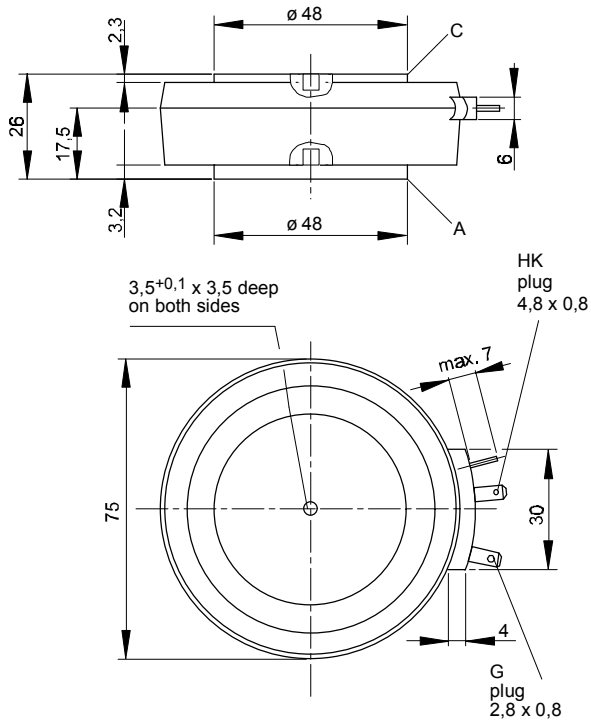




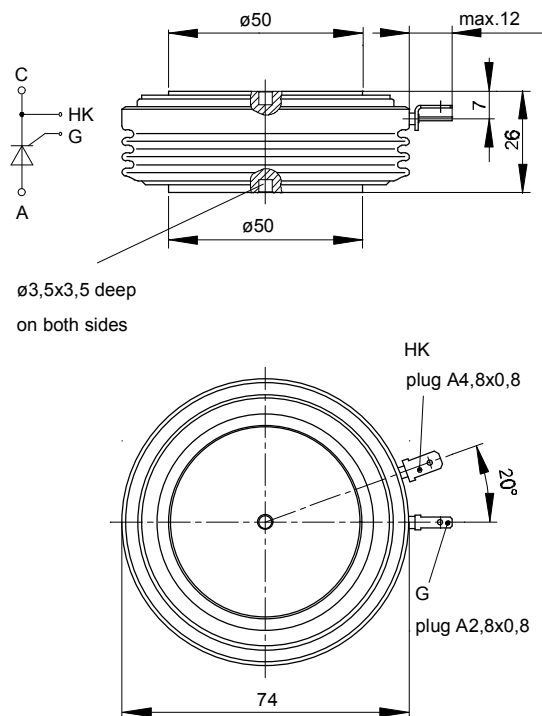
European Power-Semiconductor and Electronics Company

Marketing Information

T 1189 N



T 1190 N



T 1189 N T 1190 N

Elektrische Eigenschaften

Höchstzulässige Werte

Periodische Vorwärts- und Rückwärts-Spitzensperrspannung

Electrical properties

Maximum rated values

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 1400 1600
1800

V

Vorwärts-Stoßspitzensperrspannung

non-repetitive peak forward off-state voltage

$$t_{vj} = -40^{\circ}\text{C} \dots t_{vj \text{ max}}$$

$$V_{\text{DSM}} = V_{\text{DRM}}$$

1200 1400 1600
1800

V

Rückwärts-Stoßspitzensperrspannung

non-repetitive peak reverse voltage

$$t_{vj} = +25^{\circ}\text{C} \dots t_{vj \text{ max}}$$

$$V_{\text{RSM}} = V_{\text{RRM}}$$

1300 1500 1700
1900

V

Durchlaßstrom-Grenzeffektivwert

RMS on-state current

$$I_{\text{TRMSM}}$$

2800 A

Dauergrenzstrom

average on-state current

$$t_c = 85^{\circ}\text{C}$$

$$I_{\text{TAVM}}$$

1190 A

$$t_c = 53^{\circ}\text{C}$$

1800 A

Stoßstrom-Grenzwert

surge current

$$t_{vj} = 25^{\circ}\text{C}, t_p = 10 \text{ ms}$$

$$I_{\text{TSM}}$$

25500 A

$$t_{vj} = t_{vj \text{ max}}, t_p = 10 \text{ ms}$$

22500 A

Grenzlastintegral

$I^2 t$ -value

$$t_{vj} = 25^{\circ}\text{C}, t_p = 10 \text{ ms}$$

$$I^2 t$$

$3,25 \cdot 10^6 \text{ A}^2\text{s}$

$$t_{vj} = t_{vj \text{ max}}, t_p = 10 \text{ ms}$$

$2,53 \cdot 10^6 \text{ A}^2\text{s}$

Kritische Stromsteilheit

critical rate of rise of on-state current

$$v_D \leq 67\%, V_{\text{DRM}}, f = 50 \text{ Hz}$$

$$(di_T/dt)_{\text{cr}}$$

200 A/ μs

$$i_{\text{GM}} = 1 \text{ A}, di_G/dt = 1 \text{ A}/\mu\text{s}$$

Kritische Spannungssteilheit

critical rate of rise of off-state voltage

$$t_{vj} = t_{vj \text{ max}}, v_D = 67\% V_{\text{DRM}}$$

$$(dv/dt)_{\text{cr}}$$

1000 V/ μs

Charakteristische Werte

Characteristic values

Durchlaßspannung

on-state voltage

$$t_{vj} = t_{vj \text{ max}}, i_T = 5400 \text{ A}$$

$$v_T$$

max. 2,05 V

Schleusenspannung

threshold voltage

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

$$V_{\text{T(TO)}}$$

0,9 V

Ersatzwiderstand

slope resistance

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

$$r_T$$

0,19 m Ω

Zündstrom

gate trigger current

$$t_{vj} = 25^{\circ}\text{C}, v_D = 6 \text{ V}$$

$$I_{\text{GT}}$$

max. 250 mA

Zündspannung

gate trigger voltage

$$t_{vj} = 25^{\circ}\text{C}, v_D = 6 \text{ V}$$

$$V_{\text{GT}}$$

max. 2 V

Nicht zündender Steuerstrom

gate non-trigger current

$$t_{vj} = t_{vj \text{ max}}, v_D = 6 \text{ V}$$

$$I_{\text{GD}}$$

max. 200 mA

$$t_{vj} = t_{vj \text{ max}}, v_D = 0,5 V_{\text{DRM}}$$

max. 10 mA

Nicht zündende Steuerspannung

gate non-trigger voltage

$$t_{vj} = t_{vj \text{ max}}, v_D = 0,5 V_{\text{DRM}}$$

$$V_{\text{GD}}$$

max. 0,2 V

Haltestrom

holding current

$$t_{vj} = 25^{\circ}\text{C}, v_D = 6 \text{ V}, R_A = 2 \Omega$$

$$I_H$$

max. 500 mA

Einraststrom

latching current

$$t_{vj} = 25^{\circ}\text{C}, v_D = 6 \text{ V}, R_{\text{GK}} \geq 10 \Omega$$

$$I_L$$

max. 2500 mA

$$i_{\text{GM}} = 1 \text{ A}, di_G/dt = 1 \text{ A}/\mu\text{s}, t_g = 20 \mu\text{s}$$

Vorwärts- und Rückwärts-Sperrstrom

forward off-state and reverse currents

$$t_{vj} = t_{vj \text{ max}}, v_D = V_{\text{DRM}}, v_R = V_{\text{RRM}}$$

$$i_D, i_R$$

max. 150 mA

Zündverzögerung

gate controlled delay time

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

$$t_{\text{gd}}$$

max. 4 μs

Freiwerdzeit

circuit commutated turn-off time

siehe Techn.Erl./see Techn. Inf.

$$t_q$$

typ. 240 μs

Thermische Eigenschaften

Thermal properties

Innerer Wärmewiderstand für beidseitige Kühlung

thermal resistance, junction to case for two-sided cooling

$$\Theta = 180^{\circ} \text{ el, sin}$$

$$R_{\text{thJC}}$$

max. 0,0230 $^{\circ}\text{C}/\text{W}$

$$\text{DC}$$

max. 0,0210 $^{\circ}\text{C}/\text{W}$

für anodenseitige Kühlung

for anode-sided cooling

$$\Theta = 180^{\circ} \text{ el, sin}$$

$$R_{\text{thJC(A)}}$$

max. 0,0395 $^{\circ}\text{C}/\text{W}$

$$\text{DC}$$

max. 0,0375 $^{\circ}\text{C}/\text{W}$

für kathodenseitige Kühlung

for cathode-sided cooling

$$\Theta = 180^{\circ} \text{ el, sin}$$

$$R_{\text{thJC(K)}}$$

max. 0,0500 $^{\circ}\text{C}/\text{W}$

$$\text{DC}$$

max. 0,0480 $^{\circ}\text{C}/\text{W}$

Übergangs-Wärmewiderstand

thermal resistance, case to heatsink

beidseitig/two-sided

$$R_{\text{thCK}}$$

max. 0,0035 $^{\circ}\text{C}/\text{W}$

einseitig/one-sided

max. 0,0070 $^{\circ}\text{C}/\text{W}$

Höchstzul. Sperrschichttemperatur

max. junction temperature

$$t_{vj \text{ max}}$$

125 $^{\circ}\text{C}$

Betriebstemperatur

operating temperature

$$t_{c \text{ op}}$$

-40...+125 $^{\circ}\text{C}$

Lagertemperatur

storage temperature

$$t_{\text{stg}}$$

-40...+150 $^{\circ}\text{C}$

Mechanische Eigenschaften

Mechanical properties

Si-Elemente mit Druckkontakt

Si-pellet with pressure contact

Anpreßkraft

clamping force

$$F$$

16...32 kN

Gewicht

weight

$$T 1189 \text{ N/T } 1190 \text{ N}$$

$$G$$

typ. 520/580 g

Kriechstrecke

creepage distance

$$T 1189 \text{ N/T } 1190 \text{ N}$$

32/30 mm

Feuchteklasse

humidity classification

$$\text{DIN 40040}$$

C

Schwingfestigkeit

vibration resistance

$$f = 50 \text{ Hz}$$

50 m/s^2

Maßbild, anliegend

outline, attached

$$\text{DIN 41814-155B4}$$

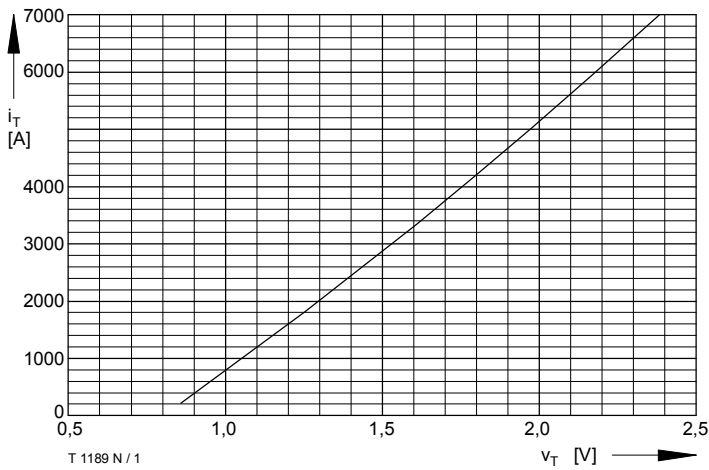


Bild / Fig. 1
Grenzdurchlaßkennlinie / Limiting on-state characteristic
 $i_T = f(v_T), t_{vj} = t_{vj\ max}$

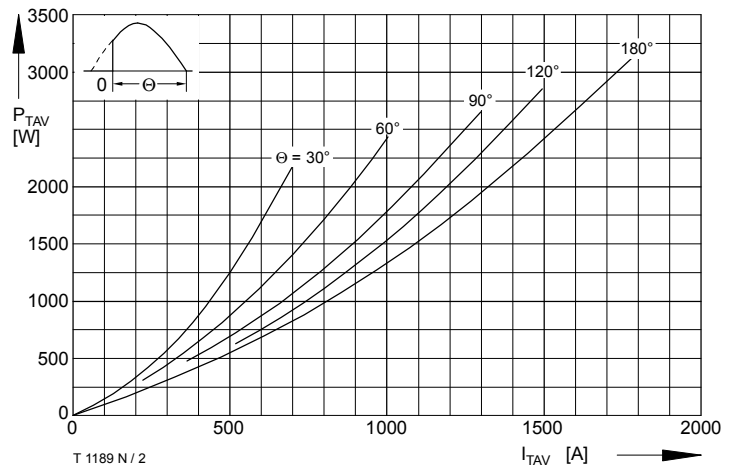


Bild / Fig. 2
Durchlaßverlustleistung / On-state power loss $P_{TAV} = f(I_{TAV})$
Parameter: Stromflußwinkel / Current conduction angle θ

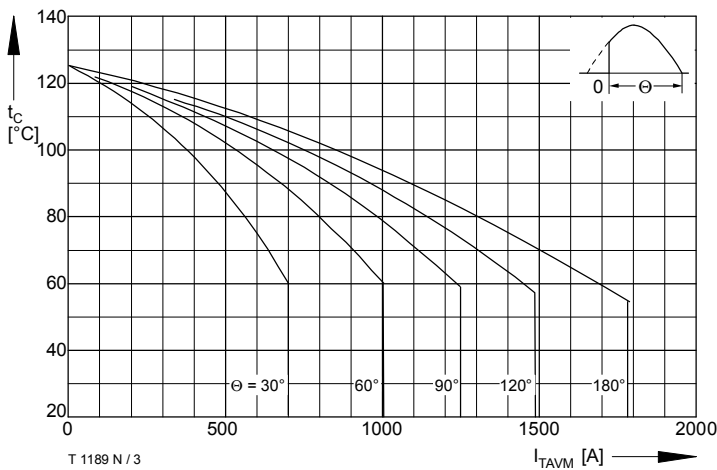


Bild / Fig. 3
Höchstzulässige Gehäusetemperatur / Max. allowable case temperature
 $t_c = f(I_{TAVM})$
Beidseitige Kühlung / Two-sided cooling
Parameter: Stromflußwinkel / Current conduction angle θ

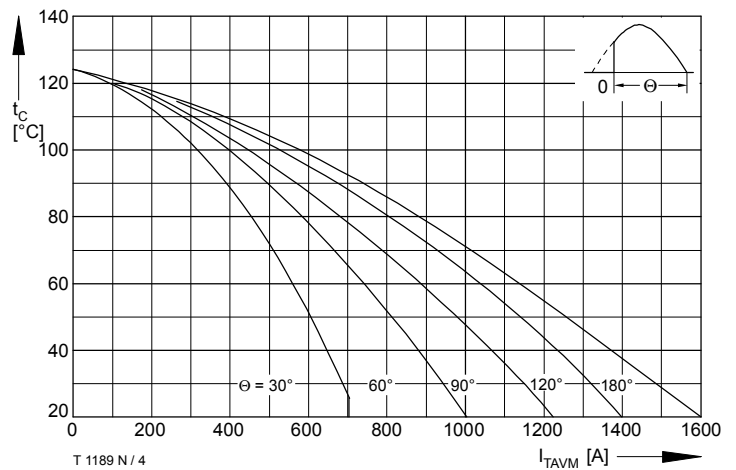


Bild / Fig. 4
Höchstzulässige Gehäusetemperatur / Max. allowable case temperature
 $t_c = f(I_{TAVM})$
Anodenseitige Kühlung / Anode-sided cooling
Parameter: Stromflußwinkel / Current conduction angle θ

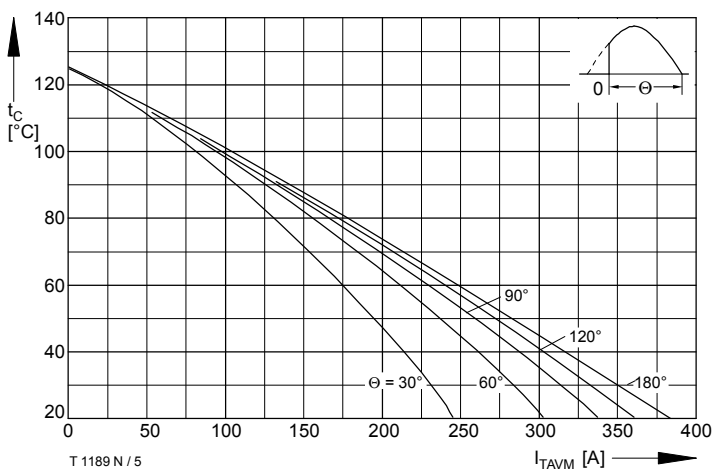


Bild / Fig. 5
Höchstzulässige Kühlmitteltemperatur / Max. allowable cooling medium temperature $t_A = f(I_{TAVM})$
Luftselbstkühlung / Natural air-cooling
Kühlkörper / Heatsink: K0.05F
Parameter: Stromflußwinkel / Current conduction angle θ

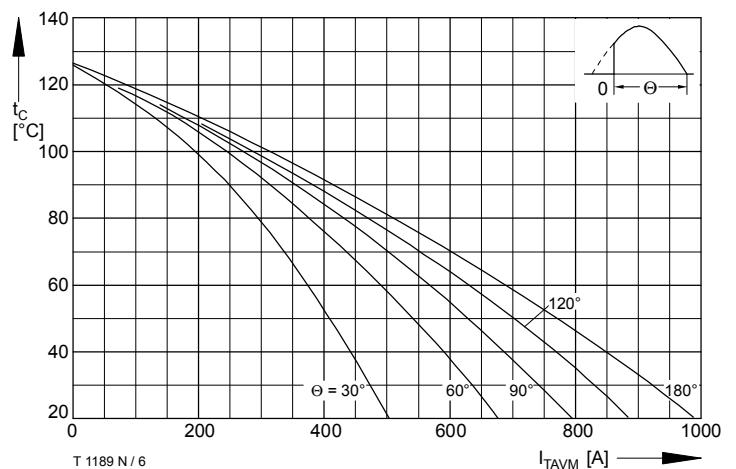


Bild / Fig. 6
Höchstzulässige Kühlmitteltemperatur / Max. allowable cooling medium temperature $t_A = f(I_{TAVM})$
Verstärkte Luftkühlung / Forced air cooling
Kühlkörper / Heatsink: K0.05F, $V_L = 120$ l/s
Parameter: Stromflußwinkel / Current conduction angle θ

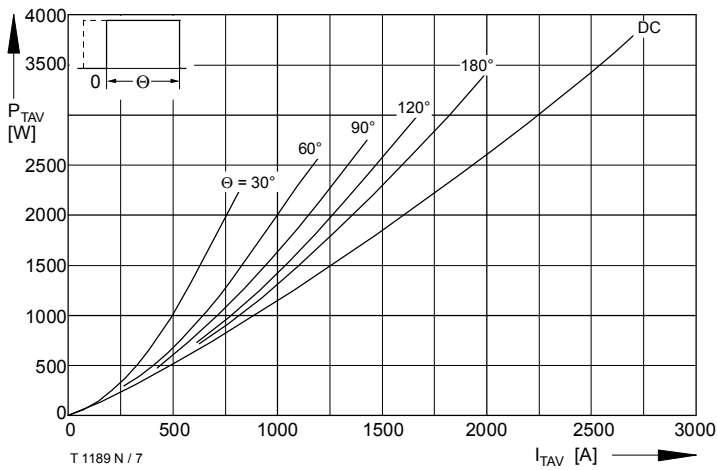


Bild / Fig. 7
Durchlaßverlustleistung / On-state power loss $P_{TAV} = f(I_{TAV})$
Parameter: Stromflußwinkel / Current conduction angle θ

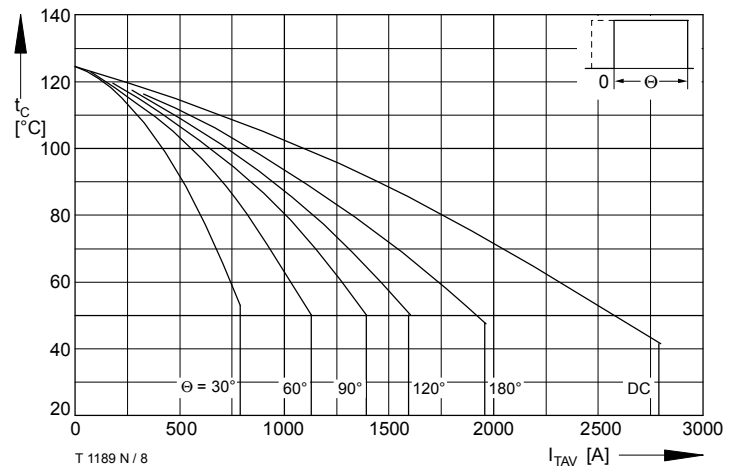


Bild / Fig. 8
Höchstzulässige Gehäusetemperatur / Max. allowable case temperature
 $t_c = f(I_{TAVM})$
Beidseitige Kühlung / Two-sided cooling
Parameter: Stromflußwinkel / Current conduction angle θ

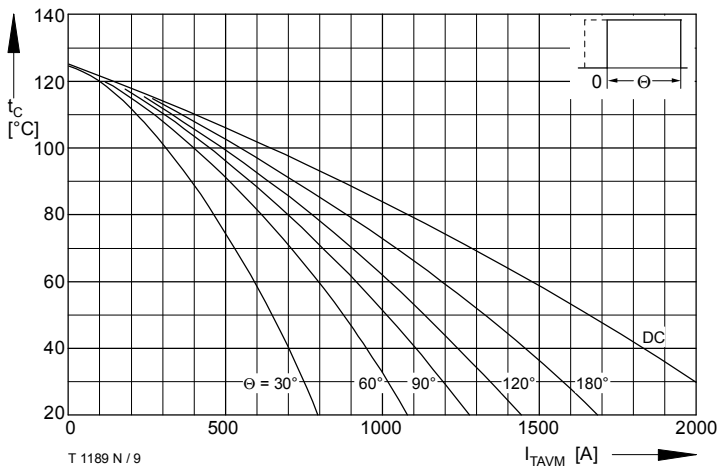


Bild / Fig. 9
Höchstzulässige Gehäusetemperatur / Max. allowable case temperature
 $t_c = f(I_{TAVM})$
Anodenseitige Kühlung / Anode-sided cooling
Parameter: Stromflußwinkel / Current conduction angle θ

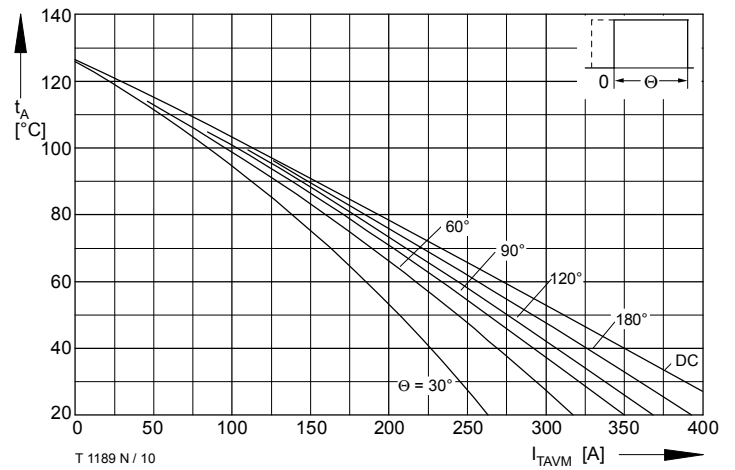


Bild / Fig. 10
Höchstzulässige Kühlmitteltemperatur / Max. allowable cooling medium temperature $t_A = f(I_{TAVM})$
Luftselbstkühlung / Natural air-cooling
Kühlkörper / Heatsink: K0.55F
Parameter: Stromflußwinkel / Current conduction angle θ

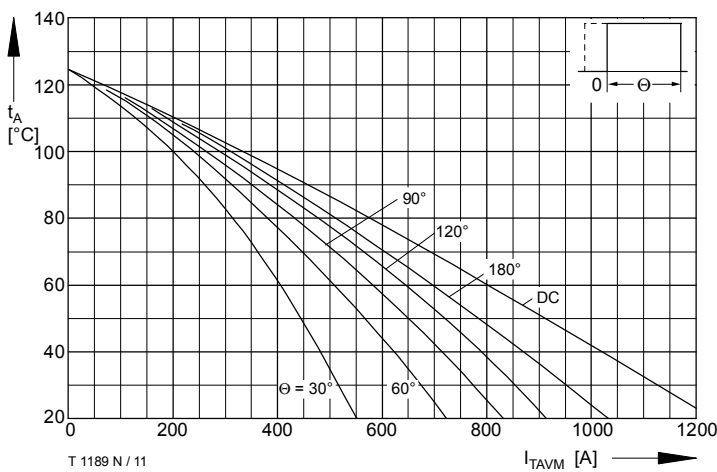


Bild / Fig. 11
Höchstzulässige Kühlmitteltemperatur / Max. allowable cooling medium temperature $t_A = f(I_{TAVM})$
Verstärkte Luftkühlung / forced air cooling
Kühlkörper / Heatsink: K0.05F, $V_L = 120$ l/s
Parameter: Stromflußwinkel / Current conduction angle θ

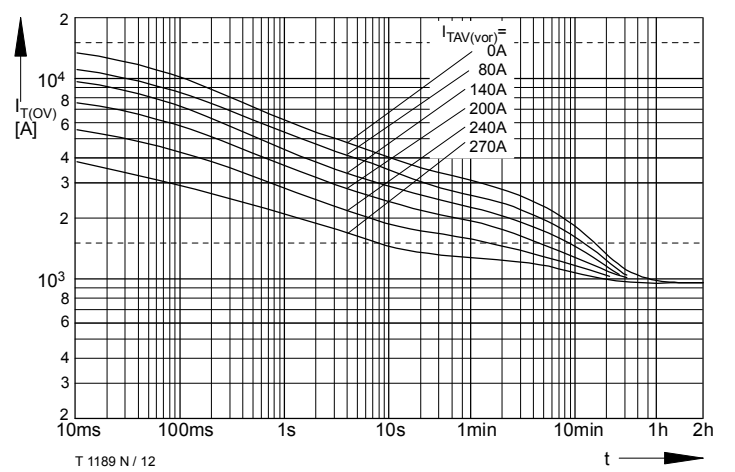


Bild / Fig. 12
Überstrom / Overload on-state current $I_{T(OV)} = f(t)$
Luftselbstkühlung / Natural air-cooling, $t_A = 45$ °C
Kühlkörper / Heatsink: K0.55F
Parameter: Vorlaststrom / Pre-load current $I_{TAV(vor)}$

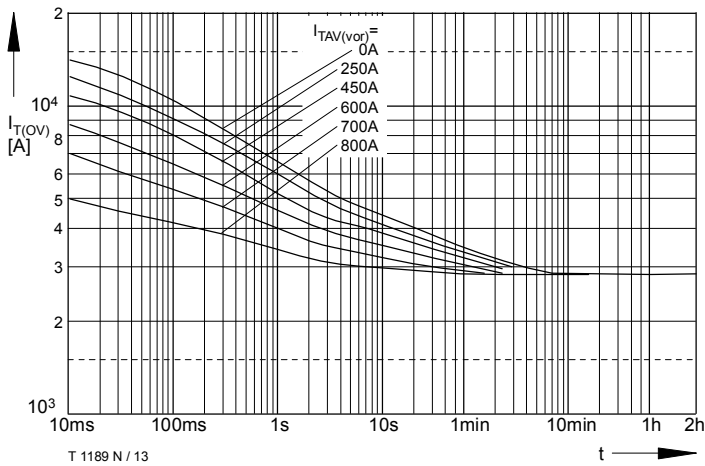


Bild / Fig. 13
 Überstrom / Overload on-state current $I_{T(OV)} = f(t)$
 Verstärkte Luftkühlung / Forced air-cooling, $t_A = 35^\circ\text{C}$
 Kühlkörper / Heatsink: K0.05F, $V_L = 120 \text{ l/s}$
 Parameter: Vorlaststrom / Pre-load current $I_{TAV(vor)}$

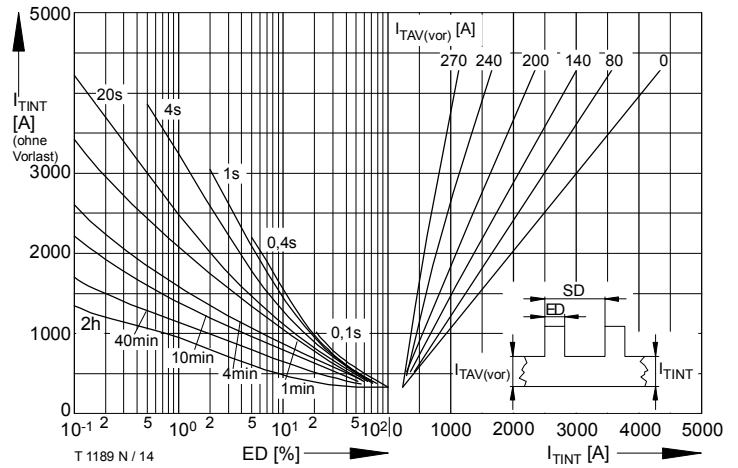


Bild / Fig. 14
 Höchstzulässiger Durchlaßstrom bei Aussetzbetrieb / Max. allowable on-state current at intermittent operation $I_{TINT} = f(ED)$
 Luftselbstkühlung / Natural air-cooling, $t_A = 45^\circ\text{C}$
 Kühlkörper / Heatsink: K0.05F
 Parameter: Spieldauer / Cycle duration SD
 Vorlaststrom / Pre-load current $I_{TAV(vor)}$

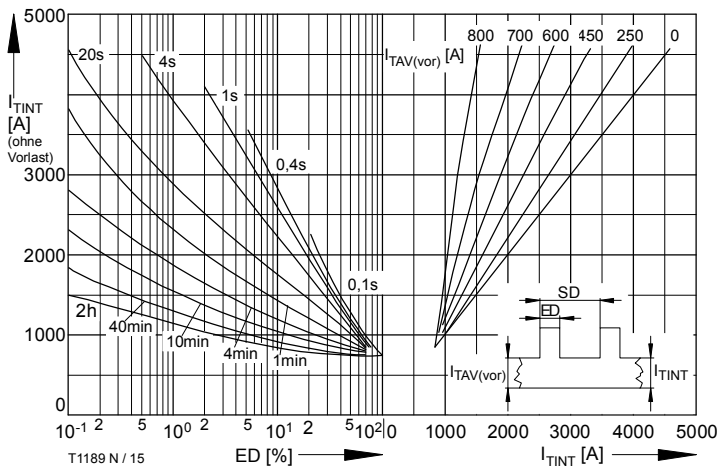


Bild / Fig. 15
 Höchstzulässiger Durchlaßstrom bei Aussetzbetrieb / Max. allowable on-state current at intermittent operation $I_{TINT} = f(ED)$
 Verstärkte Luftkühlung / Forced air-cooling, $t_A = 35^\circ\text{C}$
 Kühlkörper / Heatsink: K0.05F, $V_L = 120 \text{ l/s}$
 Parameter: Spieldauer / Cycle duration SD
 Vorlaststrom / Pre-load current $I_{TAV(vor)}$

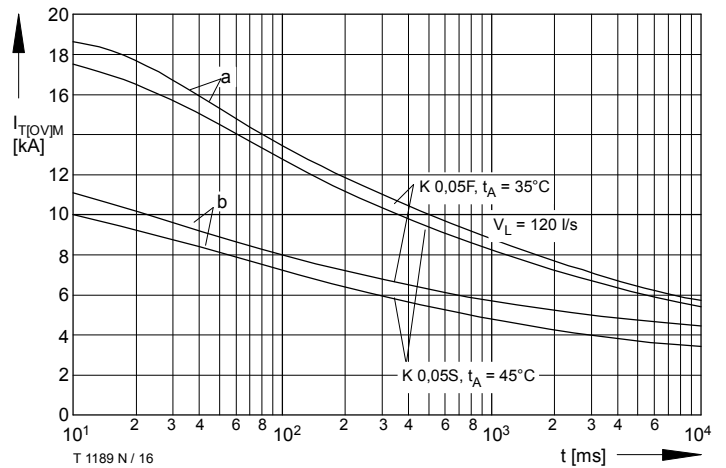


Bild / Fig. 16
 Grenzstrom / Max. overload on-state current $I_{T(OV)M} = f(t)$, $v_{RM} = 0,8 V_{RRM}$
 Beidseitige Kühlung / Two-sided cooling
 Kühlkörper / Heatsink: K0.55F
 Belastung aus / Surge current occurs:
 a - Leerlauf / No-load conditions
 b - Betrieb mit Dauergrenzstrom / During operation at max. average on-state current I_{TAVM}

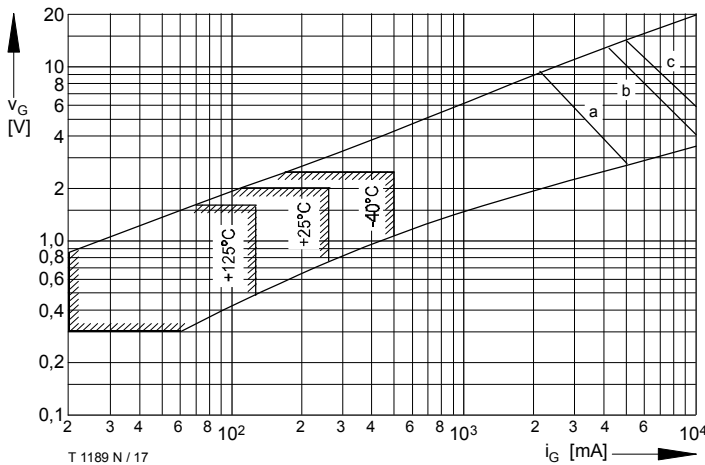


Bild / Fig. 17
 Steuercharakteristik mit Zündbereichen / Gate characteristic with triggering areas $V_G = f(i_G)$, $V_D = 6 \text{ V}$
 Parameter:

	a	b	c
Steuerimpulsdauer / trigger puls duration t_g [ms]	10	1	0,5
Höchstzulässige Spitzensteuerverlustleistung / Max. rated peak gate power dissipation [W]	20	40	60

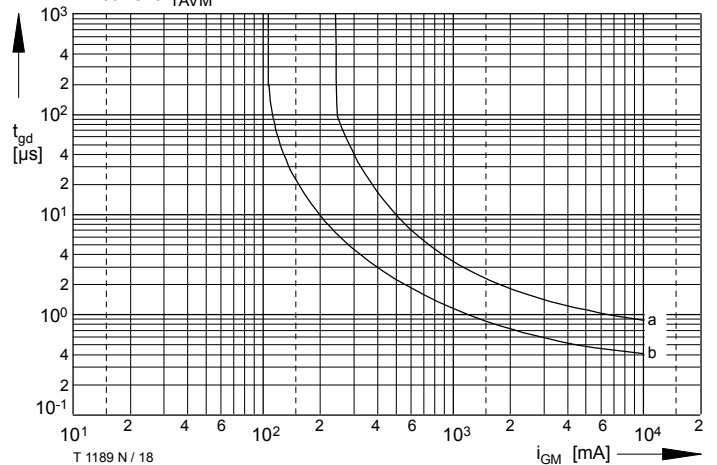


Bild / Fig. 18
 Zündverzug / Gate controlled delay time $t_{gd} = f(i_{GM})$
 $t_{vj} = 25^\circ\text{C}$, $di_G/dt = i_{GM}/1\mu\text{s}$
 a - Maximaler Verlauf / Limiting characteristic
 b - Typischer Verlauf / Typical characteristic

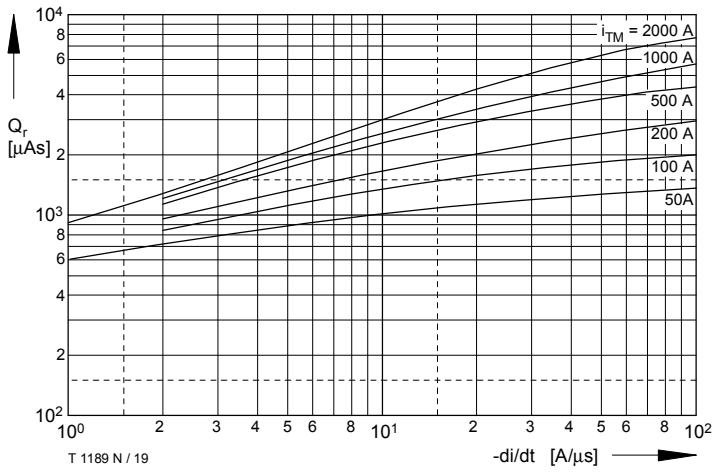


Bild / Fig. 19
 Sperrverzögerungsladung / Recovered charge $Q_r = f(di/dt)$
 $t_{vj} = t_{vj \max}$; $V_R = 0,5 V_{RRM}$; $V_{RM} = 0,8 V_{RRM}$
 Parameter: Durchlaßstrom / On-state current i_{TM}

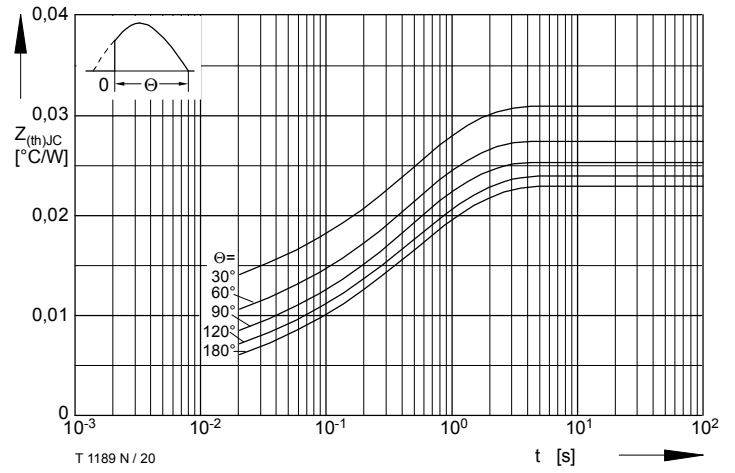


Bild / Fig. 20
 Transienter innerer Wärmewiderstand / Transient thermal impedance
 $Z_{thJC} = f(t)$
 Beidseitige Kühlung / Two-sided cooling
 Parameter: Stromflußwinkel / current conduction angle θ

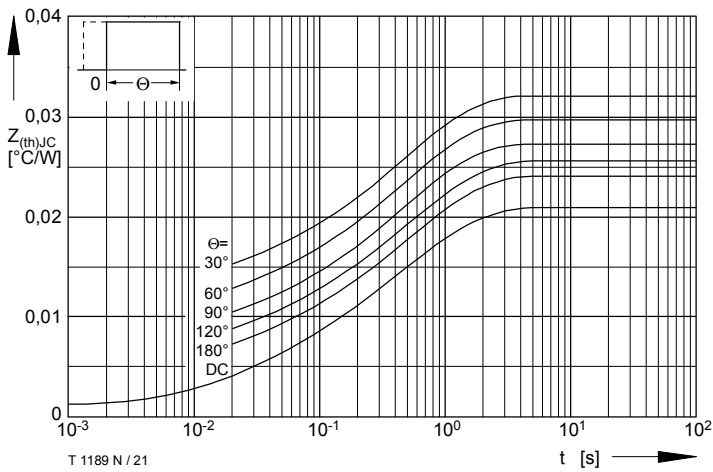


Bild / Fig. 21
 Transienter innerer Wärmewiderstand / Transient thermal impedance
 $Z_{thJC} = f(t)$
 Beidseitige Kühlung / Two-sided cooling
 Parameter: Stromflußwinkel / current conduction angle θ

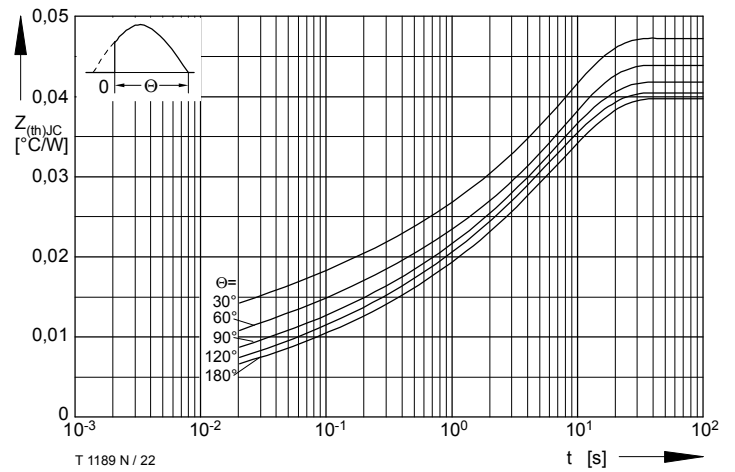


Bild / Fig. 22
 Transienter innerer Wärmewiderstand / Transient thermal impedance
 $Z_{thJC} = f(t)$
 Anodenseitige Kühlung / Anode-sided cooling
 Parameter: Stromflußwinkel / current conduction angle θ

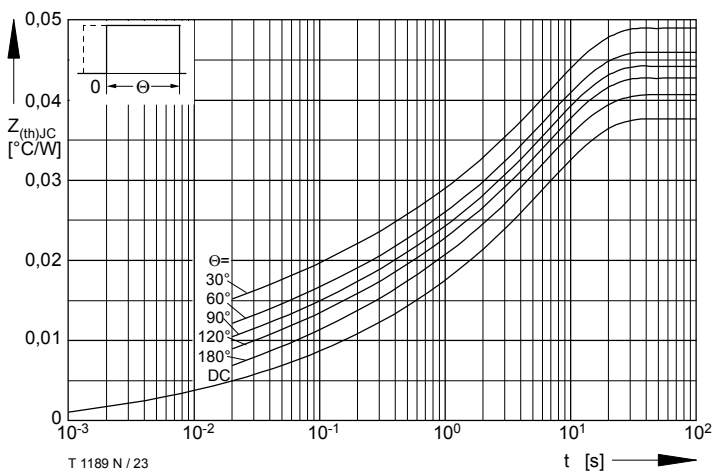


Bild / Fig. 23
 Transienter innerer Wärmewiderstand / Transient thermal impedance
 $Z_{thJC} = f(t)$
 Anodenseitige Kühlung / Anode-sided cooling
 Parameter: Stromflußwinkel / current conduction angle θ

Analytische Elemente des transienten Wärmewiderstandes Z_{thJC} pro Zweig für DC
 Analytical elements of transient thermal impedance Z_{thJC} per arm for DC

Beidseitig / Two-sided

Pos. n	1	2	3	4	5
R_{thn} [$^{\circ}\text{C}/\text{W}$]	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

Pos. n	1	2	3	4	5
R_{thn} [$^{\circ}\text{C}/\text{W}$]	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

Pos. n	1	2	3	4	5
R_{thn} [$^{\circ}\text{C}/\text{W}$]	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:

$$Z_{thJC} = \sum_{n=1}^{n_{\max}} R_{thn} \left(1 - e^{-\frac{t}{\tau_n}}\right)$$

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