

## Thyristor Modules Thyristor/Diode Modules

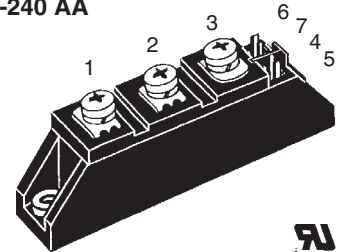
$$I_{TRMS} = 2 \times 180 \text{ A}$$

$$I_{TAVM} = 2 \times 115 \text{ A}$$

$$V_{RRM} = 800-1800 \text{ V}$$

$V_{RSM}$	$V_{RRM}$	Type					
$V_{DSM}$	$V_{DRM}$						
V	V	Version	1 B	8 B	Version	1 B	8 B
900	800	MCC 72-08	io1 B / io8 B		MCD 72-08	io1 B / io8 B	
1300	1200	MCC 72-12	io1 B / io8 B		MCD 72-12	io1 B / io8 B	
1500	1400	MCC 72-14	io1 B / io8 B		MCD 72-14	io1 B / io8 B	
1700	1600	MCC 72-16	io1 B / io8 B		MCD 72-16	io1 B / io8 B	
1900	1800	MCC 72-18	io1 B / io8 B		MCD 72-18	io1 B / io8 B	

TO-240 AA

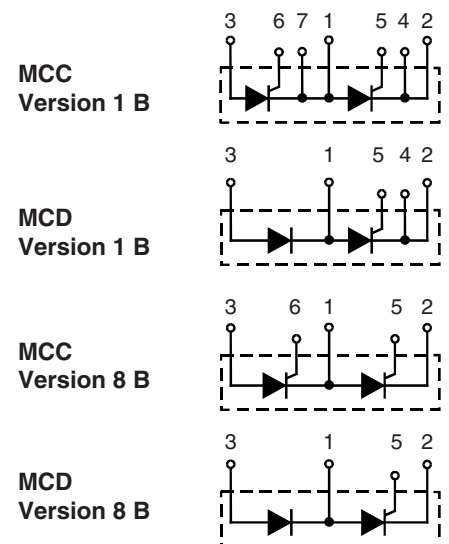


Symbol	Conditions	Maximum Ratings	
$I_{TRMS}, I_{FRMS}$	$T_{VJ} = T_{VJM}$	180	A
$I_{TAVM}, I_{FAVM}$	$T_C = 63^\circ\text{C}; 180^\circ \text{ sine}$	115	A
	$T_C = 85^\circ\text{C}; 180^\circ \text{ sine}$	85	A
$I_{TSM}, I_{FSM}$	$T_{VJ} = 45^\circ\text{C}$	$t = 10 \text{ ms (50 Hz), sine}$	1700 A
	$V_R = 0$	$t = 8.3 \text{ ms (60 Hz), sine}$	1800 A
	$T_{VJ} = T_{VJM}$	$t = 10 \text{ ms (50 Hz), sine}$	1540 A
	$V_R = 0$	$t = 8.3 \text{ ms (60 Hz), sine}$	1640 A
$\int i^2 dt$	$T_{VJ} = 45^\circ\text{C}$	$t = 10 \text{ ms (50 Hz), sine}$	14 450 $\text{A}^2\text{s}$
	$V_R = 0$	$t = 8.3 \text{ ms (60 Hz), sine}$	13 500 $\text{A}^2\text{s}$
	$T_{VJ} = T_{VJM}$	$t = 10 \text{ ms (50 Hz), sine}$	11 850 $\text{A}^2\text{s}$
	$V_R = 0$	$t = 8.3 \text{ ms (60 Hz), sine}$	11 300 $\text{A}^2\text{s}$
$(di/dt)_{cr}$	$T_{VJ} = T_{VJM}$	repetitive, $I_T = 250 \text{ A}$	150 $\text{A}/\mu\text{s}$
	$f = 50 \text{ Hz}; t_p = 200 \mu\text{s}$		
	$V_D = \frac{2}{3} V_{DRM}$	non repetitive, $I_T = I_{TAVM}$	500 $\text{A}/\mu\text{s}$
	$I_G = 0.45 \text{ A}$		
	$di_G/dt = 0.45 \text{ A}/\mu\text{s}$		
$(dv/dt)_{cr}$	$T_{VJ} = T_{VJM};$	$V_{DR} = \frac{2}{3} V_{DRM}$	1000 $\text{V}/\mu\text{s}$
	$R_{GK} = \infty;$ method 1 (linear voltage rise)		
$P_{GM}$	$T_{VJ} = T_{VJM};$	$t_p = 30 \mu\text{s}$	10 W
	$I_T = I_{TAVM};$	$t_p = 300 \mu\text{s}$	5 W
$P_{GAV}$			0.5 W
$V_{RGM}$			10 V
$T_{VJ}$			-40...+125 $^\circ\text{C}$
$T_{VJM}$			125 $^\circ\text{C}$
$T_{stg}$			-40...+125 $^\circ\text{C}$
$V_{ISOL}$	50/60 Hz, RMS;	$t = 1 \text{ min}$	3000 V~
	$I_{ISOL} \leq 1 \text{ mA};$	$t = 1 \text{ s}$	3600 V~
$M_d$	Mounting torque (M5)	2.5-4.0/22-35	Nm/lb.in.
	Terminal connection torque (M5)	2.5-4.0/22-35	Nm/lb.in.
Weight	Typical including screws	90	g

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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### Features

- International standard package, JEDEC TO-240 AA
- Direct copper bonded  $\text{Al}_2\text{O}_3$  -ceramic base plate
- Planar passivated chips
- Isolation voltage 3600 V~
- UL registered, E 72873
- Gate-cathode twin pins for version 1B

### Applications

- DC motor control
- Softstart AC motor controller
- Light, heat and temperature control

### Advantages

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

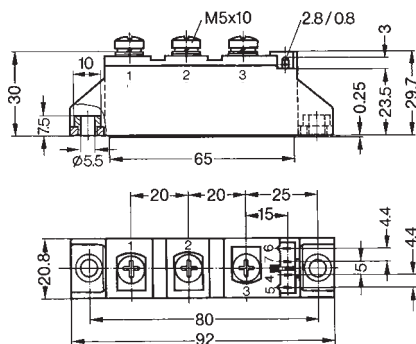
Symbol	Conditions	Characteristic Values
$I_{RRM}, I_{DRM}$	$T_{VJ} = T_{VJM}; V_R = V_{RRM}; V_D = V_{DRM}$	5 mA
$V_T / V_F$	$I_T / I_F = 300 \text{ A}; T_{VJ} = 25^\circ\text{C}$	1.74 V
$V_{T0}$	For power-loss calculations only ( $T_{VJ} = 125^\circ\text{C}$ )	0.85 V
$r_T$		3.2 mΩ
$V_{GT}$	$V_D = 6 \text{ V}; T_{VJ} = 25^\circ\text{C}$	2.5 V
	$T_{VJ} = -40^\circ\text{C}$	2.6 V
$I_{GT}$	$V_D = 6 \text{ V}; T_{VJ} = 25^\circ\text{C}$	150 mA
	$T_{VJ} = -40^\circ\text{C}$	200 mA
$V_{GD}$	$T_{VJ} = T_{VJM}; V_D = \frac{2}{3} V_{DRM}$	0.2 V
$I_{GD}$		10 mA
$I_L$	$T_{VJ} = 25^\circ\text{C}; t_p = 10 \mu\text{s}; V_D = 6 \text{ V}$ $I_G = 0.45 \text{ A}; di/dt = 0.45 \text{ A}/\mu\text{s}$	450 mA
$I_H$	$T_{VJ} = 25^\circ\text{C}; V_D = 6 \text{ V}; R_{GK} = \infty$	200 mA
$t_{gd}$	$T_{VJ} = 25^\circ\text{C}; V_D = \frac{1}{2} V_{DRM}$ $I_G = 0.45 \text{ A}; di/dt = 0.45 \text{ A}/\mu\text{s}$	2 μs
$t_q$	$T_{VJ} = T_{VJM}; I_T = 150 \text{ A}, t_p = 200 \mu\text{s}; -di/dt = 10 \text{ A}/\mu\text{s}$ $V_R = 100 \text{ V}; dv/dt = 20 \text{ V}/\mu\text{s}; V_D = \frac{2}{3} V_{DRM}$	typ. 185 μs
$Q_S$	$T_{VJ} = T_{VJM}; I_T / I_F = 50 \text{ A}, -di/dt = 6 \text{ A}/\mu\text{s}$	170 μC
$I_{RM}$		45 A
$R_{thJC}$	per thyristor/diode; DC current per module	0.3 K/W
$R_{thJK}$	per thyristor/diode; DC current per module	0.15 K/W
	other values see Fig. 8/9	0.5 K/W
		0.25 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 <sup>2</sup>

Optional accessories for module-type MCC 72 version 1 B

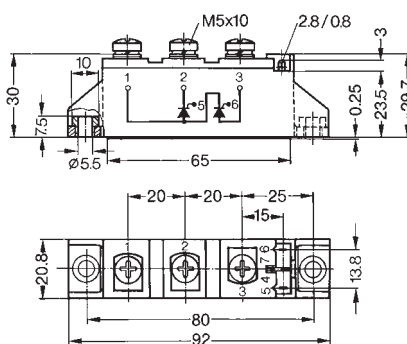
Keyed gate/cathode twin plugs with wire length = 350 mm, gate = yellow, cathode = red  
 Type **ZY 200L** (L = Left for pin pair 4/5) } UL 758, style 1385,  
 Type **ZY 200R** (R = right for pin pair 6/7) } CSA class 5851, guide 460-1-1

Dimensions in mm (1 mm = 0.0394")

### MCC / MCD Version 1 B



### MCC Version 8 B



### MCD Version 8 B

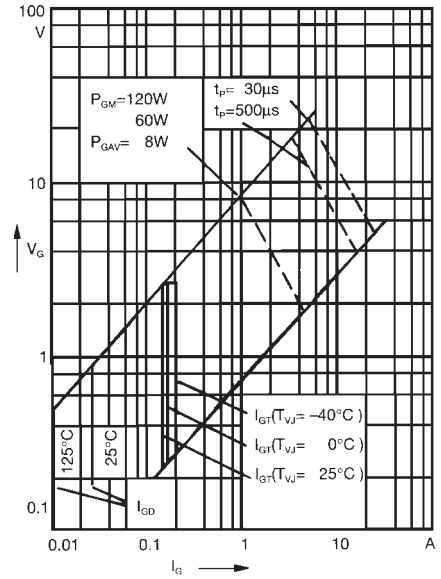
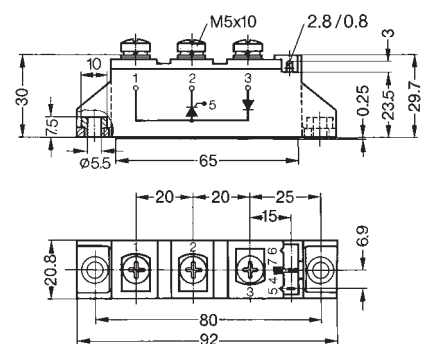


Fig. 1 Gate trigger characteristics

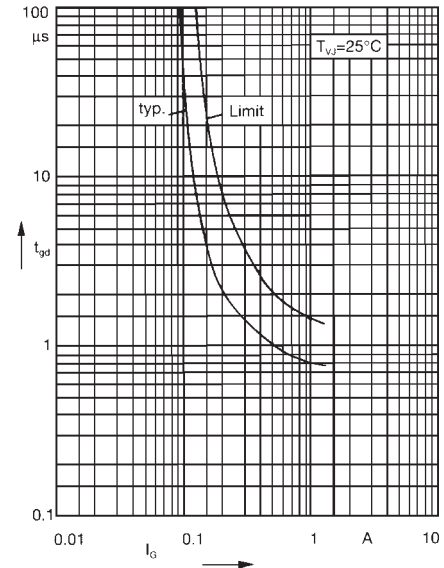
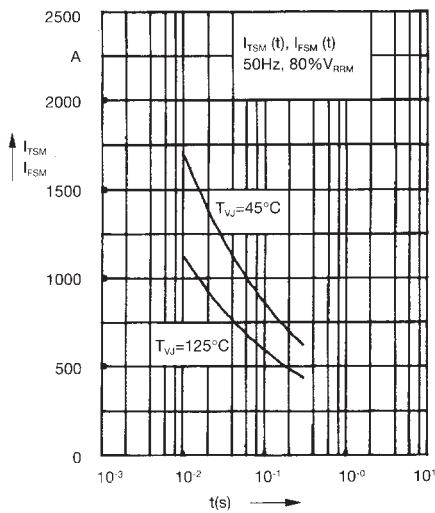
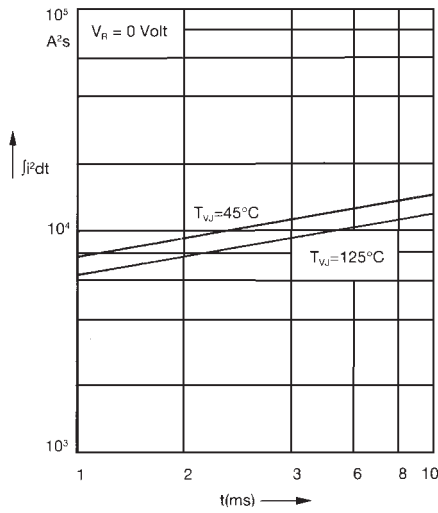


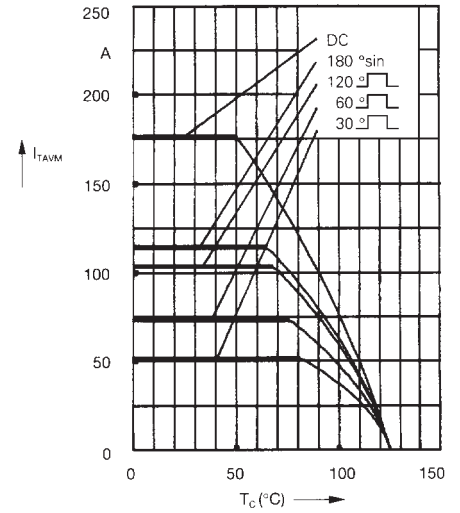
Fig. 2 Gate trigger delay time



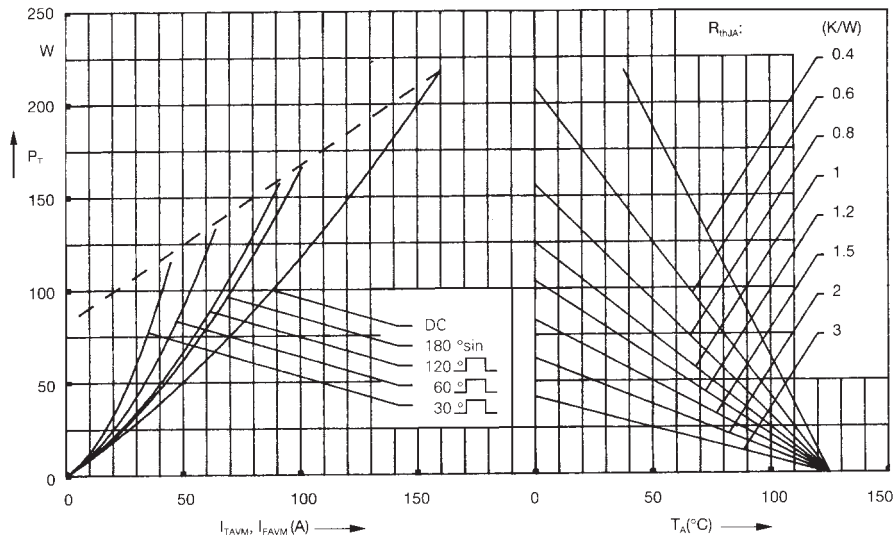
**Fig. 3 Surge overload current**  
 $I_{TSM}$ ,  $I_{FSM}$ : Crest value,  $t$ : duration



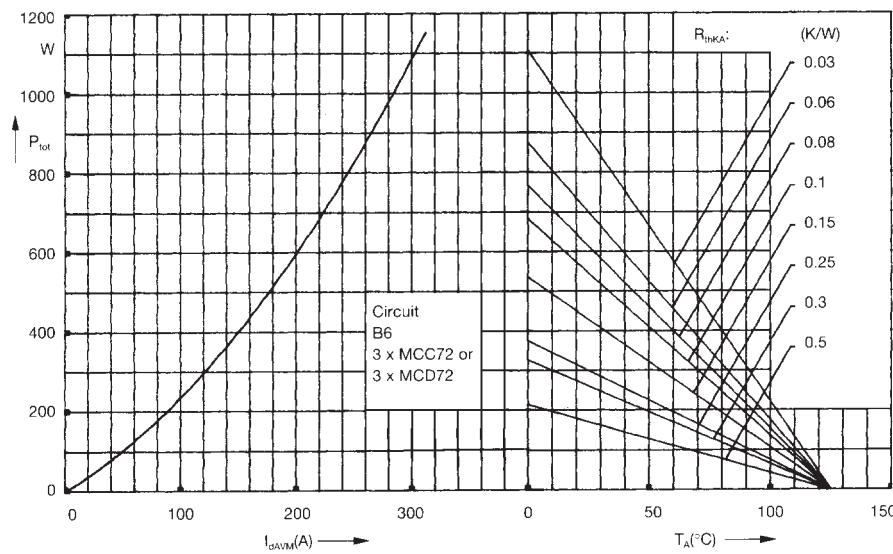
**Fig. 4  $\int i^2 dt$  versus time (1-10 ms)**



**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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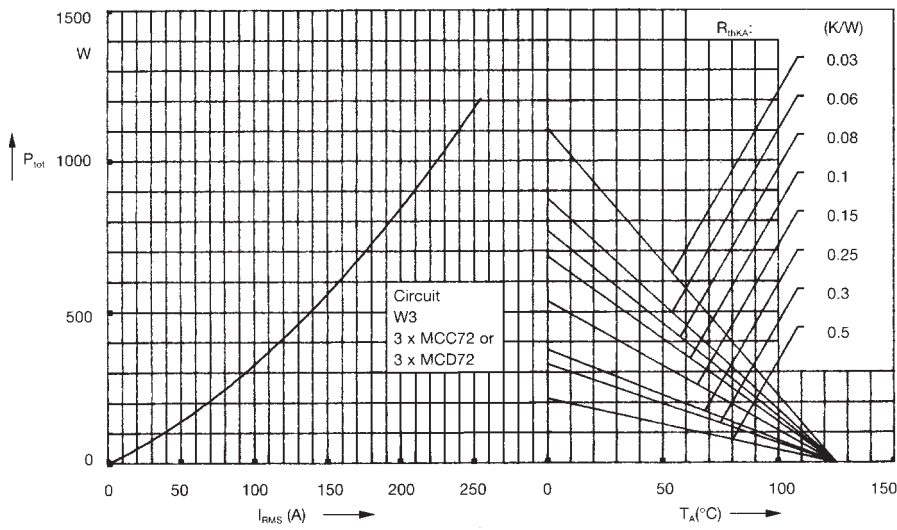


Fig. 7 Three phase AC-controller:  
Power dissipation versus RMS  
output current and ambient  
temperature

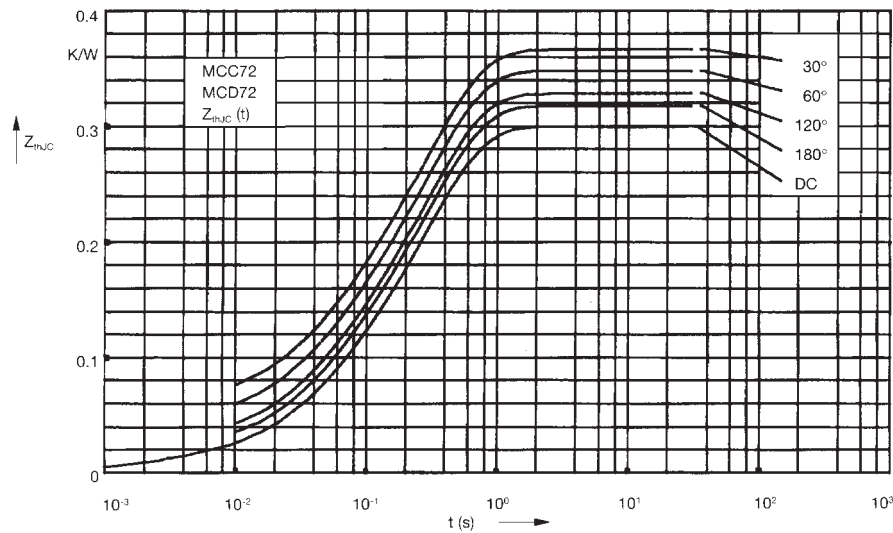


Fig. 8 Transient thermal impedance  
junction to case (per thyristor or  
diode)

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

d	$R_{thJC}$ (K/W)
DC	0.3
180°	0.31
120°	0.33
60°	0.35
30°	0.37

Constants for  $Z_{thJC}$  calculation:

i	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.008	0.0019
2	0.054	0.047
3	0.238	0.3

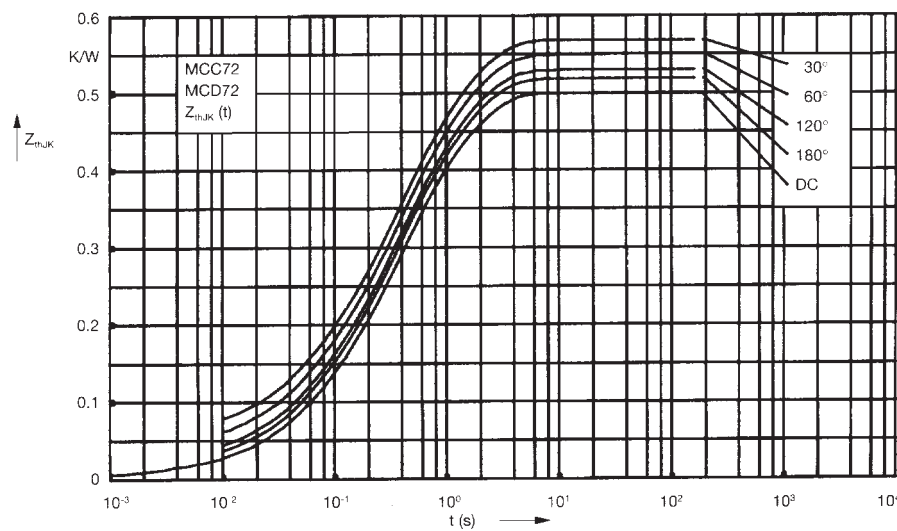


Fig. 9 Transient thermal impedance  
junction to heatsink (per thyristor  
or diode)

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

d	$R_{thJK}$ (K/W)
DC	0.5
180°	0.51
120°	0.53
60°	0.55
30°	0.57

Constants for  $Z_{thJK}$  calculation:

i	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.008	0.0019
2	0.054	0.047
3	0.238	0.3
4	0.2	1.25