DCR390J85

Phase Control Thyristor

DS5833-4 June 2014 (LN31648)

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
DCR390J85* DCR390J80 DCR390J70	8500 8000 7000	T_{vj} = -40°C to 125°C, I_{DRM} = I_{RRM} = 100mA, V_{DRM}, V_{RRM} t_p = 10ms, V_{DSM} & V_{RSM} = V_{DRM} & V_{RRM} + 100V respectively

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

ORDERING INFORMATION

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

For example:

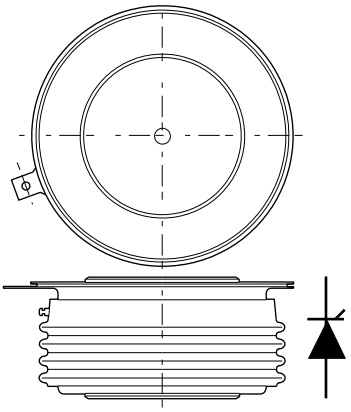
DCR390J85

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

KEY PARAMETERS

V_{DRM}	**8500V**
$I_{T(AV)}$	**387A**
I_{TSM}	**5250A**
dV/dt*	**1500V/µs**
dI/dt	**200A/us**

*** Higher dV/dt selections available**



Outline type code: J

(See Package Details for further information)

Fig. 1 Package outline

CURRENT RATINGS

T_{case} = 60°C unless stated otherwise

Symbol	Parameter	Test Conditions	Max.	Units
Double Side Cooled				
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	387	A
$I_{T(RMS)}$	RMS value	-	608	A
I_T	Continuous (direct) on-state current	-	583	A

SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
I_{TSM}	Surge (non-repetitive) on-state current	10ms half sine, T_{case} = 125°C	5.25	kA
I^2t	I^2t for fusing	V_R = 0	0.138	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	-	0.0379	°C/W
		Single side cooled	Anode DC	-	0.0745	°C/W
			Cathode DC	-	0.0797	°C/W
$R_{th(c-h)}$	Thermal resistance – case to heatsink	Clamping force 11.5kN	Double side	-	0.0072	°C/W
		(with mounting compound)	Single side	-	.0144	°C/W
T_{vj}	Virtual junction temperature	Blocking V_{DRM} / V_{RRM}		-	125	°C
T_{stg}	Storage temperature range			-55	125	°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
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 $I_{T(AV)}$	Repetitive 50Hz	-	100	A/µs
		Gate source 30V, 10Ω, t_r < 0.5µs, T_j = 125°C	Non-repetitive	-	200	A/µs
$V_{T(TO)}$	Threshold voltage – Low level	50A to 400A at T_{case} = 125°C		-	1.162	V
	Threshold voltage – High level	400A to 1600A at T_{case} = 125°C		-	1.3063	V
r_T	On-state slope resistance – Low level	50A to 400A at T_{case} = 125°C		-	3.153	mΩ
	On-state slope resistance – High level	400A to 1600A at T_{case} = 125°C		-	2.763	mΩ
t_{gd}	Delay time	V_D = 67% V_{DRM}, gate source 30V, 10Ω t_r = 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,		2000	3000	µC
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°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	350	mA
I_{GD}	Gate non-trigger current	At 50% V_{DRM}, T_{case} = 125°C	15	mA

CURVES

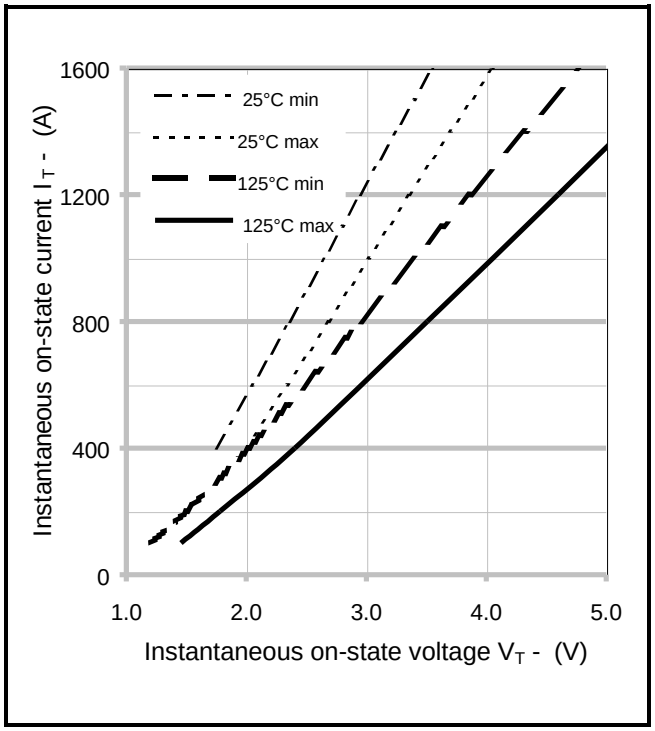


Fig.2 Maximum & minimum on-state characteristics

V_{TM} EQUATION

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

Where A = 1.545561
B = -0.202735
C = 0.001865
D = 0.066158

these values are valid for T_j = 125°C for I_T 50A to 1600A

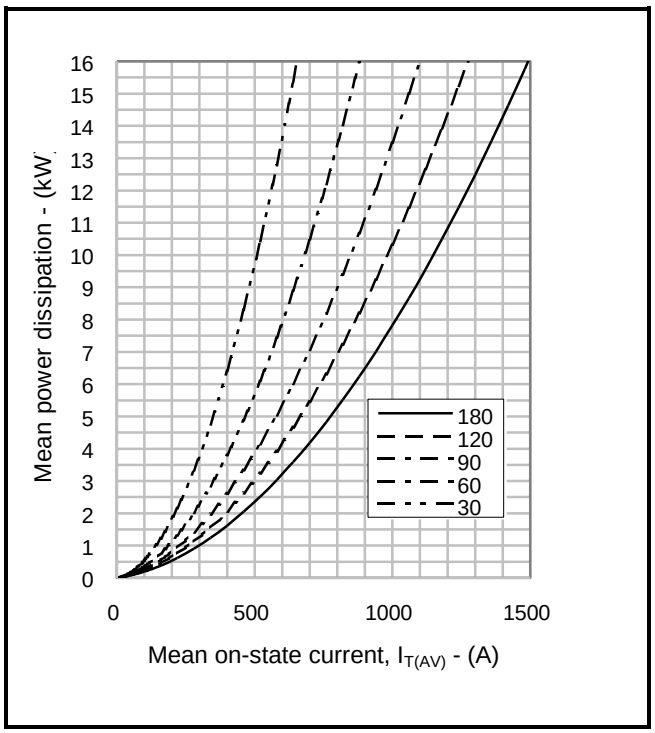


Fig.3 On-state power dissipation – sine wave

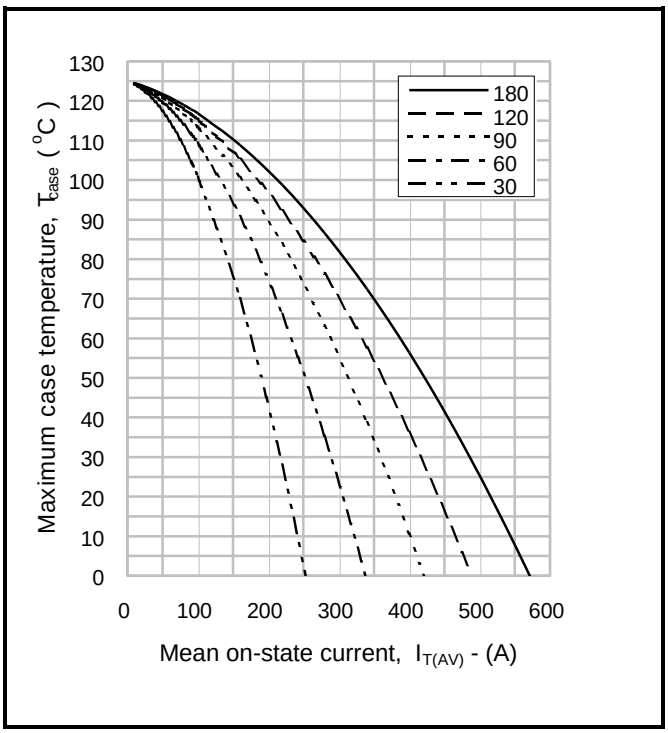


Fig.4 Maximum permissible case temperature, double side cooled – sine wave

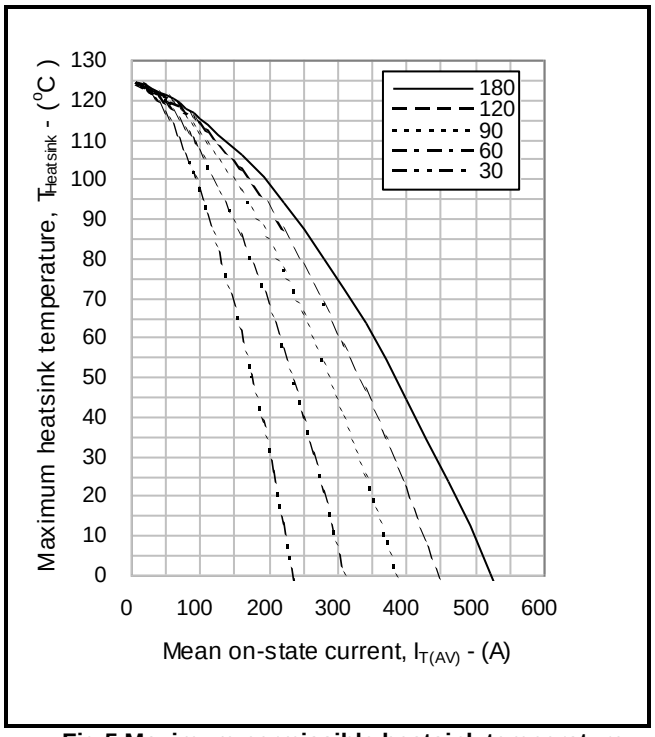


Fig.5 Maximum permissible heatsink temperature, double side cooled – sine wave

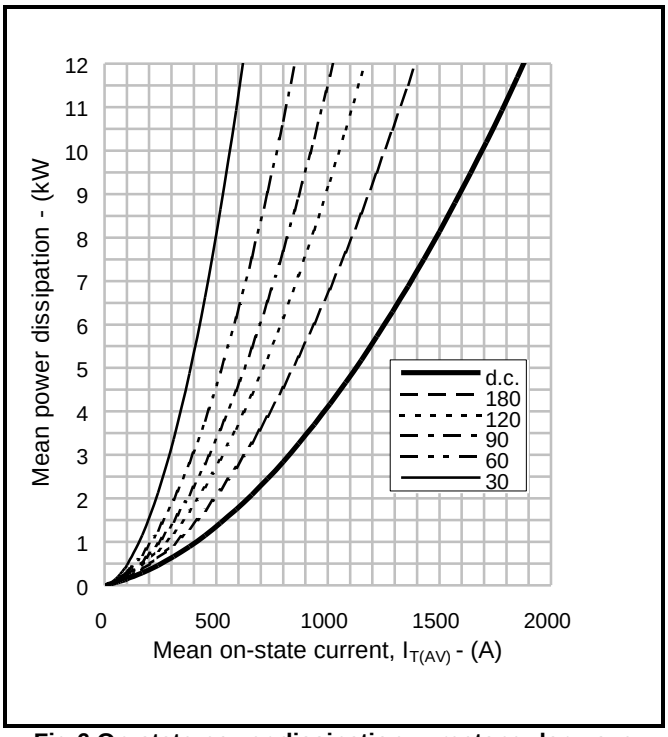


Fig.6 On-state power dissipation – rectangular wave

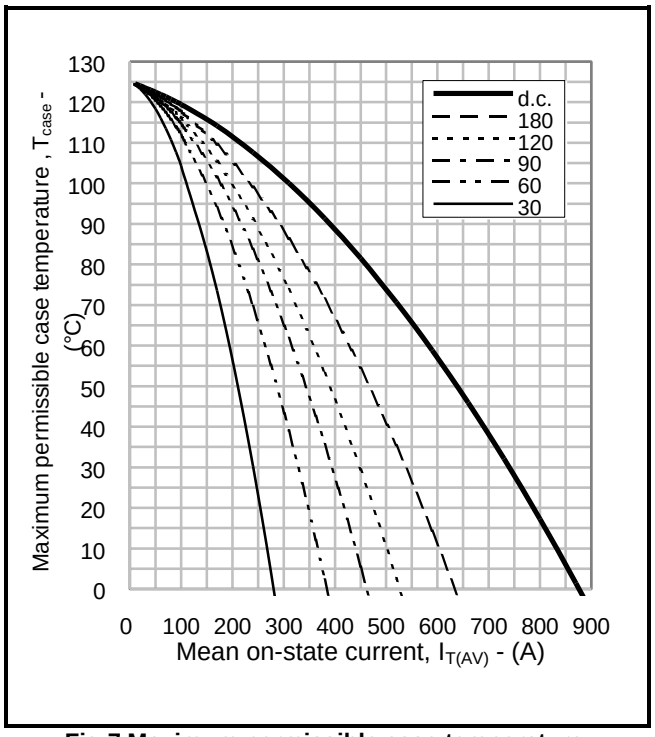


Fig.7 Maximum permissible case temperature, double side cooled – rectangular wave

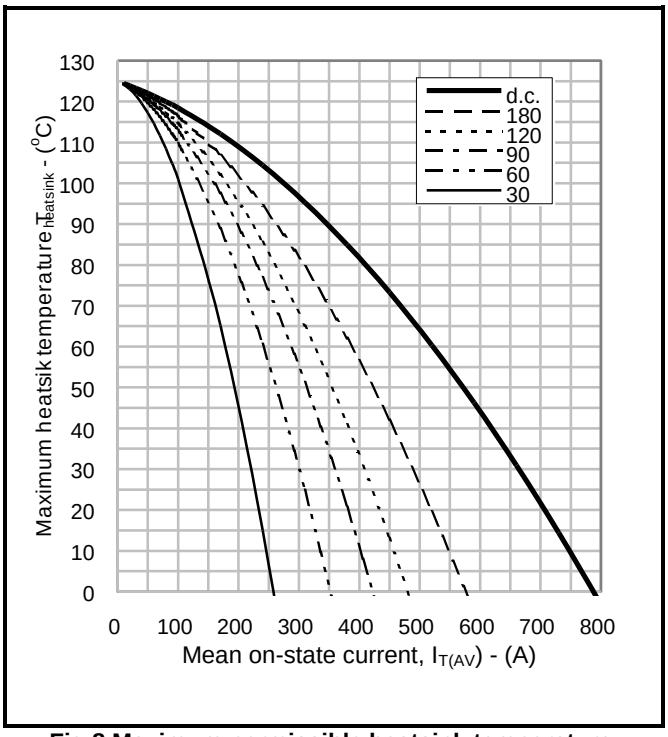
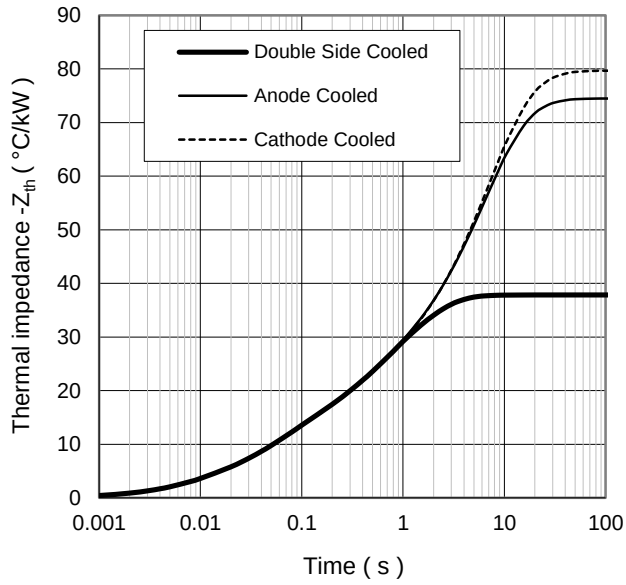


Fig.8 Maximum permissible heatsink temperature, double side cooled – rectangular wave



		1	2	3	4
Double side cooled	R_i (°C/kW)	2.4256	9.3503	10.6963	15.3758
	T_i (s)	0.0087759	0.053099	0.4497246	1.395
Anode side cooled	R_i (°C/kW)	2.8091	9.5576	11.3564	50.6136
	T_i (s)	0.0097443	0.0591913	0.4759179	6.5548
Cathode side cooled	R_i (°C/kW)	2.9507	9.4031	11.0771	56.0405
	T_i (s)	0.0100391	0.0606056	0.4732916	7.228

$Z_{th} = \Sigma [R_i \times (1\text{-exp. } (t/t_i))]$ **[1]**

$\Delta R_{th(j-c)}$ 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		
	ΔZ_{th} (z)	
θ°	sine.	rect.
180	4.43	3.01
120	5.13	4.30
90	5.89	5.03
60	6.58	5.81
30	7.12	6.67
15	7.36	7.13

Anode Side Cooling		
	ΔZ_{th} (z)	
θ°	sine.	rect.
180	4.39	2.99
120	5.07	4.26
90	5.81	4.97
60	6.48	5.74
30	7.00	6.57
15	7.24	7.01

Cathode Sided Cooling		
	ΔZ_{th} (z)	
θ°	sine.	rect.
180	4.37	2.98
120	5.05	4.25
90	5.79	4.96
60	6.45	5.72
30	6.97	6.54
15	7.20	6.98

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

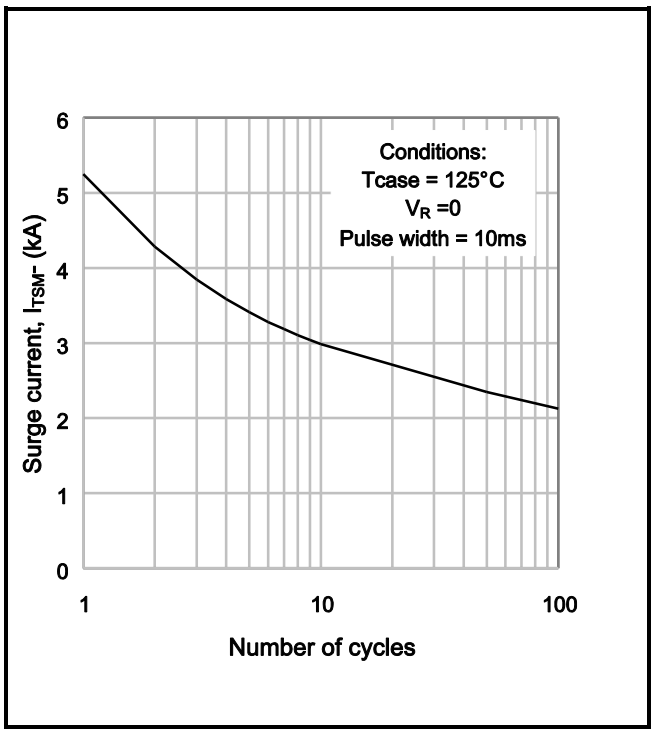


Fig.10 Multi-cycle surge current

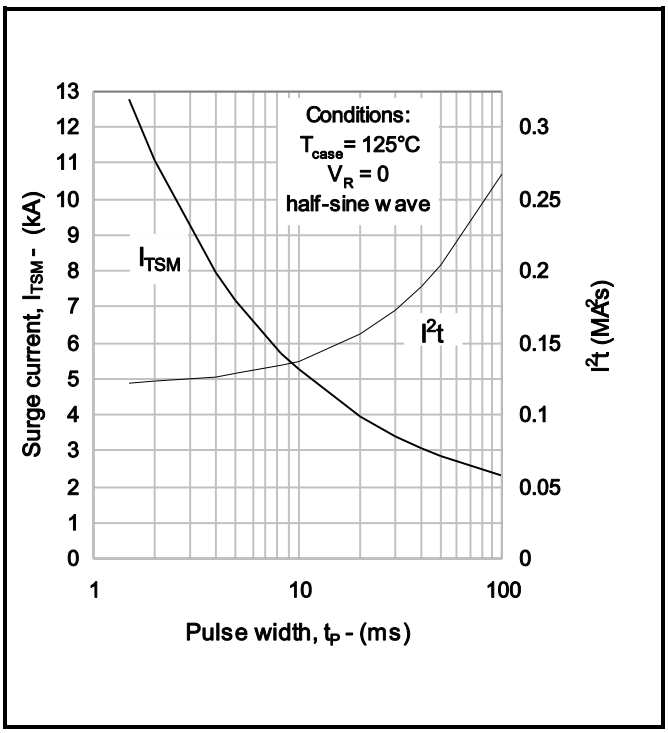


Fig.11 Single-cycle surge current

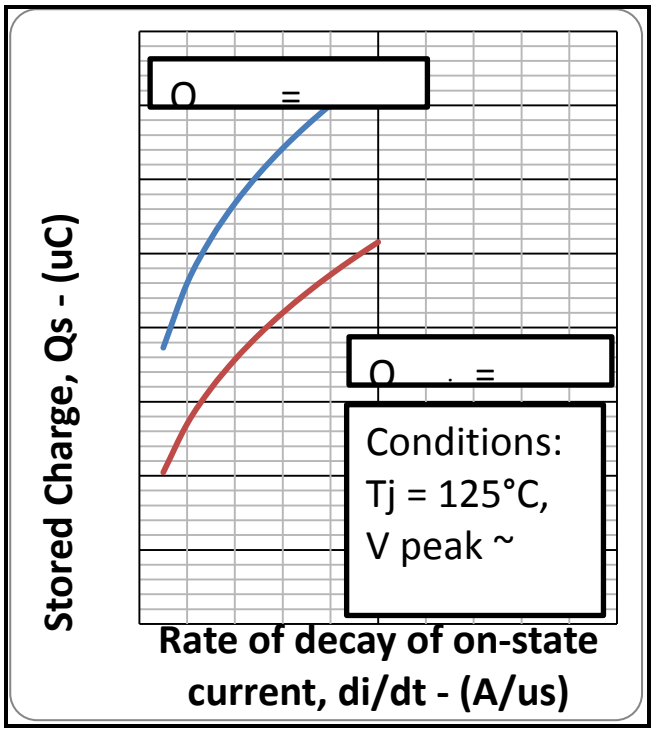


Fig.12 Stored charge

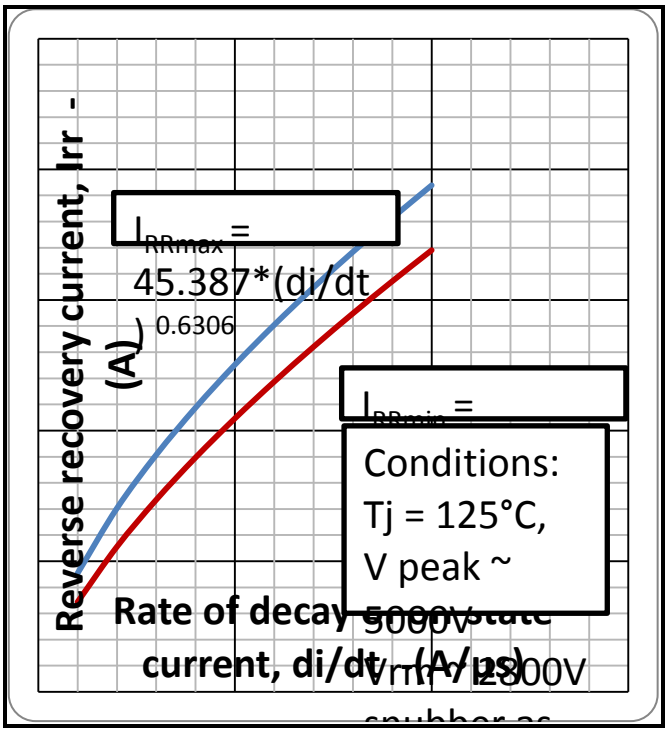


Fig.13 Reverse recovery current

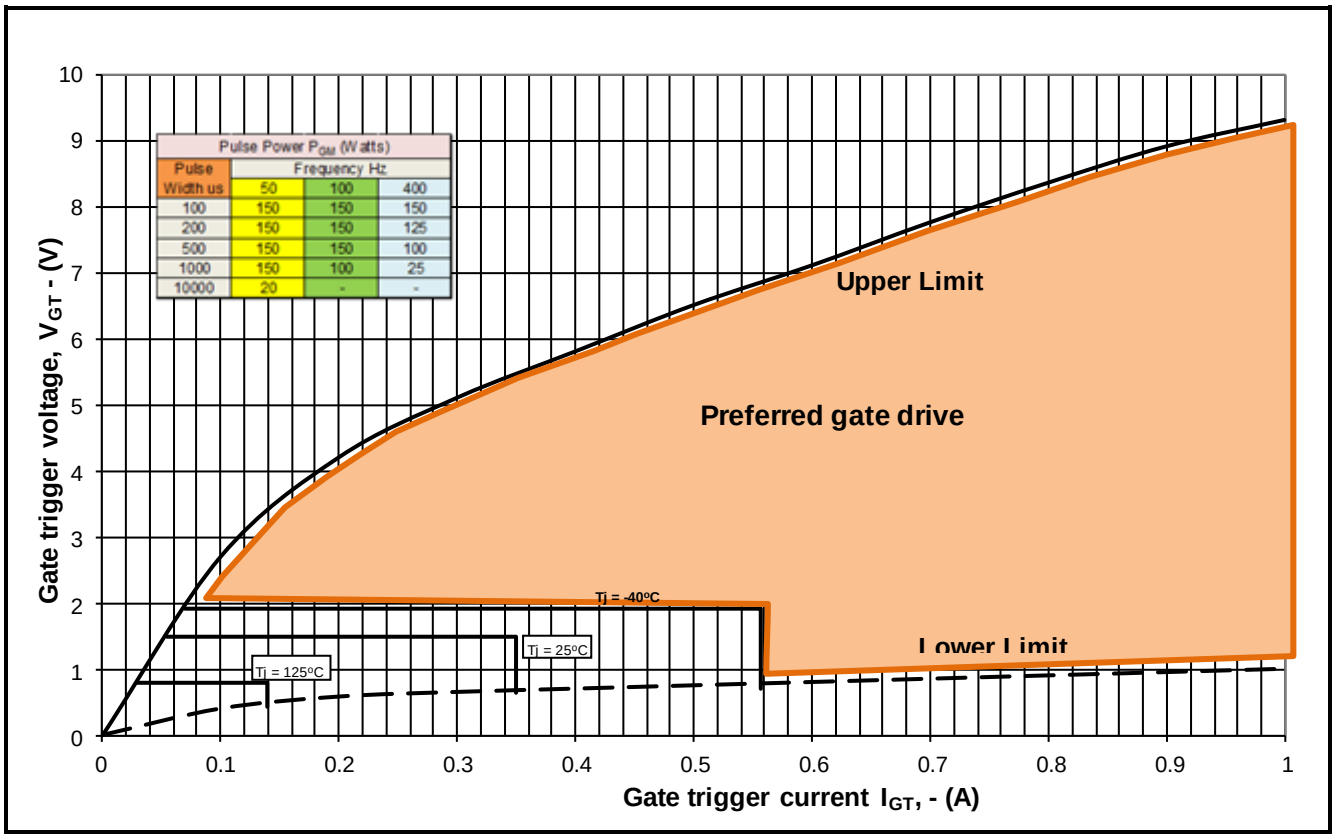


Fig14 Gate Characteristics

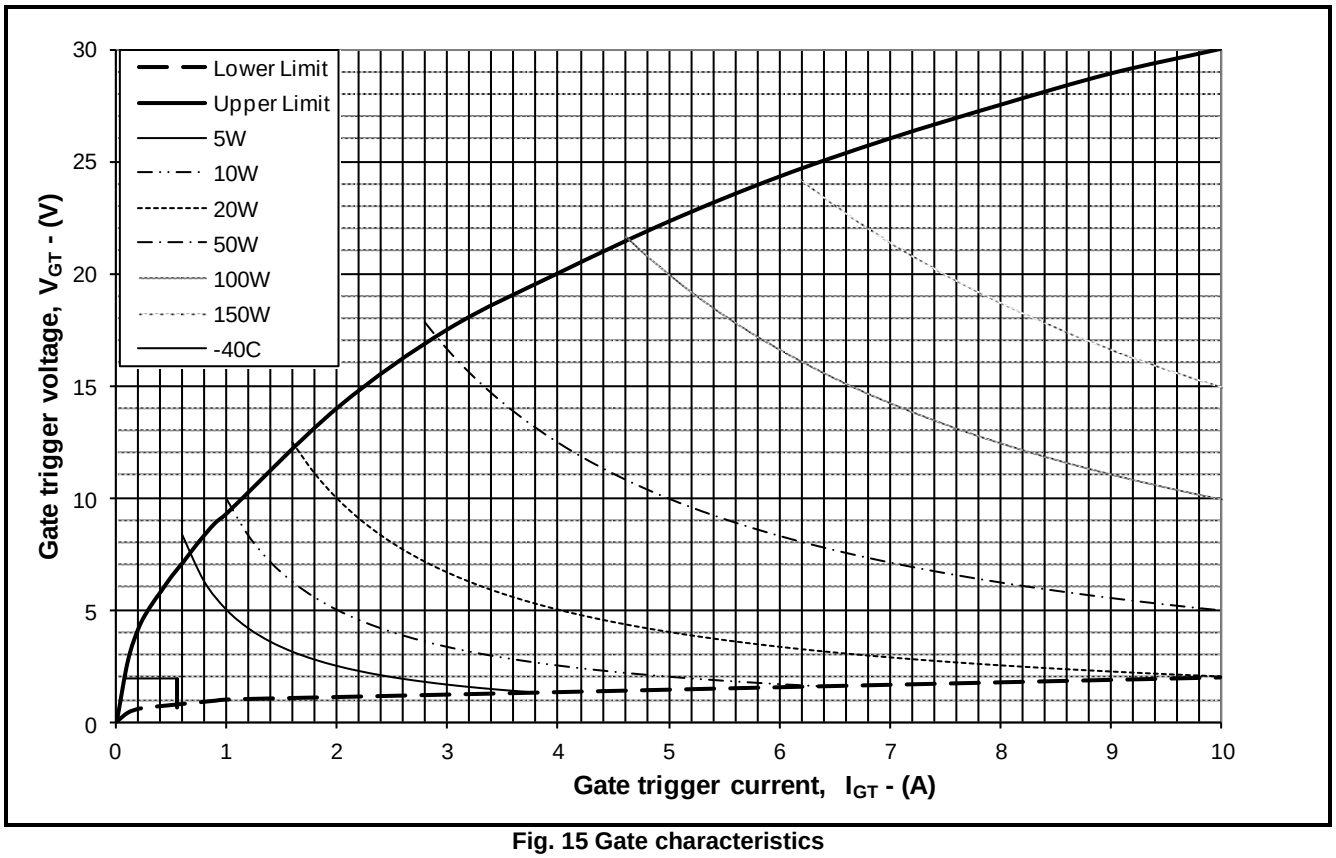
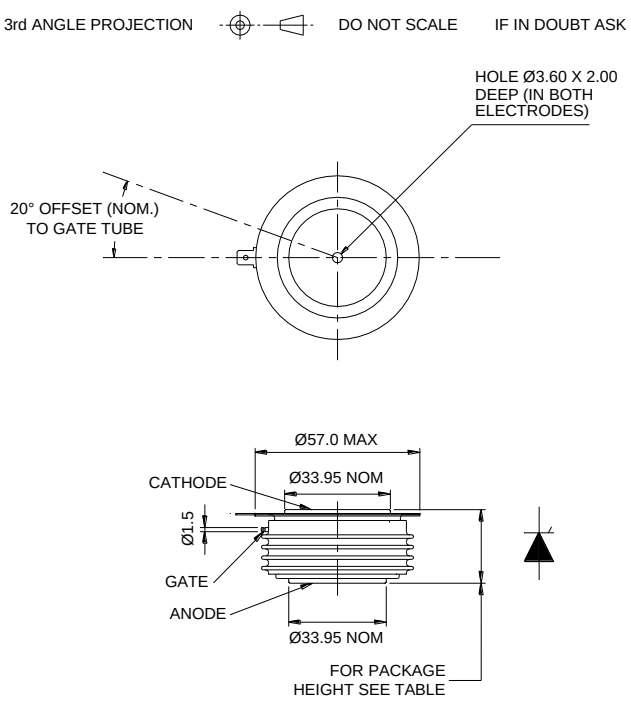


Fig. 15 Gate characteristics

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)
DCR880J22	34.465	33.915
DCR780J28	34.54	33.99
DCR640J42	34.77	34.22
DCR570J52	34.89	34.34
DCR490J65	35.15	34.6
DCR390J85	**35.51**	**34.96**

Clamping force: 11.5 kN ±10%
Lead length: 420mm
Lead terminal connector: M4 ring

Package outline type code: J

Fig.16 Package outline

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