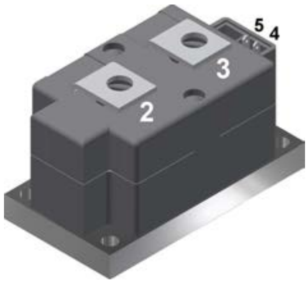
Thyristor Module

V_{RRM} = 1400 V
I_{TAV} = 560 A
V_T = 1,01 V

Single Thyristor

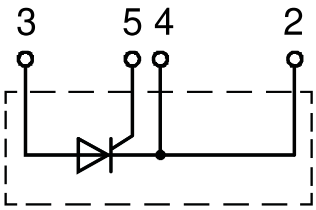
Part number

MCO500-14io1



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: Y1

- Isolation Voltage: 4800 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: Copper internally DCB isolated
- Advanced power cycling

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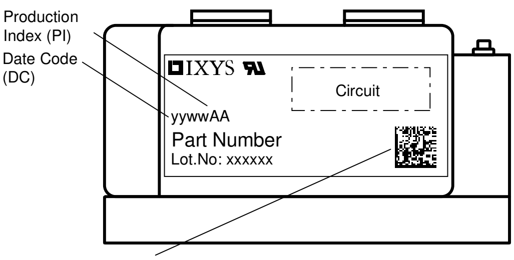
Thyristor

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			2	mA
		$V_{R/D}$ = 1400 V	T_{VJ} = 125°C			40	mA
V_T	*forward voltage drop*	I_T = 500 A	T_{VJ} = 25°C			1,08	V
		I_T = 1000 A				1,27	V
		I_T = 500 A	T_{VJ} = 125°C			1,01	V
		I_T = 1000 A				1,24	V
I_{TAV}	*average forward current*	T_C = 85°C	T_{VJ} = 140°C			560	A
$I_{T(RMS)}$	*RMS forward current*	180° sine				880	A
V_{T0}	*threshold voltage*	*for power loss calculation only*	T_{VJ} = 140°C			0,80	V
r_T	*slope resistance*					0,38	mΩ
R_{thJC}	*thermal resistance junction to case*					0,072	K/W
R_{thCH}	*thermal resistance case to heatsink*				0,024		K/W
P_{tot}	*total power dissipation*		T_C = 25°C			1600	W
I_{TSM}	*max. forward surge current*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			17,0	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			18,4	kA
		t = 10 ms; (50 Hz), sine	T_{VJ} = 140°C			14,5	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			15,6	kA
I^2t	*value for fusing*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			1,45	MA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			1,40	MA²s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 140°C			1,04	MA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			1,01	MA²s
C_J	*junction capacitance*	V_R = 400V f = 1 MHz	T_{VJ} = 25°C		876		pF
P_{GM}	*max. gate power dissipation*	t_P = 30 µs	T_C = 140°C			120	W
		t_P = 300 µs				60	W
P_{GAV}	*average gate power dissipation*					20	W
$(di/dt)_{cr}$	*critical rate of rise of current*	T_{VJ} = 140°C; f = 50 Hz	repetitive, I_T = 1500 A			100	A/µs
		t_P = 200 µs; di_G/dt = 1 A/µs;					
		I_G = 1 A; V_D = ⅔ V_{DRM}	non-repet., I_T = 500 A			500	A/µs
$(dv/dt)_{cr}$	*critical rate of rise of voltage*	V_D = ⅔ V_{DRM}	T_{VJ} = 140°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			300	mA
			T_{VJ} = -40°C			400	mA
V_{GD}	*gate non-trigger voltage*	V_D = ⅔ V_{DRM}	T_{VJ} = 140°C			0,25	V
I_{GD}	*gate non-trigger current*					10	mA
I_L	*latching current*	t_p = 30 µs	T_{VJ} = 25°C			400	mA
		I_G = 1 A; di_G/dt = 1 A/µs					
I_H	*holding current*	V_D = 6 V R_{GK} = ∞	T_{VJ} = 25°C			300	mA
t_{gd}	*gate controlled delay time*	V_D = ½ V_{DRM}	T_{VJ} = 25°C			2	µs
		I_G = 1 A; di_G/dt = 1 A/µs					
t_q	*turn-off time*	V_R = 100 V; I_T = 500A; V_D = ⅔ V_{DRM}	T_{VJ} = 125 °C		350		µs
		di/dt = 10 A/µs; dv/dt = 50 V/µs; t_p = 200 µs					

MCO500-14io1

Package Y1				Ratings		
Symbol	**Definition**	**Conditions**	**min.**	**typ.**	**max.**	**Unit**
I_{RMS}	*RMS current*	per terminal			600	A
T_{VJ}	*virtual junction temperature*		-40		140	°C
T_{op}	*operation temperature*		-40		125	°C
T_{stg}	*storage temperature*		-40		125	°C
Weight				650		g
M_D	*mounting torque*		4,5		7	Nm
M_T	*terminal torque*		11		13	Nm
$d_{Spp/App}$	*creepage distance on surface | striking distance through air*	*terminal to terminal*	16,0			mm
$d_{Spb/Apb}$		*terminal to backside*	25,0			mm
V_{ISOL}	*isolation voltage*	t = 1 second; 50/60 Hz, RMS; $I_{ISOL} \le 1$ mA	4800			V
		t = 1 minute	4000			V



Data Matrix: *part no.* (1-19), DC + *PI* (20-25), *lot.no.#* (26-31), *blank* (32), *serial no.#* (33-36)

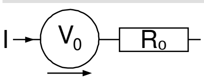
Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCO500-14io1	MCO500-14io1	Box	2	463736

Similar Part	Package	Voltage class
MCO500-12io1	Y1-2-CU	1200
MCO500-16io1	Y1-2-CU	1600
MCO500-18io1	Y1-2-CU	1800
MCO600-20io1	Y1-2-CU	2000

MCO600-22io1	Y1-2-CU	2200

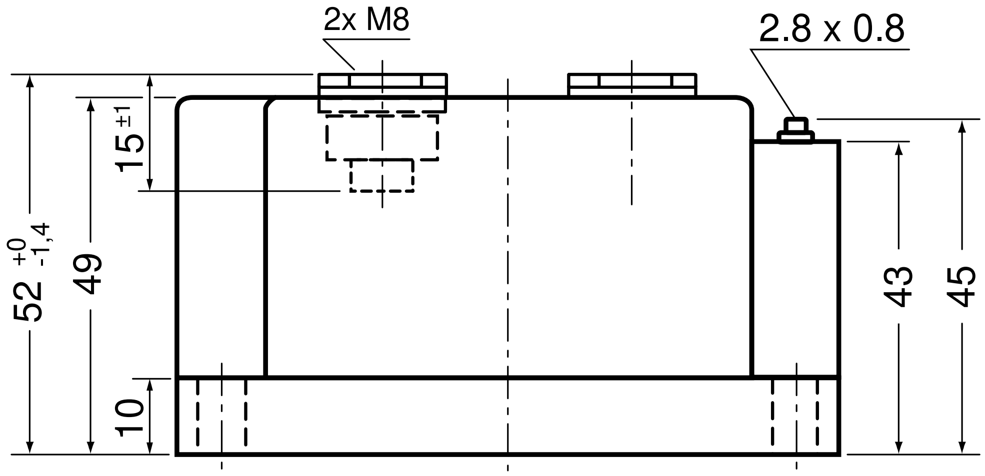
Equivalent Circuits for Simulation

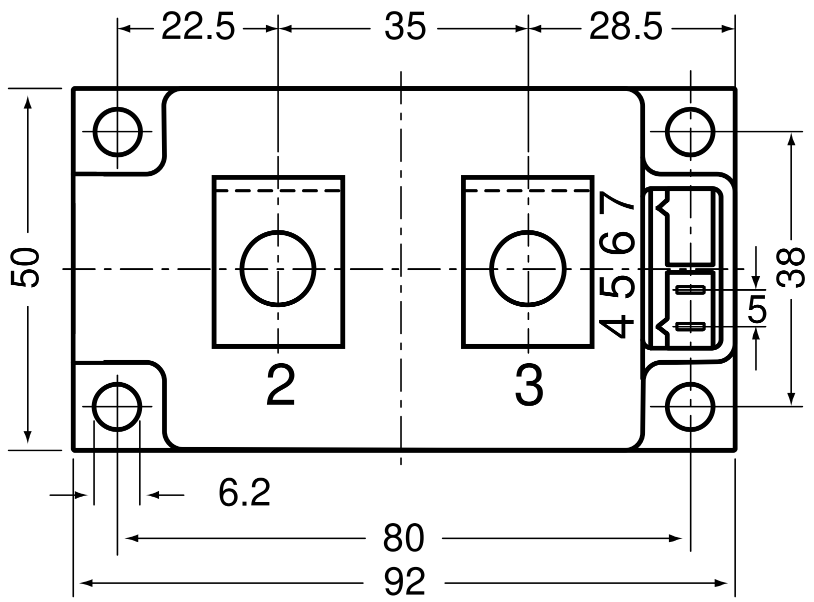
** on die level* $T_{VJ} = 140°C$



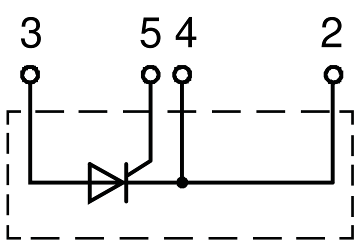
		Thyristor	
$V_{0\,max}$	*threshold voltage*	0,8	V
$R_{0\,max}$	*slope resistance **	0,22	mΩ

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) UL 758, style 3751



Thyristor

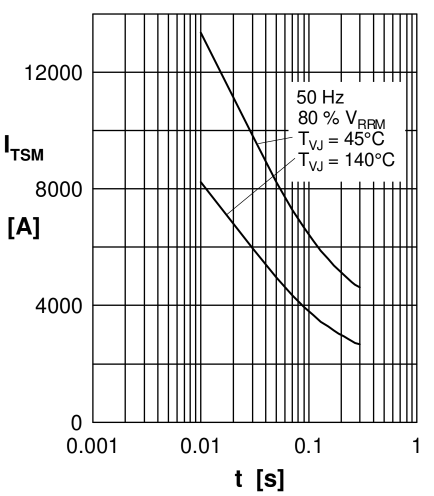


Fig. 1 Surge overload current
I_{TSM}: Crest value, t: duration

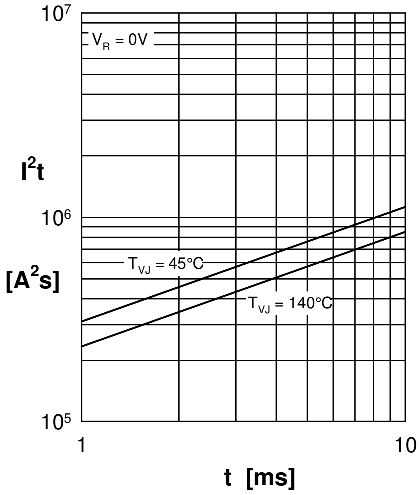


Fig. 2 I^2t versus time (1-10 ms)

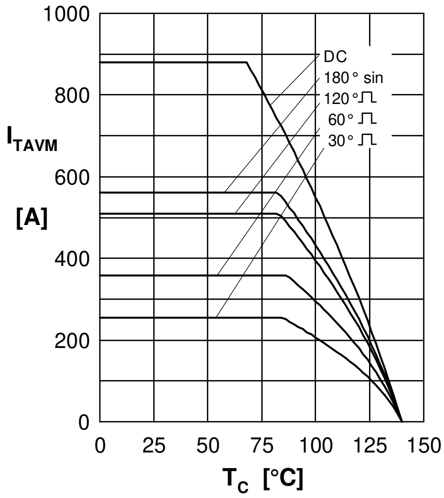


Fig. 3 Maximum forward current at case temperature

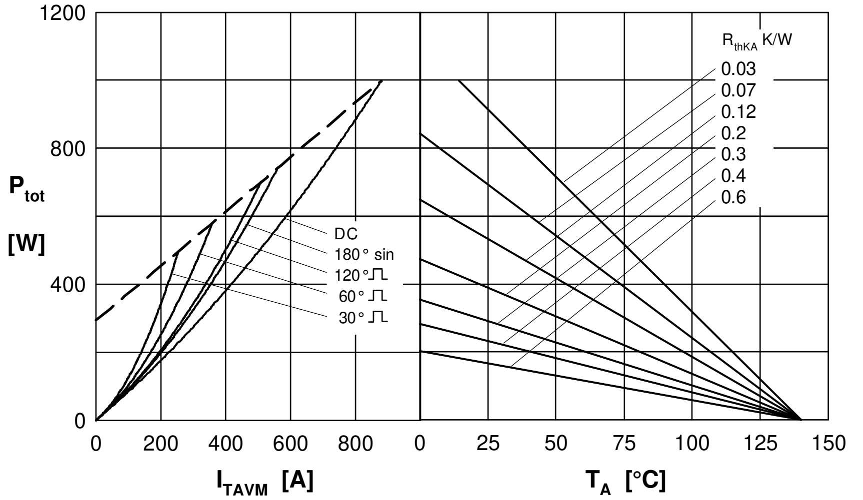


Fig. 4 Power dissipation versus on-state current & ambient temperature

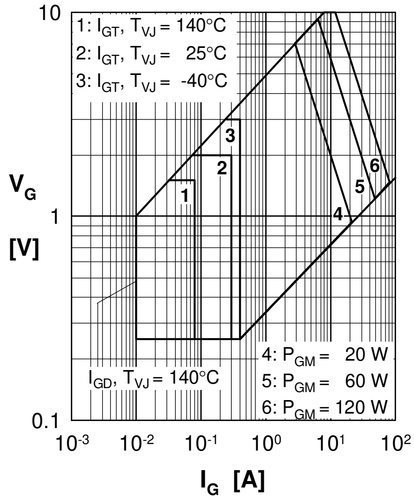


Fig. 5 Gate trigger characteristics

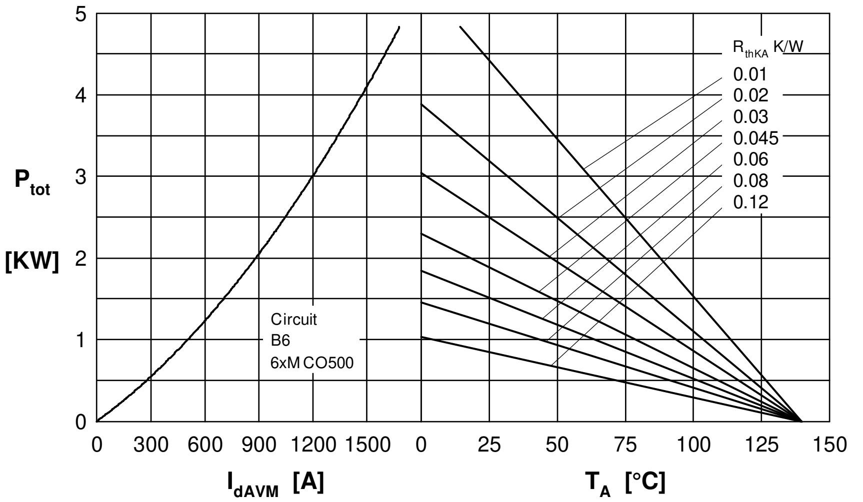


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

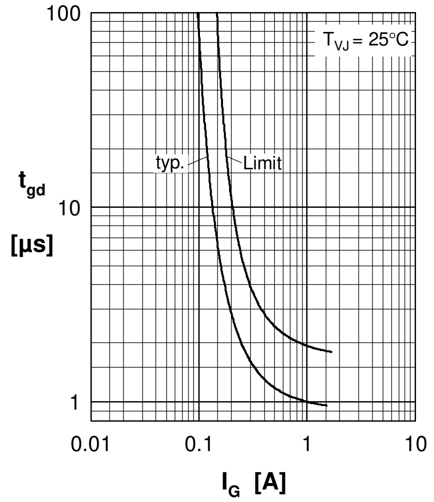


Fig. 7 Gate trigger delay time

Thyristor

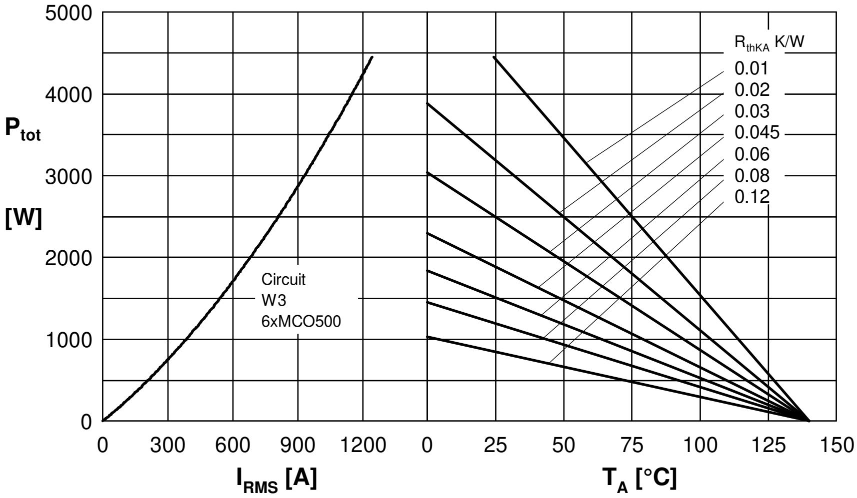


Fig. 8 Three phase AC-controller: Power dissipation versus RMS output current and ambient temperatur

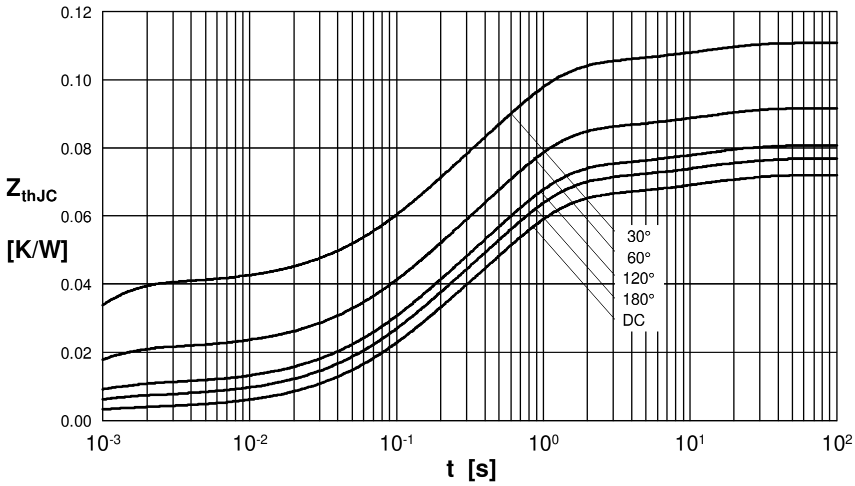


Fig. 9 Transient thermal impedance junction to case

R_{thJC} for various conduction angles d:

d	R_{thJC} (K/W)
DC	0.072
180°	0.0768
120°	0.081
60°	0.092
30°	0.111

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.0035	0.0054
2	0.0186	0.098
3	0.0432	0.54
4	0.0067	12

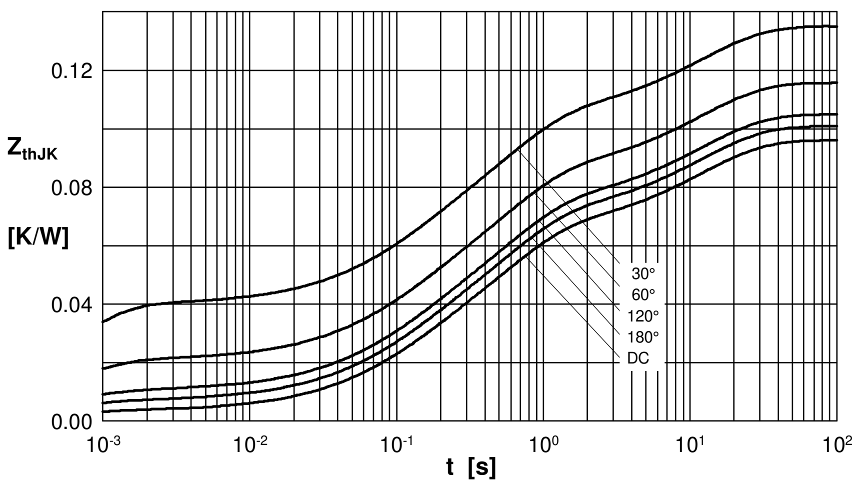


Fig.10 Transient thermal impedance junction to heatsink

R_{thJK} for various conduction angles d:

d	R_{thJK} (K/W)
DC	0.096
180°	0.1
120°	0.105
60°	0.116
30°	0.135

Constants for Z_{thJK} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.0035	0.0054
2	0.0186	0.098
3	0.0432	0.54
4	0.0067	12
5	0.024	12