N		Datenblatt / Data sheet	eupec
Netz-Thyristor-Modul **Phase Control Thyristor Modul**		**TT92N**	

TT92N **TT92N..K..-A** **TT92N..K..-K**
TD92N **TD92N..K..-A** **NT92N**
DT92N **DT92N..K..-K**

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}	1000 1200 1400 1600	V V
Vorwärts-Stoßspitzensperrspannung non-repetitive peak forward off-state voltage	T_{vj} = -40°C... $T_{vj\,max}$	V_{DSM}	1000 1200 1400 1600	V V
Rückwärts-Stoßspitzensperrspannung non-repetitive peak reverse voltage	T_{vj} = +25°C... $T_{vj\,max}$	V_{RSM}	1100 1300 1500 1700	V V
Durchlaßstrom-Grenzeffektivwert maximum RMS on-state current		I_{TRMSM}	160	A
Dauergrenzstrom average on-state current	T_C = 85°C T_C = 76°C	I_{TAVM}	92 104	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}	2050 1800	A A
Grenzlastintegral I²t-value	T_{vj} = 25 °C, t_P = 10 ms T_{vj} = $T_{vj\,max}$, t_P = 10 ms	I²t	21000 16200	A²s A²s
Kritische Stromsteilheit critical rate of rise of on-state current	DIN IEC 747-6 f = 50 Hz, i_{GM} = 1 A, di_G/dt = 1 A/µs	$(di_T/dt)_{cr}$	150	A/µs
Kritische Spannungssteilheit critical rate of rise of off-state voltage	T_{vj} = $T_{vj\,max}$, v_D = 0,67 V_{DRM} 6.Kennbuchstabe / 6th letter C 6.Kennbuchstabe / 6th letter F	$(dv_D/dt)_{cr}$	 500 1000	 V/µs V/µs

Charakteristische Werte / Characteristic values

Durchlaßspannung on-state voltage	T_{vj} = $T_{vj\,max}$, i_T = 300 A	v_T	max. 1,62	V
Schleusenspannung threshold voltage	T_{vj} = $T_{vj\,max}$	$V_{(TO)}$	0,85	V
Ersatzwiderstand slope resistance	T_{vj} = $T_{vj\,max}$	r_T	2,15	mΩ
Zündstrom gate trigger current	T_{vj} = 25°C, v_D = 6 V	I_{GT}	max. 120	mA
Zündspannung gate trigger voltage	T_{vj} = 25°C, v_D = 6 V	V_{GT}	max. 1,4	V
Nicht zündender Steuerstrom gate non-trigger current	T_{vj} = $T_{vj\,max}$, v_D = 6 V T_{vj} = $T_{vj\,max}$, v_D = 0,5 V_{DRM}	I_{GD}	max. 5,0 max. 2,5	mA mA
Nicht zündende Steuerspannung gate non-trigger voltage	T_{vj} = $T_{vj\,max}$, v_D = 0,5 V_{DRM}	V_{GD}	max. 0,2	V
Haltestrom holding current	T_{vj} = 25°C, v_D = 6 V, R_A = 5 Ω	I_H	max. 200	mA
Einraststrom latching current	T_{vj} = 25°C, v_D = 6 V, R_{GK} ≥ 10 Ω i_{GM} = 1 A, di_G/dt = 1 A/µs, t_g = 20 µs	I_L	max. 620	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. 25	mA
Zündverzug gate controlled delay time	DIN IEC 747-6 T_{vj} = 25 °C,i_{GM} = 1 A, di_G/dt = 1 A/µs	t_{gd}	max. 3	µs

prepared by:	C.Drilling		date of publication:	18.12.01
approved by:	J. Novotny		revision:	1

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 5.Kennbuchstabe / 5th letter O	t_q	typ. 150	µs
Isolations-Prüfspannung insulation test voltage	RMS, f = 50 Hz, t = 1 min RMS, f = 50 Hz, t = 1 sec	V_{ISOL}	2,5 3,0	kV kV

Thermische Eigenschaften / Thermal properties

Innerer Wärmewiderstand thermal resistance, junction to case	pro Modul / per Module, Θ = 180° sin pro Zweig / per arm, Θ = 180° sin pro Modul / per Module, DC pro Zweig / per arm, DC	R_{thJC}	max. 0,185 max. 0,370 max. 0,175 max. 0,350	°C/W °C/W °C/W °C/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per Module pro Zweig / per arm	R_{thCH}	max. 0,05 max. 0,10	°C/W °C/W
Höchstzulässige Sperrschichttemperatur maximum junction temperature		$T_{vj\,max}$	130	°C
Betriebstemperatur operating temperature		$T_{c\,op}$	-40...+130	°C
Lagertemperatur storage temperature		T_{stg}	-40...+130	°C

Mechanische Eigenschaften / Mechanical properties

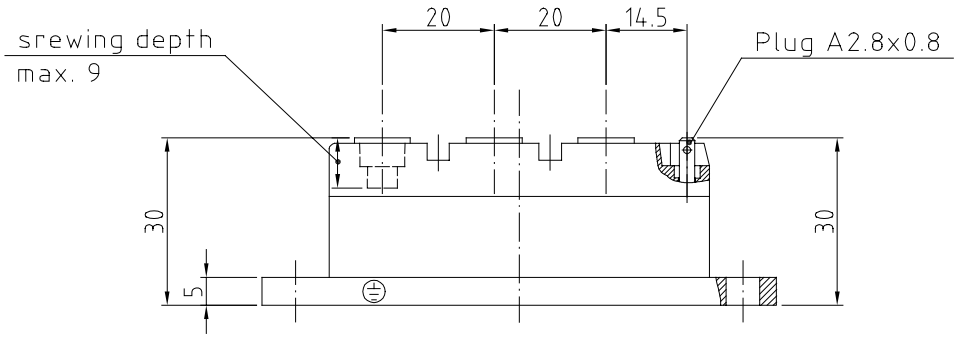
Gehäuse, siehe Anlage case, see annex			Seite 3 page 3	
Si-Element mit Druckkontakt Si-pellet with pressure contact				
Innere Isolation internal insulation			AlN	
Anzugsdrehmoment für mechanische Anschlüsse mounting torque	Toleranz / Tolerance ± 15%	M1	4	Nm
Anzugsdrehmoment für elektrische Anschlüsse terminal connection torque	Toleranz / Tolerance + 5% / - 10%	M2	4	Nm
Steueranschlüsse control terminals	DIN 46 244		A 2,8 x 0,8	
Gewicht weight		G	typ. 160	g
Kriechstrecke creepage distance			12,5	mm
Schwingfestigkeit vibration resistance	f = 50 Hz		50	m/s²
UL-gelistet UL listed	file-No.		E 83336	

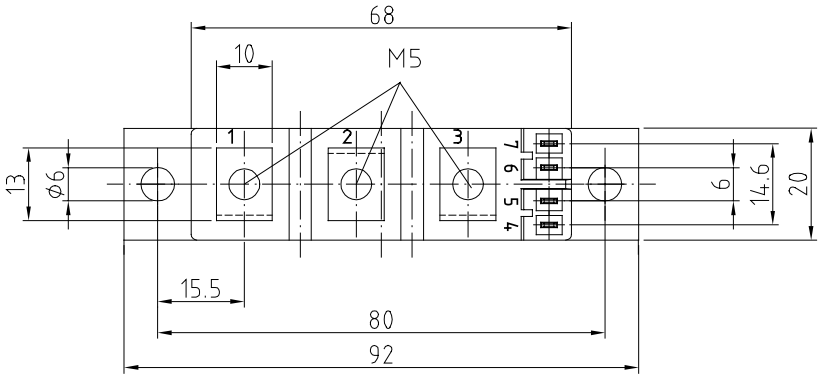
Mit diesem Datenblatt werden Halbleiterbauelemente spezifiziert, jedoch keine Eigenschaften zugesichert. Sie gilt in Verbindung mit den zugehörigen technischen Erläuterungen.

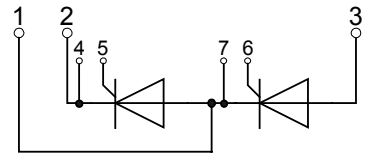
This data sheet specifies semiconductor devices, but promises no characteristics. It is valid in combination with the belonging technical notes.

Netz-Thyristor-Modul
Phase Control Thyristor Modul

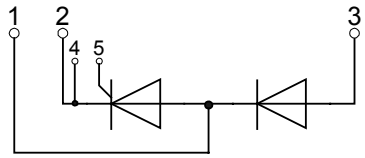
TT92N



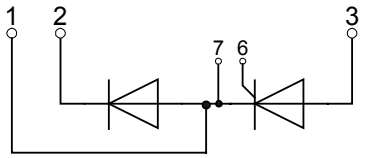




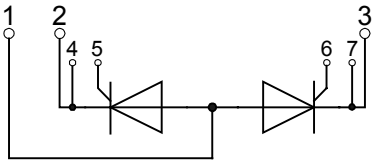
TT



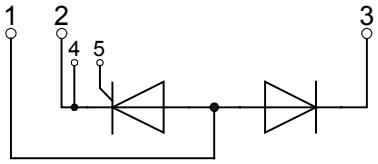
TD



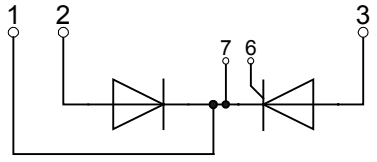
DT



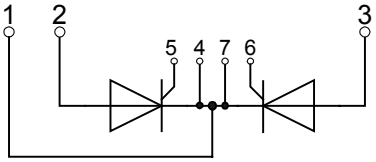
TT-A



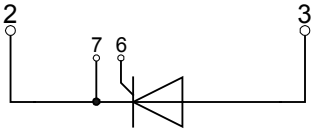
TD-A



DT-K



TT-K



NT

Analytische Elemente des transienten Wärmewiderstandes Z_{thJC} für DC Analytical elements of transient thermal impedance Z_{thJC} for DC							
Pos. n	1	2	3	4	5	6	7
R_{thn} [°C/W]	0,005	0,0195	0,0518	0,128	0,146		
τ_n [s]	0,00004	0,00223	0,022	0,235	1,24		
Analytische Funktion / Analytical function: $Z_{thJC} = \sum_{n=1}^{n_{max}} R_{thn} \left[1 - e^{\frac{-t}{\tau_n}}\right]$							

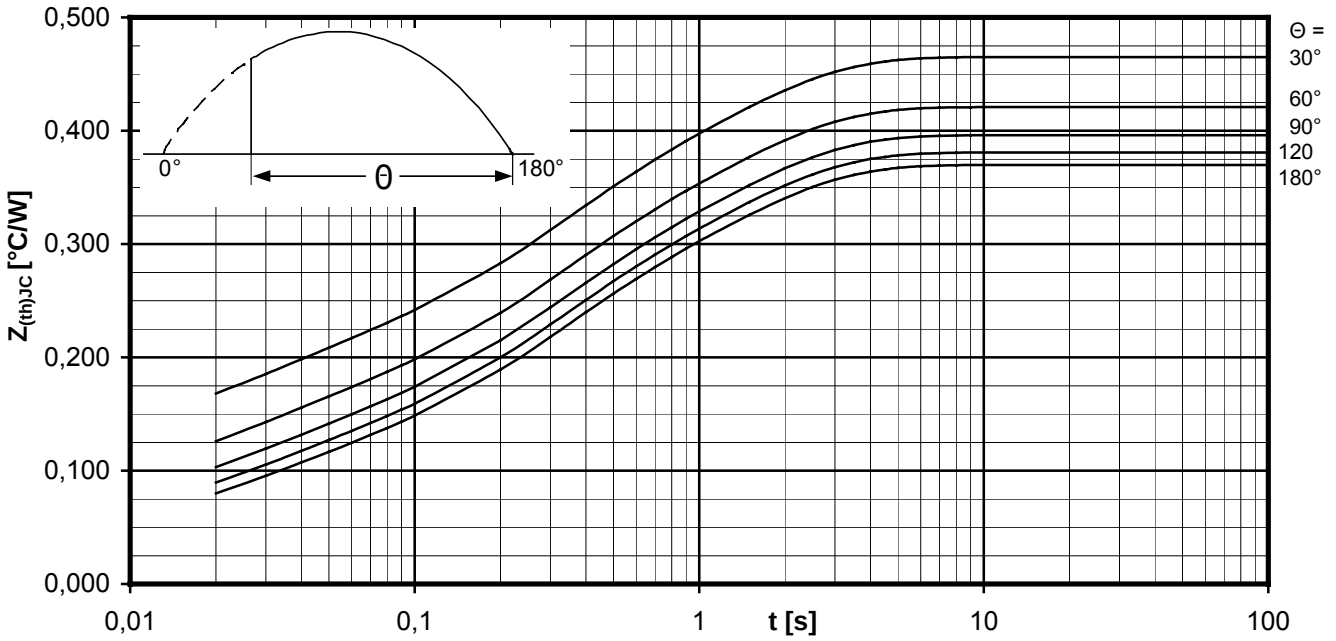
Natürliche Kühlung / Natural cooling
3 Module pro Kühler / 3 modules per heatsink
Kühler / Heatsink type: KM14 (50W)

Analytische Elemente des transienten Wärmewiderstandes Z_{thCA} Analytical elements of transient thermal impedance Z_{thCA}							
Pos. n	1	2	3	4	5	6	7
R_{thn} [°C/W]	0,007	0,141	0,119	2,133			
τ_n [s]	0,701	4,72	42,5	910			

Verstärkte Kühlung / Forced cooling
3 Module pro Kühler / 3 modules per heatsink
Kühler / Heatsink type: KM14 (Papst 4650N)

Analytische Elemente des transienten Wärmewiderstandes Z_{thCA} Analytical elements of transient thermal impedance Z_{thCA}							
Pos. n	1	2	3	4	5	6	7
R_{thn} [°C/W]	0,007	0,141	0,119	0,583			
τ_n [s]	0,701	4,72	42,5	249			

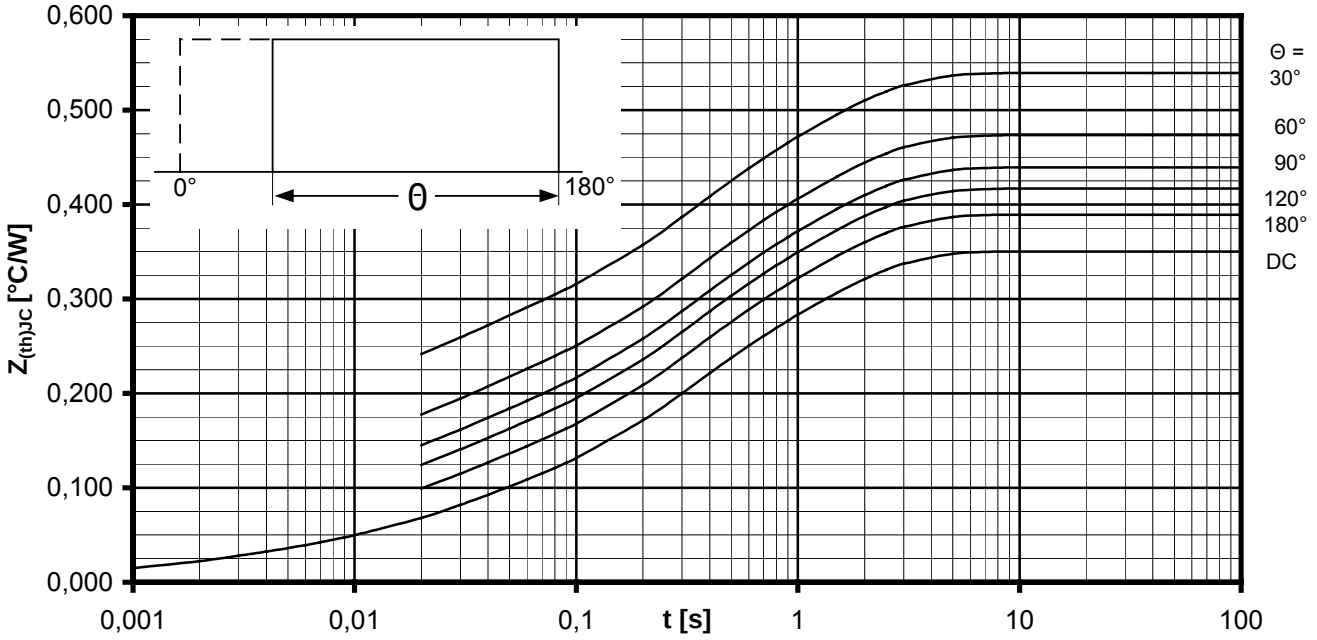
Analytische Funktion / Analytical function: $Z_{thCA} = \sum_{n=1}^{n_{max}} R_{thn} \left[1 - e^{\frac{-t}{\tau_n}}\right]$



Transienter innerer Wärmewiderstand je Zweig / Transient thermal impedance per arm $Z_{thJC} = f(t)$

Sinusförmiger Strom / Sinusoidal current

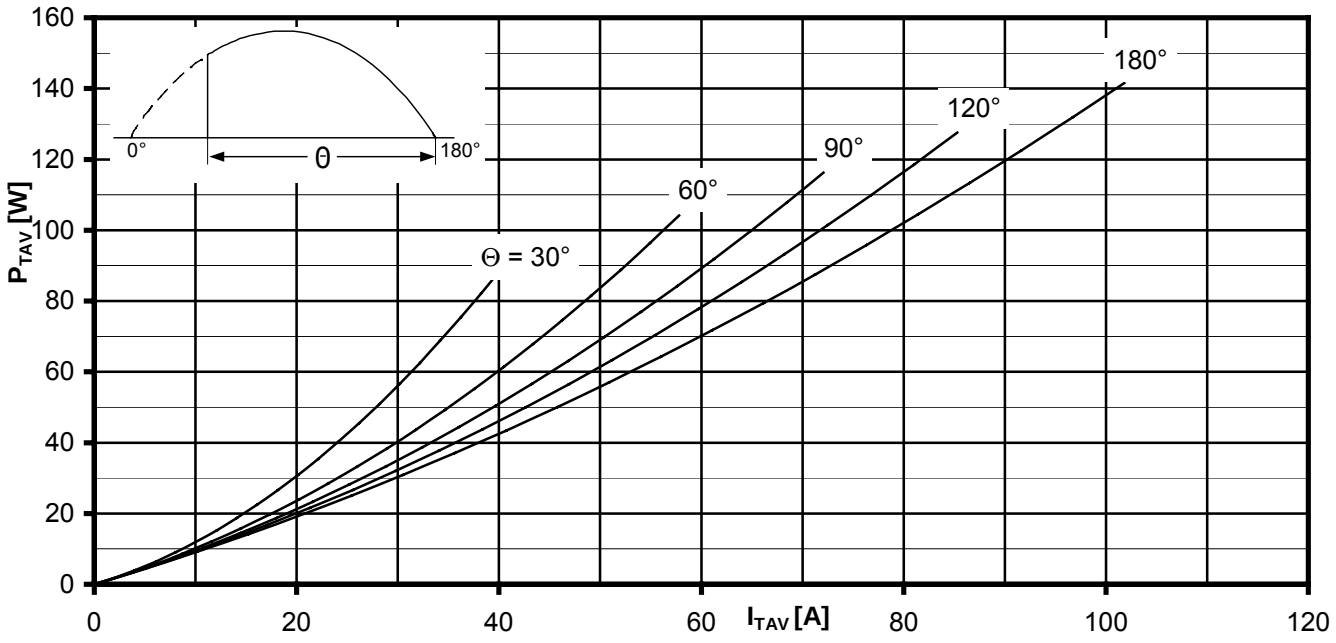
Parameter: Stromflußwinkel Θ / Current conduction angle Θ



Transienter innerer Wärmewiderstand je Zweig / Transient thermal impedance per arm $Z_{thJC} = f(t)$

Rechteckförmiger Strom / Rectangular current

Parameter: Stromflußwinkel Θ / Current conduction angle Θ

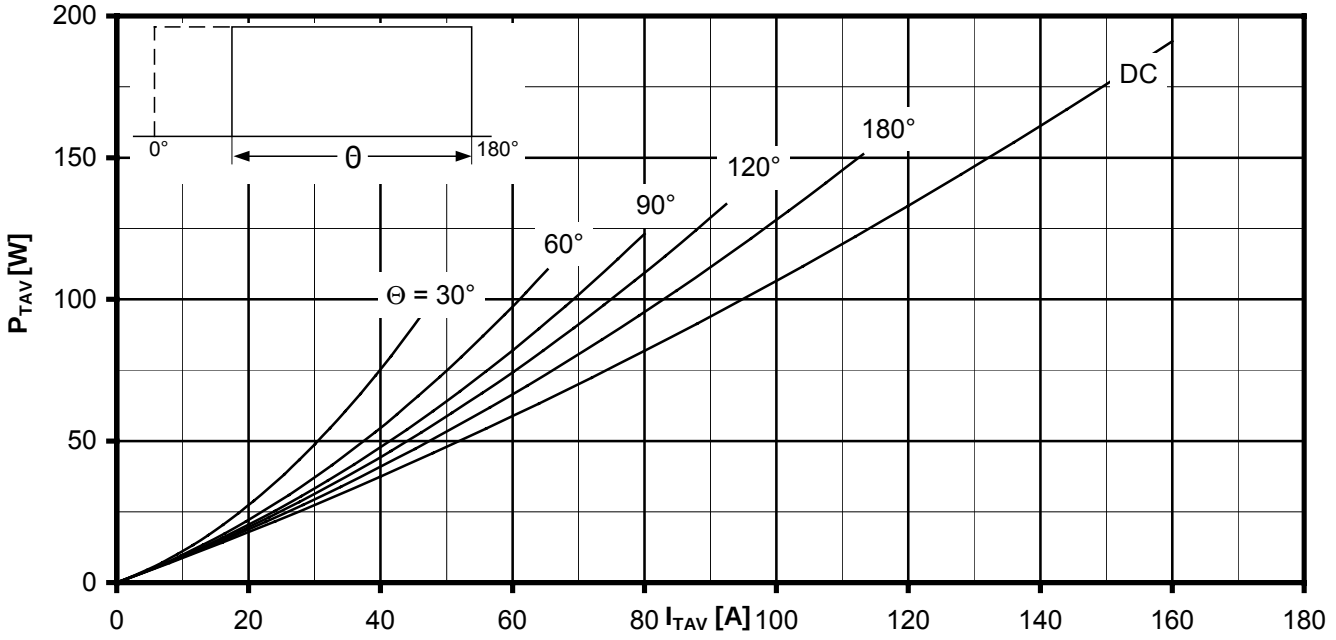


Durchlassverlustleistung je Zweig / On-state power loss per arm $P_{TAV} = f(I_{TAV})$

Sinusförmiger Strom / Sinusoidal current Strombelastung je Zweig / Current load per arm

Berechnungsgrundlage P_{TAV} (Schaltverluste gesondert berücksichtigen)
Calculation base P_{TAV} (switching losses should be considered separately)

Parameter: Stromflußwinkel / Current conduction angle Θ

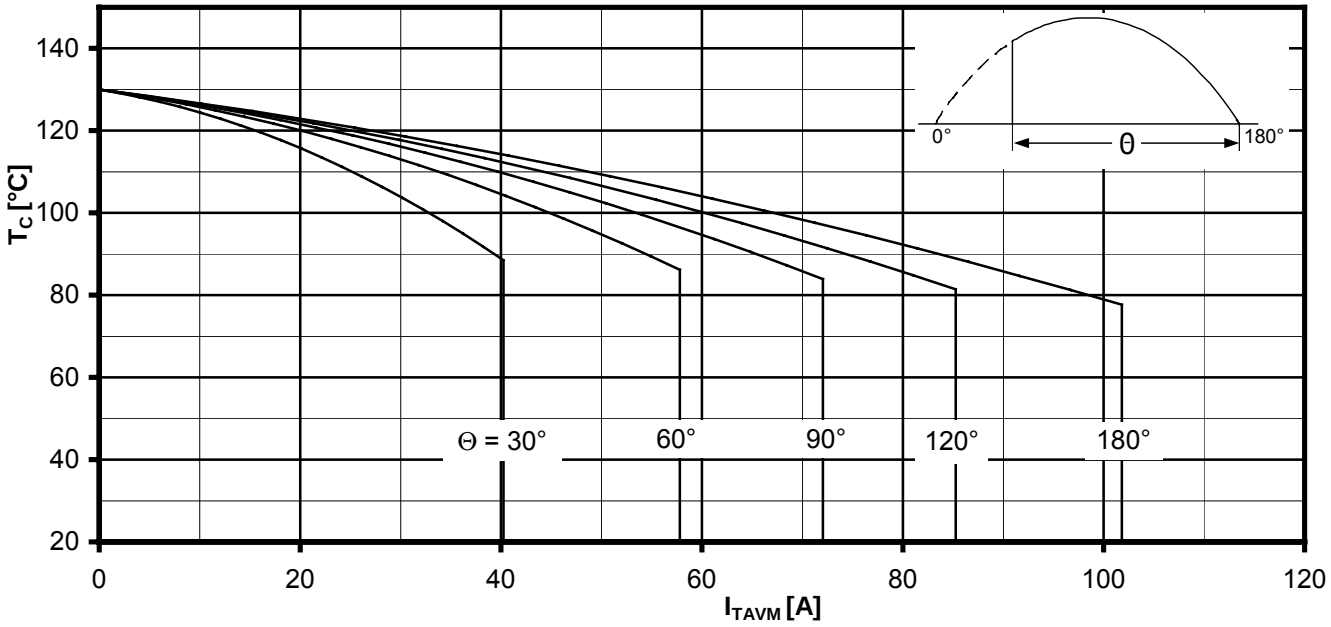


Durchlassverlustleistung je Zweig / On-state power loss per arm $P_{TAV} = f(I_{TAV})$

Rechteckförmiger Strom / Rectangular current Strombelastung je Zweig / Current load per arm

Berechnungsgrundlage P_{TAV} (Schaltverluste gesondert berücksichtigen)
Calculation base P_{TAV} (switching losses should be considered separately)

Parameter: Stromflußwinkel / Current conduction angle Θ

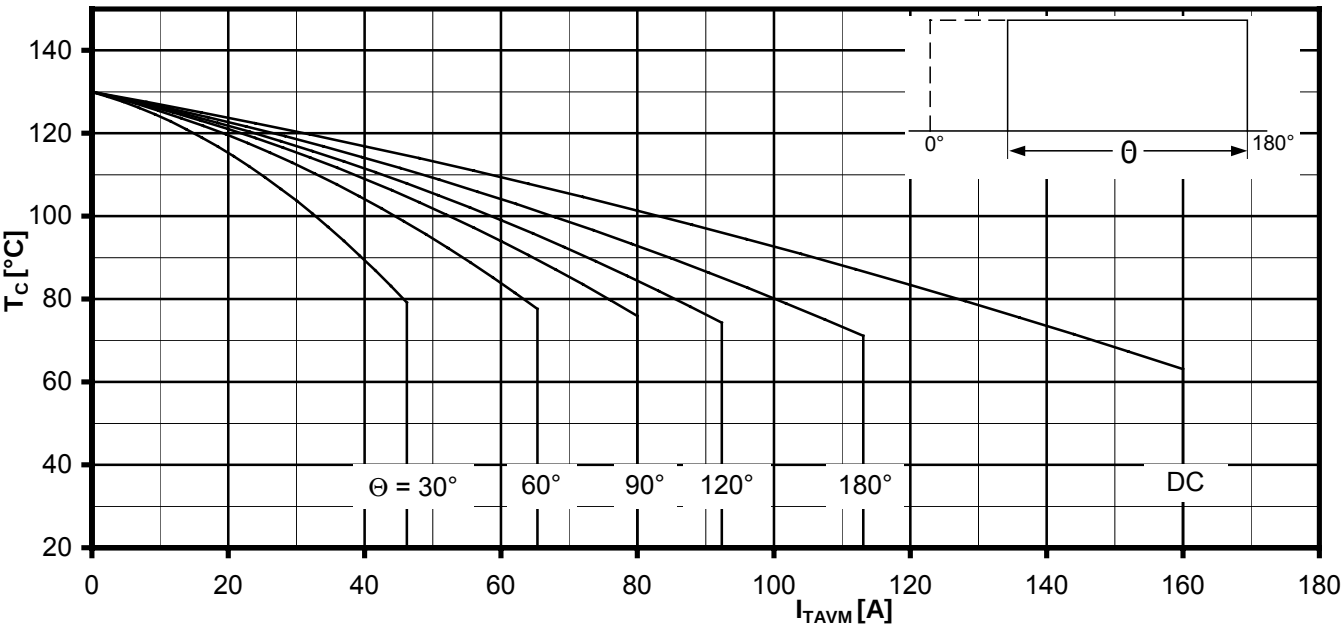


Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAVM})$

Sinusförmiger Strom / Sinusoidal current Strombelastung je Zweig / Current load per arm

Berechnungsgrundlage P_{TAV} (Schaltverluste gesondert berücksichtigen)
Calculation base P_{TAV} (switching losses should be considered separately)

Parameter: Stromflußwinkel Θ / Current conduction angle Θ

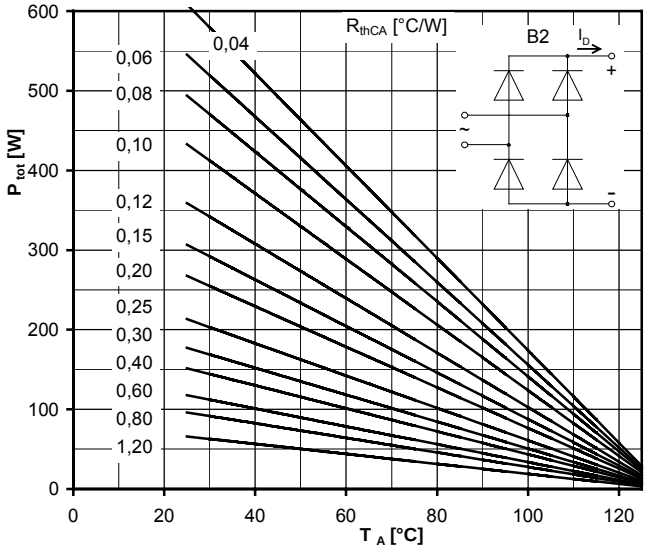


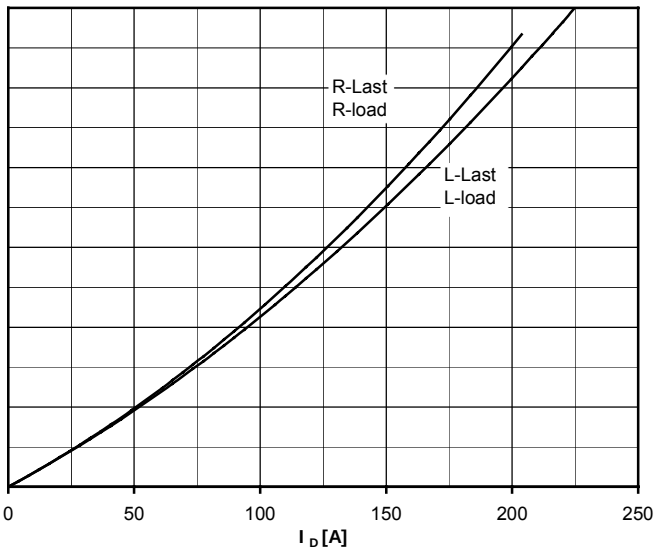
Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAVM})$

Rechteckförmiger Strom / Rectangular current Strombelastung je Zweig / Current load per arm

Berechnungsgrundlage P_{TAV} (Schaltverluste gesondert berücksichtigen)
Calculation base P_{TAV} (switching losses should be considered separately)

Parameter: Stromflußwinkel Θ / Current conduction angle Θ



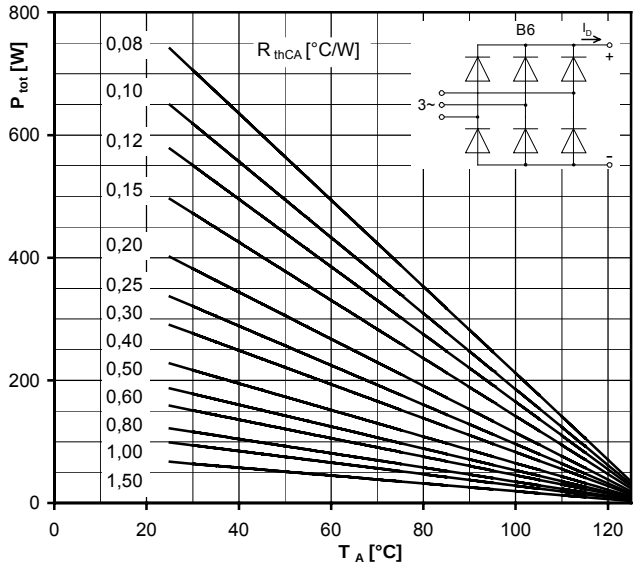


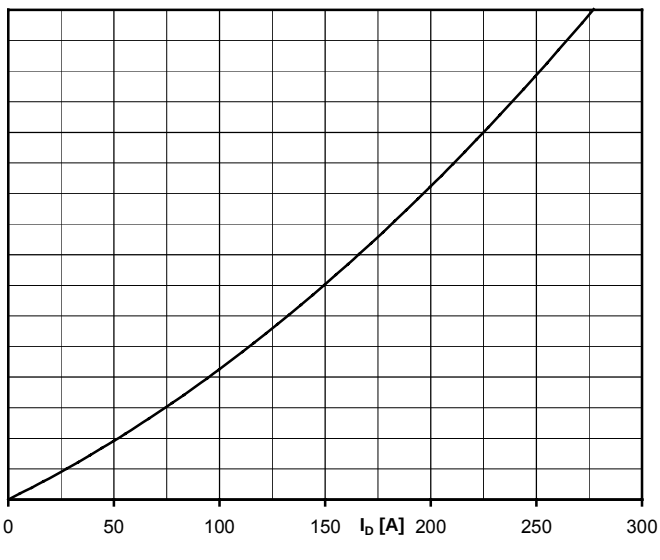
Höchstzulässiger Ausgangsstrom / Maximum rated output current I_D

B2- Zweipuls-Brückenschaltung / Two-pulse bridge circuit

Gesamtverlustleistung der Schaltung / Total power dissipation at circuit P_{tot}

Parameter:
Wärmewiderstand zwischen den Gehäusen und Umgebung / Thermal resistance cases to ambient R_{thCA}



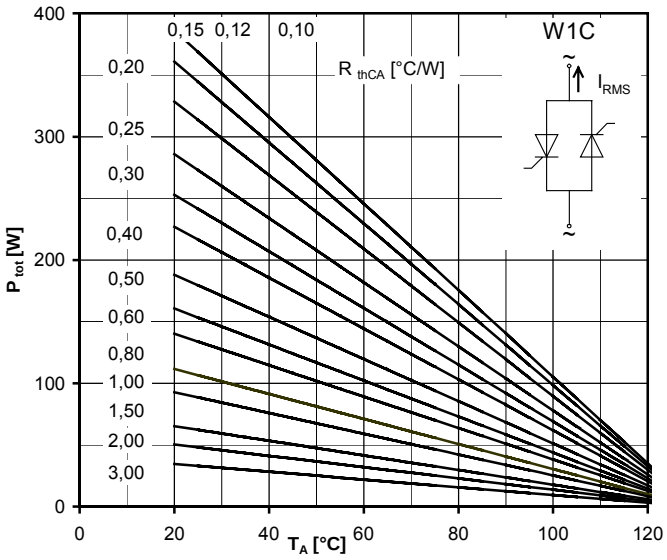


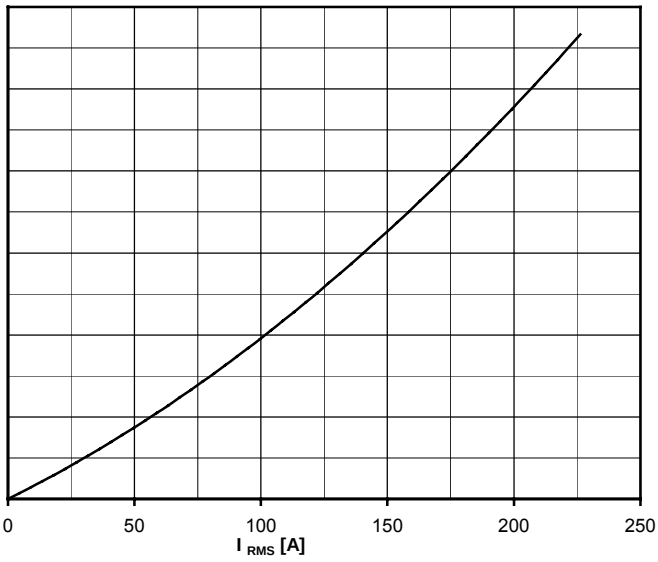
Höchstzulässiger Ausgangsstrom / Maximum rated output current I_D

B6- Sechspuls-Brückenschaltung / Six-pulse bridge circuit

Gesamtverlustleistung der Schaltung / Total power dissipation at circuit P_{tot}

Parameter:
Wärmewiderstand zwischen den Gehäusen und Umgebung / Thermal resistance cases to ambient R_{thCA}



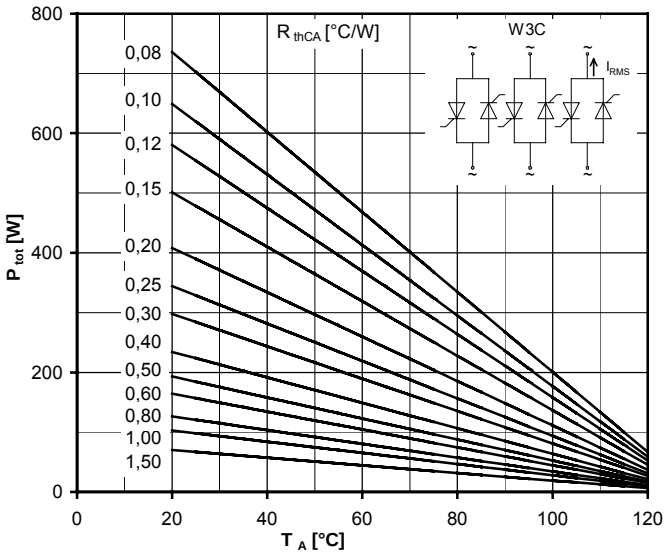


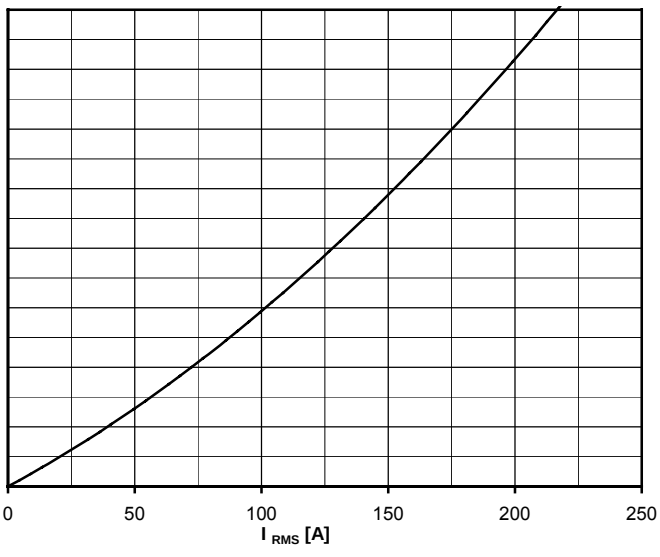
Höchstzulässiger Effektivstrom / Maximum rated RMS current I_{RMS}

W1C - Einphasen-Wechselwegschaltung / Single-phase inverse parallel circuit

Gesamtverlustleistung der Schaltung / Total power dissipation at circuit P_{tot}

Parameter:
Wärmewiderstand zwischen den Gehäuse und Umgebung / Thermal resistance case to ambient R_{thCA}



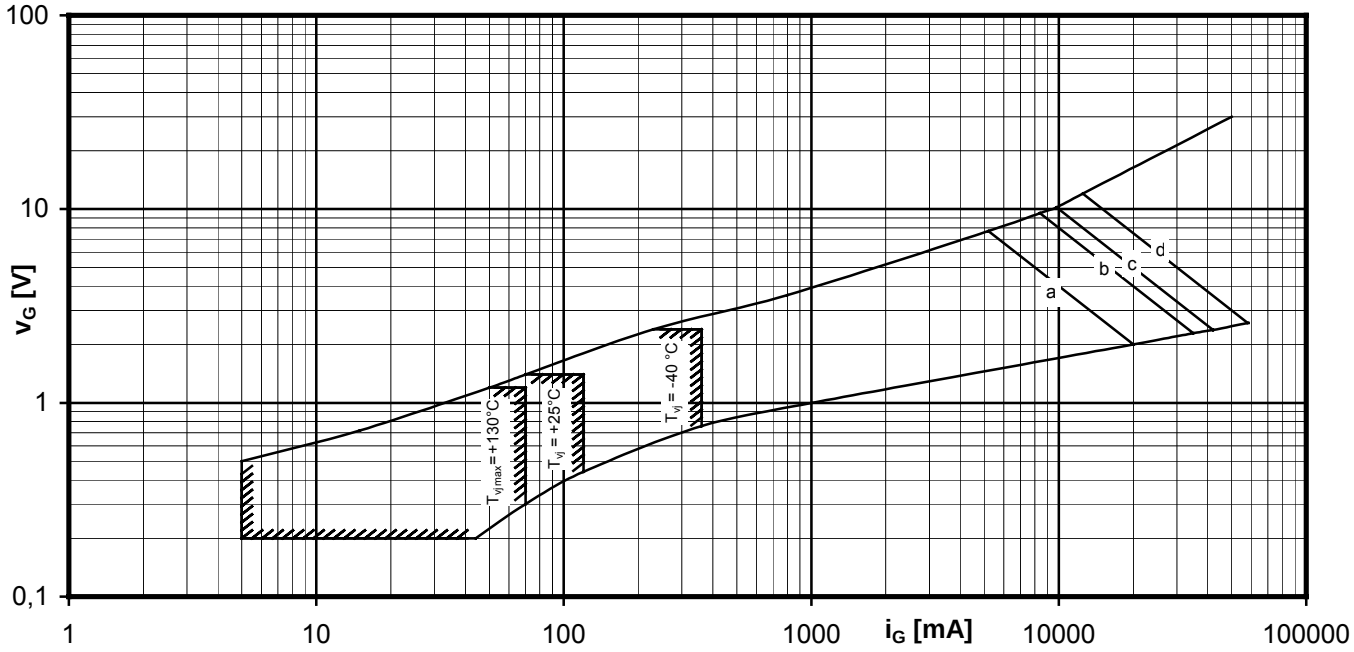


Höchstzulässiger Effektivstrom / Maximum rated RMS current I_{RMS}

W3C - Dreiphasen-Wechselwegschaltung / Three-phase inverse parallel circuit

Gesamtverlustleistung der Schaltung / Total power dissipation at circuit P_{tot}

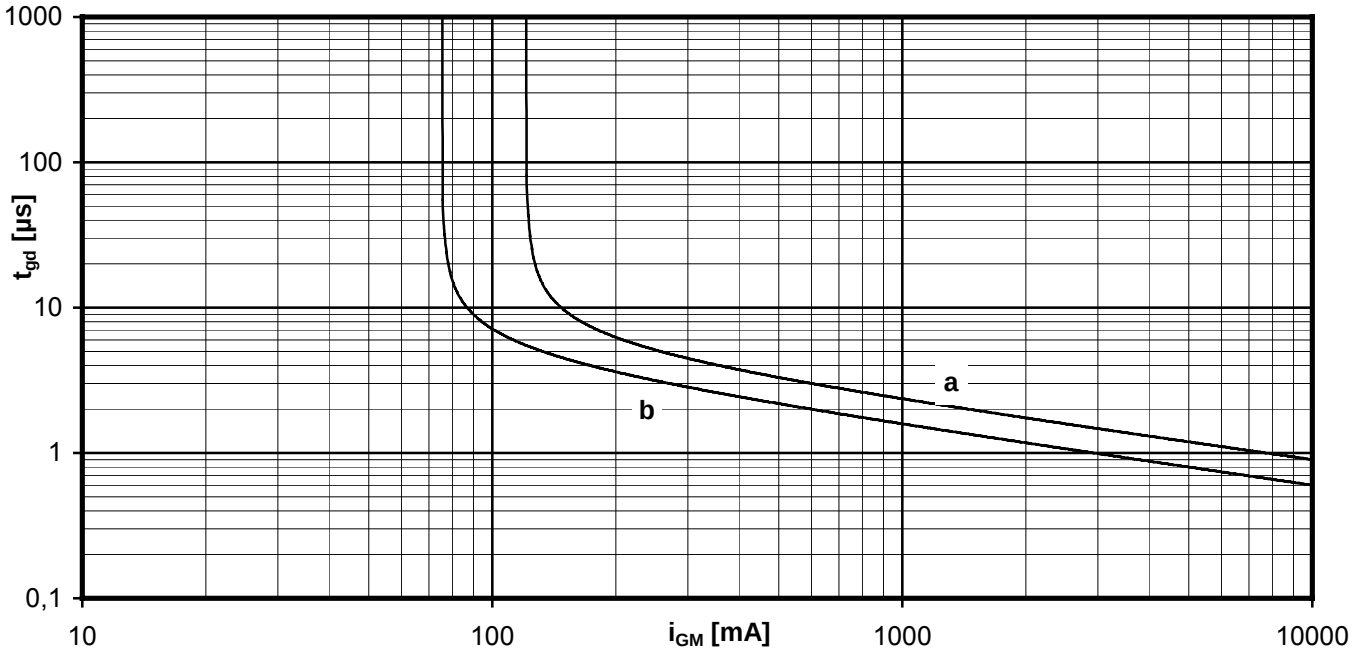
Parameter:
Wärmewiderstand zwischen den Gehäusen und Umgebung / Thermal resistance cases to ambient R_{thCA}



Steuercharakteristik $v_G = f(i_G)$ mit Zündbereichen für V_D = 6 V
Gate characteristic $v_G = f(i_G)$ with triggering area for V_D = 6 V

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

a - 40 W/10ms b - 80 W/1ms c - 100 W/0,5ms d – 150W/0,1ms

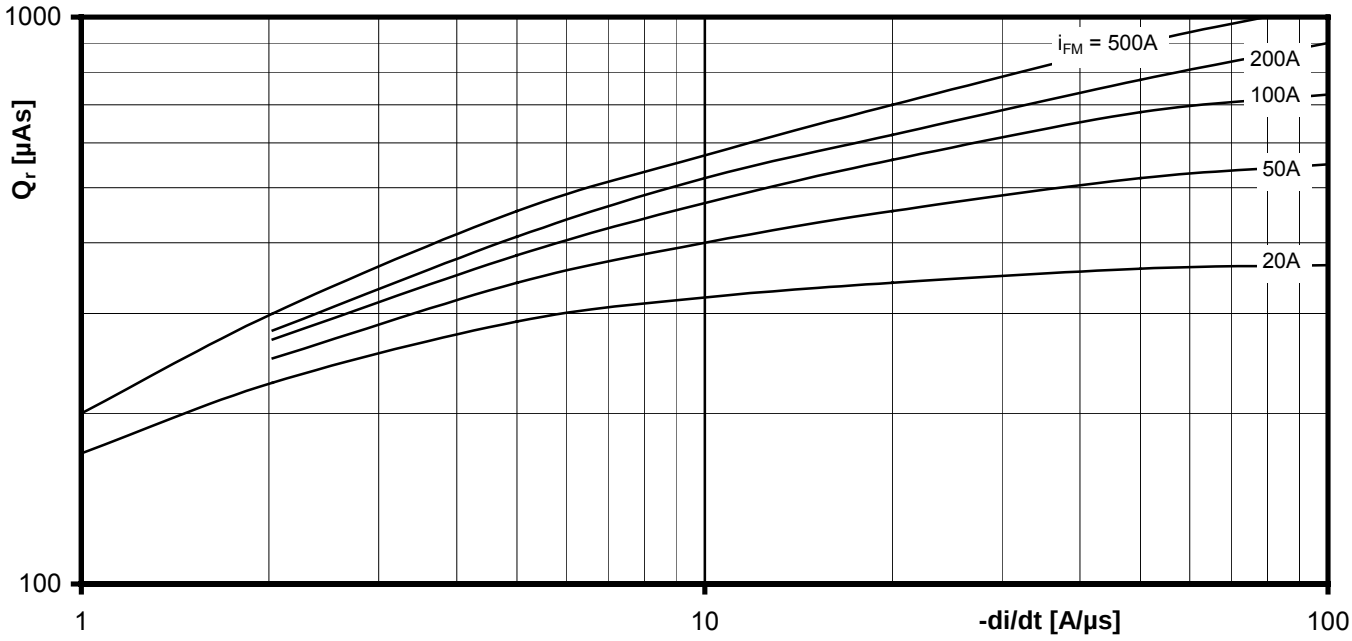


Zündverzug / Gate controlled delay time $t_{gd} = f(i_G)$

T_{vj} = 25°C, $di_G/dt = i_{GM}/1\mu s$

a - maximaler Verlauf / Limiting characteristic

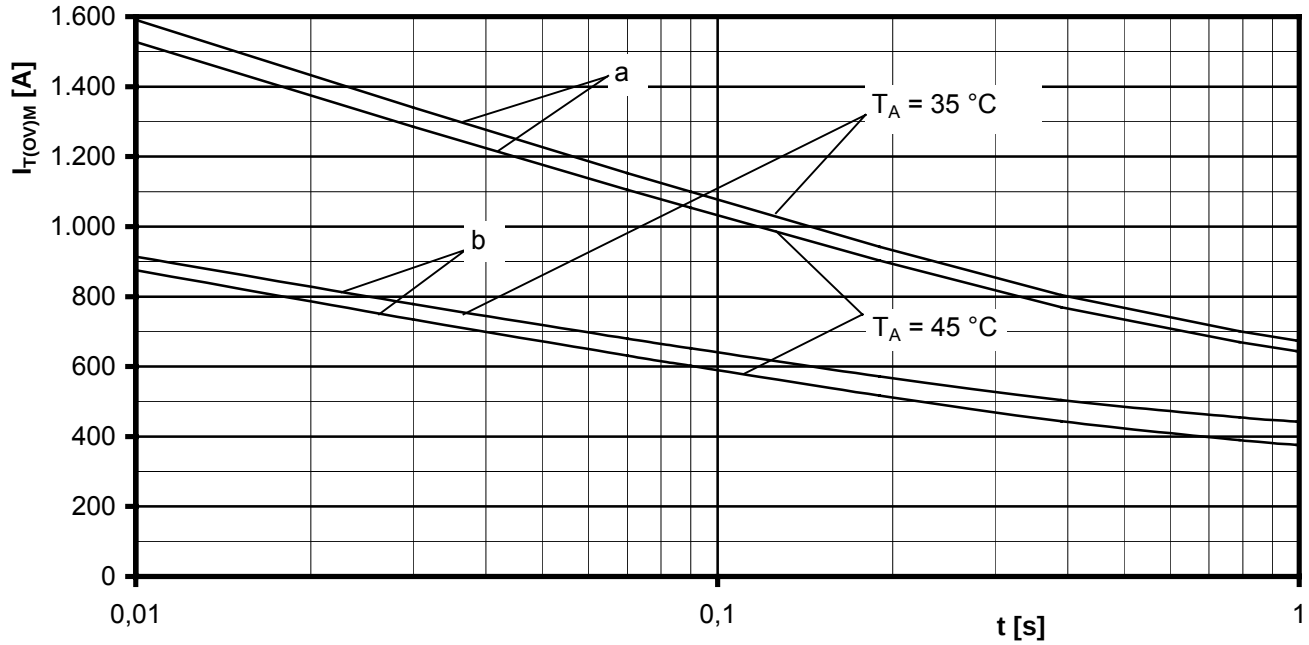
b - typischer Verlauf / Typical characteristic



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}

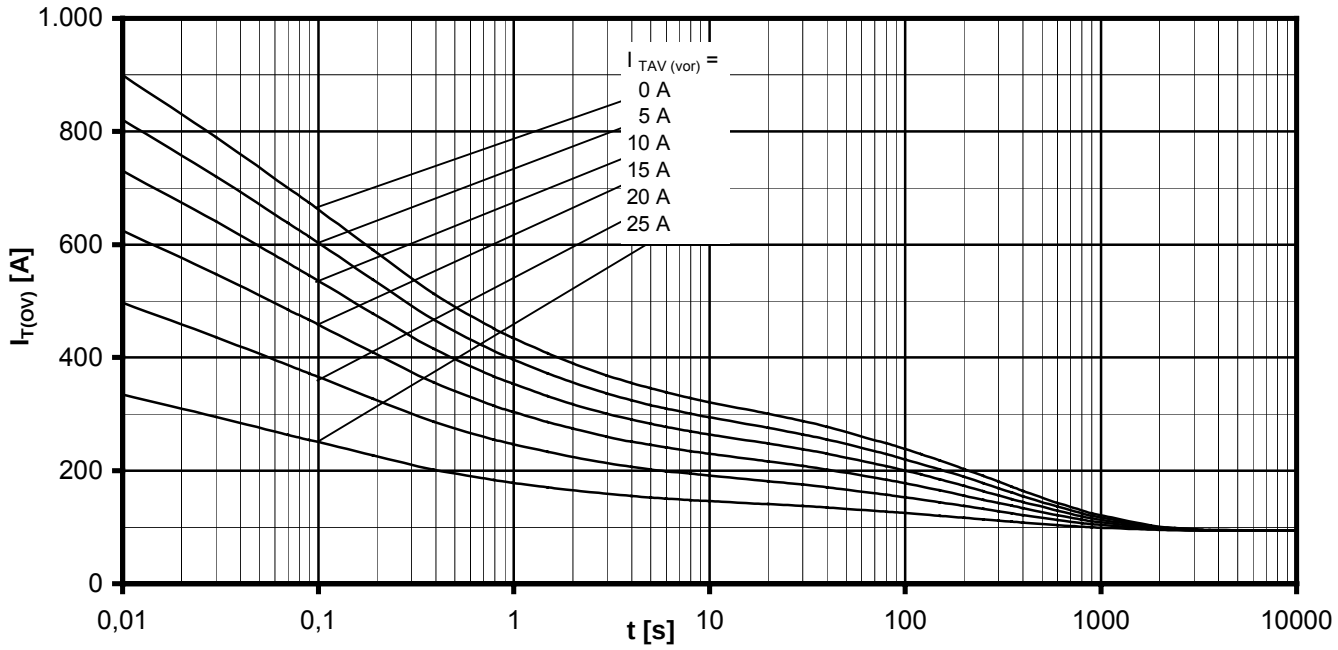


Grenzstrom / Maximum overload on-state current $I_{T(OV)M} = f(t)$, $v_{RM} = 0{,}8\ V_{RRM}$

Leerlauf / No-load conditions

a: T_A = 35°C, verstärkte Luftkühlung / Forced air cooling

b: T_A = 45°C, natürliche Luftkühlung / Natural air cooling

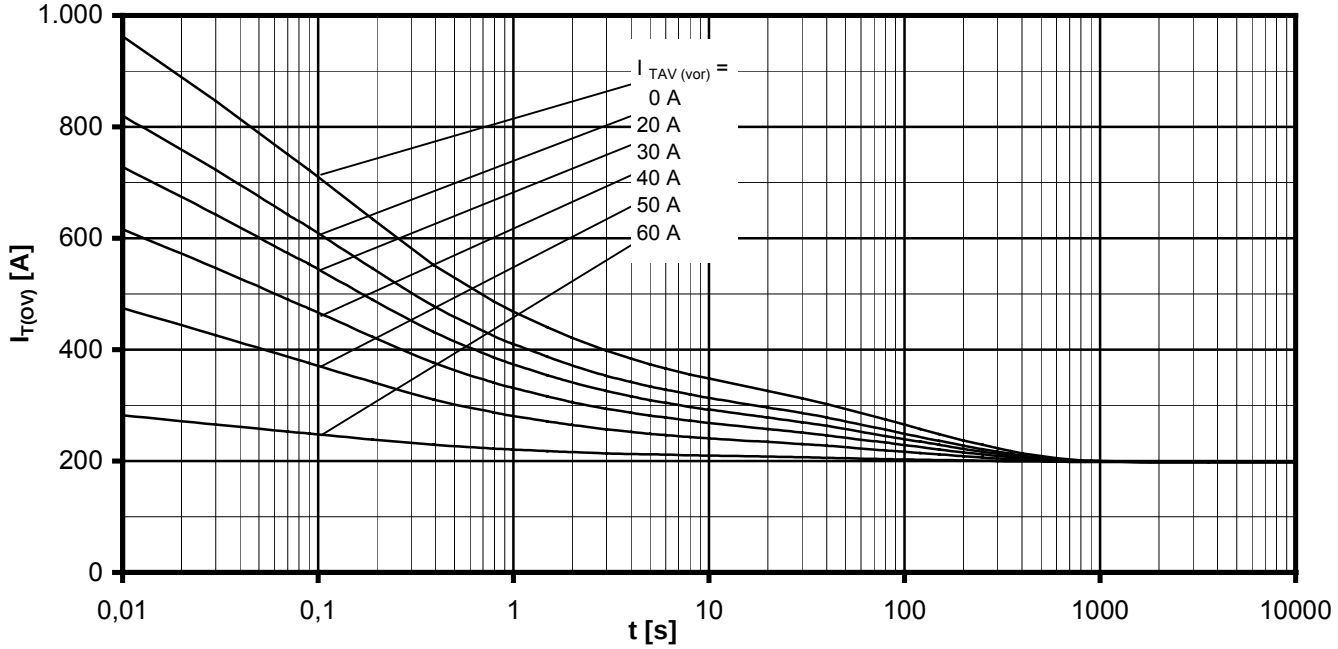


Überstrom je Zweig / Overload on-state current $I_{F(OV)}$

B6- Sechspuls-Brückenschaltung, 120° Rechteck / Six-pulse bridge circuit, 120° rectangular

Kühlkörper / Heatsink type KM14 (50W) Natürliche Kühlung bei / Natural cooling at T_A = 45°C

Parameter: Vorlaststrom je Zweig / Pre-load current per arm $I_{FAV(vor)}$



Überstrom je Zweig / Overload on-state current $I_{F(OV)}$

B6- Sechspuls-Brückenschaltung, 120° Rechteck / Six-pulse bridge circuit, 120° rectangular

Kühlkörper / Heatsink type KM14 (Papst 4650N) Verstärkte Kühlung bei / Forced cooling at T_A = 35°C

Parameter: Vorlaststrom je Zweig / Pre-load current per arm $I_{FAV(vor)}$