

## Elektrische Eigenschaften

## Electrical properties

## Höchstzulässige Werte

## Maximum rated values

Periodische Vorwärts- und Rückwärts-Sperrspannung	repetitive peak forward off-state and reverse voltages	$t_{vj} = -40^{\circ}\text{C} \dots t_{vj\text{max}}$	$V_{\text{DRM}}, V_{\text{RRM}}$	800, 900 V
Vorwärts-Stoßsperrspannung	non repetitive peak forward off-state voltage	$t_{vj} = -40^{\circ}\text{C} \dots t_{vj\text{max}}$	$V_{\text{DSM}} = V_{\text{DRM}}$	
Rückwärts-Stoßsperrspannung	non repetitive peak reverse voltage	$t_{vj} = +25^{\circ}\text{C} \dots t_{vj\text{max}}$	$V_{\text{RSM}} = V_{\text{RRM}}$	+100 V
Durchlaßstrom-Grenzeffektivwert	RMS on-state current	$t_{\text{C}} = 85^{\circ}\text{C}$	$I_{\text{TRMSM}}$	1200 A
Dauergrenzstrom	average on-state current	$t_{\text{C}} = 52^{\circ}\text{C}$	$I_{\text{TAVM}}$	500 A
Stoßstrom-Grenzwert	surge current	$t_{vj} = 25^{\circ}\text{C}, t_p = 10 \text{ ms}$	$I_{\text{TSM}}$	7,62 kA
Grenzlastintegral	I <sup>2</sup> t-value	$t_{vj} = t_{vj\text{max}}, t_p = 10 \text{ ms}$		7 kA
Kritische Stromsteilheit	critical rate of rise of on-state current	$t_{vj} = 25^{\circ}\text{C}, t_p = 10 \text{ ms}$	I <sup>2</sup> t	290 kA <sup>2</sup> s
Kritische Spannungssteilheit	critical rate of rise of Off-state voltage	$t_{vj} = t_{vj\text{max}}, t_p = 10 \text{ ms}$	(di/dt) <sub>cr</sub>	245 kA <sup>2</sup> s
		$V_D \leq 67\% V_{\text{DRM}}, f = 50 \text{ Hz}$		400 A/μs
		$i_{\text{GM}} = 1,5 \text{ A}, di_G/dt = 2 \text{ A}/\mu\text{s}$	(dv/dt) <sub>cr</sub> L:	1) 500 2) 50 V/μs
		$t_{vj} = t_{vj\text{max}}, V_D = 67\% V_{\text{DRM}}$		

## Charakteristische Werte

## Characteristic values

Durchlaßspannung	on-state voltage	$t_{vj} = t_{vj\text{max}}, i_T = 2300 \text{ A}$	$V_T$	max.	2,85 V
Schleusenspannung	threshold voltage	$t_{vj} = t_{vj\text{max}}$	$V_{T(\text{TO})}$		1,5 V
Ersatzwiderstand	slope resistance	$t_{vj} = t_{vj\text{max}}$	$r_T$		0,52 mΩ
Zündstrom	gate trigger current	$t_{vj} = 25^{\circ}\text{C}, V_D = 6 \text{ V}$	$I_{\text{GT}}$	max.	300 mA
Zündspannung	gate trigger voltage	$t_{vj} = 25^{\circ}\text{C}, V_D = 6 \text{ V}$	$V_{\text{GT}}$	max.	2,5 V
Nicht zündender Steuerstrom	gate non-trigger current	$t_{vj} = t_{vj\text{max}}, V_D = 6 \text{ V}$	$I_{\text{GD}}$	max.	40 mA
Nicht zündende Steuerspannung	gate non-trigger voltage	$t_{vj} = t_{vj\text{max}}, V_D = 0,95 V_{\text{DRM}}$	$V_{\text{GD}}$	max.	0,3 V
Haltestrom	holding current	$t_{vj} = 25^{\circ}\text{C}, V_D = 6 \text{ V}, R_A = 5 \Omega$	$I_H$	max.	250 mA
Einraststrom	latching current	$t_{vj} = 25^{\circ}\text{C}, V_D = 6 \text{ V}, R_{\text{GK}} \geq 10 \Omega$	$I_L$	max.	2 A
Vorwärts- u. Rückwärts-Sperrstrom	forward off-state and reverse currents	$i_{\text{GM}} = 1 \text{ A}, di_G/dt = 1 \text{ A}/\mu\text{s}, t_{\text{g}} = 20 \text{ ps}$	$i_D, i_R$	max.	100 mA
Zündverzögerung	gate controlled delay time	$t_{vj} = t_{vj\text{max}}, V_D = V_{\text{DRM}}, V_R = V_{\text{RRM}}$	$t_{\text{gd}}$	max.	1,5 μs
Freiwerdezeit	circuit commutated turn-Off time	$t_{vj} = 25^{\circ}\text{C}, i_{\text{GM}} = 1 \text{ A}, di_G/dt = 1 \text{ A}/\mu\text{s}$	$t_q$ 13):	max.	10 μs
		siehe Techn. Erl./see Techn. Inf.	23):	max.	12 μs

## Thermische Eigenschaften

## Thermal properties

Innerer Wärmewiderstand für beidseitige Kühlung	thermal resistance, junction to case for two-sided cooling	$\Theta = 180^{\circ} \text{ el, sin DC}$	$R_{\text{thJC}}$	max.	0,0384 °C/W
für anodenseitige Kühlung	for anode-sided cooling	$\Theta = 180^{\circ} \text{ el, sin DC}$	$R_{\text{thJC(A)}}$	max.	0,0350 °C/W
für kathodenseitige Kühlung	for cathode-sided cooling	$\Theta = 180^{\circ} \text{ el, sin DC}$	$R_{\text{thJC(K)}}$	max.	0,0694 °C/W
Übergangswärmewiderstand	thermal resistance, case to heatsink	beidseitig/two-sided einseitig/one-sided	$R_{\text{thCK}}$	max.	0,0779 °C/W
Höchstzul. Sperrschichttemperatur	max. junction temperature		$R_{\text{thCK}}$	max.	0,0745 °C/W
Betriebstemperatur	Operating temperature		$t_{vj\text{max}}$		125 °C
Lagertemperatur	Storage temperature		$t_{\text{C op}}$		-40... + 125 °C
			$t_{\text{stg}}$		-40... + 150 °C

## Mechanische Eigenschaften

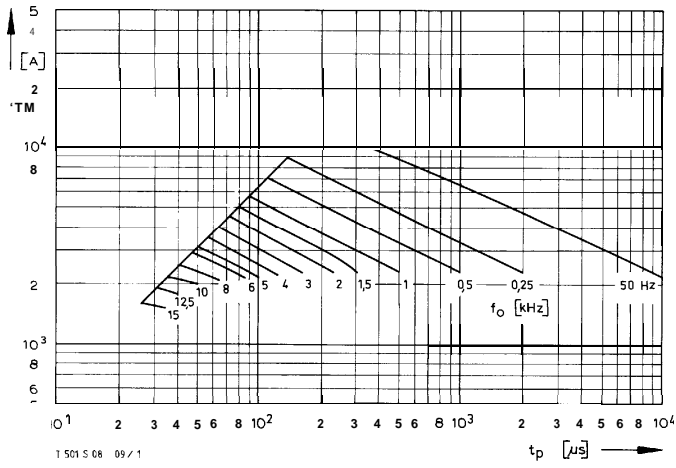
## Mechanical properties

Si-Element mit Druckkontakt	Si-pellet with pressure contact		F		9... 13 kN
Anpreßkraft	Clamping force		G	typ.	150g
Gewicht	weight				14 mm
Kriechstrecke	Creepage distance				C
Feuchteklasse	humidity classification	DIN 40040			50 m/s <sup>2</sup>
Schwingfestigkeit	Vibration resistance	f = 50 Hz			Seite/page 155
Maßbild	outline	DIN 41814-151A4			

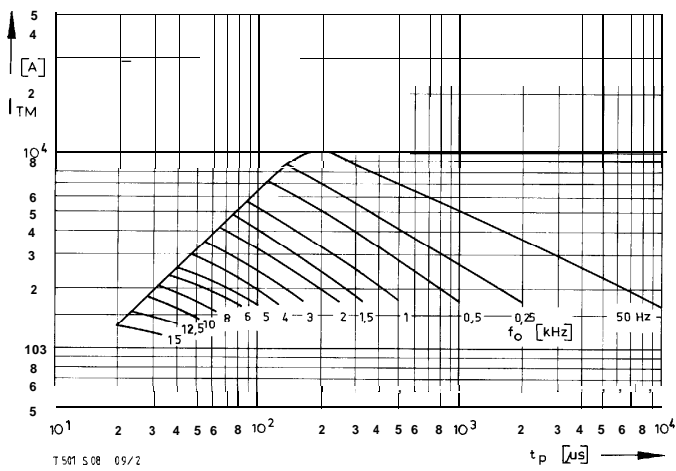
1) Werte nach DIN IEC 747-6 (ohne vorausgehende Kommutierung)/Values to DIN IEC 747-6 (without Prior commutation)

2) Unmittelbar nach der Freiwerdezeit, vgl. Meßbedingungen für  $t_q$ /Immediately after circuit commutated turn-Off time, see Parameters  $t_q$

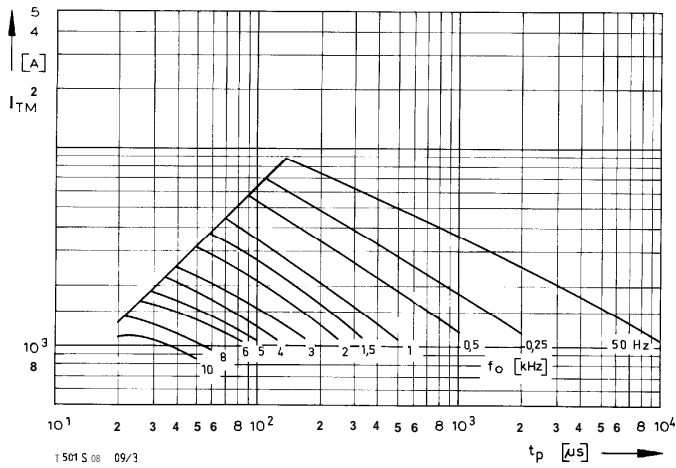
3)  $-di_T/dt = 100 \text{ A}/\mu\text{s}; dv_D/dt = 50 \text{ V}/\mu\text{s}$



Bild/Fig. 1  $t_c = 60^\circ\text{C}$



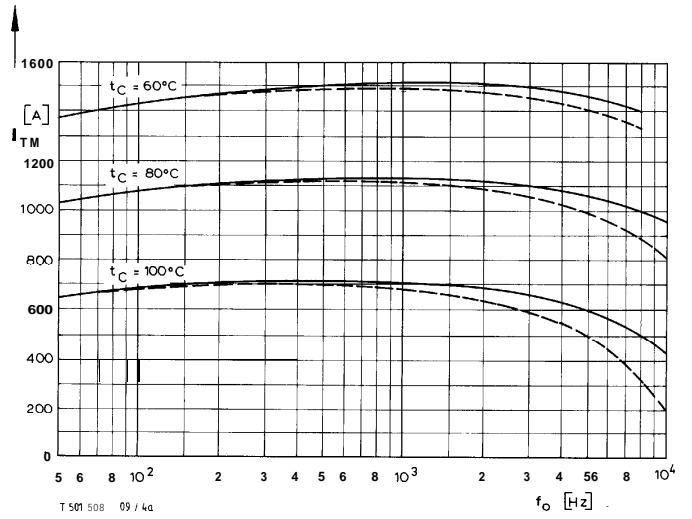
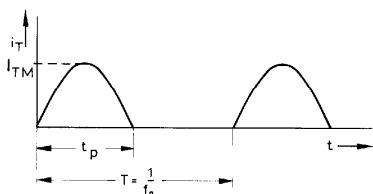
Bild/Fig. 2  $t_c = 80^\circ\text{C}$



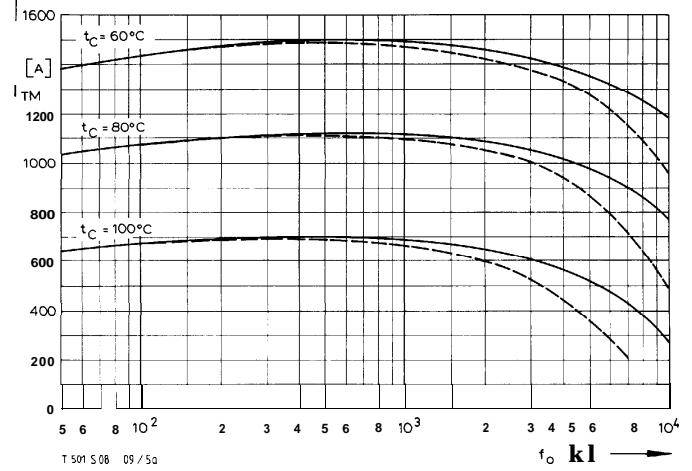
Bild/Fig. 3  $t_c = 100^\circ\text{C}$

Bild/Fig. 1, 2, 3  
Steuergenerator/pulse generator:  
 $i_G = 1,5 \text{ A}$ ,  $di_G/dt = 2 \text{ A}/\mu\text{s}$

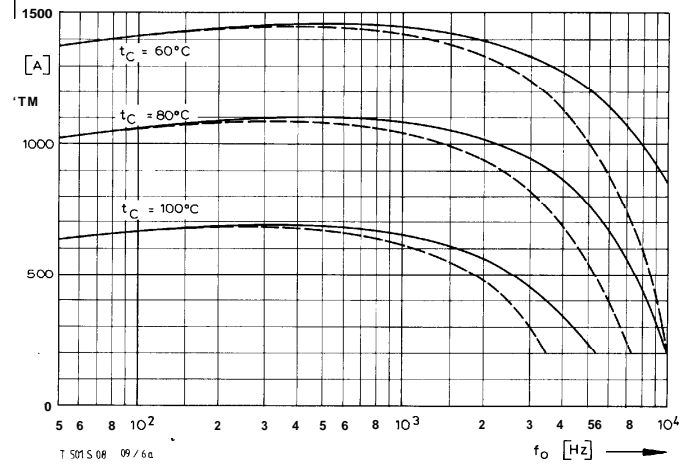
RC-Glied/RC-network:  
 $R \geq 8,2 \Omega$   
 $C \leq 0,22 \mu\text{F}$   
 $V_{DM} \leq 0,85 V_{DRM}$



Bild/Fig. 4a  $-di_T/dt = 50 \text{ A}/\mu\text{s}$ , RC-Glied/RC-network  $R \geq 12 \Omega$ ,  $C \leq 0,22 \mu\text{F}$



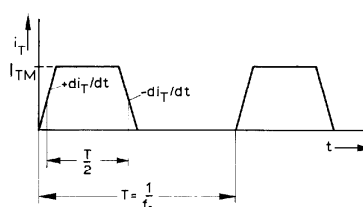
Bild/Fig. 5a  $-di_T/dt = 100 \text{ A}/\mu\text{s}$ , RC-Glied/RC-network  $R \geq 7,5 \Omega$ ,  $C \leq 0,22 \mu\text{F}$

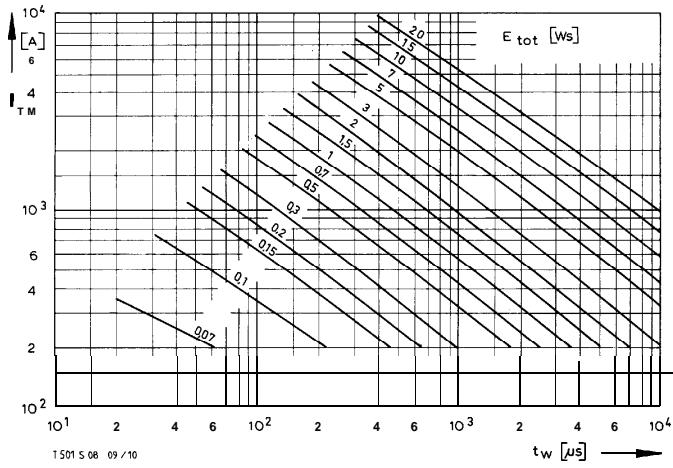


Bild/Fig. 6a  $-di_T/dt = 200 \text{ A}/\mu\text{s}$ , RC-Glied/RC-network  $R \geq 8,2 \Omega$ ,  $C \leq 0,22 \mu\text{F}$

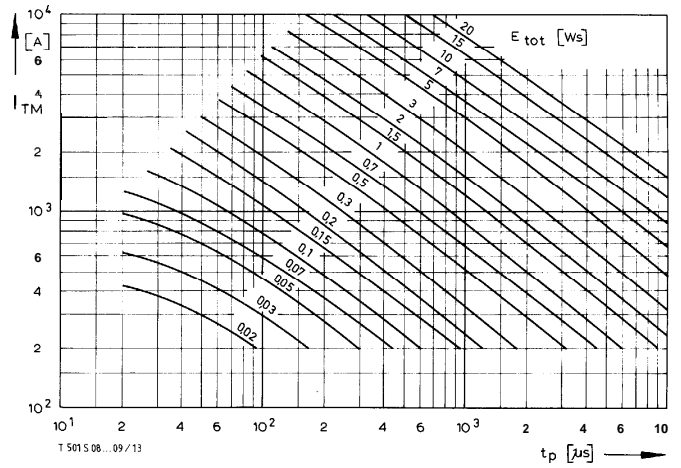
Bild/Fig. 4a, 5a, 6a  
Steuergenerator/pulse generator:  
 $i_G = 1,5 \text{ A}$ ,  $di_G/dt = 2 \text{ A}/\mu\text{s}$

$V_{DM} \leq 0,85 V_{RM}$   
 $dv_T/dt \leq 600 \text{ V}/\mu\text{s}$   
 $V_{RM} \leq 0,85 V_{RRM}$

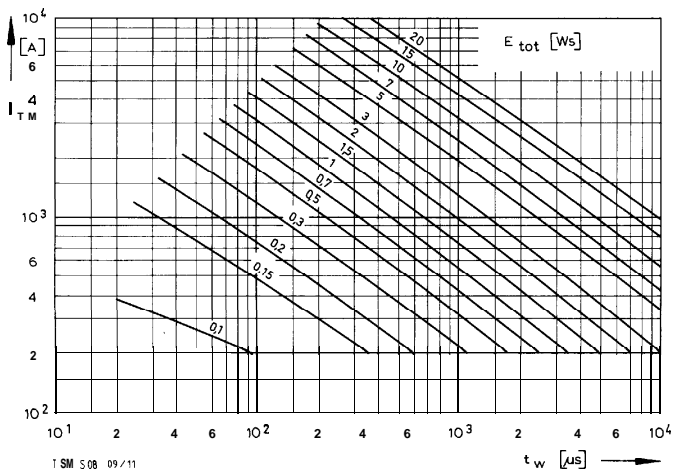




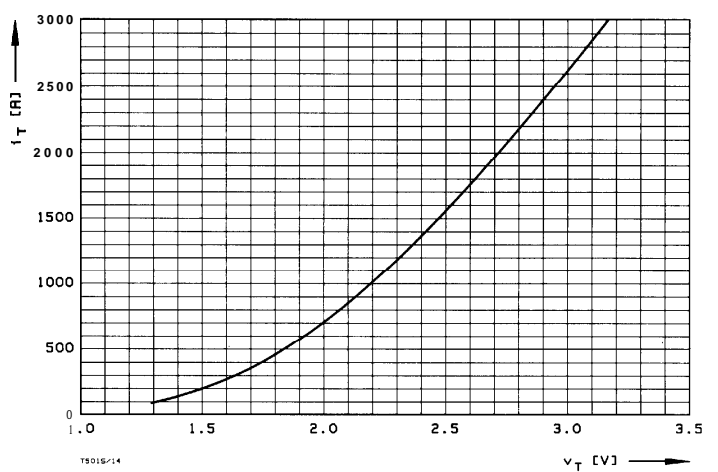
Bild/fig. 10  $-di_T/dt = 50 \text{ A}/\mu\text{s}$ , RC-Glied/RC-network  $R \geq 12 \Omega$ ,  $C \leq 0,22 \mu\text{F}$



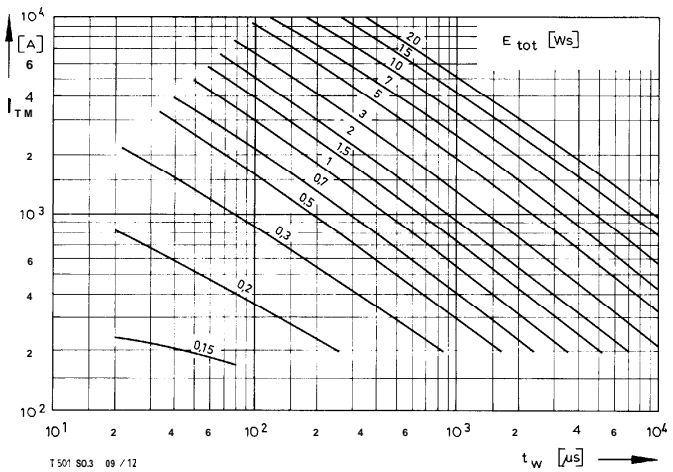
Bild/fig. 13



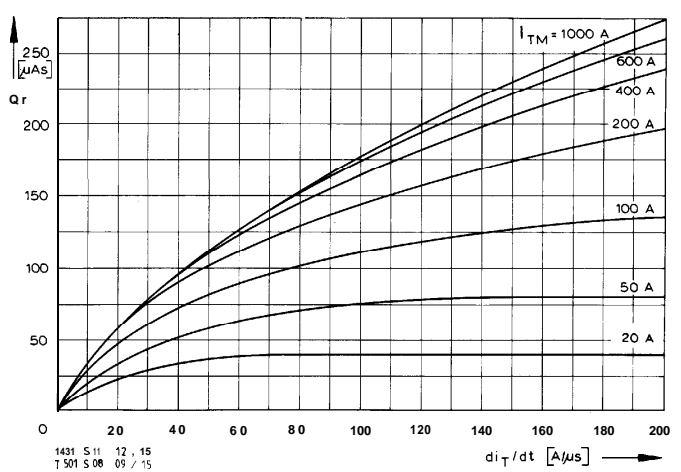
Bild/fig. 11  $-di_T/dt = 100 \text{ A}/\mu\text{s}$ , RC-Glied/RC-network  $R \geq 7,5 \Omega$ ,  $C \leq 0,22 \mu\text{F}$



Bild/fig. 14



Bild/fig. 12  $-di_T/dt = 200 \text{ A}/\mu\text{s}$ , RC-Glied/RC-network  $R \geq 8,2 \Omega$ ,  $C \leq 0,22 \mu\text{F}$



Bild/fig. 15

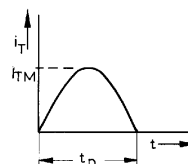
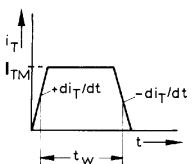
Bild/fig. 10, 11, 12  
Steuergenerator/pulse generator:  
 $I_G = 1,5 \text{ A}$ ,  $di_G/dt = 2 \text{ A}/\mu\text{s}$

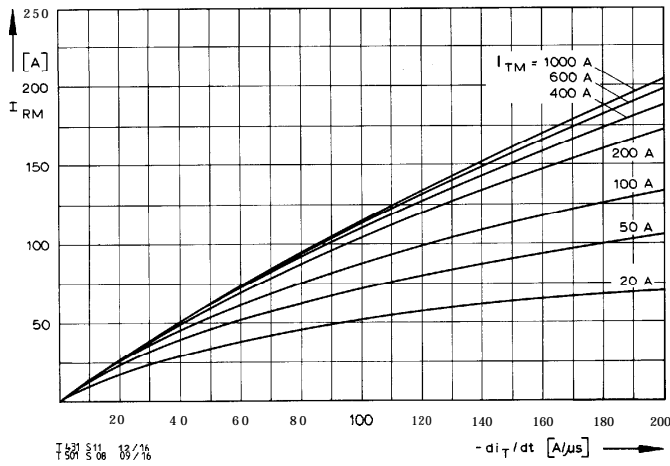
$v_{DM} \leq 0,85 V_{DRM}$   
 $dv_R/dt \leq 600 \text{ V}/\mu\text{s}$   
 $v_{RM} \leq 0,85 V_{RRM}$

zu Bild/fig. 13  
Steuergenerator/puls generator:  
 $I_G = 1,5 \text{ A}$ ,  $di_G/dt = 2 \text{ A}/\mu\text{s}$

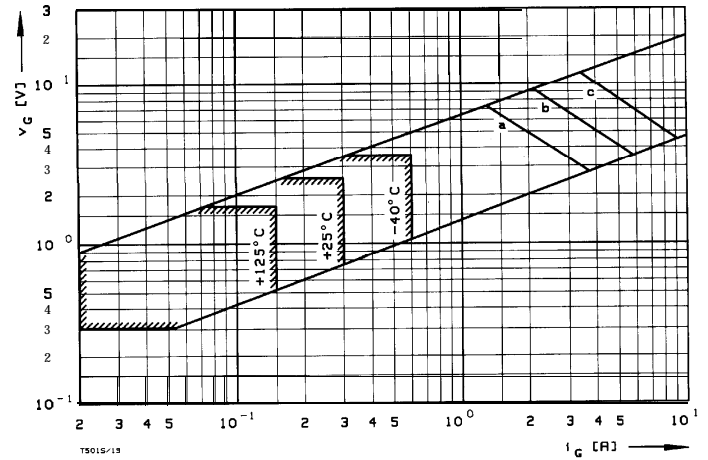
$v_{DM} \leq 0,85 V_{DRM}$   
 $dv_R/dt \leq 100 \text{ V}/\mu\text{s}$   
 $v_{RM} \leq 50 \text{ V}$

RC-Glied/RC-network:  
 $R \geq 8,2 \Omega$   
 $C \leq 0,22 \mu\text{F}$



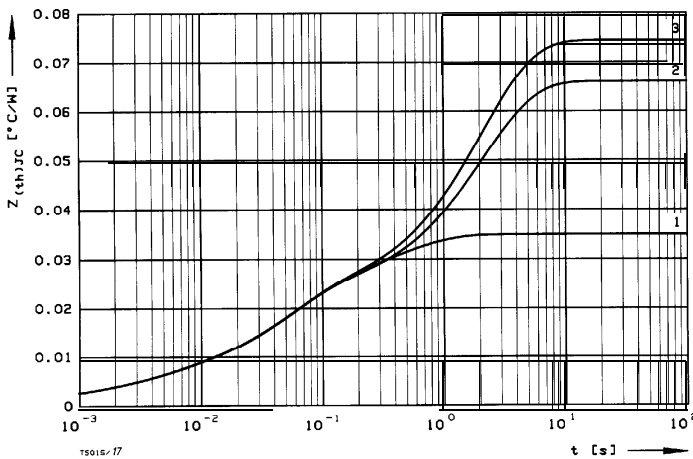


**Bild/Fig. 16**  
 Rückstromspitze  $I_{RM} = f(-di/dt)$ ,  $t_{vj} = t_{v(max)}$ ,  $V_R = 0,5 V_{RRM}$ ,  $V_{RM} = 0,8 V_{RRM}$   
 Peak reverse recovery current  $I_{RM} = f(-di/dt)$ ,  $t = t_{vj(max)}$ ,  $V_R = 0.5 V_{RRM}$ ,  $V_{RM} = 0.8 V_{RRM}$   
 Parameter: Durchlaßstrom/On-state current  $I_{TM}$

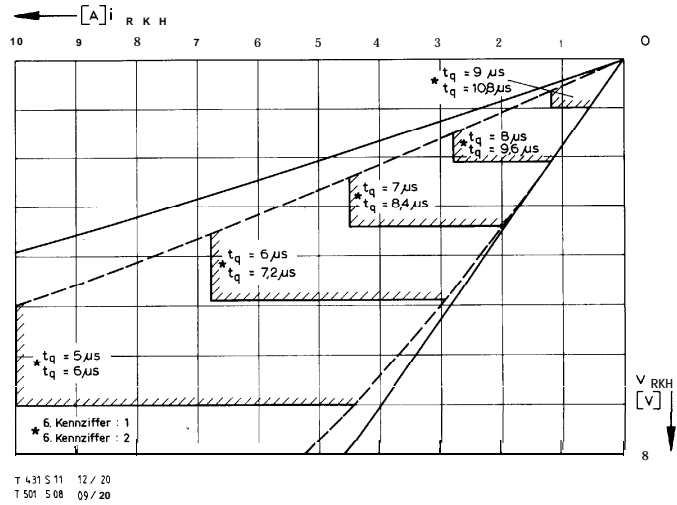


**BildFig. 19**  
 Steuercharakteristik mit Zündbereichen/Gate characteristic with triggering areas  
 $v_o=f(i_e)$ ,  $V_o=6V$

Parameter:	a	b	c
Steuerimpulsdauer/Trigger pulse duration $t_g$ [ms]	10	1	0,5
Höchstzulässige Spitzensteuerverlustleistung/Max. rated peak gate power dissipation $P_{GM}$ [W]	10	20	40



**Bild/Fig. 17**  
 Transienter innerer Wärmewiderstand  $Z_{thJC} = f(t)$ , DC  
 Transient thermal impedance  $Z_{thJC} = f(t)$ , DC  
 1 Beidseitige Kühlung/two-sided cooling  
 2 Anodenseitige Kühlung/anode side cooling  
 3 Kathodenseitige Kühlung/cathode side cooling



**Bild/Fig.20**  
 Steuercharakteristik  $i_{RKH}=f(v_{RKH})$  zwischen Anschlüssen HK u. K in Rückwärtsrichtung  
 Gate characteristic  $i_{RKH} = f(v_{RKH})$  between terminals HK and K in reverse direction  
 $I_{RKH RMS} = 5$  A,  $P_{RKH AV} = 20$  W,  $t_{RKH} = 14 \mu\text{s}$   
 Parameter: Freierzeit/circuit commutated turn-off time  $t_q$   
 —  $t_{vj} = t_{vj max}$   
 - - -  $t_{vj} = 25^\circ\text{C}$

Analytische Elemente des transienten Wärmewiderstandes  $Z_{thJC}$  für DC  
 Analytical elements of transient thermal impedance  $Z_{thJC}$  for DC

Kühlung	Pos. n	1	2	3	4	5	6	7
beidseitig	$R_{thn}$ [°C/W]	0,0017	0,0043	0,0128	0,006	0,0102		
two-sided	$\tau_n$ [s]	0,00057	0,0043	0,044	0,105	0,457		
anodenseitig	$R_{thn}$ [°C/W]	0,0017	0,0043	0,0128	0,005	0,0422		
anode-sided	$\tau_n$ [s]	0,00057	0,0043	0,044	0,074	2,15		
kathodenseitig	$R_{thn}$ [°C/W]	0,0017	0,0043	0,0128	0,0047	0,0510		
cathode-sided	$\tau_n$ [s]	0,00057	0,0043	0,044	0,077	2,115		

Analytische Funktion/analytical function:

$$Z_{thJC} = \sum_{n=1}^{n_{max}} R_{thn} (1 - \text{EXP}(-t/\tau_n))$$