# imall

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**Thyristor Module** 

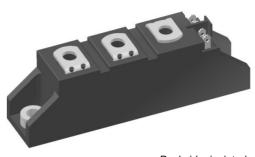
## MCC56-14io1B

$V_{\text{RRM}}$	<i>=</i> 2x 1400 V		
I <sub>tav</sub>	=	60 A	
V <sub>T</sub>	=	1.24 V	

Phase leg

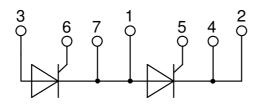
Part number

MCC56-14io1B



Backside: isolated **E**72873

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### 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: TO-240AA

- 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 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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# LIXYS

## MCC56-14io1B

Symbol	r Definition	Conditions		min.	typ.	max.	Uni
V <sub>RSM/DSM</sub>	max. non-repetitive reverse/forwa		T <sub>vj</sub> = 25°C		ιyp.	1500	Uni \
V <sub>RRM/DRM</sub>	max. repetitive reverse/forward b		$T_{VJ} = 25^{\circ}C$			1400	\ \
-	,	$V_{B/D} = 1400 \text{ V}$	$T_{v_{J}} = 25^{\circ}C$			200	μ <i>Α</i>
R/D	reverse current, drain current	$V_{\rm R/D} = 1400 V$ $V_{\rm R/D} = 1400 V$	$T_{v_{J}} = 125^{\circ}C$			5	μ/ m/
V <sub>T</sub>	forward voltage drop	$V_{\rm R/D} = 1400 V$ $I_{\rm T} = 100 A$	$T_{VJ} = 125 \text{ C}$ $T_{VJ} = 25^{\circ}\text{C}$			1.26	1117
ΨŢ	Torward Voltage drop	$I_{T} = 100 \text{ A}$ $I_{T} = 200 \text{ A}$	$T_{VJ} = 250$			1.57	۱ ۱
		$I_{T} = 200 \text{ A}$ $I_{T} = 100 \text{ A}$	T <sub>v.i</sub> = 125°C			1.24	
		$I_{\rm T} = 200  {\rm A}$	T <sub>VJ</sub> = 125 O			1.62	، ۱
ITAV	average forward current	$T_{c} = 85^{\circ}C$	T <sub>v.i</sub> = 125°C			60	Á
TAV	RMS forward current	180° sine	1 <sub>VJ</sub> = 120 0			94	, A
V <sub>T0</sub>			T <sub>v.1</sub> = 125°C			0.85	, \
	threshold voltage slope resistance for power l	oss calculation only	T <sub>VJ</sub> = 125 O			3.7	mΩ
r <sub>T</sub>						0.45	K/W
R <sub>thJC</sub>	thermal resistance junction to cas thermal resistance case to heats				0.20	0.45	K/W
R <sub>thCH</sub> P <sub>tot</sub>			$T_c = 25^{\circ}C$		0.20	222	N/M
_	total power dissipation max. forward surge current	t = 10 ms; (50 Hz), sine	$T_{c} = 25 C$ $T_{v,i} = 45^{\circ}C$			1.50	k/
I <sub>TSM</sub>	max. Iorward Surge current		$V_{\rm NJ} = 45 \text{ C}$ $V_{\rm R} = 0 \text{ V}$			1.62	k/
		t = 8,3  ms; (60  Hz),  sine t = 10  ms; (50  Hz),  sine	$V_{R} = 0 V$ $T_{VI} = 125^{\circ}C$				k/
						1.28	į
124	value for fueing	t = 8,3 ms; (60 Hz), sine	$V_{\rm R} = 0 V$ $T_{\rm VJ} = 45^{\circ} C$			1.38	k/
l²t	value for fusing	t = 10 ms; (50 Hz), sine				11.3	kA <sup>2</sup> s
		t = 8,3 ms; (60 Hz), sine	$\frac{V_{R} = 0 V}{T_{R} + 105 \circ C}$			10.9	
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 125^{\circ}C$			8.13	kA <sup>2</sup> s
<u> </u>	iunation consultance	t = 8,3 ms; (60 Hz), sine	$V_{\rm R} = 0 V$		74	7.87	kA <sup>2</sup> s
C,	junction capacitance	$V_{\rm R} = 400  \text{V}  \text{f} = 1  \text{MHz}$	$T_{\rm VJ} = 25^{\circ}\rm C$		74	10	pF
P <sub>GM</sub>	max. gate power dissipation	$t_p = 30 \mu s$	$T_c = 125^{\circ}C$			10	W W
-		t <sub>P</sub> = 300 μs				5	W W
P <sub>GAV</sub>	average gate power dissipation	T (0500 ( 50 H				0.5	W A (
(di/dt) <sub>cr</sub>	critical rate of rise of current	$T_{VJ} = 125 ^{\circ}\text{C}; f = 50 \text{Hz}$ repetitive, $I_T = 150 \text{A}$				150	A/µs
			$t_{p}$ = 200 µs; di <sub>g</sub> /dt = 0.45 A/µs;				. /
			on-repet., $I_{T} = 60 \text{ A}$				Α/με
(dv/dt) <sub>cr</sub>	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$	T <sub>VJ</sub> = 125°C			1000	V/με
		$R_{GK} = \infty$ ; method 1 (linear volta					
V <sub>GT</sub>	gate trigger voltage	$V_{D} = 6 V$	$T_{VJ} = 25^{\circ}C$			1.5	V
			$T_{vJ} = -40 ^{\circ}\text{C}$			1.6	١
I <sub>GT</sub>	gate trigger current	$V_{D} = 6 V$	$T_{vJ} = 25^{\circ}C$			100	mA
			$T_{vJ} = -40^{\circ}C$			200	mA
V <sub>gd</sub>	gate non-trigger voltage	$V_{D} = \frac{2}{3} V_{DRM}$	$T_{vJ} = 125^{\circ}C$			0.2	V
l <sub>gd</sub>	gate non-trigger current					10	mA
I.	latching current	t <sub>p</sub> = 10 μs	$T_{vJ} = 25 °C$			450	mA
		$I_{\rm G} = 0.45 \text{A};  \text{di}_{\rm G}/\text{dt} = 0.45 \text{A}/\mu\text{s}$					1 1 1 1 1
I <sub>H</sub>	holding current	$V_{D} = 6 V R_{GK} = \infty$	$T_{vJ} = 25 °C$			200	mA
t <sub>gd</sub>	gate controlled delay time	$V_{D} = \frac{1}{2} V_{DRM}$	$T_{v_J} = 25 °C$			2	μ
		$I_{G} = 0.45 \text{ A}; \ di_{G}/dt = 0.45 \text{ A}/\mu s$					     
t <sub>q</sub>	turn-off time	$V_{R} = 100 \text{ V}; I_{T} = 150 \text{ A}; \text{ V} = \frac{2}{7}$	$\frac{1}{3} V_{\text{DRM}}  T_{\text{VJ}} = 100 \text{ °C}$		150		με
		di/dt = 10 A/µs dv/dt = 20 V	/μs t <sub>p</sub> = 200 μs				1 1 1

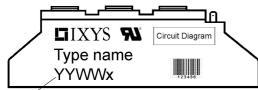
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## MCC56-14io1B

Package	TO-240AA				F	Rating	S	
Symbol	Definition	Conditions			min.	typ.	max.	Unit
	RMS current	per terminal					200	Α
T <sub>vj</sub>	virtual junction temperature				-40		125	°C
T <sub>op</sub>	operation temperature				-40		100	°C
T <sub>stg</sub>	storage temperature		-40		125	°C		
Weight						81		g
M <sub>D</sub>	mounting torque		2.5		4	Nm		
M <sub>T</sub>	terminal torque				2.5		4	Nm
d <sub>Spp/App</sub>	creepage distance on surface   striking distance through air		terminal to terminal	13.0	9.7			mm
<b>d</b> <sub>Spb/Apb</sub>	creepage distance on surfac	terminal to backs		16.0	16.0			mm
V	isolation voltage	t = 1 second			3600			V
		t = 1 minute	50/60 Hz, RMS; liso∟ ≤ 1 mA		3000			V



Date Code

ſ	Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
	Standard	MCC56-14io1B	MCC56-14io1B	Box	36	452750

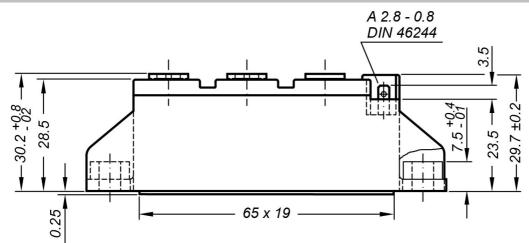
Similar Part	Package	Voltage class
MCMA65P1600TA	TO-240AA-1B	1600
MCMA85P1600TA	TO-240AA-1B	1600

Equiva	lent Circuits for	Simulation	* on die level	T <sub>vj</sub> = 125 °C
	⊢R₀_−	Thyristor		
V <sub>0 max</sub>	threshold voltage	0.85		V
$\mathbf{R}_{0 \max}$	slope resistance *	2.5		mΩ

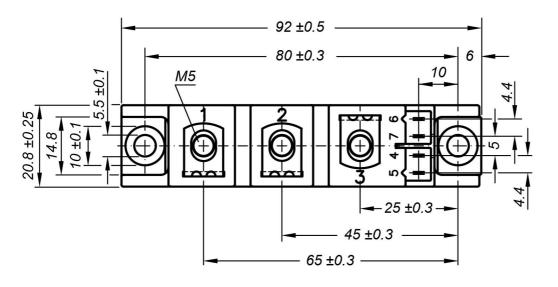
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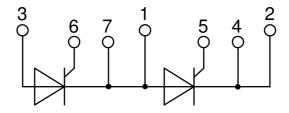
### Outlines TO-240AA



General tolerance: DIN ISO 2768 class "c"



Optional accessories: Keyed gate/cathode twin plugs Wire length: 350 mm, gate = white, cathode = red UL 758, style 3751 Type **ZY 200L** (L = Left for pin pair 4/5) Type **ZY 200R** (R = Right for pin pair 6/7)



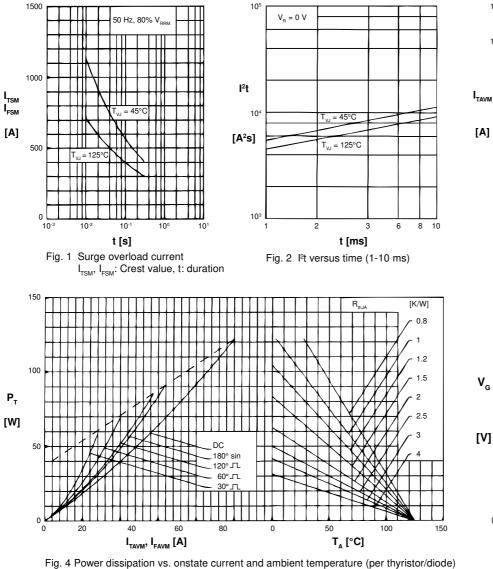
DC

180° sin 120°-√\_

60° \_⊤\_ 30° □

150

### Thyristor



600 R<sub>thK</sub> [K/W] 0.1 500 0.15 0.2 400 0.25  $\mathbf{P}_{tot}$ 0.3 300 [W] 0.4 0.5 200 0.6 Circuit B6 3x MCC56 or 100 3x MCD56 0 50 100 150 0 50 100 150 I<sub>dAVM</sub> [A] T<sub>^</sub> [°C] Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current

120

100

80

60

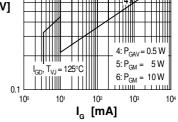


Fig. 5 Gate trigger charact.

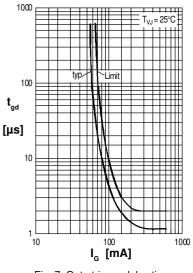


Fig. 7 Gate trigger delay time

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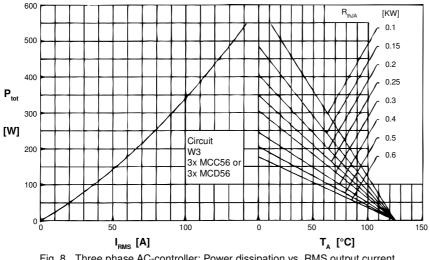
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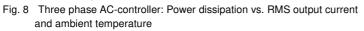
and ambient temperature

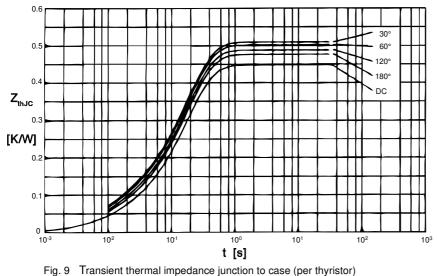
<sup>[</sup>A] 40 20 0 50 100 0 **T**<sub>c</sub> [°**C**] Fig. 3 Maximum forward current at case temperature 10 1:  $I_{GT}$ ,  $T_{VJ} = 125^{\circ}C$ 2:  $I_{GT}$ ,  $T_{VJ}$  = 25°C 3:  $I_{GT}$ ,  $T_{VJ}$  = -40°C ۷<sub>g</sub> [V]

## MCC56-14io1B

### Thyristor



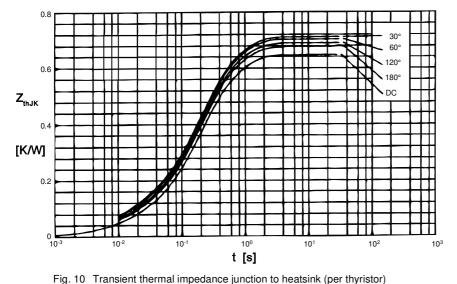




$R_{_{thJC}}$ for various conduction angles d:					
	d R <sub>t</sub>	<sub>hJC</sub> [K/W]			
	DC	0.450			
	180°	0.470			
	120°	0.490			
	60°	0.505			
	30°	0.520			
Constants for $Z_{thJC}$ calculation:					
i F	R <sub>thi</sub> [K/W	/] t <sub>i</sub> [s]			
1	0.014	0.0150			
2	0.026	0.0095			

3	0.410	0.1750





$R_{th,IK}$ for various conduction angles d:				
d	R <sub>thJK</sub> [K/W]			
DC	0.650			
180°	0.670			
120°	0.690			
60°	0.705			
30°	0.720			
Constants for $Z_{thJK}$ calculation:				

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		INJK
i	R <sub>thi</sub> [K/W]	t <sub>i</sub> [s]
1	0.014	0.0150
2	0.026	0.0095
3	0.410	0.1750
4	0.200	0.6700

