

**FEATURES**

- Double Side Cooling
- High Surge Capability

**KEY PARAMETERS**

$V_{DRM}$	<b>4200V</b>
$I_{T(AV)}$	<b>780A</b>
$I_{TSM}$	<b>10500A</b>
$dV/dt^*$	<b>1500V/<math>\mu</math>s</b>
$dI/dt$	<b>400A/<math>\mu</math>s</b>

**APPLICATIONS**

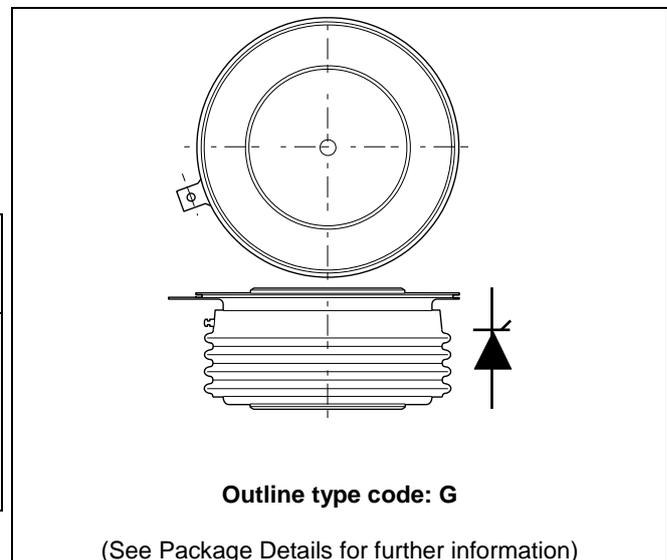
- High Power Drives
- High Voltage Power Supplies
- Static Switches

\* Higher  $dV/dt$  selections available

**VOLTAGE RATINGS**

Part and Ordering Number	Repetitive Peak Voltages $V_{DRM}$ and $V_{RRM}$ V	Conditions
DCR780G42	4200	$T_{vj} = -40^{\circ}\text{C}$ to $125^{\circ}\text{C}$ , $I_{DRM} = I_{RRM} = 100\text{mA}$ , $V_{DRM}, V_{RRM} t_p = 10\text{ms}$ , $V_{DSM} \& V_{RSM} =$ $V_{DRM} \& V_{RRM} + 100\text{V}$ respectively
DCR780G40	4000	
DCR780G38	3800	

Lower voltage grades available.



**Fig. 1 Package outline**

**ORDERING INFORMATION**

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

For example:

**DCR780G42**

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	780	A
$I_{T(RMS)}$	RMS value	-	1225	A
$I_T$	Continuous (direct) on-state current	-	1173	A

## SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
$I_{TSM}$	Surge (non-repetitive) on-state current	10ms half sine, $T_{case} = 125^{\circ}\text{C}$	10.5	kA
$I^2t$	$I^2t$ for fusing	$V_R = 0$	0.55	$\text{MA}^2\text{s}$

## THERMAL AND MECHANICAL RATINGS

Symbol	Parameter	Test Conditions	Min.	Max.	Units	
$R_{th(j-c)}$	Thermal resistance – junction to case	Double side cooled	DC	-	0.0268	$^{\circ}\text{C/W}$
		Single side cooled	Anode DC	-	0.0527	$^{\circ}\text{C/W}$
			Cathode DC	-	0.0652	$^{\circ}\text{C/W}$
$R_{th(c-h)}$	Thermal resistance – case to heatsink	Clamping force 11.5kN (with mounting compound)	Double side	-	0.0072	$^{\circ}\text{C/W}$
			Single side	-	.0144	$^{\circ}\text{C/W}$
$T_{vj}$	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		10	13	kN	

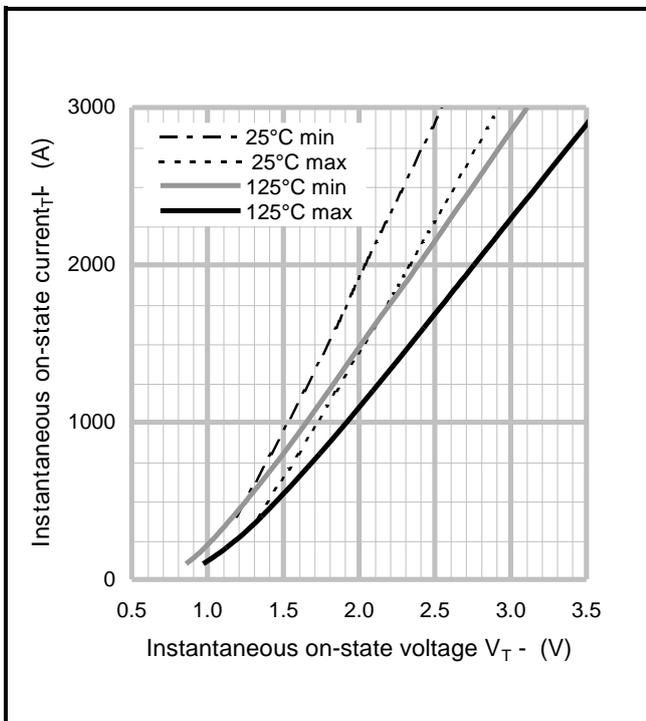
**DYNAMIC CHARACTERISTICS**

Symbol	Parameter	Test Conditions	Min.	Max.	Units	
$I_{RRM}/I_{DRM}$	Peak reverse and off-state current	At $V_{RRM}/V_{DRM}$ , $T_{case} = 125^{\circ}C$	-	100	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	100A to 500A at $T_{case} = 125^{\circ}C$	-	.87	V	
	Threshold voltage – High level	500A to 3000A at $T_{case} = 125^{\circ}C$	-	1.053	V	
$r_T$	On-state slope resistance – Low level	100A to 500A at $T_{case} = 125^{\circ}C$	-	1.2244	m $\Omega$	
	On-state slope resistance – High level	500A to 3000A at $T_{case} = 125^{\circ}C$	-	0.8443	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	$T_j = 125^{\circ}C$ , $V_R = 200V$ , $di/dt = 5A/\mu$ s, $dV_{DR}/dt = 20V/\mu$ s linear	300	600	$\mu$ s	
$Q_S$	Stored charge	$I_T = 2000A$ , $T_j = 125^{\circ}C$ , $di/dt = 5A/\mu$ s,	1100	2200	$\mu$ 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 50% 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	At 50% V <sub>DRM</sub> , T <sub>case</sub> = 125°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 = 0.251561  
 B = 0.154175  
 C = 0.000839  
 D = -0.007548

these values are valid for  $T_j = 125^\circ\text{C}$  for  $I_T$  50A to 3000A

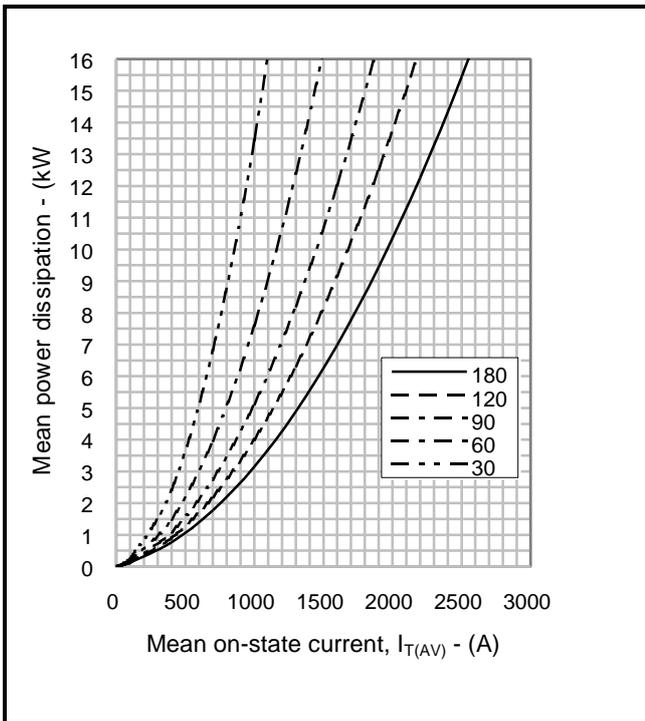


Fig.3 On-state power dissipation – sine wave

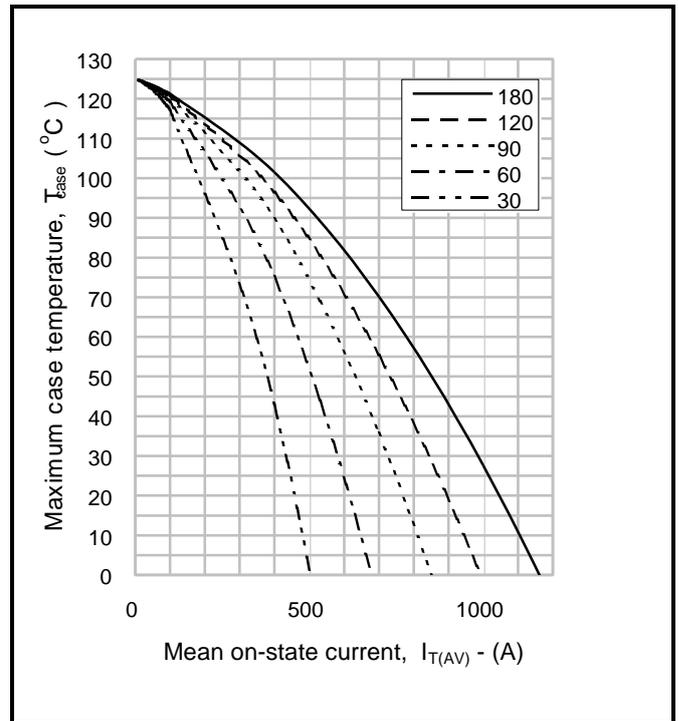


Fig.4 Maximum permissible case temperature, double side cooled – sine wave

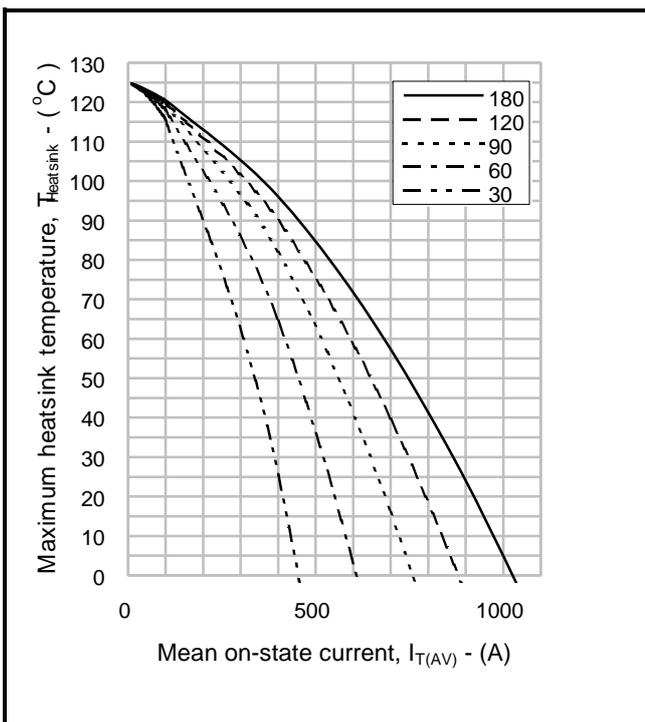


Fig.5 Maximum permissible heatsink temperature, double side cooled – sine wave

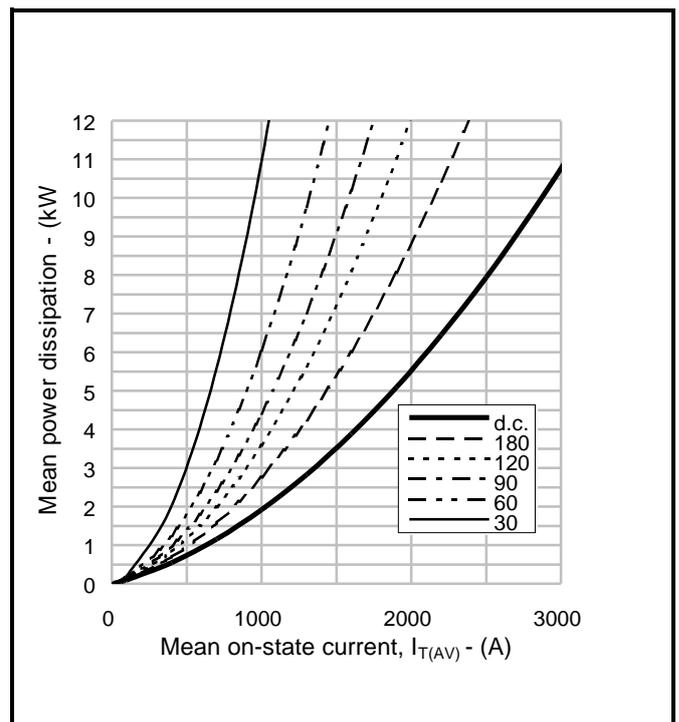


Fig.6 On-state power dissipation – rectangular wave

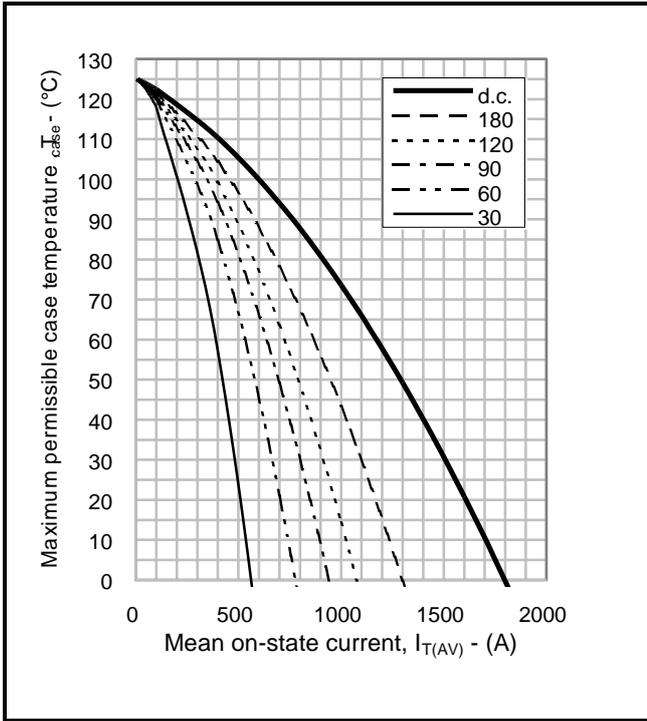


Fig.7 Maximum permissible case temperature, double side cooled – rectangular wave

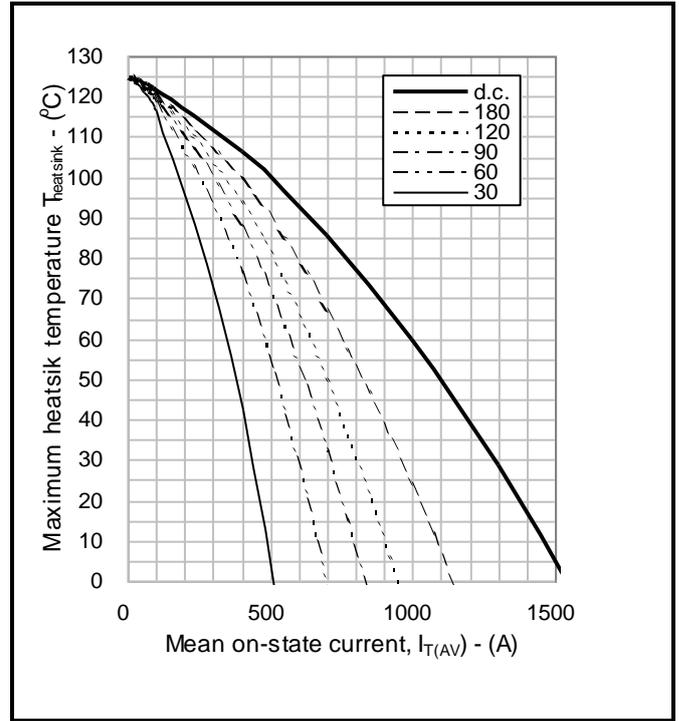


Fig.8 Maximum permissible heatsink temperature, double side cooled – rectangular wave

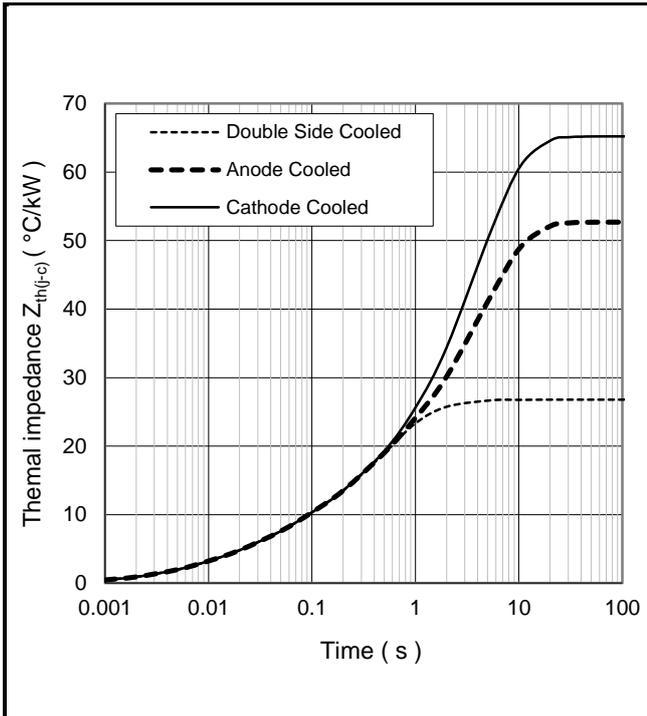


Fig.9 Maximum (limit) transient thermal impedance – junction to case (°C/kW)

		1	2	3	4
Double side cooled	R <sub>i</sub> (°C/kW)	2.2995	5.4226	16.9074	2.1488
	T <sub>i</sub> (s)	0.0066401	0.0457025	0.4962482	1.8248
Anode side cooled	R <sub>i</sub> (°C/kW)	2.3214	5.2661	10.2686	34.8031
	T <sub>i</sub> (s)	0.0066948	0.045528	0.3484209	4.582
Cathode side cooled	R <sub>i</sub> (°C/kW)	2.4895	5.9105	7.4256	49.3432
	T <sub>i</sub> (s)	0.0070404	0.052895	0.3933903	4.2295

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

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		
ΔZ <sub>th</sub> (z)			ΔZ <sub>th</sub> (z)			ΔZ <sub>th</sub> (z)		
θ°	sine.	rect.	θ°	sine.	rect.	θ°	sine.	rect.
180	4.15	2.72	180	4.15	2.72	180	4.13	2.71
120	4.90	4.02	120	4.89	4.02	120	4.87	4.00
90	5.74	4.79	90	5.73	4.78	90	5.69	4.76
60	6.53	5.65	60	6.52	5.65	60	6.46	5.60
30	7.16	6.64	30	7.15	6.62	30	7.07	6.56
15	7.46	7.18	15	7.44	7.16	15	7.36	7.09

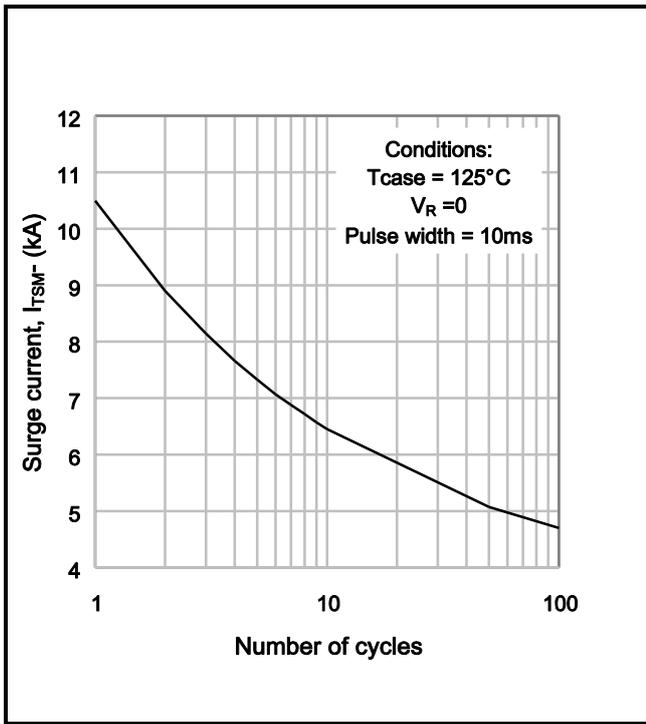


Fig.10 Multi-cycle surge current

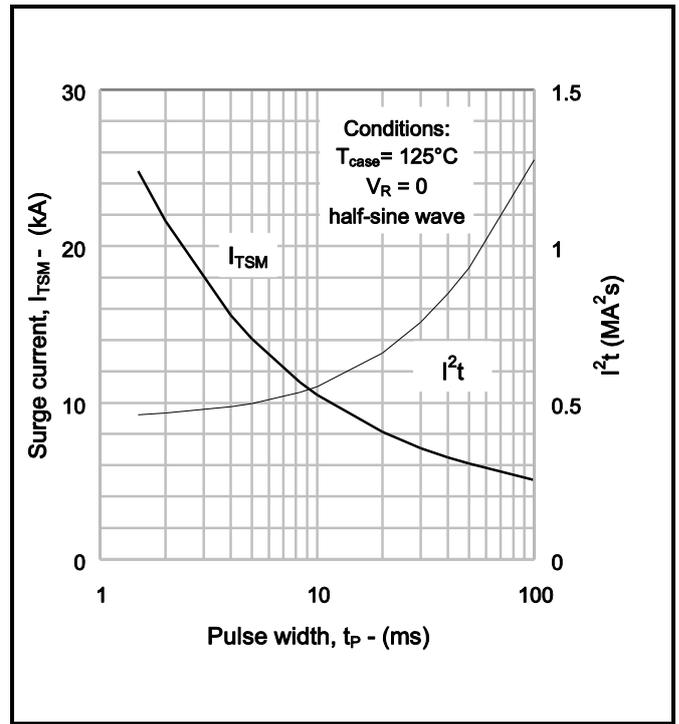


Fig.11 Single-cycle surge current

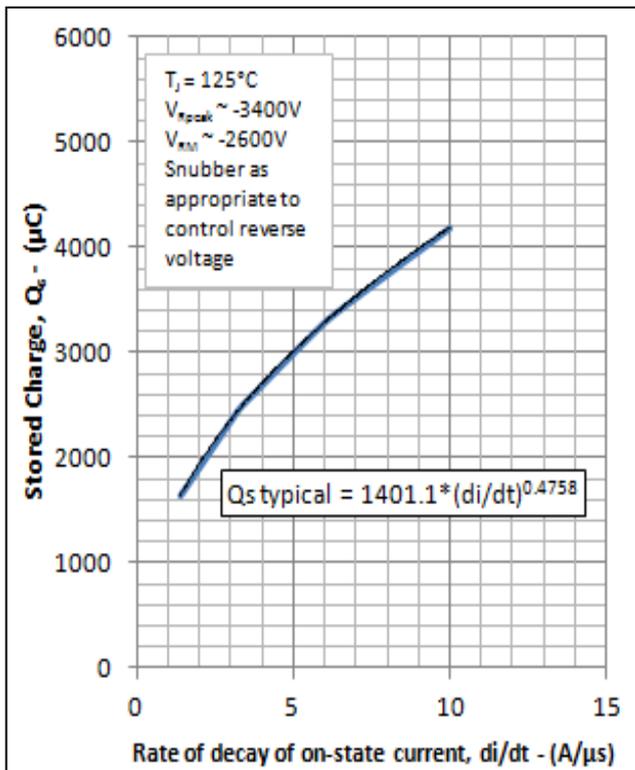


Fig.12 Stored Charge vs di/dt

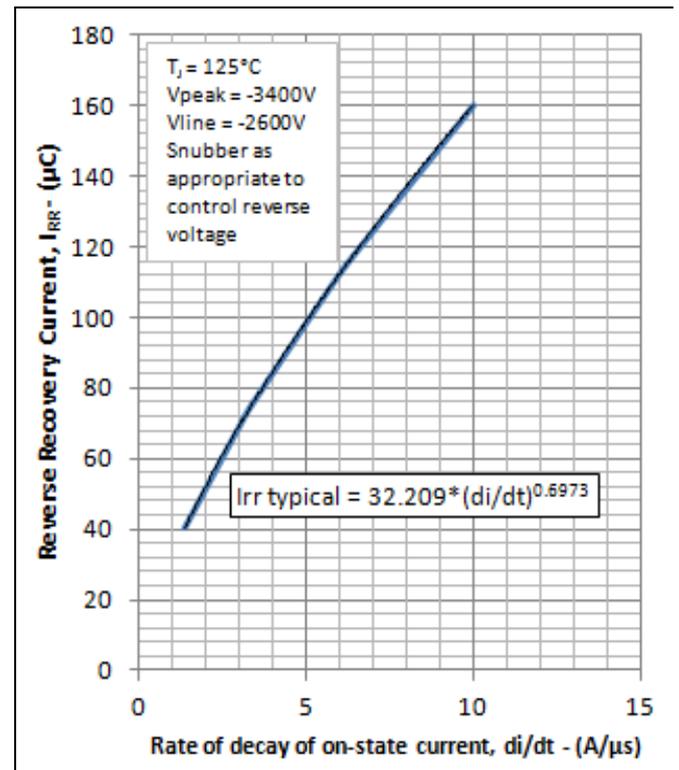


Fig.13 Reverse Recovery Current vs di/dt

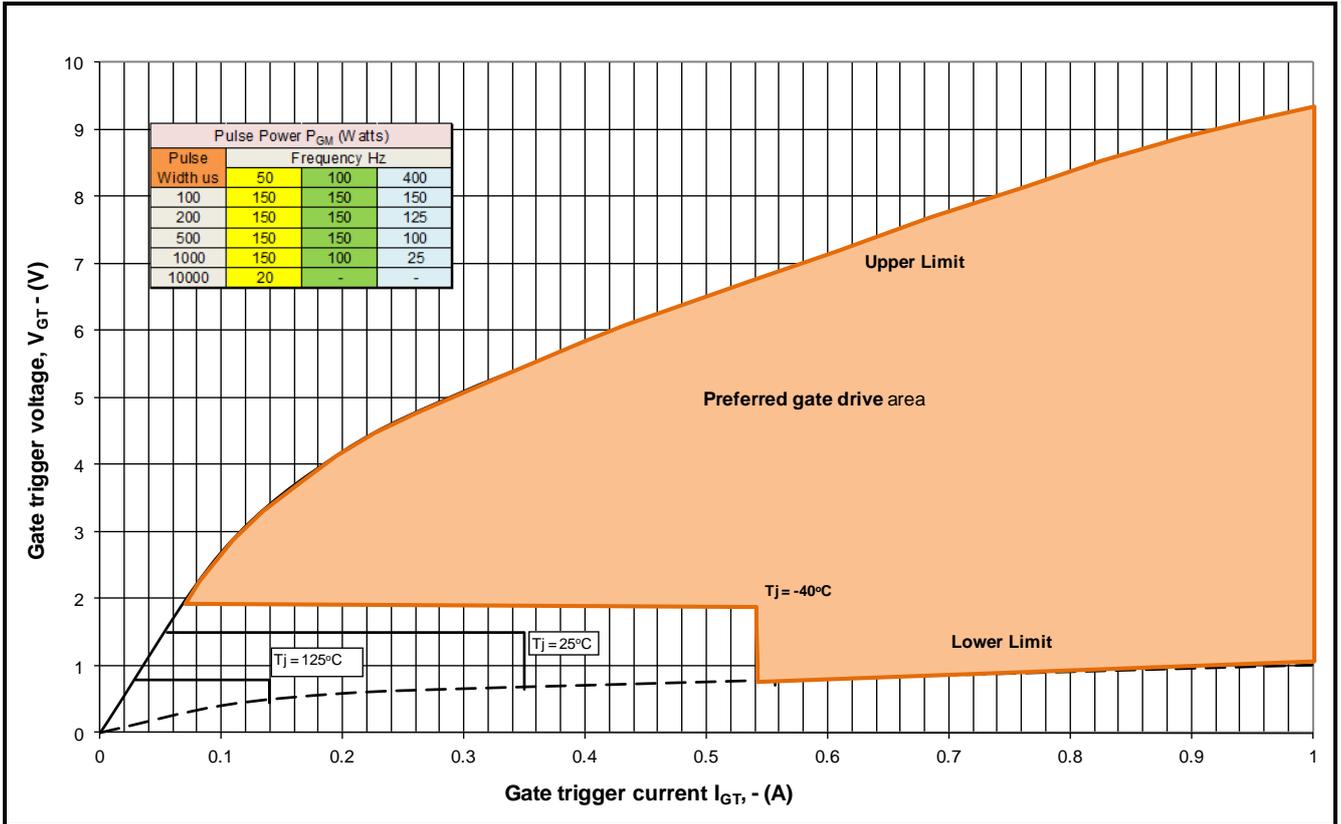


Fig14 Gate Characteristics

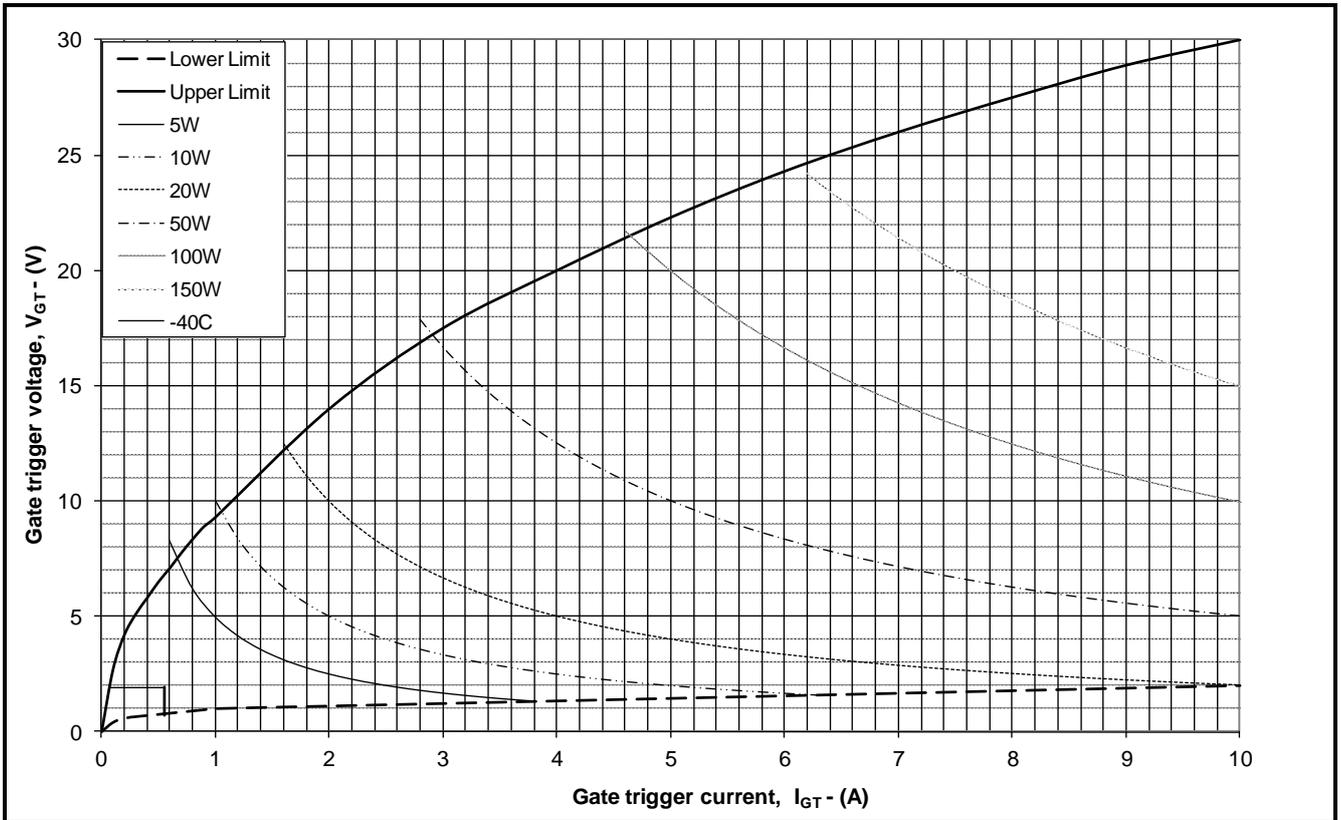
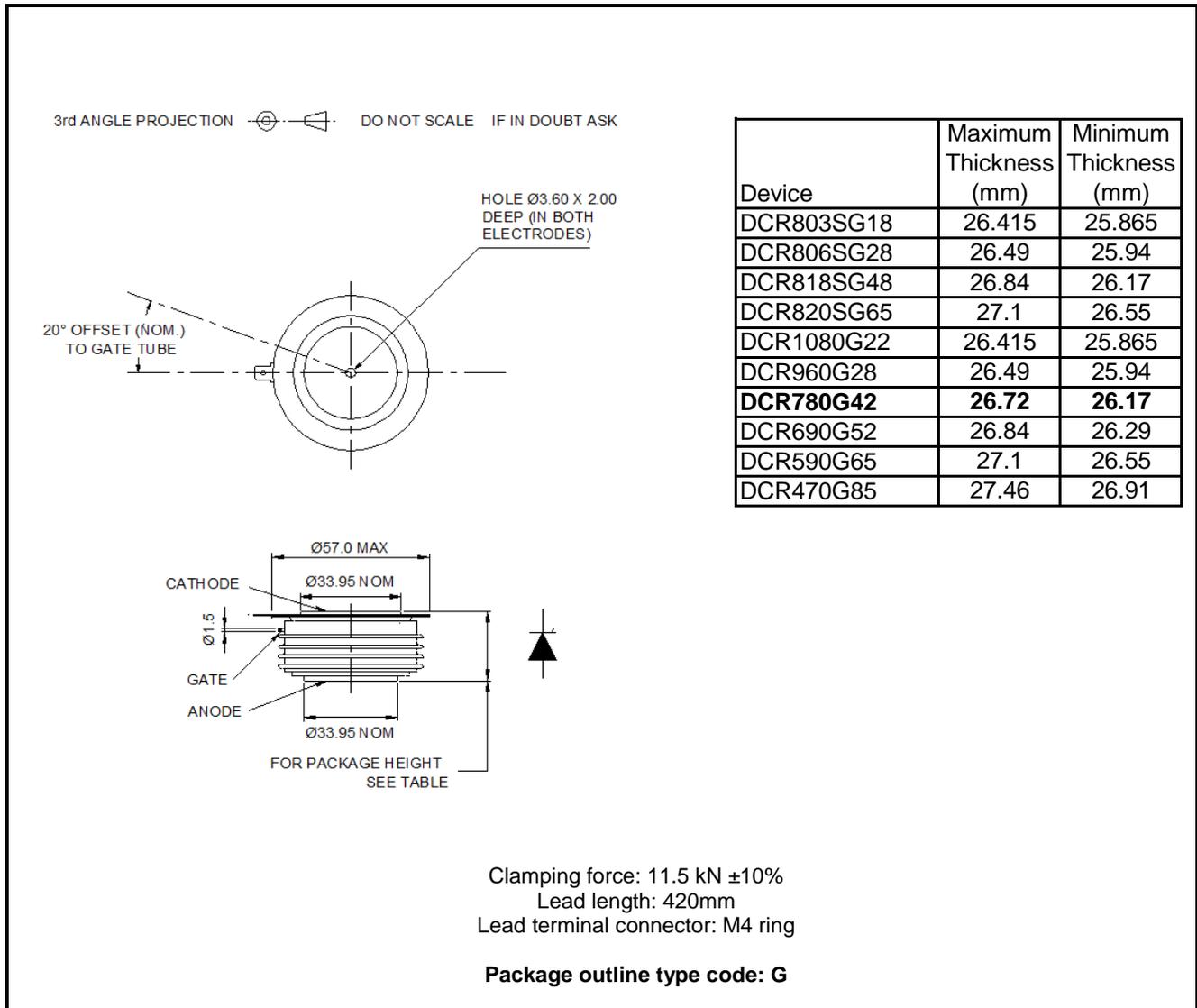


Fig. 15 Gate characteristics

**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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