

Thyristor \ Diode Module

= 2x 1400 V

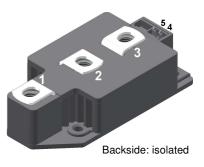
320 A

 V_{τ} 1.08 V

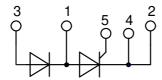
Phase leg

Part number

MCD310-14io1







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: Y2

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: DCB ceramic
- · Reduced weight
- Advanced power cycling

Terms and 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

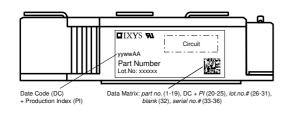
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			'	Ratings	I	!
Definition	Conditions		min.	typ.	max.	Ur
max. non-repetitive reverse/forwa	rd blocking voltage				1500	! ! !
max. repetitive reverse/forward bl	ocking voltage				1400	i !
reverse current, drain current	$V_{\text{R/D}} = 1400 \text{ V}$	$T_{VJ} = 25^{\circ}C$			1	m
	$V_{R/D} = 1400 \text{ V}$	$T_{VJ} = 140$ °C			40	m
forward voltage drop	I _T = 300 A	$T_{VJ} = 25^{\circ}C$			1.14	
	$I_{T} = 600 \text{ A}$				1.32	
	$I_{T} = 300 \text{ A}$	T _{VJ} = 125°C			1.08	
	$I_{T} = 600 \text{ A}$				1.30	
average forward current	T _C = 85°C	T _{VJ} = 140°C			320	
RMS forward current	180° sine				500	
threshold voltage		T _{v.i} = 140°C			0.80	
slope resistance } for power lo	oss calculation only	***			0.82	m!
thermal resistance junction to case	e					K/V
				0.040		K/V
total power dissipation		$T_{c} = 25^{\circ}C$			1030	٧
<u> </u>	t = 10 ms: (50 Hz) sine					<u> </u>
	, ,	••				1
	· · · · · · · · · · · · · · · · · · ·					1
		• •				k
value for fusing						1
value for fusing						1
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		**				į
i ve aki na a na a ikan a a	· · · ·			400	296.7	-
	**			438	400	p
max. gate power dissipation		$I_{\rm C} = 140^{\rm o}{\rm G}$				į.
	t _P = 500 μs					۷
average gate power dissipation						٧
critical rate of rise of current	,	•			100	A/μ
	· · · · · · · · · · · · · · · · · · ·					!
					500	A/µ
critical rate of rise of voltage	51111	- -			1000	V/µ
	R _{GK} = ∞; method 1 (linear volta	ge rise)				i ! ! !
gate trigger voltage	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$			2	
		$T_{VJ} = -40$ °C			3	!
gate trigger current	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$			150	m
		$T_{VJ} = -40$ °C			200	m
gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 140^{\circ}C$			0.25	
gate non-trigger current					10	m
latching current	t _n = 30 μs	T _{v.i} = 25°C			200	m
	$I_{G} = 0.45 \text{A}; \text{di}_{G}/\text{dt} = 0.45 \text{A}/\mu\text{s}$	3				
holding current					150	m
					2	Î
5					_	۲
turn-off time	$V_{\rm R} = 100 \text{ V}; \ I_{\rm T} = 320 \text{ A}; \ V = 320 \text$			200		μ
		3 VDD4 1// = 1/3 ()			1	· u
	max. non-repetitive reverse/forward bil reverse current, drain current forward voltage drop average forward current threshold voltage slope resistance junction to case thermal resistance case to heatsing total power dissipation max. forward surge current value for fusing junction capacitance max. gate power dissipation average gate power dissipation critical rate of rise of current critical rate of rise of voltage gate trigger voltage gate trigger current gate non-trigger current latching current holding current gate controlled delay time	$\begin{array}{llllllllllllllllllllllllllllllllllll$	$\begin{array}{llllllllllllllllllllllllllllllllllll$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	max. non-repetitive reverse/forward blocking voltage $T_{v_1} = 25^{\circ}C$ 1500 max. repetitive reverse/forward blocking voltage $T_{v_2} = 25^{\circ}C$ 1400 reverse current, drain current $V_{ND} = 1400 \text{ V}$ $T_{v_2} = 140^{\circ}C$ 40 forward voltage drop $I_{1} = 300 \text{ A}$ $T_{v_2} = 125^{\circ}C$ 1.14 $I_{1} = 600 \text{ A}$ $I_{1} = 125^{\circ}C$ 1.08 $I_{1} = 600 \text{ A}$ $I_{1} = 140^{\circ}C$ 320 severage forward current $T_{0} = 85^{\circ}C$ $T_{v_1} = 140^{\circ}C$ 320 fibMS forward current $T_{0} = 85^{\circ}C$ $T_{v_2} = 140^{\circ}C$ 0.80 slope resistance $T_{0} = 85^{\circ}C$ $T_{v_2} = 140^{\circ}C$ 0.80 thermal resistance case to beatsink 0.040 0.040 0.040 total power dissipation $T_{0} = 25^{\circ}C$ 1030 0.040 total power dissipation $T_{0} = 25^{\circ}C$ 1030 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040



Package Y2			Ratings				
Symbol	Definition	Conditions		min.	typ.	max.	Unit
RMS	RMS current	per terminal				600	Α
T _{VJ}	virtual junction temperature			-40		140	°C
Top	operation temperature			-40		125	°C
T _{stg}	storage temperature			-40		125	°C
Weight					255		g
M _D	mounting torque			2.5		5	Nm
$\mathbf{M}_{\scriptscriptstyleT}$	terminal torque			12		15	Nm
d _{Spp/App}	araanaga diatanaa an ayufaaa	Latriting distance through air	terminal to terminal	13.0			mm
d _{Spb/Apb}	creepage distance on surface striking distance throu		terminal to backside	13.0			mm
V _{ISOL}	isolation voltage	t = 1 second		3600			٧
.002		t = 1 minute	50/60 Hz, RMS; IISOL ≤ 1 mA	3000			٧

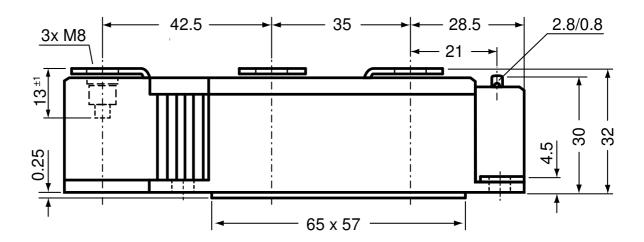


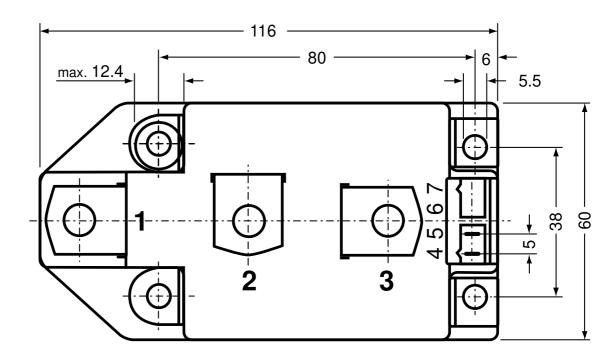
C	Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
S	Standard	MCD310-14io1	MCD310-14io1	Box	2	428809

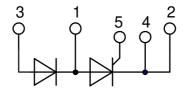
Equiva	alent Circuits for	Simulation	* on die level	$T_{VJ} = 140 ^{\circ}\text{C}$
$I \rightarrow V_0$)—[R_o]-	Thyristor		
V _{0 max}	threshold voltage	8.0		V
$R_{0\;max}$	slope resistance *	0.32		$m\Omega$



Outlines Y2

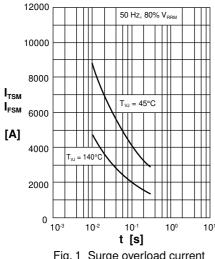








Thyristor



 $V_{R} = 0 V$ $V_{R} = 0 V$ $T_{VJ} = 45^{\circ}C$ $T_{VJ} = 140^{\circ}C$ $T_{VJ} = 140^{\circ}C$ $T_{VJ} = 140^{\circ}C$

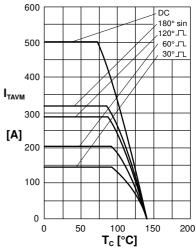
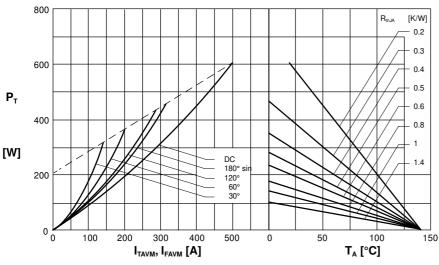


Fig. 1 Surge overload current $I_{T(F)SM}$: crest value, t: duration

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

Fig. 3 Max. forward current at case temperature



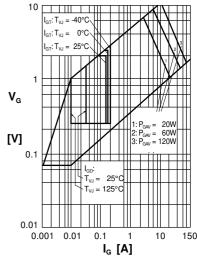
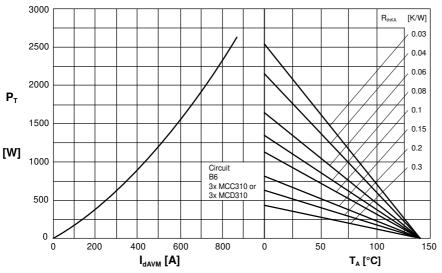


Fig. 4 Power dissipation versus onstate current and ambient temperature (per thyristor/diode)

Fig. 5 Gate trigger characteristics



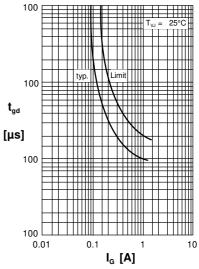
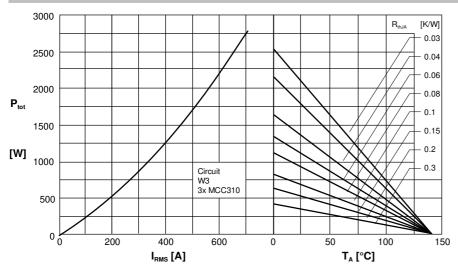


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

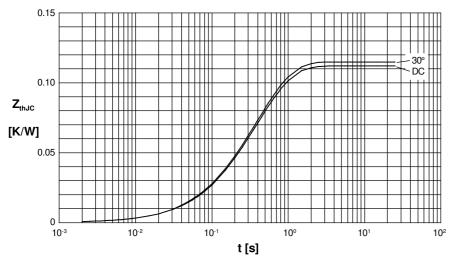
Fig. 7 Gate trigger delay time



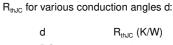
Rectifier



Three phase AC-controller: • Fig. 7 Power dissipation versus RMS output current and ambient temperature



Transient thermal impedance junction to case (per thyristor) Fig. 8



u	H _{thJC} (N/VV)
DC	0.112
180°C	0.113
120°C	0.114
60°C	0.115
30°C	0.115

Constants for Z_{thJC} calculation:

i	R_{thi} [K/W]	t _i [s]
1	0.003	0.099
2	0.0143	0.168
3	0.0947	0.456

 R_{thJK} for various conduction angles d:

d	R_{thJK} [K/W]
DC	0.152
180°C	0.154
120°C	0.154
60°C	0.155
30°C	0.155

Constants for Z_{thJK} calculation:

i	R_{thi} (K/W)	$t_{i}(s)$
1	0.003	0.099
2	0.0143	0.168
3	0.0947	0.456
4	0.04	1.36

Fig. 9 Transient thermal impedance junction to heatsink (per hyristor)

t [s]

10°

10-2

0.20

0.15

0.10

0.05

0 10⁻³

 $\boldsymbol{Z}_{\text{thJK}}$

[K/W]

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