

# High Voltage Thyristor Module

$$V_{RRM} = 2200V$$

$$I_{TAV} = 600A$$

$$V_T = 1.11V$$


## Single Thyristor

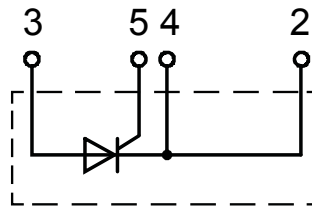
Part number

MCO600-22io1



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:

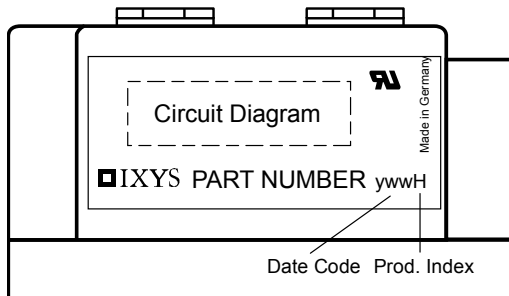
- Line rectifying 50/60 Hz
- Softstart AC motor control
- DC Motor control
- Power converter
- AC power control
- Lighting and temperature control

### 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

Thyristor				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			2300	V	
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			2200	V	
$I_{RD}$	reverse current, drain current	$V_{R/D} = 2200 V$	$T_{VJ} = 25^{\circ}C$		2	mA	
		$V_{R/D} = 2200 V$	$T_{VJ} = 125^{\circ}C$		40	mA	
$V_T$	forward voltage drop	$I_T = 600 A$	$T_{VJ} = 25^{\circ}C$		1.16	V	
		$I_T = 1200 A$			1.38	V	
		$I_T = 600 A$	$T_{VJ} = 125^{\circ}C$		1.11	V	
		$I_T = 1200 A$			1.37	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	
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		16.2	kA	
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 140^{\circ}C$		12.8	kA	
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		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	
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		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	
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		788.8	kA <sup>2</sup> s	
$C_J$	junction capacitance	$V_R = 700 V \quad f = 1 \text{ MHz}$	$T_{VJ} = 25^{\circ}C$		469	pF	
$P_{GM}$	max. gate power dissipation	$t_p = 30 \mu s$	$T_C = 140^{\circ}C$		120	W	
		$t_p = 300 \mu s$			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, $I_T = 1800 A$			100	A/μs	
		$t_p = 200 \mu s; di_G/dt = 1 A/\mu s;$ $I_G = 1 A; V_D = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 600 A$			500	A/μs	
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V_D = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty$ ; method 1 (linear voltage rise)	$T_{VJ} = 140^{\circ}C$		1000	V/μs	
$V_{GT}$	gate trigger voltage	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		2	V	
			$T_{VJ} = -40^{\circ}C$		3	V	
$I_{GT}$	gate trigger current	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		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	$t_p = 30 \mu s$	$T_{VJ} = 25^{\circ}C$		400	mA	
		$I_G = 1 A; di_G/dt = 1 A/\mu s$					
$I_H$	holding current	$V_D = 6 V \quad R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		300	mA	
$t_{gd}$	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}C$		2	μs	
		$I_G = 1 A; di_G/dt = 1 A/\mu s$					
$t_q$	turn-off time	$V_R = 100 V; I_T = 600 A; V_D = \frac{2}{3} V_{DRM}$ $di/dt = 10 A/\mu s; dv/dt = 50 V/\mu s; t_p = 200 \mu s$	$T_{VJ} = 140^{\circ}C$		350	μs	

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
$d_{Sppl/App}$	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



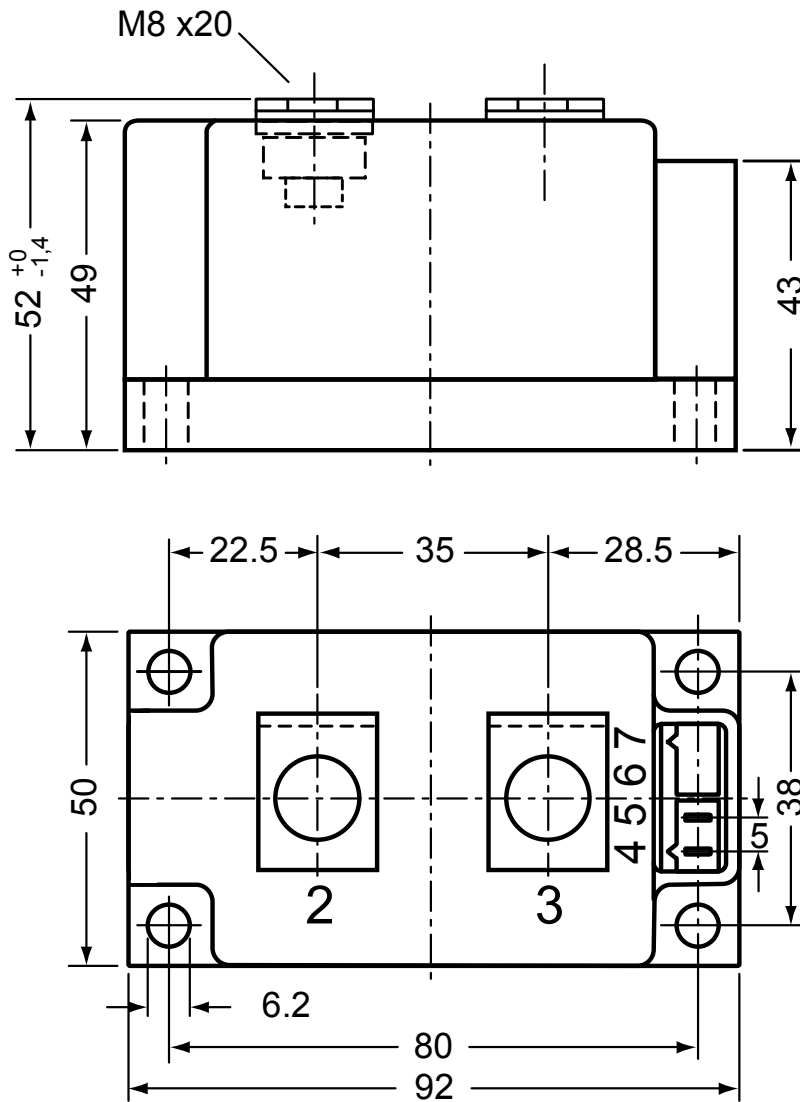
Ordering	Part Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCO600-22io1	MCO600-22io1	Box	3	474339

**Equivalent Circuits for Simulation** \* on die level  $T_{VJ} = 140\text{ }^\circ\text{C}$

**Thyristor**

$V_{0\text{ max}}$	threshold voltage	0.81	V
$R_{0\text{ max}}$	slope resistance *	0.21	mΩ

**Outlines Y1**

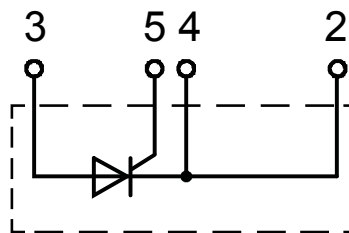


**Optional accessories for modules**

Keyed gate/cathode twin plugs with wire length = 350 mm, gate = white, cathode = red

Type ZY 180L (L = Left for pin pair 4/5)

Type ZY 180R (R = Right for pin pair 6/7) } UL 758, style 3751



## Thyristor

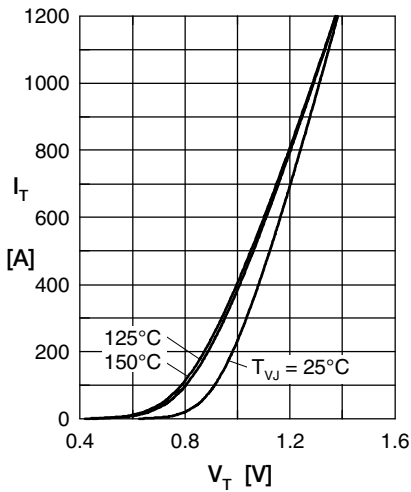


Fig. 1 Forward characteristics

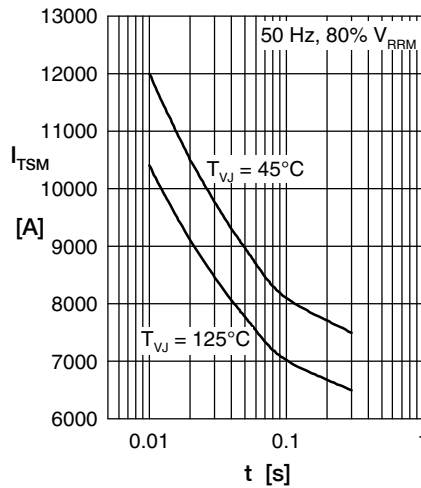


Fig. 2 Surge overload current

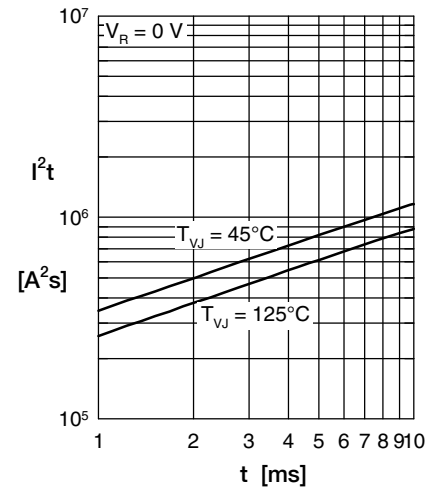


Fig. 3  $I^2t$  versus time (1-10 ms)

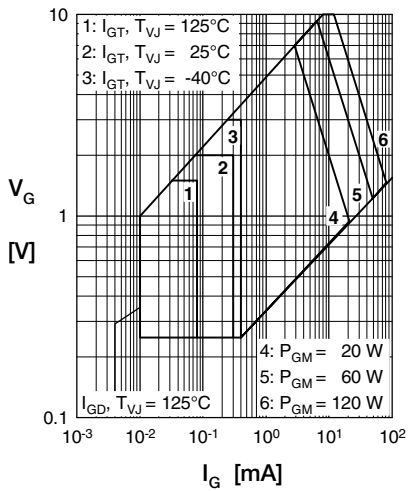


Fig. 4 Gate trigger characteristics

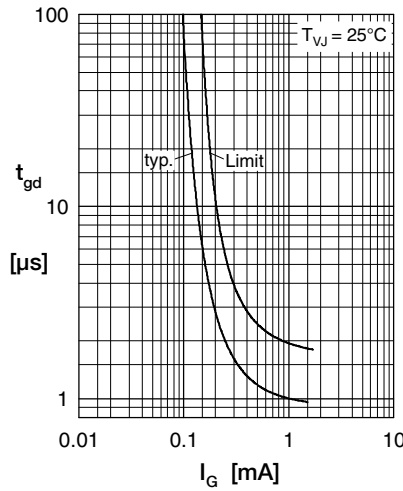


Fig. 5 Gate controlled delay time

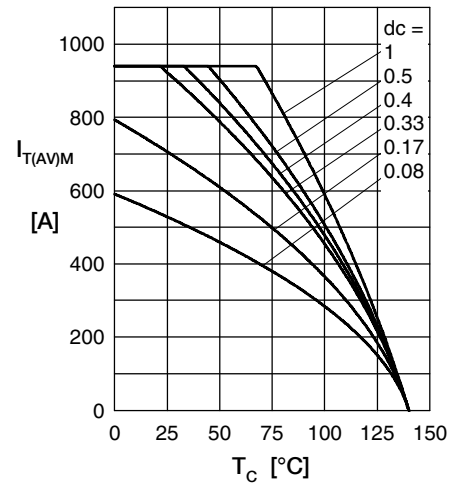


Fig. 6 Max. forward current at case temperature

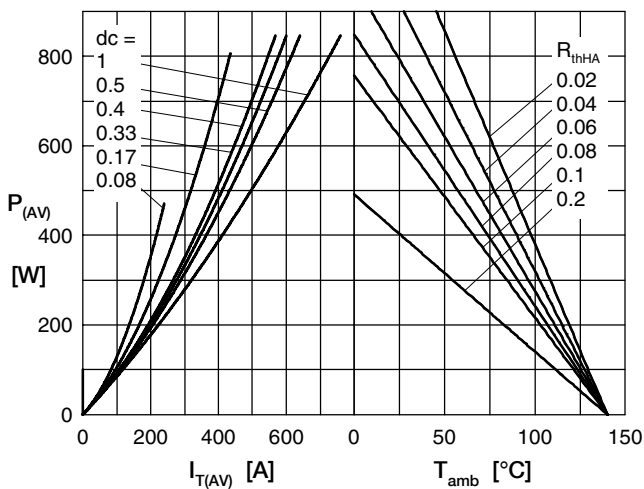


Fig. 7a Power dissipation versus direct output current



Fig. 7b and ambient temperature

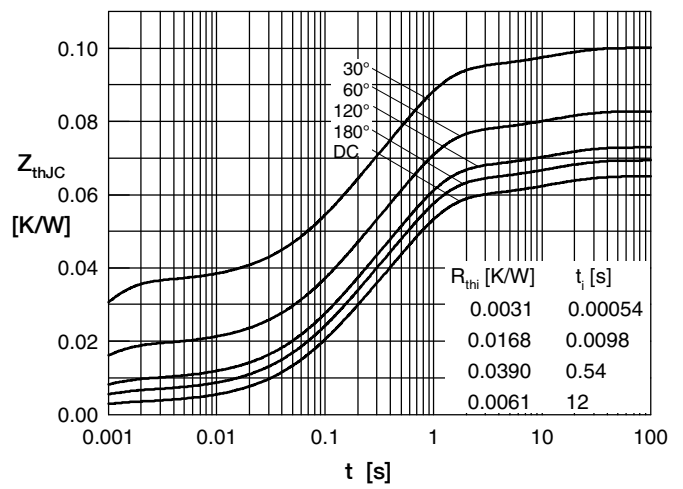


Fig. 8 Transient thermal impedance