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}	1600 2000 1800 2200	V V
Vorwärts-Stossspitzensperrspannung non-repetitive peak forward off-state voltage	T_{vj} = -40 °C... $T_{vj\,max}$	V_{DSM}	1600 2000 1800 2200	V V
Rückwärts-Stossspitzensperrspannung non-repetitive peak reverse voltage	T_{vj} = +25 °C... $T_{vj\,max}$	V_{RSM}	1700 2100 1900 2300	V V
Durchlassstrom-Grenzeffektivwert maximum RMS on-state current		I_{TRMSM}	5800	A
Dauergrenzstrom average on-state current	T_C = 85 °C	I_{TAVM}	2810	A
Dauergrenzstrom average on-state current Durchlaßstrom-Effektivwert RMS on-state current	T_C = 55 °C, θ = 180°sin, t_P = 10 ms	I_{TAVM} I_{TRMS}	4070 6390	A A
Stossstrom-Grenzwert surge current	T_{vj} = 25 °C, t_P = 10 ms T_{vj} = $T_{vj\,max}$, t_P = 10 ms	I_{TSM}	58000 50000	A A
Grenzlastintegral I²t-value	T_{vj} = 25 °C, t_P = 10 ms T_{vj} = $T_{vj\,max}$, t_P = 10 ms	I^2t	16820 12500	10^3 A²s 10^3 A²s
Kritische Stromsteilheit critical rate of rise of on-state current	DIN IEC 60747-6 f = 50 Hz, i_{GM} = 1 A, di_G/dt = 1 A/µs	$(di_T/dt)_{cr}$	200	A/µs
Kritische Spannungssteilheit critical rate of rise of off-state voltage	T_{vj} = $T_{vj\,max}$, v_D = 0,67 V_{DRM} 5.Kennbuchstabe / 5th letter F	$(dv_D/dt)_{cr}$	1000	V/µs

Charakteristische Werte / Characteristic values

Durchlassspannung on-state voltage	T_{vj} = $T_{vj\,max}$, i_T = 11 kA T_{vj} = $T_{vj\,max}$, i_T = 3 kA	v_T	max. 2,13 max. 1,25	V V
Schleusenspannung threshold voltage	T_{vj} = $T_{vj\,max}$	$V_{(TO)}$	0,90	V
Ersatzwiderstand slope resistance	T_{vj} = $T_{vj\,max}$	r_T	0,112	mΩ
Durchlasskennlinie 700 A ≤ i_T ≤ 14100 A on-state characteristic $v_T = A + B \cdot i_T + C \cdot \ln(i_T + 1) + D \cdot \sqrt{i_T}$	T_{vj} = $T_{vj\,max}$	A= B= C= D=	9,473E-01 6,789E-05 -4,228E-02 7,908E-03	
Zündstrom gate trigger current	T_{vj} = 25 °C, v_D = 12V	I_{GT}	max. 300	mA
Zündspannung gate trigger voltage	T_{vj} = 25 °C, v_D = 12V	V_{GT}	max. 2,5	V
Nicht zündender Steuerstrom gate non-trigger current	T_{vj} = $T_{vj\,max}$, v_D = 12V T_{vj} = $T_{vj\,max}$, v_D = 0,5 V_{DRM}	I_{GD}	max. 10 max. 5	mA mA
Nicht zündende Steuerspannung gate non-trigger voltage	T_{vj} = $T_{vj\,max}$, v_D = 0,5 V_{DRM}	V_{GD}	max. 0,25	V
Haltestrom holding current	T_{vj} = 25°C, v_D = 12V	I_H	max. 300	mA
Einraststrom latching current	T_{vj} = 25°C, v_D = 12V, R_{GK} ≥ 10 Ω i_{GM} = 1 A, di_G/dt = 1 A/µs, t_g = 20 µs	I_L	max. 1500	mA
Vorwärts- und Rückwärts-Sperrstrom forward off-state and reverse current	T_{vj} = $T_{vj\,max}$ v_D = V_{DRM}, v_R = V_{RRM}	i_D, i_R	max. 250	mA
Zündverzug gate controlled delay time	DIN IEC 60747-6 T_{vj} = 25 °C, i_{GM} = 1 A, di_G/dt = 1 A/µs	t_{gd}	max. 4	µs

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Elektrische Eigenschaften / Electrical properties
Charakteristische Werte / Characteristic values

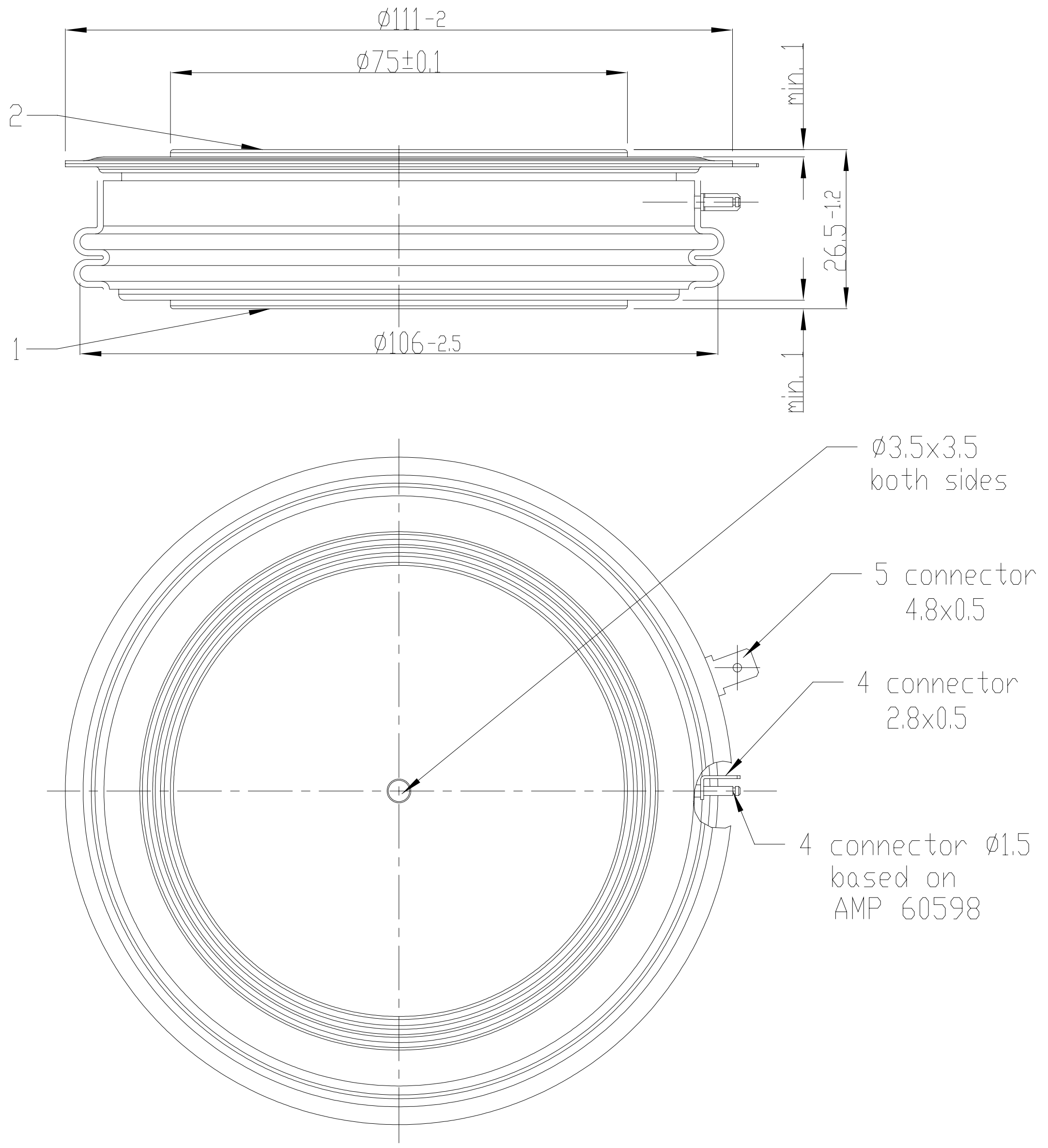
Freiwerdezeit circuit commutated turn-off time	$T_{vj} = T_{vj\,max}$, $i_{TM} = I_{TAVM}$ v_{RM} = 100 V, v_{DM} = 0,67 V_{DRM} dv_D/dt = 20 V/µs, $-di_T/dt$ = 10 A/µs 4.Kennbuchstabe / 4th letter O	t_q	typ. 300	µs

Thermische Eigenschaften / Thermal properties

Innerer Wärmewiderstand thermal resistance, junction to case	<u>Kühlfläche / cooling surface</u> beidseitig / two-sided, θ = 180°sin beidseitig / two-sided, DC Anode / anode, θ = 180°sin Anode / anode, DC Kathode / cathode, θ = 180°sin Kathode / cathode, DC	R_{thJC}	 max. 0,0085 max. 0,0078 max. 0,0152 max. 0,0146 max. 0,0183 max. 0,0169	 °C/W °C/W °C/W °C/W °C/W °C/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	<u>Kühlfläche / cooling surface</u> beidseitig / two-sides einseitig / single-sides	R_{thCH}	 max. 0,0025 max. 0,0050	 °C/W °C/W
Höchstzulässige Sperrschichttemperatur maximum junction temperature		$T_{vj\,max}$	125	°C
Betriebstemperatur operating temperature		$T_{c\,op}$	-40...+125	°C
Lagertemperatur storage temperature		T_{stg}	-40...+150	°C

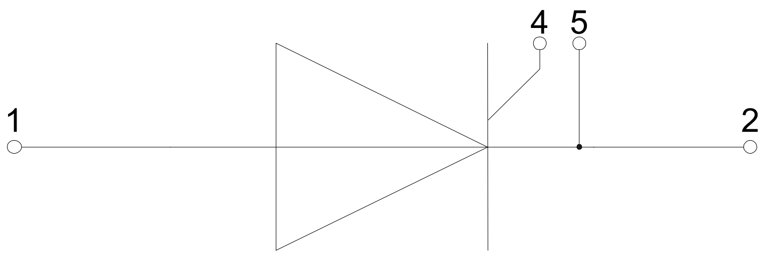
Mechanische Eigenschaften / Mechanical properties

Gehäuse, siehe Anlage case, see annex			Seite 3 page 3	
Si-Element mit Druckkontakt Si-pellet with pressure contact				
Anpresskraft clamping force		F	42...95	kN
Steueranschlüsse control terminals	Gate (flat) Gate (round, based on AMP 60598) Kathode / cathode		A 2,8x0,5 Ø 1,5 A 4,8x0,5	mm mm mm
Gewicht weight		G	typ. 1200	g
Kriechstrecke creepage distance			25	mm
Schwingfestigkeit vibration resistance	f = 50 Hz		50	m/s²



strike distance: 15mm
creepage distance: 25mm

overall height based
on contact pressure



1: Anode / Anode

2: Kathode / Cathode

4: Gate

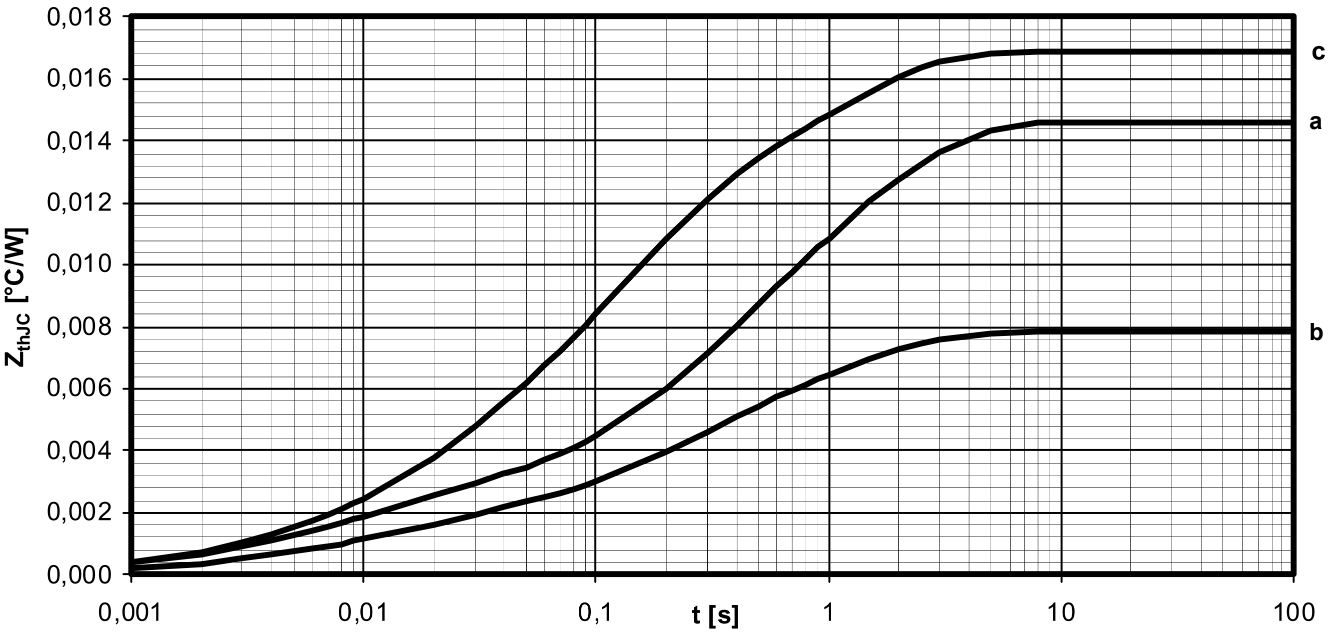
5: Hilfskathode/
Auxiliary Cathode

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

Kühlung / Cooling	Pos. n	1	2	3	4	5	6	7
beidseitig two-sided	R_{thn} [°C/W]	0,00003	0,00039	0,00123	0,0028	0,00338	-	-
	τ_n [s]	0,00006	0,00392	0,01520	0,2068	1,09140	-	-
anodenseitig anode-sided	R_{thn} [°C/W]	0,00001	0,00037	0,00190	0,0013	0,00434	0,00668	-
	τ_n [s]	0,00001	0,00182	0,00951	0,1350	0,34700	1,54000	-
kathodenseitig cathode-sided	R_{thn} [°C/W]	0,00003	0,00073	0,00302	0,00802	0,0051	-	-
	τ_n [s]	0,00004	0,00341	0,02150	0,13500	1,1100	-	-

Analytische Funktion / Analytical function:

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



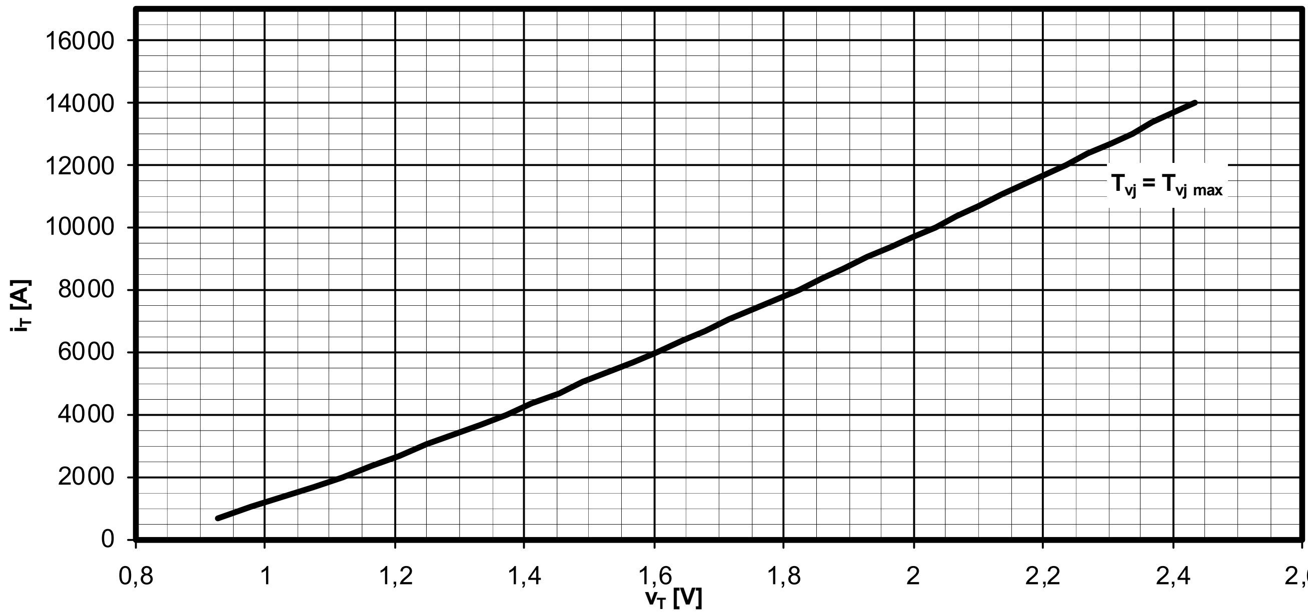
Transienter innerer Wärmewiderstand für DC / Transient thermal impedance for DC
Z_{thJC} = f(t)

a - Anodenseitige Kühlung / Anode-sided cooling
b - Beidseitige Kühlung / Two-sided cooling
c - Kathodenseitige Kühlung / Cathode-sided cooling

Erhöhung des $Z_{th\ DC}$ bei Sinus und Rechteckströmen mit unterschiedlichen Stromflusswinkeln Θ
Rise of $Z_{th\ DC}$ for sinewave and rectangular current with different current conduction angles Θ
$\Delta Z_{th\ \Theta\ rec}$ / $\Delta Z_{th\ \Theta\ sin}$

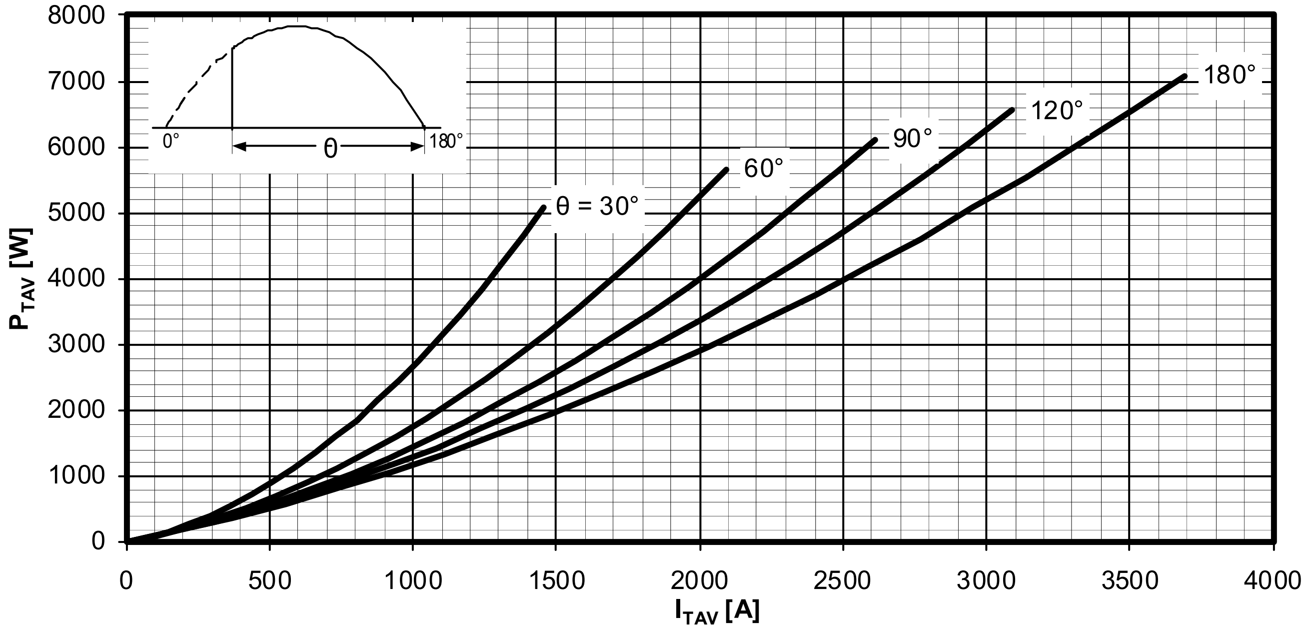
Kühlung / Cooling		Θ = 180°	Θ = 120°	Θ = 90°	Θ = 60°	Θ = 30°
beidseitig two-sided	$\Delta Z_{th\ \Theta\ rec}$ [°C/W]	0,00084	0,00130	0,00161	0,00201	0,00259
	$\Delta Z_{th\ \Theta\ sin}$ [°C/W]	0,00069	0,00093	0,00120	0,00156	0,00208
anodenseitig anode-sided	$\Delta Z_{th\ \Theta\ rec}$ [°C/W]	0,00143	0,00228	0,00288	0,00371	0,00492
	$\Delta Z_{th\ \Theta\ sin}$ [°C/W]	0,00112	0,00154	0,00208	0,00289	0,00425
kathodenseitig cathode-sided	$\Delta Z_{th\ \Theta\ rec}$ [°C/W]	0,00170	0,00261	0,00322	0,00399	0,00506
	$\Delta Z_{th\ \Theta\ sin}$ [°C/W]	0,00144	0,00191	0,00246	0,00321	0,00430

$$Z_{th\ \Theta\ rec} = Z_{th\ DC} + \Delta Z_{th\ \Theta\ rec}$$
$$Z_{th\ \Theta\ sin} = Z_{th\ DC} + \Delta Z_{th\ \Theta\ sin}$$



Grenzdurchlasskennlinie / Limiting on-state characteristic $i_T = f(v_T)$

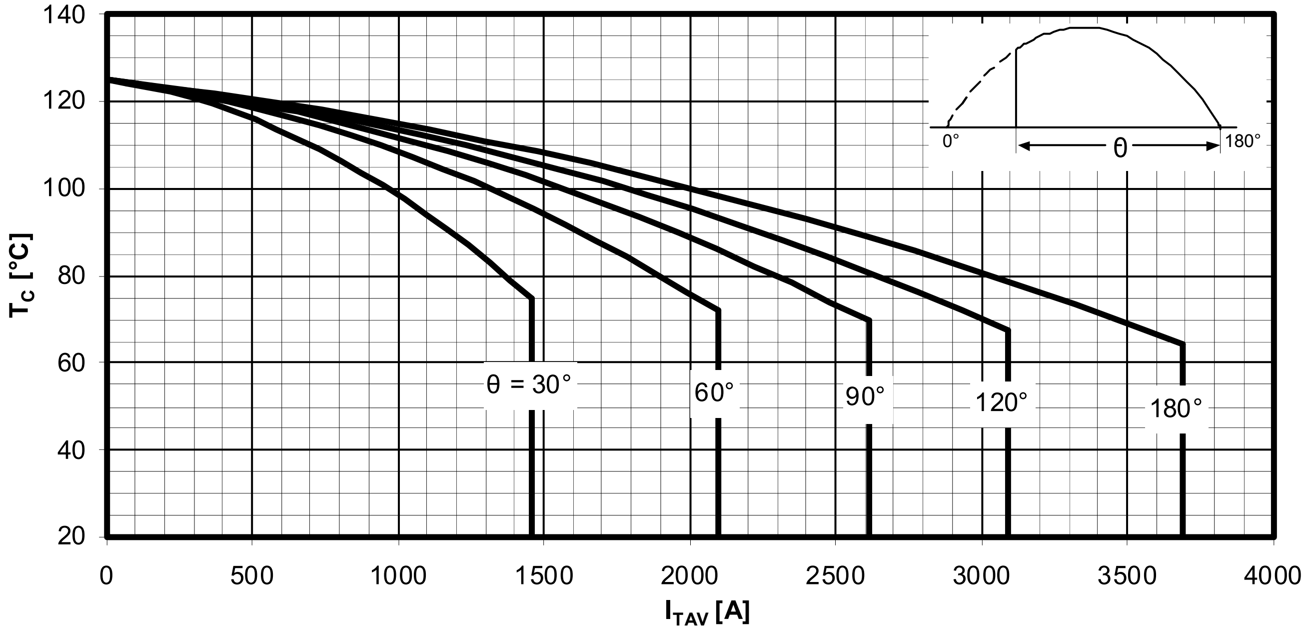
$T_{vj} = T_{vj\ max}$



Durchlassverlustleistung / On-state power loss $P_{TAV} = f(I_{TAV})$

Sinusförmiger Strom / Sinusoidal current

Parameter: Stromflusswinkel Θ / Current conduction angle Θ

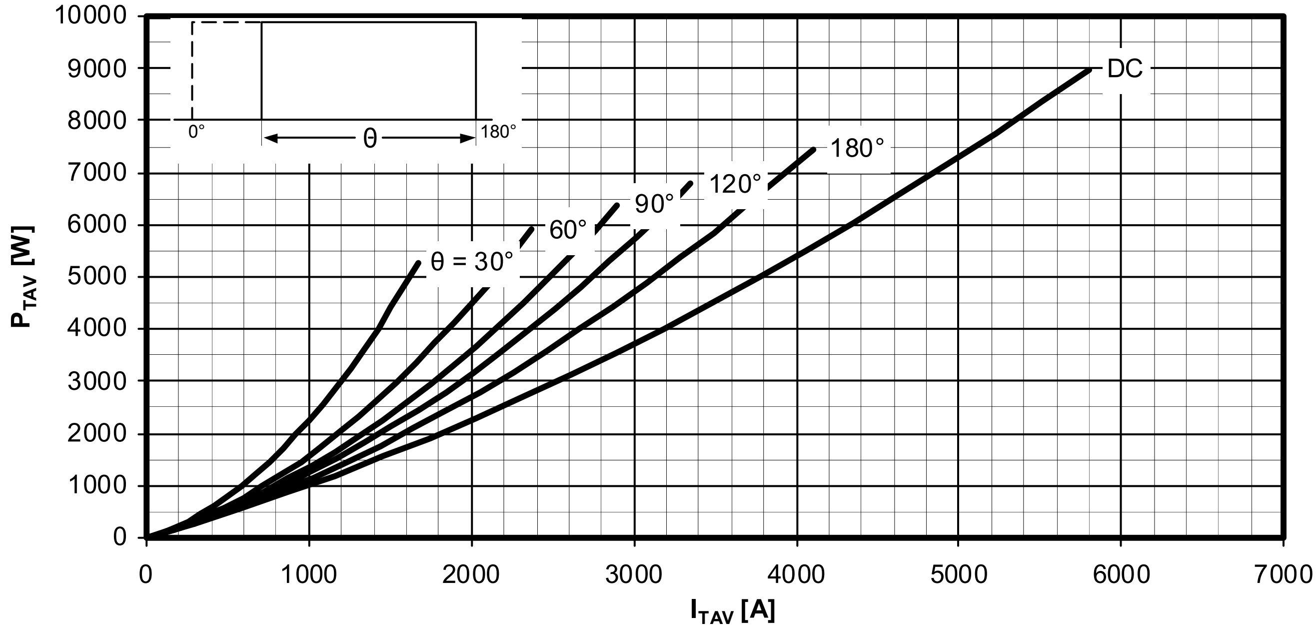


Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAV})$

Sinusförmiger Strom / Sinusoidal current

Beidseitige Kühlung / Two-sided cooling

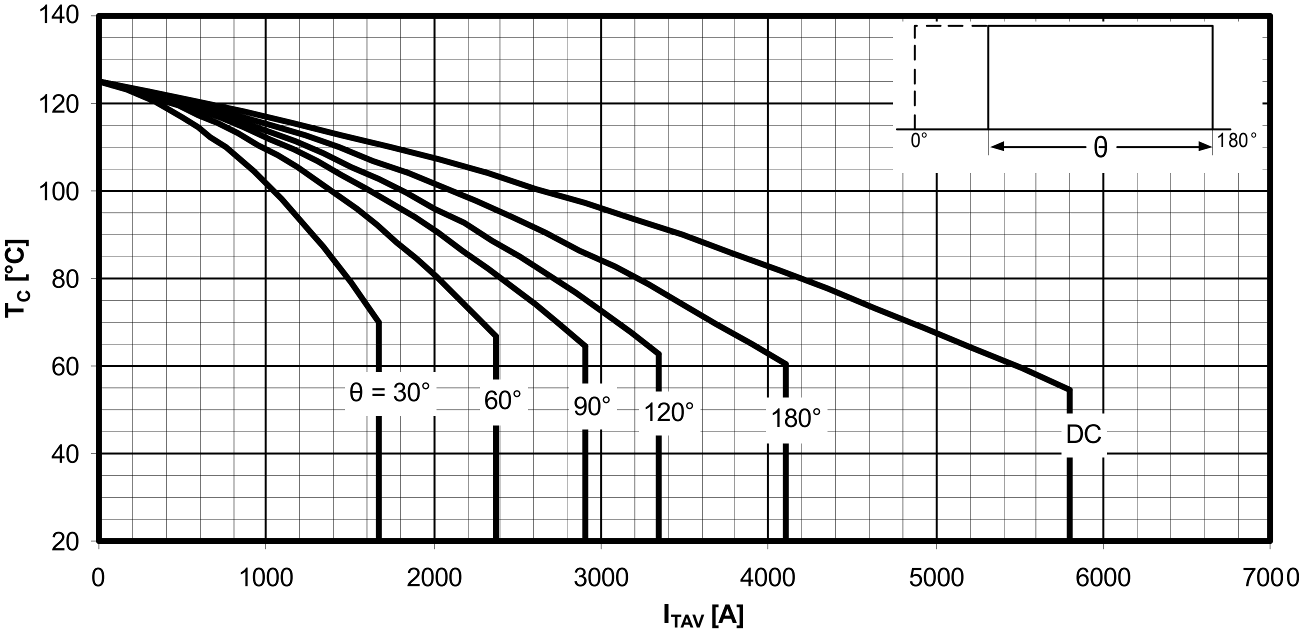
Parameter: Stromflusswinkel Θ / Current conduction angle Θ



Durchlassverlustleistung / On-state power loss $P_{TAV} = f(I_{TAV})$

Rechteckförmiger Strom / Rectangular current

Parameter: Stromflusswinkel Θ / Current conduction angle Θ

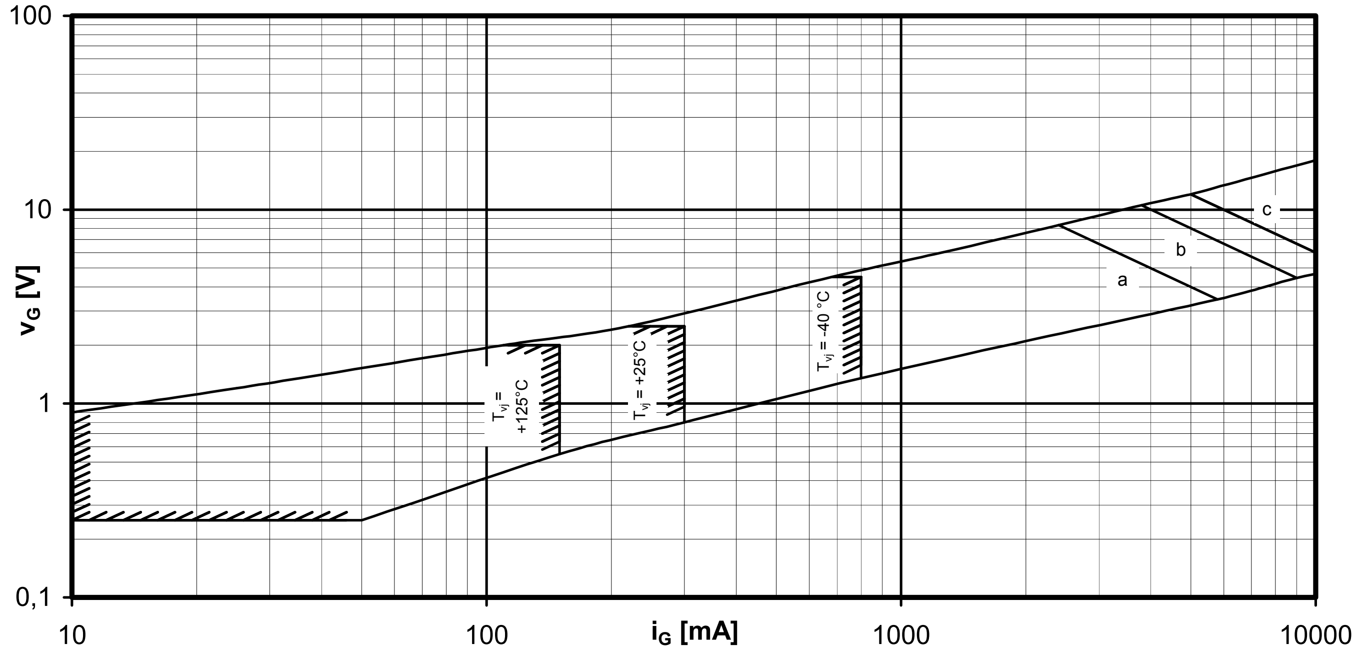


Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAV})$

Rechteckförmiger Strom / Rectangular current

Beidseitige Kühlung / Two-sided cooling

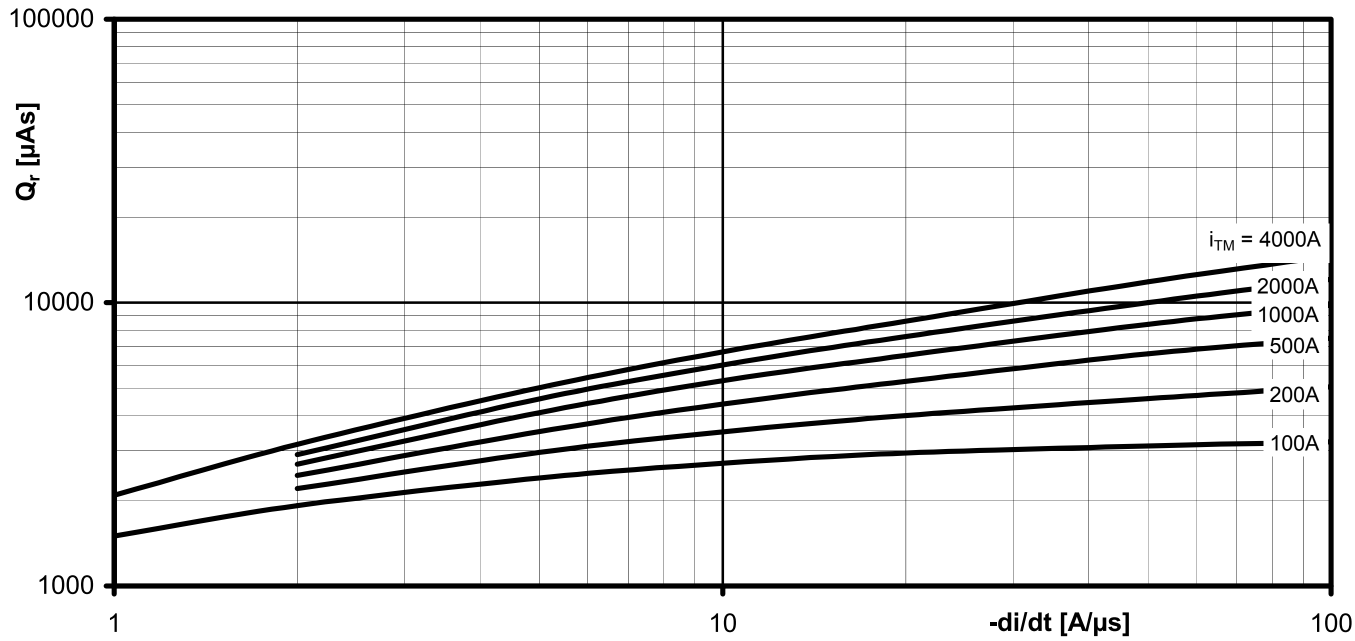
Parameter: Stromflusswinkel Θ / Current conduction angle Θ



Steuercharakteristik $v_G = f(i_G)$ mit Zündbereichen für V_D = 12 V
Gate characteristic $v_G = f(i_G)$ with triggering area for V_D = 12 V

Höchstzulässige Spitzensteuerverlustleistung / Maximum rated peak gate power dissipation $P_{GM} = f(t_g)$:

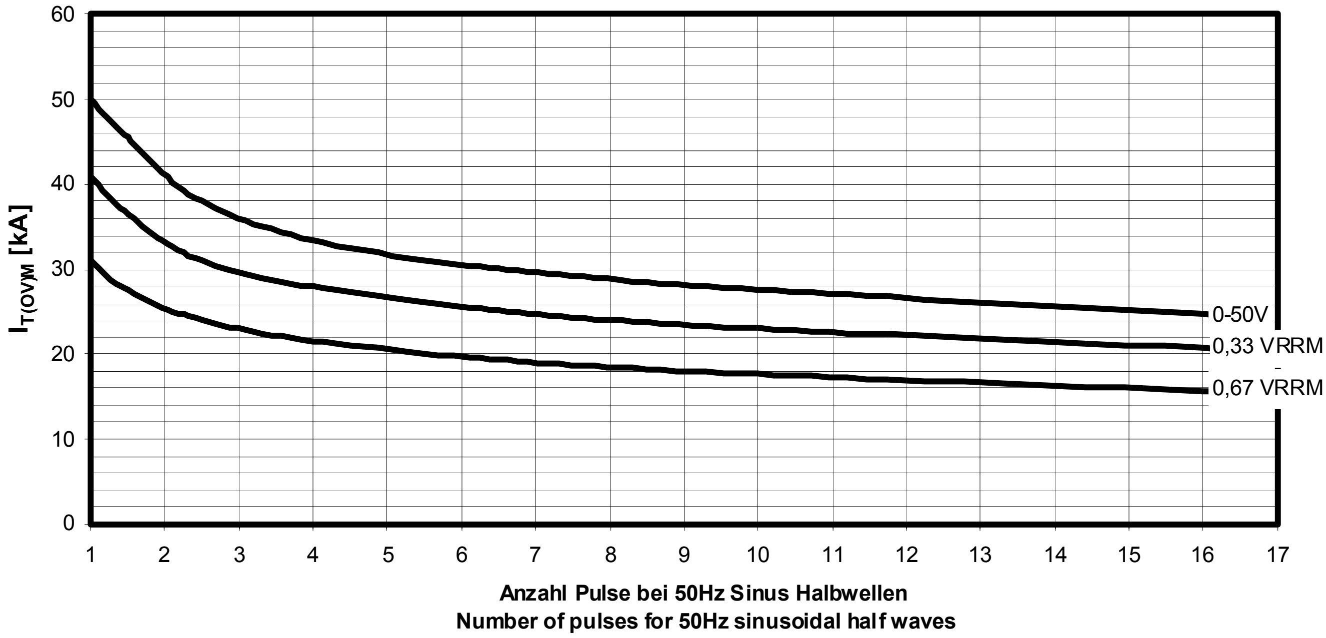
a - 20W / 10ms b - 40W / 1ms c - 60W / 0,5ms



Sperrverzögerungsladung / Recovered charge Q_r = f(di/dt)

$T_{vj} = T_{vjmax}$, $v_R \leq 0{,}5\ V_{RRM}$, $V_{RM} = 0{,}8\ V_{RRM}$

Parameter: Durchlassstrom / On-state current i_{TM}



Typische Abhängigkeit des Grenzstromes $I_{T(OV)M}$ von der Anzahl für eine Folge von Sinus Halbwellen bei 50Hz. Parameter: Rückwärtsspannung V_{RM}
Typical dependency of maximum overload on-state current $I_{T(OV)M}$ as a number of a sequence of sinusoidal half waves at 50Hz. Parameter: peak reverse voltage V_{RM}
$I_{T(OV)M}$ = f (pulses, V_{RM}) ; T_{vj} = T_{vjmax}