

**FEATURES**

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

**Applications**

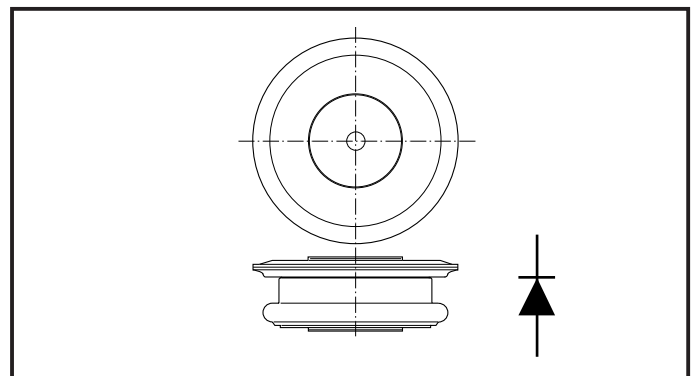
- Induction Heating
- A.C. Motor Drives
- Inverters And Choppers
- Welding
- High Frequency Rectification
- UPS

**KEY PARAMETERS**

|             |                              |
|-------------|------------------------------|
| $V_{RRM}$   | <b>1600V</b>                 |
| $I_{F(AV)}$ | <b>295A</b>                  |
| $I_{FSM}$   | <b>3500A</b>                 |
| $Q_r$       | <b>25<math>\mu</math>C</b>   |
| $t_{rr}$    | <b>1.22<math>\mu</math>s</b> |

**Voltage Ratings**

| Type Number | Repetitive Peak Reverse Voltage<br>$V_{RRM}$ | Conditions                 |
|-------------|--|----------------------------|
| DF451 16    | 1600   | $V_{RSM} = V_{RRM} + 100V$ |
| DF451 14    | 1400   |                            |
| DF451 12    | 1200   |                            |
| DF451 10    | 1000   |                            |
| DF451 08    | 800  |                            |
| DF451 06    | 600  |                            |



Outline type code: M771.  
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, $T_{case} = 65^{\circ}C$ | 295  | A     |
| $I_{F(RMS)}$                           | RMS value                           | $T_{case} = 65^{\circ}C$                           | 543  | A     |
| $I_F$                                  | Continuous (direct) forward current | $T_{case} = 65^{\circ}C$                           | 391  | A     |
| <b>Single Side Cooled (Anode side)</b> |                                     |  |      |       |
| $I_{F(AV)}$                            | Mean forward current                | Half wave resistive load, $T_{case} = 65^{\circ}C$ | 220  | A     |
| $I_{F(RMS)}$                           | RMS value                           | $T_{case} = 65^{\circ}C$                           | 348  | A     |
| $I_F$                                  | Continuous (direct) forward current | $T_{case} = 65^{\circ}C$                           | 285  | A     |

# DF451

## SURGE RATINGS

| Symbol    | Parameter                              | Conditions   | Max.                | Units                |
|-----------|--|--|---------------------|----------------------|
| $I_{FSM}$ | Surge (non-repetitive) forward current | 10ms half sine; with 0% $V_{RRM}$ , $T_j = 150^\circ\text{C}$  | 3.5                 | kA                   |
| $I^2t$    | $I^2t$ for fusing                      |  | $61.25 \times 10^3$ | $\text{A}^2\text{s}$ |
| $I_{FSM}$ | Surge (non-repetitive) forward current | 10ms half sine; with 50% $V_{RRM}$ , $T_j = 150^\circ\text{C}$ | 2.8                 | kA                   |
| $I^2t$    | $I^2t$ for fusing                      |  | $39.2 \times 10^3$  | $\text{A}^2\text{s}$ |

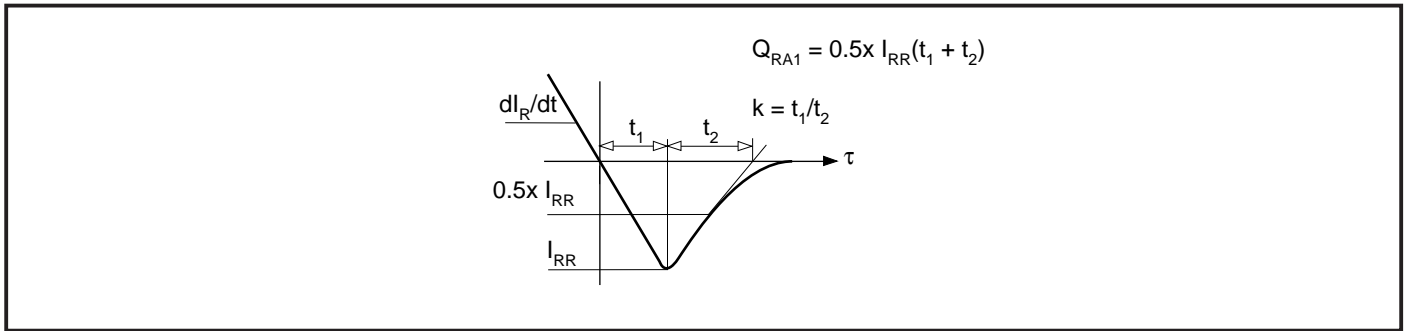
## THERMAL AND MECHANICAL DATA

| Symbol        | Parameter                             | Conditions                                  | -           | Max. | Units            |                    |
|---------------|---------------------------------------|---|-------------|------|------------------|--------------------|
| $R_{th(j-c)}$ | Thermal resistance - junction to case | Double side cooled                          | dc          | -    | 0.07             | $^\circ\text{C/W}$ |
|               |                                       | Single side cooled                          | Anode dc    | -    | 0.133            | $^\circ\text{C/W}$ |
|               |                                       |   | Cathode dc  | -    | 0.147            | $^\circ\text{C/W}$ |
| $R_{th(c-h)}$ | Thermal resistance - case to heatsink | Clamping force 5.0kN with mounting compound | Double side | -    | 0.02             | $^\circ\text{C/W}$ |
|               |                                       |   | Single side | -    | 0.02             | $^\circ\text{C/W}$ |
| $T_{vj}$      | Virtual junction temperature          | Forward (conducting)                        | -           | 150  | $^\circ\text{C}$ |                    |
| $T_{stg}$     | Storage temperature range             |   | -55         | 150  | $^\circ\text{C}$ |                    |
| -             | Clamping force                        |   | 4.5         | 5.5  | kN               |                    |

## CHARACTERISTICS

| Symbol    | Parameter                    | Conditions   | Typ. | Max. | Units            |
|-----------|------------------------------|--|------|------|------------------|
| $V_{FM}$  | Forward voltage              | At 600A peak, $T_{case} = 25^\circ\text{C}$  | -    | 2.65 | V                |
| $I_{RRM}$ | Peak reverse current         | At $V_{RRM}$ , $T_{case} = 125^\circ\text{C}$  | -    | 100  | mA               |
| $t_{rr}$  | Reverse recovery time        | $I_F = 500\text{A}$ , $di_{RR}/dt = -80\text{A}/\mu\text{s}$<br>$T_{case} = 125^\circ\text{C}$ , $V_R = 100\text{V}$ | 1.22 | -    | $\mu\text{s}$    |
| $Q_{RA1}$ | Recovered charge (50% chord) |  | -    | 25   | $\mu\text{C}$    |
| $I_{RM}$  | Reverse recovery current     |  | -    | 40   | A                |
| K         | Soft factor                  |  | 1.7  | -    | -                |
| $V_{TO}$  | Threshold voltage            | At $T_{vj} = 125^\circ\text{C}$  | -    | 1.6  | V                |
| $r_T$     | Slope resistance             | At $T_{vj} = 125^\circ\text{C}$  | -    | 1.5  | $\text{m}\Omega$ |
| $V_{FRM}$ | Forward recovery voltage     | $di/dt = 1000\text{A}/\mu\text{s}$ , $T_j = 125^\circ\text{C}$   | -    | 40   | V                |

DEFINITION OF K FACTOR AND  $Q_{RA1}$



CURVES

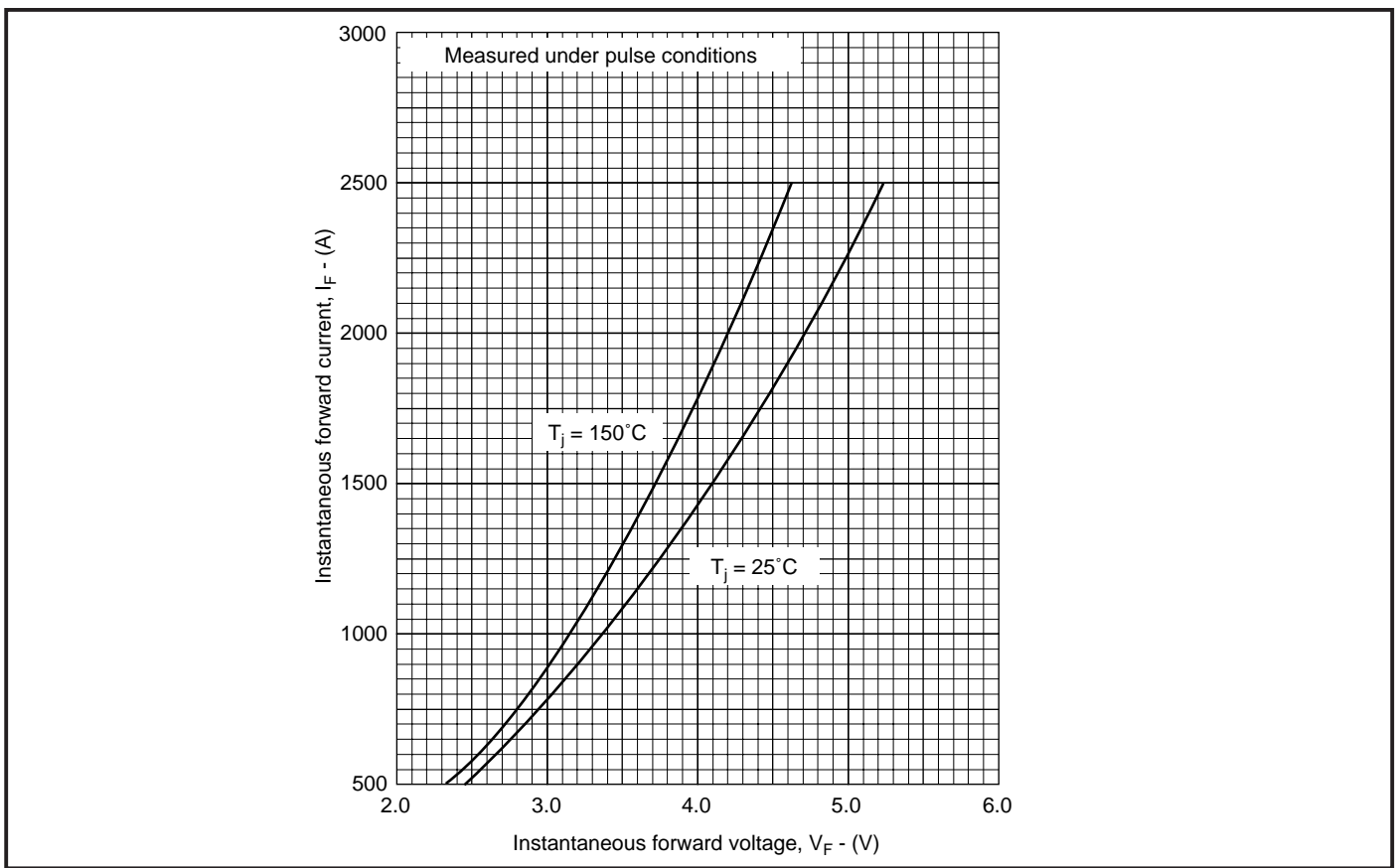


Fig.1 Maximum (limit) forward characteristics

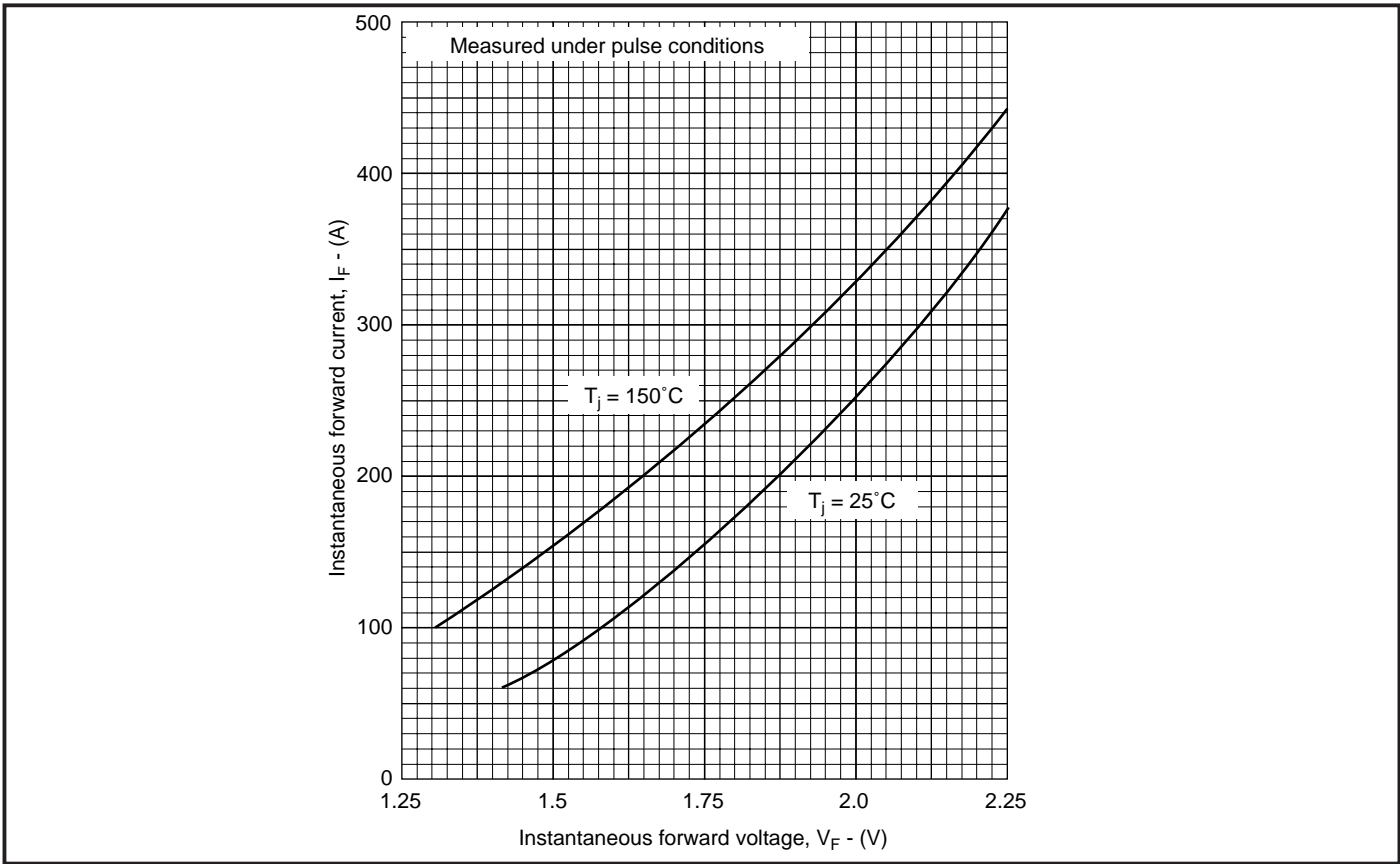


Fig.2 Maximum (limit) forward characteristics

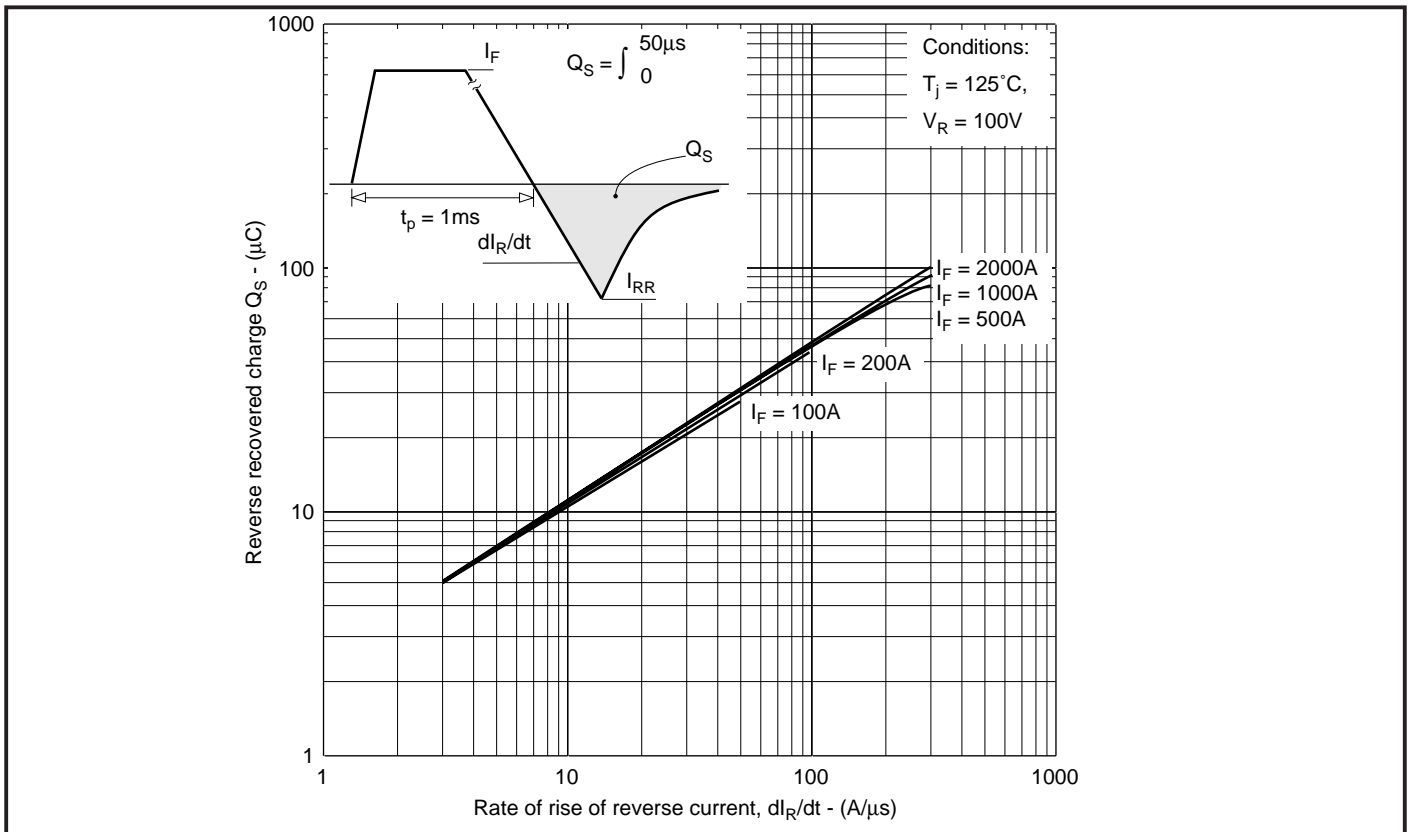


Fig.3 Recovered charge

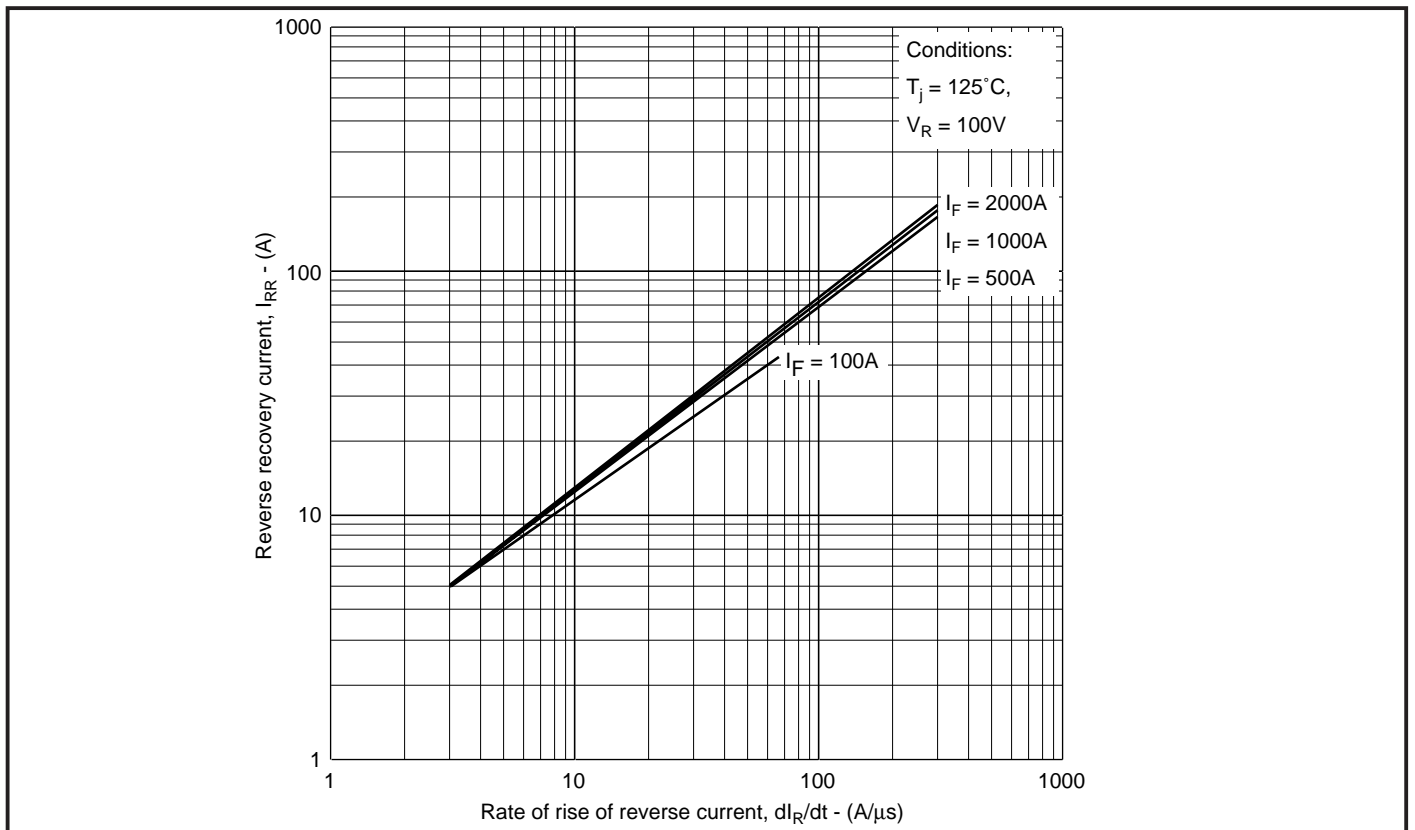


Fig.4 Typical reverse recovery current vs rate of rise of forward current

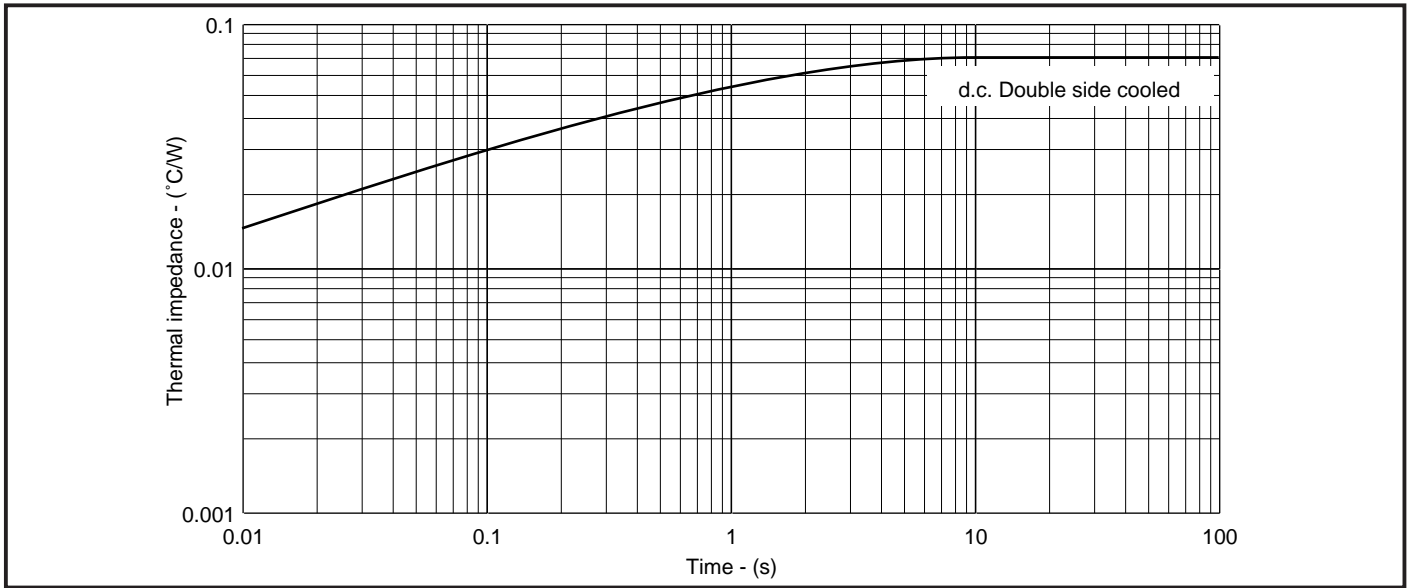
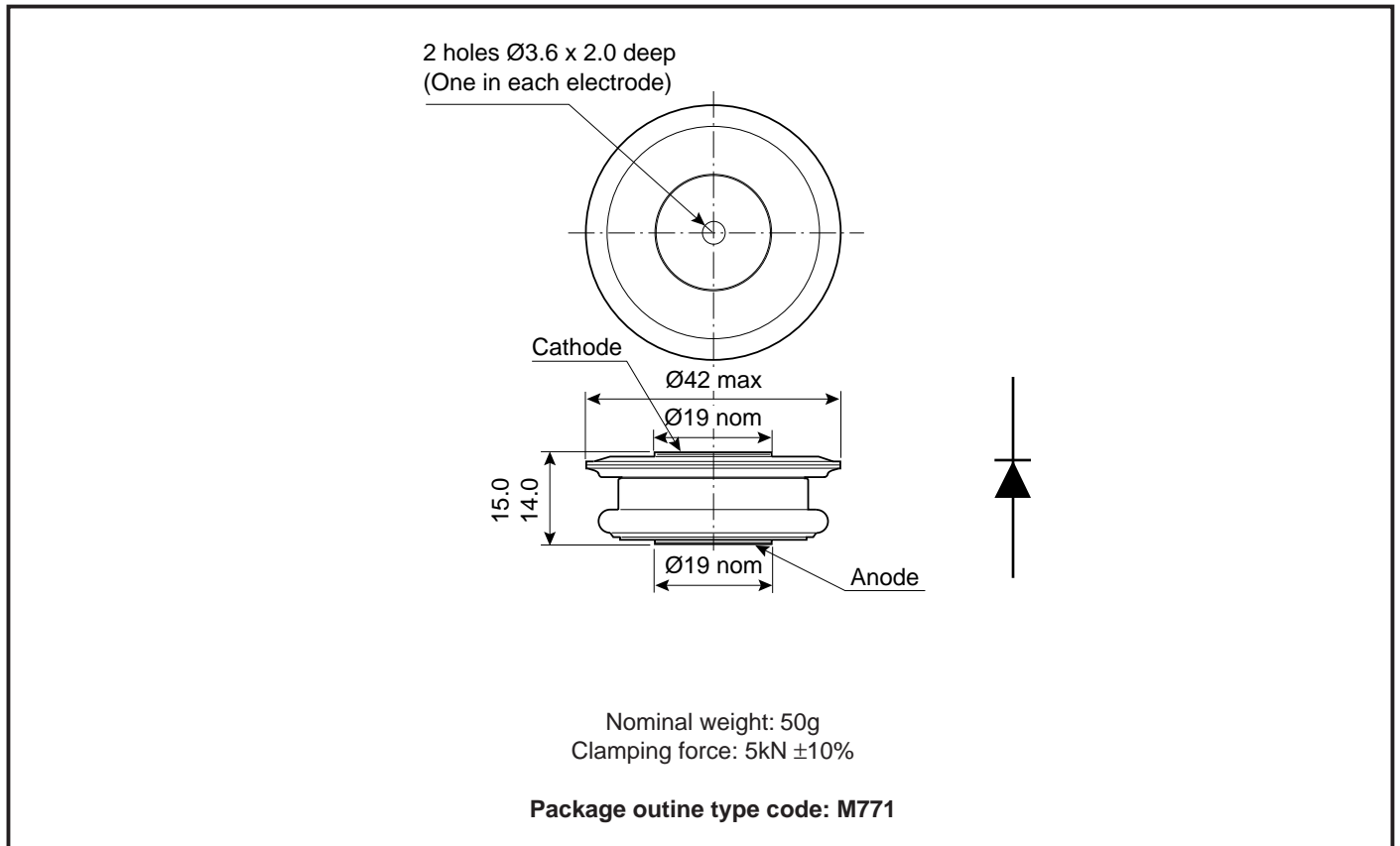


Fig.5 Maximum (limit) transient thermal impedance - junction to case - (°C/W)

**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

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| Title  | Application Note<br>Number |
|--|----------------------------|
| Calculating the junction temperature of 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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