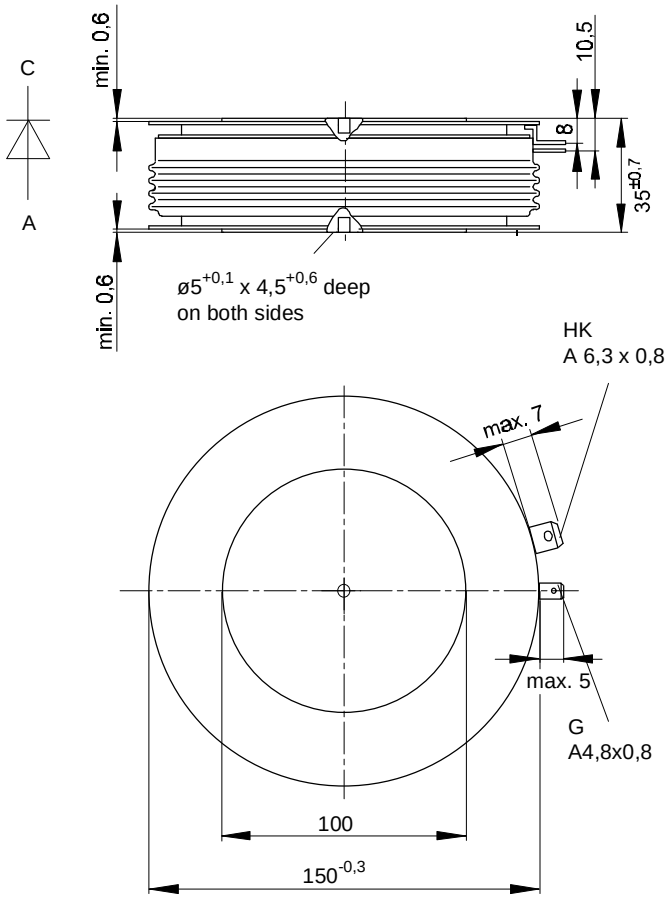
European Power-
Semiconductor and
Electronics Company

Marketing Information
T 2451 N



VWK Aug. 1996

T 2451 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}	3600 3800 4000 4200	V
Vorwärts-Stoßspitzensperrspannung	non-repetitive peak forward off-state voltage	t_{vj} = -40°C...$t_{vj\ max}$	$V_{DSM} = V_{DRM}$	3600 3800 4000 4200	V
Rückwärts-Stoßspitzensperrspannung	non-repetitive peak reverse voltage	t_{vj} = +25°C...$t_{vj\ max}$	$V_{RSM} = V_{RRM}$	3700 3900 4100 4300	V
Durchlaßstrom-Grenzeffektivwert	RMS on-state current		I_{TRMSM}	5300	A
Dauergrenzstrom	average on-state current	t_c = 85°C	I_{TAVM}	2450	A
		t_c = 62°C		3400	A
Stoßstrom-Grenzwert	surge current	t_{vj} = 25°C, t_p = 10 ms	I_{TSM}	65000[1])	A
		$t_{vj} = t_{vj\ max}$, t_p = 10 ms		57000[1])	A
Grenzlastintegral	I^2t-value	t_{vj} = 25°C, t_p = 10 ms	I^2t	21 . 10^6	A^2s
		$t_{vj} = t_{vj\ max}$, t_p = 10 ms		16 . 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
		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}	$(dv/dt)_{cr}$	1000	V/µs

Charakteristische Werte *Characteristic values*

Durchlaßspannung	on-state voltage	$t_{vj} = t_{vj\ max}$, i_T = 10 kA	v_T	max. 3,05	V
Schleusenspannung	threshold voltage	$t_{vj} = t_{vj\ max}$	$V_{T(TO)}$	1,17	V
Ersatzwiderstand	slope resistance	$t_{vj} = t_{vj\ max}$	r_T	0,176	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. 2,5	V
Nicht zündender Steuerstrom	gate non-trigger current	$t_{vj} = t_{vj\ max}$, v_D = 6 V	I_{GD}	max. 20	mA
		$t_{vj} = t_{vj\ max}$, v_D = 0,5 V_{DRM}		max. 10	mA
Nicht zündende Steuerspannung	gate non-trigger voltage	$t_{vj} = t_{vj\ max}$, v_D = 0,5 V_{DRM}	V_{GD}	max. 0,4	V
Haltestrom	holding current	t_{vj} = 25 °C, v_D = 12 V, R_A = 4,7 Ω	I_H	max. 350	mA
Einraststrom	latching current	t_{vj} = 25 °C,v_D = 12 V, $R_{GK} \geq$ 10 Ω	I_L	max. 2000	mA
		i_{GM} = 1 A, di_G/dt = 1 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. 430	mA
Zündverzug	gate controlled delay time	t_{vj}=25°C, i_{GM} = 1 A, di_G/dt = 1 A/µs	t_{gd}	max. 2,3	µs
Freiwerdezeit	circuit commutated turn-off time	siehe Techn.Erl./see Techn. Inf.	t_q	typ. 370	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. 0,0064	°C/W
		DC		max. 0,0060	°C/W
Übergangs-Wärmewiderstand	thermal resistance, case to heatsink	beidseitig/two-sided	R_{thCK}	max. 0,0015	°C/W
Höchstzul.Sperrschichttemperatur	max. junction temperature		$t_{vj\ max}$	120	°C
Betriebstemperatur	operating temperature		$t_{c\ op}$	-40...+120	°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	63...91	kN
Gewicht	weight		G	typ. 3000	g
Kriechstrecke	creepage distance			33	mm
Feuchteklasse	humidity classification	DIN 40040			C
Schwingfestigkeit	vibration resistance	f = 50 Hz		50	m/s^2
Maßbild, anliegend	outline, attached				

[1]) Gehäusegrenzstrom 40 kA (Sinushalbwelle 50 Hz)/Current limit of case 40 kA (sinusoidal half-wave 50 Hz)

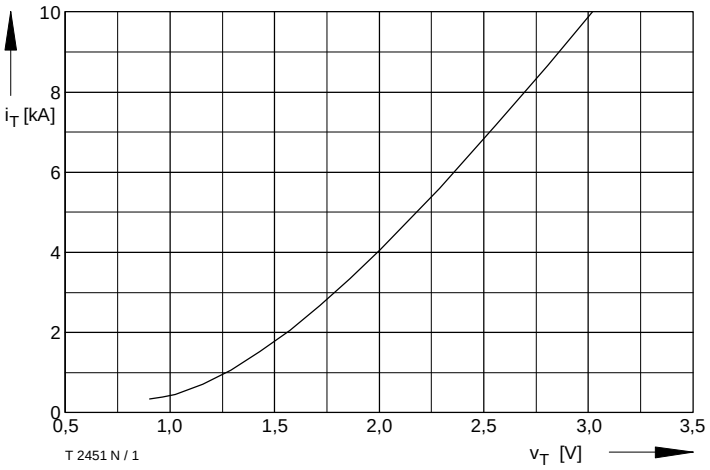


Bild / Fig. 1
Grenzdurchlaßkennlinie / Limiting on-state characteristic
$i_T = f(v_T)$, $t_{vj} = t_{vj\ max}$

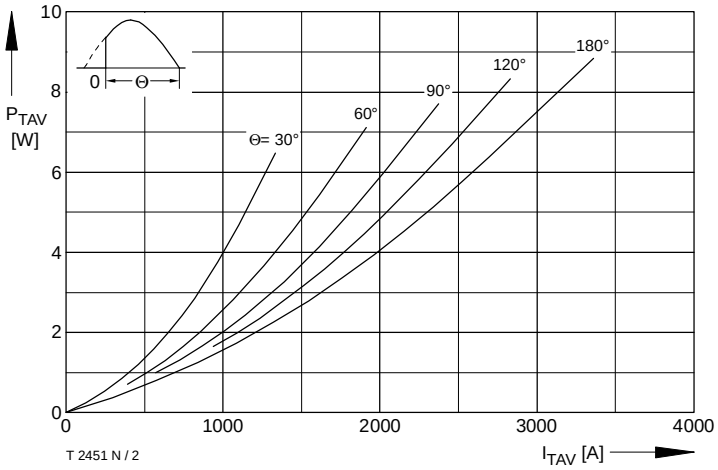


Bild / Fig. 2
Durchlaßverlustleistung / On-state power loss $P_{TAV} = f(I_{TAV})$
Parameter: Stromflußwinkel / Current conduction angle θ

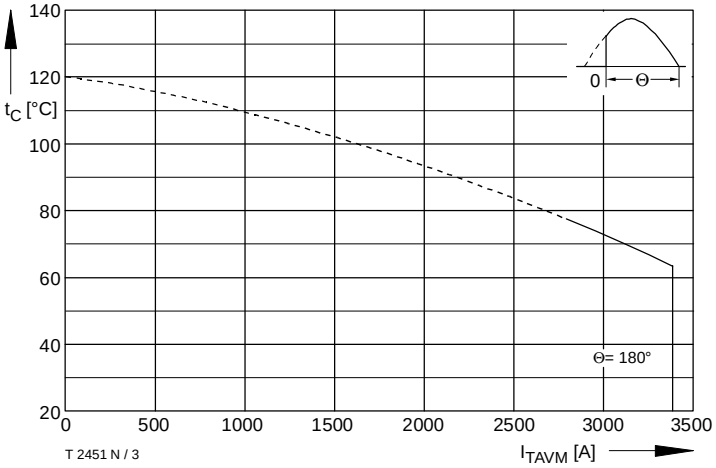


Bild / Fig. 3
Höchstzulässige Gehäusetemperatur / Max. allowable case temperature
$t_C = f(I_{TAVM})$
Beidseitige Kühlung / Two-sided cooling
Parameter: Stromflußwinkel / Current conduction angle θ
Berechnungsgrundlage P_{TAV} (Schaltverluste gesondert berücksichtigen) /
Calculation base P_{TAV} (switching losses should be considered separately)

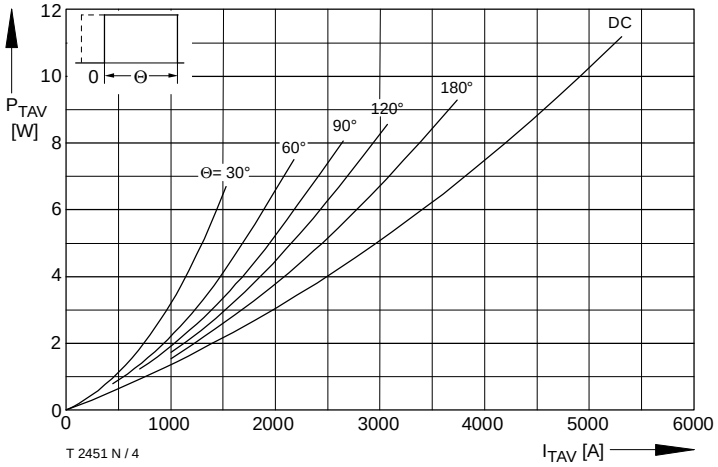


Bild / Fig. 4
Durchlaßverlustleistung / On-state power loss $P_{TAV} = f(I_{TAV})$
Parameter: Stromflußwinkel / Current conduction angle θ

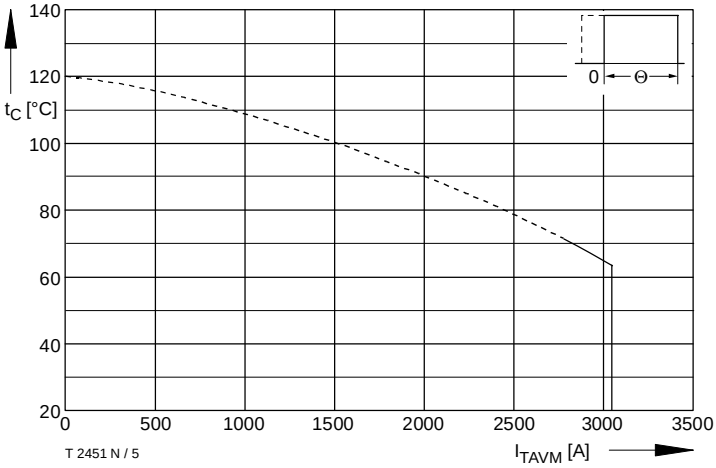


Bild / Fig. 5
Höchstzulässige Gehäusetemperatur / Max. allowable case temperature
$t_C = f(I_{TAVM})$
Beidseitige Kühlung / Two-sided cooling
Parameter: Stromflußwinkel / Current conduction angle θ
Berechnungsgrundlage P_{TAV} (Schaltverluste gesondert berücksichtigen) /
Calculation base P_{TAV} (switching losses should be considered separately)

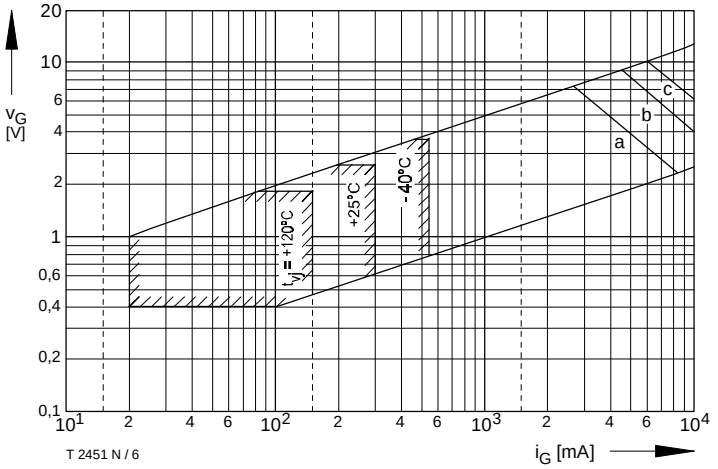


Bild / Fig. 6
Steuercharakteristik mit Zündbereichen / Gate characteristic with trigging areas $v_G = f(i_G)$, V_D = 6 V

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

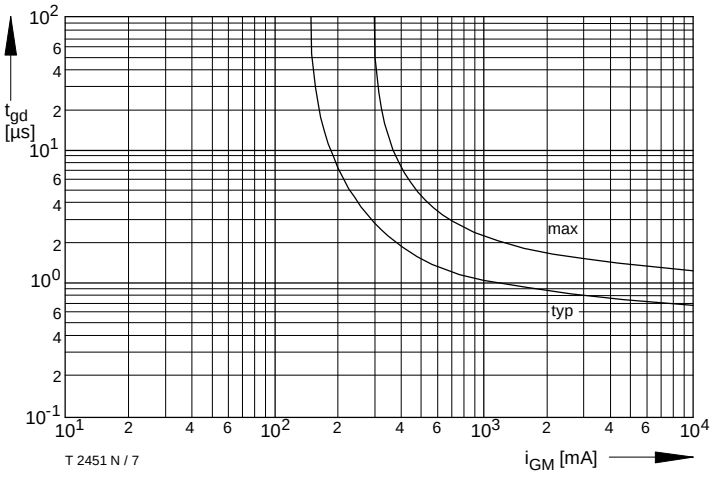


Bild / Fig. 7
Zündverzug / Gate controlled delay time $t_{gd} = f(i_{GM})$
t_{vj} = 25 °C, $di_G/dt = i_{GM}/1µs$

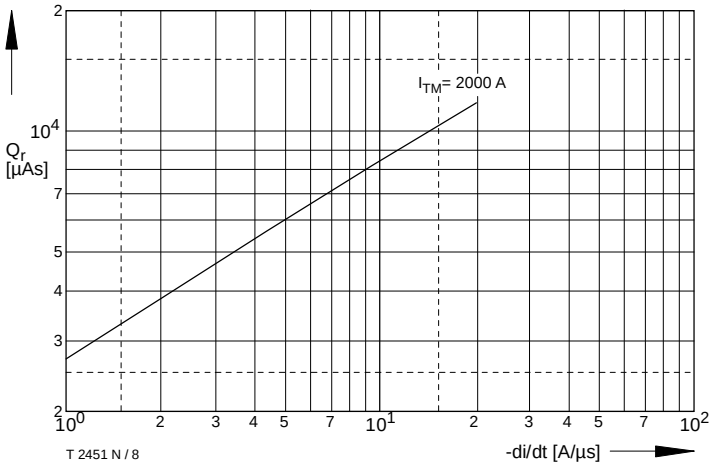


Bild / Fig. 8
Sperrverzögerungsladung / Recovered charge $Q_r = f(di/dt)$
$t_{vj} = t_{vj\ max}$, v_R = 0,5 V_{RRM}, v_{RM} = 0,8 V_{RRM}
Parameter: Durchlaßstrom / On-state current i_{TM}

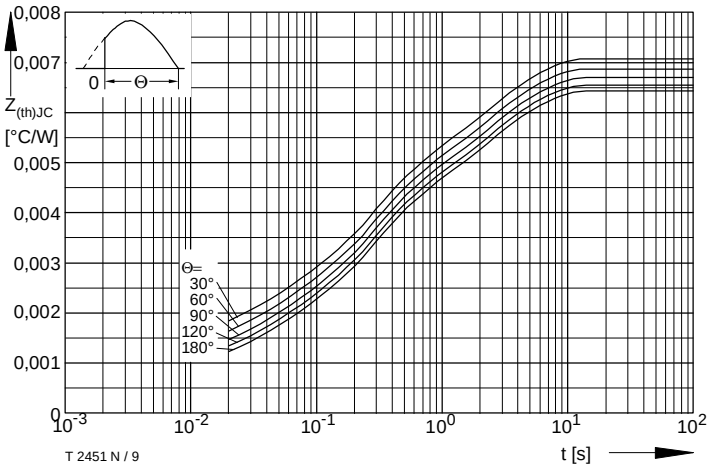


Bild / Fig. 9
Transienter innerer Wärmewiderstand / Transient thermal impedance
$Z_{thJC} = f(t)$
Parameter: Stromflußwinkel / current conduction angle θ

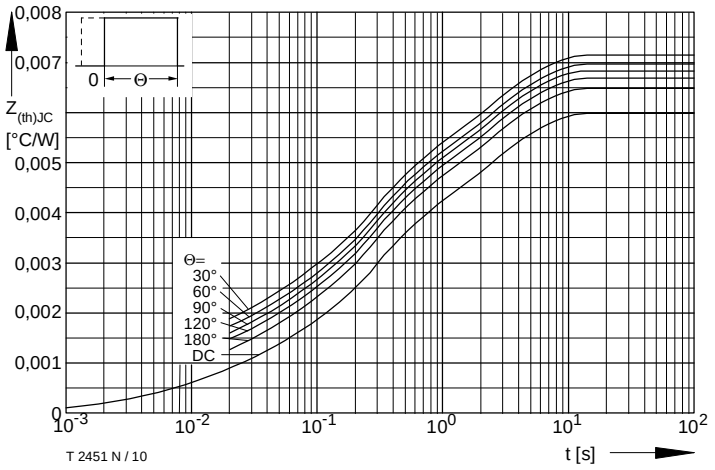


Bild / Fig. 10
Transienter innerer Wärmewiderstand / Transient thermal impedance
$Z_{thJC} = f(t)$
Parameter: Stromflußwinkel / current conduction angle θ

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

Pos. n	1	2	3	4	5
R_{thn}[°C/W]	0,0003844	0,00074	0,00185	0,0038	0,00327
τ_n [s]	0,0012	0,007	0,056	0,27	3,08

Analytische Funktion / Analytical function:

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