

## Excellent Integrated System Limited

Stocking Distributor

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[IXYS Corporation](#)  
[MCC44-16IO1B](#)

For any questions, you can email us directly:  
[sales@integrated-circuit.com](mailto:sales@integrated-circuit.com)

## Thyristor Module

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

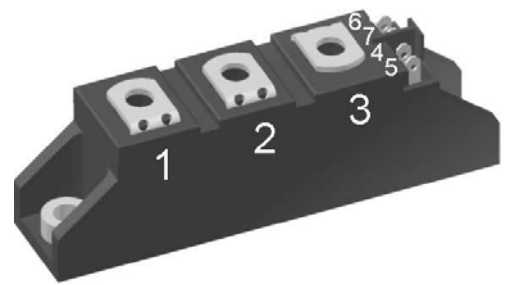
$$I_{TAV} = 49 \text{ A}$$

$$V_T = 1.34 \text{ V}$$

Phase leg

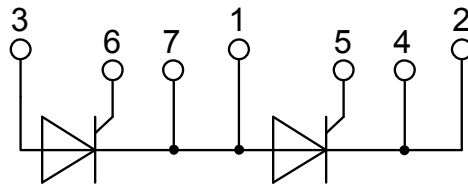
Part number

**MCC44-16io1B**



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

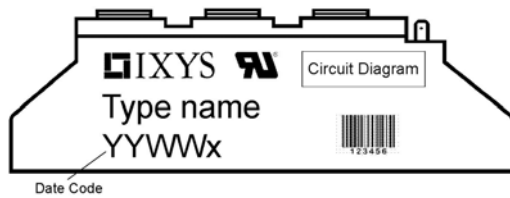
- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

Thyristor				Ratings		
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			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	$I_T = 100 A$	$T_{VJ} = 25^{\circ}C$		1.34	V
		$I_T = 200 A$			1.75	V
		$I_T = 100 A$	$T_{VJ} = 125^{\circ}C$		1.34	V
		$I_T = 200 A$			1.80	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
$V_{T0}$	threshold voltage	} for power loss calculation only	$T_{VJ} = 125^{\circ}C$		0.85	V
$r_T$	slope resistance				5.3	m $\Omega$
$R_{thJC}$	thermal resistance junction to case				0.53	K/W
$R_{thCH}$	thermal resistance case to heatsink			0.20		K/W
$P_{tot}$	total power dissipation		$T_C = 25^{\circ}C$		180	W
$I_{TSM}$	max. forward surge current	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		1.15	kA
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		1.24	kA
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 125^{\circ}C$		980	A
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		1.06	kA
$I^2t$	value for fusing	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		6.62	kA <sup>2</sup> s
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		6.40	kA <sup>2</sup> s
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 125^{\circ}C$		4.80	kA <sup>2</sup> s
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		4.63	kA <sup>2</sup> s
$C_J$	junction capacitance	$V_R = 400 V \quad f = 1 \text{ MHz}$	$T_{VJ} = 25^{\circ}C$		54	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, $I_T = 150 A$			150	A/ $\mu s$
		$t_p = 200 \mu s; di_G/dt = 0.45 A/\mu s;$ $I_G = 0.45 A; V_D = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 49 A$			500	A/ $\mu s$
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V_D = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty; \text{ method 1 (linear voltage rise)}$	$T_{VJ} = 125^{\circ}C$		1000	V/ $\mu s$
$V_{GT}$	gate trigger voltage	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		1.5	V
			$T_{VJ} = -40^{\circ}C$		1.6	V
$I_{GT}$	gate trigger current	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		100	mA
			$T_{VJ} = -40^{\circ}C$		200	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	$t_p = 10 \mu s$	$T_{VJ} = 25^{\circ}C$		450	mA
		$I_G = 0.45 A; di_G/dt = 0.45 A/\mu s$				
$I_H$	holding current	$V_D = 6 V \quad R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		200	mA
$t_{gd}$	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}C$		2	$\mu s$
		$I_G = 0.45 A; di_G/dt = 0.45 A/\mu s$				
$t_q$	turn-off time	$V_R = 100 V; I_T = 120 A; V_D = \frac{2}{3} V_{DRM}$ $di/dt = 10 A/\mu s; dv/dt = 20 V/\mu s; t_p = 200 \mu s$	$T_{VJ} = 125^{\circ}C$		150	$\mu s$



# MCC44-16io1B

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>					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



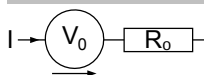
Ordering	Part Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCC44-16io1B	MCC44-16io1B	Box	6	452920

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

### Equivalent Circuits for Simulation

\* on die level

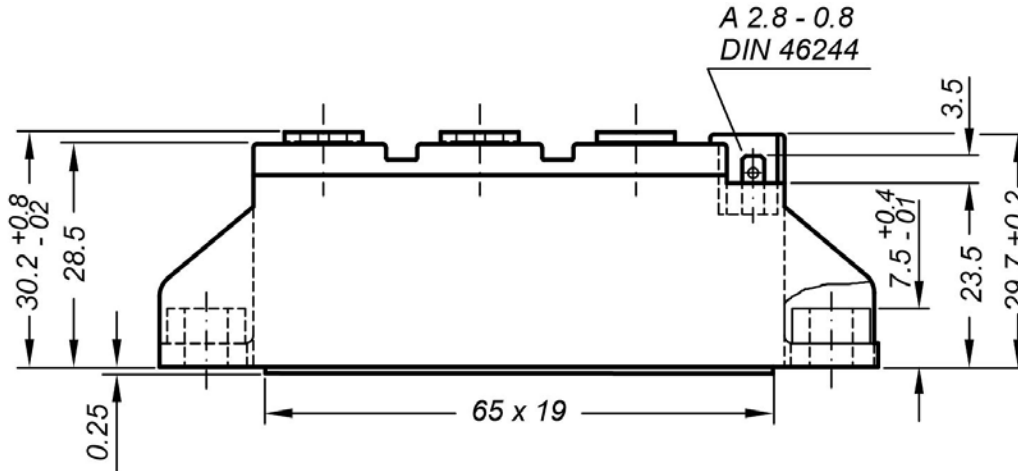
$T_{VJ} = 125^\circ\text{C}$



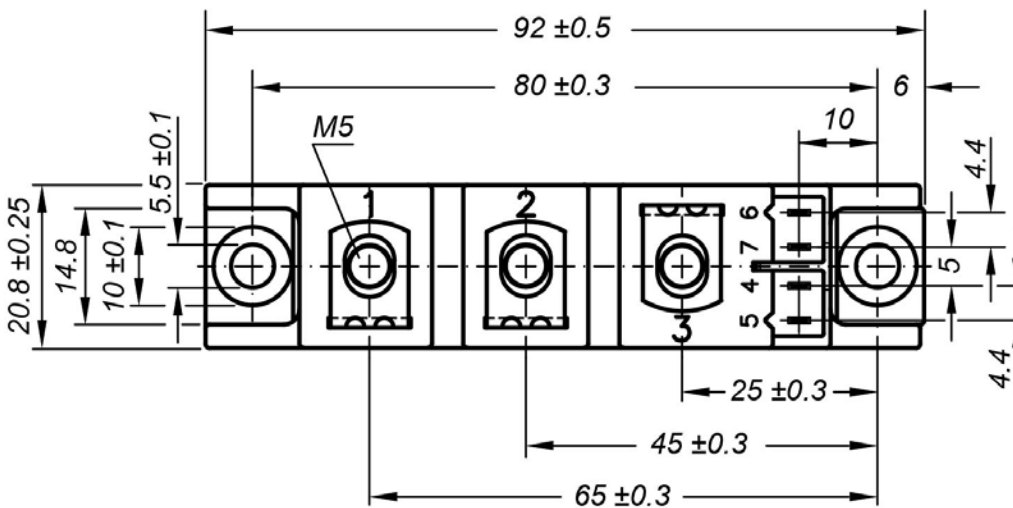
Thyristor

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

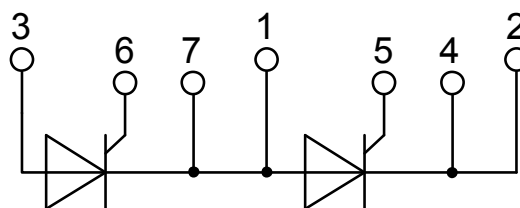
**Outlines TO-240AA**



General tolerance: DIN ISO 2768 class „c“



Optional accessories: 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**

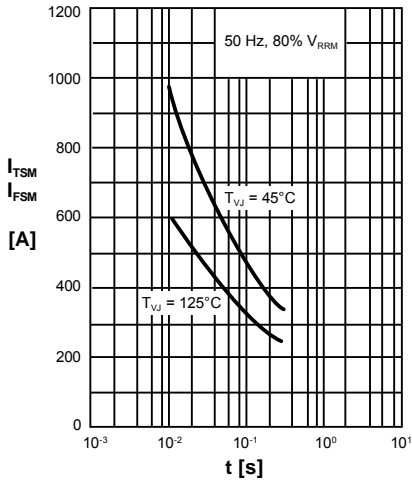


Fig. 1 Surge overload current  
 $I_{TSM}$ ,  $I_{FSM}$ : Crest value,  $t$ : duration

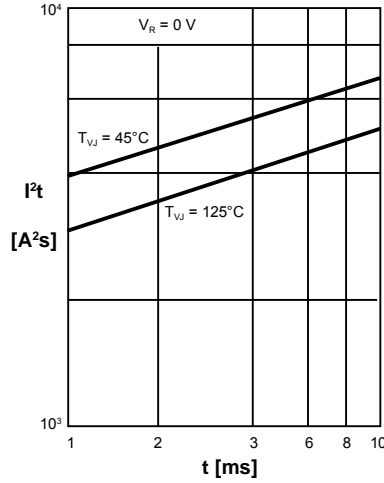


Fig. 2  $I^2t$  versus time (1-10 ms)

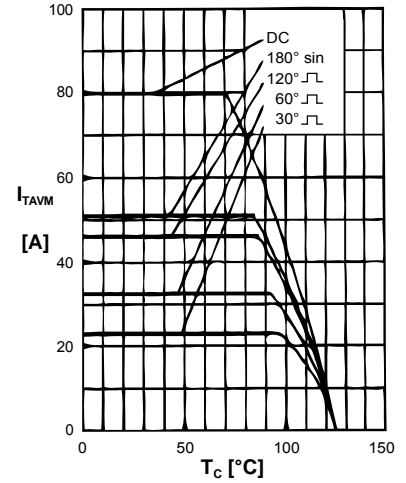


Fig. 3 Maximum forward current at case temperature

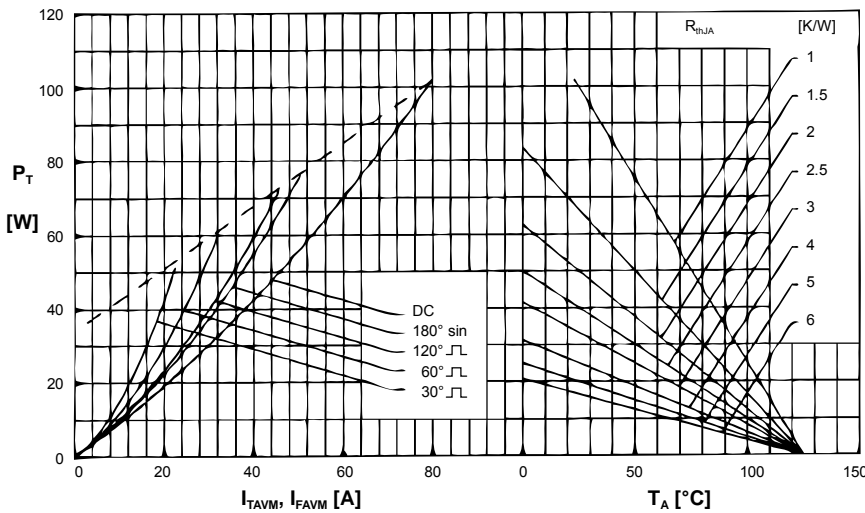


Fig. 4 Power dissipation vs. onstate current and ambient temperature (per thyristor/diode)

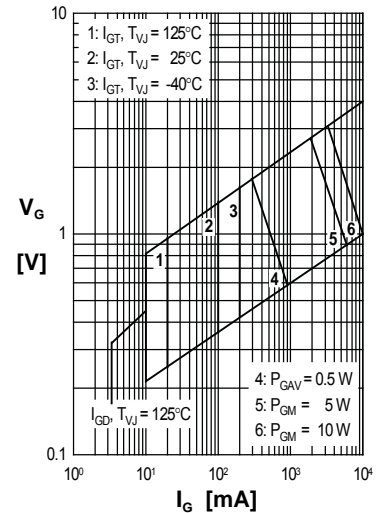


Fig. 5 Gate trigger characteristics

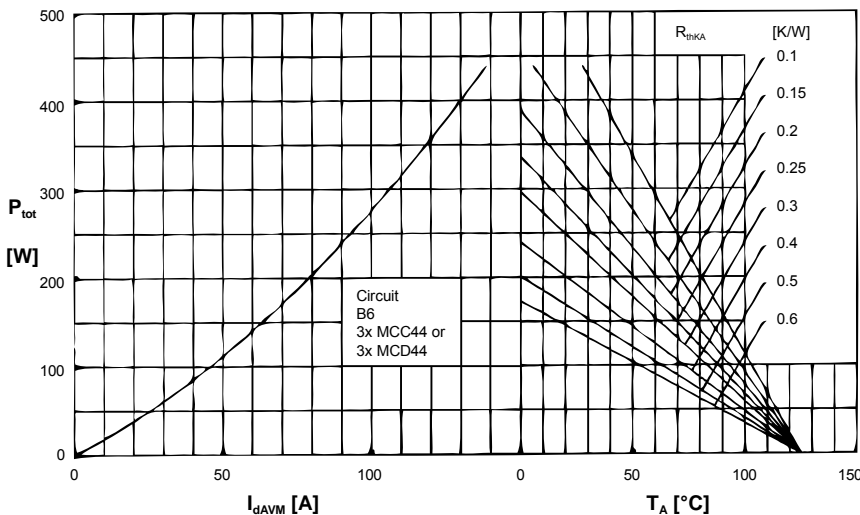


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

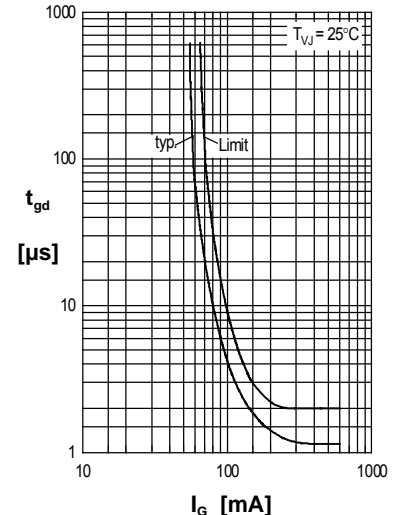


Fig. 7 Gate trigger delay time

**Thyristor**

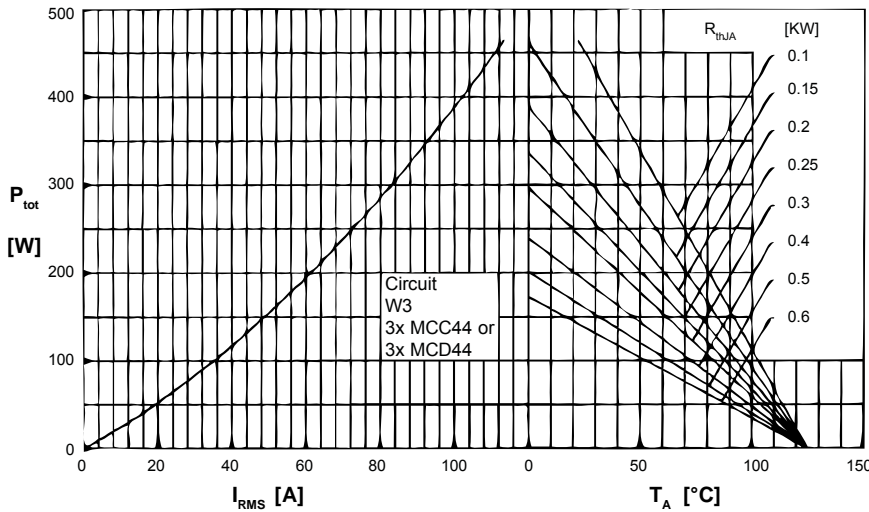


Fig. 8 Three phase AC-controller: Power dissipation versus RMS output current and ambient temperature

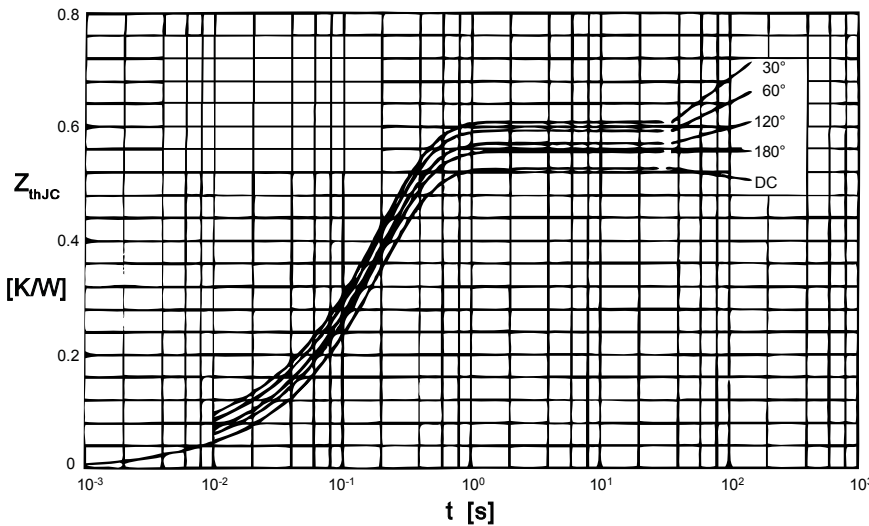


Fig. 9 Transient thermal impedance junction to case (per thyristor)

$R_{thJC}$  for various conduction angles d:

d	$R_{thJC}$ [KW]
DC	0.53
180°	0.55
120°	0.58
60°	0.60
30°	0.62

Constants for  $Z_{thJC}$  calculation:

i	$R_{thi}$ [KW]	$t_i$ [s]
1	0.015	0.0035
2	0.026	0.0200
3	0.489	0.1950

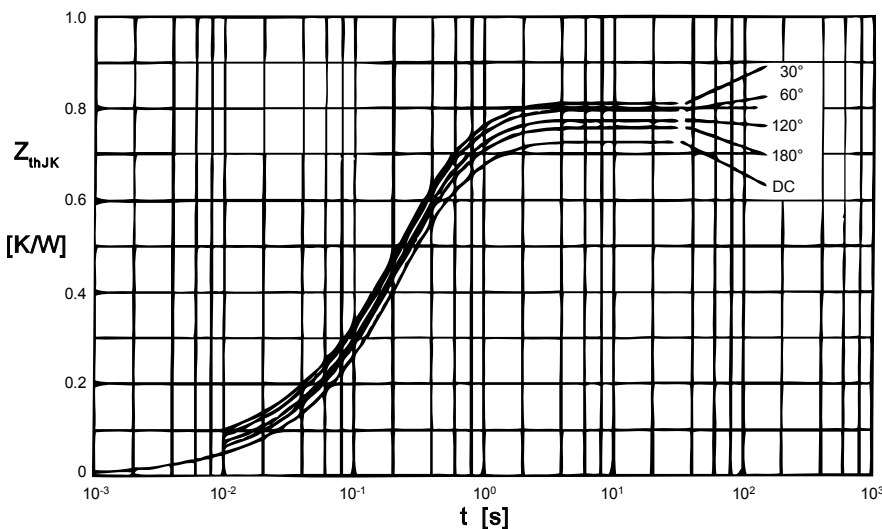


Fig. 10 Transient thermal impedance junction to heatsink (per thyristor)

$R_{thJK}$  for various conduction angles d:

d	$R_{thJK}$ [KW]
DC	0.73
180°	0.75
120°	0.78
60°	0.80
30°	0.82

Constants for  $Z_{thJK}$  calculation:

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