

Thyristor Modules

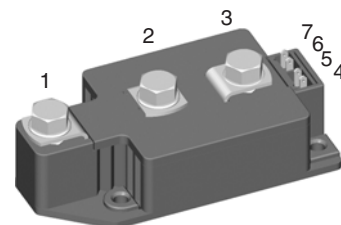
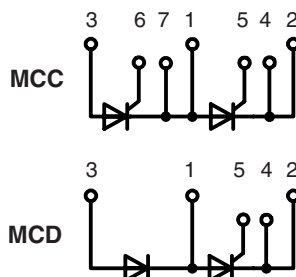
Thyristor/Diode Modules

$$I_{TRMS} = 2x 500 A$$

$$I_{TAVM} = 2x 320 A$$

$$V_{RRM} = 2200 V$$

V_{RSM}	V_{RRM}	Type	
V_{DSM}	V_{DRM}		
V	V	Version 1	Version 1
2300	2200	MCC 310-22io1	MCD 310-22io1



Symbol	Conditions	Maximum Ratings	
I_{TRMS}, I_{FRMS}	$T_{VJ} = T_{VJM}$	500	A
I_{TAVM}, I_{FAVM}	$T_C = 85^\circ C; 180^\circ$ sine	320	A
I_{TSM}, I_{FSM}	$T_{VJ} = 45^\circ C$	$t = 10$ ms (50 Hz), sine	8000 A
	$V_R = 0$	$t = 8.3$ ms (60 Hz), sine	8600 A
I^2dt	$T_{VJ} = 45^\circ C$	$t = 10$ ms (50 Hz), sine	320 000 A^2s
	$V_R = 0$	$t = 8.3$ ms (60 Hz), sine	310 000 A^2s
$(di/dt)_{cr}$	$T_{VJ} = T_{VJM}$	repetitive, $I_T = 960$ A	100 $A/\mu s$
	$f = 50$ Hz, $t_p = 200$ μs $V_D = \frac{2}{3} V_{DRM}$ $I_G = 1$ A $di_G/dt = 1$ $A/\mu s$	non repetitive, $I_T = 320$ A	500 $A/\mu s$
$(dv/dt)_{cr}$	$T_{VJ} = T_{VJM}; V_{DR} = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty$; method 1 (linear voltage rise)		1000 $V/\mu s$
P_{GM}	$T_{VJ} = T_{VJM}; t_p = 30$ μs	120	W
	$I_T = I_{TAVM}; t_p = 500$ μs	60	W
P_{GAV}		20	W
V_{RGM}		10	V
T_{VJ}		-40...+140	$^\circ C$
T_{VJM}		140	$^\circ C$
T_{stg}		-40...+125	$^\circ C$
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

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.

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Symbol	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	$I_T, I_F = 600 \text{ A}; T_{VJ} = 25^\circ\text{C}$	1.40	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}	$T_{VJ} = T_{VJM}; V_D = \frac{2}{3} V_{DRM}$	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}	$T_{VJ} = 25^\circ\text{C}; V_D = \frac{1}{2} V_{DRM}$ $I_G = 1 \text{ A}; di_G/dt = 1 \text{ A}/\mu\text{s}$	2	μs
t_q	$T_{VJ} = T_{VJM}; I_T = 300 \text{ A}, t_p = 200 \mu\text{s}; -di/dt = 10 \text{ A}/\mu\text{s}$ $V_R = 100 \text{ V}; dv/dt = 50 \text{ V}/\mu\text{s}; V_D = \frac{2}{3} V_{DRM}$	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	0.112	K/W
R_{thJK}	per thyristor/diode; DC current per module	0.056	K/W
	other values see Fig. 8/9	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

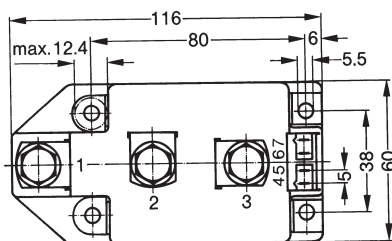
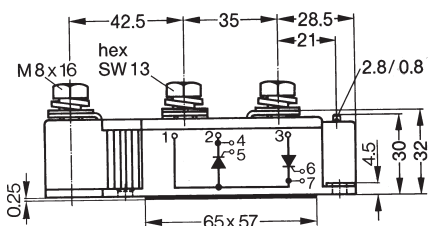
Optional accessories for modules

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

Type **ZY 180L** (L = Left for pin pair 4/5) } UL 758, style 1385,
Type **ZY 180R** (R = right for pin pair 6/7) } CSA class 5851, guide 460-1-1

Dimensions in mm (1 mm = 0.0394")

MCC



MCD

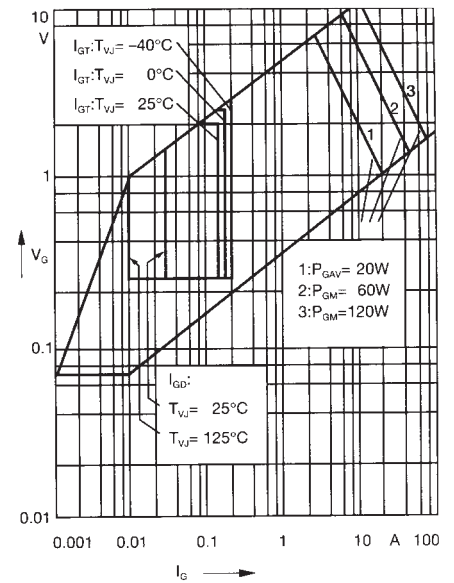
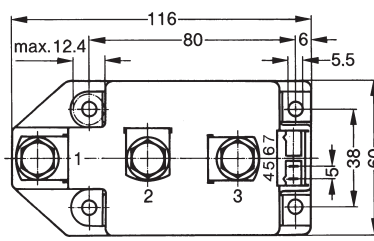
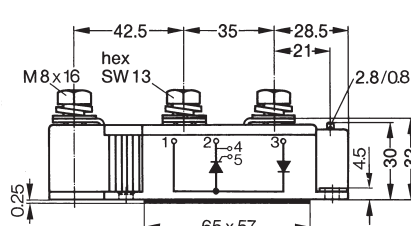


Fig. 1 Gate trigger characteristics

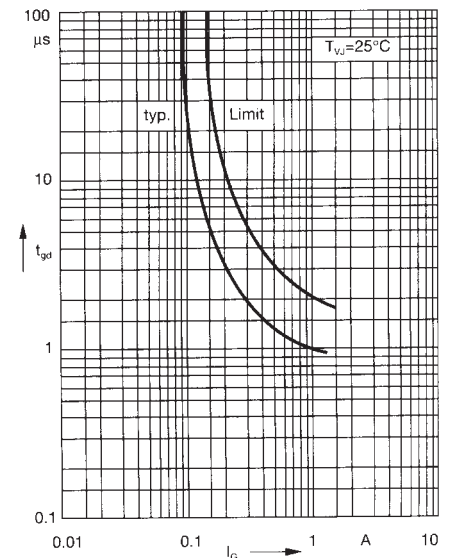
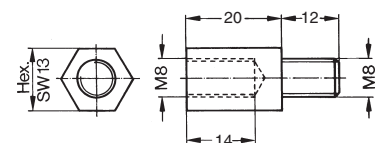


Fig. 2 Gate trigger delay time

Threaded spacer for higher Anode/Cathode construction:
Type **ZY 250**, material brass



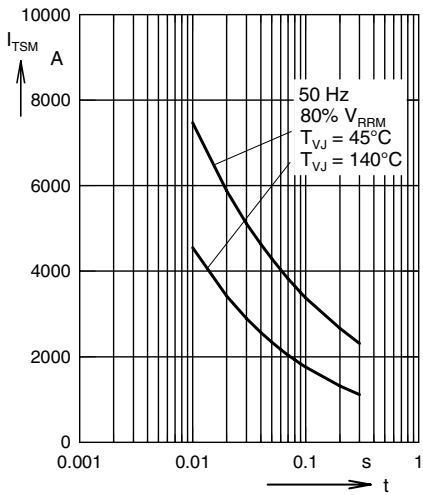


Fig. 3 Surge overload current
 I_{TSM} , I_{FSM} : Crest value, t : duration

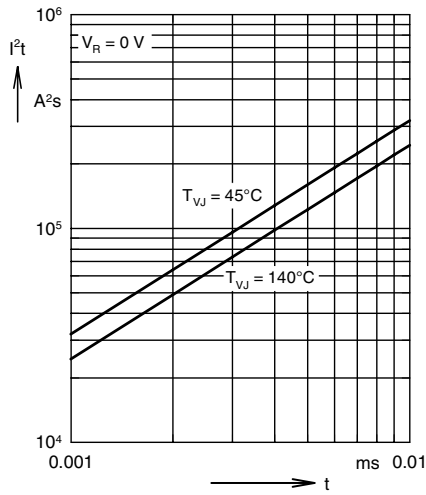


Fig. 4 $\int i^2 dt$ versus time (1-10 ms)

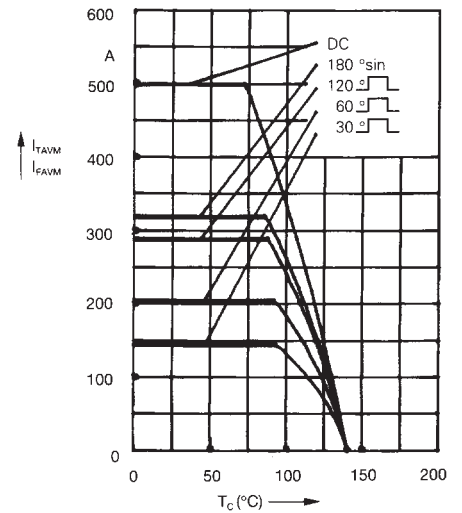


Fig. 4a Maximum forward current at case temperature

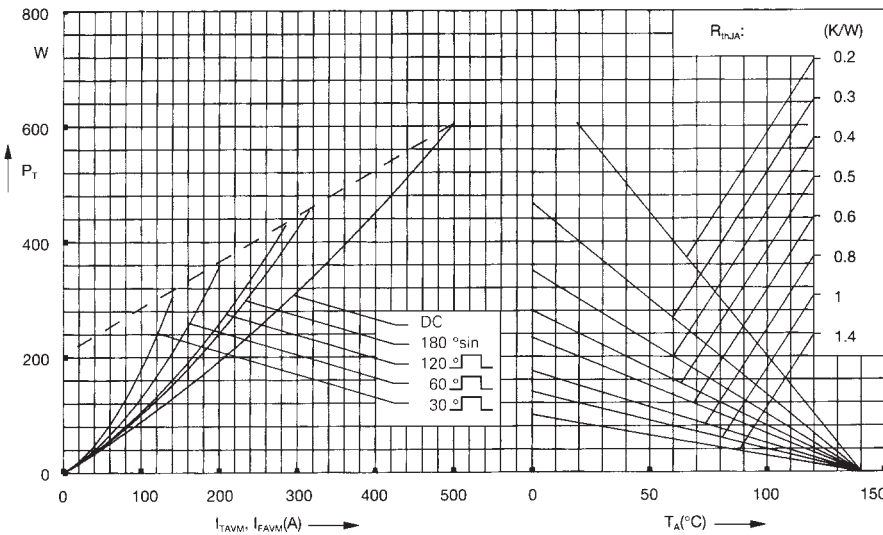


Fig. 5 Power dissipation versus on-state current and ambient temperature (per thyristor or diode)

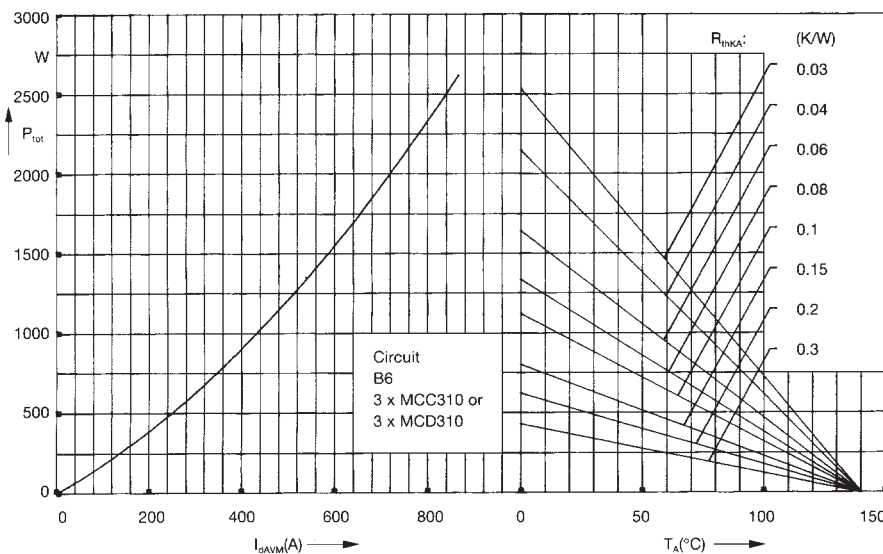


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

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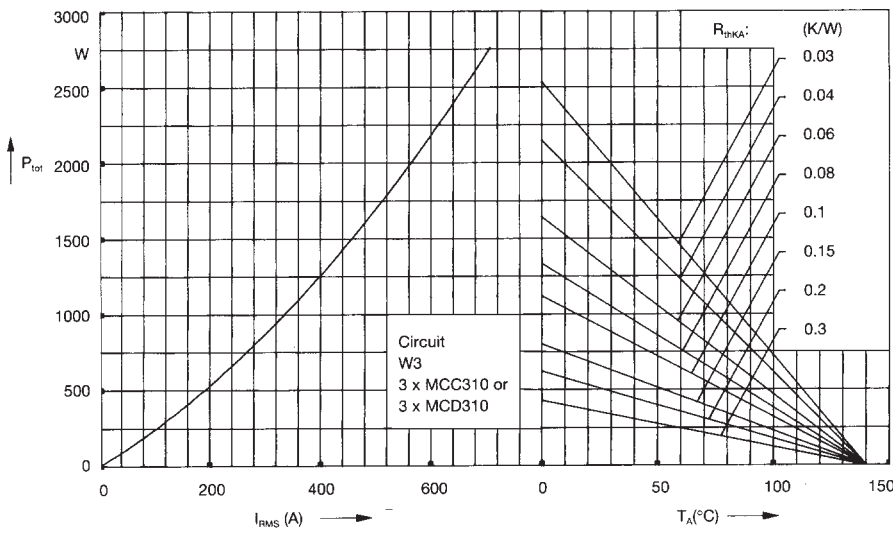


Fig. 7 Three phase AC-controller:
Power dissipation versus RMS
output current and ambient
temperature

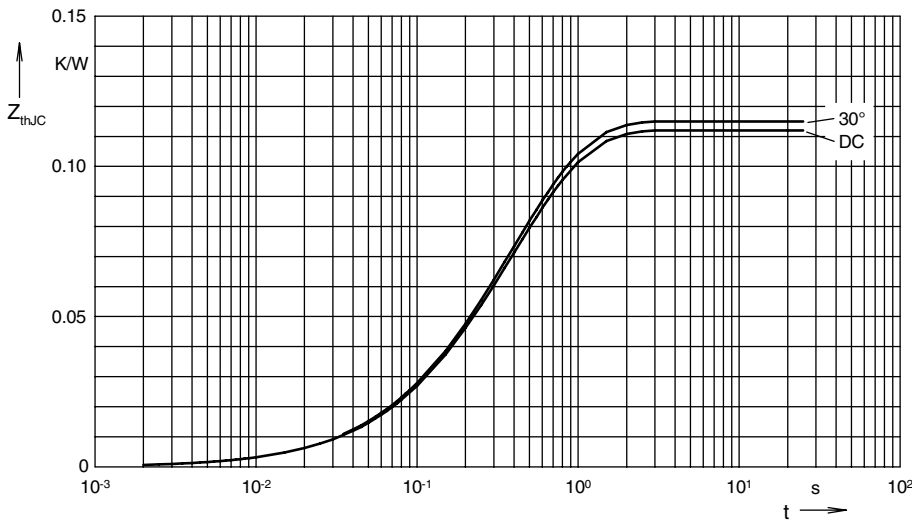


Fig. 8 Transient thermal impedance
junction to case (per thyristor or
diode)

R_{thJC} for various conduction angles d :

d	R_{thJC} (K/W)
DC	0.112
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

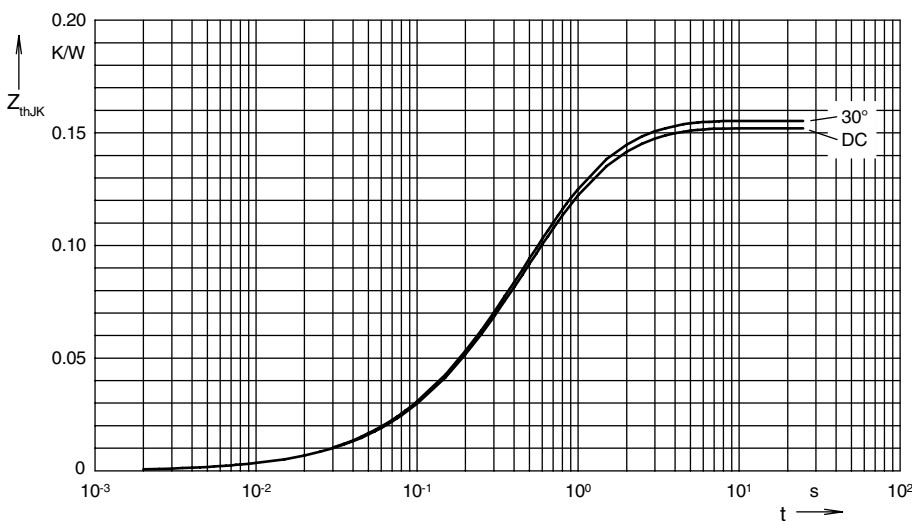


Fig. 9 Transient thermal impedance
junction to heatsink (per thyristor
or diode)

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