

### 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
DCR490J65*	6500	$T_{vj} = -40^{\circ}\text{C}$ 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
DCR490J60	6000	
DCR490J55	5500	

Lower voltage grades available.  
 \*6200V @  $-40^{\circ}\text{C}$ , 6500V @  $0^{\circ}\text{C}$

### KEY PARAMETERS

$V_{DRM}$	<b>6500V</b>
$I_{T(AV)}$	<b>490A</b>
$I_{TSM}$	<b>6600A</b>
$dV/dt^*$	<b>1500V/<math>\mu\text{s}</math></b>
$dI/dt$	<b>200A/<math>\mu\text{s}</math></b>

\* Higher  $dV/dt$  selections available

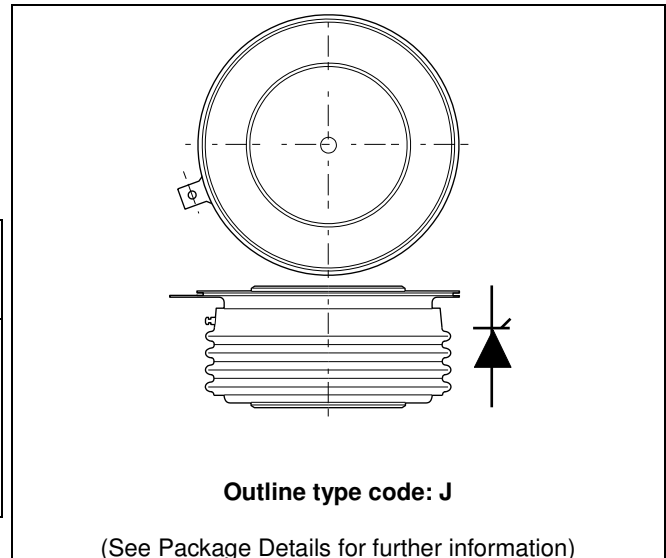


Fig. 1 Package outline

### ORDERING INFORMATION

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

For example:

#### DCR490J65

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	490	A
$I_{T(RMS)}$	RMS value	-	770	A
$I_T$	Continuous (direct) on-state current	-	730	A

## SURGE RATINGS

Symbol	Parameter	Test Conditions	Max.	Units
$I_{TSM}$	Surge (non-repetitive) on-state current	10ms half sine, $T_{case} = 125^{\circ}\text{C}$	6.6	kA
$I^2t$	$I^2t$ for fusing	$V_R = 0$	0.22	$\text{MA}^2\text{s}$

## THERMAL AND MECHANICAL RATINGS

Symbol	Parameter	Test Conditions	Min.	Max.	Units	
$R_{th(j-c)}$	Thermal resistance – junction to case	Double side cooled	DC	-	0.0379	$^{\circ}\text{C/W}$
		Single side cooled	Anode DC	-	0.0745	$^{\circ}\text{C/W}$
			Cathode DC	-	0.0797	$^{\circ}\text{C/W}$
$R_{th(c-h)}$	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	

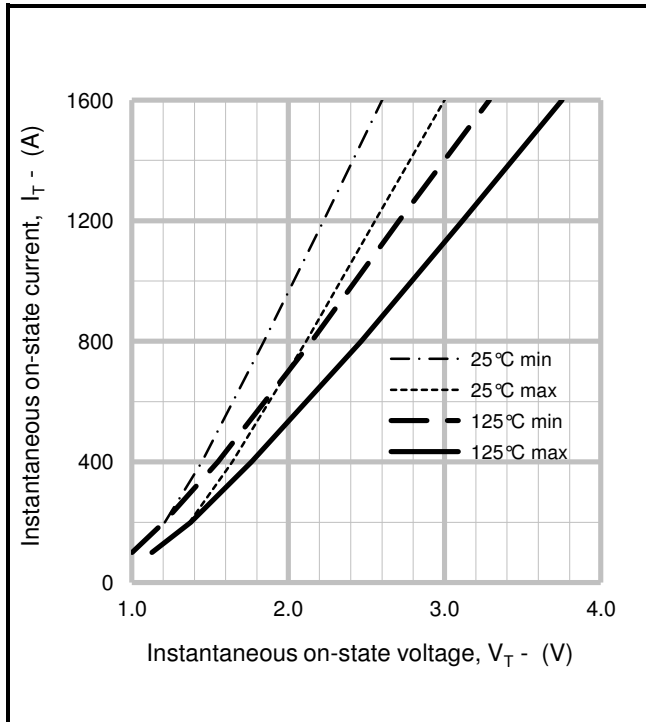
**DYNAMIC CHARACTERISTICS**

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	-	100	A/ $\mu s$
		Gate source 30V, 10 $\Omega$ , $t_r < 0.5\mu s$ , $T_j = 125^{\circ}C$	Non-repetitive	-	200	A/ $\mu s$
$V_{T(TO)}$	Threshold voltage – Low level	50A to 400A at $T_{case} = 125^{\circ}C$	-	0.912	V	
	Threshold voltage – High level	400A to 1600A at $T_{case} = 125^{\circ}C$	-	1.108	V	
$r_T$	On-state slope resistance – Low level	50A to 400A at $T_{case} = 125^{\circ}C$	-	2.157	m $\Omega$	
	On-state slope resistance – High level	400A to 1600A at $T_{case} = 125^{\circ}C$	-	1.647	m $\Omega$	
$t_{gd}$	Delay time	$V_D = 67\% V_{DRM}$ , gate source 30V, 10 $\Omega$ $t_r = 0.5\mu s$ , $T_j = 25^{\circ}C$	-	3	$\mu s$	
$t_q$	Turn-off time	$I_T = 500A$ , $T_j = 125^{\circ}C$ , $V_R = 100V$ , $dI/dt = 5A/\mu s$ , $dV_{DR}/dt = 20V/\mu s$ linear	550	1100	$\mu s$	
$Q_S$	Stored charge	$I_T = 500A$ , $T_j = 125^{\circ}C$ , $dI/dt = 5A/\mu s$ ,	1800	2600	$\mu C$	
$I_{RR}$	Reverse recovery current	$I_T = 500A$ , $T_j = 125^{\circ}C$ , $dI/dt = 5A/\mu s$ ,	77	90	A	
$I_L$	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	15	mA

**CURVES**



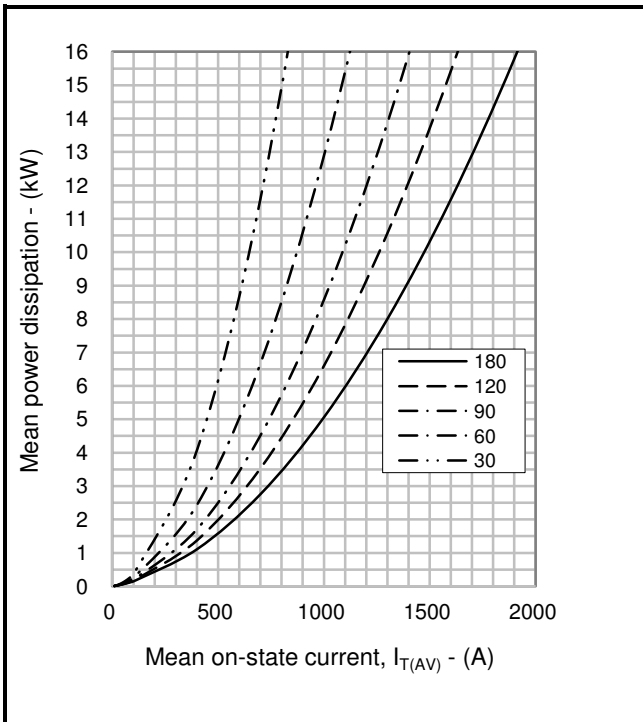
**Fig.2 Maximum & minimum on-state characteristics**

**V<sub>TM</sub> EQUATION**

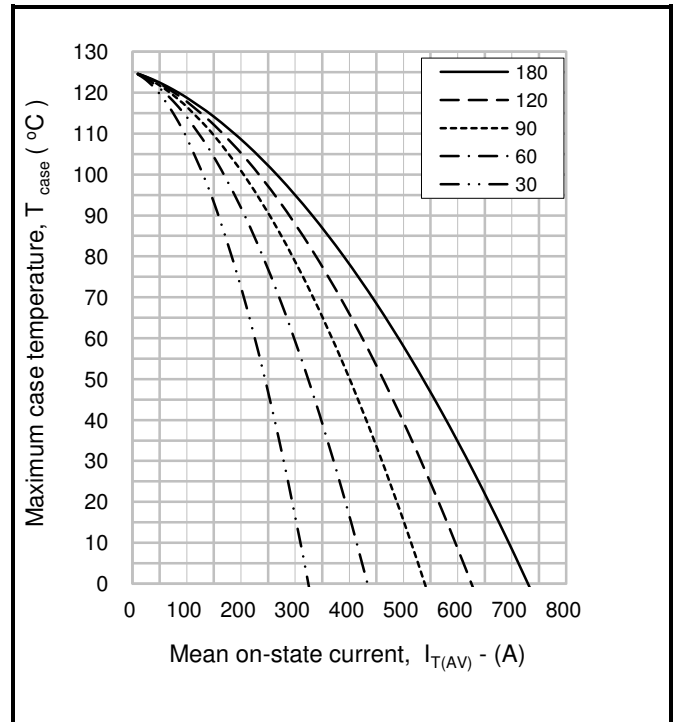
$$V_{TM} = A + B \ln(I_T) + C \cdot I_T + D \cdot \sqrt{I_T}$$

Where A = 0.542452  
 B = 0.065613  
 C = 0.001318  
 D = 0.015356

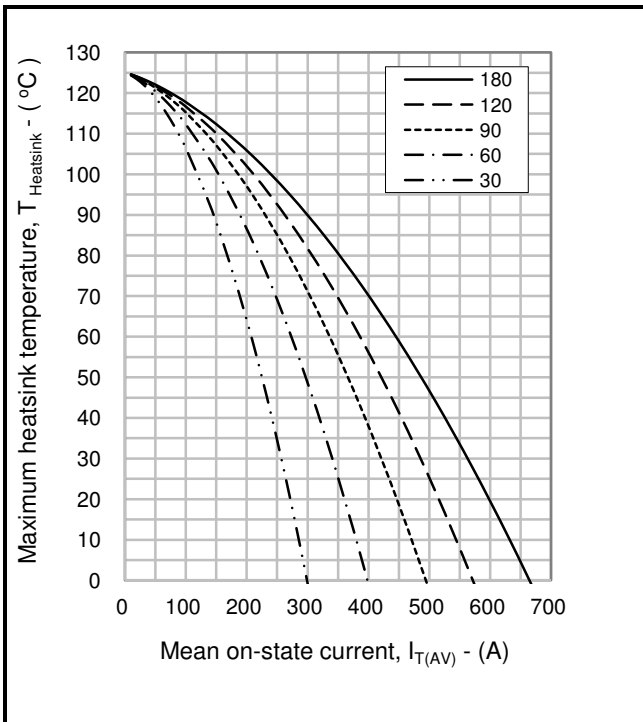
these values are valid for T<sub>j</sub> = 125 °C for I<sub>T</sub> 50A to 1600A



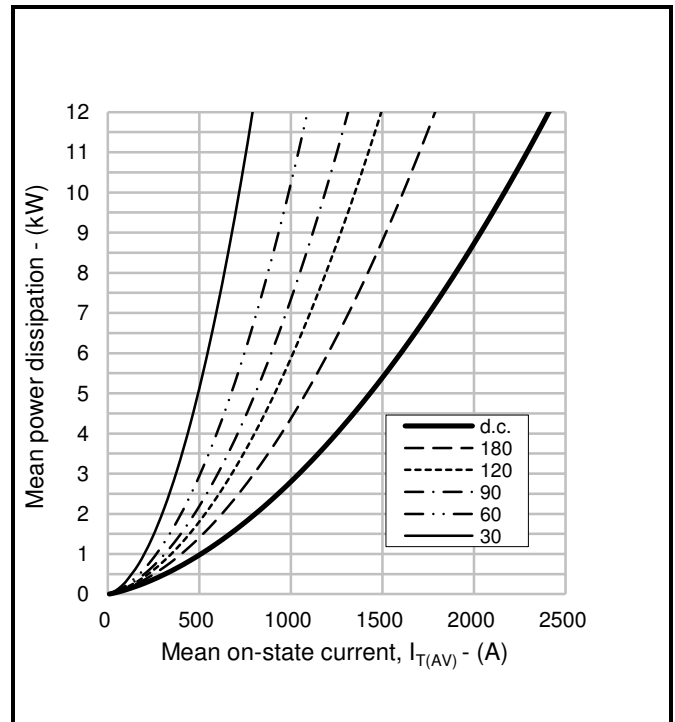
**Fig.3 On-state power dissipation – sine wave**



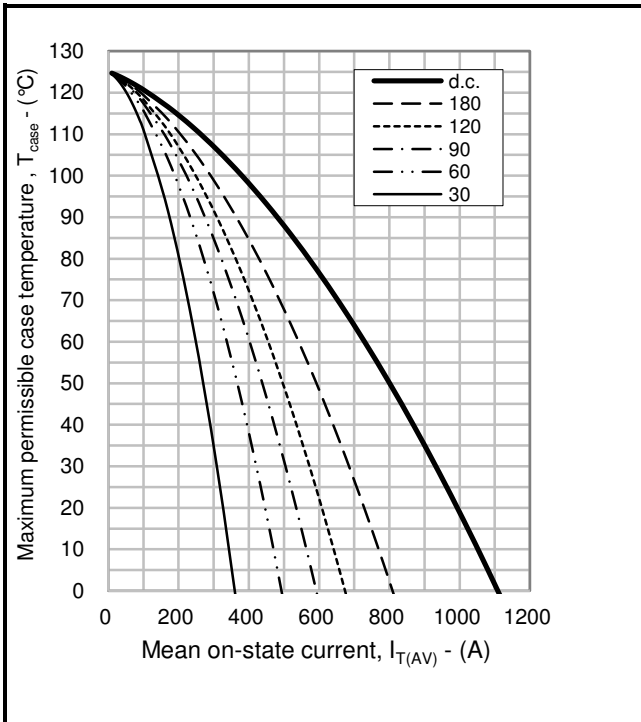
**Fig.4 Maximum permissible case temperature, double side cooled – sine wave**



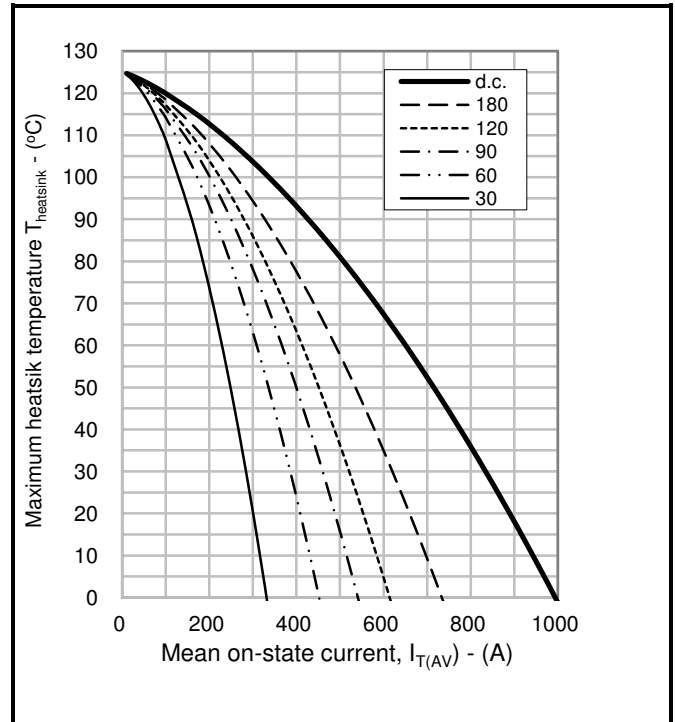
**Fig.5 Maximum permissible heatsink temperature, double side cooled – sine wave**



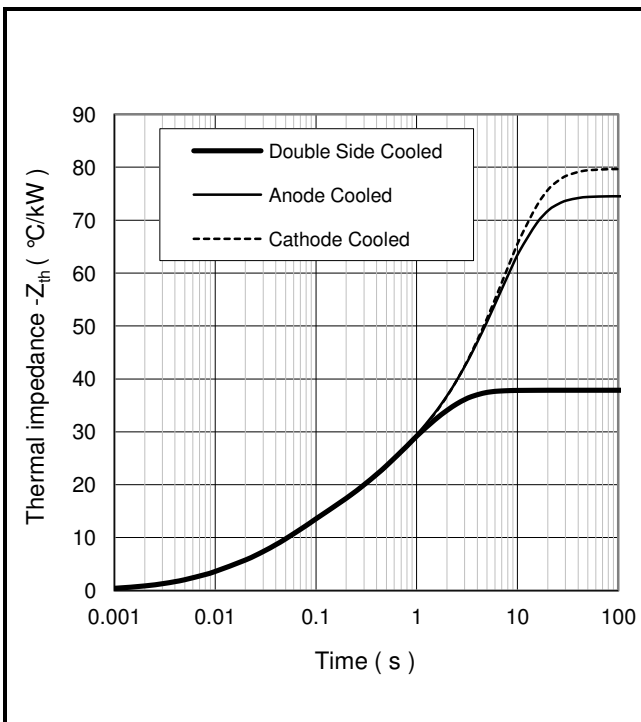
**Fig.6 On-state power dissipation – rectangular wave**



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



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



**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)	2.4256	9.3503	10.6963	15.3758
	T <sub>i</sub> (s)	0.0087759	0.053099	0.4497246	1.395
Anode side cooled	R <sub>i</sub> (°C/kW)	2.8091	9.5576	11.3564	50.6136
	T <sub>i</sub> (s)	0.0097443	0.0591913	0.4759179	6.5548
Cathode side cooled	R <sub>i</sub> (°C/kW)	2.9507	9.4031	11.0771	56.0405
	T <sub>i</sub> (s)	0.0100391	0.0606056	0.4732916	7.228

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

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		
ρ°	ΔZ <sub>th</sub> (z)		ρ°	ΔZ <sub>th</sub> (z)		ρ°	ΔZ <sub>th</sub> (z)	
	sine.	rect.		sine.	rect.		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

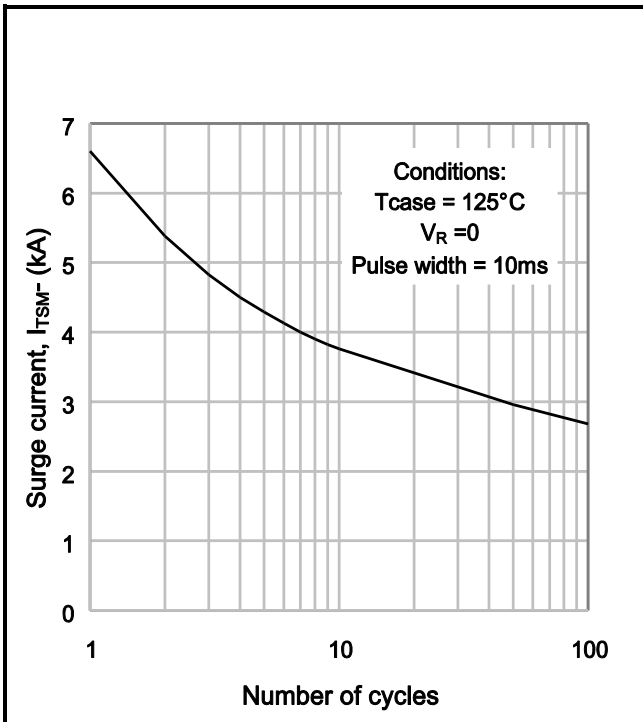


Fig.10 Multi-cycle surge current

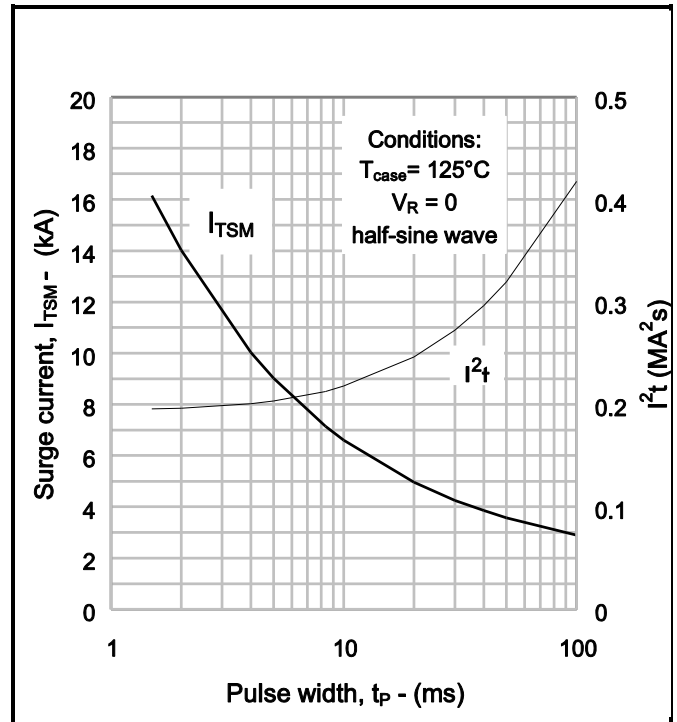


Fig.11 Single-cycle surge current

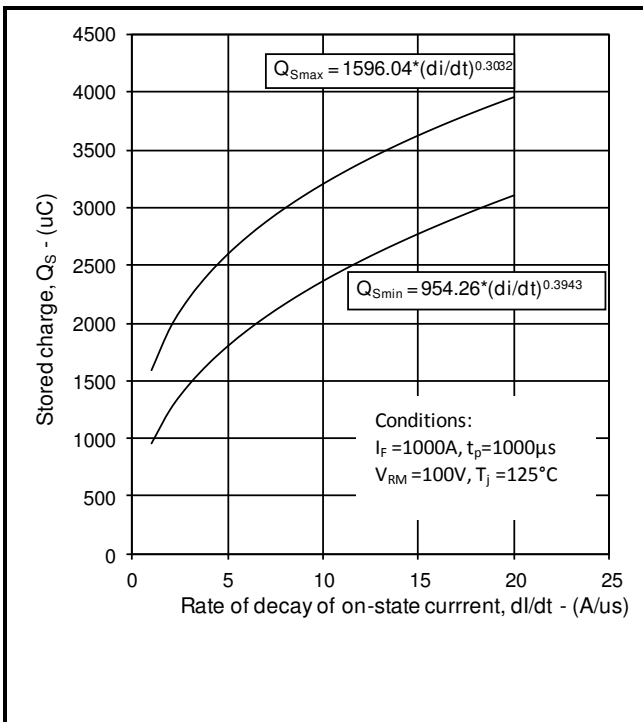


Fig.12 Stored charge vs di/dt

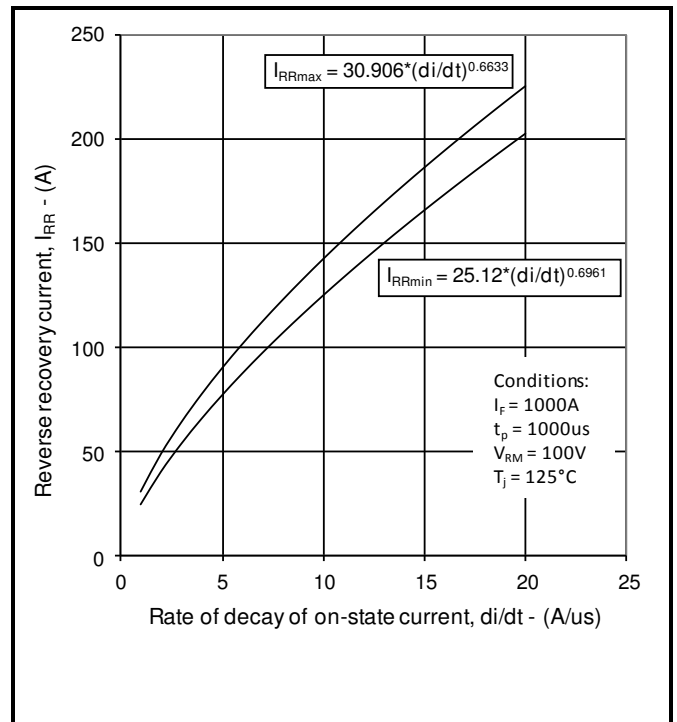


Fig.13 Reverse recovery current vs di/dt

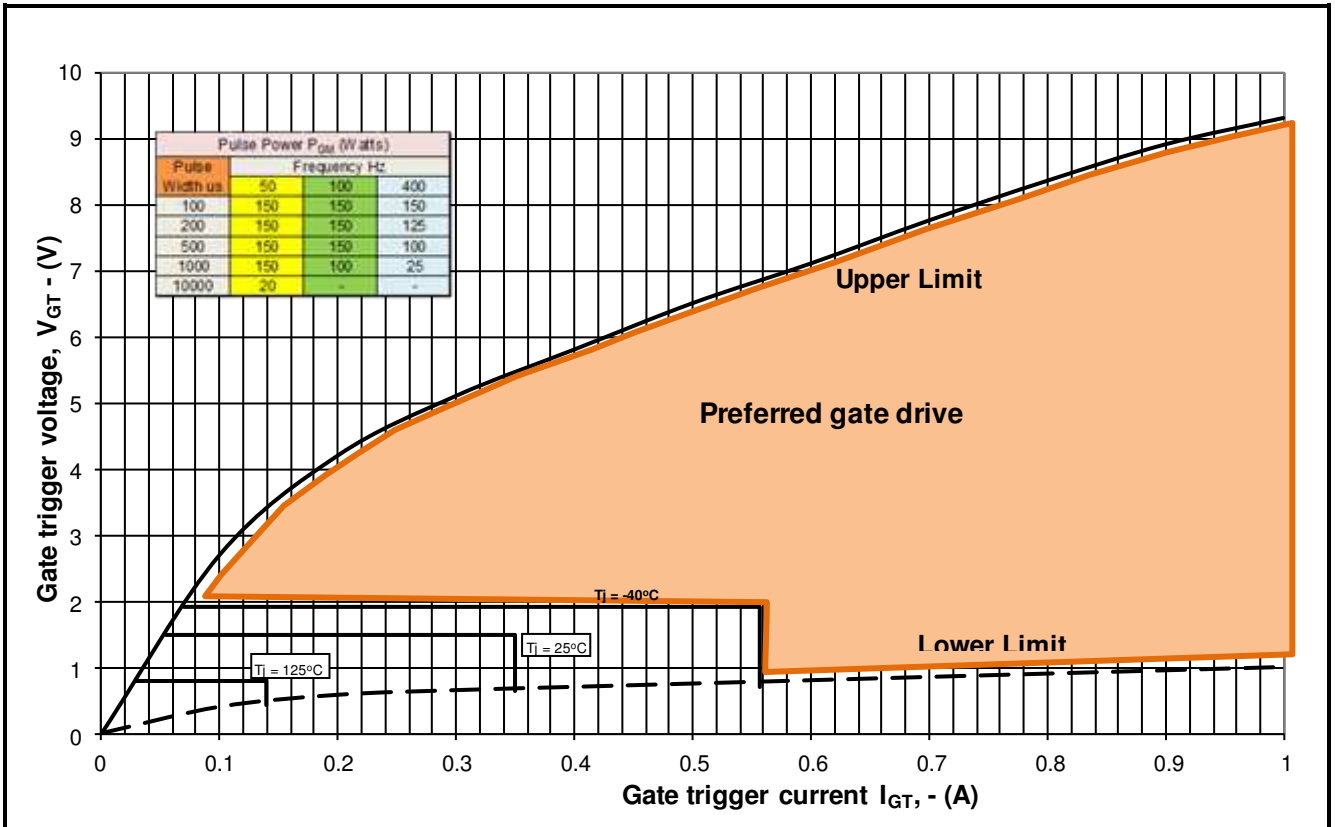


Fig14 Gate Characteristics

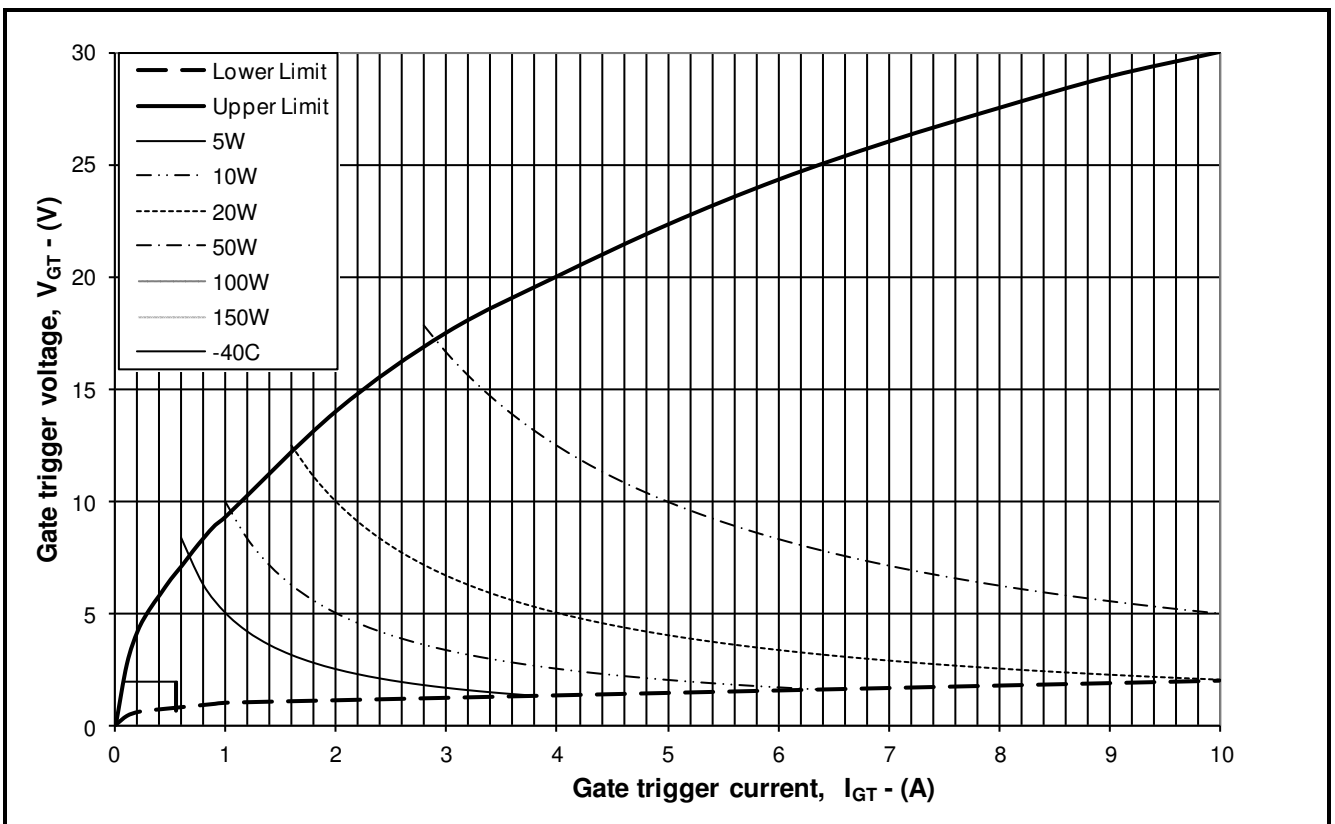
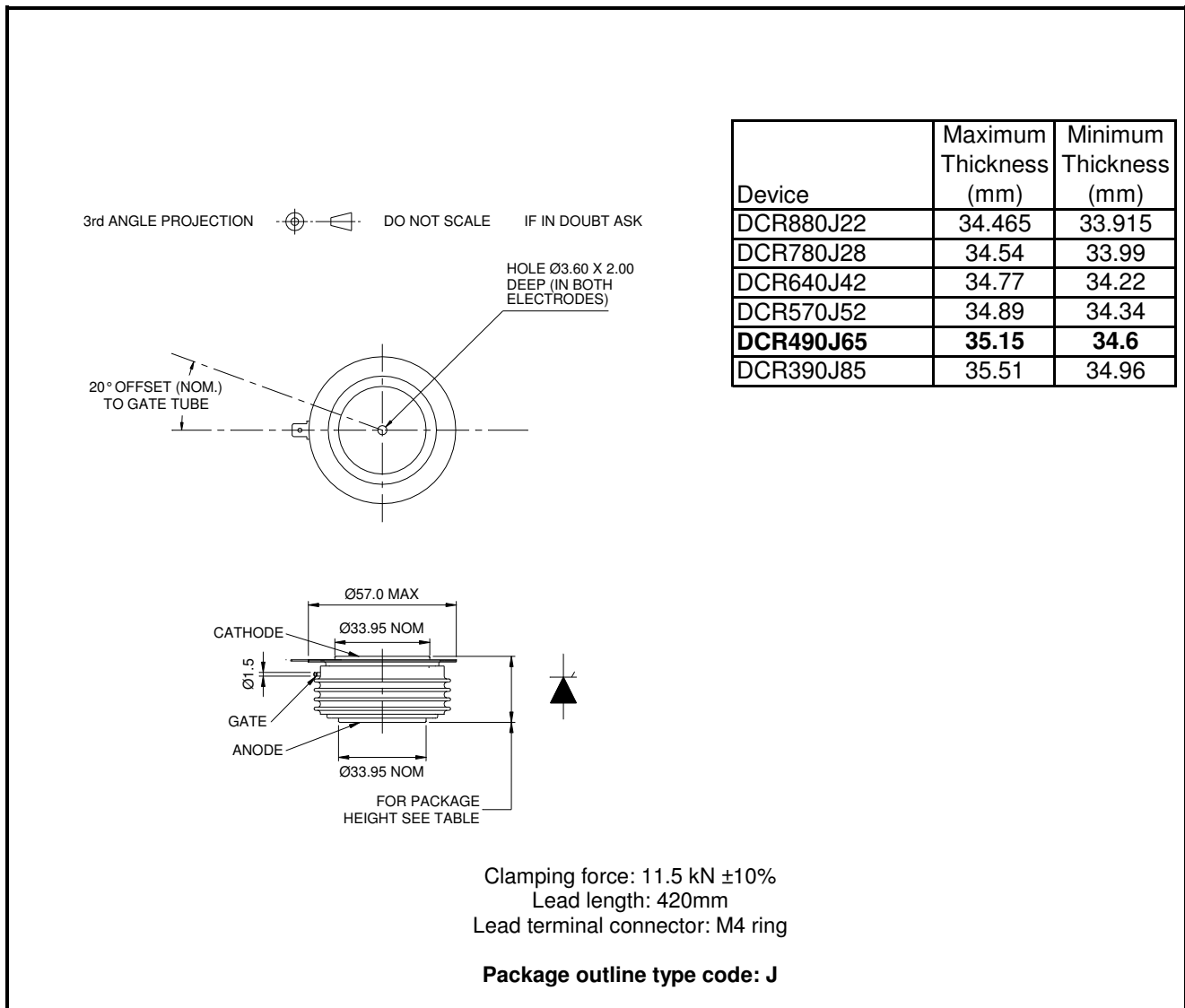


Fig. 15 Gate characteristics

**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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