
**Netz-Thyristor**  
**Phase Control Thyristor**
**T390N**

 Infineon Technologies Bipolar  
 GmbH & Co. KG

**Elektrische Eigenschaften / Electrical properties**  
 Höchstzulässige Werte / Maximum rated values

Periodische Vorwärts- und Rückwärts-Spitzensperrspannung repetitive peak forward off-state and reverse voltages	$T_{vj} = -40^{\circ}\text{C} \dots T_{vj \max}$	$V_{\text{DRM}}, V_{\text{RRM}}$	1200 V 1400 V 1600 V
Vorwärts-Stosspitzensperrspannung non-repetitive peak forward off-state voltage	$T_{vj} = -40^{\circ}\text{C} \dots T_{vj \max}$	$V_{\text{DSM}}$	1200 V 1400 V 1600 V
Rückwärts-Stosspitzensperrspannung non-repetitive peak reverse voltage	$T_{vj} = +25^{\circ}\text{C} \dots T_{vj \max}$	$V_{\text{RSM}}$	1300 V 1500 V 1700 V
Durchlassstrom-Grenzeffektivwert maximum RMS on-state current		$I_{\text{TRMSM}}$	600 A
Dauergrenzstrom average on-state current	$T_C = 85^{\circ}\text{C}$	$I_{\text{TAVM}}$	381 A
Dauergrenzstrom average on-state current	$T_C = 55^{\circ}\text{C}, \theta = 180^{\circ}\sin, t_p = 10 \text{ ms}$	$I_{\text{TAVM}}$	550 A
Durchlaßstrom-Effektivwert RMS on-state current		$I_{\text{TRMS}}$	860 A
Stossstrom-Grenzwert surge current	$T_{vj} = 25^{\circ}\text{C}, t_p = 10 \text{ ms}$ $T_{vj} = T_{vj \max}, t_p = 10 \text{ ms}$	$I_{\text{TSM}}$	4900 A 4250 A
Grenzlastintegral $I^2t$ -value	$T_{vj} = 25^{\circ}\text{C}, t_p = 10 \text{ ms}$ $T_{vj} = T_{vj \max}, t_p = 10 \text{ ms}$	$I^2t$	120 $10^3 \text{ A}^2\text{s}$ 90,6 $10^3 \text{ A}^2\text{s}$
Kritische Stromsteilheit critical rate of rise of on-state current	DIN IEC 60747-6 $f = 50 \text{ Hz}, i_{\text{GM}} = 0,6 \text{ A},$ $di_{\text{G}}/dt = 0,6 \text{ A}/\mu\text{s}$	$(di_{\text{T}}/dt)_{\text{cr}}$	150 $\text{A}/\mu\text{s}$
Kritische Spannungssteilheit critical rate of rise of off-state voltage	$T_{vj} = T_{vj \max}, V_{\text{D}} = 0,67 V_{\text{DRM}}$ 5.Kennbuchstabe / 5 <sup>th</sup> letter F	$(dv_{\text{D}}/dt)_{\text{cr}}$	1000 $\text{V}/\mu\text{s}$

**Charakteristische Werte / Characteristic values**

Durchlassspannung on-state voltage	$T_{vj} = T_{vj \max}, i_{\text{T}} = 1100 \text{ A}$ $T_{vj} = T_{vj \max}, i_{\text{T}} = 300 \text{ A}$	$v_{\text{T}}$	max. 2 V max. 1,23 V
Schleusenspannung threshold voltage	$T_{vj} = T_{vj \max}$	$V_{(\text{TO})}$	0,85 V
Ersatzwiderstand slope resistance	$T_{vj} = T_{vj \max}$	$r_{\text{T}}$	0,900 $\text{m}\Omega$
Durchlasskennlinie $100 \text{ A} \leq i_{\text{T}} \leq 1900 \text{ A}$ on-state characteristic $v_{\text{T}} = A + B \cdot i_{\text{T}} + C \cdot \ln(i_{\text{T}} + 1) + D \cdot \sqrt{i_{\text{T}}}$	$T_{vj} = T_{vj \max}$	A= B= C= D=	9,486E-01 6,089E-04 -5,553E-02 2,294E-02
Zündstrom gate trigger current	$T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12 \text{ V}$	$i_{\text{GT}}$	max. 150 mA
Zündspannung gate trigger voltage	$T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12 \text{ V}$	$V_{\text{GT}}$	max. 2 V
Nicht zündender Steuerstrom gate non-trigger current	$T_{vj} = T_{vj \max}, V_{\text{D}} = 12 \text{ V}$ $T_{vj} = T_{vj \max}, V_{\text{D}} = 0,5 V_{\text{DRM}}$	$i_{\text{GD}}$	max. 10 mA max. 5 mA
Nicht zündende Steuerspannung gate non-trigger voltage	$T_{vj} = T_{vj \max}, V_{\text{D}} = 0,5 V_{\text{DRM}}$	$V_{\text{GD}}$	max. 0,25 V
Haltestrom holding current	$T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12 \text{ V}$	$i_{\text{H}}$	max. 200 mA
Einraststrom latching current	$T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12 \text{ V}, R_{\text{GK}} \geq 10 \Omega$ $i_{\text{GM}} = 0,6 \text{ A}, di_{\text{G}}/dt = 0,6 \text{ A}/\mu\text{s},$ $t_{\text{g}} = 20 \mu\text{s}$	$i_{\text{L}}$	max. 800 mA
Vorwärts- und Rückwärts-Sperrstrom forward off-state and reverse current	$T_{vj} = T_{vj \max}$ $V_{\text{D}} = V_{\text{DRM}}, V_{\text{R}} = V_{\text{RRM}}$	$i_{\text{D}}, i_{\text{R}}$	max. 30 mA
Zündverzug gate controlled delay time	DIN IEC 60747-6 $T_{vj} = 25^{\circ}\text{C}, i_{\text{GM}} = 0,6 \text{ A},$ $di_{\text{G}}/dt = 0,6 \text{ A}/\mu\text{s}$	$t_{\text{gd}}$	max. 3 $\mu\text{s}$

prepared by:	H.Sandmann	date of publication:	2009-11-30
approved by:	M.Leifeld	revision:	3.1


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**Elektrische Eigenschaften / Electrical properties**  
 Charakteristische Werte / Characteristic values

Freiwerdezeit circuit commutated turn-off time	$T_{vj} = T_{vj\ max}$ , $i_{TM} = I_{TAVM}$ $V_{RM} = 100\ V$ , $V_{DM} = 0,67\ V_{DRM}$ $dv_D/dt = 20\ V/\mu s$ , $-di_T/dt = 10\ A/\mu s$ 4.Kennbuchstabe / 4 <sup>th</sup> letter O	$t_q$	typ. 200	$\mu s$
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**Thermische Eigenschaften / Thermal properties**

Innerer Wärmewiderstand thermal resistance, junction to case	<u>Kühlfläche / cooling surface</u> beidseitig / two-sided, $\theta = 180^\circ\text{sin}$ beidseitig / two-sided, DC Anode / anode, $\theta = 180^\circ\text{sin}$ Anode / anode, DC Kathode / cathode, $\theta = 180^\circ\text{sin}$ Kathode / cathode, DC	$R_{thJC}$	max. 0,062 °C/W max. 0,055 °C/W max. 0,092 °C/W max. 0,085 °C/W max. 0,162 °C/W max. 0,155 °C/W	
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	<u>Kühlfläche / cooling surface</u> beidseitig / two-sides einseitig / single-sides	$R_{thCH}$	max. 0,015 °C/W max. 0,030 °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	3...6	kN
Steueranschlüsse control terminals	Gate (flat) Gate (round, based on AMP 60598) Kathode / cathode		A 2,8x0,5 mm $\varnothing 1,5$ mm A 4,8x0,5 mm	
Gewicht weight		G	typ. 70	g
Kriechstrecke creepage distance			6	mm
Schwingfestigkeit vibration resistance	f = 50 Hz		50	m/s <sup>2</sup>

**N**

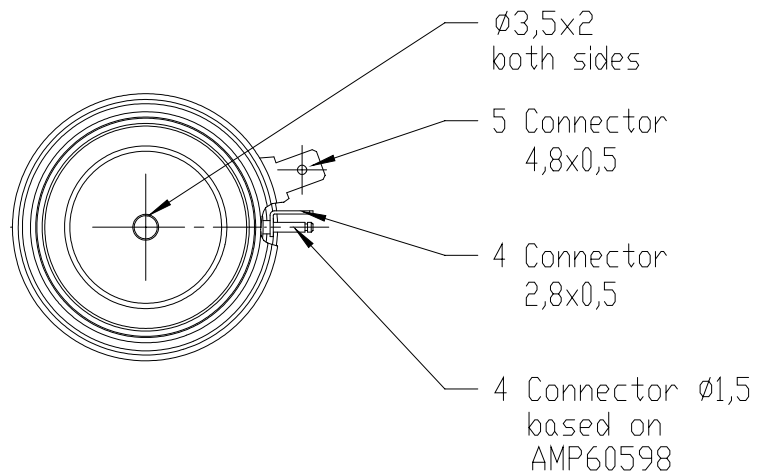
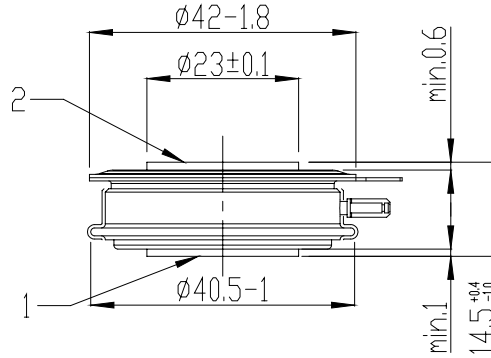
# Datenblatt / Data sheet



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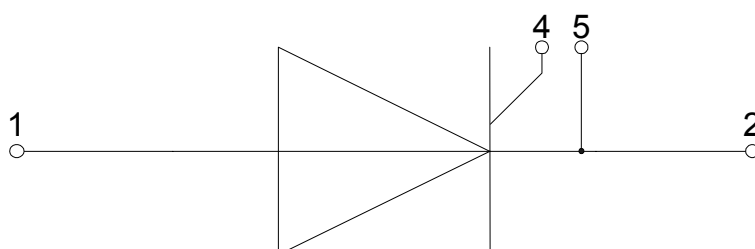
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strike distance: 5mm  
creepage distance: 6mm

overall height based  
on contact pressure



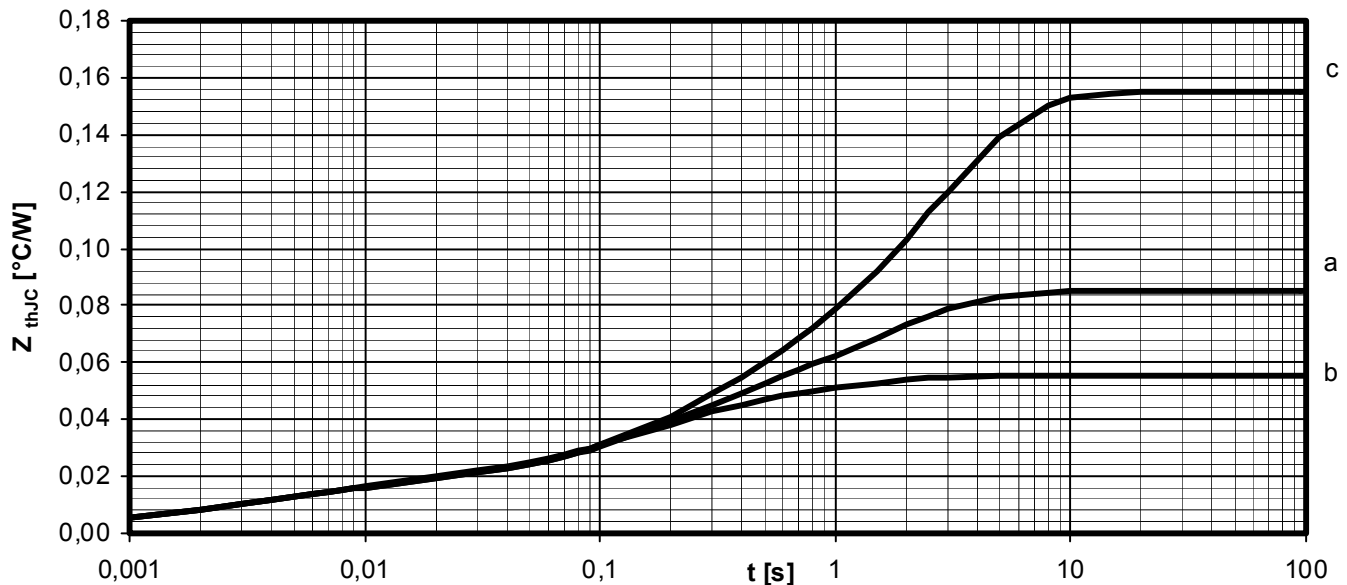
- 1: Anode / Anode**
- 2: Kathode / Cathode**
- 4: Gate**
- 5: Hilfskathode/  
Auxiliary Cathode**


**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]	0,00138	0,00480	0,01087	0,02436	0,01359	-	-
	$\tau_n$ [s]	0,00040	0,00135	0,00685	0,14400	0,82500	-	-
anodenseitig anode-sided	$R_{thn}$ [°C/W]	0,00138	0,00480	0,01073	0,02573	0,04236	-	-
	$\tau_n$ [s]	0,00040	0,00135	0,00685	0,18400	1,57000	-	-
kathodenseitig cathode-sided	$R_{thn}$ [°C/W]	0,00138	0,00480	0,01073	0,02573	0,11236	-	-
	$\tau_n$ [s]	0,00040	0,00135	0,00685	0,21400	2,57000	-	-

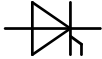
Analytische Funktion / Analytical function:

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


**Transienter innerer Wärmewiderstand für DC / Transient thermal impedance for DC**

$$Z_{thJC} = f(t)$$

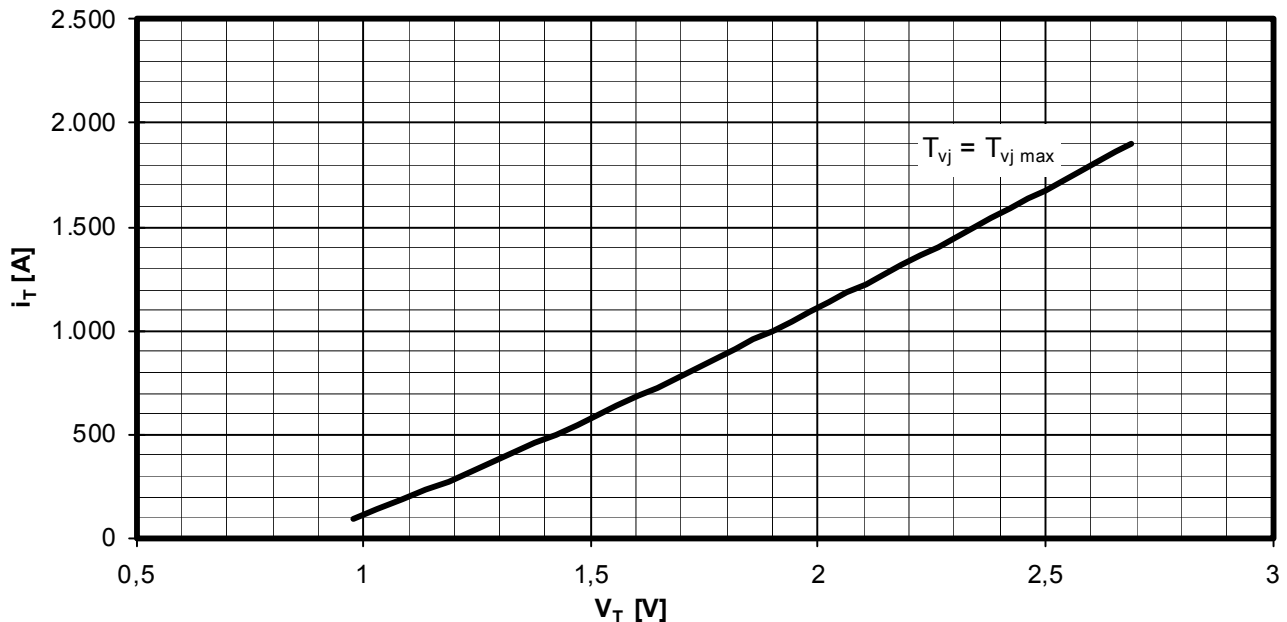
- a - Anodenseitige Kühlung / Anode-sided cooling
- b - Beidseitige Kühlung / Two-sided cooling
- c - Kathodenseitige Kühlung / Cathode-sided cooling

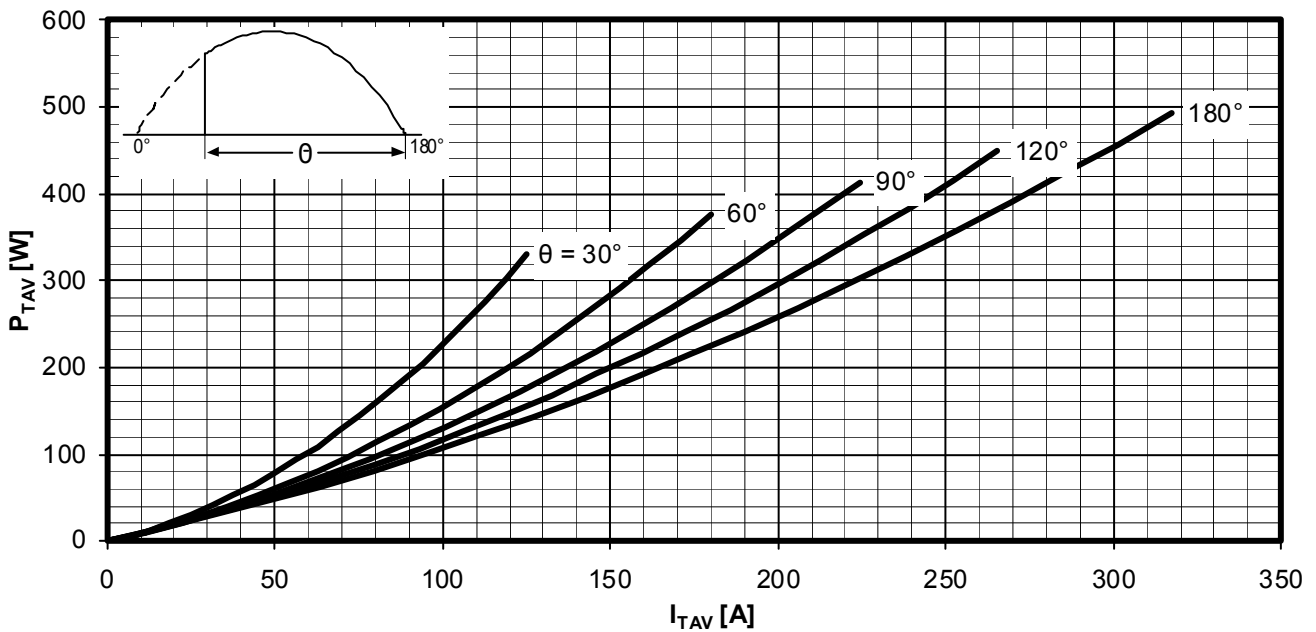
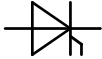

**Erhöhung des  $Z_{th DC}$  bei Sinus und Rechteckströmen mit unterschiedlichen Stromflusswinkeln  $\Theta$**   
**Rise of  $Z_{th DC}$  for sinewave and rectangular current with different current conduction angles  $\Theta$** 
 $\Delta Z_{th \Theta rec} / \Delta Z_{th \Theta sin}$ 

Kühlung / Cooling		$\Theta = 180^\circ$	$\Theta = 120^\circ$	$\Theta = 90^\circ$	$\Theta = 60^\circ$	$\Theta = 30^\circ$
beidseitig two-sided	$\Delta Z_{th \Theta rec}$ [°C/W]	0,01387	0,02408	0,03241	0,04576	0,07162
	$\Delta Z_{th \Theta sin}$ [°C/W]	0,00683	0,01098	0,01691	0,02785	0,05295
anodenseitig anode-sided	$\Delta Z_{th \Theta rec}$ [°C/W]	0,01369	0,02382	0,03210	0,04539	0,07120
	$\Delta Z_{th \Theta sin}$ [°C/W]	0,00666	0,01075	0,01665	0,02751	0,05255
kathodenseitig cathode-sided	$\Delta Z_{th \Theta rec}$ [°C/W]	0,01368	0,02380	0,03208	0,04536	0,07118
	$\Delta Z_{th \Theta sin}$ [°C/W]	0,00665	0,01072	0,01662	0,02747	0,05253

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

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

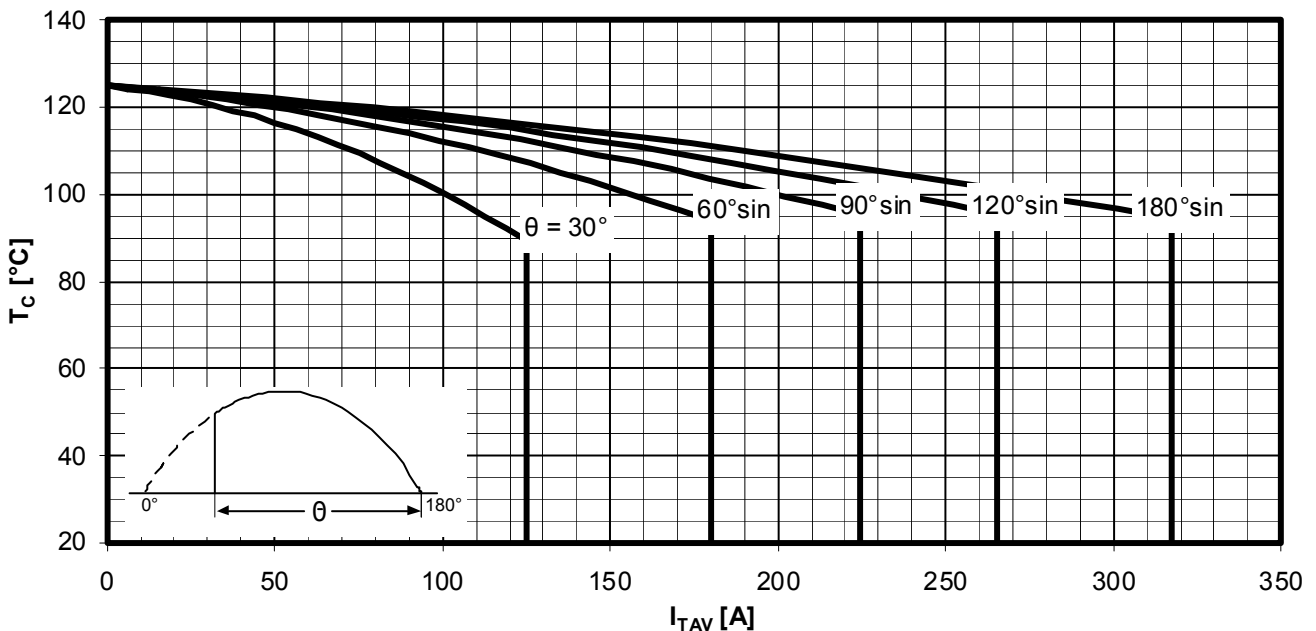

**Grenzdurchlasskennlinie / Limiting on-state characteristic  $i_T = f(v_T)$** 
 $T_{vj} = T_{vj max}$



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

Sinusförmiger Strom / Sinusoidal current

Parameter: Stromflusswinkel  $\Theta$  / Current conduction angle  $\Theta$

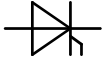


Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature  $T_c = f(I_{TAV})$

Sinusförmiger Strom / Sinusoidal current

Beidseitige Kühlung / Two-sided cooling

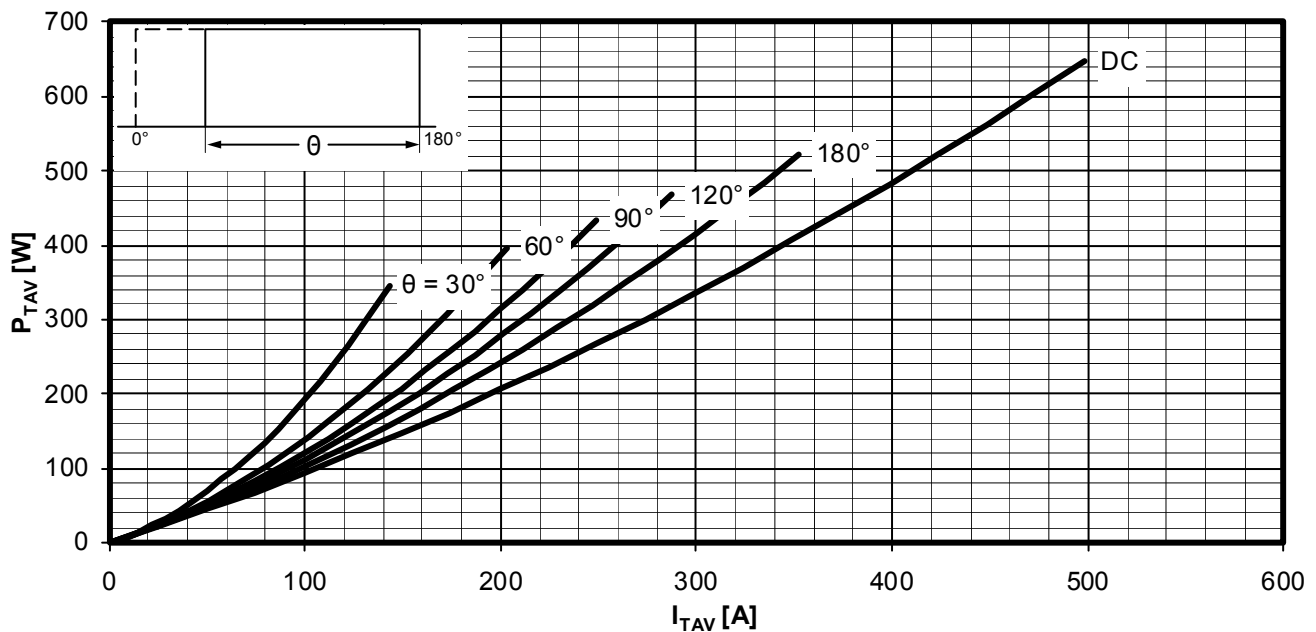
Parameter: Stromflusswinkel  $\Theta$  / Current conduction angle  $\Theta$



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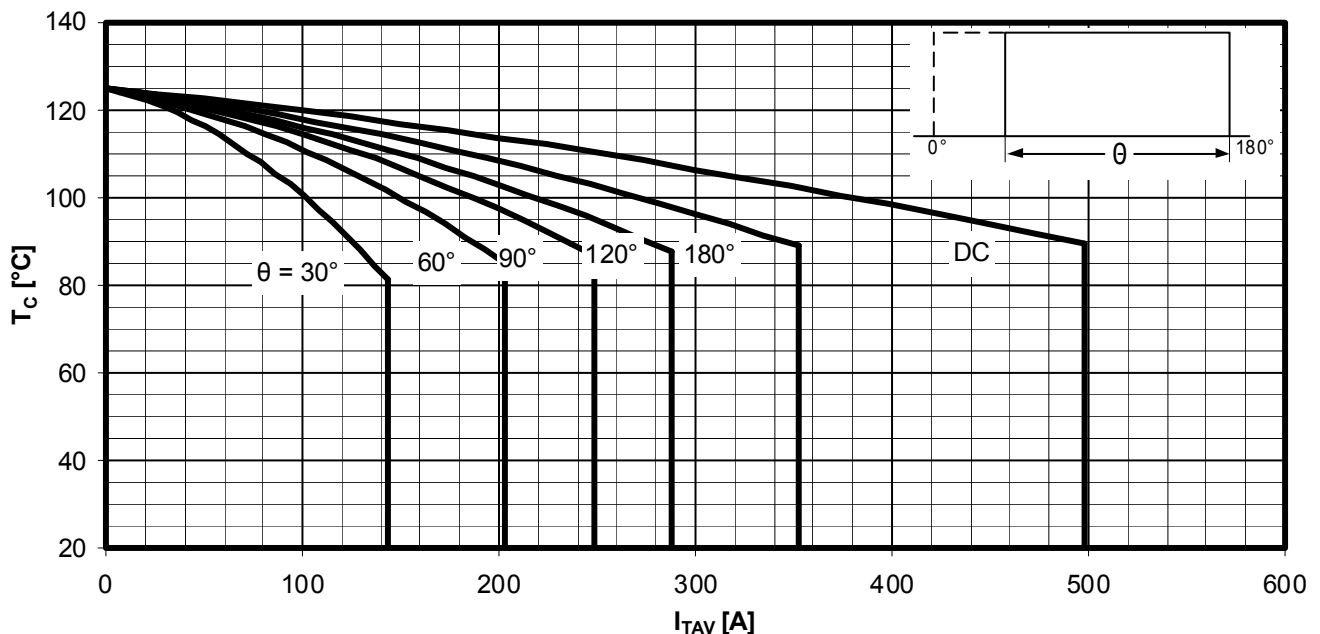
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Durchlassverlustleistung / On-state power loss  $P_{TAV} = f(I_{TAV})$

Rechteckförmiger Strom / Rectangular current

Parameter: Stromflusswinkel  $\Theta$  / Current conduction angle  $\Theta$

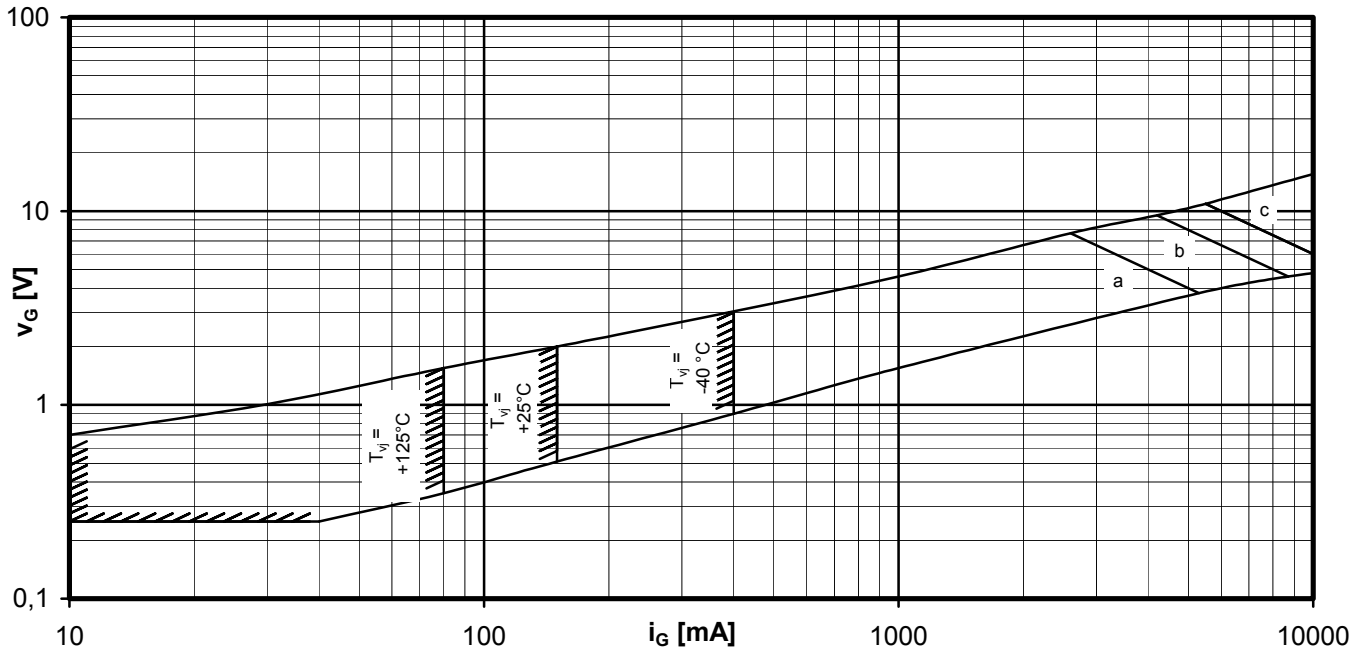
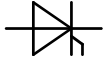


Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature  $T_c = f(I_{TAV})$

Rechteckförmiger Strom / Rectangular current

Beidseitige Kühlung / Two-sided cooling

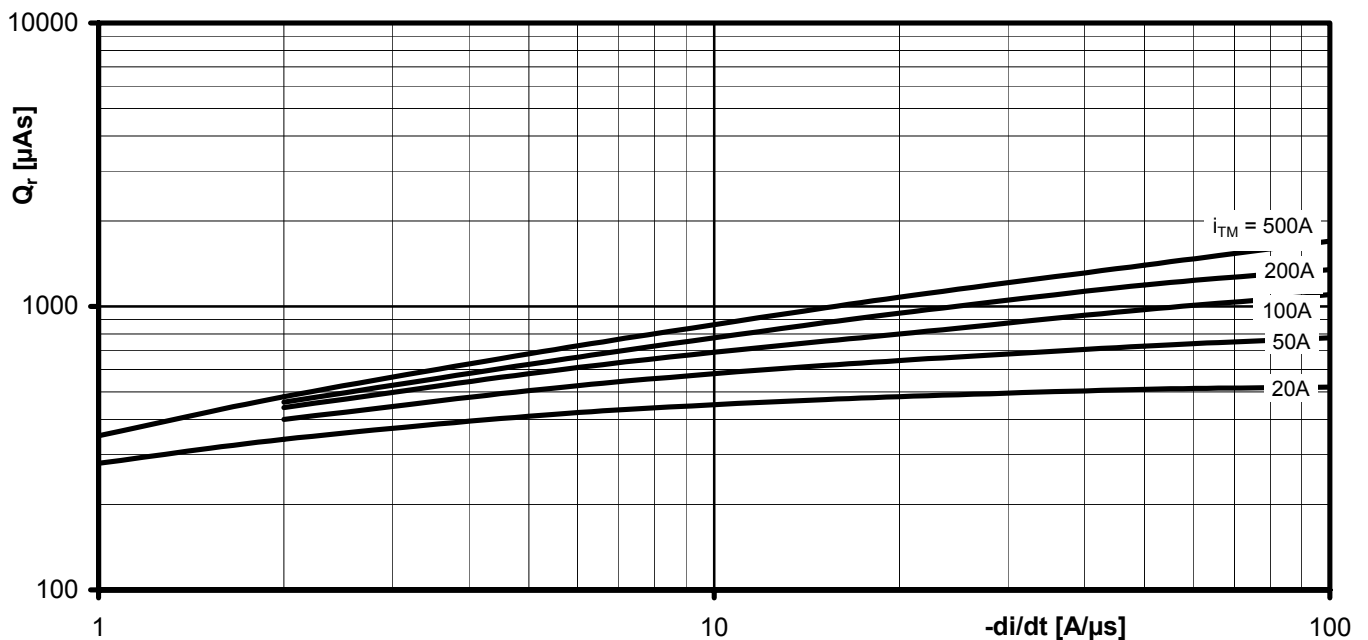
Parameter: Stromflusswinkel  $\Theta$  / Current conduction angle  $\Theta$



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

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

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

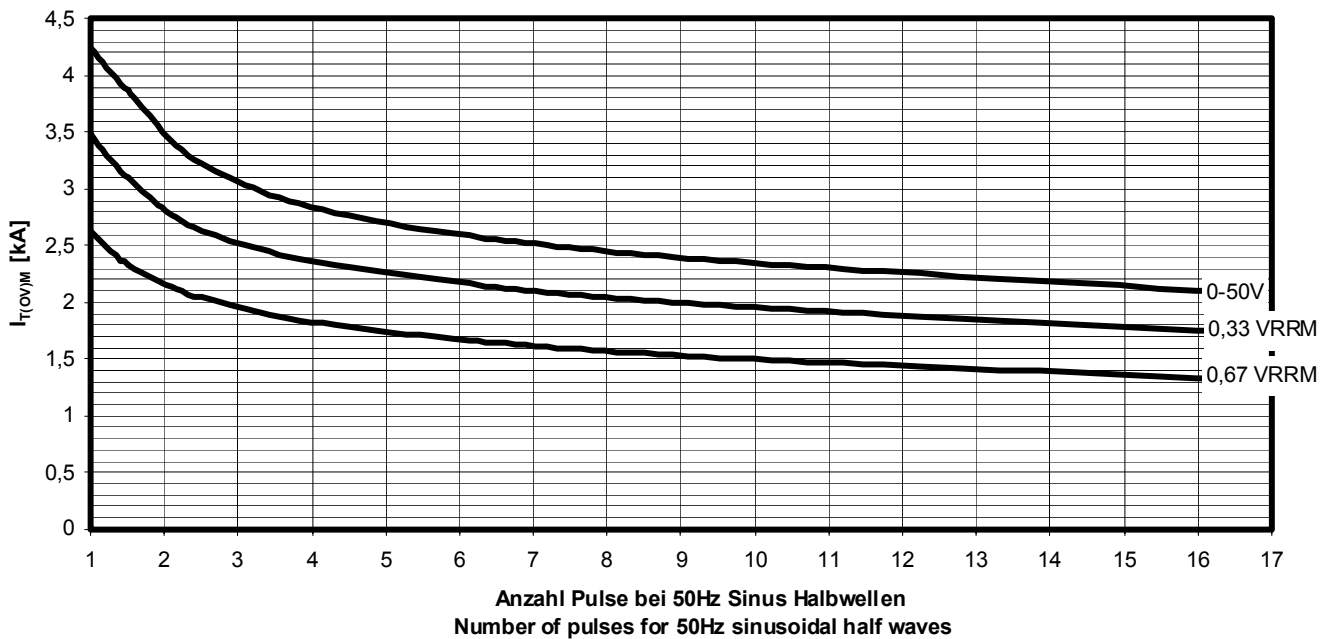


Sperrverzögerungsladung / Recovered charge  $Q_r = f(di/dt)$

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

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  $V_{RM}$**   
 $I_{T(OV)M} = f(\text{pulses}, V_{RM}) ; T_{vj} = T_{vjmax}$