

Technische Information / Technical Information

eupec

Netz-Thyristor
Phase Control Thyristor

T 2480 22...28

N



Elektrische Eigenschaften / Electrical properties

Höchstzulässige Werte / Maximum rated values

Vorläufige Daten

Preliminary Data

| | | | | |
|--|--|----------------------------------|--------------------------|--|
| Periodische Vorwärts- und Rückwärts-Spitzensperrspannung repetitive peak forward off-state and reverse voltages | $T_{vj} = -40^{\circ}\text{C} \dots T_{vj\text{max}}$ | $V_{\text{DRM}}, V_{\text{RRM}}$ | 2200, 2400 2600, 2800 | V |
| Vorwärts-Stoßspitzensperrspannung non-repetitive peak forward off-state voltage | $T_{vj} = -40^{\circ}\text{C} \dots T_{vj\text{max}}$ | V_{DSM} | 2200, 2400 2600, 2800 | V |
| Rückwärts-Stoßspitzensperrspannung non-repetitive peak reverse voltage | $T_{vj} = +25^{\circ}\text{C} \dots T_{vj\text{max}}$ | V_{RSM} | 2300, 2500 2700, 2900 | V |
| Durchlaßstrom-Grenzeffektivwert RMSM on-state current | | I_{TRSM} | 5100 | A |
| Dauergrenzstrom average on-state current | $T_{\text{C}} = 85^{\circ}\text{C}$ $T_{\text{C}} = 65^{\circ}\text{C}$ | I_{TAVM} | 2480 3250 | 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_{TSM} | 47500 43500 | 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 | 11045 9460 | $\text{A}^2\text{s} \cdot 10^3$ $\text{A}^2\text{s} \cdot 10^3$ |
| 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 | $T_{vj} = T_{vj\text{max}}, i_{\text{T}} = 6500\text{ A}$ $T_{vj} = T_{vj\text{max}}, i_{\text{T}} = 3000\text{ A}$ | v_{T} | max. 2,00 max. 1,43 | V V |
| Schleusenspannung threshold voltage | $T_{vj} = T_{vj\text{max}}$ | $V_{\text{T(TO)}}$ | 0,95 | V |
| Ersatzwiderstand slope resistance | $T_{vj} = T_{vj\text{max}}$ | r_{T} | 0,154 | $\text{m}\Omega$ |
| 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=0,8249 B=1,398E-04 C=8,03563E-03 D=2,4542E-03 | | |
| Zündstrom gate trigger current | $T_{vj} = 25^{\circ}\text{C}, v_{\text{D}} = 6\text{ V}$ | I_{GT} | max. 250 | mA |
| Zündspannung gate trigger voltage | $T_{vj} = 25^{\circ}\text{C}, v_{\text{D}} = 6\text{ V}$ | V_{GT} | max. 2,5 | 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_{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_{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_{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_{L} | max. 1500 | 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. 250 | 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_{gd} | max. 4 | μs |

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Elektrische Eigenschaften / Electrical properties

Vorläufige Daten

Charakteristische Werte / Characteristic values

Preliminary Data

| | | | | | |
|---|--|-------|------|-----|---------|
| Freiwerdezeit circuit commutated turn-off time | $T_{vj} = T_{vj\ max}$, $i_{TM} = I_{TAVM}$ $V_{RM} = 100V$, $V_{DM} = 0,67 V_{DRM}$ $dv_p/dt = 20 V/\mu s$, $-di_T/dt = 10 A/\mu s$ 4. Kennbuchstabe / 4th letter O | t_q | typ. | 400 | μs |
|---|--|-------|------|-----|---------|

Thermische Eigenschaften / Thermal properties

| | | | | | |
|---|---|---------------|------|-----------|--------------|
| Innerer Wärmewiderstand thermal resistance, junction to case | Kühlfläche / cooling surface beidseitig / two-sided, $\Theta = 180^\circ \sin$ beidseitig / two-sided, DC Anode / anode, $\Theta = 180^\circ \sin$ Anode / anode, DC Kathode / cathode, $\Theta = 180^\circ \sin$ Kathode / cathode, DC | R_{thJC} | max. | 0,0085 | $^\circ C/W$ |
| | | | max. | 0,0078 | $^\circ C/W$ |
| | | | max. | 0,0152 | $^\circ C/W$ |
| | | | max. | 0,0146 | $^\circ C/W$ |
| | | | max. | 0,0183 | $^\circ C/W$ |
| | | | max. | 0,0169 | $^\circ C/W$ |
| Übergangs- Wärmewiderstand thermal resistance, case to heatsink | Kühlfläche / cooling surface beidseitig / two-sided einseitig / single-sided | R_{thCK} | max. | 0,0025 | $^\circ C/W$ |
| | | | max. | 0,0050 | $^\circ C/W$ |
| 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 | $^\circ C$ |

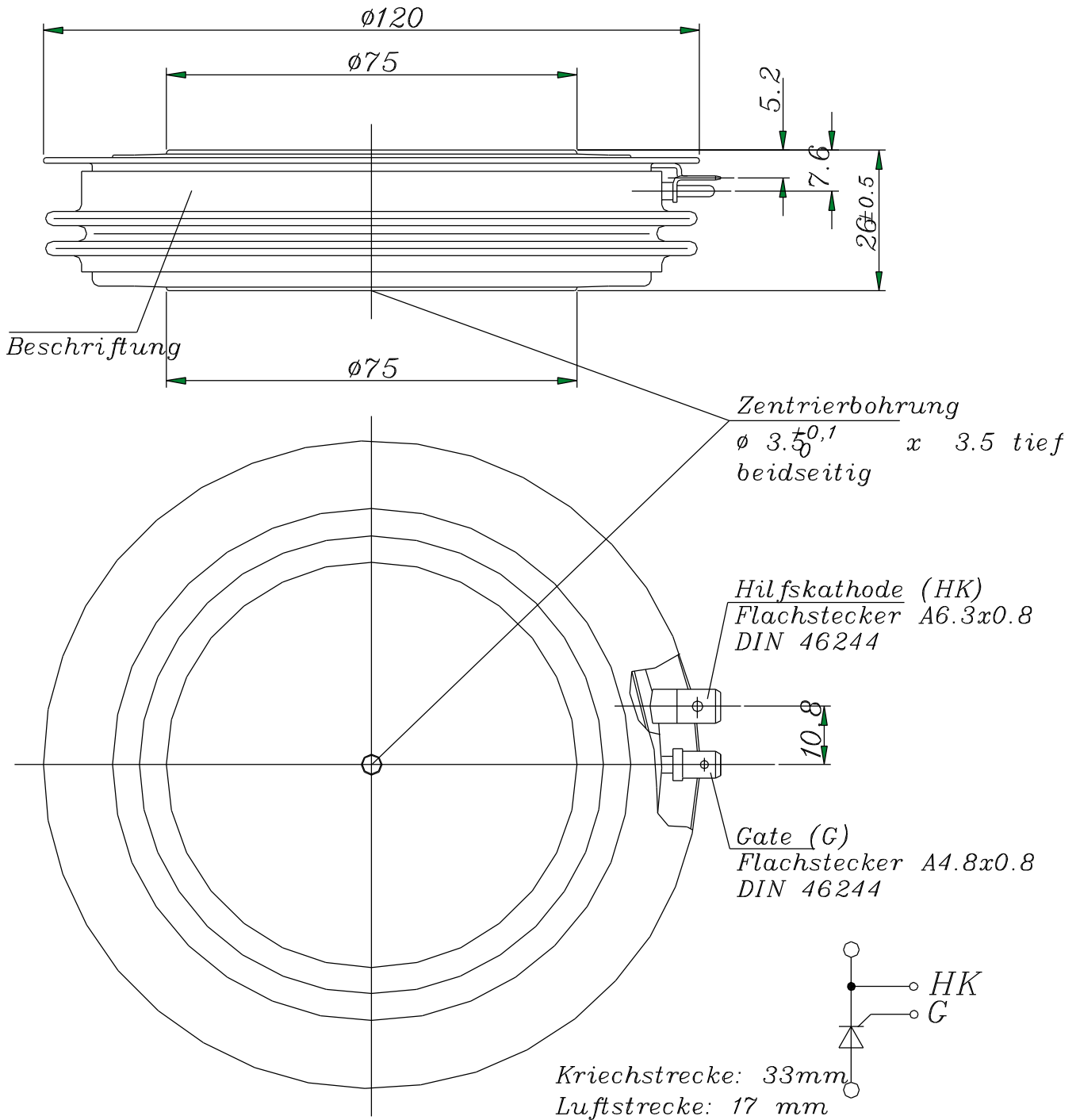
Mechanische Eigenschaften / Mechanical properties

| | | | | | |
|--|-----------|---|------|-------------------|------------------|
| Gehäuse, siehe Anlage case, see appendix | | | | Seite 3 page 3 | |
| Si-Element mit Druckkontakt, Amplifying-Gate Si-pellet with pressure contact, amplifying gate | | | | | |
| Anpreßkraft clamping force | | F | | 42...95 | kN |
| Gewicht weight | | G | typ. | 1200 | g |
| Kriechstrecke creepage distance | | | | 33 | 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./ This technical information specifies semiconductor devices but promises no characteristics. It is valid in combination with the belonging technical notes.

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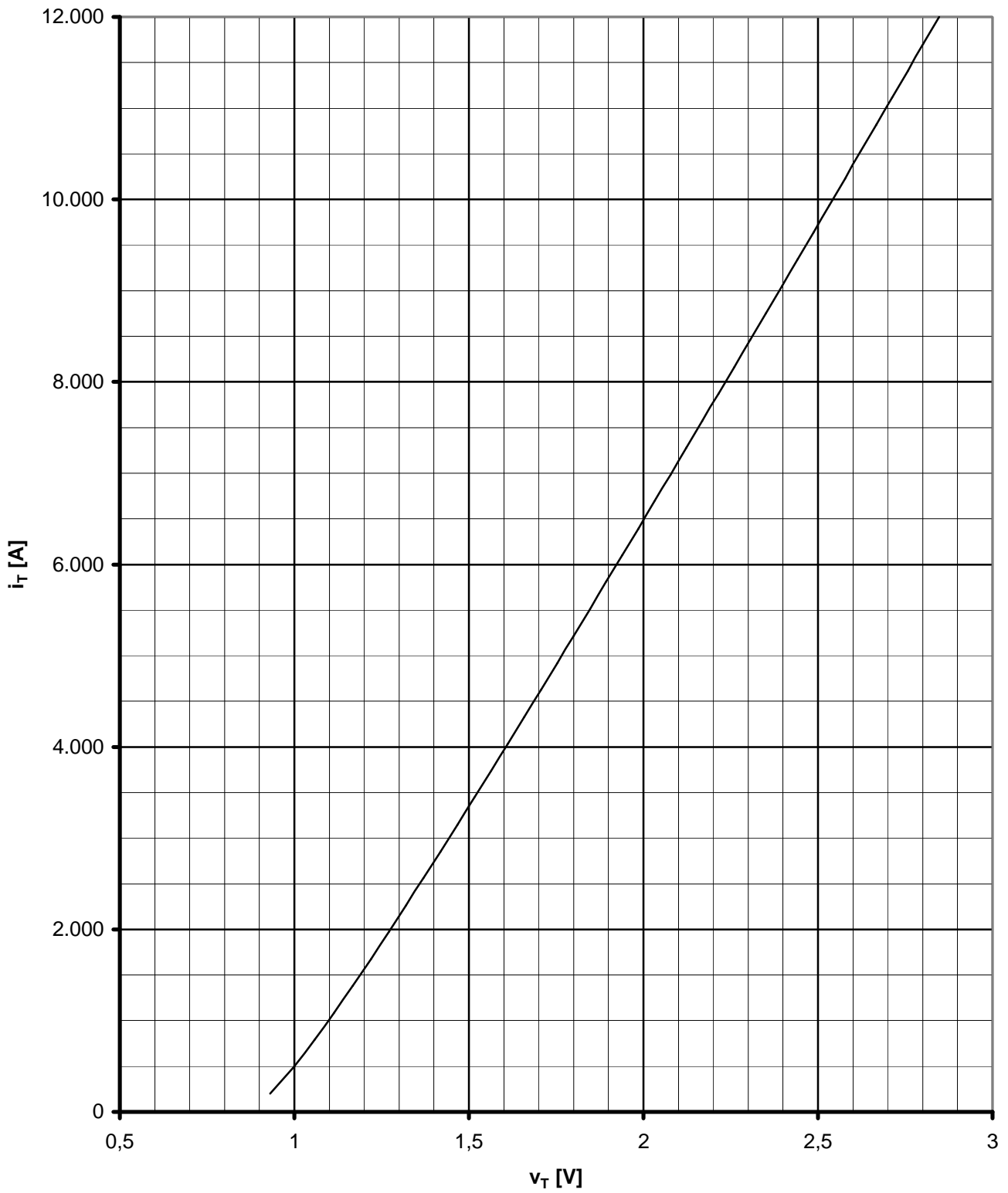
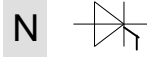


| | | | | | | | | |
|---------------------------------|--|----------|----------|---------|---------|---------|---------|---|
| Kühlung cooling | Analytische Elemente des transienten Wärmewiderstandes Z_{thJC} für DC Analytical elements of transient thermal impedance Z_{thJC} for DC | | | | | | | |
| | Pos.n | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| beidseitig two-sided | R_{thn} [°C/W] | 0,000030 | 0,00039 | 0,00123 | 0,0028 | 0,00338 | | |
| | τ_n [s] | 0,000055 | 0,00392 | 0,0152 | 0,2068 | 1,0914 | | |
| anodenseitig anode-sided | R_{thn} [°C/W] | 0,000009 | 0,000371 | 0,0019 | 0,0013 | 0,00434 | 0,00668 | |
| | τ_n [s] | 0,000010 | 0,001820 | 0,00951 | 0,135 | 0,347 | 1,54 | |
| kathodenseitig cathode-sided | R_{thn} [°C/W] | 0,000032 | 0,000728 | 0,00302 | 0,00802 | 0,0051 | | |
| | τ_n [s] | 0,000035 | 0,00341 | 0,0215 | 0,135 | 1,11 | | |

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

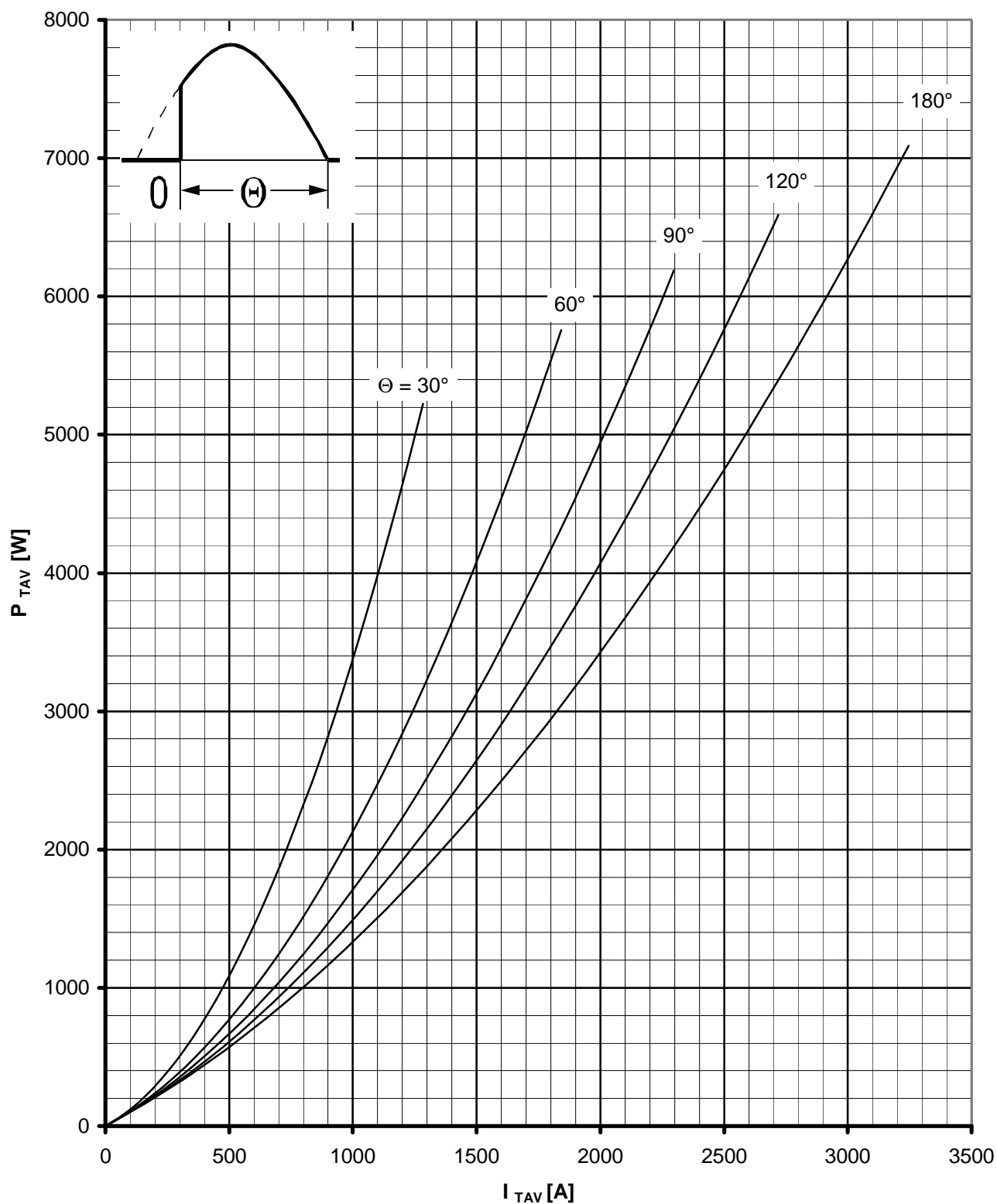
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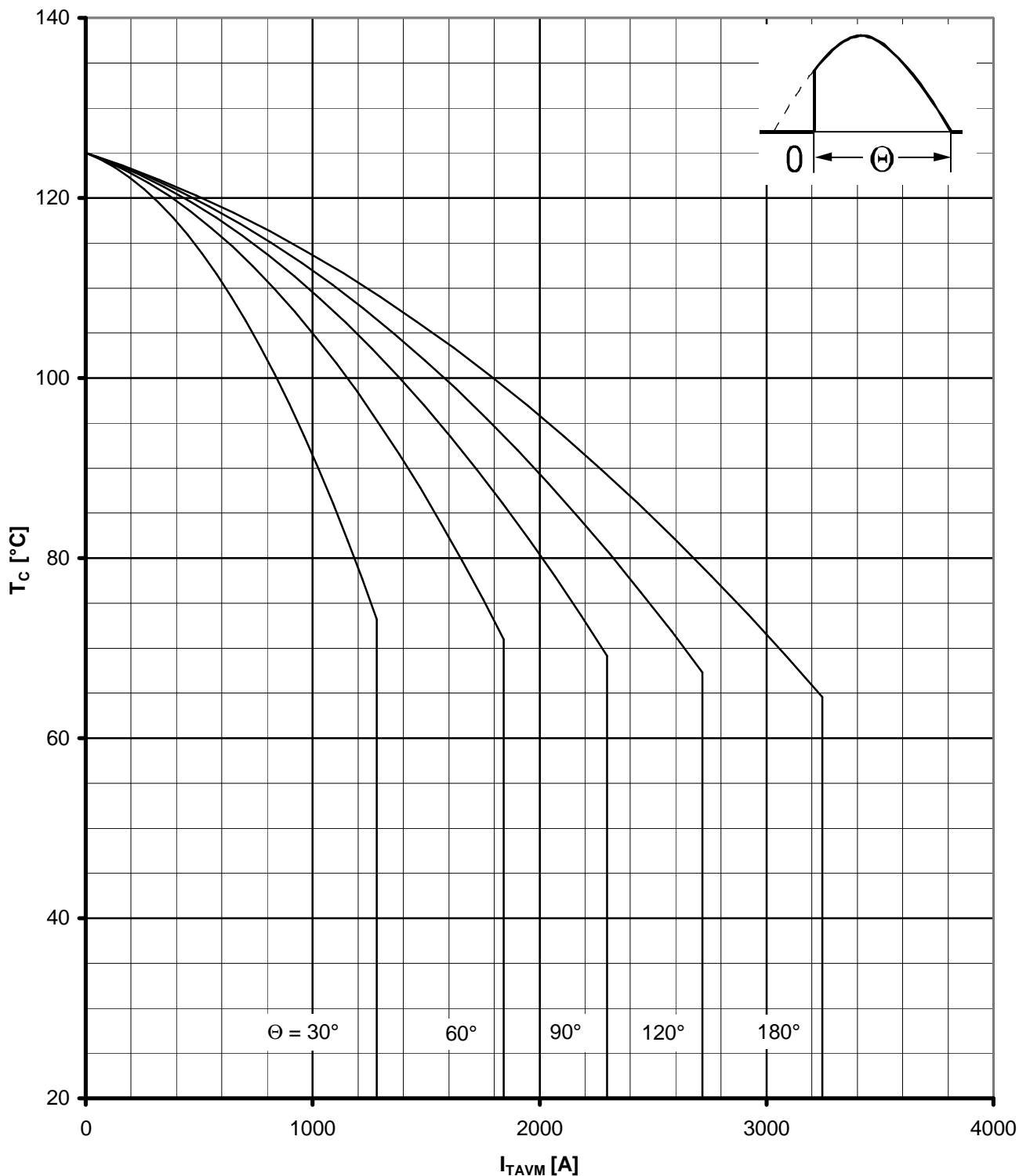


Grenzdurchlaßkennlinie / Limiting on-state characteristic $i_T = f(v_T)$

$T_{vj} = 125\text{ °C}$



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

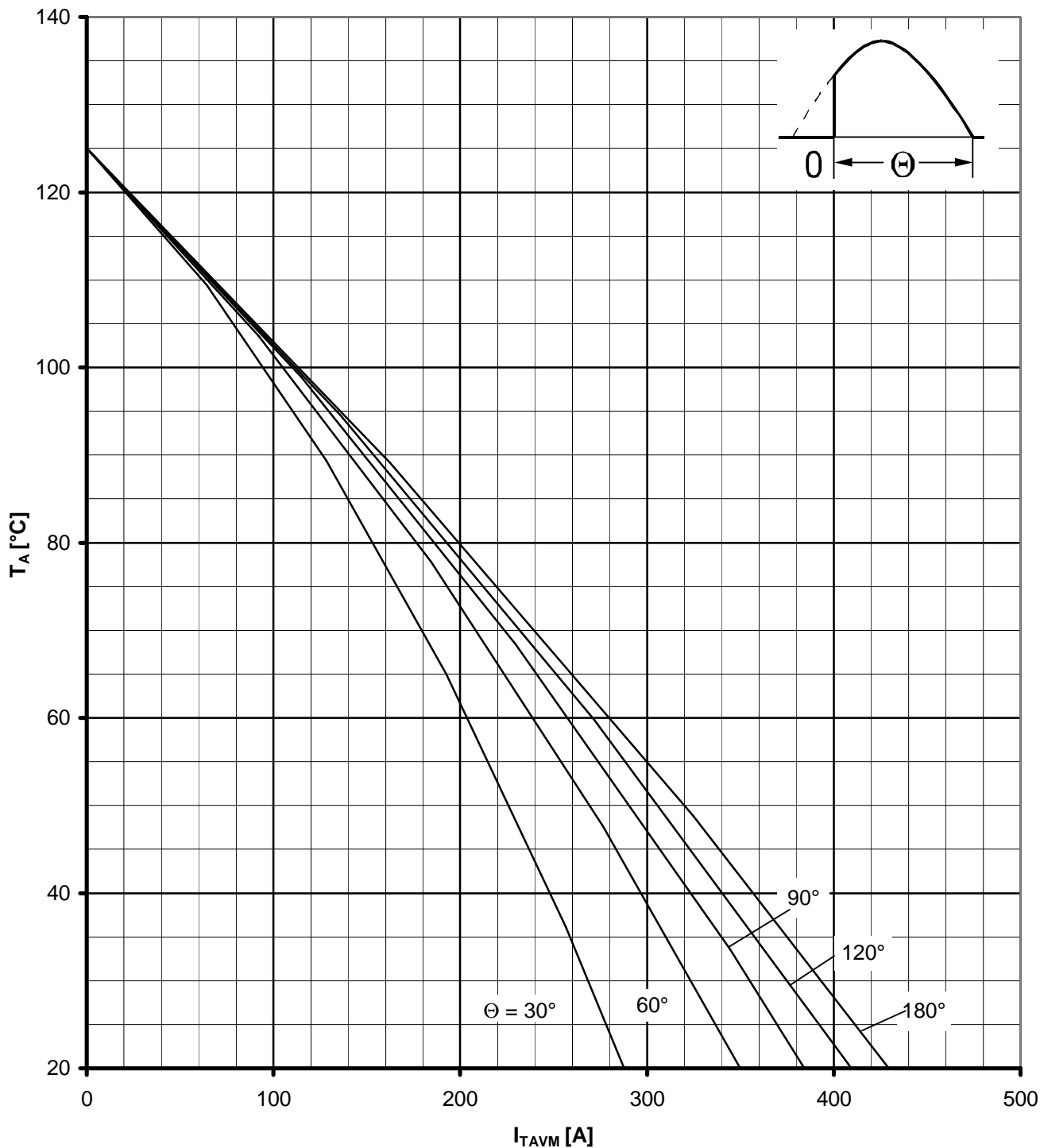
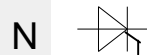
Parameter: Stromflußwinkel Θ / current conduction angle Θ

Berechnungsgrundlage P_{TAV} (Schaltverluste gesondert berücksichtigen)

Calculation base P_{TAV} (switching losses should be considered separately)

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

Luftselbstkühlung / Natural air-cooling

Kühlkörper / Heatsink. K 0.48 F

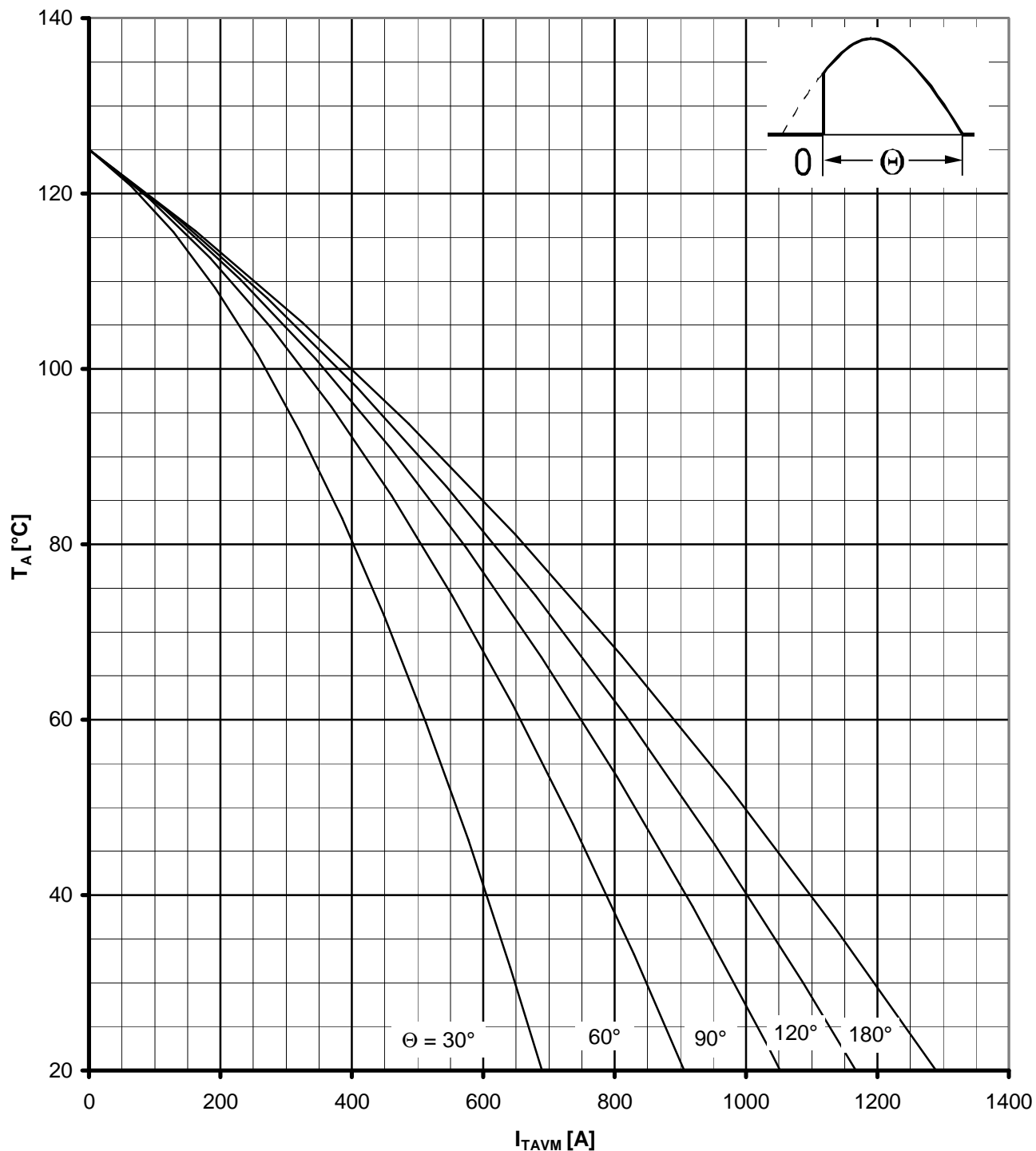
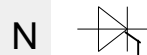
Parameter: Stromflußwinkel θ / current conduction angle θ

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Calculation base P_{TAV} (switching losses should be considered separately)

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

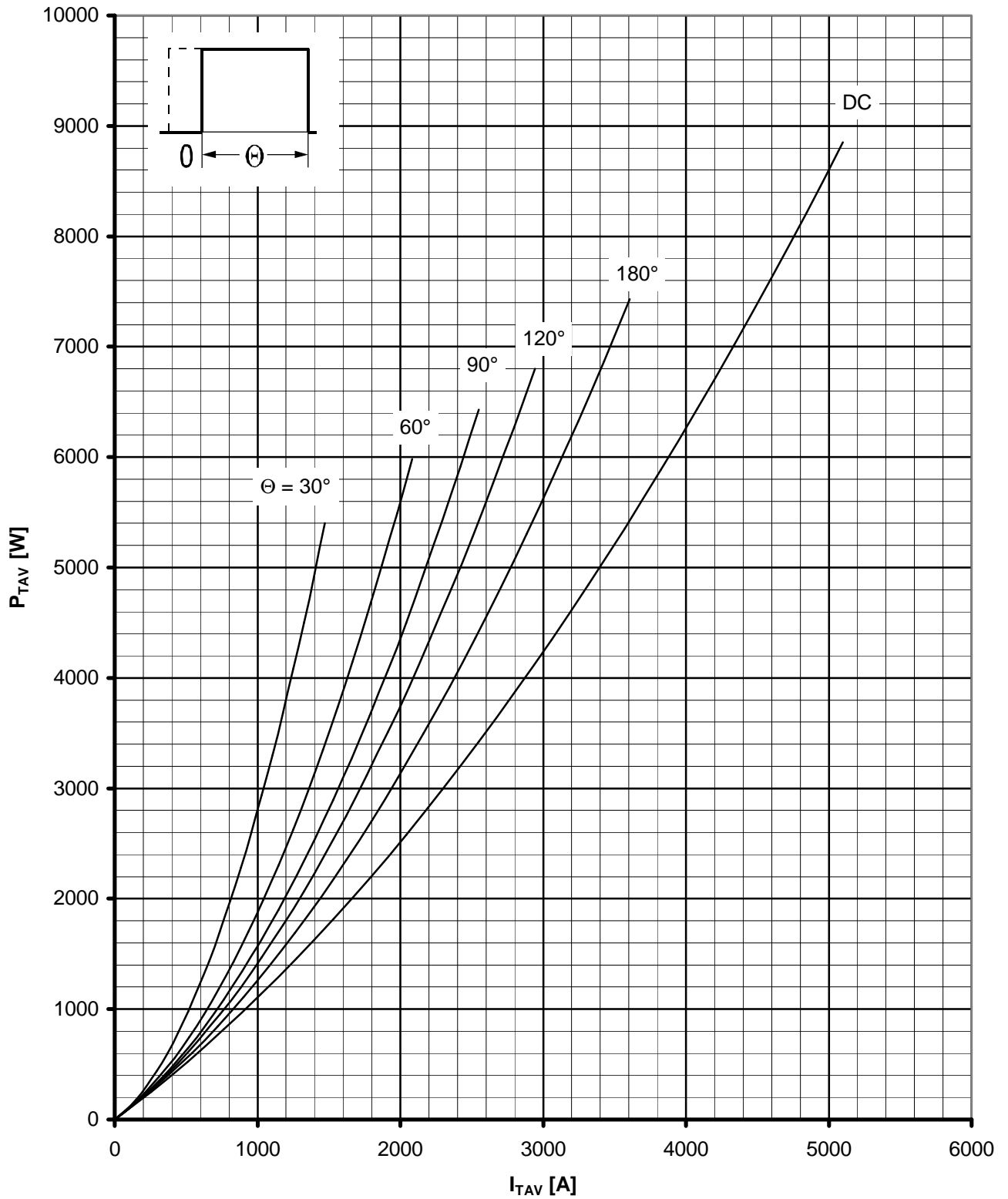
Verstärkte Luftkühlung / Forced air-cooling

Kühlkörper / Heatsink. $K 0.48F$, $V_L = 120$ l/s

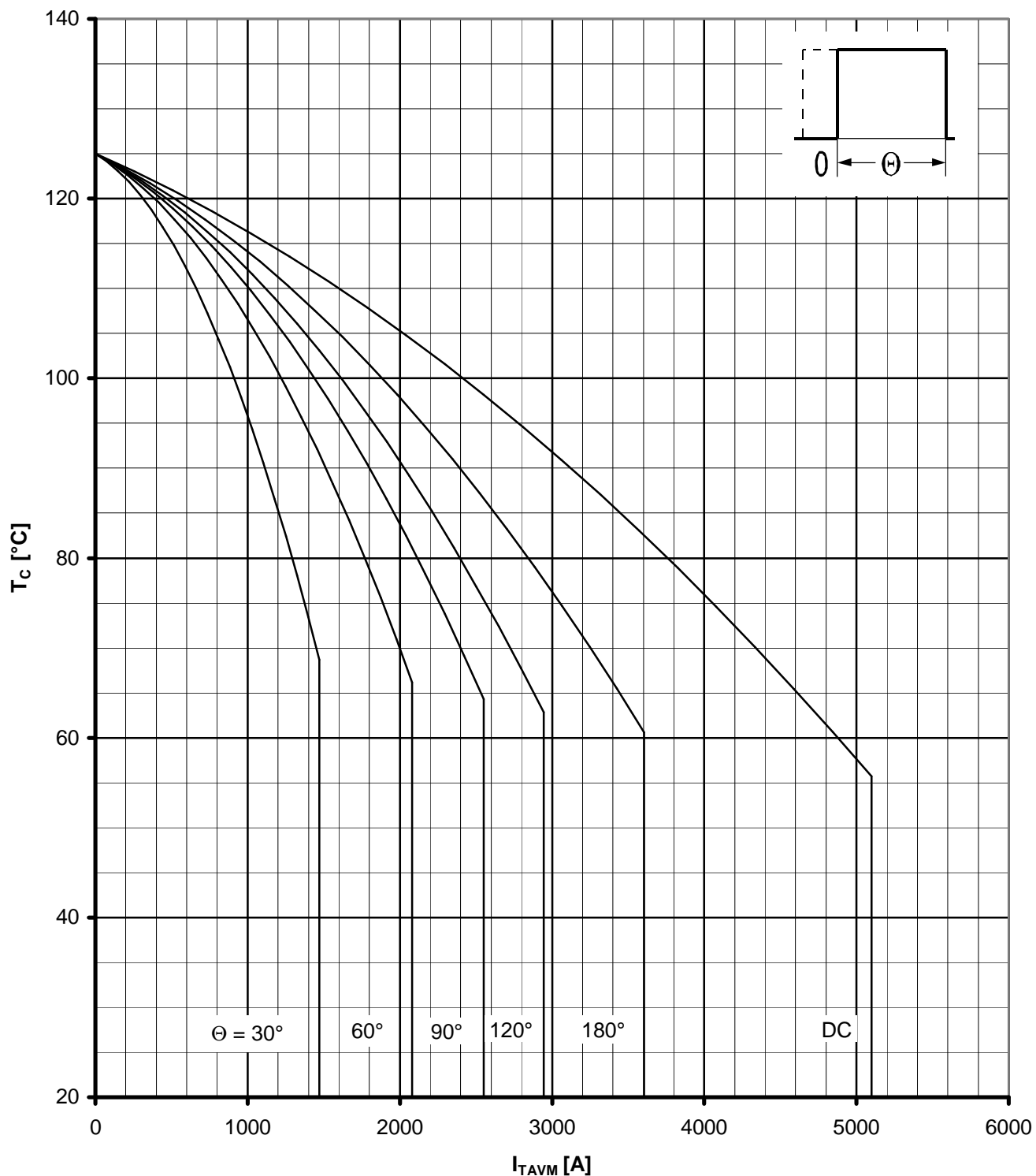
Parameter: Stromflußwinkel θ / current conduction angle θ

Berechnungsgrundlage P_{TAV} (Schaltverluste gesondert berücksichtigen)

Calculation base P_{TAV} (switching losses should be considered separately)



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

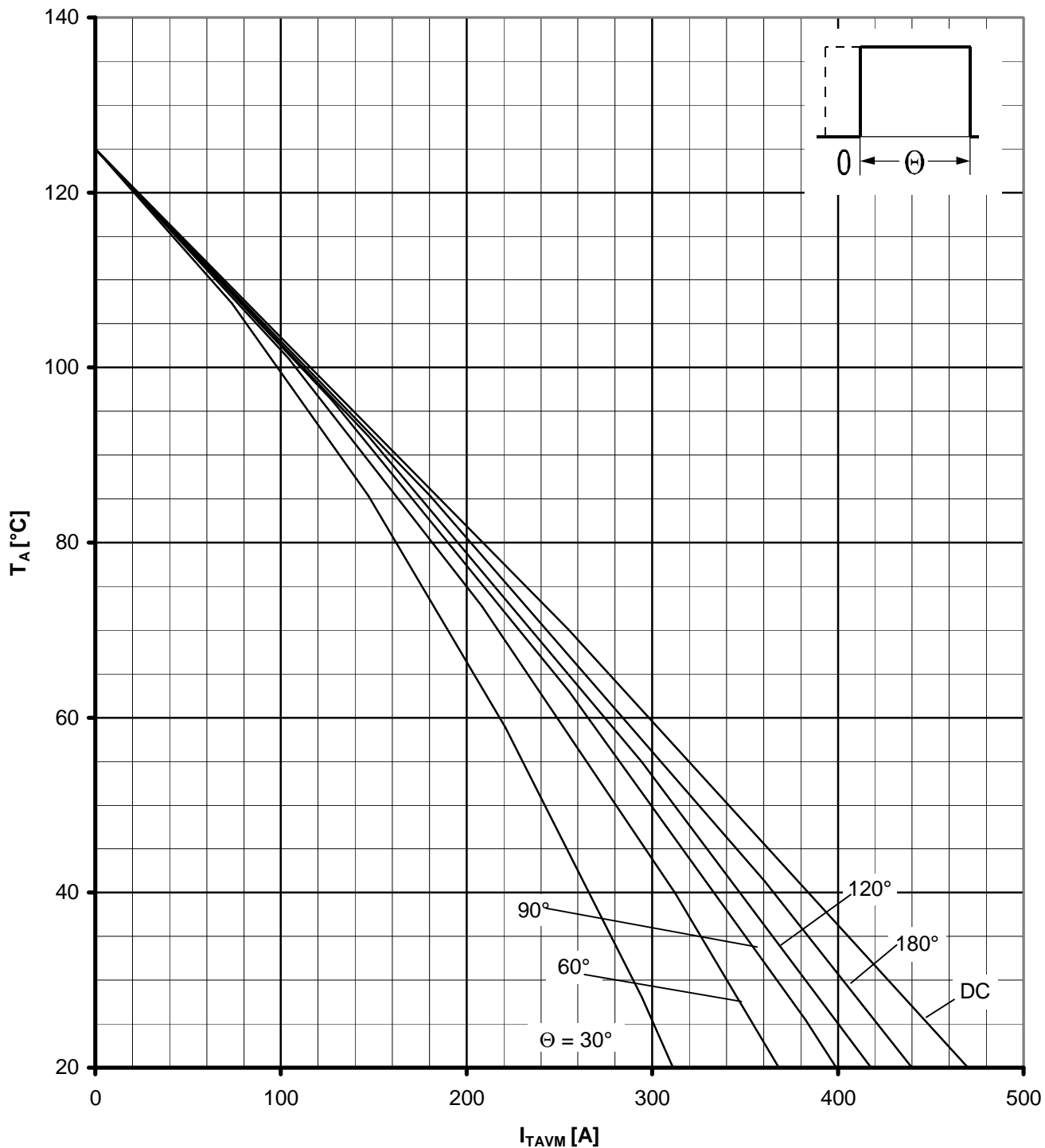
Parameter: Stromflußwinkel Θ / current conduction angle Θ

Berechnungsgrundlage P_{TAV} (Schaltverluste gesondert berücksichtigen)

Calculation base P_{TAV} (switching losses should be considered separately)

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

Luftselbstkühlung / Natural air-cooling

Kühlkörper / Heatsink. K 0.48 F

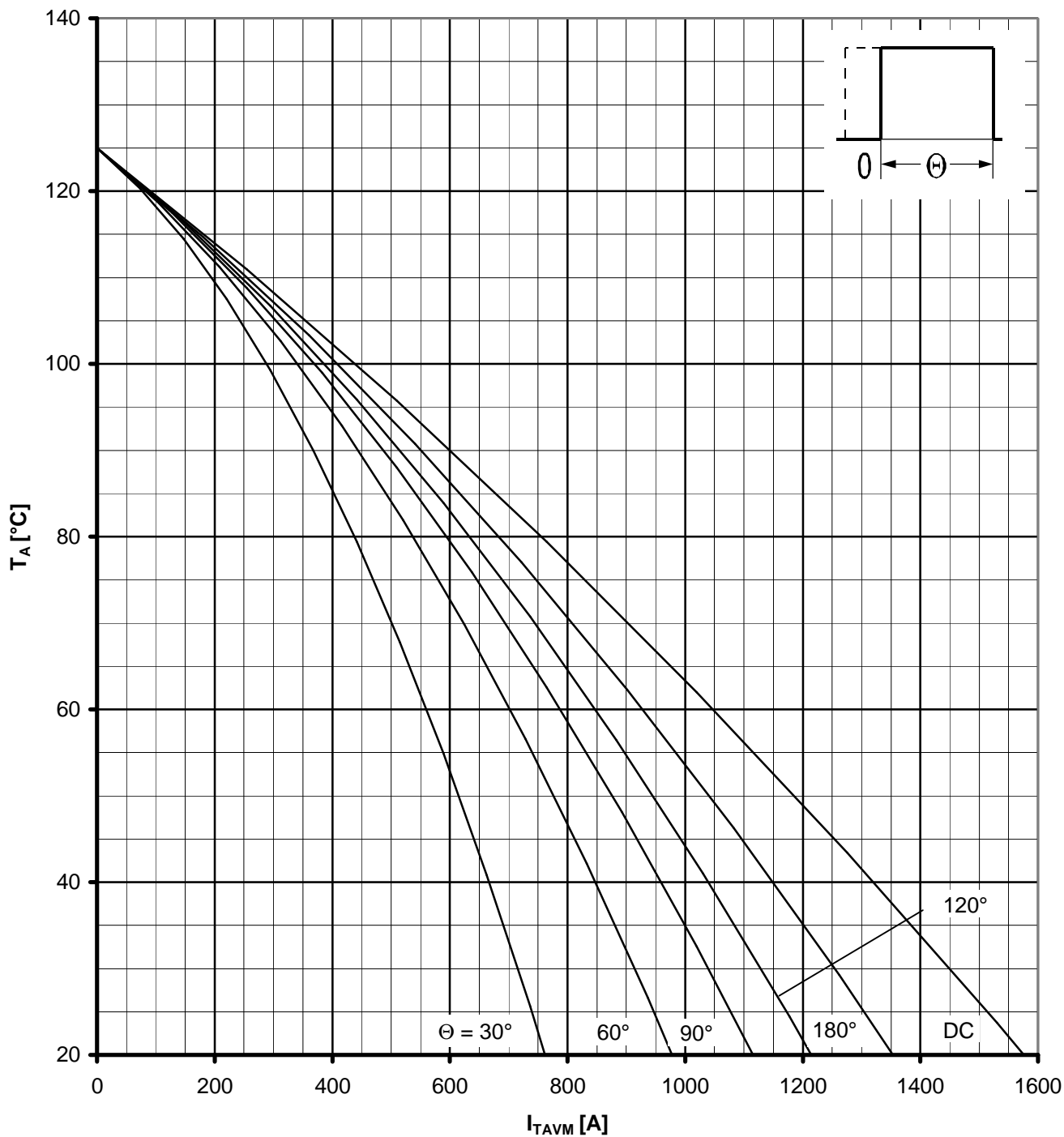
Parameter: Stromflußwinkel θ / current conduction angle θ

Berechnungsgrundlage P_{TAV} (Schaltverluste gesondert berücksichtigen)

Calculation base P_{TAV} (switching losses should be considered separately)

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

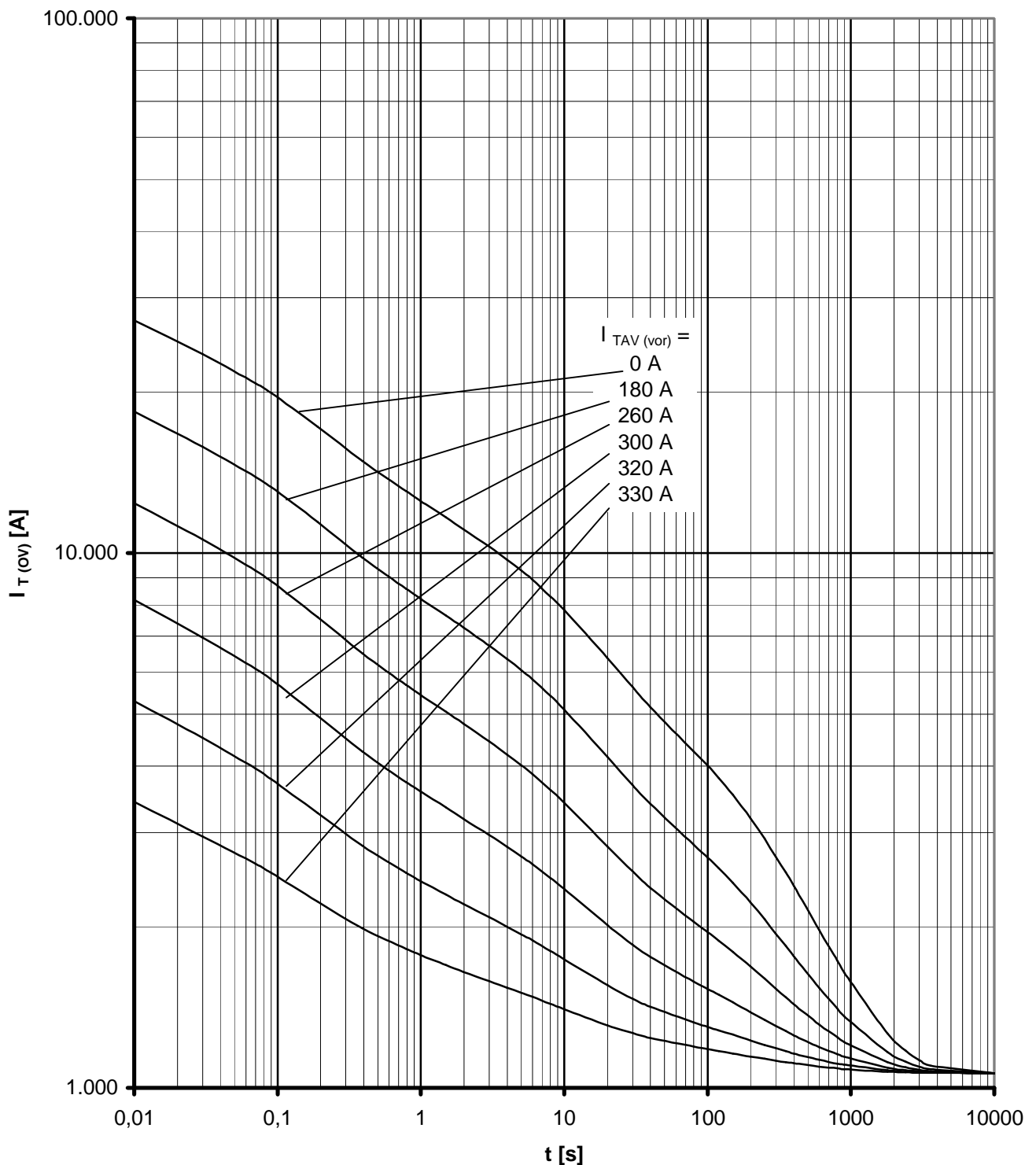
Verstärkte Luftkühlung / Forced air-cooling

Kühlkörper / Heatsink. $K 0.48F$, $V_L = 120$ l/s

Parameter: Stromflußwinkel θ / current conduction angle θ

Berechnungsgrundlage P_{TAV} (Schaltverluste gesondert berücksichtigen)

Calculation base P_{TAV} (switching losses should be considered separately)

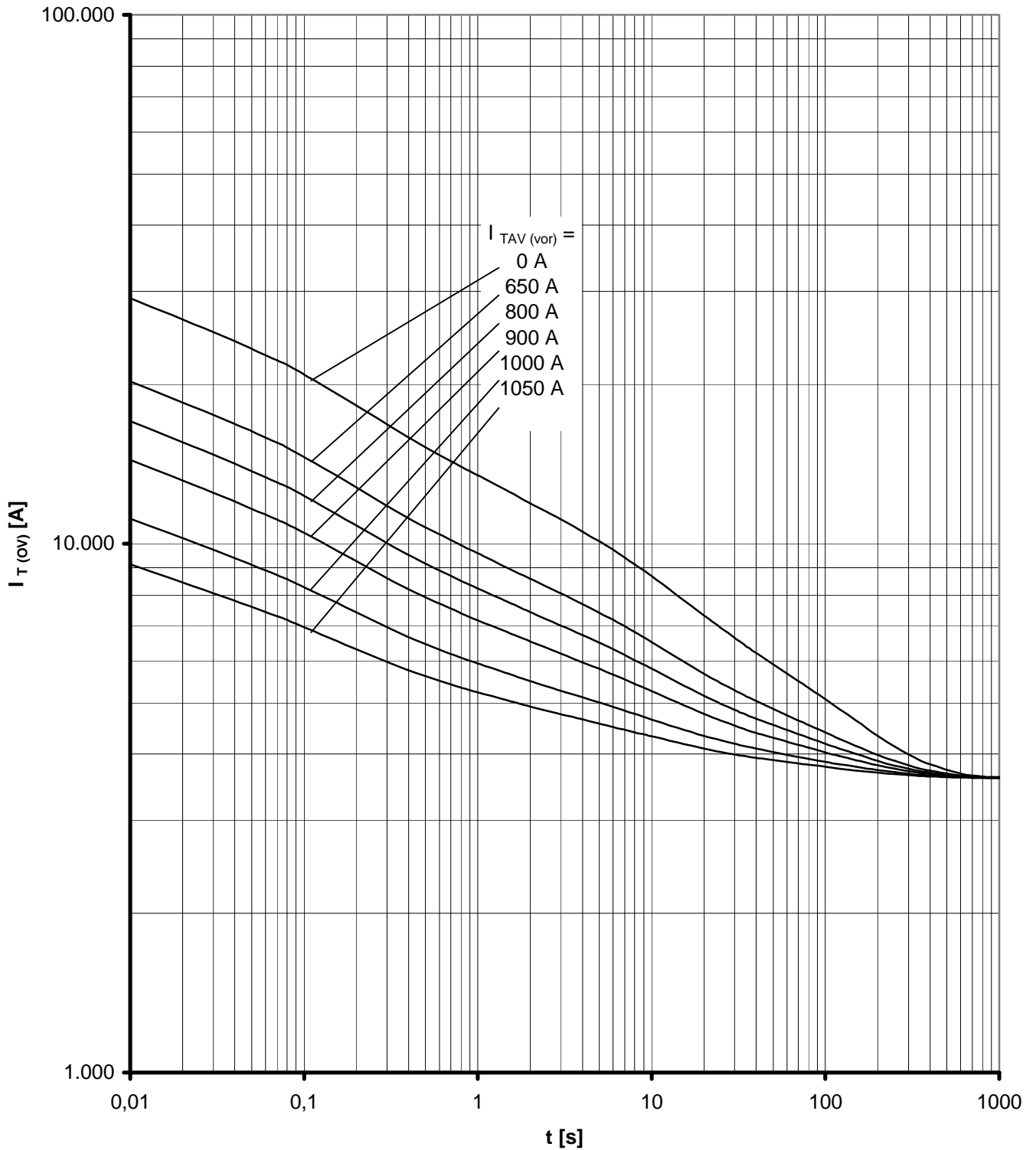


Überstrom / Overload on-state current $I_{T(OV)} = f(t)$

Luftselbstkühlung / Natural cooling K 0.48F

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

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

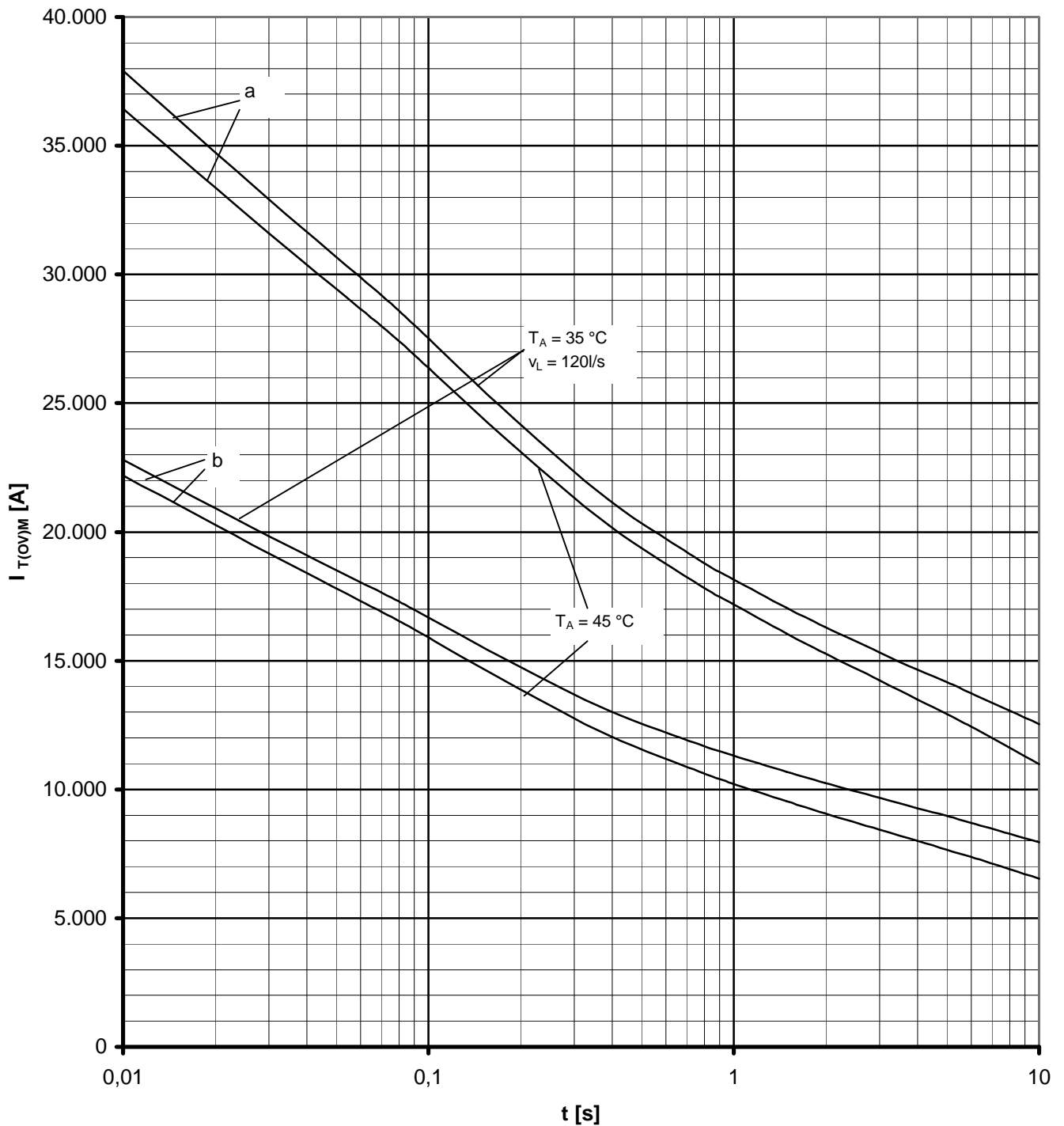


Überstrom / Overload on-state current $I_{T(OV)} = f(t)$

Verstärkte Kühlung / Forced cooling K 0.48F

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

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



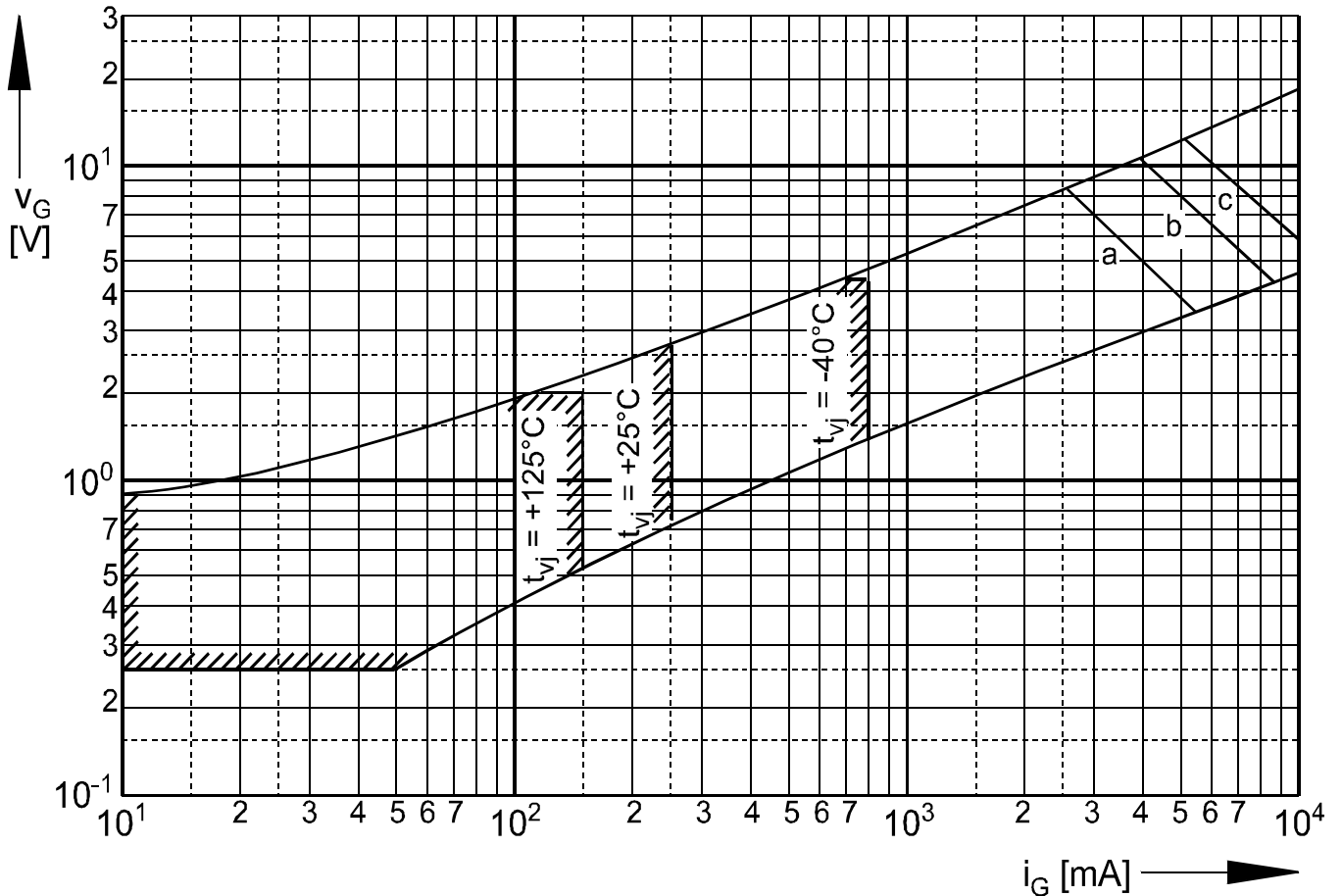
Grenzstrom / Max. overload on-state current $I_{T(OV)M} = f(t)$, $v_{RM} = 0,8 V_{RRM}$

Kühlkörper / Heatsink: K 0.48F

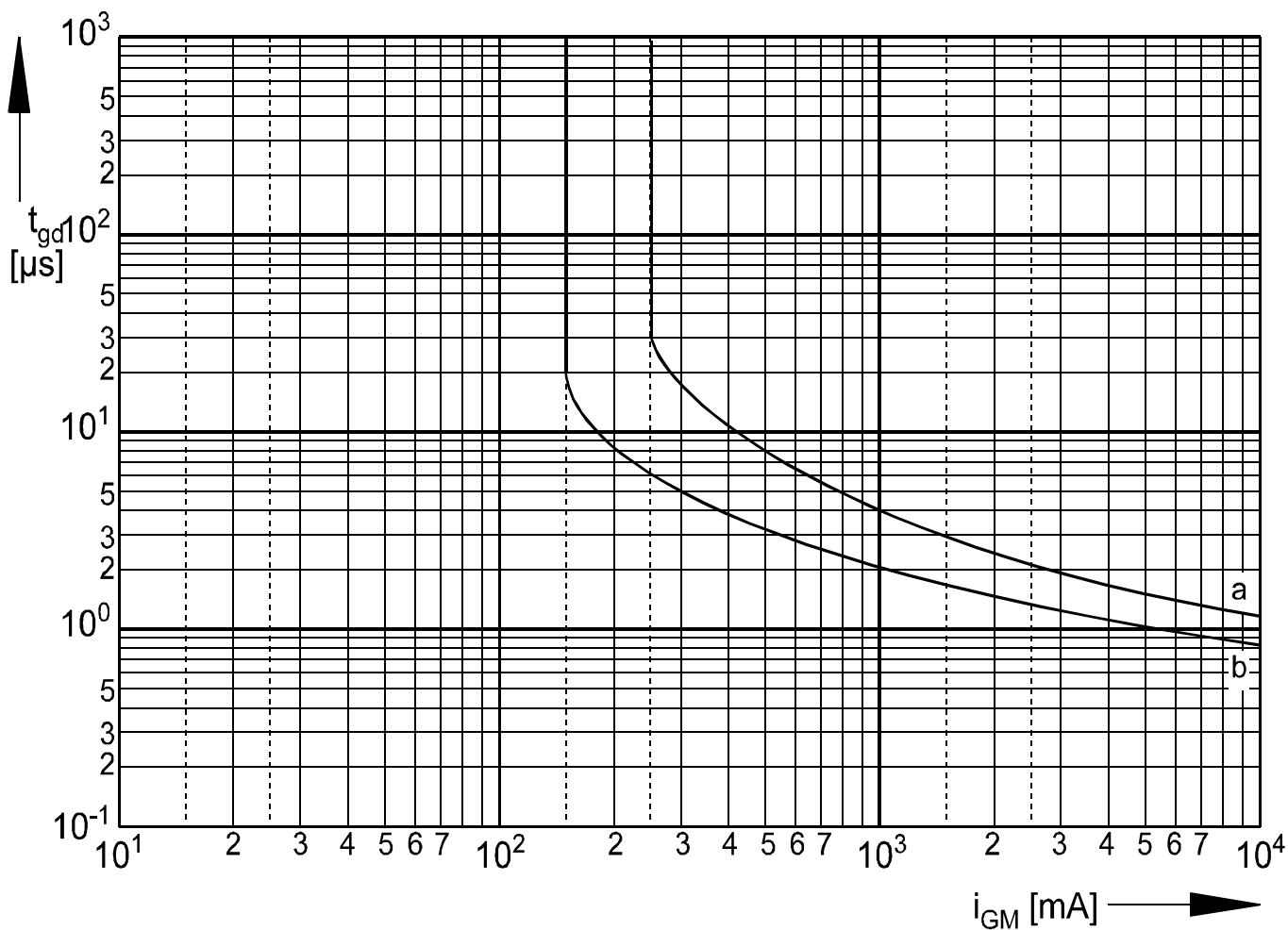
Belastung aus / Surge current occurs:

a - Leerlauf / No-load conditions

b - Betrieb mit Dauergrenzstrom / 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 $PGM = f(t_g)$:
 a - 20W/10ms b - 40W/1ms c - 60/0,5ms



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

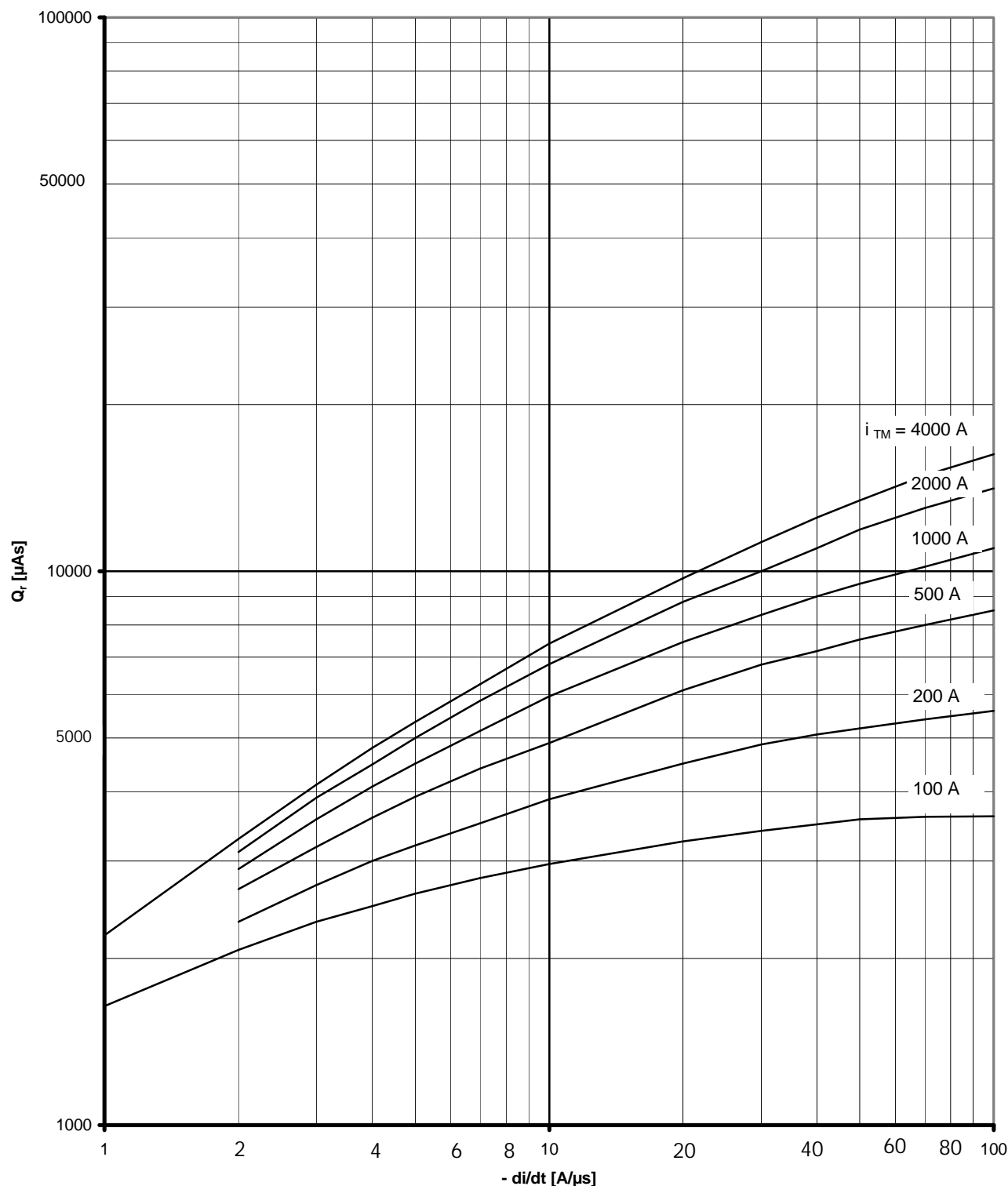
$T_{vj} = 25^\circ\text{C}$, $di_G/dt = i_{GM} / 1\mu\text{s}$

a - maximaler Verlauf / limiting characteristic

b - typischer Verlauf / typical characteristic

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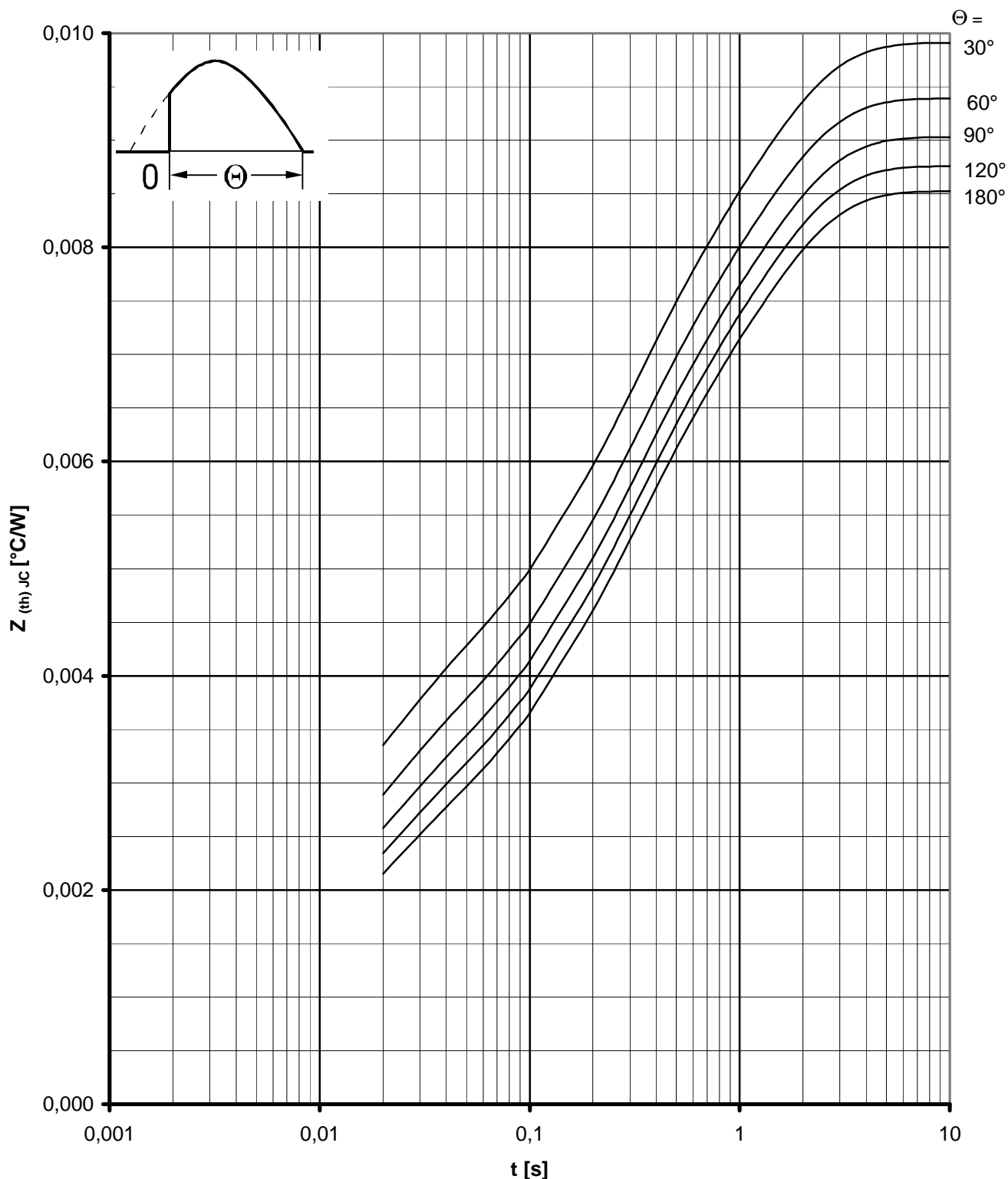
T 2480 N 22...28



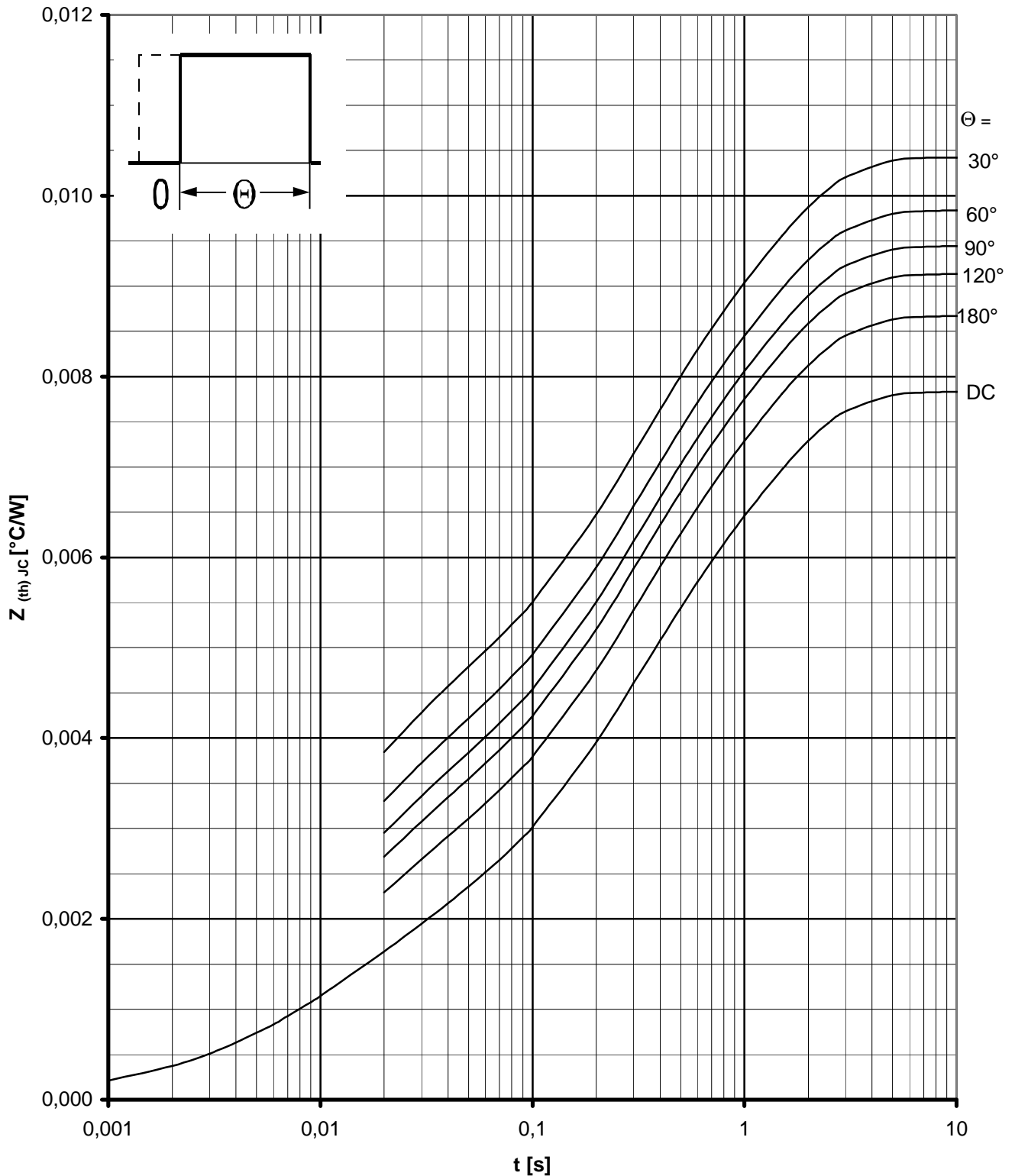
Sperrverzögerungsladung / Recovered charge $Q_r = f(-di/dt)$

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

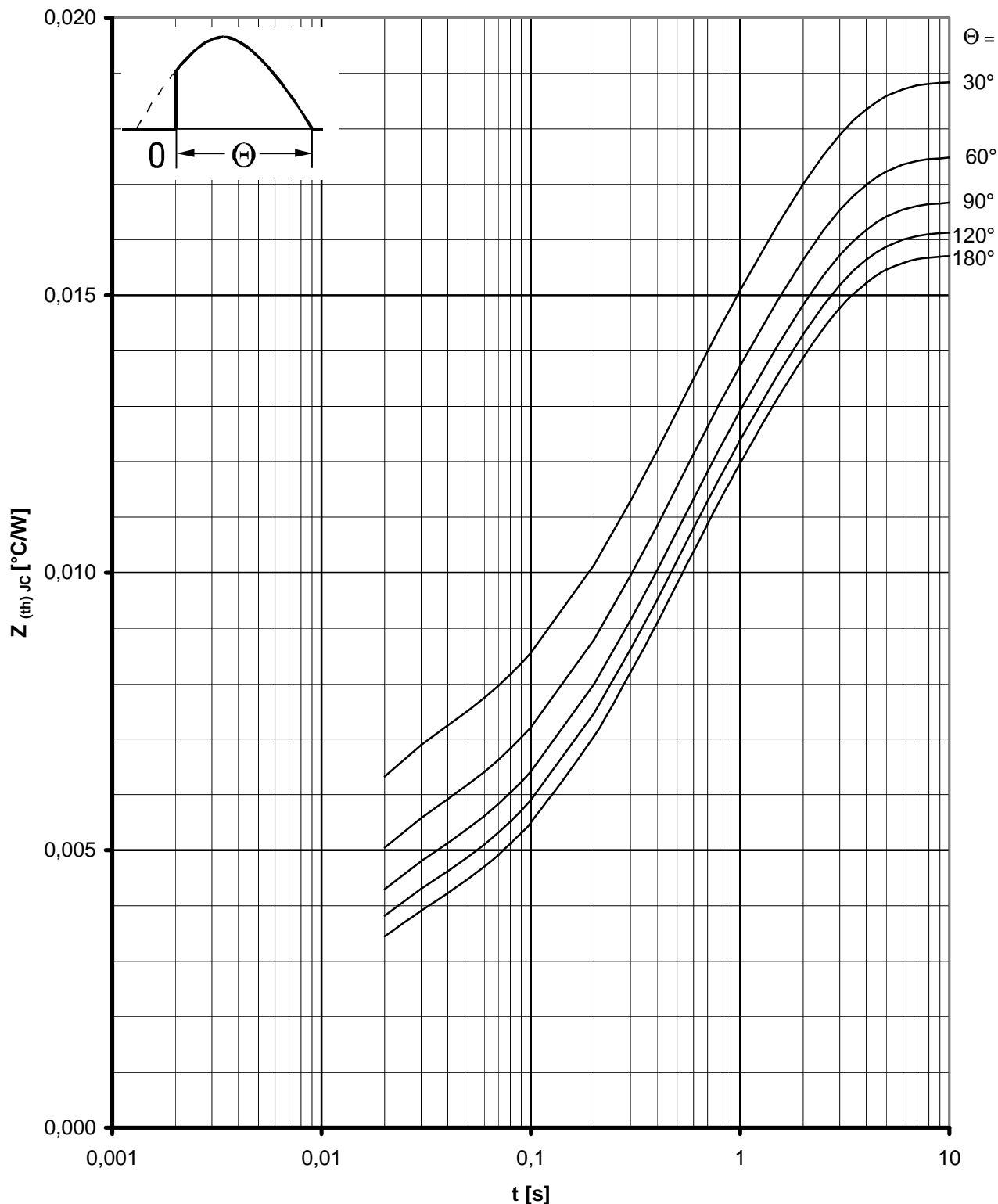
Parameter: Durchlaßstrom / On-state current i_{TM}



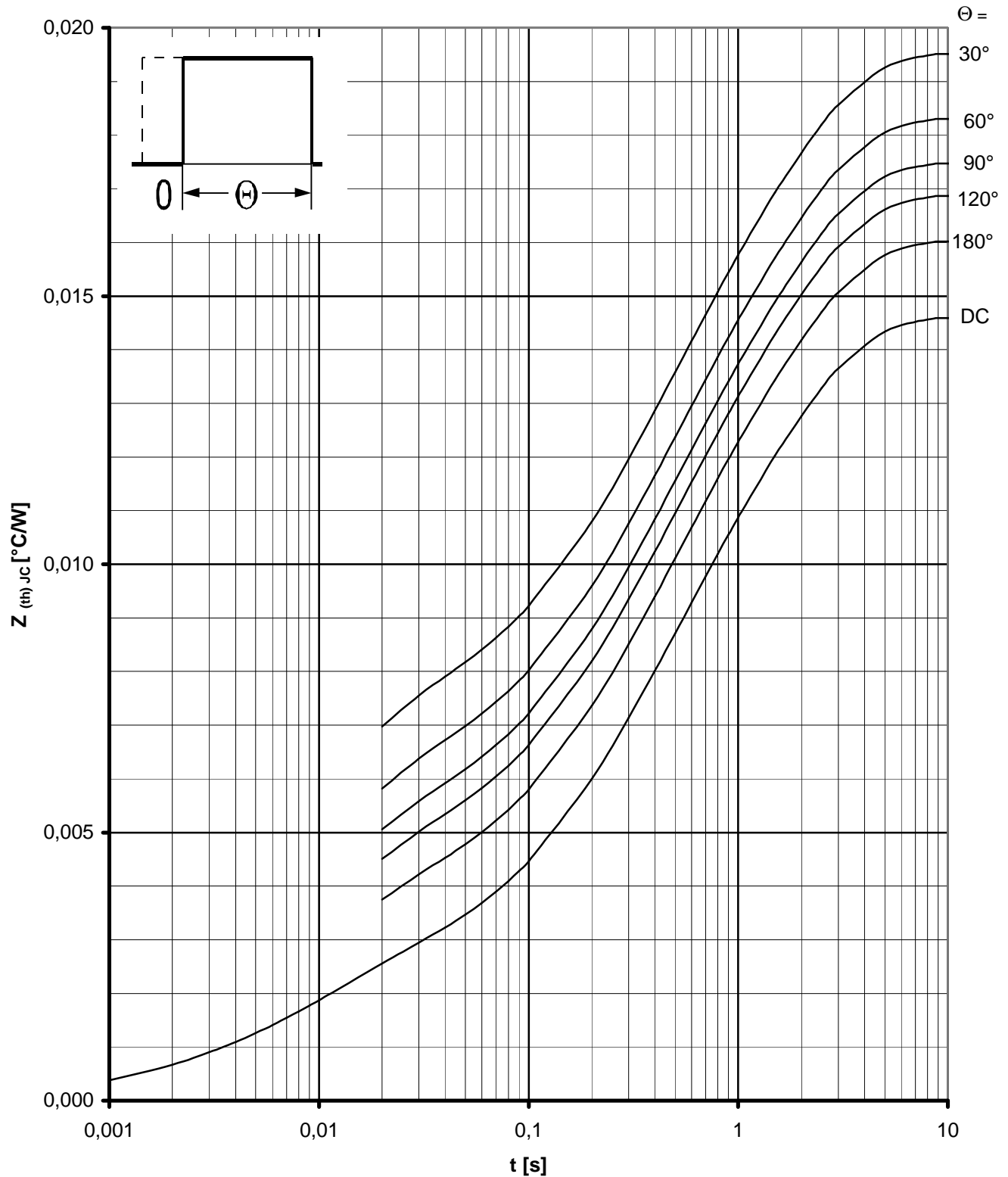
Transienter innerer Wärmewiderstand / Transient thermal impedance $Z_{(th)JC} = f(t)$
 Beidseitige Kühlung / Two-sided cooling
 Parameter: Stromflußwinkel Θ / current conduction angle Θ



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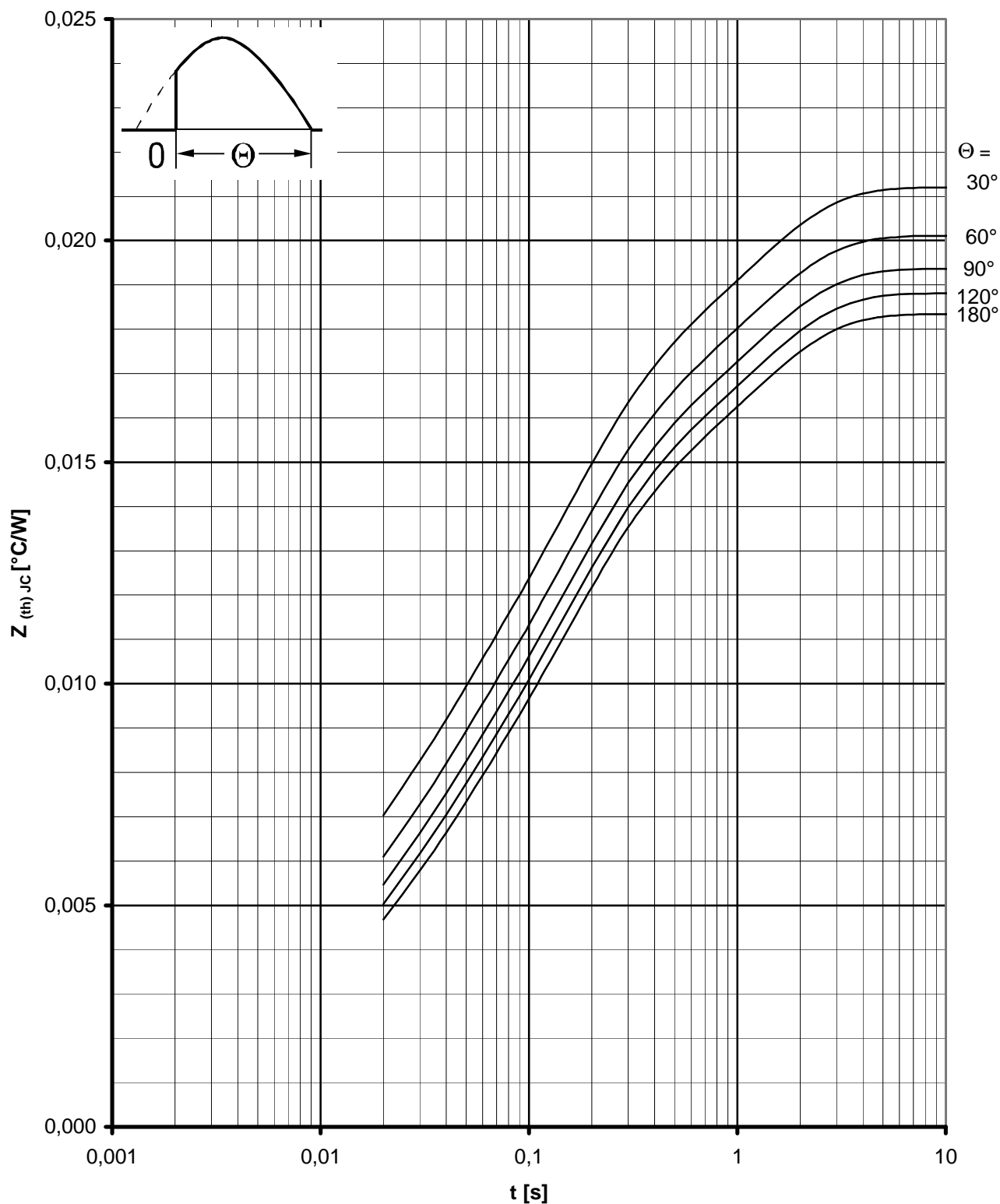
Transienter innerer Wärmewiderstand / Transient thermal impedance $Z_{(th)JC} = f(t)$
 Anodenseitige Kühlung / Anode-sided cooling
 Parameter: Stromflußwinkel Θ / current conduction angle Θ



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

Anodenseitige Kühlung / Anode-sided cooling

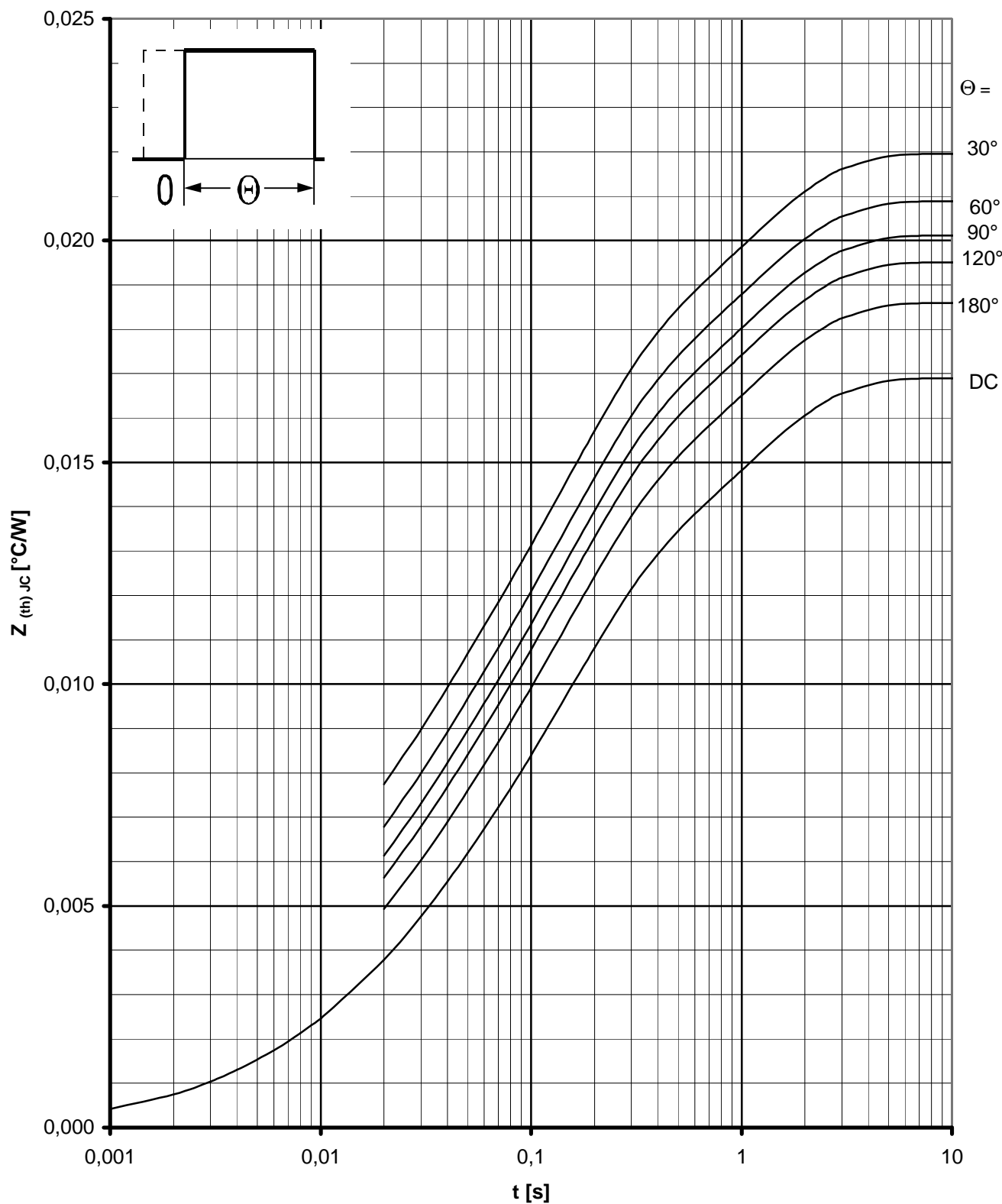
Parameter: Stromflußwinkel Θ / current conduction angle Θ



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

Kathodenseitige Kühlung / Cathode-sided cooling

Parameter: Stromflußwinkel Θ / current conduction angle Θ



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