Thyristor Modules
Thyristor/Diode Modules

I_{TRMS} = 2x 520 A
I_{TAVM} = 2x 320 A
V_{RRM} = 1200-1800 V

V_{RSM} V_{DSM}	V_{RRM} V_{DRM}	Type	
V	V		
1300	1200	MCC 312-12io1	MCD 312-12io1
1500	1400	MCC 312-14io1	MCD 312-14io1
1700	1600	MCC 312-16io1	MCD 312-16io1
1900	1800	MCC 312-18io1	MCD 312-18io1

MCC

MCD
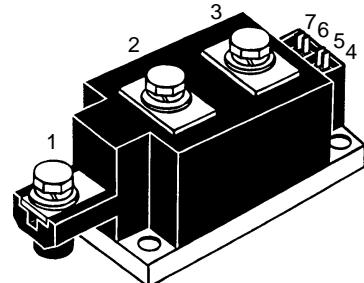
Symbol	Test Conditions		Maximum Ratings	
I_{TRMS}, I_{FRMS}	$T_{VJ} = T_{VJM}$		520	A
I_{TAVM}, I_{FAVM}	$T_C = 85°C$; 180° sine		320	A
I_{TSM}, I_{FSM}	$T_{VJ} = 45°C$;	t = 10 ms (50 Hz)	9200	A
	$V_R = 0$	t = 8.3 ms (60 Hz)	10100	A
	$T_{VJ} = T_{VJM}$	t = 10 ms (50 Hz)	8000	A
	$V_R = 0$	t = 8.3 ms (60 Hz)	8800	A
$\int i^2 dt$	$T_{VJ} = 45°C$	t = 10 ms (50 Hz)	423 000	A²s
	$V_R = 0$	t = 8.3 ms (60 Hz)	423 000	A²s
	$T_{VJ} = T_{VJM}$	t = 10 ms (50 Hz)	320 000	A²s
	$V_R = 0$	t = 8.3 ms (60 Hz)	321 000	A²s
$(di/dt)_{cr}$	$T_{VJ} = T_{VJM}$ f =50 Hz, t_P =200 μs $V_D = 2/3\ V_{DRM}$	repetitive, I_T = 960 A	100	A/μs
	$I_G = 1$ A, $di_G/dt = 1$ A/μs	non repetitive, $I_T = I_{TAVM}$	500	A/μs
$(dv/dt)_{cr}$	$T_{VJ} = T_{VJM}$; $V_{DR} = 2/3\ V_{DRM}$ $R_{GK} = \infty$; method 1 (linear voltage rise)		1000	V/μs
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	°C
T_{VJM}			140	°C
T_{stg}			-40...+125	°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 (M6)		4.5-7/40-62	Nm/lb.in.
	Terminal connection torque (M8)		11-13/97-115	Nm/lb.in.
Weight	Typical including screws		750	g
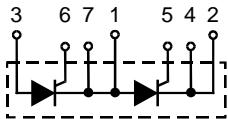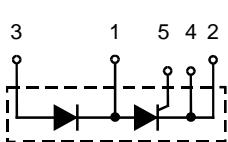
Features
• International standard package
• Direct copper bonded Al_2O_3-ceramic with copper base plate
• Planar passivated chips
• Isolation voltage 3600 V~
•
• Keyed gate/cathode twin pins

Applications
• Motor control, softstarter
• Power converter
• Heat and temperature control for industrial furnaces and chemical processes
• Lighting control
• Solid state switches

Advantages
• Simple mounting
• Improved temperature and power cycling
• Reduced protection circuits

| Symbol	Test Conditions		Characteristic Values	
I_{RRM}, I_{DRM}	$T_{VJ} = T_{VJM}$; $V_R = V_{RRM}$; $V_D = V_{DRM}$		40	mA
V_T, V_F	I_T, I_F = 600 A; $T_{VJ} = 25°C$		1.32	V
V_{T0}	For power-loss calculations only ($T_{VJ} = 140°C$)		0.8	V
r_T			0.68	mΩ
V_{GT}	$V_D = 6$ V;	$T_{VJ} = 25°C$	2	V
		$T_{VJ} = -40°C$	3	V
I_{GT}	$V_D = 6$ V;	$T_{VJ} = 25°C$	150	mA
		$T_{VJ} = -40°C$	220	mA
V_{GD}	$T_{VJ} = T_{VJM}$;	$V_D = 2/3\ V_{DRM}$	0.25	V
I_{GD}	$T_{VJ} = T_{VJM}$;	$V_D = 2/3\ V_{DRM}$	10	mA
I_L	$T_{VJ} = 25°C$; $t_P = 30$ μs; $V_D = 6$ V $I_G = 0.45$ A; $di_G/dt = 0.45$ A/μs		200	mA
I_H	$T_{VJ} = 25°C$; $V_D = 6$ V; $R_{GK} = \infty$		150	mA
t_{gd}	$T_{VJ} = 25°C$; $V_D = 1/2\ V_{DRM}$ $I_G = 1$ A; $di_G/dt = 1$ A/μs		2	μs
t_q	$T_{VJ} = T_{VJM}$; $I_T = 300$ A, $t_P = 200$ μs; $-di/dt = 10$ A/μs typ. $V_R = 100$ V; $dv/dt = 50$ V/μs; $V_D = 2/3\ V_{DRM}$		200	μs
Q_S	$T_{VJ} = 125°C$; I_T, $I_F = 300$ A; $-di/dt = 50$ A/μs		760	μC
I_{RM}			275	A
R_{thJC}	per thyristor (diode); DC current	other values	0.12	K/W
	per module	see Fig. 8/9	0.06	K/W
R_{thJK}	per thyristor (diode); DC current		0.16	K/W
	per module		0.08	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
Keyed Gate/Cathode twin plugs with wire length = 350 mm, gate = yellow, cathode = red
Type **ZY 180 L** (L = Left for pin pair 4/5)   ⎫   UL 758, style 1385,
Type **ZY 180 R** (R = Right for pin pair 6/7)   ⎬   CSA class 5851, guide 460-1-1

Fig. 1 Gate trigger characteristics

1: I_{GT}, $T_{VJ} = 140°C$
2: I_{GT}, $T_{VJ} = 25°C$
3: I_{GT}, $T_{VJ} = -40°C$
4: P_{GM} = 20 W
5: P_{GM} = 60 W
6: P_{GM} = 120 W
I_{GD}, $T_{VJ} = 140°C$
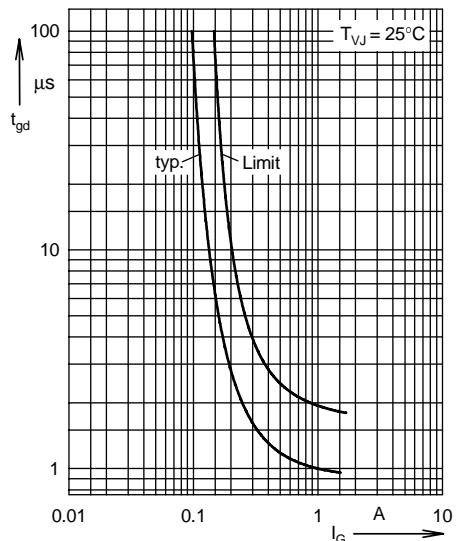
Fig. 2 Gate trigger delay time

**Dimensions in mm (1 mm = 0.0394")**

MCC

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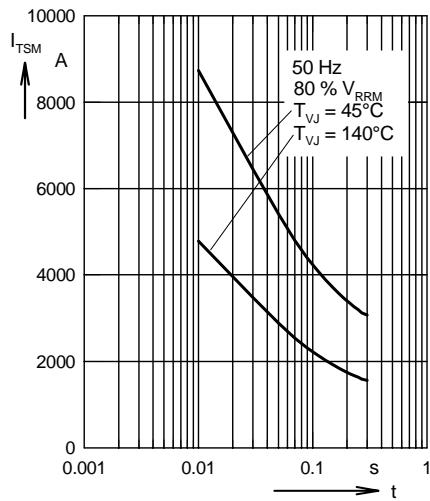
Fig. 3 Surge overload current
I_{TSM}, I_{FSM}: Crest value, t: duration
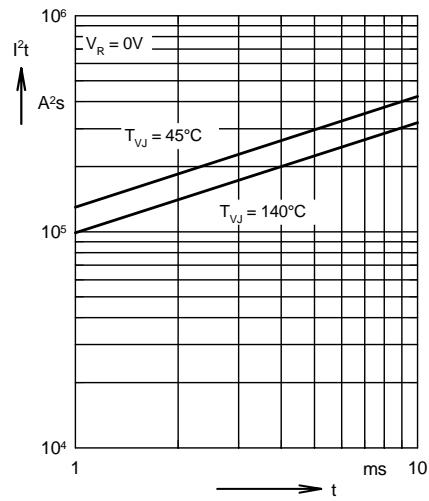

Fig. 4 I²t versus time (1-10 ms)
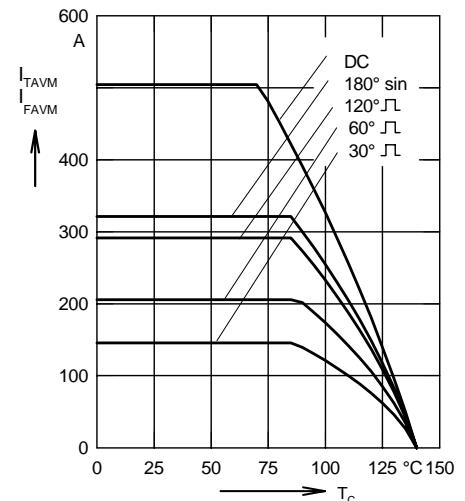
Fig. 4a Maximum forward current
at case temperature
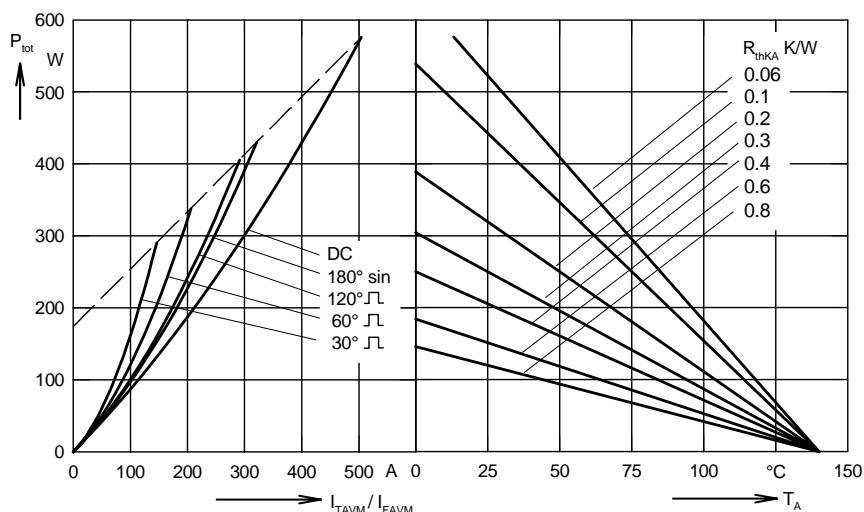
Fig. 5 Power dissipation versus on-
state current and ambient
temperature (per thyristor or
diode)
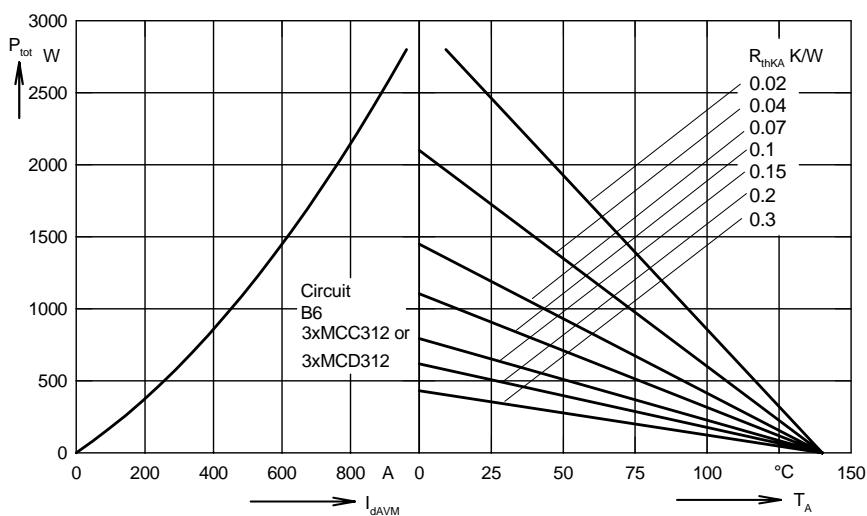
Fig. 6 Three phase rectifier bridge:
Power dissipation versus direct
output current and ambient
temperature
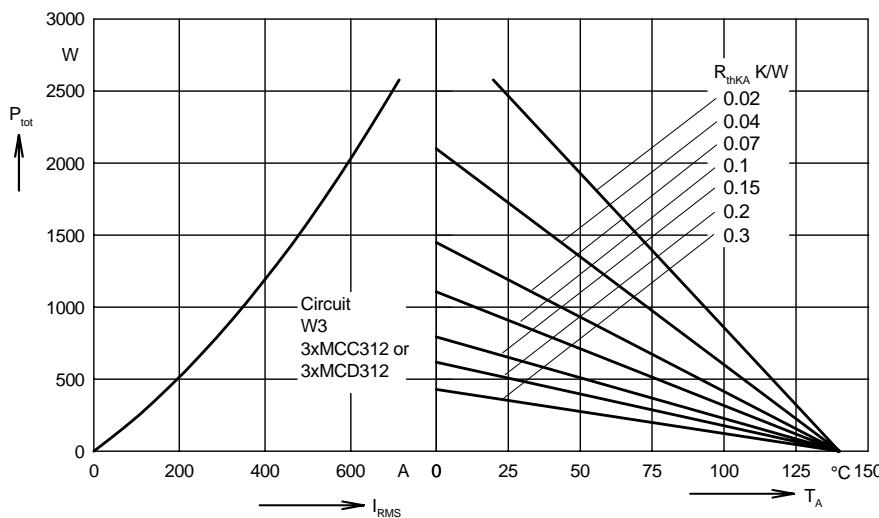
Fig. 7 Three phase AC-controller:
Power dissipation versus RMS
output current and ambient
temperature
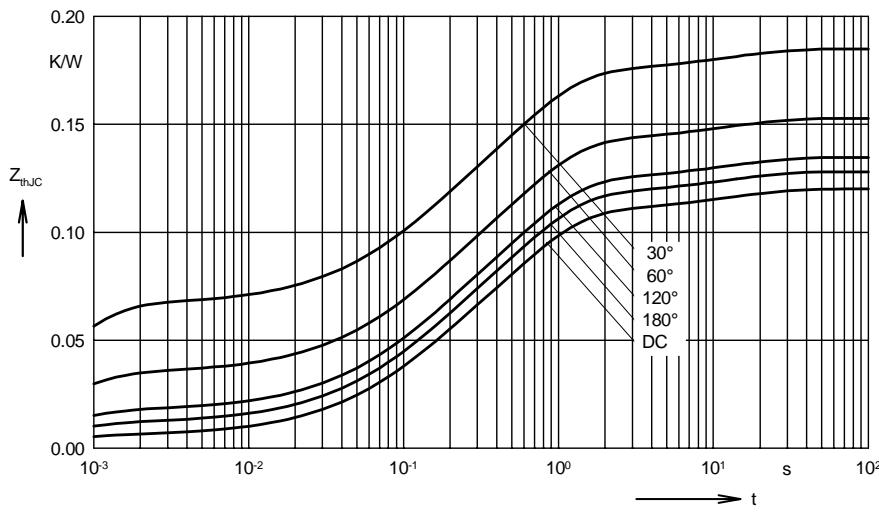
Fig. 8 Transient thermal impedance
junction to case (per thyristor or
diode)

R_{thJC} for various conduction angles d:

d	R_{thJC} (K/W)
DC	0.120
180°	0.128
120°	0.135
60°	0.153
30°	0.185

Constants for Z_{thJC} calculation:

| i	R_{thi} (K/W)	t_i (s)
1	0.0058	0.00054
2	0.031	0.098
3	0.072	0.54
4	0.0112	12
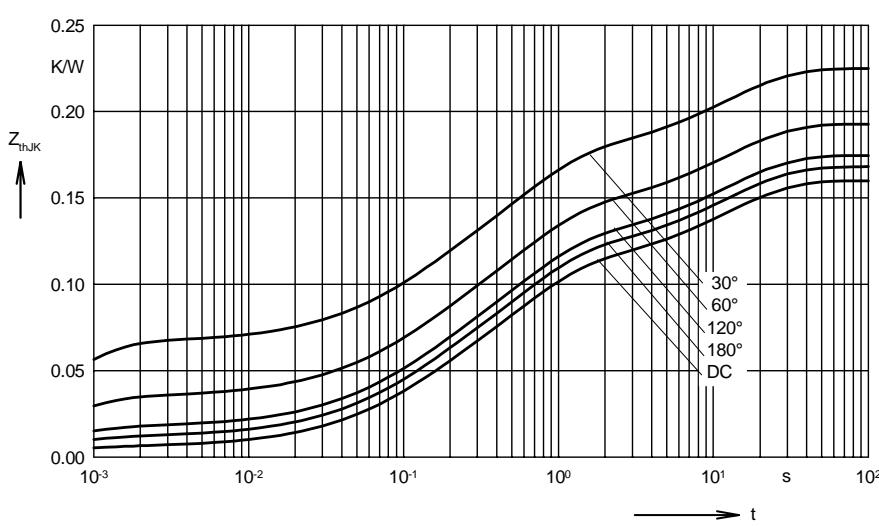
Fig. 9 Transient thermal impedance
junction to heatsink (per thyristor
or diode)

R_{thJK} for various conduction angles d:

d	R_{thJK} (K/W)
DC	0.160
180°	0.168
120°	0.175
60°	0.193
30°	0.225

Constants for Z_{thJK} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.0058	0.00054
2	0.031	0.098
3	0.072	0.54
4	0.0112	12
5	0.04	12