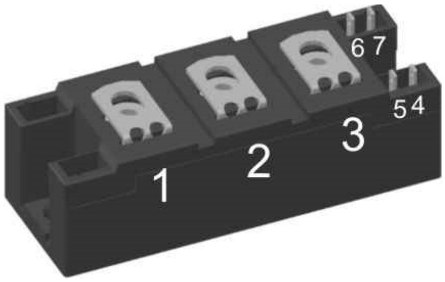
Thyristor Module

V_{RRM}	=	2x 1800 V
I_{TAV}	=	216 A
V_T	=	1.1 V

Phase leg

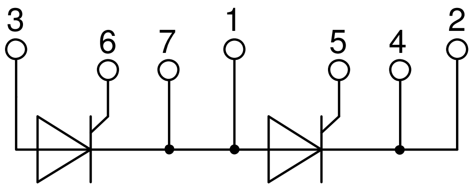
Part number

MCC200-18io1



Backside: isolated

E72873



Features / Advantages:

- Thyristor for line frequency
- Planar passivated chip
- Long-term stability
- Direct Copper Bonded Al2O3-ceramic

Applications:

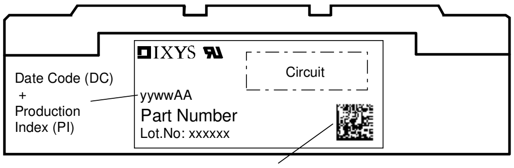
- Line rectifying 50/60 Hz
- Softstart AC motor control
- DC Motor control
- Power converter
- AC power control
- Lighting and temperature control

Package: Y4

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

Thyristor				Ratings			
Symbol	**Definition**	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
$V_{RSM/DSM}$	*max. non-repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			1900	V
$V_{RRM/DRM}$	*max. repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			1800	V
$I_{R/D}$	*reverse current, drain current*	$V_{R/D}$ = 1800 V	T_{VJ} = 25°C			400	µA
		$V_{R/D}$ = 1800 V	T_{VJ} = 125°C			15	mA
V_T	*forward voltage drop*	I_T = 200 A	T_{VJ} = 25°C			1.20	V
		I_T = 400 A				1.52	V
		I_T = 200 A	T_{VJ} = 125°C			1.10	V
		I_T = 400 A				1.50	V
I_{TAV}	*average forward current*	T_C = 85°C	T_{VJ} = 125°C			216	A
$I_{T(RMS)}$	*RMS forward current*	180° sine				340	A
V_{T0}	*threshold voltage*	*for power loss calculation only*	T_{VJ} = 125°C			0.80	V
r_T	*slope resistance*					1.4	mΩ
R_{thJC}	*thermal resistance junction to case*					0.13	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.050		K/W
P_{tot}	*total power dissipation*		T_C = 25°C			770	W
I_{TSM}	*max. forward surge current*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			8.00	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			8.64	kA
		t = 10 ms; (50 Hz), sine	T_{VJ} = 125°C			6.80	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			7.35	kA
I^2t	*value for fusing*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			320.0	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			310.5	kA²s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 125°C			231.2	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			224.4	kA²s
C_J	*junction capacitance*	V_R = 400 V f = 1 MHz	T_{VJ} = 25°C		366		pF
P_{GM}	*max. gate power dissipation*	t_P = 30 µs	T_C = 125°C			120	W
		t_P = 500 µs				60	W
P_{GAV}	*average gate power dissipation*					20	W
$(di/dt)_{cr}$	*critical rate of rise of current*	T_{VJ} = 125°C; f = 50 Hz	repetitive, I_T = 600 A			100	A/µs
		t_P = 200 µs; di_G/dt = 0.5 A/µs;					
		I_G = 0.5 A; V = ⅔ V_{DRM}	non-repet., I_T = 200 A			500	A/µs
$(dv/dt)_{cr}$	*critical rate of rise of voltage*	V = ⅔ V_{DRM}	T_{VJ} = 125°C			1000	V/µs
		R_{GK} = ∞; method 1 (linear voltage rise)					
V_{GT}	*gate trigger voltage*	V_D = 6 V	T_{VJ} = 25°C			2	V
			T_{VJ} = -40°C			3	V
I_{GT}	*gate trigger current*	V_D = 6 V	T_{VJ} = 25°C			150	mA
			T_{VJ} = -40°C			220	mA
V_{GD}	*gate non-trigger voltage*	V_D = ⅔ V_{DRM}	T_{VJ} = 125°C			0.25	V
I_{GD}	*gate non-trigger current*					10	mA
I_L	*latching current*	t_p = 30 µs	T_{VJ} = 25°C			200	mA
		I_G = 0.5 A; di_G/dt = 0.5 A/µs					
I_H	*holding current*	V_D = 6 V R_{GK} = ∞	T_{VJ} = 25°C			150	mA
t_{gd}	*gate controlled delay time*	V_D = ½ V_{DRM}	T_{VJ} = 25°C			2	µs
		I_G = 0.5 A; di_G/dt = 0.5 A/µs					
t_q	*turn-off time*	V_R = 100 V; I_T = 300 A; V = ⅔ V_{DRM}	T_{VJ} = 100 °C		200		µs
		di/dt = 10 A/µs dv/dt = 50 V/µs t_p = 200 µs					

Package Y4				Ratings			
Symbol	**Definition**	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
I_{RMS}	*RMS current*	per terminal				300	A
T_{VJ}	*virtual junction temperature*			-40		125	°C
T_{op}	*operation temperature*			-40		100	°C
T_{stg}	*storage temperature*			-40		125	°C
Weight					150		g
M_D	*mounting torque*			2.25		2.75	Nm
M_T	*terminal torque*			4.5		5.5	Nm
$d_{Spp/App}$	*creepage distance on surface | striking distance through air*	*terminal to terminal*	14.0	10.0			mm
$d_{Spb/Apb}$		*terminal to backside*	16.0	16.0			mm
V_{ISOL}	*isolation voltage*	t = 1 second; 50/60 Hz, RMS; I_{ISOL} ≤ 1 mA		3600			V
		t = 1 minute		3000			V

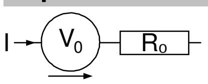


Data Matrix: *part no.* (1-19), DC + *PI* (20-25), *lot.no.#* (26-31), *blank* (32), *serial no.#* (33-36)

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCC200-18io1	MCC200-18io1	Box	6	497479

Equivalent Circuits for Simulation

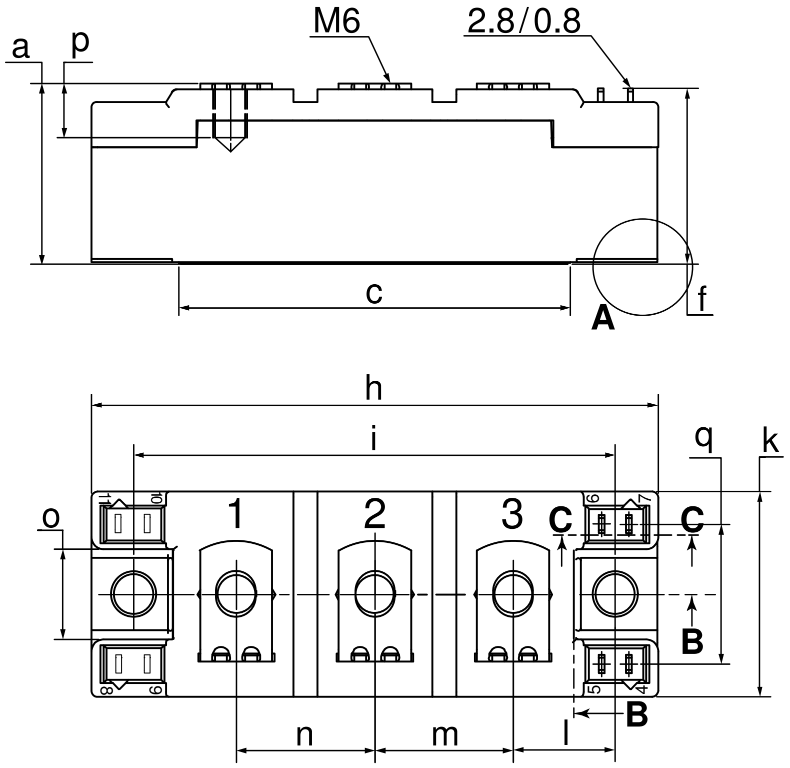
** on die level* $T_{VJ} = 125\,°C$



Thyristor

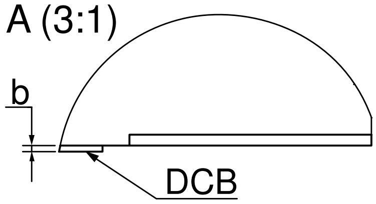
$V_{0\,max}$	*threshold voltage*	0.8	V
$R_{0\,max}$	*slope resistance **	0.7	mΩ

Outlines Y4

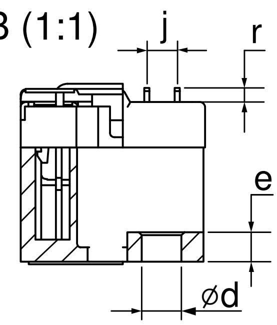


Dim.	MIN [mm]	MAX [mm]	MIN [inch]	MAX [inch]
a	30.0	30.6	1.181	1.205
b	typ. 0.25		typ. 0.010	
c	64.0	65.0	2.520	2.559
d	6.5	7.0	0.256	0.275
e	4.9	5.1	0.193	0.201
f	28.6	29.2	1.126	1.150
g	7.3	7.7	0.287	0.303
h	93.5	94.5	3.681	3.720
i	79.5	80.5	3.130	3.169
j	4.8	5.2	0.189	0.205
k	33.4	34.0	1.315	1.339
l	16.7	17.3	0.657	0.681
m	22.7	23.3	0.894	0.917
n	22.7	23.3	0.894	0.917
o	14.0	15.0	0.551	0.591
p	typ. 10.5		typ. 0.413	
q	22.8	23.3	0.898	0.917
r	1.8	2.4	0.071	0.041

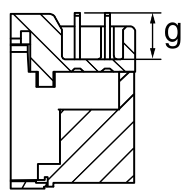
A (3:1)

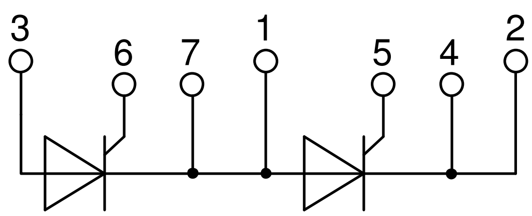


B-B (1:1)



C-C (1:1)





Thyristor

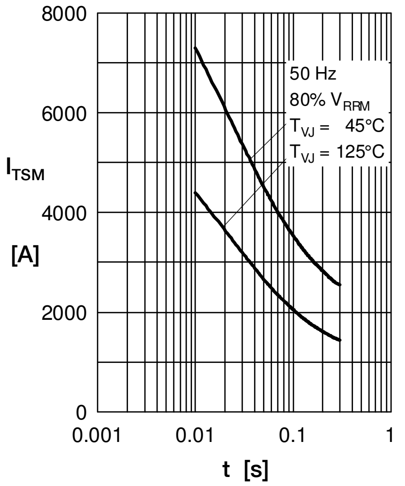


Fig. 1 Surge overload current I_{TSM}, I_{FSM}: Crest value, t: duration

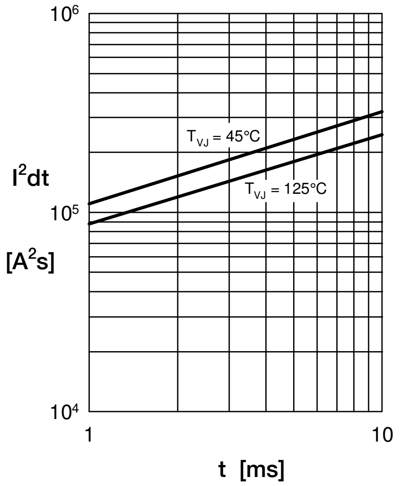


Fig. 2 I^2t versus time (1-10 ms)

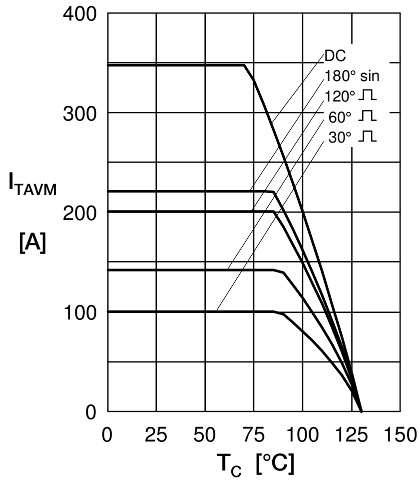


Fig. 3 Max. forward current at case temperature

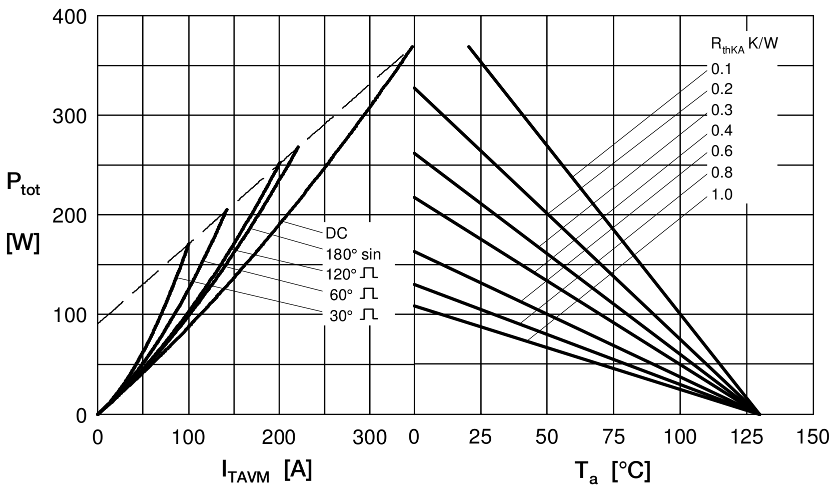


Fig. 4 Power dissipation vs. on-state current & ambient temperature (per thyristor or diode)

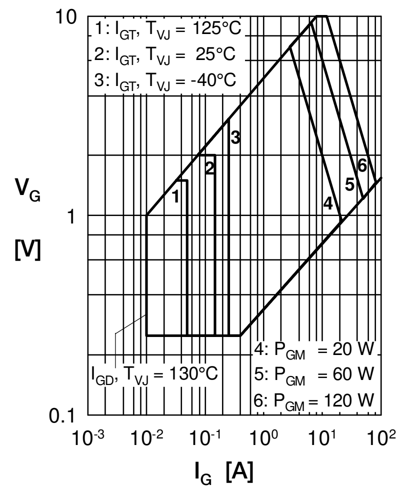


Fig. 5 Gate trigger characteristics

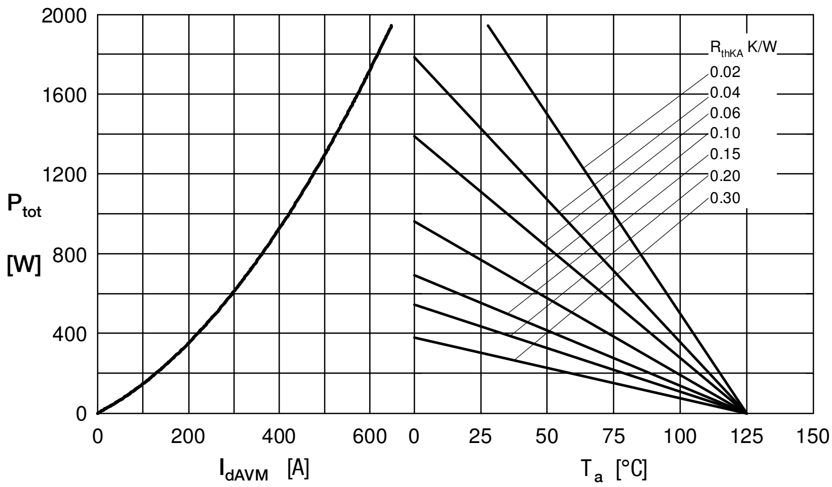


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

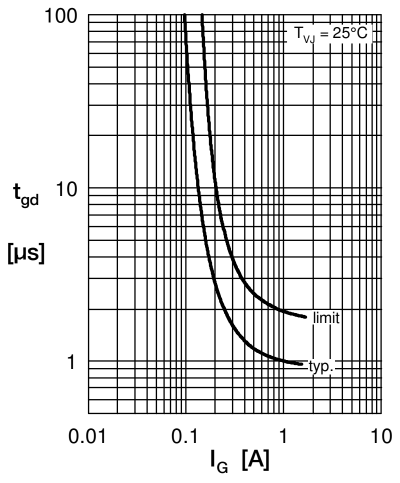


Fig. 7 Gate trigger delay time

Thyristor

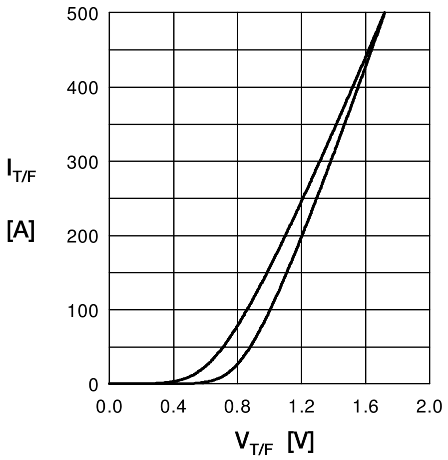


Fig. 8 Forward current versus voltage drop

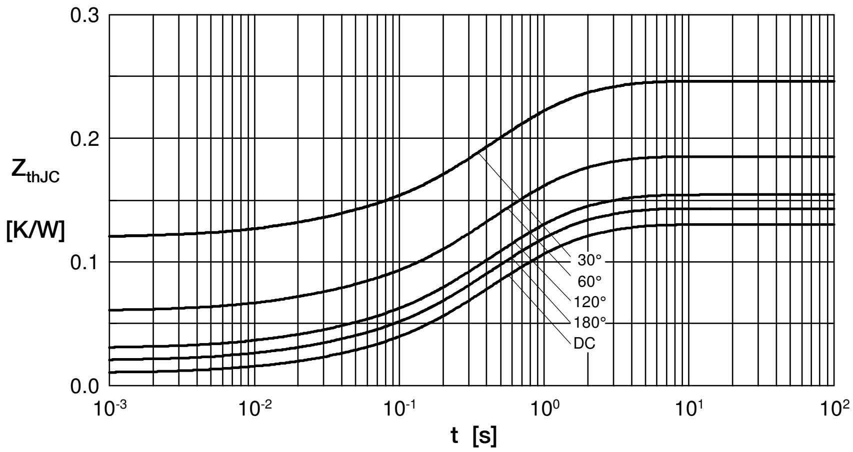


Fig. 9 Transient thermal impedance junction to case at various conduction angles

Constants for Z_{thJC} calculation:

i	R_{thi} [K/W]	t_i [s]
1	0.0100	0.00014
2	0.0065	0.019
3	0.0250	0.180
4	0.0615	0.520
5	0.0270	1.600

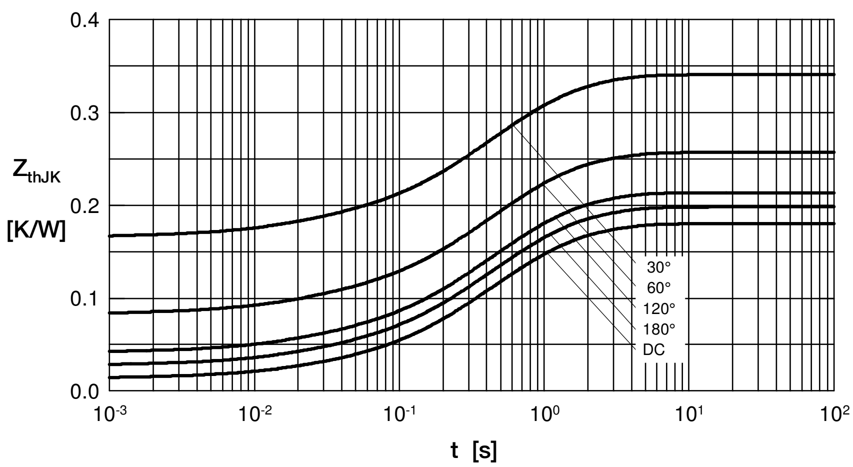


Fig. 10 Transient thermal impedance junction to heatsink (per thyristor/diode)