

FEATURES

- Double Side Cooling
- High Surge Capability

APPLICATIONS

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

KEY PARAMETERS

V_{DRM}	8500V
$I_{T(AV)}$	390A
I_{TSM}	5250A
dV/dt^*	1500V/μs
dI/dt	200A/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
DCR390J85*	8500	$T_{vj} = -40^{\circ}\text{C}$ to 125°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
DCR390J80	8000	
DCR390J75	7500	
DCR390J70	7000	

Lower voltage grades available.

*8200V @ -40°C , 8500V @ 0°C

ORDERING INFORMATION

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

For example:

DCR390J85

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

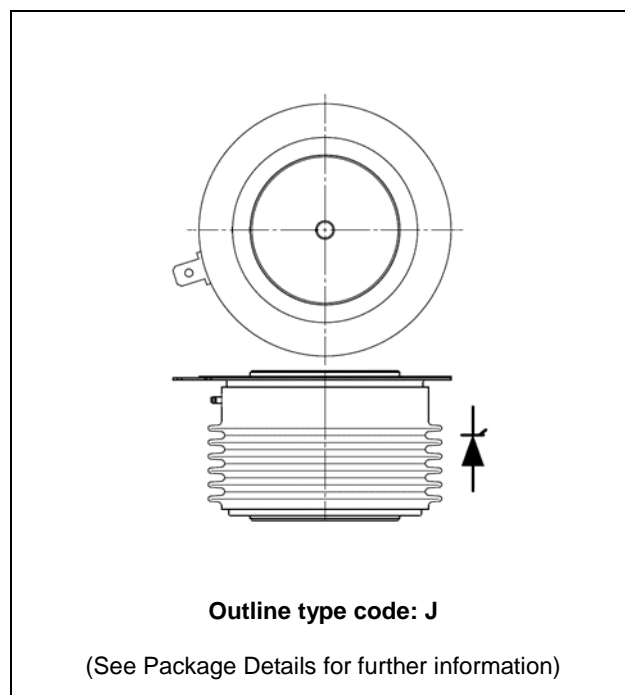


Fig. 1 Package outline

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	390	A
$I_{T(RMS)}$	RMS value	-	610	A
I_r	Continuous (direct) on-state current	-	590	A

SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine, $T_{case} = 125^{\circ}\text{C}$ $V_R = 0$	5.25	kA
I^2t	I^2t for fusing		0.14	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	-	37.8	$^{\circ}\text{C/kW}$
		Single side cooled	Anode DC	-	74.3	$^{\circ}\text{C/kW}$
			Cathode DC	-	79.5	$^{\circ}\text{C/kW}$
$R_{th(c-h)}$	Thermal resistance - case to heatsink	Clamping force 11.5kN (with mounting compound)	Double side	-	7.2	$^{\circ}\text{C/kW}$
			Single side	-	14.4	$^{\circ}\text{C/kW}$
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			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°C		-	100	mA
V_{TM}	Instantaneous forward voltage	At 1600A peak, T _j = 25°C		3.55	4.05	V
dV/dt	Max. linear rate of rise of off-state voltage	To 67% V _{DRM} , T _j = 125°C, gate open		-	1500	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	-	100	A/μs
			Non-repetitive	-	200	A/μs
V_{T(TO)}	Threshold voltage - Low level	100A to 400A at T _{case} = 125°C		-	1.14	V
	Threshold voltage - High level	400A to 1600A at T _{case} = 125°C		-	1.32	V
r_T	On-state slope resistance - Low level	100A to 400A at T _{case} = 125°C		-	3.15	mΩ
	On-state slope resistance - High level	400A to 1600A at T _{case} = 125°C		-	2.73	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	T _j = 125°C, V _R = 100V, dI/dt = 5A/μs, dV _{DR} /dt = 20V/μs linear		-	1200	μs
Q_S	Stored charge	I _T = 500A, T _j = 125°C, dI/dt = 5A/μs [LEM]		2000	3000	μC
I_{RR}	Reverse recovery current			80	100	A
Q_S	Stored charge	T _j = 125°C, dI/dt = 1A/μs, V _{R peak} ~ 5000V, V _R ~ 2800V		2050	3730	μC
I_{RR}	Reverse recovery current			34	45	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	$V_{DRM} = 5V$, $T_{case} = 25^{\circ}C$	350	mA
I_{GD}	Gate non-trigger current	At 50% V_{DRM} , $T_{case} = 125^{\circ}C$	15	mA

CURVES

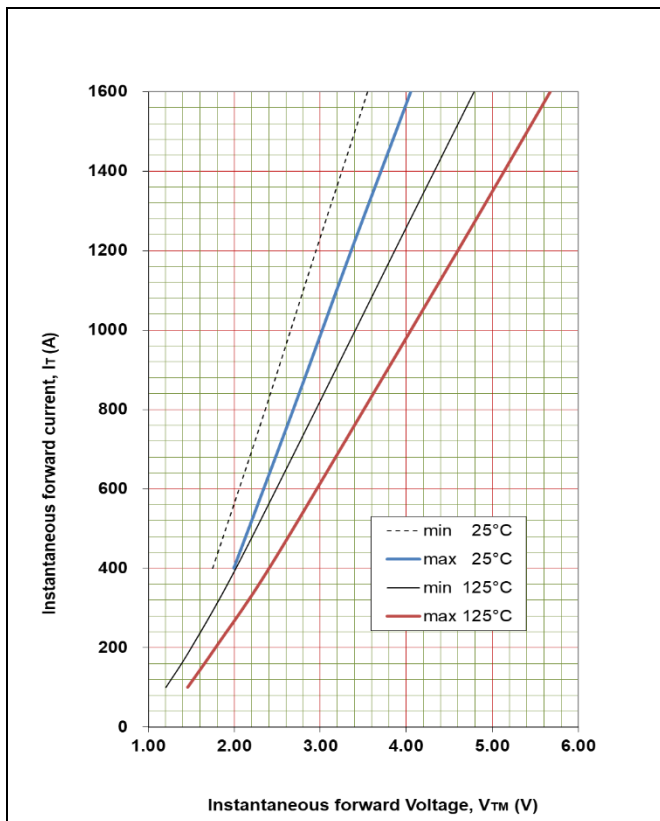


Fig. 2 Maximum & minimum on state characteristics

V_{TM} EQUATION

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

Where $A = 0.690035$

$B = 0.110080$

$C = 0.002617$

$D = -0.000340$

These values are valid for $T_j = 125^{\circ}C$ for I_T 100A to 1600A

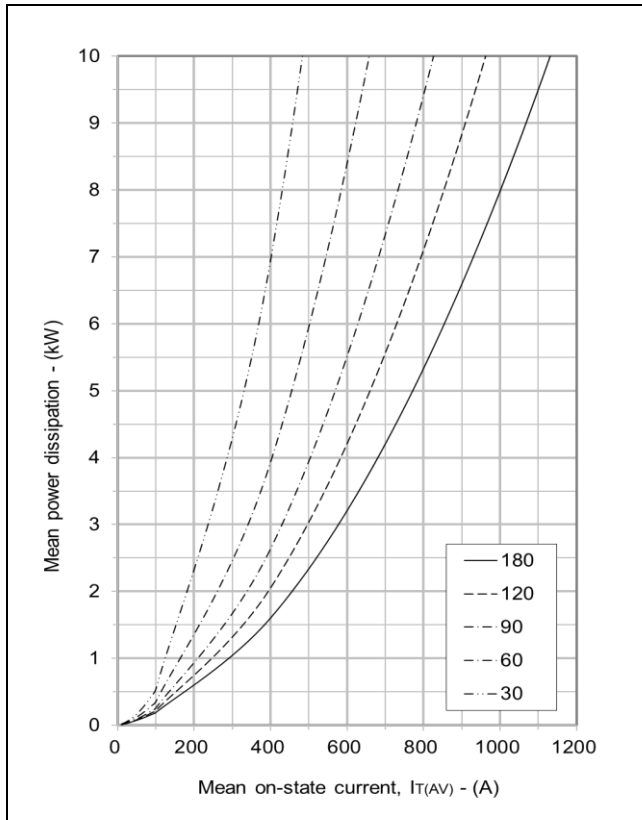


Fig. 3 On-state power dissipation - sine wave

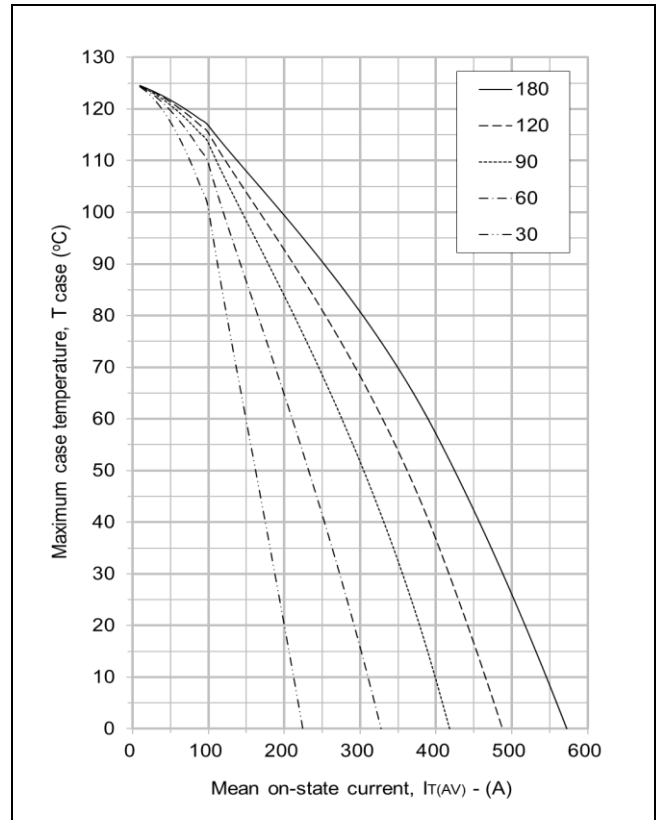


Fig. 4 Maximum permissible case temperature, double side cooled - sine wave

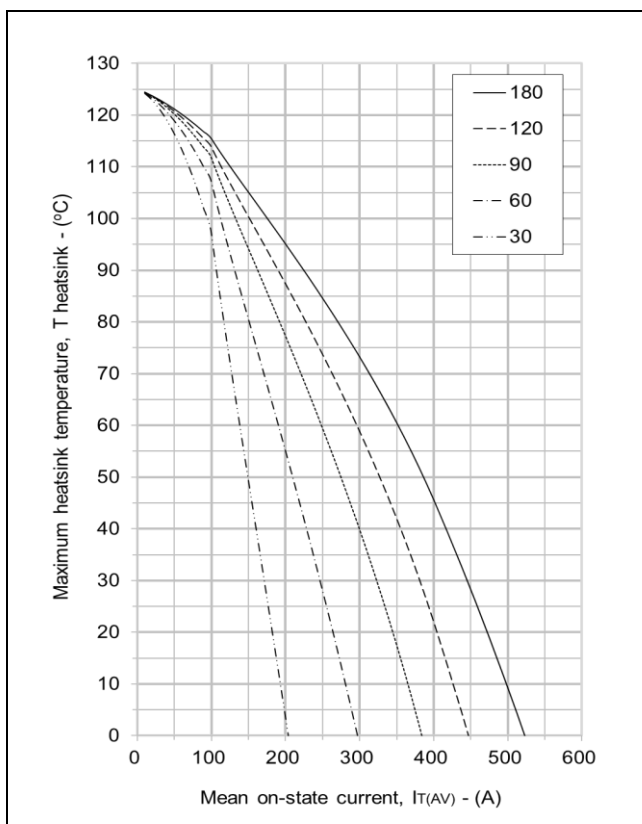


Fig. 5 Maximum permissible heatsink temperature, double side cooled - sine wave

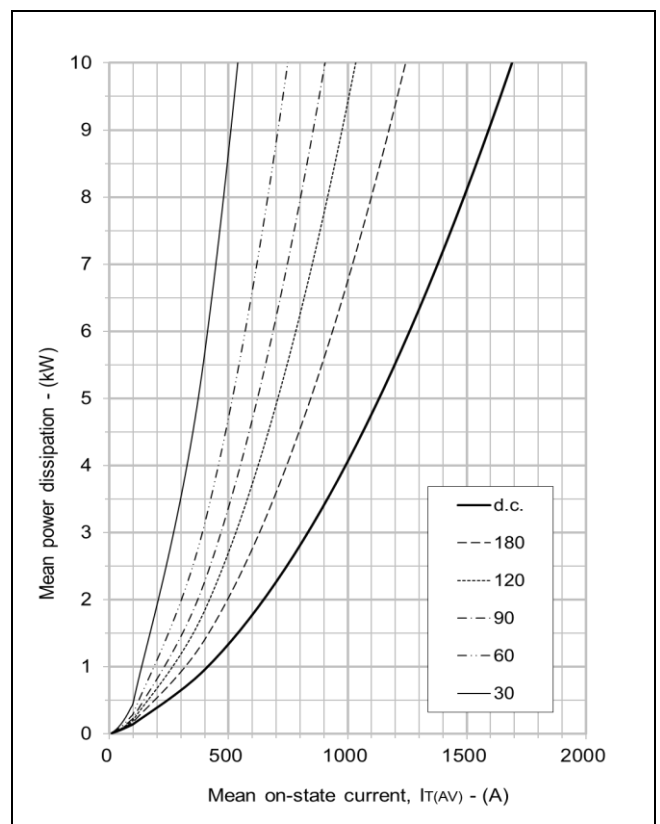


Fig. 6 On-state power dissipation - rectangular wave

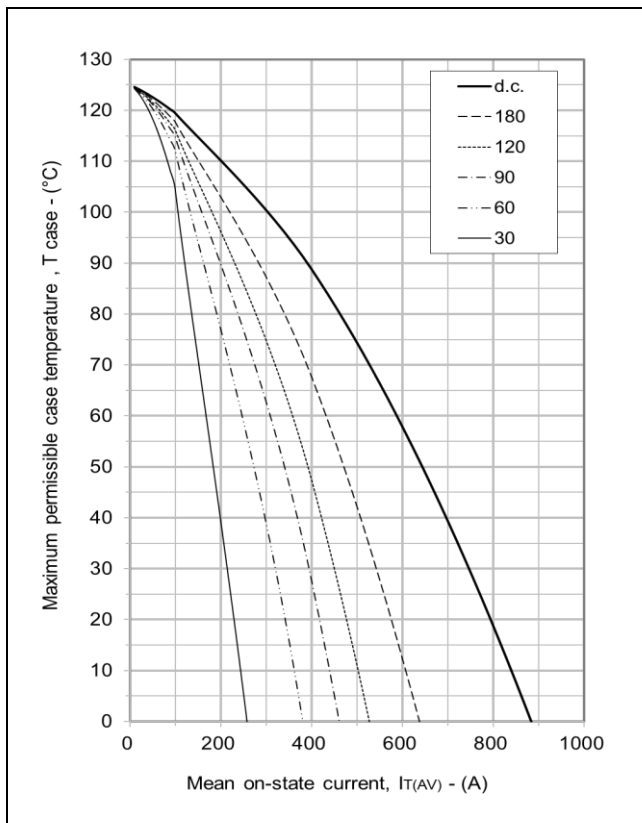


Fig. 7 Maximum permissible case temperature, double side cooled - rectangular wave

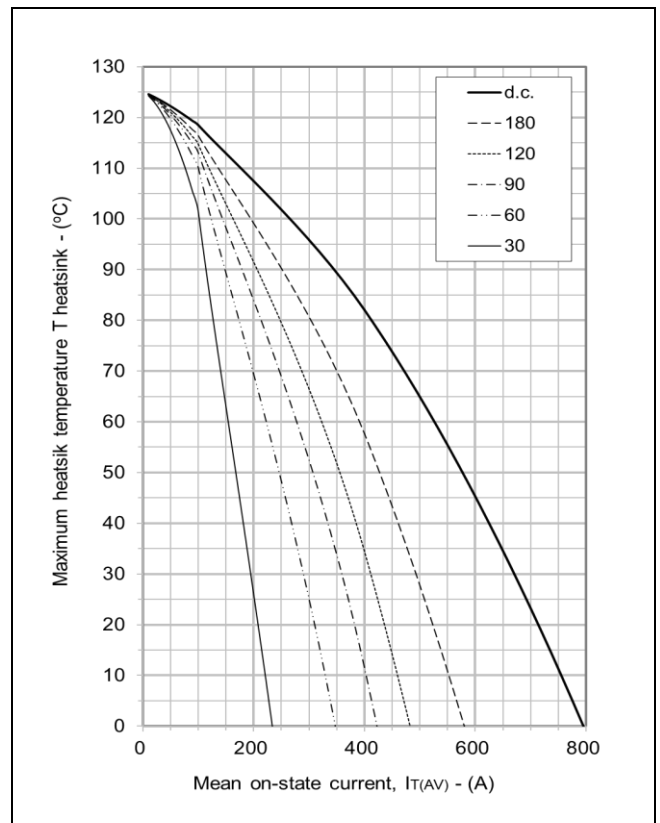


Fig. 8 Maximum permissible heatsink temperature, double side cooled - rectangular wave

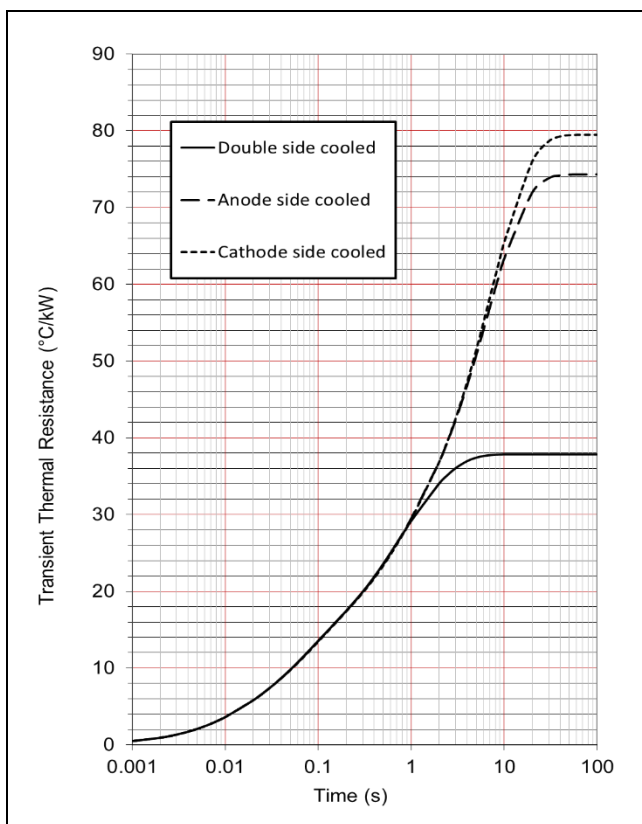


Fig. 9 Maximum (limit) transient thermal impedance – junction to case (degC/kW)

		1	2	3	4
Double side cooled	Ri(°C/kW)	2.426	9.350	10.696	15.376
	Ti(s)	0.009	0.053	0.450	1.395
Anode side cooled	Ri(°C/kW)	2.809	9.558	11.356	50.614
	Ti(s)	0.010	0.059	0.476	6.555
Cathode side cooled	Ri(°C/kW)	2.951	9.403	11.077	56.041
	Ti(s)	0.010	0.061	0.473	7.228

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

$\Delta R_{th(j-c)}$ 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		
$\Delta Z_{th}(z)$			$\Delta Z_{th}(z)$			$\Delta Z_{th}(z)$		
α°	sine	rect	α°	sine	rect	α°	sine	rect
180	4.43	3.01	180	4.39	2.99	180	4.37	2.98
120	5.13	4.30	120	5.07	4.26	120	5.05	4.25
90	5.89	5.03	90	5.81	4.97	90	5.79	4.96
60	6.58	5.81	60	6.48	5.74	60	6.45	5.72
30	7.12	6.67	30	7.00	6.57	30	6.97	6.54
15	7.36	7.13	15	7.24	7.01	15	7.20	6.98

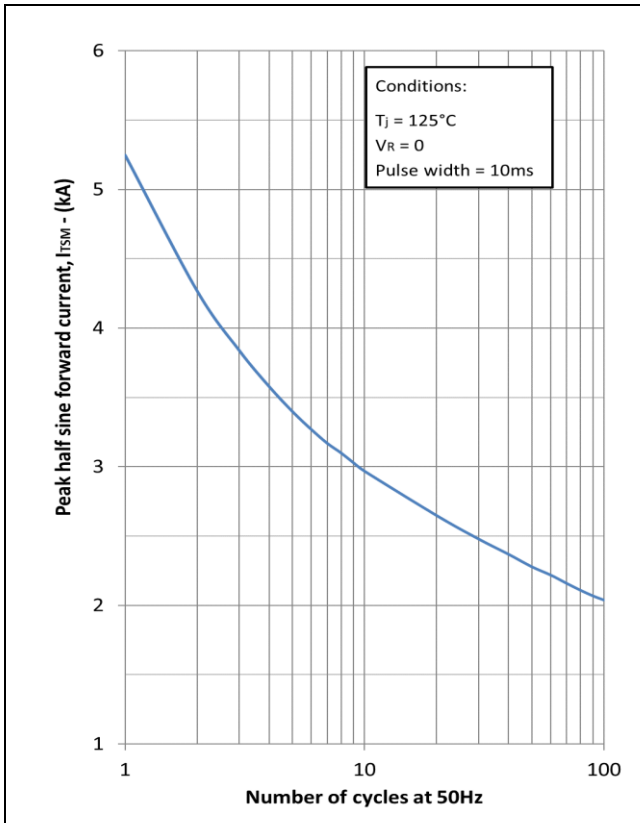


Fig. 10 Multi-cycle surge current

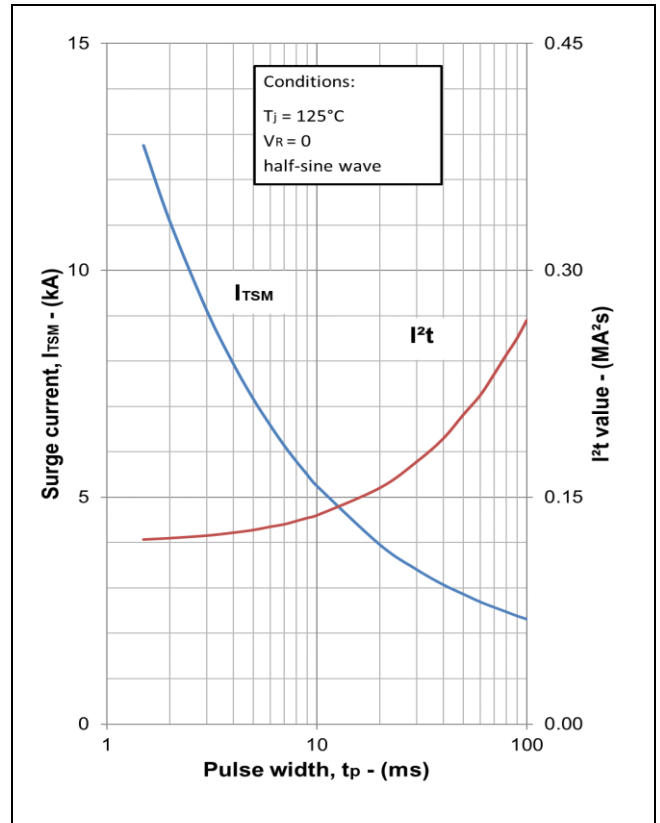


Fig. 11 Single-cycle surge current

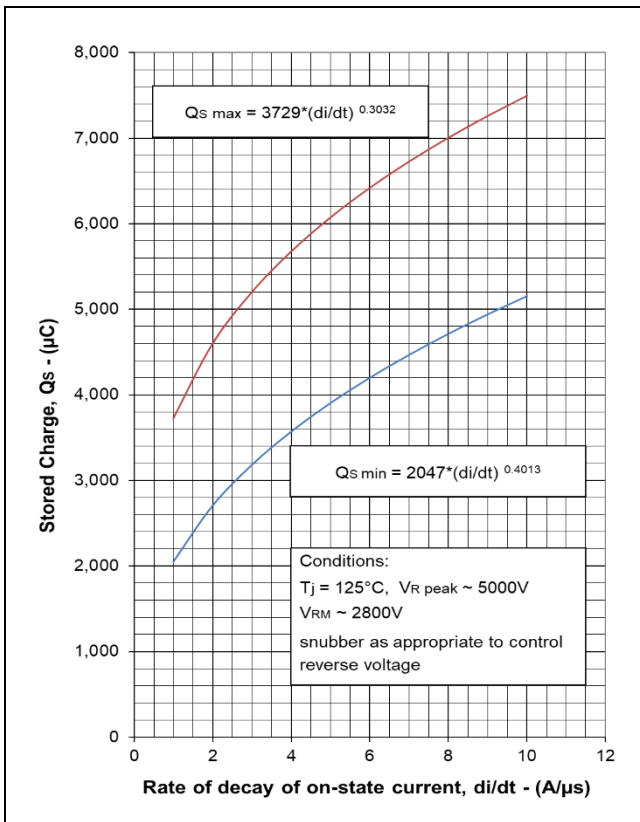


Fig. 12 Stored charge

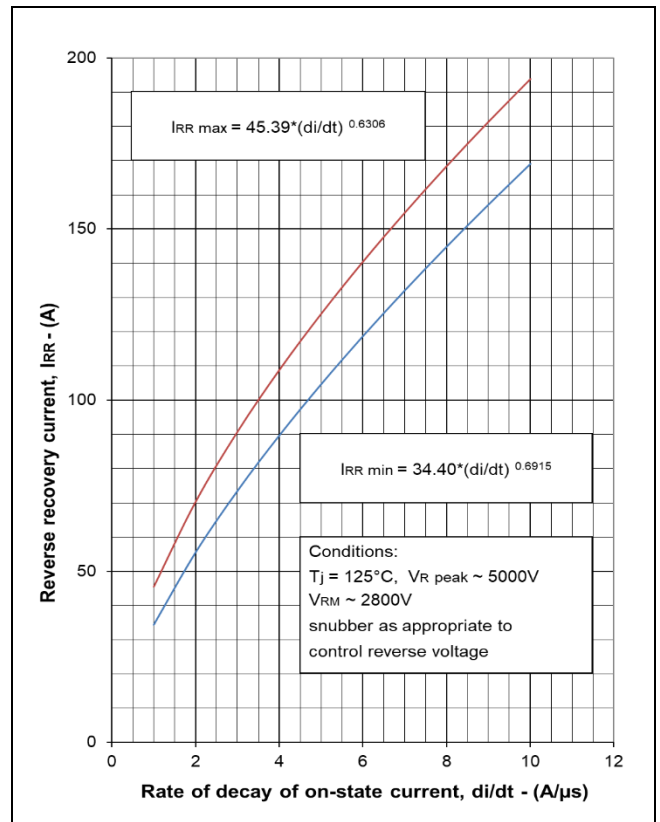


Fig. 13 Reverse recovery current

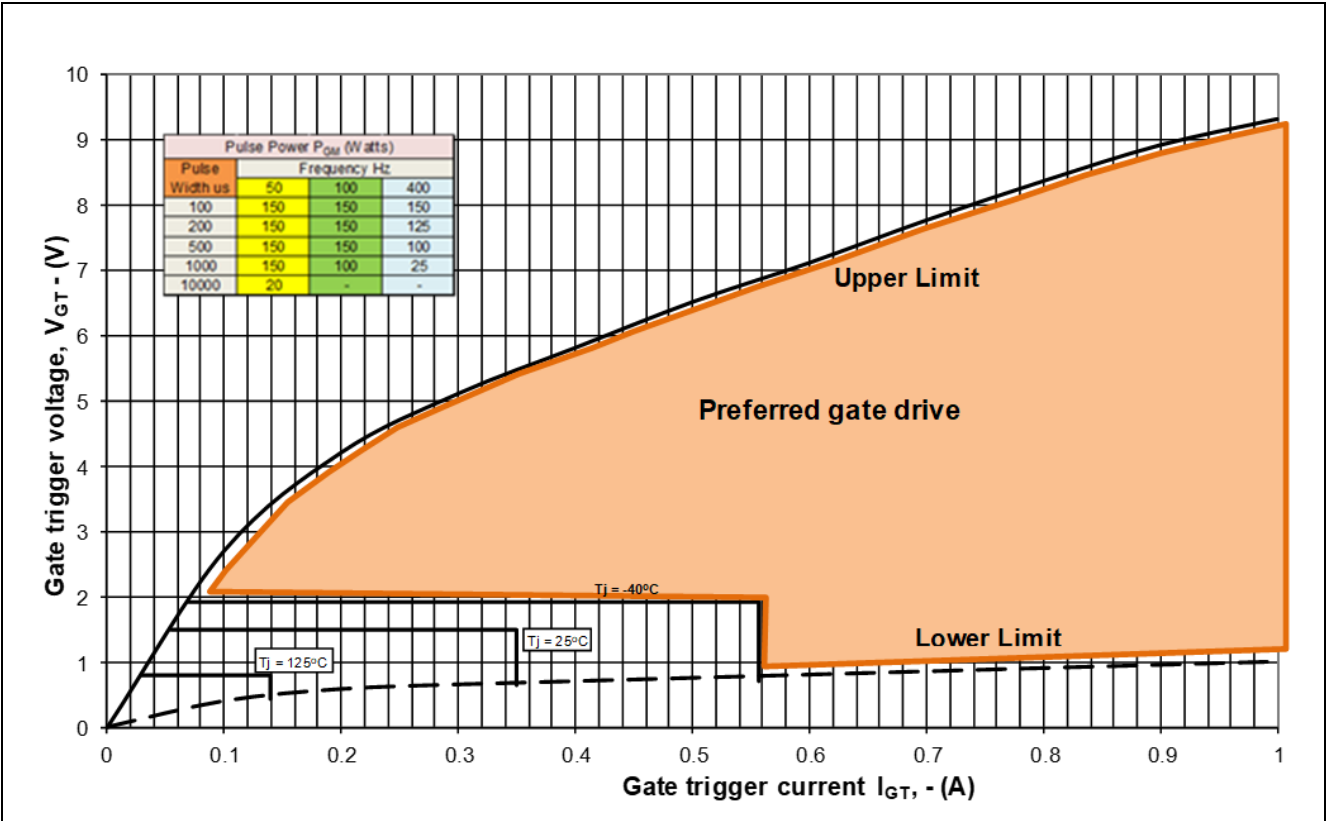


Fig. 14 Gate characteristics

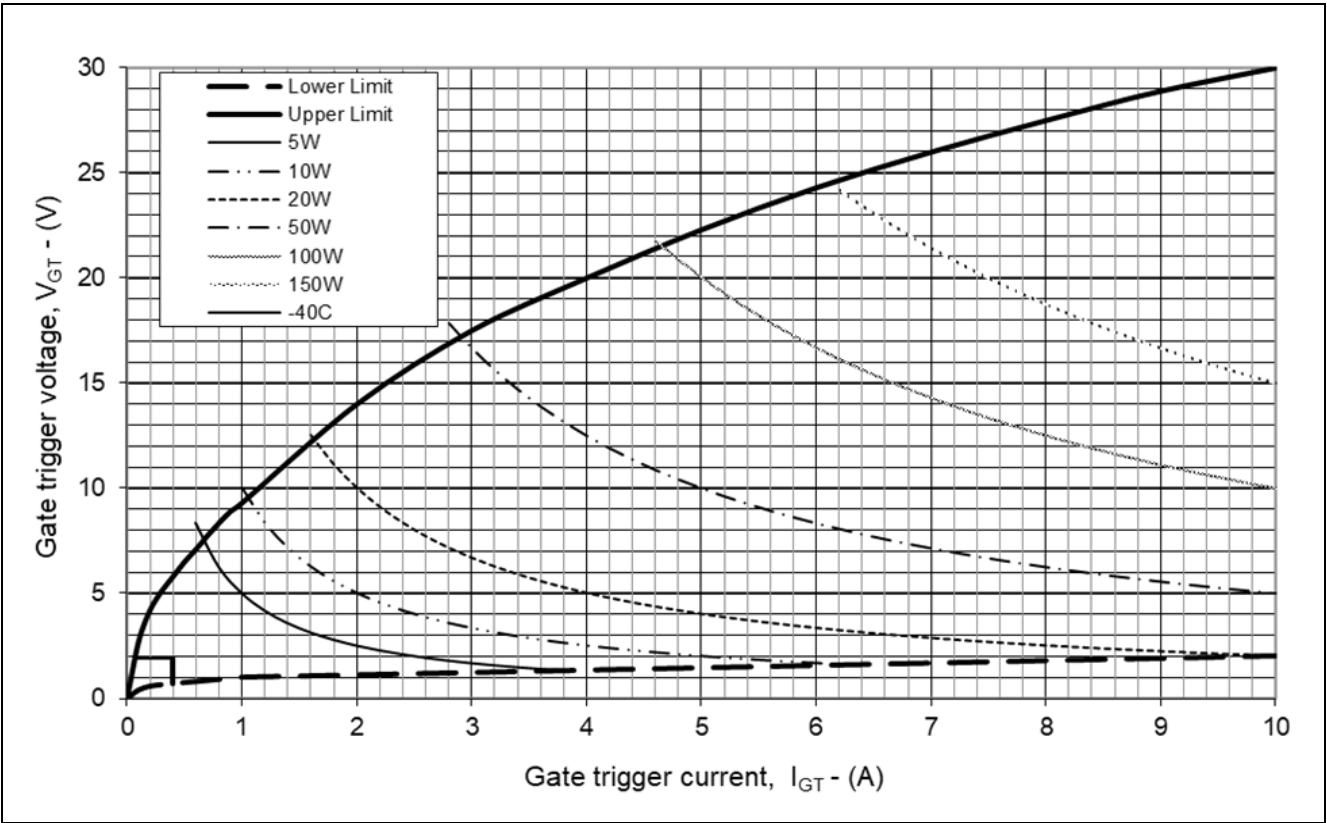


Fig. 15 Gate characteristics

PACKAGE DETAILS

For further package information, please contact Customer services.

All dimensions in mm, unless stated otherwise.

DO NOT SCALE

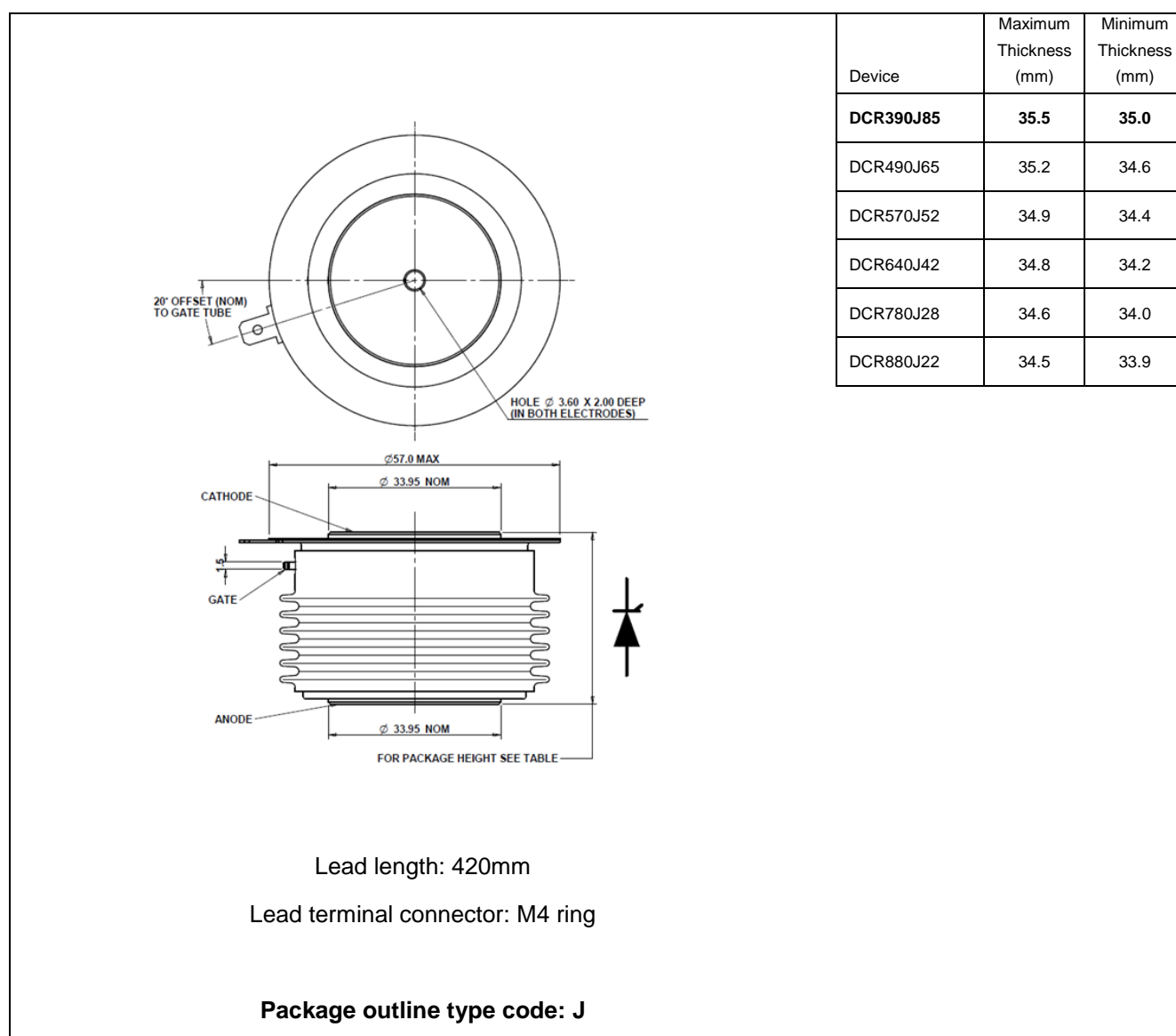


Fig. 16 Package outline

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