



Phase Control Thyristor

DS6078-1 September 2012 (LN 29818)

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
DCR2760M85*	8500	$T_{vj} = -40^{\circ}\text{C}$ to 125°C , $I_{DRM} = I_{RRM} = 300\text{mA}$, $V_{DRM}, V_{RRM} t_p = 10\text{ms}$, $V_{DSM} \& V_{RSM} =$ $V_{DRM} \& V_{RRM} + 100\text{V}$ respectively
DCR2760M80	8000	
DCR2760M75	7500	
DCR2760M70	7000	

Lower voltage grades available.
 *8200V @ -40°C , 8500V @ 0°C

KEY PARAMETERS

V_{DRM}	8500V
$I_{T(AV)}$	2765A
I_{TSM}	32500A
dV/dt^*	1500V/ μs
di/dt	200A/ μs

* Higher dV/dt selections available

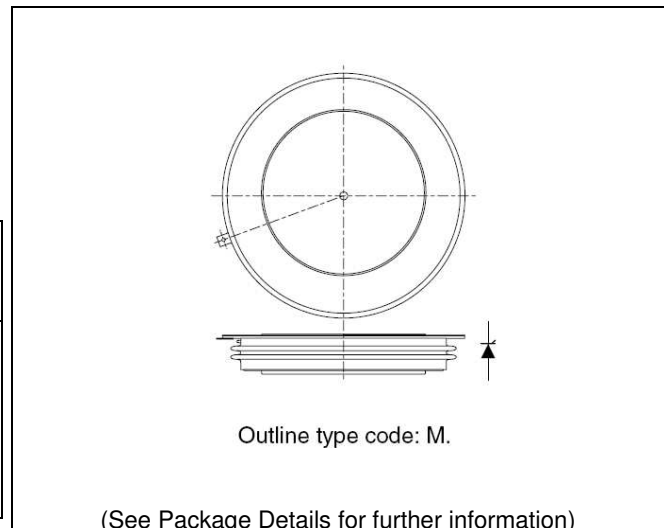


Fig. 1 Package outline

ORDERING INFORMATION

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

For example:

DCR2760M85

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
Double Side Cooled				
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	2765	A
$I_{T(RMS)}$	RMS value	-	4343	A
I_T	Continuous (direct) on-state current	-	4083	A

SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine, $T_{case} = 125^{\circ}\text{C}$	32.5	kA
I^2t	I^2t for fusing	$V_R = 0$	5.28	MA^2s

THERMAL AND MECHANICAL RATINGS

Symbol	Parameter	Test Conditions	Min.	Max.	Units	
$R_{th(j-c)}$	Thermal resistance – junction to case	Double side cooled	DC	-	0.00518	$^{\circ}\text{C/W}$
		Single side cooled	Anode DC	-	0.01012	$^{\circ}\text{C/W}$
			Cathode DC	-	0.01080	$^{\circ}\text{C/W}$
$R_{th(c-h)}$	Thermal resistance – case to heatsink	Clamping force 83.0kN (with mounting compound)	Double side	-	0.001	$^{\circ}\text{C/W}$
			Single side	-	0.002	$^{\circ}\text{C/W}$
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		74.0	91.0	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} , $T_{case} = 125^{\circ}C$	-	300	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/ μs	
dI/dt	Rate of rise of on-state current	From 67% V_{DRM} to $2x I_{T(AV)}$	Repetitive 50Hz	-	100	A/ μs
		Gate source 30V, 10 Ω , $t_r < 0.5\mu s$, $T_j = 125^{\circ}C$	Non-repetitive	-	200	A/ μs
$V_{T(TO)}$	Threshold voltage – Low level	500 to 1600A at $T_{case} = 125^{\circ}C$	-	0.9	V	
	Threshold voltage – High level	1600 to 4000A at $T_{case} = 125^{\circ}C$	-	1.18	V	
r_T	On-state slope resistance – Low level	500A to 1600A at $T_{case} = 125^{\circ}C$	-	0.65	m Ω	
	On-state slope resistance – High level	1600A to 4000A at $T_{case} = 125^{\circ}C$	-	0.46	m Ω	
t_{gd}	Delay time	$V_D = 67\% V_{DRM}$, gate source 30V, 10 Ω $t_r = 0.5\mu s$, $T_j = 25^{\circ}C$	-	3	μs	
t_q	Turn-off time	$I_T = 3000A$, $T_j = 125^{\circ}C$, $V_R = 200V$, $dI/dt = 1A/\mu s$, $dV_{DR}/dt = 20V/\mu s$ linear	-	1000	μs	
Q_S	Stored charge	$I_T = 3000A$, $T_j = 125^{\circ}C$, $dI/dt = 1A/\mu s$, $V_{Rpeak} \sim 5100V$, $V_R \sim 3400V$	5150	7950	μC	
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°C	1.5	V
V _{GD}	Gate non-trigger voltage	At 50% V _{DRM} , T _{case} = 125°C	0.4	V
I _{GT}	Gate trigger current	V _{DRM} = 5V, T _{case} = 25°C	400	mA
I _{GD}	Gate non-trigger current	At 50% V _{DRM} , T _{case} = 125°C	10	mA

CURVES

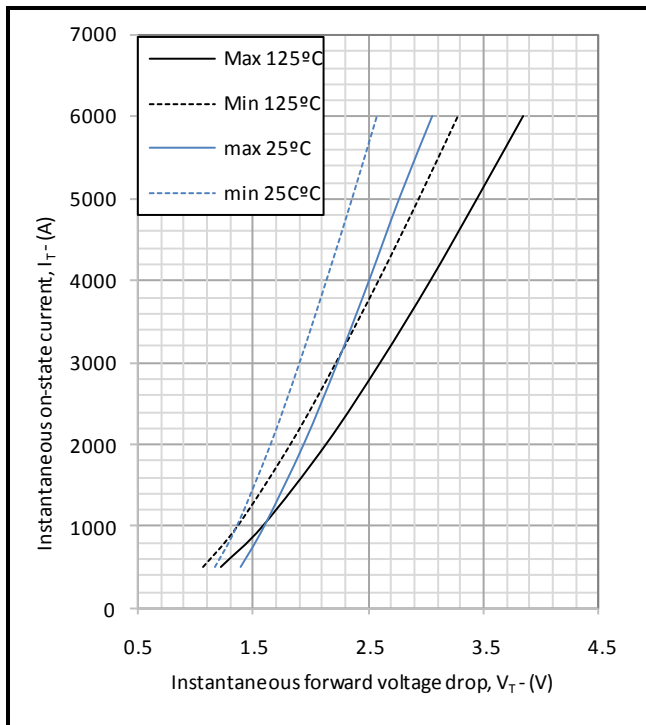


Fig.2 Maximum & minimum on-state characteristics

V_{TM} EQUATION

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

Where A = -0.224010
 B = 0.1725829
 C = 0.000292
 D = 0.01039

these values are valid for T_j = 125°C for I_T 500A to 4200A

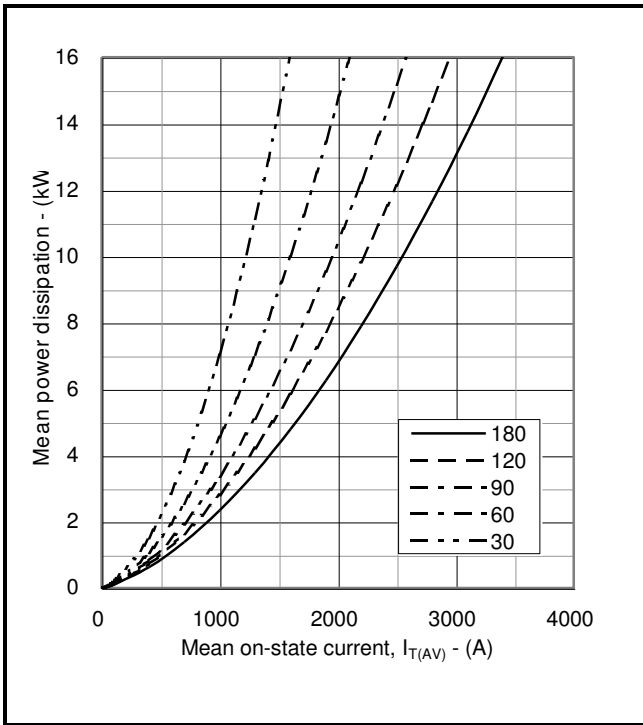


Fig.3 On-state power dissipation – sine wave

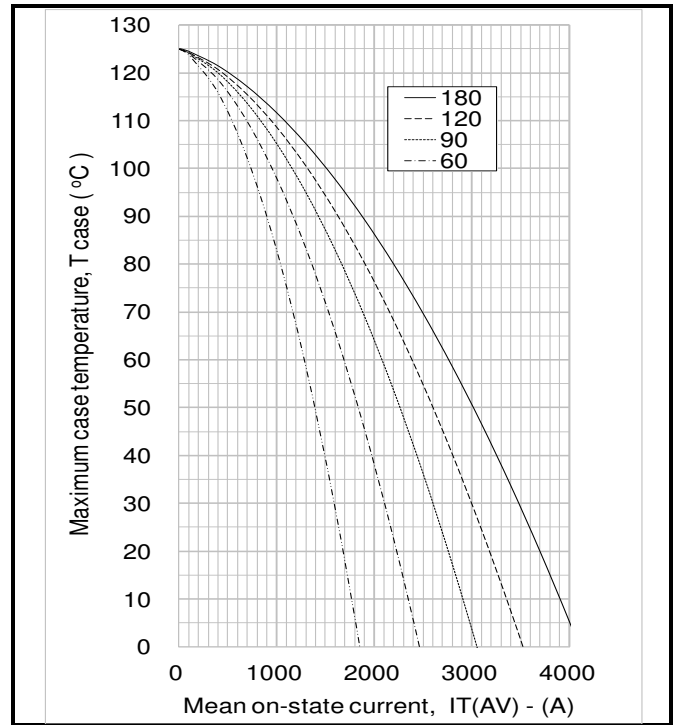


Fig.4 Maximum permissible case temperature, double side cooled – sine wave

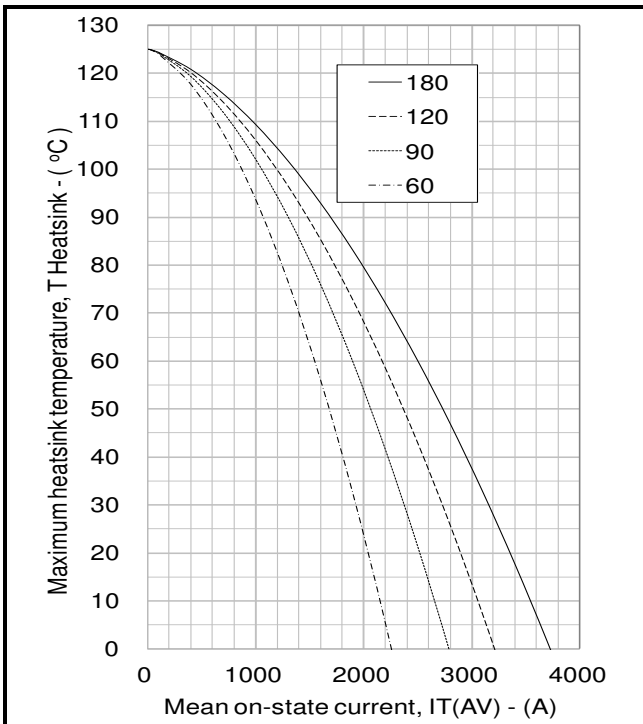


Fig.5 Maximum permissible heatsink temperature, double side cooled – sine wave

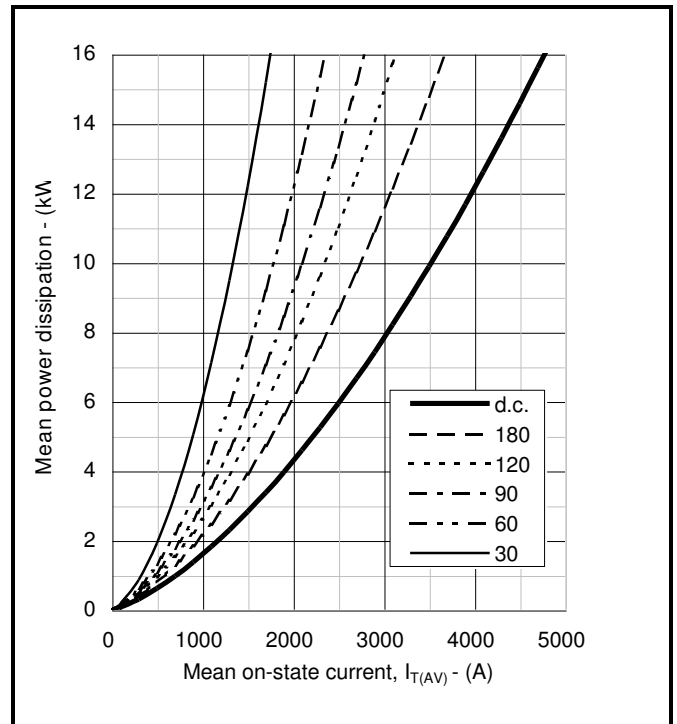


Fig.6 On-state power dissipation – rectangular wave

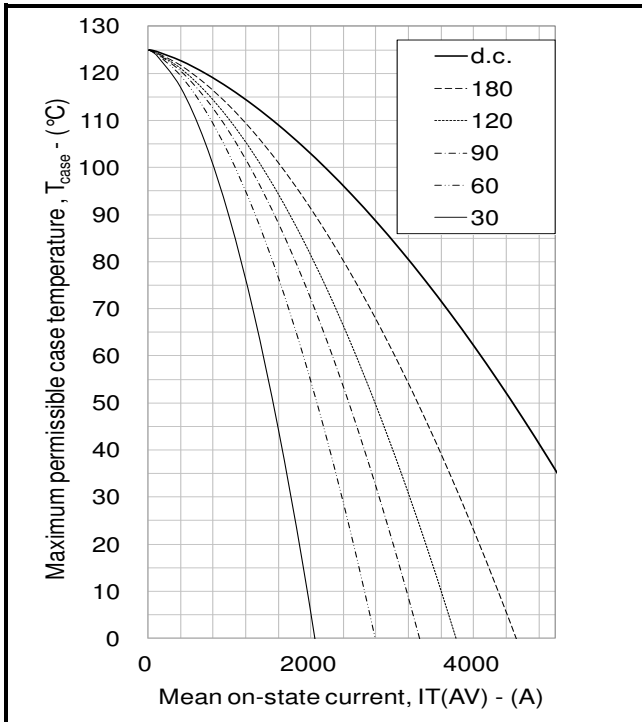


Fig.7 Maximum permissible case temperature, double side cooled – rectangular wave

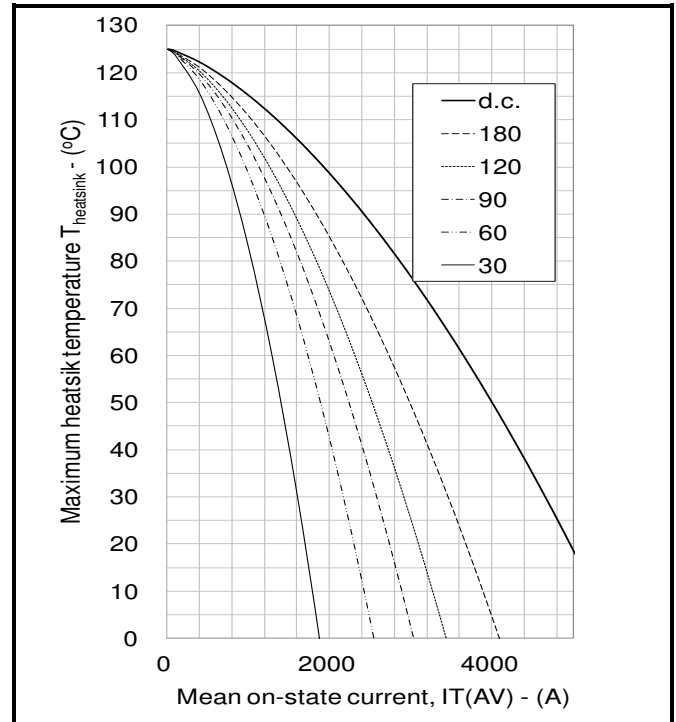


Fig.8 Maximum permissible heatsink temperature, double side cooled – rectangular wave

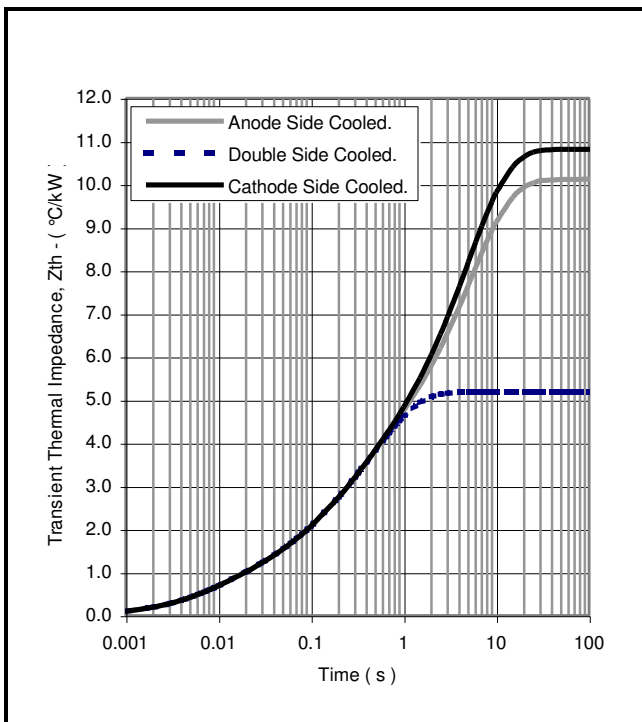


Fig.9 Maximum (limit) transient thermal impedance – junction to case (°C/kW)

		1	2	3	4
Double side cooled	R _i (°C/kW)	1.995338	1.242784	1.9448	0.005
	T _i (s)	0.05	0.592935	0.592385	110.5108
Anode side cooled	R _i (°C/kW)	6.092995	1.957372	2.042252	0.035908
	T _i (s)	5.459764	0.510898	0.05	110.1735
Cathode side cooled	R _i (°C/kW)	6.856845	1.876401	2.062845	0.025343
	T _i (s)	5.181139	0.557321	0.05	110.1546

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

ΔR_{th(j-c)} Conduction

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

Double side cooling		
θ°	ΔZ _{th} (z)	
	sine.	rect.
180	0.51	0.36
120	0.57	0.49
90	0.64	0.56
60	0.70	0.63
30	0.74	0.71
15	0.76	0.74

Anode Side Cooling		
θ°	ΔZ _{th} (z)	
	sine.	rect.
180	0.51	0.36
120	0.58	0.50
90	0.65	0.57
60	0.71	0.64
30	0.75	0.71
15	0.77	0.75

Cathode Sided Cooling		
θ°	ΔZ _{th} (z)	
	sine.	rect.
180	0.51	0.36
120	0.58	0.50
90	0.65	0.57
60	0.71	0.64
30	0.75	0.71
15	0.77	0.75

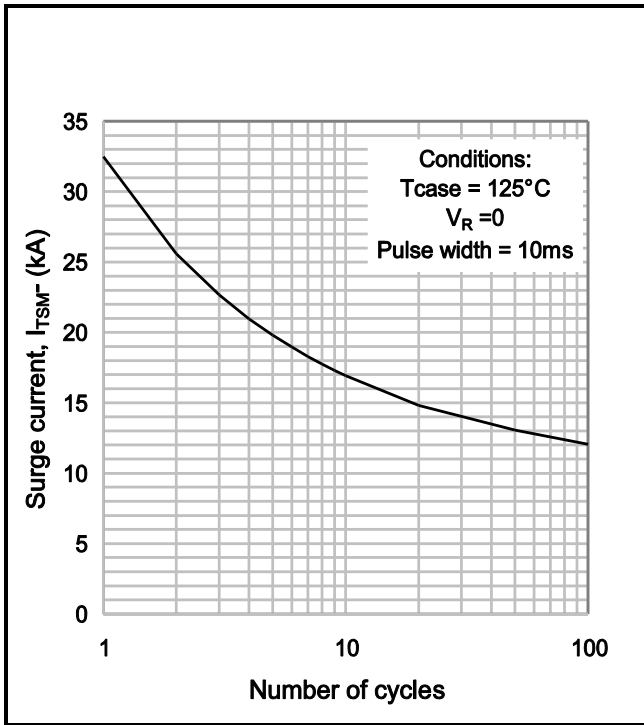


Fig.10 Multi-cycle surge current

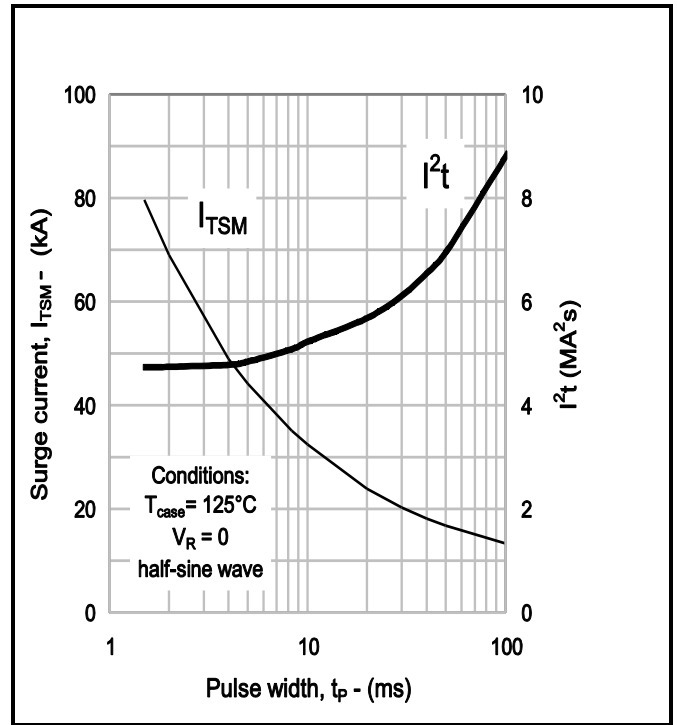


Fig.11 Single-cycle surge current

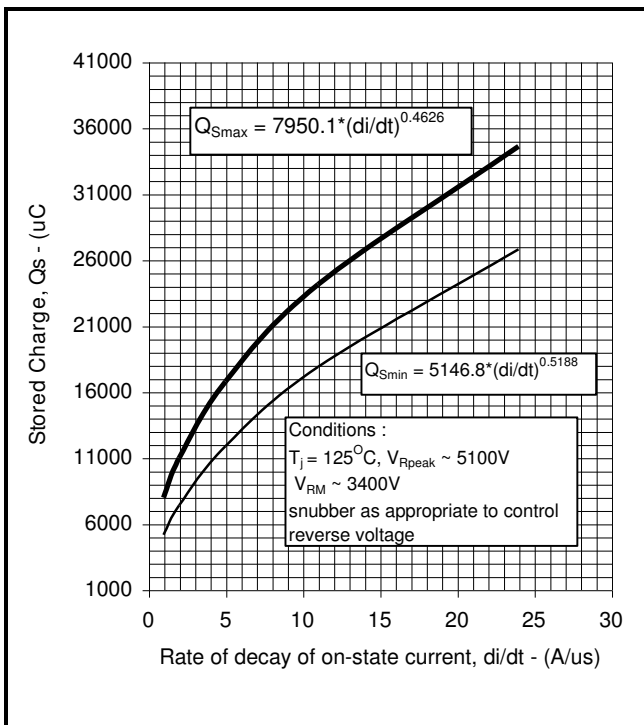


Fig.12 Stored charge

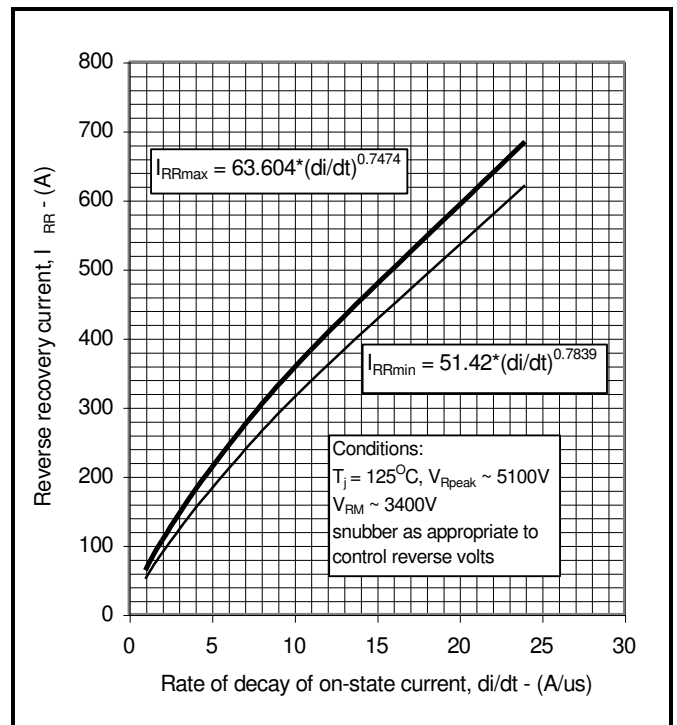


Fig.13 Reverse recovery current

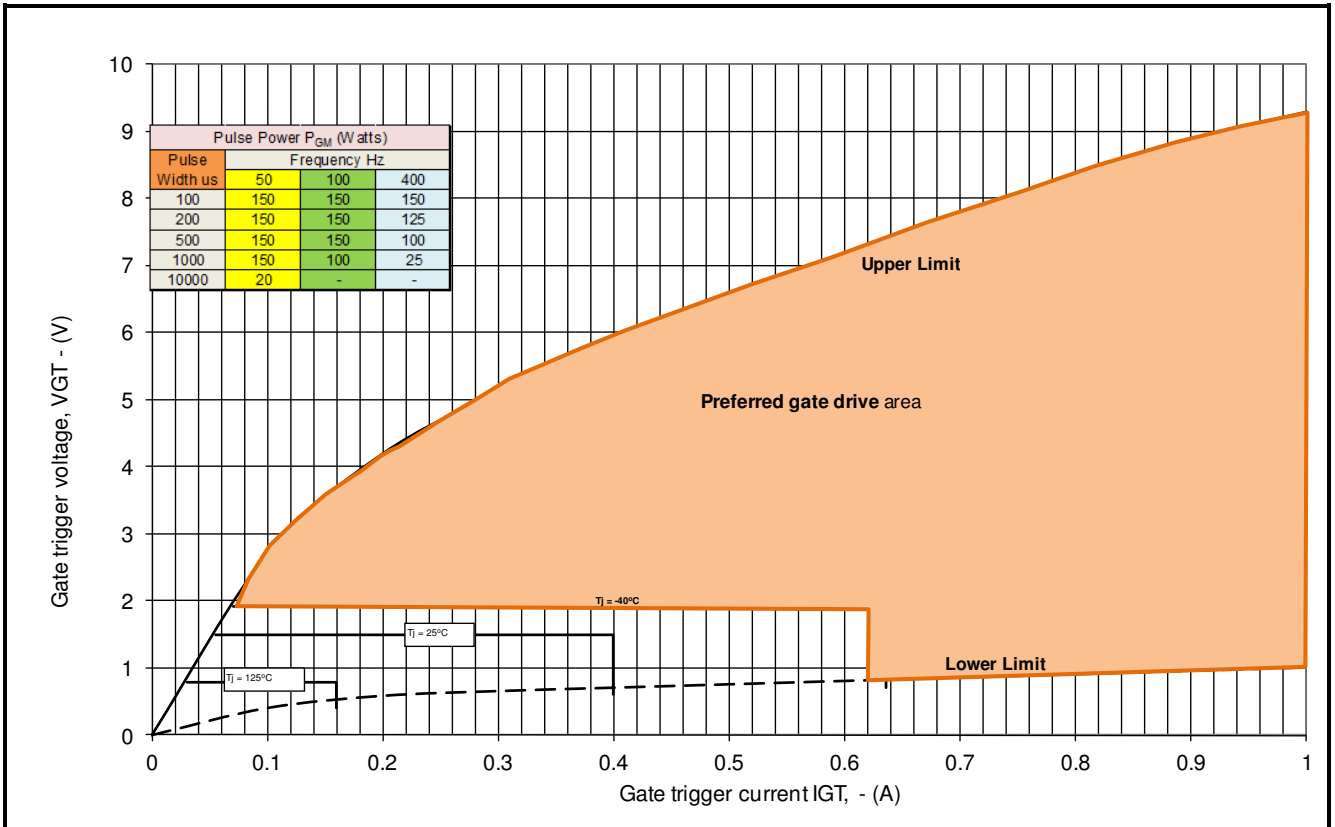


Fig14 Gate Characteristics

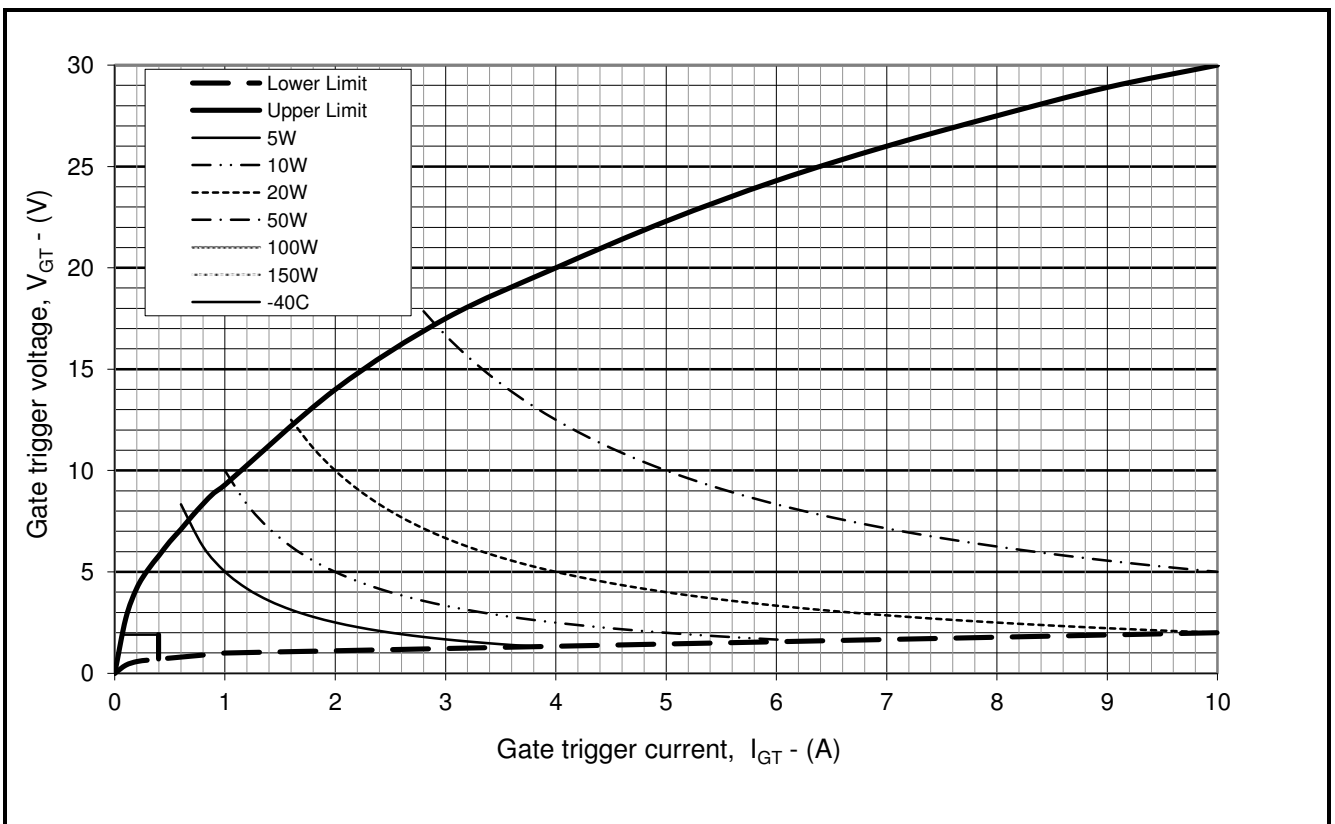
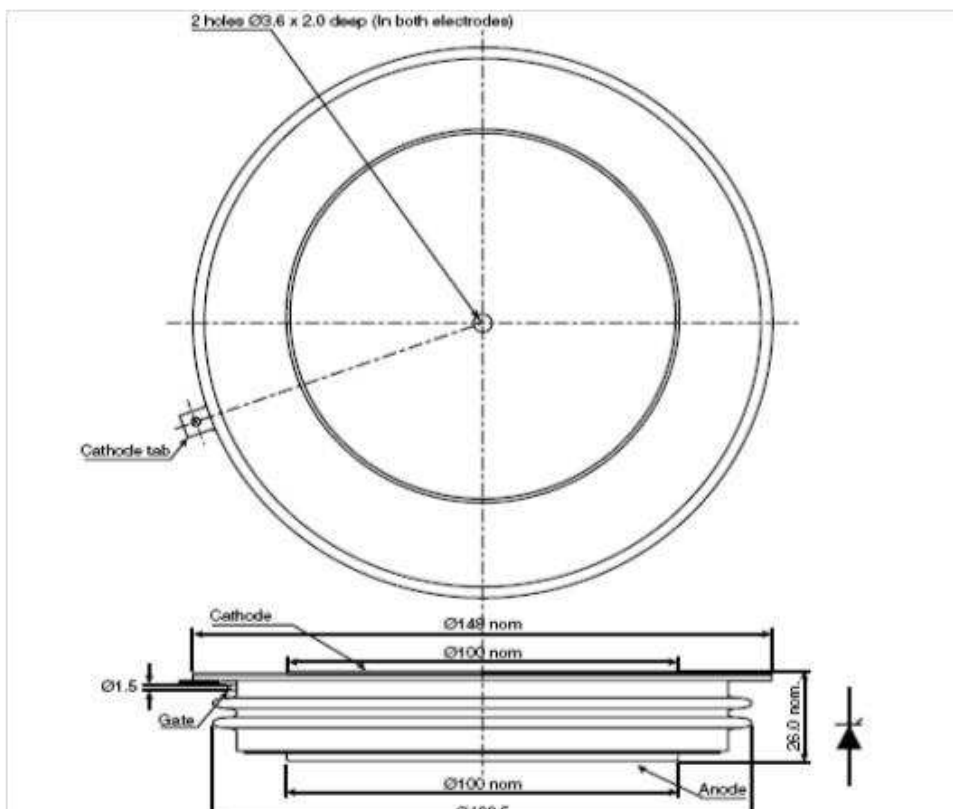


Fig. 15 Gate characteristics

PACKAGE DETAILS

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

Device	Maximum Thickness (mm)	Minimum Thickness (mm)
DCR4880M42	26.12	25.61
DCR4330M52	26.26	25.75
DCR3480M65	26.5	25.99
DCR2760M85	26.84	26.33



Lead length: 420mm
Lead terminal connector: M4 ring
Nominal weight: 1950g

Package outline type code: M

Fig.16 Package outline

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Extended exposure to conditions outside the product ratings may affect reliability leading to premature product failure. Use outside the product ratings is likely to cause permanent damage to the product. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture, a large current to flow or high voltage arcing, resulting in fire or explosion. Appropriate application design and safety precautions should always be followed to protect persons and property.

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Target Information:	This is the most tentative form of information and represents a very preliminary specification. No actual design work on the product has been started.
Preliminary Information:	The product design is complete and final characterisation for volume production is in progress. The datasheet represents the product as it is now understood but details may change.
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