

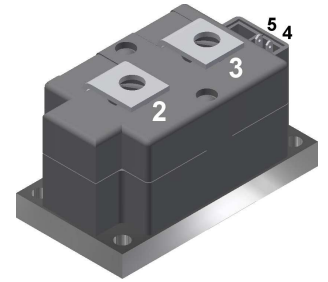
# High Voltage Thyristor Module

$V_{RRM} = 2000\text{ V}$   
 $I_{TAV} = 600\text{ A}$   
 $V_T = 1.06\text{ V}$

## Single Thyristor

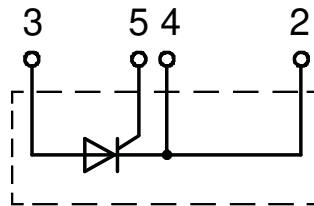
**Part number**

**MCO600-20io1**



Backside: isolated

E72873



### Features / Advantages:

- Thyristor for line frequency
- Planar passivated chip
- Long-term stability
- Direct Copper Bonded Al<sub>2</sub>O<sub>3</sub>-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 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

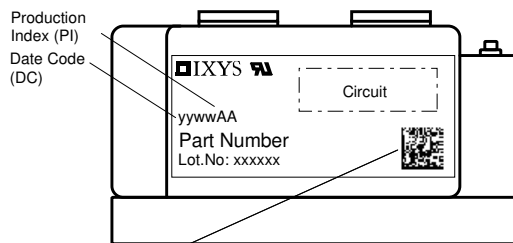
- to perform joint risk and quality assessments;

- 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.

Thyristor			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			2100	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			2000	V
$I_{RD}$	reverse current, drain current	$V_{R/D} = 2000\text{ V}$	$T_{VJ} = 25^{\circ}C$		2	mA
		$V_{R/D} = 2000\text{ V}$	$T_{VJ} = 125^{\circ}C$		40	mA
$V_T$	forward voltage drop	$I_T = 600\text{ A}$	$T_{VJ} = 25^{\circ}C$		1.12	V
		$I_T = 1200\text{ A}$			1.34	V
		$I_T = 600\text{ A}$	$T_{VJ} = 125^{\circ}C$		1.06	V
		$I_T = 1200\text{ A}$			1.33	V
$I_{TAV}$	average forward current	$T_C = 85^{\circ}C$	$T_{VJ} = 140^{\circ}C$		600	A
$I_{T(RMS)}$	RMS forward current	180° sine			940	A
$V_{T0}$	threshold voltage	} for power loss calculation only	$T_{VJ} = 140^{\circ}C$		0.81	V
$r_T$	slope resistance				0.4	mΩ
$R_{thJC}$	thermal resistance junction to case				0.065	K/W
$R_{thCH}$	thermal resistance case to heatsink			0.02		K/W
$P_{tot}$	total power dissipation		$T_C = 25^{\circ}C$		1770	W
$I_{TSM}$	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		15.0	kA
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		16.2	kA
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 140^{\circ}C$		12.8	kA
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		13.8	kA
$I^2t$	value for fusing	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		1.13	MA <sup>2</sup> s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		1.09	MA <sup>2</sup> s
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 140^{\circ}C$		812.8	kA <sup>2</sup> s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		788.8	kA <sup>2</sup> s
$C_J$	junction capacitance	$V_R = 700\text{ V}$ $f = 1\text{ MHz}$	$T_{VJ} = 25^{\circ}C$		469	pF
$P_{GM}$	max. gate power dissipation	$t_p = 30\text{ }\mu\text{s}$	$T_C = 140^{\circ}C$		120	W
		$t_p = 300\text{ }\mu\text{s}$			60	W
$P_{GAV}$	average gate power dissipation				20	W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 140^{\circ}C; f = 50\text{ Hz}$ repetitive, $I_T = 1800\text{ A}$			100	A/ $\mu\text{s}$
		$t_p = 200\text{ }\mu\text{s}; di_G/dt = 1\text{ A}/\mu\text{s};$ $I_G = 1\text{ A}; V = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 600\text{ A}$			500	A/ $\mu\text{s}$
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty$ ; method 1 (linear voltage rise)	$T_{VJ} = 140^{\circ}C$		1000	V/ $\mu\text{s}$
$V_{GT}$	gate trigger voltage	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}C$		2	V
			$T_{VJ} = -40^{\circ}C$		3	V
$I_{GT}$	gate trigger current	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}C$		300	mA
			$T_{VJ} = -40^{\circ}C$		400	mA
$V_{GD}$	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 140^{\circ}C$		0.25	V
$I_{GD}$	gate non-trigger current				10	mA
$I_L$	latching current	$t_p = 30\text{ }\mu\text{s}$	$T_{VJ} = 25^{\circ}C$		400	mA
		$I_G = 1\text{ A}; di_G/dt = 1\text{ A}/\mu\text{s}$				
$I_H$	holding current	$V_D = 6\text{ V}$ $R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		300	mA
$t_{gd}$	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}C$		2	$\mu\text{s}$
		$I_G = 1\text{ A}; di_G/dt = 1\text{ A}/\mu\text{s}$				
$t_q$	turn-off time	$V_R = 100\text{ V}; I_T = 600\text{ A}; V = \frac{2}{3} V_{DRM}$ $di/dt = 10\text{ A}/\mu\text{s}$ $dv/dt = 50\text{ V}/\mu\text{s}$ $t_p = 200\text{ }\mu\text{s}$	$T_{VJ} = 125^{\circ}C$		350	$\mu\text{s}$

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	
<b>Weight</b>					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	3600			V	
		t = 1 minute	3000			V	



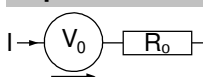
Data Matrix: part no. (1-19), DC + PI (20-25), lot.no.# (26-31), blank (32), serial no.# (33-36)

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCO600-20io1	MCO600-20io1	Box	2	474320

### Equivalent Circuits for Simulation

\* on die level

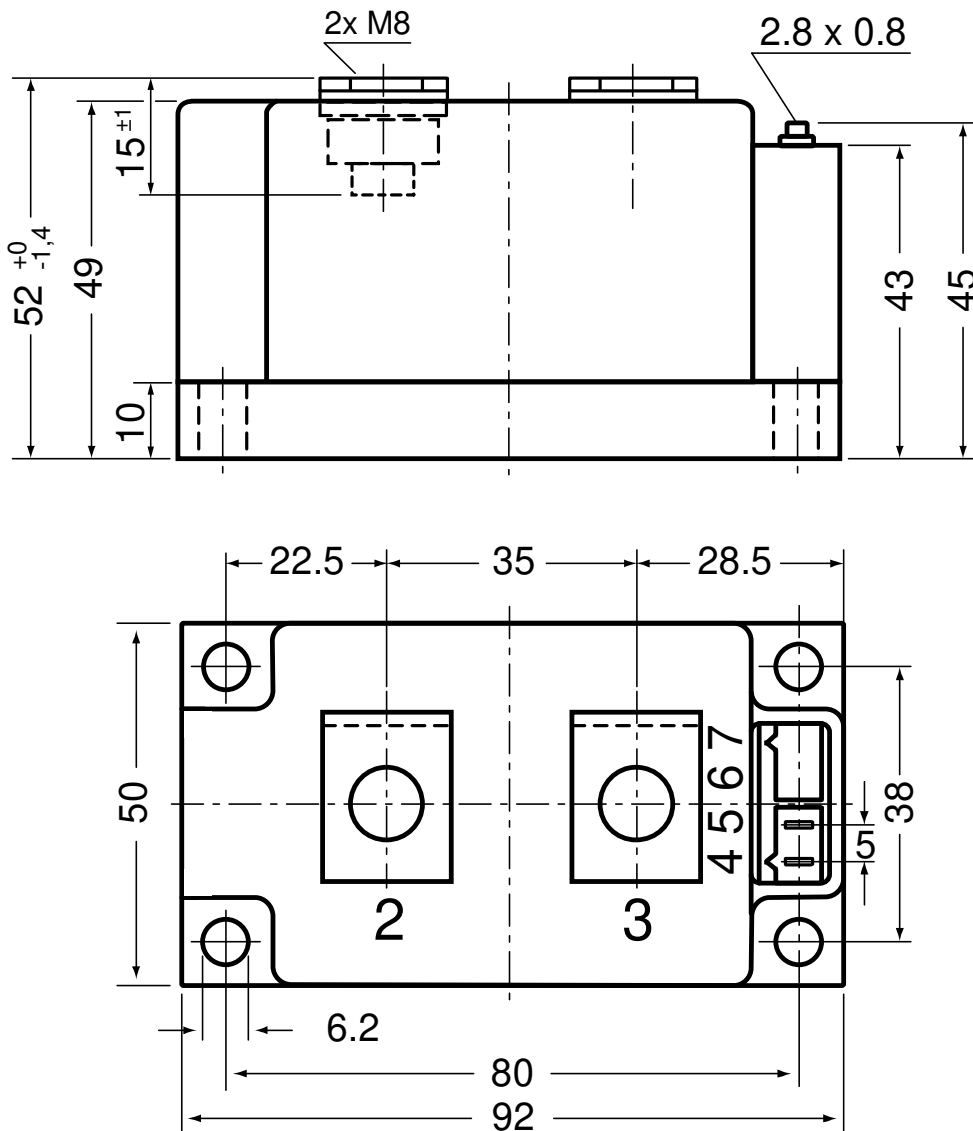
$T_{VJ} = 140\text{ °C}$



Thyristor

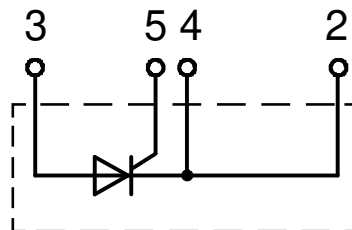
$V_{0\ max}$	threshold voltage	0.81	V
$R_{0\ max}$	slope resistance *	0.22	mΩ

**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

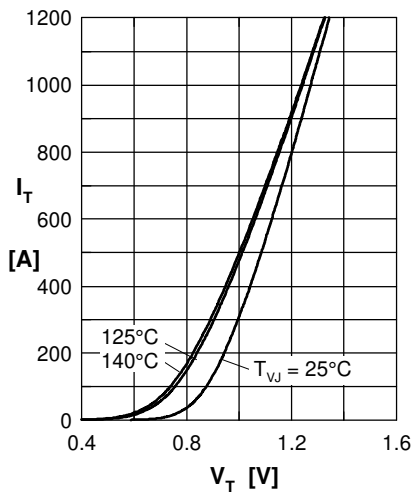


Fig. 1 Forward characteristics

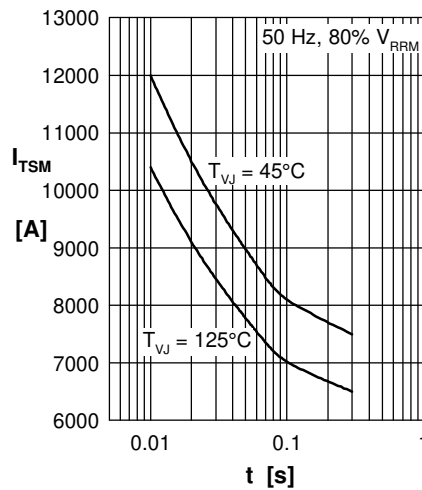


Fig. 2 Surge overload current

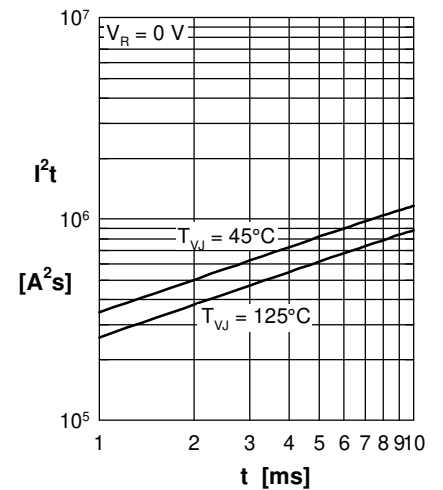


Fig. 3  $I^2t$  versus time (1-10 ms)

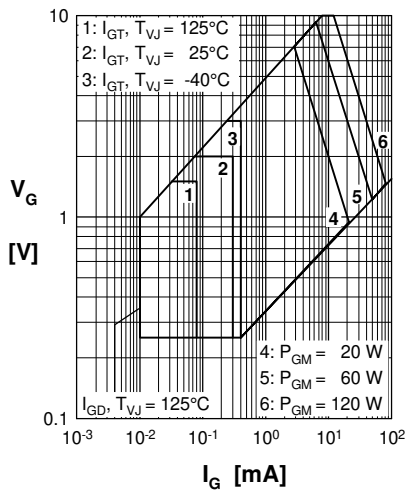


Fig. 4 Gate trigger characteristics

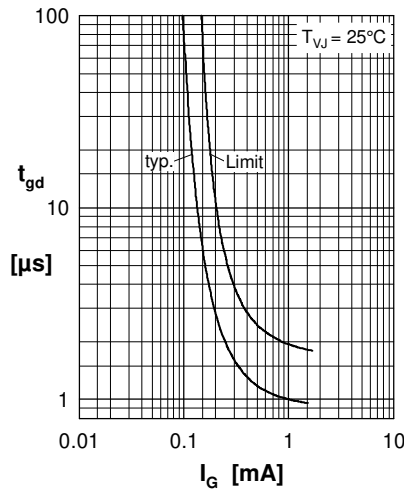


Fig. 5 Gate controlled delay time

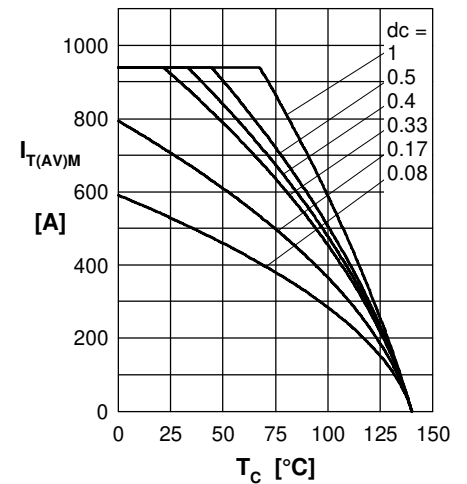


Fig. 6 Max. forward current at case temperature

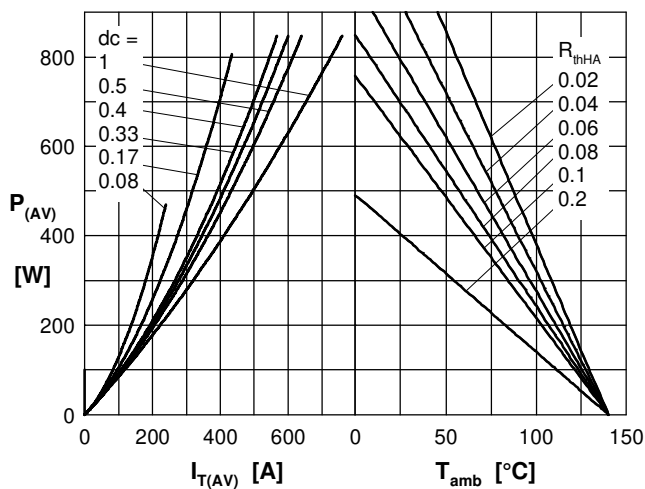


Fig. 7a Power dissipation versus direct output current  
Fig. 7b and ambient temperature

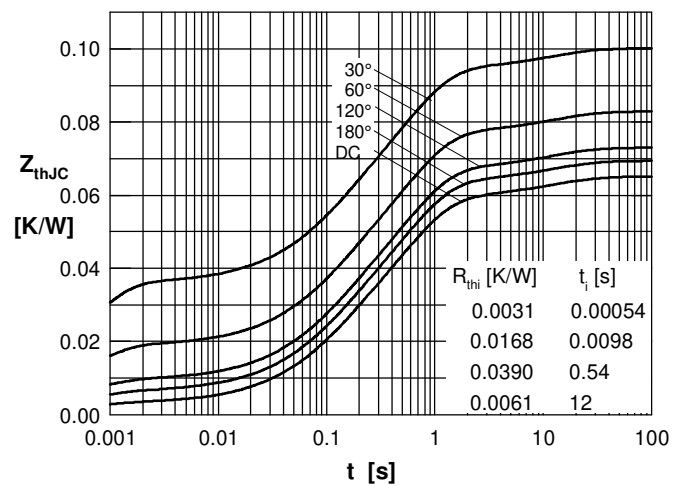


Fig. 8 Transient thermal impedance