

Thyristor Modules

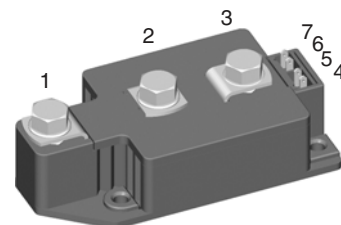
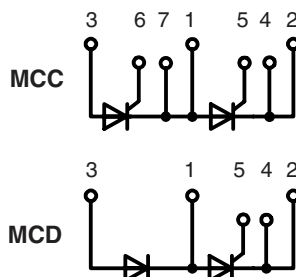
Thyristor/Diode Modules

$$I_{TRMS} = 2x 500 A$$

$$I_{TAVM} = 2x 320 A$$

$$V_{RRM} = 2200 V$$

| V_{RSM} | V_{RRM} | Type | |
|-----------|-----------|---------------|---------------|
| V_{DSM} | V_{DRM} | | |
| V | V | Version 1 | Version 1 |
| 2300 | 2200 | MCC 310-22io1 | MCD 310-22io1 |



| Symbol | Conditions | Maximum Ratings | |
|----------------------|---|-------------------------------|----------------|
| I_{TRMS}, I_{FRMS} | $T_{VJ} = T_{VJM}$ | 500 | A |
| I_{TAVM}, I_{FAVM} | $T_C = 85^\circ C; 180^\circ$ sine | 320 | A |
| I_{TSM}, I_{FSM} | $T_{VJ} = 45^\circ C$ | $t = 10$ ms (50 Hz), sine | 8000 A |
| | $V_R = 0$ | $t = 8.3$ ms (60 Hz), sine | 8600 A |
| I^2dt | $T_{VJ} = 45^\circ C$ | $t = 10$ ms (50 Hz), sine | 320 000 A^2s |
| | $V_R = 0$ | $t = 8.3$ ms (60 Hz), sine | 310 000 A^2s |
| $(di/dt)_{cr}$ | $T_{VJ} = T_{VJM}$ | repetitive, $I_T = 960$ A | 100 $A/\mu s$ |
| | $f = 50$ Hz, $t_p = 200$ μs $V_D = \frac{2}{3} V_{DRM}$ $I_G = 1$ A $di_G/dt = 1$ $A/\mu s$ | non repetitive, $I_T = 320$ A | 500 $A/\mu s$ |
| $(dv/dt)_{cr}$ | $T_{VJ} = T_{VJM}; V_{DR} = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty$; method 1 (linear voltage rise) | | 1000 $V/\mu s$ |
| P_{GM} | $T_{VJ} = T_{VJM}; t_p = 30$ μs | 120 | W |
| | $I_T = I_{TAVM}; t_p = 500$ μs | 60 | W |
| P_{GAV} | | 20 | W |
| V_{RGM} | | 10 | V |
| T_{VJ} | | -40...+140 | $^\circ C$ |
| T_{VJM} | | 140 | $^\circ C$ |
| T_{stg} | | -40...+125 | $^\circ C$ |
| V_{ISOL} | 50/60 Hz, RMS; $t = 1$ min | 3000 | V~ |
| | $I_{ISOL} \leq 1$ mA; $t = 1$ s | 3600 | V~ |
| M_d | Mounting torque (M5) | 2.5-5/22-44 | Nm/lb.in. |
| | Terminal connection torque (M8) | 12-15/106-132 | Nm/lb.in. |
| Weight | Typical including screws | 320 | g |

Features

- International standard package
- Direct copper bonded Al_2O_3 -ceramic base plate
- Planar passivated chips
- Isolation voltage 3600 V~
- UL registered, E 72873
- Keyed gate/cathode twin pins

Applications

- Motor control
- Power converter
- Heat and temperature control for industrial furnaces and chemical processes
- Lighting control
- Contactless switches

Advantages

- Space and weight savings
- Simple mounting
- Improved temperature and power cycling
- Reduced protection circuits

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

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

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| Symbol | Conditions | Characteristic Values | |
|------------|---|-----------------------|------------------|
| I_{RRM} | $T_{VJ} = T_{VJM}; V_R = V_{RRM}; V_D = V_{DRM}$ | 70 | mA |
| I_{DRM} | | 40 | mA |
| V_T, V_F | $I_T, I_F = 600 \text{ A}; T_{VJ} = 25^\circ\text{C}$ | 1.40 | V |
| V_{T0} | For power-loss calculations only ($T_{VJ} = 140^\circ\text{C}$) | 0.8 | V |
| r_T | | 0.82 | m Ω |
| V_{GT} | $V_D = 6 \text{ V}; T_{VJ} = 25^\circ\text{C}$ | 2 | V |
| | $T_{VJ} = -40^\circ\text{C}$ | 3 | V |
| I_{GT} | $V_D = 6 \text{ V}; T_{VJ} = 25^\circ\text{C}$ | 150 | mA |
| | $T_{VJ} = -40^\circ\text{C}$ | 200 | mA |
| V_{GD} | $T_{VJ} = T_{VJM}; V_D = \frac{2}{3} V_{DRM}$ | 0.25 | V |
| I_{GD} | | 10 | mA |
| I_L | $T_{VJ} = 25^\circ\text{C}; t_p = 30 \mu\text{s}; V_D = 6 \text{ V}$ $I_G = 0.45 \text{ A}; di_G/dt = 0.45 \text{ A}/\mu\text{s}$ | 200 | mA |
| I_H | $T_{VJ} = 25^\circ\text{C}; V_D = 6 \text{ V}; R_{GK} = \infty$ | 150 | mA |
| t_{gd} | $T_{VJ} = 25^\circ\text{C}; V_D = \frac{1}{2} V_{DRM}$ $I_G = 1 \text{ A}; di_G/dt = 1 \text{ A}/\mu\text{s}$ | 2 | μs |
| t_q | $T_{VJ} = T_{VJM}; I_T = 300 \text{ A}, t_p = 200 \mu\text{s}; -di/dt = 10 \text{ A}/\mu\text{s}$ $V_R = 100 \text{ V}; dv/dt = 50 \text{ V}/\mu\text{s}; V_D = \frac{2}{3} V_{DRM}$ | typ. 200 | μs |
| Q_S | $T_{VJ} = 125^\circ\text{C}; I_T, I_F = 400 \text{ A}, -di/dt = 50 \text{ A}/\mu\text{s}$ | 760 | μC |
| I_{RM} | | 275 | A |
| R_{thJC} | per thyristor/diode; DC current per module | 0.112 | K/W |
| R_{thJK} | per thyristor/diode; DC current per module | 0.056 | K/W |
| | other values see Fig. 8/9 | 0.152 | K/W |
| | | 0.076 | K/W |
| d_s | Creepage distance on surface | 12.7 | mm |
| d_A | Strike distance through air | 9.6 | mm |
| a | Maximum allowable acceleration | 50 | m/s ² |

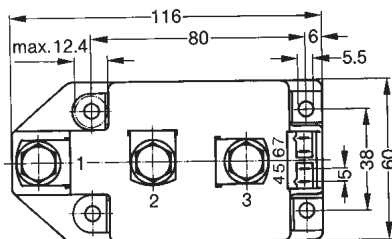
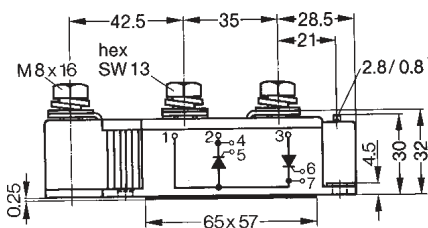
Optional accessories for modules

Keyed gate/cathode twin plugs with wire length = 350 mm, gate = yellow, cathode = red

Type ZY 180L (L = Left for pin pair 4/5) } UL 758, style 1385,
Type ZY 180R (R = right for pin pair 6/7) } CSA class 5851, guide 460-1-1

Dimensions in mm (1 mm = 0.0394")

MCC



MCD

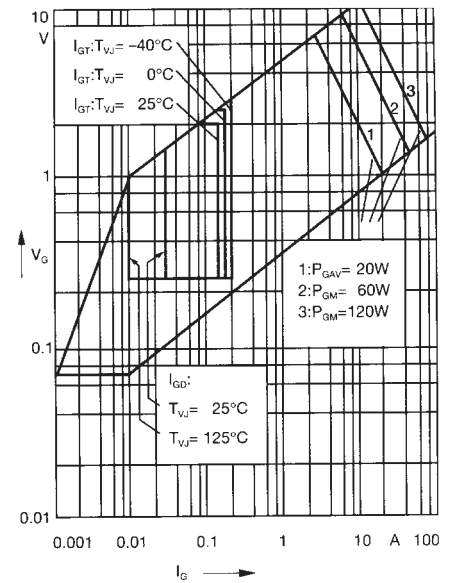
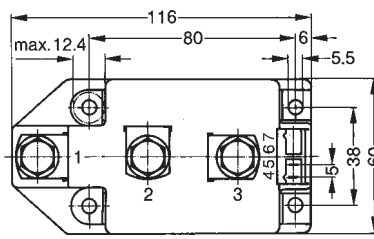
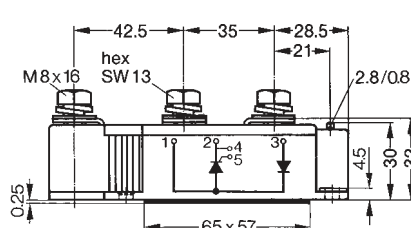


Fig. 1 Gate trigger characteristics

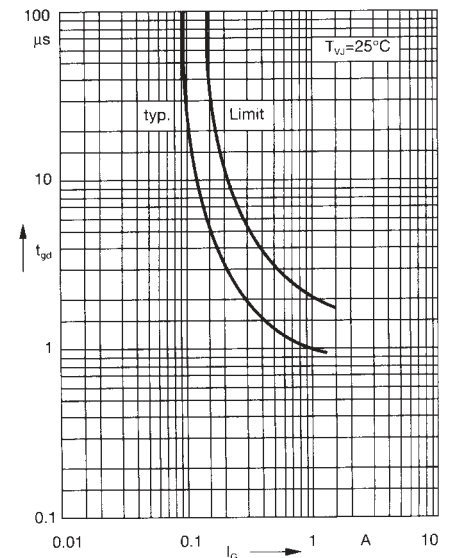
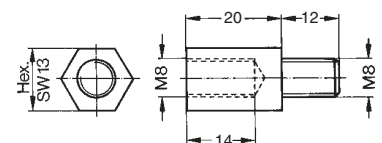


Fig. 2 Gate trigger delay time

Threaded spacer for higher Anode/Cathode construction:
Type ZY 250, material brass



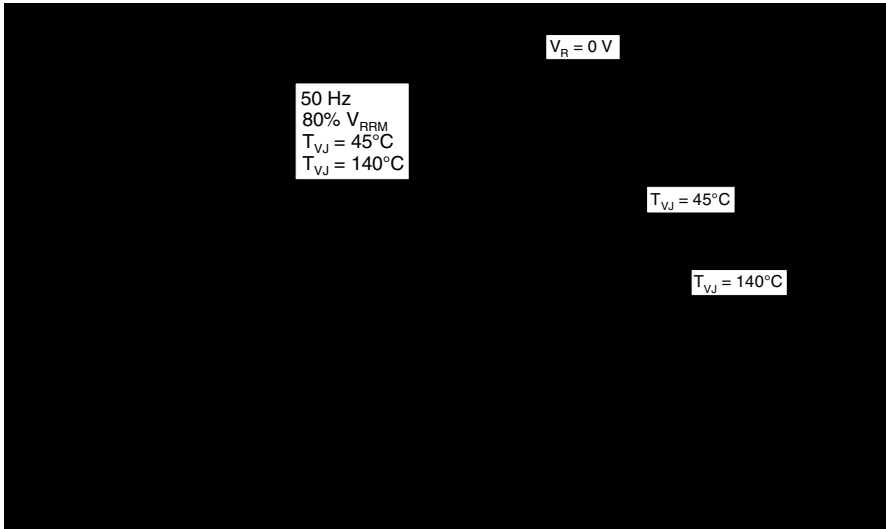


Fig. 3 Surge overload current
 I_{TSM} , I_{FSM} : Crest value, t: duration

Fig. 4 $\int i^2 dt$ versus time (1-10 ms)

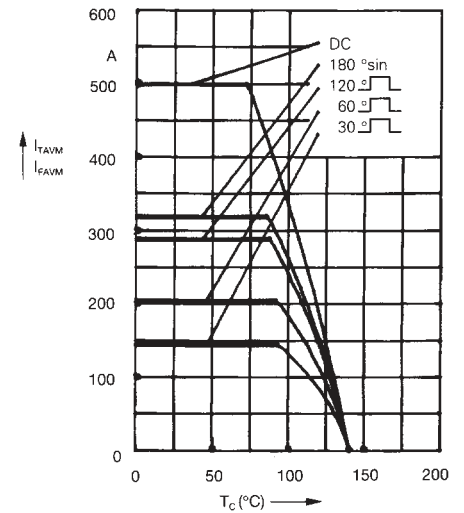


Fig. 4a Maximum forward current at case temperature

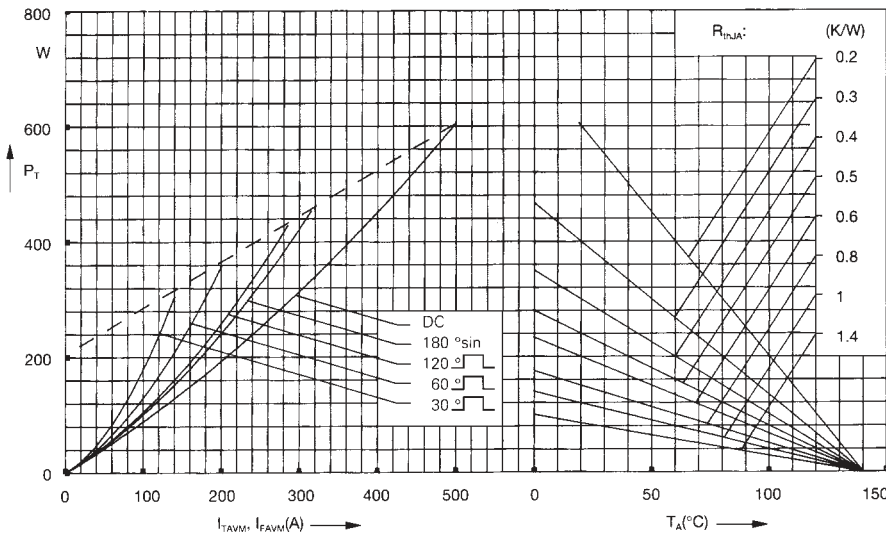


Fig. 5 Power dissipation versus on-state current and ambient temperature (per thyristor or diode)

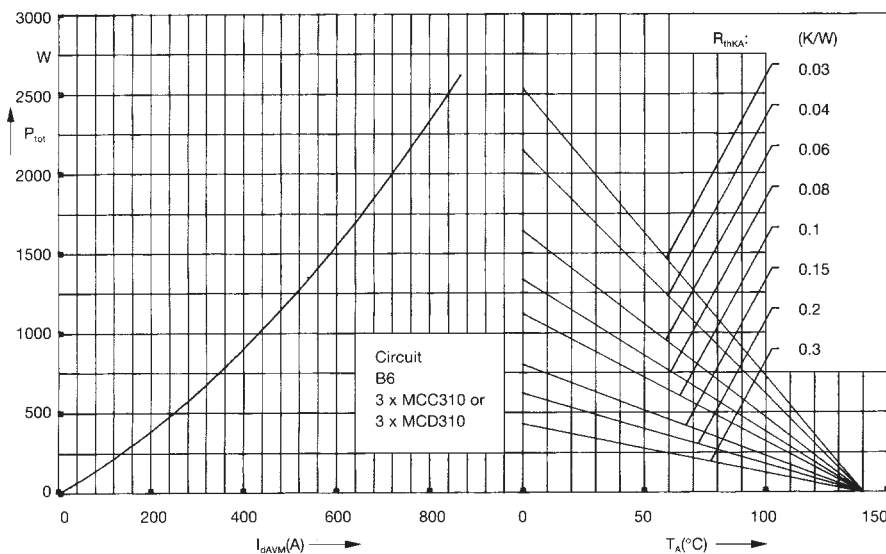


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

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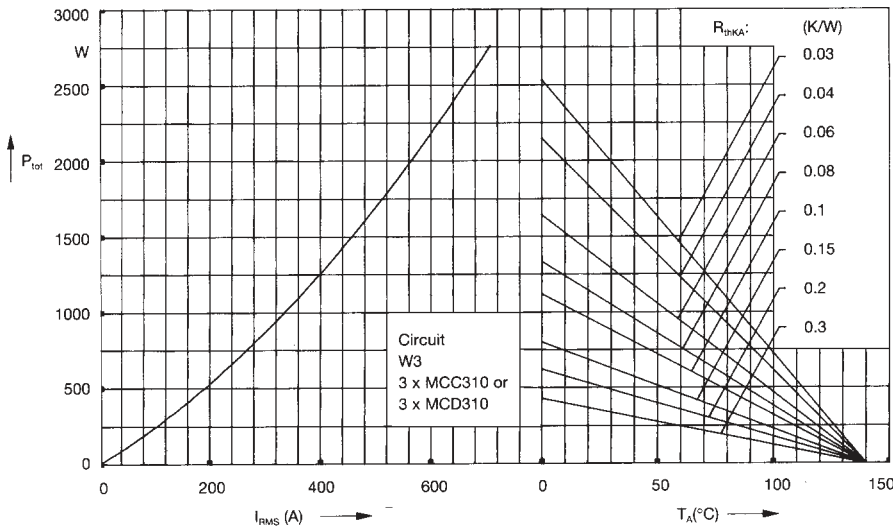


Fig. 7 Three phase AC-controller:
Power dissipation versus RMS
output current and ambient
temperature

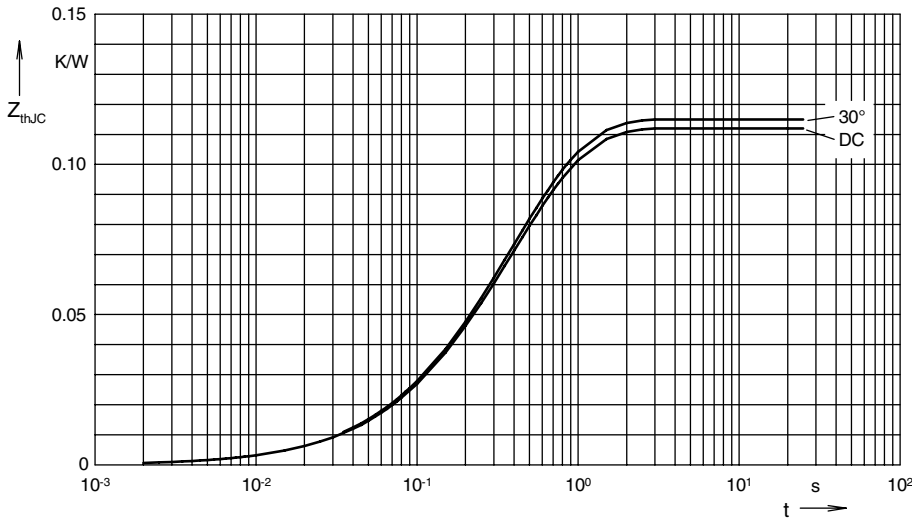


Fig. 8 Transient thermal impedance
junction to case (per thyristor or
diode)

R_{thJC} for various conduction angles d :

| d | R_{thJC} (K/W) |
|-------|------------------|
| DC | 0.112 |
| 180°C | 0.113 |
| 120°C | 0.114 |
| 60°C | 0.115 |
| 30°C | 0.115 |

Constants for Z_{thJC} calculation:

| i | R_{thi} (K/W) | t_i (s) |
|-----|-----------------|-----------|
| 1 | 0.003 | 0.099 |
| 2 | 0.0143 | 0.168 |
| 3 | 0.0947 | 0.456 |

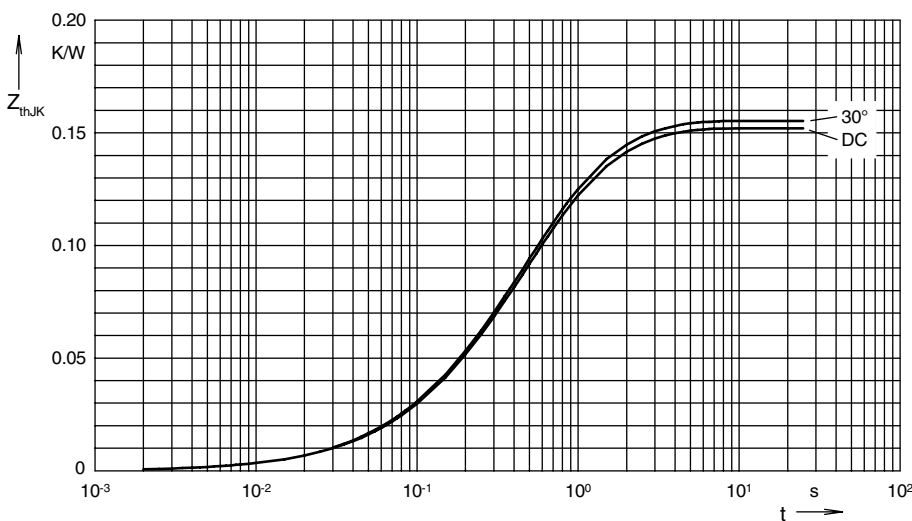


Fig. 9 Transient thermal impedance
junction to heatsink (per thyristor
or diode)

R_{thJK} for various conduction angles d :

| d | R_{thJK} (K/W) |
|-------|------------------|
| DC | 0.152 |
| 180°C | 0.154 |
| 120°C | 0.154 |
| 60°C | 0.155 |
| 30°C | 0.155 |

Constants for Z_{thJK} calculation:

| i | R_{thi} (K/W) | t_i (s) |
|-----|-----------------|-----------|
| 1 | 0.003 | 0.099 |
| 2 | 0.0143 | 0.168 |
| 3 | 0.0947 | 0.456 |
| 4 | 0.04 | 1.36 |