

# Thyristor Module

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

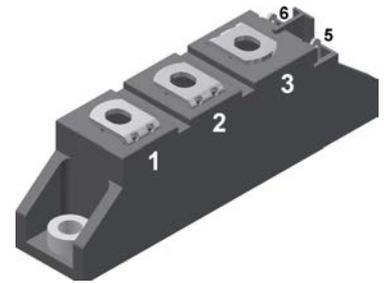
$$I_{TAV} = 21 \text{ A}$$

$$V_T = 1,52 \text{ V}$$

Phase leg

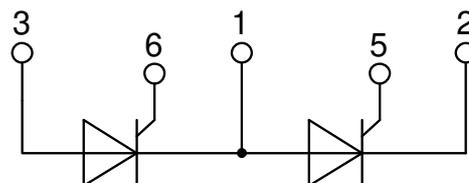
Part number

**MCC21-16io8B**



Backside: isolated

 E72873



### Features / Advantages:

- Thyristor for line frequency
- Planar passivated chip
- Long-term stability
- Direct Copper Bonded Al<sub>2</sub>O<sub>3</sub>-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

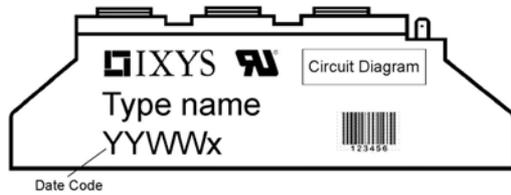
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Thyristor			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1700	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1600	V
$I_{RD}$	reverse current, drain current	$V_{R/D} = 1600 V$	$T_{VJ} = 25^{\circ}C$		100	$\mu A$
		$V_{R/D} = 1600 V$	$T_{VJ} = 125^{\circ}C$		5	mA
$V_T$	forward voltage drop	$I_T = 45 A$	$T_{VJ} = 25^{\circ}C$		1,45	V
		$I_T = 90 A$			1,89	V
		$I_T = 45 A$	$T_{VJ} = 125^{\circ}C$		1,52	V
		$I_T = 90 A$			2,20	V
$I_{TAV}$	average forward current	$T_C = 85^{\circ}C$	$T_{VJ} = 125^{\circ}C$		21	A
$I_{T(RMS)}$	RMS forward current	180° sine			33	A
$V_{T0}$	threshold voltage	} for power loss calculation only	$T_{VJ} = 125^{\circ}C$		0,85	V
$r_T$	slope resistance				15	m $\Omega$
$R_{thJC}$	thermal resistance junction to case				1,1	K/W
$R_{thCH}$	thermal resistance case to heatsink			0,2		K/W
$P_{tot}$	total power dissipation		$T_C = 25^{\circ}C$		90	W
$I_{TSM}$	max. forward surge current	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		320	A
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		345	A
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 125^{\circ}C$		270	A
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		295	A
$I^2t$	value for fusing	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		510	A <sup>2</sup> s
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		495	A <sup>2</sup> s
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 125^{\circ}C$		365	A <sup>2</sup> s
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		360	A <sup>2</sup> s
$C_J$	junction capacitance	$V_R = 400V \quad f = 1 \text{ MHz}$	$T_{VJ} = 25^{\circ}C$		22	pF
$P_{GM}$	max. gate power dissipation	$t_p = 30 \mu s$	$T_C = 125^{\circ}C$		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	$T_{VJ} = 125^{\circ}C; f = 50 \text{ Hz}$ repetitive, $I_T = 45 A$			150	A/ $\mu s$
		$t_p = 200 \mu s; di_G/dt = 0,45 A/\mu s;$ $I_G = 0,45A; V_D = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 21 A$			500	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	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		1	V
			$T_{VJ} = -40^{\circ}C$		1,2	V
$I_{GT}$	gate trigger current	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		65	mA
			$T_{VJ} = -40^{\circ}C$		80	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				5	mA
$I_L$	latching current	$t_p = 10 \mu s$	$T_{VJ} = 25^{\circ}C$		150	mA
		$I_G = 0,3A; di_G/dt = 0,3 A/\mu s$				
$I_H$	holding current	$V_D = 6 V \quad R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		100	mA
$t_{gd}$	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}C$		2	$\mu s$
		$I_G = 0,3A; di_G/dt = 0,3 A/\mu s$				
$t_q$	turn-off time	$V_R = 100 V; I_T = 15A; V_D = \frac{2}{3} V_{DRM}$ $di/dt = 10 A/\mu s; dv/dt = 20 V/\mu s; t_p = 300 \mu s$	$T_{VJ} = 100^{\circ}C$		150	$\mu s$



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	
<b>Weight</b>					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	



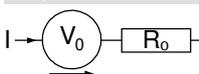
Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCC21-16io8B	MCC21-16io8B	Box	36	477338

Similar Part	Package	Voltage class
MCMA25P1600TA	TO-240AA-1B	1600
MCMA35P1600TA	TO-240AA-1B	1600

**Equivalent Circuits for Simulation**

\* on die level

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

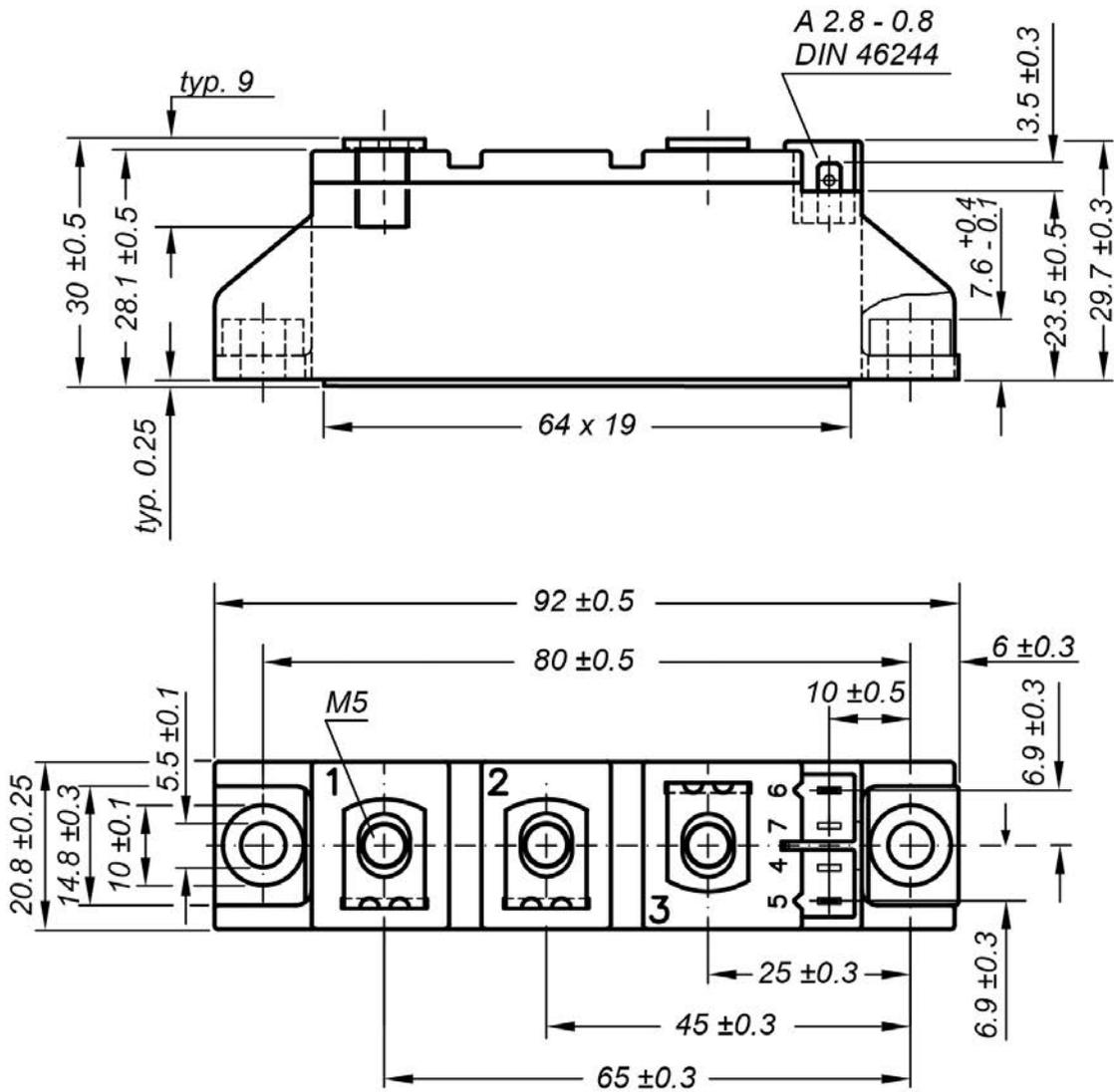


**Thyristor**

$V_{0\ max}$	threshold voltage	0,85	V
$R_{0\ max}$	slope resistance *	13,8	mΩ



**Outlines TO-240AA**



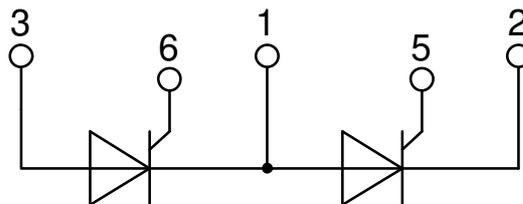
**Optional accessories for modules**

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**

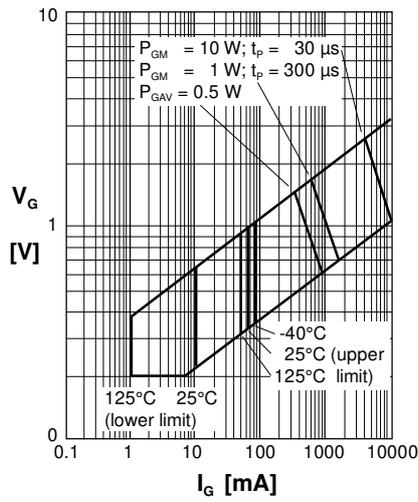


Fig. 1 Gate trigger characteristics

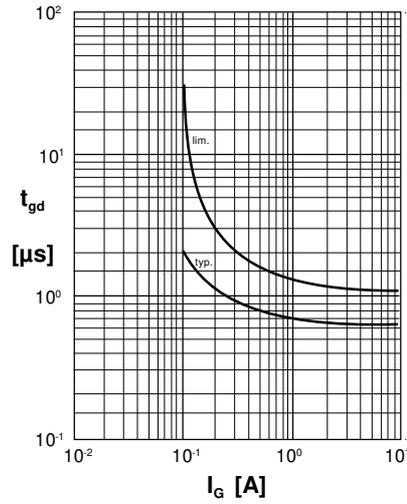


Fig. 2 Gate trigger delay time