

#### FEATURES

- Double Side Cooling
- High Surge Capability
- Low Turn-on Losses

#### APPLICATIONS

- High Power Converters
- High Voltage Power Supplies
- DC Motor Control

#### VOLTAGE RATINGS

Type Number	Repetitive Peak Voltages $V_{DRM}$ $V_{RRM}$ V	Conditions
DCR840F48	4800	$T_{vj} = 0^\circ \text{ to } 125^\circ \text{C}$ , $I_{DRM} = I_{RRM} = 100\text{mA}$ , $V_{DRM}, V_{RRM} t_p = 10\text{ms}$ , $V_{DSM} \text{ \& } V_{RSM} =$ $V_{DRM} \text{ \& } V_{RRM} + 100\text{V}$ respectively
DCR840F46	4600	
DCR840F44	4400	
DCR840F42	4200	

Lower voltage grades available.

#### ORDERING INFORMATION

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

For example:

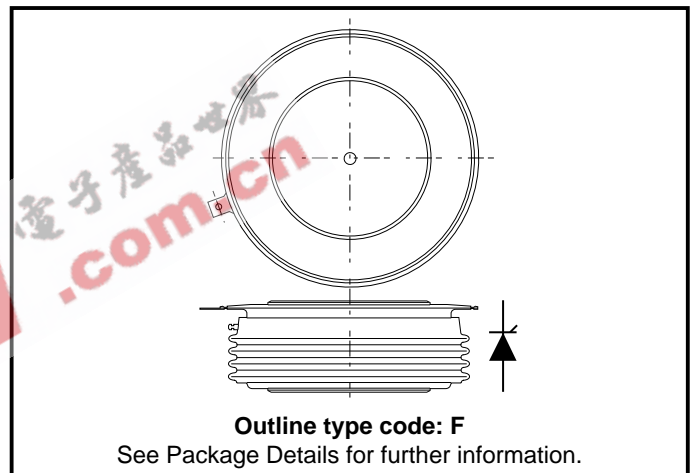
#### DCR840F48

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

#### KEY PARAMETERS

$V_{DRM}$	<b>4800V</b>
$I_{T(AV)}$	<b>840A</b>
$I_{TSM}$	<b>10,000A</b>
$dV/dt^*$	<b>1000V/<math>\mu\text{s}</math></b>
$di/dt$	<b>300A/<math>\mu\text{s}</math></b>

\*Higher  $dV/dt$  selections available



Outline type code: F

See Package Details for further information.

Fig. 1 Package outline

## CURRENT RATINGS

 $T_{\text{case}} = 60^{\circ}\text{C}$  unless stated otherwise.

Symbol	Parameter	Conditions	Max.	Units
<b>Double Side Cooled</b>				
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	840	A
$I_{T(RMS)}$	RMS value	-	1320	A
$I_T$	Continuous (direct) on-state current	-	1220	A
<b>Single Side Cooled (Anode side)</b>				
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	610	A
$I_{T(RMS)}$	RMS value	-	950	A
$I_T$	Continuous (direct) on-state current	-	830	A

## CURRENT RATINGS

 $T_{\text{case}} = 80^{\circ}\text{C}$  unless stated otherwise.

Symbol	Parameter	Conditions	Max.	Units
<b>Double Side Cooled</b>				
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	670	A
$I_{T(RMS)}$	RMS value	-	1050	A
$I_T$	Continuous (direct) on-state current	-	940	A
<b>Single Side Cooled (Anode side)</b>				
$I_{T(AV)}$	Mean on-state current	Half wave resistive load	470	A
$I_{T(RMS)}$	RMS value	-	740	A
$I_T$	Continuous (direct) on-state current	-	630	A

**SURGE RATINGS**

Symbol	Parameter	Conditions	Max.	Units
$I_{TSM}$	Surge (non-repetitive) on-state current	10ms half sine; $T_{case} = 125^{\circ}C$	10	kA
$I^2t$	$I^2t$ for fusing	$V_R = 50\% V_{RRM}$ - 1/4 sine	$0.5 \times 10^6$	A <sup>2</sup> s
$I_{TSM}$	Surge (non-repetitive) on-state current	10ms half sine; $T_{case} = 125^{\circ}C$	12.5	kA
$I^2t$	$I^2t$ for fusing	$V_R = 0$	$0.78 \times 10^6$	A <sup>2</sup> s

**THERMAL AND MECHANICAL DATA**

Symbol	Parameter	Conditions	Min.	Max.	Units	
$R_{th(j-c)}$	Thermal resistance - junction to case	Double side cooled	dc	-	0.022	$^{\circ}C/W$
		Single side cooled	Anode dc	-	0.038	$^{\circ}C/W$
			Cathode dc	-	0.052	$^{\circ}C/W$
$R_{th(c-h)}$	Thermal resistance - case to heatsink	Clamping force 19.5kN with mounting compound	Double side	-	0.004	$^{\circ}C/W$
			Single side	-	0.008	$^{\circ}C/W$
$T_{vj}$	Virtual junction temperature	On-state (conducting)	-	135	$^{\circ}C$	
		Reverse (blocking)	-	125	$^{\circ}C$	
$T_{stg}$	Storage temperature range		-55	125	$^{\circ}C$	
-	Clamping force		18.0	22.0	kN	

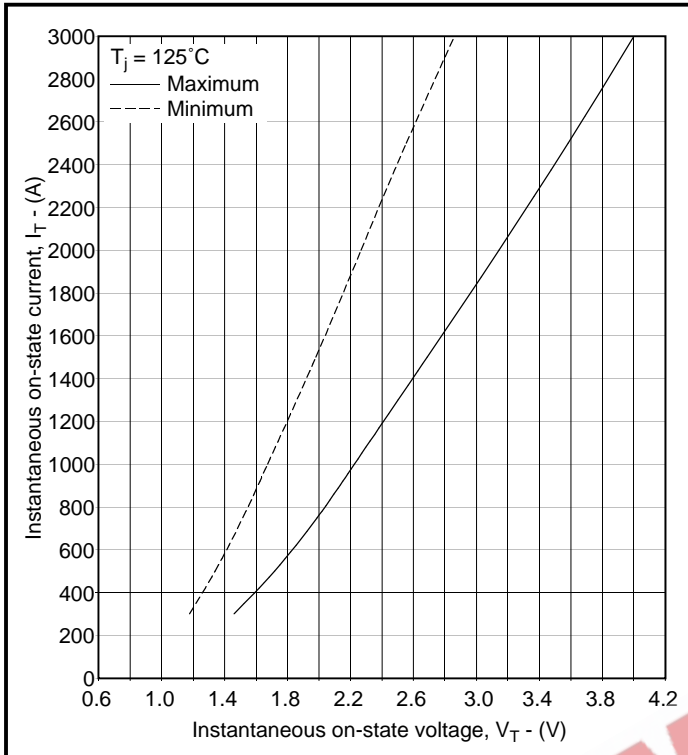
## DYNAMIC CHARACTERISTICS

Symbol	Parameter	Conditions	Typ.	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	Maximum linear rate of rise of off-state voltage	To 67% $V_{DRM}$ , $T_j = 125^{\circ}C$ .	-	1000	V/ $\mu$ s	
di/dt	Rate of rise of on-state current	From 67% $V_{DRM}$ to 1000A Gate source 1.5A $t_r = 0.5\mu$ s, $T_j = 125^{\circ}C$ .	Repetitive 50Hz	-	150	A/ $\mu$ s
			Non-repetitive	-	300	A/ $\mu$ s
$V_{T(TO)}$	Threshold voltage	At $T_{vj} = 125^{\circ}C$	-	1.3	V	
$r_T$	On-state slope resistance	At $T_{vj} = 125^{\circ}C$	-	0.92	m $\Omega$	
$t_{gd}$	Delay time	$V_D = 67\% V_{DRM}$ , Gate source 30V, 15 $\Omega$ Rise time 0.5 $\mu$ s, $T_j = 25^{\circ}C$	-	1.8	$\mu$ s	
$t_q$	Turn-off time	$I_T = 1000A$ , $t_p = 1ms$ , $T_j = 125^{\circ}C$ , $V_{RM} = 50V$ , $di_{RR}/dt = 10A/\mu$ s, $V_{DR} = 50\% V_{DRM}$ , $dV_{DR}/dt = 20V/\mu$ s linear	600	-	$\mu$ s	
$I_L$	Latching current	$T_j = 25^{\circ}C$ , $V_D = 5V$	-	1000	mA	
$I_H$	Holding current	$T_j = 25^{\circ}C$ , $R_{g-k} = \infty$	-	500	mA	

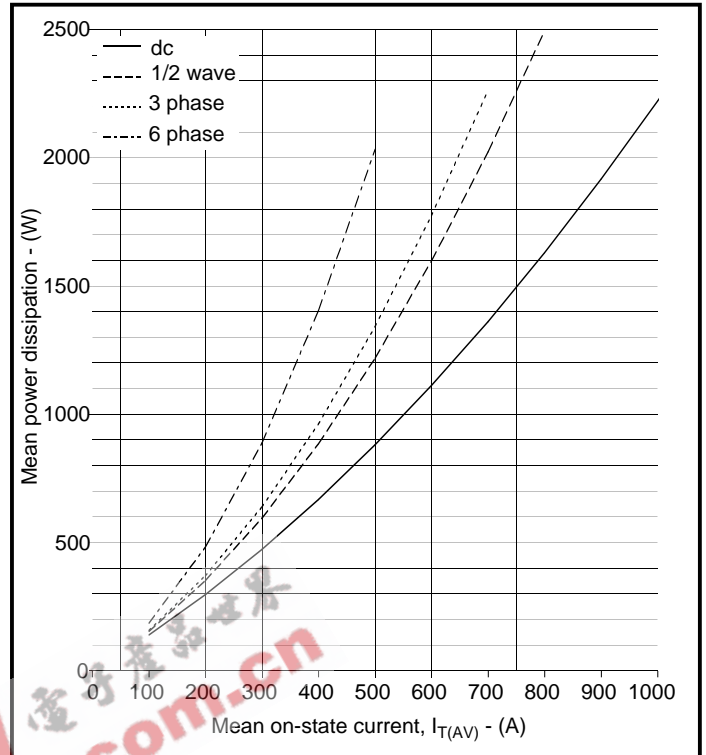
## GATE TRIGGER CHARACTERISTICS AND RATINGS

Symbol	Parameter	Conditions	Max.	Units
$V_{GT}$	Gate trigger voltage	$V_{DRM} = 5V$ , $T_{case} = 25^{\circ}C$	3.5	V
$I_{GT}$	Gate trigger current	$V_{DRM} = 5V$ , $T_{case} = 25^{\circ}C$	200	mA
$V_{GD}$	Gate non-trigger voltage	At 67% $V_{DRM}$ , $T_{case} = 125^{\circ}C$	0.25	V
$V_{FGM}$	Peak forward gate voltage	Anode positive with respect to cathode	30	V
$V_{FGN}$	Peak forward gate voltage	Anode negative with respect to cathode	0.25	V
$V_{RGM}$	Peak reverse gate voltage		5	V
$I_{FGM}$	Peak forward gate current	Anode positive with respect to cathode	30	A
$P_{GM}$	Peak gate power	See table, gate characteristics curve	150	W
$P_{G(AV)}$	Mean gate power		10	W

**CURVES**



**Fig.2 Maximum (limit) on-state characteristics**



**Fig.3 Dissipation curves**

$V_{TM}$  Equation:-

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

Where

- A = 6.698580464
- B = -1.571103736
- C = -0.001210868
- D = 0.239948957

these values are valid for  $T_j = 125^\circ\text{C}$  for  $I_T$  300A to 3000A

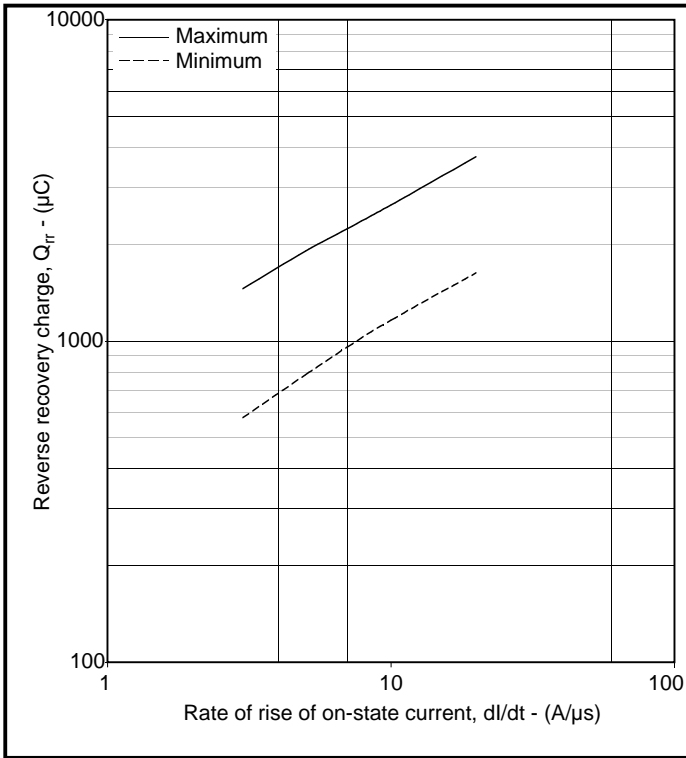


Fig.4 Recovered charge

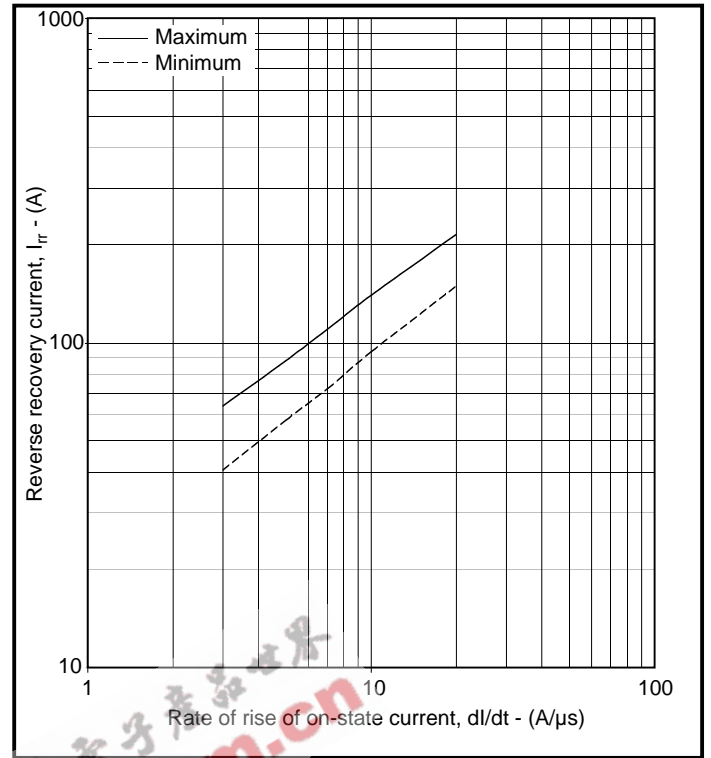


Fig.5 Reverse recovery current

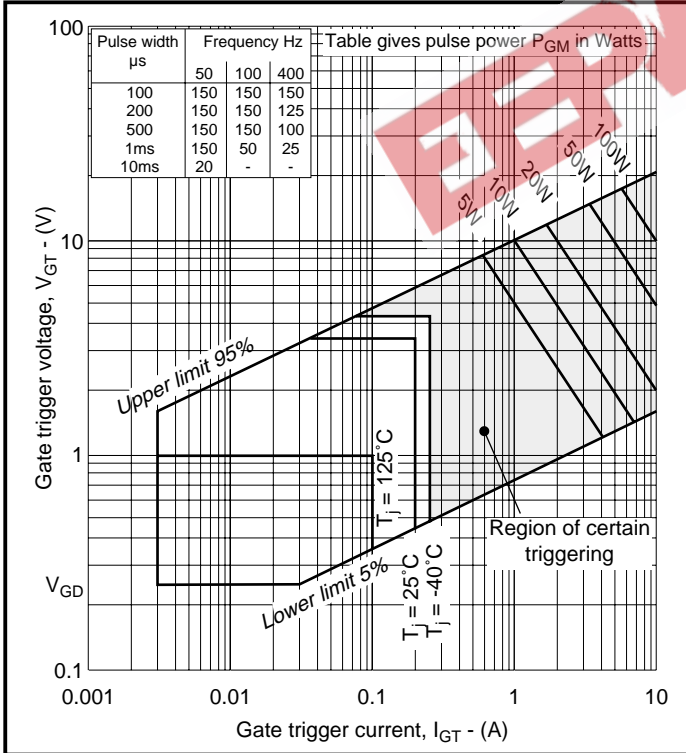


Fig.6 Gate characteristics

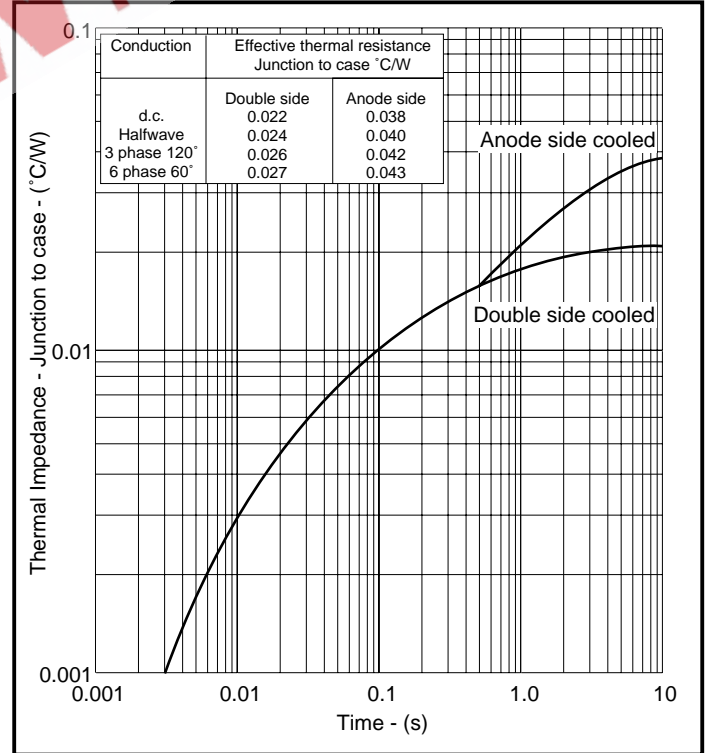
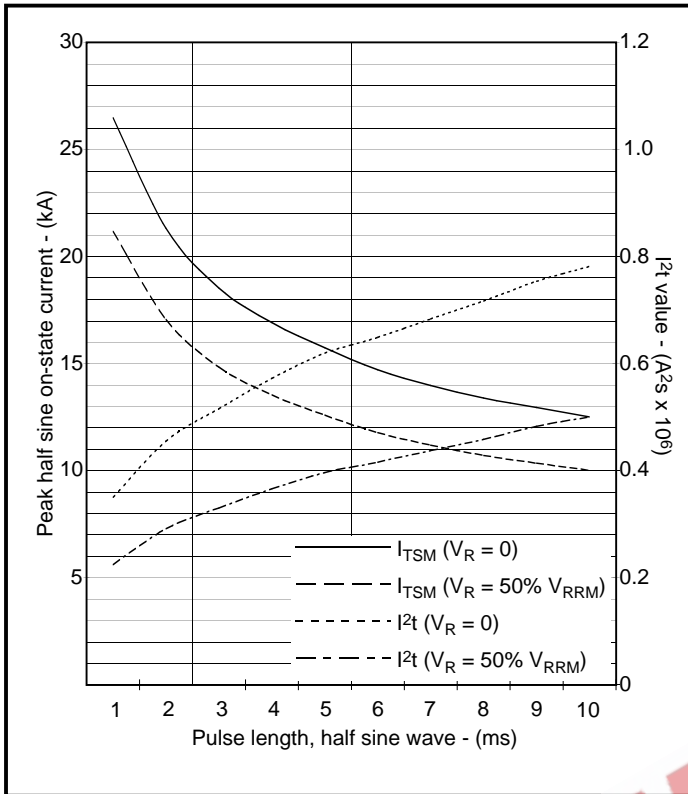
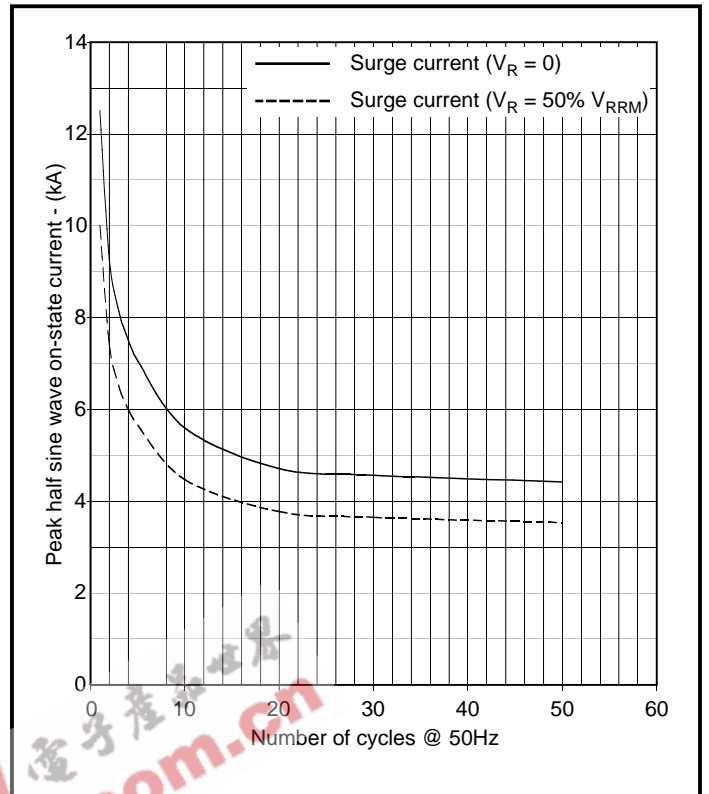


Fig.6 Transient thermal impedance - junction to case



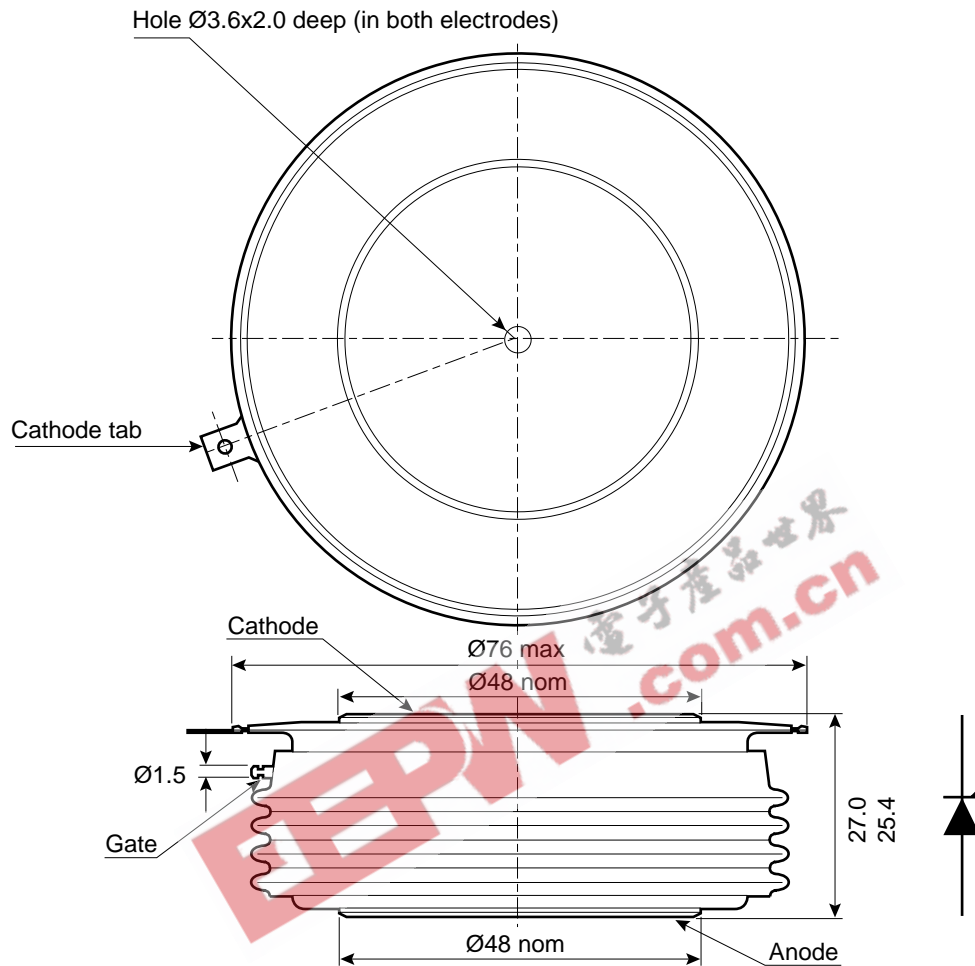
**Fig.7 Sub-cycle surge currents**



**Fig.8 Multi-cycle surge currents**

## PACKAGE DETAILS

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



Nominal weight: 450g  
 Clamping force:  $19.5\text{kN} \pm 10\%$   
 Lead length: 420mm  
 Lead terminal connector: M4 ring

**Package outline type code: F**



## 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 and clamping systems in line with advances in device voltages 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 latest 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 includes a varied selection of pre-loaded clamps to suit all of our manufactured devices. Types available include cube clamps for single side cooling of 'T' 23mm and 'E' 30mm discs, and bar clamps right up to 83kN for our 'Z' 100mm thyristors and diodes.

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

The Power Assembly group has its own proprietary range of extruded aluminium heatsinks. They have been designed to optimise the performance of Dynex 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 customer service office.



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**Target Information:** This is the most tentative form of information and represents a very preliminary specification. No actual design work on the product has been started.

**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.

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