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## **Thyristor \ Diode Module**

=2x 800 V

130 A

 $V_{T}$ 1.08 V

### Phase leg

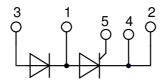
#### Part number

#### MCD132-08io1



Backside: isolated

**F1** 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 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 60747 and per semiconductor unless otherwise specified

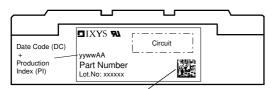
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Rectifier					Ratings	•	1
Symbol	Definition	Conditions		min.	typ.	max.	Un
V <sub>RSM/DSM</sub>	max. non-repetitive reverse/forwa	rd blocking voltage	$T_{VJ} = 25^{\circ}C$			900	
V <sub>RRM/DRM</sub>	max. repetitive reverse/forward bl	ocking voltage	$T_{VJ} = 25^{\circ}C$			800	<u>į</u>
R/D	reverse current, drain current	$V_{R/D} = 800 \text{ V}$	$T_{VJ} = 25^{\circ}C$			200	μ
		$V_{R/D} = 800 V$	$T_{VJ} = 125^{\circ}C$			10	m
V <sub>T</sub>	forward voltage drop	I <sub>T</sub> = 150 A	$T_{VJ} = 25^{\circ}C$			1.14	
		$I_{T} = 300 \text{ A}$				1.36	
		$I_{T} = 150 \text{ A}$	T <sub>VJ</sub> = 125°C			1.08	
		$I_{T} = 300 \text{ A}$				1.36	
I <sub>TAV</sub>	average forward current	T <sub>C</sub> = 85°C	T <sub>vJ</sub> = 125°C			130	
I <sub>T(RMS)</sub>	RMS forward current	180° sine				300	
V <sub>T0</sub>	threshold voltage		T <sub>v.1</sub> = 125°C			0.80	
r <sub>T</sub>	slope resistance	oss calculation only	VO			1.5	m!
R <sub>thJC</sub>	thermal resistance junction to cas	ρ				0.23	!
R <sub>thCH</sub>	thermal resistance case to heatsi				0.100	0.20	K/V
P <sub>tot</sub>	total power dissipation	<u> </u>	T <sub>C</sub> = 25°C		0.100	435	٧
	max. forward surge current	t = 10 ms; (50 Hz), sine	$T_{v,i} = 45^{\circ}C$			4.75	<u> </u>
I <sub>TSM</sub>	max. forward surge current	t = 8,3 ms; (60 Hz), sine	$V_R = 0 V$			5.13	k
		t = 6.5  ms, (60  Hz),  sine t = 10  ms; (50  Hz),  sine					Î
		, , , , , , , , , , , , , , , , , , , ,	$T_{VJ} = 125$ °C			4.04	į
In.	valva fau fivalia	t = 8,3 ms; (60 Hz), sine	$V_R = 0 V$			4.36	k
l²t	value for fusing	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45^{\circ}C$			112.8	i .
		t = 8,3 ms; (60 Hz), sine	$V_R = 0 V$			109.5	<u> </u>
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 125$ °C				kA <sup>2</sup>
		t = 8,3 ms; (60 Hz), sine	$V_R = 0 V$			79.1	
C <sub>J</sub>	junction capacitance	$V_R = 400 V$ f = 1 MHz	$T_{VJ} = 25^{\circ}C$		211		р
$P_{GM}$	max. gate power dissipation	$t_P = 30 \mu s$	$T_{C} = 125^{\circ}C$			120	٧
		t <sub>P</sub> = 500 μs				60	٧
$P_{GAV}$	average gate power dissipation					8	٧
(di/dt) <sub>cr</sub>	critical rate of rise of current	$T_{VJ} = 125 ^{\circ}\text{C}; f = 50 \text{ Hz}$ re	epetitive, $I_T = 500 A$			150	A/μ
		$t_P = 200  \mu s; di_G/dt = 0.5  A/\mu s;$					
		$I_G = 0.5 A; V = \frac{2}{3} V_{DRM}$ no	on-repet., $I_{T} = 160 \text{ A}$			500	$A/\mu$
(dv/dt) <sub>cr</sub>	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$	$T_{VJ} = 125$ °C			1000	V/μ
		R <sub>GK</sub> = ∞; method 1 (linear voltage	ge rise)				
<b>V</b> <sub>GT</sub>	gate trigger voltage	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$			2.5	١
			$T_{VJ} = -40$ °C			2.6	١
I <sub>GT</sub>	gate trigger current	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$			150	m
<b>u</b> .		J	$T_{VJ} = -40$ °C			200	m
V <sub>GD</sub>	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DBM}$	$T_{VJ} = 125^{\circ}C$			0.2	,
I <sub>GD</sub>	gate non-trigger current	- U / - DAW	. v3			10	m
I <sub>L</sub>	latching current	t <sub>p</sub> = 30 μs	T <sub>vJ</sub> = 25°C			300	m
·L	latering current	·				300	1117
	holding ourrent	$I_{\rm G} = 0.5  \text{A};  \text{di}_{\rm G}/\text{dt} = 0.5  \text{A}/\mu \text{s}$				200	m
I <sub>H</sub>	holding current	$V_D = 6 V R_{GK} = \infty$	$T_{VJ} = 25 ^{\circ}\text{C}$			200	m.
t <sub>gd</sub>	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}C$			2	μ
_		$I_{\rm G} = 0.5  \text{A};  \text{di}_{\rm G}/\text{dt} = 0.5  \text{A}/\mu \text{s}$					
tq	turn-off time	$V_R = 100 \text{ V}; I_T = 160 \text{ A}; V = \frac{2}{3}$			150		μ
		$di/dt = 10 A/\mu s dv/dt = 20 V$	/μs t <sub>p</sub> = 200 μs				1 1 1 1



Package	Y4				ı	Ratings	5	
Symbol	Definition	Conditions			min.	typ.	max.	Unit
RMS	RMS current	per terminal					300	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						150		g
M <sub>D</sub>	mounting torque				2.25		2.75	Nm
$\mathbf{M}_{_{T}}$	terminal torque				4.5		5.5	Nm
d <sub>Spp/App</sub>	creepage distance on surface	Latriking diatanga through air	terminal to terminal	14.0	10.0			mm
d <sub>Spb/Apb</sub>	creepage distance on surface	Striking distance through an	terminal to backside 16.0		16.0			mm
V <sub>ISOL</sub>	isolation voltage	t = 1 second			3600			٧
.002		t = 1 minute		50/60 Hz, RMS; IsoL ≤ 1 mA				٧



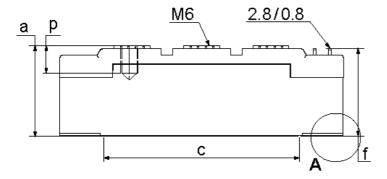
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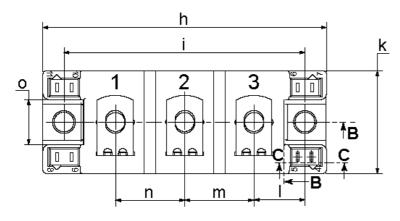
ĺ	Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
	Standard	MCD132-08io1	MCD132-08io1	Box	6	430595

<b>Equivalent Circuits for Simulation</b>		* on die level	$T_{VJ} = 125 ^{\circ}\text{C}$	
$I \rightarrow V_0$	$R_0$	Thyristor		
V <sub>0 max</sub>	threshold voltage	8.0		V
$R_{0 \; \text{max}}$	slope resistance *	0.8		$m\Omega$

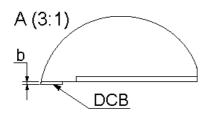


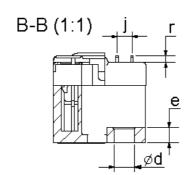
### Outlines Y4



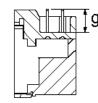


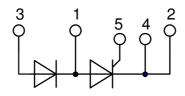
Di	MIN	MAX	MIN	MAX
Dim.	[mm]	[mm]	[inch]	[inch]
а	30.0	30.6	1.181	1.205
b	typ.	0.25	typ. (	0.010
С	64.0	65.0	2.520	2.559
d	6.5	7.0	0.256	0.275
е	4.9	5.1	0.193	0.201
f	28.6	29.2	1.126	1.150
g	7.3	7.7	0.287	0.303
h	93.5	94.5	3.681	3.720
i	79.5	80.5	3.130	3.169
j	4.8	5.2	0.189	0.205
k	33.4	34.0	1.315	1.339
- 1	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
0	14.0	15.0	0.551	0.591
р	typ.	10.5	typ. (	0.413
r	1.8	2.4	0.071	0.041





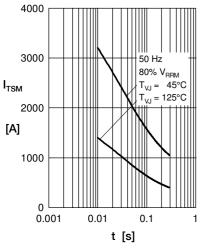


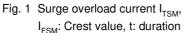






#### **Thyristor**





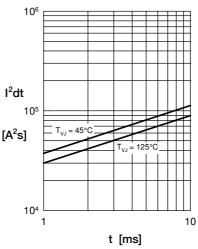


Fig. 2 I<sup>2</sup>t versus time (1-10 ms)

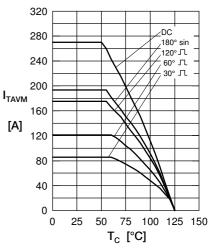


Fig. 3 Max. forward current at case temperature

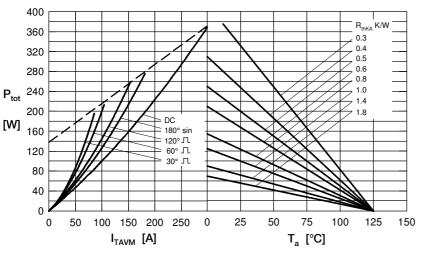


Fig. 4 Power dissipation vs. on-state current & ambient temperature (per thyristor or diode)

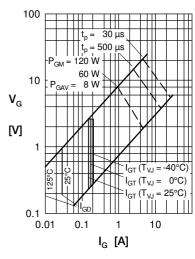


Fig. 5 Gate trigger characteristics

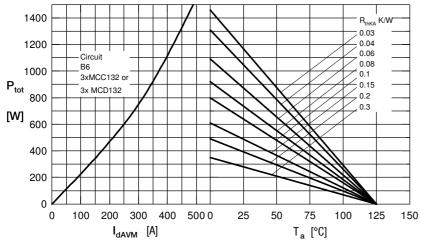


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

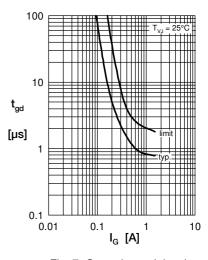


Fig. 7 Gate trigger delay time



#### Rectifier

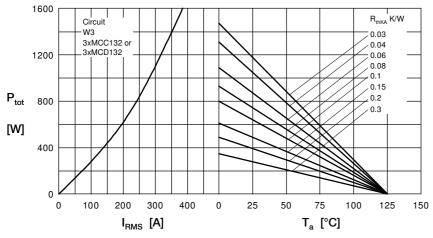


Fig. 8 Three phase AC-controller: Power dissipation versus RMS output current and ambient temperature

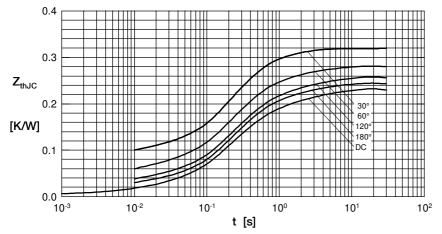


Fig. 9 Transient thermal impedance junction to case (per thyristor/diode)

 $\mathbf{R}_{\text{thJC}}$  for various conduction angles d:

d	R <sub>thJC</sub> [K/W]
DC	0.230
180°	0.244
120°	0.255
60°	0.283
30°	0.321

### Constants for $Z_{thJC}$ calculation:

i	$R_{thi}$ [K/W]	t <sub>i</sub> [s]
1	0.0095	0.001
2	0.0175	0.065
3	0.2030	0.400

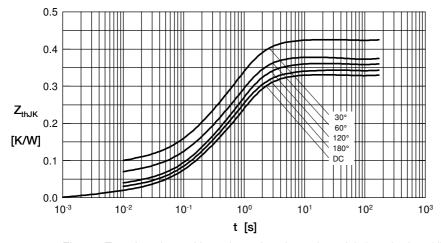


Fig. 10 Transient thermal impedance junction to heatsink (per thyristor/diode)

 $\mathbf{R}_{\text{thJK}}$  for various conduction angles d:

d	$R_{thJK}$ [K/W]
DC	0.330
180°	0.344
120°	0.355
60°	0.383
30°	0.421

#### Constants for $Z_{\text{thJK}}$ calculation:

i	$R_{thi}$ [K/W]	t <sub>i</sub> [s]
1	0.0095	0.001
2	0.0175	0.065
3	0.2030	0.400
4	0.1000	1.290