

Thyristor Module

$$V_{RRM} = 2 \times 1200 \text{ V}$$

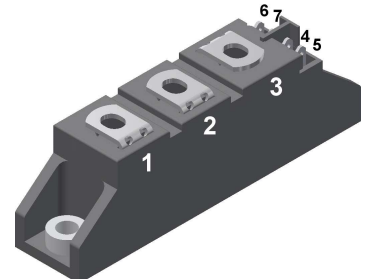
$$I_{TAV} = 110 \text{ A}$$

$$V_T = 1.21 \text{ V}$$

Phase leg

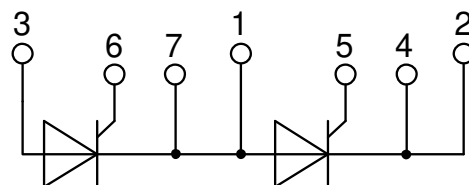
Part number

MCMA110P1200TA



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

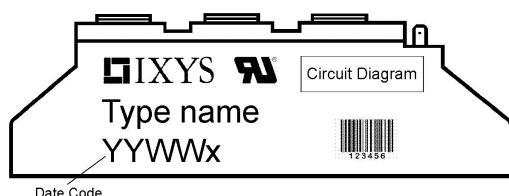
- Isolation Voltage: 4800 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

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Thyristor				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				1300	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				1200	V
$I_{R/D}$	reverse current, drain current	$V_{R/D} = 1200\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			100	μA
		$V_{R/D} = 1200\text{ V}$	$T_{VJ} = 140^{\circ}\text{C}$			10	mA
V_T	forward voltage drop	$I_T = 110\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$			1.24	V
		$I_T = 220\text{ A}$				1.52	V
		$I_T = 110\text{ A}$	$T_{VJ} = 125^{\circ}\text{C}$			1.21	V
		$I_T = 220\text{ A}$				1.57	V
I_{TAV}	average forward current	$T_C = 85^{\circ}\text{C}$	$T_{VJ} = 140^{\circ}\text{C}$			110	A
$I_{T(RMS)}$	RMS forward current	180° sine				170	A
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 140^{\circ}\text{C}$			0.85	V
r_T	slope resistance					3.3	m Ω
R_{thJC}	thermal resistance junction to case					0.3	K/W
R_{thCH}	thermal resistance case to heatsink				0.2		K/W
P_{tot}	total power dissipation		$T_C = 25^{\circ}\text{C}$			380	W
I_{TSM}	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$			1.90	kA
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			2.05	kA
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 140^{\circ}\text{C}$			1.62	kA
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			1.75	kA
I^2t	value for fusing	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$			18.1	kA ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			17.5	kA ² s
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 140^{\circ}\text{C}$			13.0	kA ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			12.7	kA ² s
C_J	junction capacitance	$V_R = 400\text{ V}$ $f = 1\text{ MHz}$	$T_{VJ} = 25^{\circ}\text{C}$		95		pF
P_{GM}	max. gate power dissipation	$t_p = 30\text{ }\mu\text{s}$	$T_C = 140^{\circ}\text{C}$			10	W
		$t_p = 300\text{ }\mu\text{s}$				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, $I_T = 330\text{ A}$				150	A/ μs
		$t_p = 200\text{ }\mu\text{s}; di_G/dt = 0.45\text{ A}/\mu\text{s};$ $I_G = 0.45\text{ A}; V = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 110\text{ A}$				500	A/ μs
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$	$T_{VJ} = 140^{\circ}\text{C}$			1000	V/ μs
		$R_{GK} = \infty$; 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	$t_p = 10\text{ }\mu\text{s}$	$T_{VJ} = 25^{\circ}\text{C}$			200	mA
		$I_G = 0.45\text{ A}; di_G/dt = 0.45\text{ A}/\mu\text{s}$					
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	$V_R = 100\text{ V}; I_T = 110\text{ A}; V = \frac{2}{3} V_{DRM}$ $T_{VJ} = 125^{\circ}\text{C}$ $di/dt = 10\text{ A}/\mu\text{s}$ $dv/dt = 20\text{ V}/\mu\text{s}$ $t_p = 200\text{ }\mu\text{s}$			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
$d_{Spp/Apb}$	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	50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA	4800			V
		t = 1 minute		4000			V



Part description

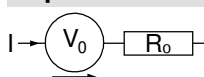
M = Module
 C = Thyristor (SCR)
 M = Thyristor
 A = (up to 1800V)
 110 = Current Rating [A]
 P = Phase leg
 1200 = Reverse Voltage [V]
 TA = TO-240AA-1B

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCMA110P1200TA	MCMA110P1200TA	Box	36	513376

Equivalent Circuits for Simulation

* on die level

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



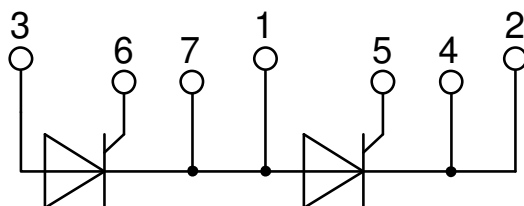
Thyristor

$V_{0\max}$	threshold voltage	0.85	V
$R_{0\max}$	slope resistance *	2.1	mΩ

Technical drawing of a 5-pin DIN connector. The drawing shows the front and side views with the following dimensions and labels:

- Overall length: 92 ± 0.5
- Distance from front face to center of pin 1: 80 ± 0.3
- Pin 1 thread: M5
- Pin 1 diameter: 5.5 ± 0.1
- Pin 1 height: 10 ± 0.1
- Pin 1 mounting hole diameter: 14.8
- Pin 1 mounting hole offset: 20.8 ± 0.25
- Pin 2 diameter: 4.4
- Pin 2 height: 5
- Pin 2 mounting hole diameter: 4.4
- Pin 2 mounting hole offset: 4.4
- Pin 3 diameter: 4.4
- Pin 3 height: 5
- Pin 3 mounting hole diameter: 4.4
- Pin 3 mounting hole offset: 4.4
- Pin 4 diameter: 4.4
- Pin 4 height: 5
- Pin 4 mounting hole diameter: 4.4
- Pin 4 mounting hole offset: 4.4
- Pin 5 diameter: 4.4
- Pin 5 height: 5
- Pin 5 mounting hole diameter: 4.4
- Pin 5 mounting hole offset: 4.4
- Pin 6 diameter: 4.4
- Pin 6 height: 5
- Pin 6 mounting hole diameter: 4.4
- Pin 6 mounting hole offset: 4.4
- Pin 7 diameter: 4.4
- Pin 7 height: 5
- Pin 7 mounting hole diameter: 4.4
- Pin 7 mounting hole offset: 4.4
- Pin 8 diameter: 4.4
- Pin 8 height: 5
- Pin 8 mounting hole diameter: 4.4
- Pin 8 mounting hole offset: 4.4
- Pin 9 diameter: 4.4
- Pin 9 height: 5
- Pin 9 mounting hole diameter: 4.4
- Pin 9 mounting hole offset: 4.4
- Pin 10 diameter: 4.4
- Pin 10 height: 5
- Pin 10 mounting hole diameter: 4.4
- Pin 10 mounting hole offset: 4.4
- Pin 11 diameter: 4.4
- Pin 11 height: 5
- Pin 11 mounting hole diameter: 4.4
- Pin 11 mounting hole offset: 4.4
- Pin 12 diameter: 4.4
- Pin 12 height: 5
- Pin 12 mounting hole diameter: 4.4
- Pin 12 mounting hole offset: 4.4
- Pin 13 diameter: 4.4
- Pin 13 height: 5
- Pin 13 mounting hole diameter: 4.4
- Pin 13 mounting hole offset: 4.4
- Pin 14 diameter: 4.4
- Pin 14 height: 5
- Pin 14 mounting hole diameter: 4.4
- Pin 14 mounting hole offset: 4.4
- Pin 15 diameter: 4.4
- Pin 15 height: 5
- Pin 15 mounting hole diameter: 4.4
- Pin 15 mounting hole offset: 4.4
- Pin 16 diameter: 4.4
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- Pin 24 diameter: 4.4
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- Pin 24 mounting hole diameter: 4.4
- Pin 24 mounting hole offset: 4.4
- Pin 25 diameter: 4.4
- Pin 25 height: 5
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- Pin 25 mounting hole offset: 4.4
- Pin 26 diameter: 4.4
- Pin 26 height: 5
- Pin 26 mounting hole diameter: 4.4
- Pin 26 mounting hole offset: 4.4
- Pin 27 diameter: 4.4
- Pin 27 height: 5
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- Pin 27 mounting hole offset: 4.4
- Pin 28 diameter: 4.4
- Pin 28 height: 5
- Pin 28 mounting hole diameter: 4.4
- Pin 28 mounting hole offset: 4.4
- Pin 29 diameter: 4.4
- Pin 29 height: 5
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- Pin 29 mounting hole offset: 4.4
- Pin 30 diameter: 4.4
- Pin 30 height: 5
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- Pin 30 mounting hole offset: 4.4
- Pin 31 diameter: 4.4
- Pin 31 height: 5
- Pin 31 mounting hole diameter: 4.4
- Pin 31 mounting hole offset: 4.4
- Pin 32 diameter: 4.4
- Pin 32 height: 5
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- Pin 32 mounting hole offset: 4.4
- Pin 33 diameter: 4.4
- Pin 33 height: 5
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- Pin 34 height: 5
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- Pin 35 height: 5
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- Pin 35 mounting hole offset: 4.4
- Pin 36 diameter: 4.4
- Pin 36 height: 5
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- Pin 36 mounting hole offset: 4.4
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- Pin 37 height: 5
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- Pin 37 mounting hole offset: 4.4
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- Pin 38 height: 5
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- Pin 38 mounting hole offset: 4.4
- Pin 39 diameter: 4.4
- Pin 39 height: 5
- Pin 39 mounting hole diameter: 4.4
- Pin 39 mounting hole offset: 4.4
- Pin 40 diameter: 4.4
- Pin 40 height: 5
- Pin 40 mounting hole diameter: 4.4
- Pin 40 mounting hole offset: 4.4
- Pin 41 diameter: 4.4
- Pin 41 height: 5
- Pin 41 mounting hole diameter: 4.4
- Pin 41 mounting hole offset: 4.4
- Pin 42 diameter: 4.4
- Pin 42 height: 5
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- Pin 42 mounting hole offset: 4.4
- Pin 43 diameter: 4.4
- Pin 43 height: 5
- Pin 43 mounting hole diameter: 4.4
- Pin 43 mounting hole offset: 4.4
- Pin 44 diameter: 4.4
- Pin 44 height: 5
- Pin 44 mounting hole diameter: 4.4
- Pin 44 mounting hole offset: 4.4
- Pin 45 diameter: 4.4
- Pin 45 height: 5
- Pin 45 mounting hole diameter: 4.4
- Pin 45 mounting hole offset: 4.4
- Pin 46 diameter: 4.4
- Pin 46 height: 5
- Pin 46 mounting hole diameter: 4.4
- Pin 46 mounting hole offset: 4.4
- Pin 47 diameter: 4.4
- Pin 47 height: 5
- Pin 47 mounting hole diameter: 4.4
- Pin 47 mounting hole offset: 4.4
- Pin 48 diameter: 4.4
- Pin 48 height: 5
- Pin 48 mounting hole diameter: 4.4
- Pin 48 mounting hole offset: 4.4
- Pin 49 diameter: 4.4
- Pin 49 height: 5
- Pin 49 mounting hole diameter: 4.4 </

- UL 758, style 3751



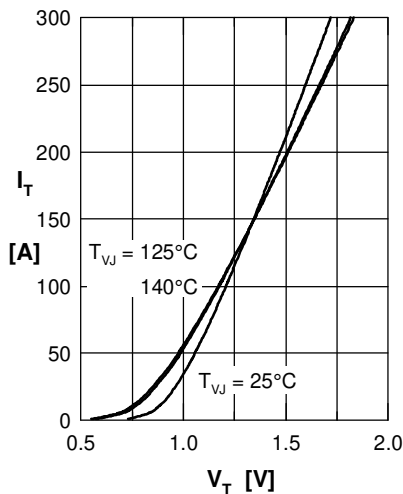
Thyristor


Fig. 1 Forward characteristics

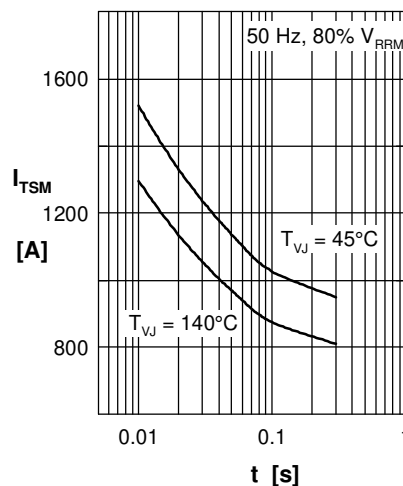
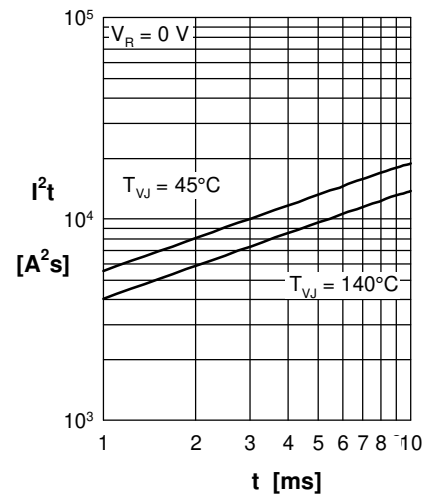
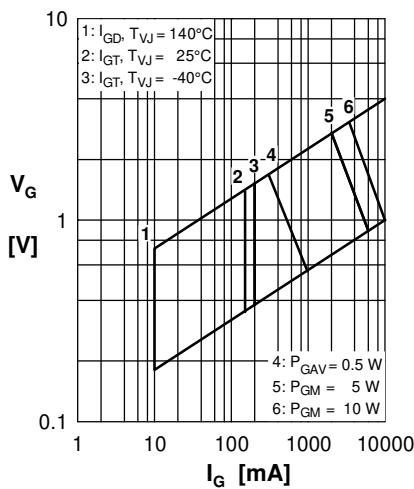

 Fig. 2 Surge overload current
 I_{TSM} : crest value, t : duration

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


Fig. 4 Gate voltage & gate current

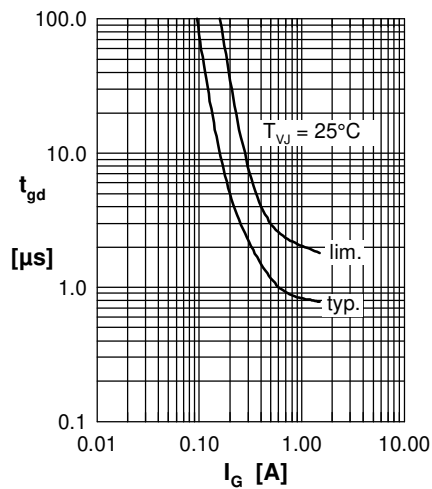
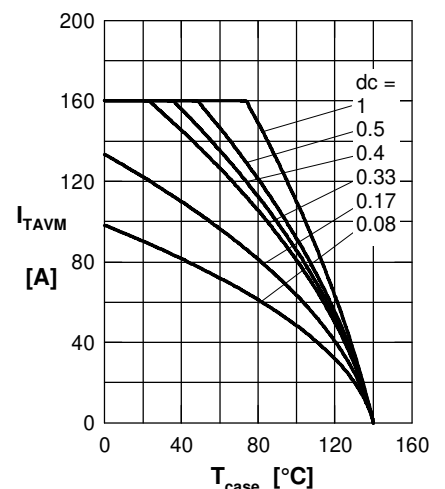

 Fig. 5 Gate controlled delay time t_{gd}


Fig. 6 Max. forward current at case temperature

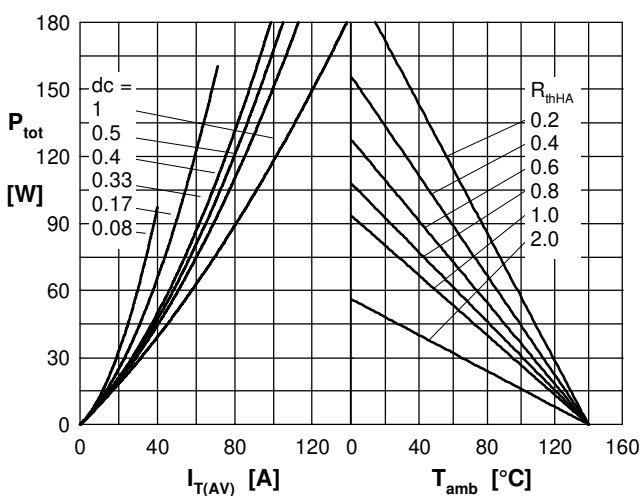
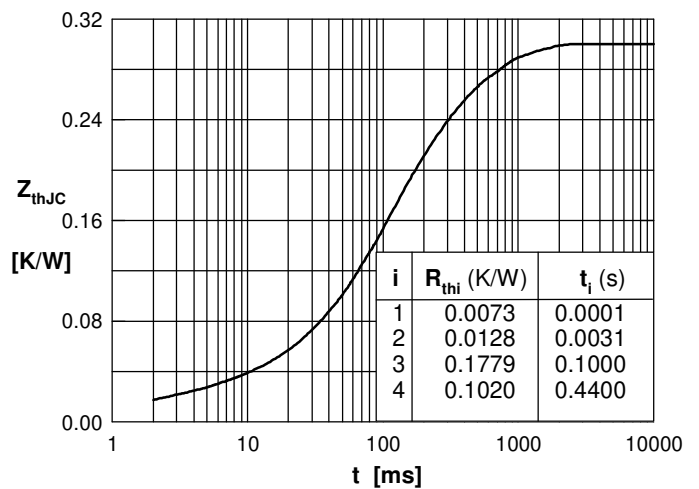

 Fig. 7a Power dissipation versus direct output current
 Fig. 7b and ambient temperature


Fig. 8 Transient thermal impedance junction to case