Thyristor Module

V_{RRM}	$=$	$2 \times 2400\,V$
I_{TAV}	$=$	$104\,A$
V_T	$=$	$1.46\,V$

Phase leg

Part number

MCC94-24io1B
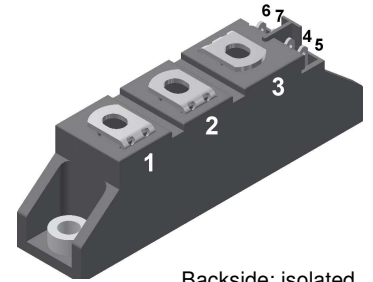
Backside: isolated

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

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Thyristor

Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage		$T_{VJ} = 25°C$			2500	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage		$T_{VJ} = 25°C$			2400	V
$I_{R/D}$	reverse current, drain current	$V_{R/D} = 2400$ V	$T_{VJ} = 25°C$			200	µA
		$V_{R/D} = 2400$ V	$T_{VJ} = 125°C$			15	mA
V_T	forward voltage drop	$I_T = 150$ A	$T_{VJ} = 25°C$			1.44	V
		$I_T = 300$ A				1.74	V
		$I_T = 150$ A	$T_{VJ} = 125°C$			1.46	V
		$I_T = 300$ A				1.99	V
I_{TAV}	average forward current	$T_C = 85°C$	$T_{VJ} = 125°C$			104	A
$I_{T(RMS)}$	RMS forward current	180° sine				163	A
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 125°C$			0.85	V
r_T	slope resistance					3.2	mΩ
R_{thJC}	thermal resistance junction to case					0.22	K/W
R_{thCH}	thermal resistance case to heatsink				0.20		K/W
P_{tot}	total power dissipation		$T_C = 25°C$			455	W
I_{TSM}	max. forward surge current	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45°C$			1.70	kA
		t = 8,3 ms; (60 Hz), sine	$V_R = 0$ V			1.84	kA
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 125°C$			1.45	kA
		t = 8,3 ms; (60 Hz), sine	$V_R = 0$ V			1.56	kA
I^2t	value for fusing	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45°C$			14.5	kA²s
		t = 8,3 ms; (60 Hz), sine	$V_R = 0$ V			14.0	kA²s
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 125°C$			10.4	kA²s
		t = 8,3 ms; (60 Hz), sine	$V_R = 0$ V			10.1	kA²s
C_J	junction capacitance	$V_R = 700$ V f = 1 MHz	$T_{VJ} = 25°C$		63		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, $I_T = 250$ A $t_P = 200$ µs; $di_G/dt = 0.45$ A/µs;				150	A/µs
		$I_G = 0.45$ A; V = ⅔ V_{DRM} non-repet., $I_T = 104$ A				500	A/µs
$(dv/dt)_{cr}$	critical rate of rise of voltage	V = ⅔ V_{DRM} $R_{GK} = ∞$; method 1 (linear voltage rise)	$T_{VJ} = 125°C$			1000	V/µs
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	$T_{VJ} = 25°C$			150	mA
			$T_{VJ} = -40°C$			200	mA
V_{GD}	gate non-trigger voltage	$V_D = ⅔ V_{DRM}$	$T_{VJ} = 125°C$			0.25	V
I_{GD}	gate non-trigger current					10	mA
I_L	latching current	$t_p = 10$ µs $I_G = 0.45$ A; $di_G/dt = 0.45$ A/µs	$T_{VJ} = 25°C$			200	mA
I_H	holding current	$V_D = 6$ V $R_{GK} = ∞$	$T_{VJ} = 25°C$			150	mA
t_{gd}	gate controlled delay time	$V_D = ½ V_{DRM}$ $I_G = 0.45$ A; $di_G/dt = 0.45$ A/µs	$T_{VJ} = 25°C$			2	µs
t_q	turn-off time	$V_R = 100$ V; $I_T = 150$ A; V = ⅔ V_{DRM} $T_{VJ} = 100$ °C di/dt = 10 A/µs dv/dt = 20 V/µs $t_p = 200$ µs			185		µs

		Ratings	

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					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

Ordering	**Ordering Number**	**Marking on Product**	**Delivery Mode**	**Quantity**	**Code No.**
Standard	MCC94-24io1B	MCC94-24io1B	Box	36	508871

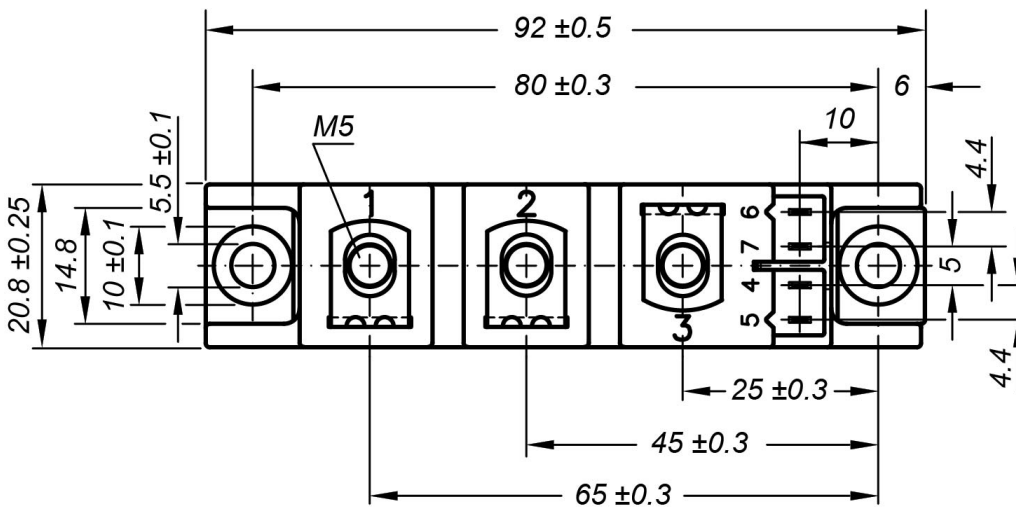## Equivalent Circuits for Simulation   ** on die level* $T_{VJ} = 125\,°C$
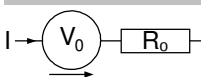
Thyristor

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

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Outlines   TO-240AA

A 2.8 - 0.8
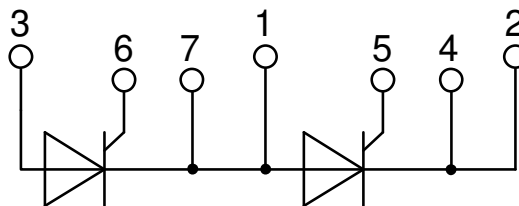DIN 46244

General tolerance: DIN ISO 2768 class „c"

M5

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)*
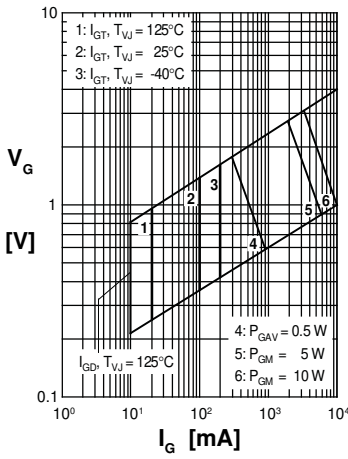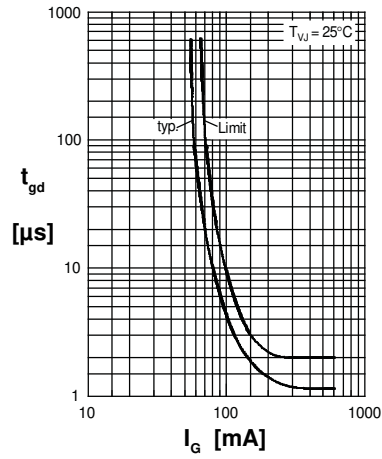*Type **ZY 200R** (R = Right for pin pair 6/7)*

Thyristor

Fig. 1 Gate trigger characteristics

Fig. 2 Gate trigger delay time