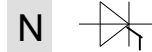


# Technische Information / Technical Information

**eupec**

NETZ-1 thyristor  
Phase Control Thyristor

## T 1329 N 18...22



Elektrische Eigenschaften / Electrical properties

Vorläufige Daten

Höchstzulässige Werte / Maximum rated values

Preliminary Data

Periodische Vorwärts- und Rückwärts-Spitzensperrspannung repetitive peak forward off-state and reverse voltages	$T_{vj} = -40^{\circ}\text{C} \dots T_{vj\text{max}}$	$V_{\text{DRM}}, V_{\text{RRM}}$	1800, 2000 2200	V V
Vorwärts-Stoßspitzensperrspannung non-repetitive peak forward off-state voltage	$T_{vj} = -40^{\circ}\text{C} \dots T_{vj\text{max}}$	$V_{\text{DSM}}$	1800, 2000 2200	V V
Rückwärts-Stoßspitzensperrspannung non-repetitive peak reverse voltage	$T_{vj} = +25^{\circ}\text{C} \dots T_{vj\text{max}}$	$V_{\text{RSM}}$	1900, 2100 2300	V V
Durchlaßstrom-Grenzeffektivwert RMSM on-state current		$I_{\text{TRSMMSM}}$	2600	A
Dauergrenzstrom average on-state current	$T_{\text{C}} = 85^{\circ}\text{C}$ $T_{\text{C}} = 70^{\circ}\text{C}$	$I_{\text{TAVM}}$	1329 1655	A A
Stoßstrom-Grenzwert surge current	$T_{vj} = 25^{\circ}\text{C}, t_p = 10\text{ms}$ $T_{vj} = T_{vj\text{max}}, t_p = 10\text{ms}$	$I_{\text{TSM}}$	26500 23000	A A
Grenzlastintegral $I^2t$ -value	$T_{vj} = 25^{\circ}\text{C}, t_p = 10\text{ms}$ $T_{vj} = T_{vj\text{max}}, t_p = 10\text{ms}$	$I^2t$	3510 2645	$\text{A}^2\text{s} \cdot 10^3$ $\text{A}^2\text{s} \cdot 10^3$
Kritische Stromsteilheit critical rate of rise of on-state current	DIN IEC 747-6 $f=50\text{Hz}, v_L = 10\text{V}, i_{\text{GM}} = 1\text{A}$ $di_{\text{G}}/dt = 1\text{A}/\mu\text{s}$	$(di_{\text{T}}/dt)_{\text{cr}}$	200	$\text{A}/\mu\text{s}$
Kritische Spannungssteilheit critical rate of rise of off-state voltage	$T_{vj} = T_{vj\text{max}}, v_{\text{D}} = 0,67 V_{\text{DRM}}$ 5.Kennbuchstabe / 5th letter F	$(dv_{\text{D}}/dt)_{\text{cr}}$	1000	$\text{V}/\mu\text{s}$

Charakteristische Werte / Characteristic values

Durchlaßspannung on-state voltage	$T_{vj} = T_{vj\text{max}}, i_{\text{T}} = 3000\text{A}$ $T_{vj} = T_{vj\text{max}}, i_{\text{T}} = 1000\text{A}$	$v_{\text{T}}$	max. 1,65 max. 1,13	V V
Schleusenspannung threshold voltage	$T_{vj} = T_{vj\text{max}}$	$V_{\text{T(TO)}}$	0,9	V
Ersatzwiderstand slope resistance	$T_{vj} = T_{vj\text{max}}$	$r_{\text{T}}$	0,234	$\text{m}\Omega$
Durchlaßkennlinie on-state voltage $v_{\text{T}} = A + B \times i_{\text{T}} + C \times \ln(i_{\text{T}} + 1) + D \times \sqrt{i_{\text{T}}}$	$T_{vj} = T_{vj\text{max}}$	A B C D	0,9012 1,89E-4 -2,256E-2 0,006587	
Zündstrom gate trigger current	$T_{vj} = 25^{\circ}\text{C}, v_{\text{D}} = 6\text{V}$	$I_{\text{GT}}$	max. 250	mA
Zündspannung gate trigger voltage	$T_{vj} = 25^{\circ}\text{C}, v_{\text{D}} = 6\text{V}$	$V_{\text{GT}}$	max. 2,2	V
Nicht zündener Steuerstrom gate non-trigger current	$T_{vj} = T_{vj\text{max}}, v_{\text{D}} = 6\text{V}$ $T_{vj} = T_{vj\text{max}}, v_{\text{D}} = 0,5 V_{\text{DRM}}$	$I_{\text{GD}}$	max. 10 max. 5	mA mA
Nicht zündene Steuerspannung gate non-trigger voltage	$T_{vj} = T_{vj\text{max}}, v_{\text{D}} = 0,5 V_{\text{DRM}}$	$V_{\text{GD}}$	max. 0,25	mV
Haltestrom holding current	$T_{vj} = 25^{\circ}\text{C}, v_{\text{D}} = 6\text{V}, R_{\text{A}} = 5\Omega$	$I_{\text{H}}$	max. 300	mA
Einraststrom latching current	$T_{vj} = 25^{\circ}\text{C}, v_{\text{D}} = 6\text{V}, R_{\text{GK}} \geq 10\Omega$ $i_{\text{GM}} = 1\text{A}, di_{\text{G}}/dt = 1\text{A}/\mu\text{s}$ $t_{\text{G}} = 20\mu\text{s}$	$I_{\text{L}}$	max. 1200	mA
Vorwärts- und Rückwärts-Sperrstrom forward off-state and reverse currents	$T_{vj} = T_{vj\text{max}}$ $v_{\text{D}} = V_{\text{DRM}}, v_{\text{R}} = V_{\text{RRM}}$	$i_{\text{D}}, i_{\text{R}}$	max. 150	mA
Zündverzug gate controlled delay time	DIN IEC 747-6 $T_{vj} = 25^{\circ}\text{C}$ $i_{\text{GM}} = 1\text{A}, di_{\text{G}}/dt = 1\text{A}/\mu\text{s}$	$t_{\text{gd}}$	max. 4	$\mu\text{s}$

# Technische Information / Technical Information

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NETZ-1 thyristor  
Phase Control Thyristor

## T 1329 N 18...22



### Elektrische Eigenschaften / Electrical properties

Vorläufige Daten

Charakteristische Werte / Characteristic values

Preliminary Data

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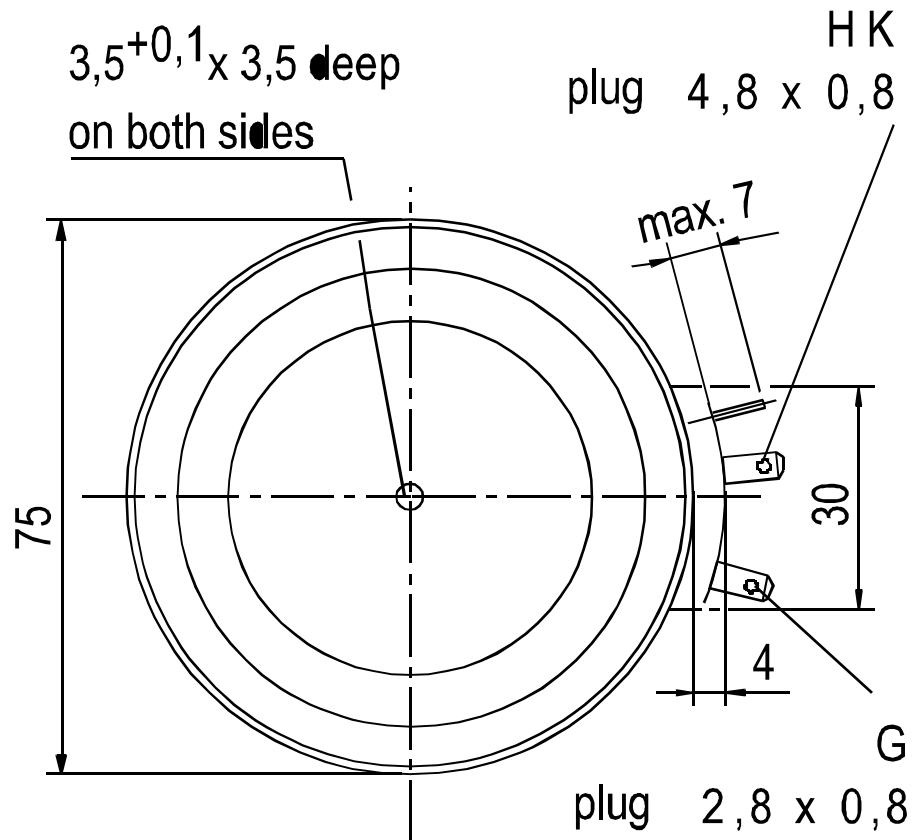
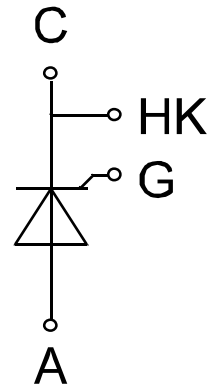
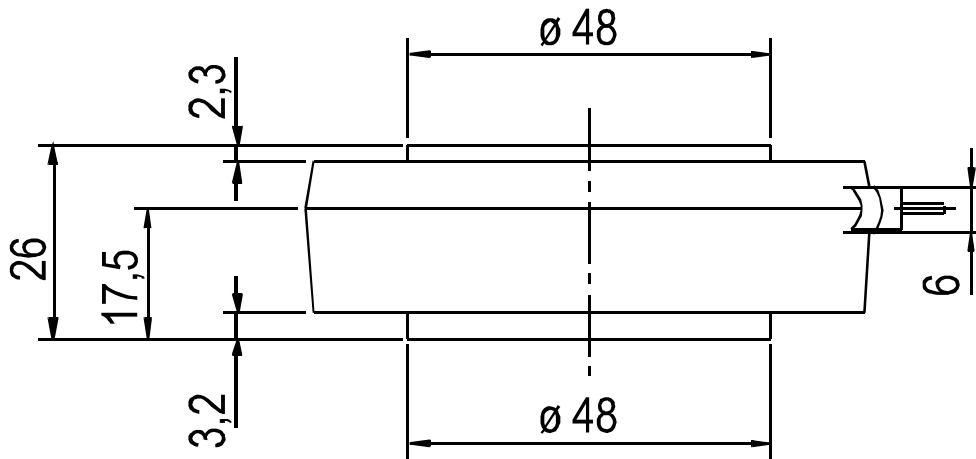
### Thermische Eigenschaften / Thermal properties

Innerer Wärmewiderstand thermal resistance, junction to case	Kühlfläche / cooling surface beidseitig / two-sided, $\square=180^\circ\sin$ beidseitig / two-sided, DC Anode / anode, $\square=180^\circ\sin$ Anode / anode, DC Kathode / cathode, $\square=180^\circ\sin$ Kathode / cathode, DC	$R_{thJC}$	max. 0,0184 max. 0,0170 max. 0,0344 max. 0,0330 max. 0,0364 max. 0,0350	$^\circ C/W$ $^\circ C/W$ $^\circ C/W$ $^\circ C/W$ $^\circ C/W$ $^\circ C/W$
Übergangs- Wärmewiderstand thermal resistance, case to heatsink	Kühlfläche / cooling surface beidseitig / two-sided einseitig / single-sided	$R_{thJK}$	max. 0,0025 max. 0,0050	$^\circ C/W$ $^\circ C/W$
Höchstzulässige Sperrschichttemperatur max. junction temperature		$T_{vj\max}$	125	$^\circ C$
Betriebstemperatur operating temperature		$T_{c\ op}$	-40...125	$^\circ C$
Lagertemperatur storage temperature		$T_{stg}$	-40...150	$^\circ C$

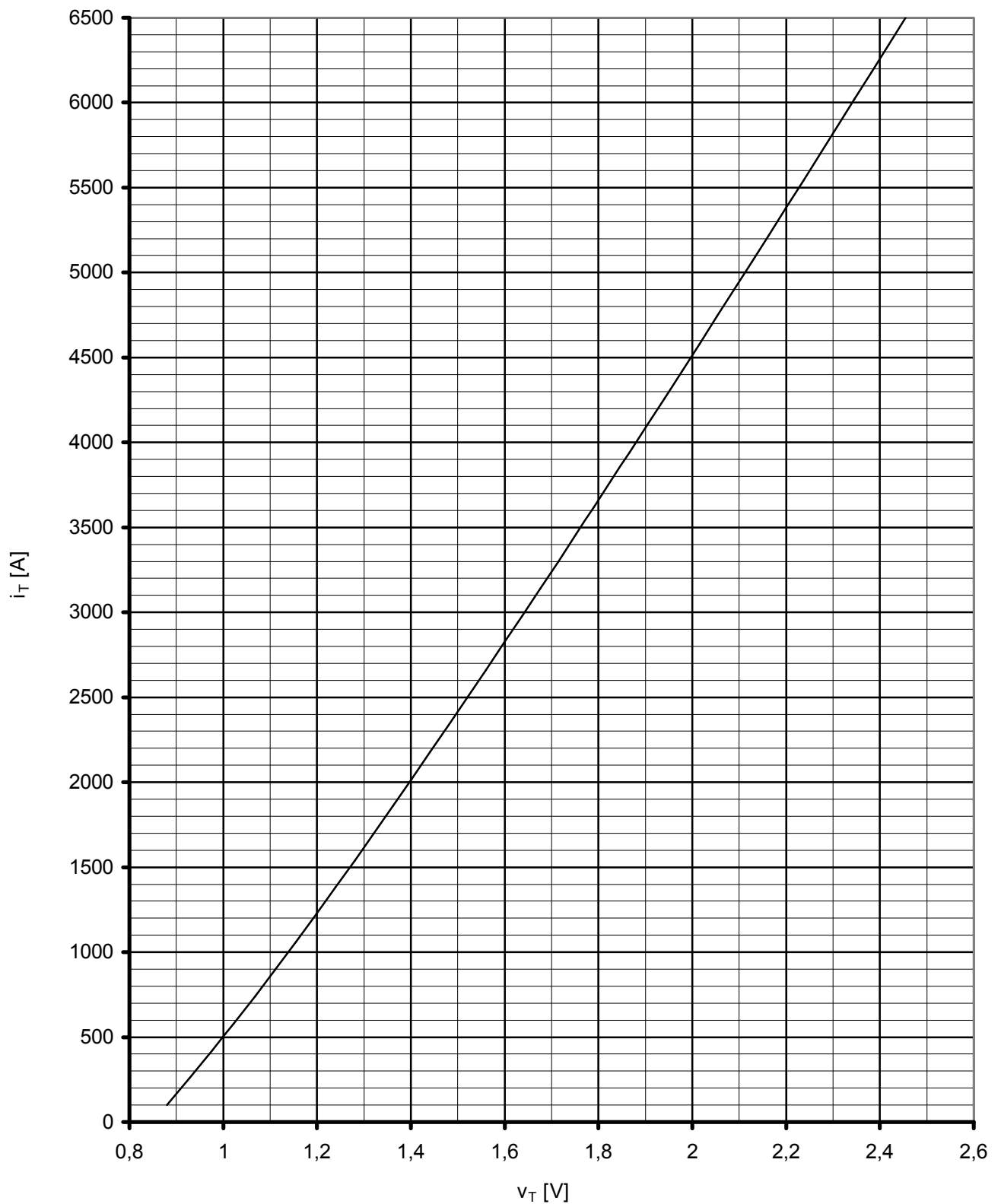
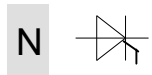
### Mechanische Eigenschaften / Mechanical properties

Gehäuse, siehe Anlage case, see appendix			Seite 3 page 3	
Si-Element mit Druckkontakt, Amplying-Gate Si-pellet with pressure contact, amplifying gate				
Anpreßkraft clamping force		F	20 ...45	kN
Gewicht weight		G	typ. 540	g
Kriechstrecke creepage distance			32	mm
Feuchteklasse humidity classification	DIN 40040		C	
Schwingfestigkeit vibration resistance	f = 50Hz		50	$m/s^2$

Mit dieser technischen Information werden Halbleiterbauelemente spezifiziert, jedoch keine Eigenschaften zugesichert. Sie gilt in Verbindung mit den zugehörigen Technischen Erläuterungen./ The technical information specifies semiconductor devices but promises no characteristics. It is valid in combination with the belonging technical notes.

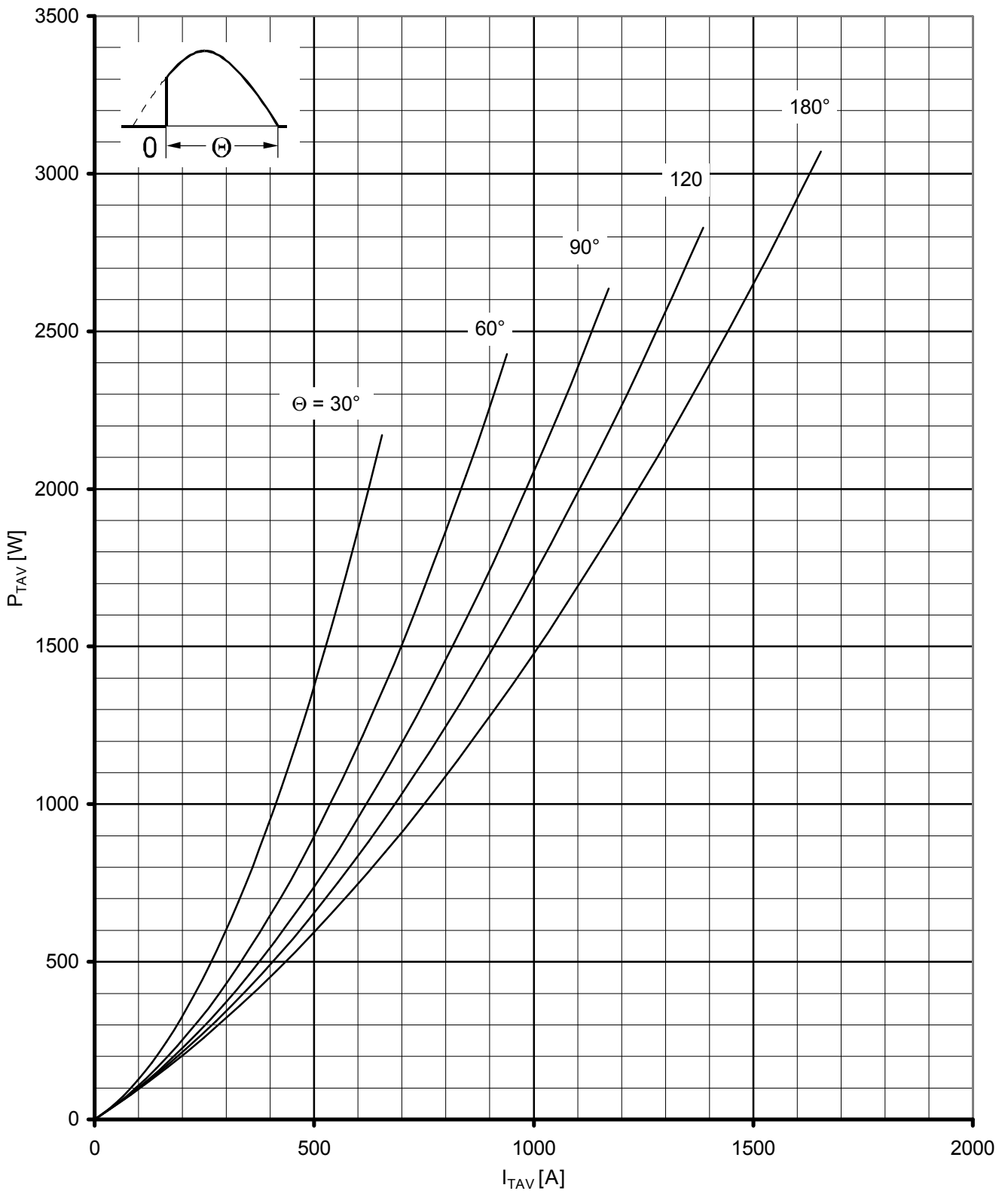


Kühlung cooling	Analytische Elemente des transienten Wärmewiderstandes $Z_{thJC}$ für DC Analytical elements of transient thermal impedance $Z_{thJC}$ for DC							
	Pos.n	1	2	3	4	5	6	7
beidseitig two-sided	$R_{thn}$ [°C/W]	0,00022	0,0011	0,00102	0,00283	0,00608	0,00575	
	$\tau_n$ [s]	0,00136	0,00306	0,0139	0,0662	0,512	1,49	
anodenseitig anode-sided	$R_{thn}$ [°C/W]	0,00065	0,0019	0,00239	0,00381	0,00425	0,02	
	$\tau_n$ [s]	0,0016	0,0091	0,0791	0,26	1,736	7,21	
kathodenseitig cathode-sided	$R_{thn}$ [°C/W]	0,00055	0,00206	0,00604	0,00551	0,02084		
	$\tau_n$ [s]	0,0014	0,00857	0,154	2,58	7,007		
Analytische Funktion / analytical function : $Z_{thJC} = \sum_{n=1}^{n_{max}} R_{thn} ( 1 - EXP ( - t / \tau_n ) )$								

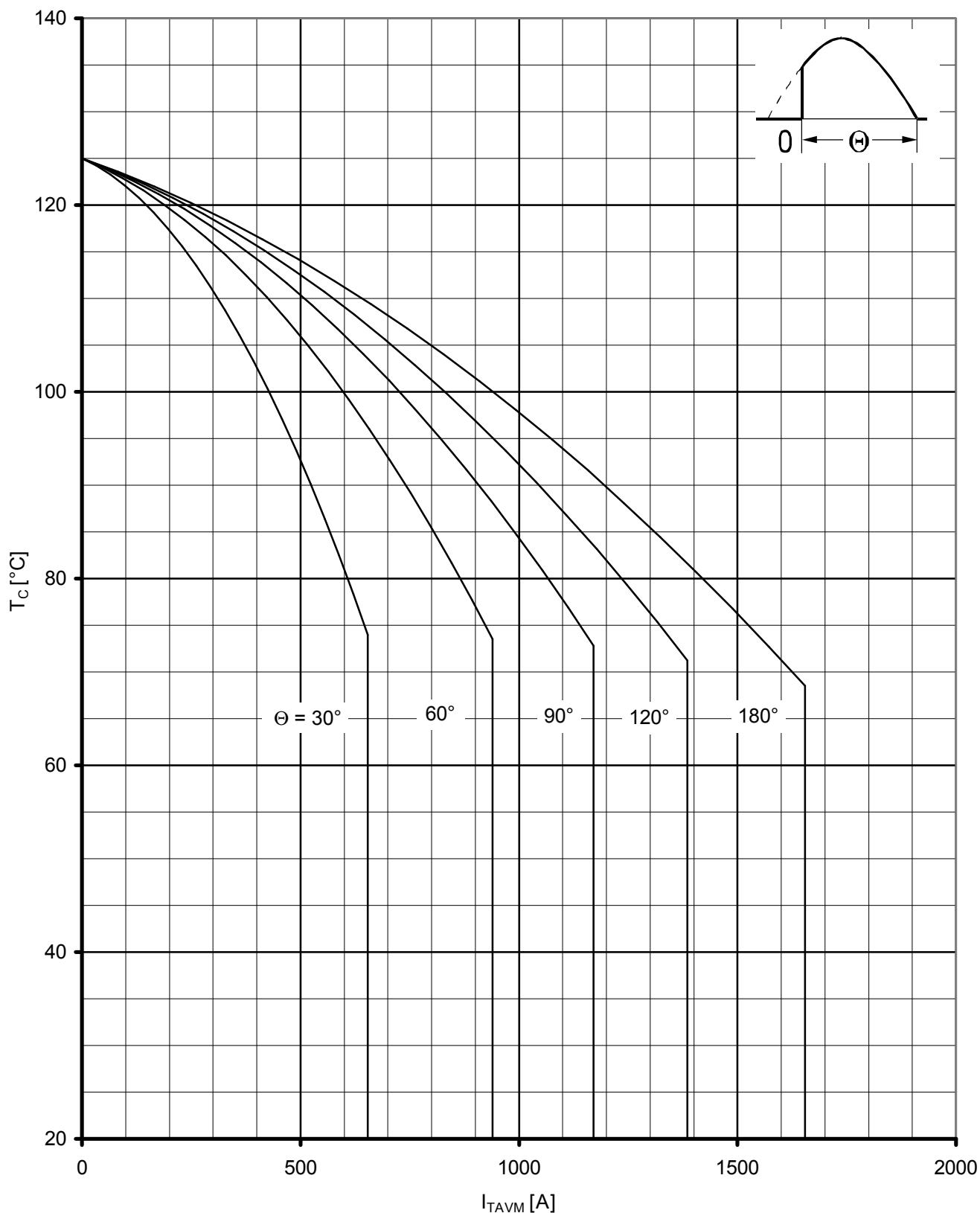


Durchlaßkennlinie / On-state characteristic  $i_T=f(v_T)$

$T_{vj} = T_{vj \max}$



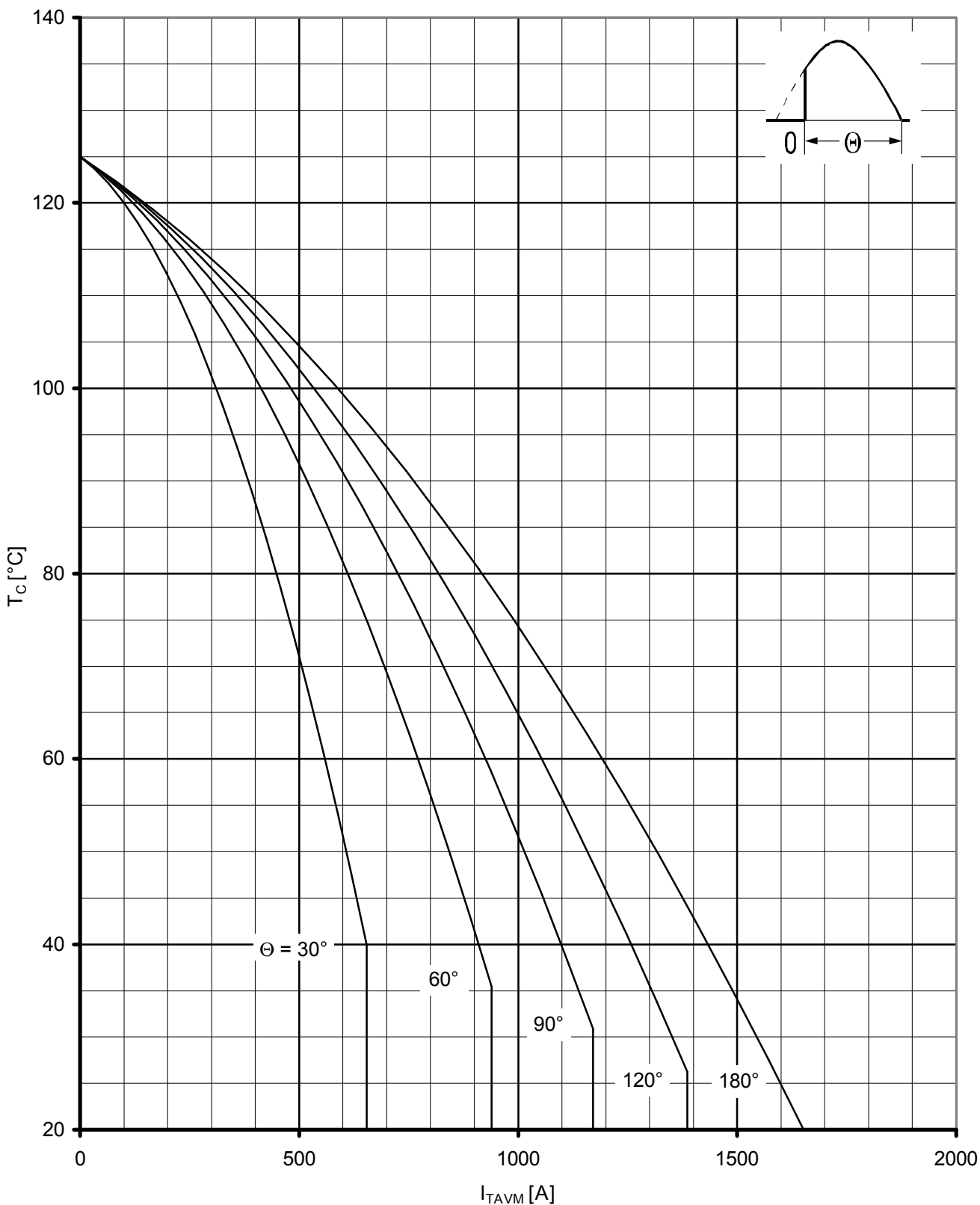
Durchlaßverlustleistung / On-state power loss  $P_{TAV} = f(I_{TAV})$   
Parameter: Stromflußwinkel  $\theta$  / current conduction angle  $\theta$



Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature  $T_c = f(I_{TAVM})$

Beidseitige Kühlung / two sided cooling

Parameter: Stromflußwinkel  $\theta$  / current conduction angle  $\theta$

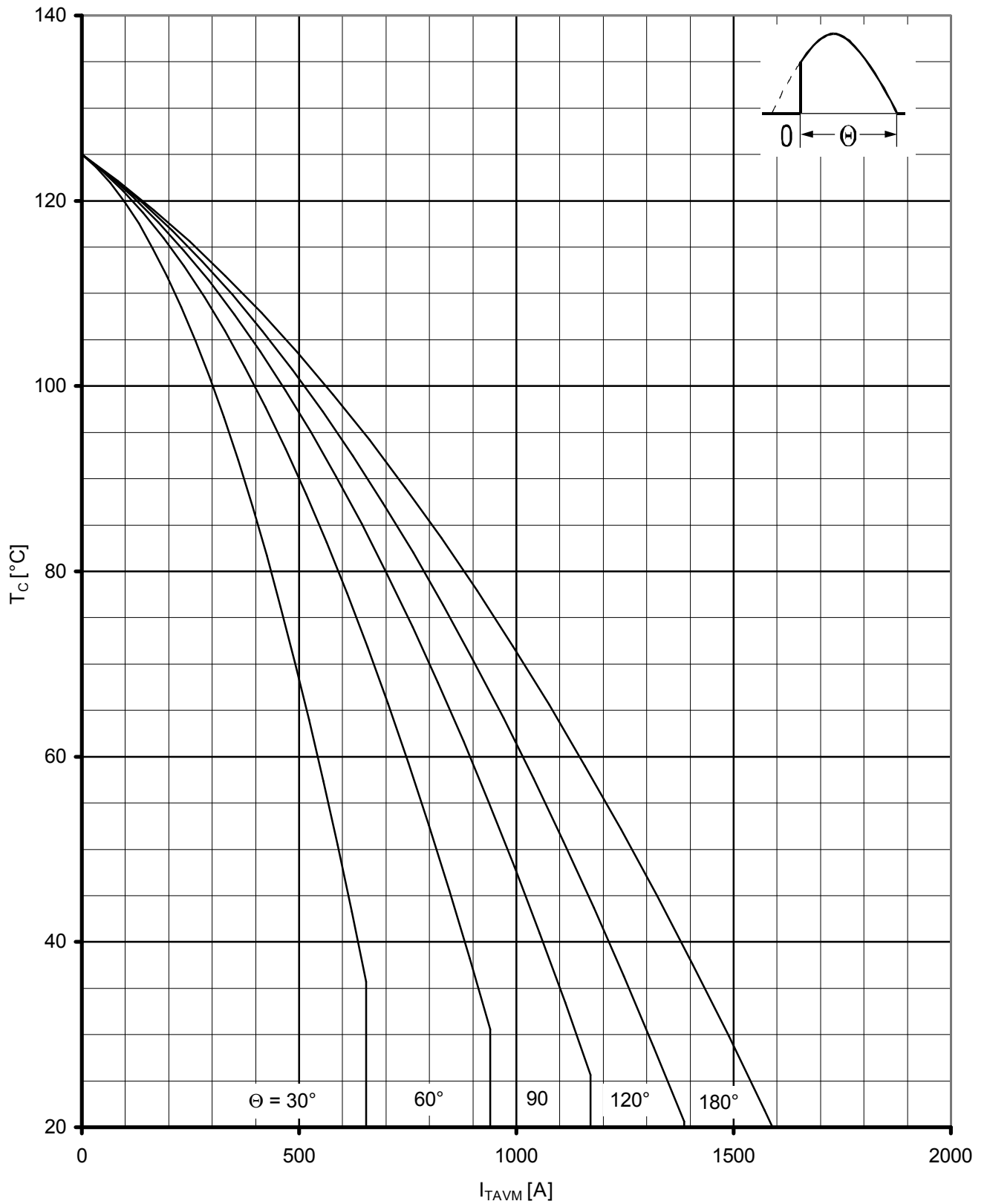


Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature  $T_c = f(I_{TAVM})$

Anodenseitige Kühlung / anode sided cooling

Parameter: Stromflußwinkel  $\theta$  / current conduction angle  $\theta$

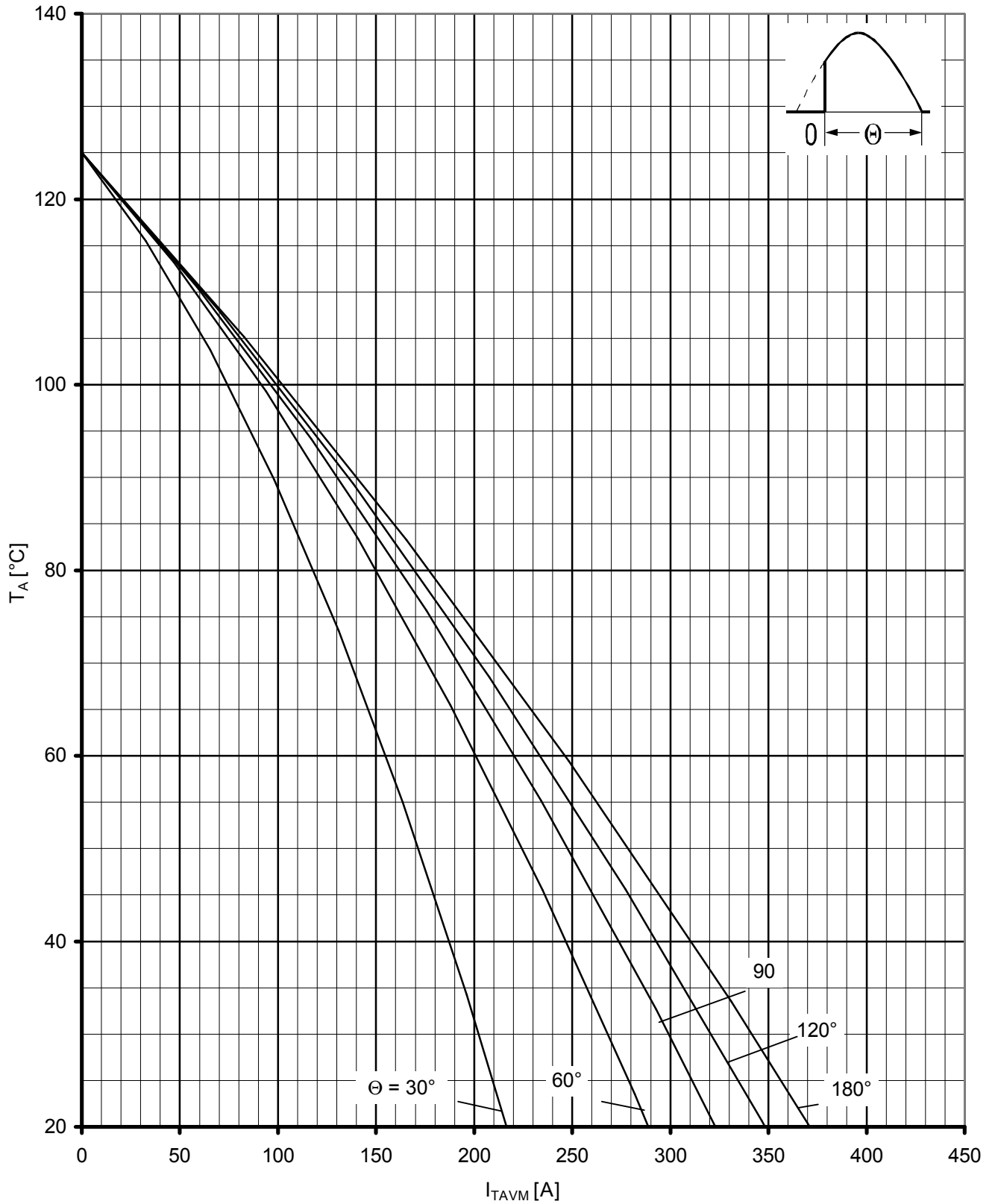




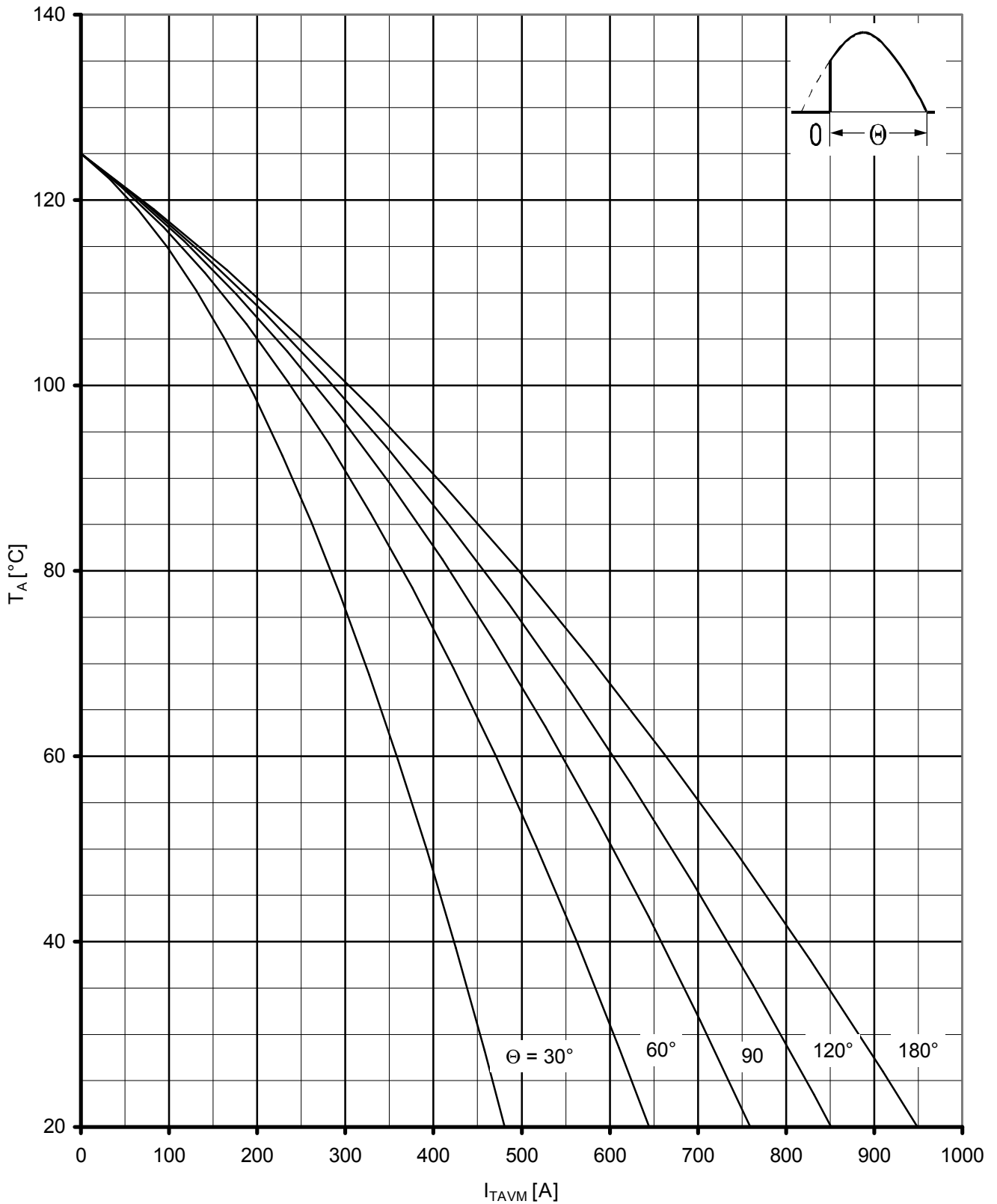
Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature  $T_c = f(I_{TAVM})$

Kathodenseitige Kühlung / cathode sided cooling

Parameter: Stromflußwinkel  $\theta$  / current conduction angle  $\theta$



Höchstzul. Kühlmitteltemperatur / Max. allowable cooling medium temperature  $T_A = f(I_{TAVM})$   
 Beidseitige Luftselbstkühlung / two sided natural cooling K 0,05 F  
 Parameter: Stromflußwinkel  $\theta$  / current conduction angle  $\theta$

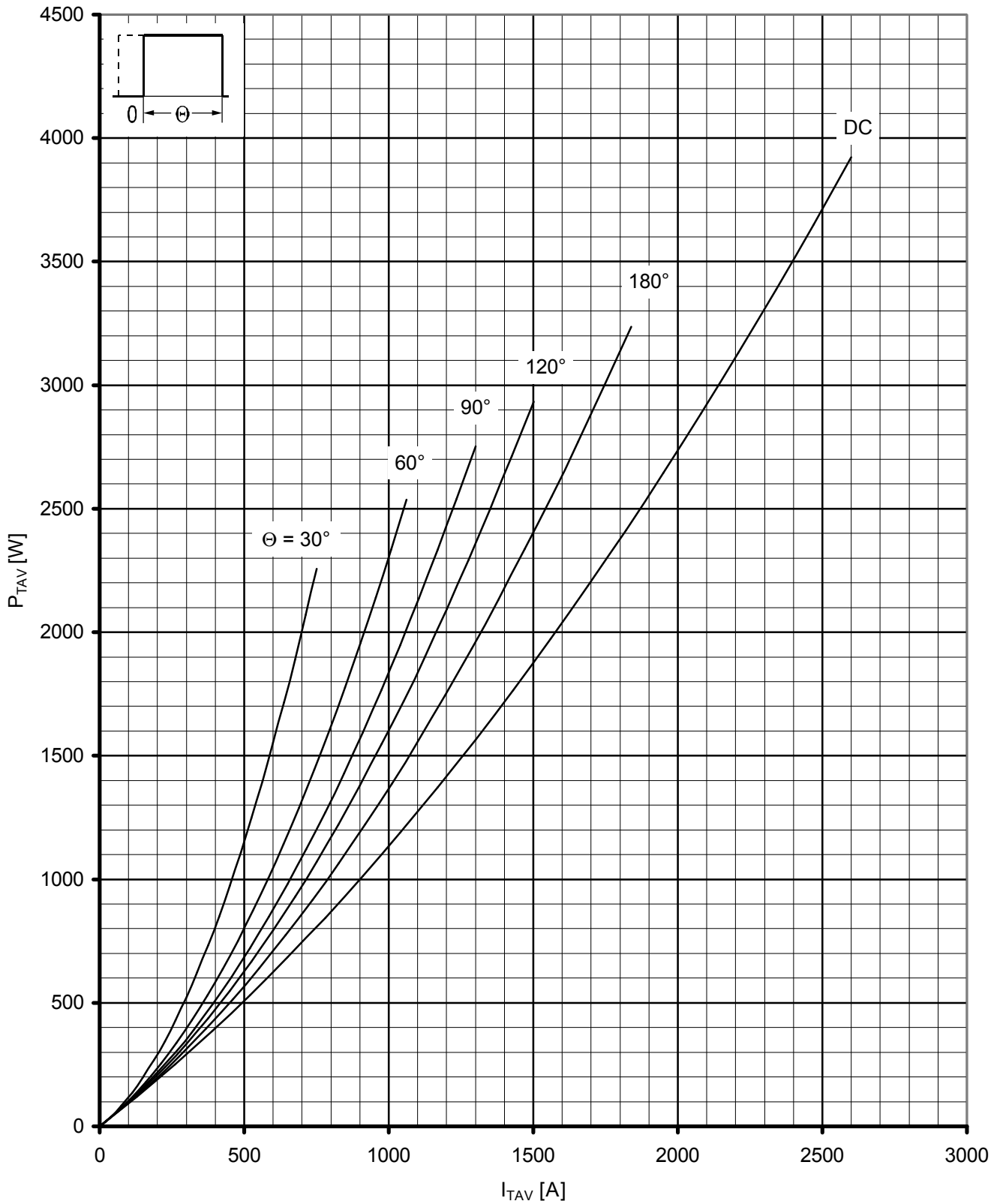


Höchstzul. Kühlmitteltemperatur / Max. allowable cooling medium temperature  $T_A = f(I_{TAVM})$

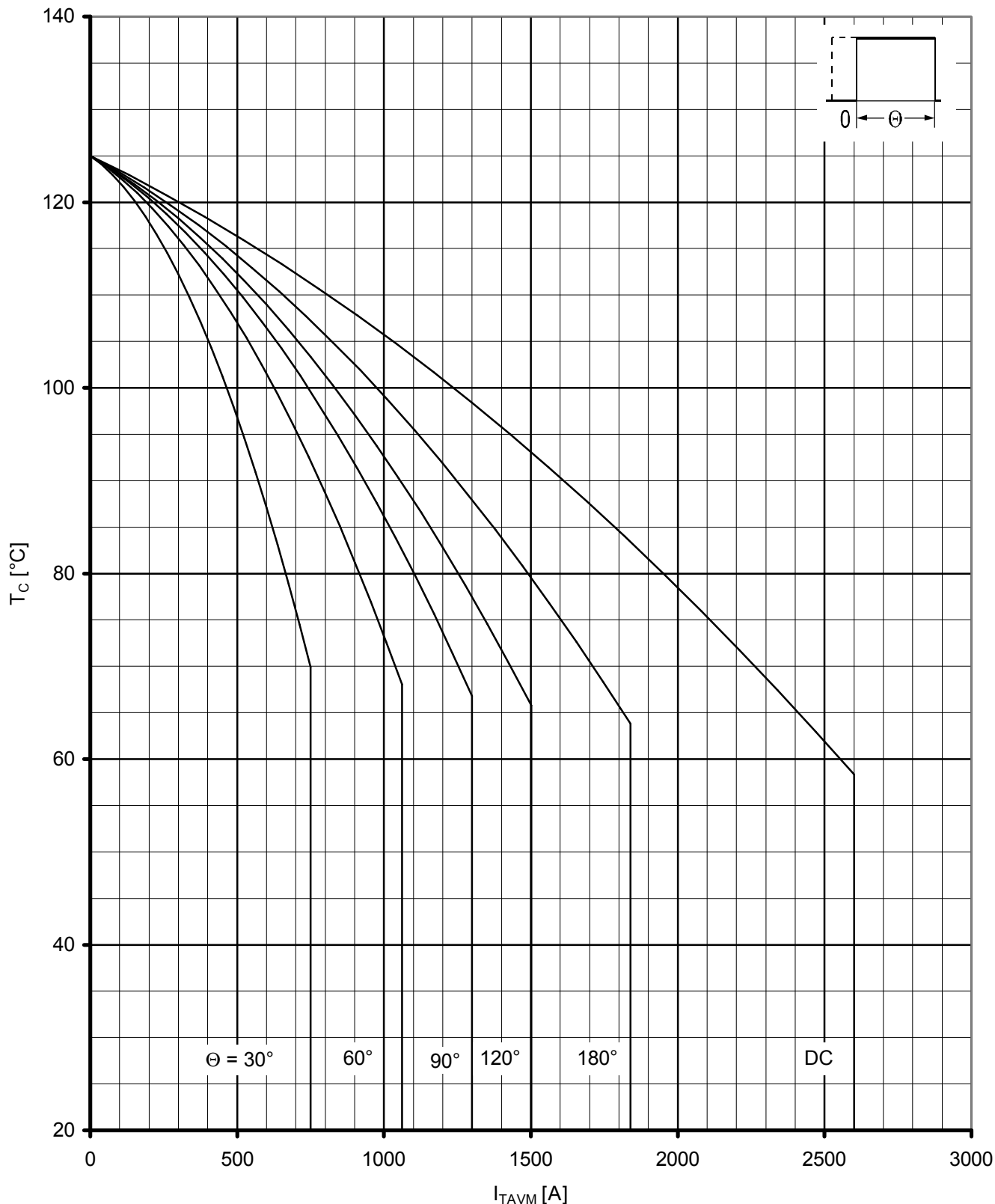
Beidseitige Luftselbstkühlung / two sided natural cooling K 0,05 F

$V_L = 120$  l/s

Parameter: Stromflußwinkel  $\Theta$  / current conduction angle  $\Theta$



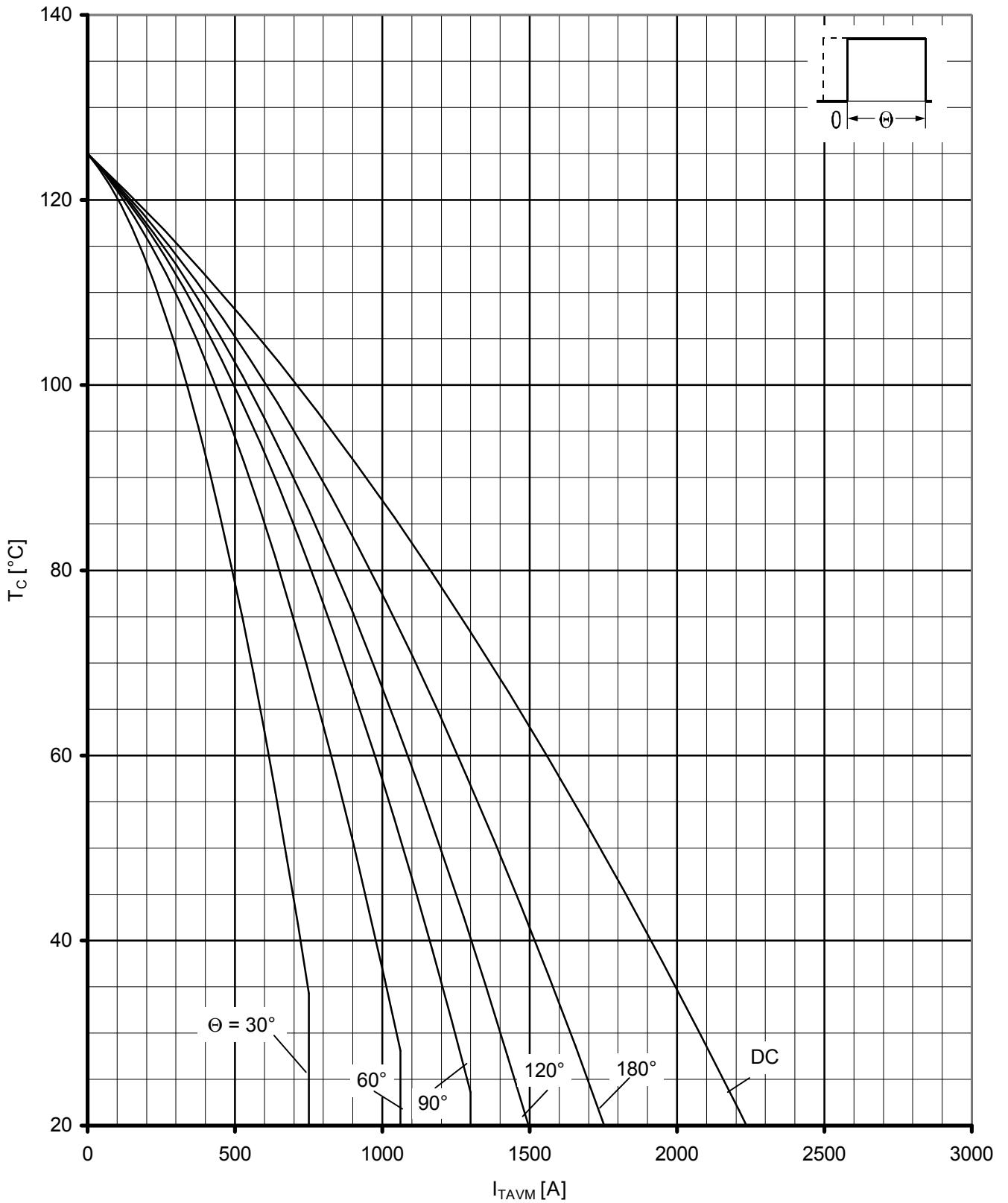
Durchlaßverlustleistung / On-state power loss  $P_{TAV} = f(I_{TAV})$   
Parameter: Stromflußwinkel / current conduction angle  $\theta$



Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature  $T_c = f(I_{TAVM})$

Beidseitige Kühlung / two sided cooling

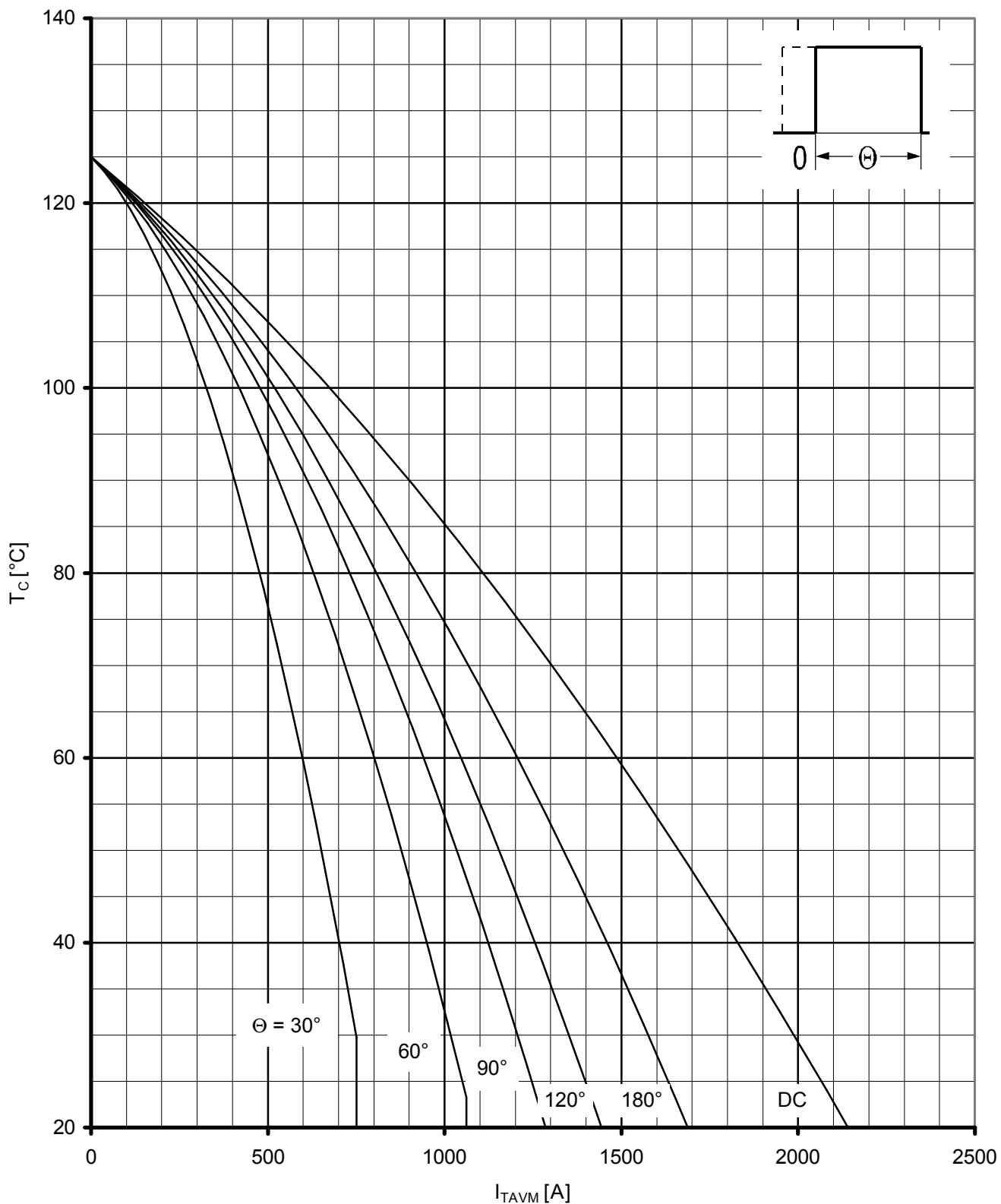
Parameter: Stromflußwinkel  $\theta$  / current conduction angle  $\theta$



Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature  $T_c = f(I_{TAVM})$

Anodenseitige Kühlung / anode sided cooling

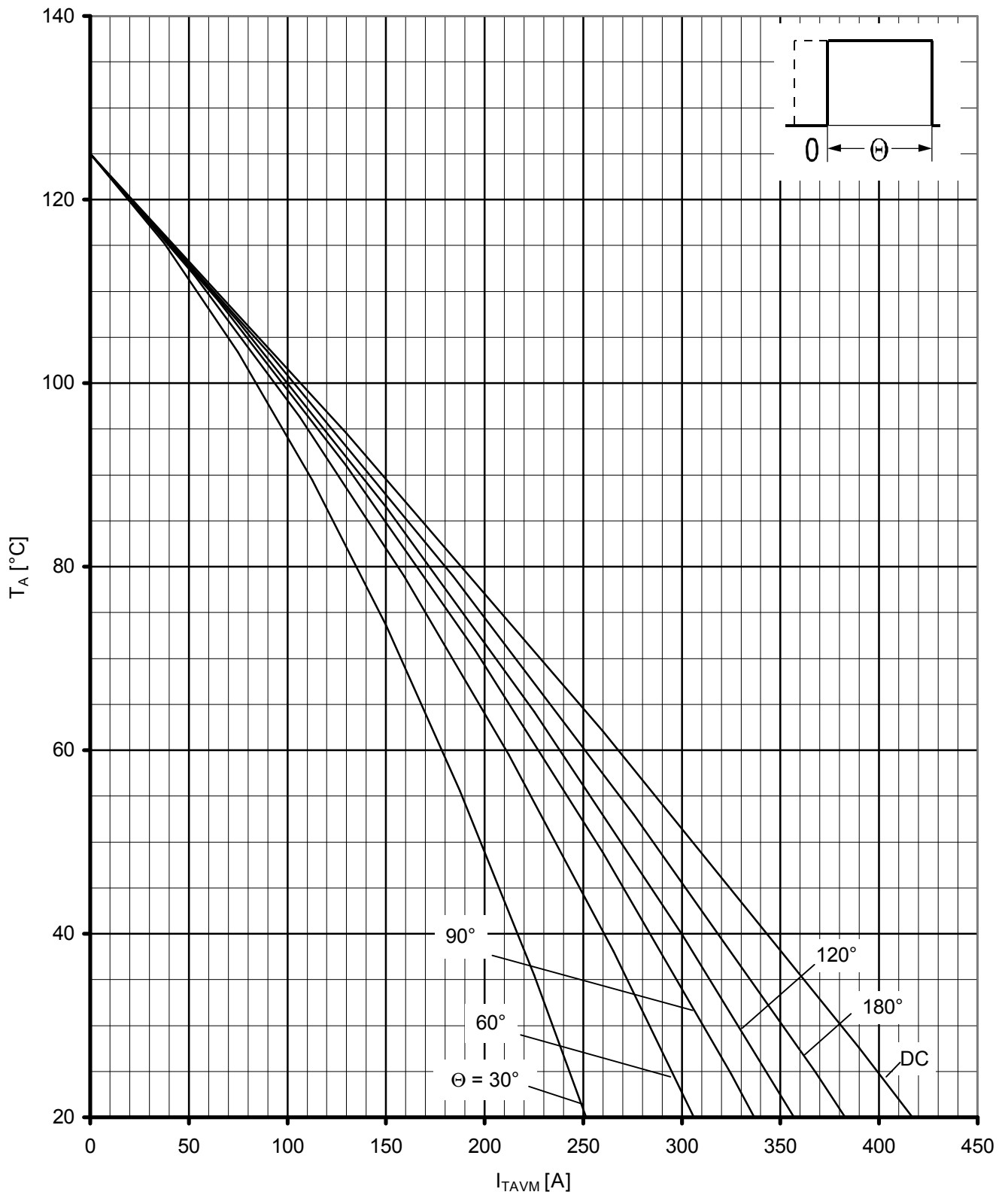
Parameter: Stromflußwinkel  $\theta$  / current conduction angle  $\theta$



Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature  $T_c = f(I_{TAVM})$

Kathodenseitige Kühlung / cathode sided cooling

Parameter: Stromflußwinkel  $\theta$  / current conduction angle  $\theta$

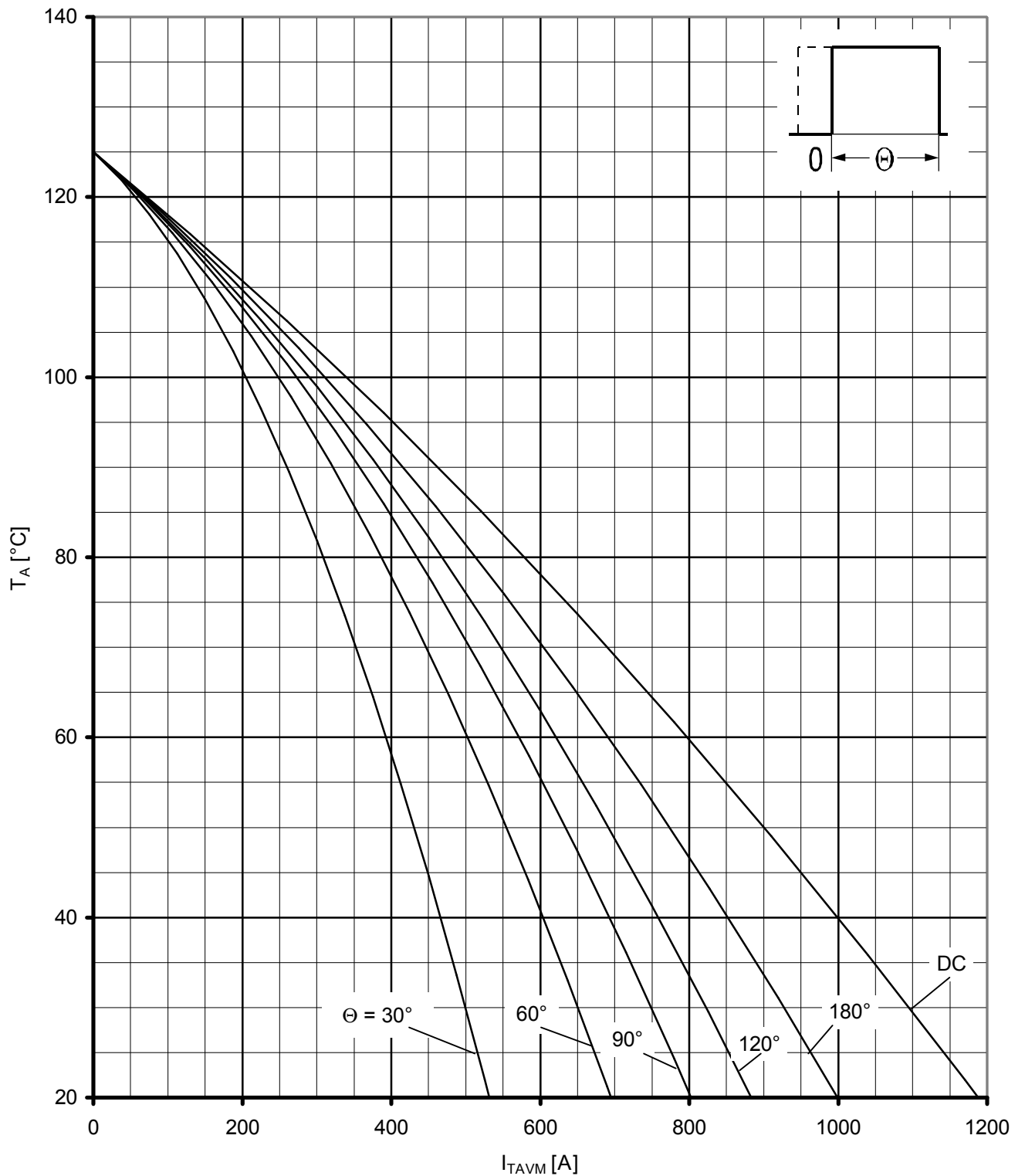


Höchstzul. Kühlmitteltemperatur / Max. allowable cooling medium temperature  $T_A = f(I_{TAVM})$

Beidseitige Luftselbstkühlung / two sided natural cooling  $K 0,05 F$

Parameter: Stromflußwinkel  $\theta$  / current conduction angle  $\theta$



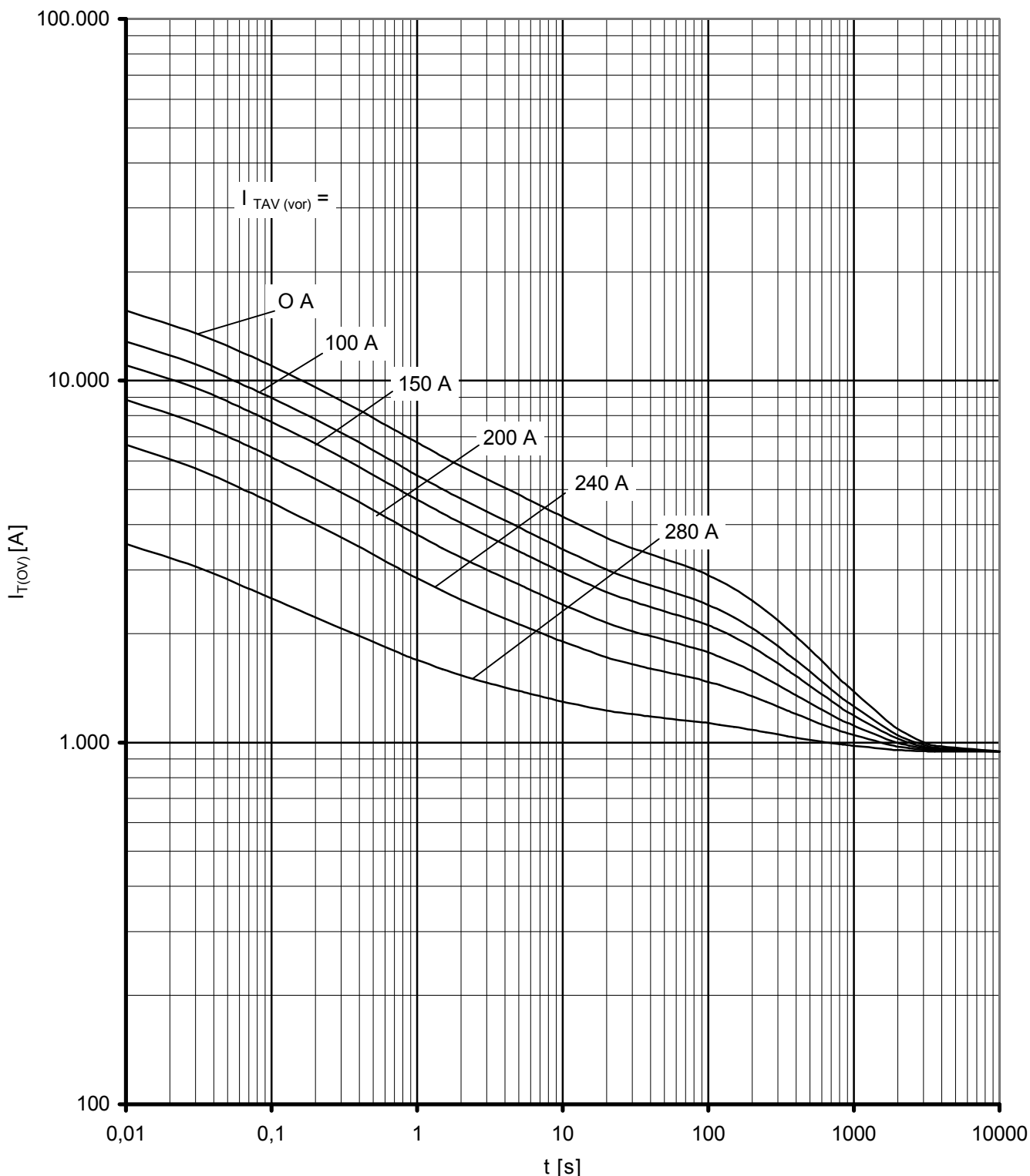


Höchstzul. Kühlmitteltemperatur / Max. allowable cooling medium temperature  $T_A = f(I_{TAVM})$

Beidseitige Luftselbstkühlung / two sided natural cooling K 0,05 F

$V_L = 120$  l/s

Parameter: Stromflußwinkel  $\theta$  / current conduction angle  $\theta$

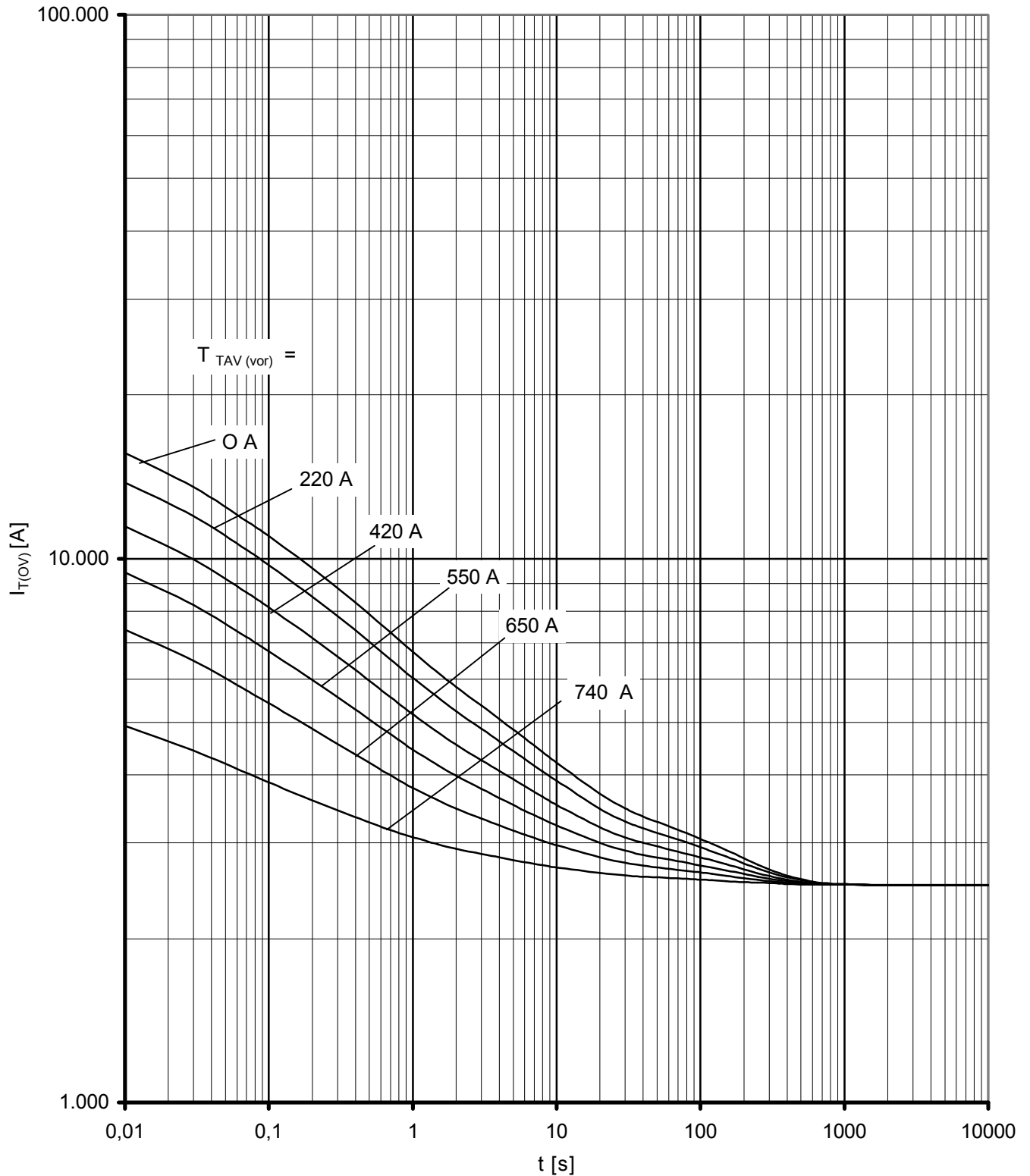


Überstrom / Overload on-state current  $I_{T(OV)} = f(t)$

Beidseitige Luftselbstkühlung / Two-sided natural cooling K 0.05 F

$T_A = 45^\circ\text{C}$

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

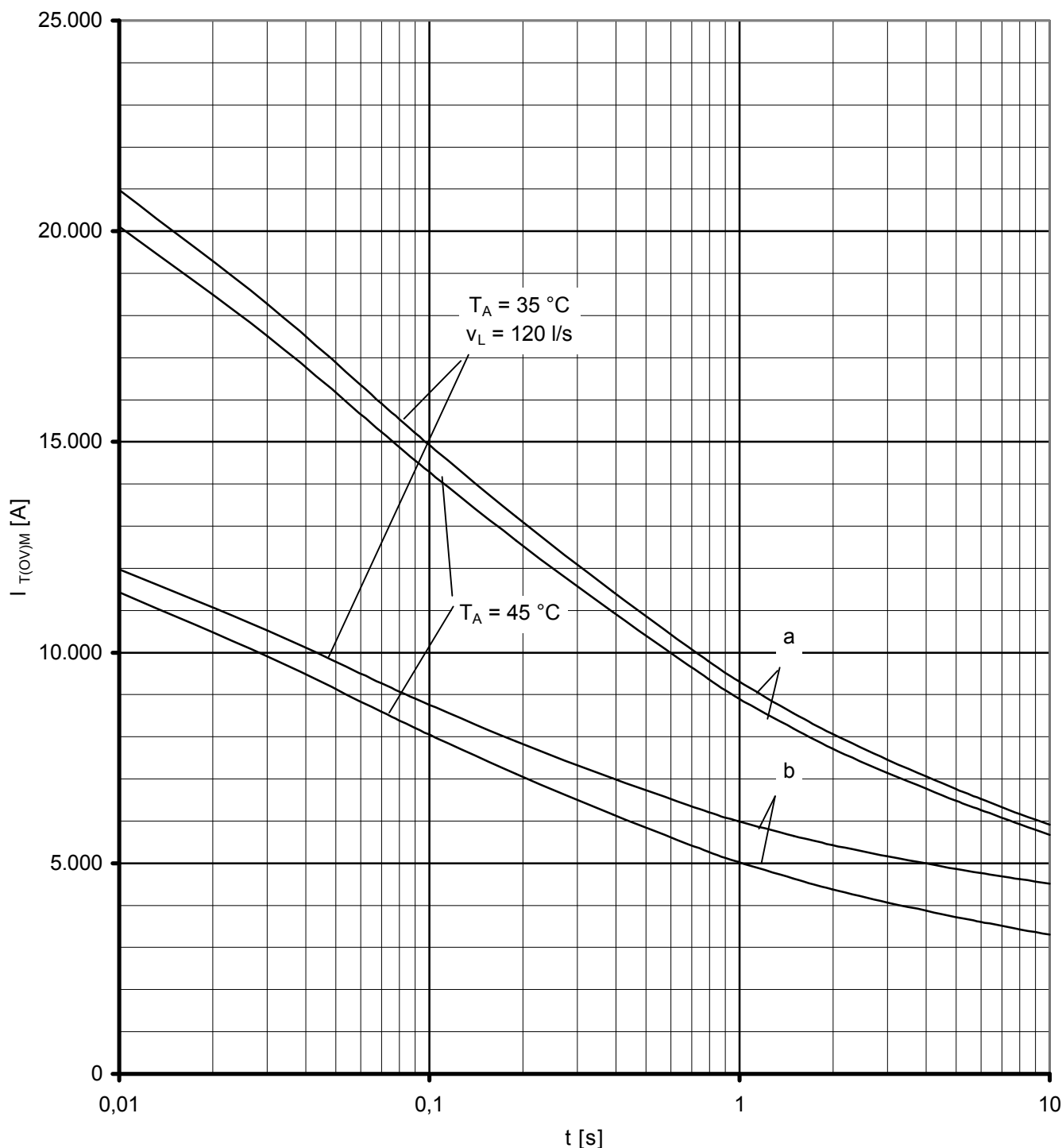


Überstrom / Overload on-state current  $I_{T(OV)} = f(t)$

Beidseitige verstärkte Kühlung / forced two-sided cooling K0.05F

$T_A = 35^\circ\text{C}$ , 120 l/s

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



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

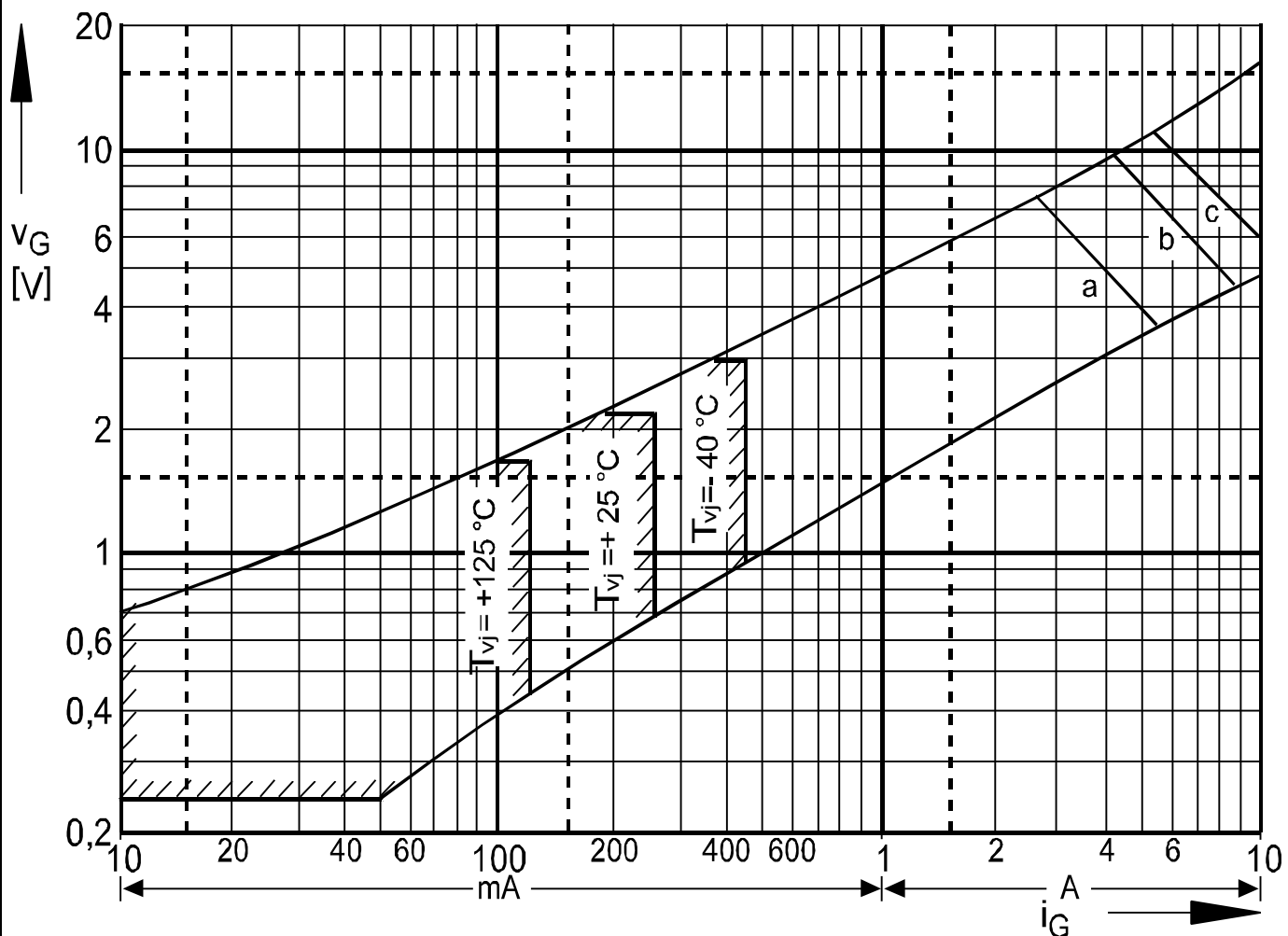
Beidseitige Kühlung / Two-sided cooling

Kühlkörper / Heatsink K 0,05 F

Belastung aus / Surge current occurs:

a - Leerlauf / No-load conditions

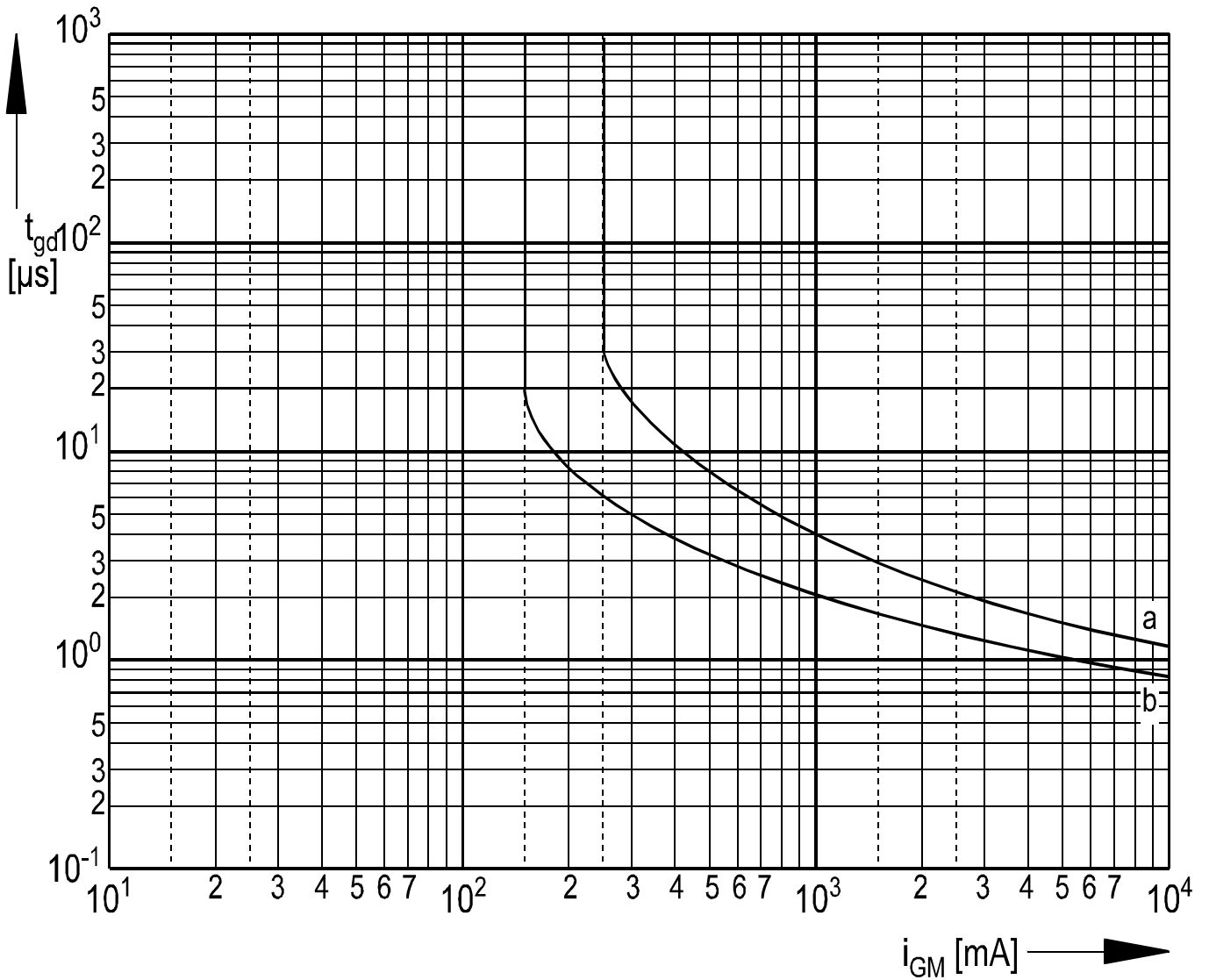
b - Betrieb mit Dauergrenzstrom  $I_{TAVM}$  / During operation at max. average on-state current  $I_{TAVM}$



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

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

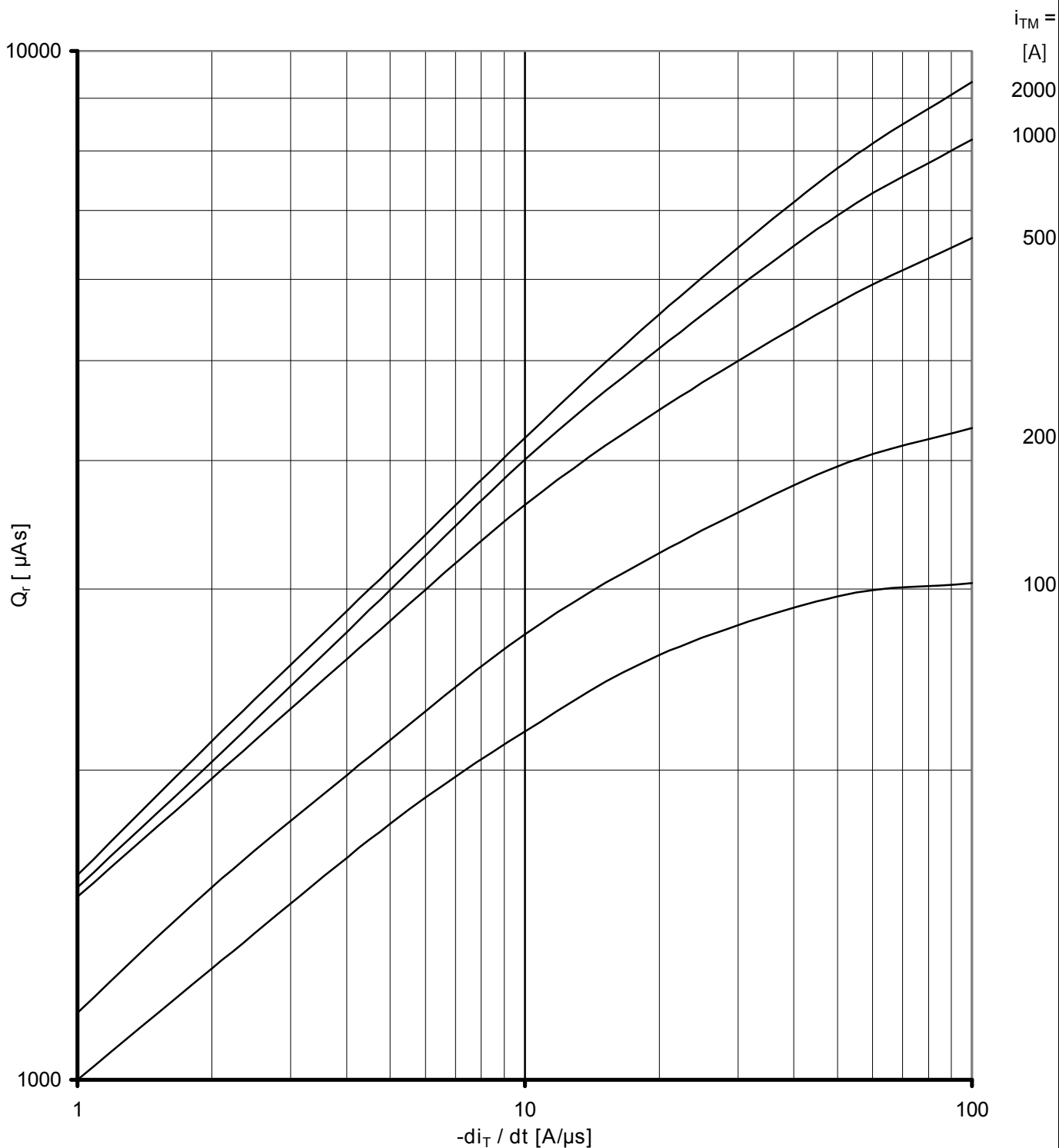


Zündverzögerung / Gate controlled delay time  $t_{gd} = f(i_{GM})$

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

a - maximaler Verlauf / limiting characteristic

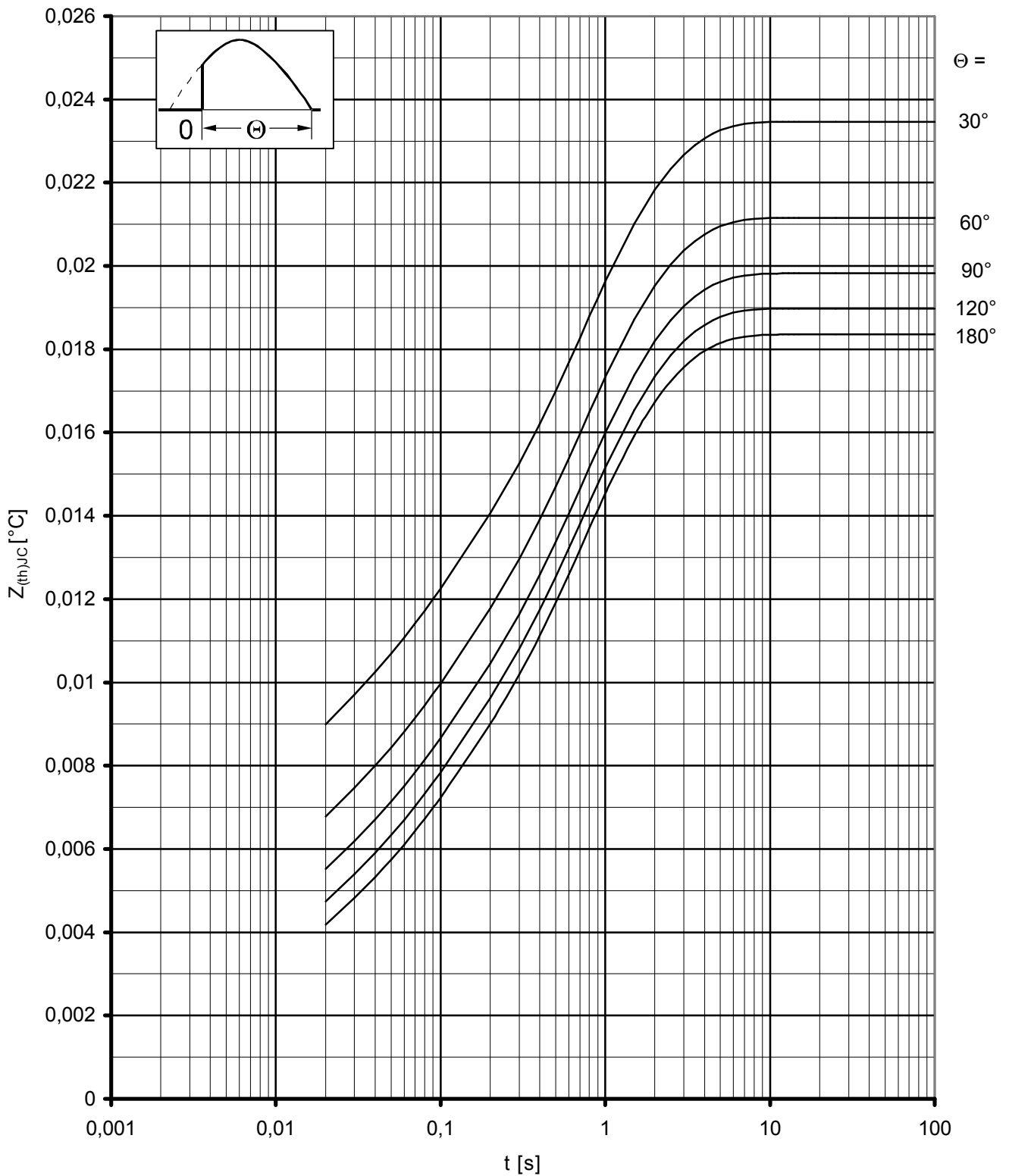
b - typischer Verlauf / typical characteristic



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

$T_{vj} = T_{vj\ max}, V_R \leq 0,5 V_{RRM}, V_{RM} \leq 0,8 V_{RRM}$

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

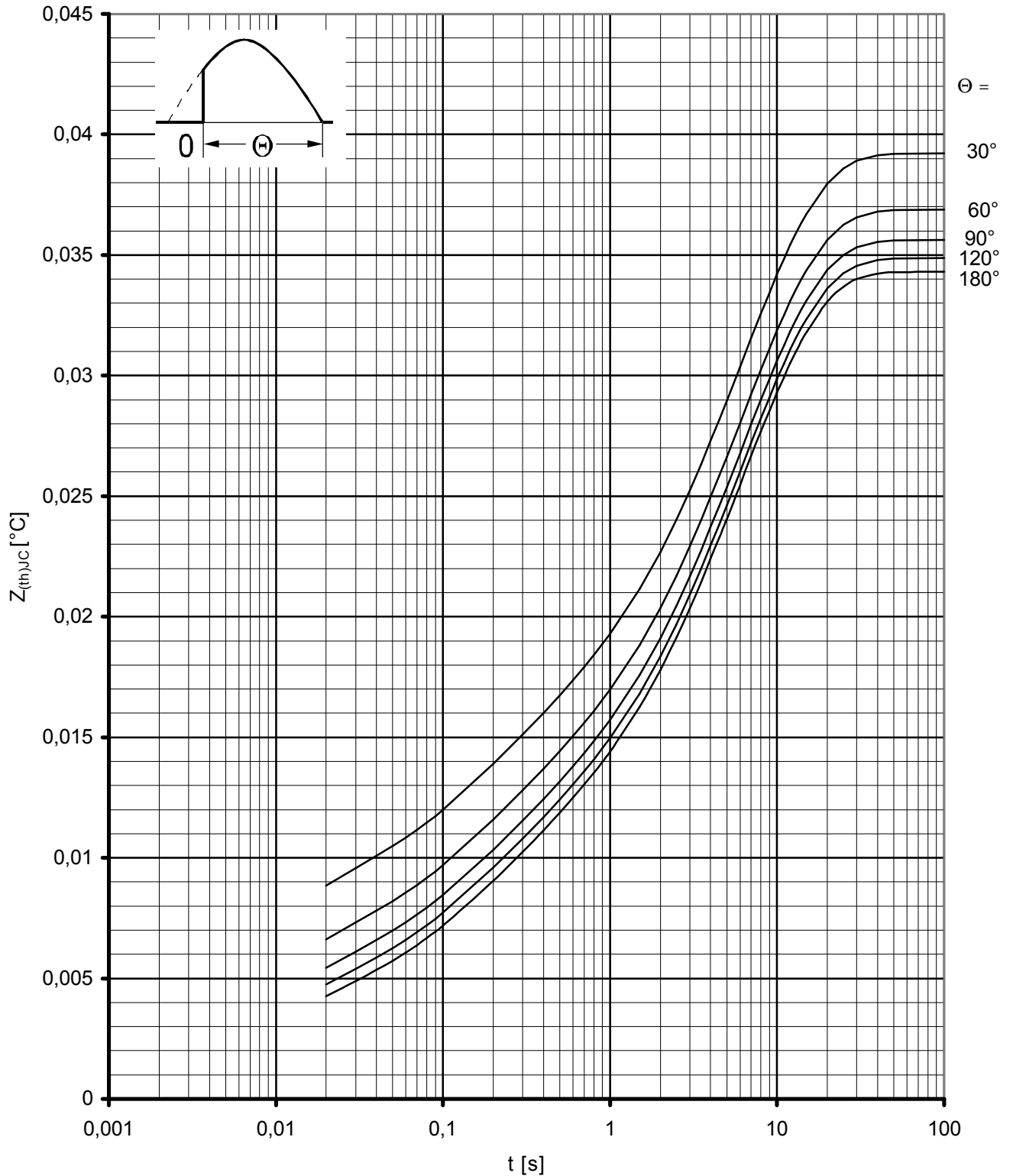


Transienter innerer Wärmewiderstand / Transient thermal impedance  $Z_{(th)JC} = f(t)$

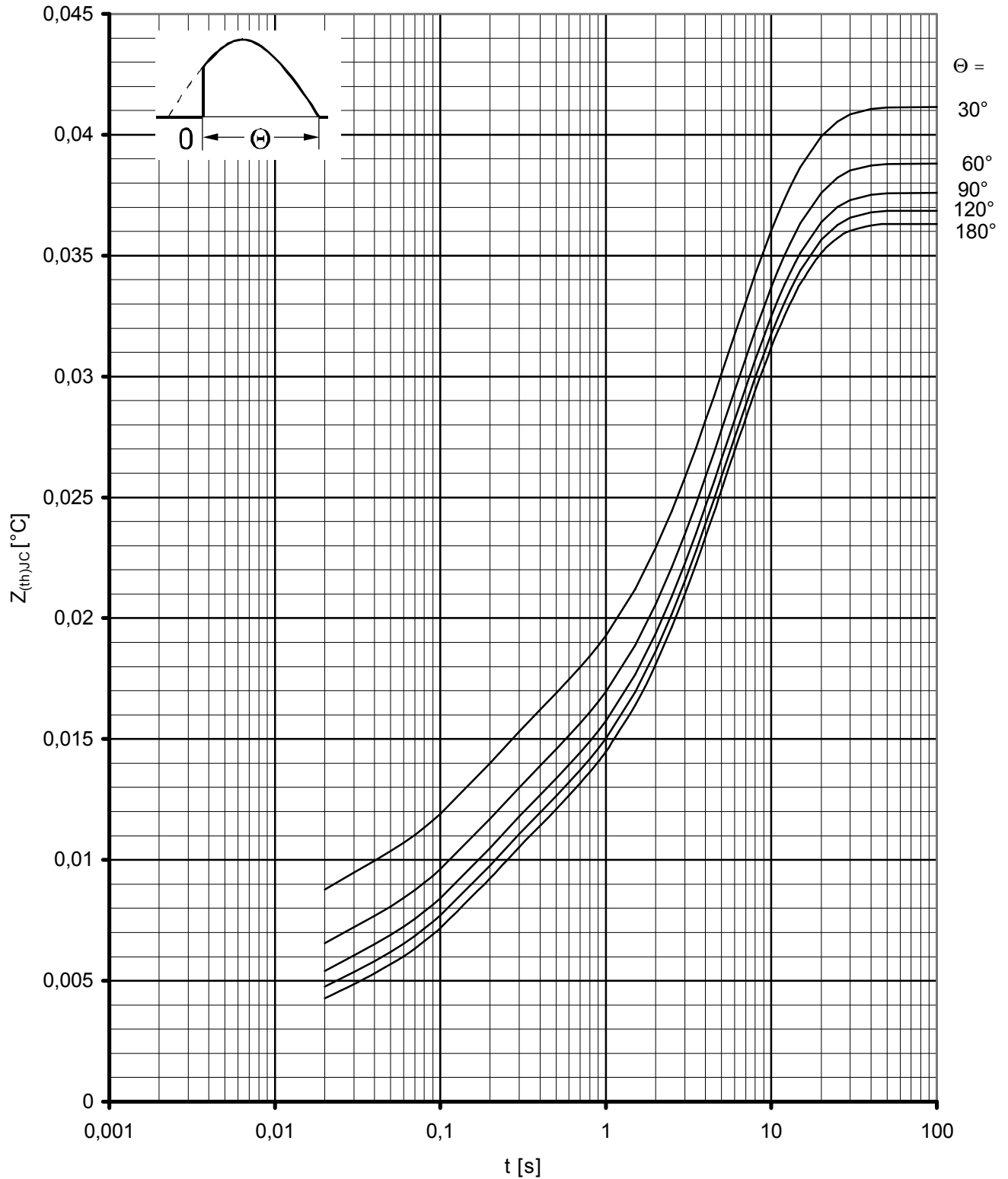
Beidseitige Kühlung / two sided cooling

Parameter: Stromflußwinkel  $\Theta$  / current conduction angle  $\Theta$





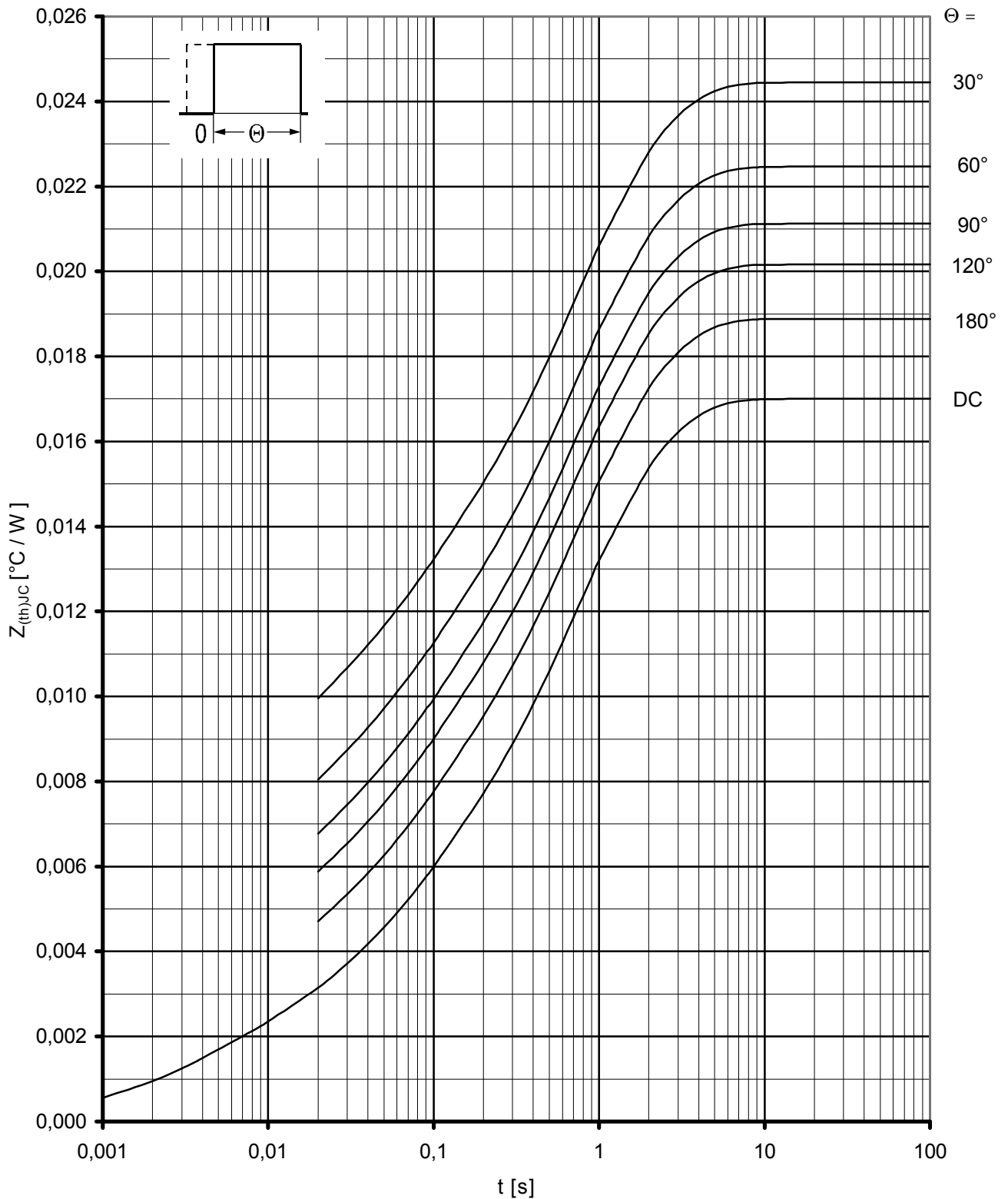
Transienter innerer Wärmewiderstand / Transient thermal impedance  $Z_{(th)JC} = f(t)$   
 Anodenseitige Kühlung / anode side cooling  
 Parameter: Stromflußwinkel  $\Theta$  / current conduction angle  $\Theta$



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

Kathodenseitige Kühlung / cathode side cooling

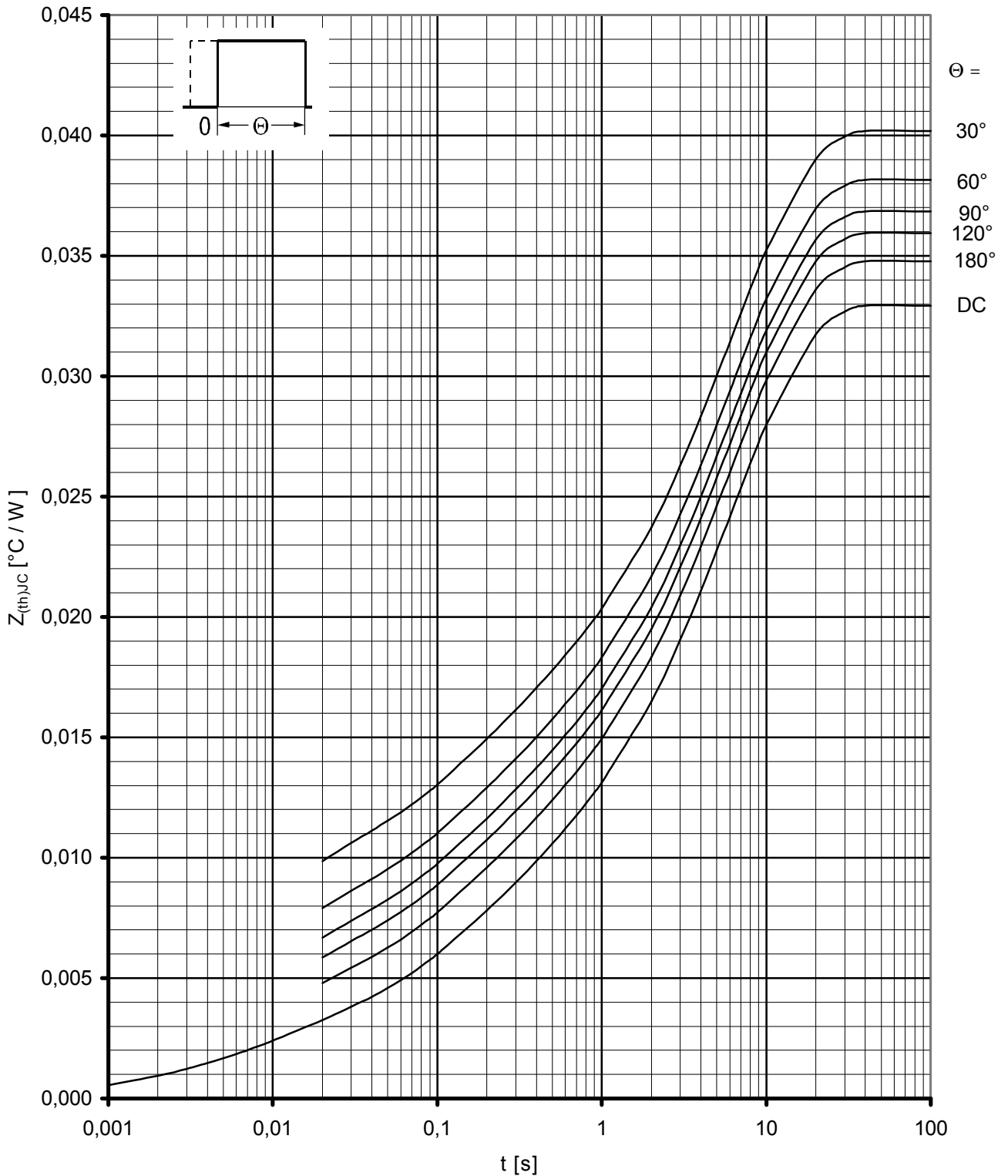
Parameter: Stromflußwinkel  $\Theta$  / current conduction angle  $\Theta$



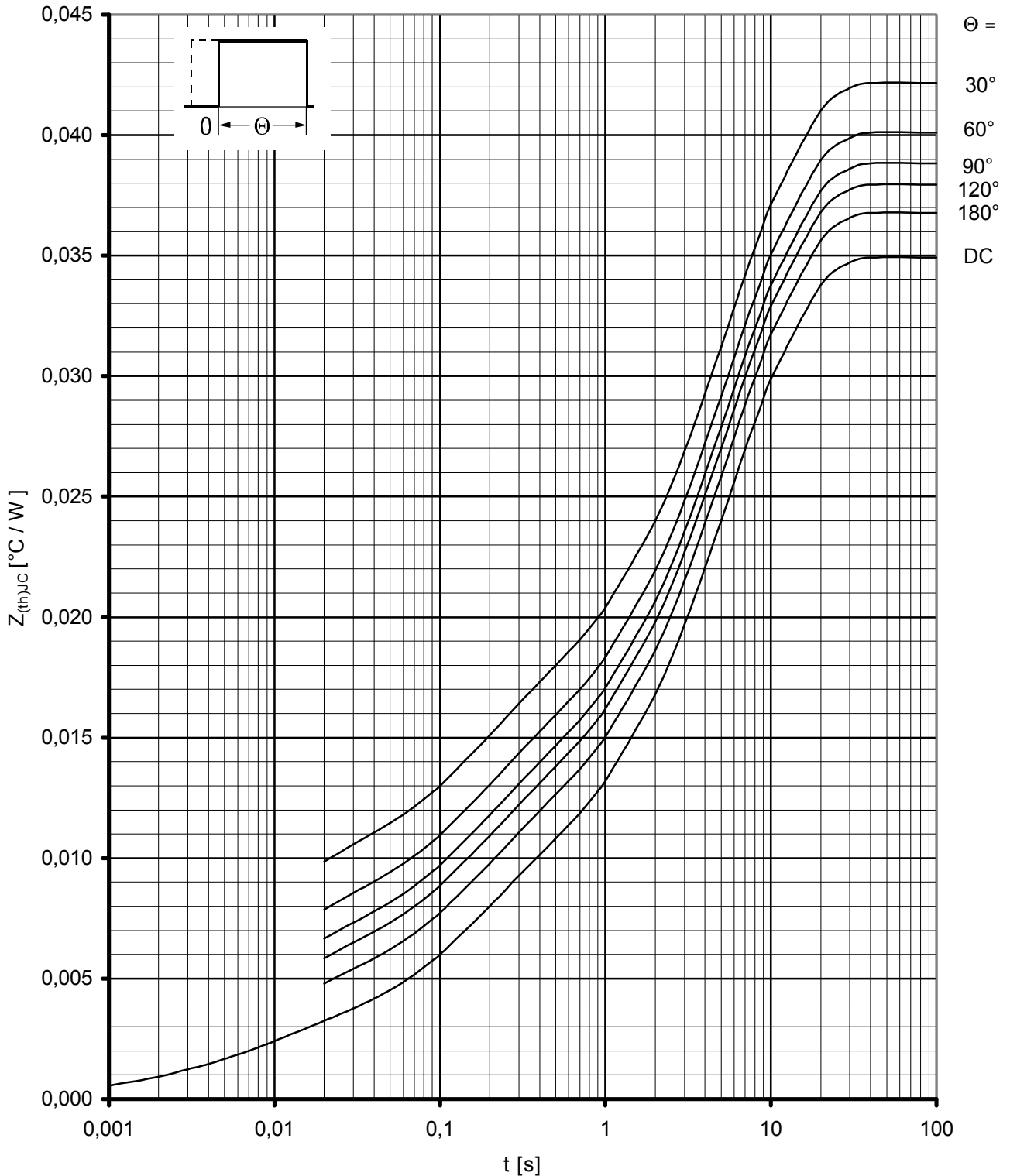
Transienter innerer Wärmewiderstand / Transient thermal impedance  $Z_{(th)JC} = f(t)$

Beidseitige Kühlung / two sided cooling

Parameter: Stromflußwinkel  $\Theta$  / current conduction angle  $\Theta$



Transienter innerer Wärmewiderstand / Transient thermal impedance  $Z_{(th)JC} = f(t)$   
 Anodenseitige Kühlung / anode side cooling  
 Parameter: Stromflußwinkel  $\Theta$  / current conduction angle  $\Theta$



Transienter innerer Wärmewiderstand / Transient thermal impedance  $Z_{(th)JC} = f(t)$   
 Kathodenseitige Kühlung / cathode side cooling  
 Parameter: Stromflußwinkel  $\theta$  / current conduction angle  $\theta$