

Thyristor Modules

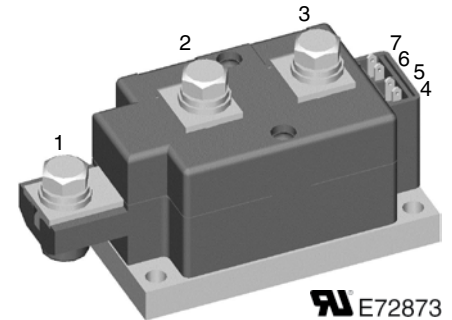
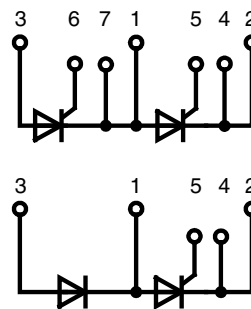
Thyristor/Diode Modules

$$I_{TRMS} = 2 \times 400 \text{ A}$$

$$I_{TAVM} = 2 \times 240 \text{ A}$$

$$V_{RRM} = 2000/2200 \text{ V}$$

V_{RSM}	V_{RRM}	Type
V_{DSM}	V_{DRM}	
V	V	
2100	2000	MCC 224-20io1 MCD 224-20io1
2300	2200	MCC 224-22io1 MCD 224-22io1



Symbol	Conditions	Maximum Ratings	
I_{TRMS}	$T_{VJ} = T_{VJM}$	400	A
I_{TAVM}	$T_C = 85^\circ\text{C}; 180^\circ \text{ sine}$	240	A
I_{TSM}	$T_{VJ} = 45^\circ\text{C}; t = 10 \text{ ms}$ (50 Hz)	8000	A
	$V_R = 0; t = 8.3 \text{ ms}$ (60 Hz)	8500	A
	$T_{VJ} = T_{VJM}; t = 10 \text{ ms}$ (50 Hz)	7000	A
	$V_R = 0; t = 8.3 \text{ ms}$ (60 Hz)	7500	A
I^2t	$T_{VJ} = 45^\circ\text{C}; t = 10 \text{ ms}$ (50 Hz)	320 000	A ² s
	$V_R = 0; t = 8.3 \text{ ms}$ (60 Hz)	303 000	A ² s
	$T_{VJ} = T_{VJM}; t = 10 \text{ ms}$ (50 Hz)	245 000	A ² s
	$V_R = 0; t = 8.3 \text{ ms}$ (60 Hz)	240 000	A ² s
$(di/dt)_{cr}$	$T_{VJ} = T_{VJM};$ repetitive, $I_T = 750 \text{ A}$ $f = 50 \text{ Hz}; t_p = 200 \mu\text{s};$	100	A/ μs
	$V_D = 2/3 V_{DRM};$ non repetitive, $I_T = I_{TAVM}$ $I_G = 1 \text{ A};$ $di_G/dt = 1 \text{ A}/\mu\text{s}$	500	A/ μs
$(dv/dt)_{cr}$	$T_{VJ} = T_{VJM}; V_D = 2/3 V_{DRM};$ $R_{GK} = \infty; \text{method 1 (linear voltage rise)}$	1000	V/ μs
P_{GM}	$T_{VJ} = T_{VJM}; t_p = 30 \mu\text{s}$	120	W
P_{GAV}	$I_T = I_{T(AV)M}; t_p = 500 \mu\text{s}$	60	W
		20	W
V_{RGM}		10	V
T_{VJ}		-40...+130	$^\circ\text{C}$
T_{VJM}		130	$^\circ\text{C}$
T_{stg}		-40...+125	$^\circ\text{C}$
V_{ISOL}	50/60 Hz, RMS $t = 1 \text{ min}$	3000	V~
	$I_{ISOL} \leq 1 \text{ mA} \quad t = 1 \text{ s}$	3600	V~
M_d	Mounting torque (M6)	4.5 - 7	Nm
	Terminal connection torque (M8)	11 - 13	Nm
Weight	Typical including screws	750	g

Data according to IEC 60747 and refer to a single diode unless otherwise stated.

Features

- International standard package
- Direct Copper Bonded Al_2O_3 -ceramic base plate
- Planar passivated chips
- Isolation voltage 3600 V~
- UL registered, E 72873
- Keyed gate/cathode twin pins

Applications

- Motor control, softstarter
- Power converter
- Heat and temperature control for industrial furnaces and chemical processes
- Lighting control
- Solid state switches

Advantages

- Simple mounting
- Improved temperature and power cycling
- Reduced protection circuits

Symbol	Conditions	Characteristic Values	
		typ.	max.
I_{RRM}, I_{DRM}	$V_R / V_D = V_{RRM} / V_{DRM}$	$T_{VJ} = T_{VJM}$	40 mA
V_T	$I_T = 600$ A	$T_{VJ} = 25^\circ\text{C}$	1.4 V
V_{T0}	For power-loss calculations only		0.8 V
r_t		$T_{VJ} = T_{VJM}$	0.76 mΩ
V_{GT}	$V_D = 6$ V	$T_{VJ} = 25^\circ\text{C}$	2 V
		$T_{VJ} = -40^\circ\text{C}$	3 V
I_{GT}	$V_D = 6$ V	$T_{VJ} = 25^\circ\text{C}$	150 mA
		$T_{VJ} = -40^\circ\text{C}$	220 mA
V_{GD}	$V_D = 2/3 V_{DRM}$	$T_{VJ} = T_{VJM}$	0.25 V
I_{GD}			10 mA
I_L	$t_p = 30 \mu\text{s}; V_D = 6$ V $I_G = 0.45$ A; $di_G/dt = 0.45$ A/ μs	$T_{VJ} = 25^\circ\text{C}$	200 mA
I_H	$V_D = 6$ V; $R_{GK} = \infty$;	$T_{VJ} = 25^\circ\text{C}$	150 mA
t_{gd}	$V_D = 1/2 V_{DRM}$ $I_G = 1$ A; $di_G/dt = 1$ A/ μs	$T_{VJ} = 25^\circ\text{C}$	2 μs
t_q	$V_D = 2/3 V_{DRM}$ $dv/dt = 50$ V/ μs ; $-di/dt = 10$ A/ μs $I_T = 300$ A; $V_R = 100$ V; $t_p = 200 \mu\text{s}$	$T_{VJ} = T_{VJM}$	200 μs
Q_S	$I_T = 300$ A; $-di/dt = 50$ A/ μs	$T_{VJ} = T_{VJM}$	760 μC
I_{RM}			275 A
R_{thJC}	per thyristor; DC current per module		0.139 K/W 0.069 K/W
R_{thJK}	per thyristor; DC current per module		0.179 K/W 0.089 K/W
d_S	Creeping distance on surface		12.7 mm
d_A	Creepage distance in air		9.6 mm
a	Maximum allowable acceleration		50 m/s ²

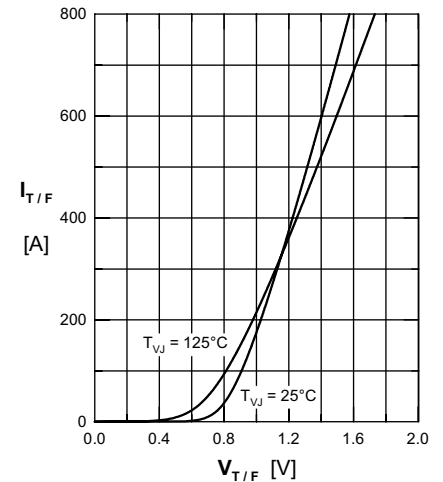


Fig. 1 Forward characteristics

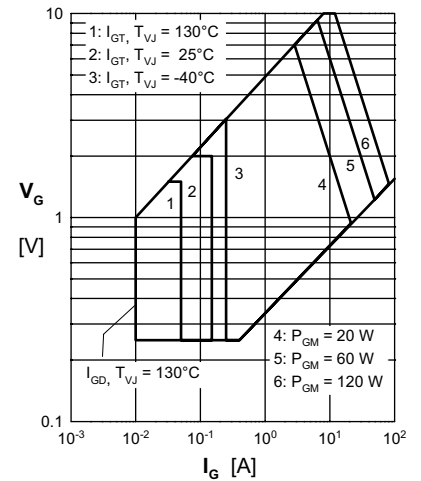


Fig. 2 Gate trigger characteristics

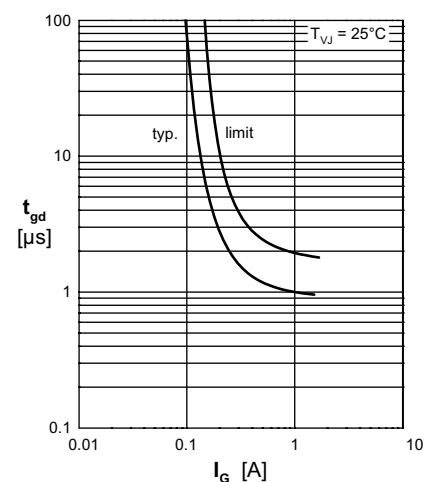
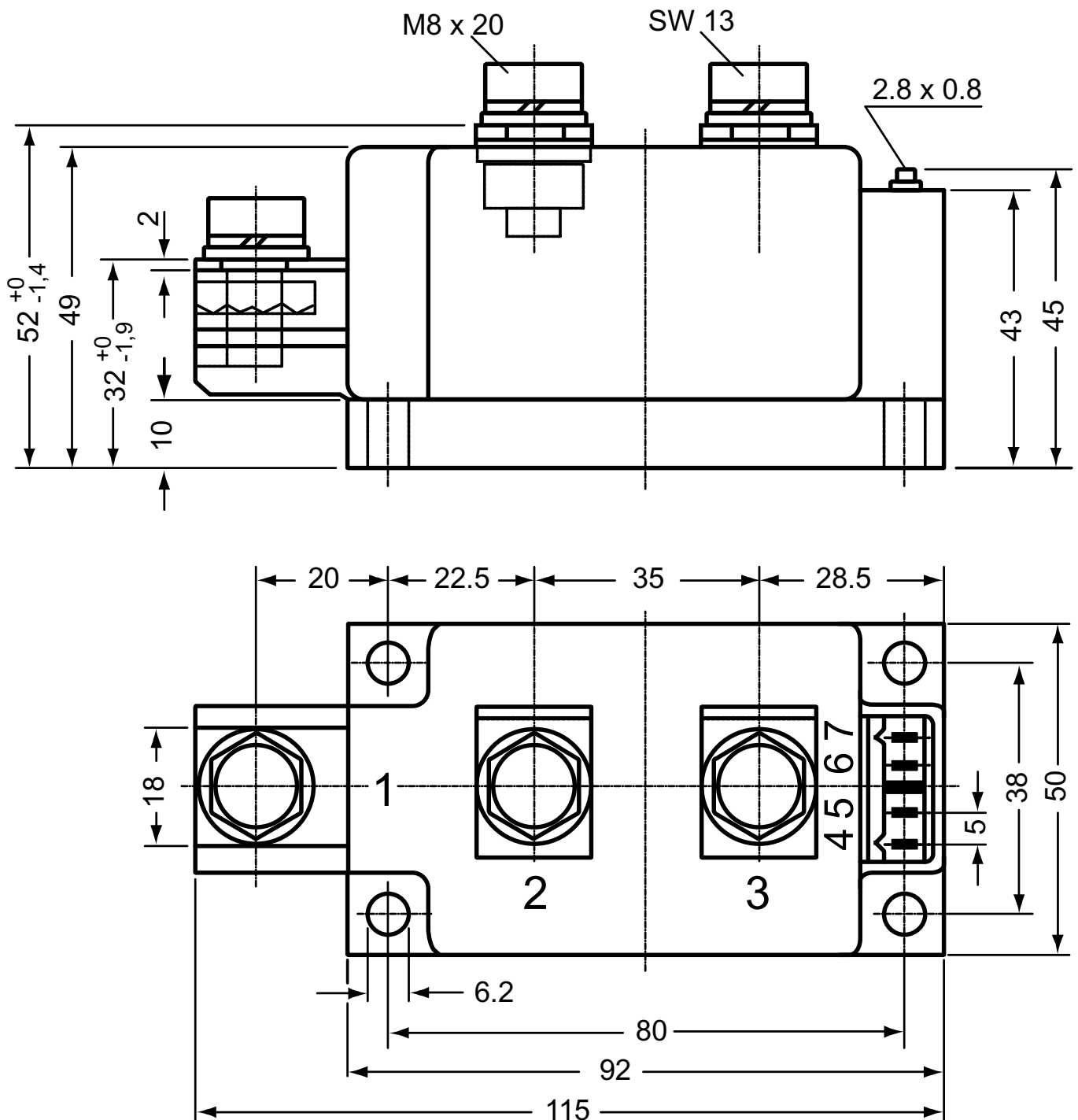


Fig. 3 Gate trigger delay time

Dimensions in mm (1 mm = 0.0394")



Optional accessories for modules

Keyed gate/cathode twin plugs with wire length = 350 mm, gate = white, cathode = red

Type ZY 180L (L = Left for pin pair 4/5)

Type ZY 180R (R = Right for pin pair 6/7) } UL 758, style 3751

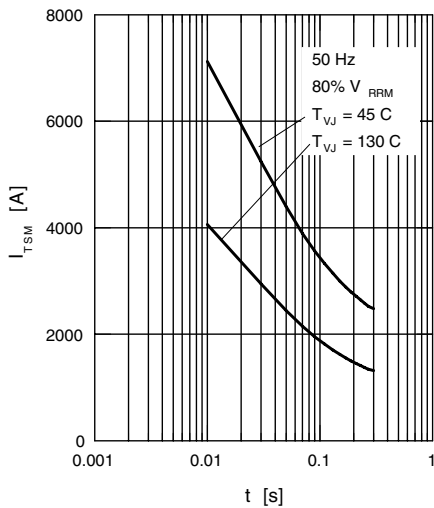


Fig. 4 Surge overload current
 I_{TSM} : Crest value, t : duration

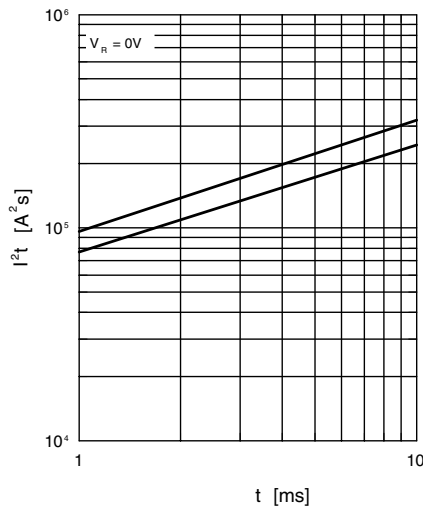


Fig. 5 i^2t versus time (1-10 ms)

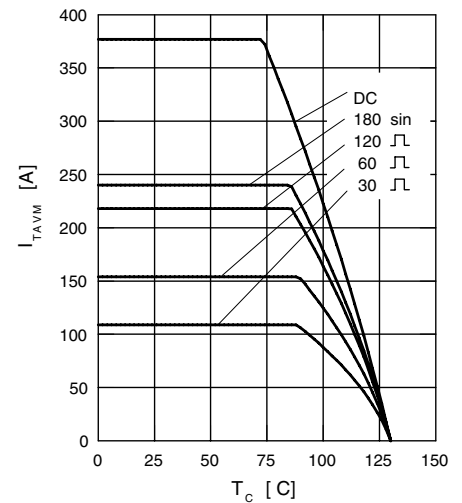


Fig. 5a Maximum forward current at case temperature

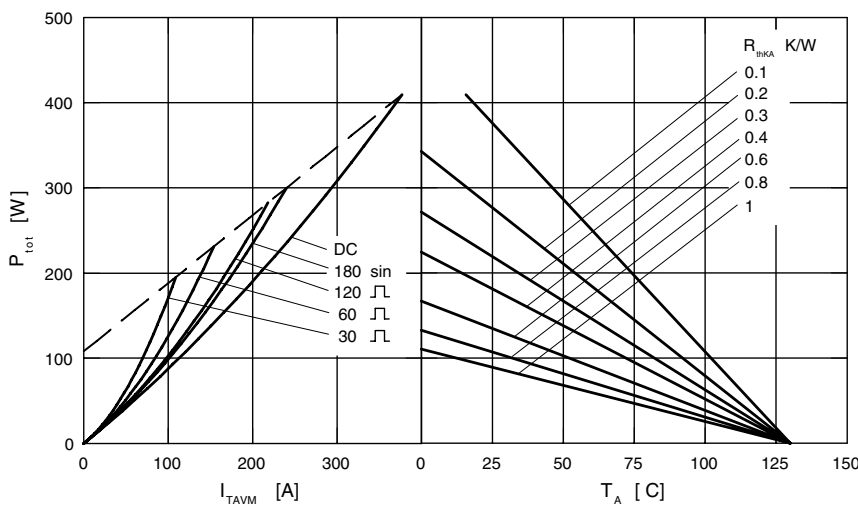


Fig. 6 Power dissipation vs. on-state current and ambient temperature

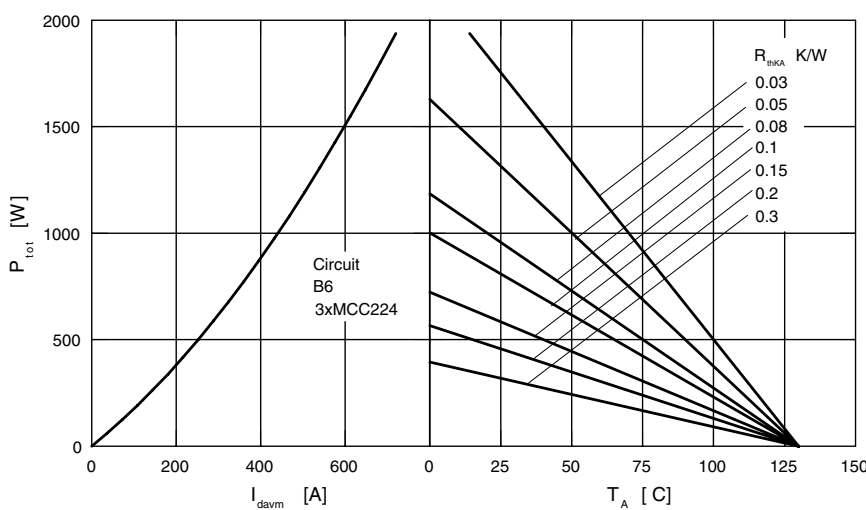


Fig. 7 Three phase rectifier bridge:
Power dissipation vs. direct output current and ambient temperature

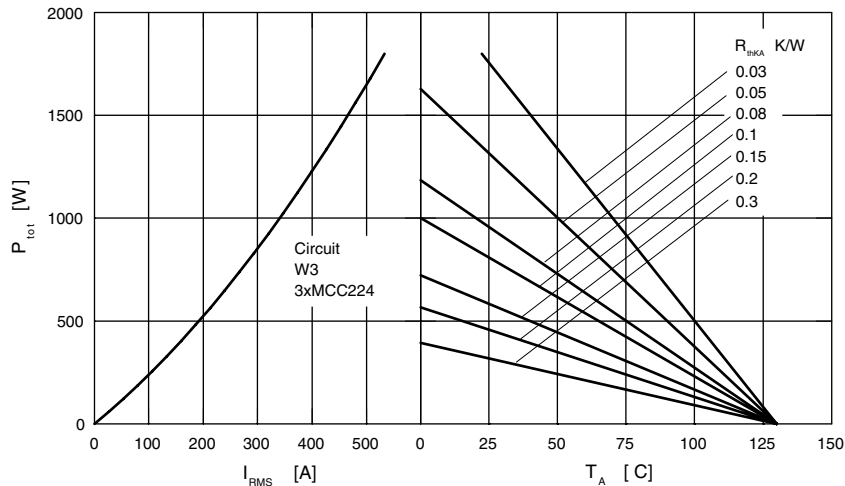


Fig. 8 3~ AC-controller: Power dissipation vs. RMS output current & ambient temperature

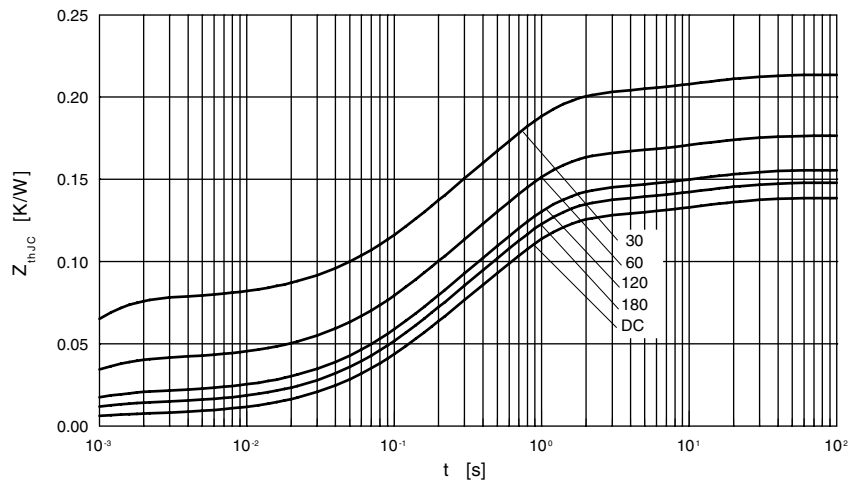


Fig. 9 Transient thermal impedance junction to case

R_{thJC} for various conduction angles d :

d	R_{thJC} (K/W)
DC	0.139
180°	0.148
120°	0.156
60°	0.176
30°	0.214

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.0067	0.00054
2	0.0358	0.098
3	0.0832	0.54
4	0.0129	12

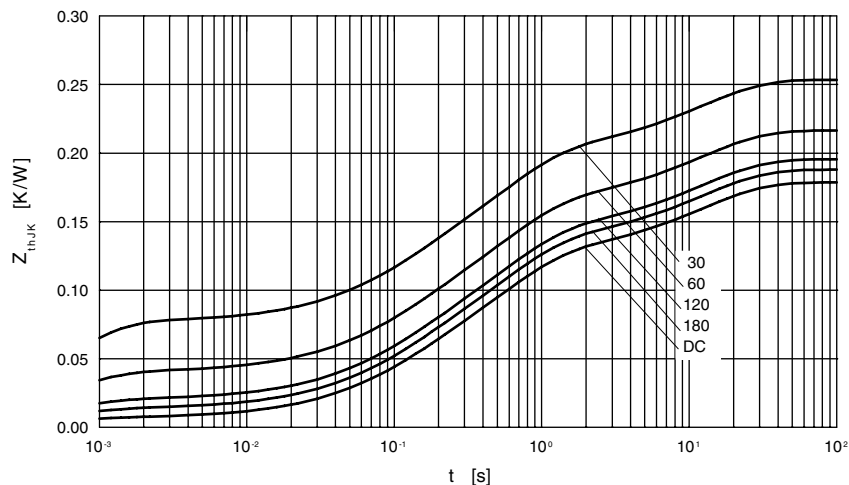


Fig. 10 Transient thermal impedance junction to heatsink

R_{thJK} for various conduction angles d :

d	R_{thJK} (K/W)
DC	0.179
180°	0.188
120°	0.196
60°	0.216
30°	0.256

Constants for Z_{thJK} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.0067	0.001
2	0.0358	0.08
3	0.0832	0.20
4	0.0129	1.0
5	0.04	