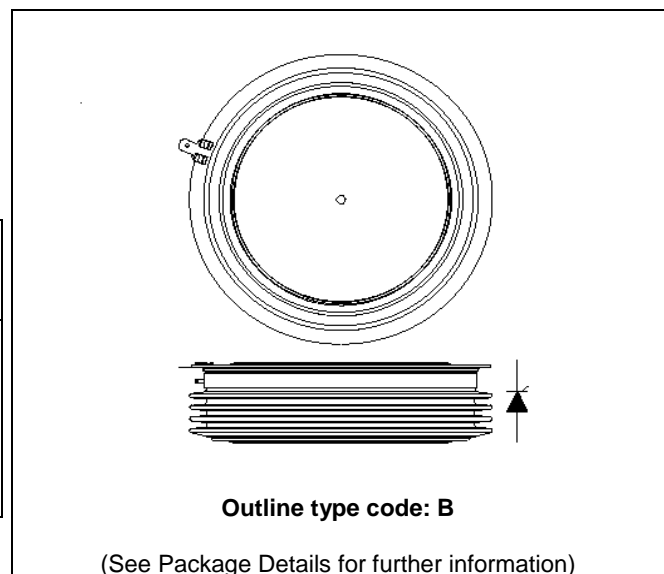
Part and Ordering Number	Repetitive Peak Voltages $V_{DRM}$ and $V_{RRM}$ V	Conditions
DCR4590B28	2800	$T_{vj} = -40^{\circ}\text{C}$ to $125^{\circ}\text{C}$ , $I_{DRM} = I_{RRM} = 200\text{mA}$ , $V_{DRM}, V_{RRM} t_p = 10\text{ms}$ , $V_{DSM} \& V_{RSM} =$ $V_{DRM} \& V_{RRM} + 100\text{V}$ respectively
DCR4590B26	2600	
DCR4590B24	2400	

Lower voltage grades available.

**KEY PARAMETERS**

$V_{DRM}$	<b>2800V</b>
$I_{T(AV)}$	<b>4950A</b>
$I_{TSM}$	<b>65000A</b>
$dV/dt^*$	<b>2000V/<math>\mu\text{s}</math></b>
$dI/dt$	<b>500A/<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:

**DCR4590B28**

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	4590	A
$I_{T(RMS)}$	RMS value	-	7210	A
$I_T$	Continuous (direct) on-state current	-	6180	A

## SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
$I_{TSM}$	Surge (non-repetitive) on-state current	10ms half sine, $T_{case} = 125^{\circ}\text{C}$	65	kA
$I^2t$	$I^2t$ for fusing	$V_R = 0$	21.13	$\text{MA}^2\text{s}$

## THERMAL AND MECHANICAL RATINGS

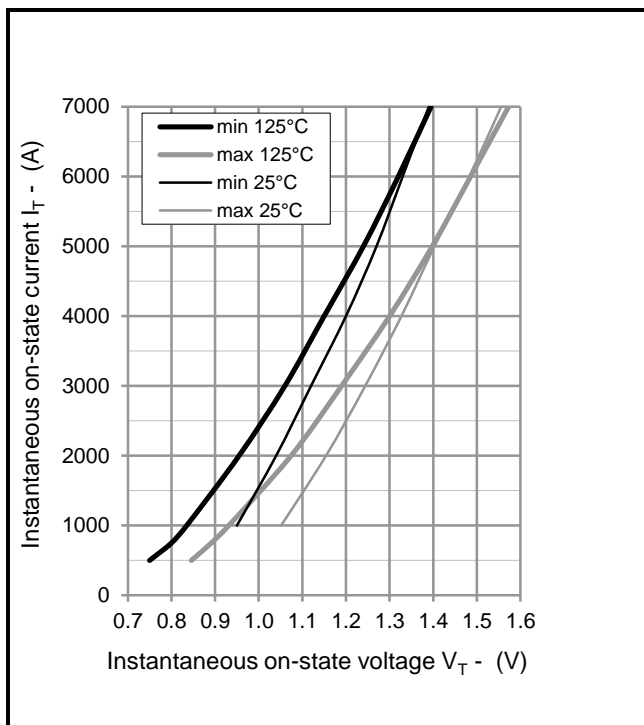
Symbol	Parameter	Test Conditions	Min.	Max.	Units	
$R_{th(j-c)}$	Thermal resistance – junction to case	Double side cooled	DC	-	0.007	$^{\circ}\text{C/W}$
		Single side cooled	Anode DC	-	0.0116	$^{\circ}\text{C/W}$
			Cathode DC	-	0.0181	$^{\circ}\text{C/W}$
$R_{th(c-h)}$	Thermal resistance – case to heatsink	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	-	2000	V/ $\mu s$	
$di/dt$	Rate of rise of on-state current	From 67% $V_{DRM}$ to $2x I_{T(AV)}$	Repetitive 50Hz	-	250	A/ $\mu s$
		Gate source 30V, 10 $\Omega$ , $t_r < 0.5\mu s$ , $T_j = 125^{\circ}C$	Non-repetitive	-	500	A/ $\mu s$
$V_{T(TO)}$	Threshold voltage – Low level	500A to 3000A at $T_{case} = 125^{\circ}C$	-	0.78	V	
	Threshold voltage – High level	3000A to 10000A at $T_{case} = 125^{\circ}C$	-	0.90	V	
$r_T$	On-state slope resistance – Low level	500A to 3000A at $T_{case} = 125^{\circ}C$	-	0.1371	m $\Omega$	
	On-state slope resistance – High level	3000A to 10000A at $T_{case} = 125^{\circ}C$	-	0.0957	m $\Omega$	
$t_{gd}$	Delay time	$V_D = 67\% V_{DRM}$ , gate source 30V, 10 $\Omega$ $t_r = 0.5\mu s$ , $T_j = 25^{\circ}C$		1.5	$\mu s$	
$t_q$	Turn-off time	$T_j = 125^{\circ}C$ , $V_R = 200V$ , $di/dt = 1A/\mu s$ , $dV_{DR}/dt = 20V/\mu s$ linear		250	$\mu s$	
$Q_S$	Stored charge	$I_T = 2000A$ , $T_j = 125^{\circ}C$ , $di/dt = 1A/\mu s$ ,	545	2030	$\mu C$	
$I_L$	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**

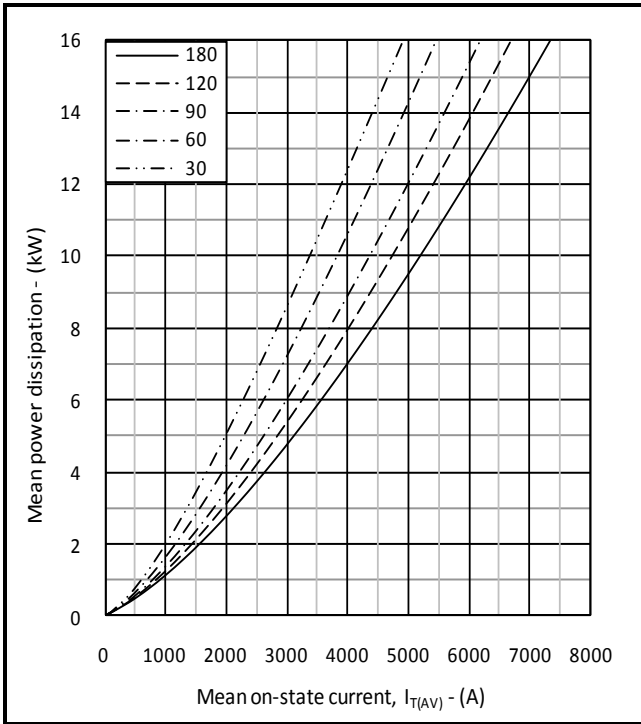
Symbol	Parameter	Test Conditions	Max.	Units
$V_{GT}$	Gate trigger voltage	$V_{DRM} = 5V, T_{case} = 25^{\circ}C$	1.5	V
$V_{GD}$	Gate non-trigger voltage	At 50% $V_{DRM}, T_{case} = 125^{\circ}C$	0.4	V
$I_{GT}$	Gate trigger current	$V_{DRM} = 5V, T_{case} = 25^{\circ}C$	250	mA
$I_{GD}$	Gate non-trigger current	At 50% $V_{DRM}, T_{case} = 125^{\circ}C$	10	mA

**CURVES**

**Fig.2 Maximum & minimum on-state characteristics**
 **$V_{TM}$  EQUATION**

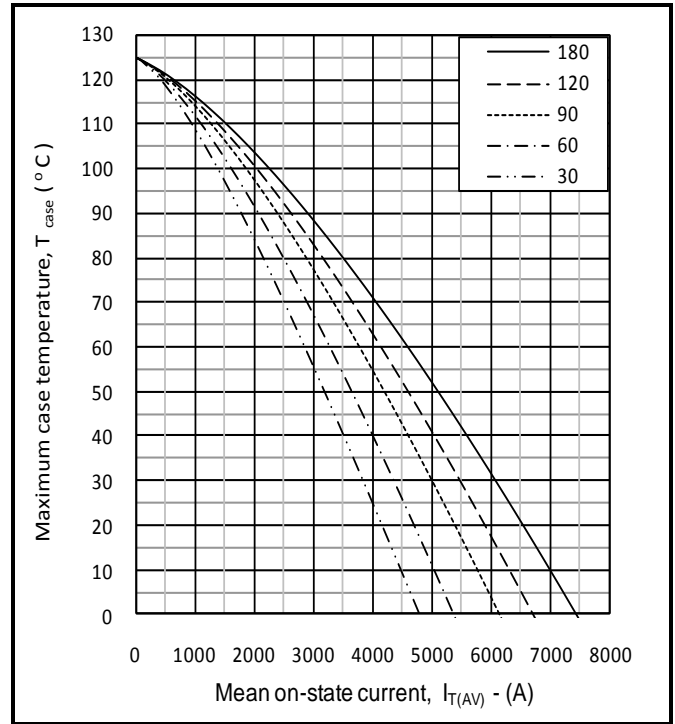
$$V_{TM} = A + B \ln(I_T) + C \cdot I_T + D \cdot \sqrt{I_T}$$

Where  $A = 1.344406$   
 $B = -0.153272$   
 $C = -0.000026$   
 $D = 0.021061$

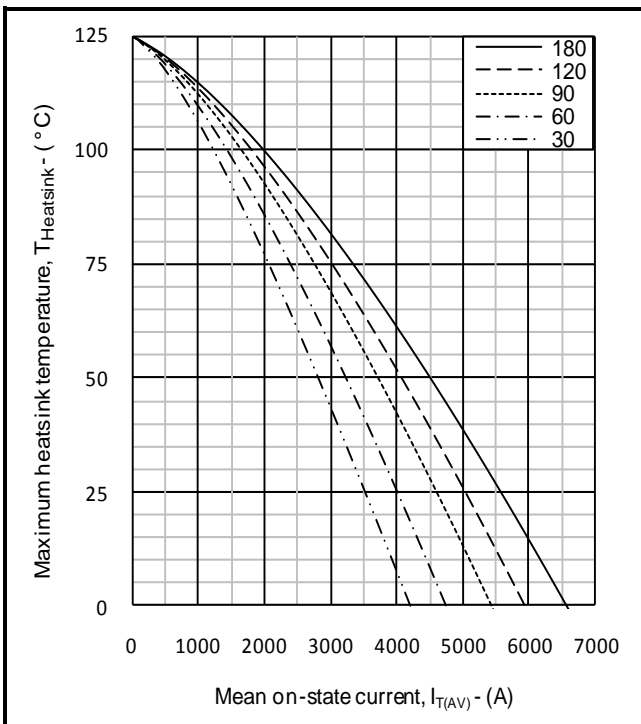
these values are valid for  $T_j = 125^{\circ}C$  for  $I_T$  500A to 10000A



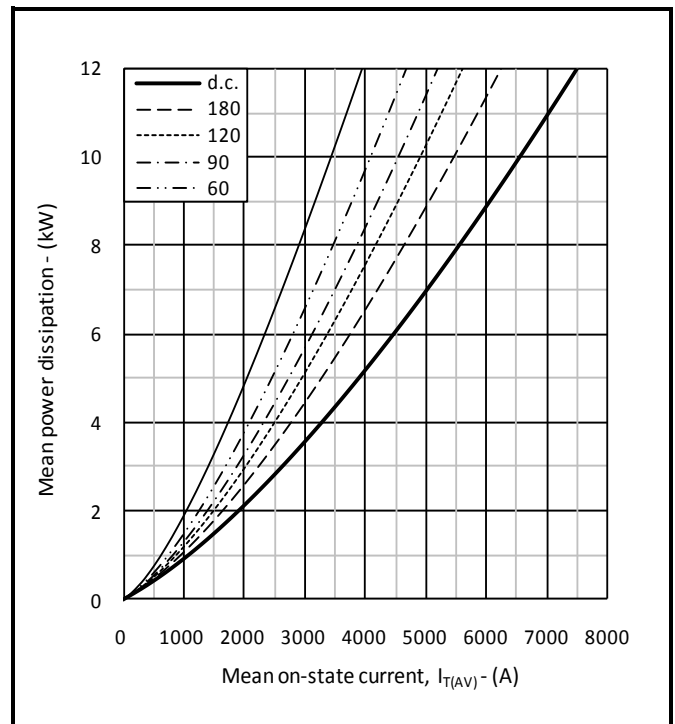
**Fig.3 On-state power dissipation – sine wave**



**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**

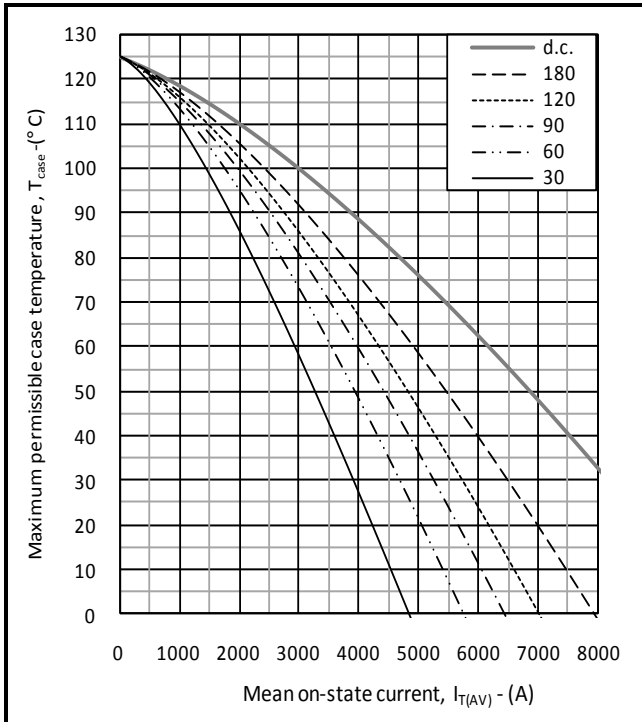


Fig.7 Maximum permissible case temperature, double side cooled – rectangular wave

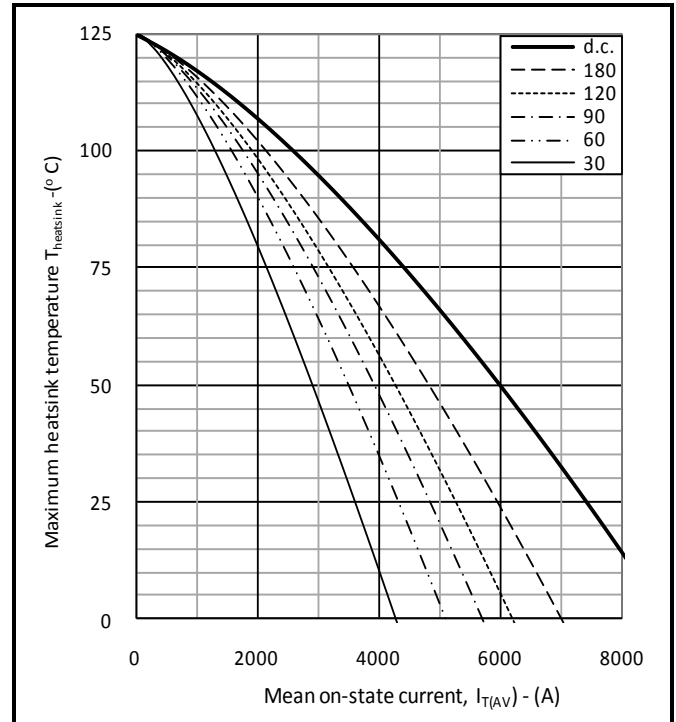


Fig.8 Maximum permissible heatsink temperature, double side cooled – rectangular wave

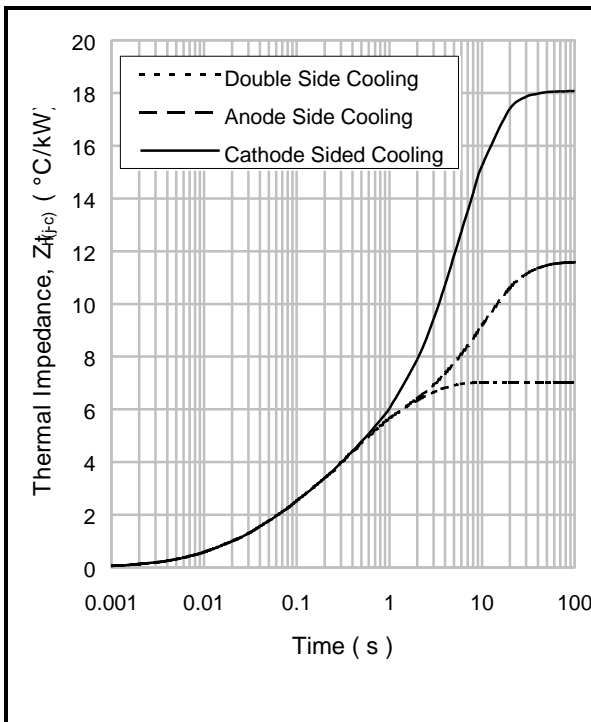


Fig.9 Maximum (limit) transient thermal impedance – junction to case (°C/kW)

		1	2	3	4
Double side cooled	R <sub>i</sub> (°C/kW)	0.502	1.333	2.9559	2.2335
	T <sub>i</sub> (s)	0.013708	0.054888	0.331193	1.6905
Anode side cooled	R <sub>i</sub> (°C/kW)	1.3035	3.138	1.1859	5.9136
	T <sub>i</sub> (s)	0.025107	0.241026	1.0806	11.002
Cathode side cooled	R <sub>i</sub> (°C/kW)	1.2616	2.6216	13.3603	0.8304
	T <sub>i</sub> (s)	0.024584	0.200504	5.7854	16.765

$$Z_{th} = \sum_{i=1}^{i=4} [R_i \times (1 - \exp(-T / T_i))]$$

**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		
θ°	ΔZ <sub>th</sub> (z)		θ°	ΔZ <sub>th</sub> (z)		θ°	ΔZ <sub>th</sub> (z)	
	sine.	rect.		sine.	rect.		sine.	rect.
180	0.70	0.48	180	0.67	0.47	180	0.67	0.47
120	0.80	0.68	120	0.77	0.66	120	0.77	0.66
90	0.90	0.78	90	0.87	0.75	90	0.87	0.76
60	1.00	0.89	60	0.95	0.86	60	0.95	0.86
30	1.07	1.01	30	1.02	0.96	30	1.02	0.96
15	1.10	1.07	15	1.05	1.02	15	1.05	1.02

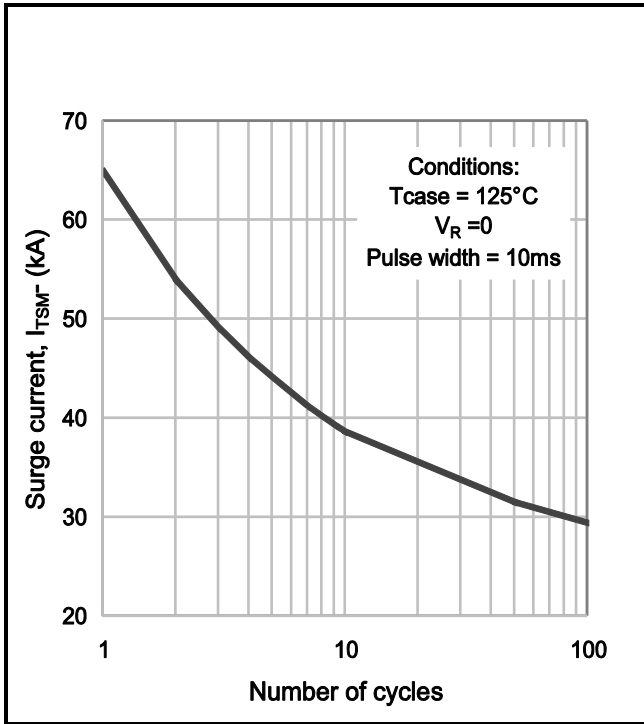


Fig.10 Multi-cycle surge current

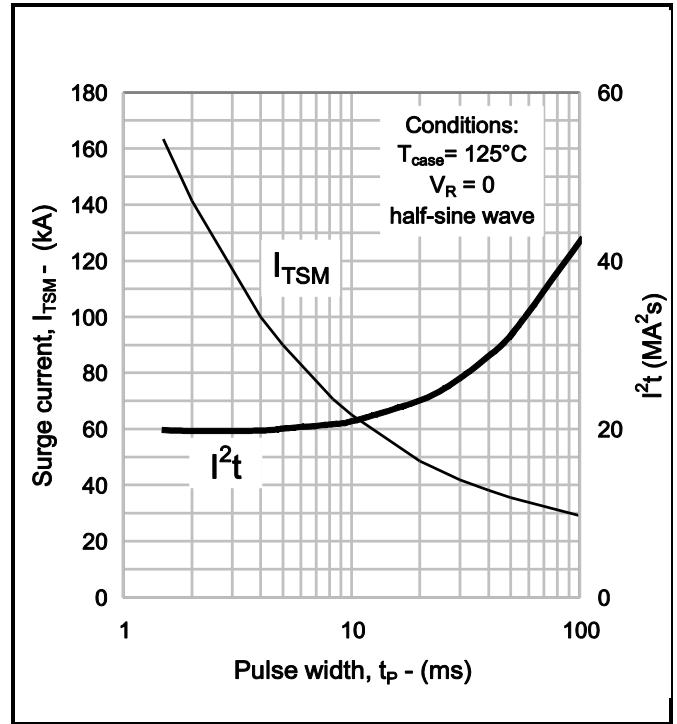


Fig.11 Single-cycle surge current

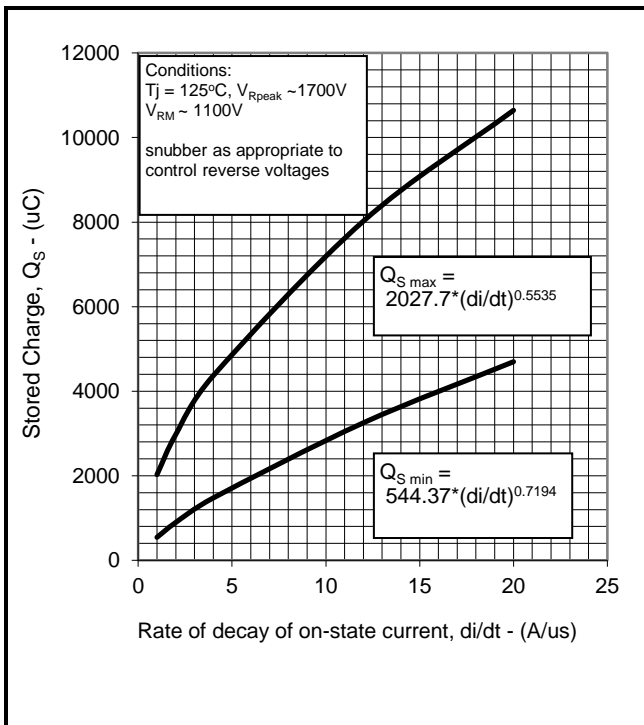


Fig.12 Stored charge

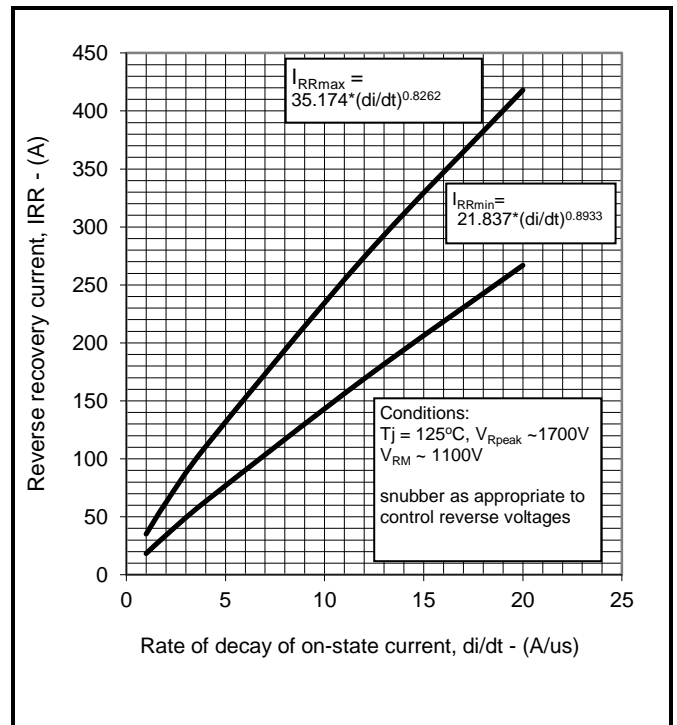
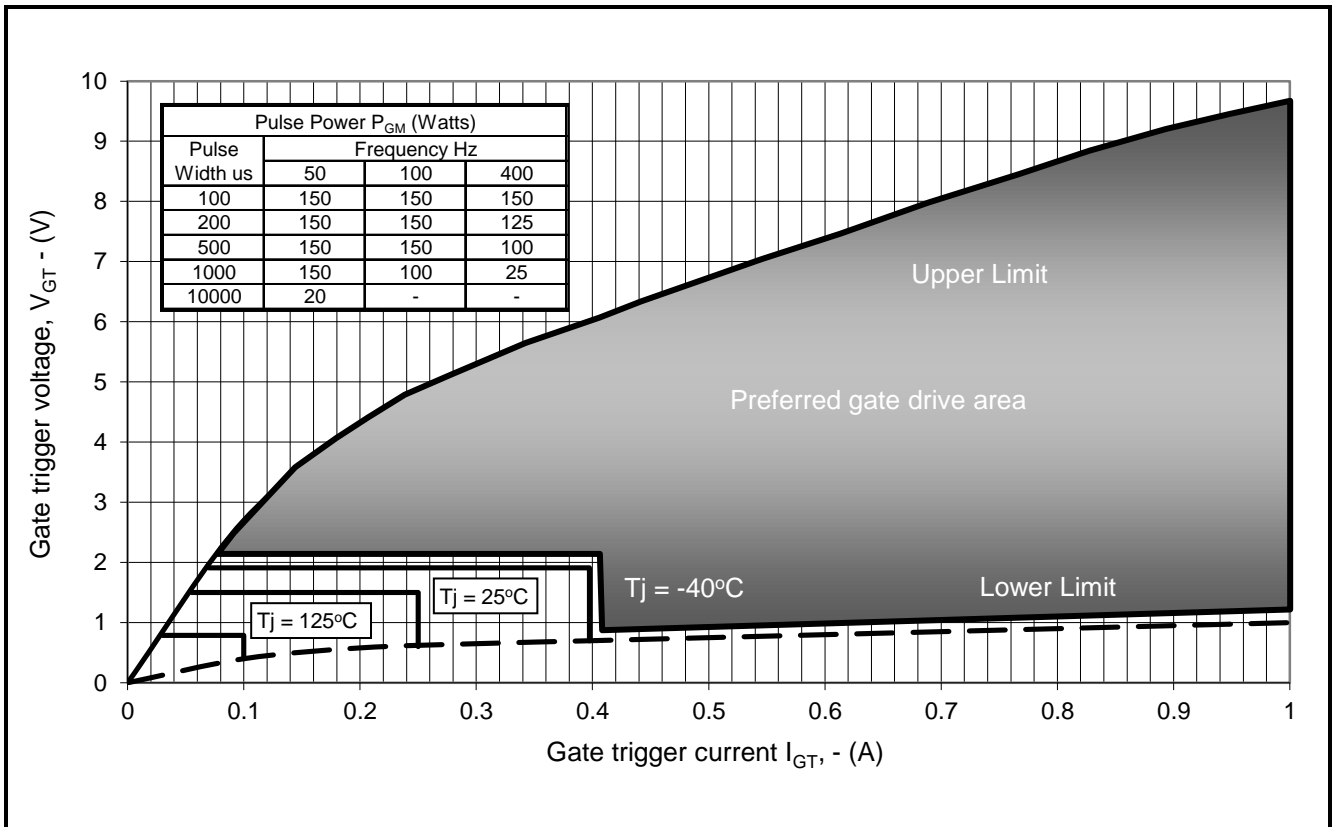
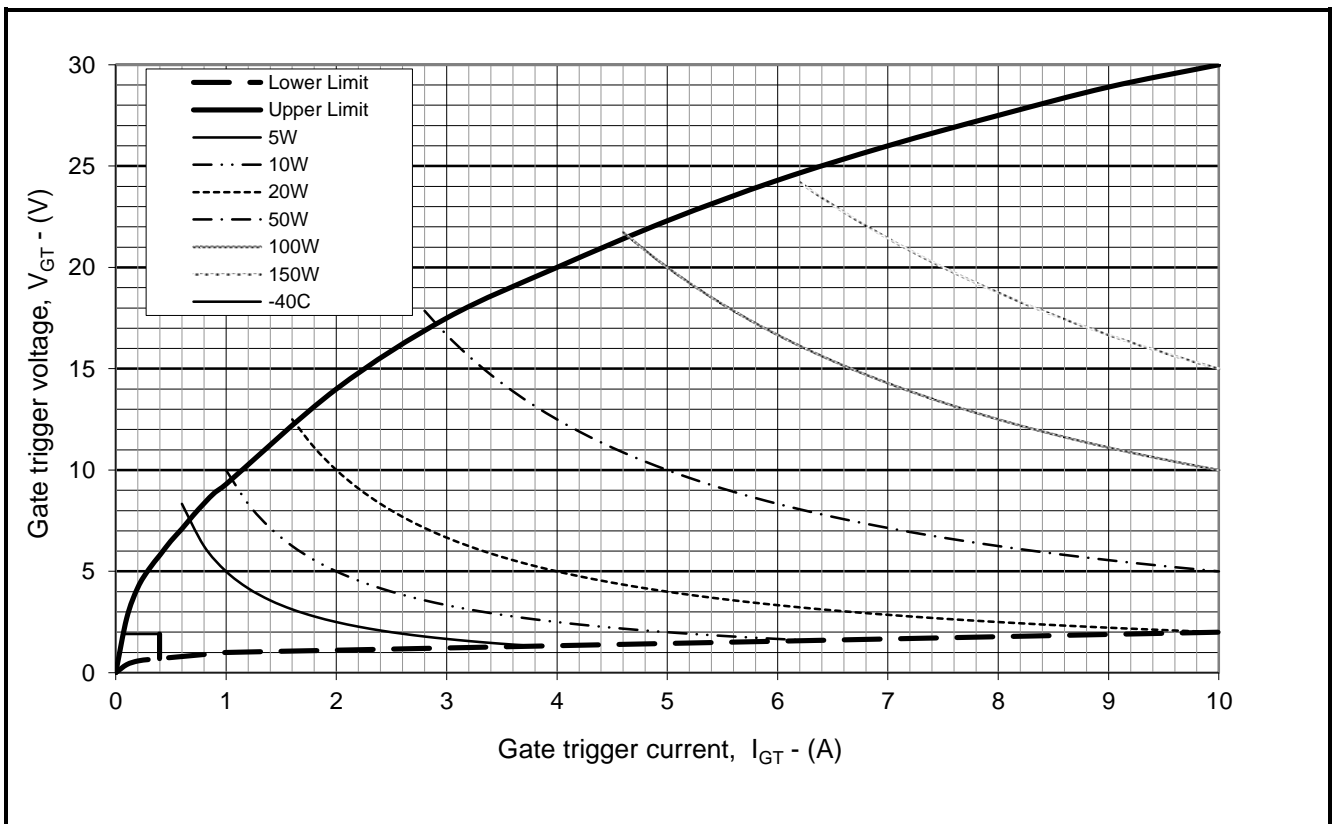


Fig.13 Reverse recovery current



**Fig14 Gate Characteristics**

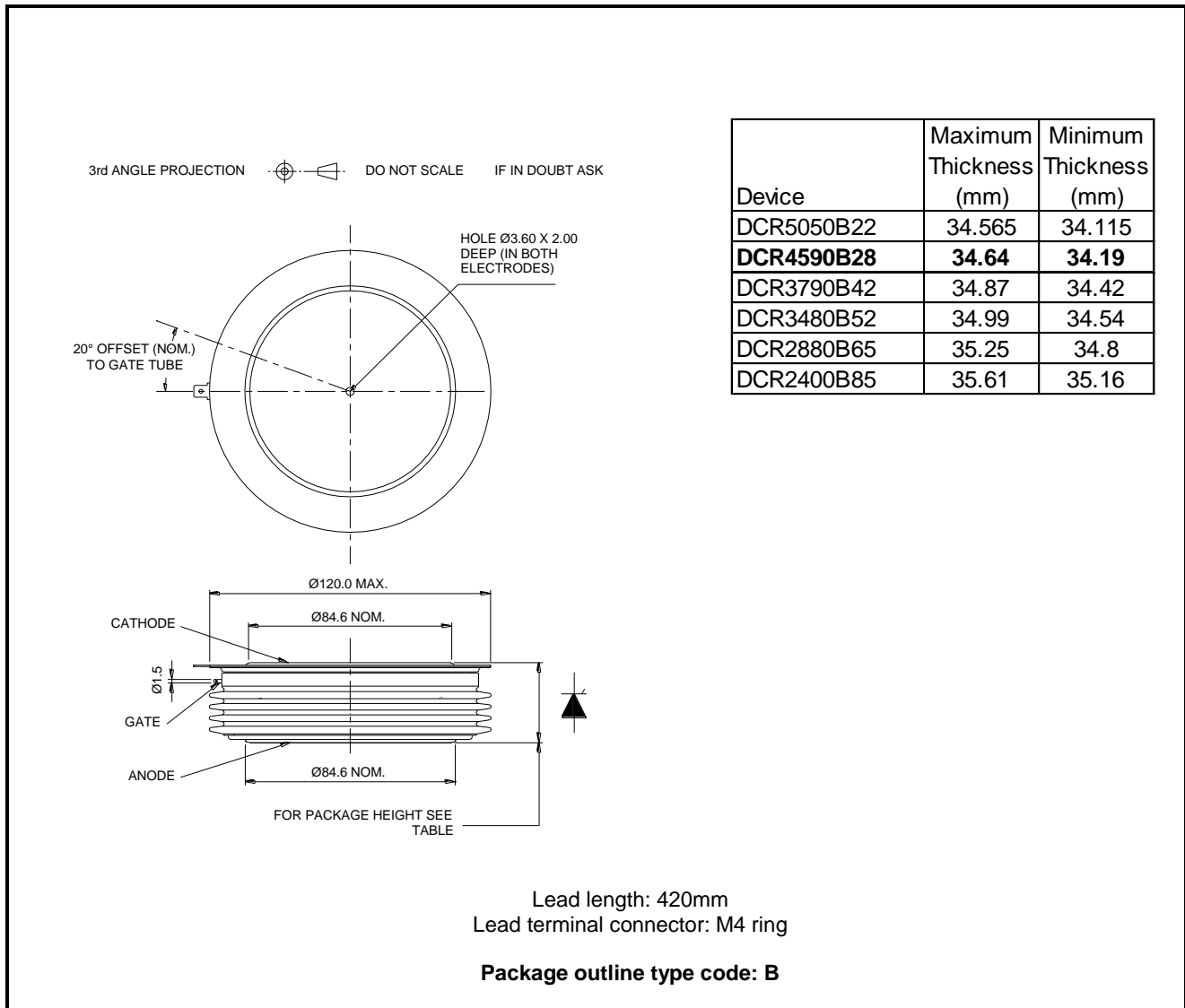


**Fig. 15 Gate characteristics**



**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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