Technische Information / Technical Information

eupec

Netz-Thyristor
Phase Control Thyristor

T 1039 N 18...22

N

Elektrische Eigenschften / Electrical properties **Vorläufige Daten**

Höchstzulässige Werte / Maximum rated values **Preliminary Data**

Periodische Vorwärts- und Rückwärts-Spitzensperrspannung repetitive peak forward off-state and reverse voltages	T_{vj} = - 40°C...$T_{vj\,max}$	V_{DRM} , V_{RRM}	1800, 2000 2200	V V
Vorwärts-Stoßspitzensperrspannung non-repetitive peak foward off-state voltage	T_{vj} = - 40°C...$T_{vj\,max}$	V_{DSM}	1800, 2000 2200	V V
Rückwärts-Stoßspitzensperrspannung non-repetitive peak reverse voltage	T_{vj} = + 25°C...$T_{vj\,max}$	V_{RSM}	1900, 2100 2300	V V
Durchlaßstrom-Grenzeffektivwert RMSM on-state current		I_{TRSMSM}	2200	A
Dauergrenzstrom average on-state current	T_C = 85 °C T_C = 62 °C	I_{TAVM}	1039 1400	A A
Stoßstrom-Grenzwert surge current	T_{vj} = 25°C, t_p = 10 ms T_{vj} = $T_{vj\,max}$, t_p = 10 ms	I_{TSM}	21.500 18.500	A A
Grenzlastintegral I²t-value	T_{vj} = 25°C, t_p = 10ms T_{vj} = $T_{vj\,max}$, t_p = 10ms	I²t	2.311 1.711	A^2s*10^3 A^2s*10^3
Kritische Stromsteilheit critical rate of rise of on-state current	DIN IEC 747-6 f=50 Hz, v_L = 10V, i_{GM} = 1 A di_G/dt = 1 A/µs	$(di_T/dt)_{cr}$	200	A/µs
Kritische Spannungssteilheit critical rate of rise of off-state voltage	T_{vj} = $T_{vj\,max}$, v_D = 0,67 V_{DRM} 5.Kennbuchstabe / 5th letter F	$(dv_D/dt)_{cr}$	1000	V/µs

Charakteristische Werte / Characteristic values

Durchlaßspannung on-state voltage	T_{vj} = $T_{vj\,max}$, i_T = 2000 A T_{vj} = $T_{vj\,max}$, i_T = 1000 A	v_T	max. 1,530 max. 1,207	V V
Schleusenspannung threshold voltage	T_{vj} = $T_{vj\,max}$	$V_{T(TO)}$	0,9	V
Ersatzwiderstand slope resistance	T_{vj} = $T_{vj\,max}$	r_T	0,3	mΩ
Durchlaßkennlinie on-state voltage $v_T = A + B \times i_T + C \times \ln(i_T + 1) + D \times \sqrt{i_T}$	T_{vj} = $T_{vj\,max}$	A=0,8835 B=2,9753E-04 C=-6,7109E-03 D=2,2924E-03		
Zündstrom gate trigger current	T_{vj} = 25°C, v_D = 6 V	I_{GT}	max. 250	mA
Zündspannung gate trigger voltage	T_{vj} = 25°C, v_D = 6V	V_{GT}	max. 2,2	V
Nicht zündener Steuerstrom gate non-trigger current	T_{vj} = $T_{vj\,max}$, v_D = 6 V T_{vj} = $T_{vj\,max}$, v_D = 0,5 V_{DRM}	I_{GD}	max. 10 max. 5	mA mA
Nicht zündene Steuerspannung gate non-trigger voltage	T_{vj} = $T_{vj\,max}$, v_D = 0,5 V_{DRM}	V_{GD}	max. 0,25	mV
Haltestrom holding current	T_{vj} = 25°C, v_D = 6 V, R_A = 5 Ω	I_H	max. 300	mA
Einraststrom latching current	T_{vj} = 25°C, v_D = 6 V, R_{GK}>=10 Ω i_{GM} = 1 A, di_G/dt = 1 A/µs t_g = 20 µs	I_L	max. 1200	mA
Vorwärts- und Rückwärts-Sperrstrom forward off-state and reverse currents	T_{vj} = $T_{vj\,max}$ v_D = V_{DRM}, v_R = V_{RRM}	i_D, i_R	max. 160	mA
Zündverzug gate controlled delay time	DIN IEC 747-6 T_{vj} = 25°C i_{GM} = 1 A, di_G/dt = 1 A/µs	t_{gd}	max. 4	µs

Elektrische Eigenschften / Electrical properties

Vorläufige Daten

Charakteristische Werte / Characteristic values

Preliminary Data

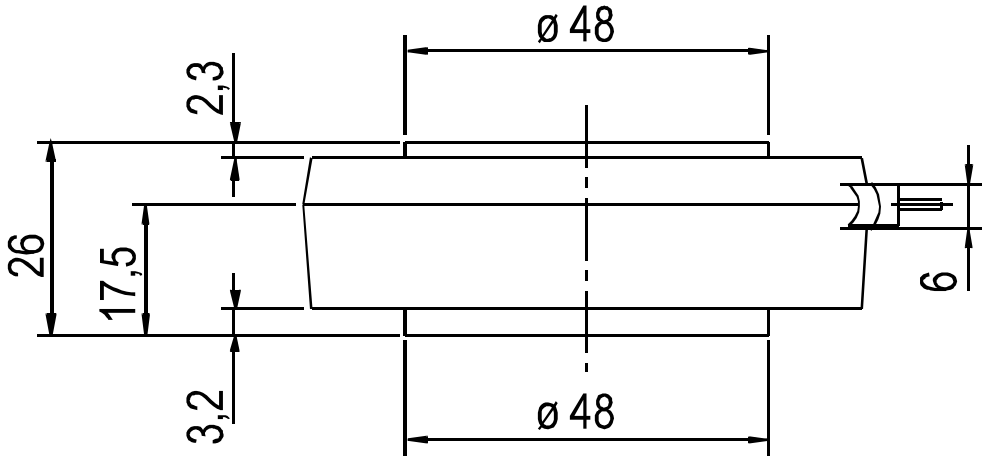
Freiwerdezeit circuit commutatet turn-off time	$T_{vj} = T_{vj\,max}$, $i_{TM}=I_{TAVM}$ v_{RM} =100V, v_{DM} = 0,67 V_{DRM} dv_D/dt = 20 V/µs, $-di_T/dt$ = 10 A/µs 4. Kennbuchstabe / 4th letter O	t_q	typ. 300	µs

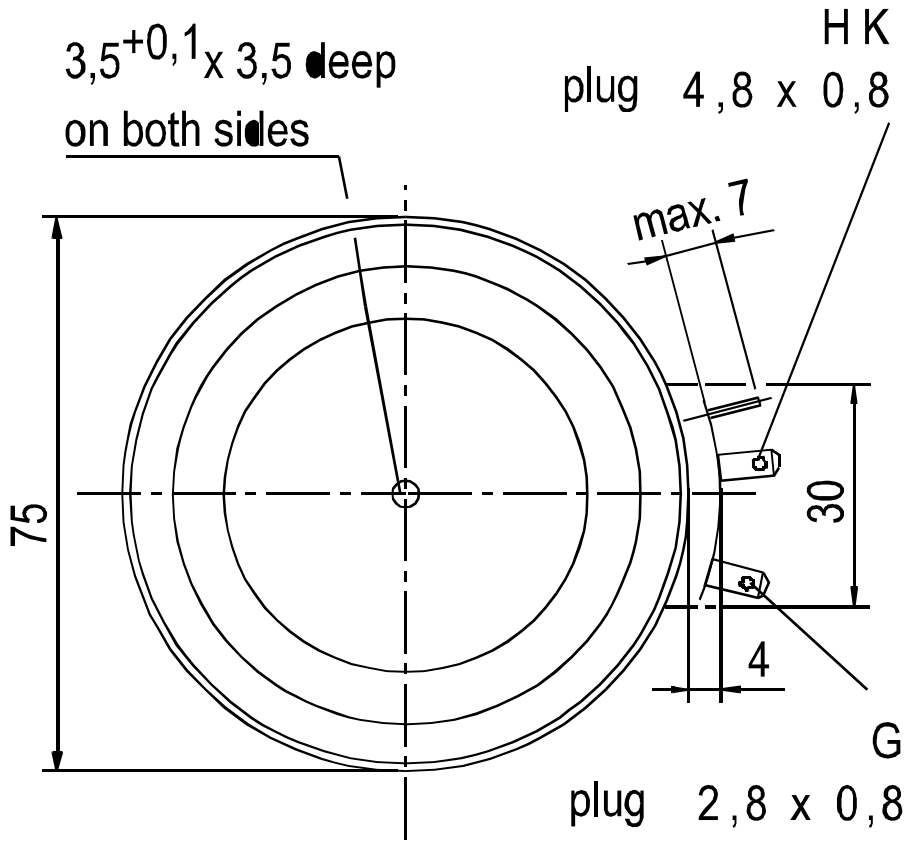
Thermische Eigenschaften / Thermal properties

Innerer Wärmewiderstand thermal resitance, junction to case	Kühlfläche / cooling surface beidseitig / two-sided, ? =180°sin beidseitig / two-sided, DC Anode / anode, ? =180°sin Anode / anode, DC Kathode / cathode, ? =180°sin Kathode / cathode, DC	R_{thJC}	 max. 0,0231 max. 0,0210 max. 0,0395 max. 0,0375 max. 0,0500 max. 0,0480	 °C/W °C/W °C/W °C/W °C/W °C/W
Übergangs- Wärmewiderstand thermal resitance, case to heatsink	Kühlfläche / cooling surface beidseitig / two-sided einseitig / single-sided	R_{thCK}	 max. 0,0035 max. 0,0070	 °C/W °C/W
Höchstzulässige Sperrschichttemperatur max. junction temperature		$T_{vj\,max}$	125	°C
Betriebstemperatur operating temperature		$T_{c\,op}$	-40...125	°C
Lagertemperatur storage temperature		T_{stg}	-40...150	°C

Mechanische Eigenschaften / Mechanical properties

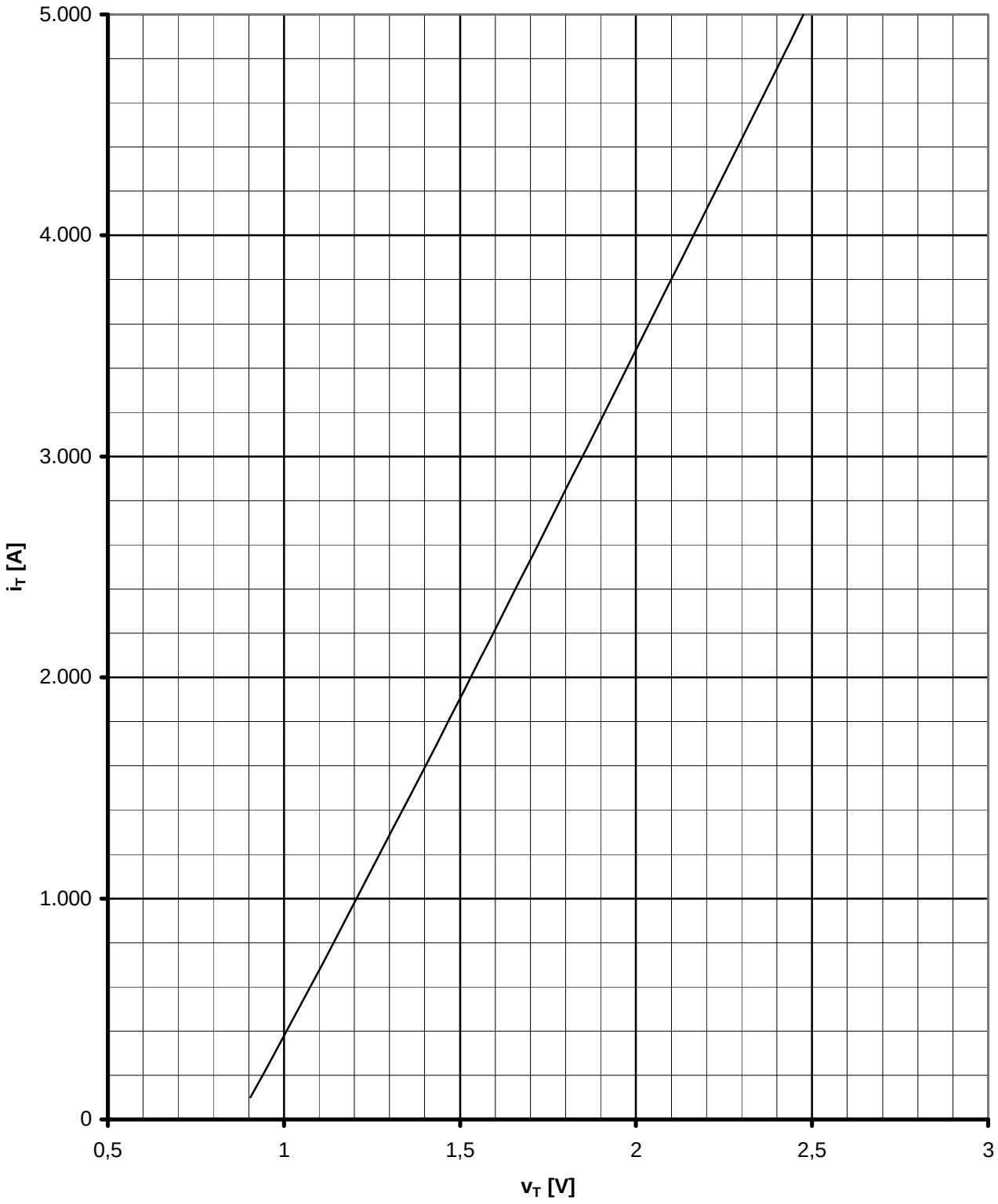
Gehäuse, siehe Anlage case, see appendix			Seite 3 page 3	
Si-Element mit Druckkontakt Si-pellet with pressure contact				
Anpreßkraft clamping force		F	16...32	kN
Gewicht weight		G	typ. 520	g
Kriechstrecke creepage distance			32	mm
Feuchteklasse humidity classification	DIN 40040		C	
Schwingfestigkeit vibration resistance	f = 50Hz		50	m/s^2


ø 48
2,3
26
17,5
3,2
6
ø 48
C
HK
G
A

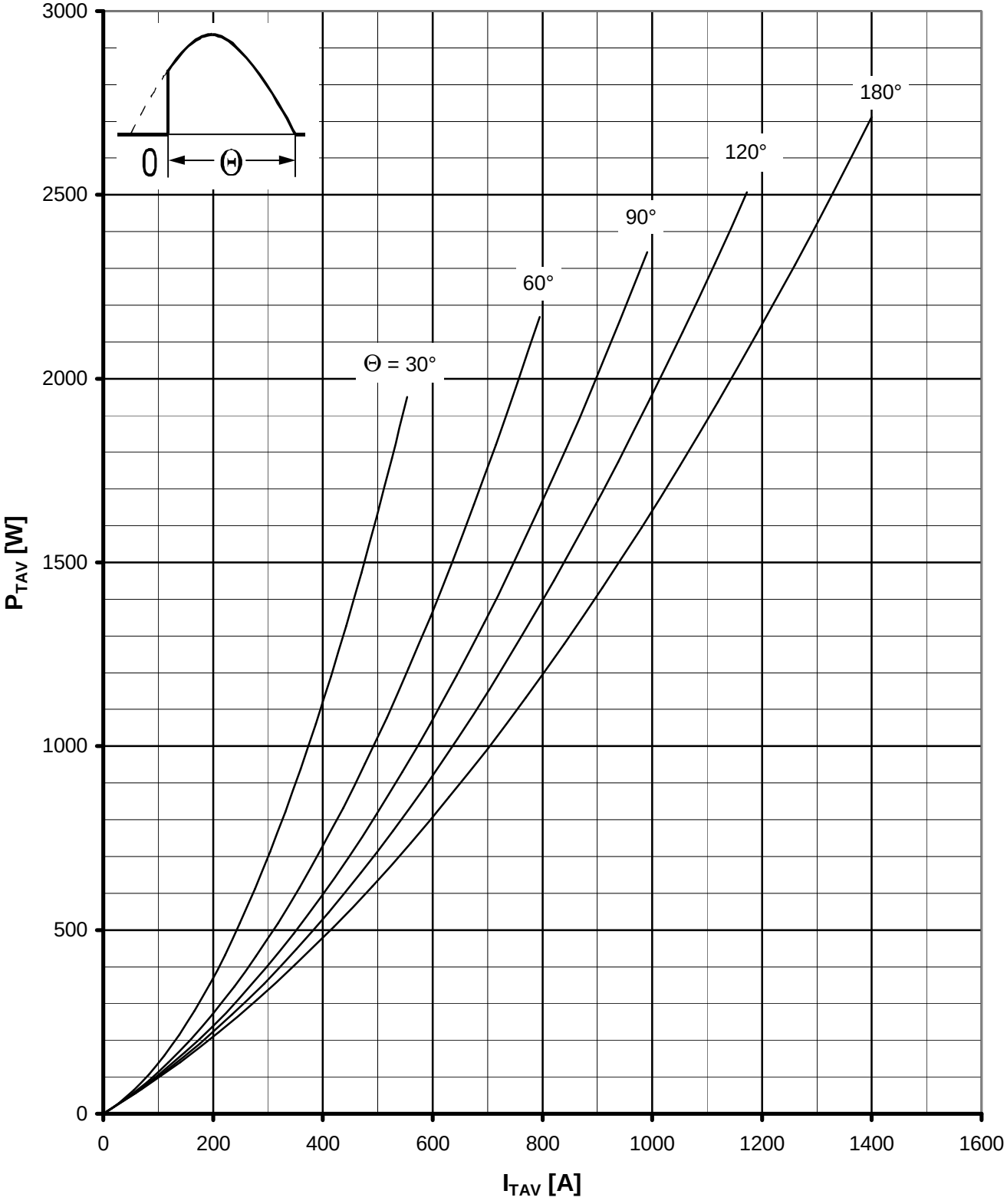

3,5+0,1 x 3,5 deep
on both sides
H K
plug 4,8 x 0,8
max. 7
75
30
4
G
plug 2,8 x 0,8

Kühlung cooling	Analytische Elemente des transienten Wärmewiderstandes Z_{thJC} für DC Analytical ementes of transient thermal impedance Z_{thJC} for DC							
	Pos.n	1	2	3	4	5	6	7
beidseitig	R_{thn} [°C/W]	0,00113	0,0021	0,00229	0,00703	0,00845		
two-sided	τ_n [s]	0,00189	0,0065	0,0456	0,23	1,134		
anodenseitig	R_{thn} [°C/W]	0,00066	0,00291	0,0037	0,00783	0,0224		
anode-sided	τ_n [s]	0,00138	0,00614	0,0765	0,374	6,66		
kathodenseitig	R_{thn} [°C/W]	0,00127	0,0026	0,00623	0,0046	0,0333		
cathode-sided	τ_n [s]	0,00201	0,00843	0,126	0,57	7,83		

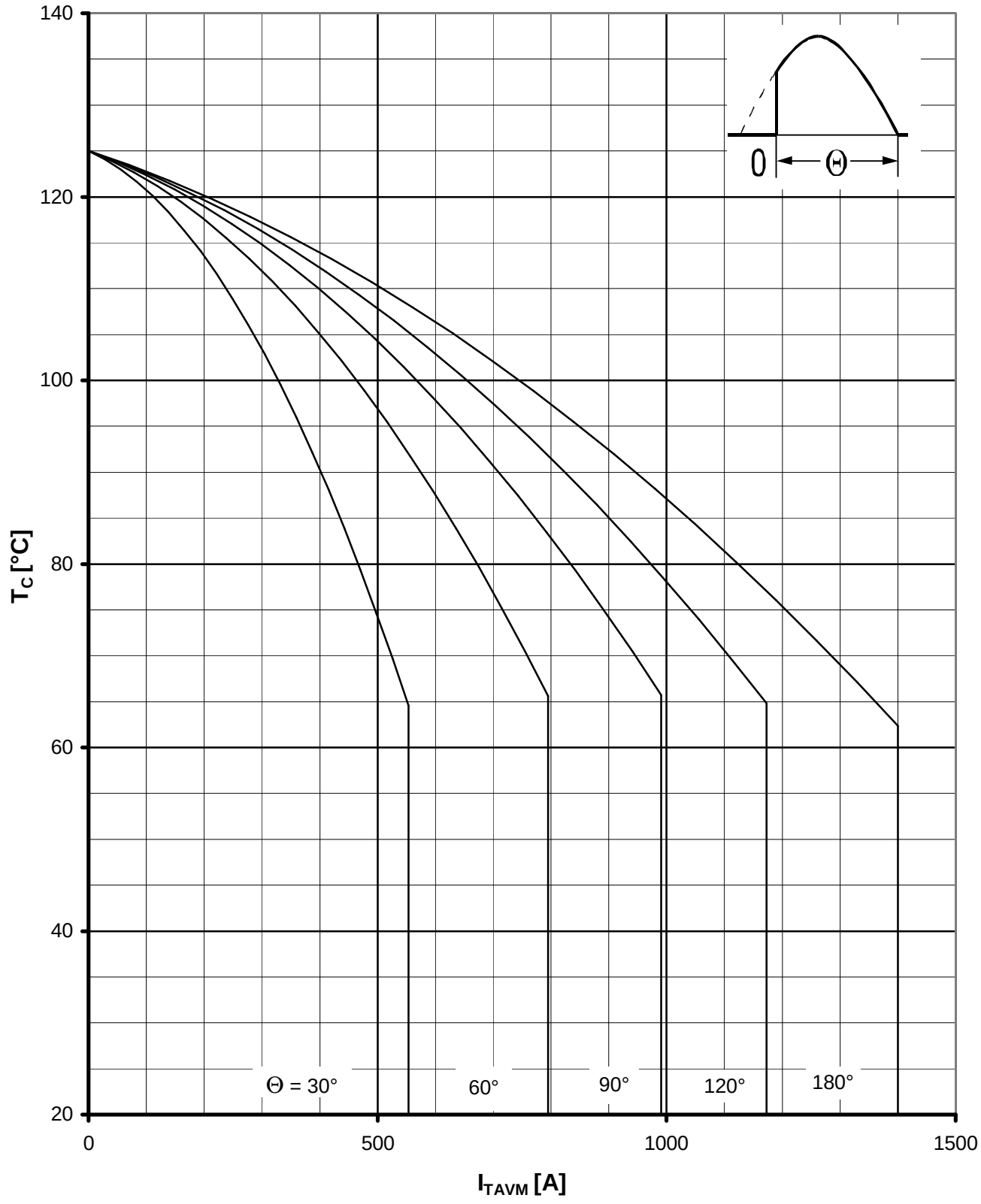
Analytische Funktion / analytical function : $Z_{thJC} = \sum_{n=1}^{n_{max}} R_{thn} (1 - EXP (- t / \tau_n))$



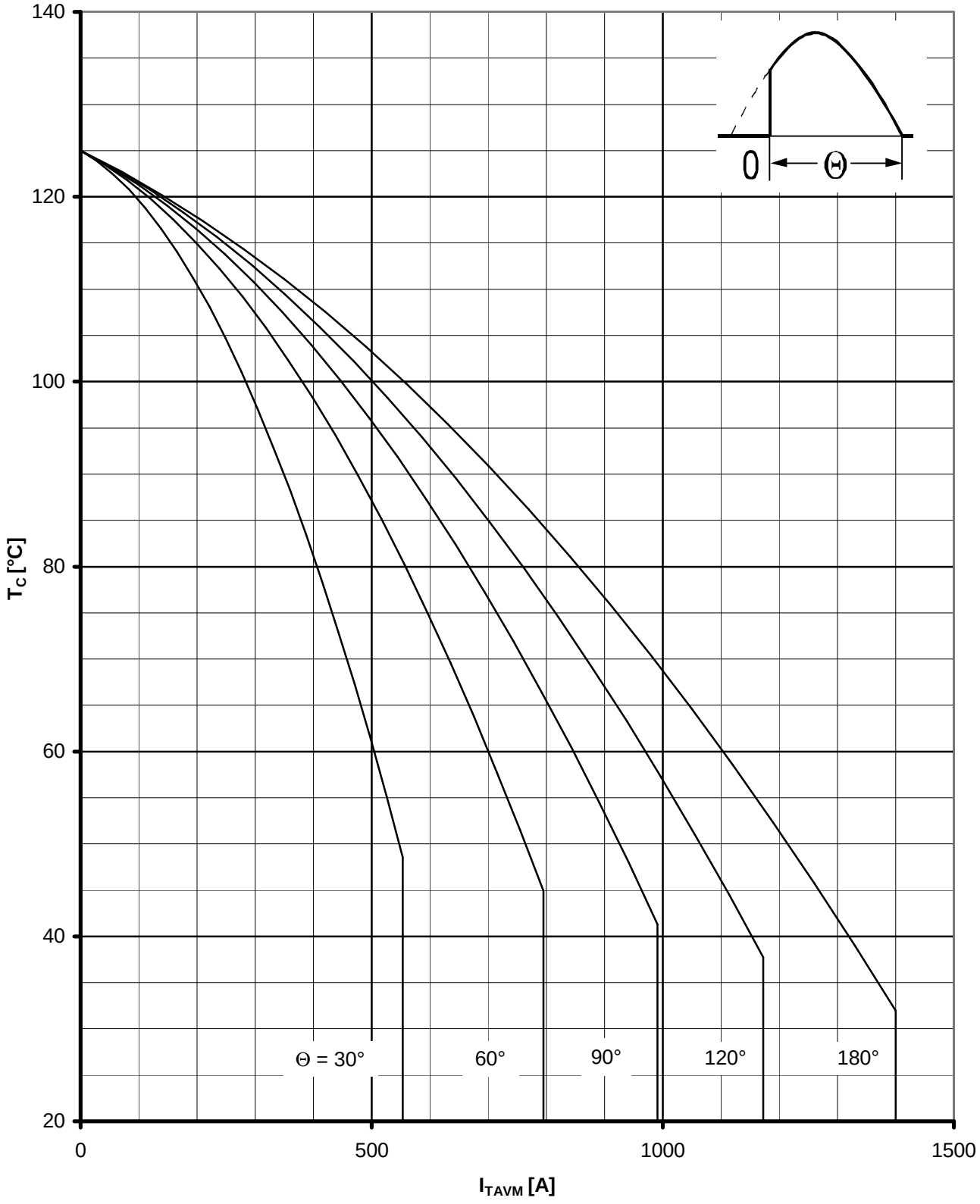
Grenzdurchlaßkennlinie / Limiting 0n-state characteristic $i_T = f(v_T)$
$T_{vj} = T_{vj}$ max



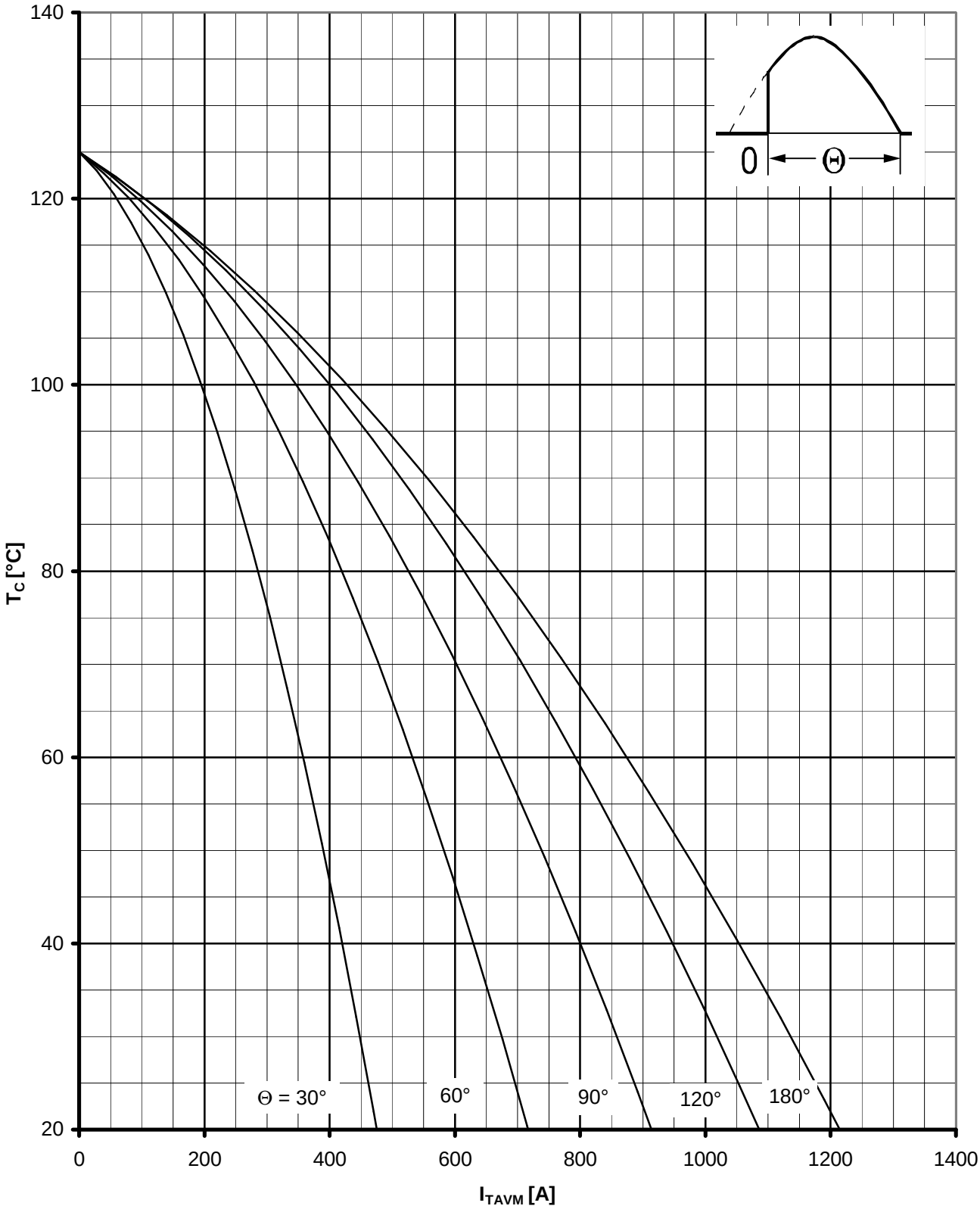
Durchlaßverlustleistung / On-state power loss $P_{TAV} = f(I_{TAV})$
Parameter: Stromflußwinkel Θ / current conduction angle Θ



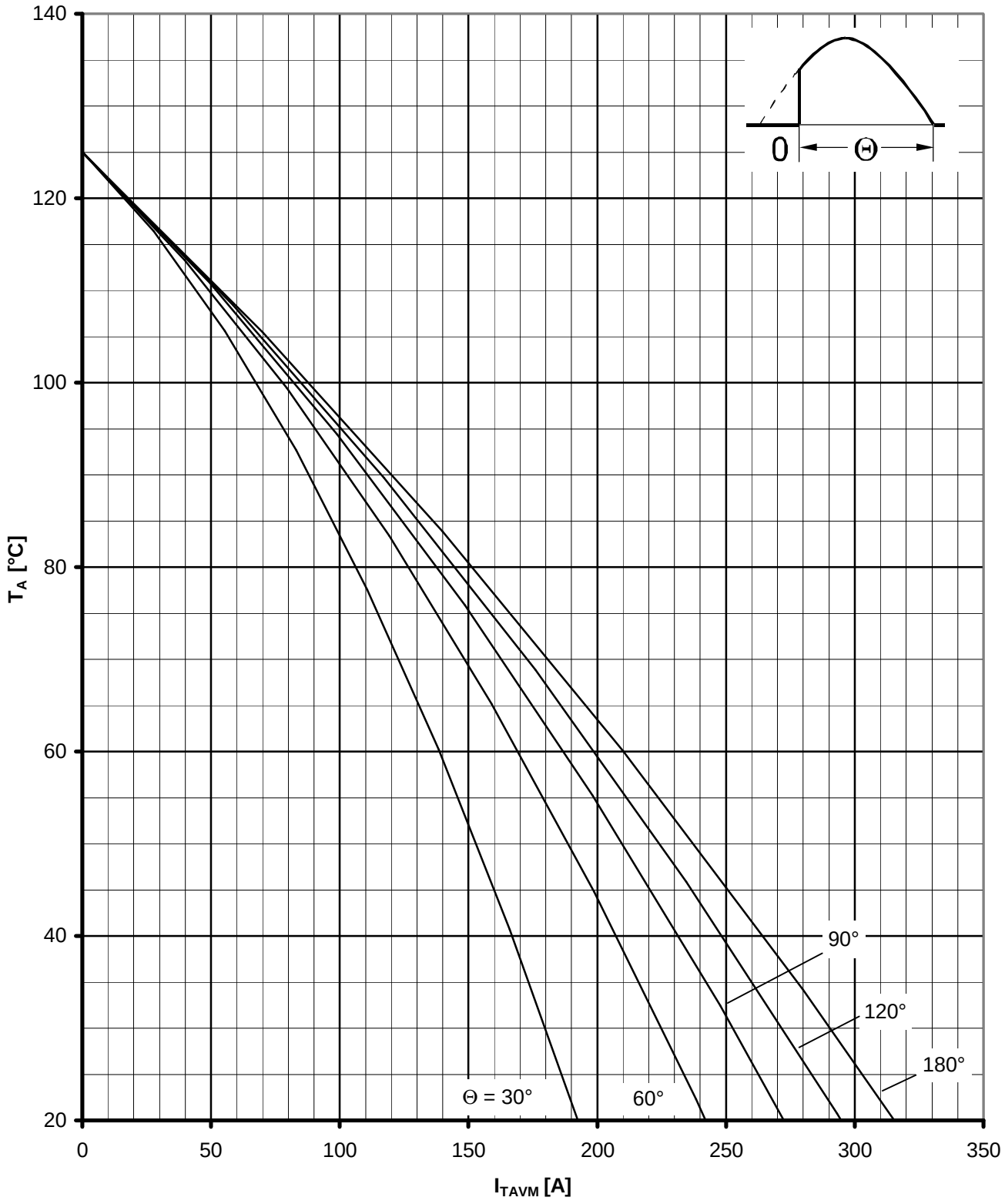
Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAVM})$
Beidseitige Kühlung / Two-sided cooling
Parameter: Stromflußwinkel Θ / current conduction angle Θ



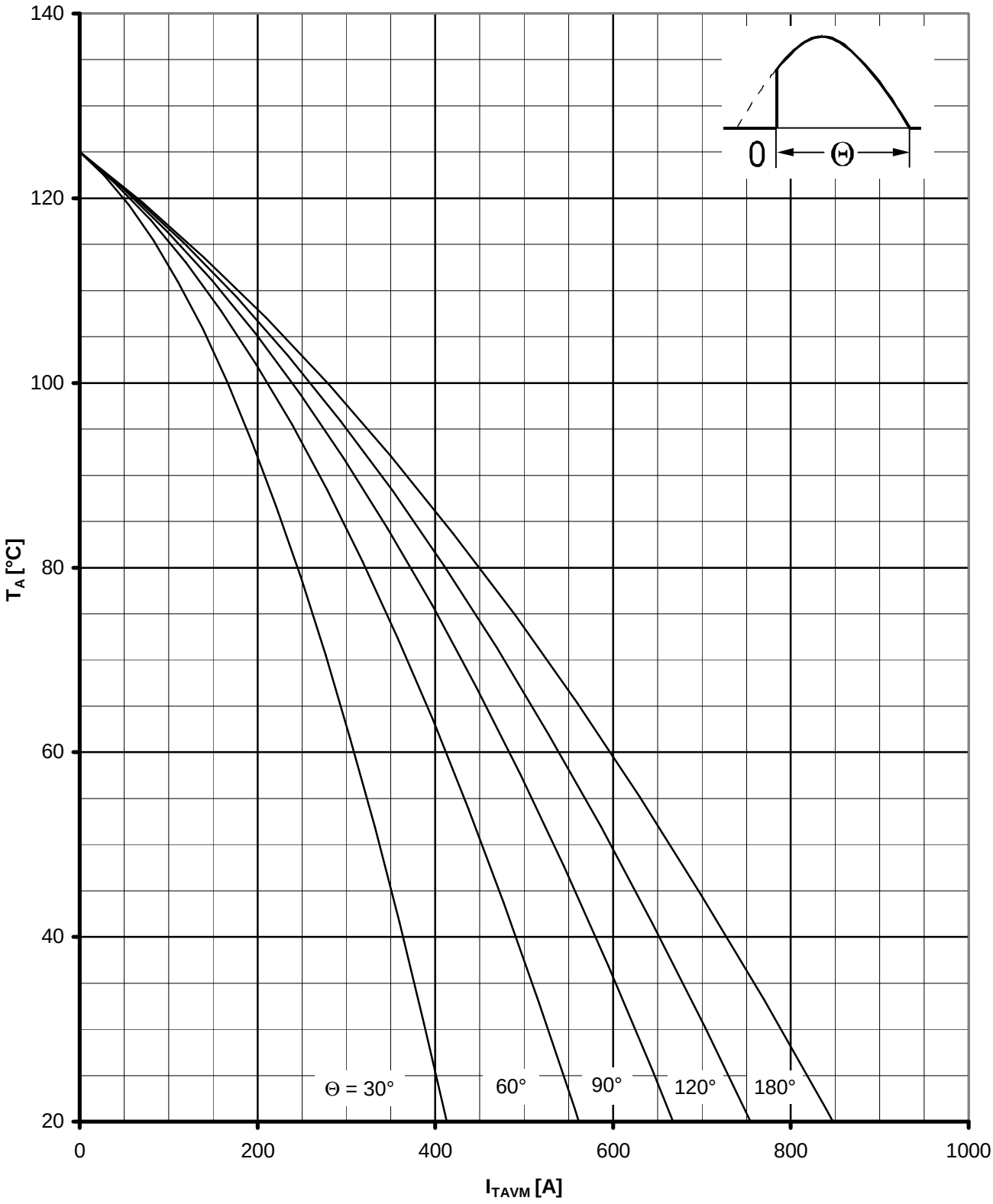
Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAVM})$
Anodenseitige Kühlung / anode sided cooling
Parameter: Stromflußwinkel Θ / current conduction angle Θ



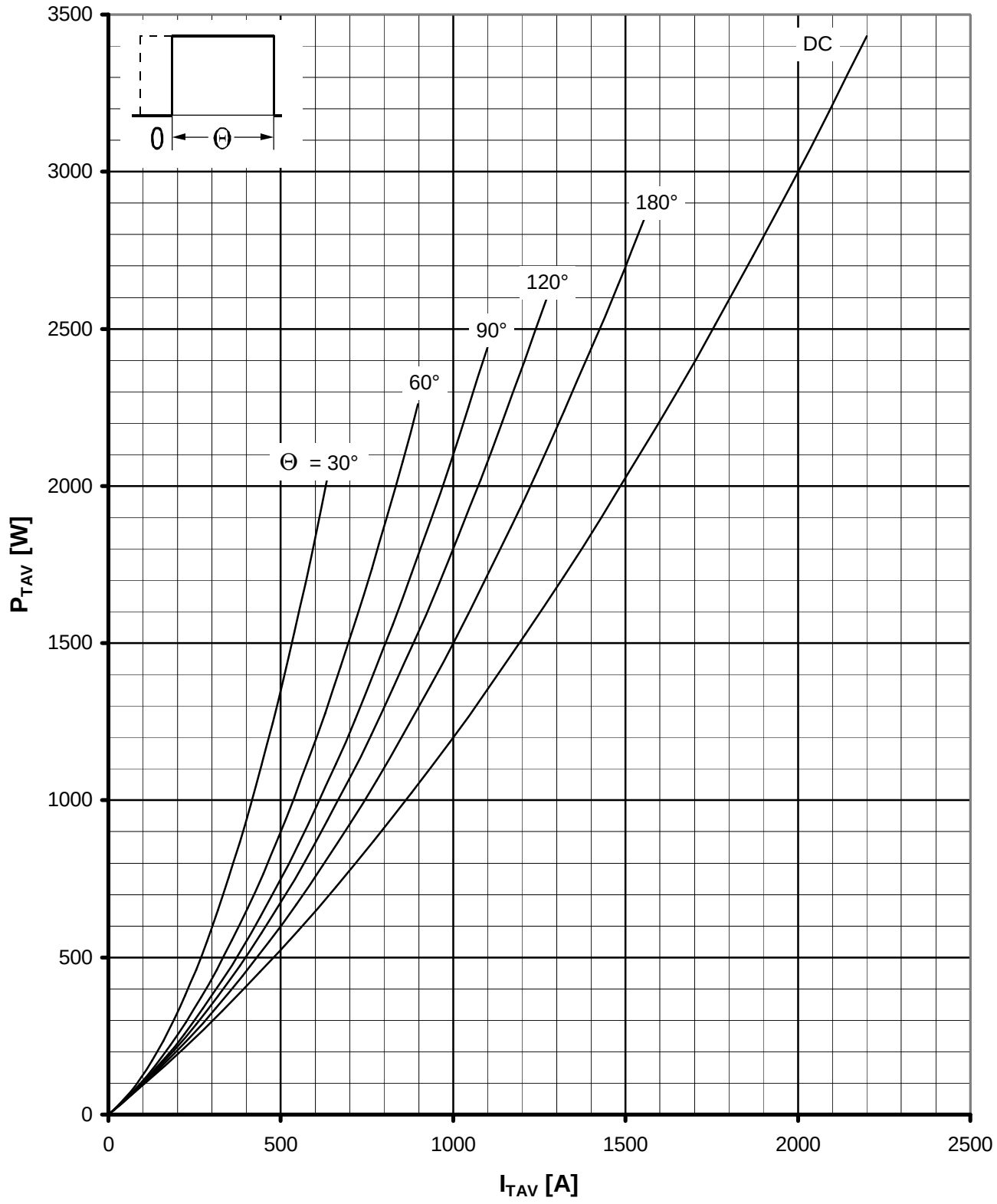
Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAVM})$
Kathodenseitige Kühlung / cathode sided cooling
Parameter: Stromflußwinkel Θ / current conduction angle Θ



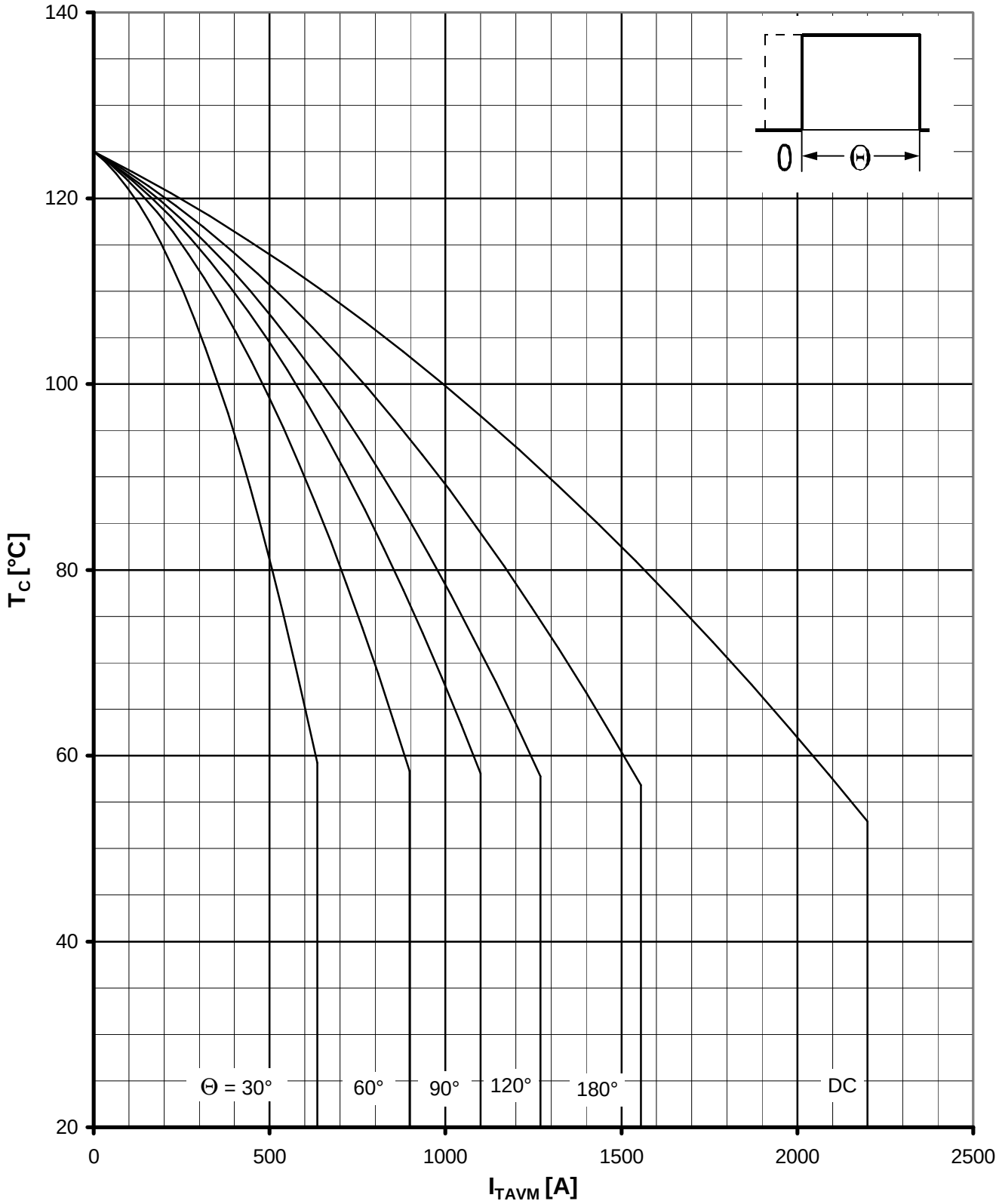
Höchstzulässige Kühlmitteltemperatur / Max. allowable cooling medium temperature $T_A = f(I_{TAVM})$
Luftselbstkühlung / Natural air-cooling
Kühlkörper/Heatsink. K0.05 F
Parameter: Stromflußwinkel Θ / current conduction angle Θ



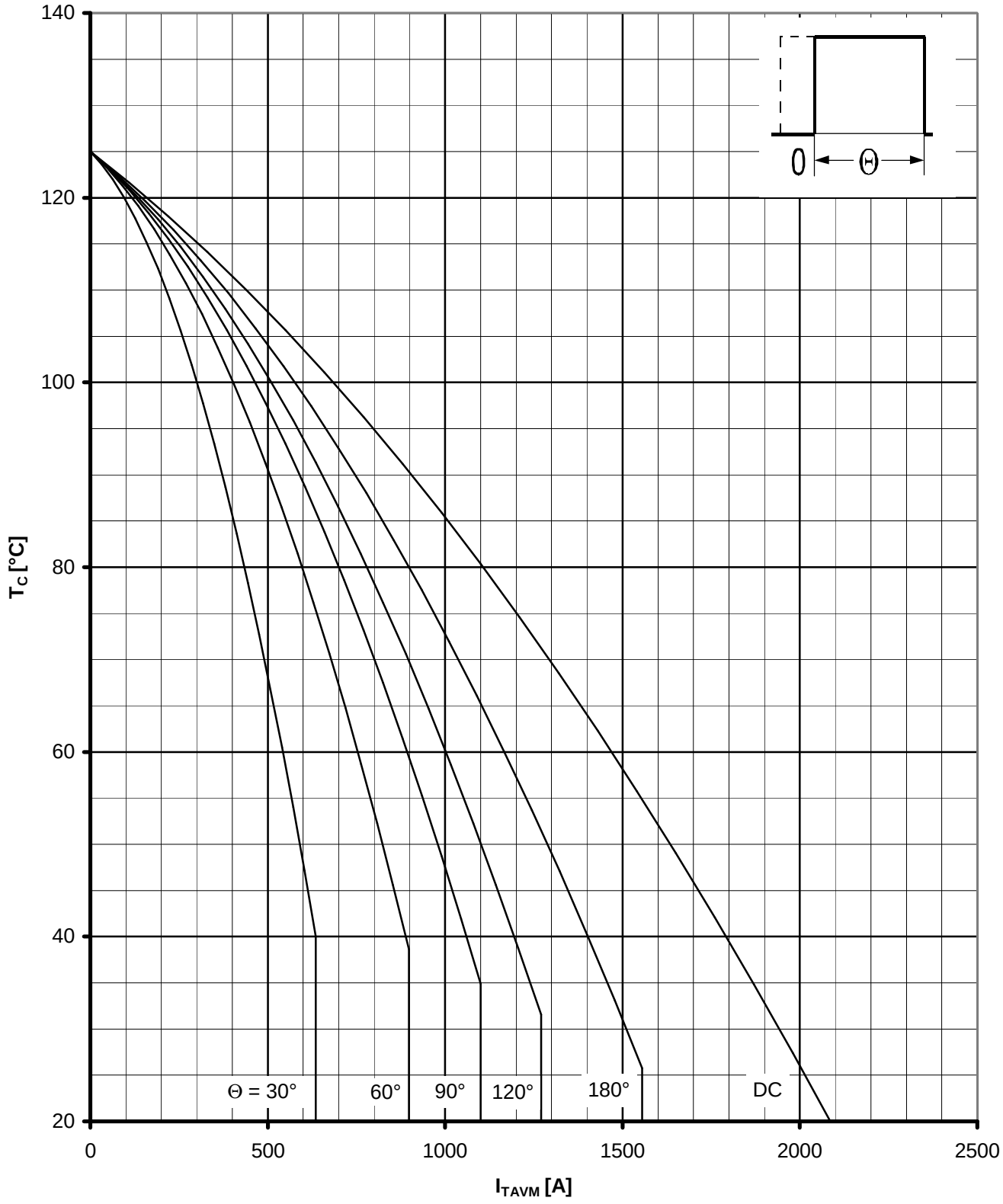
Höchstzulässige Kühlmitteltemperatur / Max. allowable cooling medium temperature $T_A = f(I_{TAVM})$
Verstärkte Luftkühlung / Forced air-cooling
Kühlkörper/Heatsink. K0.05 F, V_L = 120 l/s
Parameter: Stromflußwinkel Θ / current conduction angle Θ



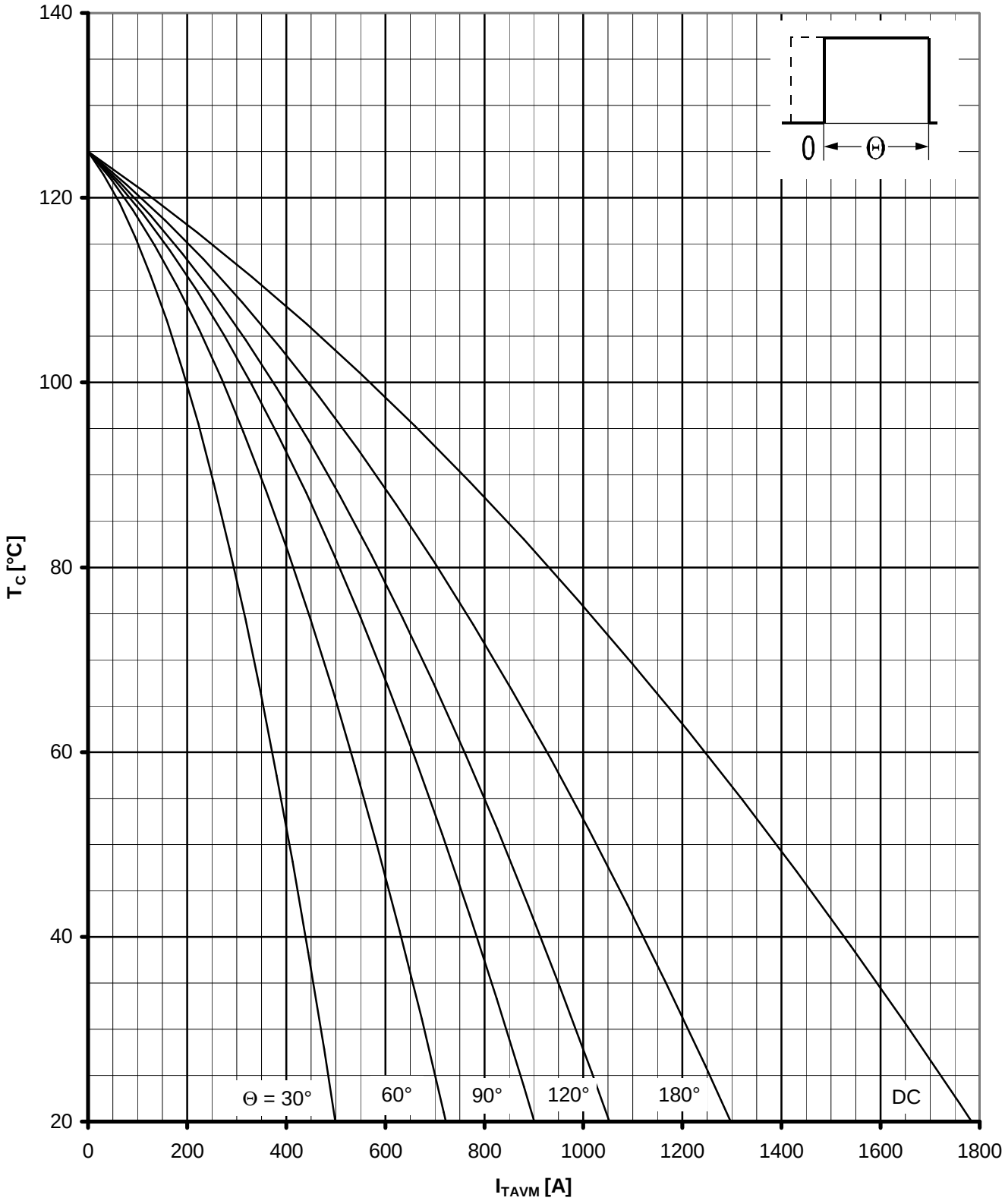
Durchlaßverlustleistung / On-state power loss $P_{TAV} = f(I_{TAV})$
Parameter: Stromflußwinkel Θ / current conduction angle Θ



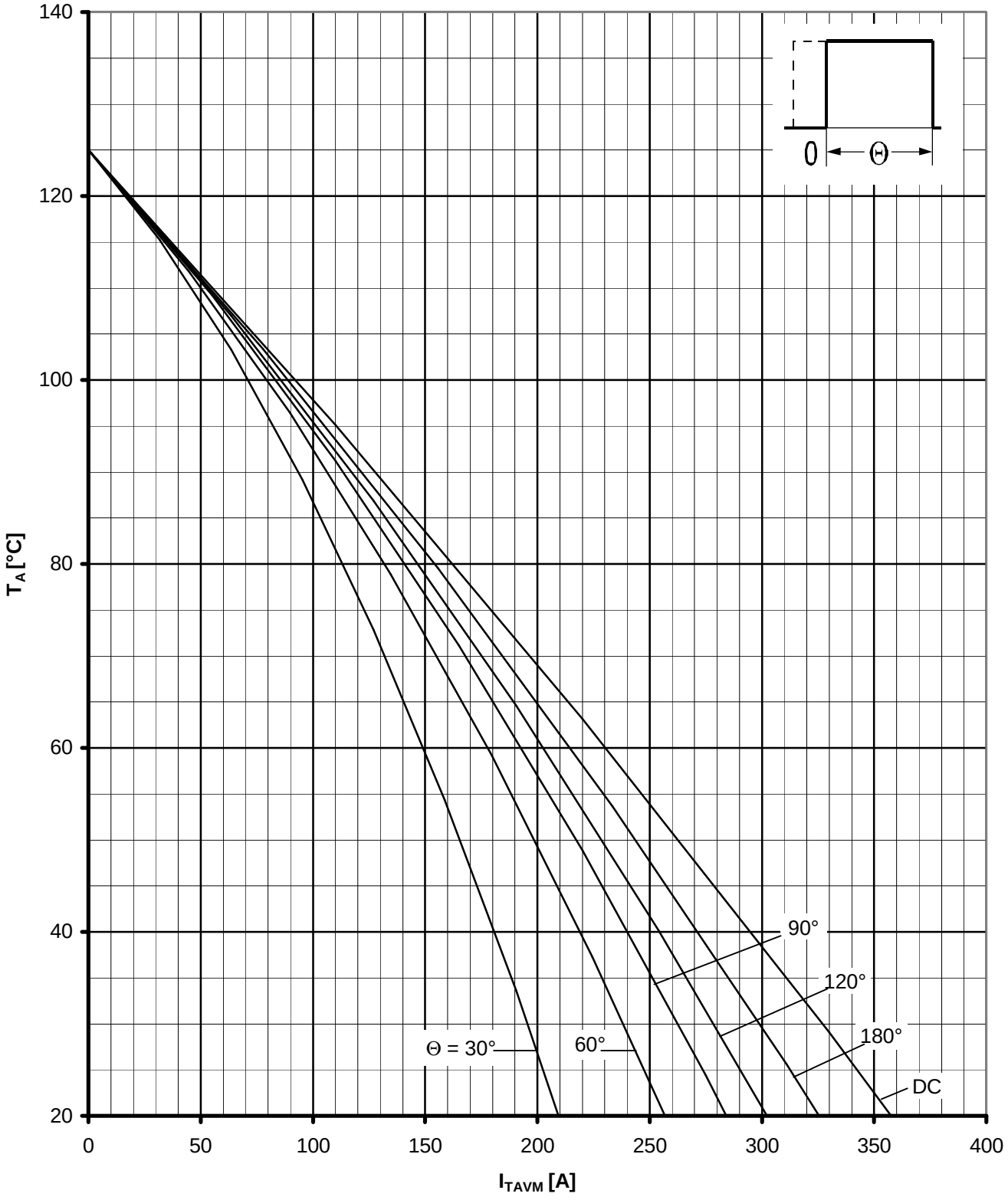
Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAVM})$
Beidseitige Kühlung / Two-sided cooling
Parameter: Stromflußwinkel Θ / current conduction angle Θ



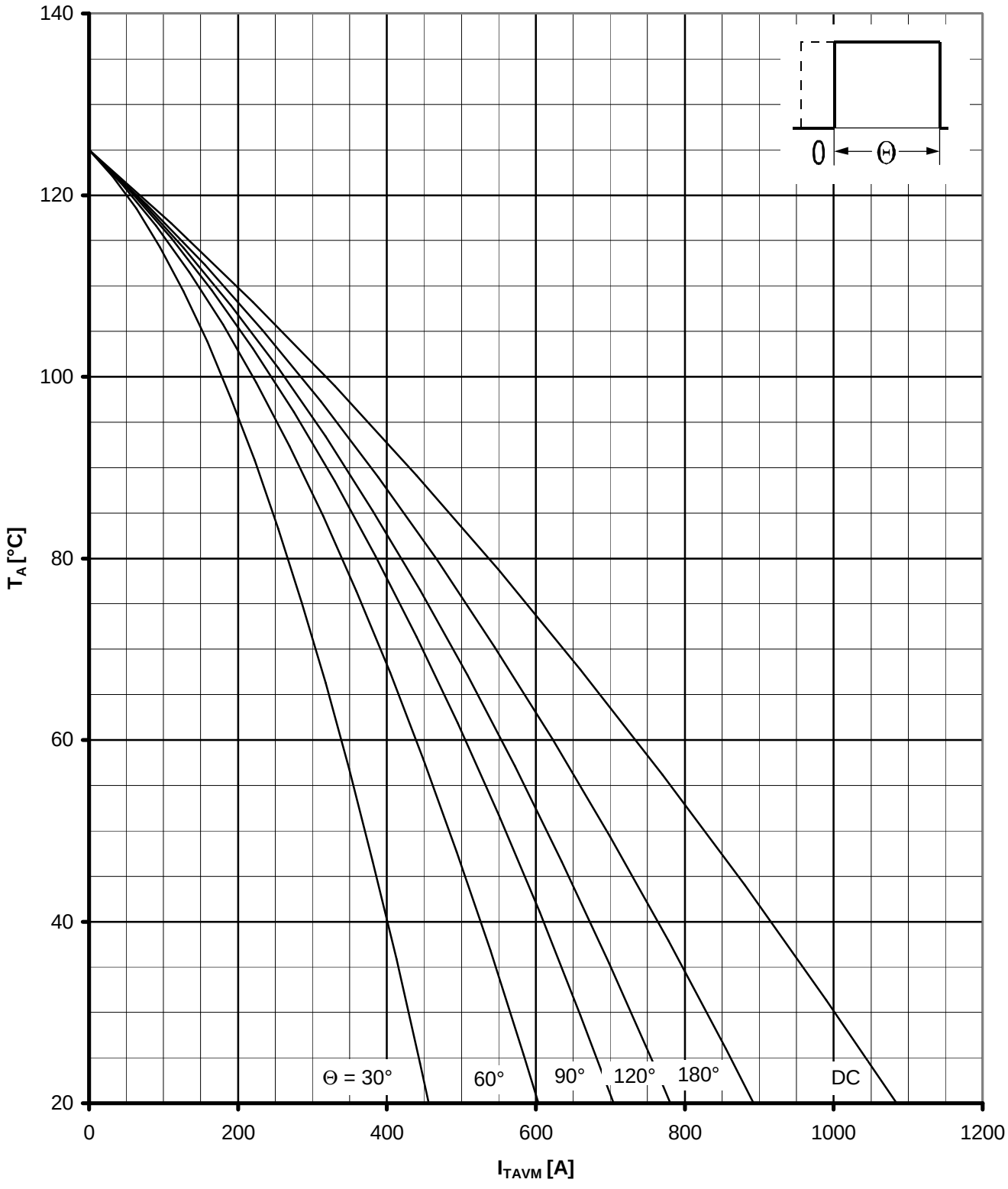
Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAVM})$
Anodenseitige Kühlung / anode sided cooling
Parameter: Stromflußwinkel Θ / current conduction angle Θ



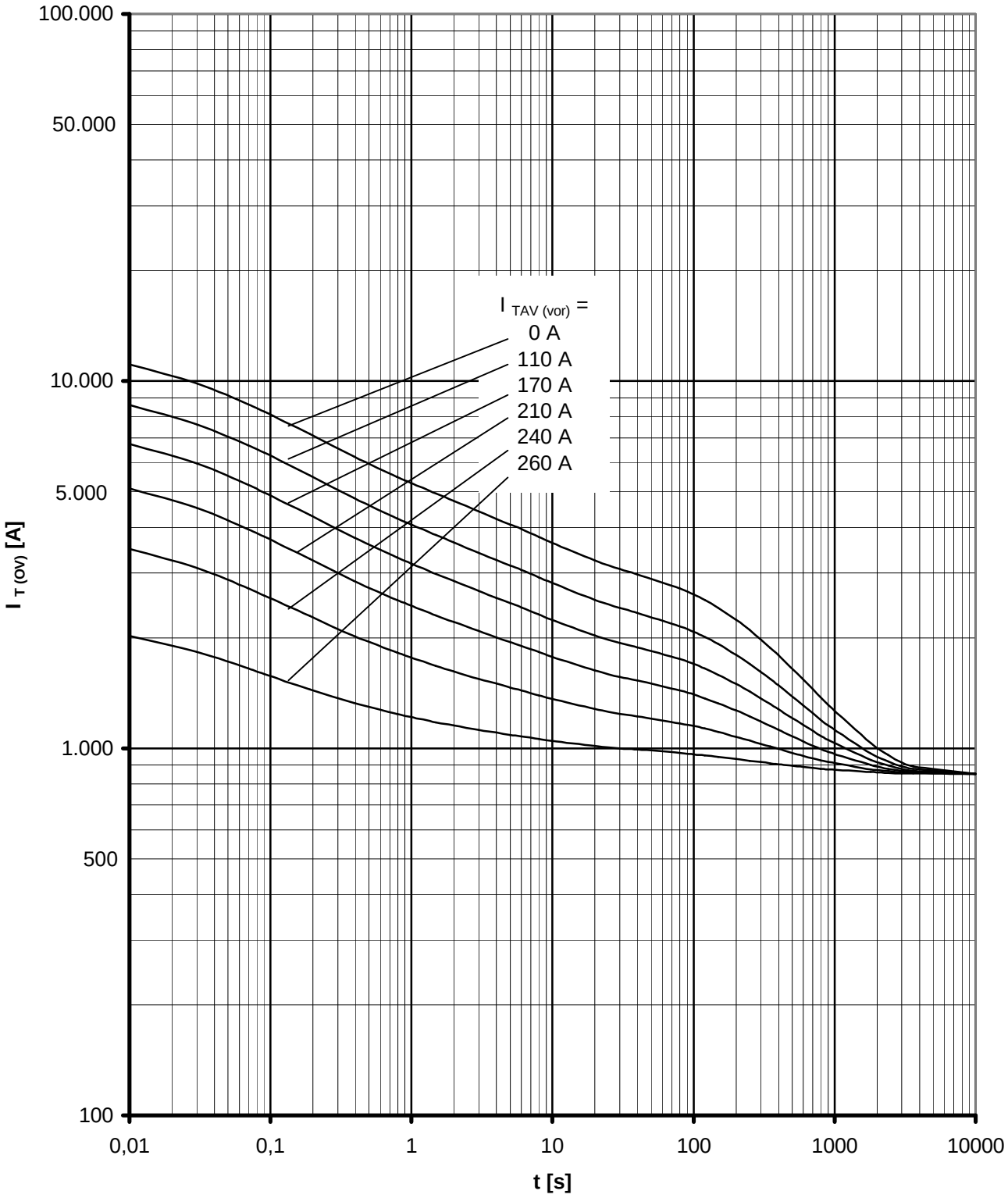
Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAVM})$
Kathodenseitige Kühlung / cathode sided cooling
Parameter: Stromflußwinkel Θ / current conduction angle Θ



Höchstzulässige Kühlmitteltemperatur / Max. allowable cooling medium temperature $T_A = f(I_{TAVM})$
Luftselbstkühlung / Natural air-cooling
Kühlkörper/Heatsink. K0.05 F
Parameter: Stromflußwinkel Θ / current conduction angle Θ



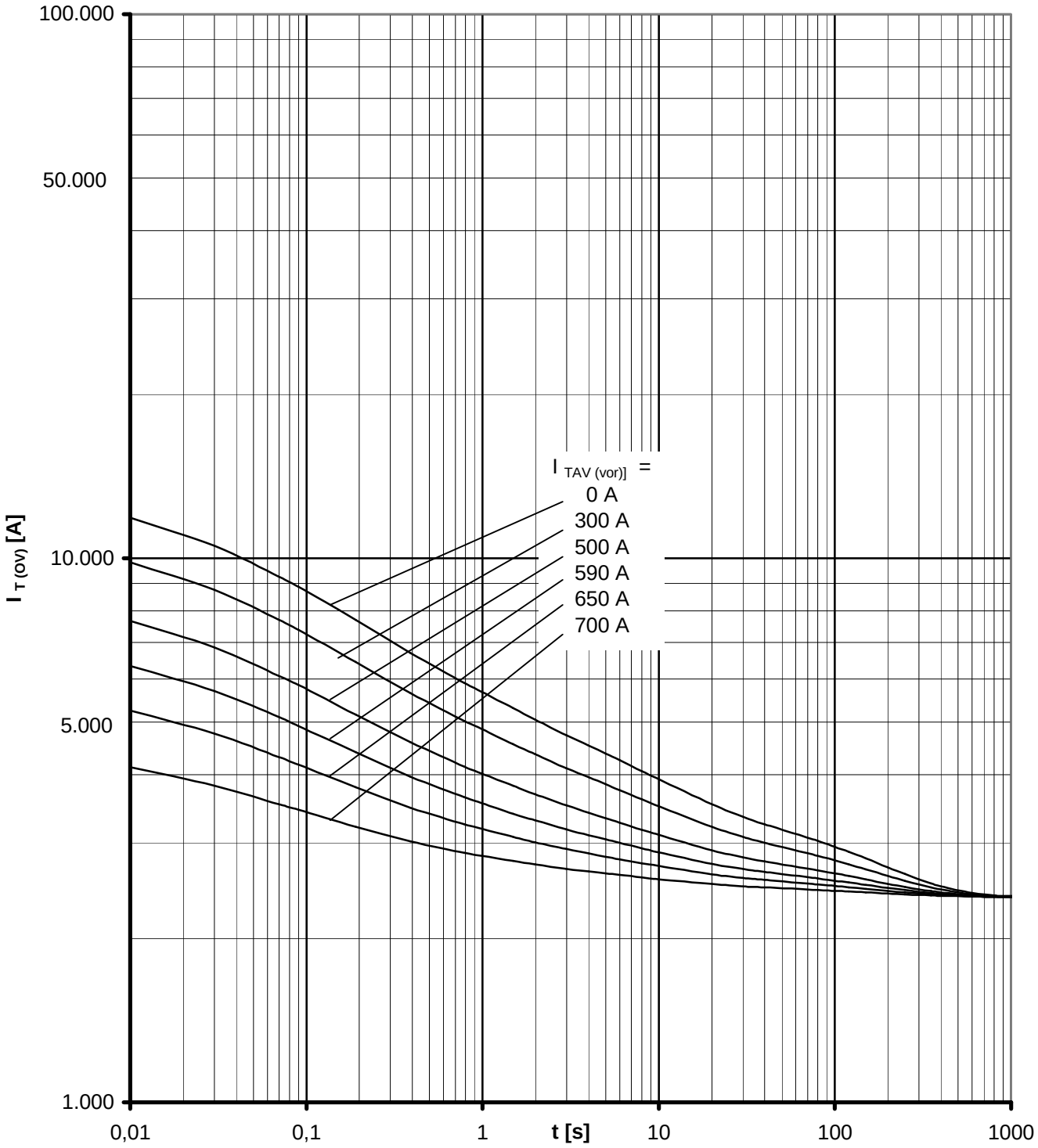
Höchstzulässige Kühlmitteltemperatur / Max. allowable cooling medium temperature $T_A = f(I_{TAVM})$
Verstärkte Luftkühlung / Forced air-cooling
Kühlkörper/Heatsink. K0.05F, V_L = 120 l/s
Parameter: Stromflußwinkel Θ / current conduction angle Θ



Überstrom / Overload on-state current $I_{T(OV)} = f(t)$

Beidseitige Luftselbstkühlung / Two-sided natural cooling K0.05F
$T_A = 45°C$

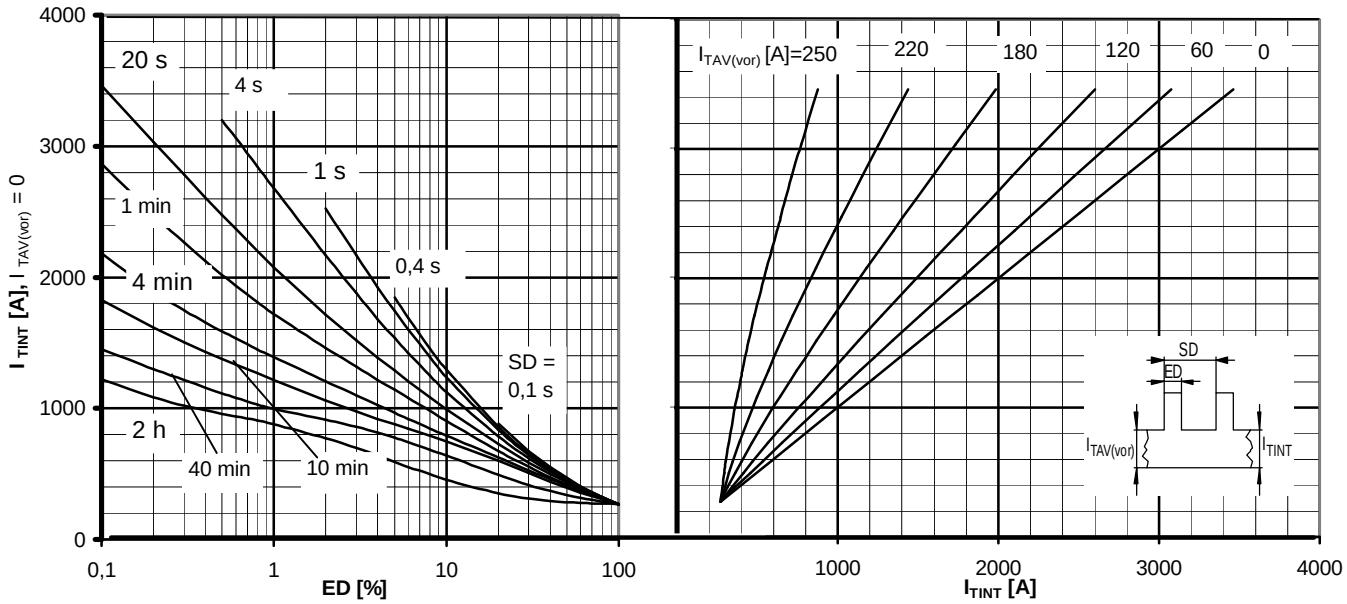
Parameter: Vorlaststrom $I_{TAV(vor)}$ / pre-load current $I_{TAV(vor)}$



Überstrom / Overload on-state current $I_{T(OV)} = f(t)$

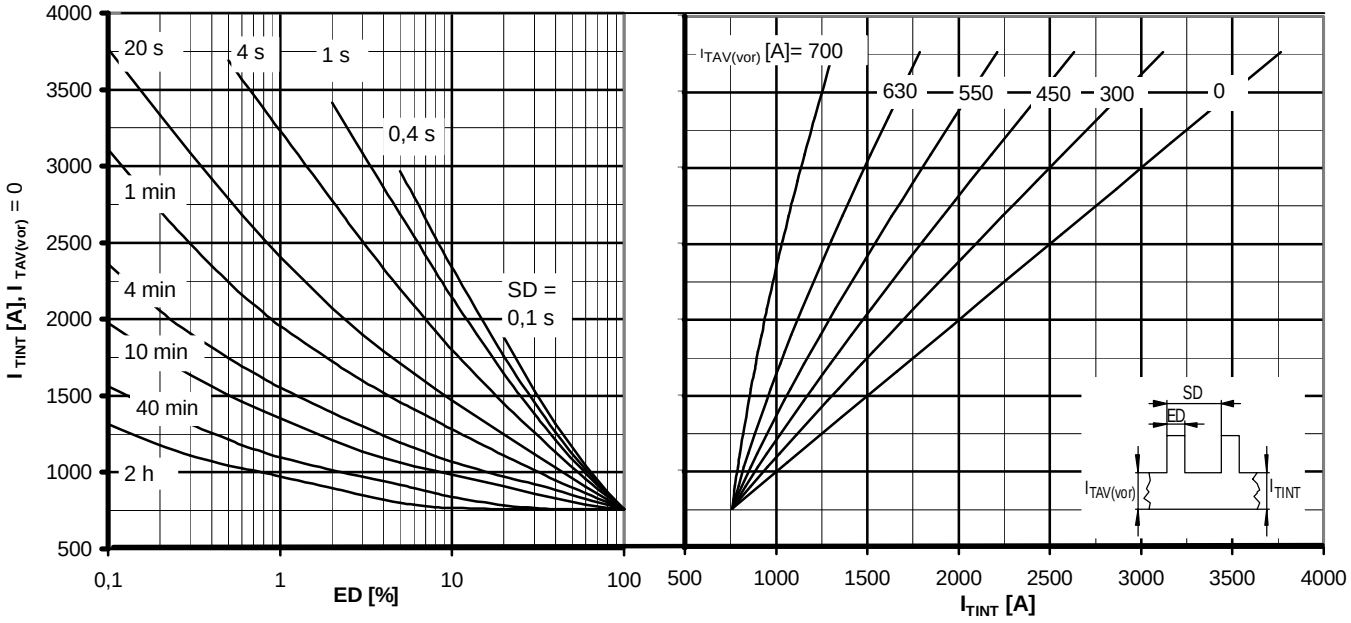
Beidseitige verstärkte Kühlung / forced two-sided cooling K0.05F
T_A = 35°C, V_L = 120 l/s

Parameter: Vorlaststrom $I_{TAV(vor)}$ / pre-load current $I_{TAV(vor)}$



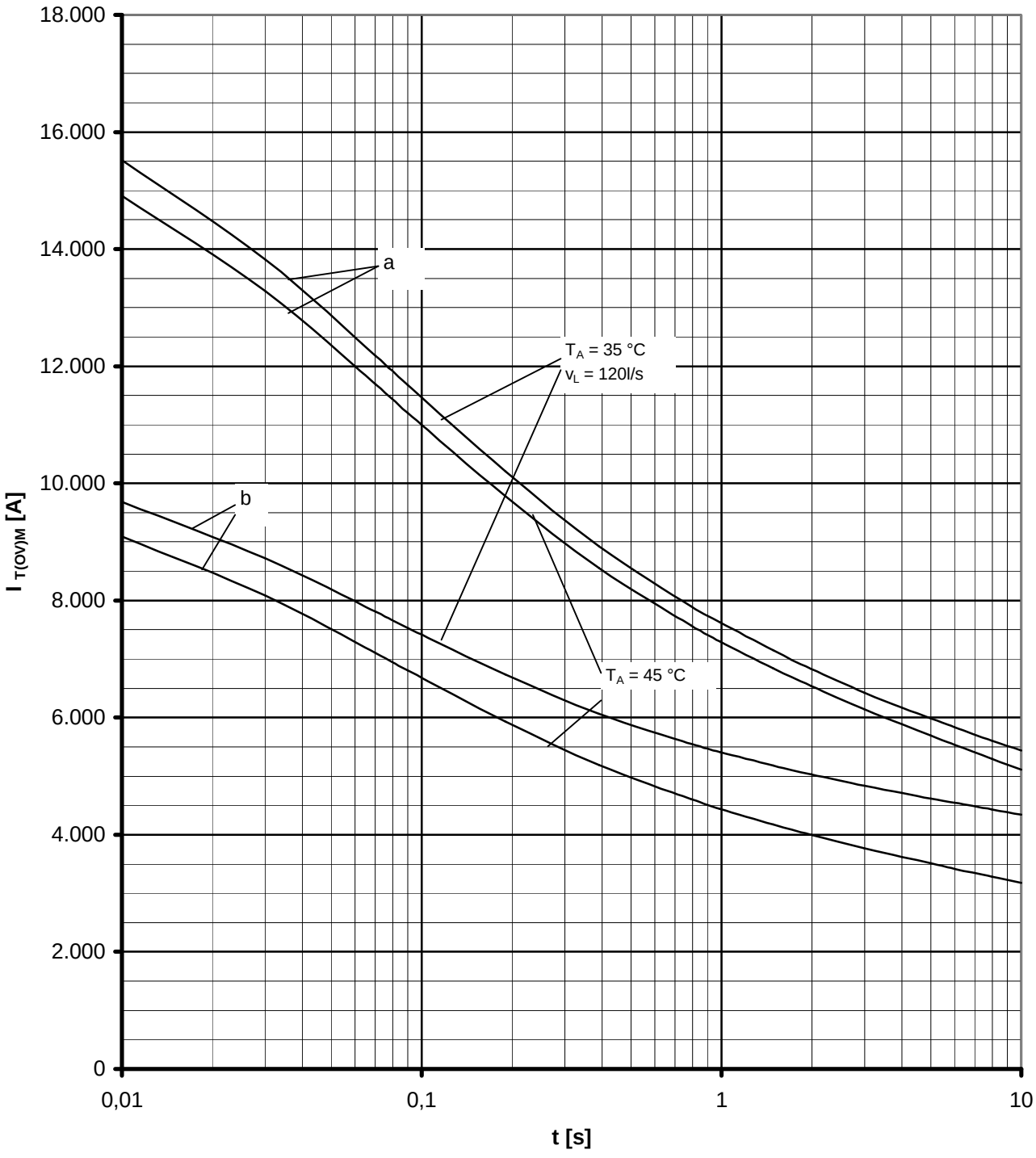
Höchstzul. Durchlaßstrom bei Ausetzbetrieb / Max. allowable on-state current
during intermittent operation $I_{TINT} = f(ED)$

Beidseitig Luftselbstkühlung / two-sided natural cooling K 0.05F
T_A = 45 °C
Parameter: Vorlaststrom / pre-load current $I_{TAV(vor)}$, Spieldauer / cycle duration SD



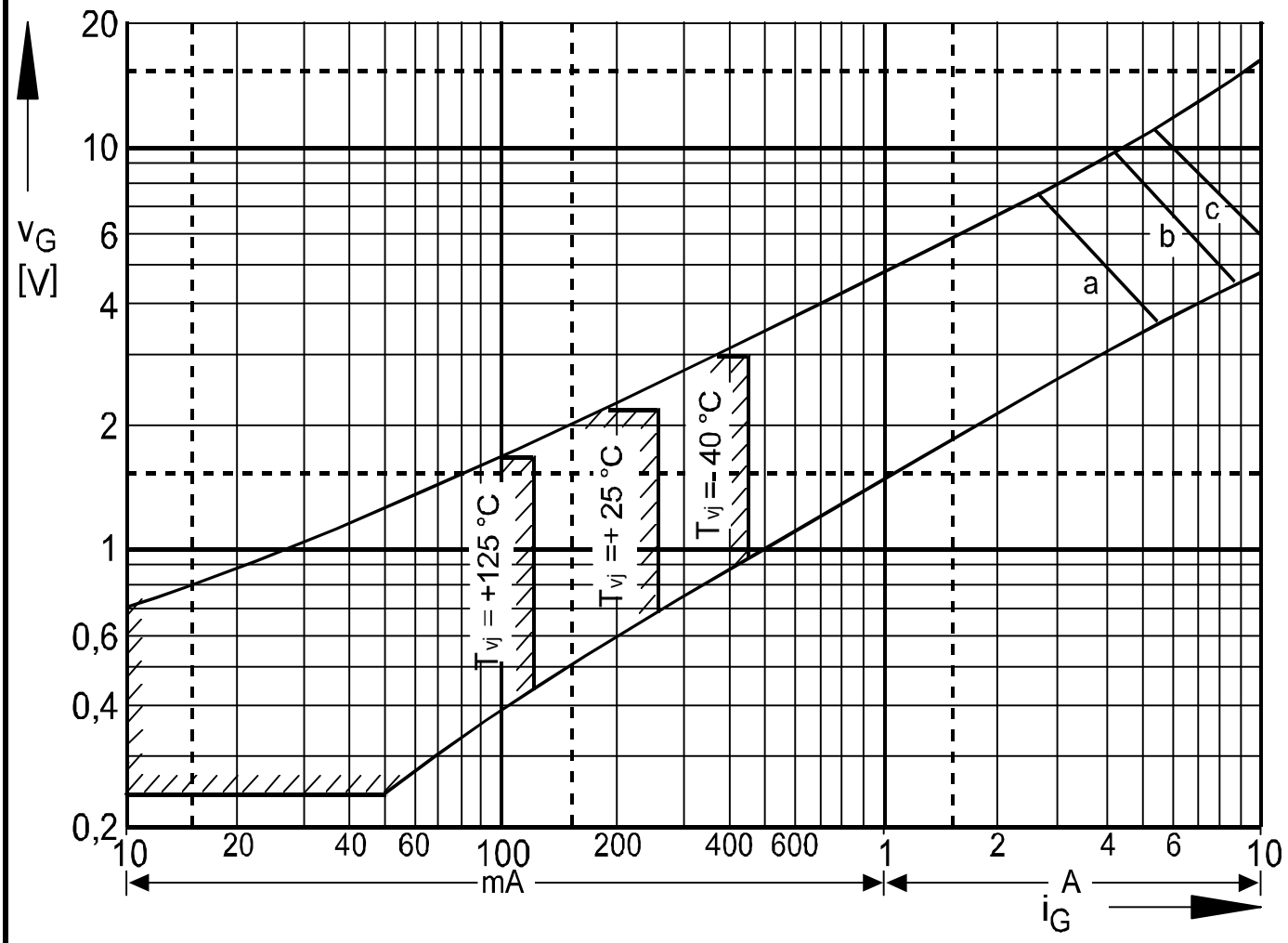
Höchstzul. Durchlaßstrom bei Ausetzbetrieb / Max. allowable on-state current
during intermittent operation $I_{TINT} = f(ED)$

Beidseitig verstärkte Kühlung / forced two-sided cooling K 0.05F
T_A = 35 °C, V_L = 120 l/s
Parameter: Vorlaststrom / pre-load current $I_{TAV(vor)}$, Spieldauer / cycle duration SD



Grenzstrom / Max. overload on-state current $I_{T(OV)M} = f(t)$, $v_{RM} = 0{,}8\ V_{RRM}$

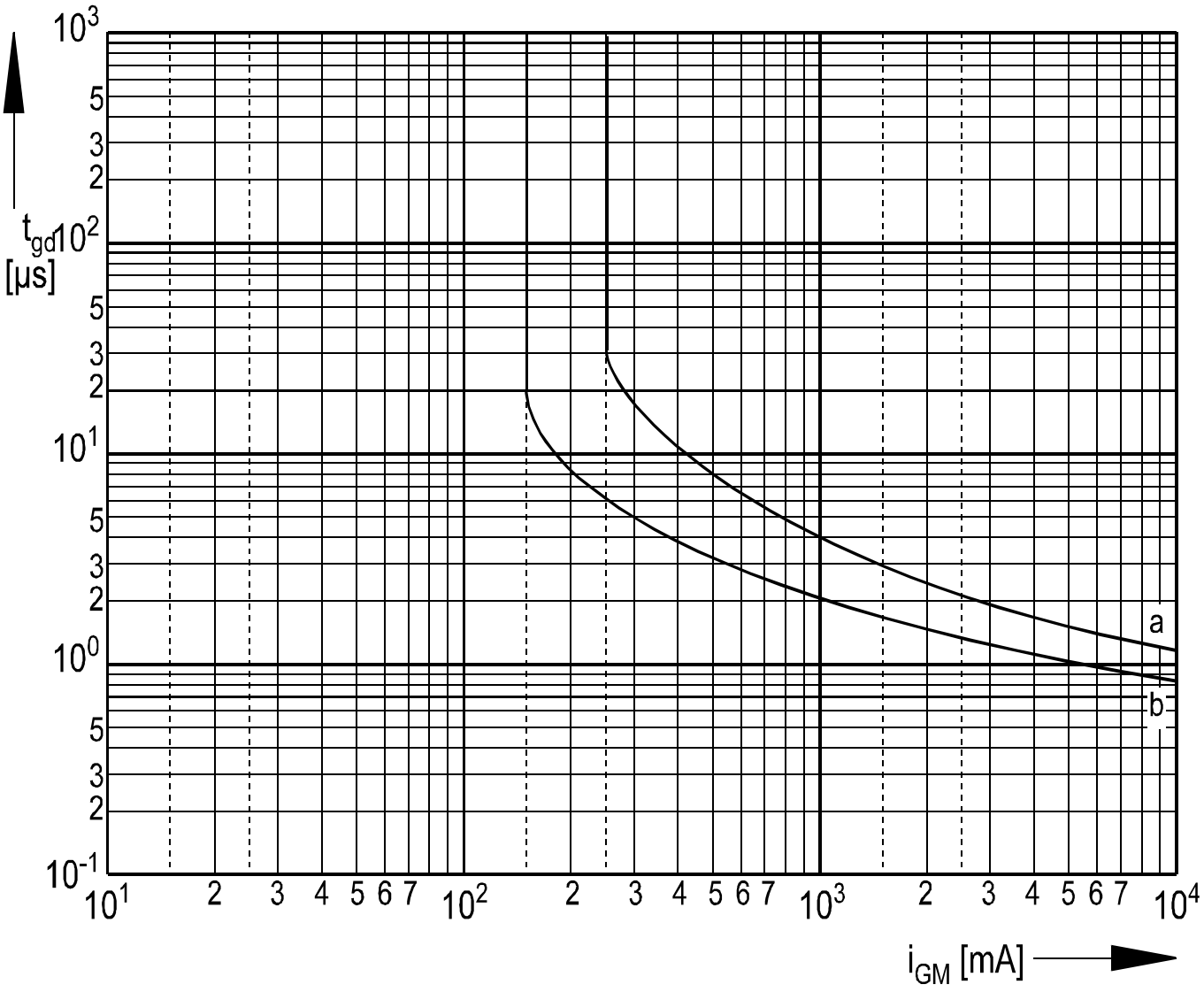
Beidseitige Kühlung / Two-sided cooling
Kühlkörper / Heatsink: K 0.05F
Belastung aus / Surge current occurs:
a - Leerlauf / No-load conditions
b - Betrieb mit Dauergrenzstrom I_{TAVM} / During operation at max. average on-state current I_{TAVM}



Steuercharakteristik $v_G = f(i_G)$ mit Zündbereichen für $V_D = 6$ V
Gate characteristic $v_G = f(i_G)$ with triggering area for $V_D = 6$ V

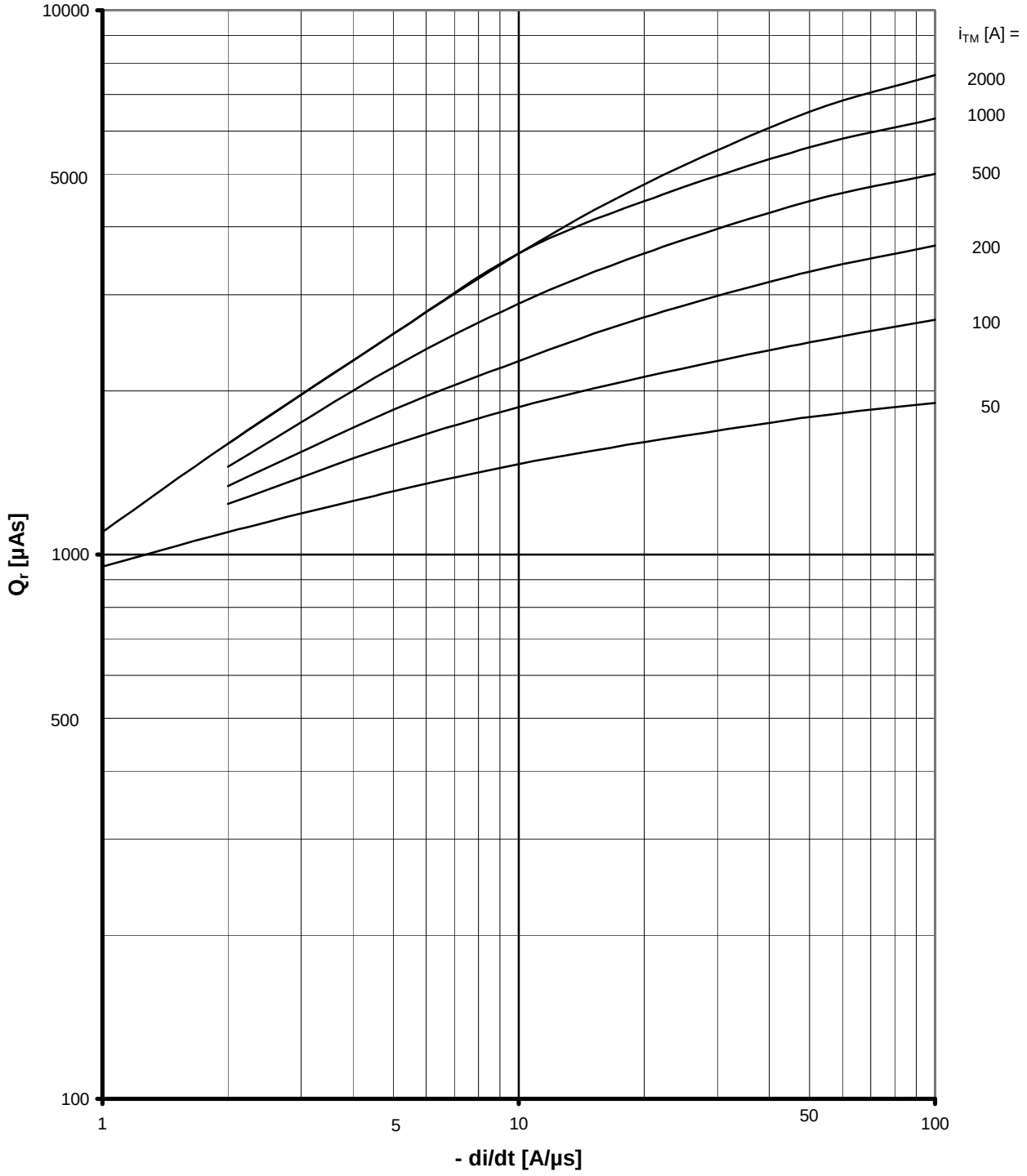
Höchstzulässige Spitzensteuerverlustleistung / Maximum rated peak gate power dissipation $P_{GM} = f(t_g)$:

a - 20 W/10ms b - 40 W/1ms c - 60 W/0,5ms



Zündverzug / Gate controlled delay time $t_{gd} = f(i_{GM})$
T_{vj} = 25°C, $di_G/dt = i_{GM}/1\mu s$

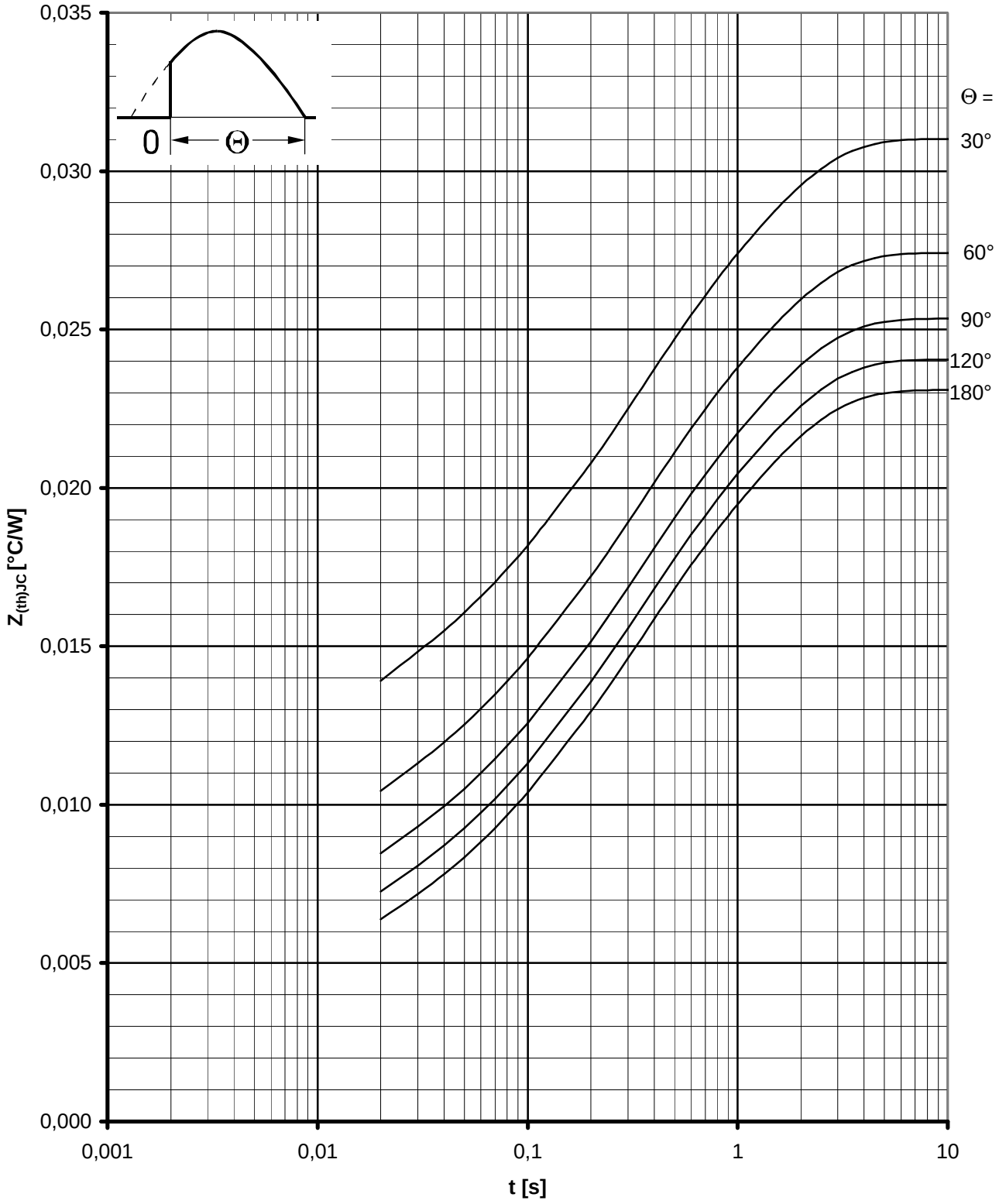
a - maximaler Verlauf / limiting characteristic
b - typischer Verlauf / typical characteristic



Sperrverzögerungsladung / Recovered charge $Q_r = f(-di/dt)$

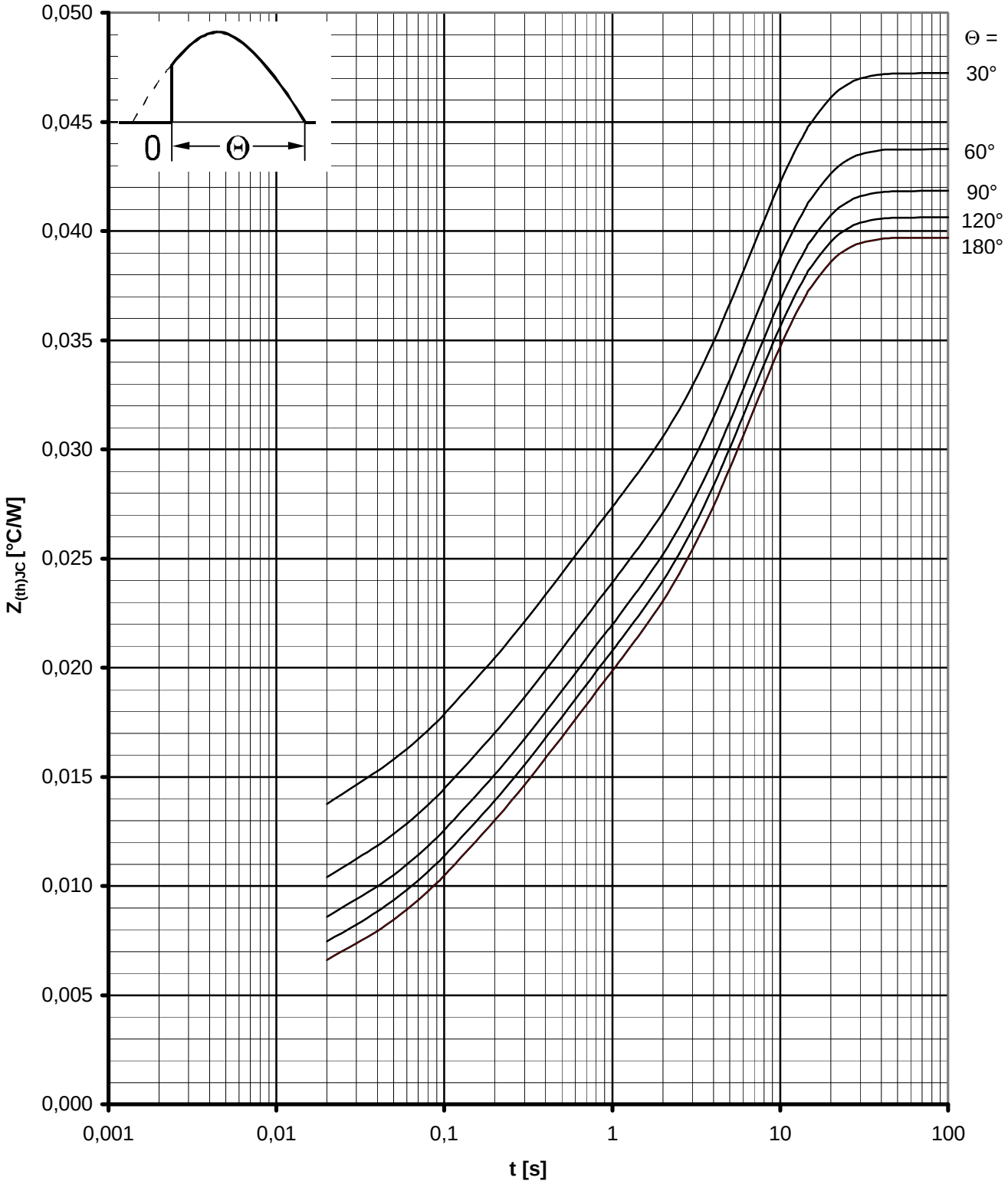
$T_{vj} = T_{vj}$ max, $v_R = 0{,}5\ V_{RRM}$, $v_{RM} = 0{,}8\ V_{RRM}$

Parameter: Durchlaßstrom i_{TM} / On-state current i_{TM}



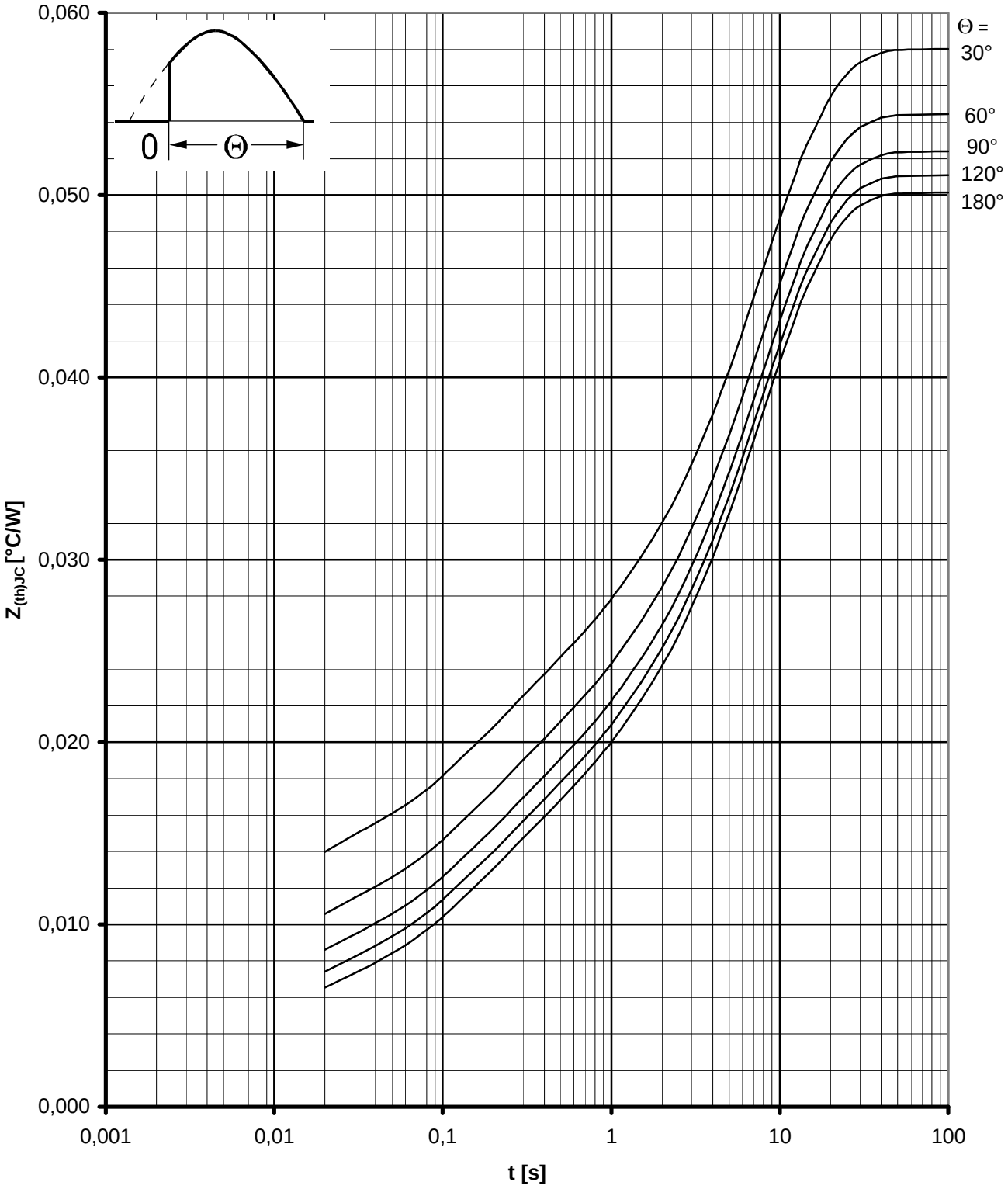
Transienter innerer Wärmewiderstand / Transient thermal impedance $Z_{(th)JC} = f(t)$

Beidseitige Kühlung /Ttwo-sided cooling
Parameter: Stromflußwinkel Θ / current conduction angle Θ

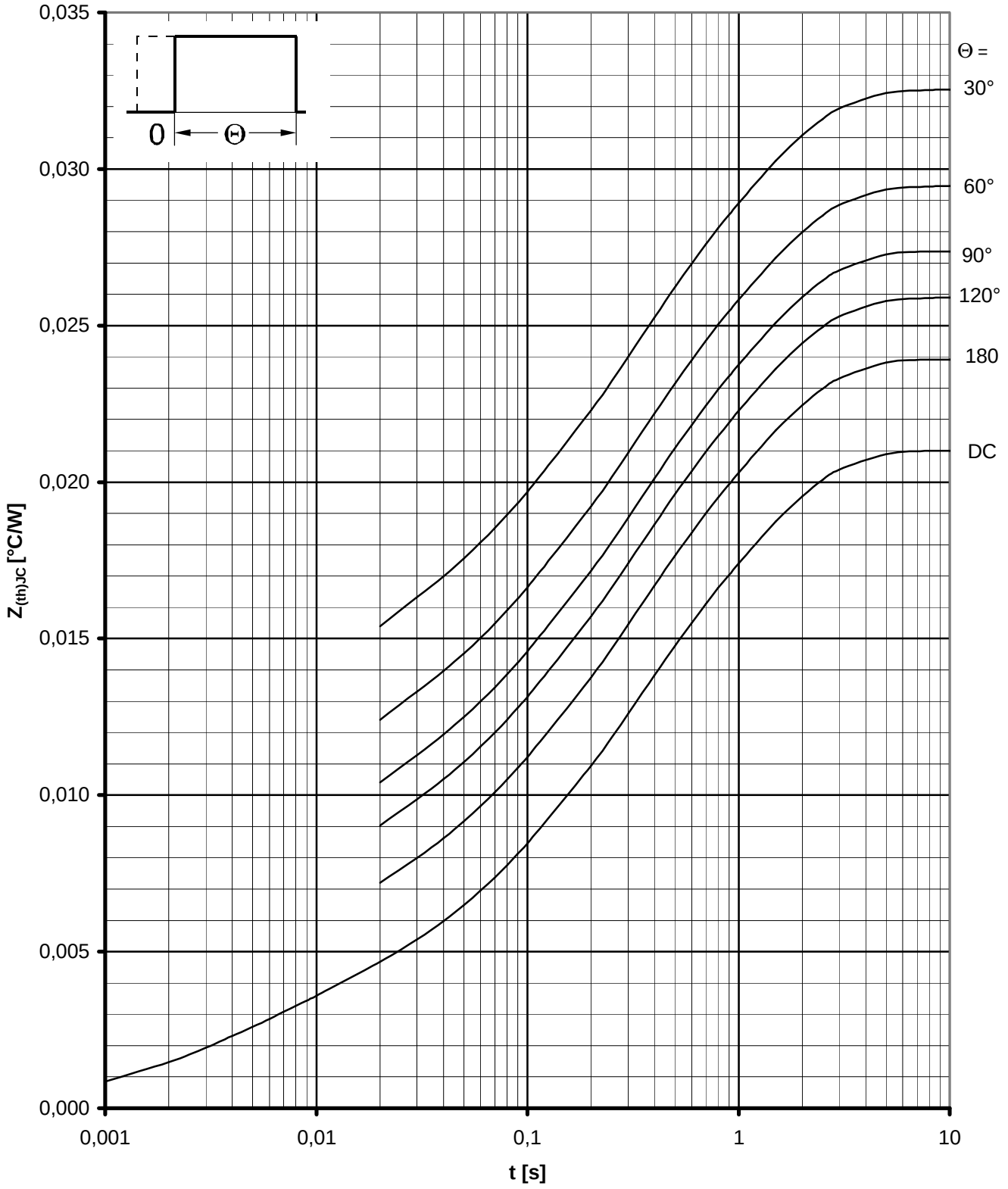


Transienter innerer Wärmewiderstand / Transient thermal impedance $Z_{(th)JC} = f(t)$

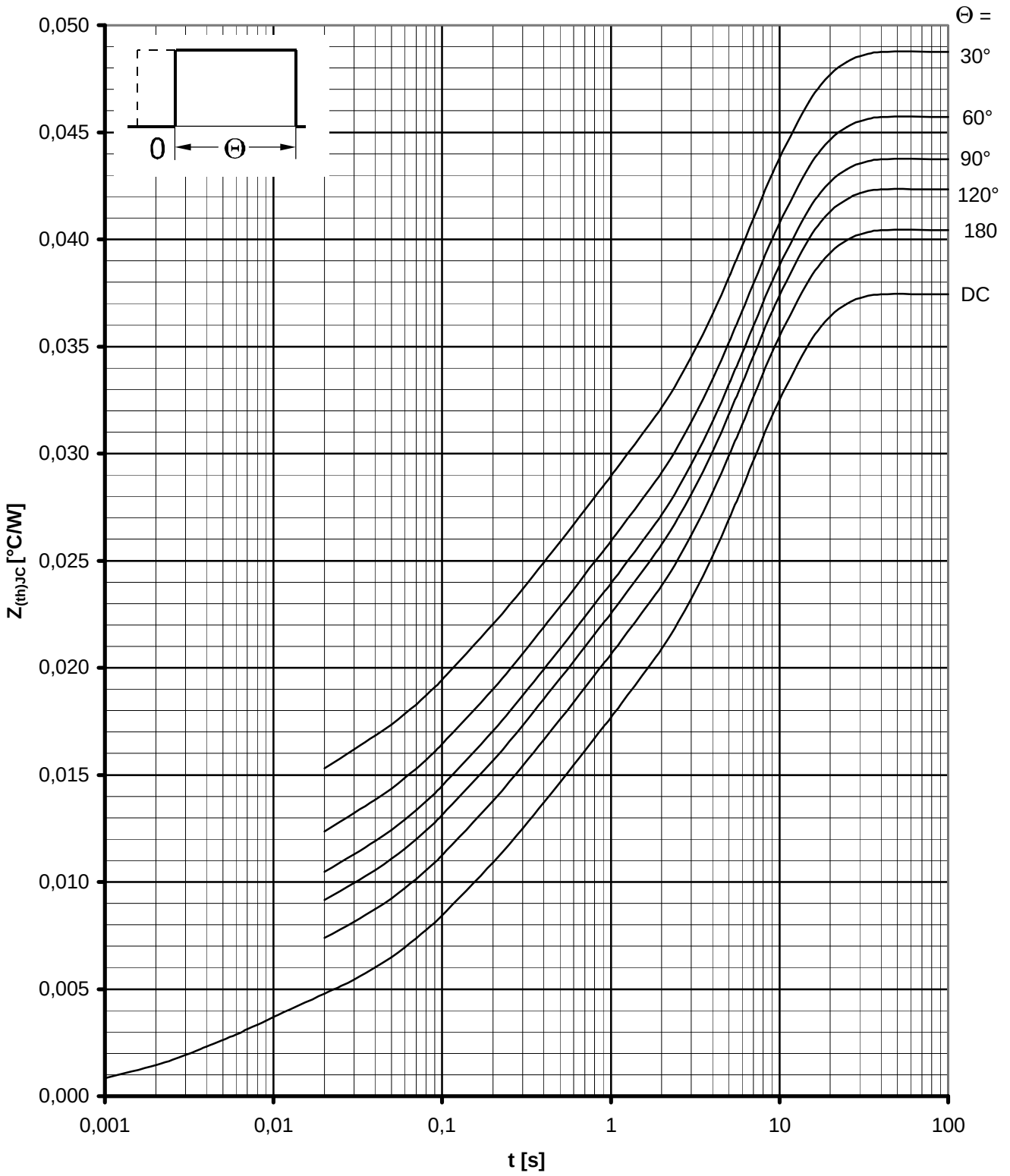
Anodenseitige Kühlung / Anode-sided sided cooling
Parameter: Stromflußwinkel Θ / current conduction angle Θ



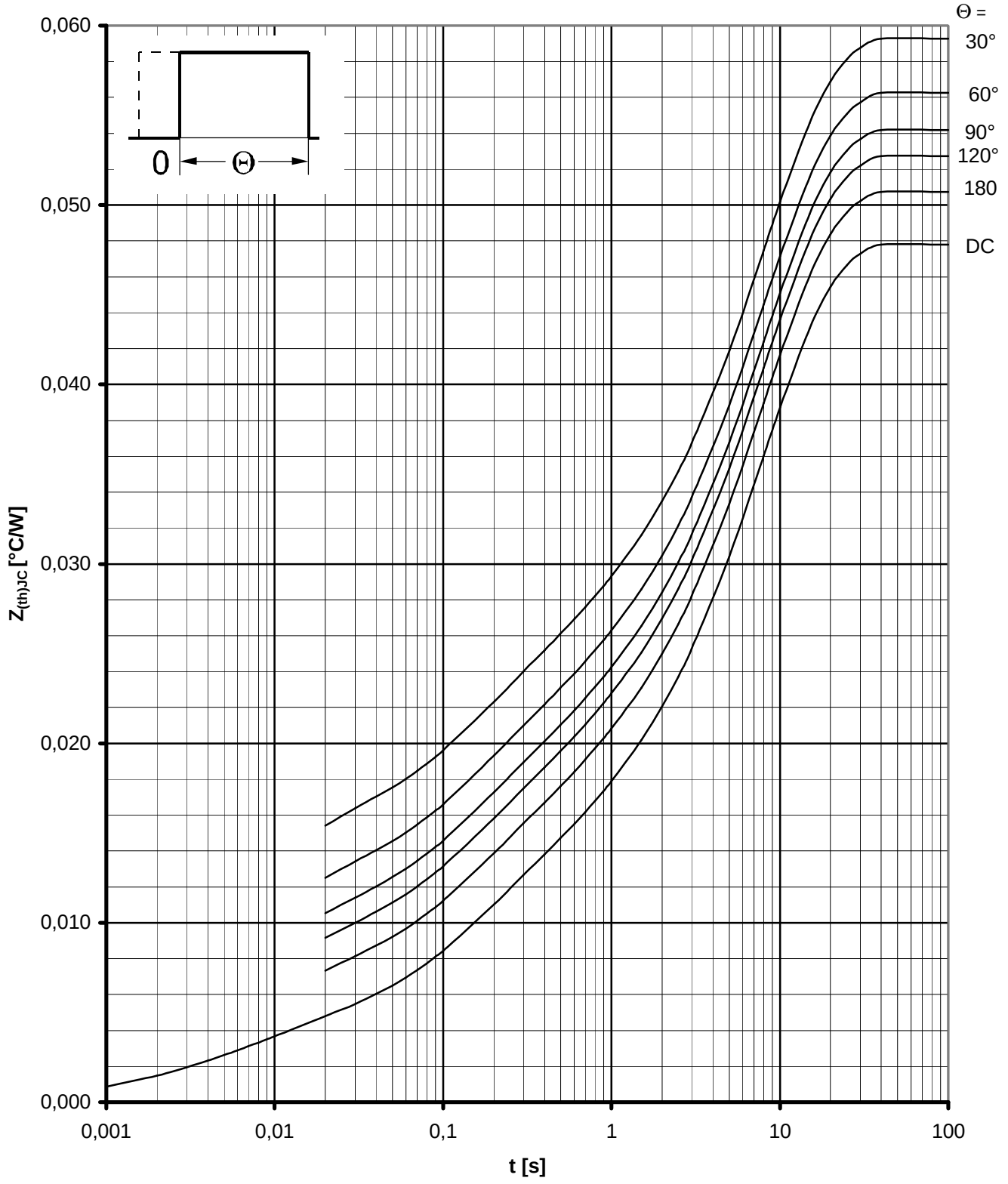
Transienter innerer Wärmewiderstand / Transient thermal impedance $Z_{(th)JC} = f(t)$
Kathodenseitige Kühlung / Cathde-sided cooling
Parameter: Stromflußwinkel Θ / current conduction angle Θ



Transienter innerer Wärmewiderstand / Transient thermal impedance $Z_{(th)JC} = f(t)$
Beidseitige Kühlung / Two-sided cooling
Parameter: Stromflußwinkel Θ / current conduction angle Θ



Transienter innerer Wärmewiderstand / Transient thermal impedance $Z_{(th)JC} = f(t)$
Anodenseitige Kühlung / Anode-sided cooling
Parameter: Stromflußwinkel Θ / current conduction angle Θ



Transienter innerer Wärmewiderstand / Transient thermal impedance $Z_{(th)JC} = f(t)$
Kathodenseitige Kühlung / Cathode-sided cooling
Parameter: Stromflußwinkel Θ / current conduction angle Θ