

Technische Information / Technical Information

eupec

Netz-Thyristor
Phase Control Thyristor

T 509 N 12 ...18

N



Elektrische Eigenschaften / Electrical properties

Höchstzulässige Werte / Maximum rated values

Periodische Vorwärts- und Rückwärts-Spitzensperrspannung repetitive peak forward off-state and reverse voltages	$T_{vj} = -40^{\circ}\text{C} \dots T_{vj\text{max}}$	$V_{\text{DRM}}, V_{\text{RRM}}$	1200 1600	1400 1800	V V ¹⁾
Vorwärts-Stoßspitzensperrspannung non-repetitive peak forward off-state voltage	$T_{vj} = -40^{\circ}\text{C} \dots T_{vj\text{max}}$	V_{DSM}	1200 1600	1400 1800	V V
Rückwärts-Stoßspitzensperrspannung non-repetitive peak reverse voltage	$T_{vj} = +25^{\circ}\text{C} \dots T_{vj\text{max}}$	V_{RSM}	1300 1700	1500 1900	V V
Durchlaßstrom-Grenzeffektivwert RMSM on-state current		I_{TRSM}		800	A
Dauergrenzstrom average on-state current	$T_{\text{C}} = 85^{\circ}\text{C}$	I_{TAVM}		508	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}		8000 6900	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		320 238	$\text{A}^2\text{s} \cdot 10^3$ $\text{A}^2\text{s} \cdot 10^5$
Kritische Stromsteilheit critical rate of rise of on-state current	DIN IEC 747-6 $f=50\text{Hz}, v_L = 10\text{V}, i_{\text{GM}} = 1\text{A}$ $di_{\text{G}}/dt = 1\text{A}/\mu\text{s}$	$(di_{\text{T}}/dt)_{\text{cr}}$		120	$\text{A}/\mu\text{s}$
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	$T_{vj} = T_{vj\text{max}}, i_{\text{T}} = 1600\text{A}$	v_{T}	max.	1,92	V
Schleusenspannung threshold voltage	$T_{vj} = T_{vj\text{max}}$	$V_{\text{T(TO)}}$		0,8	V
Ersatzwiderstand slope resistance	$T_{vj} = T_{vj\text{max}}$	r_{T}		0,6	$\text{m}\Omega$
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= 0,93854 B= 3,384E-04 C=-5,551E-02 D= 2,001E-02			
Zündstrom gate trigger current	$T_{vj} = 25^{\circ}\text{C}, v_{\text{D}} = 6\text{V}$	I_{GT}	max.	200	mA
Zündspannung gate trigger voltage	$T_{vj} = 25^{\circ}\text{C}, v_{\text{D}} = 6\text{V}$	V_{GT}	max.	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_{GD}	max.	10 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.	0,2	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	$T_{vj} = 25^{\circ}\text{C}, v_{\text{D}} = 6\text{V}, R_{\text{GK}} = 10\Omega$ $i_{\text{GM}} = 1\text{A}, di_{\text{G}}/dt = 1\text{A}/\mu\text{s}$ $t_{\text{g}} = 20\mu\text{s}$	I_{L}	max.	1200	mA
Vorwärts- und Rückwärts-Sperrstrom forward off-state and reverse currents	$T_{vj} = T_{vj\text{max}}$ $v_{\text{D}} = V_{\text{DRM}}, v_{\text{R}} = V_{\text{RRM}}$	$i_{\text{D}}, i_{\text{R}}$	max.	50	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

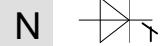
1) 1800 V auf Anfrage / 1800 V on demand

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Elektrische Eigenschaften / Electrical properties

Charakteristische Werte / Characteristic values

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. 250	μs
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Thermische Eigenschaften / Thermal properties

Innerer Wärmewiderstand thermal resistance, junction to case	Kühlfläche / cooling surface beidseitig / two-sided, $\varphi = 180^\circ \sin$	R_{thJC}	max. 0,0530	$^\circ C/W$
	beidseitig / two-sided, DC		max. 0,0500	$^\circ C/W$
	Anode / anode, $\varphi = 180^\circ \sin$		max. 0,0880	$^\circ C/W$
	Anode / anode, DC		max. 0,0850	$^\circ C/W$
	Kathode / cathode, $\varphi = 180^\circ \sin$		max. 0,1230	$^\circ C/W$
	Kathode / cathode, DC		max. 0,1200	$^\circ C/W$
Übergangs- Wärmewiderstand thermal resistance, case to heatsink	Kühlfläche / cooling surface beidseitig / two-sided	R_{thCK}	max. 0,0075	$^\circ C/W$
	einseitig / single-sided		max. 0,0150	$^\circ C/W$
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...140	$^\circ C$

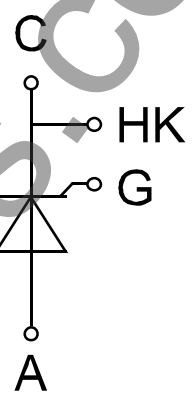
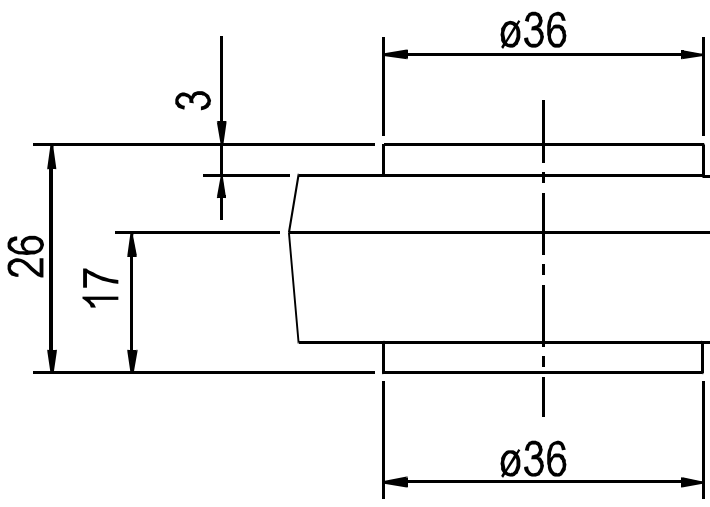
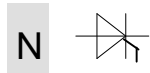
Mechanische Eigenschaften / Mechanical properties

Gehäuse, siehe Anlage case, see appendix			Seite 3 page 3	
Si-Element mit Druckkontakt Si-pellet with pressure contact				
Anpreßkraft clamping force		F	5 ...10	kN
Gewicht weight		G	typ. 270	g
Kriechstrecke creepage distance			28	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.

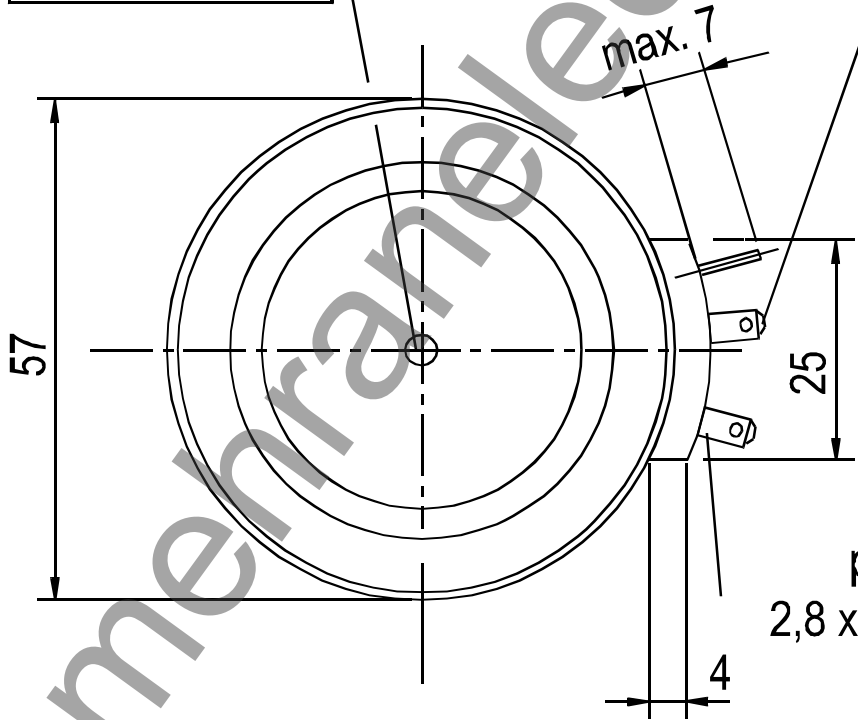
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3,5^{+0,1} x 3,5 deep
on both sides

HK
plug 4,8 x 0,8



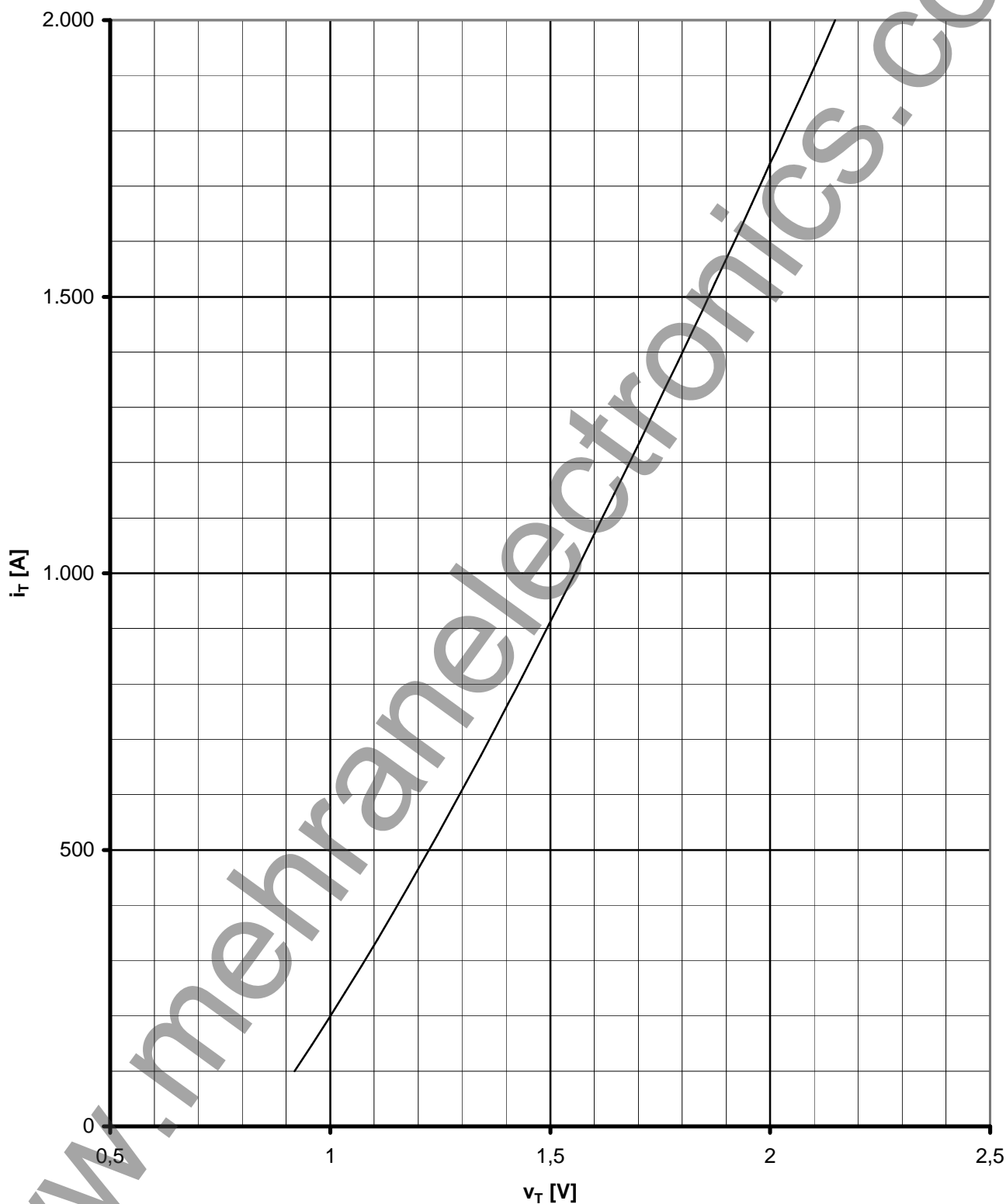
G
plug
2,8 x 0,8

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]	0,010500	0,002830	0,016700	0,018800	0,001160		
	τ_n [s]	0,001130	0,025500	0,051100	0,429000	2,490000		
anodenseitig anode-sided	R_{thn} [°C/W]	0,009400	0,009740	0,018200	0,016100	0,031600		
	τ_n [s]	0,000984	0,016700	0,204000	0,821000	5,000000		
kathodenseitig cathode-sided	R_{thn} [°C/W]	0,009280	0,014500	0,008680	0,040100	0,047500		
	τ_n [s]	0,000939	0,028500	0,156000	1,120000	9,100000		
Analytische Funktion / analytical function : $Z_{thJC} = \sum_{n=1}^{n_{max}} R_{thn} (1 - EXP(-t / \tau_n))$								

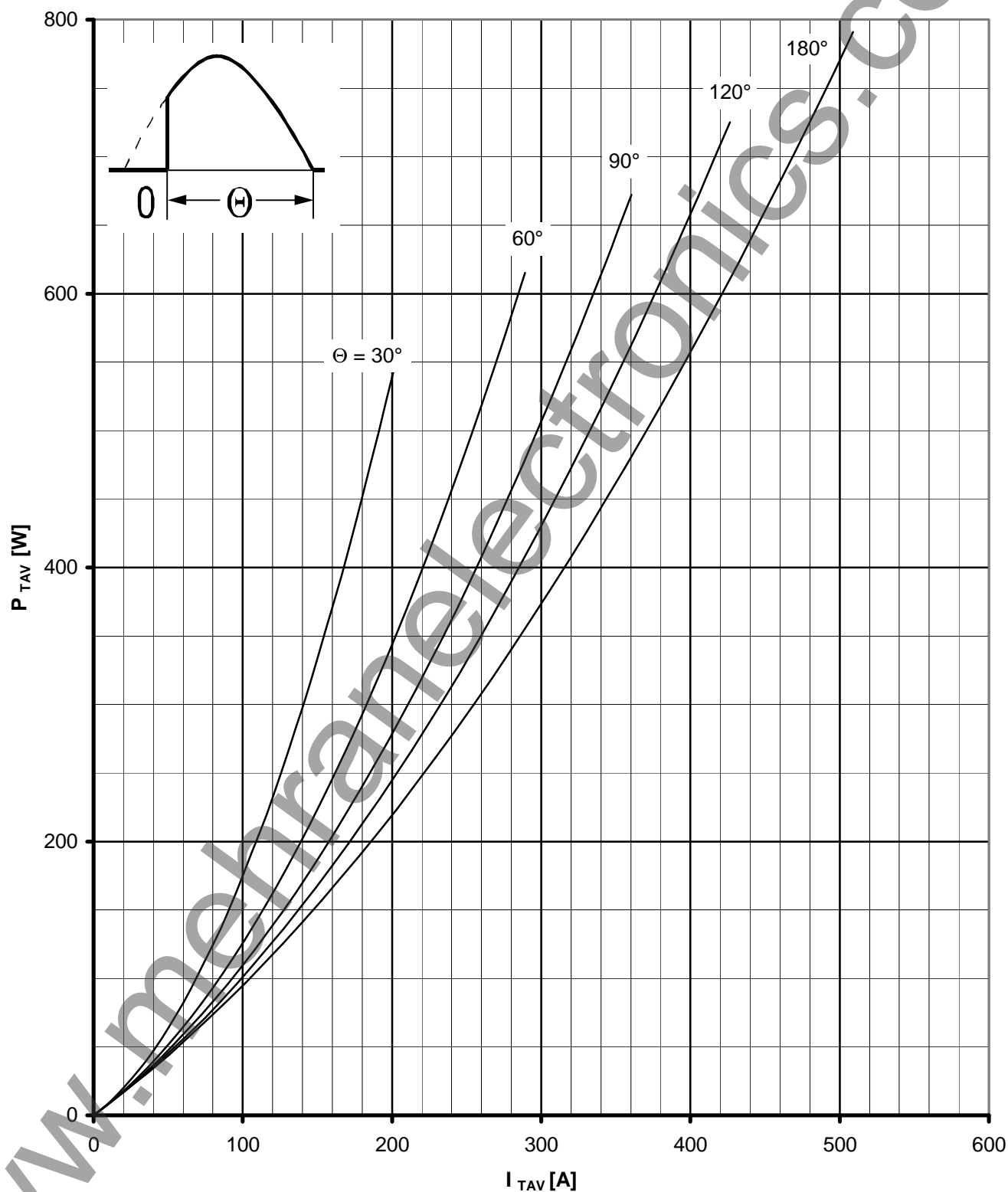
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Grenzdurchlaßkennlinie / Limiting On-state characteristics $i_T = f(v_T)$
 $T_{vj} = T_{vj} \text{ max}$

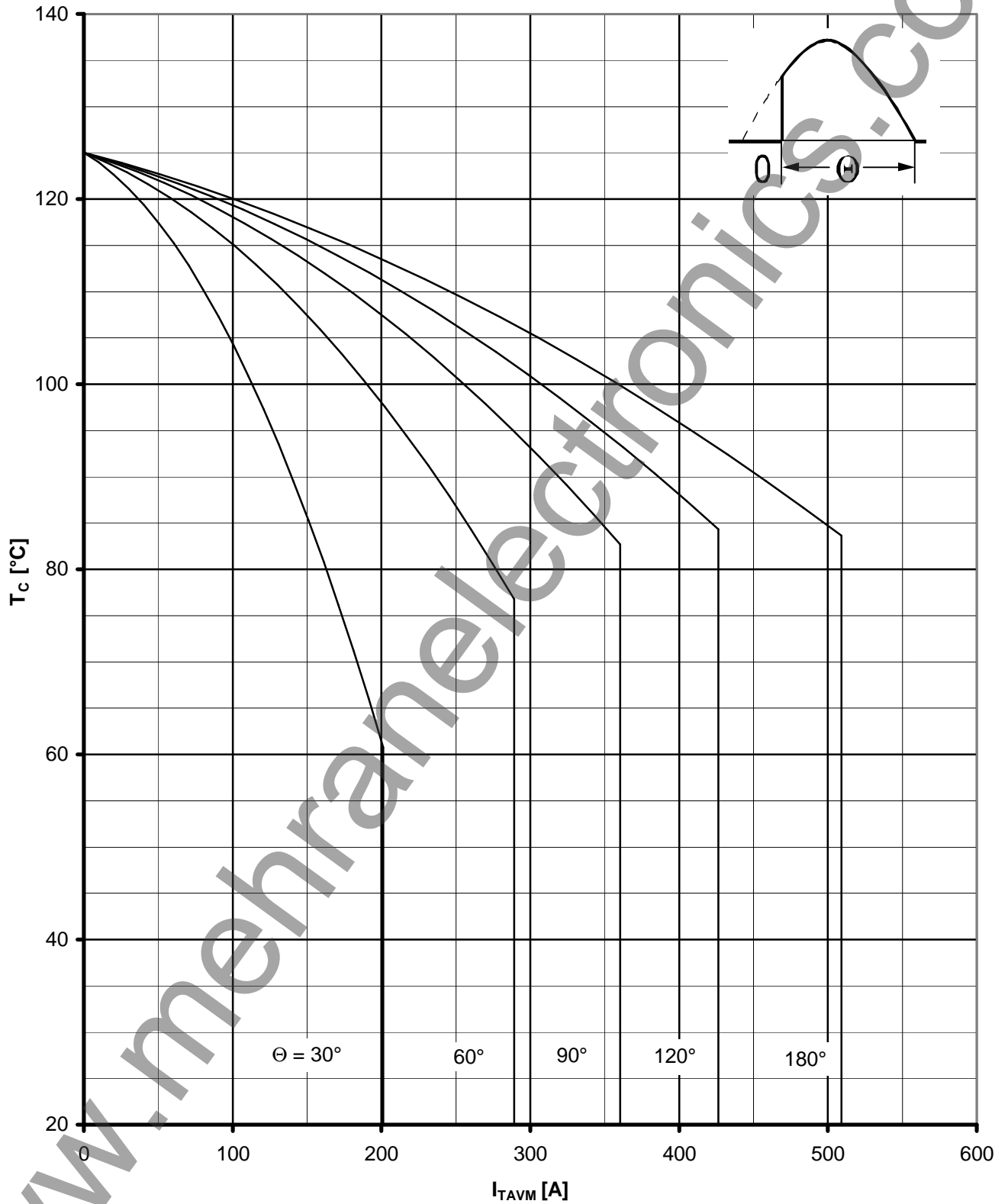


Durchlaßverlustleistung / On-state power loss $P_{TAV} = f(I_{TAV})$
 Parameter: Stromflußwinkel θ / current conduction angle θ

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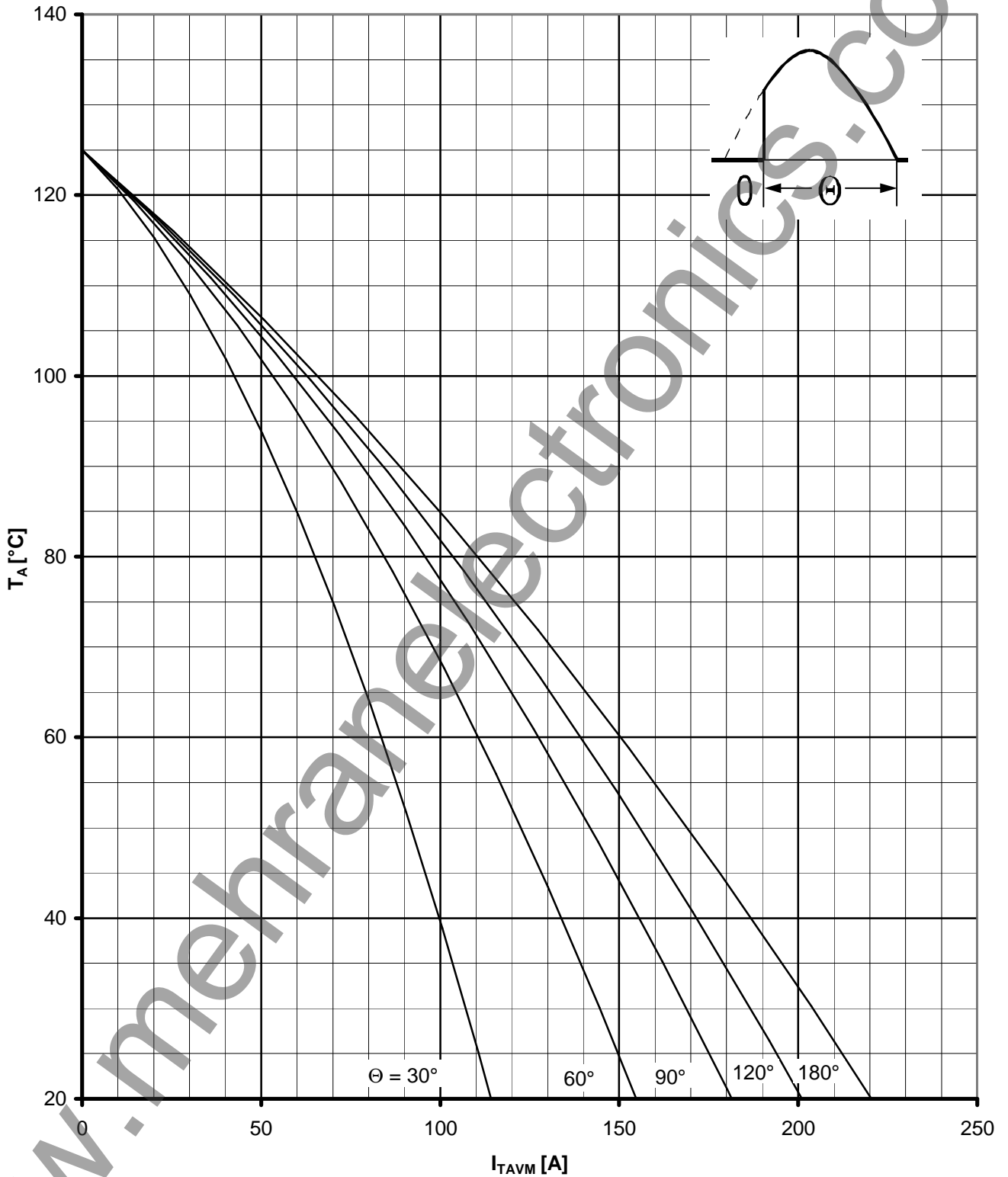


Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAVM})$
 Beidseitige Kühlung / Two-sided cooling
 Parameter: Stromflußwinkel θ / current conduction angle θ

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

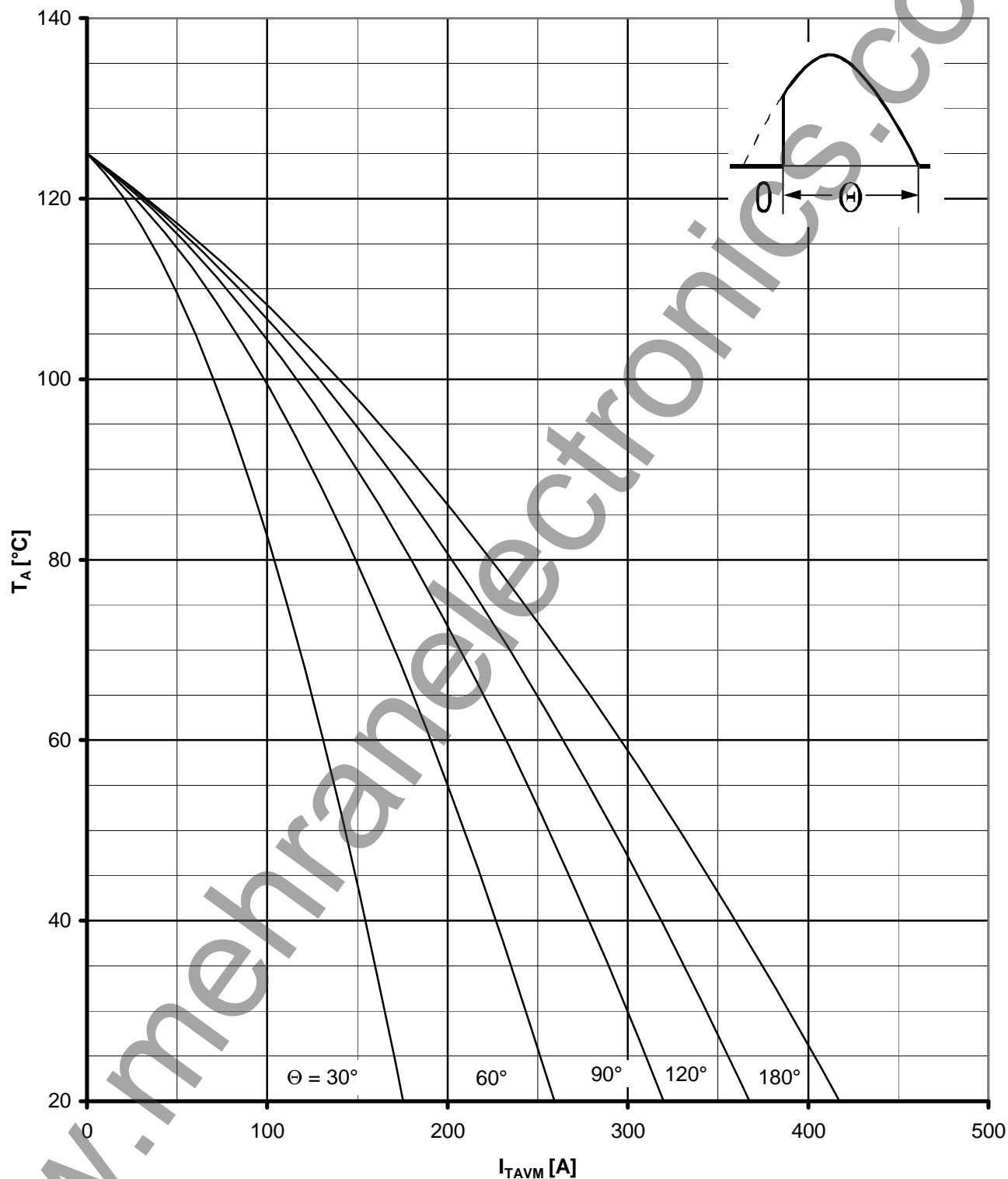
Luftselbstkühlung / Natural air-cooling

Kühlkörper/Heatsink K0.36S

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

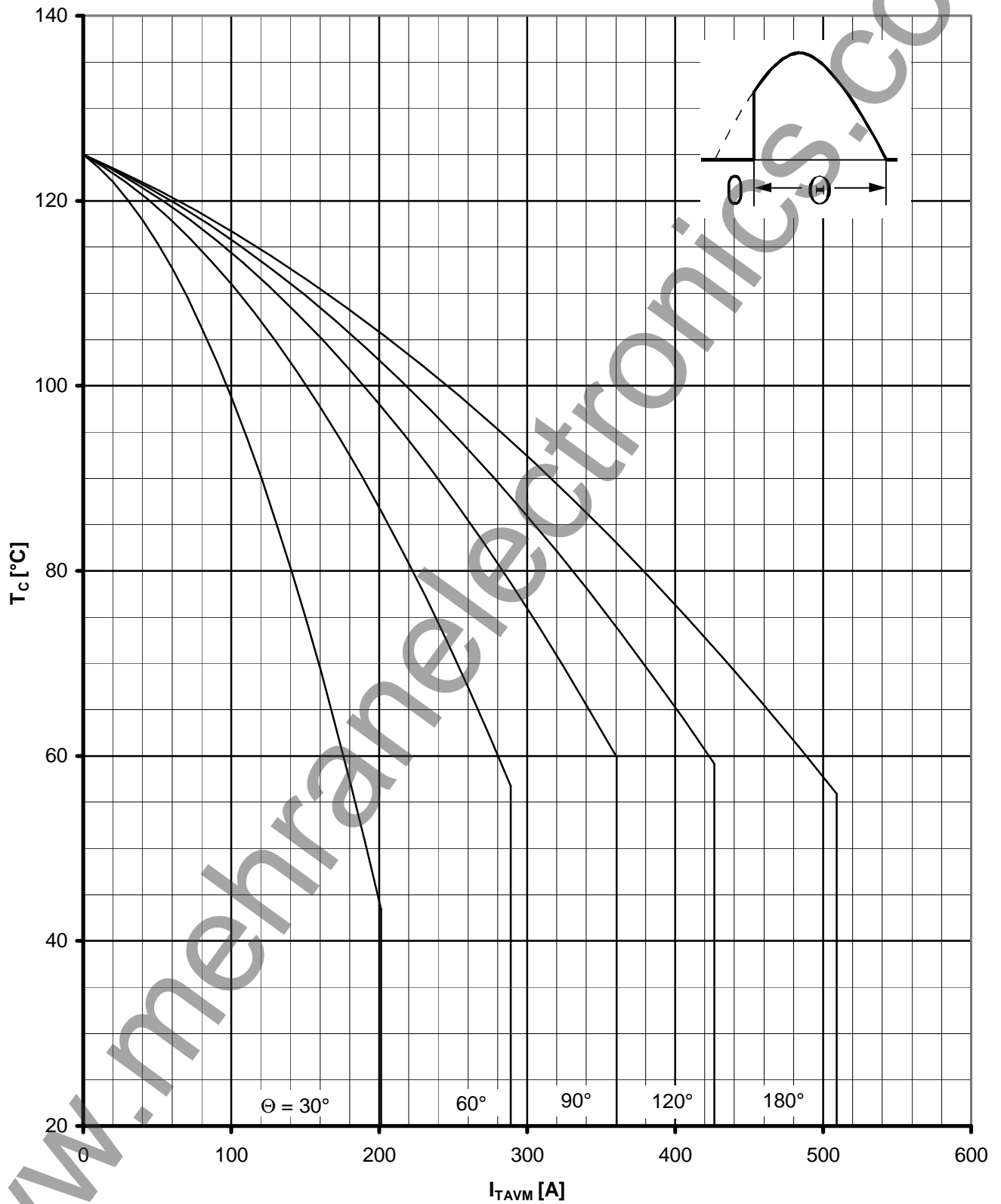
Kühlkörper/Heatsink. K0.05F, $V_L = 50$ l/s

Parameter: Stromflußwinkel θ / current conduction angle θ

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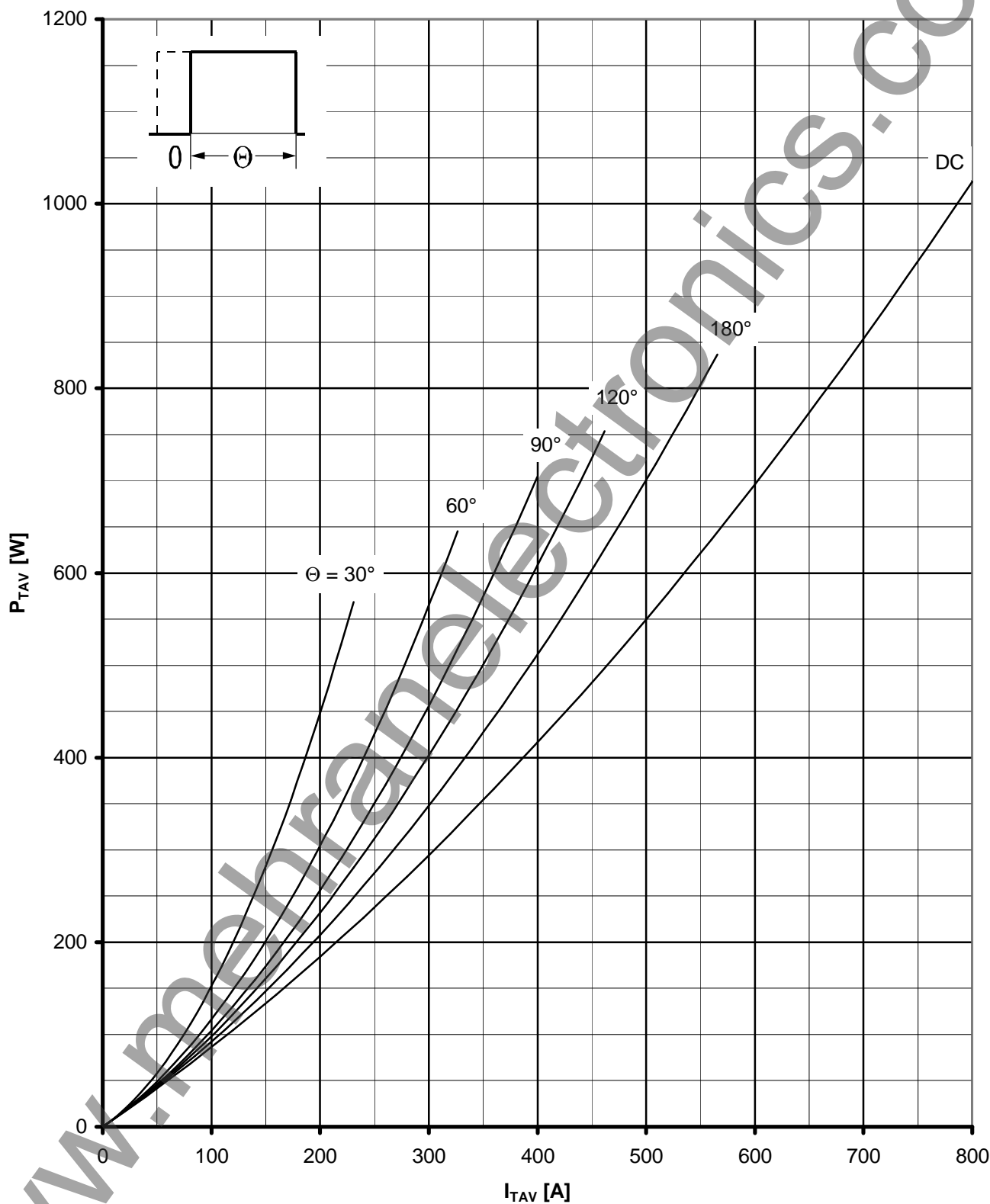
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Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_c = f(I_{TAVM})$

Anodenseitige Kühlung / anode sided cooling

Parameter: Stromflußwinkel θ / current conduction angle θ

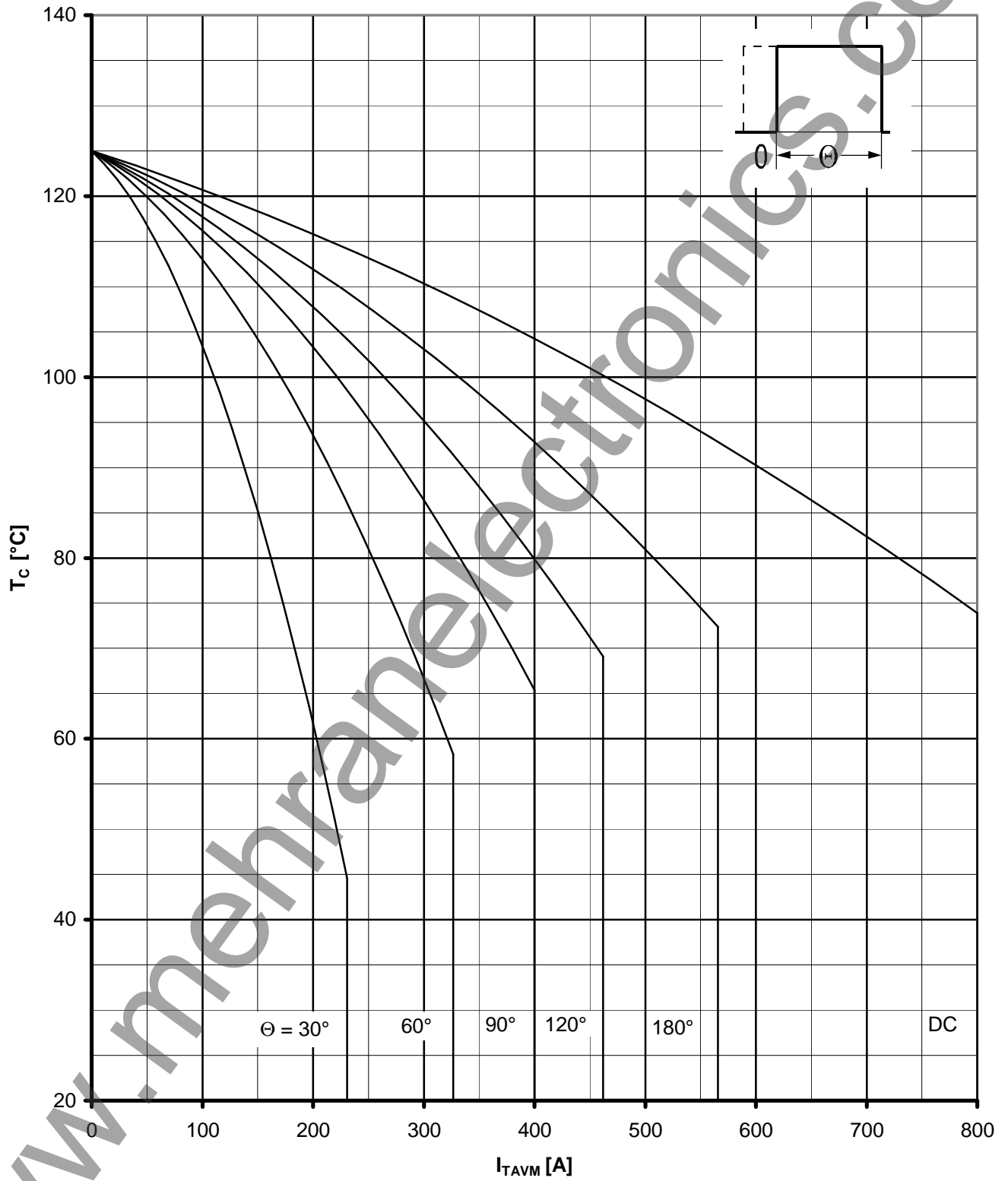


Durchlaßverlustleistung / On-state power loss $P_{TAV} = f(I_{TAV})$
Parameter: Stromflußwinkel θ / current conduction angle θ

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

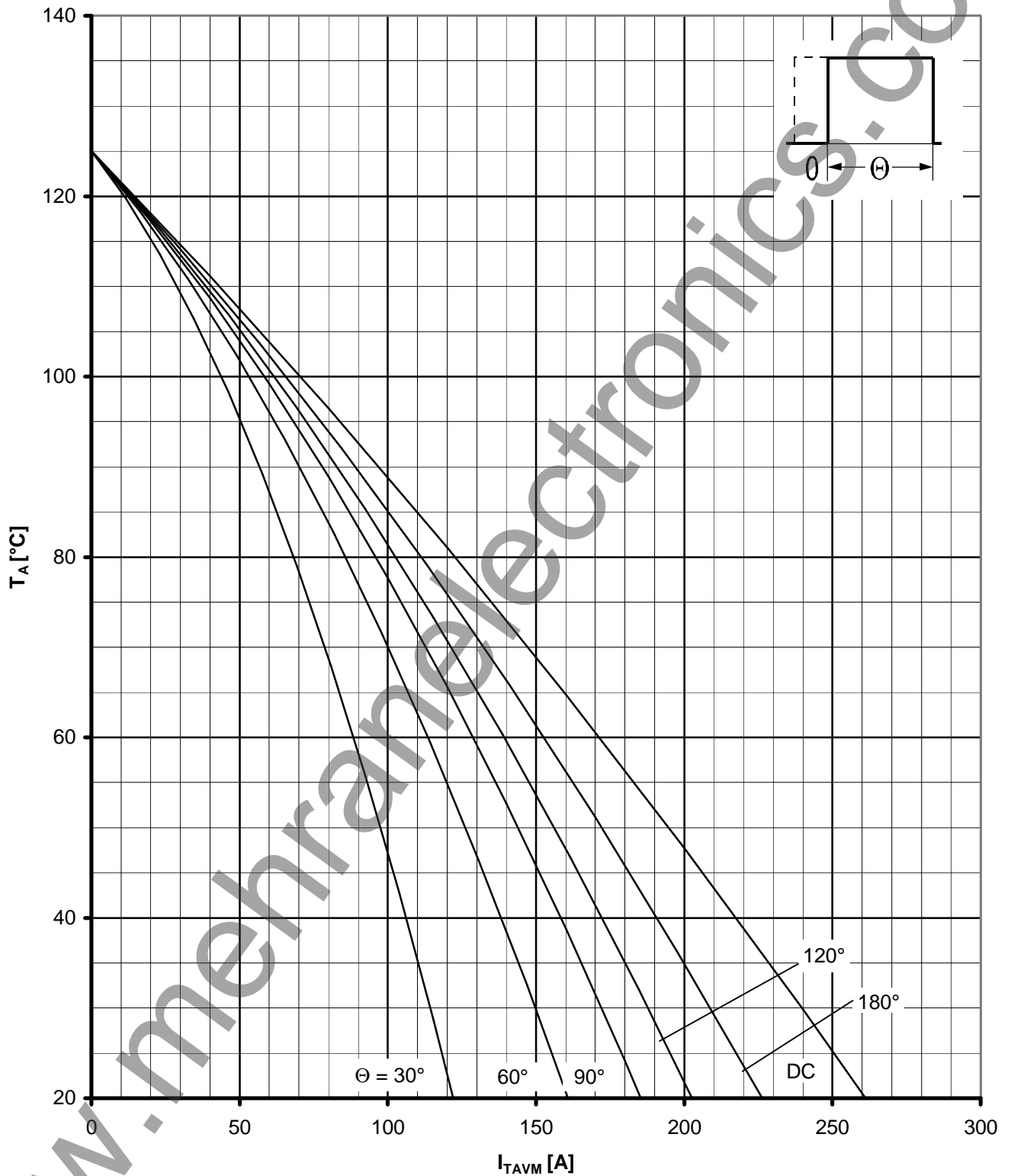
Beidseitige Kühlung / Two-sided cooling

Parameter: Stromflußwinkel θ / current conduction angle θ

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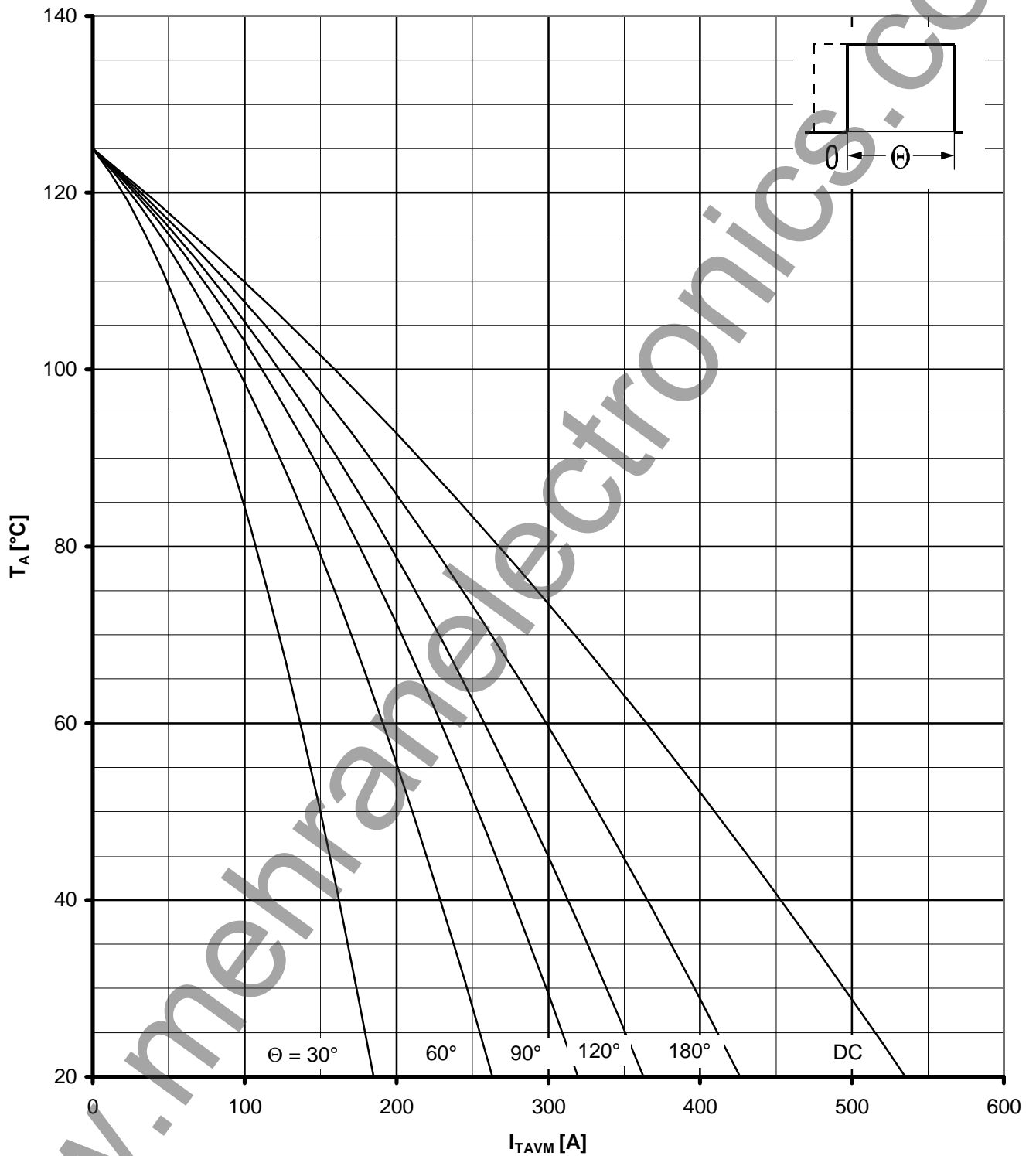


Höchstzulässige Kühlmitteltemperatur / Max. allowable cooling medium temperature $T_A = f(I_{TAVM})$
 Luftselbstkühlung / Natural air-cooling
 Kühlkörper/Heatsink. K 0.36 S
 Parameter: Stromflußwinkel Θ / current conduction angle Θ

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

Verstärkte Luftkühlung / Forced air-cooling

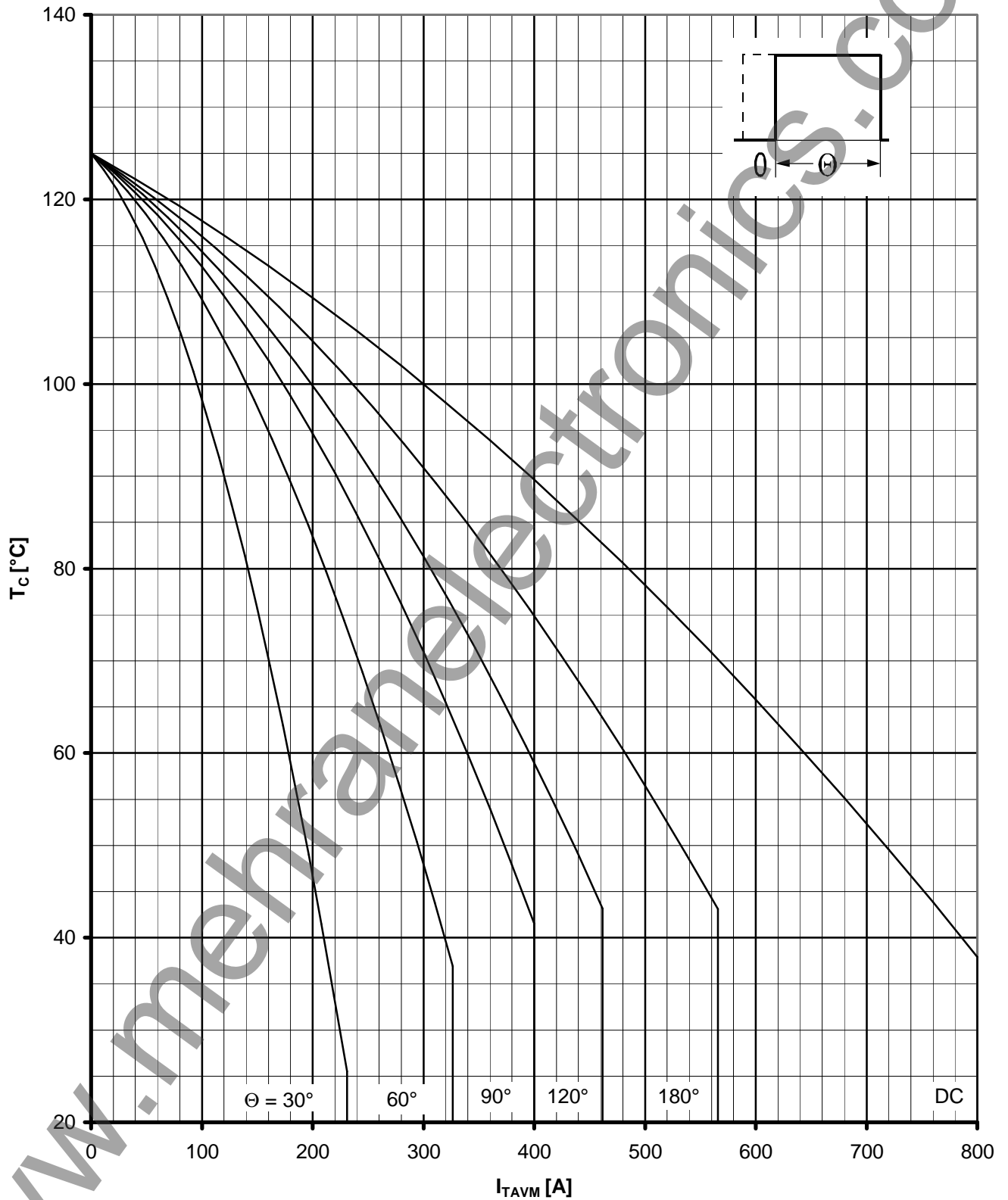
Kühlkörper/Heatsink. K0.05F, $V_L = 50$ l/s

Parameter: Stromflußwinkel Θ / current conduction angle Θ

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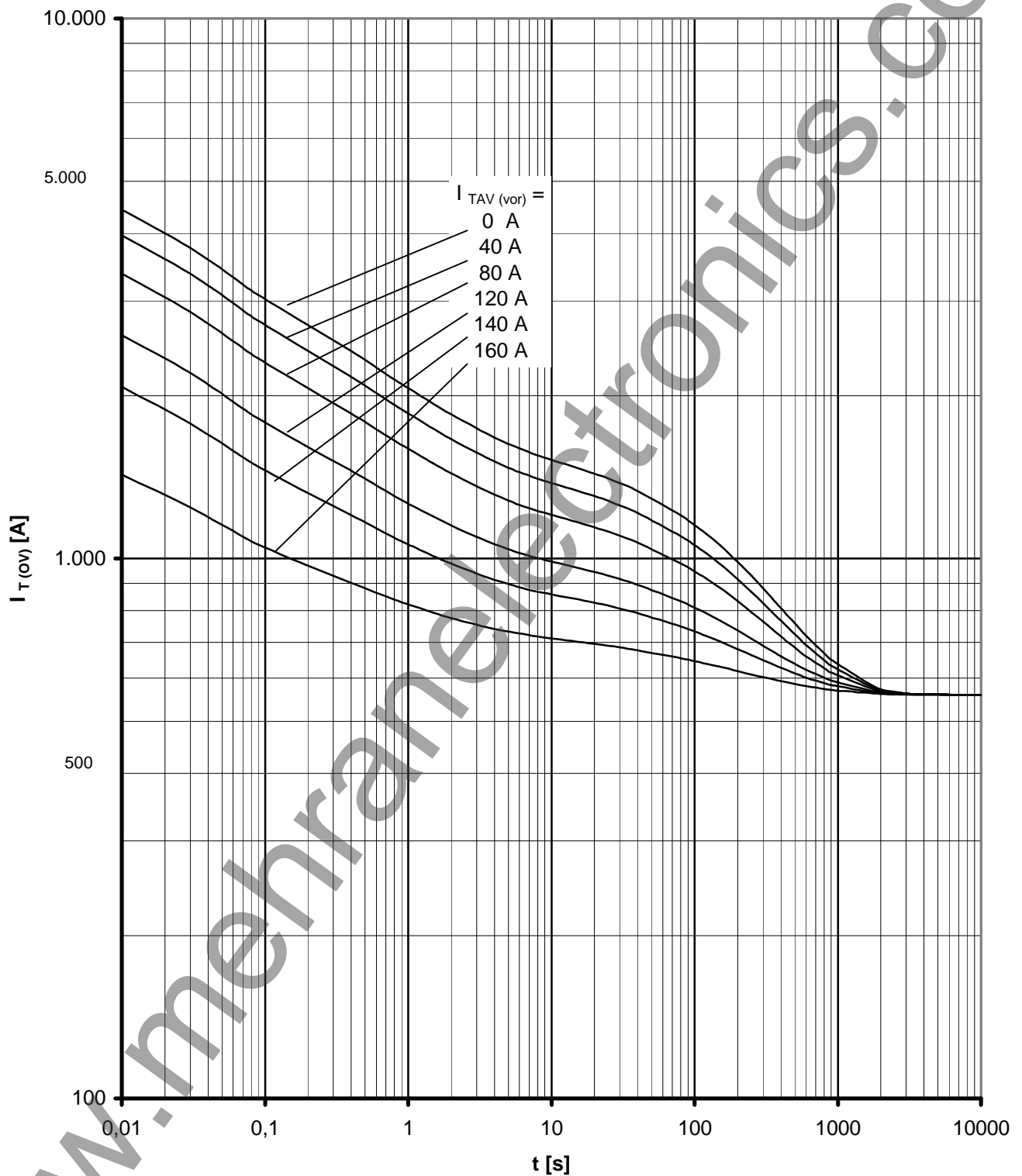
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Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_c = f(I_{TAVM})$

Anodenseitige Kühlung / anode sided cooling

Parameter: Stromflußwinkel θ / current conduction angle θ



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

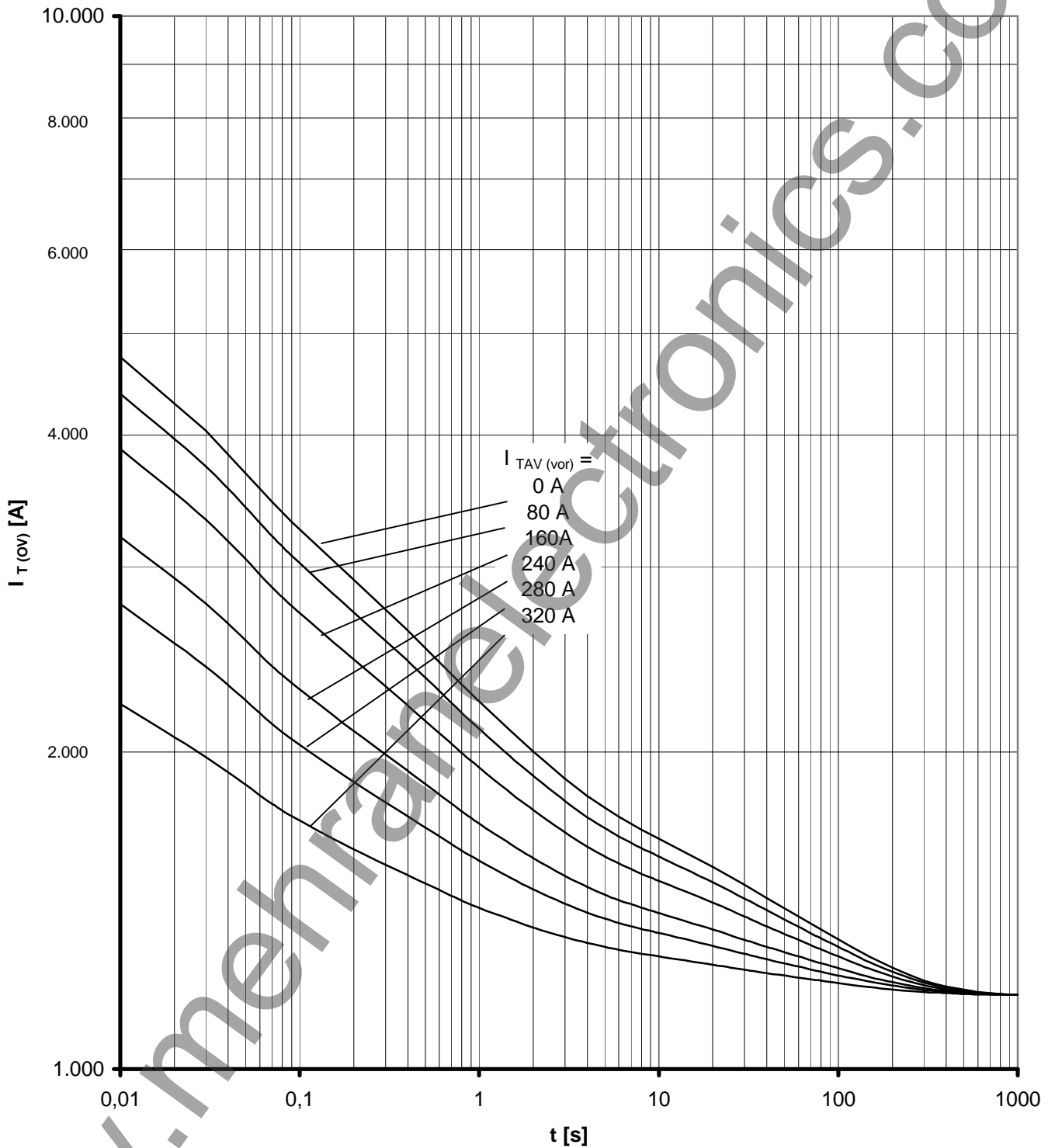
Beidseitige Luftselbstkühlung / Two-sided natural cooling K 0.36 S

$T_A = 45^\circ C$

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

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

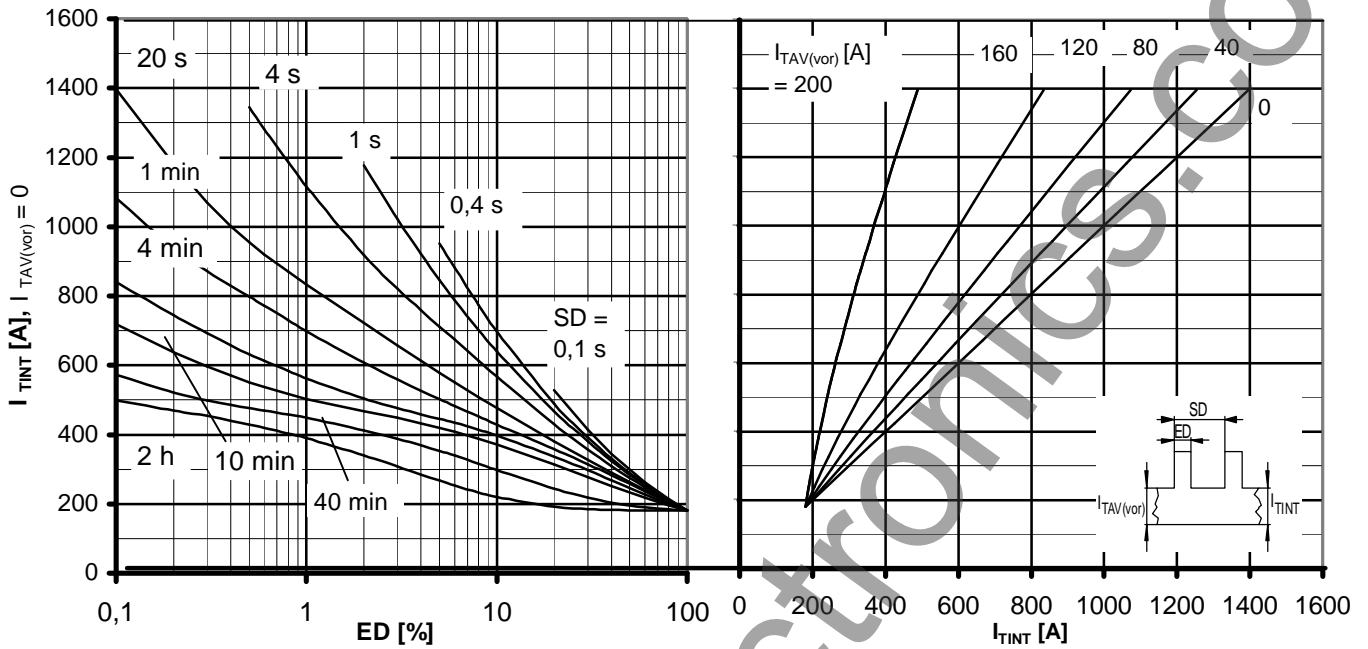
Beidseitige verstärkte Kühlung / forced two-sided cooling K0.12F

$T_A = 35^\circ\text{C}$, $V_L = 50$ l/s

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

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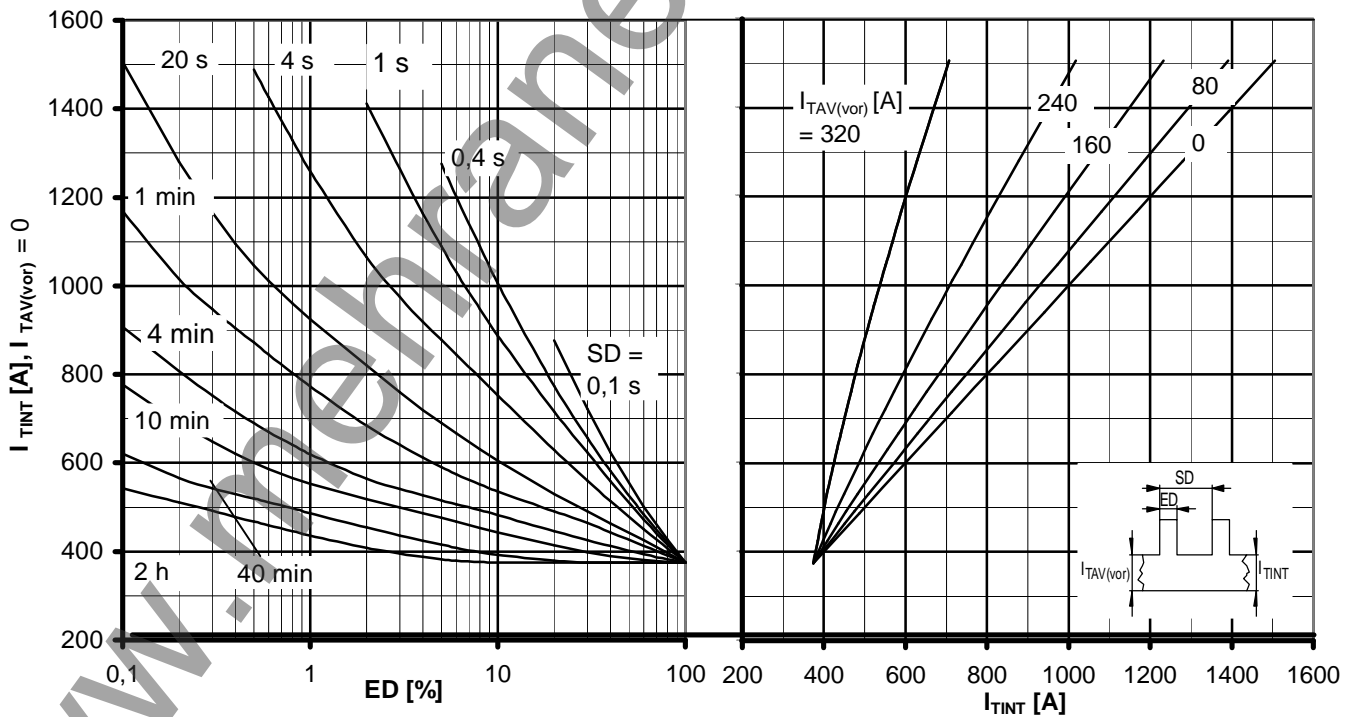
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Höchstzul. Durchlaßstrom bei Ausetzbetrieb / Max. allowable on-state current during intermittent operation $I_{TINT} = f(ED)$

Beidseitig Luftselbstkühlung / two-sided natural cooling $K 0.05F$
 $T_A = 45$ °C

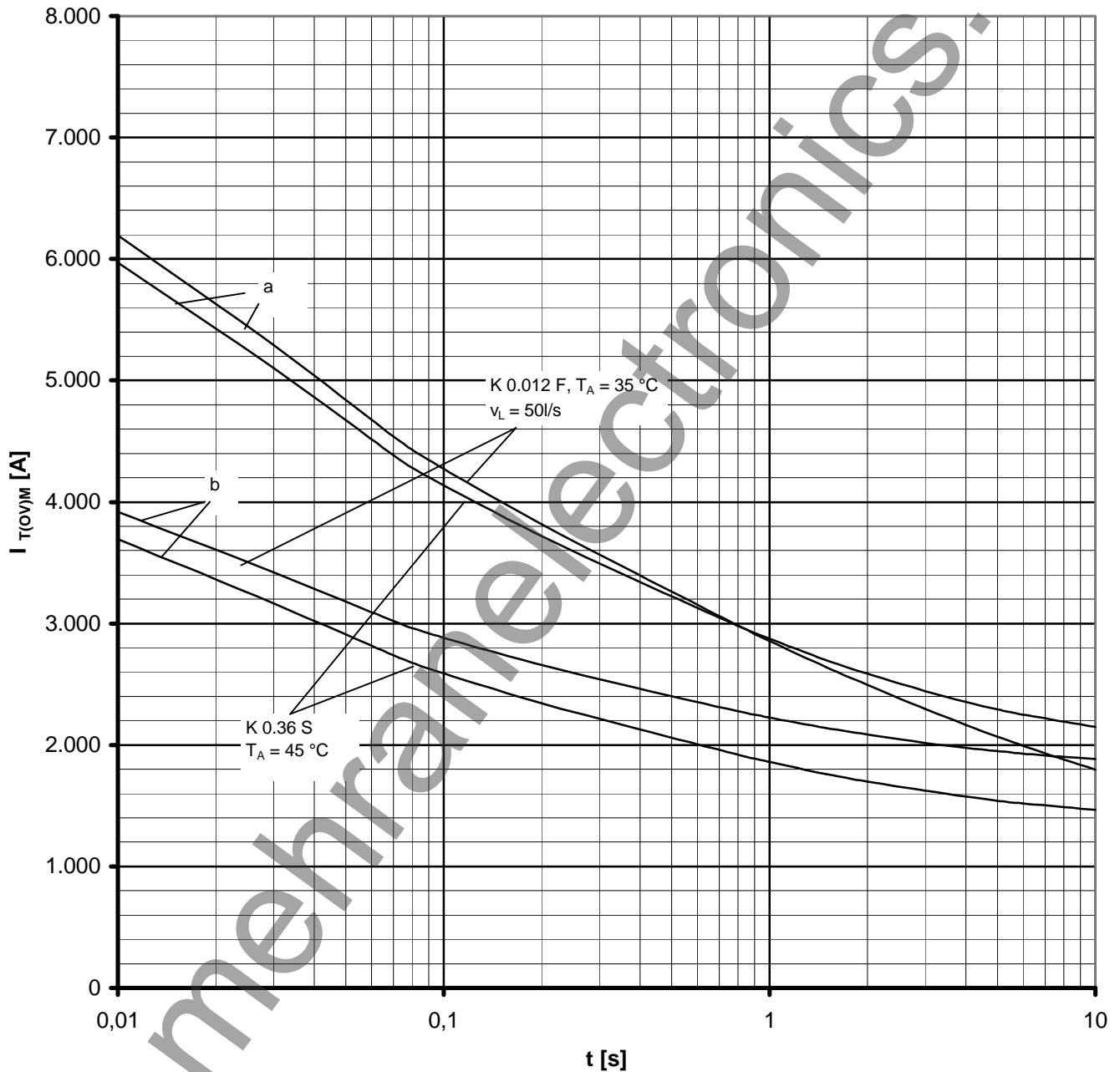
Parameter: Vorlaststrom / pre-load current $I_{TAV(vor)}$, Spieldauer / cycle duration SD



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 $I_{T(OV)M} = f(t), v_{RM} = 0,8 V_{RRM}$

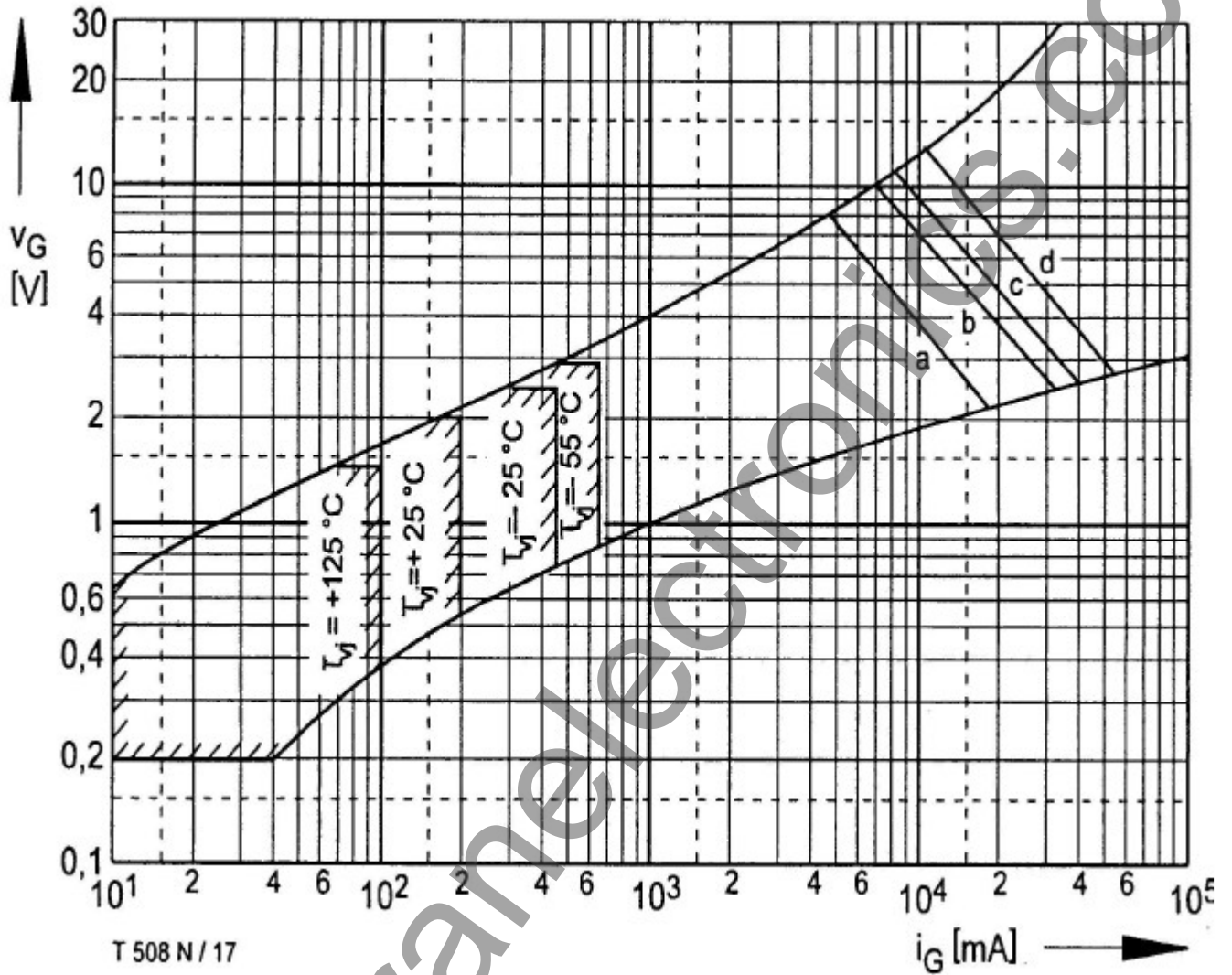
Beidseitige Kühlung / Two-sided cooling

Kühlkörper / Heatsink: K0.36S, K 0.05F

Belastung aus / Surge current occurs:

a - Leerlauf / No-load conditions

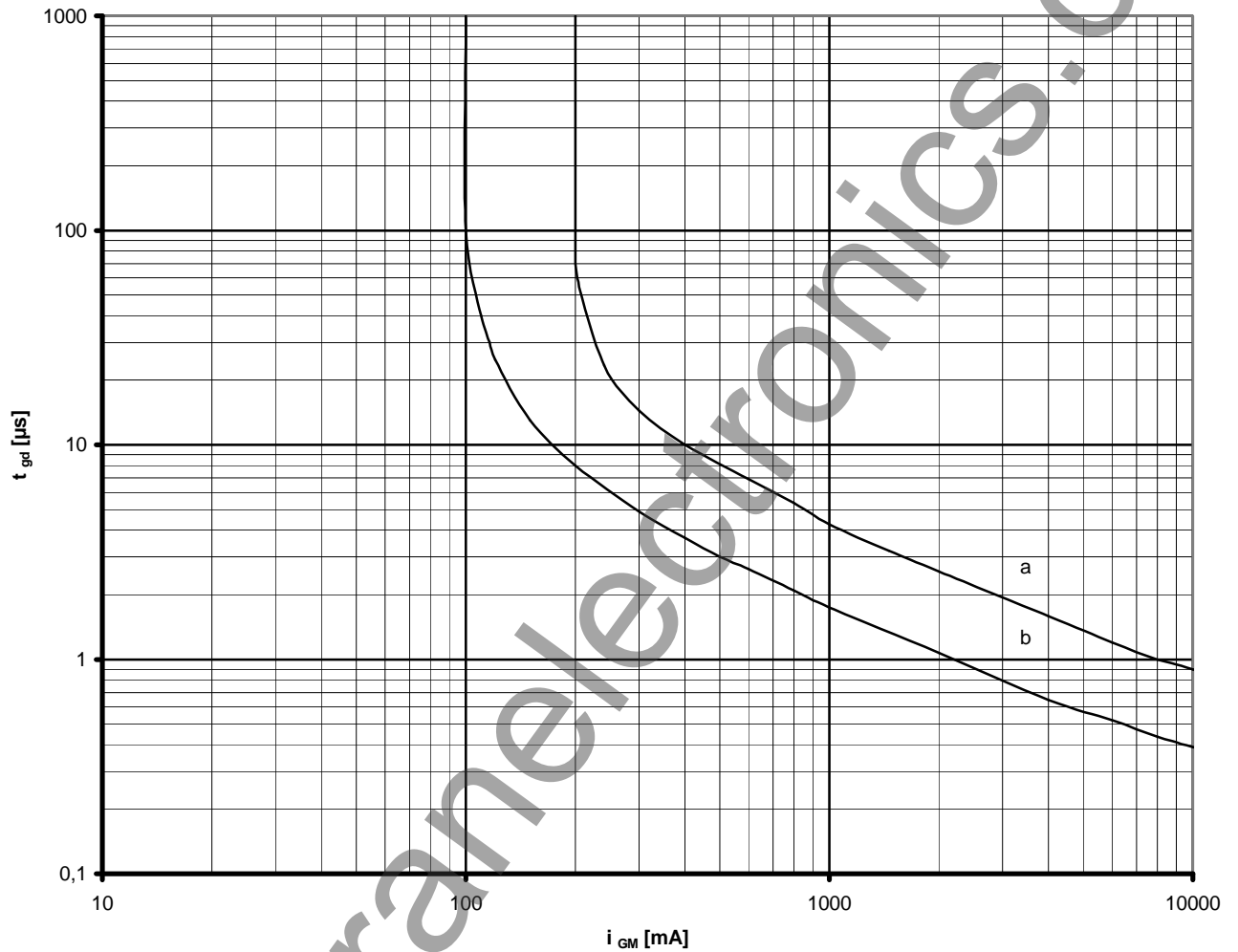
b - Betrieb mit Dauergrenzstrom / During operation at max. average on-state current I_{TAVM}



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

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

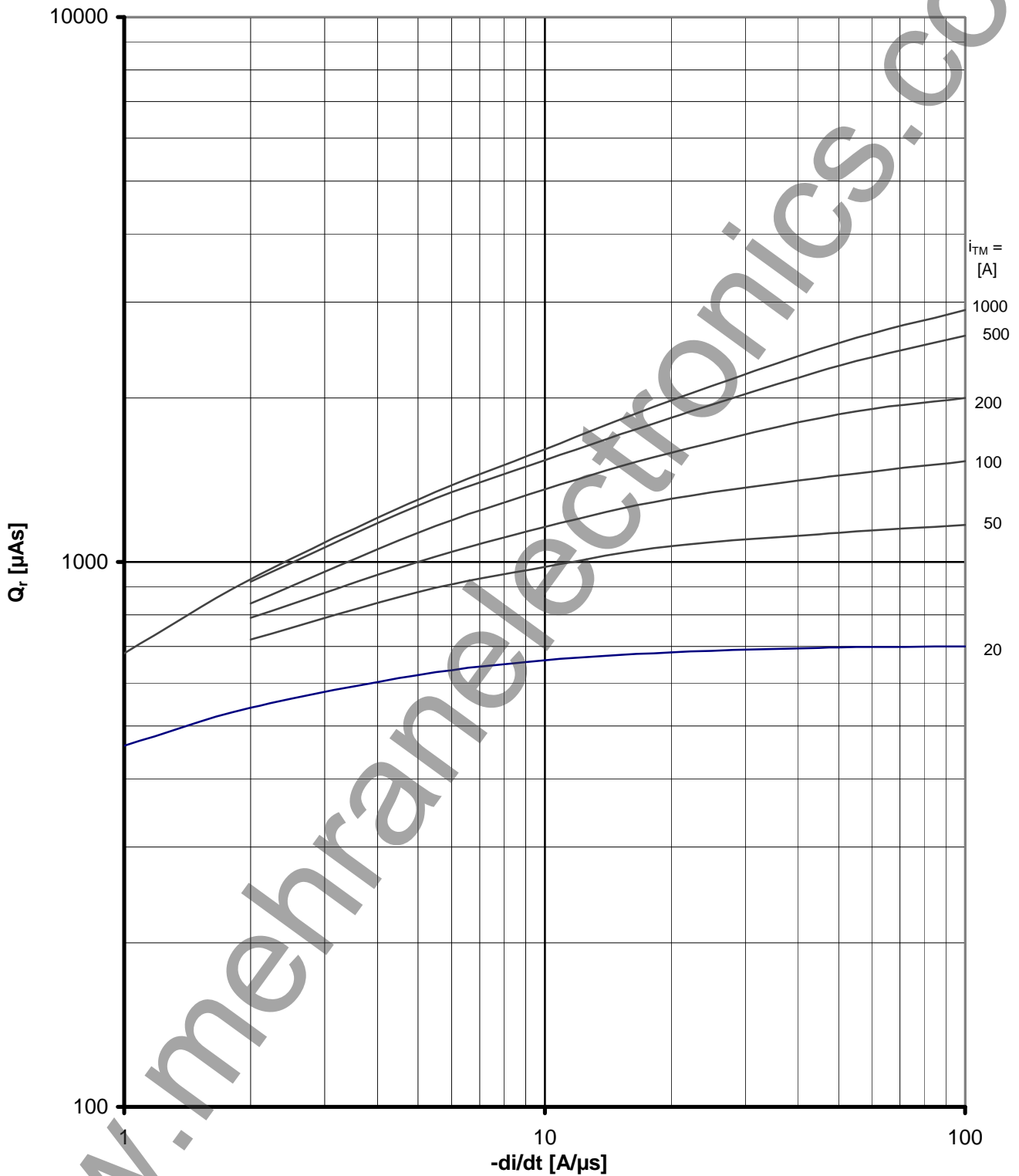


Zündverzögerung / Gate controlled delay time $t_{gd} = f(i_{GM})$

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

a - maximaler Verlauf / limiting characteristic

b - typischer Verlauf / typical characteristic



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

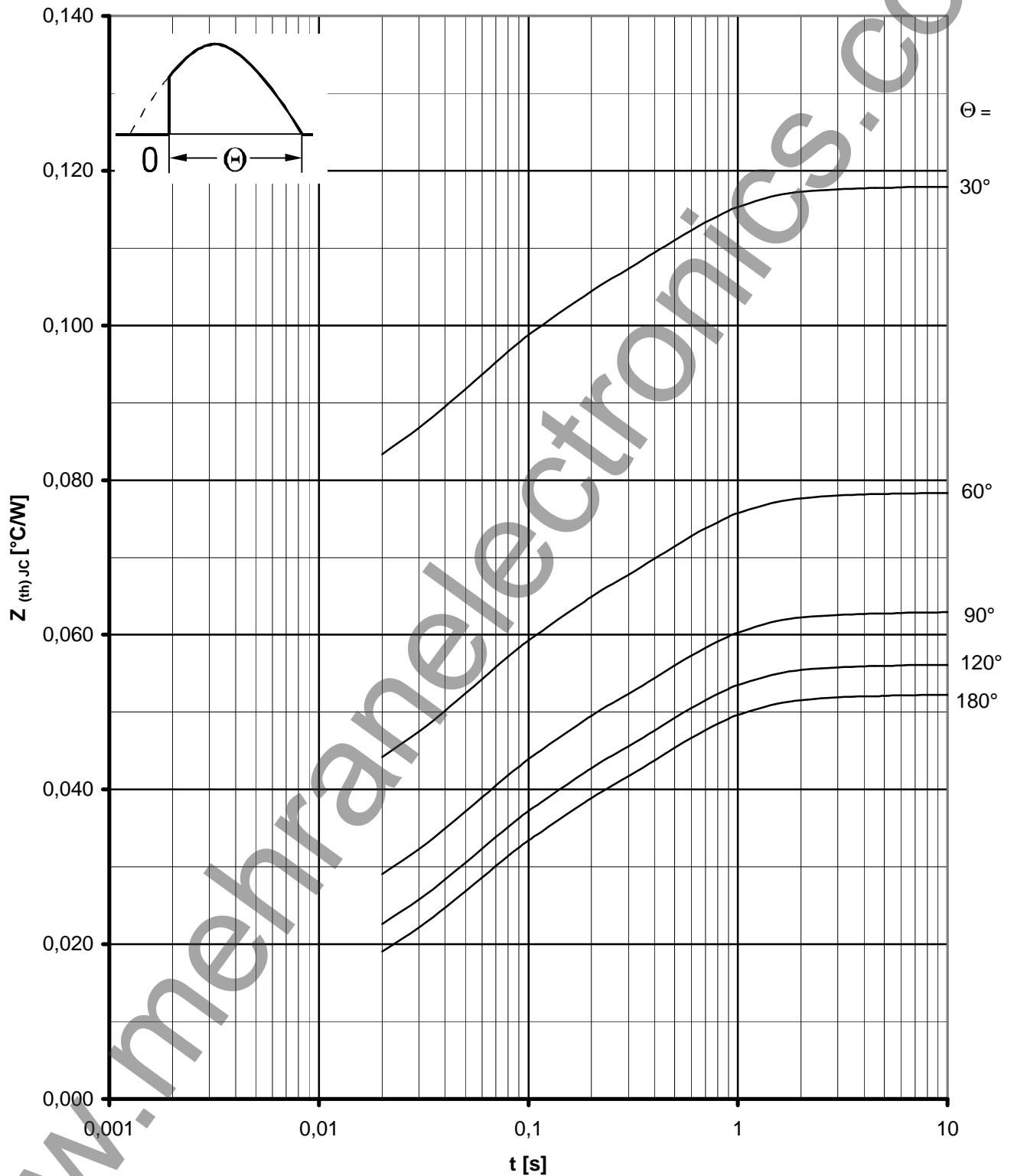
$T_{vj} = T_{vj} \text{ max}$, $v_R = 0,5 V_{RRM}$, $v_{RM} = 0,8 V_{RRM}$

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

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

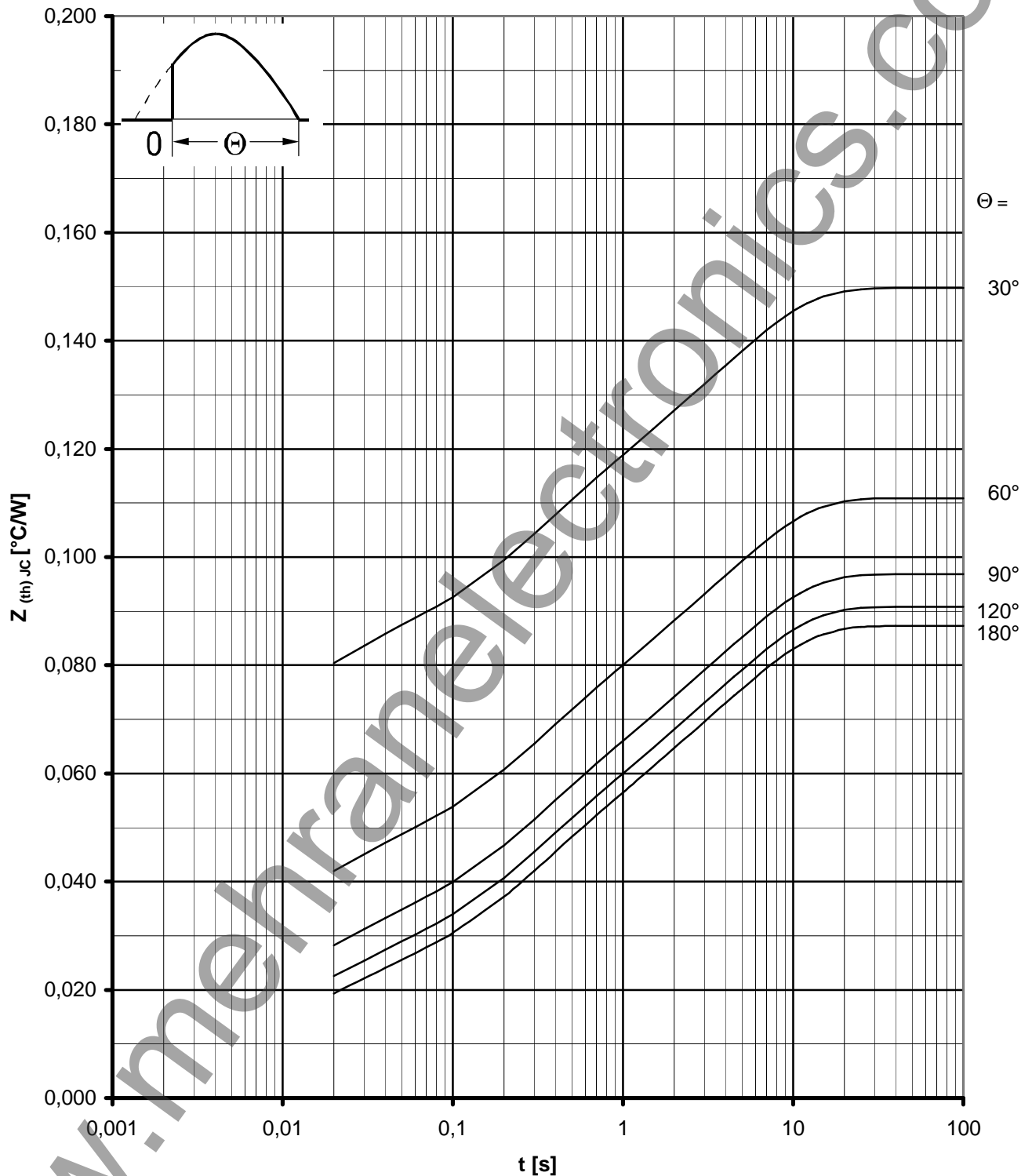
Beidseitige Kühlung / Two-sided cooling

Parameter: Stromflußwinkel Θ / current conduction angle Θ

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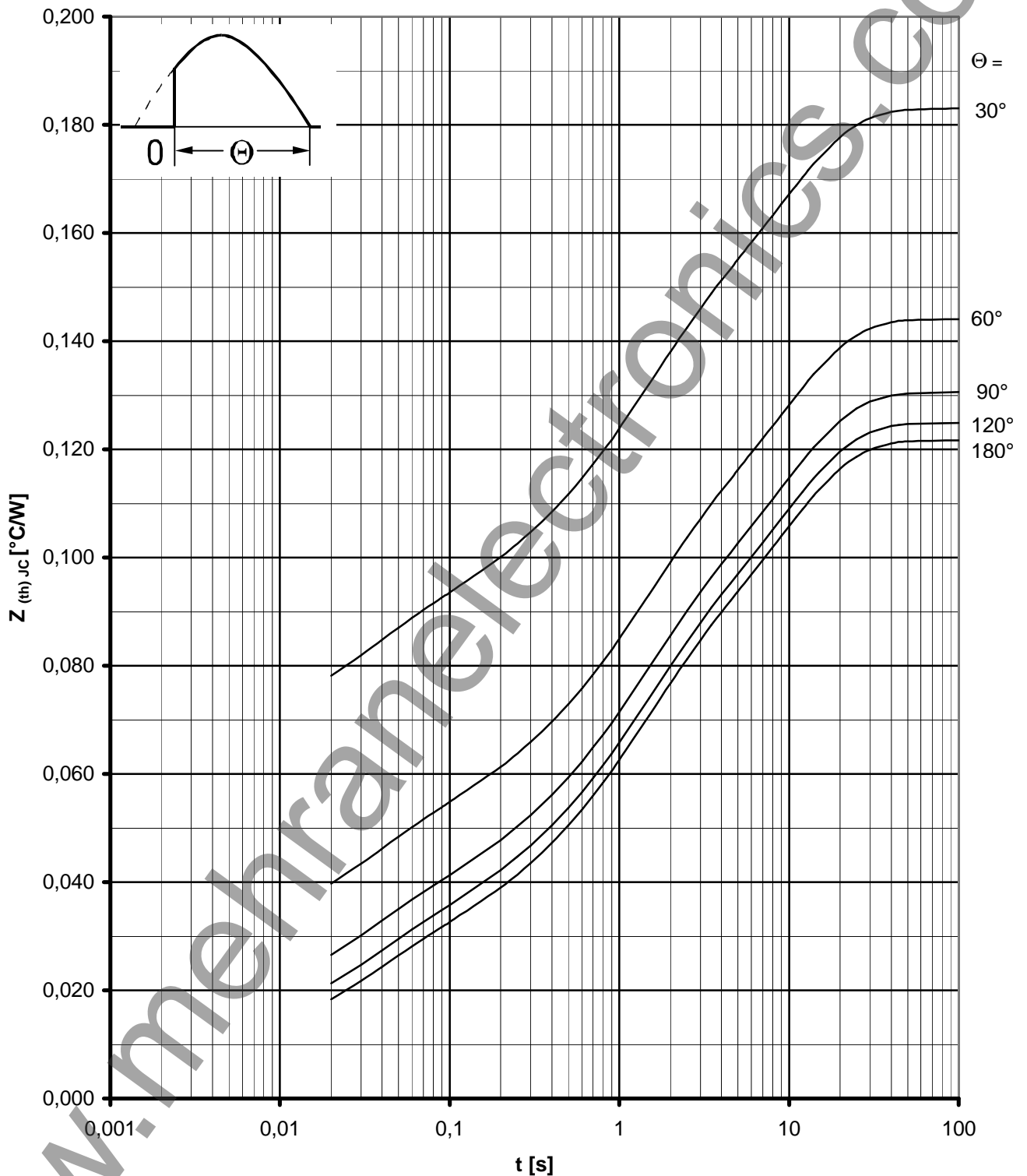


Transienter innerer Wärmewiderstand / Transient thermal impedance $Z_{(th)JC} = f(t)$
Anodenseitige Kühlung / Anode-sided cooling
Parameter: Stromflußwinkel Θ / current conduction angle Θ

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

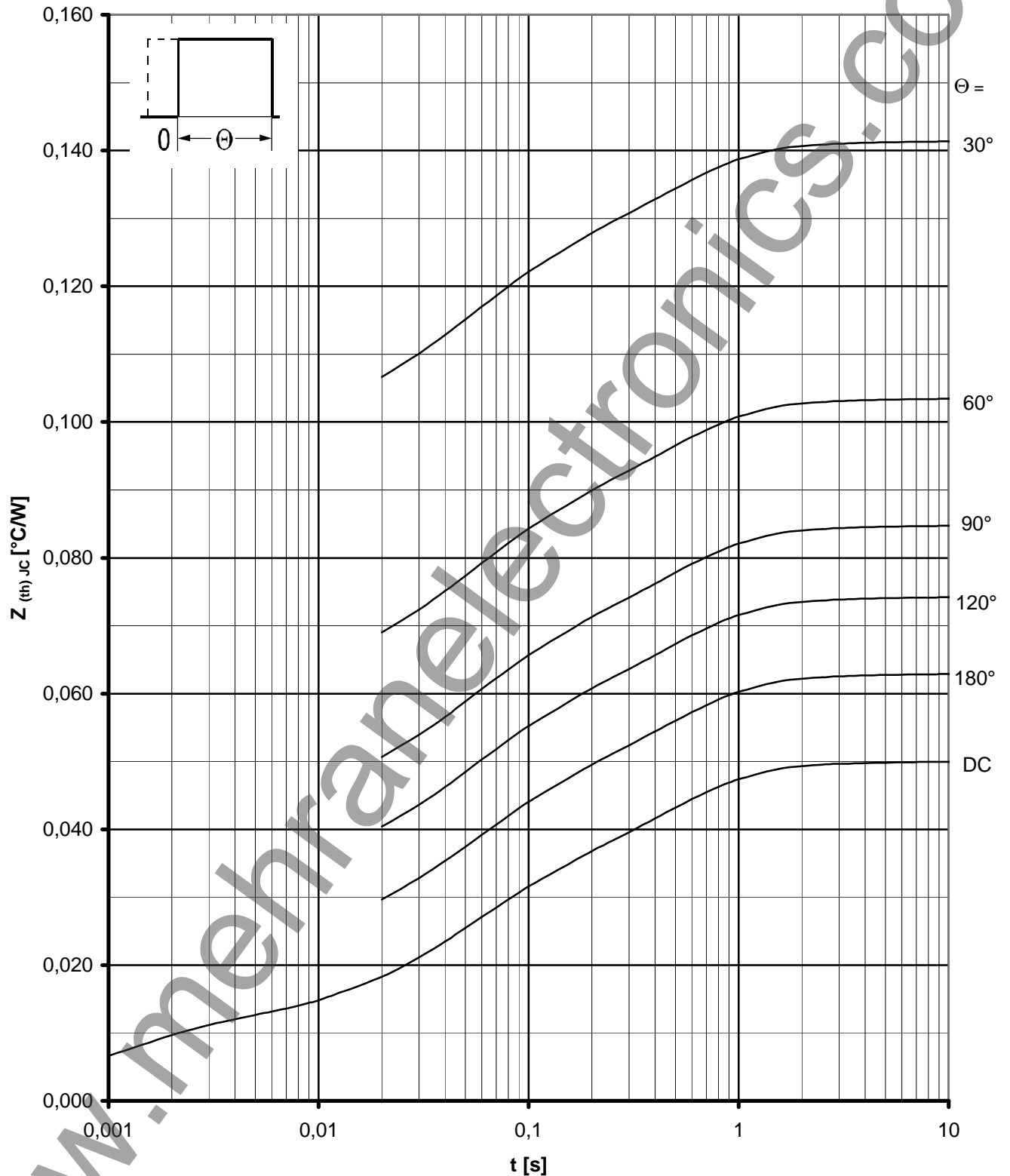
Kathodenseitige Kühlung / Cathode-sided cooling

Parameter: Stromflußwinkel Θ / current conduction angle Θ

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

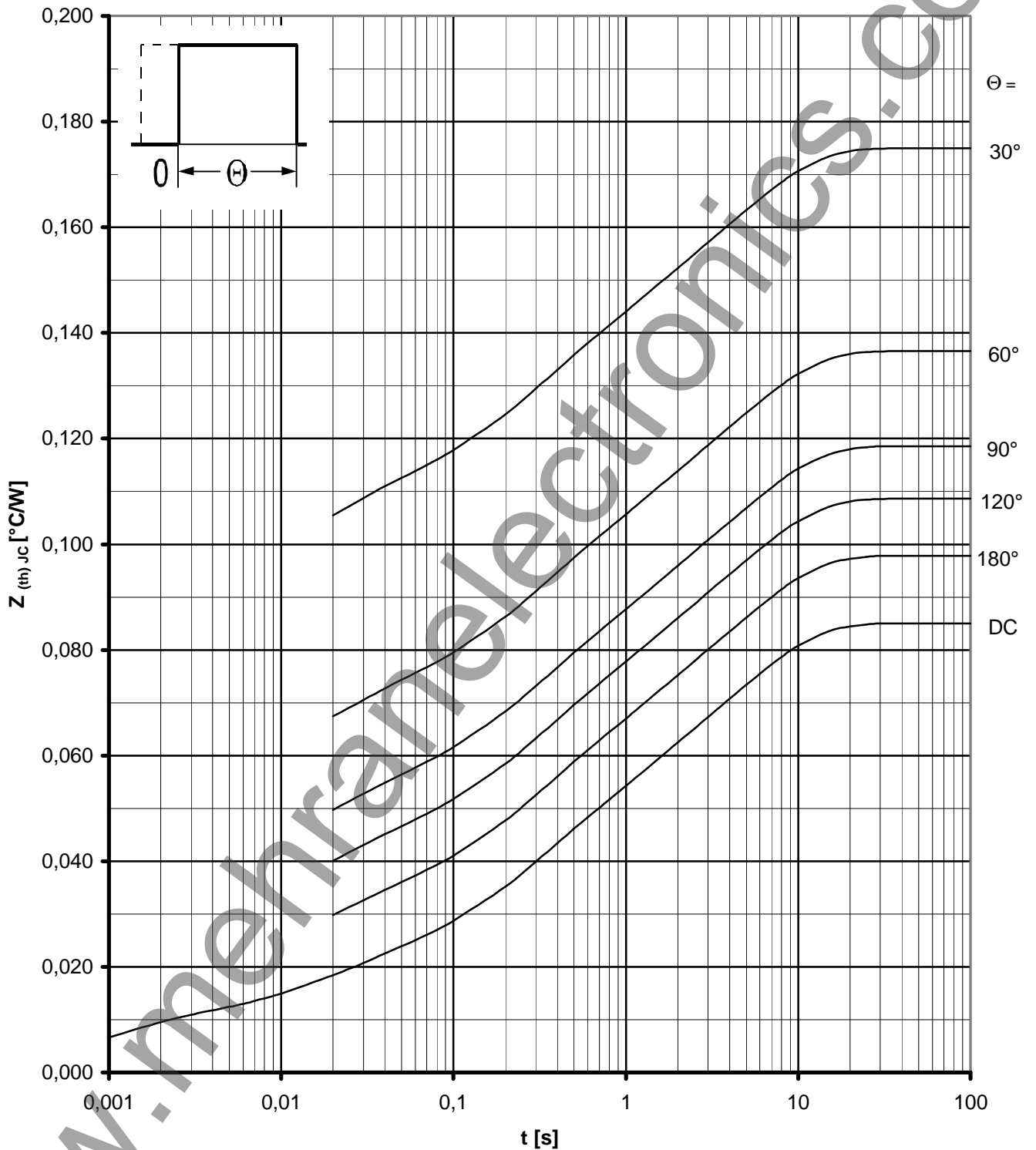
Beidseitige Kühlung / Two-sided cooling

Parameter: Stromflußwinkel Θ / current conduction angle Θ

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

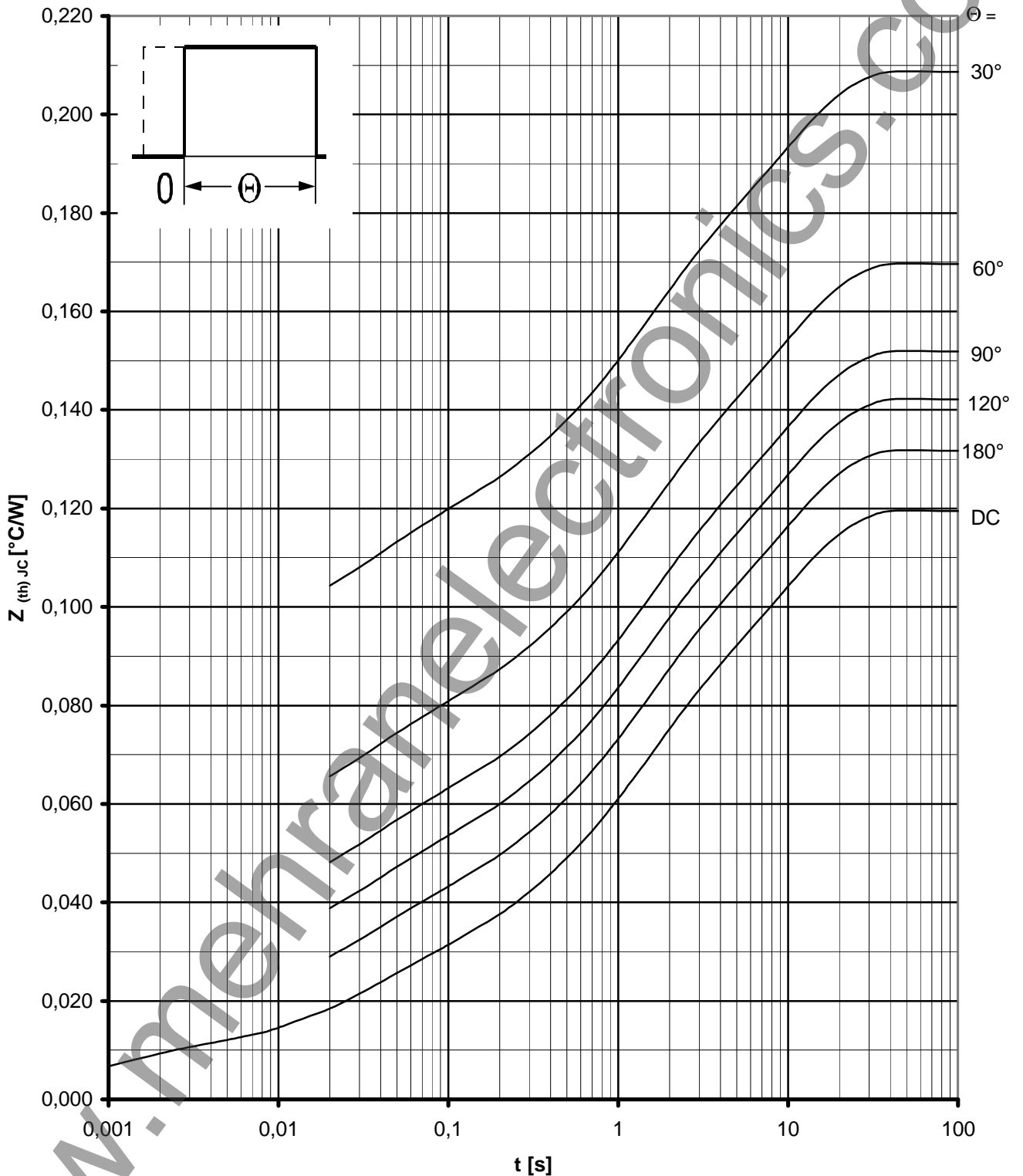
Anodenseitige Kühlung / Anode-sided cooling

Parameter: Stromflußwinkel θ / current conduction angle θ

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

Kathodenseitige Kühlung / Cathode-sided cooling

Parameter: Stromflußwinkel Θ / current conduction angle Θ

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You and your technical departments will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to such application. Should you require product information in excess of the data given in the Data Sheet, please contact your local Sales Office via "www.eupec.com / sales & contact".

Warning

Due to technical requirements the products may contain dangerous substances. For information on the types in question please contact your local Sales Office via "www.eupec.com / sales & contact".