Thyristor \ Diode Module

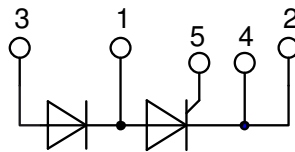|		
V_{RRM}	$=$	$2 \times 1400\,V$
I_{TAV}	$=$	$216\,A$
V_T	$=$	$1.1\,V$

Phase leg

Part number

MCD200-14io1
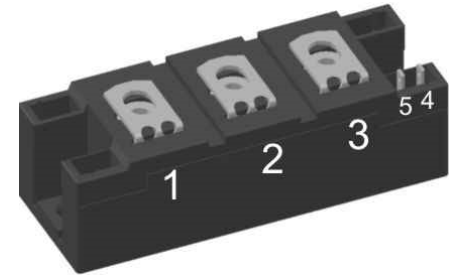
Backside: isolated

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

Rectifier

Ratings

Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25°C$				1500	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25°C$				1400	V
$I_{R/D}$	reverse current, drain current	$V_{R/D} = 1400$ V	$T_{VJ} = 25°C$			400	µA
		$V_{R/D} = 1400$ 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
I²t	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

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		3600			V
		t = 1 minute 50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA		3000			V
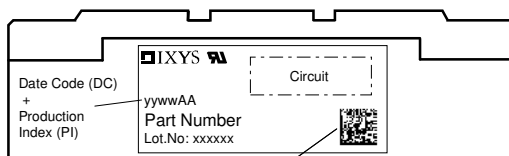
Data Matrix: *part no.* (1-19), DC + *PI* (20-25), *lot.no.#* (26-31), *blank* (32), *serial no.#* (33-36)

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCD200-14io1	MCD200-14io1	Box	6	498270

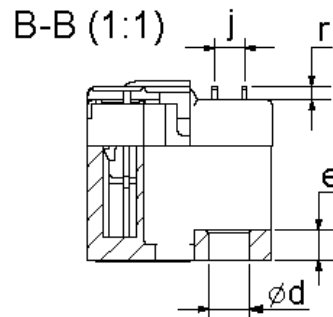## Equivalent Circuits for Simulation   ** on die level* $T_{VJ} = 125\,°C$

Thyristor

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

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Outlines   Y4
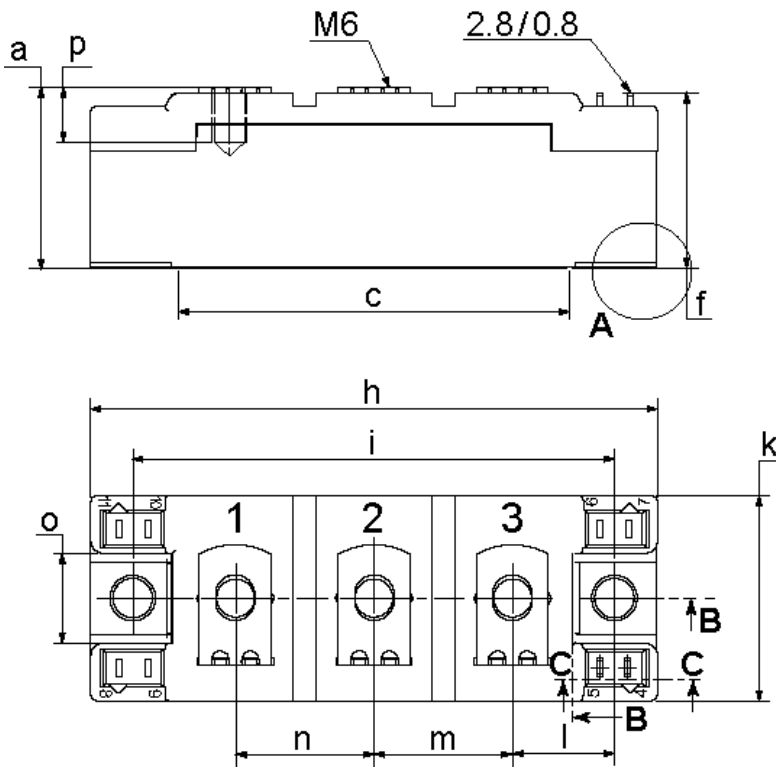
Dim.	MIN [mm]	MAX [mm]	MIN [inch]	MAX [inch]
a	30.0	30.6	1.181	1.205
b	typ. 0.25		typ. 0.010	
c	64.0	65.0	2.520	2.559
d	6.5	7.0	0.256	0.275
e	4.9	5.1	0.193	0.201
f	28.6	29.2	1.126	1.150
g	7.3	7.7	0.287	0.303
h	93.5	94.5	3.681	3.720
i	79.5	80.5	3.130	3.169
j	4.8	5.2	0.189	0.205
k	33.4	34.0	1.315	1.339
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	
r	1.8	2.4	0.071	0.041

A (3:1)

B-B (1:1)

C-C (1:1)

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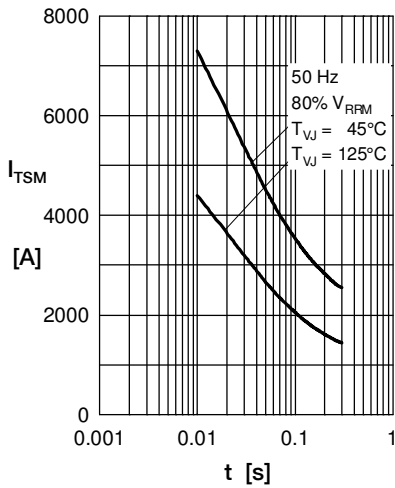© 2016 IXYS all rights reserved
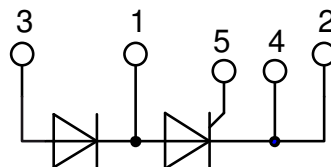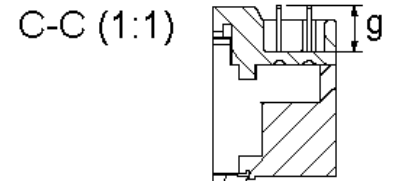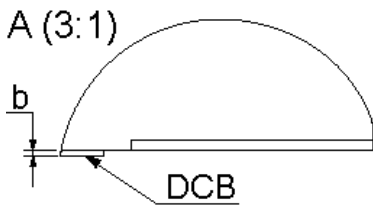
Thyristor

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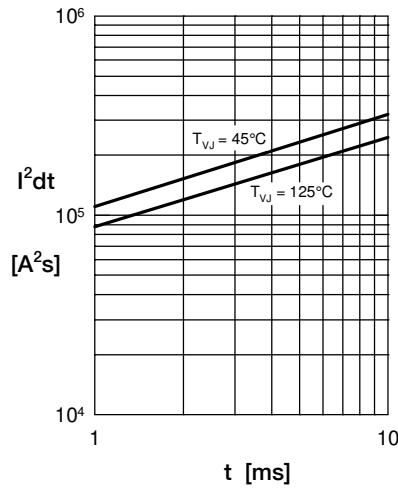

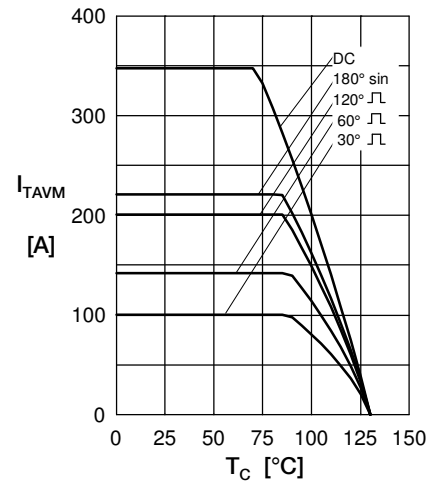Fig. 2 I^2t versus time (1-10 ms)

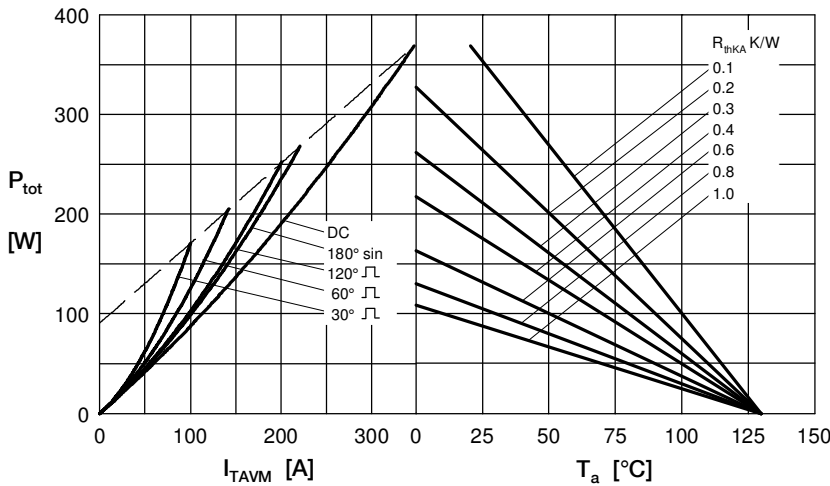Fig. 3 Max. forward current at case temperature

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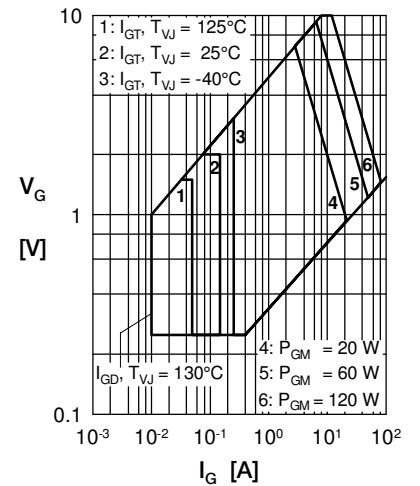

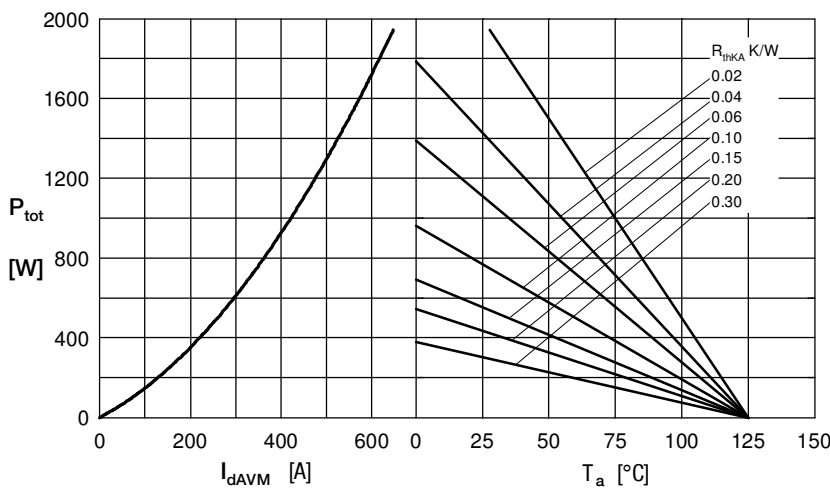Fig. 5 Gate trigger characteristics

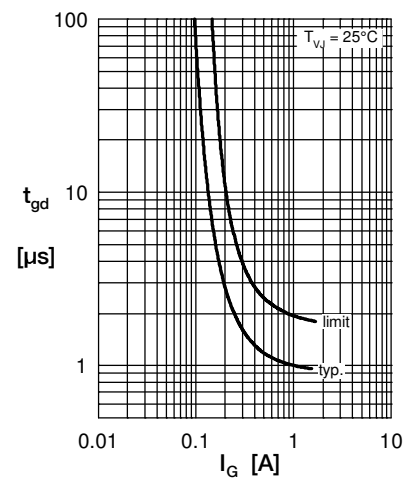Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

Fig. 7 Gate trigger delay time

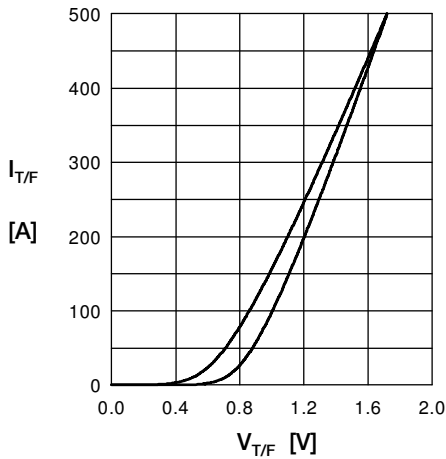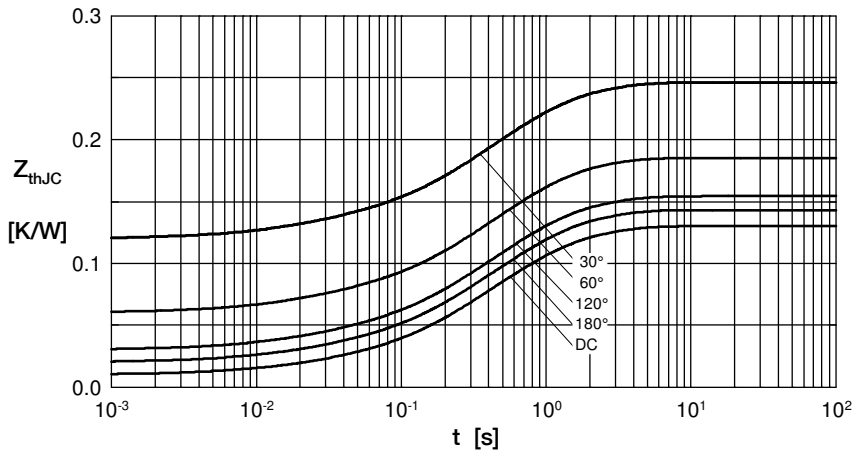IXYS reserves the right to change limits, conditions and dimensions.

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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:

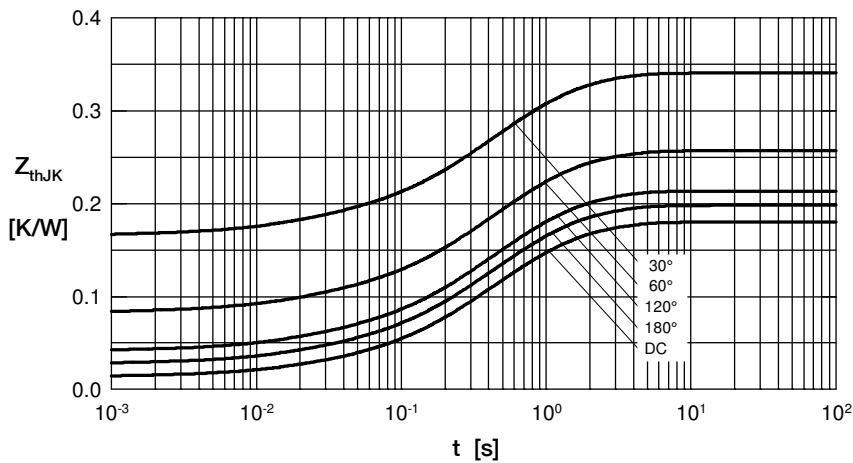| i	R_{thi} [K/W]	t_i [s]
1	0.0100	0.00014
2	0.0065	0.019
3	0.0250	0.180
4	0.0615	0.520
5	0.0270	1.600

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

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