

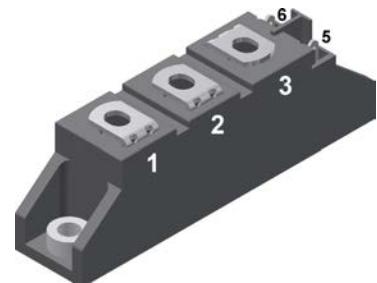
Thyristor Module

V_{RRM} = 2x 1600 V
 I_{TAV} = 49 A
 V_T = 1,34 V

Phase leg

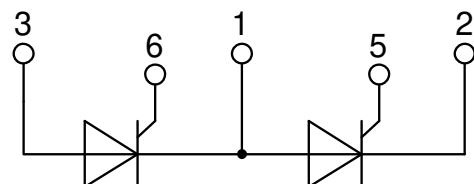
Part number

MCC44-16io8B



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

Disclaimer Notice

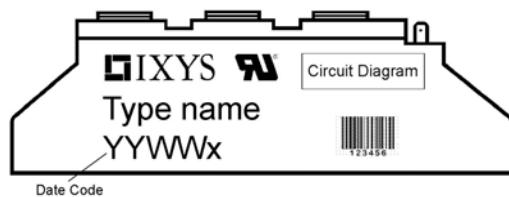
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Thyristor

Symbol	Definition	Conditions	Ratings			
			min.	typ.	max.	
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^\circ C$			1700	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^\circ C$			1600	V
$I_{R/D}$	reverse current, drain current	$V_{R/D} = 1600 V$ $V_{R/D} = 1600 V$	$T_{VJ} = 25^\circ C$ $T_{VJ} = 125^\circ C$		100 5	μA mA
V_T	forward voltage drop	$I_T = 100 A$ $I_T = 200 A$ $I_T = 100 A$ $I_T = 200 A$	$T_{VJ} = 25^\circ C$ $T_{VJ} = 125^\circ C$		1,34 1,75 1,34 1,80	V V
I_{TAV}	average forward current	$T_C = 85^\circ C$	$T_{VJ} = 125^\circ C$		49	A
$I_{T(RMS)}$	RMS forward current	180° sine			77	A
V_{TO}	threshold voltage	r_T slope resistance } for power loss calculation only	$T_{VJ} = 125^\circ C$		0,85	V
	slope resistance				5,3	$m\Omega$
R_{thJC}	thermal resistance junction to case				0,53	K/W
R_{thCH}	thermal resistance case to heatsink			0,2		K/W
P_{tot}	total power dissipation		$T_C = 25^\circ C$		180	W
I_{TSM}	max. forward surge current	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{sine}$ $t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{sine}$ $t = 10 \text{ ms}; (50 \text{ Hz}), \text{sine}$ $t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{sine}$	$T_{VJ} = 45^\circ C$ $V_R = 0 V$ $T_{VJ} = 125^\circ C$ $V_R = 0 V$		1,15 1,24 980 1,06	kA kA
I^2t	value for fusing	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{sine}$ $t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{sine}$ $t = 10 \text{ ms}; (50 \text{ Hz}), \text{sine}$ $t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{sine}$	$T_{VJ} = 45^\circ C$ $V_R = 0 V$ $T_{VJ} = 125^\circ C$ $V_R = 0 V$		6,62 6,40 4,80 4,63	kA^2s kA^2s kA^2s kA^2s
C_J	junction capacitance	$V_R = 400 V$ $f = 1 \text{ MHz}$	$T_{VJ} = 25^\circ C$	54		pF
P_{GM}	max. gate power dissipation	$t_p = 30 \mu s$ $t_p = 300 \mu s$	$T_C = 125^\circ C$		10 5 0,5	W W W
P_{GAV}	average gate power dissipation					
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 125^\circ C; f = 50 \text{ Hz}$ repetitive, $I_T = 150 A$ $t_p = 200 \mu s; di_G/dt = 0,45 A/\mu s;$ $I_G = 0,45 A; V_D = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 49 A$			150	$A/\mu s$
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V_D = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty$; method 1 (linear voltage rise)	$T_{VJ} = 125^\circ C$		1000	$V/\mu s$
V_{GT}	gate trigger voltage	$V_D = 6 V$	$T_{VJ} = 25^\circ C$ $T_{VJ} = -40^\circ C$		1,5 1,6	V
I_{GT}	gate trigger current	$V_D = 6 V$	$T_{VJ} = 25^\circ C$ $T_{VJ} = -40^\circ C$		100 200	mA mA
V_{GD}	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 125^\circ C$		0,2	V
I_{GD}	gate non-trigger current				10	mA
I_L	latching current	$t_p = 10 \mu s$ $I_G = 0,45 A; di_G/dt = 0,45 A/\mu s$	$T_{VJ} = 25^\circ C$		450	mA
I_H	holding current	$V_D = 6 V$ $R_{GK} = \infty$	$T_{VJ} = 25^\circ C$		200	mA
t_{gd}	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$ $I_G = 0,45 A; di_G/dt = 0,45 A/\mu s$	$T_{VJ} = 25^\circ C$		2	μs
t_q	turn-off time	$V_R = 100 V; I_T = 150 A; V_D = \frac{2}{3} V_{DRM}$ $T_{VJ} = 100^\circ C$ $di/dt = 10 A/\mu s; dv/dt = 20 V/\mu s; t_p = 200 \mu s$		150		μs

Package TO-240AA
Ratings

Symbol	Definition	Conditions	min.	typ.	max.	Unit
I_{RMS}	<i>RMS current</i>	per terminal			200	A
T_{VJ}	<i>virtual junction temperature</i>		-40		125	°C
T_{op}	<i>operation temperature</i>		-40		100	°C
T_{stg}	<i>storage temperature</i>		-40		125	°C
Weight				81		g
M_D	<i>mounting torque</i>		2,5		4	Nm
M_T	<i>terminal torque</i>		2,5		4	Nm
$d_{Spp/App}$	<i>creepage distance on surface striking distance through air</i>		<i>terminal to terminal</i>	13,0	9,7	mm
$d_{Spb/Apb}$			<i>terminal to backside</i>	16,0	16,0	mm
V_{ISOL}	<i>isolation voltage</i>	$t = 1 \text{ second}$ $t = 1 \text{ minute}$ 50/60 Hz, RMS; $I_{ISOL} \leq 1 \text{ mA}$		4800		V
				4000		V

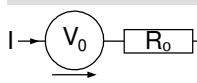


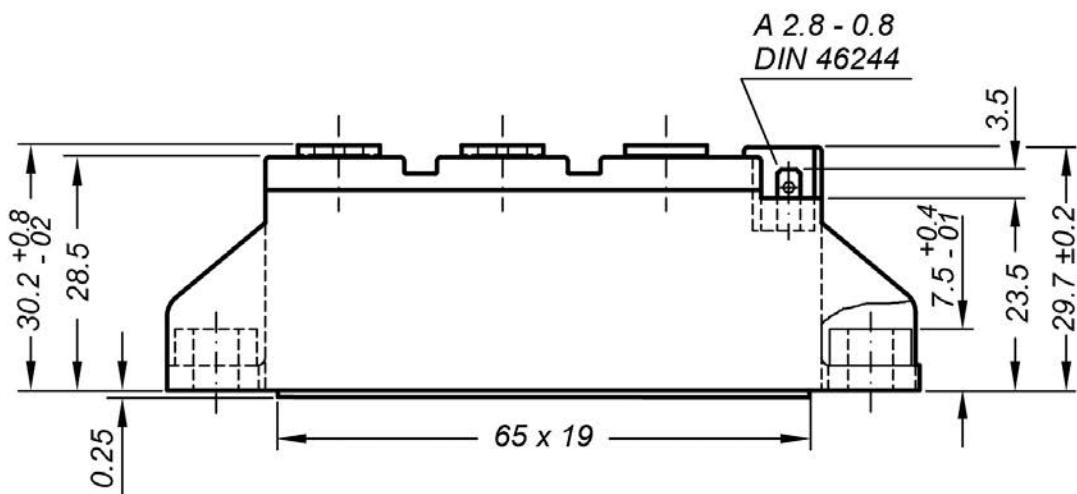
Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCC44-16io8B	MCC44-16io8B	Box	36	452971

Similar Part	Package	Voltage class
MCMA50P1600TA	TO-240AA-1B	1600
MCMA65P1600TA	TO-240AA-1B	1600

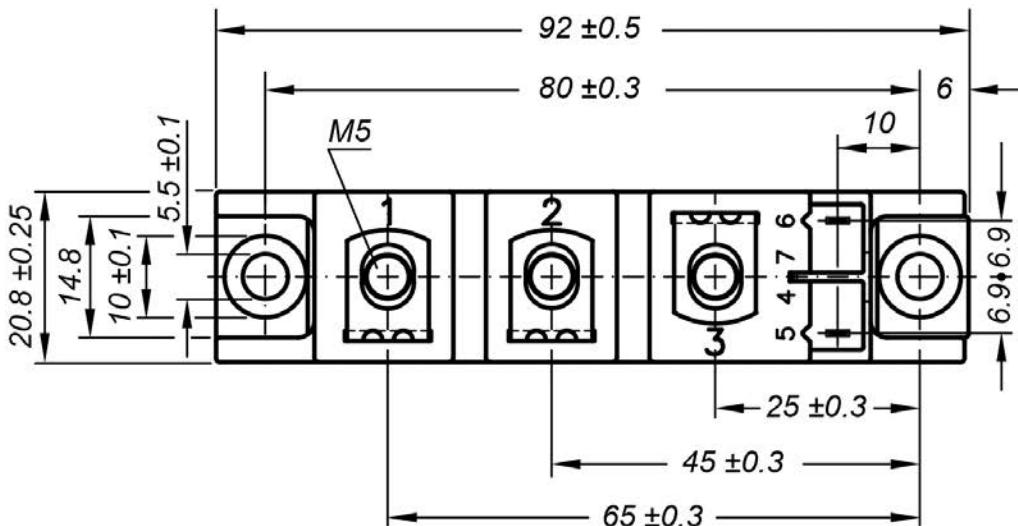
Equivalent Circuits for Simulation
^{*}on die level

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

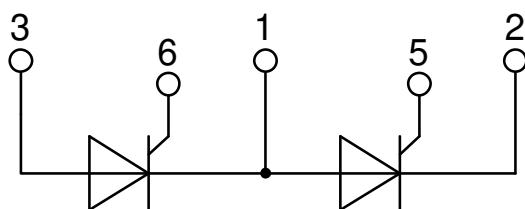
	Thyristor	
V_0	threshold voltage	0,85 V
$R_{0\max}$	slope resistance *	4,1 mΩ

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



Thyristor

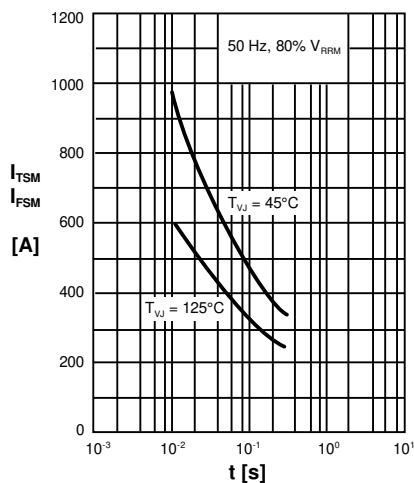


Fig. 1 Surge overload current
 I_{TSM} : Crest value, t: duration

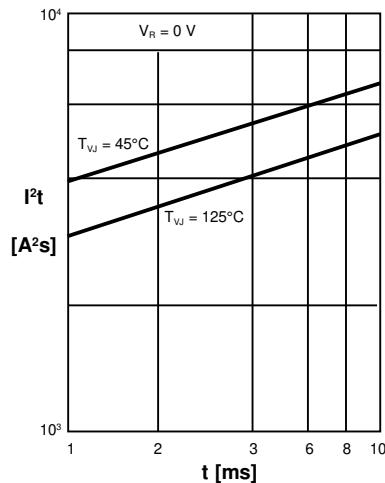


Fig. 2 I^2t versus time (1-10 ms)

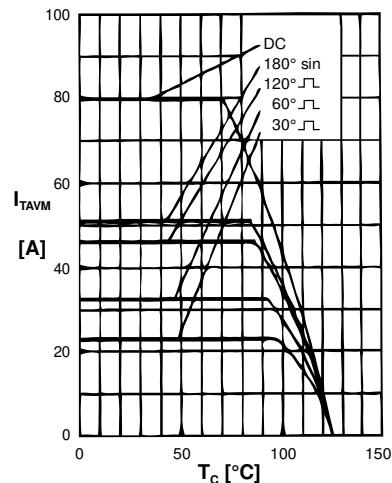


Fig. 3 Maximum forward current at case temperature

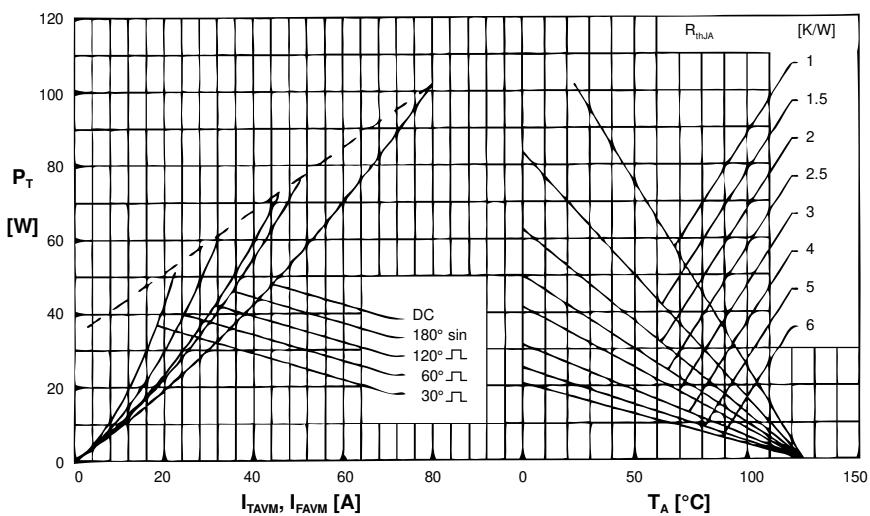


Fig. 4 Power dissipation vs. onstate current and ambient temperature (per thyristor/diode)

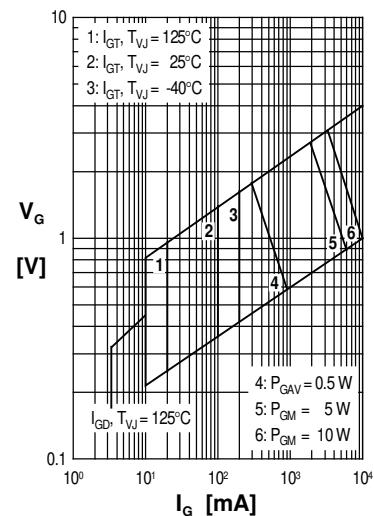


Fig. 5 Gate trigger characteristics

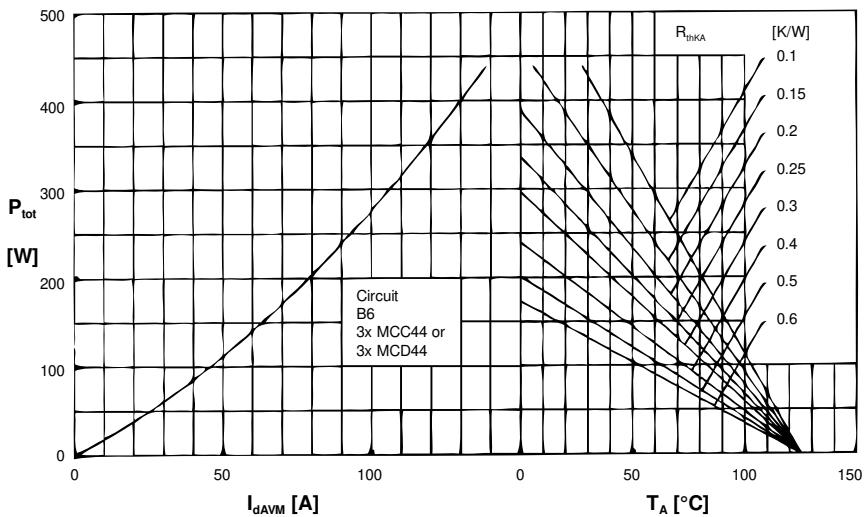


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

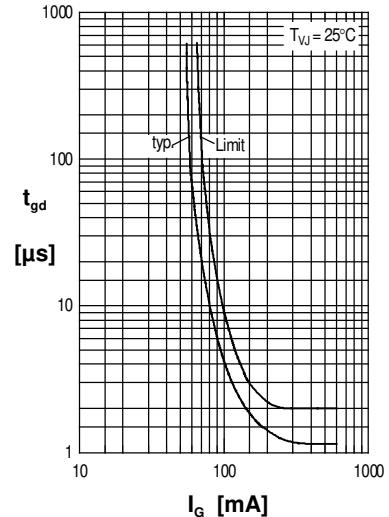


Fig. 7 Gate trigger delay time

Thyristor

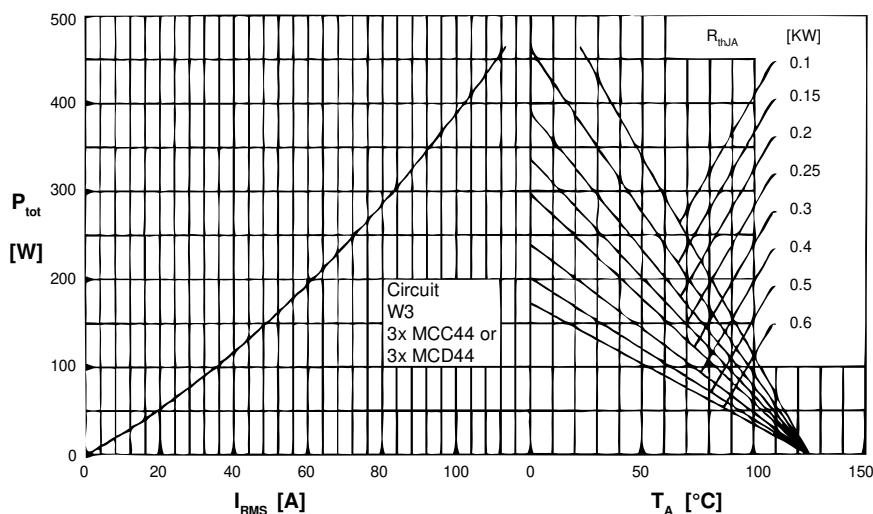


Fig. 8 Three phase AC-controller: Power dissipation versus RMS output current and ambient temperature

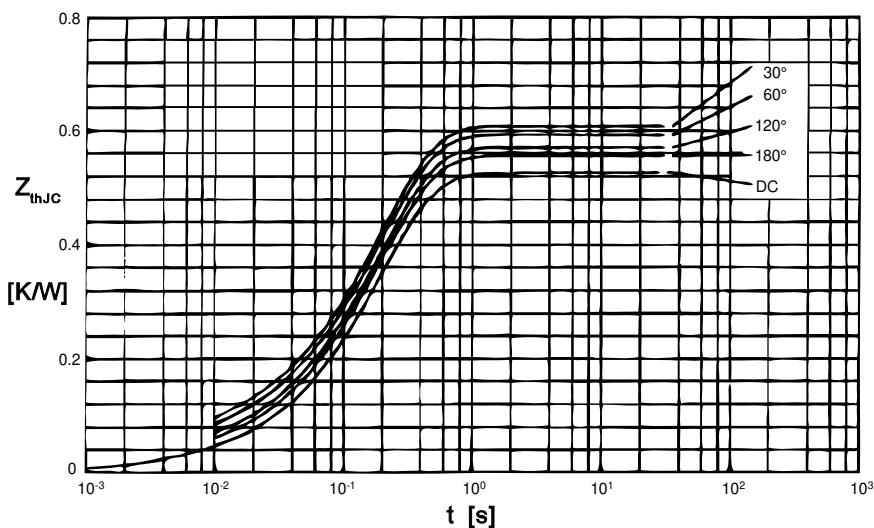


Fig. 9 Transient thermal impedance junction to case (per thyristor)

R_{thJC} for various conduction angles d :

d	R_{thJC} [K/W]
DC	0.53
180°	0.55
120°	0.58
60°	0.60
30°	0.62

Constants for Z_{thJC} calculation:

i	R_{thi} [K/W]	t_i [s]
1	0.015	0.0035
2	0.026	0.0200
3	0.489	0.1950

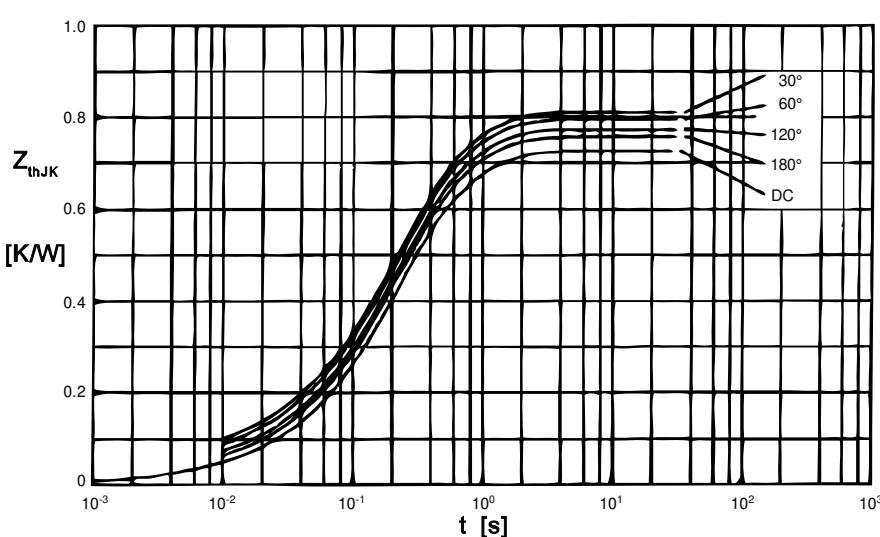


Fig. 10 Transient thermal impedance junction to heatsink (per thyristor)

R_{thJK} for various conduction angles d :

d	R_{thJK} [K/W]
DC	0.73
180°	0.75
120°	0.78
60°	0.80
30°	0.82

Constants for Z_{thJK} calculation:

i	R_{thi} [K/W]	t_i [s]
1	0.015	0.0035
2	0.026	0.0200
3	0.489	0.0195
4	0.200	0.6800