

Thyristor Module

V_{RRM} = 2x1600 V

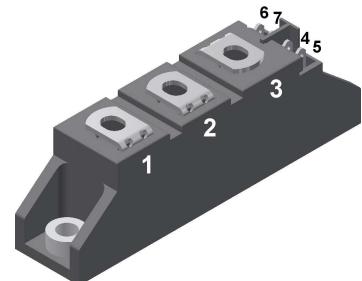
I_{TAV} = 140 A

V_T = 1.28 V

Phase leg

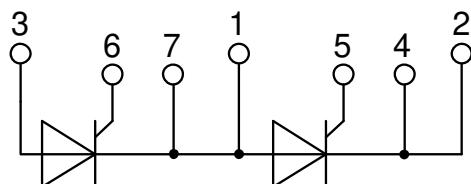
Part number

MCMA140P1600TA



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: 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

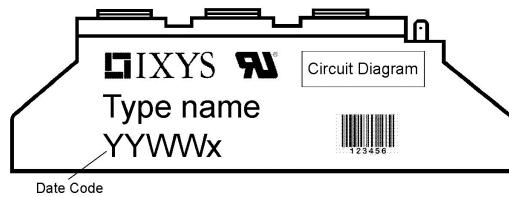
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Thyristor

Symbol	Definition	Conditions	Ratings			
			min.	typ.	max.	
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^\circ\text{C}$			1700	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^\circ\text{C}$			1600	V
$I_{R/D}$	reverse current, drain current	$V_{R/D} = 1600 \text{ V}$ $V_{R/D} = 1600 \text{ V}$	$T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 140^\circ\text{C}$		100 10	μA mA
V_T	forward voltage drop	$I_T = 150 \text{ A}$	$T_{VJ} = 25^\circ\text{C}$		1.29	V
		$I_T = 300 \text{ A}$			1.63	V
		$I_T = 150 \text{ A}$ $I_T = 300 \text{ A}$	$T_{VJ} = 125^\circ\text{C}$		1.28 1.70	V
I_{TAV}	average forward current	$T_C = 85^\circ\text{C}$	$T_{VJ} = 140^\circ\text{C}$		140	A
$I_{T(RMS)}$	RMS forward current	180° sine			220	A
V_{T0}	threshold voltage	r_T slope resistance } for power loss calculation only	$T_{VJ} = 140^\circ\text{C}$		0.85	V
	slope resistance				2.8	$\text{m}\Omega$
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		$T_C = 25^\circ\text{C}$		520	W
I_{TSM}	max. forward surge current	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{sine}$	$T_{VJ} = 45^\circ\text{C}$		2.40	kA
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{sine}$	$V_R = 0 \text{ V}$		2.59	kA
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{sine}$	$T_{VJ} = 140^\circ\text{C}$		2.04	kA
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{sine}$	$V_R = 0 \text{ V}$		2.21	kA
I^2t	value for fusing	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{sine}$	$T_{VJ} = 45^\circ\text{C}$		28.8	kA^2s
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{sine}$	$V_R = 0 \text{ V}$		27.9	kA^2s
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{sine}$	$T_{VJ} = 140^\circ\text{C}$		20.8	kA^2s
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{sine}$	$V_R = 0 \text{ V}$		20.2	kA^2s
C_J	junction capacitance	$V_R = 400 \text{ V}$ $f = 1 \text{ MHz}$	$T_{VJ} = 25^\circ\text{C}$	119		pF
P_{GM}	max. gate power dissipation	$t_p = 30 \mu\text{s}$	$T_C = 140^\circ\text{C}$		10	W
		$t_p = 300 \mu\text{s}$			5	W
P_{GAV}	average gate power dissipation				0.5	W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 140^\circ\text{C}; f = 50 \text{ Hz}$ repetitive, $I_T = 450 \text{ A}$			150	$\text{A}/\mu\text{s}$
		$t_p = 200 \mu\text{s}; di_G/dt = 0.45 \text{ A}/\mu\text{s};$				
		$I_G = 0.45 \text{ A}; V = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 150 \text{ A}$			500	$\text{A}/\mu\text{s}$
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$	$T_{VJ} = 140^\circ\text{C}$		1000	$\text{V}/\mu\text{s}$
		$R_{GK} = \infty$; method 1 (linear voltage rise)				
V_{GT}	gate trigger voltage	$V_D = 6 \text{ V}$	$T_{VJ} = 25^\circ\text{C}$		1.5	V
			$T_{VJ} = -40^\circ\text{C}$		1.6	V
I_{GT}	gate trigger current	$V_D = 6 \text{ V}$	$T_{VJ} = 25^\circ\text{C}$		150	mA
			$T_{VJ} = -40^\circ\text{C}$		200	mA
V_{GD}	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 140^\circ\text{C}$		0.2	V
I_{GD}	gate non-trigger current				10	mA
I_L	latching current	$t_p = 10 \mu\text{s}$ $I_G = 0.45 \text{ A}; di_G/dt = 0.45 \text{ A}/\mu\text{s}$	$T_{VJ} = 25^\circ\text{C}$		200	mA
I_H	holding current	$V_D = 6 \text{ V}$ $R_{GK} = \infty$	$T_{VJ} = 25^\circ\text{C}$		200	mA
t_{gd}	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^\circ\text{C}$		2	μs
		$I_G = 0.45 \text{ A}; di_G/dt = 0.45 \text{ A}/\mu\text{s}$				
t_q	turn-off time	$V_R = 100 \text{ V}; I_T = 150 \text{ A}; V = \frac{2}{3} V_{DRM}$ $T_{VJ} = 125^\circ\text{C}$	$di/dt = 10 \text{ A}/\mu\text{s}$ $dv/dt = 20 \text{ V}/\mu\text{s}$ $t_p = 200 \mu\text{s}$	185		μs

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
Weight				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 t = 1 minute	50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA		4800 4000	V V

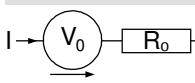

Part description

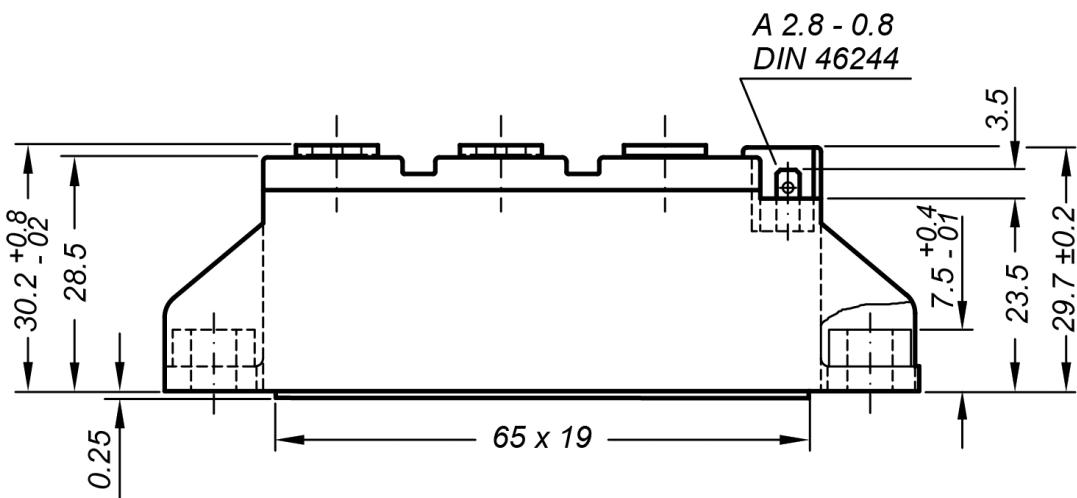
M = Module
C = Thyristor (SCR)
M = Thyristor
A = (up to 1800V)
140 = Current Rating [A]
P = Phase leg
1600 = Reverse Voltage [V]
TA = TO-240AA-1B

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCMA140P1600TA	MCMA140P1600TA	Box	36	509341

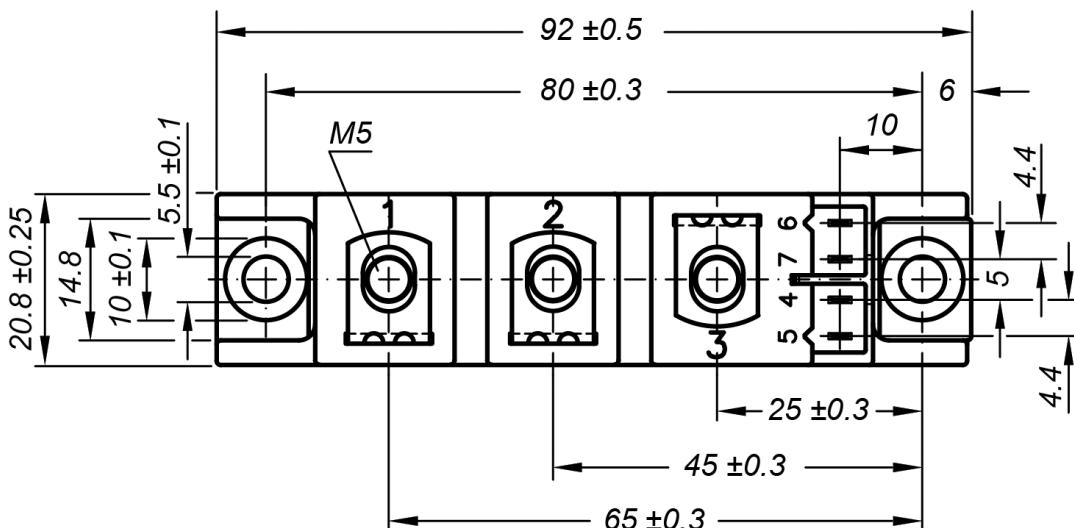
Similar Part	Package	Voltage class
MCMA140P1800TA	TO-240AA-1B	1800

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

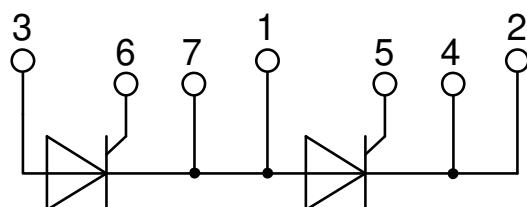
	Thyristor
V_0	
$V_{0\max}$	threshold voltage
$R_{0\max}$	slope resistance *

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

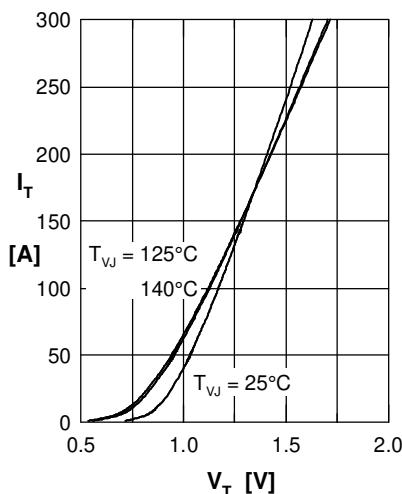


Fig. 1 Forward characteristics

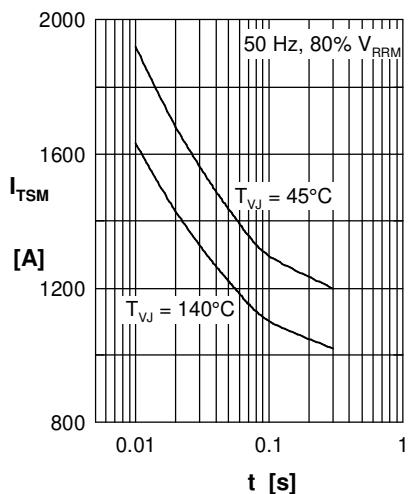


Fig. 2 Surge overload current
 I_{TSM} : crest value, t : duration

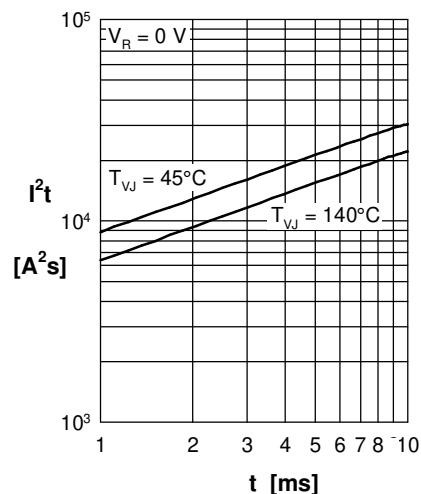


Fig. 3 I^2t versus time (1-10 s)

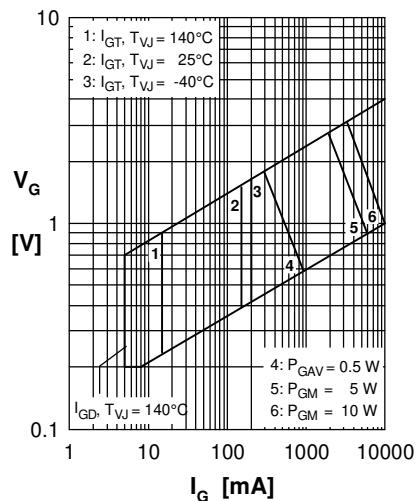


Fig. 4 Gate voltage & gate current

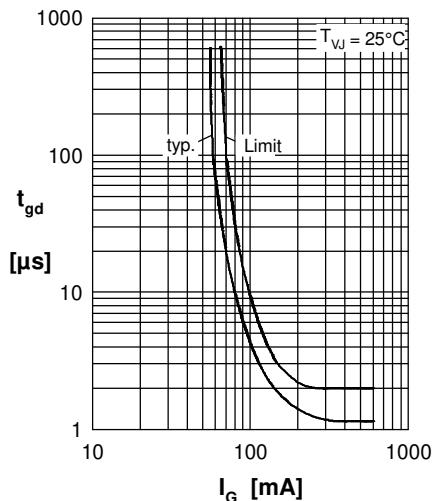


Fig. 5 Gate controlled delay time t_{gd}

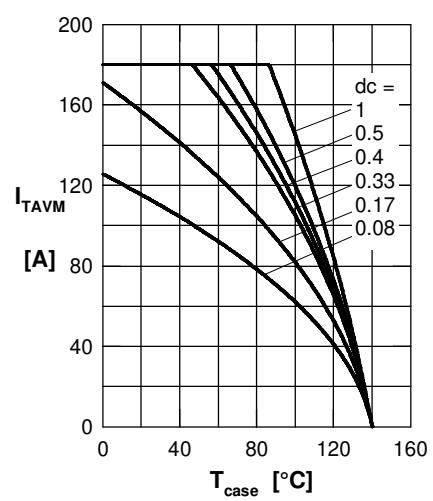


Fig. 6 Max. forward current at case temperature

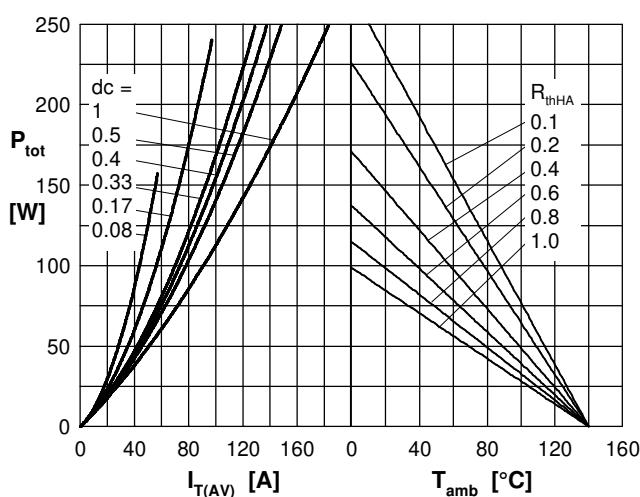


Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature

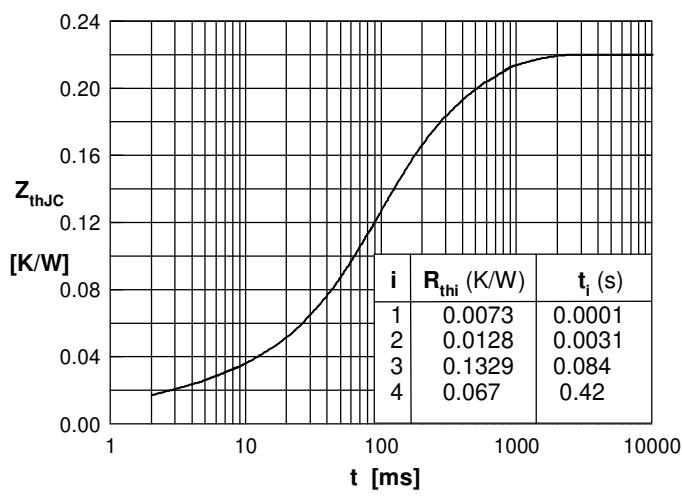


Fig. 7b Transient thermal impedance junction to case

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