

# Thyristor Module

$$V_{RRM} = 2 \times 1600 \text{ V}$$

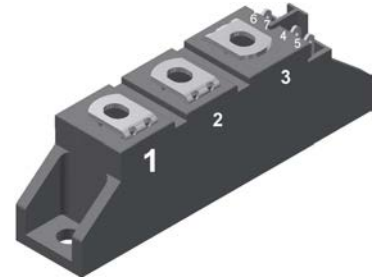
$$I_{TAV} = 140 \text{ A}$$

$$V_T = 1,28 \text{ V}$$


Phase leg

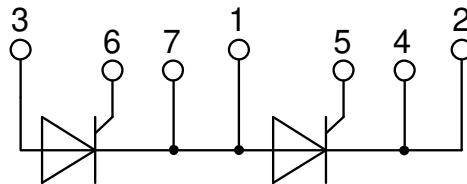
Part number

**MCMA140P1600TA-NI**



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: TO-240AA

- Isolation Voltage: 4800 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

### Disclaimer Notice

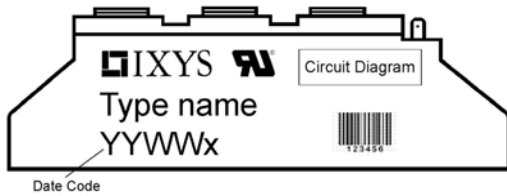
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Thyristor				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1700	V	
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1600	V	
$I_{RD}$	reverse current, drain current	$V_{R/D} = 1600 V$	$T_{VJ} = 25^{\circ}C$		100	$\mu A$	
		$V_{R/D} = 1600 V$	$T_{VJ} = 140^{\circ}C$		10	mA	
$V_T$	forward voltage drop	$I_T = 150 A$	$T_{VJ} = 25^{\circ}C$		1,29	V	
		$I_T = 300 A$			1,63	V	
		$I_T = 150 A$	$T_{VJ} = 125^{\circ}C$		1,28	V	
		$I_T = 300 A$			1,70	V	
$I_{TAV}$	average forward current	$T_C = 85^{\circ}C$	$T_{VJ} = 140^{\circ}C$		140	A	
$I_{T(RMS)}$	RMS forward current	180° sine			220	A	
$V_{T0}$	threshold voltage	} for power loss calculation only	$T_{VJ} = 140^{\circ}C$		0,85	V	
$r_T$	slope resistance				2,8	m $\Omega$	
$R_{thJC}$	thermal resistance junction to case				0,22	K/W	
$R_{thCH}$	thermal resistance case to heatsink			0,2		K/W	
$P_{tot}$	total power dissipation		$T_C = 25^{\circ}C$		520	W	
$I_{TSM}$	max. forward surge current	$t = 10 ms; (50 Hz), sine$	$T_{VJ} = 45^{\circ}C$		2,40	kA	
		$t = 8,3 ms; (60 Hz), sine$	$V_R = 0 V$		2,59	kA	
		$t = 10 ms; (50 Hz), sine$	$T_{VJ} = 140^{\circ}C$		2,04	kA	
		$t = 8,3 ms; (60 Hz), sine$	$V_R = 0 V$		2,21	kA	
$I^2t$	value for fusing	$t = 10 ms; (50 Hz), sine$	$T_{VJ} = 45^{\circ}C$		28,8	kA <sup>2</sup> s	
		$t = 8,3 ms; (60 Hz), sine$	$V_R = 0 V$		27,9	kA <sup>2</sup> s	
		$t = 10 ms; (50 Hz), sine$	$T_{VJ} = 140^{\circ}C$		20,8	kA <sup>2</sup> s	
		$t = 8,3 ms; (60 Hz), sine$	$V_R = 0 V$		20,2	kA <sup>2</sup> s	
$C_J$	junction capacitance	$V_R = 400V f = 1 MHz$	$T_{VJ} = 25^{\circ}C$		119	pF	
$P_{GM}$	max. gate power dissipation	$t_p = 30 \mu s$	$T_C = 140^{\circ}C$		10	W	
		$t_p = 300 \mu s$			5	W	
$P_{GAV}$	average gate power dissipation				0,5	W	
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 140^{\circ}C; f = 50 Hz$ repetitive, $I_T = 450 A$			150	A/ $\mu s$	
		$t_p = 200 \mu s; di_G/dt = 0,45 A/\mu s;$ $I_G = 0,45A; V_D = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 150 A$			500	A/ $\mu s$	
$(dv/dt)_{cr}$	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/ $\mu s$	
$V_{GT}$	gate trigger voltage	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		1,5	V	
			$T_{VJ} = -40^{\circ}C$		1,6	V	
$I_{GT}$	gate trigger current	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		150	mA	
			$T_{VJ} = -40^{\circ}C$		200	mA	
$V_{GD}$	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 140^{\circ}C$		0,2	V	
$I_{GD}$	gate non-trigger current				10	mA	
$I_L$	latching current	$t_p = 10 \mu s$	$T_{VJ} = 25^{\circ}C$		200	mA	
		$I_G = 0,45A; di_G/dt = 0,45 A/\mu s$					
$I_H$	holding current	$V_D = 6 V R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		200	mA	
$t_{gd}$	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}C$		2	$\mu s$	
		$I_G = 0,45A; di_G/dt = 0,45 A/\mu s$					
$t_q$	turn-off time	$V_R = 100 V; I_T = 150A; V_D = \frac{2}{3} V_{DRM}$ $di/dt = 10 A/\mu s; dv/dt = 20 V/\mu s; t_p = 200 \mu s$	$T_{VJ} = 125^{\circ}C$		185	$\mu s$	



Package TO-240AA				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$I_{RMS}$	RMS current	per terminal			200	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>					81	g	
$M_D$	mounting torque		2,5		4	Nm	
$M_T$	terminal torque		2,5		4	Nm	
$d_{Spp/App}$	creepage distance on surface   striking distance through air	terminal to terminal	13,0	9,7		mm	
$d_{Spb/Apb}$		terminal to backside	16,0	16,0		mm	
$V_{ISOL}$	isolation voltage	t = 1 second		4800		V	
		t = 1 minute	50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA	4000		V	



**Part description**

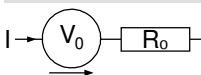
- M = Module
- C = Thyristor (SCR)
- M = Thyristor
- A = (up to 1800V)
- 140 = Current Rating [A]
- P = Phase leg
- 1600 = Reverse Voltage [V]
- TA = TO-240AA-1B
- = Hyphen
- NI = without metal inserts

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCMA140P1600TA-NI	MCMA140P1600TA-NI	Box	36	

**Equivalent Circuits for Simulation**

\* on die level

$T_{VJ} = 140^{\circ}C$

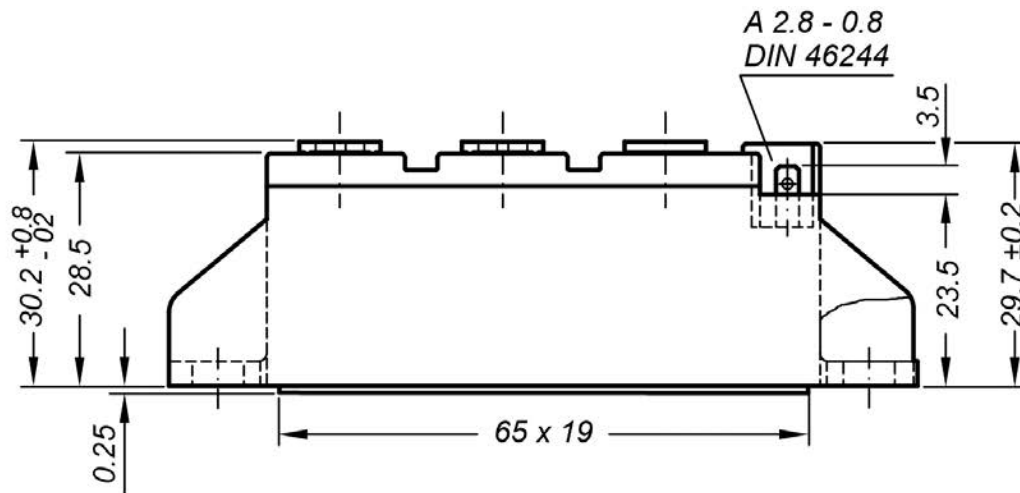


Thyristor

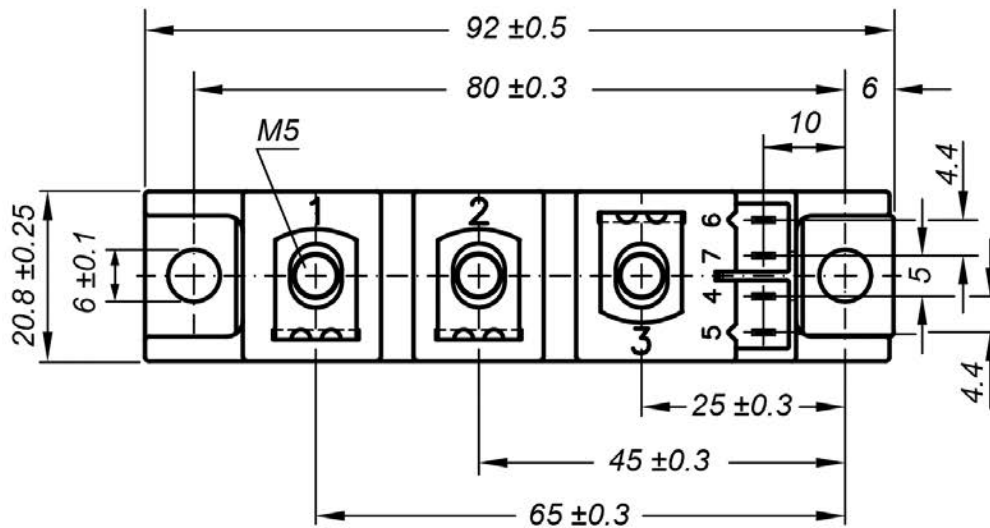
$V_{0\ max}$	threshold voltage	0,85	V
$R_{0\ max}$	slope resistance *	1,6	mΩ



**Outlines TO-240AA**



General tolerance: DIN ISO 2768 class „c“

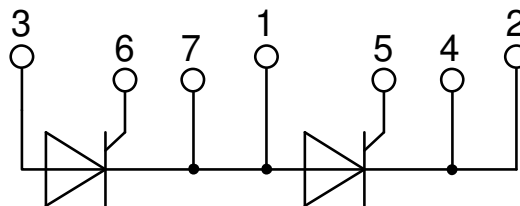


Optional accessories for modules

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

Type ZY 200L (L = Left for pin pair 4/5)

Type ZY 200R (R = Right for pin pair 6/7) } UL 758, style 3751



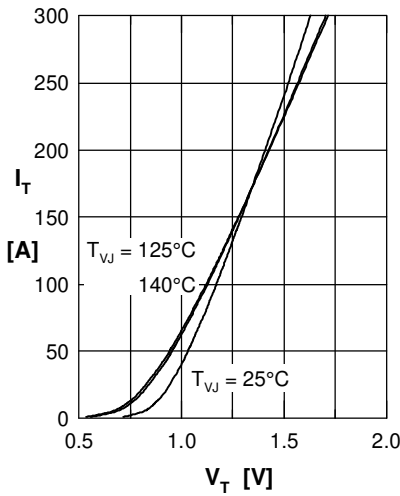
**Thyristor**


Fig. 1 Forward characteristics

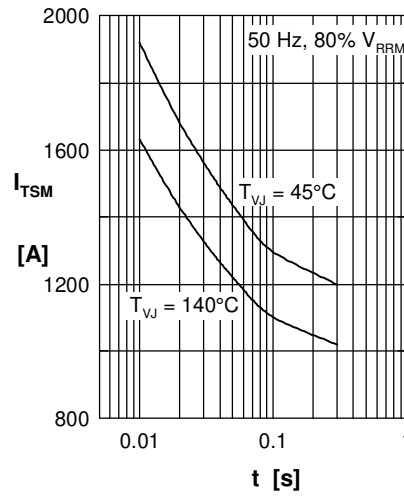
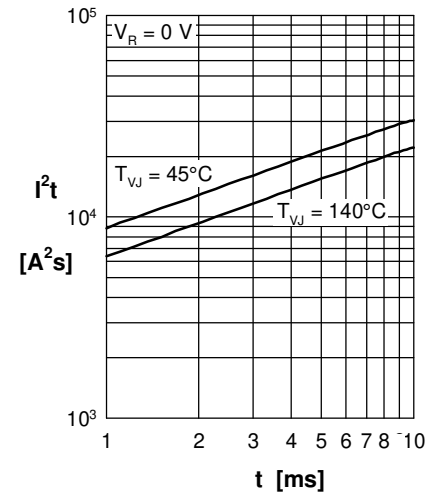
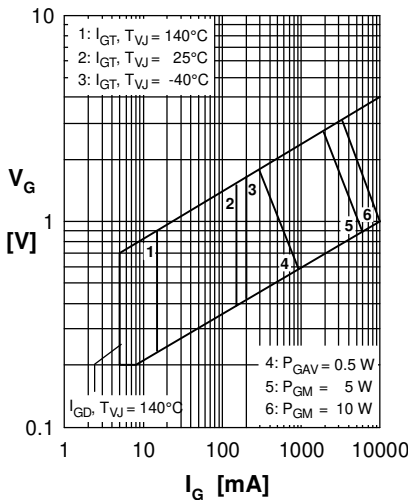

 Fig. 2 Surge overload current  
 $I_{TSM}$ : crest value,  $t$ : duration

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


Fig. 4 Gate voltage &amp; gate current

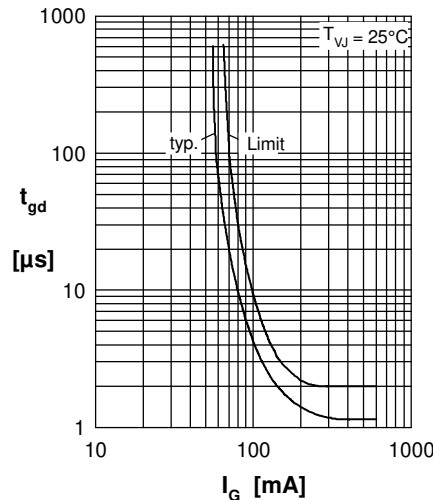
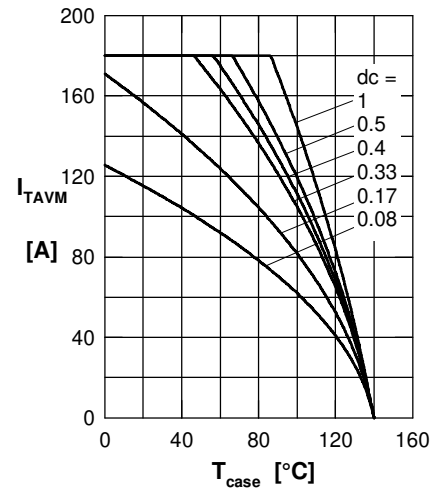

 Fig. 5 Gate controlled delay time  $t_{gd}$ 


Fig. 6 Max. forward current at case temperature

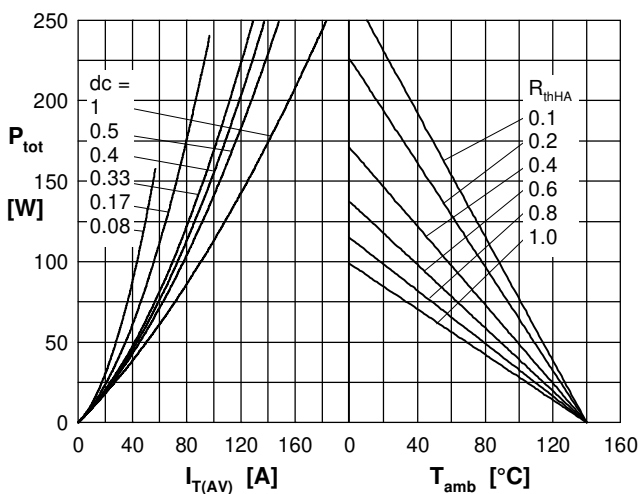
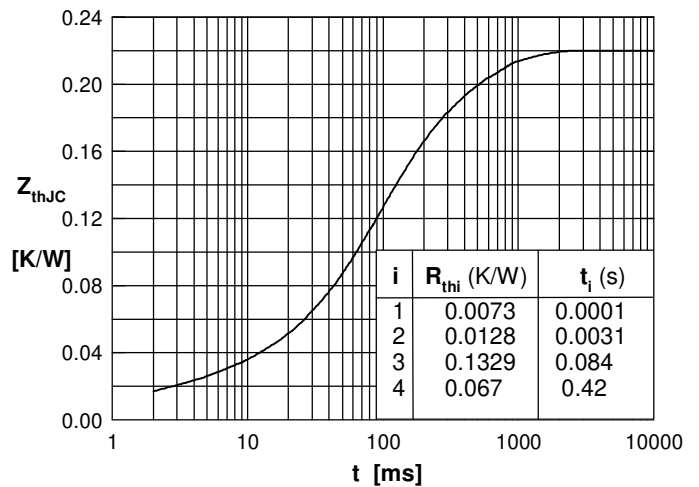

 Fig. 7a Power dissipation versus direct output current  
 Fig. 7b and ambient temperature


Fig. 8 Transient thermal impedance junction to case