

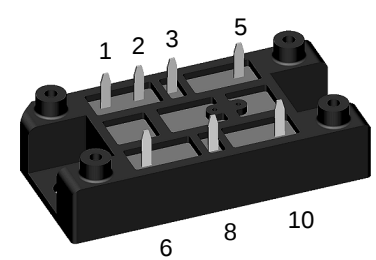
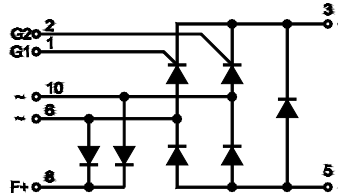
# Half Controlled Single Phase Rectifier Bridge

Including Freewheeling Diode and Field Diodes

$$V_{RRM} = 800-1600 \text{ V}$$

$$I_{dAVM} = 21 \text{ A}$$

| $V_{RSM}$<br>$V_{DSM}$<br>V | $V_{RRM}$<br>$V_{DRM}$<br>V | Type          |
|-----------------------------|-----------------------------|---------------|
| 900                         | 800                         | VHFD 16-08io1 |
| 1300                        | 1200                        | VHFD 16-12io1 |
| 1500                        | 1400                        | VHFD 16-14io1 |
| 1700                        | 1600                        | VHFD 16-16io1 |



## Bridge and Freewheeling Diode

| Symbol                  | Test Conditions                                                                                                                                                          | Maximum Ratings                                          |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| $I_{dAV}$               | $T_H = 85^\circ\text{C}$ , module                                                                                                                                        | 16 A                                                     |
| $I_{dAVM}$ ①            | module                                                                                                                                                                   | 21 A                                                     |
| $I_{FRMS}$ , $I_{TRMS}$ | per leg                                                                                                                                                                  | 15 A                                                     |
| $I_{FSM}$ , $I_{TSM}$   | $T_{VJ} = 45^\circ\text{C}$ ;<br>$V_R = 0 \text{ V}$                                                                                                                     | $t = 10 \text{ ms}$ (50 Hz), sine 150 A                  |
|                         |                                                                                                                                                                          | $t = 8.3 \text{ ms}$ (60 Hz), sine 170 A                 |
|                         | $T_{VJ} = T_{VJM}$                                                                                                                                                       | $t = 10 \text{ ms}$ (50 Hz), sine 130 A                  |
|                         | $V_R = 0 \text{ V}$                                                                                                                                                      | $t = 8.3 \text{ ms}$ (60 Hz), sine 140 A                 |
| $I^2t$                  | $T_{VJ} = 45^\circ\text{C}$                                                                                                                                              | $t = 10 \text{ ms}$ (50 Hz), sine 110 A <sup>2</sup> s   |
|                         | $V_R = 0 \text{ V}$                                                                                                                                                      | $t = 8.3 \text{ ms}$ (60 Hz), sine 120 A <sup>2</sup> s  |
|                         | $T_{VJ} = T_{VJM}$                                                                                                                                                       | $t = 10 \text{ ms}$ (50 Hz), sine 85 A <sup>2</sup> s    |
|                         | $V_R = 0 \text{ V}$                                                                                                                                                      | $t = 8.3 \text{ ms}$ (60 Hz), sine 80 A <sup>2</sup> s   |
| $(di/dt)_{cr}$          | $T_{VJ} = 125^\circ\text{C}$<br>$f = 50 \text{ Hz}$ , $t_p = 200 \mu\text{s}$<br>$V_D = 2/3 V_{DRM}$<br>$I_G = 0.3 \text{ A}$ ,<br>$di_G/dt = 0.3 \text{ A}/\mu\text{s}$ | repetitive, $I_T = 50 \text{ A}$ 150 A/ $\mu\text{s}$    |
|                         |                                                                                                                                                                          | non repetitive, $I_T = 0.5 I_{dAV}$ 500 A/ $\mu\text{s}$ |
| $(dv/dt)_{cr}$          | $T_{VJ} = T_{VJM}$ ; $V_{DR} = 2/3 V_{DRM}$<br>$R_{GK} = \infty$ ; method 1 (linear voltage rise)                                                                        | 1000 V/ $\mu\text{s}$                                    |
| $V_{RGM}$               |                                                                                                                                                                          | 10 V                                                     |
| $P_{GM}$                | $T_{VJ} = T_{VJM}$                                                                                                                                                       | $t_p = 30 \mu\text{s}$ $\leq 10 \text{ W}$               |
|                         | $I_T = 0.5 I_{dAVM}$                                                                                                                                                     | $t_p = 500 \mu\text{s}$ $\leq 5 \text{ W}$               |
|                         |                                                                                                                                                                          | $t_p = 10 \text{ ms}$ $\leq 1 \text{ W}$                 |
| $P_{GAVM}$              |                                                                                                                                                                          | 0.5 W                                                    |
| $T_{VJ}$                |                                                                                                                                                                          | -40...+125 °C                                            |
| $T_{VJM}$               |                                                                                                                                                                          | 125 °C                                                   |
| $T_{stg}$               |                                                                                                                                                                          | -40...+125 °C                                            |
| $V_{ISOL}$              | 50/60 Hz, RMS                                                                                                                                                            | $t = 1 \text{ min}$ 3000 V~                              |
|                         | $I_{ISOL} \leq 1 \text{ mA}$                                                                                                                                             | $t = 1 \text{ s}$ 3600 V~                                |
| $d_s$                   | Creep distance on surface                                                                                                                                                | 12.7 mm                                                  |
| $d_A$                   | Strike distance in air                                                                                                                                                   | 9.4 mm                                                   |
| $a$                     | Max. allowable acceleration                                                                                                                                              | 50 m/s <sup>2</sup>                                      |
| $M_d$                   | Mounting torque (M5)                                                                                                                                                     | 2-2.5 Nm                                                 |
|                         | (10-32 UNF)                                                                                                                                                              | 18-22 lb.in.                                             |
| Weight                  |                                                                                                                                                                          | 35 g                                                     |

## Features

- Package with DCB ceramic base plate
- Isolation voltage 3600 V~
- Planar passivated chips
- Blocking voltage up to 1600 V
- Low forward voltage drop
- Leads suitable for PC board soldering
- UL registered E 72873

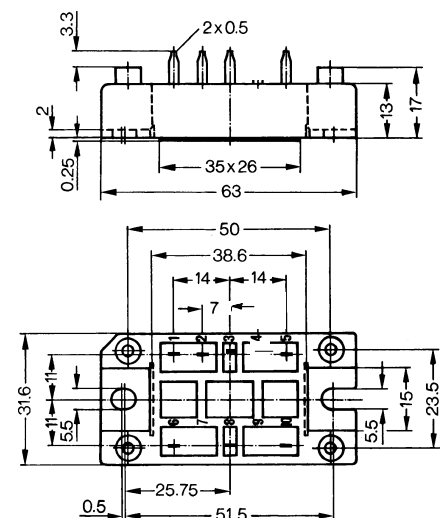
## Applications

- Supply for DC power equipment
- DC motor control

## Advantages

- Easy to mount with two screws
- Space and weight savings
- Improved temperature and power cycling

## Dimensions in mm (1 mm = 0.0394")



| Symbol     | Test Conditions                                                                                                                                                          | Characteristic Values                           |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| $I_R, I_D$ | $V_R = V_{RRM}; V_D = V_{DRM}$<br>$T_{VJ} = T_{VJM}$<br>$T_{VJ} = 25^\circ\text{C}$                                                                                      | $\leq 5$ mA<br>$\leq 0.3$ mA                    |
| $V_T, V_F$ | $I_T, I_F = 45$ A; $T_{VJ} = 25^\circ\text{C}$                                                                                                                           | $\leq 2.55$ V                                   |
| $V_{T0}$   | For power-loss calculations only ( $T_{VJ} = 125^\circ\text{C}$ )                                                                                                        | 1.0 V                                           |
| $r_T$      |                                                                                                                                                                          | 40 m $\Omega$                                   |
| $V_{GT}$   | $V_D = 6$ V;<br>$T_{VJ} = 25^\circ\text{C}$<br>$T_{VJ} = -40^\circ\text{C}$                                                                                              | $\leq 1.0$ V<br>$\leq 1.2$ V                    |
| $I_{GT}$   | $V_D = 6$ V;<br>$T_{VJ} = 25^\circ\text{C}$<br>$T_{VJ} = -40^\circ\text{C}$<br>$T_{VJ} = 125^\circ\text{C}$                                                              | $\leq 65$ mA<br>$\leq 80$ mA<br>$\leq 50$ mA    |
| $V_{GD}$   | $T_{VJ} = T_{VJM}; V_D = 2/3 V_{DRM}$                                                                                                                                    | $\leq 0.2$ V                                    |
| $I_{GD}$   | $T_{VJ} = T_{VJM}; V_D = 2/3 V_{DRM}$                                                                                                                                    | $\leq 5$ mA                                     |
| $I_L$      | $I_G = 0.3$ A; $t_G = 30$ $\mu\text{s}$ ; $T_{VJ} = 25^\circ\text{C}$<br>$di_G/dt = 0.3$ A/ $\mu\text{s}$ ; $T_{VJ} = -40^\circ\text{C}$<br>$T_{VJ} = 125^\circ\text{C}$ | $\leq 150$ mA<br>$\leq 200$ mA<br>$\leq 100$ mA |
| $I_H$      | $T_{VJ} = 25^\circ\text{C}; V_D = 6$ V; $R_{GK} = \infty$                                                                                                                | $\leq 100$ mA                                   |
| $t_{gd}$   | $T_{VJ} = 25^\circ\text{C}; V_D = 0.5 V_{DRM}$<br>$I_G = 0.3$ A; $di_G/dt = 0.3$ A/ $\mu\text{s}$                                                                        | $\leq 2$ $\mu\text{s}$                          |
| $t_q$      | $T_{VJ} = 125^\circ\text{C}; I_T = 15$ A; $t_p = 300$ $\mu\text{s}$ ; $V_R = 100$ V                                                                                      | typ. 150 $\mu\text{s}$                          |
| $Q_r$      | $di/dt = -10$ A/ $\mu\text{s}$ ; $dv/dt = 20$ V/ $\mu\text{s}$ ; $V_D = 2/3 V_{DRM}$                                                                                     | 75 $\mu\text{C}$                                |
| $R_{thJC}$ | per thyristor (diode); DC current                                                                                                                                        | 2.4 K/W                                         |
|            | per module                                                                                                                                                               | 0.6 K/W                                         |
| $R_{thJH}$ | per thyristor (diode); DC current                                                                                                                                        | 3.0 K/W                                         |
|            | per module                                                                                                                                                               | 0.75 K/W                                        |

### Field Diodes

| Symbol     | Test Conditions                                                                                   | Maximum Ratings                            |
|------------|---------------------------------------------------------------------------------------------------|--------------------------------------------|
| $I_{FAV}$  | $T_H = 85^\circ\text{C}$ , per Diode                                                              | 4 A                                        |
| $I_{FAVM}$ | per diode                                                                                         | 4 A                                        |
| $I_{FRMS}$ | per diode                                                                                         | 6 A                                        |
| $I_{FSM}$  | $T_{VJ} = 45^\circ\text{C}; V_R = 0$ V<br>$t = 10$ ms (50 Hz), sine<br>$t = 8.3$ ms (60 Hz), sine | 100 A<br>110 A                             |
|            | $T_{VJ} = T_{VJM}; V_R = 0$ V<br>$t = 10$ ms (50 Hz), sine<br>$t = 8.3$ ms (60 Hz), sine          | 85 A<br>94 A                               |
| $I^2t$     | $T_{VJ} = 45^\circ\text{C}; V_R = 0$ V<br>$t = 10$ ms (50 Hz), sine<br>$t = 8.3$ ms (60 Hz), sine | 50 A <sup>2</sup> s<br>50 A <sup>2</sup> s |
|            | $T_{VJ} = T_{VJM}; V_R = 0$ V<br>$t = 10$ ms (50 Hz), sine<br>$t = 8.3$ ms (60 Hz), sine          | 36 A <sup>2</sup> s<br>37 A <sup>2</sup> s |
| $I_R$      | $V_R = V_{RRM}; T_{VJ} = T_{VJM}$<br>$T_{VJ} = 25^\circ\text{C}$                                  | 1 mA<br>0.15 mA                            |
| $V_F$      | $I_F = 21$ A; $T_{VJ} = 25^\circ\text{C}$                                                         | 1.83 V                                     |
| $V_{T0}$   | For power-loss calculations only ( $T_{VJ} = 125^\circ\text{C}$ )                                 | 0.9 V                                      |
| $r_T$      |                                                                                                   | 50 m $\Omega$                              |
| $R_{thJC}$ | per diode; DC current                                                                             | 4.4 K/W                                    |
| $R_{thJH}$ | per diode; DC current                                                                             | 5.2 K/W                                    |

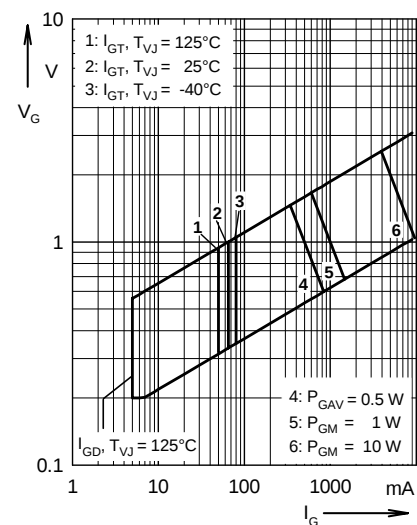


Fig. 1 Gate trigger range

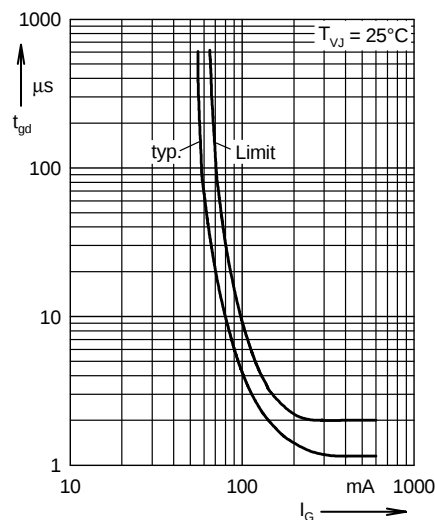


Fig. 2 Gate controlled delay time  $t_{gd}$

Data according to IEC 60747 and refer to a single thyristor/diode unless otherwise stated.

① for resistive load

IXYS reserves the right to change limits, test conditions and dimensions.

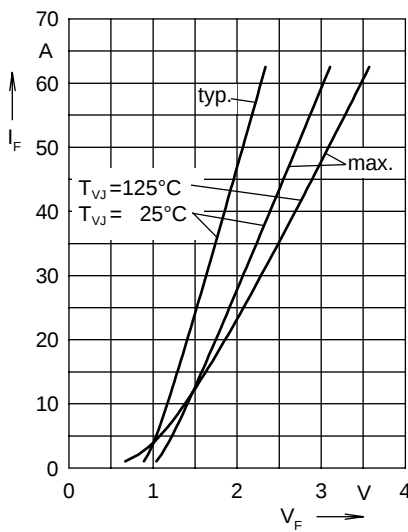


Fig. 3 Forward current versus voltage drop per diode

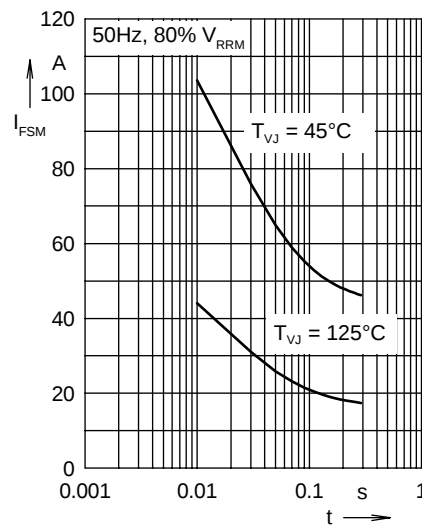


Fig. 4 Surge overload current

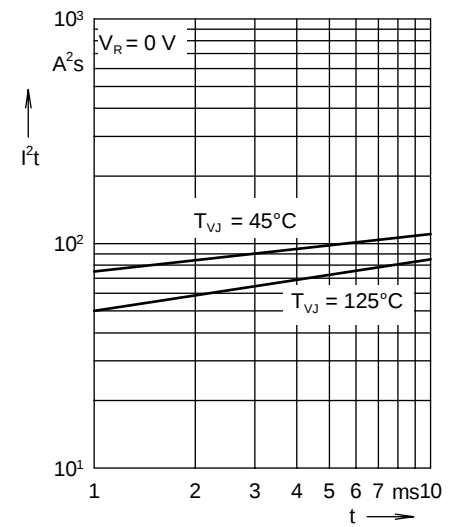


Fig. 5  $I^2t$  versus time per diode

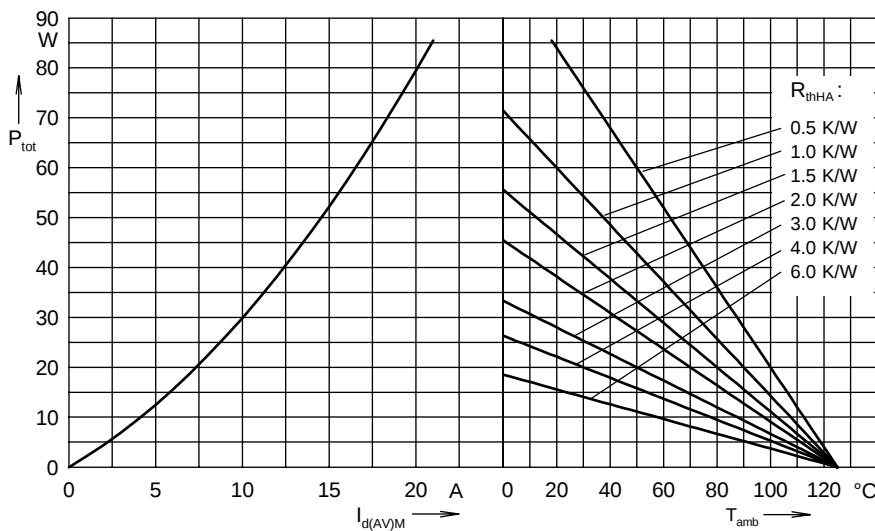


Fig. 6 Power dissipation versus direct output current and ambient temperature

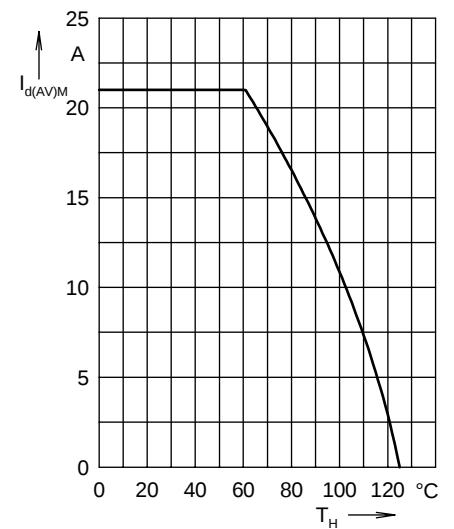


Fig. 7 Max. forward current versus heatsink temperature

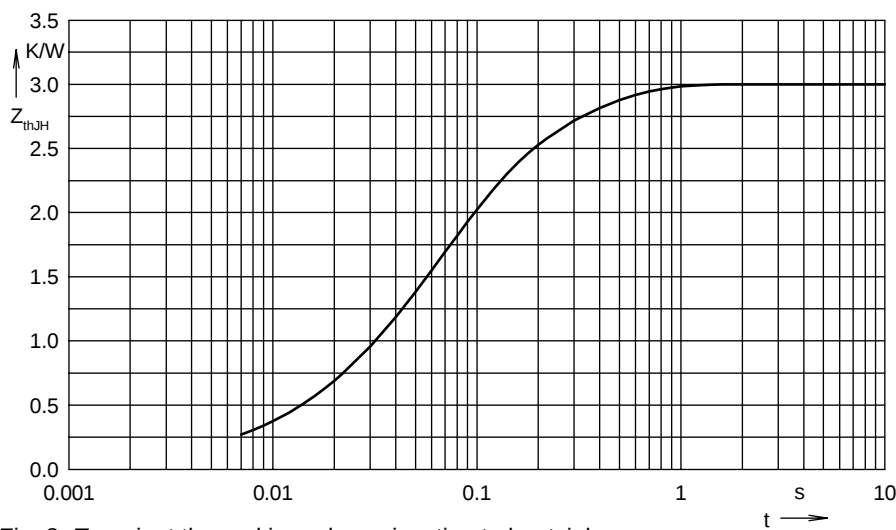


Fig. 8 Transient thermal impedance junction to heatsink

Constants for  $Z_{thJH}$  calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|-----------------|-----------|
| 1 | 0.01            | 0.008     |
| 2 | 0.4             | 0.05      |
| 3 | 1.69            | 0.06      |
| 4 | 0.9             | 0.25      |