

Thyristor Module

$$V_{RRM} = 2 \times 1400 \text{ V}$$

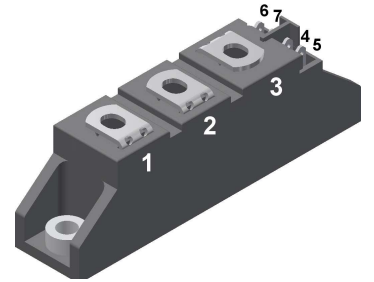
$$I_{TAV} = 18 \text{ A}$$

$$V_T = 1.57 \text{ V}$$

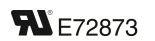
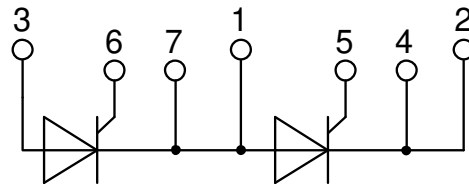
Phase leg

Part number

MCC19-14io1B



Backside: isolated

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

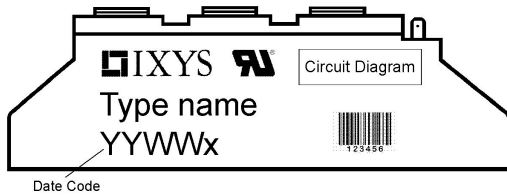
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Thyristor			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1500	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1400	V
I_{RD}	reverse current, drain current	$V_{R/D} = 1400\text{ V}$	$T_{VJ} = 25^{\circ}C$		100	μ A
		$V_{R/D} = 1400\text{ V}$	$T_{VJ} = 125^{\circ}C$		3	mA
V_T	forward voltage drop	$I_T = 40\text{ A}$	$T_{VJ} = 25^{\circ}C$		1.56	V
		$I_T = 80\text{ A}$			2.05	V
		$I_T = 40\text{ A}$	$T_{VJ} = 125^{\circ}C$		1.57	V
		$I_T = 80\text{ A}$			2.29	V
I_{TAV}	average forward current	$T_C = 85^{\circ}C$	$T_{VJ} = 125^{\circ}C$		18	A
$I_{T(RMS)}$	RMS forward current	180° sine			28	A
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 125^{\circ}C$		0.85	V
r_T	slope resistance				18	m Ω
R_{thJC}	thermal resistance junction to case				1.3	K/W
R_{thCH}	thermal resistance case to heatsink			0.2		K/W
P_{tot}	total power dissipation		$T_C = 25^{\circ}C$		77	W
I_{TSM}	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		400	A
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		430	A
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 125^{\circ}C$		340	A
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		365	A
I^2t	value for fusing	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		800	A ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		770	A ² s
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 125^{\circ}C$		580	A ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		555	A ² s
C_J	junction capacitance	$V_R = 400\text{ V}$ $f = 1\text{ MHz}$	$T_{VJ} = 25^{\circ}C$		22	pF
P_{GM}	max. gate power dissipation	$t_p = 30\ \mu\text{s}$	$T_C = 125^{\circ}C$		10	W
		$t_p = 300\ \mu\text{s}$			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, $I_T = 75\text{ A}$			150	A/ μs
		$t_p = 200\ \mu\text{s}; di_G/dt = 0.45\text{ A}/\mu\text{s}; I_G = 0.45\text{ A}; V = 2/3 V_{DRM}$ non-repet., $I_T = 18\text{ A}$			500	A/ μs
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = 2/3 V_{DRM}$	$T_{VJ} = 125^{\circ}C$		1000	V/ μs
V_{GT}	gate trigger voltage	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}C$		1.5	V
			$T_{VJ} = -40^{\circ}C$		1.6	V
I_{GT}	gate trigger current	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}C$		100	mA
			$T_{VJ} = -40^{\circ}C$		200	mA
V_{GD}	gate non-trigger voltage	$V_D = 2/3 V_{DRM}$	$T_{VJ} = 125^{\circ}C$		0.2	V
I_{GD}	gate non-trigger current				5	mA
I_L	latching current	$t_p = 10\ \mu\text{s}$	$T_{VJ} = 25^{\circ}C$		450	mA
		$I_G = 0.45\text{ A}; di_G/dt = 0.45\text{ A}/\mu\text{s}$				
I_H	holding current	$V_D = 6\text{ V}$ $R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		200	mA
t_{gd}	gate controlled delay time	$V_D = 1/2 V_{DRM}$	$T_{VJ} = 25^{\circ}C$		2	μs
		$I_G = 0.45\text{ A}; di_G/dt = 0.45\text{ A}/\mu\text{s}$				
t_q	turn-off time	$V_R = 100\text{ V}; I_T = 20\text{ A}; V = 2/3 V_{DRM}$ $T_{VJ} = 100^{\circ}C$		150		μs
			$di/dt = 10\text{ A}/\mu\text{s}$ $dv/dt = 20\text{ V}/\mu\text{s}$ $t_p = 200\ \mu\text{s}$			



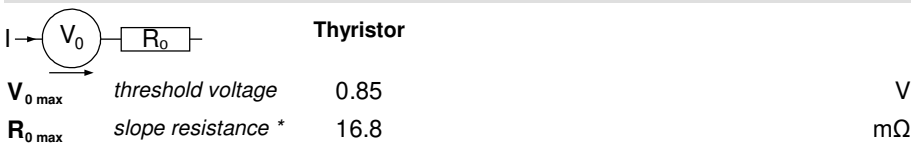
Package TO-240AA			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
I_{RMS}	RMS current	per terminal			200	A
T_{VJ}	virtual junction temperature		-40		125	°C
T_{op}	operation temperature		-40		100	°C
T_{stg}	storage temperature		-40		125	°C
Weight				81		g
M_D	mounting torque		2.5		4	Nm
M_T	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			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	MCC19-14io1B	MCC19-14io1B	Box	36	452858

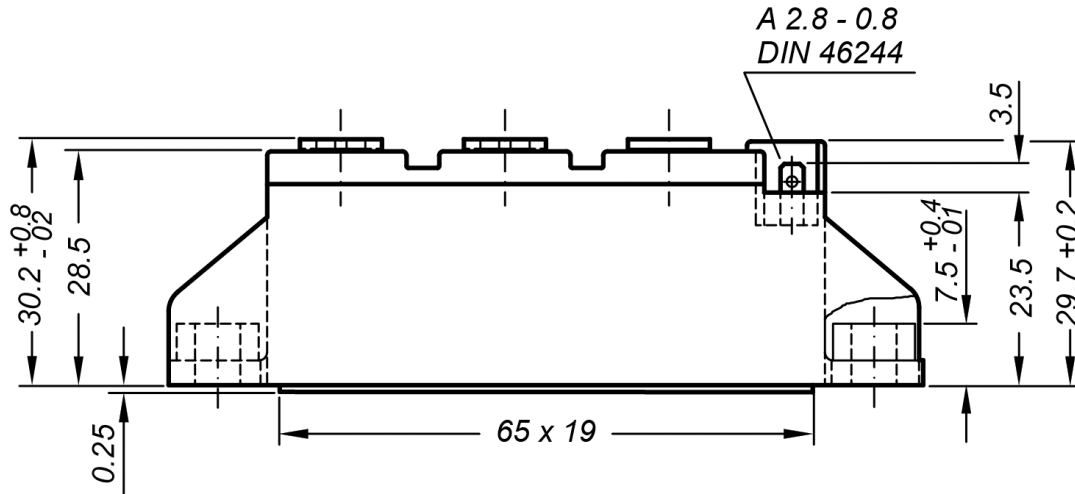
Similar Part	Package	Voltage class
MCMA25P1600TA	TO-240AA-1B	1600
MCMA35P1600TA	TO-240AA-1B	1600

Equivalent Circuits for Simulation * on die level $T_{VJ} = 125^{\circ}C$

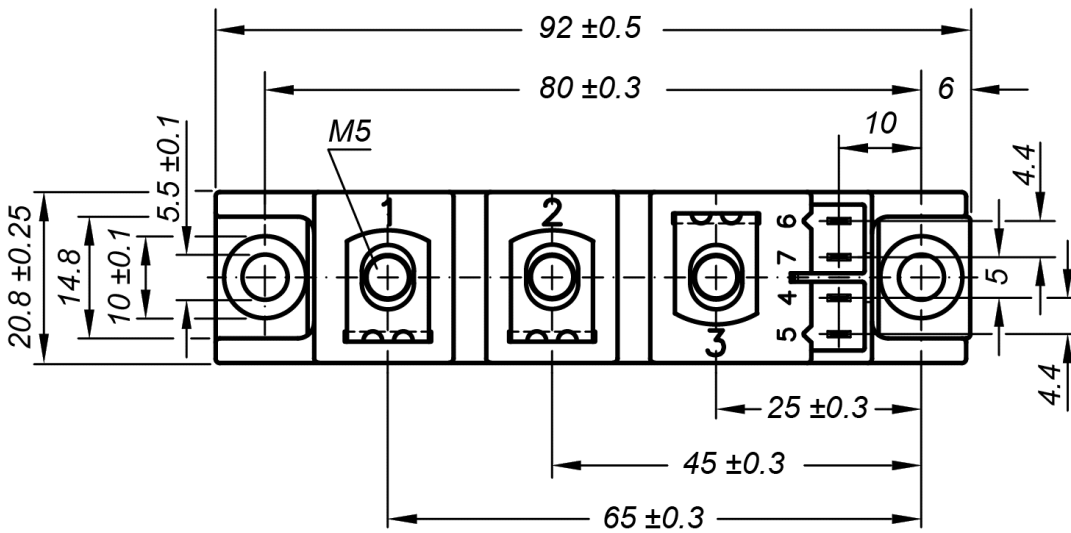




Outlines TO-240AA



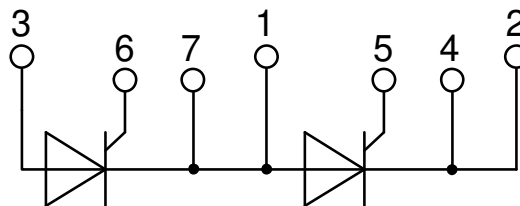
General tolerance: DIN ISO 2768 class „c“



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

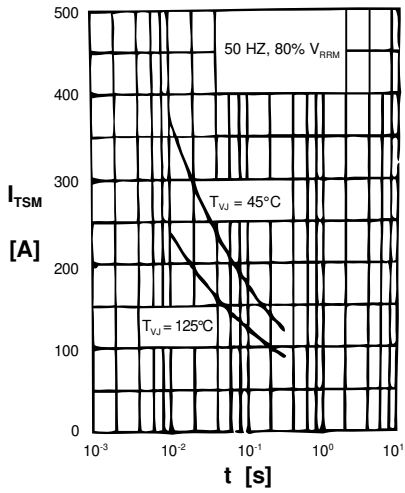


Fig. 1 Surge overload current I_{TSM} : Crest value, t : duration

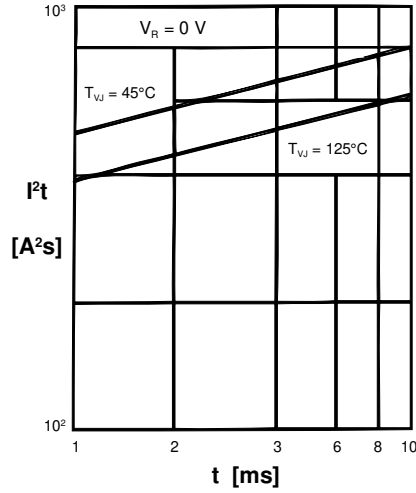


Fig. 2 I^2t versus time (1-10 ms)

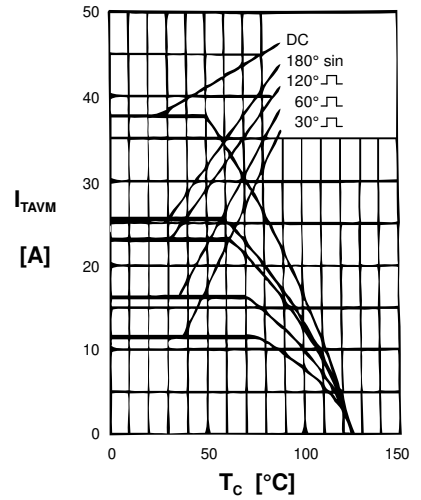


Fig. 3 Max. forward current at case temperature

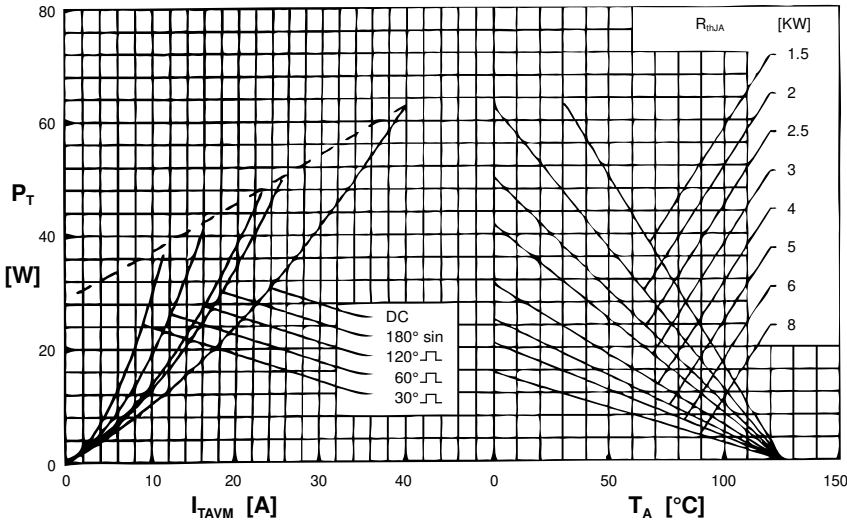


Fig. 4 Power dissipation versus onstate current & ambient temp. (per thyristor)

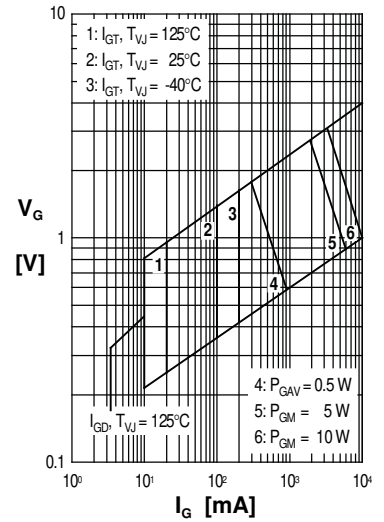


Fig. 5 Gate trigger charact.

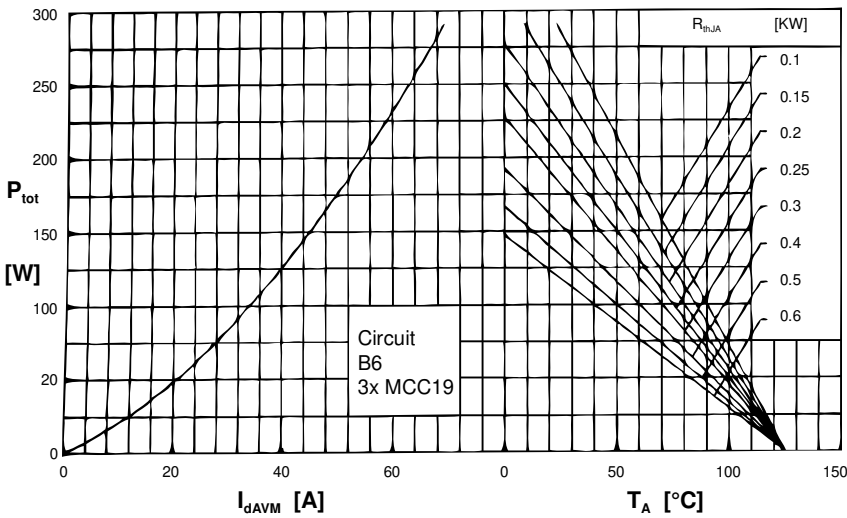


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

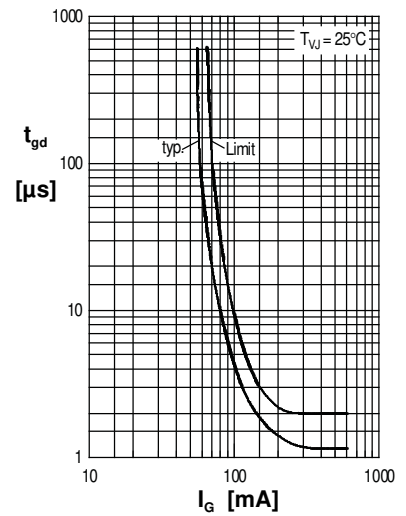


Fig. 7 Gate trigger delay time

Thyristor

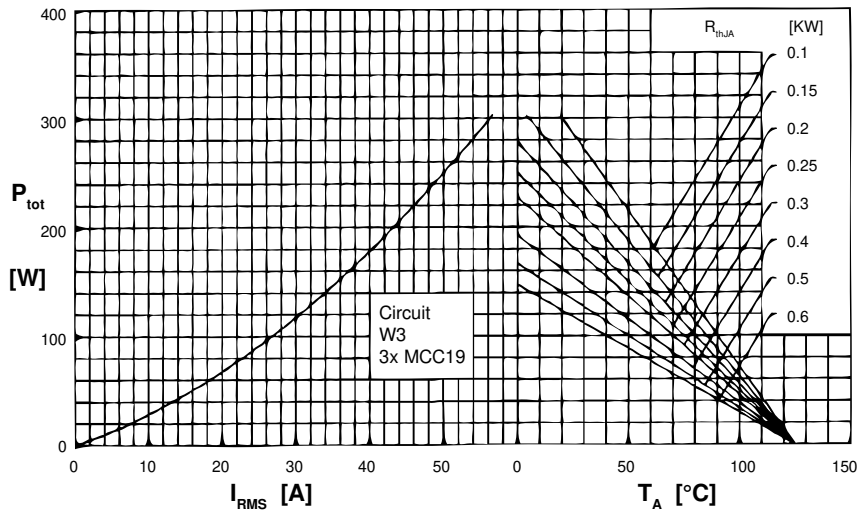
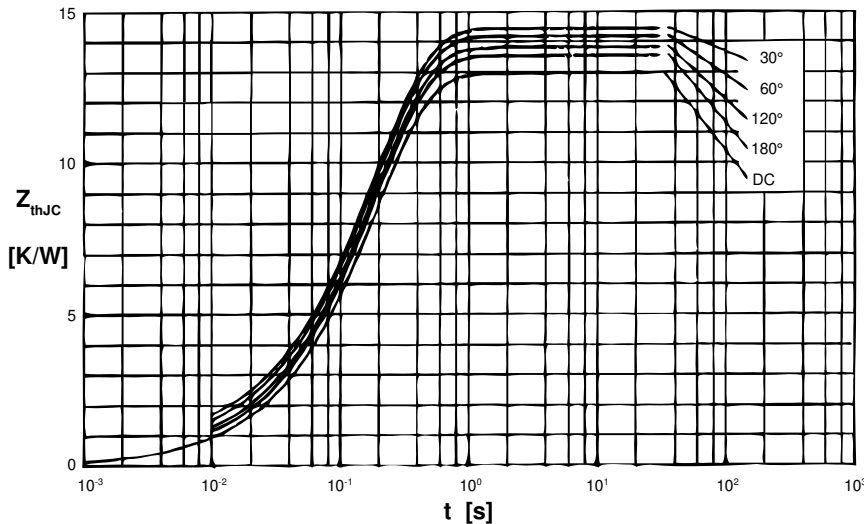


Fig. 8 Three phase AC-controller: Power dissipation vs. RMS output current and ambient temperature



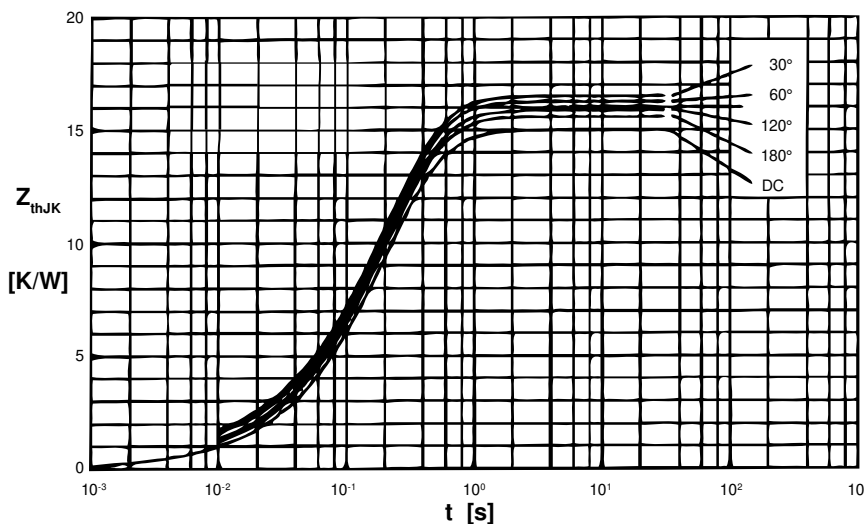
R_{thJC} for various conduction angles d:

d	R _{thJC} [K/W]
DC	1.30
180°	1.35
120°	1.39
60°	1.42
30°	1.45

Constants for Z_{thJC} calculation:

i	R _{thi} [K/W]	t _i [s]
1	0.018	0.0033
2	0.041	0.0216
3	1.241	0.1910

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



R_{thJK} for various conduction angles d:

d	R _{thJK} [K/W]
DC	1.50
180°	1.55
120°	1.59
60°	1.62
30°	1.65

Constants for Z_{thJK} calculation:

i	R _{thi} [K/W]	t _i [s]
1	0.018	0.0033
2	0.041	0.0216
3	1.241	0.1910
4	0.200	0.4600

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