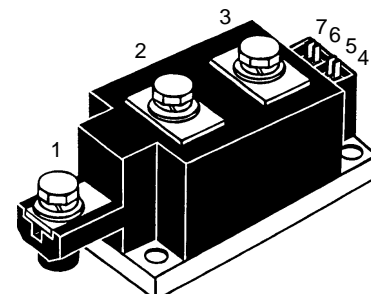


Thyristor Modules

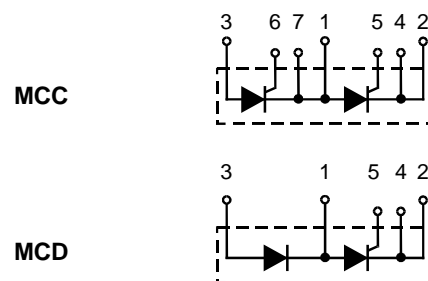
Thyristor/Diode Modules

$I_{TRMS} = 2x 400 A$
 $I_{TAVM} = 2x 240 A$
 $V_{RRM} = 2000-2200 V$

| V_{RSM} | V_{RRM} | Type | |
|-----------|-----------|---------------|---------------|
| V_{DSM} | V_{DRM} | | |
| V | V | | |
| 2100 | 2000 | MCC 224-20io1 | MCD 224-20io1 |
| 2300 | 2200 | MCC 224-22io1 | MCD 224-22io1 |



| Symbol | Test Conditions | Maximum Ratings | |
|----------------|--|--------------------|-------------------------|
| I_{TRMS} | $T_{VJ} = T_{VJM}$ | 400 | A |
| I_{TAVM} | $T_C = 85^\circ C; 180^\circ$ sine | 240 | A |
| I_{TSM} | $T_{VJ} = 45^\circ C;$ $V_R = 0$ | t = 10 ms (50 Hz) | 8000 A |
| | | t = 8.3 ms (60 Hz) | 8500 A |
| | $T_{VJ} = T_{VJM}$ | t = 10 ms (50 Hz) | 7000 A |
| | $V_R = 0$ | t = 8.3 ms (60 Hz) | 7500 A |
| $\int i^2 dt$ | $T_{VJ} = 45^\circ C$ $V_R = 0$ | t = 10 ms (50 Hz) | 320000 A ² s |
| | | t = 8.3 ms (60 Hz) | 303000 A ² s |
| | $T_{VJ} = T_{VJM}$ | t = 10 ms (50 Hz) | 245000 A ² s |
| | $V_R = 0$ | t = 8.3 ms (60 Hz) | 240000 A ² s |
| $(di/dt)_{cr}$ | $T_{VJ} = T_{VJM}$ repetitive, $I_T = 750 A$ f = 50 Hz, $t_p = 200 \mu s$ | | 100 A/ μs |
| | $V_D = 2/3 V_{DRM}$ $I_G = 1 A$ non repetitive, $I_T = I_{TAVM}$ $di_G/dt = 1 A/\mu s$ | | 500 A/ μs |
| $(dv/dt)_{cr}$ | $T_{VJ} = T_{VJM}; V_{DR} = 2/3 V_{DRM}$ $R_{GK} = \infty$; method 1 (linear voltage rise) | | 1000 V/ μs |
| P_{GM} | $T_{VJ} = T_{VJM}$ $t_p = 30 \mu s$ | 120 | W |
| | $I_T = I_{TAVM}$ $t_p = 500 \mu s$ | 60 | W |
| P_{GAV} | | 20 | W |
| V_{RGM} | | 10 | V |
| T_{VJ} | | -40 ... 130 | °C |
| T_{VJM} | | 130 | °C |
| T_{stg} | | -40 ... 125 | °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 (M6) | 4.5-7/40-62 | Nm/lb.in. |
| | Terminal connection torque (M8) | 11-13/97-115 | Nm/lb.in. |
| Weight | Typical including screws | 750 | g |



Features

- International standard package
- **Direct Copper Bonded** Al₂O₃-ceramic with copper base plate
- Planar passivated chips
- Isolation voltage 3600 V~
- UL registered E 72873
- Keyed gate/cathode twin pins

Applications

- Motor control, softstarter
- Power converter
- Heat and temperature control for industrial furnaces and chemical processes
- Lighting control
- Solid state switches

Advantages

- 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

| Symbol | Test Conditions | Characteristic Values | |
|--------------------|---|-----------------------|------------------|
| I_{RRM}, I_{DRM} | $T_{VJ} = T_{VJM}; V_R = V_{RRM}$ | 40 | mA |
| V_T | $I_T = 600 \text{ A}; T_{VJ} = 25^\circ\text{C}$ | 1.4 | V |
| V_{T0} | For power-loss calculations only ($T_{VJ} = T_{VJM}$) | 0.8 | V |
| r_T | | 0.76 | 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 |
| | $T_{VJ} = -40^\circ\text{C}$ | 220 | mA |
| V_{GD} | $T_{VJ} = T_{VJM}; V_D = 2/3 V_{DRM}$ | 0.25 | V |
| I_{GD} | $T_{VJ} = T_{VJM}; V_D = 2/3 V_{DRM}$ | 10 | mA |
| I_L | $T_{VJ} = 25^\circ\text{C}; V_D = 6 \text{ V}; t_p = 30 \mu\text{s}$ $di_G/dt = 0.45 \text{ A}/\mu\text{s}; I_G = 0.45 \text{ A}$ | 200 | mA |
| I_H | $T_{VJ} = 25^\circ\text{C}; V_D = 6 \text{ V}; R_{GK} = \infty$ | 150 | mA |
| t_{gd} | $T_{VJ} = 25^\circ\text{C}; V_D = 1/2 V_{DRM}$ $di_G/dt = 1 \text{ A}/\mu\text{s}; I_G = 1 \text{ A}$ | 2 | μs |
| t_q | $T_{VJ} = T_{VJM}; V_R = 100 \text{ V}; V_D = 2/3 V_{DRM}; t_p = 200 \mu\text{s}$ $dv/dt = 50 \text{ V}/\mu\text{s}; I_T = 300 \text{ A}; -di/dt = 10 \text{ A}/\mu\text{s}$ | typ. 200 | μs |
| Q_S | $T_{VJ} = T_{VJM}$ $-di/dt = 50 \text{ A}/\mu\text{s}; I_T = 400 \text{ A}$ | 760 | μC |
| I_{RM} | | 275 | A |
| R_{thJC} | per thyristor; DC current | 0.139 | K/W |
| | per module | 0.069 | K/W |
| R_{thJK} | per thyristor; DC current | 0.179 | K/W |
| | per module | 0.089 | K/W |
| d_s | Creeping distance on surface | 12.7 | mm |
| d_A | Creepage distance in air | 9.6 | mm |
| a | Maximum allowable acceleration | 50 | m/s ² |

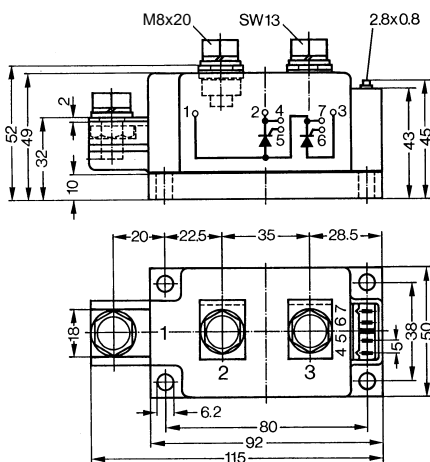
Optional accessories for modules

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

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

Dimensions in mm (1 mm = 0.0394")

MCC



MCD

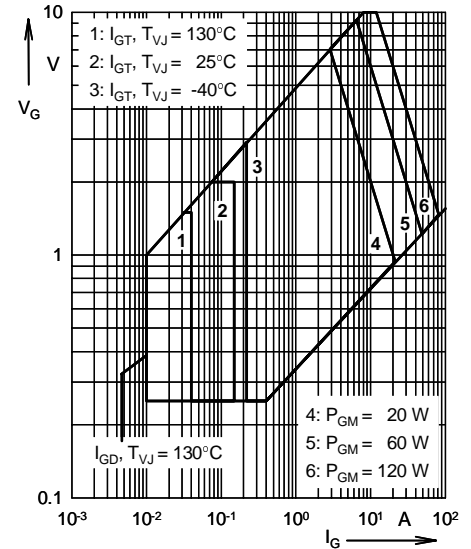
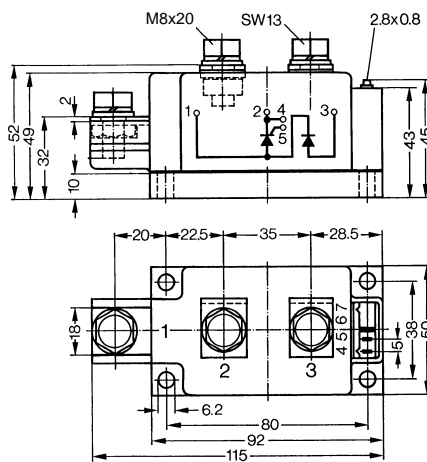


Fig. 1 Gate trigger characteristics

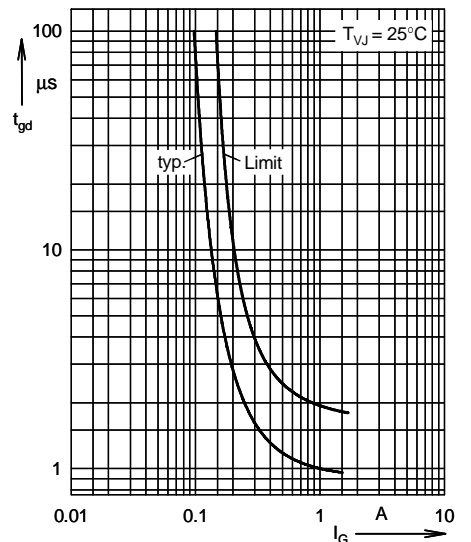


Fig. 2 Gate trigger delay time

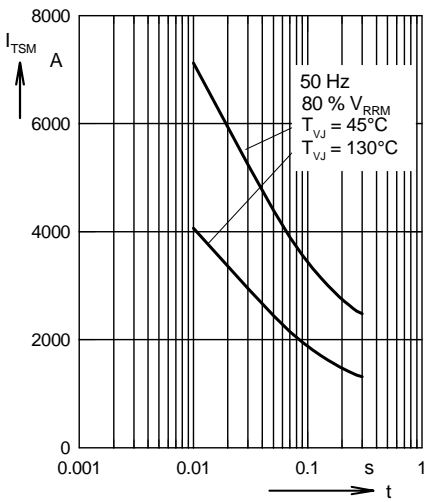


Fig. 3 Surge overload current
 I_{TSM} : Crest value, t : duration

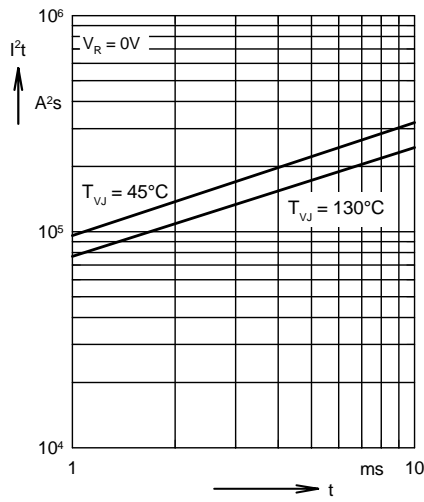


Fig. 4 I^2t versus time (1-10 ms)

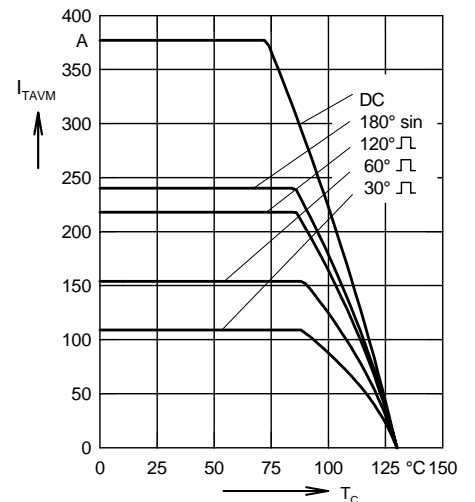


Fig. 4a Maximum forward current at case temperature

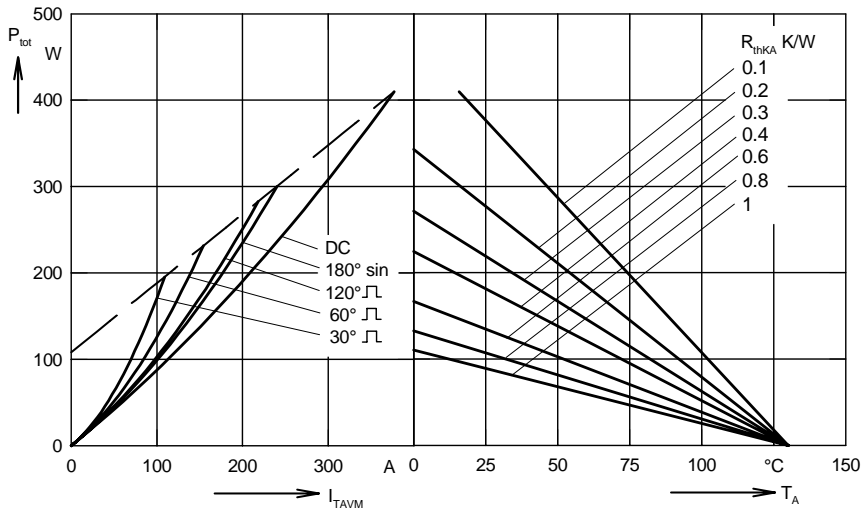


Fig. 5 Power dissipation versus on-state current and ambient temperature (per thyristor or diode)

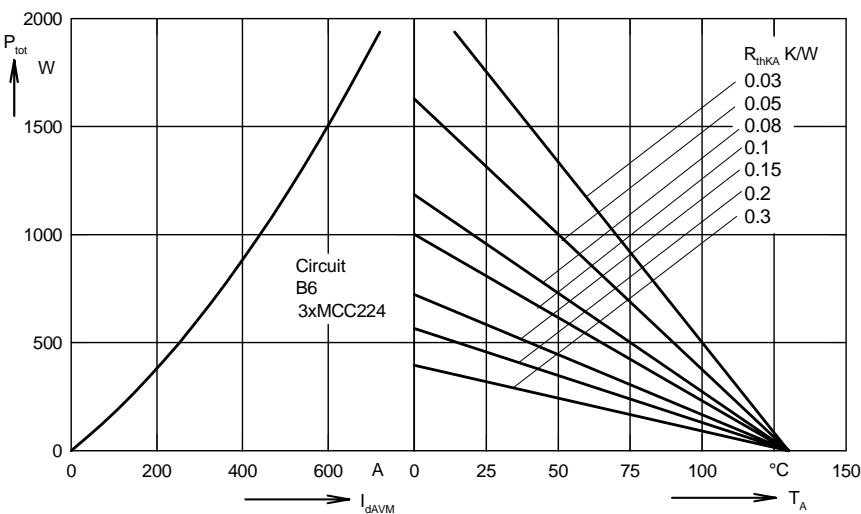


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

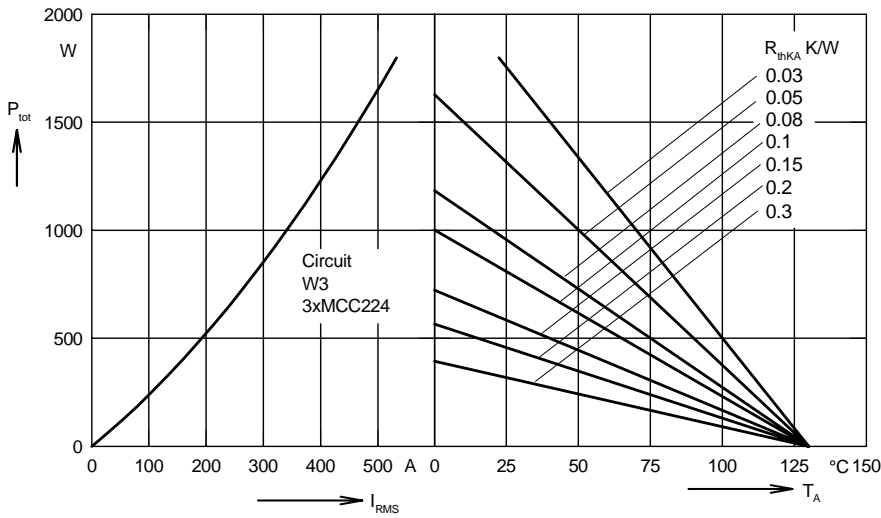


Fig. 7 Three phase AC-controller: Power dissipation versus RMS output current and ambient temperature

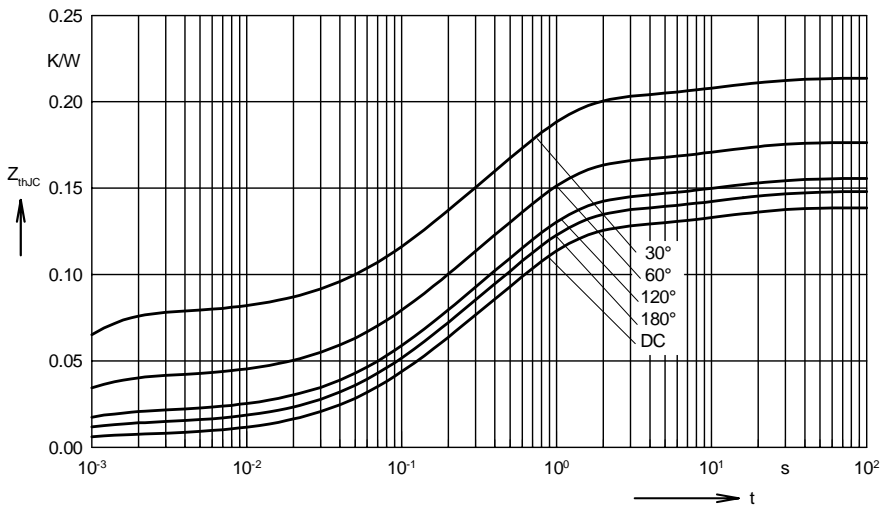


Fig. 8 Transient thermal impedance junction to case (per thyristor or diode)

R_{thJC} for various conduction angles d:

| d | R_{thJC} (K/W) |
|------|------------------|
| DC | 0.139 |
| 180° | 0.148 |
| 120° | 0.156 |
| 60° | 0.176 |
| 30° | 0.214 |

Constants for Z_{thJC} calculation:

| i | R_{thi} (K/W) | t_i (s) |
|---|-----------------|-----------|
| 1 | 0.0067 | 0.00054 |
| 2 | 0.0358 | 0.098 |
| 3 | 0.0832 | 0.54 |
| 4 | 0.0129 | 12 |

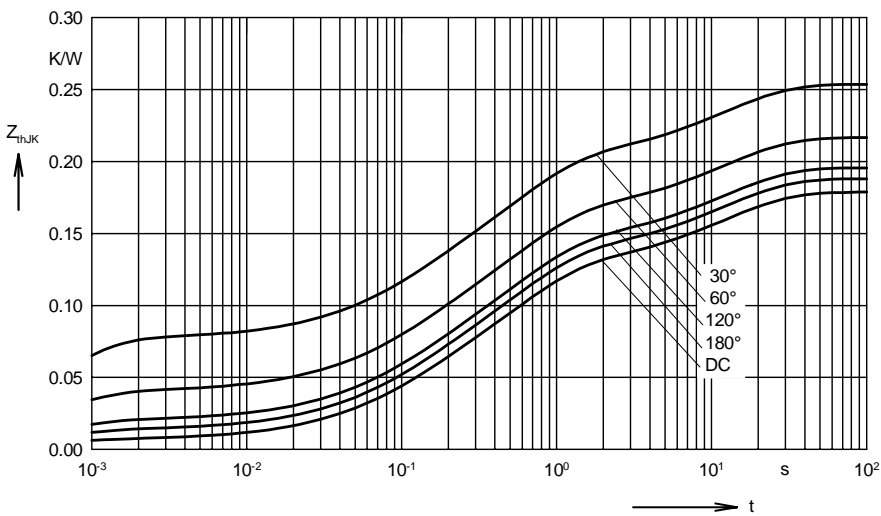


Fig. 9 Transient thermal impedance junction to heatsink (per thyristor or diode)

R_{thJK} for various conduction angles d:

| d | R_{thJK} (K/W) |
|------|------------------|
| DC | 0.179 |
| 180° | 0.188 |
| 120° | 0.196 |
| 60° | 0.216 |
| 30° | 0.256 |

Constants for Z_{thJK} calculation:

| i | R_{thi} (K/W) | t_i (s) |
|---|-----------------|-----------|
| 1 | 0.0067 | 0.00054 |
| 2 | 0.0358 | 0.098 |
| 3 | 0.0832 | 0.54 |
| 4 | 0.0129 | 12 |
| 5 | 0.04 | 12 |