

# **DF685**

# **Fast Recovery Diode**

#### **APPLICATIONS**

Snubber Diode For GTO Applications

DS4303-2.0 January 200	0
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KEY PAR	AMETERS
V <sub>RRM</sub>	4500V
I <sub>F(AV)</sub>	445A
I <sub>FSM</sub>	4500A
Q,	<b>650</b> μC
t	<b>5</b> μs



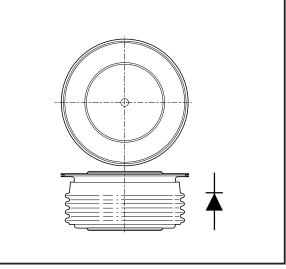
- Double Side Cooling
- High Surge Capability
- Low Recovery Charge

### **VOLTAGE RATINGS**

Type Number	Repetitive Peak Reverse Voltage V <sub>RRM</sub> 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.

#### **CURRENT RATINGS**



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

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

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#### SURGE RATINGS

Symbol	Parameter	Conditions	Max.	Units
I <sub>FSM</sub>	Surge (non-repetitive) forward current	10mc holf since with $0%$ V T = 150%	4.5	kA
l <sup>2</sup> t	I <sup>2</sup> t for fusing	10ms half sine; with 0% $V_{RRM}$ , $T_j = 150^{\circ}C$	101.25x10 <sup>3</sup>	A <sup>2</sup> s
I <sub>FSM</sub>	Surge (non-repetitive) forward current	10mc holf cinculuith $E00(1)$ T $1E00$	3.6	kA
l <sup>2</sup> t	I <sup>2</sup> t for fusing	10ms half sine; with 50% $V_{RRM}$ , $T_j = 150^{\circ}C$	64.8x10 <sup>3</sup>	A <sup>2</sup> s
I <sub>FSM</sub>	Surge (non-repetitive) forward current	10ma half since with 100% \/ T 150%	-	kA
l <sup>2</sup> t	I <sup>2</sup> t for fusing	10ms half sine; with 100% $V_{RRM}$ , $T_j = 150^{\circ}C$	-	A <sup>2</sup> s

## THERMAL AND MECHANICAL DATA

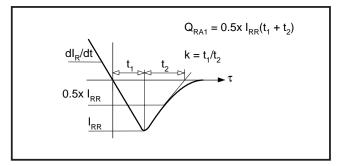
Symbol	Parameter	Conditions		Min.	Max.	Units	
		Double side cooled	dc	-	0.045	°C/W	
R <sub>th(j-c)</sub>	c) Thermal resistance - junction to case	Anode dc	-	0.086	°C/W		
		Single side cooled	Cathode dc	-	0.095	°C/W	
	Thermal resistance - case to heatsink	Clamping force 10kN	Clamping force 10kN	Double side	-	0.01	°C/W
R <sub>th(c-h)</sub>	mermanesistance - case to neatsink		Single side	-	0.02	°C/W	
T <sub>vj</sub>	Virtual junction temperature	On-state (conducting)		-	150	°C	
T <sub>stg</sub>	Storage temperature range			-55	150	°C	
-	Clamping force			9.0	11.0	kN	

## CHARACTERISTICS

Symbol	Parameter	Conditions	Тур.	Max.	Units
V <sub>FM</sub>	Forward voltage	At 1500A peak, T <sub>case</sub> = 25°C	-	4.8	V
I <sub>RRM</sub>	Peak reverse current	At $V_{\text{RRM}}$ , $T_{\text{case}} = 150^{\circ}\text{C}$	-	80	mA
t <sub>rr</sub>	Reverse recovery time		5	-	μs
Q <sub>RA1</sub>	Recovered charge (50% chord)	I <sub>F</sub> = 1000A, di <sub>RR</sub> /dt = 100A/μs	-	650	μC
I <sub>RM</sub>	Reverse recovery current	T <sub>case</sub> = 150°C, V <sub>R</sub> = 100V	270	-	А
к	Soft factor		1.8	-	-
V <sub>to</sub>	Threshold voltage	At $T_{vj} = 150^{\circ}C$	-	2.0	V
r <sub>T</sub>	Slope resistance	At T <sub>vj</sub> = 150°C	-	1.76	mΩ
V <sub>frm</sub>	Forward recovery voltage	di/dt = 1000A/µs, T <sub>j</sub> = 125°C	-	220	V

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# DEFINITION OF K FACTOR AND $\mathbf{Q}_{_{\mathrm{RA1}}}$



#### **CURVES**

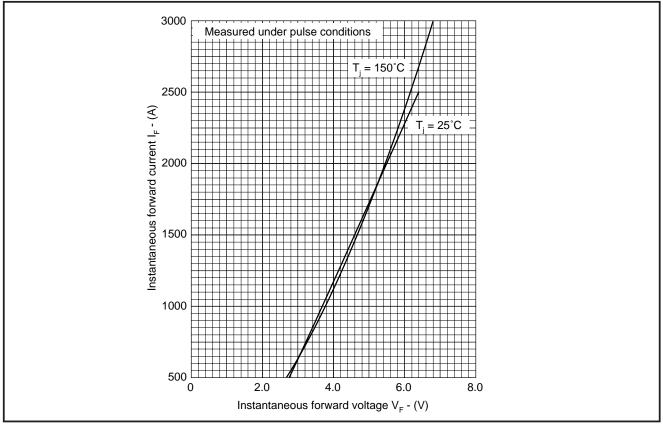


Fig. 1 Maximum (limit) forward characteristics

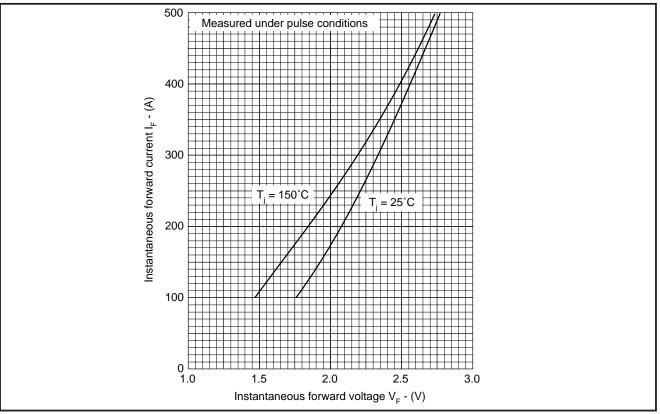
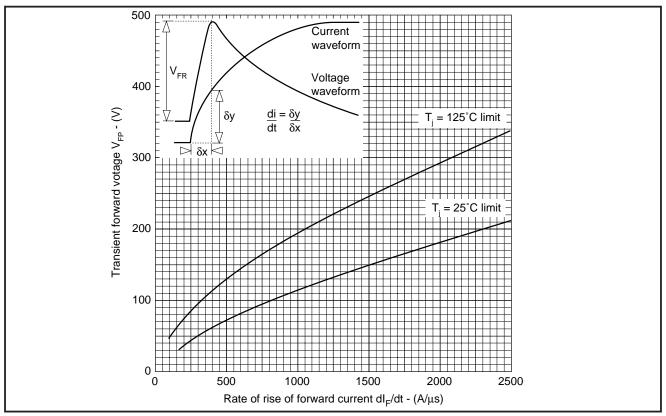
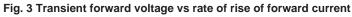


Fig. 2 Maximum (limit) forward characteristics





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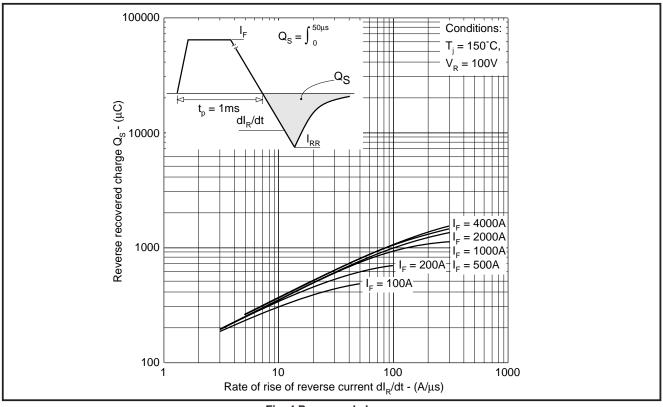


Fig. 4 Recovered charge

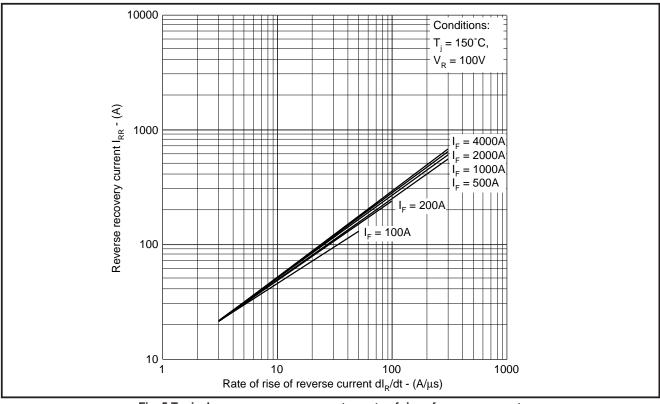


Fig. 5 Typical reverse recovery current vs rate of rise of reverse current

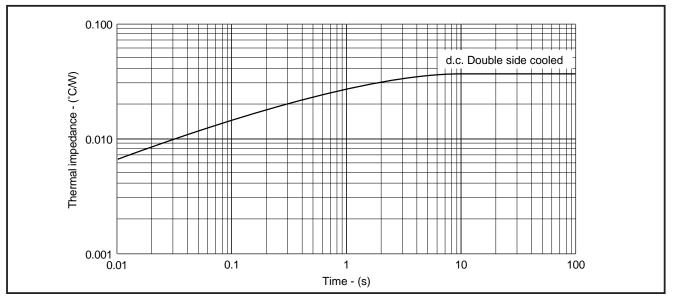
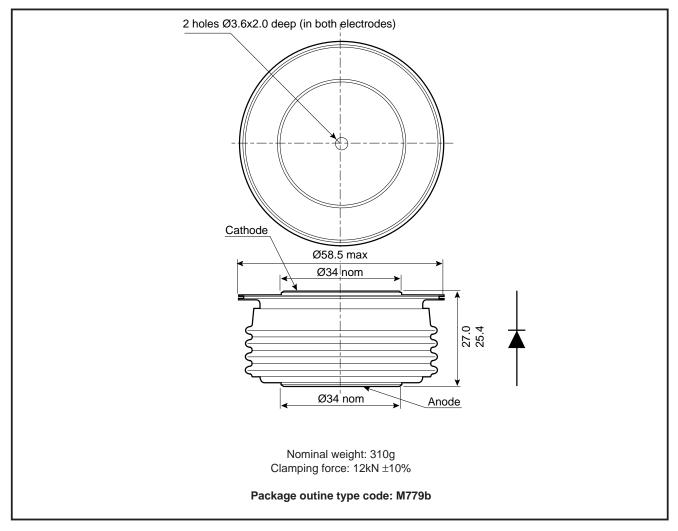


Fig. 6 Maximum (limit) transient thermal impedance - junction to case - (°C/W)

### **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	

#### **DF685**

#### 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 preloaded 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 or 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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Preliminary Information: The product is in design and development. The datasheet represents the product as it is understood but details may change.

Advance Information: The product design is complete and final characterisation for volume production is well in hand.

No Annotation: The product parameters are fixed and the product is available to datasheet specification.

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