

# Thyristor Modules

## Thyristor/Diode Modules

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

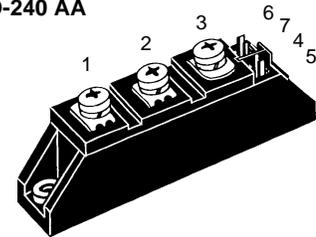
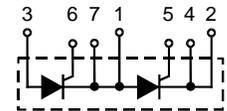
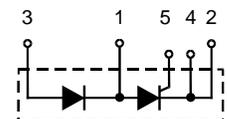
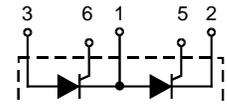
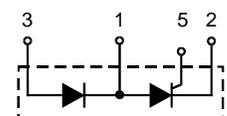
$$I_{TAVM} = 2 \times 116 \text{ A}$$

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

$V_{RSM}$ $V_{DSM}$ V	$V_{RRM}$ $V_{DRM}$ V	Type		
		Version 1		Version 8
900	800	MCC 95-08io1 B	--	MCC 95-08io8 B
1300	1200	MCC 95-12io1 B	MCD 95-12io1 B	MCD 95-12io8 B
1500	1400	MCC 95-14io1 B	--	MCD 95-14io8 B
1700	1600	MCC 95-16io1 B	MCD 95-16io1 B	MCD 95-16io8 B
1900	1800	MCC 95-18io1 B	--	MCD 95-18io8 B
1500	1400	MCC 95-16io1		
1700	1600	MCC 95-18io1		

Symbol	Test Conditions	Maximum Ratings	
$I_{TRMS}^1$ $I_{FRMS}$	$T_{VJ} = T_{VJM}$	180	A
$I_{TAVM}^1$ $I_{FAVM}$	$T_C = 85^\circ\text{C}$ ; 180° sine	116	A
$I_{TSM}^1$ $I_{FSM}$	$T_{VJ} = 45^\circ\text{C}$ ; $V_R = 0$	t = 10 ms (50 Hz), sine	2250 A
		t = 8.3 ms (60 Hz), sine	2400 A
$\int i^2 dt$	$T_{VJ} = T_{VJM}$	t = 10 ms (50 Hz), sine	2000 A
	$V_R = 0$	t = 8.3 ms (60 Hz), sine	2150 A
$\int i^2 dt$	$T_{VJ} = 45^\circ\text{C}$	t = 10 ms (50 Hz), sine	25 300 A <sup>2</sup> s
	$V_R = 0$	t = 8.3 ms (60 Hz), sine	23 900 A <sup>2</sup> s
$(di/dt)_{cr}$	$T_{VJ} = T_{VJM}$	t = 10 ms (50 Hz), sine	20 000 A <sup>2</sup> s
	$V_R = 0$	t = 8.3 ms (60 Hz), sine	19 100 A <sup>2</sup> s
$(di/dt)_{cr}$	$T_{VJ} = T_{VJM}$ f = 50 Hz, t <sub>p</sub> = 200 μs	repetitive, I <sub>T</sub> = 250 A	150 A/μs
	$V_D = 2/3 V_{DRM}$ I <sub>G</sub> = 0.45 A di <sub>G</sub> /dt = 0.45 A/μs	non repetitive, I <sub>T</sub> = I <sub>TAVM</sub>	500 A/μs
$(dv/dt)_{cr}$	$T_{VJ} = T_{VJM}$ ; R <sub>GK</sub> = ∞; method 1 (linear voltage rise)	V <sub>DR</sub> = 2/3 V <sub>DRM</sub>	1000 V/μs
P <sub>GM</sub>	$T_{VJ} = T_{VJM}$	t <sub>p</sub> = 30 μs	10 W
	I <sub>T</sub> = I <sub>TAVM</sub>	t <sub>p</sub> = 300 μs	5 W
P <sub>GAV</sub>			0.5 W
V <sub>RGM</sub>			10 V
T <sub>VJ</sub>		-40...+125	°C
T <sub>VJM</sub>		125	°C
T <sub>sig</sub>		-40...+125	°C
V <sub>ISOL</sub>	50/60 Hz, RMS	t = 1 min	3000 V~
	I <sub>ISOL</sub> ≤ 1 mA	t = 1 s	3600 V~
M <sub>d</sub>	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

**TO-240 AA**

**MCC Version 1**

**MCD Version 1**

**MCC Version 8**

**MCD Version 8**

**Features**

- International standard package, JEDEC TO-240 AA
- Direct copper bonded Al<sub>2</sub>O<sub>3</sub> -ceramic base plate
- Planar passivated chips
- Isolation voltage 3600 V~
- UL registered, E 72873
- Gate-cathode twin pins for version 1

**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	Test Conditions	Characteristic Values
$I_{RRM}, I_{DRM}$	$T_{VJ} = T_{VJM}; V_R = V_{RRM}; V_D = V_{DRM}$	5 mA
$V_T, V_F$	$I_T, I_F = 300 \text{ A}; T_{VJ} = 25^\circ\text{C}$	1.5 V
$V_{TO}$	For power-loss calculations only ( $T_{VJ} = 125^\circ\text{C}$ )	0.8 V
$r_T$		2.4 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
$V_{GD}$	$T_{VJ} = T_{VJM}; V_D = 2/3 V_{DRM}$	0.2 V
$I_{GD}$		10 mA
$I_L$	$T_{VJ} = 25^\circ\text{C}; t_p = 10 \mu\text{s}; V_D = 6 \text{ V}$ $I_G = 0.45 \text{ A}; di_G/dt = 0.45 \text{ A}/\mu\text{s}$	450 mA
$I_H$	$T_{VJ} = 25^\circ\text{C}; V_D = 6 \text{ V}; R_{GK} = \infty$	200 mA
$t_{gd}$	$T_{VJ} = 25^\circ\text{C}; V_D = 1/2 V_{DRM}$ $I_G = 0.45 \text{ A}; di_G/dt = 0.45 \text{ A}/\mu\text{s}$	2 μs
$t_q$	$T_{VJ} = T_{VJM}; I_T = 150 \text{ A}; t_p = 200 \mu\text{s}; -di/dt = 10 \text{ A}/\mu\text{s}$ typ. $V_R = 100 \text{ V}; dv/dt = 20 \text{ V}/\mu\text{s}; V_D = 2/3 V_{DRM}$	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	0.22 K/W
$R_{thJK}$	per thyristor/diode; DC current per module	0.11 K/W
	other values see Fig. 8/9	0.42 K/W
		0.21 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 95 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

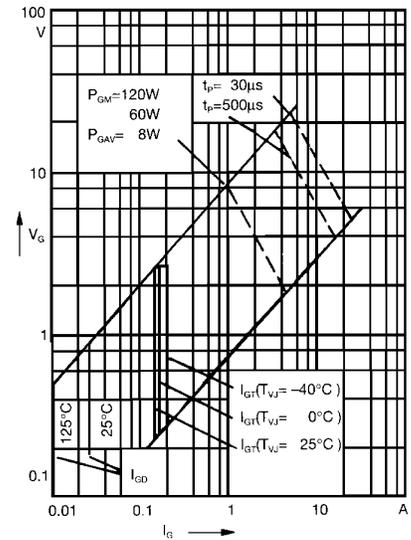


Fig. 1 Gate trigger characteristics

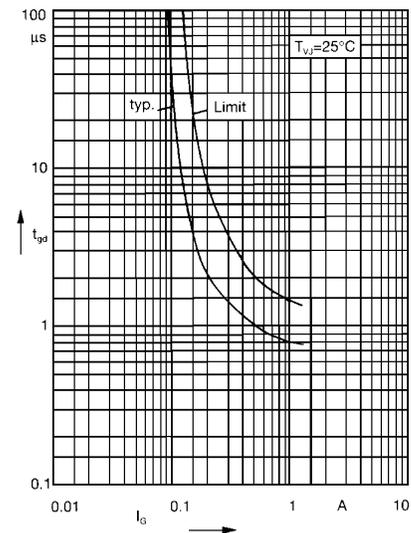
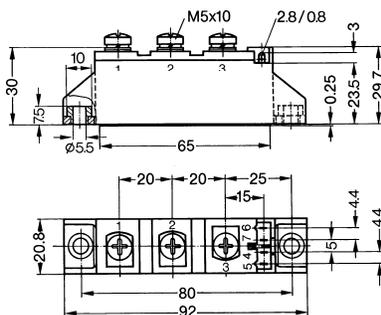


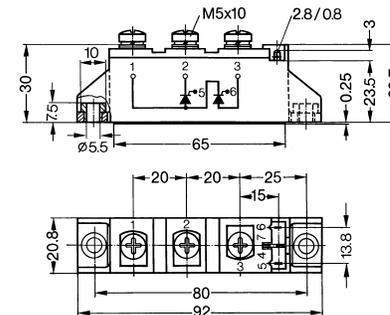
Fig. 2 Gate trigger delay time

Dimensions in mm (1 mm = 0.0394")

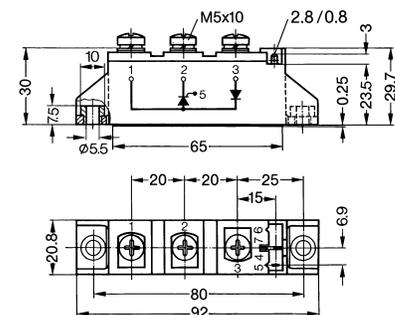
### MCC / MCD Version 1 B



### MCC Version 8 B



### MCD Version 8 B



Version 1 or 8 without B in typ designation = without insert in mounting holes

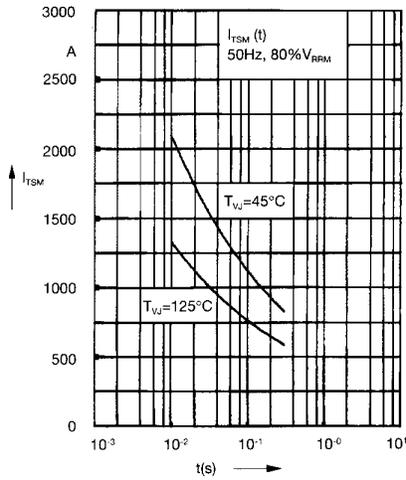


Fig. 3 Surge overload current  
 $I_{TSM}$ ,  $I_{FSM}$ : Crest value,  $t$ : duration

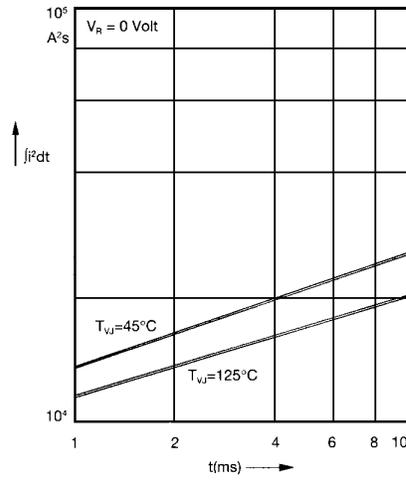


Fig. 4  $\int j^2 dt$  versus time (1-10 ms)

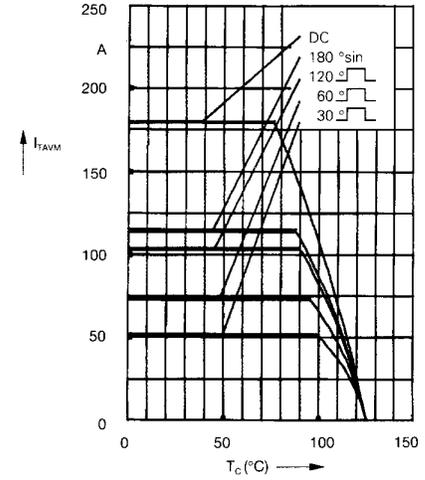


Fig. 4a Maximum forward current at case temperature

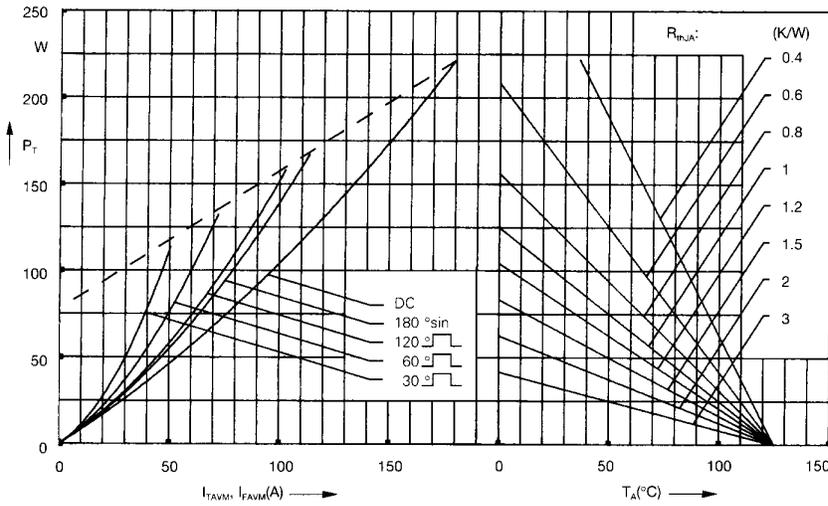


Fig. 5 Power dissipation versus on-state current and ambient temperature (per thyristor or diode)

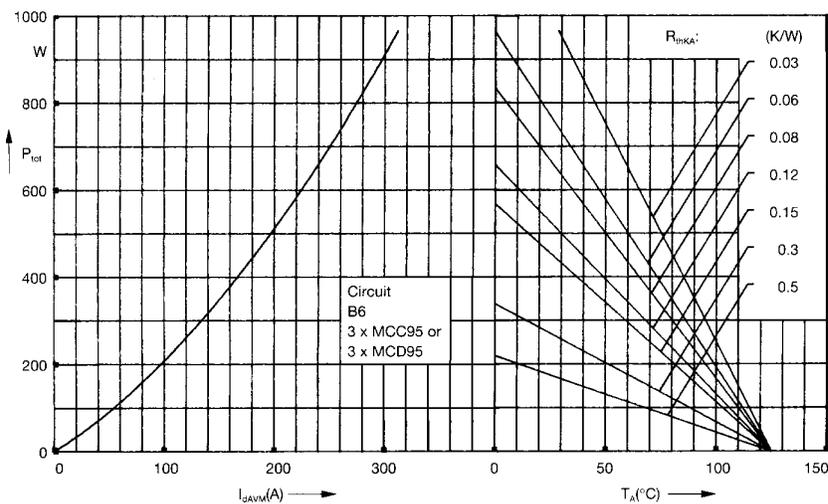


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

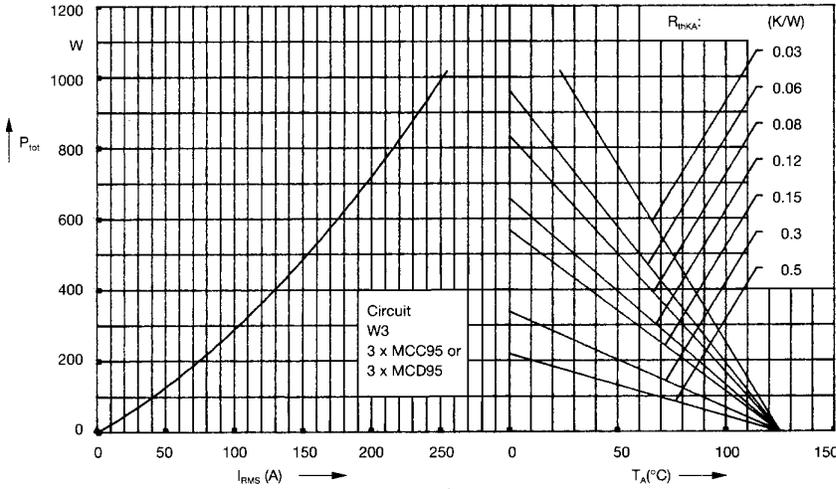


Fig. 7 Three phase AC-controller:  
Power dissipation versus RMS  
output current and ambient  
temperature

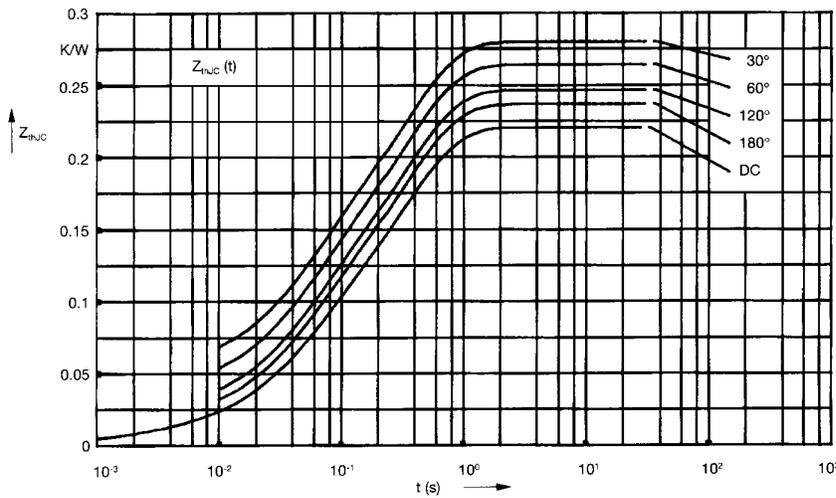


Fig. 8 Transient thermal impedance  
junction to case (per thyristor or  
diode)

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

d	$R_{thJC}$ (K/W)
DC	0.22
180°	0.23
120°	0.25
60°	0.27
30°	0.28

Constants for  $Z_{thJC}$  calculation:

i	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.0066	0.0019
2	0.0678	0.0477
3	0.1456	0.344

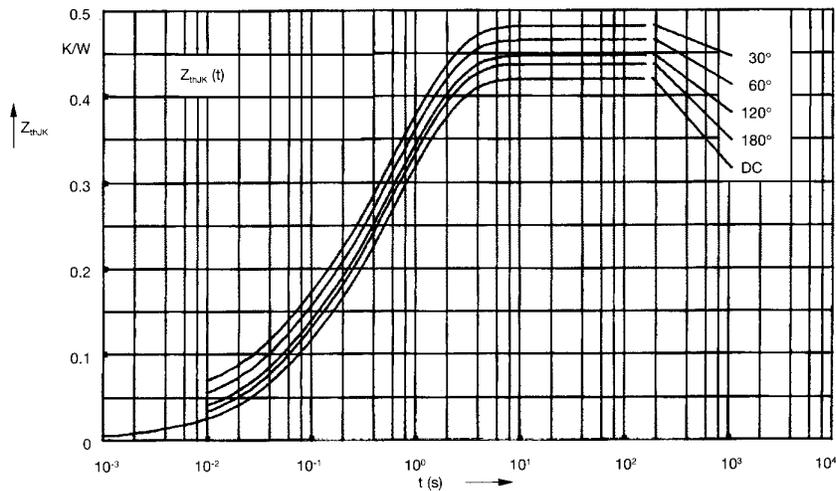


Fig. 9 Transient thermal impedance  
junction to heatsink (per thyristor  
or diode)

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

d	$R_{thJK}$ (K/W)
DC	0.42
180°	0.43
120°	0.45
60°	0.47
30°	0.48

Constants for  $Z_{thJK}$  calculation:

i	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.0066	0.0019
2	0.0678	0.0477
3	0.1456	0.344
4	0.2	1.32