

Thyristor Module

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

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

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

Phase leg

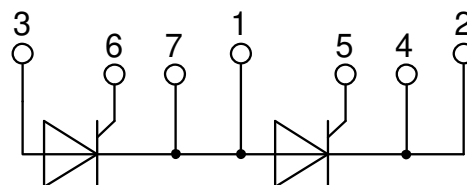
Part number

MCMA110P1600TA



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	$T_{VJ} = 25^{\circ}C$			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	μA	
		$V_{R/D} = 1600 V$	$T_{VJ} = 140^{\circ}C$		10	mA	
V_T	forward voltage drop	$I_T = 110 A$	$T_{VJ} = 25^{\circ}C$		1.24	V	
		$I_T = 220 A$			1.52	V	
		$I_T = 110 A$	$T_{VJ} = 125^{\circ}C$		1.21	V	
		$I_T = 220 A$			1.57	V	
I_{TAV}	average forward current	$T_C = 85^{\circ}C$	$T_{VJ} = 140^{\circ}C$		110	A	
$I_{T(RMS)}$	RMS forward current	180° sine			170	A	
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 140^{\circ}C$		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		$T_C = 25^{\circ}C$		380	W	
I_{TSM}	max. forward surge current	$t = 10 ms$; (50 Hz), sine	$T_{VJ} = 45^{\circ}C$		1.90	kA	
		$t = 8,3 ms$; (60 Hz), sine	$V_R = 0 V$		2.05	kA	
		$t = 10 ms$; (50 Hz), sine	$T_{VJ} = 140^{\circ}C$		1.62	kA	
		$t = 8,3 ms$; (60 Hz), sine	$V_R = 0 V$		1.75	kA	
I^2t	value for fusing	$t = 10 ms$; (50 Hz), sine	$T_{VJ} = 45^{\circ}C$		18.1	kA ² s	
		$t = 8,3 ms$; (60 Hz), sine	$V_R = 0 V$		17.5	kA ² s	
		$t = 10 ms$; (50 Hz), sine	$T_{VJ} = 140^{\circ}C$		13.0	kA ² s	
		$t = 8,3 ms$; (60 Hz), sine	$V_R = 0 V$		12.7	kA ² s	
C_J	junction capacitance	$V_R = 400 V$ $f = 1 MHz$	$T_{VJ} = 25^{\circ}C$		95	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, $I_T = 330 A$			150	A/ μs	
		$t_p = 200 \mu s$; $di_G/dt = 0.45 A/\mu s$; $I_G = 0.45 A$; $V = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 110 A$			500	A/ μs	
$(dv/dt)_{cr}$	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/ μs	
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	
		$I_G = 0.45 A$; $di_G/dt = 0.45 A/\mu s$					
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	μs	
		$I_G = 0.45 A$; $di_G/dt = 0.45 A/\mu s$					
t_q	turn-off time	$V_R = 100 V$; $I_T = 110 A$; $V = \frac{2}{3} V_{DRM}$ $di/dt = 10 A/\mu s$ $dv/dt = 20 V/\mu s$ $t_p = 200 \mu s$	$T_{VJ} = 125^{\circ}C$		185	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		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)
- 110 = 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	MCMA110P1600TA	MCMA110P1600TA	Box	36	513383

Equivalent Circuits for Simulation

* on die level

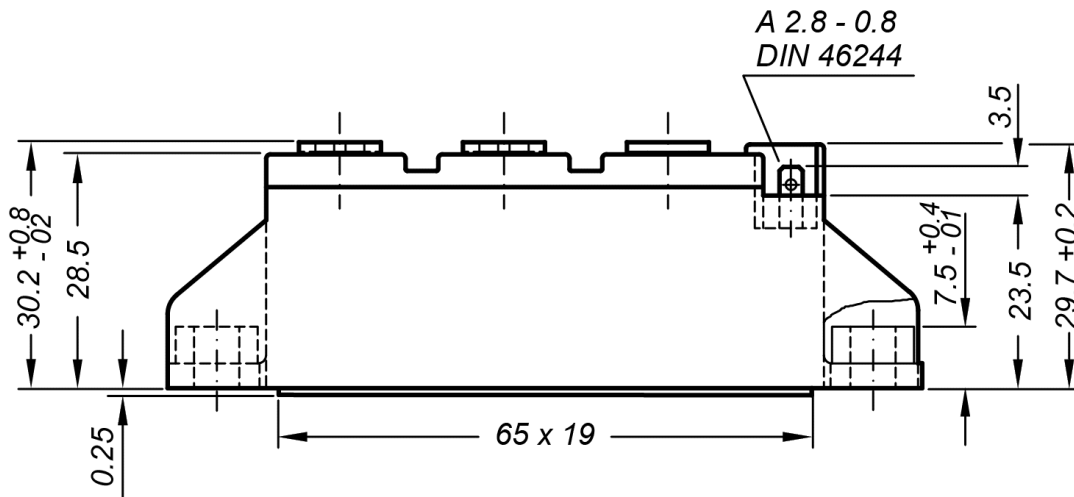
$T_{VJ} = 140^{\circ}\text{C}$



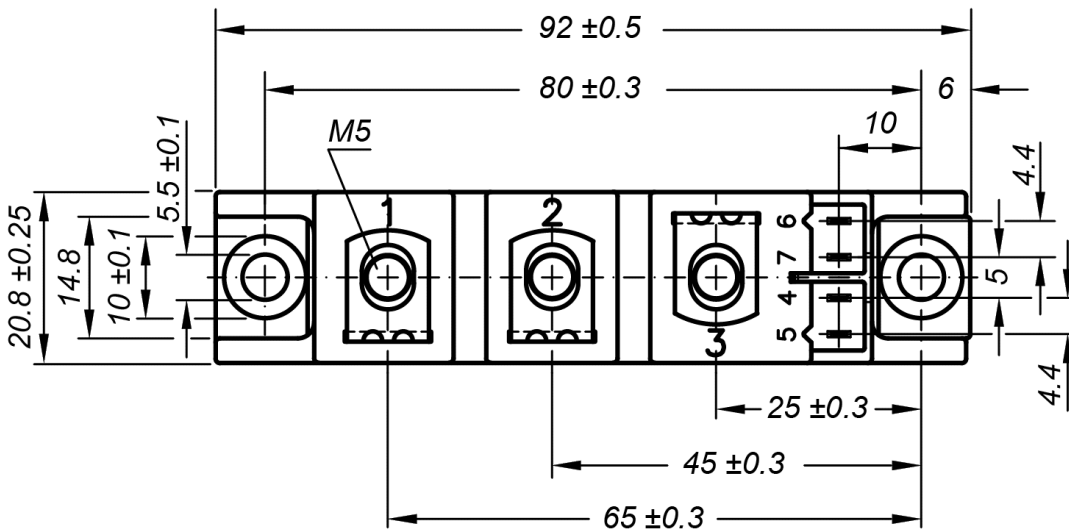
Thyristor

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

Outlines TO-240AA



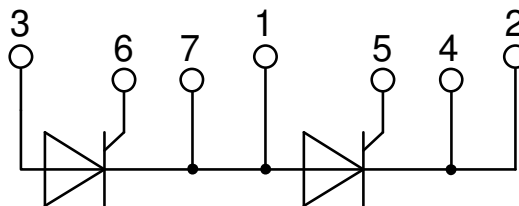
General tolerance: DIN ISO 2768 class „c“



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



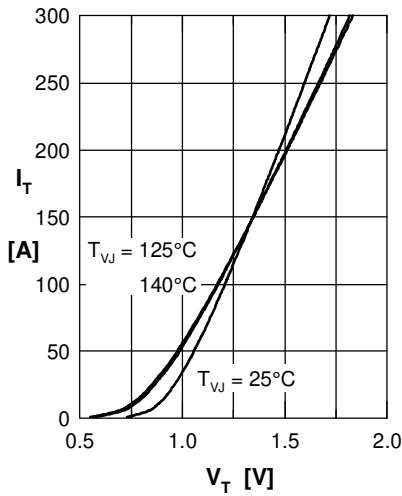
Thyristor


Fig. 1 Forward characteristics

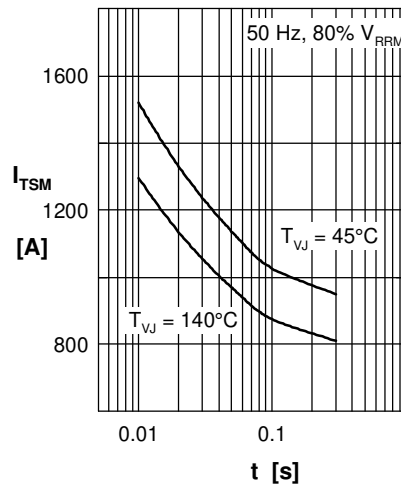
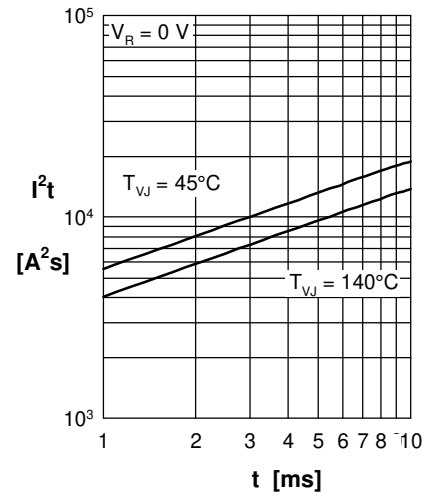
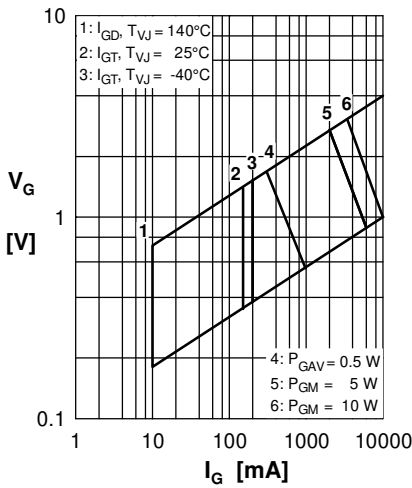

 Fig. 2 Surge overload current
 I_{TSM} : crest value, t : duration

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


Fig. 4 Gate voltage & gate current

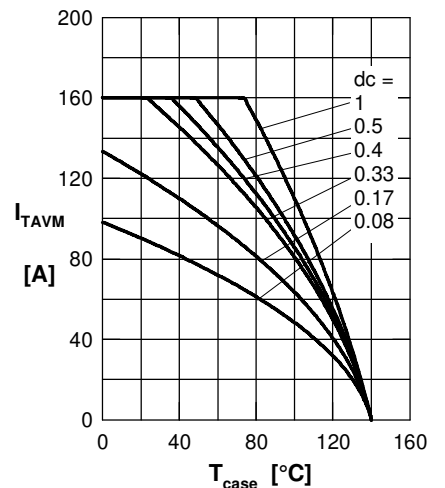

 Fig. 5 Gate controlled delay time t_{gd}


Fig. 6 Max. forward current at case temperature

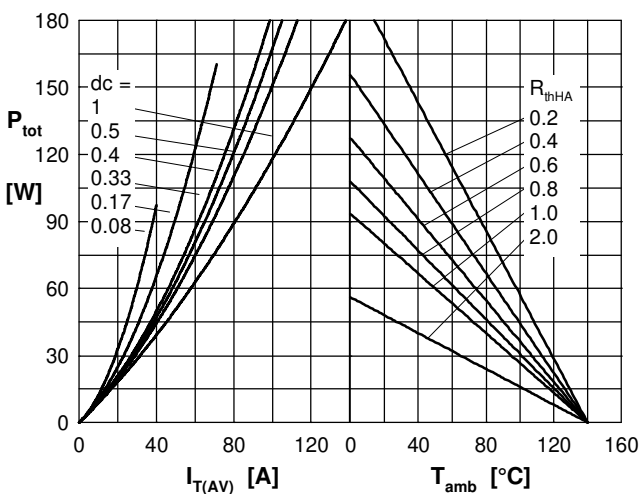
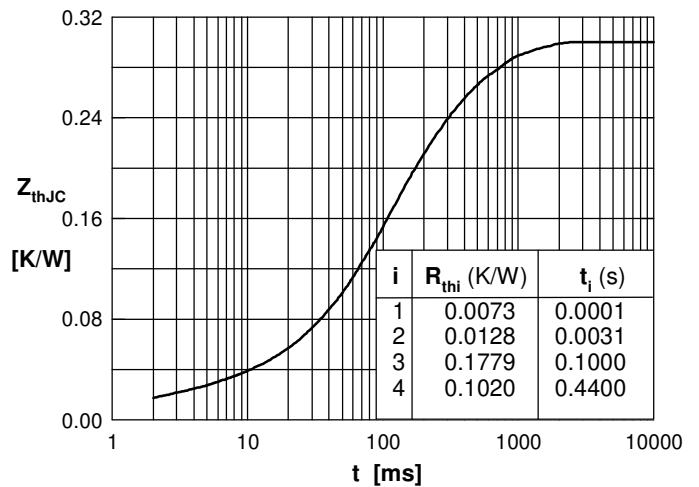

 Fig. 7a Power dissipation versus direct output current
 Fig. 7b and ambient temperature


Fig. 8 Transient thermal impedance junction to case