

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 | $T_{vj} = -40^{\circ}\text{C} \dots T_{vj \max}$ | $V_{\text{DRM}}, V_{\text{RRM}}$ | 2000, 2200 2400, 2600 | V V |
| Vorwärts-Stoßspitzensperrspannung non-repetitive peak forward off-state voltage | $T_{vj} = -40^{\circ}\text{C} \dots T_{vj \max}$ | V_{DSM} | 2000, 2200 2400, 2600 | V V |
| Rückwärts-Stoßspitzensperrspannung non-repetitive peak reverse voltage | $T_{vj} = +25^{\circ}\text{C} \dots T_{vj \max}$ | V_{RSM} | 2100, 2300 2500, 2700 | V V |
| Durchlaßstrom-Grenzeffektivwert RMSM on-state current | | I_{TRSM} | 1900 | A |
| Dauergrenzstrom average on-state current | $T_{\text{C}} = 85^{\circ}\text{C}$ $T_{\text{C}} = 64^{\circ}\text{C}$ | I_{TAVM} | 940 1210 | A A |
| Stoßstrom-Grenzwert surge current | $T_{vj} = 25^{\circ}\text{C}, t_p = 10 \text{ ms}$ $T_{vj} = T_{vj \max}, t_p = 10 \text{ ms}$ | I_{TSM} | 19.500 16.500 | A A |
| Grenzlastintegral I^2t -value | $T_{vj} = 25^{\circ}\text{C}, t_p = 10 \text{ ms}$ $T_{vj} = T_{vj \max}, t_p = 10 \text{ ms}$ | I^2t | 1.900 1.360 | $\text{A}^2\text{s} \cdot 10^3$ $\text{A}^2\text{s} \cdot 10^3$ |
| 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 | $T_{vj} = T_{vj \max}, V_{\text{D}} = 0,67 V_{\text{DRM}}$ 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 | $T_{vj} = T_{vj \max}, i_{\text{T}} = 2500 \text{ A}$ $T_{vj} = T_{vj \max}, i_{\text{T}} = 1000 \text{ A}$ | v_{T} | max. 1,98 max. 1,38 | V V |
| Schleusenspannung threshold voltage | $T_{vj} = T_{vj \max}$ | $V_{\text{T(TO)}}$ | 0,95 | V |
| Ersatzwiderstand slope resistance | $T_{vj} = T_{vj \max}$ | r_{T} | 0,38 | $\text{m}\Omega$ |
| Durchlaßkennlinie on-state voltage $v_{\text{T}} = A + B \times i_{\text{T}} + C \times \ln(i_{\text{T}} + 1) + D \times \sqrt{i_{\text{T}}}$ | $T_{vj} = T_{vj \max}$ | A=1,0312 B=3,4432E-04 C=-2,802E-02 D=6,0023E-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. 2,2 | V |
| Nicht zündener Steuerstrom gate non-trigger current | $T_{vj} = T_{vj \max}, v_{\text{D}} = 6 \text{ V}$ $T_{vj} = T_{vj \max}, v_{\text{D}} = 0,5 V_{\text{DRM}}$ | I_{GD} | max. 10 max. 5 | mA mA |
| Nicht zündene Steuerspannung gate non-trigger voltage | $T_{vj} = T_{vj \max}, v_{\text{D}} = 0,5 V_{\text{DRM}}$ | 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. 1200 | mA |
| Vorwärts- und Rückwärts-Sperrstrom forward off-state and reverse currents | $T_{vj} = T_{vj \max}$ $v_{\text{D}} = V_{\text{DRM}}, v_{\text{R}} = V_{\text{RRM}}$ | $i_{\text{D}}, i_{\text{R}}$ | 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_{gd} | max. 4 | μs |

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Charakteristische Werte / Characteristic values

Vorläufige Daten

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. 350 | μs |
|---|---|-------|----------|---------|

Thermische Eigenschaften / Thermal properties

| | | | | |
|---|---|---------------|--|--|
| Innerer Wärmewiderstand thermal resistance, junction to case | Kühlfläche / cooling surface beidseitig / two-sided, $\checkmark = 180^\circ \sin$ beidseitig / two-sided, DC Anode / anode, $\checkmark = 180^\circ \sin$ Anode / anode, DC Kathode / cathode, $\checkmark = 180^\circ \sin$ Kathode / cathode, DC | R_{thJC} | max. 0,0231 max. 0,0210 max. 0,0395 max. 0,0375 max. 0,0500 max. 0,0480 | $^\circ C/W$ $^\circ C/W$ $^\circ C/W$ $^\circ C/W$ $^\circ C/W$ $^\circ C/W$ |
| Übergangs- Wärmewiderstand thermal resistance, case to heatsink | Kühlfläche / cooling surface beidseitig / two-sided einseitig / single-sided | R_{thJK} | max. 0,0035 max. 0,0070 | $^\circ C/W$ $^\circ C/W$ |
| 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 | $^\circ C$ |

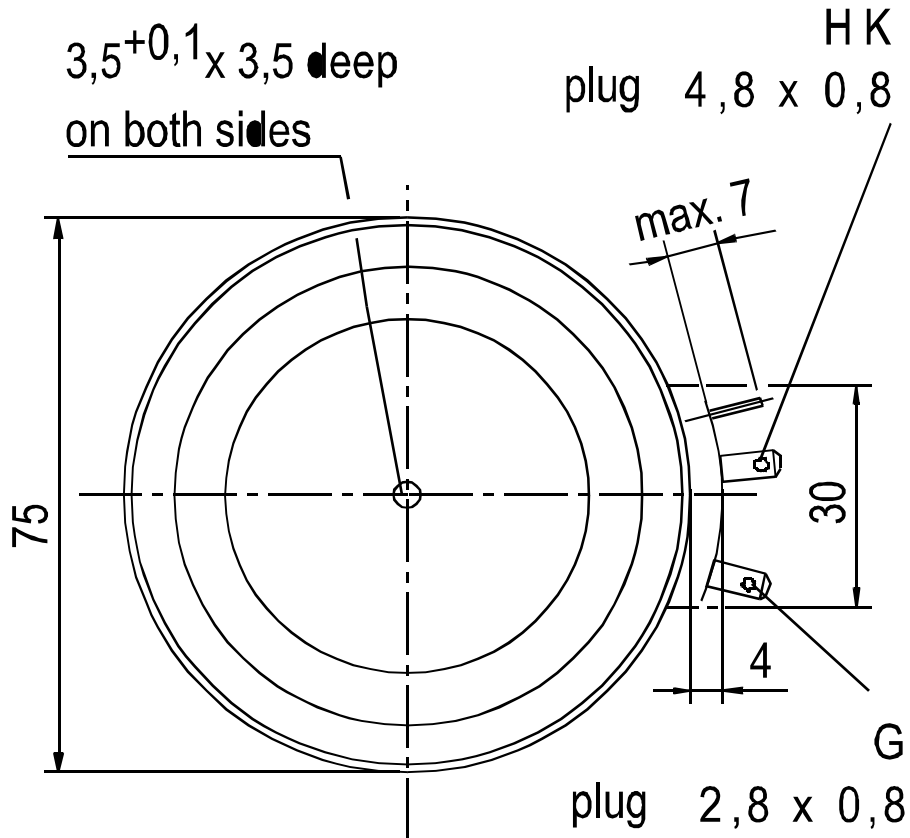
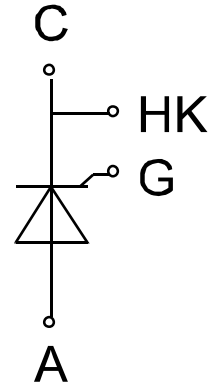
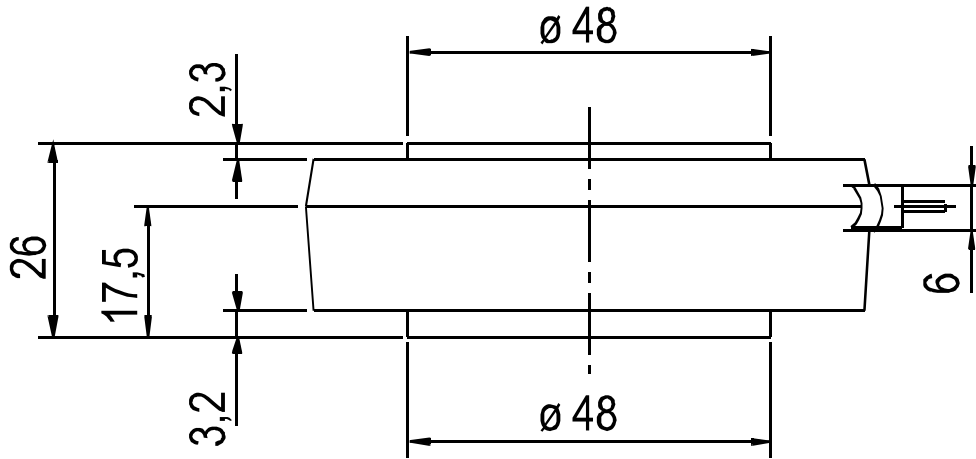
Mechanische Eigenschaften / Mechanical properties

| | | | | |
|--|-----------|---|-------------------|------------------|
| Gehäuse, siehe Anlage case, see appendix | | | Seite 3 page 3 | |
| Si-Element mit Druckkontakt 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 |

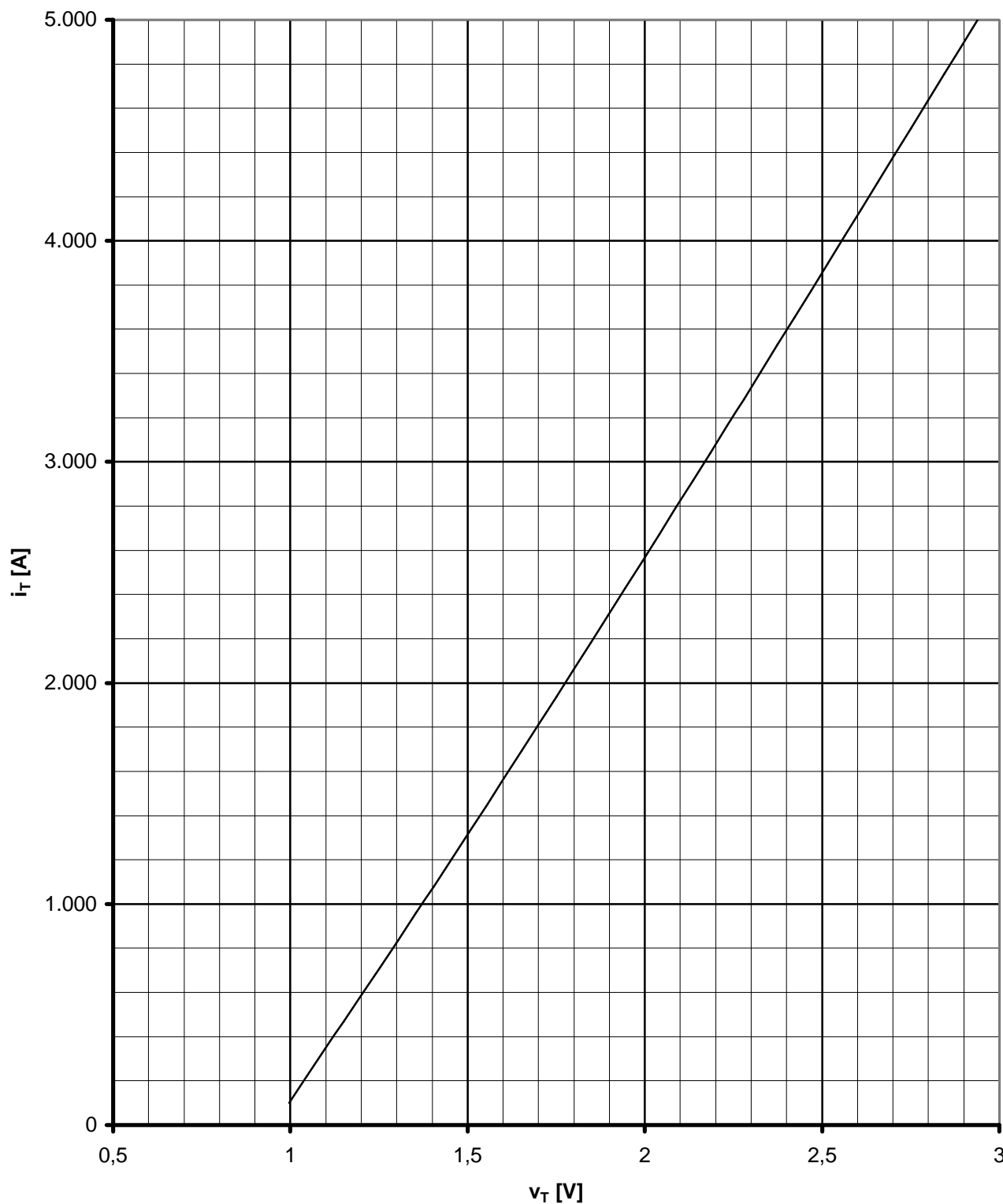
Mit dieser technischen Information werden Halbleiterbauelemente spezifiziert, jedoch keine Eigenschaften zugesichert. Sie gilt in Verbindung mit den zugehörigen Technischen Erläuterungen./ The technical information specifies semiconductor devices but promises no characteristics. It is valid in combination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

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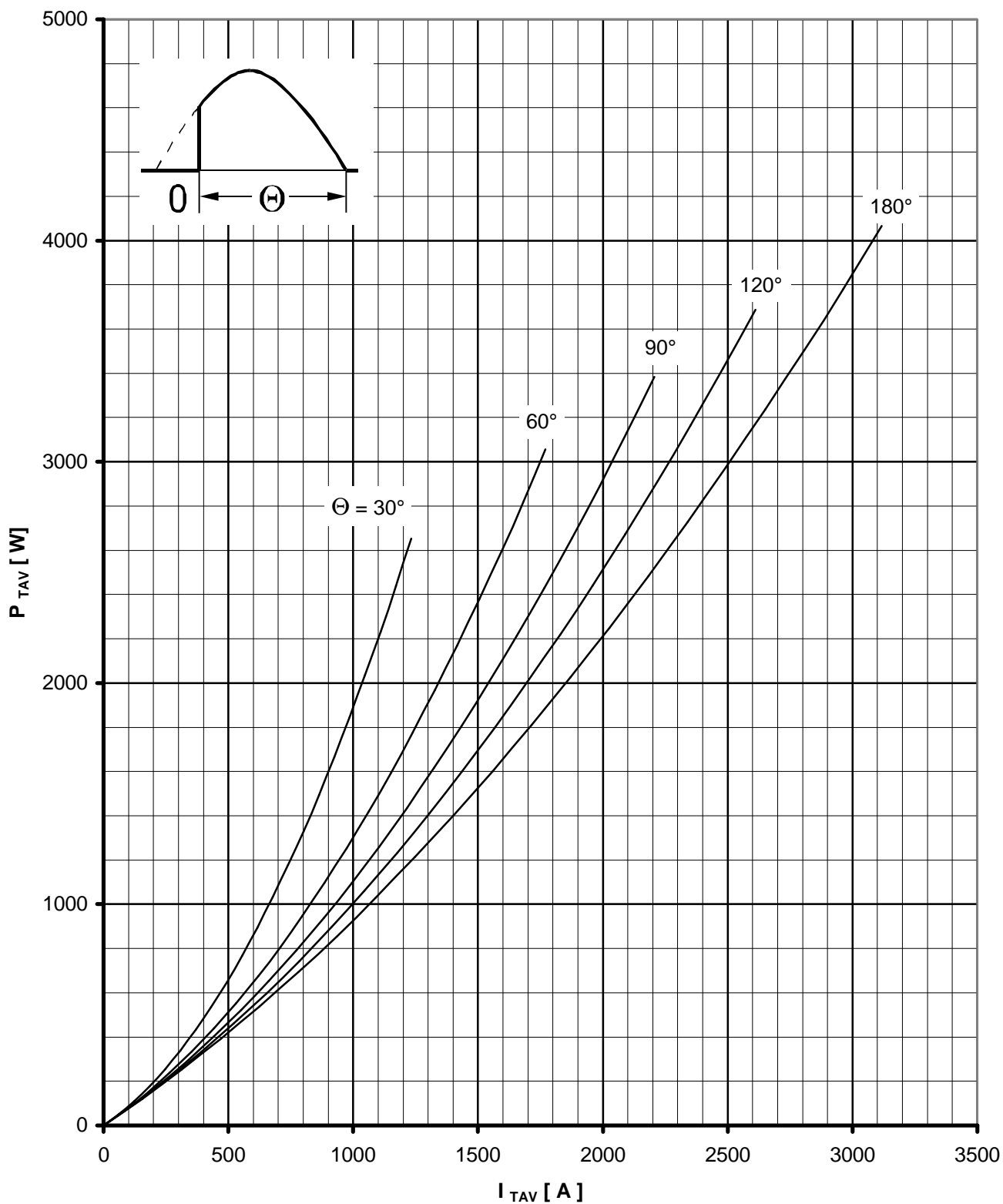


| | | | | | | | | |
|---|--|---------|---------|---------|---------|---------|---|---|
| Kühlung cooling | Analytische Elemente des transienten Wärmewiderstandes Z_{thJC} für DC Analytical elements of transient thermal impedance Z_{thJC} for DC | | | | | | | |
| | Pos.n | 1 | 2 | 3 | 4 | 5 | 6 | 7 |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

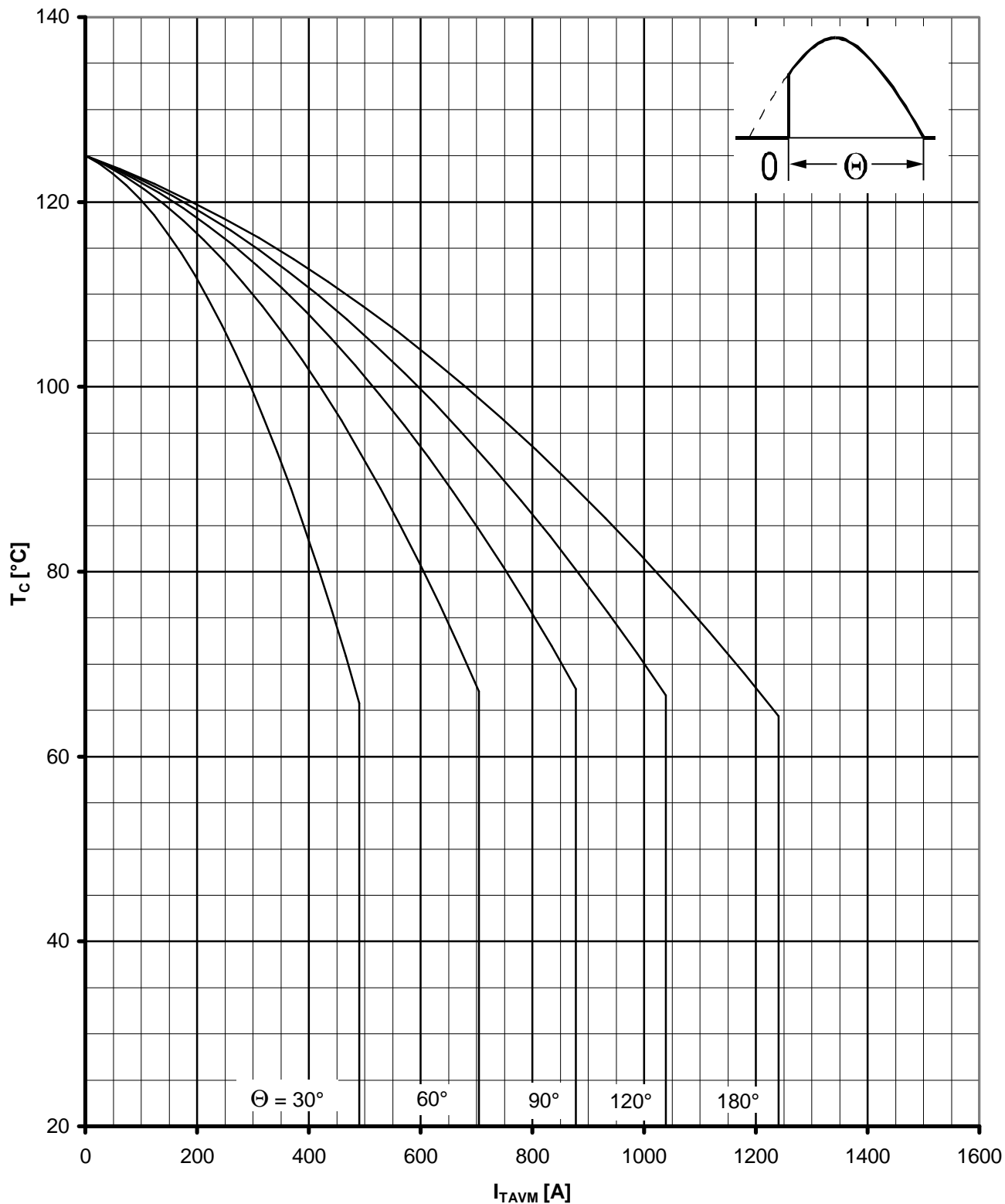
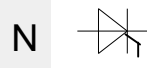
$T_{vj} = T_{vj} \text{ max}$



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

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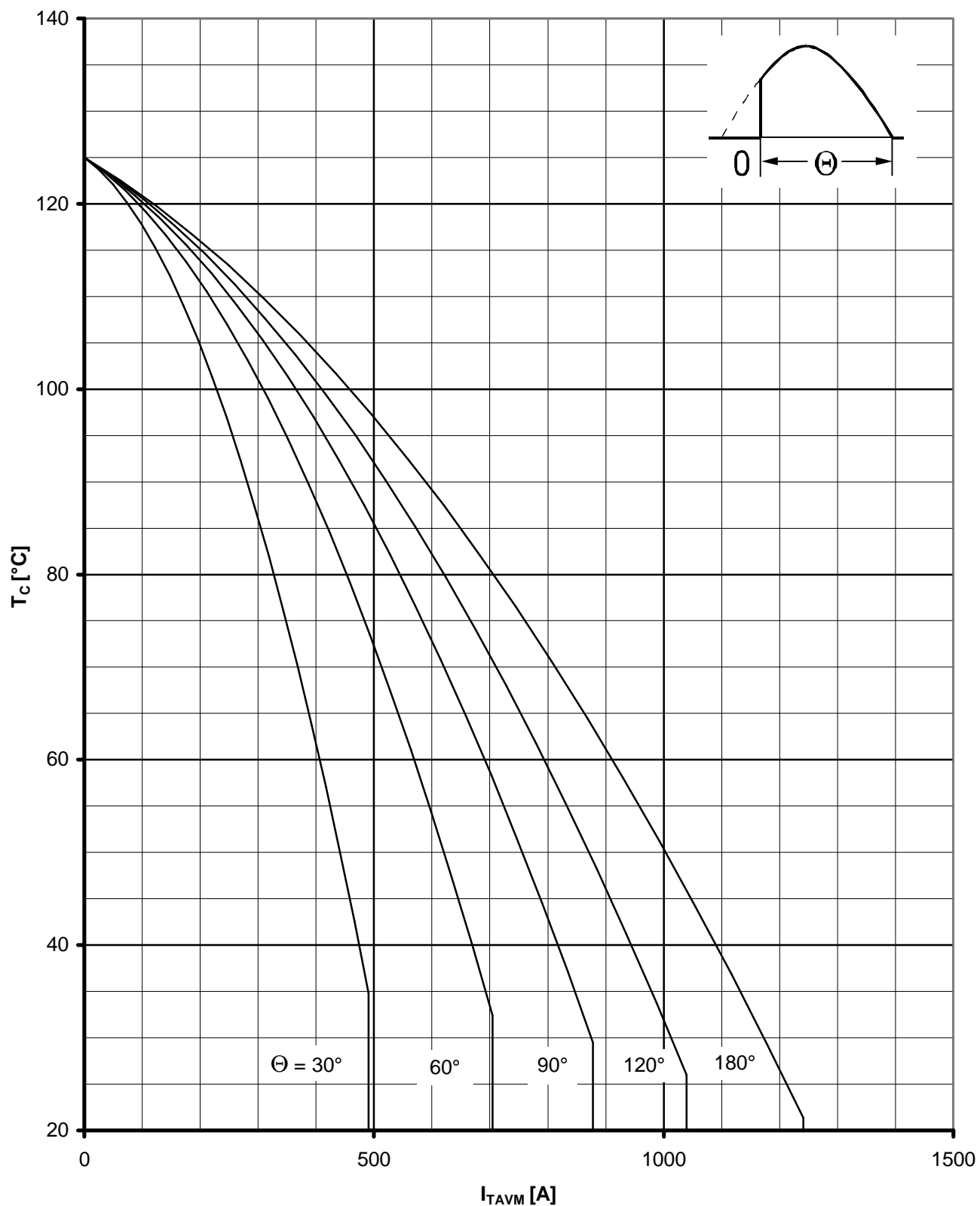
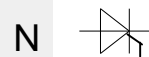
Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAVM})$

Beidseitige Kühlung / Two-sided cooling

Parameter: Stromflußwinkel Θ / current conduction angle Θ

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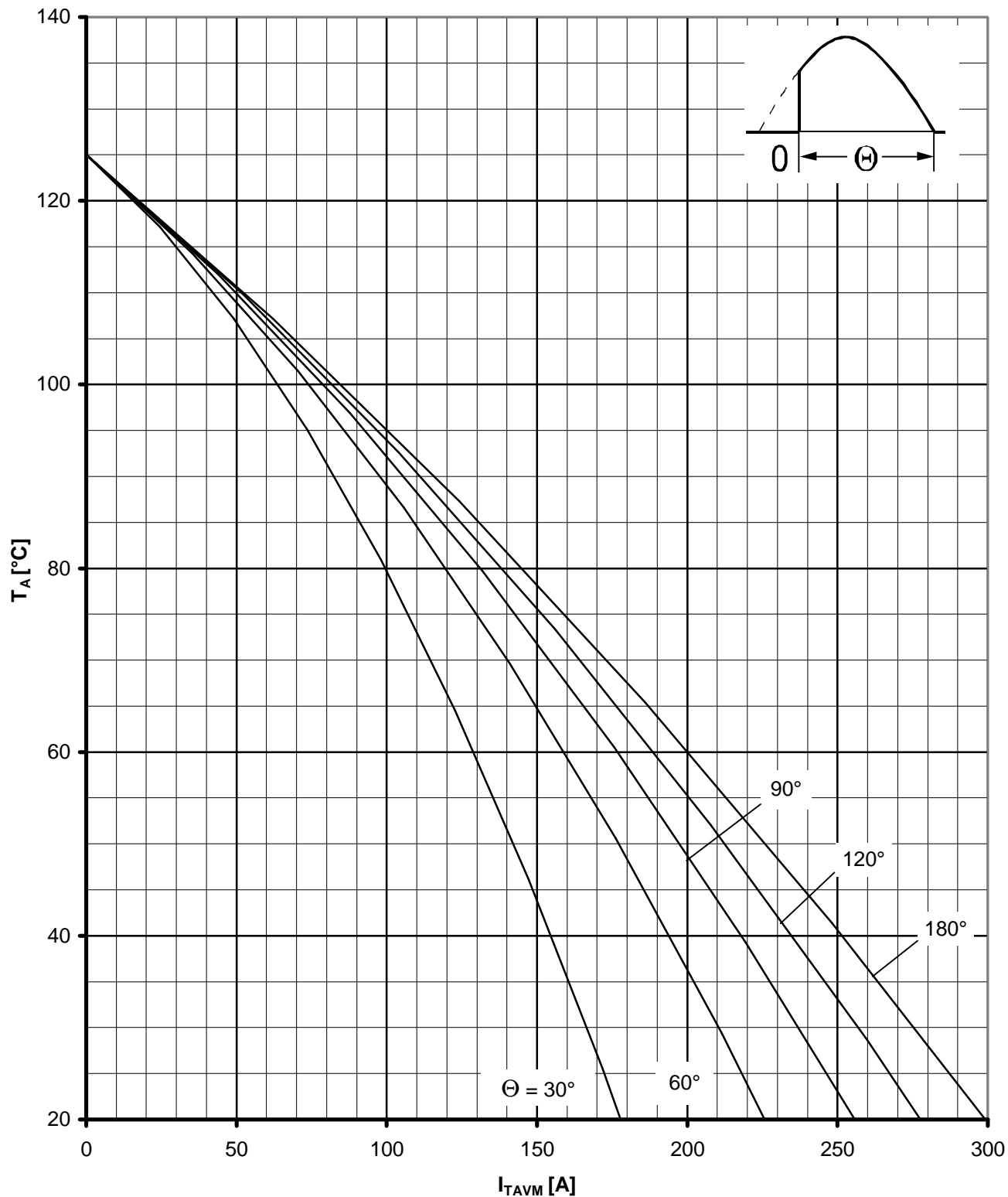
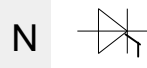
Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAVM})$

Anodenseitige Kühlung / anode sided cooling

Parameter: Stromflußwinkel Θ / current conduction angle Θ

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

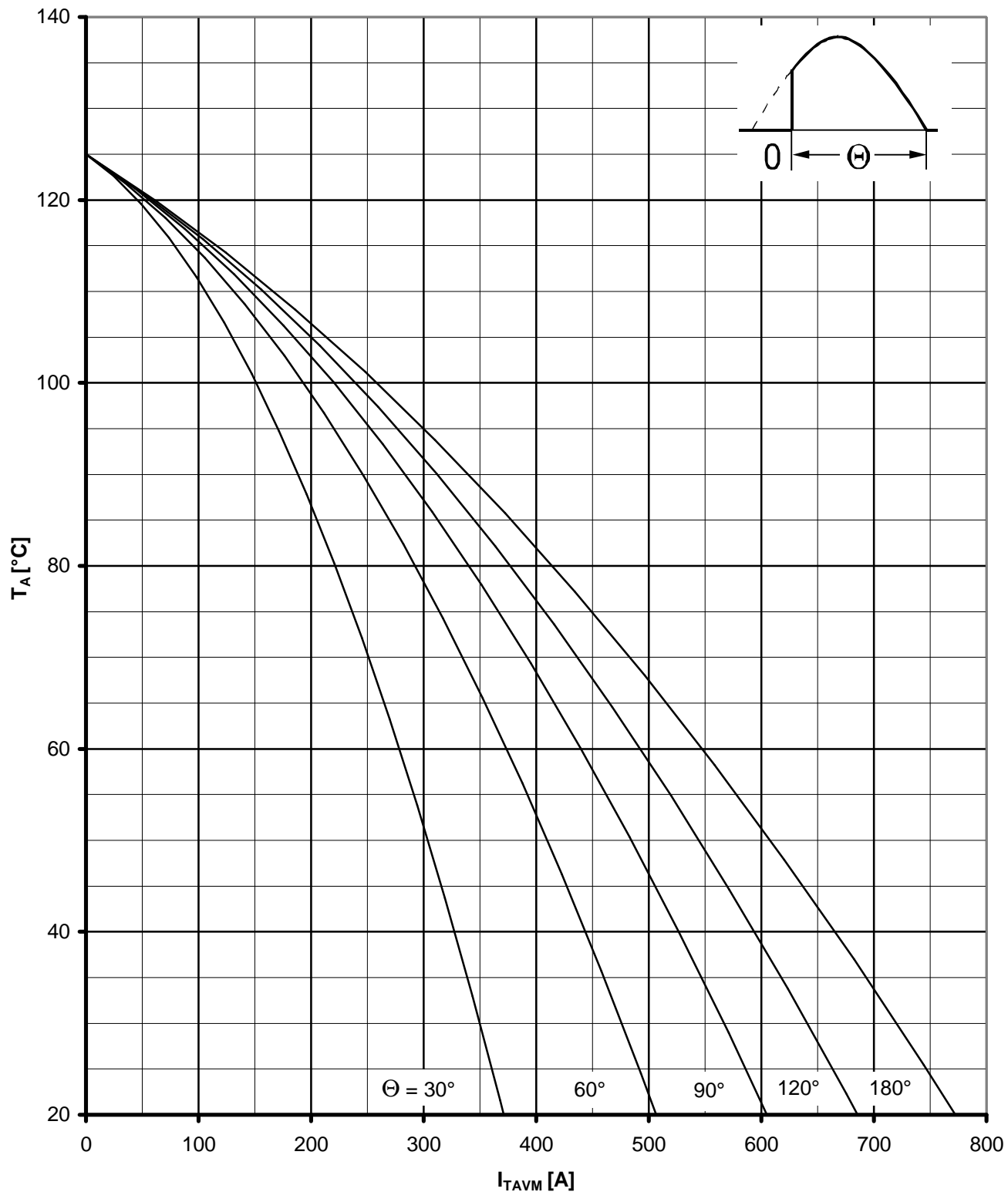
Luftselbstkühlung / Natural air-cooling

Kühlkörper/Heatsink. K0.05 F

Parameter: Stromflußwinkel Θ / current conduction angle Θ

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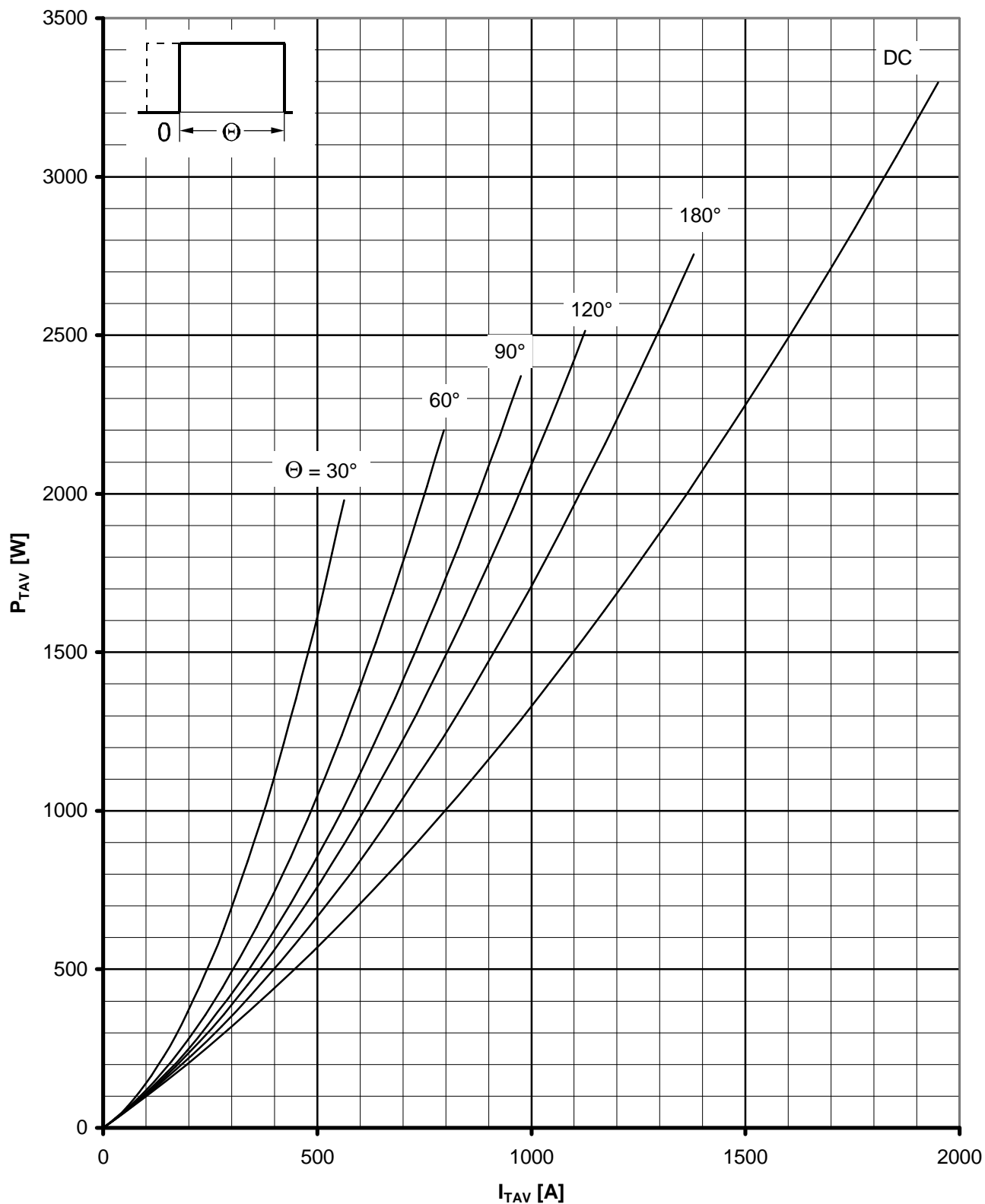


Höchstzulässige Kühlmitteltemperatur / Max. allowable cooling medium temperature $T_A = f(I_{TAVM})$

Verstärkte Luftkühlung / Forced air-cooling

Kühlkörper/Heatsink. K0.05F, $V_L = 120 \text{ l/s}$

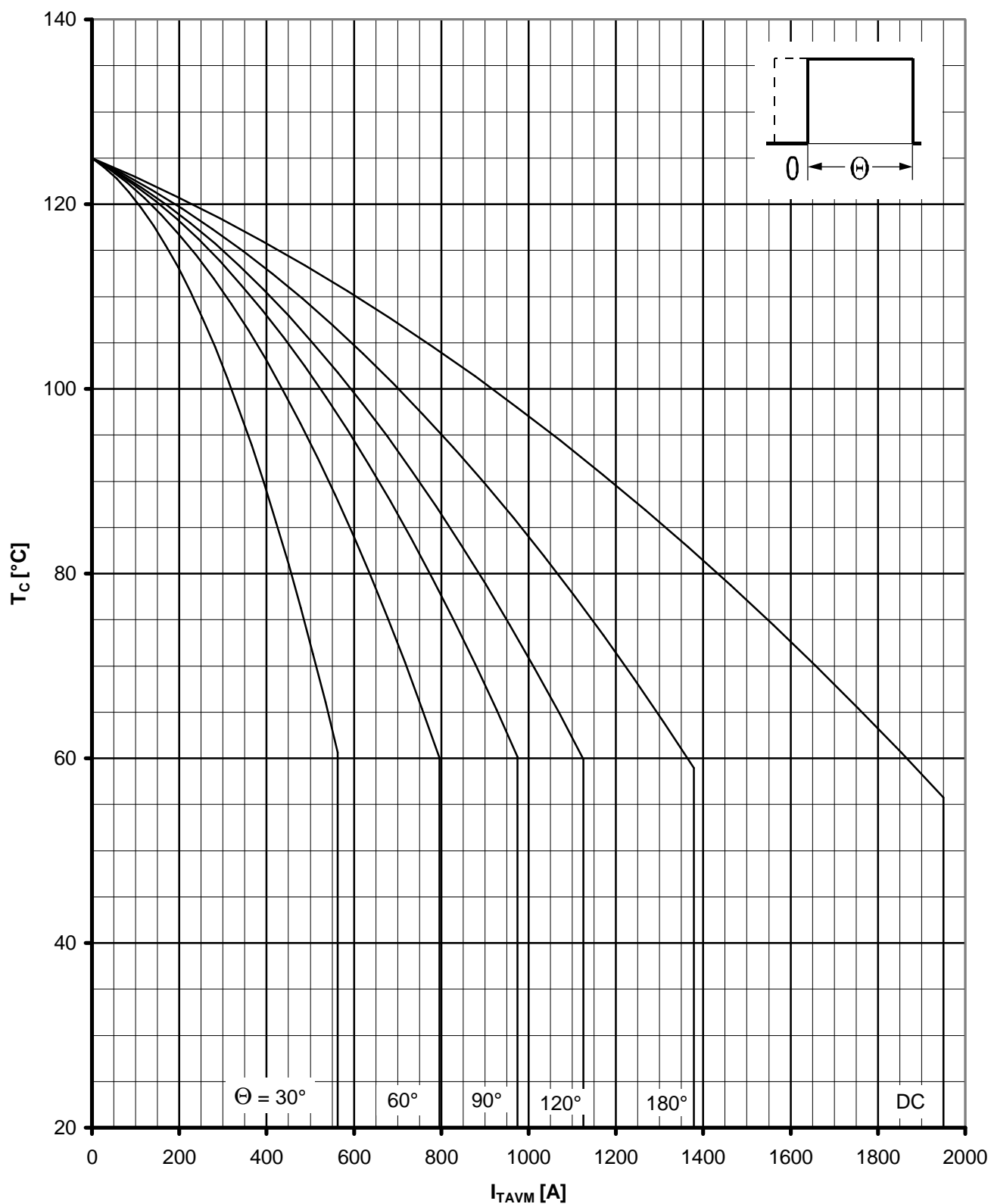
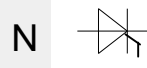
Parameter: Stromflußwinkel Θ / current conduction angle Θ



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

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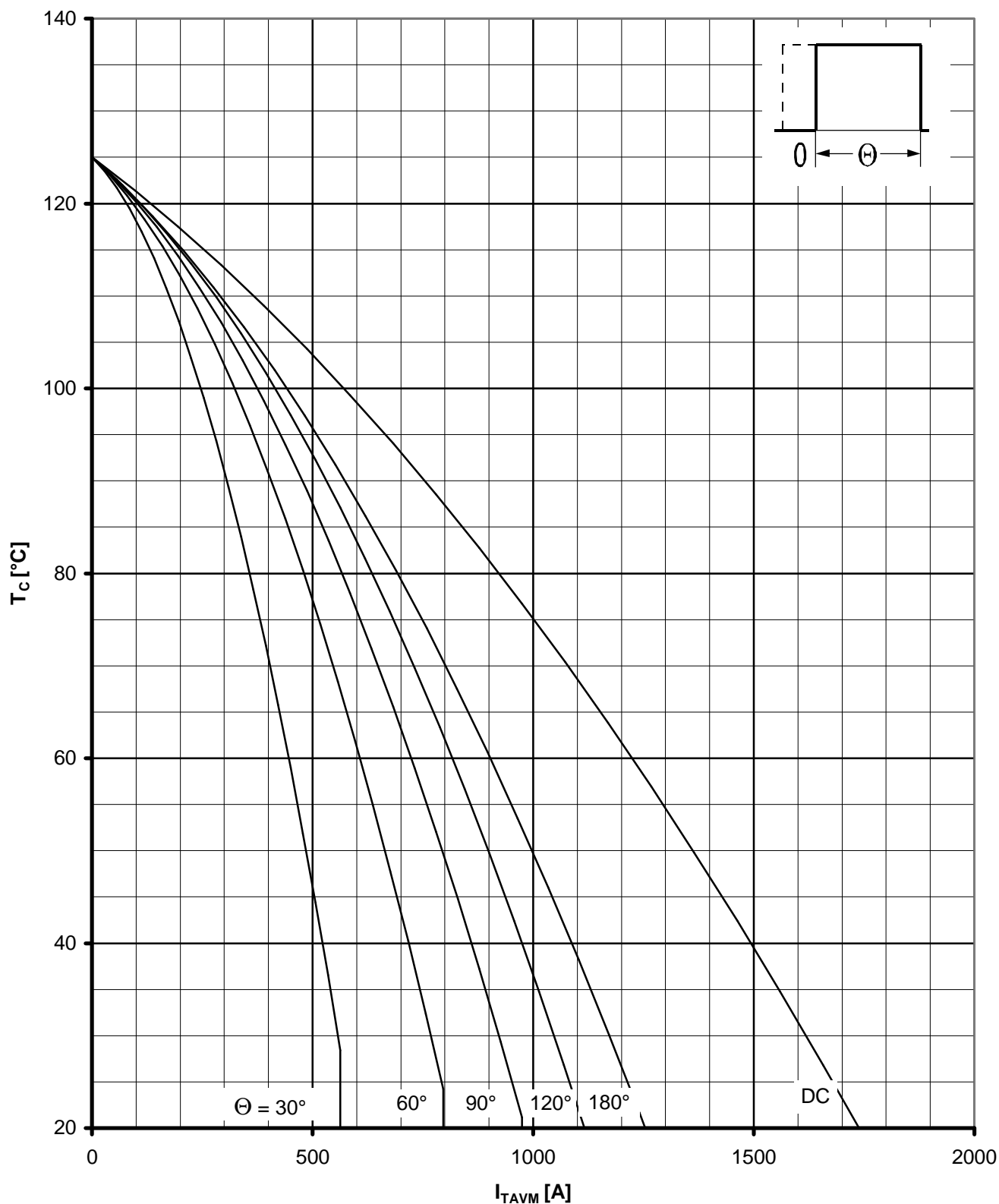
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Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAVM})$

Beidseitige Kühlung / Two-sided cooling

Parameter: Stromflußwinkel θ / current conduction angle θ



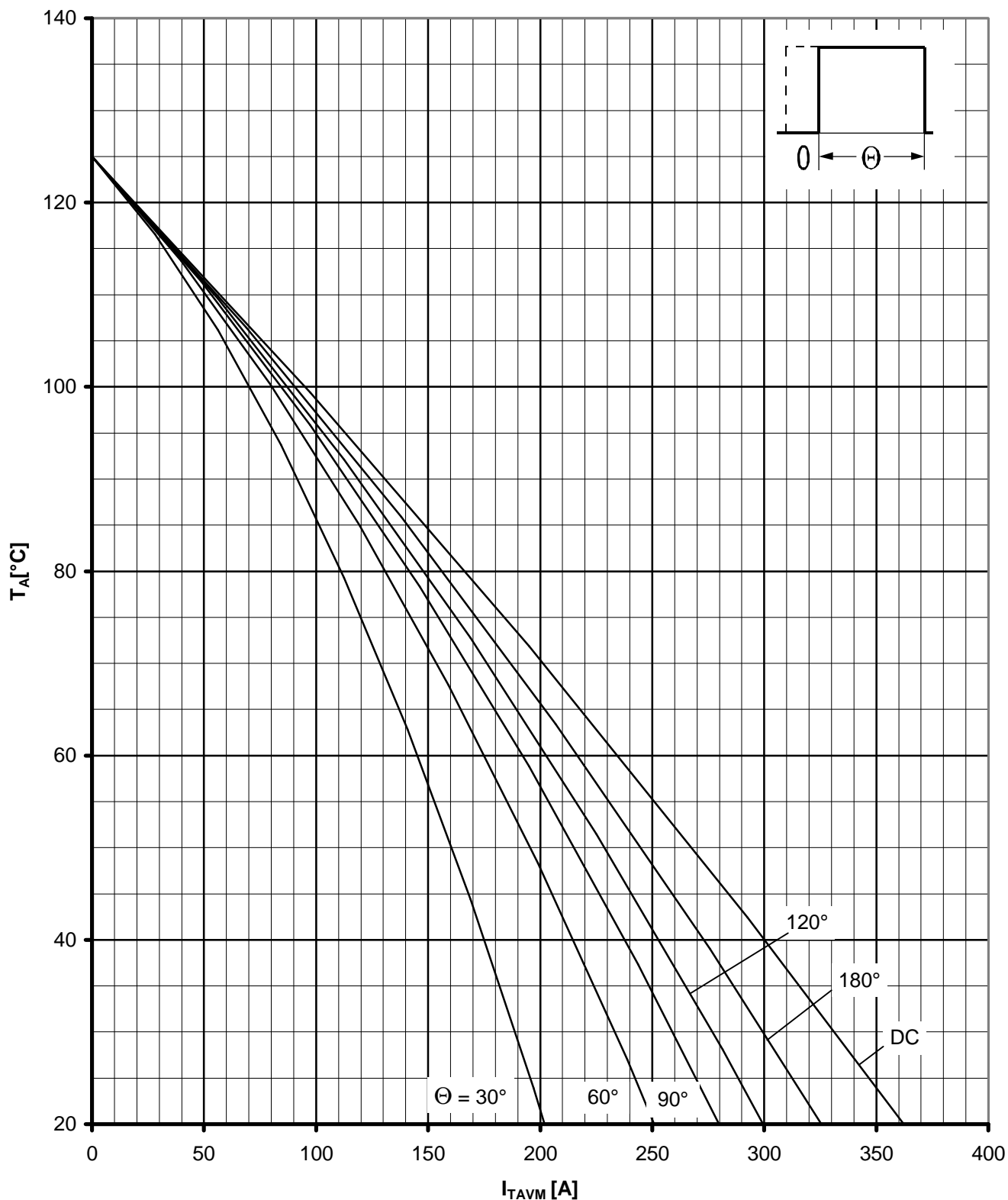
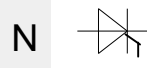
Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_c = f(I_{TAVM})$

Anodenseitige Kühlung / anode sided cooling

Parameter: Stromflußwinkel Θ / current conduction angle Θ

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

Luftselbstkühlung / Natural air-cooling

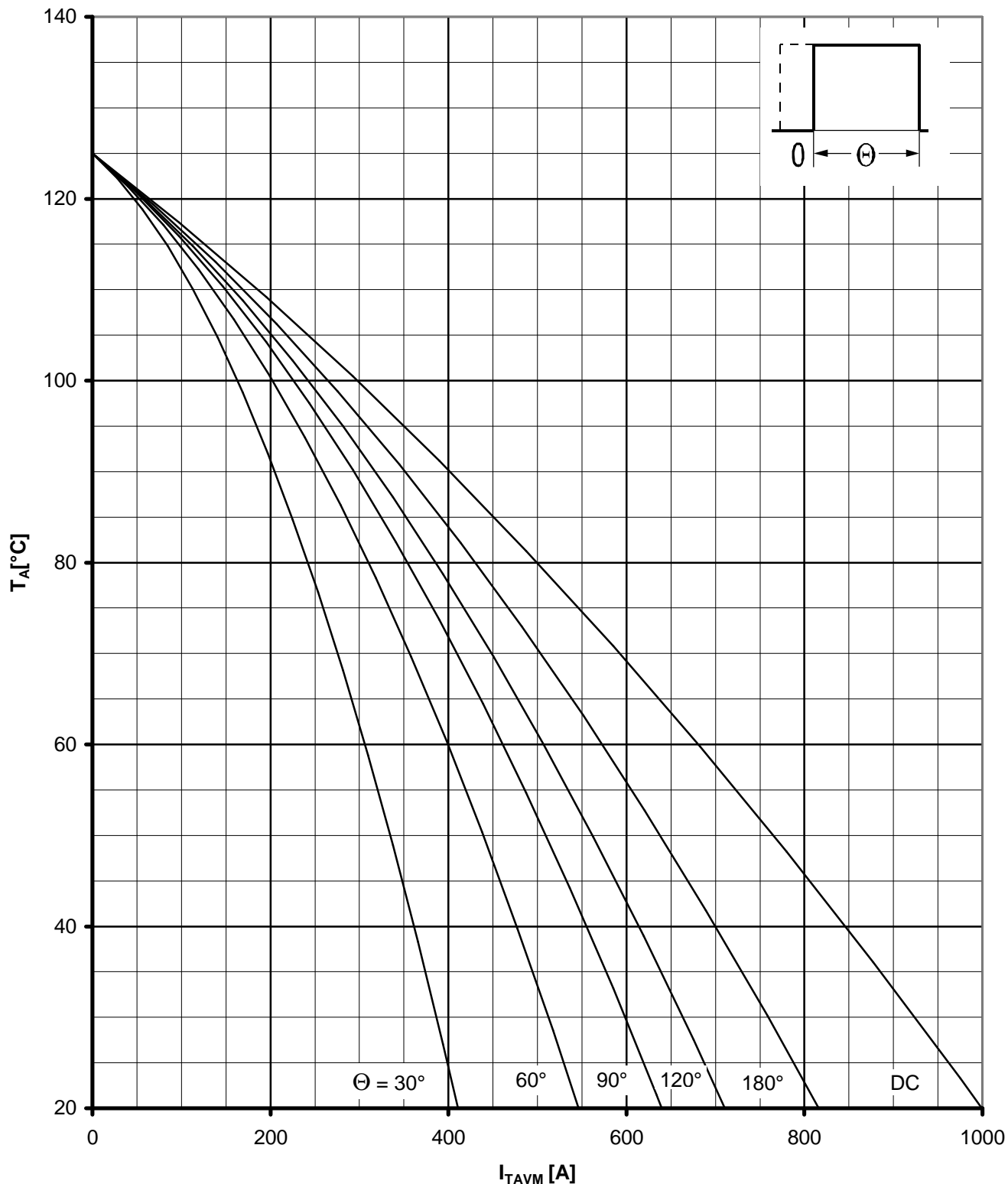
Kühlkörper/Heatsink. K0.05 F

Parameter: Stromflußwinkel Θ / current conduction angle Θ

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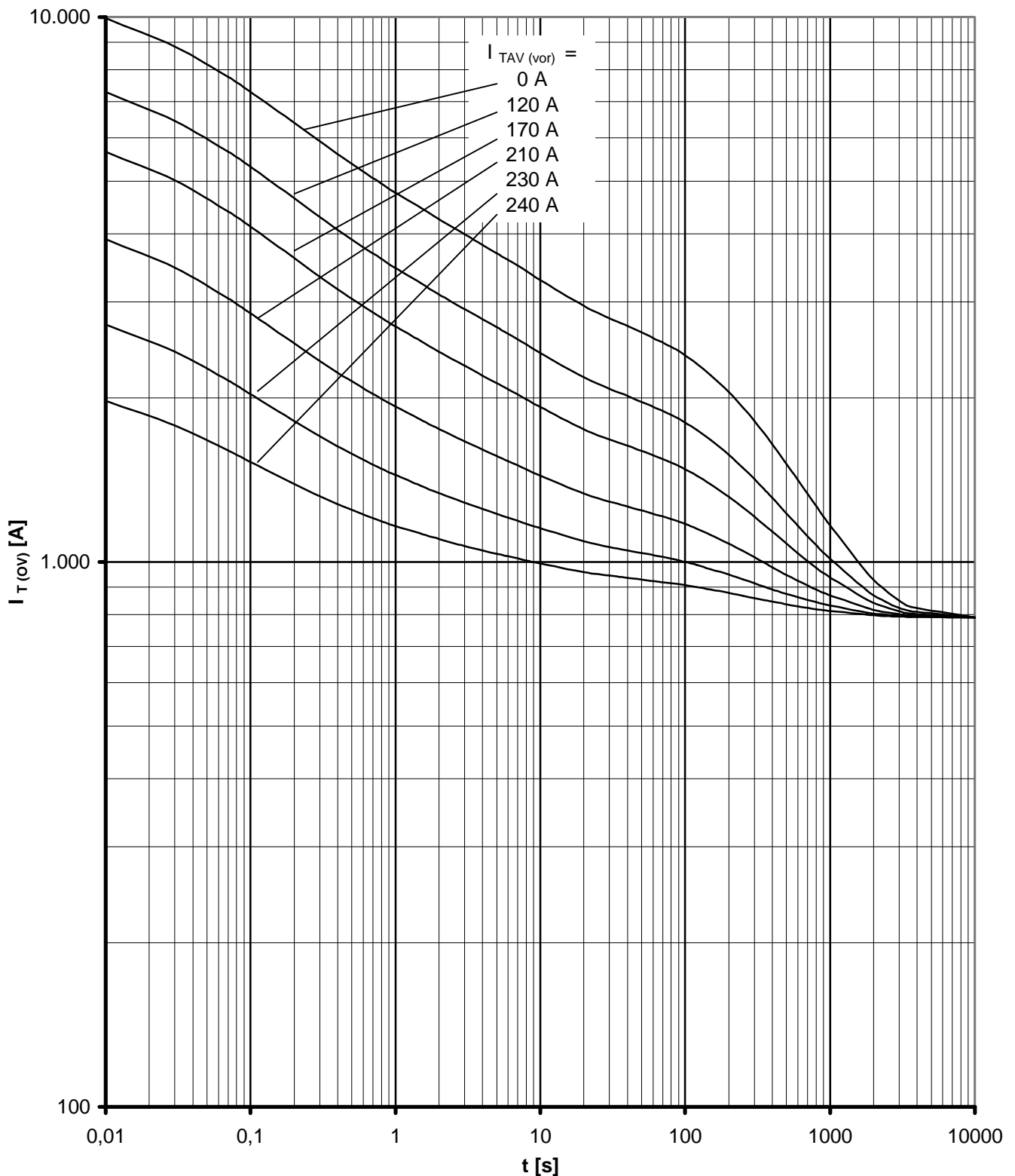


Höchstzulässige Kühlmitteltemperatur / Max. allowable cooling medium temperature $T_A = f(I_{TAVM})$

Verstärkte Luftkühlung / Forced air-cooling

Kühlkörper/Heatsink. K0.05F, $V_L = 120$ l/s

Parameter: Stromflußwinkel Θ / current conduction angle Θ

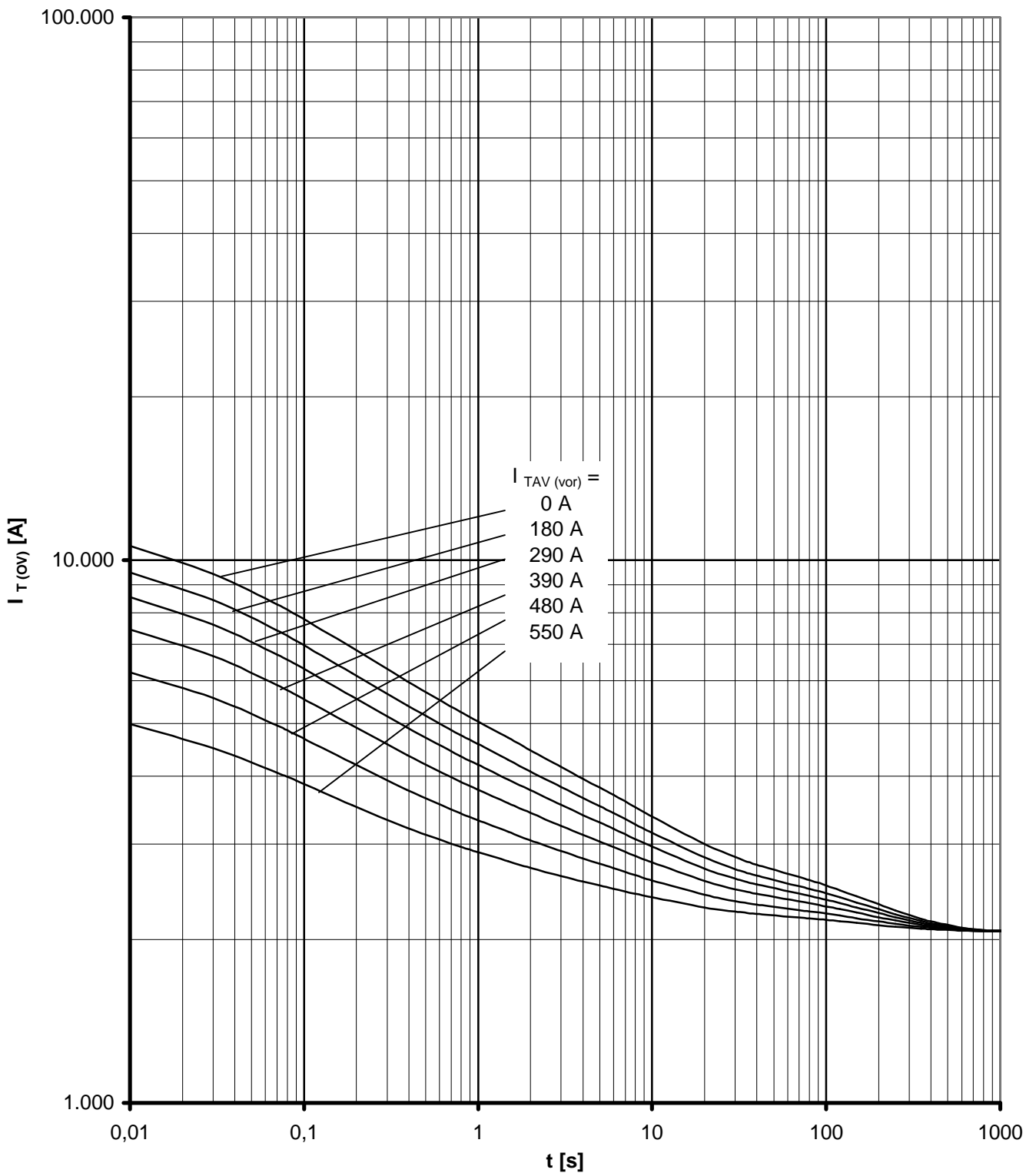


Überstrom / Overload on-state current $I_{T(OV)} = f(t)$

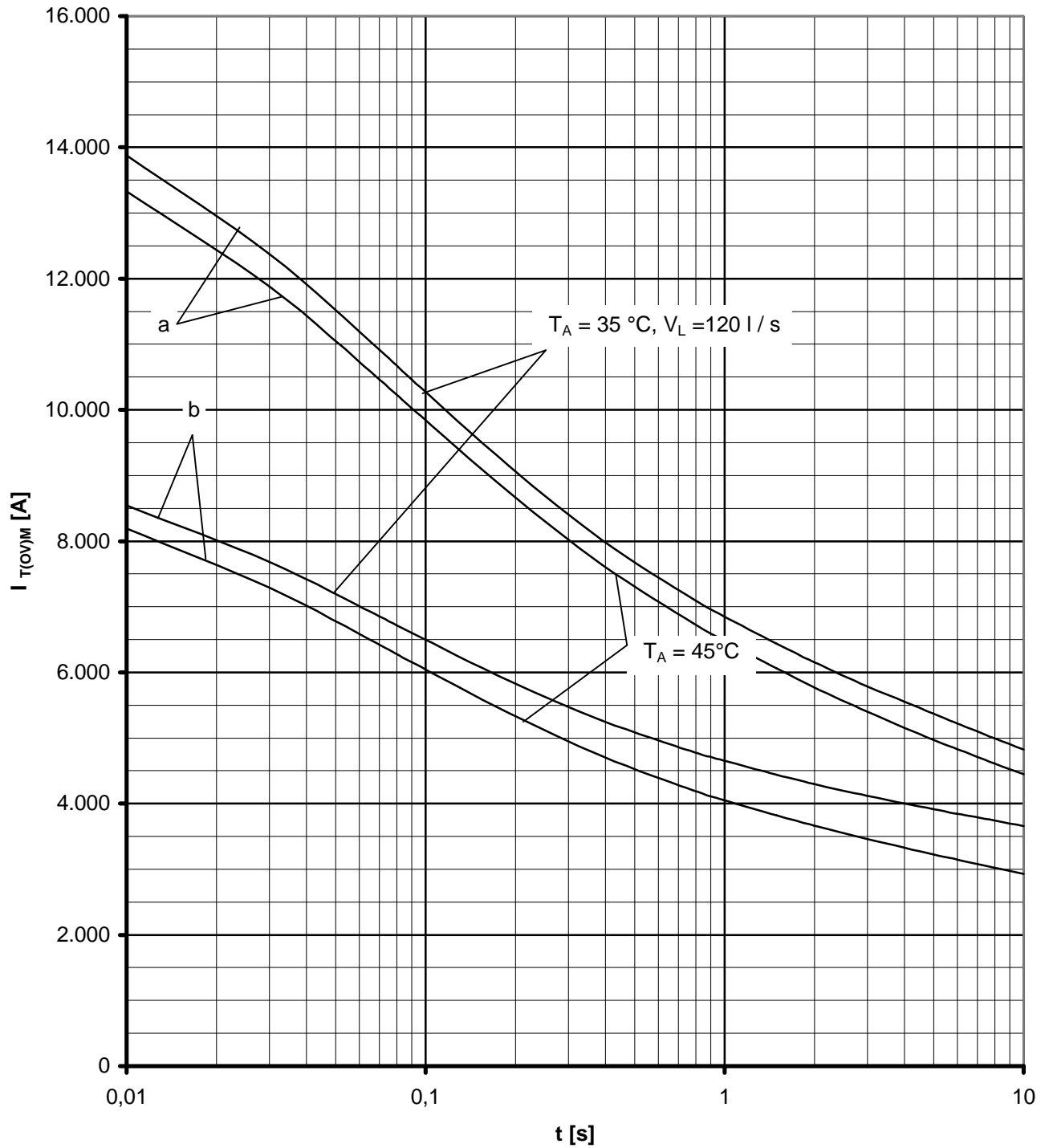
Beidseitige Luftselbstkühlung / Two-sided natural cooling K0.05F

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

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
 $T_A = 35^\circ\text{C}$, $V_L = 120$ l/s
 Parameter: Vorlaststrom $I_{TAV(vor)}$ / pre-load current $I_{TAV(vor)}$



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

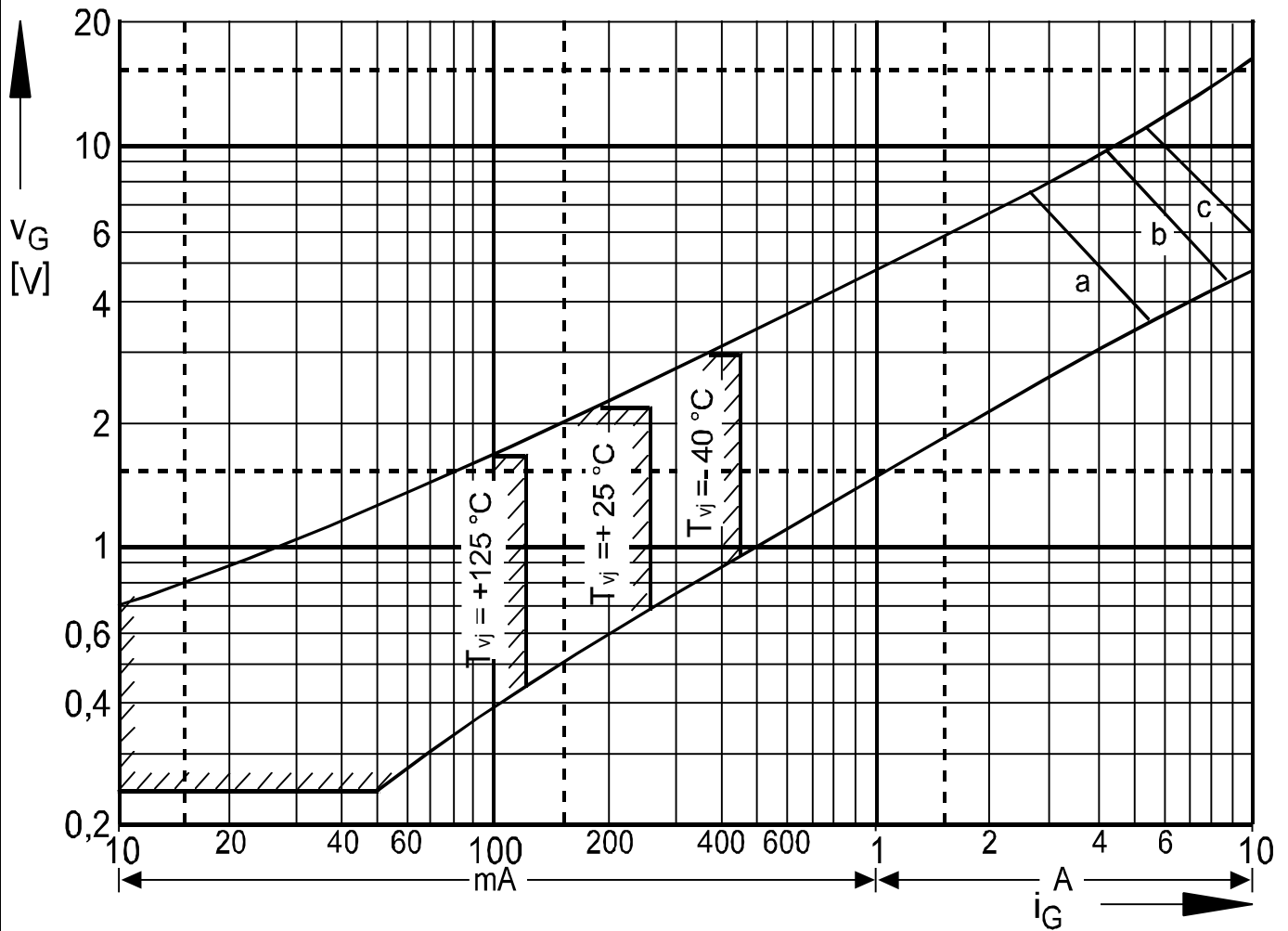
Beidseitige Kühlung / Two-sided cooling

Kühlkörper / Heatsink: K 0.05F

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}

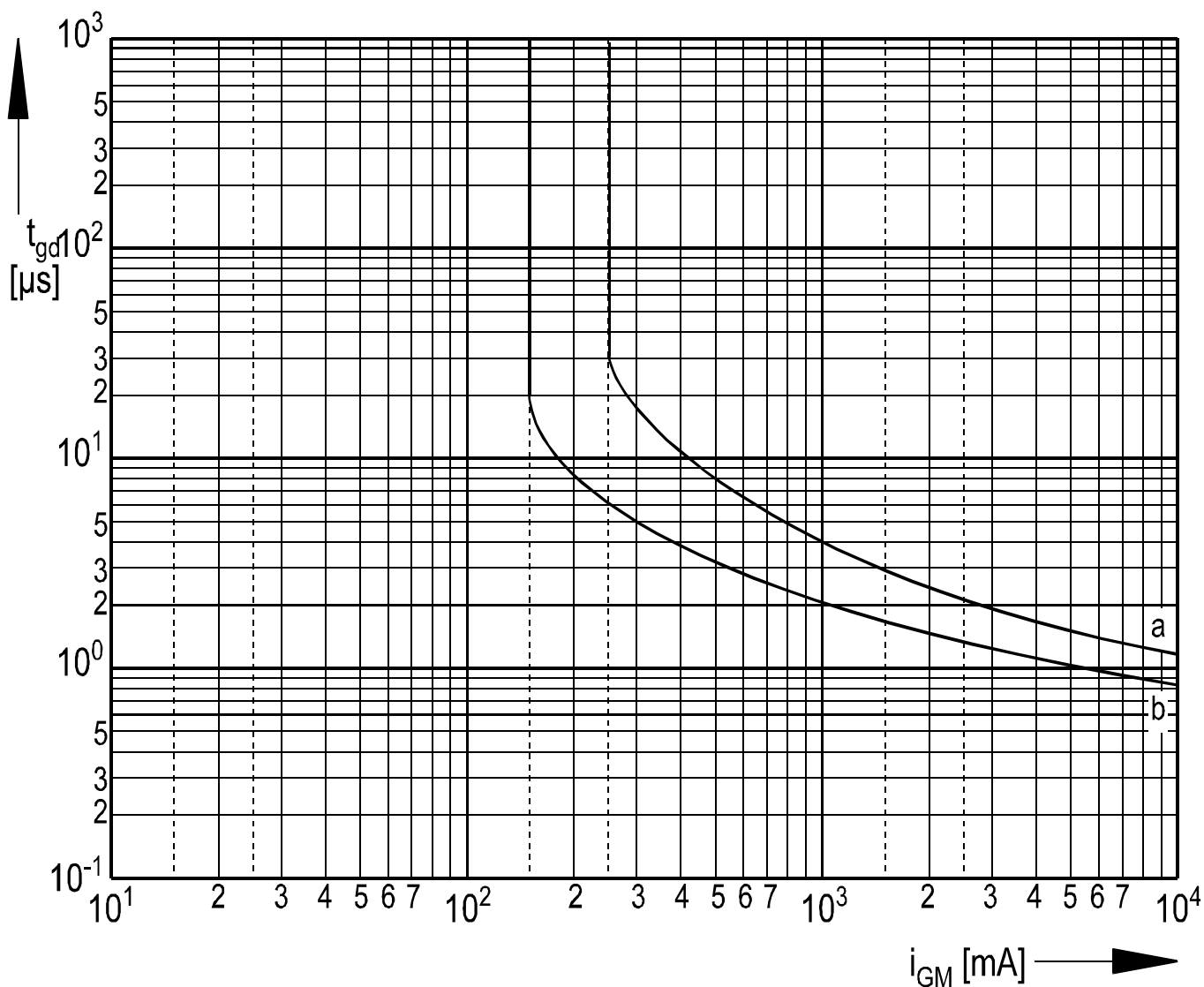


Steuercharakteristik $v_G = f(i_G)$ mit Zündbereichen für $V_D = 6 \text{ V}$

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

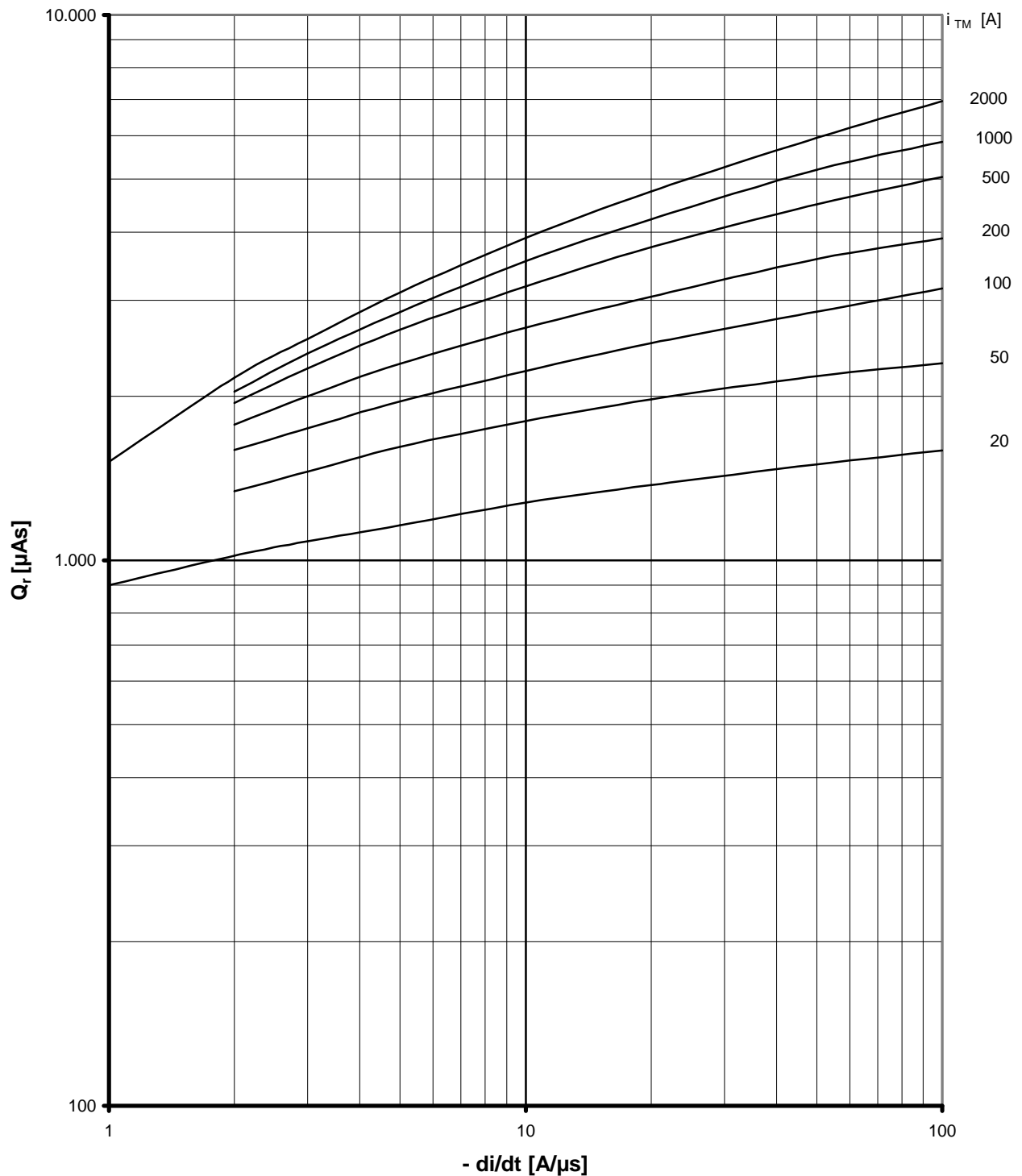


Zündverzug / Gate controlled delay time $t_{gd} = f(i_{GM})$

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

a - maximaler Verlauf / limiting characteristic

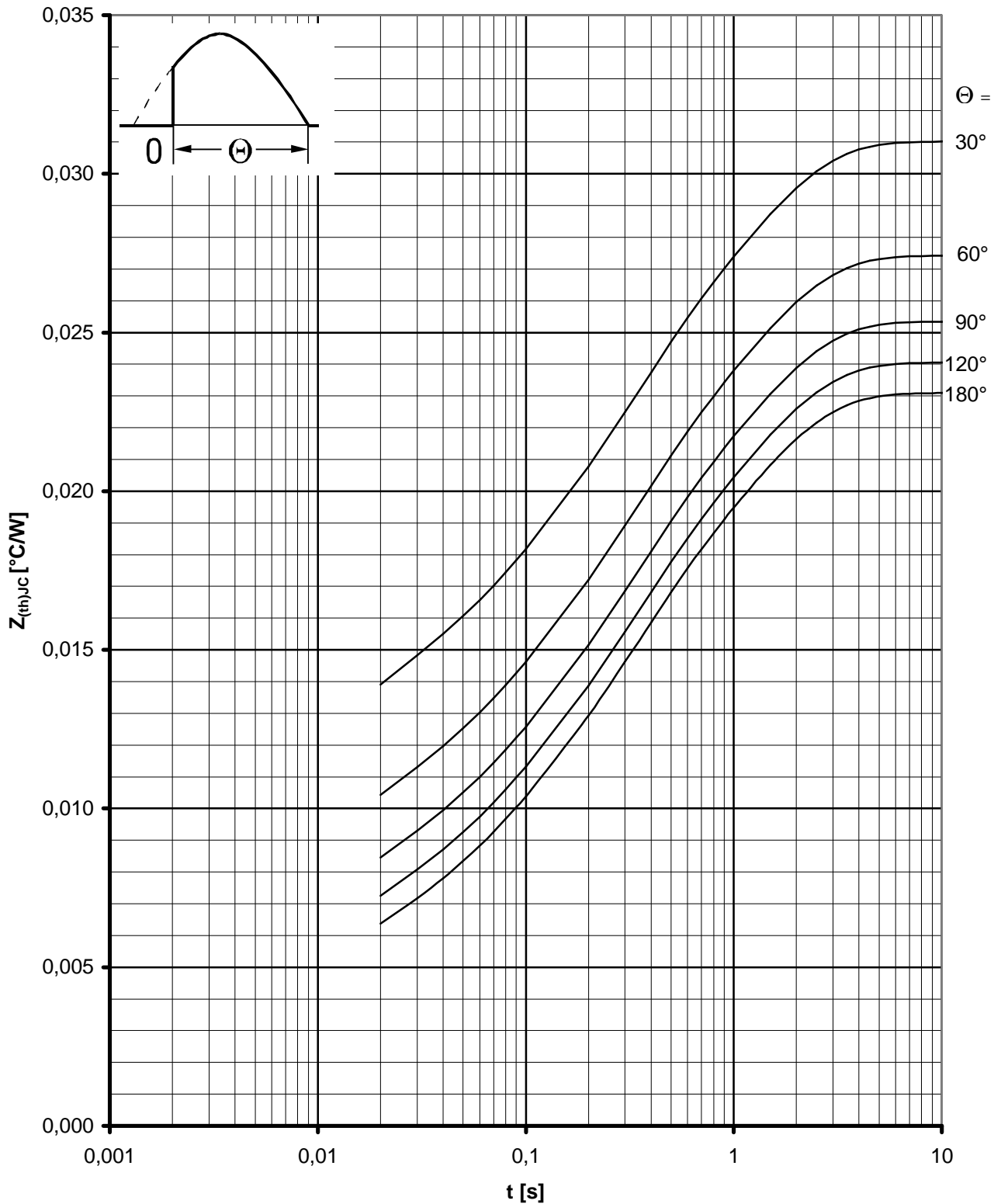
b - typischer Verlauf / typical characteristic



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

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

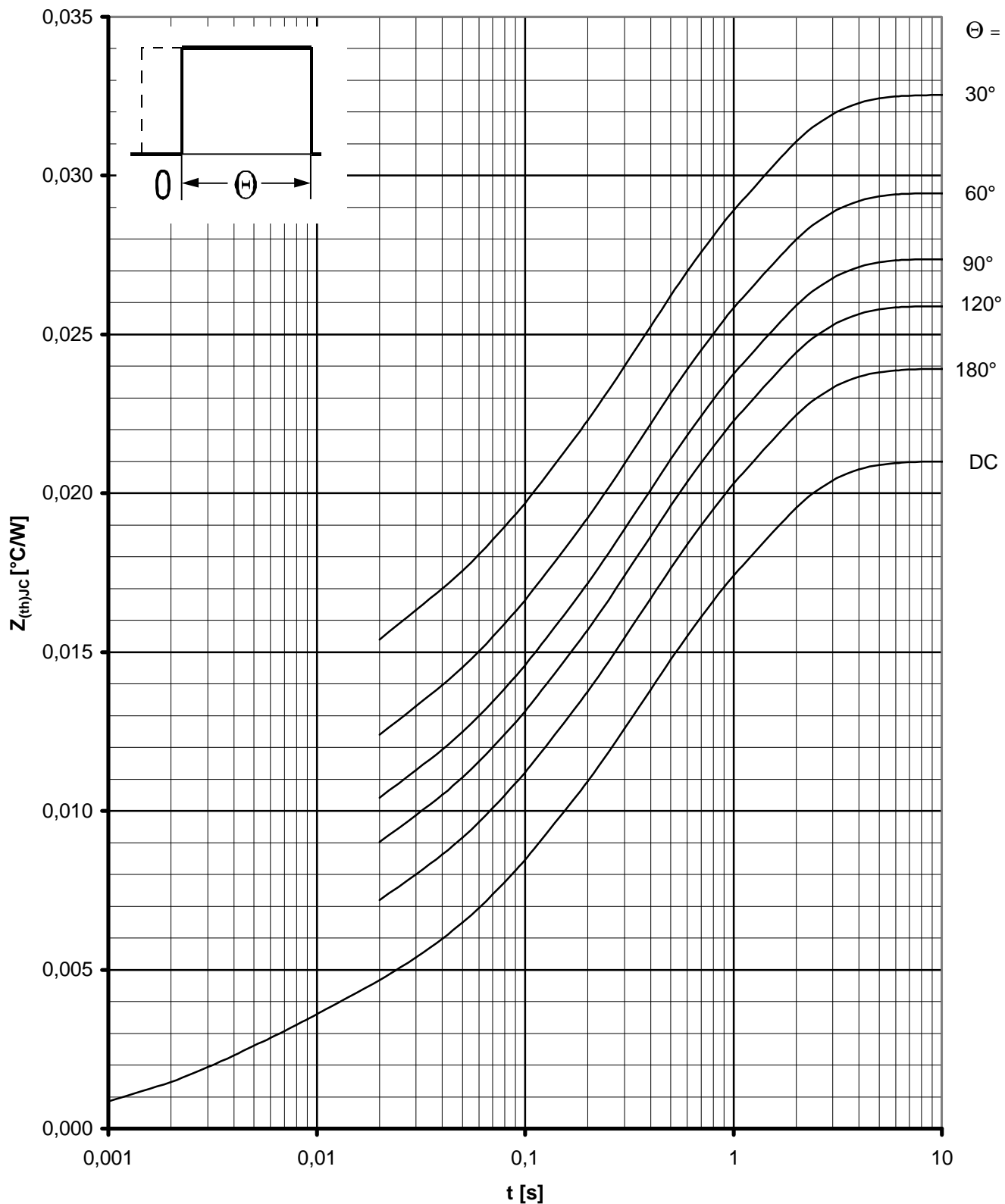
Parameter: Durchlaßstrom / On-state current i_{TM}



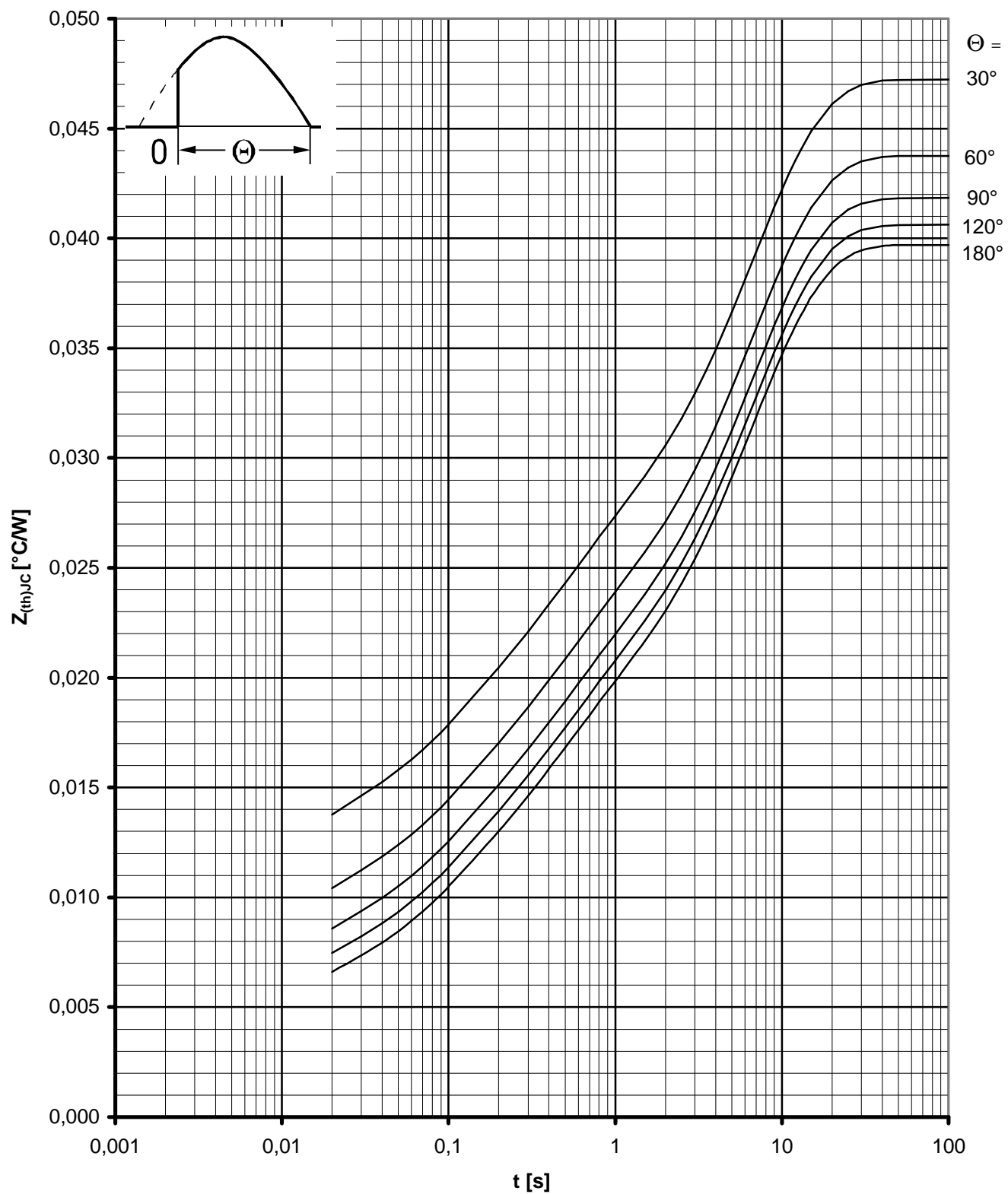
Transienter innerer Wärmewiderstand / Transient thermal impedance $Z_{(th)JC} = f(t)$

Beidseitige Kühlung / Two-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

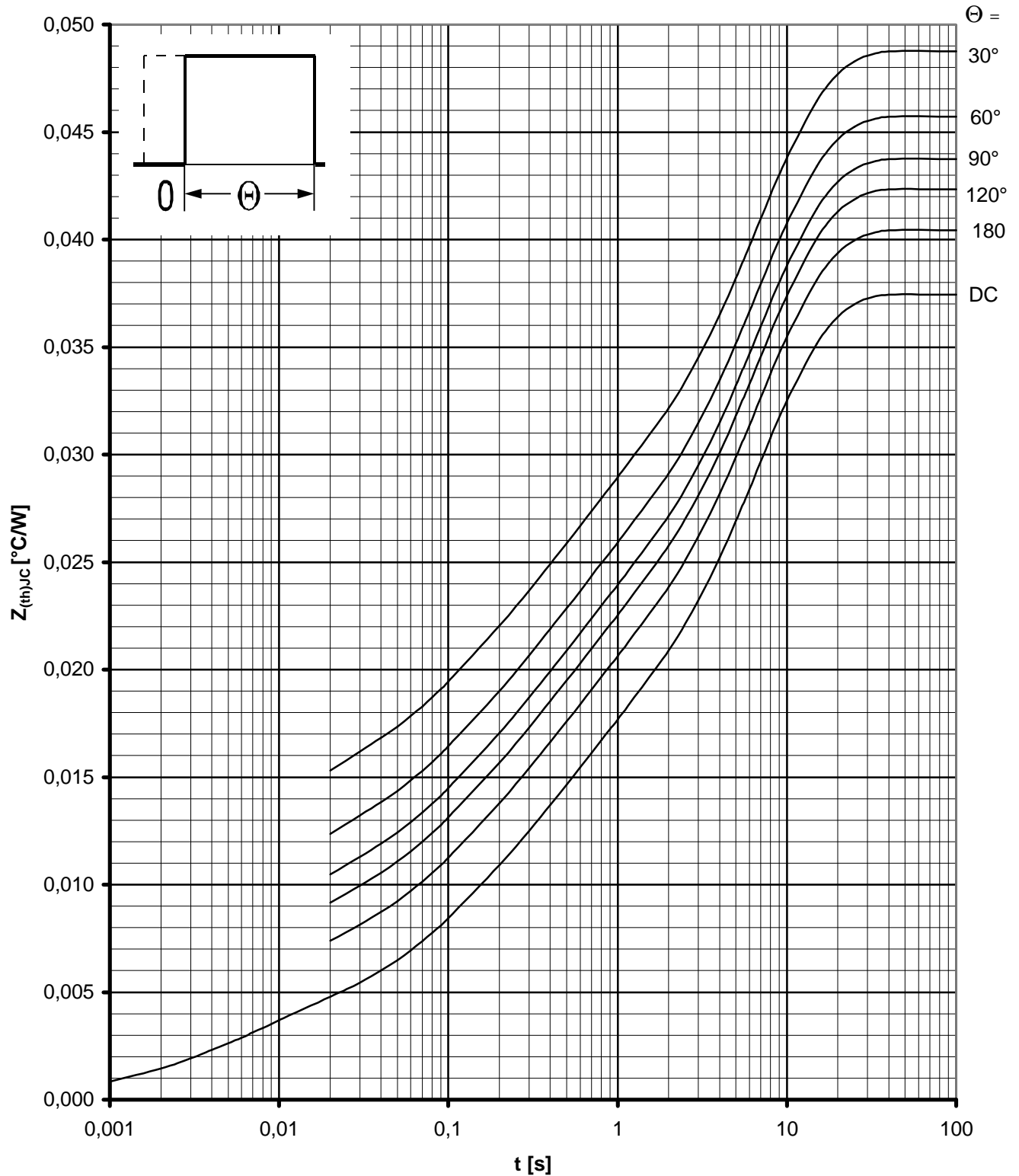


Transienter innerer Wärmewiderstand / Transient thermal impedance $Z_{(th)JC} = f(t)$
 Anodenseitige Kühlung / Anode-sided cooling
 Parameter: Stromflußwinkel Θ / current conduction angle Θ

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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