

**APPLICATIONS**

- Snubber Diode For GTO Applications

**KEY PARAMETERS**

$V_{RRM}$	<b>4500V</b>
$I_{F(AV)}$	<b>445A</b>
$I_{FSM}$	<b>4500A</b>
$Q_r$	<b>650<math>\mu</math>C</b>
$t_{rr}$	<b>5<math>\mu</math>s</b>

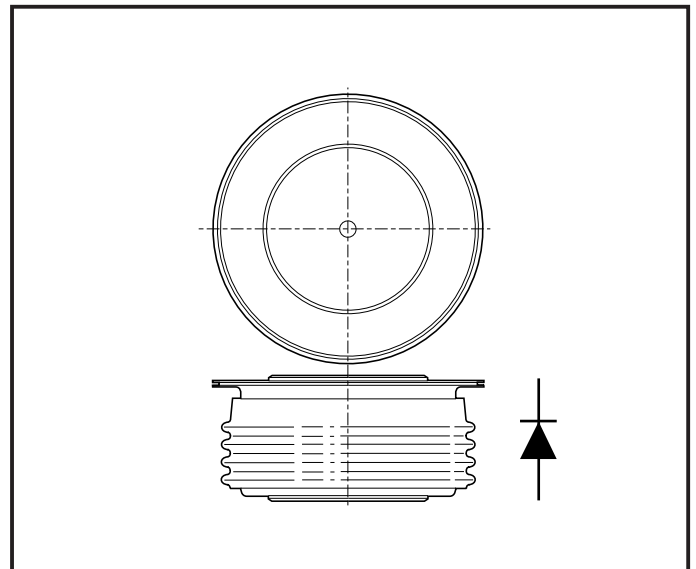
**FEATURES**

- Double Side Cooling
- High Surge Capability
- Low Recovery Charge

**VOLTAGE RATINGS**

Type Number	Repetitive Peak Reverse Voltage $V_{RRM}$ V	Conditions
DF685 45	4500	$V_{RSM} = V_{RRM} + 100V$
DF685 44	4400	
DF685 43	4300	
DF685 42	4200	
DF685 41	4100	
DF685 40	4000	

Lower voltage grades available.



Outline type code: M779b.  
See Package Details for further information.

**CURRENT RATINGS**

Symbol	Parameter	Conditions	Max.	Units
<b>Double Side Cooled</b>				
$I_{F(AV)}$	Mean forward current	Half wave resistive load, $T_{case} = 65^\circ C$	445	A
$I_{F(RMS)}$	RMS value	$T_{case} = 65^\circ C$	700	A
$I_F$	Continuous (direct) forward current	$T_{case} = 65^\circ C$	610	A
<b>Single Side Cooled (Anode side)</b>				
$I_{F(AV)}$	Mean forward current	Half wave resistive load, $T_{case} = 65^\circ C$	280	A
$I_{F(RMS)}$	RMS value	$T_{case} = 65^\circ C$	440	A
$I_F$	Continuous (direct) forward current	$T_{case} = 65^\circ C$	365	A

# DF685

## SURGE RATINGS

Symbol	Parameter	Conditions	Max.	Units
$I_{FSM}$	Surge (non-repetitive) forward current	10ms half sine; with 0% $V_{RRM}$ , $T_j = 150^\circ\text{C}$	4.5	kA
$I^2t$	$I^2t$ for fusing		$101.25 \times 10^3$	$\text{A}^2\text{s}$
$I_{FSM}$	Surge (non-repetitive) forward current	10ms half sine; with 50% $V_{RRM}$ , $T_j = 150^\circ\text{C}$	3.6	kA
$I^2t$	$I^2t$ for fusing		$64.8 \times 10^3$	$\text{A}^2\text{s}$
$I_{FSM}$	Surge (non-repetitive) forward current	10ms half sine; with 100% $V_{RRM}$ , $T_j = 150^\circ\text{C}$	-	kA
$I^2t$	$I^2t$ for fusing		-	$\text{A}^2\text{s}$

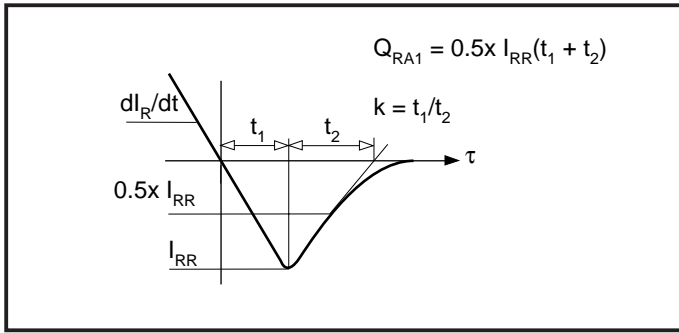
## THERMAL AND MECHANICAL DATA

Symbol	Parameter	Conditions	Min.	Max.	Units	
$R_{th(j-c)}$	Thermal resistance - junction to case	Double side cooled	dc	-	0.045	$^\circ\text{C/W}$
		Single side cooled	Anode dc	-	0.086	$^\circ\text{C/W}$
			Cathode dc	-	0.095	$^\circ\text{C/W}$
$R_{th(c-h)}$	Thermal resistance - case to heatsink	Clamping force 10kN with mounting compound	Double side	-	0.01	$^\circ\text{C/W}$
			Single side	-	0.02	$^\circ\text{C/W}$
$T_{vj}$	Virtual junction temperature	On-state (conducting)	-	150	$^\circ\text{C}$	
$T_{stg}$	Storage temperature range		-55	150	$^\circ\text{C}$	
-	Clamping force		9.0	11.0	kN	

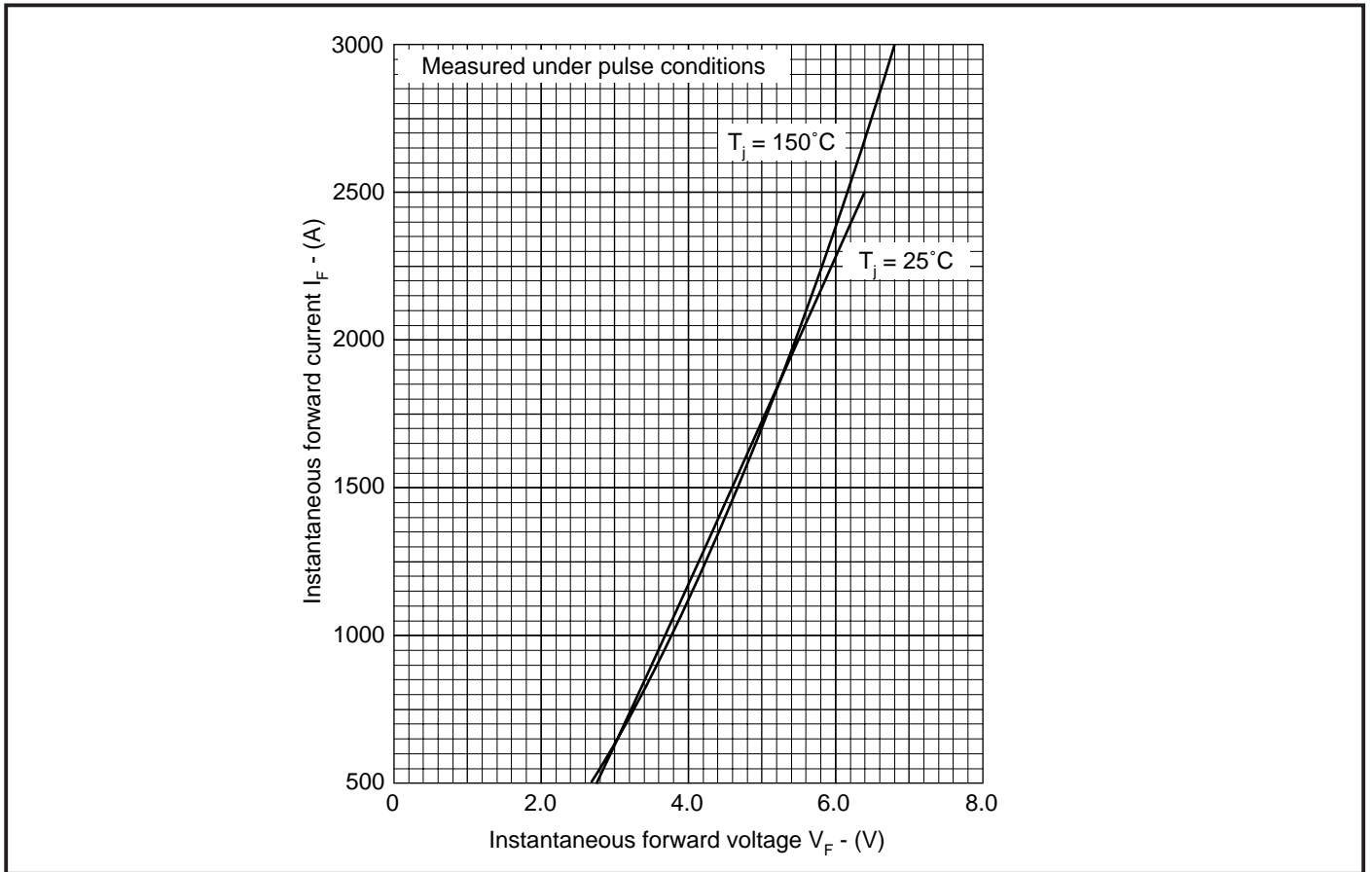
## CHARACTERISTICS

Symbol	Parameter	Conditions	Typ.	Max.	Units
$V_{FM}$	Forward voltage	At 1500A peak, $T_{case} = 25^\circ\text{C}$	-	4.8	V
$I_{RRM}$	Peak reverse current	At $V_{RRM}$ , $T_{case} = 150^\circ\text{C}$	-	80	mA
$t_{rr}$	Reverse recovery time	$I_F = 1000\text{A}$ , $di_{RR}/dt = 100\text{A}/\mu\text{s}$ $T_{case} = 150^\circ\text{C}$ , $V_R = 100\text{V}$	5	-	$\mu\text{s}$
$Q_{RA1}$	Recovered charge (50% chord)		-	650	$\mu\text{C}$
$I_{RM}$	Reverse recovery current		270	-	A
K	Soft factor		1.8	-	-
$V_{TO}$	Threshold voltage	At $T_{vj} = 150^\circ\text{C}$	-	2.0	V
$r_T$	Slope resistance	At $T_{vj} = 150^\circ\text{C}$	-	1.76	$\text{m}\Omega$
$V_{FRM}$	Forward recovery voltage	$di/dt = 1000\text{A}/\mu\text{s}$ , $T_j = 125^\circ\text{C}$	-	220	V

**DEFINITION OF K FACTOR AND  $Q_{RA1}$**



**CURVES**



**Fig. 1 Maximum (limit) forward characteristics**

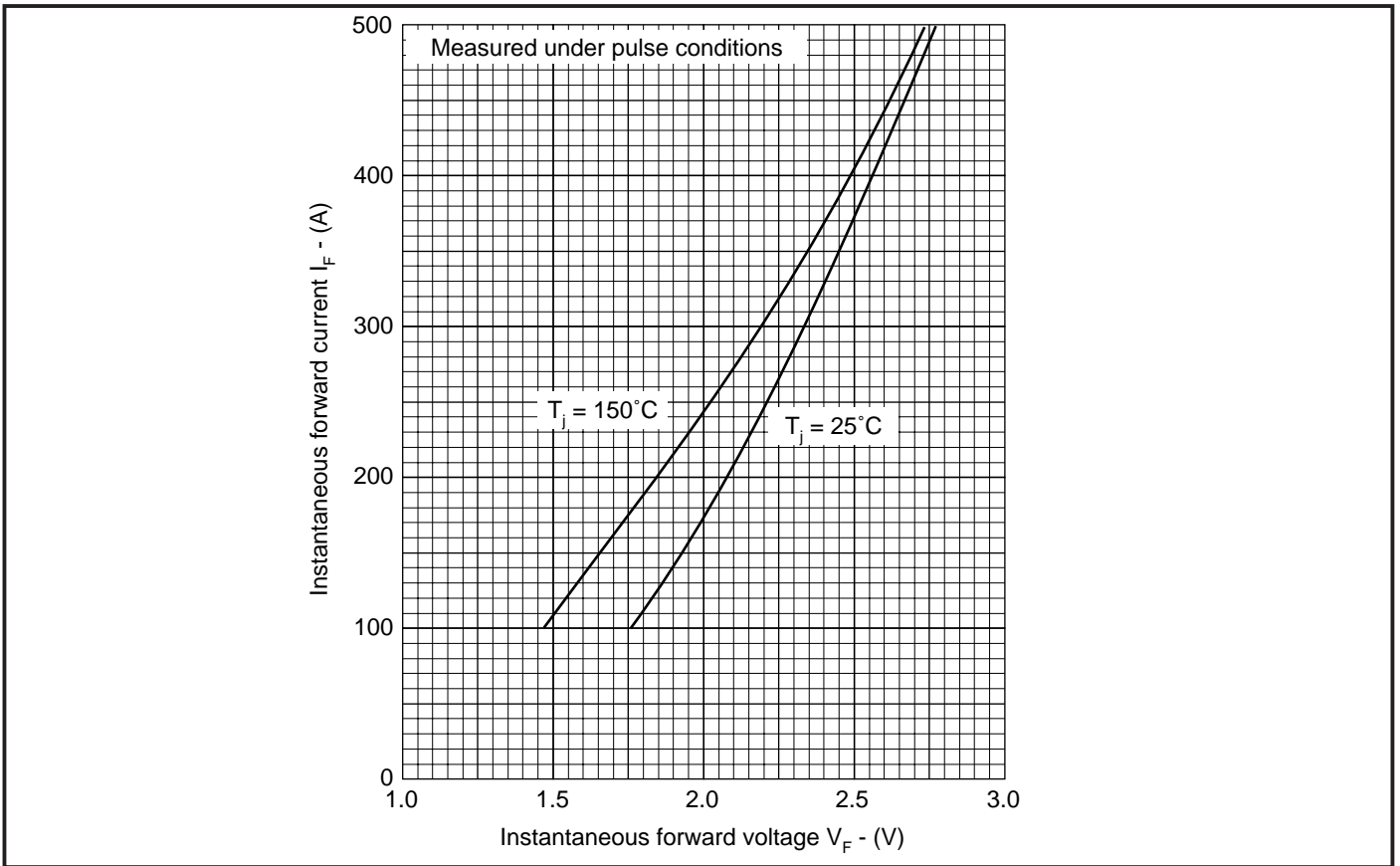


Fig. 2 Maximum (limit) forward characteristics

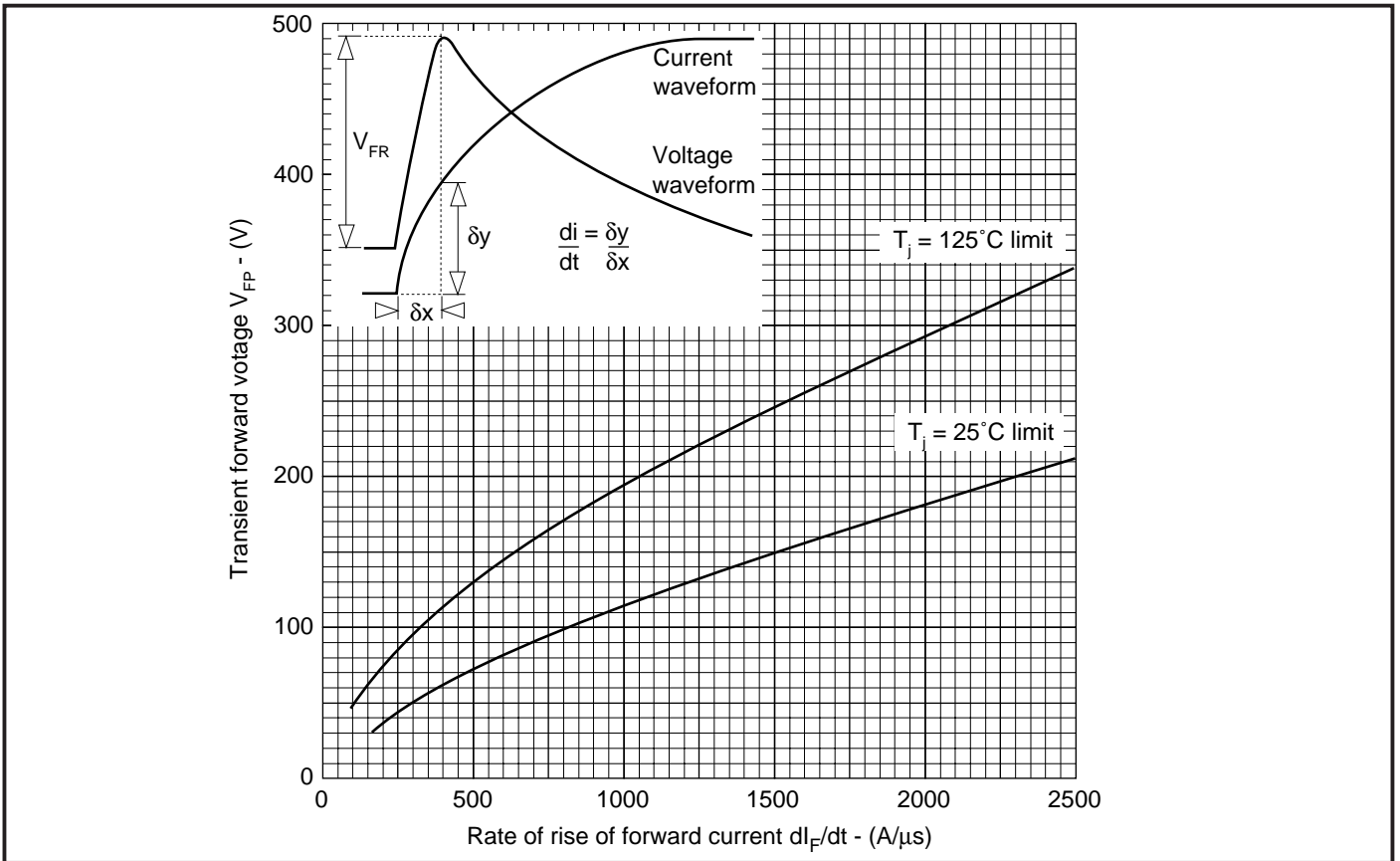


Fig. 3 Transient forward voltage vs rate of rise of forward current

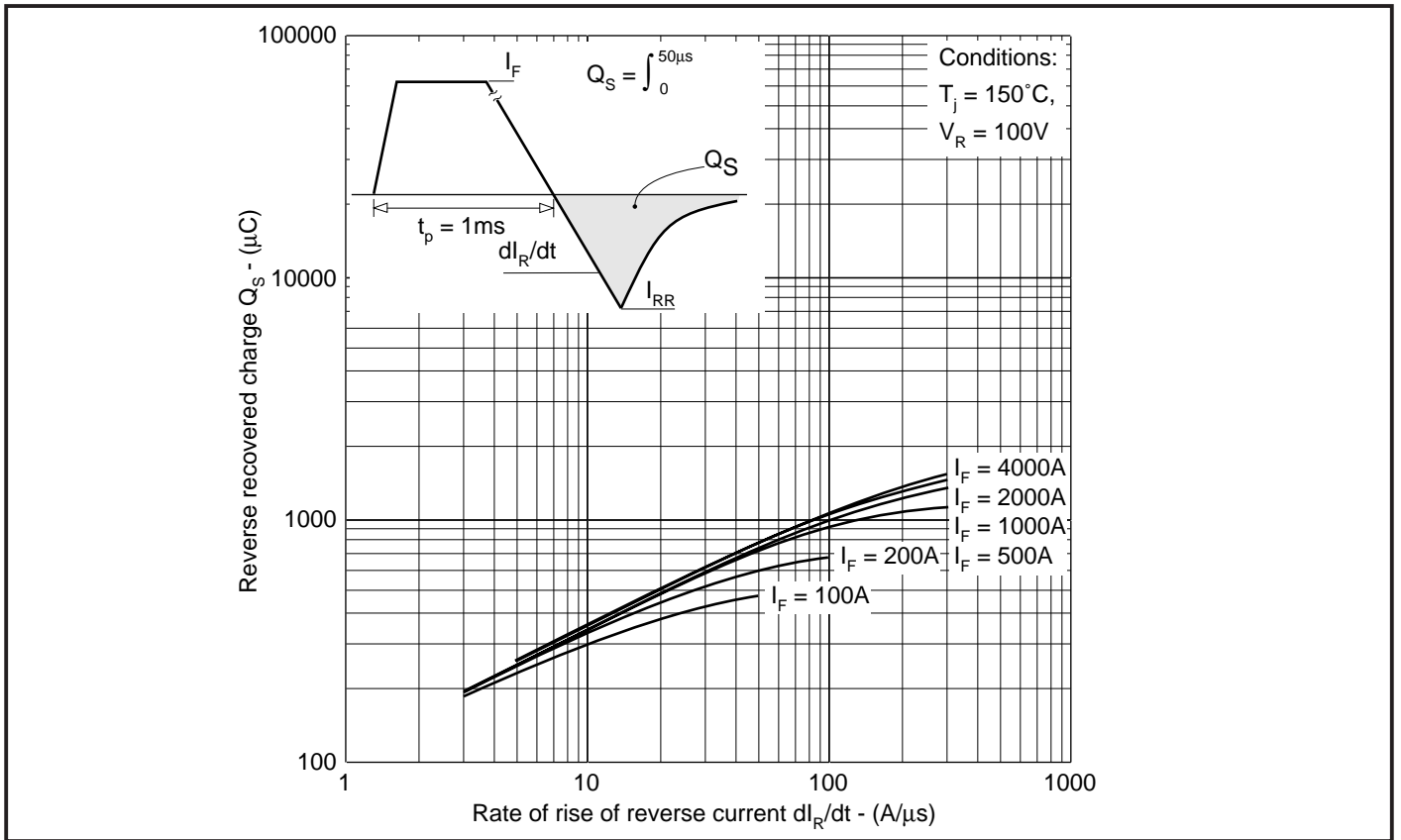


Fig. 4 Recovered charge

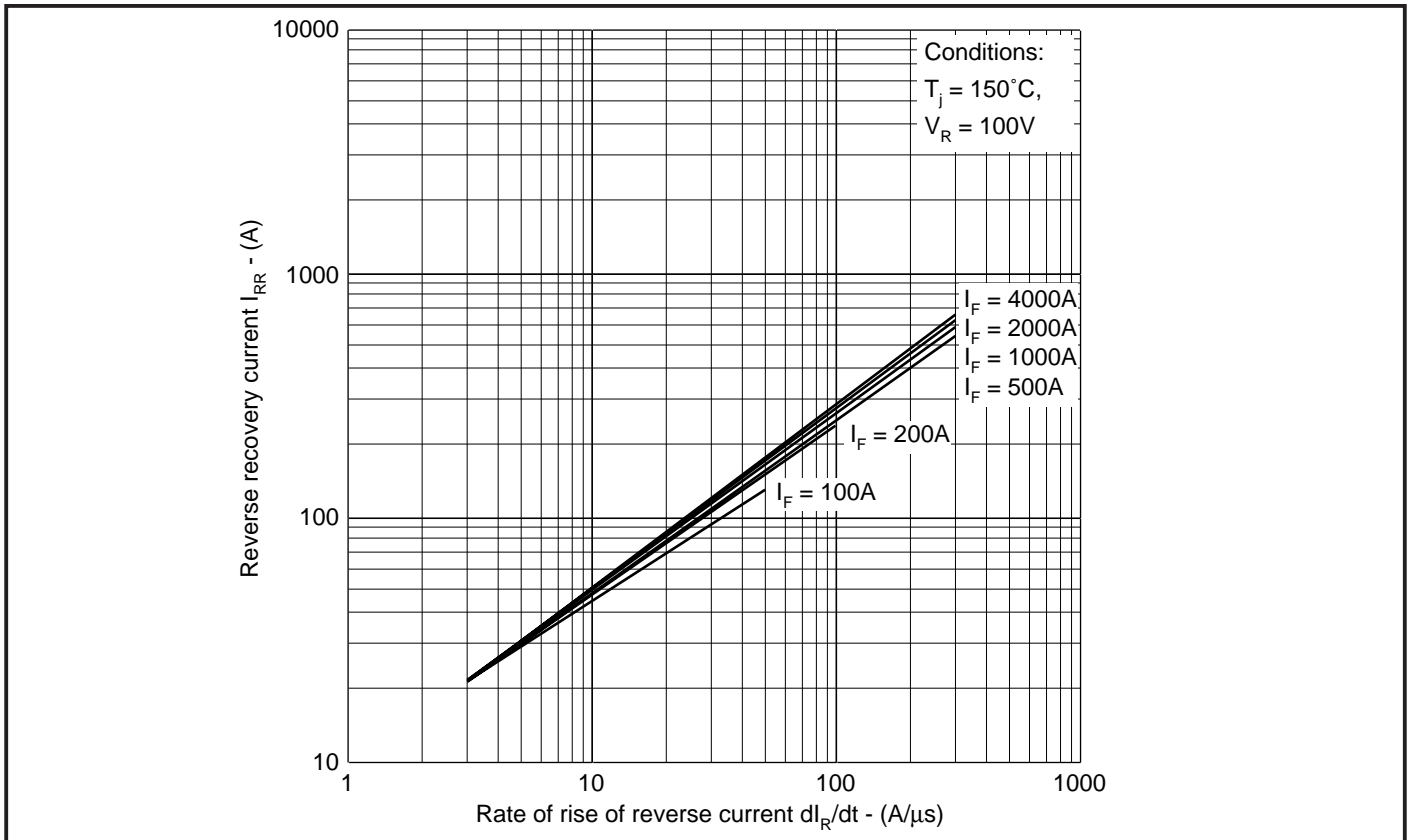


Fig. 5 Typical reverse recovery current vs rate of rise of reverse current

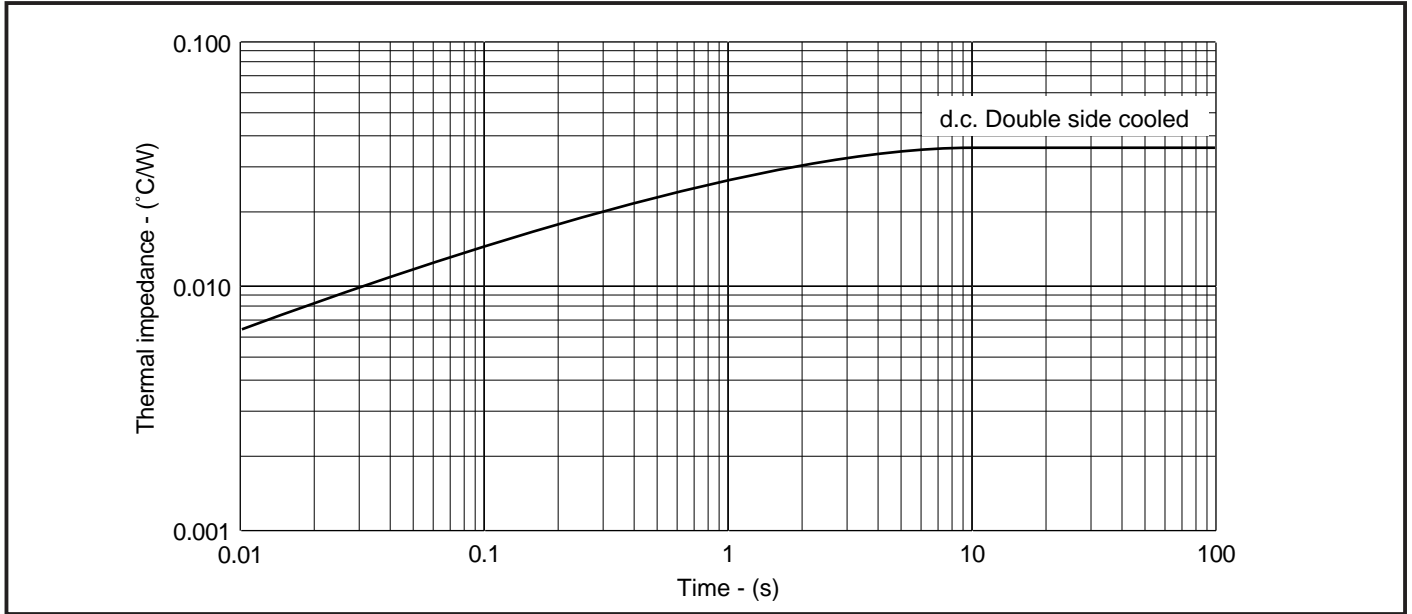
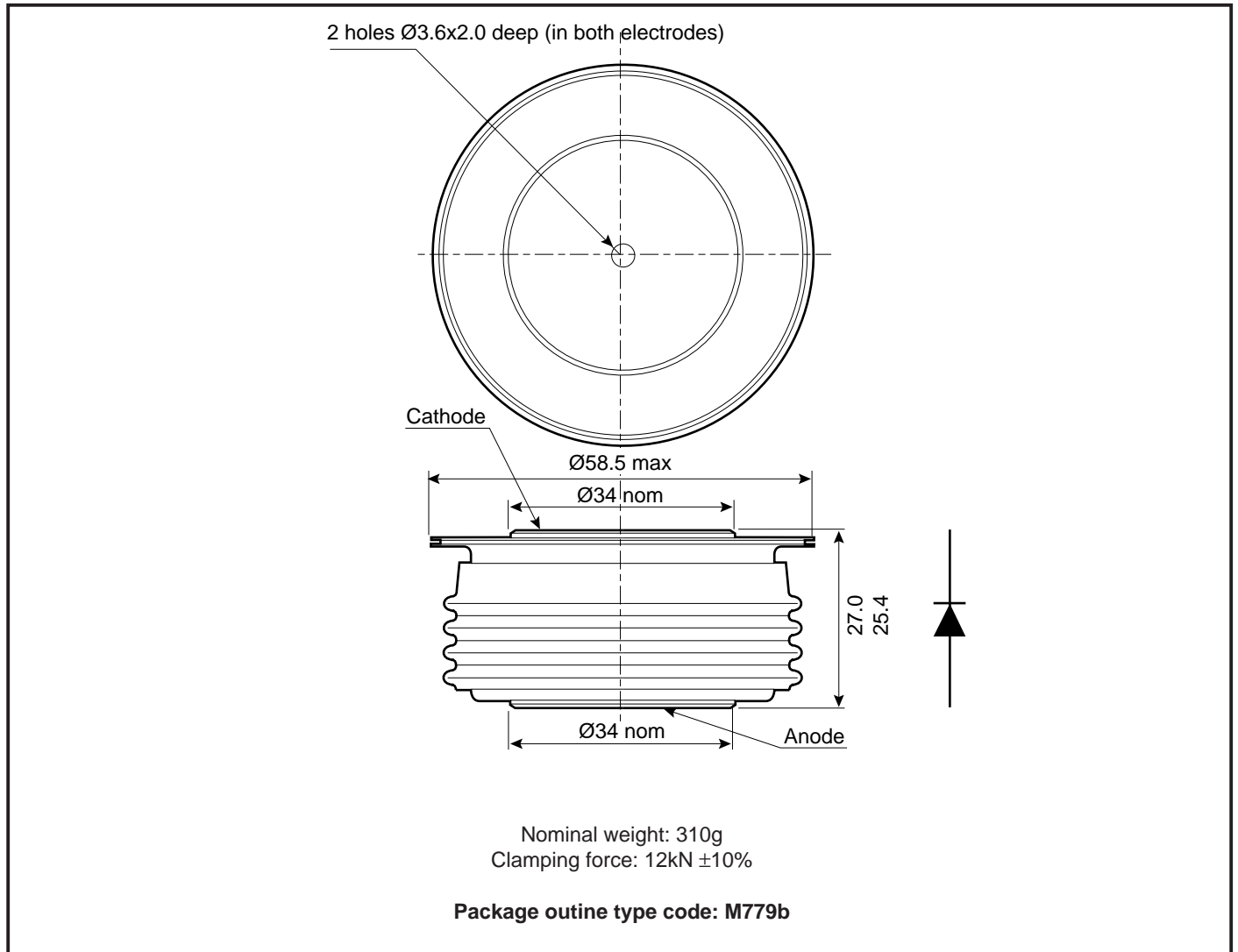


Fig. 6 Maximum (limit) transient thermal impedance - junction to case - (°C/W)

**PACKAGE DETAILS**

For further package information, please contact your local Customer Service Centre. All dimensions in mm, unless stated otherwise. DO NOT SCALE.



**ASSOCIATED PUBLICATIONS**

Title	Application Note
	Number
Calculating the junction temperature or power semiconductors	AN4506
Recommendations for clamping power semiconductors	AN4839
Thyristor and diode measurement with a multi-meter	AN4853
Use of $V_{TO}$ , $r_T$ on-state characteristic	AN5001

**POWER ASSEMBLY CAPABILITY**

The Power Assembly group was set up to provide a support service for those customers requiring more than the basic semiconductor, and has developed a flexible range of heatsink / clamping systems in line with advances in device types and the voltage and current capability of our semiconductors.

We offer an extensive range of air and liquid cooled assemblies covering the full range of circuit designs in general use today. The Assembly group continues to offer high quality engineering support dedicated to designing new units to satisfy the growing needs of our customers.

Using the up to date CAD methods our team of design and applications engineers aim to provide the Power Assembly Complete solution (PACs).

**DEVICE CLAMPS**

Disc devices require the correct clamping force to ensure their safe operation. The PACs range offers a varied selection of pre-loaded clamps to suit all of our manufactured devices. This include cube clamps for single side cooling of 'T' 22mm

Clamps are available for single or double side cooling, with high insulation versions for high voltage assemblies.

Please refer to our application note on device clamping, AN4839

**HEATSINKS**

Power Assembly has it's own proprietary range of extruded aluminium heatsinks. They have been designed to optimise the performance of our semiconductors. Data with respect to air natural, forced air and liquid cooling (with flow rates) is available on request.

For further information on device clamps, heatsinks and assemblies, please contact your nearest Sales Representative or the factory.



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