

Technische Information / technical information



Netz-Thyristor-Modul
Phase Control Thyristor Module

TT500N

Infineon Technologies Bipolar
GmbH & Co. KG

Key Parameters

V_{DRM} / V_{RRM}	1200 - 1800V
I_{TAVM}	500A ($T_C=85^\circ\text{C}$)
I_{TSM}	17000A
V_{T0}	0,85V
r_T	0,35m Ω
R_{thJC}	0,055K/W
Base plate	60mm
Weight	1450g



For type designation please refer to actual short form catalog

<http://www.ifbip.com/catalog>

Merkmale

- Druckkontakt-Technologie für hohe Zuverlässigkeit
- Advanced Medium Power Technology (AMPT)
- Industrie-Standard-Gehäuse
- Elektrisch isolierte Bodenplatte
- Optional: Thermisches Interface Material (TIM) bereits aufgetragen

Features

- Pressure contact technology for high reliability
- Advanced Medium Power Technology (AMPT)
- Industrial standard package
- Electrically insulated base plate
- Option: Pre-applied thermal interface material (TIM)

Typische Anwendungen

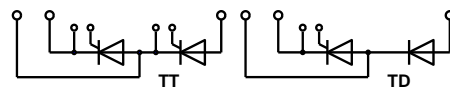
- Sanftanlasser
- Gleichrichter für Antriebsapplikationen
- Kurzschließer-Applikationen
- Leistungssteller
- Gleichrichter für UPS
- Batterieladegleichrichter
- Statische Umschalter

Typical Applications

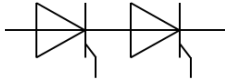
- Soft starter
- Rectifier for drives applications
- Crowbar applications
- Power controllers
- Rectifiers for UBS
- Battery chargers
- Static switches



content of customer DMX code	DMX code digit	DMX code digit quantity
serial number	1..5	5
SAP material number	6..12	7
Internal production order number	13..20	8
datecode (production year)	21..22	2
datecode (production week)	23..24	2



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TD500N

TT500N16KOF_TIM

TD500N16KOF_TIM

Elektrische Eigenschaften / Electrical properties

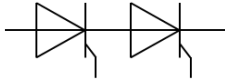
Höchstzulässige Werte / Maximum rated values

Periodische Vorwärts- und Rückwärts-Spitzensperrspannung repetitive peak forward off-state and reverse voltages	$T_{vj} = -40^{\circ}\text{C} \dots T_{vj\text{ max}}$	$V_{\text{DRM}}, V_{\text{RRM}}$	1200 1600	1400 1800	V V
Vorwärts-Stoßspitzensperrspannung non-repetitive peak forward off-state voltage	$T_{vj} = -40^{\circ}\text{C} \dots T_{vj\text{ max}}$	V_{DSM}	1200 1600	1400 1800	V V
Rückwärts-Stoßspitzensperrspannung non-repetitive peak reverse voltage	$T_{vj} = +25^{\circ}\text{C} \dots T_{vj\text{ max}}$	V_{RSM}	1300 1700	1500 1900	V V
Durchlaßstrom-Grenzeffektivwert maximum RMS on-state current		I_{TRMSM}		900	A
Dauergrenzstrom average on-state current	$T_{\text{C}} = 85^{\circ}\text{C}$	I_{TAVM}		500	A
Stoßstrom-Grenzwert surge current	$T_{vj} = 25^{\circ}\text{C}, t_{\text{p}} = 10\text{ms}$ $T_{vj} = T_{vj\text{ max}}, t_{\text{p}} = 10\text{ms}$	I_{TSM}		17000 14500	A A
Grenzlastintegral I^2t -value	$T_{vj} = 25^{\circ}\text{C}, t_{\text{p}} = 10\text{ms}$ $T_{vj} = T_{vj\text{ max}}, t_{\text{p}} = 10\text{ms}$	I^2t		1445000 1051000	A^2s A^2s
Kritische Stromsteilheit critical rate of rise of on-state current	DIN IEC 747-6 $f = 50\text{Hz}, i_{\text{GM}} = 1\text{A}, di_{\text{G}}/dt = 1\text{A}/\mu\text{s}$	$(di_{\text{T}}/dt)_{\text{cr}}$		200	$\text{A}/\mu\text{s}$
Kritische Spannungssteilheit critical rate of rise of off-state voltage	$T_{vj} = T_{vj\text{ max}}, V_{\text{D}} = 0,67 V_{\text{DRM}}$ 6.Kennbuchstabe / 6 th letter C	$(dv_{\text{D}}/dt)_{\text{cr}}$		1000	$\text{V}/\mu\text{s}$

Charakteristische Werte / Characteristic values

Durchlaßspannung on-state voltage	$T_{vj} = T_{vj\text{ max}}, i_{\text{T}} = 1700\text{ A}$	V_{T}	max.	1,45	V
Schleusenspannung threshold voltage	$T_{vj} = T_{vj\text{ max}}$	$V_{(\text{TO})}$	max.	0,85	V
Ersatzwiderstand slope resistance	$T_{vj} = T_{vj\text{ max}}$	r_{T}	max.	0,35	m Ω
Zündstrom gate trigger current	$T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12\text{V}$	I_{GT}	max.	250	mA
Zündspannung gate trigger voltage	$T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12\text{V}$	V_{GT}	max.	2,2	V
Nicht zündender Steuerstrom gate non-trigger current	$T_{vj} = T_{vj\text{ max}}, V_{\text{D}} = 12\text{V}$ $T_{vj} = T_{vj\text{ max}}, V_{\text{D}} = 0,5 V_{\text{DRM}}$	I_{GD}	max. max.	10 5	mA mA
Nicht zündende Steuerspannung gate non-trigger voltage	$T_{vj} = T_{vj\text{ max}}, V_{\text{D}} = 0,5 V_{\text{DRM}}$	V_{GD}	max.	0,25	V
Haltestrom holding current	$T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12\text{V}, R_{\text{A}} = 1\Omega$	I_{H}	max.	300	mA
Einraststrom latching current	$T_{vj} = 25^{\circ}\text{C}, V_{\text{D}} = 12\text{V}, R_{\text{GK}} \geq 10\Omega$ $i_{\text{GM}} = 1\text{A}, di_{\text{G}}/dt = 1\text{A}/\mu\text{s}, t_{\text{g}} = 20\mu\text{s}$	I_{L}	max.	1500	mA
Vorwärts- und Rückwärts-Sperrstrom forward off-state and reverse current	$T_{vj} = T_{vj\text{ max}}$ $V_{\text{D}} = V_{\text{DRM}}, V_{\text{R}} = V_{\text{RRM}}$	$i_{\text{D}}, i_{\text{R}}$	max.	100	mA
Zündverzug gate controlled delay time	DIN IEC 747-6 $T_{vj} = 25^{\circ}\text{C}, i_{\text{GM}} = 1\text{A}, di_{\text{G}}/dt = 1\text{A}/\mu\text{s}$	t_{gd}	max.	4	μs

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Elektrische Eigenschaften / Electrical properties
Charakteristische Werte / Characteristic values

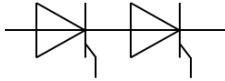
Freiwerdezeit circuit commutated turn-off time	$T_{vj} = T_{vj\ max}$, $i_{TM} = I_{TAVM}$ $V_{RM} = 100\ V$, $v_{DM} = 0,67\ V_{DRM}$ $dv_D/dt = 20\ V/\mu s$, $-di_T/dt = 10\ A/\mu s$ 5.Kennbuchstabe / 5 th letter O	t_q	typ.	250	μs
Isolations-Prüfspannung insulation test voltage	RMS, $f = 50\ Hz$, $t = 1\ min$ RMS, $f = 50\ Hz$, $t = 1\ sec$	V_{ISOL}		3,0 3,6	kV kV

Thermische Eigenschaften / Thermal properties

Innerer Wärmewiderstand thermal resistance, junction to case	pro Modul / per Module, $\Theta = 180^\circ\ sin$ pro Zweig / per arm, $\Theta = 180^\circ\ sin$ pro Modul / per Module, DC pro Zweig / per arm, DC	R_{thJC}	max.	0,0290	K/W
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per Module pro Zweig / per arm	R_{thCH}	max.	0,01	K/W
Übergangs-Wärmewiderstand mit TIM thermal resistance, case to heatsink, with TIM	pro Modul / per Module pro Zweig / per arm		max.	0,0075	K/W
Höchstzulässige Sperrschichttemperatur maximum junction temperature		$T_{vj\ max}$		125	$^\circ C$
Betriebstemperatur operating temperature		$T_{c\ op}$		-40...+125	$^\circ C$
Lagertemperatur storage temperature		T_{stg}		-40...+130	$^\circ C$
Lagertemperatur mit TIM storage temperature with TIM				+5...+50	$^\circ C$

Mechanische Eigenschaften / Mechanical properties

Gehäuse, siehe Anlage case, see annex				Seite 4 page 4	
Si-Element mit Druckkontakt Si-pellet with pressure contact					
Innere Isolation internal insulation	Basisisolierung (Schutzklasse 1, EN61140) Basic insulation (class 1, IEC61140)			AIN	
Anzugsdrehmoment für mechanische Anschlüsse mounting torque	Toleranz / Tolerance $\pm 15\%$	M1		6	Nm
Anzugsdrehmoment für elektrische Anschlüsse terminal connection torque	Toleranz / Tolerance $\pm 10\%$	M2		12	Nm
Steueranschlüsse control terminals	DIN 46 244			A 2,8 x 0,8	
Gewicht weight		G	typ.	1450	g
Kriechstrecke creepage distance				19	mm
Schwingfestigkeit vibration resistance	$f = 50\ Hz$			50	m/s^2
	file-No.			E 83335	



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**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} [K/W]	0,019	0,019	0,0111	0,00486	0,00137		
τ_n [s]	3,12	0,56	0,101	0,0086	0,00076		

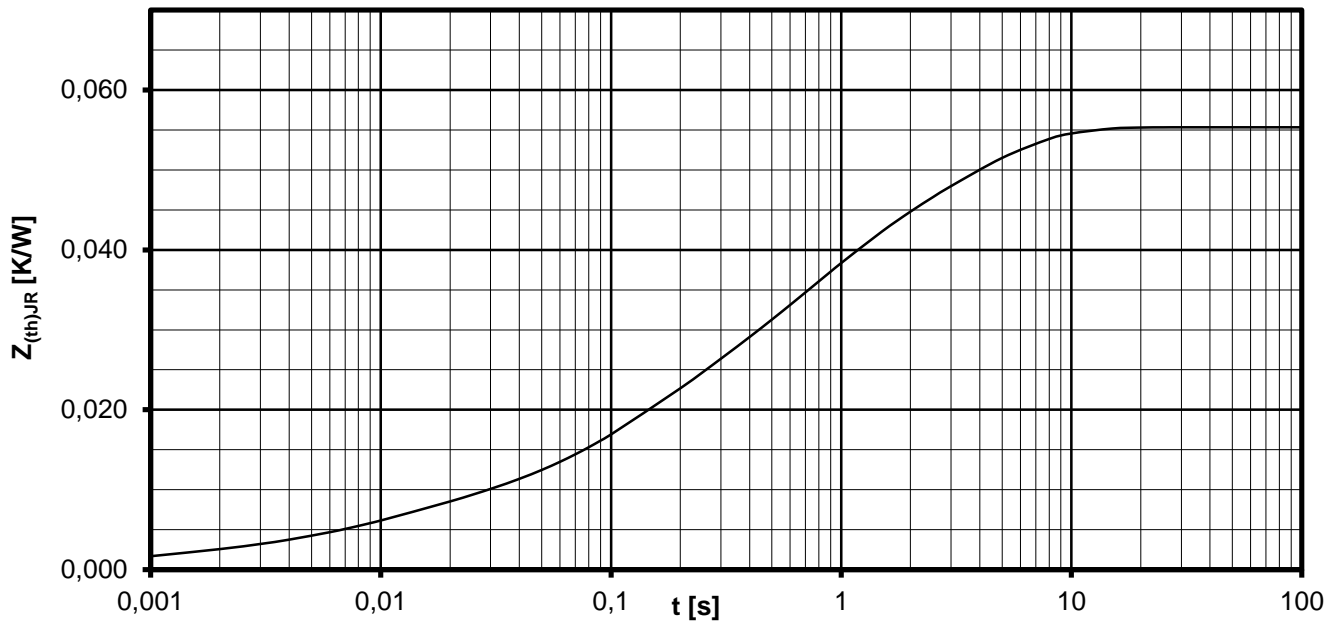
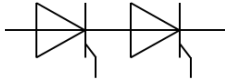
Analytische Funktion / Analytical function:
$$Z_{thJC} = \sum_{n=1}^{n_{max}} R_{thn} \left(1 - e^{-\frac{t}{\tau_n}} \right)$$

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

	$\Theta = 180^\circ$	$\Theta = 120^\circ$	$\Theta = 90^\circ$	$\Theta = 60^\circ$	$\Theta = 30^\circ$
$\Delta Z_{th \Theta rec}$ [K/W]	0,00466	0,00760	0,00988	0,01362	0,02118
$\Delta Z_{th \Theta sin}$ [K/W]	0,00272	0,00390	0,00547	0,00833	0,01577

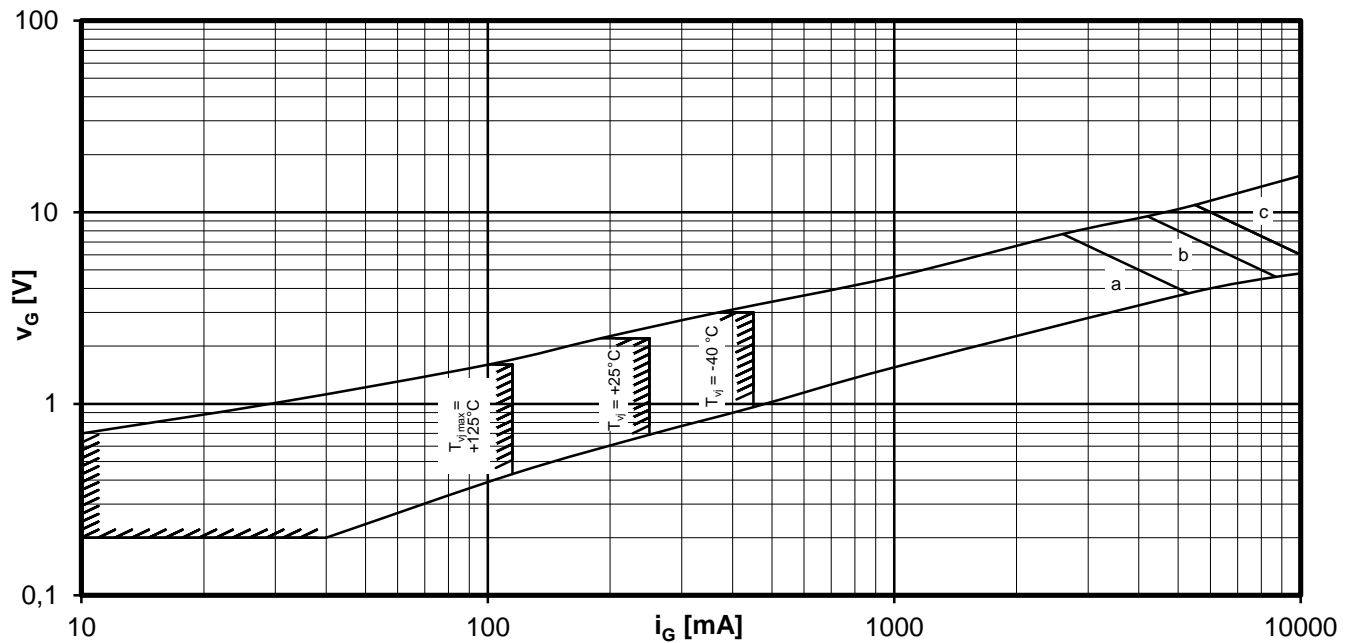
$$Z_{th \Theta rec} = Z_{thDC} + \Delta Z_{th \Theta rec}$$

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



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

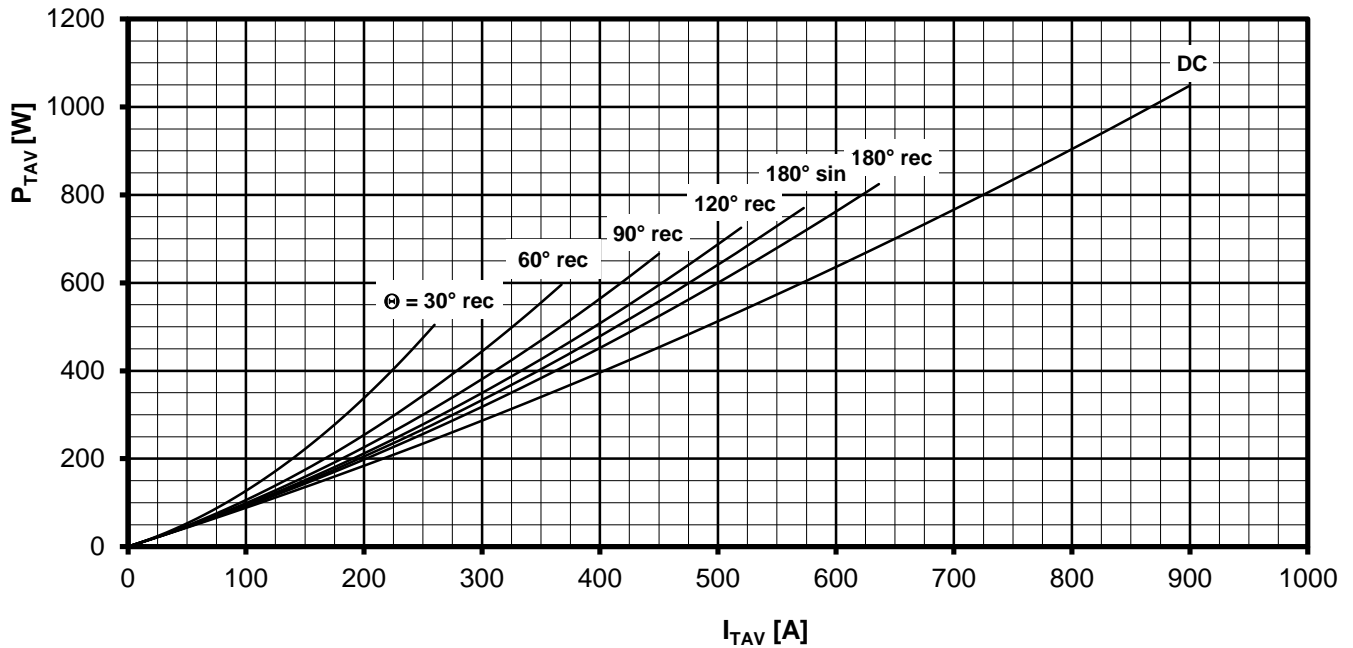
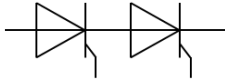
Parameter: Stromflußwinkel Θ / Current conduction angle Θ



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

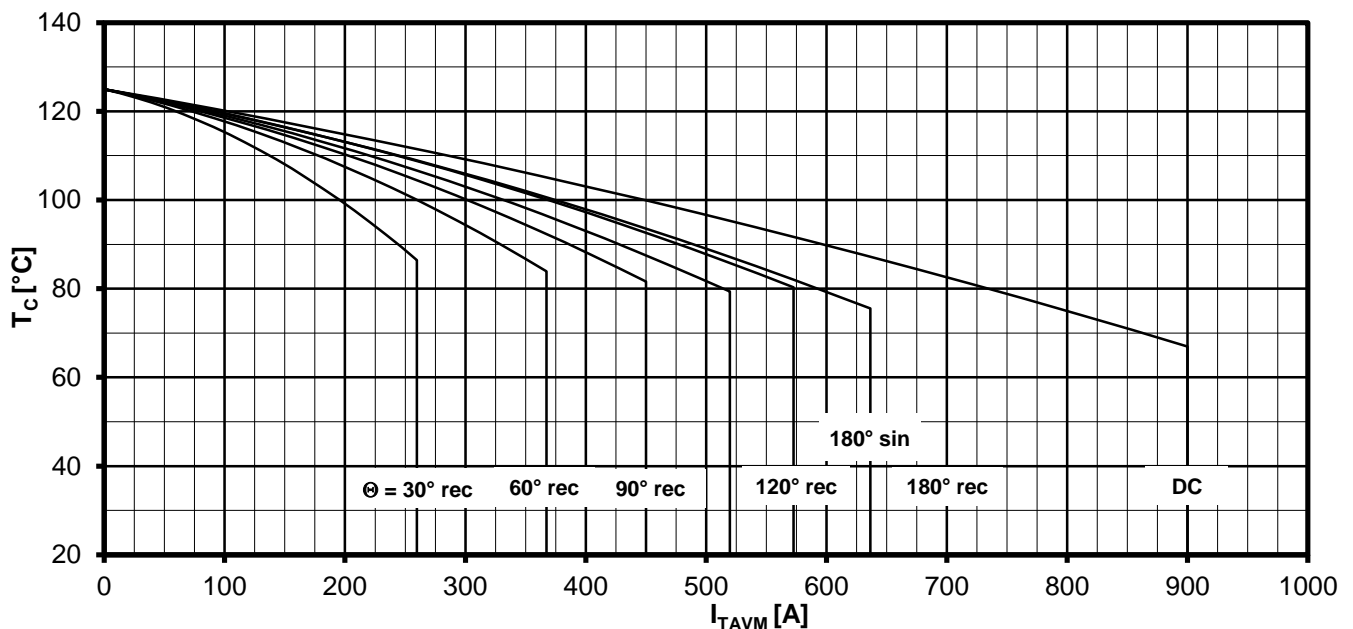


Durchlassverlustleistung je Zweig / On-state power loss per arm $P_{TAV} = f(I_{TAV})$

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

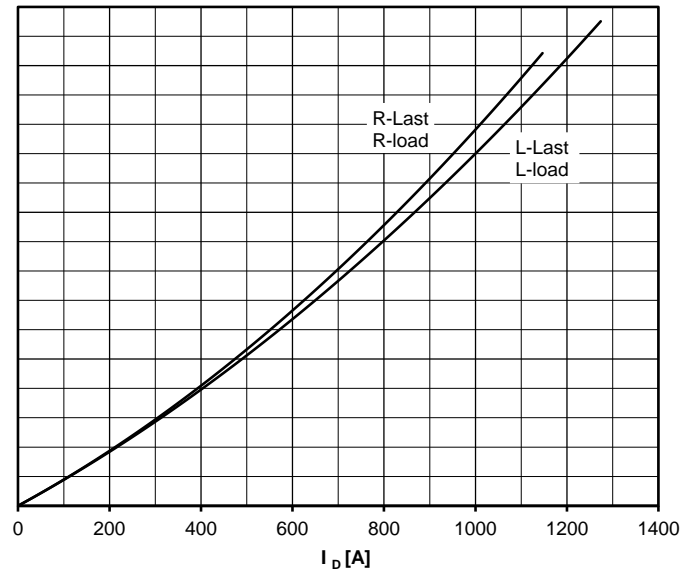
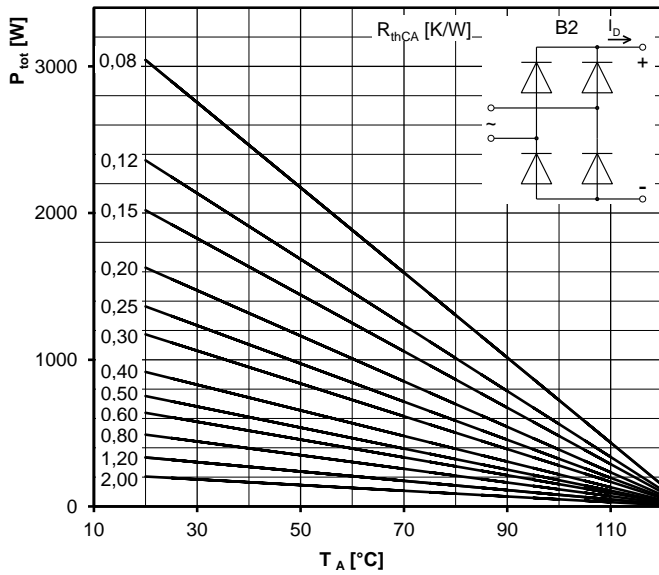
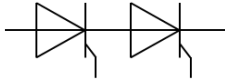


Höchstzulässige Gehäusetemperatur / Maximum allowable case temperature $T_C = f(I_{TAVM})$

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



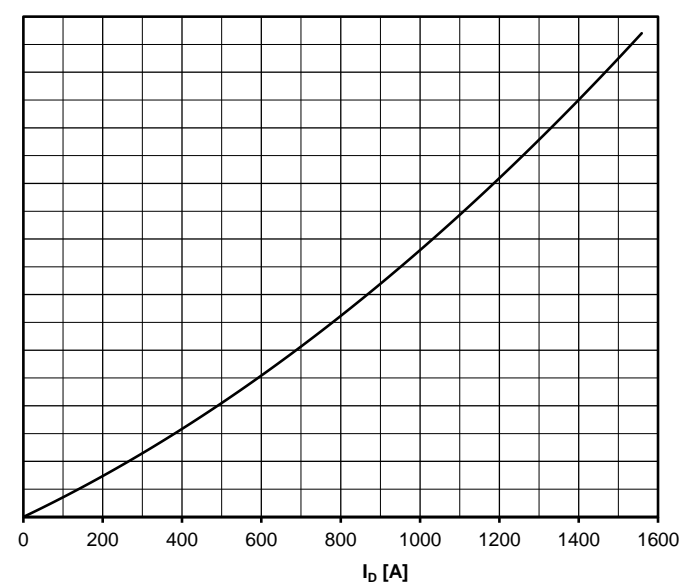
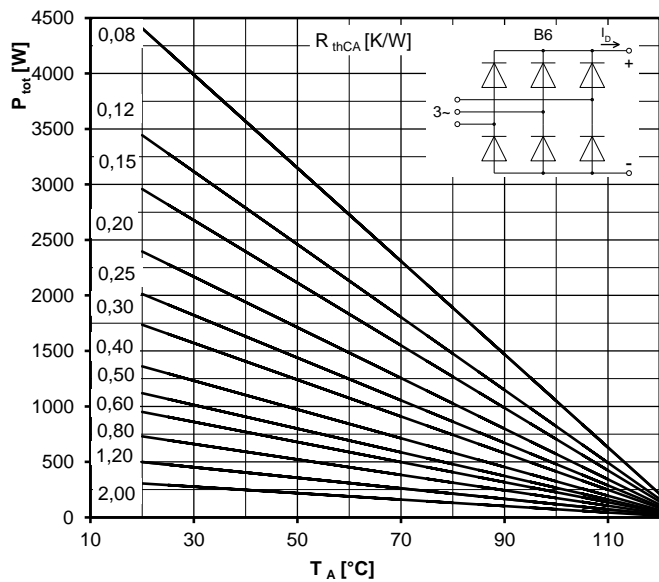
Höchstzulässiger Ausgangsstrom / Maximum rated output current I_D

B2- Zweipuls-Brückenschaltung / Two-pulse bridge circuit

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

Parameter:

Wärmewiderstand pro Element zwischen den Gehäusen und Umgebung /
Thermal resistance per chip cases to ambient R_{thCA}



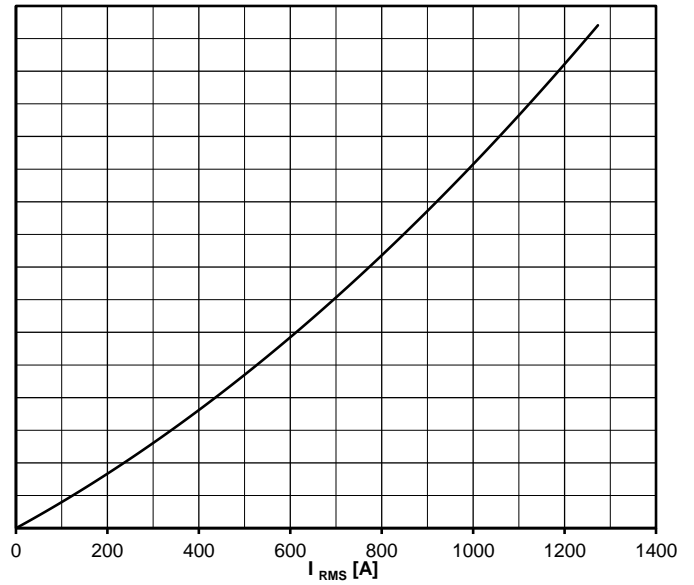
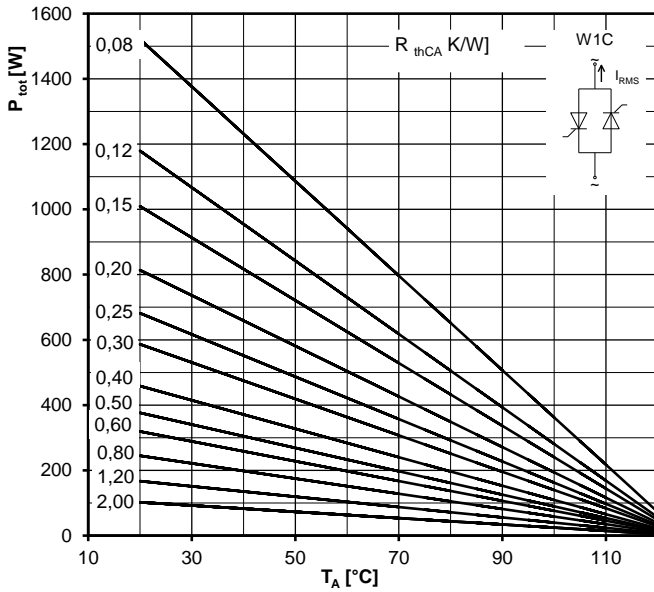
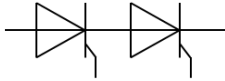
Höchstzulässiger Ausgangsstrom / Maximum rated output current I_D

B6- Sechspuls-Brückenschaltung / Six-pulse bridge circuit

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

Parameter:

Wärmewiderstand pro Element zwischen den Gehäusen und Umgebung /
Thermal resistance per chip cases to ambient R_{thCA}



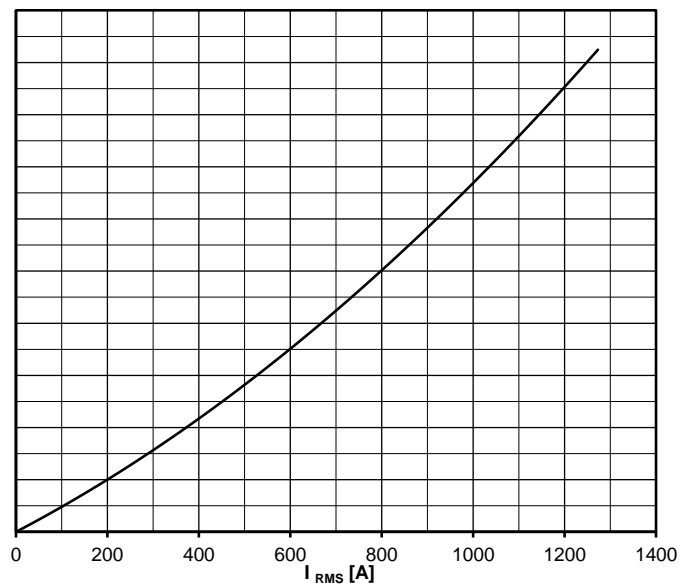
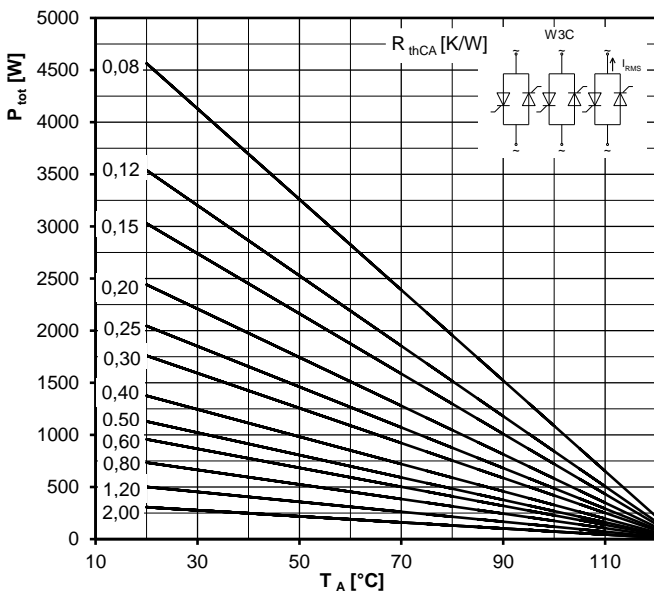
Höchstzulässiger Effektivstrom / Maximum rated RMS current I_{RMS}

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

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

Parameter:

Wärmewiderstand pro Element zwischen den Gehäusen und Umgebung /
Thermal resistance per chip cases to ambient R_{thCA}



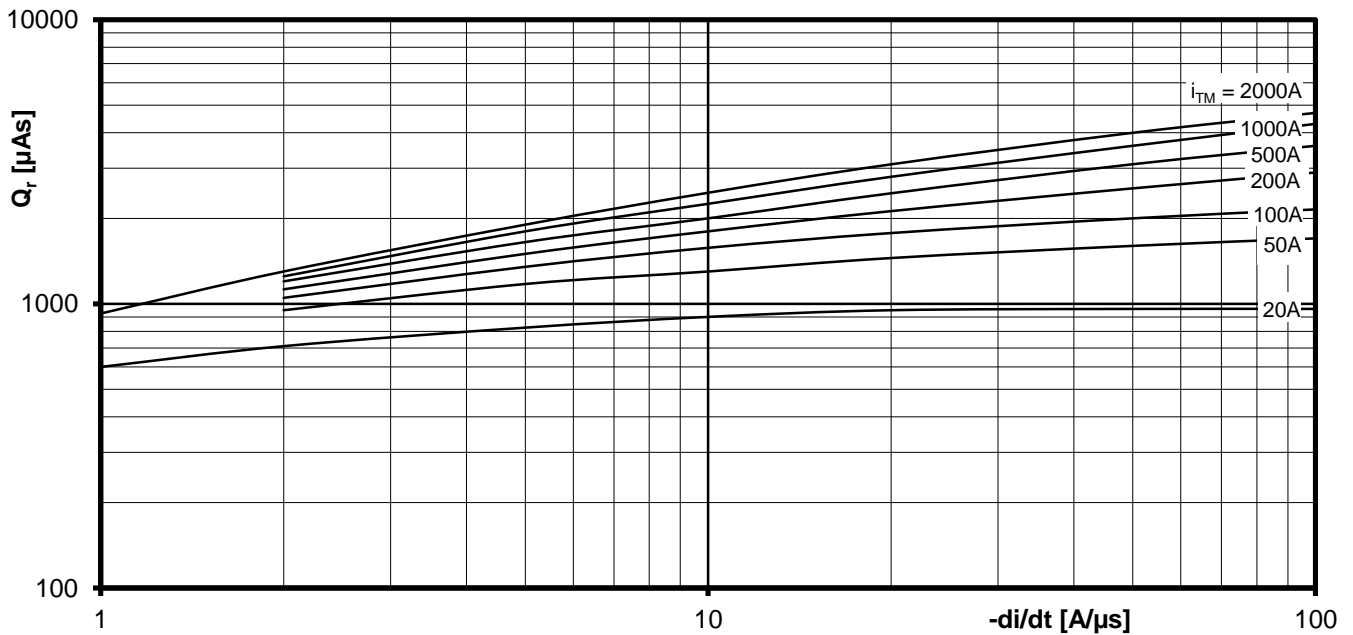
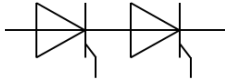
Höchstzulässiger Effektivstrom / Maximum rated RMS current I_{RMS}

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

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

Parameter:

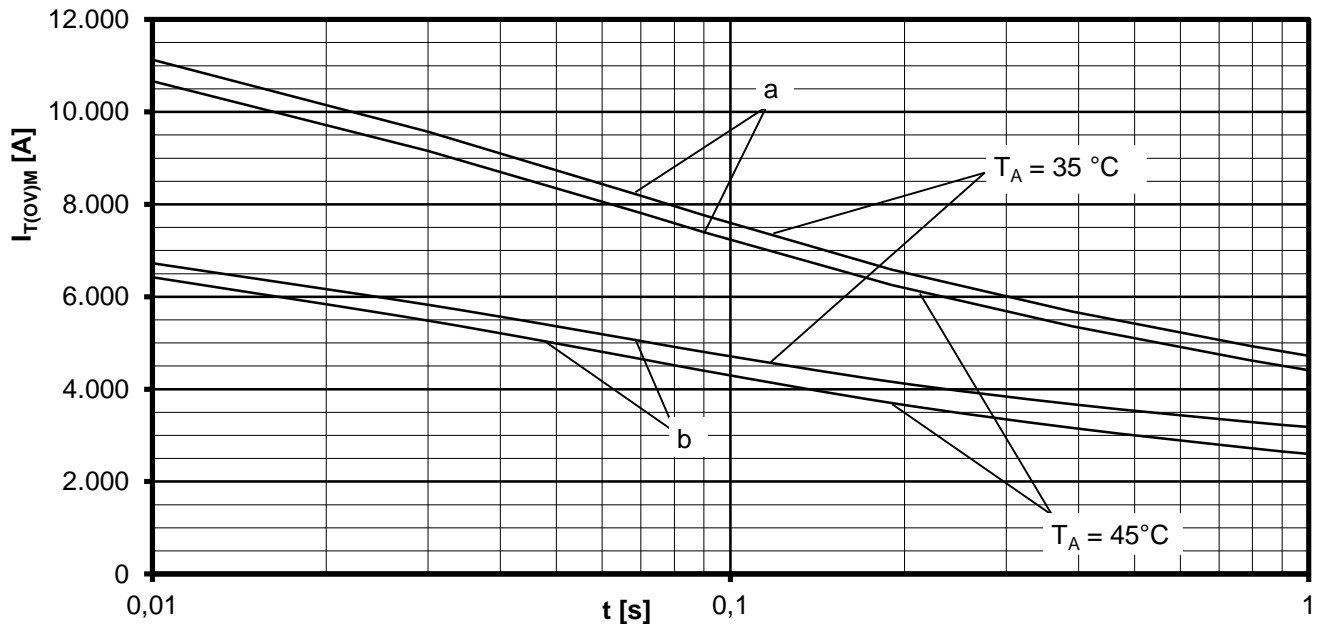
Wärmewiderstand pro Element zwischen den Gehäusen und Umgebung /
Thermal resistance per chip cases to ambient R_{thCA}



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 $I_{T(OV)M} = f(t), v_{RM} = 0,8 V_{RRM}$

a: Leerlauf / No-load conditions

b: nach Belastung mit I_{TAVM} / after load with I_{TAVM}

$T_A = 35^\circ\text{C}$, verstärkte Luftkühlung / Forced air cooling

$T_A = 45^\circ\text{C}$, Luftselbstkühlung / Natural air cooling