

# Thyristor Modules

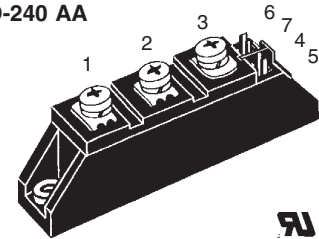
## Thyristor/Diode Modules

$$I_{TRMS} = 2 \times 80 \text{ A}$$

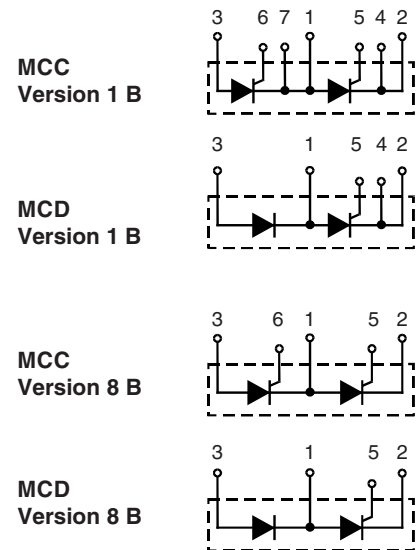
$$I_{TAVM} = 2 \times 51 \text{ A}$$

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

$V_{RSM}$	$V_{RRM}$	Type					
$V_{DSM}$	$V_{DRM}$						
V	V	Version	1 B	8 B	Version	1 B	8 B
900	800	MCC 44-08	io1 B / io8 B		MCD 44-08	io1 B / io8 B	
1300	1200	MCC 44-12	io1 B / io8 B		MCD 44-12	io1 B / io8 B	
1500	1400	MCC 44-14	io1 B / io8 B		MCD 44-14	io1 B / io8 B	
1700	1600	MCC 44-16	io1 B / io8 B		MCD 44-16	io1 B / io8 B	
1900	1800	MCC 44-18	io1 B / io8 B		MCD 44-18	io1 B / io8 B	

**TO-240 AA**


Symbol	Conditions	Maximum Ratings	
$I_{TRMS}, I_{FRMS}$ $I_{TAVM}, I_{FAVM}$	$T_{VJ} = T_{VJM}$ $T_C = 83^\circ\text{C}; 180^\circ \text{ sine}$ $T_C = 85^\circ\text{C}; 180^\circ \text{ sine}$	80 51 49	A A A
$I_{TSM}, I_{FSM}$	$T_{VJ} = 45^\circ\text{C};$ $V_R = 0;$	$t = 10 \text{ ms (50 Hz), sine}$ $t = 8.3 \text{ ms (60 Hz), sine}$	1150 A 1230 A
	$T_{VJ} = T_{VJM};$ $t = 10 \text{ ms};$ $V_R = 0;$	(50 Hz), sine $t = 8.3 \text{ ms (60 Hz), sine}$	1000 A 1070 A
$I^2dt$	$T_{VJ} = 45^\circ\text{C};$ $V_R = 0,$	$t = 10 \text{ ms (50 Hz), sine}$ $t = 8.3 \text{ ms (60 Hz), sine}$	6600 $\text{A}^2\text{s}$ 6280 $\text{A}^2\text{s}$
	$T_{VJ} = T_{VJM};$ $V_R = 0;$	$t = 10 \text{ ms (50 Hz), sine}$ $t = 8.3 \text{ ms (60 Hz), sine}$	5000 $\text{A}^2\text{s}$ 4750 $\text{A}^2\text{s}$
$(di/dt)_{cr}$	$T_{VJ} = T_{VJM};$ $f = 50\text{Hz}; t_p = 200\mu\text{s};$ $V_D = \frac{2}{3} V_{DRM};$ $I_G = 0.45 \text{ A};$ $di_G/dt = 0.45 \text{ A}/\mu\text{s}$	repetitive, $I_T = 150 \text{ A}$	150 $\text{A}/\mu\text{s}$
		non repetitive, $I_T = I_{TAVM}$	500 $\text{A}/\mu\text{s}$
$(dv/dt)_{cr}$	$T_{VJ} = T_{VJM};$ $R_{GK} = \infty;$ method 1 (linear voltage rise)	$V_{DR} = \frac{2}{3} V_{DRM}$	1000 $\text{V}/\mu\text{s}$
$P_{GM}$	$T_{VJ} = T_{VJM};$ $I_T = I_{TAVM};$	$t_p = 30 \mu\text{s}$ $t_p = 300 \mu\text{s}$	10 W 5 W
			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


**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**

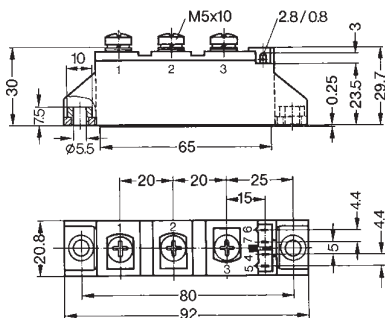
- Space and weight savings
- Simple mounting with two screws
- Improved temperature and power cycling
- Reduced protection circuits

Symbol	Conditions	Characteristic Values
$I_{RRM}, I_{DRM}$	$T_{VJ} = T_{VJM}; V_R = V_{RRM}; V_D = V_{DRM}$	5 mA
$V_T, V_F$	$I_T, I_F = 200 \text{ A}; T_{VJ} = 25^\circ\text{C}$	1.75 V
$V_{T0}$	For power-loss calculations only ( $T_{VJ} = 125^\circ\text{C}$ )	0.85 V
$r_T$		5.3 m $\Omega$
$V_{GT}$	$V_D = 6 \text{ V}; T_{VJ} = 25^\circ\text{C}$	1.5 V
	$V_D = 6 \text{ V}; T_{VJ} = -40^\circ\text{C}$	1.6 V
$I_{GT}$	$V_D = 6 \text{ V}; T_{VJ} = 25^\circ\text{C}$	100 mA
	$V_D = 6 \text{ V}; T_{VJ} = -40^\circ\text{C}$	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 $\mu\text{s}$
$t_q$	$T_{VJ} = T_{VJM}; I_T = 120 \text{ A}; t_p = 200 \mu\text{s}; -di/dt = 10 \text{ A}/\mu\text{s}$ $V_R = 100 \text{ V}; dv/dt = 20 \text{ V}/\mu\text{s}; V_D = 2/3 V_{DRM}$	typ. 150 $\mu\text{s}$
$Q_S$	$T_{VJ} = T_{VJM}; I_T/I_F = 50 \text{ A}; -di/dt = 0.64 \text{ A}/\mu\text{s}$	90 $\mu\text{C}$
$I_{RM}$		11 A
$R_{thJC}$	per thyristor/diode; DC current per module other values see Fig. 8/9	0.53 K/W
		0.265 K/W
$R_{thJK}$	per thyristor/diode; DC current per module	0.73 K/W
		0.365 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>

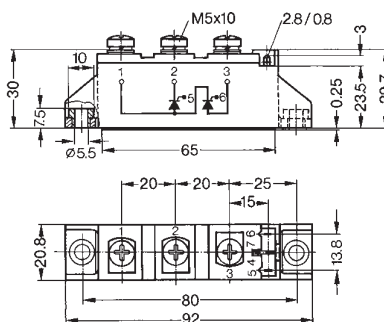
Optional accessories for module-type MCC 44 version 1 B  
 Keyed gate/cathode twin plugs with wire length = 350 mm, gate = yellow, cathode = red  
 Type **ZY 200L** (L = Left for pin pair 4/5) } UL 758, style 1385,  
 Type **ZY 200R** (R = right for pin pair 6/7) } CSA class 5851, guide 460-1-1

Dimensions in mm (1 mm = 0.0394")

MCC/MCD Version 1 B



MCC Version 8 B



MCD Version 8 B

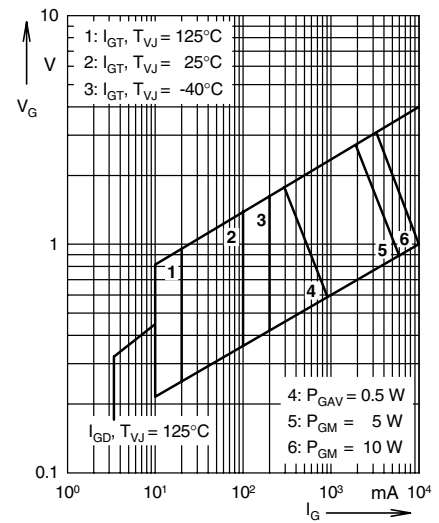
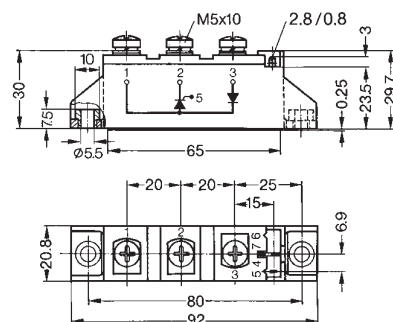


Fig. 1 Gate trigger characteristics

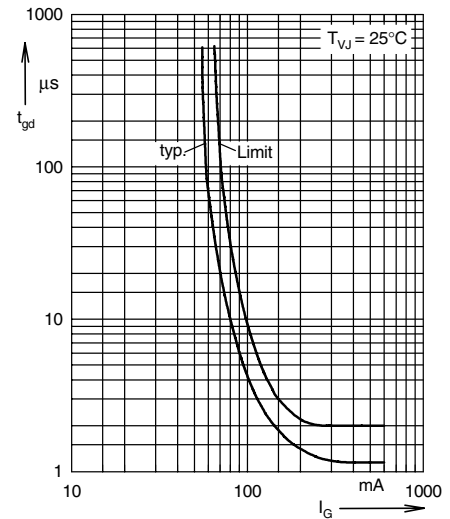


Fig. 2 Gate trigger delay time

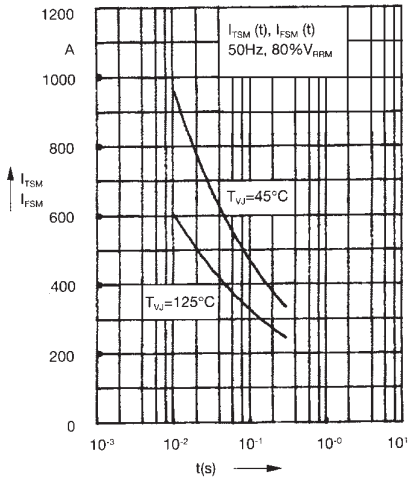


Fig. 3 Surge overload current  
 $I_{TSM}$ ,  $I_{FSM}$ : Crest value,  $t$ : duration

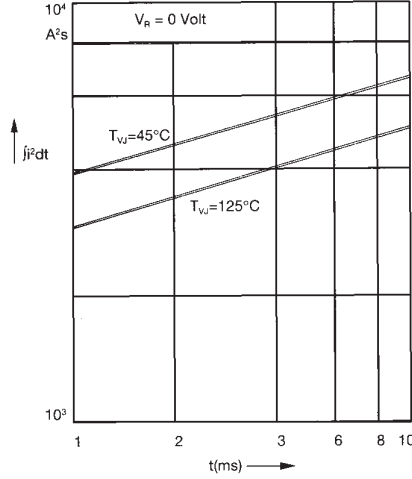


Fig. 4  $\int j^2 dt$  versus time (1-10 ms)

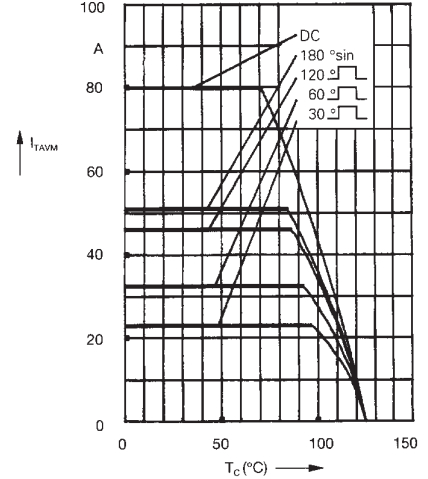


Fig. 4a Maximum forward current at case temperature

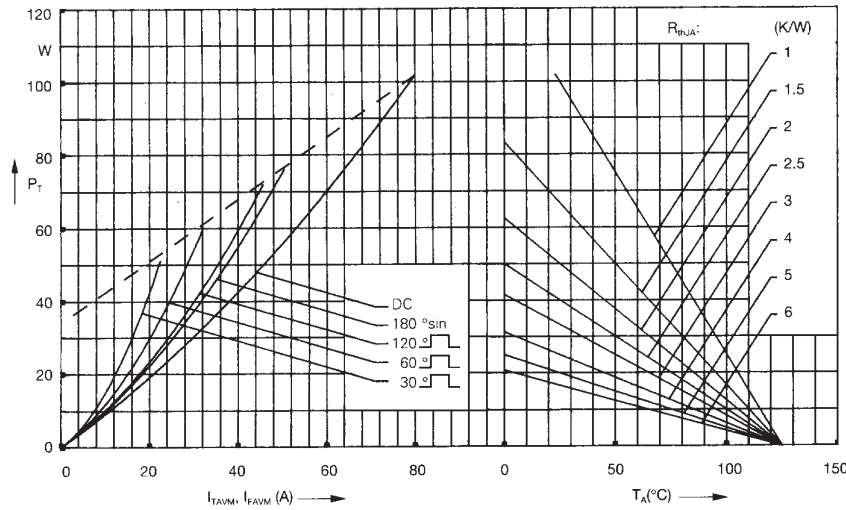


Fig. 5 Power dissipation versus on-state current and ambient temperature (per thyristor or diode)

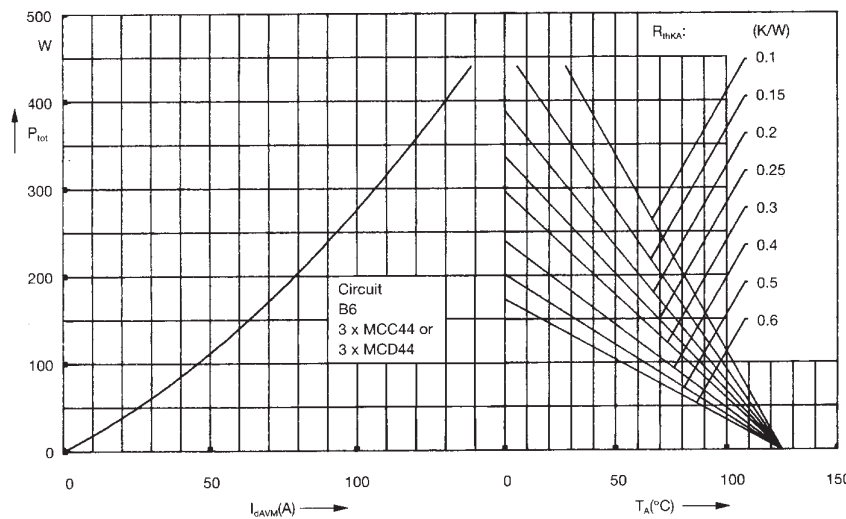


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

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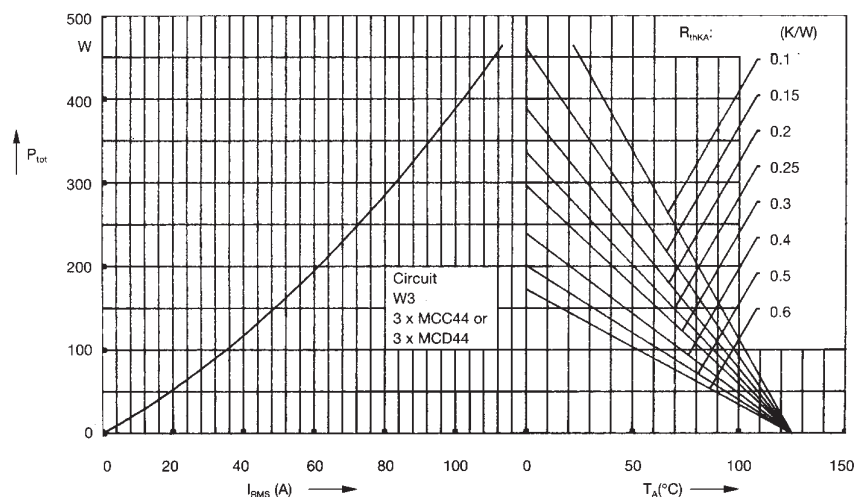


Fig. 7 Three phase AC-controller:  
Power dissipation versus RMS  
output current and ambient  
temperature

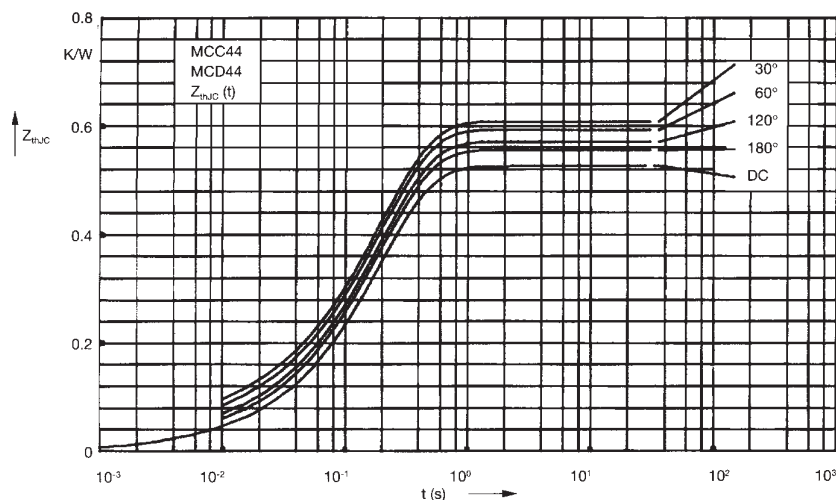


Fig. 8 Transient thermal impedance  
junction to case (per thyristor or  
diode)

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

d	$R_{thJC}$ (K/W)
DC	0.53
180°	0.55
120°	0.58
60°	0.6
30°	0.62

Constants for  $Z_{thJC}$  calculation:

i	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.015	0.0035
2	0.026	0.02
3	0.489	0.195

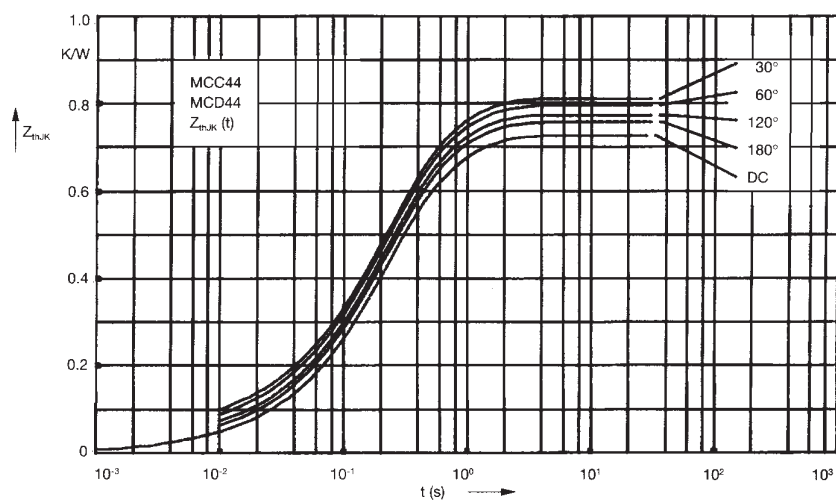


Fig. 9 Transient thermal impedance  
junction to heatsink (per thyristor  
or diode)

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

d	$R_{thJK}$ (K/W)
DC	0.73
180°	0.75
120°	0.78
60°	0.8
30°	0.82

Constants for  $Z_{thJK}$  calculation:

i	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.015	0.0035
2	0.026	0.02
3	0.489	0.195
4	0.2	0.68