Thyristor \ Diode Module

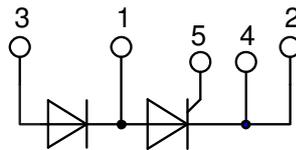|		
V_{RRM}	$=$	2×1600 V
I_{TAV}	$=$	60 A
V_T	$=$	1.24 V

Phase leg

Part number

MCD56-16io1B
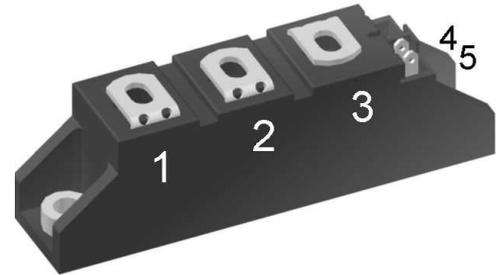
Backside: isolated

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

Terms -Conditions of usage:

The data contained in this product data sheet is exclusively intended for technically trained staff. The user will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to his application. The specifications of our components may not be considered as an assurance of component characteristics. The information in the valid application- and assembly notes must be considered. Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of your product, please contact your local sales office.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact your local sales office.

Should you intend to use the product in aviation, in health or life endangering or life support applications, please notify. For any such application we urgently recommend
- to perform joint risk and quality assessments;
- the conclusion of quality agreements;
- to establish joint measures of an ongoing product survey, and that we may make delivery dependent on the realization of any such measures.

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Rectifier | Ratings

Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25°C$				1700	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25°C$				1600	V
$I_{R/D}$	reverse current, drain current	$V_{R/D} = 1600\ V$	$T_{VJ} = 25°C$			200	µA
		$V_{R/D} = 1600\ V$	$T_{VJ} = 125°C$			5	mA
V_T	forward voltage drop	$I_T = 100\ A$	$T_{VJ} = 25°C$			1.26	V
		$I_T = 200\ A$				1.57	V
		$I_T = 100\ A$	$T_{VJ} = 125°C$			1.24	V
		$I_T = 200\ A$				1.62	V
I_{TAV}	average forward current	$T_C = 85°C$	$T_{VJ} = 125°C$			60	A
$I_{T(RMS)}$	RMS forward current	180° sine				94	A
V_{T0}	threshold voltage } for power loss calculation only		$T_{VJ} = 125°C$			0.85	V
r_T	slope resistance }					3.7	mΩ
R_{thJC}	thermal resistance junction to case					0.45	K/W
R_{thCH}	thermal resistance case to heatsink				0.20		K/W
P_{tot}	total power dissipation	$T_C = 25°C$				222	W
I_{TSM}	max. forward surge current	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45°C$			1.50	kA
		t = 8,3 ms; (60 Hz), sine	$V_R = 0\ V$			1.62	kA
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 125°C$			1.28	kA
		t = 8,3 ms; (60 Hz), sine	$V_R = 0\ V$			1.38	kA
I^2t	value for fusing	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45°C$			11.3	kA²s
		t = 8,3 ms; (60 Hz), sine	$V_R = 0\ V$			10.9	kA²s
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 125°C$			8.13	kA²s
		t = 8,3 ms; (60 Hz), sine	$V_R = 0\ V$			7.87	kA²s
C_J	junction capacitance	$V_R = 400\ V$ f = 1 MHz	$T_{VJ} = 25°C$		74		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, $I_T = 150\ A$ $t_P = 200$ µs; $di_G/dt = 0.45$ A/µs;				150	A/µs
		$I_G = 0.45\ A$; $V = ⅔\ V_{DRM}$ non-repet., $I_T = 60\ A$				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	$V_D = 6\ V$	$T_{VJ} = 25°C$			100	mA
			$T_{VJ} = -40°C$			200	mA
V_{GD}	gate non-trigger voltage	$V_D = ⅔\ V_{DRM}$	$T_{VJ} = 125°C$			0.2	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	$T_{VJ} = 25°C$			450	mA
I_H	holding current	$V_D = 6\ V$ $R_{GK} = ∞$	$T_{VJ} = 25°C$			200	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			150		µs

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
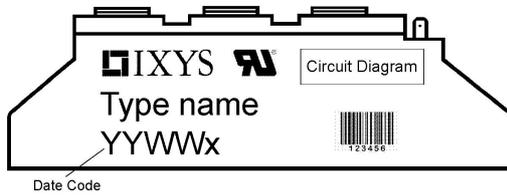
Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCD56-16io1B	MCD56-16io1B	Box	36	465984

Similar Part	Package	Voltage class
MCMA65PD1600TB	TO-240AA-1B	1600
MCMA85PD1600TB	TO-240AA-1B	1600

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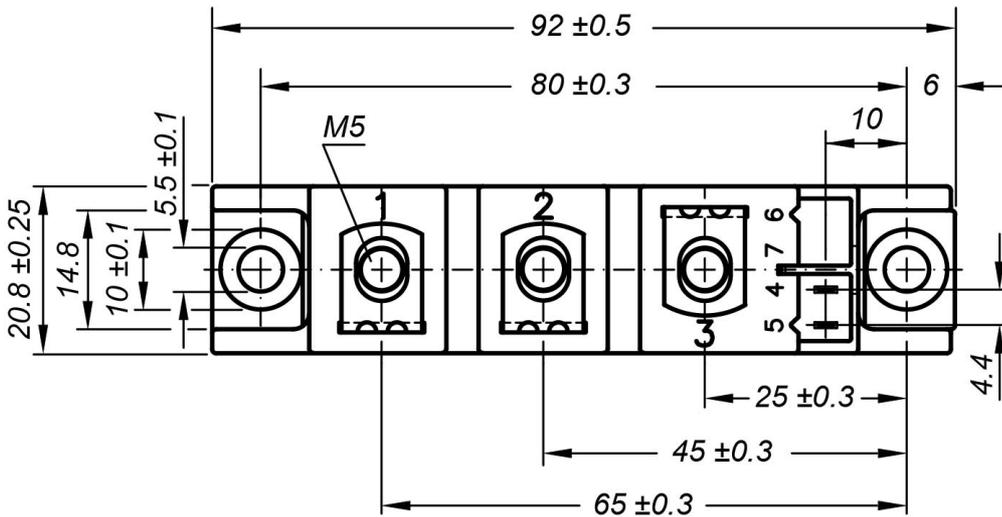

Thyristor

$V_{0\,max}$	threshold voltage	0.85		V
$R_{0\,max}$	slope resistance *	2.5		mΩ

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Outlines   TO-240AA

A 2.8 - 0.8
DIN 46244

3.5

$30.2 \, ^{+0.8}_{-0.2}$ 28.5

$7.5 \, ^{+0.4}_{-0.1}$ 23.5 29.7 ± 0.2

0.25

65 x 19
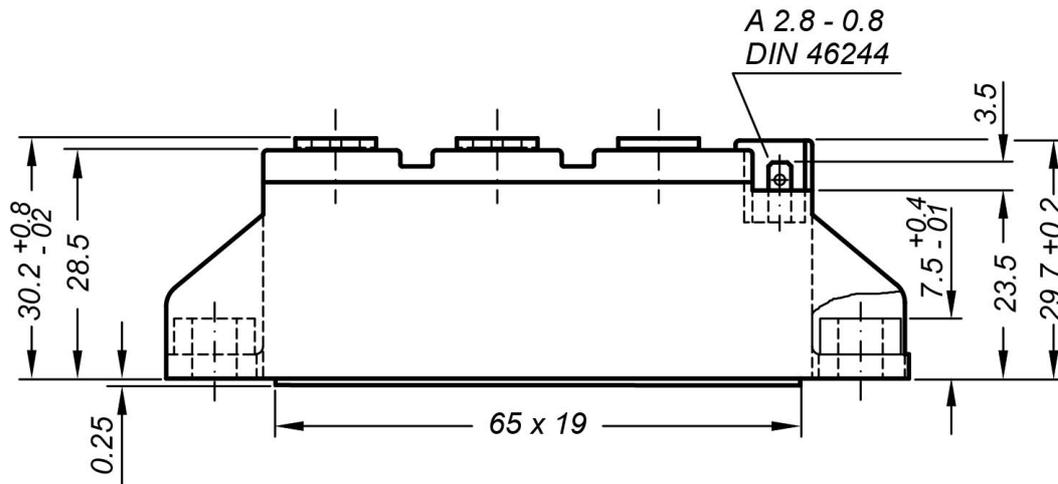
General tolerance: DIN ISO 2768 class „c"

92 ±0.5

80 ±0.3   6

M5   10

20.8 ± 0.25 5.5 ± 0.1 14.8 10 ± 0.1

1   2   6   7   4   5

4.4

25 ±0.3

45 ±0.3

65 ±0.3

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)*

3   1   5   4   2
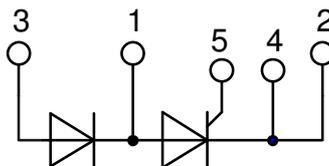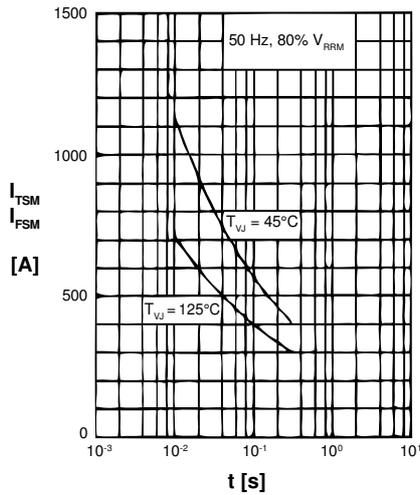
Thyristor

Fig. 1 Surge overload current
I_{TSM}, I_{FSM}: Crest value, t: duration
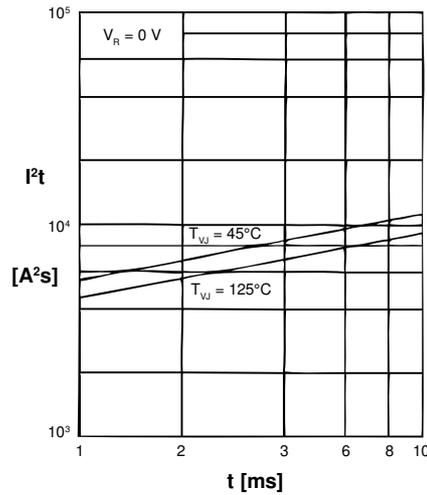
Fig. 2 I²t versus time (1-10 ms)
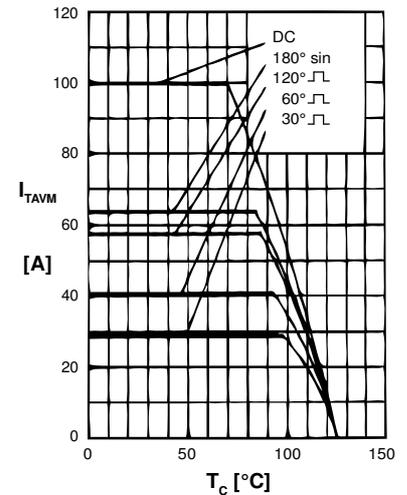
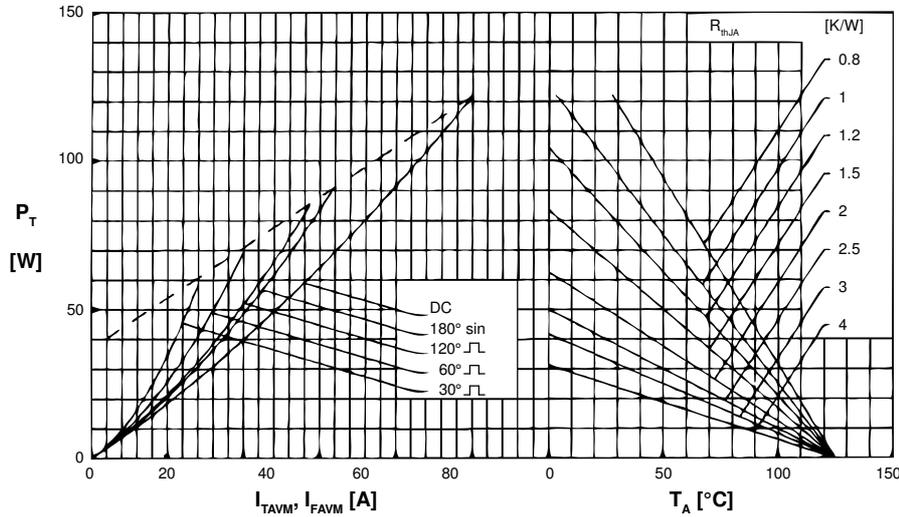Fig. 3 Maximum forward current
at case temperature

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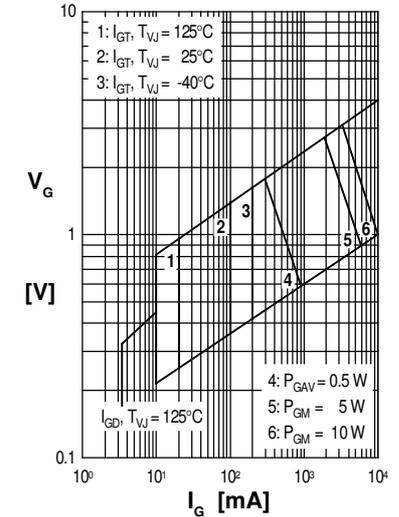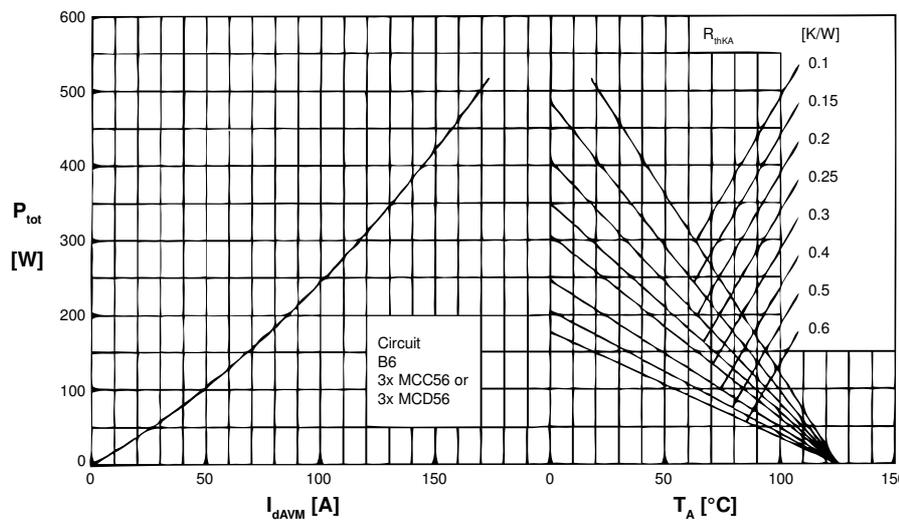

Fig. 5 Gate trigger charact.

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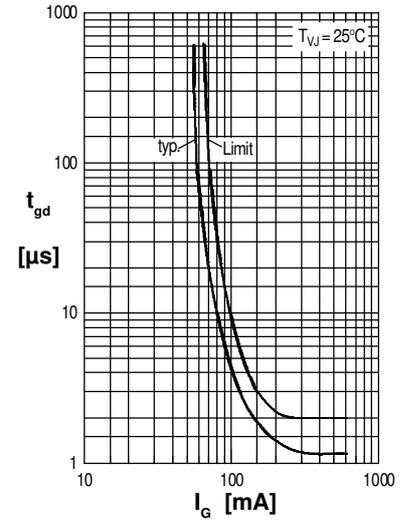and ambient temperature

Fig. 7 Gate trigger delay time

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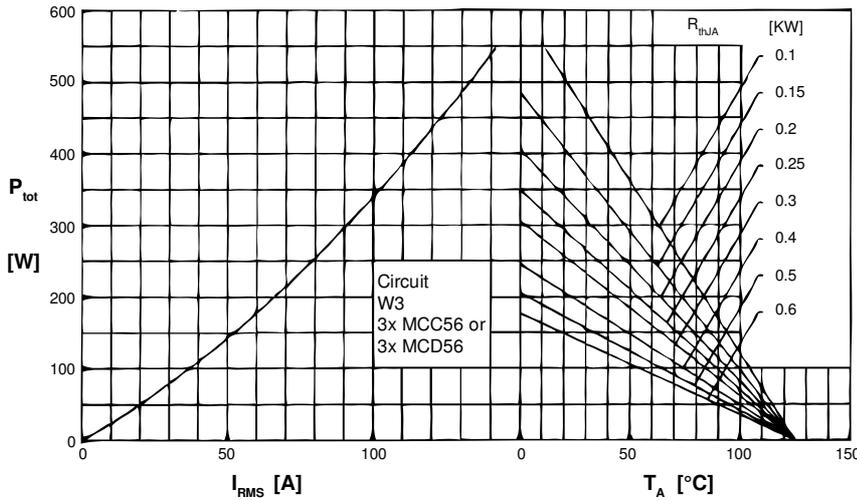
Rectifier

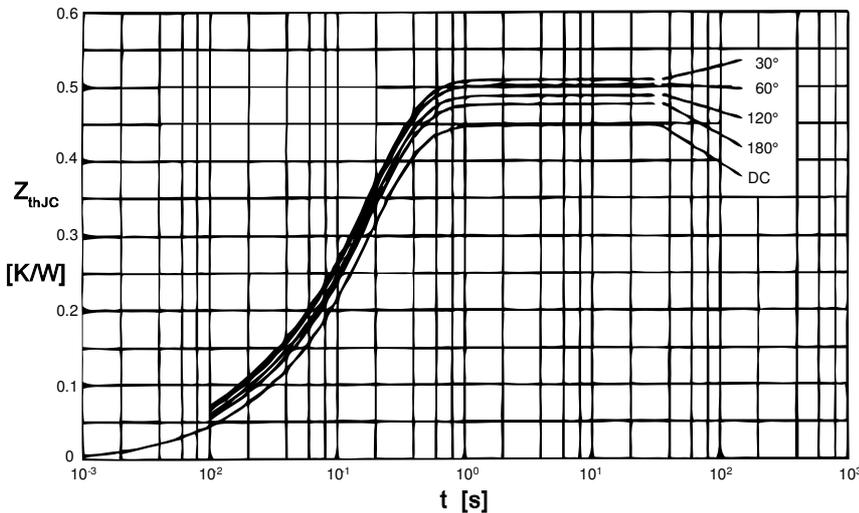Fig. 8   Three phase AC-controller: Power dissipation vs. RMS output current
and ambient temperature

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

R_{thJC} for various conduction angles d:

d	R_{thJC} [K/W]
DC	0.450
180°	0.470
120°	0.490
60°	0.505
30°	0.520

Constants for Z_{thJC} calculation:

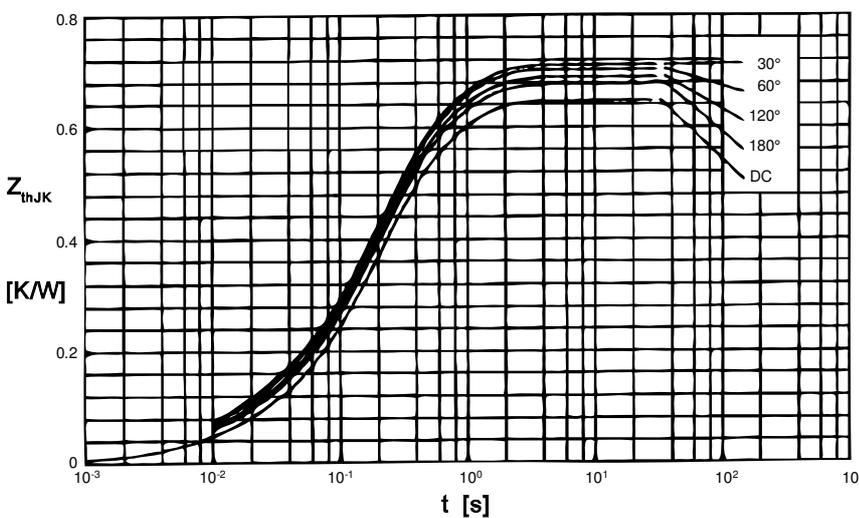| i	R_{thI} [K/W]	t_i [s]
1	0.014	0.0150
2	0.026	0.0095
3	0.410	0.1750

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

R_{thJK} for various conduction angles d:

d	R_{thJK} [K/W]
DC	0.650
180°	0.670
120°	0.690
60°	0.705
30°	0.720

Constants for Z_{thJK} calculation:

i	R_{thI} [K/W]	t_i [s]
1	0.014	0.0150
2	0.026	0.0095
3	0.410	0.1750
4	0.200	0.6700

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