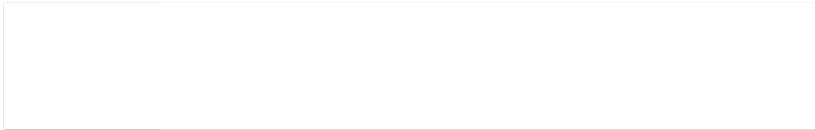


Thyristor \ Diode Module



Phase leg

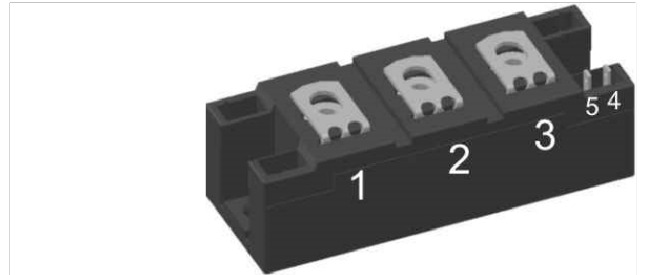
$$V_{RRM} = 2 \times 1600 \text{ V}$$

$$I_{TAV} = 216 \text{ A}$$

$$V_T = 1.1 \text{ V}$$

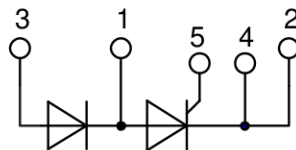
Part number

MCD200-16io1



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

Terms Conditions of usage:

The data contained in this product data sheet is exclusively intended for technically trained staff. The user will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to his application. The specifications of our components may not be considered as an assurance of component characteristics. The information in the valid application- and assembly notes must be considered. Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of your product, please contact the sales office, which is responsible for you.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact the sales office, which is responsible for you.

Should you intend to use the product in aviation, in health or life endangering or life support applications, please notify. For any such application we urgently recommend

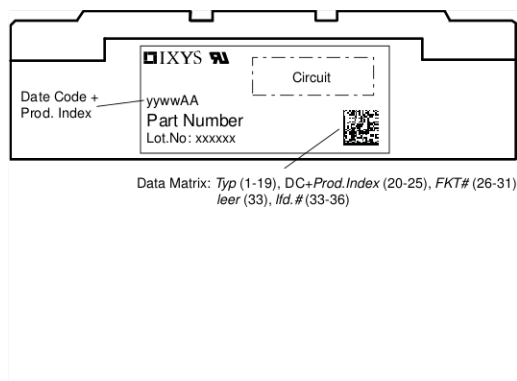
- to perform joint risk and quality assessments;

- the conclusion of quality agreements;

- to establish joint measures of an ongoing product survey, and that we may make delivery dependent on the realization of any such measures.

Rectifier				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
V _{RSM/DSM}	max. non-repetitive reverse/forward blocking voltage	T _{VJ} = 25°C				1700	V
V _{RRM/DRM}	max. repetitive reverse/forward blocking voltage	T _{VJ} = 25°C				1600	V
I _{R/D}	reverse current, drain current	V _{R/D} = 1600 V	T _{VJ} = 25°C			400	μA
		V _{R/D} = 1600 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				0.05		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 ² t	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					

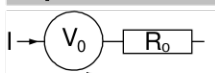
Package Y4				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
I_{RMS}	RMS current	per terminal				300	A
T_{VJ}	virtual junction temperature			-40		125	°C
T_{op}	operation temperature			-40		100	°C
T_{stg}	storage temperature			-40		125	°C
Weight					150		g
M_D	mounting torque			2.25		2.75	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; $I_{ISOL} \leq 1$ mA	3600			V
		t = 1 minute		3000			V



Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCD200-16io1	MCD200-16io1	Box	6	498269

Equivalent Circuits for Simulation

* on die level

 $T_{VJ} = 125^\circ\text{C}$ 

Thyristor

 $V_{0\max}$ threshold voltage

0.8

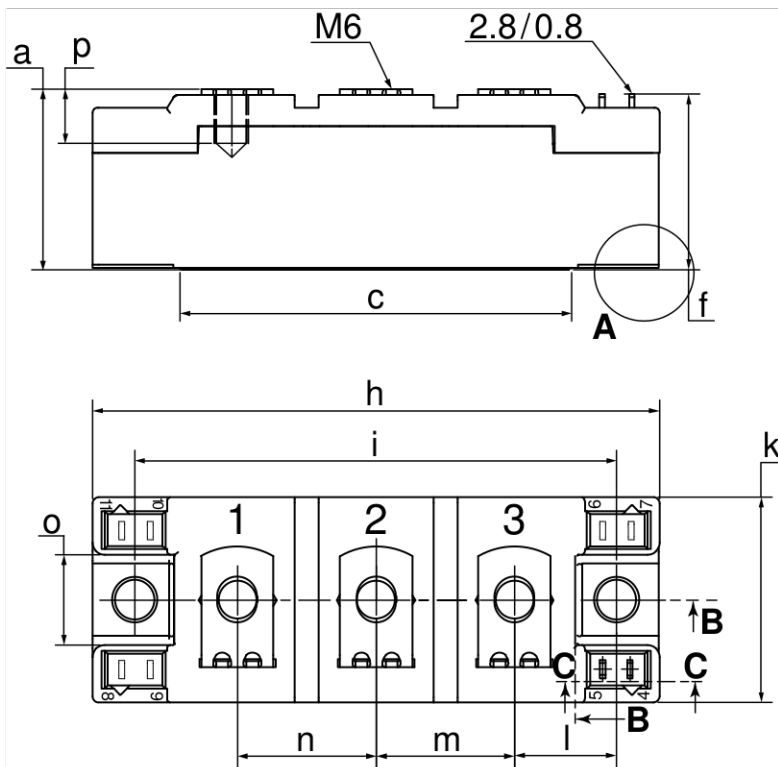
V

 $R_{0\max}$ slope resistance *

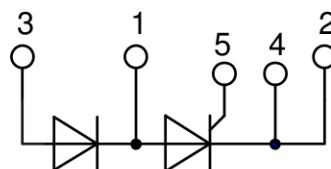
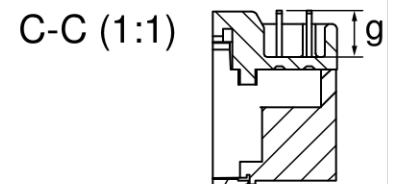
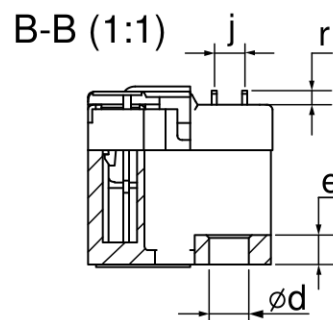
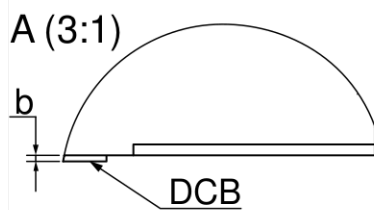
0.7

mΩ

Outlines Y4



Dim.	MIN [mm]	MIN [mm]	MIN [inch]	MIN [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	
r	1.8	2.4	0.071	0.041



Thyristor

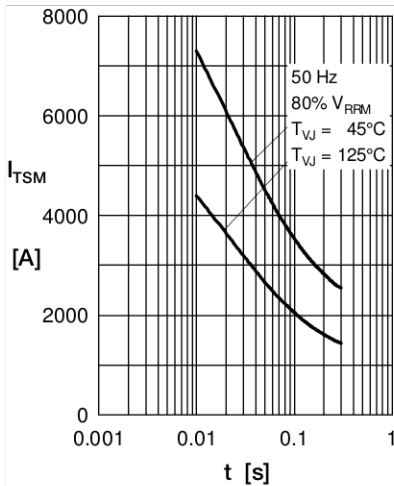


Fig. 1 Surge overload current I_{TSM} ,
 I_{FSM} : Crest value, t : duration

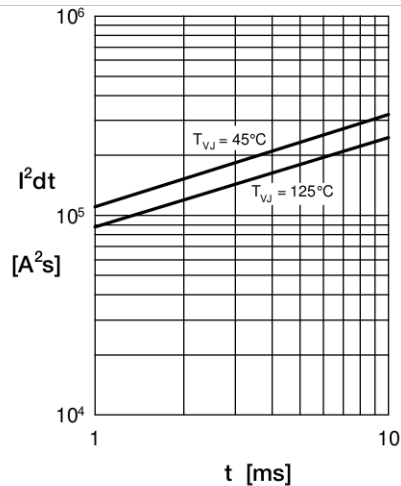


Fig. 2 I^2t versus time (1-10 ms)

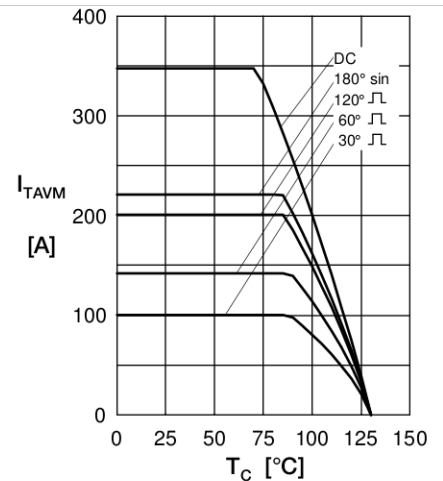


Fig. 3 Max. forward current
at case temperature

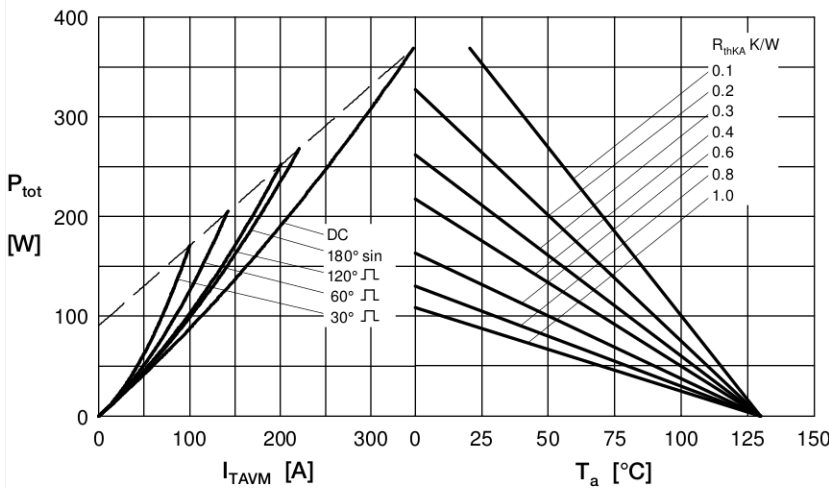


Fig. 4 Power dissipation vs. on-state current & ambient temperature
(per thyristor or diode)

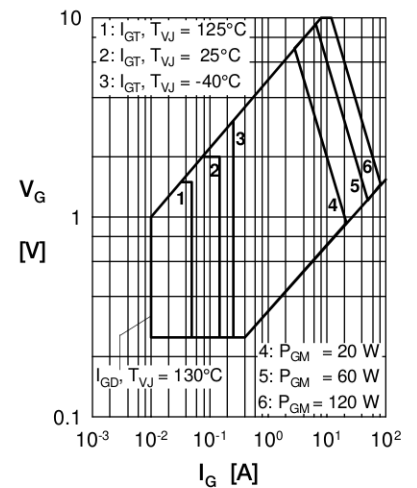


Fig. 5 Gate trigger characteristics

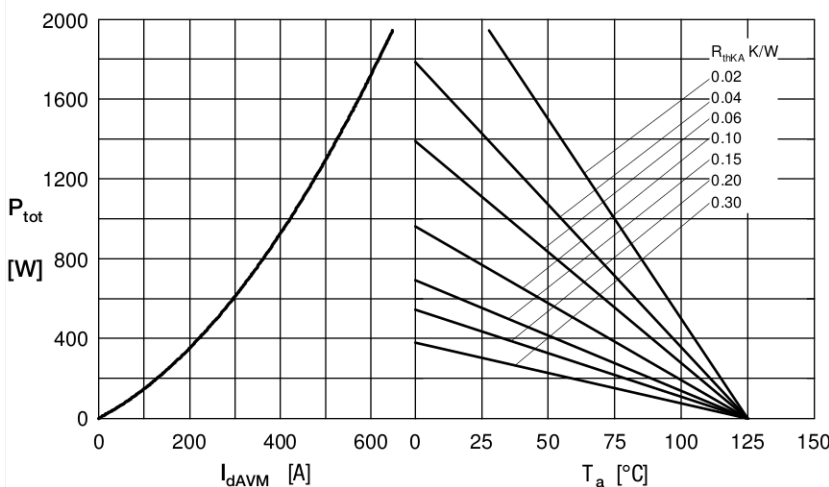


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct
output current and ambient temperature

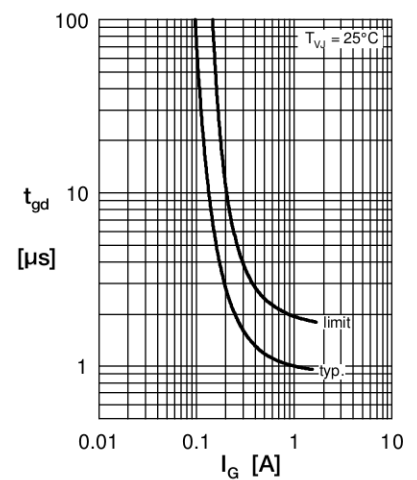


Fig. 7 Gate trigger delay time

Rectifier

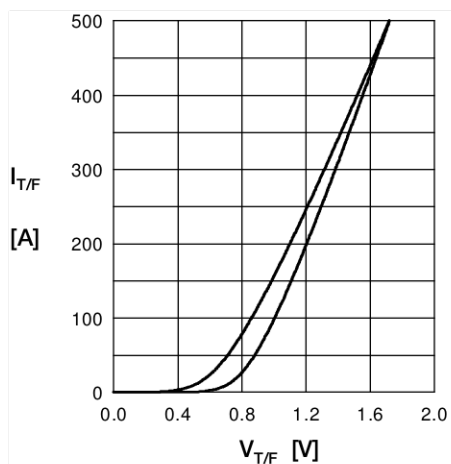


Fig. 8 Forward current versus voltage drop

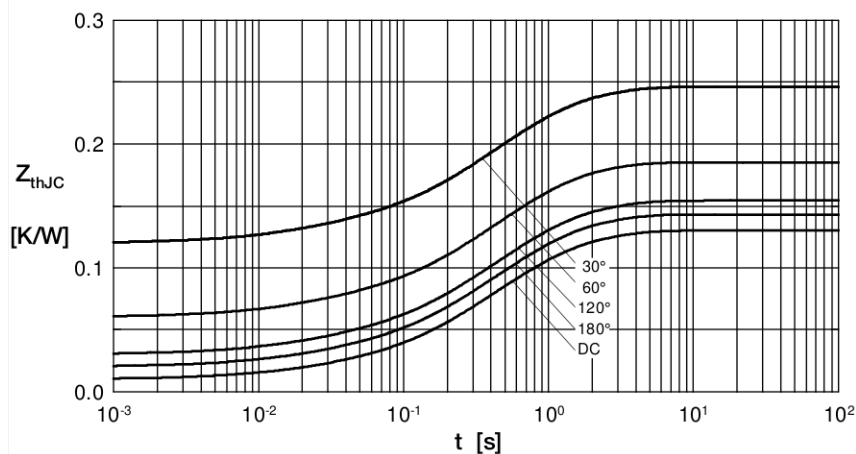


Fig. 9 Transient thermal impedance junction to case at various conduction angles

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

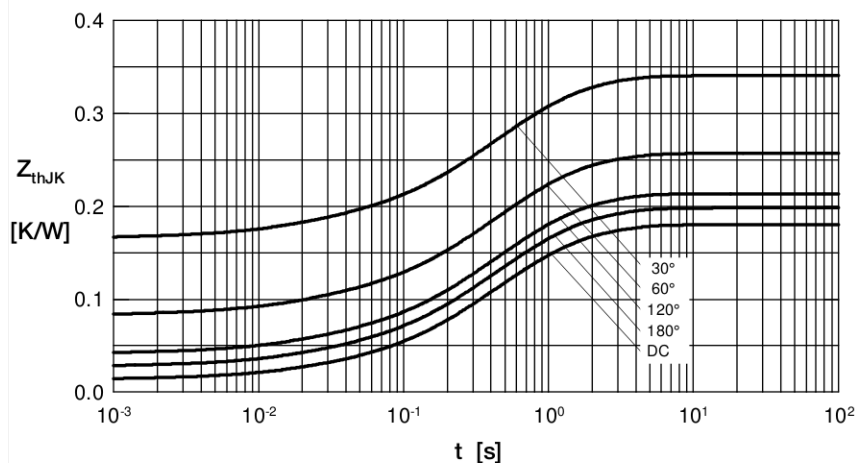


Fig. 10 Transient thermal impedance junction to heatsink (per thyristor/diode)