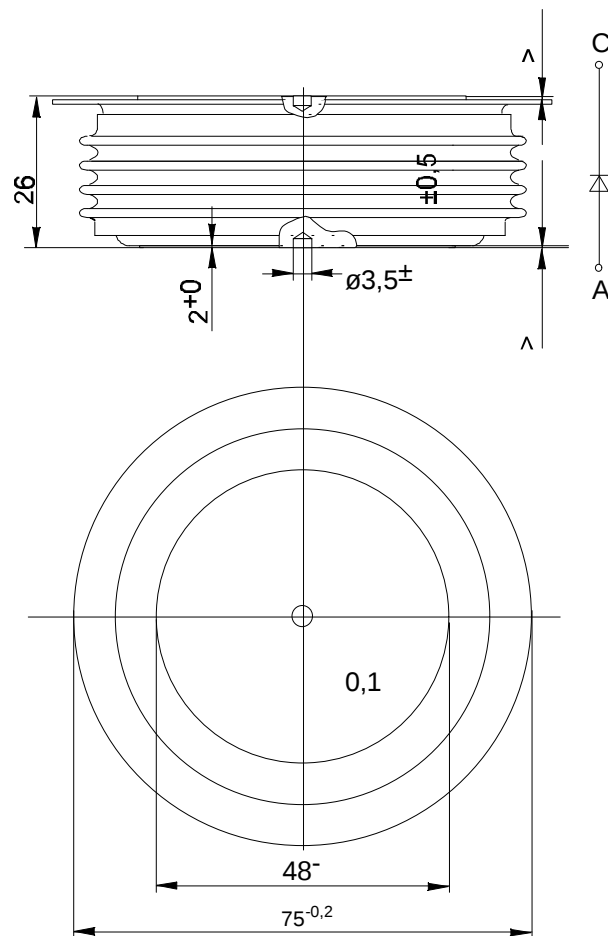


European Power-Semiconductor and Electronics Company

Marketing Information

D 721 S



Applikation: Freilaufdiode in Spannungszwischenkreisumrichter
bis $V_D(\text{DC}) = 2000 \text{ V}$

VWK January

Elektrische Eigenschaften / Electrical properties

Höchstzulässige Werte / Maximum rated values

Periodische Spitzensperrspannung repetitive peak reverse voltage	$t_{vj} = -40^{\circ}\text{C} \dots 125^{\circ}\text{C}$	V_{RRM}	3500 V, 4000 V 4500 V
Stoßspitzensperrspannung non-repetitive peak reverse voltage	$t_{vj} = +25^{\circ}\text{C} \dots 125^{\circ}\text{C}$	V_{RSM}	3600 V, 4100 V 4600 V
Durchlaßstrom-Grenzeffektivwert / RMS forward current		I_{FRMSM}	1700 A
Dauergrenzstrom / mean forward current	$t_C = 85^{\circ}\text{C}$	I_{FAVM}	720 A
	$t_C = 52^{\circ}\text{C}$		1080 A
Stoßstrom-Grenzwert ¹⁾ surge forward current ¹⁾	$t_{vj} = 25^{\circ}\text{C}$	I_{FSM}	16000 A
	$t_{vj} = 125^{\circ}\text{C}$		15000 A
Grenzlastintegral	$t_{vj} = 25^{\circ}\text{C}$	I^2t	$1,3 \times 10^6 \text{ A}^2\text{s}$
I^2t -value	$t_{vj} = 125^{\circ}\text{C}$		$1,13 \times 10^6 \text{ A}^2\text{s}$
Kritische periodische Ausschaltstromsteilheit critical repetitive rate of fall of on - state	$t_{vj} = 125^{\circ}\text{C}$, $I_M = 2000 \text{ A}$, $V_R = 3000 \text{ V}$ $C = 0,25 \text{ }\mu\text{F}$, $R = 6\Omega$	$(-di/dt)_{com}$	500 A/ μs

Charakteristische Werte / Characteristic values

Gleichsperrspannung / cont. direct reverse voltage	$t_C = -40^{\circ}\text{C} \dots +85^{\circ}\text{C}$	$V_{R(D)}$	typ. 2000 V
Durchlaßspannung / forward voltage	$t_{vj} = 125^{\circ}\text{C}$, $I_M = 2500 \text{ A}$	V_F	3,5 V
Schleusenspannung / threshold voltage	$t_{vj} = 125^{\circ}\text{C}$	$V_{(TO)}$	1,7 V
Ersatzwiderstand / forward slope resistance	$t_{vj} = 125^{\circ}\text{C}$	r_T	0,69 m Ω
Sperrstrom / reverse current	$t_{vj} = 125^{\circ}\text{C}$, $V_R = 0,67 V_{RRM}$	i_R	ca. 75 mA
	$t_{vj} = 125^{\circ}\text{C}$, $V_R = V_{RRM}$		140 mA ¹⁾
Rückstromspitze / peak reverse recovery current	$i_{FM} = 1000 \text{ A}$, $-di/dt = 250 \text{ A}/\mu\text{s}$	I_{RM}	600 A
	$t_{vj} = 125^{\circ}\text{C}$; $V_R = 1000 \text{ V}$;		
	$C = 0,25 \text{ }\mu\text{F}$; $R = 6\Omega$		
Sperrverzögerungsladung recovered charge	$i_{FM} = 1000 \text{ A}$, $-di/dt = 250 \text{ A}/\mu\text{s}$	Q_{rr}	1700 μAs
	$t_{vj} = 125^{\circ}\text{C}$; $V_R = 1000 \text{ V}$;		
	$C = 0,25 \text{ }\mu\text{F}$; $R = 6\Omega$		

Thermische Eigenschaften / Thermal properties

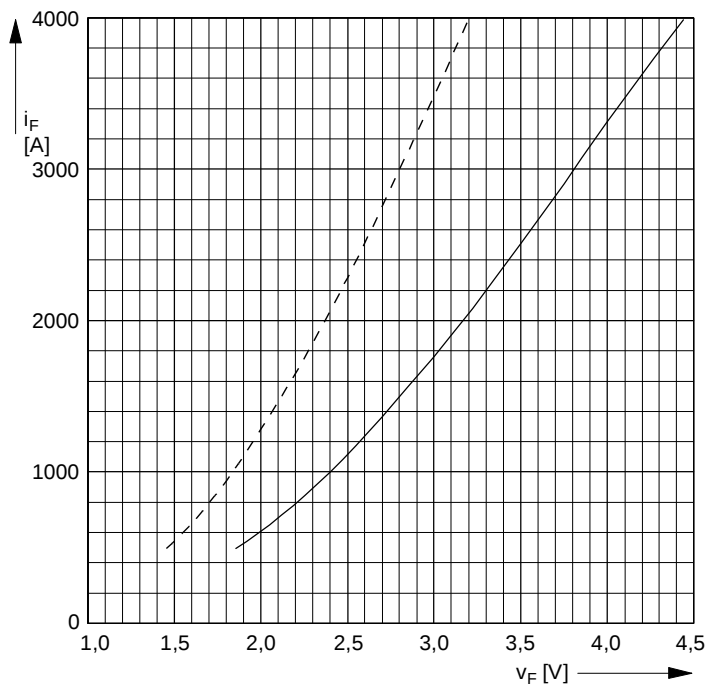
Innerer Wärmewiderstand thermal resistance, junction to case	Kühlfläche / cooling surface	R_{thJC}	
	beidseitig / two-sided		0,018 K/W
	Anoden / anode		0,033 K/W
	Kathode / cathode		0,04 K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	Kühlfläche / cooling surface	R_{thCK}	
	beidseitig / two-sided		0,005 K/W
	einseitig / single-sided		0,01 K/W
Höchstzul. Sperrschichttemp. / max. junction temperat.		t_{vjmax}	125 $^{\circ}\text{C}$
Betriebstemperatur / operating temperature		$t_C \text{ op}$	-40...+125 $^{\circ}\text{C}$
Lagertemperatur / storage temperature		t_{stg}	-40...+150 $^{\circ}\text{C}$

Mechanische Eigenschaften / Mechanical properties

Gehäuse, siehe Anlage / case, see appendix		Seite / page 1
Anpreßkraft /clamping force	F	15...36 kN
Gewicht / weight	G	ca. 600 g
Luftstrecke / air distance		ca. 20 mm
Kriechstrecke / creepage distance		30 mm
Feuchteklasse / humidity classification	DIN 40040	C
Schwingfestigkeit / vibration resistance	f = 50 Hz	50 m/s ²

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

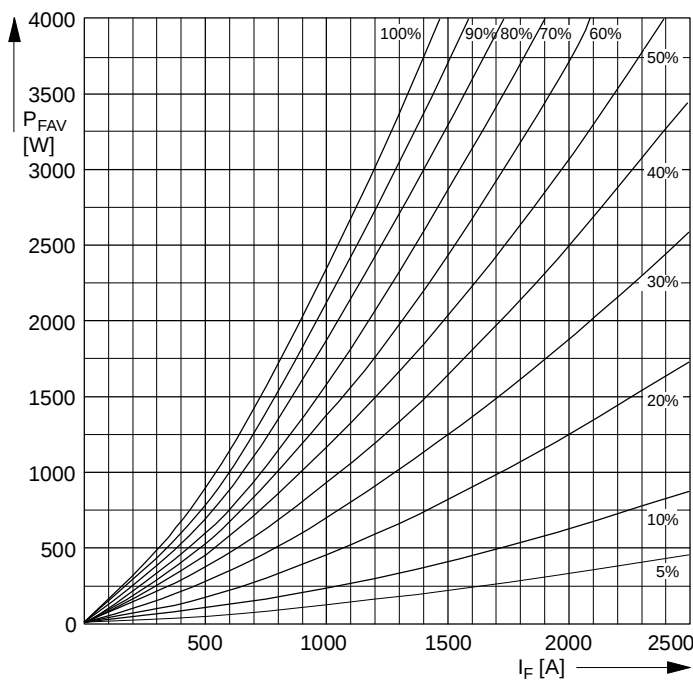
1) Richtwert für obere Streubereichsgrenze / Upper limit of scatter range (standart value)



D 721 S_01

Fig. 1
On-state characteristic $i_F = f(v_F)$
 $t_{vj} = 125^\circ\text{C}$

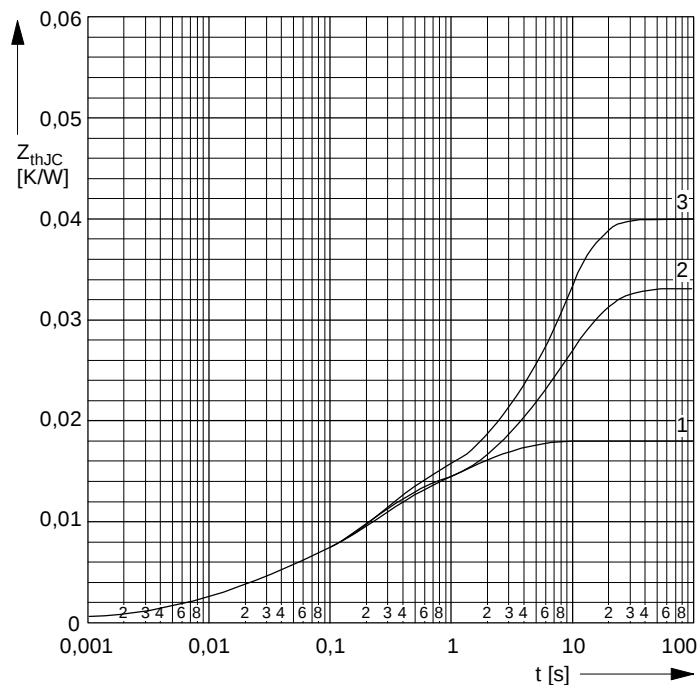
— Upper limit of scatter range
- - - Lower limit of scatter range



D 721 S_02

Fig. 2
On-state losses (average values)
 $I_F = f(P_{FAV})$

$t_{vj} = 125^\circ\text{C}$



D 721 S_03

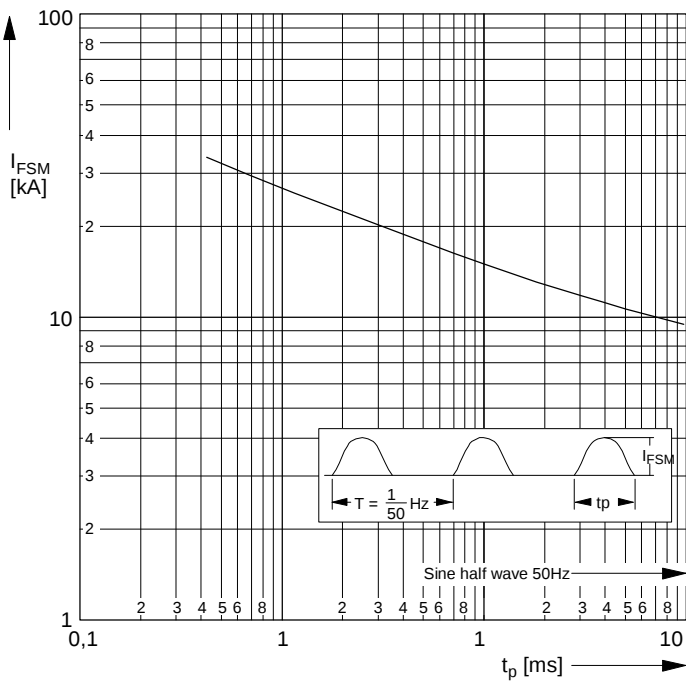
Fig. 3
Transient thermal impedance $Z_{thJC} = f(t)$, DC
1 - Two-sided cooling
2 - Anode-sided cooling
3 - Cathode-sided cooling

Analytical elements of transient thermal impedance Z_{thJC} for DC

	1. Z_{thJC}		2. Z_{thJC}		3. Z_{thJC}	
	r [K/W]	τ [s]	r [K/W]	τ [s]	r [K/W]	τ [s]
1	0,00637	1,80000	0,02137	8,00000	0,02837	6,80000
2	0,00904	0,14000	0,00904	0,14000	0,00904	0,14000
3	0,00267	0,01410	0,00167	0,01410	0,00167	0,01410
4	0,00080	0,00265	0,00080	0,00265	0,00080	0,00265
5	0,00012	0,00067	0,00012	0,00067	0,00012	0,00067
Σ	0,00180	-	0,03300	-	0,04000	-

Analytical function:

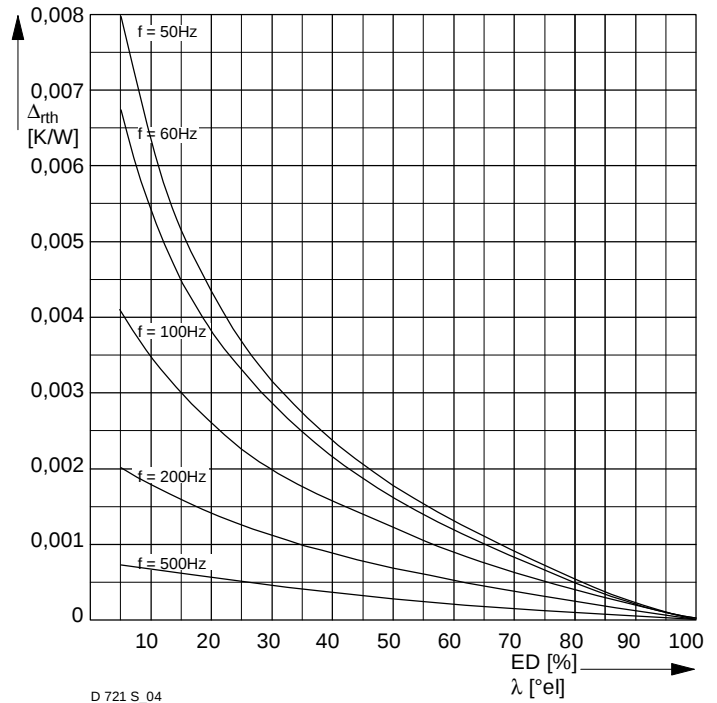
$$Z_{thJC} = \sum_{n=1}^{n_{max}} R_{thn} (1 - \exp(-t/\tau_n))$$



D 721 S_05

Fig. 4
Surge Current $I_{FSM} = f(t_p)$
 $I_{FSM} = f(\text{Sine half wave})$

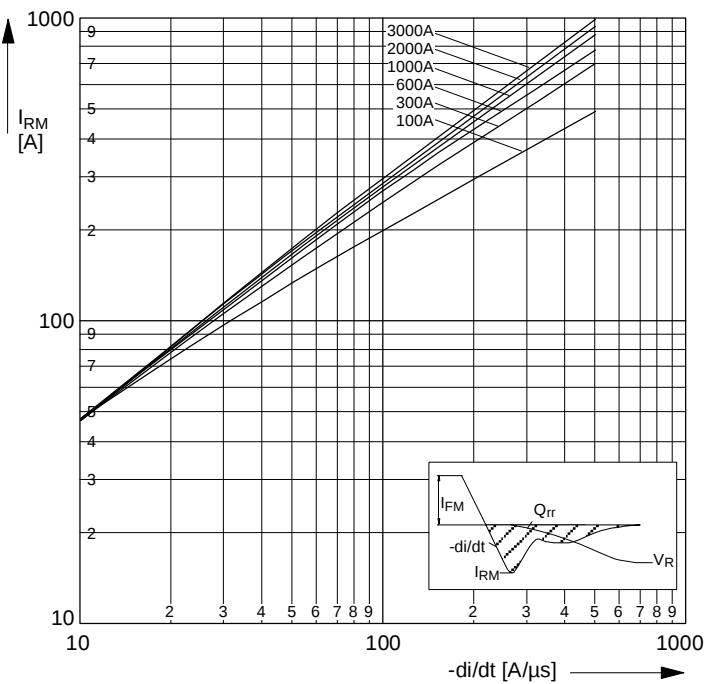
$t_{vj} = 125^\circ\text{C}$
 $V_R = 0$



D 721 S_04

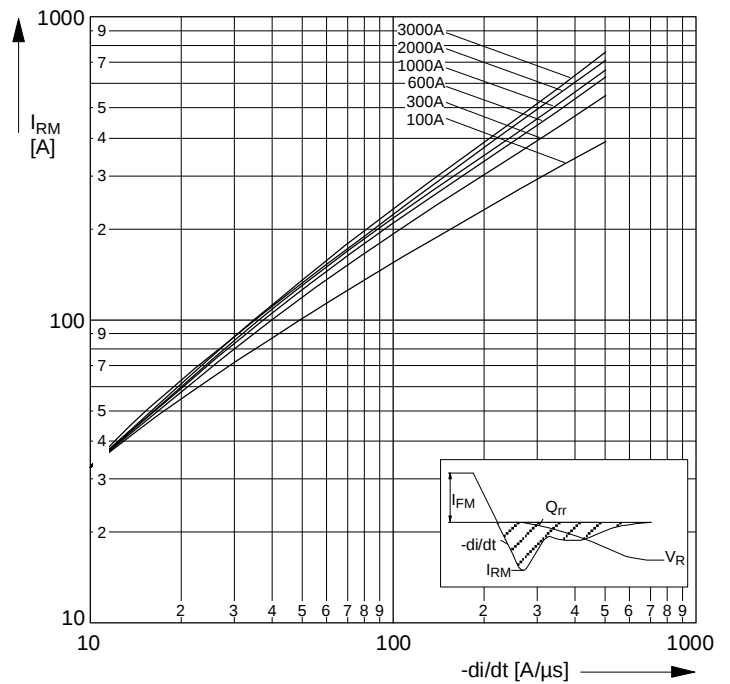
Fig. 5
 $\Delta r_{th} = f(ED, \text{Frequency})$

Two-sided cooling
Current wave form: square wave
Parameter: frequency



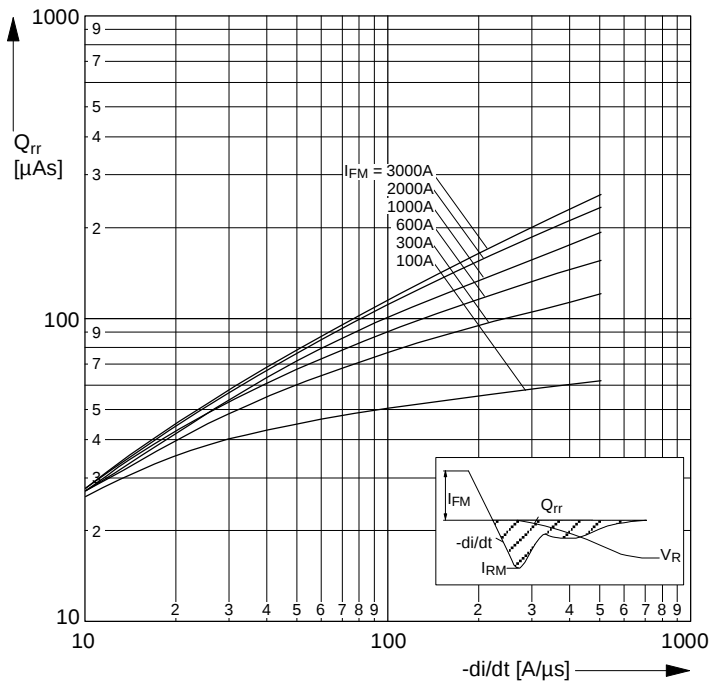
D 721 S_06

Fig. 6
Reverse recovery current (upper-limit, ca. 98% values)
Application: GTO-freewheeling diode
Parameter: I_{FM}
 $t_{vj} \leq 125^\circ\text{C}$; $C_S \geq 4\mu\text{F}$
 $R_S = 0\ \Omega$; $V_R > 2000\ \text{V} \dots 3000\ \text{V}$



D 721 S_07

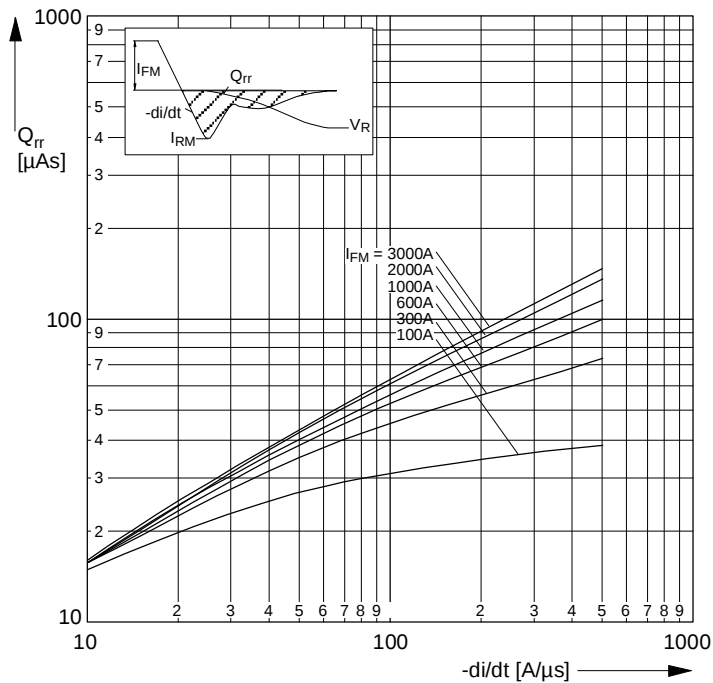
Fig. 7
Reverse recovery current (lower-limit, ca. 2% values)
Application: GTO-freewheeling diode
Parameter: I_{FM}
 $t_{vj} \leq 125^\circ\text{C}$; $C_S \geq 4\mu\text{F}$; Diode D291S
 $R_S = 0\ \Omega$; $V_R > 2000\ \text{V} \dots 3000\ \text{V}$



D 721 S_08

Fig. 8
Reverse recovery charge (upper limit, ca. 98% values)

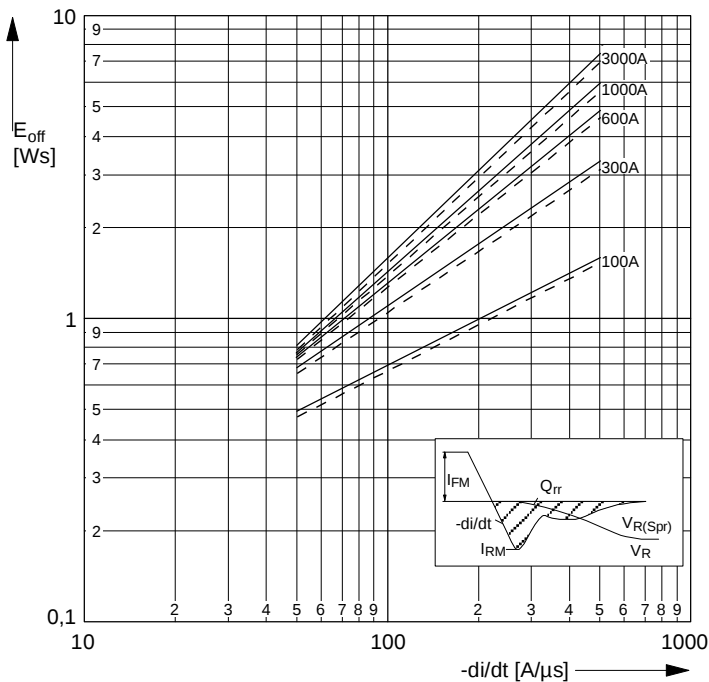
Application: GTO-freewheeling diode
Parameter: I_{FM}
 $t_{vj} \leq 125^\circ\text{C}$; $C_S \geq 4\mu\text{F}$
 $R_S = 0 \Omega$; $V_R > 2000 \text{ V} \dots 3000 \text{ V}$



D 721 S_09

Fig. 9
Reverse recovery charge (lower limit, ca. 2% values)

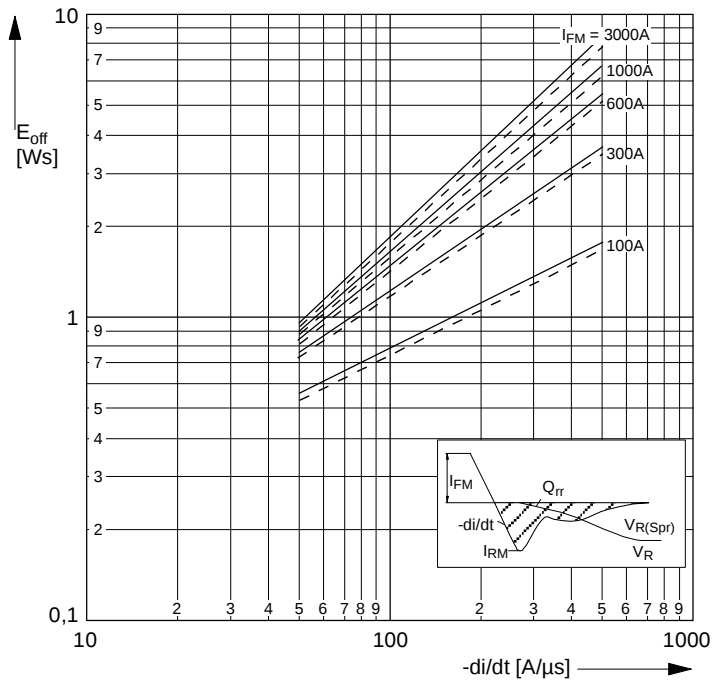
Application: GTO-freewheeling diode
Parameter: I_{FM}
 $t_{vj} \leq 125^\circ\text{C}$; $C_S \geq 4\mu\text{F}$
 $R_S = 0 \Omega$; $V_R > 2000 \text{ V} \dots 3000 \text{ V}$



D 721 S_13

Fig. 10
Turn-off-losses $E_{off} = f(di/dt)$
diodes with V_{Fmax}

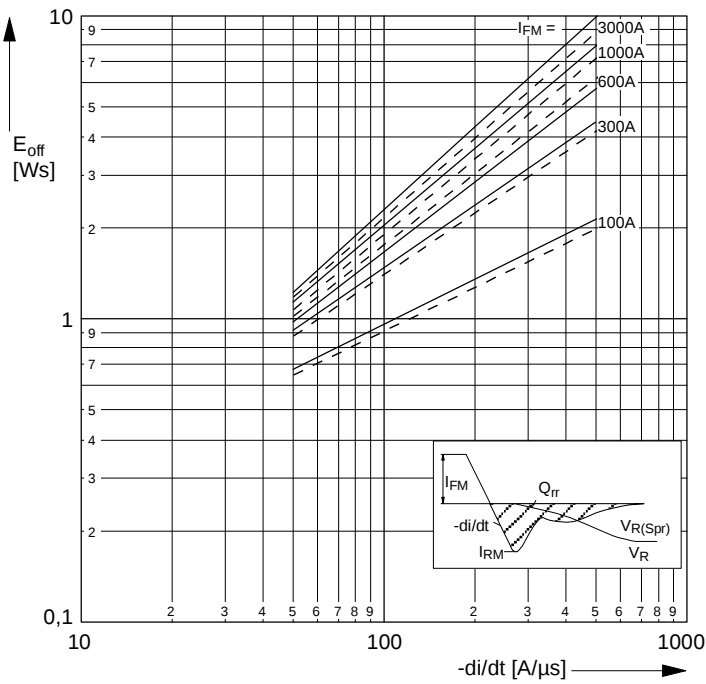
Application: GTO-freewheeling diode
Parameter: I_{FM} ; Snubberdiode D 291 S
 $t_{vj} \leq 125^\circ\text{C}$; $C_S = 6 \mu\text{F}$ für $V_R \leq V_{RM}$
 $C_S = 36 \mu\text{F}$ für $V_R \geq V_{RM}$
 $L_S = 0.2 \mu\text{H}$
— $V_{R(Spr)} = 3000 \text{ V}$
- - - $V_{R(Spr)} = 2000 \text{ V}$



D 721 S_11

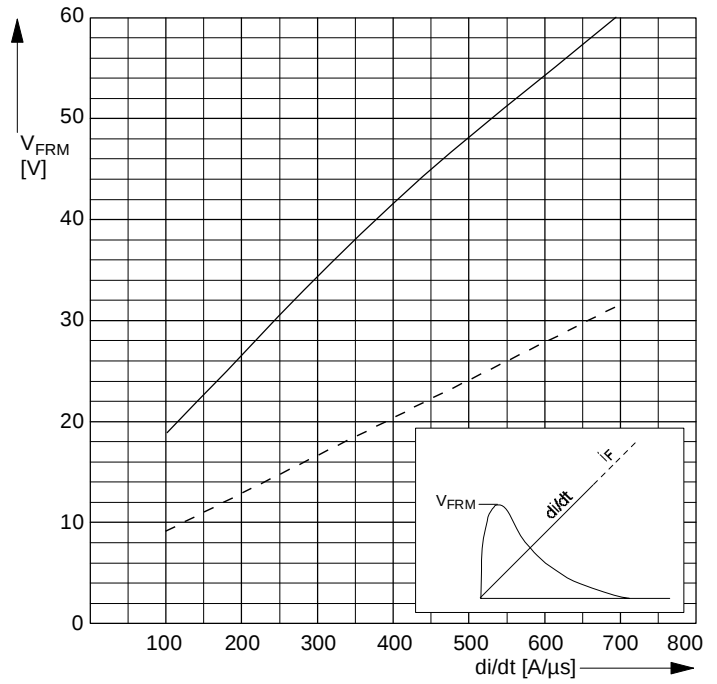
Fig. 11
Turn-off-losses $E_{off} = f(di/dt)$
diodes with V_{Fmax}

Application: GTO-freewheeling diode — $V_{R(Spr)} = 3000 \text{ V}$
Parameter: I_{FM} ; Snubberdiode D 291 S
 $t_{vj} \leq 125^\circ\text{C}$; $C_S = 4 \mu\text{F}$ für $V_R \leq V_{RM}$
 $C_S = 24 \mu\text{F}$ für $V_R \geq V_{RM}$
 $L_S = 0.2 \mu\text{H}$
- - - $V_{R(Spr)} = 2000 \text{ V}$



D 721 S_12

Fig. 12
Turn-off-losses $E_{off} = f(di/dt)$
diodes with V_{Fmax}
Application: GTO-freewheeling diode
Parameter: I_{FM} ; Snubberdiode D 291 S
 $t_{vj} = 125^\circ\text{C}$; $C_S = 4 \mu\text{F}$ für $V_R \leq V_{RM}$
 $C_S = 24 \mu\text{F}$ für $V_R \geq V_{RM}$
 $L_S = 0.2 \mu\text{H}$



D 721 S_10

Fig. 13
Peak Forward Recovery Voltage
(typical values)
Parameter: t_{vj}
— $t_{vj} = 125^\circ\text{C}$
- - - $t_{vj} = 25^\circ\text{C}$