Thyristor Module

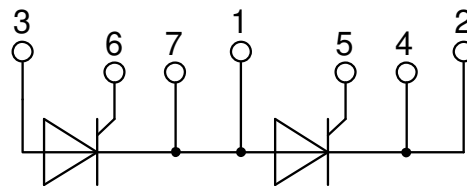|		
V_{RRM}	$=$	$2 \times 1400\,V$
I_{TAV}	$=$	$49\,A$
V_T	$=$	$1.34\,V$

Phase leg

Part number

MCC44-14io1B
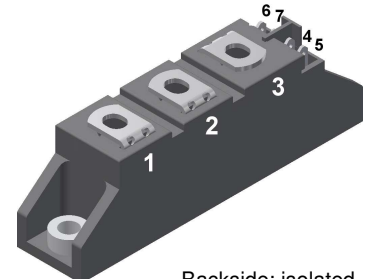
Backside: isolated

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

Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage		$T_{VJ} = 25°C$			1500	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage		$T_{VJ} = 25°C$			1400	V
$I_{R/D}$	reverse current, drain current	$V_{R/D} = 1400$ V	$T_{VJ} = 25°C$			100	μA
		$V_{R/D} = 1400$ V	$T_{VJ} = 125°C$			5	mA
V_T	forward voltage drop	$I_T = 100$ A	$T_{VJ} = 25°C$			1.34	V
		$I_T = 200$ A				1.75	V
		$I_T = 100$ A	$T_{VJ} = 125°C$			1.34	V
		$I_T = 200$ A				1.80	V
I_{TAV}	average forward current	$T_C = 85°C$	$T_{VJ} = 125°C$			49	A
$I_{T(RMS)}$	RMS forward current	180° sine				77	A
V_{T0}	threshold voltage ⎫ for power loss calculation only		$T_{VJ} = 125°C$			0.85	V
r_T	slope resistance ⎭					5.3	mΩ
R_{thJC}	thermal resistance junction to case					0.53	K/W
R_{thCH}	thermal resistance case to heatsink				0.20		K/W
P_{tot}	total power dissipation		$T_C = 25°C$			180	W
I_{TSM}	max. forward surge current	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45°C$			1.15	kA
		t = 8,3 ms; (60 Hz), sine	$V_R = 0$ V			1.24	kA
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 125°C$			980	A
		t = 8,3 ms; (60 Hz), sine	$V_R = 0$ V			1.06	kA
I^2t	value for fusing	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45°C$			6.62	kA²s
		t = 8,3 ms; (60 Hz), sine	$V_R = 0$ V			6.40	kA²s
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 125°C$			4.80	kA²s
		t = 8,3 ms; (60 Hz), sine	$V_R = 0$ V			4.63	kA²s
C_J	junction capacitance	$V_R = 400$ V f = 1 MHz	$T_{VJ} = 25°C$		54		pF
P_{GM}	max. gate power dissipation	$t_P = 30$ μs	$T_C = 125°C$			10	W
		$t_P = 300$ μs				5	W
P_{GAV}	average gate power dissipation					0.5	W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 125°C$; f = 50 Hz repetitive, $I_T = 150$ A				150	A/μs
		$t_P = 200$ μs; $di_G/dt = 0.45$ A/μs;					
		$I_G = 0.45$ A; V = ⅔ V_{DRM} non-repet., $I_T = 49$ A				500	A/μs
$(dv/dt)_{cr}$	critical rate of rise of voltage	V = ⅔ V_{DRM}	$T_{VJ} = 125°C$			1000	V/μs
		$R_{GK} = ∞$; method 1 (linear voltage rise)					
V_{GT}	gate trigger voltage	$V_D = 6$ V	$T_{VJ} = 25°C$			1.5	V
			$T_{VJ} = -40°C$			1.6	V
I_{GT}	gate trigger current	$V_D = 6$ V	$T_{VJ} = 25°C$			100	mA
			$T_{VJ} = -40°C$			200	mA
V_{GD}	gate non-trigger voltage	$V_D = ⅔ V_{DRM}$	$T_{VJ} = 125°C$			0.2	V
I_{GD}	gate non-trigger current					10	mA
I_L	latching current	$t_p = 10$ μs	$T_{VJ} = 25°C$			450	mA
		$I_G = 0.45$ A; $di_G/dt = 0.45$ A/μs					
I_H	holding current	$V_D = 6$ V $R_{GK} = ∞$	$T_{VJ} = 25°C$			200	mA
t_{gd}	gate controlled delay time	$V_D = ½ V_{DRM}$	$T_{VJ} = 25°C$			2	μs
		$I_G = 0.45$ A; $di_G/dt = 0.45$ A/μs					
t_q	turn-off time	$V_R = 100$ V; $I_T = 120$ A; V = ⅔ V_{DRM} $T_{VJ} = 100$ °C			150		μs
		di/dt = 10 A/μs dv/dt = 20 V/μs $t_p = 200$ μs					

Package   TO-240AA

Symbol	Definition	Conditions		min.	typ.	max.	Unit
						Ratings	
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					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	50/60 Hz, RMS; $I_{ISOL} \leq$ 1 mA	3600			V
		t = 1 minute		3000			V

Type name
YYWWx
Date Code

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCC44-14io1B	MCC44-14io1B	Box	36	452912

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 °C

Thyristor

$V_{0\ max}$	threshold voltage	0.85	V
$R_{0\ max}$	slope resistance *	4.1	mΩ

IXYS reserves the right to change limits, conditions and dimensions.   Data according to IEC 60747 and per semiconductor unless otherwise specified   20161222b

Outlines   TO-240AA

A 2.8 - 0.8
DIN 46244

65 x 19

General tolerance: DIN ISO 2768 class „c"

M5

92 ±0.5
80 ±0.3
6
10
25 ±0.3
45 ±0.3
65 ±0.3
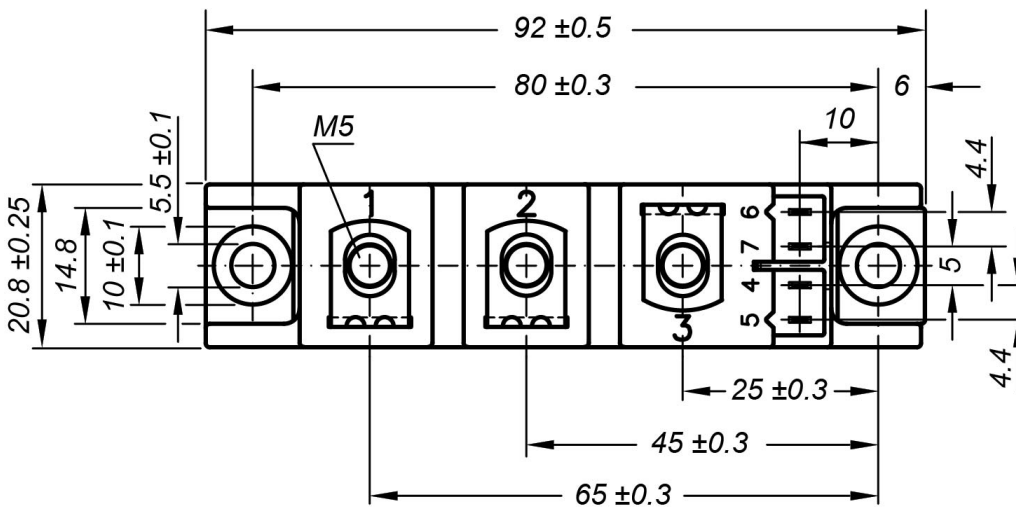
Optional accessories: Keyed gate/cathode twin plugs
Wire length: 350 mm, gate = white, cathode = red
UL 758, style 3751
Type ZY 200L (L = Left   for pin pair 4/5)
Type ZY 200R (R = Right for pin pair 6/7)
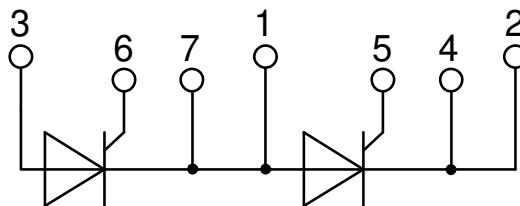
Thyristor

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

Fig. 2 I²t 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
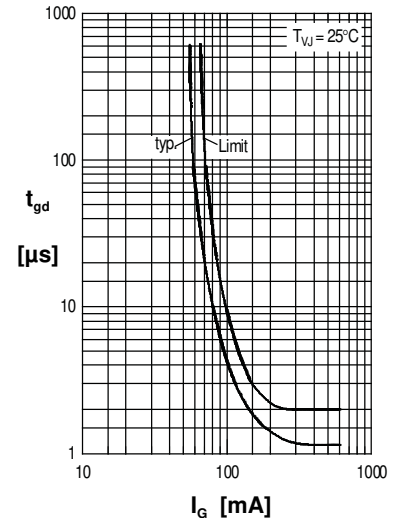and ambient temperature

Fig. 7 Gate trigger delay time

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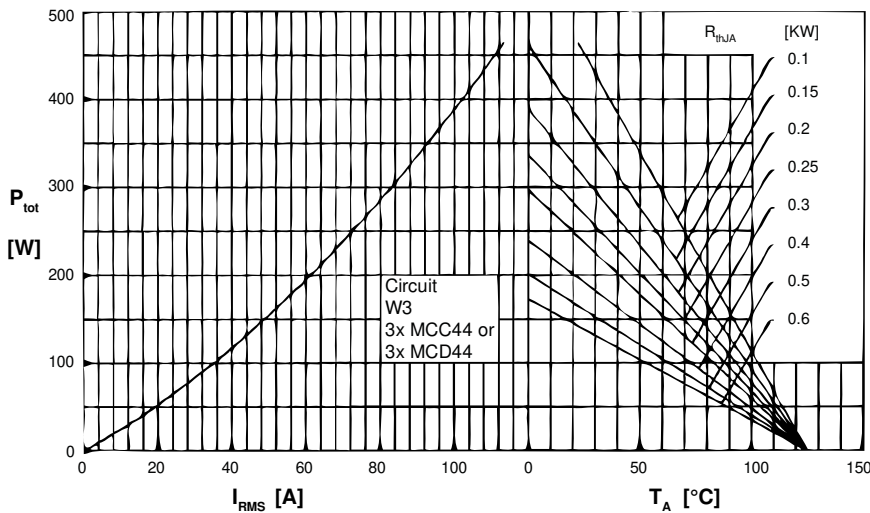
Thyristor

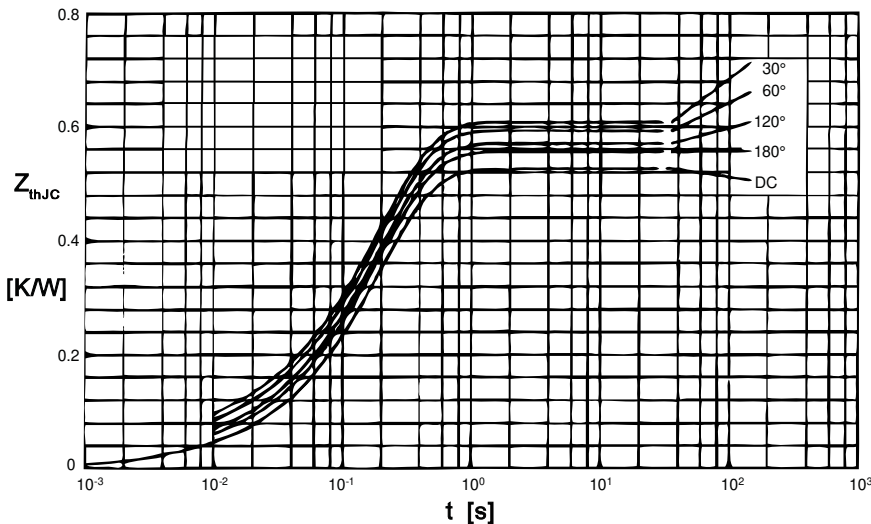Fig. 8 Three phase AC-controller: Power dissipation versus RMS output current and ambient temperature

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:

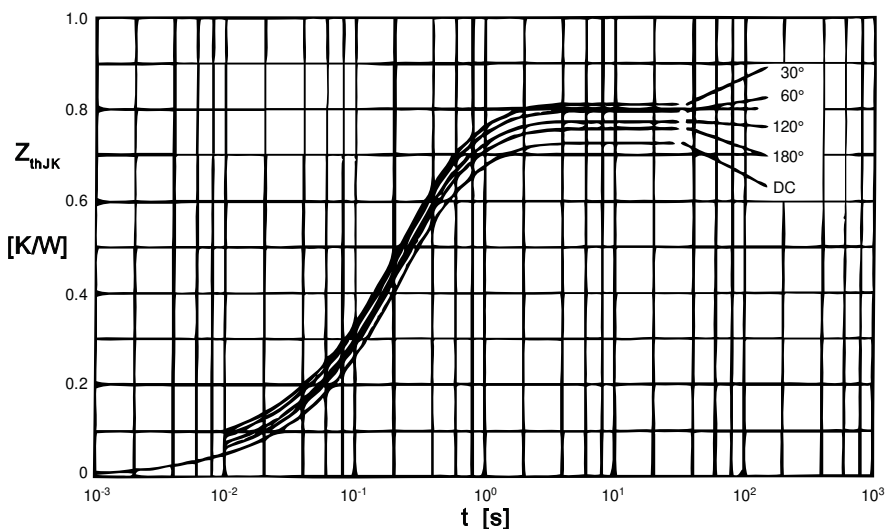| i	R_{thi} [K/W]	t_i [s]
1	0.015	0.0035
2	0.026	0.0200
3	0.489	0.1950

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