

Thyristor Modules

Thyristor/Diode Modules

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

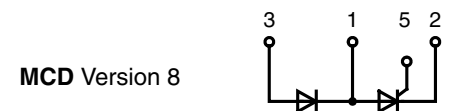
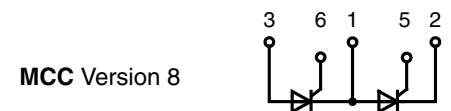
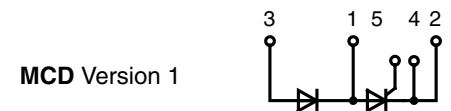
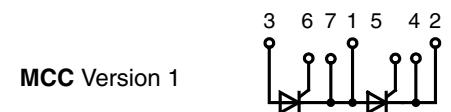
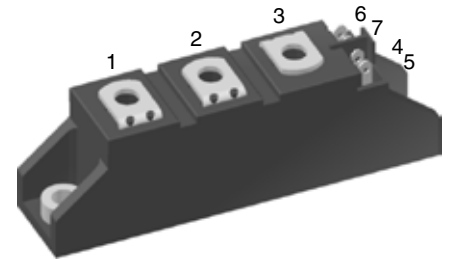
$$I_{TAVM} = 2 \times 116 \text{ A}$$

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

V_{RSM} V_{DSM} V	V_{RRM} V_{DRM} V	Type	Version	1B	8B	Version	1B	8B
900	800	MCC 95-08	io1B / io8B			MCD 95-08	io1B / io8B	
1300	1200	MCC 95-12	io1B / io8B			MCD 95-12	io1B / io8B	
1500	1400	MCC 95-14	io1B / io8B			MCD 95-14	io1B / io8B	
1700	1600	MCC 95-16	io1B / io8B			MCD 95-16	io1B / io8B	
1900	1800	MCC 95-18	io1B / io8B			MCD 95-18	io1B / io8B	

Symbol	Conditions	Maximum Ratings		
I_{TRMS}, I_{FRMS} I_{TAVM}, I_{FAVM}	$T_{VJ} = T_{VJM}$ $T_C = 85^{\circ}\text{C}; 180^{\circ}$ sine	180 116	A A	
I_{TSM}, I_{FSM}	$T_{VJ} = 45^{\circ}\text{C}$ $V_R = 0$	$t = 10\text{ ms}$ (50 Hz) $t = 8.3\text{ ms}$ (60 Hz)	2250 2400	A A
	$T_{VJ} = T_{VJM}$ $V_R = 0$	$t = 10\text{ ms}$ (50 Hz) $t = 8.3\text{ ms}$ (60 Hz)	2000 2150	A A
	$T_{VJ} = 45^{\circ}\text{C}$ $V_R = 0$	$t = 10\text{ ms}$ (50 Hz) $t = 8.3\text{ ms}$ (60 Hz)	25 300 23 900	A^2s A^2s
	$T_{VJ} = T_{VJM}$ $V_R = 0$	$t = 10\text{ ms}$ (50 Hz) $t = 8.3\text{ ms}$ (60 Hz)	20 000 19 100	A^2s A^2s
$(di/dt)_{cr}$	$T_{VJ} = T_{VJM}$ $f = 50\text{ Hz}; t_p = 200\text{ }\mu\text{s};$ $V_D = \frac{2}{3} V_{DRM}$ $I_G = 0.45\text{ A}$ $di_G/dt = 0.45\text{ A}/\mu\text{s}$	repetitive, $I_T = 250\text{ A}$ non repetitive, $I_T = I_{TAVM}$	150 500	$\text{A}/\mu\text{s}$ $\text{A}/\mu\text{s}$
	$(dv/dt)_{cr}$	$T_{VJ} = T_{VJM}; V_D = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty; \text{method 1 (linear voltage rise)}$	1000	$\text{V}/\mu\text{s}$
P_{GM}	$T_{VJ} = T_{VJM}; t_p = 30\text{ }\mu\text{s}$ $I_T = I_{T(AV)M}; t_p = 500\text{ }\mu\text{s}$	10 5	W W	
P_{GAV}		0.5	W	
V_{RGM}		10	V	
T_{VJ} T_{VJM} T_{stg}		-40...+125 125 -40...+125	$^{\circ}\text{C}$ $^{\circ}\text{C}$ $^{\circ}\text{C}$	
V_{ISOL}	50/60 Hz, RMS $I_{ISOL} \leq 1\text{ mA}$	$t = 1\text{ min}$ $t = 1\text{ s}$	3000 3600	$\text{V}\sim$ $\text{V}\sim$
M_d	Mounting torque (M5) Terminal connection torque (M5)	2.5 - 4 2.5 - 4	Nm Nm	
Weight	Typical including screws	85	g	

Data according to IEC 60747 and refer to a single diode unless otherwise stated.



Features

- International standard package, JEDEC TO-240 AA
- Direct copper bonded Al_2O_3 -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 & power cycling
- Reduced protection circuits

Symbol	Conditions	Characteristic Values	
		typ.	max.
I_{RRM}, I_{DRM}	$V_R / V_D = V_{RRM} / V_{DRM}$	$T_{VJ} = T_{VJM}$	5 mA
V_T, V_F	$I_T / I_F = 300$ A	$T_{VJ} = 25^\circ\text{C}$	1.5 V
V_{T0}	For power-loss calculations only		0.8 V
r_t		$T_{VJ} = T_{VJM}$	2.4 mΩ
V_{GT}	$V_D = 6$ V	$T_{VJ} = 25^\circ\text{C}$	2.5 V
		$T_{VJ} = -40^\circ\text{C}$	2.6 V
I_{GT}	$V_D = 6$ V	$T_{VJ} = 25^\circ\text{C}$	150 mA
		$T_{VJ} = -40^\circ\text{C}$	200 mA
V_{GD}	$V_D = 2/3 V_{DRM}$	$T_{VJ} = T_{VJM}$	0.2 V
I_{GD}			10 mA
I_L	$t_p = 10 \mu\text{s}; V_D = 6$ V $I_G = 0.45$ A; $di_G/dt = 0.45$ A/ μs	$T_{VJ} = 25^\circ\text{C}$	450 mA
I_H	$V_D = 6$ V; $R_{GK} = \infty$;	$T_{VJ} = 25^\circ\text{C}$	200 mA
t_{gd}	$V_D = 1/2 V_{DRM}$ $I_G = 0.45$ A; $di_G/dt = 0.45$ A/ μs	$T_{VJ} = 25^\circ\text{C}$	2 μs
t_q	$V_D = 2/3 V_{DRM}$ $dv/dt = 20$ V/ μs ; $-di/dt = 10$ A/ μs $I_T = 150$ A; $V_R = 100$ V; $t_p = 200 \mu\text{s}$	$T_{VJ} = T_{VJM}$	185 μs
Q_S	$I_T / I_F = 50$ A; $-di/dt = 6$ A/ μs	$T_{VJ} = T_{VJM}$	170 μC
I_{RM}			45 A
R_{thJC}	per thyristor; DC current	other values see Fig. 8/9	0.22 K/W
	per module		0.11 K/W
R_{thJK}	per thyristor; DC current		0.42 K/W
	per module		0.21 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 ²

Optional accessories for modules

Coded 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

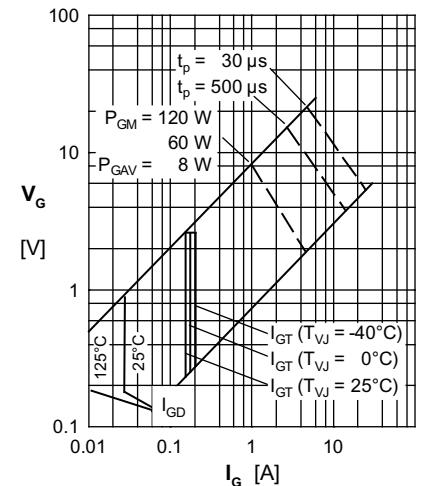


Fig. 1 Gate trigger characteristics

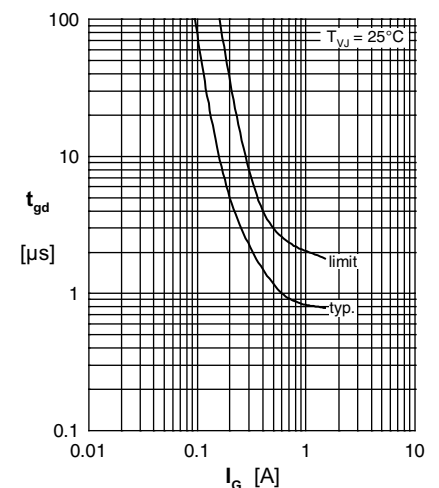
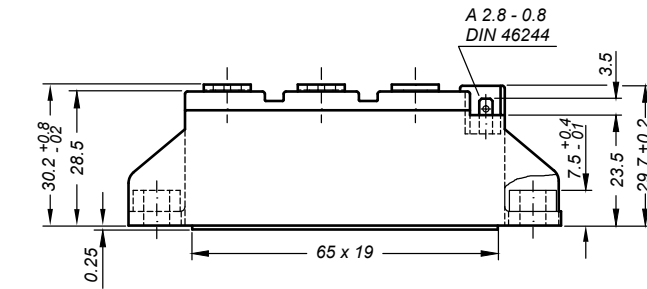


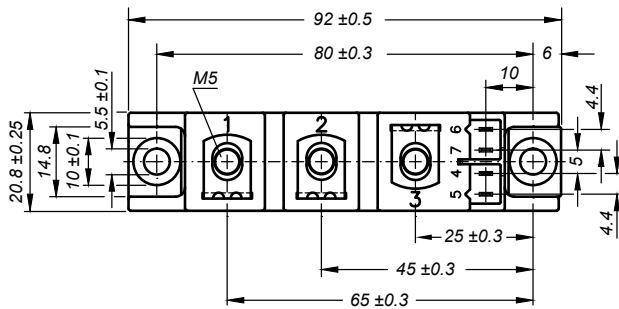
Fig. 2 Gate trigger delay time

Dimensions in mm (1 mm = 0.0394")

MCC... Version 1B

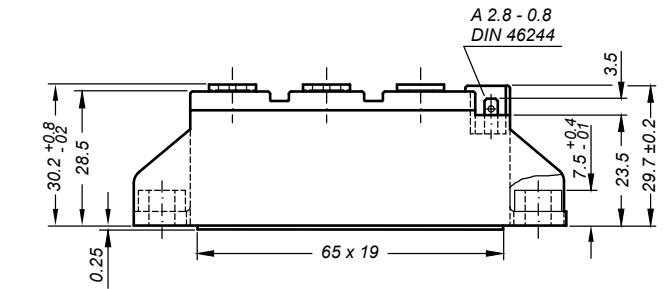


General tolerance: DIN ISO 2768 class „c“

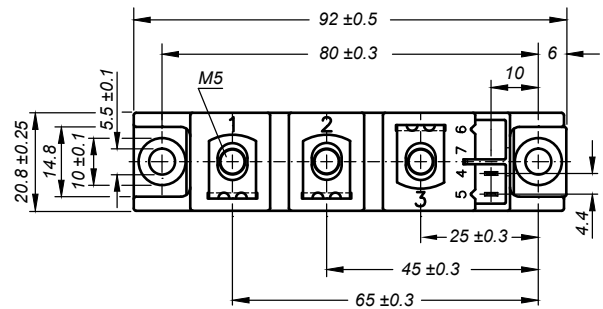


Optional accessories: Keyed gate/cathode twin plugs
 Wire length: 350 mm, gate = yellow, cathode = red
 UL 758, style 1385, CSA class 5851, guide 460-1-1
 Type ZY 200L (L = Left for pin pair 4/5)
 Type ZY 200R (R = Right for pin pair 6/7)

MCD... Version 1B

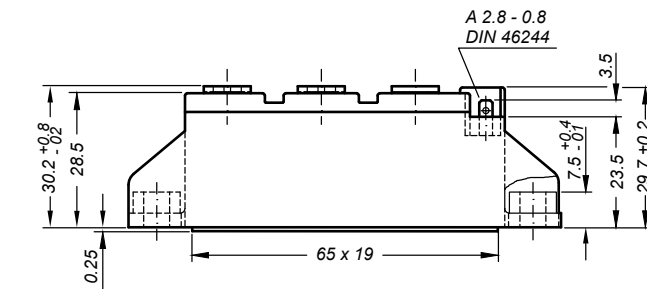


General tolerance: DIN ISO 2768 class „c“

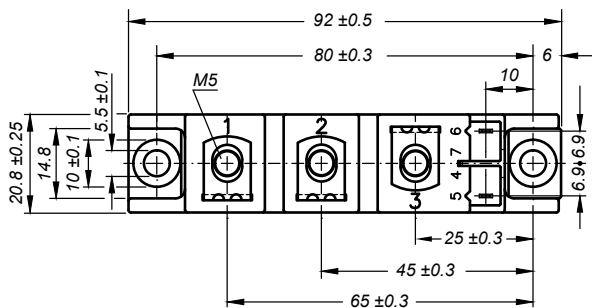


Optional accessories: Keyed gate/cathode twin plugs
 Wire length: 350 mm, gate = yellow, cathode = red
 UL 758, style 1385, CSA class 5851, guide 460-1-1
 Type ZY 200L (L = Left for pin pair 4/5)

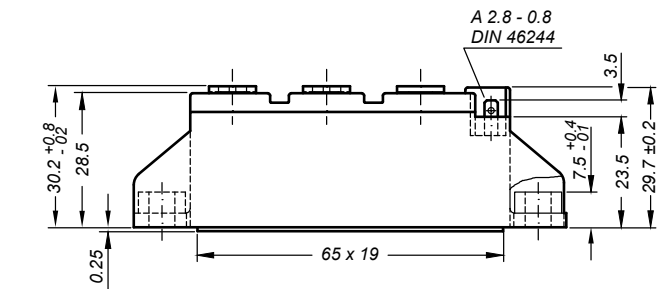
MCC... Version 8B



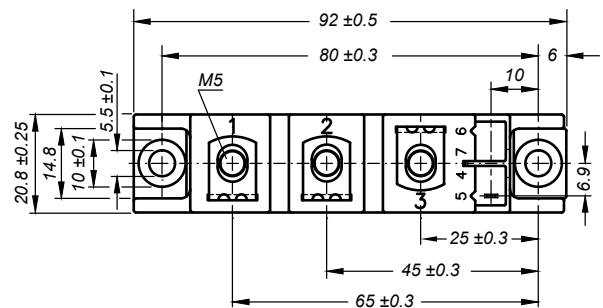
General tolerance: DIN ISO 2768 class „c“



MCD... Version 8B



General tolerance: DIN ISO 2768 class „c“



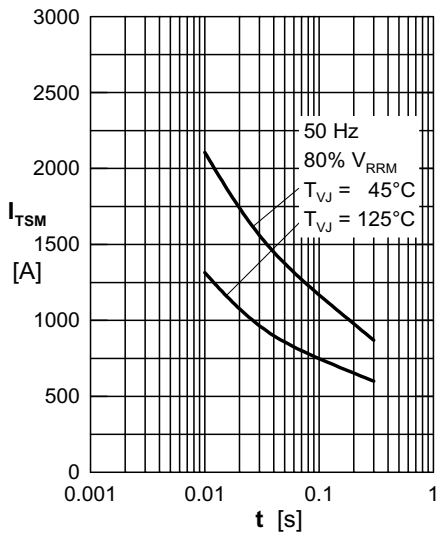


Fig. 3 Surge overload current I_{TSM} ,
 I_{FSM} : Crest value, t : duration

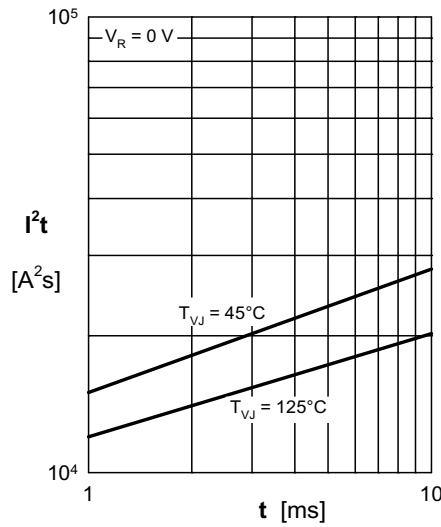


Fig. 4 I^2t versus time (1-10 ms)

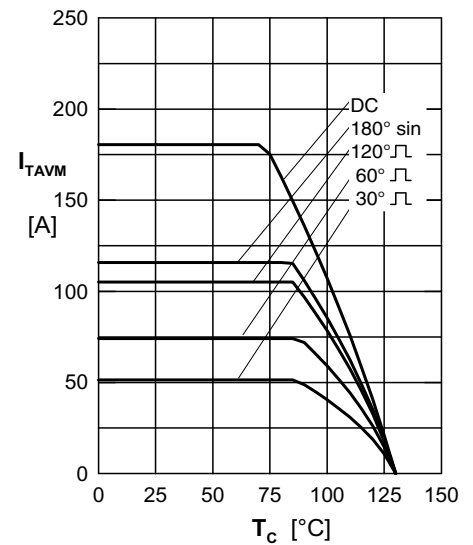


Fig. 4a Maximum forward current
at case temperature

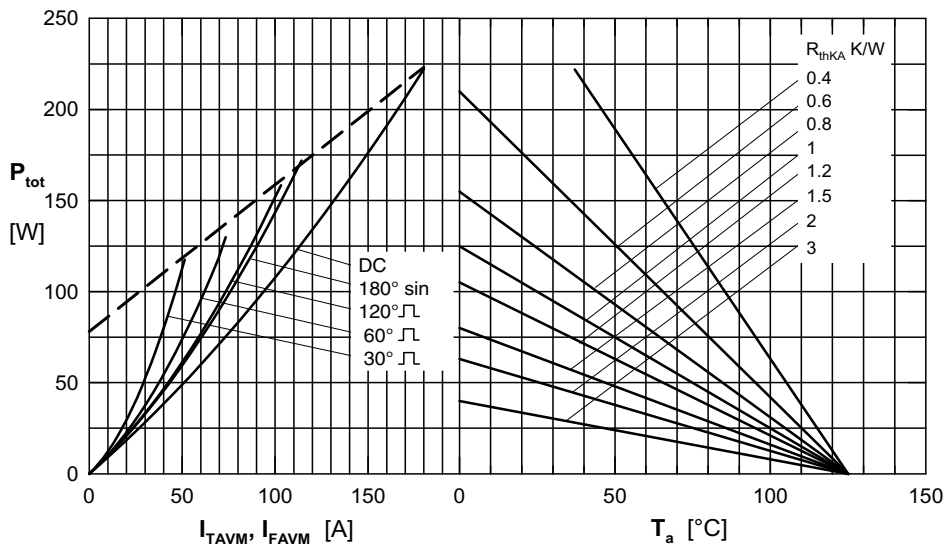


Fig. 5 Power dissipation versus
on-state current & ambient
temperature
(per thyristor or diode)

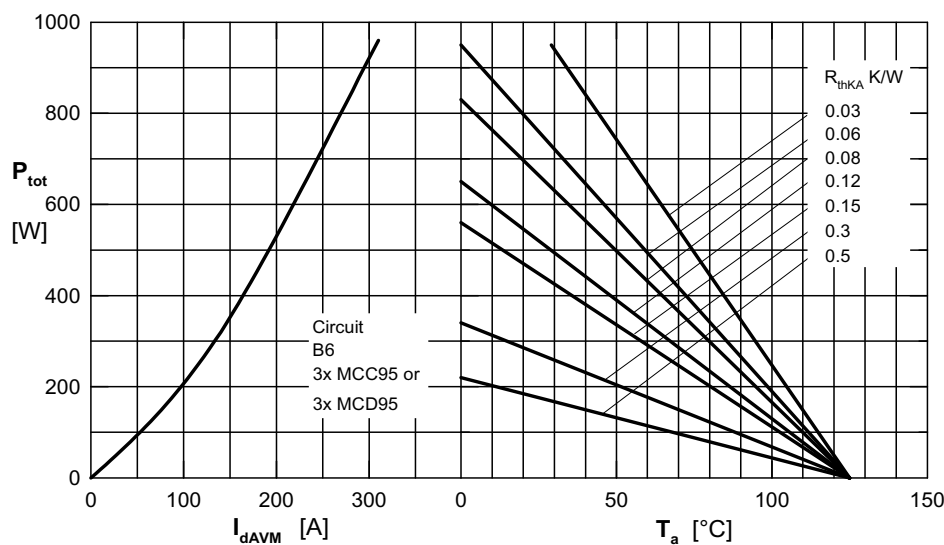


Fig. 6 Three phase rectifier bridge:
Power dissipation vs. direct
output current and ambient
temperature

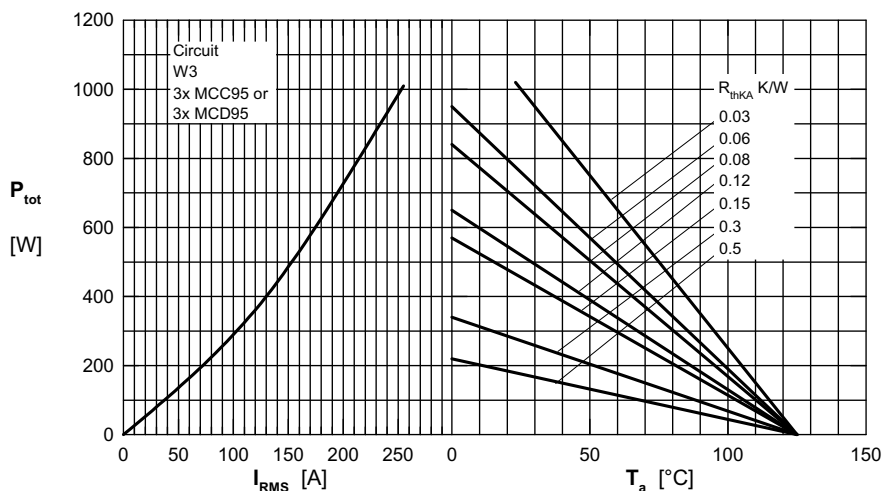


Fig. 7 Three phase AC-controller:
Power dissipation versus RMS
output current and ambient
temperature

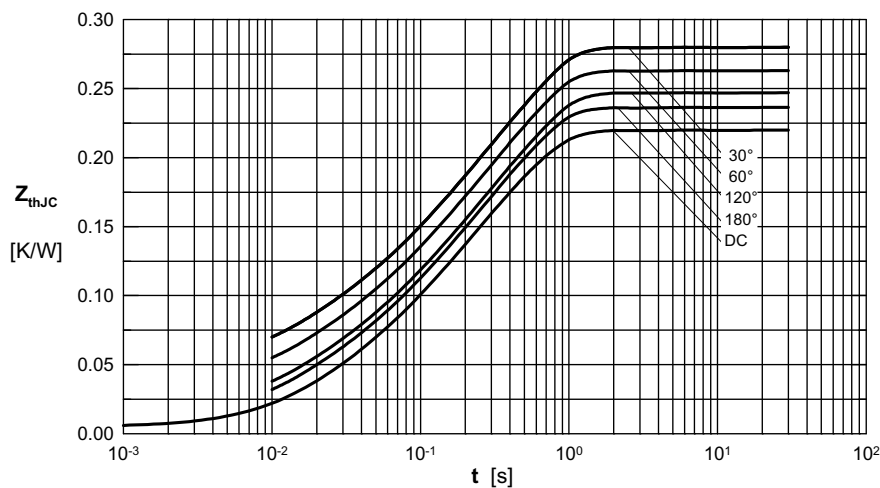


Fig. 8 Transient thermal impedance
junction to case
(per thyristor or diode)

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

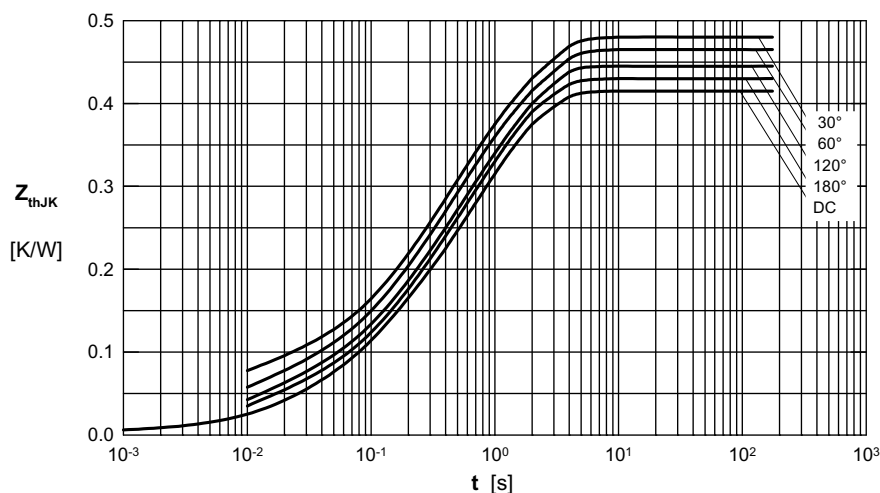


Fig. 9 Transient thermal impedance
junction to heatsink
(per thyristor or diode)

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

Thyristor Modules

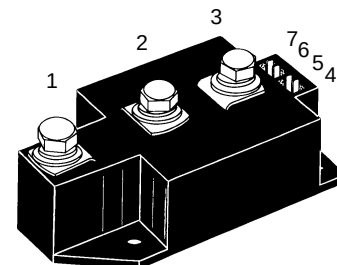
Thyristor/Diode Modules

$$I_{TRMS} = 2 \times 500 \text{ A}$$

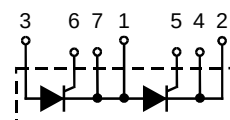
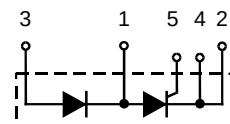
$$I_{TAVM} = 2 \times 320 \text{ A}$$

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

V_{RSM} V_{DSM} V	V_{RRM} V_{DRM} V	Type	
		Version 1	Version 1
900	800	MCC 310-08io1	MCD 310-08io1
1300	1200	MCC 310-12io1	MCD 310-12io1
1500	1400	MCC 310-14io1	MCD 310-14io1
1700	1600	MCC 310-16io1	MCD 310-16io1
1900	1800	MCC 310-18io1	MCD 310-18io1



Symbol	Test Conditions		Maximum Ratings		
I_{TRMS}, I_{FRMS} I_{TAVM}, I_{FAVM}	$T_{VJ} = T_{VJM}$		500	A	
	$T_C = 85^{\circ}\text{C}; 180^{\circ}$ sine		320	A	
I_{TSM}, I_{FSM}	$T_{VJ} = 45^{\circ}\text{C};$ $V_R = 0$	$t = 10$ ms (50 Hz), sine $t = 8.3$ ms (60 Hz), sine	9200 9800	A A	
	$T_{VJ} = T_{VJM}$ $V_R = 0$	$t = 10$ ms (50 Hz), sine $t = 8.3$ ms (60 Hz), sine	8000 8600	A A	
	$\int i^2 dt$	$T_{VJ} = 45^{\circ}\text{C}$ $V_R = 0$	$t = 10$ ms (50 Hz), sine $t = 8.3$ ms (60 Hz), sine	420 000 400 000	A^2s A^2s
		$T_{VJ} = T_{VJM}$ $V_R = 0$	$t = 10$ ms (50 Hz), sine $t = 8.3$ ms (60 Hz), sine	320 000 306 000	A^2s A^2s
$(di/dt)_{cr}$	$T_{VJ} = T_{VJM}$ $f = 50$ Hz, $t_p = 200$ μs $V_D = 2/3 V_{DRM}$ $I_G = 1$ A $di_G/dt = 1$ A/ μs	repetitive, $I_T = 960$ A non repetitive, $I_T = 320$ A	100 500	A/ μs A/ μs	
	$(dv/dt)_{cr}$	$T_{VJ} = T_{VJM};$ $R_{GK} = \infty$; method 1 (linear voltage rise)	$V_{DR} = 2/3 V_{DRM}$	1000	V/ μs
P_{GM}	$T_{VJ} = T_{VJM}$ $I_T = I_{TAVM}$	$t_p = 30$ μs $t_p = 500$ μs	120 60 20	W W W	
P_{GAV}			10	V	
V_{RGM}					
T_{VJ}			-40...+140	$^{\circ}\text{C}$	
T_{VJM}			140	$^{\circ}\text{C}$	
T_{stg}			-40...+125	$^{\circ}\text{C}$	
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 (M5)		2.5-5/22-44	Nm/lb.in.	
	Terminal connection torque (M8)		12-15/106-132	Nm/lb.in.	
Weight	Typical including screws		320	g	

MCC

MCD


Features

- International standard package
- Direct copper bonded Al_2O_3 -ceramic base plate
- Planar passivated chips
- Isolation voltage 3600 V~
- UL registered, E 72873
- Keyed gate/cathode twin pins

Applications

- Motor control
- Power converter
- Heat and temperature control for industrial furnaces and chemical processes
- Lighting control
- Contactless switches

Advantages

- Space and weight savings
- 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}	$T_{VJ} = T_{VJM}; V_R = V_{RRM}; V_D = V_{DRM}$	70	mA
I_{DRM}		40	mA
V_T, V_F	$I_T, I_F = 600 \text{ A}; T_{VJ} = 25^\circ\text{C}$	1.32	V
V_{T0}	For power-loss calculations only ($T_{VJ} = 140^\circ\text{C}$)	0.8	V
r_T		0.82	m Ω
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
	$T_{VJ} = -40^\circ\text{C}$	200	mA
V_{GD}	$T_{VJ} = T_{VJM}; V_D = 2/3 V_{DRM}$	0.25	V
I_{GD}		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	μs
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	μs
Q_S	$T_{VJ} = 125^\circ\text{C}; I_T, I_F = 400 \text{ A}, -di/dt = 50 \text{ A}/\mu\text{s}$	760	μC
I_{RM}		275	A
R_{thJC}	per thyristor/diode; DC current per module	other values see Fig. 8/9	0.112 K/W
R_{thJK}	per thyristor/diode; DC current per module		0.056 K/W
			0.152 K/W
			0.076 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 ²

Optional accessories for modules

Keyed gate/cathode twin plugs with wire length = 350 mm, gate = yellow, cathode = red

Type **ZY 180L** (L = Left for pin pair 4/5)

Type **ZY 180R** (R = right for pin pair 6/7)

UL 758, style 1385.

Type **ZY 180R** (R = right for pin pair 6/7) } CE 180, style 1800,
CSA class 5851, guide 460-1-1

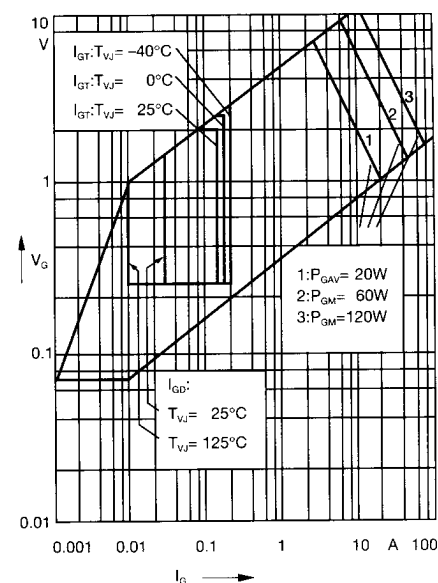


Fig. 1 Gate trigger characteristics

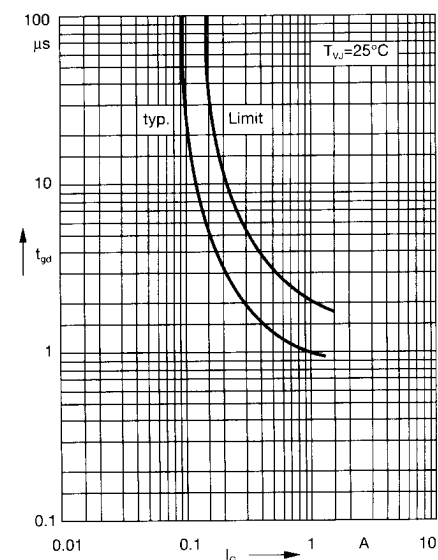
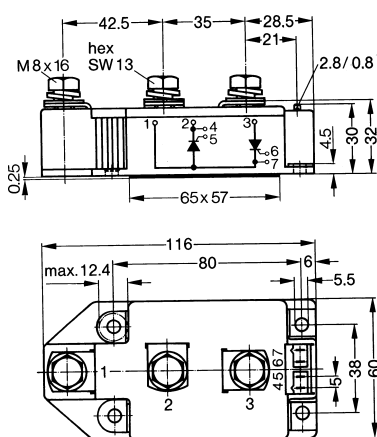


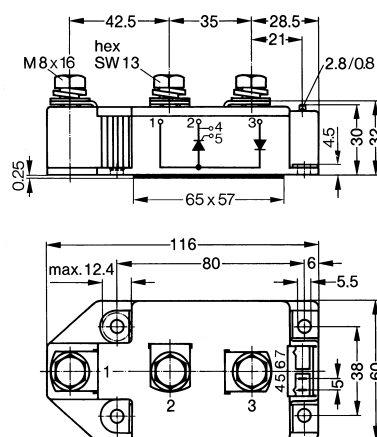
Fig. 2 Gate trigger delay time

Dimensions in mm (1 mm = 0.0394")

MCC

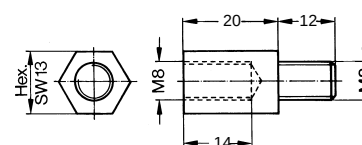


MCD



Threaded spacer for higher Anode/
Cathode construction:

Type **ZY 250**, material brass



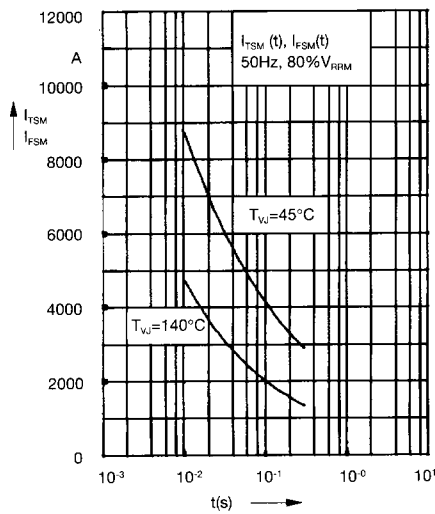


Fig. 3 Surge overload current
 I_{TSM}, I_{FSM} : Crest value, t : duration

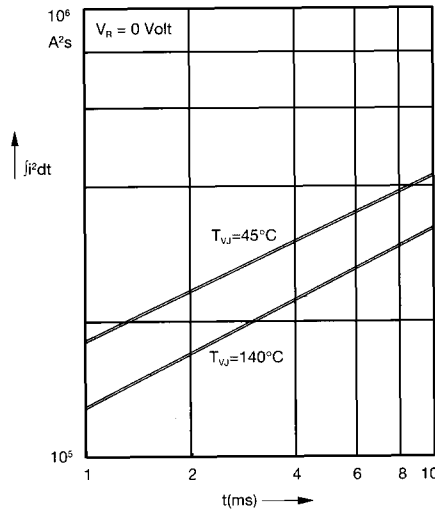


Fig. 4 $\int i^2 dt$ versus time (1-10 ms)

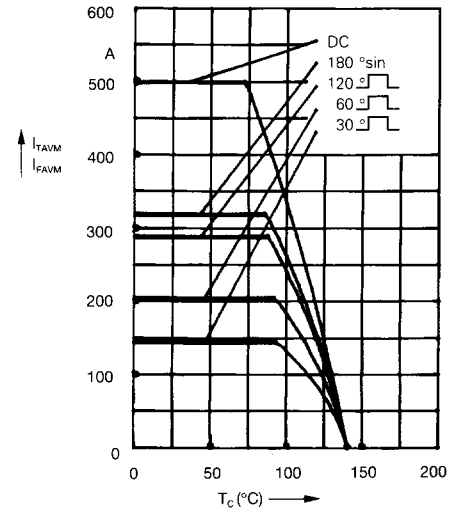


Fig. 4a Maximum forward current at case temperature

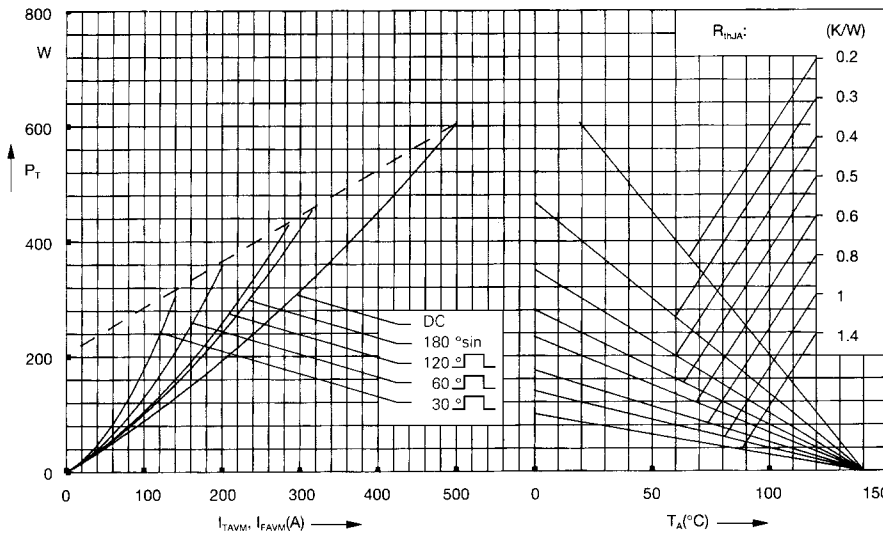


Fig. 5 Power dissipation versus on-state current and ambient temperature (per thyristor or diode)

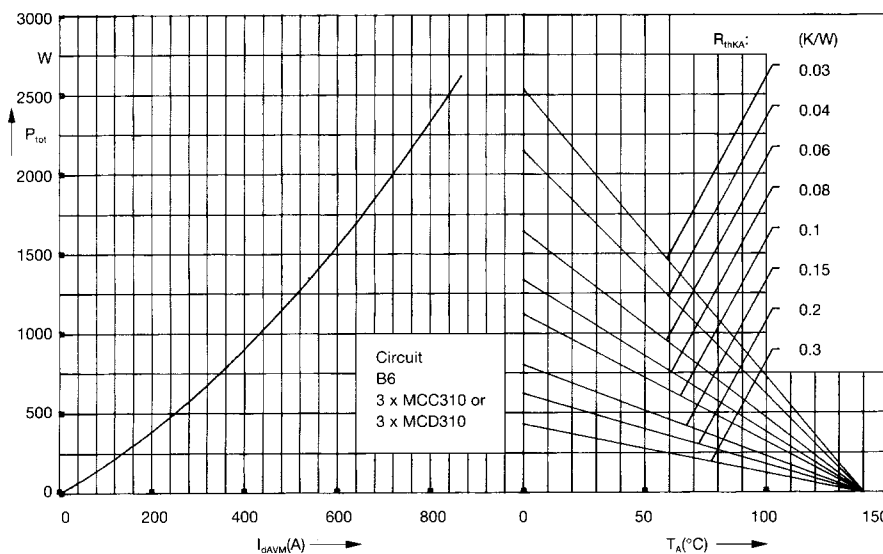


Fig. 6 Three phase rectifier bridge:
Power dissipation versus direct output current and ambient temperature

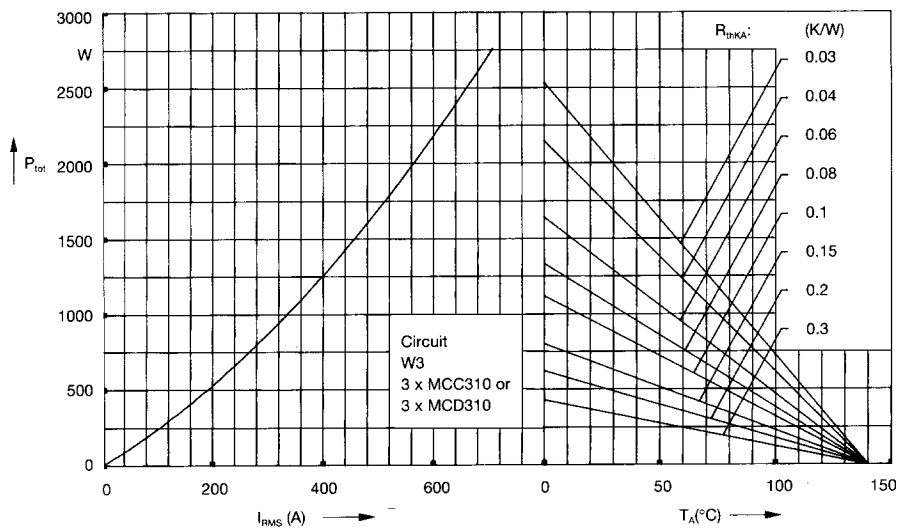


Fig. 7 Three phase AC-controller: Power dissipation versus RMS output current and ambient temperature

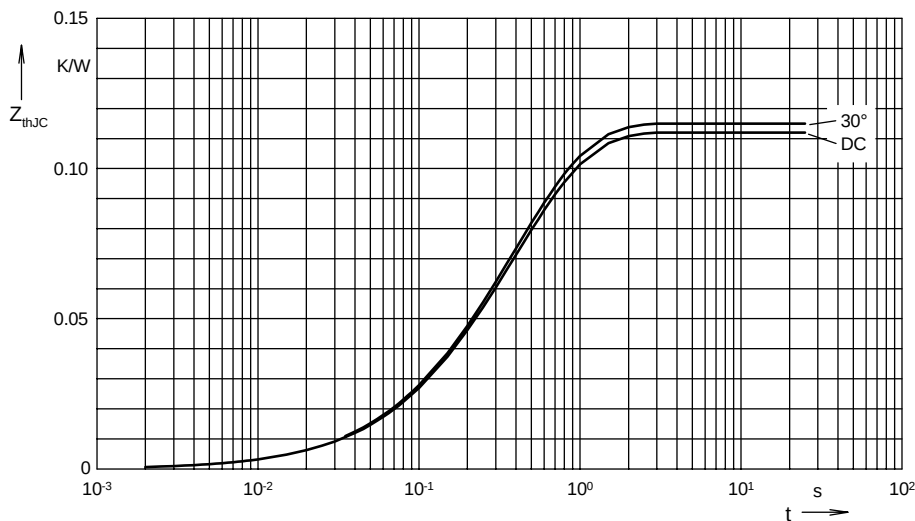


Fig. 8 Transient thermal impedance junction to case (per thyristor or diode)

R_{thJC} for various conduction angles d :

d	R_{thJC} (K/W)
DC	0.112
180°C	0.113
120°C	0.114
60°C	0.115
30°C	0.115

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.003	0.099
2	0.0143	0.168
3	0.0947	0.456

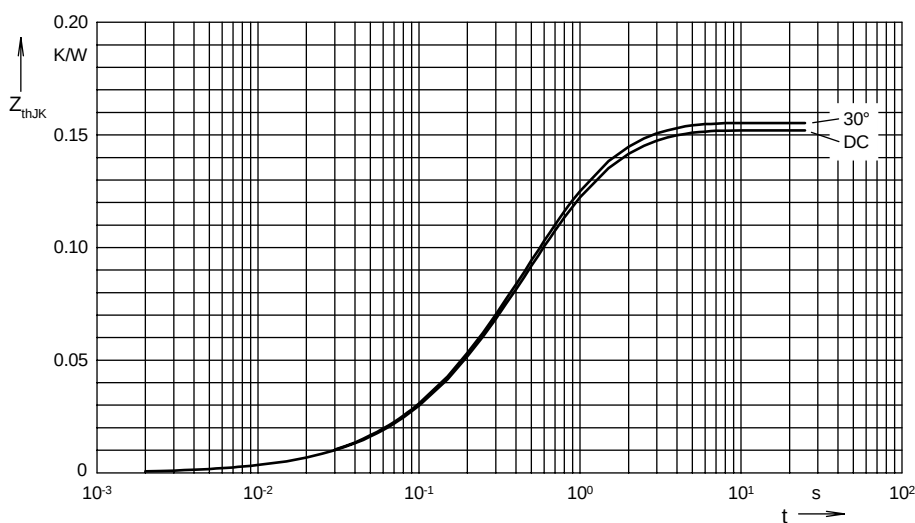


Fig. 9 Transient thermal impedance junction to heatsink (per thyristor or diode)

R_{thJK} for various conduction angles d :

d	R_{thJK} (K/W)
DC	0.152
180°C	0.154
120°C	0.154
60°C	0.155
30°C	0.155

Constants for Z_{thJK} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.003	0.099
2	0.0143	0.168
3	0.0947	0.456
4	0.04	1.36