

# Thyristor Modules

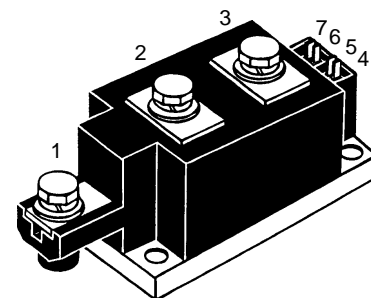
## Thyristor/Diode Modules

$$I_{TRMS} = 2 \times 400 \text{ A}$$

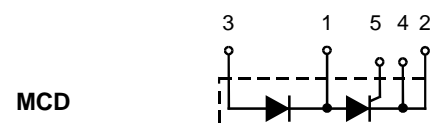
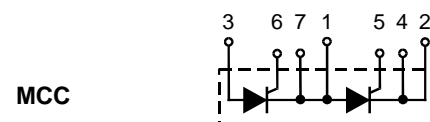
$$I_{TAVM} = 2 \times 221 \text{ A}$$

$$V_{RRM} = 1200-1800 \text{ V}$$

$V_{RSM}$	$V_{RRM}$	Type	
$V_{DSM}$	$V_{DRM}$		
V	V		
1300	1200	MCC 225-12io1	MCD 225-12io1
1500	1400	MCC 225-14io1	MCD 225-14io1
1700	1600	MCC 225-16io1	MCD 225-16io1
1900	1800	MCC 225-18io1	MCD 225-18io1



Symbol	Test Conditions	Maximum Ratings	
$I_{TRMS}$	$T_{VJ} = T_{VJM}$	400	A
$I_{TAVM}$	$T_C = 85^\circ\text{C}; 180^\circ \text{ sine}$	221	A
$I_{TSM}, I_{FSM}$	$T_{VJ} = 45^\circ\text{C};$ $V_R = 0$	$t = 10 \text{ ms (50 Hz)}$	8000 A
		$t = 8.3 \text{ ms (60 Hz)}$	8500 A
	$T_{VJ} = T_{VJM}$ $V_R = 0$	$t = 10 \text{ ms (50 Hz)}$	7000 A
		$t = 8.3 \text{ ms (60 Hz)}$	7700 A
$\int i^2 dt$	$T_{VJ} = 45^\circ\text{C}$ $V_R = 0$	$t = 10 \text{ ms (50 Hz)}$	320 000 $\text{A}^2\text{s}$
		$t = 8.3 \text{ ms (60 Hz)}$	300 000 $\text{A}^2\text{s}$
	$T_{VJ} = T_{VJM}$ $V_R = 0$	$t = 10 \text{ ms (50 Hz)}$	245 000 $\text{A}^2\text{s}$
		$t = 8.3 \text{ ms (60 Hz)}$	246 000 $\text{A}^2\text{s}$
$(di/dt)_{cr}$	$T_{VJ} = T_{VJM}$ $f = 50 \text{ Hz}, t_p = 200 \mu\text{s}$ $V_D = 2/3 V_{DRM}$ $I_G = 1 \text{ A},$ $di_G/dt = 1 \text{ A}/\mu\text{s}$	repetitive, $I_T = 750 \text{ A}$	100 $\text{A}/\mu\text{s}$
		non repetitive, $I_T = I_{TAVM}$	500 $\text{A}/\mu\text{s}$
$(dv/dt)_{cr}$	$T_{VJ} = T_{VJM}; V_{DR} = 2/3 V_{DRM}$ $R_{GK} = \infty; \text{method 1 (linear voltage rise)}$	1000	$\text{V}/\mu\text{s}$
$P_{GM}$	$T_{VJ} = T_{VJM}$ $I_T = I_{TAVM}$	$t_p = 30 \mu\text{s}$	120 W
		$t_p = 500 \mu\text{s}$	60 W
$P_{GAV}$		20	W
$V_{RGM}$		10	V
$T_{VJ}$		-40...+130	$^\circ\text{C}$
$T_{VJM}$		130	$^\circ\text{C}$
$T_{stg}$		-40...+125	$^\circ\text{C}$
$V_{ISOL}$	50/60 Hz, RMS $I_{ISOL} \leq 1 \text{ mA}$	$t = 1 \text{ min}$	3000 V~
		$t = 1 \text{ s}$	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  $\text{Al}_2\text{O}_3$ -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

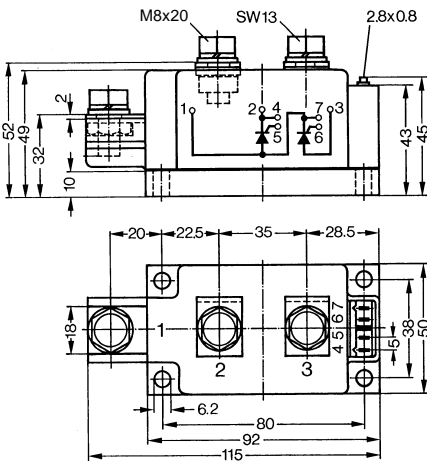
Data according to IEC 60747 and refer to a single thyristor/diode unless otherwise stated. IXYS reserves the right to change limits, test conditions and dimensions

Symbol	Test Conditions	Characteristic Values
$I_{RRM}, I_{DRM}$	$T_{VJ} = T_{VJM}; V_R = V_{RRM}; V_D = V_{DRM}$	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 ( $T_{VJ} = 130^\circ\text{C}$ )	0.8 V
$r_T$		0.76 mΩ
$V_{GT}$	$V_D = 6 \text{ V}; T_{VJ} = 25^\circ\text{C}$	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
$I_L$	$T_{VJ} = 25^\circ\text{C}; t_p = 30 \mu\text{s}; V_D = 6 \text{ V}$ $I_G = 0.45 \text{ A}; di_G/dt = 0.45 \text{ A}/\mu\text{s}$	200 mA
$I_H$	$T_{VJ} = 25^\circ\text{C}; V_D = 6 \text{ V}; R_{GK} = \infty$	150 mA
$t_{gd}$	$T_{VJ} = 25^\circ\text{C}; V_D = 1/2 V_{DRM}$ $I_G = 1 \text{ A}; di_G/dt = 1 \text{ A}/\mu\text{s}$	2 μs
$t_q$	$T_{VJ} = T_{VJM}; I_T = 300 \text{ A}, t_p = 200 \mu\text{s}; -di/dt = 10 \text{ A}/\mu\text{s}$ typ. 200 μs $V_R = 100 \text{ V}; dv/dt = 50 \text{ V}/\mu\text{s}; V_D = 2/3 V_{DRM}$	
$Q_S$	$T_{VJ} = 125^\circ\text{C}; I_T, I_F = 300 \text{ A}; -di/dt = 50 \text{ A}/\mu\text{s}$	550 μC
$I_{RM}$		235 A
$R_{thJC}$	per thyristor (diode); DC current per module	0.157 K/W
$R_{thJK}$	per thyristor (diode); DC current per module	0.197 K/W
	other values see Fig. 8/9	0.08 K/W
		0.1 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 <sup>2</sup>

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

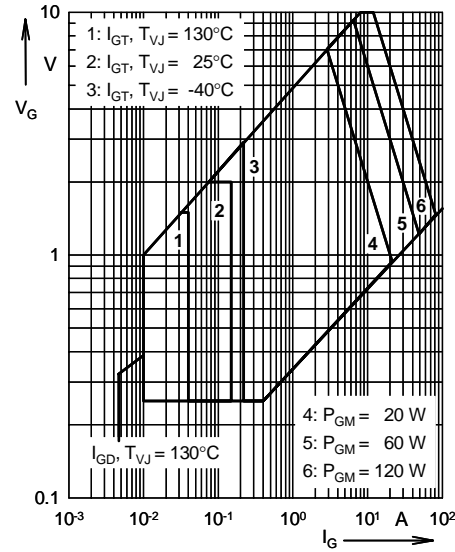
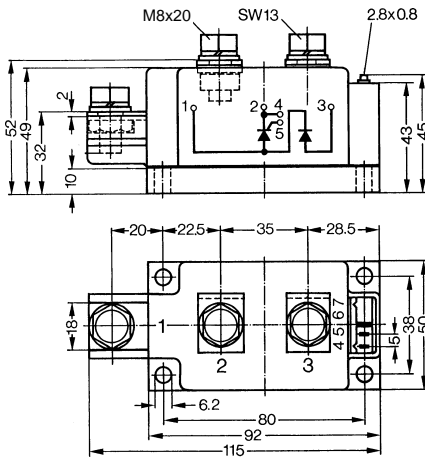


Fig. 1 Gate trigger characteristics

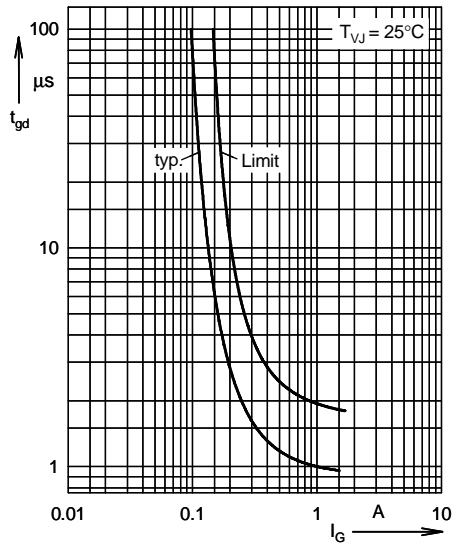


Fig. 2 Gate trigger delay time

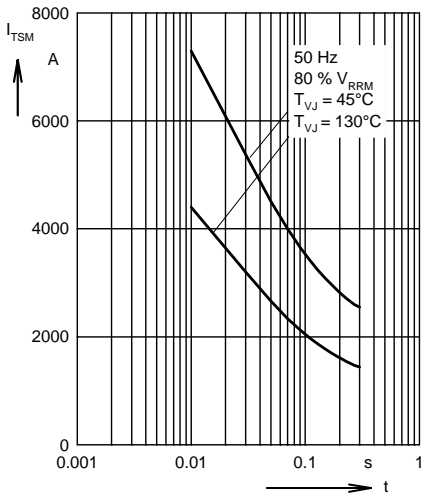


Fig. 3 Surge overload current  
 $I_{TSM}, I_{FSM}$ : Crest value, t: duration

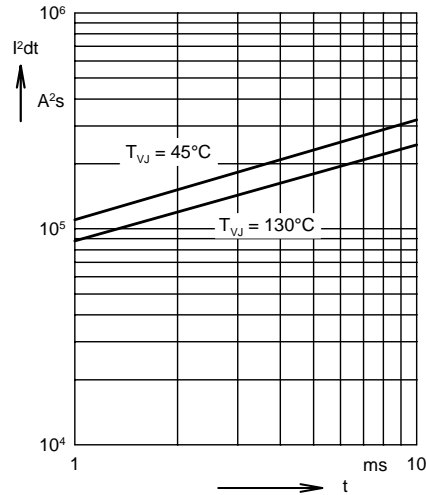


Fig. 4  $\int j^2 dt$  versus time (1-10 ms)

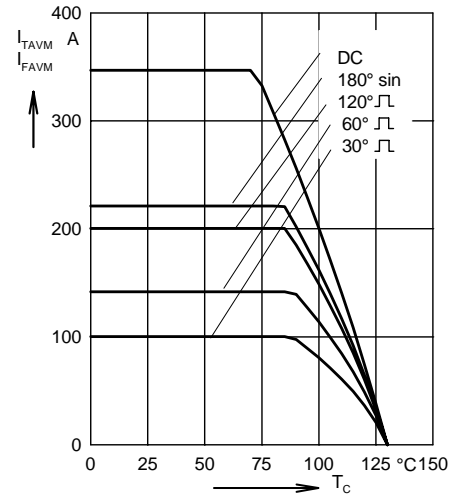


Fig. 4a Maximum forward current at case temperature

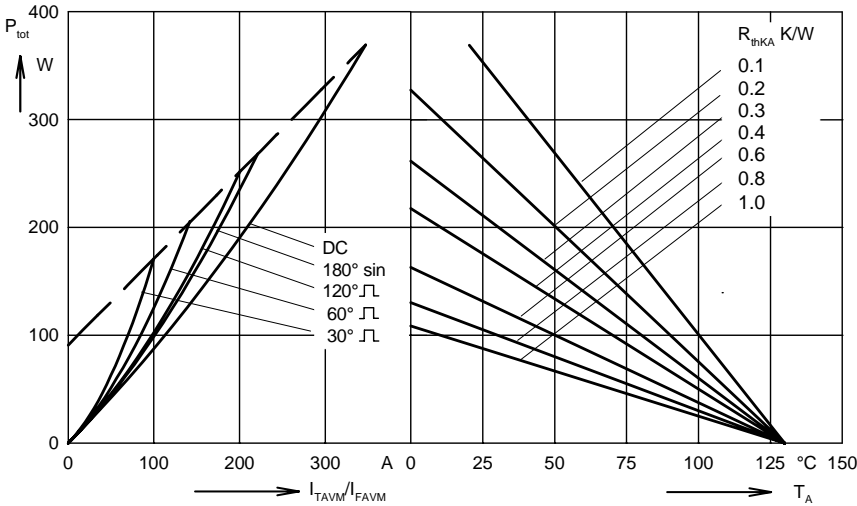


Fig. 5 Power dissipation versus on-state current and ambient temperature (per thyristor or diode)

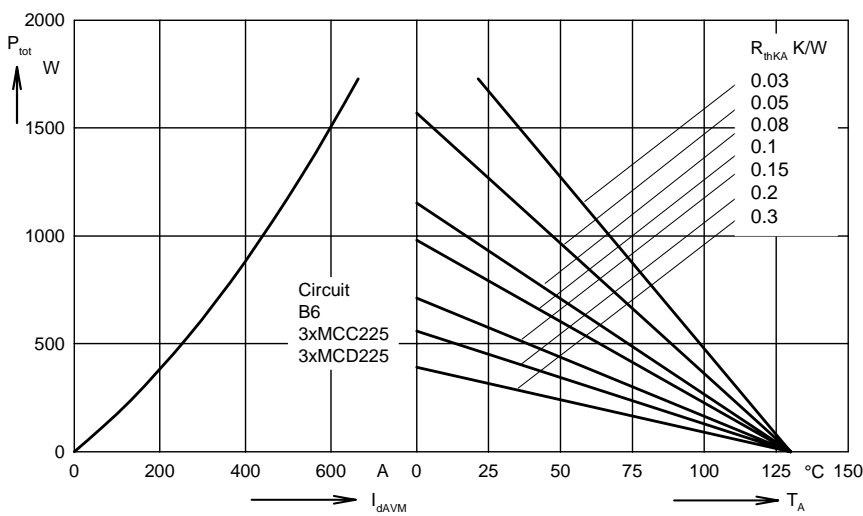


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

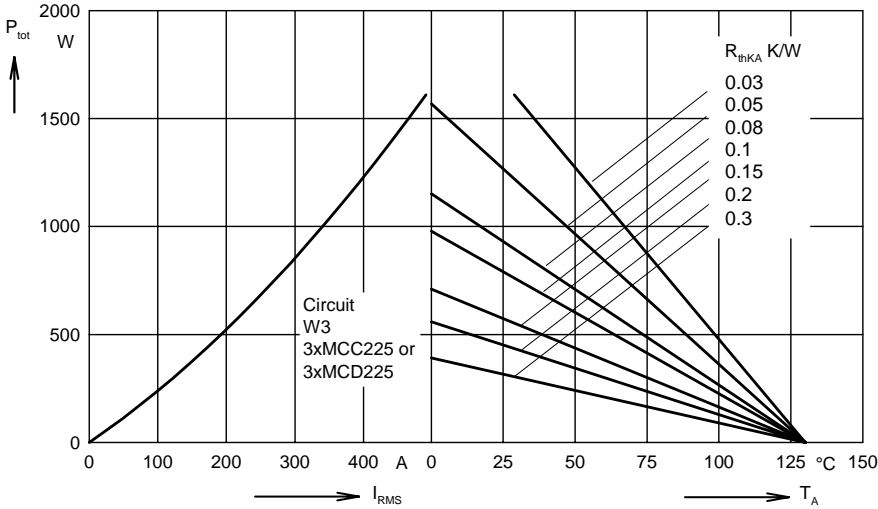


Fig. 7 Three phase AC-controller: Power dissipation versus RMS output current and ambient temperature

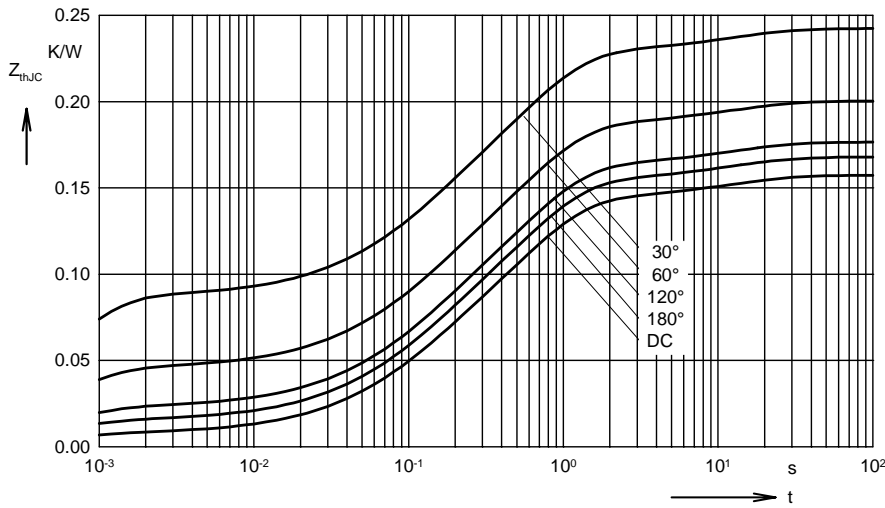


Fig. 8 Transient thermal impedance junction to case (per thyristor or diode)

$R_{thJC}$  for various conduction angles d:

d	$R_{thJC}$ (K/W)
DC	0.157
180°	0.168
120°	0.177
60°	0.200
30°	0.243

Constants for  $Z_{thJC}$  calculation:

i	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.0076	0.00054
2	0.0406	0.098
3	0.0944	0.54
4	0.0147	12

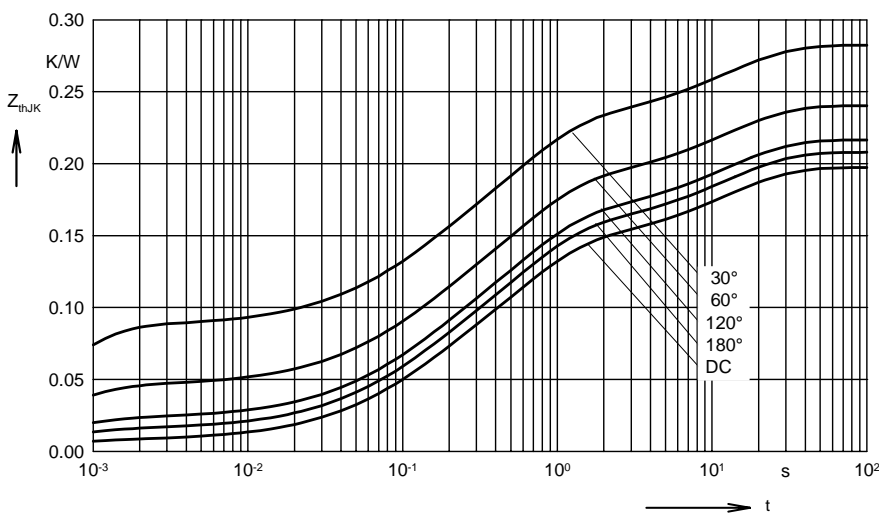


Fig. 9 Transient thermal impedance junction to heatsink (per thyristor or diode)

$R_{thJK}$  for various conduction angles d:

d	$R_{thJK}$ (K/W)
DC	0.197
180°	0.208
120°	0.217
60°	0.240
30°	0.283

Constants for  $Z_{thJK}$  calculation:

i	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.0076	0.00054
2	0.0406	0.098
3	0.0944	0.54
4	0.0147	12
5	0.04	12