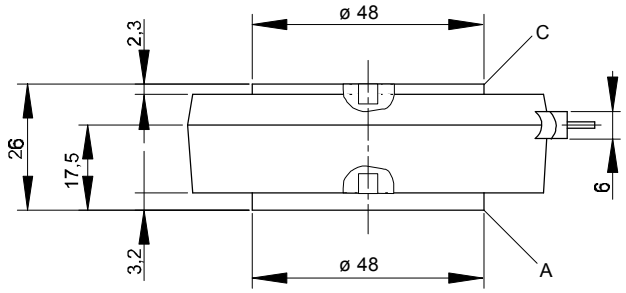
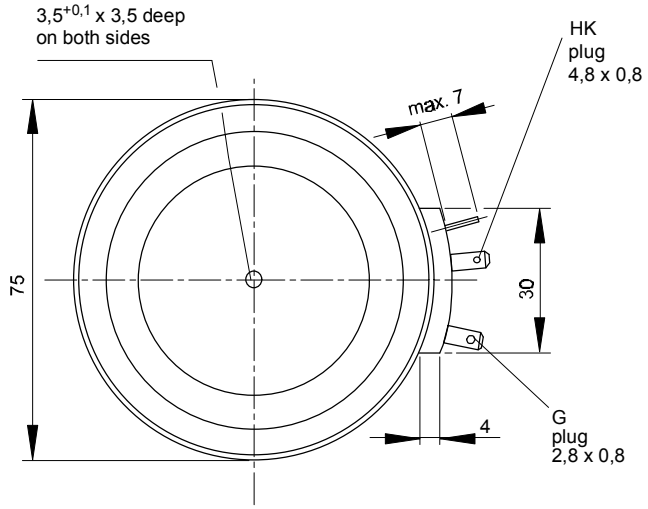
European Power-
Semiconductor and
Electronics Company

Marketing Information
T 709 N





VWK Aug. 1996

T 709 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°C...$t_{vj\,max}$	V_{DRM}, V_{RRM}	2000 2200 2400 2600	V
Vorwärts-Stoßspitzensperrspannung	non-repetitive peak forward off-state voltage	t_{vj} = -40°C...$t_{vj\,max}$	$V_{DSM} = V_{DRM}$	2000 2200 2400 2600	V
Rückwärts-Stoßspitzensperrspannung	non-repetitive peak reverse voltage	t_{vj} = +25°C...$t_{vj\,max}$	$V_{RSM} = V_{RRM}$	2100 2300 2500 2700	V
Durchlaßstrom-Grenzeffektivwert	RMS on-state current		I_{TRMSM}	1500	A
Dauergrenzstrom	average on-state current	t_c = 85°C	I_{TAVM}	700	A
		t_c = 61°C		960	A
Stoßstrom-Grenzwert	surge current	t_{vj} = 25°C, t_p = 10 ms	I_{TSM}	14500	A
		$t_{vj} = t_{vj\,max}$, t_p = 10 ms		13000	A
Grenzlastintegral	I^2t-value	t_{vj} = 25°C, t_p = 10 ms	I^2t	$1{,}05 \cdot 10^6$	A^2s
		$t_{vj} = t_{vj\,max}$, t_p = 10 ms		$0{,}845 \cdot 10^6$	A^2s
Kritische Stromsteilheit	critical rate of rise of on-state current	$v_D \leq$ 67%, v_{DRM}, f = 50 Hz	$(di_T/dt)_{cr}$	50	A/µs
		v_L = 10 V, i_{GM}= 1,5 A, di_G/dt = 1,5 A/µs			
Kritische Spannungssteilheit	critical rate of rise of off-state voltage	$t_{vj} = t_{vj\,max}$, v_D = 67% V_{DRM}	$(dv/dt)_{cr}$		
		5.Kennbuchstabe/5th letter C		500	V/µs
		5.Kennbuchstabe/5th letter F		1000	V/µs

Charakteristische Werte / Characteristic values

Durchlaßspannung	on-state voltage	$t_{vj} = t_{vj\,max}$, i_T = 3 kA	v_T	max. 2,84	V
Schleusenspannung	threshold voltage	$t_{vj} = t_{vj\,max}$	$V_{T(TO)}$	1,05	V
Ersatzwiderstand	slope resistance	$t_{vj} = t_{vj\,max}$	r_T	0,53	mΩ
Zündstrom	gate trigger current	t_{vj} = 25 °C, v_D = 6 V	I_{GT}	max. 300	mA
Zündspannung	gate trigger voltage	t_{vj} = 25 °C, v_D = 6 V	V_{GT}	max. 1,5	V
Nicht zündender Steuerstrom	gate non-trigger current	$t_{vj} = t_{vj\,max}$, v_D = 6 V	I_{GD}	max. 10	mA
Nicht zündende Steuerspannung	gate non-trigger voltage	$t_{vj} = t_{vj\,max}$, v_D = 0,5 V_{DRM}	V_{GD}	max. 0,3	V
Haltestrom	holding current	t_{vj} = 25 °C, v_D = 6 V, R_A = 5 Ω	I_H	max. 600	mA
Einraststrom	latching current	t_{vj} = 25 °C,v_D = 6 V, $R_{GK} \geq$ 10 Ω	I_L	max. 2	A
		i_{GM} = 1,5 A, di_G/dt = 1,5 A/µs, t_g = 20 µs			
Vorwärts- und Rückwärts-Sperrstrom	forward off-state and reverse currents	$t_{vj} = t_{vj\,max}$, $v_D = V_{DRM}$, $v_R = V_{RRM}$	i_D, i_R	max. 100	mA
Zündverzug	gate controlled delay time	t_{vj}=25°C, i_{GM} = 1,5 A, di_G/dt = 1,5 A/µs	t_{gd}	max. 5,5	µs
Freiwerdezeit	circuit commutated turn-off time	siehe Techn.Erl./see Techn. Inf.	t_q	typ. 300	µs

Thermische Eigenschaften / Thermal properties

Innerer Wärmewiderstand für beidseitige Kühlung	thermal resistance, junction to case for two-sided cooling	Θ =180° el, sin	R_{thJC}	max. 0,029	°C/W
		DC		max. 0,028	°C/W
für anodenseitige Kühlung	for anode-sided cooling	Θ =180° el, sin	$R_{thJC(A)}$	max. 0,043	°C/W
		DC		max. 0,042	°C/W
für kathodenseitige Kühlung	for cathode-sided cooling	Θ =180° el, sin	$R_{thJC(K)}$	max. 0,085	°C/W
		DC		max. 0,084	°C/W
Übergangs-Wärmewiderstand	thermal resistance, case to heatsink	beidseitig/two-sided	R_{thCK}	max. 0,004	°C/W
		einseitig/one-sided		max. 0,008	°C/W
Höchstzul.Sperrschichttemperatur	max. junction temperature		$t_{vj\,max}$	125	°C
Betriebstemperatur	operating temperature		$t_{c\,op}$	-40...+125	°C
Lagertemperatur	storage temperature		t_{stg}	-40...+150	°C

Mechanische Eigenschaften / Mechanical properties

Si-Elemente mit Druckkontakt	Si-pellet with pressure contact				
Anpreßkraft	clamping force		F	12...29	kN
Gewicht	weight		G	typ. 540	g
Kriechstrecke	creepage distance			32	mm
Feuchteklasse	humidity classification	DIN 40040			C
Schwingfestigkeit	vibration resistance	f = 50 Hz		50	m/s²
Maßbild, anliegend	outline, attached	DIN 41814-155B4			

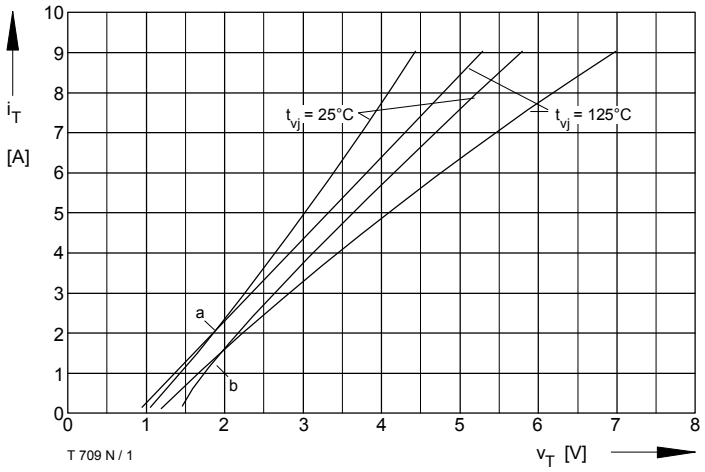


Bild / Fig. 1
Durchlaßkennlinien / On-state characteristics $i_T = f(v_T)$, $t_{vj} = t_{vj\ max}$
a -Typische Kennlinien / typical characteristics
b -Grenzkennlinien / limiting characteristics

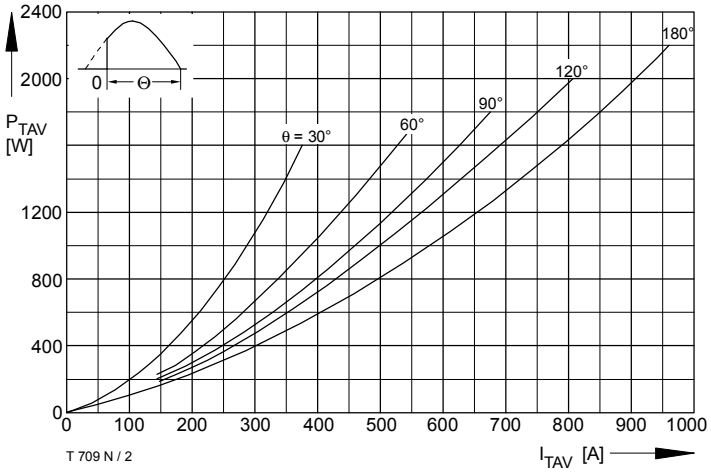


Bild / Fig. 2
Durchlaßverlustleistung / On-state power loss $P_{TAV} = f(I_{TAV})$
Parameter: Stromflußwinkel / Current conduction angle θ

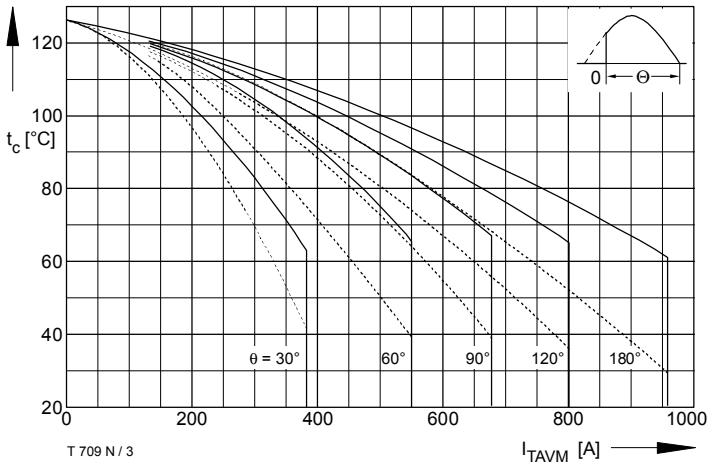


Bild / Fig. 3
Höchstzulässige Gehäusetemperatur / Max. allowable case temperature
$t_A = f(I_{TAVM})$
- - - - - - - - - Anodenseitige Kühlung / Anode-sided cooling
——————— Beidseitige Kühlung / Two-sided cooling
Parameter: Stromflußwinkel / Current conduction angle θ

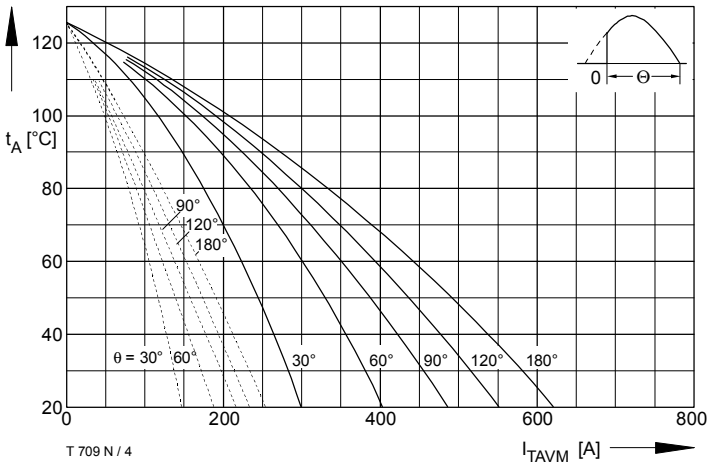


Bild / Fig. 4
Höchstzulässige Kühlmitteltemperatur / Max. allowable cooling medium temperature $t_A = f(I_{TAVM})$
Kühlkörper / Heatsink: K0.05F
- - - - - - - - - Luftsebstkühlung / Natural air-cooling
——————— Verstärkte Luftkühlung / Forced air-cooling, V_L = 120 l/s
Parameter: Stromflußwinkel / Current conduction angle θ

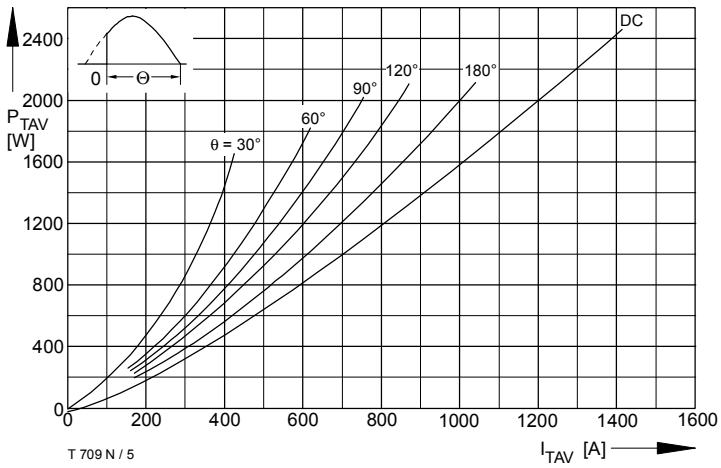


Bild / Fig. 5
Durchlaßverlustleistung / On-state power loss $P_{TAV} = f(I_{TAV})$
Parameter: Stromflußwinkel / Current conduction angle θ

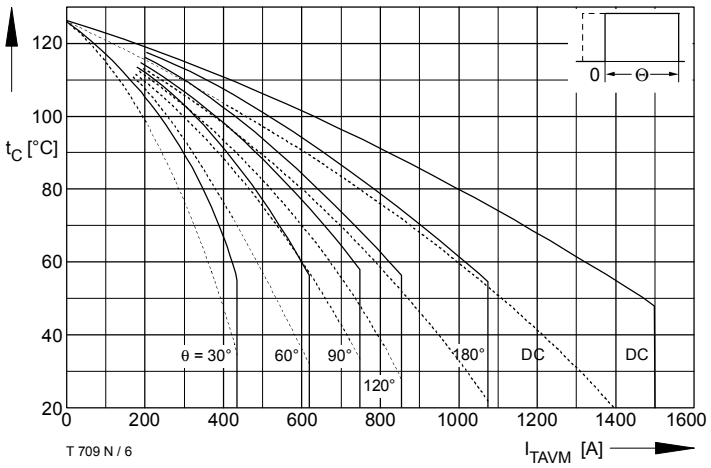


Bild / Fig. 6
Höchstzulässige Gehäusetemperatur / Max. allowable case temperature
$t_A = f(I_{TAVM})$
- - - - - - - - - Anodenseitige Kühlung / Anode-sided cooling
——————— Beidseitige Kühlung / Two-sided cooling
Parameter: Stromflußwinkel / Current conduction angle θ

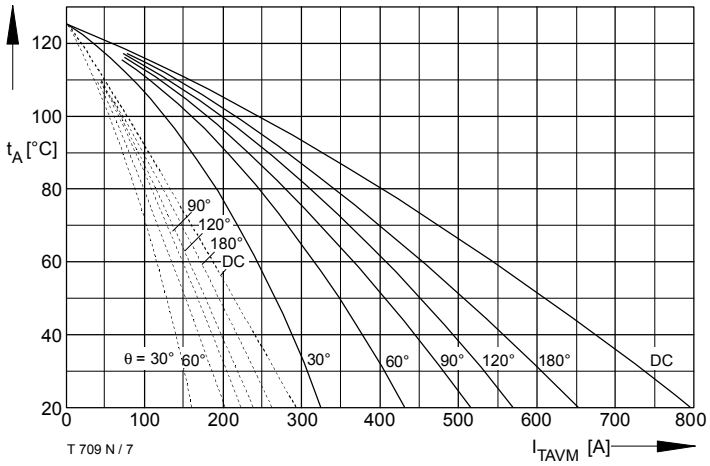


Bild / Fig. 7
Höchstzulässige Kühlmitteltemperatur / Max. allowable cooling medium temperature $t_A = f(I_{TAVM})$
Kühlkörper / Heatsink: K0.05F
- - - - - - - - - Luftsebstkühlung / Natural air-cooling
——— Verstärkte Luftkühlung / Forced air-cooling, V_L = 30 l/s
Parameter: Stromflußwinkel / Current conduction angle θ

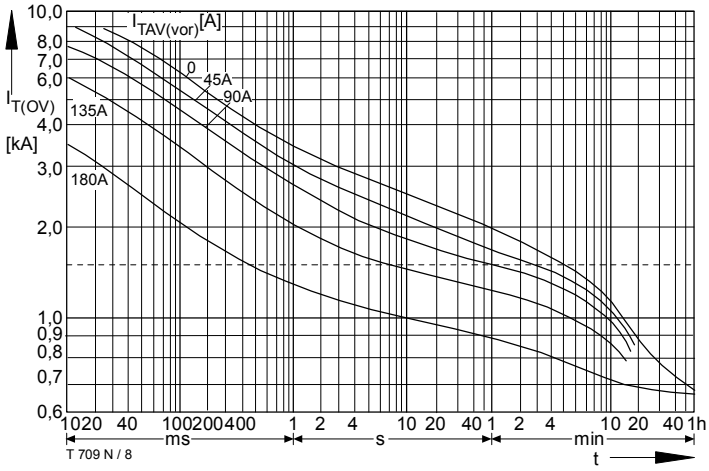


Bild / Fig. 8
Überstrom / Overload on-state current $I_{T(OV)} = f(t)$
Luftselbstkühlung / Natural air-cooling, t_A = 45°C
Kühlkörper / Heatsink: K0.55F
Parameter: Vorlaststrom / Pre-load current $I_{TAV(vor)}$

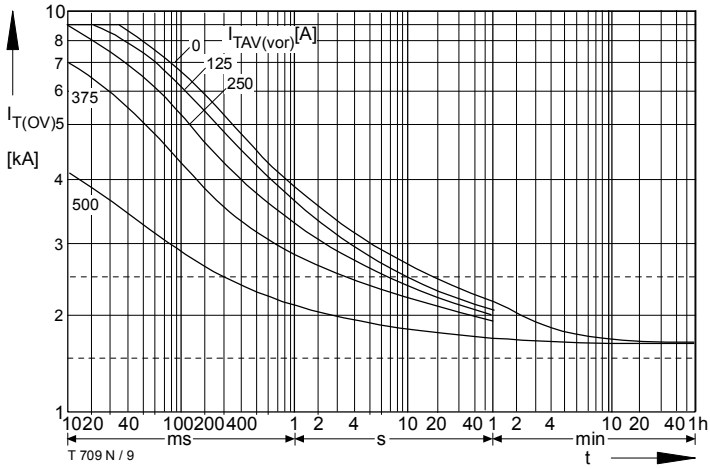


Bild / Fig. 9
Überstrom / Overload on-state current $I_{T(OV)} = f(t)$
Verstärkte Luftkühlung / Forced air-cooling, t_A= 35 °C
Kühlkörper / Heatsink: K0.55F, V_L = 120 l/s
Parameter: Vorlaststrom / Pre-load current $I_{TAV(vor)}$

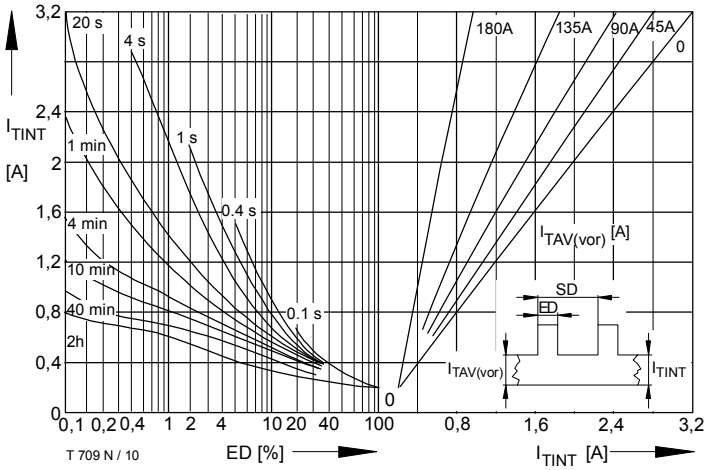


Bild / Fig. 10
Höchstzulässiger Durchlaßstrom bei Aussetzbetrieb / Max. allowable on-state current at intermittent operation $I_{TINT} = f(ED)$
Luftselbstkühlung / Natural air-cooling, t_A = 45°C
Kühlkörper / Heatsink: K0.55F
Parameter: Spieldauer / Cycle duration SD
Vorlaststrom / Pre-load current $I_{TAV(vor)}$

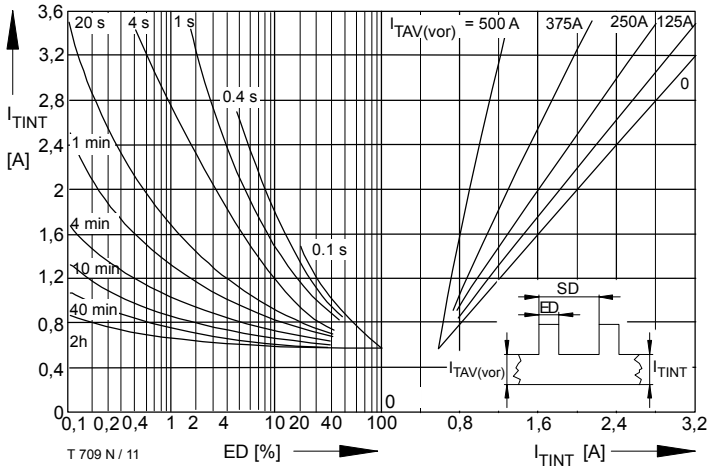


Bild / Fig. 11
Höchstzulässiger Durchlaßstrom bei Aussetzbetrieb / Max. allowable on-state current at intermittent operation $I_{TINT} = f(ED)$
Luftselbstkühlung / Natural air-cooling, t_A = 35°C
Kühlkörper / Heatsink: K0.55F, V_L = 120 l/s
Parameter: Spieldauer / Cycle duration SD
Vorlaststrom / Pre-load current $I_{TAV(vor)}$

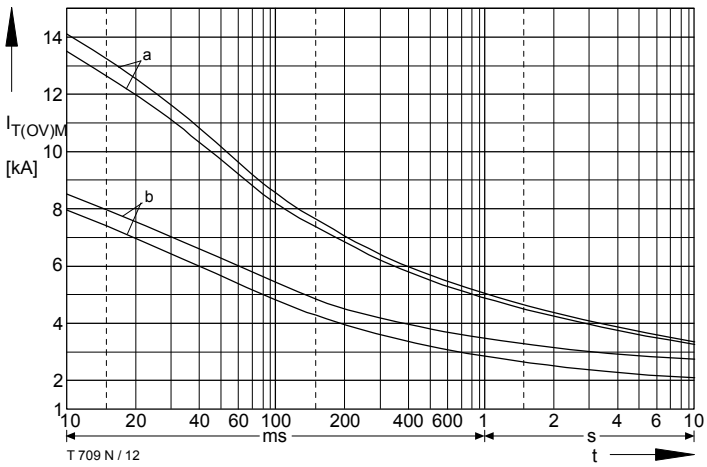


Bild / Fig. 12
Grenzstrom / Max. overload on-state current $I_{T(OV)M} = f(t)$, v_{RM} = 0,8 V_{RRM}
Beidseitige Kühlung / Two-sided cooling
Kühlkörper / Heatsink: K0.05F
Belastung aus / Surge current occurs:
a - Leerlauf / No-load conditions
b - Betrieb mit Dauergrenzstrom / During operation at max. average on-state current I_{TAVM}

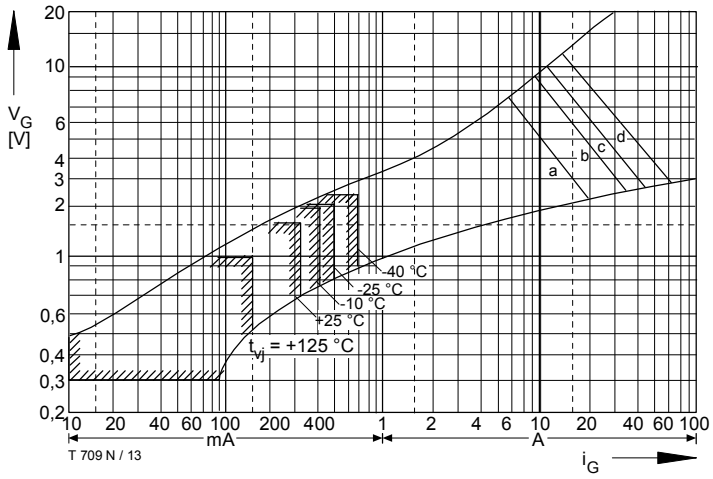


Bild / Fig. 13
Steuercharakteristik mit Zündbereichen / Gate characteristic with trigging areas $v_G = f(i_G)$, V_D = 6 V

Parameter:		a	b	c	d
Steuerimpulsdauer / trigger puls duration t_g	[ms]	10	1	0,5	0,1
Höchstzulässige Spitzensteuerverlustleistung / Max. rated peak gate power dissipation	[W]	40	80	100	150

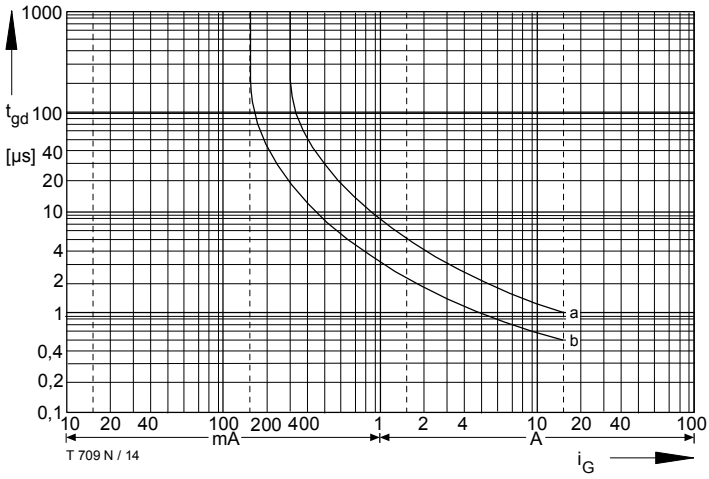


Bild / Fig. 14
Zündverzug / Gate controlled delay time $t_{gd} = f(i_G)$
t_{vj} = 25 °C, $di_G/dt = i_{GM}/1µs$
a - Maximaler Verlauf / Limiting characteristic
b - Typischer Verlauf / Typical characteristic

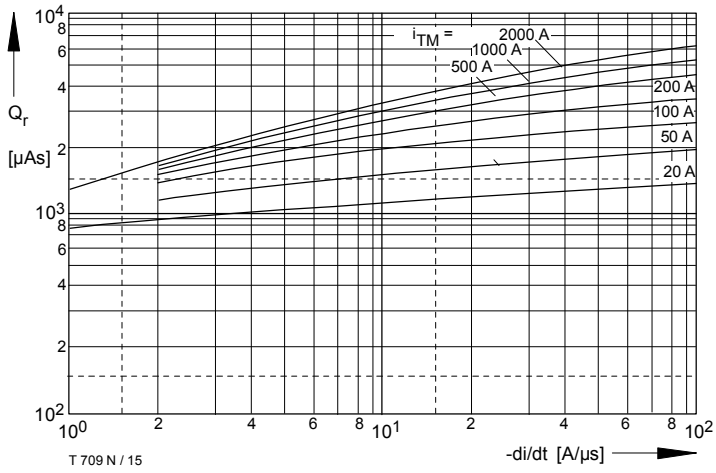


Bild / Fig. 15
Sperrverzögerungsladung / Recovered charge $Q_r = f(di/dt)$
$t_{vj} = t_{vj\ max}$, v_R = 0,5 V_{RRM}, v_{RM} = 0,8 V_{RRM}
Parameter: Durchlaßstrom / On-state current i_{TM}

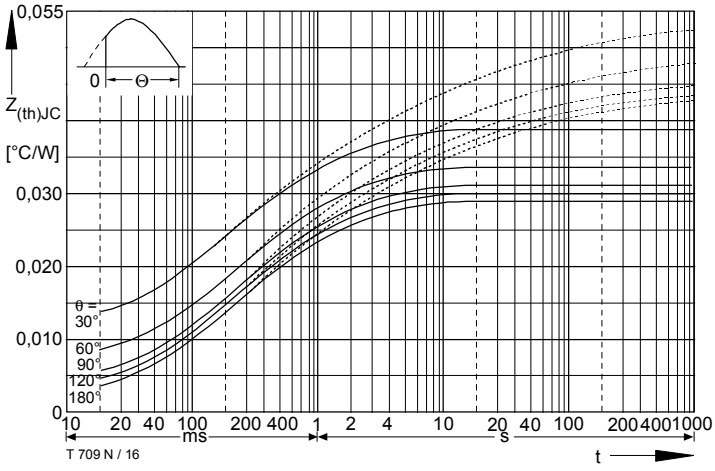


Bild / Fig. 16
Transienter innerer Wärmewiderstand / Transient thermal impedance
$Z_{thJC} = f(t)$
- - - - - - - - Anodenseitige Kühlung / Anode-sided cooling
———— Beidseitige Kühlung / Two-sided cooling
Parameter: Stromflußwinkel / current conduction angle θ

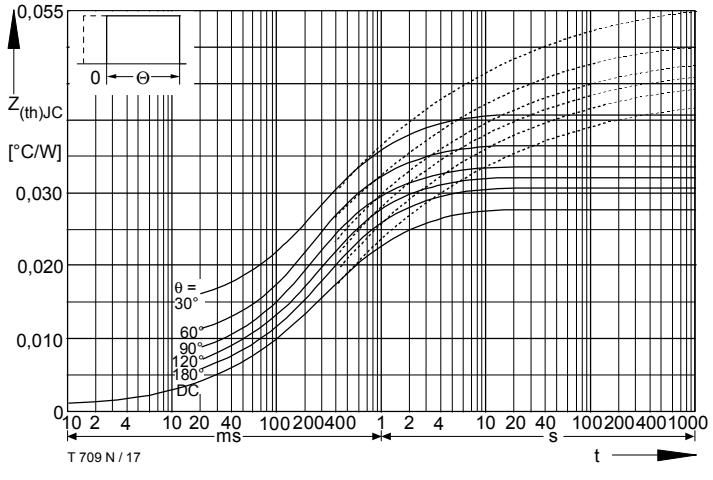


Bild / Fig. 17
Transienter innerer Wärmewiderstand / Transient thermal impedance
$Z_{thJC} = f(t)$
- - - - - - - - Anodenseitige Kühlung / Anode-sided cooling
———— Beidseitige Kühlung / Two-sided cooling
Parameter: Stromflußwinkel / current conduction angle θ

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	6
R_{thn}[°C/W]	0,0016	0,0026	0,0146	0,0079	0,0013	
τ_n [s]	0,00141	0,0343	0,255	1,15	17,9	

Anodenseitig / Anode-sided

Pos. n	1	2	3	4	5	6
R_{thn}[°C/W]	0,00159	0,00326	0,0126	0,0119	0,00665	0,006
τ_n [s]	0,00141	0,0408	0,253	1,44	12,2	144

Kathodenseitig / Cathode-sided

Pos. n	1	2	3	4	5	6
R_{thn}[°C/W]	0,0019	0,0066	0,0158	0,0224	0,0253	0,012
τ_n [s]	0,0017	0,0784	0,635	3,69	21,6	144

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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