

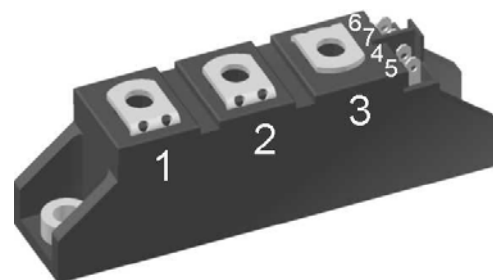
Thyristor Module

$$\begin{aligned} V_{RRM} &= 2 \times 800 \text{ V} \\ I_{TAV} &= 85 \text{ A} \\ V_T &= 1.34 \text{ V} \end{aligned}$$

Phase leg

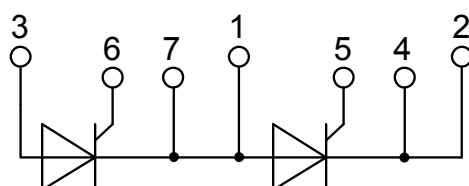
Part number

MCC72-08io1B



Backside: isolated

 E72873



Features / Advantages:

- Thyristor for line frequency
- Planar passivated chip
- Long-term stability
- Direct Copper Bonded Al₂O₃-ceramic

Applications:

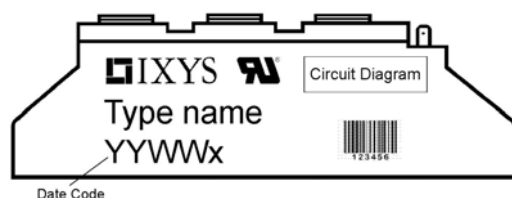
- Line rectifying 50/60 Hz
- Softstart AC motor control
- DC Motor control
- Power converter
- AC power control
- Lighting and temperature control

Package: TO-240AA

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

Thyristor				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				900	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				800	V
I_{RD}	reverse current, drain current	$V_{RD} = 800\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			200	μA
		$V_{RD} = 800\text{ V}$	$T_{VJ} = 125^{\circ}\text{C}$			5	mA
V_T	forward voltage drop	$I_T = 150\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$			1.34	V
		$I_T = 300\text{ A}$				1.74	V
		$I_T = 150\text{ A}$	$T_{VJ} = 125^{\circ}\text{C}$			1.34	V
		$I_T = 300\text{ A}$				1.82	V
I_{TAV}	average forward current	$T_C = 85^{\circ}\text{C}$	$T_{VJ} = 125^{\circ}\text{C}$			85	A
$I_{T(RMS)}$	RMS forward current	180° sine				180	A
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 125^{\circ}\text{C}$			0.85	V
r_T	slope resistance					3.2	m Ω
R_{thJC}	thermal resistance junction to case					0.3	K/W
R_{thCH}	thermal resistance case to heatsink				0.20		K/W
P_{tot}	total power dissipation		$T_C = 25^{\circ}\text{C}$			333	W
I_{TSM}	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$			1.70	kA
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			1.84	kA
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 125^{\circ}\text{C}$			1.45	kA
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			1.56	kA
I^2t	value for fusing	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$			14.5	kA ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			14.0	kA ² s
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 125^{\circ}\text{C}$			10.4	kA ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			10.1	kA ² s
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	$t_p = 30\text{ }\mu\text{s}$	$T_C = 125^{\circ}\text{C}$			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	$T_{VJ} = 125^{\circ}\text{C}; f = 50\text{ Hz}$ repetitive, $I_T = 250\text{ A}$				150	A/ μs
		$t_p = 200\text{ }\mu\text{s}; di_G/dt = 0.45\text{ A}/\mu\text{s};$ $I_G = 0.45\text{ A}; V_D = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 85\text{ A}$				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)	$T_{VJ} = 125^{\circ}\text{C}$			1000	V/ μs
V_{GT}	gate trigger voltage	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			2.5	V
			$T_{VJ} = -40^{\circ}\text{C}$			2.6	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	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 125^{\circ}\text{C}$			0.2	V
I_{GD}	gate non-trigger current					10	mA
I_L	latching current	$t_p = 10\text{ }\mu\text{s}$	$T_{VJ} = 25^{\circ}\text{C}$			450	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	$V_R = 100\text{ V}; I_T = 150\text{ A}; V_D = \frac{2}{3} V_{DRM}$ $di/dt = 10\text{ A}/\mu\text{s}; dv/dt = 20\text{ V}/\mu\text{s}; t_p = 200\text{ }\mu\text{s}$	$T_{VJ} = 125^{\circ}\text{C}$		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		125	°C
T_{op}	operation temperature			-40		100	°C
T_{stg}	storage temperature			-40		125	°C
Weight					90		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	50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA	3600			V
		t = 1 minute		3000			V



Ordering	Part Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCC72-08io1B	MCC72-08io1B	Box	6	458155

Similar Part	Package	Voltage class
MCMA85P1200TA	TO-240AA-1B	1200
MCMA110P1200TA	TO-240AA-1B	1200

Equivalent Circuits for Simulation

* on die level

$T_{VJ} = 125^\circ\text{C}$

			Thyristor
$V_{0\max}$	threshold voltage	0.85	V
$R_{0\max}$	slope resistance *	2	mΩ

Technical drawing of a 6-hole PCB connector. The drawing shows a side view of the component with various dimensions and labels. Key dimensions include:

- Overall length: 92 ± 0.5
- Distance from the first hole to the center of the last hole: 80 ± 0.3
- Distance from the first hole to the center of the second hole: 10 ± 0.1
- Distance from the center of the second hole to the center of the third hole: 14.8
- Distance from the center of the third hole to the center of the fourth hole: 10 ± 0.1
- Distance from the center of the fourth hole to the center of the fifth hole: 5.5 ± 0.1
- Distance from the center of the fifth hole to the center of the sixth hole: 5
- Distance from the center of the sixth hole to the right edge: 4.4
- Distance from the center of the first hole to the right edge: 65 ± 0.3
- Distance from the center of the second hole to the right edge: 45 ± 0.3
- Distance from the center of the third hole to the right edge: 25 ± 0.3
- Distance from the center of the fourth hole to the right edge: 10
- Distance from the center of the fifth hole to the right edge: 4.4
- Distance from the center of the sixth hole to the right edge: 4.4
- Distance from the center of the first hole to the center of the second hole: 10 ± 0.1
- Distance from the center of the second hole to the center of the third hole: 14.8
- Distance from the center of the third hole to the center of the fourth hole: 10 ± 0.1
- Distance from the center of the fourth hole to the center of the fifth hole: 5.5 ± 0.1
- Distance from the center of the fifth hole to the center of the sixth hole: 5
- Distance from the center of the sixth hole to the right edge: 4.4
- Distance from the center of the first hole to the right edge: 65 ± 0.3
- Distance from the center of the second hole to the right edge: 45 ± 0.3
- Distance from the center of the third hole to the right edge: 25 ± 0.3
- Distance from the center of the fourth hole to the right edge: 10
- Distance from the center of the fifth hole to the right edge: 4.4
- Distance from the center of the sixth hole to the right edge: 4.4

The drawing also includes labels for the holes: "M5" for the first hole, "1" for the second hole, "2" for the third hole, "3" for the fourth hole, "4" for the fifth hole, and "5" for the sixth hole. The drawing is a technical drawing of a 6-hole PCB connector.

Thyristor

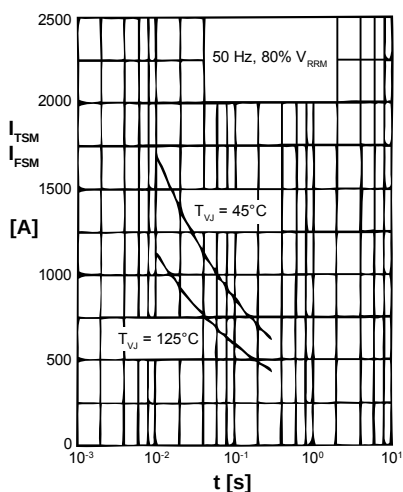


Fig. 1 Surge overload current
 I_{TSM} , I_{FSM} : Crest value, t: duration

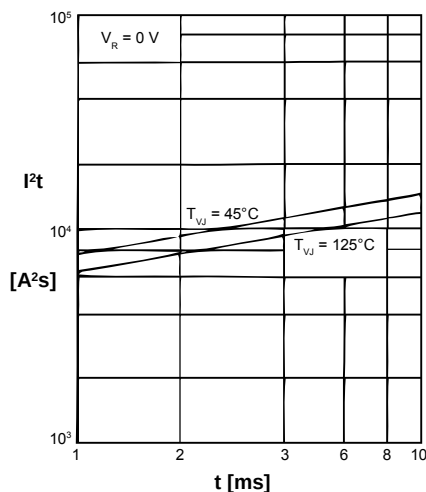


Fig. 2 I^2t versus time (1-10 ms)

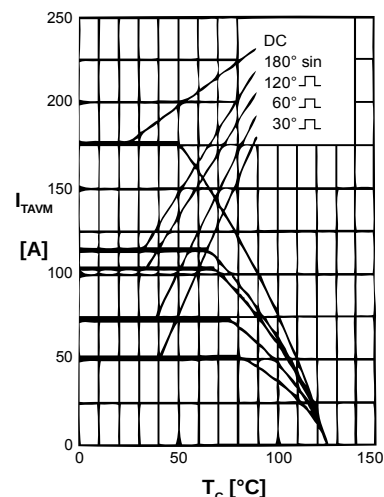


Fig. 3 Maximum forward current at case temperature

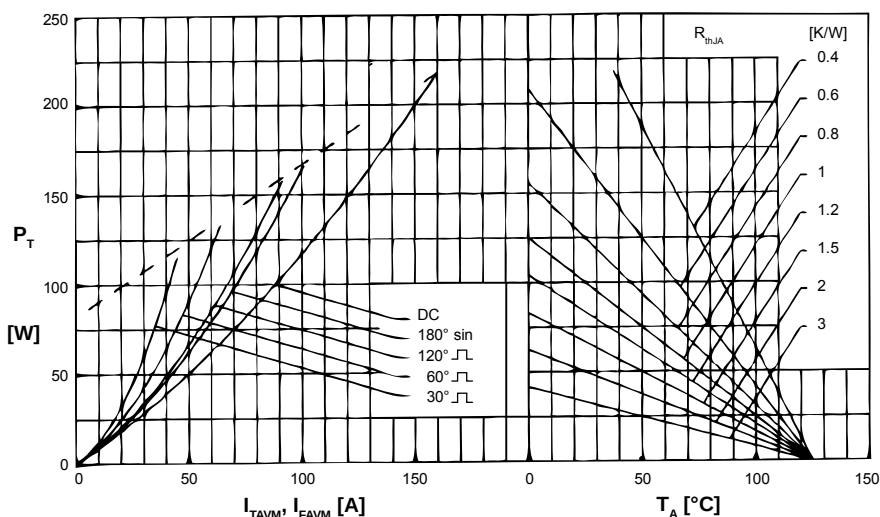


Fig. 4 Power dissipation vs. onstate current and ambient temperature (per thyristor/diode)

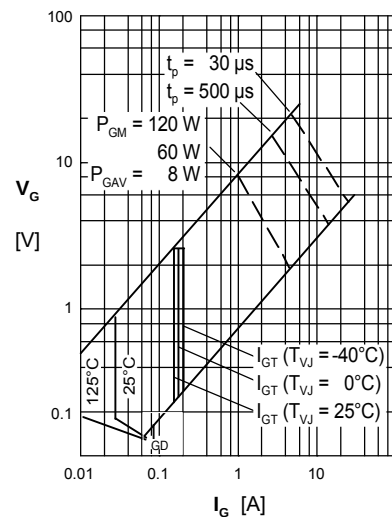


Fig. 5 Gate trigger characteristics

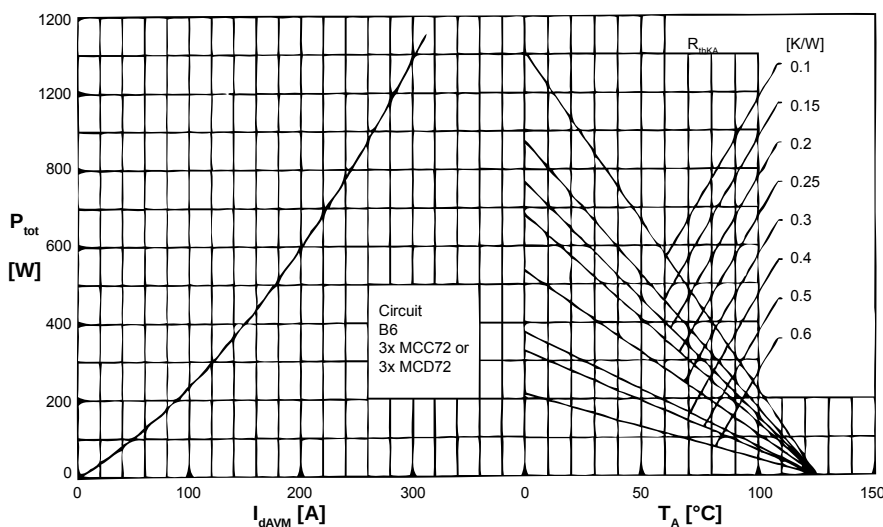


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

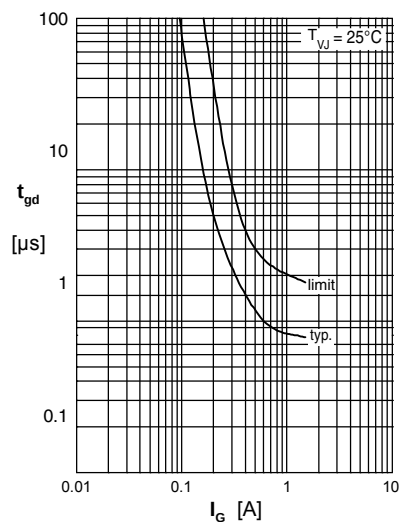


Fig. 7 Gate trigger delay time

Thyristor

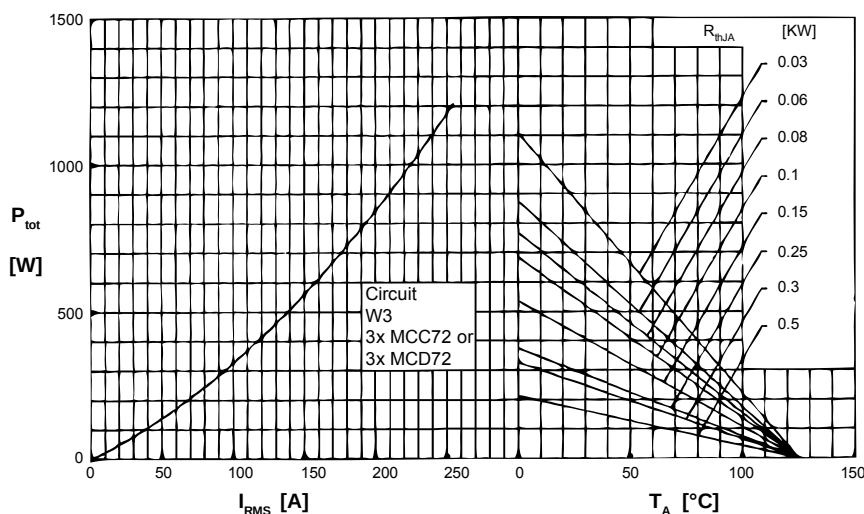


Fig. 8 Three phase AC-controller: Power dissipation versus RMS output current and ambient temperature

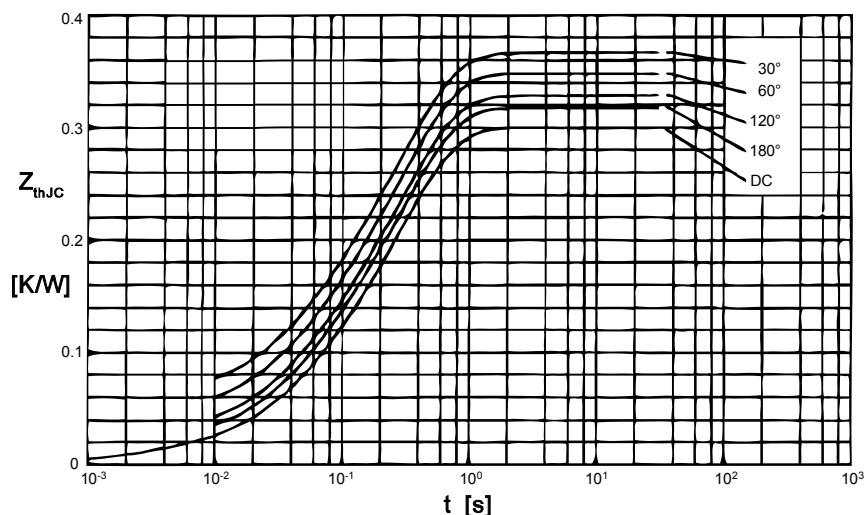


Fig. 9 Transient thermal impedance junction to case (per thyristor)

R_{thJC} for various conduction angles d :

d	R_{thJC} [K/W]
DC	0.30
180°	0.31
120°	0.33
60°	0.35
30°	0.37

Constants for Z_{thJC} calculation:

i	R_{thi} [K/W]	t_i [s]
1	0.008	0.0019
2	0.054	0.0470
3	0.238	0.3000

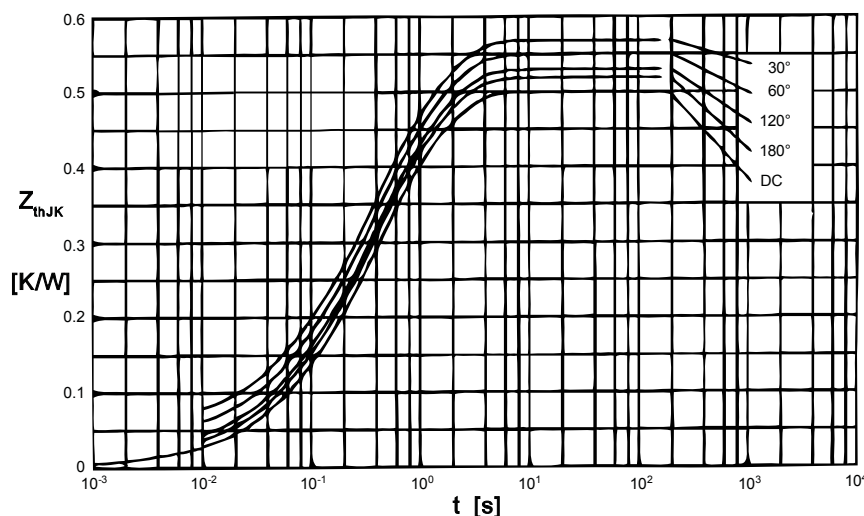


Fig. 10 Transient thermal impedance junction to heatsink (per thyristor)

R_{thJK} for various conduction angles d :

d	R_{thJK} [K/W]
DC	0.50
180°	0.51
120°	0.53
60°	0.55
30°	0.57

Constants for Z_{thJK} calculation:

i	R_{thi} [K/W]	t_i [s]
1	0.008	0.0019
2	0.054	0.0470
3	0.238	0.3000
4	0.200	1.2500

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