

# Thyristor Modules

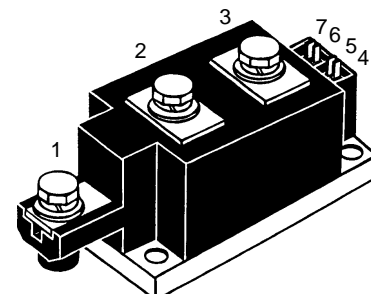
## Thyristor/Diode Modules

$$I_{TRMS} = 2x 400 A$$

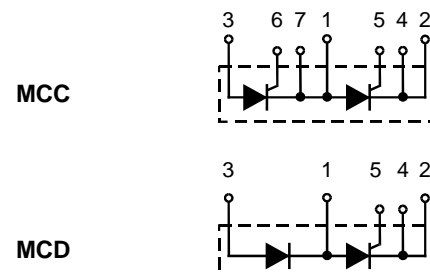
$$I_{TAVM} = 2x 240 A$$

$$V_{RRM} = 2000-2200 V$$

$V_{RSM}$	$V_{RRM}$	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)	A
		t = 8.3 ms (60 Hz)	A
	$T_{VJ} = T_{VJM}$	t = 10 ms (50 Hz)	A
	$V_R = 0$	t = 8.3 ms (60 Hz)	A
$\int i^2 dt$	$T_{VJ} = 45^\circ C$ $V_R = 0$	t = 10 ms (50 Hz)	A <sup>2</sup> s
		t = 8.3 ms (60 Hz)	A <sup>2</sup> s
	$T_{VJ} = T_{VJM}$	t = 10 ms (50 Hz)	A <sup>2</sup> s
	$V_R = 0$	t = 8.3 ms (60 Hz)	A <sup>2</sup> s
$(di/dt)_{cr}$	$T_{VJ} = T_{VJM}$ repetitive, $I_T = 750 A$ f = 50 Hz, $t_p = 200 \mu s$	100	A/ $\mu s$
	$V_D = 2/3 V_{DRM}$ $I_G = 1 A$ non repetitive, $I_T = I_{TAVM}$ $di_G/dt = 1 A/\mu s$	500	A/ $\mu s$
$(dv/dt)_{cr}$	$T_{VJ} = T_{VJM}; V_{DR} = 2/3 V_{DRM}$ $R_{GK} = \infty$ ; method 1 (linear voltage rise)	1000	V/ $\mu s$
$P_{GM}$	$T_{VJ} = T_{VJM}$ $t_p = 30 \mu s$	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** Al<sub>2</sub>O<sub>3</sub>-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 $\Omega$
$V_{GT}$	$V_D = 6 \text{ V}; T_{VJ} = 25^\circ\text{C}$	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	$\mu\text{s}$
$t_q$	$T_{VJ} = T_{VJM}; V_R = 100 \text{ V}; V_D = 2/3 V_{DRM}; t_p = 200 \mu\text{s}$ $dv/dt = 50 \text{ V}/\mu\text{s}; I_T = 300 \text{ A}; -di/dt = 10 \text{ A}/\mu\text{s}$	typ. 200	$\mu\text{s}$
$Q_S$	$T_{VJ} = T_{VJM}$ $-di/dt = 50 \text{ A}/\mu\text{s}; I_T = 400 \text{ A}$	760	$\mu\text{C}$
$I_{RM}$		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 <sup>2</sup>

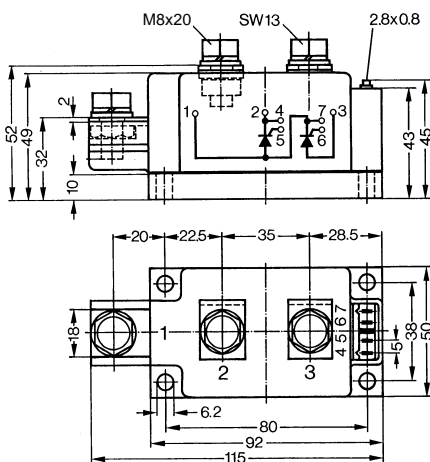
Optional accessories for modules

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

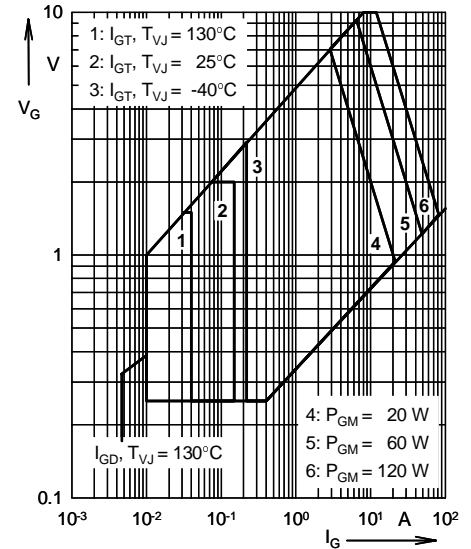
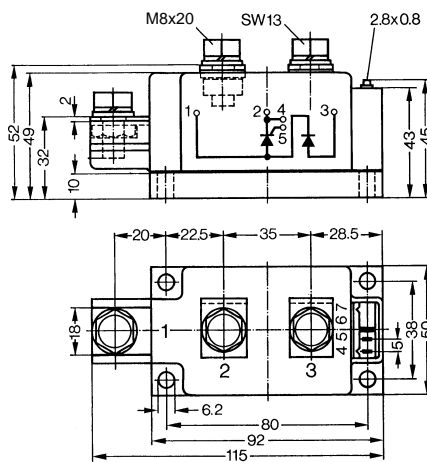


Fig. 1 Gate trigger characteristics

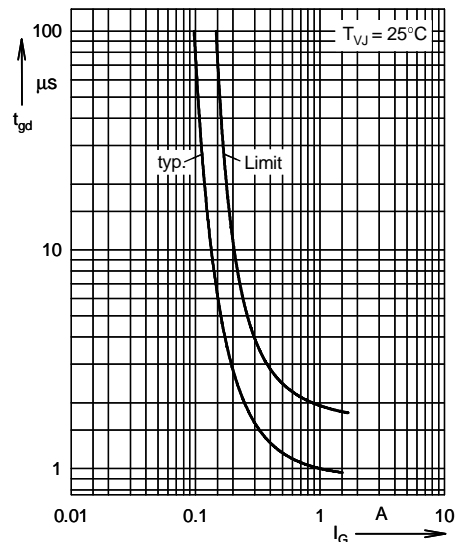


Fig. 2 Gate trigger delay time

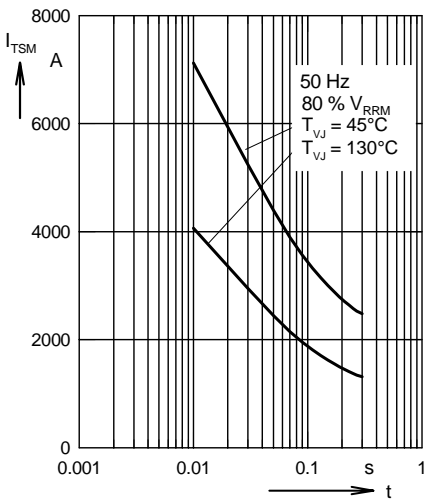


Fig. 3 Surge overload current  
 $I_{TSM}$ : Crest value,  $t$ : duration

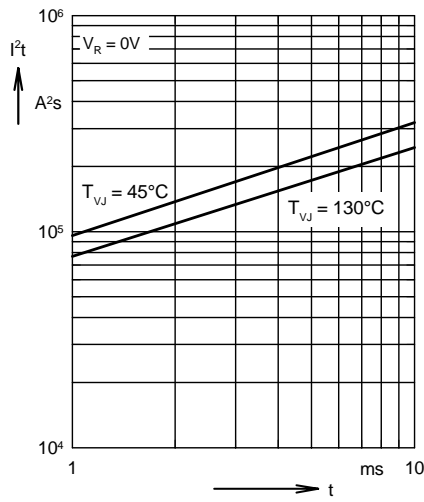


Fig. 4  $I^2t$  versus time (1-10 ms)

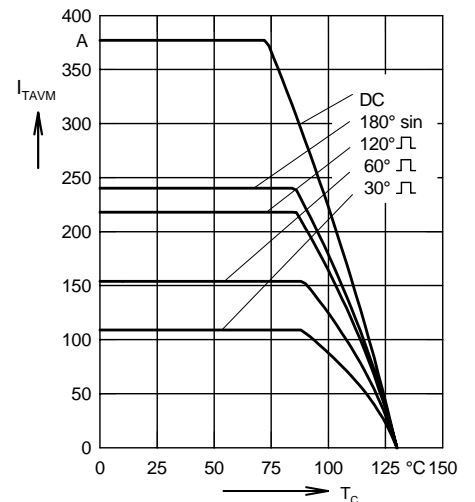


Fig. 4a Maximum forward current at case temperature

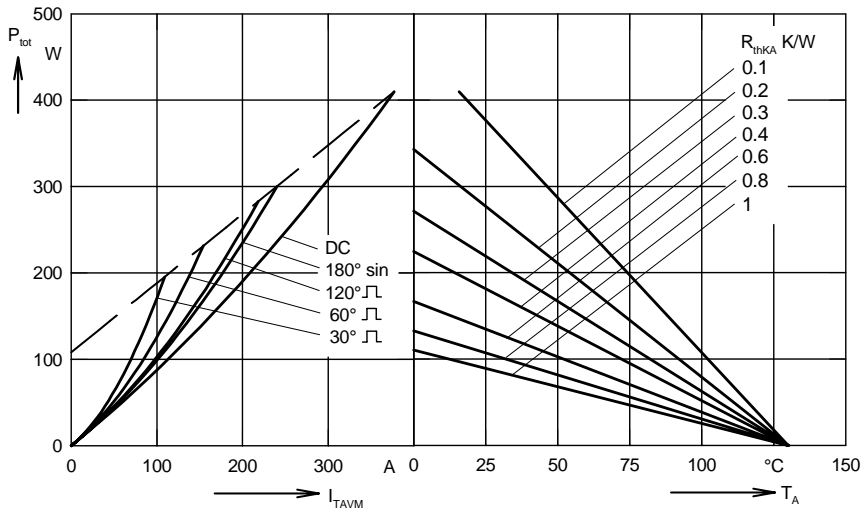


Fig. 5 Power dissipation versus on-state current and ambient temperature (per thyristor or diode)

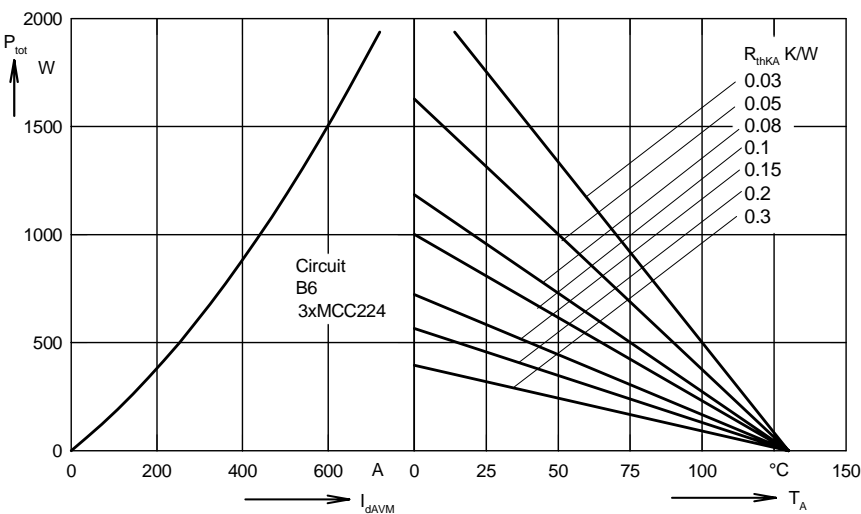


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

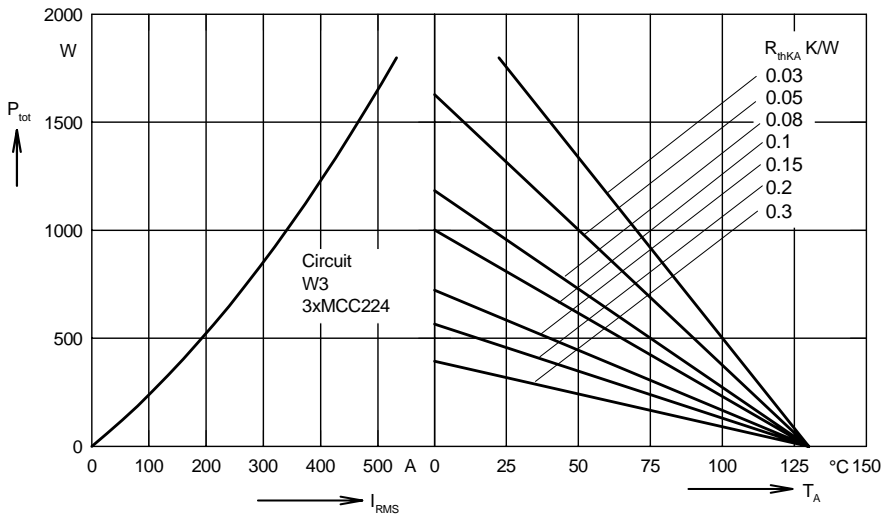


Fig. 7 Three phase AC-controller: Power dissipation versus RMS output current and ambient temperature

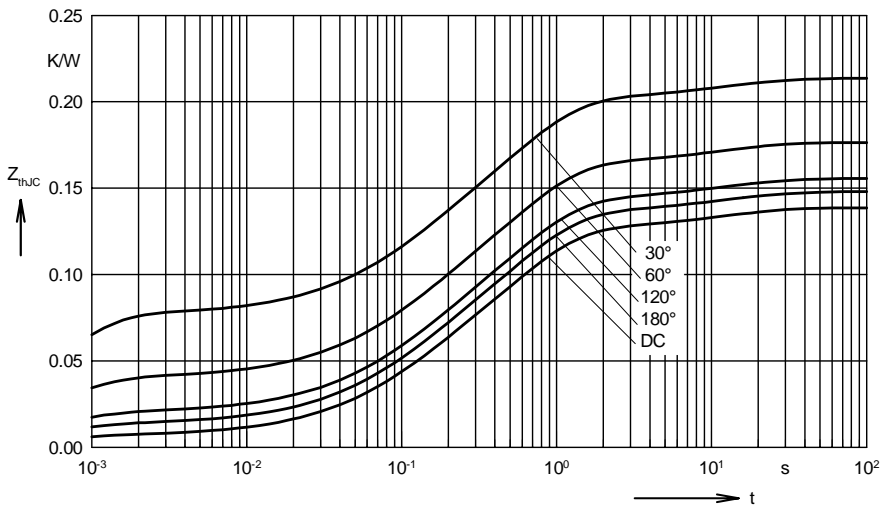


Fig. 8 Transient thermal impedance junction to case (per thyristor or diode)

$R_{thJC}$  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

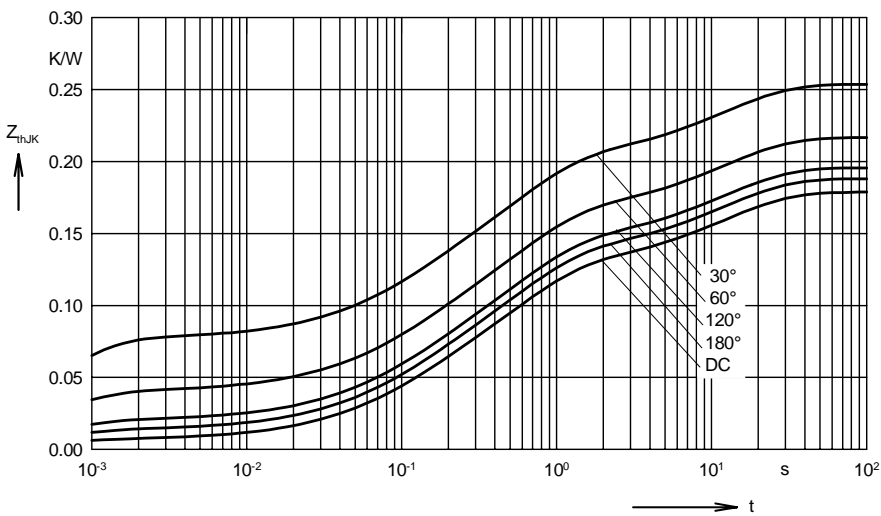


Fig. 9 Transient thermal impedance junction to heatsink (per thyristor or diode)

$R_{thJK}$  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