# imall

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**Thyristor Module** 

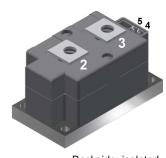
### MCO500-18io1

$V_{\text{RRM}}$	=	1800 V
I <sub>tav</sub>	=	560 A
V <sub>T</sub>	=	1.01 V

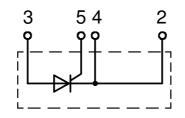
Single Thyristor

### Part number

### MCO500-18io1



Backside: isolated **E**72873



#### 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: Y1

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: Copper
- internally DCB isolated
- 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 your local sales office. Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact your local sales office. 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.

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

Data according to IEC 60747and per semiconductor unless otherwise specified

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### MCO500-18io1

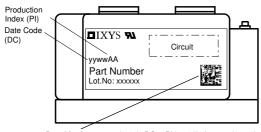
Thyristo					Ratings	l I	
Symbol	Definition	Conditions		min.	typ.	max.	Uni
V <sub>RSM/DSM</sub>	max. non-repetitive reverse/forwa		$T_{VJ} = 25^{\circ}C$			1900	V
V <sub>RRM/DRM</sub>	max. repetitive reverse/forward b		$T_{VJ} = 25^{\circ}C$			1800	۷
R/D	reverse current, drain current	V <sub>R/D</sub> = 1800 V	$T_{vJ} = 25^{\circ}C$			2	mA
	V <sub>R/D</sub> = 1800 V	$T_{VJ} = 125^{\circ}C$			40	mA	
V <sub>T</sub>	forward voltage drop	$I_{T} = 500 \text{ A}$	$T_{VJ} = 25^{\circ}C$			1.08	۷
		I <sub>T</sub> =1000 A				1.27	۷
		$I_{T} = 500 \text{ A}$	$T_{vJ} = 125 \degree C$			1.01	٧
		I <sub>T</sub> =1000 A				1.24	V
ITAV	average forward current	$T_c = 85^{\circ}C$	$T_{vJ} = 140^{\circ}C$			560	A
T(RMS)	RMS forward current	180° sine				880	A
ν <sub>το</sub>	threshold voltage		T <sub>v.i</sub> = 140°C			0.80	٧
r <sub>T</sub>	slope resistance } for power l	oss calculation only				0.38	mΩ
R <sub>thJC</sub>	thermal resistance junction to cas	Se				0.072	K/W
R <sub>thCH</sub>	thermal resistance case to heatsi				0.024		K/W
P <sub>tot</sub>	total power dissipation		$T_c = 25^{\circ}C$			1600	W
I <sub>TSM</sub>	max. forward surge current	t = 10 ms; (50 Hz), sine	$T_{v_1} = 45^{\circ}C$			17.0	kA
•TSM		t = 8,3 ms; (60 Hz), sine	$V_{\rm N} = 0 V$			18.4	kA
		t = 0.0  ms; (00  Hz);  sine t = 10  ms; (50  Hz),  sine	$T_{V,I} = 140^{\circ}C$			14.5	kA
124	value for fueing	t = 8,3 ms; (60 Hz), sine	$\frac{V_{R} = 0 V}{T_{R} + 45\%}$			15.6	kA
l²t	value for fusing	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45^{\circ}C$				MA <sup>2</sup> s
		t = 8,3 ms; (60 Hz), sine	$V_{\rm R} = 0 V$				MA <sup>2</sup> s
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 140 ^{\circ}\text{C}$				MA <sup>2</sup> s
		t = 8,3 ms; (60 Hz), sine	$V_{R} = 0 V$			1.01	MA <sup>2</sup> s
C	junction capacitance	$V_{R} = 400 V$ f = 1 MHz	$T_{VJ} = 25^{\circ}C$		876		pF
<b>P</b> <sub>GM</sub>	max. gate power dissipation	t <sub>P</sub> = 30 μs	$T_{\rm C} = 140^{\circ}{\rm C}$			120	W
		t <sub>P</sub> = 300 μs				60	W
P <sub>GAV</sub>	average gate power dissipation					20	W
(di/dt) <sub>cr</sub>	critical rate of rise of current	$T_{VJ} = 140 ^{\circ}\text{C}; f = 50 \text{Hz}$ re	epetitive, $I_{T} = 1500 \text{ A}$			100	A/μs
		$t_{P}$ = 200 µs; di <sub>G</sub> /dt = 1 A/µs; -					
		$I_{g} = 1 \text{ A}; \text{ V} = \frac{2}{3} \text{ V}_{DRM}$ n	on-repet., $I_{T} = 500 \text{ A}$			500	A/μs
(dv/dt) <sub>cr</sub>	critical rate of rise of voltage	$V = \frac{2}{3} V_{\text{DBM}}$	T <sub>v.i</sub> = 140°C			1000	V/µs
, ,,,		$R_{GK} = \infty$ ; method 1 (linear volta	age rise)				
V <sub>gt</sub>	gate trigger voltage	$V_{\rm p} = 6 \text{ V}$	$T_{v,l} = 25^{\circ}C$			2	V
- 01			$T_{y_J} = -40^{\circ}C$			3	V
I <sub>GT</sub>	gate trigger current	$V_{D} = 6 V$	$T_{VJ} = 25^{\circ}C$			300	mA
■GT	gate ingger earrent	VB = C V	$T_{VJ} = -40^{\circ}C$			400	mA
V	gate non-trigger voltage	$V_{\rm D} = \frac{2}{3} V_{\rm DBM}$	$T_{VJ} = -40^{\circ} \text{C}$ $T_{VJ} = 140^{\circ} \text{C}$			0.25	١١١٦ V
V <sub>gd</sub>		$\mathbf{v}_{\mathrm{D}} = 73 \mathbf{v}_{\mathrm{DRM}}$	1 <sub>VJ</sub> = 140 O				1
I <sub>GD</sub>	gate non-trigger current		T 0500			10	mA
I.	latching current	t <sub>p</sub> = 30 μs I <sub>G</sub> = 1 A; di <sub>G</sub> /dt = 1 A/μs	$T_{VJ} = 25 ^{\circ}C$			400	mA
I <sub>H</sub>	holding current	$V_{\rm D} = 6 \ V \ R_{\rm GK} = \infty$	$T_{v_J} = 25 °C$			300	mA
t <sub>gd</sub>	gate controlled delay time	$V_{\rm D} = \frac{1}{2} V_{\rm DRM}$	$T_{VJ} = 25 ^{\circ}\text{C}$			2	με
9-	,	$I_{\rm g} = 1 {\rm A}; {\rm di}_{\rm g}/{\rm dt} = 1 {\rm A}/{\rm \mu}s$	-				
t <sub>q</sub>	turn-off time	$V_{\rm B} = 100 \text{ V}; \ I_{\rm T} = 500 \text{ A}; \ V = \frac{2}{3}$			350		με
-9	-	$\cdot_{n}$ , $\cdot_{1} = 00070, \cdot = 7$			000		μο

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### MCO500-18io1

Package Y1				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
	RMS current	per terminal				600	Α
T <sub>vj</sub>	virtual junction temperature			-40		140	°C
T <sub>op</sub>	operation temperature			-40		125	°C
T <sub>stg</sub>	storage temperature		-40		125	°C	
Weight					650		g
M <sub>D</sub>	mounting torque		4.5		7	Nm	
M <sub>T</sub>	terminal torque		11		13	Nm	
d <sub>Spp/App</sub>	creepage distance on surrace ( striking distance through an		terminal to terminal	16.0			mm
<b>d</b> <sub>Spb/Apb</sub>			terminal to backside	25.0			mm
V	isolation voltage	t = 1 second		3600			V
t = 1 minute 50/60 Hz, RMS; lisc	50/60 Hz, RMS; liso⊾ ≤ 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	MCO500-18io1	MCO500-18io1	Box	3	466433

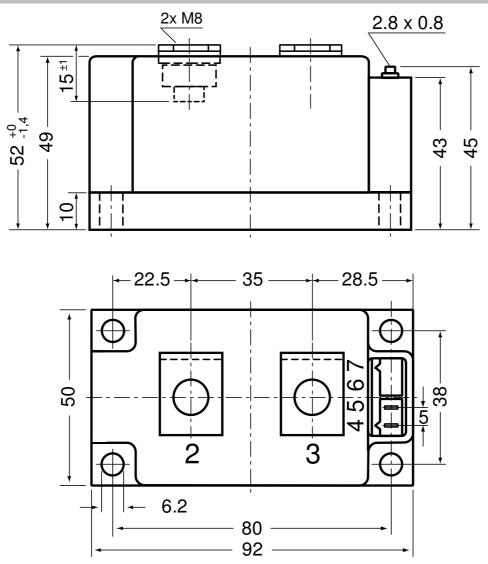
Similar Part	Package	Voltage class
MCO500-12io1	Y1-2-CU	1200
MCO500-14io1	Y1-2-CU	1400
MCO500-16io1	Y1-2-CU	1600
MCO600-20io1	Y1-2-CU	2000
MCO600-22io1	Y1-2-CU	2200

Equiva	lent Circuits for	Simulation	* on die level	$T_{VJ} = 140 \ ^{\circ}C$
	- R <sub>o</sub> -	Thyristor		
V <sub>0 max</sub>	threshold voltage	0.8		V
$\mathbf{R}_{0 \max}$	slope resistance *	0.22		mΩ

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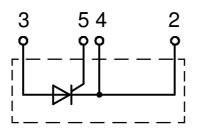
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### Outlines Y1



Optional accessories for modules

Keyed gate/cathode twin plugs with wire length = 350 mm, gate = white, cathode = red Type ZY 180L (L = Left for pin pair 4/5) Type ZY 180R (R = Right for pin pair 6/7) UL 758, style 3751



DC

180 ° sin

120 ⁰Л

60°Л

30° Г

100 125 150

1000

800

600

400

200

0

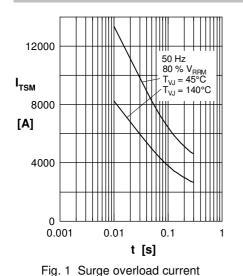
0

25 50

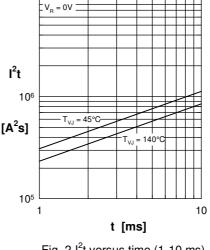
 $I_{TAVM}$ 

[A]

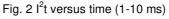
#### Thyristor



 $I_{TSM}$ : Crest value, t: duration



107



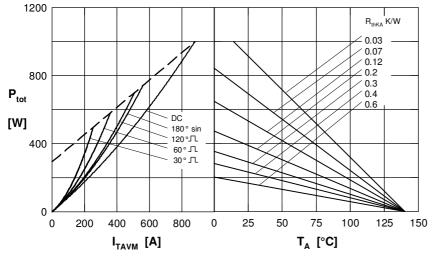
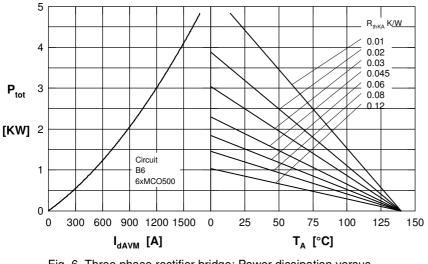
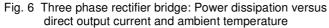


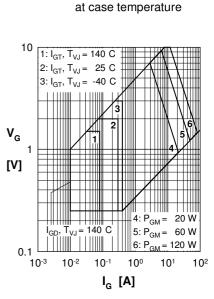
Fig. 4 Power dissipation versus on-state current & ambient temperature





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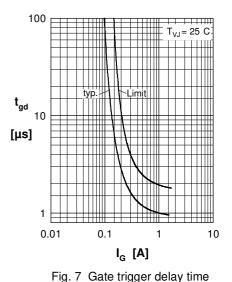


75

T<sub>c</sub> [°C]

Fig. 3 Maximum forward current

Fig. 5 Gate trigger characteristics



#### Thyristor

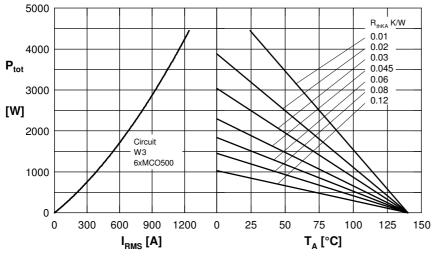
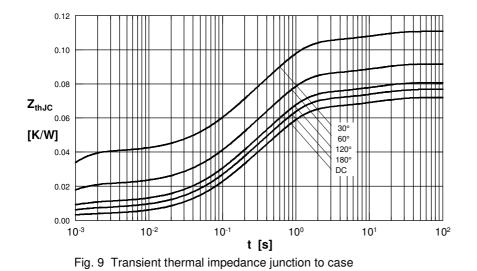


Fig. 8 Three phase AC-controller: Power dissipation versus RMS output current and ambient temperatur



0.12						
<b>Z<sub>thJK</sub></b> 0.08						
[K/W]						
0.04					30° 60° 120° 180°	
0.00						-+++++++
0.00 1(	)-3	10 <sup>-2</sup>	10 <sup>-1</sup> t	10 <sup>0</sup> [ <b>s</b> ]	101	10 <sup>2</sup>
Fig.10 Transient thermal impedance junction to heatsink						

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4

5

0.0067

0.024

$R_{thJC}$ for various conduction angles d:					
d	R <sub>thJC</sub> (K/W)				
DC	0.072				
180°	0.0768				
120°	0.081				
60°	0.092				
30°	0.111				

Constants for  $\boldsymbol{Z}_{thJC}$  calculation:

i	R <sub>thi</sub> (K/W)	t <sub>i</sub> (s)
1	0.0035	0.0054
2	0.0186	0.098
3	0.0432	0.54
4	0.0067	12

R <sub>thJK</sub>	for various	conduction angles d:
d	R <sub>thJK</sub> (K/V	V)
DC	0.096	
180°	0.1	
120°	0.105	
60°	0.116	
30°	0.135	
Cons	stants for Z <sub>t</sub>	<sub>hJK</sub> calculation:
i	R <sub>thi</sub> (K/W)	t <sub>i</sub> (s)
1	0.0035	0.0054
2	0.0186	0.098
3	0.0432	0.54

12

12