

FEATURES

- Double Side Cooling
- High Surge Capability

APPLICATIONS

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

KEY PARAMETERS

V_{DRM}	6500V
$I_{T(AV)}$	3620A
I_{TSM}	44700A
dV/dt^*	2000V/μs
dI/dt	500A/μs

* Higher dV/dt selections are available on request

VOLTAGE RATINGS

Part and Ordering Number	Repetitive Peak Voltages V_{DRM} and V_{RRM} (V)	Conditions
DCR3620M65*	6500	$T_{vj} = -40^{\circ}\text{C}$ 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
DCR3620M60	6000	
DCR3620M55	5500	

Lower voltage grades available.

*6200V @ -40°C , 6500V @ 0°C

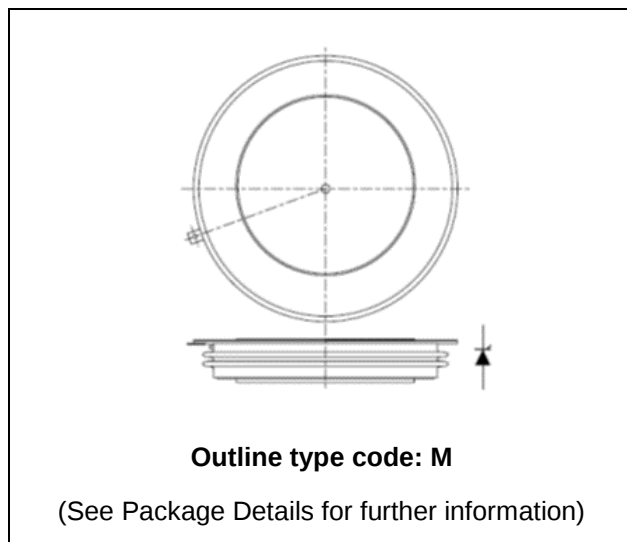


Fig. 1 Package outline

ORDERING INFORMATION

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

For example:

DCR3620M65

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	3620	A
$I_{T(RMS)}$	RMS value	-	5690	A
I_r	Continuous (direct) on-state current	-	5320	A

SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine, $T_{case} = 125^{\circ}\text{C}$ $V_R = 0$	44.7	kA
I^2t	I^2t for fusing		9.99	MA ² 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	-	5.2	$^{\circ}\text{C}/\text{kW}$
		Single side cooled	Anode DC	-	10.1	$^{\circ}\text{C}/\text{kW}$
			Cathode DC	-	10.8	$^{\circ}\text{C}/\text{kW}$
$R_{th(c-h)}$	Thermal resistance - case to heatsink	Clamping force 83kN (with mounting compound)	Double side	-	1.0	$^{\circ}\text{C}/\text{kW}$
			Single side	-	2.0	$^{\circ}\text{C}/\text{kW}$
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	91	kN

DYNAMIC CHARACTERISTICS

Symbol	Parameter	Test Conditions	Typ.	Max.	Units
I_{RRM}/I_{DRM}	Peak reverse and off-state current	At V_{RRM}/V_{DRM} , $T_{case} = 125^{\circ}C$	-	300	mA
		At 50% V_{RRM}/V_{DRM} , $T_{case} = 125^{\circ}C$	20	-	mA

Symbol	Parameter	Test Conditions		Min.	Max.	Units
V _{TM}	Instantaneous forward voltage	At 4000A peak, T _j = 125°C		1.80	2.05	V
dV/dt	Max. linear rate of rise of off-state voltage	To 67% V _{DRM} , T _j = 125°C, gate open		-	2000	V/μs
dI/dt	Rate of rise of on-state current	From 67% V _{DRM} to 2x I _{T(AV)} Gate source 30V, 10Ω tr < 0.5μs, T _j = 125°C	Repetitive 50Hz	-	200	A/μs
			Non-repetitive	-	500	A/μs
V _{T(RO)}	Threshold voltage - Low level	500A to 3300A at T _{case} = 125°C		-	0.93	V
	Threshold voltage - High level	3300A to 9000A at T _{case} = 125°C		-	1.16	V
r _T	On-state slope resistance - Low level	500A to 3300A at T _{case} = 125°C		-	0.29	mΩ
	On-state slope resistance - High level	3300A to 9000A at T _{case} = 125°C		-	0.22	mΩ
t _{gd}	Delay time	V _D = 67% V _{DRM} , gate source 30V, 10Ω tr = 0.5μs, T _j = 25°C		-	3	μs
t _q	Turn-off time	I _T = 3000A, T _j = 125°C, V _R = 200V, dI/dt = 1A/μs, dV _{DR} /dt = 20V/μs linear		-	500	μs
Q _s	Stored charge	I _T = 1500A, T _j = 125°C, dI/dt = 1A/μs V _R ~ 2600V, C _s = 1μF, R _s = 63Ω		4540	8620	μC
I _{RR}	Reverse recovery current			56	80	A
I _L	Latching current	T _j = 25°C, V _D = 5V		-	3	A
I _H	Holding current	T _j = 25°C, R _{G-K} = ∞, 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	$V_{DRM} = 5V$, $T_{case} = 25^{\circ}C$	400	mA
I_{GD}	Gate non-trigger current	At 50% V_{DRM} , $T_{case} = 125^{\circ}C$	10	mA

CURVES

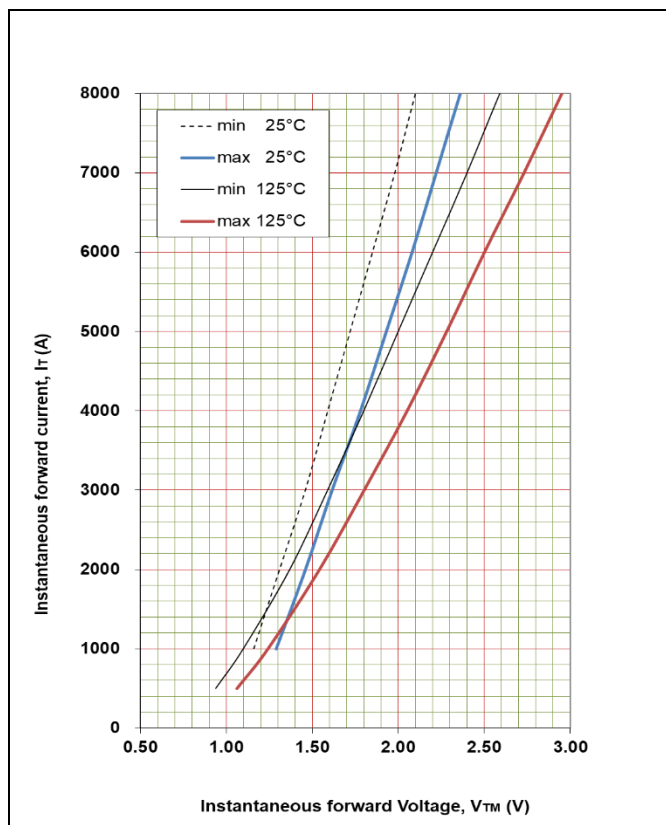


Fig. 2 Maximum & minimum on-state characteristics

V_{TM} EQUATION

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

Where $A = -0.632454$

$B = 0.283028$

$C = 0.000246$

$D = -0.010394$

These values are valid for $T_j = 125^{\circ}C$ for I_T 500A to 9000A

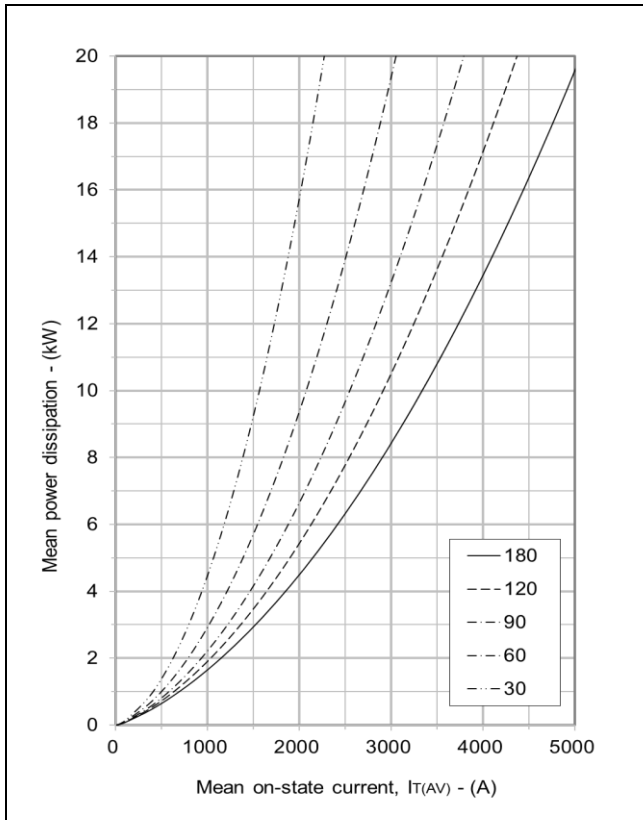


Fig. 3 On-state power dissipation - sine wave

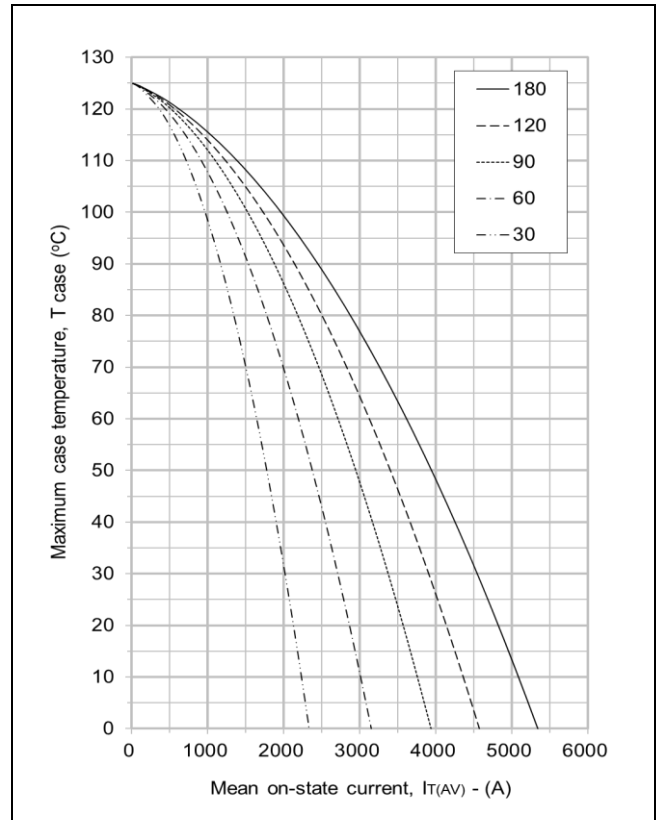


Fig. 4 Maximum permissible case temperature, double side cooled - sine wave

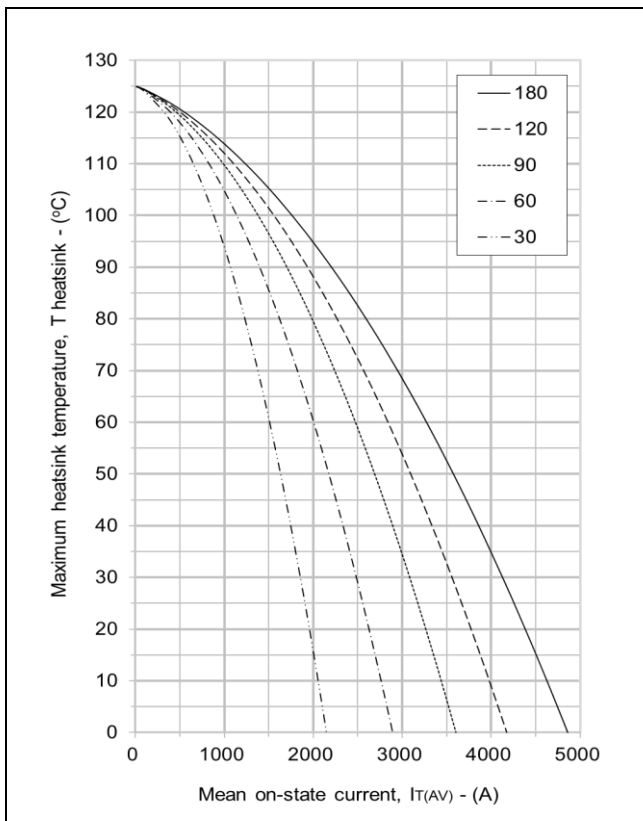


Fig. 5 Maximum permissible heatsink temperature, double side cooled - sine wave

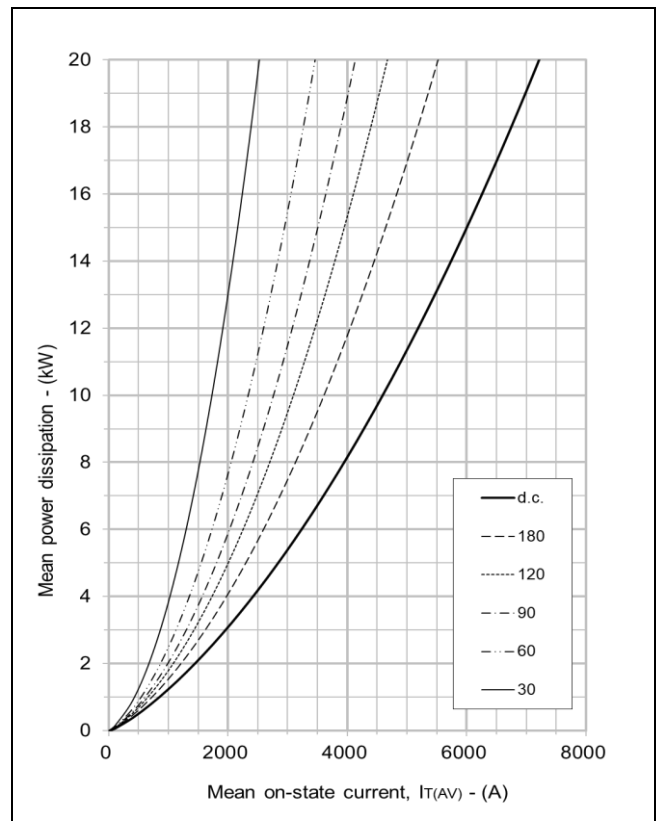


Fig. 6 On-state power dissipation - rectangular wave

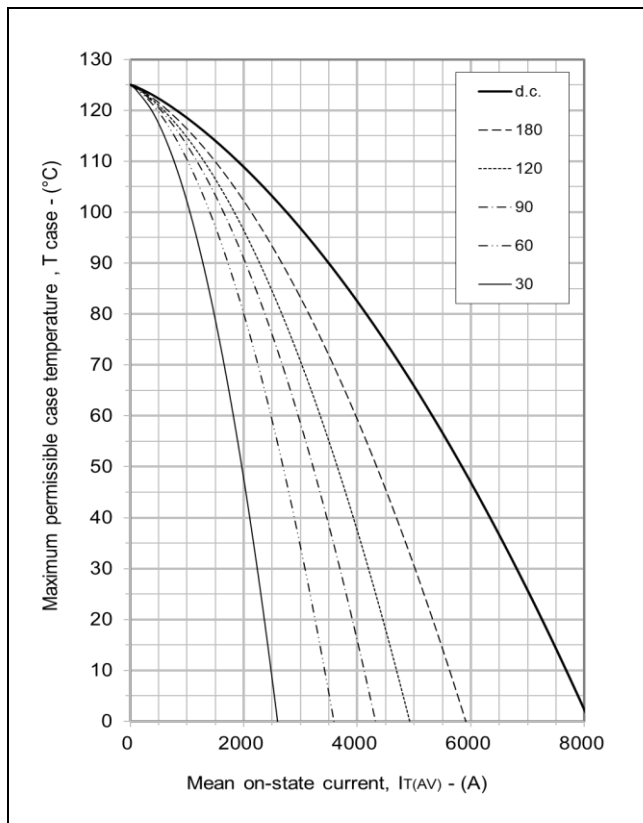


Fig. 7 Maximum permissible case temperature, double side cooled - rectangular wave

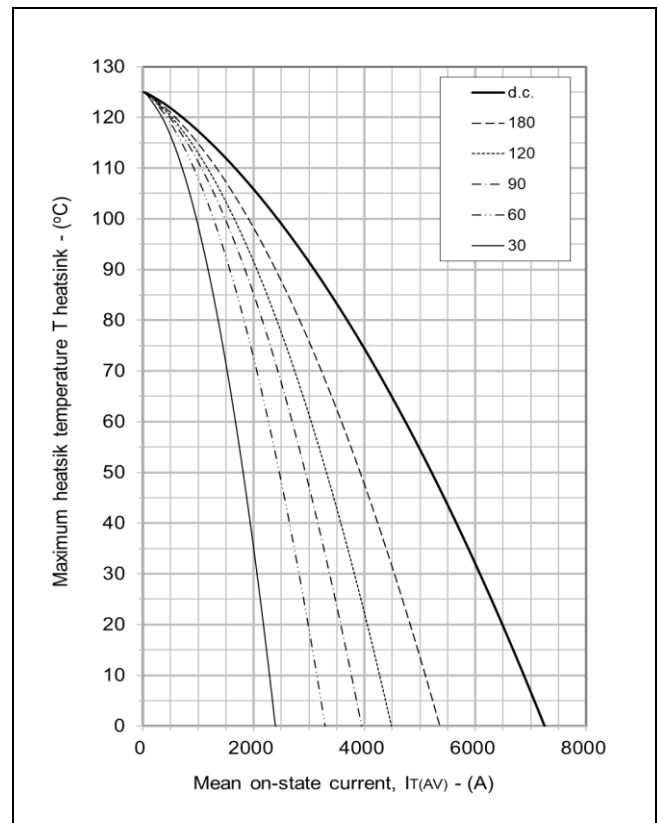


Fig. 8 Maximum permissible heatsink temperature, double side cooled - rectangular wave

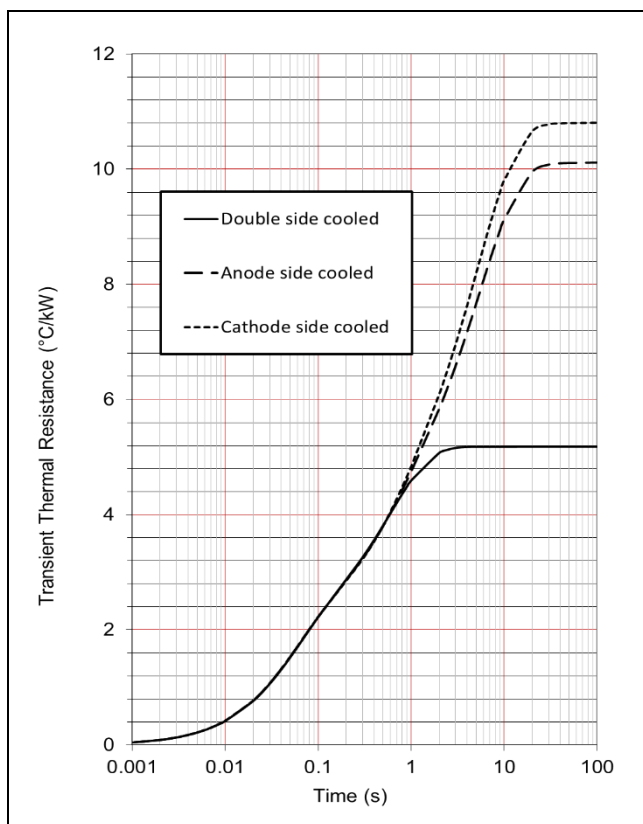


Fig.9 Maximum (limit) transient thermal impedance – junction to case (degC/kW)

		1	2	3	4
Double side cooled	Ri(°C/kW)	1.995	1.243	1.945	0.005
	Ti(s)	0.050	0.593	0.592	110.511
Anode side cooled	Ri(°C/kW)	6.093	1.957	2.042	0.036
	Ti(s)	5.460	0.511	0.050	110.174
Cathode side cooled	Ri(°C/kW)	6.857	1.876	2.063	0.025
	Ti(s)	5.181	0.557	0.050	110.155

$$Z_{th} = \sum_{i=1}^{i=4} R_i \cdot \left(1 - \exp\left(-\frac{T}{T_i}\right)\right)$$

$\Delta R_{th(j-c)}$ 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			Anode Side Cooling			Cathode Sided Cooling		
θ^*	$\Delta Z_{th} (z)$		θ^*	$\Delta Z_{th} (z)$		θ^*	$\Delta Z_{th} (z)$	
	sine.	rect.		sine.	rect.		sine.	rect.
180	0.51	0.36	180	0.51	0.36	180	0.51	0.36
120	0.57	0.49	120	0.58	0.50	120	0.58	0.50
90	0.64	0.56	90	0.65	0.57	90	0.65	0.57
60	0.70	0.63	60	0.71	0.64	60	0.71	0.64
30	0.74	0.71	30	0.75	0.71	30	0.75	0.71
15	0.76	0.74	15	0.77	0.75	15	0.77	0.75

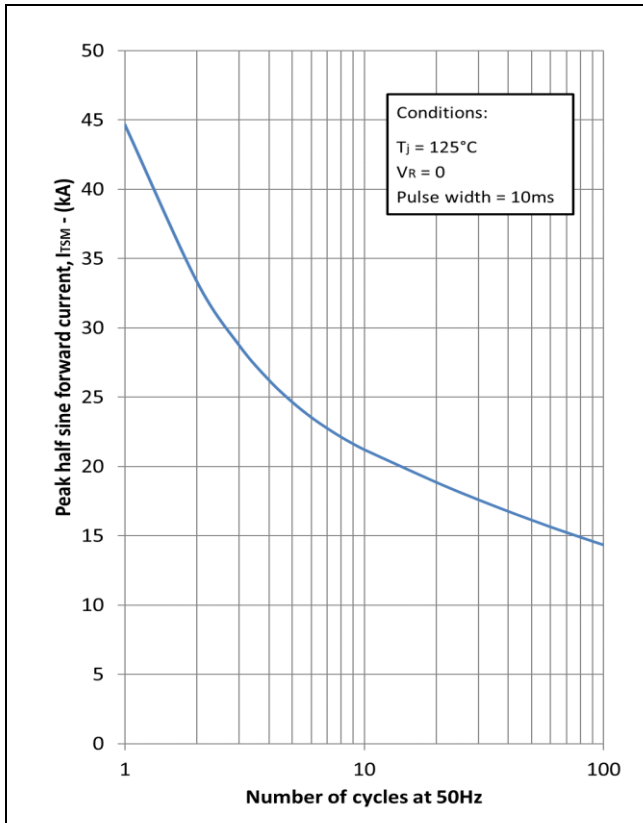


Fig. 10 Multi-cycle surge current

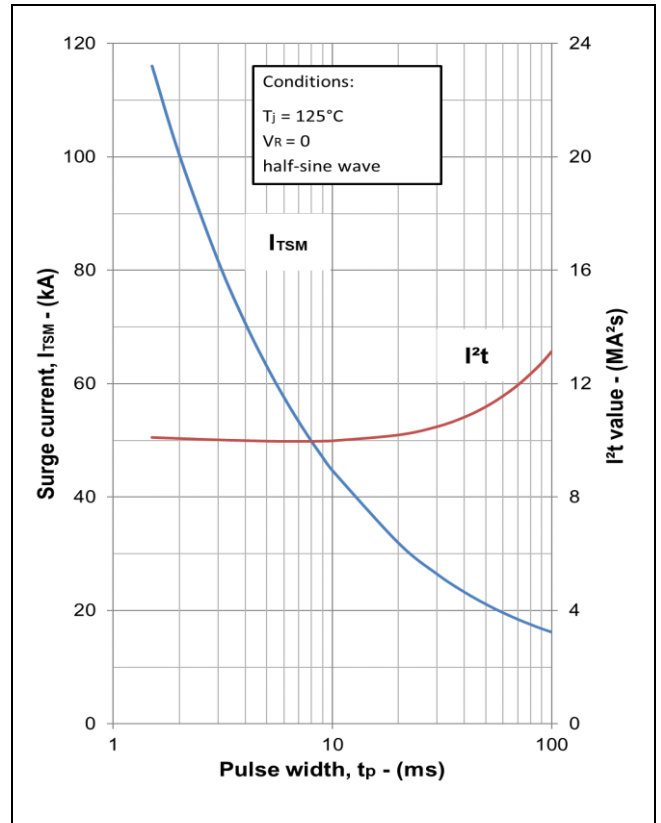


Fig. 11 Single-cycle surge current

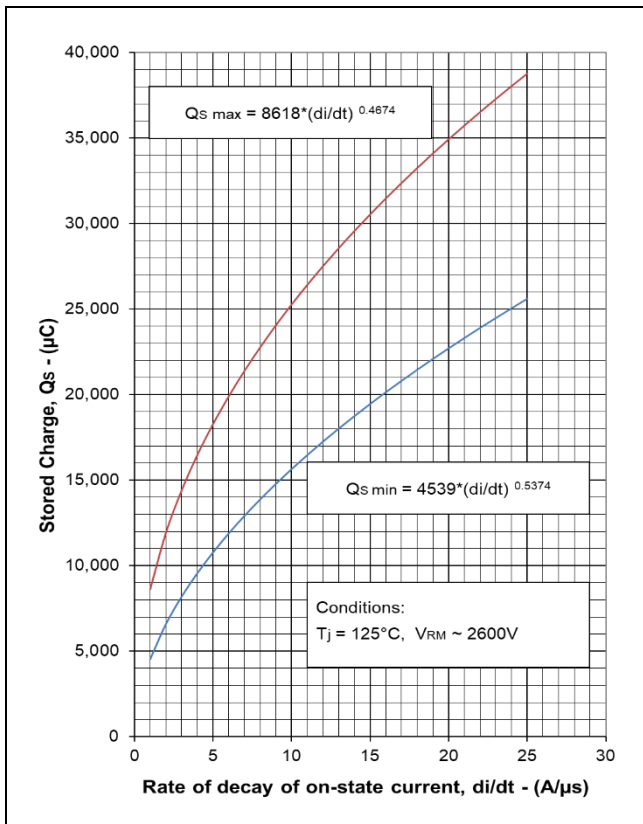


Fig. 12 Stored charge

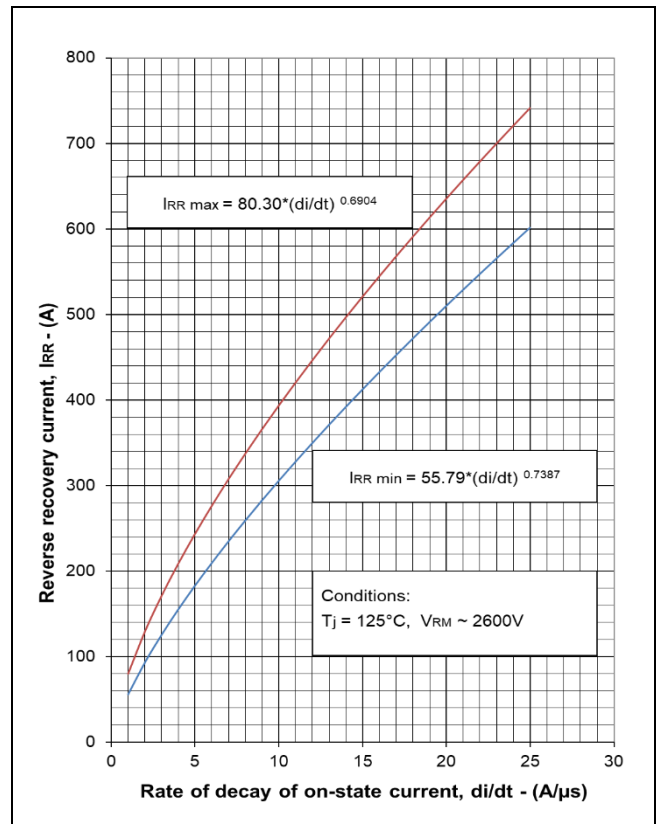


Fig. 13 Reverse recovery current

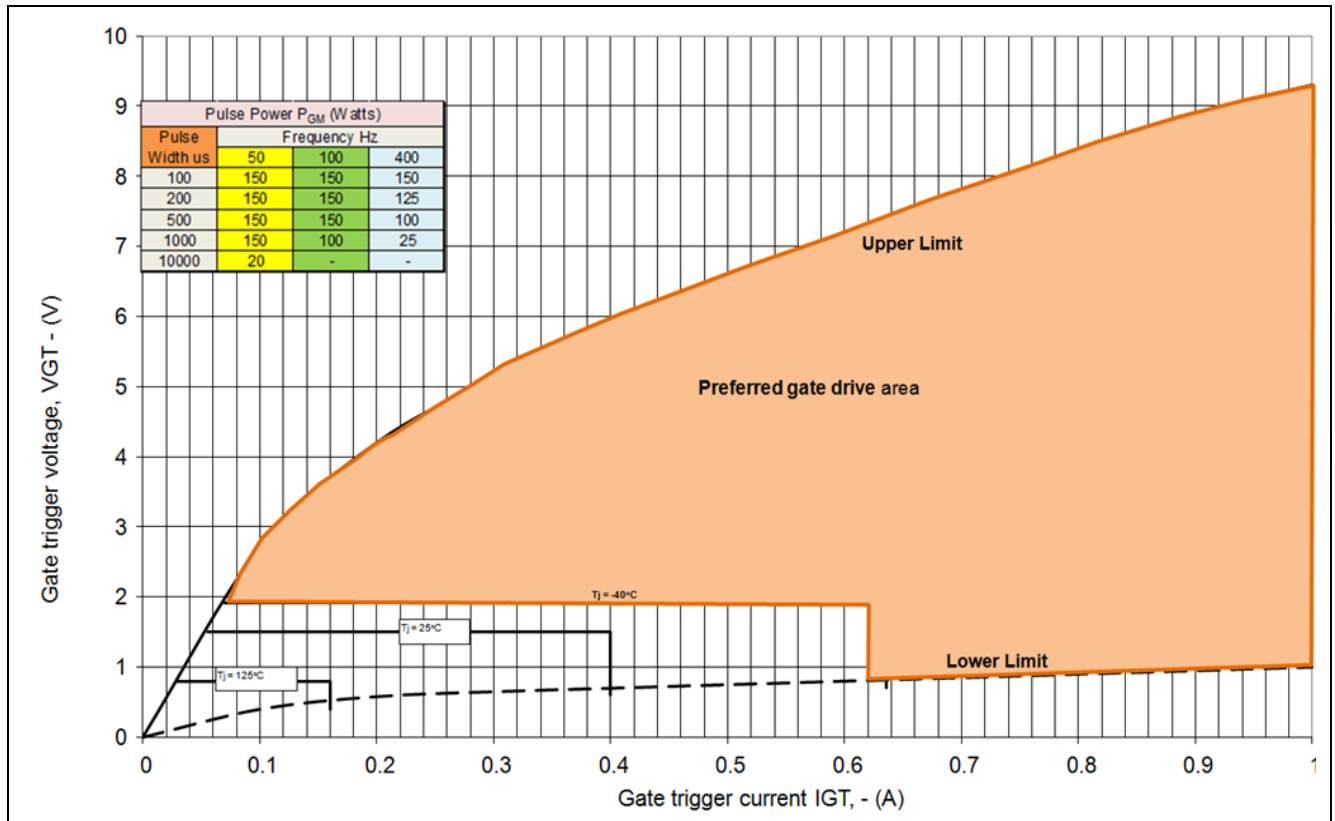


Fig.14 Gate characteristics

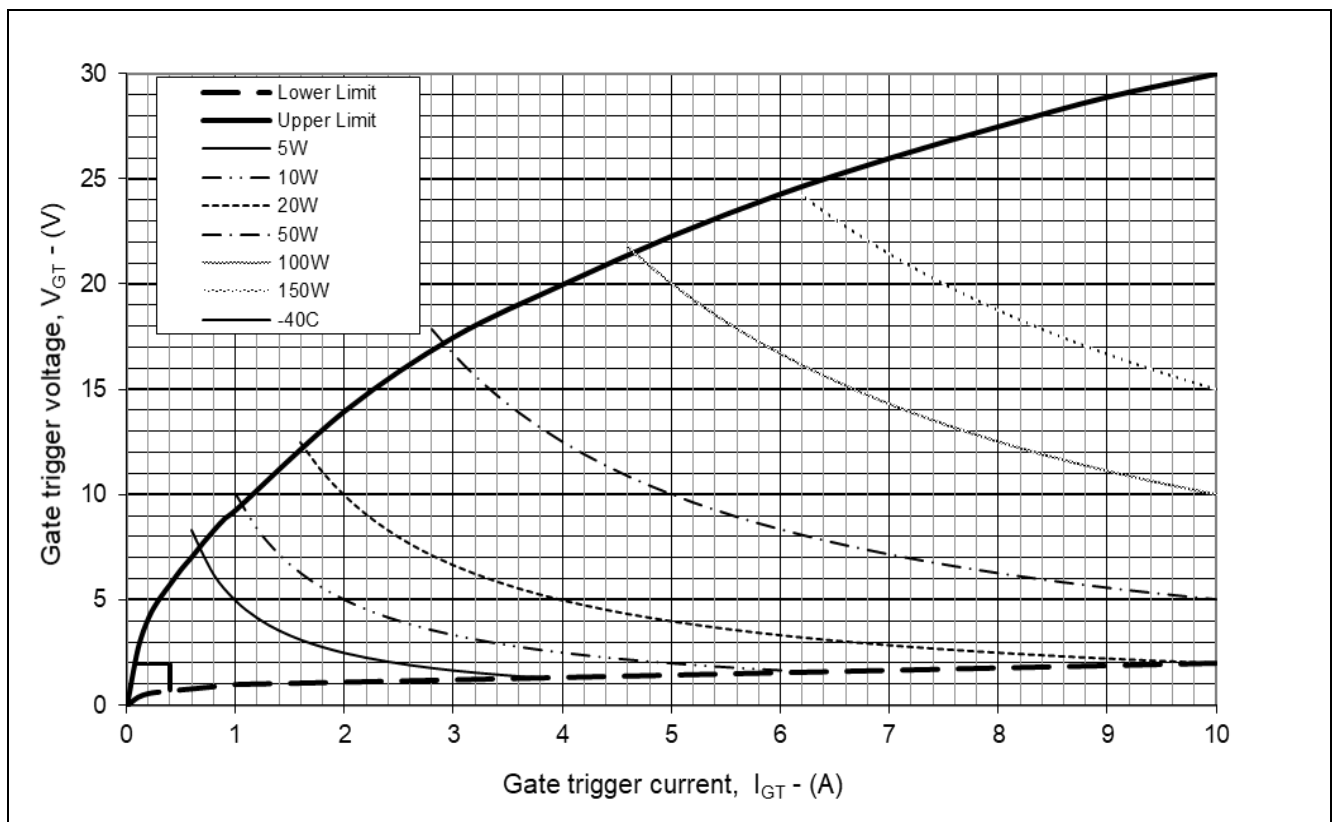


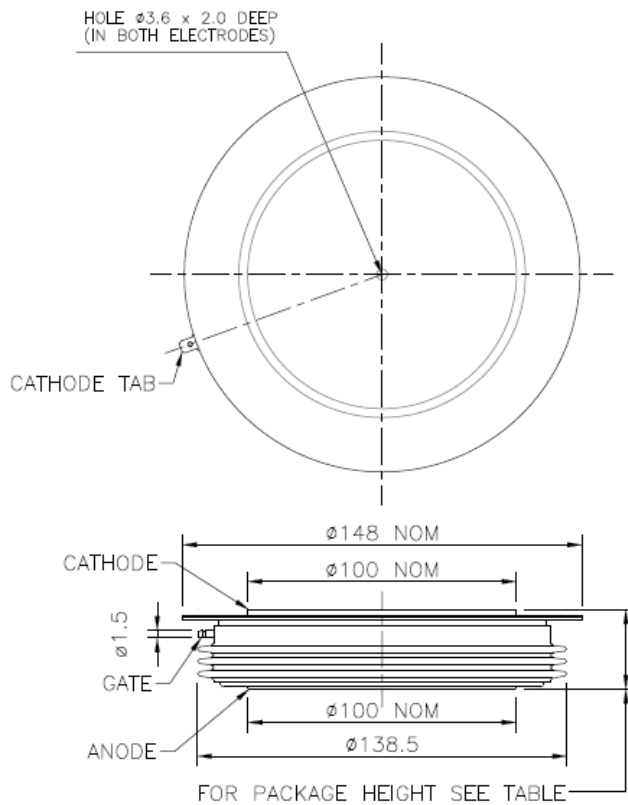
Fig. 15 Gate characteristics

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)
DCR2990M85	26.8	26.3
DCR2760M85	26.8	26.3
DCR3620M65	26.5	26.0
DCR3370M65	26.5	26.0
DCR4330M52	26.3	25.7
DCR4000M52	26.3	25.7
DCR4880M42	26.1	25.6
DCR4510M42	26.1	25.6
DCR5960M28	25.9	25.4

Clamping force: 82.5kN $\pm$ 10%

Lead length: 420mm

Lead terminal connector: M4 ring

Package outline type code: M

Fig. 16 Package outline

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The products must not be touched when operating because there is a danger of electrocution or severe burning. Always use protective safety equipment such as appropriate shields for the product and wear safety glasses. Even when disconnected any electric charge remaining in the product must be discharged and allowed to cool before safe handling using protective gloves.

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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