

## Thyristor Modules

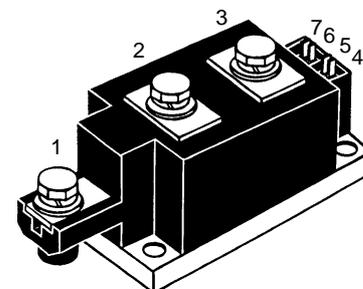
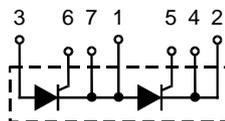
### Thyristor/Diode Modules

$$I_{TRMS} = 2 \times 350 \text{ A}$$

$$I_{TAVM} = 2 \times 203 \text{ A}$$

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

$V_{RSM}$	$V_{RRM}$	Type
$V_{DSM}$	$V_{DRM}$	
V	V	
1300	1200	MCC 170-12io1
1500	1400	MCC 170-14io1
1700	1600	MCC 170-16io1
1900	1800	MCC 170-18io1



Symbol	Test Conditions	Maximum Ratings
$I_{TRMS}$	$T_{VJ} = T_{VJM}$	350 A
$I_{TAVM}$	$T_C = 85^\circ\text{C}$ ; 180° sine	203 A
$I_{TSM}$ , $I_{FSM}$	$T_{VJ} = 45^\circ\text{C}$ ; $V_R = 0$	$t = 10 \text{ ms}$ (50 Hz) 5400 A $t = 8.3 \text{ ms}$ (60 Hz) 5800 A
	$T_{VJ} = T_{VJM}$ ; $V_R = 0$	$t = 10 \text{ ms}$ (50 Hz) 5000 A $t = 8.3 \text{ ms}$ (60 Hz) 5500 A
$\int i^2 dt$	$T_{VJ} = 45^\circ\text{C}$ ; $V_R = 0$	$t = 10 \text{ ms}$ (50 Hz) 146 000 A <sup>2</sup> s $t = 8.3 \text{ ms}$ (60 Hz) 140 000 A <sup>2</sup> s
	$T_{VJ} = T_{VJM}$ ; $V_R = 0$	$t = 10 \text{ ms}$ (50 Hz) 125 000 A <sup>2</sup> s $t = 8.3 \text{ ms}$ (60 Hz) 126 000 A <sup>2</sup> 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, $I_T = 660 \text{ A}$ 100 A/ $\mu\text{s}$ non repetitive, $I_T = I_{TAVM}$ 500 A/ $\mu\text{s}$
$(dv/dt)_{cr}$	$T_{VJ} = T_{VJM}$ ; $V_{DR} = 2/3 V_{DRM}$ $R_{GK} = \infty$ ; method 1 (linear voltage rise)	1000 V/ $\mu\text{s}$
$P_{GM}$	$T_{VJ} = T_{VJM}$ $I_T = I_{TAVM}$	$t_p = 30 \mu\text{s}$ 120 W $t_p = 500 \mu\text{s}$ 60 W
$P_{GAV}$		20 W
$V_{RGM}$		10 V
$T_{VJ}$		-40...+130 °C
$T_{VJM}$		130 °C
$T_{stg}$		-40...+125 °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) Terminal connection torque (M8)	4.5-7/40-62 Nm/lb.in. 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
$I_{RRM}, I_{DRM}$	$T_{VJ} = T_{VJM}; V_R = V_{RRM}; V_D = V_{DRM}$	40 mA
$V_T, V_F$	$I_T, I_F = 600 \text{ A}; T_{VJ} = 25^\circ\text{C}$	1.65 V
$V_{T0}$	For power-loss calculations only ( $T_{VJ} = 130^\circ\text{C}$ )	0.8 V
$r_T$		1 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
$I_L$	$T_{VJ} = 25^\circ\text{C}; t_p = 30 \mu\text{s}; V_D = 6 \text{ V}$ $I_G = 0.45 \text{ A}; di_G/dt = 0.45 \text{ A}/\mu\text{s}$	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 $\mu\text{s}$
$t_q$	$T_{VJ} = T_{VJM}; I_T = 300 \text{ A}, t_p = 200 \mu\text{s}; -di/dt = 10 \text{ A}/\mu\text{s}$ $V_R = 100 \text{ V}; dv/dt = 50 \text{ V}/\mu\text{s}; V_D = 2/3 V_{DRM}$	typ. 200 $\mu\text{s}$
$Q_S$	$T_{VJ} = 125^\circ\text{C}; I_T, I_F = 300 \text{ A}; -di/dt = 50 \text{ A}/\mu\text{s}$	550 $\mu\text{C}$
$I_{RM}$		235 A
$R_{thJC}$	per thyristor (diode); DC current per module	0.164 K/W
$R_{thJK}$	per thyristor (diode); DC current per module	0.204 K/W
	other values see Fig. 8/9	0.082 K/W 0.102 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")

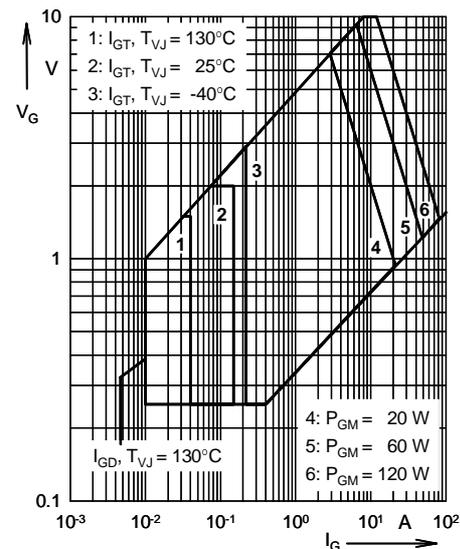
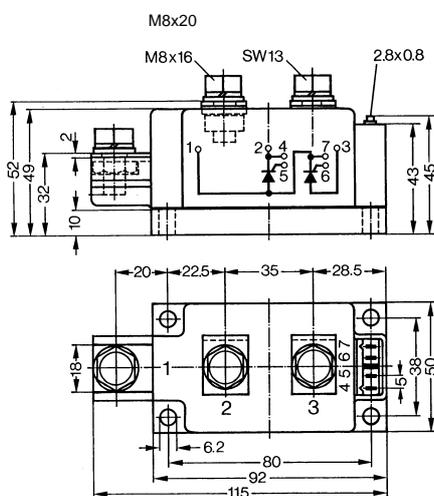


Fig. 1 Gate trigger characteristics

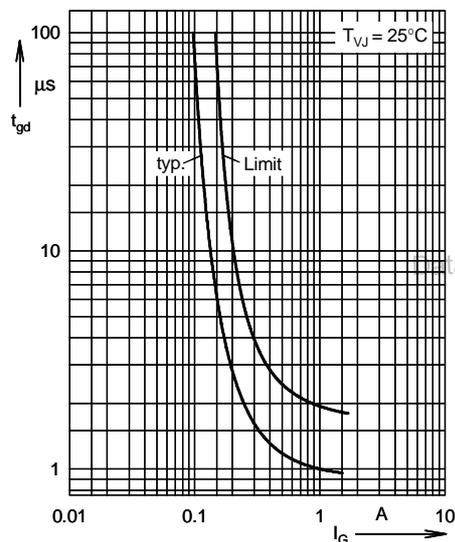


Fig. 2 Gate trigger delay time

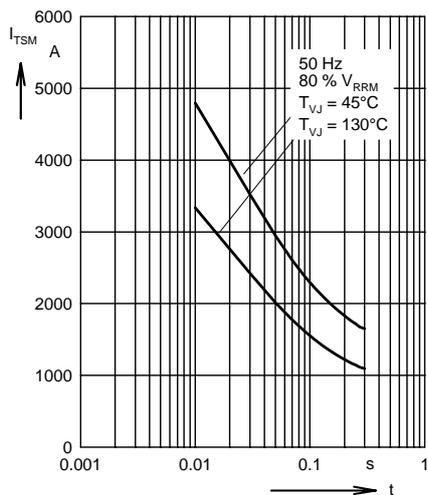


Fig. 3 Surge overload current  
 $I_{TSM}$ ,  $I_{FSM}$ : Crest value,  $t$ : duration

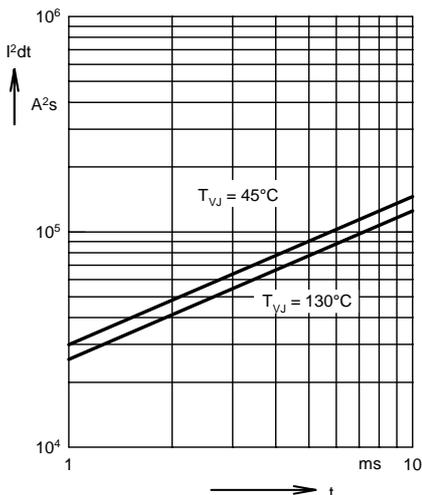


Fig. 4  $\int j^2 dt$  versus time (1-10 ms)

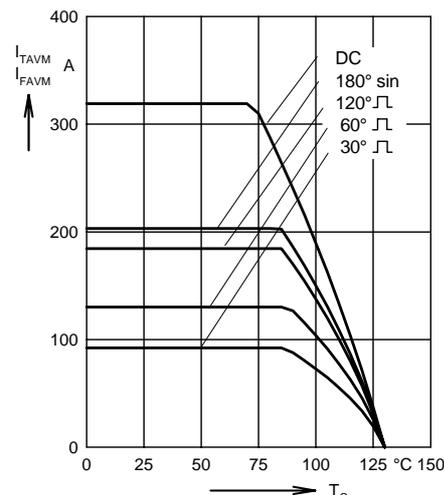


Fig. 4a Maximum forward current at case temperature

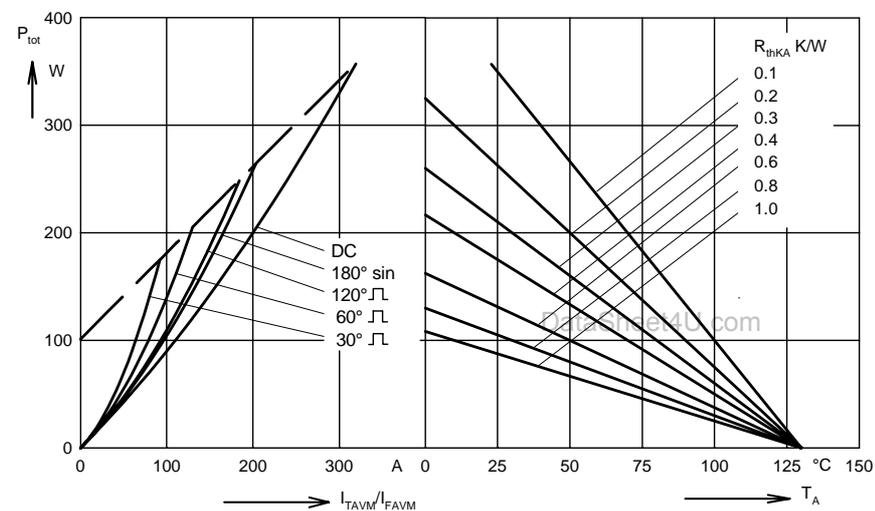


Fig. 5 Power dissipation versus on-state current and ambient temperature (per thyristor or diode)

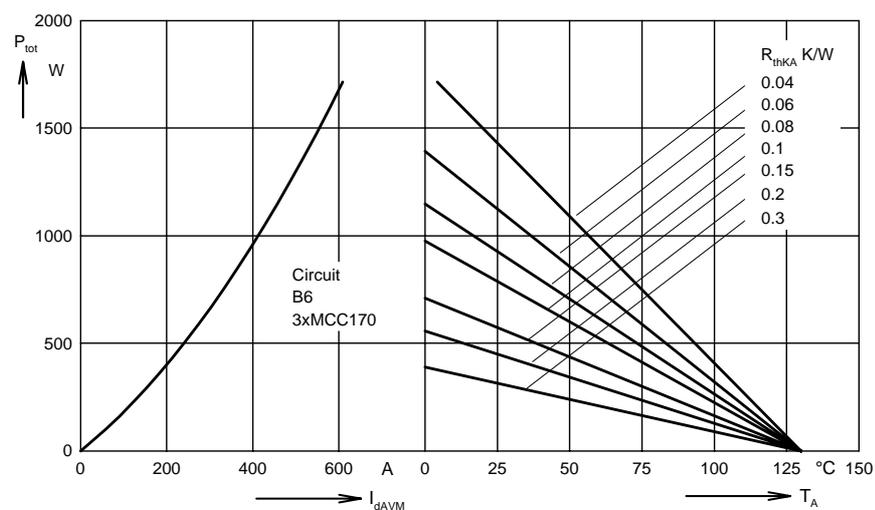


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

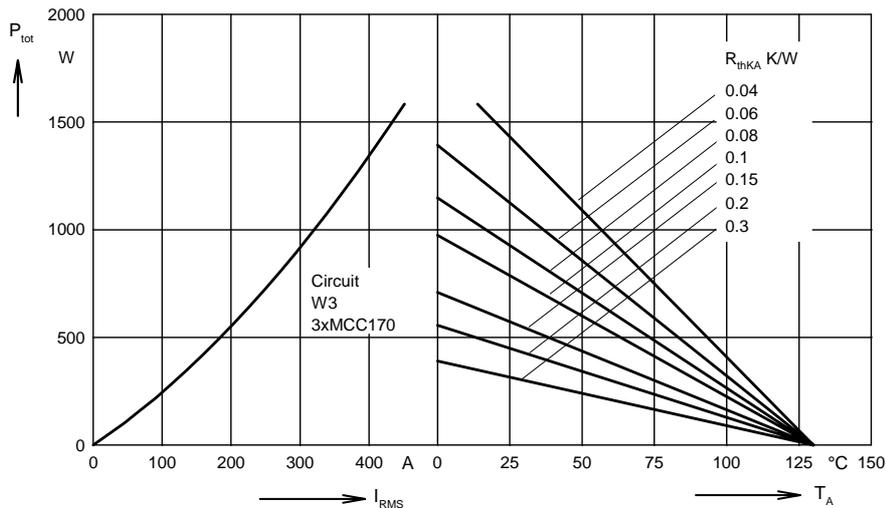


Fig. 7 Three phase AC-controller: Power dissipation versus RMS output current and ambient temperature

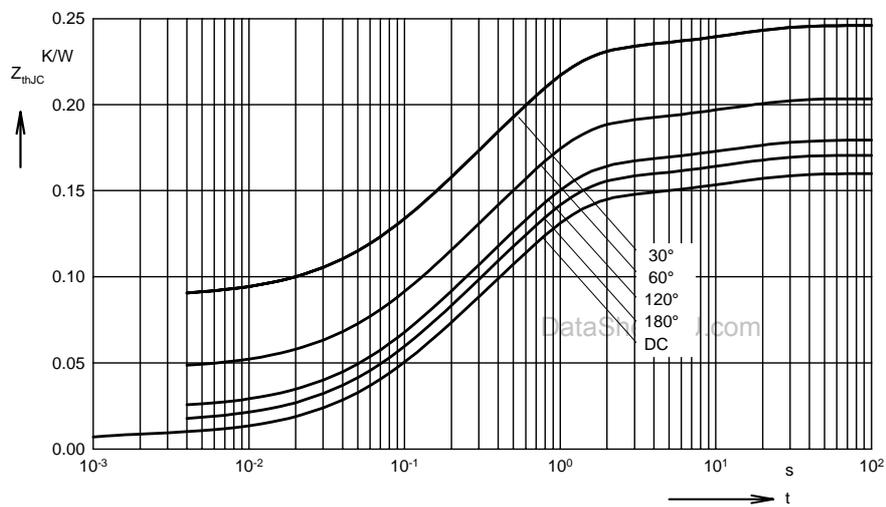


Fig. 8 Transient thermal impedance junction to case (per thyristor or diode)

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

d	$R_{thJC}$ (K/W)
DC	0.160
180°	0.171
120°	0.180
60°	0.203
30°	0.247

Constants for  $Z_{thJC}$  calculation:

i	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.0077	0.00054
2	0.0413	0.098
3	0.096	0.54
4	0.0149	12

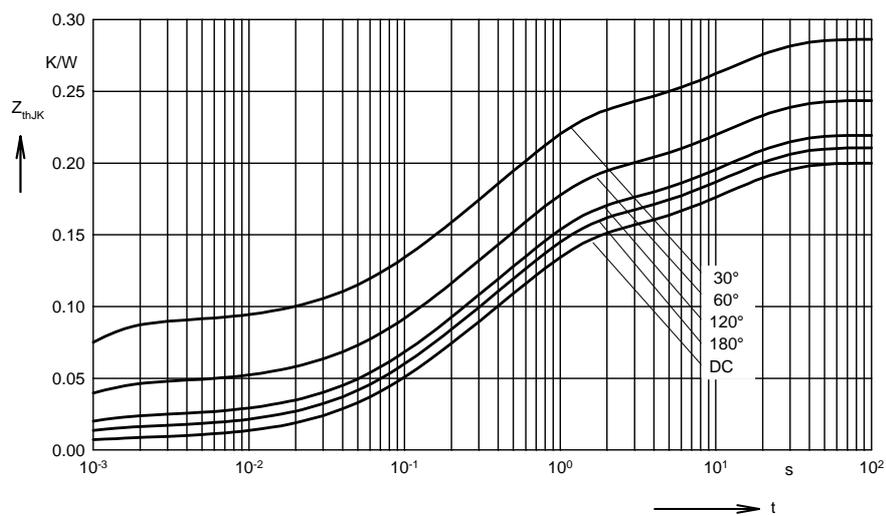


Fig. 9 Transient thermal impedance junction to heatsink (per thyristor or diode)

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

d	$R_{thJK}$ (K/W)
DC	0.200
180°	0.211
120°	0.220
60°	0.243
30°	0.287

Constants for  $Z_{thJK}$  calculation:

i	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.0077	0.00054
2	0.0413	0.098
3	0.096	0.54
4	0.0149	12
5	0.04	12