Technische Information / Technical Information

eupec

Netz-Thyristor
Phase Control Thyristor

T 3709 N 02...04

N

Elektrische Eigenschften / Electrical properties

Höchstzulässige Werte / Maximum rated values

Periodische Vorwärts- und Rückwärts-Spitzensperrspannung repetitive peak forward off-state and reverse voltages	T_{vj} = - 40°C...$T_{vj\,max}$	V_{DRM} , V_{RRM}	200 600	400 600	V V 1)
Vorwärts-Stoßspitzensperrspannung non-repetitive peak foward off-state voltage	T_{vj} = - 40°C...$T_{vj\,max}$	V_{DSM}	200 600	400 600	V V 1)
Rückwärts-Stoßspitzensperrspannung non-repetitive peak reverse voltage	T_{vj} = + 25°C...$T_{vj\,max}$	V_{RSM}	250	450 650	V V
Durchlaßstrom-Grenzeffektivwert RMSM on-state current		I_{TRSMSM}		7000	A
Dauergrenzstrom average on-state current	T_C = 85 °C T_C = 69 °C	I_{TAVM}		3710 4456	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}		70 60	kA 2) kA 2)
Grenzlastintegral I²t-value	T_{vj} = 25°C, t_p = 10ms T_{vj} = $T_{vj\,max}$, t_p = 10ms	I²t		24.500 18.000	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 = 15 kA T_{vj} = $T_{vj\,max}$, i_T = 4 kA	v_T v_T	max. max.	1,50 0,96	V V
Schleusenspannung threshold voltage	T_{vj} = $T_{vj\,max}$	$V_{T(TO)}$		0,75	V
Ersatzwiderstand slope resistance	T_{vj} = $T_{vj\,max}$	r_T		0,0475	mΩ
Durchlaßkennlinie on-state voltage $v_T = A + B \cdot i_T + C \cdot Ln(i_T + 1) + D \cdot \sqrt{i_T}$	T_{vj} = $T_{vj\,max}$ A = 2,8353E-01 B = 4,5758E-05 C = 6,5261E-02 D = -7,9187E-04				
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.	1,5	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. max.	10 5	mA mA
Nicht zündene Steuerspannung gate non-trigger voltage	T_{vj} = $T_{vj\,max}$,v_D = 0,5 V_{DRM}	V_{GD}	max.	0,2	V
Haltestrom holding current	T_{vj}=25°C, v_D = 6V, R_A =5Ω	I_H	max.	300	mA
Einraststrom latching current	T_{vj}=25°C,v_D=6V,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.	200	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

1) 600 v auf Anfrage / 600 V on demand

2) Gehäusegrenzstrom 36 kA (50Hz Sinushalbwelle). / Current limit of case 36 kA (50Hz sinusoidal half-wave).

Elektrische Eigenschften / Electrical properties

Charakteristische Werte / Characteristic values

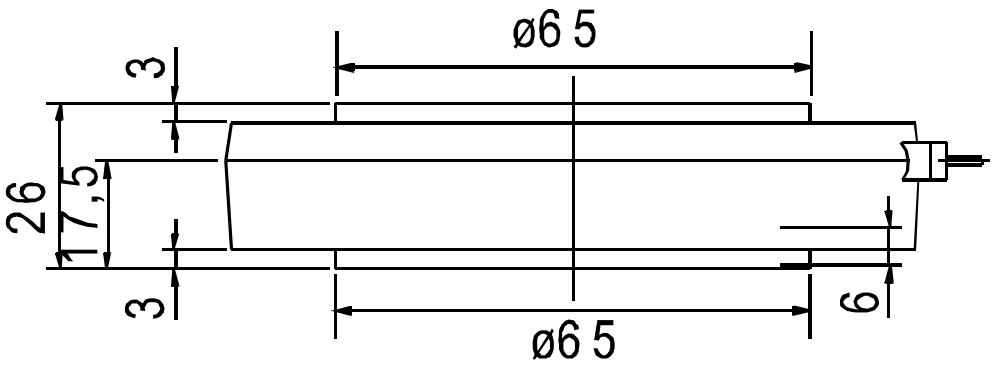
Freiwerdezeit circuit commutatet turn-off time	$T_{vj} = T_{vj\,max}$, $i_{TM}=I_{TAVM}$ v_{RM} =100V, v_{DM} = 0,67 V_{DRM} dv_D/dt = 20 V/µs, $-di_T/dt$ = 10 A/µs 4. Kennbuchstabe / 4th letter O	t_q		typ. 200	µs

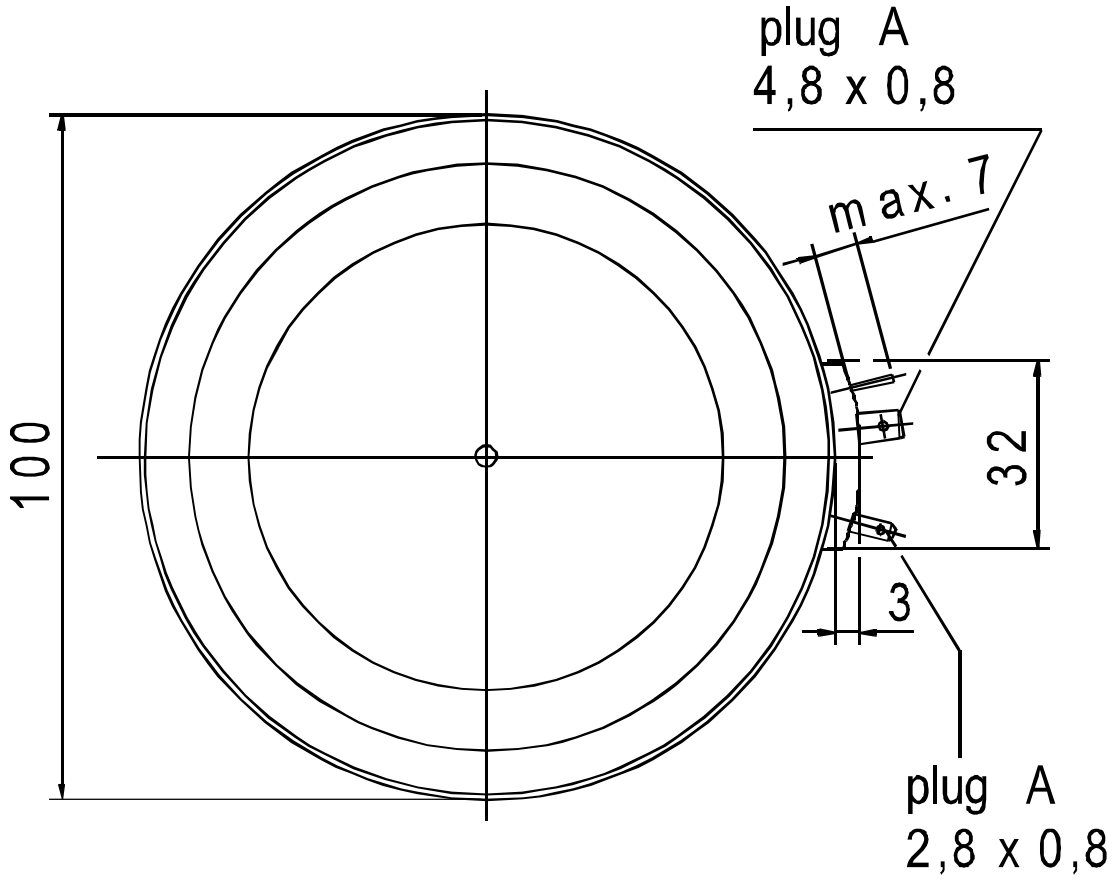
Thermische Eigenschaften / Thermal properties

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. max. max. max. max. max.	 0,0125 0,0117 0,0232 0,0225 0,0250 0,0245	 °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. max.	 0,0030 0,0060	 °C/W °C/W
Höchstzulässige Sperrschichttemperatur max. junction temperature		$T_{vj\,max}$		140	°C
Betriebstemperatur operating temperature		$T_{c\,op}$		-40...140	°C
Lagertemperatur storage temperature		T_{stg}		-40...150	°C

Mechanische Eigenschaften / Mechanical properties

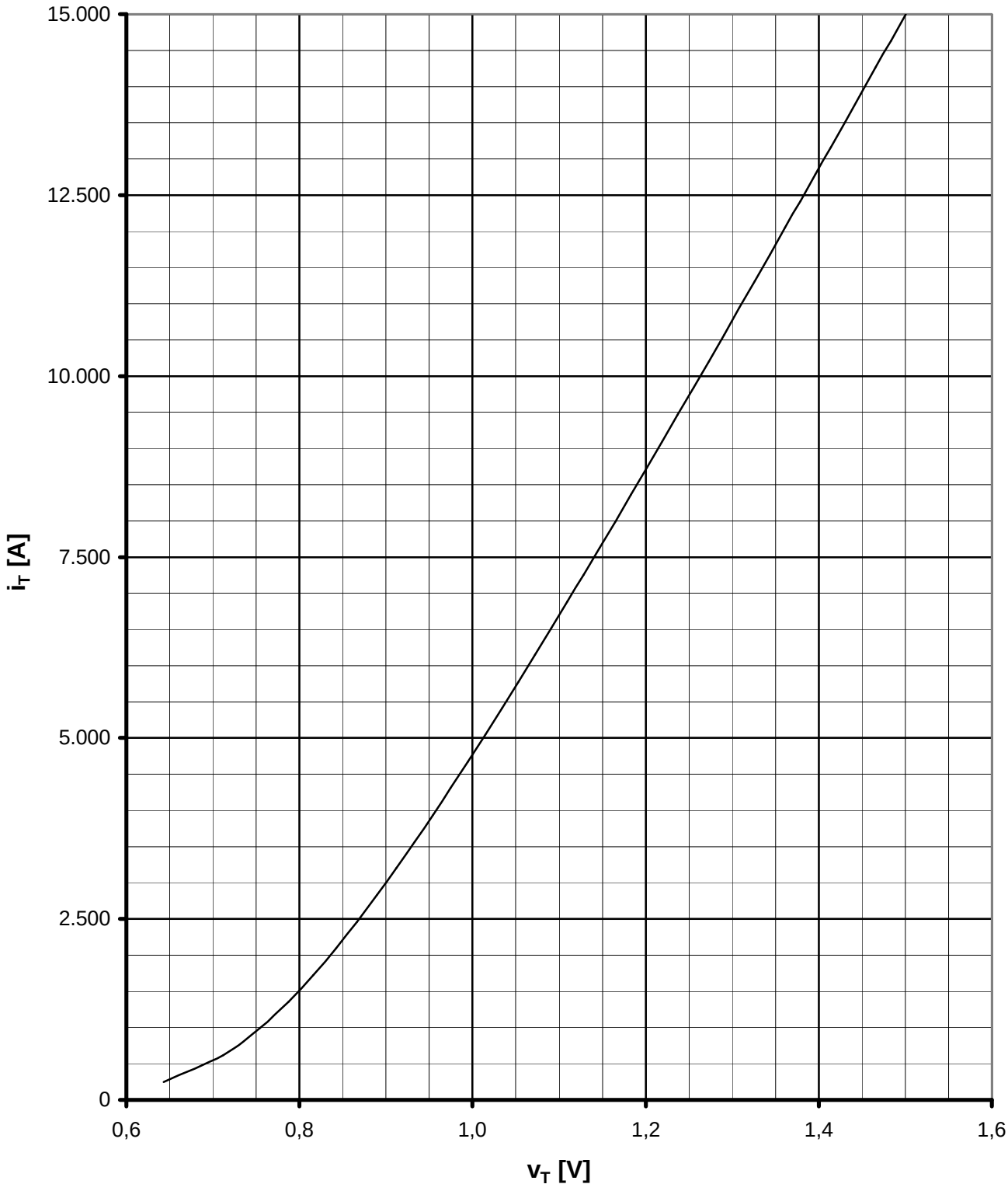
Gehäuse, siehe Anlage case, see appendix				Seite 3 page 3	
Si-Element mit Druckkontakt Si-pellet with pressure contact					
Anpreßkraft clamping force		F		30...65	kN
Gewicht weight		G	typ.	900	g
Kriechstrecke creepage distance				30	mm
Feuchteklasse humidity classification	DIN 40040			C	
Schwingfestigkeit vibration resistance	f = 50Hz			50	m/s²


ø65
3
26
17,5
3
ø65
6
C
HK
G
A

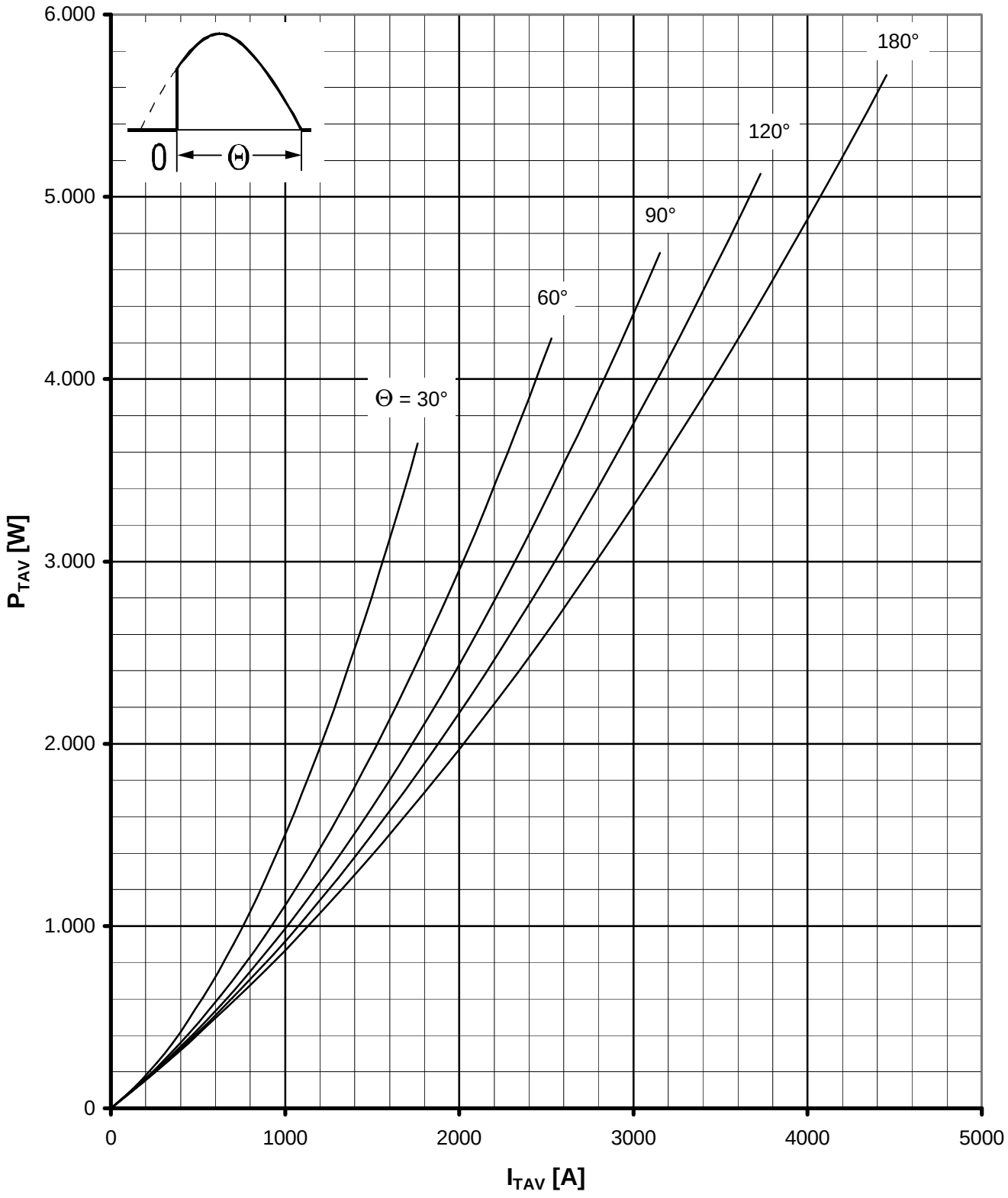

plug A
4,8 x 0,8
max. 7
100
32
3
plug A
2,8 x 0,8

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]	0,000034	0,000570	0,000912	0,002740	0,004250	0,00320	
two-sided	τ_n [s]	0,000287	0,002980	0,013500	0,134000	0,449000	2,05000	
anodenseitig	R_{thn} [°C/W]	0,000035	0,000600	0,001050	0,007600	0,008500	0,004700	
anode-sided	τ_n [s]	0,000287	0,002300	0,024000	0,310000	1,900000	6,100000	
kathodenseitig	R_{thn} [°C/W]	0,000035	0,000600	0,002050	0,008050	0,009000	0,004770	
cathode-sided	τ_n [s]	0,000287	0,003000	0,057000	0,380000	2,050000	6,100000	

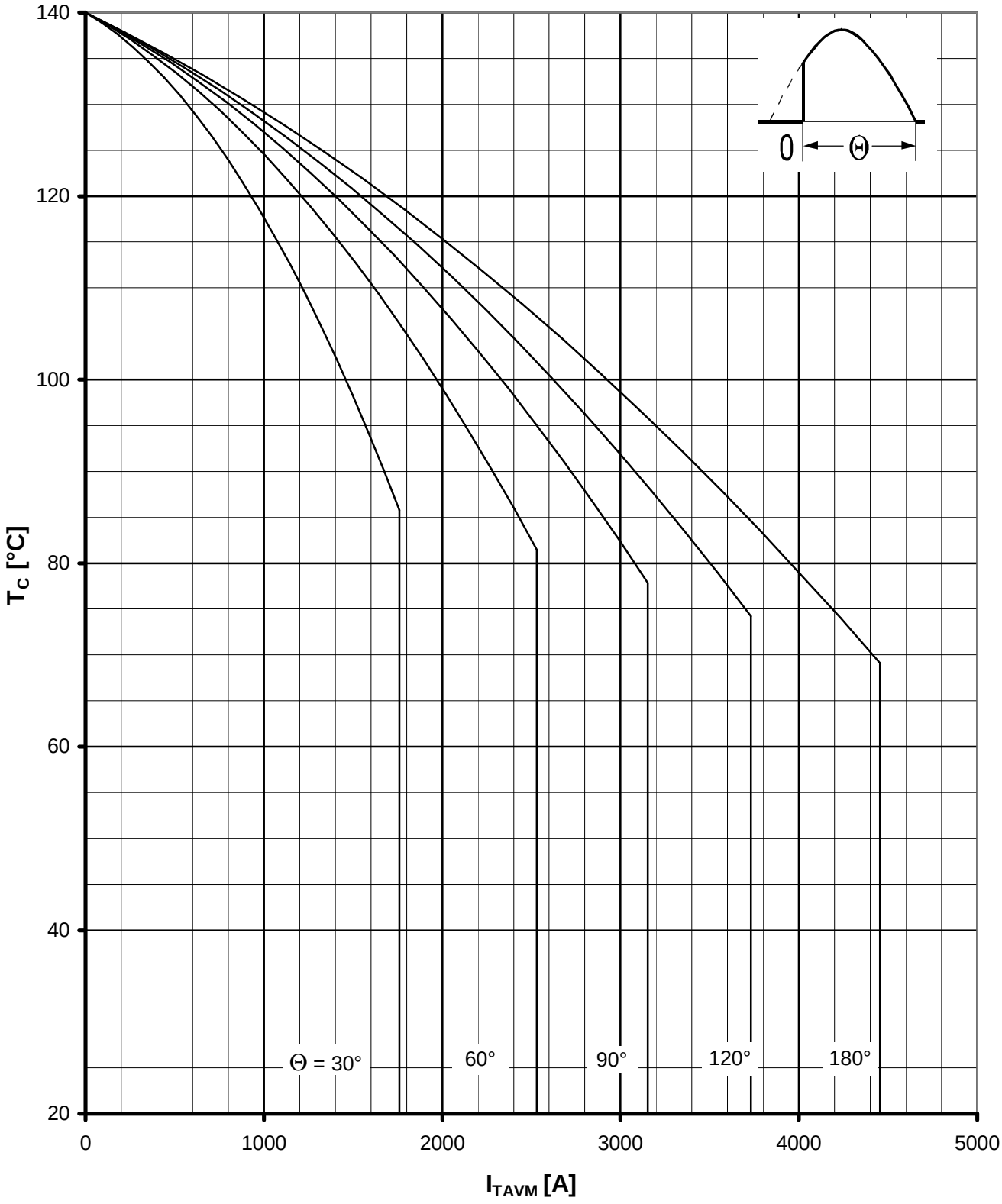
Analytische Funktion / analytical function : $Z_{thJC} = \sum_{n=1}^{n_{max}} R_{thn} (1 - EXP (- t / \tau_n))$



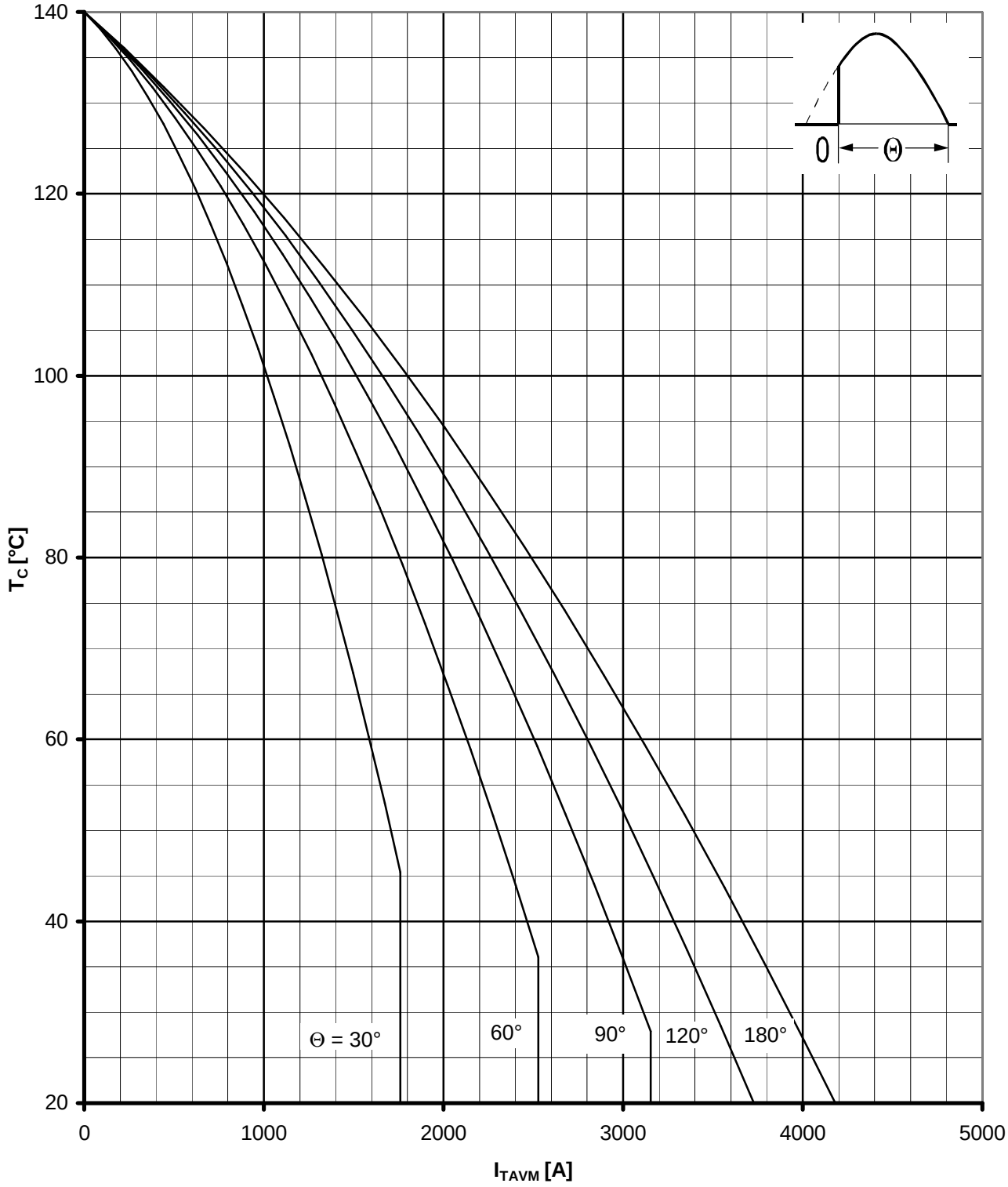
Grenzdurchlaßkennlinie / Limiting 0n-state characteristic $i_T = f(v_T)$
$T_{vj} = T_{vj}$ max



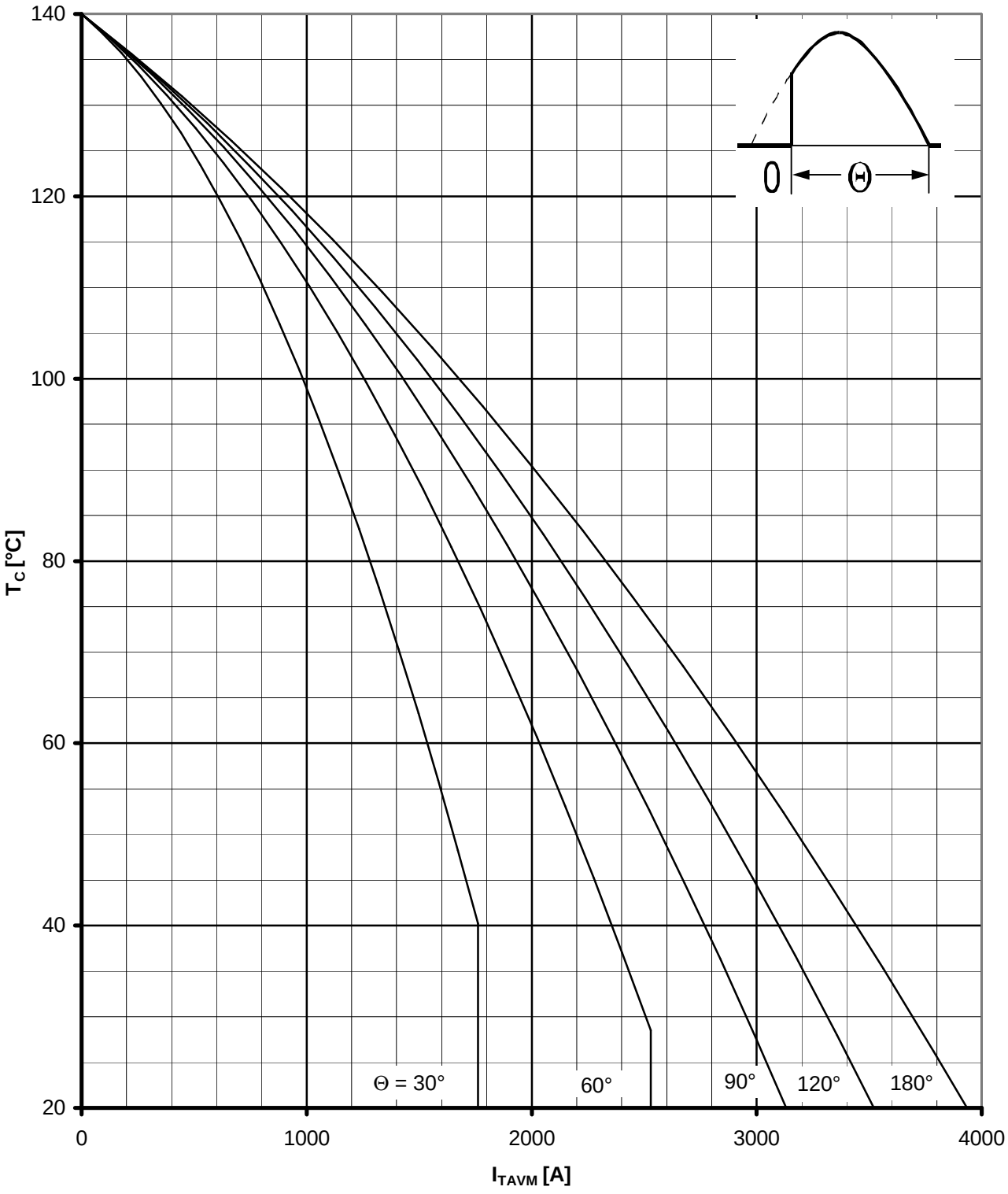
Durchlaßverlustleistung / On-state power loss $P_{TAV} = f(I_{TAV})$
Parameter: Stromflußwinkel Θ / current conduction angle Θ



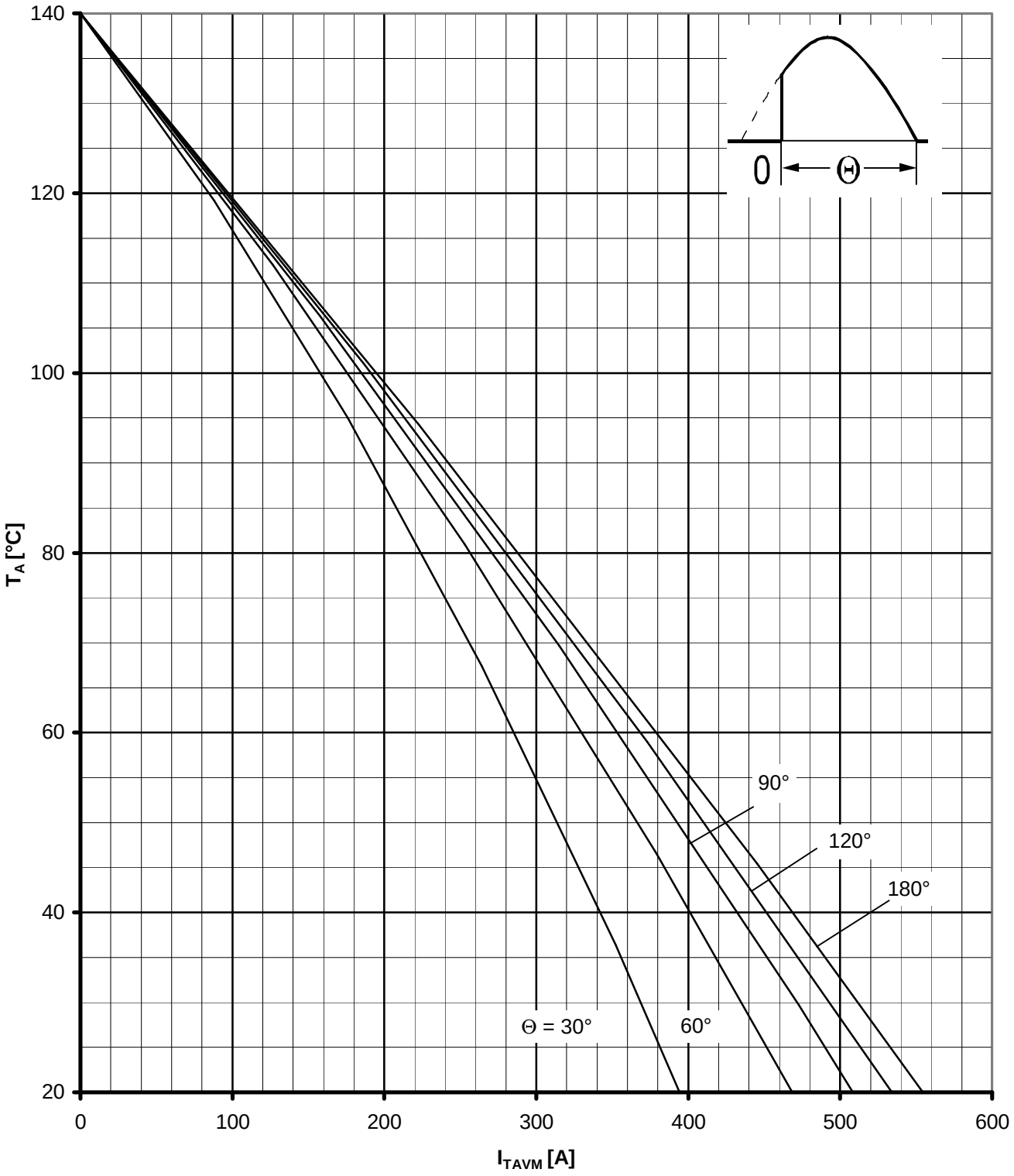
Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAVM})$
Beidseitige Kühlung / Two-sided cooling
Parameter: Stromflußwinkel Θ / current conduction angle Θ



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

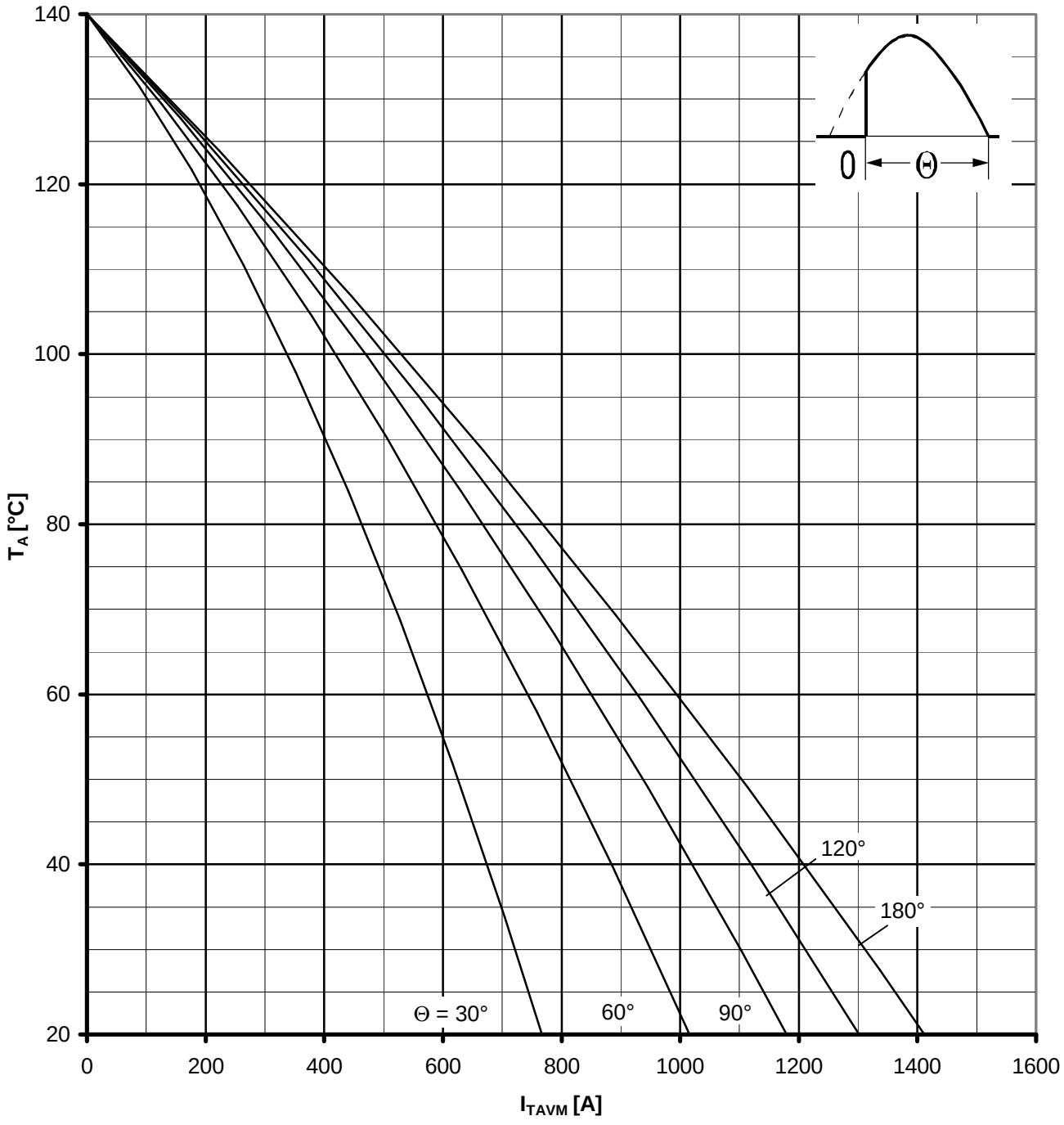


Höchstzulässige Kühlmitteltemperatur / Max. allowable cooling medium temperature $T_A = f(I_{TAVM})$

Luftselbstkühlung / Natural air-cooling

Kühlkörper/Heatsink. K0.048F

Parameter: Stromflußwinkel Θ / current conduction angle Θ

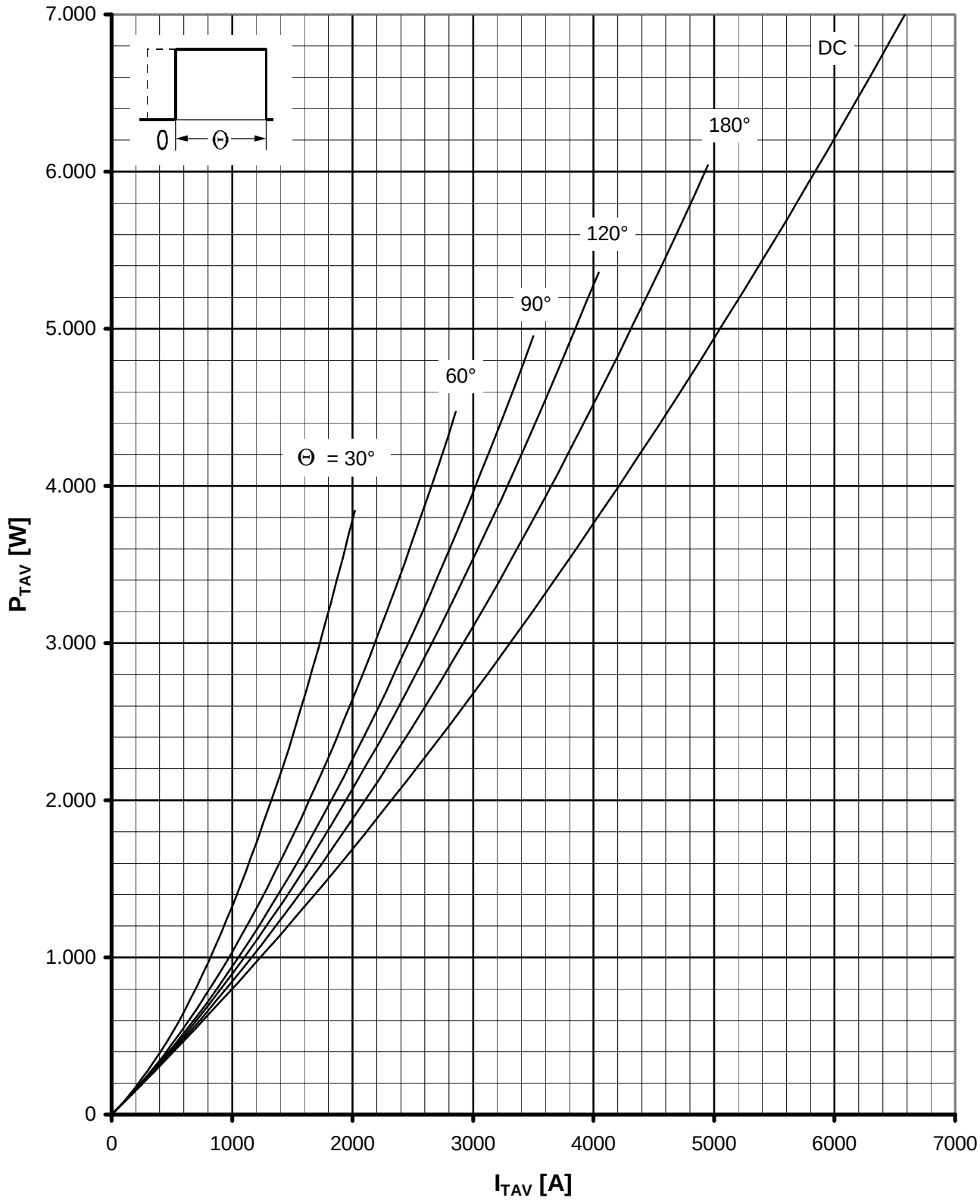


Höchstzulässige Kühlmitteltemperatur / Max. allowable cooling medium temperature $T_A = f(I_{TAVM})$

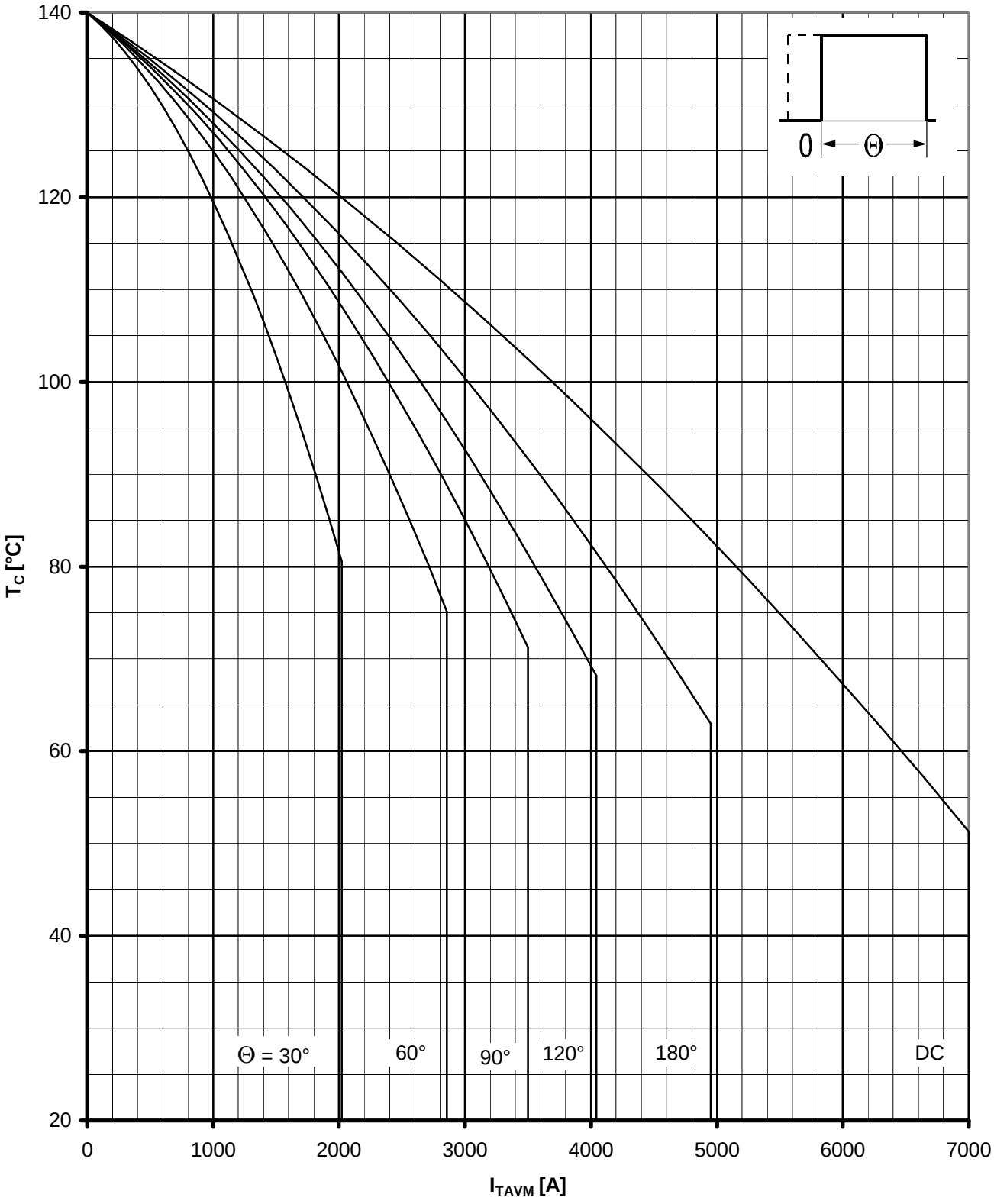
Verstärkte Luftkühlung / Forced air-cooling

Kühlkörper/Heatsink. K0.048F, T_A = 35 °C, V_L = 120 l/s

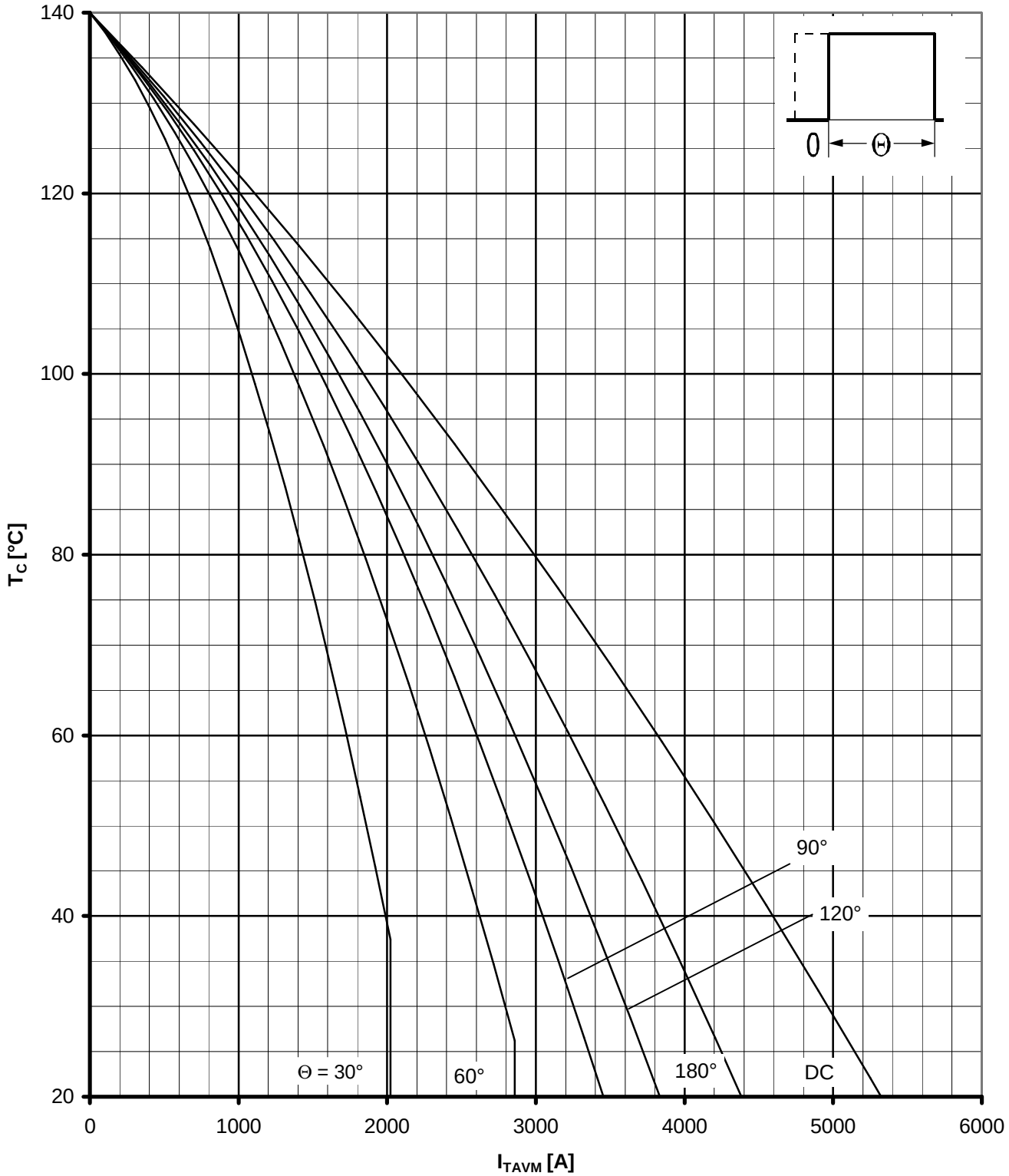
Parameter: Stromflußwinkel Θ / current conduction angle Θ



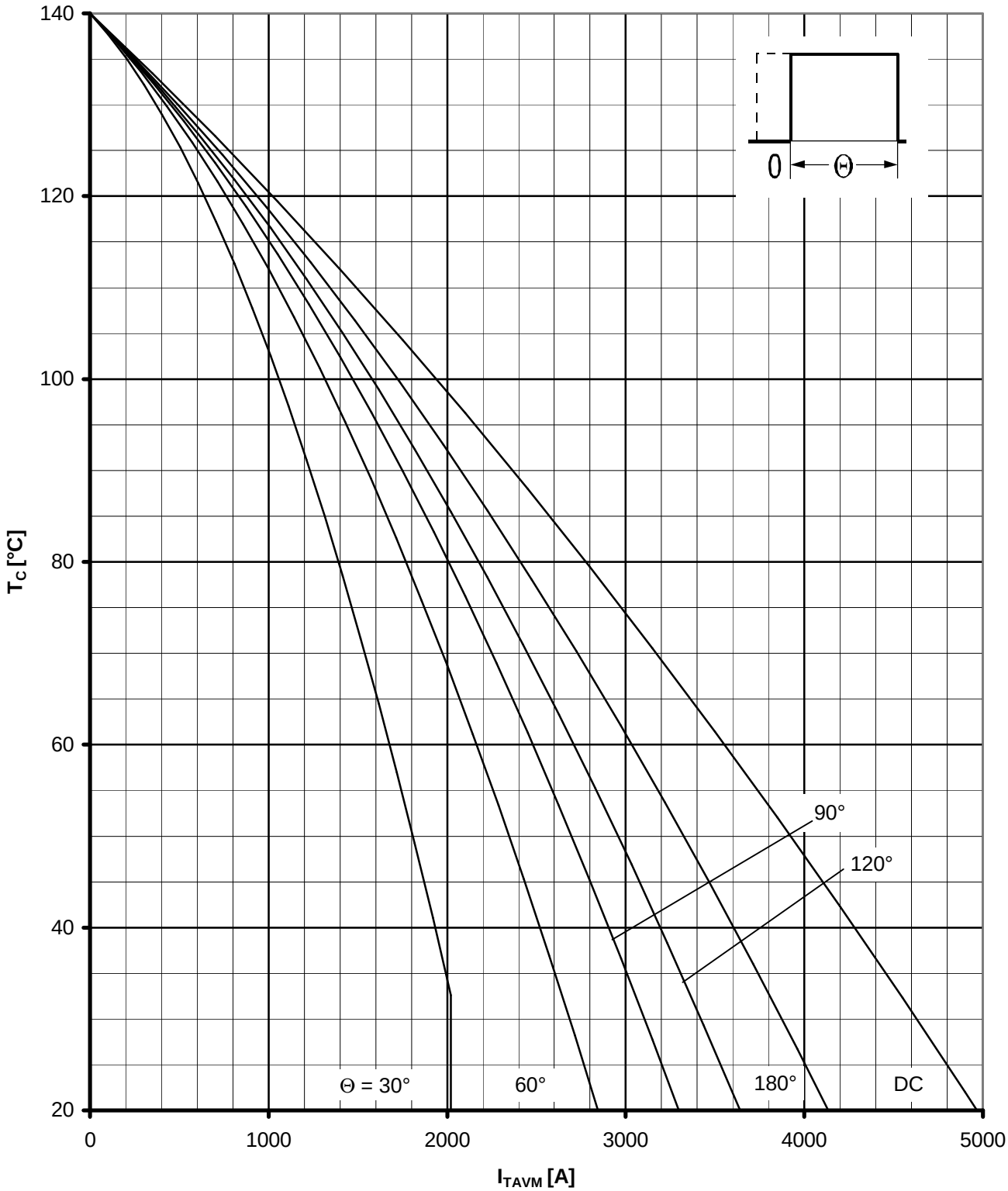
Durchlaßverlustleistung / On-state power loss $P_{TAV} = f(I_{TAV})$
Parameter: Stromflußwinkel Θ / current conduction angle Θ



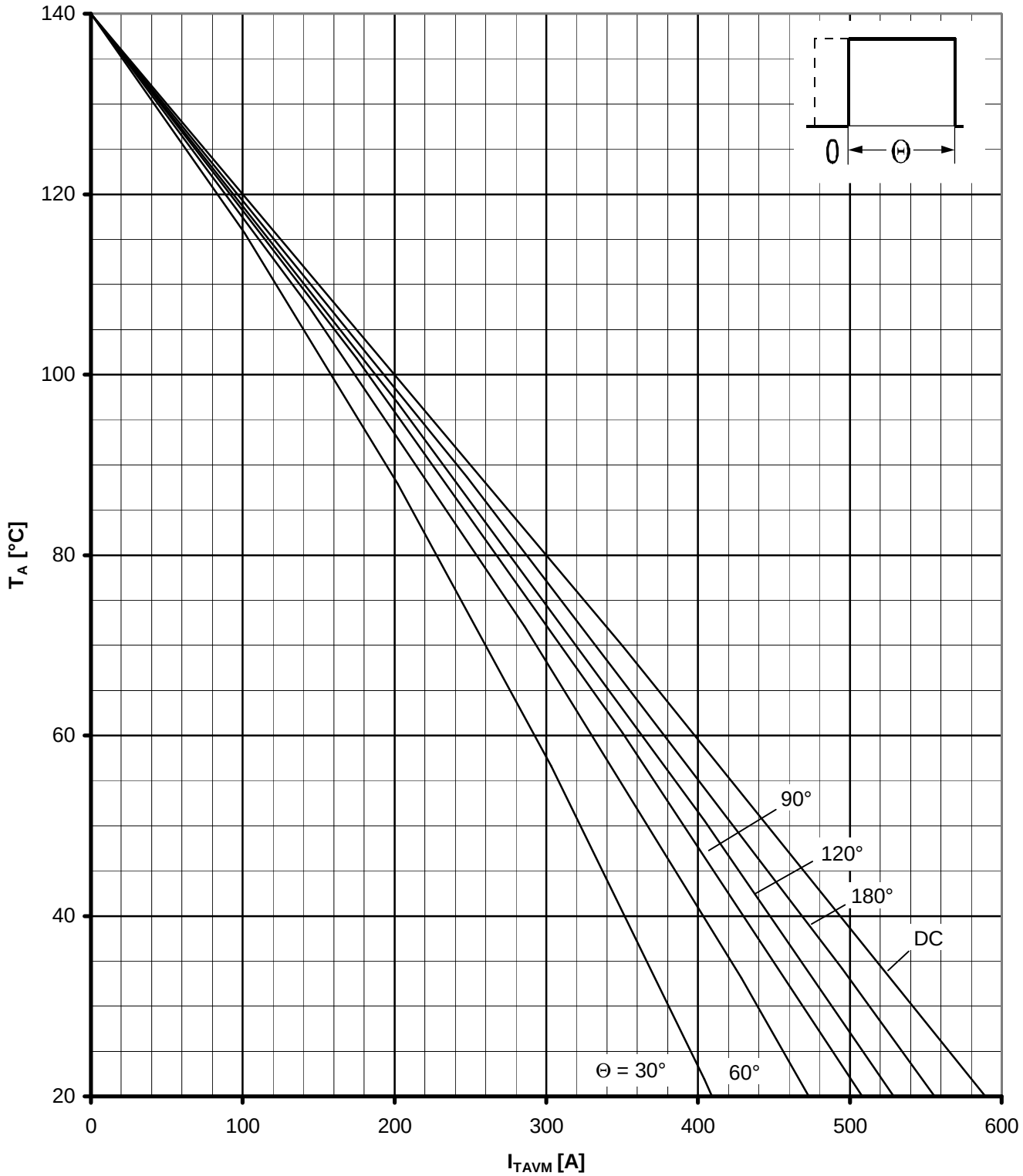
Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAVM})$
Beidseitige Kühlung / Two-sided cooling
Parameter: Stromflußwinkel Θ / current conduction angle Θ



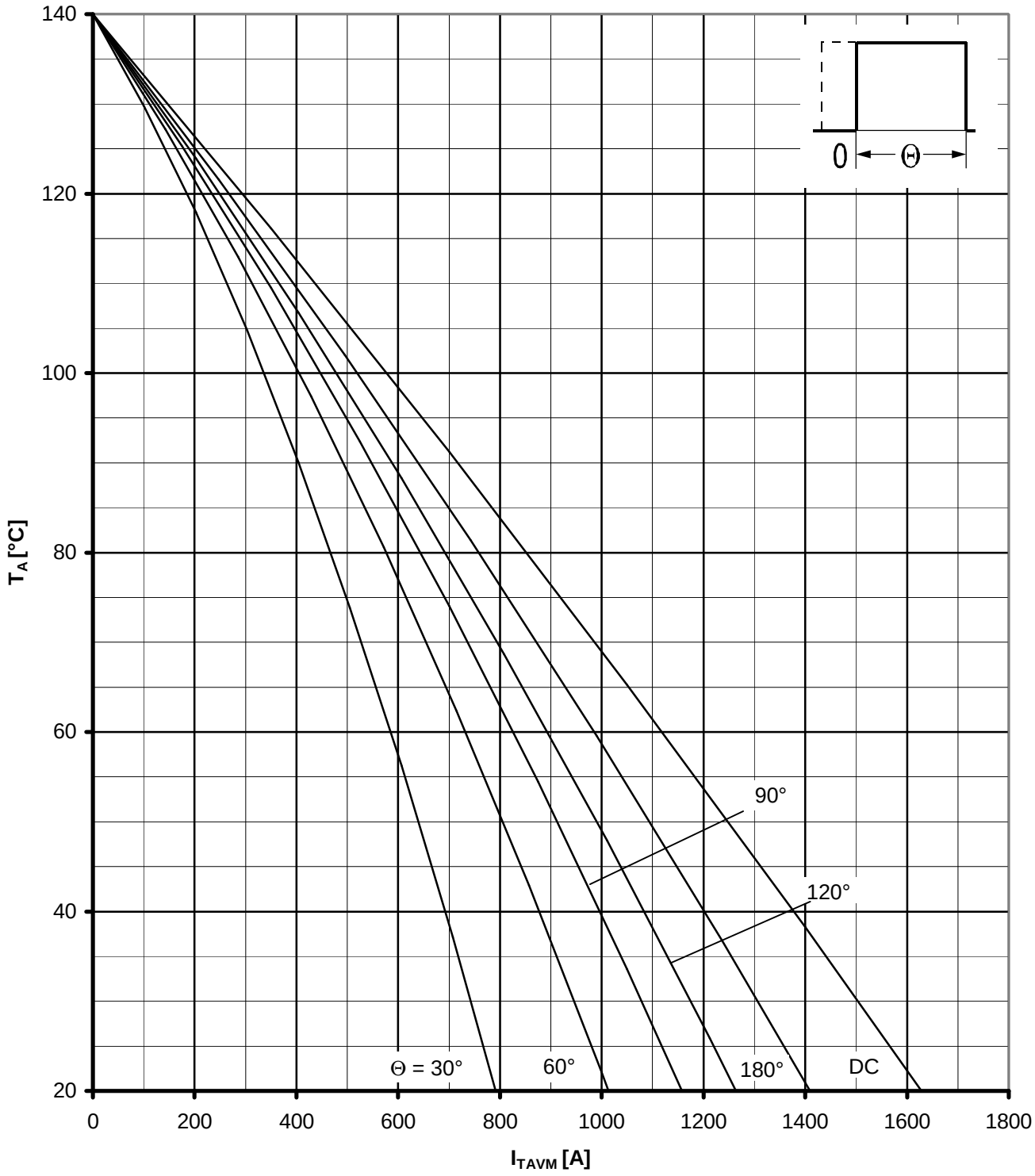
Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAVM})$
Anodenseitige Kühlung / anode sided cooling
Parameter: Stromflußwinkel Θ / current conduction angle Θ



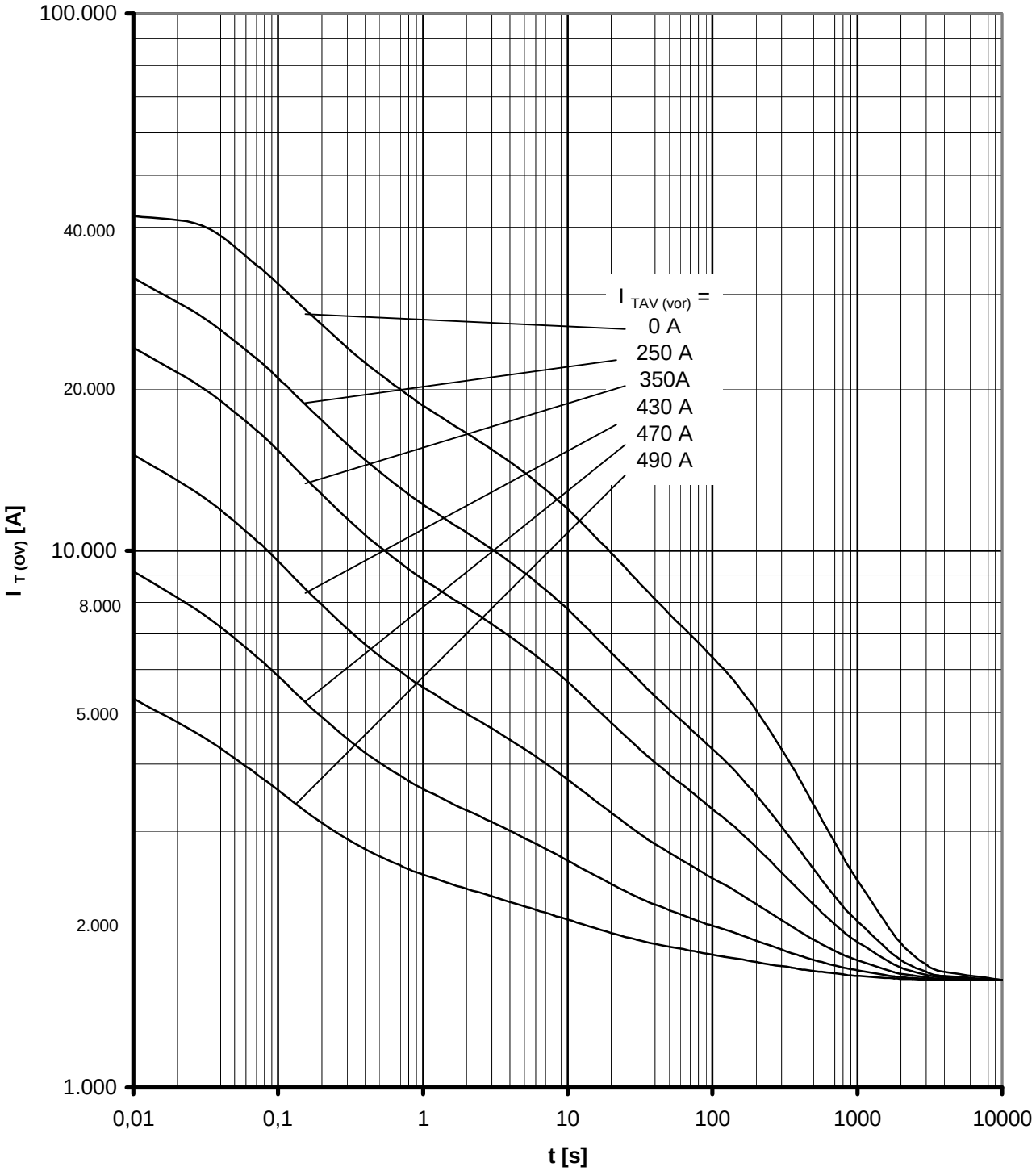
Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAVM})$
Kathodenseitige Kühlung / cathode sided cooling
Parameter: Stromflußwinkel Θ / current conduction angle Θ



Höchstzulässige Kühlmitteltemperatur / Max. allowable cooling medium temperature $T_A = f(I_{TAVM})$
Luftselbstkühlung / Natural air-cooling
Kühlkörper/Heatsink. K0.048F
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. K0.048F, V_L = 120 l/s
Parameter: Stromflußwinkel Θ / current conduction angle Θ

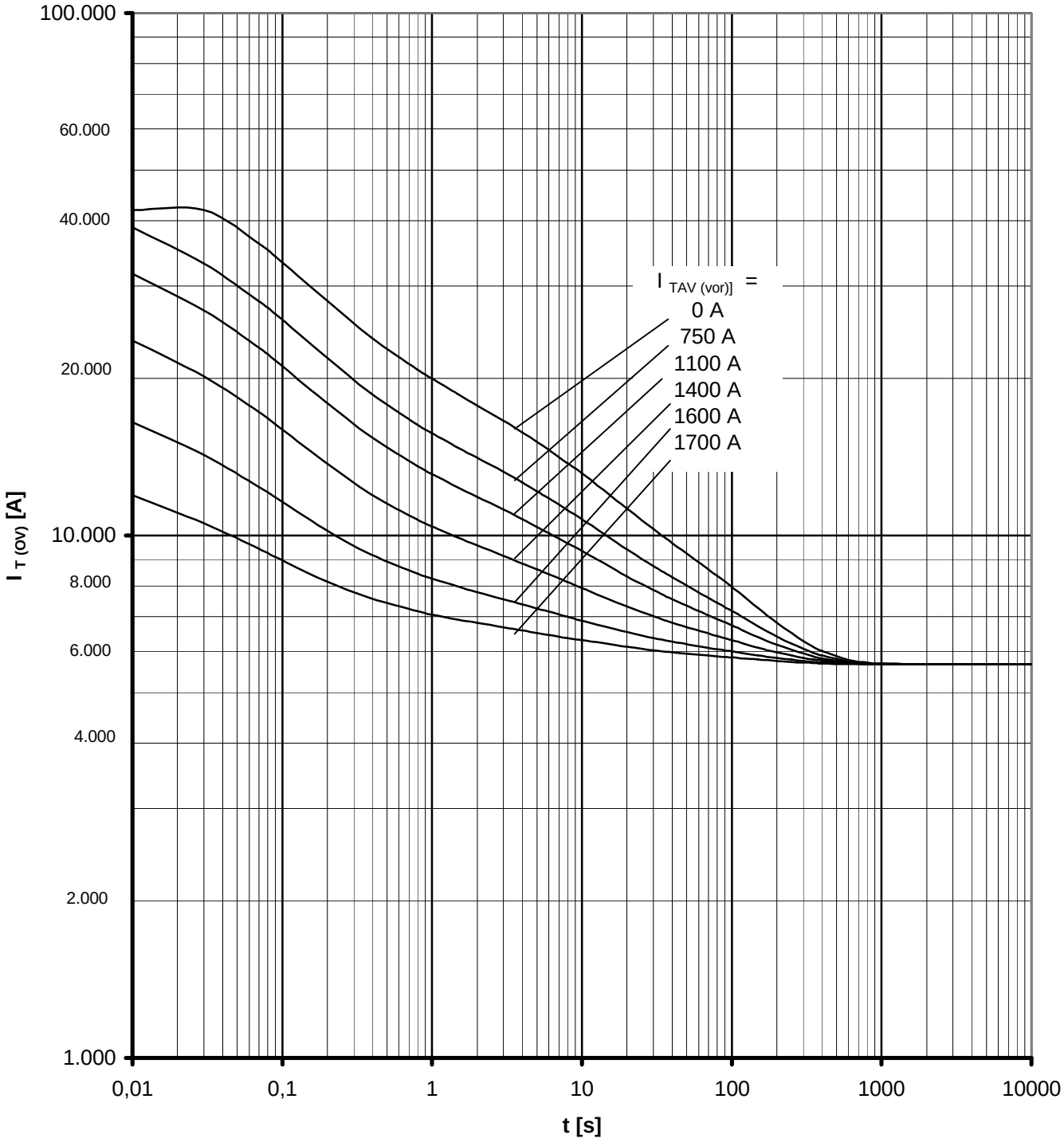


Überstrom / Overload on-state current $I_{T(OV)} = f(t)$

Beidseitige Luftselbstkühlung / Two-sided natural cooling K0.048F

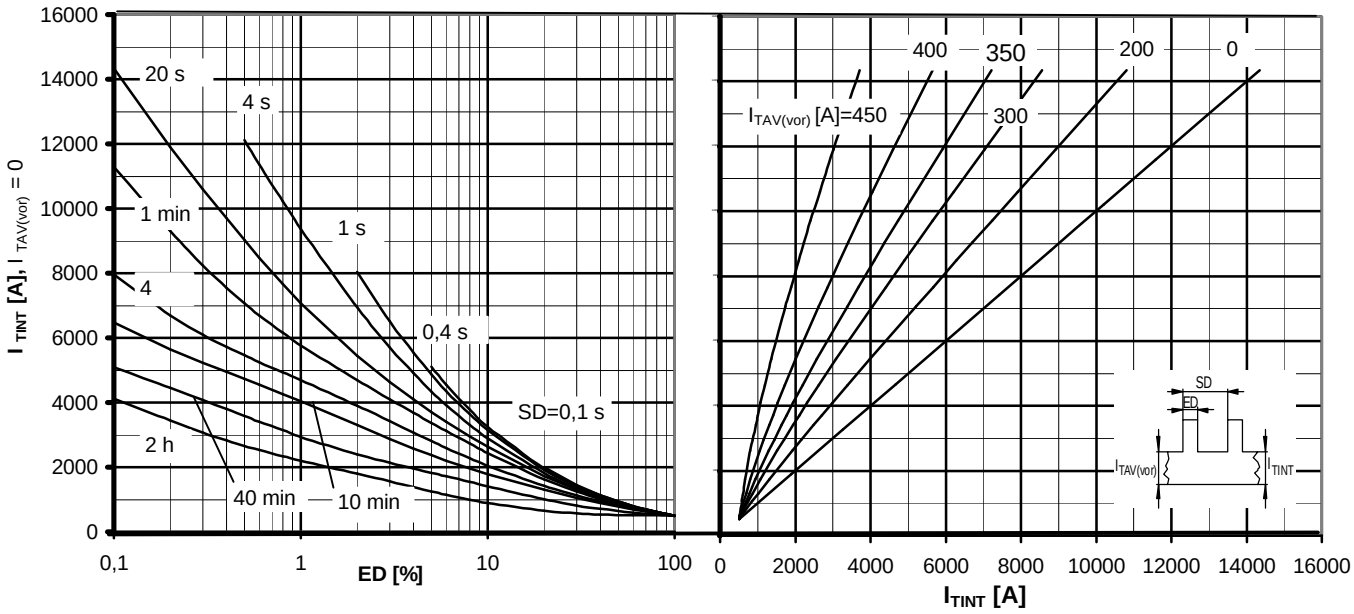
$T_A = 45°C$

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



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

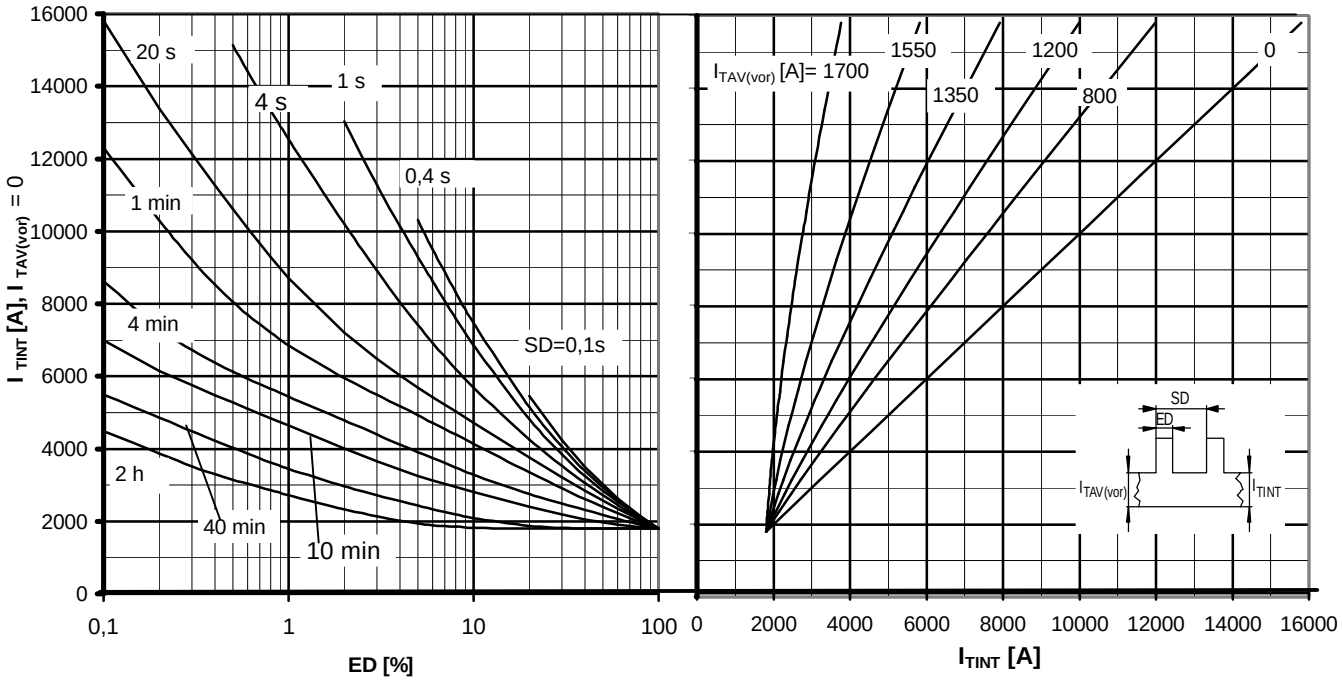
Beidseitige verstärkte Kühlung / forced two-sided cooling K0.048F
$T_A = 35°C$, $V_L = 120$ l/s
Parameter: Vorlaststrom / pre-load current $I_{TAV(vor)}$



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

Beidseitig Luftselbstkühlung / two-sided natural cooling K 0.048F
T_A = 45 °C

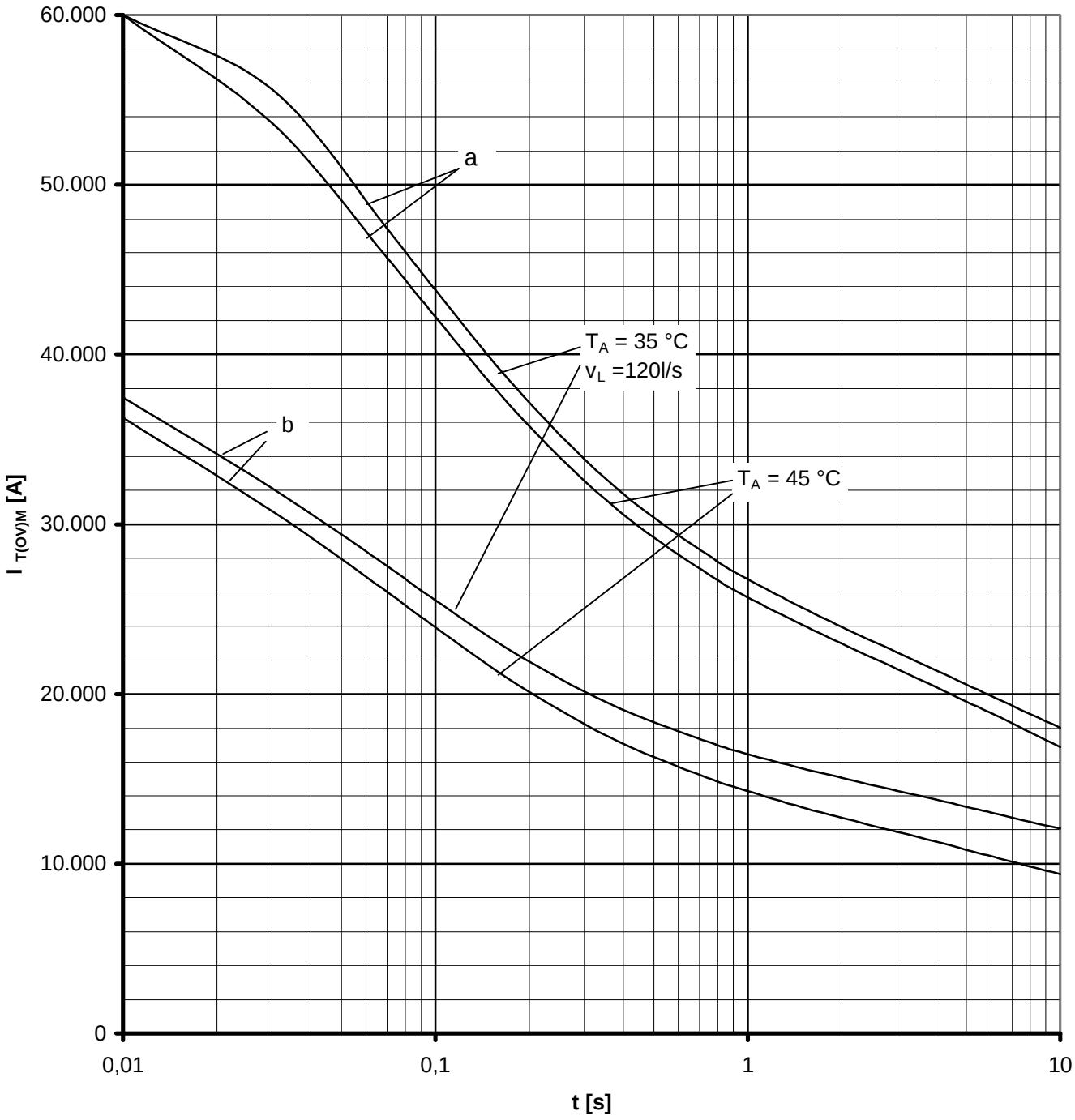
Parameter: Vorlaststrom / pre-load current $I_{TAV(vor)}$, Spieldauer / cycle duration SD



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

Beidseitig verstärkte Kühlung / forced two-sided cooling K 0.048F
T_A = 35 °C, V_L = 120 l/s

Parameter: Vorlaststrom / pre-load current ITAV(vor) , Spieldauer / cycle duration SD



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

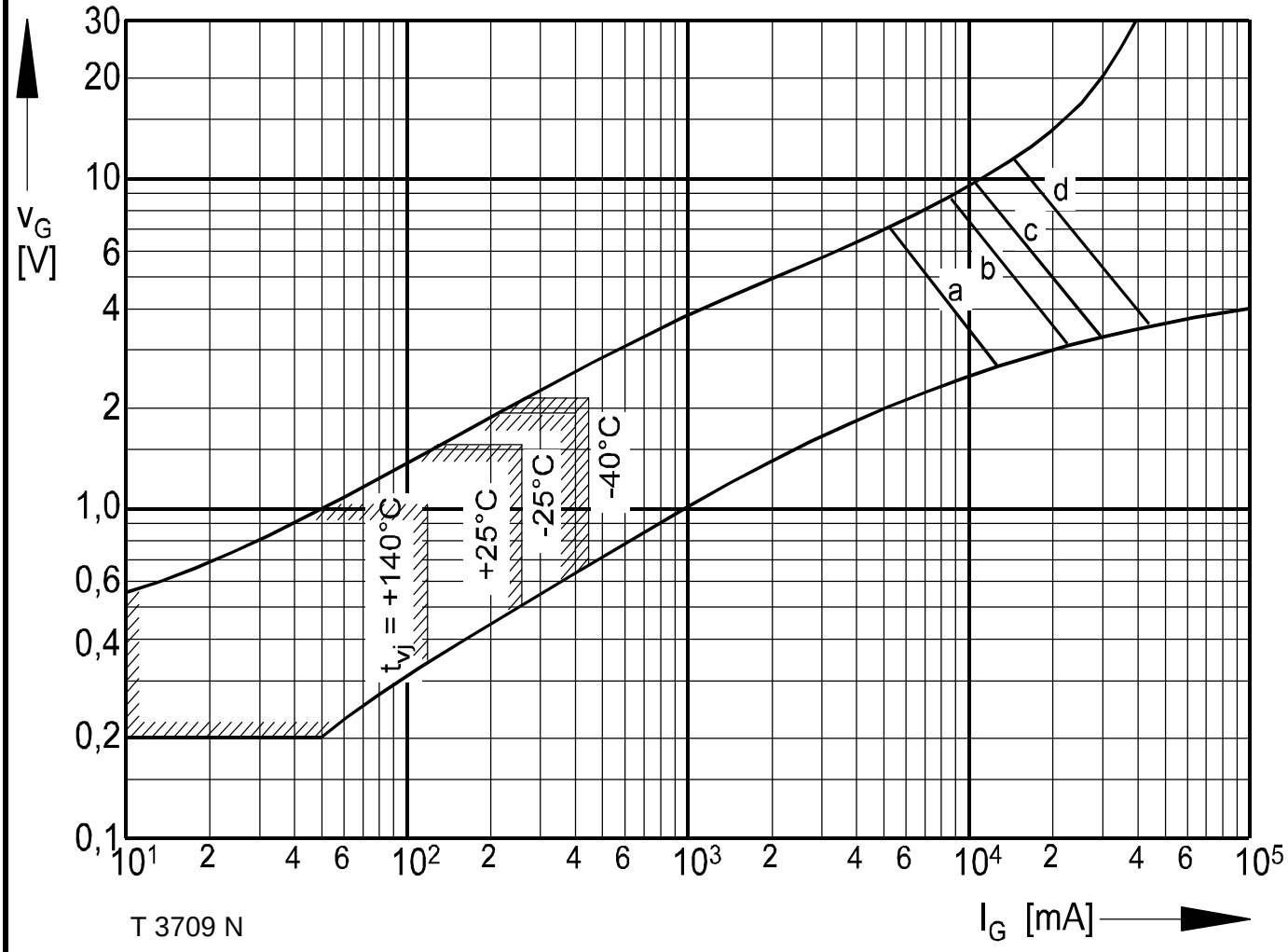
Beidseitige Kühlung / Two-sided cooling

Kühlkörper / Heatsink: K 0.048F

Belastung aus / Surge current occurs:

a - Leerlauf / No-load conditions

b - Betrieb mit Dauergrenzstrom / During operation at max. average on-state current I_{TAVM}

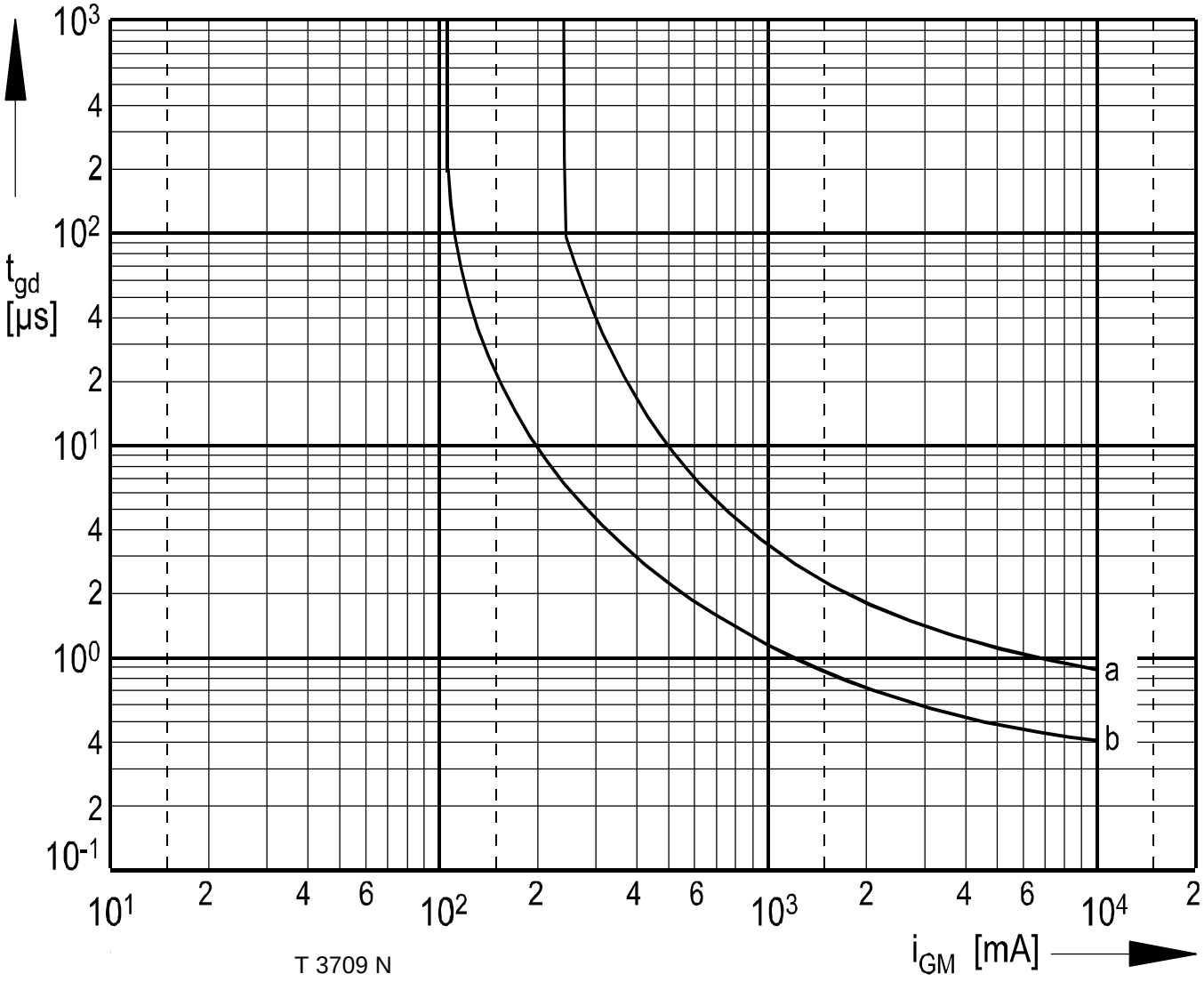


T 3709 N

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 disspation $P_{GM} = f(t_g)$:

a - 40 W/10ms b - 80 W/1ms c - 100 W/0,5ms d - 150 W/0,1ms

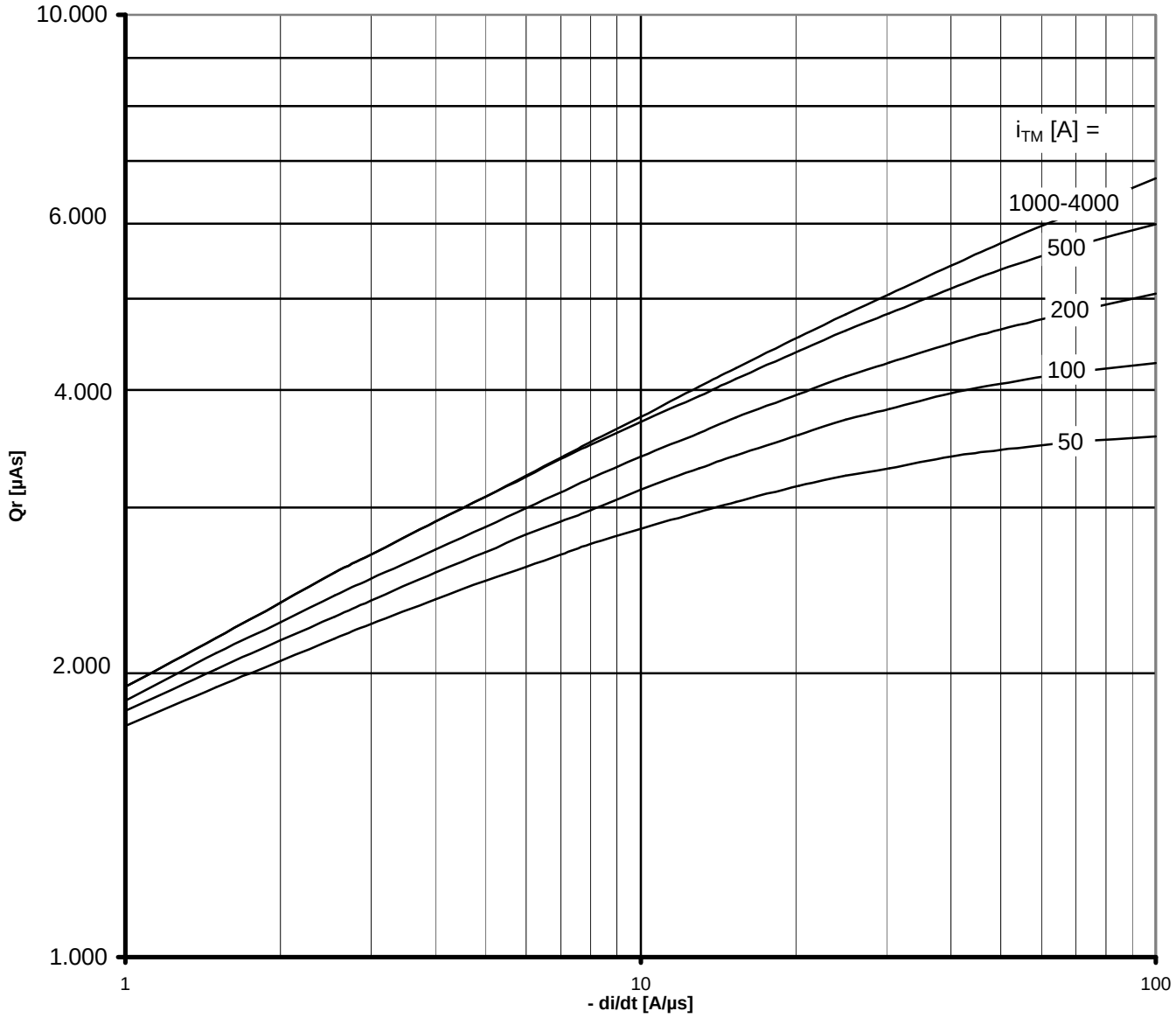


Zündverzug / Gate controlled delay time $t_{gd} = f(i_{GM})$

T_{vj} = 25°C, $di_G/dt = i_{GM}/1\mu s$

a - maximaler Verlauf / limiting characteristic

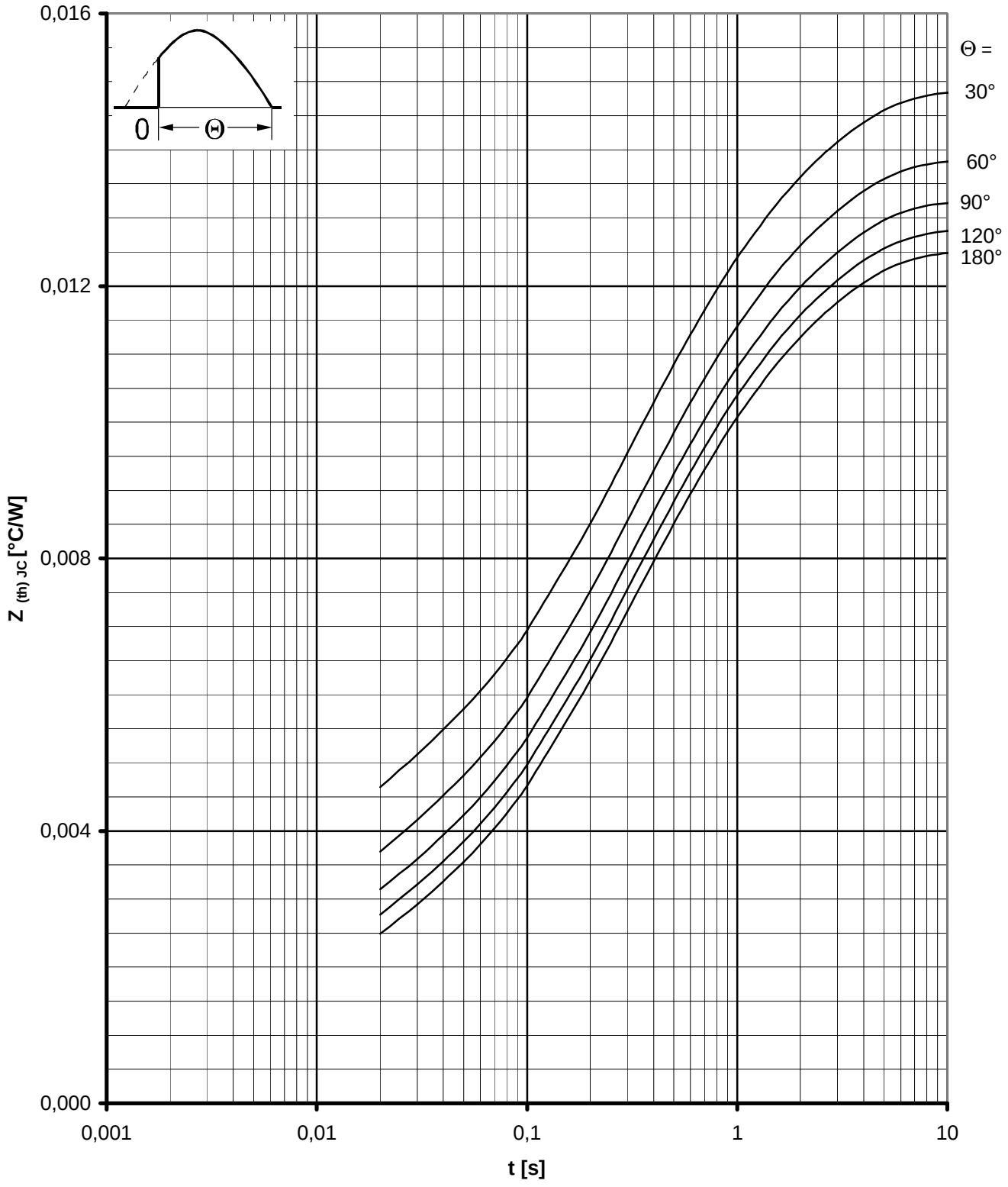
b - typischer Verlauf / typical characteristic



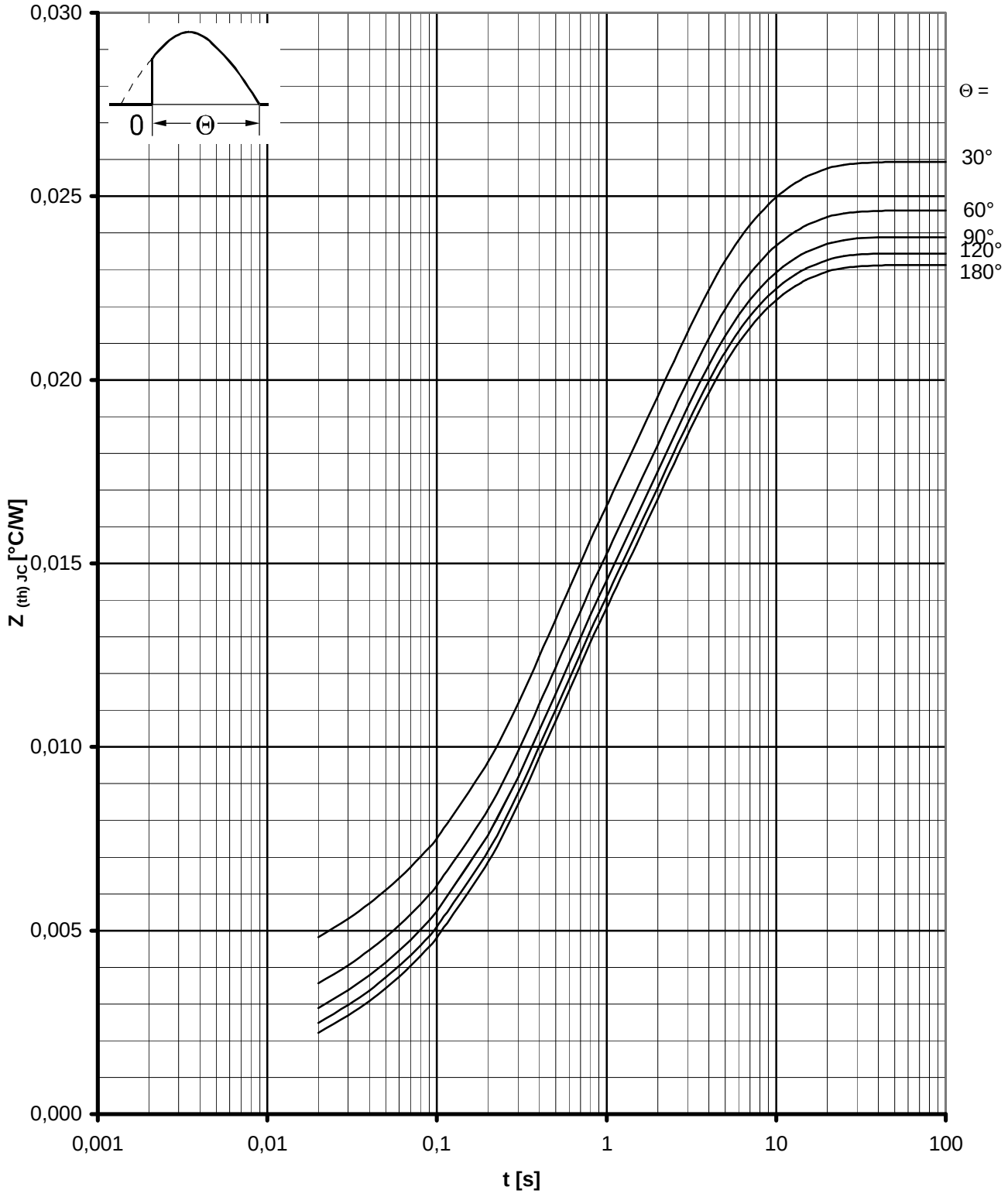
Sperrverzögerungsladung / Recovered charge $Q_r = f(di/dt)$

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

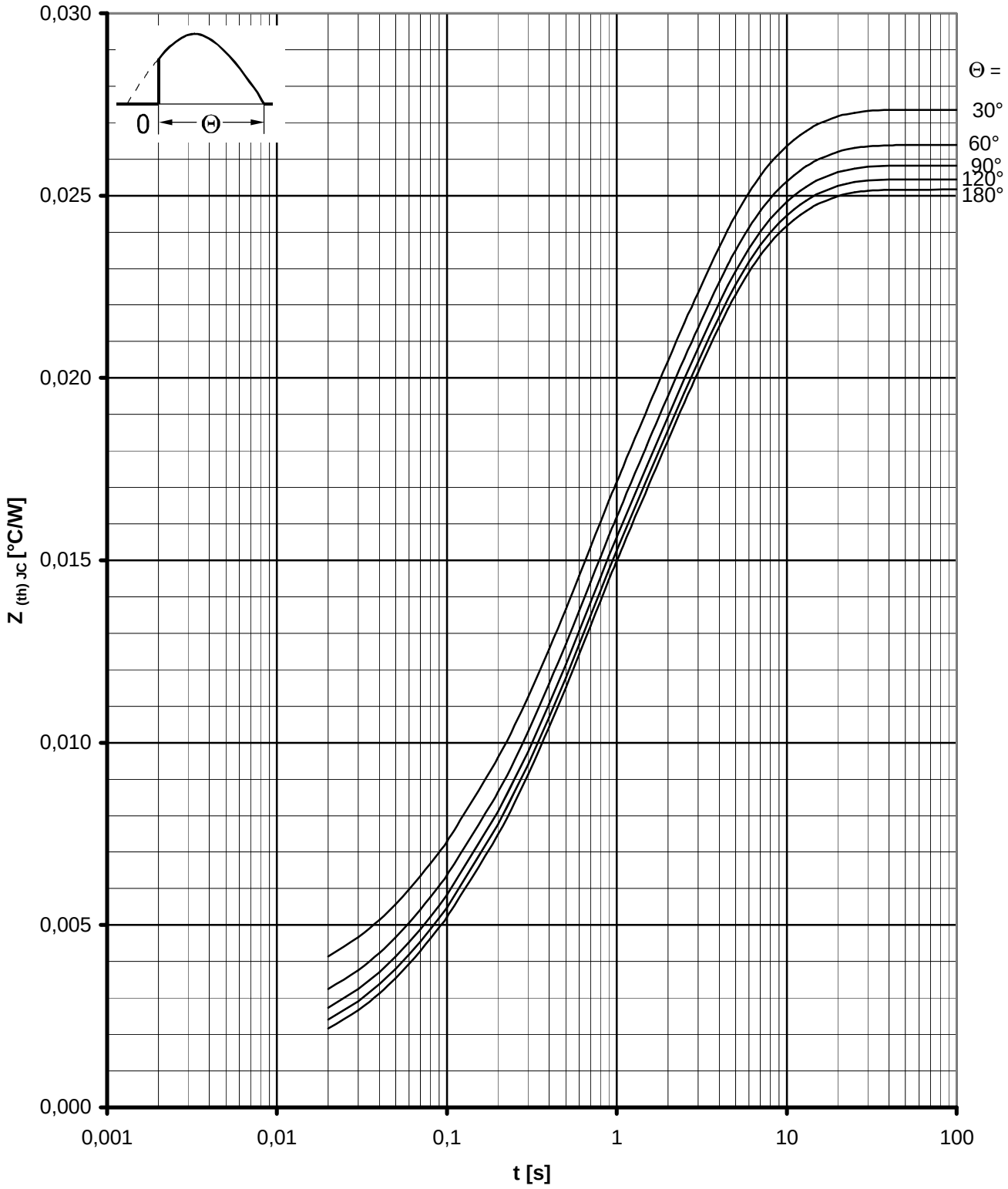
Parameter: Durchlaßstrom / On-state current i_{TM}



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



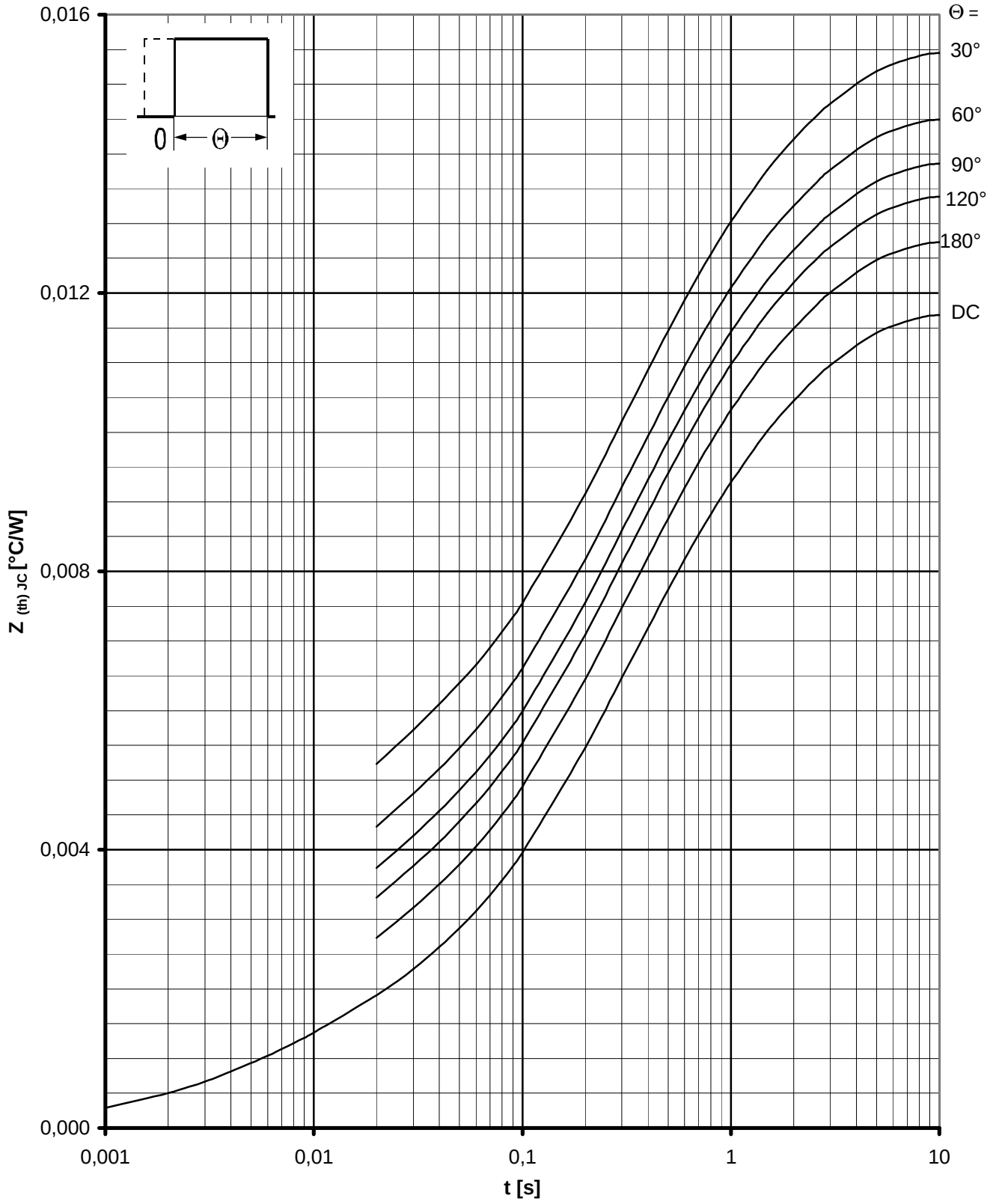
Transienter innerer Wärmewiderstand / Transient thermal impedance $Z_{(th)JC} = f(t)$
Anodenseitige Kühlung / Anode-sided sided cooling
Parameter: Stromflußwinkel Θ / current conduction angle Θ



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

Kathodenseitige Kühlung / Cathde-sided cooling

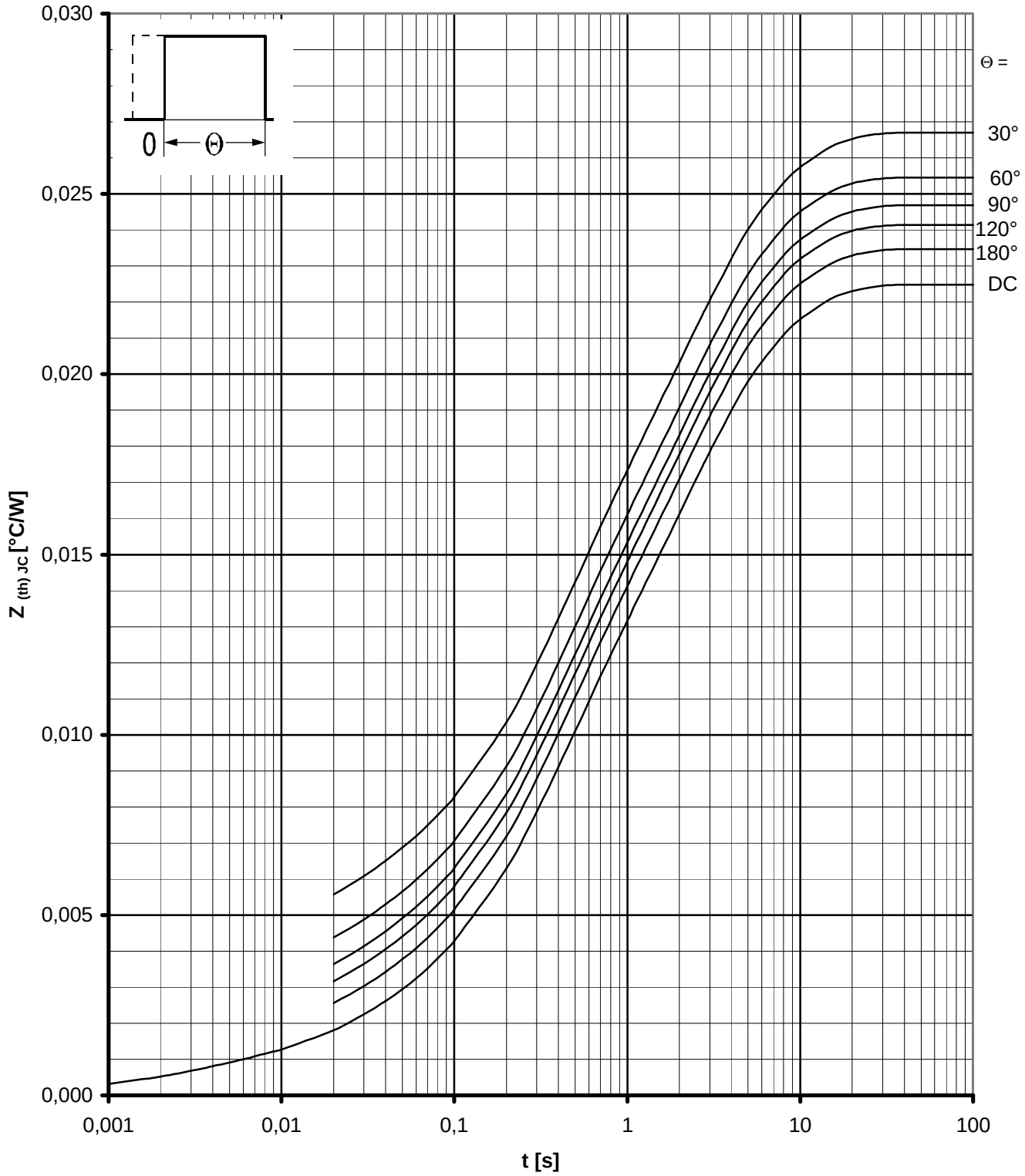
Parameter: Stromflußwinkel Θ / current conduction angle Θ



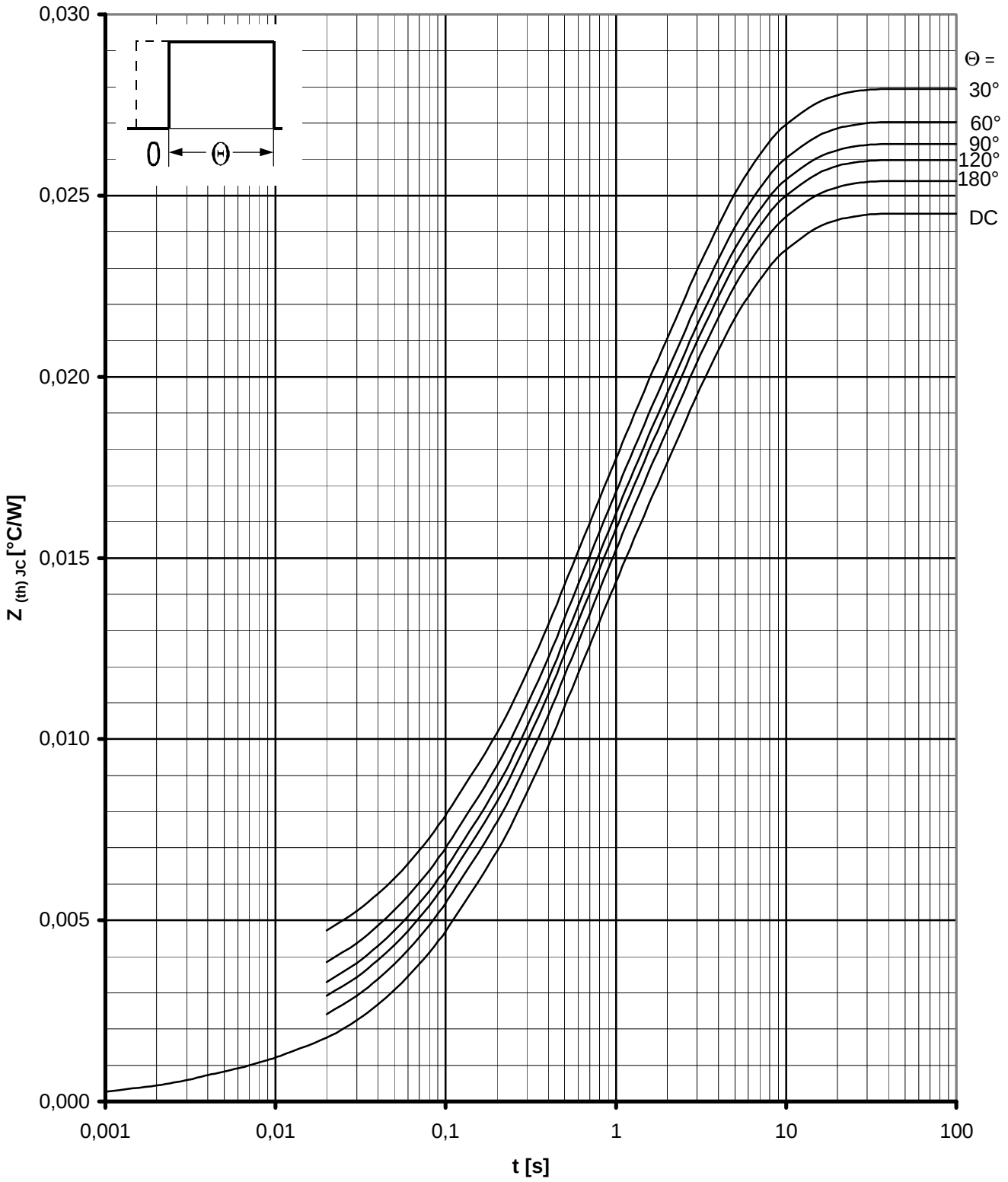
Transienter innerer Wärmewiderstand / Transient thermal impedance $Z_{(th)JC} = f(t)$

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